



***ZHX2010***

***Side-Look FIR  
Transceiver***

**Product Specification**

PS007009-0302



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## Description

The ZiLOG ZHX2010 is an ideal side-look transceiver for applications in today's ultracompact power-conscious portable products, such as notebook PCs, mobile phones, digital cameras, portable printers, handheld computers, or personal data assistants (PDAs). Designed to support all IrDA at up to 4 Mb/s and LocalTalk™ and Sharp ASK™ modes, the transceiver combines an infrared emitting diode (IRED) emitter, a PIN photodiode detector, a programmable LED driver, and a differential receiver in a single, miniature package.

The ZiLOG ZHX2010 provides an efficient implementation of the IrDA-Data 1.4 standard in a small footprint format. Application circuit space is also minimized, as only two external components (a terminating resistor and a decoupling capacitor) are required to implement a complete IrDA transceiver solution.

The ZHX2010 is capable of legacy-mode power management and bandwidth switching.

## Features

- IrDA-Data, SIR, LocalTalk™, and Sharp ASK™
- Data rates from 2400 bps–4 Mbits/s
- Ultracompact package: 9.8 mm long x 4.8 mm wide x 4.0 mm high
- On-chip LED protection circuit
- Supply voltage 2.7–5.25 V
- Low power consumption: 2 mA at 2.7 V / 3 mA at 5.25 V (typical)
- Ambient light and noise rejection circuitry
- Power shutdown mode (~50 nA typical)
- No external resistor required for LED bias
- Extended operating temperature range (–30 °C to +85 °C)
- Meets IEC 825-1 Class 1 Eye Safety Specifications

# Block Diagram

Figure 1 is the block diagram for the FIR transceiver.

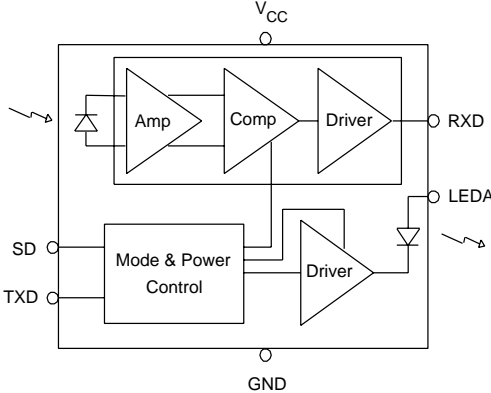


Figure 1. FIR Transceiver Block Diagram

## Applications

The ZHX2010 can be used in the following applications:

- Notebook PCs
- Digital still or video cameras
- Portable printers
- Cellular telephones
- Personal digital assistants
- Handheld or battery-operated equipment

Figure 2 shows a typical application of the FIR transceiver.

