

## Product Specification

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### Single Mode 155 Mbit/s ATM/SDH/SONET 1x9 Transceiver

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**V23826-C18-Cxx/Cxxx**  
**V23826-C18-Txx/Txxx**

#### PRODUCT FEATURES

- Compliant with ATM, SONET OC-3, SDH STM-1
- Meets mezzanine standard height of 9.8 mm
- Compact integrated transceiver unit with
  - MQW laser diode transmitter
  - InGaAs PIN photodiode receiver
  - Duplex SC/ST<sup>®</sup> receptacle
- Class 1 FDA and IEC laser safety compliant
- Single power supply (5 V or 3.3 V)
- Signal detect indicator
- PECL differential inputs and outputs
- Process plug included
- Input signal monitor
- Wave solderable and washable with process plug inserted
- Industry standard multisource 1x9 footprint
- For distances of up to 15 km/40 km on single mode fiber

V23826-C18-C



File: 1167

V23826-C18-T



File: 1168

#### APPLICATIONS

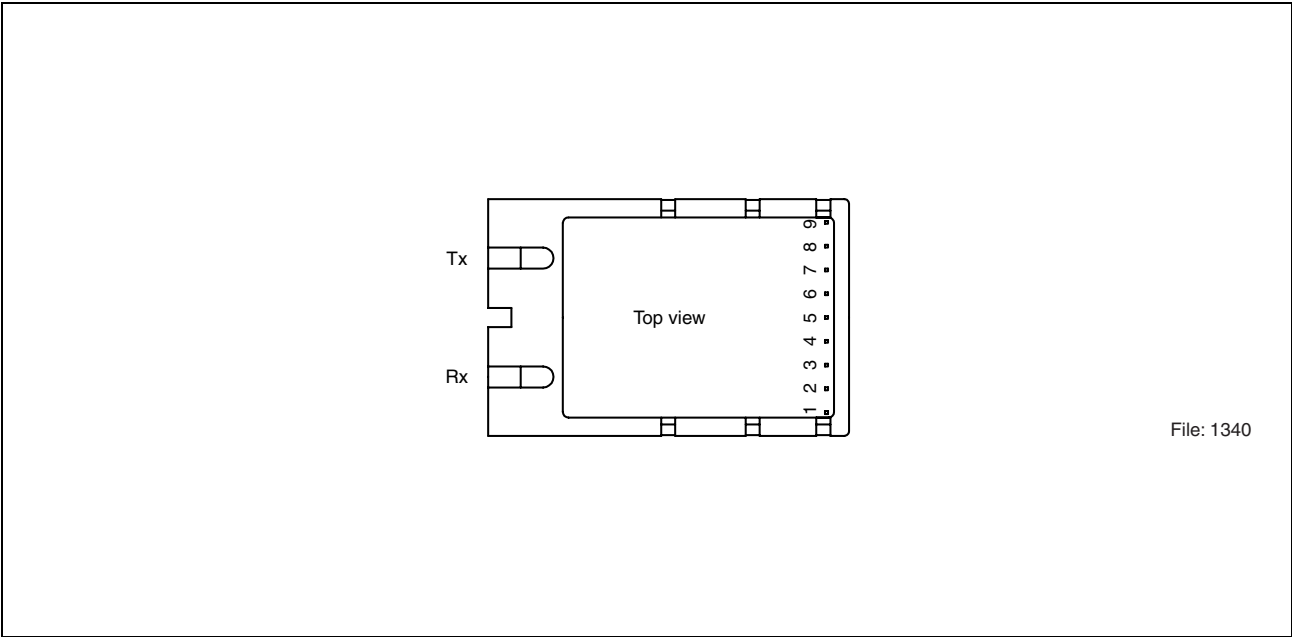
- SONET OC-3 IR-1  
Telcordia GR-253-CORE
- SDH STM-1 S-1.1 ITU-T G.957
- Suitable for Fast Ethernet

ST<sup>®</sup> is a registered trademark of AT&T.  
For **PRODUCT SELECTION** see next page.

