



---

## **SL11RIDE**

USB to IDE/ATAPI Solution

*Technical Reference*

### **Cypress Semiconductor**

3901 North First Street

San Jose, CA 95134

408-943-2600

<http://www.cypress.com>

<b><u>CONVENTIONS</u></b>	<b>5</b>
<b><u>DEFINITIONS</u></b>	<b>5</b>
<b><u>REFERENCES</u></b>	<b>5</b>
<b><u>GENERAL DESCRIPTION</u></b>	<b>6</b>
1.1 <u>OVERVIEW</u>	6
1.2 <u>FEATURES OF SL11RIDE</u>	6
1.3 <u>APPLICATIONS</u>	6
1.4 <u>LOW POWER CONSUMPTION</u>	7
1.5 <u>FUNCTIONS FOR SUSPEND, RESUME AND LOW POWER MODES</u>	7
1.6 <u>PLL CLOCK GENERATOR</u>	8
1.7 <u>SERIAL I<sup>2</sup>C INTERFACE</u>	9
<b><u>2. SOFTWARE</u></b>	<b>9</b>
2.1 <u>OVERVIEW</u>	9
2.2 <u>ATAPI/IDE FIRMWARE</u>	10
2.3 <u>WINDOWS HOST DRIVERS</u>	10
2.4 <u>MAC HOST DRIVERS</u>	11
2.5 <u>MULTI PORT DRIVER SUPPORT</u>	11
<b><u>3. FIRMWARE DOWNLOAD</u></b>	<b>13</b>
3.1 <u>HOW TO UPDATE THE SL11RIDE FIRMWARE</u>	13
3.2 <u>THE QTUI2C PROGRAM</u>	13
3.2.1 <u>Overview</u>	13
3.2.2 <u>Usage</u>	13
3.2.3 <u>How to use QTUI2C.EXE</u>	13
<b><u>4. MASS PRODUCTION DOWNLOAD EEPROM (I2C)</u></b>	<b>14</b>
4.1 <u>ToHex</u>	14
4.1.1 <u>Overview</u>	14
4.1.2 <u>Usage</u>	14
4.1.3 <u>Example</u>	14
<b><u>5. PHYSICAL CONNECTION</u></b>	<b>15</b>
5.1 <u>SL11RIDE CHIP DIMENSION</u>	16
5.2 <u>SL11RIDE PIN ASSIGNMENT AND DESCRIPTION</u>	17
5.2.1 <u>0SL11RIDE 40 Pin Interface Signals</u>	19
5.2.2 <u>Access LED Control</u>	20
5.3 <u>PACKAGE MARKINGS</u>	20
<b><u>6. ELECTRICAL SPECIFICATION</u></b>	<b>21</b>
6.1 <u>ABSOLUTE MAXIMUM RATINGS</u>	21
6.2 <u>RECOMMENDED OPERATING CONDITIONS</u>	21
6.3 <u>CRYSTAL REQUIREMENTS (XTAL1, XTAL2)</u>	21
6.4 <u>SL11RIDE USB TRANSCEIVER CHARACTERISTICS</u>	22
6.5 <u>SL11RIDE RESET TIMING</u>	22
6.6 <u>RESET CIRCUIT</u>	23
6.7 <u>SL11RIDE PIO READ/WRITE CYCLE</u>	23

<b>7. APPENDIX</b>	<b>24</b>
7.1 <a href="#">SL11RIDE PIN TRANSLATION: 36-PIN—40-PIN SIGNALS</a>	24
7.2 <a href="#">SL11RIDE PIN TRANSLATION: 40-PIN—44-PIN SIGNALS</a>	26
7.3 <a href="#">SL11RIDE PIN TRANSLATION: 40-PIN—50-PIN SLIM CONNECTOR</a>	27
7.4 <a href="#">CLIK 50-PIN CONNECT WITH SL11RIDE</a>	28
7.5 <a href="#">SL11RIDE PIN TRANSLATION: 40-PIN—50-PIN CF CARD SIGNALS</a>	29
7.6 <a href="#">FAST EPP PIN ASSIGNMENT AND DESCRIPTION</a>	31
7.7 <a href="#">DESIGN ATAPI/IDE DEVICE BEHAVES LIKE FLOPPY DISK DRIVE</a>	33
<a href="#">Speed Control Register (0xC008: R/W)</a>	35
Figure 1 USBPU pull up connection example	7
Figure 2: Full-Speed 48MHz Crystal Circuit	8
Figure 3: 12MHz Crystal circuits	8
Figure 4 I2C 2K-byte connection	9
Figure 5 General Views	10
Figure 6 Multi-portable drivers	12
Figure 7 Reset Circuit Sample	1
Figure 8 Compact Flash Design Note	34
Table 1 Windows Host Software OS compatibility	11
Table 2 Mac Host Software OS compatibility	11
Table 3 40-pin connector interface signals	19
Table 4 36-pin to 40-pin interface signals	24
Table 5 SL11RIDE Pin Translation: 40-Pin—44-Pin Signals	26
Table 6 SL11RIDE Pin Translation: 40-Pin—50-Pin SLIM Signals	27
Table 7 SL11RIDE Pin Translation: 40-Pin—50-Pin Signals	29
Table 8: Power switch operation	34
Table 9: Compact Flash Design	34

## License Agreement

Use of this document and the intellectual properties contained herein indicates acceptance of the following License Agreement. If you do not accept the terms of this License Agreement, do not use this document, or the associated intellectual properties, or any other material you received in association with this product, and return this document and the associated materials within fifteen (15) days to Cypress Semiconductor Corporation (CY) or CY's authorized distributor from whom you purchased the product.

1. You can only legally obtain CY's intellectual properties contained in this document through CY or its authorized distributors.
2. You are granted a nontransferable license to use and to incorporate CY's intellectual properties contained in this document into your product. The product may be either for your own use or for sale.
3. You may not reverse-engineer the SL11RIDE or otherwise attempt to discover the designs of SL11RIDE.
4. You may not assign, distribute, sell, transfer, or disclose SL's intellectual properties contained in this document to any other person or entity.
5. This license terminates if you fail to comply with any of the provisions of this Agreement. You agree upon termination to destroy this document, stop using the intellectual properties contained in this document and any of its modification and incorporated or merged portions in any form, and destroy any unused SL11RIDE chips.

## Warranty Disclaimer and Limited Liability

Cypress Semiconductor Corporation makes no warranty for the use of its products, other than those expressly contained in the Company's standard warranty which is detailed in Cypress's Terms and Conditions located on the Company's web site. The Company assumes no responsibility for any errors which may appear in this document, reserves the right to change devices or specifications detailed herein at any time without notice, and does not make any commitment to update the information contained herein. No licenses to patents or other intellectual property of Cypress Semiconductor are granted by the Company in connection with the sale of Cypress products, expressly or by implication. Cypress's products are not authorized for use as critical components in life support devices or systems.

SL11RIDE is a trademark of Cypress Semiconductor Corporation. All other product names are trademarks are registered trademarks of their perspective owners.

