Hardware Integration Guide

SDC-SSD40NBT

Version 1.3

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Revision History

Version	Revision Date	Change Description
0.01	03/26/10	Initial Pre-Release version
0.02	04/29/10	Revisions to Specs table and Pin descriptions
0.03	06/18/10	Revisions to Pin table
0.04	08/20/10	Revisions to Pin table
0.05	10/21/10	General Revisions
0.06	01/03/11	Updated Mechanical diagram
0.07	02/11/11	General Revisions including specifications table, revised pin table, block diagram, and mechanical drawings.
0.08	03/01/11	General Revisions including specifications table, revised pin table, block diagram, and mechanical drawings.
0.09	03/15/11	Revisions to Mechanical diagram.
0.10	04/06/11	Revisions to pin table.
0.11	04/29/11	Added data to Specifications table. General Revisions.
0.12	07/14/11	Corrected errors on the Mechanical drawings.
1.0	07/29/11	Finalized mechanical drawings. Revisions to pin table (I/O).
1.1	08/03/11	Corrected Control Signal Timing diagram and text.
1.2	08/05/11	Changed Power Type column of Pin Definitions table.
1.3	08/28/11	Added PCM Timing information.

SUMMIT DATA COMMUNICATIONS

Contents

Scope

This document describes key hardware aspects of the Summit SSD40NBT radio module. This document is intended to assist device manufacturers and related parties with the integration of this radio into their host devices. Data in this document are drawn from a number of sources and include information found in the Broadcom BCM4329data sheet issued in June of 2009.

The SDC-SSD40NBT is currently in pre-production and as such, this document is preliminary; the information in this document is subject to change. Please contact Summit or visit the Summit website at www.summitdatacom.com to obtain the most recent version of this document.

Operational Description

This device is an SDC-SSD40NBT radio module which supports IEEE 802.11a/b/g/n standards via an SDIO (Secure Digital Input/Output) interface and Bluetooth version 2.1 via a serial UART (Universal Asynchronous Receiver/Transmitter) interface. The radio operates in unlicensed portions of the 2.4 GHz and 5 GHz radio frequency spectrum. The device is compliant with IEEE 802.11a, 802.11b,802.11g, and 802.11n standards using Direct Sequence Spread Spectrum (DSSS), Orthogonal Frequency Division Multiplexing (OFDM), and supports Bluetooth 2.1 using Frequency Hopping Spread Spectrum (FHSS). The device supports all 802.11a, 802.11b, 802.11g, 802.11n, and Bluetooth data rates and automatically adjusts data rates and operational modes based on various environmental factors.

When operating on channels in the UNII-2 and UNII-2 Extended bands that are in the 5GHz portion of the frequency spectrum and are subject to Dynamic Frequency Selection requirements, the SDC-SSD40NBT fully conforms to applicable regulatory requirements. In the event that specified types of radar are detected by the network infrastructure, the SDC-SSD40NBT fully conforms to commands from the infrastructure for radar avoidance.

The SDC-SSD40NBTis a System in Package (SiP) Quad Flat pack, No leads (QFN) module and interfaces to host devices via a 56-padedge connector. The device is based on the Broadcom BCM4329chip which is an integrated device providing a Media Access Controller (MAC), a Physical Layer Controller (PHY or baseband processor), and fully integrated dual-band radio transceiver. To maximize operational range, the SDC-SSD40NBT incorporates a 5 GHz power amplifier (PA) to increase transmit power. The frequency stability for both 2.4 GHz (802.11b and 802.11g) and 5 GHz (802.11a) operation is +/- 20 ppm.

The SSD40NBT has its own RF shielding and does not require shielding provided by the host device into which it is installed in order to maintain compliance with applicable regulatory standards. As such, the device may be tested in a standalone configuration via an extender card.

The device buffers all data inputs so that it will comply with all applicable regulations even in the presence of over-modulated input from the host device. Similarly, the SDC-SSD40NBT incorporates power regulation to comply with all applicable regulations even when receiving excess power from the host device.

The SDC-SSD40NBT provides two diplexed antenna interfaces to support dual band transmit and receive diversity. Supported host device antenna types include dipole and monopole antennas.

Regulatory operational requirements are included with this document and may be incorporated into the operating manual of any device into which the SDC-SSD40NBT is installed. The SDC-SSD40NBT is

designed for installation into mobile devices such as vehicle mount data terminals (which typically operate at distances greater than 20 cm from the human body) and portable devices such as handheld data terminals (which typically operate at distances less than 20 cm from the human body). See "Documentation Requirements" for more information.

Block Diagram

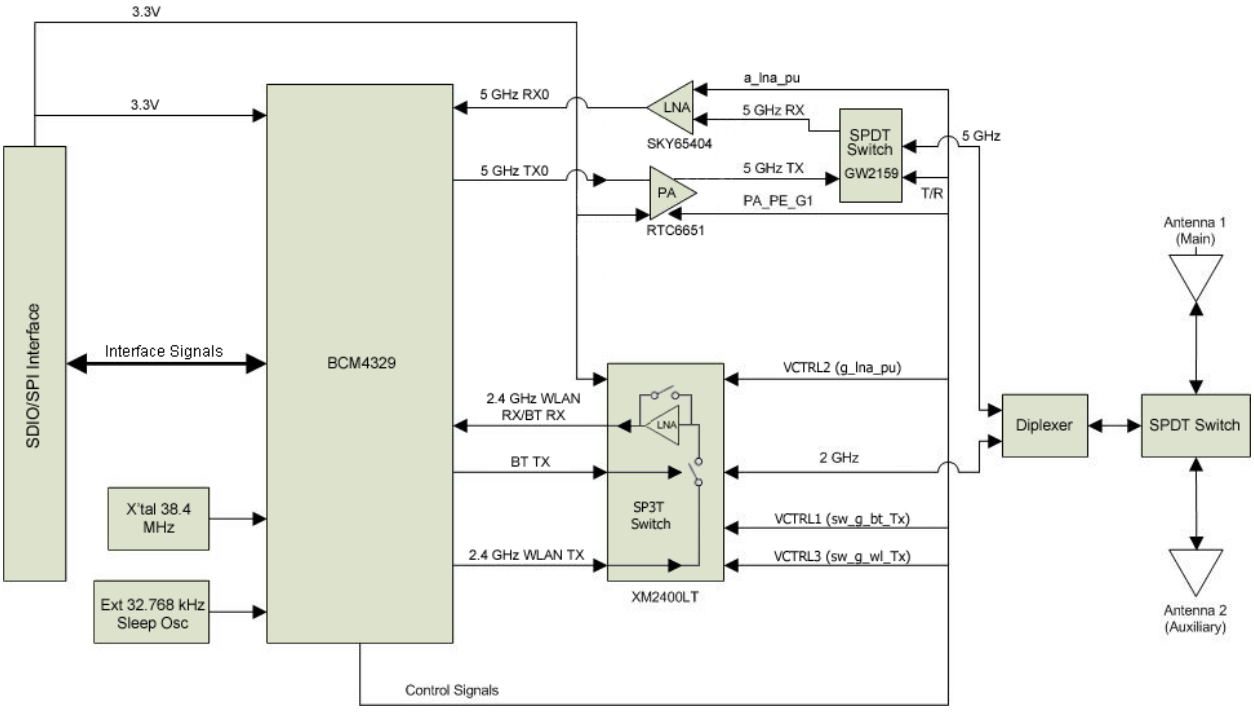


Figure 1: Block Diagram

Specifications

Feature	Description
Physical Interface	0.4mm pitch QFN (Quad Flat Pack, No Leads)
Wi-Fi Interface	1-bit or 4-bit Secure Digital I/O
Bluetooth Interface	Host Controller Interface (HCI) using High Speed UART
Main Chip	Broadcom BCM4329
Input Voltage Requirements	3.3 VDC ± 10% (core)
I/O Signaling Voltage	1.8 or 3.3 VDC ± 10%