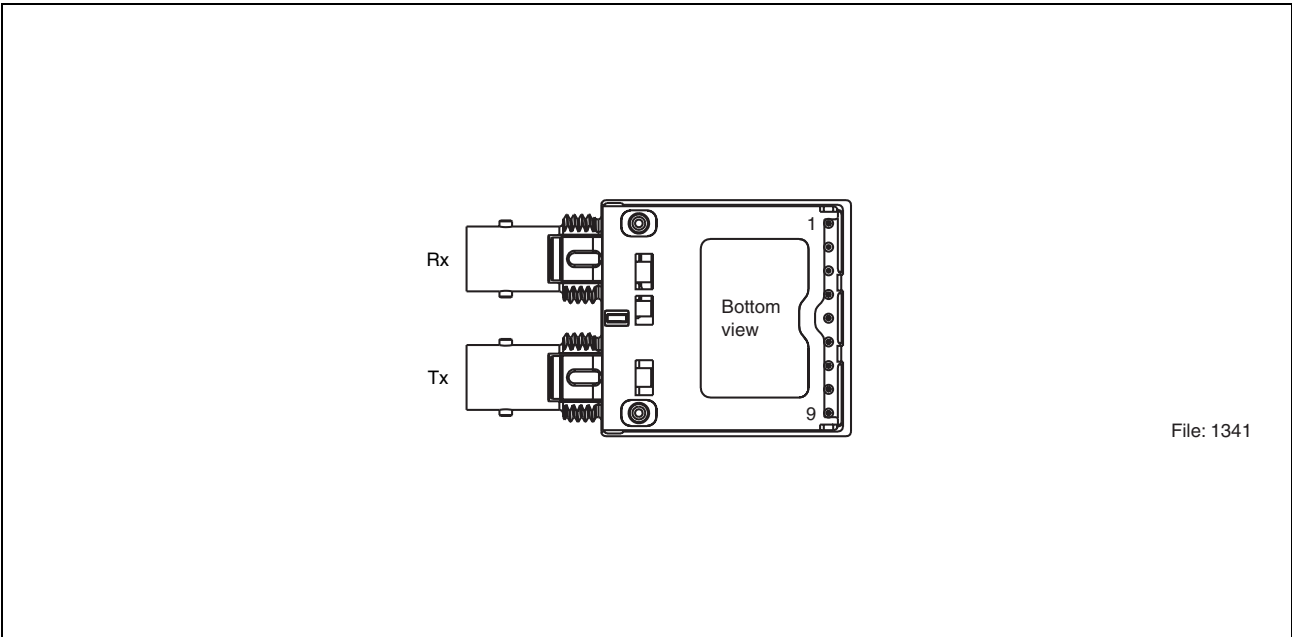
**PRODUCT SELECTION**

Part Number	Voltage	Signal Detect	Input	Output	Temperature Range	Connector	Reach
V23826-C18-C63 <sup>1)</sup>	5 V	PECL	DC	DC	0°C - 70°C	SC	15 km
V23826-C18-C363 <sup>1)</sup>	3.3 V						
V23826-C18-C64 <sup>1)</sup>	5 V	PECL	DC	DC	0°C - 70°C	SC	40 km
V23826-C18-C364 <sup>1)</sup>	3.3 V						
V23826-C18-C366 <sup>1)</sup>	3.3 V	PECL	DC	DC	–40°C - 85°C	SC	15 km
V23826-C18-T63	5 V	PECL	DC	DC	0°C - 70°C	ST®	15 km
V23826-C18-T363	3.3 V						
V23826-C18-T64	5 V	PECL	DC	DC	0°C - 70°C	ST®	40 km
V23826-C18-T364	3.3 V						
<sup>1)</sup> P/N Suffix	Shield Options						
-C3	Metallized cover, forward springs						
-D3	Metallized cover, backward springs						

**Pin Configuration**



**Figure 1 V23826-C18-C**



**Figure 2 V23826-C18-T**

**Pin Description**

Pin No.	Symbol	Level/Logic	Function	Description
1	$V_{EE}Rx$	Power Supply	Rx Ground	Negative power supply, normally ground
2	RD+	PECL Output	Rx Output Data	Receiver output data
3	RD–			Inverted receiver output data
4	SD	PECL <sup>1)</sup> Output	Rx Signal Detect	A high level on this output shows that optical data is applied to the optical input
5	$V_{CC}Rx$	Power Supply	Rx 3.3 V/5 V <sup>1)</sup>	Positive power supply, 3.3 V/5 V
6	$V_{CC}Tx$		Tx 3.3 V/5 V <sup>1)</sup>	
7	TD–	PECL Input	Tx Input Data	Inverted transmitter input data
8	TD+			Transmitter input data
9	$V_{EE}Tx$	Power Supply	Tx Ground	Negative power supply, normally ground
S1/2		Mech. Support	Stud Pin	Not connected

Notes:1) See **PRODUCT SELECTION**.

## Description

The Finisar single mode ATM transceiver complies with the ATM Forum's Network Compatible ATM for Local Network Applications document and ANSI's Broadband ISDN - Customer Installation Interfaces, Physical Media Dependent Specification, T1.646-1995, Bellcore-SONET OC-3 / IR-1/LR-1 and ITU-T G.957 STM-1 / S-1.1/L-1.1.

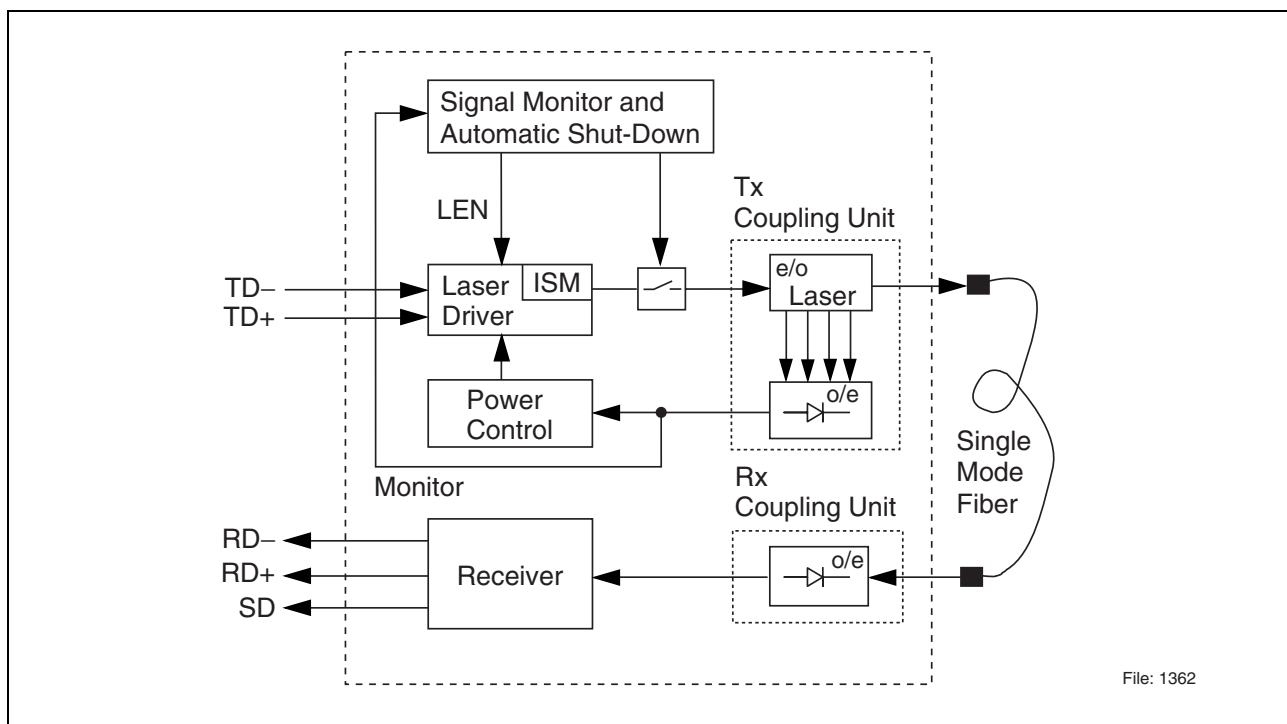
ATM was developed to facilitate solutions in multimedia applications and real time transmission. The data rate is scalable, and the ATM protocol is the basis of the broadband public networks being standardized in the International Telecommunications Union (ITU), the former International Telegraph and Telephone Consultative Committee (CCITT). ATM can also be used in local private applications.

