REU10B0007-0100

Renesas Demo Kit (RDK) for SH2A-7216

User's Manual

Renesas 32-Bit RISC Microcomputer
SuperH™ RISC engine family

Rev.1.01
Revision date: 15 March 2010

Renesas Technology America, Inc.
www.renesas.com

Disclaimer

By using this Renesas Demo Kit (RDK), the user accepts the following terms. The RDK is not guaranteed to be error free, and the User assumes the entire risk as to the results and performance of the RDK. The RDK is provided by Renesas on an “as is” basis without warranty of any kind whether express or implied, including but not limited to the implied warranties of satisfactory quality, fitness for a particular purpose, title and non-infringement of intellectual property rights with regard to the RDK. Renesas expressly disclaims all such warranties. Renesas or its affiliates shall in no event be liable for any loss of profit, loss of data, loss of contract, loss of business, damage to reputation or goodwill, any economic loss, any reprogramming or recall costs (whether the foregoing losses are direct or indirect) nor shall Renesas or its affiliates be liable for any other direct or indirect special, incidental or consequential damages arising out of or in relation to the use of this RDK, even if Renesas or its affiliates have been advised of the possibility of such damages.

Precautions

This Renesas Demo Kit is only intended for use in a laboratory environment under ambient temperature and humidity conditions. A safe separation distance should be used between this and any sensitive equipment. Its use outside the laboratory, classroom, study area or similar such area invalidates conformity with the protection requirements of the Electromagnetic Compatibility Directive and could lead to prosecution.

The product generates, uses, and can radiate radio frequency energy and may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment causes harmful interference to radio or television reception, which can be determined by turning the equipment off or on, you are encouraged to try to correct the interference by one or more of the following measures:

- Ensure attached cables do not lie across the equipment
- Reorient the receiving antenna
- Increase the distance between the equipment and the receiver
- Connect the equipment into an outlet on a circuit different from that which the receiver is connected
- Power down the equipment when not is use
- Consult the dealer or an experienced radio/TV technician for help NOTE: It is recommended that wherever possible shielded interface cables be used.

The product is potentially susceptible to certain EMC phenomena. To mitigate against them it is recommended that the following measures be undertaken:

- The user is advised that mobile phones should not be used within 10m of the product when in use.
- The user is advised to take ESD precautions when handling the equipment.

The Renesas Demo Kit does not represent an ideal reference design for an end product and does not fulfill the regulatory standards for an end product.

Table of Contents

Chapter 1. Preface

Cautions

This document may be, wholly or partially, subject to change without notice.

All rights reserved. The RDK design, documentation, and demo software are intended to improve understanding and time-to-market for SH7216-based designs. Duplication of the design, documentation, and demonstration software is encouraged.

Trademarks

All brand or product names used in this manual are trademarks or registered trademarks of their respective companies or organizations.

Copyright

© 2010 Renesas Technology America, Inc. All rights reserved.

© 2010 Renesas Technology Corporation. All rights reserved.

© 2010 Renesas Solutions Corporation. All rights reserved.

Website: http://www.renesas.com/

Glossary

ADC	Analog to Digital Converter
CPU	Central Processing Unit
DAC	Digital to Analog Converter
E10A	'E10A for Starter Kits' Debugger
EMC	Electromagnetic compatibility
ESD	Electrostatic Discharge
HEW	High-performance Embedded Workshop
I/O	Input / Output
LCD	Liquid Crystal Display
LED	Light Emitting Diode
MCU	Microcontroller Unit
NC	No Connection
PC	Program Counter
RAM	Random Access Memory
RCAN	Renesas Controller Area Network
ROM	Read-Only Memory
RDK	Renesas Demo Kit
SDRAM	Synchronous Dynamic Random Access Memory

Chapter 2. Purpose

This RDK is an evaluation and demonstration tool for Renesas SH2A and SH2A/7216 microcontrollers. The goal is to provide the user with a powerful debug and demonstration platform targeted at common applications. A set of human/machine interfaces are tightly integrated with the features of the SH2A/7216 and the software demonstration programs providing the user with an accessible platform to rapidly evaluate and customize.

Target Applications and Features:

- Audio
    - Stereo audio driver connected to the PWM interface
    - On-board microphone to demonstrate sampling, FFT/FPU capabilities
    - Volume Control Potentiometer
    - Micro SD card interface for audio files
- Motor Control
    - 3 – Phase motor control algorithm representation with LEDs
    - Motor control algorithm speed variation through volume control potentiometer
- Gaming
    - 3 – Axis Accelerometer
    - User pushbutton switches
    - Develop and submit your sample programs to demonstrate these features to the online community: www.RenesasRulz.com\rdk7216
- Communications
    - 10/100 Ethernet Interface connected to an internal Ethernet MAC
    - USB Interface connected to an internal USB controller
    - RS-232 Interface
    - CAN Interface (Not Loaded)
- User Code and Application Debugging
    - On-board E10A Debugger for high-quality source code debugging
    - User circuit breadboard area

The Renesas RDK user experience is complemented by the online Renesas ecosystem:

- Renesas Interactive: www.RenesasInteractive.com
  - Free Online Learning
  - User submitted training classes available
- Renesas Rulz: www.RenesasRulz.com
  - Online community
  - Online user forums
  - www.RenesasRules.com/rdk7216 - Online support site for this RDK
- University Program: www.RenesasUniversity.com
  - Support for Professors and Students
  - Latest University Kit (QSK) support
- Renesas Microcontroller Samples (America Customers)
  - Free of charge
  - Request directly from www.America.Renesas.com/samples

Chapter 3.Power Supply

3.1. Requirements

This RDK operates from a 5V power supply.

All RDK boards are supplied with an integrated E10A debugger. These boards have an optional center positive supply connector using a 2.1 mm barrel power jack.

Warning

The RDK is neither under nor over voltage protected. Use a center positive supply for this board.

3.2. Power – Up Behavior

When the RDK is purchased the RDK board has the 'Release' or stand-alone code from the Example #4 demonstration code pre-programmed into the Renesas microcontroller. The code excercises the user LEDs, LCD, PWM, ADC, Potentiometer, and Ethernet interfaces. The LCD powers up with the message: "Micrium uCOS-III" message. The last three 8-bit fields (xx:xx:xx) of the MAC address are then displayed. If the Ethernet interface is active, it will receive an IP Address and routing parameters via DHCP. The LCD will display DHCP initial progress and IP connectivity configuration information. The motor control LEDs will be actively cycling through the circle under control of the potentiometer, the tri-color LED will step through all colors, and the LCD displays the target and measured motor control frequency.

3.3. World Wide Kits

The YRDKSH7216W is designed for worldwide operation. The RDK uses a universal input power supply with adapters to accommodate the majority of countries.

Chapter 4. Board Layout

4.1. Component Layout

The following diagram shows top layer component layout of the board.