Feature	Description
Current Consumption (At maximum transmit power setting) **Note:** *Standby* refers to the radio operating in PM1 powersave mode.	**802.11a** Transmit: 350 mA (1153 mW) Receive: 110 mA (363 mW) Standby: TBD mA (TBD mW) **802.11b** Transmit: 360 mA (1188 mW) Receive: 110 mA (363 mW) Standby: TBD mA (TBD mW) **802.11g** Transmit: 320 mA (1056 mW) Receive: 110 mA (363 mW) Standby: TBD mA (TBD mW) **802.11n (2.4 GHz)** Transmit: 340 mA (1122 mW) Receive: 110 mA (363 mW) Standby: TBD mA (TBD mW) **802.11n (5 GHz)** Transmit: 350 mA (1155 mW) Receive: 110 mA (363 mW) Standby: TBD mA (TBD mW) **Bluetooth** Transmit: 45 mA (149 mW) Receive: TBD mA (TBD mW)
Operating Temperature	-30° to 80°C (-22° to 176°F)
Operating Humidity	10 to 90% (non-condensing)
Storage Temperature	-30° to 85°C (-22° to 185°F)
Storage Humidity	10 to 90% (non-condensing)
Maximum Electrostatic Discharge	8 kV
Length	15.0 mm (0.59”)
Width	15.0 mm (0.59”)
Thickness	2.50 mm (0.1”)
Weight	1.0 g (0.04 oz.)
Mounting	See the “Mounting” section for more information.
Wi-Fi Media	Direct Sequence-Spread Spectrum (DSSS) Complementary Code Keying (CCK) Orthogonal Frequency Divisional Multiplexing (OFDM)
Bluetooth Media	Frequency Hopping Spread Spectrum (FSSS)

Feature	Description
Wi-Fi Media Access Protocol	Carrier sense multiple access with collision avoidance (CSMA/CA)
Network Architecture Types	Infrastructure and ad hoc
Wi-Fi Standards	IEEE 802.11a, 802.11b, 802.11d, 802.11e, 802.11g, 802.11h, 802.11i, 802.11n
Bluetooth Standards	Bluetooth version 2.1 with Enhanced Data Rate
Wi-Fi Data Rates Supported	802.11a (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11b (DSSS, CCK) 1, 2, 5.5, 11 Mbps 802.11g (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11n (OFDM, MCS 0-7) 6.5, 7.2, 13.0, 14.4, 19.5, 21.7, 26.0, 28.9, 39.0, 43.3, 52.0, 57.8, 58.5, 65.0, 72.2 Mbps
Modulation	BPSK @ 1, 6, 6.5, 7.2 and 9 Mbps QPSK @ 2, 12, 13, 14.4,18, 19.5 and 21.7 Mbps CCK @ 5.5 and 11 Mbps 16-QAM @ 24, 26, 28.9, 36, 39 and 43.3 Mbps 64-QAM @ 48, 52, 54, 57.8, 58.5, 65, and 72.2 Mbps
802.11n Spatial Streams	1 (Single Input, Single Output)
Bluetooth Data Rates Supported	1, 2, 3 Mbps
Bluetooth Modulation	GFSK@ 1 Mbps π/4-DQPSK@ 2 Mbps 8-DPSK@ 3 Mbps
Regulatory Domain Support	FCC (Americas, Parts of Asia, and Middle East) ETSI (Europe, Middle East, Africa, and Parts of Asia) MIC (Japan) (formerly TELEC) KC (Korea) (formerly KCC)
2.4 GHz Frequency Bands	**ETSI** 2.4 GHz to 2.483 GHz **FCC** 2.4 GHz to 2.483 GHz **MIC (Japan)** (formerly TELEC) 2.4 GHz to 2.495 GHz **KC** (formerly KCC) 2.4 GHz to 2.483 GHz

Feature	Description
5 GHz Frequency Bands	**ETSI** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz **FCC** 5.15 GHz to 5.35 GHz 5.725 GHz to 5.82 GHz **MIC (Japan)** (formerly TELEC) 5.15 GHz to 5.35 GHz **KC** (formerly KCC) 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz 5.725 GHz to 5.82 GHz
2.4 GHz Operating Channels	ETSI: 13 (3 non-overlapping) FCC: 11 (3 non-overlapping) MIC (Japan): 14 (4 non-overlapping) KCC: 13 (3 non-overlapping)
5 GHz Operating Channels	ETSI: 19 non-overlapping FCC: 23 non-overlapping MIC (Japan): 4 non-overlapping KCC: 8 non-overlapping
Maximum Transmit Power ***Note:*** *Maximum transmit power varies according to individual country regulations. All values nominal, +/-2 dBm.* ***Note:*** *Summit 40 series radios support a single spatial stream and 20 MHz channels only.*	**802.11a** 6 Mbps 17 dBm (50 mW) 54 Mbps 12.5 dBm (18 mW) **802.11b** 1 Mbps 18 dBm (63 mW) 11 Mbps 18 dBm (63 mW) **802.11g** 6 Mbps 18 dBm (63 mW) 54 Mbps 14 dBm (25 mW) **802.11n** (2.4 GHz) 6.5 Mbps (MCS0) 18 dBm (63 mW) 65 Mbps (MCS7) 13 dBm (20 mW) **802.11n** (5 GHz) 6.5 Mbps (MCS0) 17 dBm (50 mW) 65 Mbps (MCS7) 12 dBm (16 mW) **Bluetooth** 4 dBm (2.5 mW) (Class 2)

Feature	Description
Typical Receiver Sensitivity ***Note:*** *All values nominal, +/-3 dBm.*	**802.11a:** 6 Mbps -88 dBm 54 Mbps -72 dBm (PER <= 10%) **802.11b:** 1 Mbps -95 dBm 11 Mbps -89 dBm (PER <= 8%) **802.11g:** 6 Mbps -90 dBm 54 Mbps -74 dBm (PER <= 10%) **802.11n (2.4 GHz)** MCS0 Mbps -90 dBm MCS7 Mbps -73 dBm **802.11n (5 GHz)** MCS0 Mbps -88 dBm MCS7 Mbps -71 dBm **Bluetooth:** 1 Mbps -89 dBm 2 Mbps -91 dBm 3 Mbps -85 dBm
Operating Systems Supported	Windows Mobile 6.5 Windows Mobile 6.1 Windows Mobile 6.0 Windows Mobile 5.0 Windows Embedded CE 6.0 R3 Windows Embedded CE 6.0 R2 Windows Embedded CE 6.0 Windows Embedded CE 5.0 Linux, 2.6.x kernel
Security	**Standards** ▪ Wireless Equivalent Privacy (WEP) ▪ Wi-Fi Protected Access (WPA) ▪ IEEE 802.11i (WPA2) **Encryption** ▪ Wireless Equivalent Privacy (WEP, RC4 Algorithm) ▪ Temporal Key Integrity Protocol (TKIP, RC4 Algorithm) ▪ Advanced Encryption Standard (AES, Rijndael Algorithm) **Encryption Key Provisioning** ▪ Static (40-bit and 128-bit lengths) ▪ Pre-Shared (PSK) ▪ Dynamic **802.1X Extensible Authentication Protocol Types** ▪ EAP-FAST ▪ EAP-TLS ▪ EAP-TTLS ▪ PEAP-GTC