The Finisar single mode transceiver is a single unit comprised of a transmitter, a receiver, and an SC/ST<sup>®</sup> receptacle. This design frees the customer from many alignment and PC board layout concerns. The module is designed for low cost WAN applications. It can be used as the network end device interface in workstations, servers, and storage devices, and in a broad range of network devices such as bridges, routers, and intelligent hubs, as well as wide area ATM switches.

This transceiver operates at 155.520 Mbit/s from a single power supply (5 V or 3.3 V). The differential data inputs and outputs are PECL compatible.

## Functional Description

This transceiver is designed to transmit serial data via single mode cable.



**Figure 3 Functional Diagram**

The transmitter converts electrical PECL compatible serial data (TD+ and TD–) into optical serial data. It contains a laser driver circuit that drives the modulation and bias current of the laser diode. The currents are controlled by a power control circuit to guarantee constant output power of the laser over temperature and aging.

The power control uses the output of the monitor PIN diode (mechanically built into the laser coupling unit) as a controlling signal, to prevent the laser power from exceeding the operating limits.

This transceiver contains an Input Signal Monitor (ISM), that switches the optical power off if a continuously low level is applied at Data Input.

The receiver component converts the optical serial data into PECL compatible electrical data (RD+ and RD–). The Signal Detect (SD, active high) shows whether optical data is present<sup>1)</sup>.

This module is a Class 1 laser product, due to an integrated automatic shutdown circuit that disables the laser when it detects transmitter failures.

Single fault condition is ensured by means of an integrated automatic shutdown circuit that disables the laser when it detects transmitter failures. A reset is only possible by turning the power off, and then on again.

The transceiver contains a supervisory circuit to monitor the power supply. This circuit makes an internal reset signal whenever the supply voltage drops below the reset threshold. It keeps the reset signal active for at least 15 milliseconds after the voltage has risen above the reset threshold. During this time the laser is inactive.

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**Notes:**

- 1) We recommend to switch off the transmitter supply ( $V_{CC}Tx$ ) if no transmitter input data is applied.

**Regulatory Compliance**

<b>Feature</b>	<b>Standard</b>	<b>Comments</b>
ESD: Electrostatic Discharge to the Electrical Pins	MIL-STD 883D Method 3015.7 JESD22-A114-B	Class 1 (> 1000 V) HBM  Class 1C
Immunity: Electrostatic Discharge (ESD) to the Duplex SC/ST <sup>®</sup> Receptacle	EN 61000-4-2 IEC 61000-4-2	Discharges of $\pm 15$ kV with an air discharge probe on the receptacle cause no damage.
Immunity: Radio Frequency Electromagnetic Field	EN 61000-4-3 IEC 61000-4-3	With a field strength of 3 V/m, noise frequency ranges from 10 MHz to 1 GHz <sup>1)</sup> . No effect on transceiver performance between the specification limits.
Emission: Electromagnetic Interference (EMI)	FCC 47 CFR Part 15 Class B EN 55022 Class B CISPR 22	Noise frequency range: 30 MHz to 18 GHz; Margins depend on PCB layout and chassis design.

Notes:

1) 10 MHz to 2 GHz for V23826-C18-C63/C363.

**Technical Data****Absolute Maximum Ratings**

Parameter	Symbol	Limit Values		Unit
		min.	max.	
Package Power Dissipation <sup>1)</sup>			1.5 <sup>2)</sup> 0.9 <sup>3)</sup>	W
Supply Voltage 5 V 3.3 V	$V_{CC}-V_{EE}$		7 5	V
Data Input Levels			$V_{CC}+0.5$	V
Differential Data Input Voltage Swing	$V_{ID}pk-pk$		5	V
Operating Ambient Temperature <sup>2)</sup>		0	70	°C
Operating Ambient Temperature <sup>3)</sup>		-40	85	°C
Storage Ambient Temperature		-40	85	°C
Soldering Conditions Temp/Time (MIL-STD 883C, Method 2003)			250/5.5	°C/s

**Notes:**

- 1) For  $V_{CC}-V_{EE}$  (min., max.). 50% duty cycle. The supply current does not include the load drive current of the receiver output.
- 2) Not for V23826-C18-C366.
- 3) Only for V23826-C18-C366.

Exceeding any one of these values may destroy the device immediately.

