ZKit-ARM-1343, ARM Dev. Kit

User Manual

2.0, Oct 2013

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Chapter 1. Introduction

ZKit-ARM-1343 is a ARM micro-controller development kit from Zilogic Systems. ZKit-ARM-1343 is designed for a easy usage, rapid prototyping and product design. ZKit-ARM-1343 is a single board computer which can be used as it is in the end product design.

1. Features

The ZKit-ARM-1343 comes with

- Graphics display and on-board keys
- Well defined IO connector interface for I²C, SPI, GPIO and SIO
- USB and External power supply
- Programmable through USB
- Free and open source compiler and programmer
- Zilogic's open source software library
- Ready to go with Zilogic's Relay, Motor, Display boards etc., add-on boards.

2. Applications

- CPU for embedded products
- Embedded application prototyping
- Teaching and learning embedded systems

3. Board Details

The ZKit-ARM-1343 offers the following features:

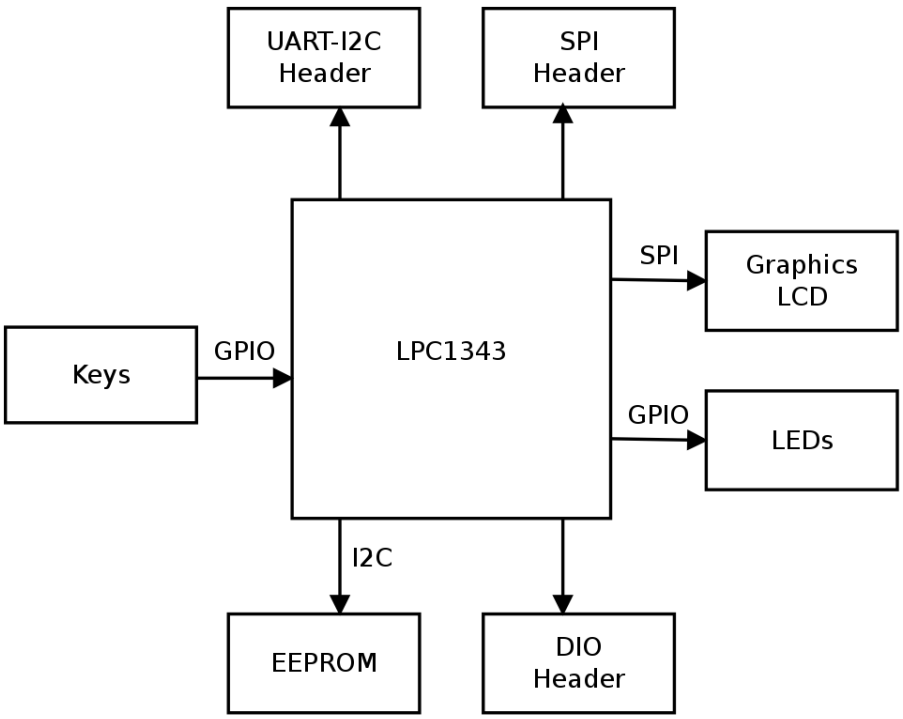
- NXP LPC1343 micro-controller with 32KB Flash and 8KB RAM
- 12MHz crystal
- On-board Peripherals
  - 128x64 graphics LCD, with backlight
  - 2K I²C EEPROM
  - 5 ADC channels
  - USB mass storage interface for code download
  - Five button keypad
  - 2 debug LEDs
- Connectors
  - USB-mini, type B connector
  - 14 pin header for Digital IO
  - 10 pin header for UART and I²C
  - 10 pin header for SPI
  - 10x2 pin header for ADC and PWM

Chapter 2. Board Design

1. Overview

A bird's eye view of the devices available on the board, is shown in the following block diagram. Each device connectivity is described in detail in the following sections.

