

LxF-LP11xx Series

Low Rider RJ Optical Transceiver

125 Mbps, 1310 nm LED Multimode



Application Example:
Low Rider transceivers with FPGA

The Low Rider RJ transceiver family offers pin-compatible versions to support an easy upgrade path for wavelength, data rate, link distance, or optical performance. Data rate options cover the range from 100 Mbps to 10 Gbps with choice of multimode or singlemode. The transceiver can be ordered with solder mounting posts or with screw posts. In both case the electrical I/O pins are the same: gull wing surface mount and footprint compatible within the entire family. The transceiver is offered with a flat shell, typically used when the device is mid-board mounted, or with an EMI clip that aids in case ground conduction when mounted through a front panel. The transceiver may be ordered with Parylene C conformal coating to provide superior long term reliability in presence of humidity.

Each transceiver in the family contains a an optical transmit and receive function, converting to/from electrical differential signals. Each device contains a laser driver that is calibrated over temperature to provide excellent TX optical performance. The transmit optic may be LED, VCSEL, FP, or DFB technology, depending upon the device part number. The receive optical signal is gain controlled and conditioned to drive the receive differential signals.

Stratos (now Cinch) is the original designer of this form factor, now copied by other suppliers. We have a long history with over 20 years supplying this transceiver family into rugged industrial and defense applications. We offer not only the standard product options as shown in this datasheet, but often can modify certain specifications in order to support your particular requirement. Customization of TX power, extinction ratio, RX sensitivity, operational temperature extension, and fiber pigtail options are common types of modifications.

Features & Benefits

- Miniature rugged optical transceiver
- 125 Mbps data rate
- 1310 nm multimode LED
- Link distance 2000 m
- Half the footprint of Small Form Factor (SFF) device
- Surface Mount I/O pins for high speed signal integrity
- Industrial Temp Range -40°C to $+85^{\circ}\text{C}$
- Vibration tolerant design
- Duplex LC receptacle for optical cable
- 3.3 VDC power supply
- Pin compatible “Low Rider RJ Family” footprint

General Specification

| Parameter | Symbol | Min | Typical | Max | Unit |
|--|-----------------|-------|---------|-------|------|
| Storage Temperature | T _s | -55 | | +100 | °C |
| Operating Temperature | T _c | -40 | | +85 | °C |
| Supply Voltage | V _{cc} | 3.135 | 3.3 | 3.465 | V |
| Supply Current | I _{cc} | | | 300 | mA |
| Lead Solder Temperature (hand solder) ¹ | | | | 260 | °C |
| Lead Solder Time ¹ | | | | 10 | s |
| TX Differential Input Voltage | V _{PP} | 0.4 | 1.25 | 2.0 | V |
| RX Data Output Load | R _L | | 50 | | Ohm |

Note:

¹ Recommend hand solder or hot bar soldering only. Convection or IR reflow oven profiles may damage internal solder joints and optical alignments. See Solder Application Note.

Conformal Coating Option

| Parameter | Value |
|----------------|-----------------------|
| Specification | MIL-I-46058C, Type XY |
| Coating | Parylene type C |
| Deposition | Vacuum deposited |
| Film Thickness | 1 MIL ± 0.0002 |

Link Distances

| Application | Fiber Type | Distance |
|---------------------------|----------------------|----------|
| Fast Ethernet IEEE 802.3U | 62.5/125, 500 MHz*km | 2.0 km |
| FDDI PMD ISO / IEC 9314-3 | 50/125, 500 MHz*km | 2.0 km |

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Low Rider RJ Optical Transceiver

Stratos Optical Technologies

LxF-LP11xx (125 Mbps, Fast Ethernet, 1310 nm multimode)

| Transmitter Parameter | Symbol | Min | Typical | Max | Unit |
|------------------------------------|--------------------|-------|---------|-------|------|
| Optical Output Power ¹ | P _O | -20.0 | | -14.0 | dBm |
| Optical Center Wavelength | λ _{OUT} | 1290 | 1310 | 1330 | nm |
| Spectral Width, FWHM | Δλ _{FWHM} | | | 175 | nm |
| Extinction Ratio | ER | 12 | | | dB |
| Supply Current | I _{CC} | | 120 | 160 | mA |
| Output Optical Rise/Fall (20/80 %) | t _R | | | 3.0 | ns |

