T-41-91

BT&D TECHNOLOGIES

XMT1300-622
FIBER OPTIC *LOGIC TO LIGHT*™ TRANSMITTER

Features:

- *Logic to Light*™ package offers
  - ECL compatibility
  - Internal diagnostics
  - Automatic level controls
- 200 microwatt optical output power at 1300nm
- Modulation capability up to 622 Mbit/s

Applications:

- SONET/SDH short/intermediate reach applications
- Telecommunications Networks
- Local area and metropolitan area networks
- Military communications and control systems
- Digital cable television

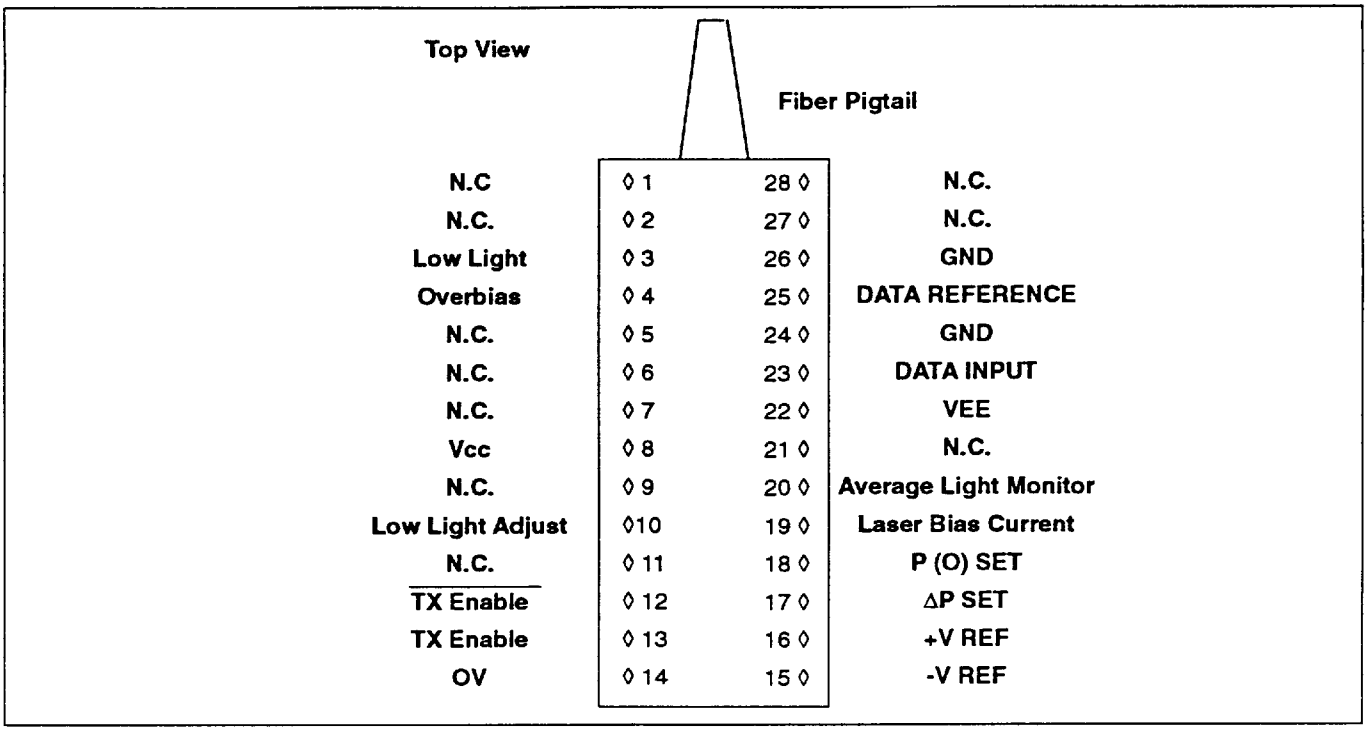
The BT&D XMT1300-622 laser transmitter is a high performance, high reliability component for Single Mode Fiber digital optical fiber systems operating in the 1300nm waveband with a data rate of up to 622 Mbit/s. The transmitter includes a number of advanced features intended to simplify system design.

