Features

- **Complies with IEEE Std. 802.3z Gigabit Ethernet 1000BASE-SX PMD requirements**
- **Also suitable for proprietary high speed datalink applications**
- **Multi-sourced 2x5 pin small form factor package**
- **High-density MT-RJ connector interface**
- **Transmitter uses 850nm vertical cavity surface emitting laser (VCSEL)**
- **Class 1 Laser Safe per FDA/CDRH and IEC 60825-1**
- **Operates to 550 m with 50/125 µm or 275 m with 62.5/125 µm fiber**
- **Single +3.3-volt power supply**
- **PECL and LVPECL compatible data interface**
- **Wave Solder and Aqueous Wash compatible**
- **Compatible with standard Gigabit Ethernet and Fibre Channel PHY transceiver chipsets.**

Applications

Standards

- **Gigabit Ethernet**
- **Proprietary ATM OC-12**

Equipment

- **Switches**
- **Repeaters**
- **Network Interface cards**
- **Hubs**
- **Routers**

AMP Transceiver 269152-3 is a short wavelength fiber optic transceiver module for use in Gigabit Ethernet and high-speed proprietary link applications. The transceiver sends and receives pre-encoded data over a pair of 62.5 µm or 50 µm core multimode optical fibers. The module, which operates from a single +3.3V power supply, contains separate transmitter and receiver sections with PECL/LVPECL compatible data interfaces. Other small form factor (SFF) AMP transceivers are available for 1.06 Gb/s Fibre Channel applications.

Package style is the multi-sourced 2x5 form factor with integral MT-RJ connector interface. This new small factor is approximately half the width of a duplex SC 1x9 module, allowing the equipment designer to double the port density of a given product. The transceiver has a DC-coupled data interface that provides a higher degree of flexibility for use in a wide variety of circuit architectures.

The AMP SFF Gigabit transceiver has been through extensive testing to be fully compliant with the Gigabit Ethernet and Fibre Channel industry standards. The VCSEL-based transmitter is certified to be Class 1 laser safe as defined by U.S. and international standards. The module has been designed with grounding and shielding features that minimize EMI susceptibility and radiated emissions. Units are supplied with process plugs which seal the optical connector interface during soldering and cleaning processes.

Gigabit Ethernet MT-RJ Multimode Short Wavelength Transceiver

Part Number
269152-3

Transmitter Performance Specifications:

(T_A=0 to 70°C, V_{CC}-V_{EE}=3.15 to 3.45V DC)

Parameter	Symbol	Notes	Min	Typ	Max	Units
Optical Output (avg.)	P_{OUT}	1,2	-9.5	–	-4	dBm
Extinction Ratio	–	3	9	–	–	dB
Center Wavelength	λ_{OUT}	4	830	845	860	nm
Spectral Width	$\Delta\lambda$	4	–	–	0.85	nm (RMS)
Coupled Power Ratio	CPR	5	9	–	–	dB
Relative Intensity Noise	RIN_{12}	6	–		-117	dB/Hz
Total Jitter	TJ	7	–	–	227	ps
Output Rise Time	t_{TLH}	8,9	–	–	260	ps
Output Fall Time	t_{THL}	8,9	–	–	260	ps
Data Input Voltage Levels	V_{IL} V_{IH}	10 10	V_{CC} - 1.9 –	– –	– V_{CC} - 0.88	V V
Pk-Pk Differential Input Voltage	V_{DIFF}		500	–	–	mV
Data Input Current	I_{IL} I_{IH}		-2 –	– –	– 350	µA µA
Transmit Disable Time	t_{DIS}		–	–	10	µs
Transmit Disable Voltage Levels						
Tx Disabled		11	V_{CC} - 1.3	–	V_{CC}	V
Tx Enabled		11	V_{EE}	–	V_{EE} + 0.8	V
Power Supply Voltage	V_{CC} - V_{EE}		3.15	3.3	3.45	V
Supply Current	I_{CC} or I_{EE}		–	35	60	mA
Operating Temperature	T_A		0	–	70	°C

Note: All measurements made with a 2 or 5 meter patch cable using 62.5 µm multimode fiber unless stated otherwise.

