6

6. Add-in Card Form Factors and Implementation

6.1. Add-in Card Form Factors

To enable the reuse of existing chassis slots, the PCI Express add-in cards are similar to the PCI add-in card form factor. Two PCI Express add-in card heights are defined: the standard height of 111.15 mm (4.376 inches) maximum and the low profile of 68.90 mm (2.731 inches) maximum. Note that card height is measured from the bottom of the edge finger to the top of the card (see Figure 6-1 and Figure 6-3). Table 6-1 lists the add-in card sizes corresponding to different PCI Express Link widths.

Table 6-1: Add-in Card Sizes

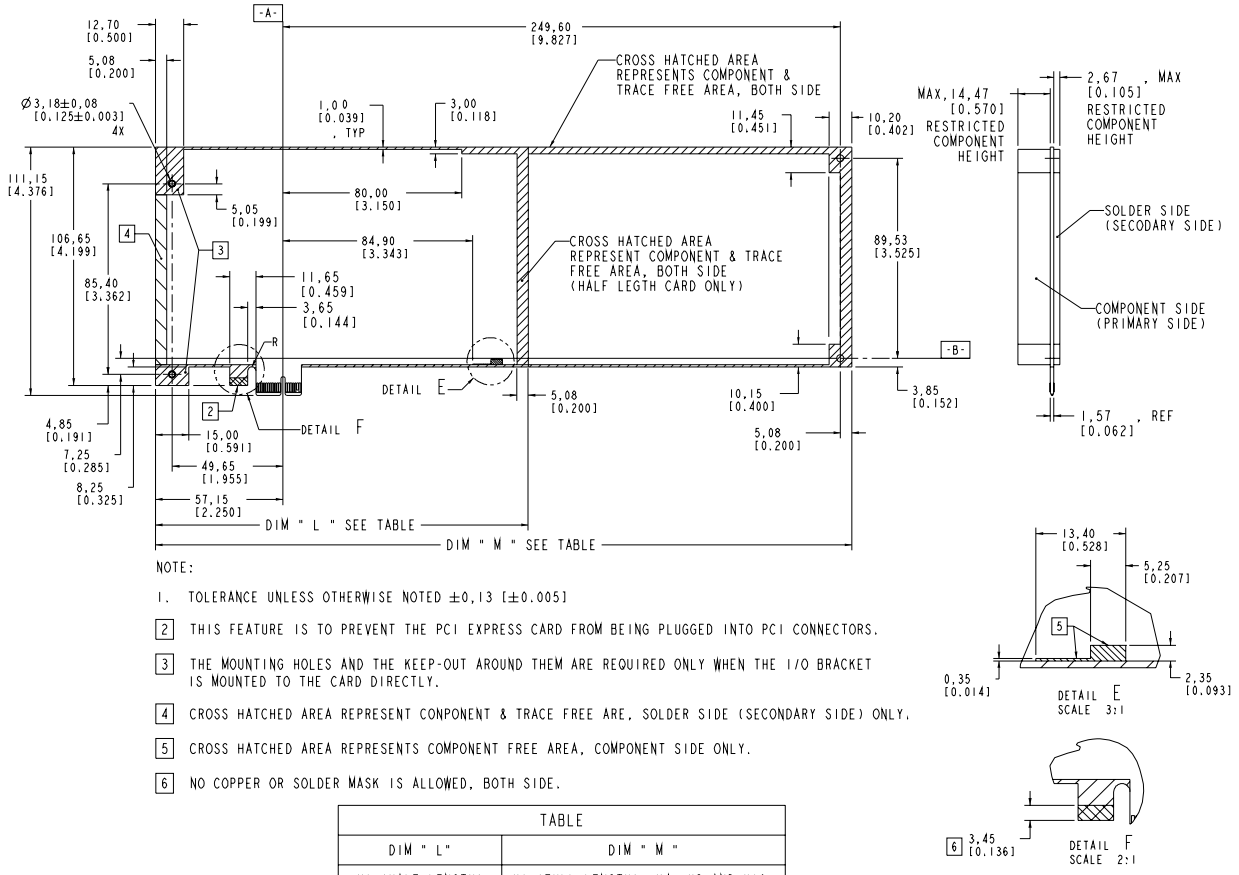
Link Width		Height	Length
x1	Standard height, half length card	111.15 mm (4.376 inches) maximum	167.65 mm (6.600 inches) maximum
x1, x4, x8, x16	Standard height, full length cards	111.15 mm (4.376 inches) maximum	312.00 mm (12.283 inches) maximum
	Low profile cards	68.90 mm (2.731 inches) maximum	167.65 mm (6.600 inches) maximum

*Not all system designs will support this length of add-in card. It is strongly recommended that standard height add-in cards be designed with a 241.30 mm (9.5 inches) maximum length.

The x1 cards allow two different maximum lengths. The x1 standard height, half length card has a maximum length of 167.65 mm (6.600 inches), with applications in the mainstream desktop and other platforms. The x1 standard height, full-length card allows a maximum length of 312.00 mm (12.283 inches). It is defined for applications that require more real estate than the half length card provides.

It should be noted that the maximum length specifies what the system design must accommodate. An add-in card can be any length up to the maximum for a particular Link width. For example, a x4 standard height card with a 177.80 mm (7.00 inches) length can be installed in a system that accommodates 241.30 mm (9.5 inches) maximum length cards, but a system that only accommodates 167.65 mm (6.6 inches) maximum length cards will not support this card.

