

Dorigo System Ltd.

DFM (Design for Manufacture)

Proven guidelines for improving quality by making products easier to build and test

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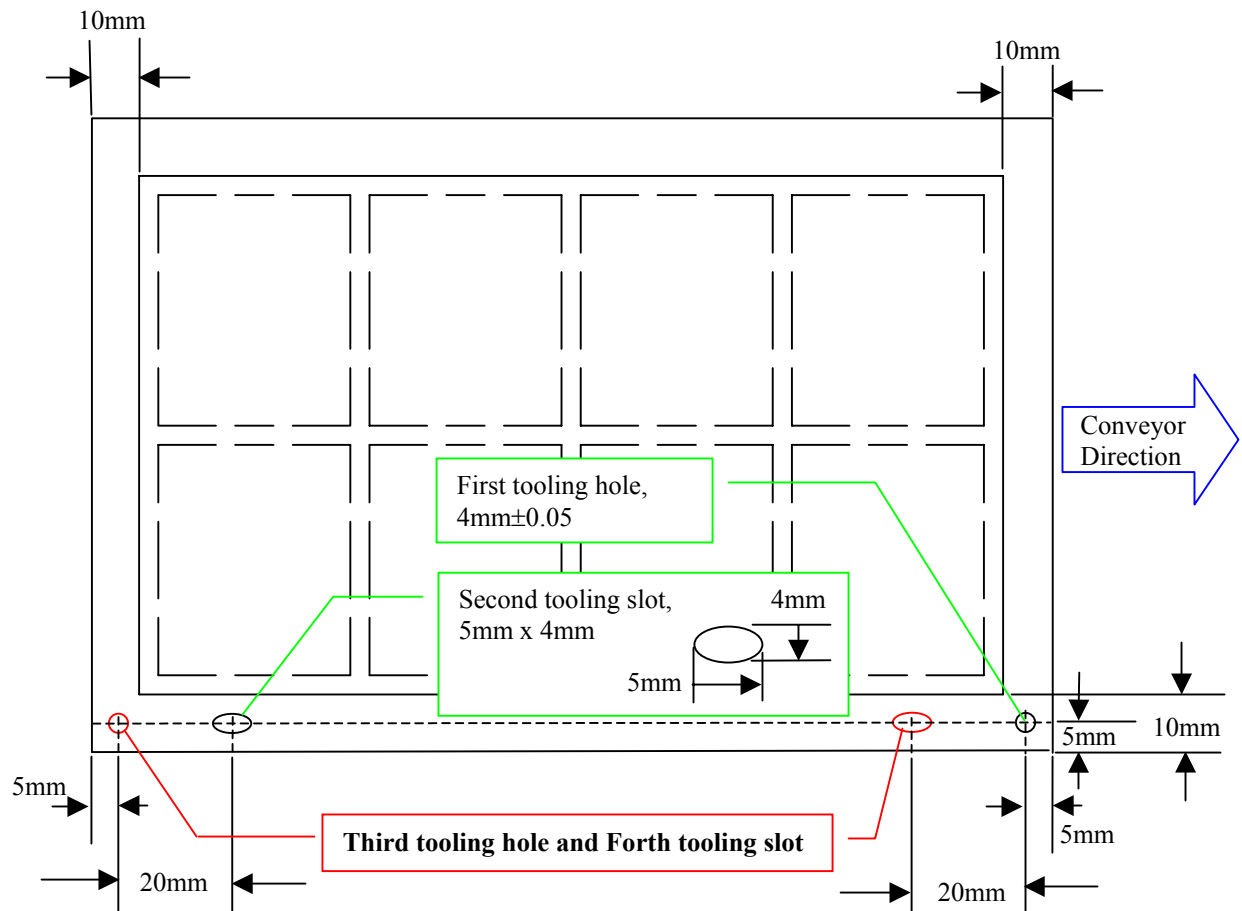
1. SMT General Requirements

- Suggested PCB land pattern specification: IPC-SM-782 (Surface Mount Design and Land Pattern Standard)
- Customer provided kits should be on tape and reels or tubes
- Fuji machine feeders require 12” of leader length on cut pieces of tape
- Panasonic machine feeders require 6” of leader length on cut pieces of tape
- Dummy leaders can be appended to cut pieces of tape with no extra length (This requires 3x the amount of time for loading)
- Standard components can be offered by Dorigo (see Appendix A)