The drive current for the laser is provided by a high speed modulation circuit implemented as a gallium arsenide FET integrated circuit.

Versatile automatic level control circuits ensure that the correct laser bias current is maintained. Monitoring circuits are included, ranging from a simple "go/no go" indication to continuous monitoring of important transmitter parameters. A transmitter enable function allows the transmitter to be shut down if required.

The XMT1300-622 operates from +5V and -5.2V supplies with low power dissipation. It is hermetically sealed in a 28 pin dual in-line package.

XMT1300-622 CONNECTION DIAGRAM



PIN DESCRIPTIONS:

Pin1, 2, 5, 6, 7, 9, 11, 21, 27 and 28 N.C.:
These pins are not connected and should be left open circuit on the application PCB.

Pin 3 Low Light:
Low Light alarm output is a standard TTL style open collector output which indicates that the laser optical output power has dropped significantly.

Pin 4 Overbias:
This pin is the Overbias alarm output. It is electrically identical to pin 3. Its function is to indicate that the laser bias current has increased beyond specific limits. This condition normally indicates laser failure or sometimes thermal runaway caused by high package to ambient thermal resistance.

Pin 8 Vcc:
This pin is the transmitter positive power supply pin. It is normally connected to a +5V nominal power supply.

Pin10 Low Light Adjust:
This pin is an analog input pin which can be used to set the switching level of the lowlight alarm. This pin would normally be connected to a resistive voltage divider, potentiometer wiper, or other voltage reference.

Pins 12 and 13 TX Enable:
These pins are the transmitter-enable differential inputs. The common mode range of these pins allows set up for TTL levels. Connect either /TX Enable or TX Enable to +Vref depending on the desired enable logic state. These pins should not be biased below ground.

Pins 14, 24 and 26:
These pins are the circuit and package ground (OV) connections.

Pin 15 -V REF:
This pin is a negative voltage reference output. It is commonly used as Vbb reference in standard ECL systems.

Pin 16 +V REF:
This pin is a positive voltage reference output. It is commonly used as a TTL threshold reference.

Pin 17 ΔP SET:
This pin is the analog input. It is used to set the laser modulation current to its optimum value. This pin would normally be connected to a resistive voltage divider, potentiometer wiper, or other adjustable voltage reference. The adjustment is made according to measured data included with each transmitter.

XMT1300-622 PIN DESCRIPTIONS (CONT.)

Pin 18 P(O) SET:
This pin is the P(O) set analog input. It is electrically similar to Pin 17. Its function is to set the laser bias current to its optimum value. Like the ΔP SET voltage, this value is included in the documentation supplied with each device.

Pin 19 Laser Bias Current Monitor:
It is an analog output whose voltage is proportional to the laser bias current. Detailed instructions for its use are available by inquiry to the factory. If not needed it can be open circuited.

Pin 20 Average Light Monitor:
This pin is the analog output derived from the laser back facet monitor detector. Its output voltage is proportional to the lasers optical output. It can be open circuited If not needed.

Pin 22 Vee:
This pin is the negative power supply pin. It is normally connected to a -5.2V nominal power supply.

Pin 23 DATA INPUT:
This is the Data Input pin. The voltage on this pin relative to the DATA REFERENCE pin voltage determines the optical output state. Low voltage relative to DATA REFERENCE turns the laser on (HIGH). The DATA pin is the input to a GaAs laser driver circuit, but its electrical properties make it compatible with all ECL families as well as AC-coupling or other logic levels. Normally this pin is terminated to a 50Ω to -2V ECL termination. It can also be connected to ground via a 50Ω resistor. A termination is always required for this input, it should never be open circuited.

