

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

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

**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® 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



For ordering information see next page.  
ST® is a registered trademark of AT&T.

Ordering Information

Ordering Information

| 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 <sup>®</sup> | 15 km |
| V23826-C18-T363               | 3.3 V                              |               |       |        |                   |                 |       |
| V23826-C18-T64                | 5 V                                | PECL          | DC    | DC     | 0°C - 70°C        | ST <sup>®</sup> | 40 km |
| V23826-C18-T364               | 3.3 V                              |               |       |        |                   |                 |       |
| <sup>1)</sup> P/N Suffix      | <b>Shield Options</b>              |               |       |        |                   |                 |       |
| -C3                           | Metallized cover, forward springs  |               |       |        |                   |                 |       |
| -D3                           | Metallized cover, backward springs |               |       |        |                   |                 |       |

Pin Configuration

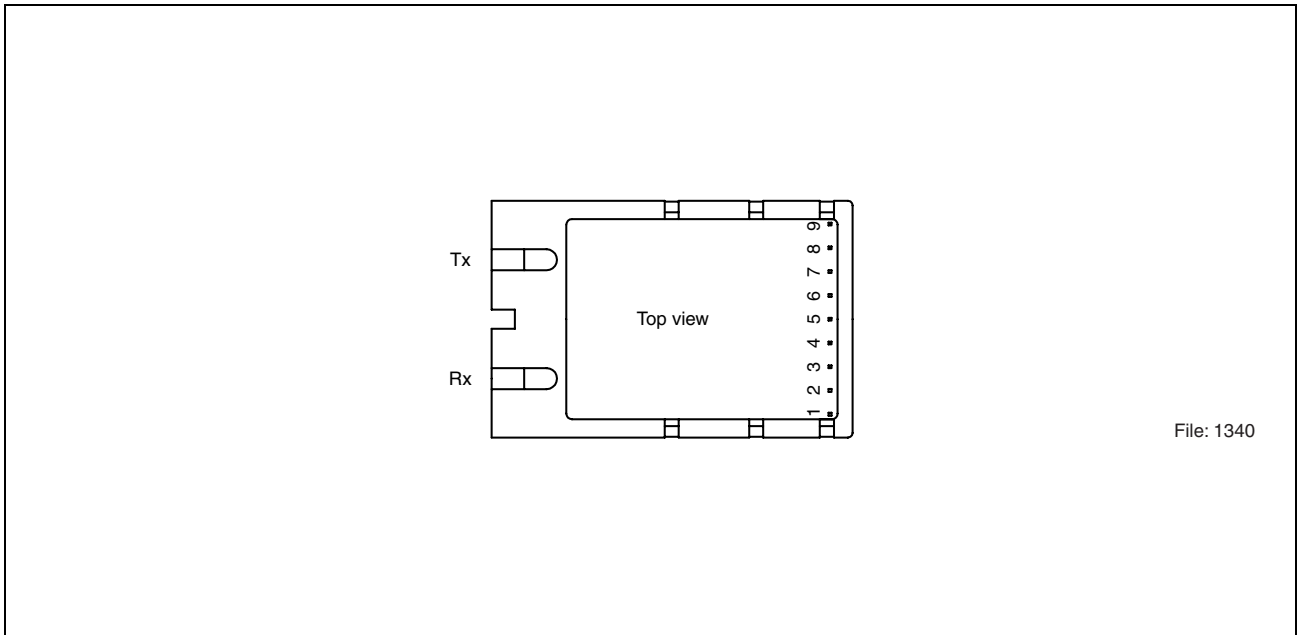


Figure 1 V23826-C18-C

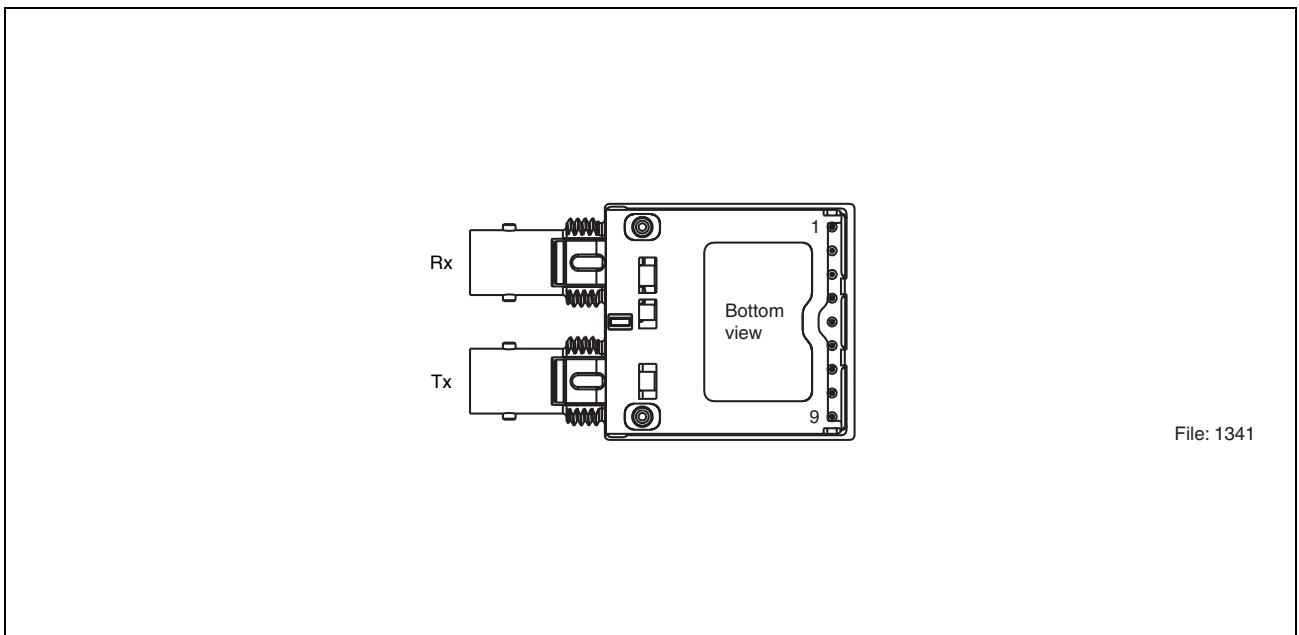


Figure 2 V23826-C18-T

Pin Description

Pin 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   |

<sup>1)</sup> See Ordering Information.

## Description

The Infineon 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 Infineon 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.