2. Tooling Hole Requirements

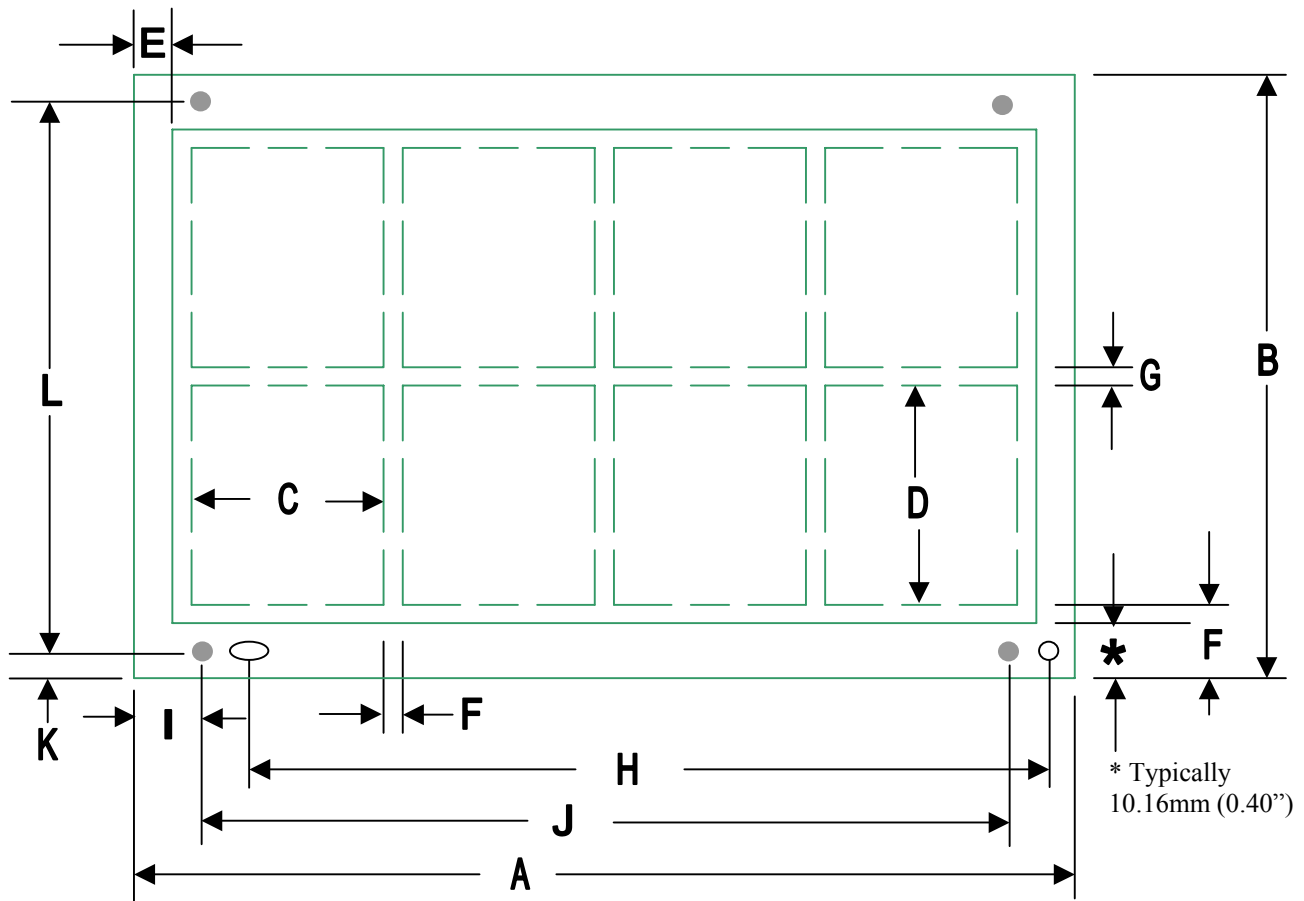
- Two 4mm (0.158") unplated holes as per drawing
- The longer side of panel should rest on bottom rail
- No thru-hole plating on any of the tooling holes
- No solder mask around any of the tooling holes
- Tooling holes are commonly placed on bottom rail where border exists or can be placed in actual PCB if room permits and conditions met
- Tooling holes are to be positioned on the border that contains the origin of the XY placement data
- Locate the first tooling hole 5mm from bottom/right corner as per the drawing
- Second tooling hole is a slot as per diagram
- Place second tooling hole along the bottom rail. Pick the largest distance you can fit on the board from the list below. Do not exceed the max. (Horizontal placement not that critical)
- Third tooling hole and fourth tooling slot are mirror position to first and second tooling hole.