Pin 25 DATA REFERENCE:
This pin is the DATA REFERENCE input. It is electrically similar to the DATA input pin. Its purpose is to establish the switching threshold for the data input circuit. For ECL logic this pin is to be tied to Vbb. If Vbb is unavailable then the -V REF output of the XMT can be used. This is nominally -1.3V and will approximate Vbb. If an AC-coupled input is used, this pin can be tied to GROUND. (See General Description section for additional information)

FUNCTIONAL DESCRIPTION XMT1300 TRANSMITTER

Design

The XMT1300 uses buried heterostructure laser as its optical source. A Single Mode Fiber pigtail is used as the coupling media between the internal Laser and the user fiber plant. The optical output is obtained by modulating the current in the Laser with an internal Galium Arsenide integrated circuit.

The transmitter is AC coupled throughout and care should be taken to operate at data rates above 100 kHz. The internal power control circuit, used to control the laser operating point, may interact with low frequency data patterns.

Thermal Performance

The XMT1300 is designed to operate properly over the temperature range listed in the specification table. The internal driver I.C. controls laser bias currents and compensates for the normal changes in laser operation that occurs over temperature.

One consideration for high speed system design is wavelength shift as a function of temperature. All uncooled Fabry-Perot laser transmitters shift center wavelength as a function of temperature. If high speed, long distance operation is planned, the effects of operating at non-zero dispersion wavelengths must be considered. More information on high speed, long distance operation may be obtained from BT&D's Application Engineering Department.

Operation

This XMT1300 is designed as a single ended interface. Pin 23 serves as the data input and is terminated with a resistor with a value equal to the characteristic impedance of the interconnect.

The XMT1300 has certain characteristics that are important to consider in the design process. The DATA IN and DATA REF pins must have an equal external DC resistance to the reference source if both pins use the same reference voltage. Internally each of these pins connect to the source of an input FET.

FUNCTIONAL DESCRIPTION XMT1300 TRANSMITTER (CONTINUED):

Each of these input pins (23 and 25) will normally source a current of 3 mA . This must be considered in designing the interface. Severe waveform distortion may occur if the DC voltages are not matched.

Page 5 shows several recommended circuits. It is recommended that capacitive coupling be used when dealing with Pseudo-ECL logic. (Figure 2A)

Product Safety Notes

The XMT1300 uses a semiconductor Laser that is capable of coherent radiation. The power output of the XMT1300 limited such that the power level at 1300 nm can be considered Class 1 under all cases.

It is highly recommended that system designers be familiar with current government regulations concerning Laser safety practices. Current references include CDRH Publication CFR 1040, ANSI Z136.2 and IEC 825.