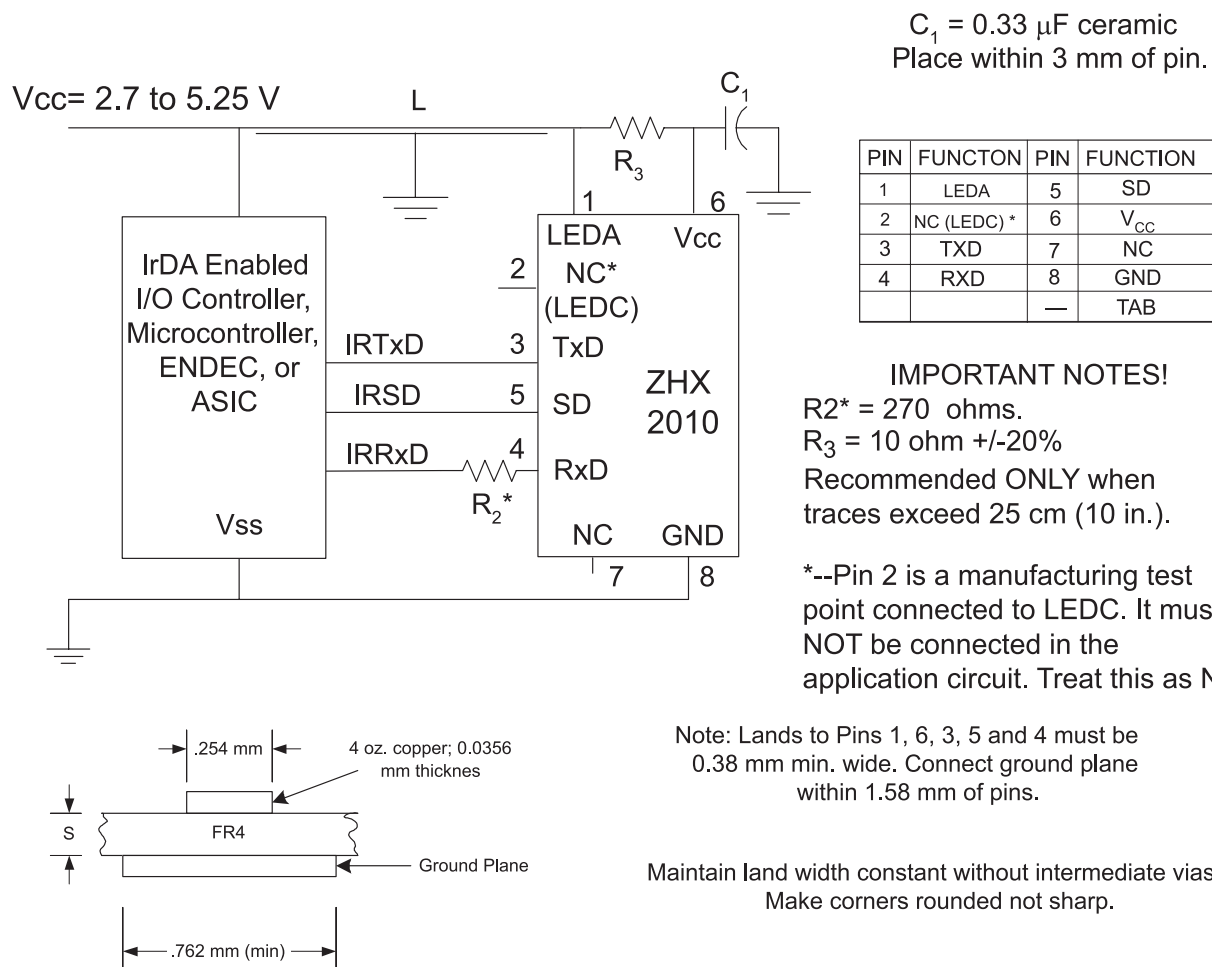


Figure 2. Application Block Diagram

## Pin Description

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

**Table 1. FIR Transceiver Pin Out**

Pin	Name	Function	I/O
1	LEDA	IREDA anode	—
2	NC(LED C)	Do not connect	—
3	TXD	Transmitter input	I
4	RXD	Receiver output	O
5	SD	Enables shutdown	I
6	V <sub>CC</sub>	Supply voltage	—
7	NC	Not connected	—
8	GND	Ground	—
—	TAB	Shield ground	—

### V<sub>CC</sub> Positive Supply

(Power)

Connect to positive power supply (2.7–5.25 V).

Place a 0.33  $\mu$ F, 6 V, +/-20% ceramic bypass capacitor as close as possible to the V<sub>CC</sub> pin.

### GND

(Power)

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

### TAB

(Shield)

The Shield tab must be soldered to the ground plane.



## TXD Transmit Data

(Input, active high)

This CMOS input is used to transmit serial data when SD is low. An on-chip protection circuit disables the IRED driver if the TX pin is asserted for longer than 100  $\mu$ s. When used in conjunction with the SD pin, this pin also provides control signals to the internal digital serial control interface and legacy mode subsystems.