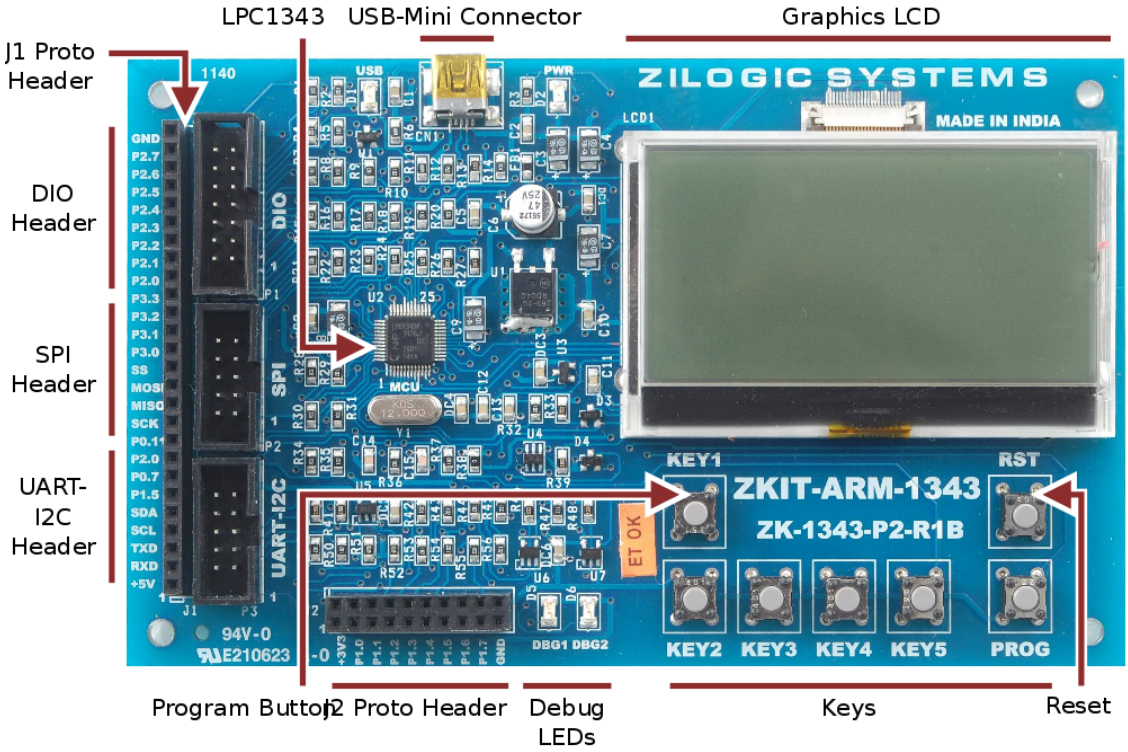
Figure 2.1. Block Diagram



2. Locating Components

The location of the components on the board is indicated in the following diagram.

Figure 2.2. Front View



3. Power Supply

The ZKit-ARM-1343 can be powered from a PC USB port, or an external power supply with USB-mini connector.

The external power supply, if used, should be a regulated power supply. The regulated power supply should have the following charactersitcs.

Output Voltage	5V
Output Current	> 500mA
Connector	USB-mini

4. CPU

The heart of the ZKit-ARM-1343 is a NXP LPC1343 micro-controller. The LPC1343 is an 32-bit ARM 3.3V low power micro-controller with 32KB Flash, 8KB of data RAM and supports In-System Programming (ISP).

The main features of the micro-controller are listed below.

- ARM Cortex-M3 processor, running at frequencies of up to 72 MHz.
- 32 kB on-chip flash programming memory.
- 8 kB SRAM.
- In-System Programming (ISP) and In-Application Programming (IAP) via on-chip bootloader software.
- Selectable boot-up: UART or USB.

- USB MSC and HID on-chip drivers.
- Serial interfaces:
  - USB 2.0 full-speed device controller with on-chip PHY for device.
  - UART with fractional baud rate generation, modem, internal FIFO, and RS-485/EIA-485 support.
  - SSP controller with FIFO and multi-protocol capabilities.
  - I^2C-bus with Fast-mode Plus with a data rate of 1 Mbit/s.
- Up to 42 General Purpose I/O (GPIO) pins with configurable pull-up/pull-down resistors.
- Four general purpose counter/timers with a total of four capture inputs and 13 match outputs.
- Programmable WatchDog Timer (WDT).
- System tick timer.
- Three reduced power modes: Sleep, Deep-sleep, and Deep power-down.
- Single power supply 3.3V.
- 10-bit ADC with input multiplexing among 8 pins.
- GPIO pins can be used as edge and level sensitive interrupt sources.
- Processor wake-up from Deep-sleep mode via a dedicated start logic using up to 40 of the functional pins.
- Power-On Reset (POR).
- System PLL allows CPU operation up to the maximum CPU rate without the need for a high-frequency crystal.
- Code Read Protection (CRP) with different security levels.
- Unique device serial number for identification.
- Available as 48-pin LQFP package and 33-pin HVQFN package.

