ZiLOG

ZHX3403

MIR UltraSlim™ Transceiver (IrMC)

**Preliminary Product Specification**

PS011606-0303

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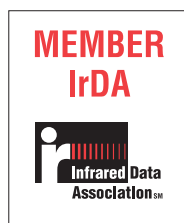
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Document Disclaimer

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Description

The ZILOG ZHX3403 for mobile phones, pagers, and PDAs is the smallest, lowest power, and highest functional transceiver in its class.

The ZiLOG ZHX3403 features exclusive AlwaysOn[TM] technology that allows the transceiver to "listen" for an IrDA communication at a typical current of 6 μA, allowing the default mode to be left on with negligible effect on the battery life. Once another IrDA device has been discovered, communication takes place at the low receive current consumption of 100 μA typically (MIR).

The UltraSlim form factor (7.3 mm long x 2.8 mm wide x 1.9 mm high) allows placement in virtually any small device (see Figure 1). Application circuit space is also minimized because only two external components are required.

Figure 1. UltraSlim Form

The ZHX3403 is designed to support IrDA-Data MIR mode, which at 1.15 Mbits/s (10 times typical PDA and mobile telephone solutions) provides enhanced capability for the user to share pictures, MP3 files, PDF files, or other large files.

The transceiver combines an IRED emitter, a PIN photodiode, and a unique driver/control ASIC in a single package, as shown in Figure 2.
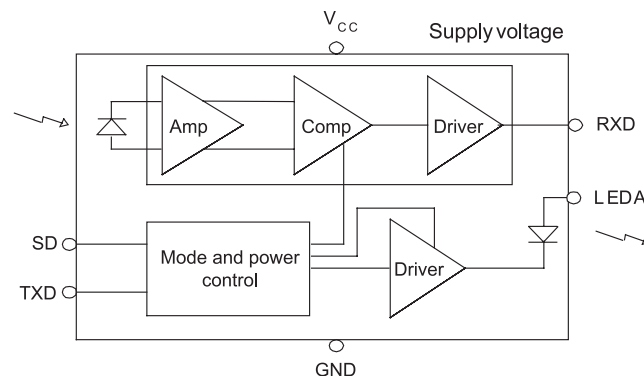
Figure 2. ZHX3403 Block Diagram

The ZILOG ZHX3403 also features a shutdown control that minimizes current draw to 0.1 μA (typical).

Features

- Compliant to IrDA Data Specification Low Power MIR (link range: low power to low power—0 to 20 cm; standard power to low power—0 to 30 cm)

- Low-power supply voltage range: 2.4 to 3.6 V

- ZHX3403 listening current: only 6 μA (typically) at 3.0 V (ZiLOG exclusive)

- UltraSlim package: 7.3 mm long x 2.8 mm wide x 1.9 mm high

- Extended operating temperature range: –30 ºC to +85 ºC

- Internal current source eliminates the need for a current limiting resistor on the IR LED

- Meets IEC 825-1 Class 1 eye safety specifications

Pin Description

Table 1 lists the pin out for the ZHX3403 transceiver. The pins are described in this section.

Table 1. ZHX3403 Transceiver Pin Out

Pin	Name	Function	I/O
1	NC	NC (future use)	—
2	V_{CC}	Supply voltage	—
3	GND	Ground	—
4	SD	Shutdown	I
5	RXD	Receiver output	O
6	TXD	Transmitter input	I
7	LEDA	IRED anode	—
—	TAB	Shield connection	—

V_{CC} Positive Supply

(Power)

Connect to positive power supply (2.4–3.6 V). Filter with a 1.0 μF ceramic bypass capacitor and terminating resistor as close as possible to the V_{CC} pin.

GND Ground

(Power)

Connect to ground of the power supply. A solid ground plane is recommended for proper operation.

SD Shutdown

(Input, active high)

This input is used to place the transceiver into a shutdown mode and to change bandwidth from SIR to MIR (see "Shutdown and Bandwidth Change" on page 8). SD should not be left floating.

RXD Receive Data

(Output, active low)

This output provides received serial data. It is a tri-state, slew rate controlled CMOS output (tri-stated during shutdown) driver capable of driving a standard CMOS or LS series TTL load. No external resistor is required.

