

The GigaTech Products **10319-GT** is programmed to be fully compatible and functional with all intended EXTREME switching devices. This QSFP+ optical transceiver is a parallel fiber optical module with four independent optical transmit and receive channels and is compliant with SFF-8436 and QSFP+ MSA standards. This module is designed for multimode fiber using MPO/MTP connection and operates at a nominal wavelength of 850nm up to 100m over OM3 and 150m over OM4 fiber.

## Features:

- Up to 41.2 Gb/s aggregate bit rates
- Four parallel lane design
- Hot-pluggable QSFP+ footprint
- Uncooled 4x10Gb/s 850nm transmitter
- MPO/MTP connector
- Built-in digital diagnostic function
- Up to 100m over OM3, 150m over OM4 fiber
- Single power supply under 1.5W
- Operating temperature range  
C-Temp: 0°C to 70°C



## Compliance:

- QSFP+ MSA
- MSA SFF-8436
- IEEE 802.3ba
- RoHS Compliant

## Applications:

- 40GBASE-SR4 Ethernet
- Breakout to 4X 10GBASE-SR Ethernet
- Infiniband SDR, DDR and QDR

## Warranty:

GigaTech Branded Optical Transceivers- Lifetime Warranty

## General Specifications - Absolute Maximum Ratings

| Parameter           | Symbol    | Min  | Typ | Max        | Unit | Remarks                    |
|---------------------|-----------|------|-----|------------|------|----------------------------|
| Storage Temperature | $T_{STO}$ | -40  |     | 100        | °C   | Ambient Temperature        |
| Bit Error Rate      | BER       |      |     | $10^{-12}$ |      |                            |
| Input Voltage       | $V_{CC}$  | 3.13 | 3.3 | 3.46       | V    |                            |
| Maximum Voltage     | $V_{MAX}$ | -0.5 |     | 3.6        | V    | Electrical Power Interface |

## Link Distances

| Parameter | Fiber Type   | Modal Bandwidth @ 850nm (MHz-km) | Distance Range (m)    |
|-----------|--------------|----------------------------------|-----------------------|
| 41.2 GBd  | 50/125um MMF | 500 (OM2)                        | 30                    |
|           | 50/125um MMF | 2000 (OM3)                       | 100                   |
|           | 50/125um MMF | 4700 (OM4)                       | 150 (engineered link) |

## Optical Characteristics - Transmitter

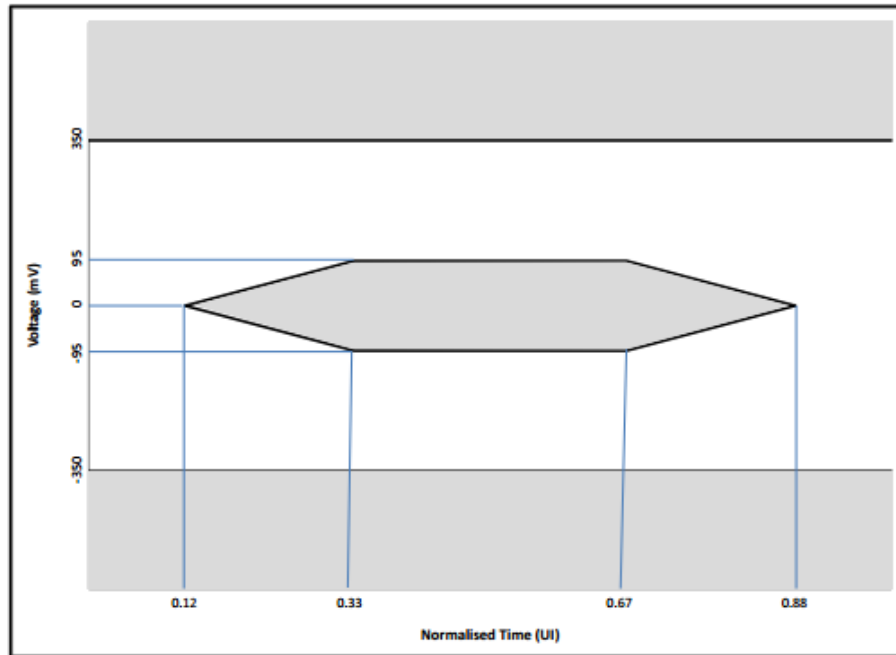
| Parameter                      | Symbol                             | Min  | Typ | Max  | Unit  | Remarks         |
|--------------------------------|------------------------------------|------|-----|------|-------|-----------------|
| Optical Center Wavelength      | $\lambda_C$                        | 840  |     | 860  | Nm    |                 |
| Average Launch Power           | $P$                                | -7.6 |     | 2.4  | dBm   | Each Lane       |
| Extinction Ratio               | ER                                 | 3    |     |      | dB    |                 |
| RMS Spectral Width (-20 dB)    | $\Delta\lambda$                    |      |     | 0.65 | nm    | EIA/TIA-455-127 |
| Relative Intensity Noise (OMA) | RIN                                |      |     | -128 | dB/Hz |                 |
| Transmit Dispersion Penalty    | TDP                                |      |     | 3.5  | dB    |                 |
| Launch Power of OFF Transmit   | $P_{OUT\_OFF}$                     |      |     | -30  | dBm   | Average         |
| Optical Eye Mask               | Compliant to IEEE 802.3ba Standard |      |     |      |       |                 |