This input has an internal pull-down resistor that is disabled (open-circuited) during shutdown. TXD has integrated digital AC coupling that prevents inadvertent “always on” IREDs; therefore, no external AC coupling components are required for input signals between GND and  $V_{CC}$ .

## RXD Receive Data

(Output, active low)

This output indicates received serial data. It is a push-pull CMOS driver capable of driving a standard CMOS or TTL load. No external pull-up or pull-down resistor is required.

## SD Shutdown

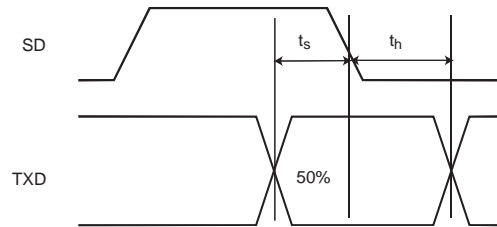
(Input, active high)

This CMOS input pad functions as a shutdown switch and as a mode switch, allowing bandwidth changes.

### Shutdown and Legacy Mode Bandwidth Switching

Assertion of this pin high for a period of time exceeding 500 m places the module into legacy shutdown mode, reducing current consumption to ~50 nA. 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 transceiver powers on with the upper limit of the receiver bandwidth set to 1.152 Mbits/s operation. To set the bandwidth for operation at 4 Mbits/s, apply the timings shown in Figure 3 to the SD and the TX inputs.



**Figure 3. Timings for 4 Mbit/s Bandwidth Operation**

- **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.

## Electrical and Timing Specifications

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

**Table 2. Absolute Maximum Ratings**

Parameter	Test Conditions	Symbol	Min	Typical	Max	Unit	Comment
Supply voltage		$V_{CC}$	-0.5		5.5	V	
Power dissipations		$P_D$			500	mW	
Junction temperature		$T_J$			125	°C	
Storage temperature range		$T_{stg}$	-25		85	°C	
Soldering temperature	20 s at 215 °C			215	240	°C	
Average IRED current		$I_{LED(DC)}$			150	mA	
Rep. pulsed IRED current		$I_{LED(RP)}$			600	mA	<90 $\mu$ s, $t_{on}$ <25%
Peak IRED current		$I_{LED(PK)}$			1	A	<2 $\mu$ s
TXD input voltage		$I_{TXD}$	-0.5		$V_{CC}+0.5$	V	
RXD output voltage		$I_{RXD}$	-0.5		$V_{CC}+0.5$	V	

**Table 3. Recommended Operating Conditions**

Parameter	Symbol	Min	Max	Unit
Supply voltage	$V_{CC}$	2.7	5.25	V
Ambient operating temperature	$T_{amb}$	-30	85	°C

**Table 4. DC Electrical Operating Characteristics**

Parameter	Test Conditions	Symbol	Min	Typical	Max	Unit	Comment
Supply current, listening		$I_{CC}$	1	2.5	3	mA	
Supply current, receiving		$I_{CC}$	1	5	7	mA	No load; no pull-up resistors
Supply current, shutdown		$I_{CC}$		50	100	nA	

Specifications hold over the recommended operating conditions unless otherwise noted. Unspecified test conditions can be anywhere in their operating range. All typical values are at 25 °C unless otherwise noted.