TXD Transmit Data

(Input, active high)

This CMOS input is used to transmit serial data and has an internal pull-down resistor that is enabled during shutdown. With integrated digital AC coupling, no external components are required for input signals between GND and V_{CC}. TXD should not be left floating.

LEDA LED Driver

(Power)

This output is internally connected to the LED anode and contains an internal current source. The voltage range on this pad is 2.4–4.2 volts.

TAB Shield Connection

The shield tab must be soldered to ground for proper operation.

P R E L I M I N A R Y

Application Block Diagrams

Figure 3 shows the application block diagrams for the ZHX3403 transceiver.

PIN	FUNCTION	PIN	FUNCTION
1*	NC	5	RxD
2	V_{CC}	6	TxD
3	GND	7	LEDA
4	SD		TAB

Tab MUST be soldered to ground.
* - Future use

Values for R $_1$

S	.38 mm (.015")	.76 mm (.030")
R_1	68 ohms	91 ohms

Maintain land width constant without intermediate vias. Make corners rounded not sharp.

Note: Lands to Pins 1, 2, 3, 4, and 5 should be 0.38 mm min. wide. Connect ground plane within 1.58 mm of pins.
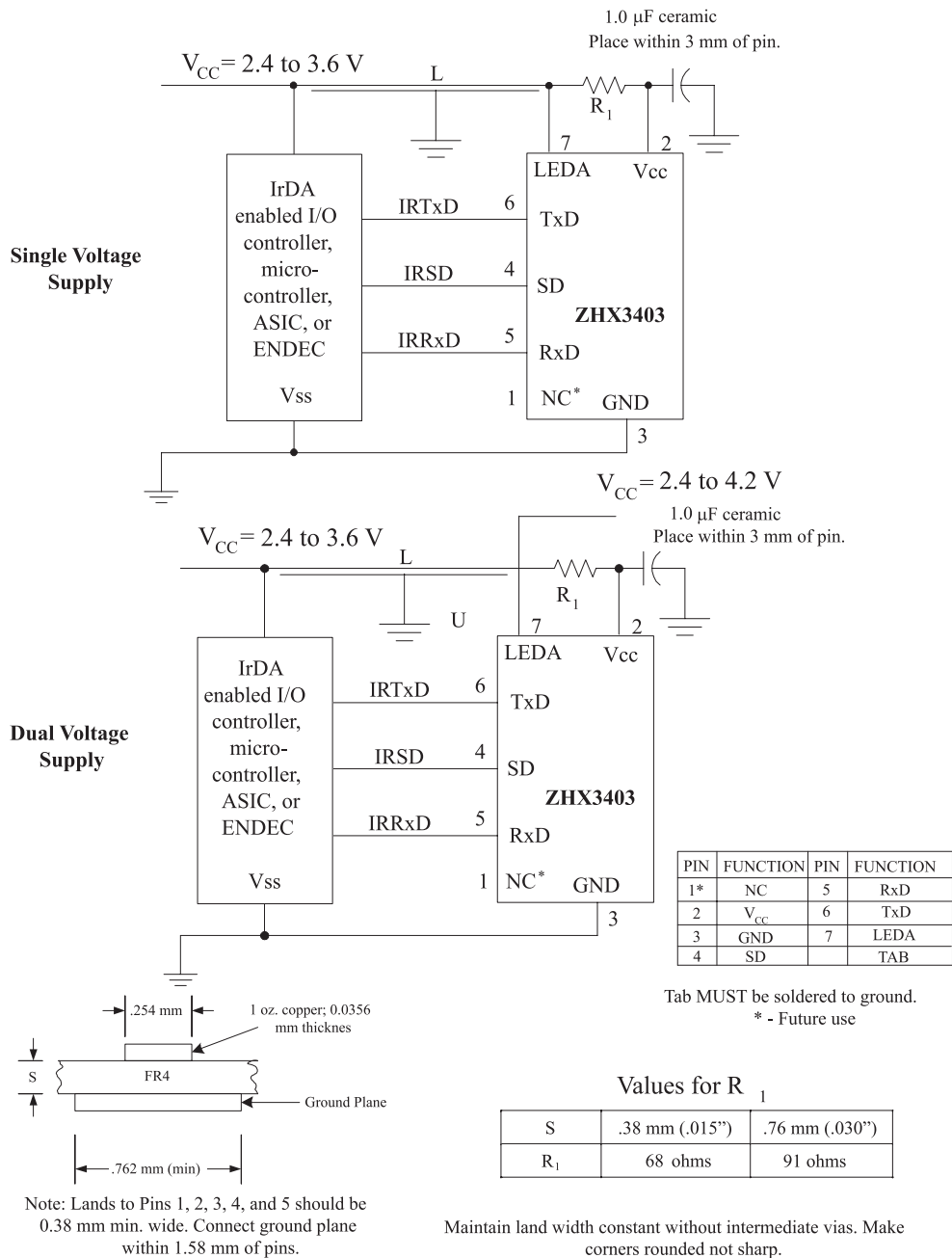
Figure 3.   ZHX3403 Application Block Diagrams

