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Transition Socket Specification

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Transition Socket Specification

INTRODUCTION

Transition sockets are products that allow header boards (for next generation in-circuit emulators or in-circuit debuggers) or device adapters (for the MPLAB ICE 2000 in-circuit emulator) to interface to sockets on target applications.

Typically, header boards or device adapters have connectors that match development cycle device formats, such as DIP or PLCC. However, target sockets will match compact production device formats, such as SOIC, SSOP, QFP, or QFN. The solution is transition sockets. A transition socket is specifically designed to provide compatibility between two differing types of IC package formats.

Transition sockets are typically composed of two parts: the adapter socket and the adapter header. The adapter socket is designed to plug into the header board or device adapter on one side, and the adapter header on the other. The adapter header is then soldered down to the target application.

WHY SHOULD I USE TRANSITION SOCKETS IN MY PRODUCT DESIGN?

There are two very significant advantages to using transition sockets:

1. Shorter product development cycle
2. Reduced expense in the design, layout and prototype testing

A typical product design cycle has two important phases: the prototype design phase and the production design phase. Traditionally, these phases were different simply because the prototype used a microcontroller with a different package type. However, with the availability of the transition sockets, the prototype design can be identical to the production design because a transition socket can be used to bridge microcontroller package differences.

WHAT TRANSITION SOCKETS ARE CURRENTLY AVAILABLE?

Microchip Technology currently offers the transition sockets listed in the “Table of Contents” following this introductory section.

Use the on-line Development Tools Selector (DTS) to find the transition sockets available for each header board or for each device adapter. For more on header boards or device adapters, see:

- *Header Board Specification* (DS51292)
- *MPLAB® ICE 2000 Processor Module and Device Adapter Specification* (DS51140)
- *MPLAB® ICE 4000 Processor Module and Device Adapter Specification* (DS51298)

Please see the Microchip web site (www.microchip.com) for the DTS and most current version of all documents.

HOW CAN I OBTAIN MAXIMUM BENEFIT FROM THE USE OF TRANSITION SOCKETS?

Attention to component placement should be considered to provide adequate clearance for the transition socket interface to the PCB footprint. This is especially true for any tall components such as connector headers, radial components or voltage regulators. Refer to the transition socket mechanical drawings for dimensions.

TRANSITION SOCKET APPLICATIONS – COMMENTS AND SUGGESTIONS

Attention to component placement should be considered in mating the adapter sockets to the SOIC/SSOP headers.

The placement of vias around the Surface Mount Technology (SMT) layout area should be examined. Vias immediately adjacent to the end of a SMT pad may inadvertently come into contact with the header leads. Vias should be placed along the center line of the SMT pad to lessen the chance of pin-to-pin shorts while soldering.

Care should be taken when soldering some transition sockets to target boards. See the releated section for specific instructions.

For information on packaging dimensions, please refer to the *Packaging Specification* (DS00049).

GLOSSARY

Terms used in this document:

DFN – Dual Flat No lead

DIP – Dual In-line Package

MQFP – Metric Quad Flat Pack

PDIP – Plastic Dual In-line Package

PLCC – Plastic Leaded Chip Carrier

QFN – Quad Flat No lead

QFP – Quad Flat Pack

SOIC – Small Outline IC

SOT – Small Outline Transistor

SSOP – Shrink Small Outline Package

TQFP – Thin Quad Flat Pack

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Discontinued Sockets

PDIP Transition Socket

SOIC Transition Socket

SSOP Transition Socket

PLCC Transition Socket

QFP Transition Socket

Transition Socket Specification

SOT/DFN/QFN Transition Sockets

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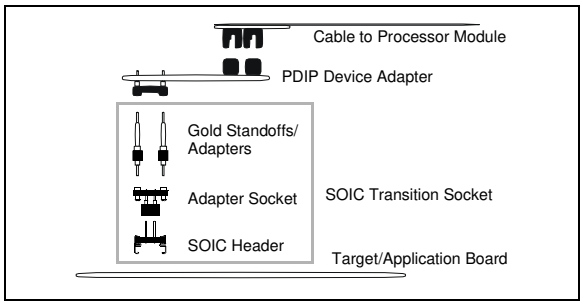
CURRENT SOCKETS

The transition sockets in this section are currently available from Microchip.

SOIC TRANSITION SOCKET

An SOIC transition socket and associated hardware is shown in Figure 1.

FIGURE 1: SOIC TRANSITION SOCKET



There are two components of the SOIC transition socket::

1. Adapter socket that connects to the DIP device adapter
2. SOIC header that is to be soldered down to the target application

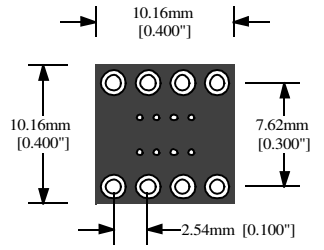
Microchip offers the following SOIC transition sockets:

- XLT08SO-1: One 8-lead DIP adapter socket and one 8-lead SOIC header (5.28mm body size)
- XLT08SN-1: One 8-lead DIP adapter socket and one 8-lead SOIC header (3.9mm body size)
- XLT14SO-1: One 14-lead DIP adapter socket and one 14-lead SOIC header
- XLT18SO-1: One 18-lead DIP adapter socket and one 18-lead SOIC header
- XLT20SO1-1: One 20-lead DIP adapter socket and one 20-lead SOIC header
- XLT28SO-1: One 28-lead DIP adapter socket and one 28-lead SOIC header

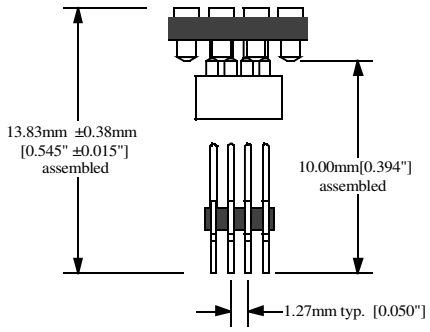
See the drawings in this section for layout dimensions.

XLT08SO-1

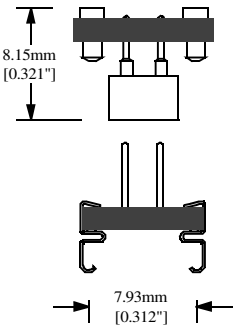
8-lead DIP to 8-lead SOIC



Top View



Side View



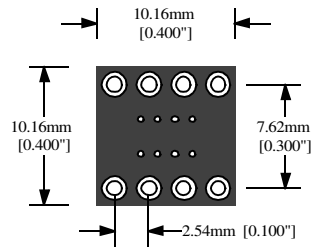
End View

Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

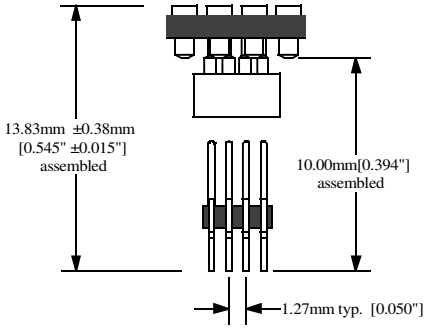
Transition Socket Specification

XLT08SN-1

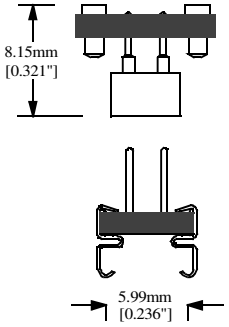
8-lead DIP to 8-lead SOIC (Narrow)



