Bluetooth Class 1 OEM Module

Parani-BCD100

Product Datasheet

Version 1.0.5.2
February 1, 2017

Sena Technologies, Inc.

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Notice to Users

When a system failure may cause serious consequences, protecting life and property against such consequences with a backup system or safety device is essential. The user agrees that protection against consequences resulting from system failure is the user's responsibility.

This device is not approved for life-support or medical systems.

Changes or modifications to this device not explicitly approved by Sena Technologies will void the user's authority to operate this device.

Precautions and Safety

Do not drop or subject the device to impact. Damage to your products may result from improper use.

Keep away from harsh environments including humid, dusty, and smoky areas. Damage to your products may result from improper use.

Do not use excessive force on the buttons or attempt to disassemble the device. Damage to your products may result from improper use.

Do not place heavy objects on the product. Damage to your products may result from improper use.

Contact Information

Technical support email: support@ParaniSerial.com

Company website: http://www.ParaniSerial.com

Contents

1. General

The Parani-BCD100 is a Bluetooth Class 1 OEM module for OEM manufacturers who want to implement Bluetooth Class 1 functionality with their products cost effectively and also in timely manner. Users can build their own antenna circuit around the BCD100 to lower the overall cost while benefit from the BCD100's field-proven standard SPP (Serial Port Profile) firmware provided with no additional cost.

The BCD100 supports Class 1 Bluetooth transmission level for longer communication distance typically ranges from 100 m up to 1 km. The BCD100 supports UART, USB, I2C, PCM, PIO interfaces for the communication with the OEM products.

The BCD100 is provided with Bluetooth v2.0 compatible firmware runs internally for SPP (Serial Port Profile) applications by default. The SPP firmware supports up to 4 simultaneous multiple connections and is designed to work out-of-box for real world SPP applications such as POS (Point-of-sales), industrial automation, remote metering and other various applications. Optionally, the BCD100 can be supplied with only software stack up to HCI level so entire Bluetooth stack runs on the host side for the application such as USB dongles for computers, or OEM manufacturers can even develop and embed their own firmware into the BCD100.

The BCD100 is fully qualified with Bluetooth v.2.0+EDR specification so OEM manufacturers can save cost and time for overall OEM product certifications, which makes the BCD100 ideal solution for larger volume and cost sensitive applications.

1.1 Features
- Bluetooth Class 1
- Fully qualified with Bluetooth v2.0 + EDR specification
- Transmit Power: +18dBm Typical
- Receive sensitivity: -90dBm (0.1% BER)
- Size: 27.1 x 14.8 x 2.4mm with shield can
- Extended operating temperature range: -40˚C ~ +85˚C
- Integrated 8Mbit Flash Memory
- USB, Dual UART, I2C, PCM, PIO interfaces
- 802.11 co-existence
- Field-proven SPP (Serial Port Profile) firmware supporting up to 4 simultaneous multiple connections
- RoHS Compliant

1.2 Applications
- High-speed data transceiver systems for long distance communication
- PCs/Personal Digital Assistants (PDA)
- Bluetooth USB dongle
- Bluetooth serial dongle
- Bluetooth access points
- Industrial automation devices
- Remote metering devices
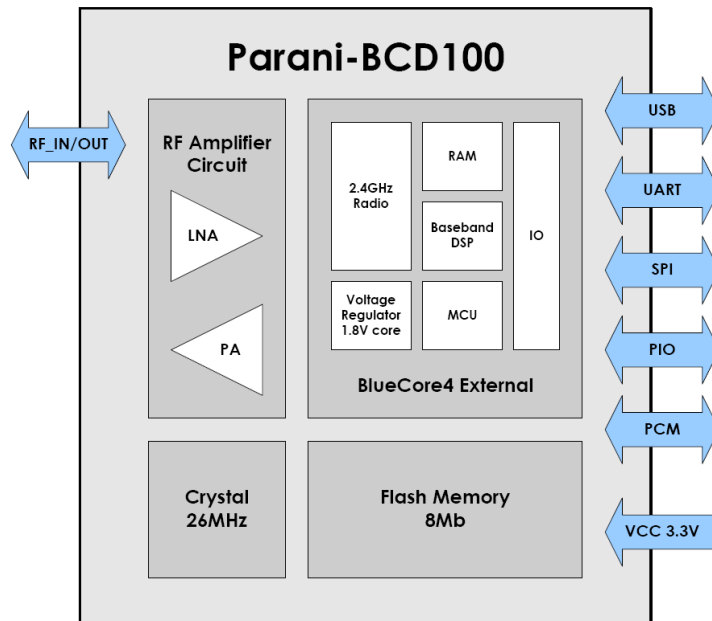- POS (Point-of-sales) devices

1.3 Device Diagram

Figure 1-1 Device Diagram

1.4 Pin Diagram

	NAME	DEFINE (ESD1XXV2)
1	GND	GND
2	GND	GND
3	PVCC	PVCC (+3.3V)
4	AIO_0	F/C_CTRL
5	AIO_1	PAIRING MODE
6	UART_RTS	UART_RTS
7	UART_RXD	UART_RXD
8	UART_TXD	UART_TXD
9	UART_CTS	UART_CTS
10	USB_DN	
11	USB_DP	
12	PCM_IN	
13	PCM_SYNC	
14	PCM_CLK	
15	PCM_OUT	
16	+3V3	+3V3
17	GND	GND
18	RESETB	RESETB
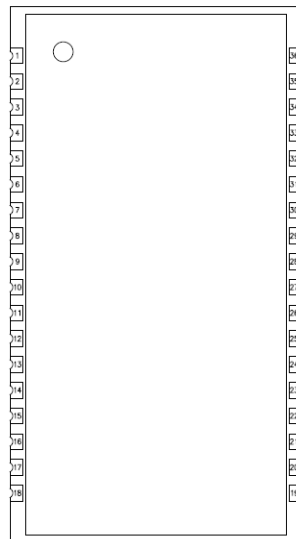
DEFINE (ESD1XXV2)	NAME	
RF_I/O	RF_I/O	36
GND	GND	35
GND	GND	34
	PIO_11	33
	PIO_10	32
	PIO_9	31
	PIO_8	30
UART_DSR	PIO_2	29
UART_DTR	PIO_3	28
	PIO_7	27
BT_STATUS	PIO_6	26
FACTORY_RESET	PIO_5	25
UART_DCD	PIO_4	24
	SPI_MOSI	23
	SPI_CSB	22
	SPI_CLK	21
	SPI_MISO	20
	GND	19

