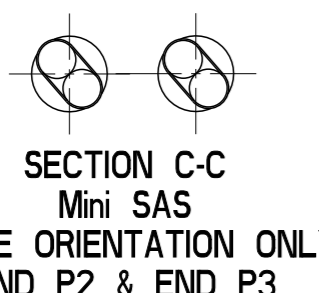


| PRODUCT NUMBER   | DESCRIPTION      | NOTES      |
|------------------|------------------|------------|
| 10117947-XXXXLF  | NON-HF           | SEE SHT. 3 |
| 10117947-XXXXHLF | HALOGEN FREE (H) | SEE SHT. 3 |



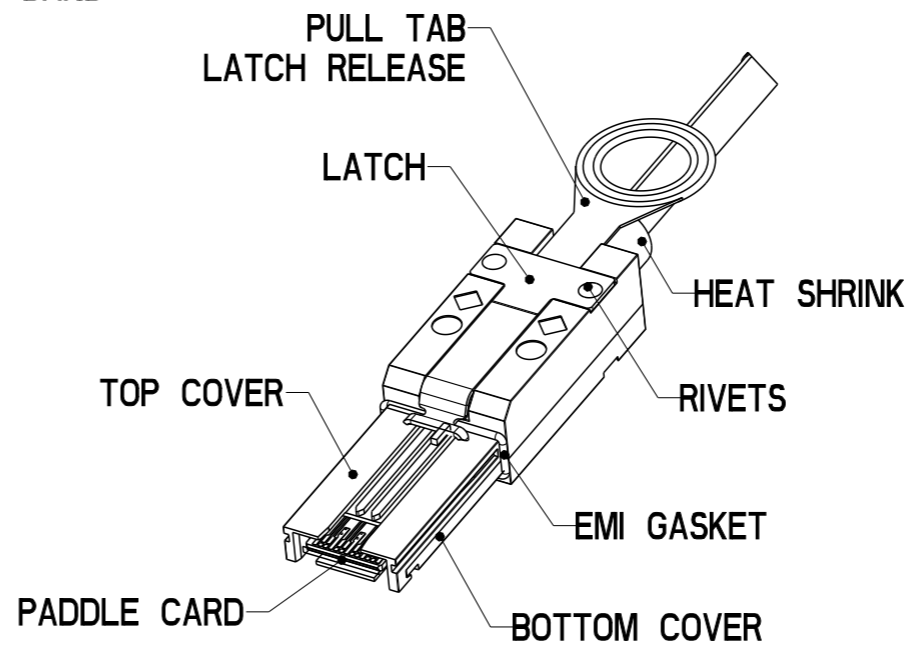
|             |                |                        |                                  |              |           |               |       |          |   |
|-------------|----------------|------------------------|----------------------------------|--------------|-----------|---------------|-------|----------|---|
| dr          | Deborah Ingram | 2011/05/23             | projection                       | mm           | size      | A3            | scale | 1:1      |   |
| eng         | Tommy Lin      | 2014/01/06             |                                  |              | ecn no    | ELX-N-16648-1 |       |          |   |
| chr         | -              | -                      |                                  |              | rel level | Released      |       |          |   |
| appr        | Roger Cheng    | 2014/01/07             | product family                   | MiniSAS/SATA | rev       | D             |       |          |   |
|             |                | title                  | MINI SAS HD 8X TO 2 MINI SAS 2.1 |              | dwg no    | 10117947      |       | cat. no. | - |
| www.fci.com |                | Product - Customer Drw |                                  | sheet 1 of 5 |           |               |       |          |   |

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| PRODUCT NUMBER   | DESCRIPTION      | NOTES      |
|------------------|------------------|------------|
| 10117947-XXXXLF  | NON-HF           | SEE SHT. 3 |
| 10117947-XXXXHLF | HALOGEN FREE (H) | SEE SHT. 3 |