Electrical and Timing Specifications

Table 2 through Table 6 list the electrical and timing specifications.

Table 2. Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit	Comment
Supply voltage	V_{CC}	–0.3	3.6	V	V_{CC}, GND
Supply voltage	V_{LED}	–0.3	4.4	V	
Input voltage	V_{IN}	GND–0.3	V_{CC}+0.3	V	TxD, SD
Output (Ext.) voltage	V_{OUT}	GND–0.3	V_{CC}+0.3	V	RxD
Storage temperature	T_{ST}	–40	100	°C	
Solder temperature	T_{SOL}		230	°C	See page 10.

Table 3. Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Supply voltage	V_{CC}	2.4	3.6	V
Supply voltage, LEDA	V_{LED}	2.4	4.2	V
Ambient operating temperature	T_{OP}	–30	85	°C

Table 4. Receiver Electrical Characteristics

Parameter	Symbol	Condition	Min	Typical	Max	Unit	Remarks
High-level output voltage	V_{OH}	I_{OH}=–100 µA	V_{CC}–0.4			V	RxD
Low-level output voltage	V_{OL}	I_{OL}=100 µA			0.4	V	RxD
RxD rise/fall time—SIR	T_r, T_f	Cload=25 pF			50	ns	10% and 90%
RxD pulse width	t_{PWA}	SIR$\leq$115.2 Kbps		1	5	µs	Input pulse=1.6 µs; rise/fall time<600 ns
RxD rise/fall time—MIR	T_r, T_f	Cload=25 pF			50	ns	10% and 90%
RxD pulse width	t_{PWA}	MIR=1.152 Mbps	200	220	700	ns	

P R E L I M I N A R Y

Table 4. Receiver Electrical Characteristics (Continued)

Parameter	Symbol	Condition	Min	Typical	Max	Unit	Remarks
Startup time	T_{STU}			300		μs	
Latency	T_{RRT}		30	50	100	μs	SIR and MIR
Minimum input irradiance—SIR	E_{emin}	V_{CC}=3.3 V			9	μW/cm^2	On axis
Minimum input irradiance—MIR	E_{emin}	V_{CC}=3.3 V			22.5	μW/cm^2	On axis
Maximum input irradiance—SIR and MIR	E_{emax}	V_{CC}=3.3 V			500	mW/cm^2	θh, θv$\leq$($\pm$15°)
Peak wavelength	$\lambda\rho$			870		nm	
Unless otherwise noted: V_{CC}=3.3 V, GND=0 V, TA=25 °C							

Table 5. Transmitter Electrical Characteristics

Parameter	Symbol	Condition	Min	Typical	Max	Unit	Remarks
High-level input voltage	V_{IH}		0.75V_{CC}			V	TxD
Low-level input voltage	V_{IL}				0.4	V	TxD
Transmitter current	I_{LED}			40	65	mA	LEDA pin (SIR)
Transmitter current	I_{LED}			100	140	mA	LEDA pin (MIR)
Startup time	T_{STU}			20		μs	
LED protection timeout				50	200	μs	Protects LED when TxD is left high
Trans. radiant intensity—SIR	I_E		3.6		72	mW/sr	On axis
Trans. radiant intensity—MIR	I_E		9		72	mW/sr	On axis
Peak wavelength	$\lambda\rho$			870		nm	
Input leakage TxD pin	I_{IL}	V_{IN}=0 V, V_{CC}	−1		1	μA	