1. Meets Class I laser safety requirements of IEC 825-1 and IEC 825-2: 1997 and U.S. Department of Health Services 21 CFR 1040.11 (1999) when operated within the specified temperature and power supply ranges.
2. Transmitter optical output power measured per TIA/EIA FOTP-95. Transmitter modulated with a valid 8B/10B data pattern. Specification applies for both 50 µm and 62.5 µm core multimode fiber.
3. Extinction ratio measured per TIA/EIA OFSTP-4A with a repeating K28.7 data pattern.
4. Center wavelength and spectral width measured per TIA/EIA FOTP-127 using optical spectrum analyzer with a valid 8B/10B data pattern.
5. CPR measured per TIA/EIA OFSTP-14A with valid 8B/10B data pattern.
6. RIN measured per ANSI X.230-1994 annex A with valid 8B/10B data pattern. RF power meter and current meter test set replaced with microwave spectrum analyzer and calibrated high speed photoreceiver. Singlemode fiber in test procedure replaced with multimode patch cable. Polarization rotator omitted.
7. TJ measured per ANSI X.230-1994 annex A using BER tester with a repeating K28.5 data pattern.
8. Measured from 20% to 80% points on rising and falling edge of transmitted waveform.
9. Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with the eye diagram shown in Figure 1. These characteristics are controlled to prevent excessive degradation of the receiver sensitivity. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter.
10. Configured for LVPECL. Compatible with 10 K, 10 KH and 100 K ECL and PECL.
11. TTL Logic levels per small form factor Multi-source Agreement dated February 1998.

Gigabit Ethernet MT-RJ Multimode Short Wavelength Transceiver

Part Number
269152-3

Receiver Performance Specifications:

(T_A=0 to 70°C, V_{CC}-V_{EE}=3.15 to 3.45V DC)

Parameter	Symbol	Notes	Min	Typ	Max	Units
Optical Input (avg.) Sensitivity	P_{IN}	1	-17	–	0	dBm
Electrical 3 dB Cut-Off	f_c	2	–	–	1.5	GHz
Stressed Receiver Sensitivity						
50 µm Fiber	–	3	-13.5	–	–	dBm
62.5 µm Fiber	–	3	-12.5	–	–	dBm
Optical wavelength	λ_{IN}	–	770	–	860	nm
Deterministic Jitter	DJ	4	–	–	170	ps
Total Jitter	TJ	5	–	–	266	ps
Return Loss	–	6	12	–	–	dB
Output Voltage Levels	V_{OH}	7	V_{CC} - 1.100	–	V_{CC} - 0.860	V
	V_{OL}	7	V_{CC} - 1.892	–	V_{CC} - 1.598	V
Signal Detect (output)	V_A	8	2.4	–	–	V
	V_D	8	–	–	0.4	V
P_{IN} Power Levels (avg.)						
Deassert	P_D	–	-30	–	–	dBm
Assert	P_A	–	P_D+1.0 dB	–	-17	dBm
Hysteresis	–	–	1.0	–	–	dB
Signal Detect Delay Time						
Deassert	–	–	–	–	350	µs
Assert	–	–	–	–	100	µs
Power Supply Voltage	V_{CC} - V_{EE}	–	3.15	3.3	3.45	V
Supply Current	I_{CC} or I_{EE}	–	–	85	100	mA
Operating Temperature	T_A	–	0	–	70	°C

Note: All measurements made with a 2 or 5 meter patch cable using 62.5 µm multimode fiber unless stated otherwise.

1. Minimum optical input power (receive sensitivity) measured using transmitter with 9 dB extinction ration while sampling at eye center with the data pattern defined in IEEE 802.3z Clause 36A.5. BER = $1x10E^{-12}$.
2. Electrical Cut-Off frequency measured per IEEE 802.3z Clause 38.6.12.
3. Receiver stress sensitivity measured per IEEE Std. 802.3z Clause 38.6.7. Tests performed with conformance test signal defined in Clause 38.6.11 and data pattern defined in Clause 36A.5. BER = $1x10E^{-12}$.
4. DJ measured per ANSI X.230 1994 annex A using digital oscilliscope with a repeating K28.5 data pattern.
5. TJ measured per ANSI X.230-1994 annex A using BER tester with a repeating K28.5 data pattern.
6. Return loss measured per TIA/EIA FOTP-107.
7. Measured with a 50 ohm load to V_{CC} – 2V.
8. TTL Logic levels per small form factor Multi-source Agreement dated February 1998.