END P1  
MINI SAS HD 8X  
ISOMETRIC VIEW



END P2 & END P3  
MINI SAS  
ISOMETRIC VIEW



KEY 3 & KEY SLOT 2, 4 & 6  
○◇ UNIVERSAL PORT

END P2 & END P3  
MINI SAS

|             |                |   |                |                        |           |               |       |     |
|-------------|----------------|---|----------------|------------------------|-----------|---------------|-------|-----|
| dr          | Deborah Ingram | 2011/05/23  | projection<br> | mm<br>                 | size      | A3            | scale | 4:5 |
| eng         | Tommy Lin      | 2014/01/06  |                |                        | ecn no    | ELX-N-16648-1 |       |     |
| chr         | -              | -   |                |                        | rel level | Released      |       |     |
| appr        | Roger Cheng    | 2014/01/07  | product family | C&A                    |           |               |       |     |
|             |                | title<br>MINI SAS HD 8X TO 2 MINI SAS 2.1<br>TRAINED UNIVERSAL FINAL ASSEMBLY (6Gb/s) |                | dwg no<br>10117947     | rev<br>D  |               |       |     |
| www.fci.com |                | cat. no.  | -              | Product - Customer Drw |           | sheet 2 of 5  |       |     |



| PRODUCT NUMBER   | DESCRIPTION      | NOTES      |
|------------------|------------------|------------|
| 10117947-XXXXLF  | NON-HF           | SEE SHT. 3 |
| 10117947-XXXXHLF | HALOGEN FREE (H) | SEE SHT. 3 |

| PRODUCT NUMBER<br>(NON-HALOGEN FREE)<br>SEE NOTE 16 | AWG    | "DIM L"<br>LENGTH<br>(Meters) | "DIM M"<br>HEIGHT<br>(mm) |
|---|--------|-------------------------------|---------------------------|
| 10117947-5020LF                                     | 24 AWG | 2 M                           | (20.1)                    |
| 10117947-5030LF                                     | 24 AWG | 3 M                           | (20.1)                    |
| 10117947-5040LF                                     | 24 AWG | 4 M                           | (20.1)                    |
| 10117947-5050LF                                     | 24 AWG | 5 M                           | (20.1)                    |
| 10117947-5060LF                                     | 24 AWG | 6 M                           | (20.1)                    |
| 10117947-5070LF                                     | 24 AWG | 7 M                           | (20.1)                    |
| 10117947-5080LF                                     | 24 AWG | 8 M                           | (20.1)                    |
| 10117947-5090LF                                     | 24 AWG | 9 M                           | (20.1)                    |
| 10117947-5100LF                                     | 24 AWG | 10 M                          | (20.1)                    |
| 10117947-4020LF                                     | 26 AWG | 2 M                           | (20.1)                    |
| 10117947-4030LF                                     | 26 AWG | 3 M                           | (20.1)                    |
| 10117947-4040LF                                     | 26 AWG | 4 M                           | (20.1)                    |
| 10117947-4050LF                                     | 26 AWG | 5 M                           | (20.1)                    |
| 10117947-4060LF                                     | 26 AWG | 6 M                           | (20.1)                    |
| 10117947-4070LF                                     | 26 AWG | 7 M                           | (20.1)                    |
| 10117947-4080LF                                     | 26 AWG | 8 M                           | (20.1)                    |
| 10117947-3010LF                                     | 28 AWG | 1 M                           | (17.3)                    |
| 10117947-3020LF                                     | 28 AWG | 2 M                           | (17.3)                    |
| 10117947-3030LF                                     | 28 AWG | 3 M                           | (17.3)                    |
| 10117947-3040LF                                     | 28 AWG | 4 M                           | (17.3)                    |
| 10117947-3050LF                                     | 28 AWG | 5 M                           | (17.3)                    |
| 10117947-3060LF                                     | 28 AWG | 6 M                           | (17.3)                    |
| 10117947-2005LF                                     | 30 AWG | 0.5 M                         | (17.3)                    |
| 10117947-2010LF                                     | 30 AWG | 1 M                           | (17.3)                    |
| 10117947-2020LF                                     | 30 AWG | 2 M                           | (17.3)                    |
| 10117947-2030LF                                     | 30 AWG | 3 M                           | (17.3)                    |
| 10117947-2040LF                                     | 30 AWG | 4 M                           | (17.3)                    |