Note:

¹ Minimum TX Optical Power can be set at the factory for a higher minimum power, such as -17 dBm. Consult the factory.

| Receiver Parameter | Symbol | Min | Typical | Max | Unit |
|--------------------------------------|-----------------------------------|--------|---------|--------|------|
| Optical Sensitivity ^{1,2} | P _I | -32 | | | dBm |
| Optical Saturation ¹ | P _S | | | -3.0 | dBm |
| Optical Center Wavelength | λ _{IN} | 1260 | | 1380 | nm |
| Supply Current | I _{CC} | | 70 | 120 | mA |
| Signal Detect Assert Time | t _{SDA} | - | 10 | 100 | μs |
| Signal Detect De-Assert Time | t _{SDD} | - | 10 | 350 | μs |
| Signal Detect Threshold ³ | Decreasing Light | LSDT | -45.0 | -32.5 | dBm |
| | Increasing Light | LSDI | -45.0 | -32.0 | dBm |
| RX Data Out - Low | V _{OL} - V _{CC} | -1.810 | | -1.475 | V |
| RX Data Out - High | V _{OH} - V _{CC} | -1.165 | | -0.880 | V |

Notes:

¹ BER = 1E-12 @ 1.25 Gbps, PRBS7, NRZ and with TX signal ER greater than 8 dB

² Optical Sensitivity listed for TX FP source. If using an TX LED source, derate RX Sensitivity to -31.5 dBm.

³ RX Data outputs are squelched when Signal Detect is de-asserted to prevent garbage output when no optical signal is present.