**Table 4. DC Electrical Operating Characteristics (Continued)**

Parameter	Test Conditions	Symbol	Min	Typical	Max	Unit	Comment
Turn-on time	SD-RX enable	$T_{on}$			200	$\mu$ s	
<b>Receiver</b>							
RX output low voltage		$V_{OL}$			0.5	V	
Static sink current on RX	2.2 k $\Omega$ load	$I_{OL}$	1.2		1.9	mA	
RX output high voltage		$V_{OH}$	$V_{CC}-0.5$			V	
Static source current on RX	2.2 k $\Omega$ load	$I_{OH}$	1.2		1.9	mA	
RX edge rates	All data rates	$t_r, t_f$	20		40	ns	
RX resistive load		$R_{Load}$			2.2	k $\Omega$	
RX capacitive load		$C_{Load}$			50	pF	
Turnaround time		TAT			200	$\mu$ s	TXD-Min Popt. RXD
<b>Transmitter</b>							
Input voltage low		$V_{IL}$	0		0.8	V	TXD, SD
Input voltage high		$V_{IH}$	1.4		$V_{CC}+0.2$	V	TXD, SD
Input capacitance		$C_i$			5	pF	
LED optical rise/fall time LED		$t_r, t_f$			40	ns	Integrated
Peak transmit current		$I_{LED}$	10		600	mA	25% duty cycle
Average transmit current		$I_{LED}$	5		150	mA	25% duty cycle
SIR TX pulse width		$T_{XPD}$	1.41		22.13	$\mu$ s	
MIR TX pulse width		$T_{XPD}$	147		261	ns	
FIR TX pulse width		$T_{XPD}$	115		135	ns	

Specifications hold over the recommended operating conditions unless otherwise noted. Unspecified test conditions can be anywhere in their operating range. All typical values are at 25 °C unless otherwise noted.



**Table 5. AC Electrical Characteristics**

Parameter	Test Conditions	Symbol	Min	Typical	Max	Unit
RX rise time	R=2 k $\Omega$ , C=50 pF	t <sub>r</sub>	10	20	40	ns
RX fall time	R=2 k $\Omega$ , C=50 pF	t <sub>f</sub>	10	20	40	ns
TX setup to SD high/low		t <sub>s</sub>	200			ns
TX hold from SD high/low		t <sub>h</sub>	200			ns
RX pulse width	9.6 kbps	t <sub>pw</sub>	0.8		20	$\mu$ s
RX pulse width	1.152 Mbps	t <sub>pw</sub>	100		800	ns
RX pulse width	4 Mbps, single	t <sub>pw</sub>	60		165	ns
RX pulse width	4 Mbps, double	t <sub>pw</sub>	185		290	ns
Output delay at 40 mW/cm <sup>2</sup>	<1.2 Mbps	t <sub>d</sub>		1	2	$\mu$ s
Receiver latency		t <sub>L</sub>			100	$\mu$ s
RX valid after shutdown		t <sub>RXDEN</sub>			60	$\mu$ s
LED protection timeout		t <sub>LEDP</sub>			100	$\mu$ s

**Table 6. Optical Characteristics**

Parameter	Test Conditions	Symbol	Min	Typical	Max	Unit
Minimum detection irradiance	SIR: 9.6–115 kbps	E <sub>MIN</sub>		2	3	$\mu$ W/cm <sup>2</sup>
	MIR: 1.152 Mbps	E <sub>MIN</sub>		2.5	4	$\mu$ W/cm <sup>2</sup>
	FIR: 4 Mbps	E <sub>MIN</sub>		7		$\mu$ W/cm <sup>2</sup>
Output radiant intensity		I <sub>E</sub>	100	140	320	mW/sr
Peak wavelength		I <sub>P</sub>	860		900	nm
Optical overshoot					25	%



# Transceiver Performance

Figure 4 through Figure 6 show the performance of the FIR transceiver.