| PRODUCT NUMBER<br>(HALOGEN FREE)<br>SEE NOTE 9 AND 16 | AWG    | "DIM L"<br>LENGTH<br>(Meters) | "DIM M"<br>HEIGHT<br>(mm) |
|---|--------|-------------------------------|---------------------------|
| 10117947-5020HLF                                      | 24 AWG | 2 M                           | (20.1)                    |
| 10117947-5030HLF                                      | 24 AWG | 3 M                           | (20.1)                    |
| 10117947-5040HLF                                      | 24 AWG | 4 M                           | (20.1)                    |
| 10117947-5050HLF                                      | 24 AWG | 5 M                           | (20.1)                    |
| 10117947-5060HLF                                      | 24 AWG | 6 M                           | (20.1)                    |
| 10117947-5070HLF                                      | 24 AWG | 7 M                           | (20.1)                    |
| 10117947-5080HLF                                      | 24 AWG | 8 M                           | (20.1)                    |
| 10117947-5090HLF                                      | 24 AWG | 9 M                           | (20.1)                    |
| 10117947-5100HLF                                      | 24 AWG | 10 M                          | (20.1)                    |
| 10117947-4020HLF                                      | 26 AWG | 2 M                           | (20.1)                    |
| 10117947-4030HLF                                      | 26 AWG | 3 M                           | (20.1)                    |
| 10117947-4040HLF                                      | 26 AWG | 4 M                           | (20.1)                    |
| 10117947-4045HLF                                      | 26 AWG | 5 M                           | (20.1)                    |
| 10117947-4060HLF                                      | 26 AWG | 6 M                           | (20.1)                    |
| 10117947-4070HLF                                      | 26 AWG | 7 M                           | (20.1)                    |
| 10117947-4080HLF                                      | 26 AWG | 8 M                           | (20.1)                    |
| 10117947-3010HLF                                      | 28 AWG | 1 M                           | (17.3)                    |
| 10117947-3020HLF                                      | 28 AWG | 2 M                           | (17.3)                    |
| 10117947-3030HLF                                      | 28 AWG | 3 M                           | (17.3)                    |
| 10117947-3040HLF                                      | 28 AWG | 4 M                           | (17.3)                    |
| 10117947-3050HLF                                      | 28 AWG | 5 M                           | (17.3)                    |
| 10117947-3060HLF                                      | 28 AWG | 6 M                           | (17.3)                    |
| 10117947-2005HLF                                      | 30 AWG | 0.5 M                         | (17.3)                    |
| 10117947-2010HLF                                      | 30 AWG | 1 M                           | (17.3)                    |
| 10117947-2020HLF                                      | 30 AWG | 2 M                           | (17.3)                    |
| 10117947-2030HLF                                      | 30 AWG | 3 M                           | (17.3)                    |
| 10117947-2040HLF                                      | 30 AWG | 4 M                           | (17.3)                    |

|   |                |  |   |                        |                |               |       |     |
|---|----------------|--|---|------------------------|----------------|---------------|-------|-----|
| dr  | Deborah Ingram | 2011/05/23   |  | mm                     | size           | A3            | scale | 1:1 |
| eng   | Tommy Lin      | 2014/01/06   |   |                        | ecn no         | ELX-N-16648-1 |       |     |
| chr   | -              | -  |   |                        | rel level      | Released      |       |     |
| appr  | Roger Cheng    | 2014/01/07   |   |                        | product family | C&A           |       |     |
|  |                | title MINI SAS HD 8X TO 2 MINI SAS 2.1<br>TRAINED UNIVERSAL FINAL ASSEMBLY (6Gb/s) |   | dwg no 10117947        | rev D          |               |       |     |
| www.fci.com   |                | cat. no.   | -   | Product - Customer Drw |                | sheet 3 of 5  |       |     |

| PRODUCT NUMBER   | DESCRIPTION      | NOTES      |
|------------------|------------------|------------|
| 10117947-XXXXLF  | NON-HF           | SEE SHT. 3 |
| 10117947-XXXXHLF | HALOGEN FREE (H) | SEE SHT. 3 |