Top View



Side View

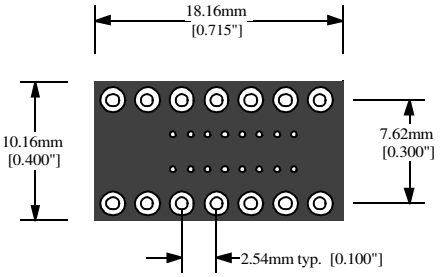


End View

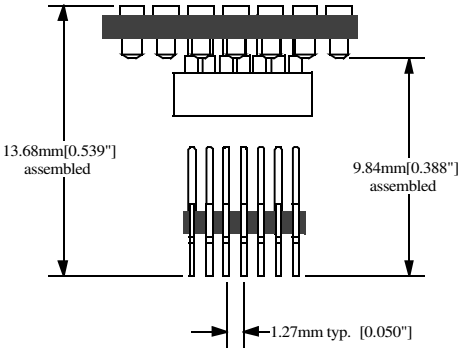
Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

XLT14SO-1

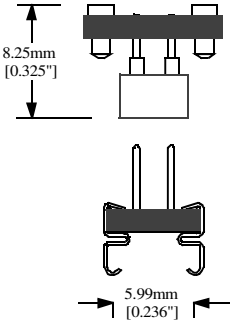
14-lead DIP to 14-lead SOIC



Top View



Side View



End View

Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

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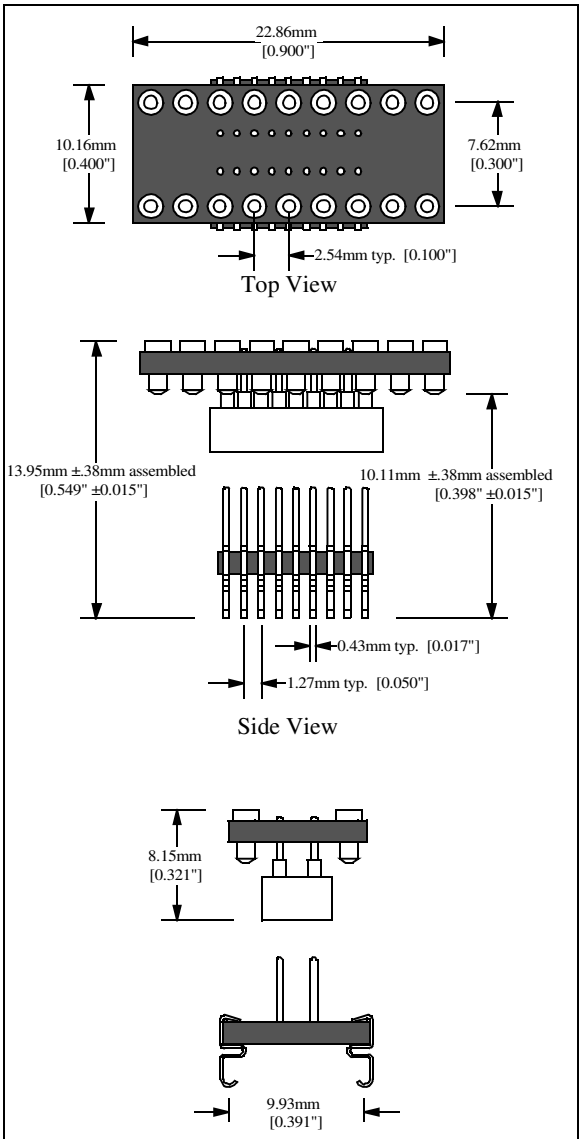
XLT18SO-1

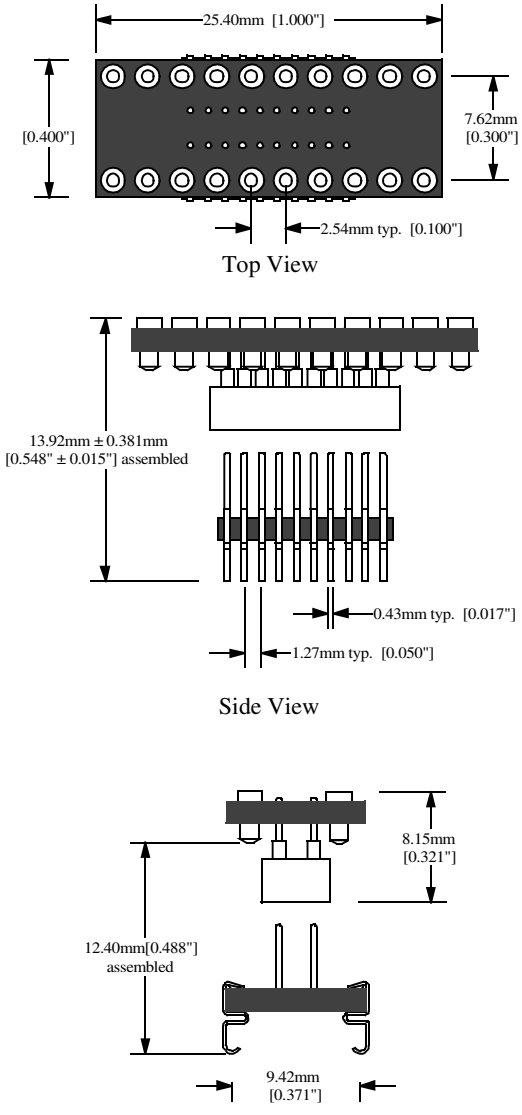
18-lead DIP to 18-lead SOIC



Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

XLT20SO1-1

20-lead DIP to 20-lead SOIC



Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

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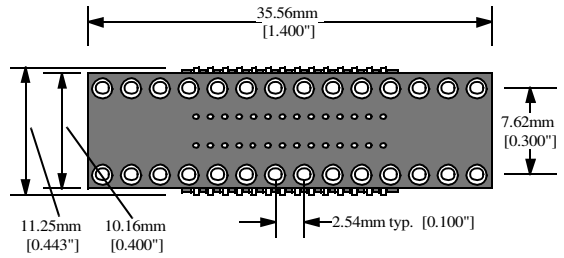
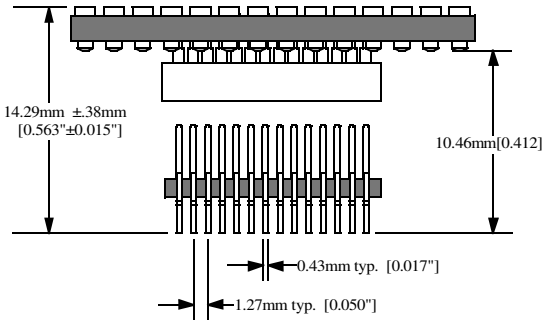
XLT28SO-1

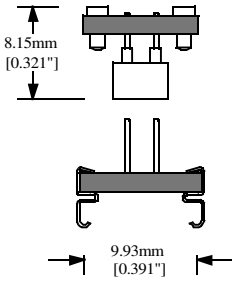
28-lead DIP to 28-lead SOIC



Top View



Side View



End View

Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

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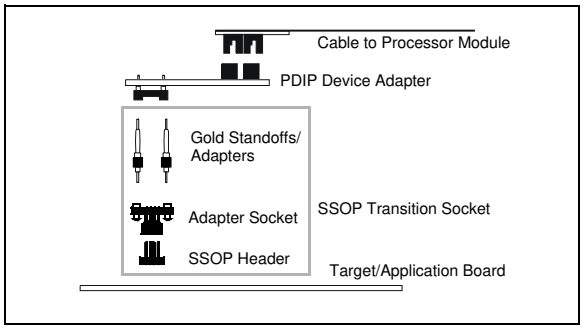
SSOP TRANSITION SOCKET

An SSOP transition socket and associated hardware is shown in Figure 2.