Figure 6-1 and Figure 6-2 show the standard PCI Express card form factor without and with the I/O bracket, respectively.



NOTE:

1. TOLERANCE UNLESS OTHERWISE NOTED ±0,13 [±0.005]
2. THIS FEATURE IS TO PREVENT THE PCI EXPRESS CARD FROM BEING PLUGGED INTO PCI CONNECTORS.
3. THE MOUNTING HOLES AND THE KEEP-OUT AROUND THEM ARE REQUIRED ONLY WHEN THE I/O BRACKET IS MOUNTED TO THE CARD DIRECTLY.
4. CROSS HATCHED AREA REPRESENT CONPONENT & TRACE FREE ARE, SOLDER SIDE (SECONDARY SIDE) ONLY.
5. CROSS HATCHED AREA REPRESENTS COMPONENT FREE AREA, COMPONENT SIDE ONLY.
6. NO COPPER OR SOLDER MASK IS ALLOWED, BOTH SIDE.

TABLE	
DIM " L"	DIM " M "
X1 (HALF LENGTH)	X1 (FULL LENGTH), X4, X8 AND X16
167,65 [6,600] MAX	312,00 [12,283] MAX

Figure 6-1: Standard Height PCI Express Add-in Card without the I/O Bracket

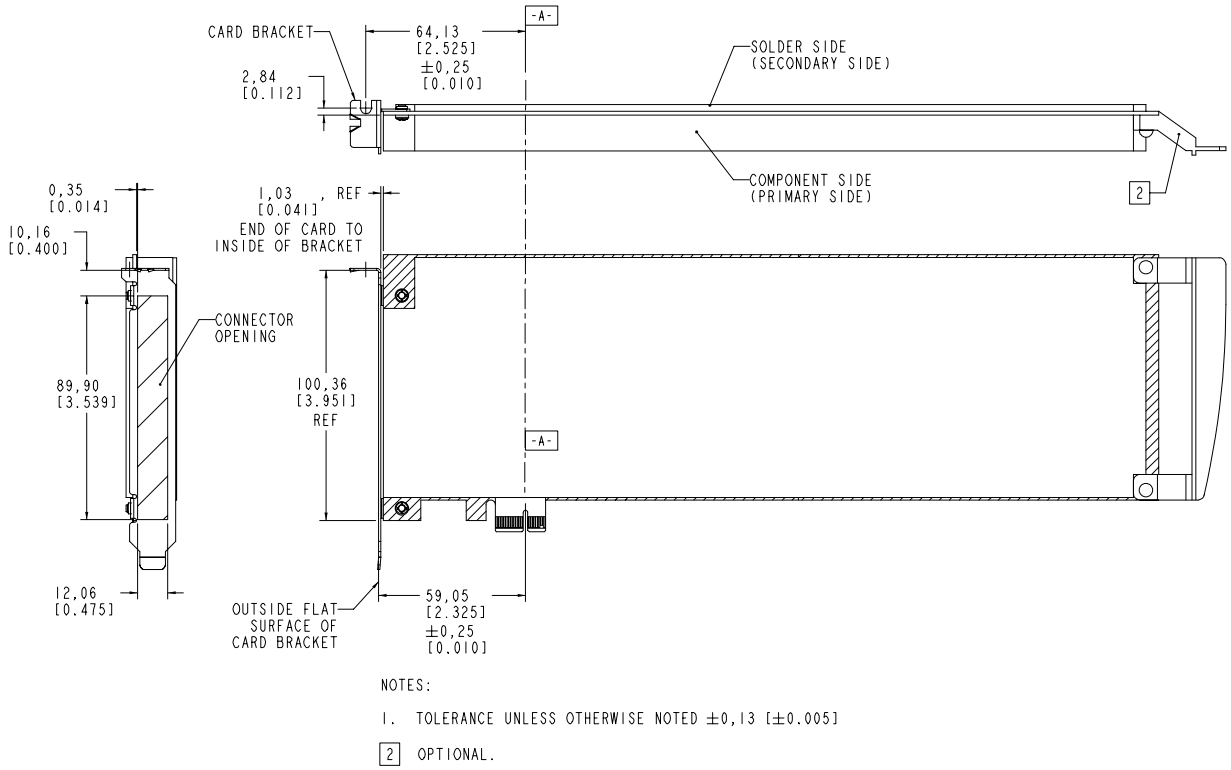


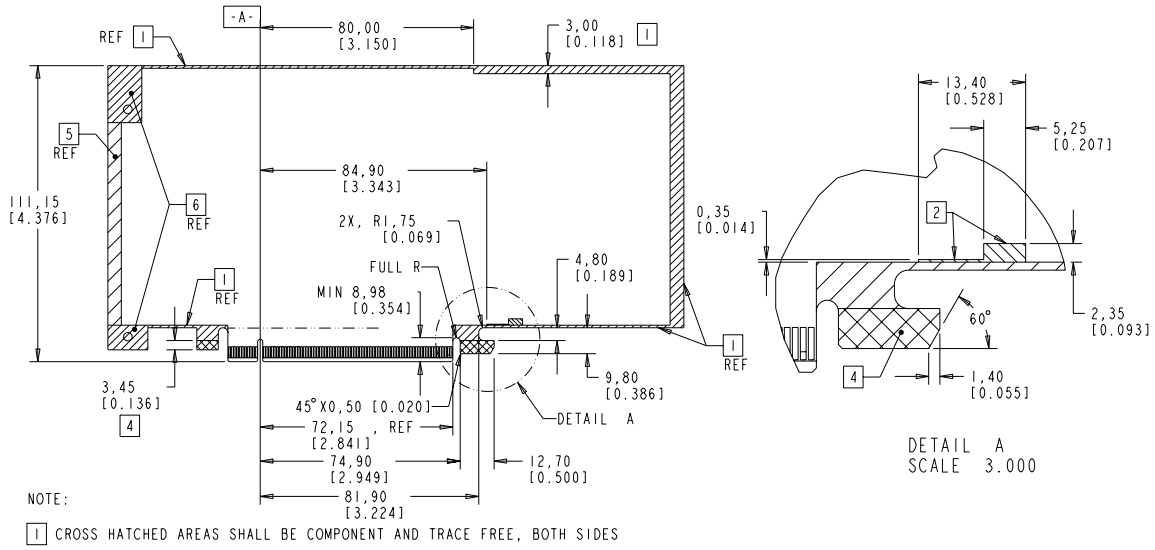
Figure 6-2: Standard Height PCI Express Add-in Card with the I/O Bracket and Card Retainer

The mounting holes illustrated in Figure 6-1 are required only on the right end of the full-length card (312.00 mm). Those holes are needed to install the optional PCI add-in card retainer, as illustrated in Figure 6-2.