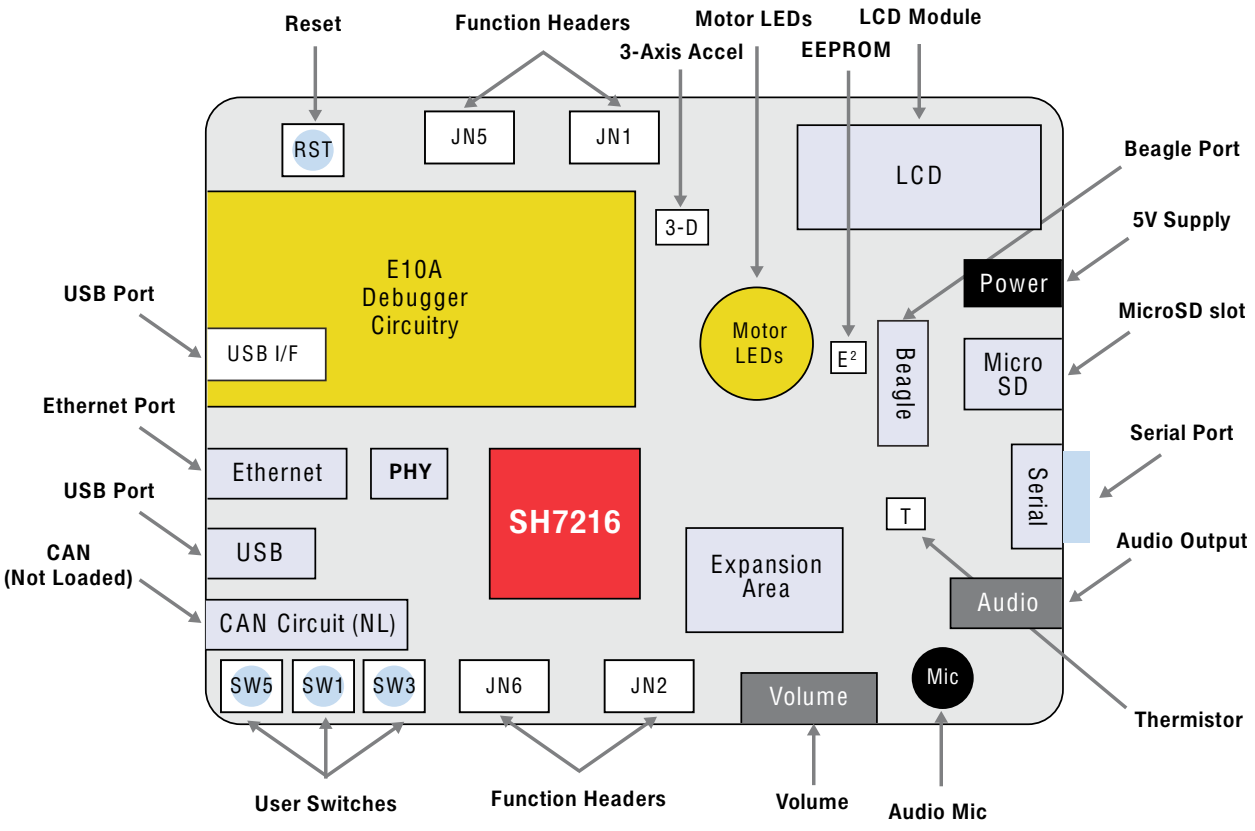


Figure 4-1: Board Layout

4.2. Board Dimensions

The following diagram gives the board dimensions and connector positions. All through hole connectors are on a common 0.1” grid for easy interfacing.

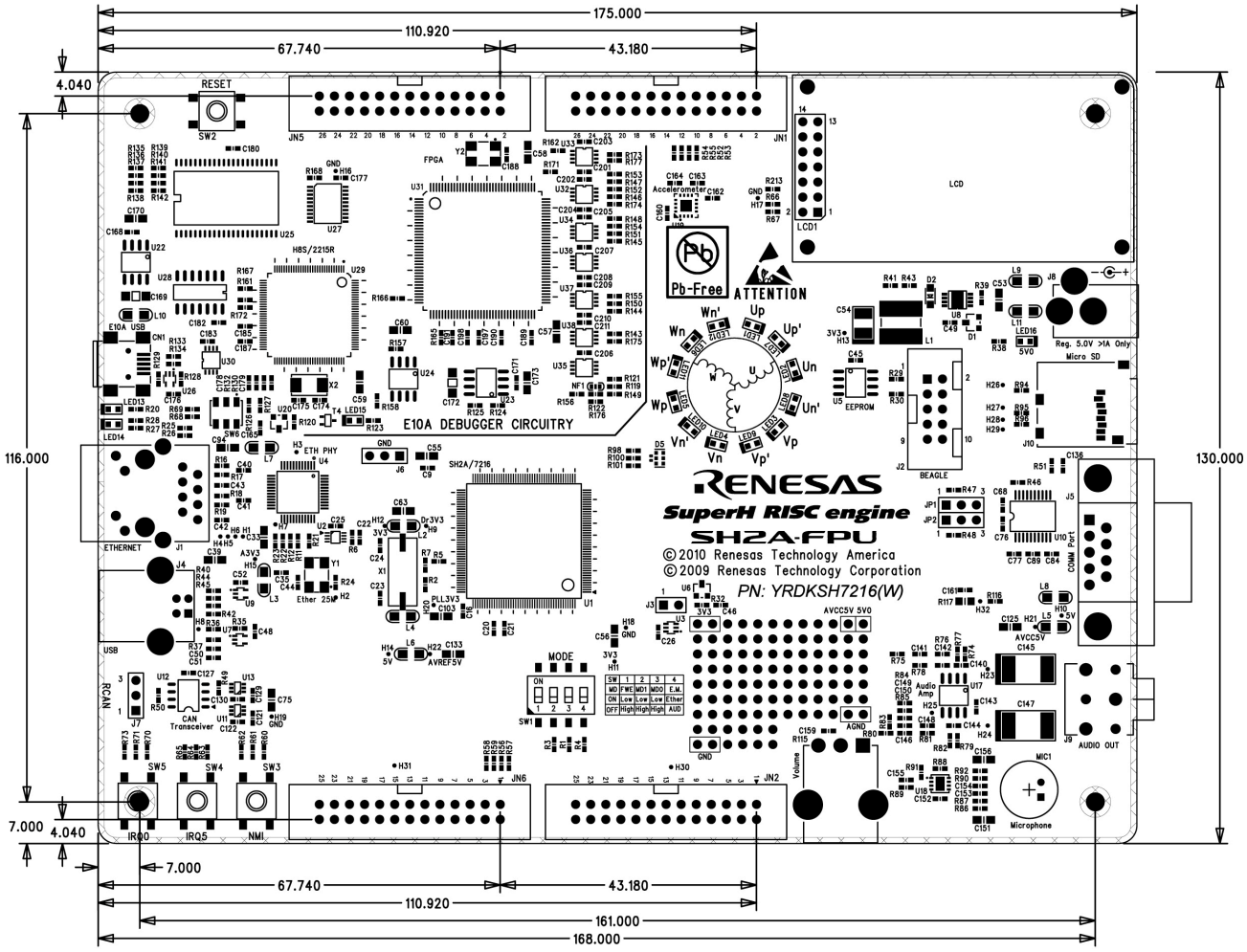


Figure 4-2: Board Dimensions

Chapter 5. Block Diagram

Figure 5-1 shows the CPU board components and their connectivity.

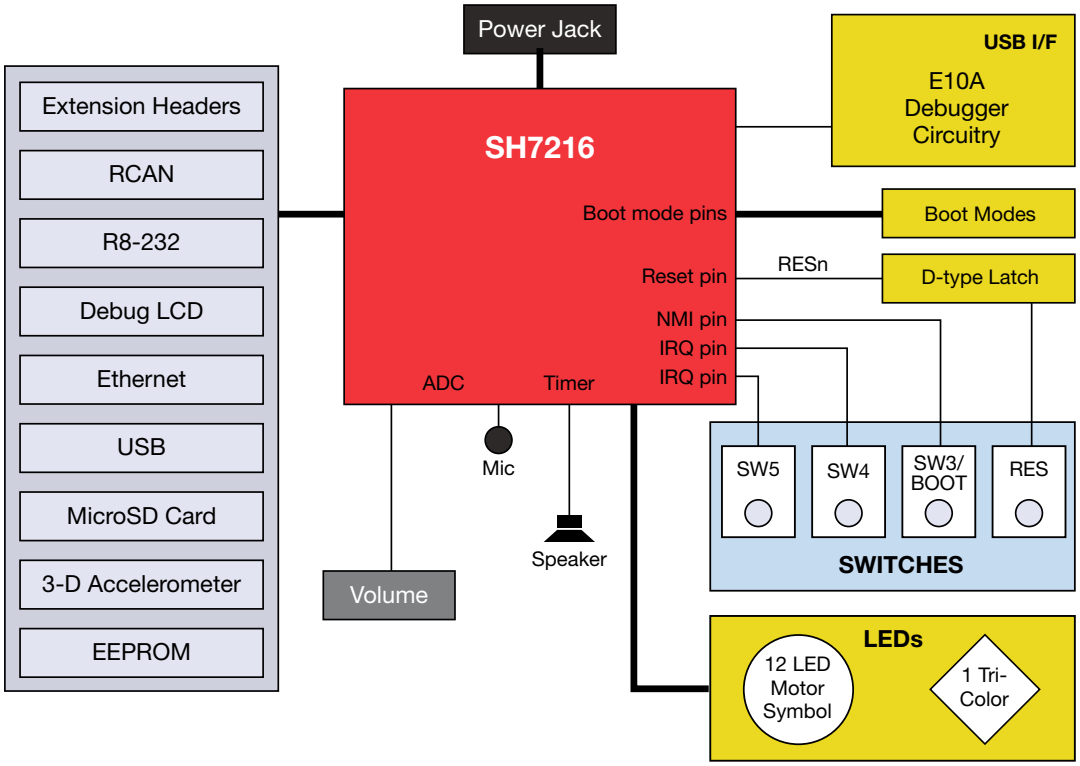


Figure 5-1: Block Diagram

Figure 5-2 shows host PC connection to the RDK board.