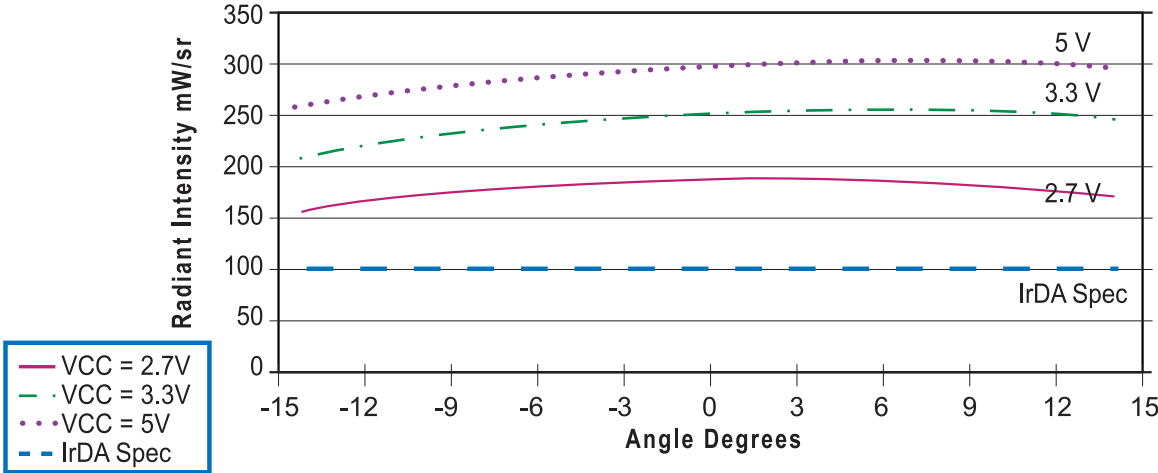


Figure 4. Typical Ie Versus Angle

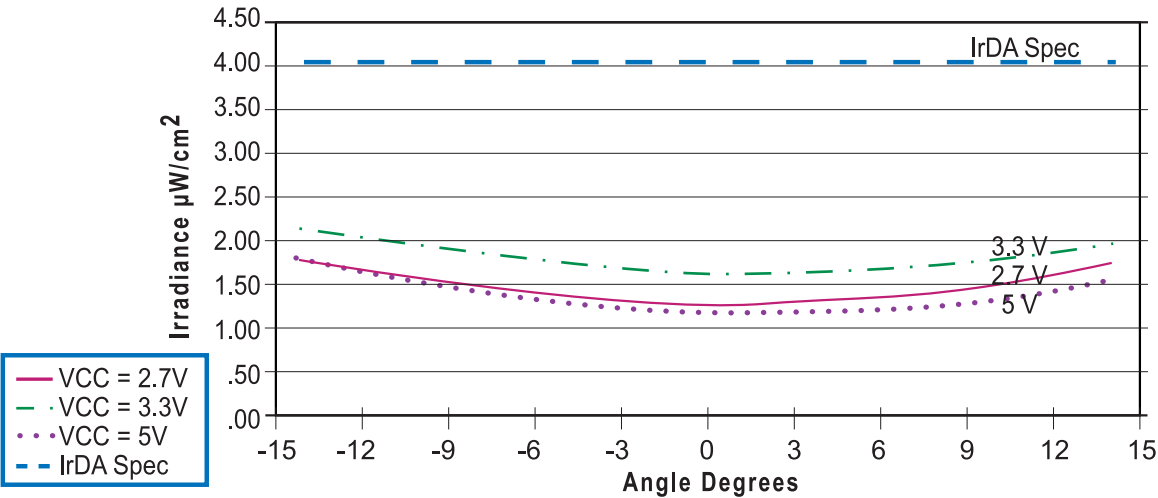


Figure 5. Typical SIR Ee Versus Angle

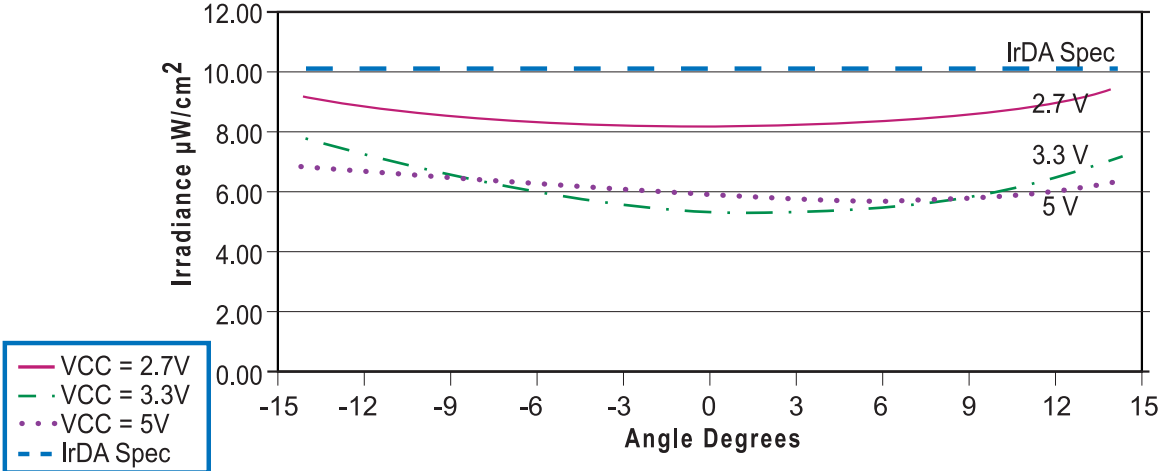


Figure 6. Typical FIR Ee Versus Angle

# Mechanical Specifications

Figure 7 shows the mechanical specifications for the FIR transceiver.