VIEW A  
SCALE: 2:1



VIEW B  
SCALE: 2:1

LEGEND:



HIGH-SPEED SERIAL DIFFERENTIAL PAIRS



SIGNAL RETURN



POWER AND MANAGEMENT INTERFACE

WIRING LIST (SEE NOTE 7)

| END P1 (B)<br>MINI SAS HD |      | CONDUCTOR #        | END P2<br>(MINI SAS) |        |
|---------------------------|------|--------------------|----------------------|--------|
| SIGNAL                    | PIN# |                    | PIN#                 | SIGNAL |
| GND                       | A9   | PAIR 2             | B7                   | GND    |
| Rx 1-                     | A5   |                    | B6                   | Tx 1-  |
| Rx 1+                     | A4   |                    | B5                   | Tx 1+  |
| GND                       | A3   | PAIR 4             | B4                   | GND    |
| Rx 3-                     | A8   |                    | B12                  | Tx 3-  |
| Rx 3+                     | A7   |                    | B11                  | Tx 3+  |
| GND                       | A6   |                    | B13                  | GND    |
| N/C                       | A1   | NO THRU CONNECTION |                      |        |
| Interrupt                 | A2   |                    |                      |        |
| GND                       | B9   | PAIR 1             |                      | GND    |
| RX 0-                     | B5   |                    | B3                   | TX 0-  |
| RX 0+                     | B4   |                    | B2                   | TX 0+  |
| GND                       | B3   | PAIR 3             | B1                   | GND    |
| RX 2-                     | B8   |                    | B9                   | TX 2-  |
| RX 2+                     | B7   |                    | B8                   | TX 2+  |
| GND                       | B6   |                    | B10                  | GND    |
| N/C                       | B1   | NO THRU CONNECTION |                      |        |
| Mod_PRS_L (GND)           | B2   |                    |                      |        |
| GND                       | C9   |                    | A7                   | GND    |
| TX 1-                     | C5   | PAIR 2             | A6                   | RX 1-  |
| TX 1+                     | C4   |                    | A5                   | RX 1+  |
| GND                       | C3   |                    | A4                   | GND    |
| TX 3-                     | C8   | PAIR 4             | A12                  | RX 3-  |
| TX 3+                     | C7   |                    | A11                  | RX 3+  |
| GND                       | C6   |                    | A13                  | GND    |
| SCL                       | C1   | NO THRU CONNECTION |                      |        |
| SDA                       | C2   |                    |                      |        |
| GND                       | D9   |                    |                      | GND    |
| TX 0-                     | D5   | PAIR 1             | A3                   | RX 0-  |
| TX 0+                     | D4   |                    | A2                   | RX 0+  |
| GND                       | D3   |                    | A1                   | GND    |
| TX 2-                     | D8   | PAIR 3             | A9                   | RX 2-  |
| TX 2+                     | D7   |                    | A8                   | RX 2+  |
| GND                       | D6   |                    | A10                  | GND    |
| N/C                       | D1   | NO THRU CONNECTION |                      |        |
| V+3.3 for EEPROM          | D2   |                    |                      |        |
| SHELL                     |      | BRAID              |                      | SHELL  |