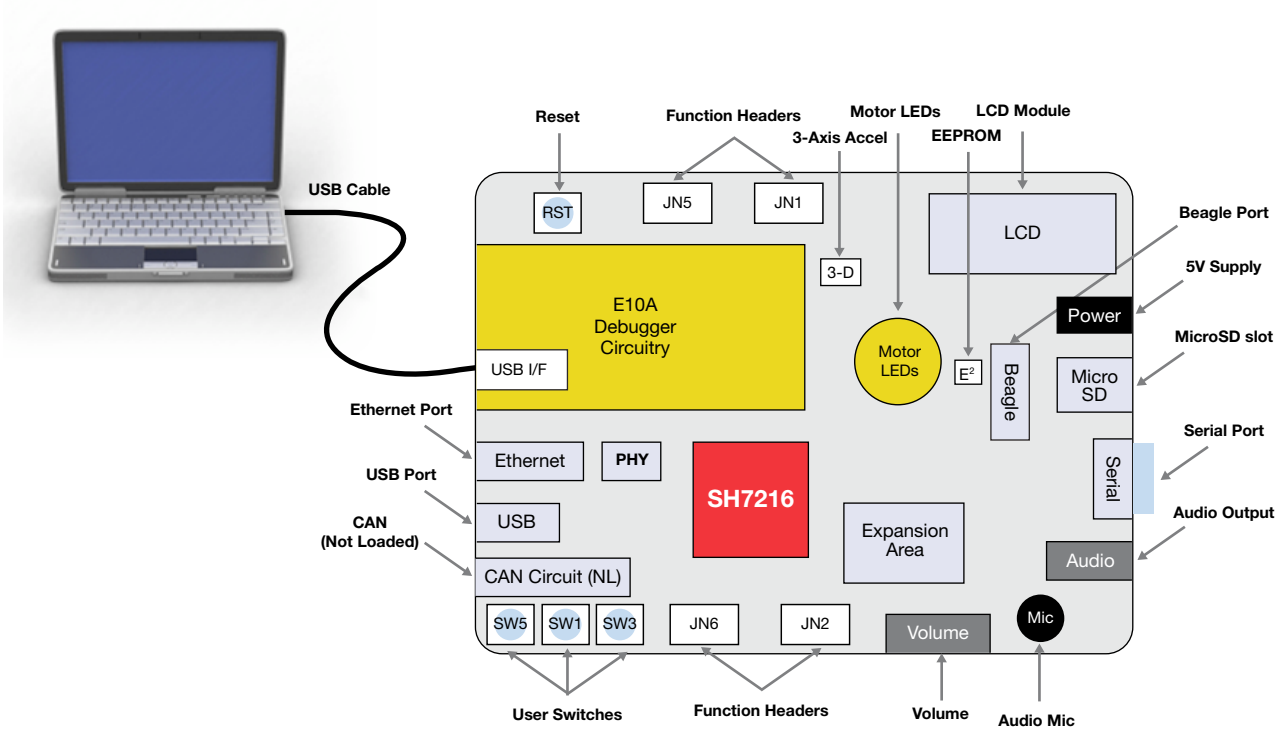


Figure 5-2: RDK Connections

Chapter 6. User Circuitry

6.1. Switches

There are four switches located on the CPU board. The function of each switch and its connection are shown in Table 6-1.

Switch	Function	Microcontroller
SW1	Mode/Debug Switch – Refer to Table 7-1 for details	**See section 7**
SW2 (RESET)	When pressed, the RDK microcontroller is reset.	**RESn**, Pin 133
SW3*	Connects to the Non-Maskable Interrupt (NMI) line.	**NMI**, Pin 123
SW4*	Connects to an IRQ line for user controls.	**IRQ5**, Pin 10 (Port B, pin 5)
SW5*	Connects to an IRQ input for user controls. The switch is also used in conjunction with the RES switch to place the device in BOOT mode when not using the E10A debugger.	**IRQ0**, Pin 77 (Port D pin 16)
SW6	E10A Mode Switch – This switch allows the user to reprogram the firmware for the E10A debugger. In normal mode, the switch should be placed in the direction shown by the arrow on the PCB, away from the board edge. Refer to Chapter 8 for details on reprogramming the E10A.	**N/A**

Table 6-1: Switch Functions

*Refer to schematic for detailed connectivity information.

6.2. Debug LCD Module

A debug LCD module is supplied on the RDK. The debug LCD module uses a 4-bit interface to reduce the pin allocation. No contrast control is provided; this is set by a resistor on the RDK. The module supplied with the RDK only supports 5V operation.

Table 6-2 shows the pin allocation and signal names used on this connector.

LCD1					
Pin	**Circuit Net Name**	**Device Pin**	**Pin**	**Circuit Net Name**	**Device Pin**
1	Ground	-	2	5VCC	-
3	No Connection	-	4	DLCDRS (PB9)	53
5	R/W (Wired to Write only)	-	6	DLCDE + 47k pull down to ground (PB14)	116
7	No Connection	-	8	No connection	-
9	No Connection	-	10	No connection	-
11	DLCDD4 (PE0)	176	12	DLCDD5 (PE1)	1
13	DLCDD6 (PE2)	2	14	DLCDD7 (PE3)	3

Table 6-2: Debug LCD Module Connections

6.3. LEDs

There are 19 LEDs on the RDK board. The green 'POWER' LED (LED16) lights when the board is powered. The E10A Debugger Interface has an LED (LED15) that illuminates when the Debugger USB Interface is connected to a host PC. A tri-color LED (Red/Green/Blue – D5) is provided as are the 12 user LEDs (LED1 – LED12) are connected to an IO port and will light when their corresponding port pin is set low. The 12 user LEDs are arranged to show the winding phases of the motor control circuit. The remaining 4 LEDs (LED13, LED14, and 2 LEDs on the RJ-45) are Ethernet specific, and are not accessed directly from the MCU.

Table 6-3, below, shows the user LED pin references and their corresponding microcontroller port pin connections.

LED Reference (As shown on silkscreen)	Color	Microcontroller Port Pin	Microcontroller Pin Number
LED1 (Up)	Green	PE9	168
LED2 (Un)	Red	PE11	169
LED3 (Vp)	Green	PE12	170
LED4 (Vn)	Red	PE13	171
LED5 (Wp)	Green	PE14	172
LED6 (Wn)	Red	PE15	173
LED7 (Up')	Green	PD10	69
LED8 (Un')	Red	PD11	70
LED9 (Vp')	Green	PD12	71
LED10 (Vn')	Red	PD13	72
LED11 (Wp')	Green	PD14	73
LED12 (Wn')	Red	PD15	74
LED13 (1PPS ENET)	Red	PE9	N/A
LED14 (Speed ENET)	Green (On for 100BT)	PE11	N/A
LED15 (E10A DBG)	Green	PE12	N/A
LED16 (Power)	Green	PE13	N/A
D5 (Tri-Color)	Green	PC10	32
D5 (Tri-Color)	Red	PB3	44
D5 (Tri-Color)	Blue	PB4	45

Table 6-3: LED Port

6.4. EEPROM

An industry standard I²C 24C02 EEPROM is provided for user non-volatile storage.

