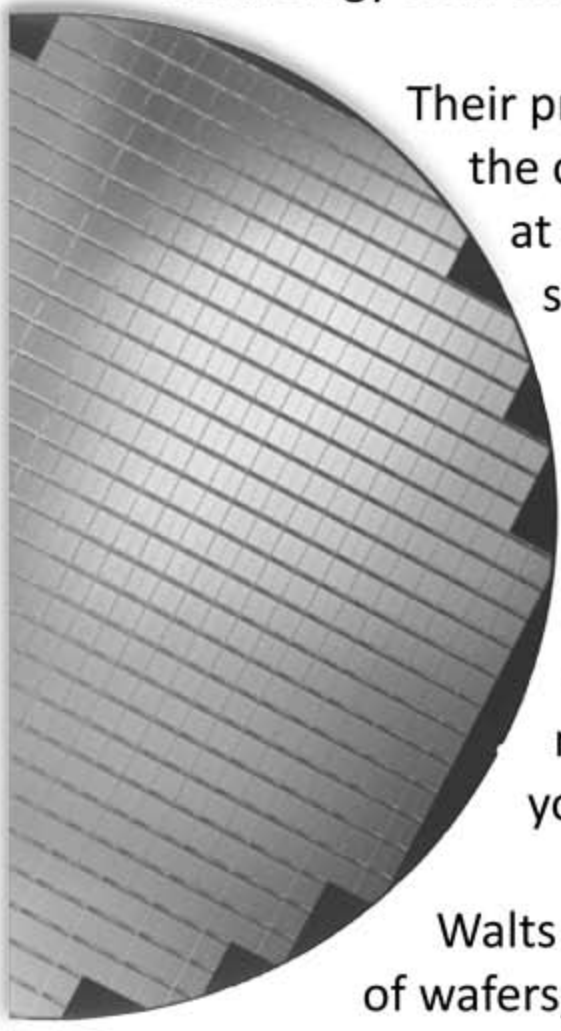
CELEBRATING 20 YEARS ANNIVERSARY

Practical components

# Dummy Components
# Solder Practice Kits
# Qualification PCBs
# Tools & Supplies

# Advanced Test Wafers

Waltz Co., Ltd. brings together state-of-the-art technology and extensive knowledge that they have cultivated over the years and is constantly opening up the next-generation electronic assembly and mounting technology with the semiconductors of tomorrow.



Their products are used as the de-facto standard of the component mounting industry worldwide and at the most advanced research and development sites.

Experienced electronic designers worldwide not only use Walts standard products but also their custom products that exactly meet the customer needs. At Walts they have experienced designers that can also custom make TEG (Test Element Groups) to better suit your needs.

Walts supports a wide variety of thin processing of wafers, film formation, sputtering, deposition, back grinding, dicing, bump forming, assemblies and various analyses are all available.

**Walts Co., Ltd. Superior-quality products and services. Made in Japan!**

*Distributor of mechanical IC samples (dummy components), test boards, kits and SMD production tools and equipment.*

## Frequently Asked Questions

### What are dummy components?*

Dummy components are the exact mechanical equivalent of functional electronic components.

### Why use dummy components?

Dummies save money. In cases where only mechanical characteristics are required, dummy components can be used instead of live functioning components. Since there is no expensive die inside the package, the cost for performing mechanical testing is significantly lower.

### Who is Practical Components?

Practical Components is a team of dedicated electronic industry professionals offering value pricing, on-time delivery, and superior service to our customers. The Practical Components team is ready to provide project assistance in the areas of technical component knowledge, drawings, component land patterns, and PCB practice kits.

### What is a PCB Practice Kit?

A PCB Practice Kit contains both the PC practice board and the necessary dummy components so customers can conduct assembly process evaluation without using high-cost, live components and functional PC boards. Kits are available in a single pack for employee hand soldering training or packaged for production equipment evaluation. Both X, Y Theta data and Gerber data are available without charge.

### What other products are offered by Practical Components?

In addition to dummy components, Practical carries solder training aids, tools and related equipment, IPC products and designs custom printed circuit boards. Your sales representative can supply technical information and pricing on all our products.

### Who uses dummy components?

Companies that are involved with electronic component assembly, testing, evaluation and employee training.

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## Contact Practical Components

If you have any additional questions concerning Practical Components, our products or policies, please contact us.

**Practical Components, Inc.**
10762 Noel Street
Los Alamitos, CA 90720 USA
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Sales..... Lisa Laphen / llaphen@TrustPCI.com
Technical Support..... techsupport@TrustPCI.com
Purchasing/Distributors.....Deanne Guzman / dguzman@TrustPCI.com
President.....Kevin Laphen / klaphen@TrustPCI.com

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* Disclaimer: Dummy components are only to be used for evaluation and testing purposes. Practical Components is not responsible for product that is used as a "live" package using live die assembly. Dummy samples are not to be used for 1st reliability testing.

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

## How To Place Your Order

Our sales staff is ready to serve you from 8:00 A.M. to 5 P. M. Pacific Standard Time, Monday through Friday. Our fax lines are open 24 hours every day.

Fax and E-mail orders received after normal business hours are processed the next business day. Please include your telephone and fax numbers so we can confirm your order.

Our website www.TrustPCI.com is always available and is loaded with valuable information about our products including detailed component drawings, daisy-chain patterns, white papers, photos and data sheets. The site has many products such as hand solder training kits available for purchase online.

## Bill / Remit to:

Practical Components, Inc.
PO Box 1037
Los Alamitos, CA 90720-1037 USA

## Ship to:

Practical Components, Inc.
10762 Noel Street
Los Alamitos, CA 90720 USA

Tel: 1-714-252-0010
Fax: 1-714-252-0026
E-mail: klaphen@practicalcomponents.com
Web Site: www.TrustPCI.com

*F.O.B. is Los Alamitos, CA USA*

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## Terms and Conditions

**Out Of Stock Items:** Items not available for immediate shipment will be shipped as they become available. Items not available at the end of 90 days will be cancelled. The number of back-ordered days may be extended beyond 90 days with customer approval.

**Return Policy:** Returns must be made promptly and accompanied by a return authorization number. Please contact a customer service representative to obtain a return authorization number. All returns must be made within 30 days of date of invoice and accompanied by return authorization number.

- Return freight charges must be prepaid.
- C.O.D. returns cannot be accepted.
- Return merchandise in original packaging and in resalable condition.
- Please note that items returned due to customer error may be subject to a restocking charge of 25%.
- Non-catalog items are not returnable.

**Catalog Listings:** Not all products listed in this catalog are maintained in stock, and all product specifications for each product are current as of the date of publication. Product listings, specifications and prices for each product are subject to change without notice.

**Product Liability:** Practical Components' sole obligation for products that prove to be defective within 10 days of purchase will be replaced or refunded. Practical Components gives no warranty either expressed or implied and specifically disclaims all other warranties, including warranties for merchantability and fitness.

In no event shall Practical Components' liability exceed the buyer's purchase price nor shall Practical Components be liable for any indirect or consequential damages.

**Shipment Damage:** Merchandise is carefully packaged in compliance with carrier requirements. Claims for loss or damage in transit must be made with the carrier by the customer. All shipments should be unpacked and inspected immediately upon receipt. If damage does not become apparent until shipment is unpacked, make a request for inspection by the carrier's agent. Failure to do so will result in the carrier refusing to honor the claim.

**Non-Catalog Items:** Merchandise not listed in our catalog, if available from our suppliers, may be subject to minimum order quantities and/or special handling charges. Shipment is made as quickly as deliveries are received from our suppliers. Special order products are sold on a non-returnable basis.

**Quotations:** All items are subject to prior sale. A quote is valid for 30 days.

**Dishonored Check Policy:** If a check you give us as payment is dishonored for any reason by the bank or any other institution on which it is drawn, you agree to pay us $20.00 as a service charge. In addition, you agree to pay any other reasonable charges imposed by any check verification company or collection agency that we may use for collection.

**Prices/Quantities:** Prices are subject to change without notice and quantities may be limited.

**Handling Charge:** A $10.00 handling charge applies to all orders less than $50.00.

**Terms:** We accept Visa, MasterCard and American Express (minimum order is $50.00).

**Open Account:** We bill on a net 30–day basis to customers with approved credit.

**Large Quantity Quotations:** Practical Components will be happy to quote quantities in excess of the amounts shown in the catalog.

**Freight Charges:** On open accounts, actual freight charges are added to the invoice. A packing and handling fee of $5.00 is added to the order. C.O.D accounts will have the freight charges pre-billed to the C.O.D. total in addition to a $5.00 packing and handling charge.

**Tray Charge:** A $8.00 tray charge is added if customer orders less than a full tray quantity.

**Special Requirements:** Please include specific instructions if you require special packing, marking, shipping, routing or insurance.

*All prices are in USD ($).

# Table of Contents

# CSPnl (RDL) Wafer

NEW!

Practical Components introduces new CSPnl (RDL) dummy wafers from Amkor. The CSPnl Bump on Redistribution (RDL) option adds a plated copper redistribution layer to route I/O pads to JEDEC/EIAJ standard pitches, avoiding the need to redesign legacy parts for CSP applications. Nickel-based or copper UBM is offered, along with polyimide or PBO repassivation. CSPnl with RDL utilizes industry-standard surface mount assembly and reflow techniques, and does not require underfill.

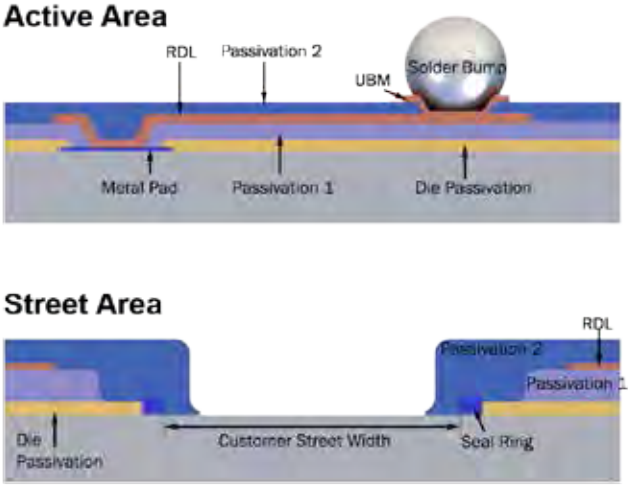
This 8 inch wafer can be provided diced into individual die or as an uncut wafer. The wafer can be provided with SAC405 bumps.

Pad pitch is 400um (0.4mm). Wafer thickness is 725um, with back grinding available to 200um.

Pads on this wafer are daisy chained and can be cut to any sized request. Packaging is tape and reel bumps down for cut die or cut and in the ring. Uncut 8inch wafers are shipped in plastic wafer packs. There is a lot of flexibility with this type of component.

In addition to the wafer Practical Components can also provide a test board (substrate) on request.

Please call our technical representatives at 714-252-0010 for additional information.




| Part Description | I/O Count | Die Size | Pitch | Matrix | Projected Die Yield | Alloy |
|---|---|---|---|---|---|---|
| A-CSPnl4-0.76mm-.4mm-DC | 4 | 0.76 | .4mm | 2x2 | 40,000 | SAC405, No Solder Ball |
| A-CSPnl16-1.56mm-.4mm-DC | 16 | 1.56 | .4mm | 4x4 | 10,000 | SAC405, No Solder Ball |
| A-CSPnl36-2.36mm-.4mm-DC | 36 | 2.36 | .4mm | 6x6 | 4,500 | SAC405, No Solder Ball |
| A-CSPnl64-3.16mm-.4mm-DC | 64 | 3.16 | .4mm | 8x8 | 2,500 | SAC405, No Solder Ball |
| A-CSPnl100-3.96mm-.4mm-DC | 100 | 3.96 | .4mm | 10x10 | 1,500 | SAC405, No Solder Ball |
| A-CSPnl144-4.76mm-.4mm-DC | 144 | 4.76 | .4mm | 12x12 | 1,000 | SAC405, No Solder Ball |
| A-CSPnl196-5.56mm-.4mm-DC | 196 | 5.56 | .4mm | 14x14 | 500 | SAC405, No Solder Ball |

***Notes***

- Trace material: Copper
- Trace thickness: 3um
- Trace width: 100um
- Bump pad shape: Circular / Square
- Bump pad size: 225/290um
- Tape and Reel: Width = 8mm Pitch = 4mm
- 0.3mm & 0.5mm Pitch packages are available. Please call for more information.

***Part Description System***

Amkor A CSPnl 100 3.96mm .4mm DC Alloy

- Wafer
- I/O Count
- Die Size
- Pitch
- Daisy Chain
- (NB, SAC405)

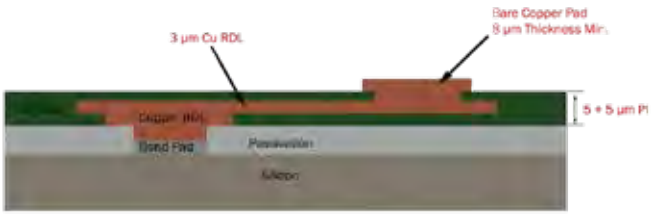
- Add "WR" to end of part number for Wafer Cut and left in Seal Ring.
- Add "TR" to end of part number for die on Tape and Reel.
- Add "NB" to end of part number for No Solder Balls.
- Add "SAC405" to end of part number for Lead-Free.
- Add "W" to end of part number for Uncut Wafer.

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

# eWLP Embeded Wafer Level Package

NEW!

Practical Components is offering Amkor's embedded copper posts/ pad on a eWLP (embedded Wafer Level Package) 8 inch wafer. eWLP wafers have copper posts that are embedded into the die. Size of the posts is 8um to 10um. Pitch between the copper posts is 400um (0.4mm).




Wafer thickness is 725um and can be back grinded to 200um.

These wafers can be supplied by uncut wafer or cut die, packaged on tape and reel with pads down. Copper pillar dummy test wafers provide an excellent opportunity to investigate the effectiveness of the flip chip die attach process.

Practical Components technical staff can provide additional information on the new Amkor eWLP test wafers. In addition to the wafers and die, Practical can supply test vehicles for the eWLP test die.

Each die is daisy chained and customer can have the wafer cut to match a required die size.

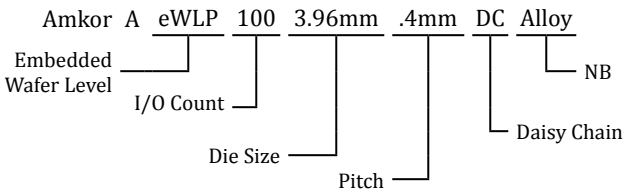
Call for more information: (714) 252-0010

| Part Description | I/O Count | Die Size | Pitch | Matrix | Projected Die Yield | Alloy |
|---|---|---|---|---|---|---|
| A-eWLP4-0.76mm-.4mm-DC | 4 | 0.76 | .4mm | 2x2 | 40,000 | No Solder Ball |
| A-eWLP16-1.56mm-.4mm-DC | 16 | 1.56 | .4mm | 4x4 | 10,000 | No Solder Ball |
| A-eWLP36-2.36mm-.4mm-DC | 36 | 2.36 | .4mm | 6x6 | 4,500 | No Solder Ball |
| A-eWLP64-3.16mm-.4mm-DC | 64 | 3.16 | .4mm | 8x8 | 2,500 | No Solder Ball |
| A-eWLP100-3.96mm-.4mm-DC | 100 | 3.96 | .4mm | 10x10 | 1,500 | No Solder Ball |
| A-eWLP144-4.76mm-.4mm-DC | 144 | 4.76 | .4mm | 12x12 | 1,000 | No Solder Ball |
| A-eWLP196-5.56mm-.4mm-DC | 196 | 5.56 | .4mm | 14x14 | 500 | No Solder Ball |

### *Notes*

- Ball Place or Electroplated: Electroplated
- Bump On Pad or redistribution Layer: Redistribution Layer
- Bump Material: Cu bump
- Bump Height: 10 um
- Bump pitch: 400 um
- Bump Shear Strength: >2 g/mil2
- Plating Area 30: 5948 mm2
  10: 10804 mm2
- Tape and Reel: Width =8mm Pitch = 4mm
- 0.3mm & 0.5mm Pitch packages are available. Please call for more information.

### *Part Description System*




- Add "WR" to end of part number for Wafer Cut and left in Seal Ring.
- Add "TR" to end of part number for die on Tape and Reel.
- Add "NB" to end of part number for No Solder Balls.
- Add "W" to end of part number for Uncut Wafer.

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# WLP
## Wafer Chip Size Package


WLP uses interconnection technology to effectively utilize the chip area by making it possible to form electrodes over the entire chip surface. This eliminates the need for the wire bonding space required by previous wiring methods. Also, electrodes are formed using copper posts for a simple structure.

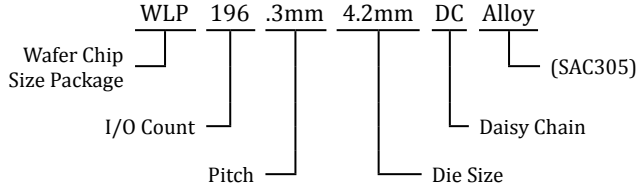
All of this means that the area of the finished package is exactly the same compact size as the original chip. It also simplifies mounting and contributes to easier high-density mounting. WLP is the perfect choice for packaging chips used in portable telephones, digital cameras, and other applications where mounting space is severely restricted.

| Part Description | I/O Count | Pitch | Body Size | Matrix | Alloy |
|---|---|---|---|---|---|
| ***.3mm Pitch*** | | | | | |
| WLP100-.3mm-3mm-DC | 100 | .3mm | 3mm | 10x10 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP144-.3mm-3.6mm-DC | 144 | .3mm | 3.6mm | 12x12 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP196-.3mm-4.2mm-DC | 196 | .3mm | 4.2mm | 14x14 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP256-.3mm-4.8mm-DC | 256 | .3mm | 4.8mm | 16x16 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP264-.3mm-6mm-DC | 264 | .3mm | 6mm | 17x17 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP400-.3mm-6mm-DC | 400 | .3mm | 6mm | 20x20 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP676-.3mm-7.8mm-DC | 676 | .3mm | 7.8mm | 26x26 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP900-.3mm-9mm-DC | 900 | .3mm | 9mm | 30x30 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP1600-.3mm-12mm-DC | 1600 | .3mm | 12mm | 40x40 | 96.5%Sn/3.0%Ag/0.5%Cu |
| ***.4mm Pitch*** | | | | | |
| WLP100-.4mm-4mm-DC | 100 | .4mm | 4mm | 10x10 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP144-.4mm-4.8mm-DC | 144 | .4mm | 4.8mm | 12x12 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP144-.4mm-6mm-DC | 144 | .4mm | 6mm | 13x13/4-Row | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP196-.4mm-5.6mm-DC | 196 | .4mm | 5.6mm | 14x14 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP256-.4mm-6.4mm-DC | 256 | .4mm | 6.4mm | 16x16 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP400-.4mm-8mm-DC | 400 | .4mm | 8mm | 20x20 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP676-.4mm-10.4mm-DC | 676 | .4mm | 10.4mm | 26x26 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP900-.4mm-12mm-DC | 900 | .4mm | 12mm | 30x30 | 96.5%Sn/3.0%Ag/0.5%Cu |
| ***.5mm Pitch*** | | | | | |
| WLP100-.5mm-5mm-DC | 100 | .5mm | 5mm | 10x10 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP144-.5mm-6mm-DC | 144 | .5mm | 6mm | 12x12 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP196-.5mm-7mm-DC | 196 | .5mm | 7mm | 14x14 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP256-.5mm-8mm-DC | 256 | .5mm | 8mm | 16x16 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP400-.5mm-10mm-DC | 400 | .5mm | 10mm | 20x20 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP676-.5mm-13mm-DC | 676 | .5mm | 13mm | 26x26 | 96.5%Sn/3.0%Ag/0.5%Cu |
| WLP900-.5mm-15mm-DC | 900 | .5mm | 15mm | 30x30 | 96.5%Sn/3.0%Ag/0.5%Cu |

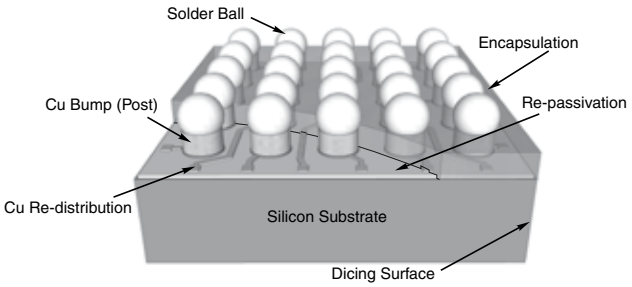
### *Notes*

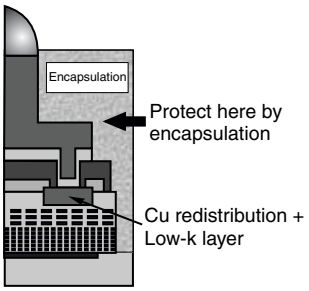
- Ultra thin type, Ultra miniature, Lightweight
- High current capacity and good heat radiation
- Stress buffer structure
- High reliability of WLP as semiconductor package makes KGD issues cleared.
- Cu-to-Cu wiring structure
- Include inductors of high Q value
- Possibility of SMT assembly
- Coplanarity (5 to 10 µm)
- Available diced and left in ring or in trays.

### *Part Description System*

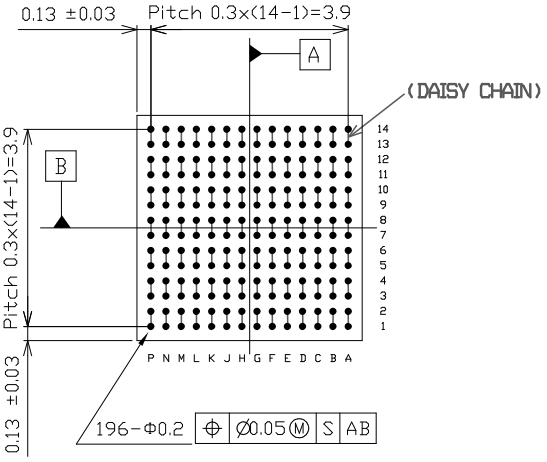



- Add "TR" to end of part number for die on Tape and Reel.
- Add "SAC305" to end of part number for Lead-Free.

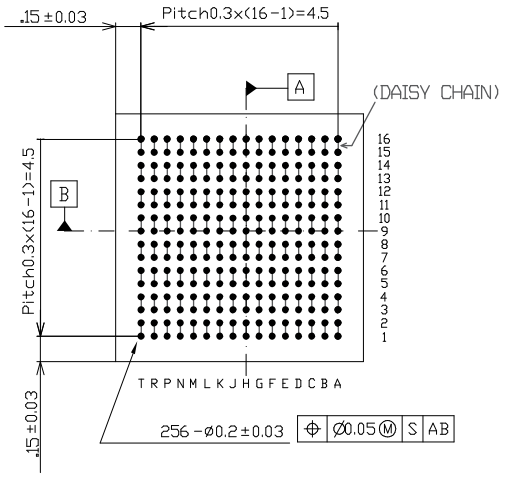


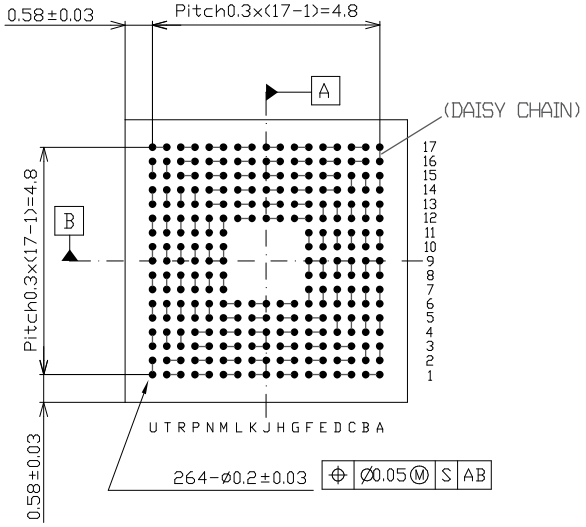

## WLP196-.3mm-4.2mm (14x14 Matrix)



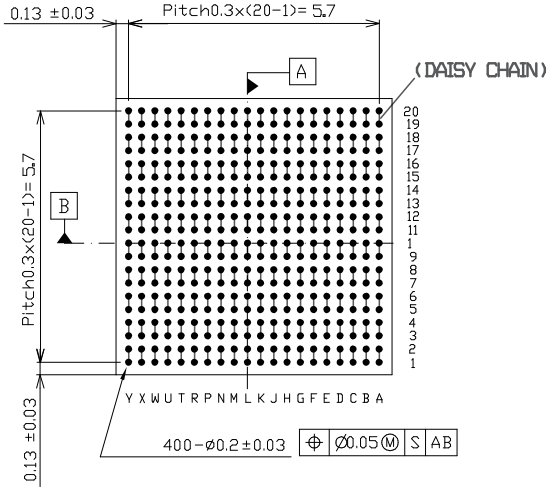

## WLP256-.3mm-4.8mm (16x16 Matrix)




## WLP264-.3mm-6mm (17x17 Matrix)




## WLP400-.3mm-6mm (20x20 Matrix)



# Flip Chips

Flip Chip describes the method of electrically connecting the die to the package carrier. The package carrier, either substrates or leadframe, then provides the connection from the die to the exterior of the package. The interconnection between die and carrier in flip chip packaging is made through a conductive bump that is placed directly on the die surface. The bumped die is then flipped over and placed face down, with the bumps connecting to the carrier. After the die is solderable, underfill is applied between the die and the substrates, around the solder bumps. The underfill is designed to contract the stress in the solder joints caused by the difference in thermal expansion between the silicon die and carrier.

Pac Tech offers a complete set of additional wafer level and backend services including: saw, dice, redistribution, repassivation, backside laser mark, backside coating, test die, and assembly. In addition, Pac Tech has the latest in metrology and analytical equipment to help in the development and production proceses, including: x-ray, shear, AOI, ICP, AA, probing, high speed ball pull, chemical analysis, etc...

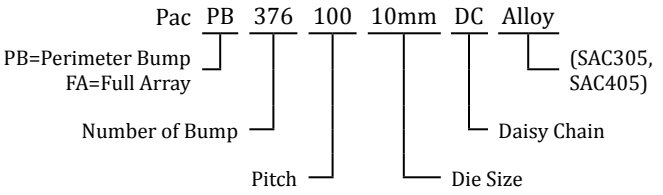
## Flip Chips

| Part Description | Die Size | No. of Bumps | Bump Pitch | Bump Height | UBM Diameter | Passivation Via | Uncut Wafer | Tray |
|---|---|---|---|---|---|---|---|---|
| Pac2.3-FA572-200/400-10mm-DC | 10x10mm 394x394mils | 572 | 200µm/400µm 7.88 / 15.76mil | 75µm | 90µm | 80µm | 6" Wafer (132 Die) | 36 per Tray |
| Pac2.5-PB376-100-10mm-DC | 10x10mm 394x394mils | 376 | 100µm 3.94mils | 53µm | 37µm | 27µm | 6" Wafer (120 Die) | 36 per Tray |

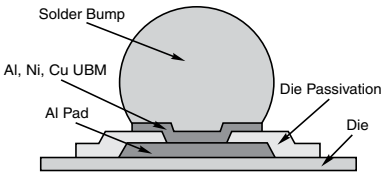
### *Notes*

- Die count represents expected yield per wafer.
- All die is packaged in waffle pack trays unless otherwise specified.
- The potential multiple is the number of die repears on the wafer. With the wafer orientated flat down, a right hand coordinate system applies.
- Die Size is from scribe line to center-to-center. Scribe width is 0.05mm Passicated. Each bump is electrically connected to one other bump and isolated form all others to facilitate electrical test.
- Bump pitch is defined as center-to-center distance between passivation openings.
- Bump height is defined as silicon surface to the top of the bump.
- Bump diameter is defined as the maximum diameter.
- UBM = Under Bump Metallurgy
- Unbumped wafers are available upon special request.
- Metal Composition is 5µm Ni, .05µm Au
- Die are packaged in Waffle Packs
- All Flip Chips are available Lead-Free with (SAC305) 96.5%Sn/3.0%Ag/0.5%Cu or (SAC405) 95.5%Sn/4.0%Ag/0.5%Cu alloys.

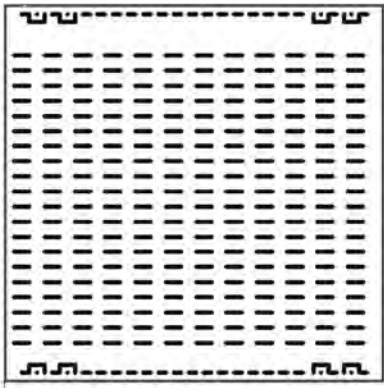
### *Part Description System*




- Add "WR" to end of part number for Wafer Cut and left in Seal Ring.
- Add "TR" to end of part number for die on Tape and Reel.
- Add "EUT" to end of part number for Eutectic.
- Add "SAC305" to end of part number for Lead-Free.
- Add "W" to end of part number for Uncut Wafer.
- Add "UB" to end of part number for unbumped wafer/die.




Pac2.3-FA572-200/400-10mm



Die size: 10x10mm (394mils sq)
Pitch: 200µm/400µm (7.88/15.76mil)

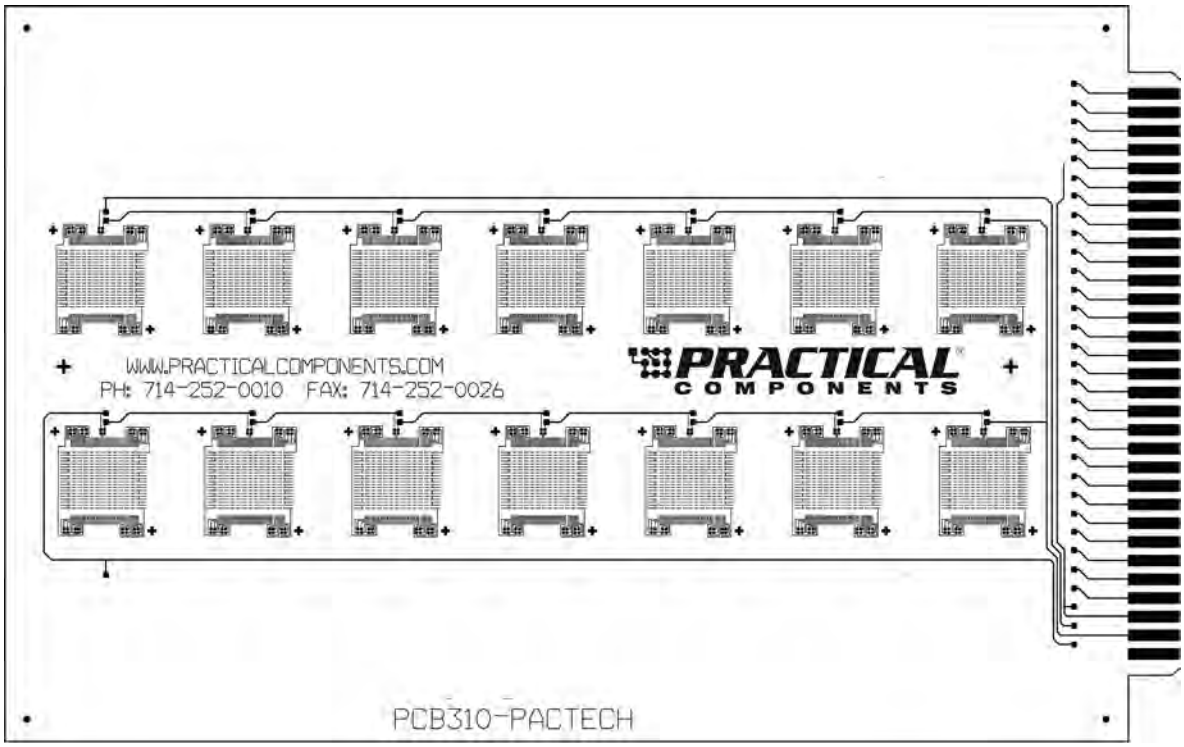
*For kit see page 9.*

Pac2.5-PB376-100-10mm


Die size: 10x10mm (394mils sq)
Pitch: 100µm (3.94mil)

# Pac Tech Flip Chip
## Test and Evaluation Kit and Board

The Pac Tech Flip Chip Test & Evaluation board is for placement and daisy chain continuity testing after assembly. Substrate has 14 mounting sites for 10 x 10mm Flip Chips. With an increasing number of I/O's on Integrated Circuits and accompanying requirements for high performance, flip chip type components are a compelling technology for potential users. Pac Tech test die are combined with test boards to provide customers with the ability to test a variety of specs and processes. The components and test board are daisy-chained for continuity. The PCB310 Pac Tech Board is single sided with 14 pads to accommodate 2 rows of 7 Pac2.3-572-200/400-10mm die each.




***Notes***

- Board size is 6.3" x 3.95", 2 layers, .062" thick.
- Board material is IS410-High Temp 180Tg.
- Standard board finish OSP Entek CU-A-HT.
- Gerber and X,Y Theta data included at no charge.
- See page 8 for available solder ball alloys.

***Order Notes***

- Order Number: 12299 PCB310-PacTech *(board only)*
- Order Number: 12312 Pac2.3-FA572-200/400-10mm-DC-305 (Rows 2 and 3)

## About Lead-Free Flip Chips

Flip Chips are used in evaluating assembly techniques, board contiunity, temperature cycle life test evaluation, underfill procsses and other generic needs to be given to the appropriate flux, underfill, temperature profile, and pad finish for the assembly. Lead-Free Flip Chips address the need for environmentally conscious assemblies as well as Alpha particle tolerant packaging.

# CVBGA
## Very Thin ChipArray® BGA

ChipArray® (CVBGA) package offering by Amkor have a .3mm and .4mm pitch. In addition to the standard core ChipArray® package (CABGA and CTBGA), Amkor offers thinner mold cap thickness of 1.0mm max. By utilizing a thin core laminate, much denser routing can be achieved, thereby enabling more I/O's in a given footprint.

Due to their small size and I/O density Amkor's ChipArray® product family is an excellent choice for new devices requiring a small footprint and low mounted height.

The .3mm and .4mm CVBGA packages have become popular choices for electronic assembly. They are identical to the live package without the expensive IC die inside. The dummy versions are made of the same materials on the same manufacturing lines and have the same size, thermal and soldering properties as the live equivalent without the cost of a live die.


### CVBGA Very Thin ChipArray® BGA

| Part Description | I/O Count | Pitch | Body Size | Ball Matrix | Ball Alignment | Quantity per Tray | Available Lead Free Alloy |
|---|---|---|---|---|---|---|---|
| ***.3mm Pitch*** | | | | | | | |
| A-CVBGA368-.3mm-8mm | 368 | .3mm | 8mm | 23x23 | Perimeter | 260 | SAC105 only |
| ***.4mm Pitch*** | | | | | | | |
| A-CVBGA97-.4mm-5mm | 97 | .4mm | 5mm | 10x10 | Full Array | 360 | SAC105, SAC305, or SAC405 |
| A-CVBGA360-.4mm-10mm | 360 | .4mm | 10mm | 23x23 | Perimeter | 168/250 | SAC105, SAC305, or SAC405 |
| A-CVBGA432-.4mm-13mm | 432 | .4mm | 13mm | 31x31 | Perimeter | 160 | SAC105, SAC305, or SAC405 |

***Notes***

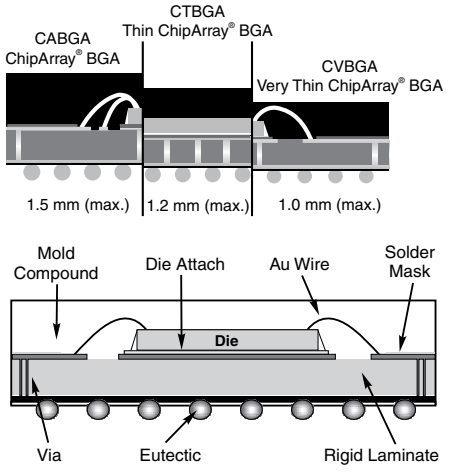
- Parts are packaged in JEDEC trays.
- All components are daisy-chained.
- Moisture sensitivity is JEDEC level 3.
- Daisy-chained connections are connections between I/O (input/output) of the component
- Lead-free parts are available with 95.5%Sn/4.0%Ag/0.5%Cu (SAC405) or 96.5%Sn/3.0%Ag/0.5%Cu (SAC305) alloy.
- Eutectic 63/37 SnPb Solder ball material is available.

***Part Description System***

Amkor A CVBGA 97 .4mm 5mm DC Alloy

- ChipArray® Very Thin Ball Grid Array
- I/O Count
- Pitch
- Body Size
- Daisy Chain
- (SAC105, SAC305, and SAC405)

- Add "TR" to end of part number for Parts on Tape and Reel.
- Add "SAC105" or "SAC305" or "SAC405" to end of .4mm pitch part number for Lead-free.




.3mm Package

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

***For kits see pages 11, 97, 108, & 113.***

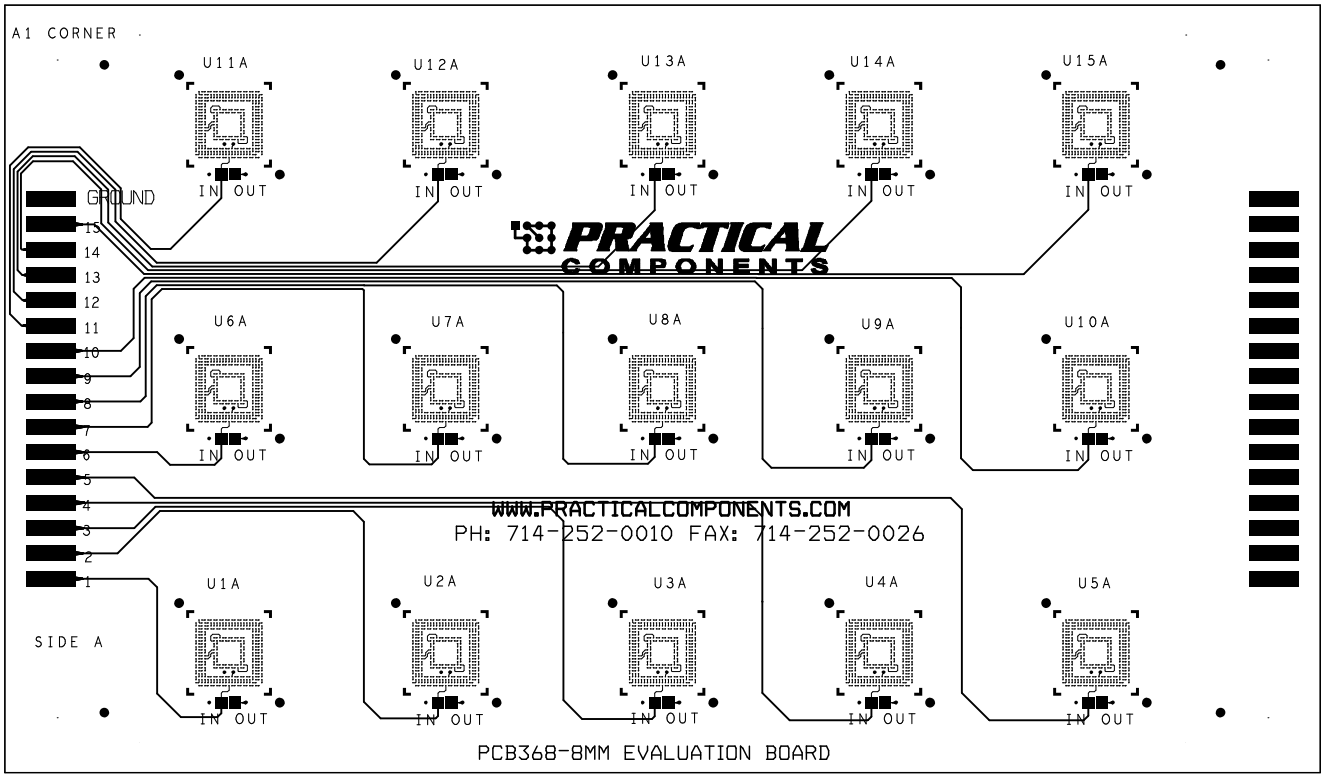
# PCB368- .3 mm Pitch CVBGA

## Evaluation and Qualification Test Board

The PCB368-8 Evaluation Board is a test vehicle for the .3mm pitch CVBGA component.

Solder practice test vehicle PCB boards and kits are used for machine setup, evaluation, qualification, workflow analysis, prototyping, testing, and solder profiling.

For this component we have added a PCB368-8 mm Evaluation Board that is ideal for testing, evaluating and qualifying this fine-pitch technology. With Practical Components test boards and the necessary dummy components, customers can conduct assembly process evaluation without using high-cost, live components and functional PC boards. Kits are available packaged for production equipment evaluation.




***Notes***

- Both X, Y Theta data and Gerber data are available without charge.
- Board Size: 77 x 132mm
- 1mm thick
- 4 layers
- 15 pads for the CVBGA368 package
- Offered with OSP, ImAg & ENIG finishes

# CTBGA
## ChipArray® Thin Core Ball Grid Array


| Part Description | I/O Count | Pitch | Body Size | Ball Matrix | Ball Alignment | Quantity per Tray | Available Lead Free Alloy |
|---|---|---|---|---|---|---|---|
| ***.5mm Pitch*** | | | | | | | |
| A-CTBGA84-.5mm-6mm | 84 | .5mm | 6mm | 10x10 | Perimeter | 608 | SAC105, SAC305, or SAC405 |
| A-CTBGA84-.5mm-7mm | 84 | .5mm | 7mm | 12x12 | Perimeter | 476 | SAC105, SAC305, or SAC405 |
| A-CTBGA108-.5mm-7mm | 108 | .5mm | 7mm | 12x12 | Perimeter | 476 | SAC105, SAC305, or SAC405 |
| A-CTBGA132-.5mm-8mm | 132 | .5mm | 8mm | 14x14 | Perimeter | 360 | SAC105, SAC305, or SAC405 |
| A-CTBGA228-.5mm-12mm | 228 | .5mm | 12mm | 22x22 | Perimeter | 189 | SAC105, SAC305, or SAC405 |
| ***.8mm Pitch*** | | | | | | | |
| A-CTBGA64-.8mm-7mm | 64 | .8mm | 7mm | 8x8 | Full Array | 476 | SAC105, SAC305, or SAC405 |
| A-CTBGA100-.8mm-10mm | 100 | .8mm | 10mm | 10x10 | Full Array | 184/250 | SAC105, SAC305, or SAC405 |
| A-CTBGA208-.8mm-15mm | 208 | .8mm | 15mm | 17x17 | Perimeter | 126 | SAC105, SAC305, or SAC405 |

***Notes***

- Parts are packaged in JEDEC trays
- All components are daisy-chained.
- <0.12mm (5 mil) coplanarity.
- BT (Bismaleimide-Triazine) substrates or equivalent.
- Package thickness is 1.2mm max for 0.8mm and 1.0mm pitch packages.
- Package thickness is 1.1mm max for 0.5mm pitch packages.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with (SAC405) 95.5% Sn/ 4.0% Ag/0.5% Cu alloy or 96.5%Sn/3.0%Ag/0.5%Cu alloy (SAC305) or (SAC105) 98.5%Sn/1.0%Ag/0.5%Cu is also available.
- CABGA, CVBGA and CTBGA parts are available without solder balls, which makes the package LGA. See page 16.

***Part Description System***

Amkor A CTBGA 84 .5mm 7mm DC Alloy

- ChipArray® Thin Ball Grid Array
- I/O Count
- Pitch
- Body Size
- Daisy Chain
- (SAC105, SAC305, and SAC405)

- Add "TR" to end of part description for Tape and Reel
- Add "SAC405" or "SAC105" or "SAC305" to end of part description for Lead-Free.

***For kit see page 113.***

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

# CABGA
## ChipArray® Ball Grid Array

ChipArray® (CABGA) packages are offered in laminate format and are available as Ball Grid Array. The near chip size standard outlines offer fixed body sizes and ball counts. Established SMT mounting processes and techniques are compatible with ChipArray®. The package size and design provides ideal RF operation (low inductance) for high speed applications requiring small footprints.

### ChipArray® Ball Grid Array

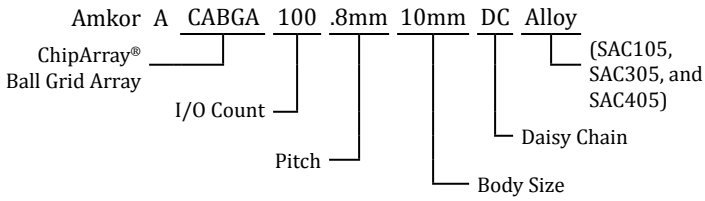
| Part Description | I/O Count | Pitch | Body Size | Ball Matrix | Ball Alignment | Quantity per Tray | Available Lead Free Alloy |
|---|---|---|---|---|---|---|---|
| ***.8mm Pitch*** | | | | | | | |
| A-CABGA36-.8mm-6mm | 36 | .8mm | 6mm | 6x6 | Full Array | 608 | SAC105, SAC305, or SAC405 |
| A-CABGA100-.8mm-10mm | 100 | .8mm | 10mm | 10x10 | Full Array | 184/250 | SAC105, SAC305, or SAC405 |
| A-CABGA144-.8mm-12mm | 144 | .8mm | 12mm | 13x13 | Perimeter | 189 | SAC105, SAC305, or SAC405 |
| A-CABGA160-.8mm-12mm | 160 | .8mm | 12mm | 14x14 | Perimeter | 189 | SAC105, SAC305, or SAC405 |
| A-CABGA176-.8mm-13mm | 176 | .8mm | 13mm | 15x15 | Perimeter | 160 | SAC105, SAC305, or SAC405 |
| A-CABGA192-.8mm-14mm | 192 | .8mm | 14mm | 16x16 | Perimeter | 119 | SAC105, SAC305, or SAC405 |
| A-CABGA208-.8mm-15mm | 208 | .8mm | 15mm | 17x17 | Perimeter | 126 | SAC105, SAC305, or SAC405 |
| A-CABGA288-.8mm-19mm | 288 | .8mm | 19mm | 22x22 | Perimeter | 84 | SAC105, SAC305, or SAC405 |
| ***1.0mm Pitch*** | | | | | | | |
| A-CABGA100-1.0mm-11mm | 100 | 1.0mm | 11mm | 10x10 | Full Array | 168 | SAC105, SAC305, or SAC405 |
| A-CABGA144-1.0mm-13mm | 144 | 1.0mm | 13mm | 12x12 | Full Array | 160 | SAC105, SAC305, or SAC405 |
| A-CABGA196-1.0mm-15mm | 196 | 1.0mm | 15mm | 14x14 | Full Array | 126 | SAC105, SAC305, or SAC405 |
| A-CABGA256-1.0mm-17mm | 256 | 1.0mm | 17mm | 16x16 | Full Array | 90 | SAC105, SAC305, or SAC405 |

***Notes***

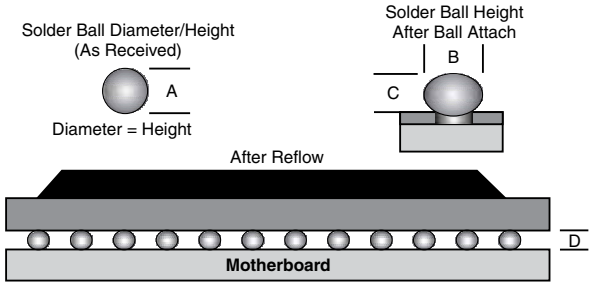
- Parts are packaged in JEDEC trays
- All components are daisy-chained.
- <0.12mm (5 mil) coplanarity.
- BT (Bismaleimide-Triazine) substrates or equivalent.
- Package thickness is 1.5mm max for 0.8mm and 1.0mm pitch packages.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with (SAC405) 95.5% Sn/ 4.0% Ag/ 0.5% Cu alloy or 96.5%Sn/3.0%Ag/0.5%Cu alloy (SAC305) or (SAC105) 98.5%Sn/1.0%Ag/0.5%Cu is also available.
- CABGA, CVBGA and CTBGA parts are available without solder balls, which makes the package LGA. See page 16.

***For kits see pages 93, 94, 98, 100, 108, 113 & 116.***

***Part Description System***




- Add "TR" to end of part description for Tape and Reel
- Add "SAC405" ,"SAC105" or "SAC305" to end of part description for Lead-Free.




| Package Pitch | A | B | C | D |
|---|---|---|---|---|
| 1.00/0.80mm | 0.46mm | 0.48mm (± 0.05mm) | 0.36mm (± 0.05mm) | 0.30mm (± 0.05mm) |

Note: Typical motherboard non-solder mask defined pad:

- 0.80 pitch = 0.30
- 1.00 pitch = 0.38

# PBGA
## Plastic Ball Grid Array

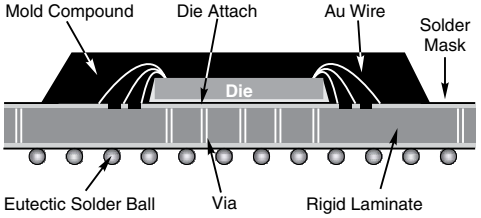
Amkor Technology®

Amkor Plastic Ball Grid Arrays (PBGA) incorporate advanced assembly processes and designs for low cost, high performance applications. PBGAs are designed for low inductance, improved thermal operation and enhanced SMT ability.

| Part Description | I/O Count | Pitch | Body Size | Ball Matrix | Ball Alignment | Quantity per Tray | Available Lead Free Alloy |
|---|---|---|---|---|---|---|---|
| ***1.0mm Pitch*** | | | | | | | |
| A-PBGA208-1.0mm-17mm | 208 | 1.0mm | 17mm | 16x16 | Perimeter | 90 | SAC305 or SAC405 |
| A-PBGA256-1.0mm-17mm | 256 | 1.0mm | 17mm | 16x16 | Full Array | 90 | SAC305 or SAC405 |
| A-PBGA288-1.0mm-23mm | 288 | 1.0mm | 23mm | 22x22 | Perimeter | 60 | SAC305 or SAC405 |
| A-PBGA289-1.0mm-19mm | 289 | 1.0mm | 19mm | 17x17 | Full Array | 84 | SAC305 or SAC405 |
| A-PBGA324-1.0mm-19mm | 324 | 1.0mm | 19mm | 18x18 | Full Array | 84 | SAC305 or SAC405 |
| A-PBGA324-1.0mm-23mm | 324 | 1.0mm | 23mm | 22x22 | Perimeter | 60 | SAC305 or SAC405 |
| A-PBGA484-1.0mm-27mm | 484 | 1.0mm | 27mm | 26x26 | Perimeter | 40 | SAC305 or SAC405 |
| A-PBGA516-1.0mm-31mm | 516 | 1.0mm | 31mm | 30x30 | Perimeter | 27 | SAC305 or SAC405 |
| A-PBGA580-1.0mm-35mm | 580 | 1.0mm | 35mm | 34x34 | Perimeter | 24 | SAC305 or SAC405 |
| A-PBGA676-1.0mm-27mm | 676 | 1.0mm | 27mm | 26x26 | Full Array | 40 | SAC305 or SAC405 |
| A-PBGA680-1.0mm-35mm | 680 | 1.0mm | 35mm | 34x34 | Perimeter | 24 | SAC305 or SAC405 |
| A-PBGA928-1.0mm-40mm | 928 | 1.0mm | 40mm | 39x39 | Perimeter | 21 | SAC305 or SAC405 |
| A-PBGA1156-1.0mm-35mm | 1156 | 1.0mm | 35mm | 34x34 | Full Array | 24 | SAC305 or SAC405 |
| ***1.27mm Pitch*** | | | | | | | |
| A-PBGA208-1.27-23mm | 208 | 1.27mm | 23mm | 17x17 | Perimeter | 60 | SAC305 or SAC405 |
| A-PBGA256-1.27mm-27mm | 256 | 1.27mm | 27mm | 20x20 | Perimeter | 40 | SAC305 or SAC405 |
| A-PBGA272-1.27mm-27mm | 272 | 1.27mm | 27mm | 20x20 | Perimeter | 40 | SAC305 or SAC405 |
| A-PBGA329-1.27mm-31mm | 329 | 1.27mm | 31mm | 23x23 | Perimeter | 27 | SAC305 or SAC405 |
| A-PBGA388-1.27mm-35mm | 388 | 1.27mm | 35mm | 26x26 | Perimeter | 24 | SAC305 or SAC405 |

### *Notes*

- Parts are packaged in JEDEC trays.
- Moisture sensitivity is JEDEC level 3.
- JEDEC MS-034 standard outlines.
- All components are daisy-chained.
- Daisy-chained connections are connections between I/O (input/output) of the component.
- Lead-free parts are available with 95.5%Sn/4.0%Ag/0.5%Cu (SAC405) or 96.5%Sn/3.0%Ag/0.5%Cu (SAC305) alloy.
- Solder ball material is available with Eutectic 63/37 SnPb.
- PBGAs are not available without solder balls.
- BGA packages should be baked at 125°C for 24 hours prior to assembly to prevent delamination during the assmbly process.

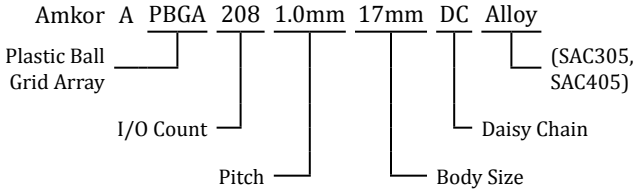



Note: Drawing not to scale.

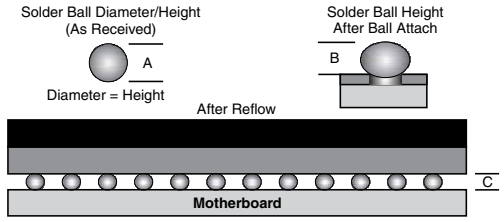
***For kits see pages 92, 98, 105, 106, 108, 111, 113, 115, 116 & 117.***

Practical does not guarantee the chain of custody for moisture sensitivity. This is due to the factory making consolidated shipments and customers quantity being met (breaking full tray quantities).

### *Part Description System*




- Add "TR" to end of part number for Tape and Reel.
- Add "SAC405" or "SAC305" to end of part number for Lead-Free.




Note: Drawing not to scale.

| Package | Pitch | Solder Ball Diameter (A) | Solder Ball Land On Package and Board | Solder Ball Height on Package (B) | Solder Joint Height After SMT* (C) |
|---|---|---|---|---|---|
| (1)PBGA | 1.00 | 0.50 | 0.45 | 0.40 | 0.32 |
| (2)PBGA | 1.00 | 0.63 | 0.45 | 0.55 | 0.48 |
| PBGA | 1.27 | 0.76 | 0.63 | 0.60 | 0.52 |
| PBGA | 1.50 | 0.76 | 0.63 | 0.60 | 0.52 |

Units = mm

*Assumptions: 5 mils Solder Paste
Solder Mask Defined Pad

(1) Applies to 13, 15 and 17mm packages.
(2) Applies to 23, 27, 31, 35mm, and 40.0mm packages.

SuperBGA® (SBGA) package is a very low profile, high-power BGA. The IC is directly attached to an integrated copper heatsink. Since the IC and the I/O are on the same side, signal vias are eliminated.

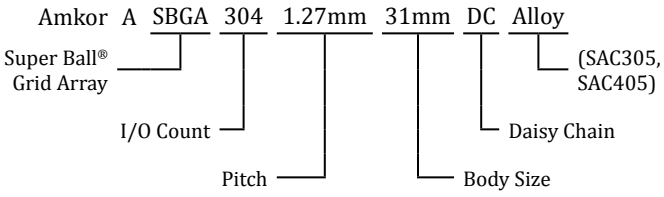
## SBGA SuperBGA® 1.27mm Pitch

| Part Description | I/O Count | Pitch | Body Size | Ball Matrix | Ball Alignment | Quantity per Tray | Available Lead Free Alloy |
|---|---|---|---|---|---|---|---|
| A-SBGA304-1.27mm-31mm | 304 | 1.27mm | 31mm | 23x23 | Perimeter | 27 | SAC305 or SAC405 |
| A-SBGA560-1.27mm-42.5mm | 560 | 1.27mm | 42.5mm | 33x33 | Perimeter | 12 | SAC305 or SAC405 |
| A-SBGA600-1.27mm-45mm | 600 | 1.27mm | 45mm | 35x35 | Perimeter | 12 | SAC305 orSAC405 |

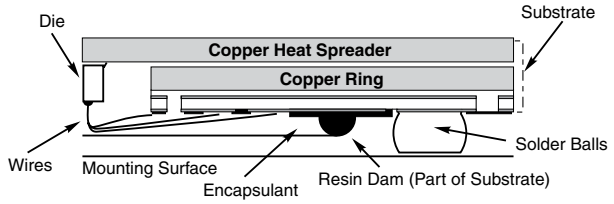
### *Notes*

- Parts are packaged in JEDEC trays.
- Moisture resistant (JEDEC level 3)
- JEDEC MO-192 standard outlines
- All components are daisy-chained
- Lead-free parts are available with (SAC405) 95.5% Sn/4.0% Ag/0.5% Cu alloy or (SAC305) 96.5% Sn/3.0% Ag/0.5% Cu alloy
- Solder ball material is available with Eutectic 63/37 SnPb
- SBGAs are not available without solder balls.
- BGA packages should be baked at 125°C for 24 hours prior to assembly to prevent delamination during assembly process.
- Parts can be baked and dry-packed.
- Superior thermal performance.
- Light weight
- Low profile (1.4mm mounted)
- Enhanced electrical performance > 1 GHz

### *Part Description System*



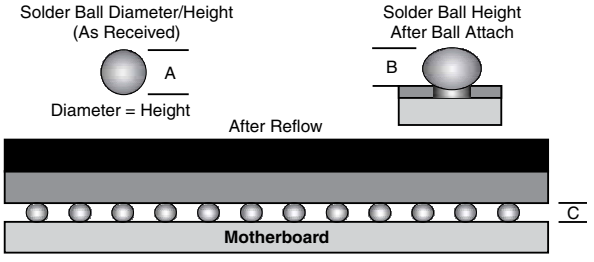

- Add "SAC405" or "SAC305" to end of part number for Lead-Free.




Note: Drawing not to scale.

**Looking for Lead-Free?**

This symbol indicates that lead-free parts are available!



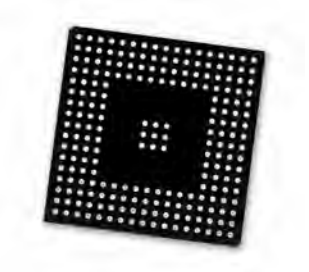

| Package | Pitch | A | B | C |
|---|---|---|---|---|
| SBGA | 1.27 | .76 | .62 | .52 |

All units in mm.
Assumptions: 5 mils solder paste. Solder mask defined pad.

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

# LGA
## Land Grid Array

Amkor laminate ChipArray® packages are available without solder balls upon special order. Packages available without solder balls include CABGA, CTBGA and CVBGA. The same standard daisy-chained substrate would be used based on open tooling.



LGA is another term used for parts without solder balls. The same BOM (bill of material) is used when parts are assembled. LGA parts are used to reduce package height, drop test performance in handheld applications, solder ball attach practice, socket insertion, P&P evaluation, reflow profiling, enhance thermal cycle reliability and other purposes.

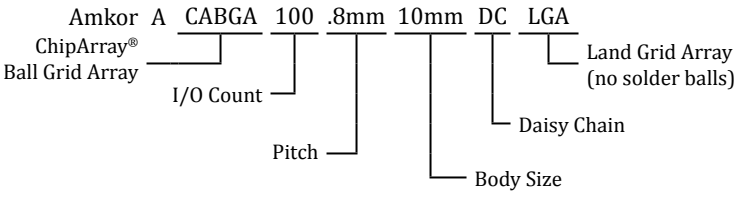
LGA solder interconnect if formed solely by solder paste applied at board assembly because there are no solder balls attached to the LGA. This results in a lower stand-off height of approximately 0.06mm to 0.10mm, depending on solder paste volume and PCB geometry. Laminate substrate is solder mask defined. Standard ball pad finish is NiAu.