## CONVENTIONS

1,2,3,4	Numbers without annotation is decimal
Dh, 1Fh, 39h	Hexadecimal numbers are followed by an “h”
0101b, 010101b	Binary numbers are followed by a “b”
<i>bRequest, n</i>	Words in <i>italics</i> indicated terms defined by USB Specification or by this Specification

## DEFINITIONS

<b>I2C</b>	2-wire Serial flash EEPROM interface
<b>SL11RIDE</b>	the SL11R-IDE is 16-bit RISC USB processor, which provides USB to ATAPI/IDE interface on a single chip
<b>USB</b>	Universal Serial Bus
<b>QTOOLS</b>	Utilities tools for ScanLogic 16-bit RISC USB processor
<b>CF</b>	Compact Flash

## REFERENCES

[ref 1] AT Attachment with Packet Interface Extension (ATA/ATAPI-5)

## Revision History

Name and Version	Date Issue	Comments
First Draft	November 8, 1999	Specification Preliminary
Rev 0.2 ... 0.9	November 12, 1999	Specification Revision 0.2 ... 0.9
Rev 1.0	November 17, 1999	Specification Revision 1.0
Rev 1.1	December 1, 1999	Specification Revision 1.1 - Add 50 Pin SLIM connector
Rev 1.12	December 5, 1999	Specification Revision 1.1
Rev 1.42	December 20, 1999	Updated for Rev 1.12 Specification
Rev 1.44	February 18, 2000	Update for Rev. 1.42 Specification - Add CLIK 50 Pin connector
Rev 1.45	February 24, 2000	Update for Rev. 1.42 Specification - Add software insert/removed for CF
Rev 1.5	September 6, 2000	Formatting
Rev 1.6	September 21, 2000	No Change
Rev 1.7	January 24, 2000	Corrections, replacing diagrams, added CPU Speed Control
Rev 2.0	April 20, 2001	Rev. Number Sinc.

## **GENERAL DESCRIPTION**

### **1.1 Overview**

The SL11RIDE is a low cost, high speed Universal Serial Bus RISC based Controller board. It contains a 16-bit RISC processor with built in SL11RIDE ROM to greatly reduce firmware development efforts. Its serial flash EEPROM interface offers low cost storage for USB device configuration and customer product specific functions. New functions can be programmed into the I2C by downloading them from a USB Host PC. This unique architecture provides the ability to upgrade products, in the field, without changing the peripheral hardware.

### **1.2 Features of SL11RIDE**

- Two-wire serial EEPROM (I2C) interface port, with SL11RIDE ROM firmware support, to allow on board flash EEPROM programming
- Supports 12 MHz/48MHz external crystal or clock.
- 6Kx8 internal Mask ROM with built-in BIOS.
- Supports up to the maximum USB transfer rate of 12 Mbits/sec.
- Power source requires only 3.3Volt, and it can be powered via a USB host PC or a Hub.
- Resume, Suspend, and Low power modes are available.
- Includes the necessary firmware to function as a USB to IDE/ATAPI controller.

### **1.3 Applications**

ScanLogic offers a Developer Kit with all its product lines. These Developer's Kits include: ATAPI/IDE firmware, multiple peripheral Mini-port class drivers for Windows98/2000, MAC 8.6 or higher available object code, a complete ATAPI/IDE solution reference design, and a demo board.

The SL11RIDE offers solutions for interfacing USB to IDE/ATAPI peripheral products including HDD, CD-ROM, CD-R/RW, ZIP drives, LS120, MO drives, Compact Flash, Disk on Chip, Tape drives, Smart Media cards, ORB, and CLIK, and MicroDrives.

## 1.4 Low Power Consumption

The SL11RIDE offers various power consumption modes. The maximum power consumption at 48 MHz operation including USB is less than 30mA, but on the average it consumes around 10mA.

The followings are measurements taken under different setups of the SL11RIDE:

Idle Mode: 2.0mA (USB is on, CPU runs at 48MHz)  
During Reset: 3.0mA (Reset is held low)  
Post Reset: 12.5mA typical at 48MHz

Max at 4MHz CPU speed: 4.0mA (USB is on)  
Max at 32MHz CPU speed: 25.0mA (USB is on)  
Max at 48MHz CPU speed: 30.0mA (USB is on)

## 1.5 Functions for Suspend, Resume and Low Power modes

The SL11RIDE's CPU supports suspend, resume, and CPU low power mode. The SL11RIDE BIOS assigns USBPU for the USB DATA+ line pull-up, which simulates USB cable removal or insertion while USB power is still applied to the board.

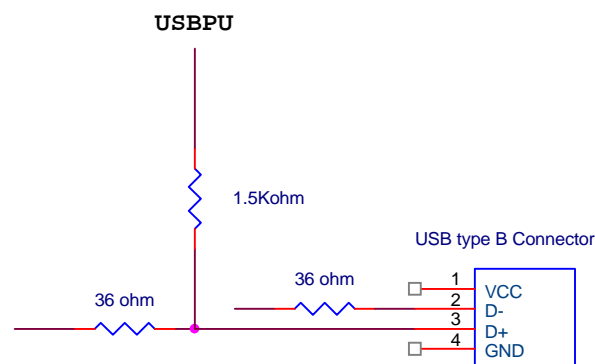


Figure 1: USBPU pull up connection example

## 1.6 PLL Clock Generator

A 48 MHz external crystal can be used with the SL11RIDE. Two pins, X1 and X2, are provided to connect a low-cost crystal circuit to the device. Circuitry is provided to generate the internal clock requirements of the device. If an external 48 MHz clock is available in the application, it may be used instead of the crystal circuit by connecting directly to the X1 input pin.

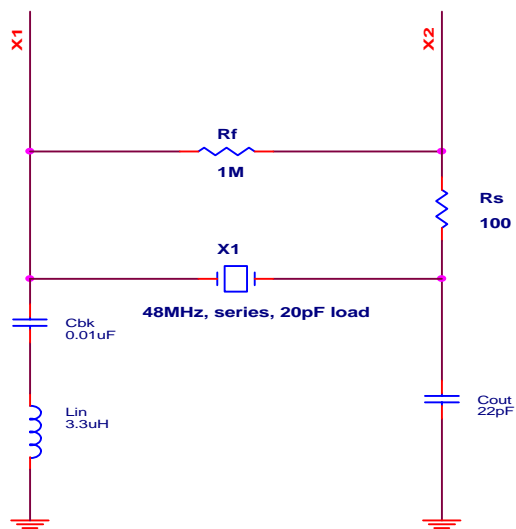


Figure 2: Full-Speed 48MHz Crystal Circuit

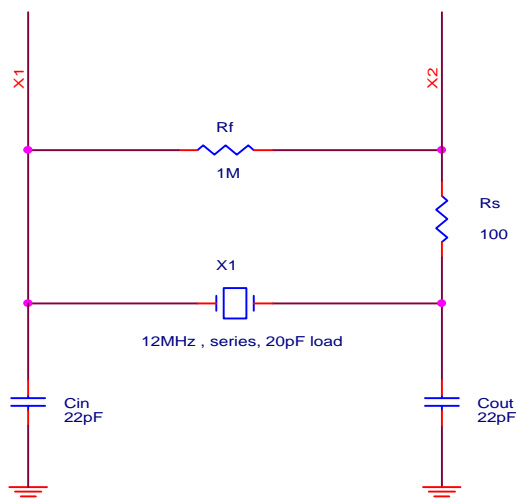


Figure 3: 12MHz Crystal circuits

Note: You need to set bit C2 = 1 from configuration address (0xC006). See **Appendix 7.8** for CPU speed control.



## 1.7 Serial I<sup>2</sup>C Interface

The SL11RIDE provides an interface to an external serial flash EEPROM. A variety of serial EEPROM formats can be supported. Currently the SL11RIDE firmware supports the two-wire serial flash EEPROM type. It can be used for field product upgrades if needed.

The recommended serial EEPROM device is a 2-Wire Serial CMOS EEPROM (AT24LCXX Device Family). Currently, the SL11RIDE allows writing to EEPROM, up to 2K Bytes, using a 16K bit I2C device (i.e. AT24LC16B/SN).