P R E L I M I N A R Y

Table 5. Transmitter Electrical Characteristics (Continued)

Parameter	Symbol	Condition	Min	Typical	Max	Unit	Remarks
Optical pulse width	t_{OW}	9.6–115.2 kb/s		1.39	30	μs	
Optical rise time	t_{OR}	9.6–115.2 kb/s		100	600	μs	
Optical fall time	t_{OF}	9.6–115.2 kb/s		100	600	μs	
TxD pulldown resistor	TxD_{RP}	SD=V_{CC}	300K			Ω	
Unless otherwise noted: V_{CC}=3.3 V, GND=0 V, TA=25 °C							

Table 6. Transceiver Electrical Characteristics

Parameter	Symbol	Condition	Min	Typical	Max	Unit	Remarks
High-level input voltage	V_{IH}		0.75V_{CC}			V	SD
Low-level input voltage	V_{IL}				0.4	V	SD
Receive current—SIR	I_{CC}			80	125	μA	Idle
Receive current—MIR	I_{CC}			100	275	μA	Idle
Listen current	I_{LIS}			6	10	μA	
Shutdown current	I_{STB}			0.1	1.0	μA	TXD=0/V_{CC}
Power shutdown time	T_{SD}				200	μs	
Input leakage SD pin	I_{IL}	V_{IN}=0 V, V_{CC}	−1		1	μA	
Transceiver data rate			9.6		1,152	kb/s	
Delay to listen	T_{LM}		30			s	Time to change between receive and listen modes
Unless otherwise noted: V_{CC}=3.3 V, GND=0 V, TA=25 °C							

⚠ **Caution:** To prevent damage and/or degradation that might be induced by electrostatic discharge (ESD), use normal static precautions in handling and assembly of this component.

Shutdown and Bandwidth Change

Simple power management and bandwidth switching are available by using a method similar to the "Legacy Mode" found in many FIR transceivers. Assertion of the SD pin high places the module into shutdown mode whereby current consumption is reduced to 100 nA (typical). On the falling edge of this signal, the state of the TX pin is sampled and used to set receiver low bandwidth (TX=Low) or high bandwidth (TX=High) mode.

The ZHX3403 powers up on with the upper limit of the receiver bandwidth set to 115.2 Kbits/s operation. To set the bandwidth for operation at 1.15 Mbits/s, apply timings as shown in Table 7 and Figure 4 to the SD and the TX inputs.

▶ **Note:** The internal LED driver is disabled when SD is active and is not enabled until the next rising edge of TX. This ensures that the LED is not active during bandwidth adjustment.

It is recommended that the SD pin be connected to GND if the bandwidth adjustment and shutdown modes are not required.

Table 7. Shutdown and Bandwidth Control Timing

Symbol	Conditions	Minimum	Unit
T1	TXD to SD low setup time	50	ns
T2	SD low to TXD hold time	50	ns
Tpd	SD high to power down	200	µs
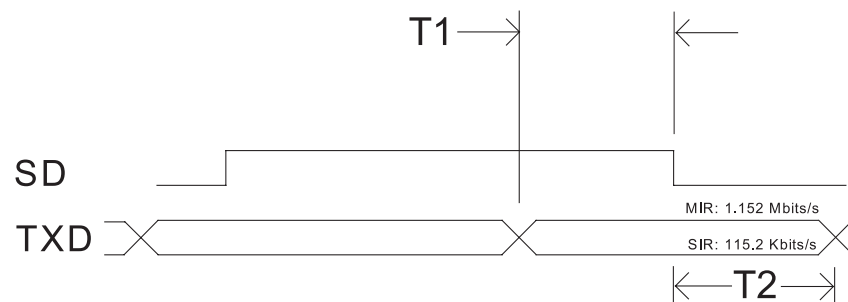
Figure 4. Shutdown and Bandwidth Control Timing