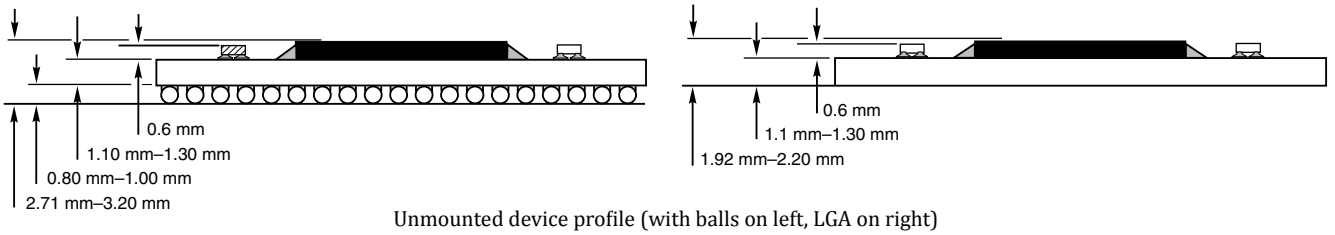
Application notes available for supporting technical data.

***Notes***

- Body sizes range from 5mm ~ 17mm.
- Available pitches are .4mm, .5mm, .8mm and 1.0mm.
- Parts packaged in trays (standard).
- Parts available on Tape and Reel upon special request.

***Part Description System (example when ordering)***




Unmounted device profile (with balls on left, LGA on right)

# TMV® PoP
## Through Mold Via Package

After three years of development, Amkor has introduced the next generation PoP solution. This new technology is called Through Mold Via (TMV®). The new TMV® technology is used to create interconnect vias through the mold cap, it also provides a more stable bottom package that enables the use of thinner substrates with a larger die to package ratio. TMV® enabled POP can support single, stacked die for wirebond and FC designs.


TMV® technology enables next generation PoPs by:

- Removing bottlenecks for fine pitch memory interfaces
- Enhancing warpage control and bottom package thickness reduction
- Increasing die to package size ratios
- Supporting wirebond, flip chip, stacked die and passive integration
- Improving board level solder joint life

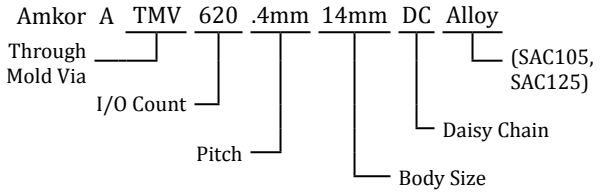
### TMV® PoP—Mating Top and Bottom Daisy Chain Samples

| Part Description | I/O Count | Pitch | Body Size | Ball Matrix | Ball Alignment | Quantity per Tray | Available Lead Free Alloy |
|---|---|---|---|---|---|---|---|
| ***14mm Body Size*** | | | | | | | |
| A-PoP200-.5mm-14mm | 200 (top) | .5mm | 14mm | 27x27 | Perimeter | 119 | SAC105 |
| A-TMV620-.4mm-14mm | 620 (bottom) | .4mm | 14mm | 33x33 | Perimeter | 119 | SAC125 |

***Notes***

- Fine pitch 0.4mm bottom package footprints.
- Stacked package heights of 1.2mm nominal (see Stack Up table on following pages).
- Package configurations compliant with JEDEC standards.
- Moisture Resistance Testing is JEDEC Level 3 @ 260 °C.
- Temp Cycle –55/+125 °C, 1000 cycles.
- HAST 130 °C, 85% RH, 96 hours.
- Temp/Humidity 85 °C/85%RH/1000 hours.
- High Temp Storage 150 °C, 1000 hours.
- Board level Thermal Cycle –40/+125 °C, 1000 cycles.
- Parts packaged in JEDEC matrix trays.
- PoPs are only available Pb-free (not Tin-Lead). Available alloys are: (SAC105) 98.5%Sn/1.0%Ag/0.5%Cu Top Package and (SAC125Ni) 98.2%Sn/1.2%Ag/0.5%Cu/0.05%Ni bottom package.
- It is recommended that parts be pre-baked at 125 °C for 48 hrs before using parts regarding moisture concern.
- PoP's are not available without solder balls.

***Part Description System (example when ordering)***




- Add "TR" to end of part number for die on Tape and Reel.
- Add "SAC105" or "SAC125" to end of part number for Lead-Free.

**Ball Diameter**

| I/O Count | Ball Diameter |
|---|---|
| 200 | 0.33mm |
| 620 | 0.30mm |

See drawings on the following pages (18–20) for additional technical data. Color coded version available on our website: www.TrustPCI.com

***Please Note***

- Amkor supporting data is available on our website for: Board Level Reliability (BLR), PoP application notes, PoP Stencil & Stacking paper for SMT Conditions.
- IMAPS and SMTA White Paper Articles for additional supporting data available on our website: www.TrustPCI.com.

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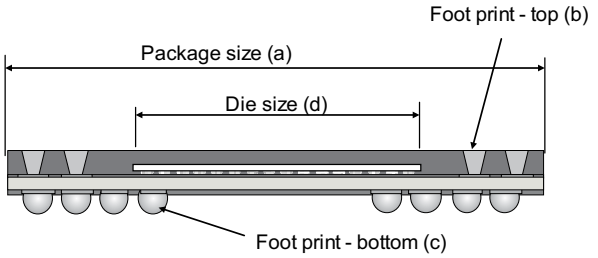
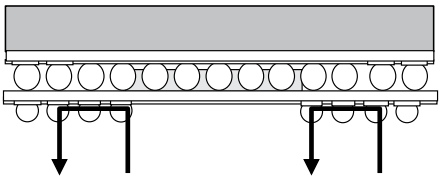
***For kit see page 21.***

## 14mm 620 TMV Bottom Package Design Dimensions

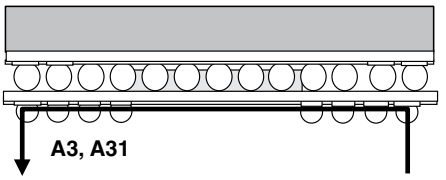



| Body (a) | Foot Print–top (b) | Foot Print–bottom (c) | Die (d) |
|---|---|---|---|
| 14 x 14mm | 0.50 pitch, 200 ball<br>27 matrix, 2 row | 0.4 pitch, 620 BGA<br>33 matrix, 4 + 2 row | 7.6 x<br>7.6mm |

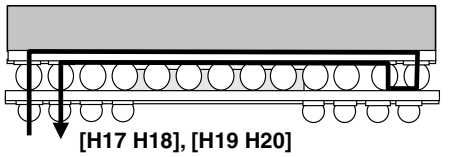
## Daisy Chain 4 Net Design



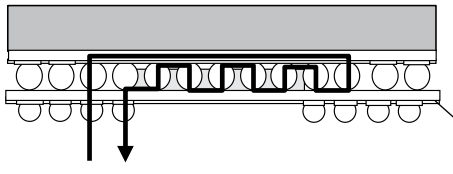
Daisy chain netlist of TMV, Bottom package balls.




Daisy chain netlist of TMV corners only.




Corner NC pads of top site package.



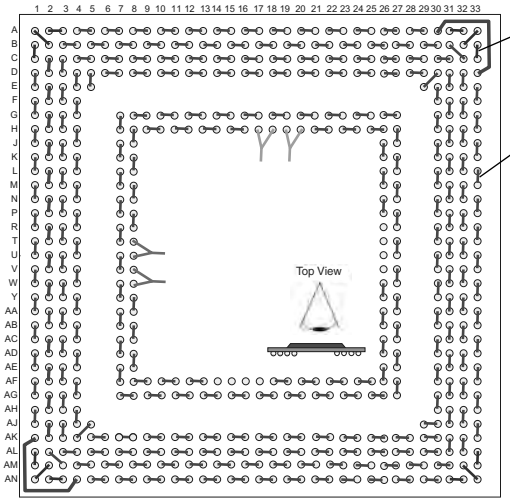

Daisy chain netlist of top side (Top FBGA to TMV pin memory interface).

Bottom package:
Package Stackable TMV.

**** Color diagram of DC Net design available on our website.***

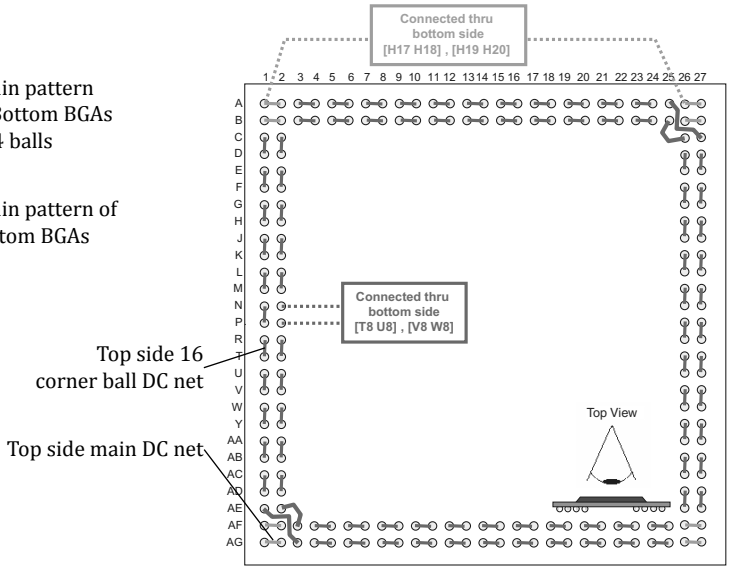
## TMV 620 (Bottom Package)
## Bottom Side Daisy Chain Nets

Bottom side of bottom package
(top view through package)
14x14mm, 0.4 mm TMV620, 33x33 ball matrix.

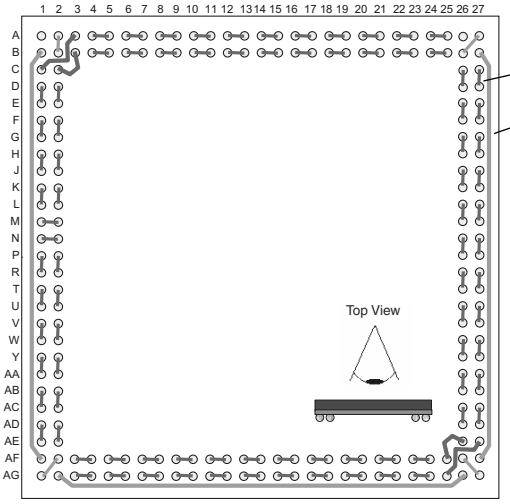



## TMV 620 (Bottom Package)
## Top Side Daisy Chain Nets

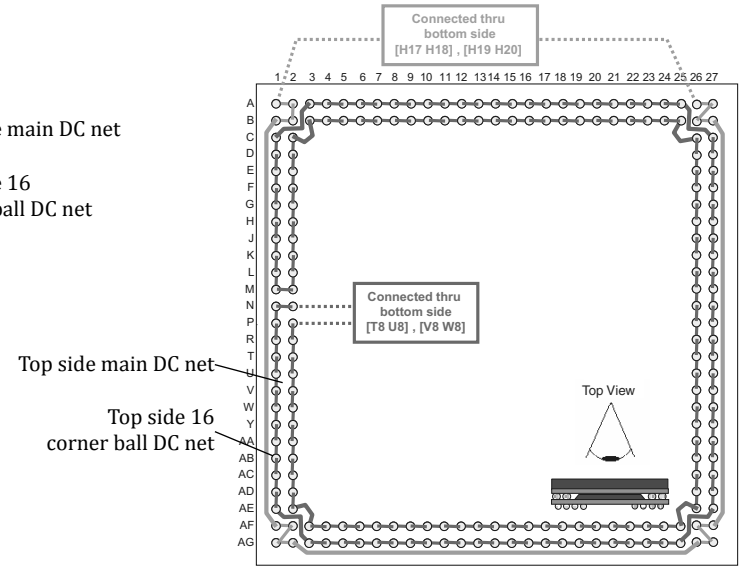
Top side of bottom package
(top view through package)
14x14mm, 0.5 mm PoP200, 27x27 ball matrix.




## 200 PoP (Top Package ONLY)
## Daisy Chain Netlist

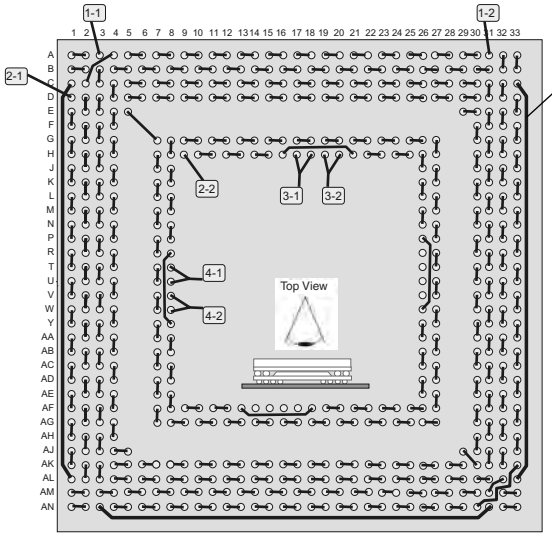



## Top PoP + TMV
## Daisy Chain Netlist

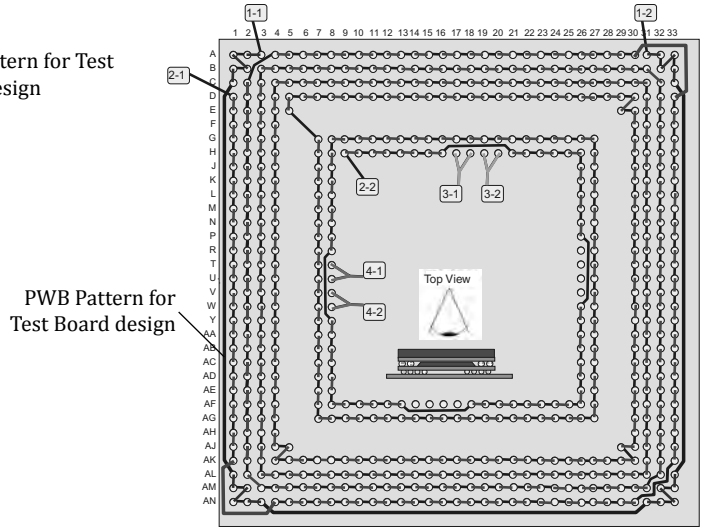



**** Color diagram of DC Net design available on our website.***

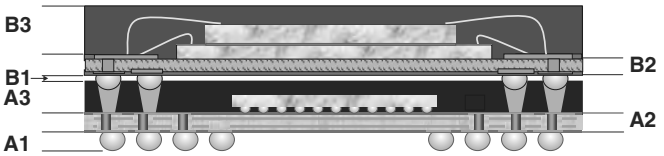
Test Board PWB Netlist Pattern for BLR Testing




Stacked view of 4 DC Nets for BLR testing




TMV® PoP Overall Stack Up Table




| 100µm core, 350µm mode cap (Laminate) | | | | | |
|---|---|---|---|---|---|
| **Symbol** | **Unit** | **Min** | **Nom** | **Max** | **Tolerance** |
| A1 (Ball, 0.4 pitch) | mm | 0.100 | 0.150 | 0.200 | 0.05 |
| A2 (4L laminate) | mm | 0.260 | 0.300 | 0.340 | 0.04 |
| A3 (Mold cap) | mm | 0.230 | 0.350 | 0.380 | 0.03 |
| Total Bottom Pkg Height | mm | 0.729 | 0.800 | 0.871 | |
| B1 (package stand-off) | mm | 0.370 | 0.400 | 0.430 | 0.03 |
| B2 Subs | mm | 0.100 | 0.130 | 0.160 | 0.03 |
| B3 Mold | mm | 0.380 | 0.400 | 0.420 | 0.02 |
| B2 + B3 | mm | 0.494 | 0.530 | 0.566 | |
| Overall PoP Stack Height | mm | 1.301 | 1.380 | 1.459 | |

**** Color diagram of DC Net design available on our website.***

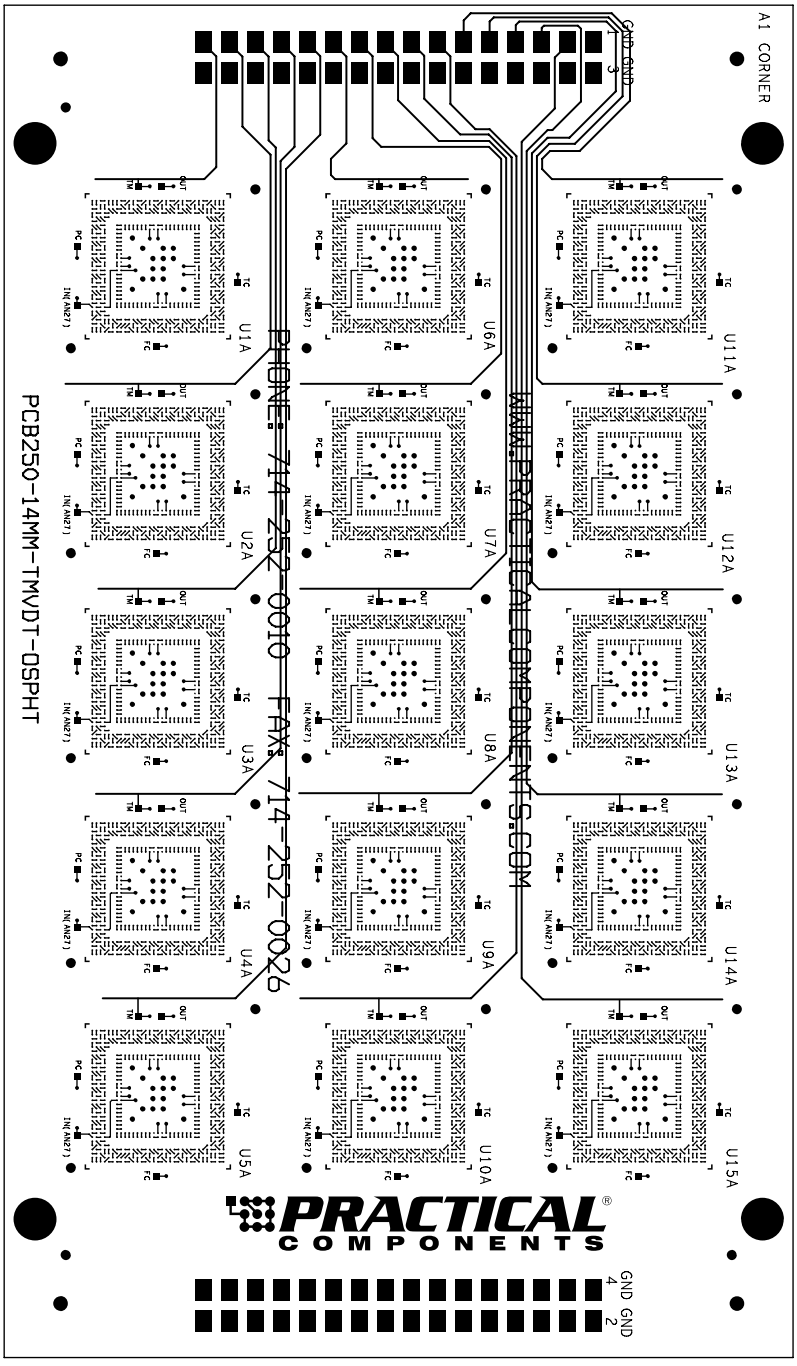
# TMV® 14mm Board & Kit
## Drop Test Lead Free Kit

### PCB250 14mm TMV Drop Test Board

Practical Components new TMV® 14MM test board and kit is a basic drop test board designed for the new Amkor TMV® (Through Mold Via) components.

This test eight layer board is a 3x5 array with 15 components placements per board. The board is 132mm x 77mm in size, and 1.0mm thick. The standard surface finish is OSP. Our test vehicle is designed for the new TMV® 620 solder ball .4mm pitch bottom component and the PoP 200 solder ball .5mm top component. Both top and bottom components have a daisy chain pattern through the substrate of the part.

A daisy chain pattern also runs through the test board. The design allows for daisy chain 3 net design. Meaning both top and bottom components as well as the board can be tested individually or as a group. This kit allows the end user to test the integrity of their process applications for TMV® components.




***Notes***

- Board size is 132 x 77mm, 8 layers, .039" thick, no microvias.
- Board material is IS-410 High Temp. 180Tg.
- Standard board finish is OSP Entek CU-106A-HT.
- 15 daisy-chain pad placements for 14x14 620 TMV® component.
- Immersion Silver board finish is available upon special request. MOQ may apply.
- Gerber and X,Y Theta data included at no charge.

***Ordering Information***

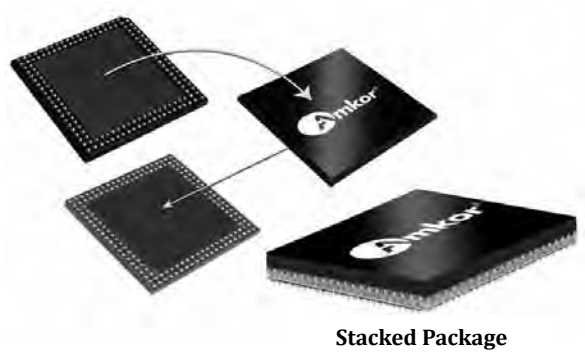
- Order Number: 15110 *(board only)*
- Order Number: 31557 A-PoP200-.5-14mm-DC-105 *(top component only)*
- Order Number: 31558 A-TMV620-.4-14mm-DC-125 *(bottom component only)*

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

# PoP
## Package on Package

Amkor is offering daisy chain samples of their award winning bottom Package Stackable Very Thin Fine Pitch BGA (PSvfBGA) and their top PoP optimized for Package on Package (PoP) requirements. PoP has become the solution of choice for an increasing number of mobile consumer applications for 3D integration of logic and memory devices.

Amkor's PSvfBGA is a high density fine pitch BGA package supporting logic or ASIC devices including base band, application and image processors. PoP stacking allows the OEM greater device, supplier and time to market flexibility by sourcing the bottom and top devices from their preferred logic and memory suppliers and then stacking the devices in the PWB surface mount assembly flow. A wide range of leading wireless and mobile integrated device manufacturers are relying on Amkor's technical and industry leadership in PoP.



**Stacked Package**

### PoP Package on Package—Mating Top and Bottom Daisy Chain Samples

| Part Description | I/O Count | Pitch | Body Size | Ball Matrix | Ball Alignment | Quantity per Tray | Available Lead Free Alloy |
|---|---|---|---|---|---|---|---|
| ***12mm Body Size*** | | | | | | | |
| A-PoP128-.65mm-12mm | 128 (top) | .65mm | 12mm | 18x18 | Perimeter | 152 | SAC105, SAC305 or SAC405 |
| A-MPoP128-.65mm-12mm | 128 (middle) | .65mm | 12mm | 18x18 | Perimeter | 152 | SAC105 |
| A-PSvfBGA305-.5mm-12mm | 305 (bottom) | .65mm (top) - .5mm (bottom) | 12mm | 23x23 | Perimeter | 152 | SAC125, SAC305 or SAC405 |
| ***14mm Body Size*** | | | | | | | |
| A-PoP152-.65mm-14mm | 152 (top) | .65mm | 14mm | 21x21 | Perimeter | 119 | SAC105, SAC305 or SAC405 |
| A-PSvfBGA353-.5mm-14mm | 353 (bottom) | .65mm (top) - .5mm (bottom) | 14mm | 26x26 | Perimeter | 119 | SAC125, SAC305 or SAC405 |

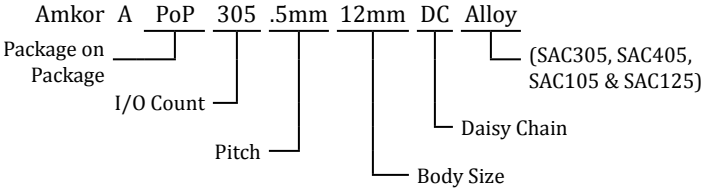
### *Notes*

- Fine pitch 0.5mm bottom package footprints
- Stacked package heights of 1.2mm to 1.6mm available in a variety of configurations (see Stack Up table on following pages)
- Wafer thinning / handling < 100 µm
- Consistent product performance and reliability
- Package configurations compliant with JEDEC standards
- Moisture Resistance Testing is JEDEC Level 3 @ 260 °C
- Temp Cycle –55/+125 °C, 1000 cycles
- HAST 130 °C, 85% RH, 96 hours
- Temp/Humidity 85 °C/85%RH/1000 hours
- High Temp Storage 150 °C, 1000 hours
- Board level Thermal Cycle –40/+125 °C, 1000 cycles
- Parts packaged in JEDEC matrix trays
- PoPs are only available Pb-free (not Tin-Lead). Available alloys are: SAC305, SAC405, SAC105 and SAC125Ni*.
- *SAC125Ni (98.25%Sn/1.2%Ag/0.5%Cu/0.05%Ni) is only available for bottom packages.
- It is recommended that parts be pre-baked at 125 °C for 48 hrs before using parts regarding moisture concern.
- PoPs are not available without solder balls.

See drawings on the following pages (23–34) for additional technical data. Color coded version available on our website: www.TrustPCI.com

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

### *Part Description System*




- Add "TR" to end of part number for die on Tape and Reel.
- Add "SAC305" , "SAC405", "SAC105 " or "SAC125" to end of part number for Lead-Free.

**Ball Diameter**

| I/O Count | Ball Diameter |
|---|---|
| 128 | 0.45mm |
| 152 | 0.45mm |
| 305 | 0.30mm |
| 353 | 0.30mm |

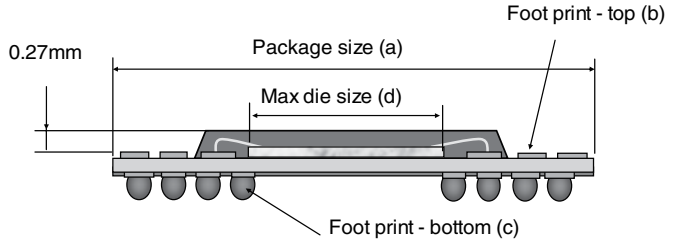
### *Please Note*

- Amkor supporting data is available on our website for: Board Level Reliability (BLR), PoP application notes, PoP Stencil & Stacking paper for SMT Conditions.
- IMAPS and SMTA White Paper Articles for additional supporting data available on our website:www.TrustPCI.com.

***For kits see pages 31 & 35.***

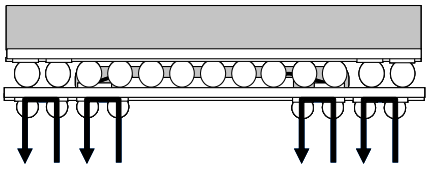
Package on Package (PoP)
12x12mm, 0.65mm to pitch
Stacked Daisy Chain

## 12mm 305 PSvfBGA Bottom Package Design Dimensions

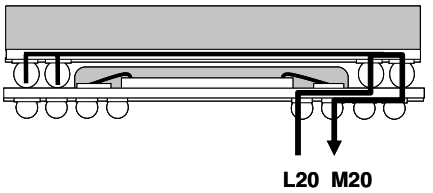



| Body (a) | Foot Print–top (b) | Foot Print–bottom (c) | Die (d) | Bond Fingers Available |
|---|---|---|---|---|
| 12 x 12mm | 0.65 pitch, 128 ball<br>18 matrix, 2 row | 0.5 pitch, 292 I/Os<br>23 matrix, 4 row<br>+ 12 NC + A1 ball 305 BGA | 7.0 mm | 332 |

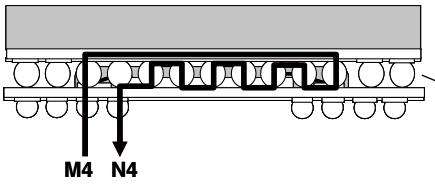
## PoP Daisy Chain 3 Net Design



Daisy chain netlist of PSvfBGA, Bottom package balls.




Daisy chain netlist of top side (Top PoP to PSvfBGA 12 corner balls reserved for NC or additional supplies as memory combinations may require).




Daisy chain netlist of top side (Top PoP to PSvfBGA 116 pin memory interface).

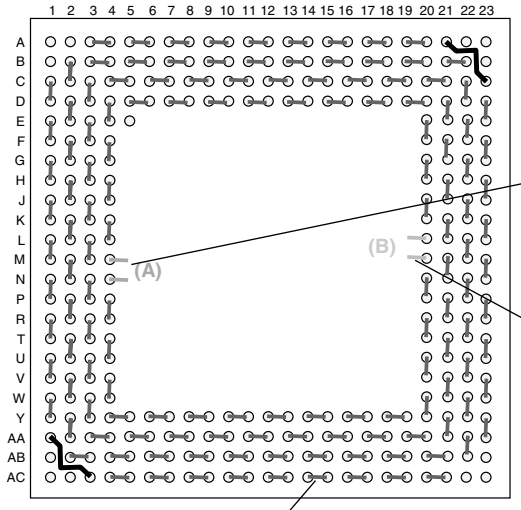
Bottom package called: Package Stackable very thin fine pitch BGA (PSvfBGA).

**** Color diagram of DC Net design available on our website.***

# Package on Package (PoP)
## 12x12mm Stacked Daisy Chain

### PSvfBGA 305
### (Bottom Package) Daisy Chain Nets

Bottom side of bottom package
(top view through package) 12x12mm,
0.5 mm PSvfBGA305, 23x23 ball matrix

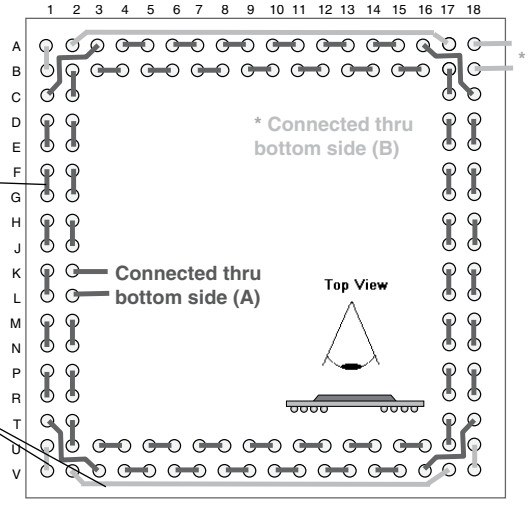



Daisy chain pattern of PSvfBGA—Top memory pads

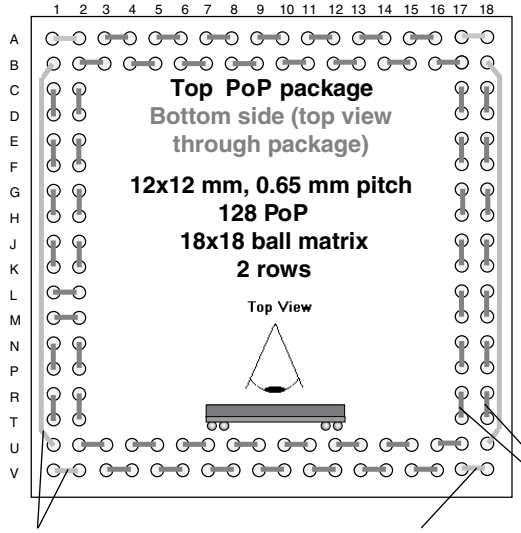
Top side 12 corner ball DC net

Daisy chain pattern of PSvfBGA -Bottom BGAs

Top side of bottom package
Top package interface (top view) 0.65 mm pitch,
128 pads, 18x18 ball matrix

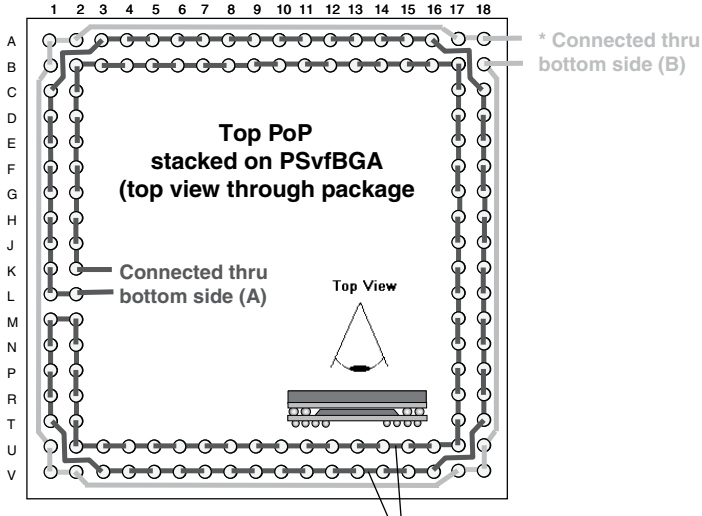



### 128 PoP (Top Package)
### Daisy Chain Netlist




Daisy chain pattern for 12 corner balls (typically reserved as NC for applications with no underfill, or option to add additional I/O or memory supplies as required for high density combinations)

### PoP + PSvfBGA
### Daisy Chain Netlist



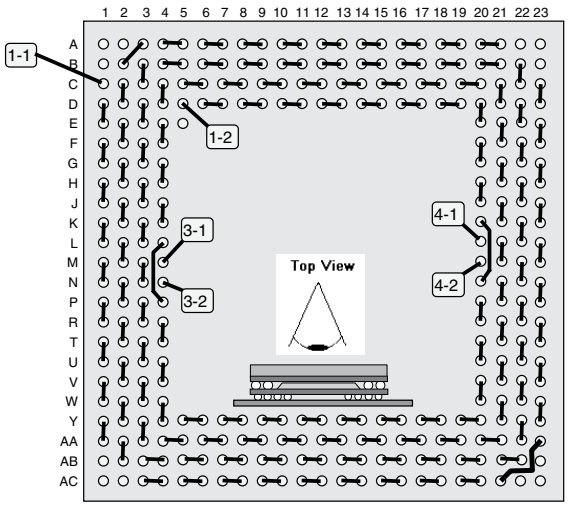

Daisy chain pattern of Top package for 116I/O memory interface

Daisy chain netlist of Top PoP and PSvfBGA.

**** Color diagram of DC Net design available on our website.***

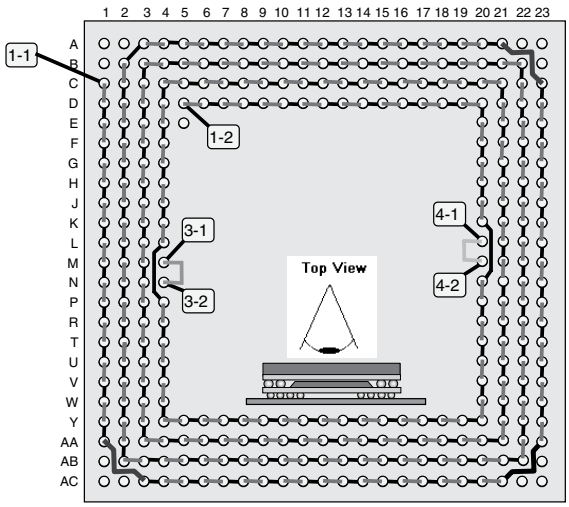
# Package on Package (PoP)
## 12x12mm Stacked Daisy Chain

PWB Netlist
Pattern for BLR Testing




Black line: PWB pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2

Stacked view of 3 DC Nets
for BLR testing




Black line: PWB pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2

PoP Overall Stack Up Example


| | | PoP +PSvfBGA | | |
|---|---|---|---|---|
| **Symbol** | **Unit** | **Min** | **Max** | **Nom** |
| A1 (Ball, 0.5 pitch) | mm | 0.150 | 0.250 | 0.200 |
| A2 (4L laminate) | mm | 0.260 | 0.340 | 0.300 |
| B1 (Ball, 0.65 pitch) | mm | 0.270 | 0.330 | 0.300 |
| B2 (2L laminate) | mm | 0.180 | 0.240 | 0.210 |
| B3 (Mold cap) | mm | 0.420 | 0.480 | 0.450 |
| Overall Pkg Height | mm | 1.378 | 1.542 | 1.460 |

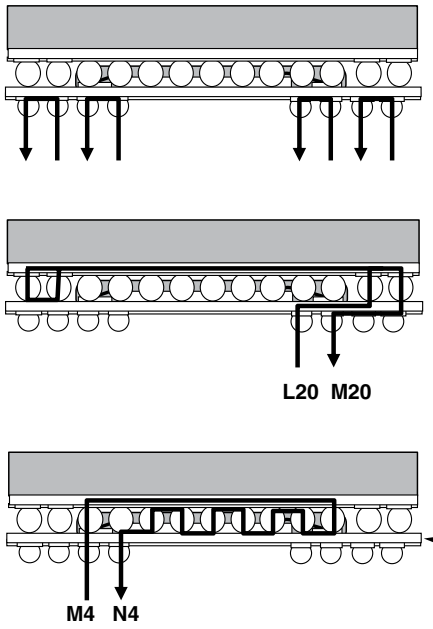
B2 and B3 may vary depending on top memory PoP (MCP) design rules.
Overall Stack up to be finalized based on top PoP rules.

**** Color diagram of DC Net design available on our website.***

# Package on Package (PoP)
## 12x12mm – 3 Package Stacking

Package on Package (PoP)
12x12mm, 0.65mm to pitch
Stacked Daisy Chain—3 Package Stacking

### PoP Daisy Chain 3 Net Design—2 Package Stack

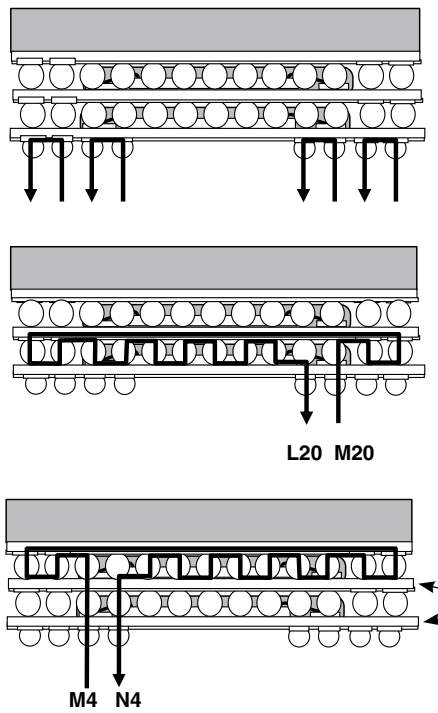



Daisy Chain netlist of PSvfBGA, Bottom package balls

Daisy chain netlist of top side (Top FBGA to PSvfBGA 116 pin memory interface)

Bottom package called:
Package Stackable very thin fine pitch BGA (PSvfBGA)

### PoP Daisy Chain 3 Net Design—3 Package Stack




Daisy Chain netlist of PSvfBGA, Bottom package balls

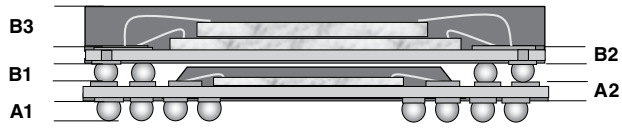
Daisy chain netlist of middle/bottom side (middle of PSvfBGA to bottom of PSvfBGA 128 balls)

Daisy chain netlist of middle/top side (FBGA to middle PSvfBGA 128 balls)

Bottom/middle package called:
Package Stackable very thin fine pitch BGA (PSvfBGA)

# Package on Package (PoP)
## 12x12mm – 3 Package Stacking

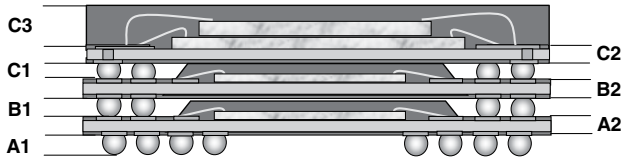
### PoP Overall Stack Up—2 Package Stack




| Symbol | Unit | Min | Nom | Max |
|---|---|---|---|---|
| A1 (Ball, 0.5 pitch) | mm | 0.180 | 0.230 | 0.280 |
| A2 (4L laminate) | mm | 0.260 | 0.300 | 0.340 |
| B1 (Ball, 0.65 pitch) | mm | 0.270 | 0.300 | 0.330 |
| B2 (2L laminate) | mm | 0.180 | 0.210 | 0.240 |
| B3 (Mold cap) | mm | 0.420 | 0.450 | 0.480 |
| Overall Pkg Height | mm | 1.408 | 1.490 | 1.572 |

Assumed standard DC substrate
Thinner stack up feasible in future build

### PoP Overall Stack Up—3 Package Stack



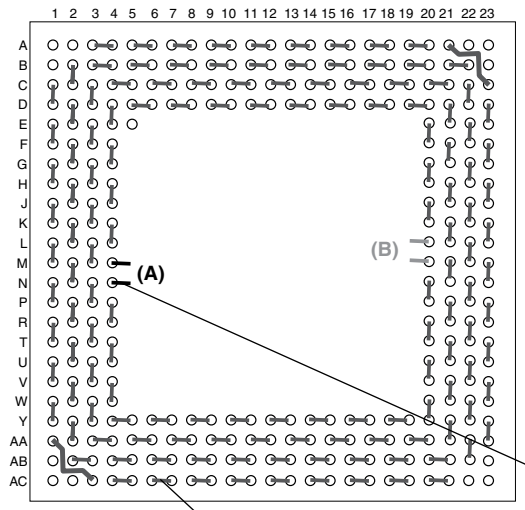

| Symbol | Unit | Min | Nom | Max |
|---|---|---|---|---|
| A1 (Ball, 0.5 pitch) | mm | 0.180 | 0.230 | 0.280 |
| A2 (4L laminate) | mm | 0.260 | 0.300 | 0.340 |
| B1 (Ball, 0.65 pitch) | mm | 0.270 | 0.300 | 0.330 |
| B2 (2L laminate) | mm | 0.180 | 0.210 | 0.240 |
| C1 (Ball, 0.65 pitch) | mm | 0.270 | 0.300 | 0.330 |
| C2 (2L laminate) | mm | 0.180 | 0.210 | 0.240 |
| C3 (Mold cap) | mm | 0.420 | 0.450 | 0.480 |
| Overall Pkg Height | mm | 1.907 | 2.000 | 2.093 |

Assumed standard DC substrate
Thinner stack up feasible in future build

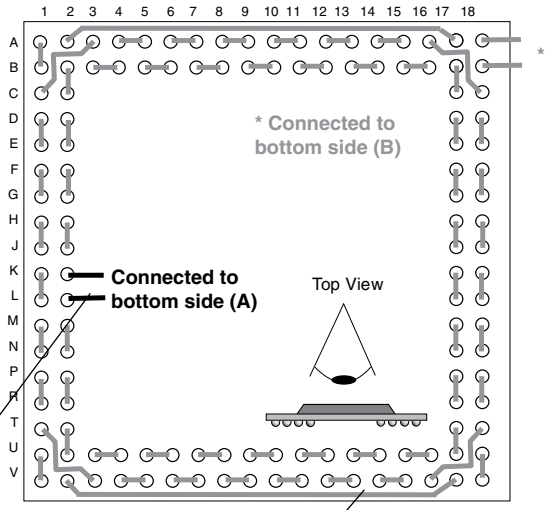
# Package on Package (PoP)
12x12mm – 3 Package Stacking

## PSvfBGA 305 (Bottom Package) Daisy Chain Nets

Bottom side of bottom package (top view through package)
12x12mm, 0.65 mm PSvfBGA305, 23x23 ball matrix




Top side of bottom package
Top/Middle package interface (top view)
0.65mm pitch, 128 pads, 18x18 ball matrix



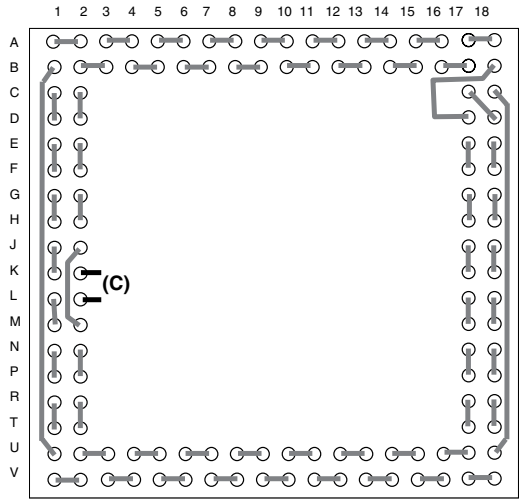

Daisy chain pattern of PSvfBGA—Top memory pads

Daisy chain pattern of PSvfBGA—Bottom BGAs

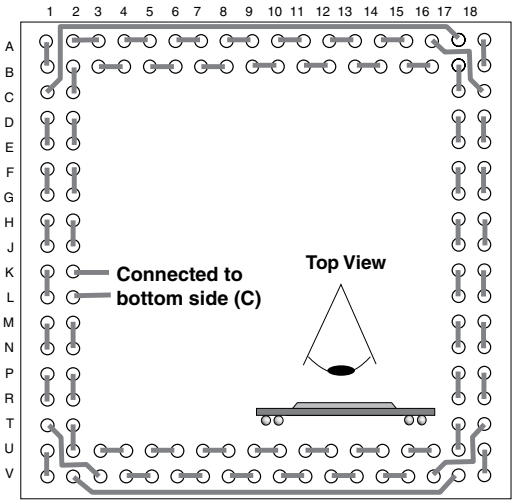
Top side 12 corner ball DC net

## PSvfBGA 128 (Middle Package) Daisy Chain Nets

Bottom side of middle package (top view through package)
12x12mm, 0.65 mm PSvfBGA128, 18x18 ball matrix

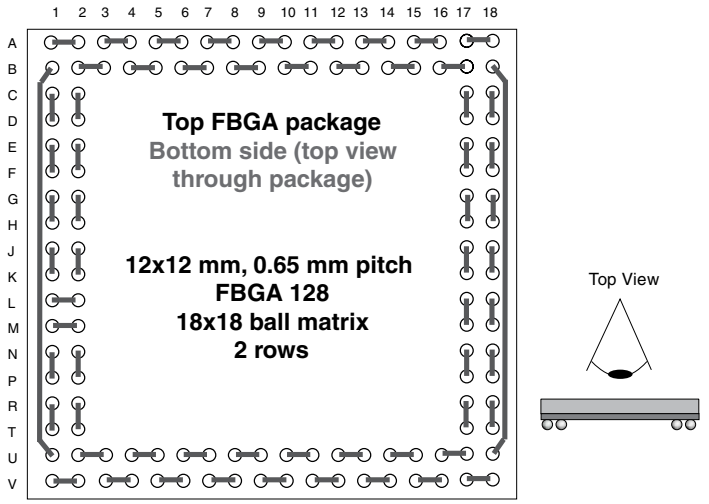



Top side of middle package
Top package interface (top view)
0.65mm pitch, 128 pads, 18x18 ball matrix

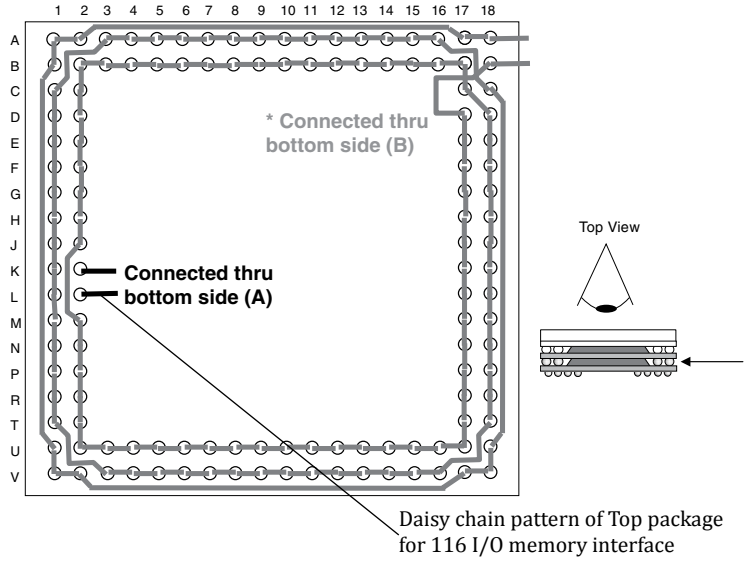



Each pad on the top side is connected to the corresponding pad on the bottom side through via.

FBGA 128 (Top Package) Daisy Chain Netlist

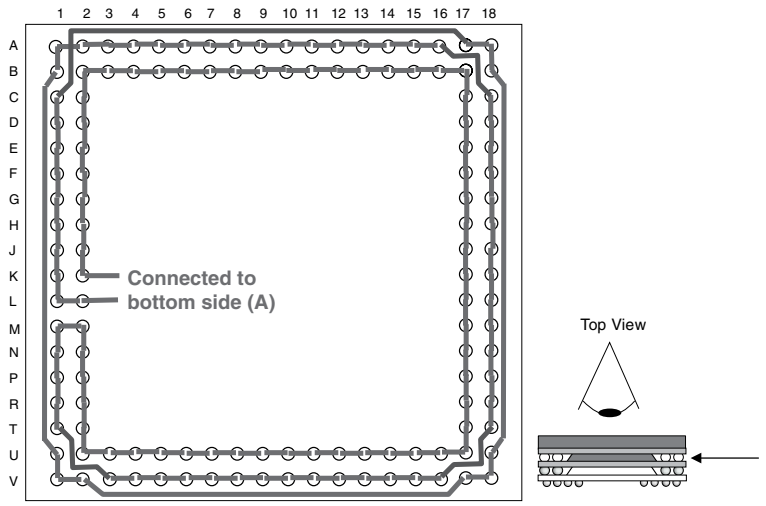



Middle-to-Bottom Package Connection after 3 PKG Stack

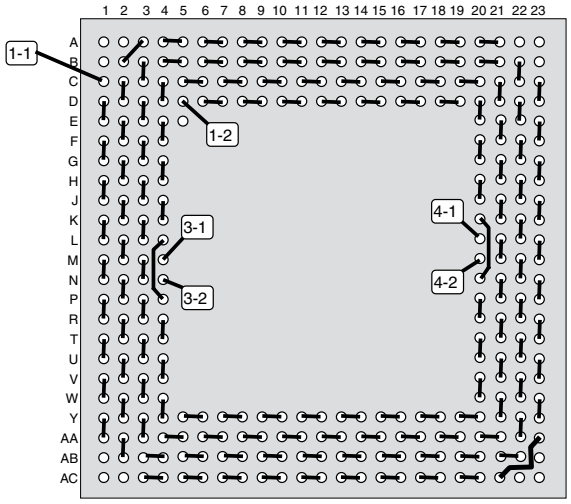


# Package on Package (PoP)
## 12x12mm – 3 Package Stacking

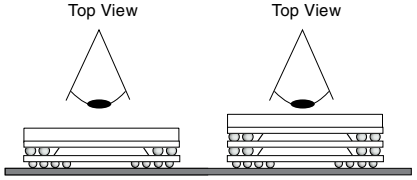
Top-to-Middle Package Connection after 3 PKG Stack



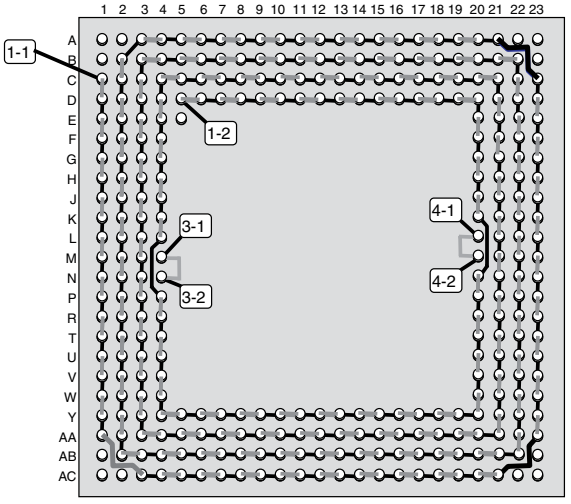

PWB Netlist Pattern for BLR Testing



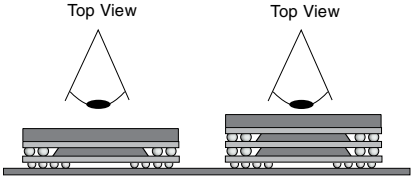

PWB Pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2




Stacked View of 3 DC Nets for BLR Testing



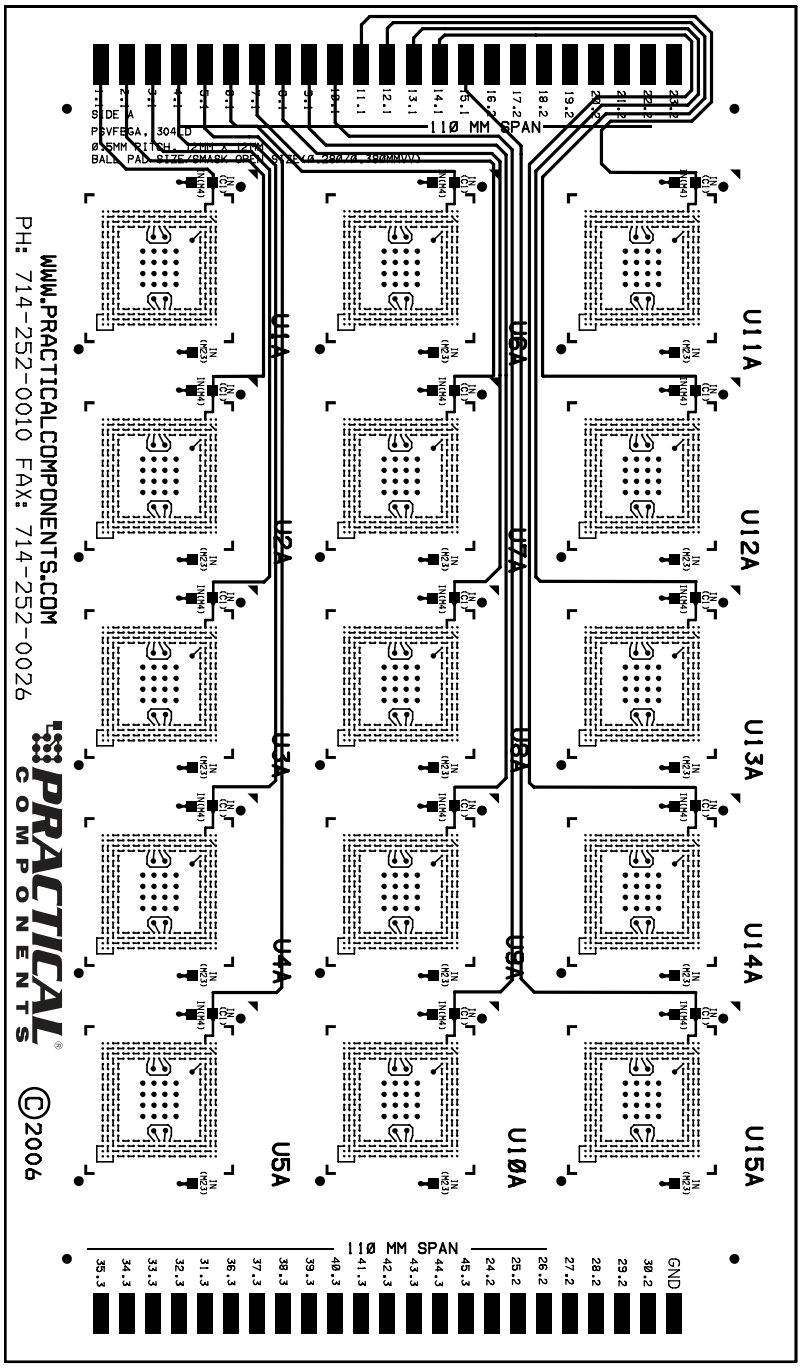

PWB Pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2



# PoP 12mm Board and Kit

## Lead-Free Test Kit

### PCB200 12mm Board




This PoP 12mm Board and Kit is designed as test vehicle for the new Amkor (PSvfBGA) 12x12 305 PoP package. PoP packages from Amkor focus on high density logic devices.

PoP packages are designed for products such as cell phones, digital cameras and other mobile applications benefiting from the combination of stacked packages and small footprint technology. This test board enables the end user to test their process applications on the top and bottom PoP components.

With daisy-chain patterns in both packages and the PCB200 Board, customers are able to check for continuity to guarantee the integrity of their process.

***Notes***

- Board size is 132 x 77mm, 8-layers, .039" thick, no microvias.
- Board material is IS-410 High Temp 180Tg.
- Standard board finish OSP Entek CU-106A-HT.
- Immersion Silver finish is also available upon special request. MOQ may apply.
- 15 daisy-chain pad placements for 12x12 305 PoP component.
- Gerber and X,Y Theta data included at no charge.
- See page 22 for available solder ball alloy's for PoP components. SAC305, SAC405, SAC105 and SAC125Ni is available.

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

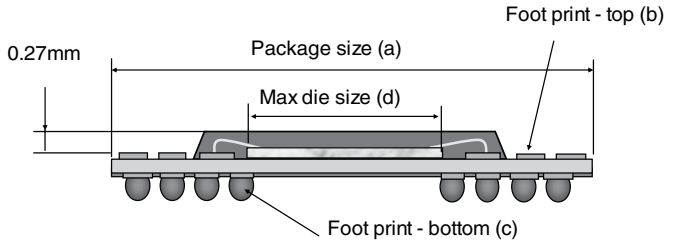
***Order Notes***

- Order Number: 19577 PCB200 12mm *(board only)*
- Order Number: 31288 A-PoP128-.65mm-12mm-DC-SAC105 *(top component only)*
- Order Number: 31289 A-PSvfBGA305-.5mm-12mm-DC-SAC125Ni *(bottom component only)*

# Package on Package (PoP)
## 14x14mm Stacked Daisy Chain

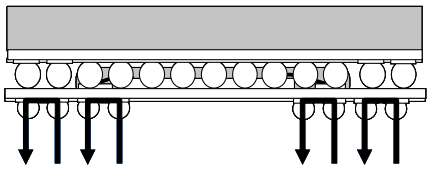
Package on Package (POP)
14x14mm
Stacked Daisy Chain

14mm 353 PSvfBGA
Bottom Package Design Dimensions

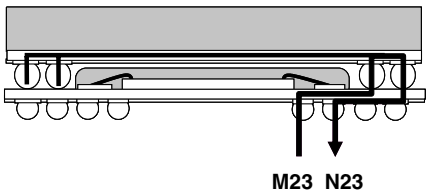



| Body (a) | Foot Print–top (b) | Foot Print–bottom (c) | Die (d) | Bond Fingers Available |
|---|---|---|---|---|
| 14 x14 mm | 0.65 pitch, 152 ball<br>21 matrix, 2 row | 0.5 pitch, 340 I/Os<br>26 matrix, 4 row<br>+ 12 NC + A1 ball 353 BGA | 8.9 mm | 328 to 396 |

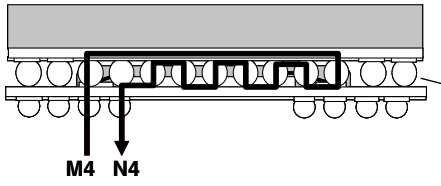
PoP Daisy Chain 3 Net Design



Daisy chain netlist of PSvfBGA, Bottom package balls




Daisy chain netlist of top side (Top PoP to PSvfBGA 12 corner balls reserved for NC or additional supplies as memory combinations may require).