4.1. In-System Programming (ISP)

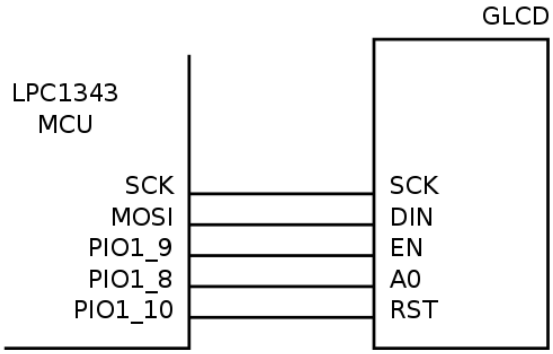
Firmware upgradation can be done through USB interface. LPC1343 includes a built-in USB bootloader that allows to enumerate the ZKit-ARM-1343 board as a Mass Storage Device. With the USB bootloader, the compiled binary file can be dragged and dropped on to the device, just like with any other USB memory stick.

To program the firmware, press the `PROG` button. This causes the microcontroller to enter ISP mode. The firmware can then be copied on to the drive corresponding to the microcontroller. To execute the programmed firmware, press the `RESET` button.

5. LCD Display

The ZKit-ARM-1343 has a TM12864, Sitronix chipset compatible, 128x64 pixel monochrome LCD. The LCD is connected to SPI lines of the MCU. The following diagram shows the LCD pin connection details.

Figure 2.3. LCD Connection Diagram

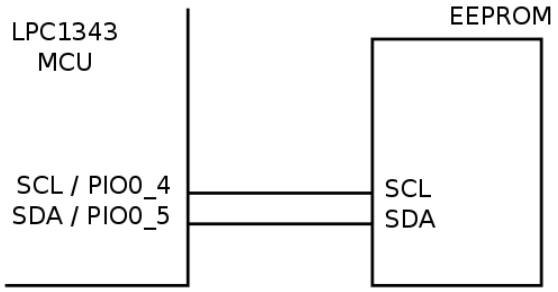


6. I²C EEPROM

The ZKit-ARM-1343 has a CAT24AA02 EEPROM for data storage. The CAT24AA02 is a 2-Kbit Serial EEPROM. The memory is accessed via I²C bus. The maximum bus speed supported by the device is 400 kbit/s

The I²C EEPROM is connected to the on-chip I²C controller of the LPC1343 MCU. The following diagram shows the EEPROM pin connection details.

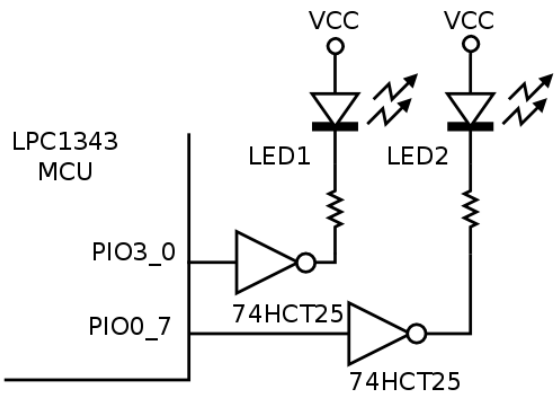
Figure 2.4. I²C EEPROM Connection Diagram



7. Debug LEDs

The ZKit-ARM-1343 has two debug LEDs connected to `PIO3_0` and `PIO0_7`, through a non-inverting buffer. By driving `PIO3_0` and `PIO0_7` high, the LEDs can be switched On.