FIGURE 2: SSOP TRANSITION SOCKET



The SSOP transition sockets are similar to the SOIC transition sockets. There are two parts to the SSOP transition socket:

1. Adapter socket that connects to the DIP device adapter.
2. SSOP header that gets soldered down to the target application.

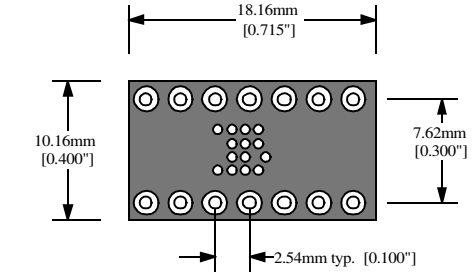
Microchip offers the following SSOP transition sockets:

- XLT14SS-1: One 14-lead DIP adapter socket and one 14-lead SSOP header
- XLT20SS-1: One 18-lead DIP adapter socket and one 20-lead SSOP header
- XLT20SS1-1: One 20-lead DIP adapter socket and one 20-lead SSOP header
- XLT28SS-1: One 28-lead DIP adapter socket and one 28-lead SSOP header
- XLT28SS2-1: One 28-lead DIP adapter socket and one 28-lead SSOP header (PIC16X55/57)

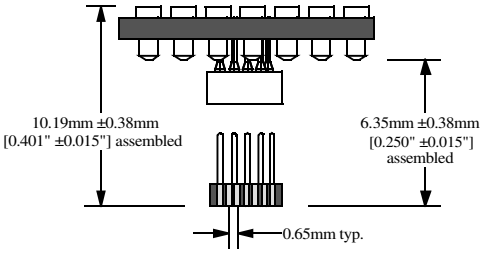
See the drawings in this section for layout dimensions and clearances for tall components.

XLT14SS-1

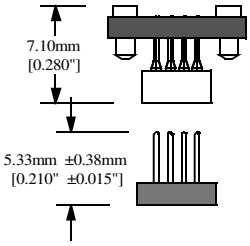
14-lead DIP to 14-lead SSOP



Top View



Side View



End View

Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

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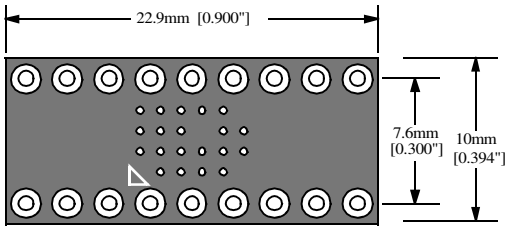
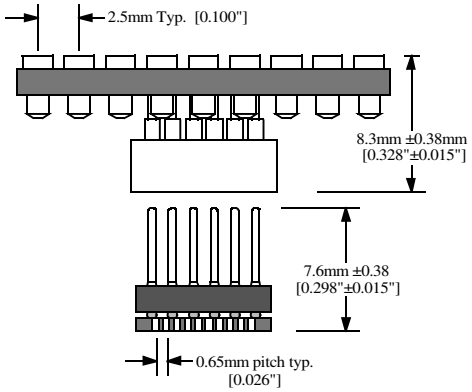
XLT20SS-1

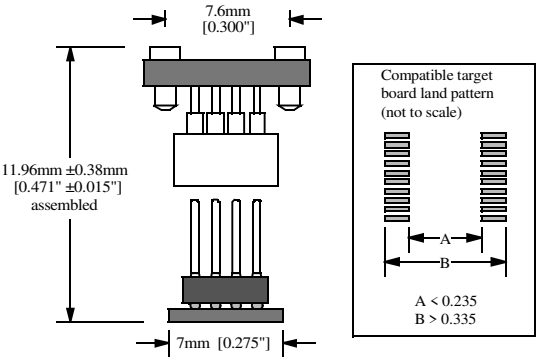
18-lead DIP to 20-lead SSOP



Top View



Side View

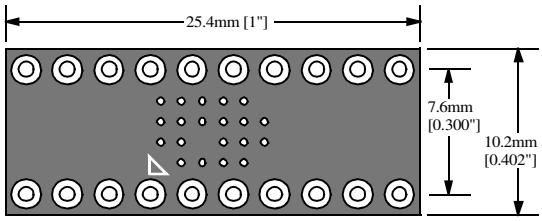


End View

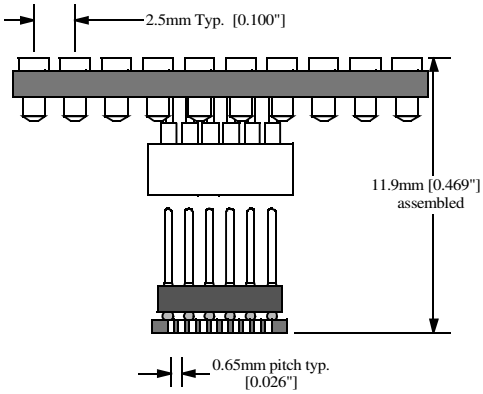
Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

XLT20SS1-1

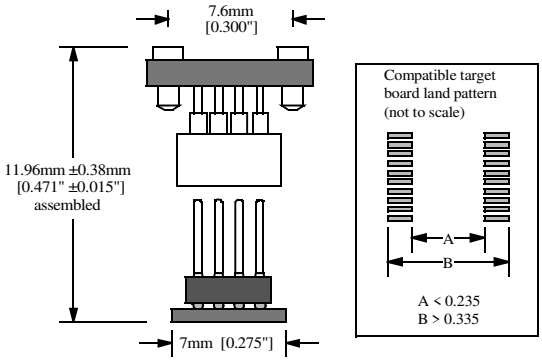
20-lead DIP to 20-lead SSOP



Top View



Side View



End View

Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

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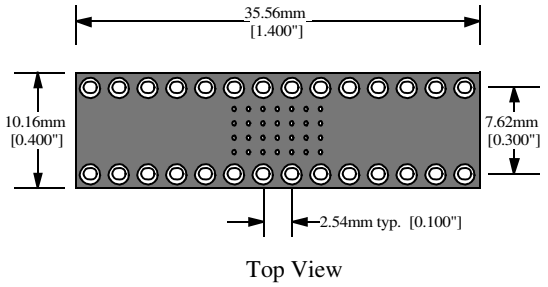
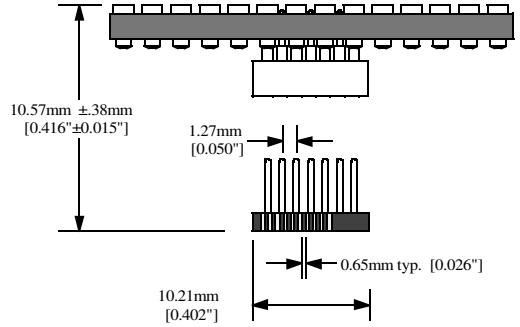
XLT28SS-1

