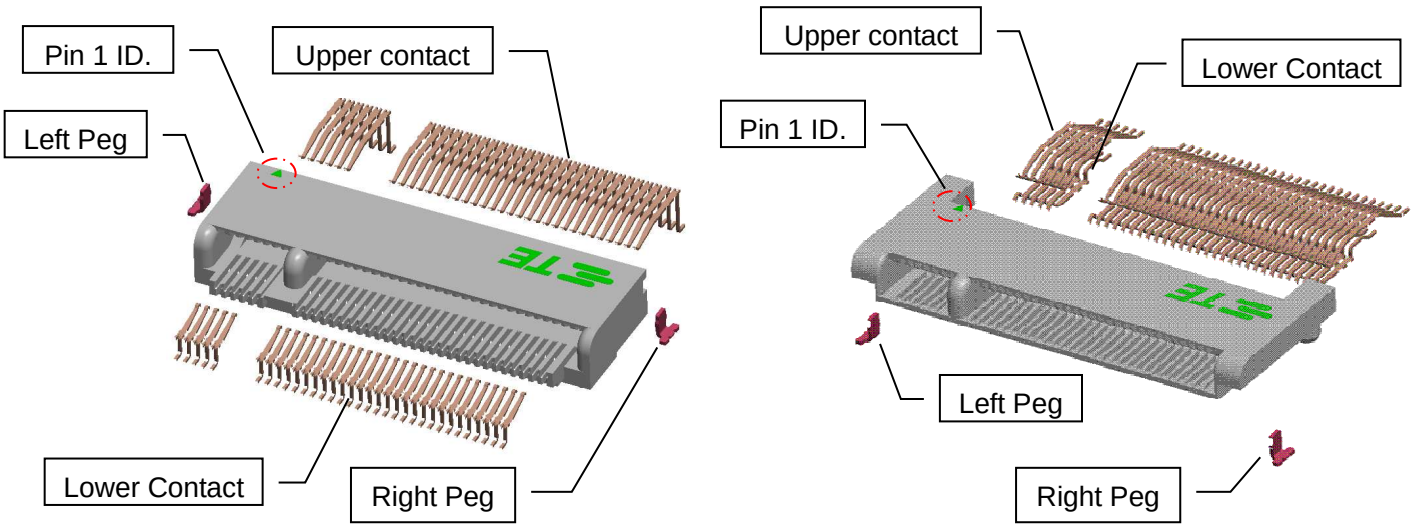
NOTE *All numerical values are in metric units [with U.S. customary units in brackets]. Dimensions are in millimeters. Unless otherwise specified, dimensions have a tolerance of ±0.13 and angles have a tolerance of ±2°. Figures and illustrations are for identification only and are not drawn to scale.*

1. INTRODUCTION

This specification covers the requirements for application of 67 positions 0.5 pitch M.2 (***N**ext **G**eneration **F**orm **F**actor*) minicard onto PCB (***P**rinted **C**ircuit **B**oard*). M.2 (NGFF) connectors that include contact pins for USB 3.0, PCI-E 3.0 and SATA 3.0 are designed according to industry specification. One M.2 (NGFF) connector consists of one housing, 34 pieces of upper contact, 33 pieces of lower contact and two pegs. The Key and boss in the housing are used to quickly mate with module and PCB. M.2 (NGFF) connectors can be placed on the PCB by automatic application tooling (typically vacuum pick and place).

When corresponding with 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



2.25H, 3.2H and 4.2H type

Mid-plane type

Figure 1 Explode View

2. REFERENCE MATERIAL

2.1. Revision summary

See revision record at end of sheet

2.2. Customer Assistance

Current M.2 (NGFF) with 4 types, the product base no. are 2199125 (2.25H), 2199119 (3.2H), 2199230 (4.2H), 2199133 (Mid-plane) and product code J649 is representative of M.2 (NGFF). 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 representative (Field Service Engineer, Field Applications Engineer, etc.) or, after purchase, by calling PRODUCT INFO at the bottom of page 1.

2.3. Drawings

Customer Drawings for product part numbers are available from service network. If there is a conflict between the information contained in the Customer Drawings and the specification or with any other technical documentation supplied, calls PRODUCT INFO at the bottom of page 1.

2.4. Specifications

Product Specification 108-115042 is for high end application and Product Specification 108-115049 is for lower end application, both of them have contained the product performance and test information.