Feature	Description
	▪ PEAP-MSCHAPv2 ▪ PEAP-TLS ▪ LEAP
Compliance **Note:** These regulatory domain certifications are pending.	**ETSI Regulatory Domain** EN 300 328 EN 300 328 v1.7.1 (BT 2.1) EN 301 489-1 EN 301 489-17 EN 301 893 EN 60950-1 EU 2002/95/EC (RoHS) **FCC Regulatory Domain** FCC 15.247 DTS – 802.11b/g (Wi-Fi) – 2.4 GHz & 5.8 GHz FCC 15.407 UNII – 802.11a (Wi-Fi) – 2.4 GHz & 5.4 GHz FCC 15.247 DSS – BT 2.1 **Industry Canada** RSS-210 – 802.11a/b/g/n (Wi-Fi) – 2.4 GHz, 5.8 GHz, 5.2 GHz, and 5.4 GHz RSS-210 – BT 2.1 **MIC (Japan) Regulatory Domain** (formerly TELEC) Article 2 Item 19, Category WW (2.4GHz Channels 1-13) Article 2 Item 19-2, Category GZ (2.4GHz Channel 14) Article 2 Item 19-3 Category XW (5150-5250 W52 & 5250-5350 W53) Article 2-1 Item 19-2 (BT 2.1)
Certifications **Note:** These certifications are pending.	**Wi-Fi Alliance** 802.11a, 802.11b, 802.11g , 802.11n WPA Enterprise WPA2 Enterprise **Compatible Extensions** (Version 4) **Bluetooth SIG Qualification**
Warranty	**Limited Lifetime**
All specifications are subject to change without notice	

Table 1: Specifications

Recommended Operating Conditions and DC Electrical Characteristics

Symbol	Parameter	Min	Typ	Max	Unit
VCC	DC Supply Voltage	3.0	3.3	3.6	V
VDD_IO	DC Supply Voltage (I/O)	-	-	-	V
V_{IL}	Low Level Input Voltage (VDDO = 3.3V)	-	-	0.8	V
V_{IH}	High Level Input Voltage (VDDO = 3.3V)	2.0	-	-	V
V_{IL}	Low Level Input Voltage (VDDO = 1.8V)	-	-	0.6	V
V_{IH}	High Level Input Voltage (VDDO = 1.8V)	1.1	-	-	V
V_{OL}	Low Level Output Voltage (100 µA load)	-	-	0.2	V
V_{OH}	High Level Output Voltage (-100 µA load)	VDDIO – 0.2V	-	-	V
I_{IL}	Low Current Input	-	0.3	-	µA
I_{IH}	High Current Input	-	0.3	-	µA
I_{OL}	Low Current Output (VDDO = 3.3V, V_{OL} = 0.4V)	-	-	3.0	mA
I_{OH}	High Current Output (VDDO = 3.3V, V_{OH} = 2.9V)	-	-	3.0	mA
C_{IN}	Input Capacitance	-	-	5	pF
	BT UART Baud Rate	9600 bps	115.2 Kbps (default coming out of reset)	4 Mbps	bps/Kbps/Mbps

Table 2: Recommended Operating Conditions and DC Electrical Characteristics

SDIO Timing Requirements

The following figure (Figure 2) and table display SDIO default mode timing.

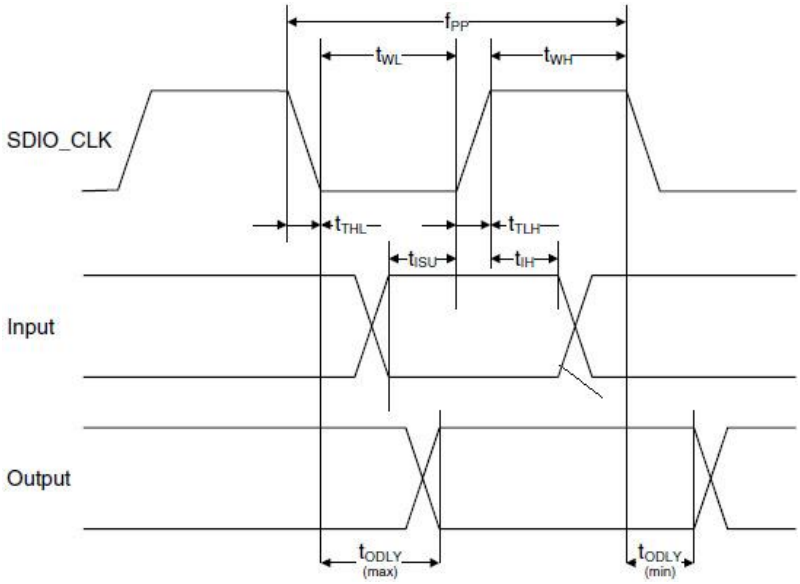


Figure 2: SDIO Default Mode Timing

Note: Timing is based on CL ≤ 40pF load on CMD and Data.

Symbol	Parameter	Min	Typ	Max	Unit
SDIO CLK (All values are referred to minimum VIH and maximum VIL*)					
fPP	Frequency – Data Transfer mode	0	-	25	MHz
fOD	Frequency – Identification mode	0	-	400	kHz
tWL	Clock low time	10	-	-	ns
tWH	Clock high time	10	-	-	ns
tTLH	Clock rise time	-	-	10	ns
tTHL	Clock low time	-	-	10	ns
Inputs: CMD, DAT (referenced to CLK)					
tISU	Input setup time	5	-	-	ns
tIH	Input hold time	5	-	-	ns
Outputs: CMD, DAT (referenced to CLK)					
tODLY	Output delay time – Data Transfer mode	0	-	14	ns
tODLY	Output delay time – Identification mode	0	-	50	ns

* min(Vih) = 0.7 x VDDIO and max(ViL) = 0.2 x VDDIO.

Table 3: SDIO Timing Requirements

UART Timing Requirements

The following figure (Figure 3) displays UART timing.

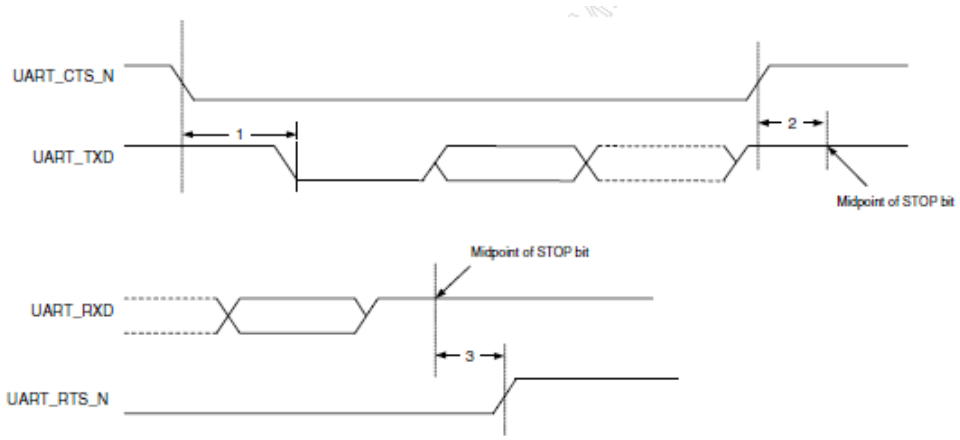


Figure 3: UART Timing Requirements

Notes: The UART 4-wire interface supports Bluetooth 2.1 HCI Specification.