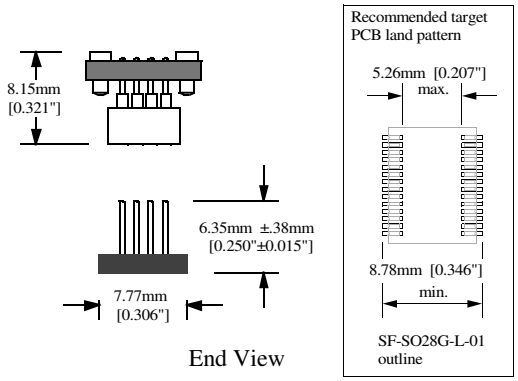
28-lead DIP to 28-lead SSOP



Top View



Side View

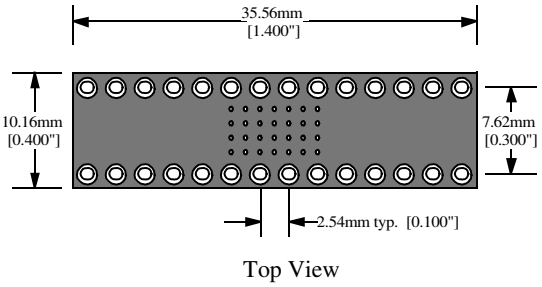


End View

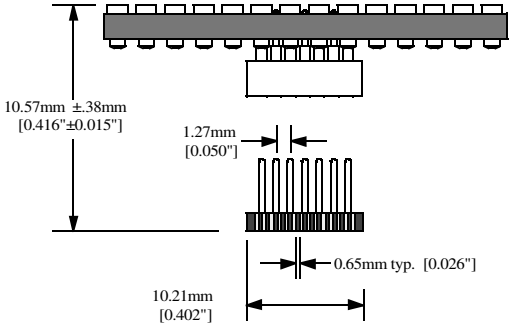
Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

XLT28SS2-1

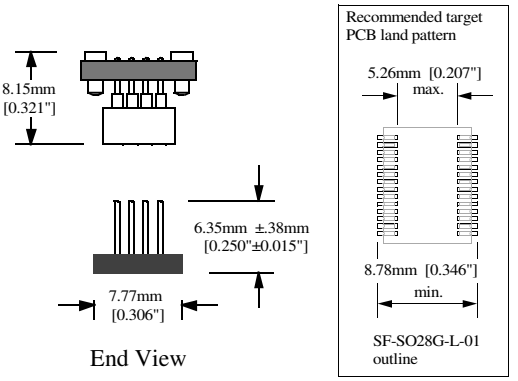
28-lead DIP to 28-lead SSOP (PIC16X55/57)



Top View



Side View



End View

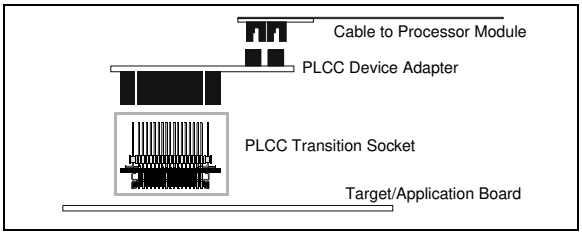
Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

Transition Socket Specification

PLCC TRANSITION SOCKET

A PLCC transition socket and associated hardware is shown in Figure 3.

FIGURE 3: PLCC TRANSITION SOCKET



The PLCC transition socket is required for use along with the PLCC device adapters. The DAF18-1 device adapter is equipped with eight socket strips that interface with one of two transition sockets. The DAF18-3 device adapter is equipped with four socket strips that interface with one transition socket.

The PLCC transition sockets are designed with a threaded insert in the center of the footprint so that a 4/40 screw can securely fasten the transition socket to the device adapter.

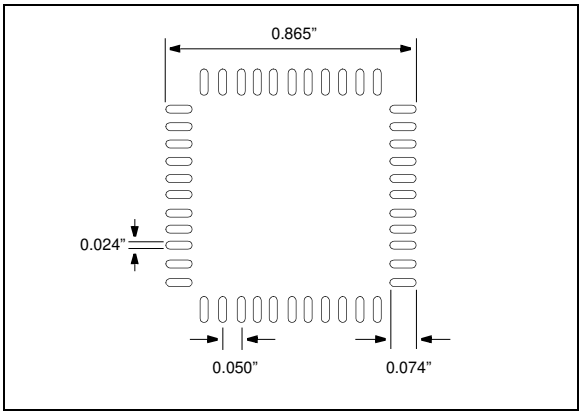
The PLCC transition sockets are designed to be soldered to the target PCB PLCC surface mount pattern or inserted into a PLCC socket on the target PCB.

Note:	To avoid solder bridging, do not place vias within 0.025-inch of the PLCC footprint. Also, any vias near the PLCC should be directly on the centerline of the pad.

Microchip offers the following PLCC transition sockets:

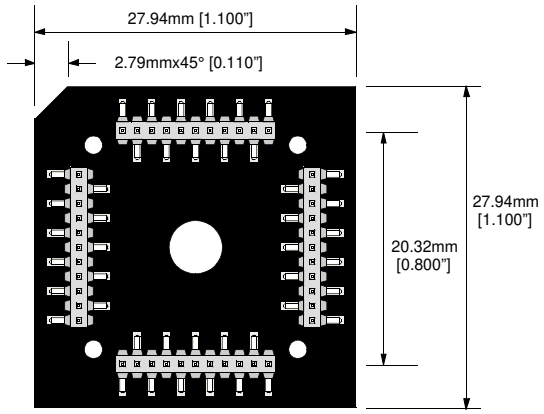
- XLT44L2: One 44-lead PLCC transition socket

RECOMMENDED PCB LAYOUT



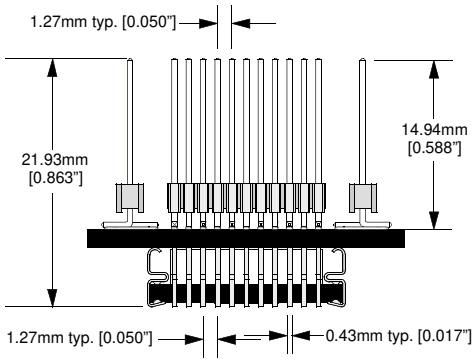
XLT44L2

44-lead PLCC (0.050”)



TOP VIEW

***Caution:** Pin 1 on the device adapter side (top of socket) is 180 degrees from pin 1 on the target side (bottom of socket).



FRONT/SIDE
VIEW

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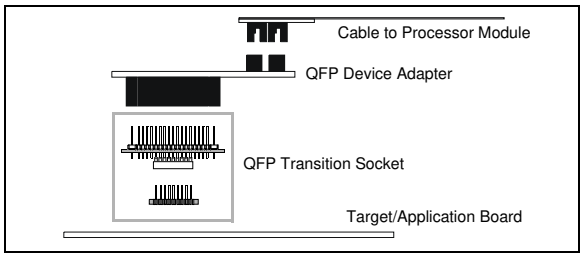
QFP TRANSITION SOCKET

QFP (MQFP, TQFP, PQFP) transition sockets and associated hardware are shown below.

FIGURE 4: QFP TRANSITION SOCKET



The QFP transition socket is required for use along with the QFP device adapter. The device adapter is equipped with four socket strips that interface with the transition socket.