The USB vendor/device configuration can be programmed and stored into the external EEPROM device. On power-up, the contents of the EEPROM will be downloaded into RAM. The advantage of the EEPROM interface is both cost and space saving compared with using an external 8-bit PROM/EPROM.

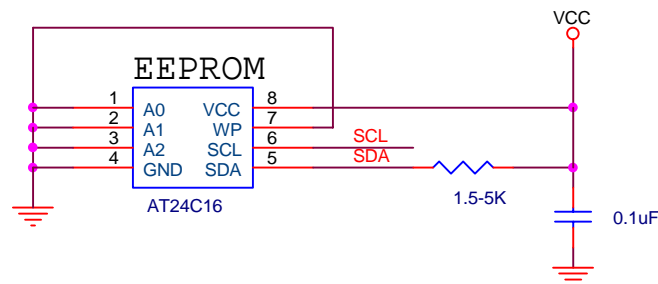


Figure 4: I2C 2K-byte connection

Note:

You can choose either a 3.3V or a 5.0V EEPROM.

## 2. SOFTWARE

The SL11RIDE software is *USB Specification* and *USB Mass Storage Class Bulk-Only Transport* version 1.0 compliant in the final release. In the meantime, it will try to track changes to the *USB Mass Storage Class Bulk-Only Transport* as closely as possible. The interface to the host PC is USB, which allows true Plug-and-Play (PnP). The requirement for Operating System (OS) on the host PC side is Win98/2000 or MAC.

### 2.1 Overview

This document provides a complete outline description of the SL11RIDE firmware and host mini-port driver under Win98/2000, which supports *Bulk Only Transport* between host PC and SL11RIDE. See Figure 5 for details.

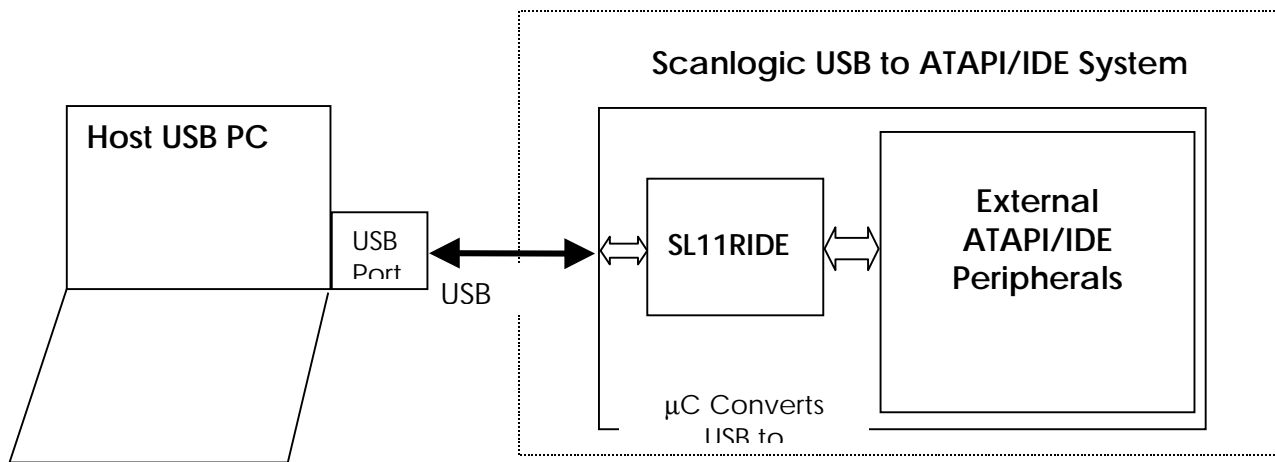


Figure 5: General Views

## 2.2 ATAPI/IDE Firmware

SL11RIDE's firmware supports both ATAPI and IDE devices. The firmware is *USB Mass Storage Class* compliant, which supports multiple Operating Systems such as Windows98/2000 and Mac.

## 2.3 Windows Host Drivers

The WDM and MPD device drivers operate under Windows 98. Win2000 doesn't need any special drivers. See Table 1 Windows Host Software OS compatibility for more detail.

Operation System	USB	Note
Windows98	√	First Edition from Microsoft
Windows98SE	√	Second Edition from Microsoft
Window2000	√	WIN2000 beta from Microsoft
Windows NT	--	NT 4.0 does not support USB

**Table 1 Windows Host Software OS compatibility**

## 2.4 Mac Host Drivers

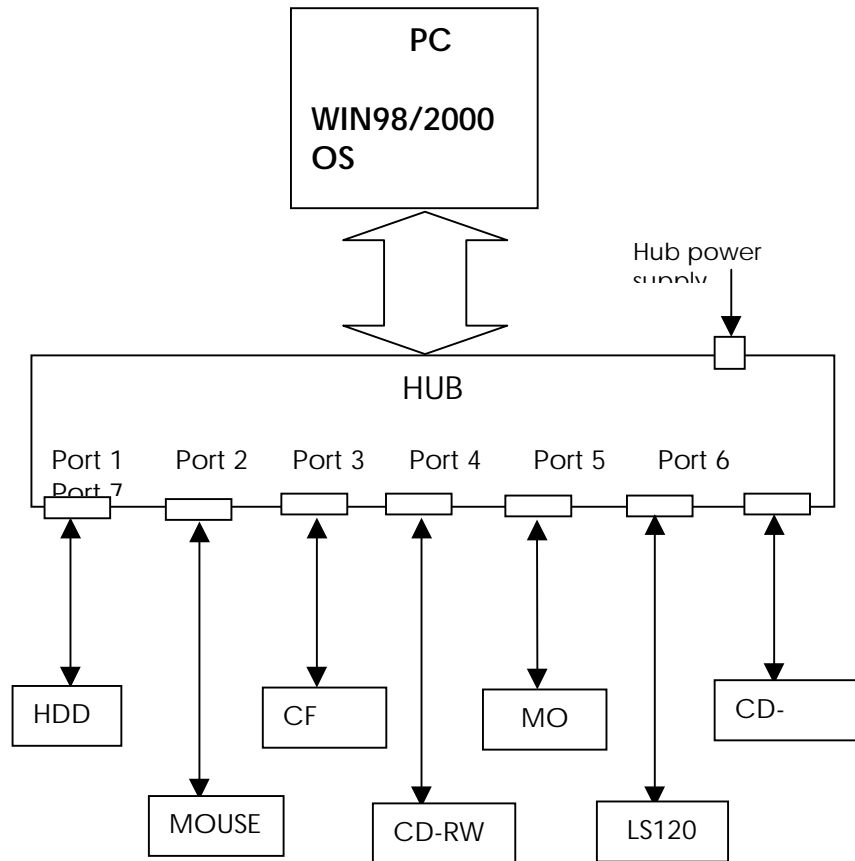
ScanLogic does not support end-user firmware updates under the Mac OS. OEM customers must download firmware from MS-DOS.

Operating System	USB	Note
G3: OS8.6, OS9	√	G3
iMAC: OS8.6, OS9	--	iMAC
Laptop: OS8.6, OS9	--	G3 Laptop

**Table 2 Mac Host Software OS compatibility**

## 2.5 Multi Port Driver support

Currently SL11RIDE mini-port driver is a multi-device driver for ATAPI/IDE peripherals. This driver supports up to 7 ATAPI/IDE devices, which connect via a USB Hub. See Figure 6: Multi-portable drivers for details.