## Optical Characteristics - Receiver

| Parameter                       | Symbol        | Min  | Typ | Max   | Unit | Remarks           |
|---------------------------------|---------------|------|-----|-------|------|-------------------|
| Optical Center Wavelength       | $\lambda_C$   | 840  |     | 860   | nm   |                   |
| Optical Input Power (Per Lane)  | $P_{IN}$      | -9.5 |     | 2.4   | dBm  | BER of $10^{-12}$ |
| Damage Threshold                | $P$           | 3.3  |     |       | dBm  |                   |
| Receiver Sensitivity (Per Lane) | $R_{X\_SEN1}$ |      |     | -11.1 | dBm  |                   |
| Stressed Receiver Sensitivity   |               |      |     | -7.5  | dBm  | In OMA Per Lane   |
| Receiver Reflectance            | $TR_{RX}$     |      |     | -12   | dB   |                   |
| LOS Assert                      | $LOS_A$       | -25  |     |       | dBm  |                   |
| LOS De-Assert                   | $LOS_D$       |      |     | -12   | dBm  |                   |
| LOS Hysteresis                  |               | 0.5  |     |       | dB   |                   |

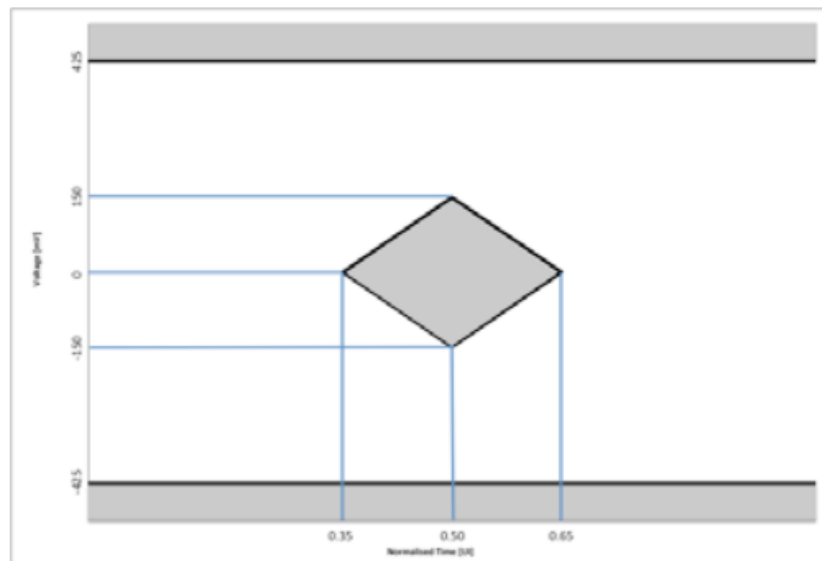
## Electrical Characteristics – Transmitter

| Parameter                    | Symbol       | Min          | Typ | Max          | Unit | Remarks        |
|------------------------------|--------------|--------------|-----|--------------|------|----------------|
| Data Rate Per Channel        | DR           |              |     | 10.5         | GB/s | Non-Condensing |
| Differential Input Amplitude | $V_{IN\_PP}$ | 300          |     | 1200         | mV   |                |
| Transmit Disable Voltage     | $V_D$        | $V_{CC}-1.3$ |     | $V_{CC}$     | V    |                |
| Transmit Enable Voltage      | $V_{EN}$     | $V_{EE}$     |     | $V_{EE}+0.8$ | V    |                |