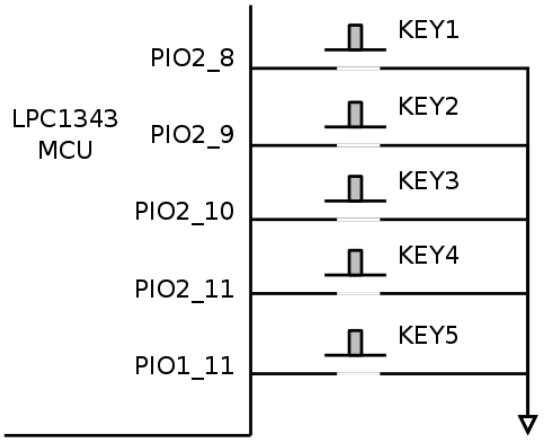
Figure 2.5. LEDs Connection Diagram



8. Keypad

The ZKit-ARM-1343 has 4 tactile push button switches connected to `PIO1_11`, `PIO2_8`, `PIO2_9`, `PIO2_10` and `PIO2_11`. The keypad connection details are shown in the following diagram.

Figure 2.6. Keypad Connection Diagram



Chapter 3. Connectors

This chapter describes the connectors in the ZKit-ARM-1343.

1. `SPI` Pinmap

The `SPI` header is terminated with serial peripheral interface (SPI) bus, 4 general purpose IO and power supply. Add-on boards with SPI interface and general purpose IOs like MMC/SD card,EEPROM etc., can be connected through this header.

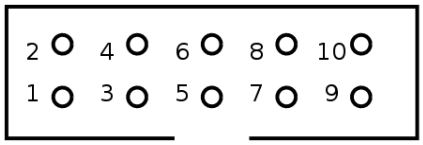


Table 3.1. `SPI` Header

Pin #	Header Signal	MCU Signal	Signal Type
1	`VCC`	-	+5V
2	`SCK`	`PIO0_10/SCK`	TTL Out
3	`MISO`	`PIO0_8/MISO`	TTL In [1]
4	`MOSI`	`PIO0_9/MOSI`	TTL Out
5	`SS`	`PIO0_2/SSEL`	TTL Out
6	`DIO0`	`PIO3_0`	TTL In/Out [1]
7	`DIO1`	`PIO3_1`	TTL In/Out [1]
8	`DIO2`	`PIO3_2`	TTL In/Out [1]
9	`DIO3`	`PIO3_3`	TTL In/Out [1]
10	`GND`	-	Ground

[1] 5V tolerant Input

`VCC` (Pin 1) — This is the +5V power supply for the external devices. The supply has a total current limit of 200mA when powered through USB.

`SCK` (Pin 2) — This is Serial Clock signal.

`MISO` (Pin 3) — This is the Master Input, Slave Output signal.

`MOSI` (Pin 4) — This is the Master Output, Slave Input signal.

`SS` (Pin 5) — This is the SPI chip select signal.

`DIO` (Pin 6-9) — These are digital input/output signals. These lines can be used to interface any extra signals required for a SPI devices like SD Card, etc., or can be used as chip selects for four other devices.

`GND` (Pin 10) — This is the ground signal. All other signals are referenced to the this signal.

2. `UART-I2C` Pinmap

The `UART-I2C` header is terminated with serial communication signals, I²C signals and power supply. Add-on boards, with different functionalities, can be connected through this header.

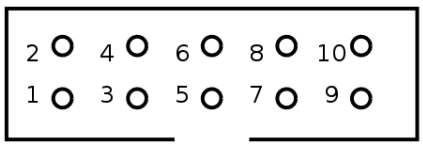


Table 3.2. `UART-I2C` Header

Pin #	Header Signal	MCU Signal	Signal Type
1	`VCC`	-	+5V
2	`RXD`	`PIO1_6/RXD`	TTL In [1]
3	`TXD`	`PIO1_7/TXD`	TTL Out
4	`SCL`	`PIO0_4/SCL`	OC [2]
5	`SDA`	`PIO0_5/SDA`	OC [2]
6	`DIO0`	`PIO1_5`	TTL In/Out [1]
7	`DIO1`	`PIO0_7`	TTL In/Out [1]
8	`DIO2`	`PIO2_0`	TTL In/Out [1]
9	`DIO3`	`PIO0_11`	TTL In/Out [1]
10	`GND`	-	Ground

[1] 5V tolerant input

[2] Open collector, with 3.3V pull-up

`VCC` (Pin 1) — This is the +5V power supply for the external devices. The supply has a total current limit of 200mA when powered through USB.

