

**NOTE**



All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters [and inches]. Unless otherwise specified, dimensions have a tolerance of  $\pm 0.13$  [ $\pm 0.005$ ] and angles have a tolerance of  $\pm 2^\circ$ . Figures and illustrations are for identification only and are not drawn to scale.

**1. INTRODUCTION**

This specification covers the requirements for application of Hermaphroditic Blade and Receptacle Connectors for use on modular printed circuit (pc) board-to-board Surface Mount Technology (SMT) applications. The connector allows installers to top mount LED lighting pc boards end-to-end as they are fastened to the mounting surface. The connector is available in 2, 4, or 6 positions. See Figure 1.

The connector can mate or unmate horizontally or vertically allowing replacement of center pc boards in a series of pc board strips. The connector can mate around corners, allowing the series of pc board strips to continue around edges. It is hermaphroditic, so the customer only needs to stock a single part number.

A dust cap is also available to protect the last connector in a series of printed circuit (pc) board strips. The dust cap is available in 2, 4, and 6 positions in natural color. The dust cap is intended to be put on after the connector has been soldered on the pc board.

When corresponding with Tyco Electronics Personnel, use the terminology provided in this specification to facilitate your inquiries for information. Basic terms and features of this product are provided in Figure 1.

*Hermaphroditic Blade  
and Receptacle Connector*

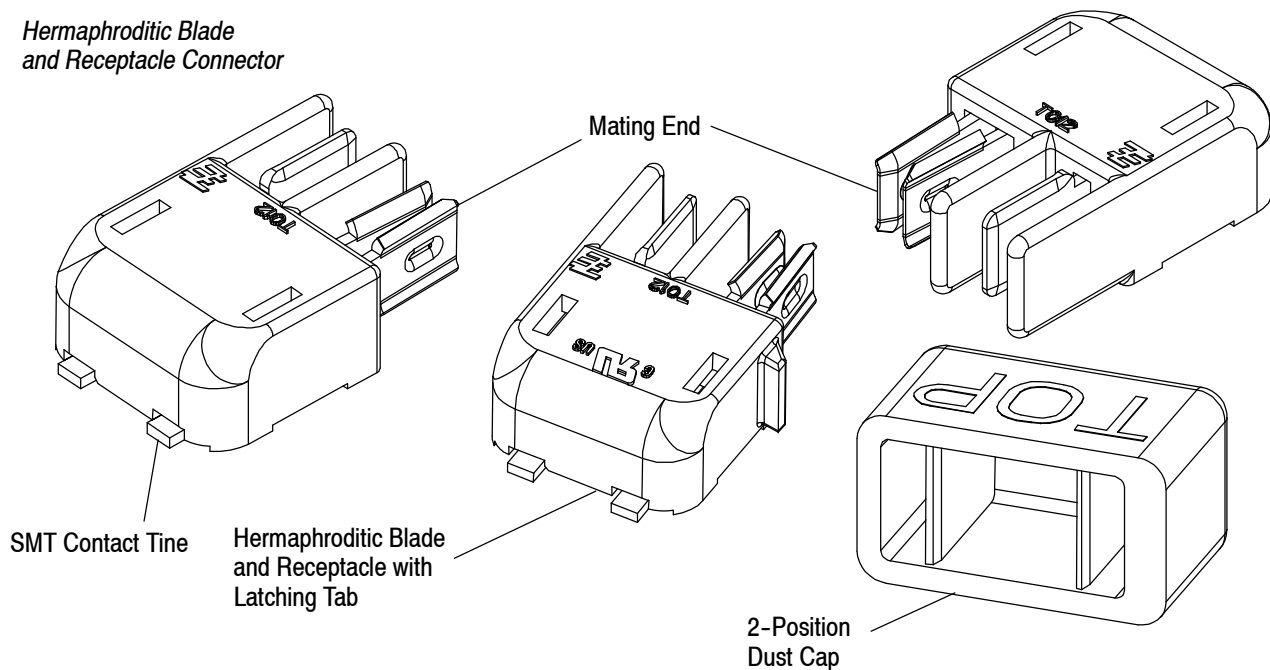


Figure 1

**2. REFERENCE MATERIAL**

**2.1. Revision Summary**

- Updated document to corporate requirements
- Added new text to Paragraph 3.8 and new Figure 10 and renumbered

## 2.2. Customer Assistance

Reference Product Base Part Numbers 1954289 and 2058703, and Product Code L012 are representative of the Hermaphroditic Blade and Receptacle Connector. Use of these numbers will identify the product line and expedite your inquiries through a service network established to help you obtain product and tooling information. Such information can be obtained through a local Tyco Electronics Representative or, after purchase, by calling Product Information at the number at the bottom of this page.

