

43 Gb/s 1: 2 DEMUX

Features

- Maximum input data rate: 43 Gb/s
- Output amplitude: 0.9 V_{pp}
- Single-ended clock/data input

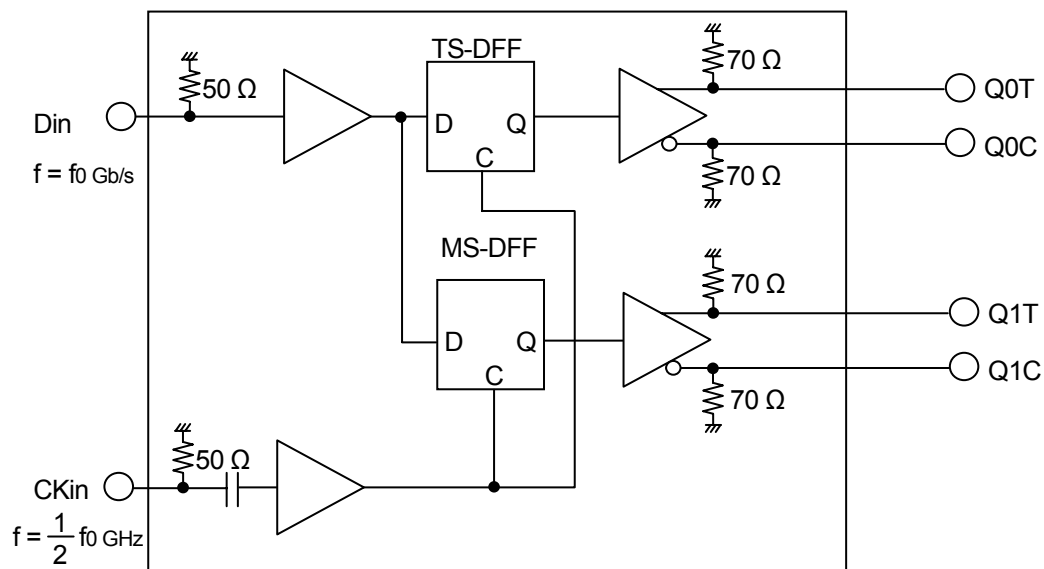
General Description

The CI0008A is a 1: 2 demultiplexer operating at rates up to 43 Gb/s. The I/O levels are SCFL (VH: 0.0 V, VL: -0.9 V). The IC is fabricated using a 0.1-μm InP HEMT process. The CI0008A is provided in a hermetically-sealed package with V-connectors.