ESD Considerations

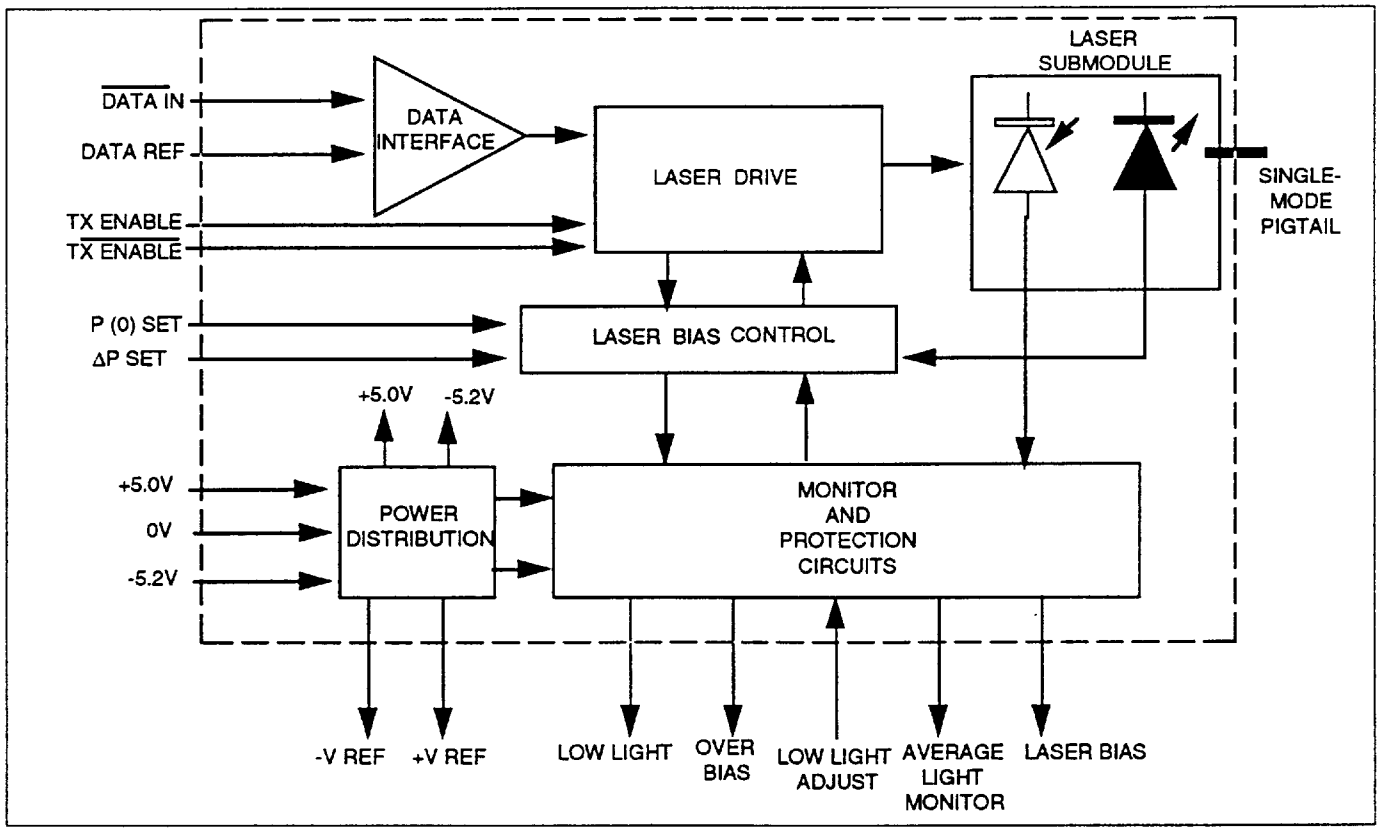
The XMT1300 uses a state of the art GaAs IC as its logic interface. As with all high speed, circuits, care must be taken with both handling and operating voltages. ESD precautions must be observed at all times.

Manufacturing

The XMT1300-622 is a fully hermetically sealed component. The fiber pigtail on the device requires normal fiber handling considerations. Care should be taken to avoid tight bends as well as excessive tension on the fiber pigtail.

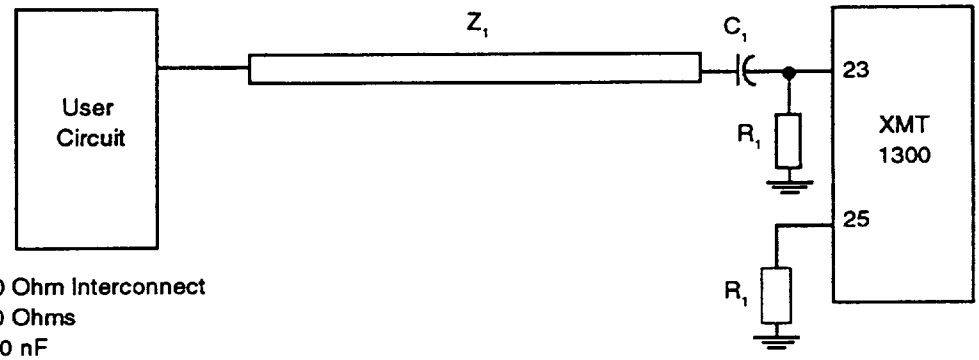
The allowable temperature range for the XMT1300 - 622 is limited by the material used in the pigtail. Exposure to temperatures over 85°C is not recommended. Low profile sockets or hand soldering is recommended for this part.