**Recommended Operating Conditions**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Ambient Temperature <sup>1)</sup>	$T_{AMB}$	0		70	°C
Ambient Temperature <sup>2)</sup>	$T_{AMB}$	–40		85	°C
Power Supply Voltage    3.3 V 5 V	$V_{CC}-V_{EE}$	3.1 4.75	3.3 5	3.5 5.25	V
Supply Current <sup>3)</sup> 3.3 V 5 V	$I_{CC}$		175 175 190	230 <sup>4)</sup> 250 <sup>5)</sup> 270	mA
<b>Transmitter</b>					
Data Input High Voltage DC/DC	$V_{IH}-V_{CC}$	–1165		–880	mV
Data Input Low Voltage DC/DC	$V_{IL}-V_{CC}$	–1810		–1475	mV
Differential Data Input Voltage Swing	$V_{IDpk-pk}$	400		3200	mV
Input Data Rise/Fall Time 10% - 90%	$t_R, t_F$	0.4		1.3	ns
<b>Receiver</b>					
Output Current <sup>6)</sup>	$I_O$			25	mA
Input Center Wavelength	$\lambda_C$	1260		1360	nm

**Notes:**

- 1) Not for V23826-C18-C366.
- 2) Only for V23826-C18-C366.
- 3) For  $V_{CC}-V_{EE}$  (min., max.) 50% duty cycle. The supply current does not include the load drive current of the receiver output.
- 4) For V23826-C18-C63/C363/T63/T363.
- 5) For V23826-C18-C64/C364/C366/T64/T364.
- 6) For V23826-C18-C64/C364/T64/T364 only.

The electro-optical characteristics described in the following tables are only valid for use under the recommended operating conditions.

**Transmitter Electro-Optical Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
C23826-C18-Xx3/Xxx3/Xx6/Xxx6					
Launched Power (Average) <sup>1)</sup>	P <sub>O</sub>	−15	−11	−8	dBm
Center Wavelength	λ <sub>C</sub>	1260		1360	nm
Spectral Width (RMS)	σ <sub>I</sub>			7.7	nm
Relative Intensity Noise	RIN			−120	dB/Hz
Extinction Ratio (Dynamic)	ER	8.2			dB
Reset Threshold <sup>2)</sup> 3.3 V 5 V	V <sub>TH</sub>		2.7 3.5		V
Reset Time Out <sup>2)</sup>	t <sub>RES</sub>	15	22	35	ms
Eye Diagram <sup>3)</sup>	ED				
C23826-C18-Xx4/Xxx4					
Output Power (Average) <sup>1)</sup>	P <sub>O</sub>	−5	−3	0	dBm
Center Wavelength	λ <sub>C</sub>	1280		1335	nm
Spectral Width (FWHM)	D <sub>I</sub>		2.4	3	nm
Output Rise Time	t <sub>R</sub>	0.6		3	ns
Extinction Ratio (Dynamic)	ER	10			dB
Reset Threshold for V <sub>CC</sub> Tx <sup>2)</sup> 3.3 V 5 V	V <sub>TH</sub>		2.7 3.5		V
Reset Active Time Out <sup>2)</sup>	t <sub>RES</sub>	15	25	35	ms
Eye Diagram <sup>3)</sup>	ED				

**Notes:**

- 1) Into single mode fiber, 9  $\mu$ m diameter.
- 2) Laser power is shut down if power supply is below  $V_{TH}$  and switched on if power supply is above  $V_{TH}$  after  $t_{RES}$ .
- 3) Transmitter meets ANSI T1E1.2, SONET OC-3 and ITU-T G.957 mask patterns.

**Receiver Electro-Optical Characteristics**

Parameter	Symbol	Values			Unit
		min.	typ.	max.	
Sensitivity (Average Power) <sup>1)</sup> V23826-C18-Xx(x)3/Xx(x)6 V23826-C18-Xx(x)4	$P_{IN}$		-36 -36	-31 -34	dBm
Saturation (Average Power) V23826-C18-Xx(x)3/Xx(x)6 V23826-C18-Xx(x)4	$P_{SAT}$	-8 -2			dBm
Signal Detect Assert Level <sup>2)</sup>	$P_{SDA}$		-37.5	-34	dBm
Signal Detect Deassert Level <sup>3)</sup>	$P_{SDD}$	-44	-40		dBm
Signal Detect Hysteresis	$P_{SDA}$ $-P_{SDD}$	1	2.5	6	dB
Signal Detect Assert Time	$t_{ASS}$			100	μs
Signal Detect Deassert Time	$t_{DAS}$			350	μs
Output Low Voltage <sup>4)</sup>	$V_{OL}-V_{CC}$	-1950		-1620	mV
Output High Voltage <sup>4)</sup>	$V_{OH}-V_{CC}$	-1025		-720	mV
Output Data Rise/Fall Time 20% - 80%	$t_R, t_F$			375	ps
Output SD Rise/Fall Time <sup>5)</sup>				40	ns

**Notes:**

- 1) Minimum average optical power at which the BER is less than  $1 \times 10^{-10}$  or lower. Measured with a  $2^{23}-1$  NRZ PRBS as recommended by ANSI T1E1.2, SONET OC-3 and ITU-T G.957.
- 2) An increase in optical power of data signal above the specified level will cause the Signal Detect to switch from a low state to a high state.
- 3) A decrease in optical power of data signal below the specified level will cause the Signal Detect to switch from a high state to a low state.
- 4) DC/DC, PECL for Signal Detect, PECL compatible. Load is  $50 \Omega$  into  $V_{CC}-2 \text{ V}$  for data,  $500 \Omega$  to  $V_{EE}$  for Signal Detect. Measured under DC conditions. For dynamic measurements a tolerance of 50 mV should be added.  $V_{CC} = 3.3 \text{ V}/5 \text{ V}$ .  $T_{AMB} = 25^\circ\text{C}$ .
- 5) V23826-C18-C64/C364/T64/T364:  
PECL compatible. A high level on this output shows that an optical signal is applied to the optical input.

## Eye Safety

This laser based single mode transceiver is a Class 1 product. It complies with IEC 60825-1/A2: 2001 and FDA performance standards for laser products (21 CFR 1040.10 and 1040.11) except for deviations pursuant to Laser Notice 50, dated July 26, 2001.