Applications

- 1: 2 Demultiplexer

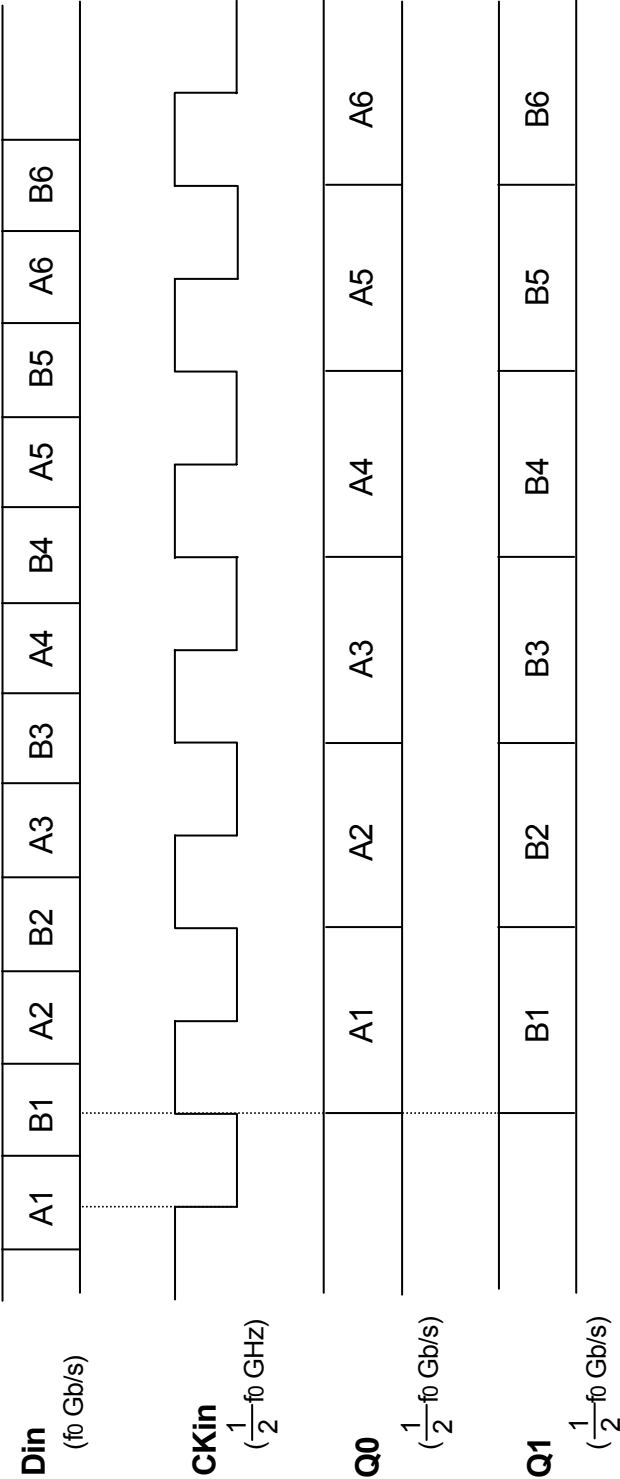
Functional Diagram



TS-DFF: Tri-Stage D-FF

MS-DFF: Master-Slave D-FF

Timing Chart



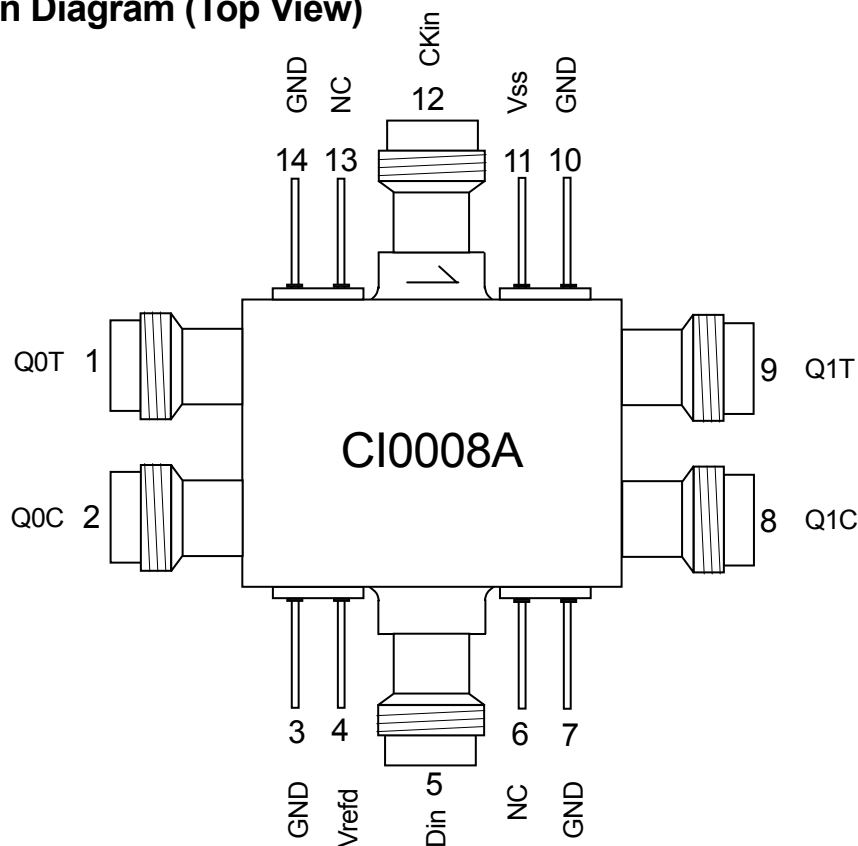
Connection Table

| No. | NAME | FUNCTION | No. | NAME | FUNCTION |
|-----|----------------------|-------------------------------|-----|--------------------|-------------------------------|
| 1 | Q0T ⁽²⁾ | Data Output 0 (True) | 8 | Q1C ⁽²⁾ | Data Output 1 (Complementary) |
| 2 | Q0C ⁽²⁾ | Data Output 0 (Complementary) | 9 | Q1T ⁽²⁾ | Data Output 1 (True) |
| 3 | GND | Ground (0.0 V) | 10 | GND | Ground (0.0 V) |
| 4 | Vrefd ⁽¹⁾ | Data Input Reference | 11 | Vss | Power Supply (-4.5 V) |
| 5 | Din | Data Input | 12 | CKin | Clock Input |
| 6 | NC | No Internal Connection | 13 | NC | No Internal Connection |
| 7 | GND | Ground (0.0 V) | 14 | GND | Ground (0.0 V) |

Notes

- (1) Adjust Vrefd in the range between -0.75 V and -0.2 V.
- (2) Terminate unused output connectors to GND through 50-ohm resistors.

Connection Diagram (Top View)



Absolute Maximum Ratings

| SYMBOL | PARAMETER | RATING | UNIT |
|-------------------|--|--------------|------|
| VSS | Power Supply Voltage | -5.0 to +0.1 | V |
| Vin | Applied Voltage Amplitude at Clock Input (CKin) | 1.2 | Vpp |
| Vind | Applied Voltage at Data Input (Din) | -1.2 to +0.1 | V |
| Vinck | Applied Voltage at Clock Input (CKin) | -1.2 to +1.2 | V |