Reference	Description	Min.	Typ.	Max.	Unit
1	Delay time, BT_UART_CTS_N low to UART_TXD valid	-	-	24	Baudout cycles
2	Setup time, BT_UART_CTS_N high before midpoint of stop bit	-	-	10	ns
3	Delay time, midpoint of stop bit to BT_UART_RTS_N high	-	-	2	Baudout cycles

Table 4: UART Timing Requirements

PCM Interface Timing

Short Frame Sync, Master Mode

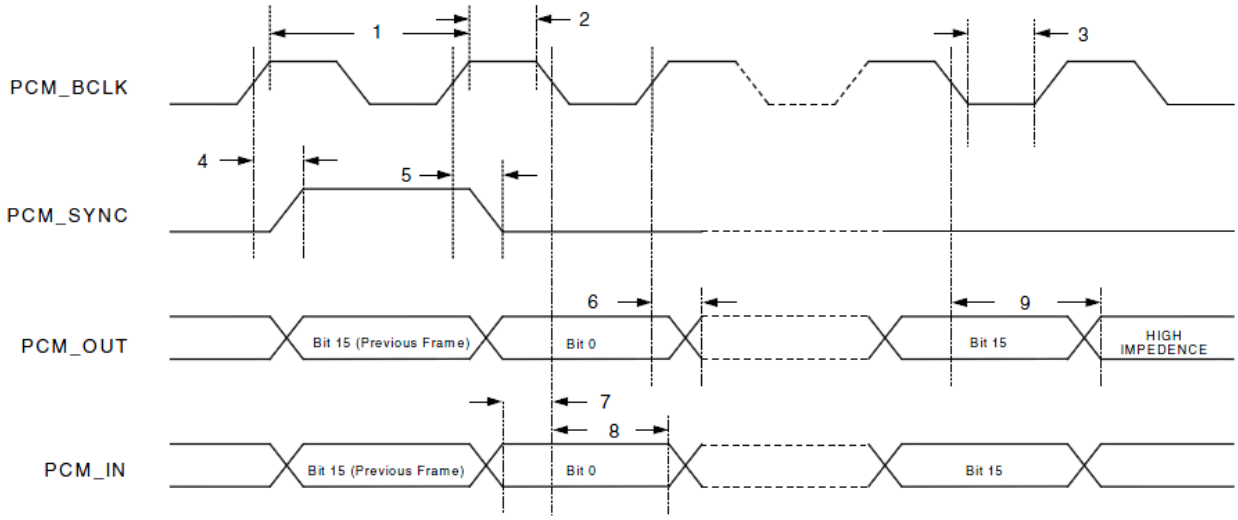


Figure 3: Short Frame Sync, Master Mode

Reference	Description	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	128	-	2048	kHz
2	PCM bit clock high time	128	-	-	ns
3	PCM bit clock low time	209	-	-	ns
4	Delay from BT_PCM_CLK rising edge to BT_PCM_SYNC high	-	-	50	ns
5	Delay from BT_PCM_CLK rising edge to BT_PCM_SYNC low	-	-	50	ns
6	Delay from BT_PCM_CLK rising edge to data valid on BT_PCM_OUT	-	-	50	ns
7	Setup time for BT_PCM_IN before BT_PCM_CLK falling edge	50	-	-	ns
8	Hold time for BT_PCM_IN after BT_PCM_CLK falling edge	10	-	-	ns
9	Delay from falling edge of BT_PCM_CLK during last bit period to BT_PCM_OUT becoming high impedance	-	-	50	ns

Table 5: Short Frame Sync, Master Mode

Short Frame Sync, Slave Mode

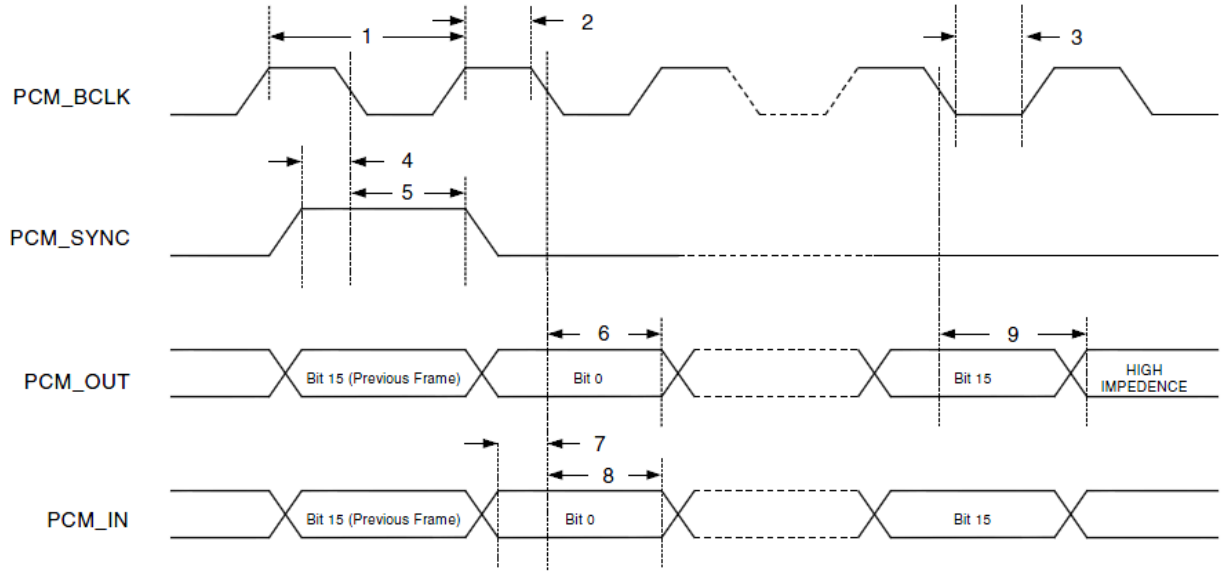


Figure 4: Short Frame Sync, Slave Mode

Reference	Description	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	128	-	2048	kHz
2	PCM bit clock high time	209	-	-	ns
3	PCM bit clock low time	209	-	-	ns
4	Setup time for BT_PCM_SYNC before falling edge of BT_PCM_BCLK	50	-	-	ns
5	Hold time for BT_PCM_SYNC after falling edge of BT_PCM_CLK	10	-	-	ns
6	Hold time of BT_PCM_OUT after BT_PCM_CLK falling time	-	-	175	ns
7	Setup time for BT_PCM_IN before BT_PCM_CLK falling edge	50	-	-	ns
8	Hold time for BT_PCM_IN after BT_PCM_CLK falling edge	10	-	-	ns
9	Delay from falling edge of BT_PCM_CLK during last bit period to BT_PCM_OUT becoming high impedance	-	-	100	ns