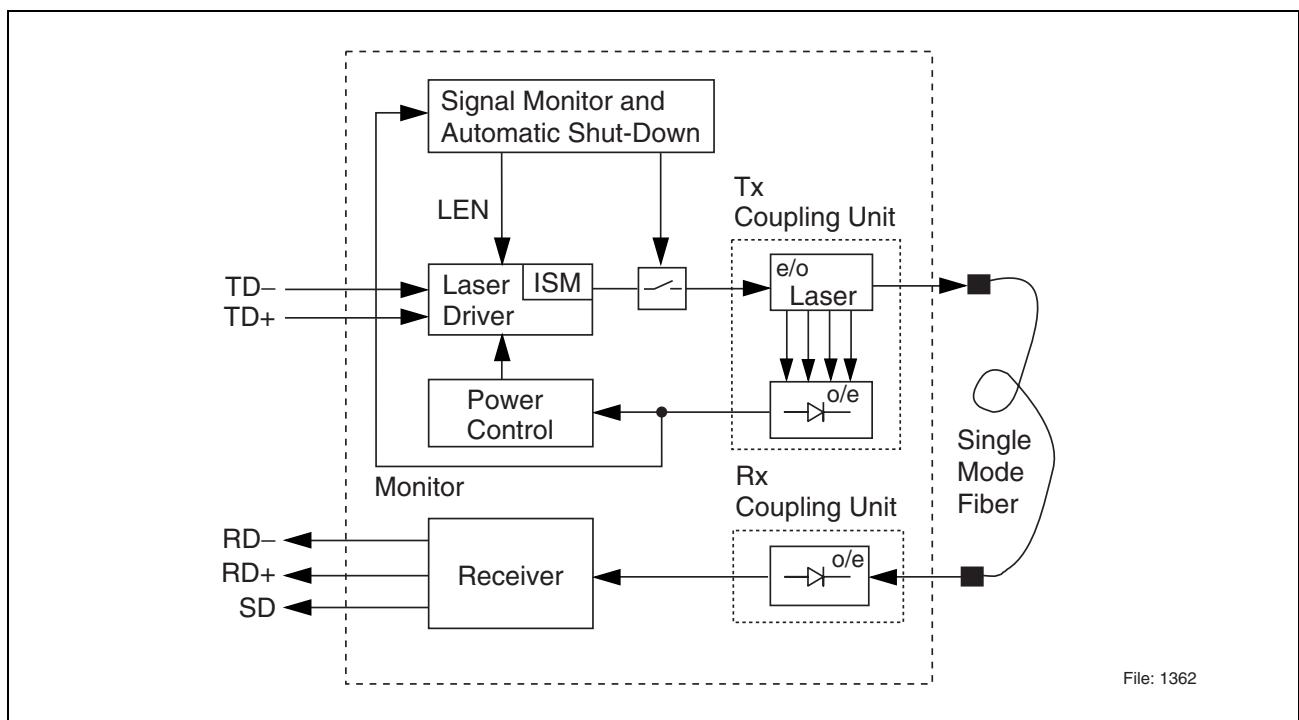


Figure 3 Functional Diagram

## Description

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

### Regulatory Compliance

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

<sup>1)</sup> 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><br>0.9 <sup>3)</sup> | W    |
| Supply Voltage<br>5 V<br>3.3 V                                | $V_{CC}-V_{EE}$ |              | 7<br>5                                 | V    |
| Data Input Levels   |                 |              | $V_{CC}+0.5$                           | V    |
| Differential Data Input Voltage Swing                         | $V_{IDpk-pk}$   |              | 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<br>(MIL-STD 883C, Method 2003) |                 |              | 250/5.5                                | °C/s |

<sup>1)</sup> For  $V_{CC}-V_{EE}$  (min., max.). 50% duty cycle. The supply current does not include the load drive current of the receiver output.

<sup>2)</sup> Not for V23826-C18-C366.

<sup>3)</sup> 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              | $V_{CC}-V_{EE}$ | 3.1<br>4.75 | 3.3<br>5          | 3.5<br>5.25                                   | V    |
| Supply Current <sup>3)</sup>      | $I_{CC}$        |             | 175<br>175<br>190 | 230 <sup>4)</sup><br>250 <sup>5)</sup><br>270 | mA   |

**Transmitter**

|                                       |                 |       |  |       |    |
|---------------------------------------|-----------------|-------|--|-------|----|
| 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 |

**Receiver**

|                              |             |      |  |      |    |
|------------------------------|-------------|------|--|------|----|
| Output Current <sup>6)</sup> | $I_O$       |      |  | 25   | mA |
| Input Center Wavelength      | $\lambda_C$ | 1260 |  | 1360 | nm |

<sup>1)</sup> Not for V23826-C18-C366.

<sup>2)</sup> Only for V23826-C18-C366.

<sup>3)</sup> For  $V_{CC}-V_{EE}$  (min., max.) 50% duty cycle. The supply current does not include the load drive current of the receiver output.

<sup>4)</sup> For V23826-C18-C63/C363/T63/T363.