Daisy chain netlist of top side (Top PoP to PSvfBGA 140 pin memory interface)

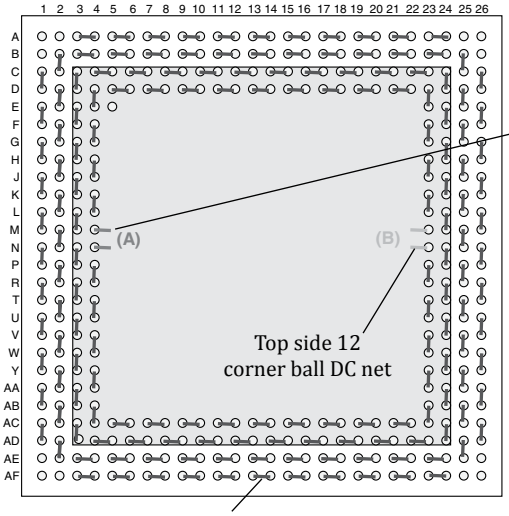
Bottom package called: Package Stackable very thin fine pitch BGA (PSvfBGA)

**** Color diagram of DC Net design available on our website.***

# Package on Package (PoP)
## 14x14mm Stacked Daisy Chain

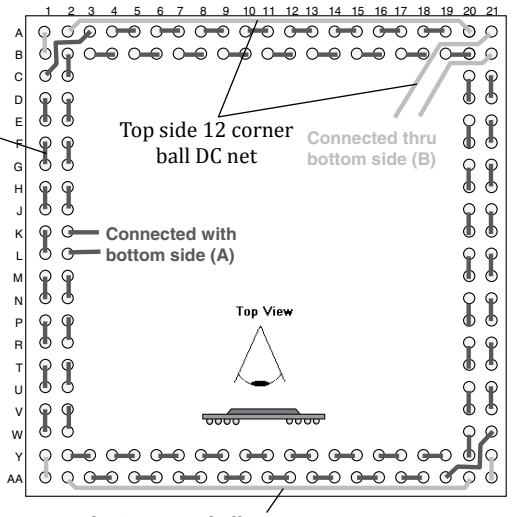
### PSvfBGA 353
### (Bottom Package) Daisy Chain Nets

Bottom side (top view through package)
14x14mm, 0.5 mm PSvfBGA353, 26x26 ball matrix




Daisy chain pattern of PSvfBGA—Top memory pads

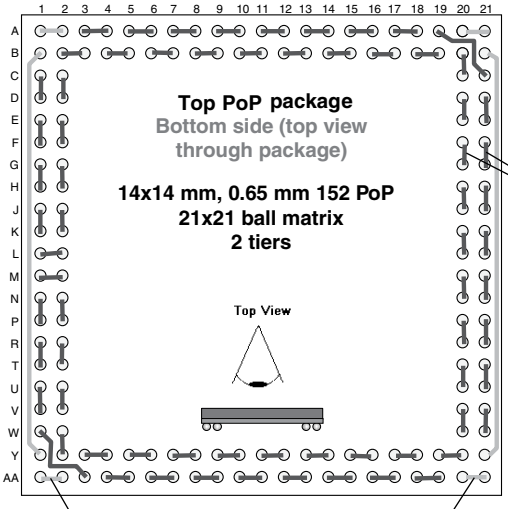
Top side—Top package interface (top view) 0.65 mm pitch, 152 pads, 21x21 ball matrix




Daisy chain pattern of PSvfBGA—Bottom BGAs

Top side 12 corner ball DC net

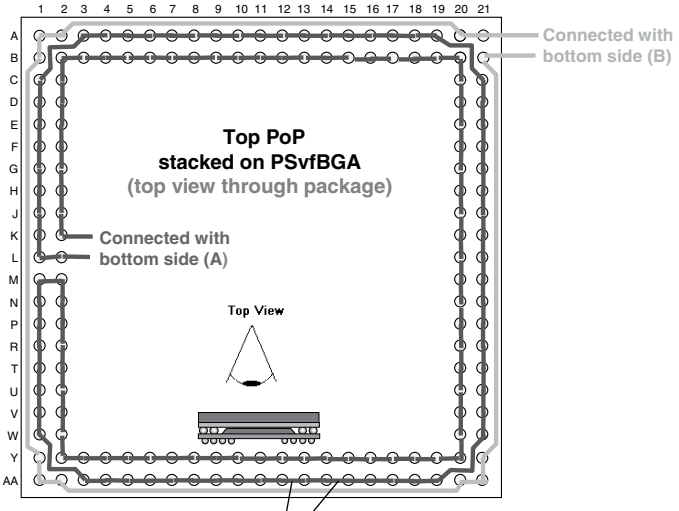
### 152 PoP
### (Top Package) Daisy Chain Netlist




Daisy chain pattern of Top package for 140 I/O memory interface

Daisy chain pattern for 12 corner balls (typically reserved as NC for applications with no underfill, or option to add additional I/O or memory supplies as required for high density combinations).

### Top PoP + PSvfBGA
### Daisy Chain Netlist



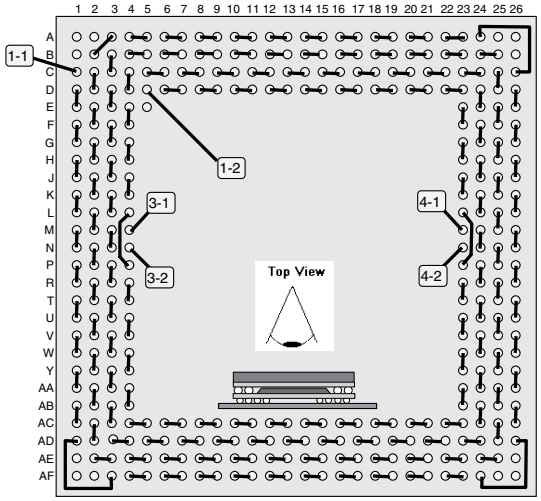

Daisy chain netlist of Top FBGA and PSvfBGA

**** Color diagram of DC Net design available on our website.***

# Package on Package (PoP)
## 14x14mm Stacked Daisy Chain

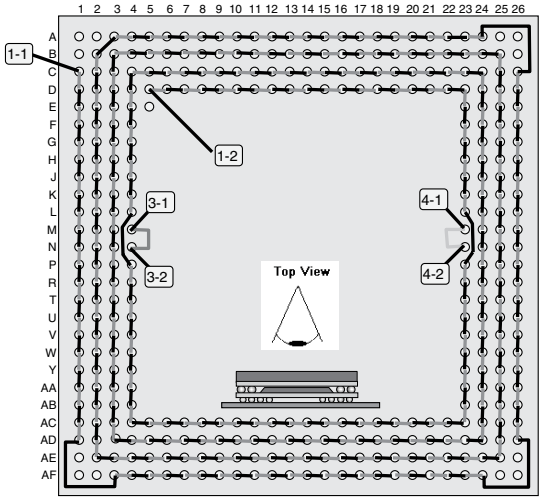
### PWB Netlist Pattern for BLR Testing

PWB (top view)



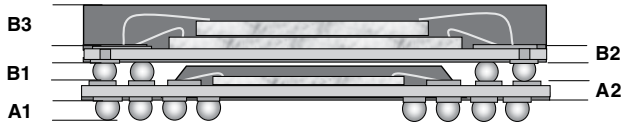

Black line: PWB pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2

### Stacked View of 3 DC Nets For BLR Testing




Black line: PWB pattern
In: 1-1, 3-1, 4-1
Common: 1-2, 3-2, 4-2

### PoP Overall Stack Up Example



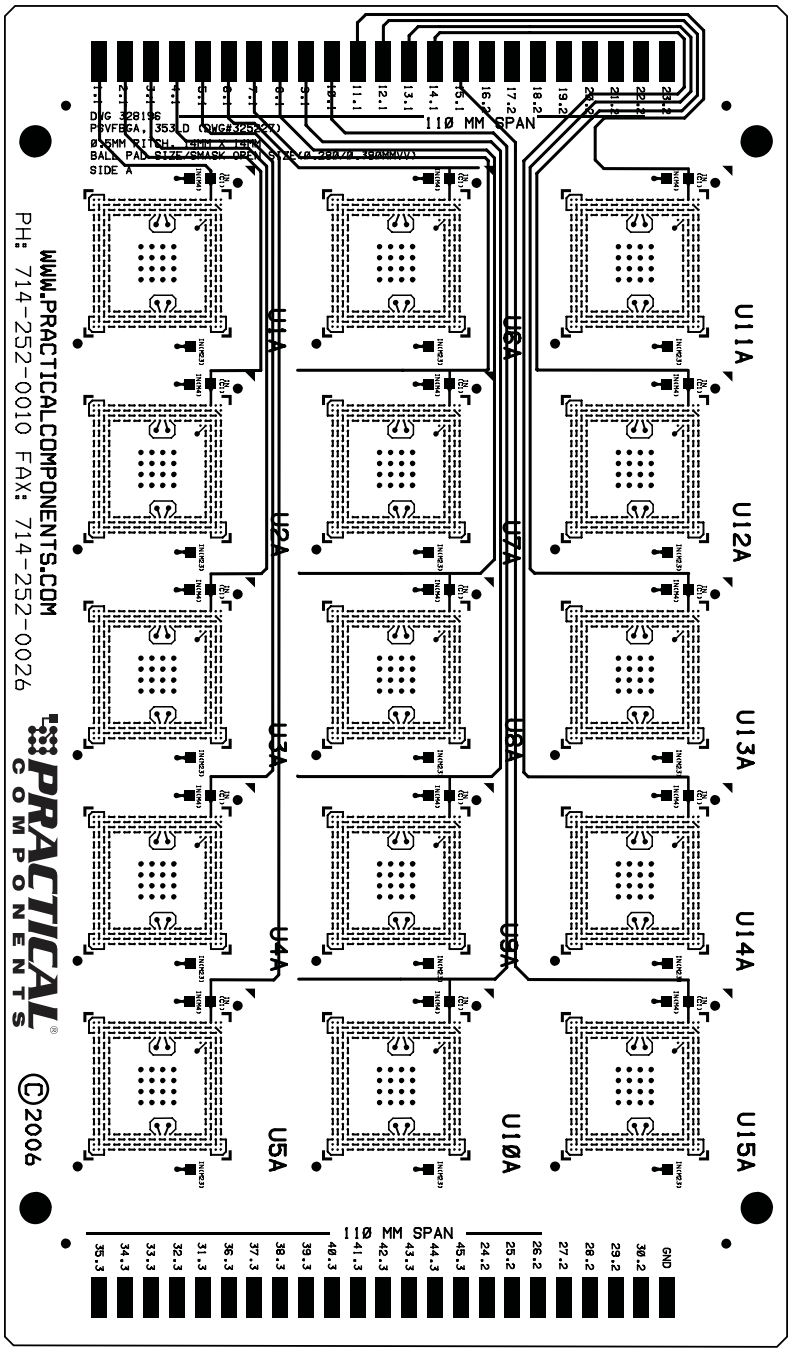

| | | PoP + PSvfBGA | | |
|---|---|---|---|---|
| **Symbol** | **Unit** | **Min** | **Max** | **Nom** |
| A1 (Ball, 0.5 pitch) | mm | 0.150 | 0.250 | 0.200 |
| A2 (4L laminate) | mm | 0.260 | 0.340 | 0.300 |
| B1 (Ball, 0.65 pitch) | mm | 0.270 | 0.330 | 0.300 |
| B2 (2L laminate) | mm | 0.180 | 0.240 | 0.210 |
| B3 (Mold cap) | mm | 0.420 | 0.480 | 0.450 |
| Overall Package Height | mm | 1.378 | 1.542 | 1.460 |

B2 and B3 may vary depending on top memory PoP (MCP) design rules.
Overall Stack up to be finalized based on top PoP rules.

**** Color diagram of DC Net design available on our website.***

# PoP 14mm Board & Kit
## Lead-Free Test Kit

### PCB200 14mm Board




This PoP 14mm Board and Kit is designed as test vehicle for the new Amkor (PSvfBGA) 14x14 305 PoP package. PoP packages from Amkor focus on high density logic devices.

PoP packages are designed for products such as cell phones, digital cameras and other mobile applications benefiting from the combination of stacked packages and small footprint technology. This test board enables the end user to test their process applications on the top and bottom PoP components.

With daisy-chain patterns in both packages and the PCB200 Board, customers are able to check for continuity to guarantee the integrity of their process.

***Notes***

- Board size is 132 x 77mm, 8-layers, .039" thick, no microvias.
- Board material is IS-410 High Temp 180Tg.
- Standard board finish OSP Entek CU-106A-HT.
- 15 daisy-chain pad placements for 14x14 353 PSvfPGA component.
- Immersion Silver finish is also available upon special request. MOQ may apply.
- Gerber and X,Y Theta data included at no charge.
- See page 22 for available solder ball alloy's for PoP components. SAC305, SAC405, SAC105 and SAC125Ni is available.

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

***Ordering Information***

- Order Number: 12953 PCB200-14mm-OSPHT *(board only)*
- Order Number: 31290 A-PoP152-.65mm-14mm-DC-LF-SAC105 *(top component only)*
- Order Number: 31291 A-PSvfBGA353-.5mm-14mm-DC-LF-SAC125Ni *(bottom component only)*

# OmQFN
## Open-molded Quad Flat Pack No Leads

From prototype to production volumes, these pre-molded QFN packages, created by Quik-Pak, provide a high quality, fast solution for your assembly needs.

The pre-molded packages come in a variety of sizes. They are available from 3x3mm to 12x12mm body size with lead pitch sizes ranging from .8mm to .4mm. Covers or lids are also available for air cavity applications.

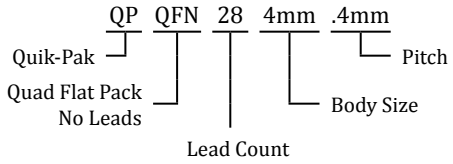
**OmQFN Open-molded Quad Flat Pack No Leads Package**

| Part Description | Lead Count | Body Size | Pitch |
|---|---|---|---|
| ***.4mm Pitch*** | | | |
| QPQFN28-4mm-.4mm | 28 | 4mm | .4mm |
| QPQFN48-6mm-.4mm | 48 | 6mm | .4mm |
| QPQFN88-10mm-.4mm | 88 | 10mm | .4mm |
| QPQFN100-12mm-.4mm | 100 | 12mm | .4mm |
| ***.5mm Pitch*** | | | |
| QPQFN12-3mm-.5mm | 12 | 3mm | .5mm |
| QPQFN16-3mm-.5mm | 16 | 3mm | .5mm |
| QPQFN20-4mm-.5mm | 20 | 4mm | .5mm |
| QPQFN24-4mm-.5mm | 24 | 4mm | .5mm |
| QPQFN28-5mm-.5mm | 28 | 5mm | .5mm |
| QPQFN32-5mm-.5mm | 32 | 5mm | .5mm |
| QPQFN40-6mm-.5mm | 40 | 6mm | .5mm |
| QPQFN44-7mm-.5mm | 44 | 7mm | .5mm |
| QPQFN48-7mm-.5mm | 48 | 7mm | .5mm |
| QPQFN56-8mm-.5mm | 56 | 8mm | .5mm |
| QPQFN64-9mm-.5mm | 64 | 9mm | .5mm |
| QPQFN72-10mm-.5mm | 72 | 10mm | .5mm |
| QPQFN80-12mm-.5mm | 80 | 12mm | .5mm |
| ***.65mm Pitch*** | | | |
| A-MLF8-3mm-.65mm | 8 | 3mm | .65mm |
| QPQFN12-3mm-.65mm | 12 | 3mm | .65mm |
| QPQFN16-4mm-.65mm | 16 | 4mm | .65mm |
| QPQFN20-5mm-.65mm | 20 | 5mm | .65mm |
| QPQFN24-5mm-.65mm | 24 | 5mm | .65mm |
| QPQFN28-6mm-.65mm | 28 | 6mm | .65mm |
| QPQFN32-7mm-.65mm | 32 | 7mm | .65mm |

***Notes***

- Larger die paddle area.
- Supports larger die and ground bonds per given body size.
- RoHS and REACH compliant “green” molding compound.
- Gold plated.
- Superior bondability.
- Custom body sizes and lead counts available.
- Components can be encapsulated or lids are available.
- 40Au/80Ni Plated

***Part Description System***




***Assembly Solutions Include the following:***

- Wafer Dicing
- Wire Bonding
- Custom Packaging
- Backgrinding
- Complete Assembly

# MLF® MicroLeadFrame®


Amkor's MicroLeadFrame® Package (MLF®) is a near CSP plastic encapsulated package with a copper leadframe substrate. This package uses perimeter lands on the bottom of the package to provide electrical contact to the PWB. The package also offers Amkor's ExposedPad™ technology as a thermal enhancement by having the die attach paddle exposed on the bottom of the package surface to provide an efficient heat path when soldered directly to the PWB.

**MLF – MicroLeadFrame®**

| Part Description | Lead Count | Body Size | Pitch | Quantity Per Tube |
|---|---|---|---|---|
| ***.4mm Pitch*** | | | | |
| A-MLF28-4mm-.4mm | 28 | 4mm | .4mm | 75 |
| A-MLF48-6mm-.4mm | 48 | 6mm | .4mm | 50 |
| A-MLF88-10mm-.4mm | 88 | 10mm | .4mm | 30 |
| A-MLF100-12mm-.4mm | 100 | 12mm | .4mm | 25 |
| ***.5mm Pitch*** | | | | |
| A-MLF12-3mm-.5mm | 12 | 3mm | .5mm | 100 |
| A-MLF16-3mm-.5mm | 16 | 3mm | .5mm | 100 |
| A-MLF20-4mm-.5mm | 20 | 4mm | .5mm | 75 |
| A-MLF24-4mm-.5mm | 24 | 4mm | .5mm | 75 |
| A-MLF28-5mm-.5mm | 28 | 5mm | .5mm | 60 |
| A-MLF32-5mm-.5mm | 32 | 5mm | .5mm | 60 |
| A-MLF36-6mm-.5mm | 36 | 6mm | .5mm | 50 |
| A-MLF40-6mm-.5mm | 40 | 6mm | .5mm | 50 |
| A-MLF44-7mm-.5mm | 44 | 7mm | .5mm | 43 |
| A-MLF48-7mm-.5mm | 48 | 7mm | .5mm | 43 |
| A-MLF52-8mm-.5mm | 52 | 8mm | .5mm | 37 |
| A-MLF56-8mm-.5mm | 56 | 8mm | .5mm | 37 |
| A-MLF64-9mm-.5mm | 64 | 9mm | .5mm | 33 |
| A-MLF68-10mm-.5mm | 68 | 10mm | .5mm | 30 |
| A-MLF72-10mm-.5mm | 72 | 10mm | .5mm | 30 |
| ***.65mm Pitch*** | | | | |
| A-MLF8-3mm-.65mm | 8 | 3mm | .65mm | 100 |
| A-MLF16-4mm-.65mm | 16 | 4mm | .65mm | 75 |
| A-MLF20-5mm-.65mm | 20 | 5mm | .65mm | 60 |
| A-MLF32-7mm-.65mm | 32 | 7mm | .65mm | 43 |
| A-MLF44-9mm-.65mm | 44 | 9mm | .65mm | 33 |
| ***.8mm Pitch*** | | | | |
| A-MLF16-5mm-.8mm | 16 | 5mm | .8mm | 60 |
| A-MLF28-7mm-.8mm | 28 | 7mm | .8mm | 43 |

***Notes***

- Parts are packaged in tubes (standard).
- Parts are available in trays or on tape and reel upon special request.
- Solder plating finish available is 100% Matte Sn.
- Moisture sensitivity level is JEDEC 1.
- Small size (50% space reduction as compared with TSSOP).
- MLF® package is a near CSP plastic encapsulated package with a copper leadframe substrate.
- MLF® is also known as QFN, MCC or MLP.
- 0.6mm to 1.5mm maximum height
- Body sizes ranging from 3 x 3mm to 12 x 12mm.
- Pin counts and body sizes change on an ongoing basis. Please call for updated listing of available packages.

***For kits see pages 93, 100, 105, 106, 107, 108, 111 & 116.***

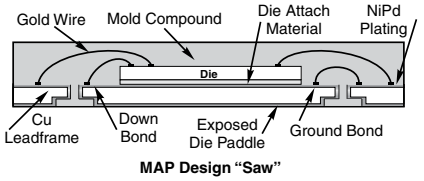
***Part Description System***

Amkor A MLF 28 4mm .4mm DC Sn

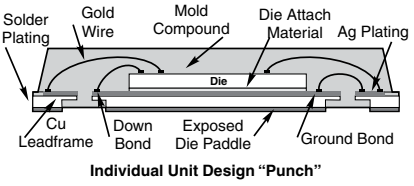
- Microlead®Frame
- Lead Count
- Body Size
- Pitch
- Daisy Chain
- (100% Matte Sn)

- Add "TR" to end of part number for Parts on Tape and Reel.
- Add "T" to end of part number for Parts in Trays.

## Cross-Sections MLF®




**MAP Design "Saw"**




**Individual Unit Design "Punch"**

# Dual Row MLF®

Amkor's new Dual Row MLF® (MicroLeadFrame®) package with 2 rows of lands is a cost effective, high performance solution for devices requiring up to 164 I/O. Typical applications include hard disk drives, USB controllers, and Wireless LAN. The small size and weight, along with excellent thermal and electrical performance, make the MLF® package an ideal choice for handheld portable applications such as cell phones and PDAs or any other application where size, weight and package performance are required issues.


| Part Description | Lead Count | Body Size | Pitch | Quantity Per Tube |
|---|---|---|---|---|
| ***.5mm Pitch*** | | | | |
| A-DualRowMLF156-12mm-.5mm | 156 | 12mm | .5mm | 25 |

***Notes***

- Parts are packaged in tubes (standard).
- Parts are available in trays or on tape and reel upon special request.
- Solder plating finish available is 100% Matte Sn.
- Moisture sensitivity level is JEDEC 1.
- Small size (reduce package footprint by 50% or more and improved RF performance) and weight.
- Process flow is same as standard "punch" MLF®.
- Dual row MLF® offers enhanced thermal capability.
- SnPb parts no longer available.

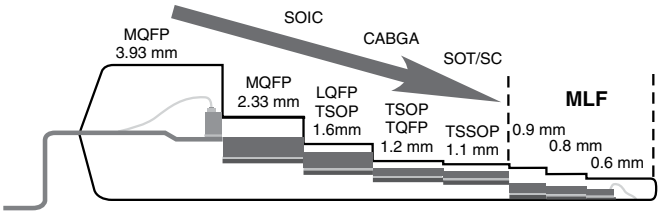
***Part Description System***

Amkor A DualRowMLF 156 12mm .5mm DC Sn

- Dual Row MicroLeadFrame®
- Lead Count
- Body Size
- Pitch
- Daisy Chain
- (100% Matte Sn)

- Add "TR" to end of part number for Tape and Reel.
- Add "T" to end of part number for parts in Trays.

## Package Height Comparison




***For kits see pages 108 & 111.***

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

# TQFP
## Thin Quad Flat Pack

Thin Quad Flat Pack (TQFP) packages provide the same benefit of the metric QFP package, but are thinner (body thickness of 1.0mm) and have a standard lead-frame footprint (2.0mm lead footprint). TQFPs are helping to solve issues such as increasing board density, die shrink programs, thin end-product profile and portability. Lead counts range from 32 to 176. Body sizes range from 5 x 5mm to 20 x 20mm. Copper lead-frames are used for the TQFP package.

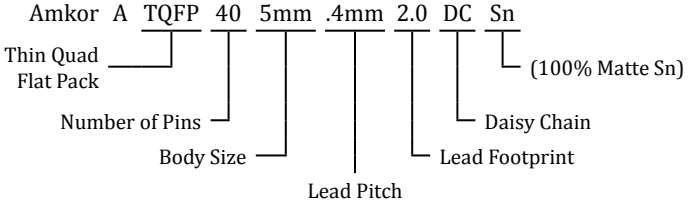
### TQFP Thin Quad Flat Pack 1.0mm Thick

| Part Description | Number of Pins | Body Size | Lead Pitch | Quantity Per Tray | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|---|
| ***.4mm Pitch*** | | | | | | | |
| A-TQFP40-5mm-.4mm-2.0 | 40 | 5mm sq | .4mm | 360 | 16mm | 12mm | 1,000 |
| A-TQFP64-7mm-.4mm-2.0 | 64 | 7mm sq | .4mm | 250 | 16mm | 12mm | 1,000 |
| A-TQFP120-14mm-.4mm-2.0 | 120 | 14mm sq | .4mm | 90 | 32mm | 24mm | 750 |
| A-TQFP128-14mm-.4mm-2.0 | 128 | 14mm sq | .4mm | 90 | 32mm | 24mm | 750 |
| A-TQFP176-20mm-.4mm-2.0 | 176 | 20mm sq | .4mm | 60 | 44mm | 24mm | 500 |
| ***.5mm Pitch*** | | | | | | | |
| A-TQFP32-5mm-.5mm-2.0 | 32 | 5mm sq | .5mm | 360 | 16mm | 12mm | 1,000 |
| A-TQFP48-7mm-.5mm-2.0 | 48 | 7mm sq | .5mm | 250 | 16mm | 12mm | 1,000 |
| A-TQFP64-10mm-.5mm-2.0 | 64 | 10mm sq | .5mm | 160 | 24mm | 16mm | 1,000 |
| A-TQFP80-12mm-.5mm-2.0 | 80 | 12mm sq | .5mm | 119 | 24mm | 24mm | 1,000 |
| A-TQFP100-14mm-.5mm-2.0 | 100 | 14mm sq | .5mm | 90 | 32mm | 24mm | 750 |
| A-TQFP128-20mm-.5mm-2.0 | 128 | 20mm sq | .5mm | 60 | 44mm | 24mm | 500 |
| A-TQFP144-20mm-.5mm-2.0 | 144 | 20mm sq | .5mm | 60 | 44mm | 24mm | 500 |
| ***.65mm Pitch*** | | | | | | | |
| A-TQFP80-14mm-.65mm-2.0 | 80 | 14mm sq | .65mm | 90 | 32mm | 24mm | 750 |
| ***.8mm Pitch*** | | | | | | | |
| A-TQFP32-7mm-.8mm-2.0 | 32 | 7mm sq | .8mm | 250 | 16mm | 12mm | 1,000 |
| A-TQFP44-10mm-.8mm-2.0 | 44 | 10mm sq | .8mm | 160 | 24mm | 16mm | 1,000 |
| A-TQFP52-10mm-.8mm-2.0 | 52 | 10mm sq | .8mm | 160 | 24mm | 16mm | 1,000 |
| A-TQFP64-14mm-.8mm-2.0 | 64 | 14mm sq | .8mm | 90 | 32mm | 24mm | 750 |

***Notes***

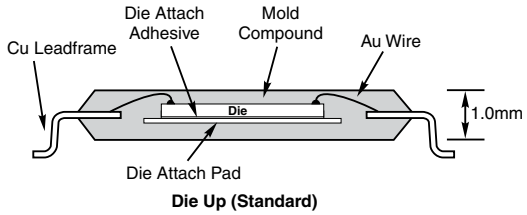
- All TQFP are standard in trays.
- Parts available on Tape and Reel.
- TQFP have body thickness of 1.0mm.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with 100% Matte Sn finish.
- SnPb parts no longer available.

***Part Description System***

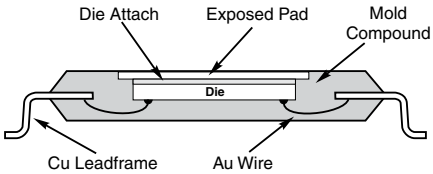



- Add "TR" to end of part number for Tape and Reel.
- Add "SN" to end of part number for Lead-Free parts.

TQFP Package

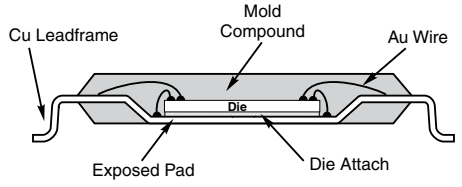



**Die Up (Standard)**




**Die Down (Inverted)**

Exposed Pad L/TQFP Package




**Die Up (Standard)**

# LQFP
## Low Profile Quad Flat Pack

Low Profile Quad Flat Pack (LQFP) packages provide the same benefit of the metric QFP packages, but are thinner (body thickness of 1.4mm) and have a standard lead-frame footprint (2.0mm lead footprint).

LQFPs help to solve issues such as increasing board density, die shrink programs, thin end-product profile and portability. Lead counts range from 32 to 256. Body sizes range from 7 x 7mm to 28 x 28mm. Copper lead-frames are used for the LQFP package.

Daisy-Chain Parts Available!


**LQFP Low Profile Quad Flat Pack 1.4mm Thick**

| Part Description | Number of Pins | Body Size | Lead Pitch | Quantity Per Tray | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|---|
| ***.4mm Pitch*** | | | | | | | |
| A-LQFP64-7mm-.4mm-2.0 | 64 | 17mm sq | .4mm | 250 | 16mm | 12mm | 1,000 |
| A-LQFP120-14mm-.4mm-2.0 | 120 | 14mm sq | .4mm | 90 | 32mm | 24mm | 750 |
| A-LQFP128-14mm-.4mm-2.0 | 128 | 14mm sq | .4mm | 90 | 32mm | 24mm | 750 |
| A-LQFP176-20mm-.4mm-2.0 | 176 | 20mm sq | .4mm | 60 | 44mm | 24mm | 500 |
| A-LQFP216-24mm-.4mm-2.0 | 216 | 24mm sq | .4mm | 40 | 44mm | 32mm | 500 |
| A-LQFP256-28mm-.4mm-2.0 | 256 | 28mm sq | .4mm | 36 | 44mm | 40mm | 500 |
| ***.5mm Pitch*** | | | | | | | |
| A-LQFP48-7mm-.5mm-2.0 | 48 | 7mm sq | .5mm | 250 | 16mm | 12mm | 1,000 |
| A-LQFP64-10mm-.5mm-2.0 | 64 | 10mm sq | .5mm | 160 | 24mm | 24mm | 1,000 |
| A-LQFP100-14mm-.5mm-2.0 | 100 | 14mm sq | .5mm | 90 | 32mm | 24mm | 750 |
| A-LQFP128-14x20-.5mm-2.0 | 128 | 14x20mm | .5mm | 72 | 44mm | 32mm | 500 |
| A-LQFP128-20mm-.5mm-2.0 | 128 | 20mm sq | .5mm | 60 | 44mm | 24mm | 500 |
| A-LQFP144-20mm-.5mm-2.0 | 144 | 20mm sq | .5mm | 60 | 44mm | 24mm | 750 |
| A-LQFP160-24mm-.5mm-2.0 | 160 | 24mm sq | .5mm | 40 | 44mm | 32mm | 500 |
| A-LQFP176-24mm-.5mm-2.0 | 176 | 24mm sq | .5mm | 40 | 44mm | 32mm | 500 |
| A-LQFP208-28mm-.5mm-2.0 | 208 | 28mm sq | .5mm | 36 | 44mm | 40mm | 500 |
| ***.65mm Pitch*** | | | | | | | |
| A-LQFP52-10mm-.65mm-2.0 | 52 | 10mm sq | .65mm | 160 | 24mm | 24mm | 1,000 |
| A-LQFP80-14mm-.65mm-2.0 | 80 | 14mm sq | .65mm | 90 | 32mm | 24mm | 750 |
| A-LQFP100-14x20-.65mm-2.0 | 100 | 14x20mm | .65mm | 72 | 44mm | 32mm | 500 |
| ***.8mm Pitch*** | | | | | | | |
| A-LQFP32-7mm-.8mm-2.0 | 32 | 7mm sq | .8mm | 250 | 16mm | 12mm | 1,000 |
| A-LQFP44-10mm-.8mm-2.0 | 44 | 10mm sq | .8mm | 160 | 24mm | 24mm | 1,000 |
| A-LQFP64-14mm-.8mm-2.0 | 64 | 14mm sq | .8mm | 90 | 32mm | 24mm | 750 |

***Notes***

- All LQFPs are standard in trays.
- Parts available on Tape and Reel.
- LQFPs have a body thickness of 1.4mm.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with 100% Matte Sn finish.
- SnPb parts no longer available.

***Part Description System***

Amkor A LQFP 64 7mm .4mm 2.0 DC Sn

- Low Profile Quad Pack
- Number of Pins
- Body Size
- Lead Pitch
- Lead Footprint
- Daisy Chain
- (100% Matte Sn)

- Add "TR" to end of part number for Tape and Reel.
- Add "SN" to end of part number for Lead Free parts.

***For kits see pages 100, 101, 105, 108, 111, 116 & 117.***

For drawings, please visit our web site at www.TrustPCI.com.

# QFP
## Quad Flat Pack

Quad Flat Pack (QFP) components have four sides with leads extending from the component body on all four sides. QFP components come packaged in trays or on tape and reel to protect the component leads that can be easily damaged. An important measurement for QFPs is coplanarity. When the first lead from the component is placed on the PCB coplanarity is established. Coplanarity ensures the last lead can be placed on the board. The standard for QFP coplanarity is ±4 mils.

### QFP Quad Flat Pack

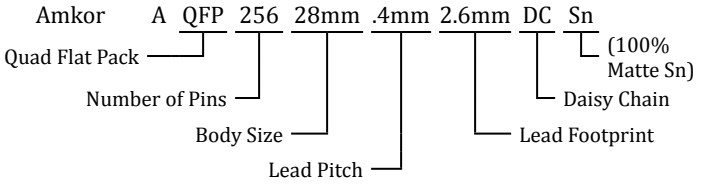
| Part Description | Number of Pins | Body Size | Body Thickness | Lead Pitch | Footprint | Quantity Per Tray | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|---|---|---|
| ***.4mm Pitch*** | | | | | | | | | |
| A-QFP256-28mm-.4mm-2.6 | 256 | 28mm sq | 3.37mm | .4mm | 2.6mm | 24 | 44 | 40 | 200 |
| ***.5mm Pitch*** | | | | | | | | | |
| A-QFP64-10mm-.5mm-3.2 | 64 | 10mm sq | 2.0mm | .5mm | 3.2mm | 96 | 24 | 24 | 500 |
| A-QFP64-10mm-.5mm-3.9 | 64 | 10mm sq | 2.0mm | .5mm | 3.9mm | 96 | 24 | 24 | 500 |
| A-QFP100-14mm-.5mm-3.2 | 100 | 14mm sq | 2.0/2.67mm | .5mm | 3.2mm | 84 | 32 | 24 | 350 |
| A-QFP100-14mm-.5mm-3.9 | 100 | 14mm sq | 2.67mm | .5mm | 3.9mm | 84 | 32 | 24 | 350 |
| A-QFP128-14x20mm-.5mm-3.2 | 128 | 14x20mm | 2.71mm | .5mm | 3.2mm | 66 | 44 | 32 | 200 |
| A-QFP128-14x20mm-.5mm-3.2 | 128 | 14x20mm | 2.71mm | .5mm | 3.9mm | 66 | 44 | 32 | 200 |
| A-QFP208-28mm-.5mm-2.6 | 208 | 28mm sq | 3.37mm | .5mm | 2.6mm | 24 | 44 | 40 | 200 |
| A-QFP208-28mm-.5mm-3.2 | 208 | 28mm sq | 3.37mm | .5mm | 3.2mm | 24 | 44 | 40 | 200 |
| A-QFP240-32mm-.5mm-2.6 | 240 | 32mm sq | 3.4mm | .5mm | 2.6mm | 24 | 56 | 44 | 250 |
| ***.65mm Pitch*** | | | | | | | | | |
| A-QFP52-10mm-.65mm-3.2 | 52 | 10mm sq | 2.0mm | .65mm | 3.2mm | 96 | 24 | 24 | 500 |
| A-QFP52-10mm-.65mm-3.9 | 52 | 10mm sq | 2.0mm | .65mm | 3.9mm | 96 | 24 | 24 | 500 |
| A-QFP80-14mm-.65mm-3.2 | 80 | 14mm sq | 2.0/2.67mm | .65mm | 3.2mm | 84 | 32 | 24 | 350 |
| A-QFP80-14mm-.65mm-3.9 | 80 | 14mm sq | 2.67mm | .65mm | 3.9mm | 84 | 32 | 24 | 350 |
| A-QFP100-14x20mm-.65mm-3.2 | 100 | 14x20mm | 2.71mm | .65mm | 3.2mm | 66 | 44 | 32 | 200 |
| A-QFP100-14x20mm-.65mm-3.9 | 100 | 14x20mm | 2.71mm | .65mm | 3.9mm | 66 | 44 | 32 | 200 |
| A-QFP144-28mm-.65mm-3.2 | 144 | 28mm sq | 3.37mm | .65mm | 3.2mm | 24 | 44 | 40 | 200 |
| A-QFP144-28mm-.65mm-3.9 | 144 | 28mm sq | 3.37mm | .65mm | 3.9mm | 24 | 44 | 40 | 200 |
| A-QFP160-28mm-.65mm-2.6 | 160 | 28mm sq | 3.37mm | .65mm | 2.6mm | 24 | 44 | 40 | 200 |
| A-QFP160-28mm-.65mm-3.2 | 160 | 28mm sq | 3.37mm | .65mm | 3.2mm | 24 | 44 | 40 | 200 |
| A-QFP160-28mm-.65mm-3.9 | 160 | 28mm sq | 3.37mm | .65mm | 3.9mm | 24 | 44 | 40 | 200 |
| ***.8mm Pitch*** | | | | | | | | | |
| A-QFP44-10mm-.8mm-3.2 | 44 | 10mm sq | 2.0mm | .8mm | 3.2mm | 96 | 24 | 24 | 500 |
| A-QFP44-10mm-.8mm-3.9 | 44 | 10mm sq | 2.0mm | .8mm | 3.9mm | 96 | 24 | 24 | 500 |
| A-QFP64-14mm-.8mm-3.2 | 64 | 14mm sq | 2.0/2.67mm | .8mm | 3.2mm | 84 | 32 | 24 | 350 |
| A-QFP64-14mm-.8mm-3.9 | 64 | 14mm sq | 2.67mm | .8mm | 3.9mm | 84 | 32 | 24 | 350 |
| A-QFP80-14x20mm-.8mm-3.2 | 80 | 14x20mm | 2.71mm | .8mm | 3.2mm | 66 | 44 | 32 | 200 |
| A-QFP80-14x20mm-.8mm-3.9 | 80 | 14x20mm | 2.71mm | .8mm | 3.9mm | 66 | 44 | 32 | 200 |
| A-QFP120-28mm-.8mm-2.6 | 120 | 28mm sq | 3.37mm | .8mm | 2.6mm | 24 | 44 | 40 | 200 |
| A-QFP120-28mm-.8mm-3.2 | 120 | 28mm sq | 3.37mm | .8mm | 3.2mm | 24 | 44 | 40 | 200 |
| A-QFP128-28mm-.8mm-2.6 | 128 | 28mm sq | 3.37mm | .8mm | 2.6mm | 24 | 44 | 40 | 200 |
| A-QFP128-28mm-.8mm-3.2 | 128 | 28mm sq | 3.37mm | .8mm | 3.2mm | 24 | 44 | 40 | 200 |
| ***1.00mm Pitch*** | | | | | | | | | |
| A-QFP52-14mm-1.0mm-3.2 | 52 | 14mm sq | 2.0/2.67mm | 1.00mm | 3.2mm | 84 | 32 | 24 | 350 |
| A-QFP52-14mm-1.0mm-3.9 | 52 | 14mm sq | 2.67mm | 1.00mm | 3.9mm | 84 | 32 | 24 | 350 |
| A-QFP64-14x20-1.0mm-3.2 | 64 | 14x20mm | 2.71mm | 1.00mm | 3.2mm | 66 | 44 | 32 | 200 |
| A-QFP64-14x20-1.0mm-3.9 | 64 | 14x20mm | 2.71mm | 1.00mm | 3.9mm | 66 | 44 | 32 | 200 |

***Notes***

- All QFPs are standard in JEDEC trays.
- Tray quantities may vary.
- Parts available on Tape and Reel.
- Lead-free parts are available with 100% Matte Sn finish.

***For kits see pages 93, 97, 98 105, 116 & 117.***

***Part Description System***




- Add "TR" to end of part number for Tape and Reel.

# CQFP
## Ceramic Quad Flat Pack

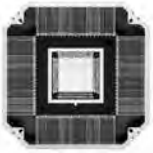
CQFPs are hermetic packages consisting of true pieces of dry pressed ceramic surrounding a uniformed leadframe with tie bar attached. Lead counts for this package range from 14 to 304, with lead pitch ranging from 15.7mil to 50mils. Package leads are gold or Kovar finish and can be solder-coated by special request. Lids are optional for CQFPs, which are sealed over the package cavity at temperatures from 400° to 460° C.

**CQFP Ceramic Quad Flat Pack**

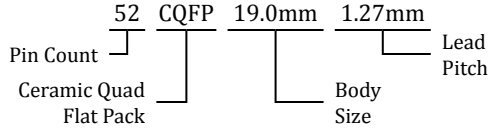
| Part Description | Number of Pins | Body Size (mm) | Body Size (inch) | Pitch |
|---|---|---|---|---|
| 52CQFP-19.0mm-1.27mm | 52 | 19.0mm sq | .750" sq | 1.27mm |
| 68CQFP-24.1mm-1.27mm | 68 | 24.1mm sq | .950" sq | 1.27mm |
| 84CQFP-16.5mm-.65mm | 84 | 16.5mm sq | .650" sq | .65mm |
| 100CQFP-19.0mm-.65mm | 100 | 19.0mm sq | .750" sq | .65mm |
| 132CQFP-24.1mm-.65mm | 132 | 24.1mm sq | .950" sq | .65mm |
| 172CQFP-29.2mm-.65mm | 172 | 29.2mm sq | 1.150" sq | .65mm |
| 196CQFP-32.0mm-.50mm | 196 | 32.0mm sq | 1.260" sq | .65mm |

***Notes***

- CQFPs are available with or without combo lid.
- Pins are flat (sandwiched) with tie bar.
- Parts are packaged in non-JEDEC trays.
- Parts available with a daisy-chain configuration upon request.
- Due to the custom nature of the package, body size and dimensions can change without notice.



***Part Description System***




# LCC
## Leadless Ceramic Carrier

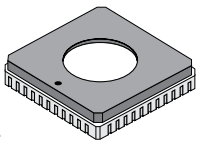
This surface mount package consists of a ceramic base that has metalized castellations/pads on the sides and bottom of the package. LCC packages have pads on all four sides of the package. Lids for LCCs can be either metal or ceramic. Lids are attached after die attach. This allows for a hermetically sealed environment for the die.

**LCC Leadless Ceramic Carrier**

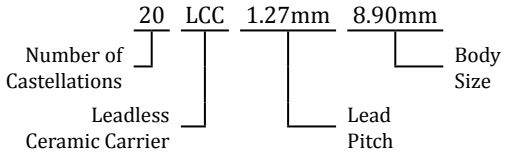
| Part Description | Number of Castellations | Body Size (mm) | Body Size (inch) | Pitch |
|---|---|---|---|---|
| 16LCC-1.27mm-7.36x8.96mm | 16 | 7.36x8.96mm | .350"x.285" | 1.27mm |
| 20LCC-1.27mm-8.90mm | 20 | 8.90mm sq | .350" sq | 1.27mm |
| 28LCC-1.27mm-11.5mm | 28 | 11.50mm sq | .450" sq | 1.27mm |
| 40LCC-1.0mm-10.1mm | 40 | 10.10mm sq | .400" sq | 1.0mm |
| 44LCC-1.27mm-16.5mm | 44 | 16.50mm sq | .650"sq | 1.27mm |
| 68LCC-1.27mm-24.11mm | 68 | 24.11mm sq | .950" sq | 1.27mm |

***Notes***

- LCCs are available with or without combo lid.
- Gold castellations are standard, but can be solder-tinned with 100% Sn or SnPb alloy.
- Parts are packaged in non-JEDEC trays.
- Parts available with a daisy-chain configuration upon request.
- Due to the custom nature of the package, body size and dimensions can change without notice.



***Part Description System***

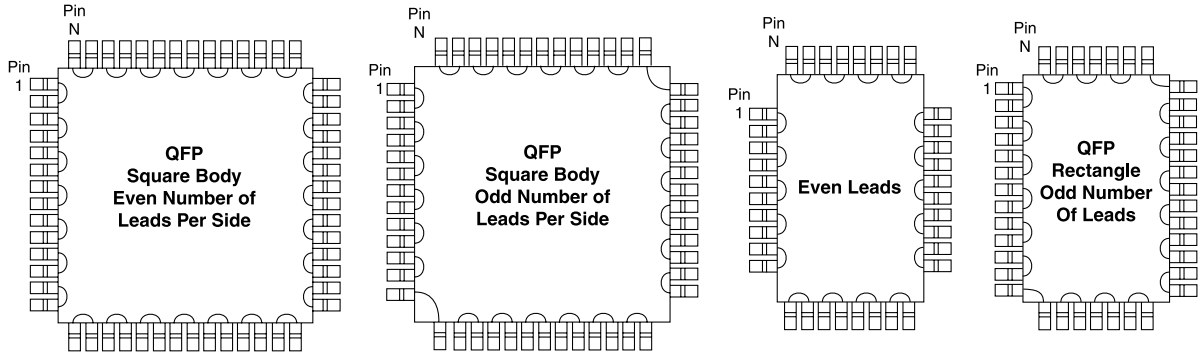



*For kits see page 92 & 106.*

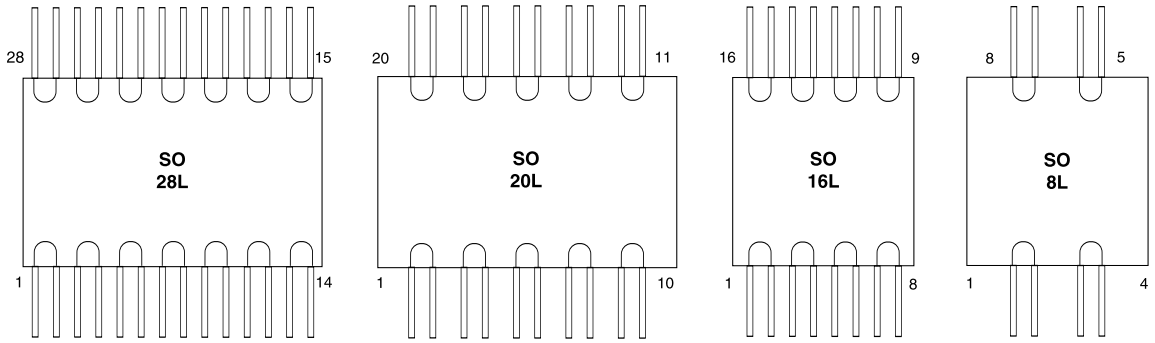
# Daisy-Chain Patterns

The standard daisy chain pattern for non-BGA IC's is Even. Example of daisy-chain "even" pattern for leadframe packages. Pin 1-2, 3-4, 5-6, 7-8, etc. Continuity testing requires dummy components to contain daisy-chain connections. There is no standard daisy-chain pattern for Ball Grid Array Packages.

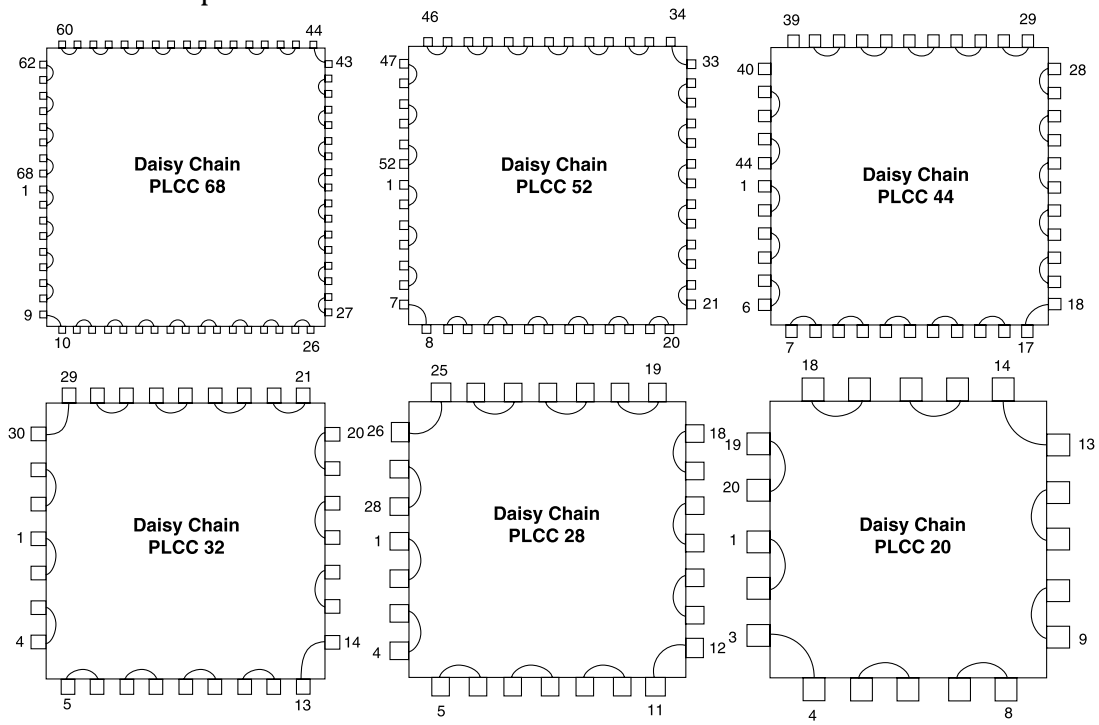
## QFP Quad Flat Packs




## SOIC Small Outline Integrated Circuits




## PLCC Plastic Leaded Chip Carriers



# PLCC
## Plastic Leaded Chip Carrier

Plastic Leaded Chip Carriers (PLCC) are four-sided "J" Leaded Plastic body packages. Lead counts range from 20 to 84. PLCC packages can be square or rectangle. Body sizes range from .35" to 1.15". PLCCs are JEDEC standard compliant. The PLCC "J" Lead configuration requires less board space versus equivalent gull leaded components.

### PLCC Plastic Leaded Chip Carrier

| Part Description | Lead Count | Body Size | Quantity Per Tube | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|
| PLCC20T | 20 | 8.8mm | 46 | 16mm | 12mm | 1,000 |
| PLCC28T | 28 | 11.4mm | 38 | 24mm | 16mm | 750 |
| PLCC32T | 32 | 11.4x13mm | 30 | 24mm | 16mm | 750 |
| PLCC44T | 44 | 16.5mm | 27 | 32mm | 24mm | 450/500 |
| PLCC68T | 68 | 24.1mm | 18 | 44mm | 32mm | 230/250 |
| PLCC84T | 84 | 29.2mm | 15 | 44mm | 36mm | 250 |

***Notes***

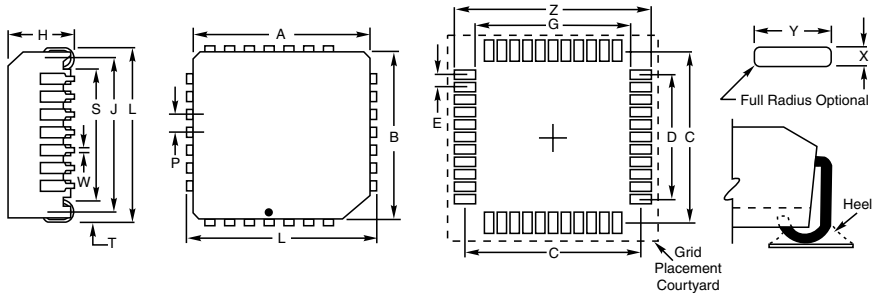
- All PLCCs have "J" leads.
- Standard lead pitch is 1.27mm (50 mils).
- PLCCs are to JEDEC standards.
- Tube quantity may vary.
- Parts available on Tape and Reel.
- Moisture sensitivity is JEDEC level 3.
- Lead-free parts are available with 100% Matte Sn finish.
- Daisy-Chained and Lead-Free parts available.

***Part Description System***

PLCC 20 T

Plastic Leaded Carrier Chip — Number of Pins — Packaging

- Packaging: T=Tubes, TR=Tape and Reel.
- Add "Sn" to end of part number for Lead-Free.




### PLCC Component Dimensions

| Component Identifier | L (mm) | | S (mm) | | W (mm) | | T (mm) | | A (mm) | | B (mm) | | J (mm) | H (mm) | P (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Ref | Max | Basic |
| PLCC-20 | 9.78 | 10.03 | 5.78 | 6.53 | 0.33 | 0.53 | 1.50 | 2.00 | 8.89 | 9.04 | 8.89 | 9.04 | 7.87 | 4.57 | 1.27 |
| PLCC-28 | 12.32 | 12.57 | 8.32 | 9.07 | 0.33 | 0.53 | 1.50 | 2.00 | 11.43 | 11.58 | 11.43 | 11.58 | 10.41 | 4.57 | 1.27 |
| PLCC-44 | 17.40 | 17.65 | 13.40 | 14.15 | 0.33 | 0.53 | 1.50 | 2.00 | 16.51 | 16.66 | 16.51 | 16.66 | 15.49 | 4.57 | 1.27 |
| PLCC-68 | 25.02 | 25.27 | 21.02 | 21.77 | 0.33 | 0.53 | 1.50 | 2.00 | 24.13 | 24.33 | 24.13 | 24.33 | 23.11 | 5.08 | 1.27 |
| PLCC-84 | 30.10 | 30.35 | 26.10 | 26.85 | 0.33 | 0.53 | 1.50 | 2.00 | 29.21 | 29.41 | 29.21 | 29.41 | 28.19 | 5.08 | 1.27 |

### PLCC Land Patterns

| Component Identifier | Z (mm) | G (mm) | X (mm) | Y (mm) Ref | C (mm) Ref | D (mm) Ref | E (mm) Ref | Placement Grid (No. of Elements) |
|---|---|---|---|---|---|---|---|---|
| PLCC-20 | 10.80 | 6.40 | 0.60 | 2.20 | 8.60 | 5.08 | 1.27 | 24 x 24 |
| PLCC-28 | 13.40 | 9.00 | 0.60 | 2.20 | 11.20 | 7.62 | 1.27 | 30 x 30 |
| PLCC-44 | 18.40 | 14.00 | 0.60 | 2.20 | 16.20 | 12.70 | 1.27 | 40 x 40 |
| PLCC-68 | 26.00 | 21.60 | 0.60 | 2.20 | 23.80 | 20.32 | 1.27 | 54 x 54 |
| PLCC-84 | 31.20 | 26.80 | 0.60 | 2.20 | 29.00 | 25.40 | 1.27 | 66 x 66 |

***For kits see pages 93, 97, 98, 100, 101, 106, 108 & 117.***

# SOIC
## Small Outline Integrated Circuit

Small Outline Package (SOIC) body size was compressed and the lead pitch tightened to obtain a smaller version SOIC. This yields an IC package that is a significant reduction in the size (compared to standard package). All IC assembly processes remain the same as with our standard SOICs.

### SOIC Small Outline Integrated Circuit

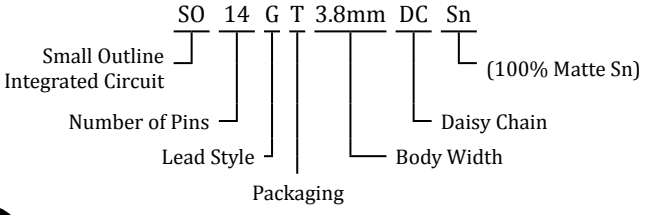
| Part Description | Number of Pins | Body Size | Quantity Per Tube | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|
| SO8GT-3.8mm | 8 | 3.8mm | 100 | 12mm | 8mm | 2,500 |
| SO14GT-3.8mm | 14 | 3.8mm | 50 | 16mm | 8mm | 2,500 |
| SO16GT-3.8mm | 16 | 3.8mm | 48 | 16mm | 8mm | 2,500 |
| SO16GT-7.6mm | 16 | 7.6mm | 46 | 16mm | 12mm | 1,000 |
| SO20GT-7.6mm | 20 | 7.6mm | 38 | 24mm | 12mm | 1,000 |
| SO24GT-7.6mm | 24 | 7.6mm | 31 | 16mm | 12mm | 1,000 |
| SO28GT-7.6mm | 28 | 7.6mm | 25 | 24mm | 12mm | 1,000 |

***Notes***

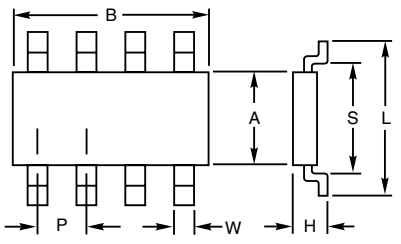
- Standard lead pitch is 1.27mm.
- Tube quantity may vary.
- Parts available on Tape and Reel.
- Lead-free parts are available with 100% Matte Sn finish.

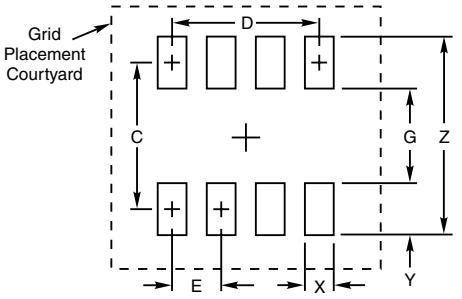
***For kits see pages 93, 94, 97, 98, 99, 100, 101, 105, 116 & 117.***

***Part Description***




- Lead Style: G=Gull Wing.
- Packaging: T=Tubes, TR=Tape and Reel.
- Add "Sn" to end of part number for Lead-Free.




### SOIC Component Dimensions

| Component Identifier | JEDEC Number | L (mm) | | S (mm) | | W (mm) | | T (mm) | | A (mm) | | B (mm) | | H (mm) | | P (mm) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Min | Max | Basic |
| SO8 | MS-012 AA | 5.80 | 6.30 | 3.26 | 4.55 | 0.33 | 0.51 | 0.40 | 1.27 | 3.80 | 4.00 | 4.80 | 5.00 | 1.35 | 1.75 | 1.27 |
| SO14 | MS-012 AB | 5.80 | 6.30 | 3.26 | 4.55 | 0.33 | 0.51 | 0.40 | 1.27 | 3.80 | 4.00 | 8.55 | 8.75 | 1.35 | 1.75 | 1.27 |
| SO16 | MS-012 AC | 5.80 | 6.30 | 3.26 | 4.55 | 0.33 | 0.51 | 0.40 | 1.27 | 3.80 | 4.00 | 9.80 | 10.00 | 1.35 | 1.75 | 1.27 |
| SO16-7.6mm | MS-013 AA | 10.00 | 10.65 | 7.46 | 8.85 | 0.33 | 0.51 | 0.40 | 1.27 | 7.40 | 7.60 | 10.10 | 10.50 | 2.35 | 2.65 | 1.27 |
| SO20-7.6mm | MS-013 AC | 10.00 | 10.65 | 7.46 | 8.85 | 0.33 | 0.51 | 0.40 | 1.27 | 7.40 | 7.60 | 12.60 | 13.00 | 2.35 | 2.65 | 1.27 |
| SO28-7.6mm | MO-119 AB | 10.29 | 10.64 | 8.21 | 9.01 | 0.36 | 0.51 | 0.53 | 1.04 | 7.40 | 7.60 | 18.08 | 18.39 | 2.34 | 2.64 | 1.27 |

### SOIC Land Pattern Dimensions

| Component Identifier | Z (mm) | G (mm) | X (mm) | Y (mm) Ref | C (mm) Ref | D (mm) Ref | E (mm) Ref | Placement Grid (No. of Grid Elements) |
|---|---|---|---|---|---|---|---|---|
| SO8 | 7.40 | 3.00 | 0.60 | 2.20 | 5.20 | 3.81 | 1.27 | 12 x 16 |
| SO14 | 7.40 | 3.00 | 0.60 | 2.20 | 5.20 | 7.62 | 1.27 | 20 x 16 |
| SO16 | 7.40 | 3.00 | 0.60 | 2.20 | 5.20 | 8.89 | 1.27 | 22 x 16 |
| SO16-7.6mm | 11.40 | 7.00 | 0.60 | 2.20 | 9.20 | 8.89 | 1.27 | 22 x 22 |
| SO20-7.6mm | 11.40 | 7.00 | 0.60 | 2.20 | 9.20 | 11.43 | 1.27 | 28 x 24 |
| SO28-7.6mm | 11.40 | 7.00 | 0.60 | 2.20 | 9.20 | 16.51 | 1.27 | 38 x 24 |

# TSOP
## Thin Small Outline Package

Thin Small Outline Packages (TSOP) are thin body size components; thickness is 1.0mm. TSOP packages have four sides and are rectangular. Type I TSOPs have the leads protruding from the width portion of the package. Lead counts range from 28 to 48. Package body size ranges from 8x11.8mm to 12x20mm.

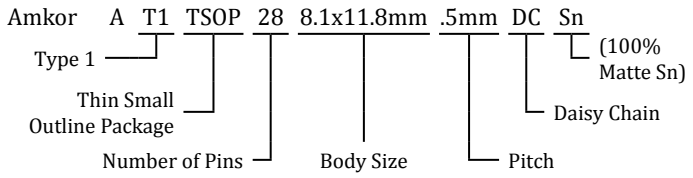

### TSOP Thin Small Outline Package – Type I

| Part Description | Number of Pins | Body Size | Lead Pitch | Quantity Per Tray | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|---|
| A-T1-TSOP28-8.1x11.8mm-.55mm | 28 | 8.1x11.8mm | .55mm | 234 | 24mm | 12mm | 1,000 |
| A-T1-TSOP32-8x11.8mm-.5mm | 32 | 8x11.8mm | .5mm | 234 | 24mm | 12mm | 1,000 |
| A-T1-TSOP32-8x18.4mm-.5mm | 32 | 8x18.4mm | .5mm | 156 | 32mm | 12/16mm | 1,000 |
| A-T1-TSOP48-12x18.4mm-.5mm | 48 | 12x18.4mm | .5mm | 96 | 32mm | 16mm | 1,000 |

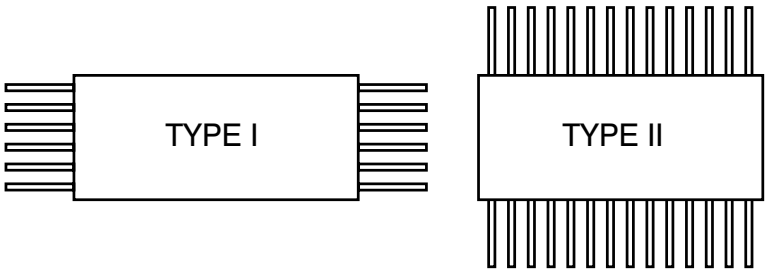
***Notes***

- Standard packaging is in JEDEC trays.
- Body dimensions are measured by body length and width.
- Type I means that pins extend from the narrow end (the width) of the body.
- Parts available on Tape and Reel.
- Type II means that pins extend from the wide end (the length) of the body. Type II TSOP are becoming obsolete. Practical has some stock. Please call for availability.