3. REQUIREMENTS

3.1. Module

The M.2 (NGFF) connector accepts standard M.2 (NGFF) module whose dimensions must be followed as industry specification.

3.2. Safety

Do not stack product package so high that the shipping containers buckled or deformed.

3.3. Limitations

The M.2 (NGFF) connector is designed to operate in a temperature range of –40ºC to 80ºC.

3.4. Materials

The housing is made of glass-filled liquid crystal polymer (LCP) plastic, the upper and lower contact is made of copper alloy, and the peg is made of stainless steel.

3.5. Storage

A. Ultraviolet Light

Prolonged exposure to ultraviolet light may deteriorate the chemical composition used in the M.2 (NGFF) connector’s material.

B. Shelf Life

The M.2 (NGFF) connector should be remained in the shipping containers until ready for using to prevent deformation or oxidation to the solder tail. The M.2 (NGFF) should be used on a first in, first out basis to avoid storage contamination that could adversely affect performance. The connectors should be used up in 6 months from its production day.

C. Chemical Exposure

Do not store M.2 (NGFF) connector near any chemical listed below as they may cause stress corrosion cracking in the solder tail.

Alkali	Ammonia	Citrates	Phosphates Citrates	Sulfur Compounds
Amines	Carbonates	Nitrites	Sulfur Nitrites	Tartrate

3.6. PCB (Printed Circuit Board)

A. Material and thickness

The PCB material shall be glass epoxy (FR-4 or G-10). There is no required thickness for the PCB.

B. Tolerance

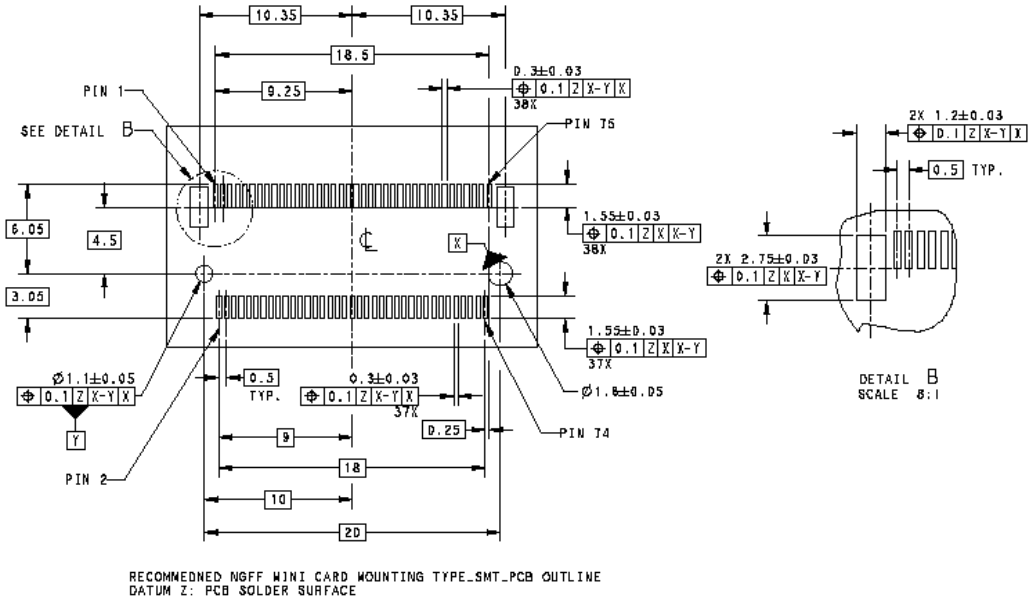
Maximum allowable bow of the PCB shall be 0.13 per 25.4 over the length of the M.2 (NGFF) connector grid area.

C. Pads

The PCB circuit pads must be solderable in accordance with Test Specification 109-11.