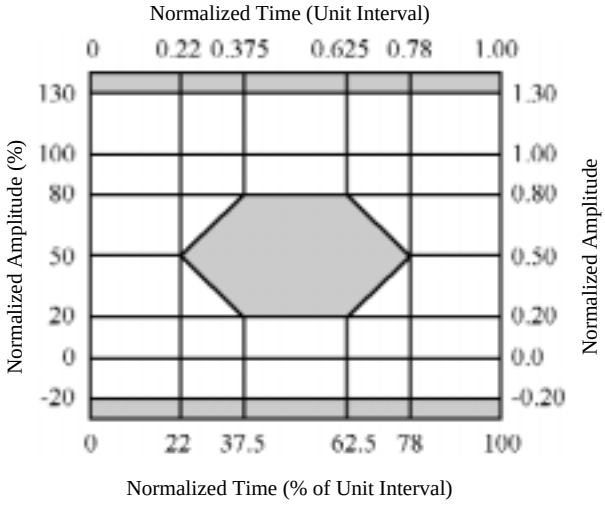
Absolute Maximum Ratings:

Parameter	Symbol	Units	Min	Max
Storage Temperature	T_S	°C	-40	85
Lead Soldering Limits/Time	–	°C/s	–	240/10
Data Input Voltage	V_{INPUT}	V	-0.5	V_{CC}
Differential Input Voltage	V_{DIFF}	V	–	2
Supply Voltage	V_{CC}-V_{EE}	V	-0.2	5.0

Regulatory Compliance:

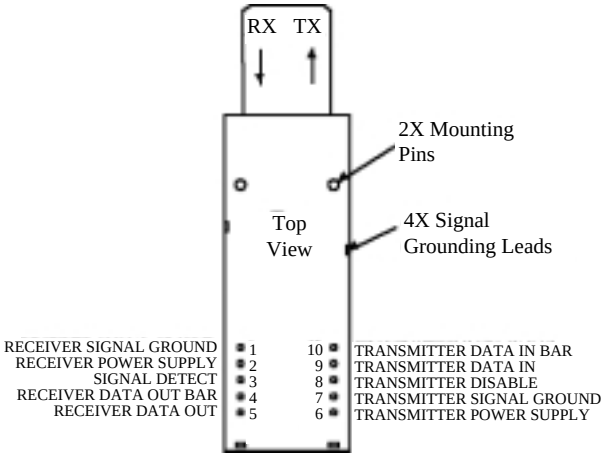
Test	Test Method	Procedure
Eye Safety	FDA CDRH 21-CFR 1040 Class I	Compliant per Tyco Electronics Fiber Optic Division testing under specified operating conditions. Accession Number: 9122051-05
	EN60825-1:1994+A11:1996 EN60825-2:1994+A1 EN60950:1992+A1+A2+A3+A4+A11	TUV Rheinland of North America, Laser Class 1 Protection Class III TUV File Number: E9971313.01 Certificate Number R9971075
UL, cUL	UL 1950	Reference: E208512, OORT03346
ESD1	JEDEC/EIA JESD22-A114-A (C=100 pF, R=1500 ohm – Human body model)	Pulses applied to each pin and Ground at 1 KV and 2 KV.
ESD2	25 KV maximum air discharge (simulates human body discharge into a DUT)	40 discharges are applied per DUT (10 at each of the top, bottom, right, and left). Each module is tested with both power ON and OFF.

Figure 1: Gigabit Ethernet Transmitter Eye Diagram



NOTE: Transmitter optical waveform characteristics including rise time, fall time, pulse undershoot, pulse overshoot, and ringing comply with this IEEE 802.3z eye mask requirement. The eye mask test is performed using a receiver with a fourth-order Bessel Thompson filter and with repeating K28.5 data pattern.