**Figure 6: Multi-portable drivers**

**Note:**

- These devices must be self-powered since the Hub cannot provide enough current to each ATAPI/IDE device.
- We recommend that a PC for this configuration be at least a 300MHz Pentium II with 64Mbyte RAM

### 3. FIRMWARE DOWNLOAD

#### 3.1 How to update the SL11RIDE firmware

The firmware on the EEPROM doesn't have to be changed after it is downloaded for the first time. If it needs to be changed during testing or for future firmware updates, this can be done from a PC using the USB port. The need to change firmware to switch between an ATAPI device and an IDE device will be removed in a future release.

#### 3.2 The QTUI2C Program

##### 3.2.1 Overview

The QTUI2C program is used to program the I2C EEPROM that is externally connected to the SL11RIDE chip. This allows programming the I2C with data alone, such as the USB data descriptors. The SL11RIDE will scan the I2C for a valid signature before attempting to load the code and/or data to the internal/external RAM.

To program the file, the input filename without the extension is required. The QTUI2C will create a file "MAKEENH.BIN" based on the Object input file. This "MAKEENH.BIN" file will contain the fix-up (.bin) information and it will have a proper format that is defined on the SL11RIDE BIOS specification.

##### 3.2.2 Usage

**QTUI2C**      <filename | filename.bin>

**Where:**

<Filename> is the output file without extension.

<filename.bin> is the output file with (.bin) extension.

**Note:**

This program is only used when the I2C is connected to the SL11RIDE chip.

Under Windows, if the EEPROM already has a version of the SL11RIDE firmware programmed, it will be necessary to remove the Bulk-Only hard disk controller from the Device Manager before this program can be used.

After this program completes, at any subsequent boot up, the SL11RIDE firmware will automatically scan the I2C and load the code from the I2C into internal/external RAM. However, if the I2C was corrupted, it sometimes causes an unexpected error on USB communication ports.

##### 3.2.3 How to use QTUI2C.EXE

The QTOOLS utilities are in directory C:\Program Files\ScanLogic\USB2IDE\bin.

- qtui2c zero.bin ; You need to erase all program from I2C each time you download a new program.
- qtui2c cidexxx.bin ; Program ATAPI and IDE firmware into I2C

## 4. MASS PRODUCTION DOWNLOAD EEPROM (I2C)

### 4.1 ToHex

#### 4.1.1 Overview

This program converts the Binary output file (. **bin**) to the INTEL HEX format. This INTEL HEX format will be used for programming the PROM on the DATAIO.

#### 4.1.2 Usage

TOHEX <infilespec.bin> <outfilepec [HEX]> [offset, default=0x0000] [h|l]

**Where:**

Infilespec.bin is the Binary output file produced by the QTASM

Outfilespec.hex is the INTEL HEX output file produced by the TOHEX program

Offset is valid from 0x0000 to 0xFFFF. Default is 0x0000.

[h|l] 'h' is selected high PROM output file. 'l' is selected low PROM output file. Without this input the default INTEL HEX output file will be stored into the single 8-bit PROM.

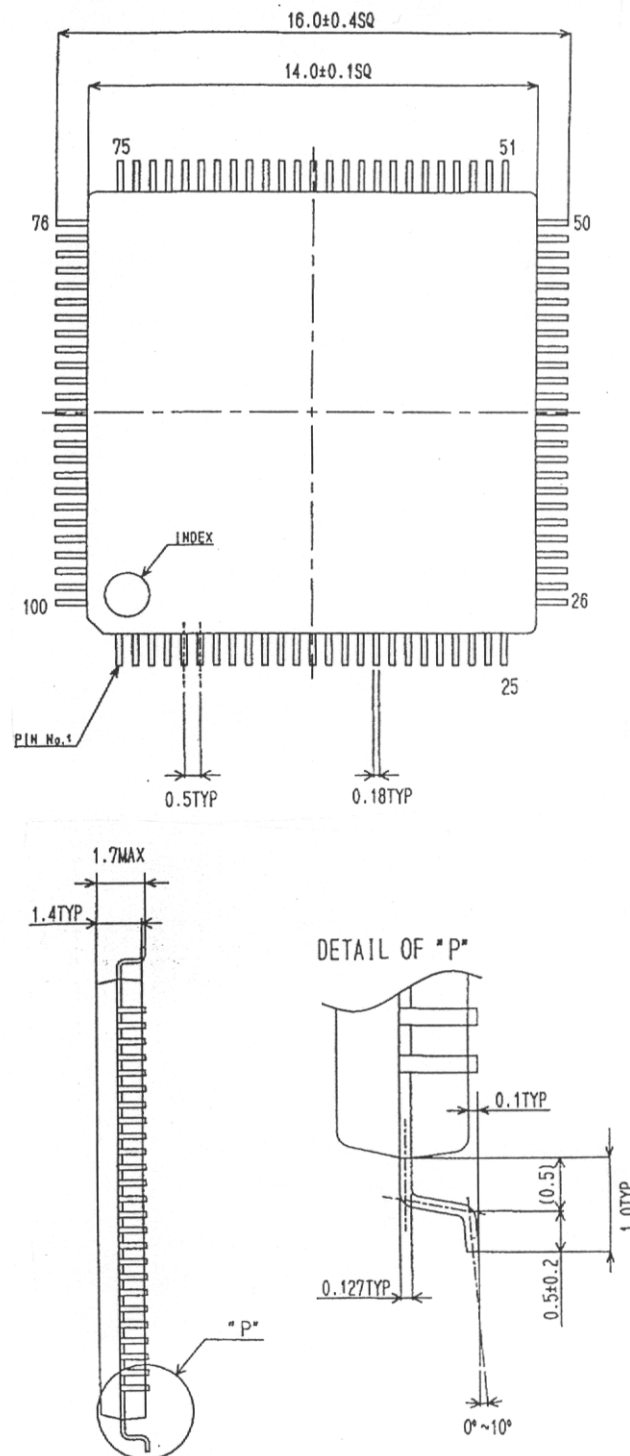
#### 4.1.3 Example

TOHEX cidexxx.bin cidexxx.hex

; Create INTEL HEX format for ATAPI device

## **5. PHYSICAL CONNECTION**

## 5.1 SL11RIDE Chip Dimension





The SL11RIDE's Package type is 100 PQFP.

## 5.2 SL11RIDE Pin Assignment and Description

Pin Name	GPIO name	Pin No	Pin Type	SL11RIDE Pin Description
VDD		1	Power	+3.3 VDC Supply (See note <sup>5</sup> )
GND		14	GND	Digital ground.
X1		15	Input	External 48 MHz Crystal or Clock Input. (See note <sup>2</sup> )
X2		16	Output	External crystal output. Not connect if X1 is used for clock input
VDD		17	Power	+3.3 VDC Supply (See note <sup>5</sup> )
GND		40	GND	Digital ground.
TEST		44	Input	NC--No Connection, MFG test only (See note <sup>1</sup> )
nRESET		48	Input	Master Reset. SL11RIDE Device active low reset input.
VDD		50	Power	+3.3 VDC Supply (See note <sup>5</sup> )
VDD		51	Power	+3.3 VDC Supply (See note <sup>5</sup> )
SCL	GPIO31	60	Bidir	Serial Flash EEPROM clock
SDA	GPIO30	61	Bidir	Serial flash EPROM Data (See note <sup>3</sup> )
USBPU	GPIO29	62	Bidir	USB Turn on/off D+ Pull Up Resistor
TXD	GPIO28	63	Output	UART TXD
GND		64	GND	Digital ground.
GND		65	GND	Digital ground.
RXD	GPIO27	66	Input	UART RXD
PWC	GPIO26	67	Bidir	Power control (See note <sup>4</sup> )
INTRQ/ HW_RESET / RB	GPIO25	68	Bidir	Interrupt triggers in the SL11RIDE processor, or define for Hardware Reset for CF (See note <sup>6</sup> )
DASP/ WP	GPIO24	69	Bidir	Device Active Present, or define for Write Protect for Smart Media (See note <sup>6</sup> )
IOWD	GPIO23	70	Bidir	IOWD- Write uses to indicate IDE write data transfer
CS0	GPIO22	71	Bidir	Chip Select 0
CS1	GPIO21	72	Bidir	Chip Select 1 or user defines Smart media card detect.