6.5. MicroSD Memory Card Slot

A MicroSD memory card slot on the RDK is provided for file system data storage.

6.6. Audio (Audio Out, Mic, Volume Potentiometer)

An amplified stereo audio output jack is provided and connected to the timer circuit on channels A17 (Right, Port pin PB1, CPU pin 42) and A18 (Left, Port pin PB2, CPU pin 43) of the microcontroller. An on-board microphone is connected to the ADC channel AN5 (Port pin PF5, CPU pin 147). A single turn potentiometer is connected to the ADC channel AN4 (Port pin PF4, CPU pin 146) of the microcontroller. This may be used to vary the input analogue voltage value to this pin between AVCC and Ground. The potentiometer is used as a volume control in the Demo Application.

Note: The potentiometer is fitted to offer an easy way of supplying a variable analogue input to the controller. It does not necessarily reflect the accuracy of the controllers ADC. Please see the device manual for details.

6.7. Serial port

The Serial module allows the MCU communication to a Host PC through the RS-232 connector, J5 using RS232Rx and RS232Tx. The serial port is configured in DCE mode allowing direct connection to a PC without a Null modem. The serial module can also be used as a serial debug port. To select between these two inputs, the jumpers JP1 and JP2 must be set appropriately (see the table of jumper settings in section 6.9). **Table 6-4** contains details of the specific pin functions and their locations.

Description	Function	MCU Pin	Header Pin
TXD1	Serial Transmission Pin	10	Not Connected
RXD1	Serial Reception Pin	11	JN1, Pin 16

Table 6-4: Serial port pin details

6.8. RCAN (Not loaded)

The RCAN module can be controlled by the MCU through the CTx0 (Port pin PA1) and CRx0 (Port pin PA0) lines, or controlled externally through the header connections CTx0 and CRx0. To select between these two inputs, the jumpers JP4 and JP5 must be set appropriately (see the table of jumper settings in section 6.9). The **Table 6-5** contains details of the specific pin functions and their locations.

Description	Function	MCU Pin	Header Pin
CTx0	RCAN Transmission Pin	158 (Not Connected)	JN6, Pin 5
CRx0	RCAN Reception Pin	157 (Not Connected)	JN6, Pin 6

Table 6-5: RCAN port pin details

6.9. USB

The USB function module can be used for USB communication with host.

Table 6-6 contains details of the signal descriptions and pin connections.

Description	Function	Microcontroller Pin Number
VBUS	USB cable connection monitor pin	118
USD+	USB data I/O pin	113
USD-	USB data I/O pin	114
DRVcc	Power supply pin for USB built-in transceiver	112
DRVss	Ground pin for USB built-in transceiver	115
PUPD	Pull-up control pin	117
USBXTAL	USB clock pin	107 (N/C)
USBEXTAL	USB clock pin	109

Table 6-6: USB module settings

6.10. Ethernet

The Ethernet module conforms to the Ethernet or IEEE802.3 media access control (MAC) standard. Ethernet controller is connected to the direct memory access controller for Ethernet controller (E-DMAC) and carries out high-speed data transfer to and from the memory. In addition, Ethernet controller is connected to DP83640 physical receiver chip enabling it to perform transmission and reception of Ethernet frames.

The Ethernet PHY is configured at power-on reset for Auto-Negotiation, advertising 10Base-T and 100Base-TX in both full and half-duplex modes. Each unit is pre-programmed with a unique IEEE assigned MAC address ranging from 00:30:55:07:00:01 to 00:30:55:07:FF:FF. If there is a problem with the pre-programmed MAC address, the demonstration code will default to 00:30:55:07:00:00. The MAC address is programmed into location 0x80107FF8. All demonstration programs display the last three 8-bit fields on the LCD at startup for verification purposes.

Table 6-7 contains details of the signal descriptions and pin connections. All connections to the MCU are direct.

Net Name	Function	MCU Pin Number
TX_CLK	Transmit/Receive Clock	97
TX_EN	Transmit Enable	98
MII_TXD0	Transmit Data, Bit 1	99
MII_TXD1	Transmit Data, Bit 2	100
MII_TXD2	Transmit Data, Bit 3	101
MII_TXD3	Transmit Data, Bit 4	102
RX_DV	Receive Data Valid	94
RX_ER	Receive Error	93
MII_RXD0	Receive Data, Bit 1	89
MII_RXD1	Receive Data, Bit 2	90
MII_RXD2	Receive Data, Bit 3	91
MII_RXD3	Receive Data, Bit 4	92
CRS	Carrier Sense	87
COL	Collision Detection	84
MDC	Management Data Clock	81
MDIO	Management data I/O	79
PB11	IEEE1588 signaling pin	55

Table 6-7: Ethernet module pins

The National Semiconductor 10/100 DP83640 Precision PHYTER® Ethernet PHY supports the IEEE1588 Precision Time Protocol (PTP) providing precision clock synchronization for real-time industrial connectivity. The RDK includes a GPIO/Interrupt connection between the PHY and the SH7216 for PTP event processing, and a direct LED connection for timing indications. The DP83640 captures a time stamp at the physical layer level with an accuracy of <10ns.

Figure 12-1 provides an overview of the DP83640.

6.11. 3 – Axis Accelerometer

The RDK board includes an Analog Devices ADXL335 3 – axis accelerometer for use in industrial control and gaming applications. The X-Axis is connected to ADC channel AN0 (Port pin PF0, CPU pin 138). The Y-Axis is connected to ADC channel AN1 (Port pin PF1, CPU pin 139). The Z-Axis is connected to ADC channel AN2 (Port pin PF2, CPU pin 140).

Figure 12-2 provides an overview of the ADXL335.

©National Semiconductor Corporation, March 2010 National and PHYTER are registered trademarks of National Semiconductor. All other products are trademarks of their respective holders. All rights reserved.

6.12.Thermistor

A thermistor for monitoring PC board temperature is available on the RDK. The thermistor is connected to ADC channel AN3 (Port pin PF3, CPU pin 141).

6.13. Option Links and Jumper Settings

Table 6-8 to Table 6-11 below describes the function of the various option links contained on this RDK board. The default configuration is indicated by **BOLD** text.

Interrupt Configuration Options				
Reference	**Function**	**Fitted**	**Alternative (Removed)**	**Related To**
R61	Interrupt Configuration	Connects the NMI pin of the MCU to the header pin JN2-3	**Disconnects the NMI pin of the MCU from the header pin JN2-3**	-
R64	Interrupt Configuration	Connects the IRQ0 pin of the MCU to the header pin JN2-7	**Disconnects the IRQ0 pin of the MCU from the header pin JN2-7**	-
R71	Interrupt Configuration	Connects the IRQ6 pin of the MCU to the header pin JN6-7	**Disconnects the IRQ6 pin of the MCU from the header pin JN6-7**	-

Table 6-8: Interrupt Configuration Options

Clock Configuration Options				
N/A	MCU Clock Configuration	Connects MCU clock pin EXTAL to the header pin JN2-2	**Disconnects MCU clock pin EXTAL from the header pin JN2-2**	R5
R5	MCU Clock Configuration	**Connects EXTAL clock pin of the MCU to the on board crystal X1**	Disconnects EXTAL clock pin of the MCU from the on board crystal X1	R4

Table 6-9: Clock Configuration Options

Ethernet Configuration Options				
Reference	**Function**	**Fitted**	**Alternative (Removed)**	**Related To**
R15	Ethernet Configuration	LED Configuration – Link/Activity (J1.L), Speed (LED14), Collision (J1.R)	**LED Configuration – Link (J1.L), Speed (LED14), Activity (J1.R)**	-

Table 6-10: Ethernet Configuration Options

Table 6-11 below describes the function of the jumper headers.