| Vout | Applied Voltage at Data Outputs (Q0T, Q0C, Q1T, Q1C) | TBD | V |
| Vrefd | Applied Voltage at Vrefd pin | -1.2 to +0.1 | V |
| Tstor | Storage Temperature | TBD | °C |
| Tc ⁽¹⁾ | Case Temperature under Bias | TBD | °C |

TBD: To Be Determined

Recommended Operating Conditions

| SYMBOL | PARAMETER | MIN. | TYP. | MAX. | UNIT |
|----------------------|------------------------------|--|------|------|------|
| VSS | Power Supply | -4.7 | -4.5 | -4.3 | V |
| Vrefd | Data Input Reference Voltage | Adjust in the range from -0.75 V to -0.2 V | | | |
| Din | Data Input Interface | DC coupling (see DC Characteristics) | | | |
| CKin | Clock Input Interface | DC coupling (see DC Characteristics) or AC coupling (see AC Characteristics) | | | |
| Q0T, Q0C Q1T, Q1C | Data Output Interface | DC coupling (see DC Characteristics), Terminate to GND through 50 Ω | | | |

DC Characteristics

(VSS = -4.5 V, GND = 0.0 V, Tc⁽¹⁾ = 30 °C)

| SYMBOL | PARAMETER | MIN. | TYP. | MAX. | UNIT |
|--------|---|------|------|------|------|
| ISS | Power Supply Current | | 690 | TBD | mA |
| VOH | Output Voltage, High (Q0T, Q0C, Q1T, Q1C) | TBD | 0.0 | | V |
| VOL | Output Voltage, Low (Q0T, Q0C, Q1T, Q1C) | | -0.9 | TBD | V |
| VIH | Input Voltage, High (Din, CKin) | TBD | 0.0 | | V |
| VIL | Input Voltage, Low (Din, CKin) | | -0.9 | TBD | V |

TBD: To Be Determined

Note

(1) Tc: Temperature at package base.