***Part Description System***




- Add "TR" to end of part number for Tape and Reel.




### TSOP Thin Small Outline Package – Type II

Type II TSOP are becoming obsolete. Practical has some stock. Please call for availability.

# TSSOP
## Thin Shrink Small Outline Package

The Thin Shrink Small Outline Package (TSSOP) offers smaller body sizes, smaller lead pitches and package thickness (0.9mm thick) than standard SOIC packages. Body widths are 3.0mm, 4.4mm and 6.1mm. Lead counts range from 8 to 80. This package conforms to JEDEC package outlines.

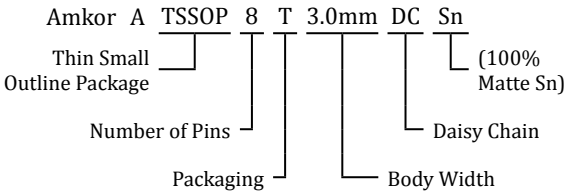

### TSSOP Thin Shrink Small Outline Package

| Part Description | Number of Pins | Body Size | Lead Pitch | Quantity Per Tube | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|---|
| A-TSSOP8T-3.0mm | 8 | 3.0mm | .65mm | 98 | 12mm | 8mm | 2,500 |
| A-TSSOP8T-4.4mm | 8 | 4.4mm | .65mm | 100 | 12/16mm | 8mm | 1,000/2,500 |
| A-TSSOP10T-3.0mm | 10 | 3.0mm | .5mm | 98 | 12mm | 8mm | 2,500 |
| A-TSSOP14T-4.4mm | 14 | 4.4mm | .65mm | 96 | 12/16mm | 8mm | 1,000/2,500 |
| A-TSSOP16T-4.4mm | 16 | 4.4mm | .65mm | 96 | 12/16mm | 8mm | 1,000/2,500 |
| A-TSSOP20T-4.4mm | 20 | 4.4mm | .65mm | 74 | 16mm | 8/12mm | 1,000/2,500 |
| A-TSSOP24T-4.4mm | 24 | 4.4mm | .65mm | 62 | 16mm | 8/12mm | 1,000/2,500 |
| A-TSSOP28T-4.4mm | 28 | 4.4mm | .65mm | 50 | 16mm | 8/12mm | 1,000 |
| A-TSSOP44T-4.4mm | 44 | 4.4mm | .5mm | 42 | 24mm | 12mm | 1,000 |
| A-TSSOP48T-6.1mm | 48 | 6.1mm | .5mm | 39 | 24mm | 12mm | 1,000 |
| A-TSSOP56T-4.4mm | 56 | 4.4mm | .4mm | 42 | 24mm | 12mm | 1,000 |
| A-TSSOP56T-6.1mm | 56 | 6.1mm | .5mm | 35 | 24mm | 12mm | 1,000 |
| A-TSSOP80T-6.1mm | 80 | 6.1mm | .4mm | 28 | N/A | N/A | N/A |

***Notes***

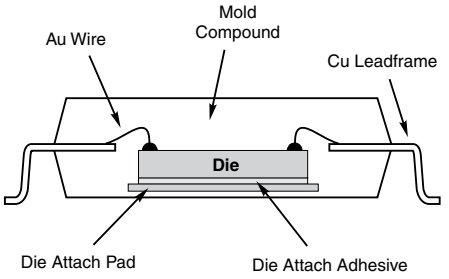
- Tube quantity may vary.
- Parts available on Tape and Reel.
- 0.9mm body thickness for 4.4 and 6.1mm body widths.
- 0.85mm body thickness for 3.0mm body width.
- JEDEC package outline is standard.
- High conductivity copper leadframes.
- Very low-stress mold compound.
- Lead-free available with 100% Matte Sn alloy.

***Part Description System***




- Packaging: "T" = Tubes, "TR" = Tape and Reel.
- Add "Sn" to end of part number for Lead-Free.

### TSSOP Package




*For kit see page 97.*

# SSOP
## Shrink Small Outline Package

The Shrink Small Outline Package (SSOP) body size is compressed and the lead pitch is tightened to obtain a small version of the standard SOIC packages. Lead counts range from 8 to 64. Body sizes are 209 and 300 mils. The SSOP package is JEDEC and EIAJ compliant. The package leads are solder plated.

### SSOP Shrink Small Outline Package

| Part Description | Number of Pins | Body Size | Lead Pitch | Quantity Per Tube | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|---|
| A-SSOP14T-5.3mm | 14 | 5.3mm | .65mm | 100 | 16mm | 12mm | 1,000 |
| A-SSOP16T-5.3mm | 16 | 5.3mm | .65mm | 80 | 16mm | 12mm | 1,000 |
| A-SSOP20T-5.3mm | 20 | 5.3mm | .65mm | 62 | 16mm | 12mm | 1,000 |
| A-SSOP24T-5.3mm | 24 | 5.3mm | .65mm | 66 | 16mm | 12mm | 1,000 |
| A-SSOP28T-5.3mm | 28 | 5.3mm | .65mm | 47 | 16/24mm | 12mm | 1,000 |
| A-SSOP36T-7.6mm | 36 | 7.6mm | .8mm | 31 | 24mm | 12mm | 1,000 |
| A-SSOP48T-7.6mm | 48 | 7.6mm | .635mm | 30 | 32mm | 12mm/16mm | 1,000 |
| A-SSOP56T-7.6mm | 56 | 7.6mm | .635mm | 26 | 32mm | 12mm/16mm | 500 |

***Notes***

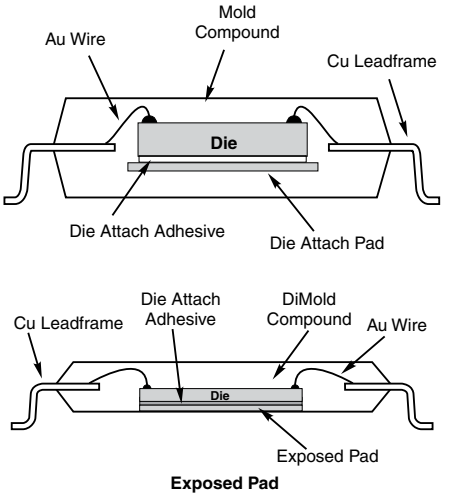
- Tube quantity may vary.
- Parts available on Tape and Reel.
- 209 and 300 mil body widths.
- JEDEC and EIAJ package outline standard compliance.
- High-conductivity copper leadframes.
- Moisture sensitivity is JEDEC level 3.
- Lead-free available with 100% Matte Sn alloy.

***Part Description System***

Amkor A SSOP 20 T 5.3mm DC Sn

- Shrink Small Outline Package
- Number of Pins
- Packaging
- Body Width
- Daisy Chain
- (100% Matte Sn)

- Packaging: "T" = Tubes, "TR" = Tape and Reel.
- Add "Sn" to end of part number for Lead-Free.




Note: Drawings not to scale.

*For kits see pages 105, 108 & 117.*

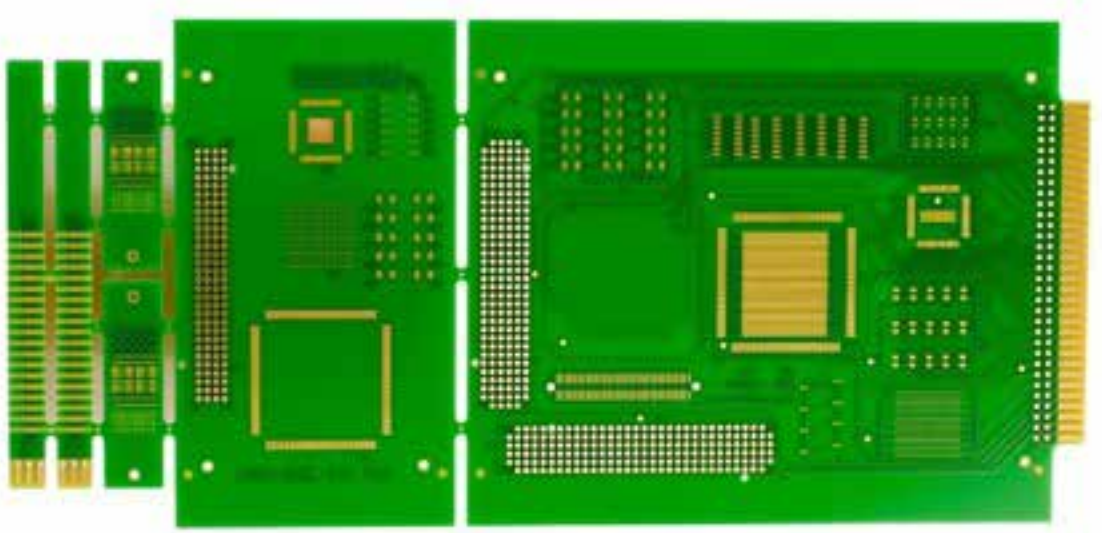
**Looking for Lead-Free?**

This symbol indicates that lead-free parts are available!

Practical Components is the exclusive distributor of Amkor Technology Mechanical Components.

# The Practical Components B-52 CRET (Cleanliness & Residue Evaluation Test) Kit

The electronics industry's primary test vehicle (TV) for evaluating flux chemistries and surface insulation resistance (SIR)



- The main SIR test board
- The Ion Chromatography (IC) test coupon
- The solder mask adhesion coupons
- The SIR mini-coupons

**Test Your Cleanliness to IPC-9201, IPC-9202 & IPC-9203 Standards**

The B-52 Rev. B board is the newest revision of the existing B-52 CRET board. The B-52 Rev. B board continues to provide a platform for the electronic assembly industry to evaluate the cleanliness of the assembly process.

Practical Components provides both test PCB boards and components to help verify your cleaning process to meet IPC standards. Practical also has a number of test PCB boards which can be assembled with our dummy components to be used with conformal coating or adhesive applications for evaluation.

Practical can also customize any board or provide a clean sheet design.

**For More Information Call Now! 888-388-7808**

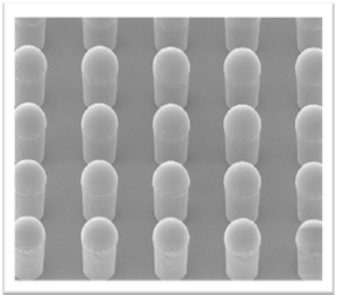
*For kits see pages 84, 85, 86, 87, 88, 89, 90, & 91.*

# Advanced Wafer Packages

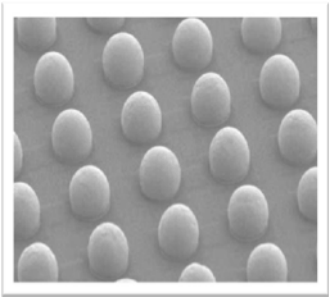
## TEG Wafers and Test Elements

Practical Components is the exclusive distributor of Walts Co., LTD In the U.S.A. Walts provides next-generation assembly technology for semiconductors with leading-edge technologies. As the de facto standard, Walts products are used in research and development sites worldwide.

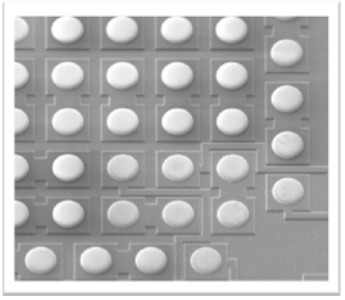
Their well experienced designers can also custom-make TEG (Test Element Groups) to better suit your needs. A wide variety of film sputtering and deposition, back grinding, dicing, bump forming, assembling and analysis are available.



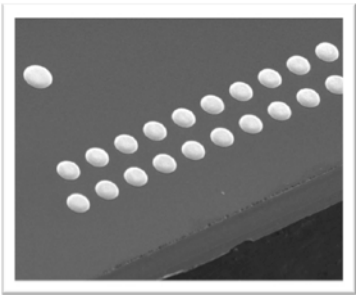
Cu Pillar Bump



Solder Bump



Electroless Plating Bump



TSV

**Wafer Specifications**

| | |
|---|---|
| Wafer Size | φ 4inch ~ φ 12inch |
| Wafer Thickness | min. 10μm |
| Bump Materials | Solder Bump (High Lead, Lead Free, Eutectic)<br>Gold Bump (Plate, Stud)<br>Copper Bump (Plate, Pillar, Stud) |
| Minimum Pitch | Full Area: min. 40μm<br>Peripheral: min. 20μm<br>min. 20μm (Gold Plate) |
| Deposition | SiN, PBO, Polyimide, Back Side Metallization etc. |

# Advanced Wafer Package Line Up

| Material / Product | Page | Au | | Solder | | Cu | | | | Ni | | Electroless Ni/Au |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | — | +SnAg | +Ni+SnAg | +NiAu | — | +SnAg | |
| | | Plate | Stud | Plate | Mount | Plate | Plate | Plate | Plate | Plate | Plate | Plate |
| | |  | | | | | | | | | | |
| MB50 | 52 | ● | ● | ● | — | ● | ● | ● | ● | ● | ● | — |
| MB60 | 52 | ● | ● | ● | — | ● | ● | ● | ● | ● | ● | — |
| MB80 | 53 | ● | ● | ● | — | ● | ● | ● | ● | ● | ● | — |
| MB130 | 54 | ● | ● | ● | — | ● | ● | ● | ● | ● | ● | ● |
| CC40 | 55 | ● | — | ● | — | ● | ● | ● | ● | ● | ● | — |
| IP40 | 56 | — | — | — | — | ● | ● | ● | ● | ● | ● | ● |
| IP40A | 56 | — | — | — | — | ● | ● | — | — | — | — | ● |
| CC80 | 57 | ● | ● | ● | — | ● | ● | ● | ● | ● | ● | — |
| IP80 | 58 | — | — | — | — | ● | ● | ● | ● | ● | ● | ● |
| CC80TSV | 59 | — | — | — | — | — | ● | ● | — | — | — | ●/■ |
| CC80Mark II | 59 | ● | ● | ● | — | ● | ● | ● | ● | ● | ● | — |
| FC150 | 60 | — | — | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| FC150LC | 61 | — | — | — | — | ● | ● | — | — | — | — | — |
| FC150SC | 61 | — | — | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| FC200 | 62 | — | — | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| FC200SC | 63 | — | — | ● | ● | ● | ● | ● | ● | ● | ● | ● |
| FBW | 64 | — | — | — | — | ● | ● | ● | — | — | — | — |
| WLP | 65 | — | — | — | ● | — | — | — | — | — | — | — |
| Free Cut Size | 65 | — | — | — | ● | — | — | — | — | — | — | — |
| ME | 66 | — | — | — | — | ● | — | — | — | — | — | — |
| STAC | 67 | ● | ● | ● | — | ● | ● | ● | ● | ● | ● | — |
| STAC150FA | 67 | — | — | — | — | ● | ● | ● | ● | ● | ● | — |
| STAC300FA | 67 | — | — | — | — | ● | ● | ● | ● | ● | ● | — |
| PWB | 68 | — | — | — | — | — | — | — | — | — | — | — |
| HPW | 68 | ● | ● | ● | — | ● | ● | ● | ● | ● | ● | — |
| HPW150FA | 69 | — | — | — | — | ● | ● | ● | ● | ● | ● | — |
| HPW300FA | 69 | — | — | — | — | ● | ● | ● | ● | ● | ● | — |
| HPWTSV | 69 | — | — | — | — | — | ● | — | — | — | — | ■ |
| LCD30 | 70 | ● | — | ● | — | ● | ● | ● | ● | ● | ● | ● |

● Top Side ■ Bottom Side

# MB50-0101JY

| Specifications | TYPE-A | TYPE-B | TYPE-C(Glass) |
|---|---|---|---|
| Wafer Size | 8 inch | 8 inch | 8 inch(Glass wafer) |
| Wafer Thickness | 725±25µm | 725±25µm | 700±70µm |
| Chip Size | 7.3mm ■ | 7.3mm ■ | 7.3mm ■ |
| Pad Pitch | 50µm | 50µm | 50µ |
| Function | Daisy Chain | Daisy Chain | — |
| Pad config | Peripheral | Peripheral | Peripheral |
| Electrode | Au-Stud Bump<br>Wire Bonding | Cu-Pillar<br>Au-Plated<br>Solder Plated<br>Ni on Cu-Pillar | Cu-Pillar |
| Pad Size | 48µm ■ | 48µm ■ | — |
| Bump Size | — | Cu, Au:30µm ■ | Cu:30µm ■ |
| | | Cu:ϕ25µm ● | Cu:ϕ25µm ● |
| Bump Height | — | any | any |
| Passivation Opening | 40µm ■ | ϕ15µm ● | — |
| Scribe Width | 120µm | 120µm | — |
| Number of Pad | 544 pads/chip | 544 pads/chip | — |
| Number of Chip | 478 chips/wafer | 478 chips/wafer | 478 chips/wafer |

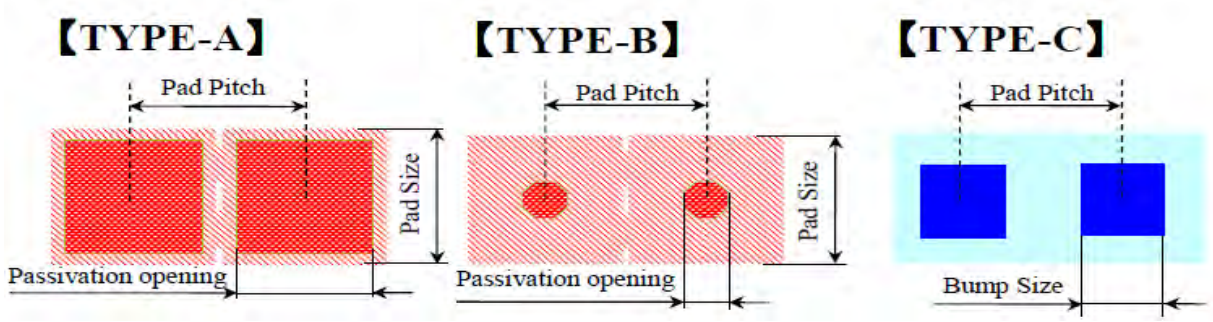
● Top Side ■ Bottom Side

### *Chip Structure*

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma

*For kit see page 71.*




# MB60-0101JY

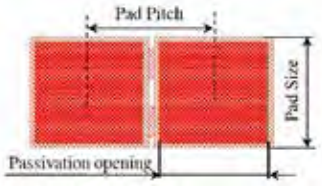
| Specifications | |
|---|---|
| Wafer Size | 8 inch |
| Wafer Thickness | 725±25µm |
| Chip Size | 7.3mm ■ |
| Pad pitch | 60µm |
| Function | Daisy Chain |
| Pad config | Peripheral |
| Electrode | Au-stud Bump<br>Wire Bonding<br>Au Plating<br>Cu pillar |
| Pad Size | 56µm ■ |
| Passivation opening | 50µm ■ |
| Scribe width | 120µm |
| Number of Pad | 448 pads/chip |
| Number of Chip | 478 chips/wafer |

■ Bottom Side


### *Chip Structure*

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma



# MB80-STG0101JY

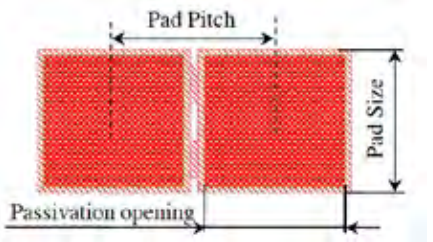
| Specifications | TYPE-A | TYPE-B |
|---|---|---|
| Wafer Size | 8 inch | 8 inch |
| Wafer Thickness | 725±25µm | 725±25µm |
| Chip Size | 7.3mm ■ | 7.3mm ■ |
| Pad pitch | 80µm staggered | 80µm staggered |
| Function | Daisy Chain | Daisy Chain |
| Pad config | Peripheral | Peripheral |
| Electrode | Wire Bonding | Cu pillar |
| Pad Size | 76µm ■ | 76µm ■ |
| Bump Size | - | 38µm ■ |
| Passivation opening | 70µm ■ | 70µm ■ |
| Scribe width | 120µm | 120µm |
| Number of Pad | 648 pads/chip<br>82pads×4(Outer line)<br>80pads×4(Inner line) | 648 pads/chip<br>82pads×4(Outer line)<br>80pads×4(Inner line) |
| Number of Chip | 478 chips/wafer | 478 chips/wafer |

■ Bottom Side


### *Chip Structure*

- Base Layer: P-TEOS*
- Metal layer: Ti / TiN / Al-0.5%Cu / TiN
- Passivation Layer: HDP* / P-SiN
  (option) Polyimide

*TEOS: Tetraethoxysilane
*HDP: High Density Plasm




# AS8R

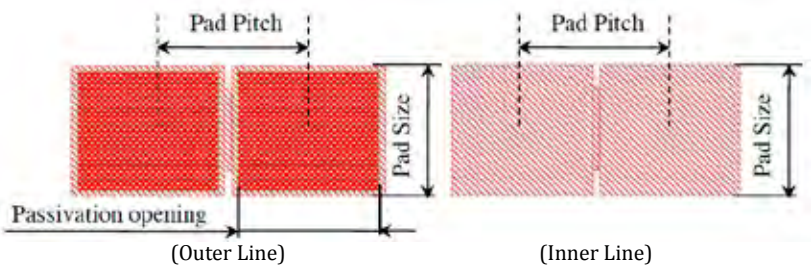
| Specifications | |
|---|---|
| Wafer Size | 8 inch |
| Wafer Thickness | 725±25µm |
| Chip Size | 3.5mm ■ |
| Pad pitch | 120µm |
| Function | Daisy Chain |
| Pad config | Peripheral |
| Electrode | Wire Bonding<br>Stud Bump |
| Pad Size | 115µm×125µm |
| Passivation opening | 95µm×100µm |
| Scribe width | 120µm |
| Number of Pad | 96 pads (Outer line)<br>88 pads (Inner line) |
| Number of Chip | 2266 chips/wafer |

■ Bottom Side


### *Chip Structure*

- Base Layer: P-TEOS*
- Metal layer: Ti / TiN / Al-0.5%Cu / TiN
- Passivation Layer: P-TEOS* / P-SiN

*TEOS: Tetraethoxysilane




(Outer Line) (Inner Line)

# MB130-STG0101JY & MB130A-STG0101JY

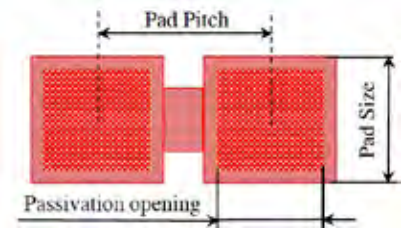
| Specifications | MB130 (Type-A) | MB130 (TYPE-B) | MB130A |
|---|---|---|---|
| Wafer Size | 6 inch | 6 inch | 8 inch |
| Wafer Thickness | 550±25µm | 550±25µm | 725±25µm |
| Chip Size | 2.13mm ■ | 2.13mm ■ | 2.13mm ■ |
| Pad pitch | 130µm | 130µm | 130µm |
| Metal Thickness | 0.8µm | 0.8µm | 1µm or 2µm or 3µm |
| Function | Daisy Chain | Daisy Chain | Daisy Chain |
| Pad config | Peripheral | Peripheral | Peripheral |
| Electrode | Wire Bonding<br>Au Stud Bump | Cu Pillar Bump | Wire Bonding<br>Au Stud Bump |
| Pad Size | 100µm ■ | 100µm ■ | 100µm ■ |
| Passivation opening | 80µm ■ | 80µm ■ | 80µm ■ |
| Polyimide opening | 80µm ■ | 80µm ■ | 90µm ■ |
| Bump Size | - | 70µm ■ | - |
| Scribe width | 50µm | 50µm | 60µm |
| Number of Pad | 108 pads/chip<br>15pads×4 (Outer line)<br>12pads×4 (Inner line) | 108 pads/chip<br>15pads×4 (Outer line)<br>12pads×4 (Inner line | 108 pads/chip<br>15pads×4 (Outer line)<br>12pads×4 (Inner line) |
| Number of Chip | 3300 chips/wafer | 3300 chips/wafer | 6060 chips/wafer |

■ Bottom Side


### *Chip Structure*

- MB130
  - Base Layer: P-TEOS*
  - Metal layer: TiW/ Al-1.0%Si-0.5%Cu
  - Passivation Layer: P-TEOS* / P-SiN (option) Polyimide
- MB130A
  - Base Layer: P-TEOS*
  - Metal layer: Ti / TiN / Al-1.0%Si-0.5%Cu
  - Passivation Layer: P-TEOS* / P-SiN (option) Polyimide

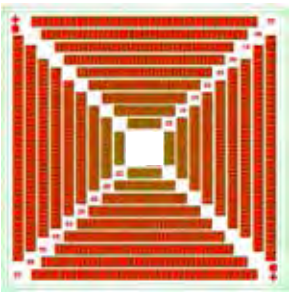
*TEOS: Tetraethoxysilane




# MB6020-0102JY

| Specifications | | | |
|---|---|---|---|
| Wafer Size | 8 inch | | |
| Wafer Thickness | 725±25um | | |
| Chip Size | 3.0mm ■ | | |
| Pad Pitch | 60/55/50/45/40/35/30/25/20 | | |
| Metal Thickness | 0.6µm or 0.8µm | | |
| Function | Daisy Chain | | |
| Pad Config | Peripheral | | |
| Electrode | Wire Bonding | | |
| Pad Size | (57×110µm)<br>(42×110µm)<br>(27×110µm) | (52×110µm)<br>(37×110µm)<br>(22×110µm) | (47×110µm)<br>(32×110µm)<br>(17×110µm) |
| Passivation Opening | (53×100µm)<br>(38×100µm)<br>(23×100µm) | (48×100µm)<br>(33×100µm)<br>(18×100µm) | (43×100µm)<br>(28×100µm)<br>(13×100µm) |
| Scribe Width | 100µm | | |
| Number of Pad | (40×4)<br>(38×4)<br>(30×4) | (40×4)<br>(36×4)<br>(26×4) | (38×4)<br>(34×4)<br>(18×4) |
| Number of Chip | 3016 chips/wafer | | |

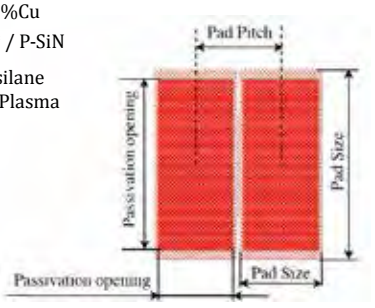
■ Bottom Side



### *Chip Structure*

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma



# CC40-0101JY

| Specifications | |
|---|---|
| Wafer Size | 8 inch |
| Wafer Thickness | 725±25um |
| Chip Size | 7.3mm ■ |
| Pad Pitch | 40µm pitch Full area + Staggered (Model I)<br>40µm pitch Staggered (Model II) |
| Function | Daisy Chain |
| Pad Config | Full Area (Model I)<br>Peripheral (Model II) |
| Electrode | Cu pillar |
| Pad Size | 32µm ■ |
| Passivation Opening | 7µm ● |
| Scribe Width | 120µm |
| Number of Chip | 478 chips/wafer |

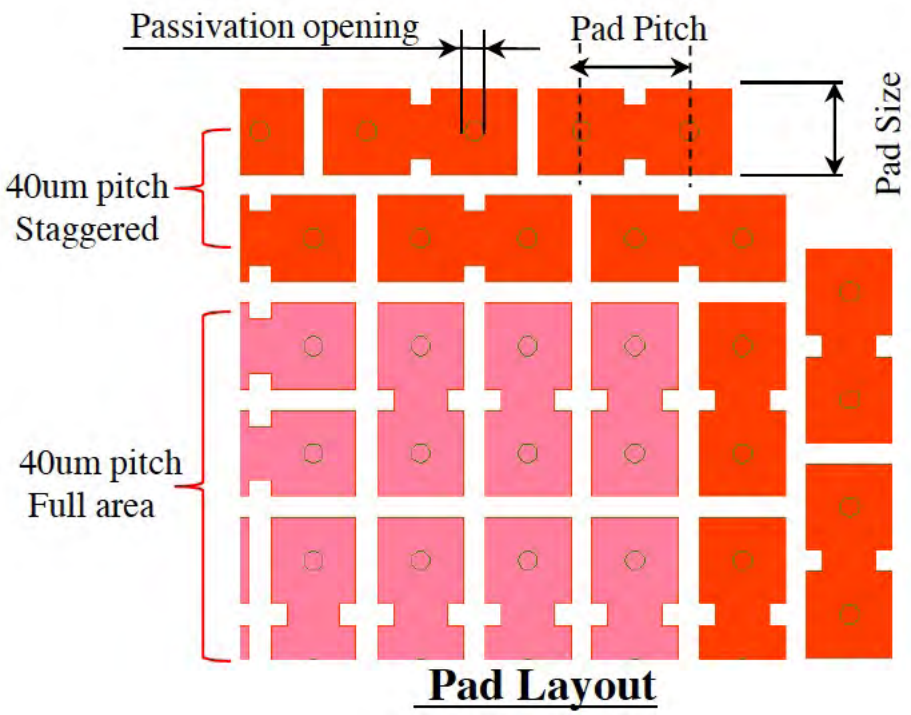
● Top Side ■ Bottom Side

***Chip Structure***

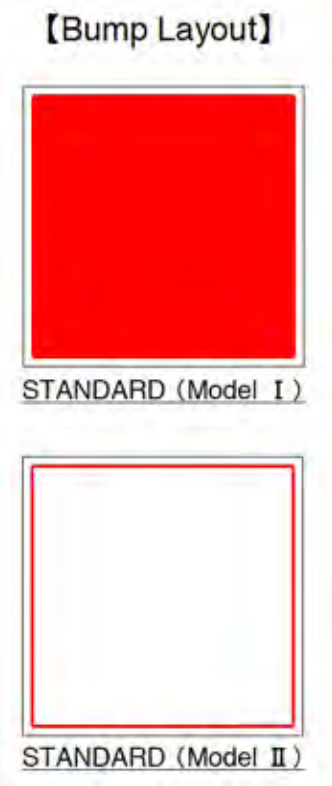
- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma

| Bump Layout | Bump Size | Number of Bumps |
|---|---|---|
| Model I | ϕ22um | 29576 |
| Model II | ϕ22um | 1352 |



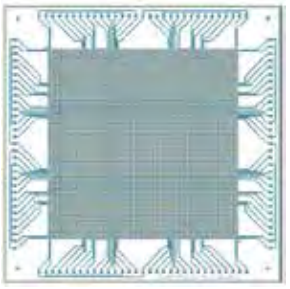

**Pad Layout**



# IP40-0101JY & IP40A-0101JY

| Specifications | IP40(Model I) | IP40A(Model I) | IP40(Model II) |
|---|---|---|---|
| Wafer Size | 8 inch | 12 inch | 8 inch |
| Wafer Thickness | 725±25um | 775±25um | 725±25um |
| Chip Size | 10.0mm | 10.0mm | 10.0mm |
| Pad Pitch | ① 40μm pitch Full Area + Staggered<br>② 250μm pitch Peripheral | | ① 40μm pitch Staggered<br>② 250μm pitch Peripheral |
| Function | Daisy Chain / Bump Short Check / Vernier<br>Breakdown Voltage Check between the Bumps | | |
| Pad Config | Full Area | | Peripheral |
| Pad Size | ① 32 μm ■ ② 110 μm ■ | | |
| Passivation Opening | ① 20 μm ● ② 100 μm ■ | | |
| Scribe Width | 100μm | | |
| Number of Pad | ①29576 pads ②124 pads | | ①1352 pads ②124 pads |
| Number of Chip | 228 chips/wafer | 616 chips/wafer | 228 chips/wafer |
| Surface Spec of Round | Electroless Ni/Au plating | | |

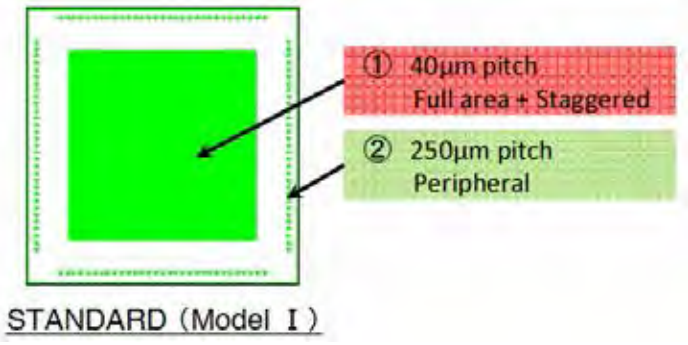
● Top Side ■ Bottom Side



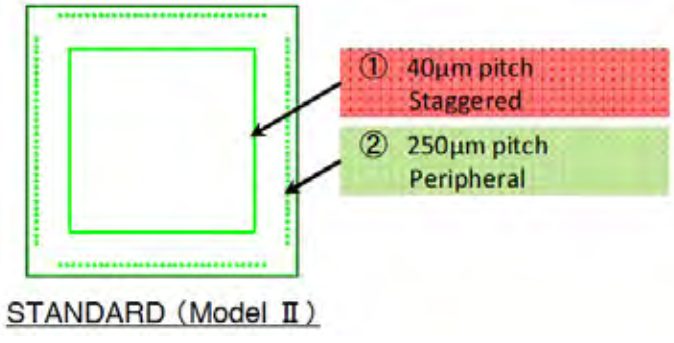
***Chip Structure***

- IP40
  - Base Layer: P-TEOS*
  - Metal layer: TiN / Al-0.5%Cu
  - Passivation Layer: HDP* / P-SiN
- IP40A
  - Base Layer: P-TEOS*
  - Metal layer: TiN / Al-0.5%Cu
  - Passivation Layer: P-SiO / P-SiN

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma



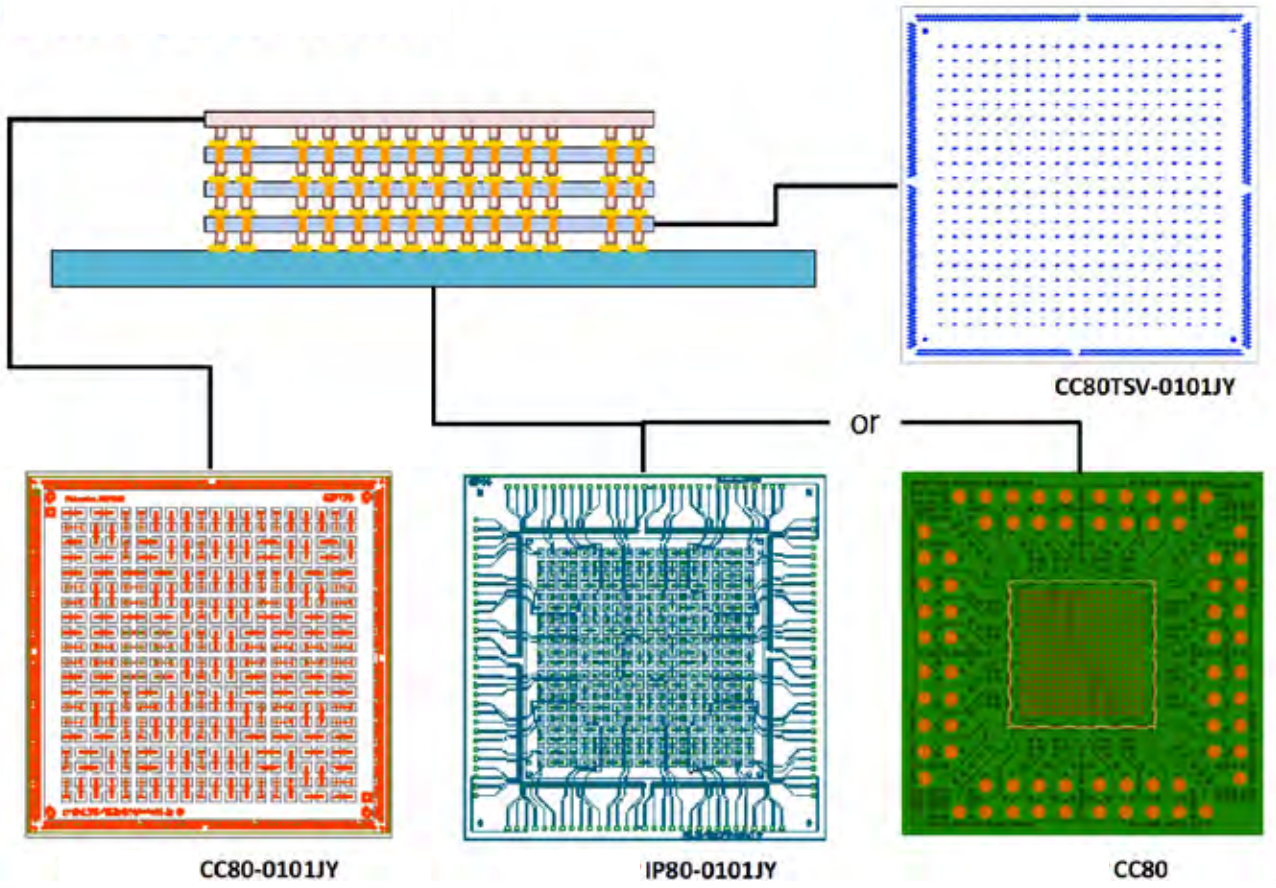

STANDARD (Model Ⅰ)




STANDARD (Model Ⅱ)

Electroless Ni/Au Plating

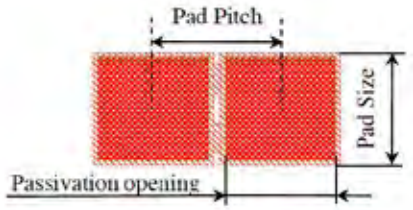
# Concept of CC80 Series



# CC80-0101JY

| Specifications | |
|---|---|
| Wafer Size | 8 inch |
| Wafer Thickness | 725±25µm |
| Chip Size | 7.3mm ■ |
| Pad pitch | 80µm staggered (Peripheral)<br>300µm Full area (Center core) |
| Function | Daisy Chain |
| Pad config | Peripheral |
| Electrode | Au-stud Bump<br>Wire Bonding<br>Au Plating<br>Cu pillar |
| Pad Size | 58µm ■ |
| Passivation opening | 48µm ■ |
| Scribe width | 120µm |
| Number of Chip | 478 chips/wafer |

■ Bottom Side




***Chip Structure:***

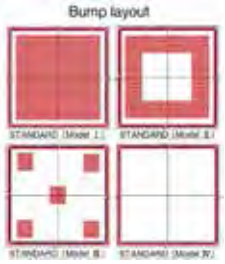
- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma

| Model | Bump Size | Number of Bumps |
|---|---|---|
| Model I | ☐ 38µmor Φ42µm | 1048 *Peripheral (648) / Full Area (400) |
| Model II | ☐ 38µm | 904 *Peripheral (648) / Full Area (256) |
| Model III | ☐ 38µm | 728 *Peripheral (648) / Full Area (80) |
| Model IV | ☐ 38µm | 648 *Peripheral (648) / Full Area (0) |

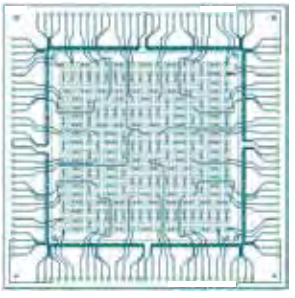
※ Model IV Compatible to WALTS-TEG MB80-STG0101JY

***For kit see page 71.***




# IP80-0101JY

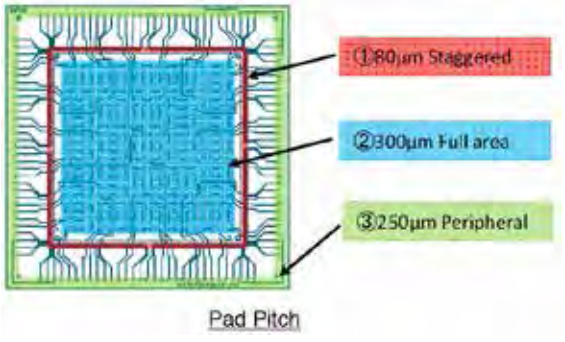
| Specifications | |
|---|---|
| Wafer Size | 8 inch |
| Wafer Thickness | 725±25µm |
| Chip Size | 10.0mm |
| Pad pitch | ① 80µm Staggered (Inner pad)<br>② 300µm Full area (Center core)<br>③ 250µm Peripheral (Outer pad) |
| Function | Daisy Chain |
| Pad config | Peripheral and Full Area |
| Pad Size | ① 58 µm<br>② 58 µm<br>③ 110 µm |
| Passivation opening | ① 48 µm<br>② 48 µm<br>③ 100 µm |
| Scribe width | 100µm |
| Number of Pad | ① 648<br>② 400<br>③ 124 |
| Number of Chip | 228 chips/wafer |
| Surface Spec of Electrode | Electroless Ni/Au plating,<br>Al-Si(0.5%) |



***Chip Structure***

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

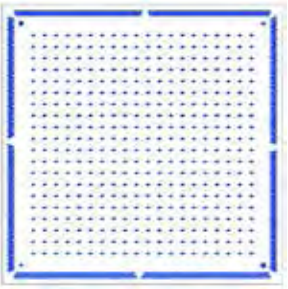
*TEOS: Tetraethoxysilane
*HDP: High Density Plasma



# CC80TSV-0101JY

| Specifications | CC80TSV-1 | | CC80TSV-2 | |
|---|---|---|---|---|
| Wafer Size | 8 inch | | 8 inch | |
| Wafer Thickness | 100µm | | 100µm | |
| Chip Size | 7.3mm ■ | | 7.3mm ■ | |
| Pad pitch | 80µm staggered (Peripheral)<br>300µm Full area (Center core) | | 80µm staggered (Peripheral)<br>300µm Full area (Center core) | |
| TOP Side | Electrode | Electroless Ni/Au plating | Electrode | Cu + SnAg |
| | Bump Size | Φ48µm (Option: ϕ42um) | Bump Size | 38µm ■ (Option: ϕ42um) |
| | Bump Height | 8 ~ 12um | Bump Height | Cu20µm + SnAg15µm |
| BOTTOM Side | Electrode | Electroless Ni/Au plating | Electrode | Electroless Ni/Au plating |
| | Bump Size | Φ48µm (Option: ϕ42um) | Bump Size | Φ48µm (Option: ϕ42um) |
| | Bump Height | 8 ~ 12um | Bump Height | 8 ~ 12um |
| Scribe width | 120µm | | 120µm | |

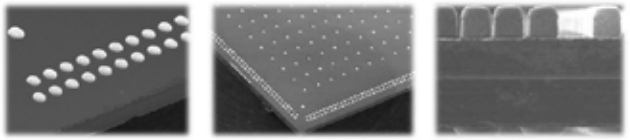
■ Bottom Side

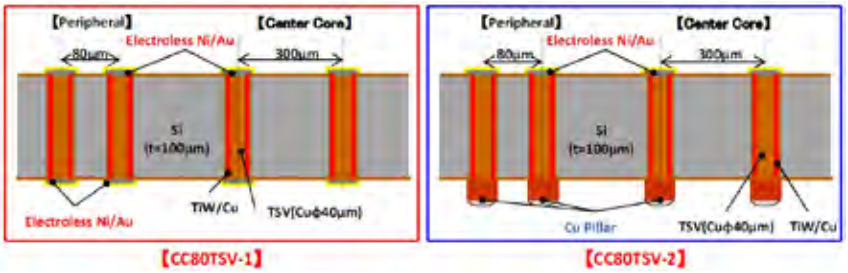


***Chip Structure***

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma

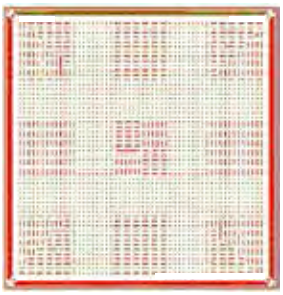


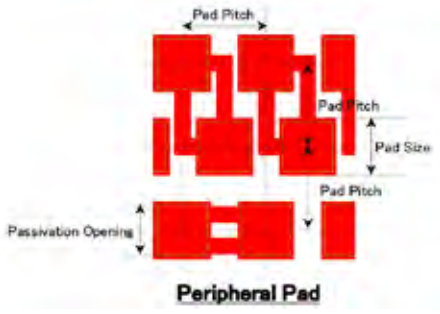



# CC80 MarkII-0101JY (STD)

| Specifications | STD | |
|---|---|---|
| Wafer Size | 8 inch (Notch) | |
| Wafer Thickness | 725±25µm | |
| Chip Size | 12.0mm ■ | |
| Function | Daisy Chain & Migration | |
| Pad Pitch | Peripheral | 80µm Three Rows Staggered |
| | Center core | 200µm Full Area |
| Electrode | Cu Pillar | |
| Pad Size | 54µm ■ | |
| Bump Size | ϕ31µm | |
| Passivation opening | 48µm ■ | |
| Scribe width | 120µm | |
| Number of Bump/Pad | Peripheral | 1660 bumps / 1660 pads |
| | Center core | 2916 bumps / 2916 pads |
| Number of Chip | 177 chips/wafer | |

■ Bottom Side



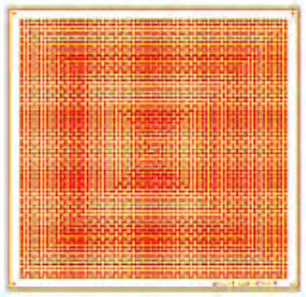


# FC150JY

| Specifications | Si | | Glass | |
|---|---|---|---|---|
| ***TYPE*** | ***A*** | ***B*** | ***A*** | ***B*** |
| Wafer Thickness | 725±25µm | 725±25µm | 700±70µm | 700±70µm |
| Wafer Size | 8 inch | 8 inch | 8 inch | 8 inch |
| Chip Size | 10.0mm ■ | 10.0mm ■ | 10.0mm ■ | 10.0mm ■ |
| Bump pitch | 150µm | 150µm | 150µm | 150µm |
| Function | Daisy Chain | Daisy Chain | — | — |
| Pad config | Area | Area | Area | Area |
| Electrode | Ball Mounted Solder Bump | Cu Pillar | Ball Mounted Solder Bump | Cu Pillar |
| Pad Size | 100µm ■ | 100µm ■ | — | — |
| Passivation opening | ϕ40µm ● | ϕ40µm ● | — | — |
| Polyimide opening | ϕ60µm ● | ϕ60µm ● | — | — |
| UBM Size | ϕ80µm ● | ϕ75µm ● | ϕ80µm ● | ϕ75µm ● |
| Bump Size | ϕ85µm ● | ϕ75µm ● | ϕ85µm ● | ϕ75µm ● |
| Scribe width | 100µm | 100µm | — | — |
| Number of Pad | 3721pads/chip(61×61) | 3721pads/chip(61×61) | — | — |
| Number of Chip | 208 chips/wafer | 208 chips/wafer | 208 chips/wafer | 208 chips/wafer |

● Top Side ■ Bottom Side

【Si-type】

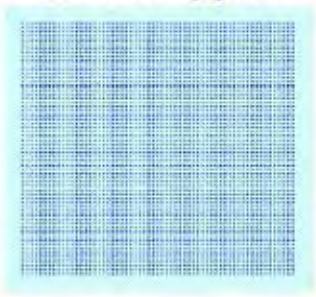


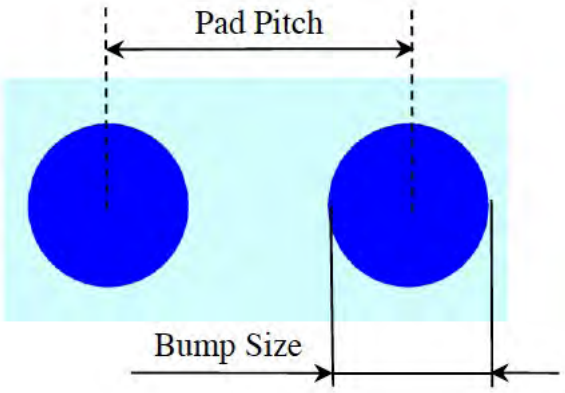
***Chip Structure***

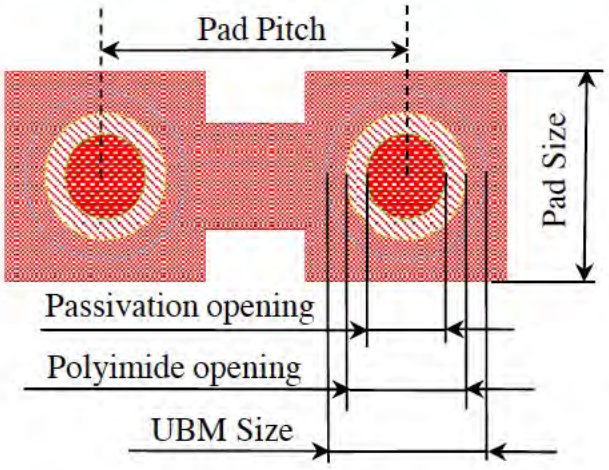
- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma

【Glass-type】





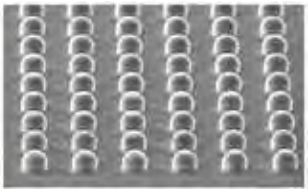




***For kit see page 71.***

# FC150LC-0101JY

**Specifications**

| | |
|---|---|
| Wafer size | ϕ300mm |
| Wafer Thickness | 775±25um |
| Chip size | 25mm * 25 mm (Scribe center to center) |
| Pad (bump)pitch | 150μm |
| Function | Daisy Chain |
| Electrode | Cu pillar (Cu30μm+SnAg15μm) |
| Bump size | ϕ75μm |
| Passivation opening | 40μm (octagon) |
| Polyimide opening | ϕ40μm |
| Scribe line width | 100μm |
| Number of pad | 25,921 pads (161×161 Matrix) |



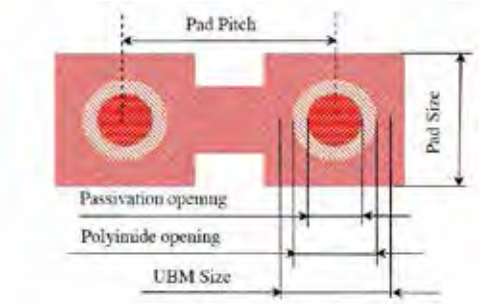
***Chip Structure***

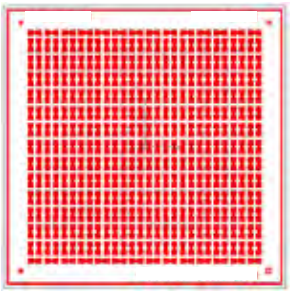
- Base Layer: P-SiO
- Metal layer: TiN / Al-Si
- Passivation Layer: P-SiO / P-SiN (option) Polyimide

# FC150SCJY

| TYPE | A | B |
|---|---|---|
| Wafer Thickness | 725±25μm | 725±25μm |
| Wafer Size | 8 inch | 8 inch |
| Chip Size | 5.02mm ■ | 5.02mm ■ |
| Bump pitch | 150μm | 150μm |
| Function | Daisy Chain | Daisy Chain |
| Pad config | Area | Area |
| Electrode | Ball Mounted Solder Bump | Cu Pillar |
| Pad Size | 100μm ■ | 100μm ■ |
| Passivation opening | ϕ40μm ● | ϕ40μm ● |
| Polyimide opening | ϕ60μm ● | ϕ60μm ● |
| UBM Size | ϕ80μm ● | ϕ75μm ● |
| Bump Size | ϕ85μm ● | ϕ75μm ● |
| Bump height | any | any |
| Scribe width | 100μm | 100μm |
| Number of Pad | 784 pads/chip (28×28)784 | pads/chip (28×28) |
| Number of Chip | 832 chips/wafer | 832 chips/wafer |

● Top Side ■ Bottom Side



***Chip Structure***

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

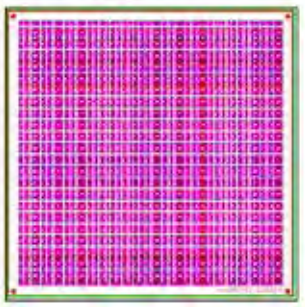
*TEOS: Tetraethoxysilane
*HDP: High Density Plasma

# FC200JY

| Specifications | Si | | Glass | |
|---|---|---|---|---|
| ***TYPE*** | ***A*** | ***B*** | ***A*** | ***B*** |
| Wafer Size | 8 inch | 8 inch | 8 inch | 8 inch |
| Wafer Thickness | 725±25µm | 725±25µm | 700±70µm | 700±70µm |
| Chip Size | 10.0mm ■ | 10.0mm ■ | 10.0mm ■ | 10.0mm ■ |
| Bump pitch | 200µm | 200µm | 200µm | 200µm |
| Function | Daisy Chain | Daisy Chain | — | — |
| Pad config | Area | Area | Area | Area |
| Electrode | Ball Mounted Solder Bump | Cu Pillar | Ball Mounted Solder Bump | Cu Pillar |
| Pad Size | 100µm ■ | 100µm ■ | — | — |
| Passivation opening | ϕ60µm ● | ϕ60µm ● | — | — |
| Polyimide opening | ϕ80µm ● | ϕ80µm ● | — | — |
| UBM Size | ϕ100µm ● | ϕ90µm ● | ϕ100µm ● | ϕ90µm ● |
| Bump Size | ϕ100µm ● | ϕ90µm ● | ϕ100µm ● | ϕ90µm ● |
| Scribe width | 100µm | 100µm | — | — |
| Number of Pad | 2116 pads/chip (46×46) | 2116 pads/chip (46×46) | — | — |
| Number of Chip | 228 chips/wafer | 228 chips/wafer | 228 chips/wafer | 228 chips/wafer |

● Top Side ■ Bottom Side

【Si-type】

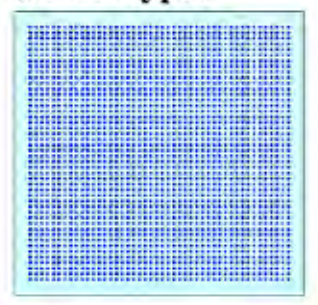


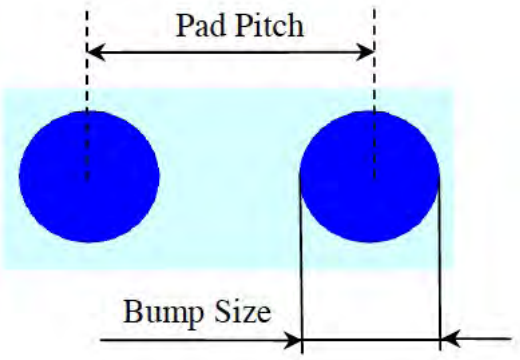
***Chip Structure***

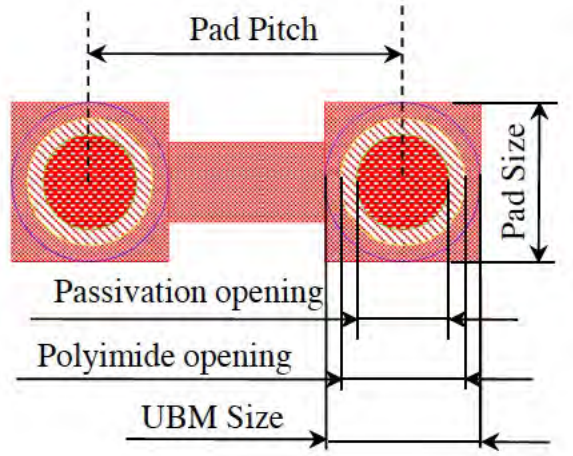
- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) NSG* / Polyimide

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma
*NSG: Non-doped Silicate Glass

【Glass-type】





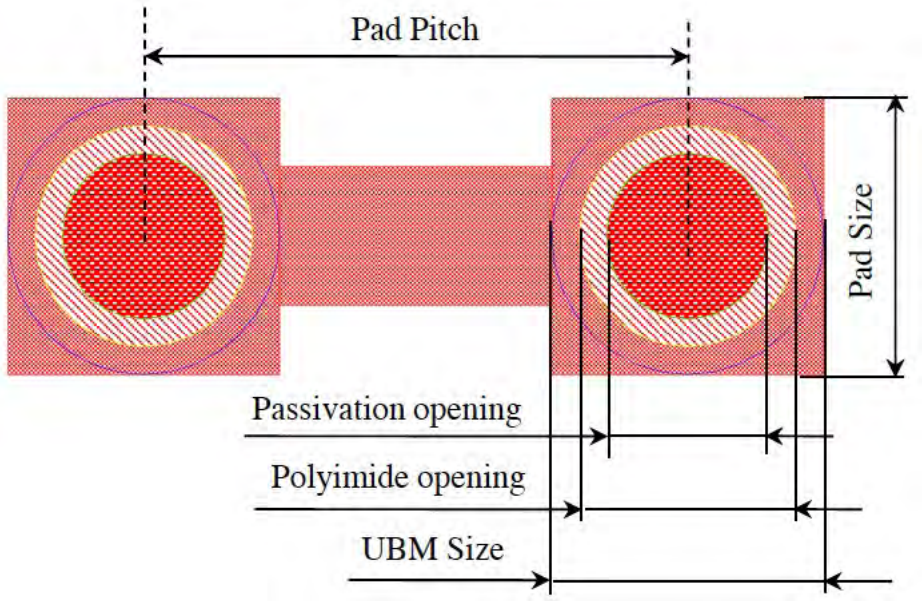

***For kit see page 71.***

| Specifications | Si | |
|---|---|---|
| ***TYPE*** | ***A*** | ***B*** |
| Wafer Size | 8 inch | 8 inch |
| Wafer Thickness | 725±25μm | 725±25μm |
| Chip Size | 5.02mm ■ | 5.02mm ■ |
| Bump pitch | 200μm | 200μm |
| Function | Daisy Chain | Daisy Chain |
| Pad config | Area | Area |
| Electrode | Ball Mounted Solder Bump | Cu Pillar |
| Pad Size | 100μm ■ | 100μm ■ |
| Passivation opening | ϕ60μm ● | ϕ60μm ● |
| Polyimide opening | ϕ80μm ● | ϕ80μm ● |
| UBM Size | ϕ100μm ● | ϕ90μm ● |
| Bump Size | ϕ100μm ● | ϕ90μm ● |
| Scribe width | 100μm | 100μm |
| Number of Pad | 484 pads/chip (22×22) | 484 pads/chip (22×22) |
| Number of Chip | 832 chips/wafer | 832 chips/wafer |
| | | ● Top Side ■ Bottom Side |

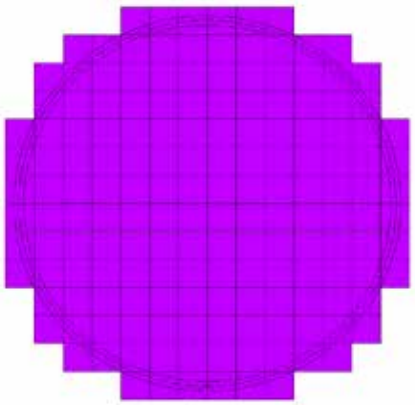
***Chip Structure***

- Base Layer: P-TEOS*
- Metal layer: TiN / Al-0.5%Cu
- Passivation Layer: HDP* / P-SiN (option) Polyimide