ZHX3403 Tape and Reel Specifications

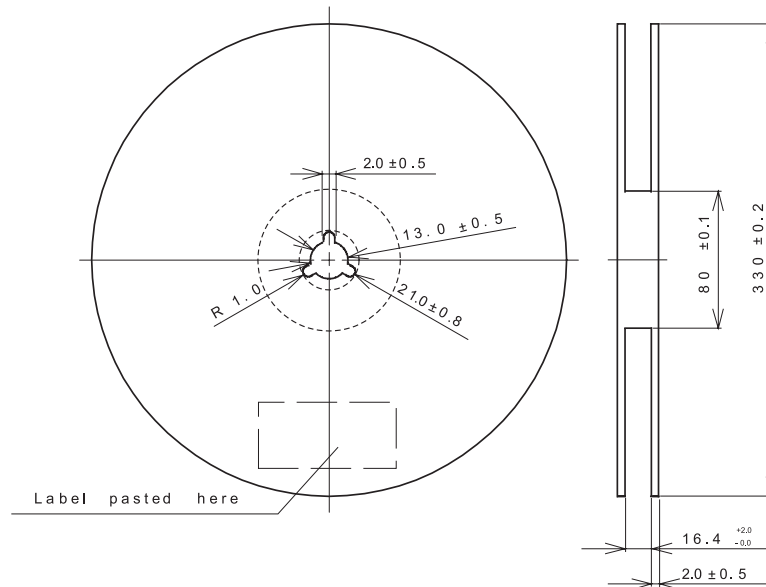Figure 5 shows the ZHX3403 reel specifications, and Figure 6 shows the ZHX3403 tape specifications.

Figure 5.   ZHX3403 Reel Specifications
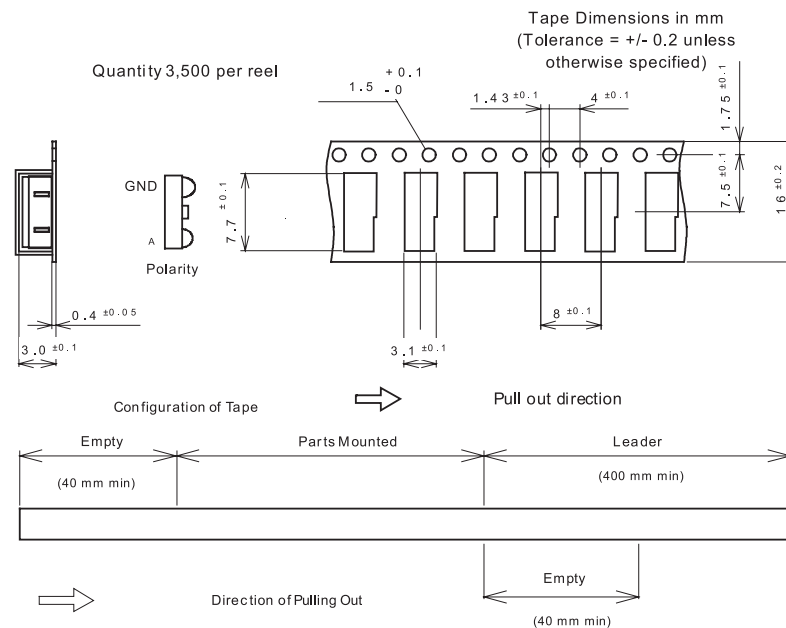

Figure 6.   ZHX3403 Tape Specifications

ZHX3403 Soldering and Cleaning Recommendations

Follow these recommendations to maintain the performance of the ZHX3403 transceiver.

Reflow Soldering

- Reflow soldering paste is recommended.

- Preheat: 140 °C~160 °C, 60 to 120 seconds

- Heating up and cooling down: 5 °C/second

- Maximum number of reflows: 2

- The temperature profile at the top surface of the ZHX3403 transceiver, shown in Figure 7, is recommended.
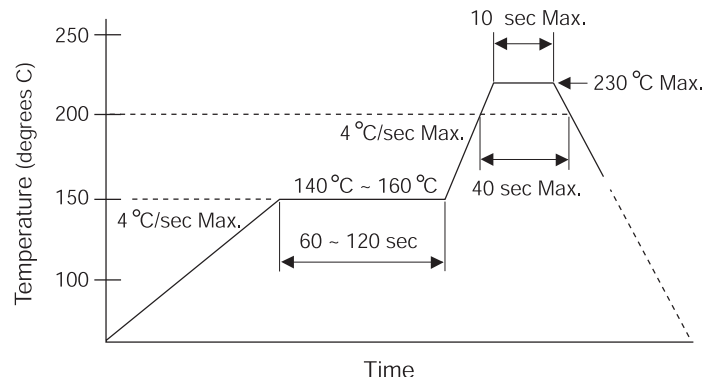
Figure 7. Temperature Profile for the Top Surface

Manual Soldering

- Use 63/37 or silver solder.