`RXD` (Pin 2) — This is receive line of serial IO.

`TXD` (Pin 3) — This is transmit line of serial IO.

`SCL`, `SDA` (Pin 4, 5) — These are I²C bus signals(clock, data), and can be used to connect I²C devices. The signals are pulled up to 3.3V, through a 4.7K resistor.

`DIO` (Pin 6-9) — These are digital input/output signals. These pins can be used for hand-shake and flow control signals like `DTR`, `RTS`, `CTS`, etc.

`GND` (Pin 10) — This is the ground signal. All other signals are referenced to this signal.

3. `DIO` Pinmap

The `DIO` header is terminated with port `PIO2` signals, along with power supply. Add-on boards, with different functionalities, can be connected through this header.

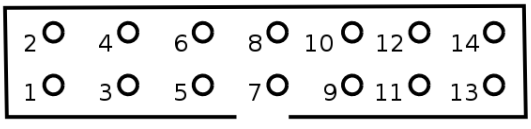


Table 3.3. `DIO` Header

Pin #	Header Signal	MCU Signal	Signal Type
1	`VCC`	-	+5V

Pin #	Header Signal	MCU Signal	Signal Type
2	DIO0	PIO2_0	TTL In/Out [1]
3	DIO1	PIO2_1	TTL In/Out [1]
4	DIO2	PIO2_2	TTL In/Out [1]
5	DIO3	PIO2_3	TTL In/Out [1]
6	DIO4	PIO2_4	TTL In/Out [1]
7	DIO5	PIO2_5	TTL In/Out [1]
8	DIO6	PIO2_6	TTL In/Out [1]
9	DIO7	PIO2_7	TTL In/Out [1]
10	DIO8	PIO2_8	TTL In/Out [1]
11	DIO9	PIO2_9	TTL In/Out [1]
12	DIO10	PIO2_10	TTL In/Out [1]
13	DIO11	PIO2_11	TTL In/Out [1]
14	GND	-	Ground

[1] 5V tolerant input

VCC (Pin 1)	This is the +5V power supply for the external devices. The supply has a total current limit of 200mA when powered through USB.
DO (Pin 2-9)	These are digital output signals. The signal is a 5V logic signal, but the output can drive a 5V device or 3.3V device with 5V tolerance. These signals are pulled up to 5V, through a 4.7K resistor since P0 port does not have internal pull up.
DIO (Pin 10-13)	These are digital input/output signals. The signal is a 5V logic signal, but the output can drive a 5V device or 3.3V device with 5V tolerance. These signals can be used as control and hand-shake signals.
GND (Pin 14)	This is the ground signal. All other signals are referenced to this signal.

4. J1 Proto Header Pinmap

The J1 Proto Header provides the signals available on the FRC-ports, through a socket header, for quick prototyping, using bread-boards and single strand wires. For the signal descriptions, refer to the corresponding FRC header.

Table 3.4. J1 Proto Header

Pin #	Header Signal	MCU Signal	Signal Type
1	VCC	-	+5V
2	RXD	PIO1_6/RXD	TTL In [1]
3	TXD	PIO1_7/TXD	TTL Out
4	SCL	PIO0_4/SCL	OC [2]
5	SDA	PIO0_5/SDA	OC [2]
6	DIO0	PIO1_5	TTL In/Out [1]
7	DIO1	PIO0_7	TTL In/Out [1]
8	DIO2	PIO2_0	TTL In/Out [1]
9	DIO3	PIO0_11	TTL In/Out [1]