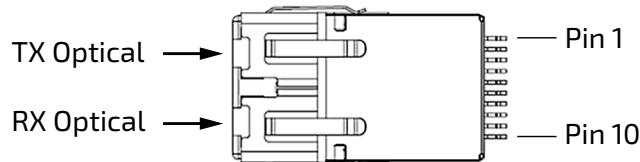
LxF-LP11xx Series

Low Rider RJ Optical Transceiver

Stratos Optical Technologies

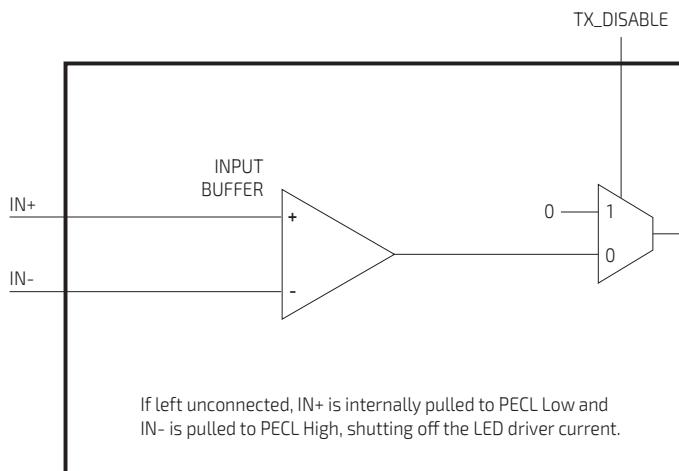
Pin-Out Signal Definition

Top View

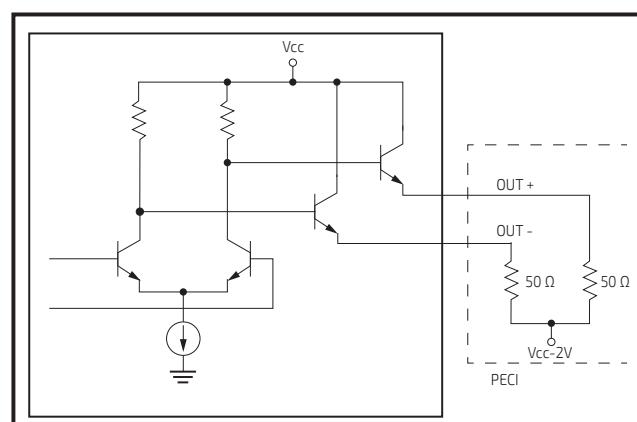


| Pin | Symbol | Signal | Description |
|-----|--------|----------|---|
| GP | GP | Chassis | Grounding Posts - Connect to chassis ground |
| 1 | TD+ | LVPECL | Transmitter DATA IN + |
| 2 | VEETX | GND | Transmitter Signal Ground |
| 3 | TD- | LVPECL | Transmitter DATA IN - |
| 4 | VCCTX | +3.3 VDC | Transmitter Power Supply |
| 5 | SD | LVPECL | Signal Detect Output (1 = Detect, 0 = Loss) |
| 6 | NC | - | Not connected (This is TXDIS control on other Low Riders) |
| 7 | RD+ | LVPECL | Receiver DATA OUT + |
| 8 | VCCRX | +3.3 VDC | Receiver Power Supply |
| 9 | RD- | LVPECL | Receiver DATA OUT - |
| 10 | VEERX | GND | Receiver Signal Ground |

TD +/- LVPECL Input Circuit



RD +/- CML Output Circuit



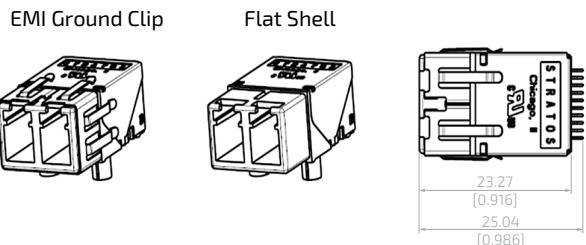
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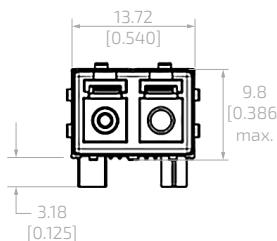
Low Rider Mechanical Details

EMI Clip Option

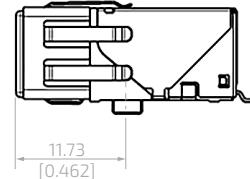
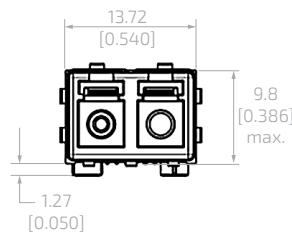
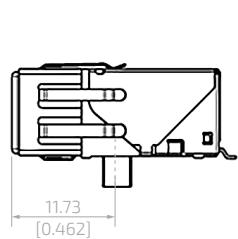


Note: Recommended panel cut-out for proper EMI ground clip contact is 0.400 x 0.560 inches.