Table 6: Short Frame Sync, Slave Mode

Long Frame Sync, Master Mode

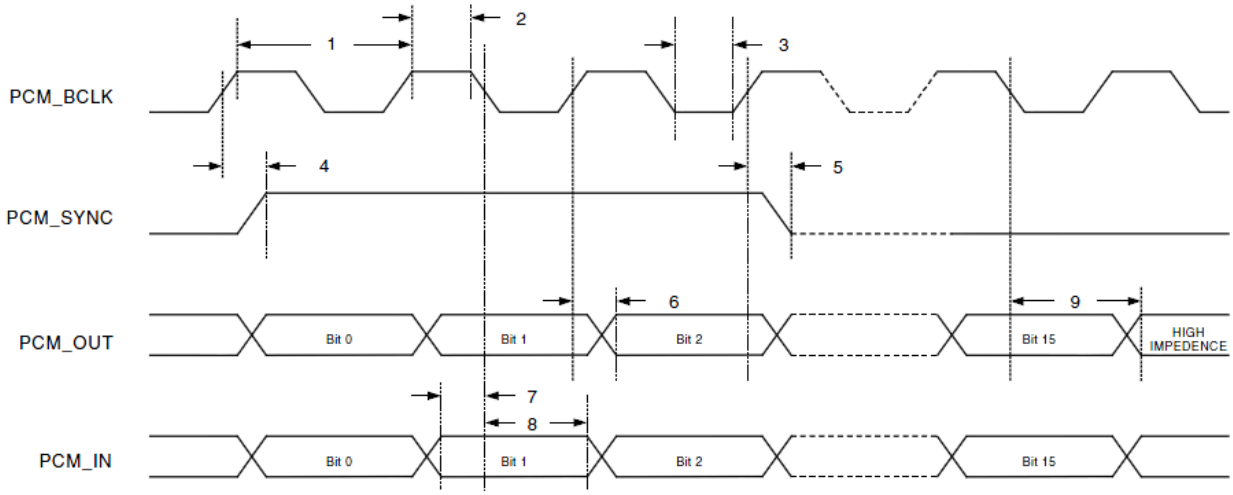


Figure 5: Long Frame Sync, Master Mode

Reference	Description	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	128	-	2048	kHz
2	PCM bit clock high time	209	-	-	ns
3	PCM bit clock low time	209	-	-	ns
4	Delay from BT_PCM_CLK rising edge to BT_PCM_SYNC high during first bit time	-	-	50	ns
5	Delay from BT_PCM_CLK rising edge to BT_PCM_SYNC low during third bit time	-	-	50	ns
6	Delay from BT_PCM_CLK rising edge to data valid on BT_PCM_OUT	-	-	50	ns
7	Setup time for BT_PCM_IN before BT_PCM_CLK falling edge	50	-	-	ns
8	Hold time for BT_PCM_IN after BT_PCM_CLK falling edge	10	-	-	ns
9	Delay from falling edge of BT_PCM_CLK during last bit period to BT_PCM_OUT becoming high impedance	-	-	50	ns

Table 7: Long Frame Sync, Master Mode

Long Frame Sync, Slave Mode

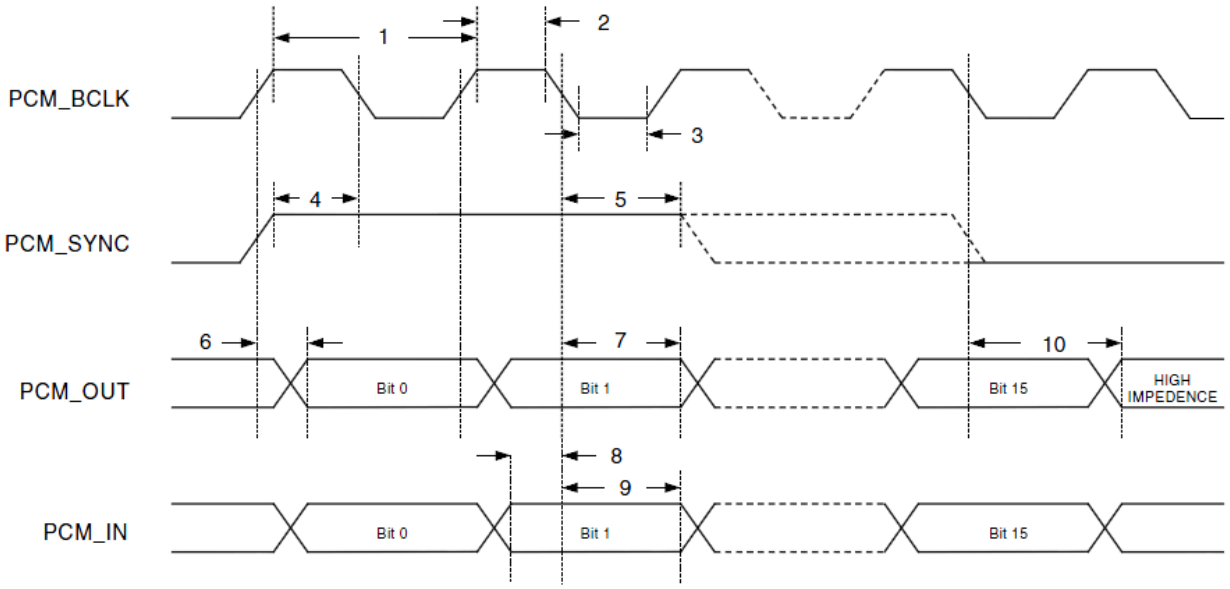


Figure 6: Long Frame Sync, Slave Mode

Reference	Description	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	128	-	2048	kHz
2	PCM bit clock high time	209	-	-	ns
3	PCM bit clock low time	209	-	-	ns
4	Setup time for BT_PCM_SYNC before falling edge of BT_PCM_CLK during first bit time	50	-	-	ns
5	Hold time for BT_PCM_SYNC after falling edge of BT_PCM_CLK during second bit period. **Note:** BT_PCM_SYNC may go low any time from second bit period to last bit period.	10	-	-	ns
6	Delay from rising edge of BT_PCM_CLK or BT_PCM_SYNC (whichever is later) to data valid for first bit on BT_PCM_OUT	-	-	50	ns
7	Hold time of BT_PCM_OUT after BT_PCM_CLK falling edge	-	-	175	ns
8	Setup time for BT_PCM_IN before BT_PCM_CLK falling edge	50	-	-	ns
9	Hold time for BT_PCM_IN after BT_PCM_CLK falling edge	10	-	-	ns

Reference	Description	Min.	Typ.	Max.	Unit
10	Delay from falling edge of BT_PCM_CLK or BT_PCM_SYNC (whichever is later) during last bit in slot to BT_PCM_OUT becoming high impedence	-	-	100	

Table 8: Long Frame Sync, Slave Mode

Control Signal Timing Requirements

The following figure (Figure 4) displays Control Signal timing.

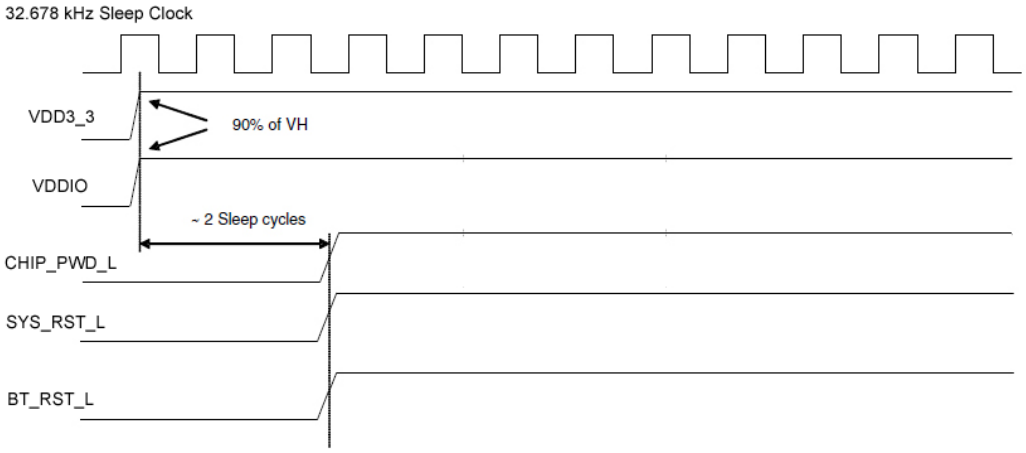


Figure 4: Control Signal Timing
WLAN = ON, Bluetooth = ON

Note: This radio has an integrated power-on reset circuit that resets all circuits to a known power-on state. The reset can also be driven by BT_RST_N (an active-low, external reset signal which can be used to externally force the device into a power-on reset state.