<sup>5)</sup> For V23826-C18-C64/C364/C366/T64/T364.

<sup>6)</sup> 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. |       |
| <b>C23826-C18-Xx3/Xxx3/Xx6/Xxx6</b>    |             |        |            |      |       |
| Launched Power (Average) <sup>1)</sup> | $P_O$       | -15    | -11        | -8   | dBm   |
| Center Wavelength                      | $\lambda_C$ | 1260   |            | 1360 | nm    |
| Spectral Width (RMS)                   | $\sigma_l$  |        |            | 7.7  | nm    |
| Relative Intensity Noise               | RIN         |        |            | -120 | dB/Hz |
| Extinction Ratio (Dynamic)             | ER          | 8.2    |            |      | dB    |
| Reset Threshold <sup>2)</sup>          | $V_{TH}$    |        | 2.7<br>3.5 |      | V     |
|  |             |        |            |      |       |
| Reset Time Out <sup>2)</sup>           | $t_{RES}$   | 15     | 22         | 35   | ms    |
| Eye Diagram <sup>3)</sup>              | ED          |        |            |      |       |
| <b>C23826-C18-Xx4/Xxx4</b>             |             |        |            |      |       |
| Output Power (Average) <sup>1)</sup>   | $P_O$       | -5     | -3         | 0    | dBm   |
| Center Wavelength                      | $\lambda_C$ | 1280   |            | 1335 | nm    |
| Spectral Width (FWHM)                  | $D_l$       |        | 2.4        | 3    | nm    |
| Output Rise Time                       | $t_R$       | 0.6    |            | 3    | ns    |
| Extinction Ratio (Dynamic)             | ER          | 10     |            |      | dB    |
| Reset Threshold                        | $V_{TH}$    |        | 2.7<br>3.5 |      | V     |
| for $V_{CCTx}$ <sup>2)</sup>           |             |        |            |      |       |
| Reset Active Time Out <sup>2)</sup>    | $t_{RES}$   | 15     | 25         | 35   | ms    |
| Eye Diagram <sup>3)</sup>              | ED          |        |            |      |       |

<sup>1)</sup> Into single mode fiber, 9  $\mu$ m diameter.

<sup>2)</sup> Laser power is shut down if power supply is below  $V_{TH}$  and switched on if power supply is above  $V_{TH}$  after  $t_{RES}$ .