SHIELD-----SHIELD

WIRING LIST (SEE NOTE 7)

| END P1 (A)<br>MINI SAS HD |      | CONDUCTOR #        | END P3<br>(MINI SAS) |        |
|---------------------------|------|--------------------|----------------------|--------|
| SIGNAL                    | PIN# |                    | PIN#                 | SIGNAL |
| GND                       | A9   | PAIR 2             | B7                   | GND    |
| Rx 1-                     | A5   |                    | B6                   | Tx 1-  |
| Rx 1+                     | A4   |                    | B5                   | Tx 1+  |
| GND                       | A3   | PAIR 4             | B4                   | GND    |
| Rx 3-                     | A8   |                    | B12                  | Tx 3-  |
| Rx 3+                     | A7   |                    | B11                  | Tx 3+  |
| GND                       | A6   |                    | B13                  | GND    |
| N/C                       | A1   | NO THRU CONNECTION |                      |        |
| Interrupt                 | A2   |                    |                      |        |
| GND                       | B9   | PAIR 1             |                      | GND    |
| RX 0-                     | B5   |                    | B3                   | TX 0-  |
| RX 0+                     | B4   |                    | B2                   | TX 0+  |
| GND                       | B3   | PAIR 3             | B1                   | GND    |
| RX 2-                     | B8   |                    | B9                   | TX 2-  |
| RX 2+                     | B7   |                    | B8                   | TX 2+  |
| GND                       | B6   |                    | B10                  | GND    |
| N/C                       | B1   | NO THRU CONNECTION |                      |        |
| Mod_PRS_L (GND)           | B2   |                    |                      |        |
| GND                       | C9   |                    | A7                   | GND    |
| TX 1-                     | C5   | PAIR 2             | A6                   | RX 1-  |
| TX 1+                     | C4   |                    | A5                   | RX 1+  |
| GND                       | C3   |                    | A4                   | GND    |
| TX 3-                     | C8   | PAIR 4             | A12                  | RX 3-  |
| TX 3+                     | C7   |                    | A11                  | RX 3+  |
| GND                       | C6   |                    | A13                  | GND    |
| SCL                       | C1   | NO THRU CONNECTION |                      |        |
| SDA                       | C2   |                    |                      |        |
| GND                       | D9   |                    |                      | GND    |
| TX 0-                     | D5   | PAIR 1             | A3                   | RX 0-  |
| TX 0+                     | D4   |                    | A2                   | RX 0+  |
| GND                       | D3   |                    | A1                   | GND    |
| TX 2-                     | D8   | PAIR 3             | A9                   | RX 2-  |
| TX 2+                     | D7   |                    | A8                   | RX 2+  |
| GND                       | D6   |                    | A10                  | GND    |
| N/C                       | D1   | NO THRU CONNECTION |                      |        |
| V+3.3 for EEPROM          | D2   |                    |                      |        |
| SHELL                     |      | BRAID              |                      | SHELL  |

SHIELD-----SHIELD

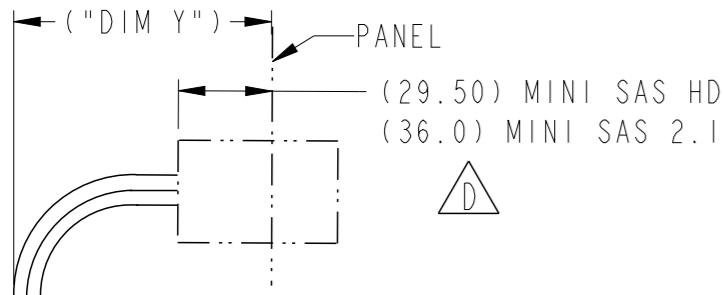
|             |                |            |                                  |     |        |               |                        |          |
|-------------|----------------|------------|----------------------------------|-----|--------|---------------|------------------------|----------|
| dr          | Deborah Ingram | 2011/05/23 | projection                       | mm  | size   | A3            | scale                  | 1:2      |
| eng         | Tommy Lin      | 2014/01/06 |                                  |     | ecn no | ELX-N-16648-1 | rel level              | Released |
| chr         | -              | -          |                                  |     |        |               |                        |          |
| appr        | Roger Cheng    | 2014/01/07 | product family                   | C&A |        |               |                        |          |
|             |                |            | MINI SAS HD 8X TO 2 MINI SAS 2.1 |     | dwg no |               | 10117947               |          |
| www.fci.com |                |            | cat. no.                         |     | -      |               | Product - Customer Drw |          |
|             |                |            | sheet 4 of 5                     |     |        |               |                        |          |