## CLASS 1 LASER PRODUCT

To meet laser safety requirements the transceiver shall be operated within the Absolute Maximum Ratings.

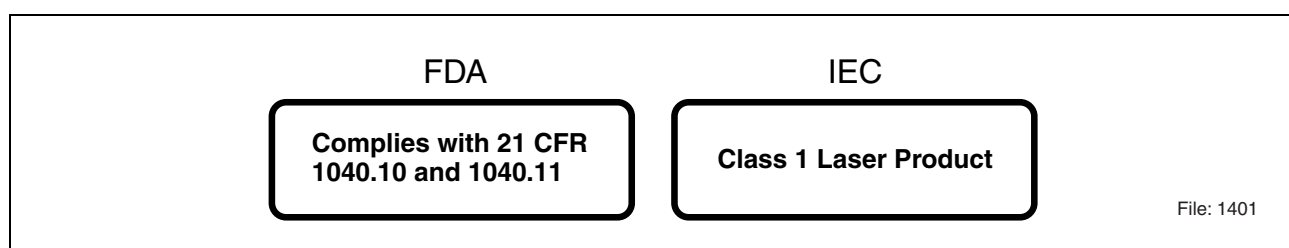
*Note: All adjustments have been made at the factory prior to shipment of the devices. No maintenance or alteration to the device is required.*

*Tampering with or modifying the performance of the device will result in voided product warranty.*

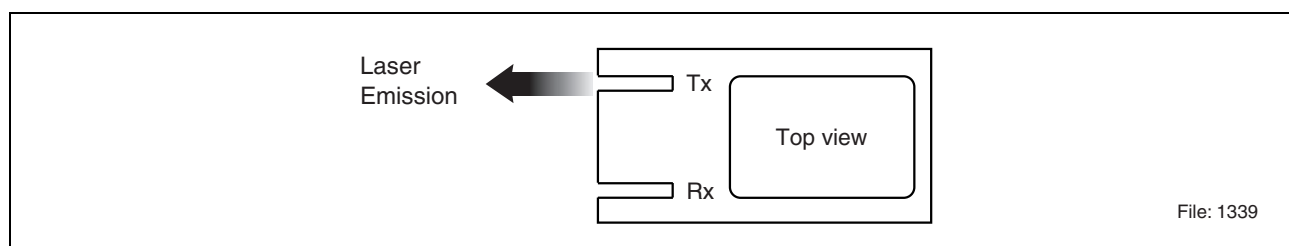
*Failure to adhere to the above restrictions could result in a modification that is considered an act of “manufacturing”, and will require, under law, recertification of the modified product with the U.S. Food and Drug Administration (ref. 21 CFR 1040.10 (i)).*

## Laser Emission Data

Wavelength	1310 nm
Maximum total output power (as defined by IEC: 7 mm aperture at 14 mm distance)	15.6 mW / 11.9 dBm
Beam divergence (full angle) / NA (half angle)	11° / 0.1 rad