Figure 1-2 Pin diagram

1.5 Pin Descriptions

Function	Pin Name	Pin Number	Description
USB Interface	USB_DP	11	USB data plus
	USB_DN	10	USB data minus
UART Interface	UART_TXD	8	UART data output
	UART_RXD	7	UART data input
	UART_RTS	6	UART request to send active low
	UART_CTS	9	UART clear to send active low
PCM Interface	PCM_OUT	15	Synchronous data output
	PCM_IN	12	Synchronous data input
	PCM_SYNC	13	Synchronous data sync
	PCM_CLK	14	Synchronous data clock
SPI Interface	SPI_MISO	20	SPI data output
	SPI_MOSI	23	SPI data input
	SPI_CSB	22	Chip select for SPI, active low
	SPI_CLK	21	SPI clock
PIO Interface	PIO_2	29	Programmable input/output line
	PIO_3	28	Programmable input/output line
	PIO_4	24	Programmable input/output line
	PIO_5	25	Programmable input/output line
	PIO_6	26	Programmable input/output line
	PIO_7	27	Programmable input/output line
	PIO_8	30	Programmable input/output line
	PIO_9	31	Programmable input/output line
	PIO_10	32	Programmable input/output line
	PIO_11	33	Programmable input/output line
	AIO_0	4	Analogue programmable input/output line
	AIO_1	5	Analogue programmable input/output line
Power	PVCC	3	Power supply for power amplifier, 3.3V
	+3V3	16	Power supply for system, 3.3V
	GND	1	Ground
	GND	2	Ground
	GND	17	Ground
	GND	19	Ground
	GND	34	Ground
	GND	35	Ground
Others	RF_I/O	36	Transmitter output/receiver input
	RESETB	18	Reset, active low, > 5ms to cause a reset

Table 1-1 Pin descriptions

1.6 Dimensions and PCB land pattern

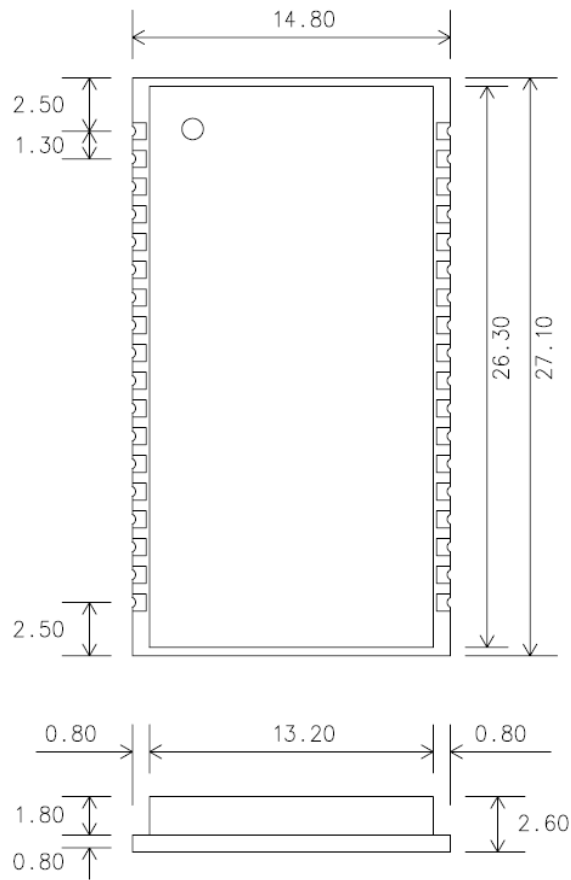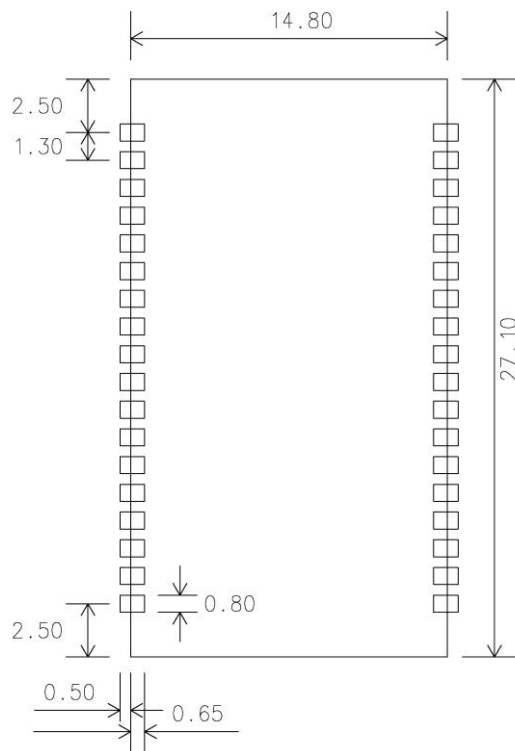Figure 1-3 Module Dimensions

Figure 1-4 Recommended Land Pattern

2. Electrical characteristics

2.1 Absolute maximum ratings

Ratings		Min	Max	Unit
Storage Temperature		-40	+85	°C
Operating Temperature		-40	+85	°C
Supply voltage	PVCC	-0.4	3.6	V
	+3V3	-0.4	3.6	V
Other terminal voltages		GND – 0.4	+3V3 +0.4	V

Table 2-1 Absolute maximum ratings

2.2 Recommended operating conditions

Ratings		Min	Typ	Max	Unit
Operating Temperature		-40	25	+85	°C
Supply voltage	PVCC	2.7	3.3	3.6	V
	+3V3	2.7	3.3	3.6	V
	UART	3.0	3.3	3.6	V
	USB	3.1	3.3	3.6	V

