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**ZHX3403**

***MIR UltraSlim™  
Transceiver (IrMC)***

**Preliminary Product Specification**

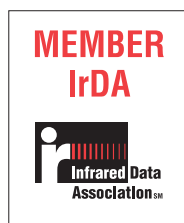
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## Description

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™ technology that allows the transceiver to “listen” for an IrDA communication at a typical current of 6  $\mu\text{A}$ , 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  $\mu\text{A}$  typically (MIR).

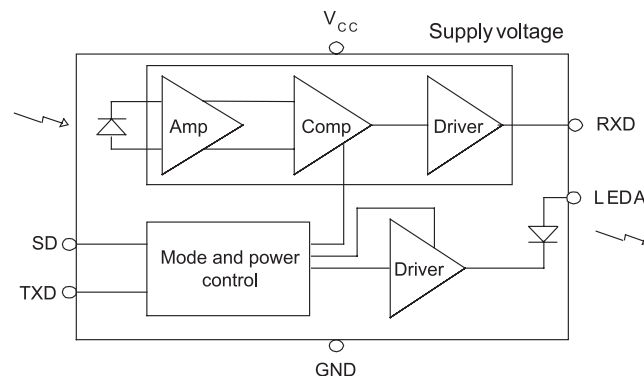
The UltraSlim form factor (7.3 mm long x 2.8 mm wide x 1.9 mm high) allows placement in virtually any small device (see Figure 1). Application circuit space is also minimized because only two external components are required.



**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  $\mu\text{A}$  (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  $\mu$ A (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:  $-30\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$
- 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 <sub>CC</sub>	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<sub>CC</sub> Positive Supply

(Power)

Connect to positive power supply (2.4–3.6 V). Filter with a 1.0  $\mu$ F ceramic bypass capacitor and terminating resistor as close as possible to the V<sub>CC</sub> 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.



