Schippers & Crew, Inc.

Printed Circuit Board Requirements

Description		PO / Job #	Build Qty.
Manufactured PCB Requirements		**All**	**Any**
Prepared By: S. Heimburger	Date: 06/07/12	Checked By: J. Sta Maria	Date: 06/18/12
Checked By: S. Saephan	Date: 06/19/12	Approved By:	Date:
Checked By: E. Guthrie	Date: 06/13/12	Approved By: S. Heimburger	Date: 06/21/12

General Requirements:

1. PCBs manufactured in accordance with IPC-6012. Boards to meet Class 2 requirements unless otherwise stated in customer assembly data.
2. Acceptability of PCBs per IPC-A-600.
3. PCB laminate defined by customer and in accordance with IPC-4101.
4. Surface finish: as stated in customer assembly data. Preferred finish: Sn63A in accordance with J-STD-006 or ENIG in accordance with IPC-4552. HASL not permitted for PCBs with 0402, leaded devices ≤ 0.5mm, BGA/QFN ≤ 0.8mm
5. Use green LPI solder mask unless otherwise stated in customer assembly data.
6. Silkscreen to be used whenever possible but is not to be allowed on any mounting pads.
7. Electrical test per customer assembly data.

PCB Thickness:

1. PCB thickness is dictated by customer assembly data. Preferred PCB thickness is 0.062" +/- 0.005".
2. PCBs of 0.062" to 0.093" +/- 0.005" can be produced without prior approval if all other criteria outlined below are met. All PCBs outside of this thickness range require Schippers Engineering approval prior to manufacture as they may require special panelization and/or fixturing.

PCB Dimensions:

1. Maximum PCB/Panel Size = 18" x 18"
2. Minimum PCB/Panel Size = 3" x 3"
3. Preferred PCB/Panel Size ≈ 5" x 8"
4. Non-rectangular PCBs must be panelized. **All panel designs must be approved by Schippers Engineering prior to manufacture.** See below for panel requirements.

Fiducials

1. All fiducials to be ≈ 0.060" diameter with ≈ 0.090" diameter solder mask clearance.
2. Single PCBs require 3 global fiducials per side.
3. Multiple PCB panels require a minimum of 2 global fiducials per board per side and 3 panel fiducials per side.
4. Clearance of ≥ 0.200" required between edge of long axis of a board and the outer edge of each fiducial.

Edge Clearance Requirements

1. All SMT PCBs/panels will require two opposite side conveyor edges with a minimum clearance to all components and pads of ≥ 0.200". Due to machine board stops, PCB/panels must have a leading edge void of any cutouts, odd shapes, etc. Edge must be flat and perpendicular to conveyor edge.
2. All PTH PCBs/panels will require conveyor edges on all 4 sides with a minimum clearance to all components and pads of ≥ 0.200".
3. If PCB layout does not allow for the required clearance, breakaway process tabs must be used on conveyor edges for SMT and all edges for PTH boards. See "V-Score Requirements" & "Perforated Tab Requirements" below for details.

Panelization Requirements

1. Edge clearances required for all panelized PCBs (see above).
2. Unpanelized PCBs are preferred if the size is appropriate (approximately 5"x 8") and all other criteria are met.
3. If the PCB size requires panelization, board technology, thickness, and edge clearances must be considered.
4. Individual PCB count per panel to be no greater than 50.

Panelization Options (in order of most preferred to least preferred)

1. No panel; minimum and maximum size and edge clearances must be met.
2. V-score; no perforated tabs in v-score lines.
3. Perforated Tabs; no v-scoring through perforated tabs.
4. Combination of V-score & Tabs; contact Schippers Engineering before proceeding with combination method.

V-Score Requirements

1. The following specifications apply to V-Score depaneling for edge clearance and design layout. See Figure 1 for edge clearance and keep outs. See Figure 2 for score line requirements.
2. The array should be designed with the score lines running perpendicular to the long axis (conveyor sides) of the PCB.