- 50mm, 2.0" (min)	100mm, 4.0"	150mm, 6.0"	
- 200mm, 8.0"	250mm, 10.0"	300mm, 12.0"	350mm, 14.0" (max)



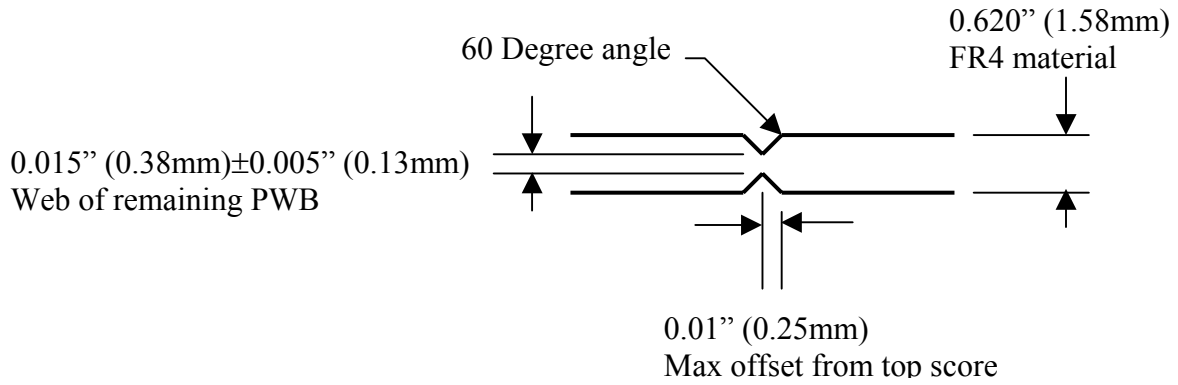
3. Panelization Dimension Requirements

- Need to provide total length (A) and width (B) of panelized board
- Need to provide length (C) and width (D) of inner circuit board
- Need to provide distance (E) and (F) from outer edge of panelized board to inner circuit board
- Need to provide distance (G) between inner circuit boards
- Need to provide distance (H) between first and second tooling hole
- Need to provide distance (I) between from outer of panelized board to 1st fiducial point on the X direction
- Need to provide distance (J) between from 1st fiducial point to 2nd fiducial point on the X direction
- Need to provide distance (K) between from outer of panelized board to 1st fiducial point on the Y direction
- Need to provide distance (L) between from 1st fiducial point to 2nd fiducial point on the Y direction



Note: Panel borders are required if components are within 3mm (.118") of top/bottom board edge. But if board size is small, panelization is still required.

Vscore Breakout Detail

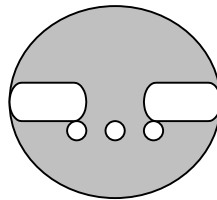


Notes:

- (1) For de-panelization purposes, ensure components are at least 3/16" (4.76mm) away from scored edges
- (2) Common scoring: 1/3-1/3-1/3 approach, 0.021" web on scoring for 1/16" PCB
- (3) Use deeper scoring as shown above if PCB is small (dense panel)

Internal Breakout Detail

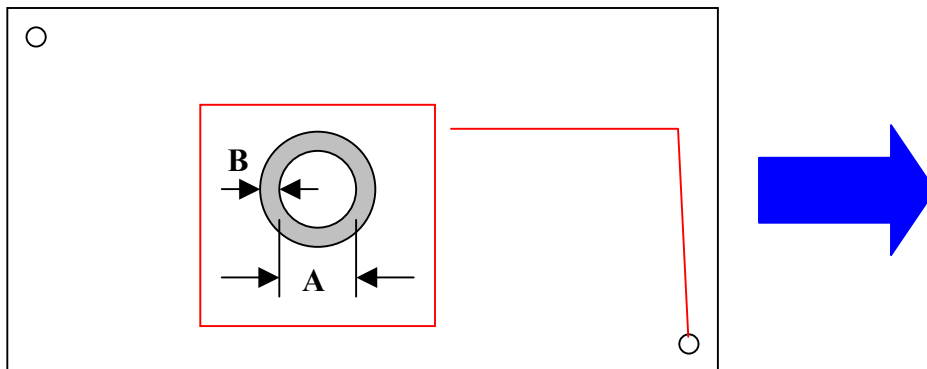
Typically 3 un-plated 0.046" (1.17mm) holes evenly spaced with left and right holes breaking through routing