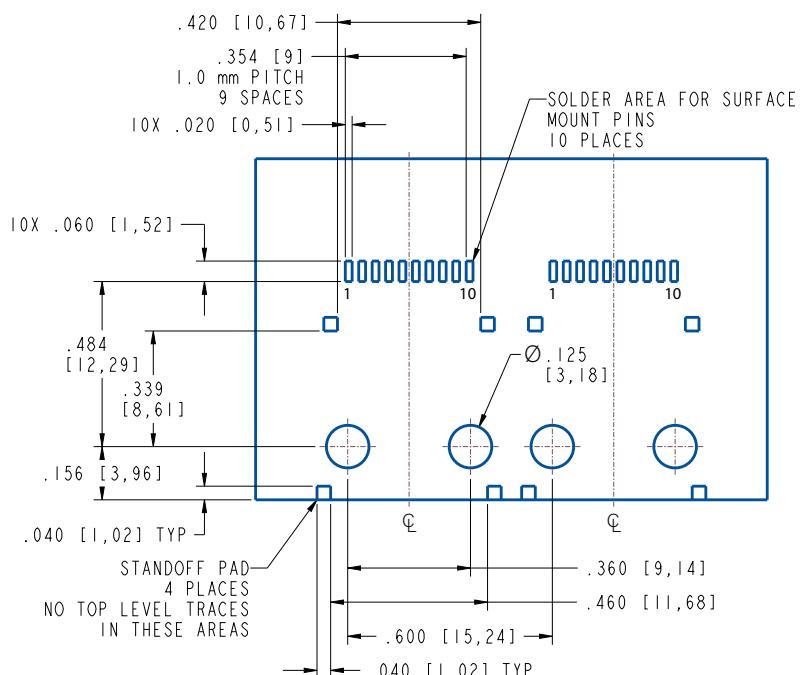
Solder Post



Screw Post



Application Card Footprint Guide



NOTES: 1. DIMENSIONS = INCHES [MM] 2. REF DRAWING 160-00003



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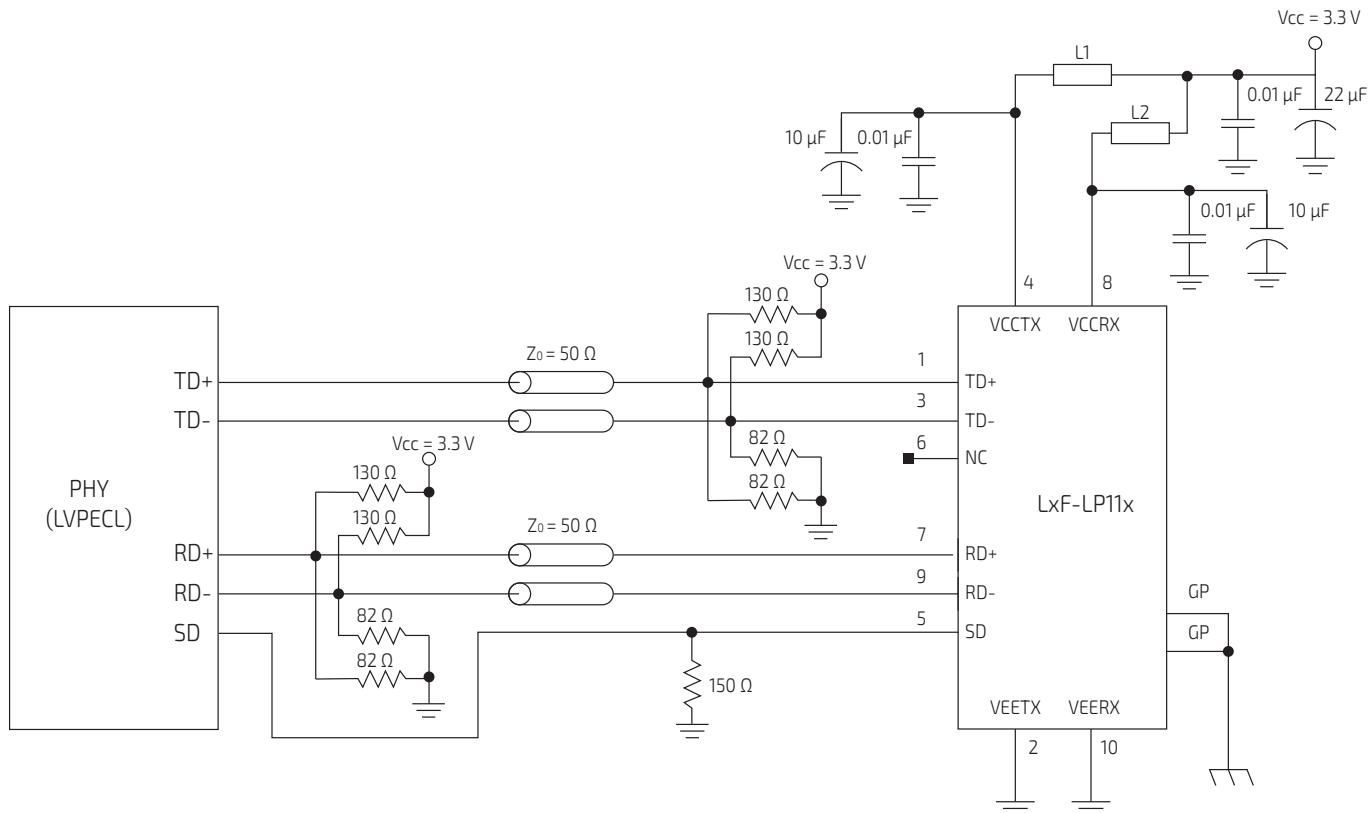
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Low Rider RJ Optical Transceiver