AC Characteristics (43 Gb/s)

(V_{SS} = -4.5 V, GND = 0.0 V, PN = 31, MR = 1/2, V_{refd}: Adjust in the range from -0.75 V to -0.2 V)

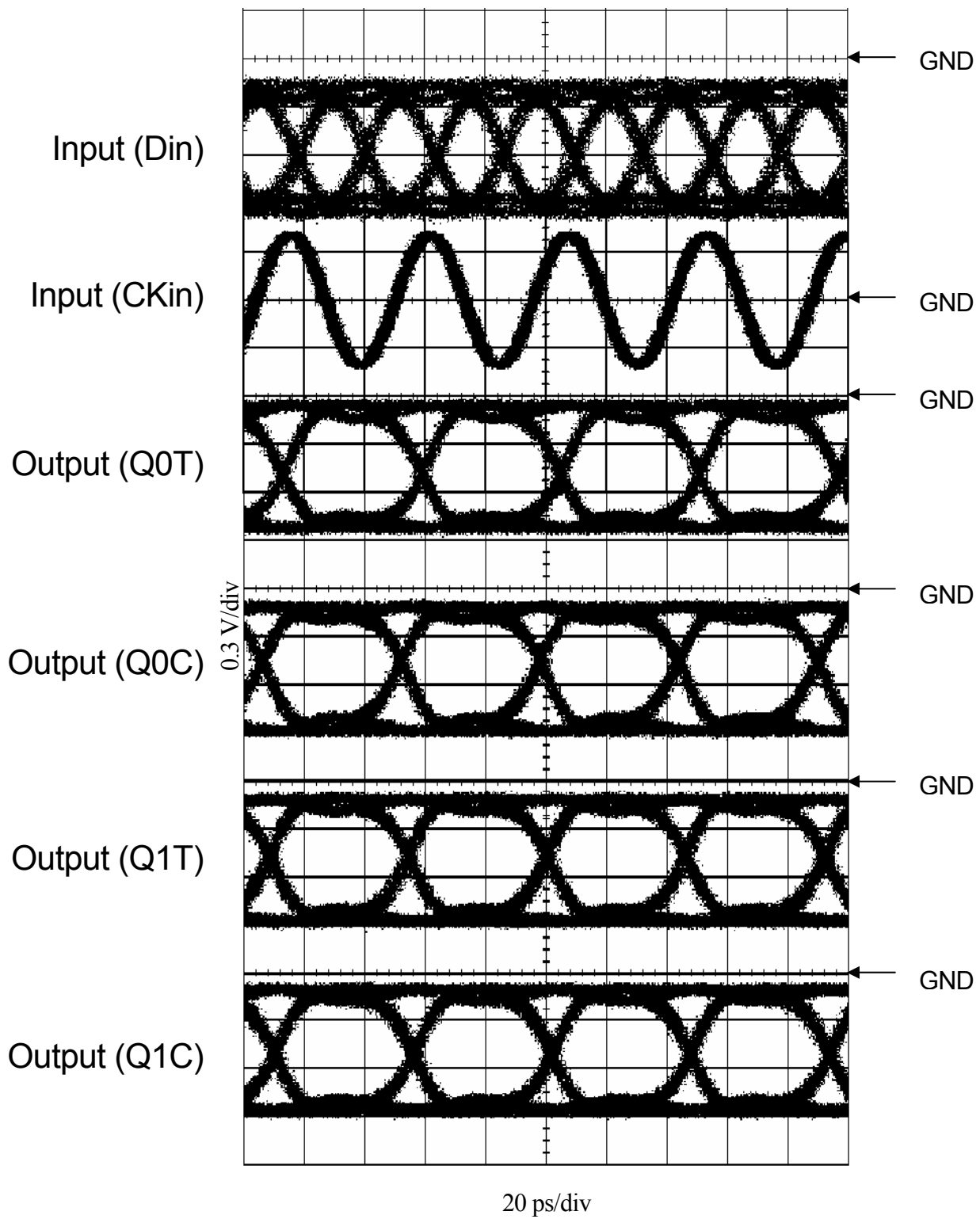
| SYMBOL | PARAMETER | Tc=30 °C | | | UNIT |
|---------------------|---|----------|-----|-----|-----------------|
| | | MIN | TYP | MAX | |
| V _{in} | Clock Input Voltage Amplitude | TBD | 0.9 | | V _{pp} |
| V _{center} | Clock Input Center Voltage | -0.5 | | 0.5 | V |
| f _{MAX} | Maximum Input Data Rate | 43 | | | Gb/s (1) |
| CK _{MIN} | Minimum Clock Frequency | | 15 | | GHz |
| V _{amp} | Output Voltage Amplitude (Q0T, Q0C, Q1T, Q1C) | TBD | 0.9 | | V _{pp} |
| t _r | Output Rise Time (Q0T, Q0C, Q1T, Q1C) 20 - 80% | | 10 | TBD | ps |
| t _f | Output Fall Time (Q0T, Q0C, Q1T, Q1C) 20 - 80% | | 10 | TBD | ps |
| PM | Phase Margin | | 200 | | deg. (1), (2) |