*TEOS: Tetraethoxysilane
*HDP: High Density Plasma



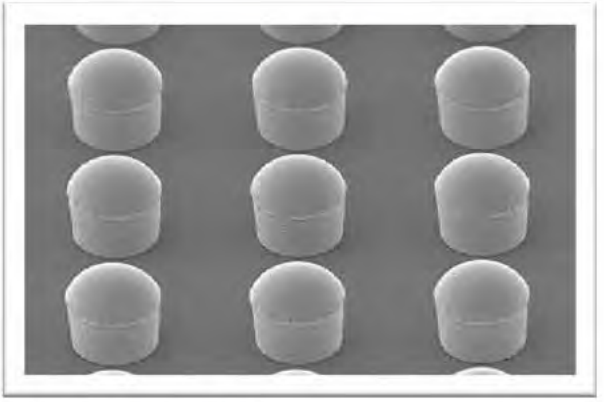
# FBW



φ8inch Wafer Shot Matrix

**Full Bump Wafer**

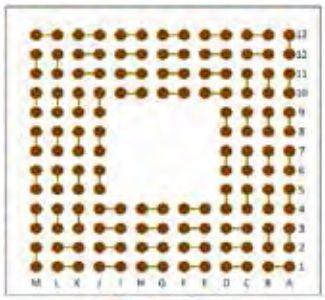
*Dicing Size is Free*



**Cu Pillar Bump TEG**

| Specifications | FBW200-0001JY | FBW150-0001JY | FBW130-0001JY | FBW100-0001JY | FBW80-0001JY |
|---|---|---|---|---|---|
| Wafer Size | 8 inch | 8 inch | 8 inch | 8 inch | 8 inch |
| Wafer Thickness | 725±25μm | 725±25μm | 725±25μm | 725±25μm | 725±25μm |
| Bump Pitch | 200μm | 150μm | 130μm | 100μm | 80μm |
| Function | — | — | — | — | — |
| Electrode | Cu Pillar | Cu Pillar | Cu Pillar | Cu Pillar | Cu Pillar |
| Bump Size | ϕ90μm | ϕ75μm | ϕ65μm | ϕ50μm | ϕ40μm |
| Bump Height | Max.60μm | Max.60μm | Max.60μm | Max.60μm | Max.50μm |

# WLP TEG (0.4mm pitch & 0.3mm pitch)



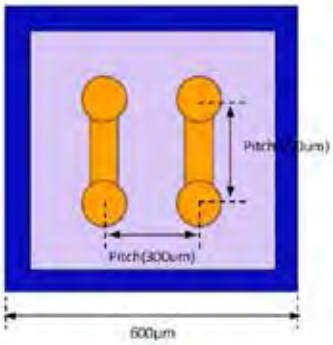
【0.4mm pitch BGA】

【0.3mm pitch BGA】

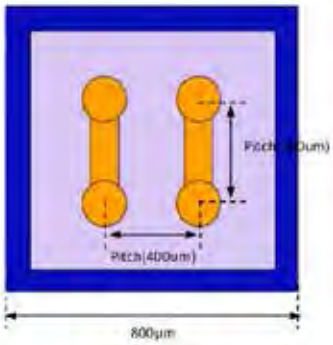
| WLP TEG | 0.4mm pitch BGA | 0.3mm pitch BGA |
|---|---|---|
| Wafer Size | 8 inch | 8 inch |
| Wafer Thickness | 400±20μm | 400±20μm |
| Chip Size | 6.0mm ■ | 6.0mm ■ |
| BGA pitch | 400μm | 300μm |
| Function | Daisy Chain | Daisy Chain |
| Electrode | Ball Mounted Solder Bump | Ball Mounted Solder Bump |
| Pad Size | (ϕ227μm) | (ϕ177μm) |
| Line width | 25μm | 20μm |
| Number of Pin | 144 pins/chip | 264 pins/chip |
| Number of Chip | 712 chips/wafer | 712 chips/wafer |

■ Bottom Side

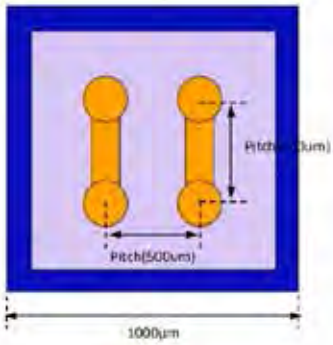
# WLP TEG (Free Size Cut TEG: TEG0306, TEG0408, TEG0510)




【TEG0306】



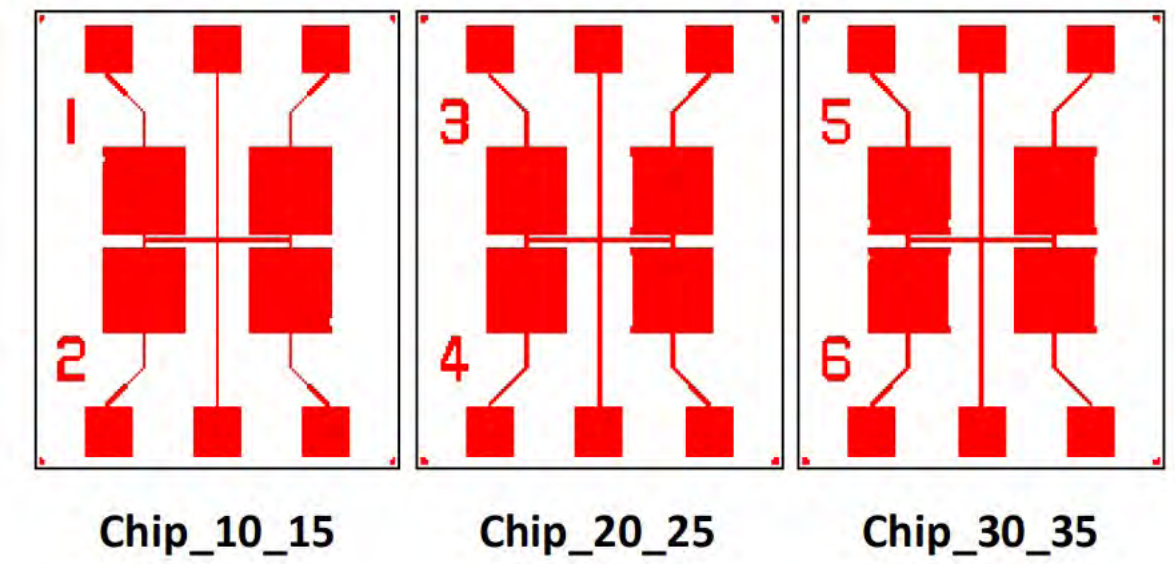

【TEG0408】

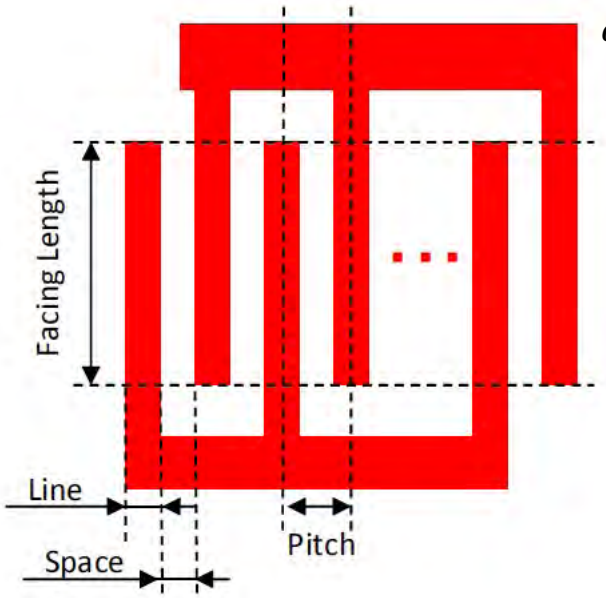



【TEG0510】

| Free Size Cut TEG | | TEG0306 | TEG0408 | TEG0510 |
|---|---|---|---|---|
| Wafer Size | | 8 inch | 8 inch | 8 inch |
| Wafer Thickness | | 400μm(or more) | 400μm(or more) | 400μm(or more) |
| Cut Size (Scribe Line Included) | Min | 600μm×600μm | 800μm×800μm | 1000μm×1000μm |
| Pad Pitch | | 300μm | 400μm | 500μm |
| Function | | Daisy Chain | Daisy Chain | Daisy Chain |
| Electrode | | Ball Mounted Solder Bump | Ball Mounted Solder Bump | Ball Mounted Solder Bump |
| Post Size | | 175μm | 200μm | 250μm |
| Number of Chip | | 79,257 chips/wafer | 44,161 chips/wafer | 28,212 chips/wafer |

# ME0102JY (for Migration Test)




***Chip Structure***

- Layer: SiO2 / Polyimide / TiCu / Cu (RDL)

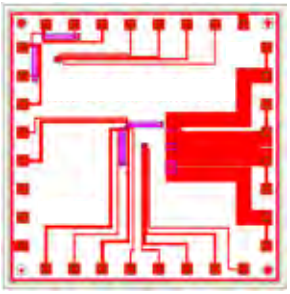
**Specifications**

| | | | | | | |
|---|---|---|---|---|---|---|
| Wafer Size | 12 inch | | | | | |
| Chip Size | 20mm×25mm | | | | | |
| Chip Name | Chip_10_15 | | Chip_20_25 | | Chip_30_35 | |
| Metal Height | 5.5µm | | | | | |
| Facing Length | 3mm | | | | | |
| Line/Space | 15µm/10µm | 15µm/15µm | 15µm/20µm | 15µm/25µm | 15µm/30µm | 15µm/35µm |
| Pitch | 25µm | 30µm | 35µm | 40µm | 45µm | 50µm |
| Number of Chip | 34 chips/wafer | | 40 chips/wafer | | 34 chips/wafer | |

# STAC-0101JY

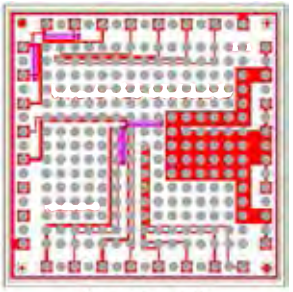
| Specifications | |
|---|---|
| Wafer Size | 6inch(OrientationFlat) |
| Wafer Thickness | 550±25µm |
| Chip Size | 3.0mm ■ |
| Pad Pitch | 300µm |
| Function | Stress Analysis by Piezoresistance<br>Thermal Analysis by Diode<br>Heat Generation by Resistance |
| Electrode | Al pad<br>Cu Pillar Bump<br>Solder Bump<br>Au Bump |
| Pad Size | 120µm ■ |
| Passivation Opening | 70µm (Octagon) |
| Polyimide Opening | ϕ90µm |
| Scribe Line Width | 80µm |
| Number of Pad | 32pads |
| <Option> | Back Side Metallization |

■ Bottom Side

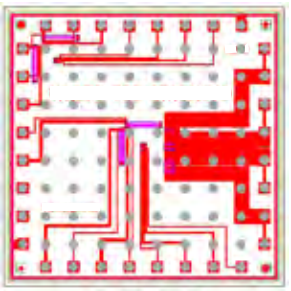


# STACTEG-150FA-0101JY & STACTEG-300FA-0101JY

| Specifications | STACTEG-150FA | STACTEG-300FA |
|---|---|---|
| Base Wafer | STAC-0101JY | STAC-0101JY |
| Electrode | Ni + SnAg Bump | Cu Pillar Bump |
| Bump Pitch | 150µm | 300µm |
| Bump Size | ϕ110µm | ϕ110µm |
| Bump Height | Ni5µm+SnAg75µm | Cu50um+SnAg10um |
| Passivation Opening | 70µm (Octagon) | 70µm (Octagon) |
| Polyimide Opening | ϕ90µm | ϕ90µm |
| Number of Pad | 32 pads | 32 pads |
| Number of Bump | 32 bumps + 253 Dummy bumps | 32 bumps + 64 Dummy bumps |
| <Option> | Back Side Metallization | Back Side Metallization |



【STACTEG-150FA】

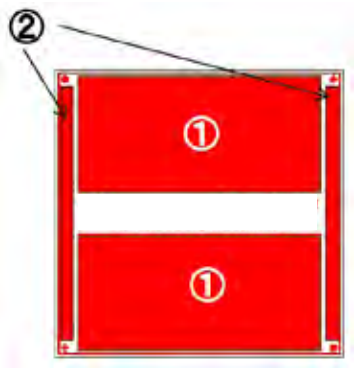


【STACTEG-300FA】

# PWB0101JY

| Specifications | TYPE-A | TYPE-B |
|---|---|---|
| Wafer Size | 6 inch | 6 inch |
| Wafer Thickness | 625±25µm | 625±25µm |
| Chip Size | 6.0mm ■ | 6.0mm ■ |
| Metal Thickness | Al-Si 3µm | Al-Si 4.5µm |
| Function | BondabilityCheck | BondabilityCheck |
| Pad config | Plane | Plane |
| Pad Size | ① 5060µm × 2420µm | ① 5060µm × 2420µm |
| | ② 270µm 5300µm | ② 270µm × 5300µm |
| Passivation opening | ① 5040µm × 2400µm | ① 5040µm × 400µm |
| | ② 250µm × 5280µm | ② 250µm × 5280µm |
| Scribe width | 100µm | 100µm |

■ Bottom Side




# HPW-0101JY

| Specifications | |
|---|---|
| Wafer Size | 8inch (Notch) |
| Wafer Thickness | 725±25µm |
| Chip Size | 3.0mm ■ |
| Pad Pitch | 300µm |
| Function | Thermal Analysis by Diode<br>Heat Generation by Resistance |
| Electrode | Al pad<br>Cu Pillar Bump<br>Solder Bump<br>Au Bump |
| Pad Size | 120µm ■ |
| Passivation Opening | 70µm (Octagon) |
| Polyimide Opening | ϕ90µm |
| Scribe Line Width | 80µm |
| Number of Pad | 32pads |
| Maximum Output | Max. 14.5W/Chip |
| <Option> | Back Side Metallization |

■ Bottom Side

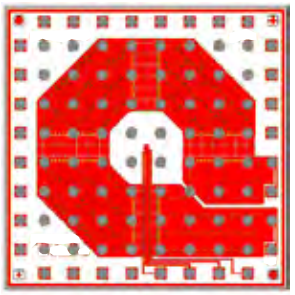
***Chip Structure***

- Base Layer: SiO2
- Metal layer: Al-1.0%Si
- Passivation Layer: P-SiN

# HPWTEG-150FA-0101JY & HPWTEG-300FA-0101JY

| Specifications | HPWTEG-150FA | HPWTEG-300FA |
|---|---|---|
| Base Wafer | HPW-0101JY | HPW-0101JY |
| Electrode | Ni + SnAg Bump | Cu Pillar Bump |
| Bump Pitch | 150µm | 300µm |
| Bump Size | ϕ110µm | ϕ110µm |
| Bump Height | Ni5µm+SnAg75µm | Cu50um+SnAg10um |
| Passivation Opening | 70µm (Octagon) | 70µm (Octagon) |
| Polyimide Opening | ϕ90µm | ϕ90µm |
| Number of Pad | 32 pads | 32 pads |
| Number of Bump | 32 bumps + 253 Dummy bumps | 32 bumps + 64 Dummy bumps |
| <Option> | Back Side Metallization | Back Side Metallization |

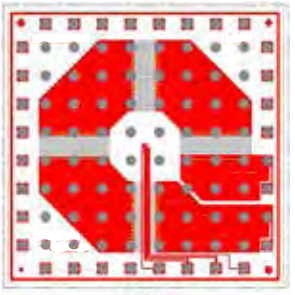
【HPWTEG-150FA】



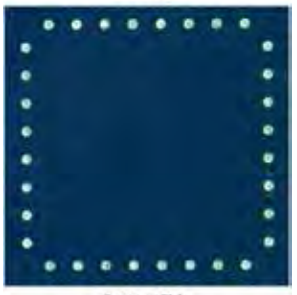
【HPWTEG-300FA】

# HPWTSV-0101JY

| Specifications | | |
|---|---|---|
| Base Wafer | HPW-0101JY (SiN) | |
| Wafer Thickness | 100µm | |
| Top Side | Electrode | Cu Pillar Bump |
| | Number of Bump | 32 bumps + 64 Dummy bumps |
| | Bump Size | ϕ100µm |
| | Bump Pitch | 300µm |
| | Bump Height | Cu50µm+SnAg10µm |
| | Top Coat Layer | Passivation (P-SiN) |
| TSV | Via Size | ϕ90µm |
| BottomSide | Electrode | Electroless Ni/Au plating |
| | Number of Bump | 32 bumps |
| | Bump Size | ϕ100µm |
| | Bump Pitch | 300µm |
| | Bump Height | 8µm |
| | Top Coat Layer | P-TEOS |

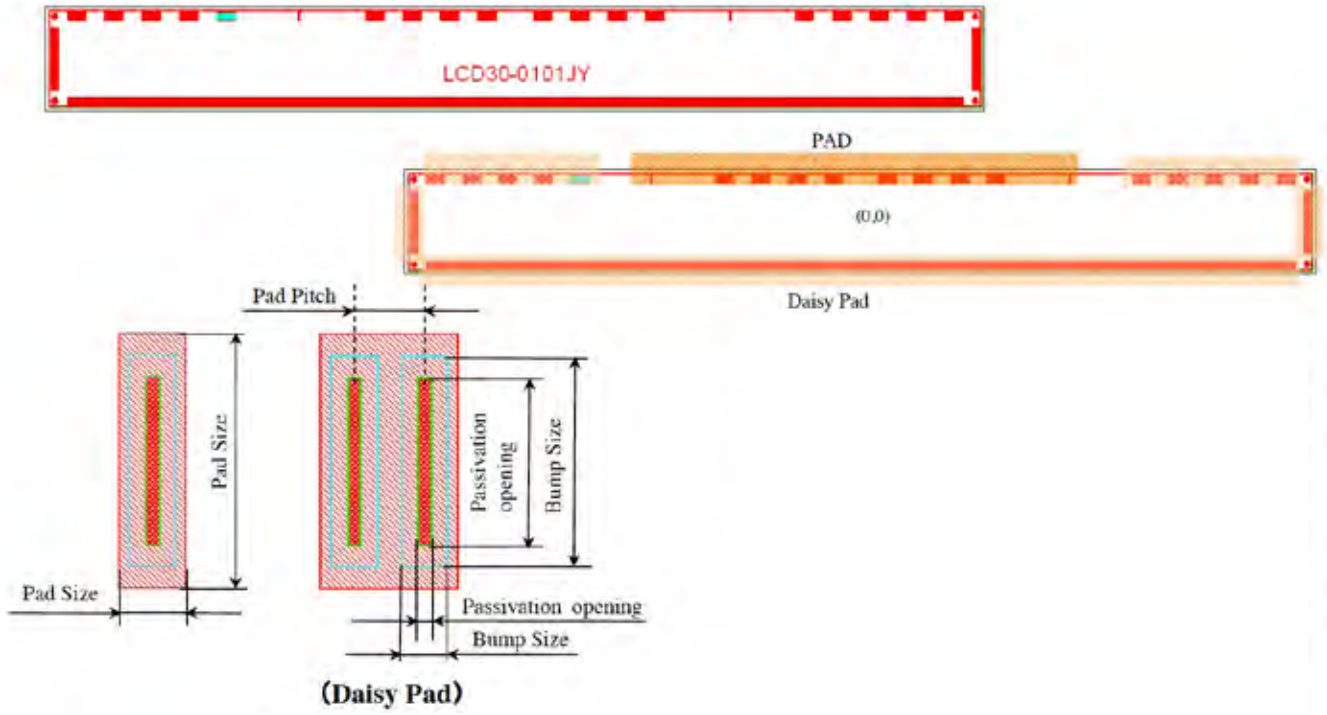


Top Side



Bottom Side

# LCD30-0101JY




**Specifications**

| | |
|---|---|
| Wafer Size | 6 inch |
| Chip Size | 15.1mm×1.6mm |
| Pad pitch | 30μm |
| Function | Daisy Chain |
| Pad config | Peripheral |
| Bump material(process) | Gold(plating) , Cu |
| Pad Size | 28μm×120μm |
| Passivation opening | 6μm×80μm |
| UBM Size | 20μm×100μm |
| Bump Size | 20μm×100μm |
| Scribe width | 100μm |
| Number of Pad | 726 pad/chip |
| Number of Chip | 530 chip/wafer |

***Chip Structure***

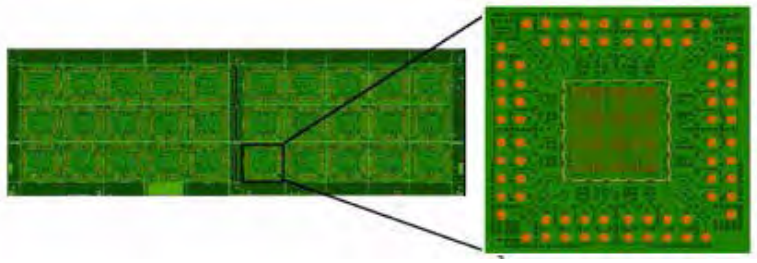
- Base Layer: P-TEOS*
- Metal layer: TiW/ Al-1.0%Si-0.5%Cu
- Passivation Layer: P-TEOS* / P-SiN

*TEOS: Tetraethoxysilane

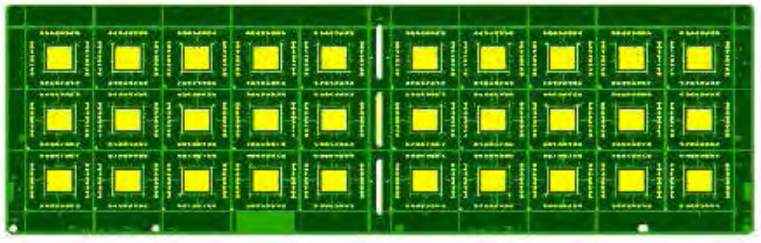
# Advanced Wafer Technology Substrates

| Part Description | W-Kit-MB50-0102 | W-Kit-CC80-0104 | W-Kit-FC150P-10 | W-Kit-FC200P-10 |
|---|---|---|---|---|
| Specifications | | | 1x1 | 1x1 |
| Structure | 1-2-1 Build Up Substrate | 1-2-1 Build Up Substrate | Rigid Substrate (both) | Rigid Substrate (both) |
| Layer Structure | Layer 1 Signal Layer (no via)<br>Layer 2 ~ Layer 4 Mesh | Layer 1,2 Signal Layer (Via)<br>Layer 3, 4 Mesh | | |
| Outline | 17.0mm x 17.0mm<br>x (0.96mmt) | 187.5mm x 64.0mm<br>x (0.36mmt) | 30.0mm x 30.0mm<br>x (0.96mmt) | 30.0mm x 30.0mm<br>x (0.86mmt) |
| Core Material | Core: E-679FGR<br>Build Layer: ABF-GX13 | Core: E-679FGBS<br>Build Layer: ABF-GX92 | Core: E-679FGR<br>Build Layer: ABF-GX92 | Core: E-679FGR |
| Solder Resist Material | PSR4000 AUS-703 | PSR4000 AUS-703 | PSR4000 AUS-703 | PSR4000 AUS-703 |
| Function | Daisy Chain | Daisy Chain | Daisy Chain | Daisy Chain |
| Land Size | | | Φ0.12µm | Φ0.14µm |
| Lead Min L/S | 20µm/30µm | 32µm/48µm | | |
| Number of Lead | 536 lead | Peripheral: 648 lead<br>Full Area: 400 leads | 3,721 (61x61) | 2,116 (46x46) |
| Pad Dimensions | Φ0.8µm (SR opening: Φ0.65µm) | Φ0.75µm (SR opening: Φ0.67µm) | SR opening: Φ0.80µm | SR opening: Φ0.95µm |
| Number of Pads | 32 Pads | 72 Pads | 24 Pads | 24 Pads |
| Daisy Chain | | | Center Area 16x15 Matrix<br>Corner Area 15x15 four Matrix | Center Area 12x12 Matrix<br>Corner Area 12x11 four Matrix |
| Surface Spec of Electrode | Electroless Ni/Au plating | Cu<br>Cu+OSP<br>Electroless Ni/Au plating | Electroless Ni/Au plating<br>Cu+OSP (Option Solder Coat)<br>Cu | Electroless Ni/Au plating<br>Cu+OSP (Option Solder Coat)<br>Cu |

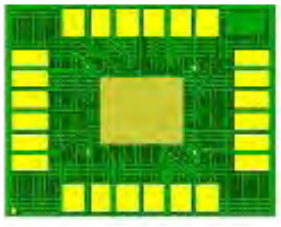
** Call Practical for custom and option kit substrate options



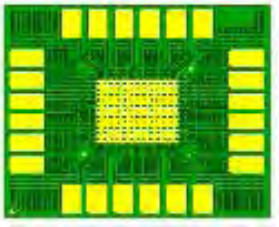
CC80 [Map]



MAP_NCR 2Block in a Sheet (3x5x2Block)



FC150 1x1



FC200 1x1

# CTReels
## Empty Carrier Tape Reels

When only the physical characteristics of the tape matter, we offer empty carrier tape reels in a variety of widths and pitches. Empty carrier tape reels are plastic embossed or paper carrier tape with sealed cover tape to simulate running parts without the cost and mess during feeder applications. CTReels are a cost saving alternative compared to actual parts on tape.

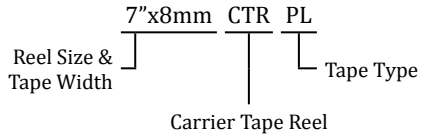
### Empty Carrier Tape Reels

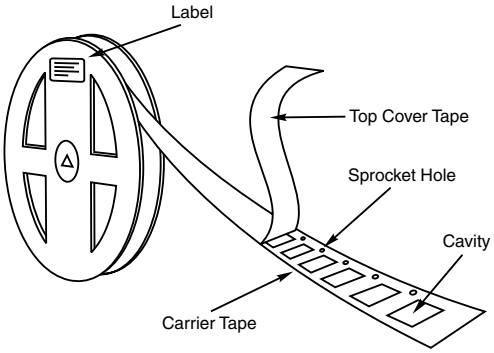
| Part Description | Reel Size | Tape Width | Tape Pitch | Standard Pocket | Pockets Per Reel | Tape Type |
|---|---|---|---|---|---|---|
| 7”x8mm-CTR-PA | 7” | 8mm | 2mm | 0402SMR | 10,000 | Paper |
| | | | 4mm | 0805SMR | 5,000 | Paper |
| 7”x8mm-CTR-PL | 7” | 8mm | 2mm | 0402SMR | 10,000 | Plastic |
| | | | 4mm | 0805SMR | 5,000 | Plastic |
| 7”x12mm-CTR-PL | 7” | 12mm | 8mm | 1812SMC | 1,000 | Paper |
| 7”x16mm-CTR-PL | 7” | 16mm | 12mm | SO16-7.6mm | 500 | Plastic |
| 13”x8mm-CTR-PA | 13” | 8mm | 4mm | 0805SMR | 10,000 | Paper |
| 13”x8mm-CTR-PL | 13” | 8mm | 4mm | 0805SMR | 10,000 | Plastic |
| 13”x12mm-CTR-PL | 13mm | 12mm | 8mm | SO8-3.8mm | 2,500 | Plastic |
| 13”x16mm-CTR-PL | 13” | 16mm | 8mm | SO14-3.8mm | 2,500 | Plastic |
| | | | 12mm | SO16-7.6mm | 1,000 | Plastic |
| 13”x24mm-CTR-PL | 13” | 24mm | 12mm | SO20-7.6mm | 1,000 | Plastic |
| | | | 16mm | PLCC28 | 750 | Plastic |
| | | | 20mm | LQFP-12mm | 750 | Plastic |
| | | | 24mm | PBGA-13mm | 500 | Plastic |
| 13”x32mm-CTR-PL | 13” | 32mm | 12mm | T1-TSOP32 | 1,000 | Plastic |
| | | | 16mm | T1-TSOP32 | 1,000 | Plastic |
| | | | 24mm | PLCC44 | 750 | Plastic |
| 13”x44mm-CTR-PL | 13” | 44mm | 16mm | T11-TSOP54 | 500 | Plastic |
| | | | 20mm | TBA | 1,000 | Plastic |
| | | | 24mm | LQFP-20mm | 750 | Plastic |
| | | | 32mm | PBGA-23mm | 250 | Plastic |
| | | | 36mm | TBA | 250 | Plastic |
| | | | 40mm | TBA | 200 | Plastic |
| 13”x56mm-CTR-PL | 13” | 56mm | 40mm | PBGA-35mm | 250 | Plastic |
| | | | 44mm | QFP-32mm | 250 | Plastic |
| 13”x72mm-CTR-PL | 13” | 72mm | 24mm | TBA | 300 | Plastic |

***Notes***

- Taped to EIA 481 standards.
- Plastic (PL) carrier tape is standard. Paper (PA) carrier tape is special order.
- Reels come standard with Heat Seal Cover Tape.
- PSA available upon request (pressure sensitive adhesive).
- 10–100g peel back pressure for 8mm carrier tapes.
- 10–130g peel back pressure for 12–56mm carrier tapes.
- 10–150g peel back pressure for 72mm carrier tapes.
- Additional pocket types available upon request.
- Additional widths and pitches may be available, call for details.

***Part Description System***



# Tape and Reel Specifications

| Part Description | Tape Width | Tape Pitch | Reel Size | Qty Per Reel |
|---|---|---|---|---|
| 01005SMR-PA | 8mm | 2mm | 7" | 20,000 |
| 0201SMR-PA | 8mm | 2mm | 7" | 15,000 |
| 0402SMR-PA | 8mm | 2mm | 7" | 10,000 |
| 0603SMR-PA | 8mm | 4mm | 7" | 5,000 |
| 0805SMR-PA | 8mm | 4mm | 7" | 5,000 |
| 1206SMR-PA | 8mm | 4mm | 7" | 5,000 |
| 1210SMR-PA | 8mm | 4mm | 7" | 5,000 |
| 0201SMC-PA | 8mm | 2mm | 7" | 15,000 |
| 0402SMC-PA | 8mm | 2mm | 7" | 10,000 |
| 0603SMC-PA | 8mm | 4mm | 7" | 4,000 |
| 0805SMC-PA | 8mm | 4mm | 7" | 4,000 |
| 1206SMC-PA | 8mm | 4mm | 7" | 4,000 |
| 0805SMC-PL | 8mm | 4mm | 7" | 4,000 |
| 1206SMC-PL | 8mm | 4mm | 7" | 3,000 |
| 1210SMC-PL | 8mm | 4mm | 7" | 3,000 |
| 1812SMC-PL | 12mm | 8mm | 7" | 1,000 |
| 1825SMC-PL | 12mm | 8mm | 7" | 1,000 |
| 3mm-SME-PL | 12mm | 8mm | 13" | 2,000 |
| 4mm-SME-PL | 12mm | 8mm | 13" | 2000 |
| 5mm-SME-PL | 12mm | 12mm | 13" | 1,000 |
| 6.3mm-SME-PL | 16mm | 12mm | 13" | 1,000 |
| 8mm-SME-PL | 16mm | 12mm | 13" | 1,000 |
| 10mm-SME-PL | 24mm | 16mm | 13" | 500 |
| 18mm-SME-PL | 44mm | 32mm | 13" | 125 |
| 3216SMTA-PL | 8mm | 4mm | 7" | 2,000 |
| 3528SMTA-PL | 8mm | 4mm | 7" | 2,000 |
| 6032SMTA-PL | 12mm | 8mm | 7" | 500 |
| 7343SMTA-PL | 12mm | 8mm | 7" | 500 |
| SC90-TR (supermini) | 8mm | 4mm | 7" | 3,000 |
| SOT323-TR | 8mm | 4mm | 7" | 3,000 |
| SOT353-TR | 8mm | 4mm | 7" | 3,000 |
| SOT363-TR | 8mm | 4mm | 7" | 3,000 |
| SOT23-TR | 8mm | 4mm | 7" | 3,000 |
| SOT25-TR | 8mm | 4mm | 7" | 3,000 |
| SOT26-TR | 8mm | 4mm | 7" | 3,000 |
| SOT143-TR | 8mm | 4mm | 7" | 3,000 |
| SOT89-TR | 12mm | 8mm | 7" | 1,000 |
| SOT223-TR | 12mm | 8mm | 7" | 1,000 |
| DPAK-TR | 16mm | 8mm | 13" | 2,500 |
| D2PAK-TR | 24mm | 12mm | 13" | 800/1,000 |
| SO8GTR-3.8mm | 12mm | 8mm | 13" | 2,500 |
| SO14GTR-3.8mm | 16mm | 8mm | 13" | 2,500 |
| SO16GTR-3.8mm | 16mm | 8mm | 13" | 2,500 |
| SO16GTR-7.6mm | 16mm | 12mm | 13" | 1,000 |
| SO20GTR-7.6mm | 24mm | 12mm | 13" | 1,000 |
| SO28GTR-7.6mm | 24mm | 12mm | 13" | 1,000 |
| SO28JTR-7.6mm | 24mm | 12mm | 13" | 1,000 |
| SSOP14TR-5.3mm | 16mm | 12mm | 13" | 1,000 |
| SSOP16TR-5.3mm | 16mm | 12mm | 13" | 1,000 |
| SSOP20TR-5.3mm | 16mm | 12mm | 13" | 1,000 |
| SSOP24TR-5.3mm | 16mm | 12mm | 13" | 1,000 |
| SSOP28TR-5.3mm | 16/24mm | 12mm | 13" | 1,000 |
| SSOP48TR-7.6mm | 32mm | 12/16mm | 13" | 1,000 |
| SSOP56TR-7.6mm | 32mm | 12/16mm | 13" | 500 |

| Part Description | Tape Width | Tape Pitch | Reel Size | Qty Per Reel |
|---|---|---|---|---|
| TSSOP8TR-3.0mm | 12mm | 8mm | 13" | 2,500 |
| TSSOP8TR-4.4mm | 12/16mm | 8mm | 13" | 1,000/2,500 |
| TSSOP10TR-3.0mm | 12mm | 8mm | 13" | 2,500 |
| TSSOP14TR-4.4mm | 12/16mm | 8mm | 13" | 1,000/2,500 |
| TSSOP16TR-4.4mm | 12/16mm | 8mm | 13" | 1,000/2,500 |
| TSSOP20TR-4.4mm | 16mm | 8/12mm | 13" | 1,000/2,500 |
| TSSOP24TR-4.4mm | 16mm | 8/12mm | 13" | 1,000/2,500 |
| TSSOP28TR-4.4mm | 16mm | 8/12mm | 13" | 1,000 |
| TSSOP32TR-6.1mm | 24mm | 12mm | 13" | 1,000 |
| TSSOP44TR-4.4mm | 24mm | 12mm | 13" | 1,000 |
| TSSOP48TR-6.1mm | 24mm | 12mm | 13" | 1,000 |
| TSSOP56TR-4.4mm | 24mm | 12mm | 13" | 1,000 |
| TSSOP56TR-6.1mm | 24mm | 12mm | 13" | 1,000 |
| T1-TSOP28-8.1x11.8mm-.55mm | 24mm | 12mm | 13" | 1,000 |
| T1-TSOP32-8x18.4mm-.5mm | 32mm | 12/16mm | 13" | 1,000 |
| T1-TSOP48-12x18.4mm-5mm | 32mm | 16mm | 13" | 1,000 |
| T11-TSOP32-10.16x20.95mm-1.27mm | 32mm | 16mm | 13" | 1,000 |
| T11-TSOP54-10.16x22.22mm-.8mm | 44mm | 16mm | 13" | 1,000 |
| PLCC20TR | 16mm | 12mm | 13" | 1,000 |
| PLCC28TR | 24mm | 16mm | 13" | 750 |
| PLCC32TR | 24mm | 16mm | 13" | 750 |
| PLCC44TR | 32mm | 24mm | 13" | 450 |
| PLCC68TR | 44mm | 32mm | 13" | 230/250 |
| PLCC84TR | 44mm | 36mm | 13" | 250 |
| QFP-10mm sq. | 24mm | 24mm | 13" | 500 |
| QFP-14mm sq. | 32mm | 24mm | 13" | 350 |
| QFP-14x20mm | 44mm | 32mm | 13" | 500 |
| QFP-28mm sq. | 44mm | 40mm | 13" | 200 |
| QFP-32mm sq. | 56mm | 44mm | 13" | 200 |
| LQFP/TQFP- 5mm sq. | 16mm | 12mm | 13" | 1,000 |
| LQFP/TQFP- 7mm sq. | 16mm | 12mm | 13" | 1,000 |
| LQFP/TQFP- 10mm sq. | 24mm | 16/24mm | 13" | 1,000 |
| LQFP/TQFP- 12mm sq. | 24mm | 20/24mm | 13" | 1,000 |
| LQFP/TQFP- 14mm sq. | 32mm | 24mm | 13" | 750 |
| LQFP/TQFP- 14x20mm | 44mm | 32mm | 13" | 500 |
| LQFP/TQFP- 20mm sq. | 44mm | 24mm | 13" | 500 |
| LQFP/TQFP- 24mm sq. | 44mm | 32mm | 13" | 500 |
| PBGA-13mm sq. | 24mm | 24mm | 13" | 500 |
| PBGA-15mm sq. | 24mm | 24mm | 13" | 500 |
| PBGA-17mm sq. | 24mm | 24mm | 13" | 500 |
| PBGA-23mm sq. | 44mm | 32mm | 13" | 250 |
| PBGA-27mm sq. | 44mm | 32mm | 13" | 250 |
| PBGA-35mm sq. | 56mm | 40mm | 13" | 250 |
| CTBGA/CABGA-5mm sq. | 12mm | 8mm | 13" | 1,000 |
| CTBGA/CABGA-6mm sq. | 16mm | 8mm | 13" | 1,000 |
| CTBGA/CABGA-7mm sq. | 16mm | 12mm | 13" | 1,000 |
| CTBGA/CABGA-8mm sq. | 16mm | 12mm | 13" | 1,000 |
| CTBGA/CABGA-9mm sq. | 16mm | 12mm | 13" | 1,000 |
| CTBGA/CABGA-10mm sq. | 24mm | 12mm | 13" | 1,000 |
| CTBGA/CABGA-11mm sq. | 24mm | 16mm | 13" | 1,000 |
| CTBGA/CABGA-12mm sq. | 24mm | 16mm | 13" | 1,000 |
| CTBGA/CABGA-14mm sq. | 24mm | 24mm | 13" | 500 |
| CTBGA/CABGA-17mm sq. | 24mm | 24mm | 13" | 500 |

# PDIP
## Plastic Dual In-Line Package

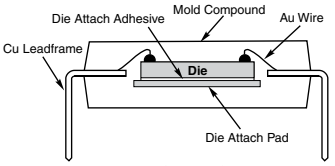
Plastic Dual In-Line Packages (PDIP) are long-established industry standard through-hole packages.

**PDIP Plastic Dual In-Line Package**

| Part Description | Number of Pins | Body Size (L) | Body Size (W) | Quantity Per Tube |
|---|---|---|---|---|
| PDIP8-300 | 8 | .360" | .300" | 50 |
| PDIP14-300 | 14 | .750" | .300" | 25 |
| PDIP16-300 | 16 | .750" | .300" | 25 |
| PDIP18-300 | 18 | .900" | .300" | 21 |
| PDIP20-300 | 20 | 1.030" | .300" | 18 |
| PDIP24-300 | 24 | 1.250" | .300" | 15 |

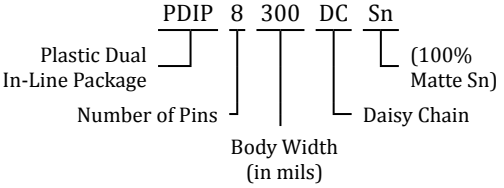
***Notes***

- High conductivity copper leadframe.
- JEDEC standard compliant.
- Parts packaged in anti-static 20" tubes.
- Pitch is 100 mils.
- Lead-free available with 100% Sn Matte alloy.
- Eutectic solder plating finish is 85% Sn/15% Pb.
- Daisy chained parts available.



PDIP Cross-Section

***Part Description System***




***For kits see pages 97, 99, 100, 101, 106, 108, 116 & 117.***

# Through-Hole Glass Diodes

Axial Leaded Through-hole Glass Diode package has been in use for over 50 years in the electronics industry. The body of these parts are glass and the package is hermetically sealed. The "DO" prefix is a JEDEC designation for through-hole diodes. The 34 and 35 references case size. These type of components are packaged on ammo pack or bulk. In most cases, these parts are sold as training aids to teach new operators how to solder.

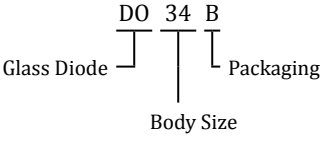
**Axial Leaded Through-Hole Glass Diode**

| Part Description | References (JEDEC) | (EIAJ) | Case Size (Inch) | Case Size (mm) | Lead Diameter |
|---|---|---|---|---|---|
| DO-34 | DO-34 | | 0.0629"x0.1197" | 1.6x3.04mm | .55mm |
| DO-35 | DO-35 | SC-40 | 0.0728"x0.1673" | 1.85x4.25mm | .56mm |

***Notes***

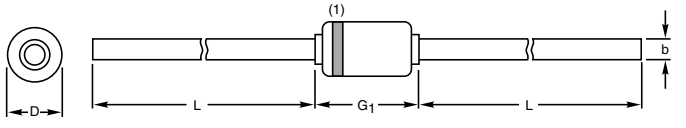
- Part is hermetically sealed glass package.
- Axial leaded (2 leads).
- Parts are packaged Ammo pack (5K per reel) or bulk.
- Lead-free available with 100% Sn alloy.

***Part Description System***



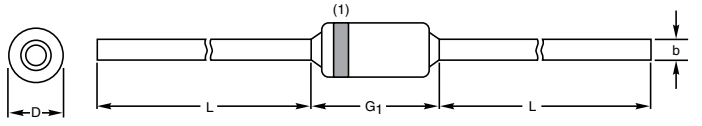

**DO-34**

| Unit | b Max | D Max | G1Max | L Min |
|---|---|---|---|---|
| mm | 0.55 | 1.6 | 3.04 | 25.4 |




**DO-35**

| Unit | b Max | D Max | G1Max | L Min |
|---|---|---|---|---|
| mm | 0.56 | 1.85 | 4.25 | 25.4 |



# Through-Hole Transistors

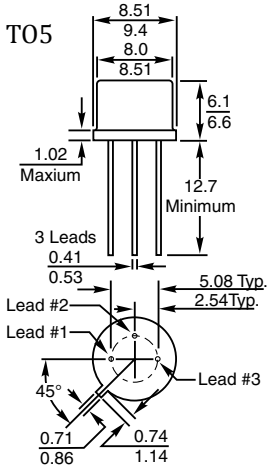
TO type components are through-hole transistors. These are basic electronic components developed in the last forty years. There are many additional types of TO components not listed. TO components come packaged in tubes, bulk, and tape and reel. Not all components types are available in all packaging styles. Please call for availability. Parts are available lead-free with Sn finish.

### Through-Hole Transistors

| Part Description | Number of Pins | Case Material |
|---|---|---|
| TO5-3-B | 3 | Metal |
| TO18-3-B | 3 | Metal |

| Part Description | Number of Pins | Case Material |
|---|---|---|
| TO92-3-B | 3 | Plastic |
| TO220-3-B | 3 | Plastic |

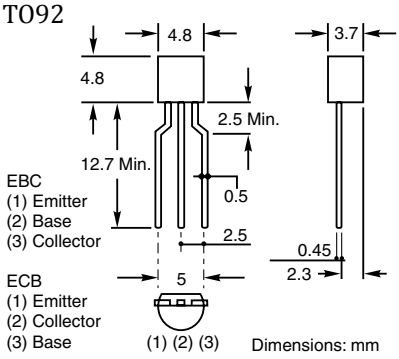
TO5




| Lead Codes | Pin 1 | 2 | 3 |
|---|---|---|---|
| SCR | C | G | A |
| Transistor | E | B | C |
| TRIAC | MT1 | G | MT2 |

Dimensions: mm

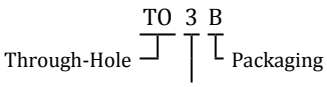
TO92



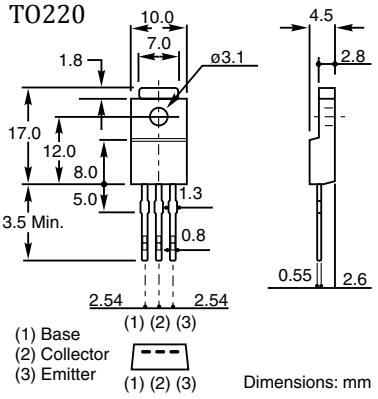

Dimensions: mm

*For kits see pages 98, 99, 100, 101, 116 & 117.*

***Part Description System***




TO220




Dimensions: mm

# Axial Leaded Resistors

Axial Leaded Resistors are through-hole mounted components.

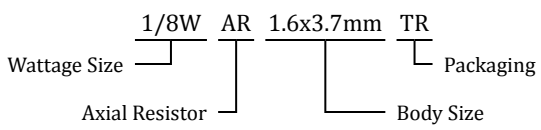
### Axial Leaded Resistors

| Part Description | Type | Dimensions L (mm) | Dimensions C (mm) | Dimensions D (mm) | Dimensions I (mm) | Dimensions d (mm) |
|---|---|---|---|---|---|---|
| 1/8W-AR-1.6x3.7mm | CF 1/8 | 3.00 ± 0.1 | 3.5 Max | 1.70 ± 0.2 | 28.0 ± 3.0 | 0.45 ± 0.05 |
| 1/4W-AR-2.3x6.5mm | CF 1/4 | 6.35 ± 0.5 | 7.1 Max | 2.30 ± 0.3 | 28.0 ± 3.0 | 0.60 ± 0.05 |
| 1/2W-AR-3.5x9.5mm | CF 1/2 | 8.51 ± 0.5 | 9.52 Max | 3.00 ± 0.3 | 28.0 ± 3.0 | 0.60 ± 0.05 |

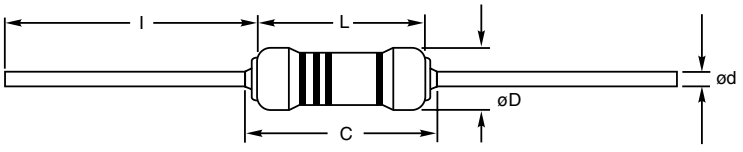
***Notes***

- Parts are conformal coated resistors—carbon film type.
- Parts are available in bulk, tape and reel or ammo pack.
- Lead-Free and Zero-Ohm value parts available

***Part Description System***




*For kits see pages 98, 99, 100, 101, 116 & 117.*



# SMT
## Lead-Free Surface Mount Transistors

SOT package is a rectangular surface mount transistor diode with three or more gull-wing leads. The leads are on the two length sides of the package. SOT packages are JEDEC compliant. Popular sizes are the SOT23, DPAK, SOT223 and SOT89.

### SMT Surface Mount Transistors

| Part Description | Number of Pins | Body Size (W) | Body Size (L) | SC Device | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|---|
| SC90-TR-Sn | 3 | 1.6mm | 1.6mm | SC-75A | 8mm | 4mm | 3,000 |
| SOT323-TR-Sn | 3 | 2.0mm | 2.1mm | SC-70 | 8mm | 4mm | 3,000 |
| SOT353-TR-Sn | 5 | 2.0mm | 2.1mm | SC-88A / SOT325 | 8mm | 4mm | 3,000 |
| SOT363-TR-Sn | 6 | 2.0mm | 2.1mm | SC-88 / SOT326 | 8mm | 4mm | 3,000 |
| SOT23-TR-Sn | 3 | 2.9mm | 2.4mm | TO-236AB | 8mm | 4mm | 3,000 |
| SOT25-TR-Sn | 5 | 2.9mm | 2.8mm | SC-74A | 8mm | 4mm | 3,000 |
| SOT26-TR-Sn | 6 | 2.9mm | 2.8mm | SC-74 | 8mm | 4mm | 3,000 |
| SOT143-TR-Sn | 4 | 2.9mm | 2.5mm | TO-253AA | 8mm | 4mm | 3,000 |
| SOT89-TR-Sn | 3 | 4.5mm | 4.0mm | SC-62 / TO-243AA | 12mm | 8mm | 1,000 |
| SOT223-TR-Sn | 3 | 6.5mm | 7.0mm | SC-73 / TO-261AA | 12mm | 8mm | 1,000 |
| DPAK-TR-Sn | | 6.5mm | 9.5mm | AC-63 / TO-252-AA | 16mm | 8mm | 2,500 |
| D2PAK-TR-Sn | | 10.0mm | 15.mm | TO-263AB | 24mm | 12mm | 800/1,000 |

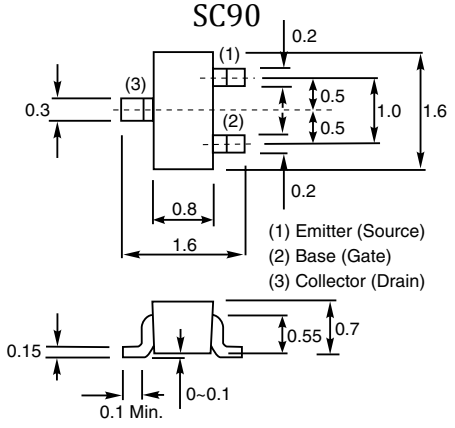
***Notes***

- Carrier pack is plastic for surface mount transistors.
- Tape type is plastic.
- Parts only available on Tape and Reel.
- Tin-Lead solder plating available upon request based on availability.
- Lead-free available with 100% Sn alloy.

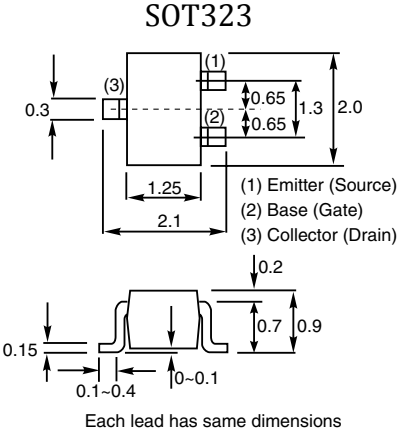
***Part Description System***

SOT23 TR
Transistor Type — Tape & Reel

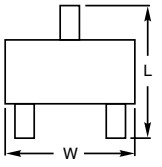
SC90



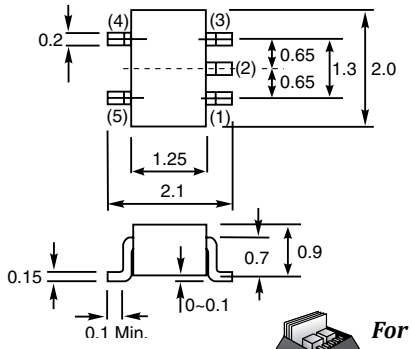

SOT323



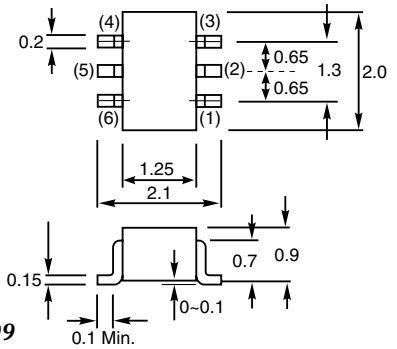

Each lead has same dimensions




SOT353



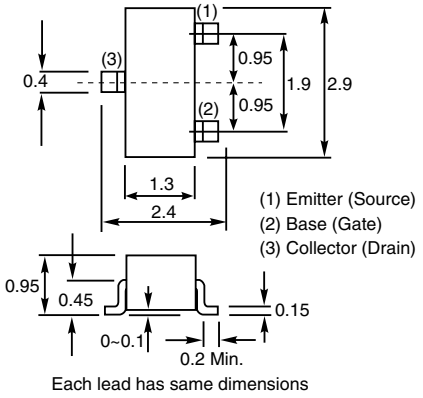

SOT363




Each lead has same dimensions

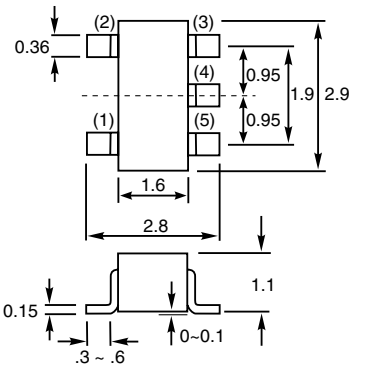
***For kits see pages 93, 97, 98, 99 100, 101, 105, 116 & 118.***

## SOT23



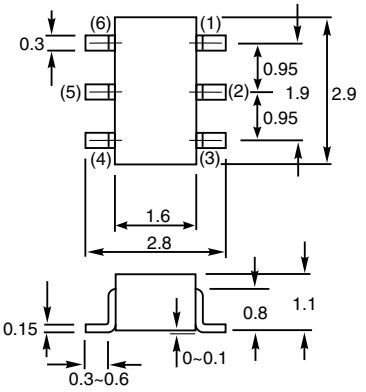

Each lead has same dimensions

## SOT25



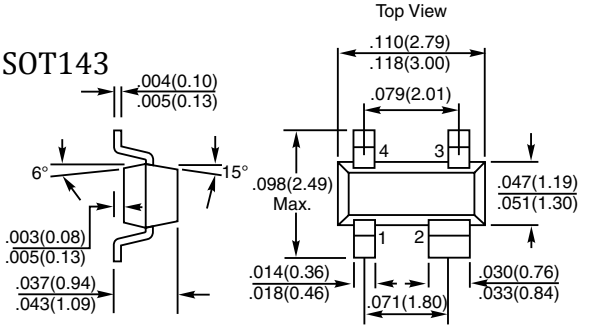

Each lead has same dimensions

## SOT26

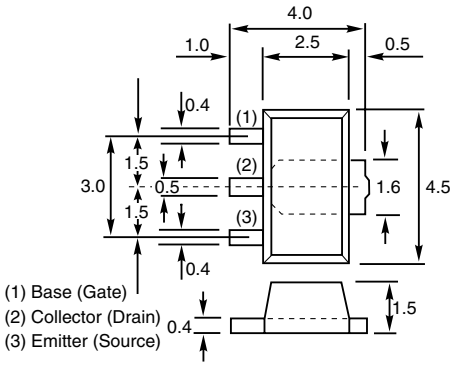



Each lead has same dimensions

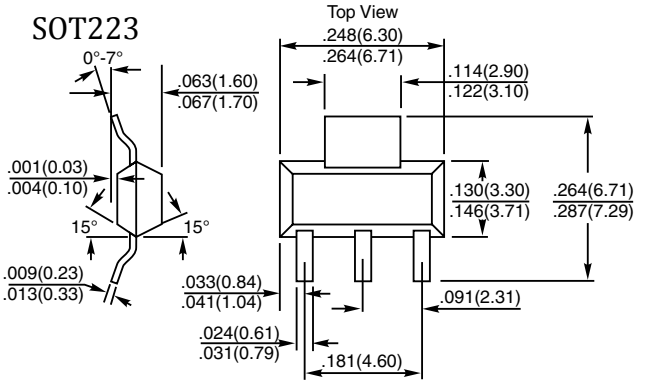
## SOT143



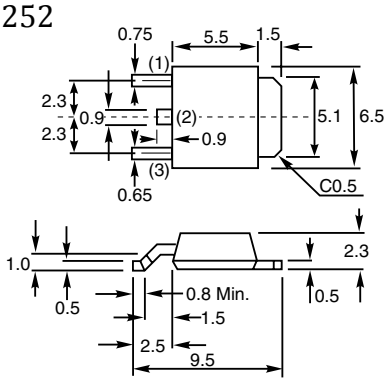

## SOT89



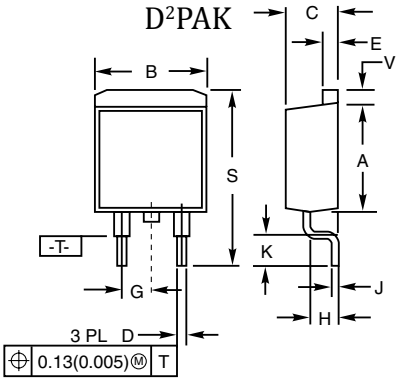

## SOT223




## DPAK TO-252




## D²PAK




| Dim. | Inches | | Millimeters | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 0.340 | 0.380 | 8.64 | 9.65 |
| B | 0.380 | 0.405 | 9.65 | 10.29 |
| C | 0.160 | 0.190 | 4.06 | 4.83 |
| D | 0.020 | 0.035 | 0.51 | 0.89 |
| E | 0.045 | 0.055 | 1.14 | 1.40 |
| G | 0.100 BSC | | 2.54 BSC | |
| H | 0.080 | 0.110 | 2.03 | 2.79 |
| J | 0.018 | 0.025 | 0.46 | 0.64 |
| K | 0.090 | 0.110 | 2.29 | 2.79 |
| S | 0.575 | 0.625 | 14.60 | 15.88 |
| V | 0.045 | 0.055 | 1.14 | 1.40 |

Notes
(1) Dimensioning and tolerancing per ANSI Y14.5M, 1982.
(2) Controlling Dimension: inch.

# SMR
## Lead-Free Surface Mount Resistors

Surface Mount Resistors (SMR) are best suited for commercial industrial and automotive applications. Chip Resistors are suitable for a wide range of solder processes, and are ideal for high-speed electronic assembly equipment. Chip Resistor body size range from 01005 to 1210. Seven-inch reels are standard, but eleven and thirteen-inch reels are available upon special request. Paper carrier tape is standard for Chip Resistors. In addition, Zero-Ohm Chip Resistors have a copper wire internally. This creates a short condition. Zero-Ohm Chip Resistors can be used to check for continuity after soldering.

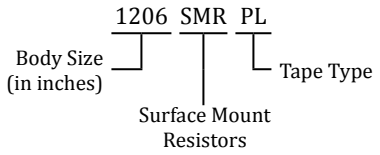
### SMR Surface Mount Resistors—Lead-Free

| Part Description | Body Size (inch) | Body Size (mm) | Metric | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|---|
| 01005SMR-PA-Sn | .01"x.005" | 0.4x0.2mm | 0402 | 8mm | 2mm | 20,000 |
| 0201SMR-PA-Sn | .02"x.01" | 0.6x0.3mm | 0603 | 8mm | 2mm | 15,000 |
| 0402SMR-PA-Sn | .04"x.02" | 1.0x0.5mm | 1005 | 8mm | 2mm | 10,000 |
| 0603SMR-PA-Sn | .06"x.03" | 1.6x0.8mm | 1608 | 8mm | 4mm | 5,000 |
| 0805SMR-PA-Sn | .08"x.05" | 2.0x1.27mm | 2012 | 8mm | 4mm | 5,000 |
| 1206SMR-PA-Sn | .12"x.06" | 3.2x1.6mm | 3216 | 8mm | 4mm | 5,000 |
| 1210SMR-PA-Sn | .12"x.10" | 3.2x2.6mm | 3225 | 8mm | 4mm | 4,000 |

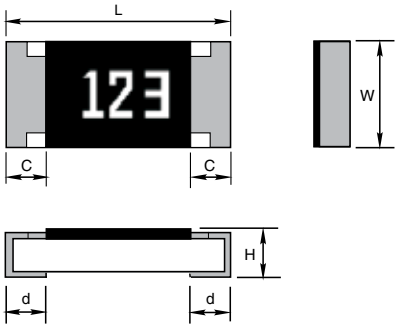
***Notes***

- Surface mount resistors come packaged on paper carrier tape and 7" reels (larger quantities are available upon request).
- Plastic carrier tape is non-standard for surface mount resistors.
- The numeric section of the part number refers to the physical body size (in inches) of the component. For example: Part number 0402SMR-PA has a body size of .04" length by .02" width.
- Chip resistor arrays are available (call for availability).
- Resistors are now only available standard lead-free with 100% Sn over Ni.

***Part Description System***




- Tape Type: "PA" = Paper Tape, "PL" = Plastic Tape.




### SMR Component Dimensions

| Metric | Inch | L | W | H | c | d | * Unit weight/pc. |
|---|---|---|---|---|---|---|---|
| 0402 | 01005 | 0.4 +/– 0.02 | 0.2 +/– 0.02 | 0.12 +/– 0.02 | 0.1 +/– 0.03 | 0.1 +/– 0.03 | — |
| 0603 | 0201 | 0.6 +/– 0.03 | 0.3 +/– 0.03 | 0.23 +/– 0.03 | 0.1 +/– 0.05 | 0.15 +/– 0.05 | 0.16mg |
| 1005 | 0402 | 1.0 +/– 0.05 | 0.5 +/– 0.05 | 0.35 +/– .05 | 0.2 +/– 0.1 | 0.25 + 0.05 – 0.10 | 0.6mg |
| 1608 | 0603 | 1.6 +/– 0.1 | 0.8 + 0.15 – 0.05 | 0.45 +/– 0.10 | 0.3 +/– 0.1 | 0.3 +/– 0.1 | 2mg |
| 2012 | 0805 | 2.0 +/– 0.1 | 1.25 +/– 0.10 | 0.55 +/– 0.10 | 0.4 +/– 0.2 | 0.4 +/– 0.2 | 5mg |
| 3216 | 1206 | 3.2 +/– 0.15 | 1.6 +/– 0.15 | 0.55 +/– 0.10 | 0.5 +/– 0.25 | 0.5 +/– 0.25 | 9mg |
| 3225 | 1210 | 3.2 +/– 0.15 | 2.5 +/– 0.15 | 0.55 +/– 0.15 | 0.5 +/– 0.25 | 0.5 +/– 0.25 | 16mg |

Unit: mm *Values for reference

***For kits see pages 93, 97, 98, 100, 101, 105, 108, 109, 116, 117 & 118.***

# SMC
## Lead-Free Surface Mount Ceramic Capacitors

Surface Mount Multilayer Ceramic (SMC) capacitors come in case sizes ranging from 01005 to 2225. The most popular case sizes are listed in the table below. Parts on tape and reel are available on paper tape or plastic tape. Larger size reels are available upon special request. Practical Components has lead-free PCB test boards available for the 01005 through 1206 case sizes.