## 2.3. Drawings

Customer Drawings for product part numbers are available from the service network. If there is a conflict between the information contained in the Customer Drawings and this specification or with any other technical documentation supplied, call the Product Information number at the bottom of this page.

## 2.4. Manuals

Manual 402-40 is available from the service network. This manual provides information on various flux types and characteristics along with the commercial designation and flux removal procedures. A checklist is included in the manual as required for information on soldering problems.

## 3. REQUIREMENTS

### 3.1. Safety

Do not stack product shipping containers so high that the containers buckle or deform.

### 3.2. Limitations

The connectors are designed to operate in a temperature range of  $-40^{\circ}$  to  $105^{\circ}\text{C}$  [ $-40^{\circ}$  to  $221^{\circ}\text{F}$ ].

### 3.3. Material

The contacts are made of tin-plated phosphor bronze, and the housing is made from UL 94V-0 rated LCP. The dust cap is made from 94V-0, glass fiber reinforced PBT.

### 3.4. Storage

#### A. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the connector material.

#### B. Shelf Life

The connectors should remain in the shipping containers until ready for use to prevent deformation. The connectors should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance.

#### C. Chemical Exposure

Do not store connectors near any chemical listed below as they may cause stress corrosion cracking in the contacts.

Alkalies	Ammonia	Citrates	Phosphates	Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur	Nitrites	Tartrates

### 3.5. PC Board

#### A. Material and Thickness

Common pc board materials may be used such as glass epoxy (FR-4 or G-10), Aluminum-clad pc boards and flex circuits. The pc board thickness may vary to suit the end use thickness.

#### B. Tolerance

Maximum allowable bow of the pc board shall be 0.10 mm [.004 in.] over the length of the connector.



*Since the connector housings may rest on top of the solder mask, an excessively high mask will allow too much space between the solder tine and pad for a good solder joint. A solder joint under these conditions would be weak, and would not provide long-term performance for the connector.*

**C. Pads**

The pc board circuit pads must be solderable in accordance with Test Specification 109-11 (Test Method A, non-activated rosin flux).

**D. Layout**

The pc board layout must be designed using the dimensions provided on the customer drawing for the specific connector. The recommended pc board layout is shown in Figure 2.

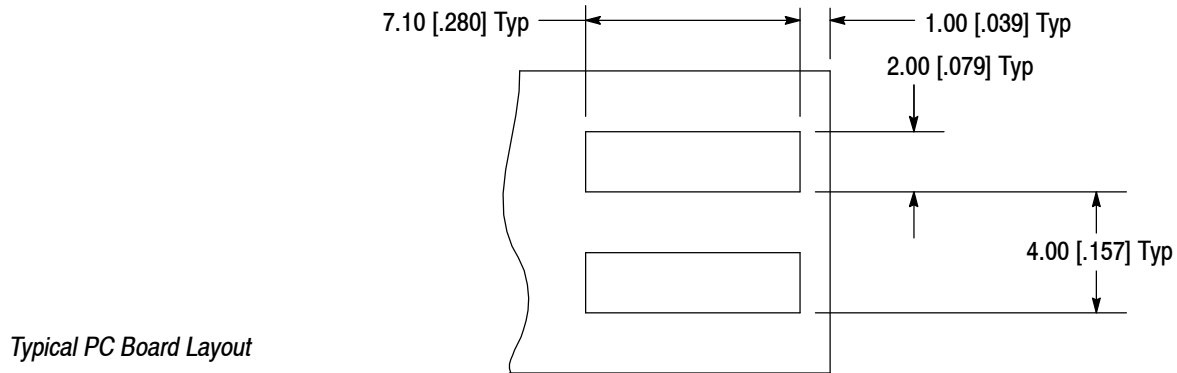


Figure 2

**3.6. Connector Placement**

This product is packaged in SMT tape and reel packaging per ANSI/EIA Std 481-B. Robotic/gripper placement requires total equipment accuracy of 0.25 mm [.010 in.] to locate the connector for insertion. This includes gripper and fixture tolerances, as well as equipment repeatability. Insertion location will be programmed by a simple pantograph/template system or software package. Optimally, the contact solder tines should be centered on the pc board pads. However, slight misalignment is permissible for the performance classifications specified in Association of Connecting Electronics Industries (IPC)-S-815, "General Requirements for Soldering Electronic Interconnection." See Figure 3.