Pin Definitions

Wi-Fi	Bluetooth

Pin Number	Pin Name	I/O	Voltage Reference	Description
1	GND	-		Ground
2	GND	-		Ground
3	GND	-		Ground
4	GND	-		Ground
5	ANT_2	I/O		Antenna 2 (Auxiliary) 50 ohm coplanar wave guide to antenna or antenna connector. **Note:** Use only for dual antenna diversity applications; do not use for single antenna applications.
6	GND	-		Ground
7	GND	-		Ground
8	GND	-		Ground
9	GND	-		Ground
10	ANT_1	I/O		Antenna 1 (Main) 50 ohm coplanar wave guide to antenna or antenna connector **Note:** Use this antenna for single-antenna applications.
11	GND	-		Ground
12	GND	-		Ground
13	GND	-		Ground
14	GND	-		Ground
15	GND	-		Ground
16	GND	-		Ground
17	GND	-		Ground
18	GND	-		Ground
19	BT_PCM_OUT	O	VDDIO	PCM data output

Pin Number	Pin Name	I/O	Voltage Reference	Description
20	BT_WAKE_B	I	VDDIO	Bluetooth device wake-up: Signal from the host to the SDC-SSD40NBT indicating that the host requires attention. Asserted: Bluetooth device must wake-up or remain awake Deasserted: Bluetooth device may sleep when sleep criteria are met The polarity of this signal is software configurable and can be asserted high or low.
21	BT_HOST_WAKE_B	O	VDDIO	Host Wake-up Signal from the SDC-SSD40NBT to the host indicating that the radio requires attention. Asserted: Host device must wake-up or remain awake. Deasserted: Host device may sleep when sleep criteria are met The polarity of this signal is software configurable and can be asserted high or low.
22	BT_LED_ACT	O	VDDIO	Bluetooth LED Activity Indicator
23	VDD3_3	-		3.3V Power
24	GND	-		Ground
25	BT_UART_CTS_N	I	VDDIO	Clear-to-send signal for the Bluetooth UART interface, active low.
26	BT_UART_RTS_N	O	VDDIO	Request-to-send signal for the Bluetooth UART interface, active low.
27	BT_UART_TXD	O	VDDIO	Bluetooth UART Serial Output.
28	BT_UART_RXD	I	VDDIO	Bluetooth UART Serial Input.
29	BT_PCM_SYNC	I/O	VDDIO	PCM sync signal Can be master (output) or slave (input)
30	BT_PCM_IN	I	VDDIO	PCM data input
31	BT_PCM_CLK	I/O	VDDIO	PCM clock; can be master (output) or slave (input)

Pin Number	Pin Name	I/O	Voltage Reference	Description
32	VDDIO	-	VDDIO	3.3/1.8V I/O Power This is the reference pin for all I/O signaling pins. It accepts 1.8VDC to 3.3VDC
33	WL_LED_ACT	O	VDDIO	WLAN LED activity indicator I_{OH} = 2mA max (VDDIO = 1.8V) I_{OH} = 4mA max (VDDIO = 3.3V)
34	WL_GPIO_1	O	VDDIO	Wake on Wireless Wake on Wireless is not currently supported in the radio firmware. Do not connect when not used
35	SYS_RST_L	I	VDDIO	Resets the radio, active low. Must be asserted when power is first applied to the radio, then released before any transaction can start. See "Electrical Considerations" for the recommended SYS_RST_L circuitry
36	CHIP_PWD_L	I	VDDIO	Powers down the radio, active low
37	BT_RST_L	I	VDDIO	Low Asserting Reset for Bluetooth core When pin 36 is pulled from low to high, BT may be reset by toggling pin 37.
38	SDIO_DATA_0	I/O	VDDIO	SDIO Data 0
39	GND	-		Ground
40	SDIO_CLK	I	VDDIO	SDIO Clock (25MHz max)
41	GND	-		Ground
42	SDIO_DATA_1	I/O	VDDIO	SDIO Data 1
43	SDIO_DATA_3	I/O	VDDIO	SDIO Data 3
44	SDIO_DATA_2	I/O	VDDIO	SDIO Data 2
45	SDIO_CMD	I/O	VDDIO	SDIO Command
46	GND	-		Ground
47	CLK_32K	I		32k Ext Sleep Clock
48	SDIO_SEL	I	VDDIO	SDIO Default No external connection required.

Pin Number	Pin Name	I/O	Voltage Reference	Description
49	WLAN_ACTIVE	O	VDDIO	Reserved for output to BT device. When high, indicates that WLAN is transmitting or receiving. Not currently supported in the firmware. When not in use, leave open (float).
50	BT_PRIORITY	I/O	VDDIO	No connect Not currently supported in the firmware. When not in use, leave open (float).
51	BT_GPIO_6	I/O	VDDIO	3.3/1.8V I/O Signaling When not in use, leave open (float).
52	BT_ACTIVE	I/O	VDDIO	No connect Not currently supported in the firmware. When not in use, leave open (float).
53	BT_GPIO_5	I/O	VDDIO	3.3/1.8V I/O Signaling
54	BT_GPIO_7	I/O	VDDIO	3.3/1.8V I/O Signaling
55	BT_GPIO_4	I/O	VDDIO	3.3/1.8V I/O Signaling
56	BT_GPIO_3	I/O	VDDIO	3.3/1.8V I/O Signaling

Table 9: Pin Definitions

Electrical Considerations

Below is a section of the schematic for the MSD40NBT, a PCB module based on the SSD40NBT. Summit provides this for your reference only to aid you in integrating the SSD40NBT into your device.

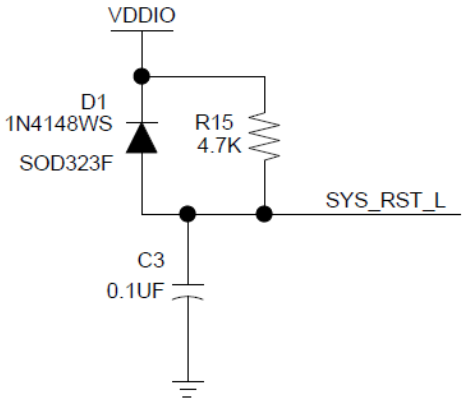


Figure 4: Recommended circuit for SYS_RST_L

Note: In the reset circuit, the diode is placed in parallel with the resistor to ensure the capacitor is discharged quickly when a power drop occurs. This minimizes the chance of register corruption within the processor and Wi-Fi module should such a power supply glitch arise.

