Hercules Series
24x Port D38999 Optical Transceiver, GbE, FC, ARINC 818 or sFPDP Applications, Multimode, 850nM

24xTX and 24xRX, Flange Mount

FEATURES
- Suitable for GbE, Fibre Channel, ARINC 818 and sFPDP applications at up to 5.0Gbps per fiber port
- Optical fiber link distances up to 550 Meters (50/125µ 2000MHz*Km MMF)
- Maximum optical channel bit error rate less than $1x10^{-12}$
- Operating temperature range from -55°C to +85°C
- Shock, vibration and immersion resistant per RTCA / D0-160E
- Aluminum alloy D38999 housings are strong, durable, corrosion resistant and light weight
- D38999 Receptacle housing embedded with MT fiber optic connectors

APPLICATIONS
Hercules series bulkhead mounted optical transceivers enable extremely high speed network communications over long distances in harsh environments.

- Gigabit Ethernet switches and peripherals
- Fibre Channel switches and peripherals
- Video displays and display drivers
- High speed sensor data links

The D38999 shell provides a sealed optical interface that is water-tight to IP68 / NEMA-4x when mated.

The multimode optical fiber interface supports applications where copper cable link distance, bandwidth, weight or bulk make the use of twisted pair, twinax or quadrax copper conductors unacceptable.

Up to 24xTX and 24xRX lines operating from 0.05 to 5.0Gbps

DESCRIPTION
Hercules series 24 port (48 fiber) optoelectronic transceivers consist of up to 24 total optical transmitter and receiver functions integrated into a bulkhead mounted D38999 / Size 21 receptacle connector. The optical transmitters are 850nm VCSEL lasers. The transmitter input lines are driven with differential CML signals applied to the transmitter (TX+ and TX-) lines. Dual loop, temperature compensated, VCSEL drivers convert the transmitter input signals to suitable VCSEL bias and modulation currents.

The optical receivers consist of PIN and preamplifier assemblies and limiting post-amplifiers. Outputs from the receivers consist of differential CML data signals on the receiver (RX+ and RX-) lines and single ended CMOS indicator functions on the Loss of Signal (LOS) lines. The receiver data lines are squelched upon LOS assertion, preventing errant data generation when an invalid incoming optical signal is presented to the transceiver.

The electrical interface to the Hercules series optical fiber transceivers is a controlled impedance Samtec connector enabling interface to a ribbon coax or twinax cable or flexible printed circuit assembly.

Hercules series 24 port optical fiber transceivers are vibration isolated, environmentally hardened components designed for use in harsh environment applications.
- Panel mounted D38999 interface sealed against liquid and solid contaminants
- Shock and vibration resistant

ORDERING INFORMATION

Application	Part Number
24xTX/RX	T38M-2424-HW

MOOG

Hercules Series D38999 Optical Transceiver,
Gigabit Ethernet, Fibre Channel, ARINC 818 Applications, Multimode, 850nM

ABSOLUTE MAXIMUM RATINGS

Absolute maximum limits mean that no catastrophic damage will occur if the product is subjected to these ratings for short periods, provided each limiting parameter is in isolation and all other parameters have values within the performance specification. It should not be assumed that limiting values of more than one parameter can be applied to the product at the same time.

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Storage Temperature	T_S	-55		+100	°C
Supply Voltage	V_{CC}	-0.5		+4.5	V
RX Output Current	I_O			50	mA
Differential Input Voltage (p-p)	V_D			2.2	V

RECOMMENDED OPERATING CONDITIONS

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Operating Temperature	T_A	-55		+85	°C
Power Supply Voltage	V_{CC}	+3.135		+3.465	V
TX Common Mode Voltage	V_{CM}			2.0	V
TX Differential Input Voltage (p-p)	V_D	0.25		2.2	V
Power Supply Noise (p-p)	N_P			200	mV

SPECIFICATIONS COMPLIANCE

Requirement	Feature	Condition	Notes
RTCA / D0-160E	ESD	Class II	2200V
RTCA / D0-160E	Vibration	$3.8g^2$/Hz	43G rms
RTCA / D0-160E	Shock	40.0g	6-9mS
RTCA / D0-160E	Flame Resistance	Method 1012	30 Seconds
RTCA / D0-160E	Damp Heat	10 Cycles	24 Hours
D38999	Mating Durability	500 Cycles	<0.5dB Change
FDA / CDRH / IEC-825-1	Eye Safety	Class 1	No Safety Interlocks Required