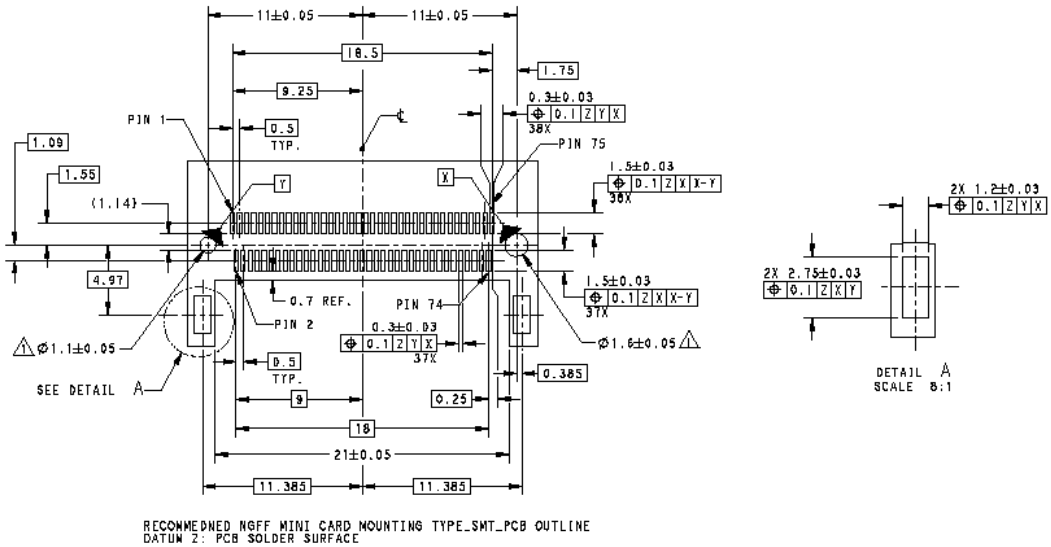
D. Layouts

The circuit pads on the PCB must be precisely located to ensure proper placement and optimum performance of the M.2 (NGFF) connector. The PCB layout must be designed as the recommended dimensions provided as Figure 2 and Figure 3. If there are any conflicted dimensions with customer drawing, please follow recommended PCB in the customer drawing.



RECOMMENDED PCB LAYOUT for 2.25H, 3.2H, and 4.2H

Figure 2



RECOMMENDED PCB LAYOUT for Mid-plane

Figure 3

3.8. Solder Paste characteristics

1. For lead free connector alloy type shall be 96.5Sn/ 3.0Ag/ 0.5Cu, this type of alloy has a melting point between 217ºand 220ºC.
2. Recommended flux incorporated in the paste should be “no clean” type. Other fluxes, such as rosin, mildly active (RMA) type are acceptable.
3. Paste will be at least 80% solids by volume.
4. Minimum viscosity of screen print shall be 5 x 10% cp (centipoise).
5. Minimum viscosity of stencil print shall be 7.5 x 10% cp (centipoise).
6. Paste thickness: 0.13~0.15mm.

3.9. Soldering

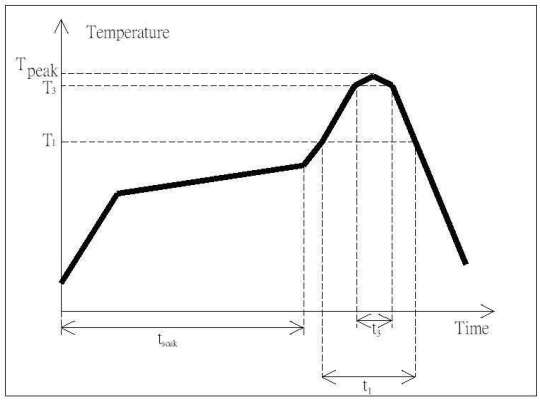
A. Process

The PCB pads must be solderable in accordance with Test Specification 109-11. The M.2 (NGFF) connector should be soldered using hot air convection oven with a minimum of five chambers (zones). The solder paste should be applied using an automatic screening process.

CAUTION *Even when using “no clean” solder paste, it is imperative that solder tail interface be kept clean of residue, since it acts as insulator.*

CAUTION *The socket body temperature must not exceed 245 ºC.*

Due to many variables involved with the reflow process (i.e., board size and thickness, component density, count, and orientation), it is recommended that trial run should be conducted under actual manufacturing conditions to ensure product and process compatibility. A reference thermal profile from a single connector mounted onto a board with ground plane is shown in figure 4.