Figure 3B shows the permissible misalignment between the connector face and pc board edge. This alignment is important to ensure that the latch in the wire-to-board connector engages with the latching tab in the hermaphroditic blade and receptacle connector.

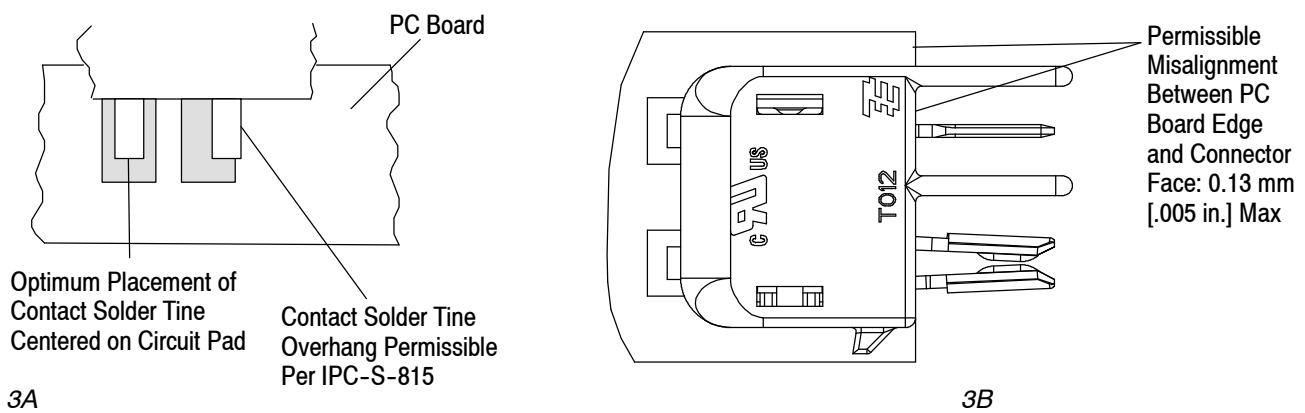


Figure 3

**3.7. Soldering**

Observe guidelines and procedures when soldering contacts. Solder, clean, and dry all leads to contacts according to the following. The connectors should be soldered using vapor phase reflow (VPR), double-sided, non-focused infrared (IR), forced air convection, or equivalent soldering techniques. All solder joints should conform to the Workmanship Specification 101-21 and IPC-S-815.

## A. Flux Selection

Contacts must be fluxed prior to soldering with a mildly active, rosin base flux. Selection of the flux will depend on the type of pc board and other components mounted on the board. Additionally, the flux must be compatible with the wave solder line, manufacturing, health, and safety requirements. Flux that is compatible with the connectors is provided in Figure 4.

FLUX TYPE	ACTIVITY	RESIDUE	COMMERCIAL DESIGNATION	
			KESTER	ALPHA
Type RMA (Mildly Activated)	Mild	Noncorrosive	185/197	611

Figure 4

## B. Connectors with SMT Contacts

### 1. Solderability

The pc board pads must be solderable in accordance with Test Specification 109-11 (Test Method A, non-activated rosin flux) and all other requirements for surface mount contacts specified in this document.

### 2. Solder Paste Characteristics

- a. Alloy type shall be SAC 305; Sn 96.5/Ag 3.0/Cu 0.5
- b. Flux incorporated in the paste shall be rosin, mildly active (RMA) type.
- c. Paste will be at least 80% solids by volume.
- d. Mesh designation -200 to +325 (74 to 44 square micron openings, respectively).
- e. Minimum viscosity of screen print shall be  $5 \times 10\%$  cp (centipoise).
- f. Minimum viscosity of stencil print shall be  $7.5 \times 10\%$  cp (centipoise).

### 3. Solder Volume

#### NOTE

Solder paste volumes are required as follows (calculated per 50% solids content). Paste volume may vary depending on the composition.



Solder volume for each Hermaphroditic Blade and Receptacle Connector must be according to the following:

1.75 mm<sup>3</sup> [.0001068 in<sup>3</sup>] per contact solder tine

### 4. Stencil

The stencil aperture shall be determined by the circuit pad size and stencil thickness. It may be any shape as long as it prevents solder bridging from one pad to another. Generally, the thinner stencil will need a larger aperture to maintain the given volume of solder paste. See Figure 5.