Table 2-2 Recommended operating conditions

2.3 Power Consumptions

Role	Operation Mode	UART Rate(kbps)	Current	Unit
-	Inquiry and page Scan	115.2	76	mA
-	Power on (Standby)	115.2	2	mA
	Connectable Mode(Mode3)	115.2	18	mA
	Connected (No data)	115.2-	15	mA
	Connected (file transfer)	115.2	45	mA
	Connected (file transfer)	9.6	55	mA

Table 2-3 Power consumptions

3. RF Characteristics

3.1 Basic Data Rate

3.1.1 Transmitter Performance

RF Characteristics PVCC = 3.3V, 25°C		Min	Typ	Max	Bluetooth Specification	Unit
Output power		16	18	19	≤ 20	dBm
Power Density		16	18	19	≤ 20	dBm
Power Control		3	4	6	2 ≤ step ≤ 8	dB
TX Output Spectrum-Frequency range		2402	-	2480	2400 ~2483.5	MHz
TX Output Spectrum-20dB Bandwidth		-	900	-	≤ 1000	kHz
Adjacent Channel Power	$F = F_0 \pm 2MHz$	-	-	-20	≤ -20	dBm
	$F = F_0 \pm 3MHz$	-	-	-40	≤ -40	dBm
	$F = F_0 \pm > 3MHz$	-	-	-40	≤ -40	dBm
Modulation Characteristics	$\Delta f1_{avg}$	145	165	175	$140 \leq \Delta f1_{avg} \leq 175$	kHz
	$\Delta f2_{avg}$	115	155	-	$\Delta f2_{avg} \geq 115$	kHz
	$\Delta f2_{avg}/\Delta f1_{avg}$	0.8	0.95	-	$(\Delta f1_{avg}/\Delta f2_{avg}) \geq 0.8$	-
Initial Carrier Frequency Tolerance		-20	-	20	≤ ±75	kHz
Carrier Frequency Drift	Drift rate	-20	-	20	≤ ±20	kHz/50μs
	1 slot Freq Drift	-25	-	25	≤ ±25	kHz
	5 slot Freq Drift	-40	-	40	≤ ±40	kHz

Table 3-1 Transmitter performance at basic data rate

3.1.2 Transceiver

RF Characteristics PVCC = 3.3V, 25°C		Min	Typ	Max	Bluetooth Specification	Unit
Out of band Spurious Emissions	0.030-1.000GHz	-36	-	-	≤ -36	dBm
	1.000-12.75GHz	-30	-	-	≤ -30	dBm
	1.800-5.100GHz	-47	-	-	≤ -47	dBm
	5.100-5.300GHz	-47	-	-	≤ -47	dBm

Table 3-2 Transceiver at basic data rate

3.1.3 Receiver Performance

RF Characteristics Temperature 25°C		Min	Typ	Max	Bluetooth Specification	Unit
Sensitivity - Single slot packets (0.1%)		-	-90	-70	≤ -70	dBm
Sensitivity - Multi slot packets (0.1%)		-	-90	-70	≤ -70	dBm
C/I performance at 0.1% BER	co-channel	-	-	-11	≤ -11	dB
	$F = F_0 + 1MHz$	-	-	0	≤ 0	kHz

		Min	Typ	Max	Spec	Unit
	$F = F_0 - 1\text{MHz}$	-	-	0	≤ 0	dB
	$F = F_0 + 2\text{MHz}$	-	-	-20	≤ -20	dB
	$F = F_0 - 2\text{MHz}$	-	-	-30	≤ -30	dB
	$F = F_0 - 3\text{MHz}$	-	-	-40	≤ -40	dB
	$F = F_0 + 5\text{MHz}$	-	-	-40	≤ -40	dB
	$F = F_{Image}$		-	-9	≤ -9	dB
Blocking performance	0.030-2.000GHz	-10	-	-	≥ -10	dBm
	2.000-2.400GHz	-27	-	-	≥ -27	dBm
	2.500-3.000GHz	-27	-	-	≥ -27	dBm
	3.000-12.75GHz	-10	-	-	≥ -10	dBm
Inter-modulation performance		-39	-	-	≥ -39	dBm
Maximum input level at 0.1% BER		-20	0	-	≥ -20	dBm

Table 3-3 Receiver Performance at basic data rate

3.2 Enhanced Data Rate

3.2.1 Transmitter performance

RF Characteristics PVCC = 3.3V, Temperature 25°C			Min	Typ	Max	Bluetooth Specification	Unit
Maximum RF Transmit Power			-2	2	-	-6 to +4	dB
Relative Transmit Power			-4	-	1	-4 to +1	dB
Carrier Frequency Stability	π/4 DQPSK	$\lvert \omega_0 \rvert$	-10	-	10	≤ ±10 for all blocks	kHz
		$\lvert \omega_i \rvert$	-75	-	75	≤ ±75 for all packets	kHz
		$\lvert \omega_0 + \omega_i \rvert$	-75	-	75	≤ ±75 for all blocks	kHz
	8DPSK	$\lvert \omega_0 \rvert$	-10	-	10	≤ ±10 for all blocks	kHz
		$\lvert \omega_i \rvert$	-75	-	75	≤ ±75 for all packets	kHz
		$\lvert \omega_0 + \omega_i \rvert$	-75	-	75	≤ ±75 for all blocks	kHz
Modulation Accuracy	π/4 DQPSK	RMS DEVM	-	-	20	≤ 20	%
		99% DEVM	-	-	30	≤ 30	%
		Peak DEVM	-	-	35	≤ 35	%
	8DPSK	RMS DEVM	-	-	13	≤ 13	%
		99% DEVM	-	-	20	≤ 20	%
		Peak DEVM	-	-	25	≤ 25	%
EDR Differential Phase Encoding			99	-	-	≥ 99	%
In-band Spurious Emissions (8DPSK)	$F \geq F_0 + 3\text{MHz}$		-	-	-40	≥ -40	dBm
	$F < F_0 + 3\text{MHz}$		-	-	-40	≥ -40	dBm
	$F = F_0 - 3\text{MHz}$		-	-	-40	≥ -40	dBm
	$F = F_0 - 2\text{MHz}$		-	-	-20	≥ -20	dBm
	$F = F_0 - 1\text{MHz}$		-	-	-26	≥ -26	dB
	$F = F_0 + 1\text{MHz}$		-	-	-26	≥ -26	dB
	$F = F_0 + 2\text{MHz}$		-	-	-20	≥ -20	dBm
	$F = F_0 + 3\text{MHz}$		-	-	-40	≥ -40	dBm