<sup>3)</sup> 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><br>V23826-C18-Xx(x)3/Xx(x)6<br>V23826-C18-Xx(x)4 | $P_{IN}$                |          | -36<br>-36 | -31<br>-34 | dBm  |
| Saturation (Average Power)<br>V23826-C18-Xx(x)3/Xx(x)6<br>V23826-C18-Xx(x)4                | $P_{SAT}$               | -8<br>-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   | $P_{SDA}$<br>$-P_{SDD}$ | 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<br>20% - 80%  | $t_R, t_F$              |          |            | 375        | ps   |
| Output SD Rise/Fall Time <sup>5)</sup>   |                         |          |            | 40         | ns   |

<sup>1)</sup> 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.

<sup>2)</sup> 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.

<sup>3)</sup> 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.

<sup>4)</sup> DC/DC, PECL for Signal Detect, PECL compatible. Load is  $50 \Omega$  into  $V_{CC}-2$  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.  $V_{CC} = 3.3$  V/5 V.  $T_{AMB} = 25^\circ\text{C}$ .

<sup>5)</sup> 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.

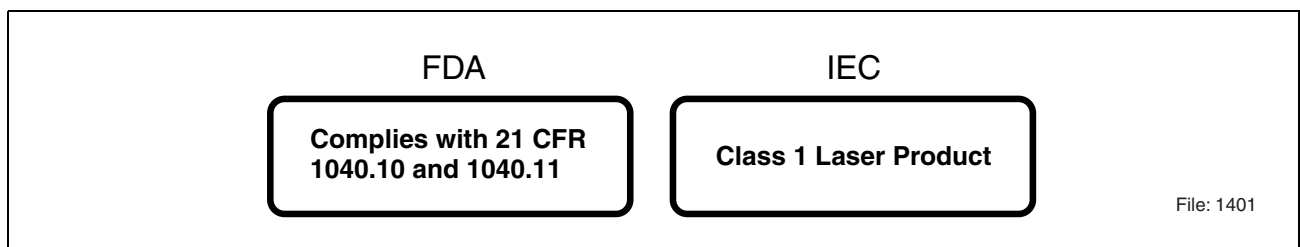
*Note: All adjustments have been made at the factory prior to shipment of the devices. No maintenance or alteration to the device is required.*

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

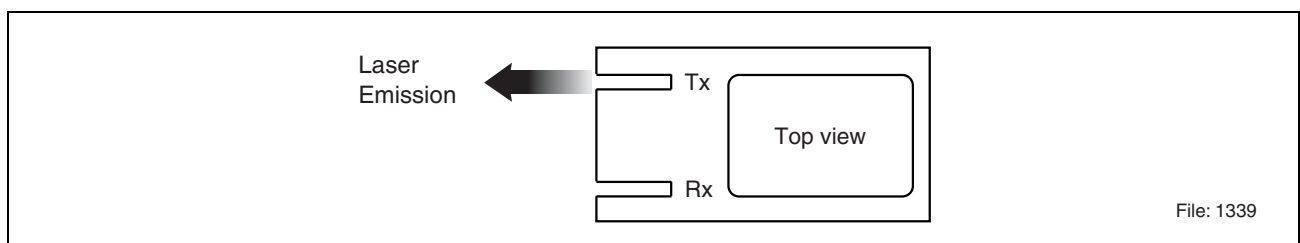
*Failure to adhere to the above restrictions could result in a modification that is considered an act of “manufacturing”, and will require, under law, recertification of the modified product with the U.S. Food and Drug Administration (ref. 21 CFR 1040.10 (i)).*

### Laser Emission Data

|  |                    |
|--|--------------------|
| Wavelength   | 1310 nm            |
| Maximum total output power<br>(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