#### NOTE

The recommended stencil thickness is 0.13 mm [.005 in.] minimum.



#### NOTE

The stencil layouts illustrated apply to the top (connector) side (unless otherwise noted) of the pc board. For any other variations, refer to the pc board mounting configurations on the appropriate customer drawing to determine modifications necessary to the solder stencils in Figure 5.





All traces must be covered by solder mask in the solder deposit area. Exposed traces could cause bridging and create a short, or wick solder away from the solder tines, producing a weak solder joint.



If a hold-down aperture is required other than that specified, the design must ensure that the connector housing will not sit on the solder deposit.

Typical Stencil Layout

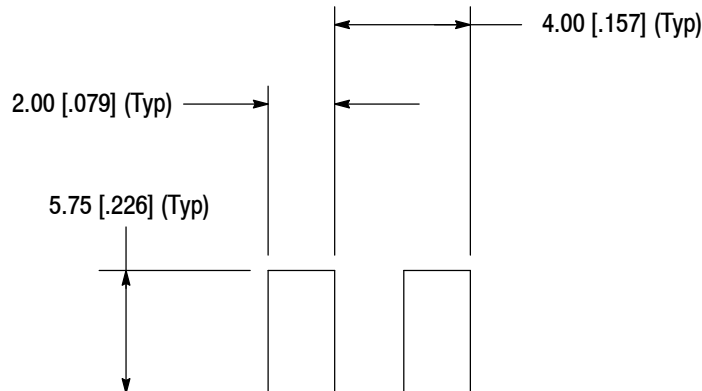


Figure 5

### 5. Solder Mask

Solder mask is recommended between all pads when soldering connectors with surface mount contacts to minimize solder bridging between pads. The mask must not exceed the height of the pad by more than 0.05 mm [.002 in.]. If a trace is run between adjacent pads on the solder side of the pc board, a solder mask must be applied over the trace to prevent bridging and wicking of solder away from the contact solder tines. Those most suitable are Liquid Photo Imageable and Dry Film.



Since the connector may rest on top of the solder mask, an excessively high mask will allow too much space between the lead and pad for a good solder joint. A solder joint under these conditions would be weak and would not provide long-term performance for the connector.

### 6. Process

Connectors with surface mount contacts should be soldered using vapor phase (VPR), double-sided, non-focused infrared reflow (IR) or equivalent soldering techniques. Due to many variables involved with the reflow process (i.e., component density, orientation, etc.), it is recommended that trial runs be conducted under actual manufacturing conditions to ensure product and process compatibility. These connectors will withstand the temperature and exposure time specified in Figure 6.

SOLDERING PROCESS	TEMPERATURE (Max)	TIME (At Max Temperature)
IR	260°C [468°F]	10 Seconds

Figure 6

The lead-free reflow profile is shown in Figure 7.