Jumper Settings				
Reference	**Function**	**Position 1**	**Position 2**	**Notes**
JP1	RS232	**Jumper across pins 1 and 2. Connects the MCU RS232 Tx line to the RS232 controller.**	Jumper across pins 2 and 3. Connects the MCU SCI Tx port to the RS232 controller for SCI boot mode.	Position 1 is defaulted via a copper trace on the PCB. To make this selectable, this trace must be cut.
JP2	RS232	**Jumper across pins 1 and 2. Connects the MCU RS232 Rx line to the RS232 controller.**	Jumper across pins 2 and 3. Connects the MCU SCI Rx port to the RS232 controller for SCI boot mode.	Position 1 is defaulted via a copper trace on the PCB. To make this selectable, this trace must be cut.
J3 (Not Loaded)	Watchdog	Jumper across pins 1 and 2. Connects the watchdog overflow pin to the reset circuit.	**No jumper isolates the watchdog overflow from the external reset.**	This header is not loaded on the board.

Table 6-11: Jumper header settings

6.14. Oscillator Sources

A crystal oscillator is fitted on the RDK and used to supply the main clock input to the Renesas microcontroller. **Table 6-12** details the oscillators that are fitted and alternative footprints provided on this RDK:

Component	Function	Frequency
Crystal (X1)	CPU/USB Clock	12 MHz
Crystal (X2)	E10A Processor	16 MHz
Oscillator (Y1)	Ethernet Clock	25 MHz
Oscillator (Y2)	E10A System	40 MHz

Table 6-12: Oscillators / Resonators

6.15. Reset Circuit

The CPU Board includes a Reset IC M51957 (U6) to meet the minimum reset period of the MCU. Please refer to the hardware manual for more information on the requirements of the reset circuit. Please check the reset requirements carefully to ensure the reset circuit on the user's board meets all the reset timing requirements.

6.16. Total Phase Beagle Debug Header

The Beagle I2C/SPI Protocol Analyzer is a non-intrusive USB-based bus monitor that can capture, display, and filter I2C and SPI data as it appears on the bus. Using both the Data Center Software and Beagle analyzer, users can easily view I2C bus traffic (up to 4 MHz) and SPI bus traffic (up to 24 Mhz) in real time. Additional functionality allows engineers to filter data against a wide variety of parameters, or instantly search for specific hexadecimal or ASCII data patterns during a live capture. The Beagle analyzer is fully supported on Windows, Linux, and Mac OS X, and comes with free software, free APIs, free technical support, and free software/firmware upgrades.

Total Phase manufactures powerful and affordable USB, I2C, SPI, and CAN tools for embedded systems engineers. The complete line of Total Phase host adapters and protocol analyzers are the development and debugging tools of choice for Fortune 500 companies, small businesses, and research institutions all over the world.

For more technical information, online demos, and ordering information, visit www.totalphase.com.

Chapter 7. Modes

This RDK supports all modes except Modes 0 and 1. The most commonly used modes are Single Chip Mode (Mode 3), USB Boot Mode (Mode 7), and SC (Single Chip) User Program Mode (Mode 7). The modes are selected using SW1. FWE (Flash Write Enable) select is located on switch 1, MD0 is located on switch 2, and MD1 is located on switch 3. Placing the switch in the 'On' position sets the value to a logic '0', and the 'Off' position sets the value to a logic '1'. The base configurations should only be set when the RDK is powered off. Toggling the FWE from ON to OFF when the RDK is powered on will cause the 7216 to enter the single chip User Program Mode. The details of programming the FLASH memory are described in the SH7216 Group Hardware Manual.

Mode No.	FWE (1)	MD0 (2)	MD1 (3)	Mode Name	On-Chip ROM	Bus Width of CS0 Space
Mode 0	0 (ON)	0 (ON)	0 (ON)	MCU Extension Mode 0	Not Active	32
Mode 1	0 (ON)	0 (ON)	1 (OFF)	MCU Extension Mode 1	Not Active	16
Mode 2	0 (ON)	1 (OFF)	0 (ON)	MCU Extension Mode 2	Active	Set by CS0BCR in BSC
Mode 3	**0 (ON)**	**1 (OFF)**	**1 (OFF)**	**Single Chip Mode**	**Active**	**---**
Mode 4*1	1 (OFF)	0 (ON)	0 (ON)	Boot Mode	Active	Set by CS0BCR in BSC
Mode 5*1	1 (OFF)	0 (ON)	1 (OFF)	User Boot Mode	Active	Set by CS0BCR in BSC
Mode 6*1	1 (OFF)	1 (OFF)	0 (ON)	User Program Mode	Active	Set by CS0BCR in BSC
Mode 7*1*2	1 (OFF)	1 (OFF)	1 (OFF)	USB Boot Mode	Active	---
Mode 7*1*3	1 (OFF)	1 (OFF)	1 (OFF)	SC User Program Mode	Active	---

Table 7-1: MCU Operating Modes Table

*1 Flash memory programming mode

*2 FWE = 1 at power-on reset.

*3 FWE = 0 (ON) at power-on reset, toggled to FWE = 1 (OFF) in Single Chip Mode will cause a transition to the User Program Mode.

The RDK can also be placed into either Debug Mode or Run Mode via switch 4 on SW1. Placing the switch in the 'OFF' position selects Debug mode, the 'ON' position selects the default Run mode.

Debug Mode	DEBUG (4)
Debug	0 (ON)
Run (Default)	**1 (OFF)**

Table 7-2: Debug Mode Selection Table

Chapter 8. Programming Methods

The RDK board is intended for use with HEW and includes an integrated E10A debugger. Refer to SH7216 Group Hardware Manual for details of programming the microcontroller without using these tools. The on-board E10A debugger is pre-programmed at the factory and configured for normal operation. The debugger can be placed into flash programming mode (this is used during manufacturing) by sliding SW6 away from pin 1 (Dot) – toward the edge of the board. For Normal E10A operation, SW6 should be positioned to the pin 1 (Dot) side – toward the inside of the board, in the direction of the arrow.

Should the E10A debugger become inoperable, it can be reprogrammed using the 'Setup Tool for E10A-USB Emulator' that is installed as part of the E10A HEW tools. Run the program that is located in the Renesas/HEW folder; slide SW6 to the program position, toward the edge of the board, in the opposite direction of the arrow when prompted to put the switch SW1 in the '1' position. The program will allow reconfiguration of the E10A firmware for SH-2A family processors, including the SH2A7216.

Chapter 9. Headers

9.1. Extension Headers

Table 9-1 to **Table 9-4** show the microcontroller pin headers and their corresponding microcontroller connections. The header pins connect directly to the microcontroller pin.

JN1 Extension Header					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	5VCC	-	2	Ground	-
3	3VCC	-	4	Ground	-
5	AVCC	142, 145	6	AGND	137, 150
7	AVREF	143, 144	8	PD17	78
9	AN0	138	10	AN1	139
11	AN2	140	12	AN3	141
13	NC	-	14	NC	-
15	PB9	53	16	RXD1	11
17	PE1	1	18	PE2	2
19	PE3	3	20	PA6	103
21	PD22	83	22	PDX21	82
23	NC	-	24	NC	-
25	SDA	111	26	SCL	110

Table 9-1: JN1 Extension Header

JN2 Extension Header					
Pin	**Circuit Net Name**	**MCU Pin**	**Pin**	**Circuit Net Name**	**MCU Pin**
1	RESET#	133*1	2	EXTAL	121
3	NMIIN	-	4	Ground	-
5	WDTOVF#	154*2	6	TXD0	99
7	IRQ0IN	-	8	RXD0	98
9	SCK	162	10	PB8	52
11	SD-CS	167	12	MTU2	166
13	LED1	168	14	LED2	169
15	LED3	170	16	LED4	172
17	LED5	171	18	LED6	173
19	PE4	4	20	PE5	5
21	PWMLP-OUT	6	22	PE7	165
23	SD2	59	24	SA0	21
25	SD3	60	26	SD4	61