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Application Schematic

Parallel Termination (Thevenin Equivalent) for DC coupled LVPECL PHY Devices



Notes:

1. *L1 and L2 = MuRata BLM21A601S or equivalent (600 Ω at 100 MHz or better).*
2. *Place LVPECL termination resistors (130/82 Ω) as close as possible to termination points.*
3. *Route the differential pairs (TD+/- and RD +/−) together using 50 Ω impedance matched traces.*
4. *Other DC coupled LVPECL termination techniques are also valid.*
5. *Use separate power supply filtering for VCCTX and VCCRX, as shown.*
6. *Ground Posts (GP) are isolated from Signal Ground (Vee), and may be connected to Chassis Ground (as shown) or to Signal Ground if a Chassis Ground is not available.*



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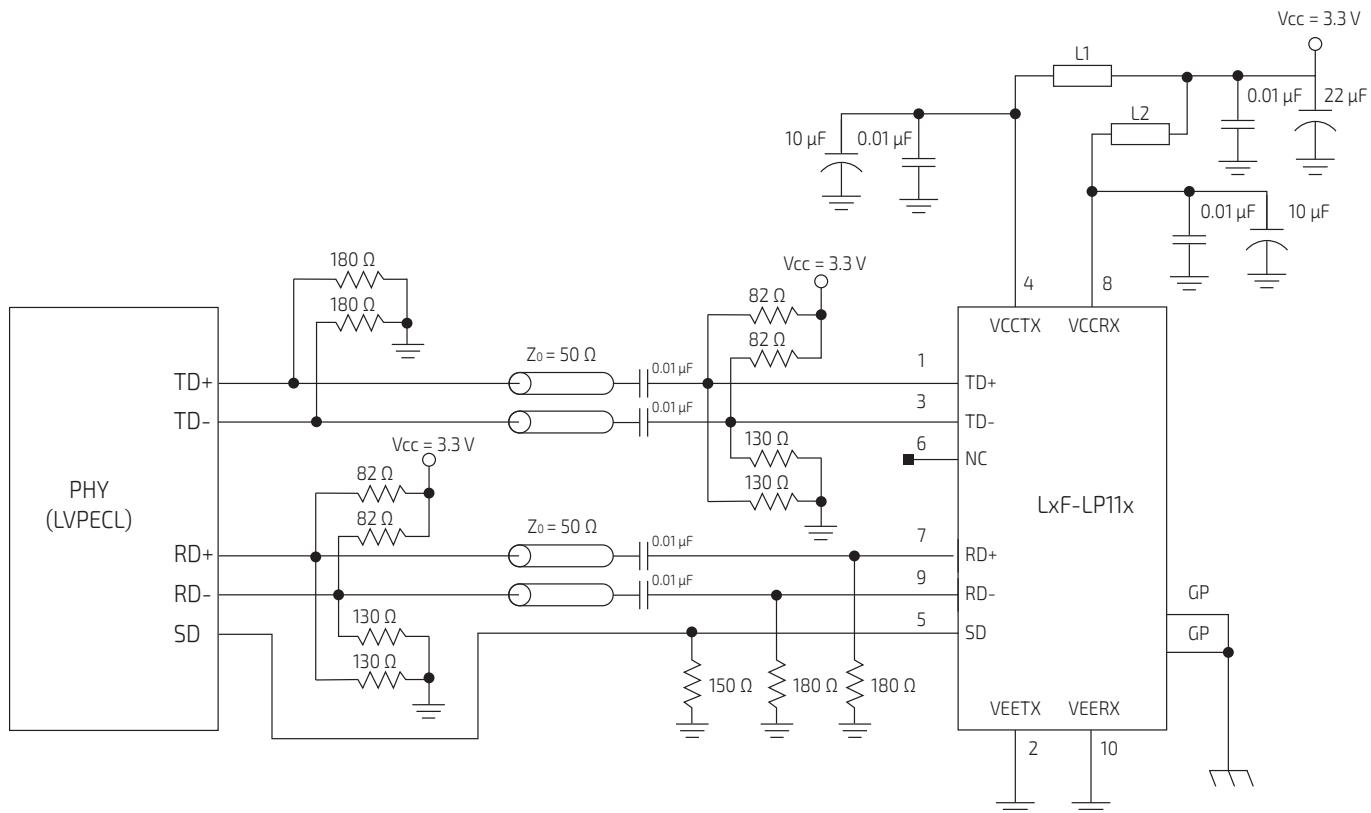
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Parallel Termination (Thevenin Equivalent) for AC coupled LVPECL PHY Devices