**Note:** The ZiLOG ZHX2010 transceiver will continue to be marked as the original Calibre part number, CHX2010.

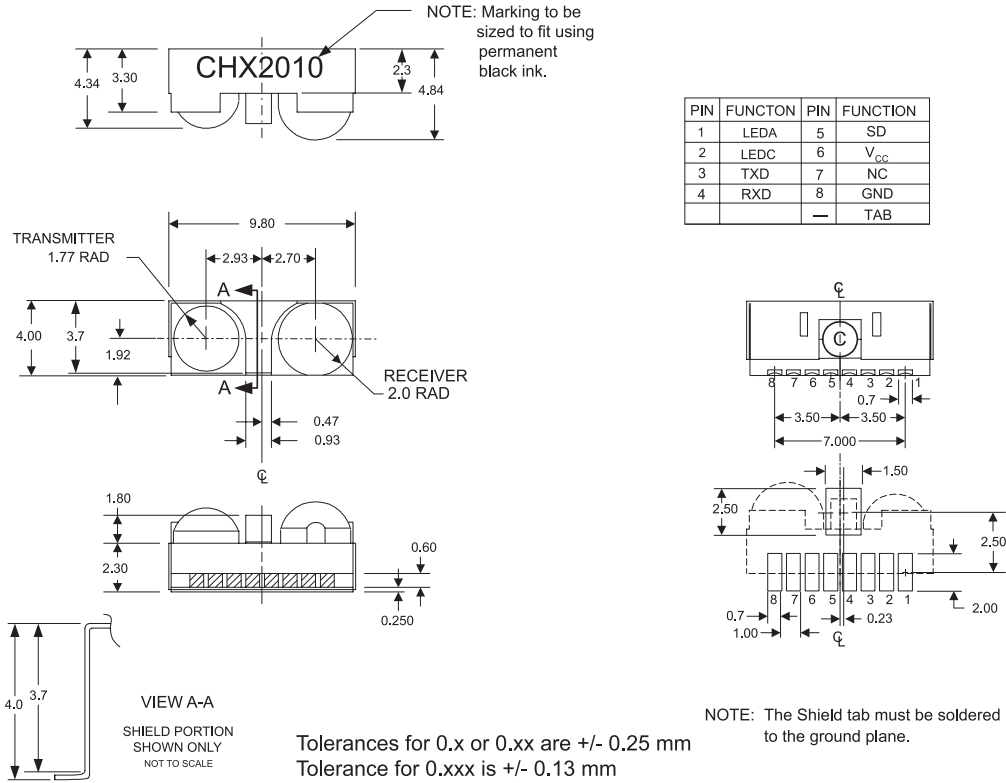


Figure 7. ZHX2010 Mechanical Specifications



## Soldering and Cleaning Recommendations

Follow these recommendations to maintain the performance of the ZHX2010 transceiver.