Figure 1 - Block diagram of the XMT1300-622



XMT1300-622 INTERFACE CIRCUITS

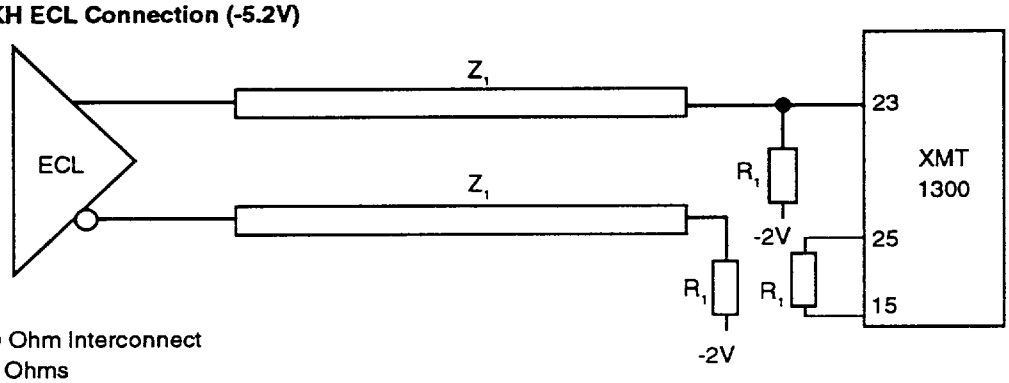
Capacitor Coupled Connection (Generic Connection)



Z_1 = 50 Ohm Interconnect
R_1 = 50 Ohms
C_1 = 100 nF

FIGURE 2A

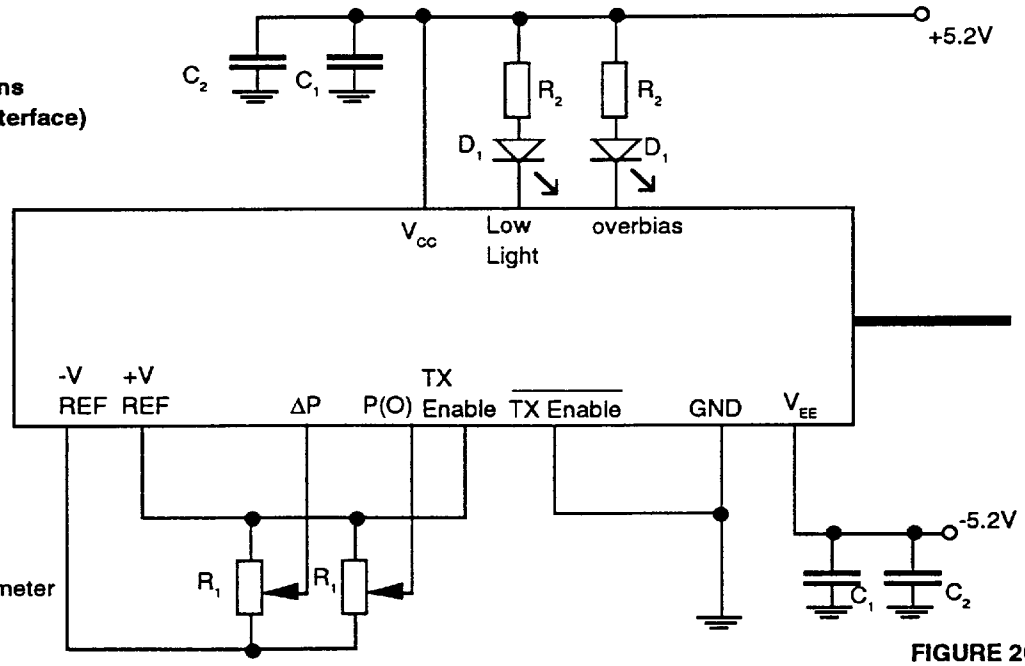
10K, 10KH ECL Connection (-5.2V)



Z_1 = 50 Ohm Interconnect
R_1 = 50 Ohms

FIGURE 2B

Typical Connections (excluding Data Interface)



C_1 =100 nF
C_2 = 10 uF
R_1 = 10K Potentiometer
R_2 = 330 Ohm
D_1 = Indicator LED