Table 3-4 Transmitter performance at enhanced data rate

3.2.2 Receiver performance

RF Characteristics Temperature 25°C			Min	Typ	Max	Bluetooth Specification	Unit
Sensitivity at 0.01% BER		π/4 DQPSK	-	-88	-70	≤ -70	dBm
		8DPSK	-	-85	-70	≤ -70	dBm
BER floor performance			-	-	-60	≤ -60	dBm
C/I Performance (co-channel at 0.1% BER)		π/4 DQPSK	-	-	13	≤ +13	dB
		8DPSK	-	-	21	≤ +21	dB
C/I Performance (Adjacent Channel Selectivity)	$F = F_0 + 1MHz$	π/4 DQPSK	-	-	0	≤ 0	dB
		8DPSK	-	-	5	≤ +5	dB
	$F = F_0 - 1MHz$	π/4 DQPSK	-	-	0	≤ 0	dB
		8DPSK	-	-	5	≤ +5	dB
	$F = F_0 + 2MHz$	π/4 DQPSK	-	-	-30	≤ -30	dB
		8DPSK	-	-	-25	≤ -25	dB
	$F = F_0 - 2MHz$	π/4 DQPSK	-	-	-20	≤ -20	dB
		8DPSK	-	-	-13	≤ -13	dB
	$F \geq F_0 + 3MHz$	π/4 DQPSK	-	-	-40	≤ -40	dB
		8DPSK	-	-	-33	≤ -33	dB
	$F \leq F_0 - 5MHz$	π/4 DQPSK	-	-	-40	≤ -40	dB
		8DPSK	-	-	-33	≤ -33	dB
	$F = F_{Image}$	π/4 DQPSK	-	-	-7	≤ -7	dB
		8DPSK	-	-	0	≤ 0	dB
Maximum input level at 0.1% BER		π/4 DQPSK	-20	-	-	≥ -20	dBm
		8DPSK	-20	-	-	≥ -20	dBm

Table 3-5 Receiver performance at enhanced data rate

4. Device Terminal Descriptions

4.1 UART Interface

UART (Universal Asynchronous Receiver and Transmitter) interface provides a simple mechanism for communicating with other serial device using the RS232 protocol. When BCD100 is connected to another digital device, UART_RX and UART_TX transfer data between the two devices. The remaining two signals, UART_CTS, UART_RTS, can be used to implement RS232 hardware flow control where both are active low indicators. All UART connections are implemented using CMOS technology and have signaling levels of 0V and 3.3V

Parameter		Possible Values
Baud Rate	Minimum	1200 baud (2%Error)
	Maximum	3M baud (1%Error)
Flow Control		RTS/CTS or None
Parity		None, Odd or Even
Number of Stop Bits		1 or 2
Bits per Channel		8

Table 4-1 Possible UART Settings

4.2 USB Interface

BCD100 USB devices contain a full speed (12Mbits/s) USB interface that is capable of driving of a USB cable directly. No external USB transceiver is required. The device operates as a USB peripheral, responding to requests from a master host controller such as a PC. Both the OHCI and the UHCI standards are supported. The set of USB endpoints implemented behave as specified in the USB section of the Bluetooth specification v2.0+EDR or alternatively can appear as a set of endpoints appropriate to USB audio devices such as speakers. As USB is a Master/Slave oriented system (in common with other USB peripherals), BCD100 only supports USB slave operation.

The USB data lines emerge as pins USB_DP and USB_DN. These terminals are connected to the internal USB I/O buffers of the BCD100, therefore, have low output impedance. To match the connection to the characteristic of the USB cable, resistors must be placed in series with USB_DP/USB_DN and the cable. BCD100 features an internal USB pull-up resistor. This pulls the USB_DP pin weakly high when BCD100 is ready to enumerate. It signals to the PC that it is a full speed (12Mbit/s) USB device.

The USB internal pull-up is implemented as a current source, and is compliant with section 7.1.5 of the USB specification v1.2. The internal pull-up pulls USB_DP high to at least 2.8V when loaded with a 15KΩ±5% pull-down resistor (in the hub/host) when VDD_PADS=3.1V. This presents a Thevenin resistance to the host of at least 900Ω.

4.3 I2C Interface

PIO[8:6] can be used to form a mater I^{2}C interface. The interface is formed using software to drive these lines. Therefore, it is suited only to relatively slow functions such as driving a dot matrix LCD (*Liquid Crystal Display*), keyboard scanner or EEPROM.

Notes:
PIO lines need to be pull-up through 2.2KΩ resistors.
PIO[7:6] dual functions, UART bypass and EEPROM support, therefore, devices using an EEPROM cannot support UART bypass mode.
For connection to EEPROMs, refer to CSR documentation on I^{2}C EEPROM for use with BlueCore. This provides information on the type of devices currently supported.

4.4 PCM CODEC Interface

PCM (*Pulse Code Modulation*) is a standard method used to digitize audio (particularly voice) for transmission over digital communication channels. Through its PCM interface, BCD100 has hardware support for continual transmission and reception of PCM data, thus reducing processor overhead for wireless headset applications. BCD100 offers a bi-directional digital audio interface that route directly into the baseband layer of the on-chip firmware. It does not pass through the HCI protocol layer.

Hardware on BCD100 allows the data to be sent to and received from a SCO connection.
Up to three SCO connections can be supported by the PCM interface at any on time.
BCD100 can operate as PCM interface Master generating an output clock of 128, 256, or 512kHz. When configured as PCM interface slave, it can operate with an input clock up to 2048kHz. BCD100 is compatible with a variety of clock formats, including Long Frame Sync, Short Frame Sync and GCI timing environments.