Similar to DC coupled, except for addition of emitter follower pull-down resistors (180 Ω), different Vt operating point (2.0 V vs 1.1 V), and addition of series RF capacitors.



Notes:

1. L1 and L2 = MuRata BLM21A601S or equivalent (600 Ω at 100 MHz or better).
2. Place LVPECL termination resistors (130/82 Ω) as close as possible to termination points. Place LVPECL emitter follower pull-down (180 Ω) as close as possible to source points.
3. Route the differential pairs (TD+/- and RD+/-) together using 50 Ω impedance matched traces.
4. Other AC coupled LVPECL termination techniques are also valid.
5. Use separate power supply filtering for VCCTX and VCCRX, as shown.
6. Ground Posts (GP) are isolated from Signal Ground (Vee), and may be connected to Chassis Ground (as shown) or to Signal Ground if a Chassis Ground is not available.
7. Use low ESR capacitors, such as NPO or COG, for AC coupling of TD+/- and RD+/- signals.

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RoHS Compliance

The standard Low Rider transceiver products are offered with high reliability internal circuits that use 63/37 tin-lead solder. The product may also be ordered with internal circuits that use SAC305 lead-free alloy, compliant to ROHS R6 requirements.

Part Numbers with internal circuits that contain 63/37 tin-lead solder

| Parameter | Flat Shell | EMI Clip | Conf. Coat | Solder Post | Screw Post |
|------------|------------|----------|------------|-------------|------------|
| LNF-LP11H | X | | | X | |
| LNF-LP11M | X | | X | X | |
| LNF-LP11HB | X | | | | X |
| LNF-LP11MB | X | | X | | X |
| LTF-LP11H | | X | | X | |
| LTF-LP11M | | X | X | X | |
| LTF-LP11HB | | X | | | X |
| LTF-LP11MB | | X | X | | X |

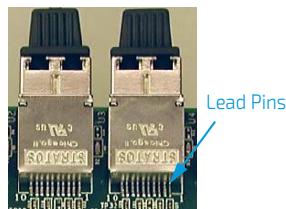
Part Numbers with internal circuits that contain SAC305 lead-free alloy solder (RoHS compliant)

| Parameter | Flat Shell | EMI Clip | Conf. Coat | Solder Post | Screw Post |
|---------------|------------|----------|------------|-------------|------------|
| LNF-LP11H-R6 | X | | | X | |
| LNF-LP11M-R6 | X | | X | X | |
| LNF-LP11HB-R6 | X | | | | X |
| LNF-LP11MB-R6 | X | | X | | X |
| LTF-LP11H-R6 | | X | | X | |
| LTF-LP11M-R6 | | X | X | X | |
| LTF-LP11HB-R6 | | X | | | X |
| LTF-LP11MB-R6 | | X | X | | X |

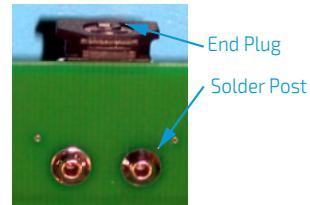
Solder Post Application Note

Each transceiver is shipped with a plastic molded boot or end plug. The end plug should remain in place during installation, soldering, and cleaning to protect the optical lenses from contamination. The end plug is designed and tested to maintain seal under IPC standard water wash processes and will withstand heated and/or ultrasonic solvent cleaning processes for up to 2 minutes before elasticity is compromised.