IORD	GPIO20	73	Bidir	IORD uses to indicate IDE read data transfer
C_DET	GPIO19	74	Bidir	C_DET uses to detect CF
VDD	75	75	Power	+3.3 VDC Supply (See note <sup>5</sup> )
A2	GPIO18	76	Bidir	Address bit 2.
A1	GPIO17	77	Bidir	Address bit 1
A0	GPIO16	78	Bidir	Address bit 0
GND	79	79	GND	Digital ground.
D15	GPIO15	80	Bidir	DATA port bit 15
D14	GPIO14	81	Bidir	DATA port bit 14
D13	GPIO13	82	Bidir	DATA port bit 13
D12	GPIO12	83	Bidir	DATA port bit 12
D11	GPIO11	84	Bidir	DATA port bit 11
D10	GPIO10	85	Bidir	DATA port bit 10
D9	GPIO9	86	Bidir	DATA port bit 9
VDD1	87	87	Power	USB +3.3 VDC Supply. (See note <sup>5</sup> )
DATA+	88	88	Bidir	USB Differential DATA Signal High Side.
DATA-	89	89	Bidir	USB Differential DATA Signal Low Side.
USB_GND	90	90	GND	USB Digital Ground.
D8	GPIO8	91	Bidir	DATA port bit 8
D7	GPIO7	92	Bidir	DATA port bit 7
D6	GPIO6	93	Bidir	DATA port bit 6
D5	GPIO5	94	Bidir	DATA port bit 5
D4	GPIO4	95	Bidir	DATA port bit 4
D3	GPIO3	96	Bidir	DATA port bit 3
D2	GPIO2	97	Bidir	DATA port bit 2
D1	GPIO1	98	Bidir	DATA port bit 1
D0	GPIO0	99	Bidir	DATA port bit 0
VDD	100	100	Power	+3.3 VDC Supply (See note <sup>5</sup> )

## Design Note:

1. All pins not shown (NC pins and reserved pins) should not be connected or used for other purposes.
2. 48 MHz Crystal or oscillator has to use a capacitor 0.1  $\mu$ F to filter output signals. It must be placed at least  $\frac{3}{4}$ " from 3.3V, 5.0V or a USB connector
3. This signal requires a 1-5K ohms pull-up.

4. GPIO26: This signal can be used for device low power mode. It will turn off or disable external powers to the peripheral in suspend mode. Once USB power is resumed, external power can be enabled again

5. All +3.3VDC must use an 0.1  $\mu$ F bypass capacitor and these capacitors must be placed near the SL11RIDE chip.

6. GPIO25 can be used as INTRQ/HW\_RESET/RB and GPIO24 can be used as DASP/WP signals. These signals are used for CF and Smart Media to exchange media cards or insert/remove media while power is still supplied to the board.

## 5.2.1 0SL11RIDE 40 Pin Interface Signals

**Table 3** 40-pin connector interface signals

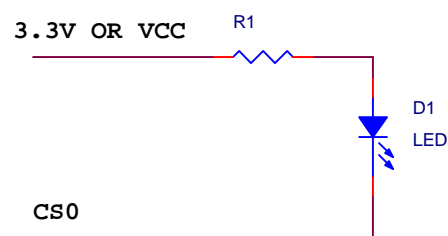
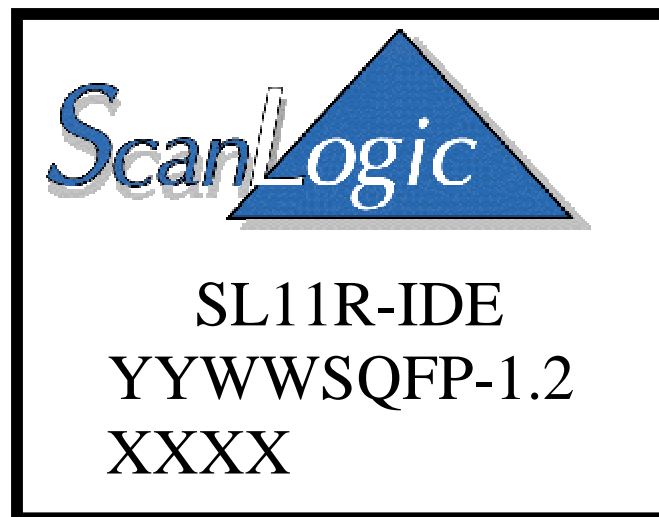
SL11RIDE Signal	IDE Signal	Pin	Pin	IDE Signal	SL11RIDE Signal
RESET	RESET	1	2	GND	GND
D7	DD7	3	4	DD8	D8
D6	DD6	5	6	DD9	D9
D5	DD5	7	8	DD10	D10
D4	DD4	9	10	DD11	D11
D3	DD3	11	12	DD12	D12
D2	DD2	13	14	DD13	D13
D1	DD1	15	16	DD14	D14
D0	DD0	17	18	DD15	D15
GND	GND	19	20	Key	(See Note <sup>2</sup> )
PU	DMARQ	21	22	GND	GND
IOWD	DLOW	23	24	GND	GND
IORD	DIOR	25	26	GND	GND
PU	IORDY	27	28	CSEL	PD (See Note <sup>3</sup> )
PU	DMACK	29	30	GND	GND
INTRQ	INTRQ	31	32	IOCS16	PU
A1	DA1	33	34	PDIAG	PU
A0	DA0	35	36	DA2	A2
CS0	CS0	37	38	CS1	CS1
DASP	DASP	39	40	GND	GND

**Note:**

1. PU: These signals need 10k ohms pull up
2. The Key pin must be not be connected
3. PD: CSEL connects to GND for default Master and Slave modes

**5.2.2 Access LED Control**

The CS0 uses LED access control. You can define the value of R1

**5.3 Package Markings**

YYWW = Date code  
XXXX = Product code

## 6. ELECTRICAL SPECIFICATION

### 6.1 Absolute Maximum Ratings

This section lists the absolute maximum ratings of the SL11RIDE. Stresses above those listed can cause permanent damage to the device. Exposure to maximum rated conditions for extended periods can affect device operation and reliability.