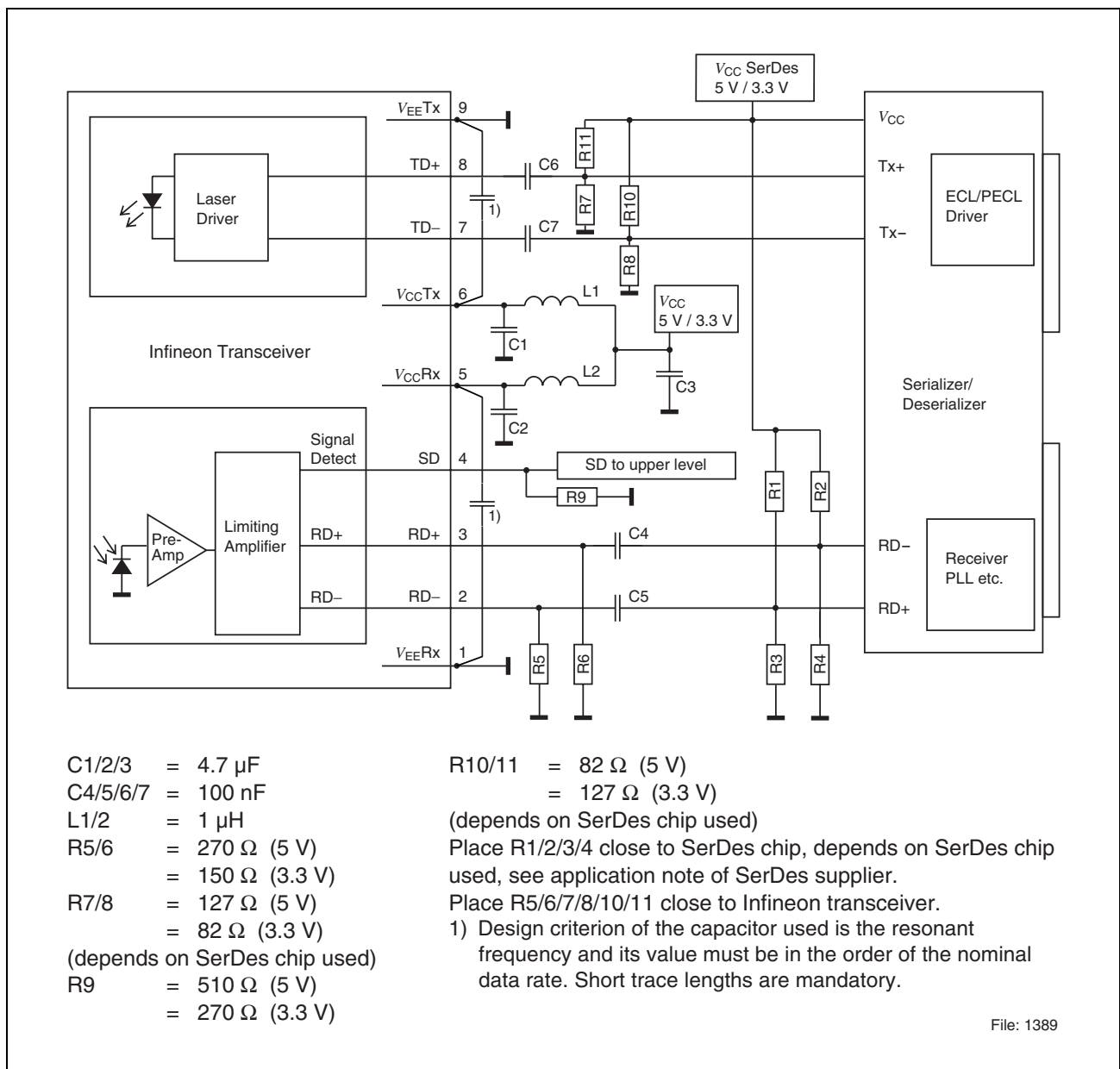


Figure 6

## Application Notes

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