## Application Block Diagrams

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

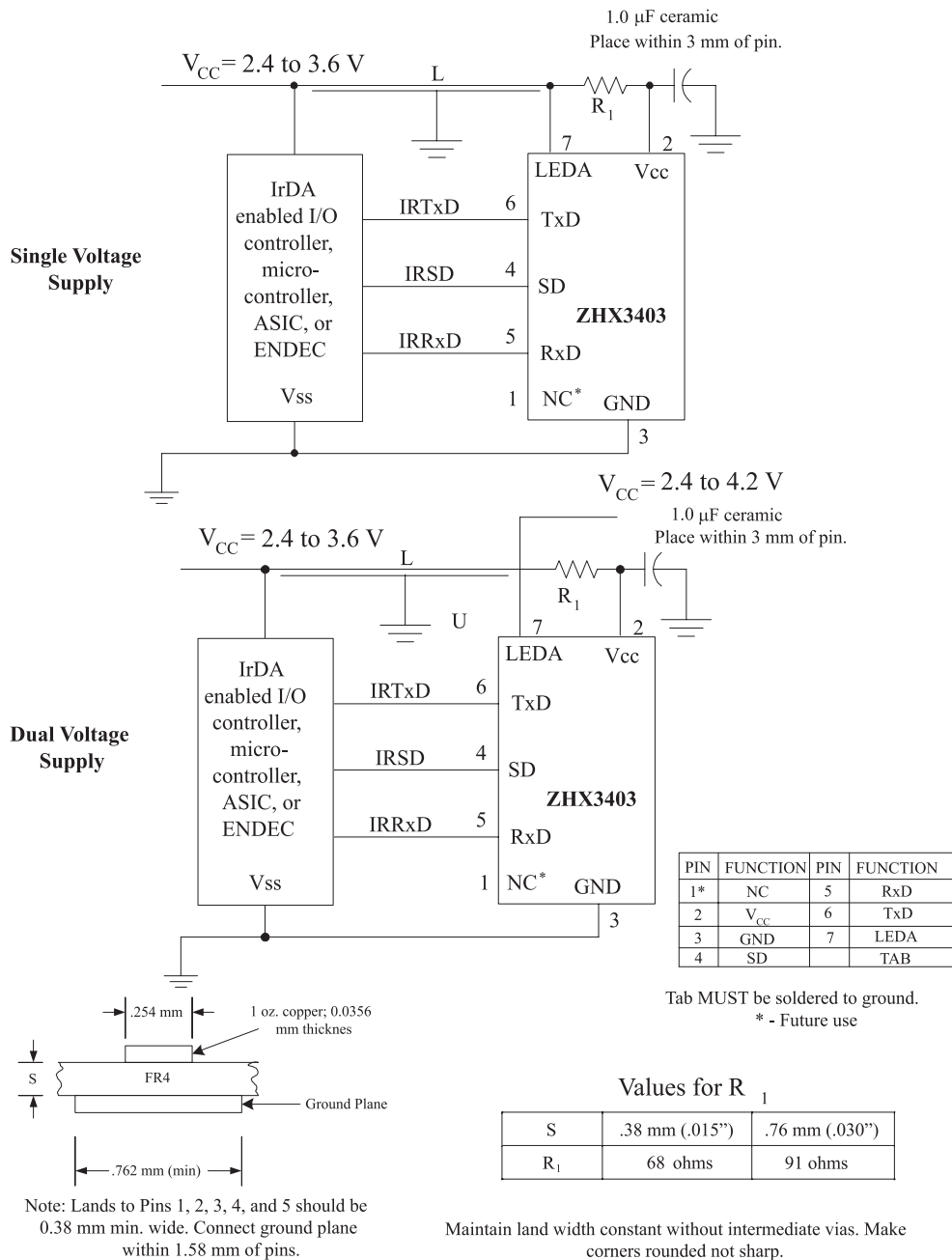


Figure 3. ZHX3403 Application Block Diagrams

## 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	$V_{OH}$	$I_{OH}=-100\ \mu\text{A}$	$V_{CC}-0.4$			V	RxD
Low-level output voltage	$V_{OL}$	$I_{OL}=100\ \mu\text{A}$			0.4	V	RxD
RxD rise/fall time—SIR	$T_r, T_f$	Clod=25 pF			50	ns	10% and 90%
RxD pulse width	$t_{PWA}$	$SIR \leq 115.2\ \text{Kbps}$		1	5	$\mu\text{s}$	Input pulse=1.6 $\mu\text{s}$ ; rise/fall time<600 ns
RxD rise/fall time—MIR	$T_r, T_f$	Clod=25 pF			50	ns	10% and 90%
RxD pulse width	$t_{PWA}$	MIR=1.152 Mbps	200	220	700	ns	

**Table 4. Receiver Electrical Characteristics (Continued)**

Parameter	Symbol	Condition	Min	Typical	Max	Unit	Remarks
Startup time	$T_{STU}$			300		$\mu s$	
Latency	$T_{RRT}$		30	50	100	$\mu s$	SIR and MIR
Minimum input irradiance—SIR	$E_{emin}$	$V_{CC}=3.3 V$			9	$\mu W/cm^2$	On axis
Minimum input irradiance—MIR	$E_{emin}$	$V_{CC}=3.3 V$			22.5	$\mu W/cm^2$	On axis
Maximum input irradiance—SIR and MIR	$E_{emax}$	$V_{CC}=3.3 V$			500	$mW/cm^2$	$\theta_h, \theta_v \leq (\pm 15^\circ)$
Peak wavelength	$\lambda_p$			870		nm	

Unless otherwise noted:  $V_{CC}=3.3 V$ ,  $GND=0 V$ ,  $T_A=25^\circ C$

**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		$\mu s$	
LED protection timeout				50	200	$\mu s$	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	$\lambda_p$			870		nm	
Input leakage TxD pin	$I_{IL}$	$V_{IN}=0 V, V_{CC}$	-1		1	$\mu A$	

**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	$\mu\text{s}$	
Optical rise time	$t_{OR}$	9.6–115.2 kb/s		100	600	$\mu\text{s}$	
Optical fall time	$t_{OF}$	9.6–115.2 kb/s		100	600	$\mu\text{s}$	
TxD pulldown resistor	$TxD_{RP}$	$SD=V_{CC}$	300K			$\Omega$	