Table 9-2: JN2 Extension Header

*1 The RESET# signal connects to the MCU via the two NOT gates U2A and U2B

*2 The WDTOVF# signal connects to the MCU via a the U3A buffer

JN5 Extension Header					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	PB8	52	2	PB9	53
3	PB7	48	4	NC	-
5	NC	-	6	NC	-
7	NC	-	8	MOSI	102*1
9	MISO	101*1	10	NC	-
11	NC	-	12	NC	-
13	NC	-	14	PE0	176
15	PB14	116	16	PB15/IRQ7	117
17	NC	-	18	NC	-
19	MD0	152	20	MD1	153
21	FWE	134	22	NC	-
23	NC	-	24	Ground	-
25	NC	-	26	NC	-

Table 9-3: JN5 Extension Header

JN6 Extension Header					
Pin	Circuit Net Name	MCU Pin	Pin	Circuit Net Name	MCU Pin
1	AN4	146	2	AN5	147
3	AN6	148	4	PWMLP-IN	149
5	CTx0	-	6	CRx0	-
7	IRQ5IN	10	8	SD5	62
9	SD6	63	10	SD7	64
11	PD17	78	12	AUD_R	42
13	AUD_L	43	14	LED-TRI-RED	44
15	MTU2S	67	16	SD9	68
17	PB7	48	18	PA2	159
19	LED7	69	20	LED8	70
21	LED9	71	22	LED10	73
23	LED11	72	24	LED12	74
25	NC	-	26	NC	-

Table 9-4: JN6 Extension Header

Chapter 10. Code Development

10.1. Overview

Note: For all code debugging using Renesas software tools, the CPU board must be connected to a PC USB port via the on-board E10A Debugger.

Due to the continuous process of improvements undertaken by Renesas the user is recommended to review the information provided on the Renesas website at www.renesas.com to check for the latest updates to the Compiler and Debugger manuals.

10.2. Compiler Restrictions

The compiler supplied with this RDK is fully functional for a period of 60 days from first use. After the first 60 days of use have expired, the compiler will default to a maximum of 256k code and data. To use the compiler with programs greater than this size you will need to purchase the full version tools from your Renesas distributor

Warning: The protection software for the compiler will detect changes to the system clock. Changes to the system clock back in time may cause the trial period to expire prematurely.

10.3. Breakpoint Support

Limited Event Conditions can be located in ROM code, which is directly supported by E10A emulator. To enable breakpoints in RAM following command needs to be included in the script –

> SH2A_SBSTK enable

For more information on this, please refer to the *SuperH™ Family E10A-USB Emulator Additional Document for User's Manual* for SH7216.