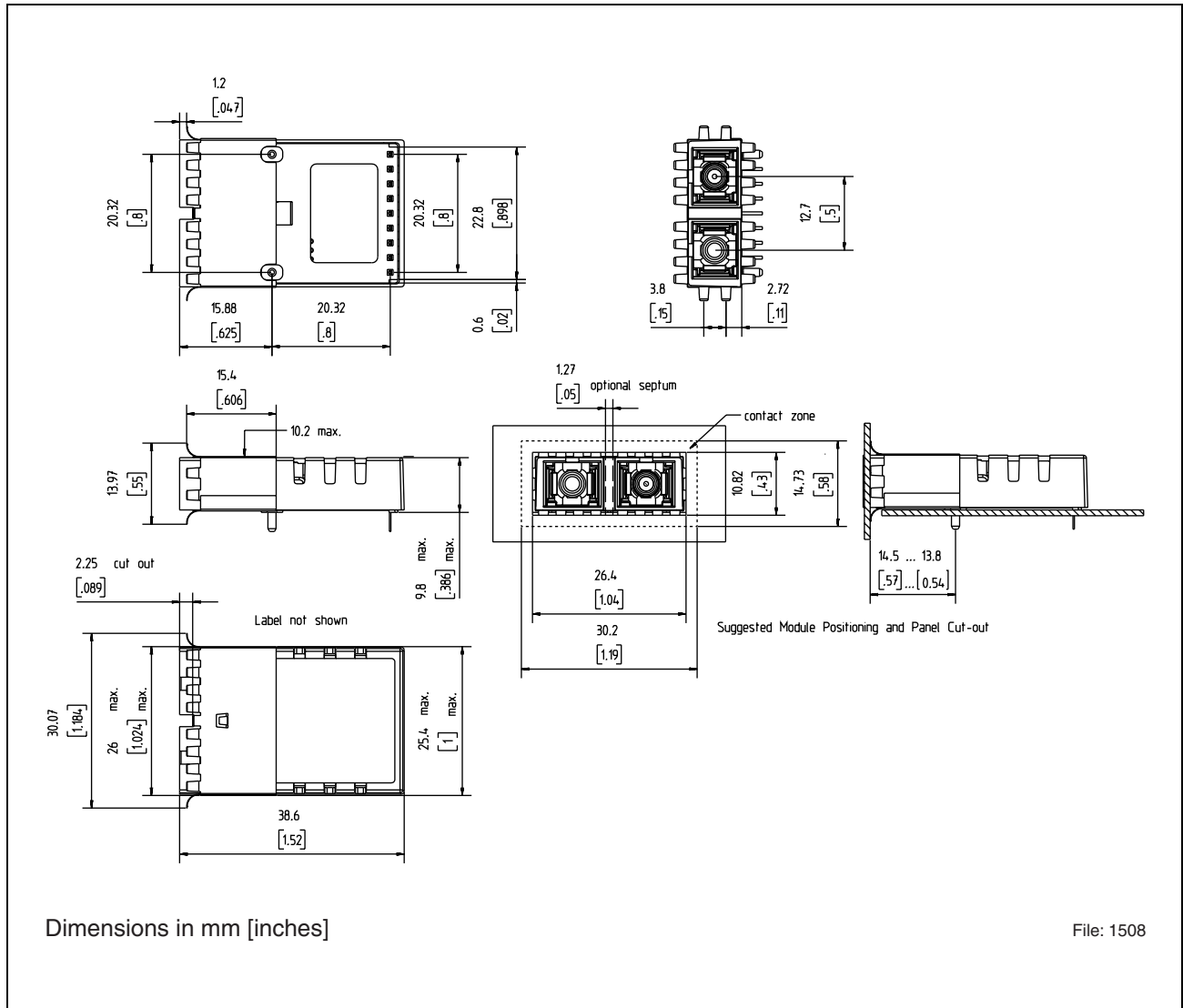


Figure 7 Shield with Forward Springs, -C3