Reflow profile for soldering heat resistance Testing:		
Item	Time	Specification
Pre Heating		≦3℃/Sec
Flux Wetting	T_{soak}	2~3Min
Time Over 217℃	t_1	60~150 Sec
Peak Temp	t_3	245℃ (±5℃)
Peak Time	T_{peak}	≦15 Sec
Speed of Cooling		≦6℃/Sec
25℃ to Peak Temp		≦8 Min

Figure 4

3.10. M.2 (NGFF) Connector Placement

The M.2 (NGFF) connector number one position must be aligned with the number one position PCB circuit pad. When placing the M.2 (NGFF) connector on the board, make sure that the solder tail are aligned with the matching pads before seating the connector onto the board.

CAUTION *The M.2 (NGFF) connector must be handled only by the outer perimeter of housing to avoid deformation, contamination, or damage to the solder tail.*

A. Seating

The M.2 (NGFF) connector's solder tails must be seated flush on the PCB.

B. Position

Optimally, the solder tails should be centered on the PCB pads. However, slight misalignment is permissible as shown in Figure 5.

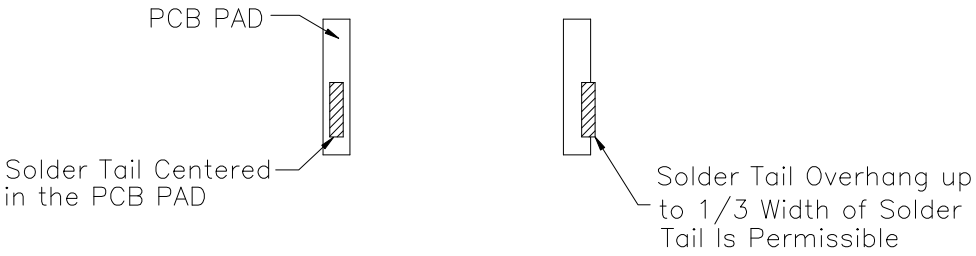


Figure 5

3.11. Checking Installed Socket

All solder joints should conform to those specification in this document. Solder fillet must be evenly formed without visible shorting.

NOTE *Due to the tight pattern associated with these solder tails, inspection techniques must provide a clear picture of possible areas of shorting. X-ray or electrical test equipment must be used to inspect solder joints.*

3.12. Repair

The M.2 (NGFF) connector must NOT be re-used. Damaged connectors must be removed, discarded or replaced. The solder tail will require de-soldering. Methods for removing the connectors from the PCB are covered in IPCJ-STD-013. It is highly recommended that the M.2 (NGFF) connectors should NOT be reworked.

CAUTION *High temperatures necessary to rework connectors could cause housing distortion or damage to internal components, and therefore, compromises the integrity of the M.2(NGFF) connector.*

3.13. Module Insertion and Removal Process

A. Module Insertion Process for 2.25H, 3.2H, and 4.2H

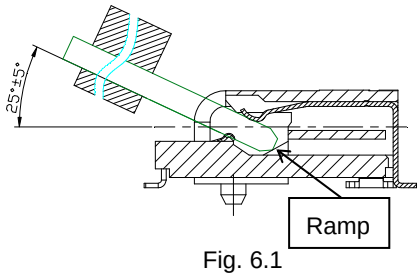


Fig. 6.1

Step 1st: Insert the module with angle 25°±5° until module touch HSG ramp. See (Fig. 6.1).

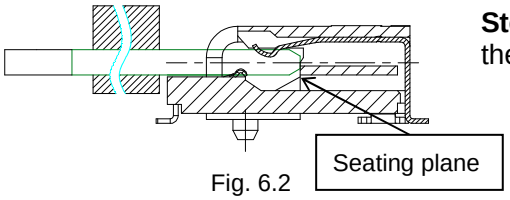


Fig. 6.2

Step 2nd: Rotate the module to horizon by hand and make sure the card's edge touch HSG seating plane. (Fig. 6.2).

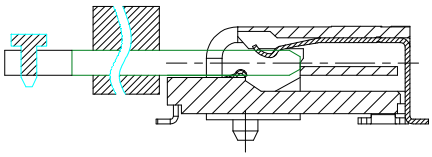


Fig. 6. 3

Step 3rd: Fix the module with PCB by screw by hand. (Fig. 6.3).