Unless otherwise noted:  $V_{CC}=3.3\text{ V}$ ,  $GND=0\text{ V}$ ,  $T_A=25\text{ }^\circ\text{C}$

**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	$\mu\text{A}$	Idle
Receive current—MIR	$I_{CC}$			100	275	$\mu\text{A}$	Idle
Listen current	$I_{LIS}$			6	10	$\mu\text{A}$	
Shutdown current	$I_{STB}$			0.1	1.0	$\mu\text{A}$	$TXD=0/V_{CC}$
Power shutdown time	$T_{SD}$				200	$\mu\text{s}$	
Input leakage SD pin	$I_{IL}$	$V_{IN}=0\text{ V}$ , $V_{CC}$	-1		1	$\mu\text{A}$	
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:  $V_{CC}=3.3\text{ V}$ ,  $GND=0\text{ V}$ ,  $T_A=25\text{ }^\circ\text{C}$



**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.

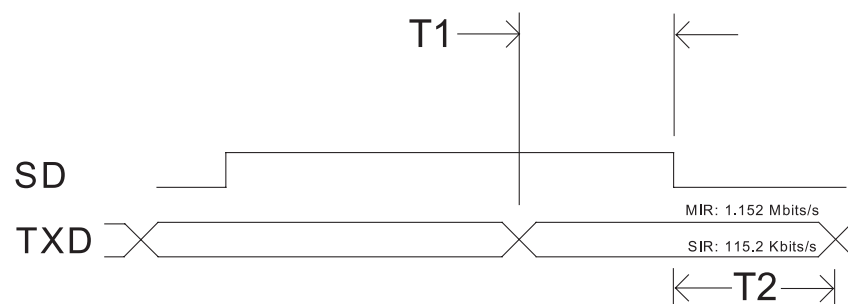
The ZHX3403 powers up on with the upper limit of the receiver bandwidth set to 115.2 Kbits/s operation. To set the bandwidth for operation at 1.15 Mbits/s, apply timings as shown in Table 7 and Figure 4 to the SD and the TX inputs.

- **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.