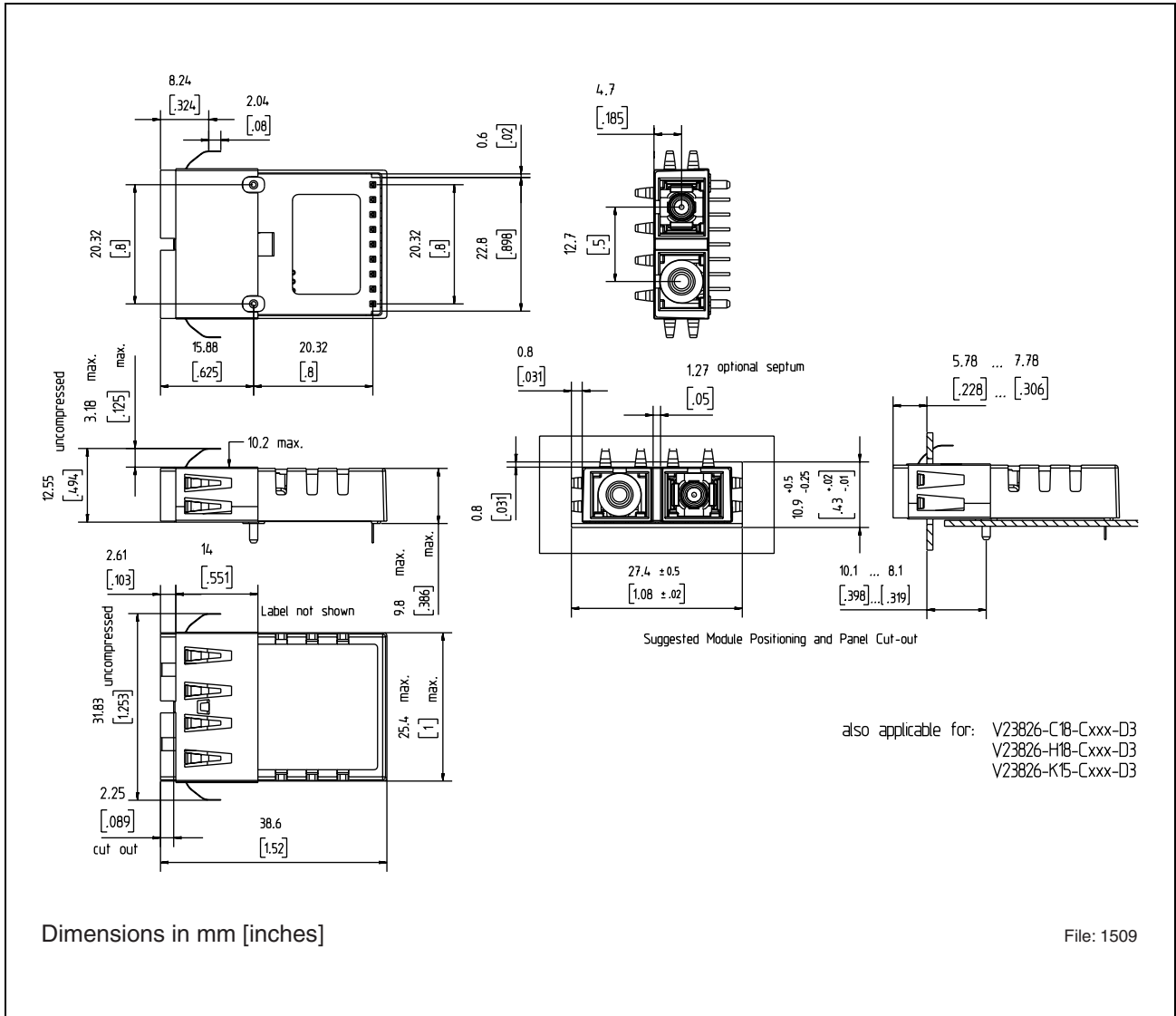


Figure 8 Shield with Backward Springs, -D3



Package Outlines