FIGURE 2C

XMT1300-622 MAXIMUM RATINGS *

ELECTRICAL

Parameter	Minimum	Maximum	Units
Supply Voltage Vcc	-0.5	7	V
Suppy Voltage Vee	-7	0.5	V
Laser Control Inputs	-5.5	5.5	V
Low Light Adjust Input	-0.5	5.5	V
Transmitter Enable Inputs	-1.5	5.5	V
Data Input/ Data Ref. Inputs	-7.5	5.5	V

ENVIRONMENTAL

Parameter	Minimum	Maximum	Units
Operating Case Temperature	0	65	°C
Storage Case Temperature	-40	85	°C

MECHANICAL

Fiber Tensile Strength	10 N maximum in coaxial direction with fiber feedthrough for 10 sec. No damage to device.
Fiber Bend Radius from Package	32 mm minimum.

***Maximum Ratings** mean that no catastrophic damage will occur if the product is subjected to these conditions for short periods, provided each 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.

XMT1300-622 SPECIFICATIONS

OPTICAL [1]

Parameter	Minimum	Typical	Maximum	Units
Center Wavelength	1273	_	1355	nm
Spectral Width RMS [2]	_	_	2.5	nm
Peak Wavelength Temp. Coefficient	_	0.5	0.6	nm/°C
Mean Output Power [3]	-8	-10	-15	dBm
Extinction Ratio [4]	8.2	_	_	dB
Eye Mask	CCITT G957 compliant			

FIBER SPECIFICATIONS [5]

Parameter	Minimum	Typical	Maximum	Units
Core/Cladding Concentricity Error	_	_	1.0	µm
Effective Cutoff Wavelength	1100	_	1200	nm
Fiber Length	0.4	0.6	0.8	meter

Notes:
[1] Specifications apply over operating temperature unless otherwise noted.

[2] 1 x σ, RMS.

[3] End of life values.

[4] Measured using a 50 MHz, 50% duty cycle input signal.

[5] Fiber is 9/125 µm singlemode fiber, 900µm O. D.

XMT1300-622 SPECIFICATIONS (CONTINUED)

ELECTRICAL [5]

Parameter	Minimum	Typical	Maximum	Units
Supply Voltage Vcc [1]	4.75	5.0	5.25	V
Supply Voltage Vee [1]	-4.3	-5.2	-5.5	V
Vcc Supply Current	–	40	120	mA
Vee Supply Current	–	70	140	mA
Output Voltage [4]				
+V ref	1.15	1.24	1.33	V
-V ref	-1.33	-1.24	-1.15	V
Analog Monitor Outputs				
Laser Bias Char.	–	+1.0	_	V/100mA
Avg. Light Char.	–	+5.0	_	V/mW
Status Output Current Sink [6]	6.0	16	_	mA
P(O) SET Control Characteristic [2]	–	-200	_	µW/V
Low Light Adjust Input Voltage	0	–	Vcc	V
$\overline{\text{Data Input}}$ & Data Ref (Common Mode Voltage)	-2.0	-1.3	+2.0	V
$\overline{\text{Data Input}}$ Differential Voltage [3] ($\overline{\text{Data Input}}$ - Data Reference)	-0.5	1	+2.0	V
Transmitter Enable Inputs				
Common Mode Input Voltage	0	_	Vcc	V
Differential Voltage	0.2	_	Vcc	V

Notes:

[1] The device will also operate with reduced 10kH ECL supply voltages,namely 4.75V and -4.3V.

[2] Above threshold.

[3] $\overline{\text{Data Input}}$ and Data Reference must not be open circuited when power is applied to module.

[4] Maximum current source or sink from V ref outputs is 4mA.