BCD100 interfaces directly to PCM audio devices including the following:
- Qualcomm MSM 3000 series and MSM 5000 series CDMA baseband devices
- OKI MSM7705 four channel A-raw and u-law CODEC
- Motorola MC145481 8-bit A-law and u-law CODEC
- Motorola MC145483 13-bit linear CODEC
- STW 5093 and 5094 14-bit linear CODECs
- BCD100 is also compatible with the Motorola SSI^{TM} interface

4.5 I/O Parallel Ports

PIO lines can be configured through software to have either weak or strong pull-downs. All PIO lines are configured as inputs with weak pull-downs at reset.

Any of the PIO lines can be configured as interrupt request lines or as wake-up lines from sleep modes. PIO_6 or PIO_2 can be configured as a request line for an external clock source. This is useful when the clock to BCD100 is provided from a system ASIC (*Application Specific Integrated Circuit*). Using PSKEY_CLOCK_REQUEST_ENABLE (0x246), this terminal can be configured to be low when BCD100 is in Deep Sleep and high when a clock is required. The clock must be supplied within 4ms of the rising edge of PIO_6 or PIO_2 to avoid losing timing accuracy in certain Bluetooth operating modes.

BCD100 has three general purpose analogue interface pins, AIO_0, AIO_1 and AIO_2. These are used to access internal circuitry and control signals. One pin is allocated to decoupling for the on-chip band gap reference voltage, the other two may be configured to provide additional functionality.

4.6 Reset Interface

BCD100 may be reset from several sources: RESETB pin, power on reset, a UART break character or via a software configured watchdog timer.

The RESETB pin is an active low reset and is internally filtered using the internal low frequency clock oscillator. A reset will be performed between 1.5 and 4.0ms following RESETB being active. It is recommended that RESETB be applied for a period greater than 5ms.

The power on reset occurs when the VDD_CORE supply falls below typically 1.5V and is released when VDD_CORE rises above typically 1.6V.

At reset the digital I/O pins are set to inputs for bi-directional pins and outputs are tri-state. The PIOs have weak pull-downs.
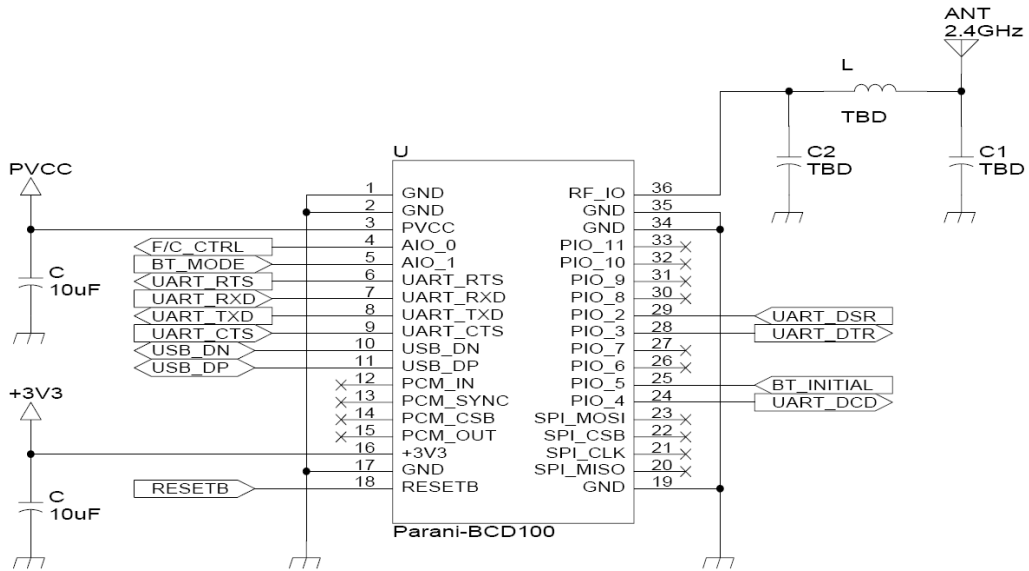
5. Application Schematic
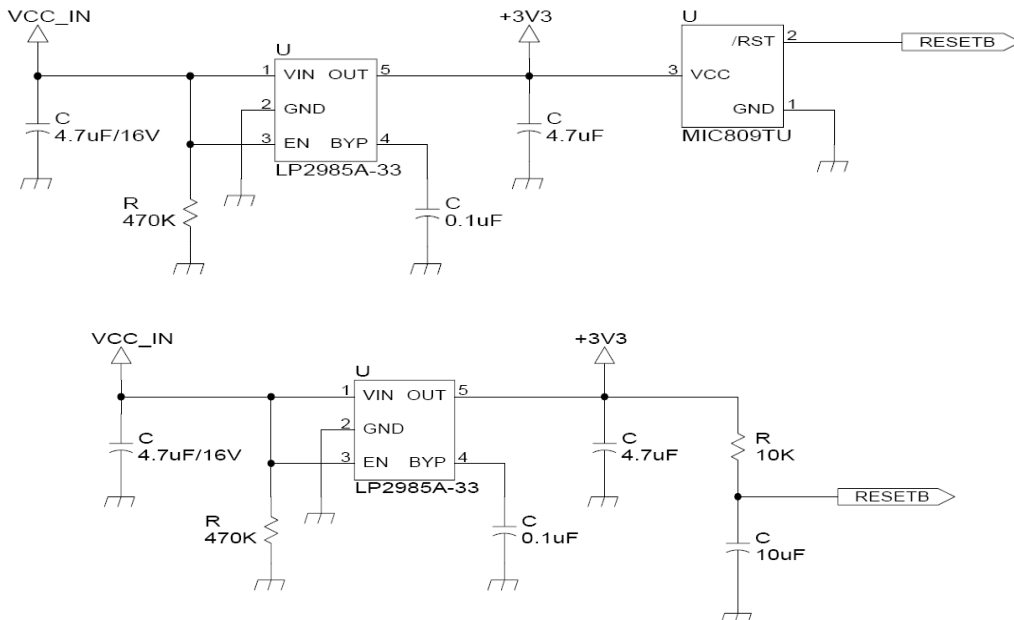