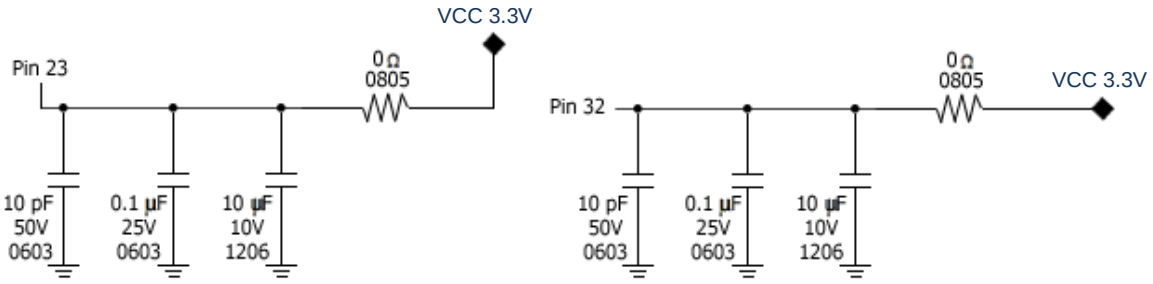
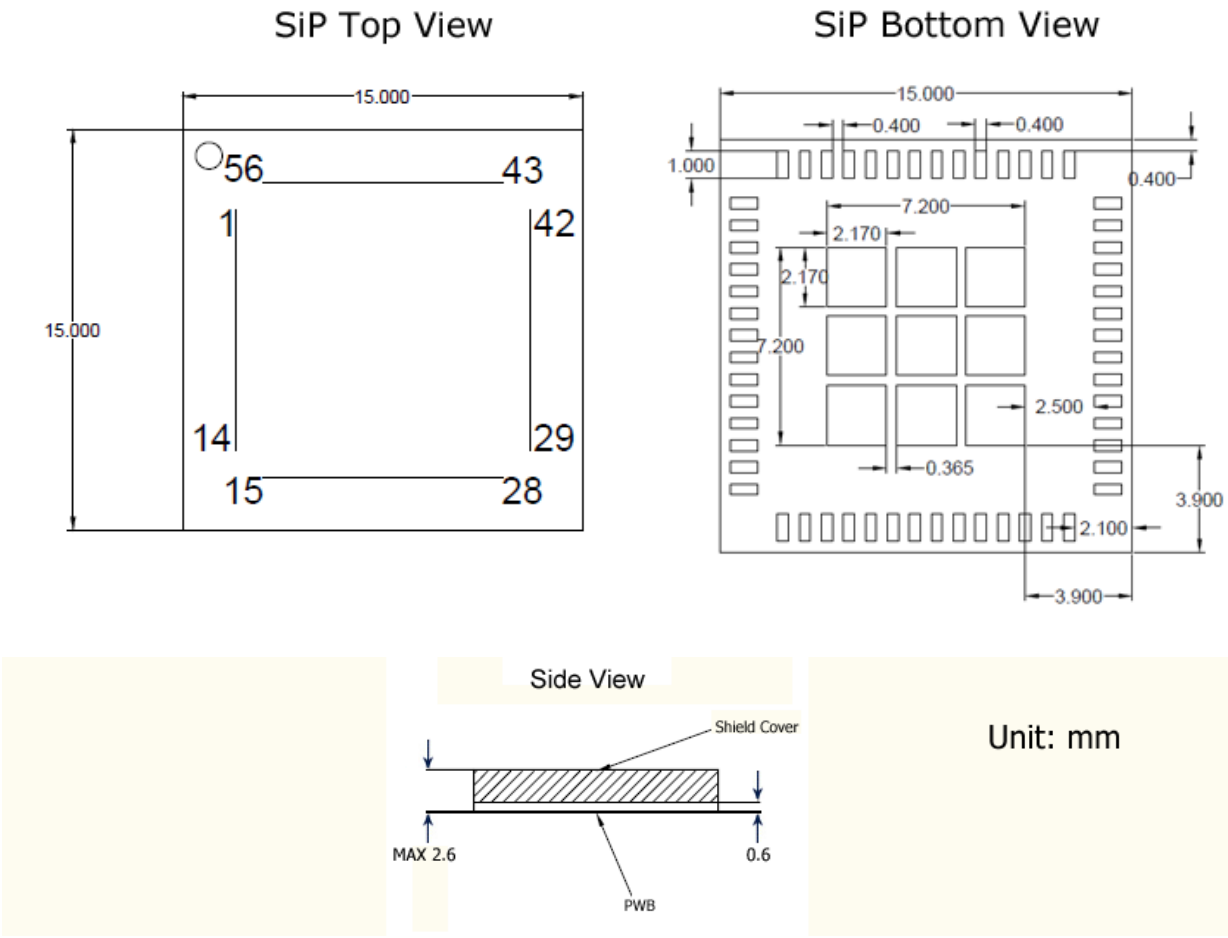


Figure 5: Recommended supply bypass

Note: The 10uF bypass capacitor must be a low-ESR type.

Note: The 0 ohm resistor is optional and could be replaced by a chip ferrite bead, if desired.

Mechanical Specifications



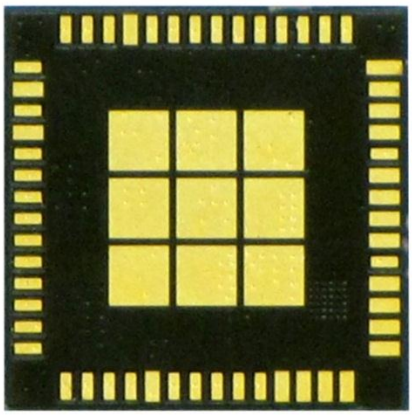
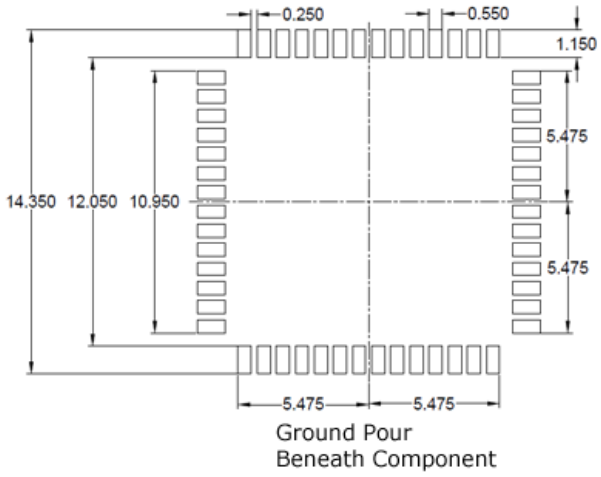
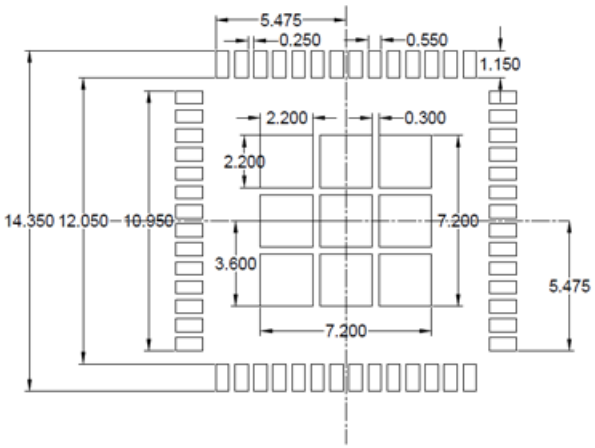


Figure 6: SiP Photo (Bottom View)

Host Land Pattern

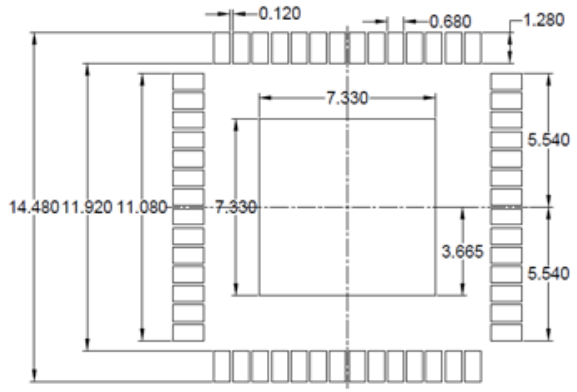


Solder Paste

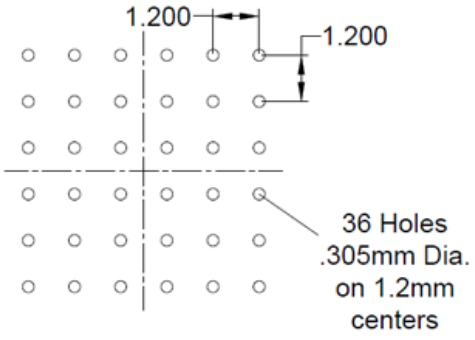


Note: The ground pad beneath the SiP (radio) should be the ground plane of your circuit board. The exposed portion of the ground pad beneath the SiP is controlled by the Solder Mask layer.

Solder Mask



Drill



Note: 36 Vias are not tented on the bottom side.

Mounting

Summit specializes in the design and manufacturing of Wi-Fi radio modules and cards. Although we understand that every system is different, our expertise does not extend to the system level. Because of this, we can provide only integration guidelines and not individual design reviews and approvals.