**Figure 4 Required Labels**



**Figure 5 Laser Emission**

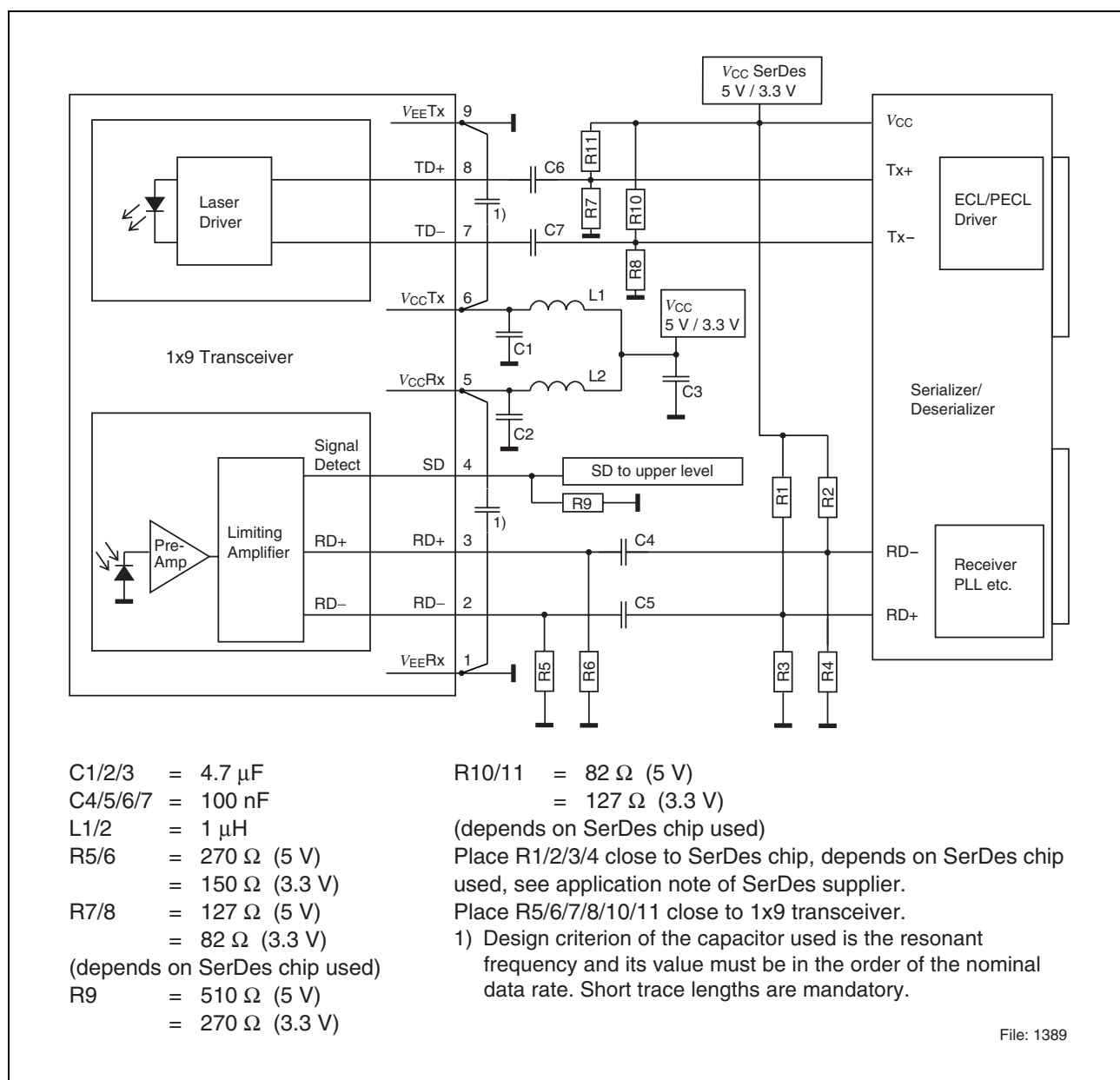
## Application Notes

ATM transceivers and matching circuits are high frequency components and shall be terminated as recommended in the application notes for proper EMI performance. Electromagnetic emission may be caused by these components.

To prevent emissions it is recommended that cutouts for the fiber connectors be designed as small as possible.

It is recommended that the Tx plug and the Rx plug be separated with a bar that divides the duplex SC opening.

## Single Mode 155 Mbit/s ATM 1x9 Transceiver



**Figure 6**

3.3 V-transceivers can be directly connected to SerDes chips using standard PECL termination network.

Value of R1...R4 may vary as long as proper  $50\ \Omega$  termination to  $V_{EE}$  or  $100\ \Omega$  differential is provided. The power supply filtering is required for good EMI performance. Use short tracks from the inductor L1/L2 to the module  $V_{CC}Rx/V_{CC}Tx$ . Further application notes for electrical interfacing are available upon request. Ask for Appnote 82.

We strongly recommend a  $V_{EE}$  plane under the module for getting good EMI performance.

The transceiver contains an automatic shutdown circuit. Reset is only possible if the power is turned off, and then on again. ( $V_{CC}Tx$  switched below  $V_{TH}$ ).

Application Board available on request.