The mounting holes and keep-out zones around them marked as note 3 in Figure 6-1 are required on those cards in which the I/O bracket is mounted to the card directly. The purpose of this keep-out is to ensure that the card cannot short out on the I/O bracket. On full-length cards, a keep-out of 5.08 mm is required to prevent card components from being damaged by the system's card guides (refer to Figure 6-1).

All graphics cards are required to be retention ready as defined in Section 5.2. This retention ready requirement may also apply to x1, x4, x8, or x16 I/O cards at each OEM, or add-in card manufacturer's discretion. See Section 5.2 for more information.

Special attention shall be given to graphics cards because of their potential high mass, driven by the high power allowed. This specification defines the additional feature and keepouts for x16 graphics cards for card retention shown in Figure 6-3.



NOTE:

1. CROSS HATCHED AREAS SHALL BE COMPONENT AND TRACE FREE, BOTH SIDES
2. CROSS HATCHED AREA REPRSENTS COMPONENT FREE AREA , COMPONENT SIDE ONLY.
3. TOLERANCE UNLESS OTHERWISE NOTED ±0,13 [±0.005], ±1°.
4. NO COPPER OR SOLDER MASK IS ALLOWED, BOTH SIDES.
5. CROSS HATCHED AREA REPRESENTS COMPONENT & TRACE FREE AREA, SOLDER SIDE (SECONDARY SIDE) ONLY.
6. THE MOUNTING HOLES AND THE KEEP-OUT AROUND THEM ARE REQUIRED ONLY WHEN THE I/O BRACKET IS MOUNTED TO THE CARD DIRECTLY.

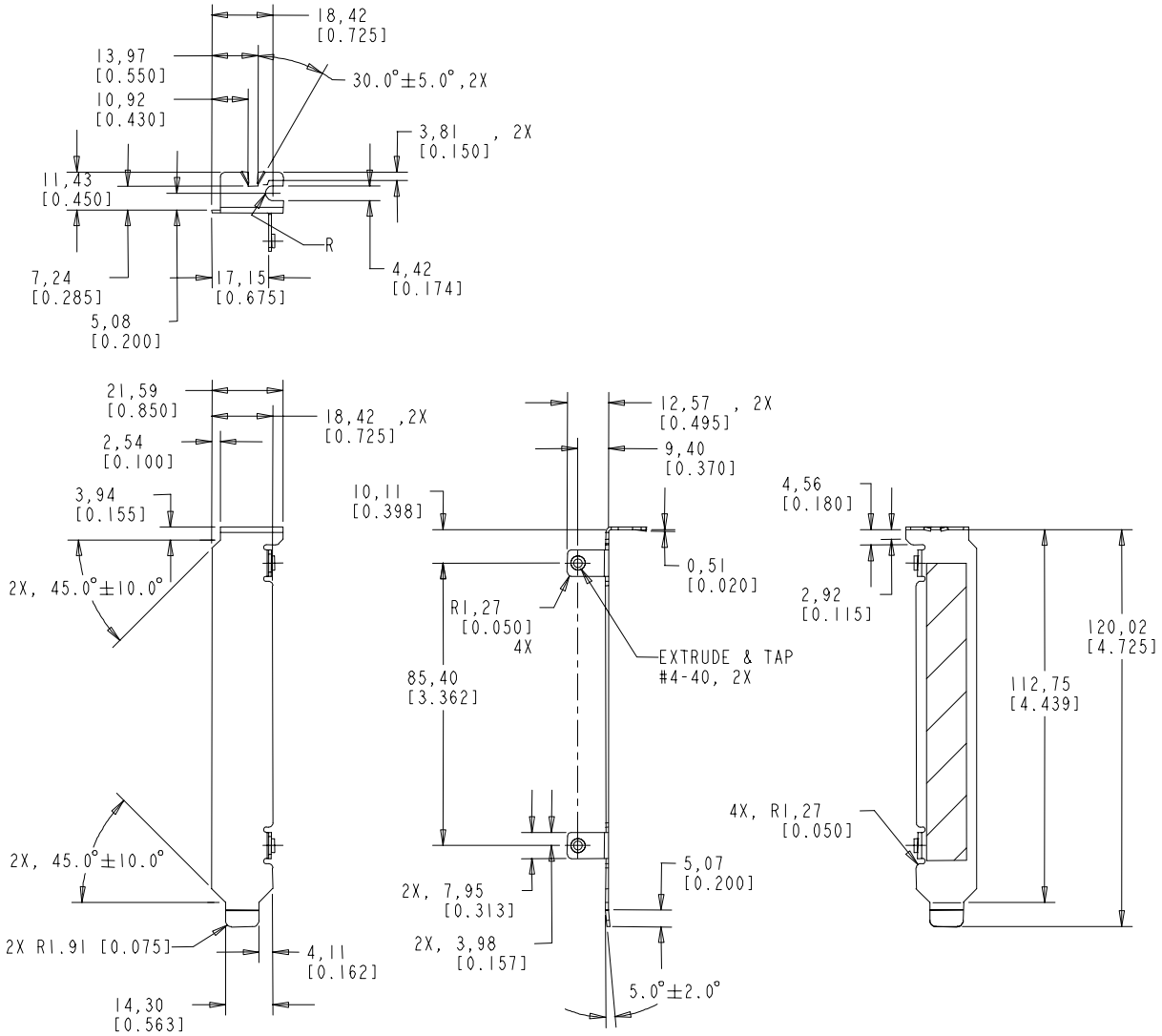
Figure 6-3: Additional Feature and Keepouts on the x16 Graphics Card