Storage Temperature	-40°C to 125°C
Power Supply Voltage (VDD)	3.3V±10%
Power Supply Voltage (VDD1)	3.3V±10%

### 6.2 Recommended Operating Conditions

Parameter	Min.	Typical	Max
Power Supply Voltage, VDD	3.0 V	3.3v	3.6 V
Power Supply Voltage, VDD1	3.0 V		3.6 V
Operating Temperature	0°C		65°C

### 6.3 Crystal Requirements (XTAL1, XTAL2)

Crystal Requirements, (XTAL1, XTAL2)	Min.	Typical	Max
Operating Temperature Range	0°C		65°C
Series Resonant Frequency		48MHz	
Frequency Drift over Temperature			+/- 20 ppm
Temperature Stability			+/- 100 ppm
Accuracy of Adjustment			+/- 30 ppm
Mode of Vibration 3 <sup>rd</sup> Overtone			
Series Resistance			100 ohms

Load Capacitance		20 pf
Shunt Capacitance	3 pf	7 pf
Driver Level	20 microwatt	5miliwatt

#### 6.4 SL11RIDE USB Transceiver Characteristics

Symbol	Parameter	Min.	Typical	Max
V <sub>IHYS</sub>	Hysteresis On Input (Data+, Data-)	0.1 V		200 mV
V <sub>USBIH</sub>	USB Input Voltage HIGH		1.5 V	2.0 V
V <sub>USBIL</sub>	USB Input Voltage LOW	0.8 V	1.3 V	
V <sub>USBOH</sub>	USB Output Voltage HIGH	2.2 V		
V <sub>USBOL</sub>	USB Output Voltage LOW			0.7 V
Z <sub>USBH</sub>	Output Impedance HIGH STATE	24 Ohms		43 Ohms
Z <sub>USBL</sub>	Output Impedance LOW STATE	24 Ohms		43 Ohms
I <sub>USB</sub>	Transceiver Supply p-p Current (3.3V)			< 220uA

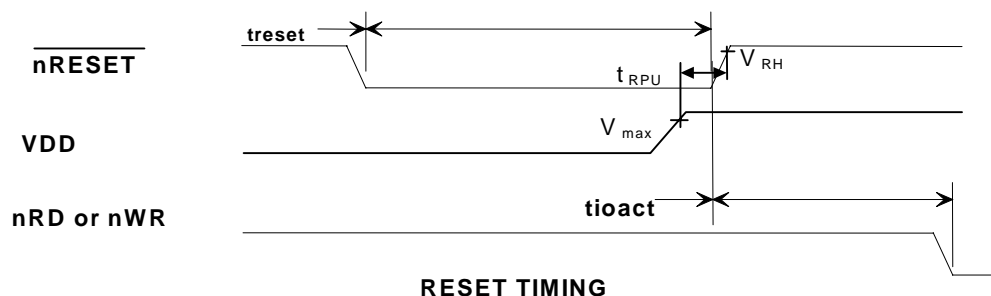
**Notes:**

All typical values are VDD2 = 3.3 V and TAMB= 25°C.

Z<sub>USBX</sub> Impedance Values includes an external resistor of 24 -- 43 Ohms ± 1%

#### 6.5 SL11RIDE RESET TIMING

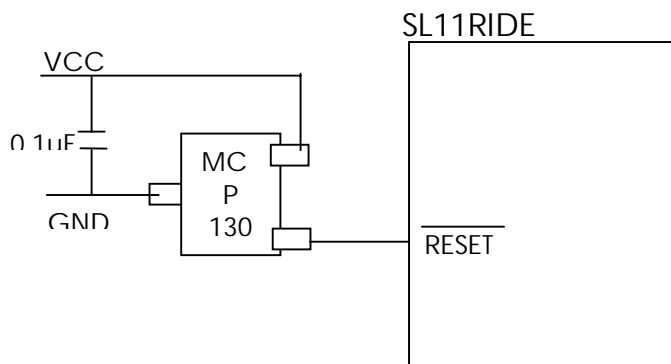
The nRESET signal from the SL11RIDE chip resets the disk drive. It forces an initialization to occur identical to that after power-up.



Symbol	Parameter	Min.	Typical	Max
VCC	Operating Voltage Range			5.5V
$t_{RPU}$	Time Reset Pull up	150ms		
$V_{max}$	Voltage reach max	VDD-0.7V		
$V_{RH}$	Voltage Reset High	3.0V		
$t_{reset}$	nRESET Pulse width	16 clocks		
$t_{ioact}$	nRESET high to nRD	16 clocks		

**Note:** Clock is 48 MHz nominal

## 6.6 Reset circuit



**Figure 7:**  
Reset Circuit Sample

## 6.7 SL11RIDE PIO READ/WRITE Cycle

At power-up and during Read/Write Cycles, the SL11RIDE uses PIO mode 2 timing for the data transfer from/to device. See chapter 10 in the section 10.2.2 of [ref 1] AT Attachment with Packet Interface Extension (ATA/ATAPI-5) for more detail

## 7. APPENDIX

This is a pin translation of SL11RIDE signals to 36, 44, 50, and 68 of the Storage Device Class, which is based on the latest AT Attachment specification and Compact Flash Specification Version 1.4.

These signals connect directly to the ATAPI/IDE devices. If you intend to design for a long IDE cable, then you have to use RC Termination. See [ref 1] AT Attachment with Packet Interface Extension (ATA/ATAPI-5).

### 7.1 SL11RIDE Pin Translation: 36-Pin—40-Pin Signals

**Table 4** 36-pin to 40-pin interface signals

SL11RIDE Signal	36-Pin Signal	36-Pin	Translate s	40-Pin
GND	GND	1	→	2
nRESET	RESET	2	→	1
D8	D8	3	→	4
D7	D7	4	→	3
D9	D9	5	→	6
D6	D6	6	→	5
D10	D10	7	→	8
D5	D5	8	→	7
D11	D11	9	→	10
D4	D4	10	→	9
D12	D12	11	→	12
D3	D3	12	→	11
D13	D13	13	→	14
D2	D2	14	→	13
D14	D14	15	→	16
D1	D1	16	→	15
D15	D15	17	→	18
D0	D0	18	→	35
PU- See note <sup>1</sup>	DMARQ	19		NC



IOWD	IOWR	20	→	23
IORD	IORD	21	→	25
PU- See note <sup>1</sup>	IORDY	22	→	27
PU- See note <sup>1</sup>	DMACK	23		NC
INTRQ	IRQ	24	→	31
PU- See note <sup>1</sup>	IOCS16	25	→	32
A1	A1	26	→	33
GND	GND	27	→	19
A0	A0	28	→	35
A2	A2	29	→	36
CS0	CS0	30	→	37
CS1	CS1	31	→	38
GND	GND	32	→	22
VCC	+5V	33		VCC
GND	GND	34	→	24
VCC	+5V	35	→	VCC
GND	GND	36	→	26

**Note:**

1. PU: These signals need 10k ohms pull up.

## 7.2 SL11RIDE Pin Translation: 40-Pin—44-Pin Signals

**Table 5** SL11RIDE Pin Translation: 40-Pin—44-Pin Signals

IDE Signal	Pin	Pin	IDE Signal
	A	B	(See note)
	C	D	(See note)
	E	F	(See note)
nRESET	1	2	GND
DD7	3	4	DD8
DD6	5	6	DD9
DD5	7	8	DD10
DD4	9	10	DD11
DD3	11	12	DD12
DD2	13	14	DD13
DD1	15	16	DD14
DD0	17	18	DD15
GND	19	20	Key-- See note <sup>1</sup>
DMARQ—See note <sub>3</sub>	21	22	GND
IOWD	23	24	GND
IORD	25	26	GND
IORDY-- See note <sup>3</sup>	27	28	CSEL-- See note <sup>2</sup>
DMACK-- See note <sub>3</sub>	29	30	GND
INTRQ	31	32	IOCS16-- See note 3
DA1	33	34	PDIAG-- See note <sup>3</sup>
DA0	35	36	DA2
CS0	37	38	CS1
DASP	39	40	GND
+5V	41	42	+5V
GND	43	44	TYPE

Note: A—F: Pins that are additional to those of the 40-pin connector.

1. The Key pin must be not connected
2. CSEL connect to GND for default Master and Slave modes
3. These signals need a 10k pull up

### 7.3 SL11RIDE Pin Translation: 40-Pin—50-Pin SLIM Connector

The SLIM connector is a new connector that is used for CD-ROM, CD-RW, and ZIP drives.