Note:	To avoid solder bridging, do not place vias within 0.025-inch of the QFP footprint. Also, any vias near the QFP should be directly on the centerline of the pad.

There are two parts to the QFP transition socket:

1. Adapter socket that connects to the QFP device adapter
2. QFP header that gets soldered down to the target application

Microchip offers the following QFP transition sockets:

- XLT44PT3: One 44-lead QFP adapter socket and one 44-lead QFP header (0.8 mm)
- XLT64PT5: One 64-lead QFP adapter socket and one 64-lead QFP header (0.5 mm)
- XLT80PT2: One 80-lead QFP adapter socket and one 80-lead QFP header (0.65 mm)
- XLT80PT3: One 80-lead QFP adapter socket and one 80-lead QFP header (0.5 mm)

See the drawings in this section for layout dimensions and clearances for tall components.

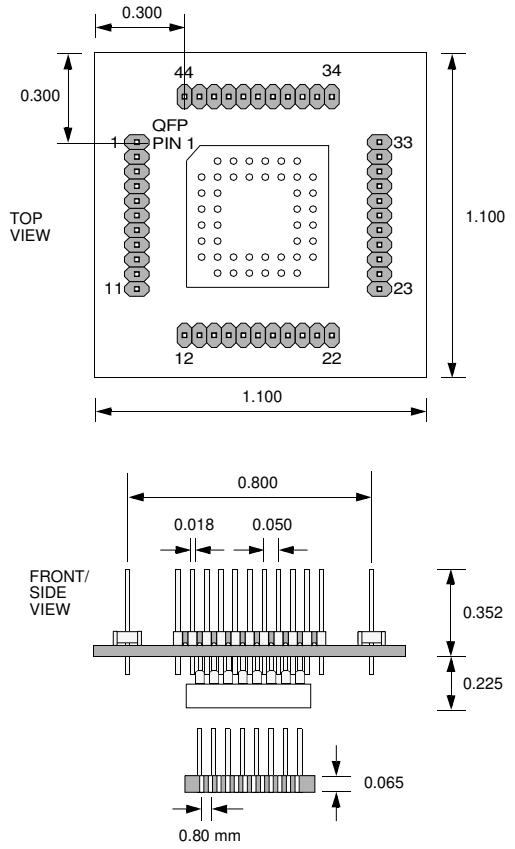
QFP TRANSITION SOCKET SOLDERING TIPS

- Use controlled soldering iron tip temperatures between 300°C and 325°C (570°F to 615°F)
- If possible, use a PACE mini wave soldering iron tip or an equivalent tip design.
- Plan to solder one (1 of 4) side first, then the opposite side, then the remaining two sides.
- Soldering iron tip movement should be in the direction of the leads (backward and forward), not across the leads; dragging the tip across the leads may cause lead damage.
- Use generous amounts of soldering flux to aid in the solder flow action.

Transition Socket Specification

XLT44PT3

44-lead QFP (0.8 mm)

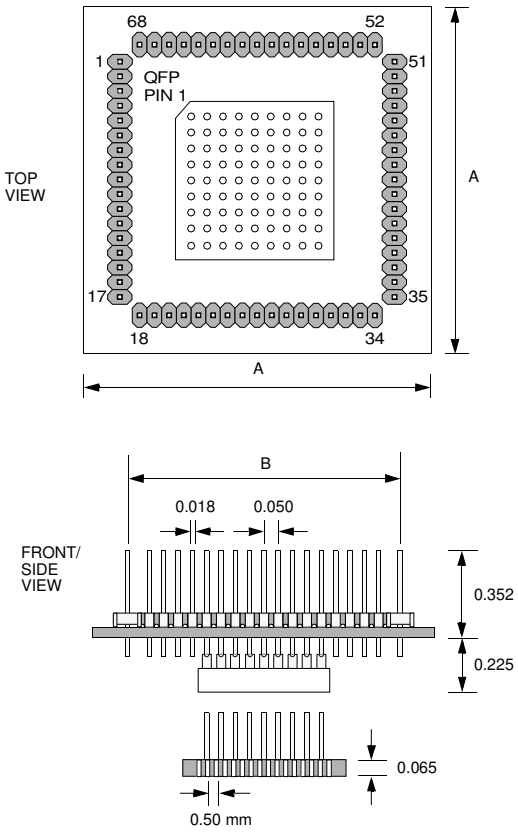


Refer to the "*Package Specification*" for PCB footprint dimensions (DS00049).

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

XLT64PT5, XLT80PT3

64/80-lead QFP (0.5 mm)



Refer to the "*Package Specification*" for PCB footprint dimensions (DS00049).

	A	B
XLT64PT5	1.250	0.960
XLT80PT3	1.450	1.160

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

Drawing shown is for 64-lead.

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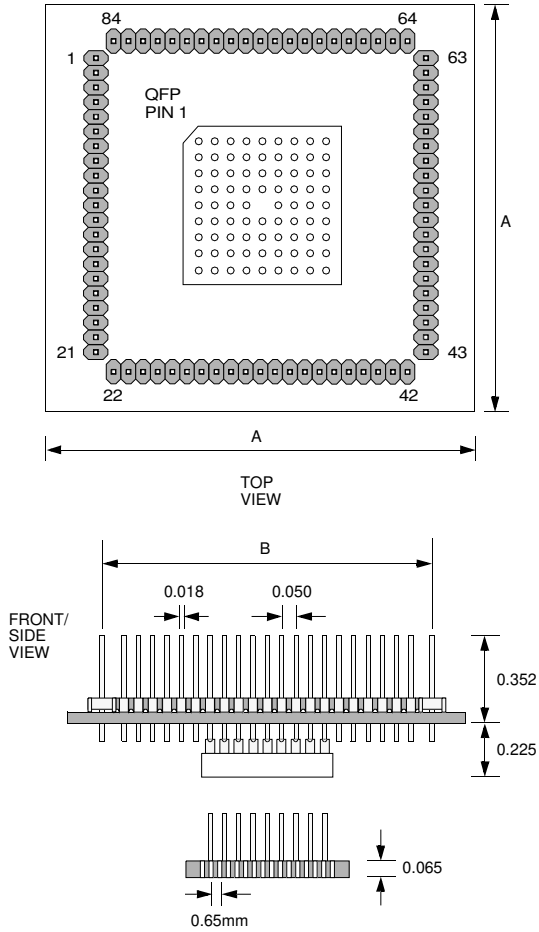
XLT80PT2

80-lead QFP (0.65 mm)



Refer to the "*Package Specification"* for PCB footprint dimensions (DS00049).

A	B
1.450	1.160

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

TABLE 1: DVA/DAF INTERFACE SPECIFICATION FOR QFP PACKAGES

Socket	Package Style*	DVA/DAF Interface Specification**
XLT44PT3	44PT TQFP 44PQ MQFP 44KW PQFP	DVA-44PL
XLT64PT5	64PT	DVA-68PL
XLT80PT2	80PF	DVA-84PL
XLT80PT3		

* Refer to the "*Package Specification"* for PCB footprint dimensions (DS00049).

** Refer to the processor module and device adapter specification for interface and dimensions to DVA/DAF (ICE 2000: "*MPLAB® ICE 2000 Processor Module and Device Adapter Specification"* (DS51140); ICE 4000: "*MPLAB® ICE 4000 Processor Module and Device Adapter Specification*" (DS51298)).