The 3.0-mm keepout on the top of the card is to accommodate system or chassis level card retention solutions at each OEM's discretion. To facilitate a chassis level retention solution, the height of the standard height graphics card is required to be fixed: 111.15 mm +/-0.13 mm. Low profile graphics cards do not require the 3.00-mm keepout.

The "hockey stick" shaped feature and keepout defined on the bottom of the card is to allow retention mechanisms either mounted directly on the system board or integrated into the x16 connector. This feature and keepout are also required for the low profile graphics card.

All retention mechanisms that are intended for the x16 graphics cards must use the feature/keepout defined in Figure 6-3. But the specific retention mechanism design is system manufacturers' choice. Reference retention mechanism designs are given in the *PCI Express Graphics Card Thermal and Mechanical Design Guideline for Desktop Systems.*

Figure 6-4 shows the standard PCI Express I/O bracket, which is the same as the PCI bracket. The mounting tabs of the bracket shown in Figure 6-4 are to be mounted onto the secondary side of the card, as illustrated in Figure 6-2. However, a user also has the option to have a bracket with the mounting tabs mounted onto the primary side of the card, as depicted in Figure 6-5.



NOTES:

1. MATERIAL: 0,86MM [0.034 INCH] THICK (20 GA)

2. TOLERANCE UNLESS OTHERWISE NOTED ±0,27 [±0.010]

Figure 6-4: Standard Add-in Card I/O Bracket

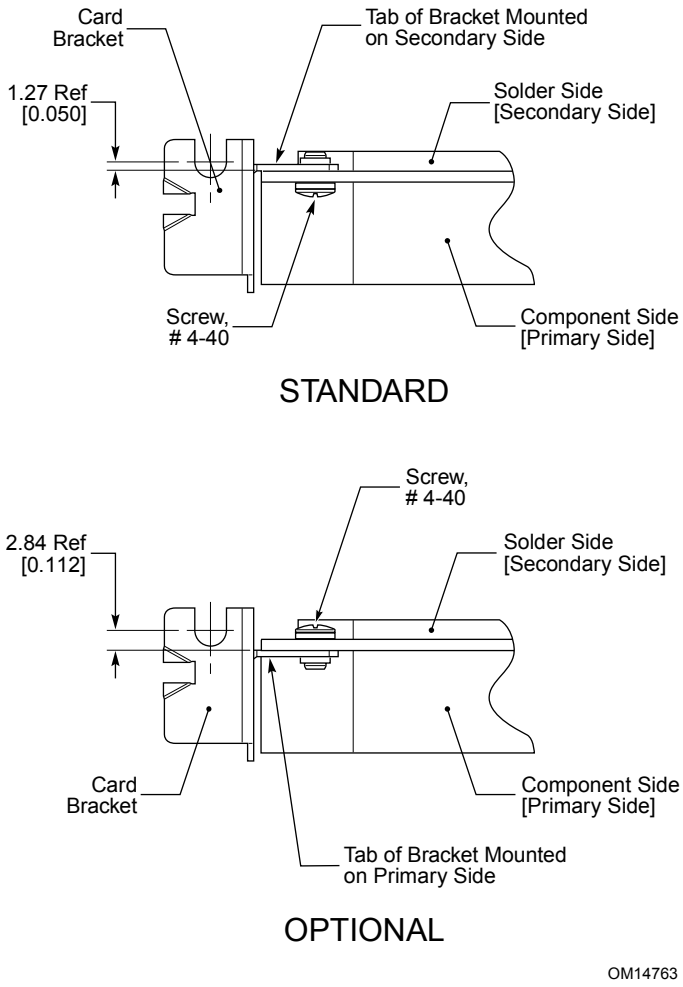


Figure 6-5: Bracket Design with the Mounting Tabs Mounted on the Primary Side of the Add-in Card

The PCI Express add-in card retainer is the same as the PCI card retainer, an optional feature used only with the full-length add-in cards at the maximum length of 312.00 mm (12.283 inches). Figure 6-6 shows the PCI Express add-in card retainer dimensions.