**Table 6** SL11RIDE Pin Translation: 40-Pin—50-Pin SLIM Signals

SL11RIDE Signals	SLIM Signals	Pin	Pin	SLIM Signals	SL11RIDE Signals
NC	LOUT	1	2	ROUT	NC
GND	AGND	3	4	NC	NC
nRESET	RESET	5	6	DD8	D8
D7	DD7	7	8	DD9	D9
D6	DD6	9	10	DD10	D10
D5	DD5	11	12	DD11	D11
D4	DD4	13	14	DD12	D12
D3	DD3	15	16	DD13	D13
D2	DD2	17	18	DD14	D14
D1	DD1	19	20	DD15	D15
D0	DD0	21	22	DMARQ	PU: See Note <sup>1</sup>
GND	GND	23	24	DIOR-	IORD
IOWD	DIOW	25	26	GND	GND
PU: See Note <sup>1</sup>	IORDY	27	28	DMACK	PU: See Note <sup>1</sup>
INTRQ	INTRQ	29	30	IOCS16	PU: See Note <sup>1</sup>
A1	DA1	31	32	PDIAG	PU: See Note <sup>1</sup>
A0	DA0	33	34	DA2	A2
CS0	CS0	35	36	CS1-	CS1
DASP	DASP	37	38	+5V	VCC
VCC	+5V	39	40	+5V	VCC

VCC	+5V	41	42	+5V	VCC
GND	GND	43	44	GND	GND
GND	GND	45	46	GND	GND
PD: See Note <sup>2</sup>	CSEL	47	48	GND	GND
NC	Reserved	49	50	Reserved	NC

Note:

1. PU: These signals need 10k ohms pull up.
2. PD: CSEL connect to GND for Master and Slave mode

## 7.4 CLIK 50-PIN CONNECT WITH SL11RIDE

The CLIK can connect directly to the SL11RIDE chip for integration solution or can interface with the SL11RIDE via a PCMCIA card.

Note:

- User can define STATUS LED.

## 7.5 SL11RIDE Pin Translation: 40-Pin—50-Pin CF Card Signals

**Table 7** SL11RIDE Pin Translation: 40-Pin—50-Pin Signals

SL11RIDE PIN	CLIK Signal	PIN	PIN	CLIK Signal	SL11RIDE PIN
VCC	VCC	1	2	GND	GND
VCC	5V	3	4	GND	GND
nRESET	HRSTD	5	6	X	X
D7	HDD7	7	8	HDD8	D8
D6	HDD6	9	10-	HDD9	D9
D5	HDD5	11	12	HDD10	D10
D4	HDD4	13	14	HDD11	D11
D3	HDD3	15	16	HDD12	D12
D2	HDD2	17	18	HDD13	D13
D1	HDD1	19	20	HDD14	D14
D0	HDD0	21	22	HDD15	D15
GND	GND	23	24	KEYED	N.C.
PU	DREOO	25	26	GND	GND
IOWD	IOWI	27	28	GND	GND
IORD	IORI	29	30	GND	GND
PU	IOCHROYI	31	32	CESEL	GND with 22hom
PU	DACK1	33	34	GND	GND
INTRQ	IA01	35	36	IOCSI61	PU
A1	HA10	37	38	POIAG	PU
A0	HA00	39	40	HA20	A2
CS0	HCS00	41	42	HCS10	CS1
DASP	DASPI	43	44	GND	GND
VCC	VCC	45	46	GND	GND
GND with 22hom	TXD	47	48	RXD	GND with 22hom
GND with 22 ohms	ATA MODE	49	50	STATUS LED	Note 1

**Cypress Semiconductor**

3901 North First Street

San Jose, CA 95134

408-943-2600

<http://www.cypress.com>

SL11RIDE Signals	CF Signals	Pin	Pin	CF Signals	SL11RIDE Signals
GND	GND	1	2	D3	D3
D4	D4	3	4	D5	D5
D6	D6	5	6	D7	D7
CS0	CE1	7	8	A10	GND
GND	OE	9	10	A9	GND
GND	A8	11	12	A7	GND
PVCC- See Note <sup>3</sup>	VCC	13	14	A6	GND
GND	A5	15	16	A4	GND
GND	A3	17	18	A2	A2
A1	A1	19	20	A0	A0
D0	D0	21	22	D1	D1
D2	D2	23	24	IOSI16	PU: See Note <sup>1</sup>
GND	CD2	25	26	CD1	C_DET
D11	D11	27	28	D12	D12
D13	D13	29	30	D14	D14
D15	D15	31	32	CE2	PU: See Note <sup>1</sup>
GND	VS1	33	34	IORD	IORD
IOWD	IOWR	35	36	WE	PVCC See Note <sup>3</sup>
PU: See Note <sup>1</sup>	IREQ	37	38	VCC	PVCC See Note <sup>3</sup>
PD: See Note <sup>2</sup>	CSEL	39	40	VS2	GND
PWC_RESET	RESET	41	42	WAIT	PU: See Note <sup>1</sup>
Not Connect	INPACK	43	44	REG	PU: See Note <sup>1</sup>
PU: See note <sup>1</sup>	BVD2	45	46	BVD1	PU: See Note <sup>1</sup>
D8	D8	47	48	D9	D9
D10	D10	49	50	GND	GND

Note:

1. PU: These signals need a 10k ohms pull up.
2. PD: CSEL connect to GND for default Master and Slave modes
3. PVCC= 5VDC from power switch
4. PWC\_RESET

## 7.6 Fast EPP Pin Assignment and Description

Pin Name	Pin No.	GPIO Pins	Pin Type	GPIO & Fast EPP Pin Chip Revision 1.1
VDD	1		Power	+3.3 VDC Supply
D0	2		Bidir	External Memory Data Bus, Data0
D1	3		Bidir	External Memory Data Bus, Data1
D2	4		Bidir	External Memory Data Bus, Data2
D3	5		Bidir	External Memory Data Bus, Data3
D4	6		Bidir	External Memory Data Bus, Data4
D5	7		Bidir	External Memory Data Bus, Data5
D6	8		Bidir	External Memory Data Bus, Data6
D7	9		Bidir	External Memory Data Bus, Data7
D8	10		Bidir	External Memory Data Bus, Data8
D9	11		Bidir	External Memory Data Bus, Data9
D10	12		Bidir	External Memory Data Bus, Data10
D11	13		Bidir	External Memory Data Bus, Data11
GND	14		GND	Digital ground.
X1	15		Input	External 48 MHz Crystal or Clock Input.
X2	16		Output	External crystal output. No connection when X1 is used for clock input
VDD	17		Power	+3.3 VDC Supply
D12	18		Bidir	External Memory Data Bus, Data12
D13	19		Bidir	External Memory Data Bus, Data13
D14	20		Bidir	External Memory Data Bus, Data14
D15	21		Bidir	External Memory Data Bus, Data15
A20	22		Output	External Memory Address Bus, A20
A19	23		Output	External Memory Address Bus, A19
A18	24		Output	External Memory Address Bus, A18
A17	25		Output	External Memory Address Bus, A17
A16	26		Output	External Memory Address Bus, A16
A15	27		Output	External Memory Address Bus, A15
A14	28		Output	External Memory Address Bus, A14
A13	29		Output	External Memory Address Bus, A13
A12	30		Output	External Memory Address Bus, A12
A11	31		Output	External Memory Address Bus, A11
A10	32		Output	External Memory Address Bus, A10
A9	33		Output	External Memory Address Bus, A9
A8	34		Output	External Memory Address Bus, A8
A7	35		Output	External Memory Address Bus, A7
A6	36		Output	External Memory Address Bus, A6
A5	37		Output	External Memory Address Bus, A5
A4	38		Output	External Memory Address Bus, A4
A3	39		Output	External Memory Address Bus, A3
GND	40		GND	Digital ground.
A2	41		Output	External Memory Address Bus, A2
A1	42		Output	External Memory Address Bus, A1
A0	43		Output	External Memory Address Bus, A0