| PRODUCT NUMBER   | DESCRIPTION      | NOTES      |
|------------------|------------------|------------|
| 10117947-XXXXLF  | NON-HF           | SEE SHT. 3 |
| 10117947-XXXXHLF | HALOGEN FREE (H) | SEE SHT. 3 |

NOTES:

1. MATERIALS MINI SAS HD (END P1)  
 BACK SHELLS: ZINC DIE CAST/ COPPER UNDER PLATE/NICKEL OVER PLATE  
 PULL TAB: THERMOPLASTIC POLYMER  
 LATCH: STAINLESS STEEL  
 FERRULE: BRASS  
 EMI GASKETS: STAINLESS STEEL  
 LOCTITE  
 HEAT SHRINK: HIGH POLYMER  
 PADDLE CARD: PRINTED CIRCUIT SUBSTRATE

MATERIALS MINI SAS (END P2 & END P3)  
 BACK SHELLS: ZINC DIE CAST  
 PULL TAB: THERMOPLASTIC POLYMER  
 LATCH: STAINLESS STEEL  
 JET MELT: POLYAMIDE POLYMER  
 HEAT SHRINK: POLYOLEFIN  
 PADDLE CARD: PRINTED CIRCUIT SUBSTRATE



**PEND RADIUS  
TOP VIEW OF CONNECTOR**

| MINI SAS HD P1<br>MINIMUM CABLE BEND TABLE |                 |                     |
|--|-----------------|---------------------|
| CABLE                                      | ("DIM Y")<br>HF | ("DIM Y")<br>NON-HF |
| 24 AWG                                     | 101.1           | 100.6               |
| 26 AWG                                     | 100.0           | 99.7                |
| 28 AWG                                     | 99.1            | 98.7                |
| 30 AWG                                     | 98.5            | 97.9                |

| MINI SAS 2.1 P2 & P3<br>MINIMUM CABLE BEND TABLE<br>PER CONNECTOR |                 |                     |
|---|-----------------|---------------------|
| CABLE   | ("DIM Y")<br>HF | ("DIM Y")<br>NON-HF |
| 24 AWG  | 90.6            | 88.3                |
| 26 AWG  | 85.3            | 82.9                |
| 28 AWG  | 79.3            | 76.9                |
| 30 AWG  | 75.7            | 72.1                |

2. ELECTRICAL PERFORMANCE PER CURRENT REVISION: T10/SAS-2.1

3. THIS PRODUCT MEETS THE RESTRICTION OF HAZARDOUS SUBSTANCES IN ELECTRICAL AND ELECTRONIC EQUIPMENT (RoHS) DIRECTIVE (2011/65/EU)

4. PRODUCT SPECIFICATIONS: Mini SAS HD GS-12-651, MINI SAS 2.1 GS-12-548

5. UNLESS OTHERWISE SPECIFIED ASSEMBLED LENGTH TOLERANCE IS TO BE:  
 "DIM L" < 1 METERS = ±25mm  
 "DIM L" 1 METER TO 10 METER = 2% OF "DIM L"