MATERIALS

Item	Detail	Notes
D38999 Shell	Aluminum	
D38999 Shell Finish	Electroless Nickel	
Insert	Arcap	
Ferrules	Ceramic	
Printed Circuits	Polyimide / FR-4	

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OPTICAL TRANSMITTERS T_A = Operating Temperature Range, V_{cc} = 3.135V to 3.465V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Optical Output Power (BER<10^{-12}, PRBS= 2^7-1)	P_o	-6.5		-1.0	dBm
Optical Output Wavelength	λ_{OUT}	830	850	860	nM
Spectral Width	$\Delta\lambda_{RMS}$			0.85	nM
Extinction Ratio	ER	9.0			dB

OPTICAL RECEIVERS T_A = Operating Temperature Range, V_{cc} = 3.135V to 3.465V

Parameter	Symbol	Minimum	Typical	Maximum	Unit

Optical Sensitivity (BER<10^{-12}, ER=9.0)
  125Mbps to 1.25Gbps
  2.125Gbps
  2.5Gbps to 3.19Gbps
  3.2Gbps to 5.0Gbps
	P_I	-17.0
		-15.0
		-15.0
		-14.0
				0.0	dBm

Optical Wavelength	λ_{IN}	830		860	nM

POWER SUPPLY CURRENT T_A = Operating Temperature Range, V_{cc} = 3.135V to 3.465V

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Current per each element	I_{CCT}		90	100	mA

OUTLINE DRAWING
Dimensions are shown as: inches (mm)
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J4

AMPHENOL CF-590421-4P

J2

J1

J3

3X SAMTEC HQDP-020
VERTICAL MOUNT

3.375

1.250

3.250

1.877

40

2

39

1
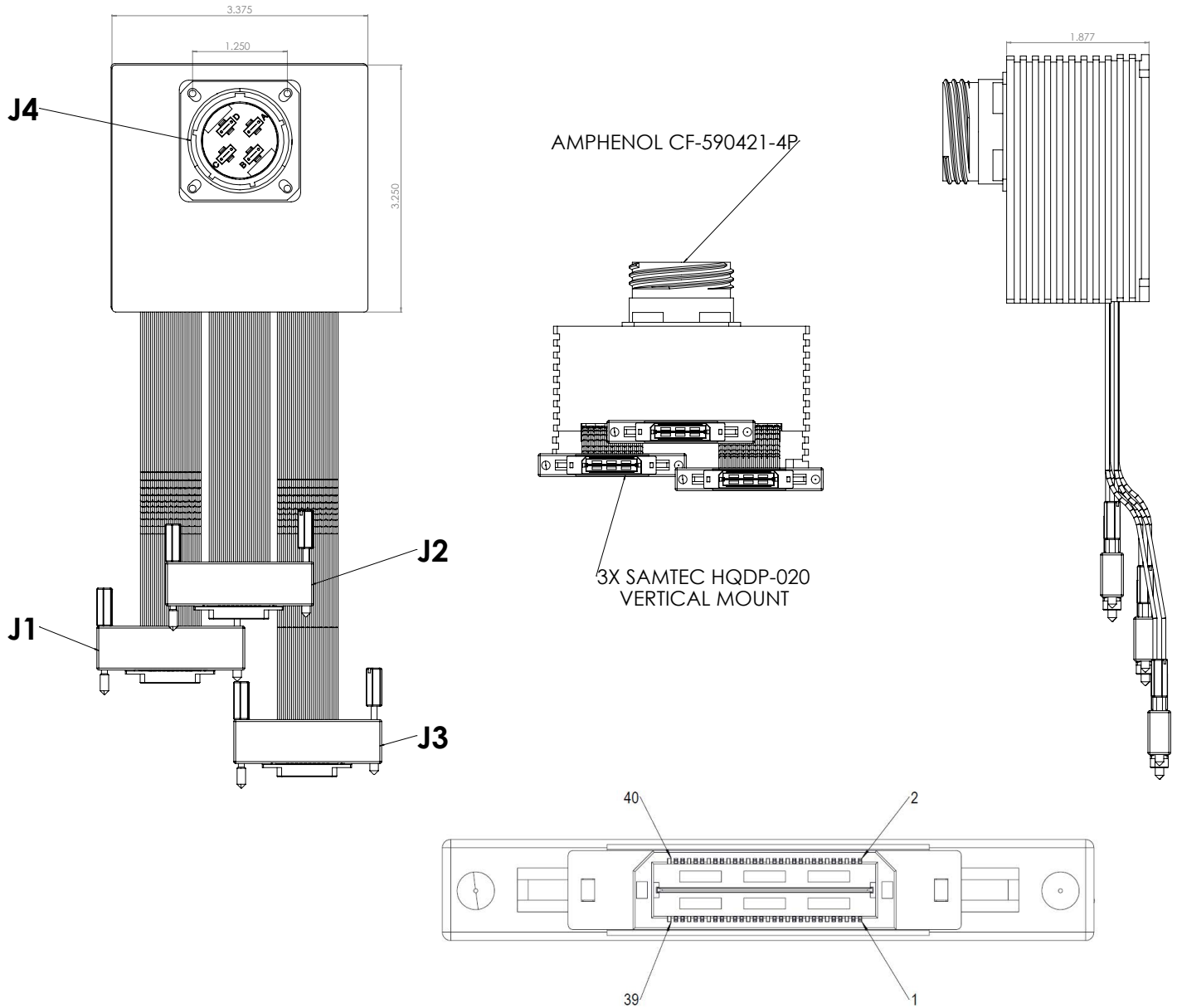
J3 Panel Cutout Dimensions				
Rear Panel Mounting Only				
J3 Shell Size Letter Code	Shell Size Number Code	M Min	P Holes	R Bsc
G	21	1.410 (36.12)	0.159 (4.0) 0.149 (3.8)	1.250 (31.75)