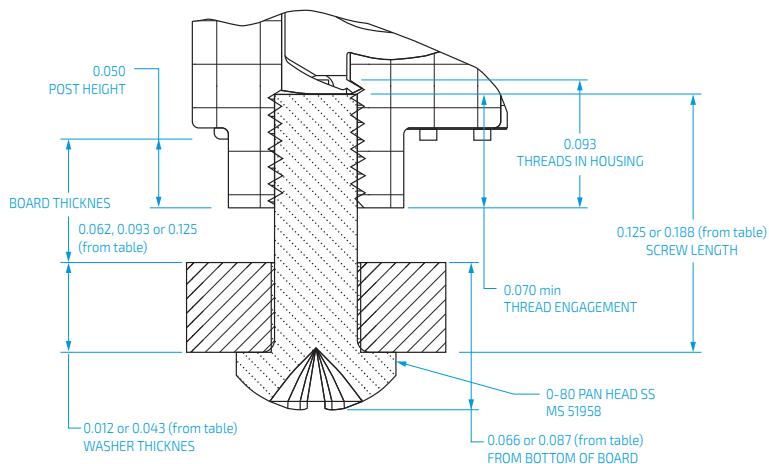
Electrical Lead Pins Solder Profile 260°C / 10 s (Hand Solder)



Solder Post Mount Solder Profile 450°C/ 10 s (Hand Solder)



Screw Post Application Note



Torque

Torque screws to 7 to 9 in-oz for a clamping force of 36 to 47 lbs per screw. Do not exceed 16 in-oz torque per screw.

| PCB Nominal Thickness | Screw Length | Washer Thickness | Screw/Washer Height | Cinch PN Washer | Cinch PN Screw |
|-----------------------|--------------|------------------|---------------------|-----------------|----------------|
| 0.062 in \pm 0.005 | 0.125 in | 0.043 in | 0.087 in | 751-00002 | 618-00001 |
| 0.093 in \pm 0.005 | 0.125 in | 0.012 in | 0.066 in | 751-00001 | 618-00001 |
| 0.125 in \pm 0.005 | 0.188 in | 0.043 in | 0.087 in | 751-00002 | 618-00002 |

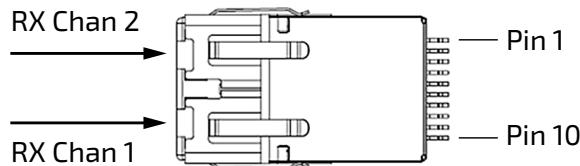
Notes:

- Customer may choose any type 0-80 Stainless Steel (SS) screw configuration (pan head, flat head, hex head, etc.) as long as the thread engagement is less than 0.093 inches max into the transceiver housing.
- Customer can order 0-80 SS pan head screws and washers from table above, sorted by standard PCB thickness. Order two each washers and screws for each optical transceiver.

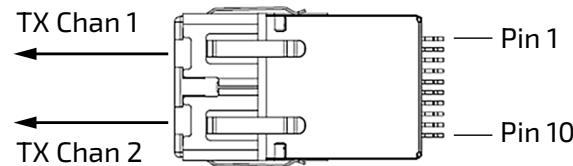
Dual Port Configurations

Low Rider RJ transceivers can be ordered with two TX channels or two RX channels, instead of a single port TX and RX combination. Consult the factory.

Dual RX Option



Dual TX Option



Fiber Pigtail Option

The Low Profile RJ optical transceiver can be ordered with permanently attached fiber pigtailed. The fiber pigtailed are customized to the customer's application and can vary in length from as short as 3 inches to as long as 50 inches, possibly longer dependent upon the application.

The fiber pigtail optical connector may be selected from a wide variety of industry supported optical termini. Almost any combination is possible, as long as the termini components are available and supported by the OEM. Common termini components selected by customers include industry standard LC, SC, FC, ST, 29504, PHD, and others. Consult the factory.



Low Rider Family Part Numbering, Footprint Compatible

Pick a base part number from Table A or Table B, then complete the PN by selecting the EMI clip, coating and mounting option.