Figure 5-1 BT Module Interface
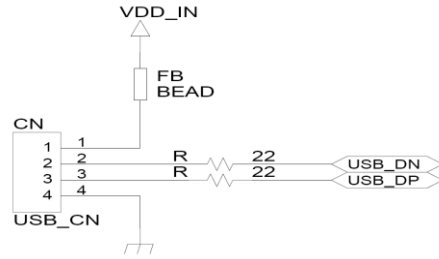

Figure 5-2 Power Supply and Reset Interface

Figure 5-3 RS232 Serial Interface

[When TTL level of MICOM is 3.3V]

[When TTL level of MICOM is 5.0V]

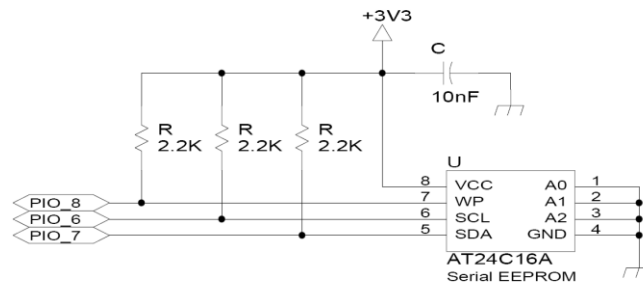Figure 5-4 MICOM UART Interface
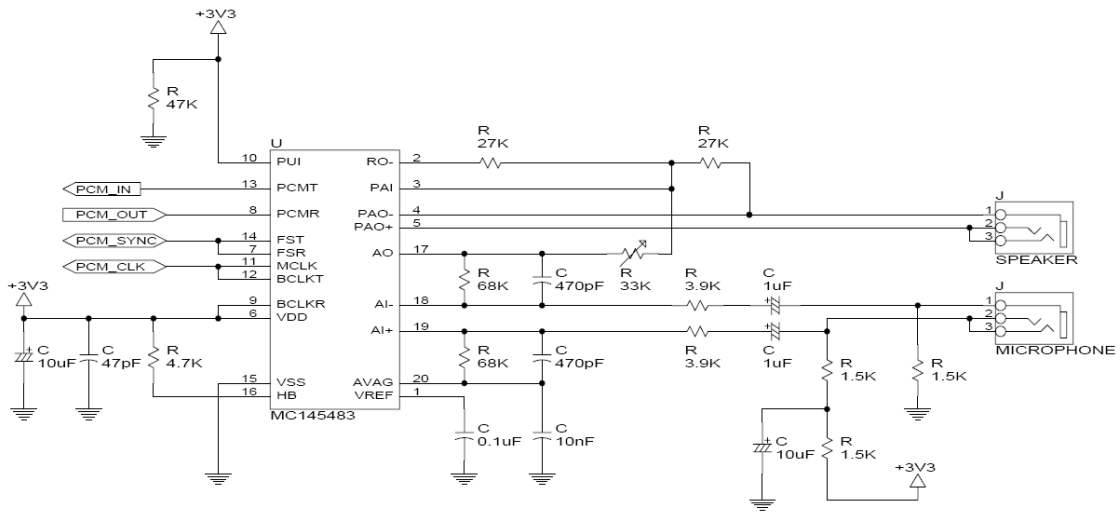
Figure 5-5 USB Interface

Figure 5-6 I^{2}C Interface

Figure 5-7 PCM Interface

6. Software Stack

BCD100 is provided with Bluetooth v2.0 compatible firmware runs internally for SPP (Serial Port Profile) applications by default. The firmware is designed to work out-of-box for real world SPP applications such as POS (Point-of-sales), industrial automation, remote metering and other various applications.

The SPP firmware can be configured and controlled by typical AT commands. Users can easily configure BCD100 by using a terminal program such as HyperTerminal and can use Bluetooth wireless communication without modifying user's existing serial communication program. In addition to the basic AT commands, BCD100 provides some expanded AT commands for various functions. User friendly ParaniWizard and ParaniWIN are also provided for easy setup on Microsoft Windows. To run AT commands on the BCD100, the BCD100 should be connected to the serial port of the user's own board or equivalent to carry the BCD100.

The SPP firmware provided with the BCD100 is identical to the firmware of the Parani-ESD100 and Parani-ESD110. To shorten the overall development cycle or for quick verification during or before own development work, users might want to try ESD100/110 starter kits first for convenience. Also, please refer to the ESD100/110 user's manual for overall concept, configuration and complete AT commands list of the SPP firmware. The ESD100/110 user's manual can be downloaded from Sena support home page at http://www.senanetworks.com/support/downloads/.

Optionally, the BCD100 can be supplied with only software stack up to HCI level so users can develop and embed their own firmware version into the BCD100 or entire Bluetooth stack runs on the host side for the application such as USB dongle for computers. Regarding these custom firmware options, please contact a Sena representative for more detail.
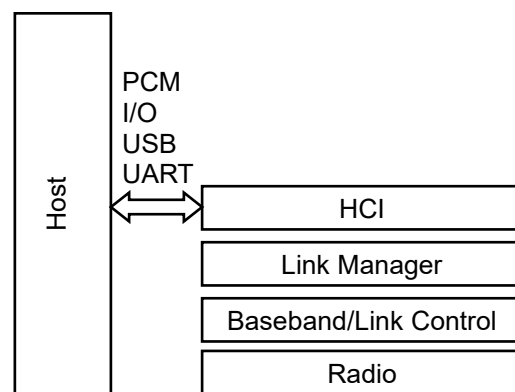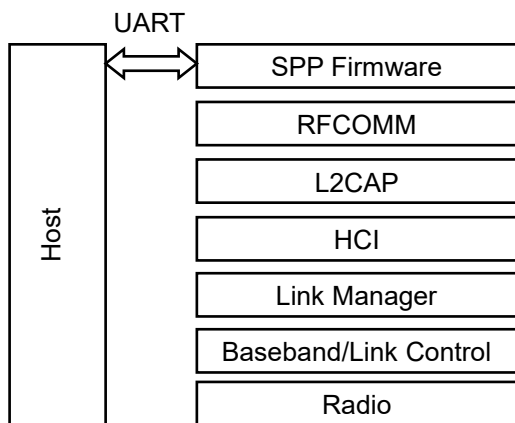