**Kester Lead-Free Reflow Profile**  
**Alloys: Sn96.5/Ag3.0/Cu0.5 and Sn96.5/Ag3.5**

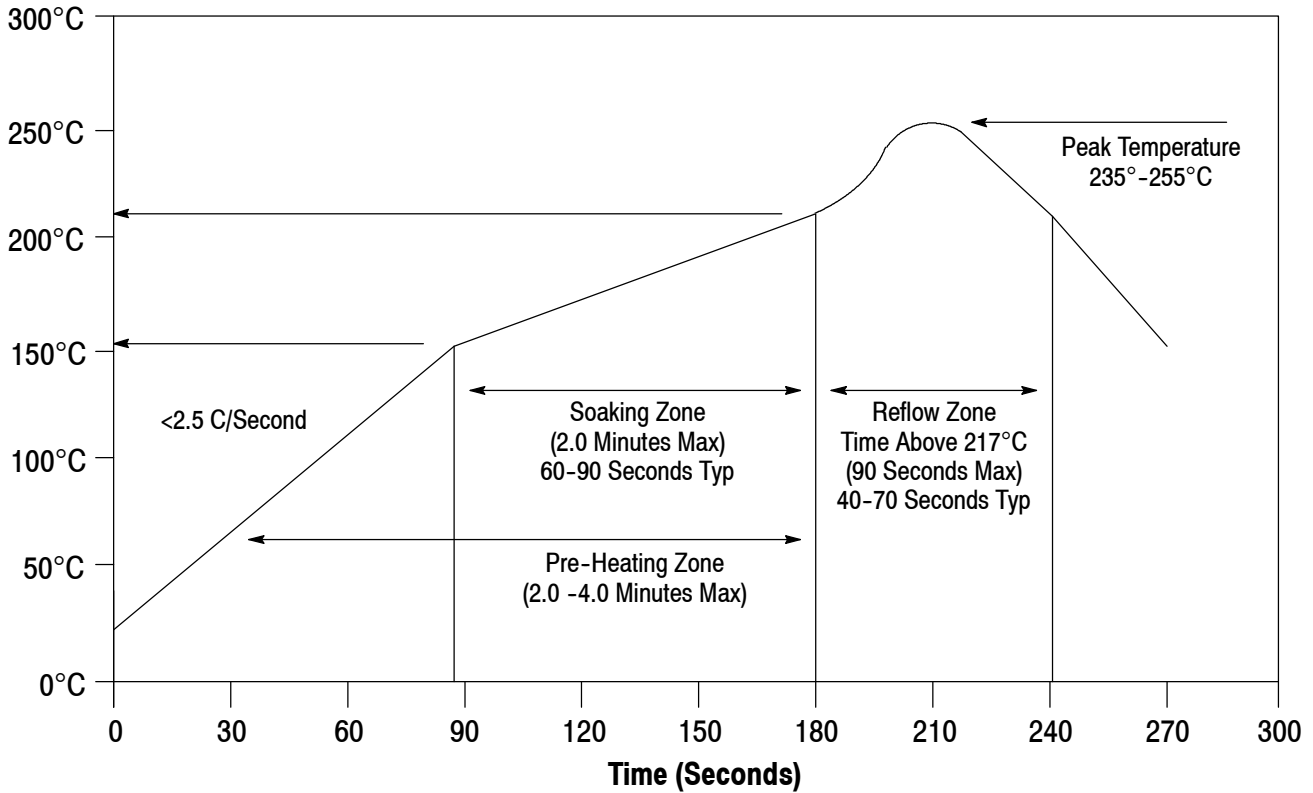


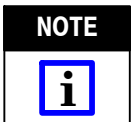
Figure 7

**C. Cleaning**

After soldering, removal of fluxes, residues, and activators is necessary. Consult with the supplier of the solder and flux for recommended cleaning solvents. Common cleaning solvents that will not affect the connectors or assemblies for the times and temperatures provided without any adverse effects on the connector assembly are listed in Figure 8.



*Consideration must be given to toxicity and other safety requirements recommended by the solvent manufacturer. Trichloroethylene and Methylene Chloride can be used with no harmful affect to the connectors; however, Tyco Electronics does not recommend them because of the harmful occupational and environmental effects. Both are carcinogenic (cancer-causing) and Trichloroethylene is harmful to the earth's ozone layer.*



*If you have a particular solvent that is not listed, contact Tyco Electronics Tooling Assistance Center or Product Information at the number on the bottom of page 1.*

CLEANER		TIME (Minutes)	TEMPERATURES (Maximum)	
NAME	TYPE		CELSIUS	FAHRENHEIT
ALPHA 2110	Aqueous	1	132	270
BIOACT EC-7	Solvent	5	100	212
BUTYL CARBITOL	Solvent	1	Room Ambient	
Isopropyl Alcohol	Solvent	5	100	212
KESTER 5778	Aqueous	5	100	212
KESTER 5779	Aqueous	5	100	212
LONCOTERGE 520	Aqueous	5	100	212
LONCOTERGE 530	Aqueous	5	100	212
Terpene Solvent	Solvent	5	100	212

Figure 8

**D. Drying**



Excessive temperatures may cause housing and plating degradation.

When drying cleaned assemblies and pc boards, temperatures to which the connectors are subject should not exceed 220°C [492°F] for more than 3 minutes.

**3.8. Alignment**

Proper alignment is essential to ensure full engagement of mating connectors and also to ensure the contacts are not bent or otherwise damaged during mating and unmating. For alignment tolerances, see Figure 9.