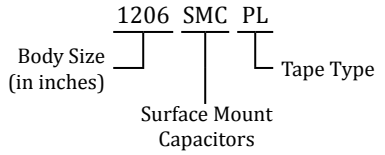
### SMC Surface Mount Ceramic Capacitors

| Part Description | Body Size (inch) | Body Size (mm) | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|
| 01005SMC-PA-Sn | .01"x.005" | 0.4x0.2mm | 8mm | 2mm | 20,000 |
| 0201SMC-PA-Sn | .02"x.01" | 0.6x0.3mm | 8mm | 2mm | 15,000 |
| 0402SMC-PA-Sn | .04"x.02" | 1.0x0.5mm | 8mm | 2mm | 10,000 |
| 0603SMC-PA-Sn | .06"x.03" | 1.6x0.8mm | 8mm | 4mm | 4,000 |
| 0805SMC-PA-Sn | .08"x.05" | 2.0x1.27mm | 8mm | 4mm | 4,000 |
| 1206SMC-PA-Sn | .12"x.06" | 3.2x1.6mm | 8mm | 4mm | 4,000 |
| 1210SMC-PA-Sn | .12"x.10" | 3.2x2.6mm | 8mm | 4mm | 4,000 |
| 1812SMC-PL-Sn | .18"x.12" | 4.5x3.2mm | 12mm | 8mm | 1,000/1,100 |
| 1825SMC-PL-Sn | .18"x.25" | 4.5x6.4mm | 12mm | 8mm | 1,000/1,100 |

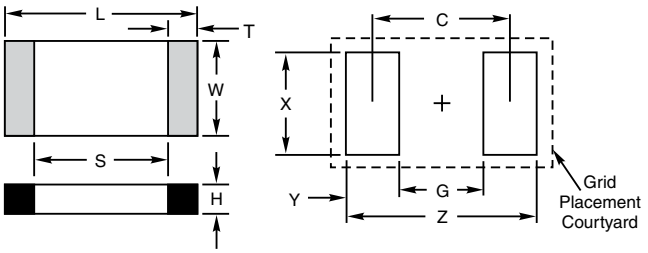
***Notes***

- Surface mount capacitors come on standard 7" reels (larger quantity reels are available upon request).
- Plastic carrier tape is non-standard for some carrier sizes.
- The numeric section of the part number refers to the physical body size (in inches) of the component. For example: Part number 0805SMC-PL has a body size of .08" length by .05" width.
- Chip capacitor arrays are available. Call for details.
- Capacitors are now only available standard lead-free with 100% Sn over Ni. SnPb is available upon request based on availability.

***Part Description System***




- Tape Type: PA = Paper Tape, PL = Plastic Tape




***For kits see pages 94, 100, 101 & 118.***

### SMC Component Dimensions

| Component Dimensions (mm) (in) | L (mm) | | S (mm) | | W (mm) | | T (mm) | | H (mm) |
|---|---|---|---|---|---|---|---|---|---|
| | Min | Max | Min | Max | Min | Max | Min | Max | Max |
| 0603 (0201) | 0.57 | 0.63 | — | — | 0.27 | 0.33 | — | — | 0.33 |
| 1005 (0402) | 0.90 | 1.10 | 0.30 | 0.65 | 0.40 | 0.60 | 0.10 | 0.30 | 0.60 |
| 1608 (0603) | 1.45 | 1.75 | 0.45 | 0.97 | 0.65 | 0.95 | 0.20 | 0.50 | 0.85 |
| 2012 (0805) | 1.80 | 2.20 | 0.30 | 1.11 | 1.05 | 1.45 | 0.25 | 0.75 | 1.10 |
| 3216 (1206) | 3.00 | 3.40 | 1.50 | 2.31 | 1.40 | 1.80 | 0.25 | 0.75 | 1.35 |
| 3225 (1210) | 3.00 | 3.40 | 1.50 | 2.31 | 2.30 | 2.70 | 0.25 | 0.75 | 1.35 |
| 4532 (1812) | 4.20 | 4.80 | 2.30 | 3.46 | 3.00 | 3.40 | 0.25 | 0.95 | 1.35 |

### SMC Land Pattern Dimensions

| Component Identifier (mm) (in) | Z (mm) | G (mm) | X (mm) | Y (mm) Ref | C (mm) Ref | Placement Grid (No. of Grid Elements) |
|---|---|---|---|---|---|---|
| 0603 (0201) | 0.72 | 0.26 | 0.32 | 0.23 | 0.49 | — |
| 1005 (0402) | 2.20 | 0.40 | 0.70 | 0.90 | 1.40 | 2 x 6 |
| 1608 (0603) | 2.80 | 0.60 | 1.00 | 1.10 | 1.70 | 4 x 6 |
| 2012 (0805) | 3.20 | 0.60 | 1.50 | 1.30 | 1.90 | 4 x 8 |
| 3216 (1206) | 4.40 | 1.20 | 1.80 | 1.60 | 2.80 | 4 x 10 |
| 3225 (1210) | 4.40 | 1.20 | 2.70 | 1.60 | 2.80 | 6 x 10 |
| 4532 (1812) | 5.80 | 2.00 | 3.40 | 1.60 | 3.90 | 8 x 12 |

# Ceramic Chip Pad Components

NEW!

Practical is pleased to offer NEW Ceramic Chip Pad components on tape and reel to help verify the contrasts of vision systems for pick and place machine evaluation. These Ceramic slugs are white ceramic with 90 degree laser cut edges in addition there are no terminations on either side of the components. Dimensions for each chip are 2.0mm x2.0mm x0.5mm. Chip material is Ceramic Rubalit 708 dry pressed. In addition to machine vision evaluation, these ceramic pads are idea for CPK testing amd increasing yield alignment.

Please call your knowledgeable Practical Components technical sales representative for further information.

# MELF Resistors

## Metal Electrode Leadless Face

Metal Electrode Leadless Face (MELF) Resistors are round or cylindrical in shape. They are available in embossed plastic tape on 7" reels. The terminals on MELF resistors are force-fitted steel caps with Sn plated termination. Parts are also available in Zero-Ohm value. Land pattern sizes for MELF resistors are the same as SMD chip resistor.

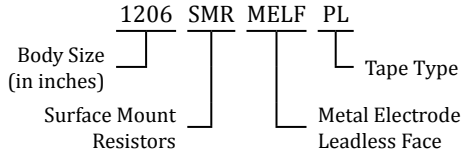
**MELF Metal Electrode Leadless Face Component Resistors**

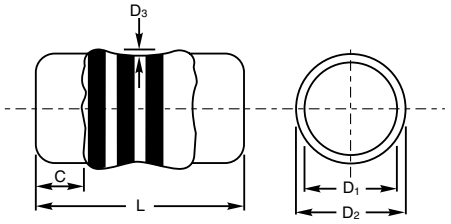
| Part Description | Body Size (inch) | Body Size (mm) | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|
| 0805SMR-MELF-PL-Sn | .08”x.05” | 2.0x1.27mm | 8mm | 4mm | 3,000 |
| 1206SMR-MELF-PL-Sn | .12”x.06” | 3.0x1.5mm | 8mm | 4mm | 2,000 |
| 1406SMR-MELF-PL-Sn | .14”x.06” | 3.56x1.5mm | 8mm | 4mm | 3,000 |
| 2309SMR-MELF-PL-Sn | .23”x.09” | 5.84x2.29mm | 12mm | 4mm | 1,500 |

***Notes***

- MELF is the acronym for Metal Electrode Leadless Face.
- 90/10 solder plated end caps.
- Suitable for reflow and wave soldering.
- Meets or exceeds EIAJ–8009, EIA–PDP–100.
- Tape type is plastic.

***Part Description System***




**Size Code Dimensions**

| Case Size | L | C Min | $D_1$ | $D_2$ Max | $D_3$ Max |
|---|---|---|---|---|---|
| 0805 | 2.0±0.1 (0.079±0.004) | 0.3 (0.012) | 1.25±0.05 (0.049±0.002) | 1.35 (0.053) | 0.07 (0.003) |
| 1406 | 3.5±0.2 (0.138±0.008) | 0.5 (0.02) | 1.45±0.10 (0.057±0.004) | 1.55 (0.061) | 0.10 (0.004) |
| 1206 | 3.2±0.2 (0.126±0.008) | | 1.55±0.15 (0.061±0.006) | 1.75 (0.069) | 0.10 (0.004) |
| 2309 | 5.9±0.2 (0.232±0.008) | | 2.2±0.10 (0.087±0.004) | 2.40 (0.094) | 0.15 (0.006) |

Unit: mm (Inch)

# SME
## Surface Mount Electrolytic Capacitors

Surface Mount Electrolytic (SME) capacitors are measured according to the diameter of the can mounted on top of the terminations. Sizes range from 3mm to 24mm in diameter. The most popular sizes are listed below. Please call if different sizes are needed. These components come packaged on plastic embossed carrier tape. Standard reel sizes are 15".

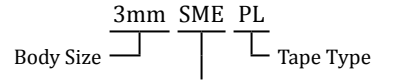
**SME Surface Mount Electrolytic Capacitors**

| Part Description | Body Size | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|
| 3mm-SME-PL-Sn | 3mm | 12mm | 8mm | 2,000 |
| 4mm-SME-PL-Sn | 4mm | 12mm | 8mm | 2,000 |
| 5mm-SME-PL-Sn | 5mm | 12mm | 12mm | 1,000 |
| 6.3mm-SME-PL-Sn | 6.3mm | 16mm | 12mm | 1,000 |
| 8mm-SME-PL-Sn | 8mm | 16mm | 12mm | 1,000 |
| 10mm-SME-PL-Sn | 10mm | 24mm | 16mm | 500 |
| 18mm-SME-PL-Sn | 18mm | 44mm | 32mm | 125 |

***Notes***

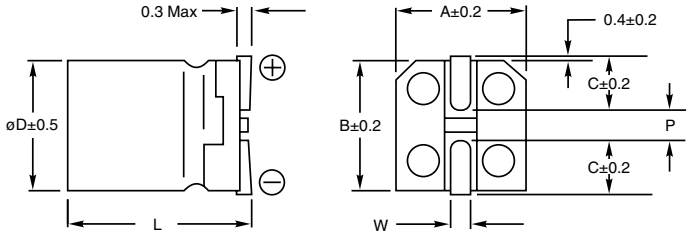
- Surface mount electrolytic capacitors come standard on 15" reels.
- Components are measured by the diameter of the electrolytic can.
- Lead-free available with 100% Sn.

***Part Description System***




| øD | L | A | B | C | W | P |
|---|---|---|---|---|---|---|
| 4 | 5.3±0.2 | 4.3 | 4.3 | 2.0 | 0.5±0.8 | 1.0 |
| 5 | 5.3±0.2 | 5.3 | 5.3 | 2.3 | 0.5±0.8 | 1.5 |
| 6.3 | 5.3±0.2 | 6.6 | 6.6 | 2.7 | 0.5±0.8 | 2.0 |
| 8 | 6.3±0.3 | 8.4 | 8.4 | 3.4 | 0.5±0.8 | 2.3 |
| 8 | 10±0.5 | 8.4 | 8.4 | 3.0 | 0.7±1.1 | 3.1 |
| 10 | 10±0.5 | 10.4 | 10.4 | 3.3 | 0.7±1.1 | 4.7 |
| 18 | 16.5 | 19.0 | 21.0 | 6.5 | 1.2±0.3 | 6.7 |

Unit: mm




# MELF Diodes
## Metal Electrode Face Components

Metal Electrode Face Components (MELF) have metallized terminals at each end of a cylindrical body. MELF components are designed to fit the same footprints as flat components i.e., 0805 (.08" x .05") and the 0603 (.06" x .03"). MELF packages are available on plastic tape and reel.

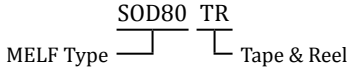
**MELF Metal Electrode Face Component Diodes**

| Part Description | Also Known As | Body Size (mm) | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|
| SOD80-TR-Sn | LL-34 or DO-213AA | 1.4x3.4mm | 8mm | 4mm | 10,000 |
| SM1-TR-Sn | DO-213AB | 2.6x5.0mm | 12mm | 4mm | 5,000 |

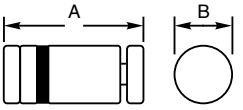
***Notes***

- MELF Diodes are cylindrical glass or plastic packages with Sn termination for lead-free.

***Part Description System***




| Package | SOD80 (LL34) | SM1 (LL41) |
|---|---|---|
| Dimension A | 3.4mm | 5.0mm |
| Dimension B | 1.5mm | 2.8mm |



# SMTA
## Lead-Free Surface Mount Tantalum Capacitors

Surface Mount Molded Tantalum Capacitors (SMTA) are polarized capacitors with solderable terminations. Surface Mount Tantalum packages are identified by case size i.e.: A, B, C and D. These case sizes stand for metric footprints of length and width. For example:
A = 3.2 x 1.6mm; B = 3.5 x 2.8mm; C = 6.0 x 3.2mm; D = 7.3 x 4.3mm.

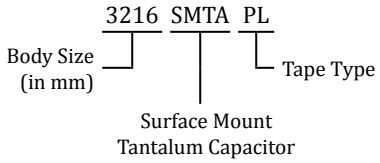
### SMTA Surface Mount Tantalum Capacitors

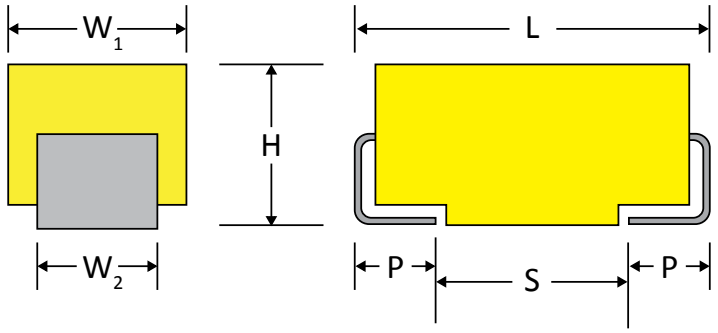
| Part Description | Body Size | Case Size | Tape Width | Tape Pitch | Quantity Per Reel |
|---|---|---|---|---|---|
| 1608SMTA-PL-Sn | 1.6x.85mm | R (smaller than A Case) | 8mm | 4mm | 500 |
| 3216SMTA-PL-Sn | 3.2x1.6mm | A | 8mm | 4mm | 2,000 |
| 3528SMTA-PL-Sn | 3.5x2.8mm | B | 8mm | 4mm | 2,000 |
| 6032SMTA-PL-Sn | 6.0x3.2mm | C | 12mm | 8mm | 500/750 |
| 7343SMTA-PL-Sn | 7.3x4.3mm | D | 12mm | 8mm | 500/750 |

***Notes***

- Components are molded, surface mount tantalums.
- Conformal coated tantalums are available.
- Please call for availability of mil-spec surface mount tantalums.
- Standard reel size is 7" (larger sizes are available upon request).
- All tantalum capacitors are on plastic carrier tape.
- Tantalums are now available as standard lead-free with 100% Sn finish.
- SnPb is available upon request based on availability.

***Part Description System***




| Case Size | Case Size | L ±0.2(±0.008) | W1 ±0.2(±0.008) | H ±0.2(±0.008) | W2 ±0.1(±0.004) | P ±0.3(±0.012) | S Min. |
|---|---|---|---|---|---|---|---|
| A | 3216-18 | 3.2 (.126) | 1.6 (.063) | 1.6 (.063) | 1.2 (.047) | 0.8 (.031) | 1.10 (0.043) |
| B | 3528-21 | 3.5 (.138) | 2.8 (.110) | 1.9 (.075) | 2.2 (.087) | .08 (.031) | 1.40 (0.055) |
| C | 6032-28 | 6.0 (.236) | 3.2 (.126) | 2.6 (.102) | 2.2 (.087) | 1.3 (.051) | 2.90 (0.114) |
| D | 7343-31 | 7.3 (.287) | 4.3 (.169) | 2.9 (.114) | 2.4 (.094) | 1.3 (.051) | 4.40 (0.173) |

## 115-1322 Epoxy Kit

This kit contains 10 packages of clear, low viscosity, superior strength epoxy, precisely measured out into two-compartment plastic packages so it's easy to use and there's no measuring.

Once cured, this epoxy makes an effective electrical insulator with good high temperature mechanical and impact resistance properties. The epoxy can be used to fill in holes, gaps, burns or to inject into delaminated locations. The kit also contains mixing sticks, mixing cups and foam swabs.

### Applications

- Base Board Repair, Epoxy Method
- Base Board Repair, Edge Transplant Method
- Coating Replacement, Solder Mask
- RoHS Compliant

## 201-3140 Plated Hole Repair Kit

Here are all the tools and materials you'll need to repair damaged plated through holes in circuit boards.

The kit includes a variety of eyelet sizes, carbide ball mills for drilling, and setting tools to form the eyelets conforming to IPC guidelines. Eyelets are made of pure copper electroplated with solder. Eyelet tooling is hardened steel.

***Application Notes***

- Plated Hole Repair, No Inner Layer Connection
- Plated Hole Repair, Double Wall Method
- Plated Hole Repair, Inner Layer Connection
- RoHS Compliant

## 201-2100 Professional Repair Kit

The Professional Repair Kit is the most complete and most versatile circuit board repair kit you'll find anywhere. It's the total package.

The kit includes dry film, epoxy-backed circuit frames, and unique replacement circuits that do not use messy liquid epoxy. Includes eyelets and setting tools for plated through hole repair, Circuit Tracks to repair damaged circuits, epoxy and color agents for solder mask or base board repairs, and a comprehensive manual all packaged in a convenient carrying case.

If you need to repair damaged circuit boards, the all-in-one Professional Kit is what you need.

### Applications

- Surface Mount Pad Repair
- BGA Pad Repair
- Land Repair
- Edge Contact Repair
- Conductor Repair
- Plated Hole Repair
- Base Board Repair, Epoxy Method
- Base Board Repair, Edge Transplant Method
- Coating Replacement
- RoHS Compliant

Professional Repair Kit is packaged in an ESD safe carry case

# Kit Identifier

## Component Part Numbers / Kit Numbers

| Kit Part Description / Component Part Description | PC000 | PC003 | PC007 | PC008 | PC009 | PC011 | SABER | PC012 | PC013 | PC014 | PC015 | PC016-J-STD-F | PC031 | WTK-1 | PC049 | PC052 | PC200-12mm | PC200-14mm | PC250-14mm-TMV-DT | PC2009 | SIR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 01005SMR-PL-0 | ● | | | ● | | | ● | | | | | | | | | | | | | ● | |
| 0201SMR-PL | | | | | | | | | | | | | | | | | | | | ● | |
| 0201SMR-PL-0 | ● | | | ● | | | | | | | | | ● | | ● | | | | | | |
| 0402SMC-PL | | | | | | | | | | ● | | | | | | ● | | | | | |
| 0402SMR-PL-0 | ● | | | ● | | | ● | | | ● | | | ● | | ● | | | | | ● | |
| 0603SMC-PL | | | | | | | | | | ● | ● | | | | | ● | | | | | |
| 0603SMR-PL-0 | ● | ● | | ● | ● | | ● | | | ● | | | ● | | ● | | | | | ● | |
| 0805SMC-PL | | | | | | | | | | | ● | | | | | ● | | | | | |
| 0805SMR-PL-0 | | ● | | ● | ● | | ● | | | | | ● | ● | | ● | | | | | ● | |
| 1/2-W-AR-3.5x9.5mm-TR | | | | | ● | | | | ● | | | | | | | | | | | | |
| 1/4-W-AR-2.3x6.5mm-TR | | | | | ● | | | | ● | | ● | ● | ● | | ● | | | | | | |
| 1206SMC-PA | | | | | | | | | | | | ● | | | | ● | | | | | |
| 1206SMR-Melf | | | | | | | | | | | | | | | | | | | | | |
| 1206SMR-PA-0 | | ● | | ● | ● | | ● | | | | ● | ● | ● | | ● | | | | | ● | |
| 1210SMR-PA-0 | | | | | | | ● | | | | | | ● | | | | | | | | |
| 6032SMTA-PL | | | | | ● | | | | | | | | | | | | | | | | |
| 68LCC | | | | | | | | | | | | | | | | | | | | | ● |
| A-CABGA36-.8mm-6mm-DC | | | | | ● | | | | | | ● | | ● | | | | | | | | |
| A-CABGA256-1.0-17mm-ISO | | | | | | | | | | | | | | | | ● | | | | | |
| A-CVBGA97-.4mm-5mm-DC | | | | | | | | | | | | | | | | | | | | ● | |
| A-CABGA196-1.0-15mm-DC | | | | | | ● | | | | | | | | | | | | | | ● | |
| A-CVBGA360-.4mm-10mm-DC | | | | | | ● | | | | | | | | | | | | | | ● | |
| A-CVBGA432-.4mm-13mm-DC | | | | | | ● | | | | | | | | | | | | | | | |
| A-CTBGA84-.5mm-7mm-DC | | | | | | ● | | | | | | | | | | | | | | | |
| A-CTBGA228-.5mm-12mm-DC | | | | | | ● | | | | | | | | | | | | | | | |
| A-DualRowMLF156-12mm-.5mm-DC | | | ● | | | | | | | | | | | | | | | | | ● | |
| A-MLF8-3mm-.65mm-DC | | | ● | | | | | | | | | | | | | | | | | | |
| A-MLF16-5mm-.8mm-DC | | | ● | | | | | | | | ● | | | | | | | | | ● | |
| A-MLF20-5mm-.65mm-DC | | | ● | | | | | | | | | | | | | | | | | | |
| A-MLF28-7mm-.8mm-DC | | | ● | | | | | | | | | | | | | | | | | | |
| A-MLF32-7mm-.65mm-DC | | | ● | | | | | | | | | | | | | | | | | ● | |
| A-MLF44-7mm-.5mm-DC | | | ● | | | | | | | | | | | | | | | | | | |
| A-MLF48-7mm-.5mm-DC | | | | | | | | | | | | | ● | | | | | | | ● | |
| A-MLF68-10mm-.5mm-DC | | | ● | ● | | | | | | | | | | | | | | | | | |
| A-PBGA1156-1.0mm-35mm-DC | | | | | | | | ● | | | | | | | | | | | | | |
| A-PBGA208-1.0mm-17mm-DC | | | | | | | | ● | | | | | | | | | | | | | ● |
| A-PBGA208-1.27mm-23mm-DC | | | | | | | | ● | | | | | ● | | | | | | | | |
| A-PBGA256-1.0mm-17mm-DC | | | ● | ● | | | | | | | | | ● | | ● | | | | | ● | |
| A-PBGA256-1.27mm-27mm-DC | | | | | ● | | | ● | | | | | | | | | | | | | |
| A-PBGA272-1.27mm-27mm-DC | | | | | | | | ● | | | | | | | | | | | | | |
| A-PBGA288-1.0mm-23mm-DC | | | | | | | | ● | | | | | | | | | | | | | |
| A-PBGA304-1.27mm-31mm-DC | | | | | | | | ● | | | | | | | | | | | | | |
| A-PBGA324-1.0mm-23mm-DC | | | | | | | | ● | | | | | | | | | | | | | |
| A-PBGA329-1.27mm-31mm-DC | | | | | | | | ● | | | | | | | | | | | | | |
| A-PBGA388-1.27mm-35mm-DC | | | | ● | | | | ● | | | | | | | | | | | | ● | |
| A-PBGA484-1.0mm-27mm-DC | | | | | | | | ● | | | | | | | | | | | | | |
| A-PBGA676-1.0mm-27mm-DC | | | | | | ● | | ● | | | | | | | | | | | | | |
| A-PBGA680-1.0mm-35mm-DC | | | | | | | | ● | | | | | | | | | | | | | |
| A-PoP128-.65mm-12mm-DC-LF | | | | | | | | | | | | | | | | | ● | | | | |

# Kit Identifier

## Component Part Numbers / Kit Numbers

| Kit Part Description / Component Part Description | PC000 | PC003 | PC007 | PC008 | PC009 | PC011 | SABER | PC012 | PC013 | PC014 | PC015 | PC016-J-STD-F | PC031 | WTK-1 | PC049 | PC052 | PC200-12mm | PC200-14mm | PC250-14mm-TMV-DT | PC2009 | SIR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A-PoP152-.65mm-14mm-DC-LF | | | | | | | | | | | | | | | | | | ● | | | |
| A-PSVfBGA305-.5-12mm-DC-LF | | | | | | | | | | | | | | | | | ● | | | | |
| A-PSVfBGA353-.5-14mm-DC-LF | | | | | | | | | | | | | | | | | | ● | | | |
| A-TMVPoP200-.5mm-14mm-DC-LF | | | | | | | | | | | | | | | | | | | ● | | |
| A-TMVPSVfBGA620-.4mm-14mm-DC-LF | | | | | | | | | | | | | | | | | | | ● | | |
| A-T1-TSOP32-8x20mm-.5mm | | | | | | | ● | | | | | | | | | | | | | | |
| A-TSSOP20T-4.4mm | | ● | | | | | | | | | | | | | | | | | | | |
| Axial Electrolytic, 5x11 | | | | | ● | | | | ● | | | | | | | | | | | | |
| CKO5 | | | | | ● | | | | ● | | ● | ● | | | | | | | | | |
| Conn-SMT | | | | | | | | | | | | | | | | ● | | | | | |
| Conn-TH-Horizontal | | | | | | | | | | | | | | | | ● | | | | | |
| Conn-TH-Vertical | | | | | | | | | | | | | | | | ● | | | | | |
| DIP14 | | ● | | | | | | | | | ● | | | | | | | | | ● | |
| DIP16 | | | | | ● | | | | ● | | | ● | ● | | ● | | | | | | |
| DIP20-DC | | | | | | | | | | | | | | | ● | | | | | | |
| DO35 | | | | | ● | | | | ● | | | ● | | | | | | | | | |
| DPAK(TO252) | | | | | | | ● | | | | | ● | | | | | | | | | |
| LQFP100-14mm-.5mm-2.0mm | | | | ● | | | | | | | ● | ● | ● | | | | | | | | |
| LQFP120-14mm-.4mm-2.0 | | | ● | | | | | | | | | | | | | | | | | | |
| LQFP160-24mm | | | | | | | | | | | | | | | | | | | | | |
| LQFP176-24mm-.5mm-2.0mm | | | | | | | | | | | | | | | | | | | | ● | |
| LQFP44-10mm-.8mm-2.0 | | | | | | | | | | | ● | | | | | | | | | | |
| LQFP64-7mm-.4mm-2.0 | | | | | | | | | | | | | | | ● | | | | | | |
| LQFP144-20mm-.5mm-2.0 | | | | | | | | | | | | | | | | | | | | ● | |
| Mono Capacitor - .200" lead space | | | | | | | | | | | | | ● | | | | | | | | |
| PLCC20 | | | | ● | | | | | | | | ● | | | | | | | | ● | |
| PLCC28 | | | | | | | | | | | ● | | | | | | | | | | |
| PLCC44 | | ● | | ● | ● | | | | | | | | | | | | | | | | |
| PLCC68 | | | | ● | ● | | ● | | | | | | | | | | | | | ● | |
| PLCC68-DC | | | | | | | | | | | | | | | ● | | | | | | |
| QFP100-14x20mm-.65mm-3.2mm | | ● | | | | | | | | | | ● | ● | | | | | | | | |
| QFP100-14x20mm-.65mm-3.9mm-DC | | | | ● | | | ● | | | | | | | | ● | | | | | | |
| QFP160-28mm-.65mm | | | | | | | | | | | | | | | | ● | | | | | |
| QFP208-28mm-.5mm-2.6mm | | ● | | | | | | | | | | | | | | | | | | | |
| QFP208-28mm-.5mm-2.6mm-DC | | | | | ● | | ● | | | | | | | | ● | | | | | | |
| QFP256-28mm-.4mm-2.6mm-DC | | | | ● | | | | | | | | | ● | | | | | | | | |
| QFP64-14mm-.8mm-3.9mm | | | | | | | | | | | | | | | | | | | | ● | |
| QFP44-10mm-.8mm-3.2mm | | ● | | ● | ● | | | | | | | | | | | | | | | ● | |
| QFP44-10mm-.8mm-3.9mm | | | | | | | | | | | | | | | | | | | | | |
| QFP48-12mm-.8mm-3.3mm | | | | | | | | | | | | | | | | | | | | | |
| QFP52-10mm-.65mm-3.9mm | | | | | | | | | | | | | | | | | | | | | |
| SO8-3.8mm | | ● | | ● | | | | | | ● | | | | | | | | | | | |
| SO14-3.8mm | | | | ● | | | | | | | ● | ● | | | | | | | | | |
| SO16-3.8mm | | | | | ● | | ● | | | | | | ● | | | ● | | | | | |
| SO16-5.6mm | | | | | | | | | ● | | | | | | | | | | | | |
| SO16-7.6mm-DC | | | | | | | | | | | | | | | ● | | | | | | |
| SO18G-7.6mm | | | | | | | | | | | | | | | | | | | | | |
| SO20-7.6mm | | ● | | ● | | | ● | | | | | | ● | | | | | | | | |
| SO44G-13.3mm | | | | | | | | | | | | | | | | | | | | | |

# Kit Identifier

## Component Part Numbers / Kit Numbers

| Kit Part Description / Component Part Description | PC000 | PC003 | PC007 | PC008 | PC009 | PC011 | SABER | PC012 | PC013 | PC014 | PC015 | PC016-J-STD-F | PC031 | WTK-1 | PC049 | PC052 | PC200-12mm | PC200-14mm | PC250-14mm-TMV-DT | PC2009 | SIR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOD80 | | | | | ● | | | | | | ● | ● | ● | | | | | | | | |
| SOT143-TR | | ● | | ● | | | | | | | | | | | | | | | | | |
| SOT23-TR | | ● | | ● | ● | | ● | | | | ● | | ● | | | | | | | | |
| Spacer, CKO5 | | | | | ● | | | | ● | | ● | ● | | | | | | | | | |
| SSOP14T-5.3mm | | | | | | | | | | | | | | | | | | | | ● | |
| SSOP16-3.8mm | | | | | | | | | | | | | | | | ● | | | | | |
| SSOP20T-5.3mm-DC | | | | | | | | | | | | | | | ● | | | | | | |
| SSOP20T-3.9mm | | | | ● | | | | | | | | | | | | | | | | ● | |
| SSOP28T-3.9mm | | | | | | | | | | | | | | | | | | | | ● | |
| SSOP8T-5.3mm | | | | | | | | | | | | | | | | | | | | | |
| Sticky Tape (double sided) | | | | | | | | | | ● | | | | | | | | | | | |
| T05 | | | | | ● | | | | ● | | ● | ● | ● | | ● | | | | | | |
| T11-TSOP54-10.16X22.22mm-.8mm | | | ● | | | | | | | | | | | | | | | | | | |
| T11-TSOP44-10.16X18.42mm-.8mm | | | ● | | | | | | | | | | | | | | | | | | |
| Terminal Holder Board, TB1 | | | | | | | | | | | | | | ● | | | | | | | |
| Terminal, Bifurcated | | | | | | | | | ● | | | ● | | ● | | | | | | | |
| Terminal, Gold Cup | | | | | | | | | ● | | | ● | | ● | | | | | | | |
| Terminal, Hook | | | | | | | | | ● | | | ● | | ● | | | | | | | |
| Terminal, Pierced | | | | | | | | | ● | | | ● | | ● | | | | | | | |
| Terminal, Turret | | | | | | | | | ● | | | ● | | ● | | | | | | | |
| TO18 | | | | | | | | | ● | | ● | | | | | | | | | | |
| TO5/18 Spacer | | | | | ● | | | | ● | | ● | ● | | | | | | | | | |
| TQFP80-12mm-.5mm | | | | | | | | | | | | | | | | ● | | | | | |
| Wire, 20 guage | | | | | | | | | ● | | | ● | | ● | | | | | | | |
| Wire, 22 guage | | | | | | | | | ● | | | ● | | ● | | | | | | | |
| Wire, 26 guage | | | | | | | | | ● | | | ● | | ● | | | | | | | |

# Custom PC Practice Boards and Kits

## Design Custom PC Practice Boards Or Complete Kits To Meet Your Specific Requirements.

Practical Components will help you design custom practice PC boards or complete kits. Use the building blocks below to create your board and start saving time and money using dummy parts and a PCB practice kit. Please contact your service representative for more information. Practical PC boards are non-solder mask defined.

**Software and Data Files Included With All Kits!**

### Board Material
- FR4 (140° Tg)
- Polyimide
- FR5
- BT
- IS-410
- 170 Tg

### Board Size/Thickness
- 4" x 5.5" (standard)
- 2.5" x 2.5"
- 3" x 3"
- 8" x 5.5"
- 0.062" thick (2 layers)
- Other

### Fiducials/Tooling Holes
- Fiducials are used to orient the position of each individual component to populate the board
- Tooling holes are 0.125" diameter
- Doughnut (local and global)

### LPI/Solder Mask
- LPI is a photo liquid imageable solder mask that will not interfere with solder paste screen printing

### Stencil
- Metal mask stencil is used for solder printing, which is available for custom or Practical board
- Stencils manufactured by Soldermask, Inc.

### Gerber Data
- Software data used to create a metal mask stencil for solder paste application

### X, Y and Theta Data
- Software used to calibrate pick and place machines for placement of components to PCB

### Surface Pad Finishes
- HASL
- Pb-Free HASL
- IMAG (Immersion Silver)
- ENIG (Immersion Gold over Electroless Nickel)
- OSP (ENTEK® CU-106A HT)

### Delivery
- Standard delivery is estimated 6 to 8 weeks
- Expedited delivery is available

### Parts for PC Board
- Capacitor
- QFP
- Transistor
- TSOP
- SOIC
- BGA
- PLCC
- Tantalum
- Resistor
- LQFP
- CABGA
- SBGA
- TQFP
- MLF
- TSSOP
- SSOP
- CTBGA
- CVBGA
- Dual Row MLF
- PoP
- Other

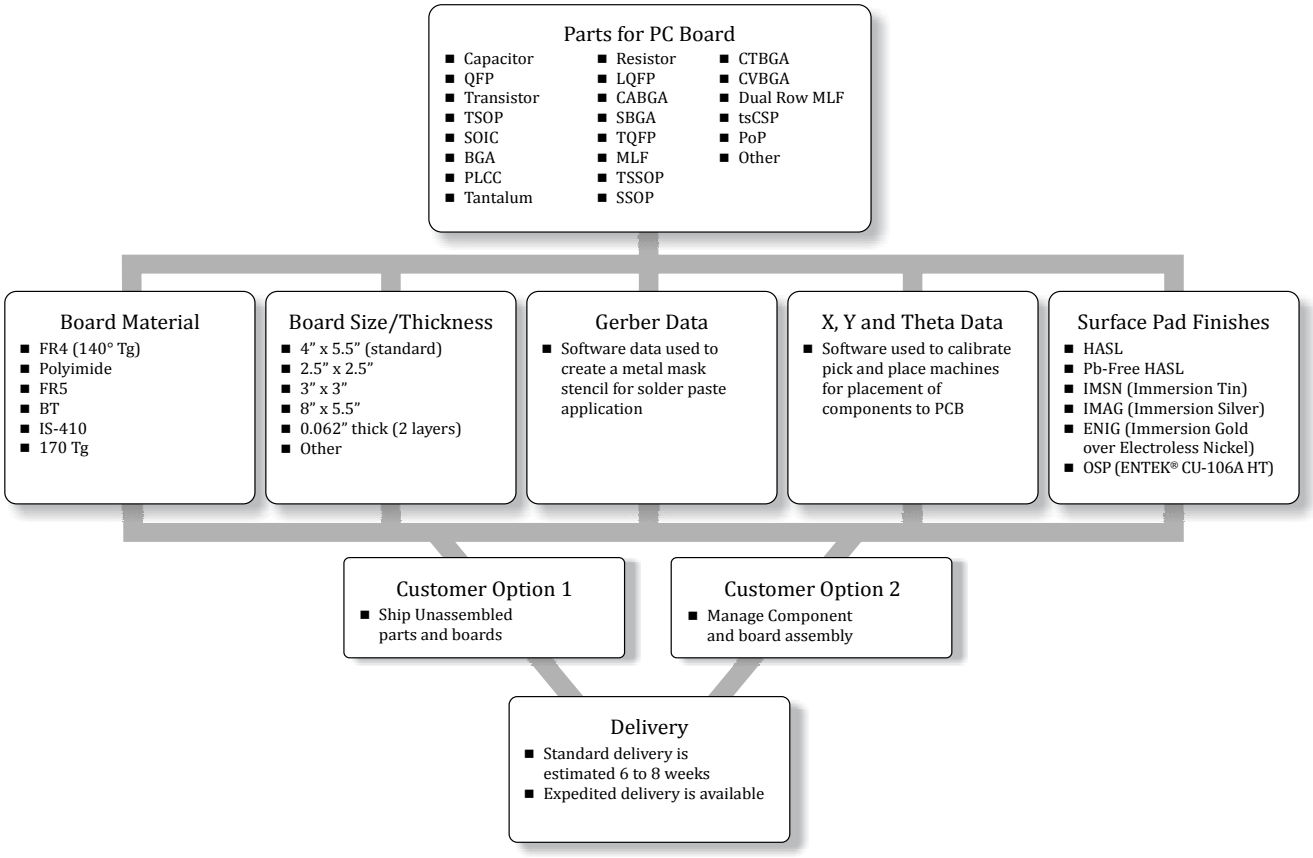
Final Product

**PCB Practice Kit**

# Conformal Coating Process Flow Chart

## Dummy Components And PCB Test Boards For Cleanliness And Conformal Coating Process Testing

Practical Components provides products and services for the testing and evaluation of Conformal Coating materials on assembled PCB test boards. Conformal coating has provided many benefits to high and reliability industries as well as commercial off the shelf products being used in extreme environments. Changes in technology have caused conformal coating to become more prevalent in different industries like telecommunications, automotive, and other hand held devices. All these products have benefited from the use of coatings for environmental protection and product enhancements.




### Practical Components products can be effective in the following areas:

- Is conformal coating necessary?
- Clean or no clean
- SIR testing
- Coating process options
- Coating reliability
- Coating material evaluation
- Correct design for costing application
- Masking options
- Inspection and quality control of coating
- Repair and rework of PCB assemblies

All Practical Components products are fully guaranteed. Our products are made to the exact equivalent of live components, without the internal live die or electrically functioning board. This significantly lowers the cost of the components and test boards. Practical Components can be one stop shop from board design and layout to completed assemblies ready for coating. You can be focused on the coating not the logistical chain of acquiring testing assemblies.

### The products and services provided by Practical Components in support of the evaluation items listed above are:

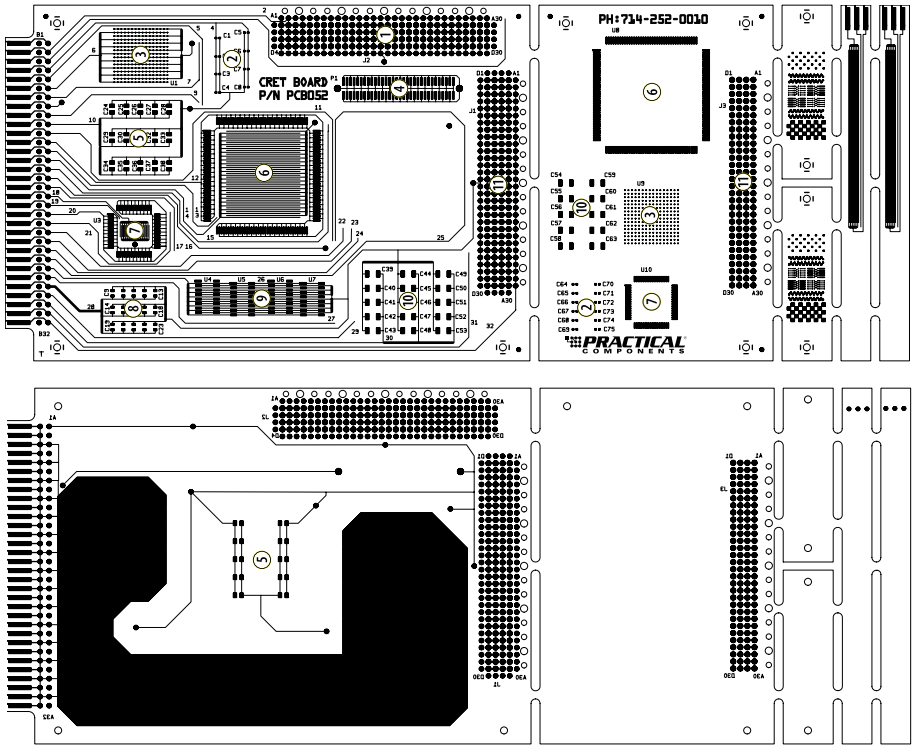
- Dummy Components including IC, Passives, transistors, connections or special items as requested
- Test PCB dummy boards, made to any size, thickness, material, or special requirements as requested
- Assembly of dummy components to the test PCB boards
- Design of the PCB board to customer's exact specifications
- Management of the procurement process and supply chain

# Test Boards for Cleanliness and Conformal Coating

Practical Components offers the following PCB Test boards for printed wiring assemblies materials for process qualification evaluations.

| Practical Components Test Coupon Board Availability | | Cu | HASL | ImAg | ENIG |
|---|---|---|---|---|---|
| PCB052/Rev B | CRET board | X | X | X | X |
| PCB-B-24 | Standard Test Board | X | X | X | X |
| PCB-B-25A | Standard Test Board | X | X | X | X |
| PCB-B-36 | Standard Test Assembly | X | X | X | X |
| PCB-SIR | Test Board | X | X | X | X |
| PCB-Saber | Evaluation Test Board | X | X | X | X |
| PCB015 | Rework Test Board | | X | | X |

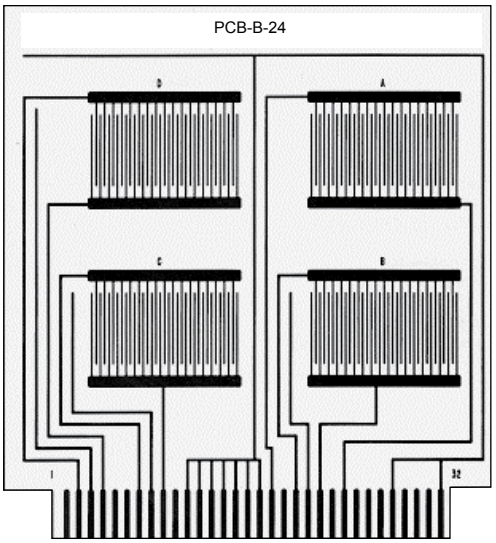
PCB052 CRET Board




The Practical Components B-52 CRET (Cleanliness & Residue Evaluation Test) board is designed to help determine the ionic cleanliness of a customers manufacturing process. The test board follows guidelines associated with the IPC-B-52 Test Vehicle. There are several different ways to measure residues and their effects on electrical performances, the two most common in the industry are ionic cleanliness testing, for determination of ionic residues, and surface insulation resistance (SIR) testing, for the evaluation of electrochemical failures in humid environments.

Of the various methods for determination of ionic residues, the method of choice is ion chromatography, which determines both the type of ionic residue and the amount of the residue. The IPC method for ion chromatography is IPC-TM-650, method 2.3.28. For SIR testing, the most modern test method, involving frequent of continuous monitoring, is IPC-TM-650, method 2.6.3.7. Consequently, a test vehicle was needed which could be used for both ion chromatography and surface insulation resistance testing, but which was more representative of mainstream manufacturing materials and process.

# Test Boards for Cleanliness and Conformal Coating

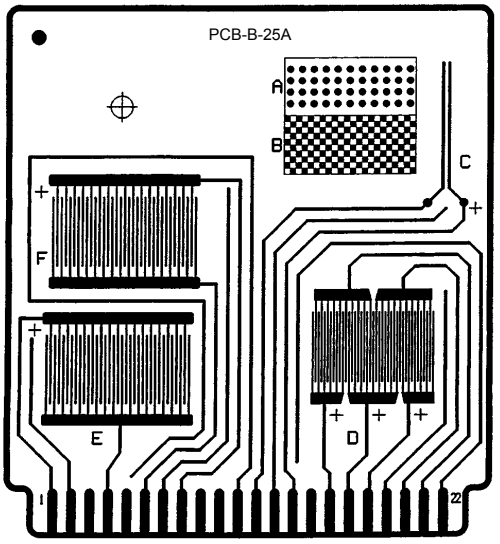



## PCB-B-24 Standard Test Board

The PCB-B-24 standard test board is compliant with the IPC Phase 3 cleaning and cleanliness test program. It was designed to be a vehicle for examining the interactions between laminate, surface metalizations, and fluxes. It is the primary qualification vehicle for ANSI J-STD-004, which is the IPC specification on fluxes.

The four comb patterns are identical and have 16 mil lines and 20 mil space. These values were chosen both for ease of stencil printing solder paste, and the board can be wave soldered with minimal chance of solder bridging.

The PCB-B-24 test board is an excellent vehicle for narrowing down fluxes or solder material, or testing material interaction.

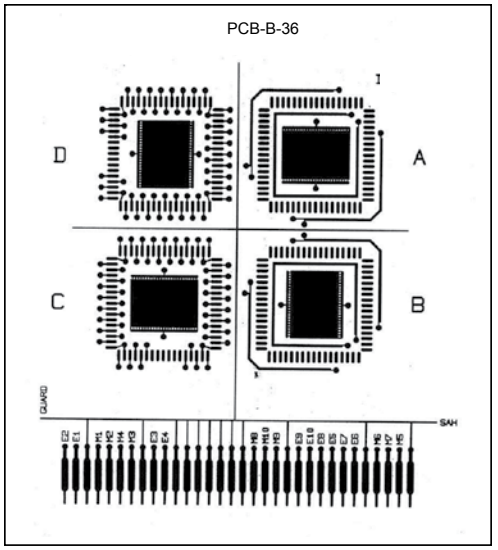



## PCB-B-25A Standard Test Board

The PCB-B-25A test board meets the current guidelines for solder Masks (IPC-SM-804C) and conformal coatings (IPC-CC-830A).

The board is normally 0.062" FR-4. The board is simple print-and-etch. The surface is bare copper for materials qualification, but could be any Surface finish required.

The PCB-B-25A is used to evaluate interactions between solder masks, solder paste, and fluxes.

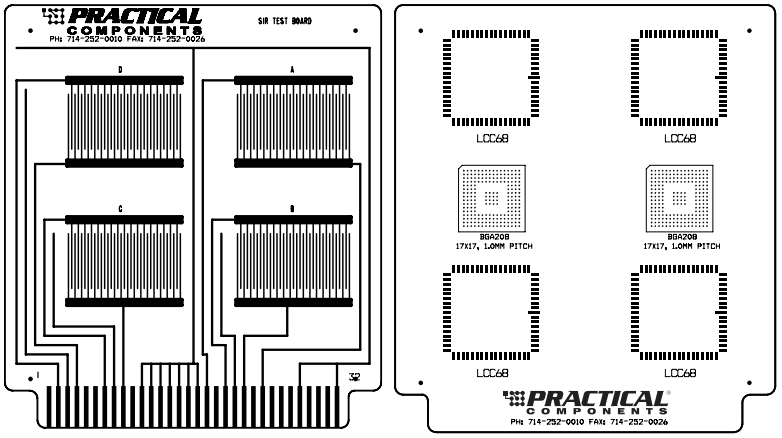



## PCB-B-36 Standard Test Assembly

The PCB-B-36 standard test board was designed for the IPC cleaning cleanliness test program, Phase 1. It was designed for examining the ability of a cleaning solvent to remove flux residues, and to examine the effects of entrapped residues under low standoff components. The PCB-B-36 test board can be used as a process qualification vehicle for the J-STD-001. This board has 10 SIR test patterns. Two patterns #2 and #4 are mounting pads in quadrants C and D. The pad spacing is 25 mils for patterns #2 and #4. The contact fingers of the board are normally gold plated for compatibility with edge card connectors. The remaining metallization is normally bare copper, or any surface finish. In most cases, four leadless ceramic chip carriers (LCCs) are mounted on the board, one in each quadrant.

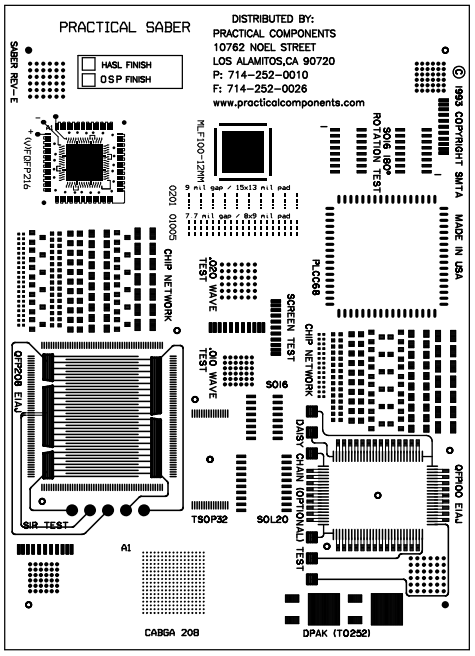
This test vehicle is designed to test combinations of conformal coatings, fluxes, solder paste and their interactions with each other. Testing cleaning residue under low stand off components is a benefit of the PCB-B-36 test board.

# Test Boards for Cleanliness and Conformal Coating



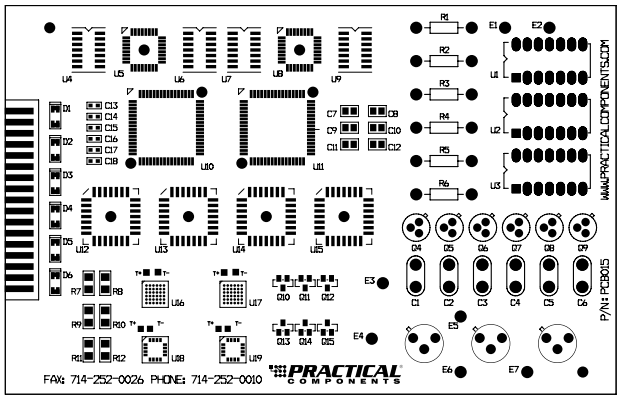

## Practical Components SIR Test Board

The Practical Components SIR board is a double sided board to characterize fluxes by determining the degradation of electrical insulation resistance of rigid printed wiring board specimens after exposure to the specified flux. The board contains pads for LCC68 and A-PBGA208-1.0mm-17mm components. Boards and kits are available in Tin-Lead or Lead-Free.




## Practical Components Saber Board

The SABER evaluation board can be used to evaluate pick and place equipment, reflow process, component, cleanliness and solder paste screening. The SABER board also has honeycomb patterns for SIR testing. Board finishes include ImAg, ENIG and Pb-Free HASL. Standard board material is IS-410.




## Practical Components PC015 Assembled Test Board

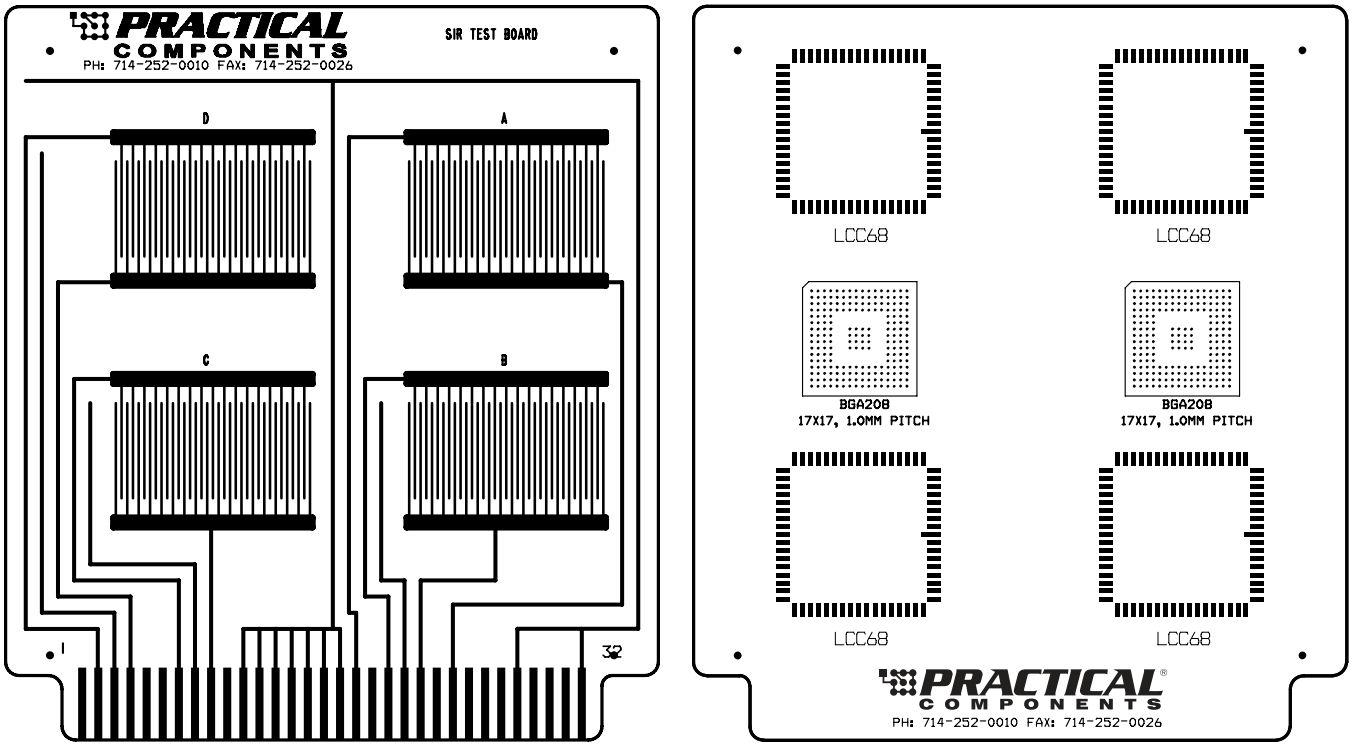
Available Pre-Assembled, this board is the ideal vehicle for Off the shelf Conformal Coating testing. Pre-Populated with a variety of component types, from LQFPs and CABGAs, DIPs down to 0603 chips this board offers a real-world conformal coating testing surface and gives standardized and repeatable results. The PC015 is available in Tin-Lead or Lead-Free versions. The PC015 and components can also be delivered unassembled or partially assembled, example: only the surface mount components mounted on the board. Practical Components also specializes in designing PCB test boards made to size, thickness, material or specified requirements as requested. Practical can also manage the procurement process and supply chain, including assembly and application of materials. Practicals PC015 Rework Kit conforms to IPC 7711/7721 standards or reworking.

# SIR Test Board and Kit

REVISED [Rev. A]

The Practical SIR board is double sided board to characterize fluxes by determining the degradation of electrical insulation resistance of rigid printed wiring board specimens after exposure to the specified flux. This test is carried out at height humidity and heat conditions. The board contains pads for LCC68 and A-PBGA208-1.0mm-17mm components. Kit is available Tin-Lead or Lead-Free.

## SIR Test Board




### SIR Kits

| Part Description | Quantity Per 1 Kit | Quantity Per 5 Kits | Quantity Per 10 Kits |
|---|---|---|---|
| 68LCC-1.27mm-24.1mm | 4 | 20 | 40 |
| A-PBGA208-1.0mm-17mm-DC | 2 | 10 | 20 |
| **Kit Order Number: (Tin-Lead)** | **SIR-0-01** | **SIR-0-05** | **SIR-0-10** |
| **Kit Order Number:(Lead-Free)** | **SIR-0-01-LF** | **SIR-0-05-LF** | **SIR-0-10-LF** |

***Notes***

- Gerber and X, Y Theta data included at no charge.
- PBGA is available Lead-Free with SAC305 or SAC405 solder ball alloy's. LCC is only available with Au castellations which is standard.
- Board finishes available are: Immersion Silver, ENIG, Bare Copper and HASL.

# SMTA Saber Evaluation Board and Kit

REVISED [Rev. E]

## The SMTA Saber Evaluation Kit.

Practical Components is licensed by SMTA to distribute the Saber Evaluation PC Board. The Saber Board includes land patterns for a wide variety of JEDEC and EIAJ components.

The Saber Board is used to evaluate:

- P&P equipment
- Reflow process
- Component placement accuracy
- Cleanliness
- Speed and accuracy of component placement
- Solder paste screening

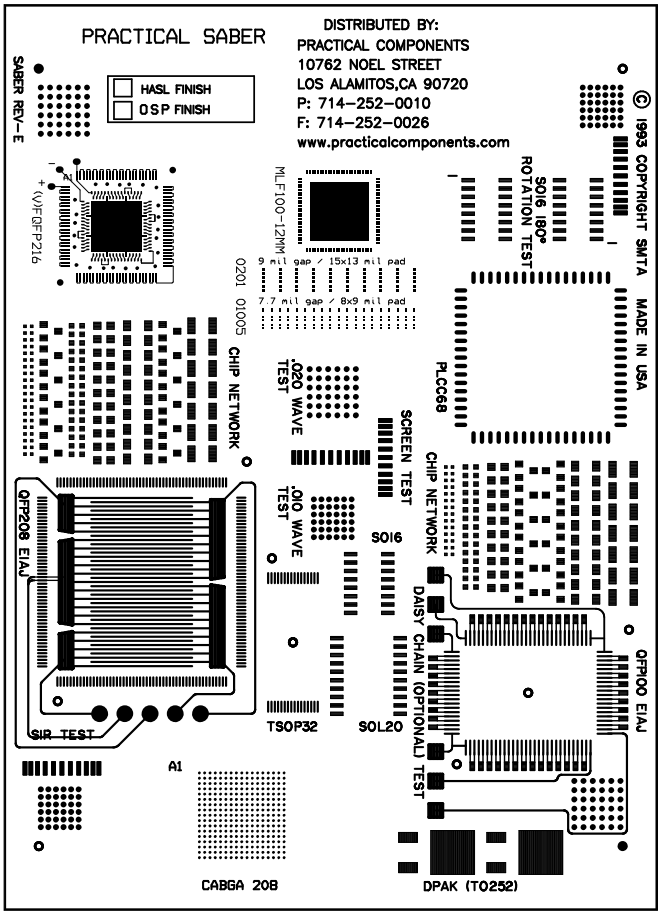
***Notes***

- Gerber Data and X, Y Theta Data are available if required at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Lead-free parts are available.
- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL.

Available as a

Single Pack Kit

## SMTA Saber Evaluation PC Board




Double Sided (top view)
Board size: 3.875" x 5.375", .062" thick.