10.4. Memory Map

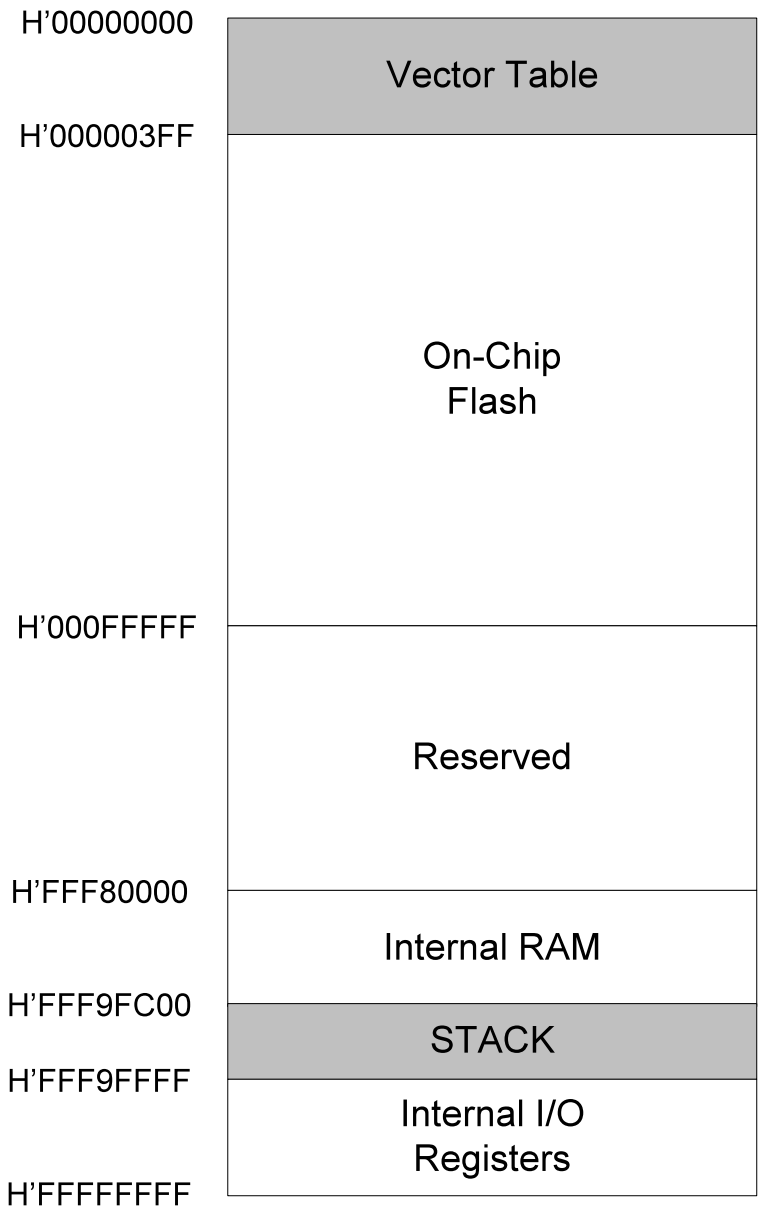


Figure 10-1: Memory Map

Chapter 11. Component Placement

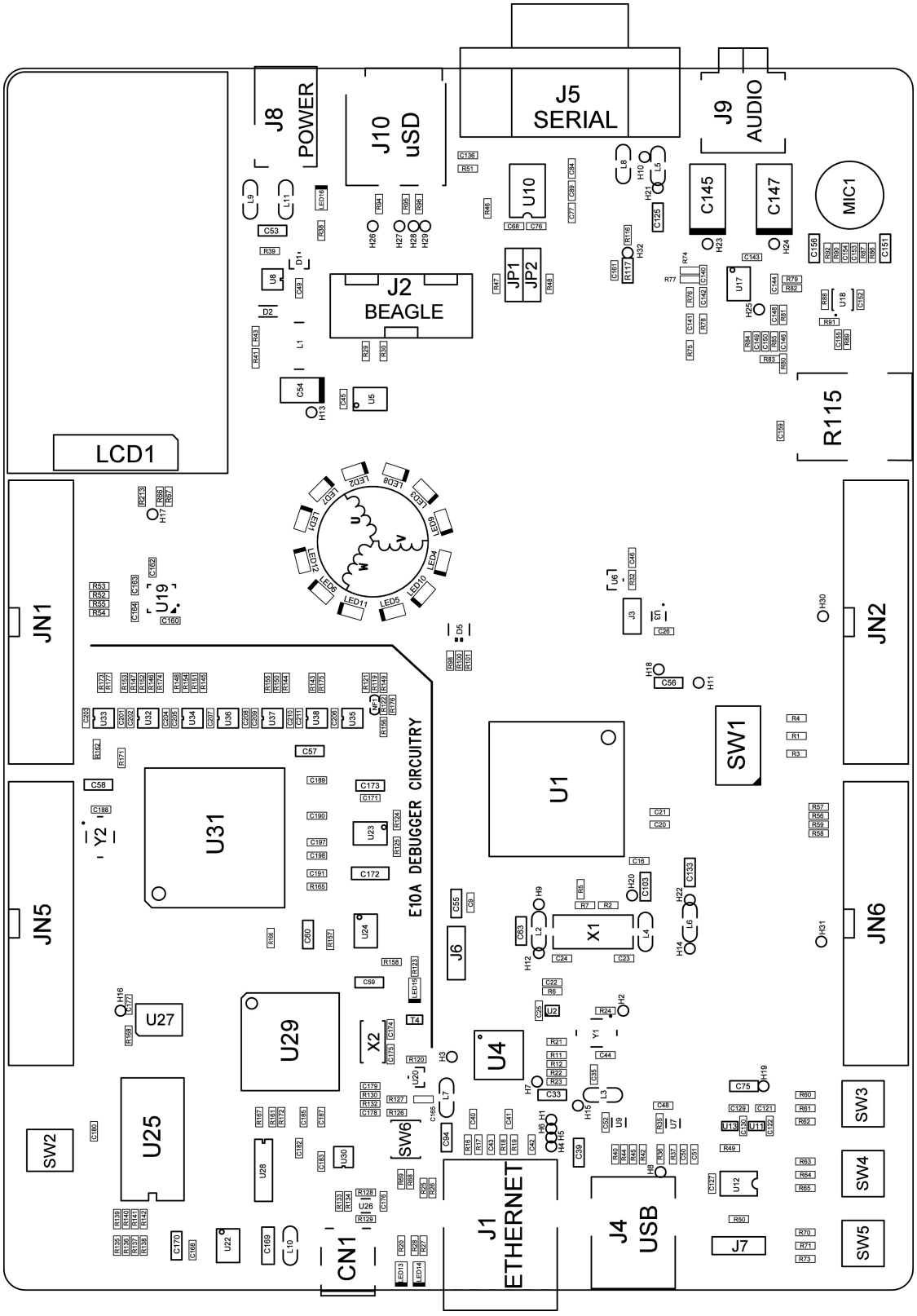


Figure 11-1: Component Placement – Front view

Chapter 12. Additional Information

12.1. Hardware Partner Information

Hardware partners played an integral role in the definition, development, and deployment of this RDK. Without their numerous contributions, this project would not have been possible. Two partners were previously identified in their respective sections, National Semiconductor for the DP83640 Precision PHYTER - IEEE1588 Precision Time Protocol Ethernet transceiver, and Analog Devices for the ADXL335 3-Axis Accelerometer. Altera is the programmable logic partner for this RDK, enabling the on-board E10A debugger through the use of the ACEX 1K EP1K30 PLD. Future Designs, Inc. provided the hardware customization, schematic capture, PCB design and layout, manufacturing, and Supply Chain Management services for this RDK. For more information or to contact our partners please refer to their websites:

- National Semiconductor – http://www.national.com
- Analog Devices – http://www.analog.com
- Altera – http://www.altera.com
- Future Designs – http://www.teamfdi.com

PowerWise

The Ultimate Precision in real-time Ethernet

DP83640 Precision PHYTER®

The IEEE 1588 Precision Time Protocol (PTP) is an important improvement to Ethernet systems that provides precise time synchronization for applications such as test and measurement, factory automation, and telecommunications. National Semiconductor's DP83640 Precision PHYTER transceiver is the industry's first to add the IEEE 1588 PTP functionality to a fully-featured, 10/100 Mbps Ethernet PHY. Both new designs and product updates are greatly simplified as custom FPGA or specialty microcontrollers are not required.

✔ IEEE 1588 V2 compliant
✔ Sub 10 ns accuracy
✔ High 8 kV ESD protection

Features

- 10/100 Mbps Ethernet PHY with IEEE 802.3u 100 BASE-FX fiber support
- IEEE 1588 Precision Time Protocol Support for V1 and V2
- Timestamp resolution of 8 ns at the PHY allows sub 10 ns synchronization to reference
- 12 IEEE 1588 GPIOs for multiple trigger or real-time event capture
- Outputs a phase-aligned, synchronized clock signal at selectable frequencies
- ESD protection – 8 kV human body model

National Semiconductor

© National Semiconductor Corporation, January 2010. National and N are registered trademarks of National Semiconductor. All other product names are trademarks or registered trademarks of their respective holders. All rights reserved.

Figure 12-1 National Semiconductor DP83640

Analog Devices ushers in a new era of motion sensing capabilities

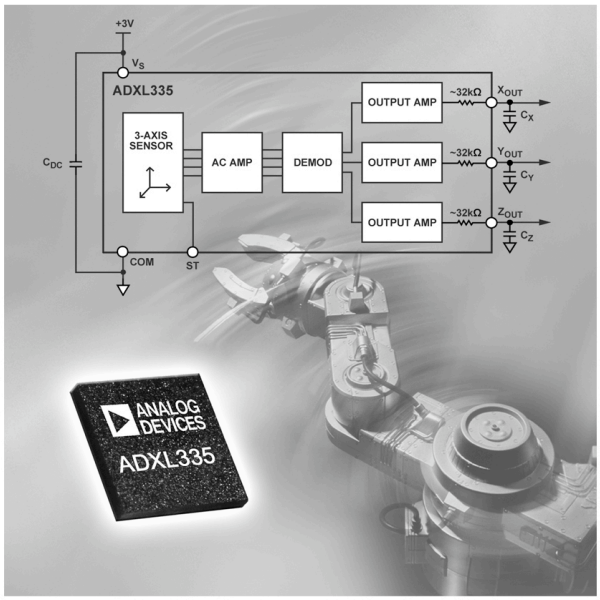
Features:

- 3-axis sensing with analog output
- Small, low profile package
- 4 mm × 4 mm × 1.45 mm LFCSP
- Low power : 350 µA (typical)
- Single-supply operation: 1.8 V to 3.6 V
- 10,000 g shock survival
- Excellent temperature stability
- BW adjustment with a single capacitor per axis
- RoHS/WEEE lead-free compliant

Applications:

- Cost sensitive, low power, motion- and tilt-sensing applications
- Industrial equipment
- Portable instrumentation
- Safety and security
- Navigational assistance
- Sports and health devices

About Analog Devices:
Innovation, performance, and excellence are the cultural pillars on which Analog Devices has built one of the longest standing, highest growth companies within the technology sector. Acknowledged industry-wide as the world leader in data conversion and signal conditioning technology, as well as a pioneer in MEMS technology, Analog Devices serves over 60,000 customers, representing virtually all types of electronic equipment.



Imagination is the only limit

With over twenty years of MEMS technology expertise, ADI continues to demonstrate its leadership and commitment to delivering the most innovative and feature rich products to market first. ADI's latest accelerometer represents a significant milestone for customers interested in employing motion sensing technology but always found it out of reach due to system complexity or cost. The ADXL335's high sensitivity, small size, low cost, rugged packaging, and ability to measure both static and dynamic acceleration forces have enabled many new and unexpected applications. With the new capability of the ADXL335, it would appear that the only design limitation is that of the design engineers own imagination. Designers, start your imagination!