## Shield Options

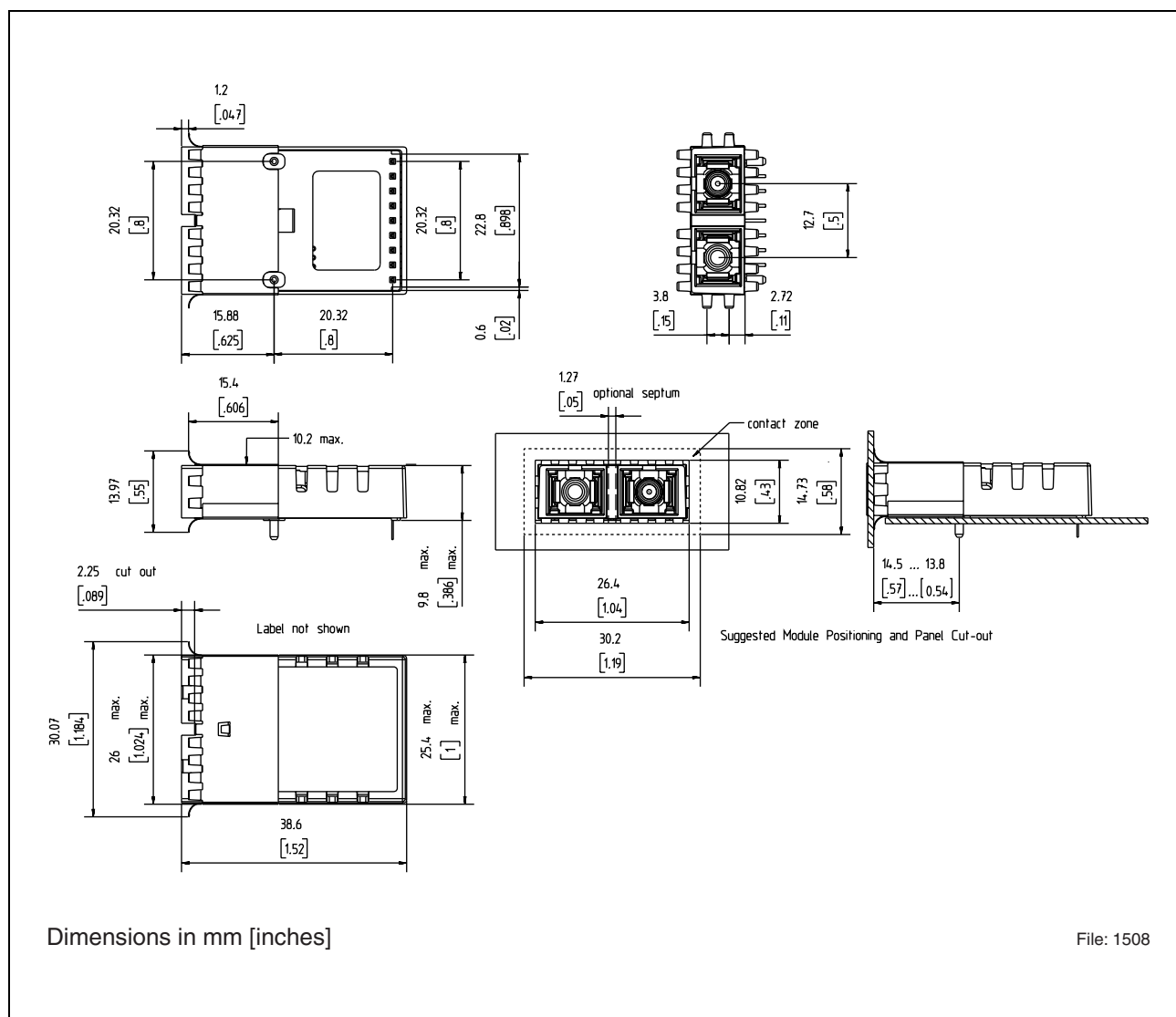
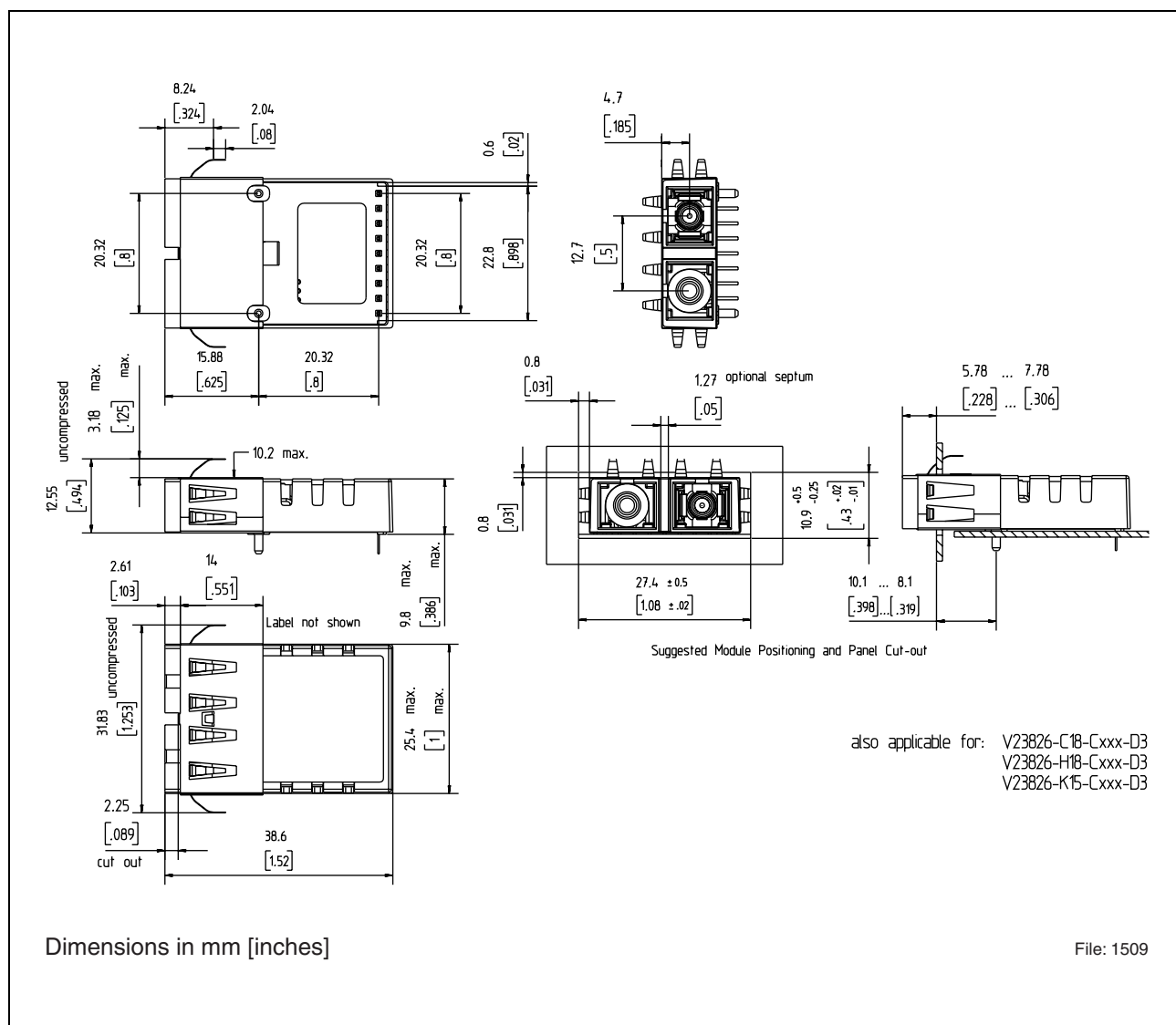