4. Fiducial Mark Requirements

Global Fiducial

- Two marks located diagonally across the board preferably on top left and bottom right corner
- The marks are formed of tin lead plating in the center circular pad
- Do not apply solder resist within outer circle as shown below
- Do not mount components or place traces within 1.5mm from the center of the mark



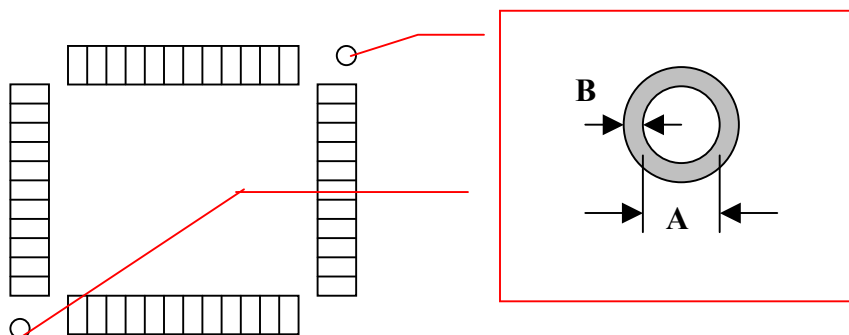
Dimensions:

A= 1.02mm (0.040") +/- 5%

B= 0.51mm (0.020") +/- 15%

Local Fiducial (QFP package component mark)

- Two marks diagonally
- Two component marks for each QFP



5. Machine Capabilities

Stencil

Print/ Board Parameters

Semi-Auto (DEK 249)

Print area- single and double Squeegee

400 x 350mm
(15.75 x 13.78 in.)

PCB thickness

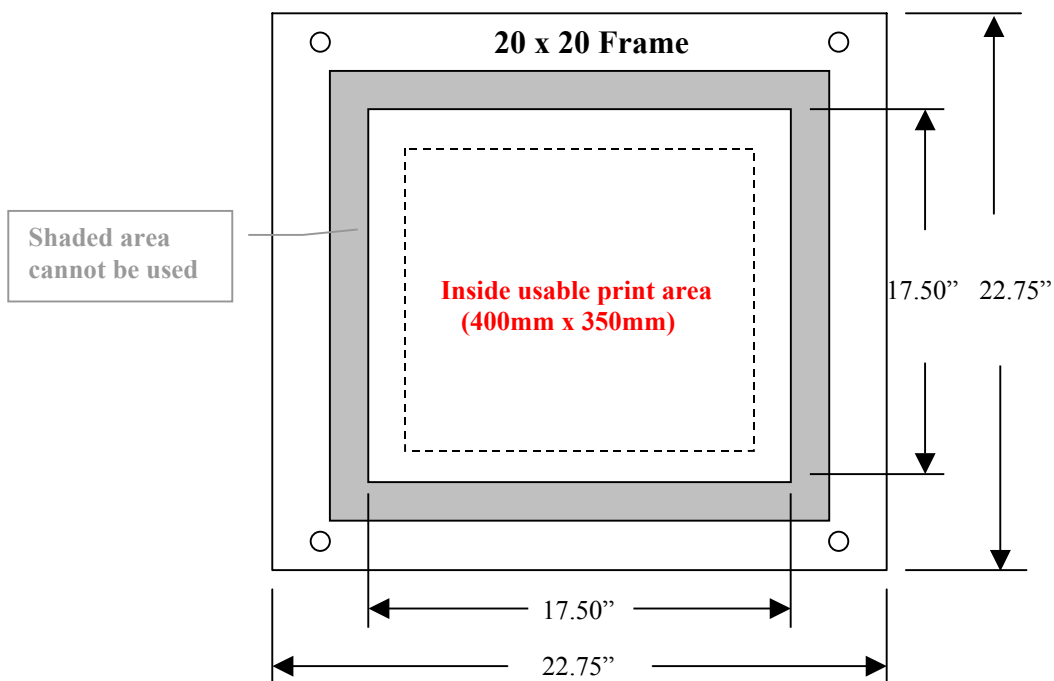
1.0 – 1.6mm (optional: 0.5 - 1.0mm, 1.6 - 2.0mm)

Amount of permissible PCB bendage

on top of PCB: max. 1.2mm
on bottom of PCB: max. 0.5mm

Conditions of PCB Before mounting

height of parts on top of PCB: max. 6.0mm
height of parts on bottom of PCB: max. 18.0mm