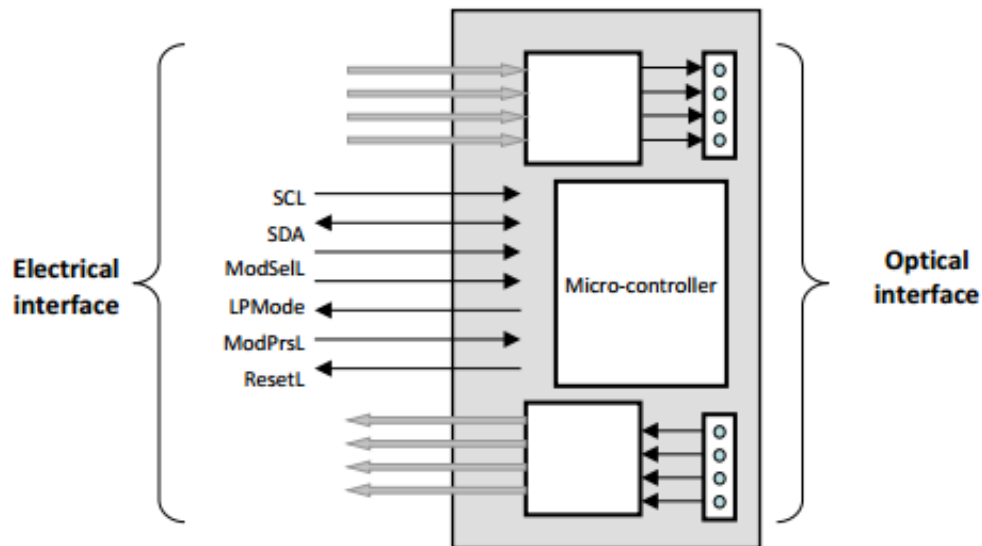


### Electrical Characteristics – Receiver

| Parameter                      | Symbol        | Min  | Typ | Max  | Unit  | Remarks        |
|--------------------------------|---------------|------|-----|------|-------|----------------|
| Data Rate Per Channel          | DR            |      |     | 10.5 | GB/s  | Non-Condensing |
| Differential Output Amplitude  | $V_{OUT\_PP}$ | 340  |     | 700  | mV    |                |
| Single Ended Voltage Tolerance | V             | -0.3 |     | 3.8  | V     |                |
| Output AC Common Mode Voltage  | $V_{CM}$      |      |     | 7.5  | mV    | RMS            |
| Output Transition Time         | $T_R, T_F$    | 28   |     |      | ps    |                |
| Total Jitter                   | $T_J$         |      |     | 0.7  | Ulp-p |                |
| Deterministic Jitter           | DJ            |      |     | 0.4  | Ulp-p |                |