Figure 6-1 SPP Firmware Bluetooth software stack   Figure 6-2 HCI firmware Bluetooth Software Stack

7. Solder Profiles

The soldering profile depends on various parameters necessitating a set up for each application. The data here is given only for guidance on solder re-flow. There are four zones:

- **Preheat Zone** – This zone raises the temperature at a controlled rate, typically 1-2.5°C /s
- **Equilibrium Zone** – This zone brings the board to a uniform temperature and also activates the flux. The duration in this zone (typically 2-3 minutes) will need to be adjusted to optimize the out gassing of the flux.
- **Reflow Zone** – The peak temperature should be high enough to achieve good wetting but not so high as to cause component discoloration or damage. Excessive soldering time can lead to intermetallic growth which can result in a brittle joint.
- **Cooling Zone** – The cooling rate should be fast, to keep the solder grains small which will give a longer lasting joint. Typical rates will be 2-5°C/s
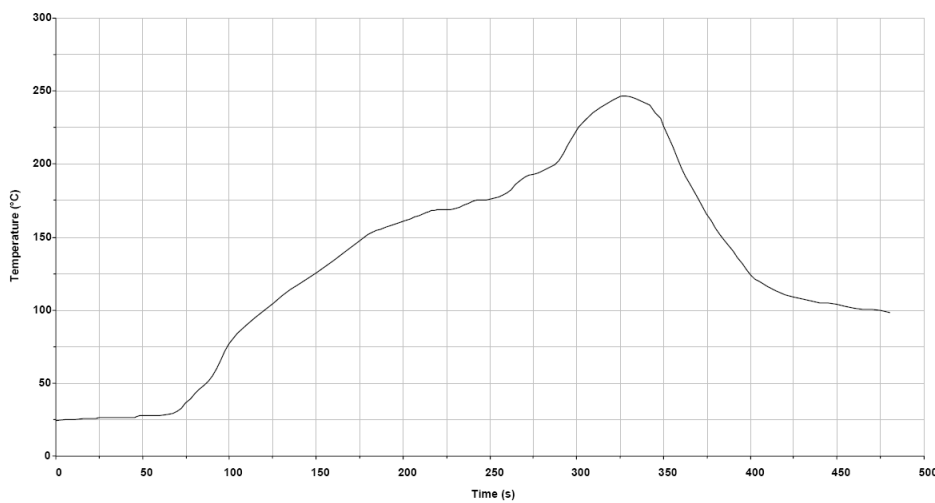

Figure 7-1 Typical Lead-Free Re-flow Solder Profile

Key features of the profile:

- Initial Ramp = 1-2.5°C/sec to 175°C±25°C equilibrium
- Equilibrium time = 60 to 180 seconds
- Ramp to Maximum temperature (245°C) = 3°C/sec max.
- Time above liquids temperature (217°C): 45~90 seconds
- Device absolute maximum reflow temperature: 260°C