Pin #	Header Signal	MCU Signal	Signal Type
10	SCK	PIO0_10/SCK	TTL Out
11	MISO	PIO0_8/MISO	TTL In [1]
12	MOSI	PIO0_9/MOSI	TTL Out
13	SS	PIO0_2/SSEL	TTL Out
14	DIO0	PIO3_0	TTL In/Out [1]
15	DIO1	PIO3_1	TTL In/Out [1]
16	DIO2	PIO3_2	TTL In/Out [1]
17	DIO3	PIO3_3	TTL In/Out [1]
18	DIO0	PIO2_0	TTL In/Out [1]
19	DIO1	PIO2_1	TTL In/Out [1]
20	DIO2	PIO2_2	TTL In/Out [1]
21	DIO3	PIO2_3	TTL In/Out [1]
22	DIO4	PIO2_4	TTL In/Out [1]
23	DIO5	PIO2_5	TTL In/Out [1]
24	DIO6	PIO2_6	TTL In/Out [1]
25	DIO7	PIO2_7	TTL In/Out [1]
26	GND	-	Ground

[1] 5V tolerant input

[2] Open collector, with 3.3V pull-up

5. J2 Proto Header

The J2 Proto Header provides ADC and PWM signals through a socket header. The 10 signals are made available through a 20 pin header, with each signal duplicated on two pins.

Table 3.5. J1 Proto Header

Pin #	MCU Signal	ADC	Capture/Match
1	3.3V	-	-
2	PIO1_0	AD1	CT32B1_CAP0
3	PIO1_1	AD2	CT32B1_MAT0
4	PIO1_2	AD3	CT32B1_MAT1
5	PIO1_2	AD4	CT32B1_MAT2
6	PIO1_4	AD5	CT32B1_MAT3
7	PIO1_5	-	CT32B0_CAP0
8	PIO1_6	-	CT32B0_MAT0
9	PIO1_7	-	CT32B0_MAT1
10	GND	-	-

Appendix A. Legal Information

1. Copying

2. Limited Hardware Warranty

The warranties provided by Zilogic Systems in this Limited Hardware Warranty apply only to Hardware Products you purchase for your use, and not for resale. The term "Hardware Product" means a computing device with a specific function and limited configuration ability.

2.1. LIMITED HARDWARE WARRANTY

Zilogic Systems warrants that the hardware components of its Hardware Product shall be free from material defects in design, materials, and workmanship and will function, under normal use and circumstances, in accordance with the documentation provided, for a period of one (1) year from the date of purchase of the Hardware Product.

Your sole and exclusive remedy, and Zilogic Systems' sole and exclusive liability for defective hardware components, shall be that Zilogic Systems, subject to the terms and conditions of this Section, and solely upon confirmation of a defect or failure of a hardware component to perform as warranted, shall at its sole option, either repair or replace the nonconforming hardware component. All replacement parts furnished to you under this warranty shall be refurbished and equivalent to new, and shall be warranted as new for the remainder of the original warranty period. All defective parts, which have been replaced, shall become the property of Zilogic Systems. All defective parts that have been repaired shall remain your property.

2.2. EXCLUSIONS

The foregoing warranties and remedies shall be void as to any Hardware Products damaged or rendered unserviceable by one or more of the following: (1) improper or inadequate maintenance by anyone other than Zilogic Systems or Zilogic Systems' authorized engineers, (2) interfacing supplied by anyone other than Zilogic Systems, (3) modifications, alterations or additions to the Hardware Products by personnel not certified by Zilogic Systems or Zilogic Systems' authorized engineers to perform such acts, or other unauthorized repair, installation or other causes beyond Zilogic Systems' control, (4) unreasonable refusal to agree with engineering change notice programs, (5) negligence by any person other than Zilogic Systems or Zilogic Systems' authorized engineers, (6) misuse, abuse, accident, electrical irregularity, theft, vandalism, fire, water or other peril, (7) damage caused by containment and/or operation outside the environmental specifications for the Hardware Products, (8) alteration or connection of the Hardware Products to other systems, equipment or devices (other than those specifically approved by Zilogic Systems) not in accordance to the board and on-board device specifications (9) any use that is inconsistent with the user manual supplied with the Hardware Product. The warranty period is not extended if Zilogic Systems repairs or replaces a warranted product or any parts. Zilogic Systems may change the availability of limited hardware warranties, at its discretion, but any changes will not be retroactive.