Eye Mask for Hit Ratio =  $1 \times 10^{-12}$

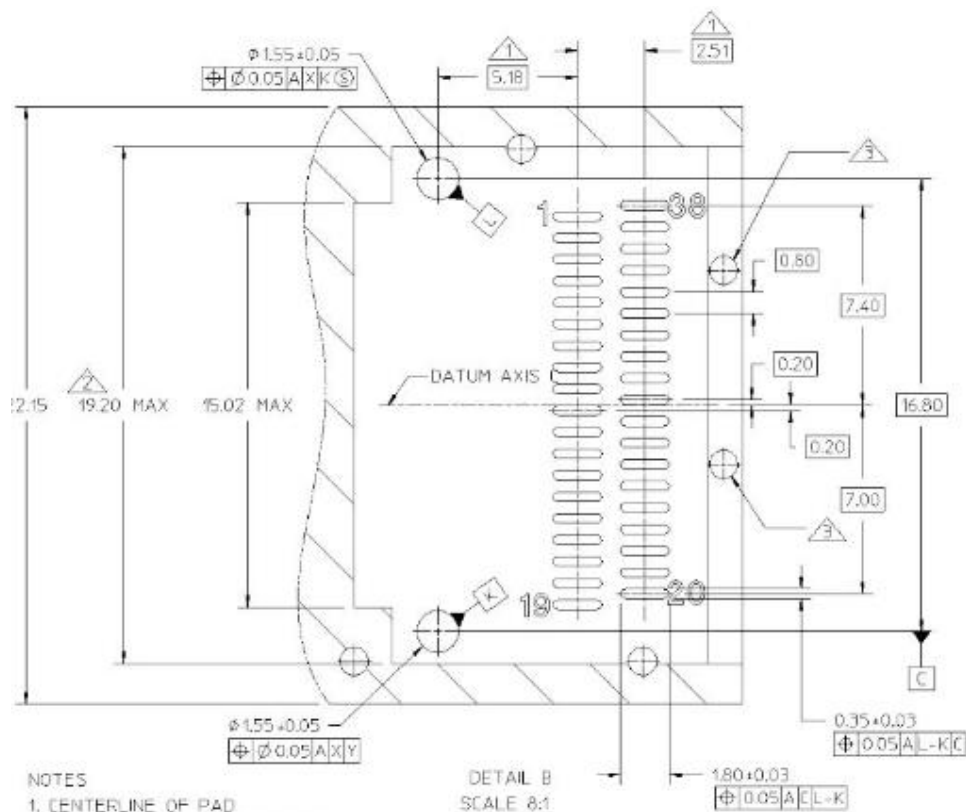
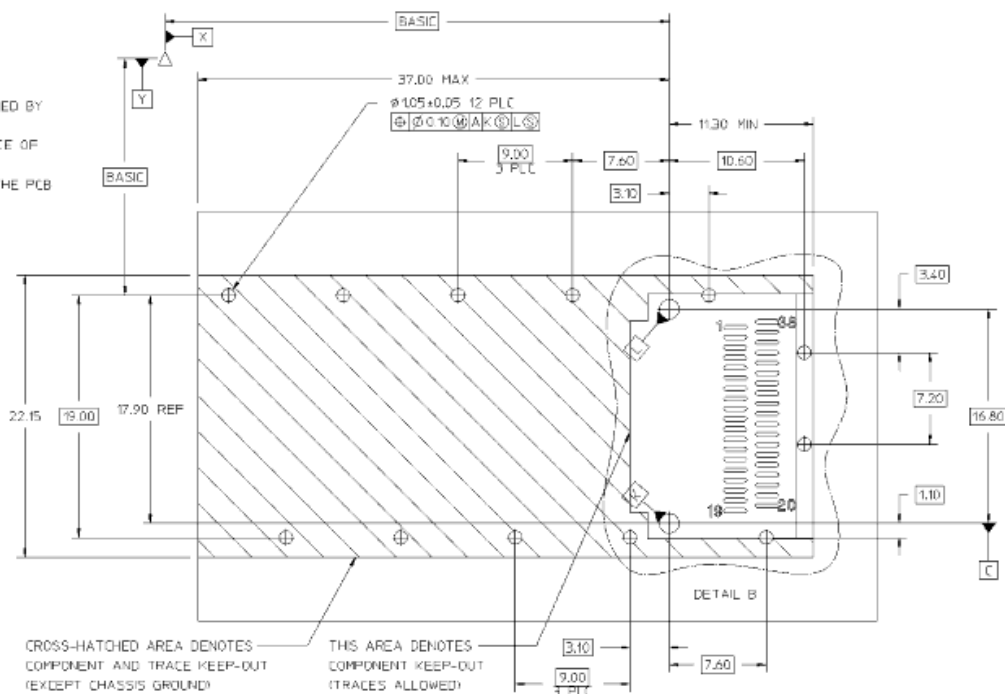
**Block Diagram of Transceiver**

The QSFP-SR4 has a miniature optical engine embedded into the QSFP module. The engine interconnects 4 independent transmit/receive lanes. A functional block diagram of the engine is shown in the above figure. The transmitter section consists of a 4-channel VCSEL array, a 4-channel input buffer and laser driver. An on board micro-controller provides control, diagnostic and monitoring for the cable functions, as well as the external I2C serial communication interface. The Receiver section consists of a 4-channel PIN photodiode array, a 4-channel TIA array, and a 4-channel output buffer.