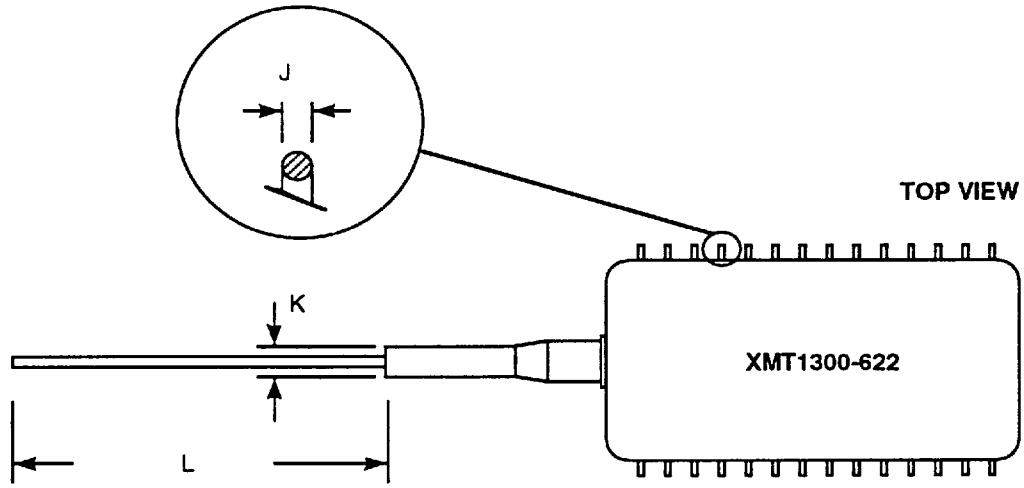
[5] All voltages are measured with respect to ground.

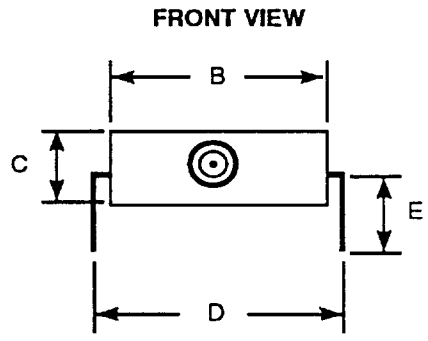
[6] Digital status outputs are open collector outputs.

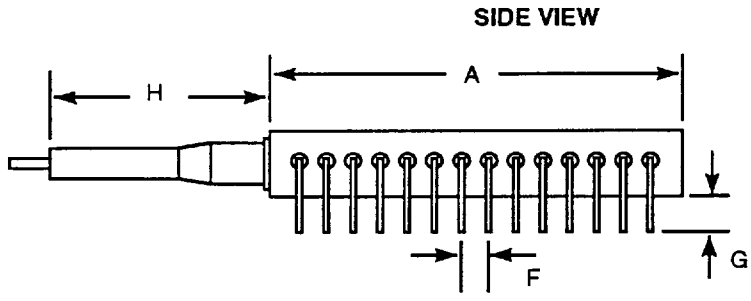
DRAWING

DIM	MIN	NOM	MAX
A	37.8	———	38.2
B	19.8	———	20.1
C	6.9	———	7.3
D	———	22.9	———
E	———	7	———
F	———	2.5	———
G	———	4.5	———
H	———	25	———
J	———	.44	———
K	———	———	4.2
L	———	≥600	———

All dimensions in mm







ORDERING INFORMATION

Please order part number - XMT1300 - XXX - XX

- XX: *Connector: FP = FC/PC Polish; ST = ST™
- XXX: Specified Data Rate: Data Rate 622 = 622 Mbit/s
- XMT1300: Model Name: XMT1300

Allowable Part Numbers:
XMT1300-622-FP
XMT1300-622-ST

*Other connectors available upon request

HANDLING PRECAUTIONS

The XMT1300-622 can be damaged by current surges or overvoltage. Power supply transient precautions should be taken. Normal handling precautions for electrostatic sensitive devices should be taken.

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(800) 848-1923 (U.S. only)

Irvine, CA
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Dallas,TX
(214) 503-0085

Class I Laser Product: This product conforms to the applicable requirements of 21 CFR 1040 at the date of manufacture

Date of Manufacture:_____

BT&D Technologies, Whitehouse Rd, Ipswich, England

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