### SMTA Saber Board Kits

| Part Description | Quantity Per 1 Kit | Quantity Per 24 Kit | Quantity Per 48 Kits | Quantity Per 96 Kits |
|---|---|---|---|---|
| PCB-Saber | 1 | 24 | 48 | 96 |
| 01005SMR-Sn | 57 | 1,368 | 2,736 | 2,736 |
| 0201SMR-Sn | 30 | 720 | 1,440 | 2,880 |
| 0402SMR-Sn | 34 | 1,000 | 1,632 | 4,000 |
| 0603SMR-Sn | 31 | 1,000 | 1,488 | 3,000 |
| 0805SMR-Sn | 21 | 500 | 1,008 | 2,000 |
| 1206SMR-Sn | 20 | 500 | 960 | 2,000 |
| 1210SMR-Sn | 14 | 500 | 672 | 2,000 |
| SOT23-Sn | 24 | 1,000 | 1,152 | 3,000 |
| A-CABGA208-.8mm-15mm-DC-305 | 1 | 24 | 48 | 96 |
| DPAK(TO252)-Sn | 2 | 48 | 96 | 200 |
| SO16GT-3.8mm-Sn | 3 | 100 | 144 | 288 |
| SO20GT-7.6mm-Sn | 1 | 24 | 48 | 96 |
| A-MLF100-12mm-.4mm-DC-Sn | 1 | 24 | 48 | 96 |
| PLCC68-Sn | 1 | 24 | 48 | 96 |
| T1-TSOP32-8x18.4mm-.5mm-Sn | 1 | 24 | 48 | 96 |
| QFP208-28mm-.5mm-2.6mm-Sn | 1 | 24 | 48 | 96 |
| QFP100-140x20mm-.65mm-3.9-DC-Sn | 1 | 24 | 48 | 96 |
| **Kit Order Number: (Tin-Lead)** | **SMTA-Saber-1** | **SMTA-Saber-24** | **SMTA-Saber-48** | **SMTA-Saber-96** |
| **Kit Order Number: (Lead-Free)** | **SMTA-Saber-1-LF** | **SMTA-Saber-24-LF** | **SMTA-Saber-48-LF** | **SMTA-Saber-96-LF** |

# B-52 CRET Rev B

## Cleanliness & Residue Evaluation Test Kits

The Practical Components B-52 CRET (Cleanliness & Residue Evaluation Test) Kit is designed to help determine the ionic cleanliness of a customer's manufacturing process. The test boards and components follow guidelines associated with the IPC-B-52 Test Vehicle.

There are several different ways to measure residues and their effects on electrical performances, the two most common in the industry are ionic cleanliness testing, for determination of ionic residues, and surface insulation resistance (SIR) testing, for the evaluation of electrochemical failures in humid environments.

Of the various methods for determination of ionic residues, the method of choice is ion chromatography, which determines both the type of ionic residue and the amount of the residue. The IPC method for ion chromatography is IPC-TM-650, method 2.3.28. For SIR testing, the most modern test method, involving frequent of continuous monitoring, is IPC-TM-650, method 2.6.3.7. Consequently, a test vehicle was needed which could be used for both ion chromatography and surface insulation resistance testing, but which was more representative of mainstream manufacturing materials and processes. The IPC-B-52 Test Vehicle was the result.

The Practical B-52 CRET test vehicle is divided into four primary segments:

1. The main SIR test board
2. The Ion Chromatography (IC) test coupon
3. The solder mask adhesion coupons
4. The SIR mini-coupons

On the Rev. B the copper designators have been moved out. The Rev. B board width has increased and the manufacturing rails have been removed. The non-plated holes were revised to accommodate the alignment pins of the connectors, in addition the diameter of through holes were reduced for better solder ability of the through hole connectors. The ground plane was changed from solid copper to copper mesh.

These changes should have a positive effect both on assembly and evaluation results. Items to note are the B-52 Rev. B is available with just the SIR coupon.

Information regarding this option is available by calling Practical Components at 714-252-0010. In addition, it is recommended that customers use test boards from their current or potential board supplier. Test boards can also be customized to the customers specific needs.

### B-52 CRET Rev B Kit

| Figure ID | Location | Part Description | Quantity Per Board |
|---|---|---|---|
| 3 | U1, U9 | A-CABGA256-1.0mm-17mm-ISO | 2 |
| 6 | U2, U8 | A-QFP160-28mm-.65mm-ISO | 2 |
| 7 | U3, U10 | A-TQFP80-12mm-.5mm-ISO | 2 |
| 9 | U4-U7 | A-SO16GT-3.8mm-ISO | 4 |
| 2 | C1-C8, C64-C75 | 0402SMC-10.0pf | 20 |
| 8 | C9-C23 | 0603SMC-10.0pf | 15 |
| 5 | C24-C38, C76-C85 | 0805SMC-10.0pf | 25 |
| 10 | C39-C63 | 1206SMC-10.0pf | 25 |
| 11 | J1, J2, J3 | Conn-TH-Ver-4x24-AMP | 3 |
| 4 | P1 | Conn-SMT-2x16-Molex | 1 |

### Lead-Free Part Number List

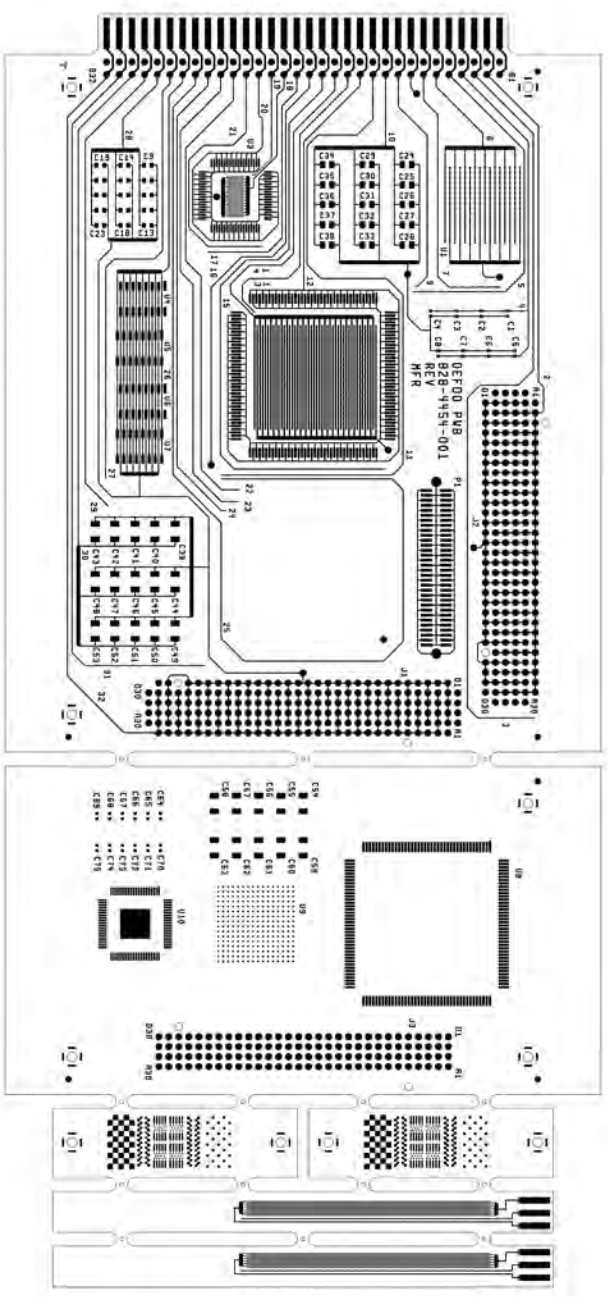
| Part Number | Part Description |
|---|---|
| 19959 | A-CABGA256-1.0mm-17mm-ISO-SAC305 |
| 19960 | A-QFP160-28mm-.65mm-2.6mm-ISO-Sn |
| 19961 | A-TQFP80-12mm-.5mm-2.0mm-ISO-Sn |
| 19962 | A-SO16GT-3.8mm-ISO-Sn |
| 20009 | 0402SMC-10.0pf-Sn |
| 20010 | 0603SMC-10.0pf-Sn |
| 20011 | 0805SMC-10.0pf-Sn |
| 20012 | 1206SMC-10.0pf-Sn |
| 19943 | Conn-TH-Ver-4x24-AMP |
| 19944 | Conn-SMT-2x16-Molex |

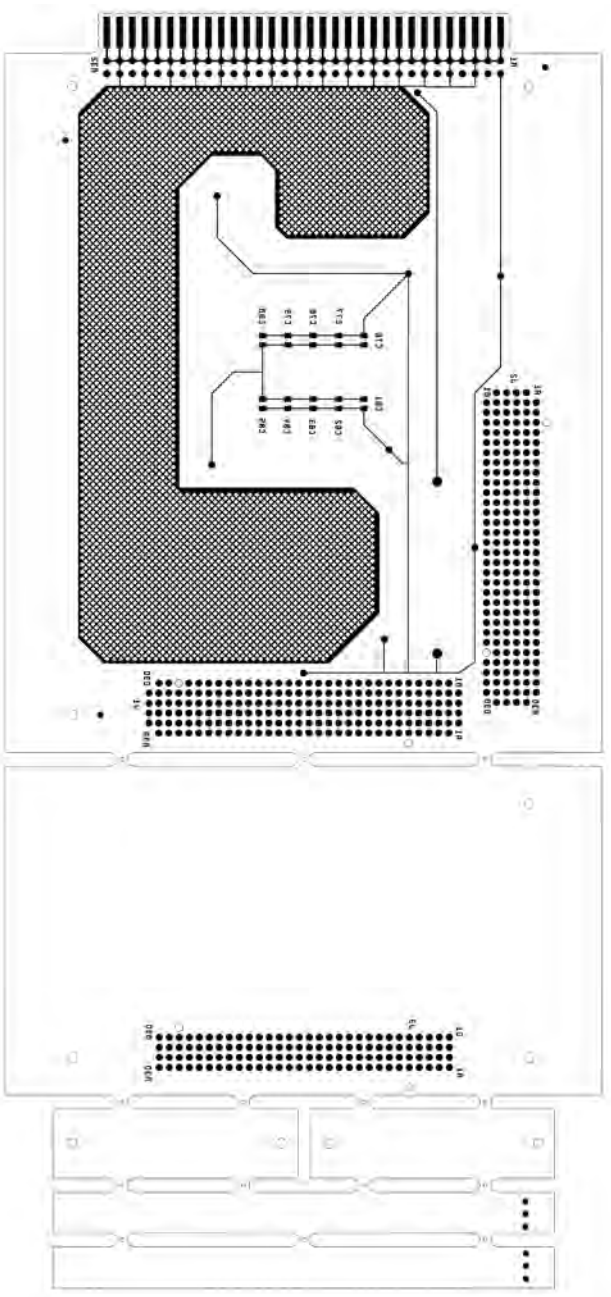
### Tin-Lead Part Number List

| Part Number | Part Description |
|---|---|
| 19967 | A-CABGA256-1.0mm-17mm-ISO |
| 19968 | A-QFP160-28mm-.65mm-2.6mm-ISO |
| 19969 | A-TQFP80-12mm-.5mm-2.0mm-ISO |
| 19970 | A-SO16GT-3.8mm-ISO |
| 20005 | 0402SMC-10.0pf |
| 20006 | 0603SMC-10.0pf |
| 20007 | 0805SMC-10.0pf |
| 20008 | 1206SMC-10.0pf |
| 19943 | Conn-TH-Ver-4x24-AMP |
| 19944 | Conn-SMT-2x16-Molex |

# B-52 CRET Rev B

## Cleanliness & Residue Evaluation Test Kits





Board size: 4.7" x 10.04", .062" thick.

***Notes***

- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL

***Ordering Information***

- Board Order Number: PCB052-RevB

# Single Pack Hand Solder Kit
## Page Matrix

The kits listed below are for Hand Assembly. Each kit is prepackaged as an individual kit. Each component is bagged and labeled for identification. The test board is also individually bagged. Both kit and test board are put in a cardboard box that identifies the kit contents. Kits can be customized to meet specific needs. Please call regarding availability of Lead-Free single pack soldering kits.

**Reference List for Single Pack Kits**

| Part Number Tin-Lead / Lead-Free | Kit Part Description | Description | IPC Reference | Page Number |
|---|---|---|---|---|
| 10680 / 12086 | PC003 | Hand Solder Kit, 2.5" square | | 97 |
| NA / 19314 | PC007T-0-01 | MLF Hand Assembly Kit | | 110 |
| NA / 19463 | PC007K-0-01 | MLF / Fine Pitch SMT (top and bottom) | | 110 |
| 19266 / 16561 | PC009 | Mixed Technology Kit | | 98 |
| 11019 / 11021 | PC011-0-01 | Fine Pitch BGA Kit (0.4, 0.5, 1.0mm) | | 113 |
| 15848 / 19742 | PC012-0-01 | Global BGA Test Kit (1.0mm and 1.27mm pitch) | | 114 |
| 15923 / 19462 | PC012T-0-01 | Global BGA Test Kit (topside only, 1.0mm pitch) | | 114 |
| 15924 / 19991 | PC012B-0-01 | Global BGA Test Kit (bottomside only, 1.27mm pitch) | | 114 |
| 15212 / 16792 | PC013-K | Through Hole Kit (with wires and terminals) | | 99 |
| 15213 / 16791 | PC013-BTK | Through-Hole Kit (no wires or terminals) | | 99 |
| 15214 / 19409 | PC013-RWTK-1 | Recertification Kit (with wires and terminals) | | 99 |
| 15215 / 19308 | PC013-RK | Recertification Kit (no wires or terminals) | | 99 |
| 15226 / 15227 | PC015-0-01-STD | Rework Kit (unassembled) | 7711/7721 | 100 |
| 11450 / 11444 | PC015-0-01-RWK | Rework Kit (assembled) | 7711/7721 | 100 |
| 18063 / 18064 | PC016-J-STD | Mixed Tech Kit | J-Std-001 Rev F | 101 |
| 15220 / 15224 | WTK-1 | Wires and Terminals (with or without holder) | | 102 |


**Looking for Lead-Free?**

This symbol indicates that lead-free parts are available!

# Solder Practice Board and Kit

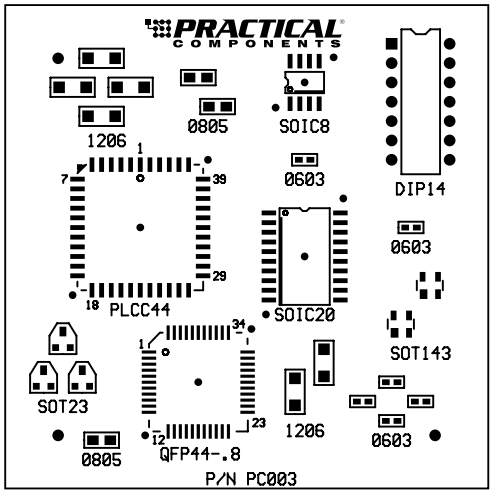
## Tin-Lead and Lead-Free Kits are available

The PC003 hand solder practice kit is a low cost, effective kit for training and testing employees. This double-sided board has pads for 13 different components: One through-hole Dip14 and twelve surface-mount components. Each item is individually bagged and tagged for easy identification. Kits consist of PLCCs, SOICs, TSSOPs, SOTs, Passives, and QFPs with 0.5mm and 0.65mm pitch. This low cost kit is ideal for classroom training and practice. IPC-A-610 Rev D compliant. Kit is available with Tin-Lead or Lead-Free components.

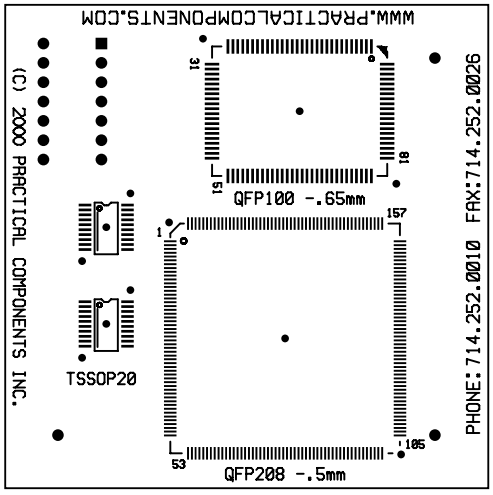
IPC Compliant

Single Pack Kit

### PCB003 Solder Practice Board




Top View




Bottom View

Board size: 2.5" x 2.5", .062" thick.

**PC003 Solder Practice Board Kit**
**(Tin-Lead and Lead-Free components available)**

| Part Description | Quantity Per Kit |
|---|---|
| PCB003 Board (customer to specify finish) | 1 |
| QFP208-28mm-.5mm-2.6mm | 1 |
| QFP44-10mm-.8mm-3.2mm | 1 |
| QFP100-14x20mm-.65mm-3.2mm | 1 |
| PLCC44 | 1 |
| SO8GT-3.8mm | 1 |
| SO20GT-7.6mm | 1 |
| SOT23 | 3 |
| SOT143 | 2 |
| TSSOP20-4.4mm | 2 |
| 0603SMR | 6 |
| 0805SMR | 3 |
| 1206SMR | 6 |
| DIP14T | 1 |
| **Kit Order Number: (Tin-Lead)** | **PC003** |
| **Kit Order Number: (Lead-Free)** | **PC003-LF** |

***Notes***

- Gerber Data and X, Y Theta Data are available at no charge.
- Lead-Free parts are available with Sn finish.
- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL

Software and Data Files Included With All Kits!

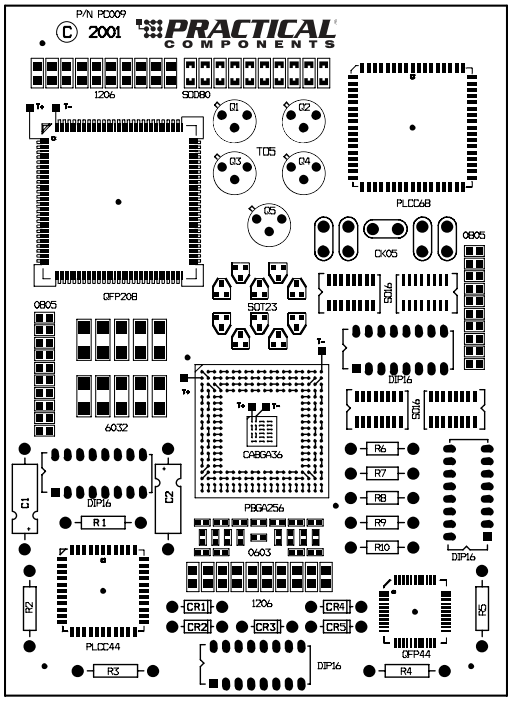
***Ordering Information***

- Order Number: PCB003 Rev B (Board Only)

# Mixed Technology Board and Kit

The PC009 Mixed Technology kit has surface mount components and through-hole components. This kit's primary use is for hand soldering but is also available as machine run upon special request. Tin-Lead and Lead-Free components available. Through-hole components are placed in close proximity to surface mount components to represent real soldering situations. Components are individually bagged and identified for component recognition.

## PCB009 Mixed Technology Board




Board size: 4" x 5.5", .062" thick.

### PC009 Mixed Technology Kits

| Part Description | Quantity per 1 Kit | Quantity per 5 Kit | Quantity per 10 Kit | Quantity per 20 Kit |
|---|---|---|---|---|
| PCB009 Board | 1 | 5 | 10 | 20 |
| ***SMD Components*** | | | | |
| A-PBGA256-1.27-27mm-DC ** | 1 | 5 | 10 | 20 |
| A-CABGA36-.8mm-6mm-DC ** | 1 | 5 | 10 | 20 |
| QFP208-28mm-.5mm-2.6mm-DC | 1 | 5 | 10 | 20 |
| QFP44-10MM-.8MM-3.2 | 1 | 5 | 10 | 20 |
| SOT23-TR | 10 | 50 | 100 | 200 |
| PLCC44 | 1 | 5 | 10 | 20 |
| PLCC68 | 1 | 5 | 10 | 20 |
| SOD80-TR | 10 | 50 | 100 | 200 |
| SO16GT-3.8mm | 4 | 20 | 40 | 80 |
| 6032SMTA | 10 | 100 | 200 | 400 |
| 0603SMR-TR | 20 | 100 | 200 | 400 |
| 0805SMR-TR | 20 | 100 | 200 | 400 |
| 1206SMR-TR | 20 | 100 | 200 | 400 |
| ***Through-Hole Components*** | | | | |
| DPIP16T | 4 | 20 | 40 | 80 |
| 1/4 Watt Axial Resistors | 5 | 25 | 50 | 100 |
| 1/2 Watt Axial Resistors | 5 | 25 | 50 | 100 |
| CK05 (with Spacers) | 5 | 25 | 50 | 100 |
| TO5 (with Spacers) | 5 | 25 | 50 | 100 |
| 5x11 Axial Electrolytic | 2 | 10 | 20 | 2 |
| DO34 or DO35 | 5 | 25 | 50 | 5 |
| **Kit Order Number: (Tin-Lead)** | **PC001-0-01** | **PC001-0-05** | **PC001-0-10** | **PC001-0-20** |
| **Kit Order Number: (Lead-Free)** | **PC009-0-01-LF** | **PC009-0-05-LF** | **PC009-0-10-LF** | **PC009-0-20-LF** |

Available as a

Single Pack Kit

***Notes***

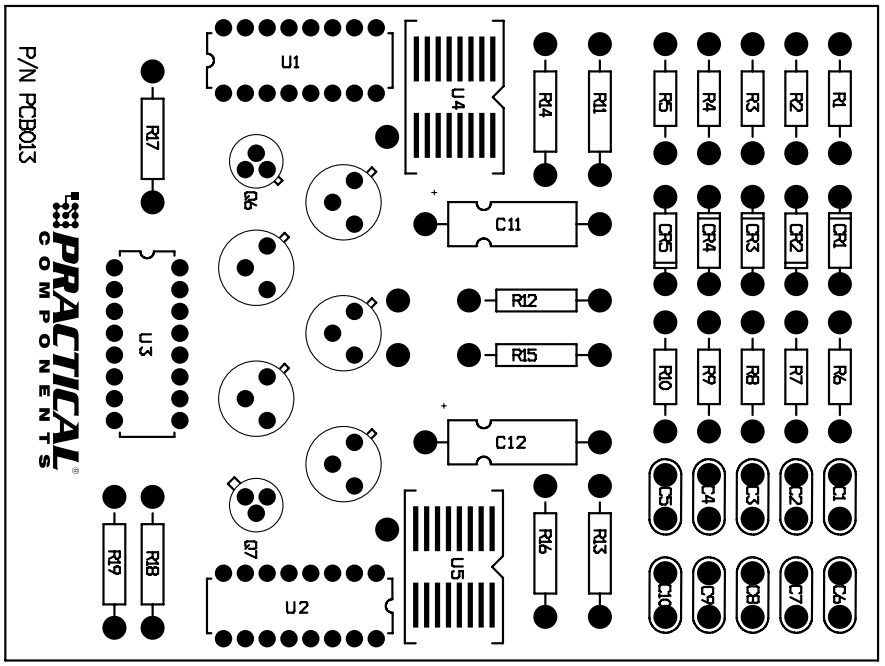
- **BGA/CABGA Packages are not included in kit. Either BGA or CABGA can be added to kit upon request.
- Mix and match components and quantities to create a custom kit.
- Gerber Data and X, Y Theta Data are available at no charge.
- Not all parts are available lead-free.
- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.

# Through-Hole Solder Training Kits

## Choose from four different variations of the PC013 kit

The PC013 hand solder practice kit is an effective way to evaluate or train employees and students. This versatile board comes with a variety of through-hole components and each kit is conveniently boxed and the components are individually bagged and labeled for easy identification. It is available in several different options to meet each company's requirements. Kits come standard with an SO16 resistor network, but can be upgraded to a Flat Pack 16. This kit is ideal for classroom settings.

### PCB013 Board




Board size: 4" x 3", .062" thick.

### Complete Through-Hole Kit

| Part Description | Quantity Per Kit |
|---|---|
| PCB013 | 2 |
| Turret Terminal | 15 |
| Bifurcated Terminal | 15 |
| Hook Terminal | 15 |
| Pierced Terminal | 15 |
| Cup Terminal | 15 |
| DO35 | 10 |
| AE-5x12 | 4 |
| CK05 | 20 |
| CK05 Spacer | 20 |
| 1/4-W-AR | 20 |
| 1/2-W-AR | 18 |
| DIP16 | 6 |
| TO5 | 10 |
| TO18 | 4 |
| TO5/18 Spacer | 14 |
| SO16GT-3.8mm | 4 |
| 20 Gauge Wire | 3' |
| 22 Gauge Wire | 3' |
| 26 Gauge Wire | 3' |
| **Order Number: (Tin-Lead)** | **PC013-K** |
| **Order Number: (Lead-Free)** | **PC013-K-LF** |

### Recertification Kit With Wires And Terminals

| Part Description | Quantity Per Kit |
|---|---|
| PCB013 | 1 |
| Turret Terminal | 5 |
| Bifurcated Terminal | 5 |
| Hook Terminal | 5 |
| Pierced Terminal | 5 |
| Cup Terminal | 5 |
| DO35 | 2 |
| AE-5x12 | 1 |
| CK05 | 6 |
| CK05 Spacer | 6 |
| 1/4-W-AR | 5 |
| 1/2-W-AR | 3 |
| DIP16 | 2 |
| TO5 | 2 |
| TO18 | 2 |
| TO5/18 Spacer | 4 |
| SO16GT-3.8mm | 1 |
| 20 Gauge Wire | 3' |
| 26 Gauge Wire | 3' |
| **Order Number: (Tin-Lead)** | **PC013-RWTK-1** |
| **Order Number: (Lead-Free)** | **PC013-RWTK-1-LF** |

### Basic Through-Hole Kit

| Part Description | Quantity Per Kit |
|---|---|
| PCB013 | 2 |
| DO35 | 10 |
| AE-5x12 | 4 |
| CK05 | 20 |
| CK05 Spacer | 20 |
| 1/2-W-AR | 18 |
| 1/4-W-AR | 20 |
| DIP16 | 6 |
| TO5 | 10 |
| TO18 | 4 |
| TO5/18 Spacer | 14 |
| SO16GT-3.8mm | 4 |
| **Order Number: (Lead-Free)** | **PC013-BTK-LF** |
| **Order Number:(Tin-Lead)** | **PC013-BTK** |

### Recertification Kit

| Part Description | Quantity Per Kit |
|---|---|
| PCB013 | 1 |
| DO35 | 2 |
| AE-5x12 | 1 |
| CK05 | 6 |
| CK05 Spacer | 6 |
| 1/4-W-AR | 5 |
| 1/2-W-AR | 3 |
| DIP16 | 2 |
| TO5 | 2 |
| TO18 | 2 |
| TO5/18 Spacer | 4 |
| SO16GT-3.8mm | 1 |
| **Order Number: (Tin-Lead)** | **PC013-RK** |
| **Order Number: (Lead-Free)** | **PC013-RK-LF** |

***Notes***

- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.

Available as a

Single Pack Kit

# Rework Kits

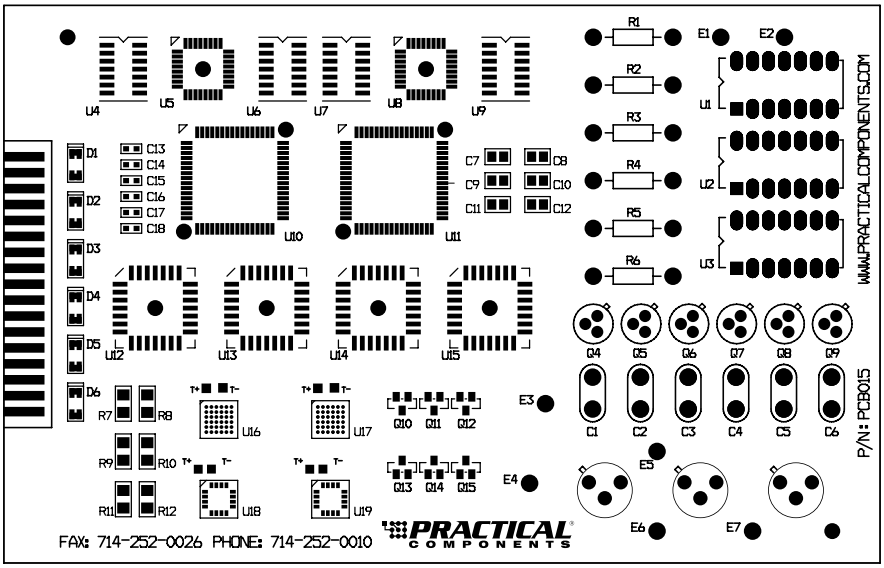
REVISED [Rev. B]

## PC015 Rework Kit Conforms to IPC 7711/7721 Standards for reworking.

The PC015 Kit is ideal for rework training or evaluating current rework procedures. This kit contains 2 fully populated boards and replacement components to enable removing and replacing ½ of the components. Reworked solder joints can then be visually compared to original solder joints (on components not reworked) on the same board. Kit includes 2 boards which allows one to be used practice and one to be used for evaluation. This kit conforms to the IPC 7711 and 7721 standards for reworking. It contains a wide range of components from Through-Hole to Chip Scale. Each kit is conveniently boxed with the replacement components individually bagged and labeled for easy identification. Forget looking for scrap boards for training purposes. Tin-Lead and Lead-Free components available.

This kit is perfect for classroom settings and can also be ordered unassembled as a standard hand solder.

PCB015 Board




Board size: 5.5" x 3.5", .062" thick.

IPC Compliant

Available as a

Single Pack Kit

### PC015 Rework Kit Assembled

| Part Description | Quantity Per Kit |
|---|---|
| PCB015-Assembled | 2 |
| LQFP100-14mm-.5mm-2.0 | 2 |
| LQFP44-10mm-.8mm-2.0 | 2 |
| PLCC28T | 4 |
| SOT23 | 6 |
| 0603SMC | 6 |
| 0805SMC | 6 |
| 1206SMR | 6 |
| SOD80 | 6 |
| SO14GT-3.8mm | 4 |
| 1/4-W-AR | 6 |
| CK05 (with Spacers) | 6 |
| DIP14 | 3 |
| TO5 (with Spacers) | 3 |
| TO18 (with Spacers) | 6 |
| *MLF16-5mm-.8mm | 2 |
| *A-CABGA36-.8mm-6mm-DC | 2 |
| **Kit Order Number: (Tin-Lead)** | **PC015-01** |
| **Kit Order Number:(Lead-Free)** | **PC015-01-LF** |

### PC015 For Hand Assembly Kit

| Part Description | Quantity Per Kit |
|---|---|
| PCB015-Standard | 1 |
| LQFP100-14mm-.5mm-2.0 | 2 |
| LQFP44-10mm-.8mm-2.0 | 2 |
| PLCC28 | 4 |
| SOT23 | 6 |
| 0603SMC | 6 |
| 0805SMC | 6 |
| 1206SMR | 6 |
| SOD80 | 6 |
| SO14GT-3.8mm | 4 |
| 1/4-W-AR | 6 |
| CK05 (with Spacers) | 6 |
| DIP14 | 3 |
| TO5 (with Spacers) | 3 |
| TO18 (with Spacers) | 6 |
| *MLF16-5mm-.8mm-DC | 2 |
| *A-CABGA36-.8mm-6mm-DC | 2 |
| **Kit Order Number: (Tin-Lead)** | **PC015-0-01-Std** |
| **Kit Order Number:(Lead-Free)** | **PC015-0-01-Std-LF** |

***Notes***

- *MLF16/CABGA36 Packages are not included in kit. Either package can be added upon request.
- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL.

# IPC Compliant Hand Soldering Kit

Pb Tin-Lead and Lead-Free Kits Available

## PCB-J-STD Board Soldering Kit Conforms to J-STD-001F Specifications

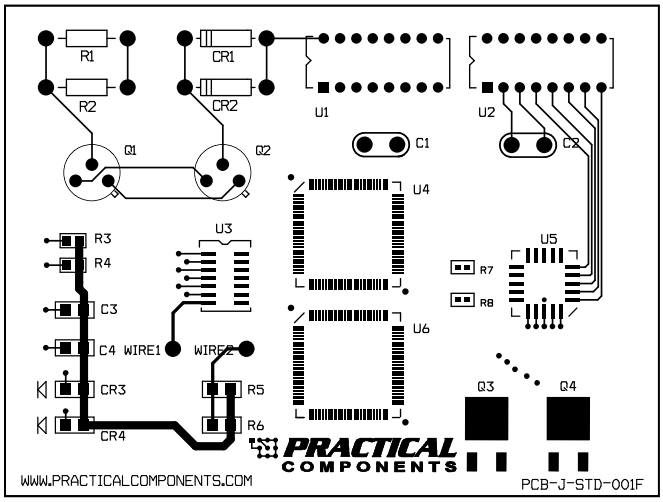
The PC016 Mixed Technology Kit is an effective and economical way to train and evaluate students and employees. This kit contains a variety of standard Surface Mount and Through-Hole components with traces to simulate real world situations. Each kit comes individually boxed with all components bagged and labeled for easy identification. Conforms to IPC J-STD-001F standard for soldering. In stock and ready to ship, this kit is perfect for classroom settings.

Available as a

Single Pack Kit

IPC Compliant

PCB-J-STD-F Board




Board size: 4" x 3", .062" thick.

### PC016-J-STD-F Hand Soldering Kit

| Part Description | Quantity per Kit |
|---|---|
| PCB-J-STD-F-HASL | 2 |
| A-LQFP100-14mm-.5mm-2.0 | 4 |
| PDIP16T | 4 |
| SO14GT-3.8mm | 2 |
| CK05 | 4 |
| CK SPACER | 4 |
| Turret Terminal | 4 |
| Hook Terminal | 4 |
| Pierced Terminal | 4 |
| Bifurcated Terminal | 4 |
| Gold Cup Terminal | 4 |
| DO35 | 4 |
| SOD80 | 4 |
| TO5-3-B | 4 |
| TO5/TO18 SPACER | 4 |
| 1206SMC | 4 |
| 0805SMR | 4 |
| 1206SMR | 4 |
| 0402SMR | 4 |
| 1/4-W-AR | 4 |
| PLCC20T | 2 |
| DPAK | 4 |
| 26 Gauge Wire Brown | 3’ |
| 22 Gauge Wire Grey | 3’ |
| 20 Gauge Wire Red | 3’ |
| **Kit Order Number:** | **PC016-J-STD-F** |

### PC016-J-STD-F Lead Free Hand Soldering Kit

| Part Description | Quantity per Kit |
|---|---|
| PCB-J-STD-F-ENIG | 2 |
| A-LQFP100-14mm-.5mm-2.0-Sn | 4 |
| PDIP16T-Sn | 4 |
| SO14GT-3.8mm-Sn | 2 |
| CK05-LF | 4 |
| CK SPACER | 4 |
| Turret Terminal | 4 |
| Hook Terminal | 4 |
| Pierced Terminal | 4 |
| Bifurcated Terminal | 4 |
| Gold Cup Terminal | 4 |
| DO35-LF | 4 |
| SOD80-Sn | 4 |
| TO5-3-B-Sn | 4 |
| TO5/TO18 SPACER | 4 |
| 1206SMC-Sn | 4 |
| 0805SMR-Sn | 4 |
| 1206SMR-Sn | 4 |
| 0402SMR-Sn | 4 |
| 1/4-W-AR-LF | 4 |
| PLCC20T-Sn | 2 |
| DPAK-LF | 4 |
| 26 Gauge Wire Brown | 3’ |
| 22 Gauge Wire Grey | 3’ |
| 20 Gauge Wire Red | 3’ |
| **Kit Order Number:** | **PC016-J-STD-F-LF** |

***Notes***

- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL.

J-STD-001F is world-recognized as the sole industry-consensus standard covering soldering materials and processes. This revision now includes support for lead free manufacturing, in addition to easier to understand criteria for materials, methods and verification for producing quality soldered interconnections and assemblies.

# Terminal and Wire Kit

The WTK-1 Kit includes everything needed to train and practice your wire soldering skills. This kit contains three different gauges of wire and five styles of terminals representative of what is available in the marketplace. Our kit also comes standard with a Terminal Holder. This reusable tool safely holds terminals during wiring and soldering operations. Terminals will fit snug in holes of the TB01 when the holder is new. The holes are intentionally slightly undersized to all for expansion with use. Each kit comes individually packaged with all components bagged and tagged for easy identification. Perfect for classroom settings.

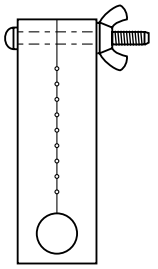
### WTK-1 Kit

| Part Description | Quantity Per Kit | Order Number |
|---|---|---|
| TB01 — Terminal Holder | 1 | 11229 |
| Turret Terminal | 5 | 11228 |
| Bifurcated Terminal | 5 | 11224 |
| Hook Terminal | 5 | 11227 |
| Pierced Terminal | 5 | 11226 |
| Cup Terminal | 5 | 11301 |
| 22 Gauge Wire | 3' | 16163 |
| 20 Gauge Wire | 3' | 16164 |
| 26 Gauge Wire | 3' | 16162 |

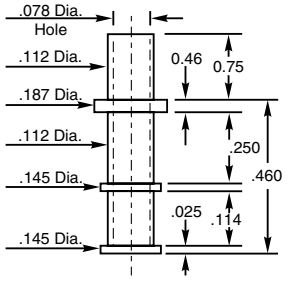
***Notes***

- Kit is available without terminal holder.

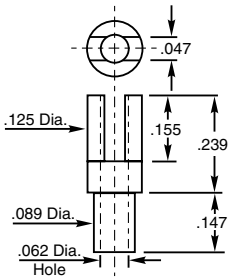
Available as a

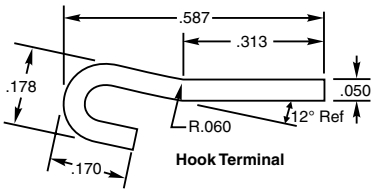
TB-01 Terminal Holder



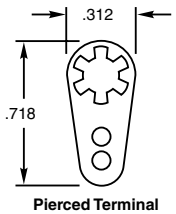

Turret Terminal



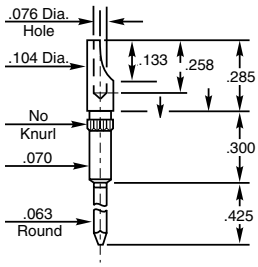

Bifurcated Terminal




Hook Terminal




Pierced Terminal




Gold Cup Terminal

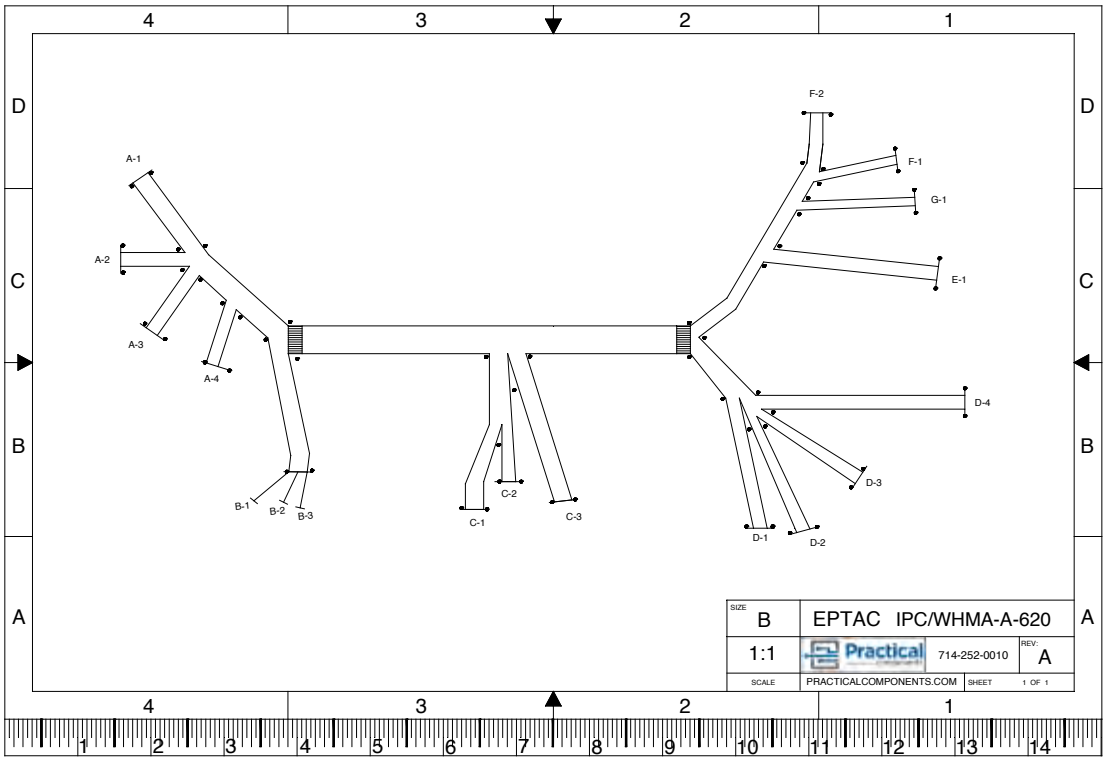
Measurements are in inches.

# IPC/WHMA-A620 Wire Harness Kit

## IPC/WHMA Compliant

The New A620 kit from Practical Components is designed to help companies meet industry standards for cable and wire harness assembly criteria. It helps teach the visual, electrical and mechanical quality acceptability requirements for cable, wire and harness assemblies. You will also learn to identify target, acceptable, process indicator and defect conditions.

## A620 Wire Harness Kit




Board Size: 15 3/8" x 11" x 1 3/4" thick.

The A620 kit enable hands on training in the following areas of wire harness assembly:

- Cable and wire dimensioning, tolerances and preparation
- Crimp Terminations
- Insulation displacement connections
- Soldered terminations
- Splices
- Connectorization
- Marking and labeling
- Co-axial and ribbon cable assembly
- Wire bundle securing
- Installation
- Wire wrap (solderless)
- Testing of wire harness assemblies

The A620 kit comes with the recommended materials to become proficient with the IPC/WHMA-A-620 standard. Each kit is individually packaged with all items labeled. Call for recommended tools.

*Lab/Manuel sold separately. Not included with kit.*

### A620 Parts Only

| Part Description | Quantity Per Kit |
|---|---|
| Gold Cup Terminal | 2 |
| Turret Terminal | 2 |
| Bifurcated Terminal | 2 |
| Pierced Terminal | 2 |
| Hook Terminal | 2 |
| RV18-16L Isulated Ring | 4 |
| R18-6L Ring | 4 |
| Butt Splice | 2 |
| Machine Pin | 3 |
| Pin Contact | 2 |
| Pin Connector | 2 |
| 2 AMP Connector | 2 |
| RJ45 Plug | 2 |
| Cable Tie | 6 |
| Stain Clip | 2 |
| 18AWG Coaxial Cable | 6’ |
| 22AWG Stranded | 4’ |
| 23AWG Coaxial Cable | 2’ |
| 24AWG Cat5E Stranded | 4’ |
| 28AWG Ribbon Cable | 1’ |
| Lacing Cord | 1 yrd |

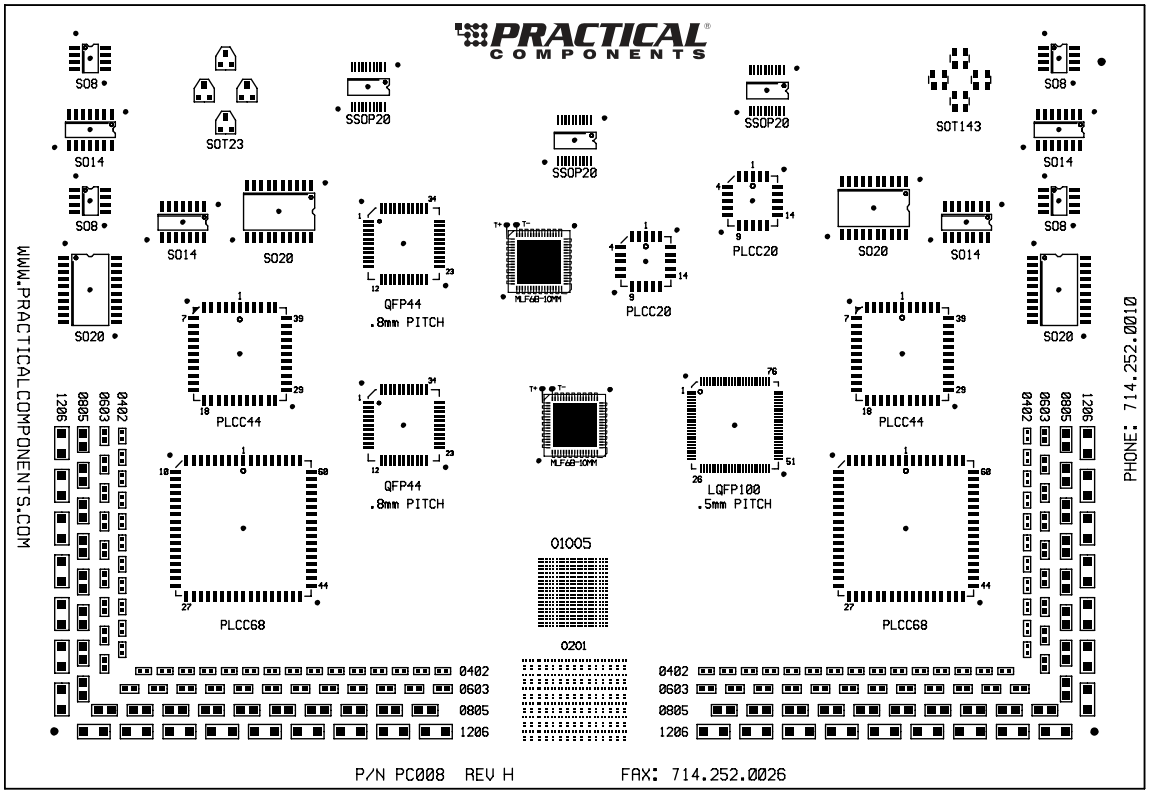
# Solder Practice Board and Kits

**REVISED** [Rev. H]

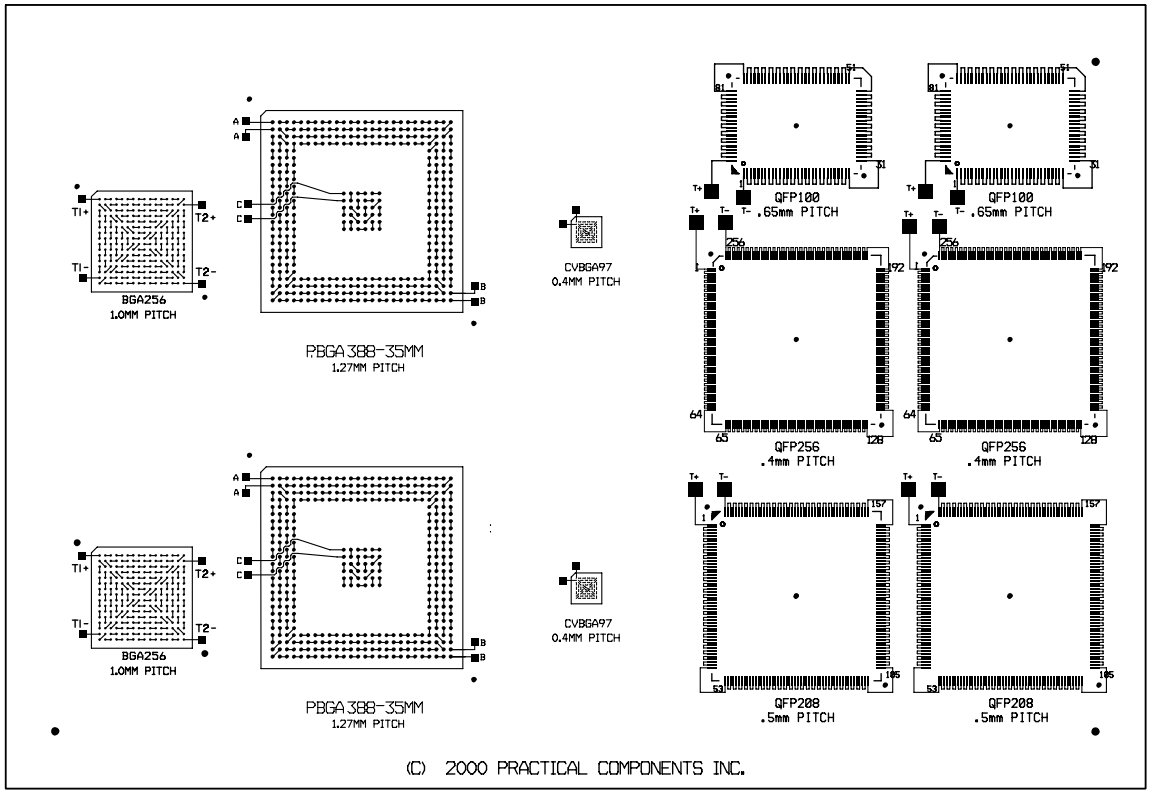
## A universal PCB to meet all your needs.

Rework practice, solder training and evaluation, and for testing and calibration of pick-and-place machines.

### PCB008 Solder Practice Board




Top view




Bottom view

Board size:
8" x 5.5", .062" thick.

# Solder Practice Board and Kits

Choose from the kits below or create your own custom configuration.

**Lead-Free Components List (included in a complete kit)**

| Part Description | Quantity Per Board |
|---|---|
| MLF68-10mm-.5mm-DC-Sn | 2 |
| PBGA256-1.0mm-17mm-DC-LF | 2 |
| CVBGA97-.4mm-5mm-DC-LF | 2 |
| PBGA388-1.27mm-35mm-DC-LF | 2 |
| QFP44-10mm-.8mm-3.9mm-Sn | 2 |
| QFP100-14x20mm-.65mm-3.9mm-DC-Sn | 2 |
| QFP208-28mm-.5mm-2.6mm-DC-Sn | 2 |
| QFP256-28mm-.4mm-2.6mm-DC-Sn | 2 |
| LQFP100-14mm-.5mm-2.0mm-Sn | 1 |
| PLCC20-Sn | 2 |
| PLCC44-Sn | 2 |
| PLCC68-Sn | 2 |
| SO8-3.8mm-Sn | 4 |
| SO14-3.8mm-Sn | 4 |
| SO20-7.6mm-Sn | 4 |
| SSOP20-5.3mm | 3 |
| 01005SMR-Sn | 200 |
| SOT23-TR-Sn | 4 |
| SOT143-TR-Sn | 4 |
| 0201SMR-Sn | 180 |
| 0402SMR-Sn | 52 |
| 0603SMR-Sn | 42 |
| 0805SMR-Sn | 36 |
| 1206SMR-Sn | 32 |
| PCB008 Board (customer to specify finish) | 1 |

**Tin-Lead Components List (included in a complete kit)**

| Part Description | Quantity Per Board |
|---|---|
| MLF68-10mm-.5mm-DC | 2 |
| PBGA256-1.0mm-17mm-DC | 2 |
| CVBGA97.4mm-5mm-DC | 2 |
| PBGA388-1.27mm-35mm-DC | 2 |
| QFP44-10mm-.8mm-3.9mm | 2 |
| QFP100-14x20mm-.65mm-3.9mm-DC | 2 |
| QFP208-28mm-.5mm-2.6mm-DC | 2 |
| QFP256-28mm-.4mm-2.6mm-DC | 2 |
| LQFP100-14mm-.5mm-2.0mm | 1 |
| PLCC20 | 2 |
| PLCC44 | 2 |
| PLCC68 | 2 |
| SO8-3.8mm | 4 |
| SO14-3.8mm | 4 |
| SO20-7.6mm | 4 |
| SSOP20-5.3mm | 3 |
| 01005SMR | 200 |
| SOT23-TR | 4 |
| SOT143-TR | 4 |
| 0201SMR | 180 |
| 0402SMR | 52 |
| 0603SMR | 42 |
| 0805SMR | 36 |
| 1206SMR | 32 |
| PCB008 Board-HASL finish | 1 |

***Notes***

- Gerber Data and X, Y Theta Data are available if required at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Kit is available with Lead-Free components (for Tin-Lead and Lead-Free kits). Substitutions may occur depending on availability of lead-free finishes and alloys.
- PBGAs are available with SAC305 or SAC405 Lead-Free alloys.
- CVBGA is available with SAC105, SAC305 or SAC405 Lead-Free alloys.
- Add "LF" to end of Kit Order Number when ordering Lead-Free kits.
- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL.


***Ordering Information***

- Order Number: PCB008 Rev H (Board Only)

# Foresite Umpire Test Board

This vehicle is best used to look at process qualifications for the primary and secondary steps. Wave Solder, SMT, Cleaning, and then the secondary steps of temporary solder mask, rework flux, and rework cleaning. It also works well to look at interactions of solder mask with fluxes and/or solder pastes, or materials characterization tests in general. This board is a good selection if you are trying to do correlations between different specifications, e.g. IPC and Bellcore. The two B-24 comb patterns allow you to do SIR for both Bellcore and J-STD-004. Pattern D can be used to correlate to existing B-25 data, or for Bellcore electromigration testing. The military Y pattern can be used for many military qualification tests. Then a direct comparison between the military Y pattern and the C3 localized test system can be made.

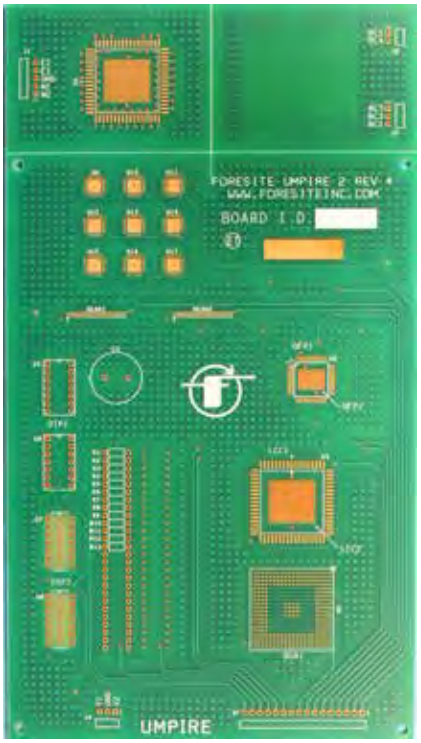
The Umpire test board is a current qualification vehicle for processes (IPC-ANSI-J-STD-001) and conformal coatings (IPC-CC-830A).

## Advantages

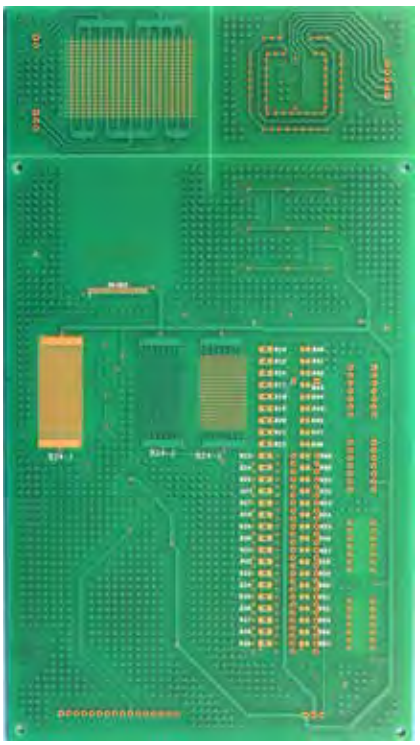
- A good vehicle to use for full process evaluations
- Easy to manufacture and therefore inexpensive
- Has all the common patterns used for SIR and electromigration resistance testing plus the component SIR patterns such as the 80 pin TQFP, 256 BGA.
- Can correlate to B-24, B-25A and B36 test boards.
- Is recognized as a valid test vehicle for Bellcore testing (both TR-78 & GR-79)
- Relatively easy to wire and test
- Can do adhesion testing and dielectric strength tests
- Good vehicle for solder mask interactions and effects

## Disadvantages

- None




Top View



Bottom View

Board size: 5.2" x 9.4", .062" thick.

### PC051 Umpire Kit

| Part Description | Quantity per Kit |
|---|---|
| PCB051-Foresite | 1 |
| PDIP14-Socket | 40 |
| 68LCC-1.27mm-24.11mm-TR | 20 |
| WM2723-ND-TR | 10 |
| S1221E-16-ND-TR | 10 |
| A-TQFP80-12mm-.5mm-2.0-TR | 10 |
| A-PBGA256-1.27mm-27mm-DC-TR | 10 |
| A-MLF40-6mm-.5mm | 90 |
| **Kit Order Number: (Tin-Lead)** | **PC051-10** |
| **Kit Order Number: (Lead-Free)** | **PC051-10-LF** |

***Notes***

- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL.

# Jabil Solder Paste Evaluation
## Board and Kit

Practical Components continues to offer high technology solder paste evaluation kits. The Jabil Solder paste evaluation test board and components is the most recent example.

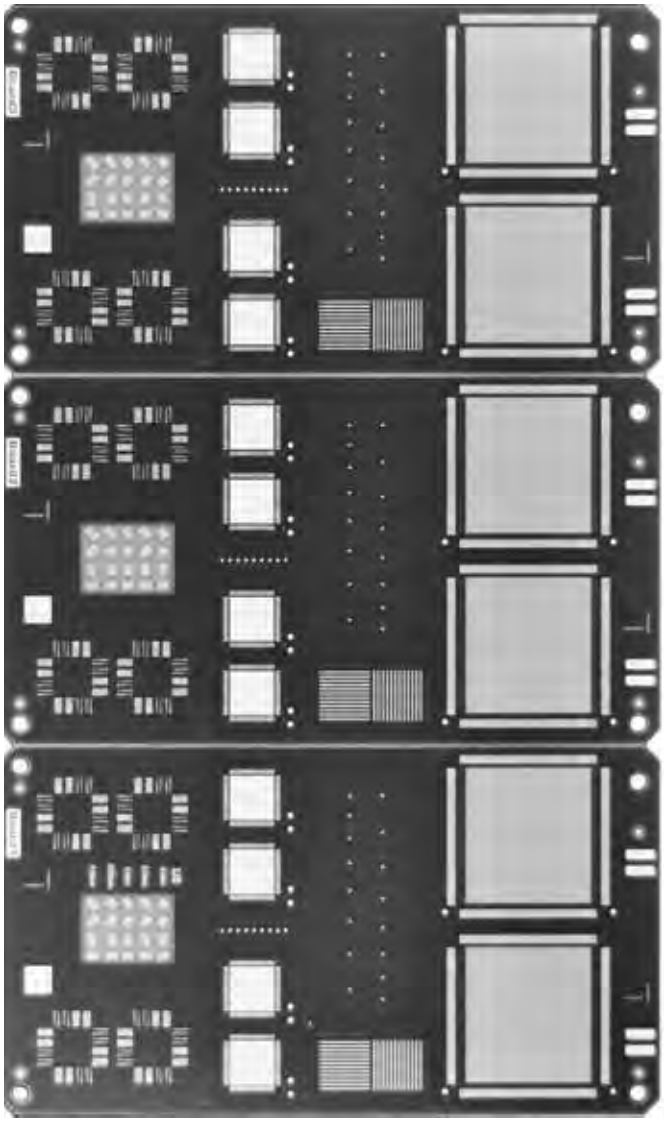
This kit can be used to evaluate new solder paste and its performance for stencil printing and reflow characteristics. The kit can also be used to evaluate the compatibility with wave and rework chemistries. Other uses include ICT probability, comparison studies with different types of solder pastes, as well as internal development and evaluation.

The Jabil Solder Paste Evaluation Test Board is a good test design to evaluate solder paste. The bottom side of the test board has three 0.5mm pitch CTBGA84 patterns and three 0.4mm pitch CVBGA360 patterns which are used for solder paste volume measurements. The test board also has two bridging test patterns used to measure bridging after print. The pitch of pads of one pattern ranges from 8 to 20 mils.

The test board includes patterns for evaluation of bridging, wetting, solder balling, voiding and graping. The wetting pattern includes 12 vertical and 12 horizontal lines. The solder balling pattern includes 16 overprinted pads of 20 mil diameter and the graping pattern includes 4 columns of 6 pads.