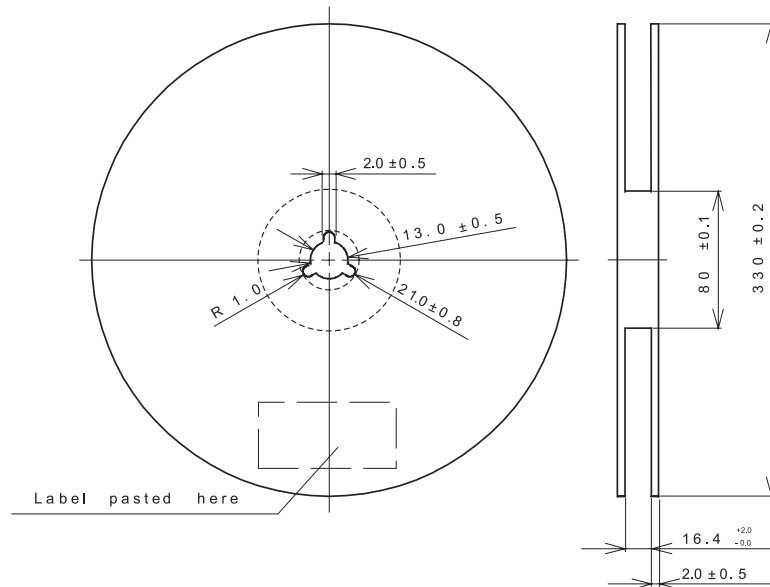


Figure 5. ZHX3403 Reel Specifications

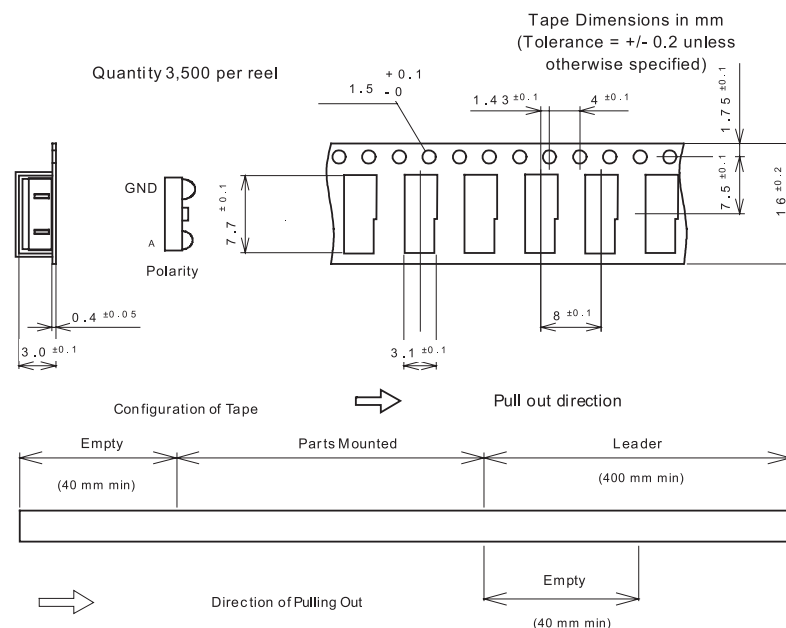


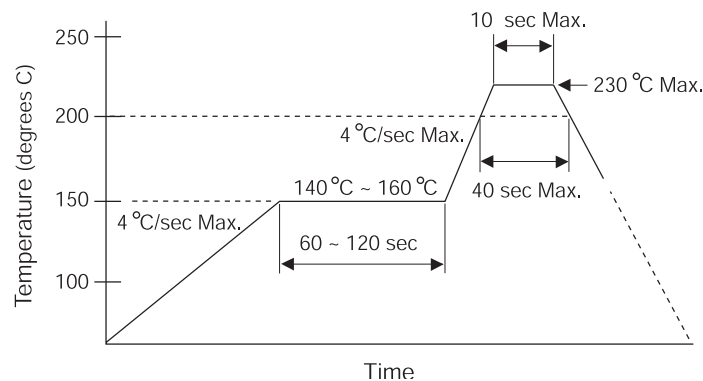
Figure 6. ZHX3403 Tape Specifications

## 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.

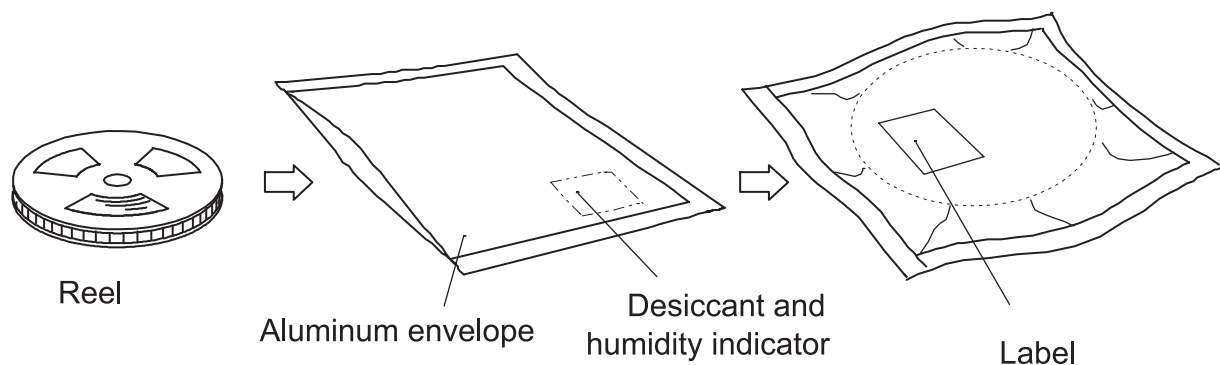


Figure 8. ZHX3403 Packaging

## 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







## Ordering Information

Use the following information to order the ZHX3403 transceiver:

ZHX3403MA012HTR      with AlwaysOn™ 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

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San Jose, CA 95126-3432  
Fax: (408) 558-8300  
Email: [zservice@zillog.com](mailto:zservice@zillog.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.