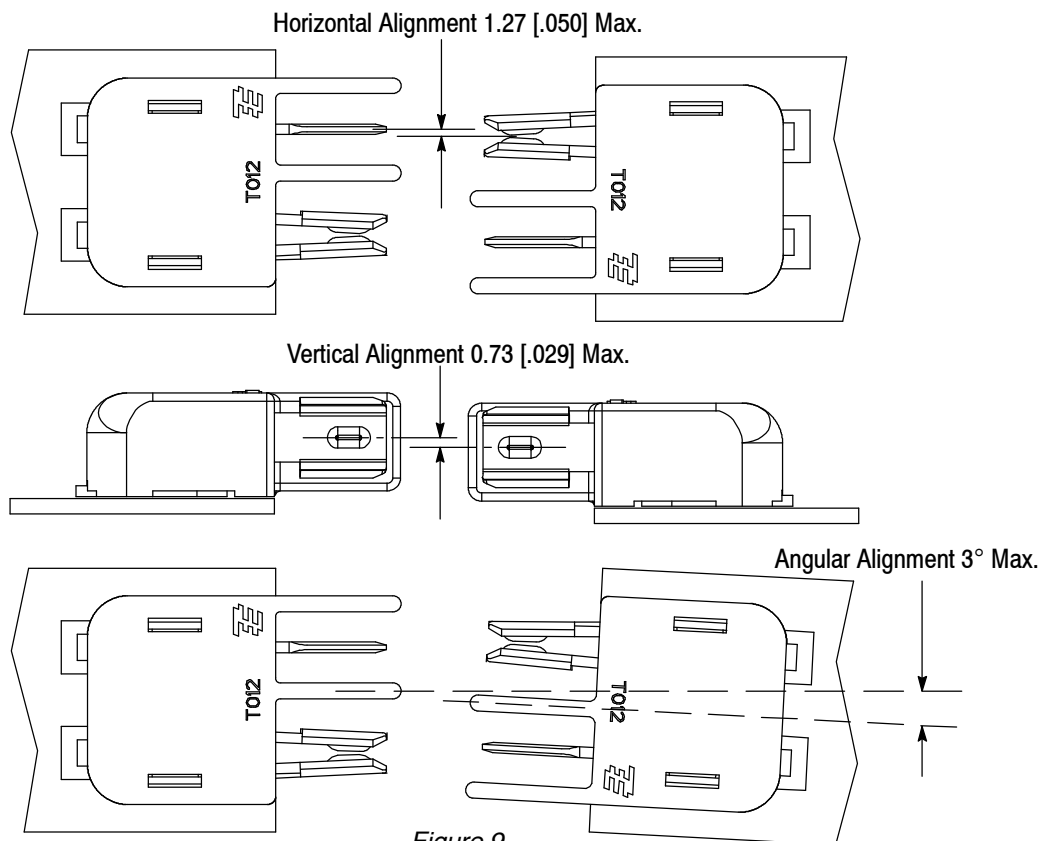


Figure 9

Figure 10 provides the maximum distance between the connector faces.

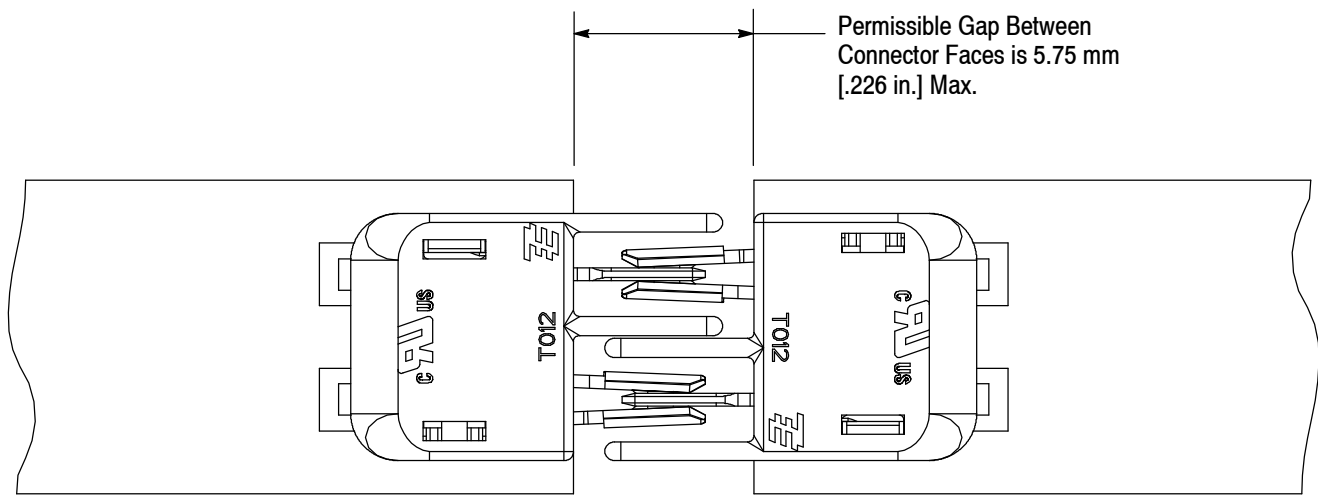


Figure 10

### 3.9. Checking Installed Connector

All solder joints should comply with Tyco Electronics Workmanship Specification 101-21. For typical fillets for surface mount time requirements, refer to Figure 11.