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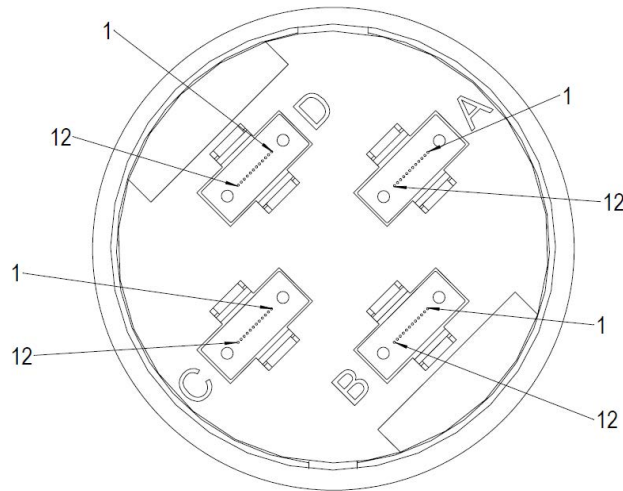### SAMTEC HQDP-020 (20 PAIRS; 40 SIGNALS) 1

PIN	DESCRIPTION	PIN	DESCRIPTION
1	CH1 RX+	2	CH5 RX+
3	CH1 RX-	4	CH5 RX-
5	CH1 TX+	6	CH5 TX+
7	CH1 TX-	8	CH5 TX-
9	CH2 RX+	10	CH6 RX+
11	CH2 RX-	12	CH6 RX-
13	CH2 TX+	14	CH6 TX+
15	CH2 TX-	16	CH6 TX-
17	CH3 RX+	18	CH7 RX+
19	CH3 RX-	20	CH7 RX-
21	CH3 TX+	22	CH7 TX+
23	CH3 TX-	24	CH7 TX-
25	CH4 RX+	26	CH8 RX+
27	CH4 RX-	28	CH8 RX-
29	CH4 TX+	30	CH8 TX+
31	CH4 TX-	32	CH8 TX-
33	5V POWER	34	5V POWER
35	GROUND	36	GROUND
37	SPARE	38	SPARE
39	SPARE	40	SPARE