Figure 2: Transceiver Pin Descriptions

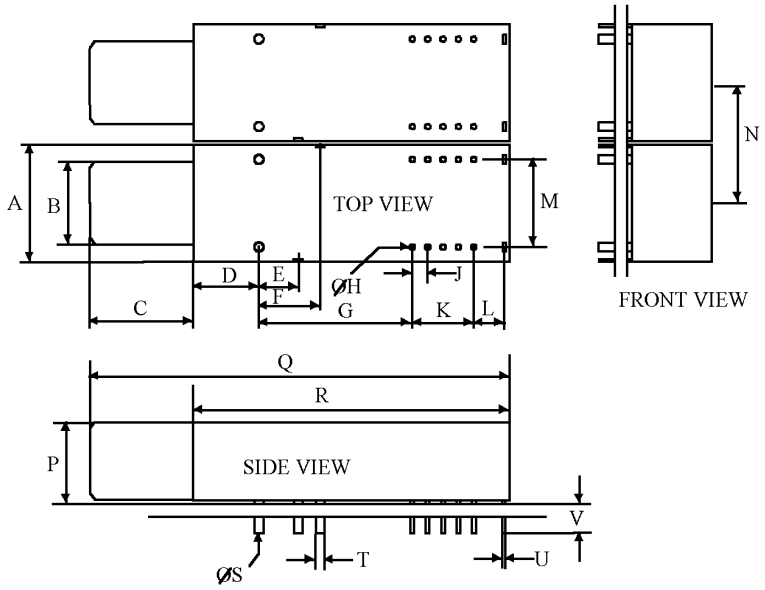


Pin-Out Description:

Symbol	Pin #	Function
Two Front Mounting Studs		Provided for mechanical attachment to the PCB and enhance mechanical strength. The holes on the PCB that they attach to must be connected to chassis ground.
Four Holes For Signal Grounding Leads		Connect to signal ground.
V_{EEr}	1	Receiver Signal Ground. Connect to receiver signal ground plane. (See Note 1)
V_{CCr}	2	Receiver Power Supply.
SD	3	Signal detect. Normal Operation: Logic "1" Output. Fault Condition: Logic "0" Output.
RD-	4	Received Data Out Bar. No internal terminations are provided.
RD+	5	Received Data Out. No internal terminations are provided.
V_{CCt}	6	Transmitter Power Supply.
V_{EEt}	7	Transmitter Signal Ground. (See Note 1)
V_{DIS}	8	Transmitter Disable Input.
TD+	9	Transmitter Data In and Data In Bar. There is an internal 100 ohm resistor across TD+ and TD- which provides a 50 ohm termination for each data input.
TD-	10	Transmitter Data In Bar. There is an internal 100 ohm resistor across TD+ and TD- which provides a 50 ohm termination for each data input.

Notes:
1. V_{EEr} and V_{EEt} are connected together inside the transceiver module.

Figure 3: Package Outline Drawing

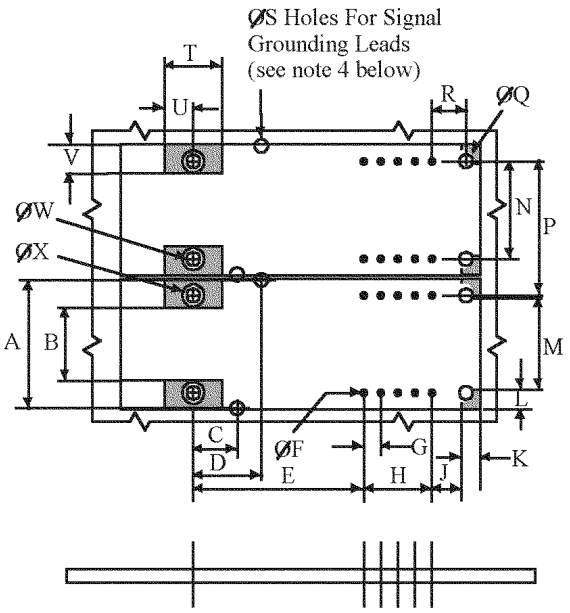


Notes:
1. This figure describes the maximum package outline, mounting studs, pins and their relationships to each other.
2. Toleranced to accommodate round or rectangular leads.
3. All 12 pins and posts are to be treated as a single pattern.
4. The MT-RJ optical connector has a 750 µm fiber spacing.
5. Refer to the MT-RJ Transceiver Pin Out Diagram for additional information.
6. This transceiver is supplied with an EMI gasket that fits onto the nose-piece and provides an intimate fit between the nose-piece and the MSA defined customer front panel cut-out shown in Figure 5. Please refer to the AMP Customer Drawing number 269152-3 for additional details on these gasket dimensions.