2.3. HARDWARE RETURN PROCEDURES

If a Hardware Product or one of its component parts does not function as warranted during the warranty period, and such nonconformance can be verified by Zilogic Systems, Zilogic Systems, at

its election, will provide either return and replacement service or replacement with a refurbished part/unit for the Hardware Product under the type of warranty service Zilogic Systems designates for that Hardware Product. A defective Hardware Product or one of its component parts may only be returned to Zilogic Systems upon Zilogic Systems' prior written approval. Any such approval shall reference an RMA number issued by an authorized Zilogic Systems service representative. If you do not register the Hardware Product with Zilogic Systems, you may be required to present proof of purchase as evidence of your entitlement to warranty service. The Hardware Product's serial number will be required for all RMA cases.

Transportation costs, if any, incurred in connection with the return of a defective item to Zilogic Systems shall be borne by You. Any transportation costs incurred in connection with the redelivery of a repaired or replacement item to You by Zilogic Systems shall be borne by Zilogic Systems; provided, however, that if Zilogic Systems determines, in its sole discretion, that the allegedly defective item is not covered by the terms and conditions of the warranty or that a warranty claim is made after the warranty period, the cost of the repair by Zilogic Systems, including all shipping expenses, shall be reimbursed by You.

2.4. HARDWARE REPLACEMENT PROCEDURES

Zilogic Systems will attempt to diagnose and resolve your problem over the phone or e-mail. Upon determination of the hardware issue is related to a malfunction of one of the Hardware Product components, an RMA process will be initiated by Zilogic Systems.

For Warranty Replacement service, it is required that you deliver the faulty unit to a location Zilogic Systems designates, and provide courier name and tracking number to Zilogic Systems. After the Faulty unit is returned to Zilogic Systems, Zilogic Systems will use commercially reasonable efforts to ship the replacement hardware within fourteen (14) business days. Actual delivery times may vary depending on availability of the spares and customer's location.

2.5. ADDITIONAL RESPONSIBILITIES

You agree:

- To provide Zilogic Systems or its partner with sufficient and safe access to your facilities to permit Zilogic Systems to fulfill its obligations.
- To ship back the faulty Hardware Product (or replaceable unit) suitably packaged, quoting the RMA number, to the Zilogic Systems designated location.
- You shall ship the faulty Hardware Product once Zilogic Systems approves the RMA and provide the courier name and tracking number.
- To securely erase from any Hardware Product you return to Zilogic Systems for any reason all programs and data not provided by Zilogic Systems with the Hardware Product. You acknowledge that in order to perform its responsibilities under this Limited Hardware Warranty, Zilogic Systems may ship all or part of the Hardware Product or its software to third party locations around the world, and you authorize Zilogic Systems to do so.

2.6. LIMITATION OF LIABILITY

Zilogic Systems' development kits are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, not in applications where failure or malfunction of a Zilogic Systems product can resonably be expected to result in personal injury, death or severe property or environmental damage.

NOTWITHSTANDING ANYTHING ELSE IN THIS AGREEMENT OR OTHERWISE, NEITHER ZILOGIC SYSTEMS NOR ITS SUPPLIERS WILL BE LIABLE WITH RESPECT TO ANY SUBJECT MATTER OF THIS AGREEMENT UNDER ANY CONTRACT, NEGLIGENCE, STRICT LIABILITY, OR OTHER LEGAL

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WARRANTY DISCLAIMER. EXCEPT AS STATED HEREIN, ZILOGIC SYSTEMS MAKES NO WARRANTIES WITH RESPECT TO any PRODUCT, license or SERVICE AND DISCLAIMS ALL Statutory or IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, or arising from a course of dealing or usage of trade and any WARRANTIES OF NONINFRINGEMENT. ZILOGIC SYSTEMS DOES NOT WARRANT THAT THE ZILOGIC SYSTEMS PRODUCT(s) WILL MEET any REQUIREMENTS or THAT THE OPERATION OF ZILOGIC SYSTEMS PRODUCTS WILL BE UNINTERRUPTED OR ERROR FREE.