TBD: To Be Determined

Notes

- (1) Confirmed by error-free operation using pseudo-random pattern with a word length of $2^{31}-1$ bits at 43 Gb/s.
- (2) Calculated as follows:
$$PM [deg.] = \frac{PM (measured) [ps]}{23.3 [ps] - Input Data Jitter (pp) [ps]} \times 360 [deg.]$$
where, $23.3 ps = \frac{1}{43 Gb/s}$

Sample Waveforms (43 Gb/s)

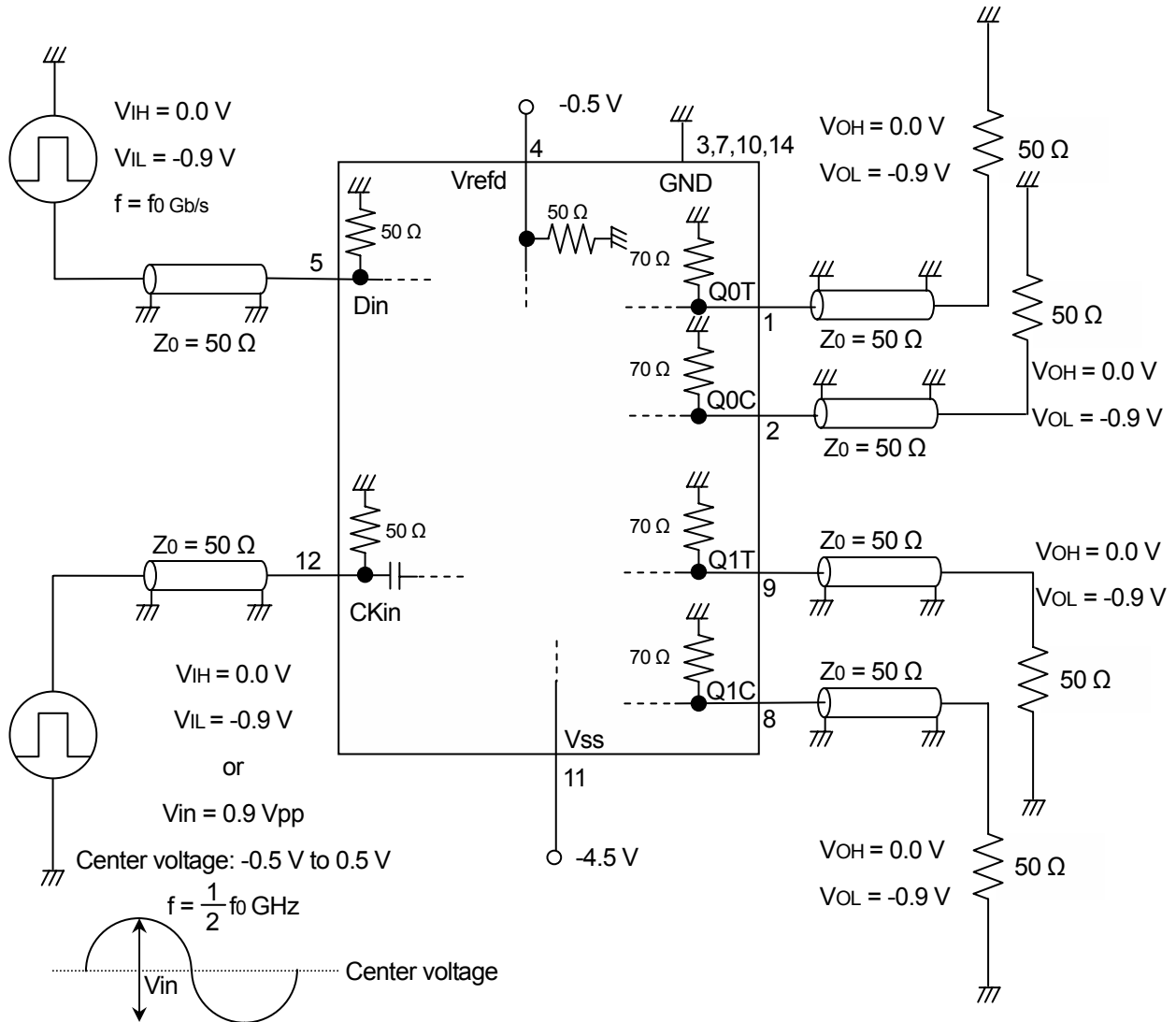


Measurement Conditions

$V_{ss} = -4.5$ V, $V_{refd} = -0.5$ V, Input Data: 43 Gb/s, Input Clock: 21.5 GHz.

Sample Implementation

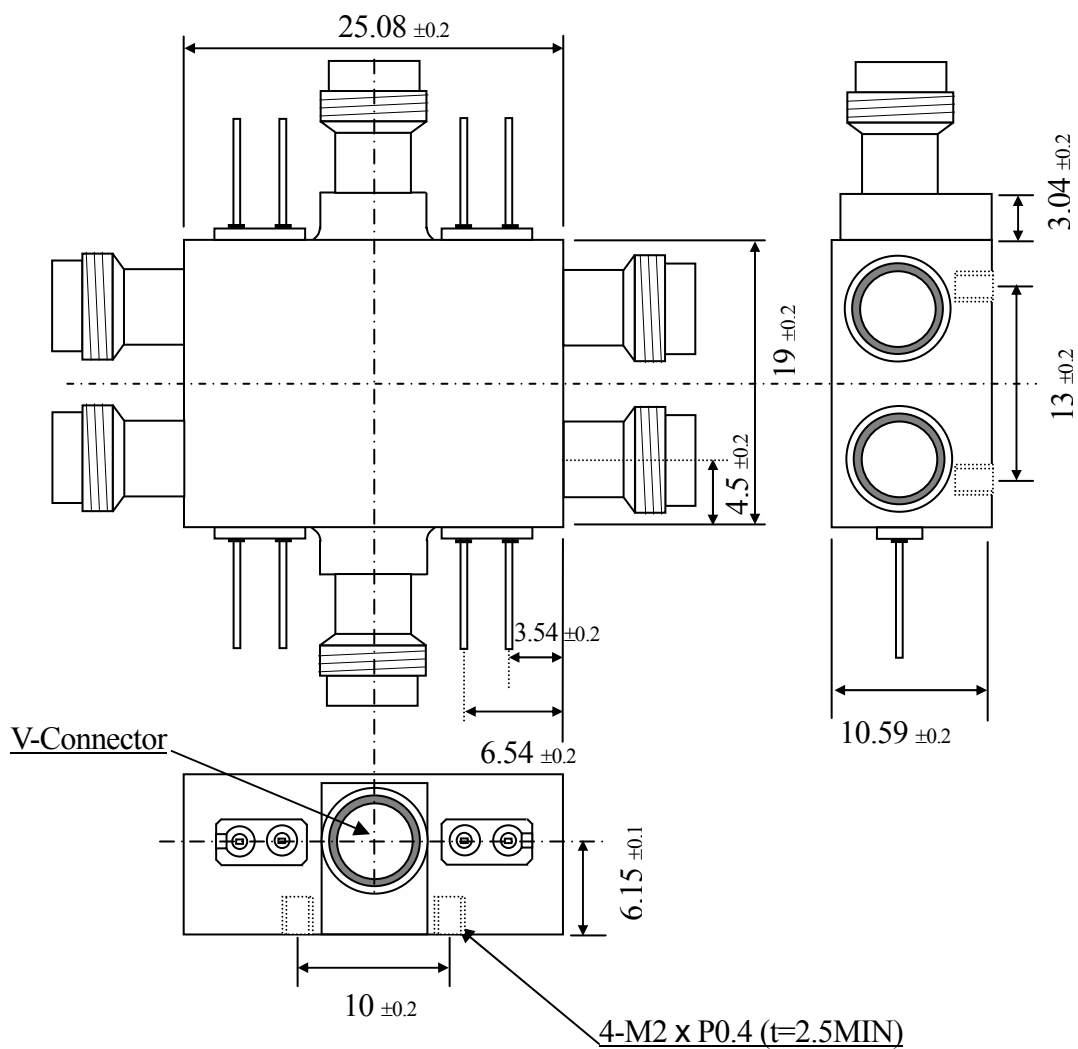
Note: Each number corresponds to a pin or a connector as shown in Connection Diagram