RIBBON CONNECTOR - QTH-020-01-H-D-DP-EM2

BOARD CONNECTOR - QSH-020-01-H-D-DP-K

BOARD CONNECTOR MUST BE USED WITH SO-0165-04-01-02 SCREW MOUNTS WITH CORRECT SPACING

SAMTEC HQDP-020 (20 PAIRS; 40 SIGNALS) 2

PIN	DESCRIPTION	PIN	DESCRIPTION
1	CH9 RX+	2	CH13 RX+
3	CH9 RX-	4	CH13 RX-
5	CH9 TX+	6	CH13 TX+
7	CH9 TX-	8	CH13 TX-
9	CH10 RX+	10	CH14 RX+
11	CH10 RX-	12	CH14 RX-
13	CH10 TX+	14	CH14 TX+
15	CH10 TX-	16	CH14 TX-
17	CH11 RX+	18	CH15 RX+
19	CH11 RX-	20	CH15 RX-
21	CH11 TX+	22	CH15 TX+
23	CH11 TX-	24	CH15 TX-
25	CH12 RX+	26	CH16 RX+
27	CH12 RX-	28	CH16 RX-
29	CH12 TX+	30	CH16 TX+
31	CH12 TX-	32	CH16 TX-
33	5V POWER	34	5V POWER
35	GROUND	36	GROUND
37	CH24 RX+	38	CH24 TX+
39	CH24 RX-	40	CH24 TX-

RIBBON CONNECTOR - QTH-020-01-H-D-DP-EM2

BOARD CONNECTOR - QSH-020-01-H-D-DP-K

BOARD CONNECTOR MUST BE USED WITH SO-0165-04-01-02 SCREW MOUNTS WITH CORRECT SPACING

SAMTEC HQDP-020 (20 PAIRS; 40 SIGNALS) 3

PIN	DESCRIPTION	PIN	DESCRIPTION
1	CH17 RX+	2	CH19 RX+
3	CH17 RX-	4	CH19 RX-
5	CH17 TX+	6	CH19 TX+
7	CH17 TX-	8	CH19 TX-
9	I2C SLC 1	10	CH20 RX+
11	I2C SDA 1	12	CH20 RX-
13	I2C SLC 2	14	CH20 TX+
15	I2C SDA 2	16	CH20 TX-
17	I2C SLC 3	18	CH21 RX+
19	I2C SDA 3	20	CH21 RX-
21	I2C SLC 4	22	CH21 TX+
23	I2C SDA 4	24	CH21 TX-
25	CH18 RX+	26	CH22 RX+
27	CH18 RX-	28	CH22 RX-
29	CH18 TX+	30	CH22 TX+
31	CH18 TX-	32	CH22 TX-
33	5V POWER	34	5V POWER
35	GROUND	36	GROUND
37	CH23 RX+	38	CH23 TX+
39	CH23 RX-	40	CH23 TX-

RIBBON CONNECTOR - QTH-020-01-H-D-DP-EM2

BOARD CONNECTOR - QSH-020-01-H-D-DP-K

BOARD CONNECTOR MUST BE USED WITH SO-0165-04-01-02 SCREW MOUNTS WITH CORRECT SPACING

MIL-DTL-38999 WITH QUAD MT

PIN	DESCRIPTION	PIN	DESCRIPTION
A1	CH1 TX	B1	CH1 RX
A2	CH2 TX	B2	CH2 RX
A3	CH3 TX	B3	CH3 RX
A4	CH4 TX	B4	CH4 RX
A5	CH5 TX	B5	CH5 RX
A6	CH6 TX	B6	CH6 RX
A7	CH7 TX	B7	CH7 RX
A8	CH8 TX	B8	CH8 RX
A9	CH9 TX	B9	CH9 RX
A10	CH10 TX	B10	CH10 RX
A11	CH11 TX	B11	CH11 RX
A12	CH12 TX	B12	CH12 RX
C1	CH13 TX	D1	CH13 RX
C2	CH14 TX	D2	CH14 RX
C3	CH15 TX	D3	CH15 RX
C4	CH16 TX	D4	CH16 RX
C5	CH17 TX	D5	CH17 RX
C6	CH18 TX	D6	CH18 RX
C7	CH19 TX	D7	CH19 RX
C8	CH20 TX	D8	CH20 RX
C9	CH21 TX	D9	CH21 RX
C10	CH22 TX	D10	CH22 RX
C11	CH23 TX	D11	CH23 RX
C12	CH24 TX	D12	CH24 RX