Figure 7 Shield with Forward Springs, -C3



**Figure 8 Shield with Backward Springs, -D3**

## Package Outlines

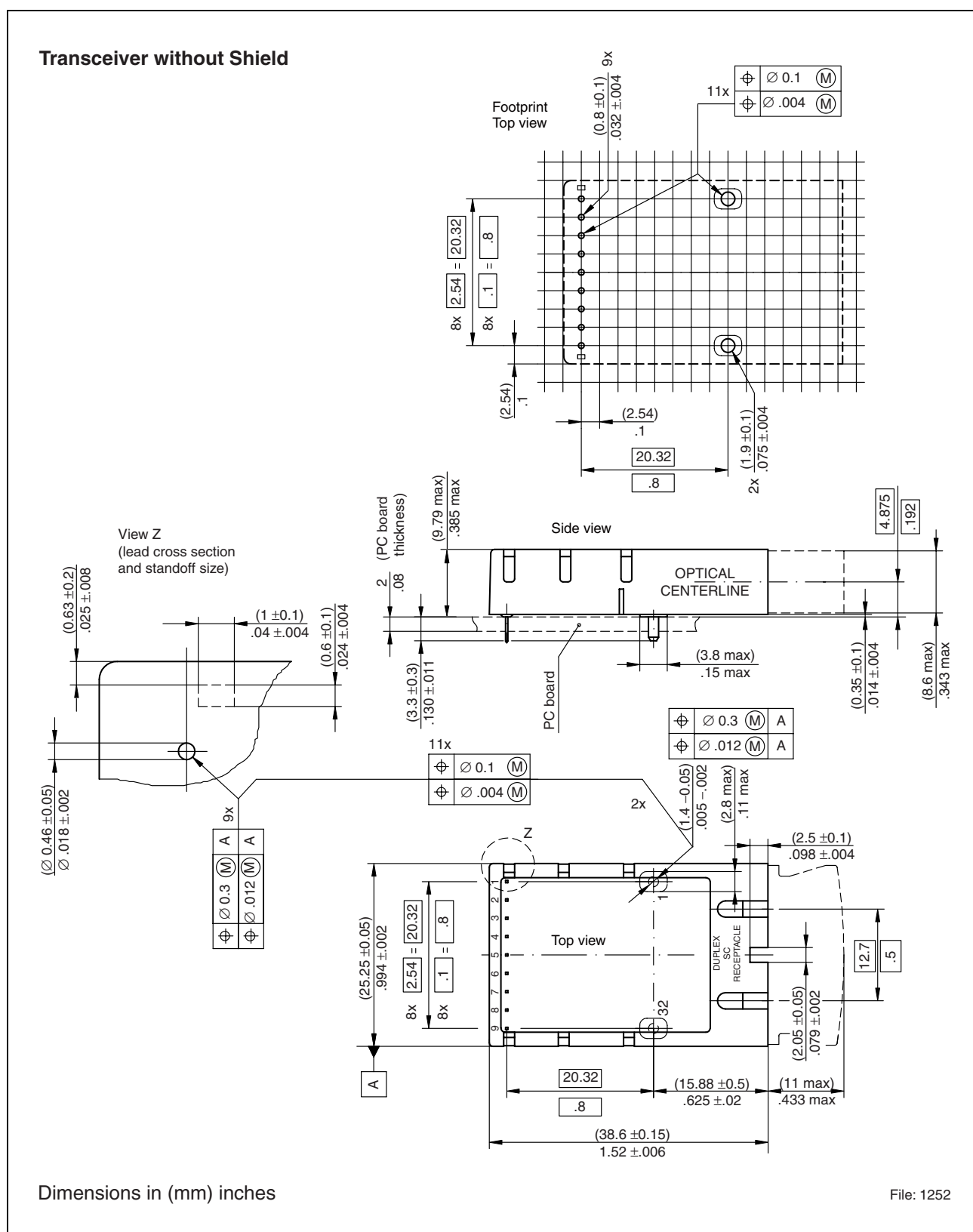
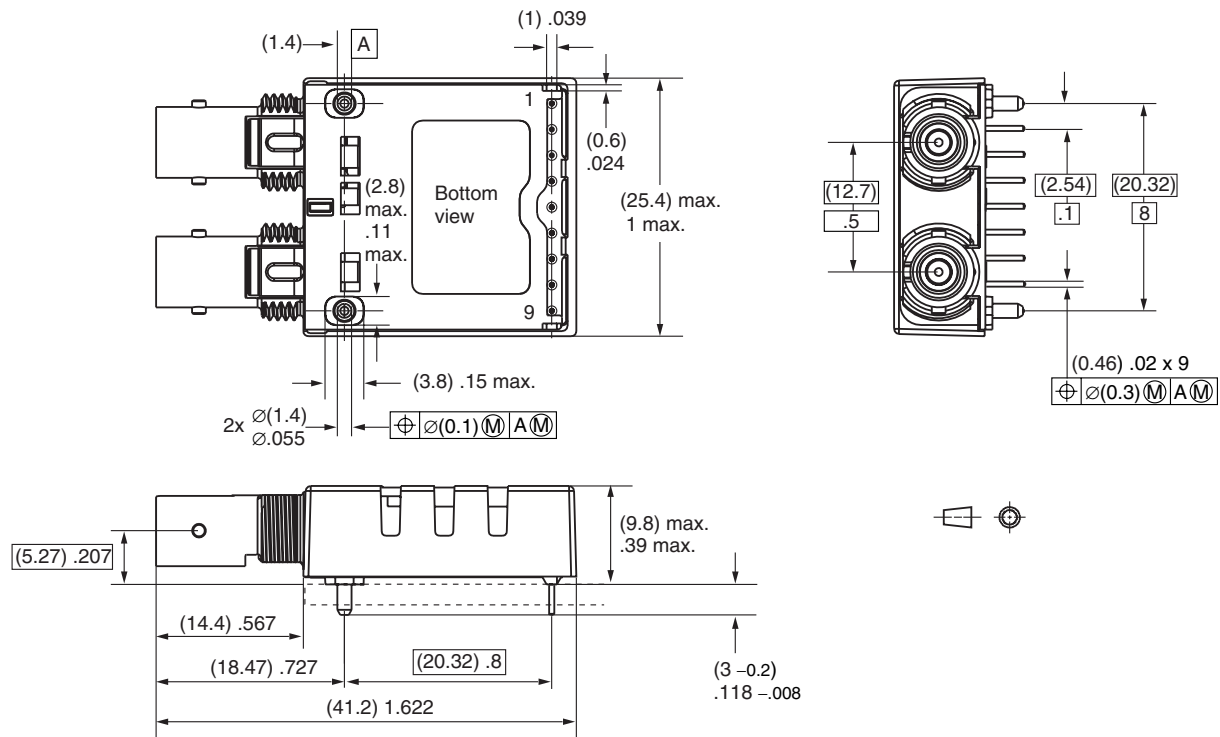


Figure 9 V23826-C18-C



File: 1253

**Figure 10 V23826-C18-T**

<b>Revision History:</b>		<b>July 09, 2004</b>	<b>Rev. B</b>
Previous Version:		2000	
<b>Page</b>	<b>Subjects</b> (major changes since last revision)		
	Company name has been changed Document's layout has been changed <b>December 2004</b>		

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