6. LABEL DETAILS:

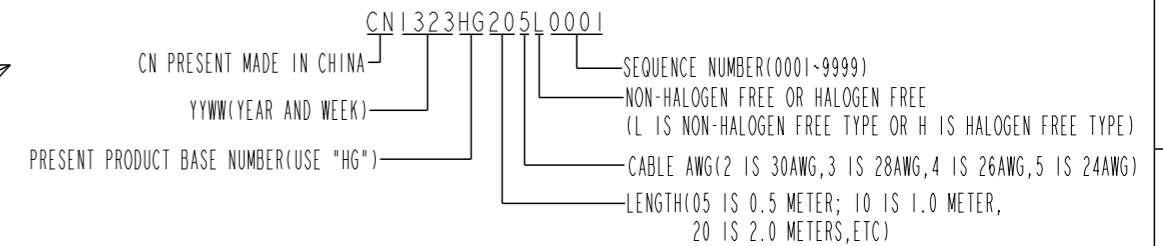
FCI CHINA  
 FCI P/N  
 FCI CUSTOMER DRAWING REVISION  
 FCI SERIAL NUMBER

FONT SHALL BE CLEARLY VISIBLE AND BLACK IN COLOR

**△ LABEL EXAMPLE**

FCI CHINA  
 10117947-5020LF  
 REV.D  
 CN1323HG205L0001

FCI SERIAL NUMBER IS ONLY FOR TRACKING PRODUCT, DEFINED AS BELOW:



7. ALL CABLE ASSEMBLIES SHALL BE 100% TESTED FOR CONTINUITY AS DEFINED IN WIRING LIST.

8. PACKAGING OF LEAD FREE PRODUCTS MEETS LABELING AND PACKAGING PER SPECIFICATION GS-14-920. PACKAGE CABLE ASSEMBLIES PER GS-14-1272. DUST COVER IS TO BE APPLIED TO MINI SAS HD CONNECTOR PRIOR TO SHIPPING. FCI PACKAGE TRACKING BAG LABEL IS ONLY FOR REFERENCE.

9. "H" PRODUCT NUMBERS DESIGNATE THE USE OF HALOGEN FREE RAW CABLE.

10. THIS DIMENSION IS A FINISHED PRODUCT LENGTH.

11. A "△" SYMBOL WILL BE NEXT TO ANY DIMENSION, VIEW, OR NOTE WHICH HAS BEEN MODIFIED WITH THE CURRENT DRAWING REVISION. THE CURRENT REVISION WILL BE SHOWN IN THE SYMBOL.

12. MEETS ELECTRICAL PERFORMANCE REQUIREMENTS OF SAS 2.1.

13. MATES WITH SERIES: MINI SAS HS - 100112627 or 10112628  
 MINI SAS 2.1 - BOARD CONNECTOR 100988870 AND CAGE 10098872

14. PLACE A CABLE TIE EVERY 0.5 METERS ON ASSEMBLIES. IN THE CASE OF A 0.5 METER CABLE LENGTH, PLACE THE CABLE TIE MIDWAY BETWEEN CONNECTORS.



NOTES CONTINUED

15. EEPROM INFORMATION OF MSHD SIDE REFER TO FCI LATEST PRODUCT SPEC. GS-12-651

16. CABLE IS OPTIONAL, WHICH HAD BEEN QUALIFIED BY FCI AND MEET FCI PRODUCT SPEC. GS-12-651/548

|             |                |            |  |          |                        |               |       |     |
|-------------|----------------|------------|--|----------|------------------------|---------------|-------|-----|
| dr          | Deborah Ingram | 2011/05/23 | projection<br>                           | mm<br>←→ | size                   | A3            | scale | 1:1 |
| eng         | Tommy Lin      | 2014/01/06 |  |          | ecn no                 | ELX-N-16648-1 |       |     |
| chr         | -              | -          |  |          | rel level              | Released      |       |     |
| appr        | Roger Cheng    | 2014/01/07 |  |          | product family         | -             |       |     |
| www.fci.com |                |            | cat. no.                                 | -        | Product - Customer Drw | sheet 5 of 5  |       |     |
| FCI         |                |            | MINI SAS HD 8X TO 2 MINI SAS 2.1         | dwg no   | 10117947               | rev           | D     |     |
|             |                |            | TRAINED UNIVERSAL FINAL ASSEMBLY (6Gb/s) |          |                        |               |       |     |

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «JONHON», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «FORSTAR».



## JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).



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