Transition Socket Specification

SOT/DFN/QFN TRANSITION SOCKETS

SOT/DFN/QFN transition sockets and associated hardware are shown below.

FIGURE 5: SOT TRANSITION SOCKET WITH CABLE

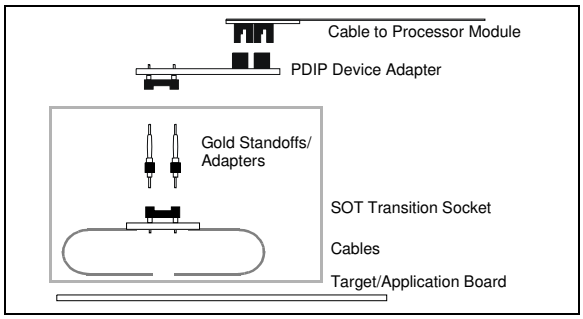


FIGURE 6: DFN TRANSITION SOCKET WITH CABLE

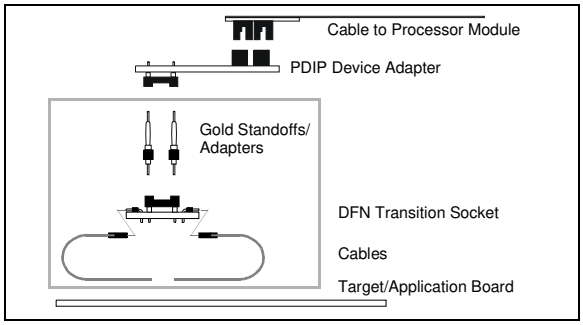


FIGURE 7: QFN TRANSITION SOCKET WITH CABLE

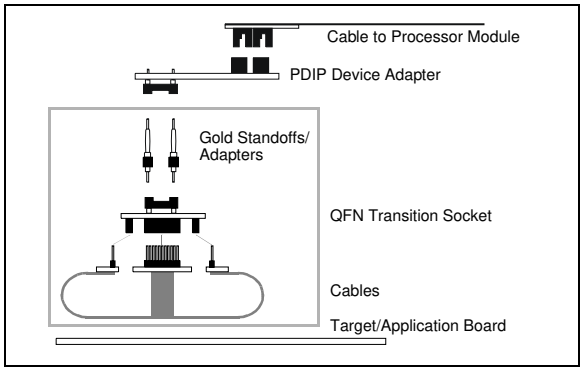
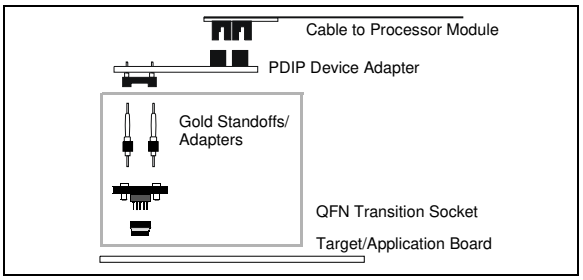


FIGURE 8: QFN TWO-PART TRANSITION SOCKET



Two-part transition sockets consist of:

1. Adapter socket that connects to the DIP device adapter
2. QFN header that is to be soldered down to the target application

Microchip offers the following SOT/DFN/QFN transition sockets:

- XLT06SOT: One 14-lead DIP to 6-lead SOT-23 transition socket with cable
- XLT08DFN2: One 14-lead DIP to 8-lead DFN transition socket with cable
- XLT16QFN1: One 14-lead DIP to 16-lead QFN transition socket with cable
- XLT20QFN-1: One 20-lead DIP adapter socket and one 20-lead QFN header
- XLT28QFN3: One 18-lead DIP to 28-lead QFN transition socket with cable
- XLT28QFN4: One 28-lead DIP to 28-lead QFN transition socket with cable
- XLT44QFN2: One 40-lead DIP to 44-lead QFN transition socket with cable
- XLT44QFN3: One 28-lead DIP to 44-lead QFN transition socket with cable
- XLT44QFN4: One 28-lead DIP to 44-lead QFN transition socket with cable
- XLT44QFN5: One 18-lead DIP to 44-lead QFN transition socket with cable

See the drawings in this section for layout dimensions.

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RECOMMENDED INSTALLATION OF TRANSITION SOCKETS WITH CABLES

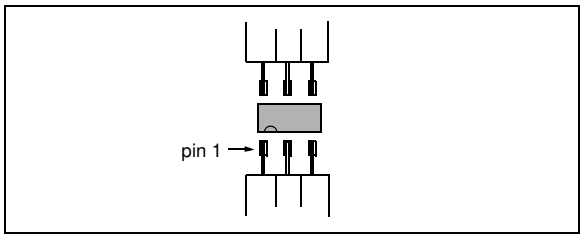
For transition sockets that use a cable, follow these instructions for installing your transition socket on the target board.

PCB Layout Considerations:

Make sure you leave enough room on the PCB to accommodate the cable, i.e., space your target pads for each device far enough apart so that the cable from one pad group will not interfere with another pad group.

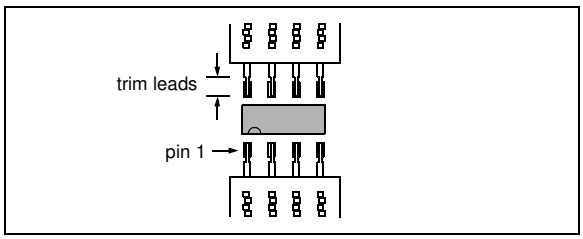
6-Pin SOT Solder Instructions:

1. Remove protective cable covering from end of cable.
2. Position cables on target board (see below). Tape down to prevent movement.
3. Solder each lead to target pad.
4. Remove tape and clean.



8-Pin DFN Solder Instructions:

1. Prepare leads by trimming narrowest portion to 0.10-inch maximum in length (see below).
2. Position cables on target board (see below). Tape down to prevent movement.
3. Solder each lead to target pad.
4. Remove tape and clean.

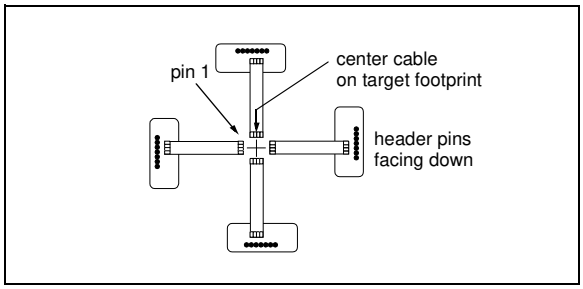


8-Pin DFN Assembly Instructions:

1. Start with cable associated with pin 1.
2. Fold cable up and over, forming a radius.
3. Mate with the header on the side of the transition socket assembly, making sure pin 1 mates with the pin labeled “DFN Pin 1”.
4. Fold over and mate the other cable.