Hercules Series D38999 Optical Transceiver,
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TRANSMITTER APPLICATION SCHEMATIC
For Xilinx Rocket I/O Interfaces
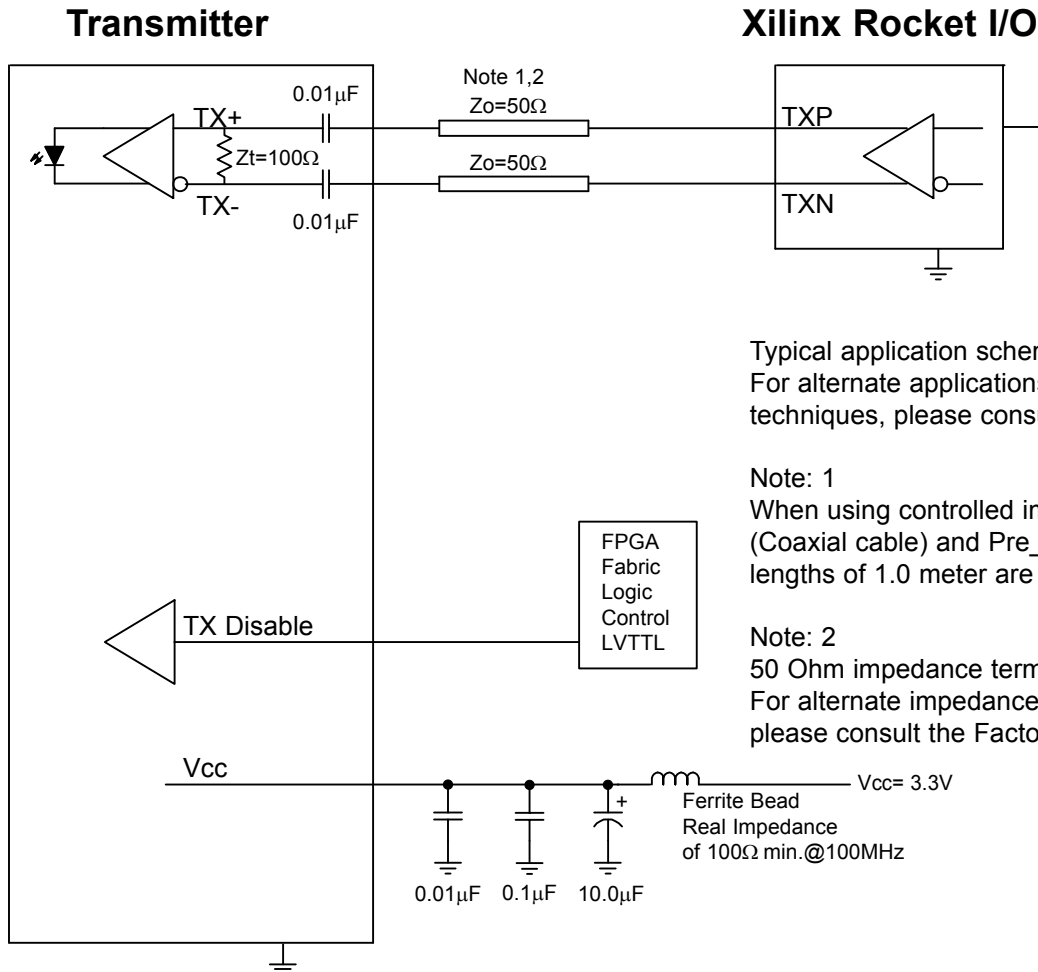
Transmitter　　　　　　　　　　　　　　**Xilinx Rocket I/O**