### Reflow Soldering

- Reflow soldering paste is recommended:  
Melting temperature: 178 °C ~ 192 °C  
Composition: Sn 63%, Pb 37%
- The recommended thickness of the metal mask is between 0.2 mm and 0.25 mm for screen printing.
- Number of soldering times: 2 times *maximum*
- The temperature profile at the top surface of ZHX2010, shown in Figure 8, is recommended.

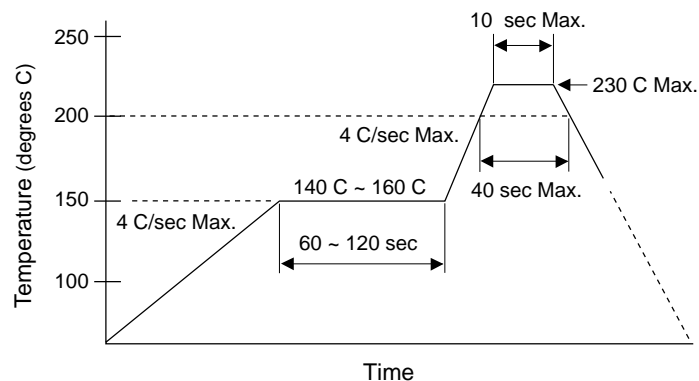


Figure 8. Temperature Profile for the Top Surface

### Manual Soldering

- Use 63/37 or silver solder.
- Use a soldering iron of 25 W or smaller. Adjust the temperature of the soldering iron below 300 °C.
- Finish soldering within 3 seconds.
- Handle only after the ZHX2010 has cooled off.



## Cleaning

Perform cleaning after soldering 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



## Packing, Storing, and Baking Recommendations

Follow these recommendations to maintain the performance of the ZHX2010 transceiver.

### Storage

To avoid moisture absorption, ZHX2010 reels must remain in the original, unopened moisture-proof packing. Parts must be soldered within 48 hours after unpacking. Reels that have been unpacked, but will not be soldered within 48 hours, must be stored in a desiccator.

### Baking

Parts that have been stored over 12 months or unpacked over 48 hours must 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

### Moisture-Proof Packing

In order to avoid moisture absorption during transportation and storage, ZHX2010 reels are packed in aluminum envelopes (see Figure 9) that contain a desiccant with a humidity indicator. The indicator changes color from blue to pink as moisture is absorbed.