16-Pin QFN Solder Instructions:

1. Remove protective cable jacket from stripped end of cable.
2. Lay out the four cables in a “+” pattern (see below).
3. Center each cable on the footprint (see below). Tape down each cable to prevent movement.
4. Solder each lead to target pad.
5. Remove tape and clean

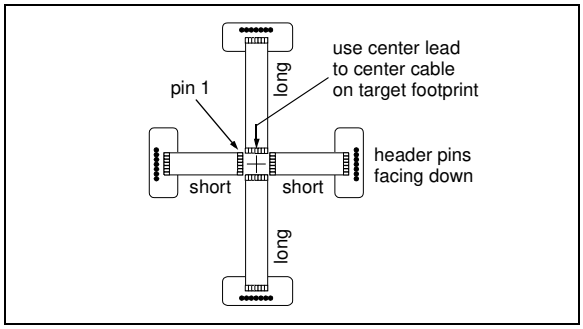


16-Pin QFN Assembly Instructions:

1. Start with cable associated with pin 1.
2. Fold cable up and over, forming a radius. Header pins will now be facing upwards.
3. Mate with the socket on the underside of the transition socket assembly, making sure pin 1 mates with the pin labeled “QFN Pin 1”.
4. Fold over and mate the other cables.

28/44-Pin QFN Solder Instructions:

1. Remove protective cable jacket from stripped end of cable.
2. Lay out with long cables opposing each other and short cables opposing each other (see below).
3. Place center lead (6th lead for 44-pin, 4th lead for 28-pin) on center target pad to center each cable on the footprint (see below). Tape down each cable to prevent movement.
4. Solder each lead to target pad.
5. Remove tape and clean



28/44-Pin QFN Assembly Instructions:

1. Start with cable associated with pin 1.
2. Fold cable up and over, forming a radius. Header pins will now be facing upwards.
3. Mate with the socket on the underside of the transition socket assembly, making sure pin 1 mates with the pin labeled “QFN Pin 1”.
4. Fold over and mate the other cables.

Transition Socket Specification

RECOMMENDED PCB LAYOUT

The recommended target board footprint layout for different pin-counts is shown here.

FIGURE 9: 6-PIN SOT, 8-PIN DFN

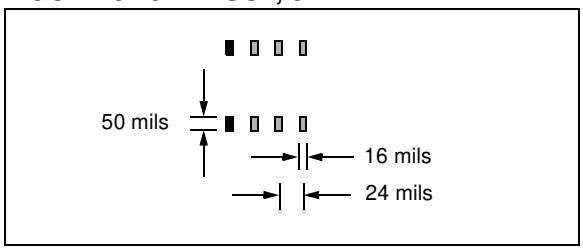


FIGURE 10: 16-PIN QFN

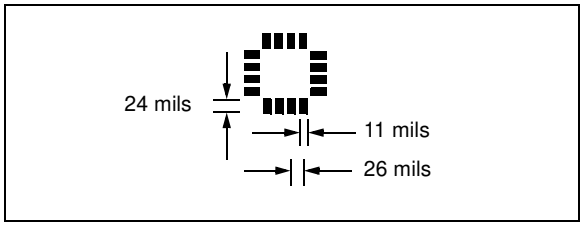


FIGURE 11: 20-PIN QFN

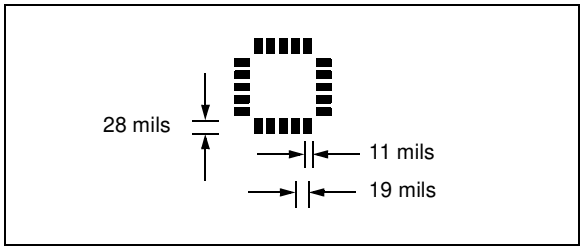


FIGURE 12: 28-PIN QFN

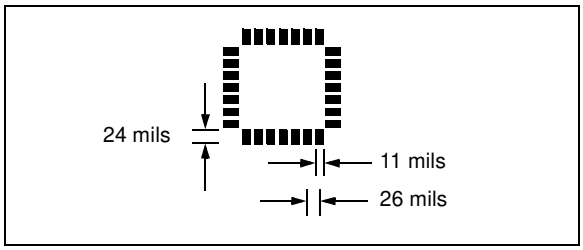
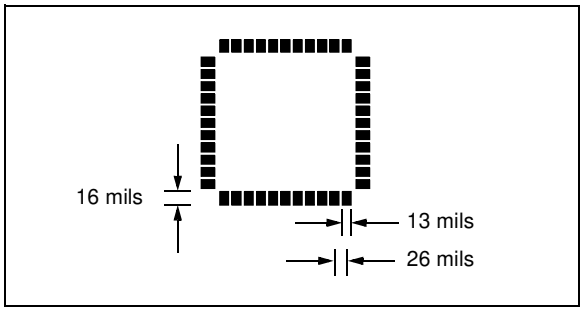
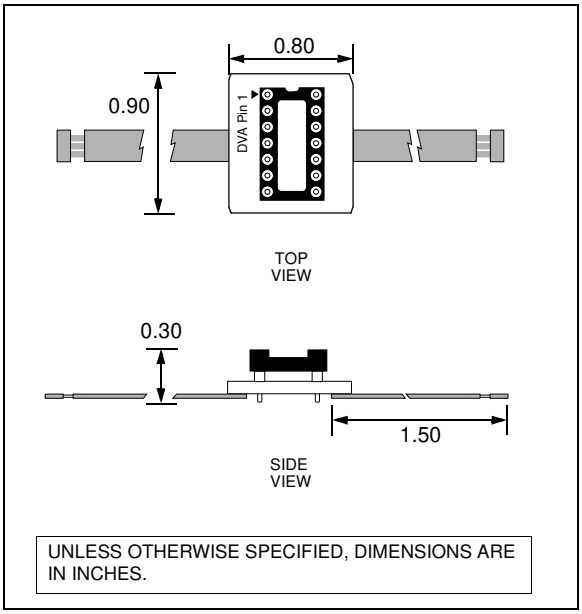


FIGURE 13: 44-PIN QFN



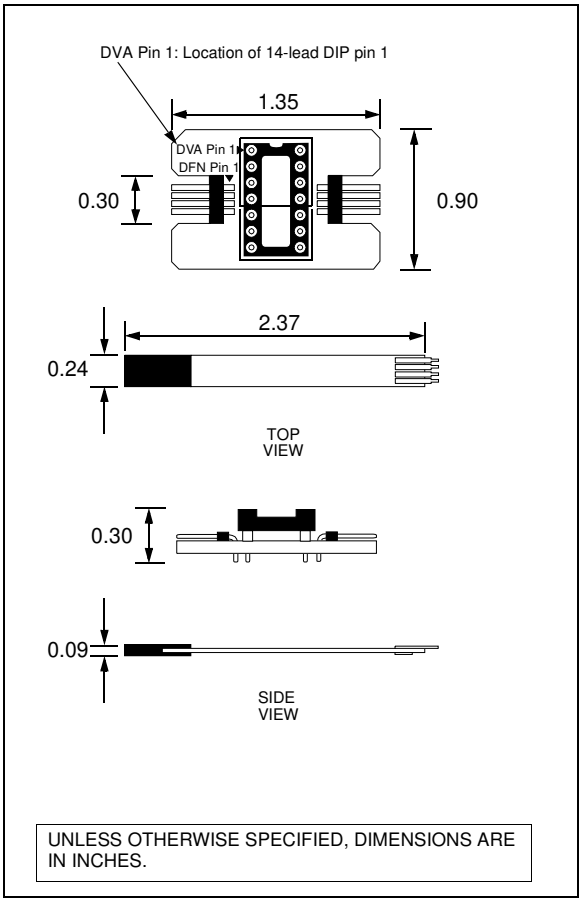
XLT06SOT

14-lead DIP to 6-lead SOT-23



XLT08DFN2

14-lead DIP to 8-lead DFN



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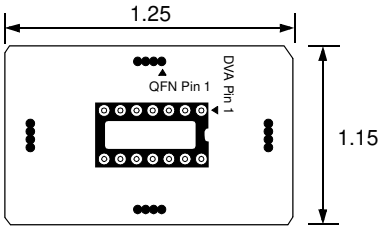
XLT16QFN1, XLT28QFN3, XLT28QFN4, XLT44QFN2, XLT44QFN3, XLT44QFN4, XLT44QFN5