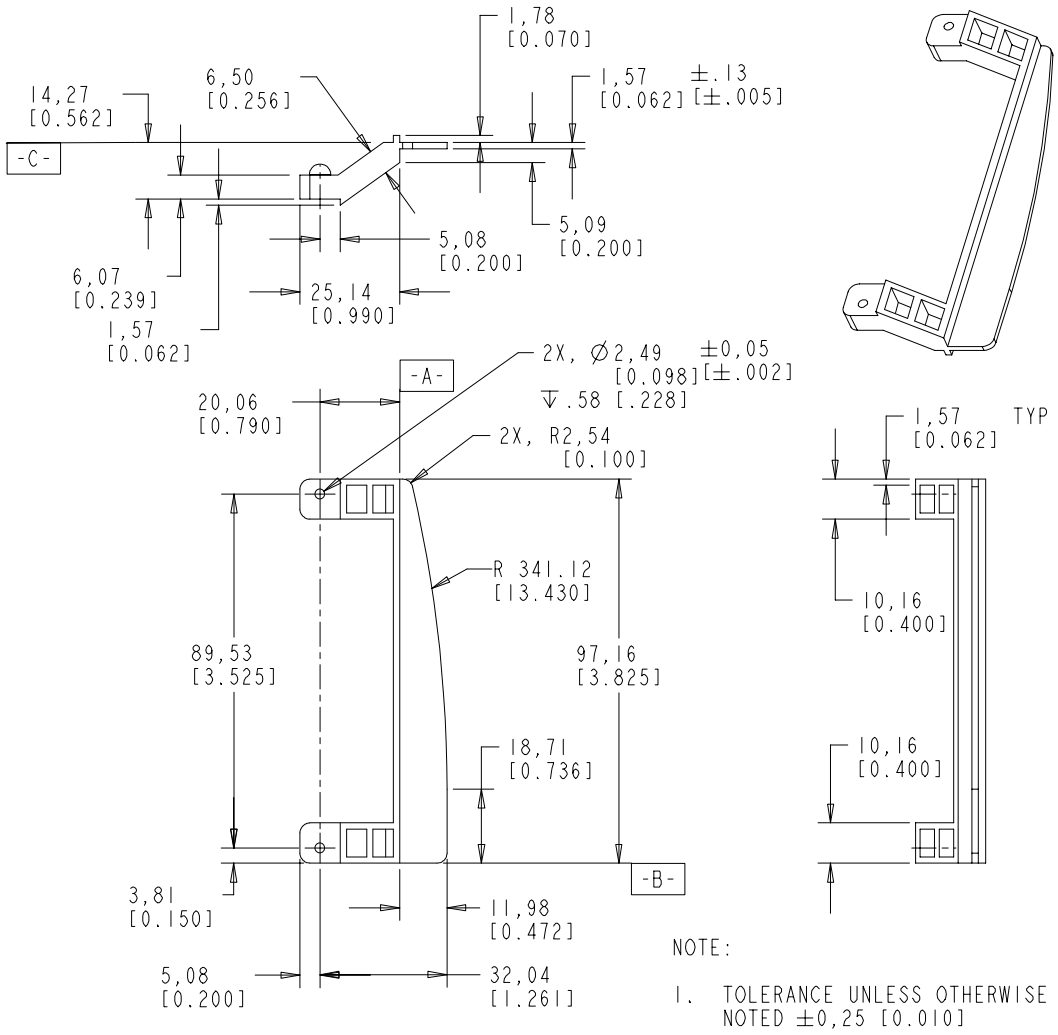


Figure 6-6: Add-in Card Retainer

The detailed add-in card edge finger dimensions are defined in Section 5.2, which describes the connector mating interface. The edge-finger portions of the PCI Express cards are required to have bevels or chamfers as defined in Figure 5-3.

Figure 6-7 and Figure 6-8 show, respectively, the low profile PCI Express add-in card form factor without and with the bracket, while Figure 6-9 shows the low profile add-in card I/O bracket.