B. Module Removal Process for 2.25H, 3.2H, and 4.2H

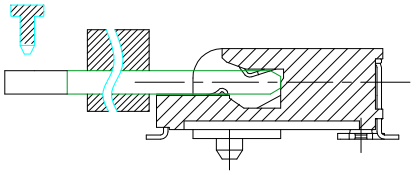


Fig. 7.1

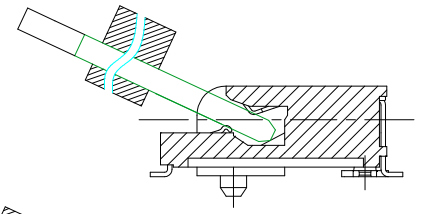


Fig. 7.2

Step 1st: Loose the screw by hand (see Fig. 7.1), and module will be rotated automatically due to connector contact's counterforce at the same time (see Fig. 7.2).

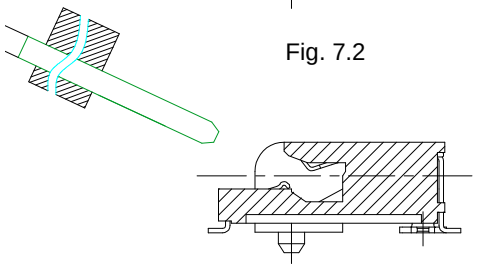


Fig. 7.3

Step 2nd: Take away the module by hand (see Fig. 7.3).

C. Module Insertion Process for Mid-plane

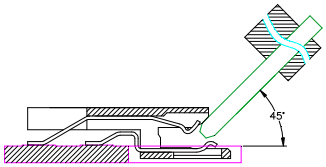


Fig. 8.1

Step 1st: Move the module against the housing's chamfer See (Fig. 8.1)
Pre-insertion Angle 45° is strongly required.

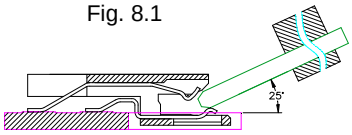


Fig. 8.2

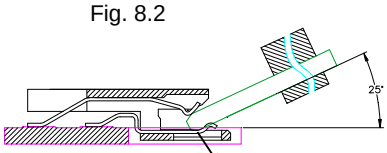


Fig. 8.3

Step 2nd: Rotate module to 25° (Fig. 8.2) and insert it until module bottom surface reach the ramp (Fig. 8.3).

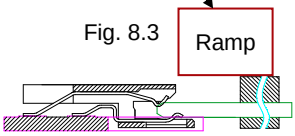


Fig. 8.4

Step 3rd: Rotate the module to horizon by hand (Fig. 8.4).

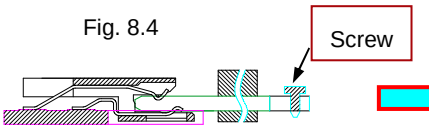


Fig. 8.5

Step 4th: Insert the module until it touches the bottom surface of the housing, and then fix the module with PCB by screw (Fig. 8.5).

D. Module Removal Process for Mid-plane

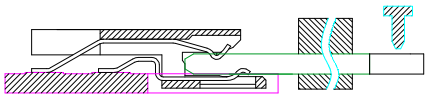


Fig. 9.1

Step 1st: Loose the screw by hand (see Fig. 9.1).

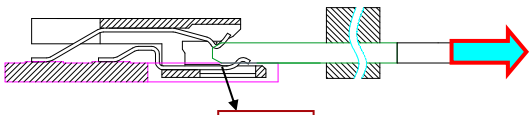


Fig. 9.2

Step 2nd: Withdraw the module by hand in horizon until the module bottom surface over the ramp (see Fig. 9.2).

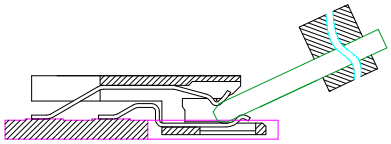


Fig. 9.3

Step 3rd: Module will be rotated automatically due to connector contact's counterforce at the same time (see Fig. 9.3).

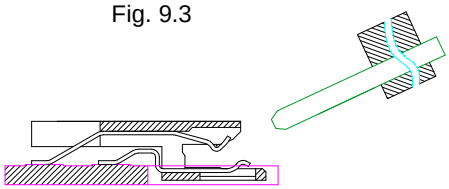


Fig. 9.4

Step 4th: Take away the module by hand (see Fig. 9.4).

Rev.	Rev. Record	EC Number	Prepared		Check		Approval	
A	Released		S.W	22JAN13	S.L	22JAN13	C.W	22JAN13
B	Released		S.W	19MAY14	W.H	19MAY14	W.H	19MAY14