MAKEADIFFERENCE

www.analog.com/mems

ANALOG DEVICES

Figure 12-2 Analog Devices ADXL335

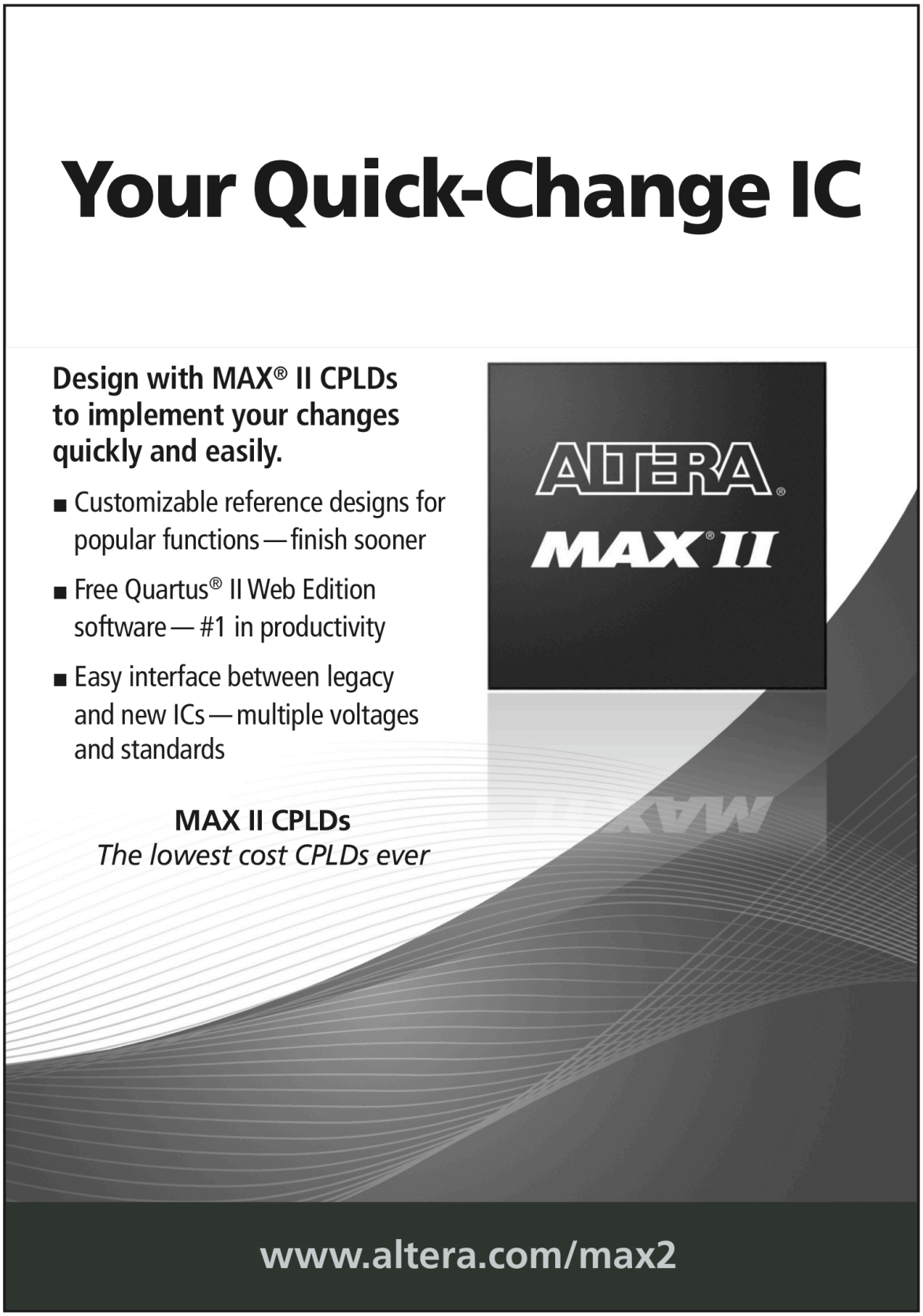


Figure 12-3 Altera Max2 PLD

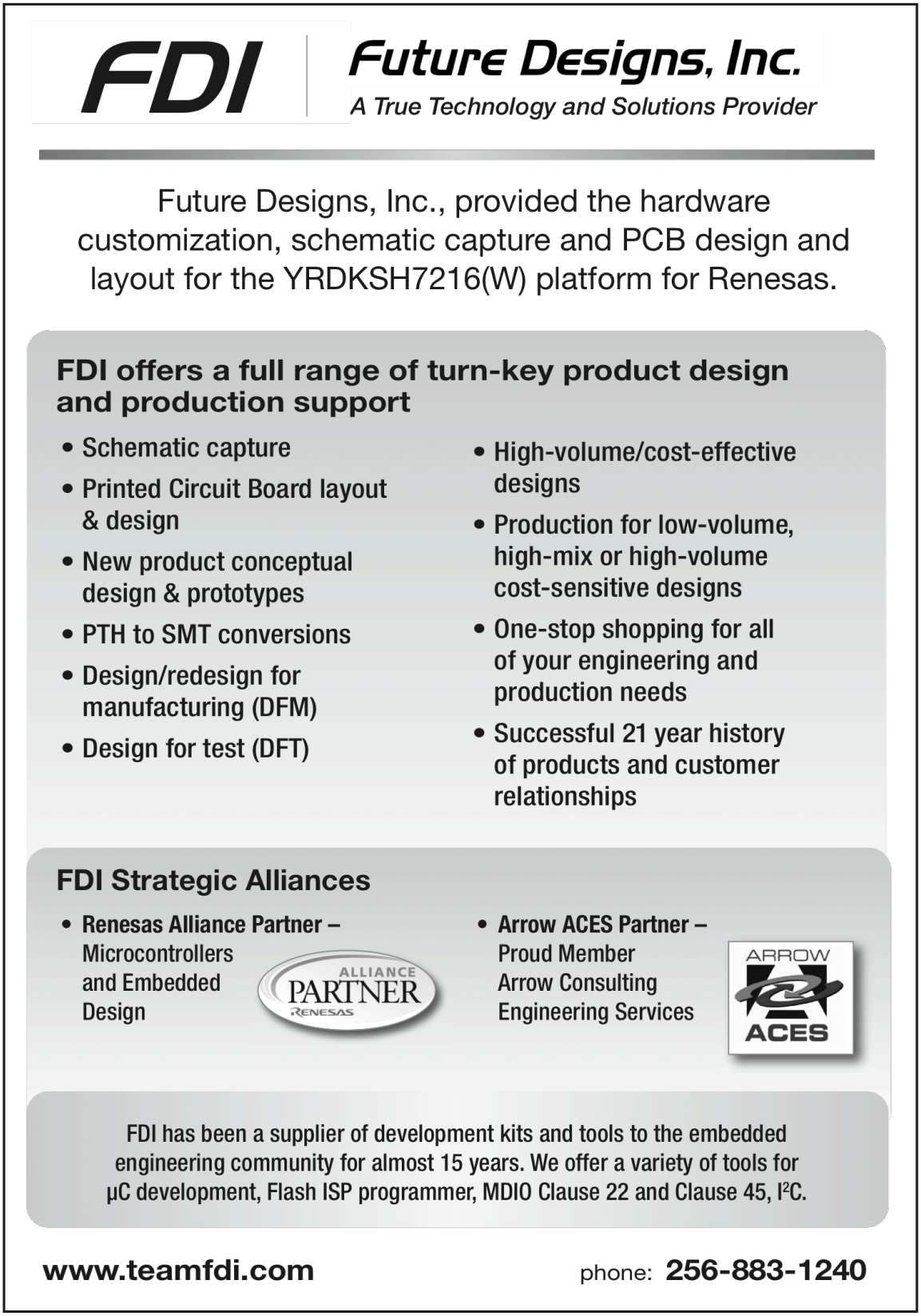


Figure 12-4 Future Designs, Inc

12.2. Renesas Contact Information

For details on how to use High-performance Embedded Workshop (HEW), refer to the HEW manual available on the web site.

For information about the SH7216 series microcontrollers refer to the SH7216 Group hardware manual.

For information about the SH7216 assembly language, refer to the SuperH Series Software Manual.

Online technical support and information is available at: http://www.renesas.com/renesas_starter_kits

Technical Contact Details

America: techsupport.rta@renesas.com
Europe: tools.support.eu@renesas.com
Japan: csc@renesas.com

General information on Renesas Microcontrollers can be found on the Renesas website at: http://www.renesas.com/

Renesas Demo Kit (RDK) for SH2A-7216

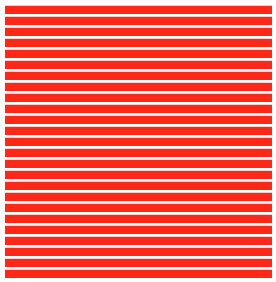
User's Manual

Publication Date: Rev.1.01 15 March 2010

Published by: **Renesas Technology America, Inc**.
450 Holger Way
San Jose, CA 95134-1368, U.S.A

©2010 Renesas Technology America and Renesas Solutions Corp., All Rights Reserved.

Renesas Demo Kit+ for SH7216
User's Manual



Renesas Technology America, Inc.
450 Holger Way
San Jose, CA 95134-1368, U.S.A