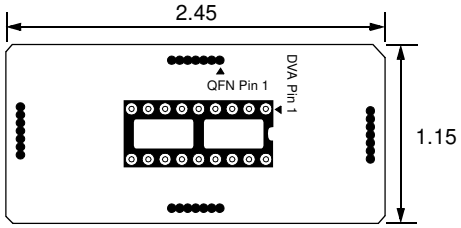
Multi-lead DIP to Multi-lead QFN, Top View

XLT16QFN1 – 14L DIP to 16L QFN



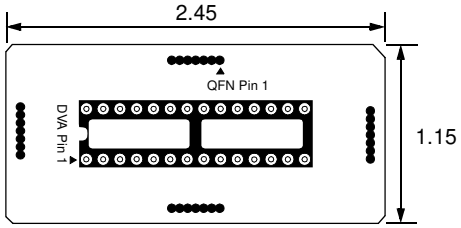
TOP VIEW

XLT28QFN3 – 18L DIP to 28L QFN (Shown)
XLT44QFN5 – 18L DIP to 44L QFN



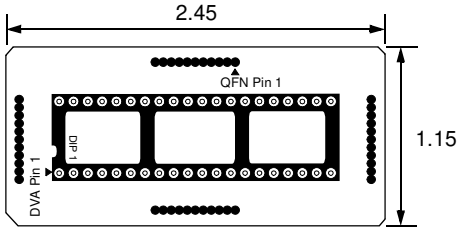
TOP VIEW

XLT28QFN4 – 28L DIP to 28L QFN (Shown)
XLT44QFN3 – 28L DIP to 44L QFN
XLT44QFN4 – 28L DIP to 44L QFN



TOP VIEW

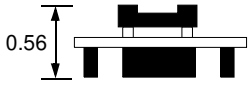
XLT44QFN2 – 40L DIP to 44L QFN



TOP VIEW

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

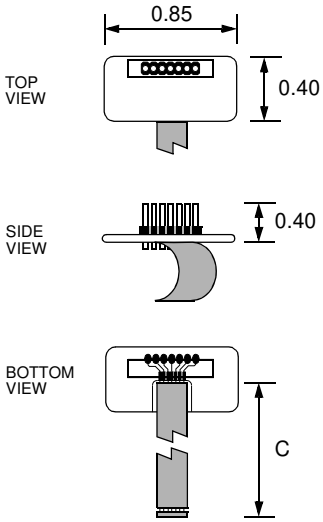
Multi-lead DIP to Multi-lead QFN, Side View



SIDE VIEW

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

Multi-lead DIP to Multi-lead QFN Cables



	cable	C
XLT16QFN1	1-4	1.30
XLT28QFN3/4	1,2	1.30
	3,4	2.00
XLT44QFN2/3 XLT44QFN4/5	1,2	1.30
	3,4	2.00

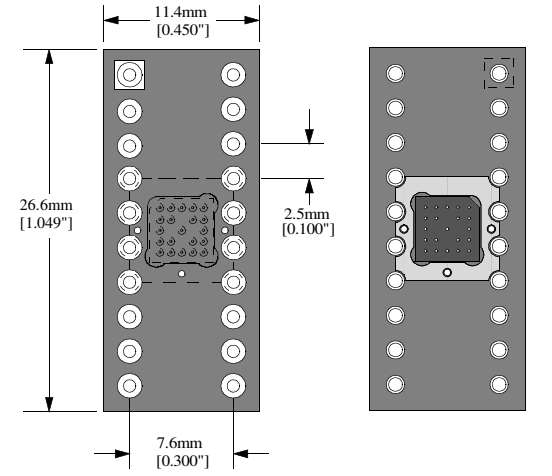
UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE IN INCHES.

Drawing shown is for 28-lead DIP.

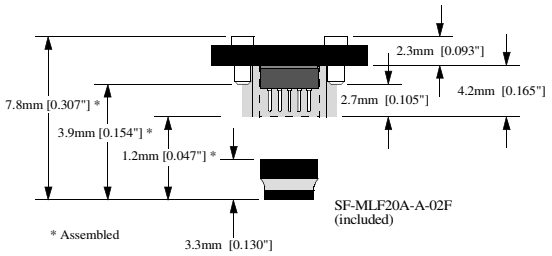
Transition Socket Specification

XLT20QFN-1

20-lead DIP Adapter Socket



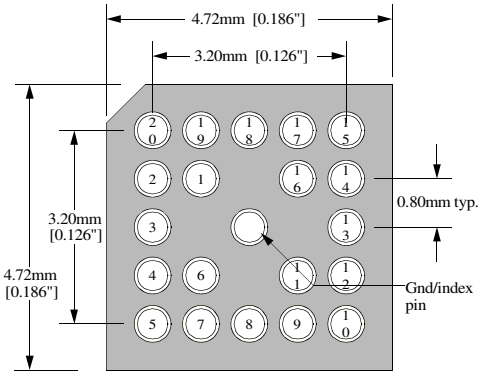
Top View Bottom View



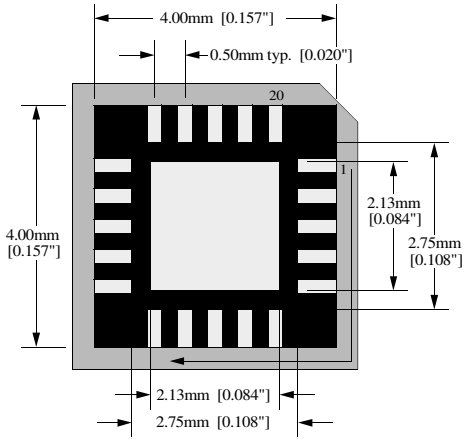
Side View

Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

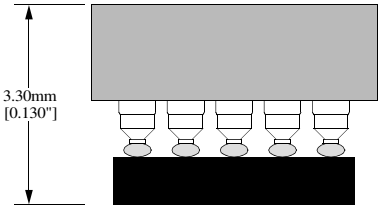
20-lead QFN Header (Surface Foot)



Top View



Bottom View



Side View

Tolerances: diameters ±0.03 mm [±0.001"], PCB perimeters ±0.13 mm [±0.005"], PCB thicknesses ±0.18 mm [±0.007"], pitches (from true position) ±0.08 mm [±0.003"], all other tolerances ±0.13 mm [±0.005"] unless stated otherwise.

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XLT20QFN-1 Soldering Suggestions

This socket is difficult to solder since the device pins are not exposed, but embedded, into the socket's Surface Foot (SF).

1. To start, add tack flux to the target land pattern.
2. Visually align the QFN SF with the target land pattern. Then solder two opposite SF pins to the target lands so that the SF does not move around.
3. Finish soldering the rest of the SF pins.
4. If the SF has a middle ground pin, feed solder through the bottom side of hte target board via holes. This will connect the center QFN SF pin to the target board.
5. Check each solder connection on the QFN SF pins.

You are now ready to attach the QFN header to the SF.