## PCB Layout Recommendation

### NOTES

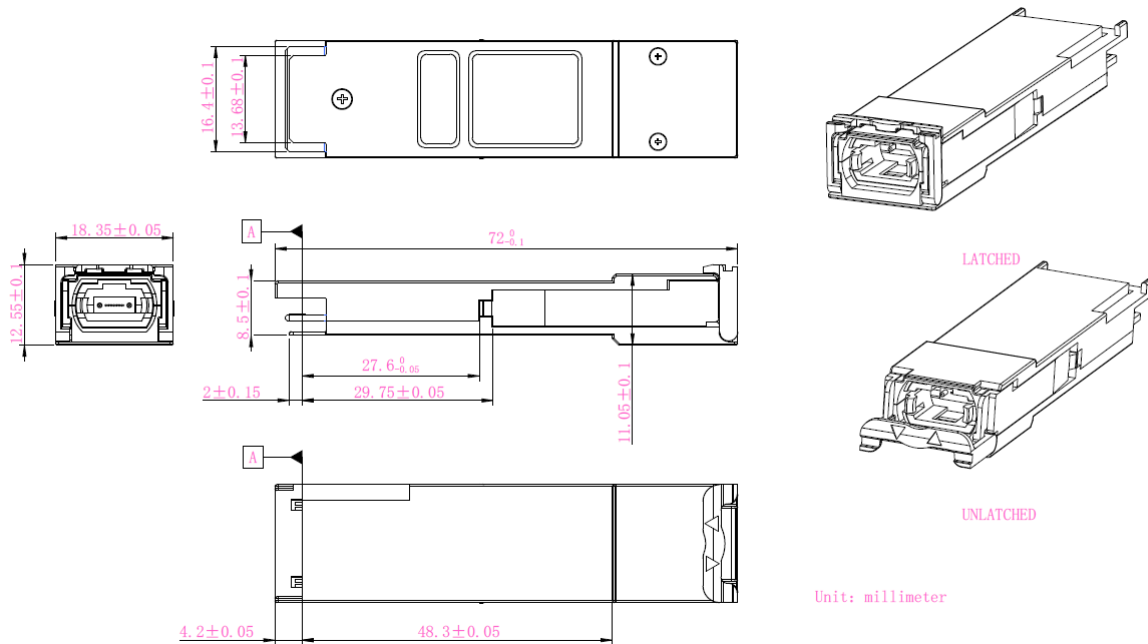
1. DATUM X & Y ARE ESTABLISHED BY THE CUSTOMER'S FIDUCIAL
2. DATUM A IS THE TOP SURFACE OF THE HOST BOARD
3. LOCATION OF THE EDGE OF THE PCB IS APPLICATION SPECIFIC
4. FINISHED PTH HOLE SIZE



### NOTES

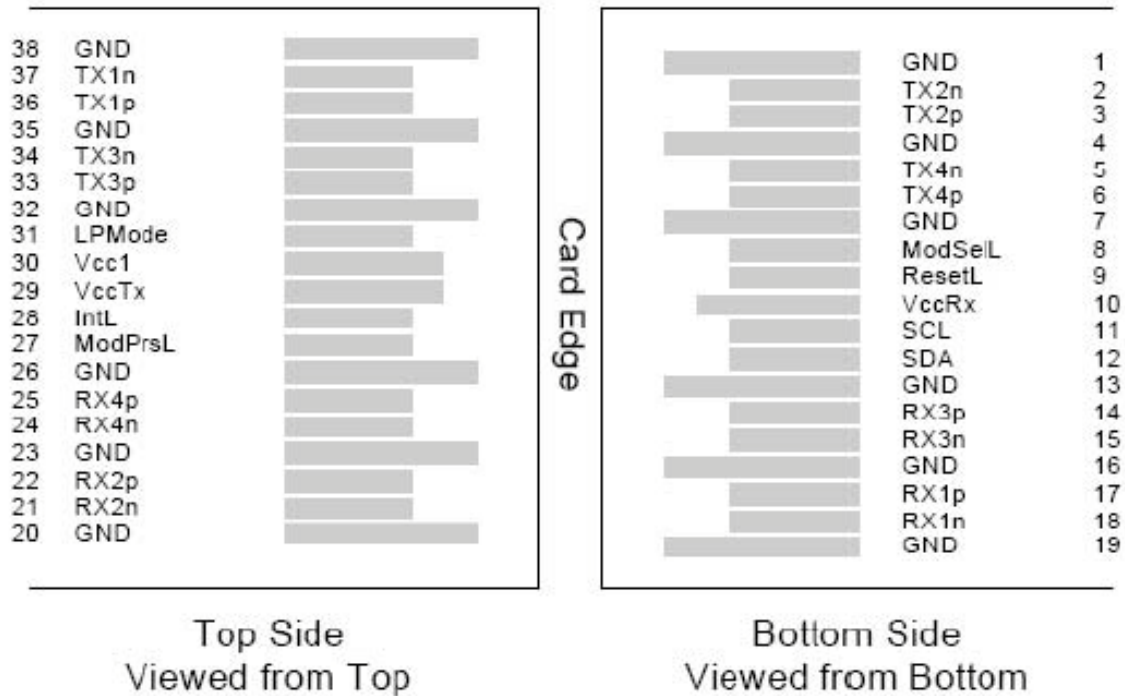
1. CENTERLINE OF PAD
2. SURFACE TRACES PERMITTED WITHIN THIS LENGTH
3. INDICATED HOLES ARE OPTIONAL