Table A — Multimode Base Part Selection Guide

| Part Number ^{1,2} | Rate | Typical App | Wavelength | Min TX | Min RX | Distance ³ |
|----------------------------|------------|------------------|------------|----------|---------|-----------------------|
| LxF-LP11xx | 125 Mbps | Fast Ethernet | 1310 nm | -20 dBm | -32 dBm | 2000 m |
| LxK-ST11xx | 1.25 Gbps | Gigabit Ethernet | 850 nm | -9.5 dBm | -21 dBm | 850 m |
| LxL-LT1Axx | 2.125 Gbps | Fiber Channel | 1310 nm | -9.5 dBm | -20 dBm | 500 m |
| LxL-ST11xx | 2.125 Gbps | Fiber Channel | 850 nm | -10 dBm | -15 dBm | 500 m |
| LxP-ST11xx | 2.5 Gbps | Infiniband | 850 nm | -10 dBm | -15 dBm | 400 m |
| LxS-ST11xx | 4.25 Gbps | 4x Fiber Channel | 850 nm | -4 dBm | -11 dBm | 350 m |
| Lx10G-ST11xx | 10.3 Gbps | 10G Ethernet | 850 nm | -4 dBm | -11 dBm | 300 m |

Table B — Singlemode Base Part Selection Guide

| Part Number ^{1,2} | Rate | Typical App | Wavelength | Min TX | Min RX | Distance ³ |
|----------------------------|------------|------------------|------------|----------|---------|-----------------------|
| LxK-LT12xx | 1.25 Gbps | Gigabit Ethernet | 1310 nm | -9.5 dBm | -20 dBm | 10 km |
| LxL-LT12xx | 2.125 Gbps | Fiber Channel | 1310 nm | -9.5 dBm | -20 dBm | 10 km |
| LxP-LT12xx | 2.5 Gbps | Infiniband | 1310 nm | -10 dBm | -18 dBm | 10 km |
| Lx10G-LT12xx | 10.3 Gbps | 10G Ethernet | 1310 nm | -10 dBm | -14 dBm | 10 km |

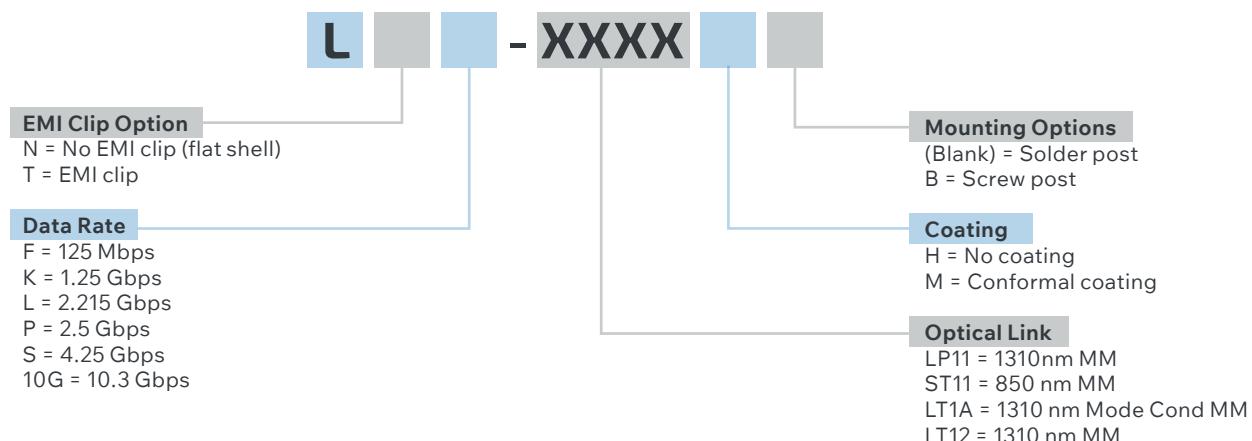
Notes:

¹ The Part number is completed by using the Configuration Options Guide.

² All Low Rider transceivers are form/fit and pin compatible for easy upgrade/downgrade path

³ Link distance is a typical value when using standard fiber types with nominal connector losses

Configuration Options Guide



Note: Pick a base part number from Table A or Table B, then complete the PN by selecting the EMI clip, coating and mounting option.