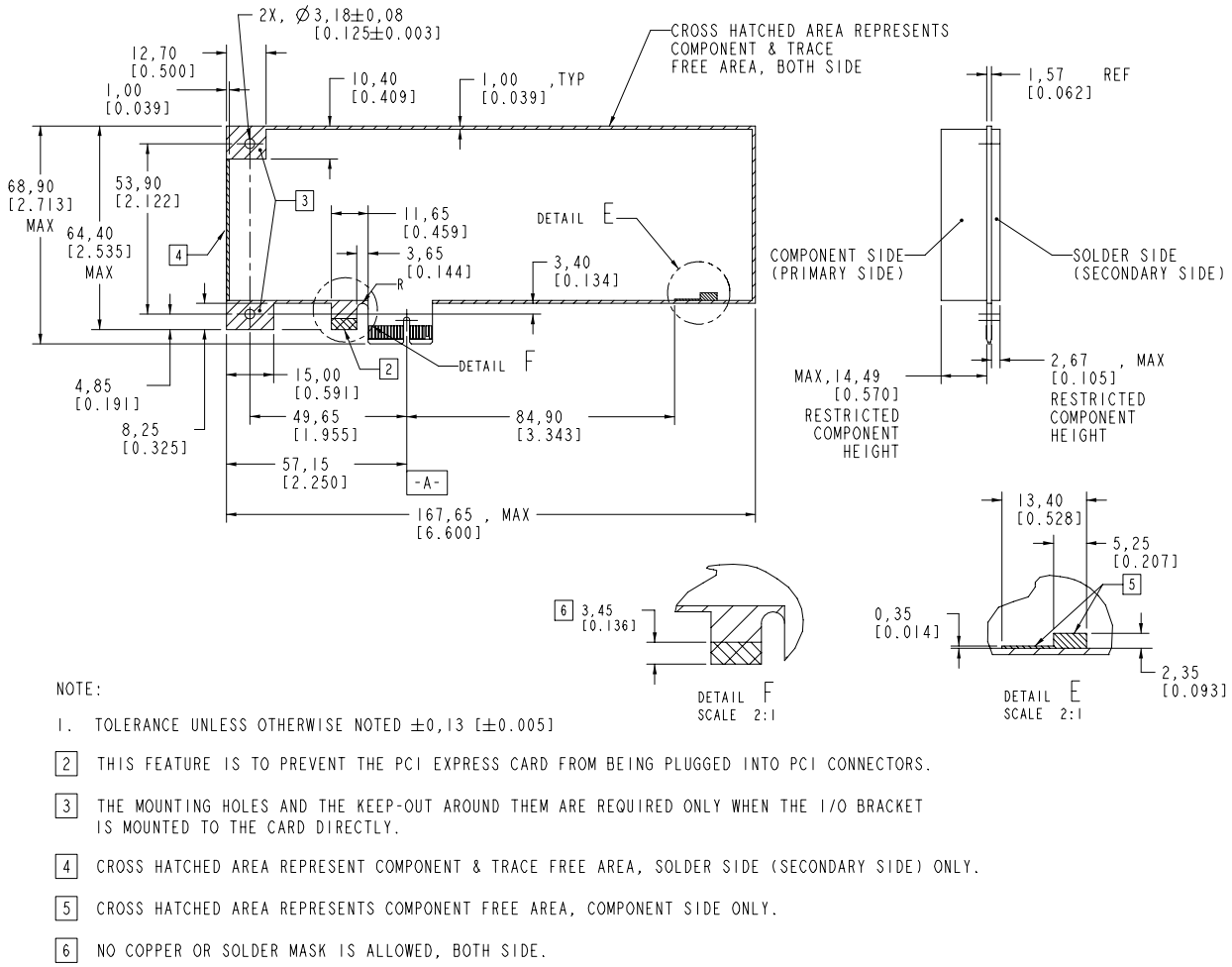


Figure 6-7: Low Profile PCI Express Add-in Card without the I/O Bracket

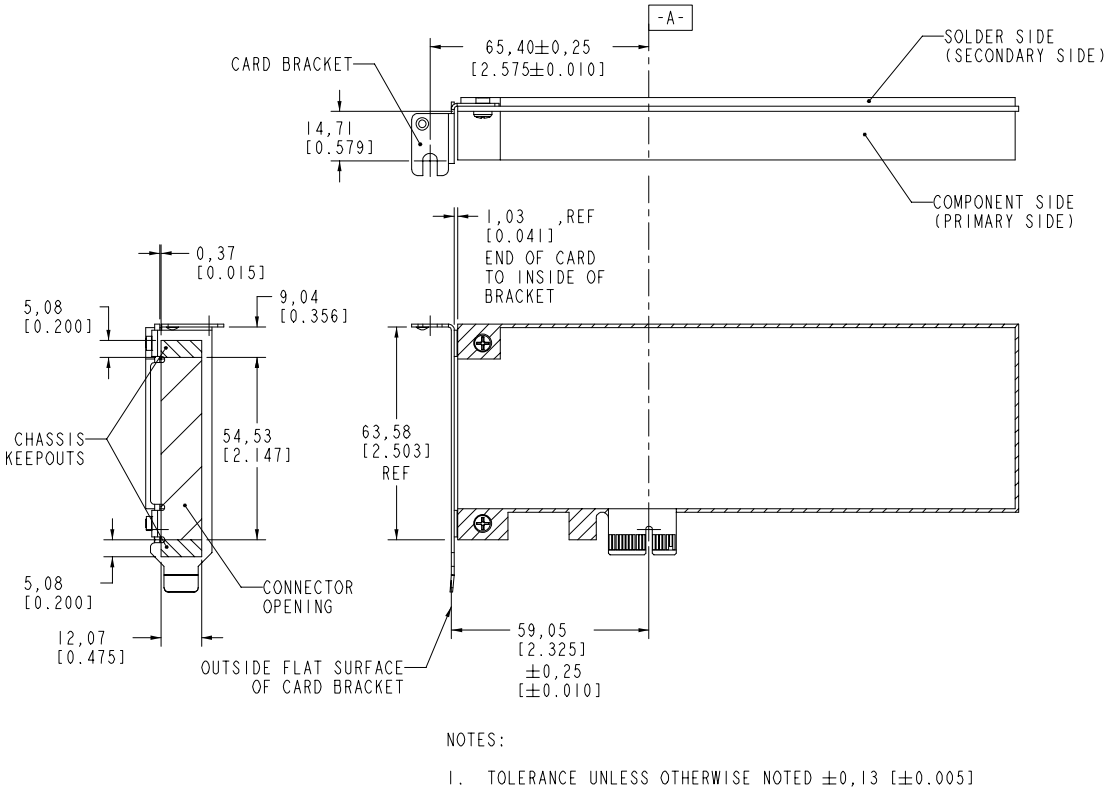