## Dimensions



ALL DIMENSIONS ARE  $\pm 0.2\text{mm}$  UNLESS OTHERWISE SPECIFIED UNIT: mm

## Electrical Pad Layout



## Pin Assignment

| <b>PIN #</b> | <b>Symbol</b> | <b>Description</b>                  | <b>Remarks</b> |
|--------------|---------------|-------------------------------------|----------------|
| 1            | GND           | Ground                              |                |
| 2            | Tx2n          | Transmitter Inverted Data Input     |                |
| 3            | Tx2p          | Transmitter Non-Inverted Data Input |                |
| 4            | GND           | Ground                              |                |
| 5            | Tx4n          | Transmitter Inverted Data Input     |                |
| 6            | Tx4p          | Transmitter Non-Inverted Data Input |                |
| 7            | GND           | Ground                              |                |
| 8            | ModSelL       | Module Select                       |                |
| 9            | ResetL        | Module Reset                        |                |
| 10           | Vcc RX        | +3.3V Power Supply Receiver         |                |
| 11           | SCL           | 2-wire serial interface clock       |                |
| 12           | SDA           | 2-wire serial interface data        |                |
| 13           | GND           | Ground                              |                |
| 14           | Rx3p          | Receiver Non-Inverted Data Output   |                |
| 15           | Rx3n          | Receiver Inverted Data Output       |                |
| 16           | GND           | Ground                              |                |
| 17           | Rx1p          | Receiver Non-Inverted Data Output   |                |
| 18           | Rx1n          | Receiver Inverted Data Output       |                |
| 19           | GND           | Ground                              |                |
| 20           | GND           | Ground                              |                |
| 21           | Rx2n          | Receiver Inverted Data Output       |                |
| 22           | Rx2p          | Receiver Non-Inverted Data Output   |                |
| 23           | GND           | Ground                              |                |
| 24           | Rx4n          | Receiver Inverted Data Output       |                |
| 25           | Rx4p          | Receiver Non-Inverted Data Output   |                |
| 26           | GND           | Ground                              |                |
| 27           | ModPrsL       | Module Present                      |                |
| 28           | IntL          | Interrupt                           |                |
| 29           | Vcc TX        | +3.3V Power Supply transmitter      |                |
| 30           | Vcc1          | +3.3V Power Supply                  |                |
| 31           | LPMode        | Low Power Mode                      |                |
| 32           | GND           | Ground                              |                |
| 33           | Tx3p          | Transmitter Non-Inverted Data Input |                |
| 34           | Tx3n          | Transmitter Inverted Data Input     |                |
| 35           | GND           | Ground                              |                |
| 36           | Tx1p          | Transmitter Non-Inverted Data Input |                |
| 37           | Tx1n          | Transmitter Inverted Data Input     |                |
| 38           | GND           | Ground                              |                |

## References

1. IEEE standard 802.3ba. IEEE Standard Department, 2010.
2. QSFP+ 10Gbs 4X PLUGGABLE TRANSCEIVER – SFF-8436