Pick and Place machine

Machine	Smallest Comp.	Largest Comp.	Finest Pitch	Largest Board
Fuji (CP3)	0402	SO24	0.050"	14" x 18"
Panasonic (MPA-80)	0603	1.25" QFP (1.96" QFP with normal camera)	0.020"	18" x 20"

SRT - Summit 1100 – BGA and microBGA placement, rework

Range of parts: Minimum – 5mm square parts with 8mil (0.008") pitch
 Maximum – BGA parts with ext. dimensions of 52-54mm square

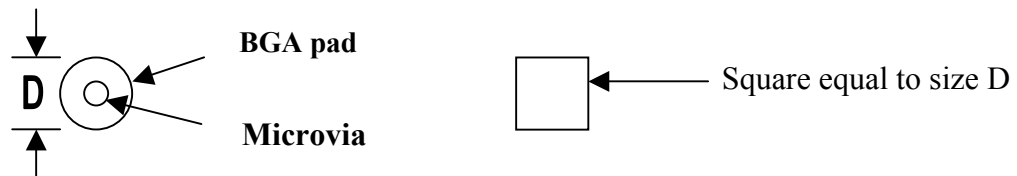
Notes: Adapters are available for processing 2mm square parts with 4mil pitch
 System field of view is 50mm square

X-Ray Machine - Nicolet NXR1525 – High resolution, high power x-ray system

Specs: 4" II zoom lens camera
 130kV, 8 micron, end window x-ray tube
 X/Y sample table, 18" x 24" scan area

Note:

*Recommended paste layer outline for BGA pads containing microvias (see dwg below)



6. **APPENDIX A (Standard Components offered by Dorigo)**

• **RESISTORS**

Description	Dorigo Part ID	Manufacturer	Mfr. Part Number
SMD 0603 Res 5% 0R	10-065-0000	Rohm Rohm	MCR03J 000 MCR03EZHJ000
SMD 0603 Res 5% 10K	10-065-1002	Rohm Rohm Philips	MCR03JW103E MCR03EZHJ103 9C06031A1002JL
SMD 0603 Res 5% 100K	10-065-1003	Rohm Rohm	MCR03JW104 MCR03EZHJ104
SMD 0805 Res 1% 1K	10-081-1001	Cal-Chip	RM10F1001CT
SMD 0805 Res 1% 10K	10-081-1002	Rohm Philips	MCR10FX1002 RC12H10K0
SMD 0805 Res 1% 100K	10-081-1003	ChipTech Philips	CR0805F1003T1 RC12H100K
SMD 0805 Res 5% 0R	10-085-0000	Rohm Philips	MCR10J 000 RC11J 0
SMD 0805 Res 5% 1K	10-085-1001	Rohm Philips KOA Cal-Chip	MCR10JW102 RC11J 1K0 RM73B2A102J RM10J102CT
SMD 0805 Res 5% 10K	10-085-1002	Rohm Philips KOA	MCR10JW103 RC11J 10K RM73B2A103J
SMD 0805 Res 5% 100K	10-085-1003	Rohm Philips	MCR10JW104 RC11J 100K

APPENDIX A (Standard Components offered by Dorigo) – continued

• DIODES, TRANSISTORS, CAPACITORS

Description	Dorigo Part ID	Manufacturer	Mfr. Part Number
SMD SOT23 Diode 1N4148	13-001-4148	Motorola Fairchild	MMBD914LT1 MMBD914
SMD SOT23 Tran 2N3904	13-010-3904	Diodes Inc. CSC Motorola Rohm	MMBT3904 CMPT3904 MMBT3904LT1 SST3904
SMD SOT23 Tran 2N3906	13-010-3906	Diodes Inc. Rohm CSC	MMBT3906 SST3906 CMPT3906
SMD 0805 Cap Cer Mono 0.01uF, X7R, 50V	12-086-0120	Cal-Chip Kemet	GMC21X7R103K50N C0805C103K5RAC
SMD 0805 Cap Cer Mono 0.1uF, X7R, 50V	12-086-0140	Cal-Chip Rohm	GMC21X7R104K50N MCH215C104KPN
SMD 0805 Cap Cer Mono 0.1uF, Y5V, 50V	12-087-0040	Kemet Rohm Novacap	C0805C104M5VAC MCH215F104ZP 0805Z104M500N
SMD 0805 Cap Cer Mono 1uF, Y5V, 16V	12-088-0020	Murata Kemet Samsung	GRM40Y5V105Z016BL C0805C105Z4VAC CL21F105ZONE