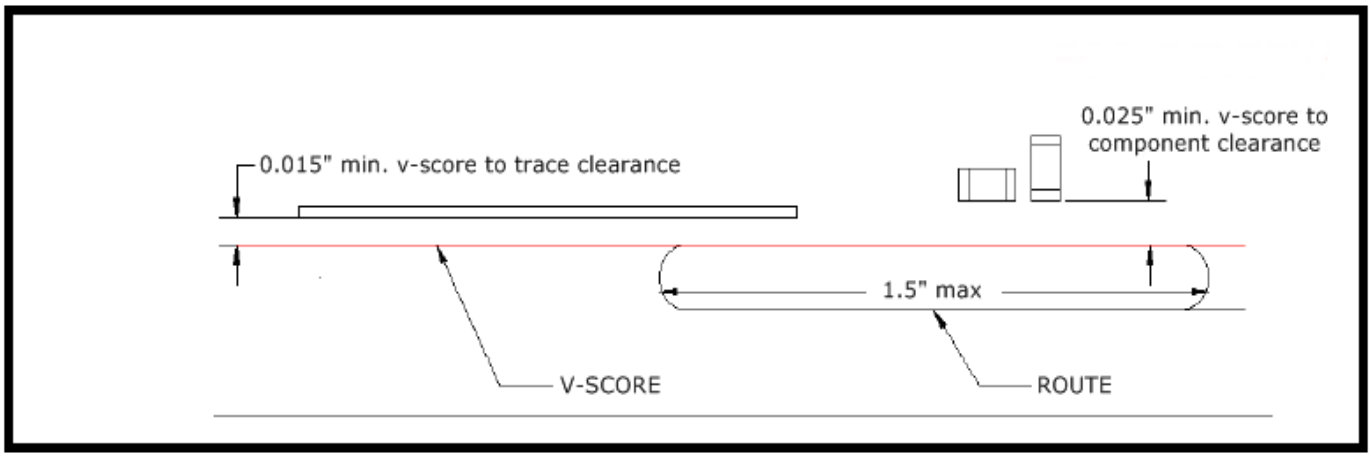

FIGURE 1

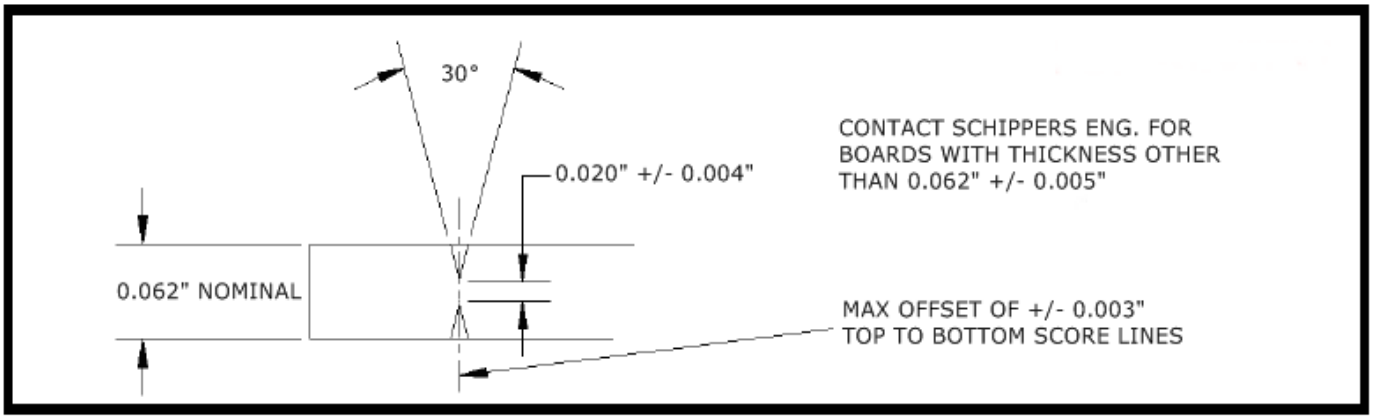

FIGURE 2

Perforated Tab Requirements

1. The following specifications apply to Tab depaneling for edge clearance and design layout. See Figure 3 for edge clearance and keepouts. See Figure 4 for Tab requirements.
2. Typical spacing from Tab to Tab is 3.0 inches, but can vary depending on customer board design.