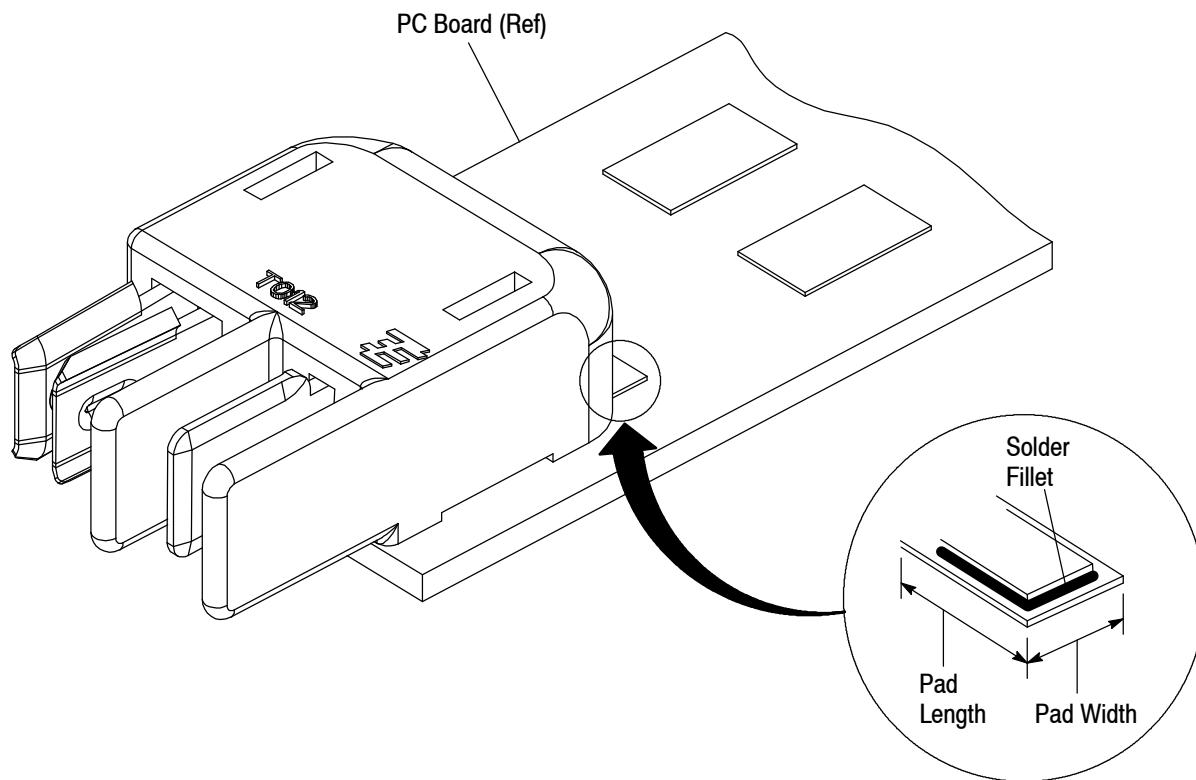


Figure 11



### 3.10. Aligning and Applying the Dust Cap

Figure 12 shows the alignment of placing the dust cap on the blade and receptacle connector.