The BCD100 will withstand the specified profile up to two reflows to a maximum temperature of 260°C
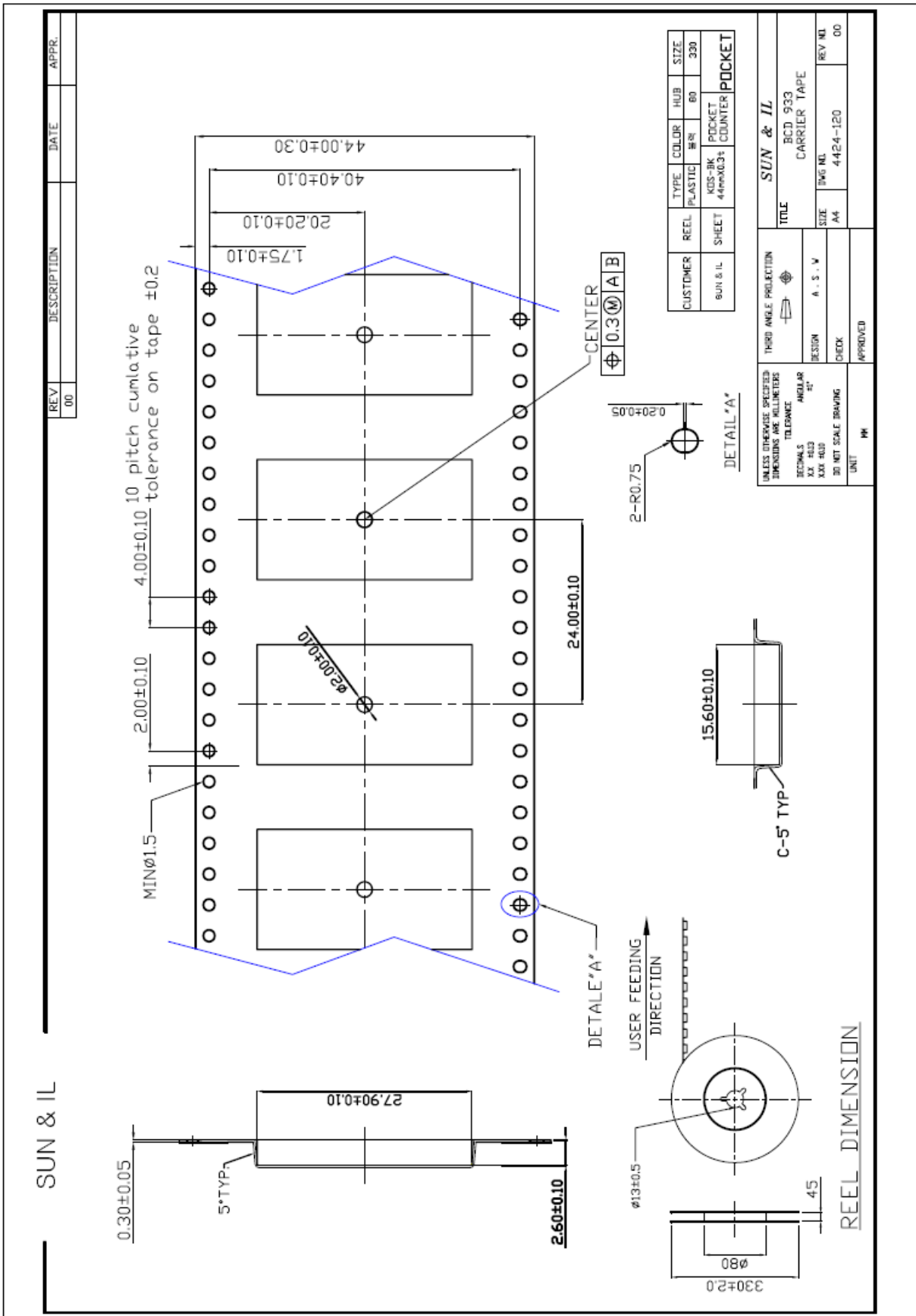
8. Packaging Information
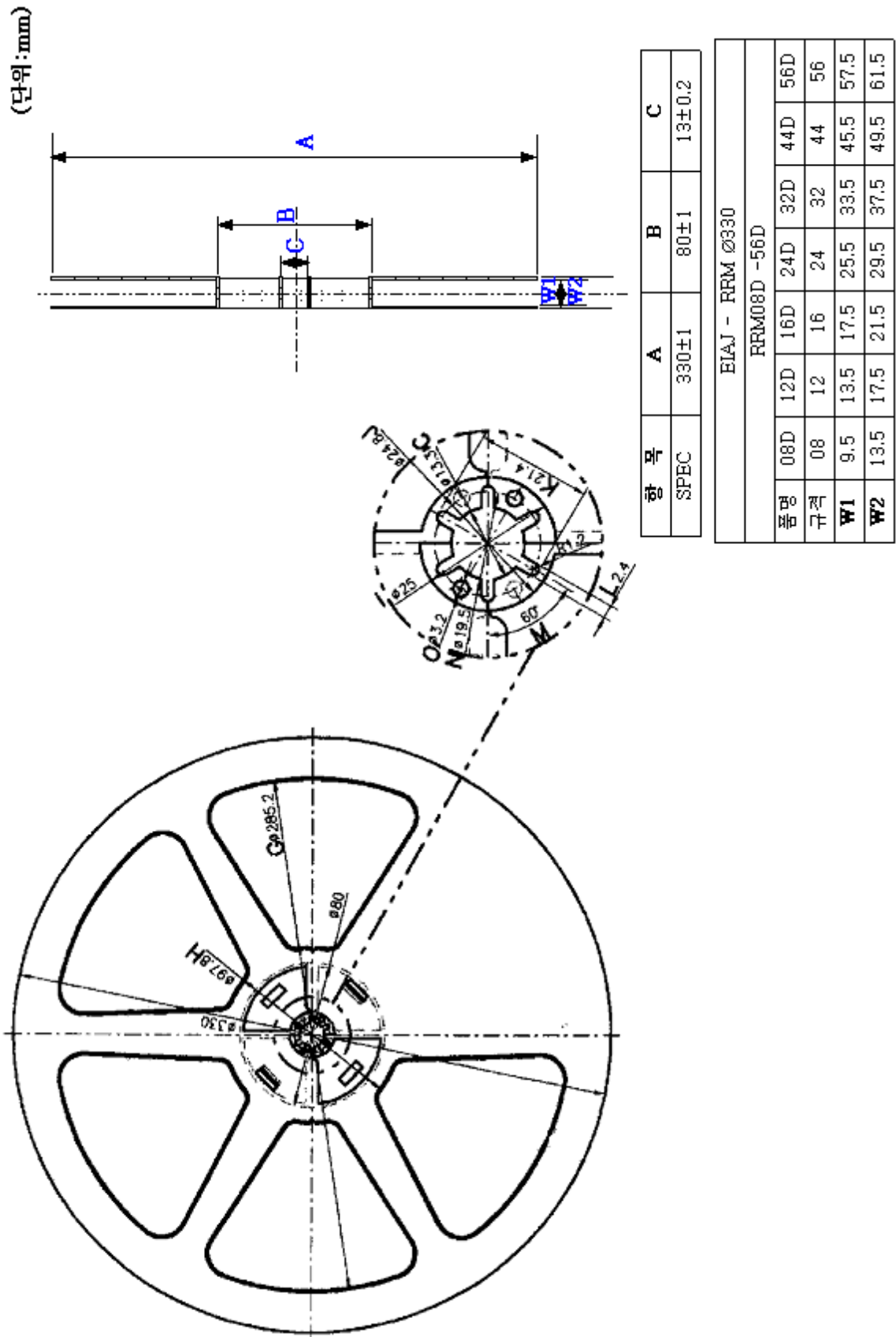

Figure 8-1 Tape Information

(단위:mm)

항 목	A	B	C
SPEC	330±1	80±1	13±0.2

EIAJ – RRM Ø330
RRM08D -56D

품명	08D	12D	16D	24D	32D	44D	56D
규격	08	12	16	24	32	44	56
W1	9.5	13.5	17.5	25.5	33.5	45.5	57.5
W2	13.5	17.5	21.5	29.5	37.5	49.5	61.5

Figure 8-2 Reel Information

9. Certificate Information

9.1 Bluetooth SIG Certification

QDID: B016862

Design Name: Sena Bluetooth Class1 Module (Parani-BCD100)

Core Version: 2.0+EDR

Product Type: Component (Tested)

Declared Specifications: Baseband Conformance, Radio, Service Discovery Protocol,

Logical Link Control and Adaption Protocol, Generic Access Profile, Link Manager, RFCOMM,

Serial Port Profile, Host Controller Interface, Summary ICS, Product Type

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