TEST	44		Input	No Connection, MFG test only
nWRL	45		Output	Active low, write to lower bank of External SRAM
nWRH	46		Output	Active low, Write to upper bank of External SRAM
nRD	47		Output	Active low, Read from External SRAM or ROM
nRESET	48		Input	Master Reset. SL11R Device active low reset input.
nRAS	49		Output	Active low, DRAM Row Address Select
VDD	50		Power	+3.3 VDC Supply
VDD	51		Power	+3.3 VDC Supply
nCASL	52		Output	Active low, DRAM Column Low Address Select
nCASH	53		Output	Active low, DRAM Column High Address Select
nDRAMOE	54		Output	Active low, DRAM Output Enable
nDRAMWR	55		Output	Active low, DRAM Write
nXRAMSEL	56		Output	Active low, select external SRAM ( 16 bit )
nXROMSEL	57		Output	Active low, select external ROM
nXMEMSEL	58		Output	Active low, select external Memory bus, external SRAM, DRAM, ROM or any memory mapped device
X_PCLK	59		Bidir	See register 0xC006 for more information
SECLK	60	GPIO31	Bidir	SECLK, Serial EEPROM clock, or GPIO31
SEDO	61	GPIO30	Bidir	SEDO, Serial flash EPROM Data, or GPIO30 This pin requires a 5K Ohm pull-up.
GPIO29	62	GPIO29	Bidir	GPIO29
UART_TXD	63	GPIO28	Output	UART Transmit Data (out), or GPIO28
GND	64		GND	Digital ground.
GND	65		GND	Digital ground.
UART_RXD	66	GPIO27	Input	UART Receive Data (in), or GPIO27
nENS	67	GPIO26	Output	Serial EPROM control signal
CLKS	68	GPIO25	Output	Serial EPROM Clock
nDTSRB	69	GPIO24	Output	EPP Data Strobe
nASTRB	70	GPIO23	Output	EPP Address Strobe
nWRITE	71	GPIO22	Output	EPP Write Strobe
P9	72	GPIO21	Output	P Register
P5	73	GPIO20	Output	P Register or PWR_OFF
P4	74	GPIO19	Output	P Register
VDD	75		Power	+3.3 VDC Supply
P3	76	GPIO18	Output	P Register or USB_PU (USB DATA+ pull up)
P2	77	GPIO17	Output	P Register
P1	78	GPIO16	Output	P Register
GND	79		GND	Digital ground.
P6	80	GPIO15	Output	P Register
P7	81	GPIO14	Output	P Register
P8	82	GPIO13	Output	P Register
GPIO12	83	GPIO12	Bidir	GPIO12
DATAS	84	GPIO11	Bidir	DATA Strobe for Serial EPROM
VREQ	85	GPIO10	Input	TBD
WAIT	86	GPIO9	Bidir	EPP WAIT signal
VDD1	87		Power	USB +3.3 VDC Supply.
DATA+	88		Bidir	USB Differential DATA Signal High Side.
DATA-	89		Bidir	USB Differential DATA Signal Low Side.
GND1	90		GND	USB Digital Ground.
INTR	91	GPIO8	Input	EPP INTR pin



SD7	92	GPIO7	Bidir	EPP Data bit 7
SD6	93	GPIO6	Bidir	EPP Data bit 6
SD5	94	GPIO5	Bidir	EPP Data bit 5
SD4	95	GPIO4	Bidir	EPP Data bit 4
SD3	96	GPIO3	Bidir	EPP Data bit 3
SD2	97	GPIO2	Bidir	EPP Data bit 2
SD1	98	GPIO1	Bidir	EPP Data bit 1
SD0	99	GPIO0	Bidir	EPP Data bit 0
VDD	100		Power	+3.3 VDC Supply

## 7.7 Design ATAPI/IDE device behaves like Floppy Disk Drive

This design applies to small and low power consumption ATAPI/IDE devices such as Compact Flash, CLIK, MicroDrives, and Smart Media cards. This is an advantage for users to exchange media cards (i.e. MP3) from the SL11RIDE board without plugging or unplugging the USB cable.

This requires three free GPIO signals:

- GPIO 19-CD\_DET: Card Detect
- GPIO 25-PWC\_RESET: Power Hardware Reset
- GPIO 26-PWC: Power Control

Figure 8: Compact Flash Design Note

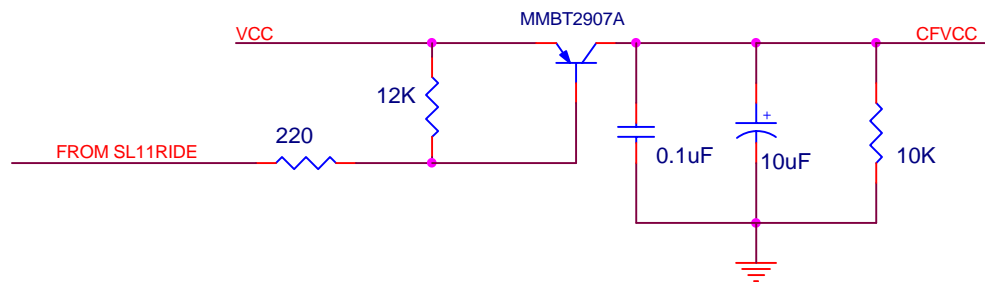


Table 8: Power switch operation

Power switch operation	PWC Signal	PVCC Output
	High	OFF
	Low	ON

Table 9: Compact Flash Design

Name	Description
VCC	+5V from USB Power or external power
R <sub>PU</sub>	10K ohms pull-up resistor
R <sub>PURS</sub>	10K ohms pull-up resistor
R <sub>RS</sub>	1K ohms series resistor (This depends on transistor requirement)
CD_DET	Card detection uses to detect card present or not. It need 10k pull-up to +3.3VDC.
PWC_RESET	Hardware Reset to the card after power on
PWC	Power control use to turn power on/off when the card insert/remove
PVCC	Power supply to Compact Flash. It must provide enough current and voltage to the card.

## 7.8 CPU Speed Control:

**Speed Control Register (0xC008: R/W)**

The Speed Control Register allows the SL11R processor to operate at a number of speed selections. A four-bit divider (SPD3-0 + 1) selects the speed as shown below. Speed will also depend on the clock multiplier. See Configuration Register (0xC006: R/W) for more information.

D15-D4	D3	D2	D1	D0
0	SPD3	SPD2	SPD1	SPD0

D3-D0 SPD3-SPD0 Speed selection bits

SPD3-0	SL11R SPEED
0000	48.00 MHz.
0001	24.00 MHz.
0010	16.00 MHz.
0011	12.00 MHz.
0100	09.60 MHz.
0101	08.00 MHz.
0110	06.86 MHz.
0111	06.00 MHz.
1000	05.33 MHz.
1001	04.80 MHz.
1010	04.36 MHz.
1011	04.00 MHz.
1100	03.69 MHz.
1101	03.42 MHz.
1110	03.20 MHz.
1111	03.00 MHz.

D15-D4 Reserved should be set to all zeros.

**Note:**

Upon reset, the lowest speed is selected for low power operation. The SL11R BIOS will configure the clock to 24MHz as part of its initialization.