	Millimeters			Inches				Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.		Min.	Typ.	Max.	Min.	Typ.	Max.
A			13.59			0.535	L		3.56			0.140	
B		9.53			0.375		M		10.16			0.400	
C		12.00			0.488		N	13.97			0.550		
D		7.59			0.299		P		9.53			0.375	
E		4.57			0.180		Q		48.82			1.922	
F		7.11			0.280		R		36.42			1.434	
G		17.78			0.700		ØS	0.97		1.07	0.038		0.042
ØH	0.41		0.61	0.016		0.024	T		1.02			0.040	
J		1.78			0.070		U		0.25			0.010	
K		7.12			0.280		V		3.30			0.130	

Important: Please see the AMP customer drawing 269152-3 for transceiver housing dimensions and tolerances.
Call 1-800-522-6752 for 24 hour fax.

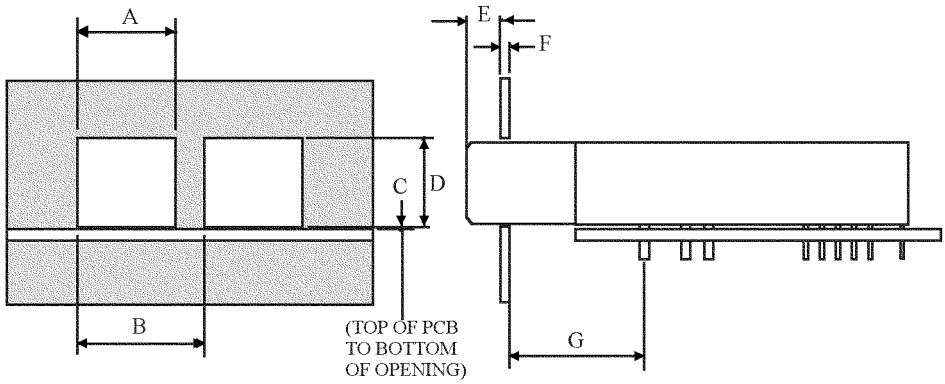
Figure 4: MSA Recommended Circuit Board Layout



Notes:
1. This figure describes the recommended circuit board layout for the MT-RJ Transceiver placed at a 0.550 inch spacing.
2. The shaded areas are keep-out areas reserved for housing standoffs. No metal traces or Ground connection in keep-out areas.
3. The 10 pin module implementation requires only 16 PCB holes.
4. These four holes for signal grounding leads must be connected to signal ground on the PCB.
5. Solder Posts should be soldered to the PCB for mechanical strength and these PCB holes should be connected to chassis ground.

	Millimeters			Inches				Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.		Min.	Typ.	Max.	Min.	Typ.	Max.
A		13.34			0.525		M		9.59			0.378	
B		7.59			0.299		N		10.16			0.400	
C		4.57			0.180		P	13.97			0.550		
D		7.11			0.280		ØQ			2.29			0.090
E		17.78			0.700		R		3.56			0.140	
ØF	0.71		0.91	0.028		0.036	ØS	1.3		1.5	0.051		0.059
G		1.78			0.070		T		6.00			0.236	
H		7.12			0.280		U		3.00			0.118	
J		3.08			0.121		V		3.00			0.118	
K		2.00			0.079		ØW	1.3		1.5	0.051		0.059
L		2.00			0.079		ØX			2.29			0.090

Figure 5: MSA Recommended MT-RJ Front Panel Opening



	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	10.70	10.80	10.90	0.421	0.425	0.429
B	13.97			0.550		
C	0.15	0.25	0.35	0.006	0.010	0.014
D	9.70	9.80	9.90	0.382	0.386	0.390
E		1.00			0.039	
F	15.50		16.25	.610		.640