Power Supply Sequence

- (1) Set power supply voltages V_{ss} , V_{refd} , and GND to 0 V .
- (2) Apply -0.5 V to V_{refd} .
- (3) Apply -4.5 V to V_{ss} .
- (4) Input data and clock signals.
- (5) Adjust V_{refd} in the range between -0.75 V and -0.2 V .

SCMD Package Dimension (mm)



Handling Instructions

Since the IC is fabricated using InP HEMT process, users are recommended to follow the instructions below to prevent damage to the chip from electro-static discharge.

- 1) Use a conductive working desk connected to the ground (or, a conductive table top connected to the ground).
- 2) Require all handling personnel to wear a conductive bracelet or wrist-strap connected to the ground through a 1 M Ω resistor.
- 3) Ground all test equipment.
- 4) Ground all soldering iron tips.
- 5) Store IC's and other devices such as chip capacitors in their conductive carriers until they are soldered.

Ordering Information

| Part #: | Description: |
|--------------|----------------------------|
| CI0008A - 43 | f _{MAX} = 43 Gb/s |
| CI0008A - 47 | f _{MAX} = 47 Gb/s |
| CI0008A - 50 | f _{MAX} = 50 Gb/s |

Caution

1. In order to improve products and technology, specifications are subject to change without notice.
2. When using the products, be sure the latest information and specifications are used.
3. Circuit drawings etc. shall be provided for the purpose of information only on application examples not for actual installation of equipment. NTT Electronics Corp. shall not assume any liability for damage that may result from the use of these circuit drawings etc. NTT Electronics Corp. shall not assent to or guarantee any rights of execution for patent rights of the third parties and other rights that may be raised for use of these circuit drawings.
4. To make a design, the products shall be used within the assured ranges with respect to maximum ratings, voltage, and radiation. NTT Electronics Corp. shall not take any responsibility for damage caused by neglecting the assured values or improper usage.
5. Though NTT Electronics Corp. makes every effort to improve quality and reliability, there is a risk that failure or malfunction may occur in semiconductors. It is therefore necessary that the purchasers should take responsibility for making a design that allows the products to operate safely on equipment and systems without any direct threat to the human body and/or property, should such failures or malfunction occur.
6. NTT Electronics Corp.'s semiconductor device products are designed to be used with multimedia networks communication equipment and related measuring equipment. They have not been developed for such equipment that may affect people's lives. Those who intend to use the products for special purposes that may affect human life as a result of failure or malfunction in the equipment using the products or that require extremely high reliability (e.g. life support, aircraft and space rockets, control in nuclear power facilities, submarine relays, control of operations, etc.) shall contact NTT Electronics Corp. before using the products. NTT Electronics Corp. shall not assume any liability for damage that may occur during operation of the products without prior consultation.
7. Some of the products are classified as strategic materials and the 'Foreign Exchange and Foreign Trade Control Act' applies. Export of the applicable products necessitates obtaining approval from the Japanese Government as required by law.
8. Some of the products use GaAs (gallium arsenide). GaAs powder and vapor are dangerous for humans. Do not break, cut, crush or chemically destroy the products. To dispose of the products, follow the relevant regulations and laws; do not mix with general industrial waste and domestic garbage.
9. Any questions should be directed to the Sales Department of NTT Electronics Corp.