- Temperature at solder iron tip: no more than 280 °C

- Finish soldering within 3 seconds.

- Handle only after ZHX3403 has cooled off.

Cleaning

Perform cleaning under the following conditions:

- Cleaning agent: alcohol

- Temperature and time 30 seconds below 50 °C or 3 minutes below 30 °C

- Ultrasonic cleaning: below 20 W

Moisture Prevention Guidelines

To avoid moisture absorption during transportation and storage, ZHX3403 reels are packed in aluminum envelopes (see Figure 8) that contain a desiccant with a humidity indicator. While this packaging is an impediment to moisture absorption, it is by no means absolute, and no warranty is implied. The user must store these parts in a controlled environment to prevent moisture entry. Please read the label on the aluminum bag for indicator instructions.
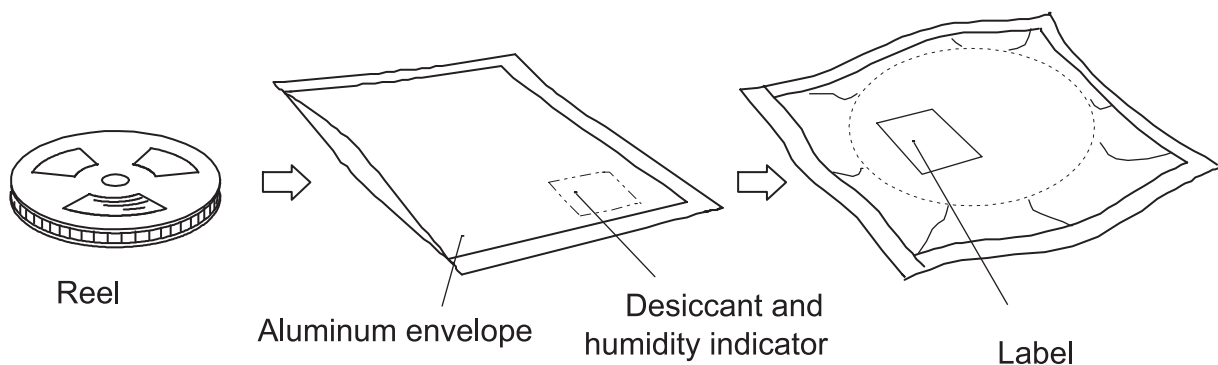

Reel

Aluminum envelope

Desiccant and
humidity indicator

Label

Figure 8.   ZHX3403 Packaging

Baking

It is recommended that parts that have been stored over 12 months or unpacked over 72 hours be baked under the following guidelines.

Reels

60 °C for 48 hours or more

Loose Parts

- 100 °C for 4 hours or more

  or

- 125 °C for 2 hours or more

  or

- 150 °C for 1 hour or more

Mechanical Drawing

Figure 9 shows the mechanical specification for the ZHX3403 transceiver.

▶ **Note:** The ZHX3403 transceiver will be marked as follows
(implementation date to be determined):
ZHX3403 = Z3403