Figure 6-8: Low Profile PCI Express Add-in Card with the I/O Bracket

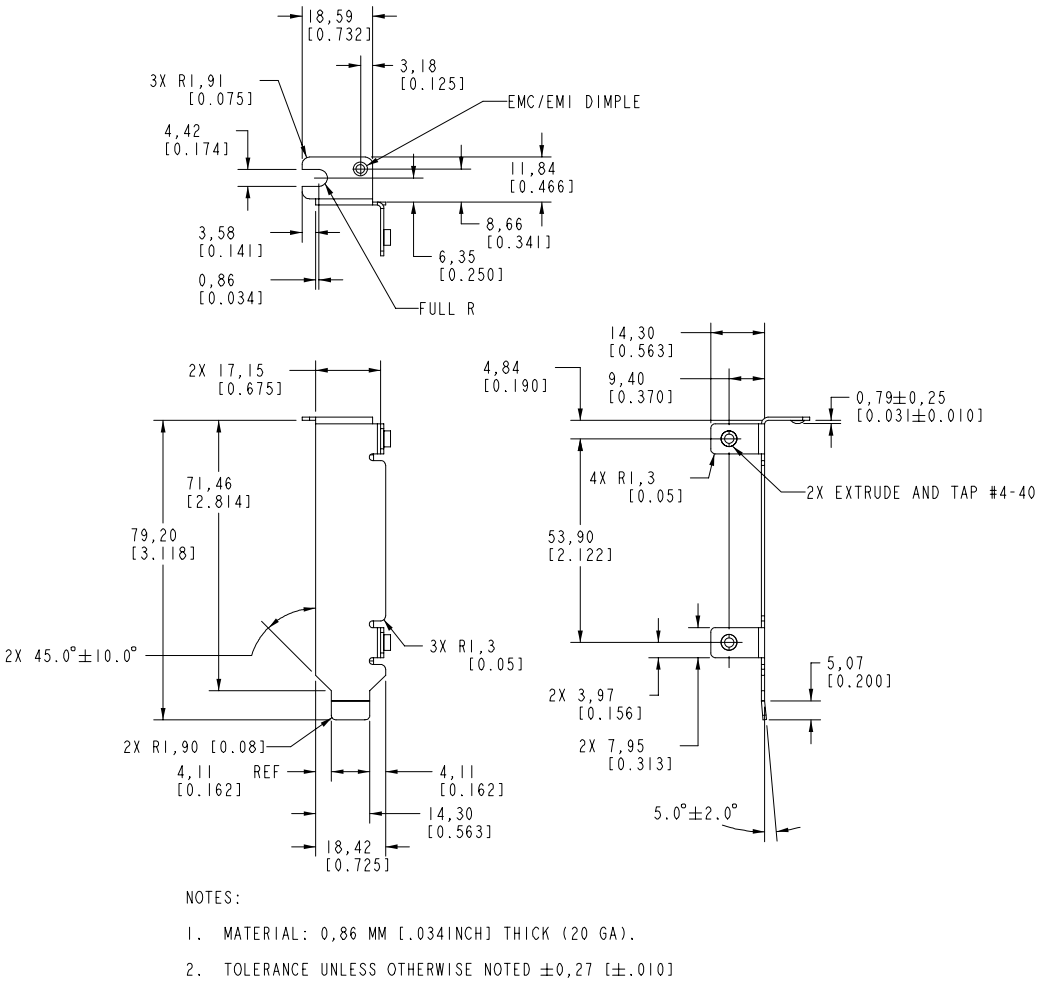
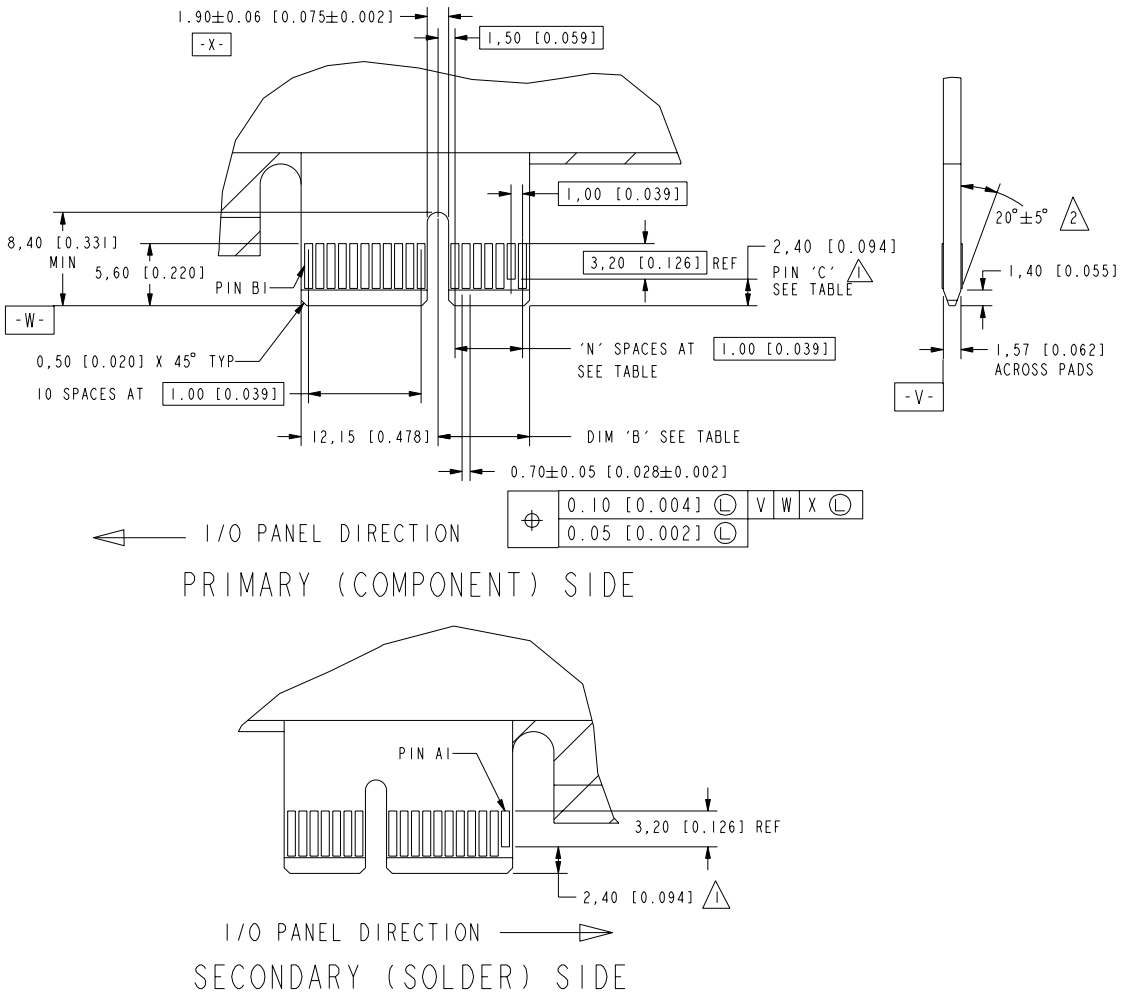