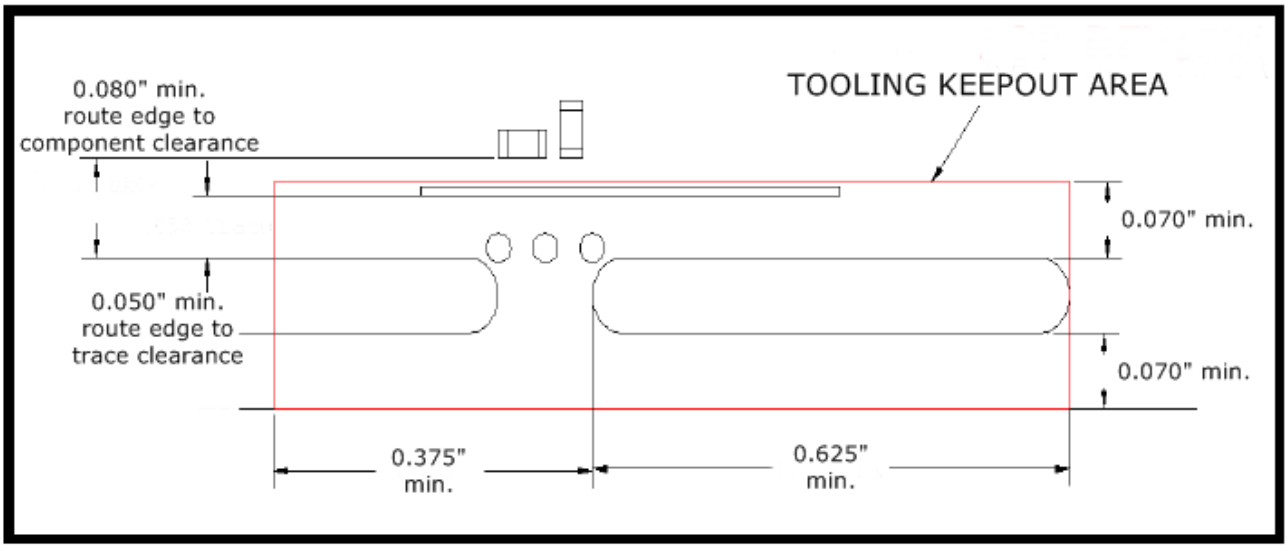

FIGURE 3

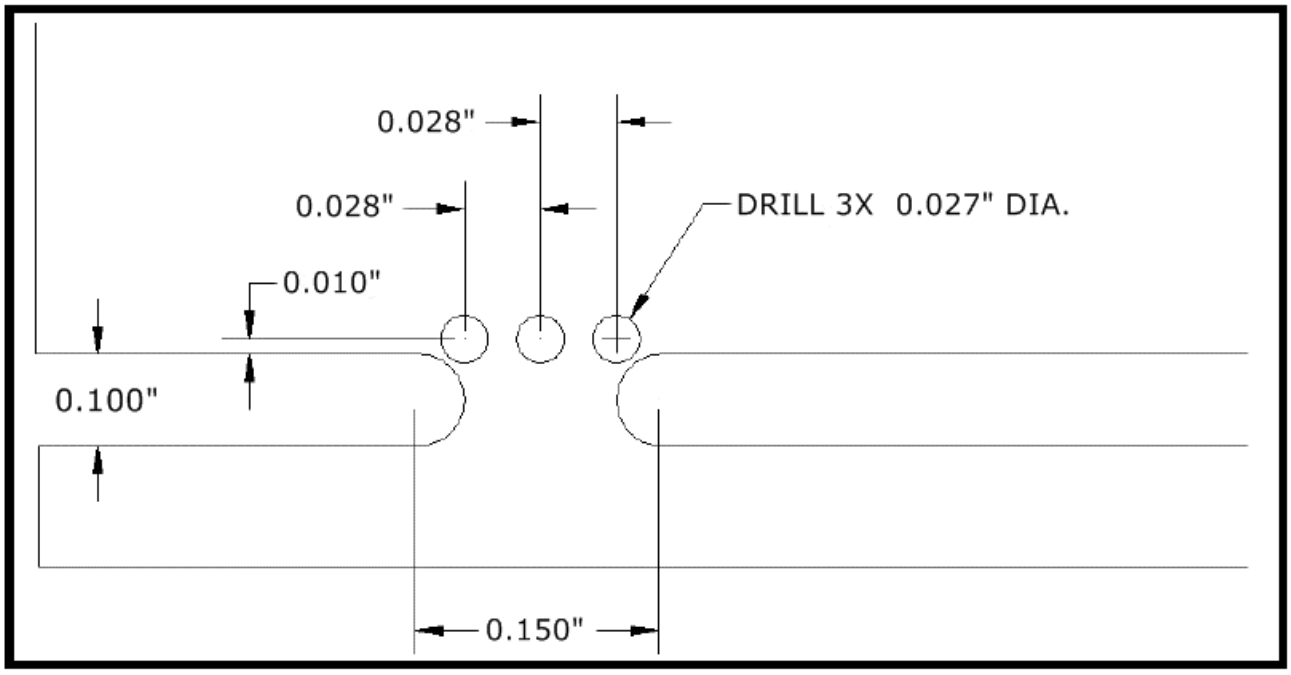

FIGURE 4

Revision History			
REV	DATE	DESCRIPTION	INITIAL
A.0	06/07/12	Released for internal review	SHEIM
A.1	06/19/12	Revised tab spacing/size, Figure 4	SHEIM
A.2	06/21/12	Vendor/customer release	SHEIM
A.3	09/11/13	Updated preferred tab route diameter; less blade breakage	SHEIM