1 - NC	2 - VCC	3 - GND	4 - SD
5 - RXD	6 - TXD	7 - LEDA	TAB

Shield thickness =
0.20 mm

Tolerances for 0.x or 0.xx are +/- 0.25 mm
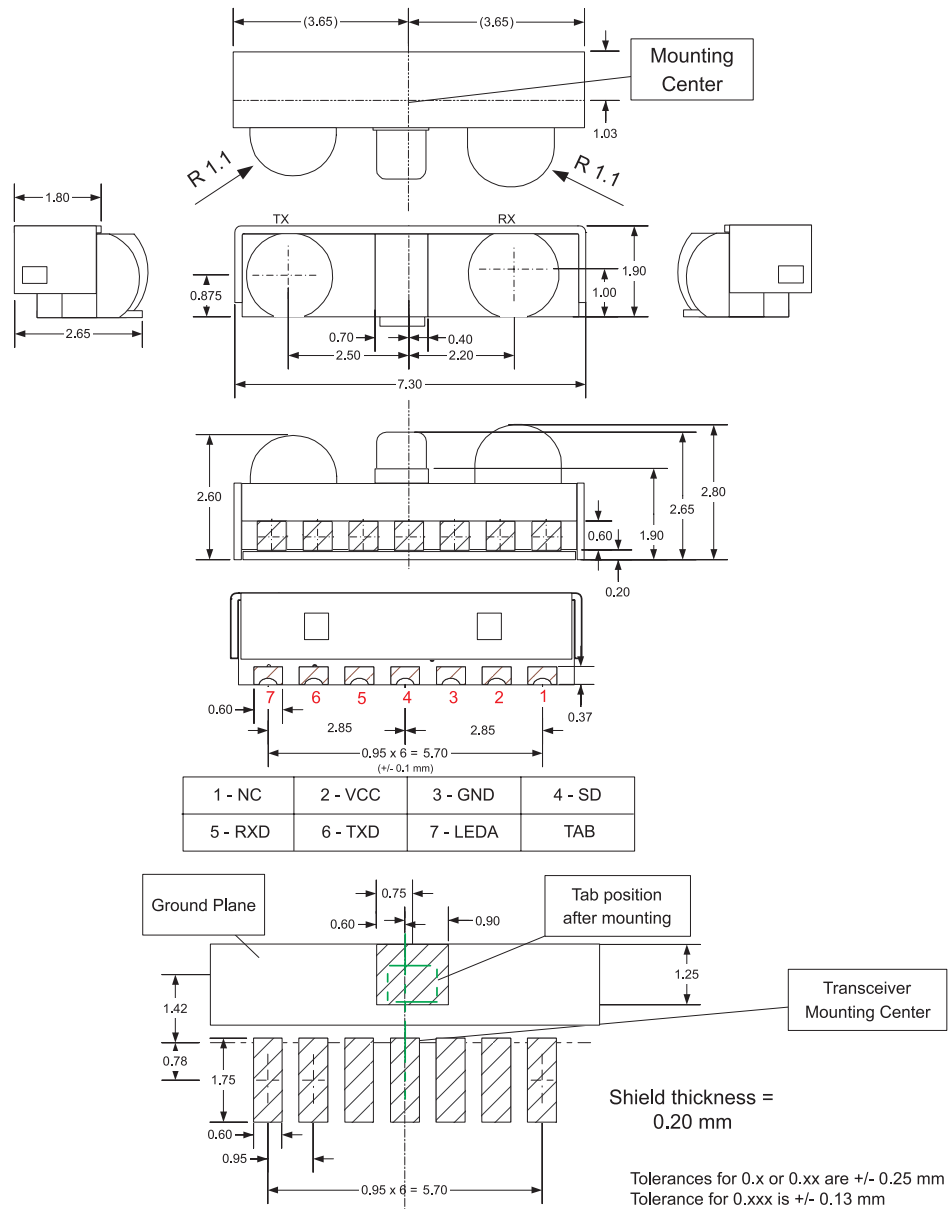Tolerance for 0.xxx is +/- 0.13 mm

Figure 9.   ZHX3403 Mechanical Drawing

Ordering Information

Use the following information to order the ZHX3403 transceiver:

ZHX3403MA012THTR   with AlwaysOn^{TM} Listen   3500 per reel

Customer Feedback Form

If you experience any problems while operating this product, or if you note any inaccuracies while reading this product specification, please copy and complete this form, then mail or fax it to ZiLOG (see *Return Information*, below). We also welcome your suggestions!

Customer Information

Name	Country
Company	Phone
Address	Fax
City/State/Zip	email

Product Information

Serial # or Board Fab #/Rev #
Software Version
Document Number
Host Computer Description/Type

Return Information

ZiLOG
System Test/Customer Support
532 Race Street
San Jose, CA 95126-3432
Fax: (408) 558-8300
Email: zservice@zilog.com

Problem Description or Suggestion

Provide a complete description of the problem or your suggestion. If you are reporting a specific problem, include all steps leading up to the occurrence of the problem. Attach additional pages as necessary.

P R E L I M I N A R Y