Patterns for testing include:

- Bridging patterns
- Wetting/spread testing
- Solder balling pull back pattern
- Graphic pattern
- Solder paste volume
- Solder paste bridging
- Voiding Testing



***Notes***

- 1 board as the 3-up panel (1 Array = 3 Cards)
- MLF come standard on Tape and Reel but can be ordered in tubes upon special request.
- 2 stencils per kit = 1 Top / 1 Bottom. 29” x 29”
- Customer to specifiy stencil thickness: 1.5” or 0.5”

***Ordering Information***

### Jabil SP Evaluation Kit #1

- Order Number: 12853
- (50) Jabil Test Boards
- (360) A-MLF68-10mm-.5mm-DC-Sn-TR
- (2) Jabil Test Board Stencils

### Jabil SP Evaluation Kit #2

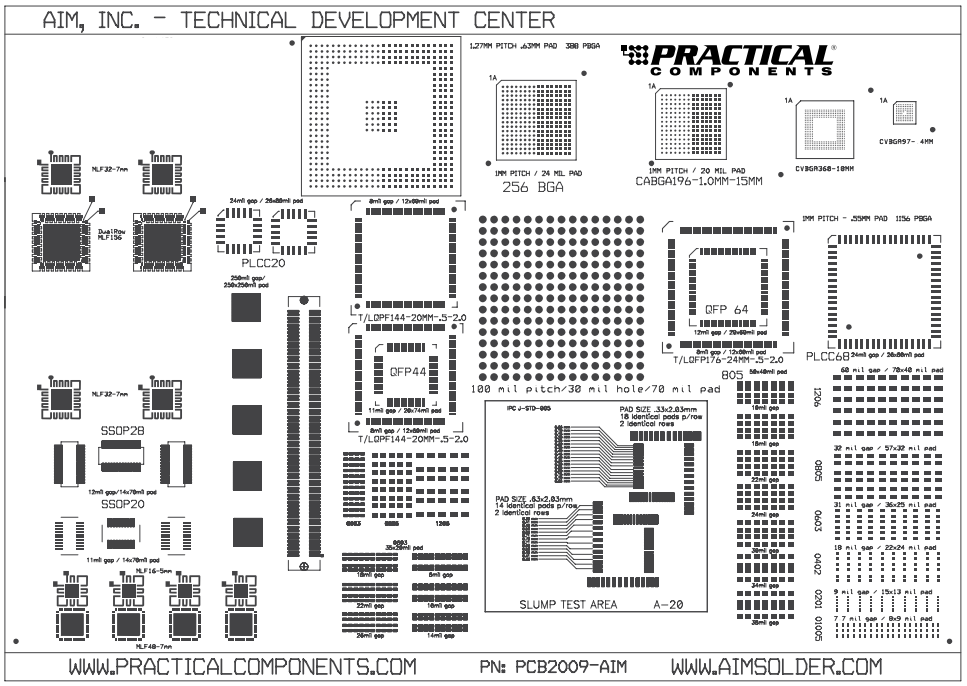
- Order Number: 12853
- (100) Jabil Test Boards
- (360) A-MLF68-10mm-.5mm-DC-Sn-TR

The following BGA are not included in the kit:

- Either BGA can be added to kit upon request.
- Order number: 32210 A-CVBGA360-.4mm-10mm-DC-LF-305
- Order number: 31407 A-CTBGA84-.5mm-6mm-DC-LF-305

# AIM Print Test Board and Kit

## PCB2009 AIM Print Test Board




Board size: 8.5" x 6", .062" thick.

The AIM print test board was designed to include many printing challenges which are commonly encountered on manufacturers assemblies. BGA pads have circular and square pad design to test paste release. AIM has included the standard IPC slump test pattern in order to further challenge the properties of any product tested thereon. This print pattern is more real life and more accurate to predict slump since individual pads are used instead of one pad that is common in the "thermometer" method. There is a number on the board indicating the distances between pads so a hard number can be used for paste evaluations.

Common pad sizes were incorporated into the layout including 1206, 0805 and 0603 rectangular pads for discrete components. These pads have varying distance between them so the user can determine solder beading of paste. Four 250 x 250mil pads are available to be utilized with various aperture styles in order to allow for wetting tests. There are also several fine pitch QFP pads designed to check for the propensity of any given product to cause bridging and to confirm the existence of torn prints, peaking (dog ears), or bridging.

***Notes***

- Digitized gerber files provided by Aegis Software included at no charge.
- Kit available with Tin/Lead and Pb-free components.
- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL.

**Software and Data Files Included With All Kits!**

### PC2009 AIM Test Kit

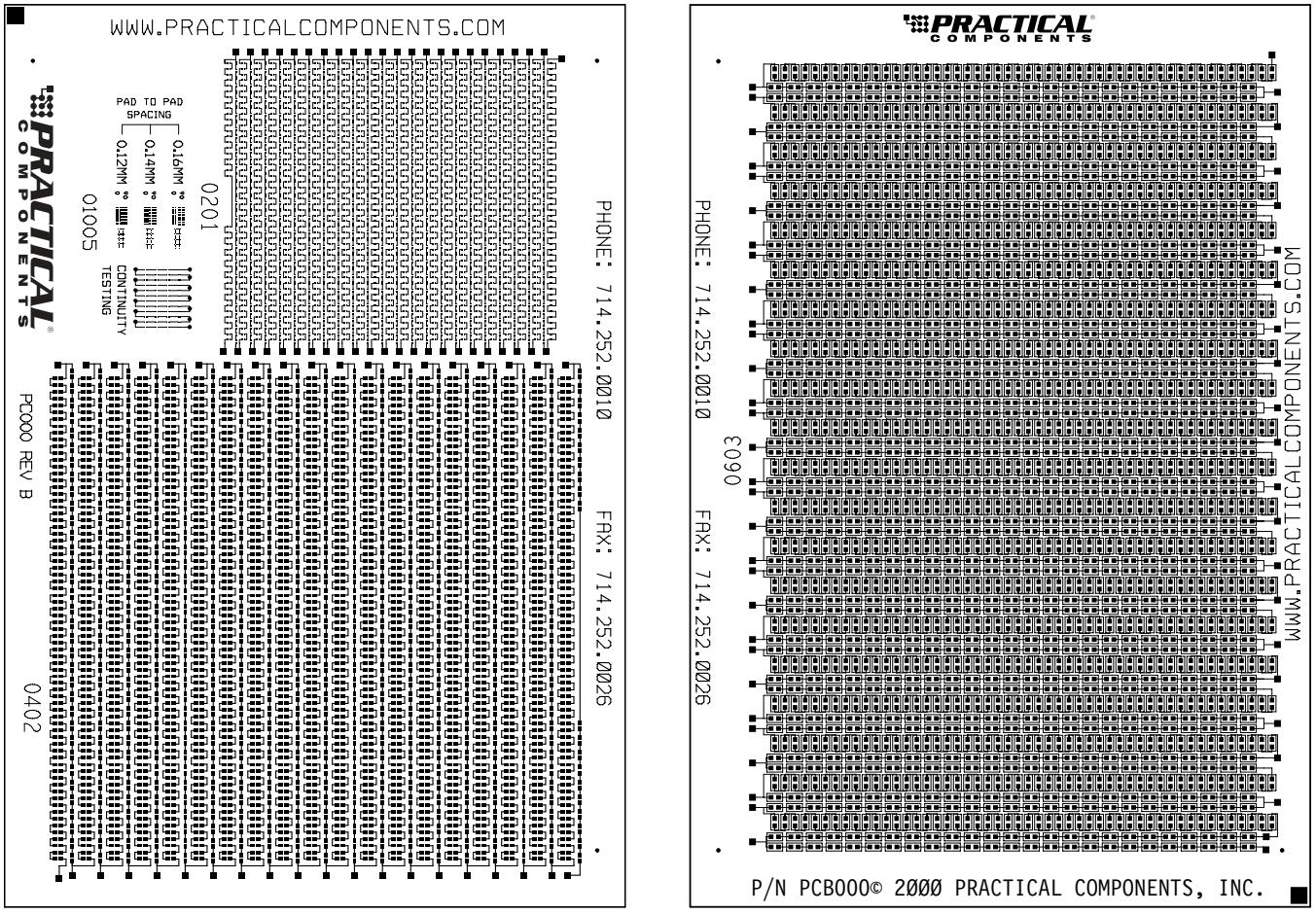
| Part Description | Quantity Per 25 Kits |
|---|---|
| A-T/LQFP144-20mm-.5mm-2.0 | 50 |
| A-PBGA388-1.27mm-35mm-DC | 25 |
| A-PLCC20T | 50 |
| A-PBGA256-1.0mm-17mm-DC | 25 |
| A-CABGA196-1.0mm-15mm-DC | 25 |
| A-QFP44-10mm-.8mm-3.2mm | 25 |
| A-QFP64-14mm-.8mm-3.2mm | 25 |
| A-LQFP176-24mm-.5mm-2.0mm | 25 |
| A-PLCC68T | 25 |
| A-SSOP28T-3.9mm | 75 |
| A-SSOP20T-3.9mm | 75 |
| 0603SMR | 5000 |
| 0805SMR | 5000 |
| 1206SMR | 1300 |
| 0402SMR | 775 |
| 0201SMR | 775 |
| 01005SMR | 1425 |
| PDIP14 | 350 |
| A-MLF48-7mm-.5mm-DC | 100 |
| A-MLF32-7mm-.65mm-DC | 100 |
| A-MLF16-5mm-.8mm-DC | 100 |
| A-DualRowMLF156-12mm-.5mm-DC | 50 |
| A-CVBGA97-.4mm-5mm-DC | 25 |
| A-CVBGA360-.4mm-10mm-DC | 25 |
| PCB2009 | 25 |
| **Kit Order Number:** | **PC2009-0-25** |

# Lead-Free Zero-Ohm SMD Resistor Kit

**REVISED** [Rev. B]

The PCB000 test board has land patterns for 01005, 0201, 0402, and 0603 Zero Ohm Lead-Free SMD Resistors. Each component pad is connected in series (daisy-chained) to the next pad. When zero ohm value resistors are placed on the pad, the result is a line of continuity. This test board can be used for placement accuracy evaluation with any type of component matching the physical size of the pads. Each component type has 2,000 pads, except for 01005 pad size which has 165 pads for Pick-n-Placement purposes only with four different pad spacing. There are also 48 pads for 01005 to test for continuity.

## PCB000 Zero-Ohm Test Board




Board size: 8" x 5.5", .062" thick.

SMD Resistors with Zero-Ohm value, and SMD Capacitors can be used on this test board. Customers can mix and match components and quantities to create a custom kit. Please contact your Practical Components sales representative for details.

### PC000 SMD Lead-Free Zero-Ohm Resistor Kits

| Part Description | Quantity Per 10 Kits | Quantity Per 25 Kits | Quantity Per 50 Kits |
|---|---|---|---|
| *01005SMR-PA-0-Sn | 2,000 | 4,300 | 8,500 |
| 0201SMR-PA-0-Sn | 20,000 | 50,000 | 100,000 |
| 0402SMR-PA-0-Sn | 20,000 | 50,000 | 100,000 |
| 0603SMR-PA-0-Sn | 20,000 | 50,000 | 100,000 |
| PCB000-Zero Ohm Board | 10 | 25 | 50 |
| Kit Order Number (Lead-Free): | PC000-0-10-LF | PC000-0-25-LF | PC000-0-50-LF |

***Notes***

- * 01005SMR-PA-0-Sn part is not included in kit. Can be added to kit-build upon request for additional price.
- Gerber and X, Y Theta data included at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL

# MLF® Test Board and Kits

**REVISED** [Rev. A]

This new PCB007 *Micro*LeadFrame® (MLF®) Test Board is two test boards in one. The top side of the board consists of daisy-chained MLF® pads. Amkor's new MLF® packages are a near CSP plastic encapsulated package with a copper leadframe substrate. MLF® packages have perimeter pads on the bottom of the package. Thermal enhancement is provided by Amkor's ExposedPad™ technology.

The test board front side has land patterns for MLF® package sizes in varying I/O counts. Lead pitches of these include 0.5mm, 0.65mm and 0.8mm. The MLF® side of the PCB007 board is designed to help customers become more familiar with the placement and process characteristics of MLF® packages. The wide assortment of pad sizes and pitches provide a comprehensive overview of MLF® packages.

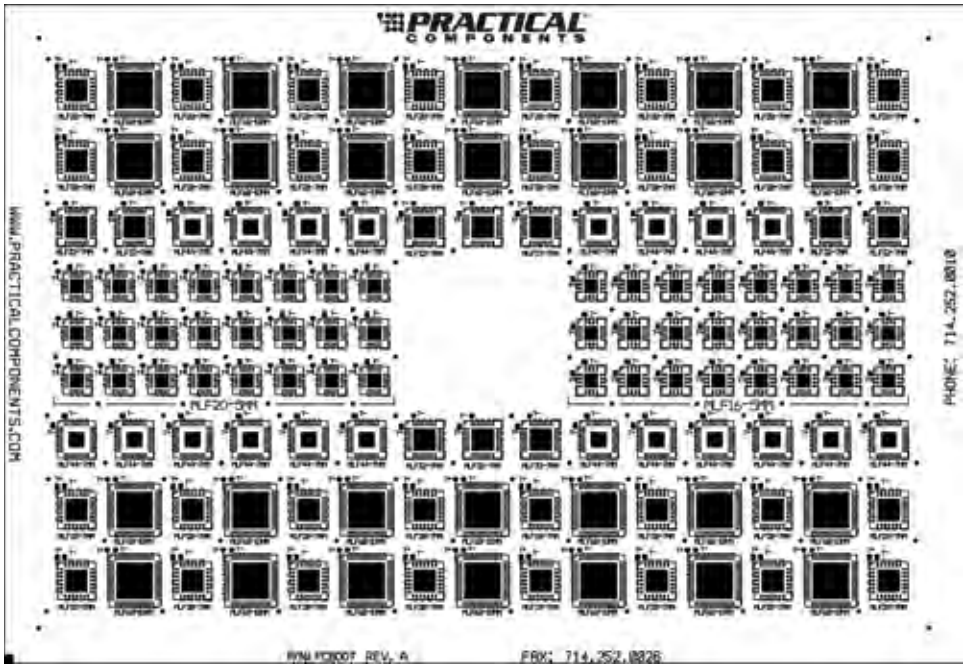
Daisy-chain patterns on the PCB007 board complement the patterns on the components, allowing continuity to be tested (except for TSOP's and T/LQFP120).

The bottom side of the PCB007 Test Board provides a variety of SMD component types. The bottom of the board has T/LQFP component with 0.4mm pitch, pads for the PBGA256 component with a 1.00mm pitch and two TSOP Type II components with 0.8mm pitch. Board also has new DualRowMLF156 component with 0.5mm pitch. Standard board finish for the PCB007 is Immersion Silver. Other finishes are available upon request. Standard board thickness is 0.062". Customers always have the option of mixing and matching components to suit their requirements.

## PCB007 MLF Test Board

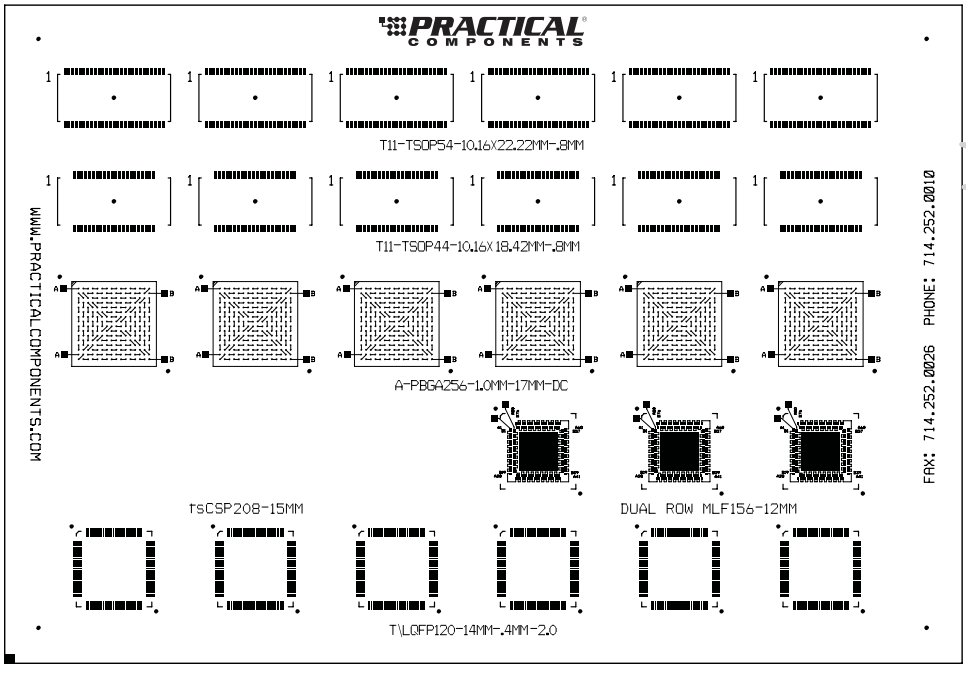
Available as a

**Single Pack Kit**




Top view

**Software and Data Files Included With All Kits!**




Bottom view

Board size: 8" x 5.5", .062" thick.

# MLF® Test Board and Kits

## PC007 MLF® Kits

| Part Description | Quantity Per 1 Kit | Quantity Per 10 Kits | Quantity Per 25 Kits | Quantity Per 50 Kits |
|---|---|---|---|---|
| **Kit Order Number (Top and Bottom):** | **PC007K-0-01** | **PC007K-0-10** | **PC007K-0-25** | **PC007K-0-50** |
| A-MLF16-5mm-.8mm-DC | 24 | 240 | 600 | 1,200 |
| A-MLF20-5mm-.65mm-DC | 24 | 240 | 600 | 1,200 |
| A-MLF28-7mm-.8mm-DC | 32 | 320 | 800 | 1,600 |
| A-MLF32-7mm-.65mm-DC | 10 | 100 | 250 | 500 |
| A-MLF44-7mm-.5mm-DC | 20 | 200 | 250 | 1,000 |
| A-MLF68-10mm-.5mm-DC | 28 | 280 | 700 | 1,400 |
| A-T/LQFP120-14mm-.4mm-2.0 | 6 | 60 | 150 | 300 |
| A-DualRowMLF156-12mm-.5mm-DC | 3 | 30 | 75 | 150 |
| PBGA256-1.0mm-17mm-DC | 6 | 60 | 150 | 300 |
| T11-TSOP44-10.16x18.42mm-.8mm | 6 | 60 | 150 | 300 |
| T11-TSOP54-10.16x22.22mm-.8mm | 6 | 60 | 150 | 300 |
| PCB007 Test Board | 1 | 10 | 25 | 50 |

| Part Description | Quantity Per 1 Kit | Quantity Per 10 Kits | Quantity Per 25 Kits | Quantity Per 50 Kits |
|---|---|---|---|---|
| **Kit Order Number (Bottom Only):** | **PC007B-0-01** | **PC007B-0-10** | **PC007B-0-25** | **PC007B-0-50** |
| A-T/LQFP120-14mm-.4mm-2.0 | 6 | 60 | 150 | 300 |
| A-DualRowMLF156-12mm-.5mm-DC | 3 | 30 | 75 | 150 |
| PBGA256-1.0mm-17mm-DC | 6 | 60 | 150 | 300 |
| T11-TSOP44-10.16x18.42mm-.8mm | 6 | 60 | 150 | 300 |
| T11-TSOP54-10.16X22.22mm-.8mm | 6 | 60 | 150 | 300 |
| PCB007 Test Board | 1 | 10 | 25 | 50 |

| Part Description | Quantity Per 1 Kit | Quantity Per 10 Kits | Quantity Per 25 Kits | Quantity Per 50 Kits |
|---|---|---|---|---|
| **Kit Order Number (Top Only):** | **PC007T-0-01** | **PC007T-0-10** | **PC007T-0-25** | **PC007T-0-50** |
| A-MLF16-5mm-.8mm-DC | 24 | 240 | 600 | 1,200 |
| A-MLF20-5mm-.65mm-DC | 24 | 240 | 600 | 1,200 |
| A-MLF28-7mm-.8mm-DC | 32 | 320 | 800 | 1,600 |
| A-MLF32-7mm-.65mm-DC | 10 | 100 | 250 | 500 |
| A-MLF44-7mm-.5mm-DC | 20 | 200 | 250 | 1,000 |
| A-MLF68-10mm-.5mm-DC | 28 | 280 | 700 | 1,400 |
| PCB007 Test Board | 1 | 10 | 25 | 50 |

***Notes***

- Kit quantities are subject to change.
- Mix and match components and quantities to create a custom kit. Please contact your sales representative for details.
- Components supplied in kits (except for TSOP's and T/LQFP120) have pairs of leads shorted together in a daisy-chain pattern that result in a line of continuity when combined with the shorted pairs of pads on the board. Continuity test pads on the board allow the end user to verify electrical connections at solder joints and to identify electrical opens.
- Gerber and X, Y Theta data included at no charge.
- Digitized files provided by Aegis Software included at no charge.
- PBGA is available with SAC305 or SAC405 Lead-Free solder ball alloy's.
- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.

## Lead-Free Part Description List

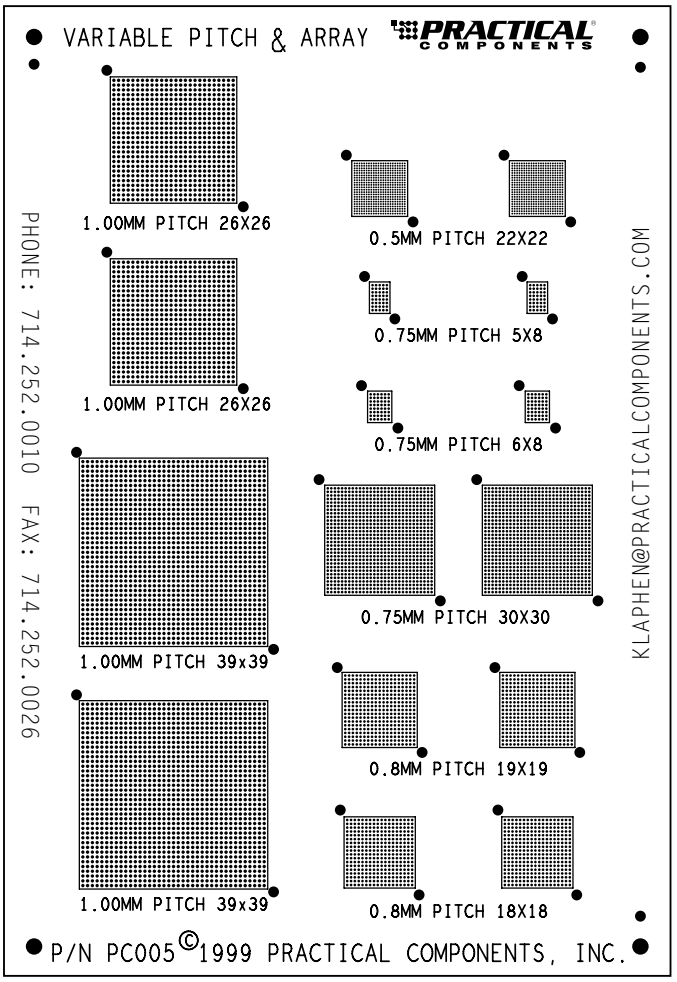
| Part Description |
|---|
| A-MLF16-5mm-.8mm-DC-Sn |
| A-MLF20-5mm-.65mm-DC-Sn |
| A-MLF28-7mm-.8mm-DC-Sn |
| A-MLF32-7mm-.65mm-DC-Sn |
| A-MLF44-7mm-.5mm-DC-Sn |
| A-MLF68-10mm-.5mm-DC-Sn |
| A-DualRowMLF156-12mm-.5mm-DC-Sn |
| A-T/LQFP120-14mm-.4mm-2.0-Sn |
| PBGA256-1.0mm-17mm-DC-SAC305 |
| T11-TSOP44-10.16x18.42mm-.8mm-Sn |
| T11-TSOP54-10.16x22.22mm-.8mm-Sn |

# BGA Variable Pitch and Array Board

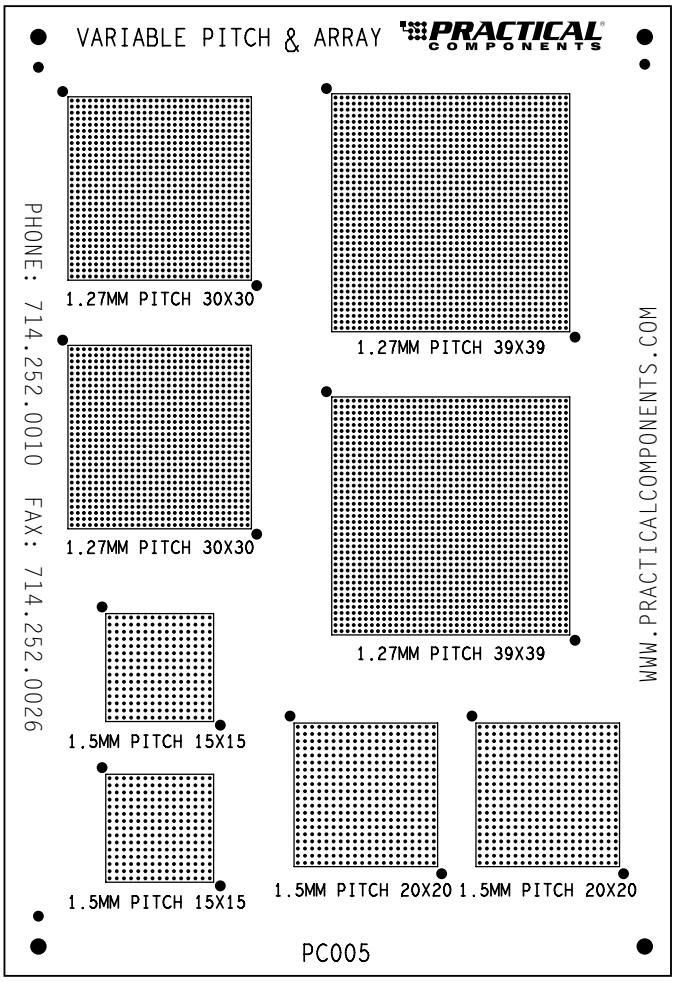
Mix and match components to configure your custom kit.

Practical Components is now offering a "one-of-a-kind" BGA Variable Pitch and Array PC Board. Each board contains matrices for the most popular ball pitches found on BGAs and CSPs. The use of full matrices allows maximum flexibility for placing parts with full, staggered, or perimeter configurations. Each board has a mixture of even and odd matrices to enable placement, using automatic equipment, of the highest ball counts available.

## PCB005 Variable Pitch and Array Board




Top View




Bottom View

Board size: 8.33" x 5.83", .062" thick.

***Notes***

- Kits can be configured to the customer's requirements.
- Gerber Data and X, Y Theta Data are available if required at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Pad dimensions:
  - 1.0mm pitch = 24 mil pad diameter
  - 1.27mm pitch = 28–30 mil pad diameter
  - 1.5mm = 28–30 mil pad diameter
  - 0.5mm = 11 mil pad diameter
  - 0.8mm = 18–19 mil pad diameter
  - 0.75mm = 18 mil pad diameter
- Board finishes available are:
  Immersion Silver, ENIG, OSP and HASL

***Ordering Information***

- Order Number: PCB005 (Board Only)

Available as a

**Single Pack Kit**

Please call your Practical Components' sales representative to identify components available for the PCB005 Test Board.

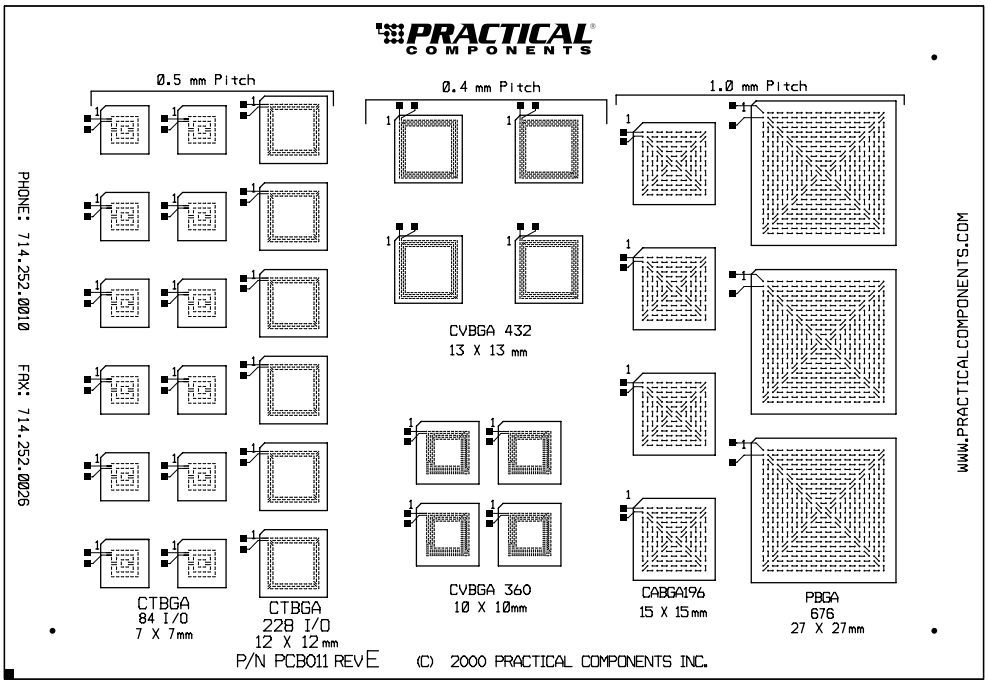
# BGA Fine Pitch Board and Kit

**REVISED** [Rev. E]

## Tin-Lead and Lead-Free Available

The PC011 BGA Kit contains Amkor daisy-chained fine pitch BGAs. The daisy-chain PCB011 test board contains patterns for the 0.4mm pitch, 0.5mm pitch and 1.0mm pitch CSP/BGA components. Amkor BGA type components on the board are the CTBGAs, CVBGAs and PBGAs. The PCB011 test board is double sided. This test board is designed to help the end user become familiar with smaller BGA body sizes and pitches. Components come in standard JEDEC trays. Kit component quantities are for one side of the board only.

### PCB011 BGA Fine Pitch Board




Board size: 8" x 5.5", .062" thick.

### PC011 BGA Kits

| Part Description | Quantity Per 1 kit | Quantity Per 10 kits | Quantity Per 25 kits |
|---|---|---|---|
| A-CTBGA84-.5mm-7mm-DC-SAC305 | 12 | 120 | 300 |
| A-CTBGA228-.5mm-12mm-DC-SAC305 | 6 | 60 | 150 |
| A-CVBGA360-.4mm-10mm-DC-SAC305 | 4 | 40 | 100 |
| A-CVBGA432-.4mm-13mm-DC-SAC305 | 4 | 40 | 100 |
| A-CABGA196-1.0mm-15mm-DC-SAC305 | 4 | 40 | 100 |
| A-PBGA676-1.0mm-27mm-DC-SAC305 | 3 | 30 | 75 |
| PCB011-RevE | 1 | 10 | 25 |
| **Kit Order Number: (Tin-Lead)** | **PC011-0-01** | **PC011-0-10** | **PC011-0-25** |
| **Kit Order Number: (Lead-Free)** | **PC011-0-01-LF** | **PC011-0-10-LF** | **PC011-0-25-LF** |

***Notes***

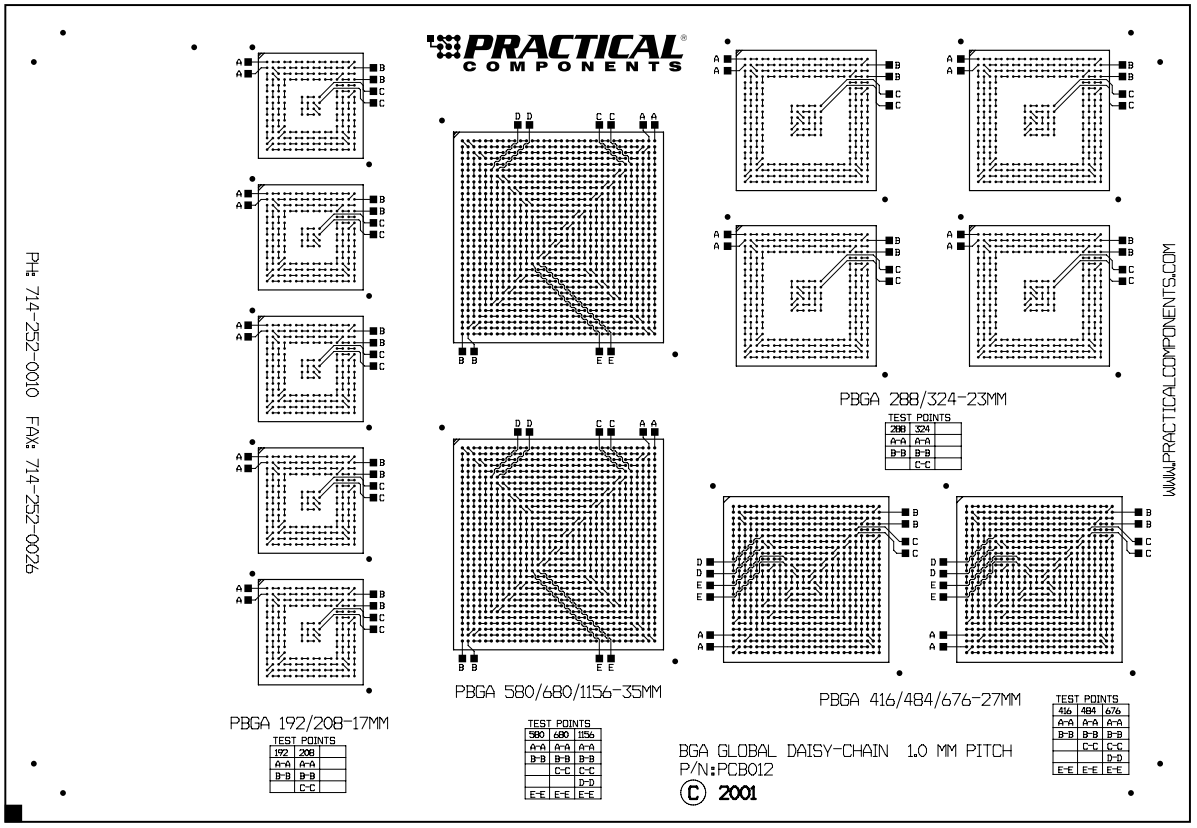
- Gerber and X, Y Theta data included at no charge.
- Digitized files provided by Aegis Software included at no charge.
- PBGAs are available with SAC305 or SAC405 solder ball alloys. CVBGA and CTBGA are available with SAC305, SAC405 or SAC105 solder ball alloys.
- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL

### Order numbers for individual items

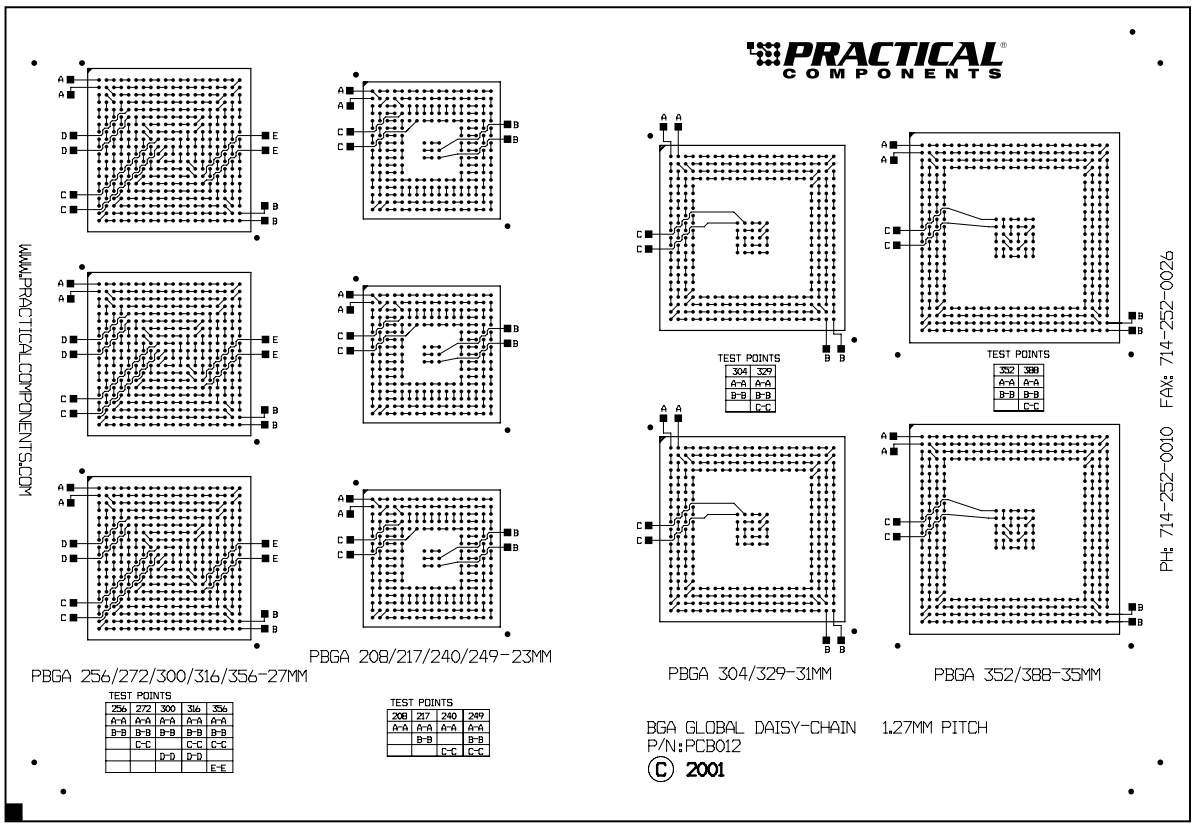
| Part Description | Order Number |
|---|---|
| A-CTBGA84-.5mm-7mm-DC-SAC305 | 31317 |
| A-CTBGA228-.5mm-12mm-DC-SAC305 | 31329 |
| A-CVBGA360-.4mm-10mm-DC-SAC305 | 32210 |
| A-CVBGA432-.4mm-13mm-DC-SAC305 | 31439 |
| A-CABGA196-1.0mm-15mm-DC-SAC305 | 31503 |
| A-PBGA676-1.0mm-27mm-DC-SAC305 | 31019 |
| PCB011-RevE | TBD |

# BGA Global Daisy-Chain Test Kit

## PCB012 BGA Global Daisy-Chain Test Board




Top view




Bottom view

Board size:
8" x 5.5", .062" thick.

# BGA Global Daisy-Chain Test Kit

## Tin-Lead and Lead-Free Available!

The New PCB012 Global Daisy-Chain test board has 25 different BGA land patterns. Board pads accommodate BGA components ranging from 17mm square to 35mm square. The PCB012 test board has 1.00mm and 1.27mm pitch pads. BGA components placed on this test board range from 208 to 1,156 balls. Daisy-chain patterns on the PCB012 board compliment the patterns on the components, allowing continuity to be tested. Each pad on the board has multiple daisy-chain patterns. These multiple daisy-chained pads allow different ball-count PBGA components to be placed on the same pad. Each pattern has test points to check for continuity. There are ball-count to test-point legends on the board. The board is double-sided with different pad sizes on the top and bottom. Customers can mix and match components to suit their requirements.

### PC012 BGA Global Daisy-Chain Test Kit

**1.0mm Pitch—Top Side**

| Part Number | Part Description | | Quantity Per 1 Kit | Quantity Per 5 Kit | Quantity Per 10 Kit | Quantity Per 25 Kit |
|---|---|---|---|---|---|---|
| 30542 | A-PBGA208-1.0mm-17mm-DC | 5 Pads Per Board | 5 | 25 | 50 | 125 |
| 31358 | A-PBGA208-1.0mm-17mm-DC-LF-305 | | | | | |
| 30362 | A-PBGA324-1.0mm-23mm-DC | 4 Pads Per Board | 4 | 20 | 40 | 20 |
| 31359 | A-PBGA324-1.0mm-23mm-DC-LF-305 | | | | | |
| 30513 | A-PBGA288-1.0mm-23mm-DC | | | | | |
| 31352 | A-PBGA288-1.0mm-23mm-DC-LF-305 | | | | | |
| 31083 | A-PBGA676-1.0mm-27mm-DC | 2 Pads Per Board | 2 | 10 | 20 | 50 |
| 31019 | A-PBGA676-1.0mm-27mm-DC-LF-305 | | | | | |
| 30604 | A-PBGA484-1.0mm-27mm-DC | | | | | |
| 31312 | A-PBGA484-1.0mm-27mm-DC-LF-305 | | | | | |
| 31123 | A-PBGA1156-1.0mm-35mm-DC | 2 Pads Per Board | 2 | 10 | 20 | 50 |
| 31306 | A-PBGA1156-1.0mm-35-DC-LF-305 | | | | | |
| 30343 | A-PBGA680-1.0mm-35mm-DC | | | | | |
| 31345 | A-PBGA680-1.0mm-35mm-DC-LF-305 | | | | | |

**1.27mm Pitch—Bottom Side**

| Part Number | Part Description | | Quantity Per 1 Kit | Quantity Per 5 Kit | Quantity Per 10 Kit | Quantity Per 25 Kit |
|---|---|---|---|---|---|---|
| 30543 | A-PBGA208-1.27mm-23mm-DC | 3 Pads Per Board | 3 | 15 | 30 | 75 |
| 31432 | A-PBGA208-1.27mm-23mm-DC-LF-305 | | | | | |
| 30047 | A-PBGA256-1.27mm-27mm-DC | 3 Pads Per Board | 3 | 15 | 30 | 75 |
| 31020 | A-PBGA256-1.27mm-27mm-DC-LF-305 | | | | | |
| 30372 | A-PBGA272-1.27mm-27mm-DC | | | | | |
| 31309 | A-PBGA272-1.27mm-27mm-DC-LF-305 | | | | | |
| 30645 | A-PBGA304-1.27mm-31mm-DC | 2 Pads Per Board | 2 | 10 | 20 | 50 |
| 30832 | A-PBGA304-1.27mm-31mm-DC-LF-305 | | | | | |
| 30644 | A-PBGA329-1.27mm-31mm-DC | | | | | |
| 31476 | A-PBGA329-1.27mm-31mm-DC-LF-305 | | | | | |
| 30065 | A-PBGA388-1.27mm-35mm-DC | 2 Pads Per Board | 2 | 10 | 20 | 50 |
| 31310 | A-PBGA388-1.27mm-35mm-DC-LF-305 | | | | | |

***Notes***

- Kit quantities are subject to change.
- Mix and match components and quantities to create a custom kit. Please contact your sales representative for details.
- Board is double sided (top side for 1.0mm pitch packages / bottom side for 1.27mm pitch package)
- Gerber and X, Y Theta data included at no charge.
- Digitized files provided by Aegis Software included at no charge.
- PBGA available as SAC405 but SAC305 is the preferred Alloy.
- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.

| | Description |
|---|---|
| Top | PC012T-0-01 |
| Top Lead Free | PC012T-0-01-LF |
| Bottom | PC012B-0-01 |
| Bottom Lead Free | PC012B-0-01-LF |
| Complete | PC012K-0-01 |
| Complete Lead Free | PC012K-0-01-LF |

# Process Capability Validation Kit

Cookson Electronics

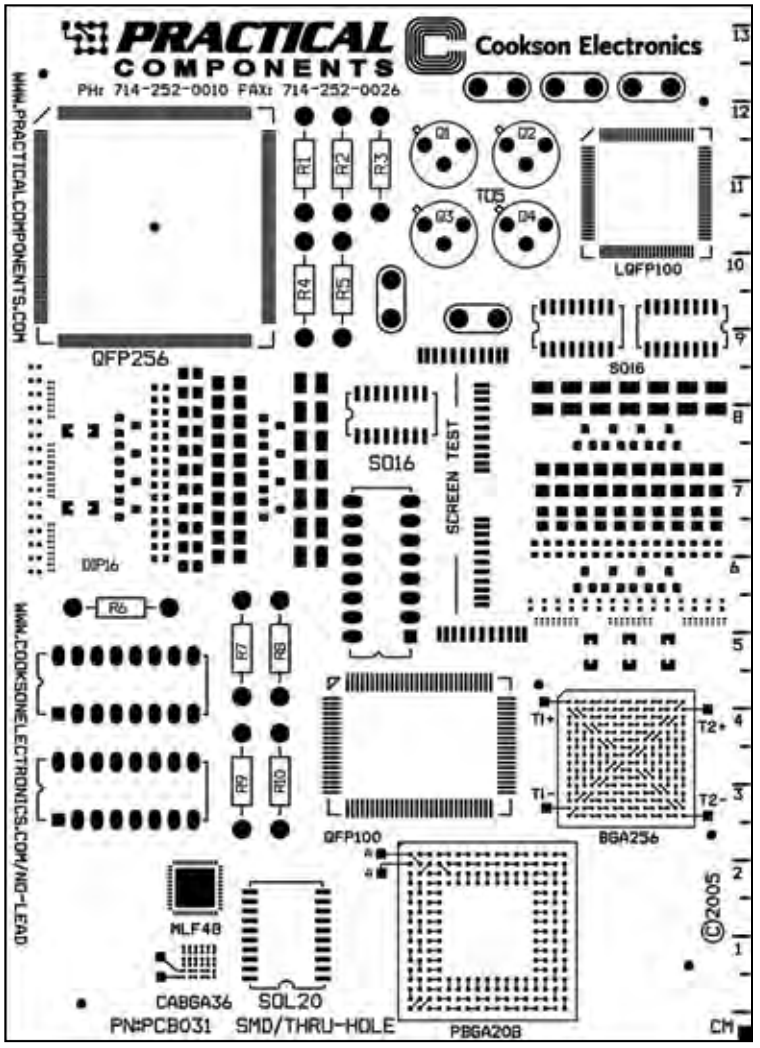
Practical Components and Cookson Electronics are teaming up to offer a new Lead-Free Process Capability Validation Program. This program consists of lead-free components and test boards from Practical Components, with Cookson Electronics' analytical evaluation and process capability validation services to the IPC and J-STD requirements.

### PC031 Cookson Lead-Free Capability Validation Kit

| Part Description | Quantity Per 25 Kits |
|---|---|
| PCB031 | 25 |
| 0201SMR-Sn | 1,250 |
| 0402SMR-Sn | 1,000 |
| 0603SMR-Sn | 1,000 |
| 0805SMR-Sn | 1,000 |
| 1206SMR-Sn | 1,000 |
| 1210SMR-Sn | 400 |
| SOT23-Sn | 400 |
| .200" Radial Mono Cap | 125 |
| SO16GT-3.8mm-Sn | 75 |
| SO20GT-7.6mm-Sn | 25 |
| PDIP16T-Sn | 75 |
| 1/4-W-AR-Sn | 250 |
| TO-5-Sn | 100 |
| QFP256-28mm-.4mm-Sn | 25 |
| QFP100-14x20mm-.65mm-Sn | 25 |
| A-PBGA256-1.0mm-17mm-SAC305 | 25 |
| A-PBGA208-1.27mm-23mm-SAC305 | 25 |
| A-LQFP100-14mm-.5mm-Sn | 25 |
| SOD80-Sn | 125 |
| A-CABGA36-6mm-.8mm-SAC305 | 25 |
| A-MLF48-7mm-.5mm-Sn | 25 |
| **Kit Order Number:** | **PC031-0-25** |

***Notes***

- Gerber Data and X,Y Theta Data are available if required at no charge.
- Digitized files provided by Aegis Software.
- Board finishes available are:
  Immersion Silver, ENIG, Bare Copper, OSP and HASL.
- Stencils are sold separately. Sizes as follows:
  - 20" x 20" size, 5mil thick.
  - 29" x 29" size, 5mil thick.



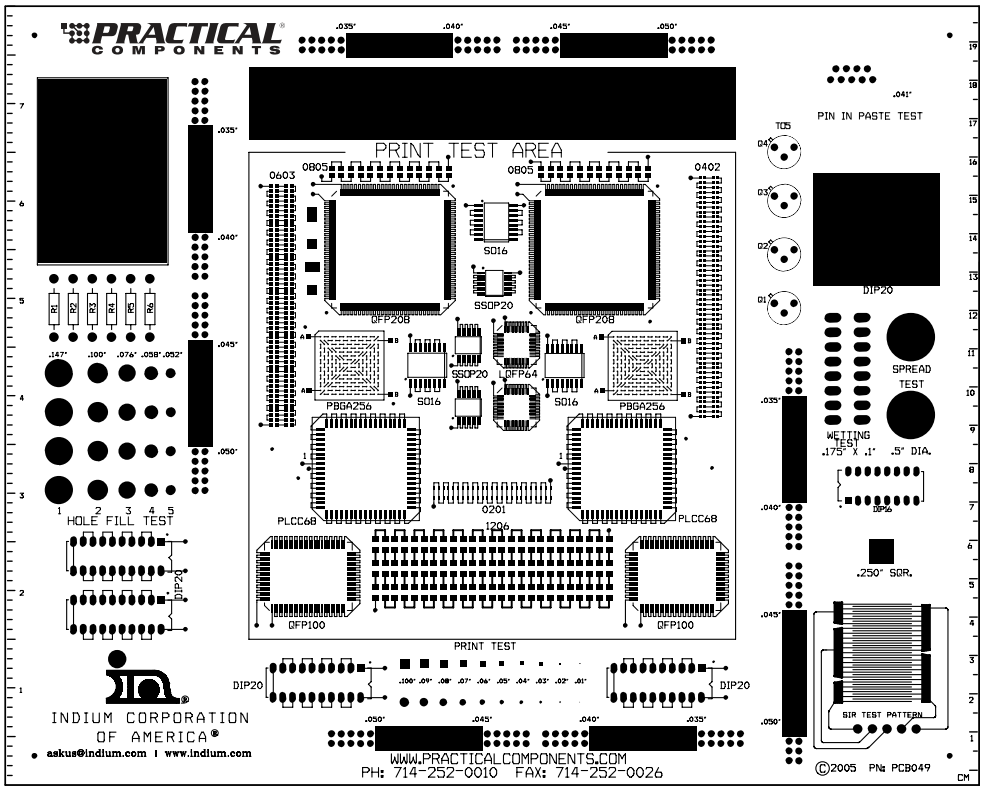

Board size: 3.875" x 5.375", .062" thick.

Indium Corporation SMT/PTH Mixed Technology Pb-Free Kit Practical Components and Indium Corporation are introducing a new Lead-Free SMT/Through-hole Mixed Technology test board and kit.

## PCB049 Board

The PCB049 Board can be used to evaluate the following conditions:

- Solder paste wetting and spread.
- Solder paste slump performance.
- Solder perform Pin-in-Paste performance.
- Wave flux hole fill performance.
- P&P equipment and placement accuracy.
- Reflow process capabilities.
- Effectiveness of cleaning processes.
- Surface Insulation resistance (SIR).
- Surface finish interaction factors.
- Pb-Free Underfill performance.




Board size: 12" x 8", .062" thick.

### PC049 Indium Lead-Free Kit

| Part Description | Quantity Per 25 Kits |
|---|---|
| A-PBGA256-1.0mm-17mm-DC-LF | 50 |
| LQFP64-7mm-.4mm-2.0-DC-Sn | 50 |
| A-QFP208-28mm-.5mm-2.6-DC-Sn | 50 |
| A-QFP100-14x20mm-.65-3.9-DC-Sn | 50 |
| A-SSOP20T-5.3mm-DC-Sn | 75 |
| A-SO16GT-7.6mm-DC-Sn | 75 |
| A-PLCC68T-DC-Sn | 50 |
| 0201SMR-PA-0-Sn | 1,250 |
| 0402SMR-PA-0-Sn | 3,125 |
| 0603SMR-PA-0-Sn | 3,125 |
| 1206SMR-PA-0-Sn | 2,085 |
| A-PDIP20T-7.6mm-DC-Sn | 150 |
| A-DIP16T-7.6mm-Sn | 25 |
| 0805SMR-PA-0-Sn | 1,050 |
| 1/4W-AR-Sn | 175 |
| TO5-Sn | 100 |
| **Kit Order Number:** | **PC049-0-25-LF** |

***Notes***

- Board finishes available are: Immersion Silver, ENIG, Bare Copper, OSP and HASL.
- For details on evaluation techniques and material performance requirements, contact Indium Corporation technical support at 1-800-4-INDIUM.
- For complete information this kit or other Lead-Free solutions please contact your Practical Components representative at 1-714-252-0010.

**Software and Data Files Included With All Kits!**

# IPC 9850 Attribute Defect Rate Kit

## IPC 9850 Kit

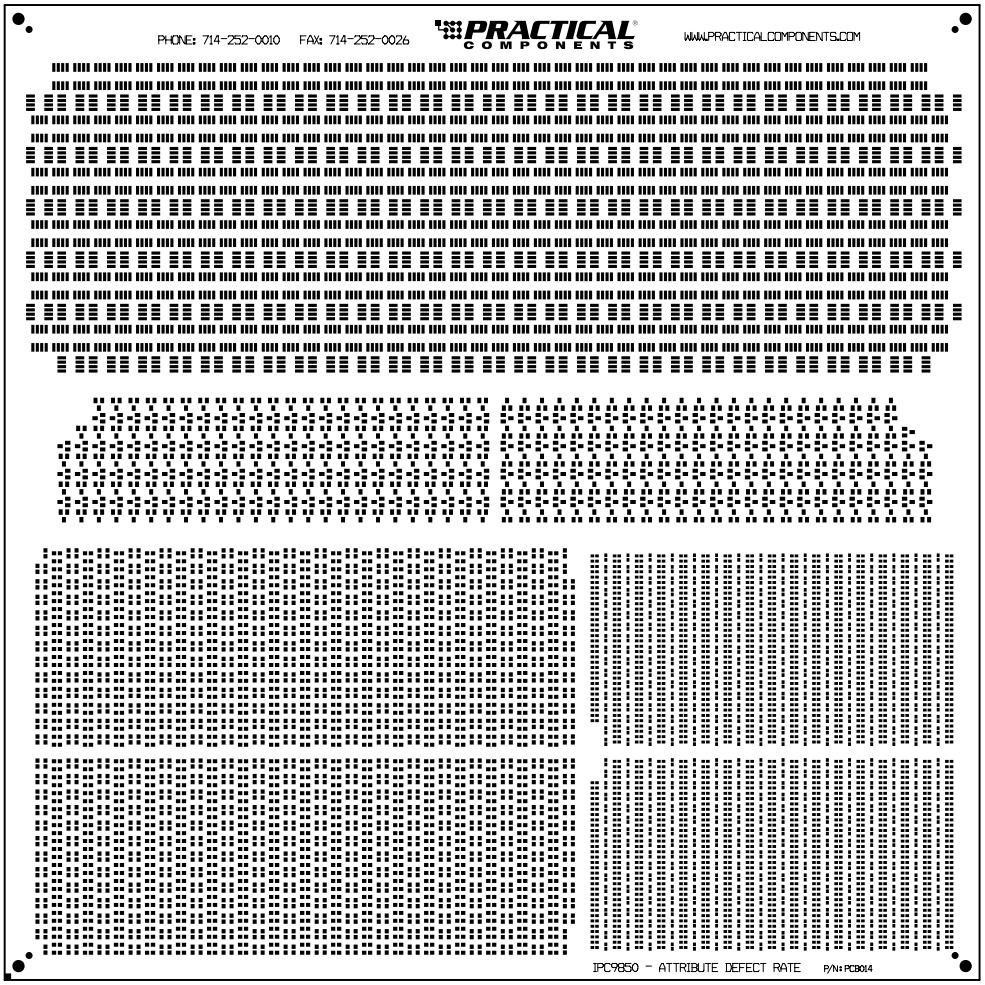
### Attribute Defect Rate Kit checks out pick and place machines.

IPC-9850 includes test methods for determining various SMT placement equipment attributes, including repeatability, accuracy and attribute defects. Each of these tests requires specific material and this new test board and kit from Practical Components provides the solution for conducting the attribute rate defect testing. The applicable section from IPC-9850 is 4.1, where attribute defects are defined as components placed upside down, tombstoned, on side, missing or extra part, damaged lead(s), damaged part(s), completely off land, or wrong polarity. Testing requires the placement of 88,000 components on 20 boards to attain reasonably accurate test results. Practical Components 9850 Kit will provide you with enough components and boards to meet this guideline. While IPC-9850 requires the placement of components on sticky tape (included), these boards can also be printed with solder paste and reflowed.

Each board contains the lands (multiple orientations) for 4,400 components (440 SOT23s, 440 SO8s, 880 0603SMCs, 880 0603 SMRs, 880 0402SMCs and 880 0402SMRs). Test material is available from Practical as single boards or complete kits with all the necessary dummy components. On request, this board comes with demonstration versions of CircuitCAM and CheckPoint manufacturing software, ready-to-run CircuitCAM Project Files (CPFs) and Gerber and X, Y Theta data at no extra charge.

IPC Compliant

PCB014 Board




Board size: 11" x 11", .062" thick.

**PC014 Kit (IPC 9850)**

| Part Description | Quantity Per 10 Kits | Quantity Per 25 Kits |
|---|---|---|
| SOT23-TR | 6,000 | 15,000 |
| SO8GTR-3.8mm | 5,000 | 12,500 |
| 0402SMC-PL | 10,000 | 50,000 |
| 0402SMR-PL | 10,000 | 50,000 |
| 0603SMC-PL | 12,000 | 50,000 |
| 0603SMR-PL | 10,000 | 50,000 |
| Sticky Tape | 2 Rolls | 3 Rolls |
| PCB014 | 10 | 25 |
| **Kit Order Number:** | **PC014-0-10** | **PC014-0-25** |

***Notes***

- Gerber Data and X, Y Theta Data are available, if required, at no charge.
- Digitized files provided by Aegis Software included at no charge.
- Only board finish available is HASL.

# CircuitCAM™ Software

## Rapidly prepare off-line machine programs and color-coded assembly documentation from CAD or Gerber data.

Practical Components' goal is to provide value to our customers by saving time when setting up board test runs. Our partnership with Aegis Industrial Software provides our customers digitized data files for use with Practical's complete line of PCB test boards. Using Aegis' CircuitCAM™ software, customers save an enormous amount of time when setting up both manual stations and automated equipment.

Customer support for installation and use of CircuitCAM™ and CheckPoint is provided directly by Aegis. Please call your Practical sales representative to request additional information.

Aegis Software is a leading provider of innovative software solutions to improve speed, control, and visibility throughout manufacturing operations. The company's FactoryLogix software is the first system designed to support all types of discrete manufacturing. From PCB assembly, to complex box-builds, large system integrations and even high-speed consumer goods processing; this adaptive, multi-market solution redefines the very concept of MES.

Aegis' integrated suite of software modules manage the entire manufacturing information environment: from product launch, to material logistics, through manufacturing execution, to operations analytics and real-time dashboard systems. This holistic solution yields unprecedented product, process, and materials traceability as well as the data fulfillment and visibility manufacturers need for competitive improvement.

With a customer base of more than 1,200 corporations across the electronics, medical, automotive, military and aerospace industries; 36 manufacturing equipment supplier partnerships, and over a decade of independent customer satisfaction awards, Aegis delivers a unique level of capability, value, and time-to-value for its manufacturing customers.

Founded in 1997 by two manufacturing engineers looking to address a noticeable gap in the manufacturing information chain, the company's mission is to provide "software for manufacturing, created by manufacturing engineers." The Aegis corporate culture and philosophy demand honesty in the sales and promotion process, honoring of customer commitments, software value, and respect for the customer's investment.

Aegis Software is headquartered in a state-of-the-art development and training facility in Philadelphia PA. Aegis has international sales and support offices in Germany, UK, China, Singapore, and Japan, and is partnered with 36 manufacturing equipment suppliers.

www.aiscorp.com

### CircuitCAM is an integral component to Aegis' Factory Logix system, a scalable suite of NPI and MES Solutions. Other integrated manufacturing tools include:

- CheckPoint—BOM Importing and Revision Control
- Web-based Paperless Documentation
- Web-based Work In Process (WIP) Tracking
- Web-based Quality Data Collection and Analysis
- Web-based Line Monitoring and Supervisory Dashboard
- Web-based Materials Setup Verification and Control
- Aegis DataMiner—Ad hoc data analysis, charting & reporting


### Virtual Factory Modeling

Create a graphical routing of your plant's assets and the processes performed at each step. Each point in this routing is associated to a user-defined documentation layout (template) and to a machine programming interface gateway. Model your entire discrete assembly process flow, from prep, assembly, inspection, test, and final assembly; out through packout and shipping.

### Total and Simplified CAD Support

Import board location data from CAD, Gerber, scanned boards, and from select machine sources. Import for any CAD type takes a single click. Knowledge of CAD formats is not required.

### Visual Documentation

Expedite documentation development for both circuit board and mechanical assemblies with drawing templates, automatic color coding, cropping, annotation, OLE, clipboard, and multimedia. CircuitCAM is the fastest tool to provide operators with the documents they need to do their jobs effectively.

### Machine Programming

CircuitCAM supports virtually all process, assembly, and inspection systems. Through an industry leading network of over 25 machine OEM partnerships, AEGIS offers comprehensive and user-friendly off-line programming for all types of SMT and through-hole insertion equipment.

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### All Practical Components kits come with:

Software and Data Files Included With All Kits!

- Demonstration versions of CircuitCAM and Checkpoint
- Ready-to-run CircuitCAM Project Files (CPFs)
- BOM, Gerber, GenCAD, and XY Centroid Files
- Assembly Documentation Samples and Templates
- Installation Instructions and User Manuals

For assistance with the installation and use of CircuitCAM and Checkpoint, please contact an Aegis sales representative at:

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