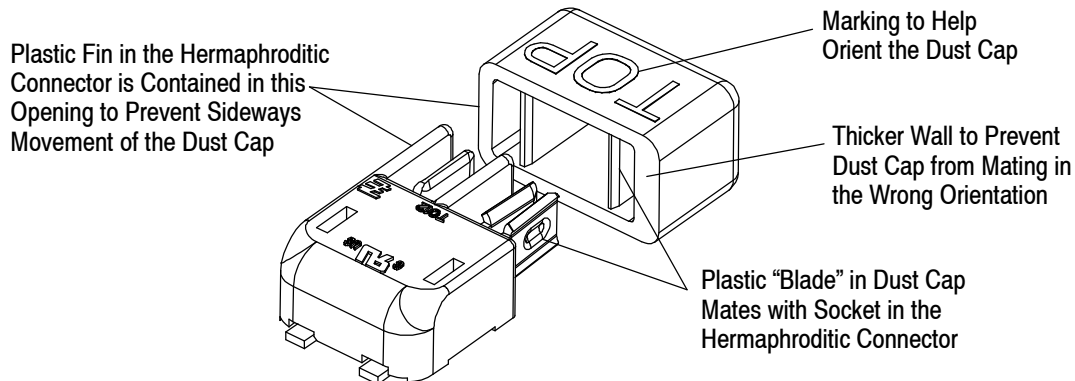


Figure 12

### 3.11. Removal and Repair



*Damaged product should not be used. If a damaged product is evident, it should be removed from the pc board and replaced with a new one. Removal of the Hermaphroditic Blade and Receptacle Connector from the pc board may be done by standard de-soldering methods.*

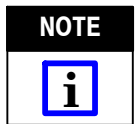
## 4. QUALIFICATIONS

Hermaphroditic Blade and Receptacle Connectors are Underwriters Laboratories, Inc. (UL) / CSA International Component Recognized in File E28476 and Volume 67.

## 5. TOOLING

### 5.1. Robotic Equipment

The robotic equipment must have a true position accuracy tolerance of 0.25 mm [.010 in.] to properly locate the connectors. This includes gripper and fixture tolerances as well as equipment repeatability.



*Automatic machine placement is recommended for connectors instead of manual placement with surface mount contacts.*

### 5.2. PC Board Support

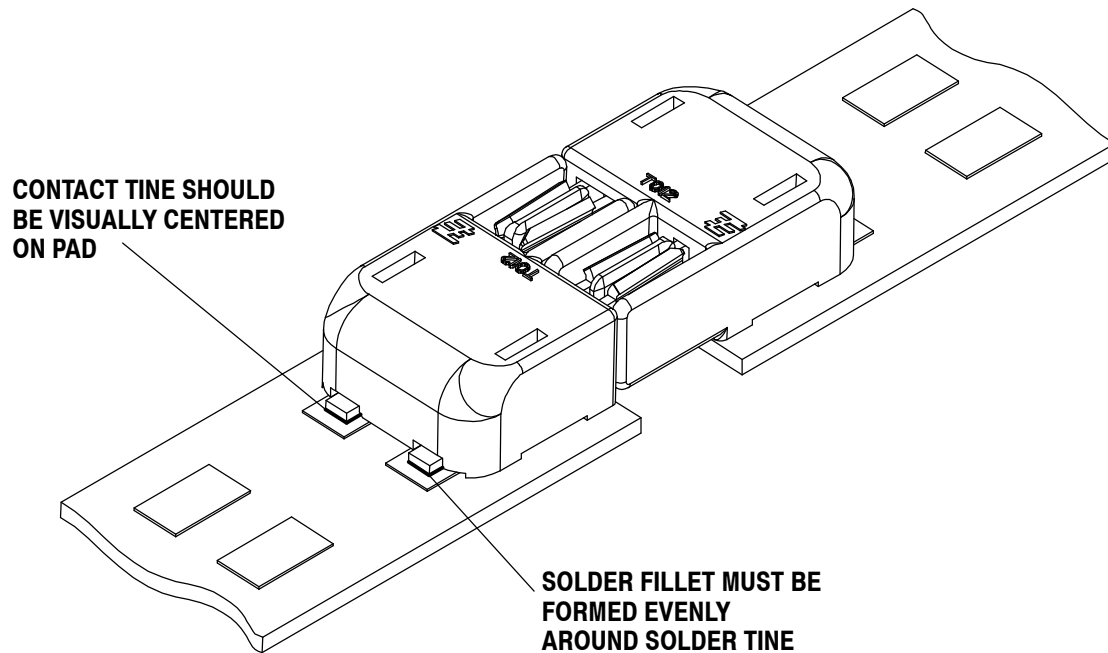
For automatic machine placement, a pc board support must be used to prevent bowing of the pc board during the placement of connectors. It should have flat surfaces with holes or a channel large enough and deep enough to receive any protruding components. The pc board support must be customer made.

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**6. VISUAL AID**

Figure 13 shows a typical application of a Hermaphroditic Blade and Receptacle Connector. This illustration should be used by production personnel to ensure a correctly applied product. Applications which DO NOT appear correct should be inspected using the information in the preceding pages of this specification and in the instructional material shipped with the product or tooling.

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**FIGURE 13. VISUAL AID**