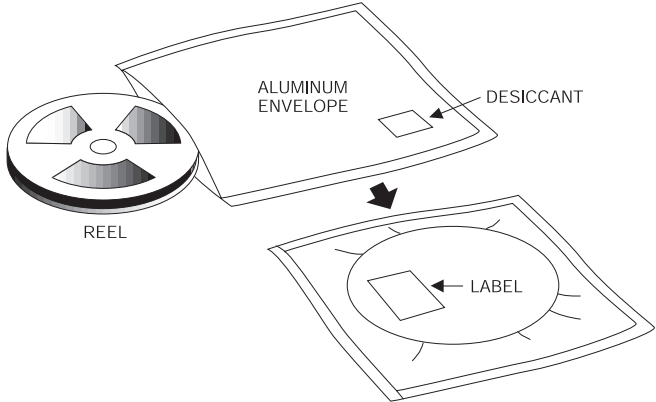
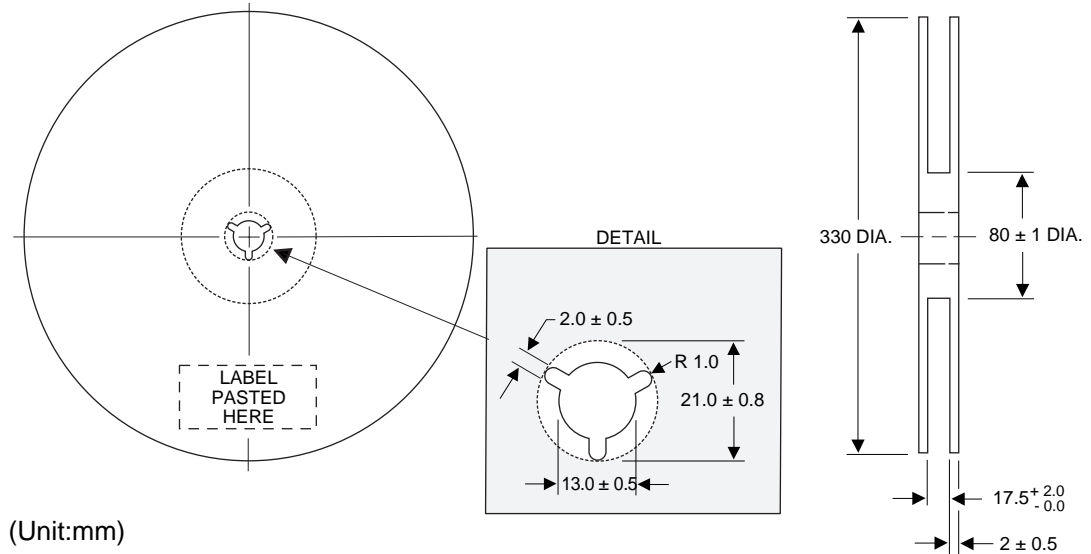


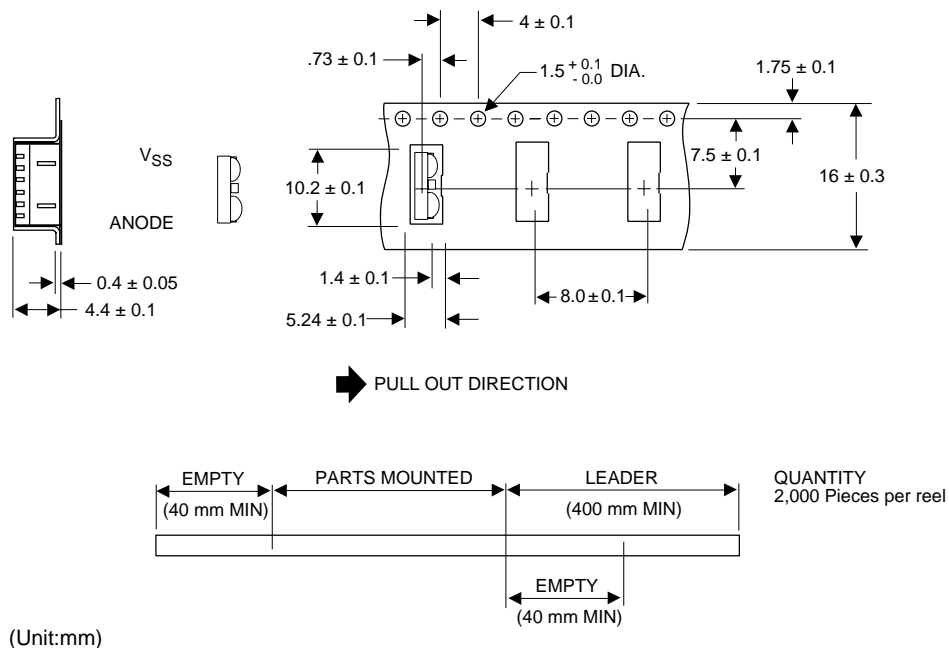
Figure 9. FIR Transceiver Packaging

## Taping Specifications (in accordance with JIS C 0806)

Figure 10 shows the reel dimensions, and Figure 11 shows the tape dimensions and configuration.



**Figure 10. Reel Dimensions**



**Figure 11. Tape Dimensions and Configuration**



# 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: tools@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.

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