TX+
0.01µF
Note 1,2
Zo=50Ω
TXP
Zt=100Ω
Zo=50Ω
TX-
0.01µF
TXN

Typical application schematic shown
For alternate applications or termination
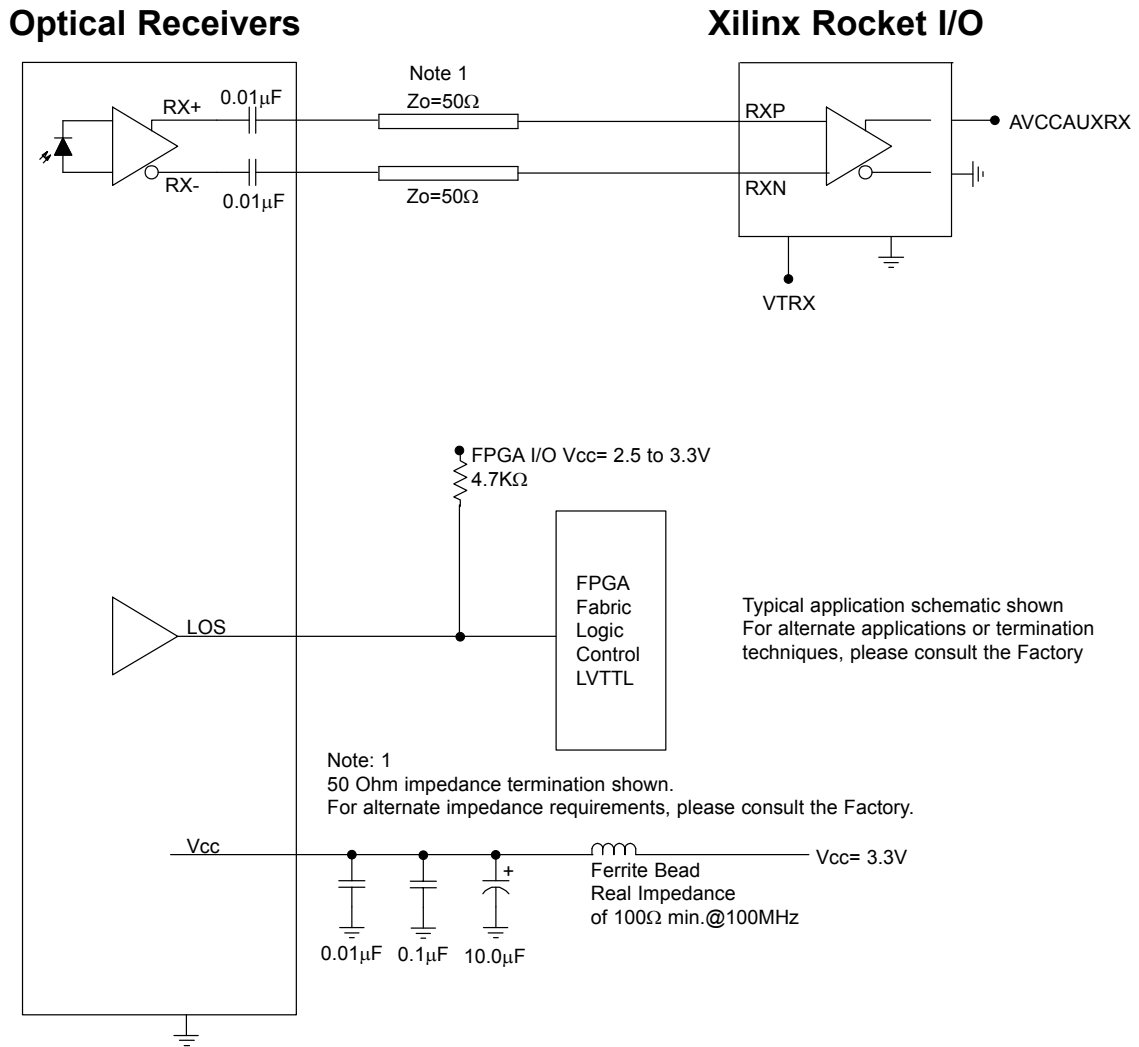techniques, please consult the Factory

Note: 1
When using controlled impedance cable
(Coaxial cable) and Pre_Emphasis,
lengths of 1.0 meter are obtainable.

Note: 2
50 Ohm impedance termination shown.
For alternate impedance requirements,
please consult the Factory.

FPGA
Fabric
Logic
Control
LVTTL

TX Disable

Vcc

Vcc= 3.3V
Ferrite Bead
Real Impedance
of 100Ω min.@100MHz

0.01µF　0.1µF　10.0µF

For all TX Disable Functions:
Logic 1: Disables Optical Output
Logic 0: Enables Optical Output
Internal 4.7KΩ to 10.0KΩ pullup

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RECEIVER APPLICATION SCHEMATIC
For Xilinx Rocket I/O Interfaces

Optical Receivers

Xilinx Rocket I/O

RX+   0.01µF   Note 1
              Zo=50Ω
RX-   0.01µF   Zo=50Ω

RXP
RXN
AVCCAUXRX
VTRX

FPGA I/O Vcc= 2.5 to 3.3V
4.7KΩ

LOS

FPGA
Fabric
Logic
Control
LVTTL

Typical application schematic shown
For alternate applications or termination
techniques, please consult the Factory

Note: 1
50 Ohm impedance termination shown.
For alternate impedance requirements, please consult the Factory.

Vcc

Vcc= 3.3V

Ferrite Bead
Real Impedance
of 100Ω min.@100MHz

0.01µF   0.1µF   10.0µF

For All LOS Functions:
Satisfactory Optical Input: Logic "0" Output
Unsatisfactory Optical Input: Logic "1" Output

MOOG
PROTOKRAFT

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