Figure 6-9: Low Profile I/O Bracket



1. NO TIE BAR PERMITTED FROM CARD EDGE TO LEADING EDGE OF PAD FOR PINS A1 AND 'C'.
2. CHAMFER EDGES MUST BE FREE OF CUTTING BURRS.
3. TOLERANCE: .XX ±0,13 [0.005]

CONNECTOR LINK WIDTH	# POS REF	N	DIM 'B'	'C' 1
X1	36	6	8.15 [0.321]	B17
X4	64	20	22.15 [0.872]	B31
X8	98	37	39.15 [1.541]	B48
X16	164	70	72.15 [2.841]	B81

Figure 5-3: Add-in Card Edge-Finger Dimensions

The following points should be noted:

- The connector has a 1.00 mm contact pitch.
- The contact shall be pre-loaded, similar to the PCI connector.
- The connector footprint (Figure 5-2) requires two 2.35 mm diameter location holes, working with either plastic pegs/posts or metal board locks. Metal board locks are allowed, although Figure 5-1 shows only the plastic pegs on the connector housing.
- Figure 5-3 defines only the mating interface related dimensions. Other add-in card dimensions are defined in Chapter 6.
- The PRSNT1# and PRSNT2# pins shown in Figure 5-3 are 1 mm shorter than the other fingers. Those pins are designated as A1, B17, B31, B48, and B81, where applicable. No plating tie bar is allowed underneath the PRSNT1# and PRSNT2# pins because those pins are meant to be last-mate and first-break.
- As shown in Figure 5-1, a ridge feature is defined on the top of the connector housing on one side. This feature can be used to facilitate card retention. A retention clip may be mounted on an add-in card and latched on the ridge.
- Two types of add-in cards must be "retention ready":
  - Graphics cards
  - x1, x4, x8, or x16 I/O cards that in the judgment of the OEM or card manufacturers have sufficient weight or length that the card may need an additional retention point for stability

  Retention ready means that the add-in card manufacturer must have selected (or created) a retention mechanism and made provisions on the card to facilitate the retention mechanism. The reference retention mechanism designs and related component keep-out or height restriction areas are defined in the *PCI Express Graphics Card Thermal Mechanical Design Guidelines*.

  The full-length card 321.00 mm (12.283 inches) long is considered retention ready. The mounting holes on one end of the full-length card allow the optional PCI card retainer to be installed to secure the card. See Section 6.1.
- Detailed connector contact and housing designs are up to each connector vendor, as long as the requirements of form, fit, and function are met.