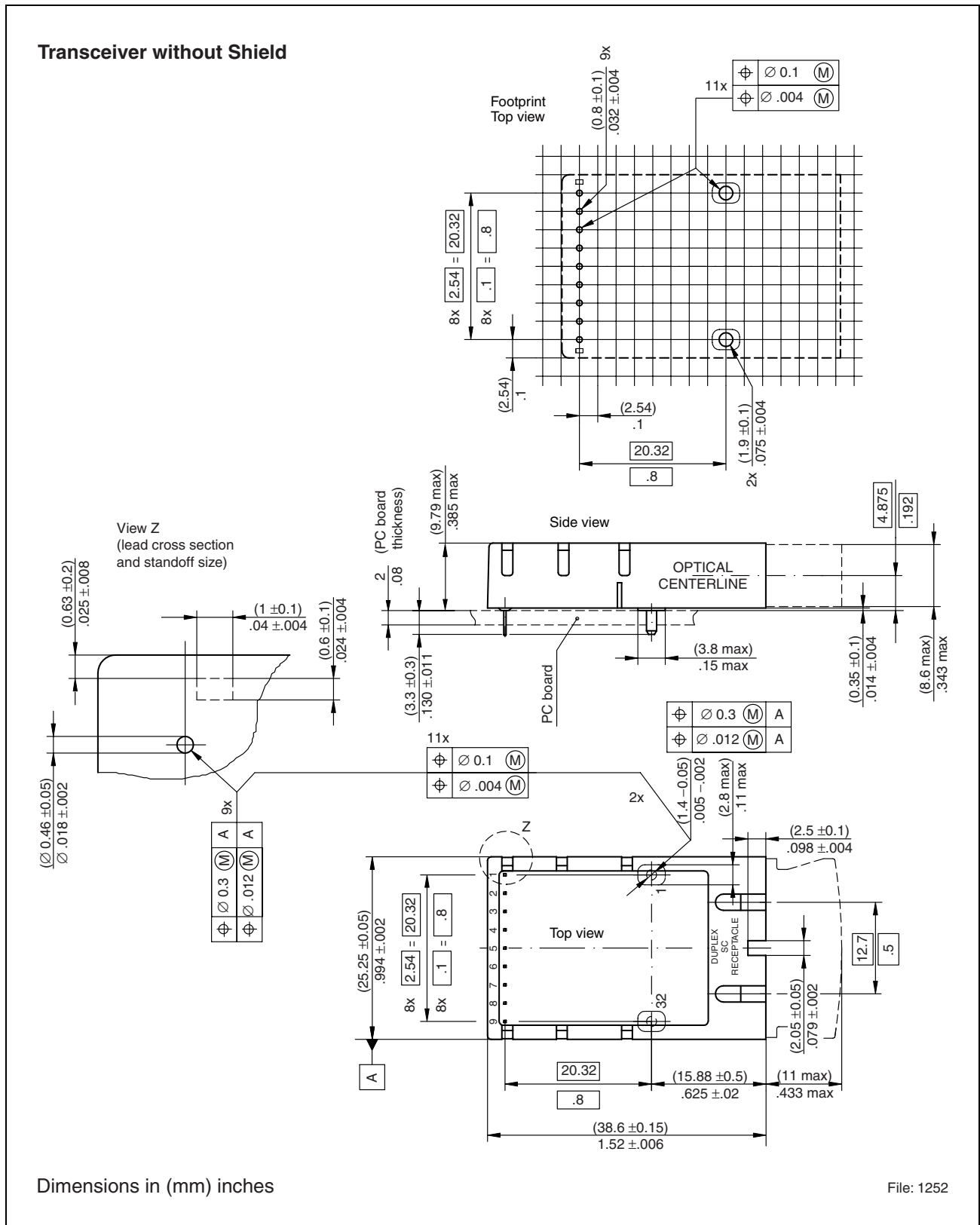


Figure 9 V23826-C18-C

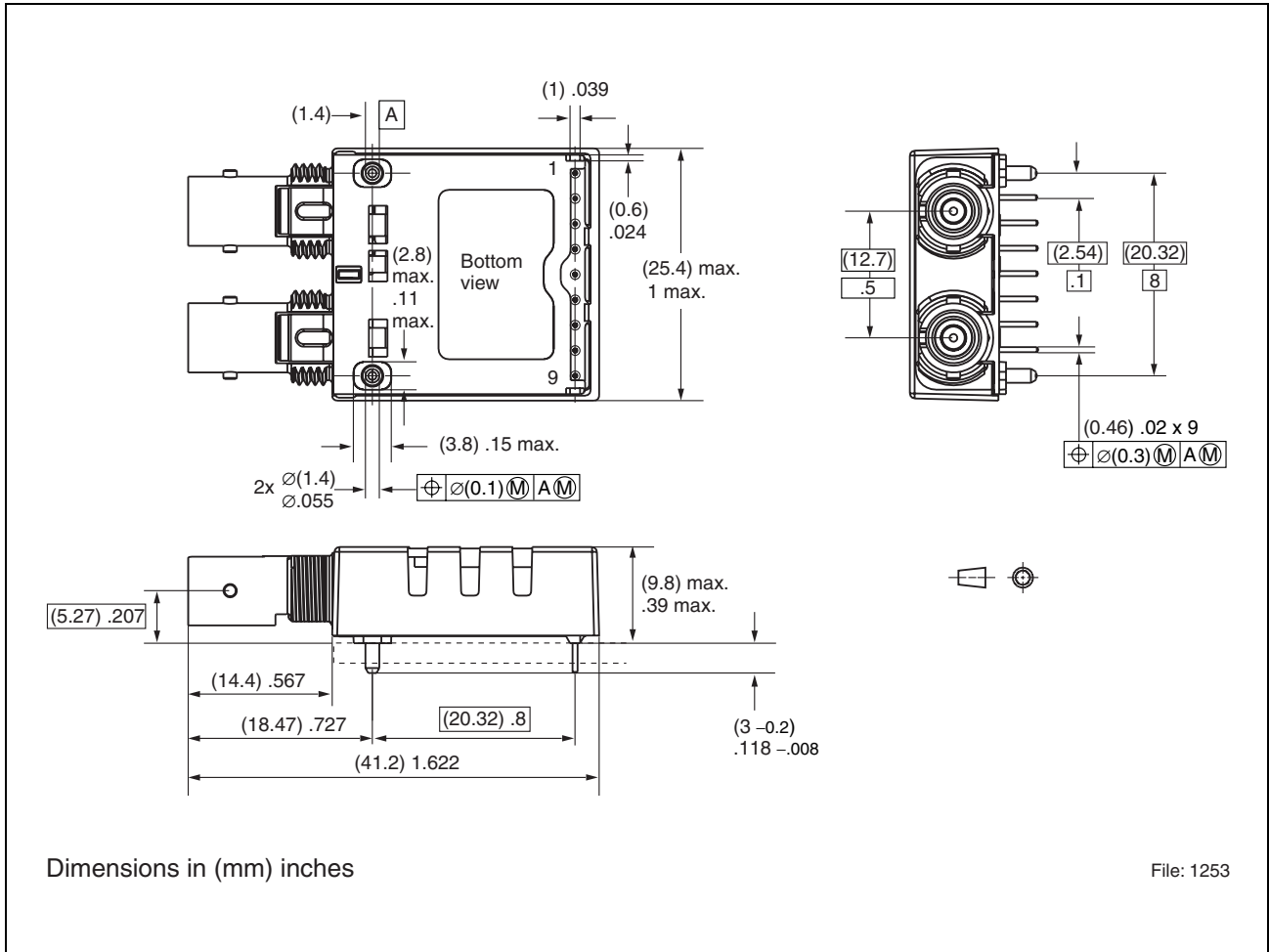


Figure 10 V23826-C18-T