The SDC-SSD40NBT is a Quad Flat pack with No Leads (QFN) System in Package (SiP). Summit has mounted this device to a PCB with a host and antenna connectors and markets that radio module as the SDC-MSD40NBT.

Note: The following information results from Summit's experience in producing the SDC-MSD40NBT. Summit provides these data for informational purposes only and provides no warranties or claims with regard to the applicability of this information to a particular design.

Solder Stencil Opening for Pads (56 signal pads): 1:1 to 1:0.9 (dependent on solder type)

Solder Stencil Opening for Thermal Pads (9 "window pane" pads): 1:0.5 to 1:0.75 (dependent on solder type)

Note: The vias that are in the thermal pad (6x6 pattern of 12 mil holes) are open; they are not tented by the solder mask on the bottom side. This allows excess paste to escape from the bottom side to help ensure a flat SIP installation.

Solder Paste Type: No-Clean as the soldered part to board clearance will not allow for adequate post solder cleaning

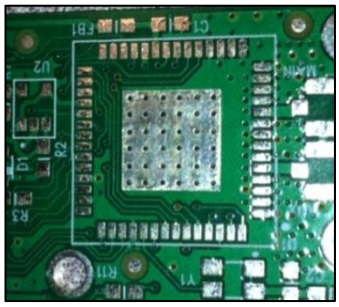


Figure 7: Footprint from the Summit MSD30/40 PCB

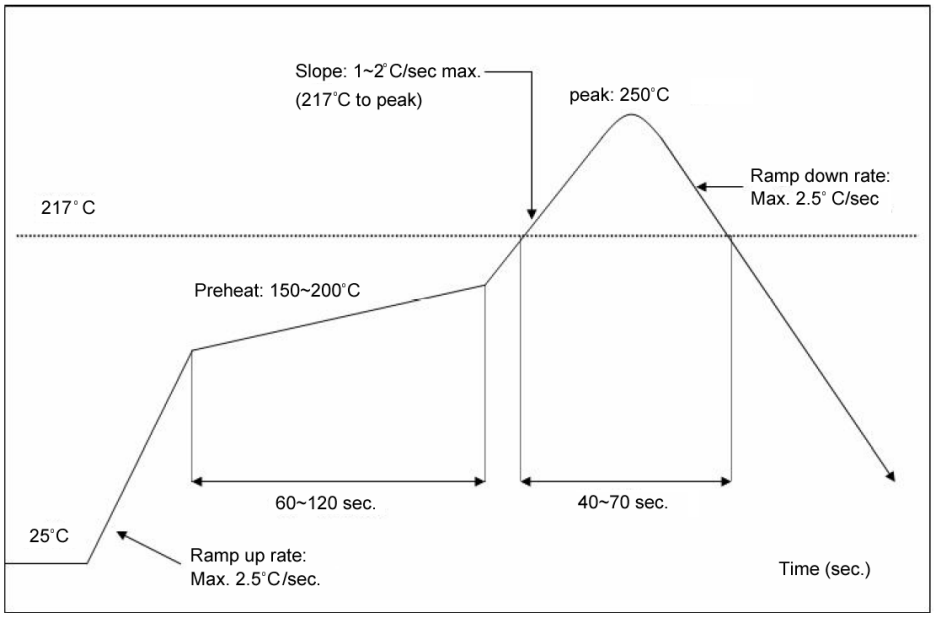
Rework is technically challenging due to parts on the SIP reflowing at the same temperature needed for rework. The SDC-SSD40NBT cannot be lifted by the shield during rework. As such, removal of part for rework is not recommended. Reflow without removal has been successfully used to clear shorts found during x-ray inspection.

Reflow: The SDC-SSD40NBT is RoHS compliant and as such is sensitive to heat. The below graphic details a typical profile for such and device and is provided for reference purposes.

Recommendations:

If the SSD30NBT has been removed from the moisture-protective packaging for more than 24 hours, bake at 125 degrees Celsius for 24 hours (per Jedec-STD-033). This is a preparatory step prior to reflow to ensure that the SIPs are sufficiently dehydrated. Reflow should occur immediately following baking to prevent rehydration.

Referred to IPC/JEDEC standard.
Peak Temperature: < 250˚C
Number of Times: ≤ 2



RF Layout Design Guidelines

The following is a list of RF layout design guidelines and recommendation when installing a Summit radio into your device.

- Do not run antenna cables directly above or directly below the radio.
- Do not place any parts or run any high speed digital lines below the radio.
- If there are other radios or transmitters located on the device (such as a Bluetooth radio), place the devices as far apart from each other as possible.
- Ensure that there is the maximum allowable spacing separating the antenna connectors on the Summit radio from the antenna. In addition, do not place antennas directly above or directly below the radio.
- Summit recommends the use of a double shielded cable for the connection between the radio and the antenna elements.
- Use proper electro-static-discharge (ESD) procedures when installing the Summit radio module.

Regulatory

Certified Antennas

The SDC-SSD40NBT will be tested to the regulatory standards defined in the “Certifications” section of the Specifications table above. Summit plans to conduct these tests with the following antennas:

Cisco AIR-ANT 4941

- **Form Factor:** Whip
- **Type:** Dipole
- **Maximum 2.4 GHz Gain:** 2.2 dBi
- **Tested and Certified 2.4 GHz Transmit Power:** TBD

Radiall Larson Dipole (R380500314))

- **Form Factor:** Whip
- **Type:** Dipole
- **Maximum 2.4 GHz Gain:** 1.6 dBi (not used during testing)
- **Maximum 5 GHz Gain:** 5 dBi
- **Tested and Certified 5 GHz Transmit Power:** TBD

HUBER+SUHNER (SOA 2459/360/5/0/V_C)

- **Form Factor:** Whip
- **Type:** Monopole
- **Maximum 2.4 GHz Gain:** 3dBi
- **Maximum 5 GHz Gain:** 6.5dBi
- **Tested and Certified 2.4 GHz Transmit Power:** TBD
- **Tested and Certified 5 GHz Transmit Power:** TBD

Note: If the formal test reports for the SDC-SSD40NBTshow that transmit power was decreased to less than 100% on 2.4 GHz edge channels. Summit will make these transmit power reductions in firmware for the edge channels. Integrators do not need to reduce transmit power on a channel-by-channel basis to comply with band edge regulations.

Antennas of differing types and higher gains may be integrated as well. If necessary, with the Summit Manufacturing Utility software utility, OEMs may reduce the transmit power of the SDC-SSD40NBT to account for higher antenna gain. In some cases, OEMs may be able to reduce certification efforts by using antennas that are of like type and equal or lesser gain to the above listed antennas.

Documentation Requirements

In order to maintain regulatory compliance, when integrating the SDC-SSD40NBT into a host device and leveraging Summit's grants and certifications, it is necessary to meet the documentation requirements set forth by the applicable regulatory agencies. The following sections (FCC, Industry Canada, and European Union) outline the information that may be included in the user's guide and external labels for the host devices into which the SDC-SSD40NBT is integrated.

FCC

User's Guide Requirements

When integrating the SDC-SSD40NBT into a host device, the integrator must include specific information in the user's guide for the device into which the SDC-SSD40NBT is integrated. The integrator must not

provide information to the end user regarding how to install or remove this RF module in the user's manual of the device into which the SDC-SSD40NBT is integrated. The following FCC statements must be added in their entirety and without modification into a prominent place in the user's guide for the device into which the SDC-SSD40NBT is integrated:

Federal Communication Commission Interference Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one of the following measures:

1. Reorient or relocate the receiving antenna.
2. Increase the separation between the equipment and receiver.
3. Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
4. Consult the dealer or an experienced radio/TV technician for help.

FCC Caution: Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

IMPORTANT NOTE: FCC Radiation Exposure Statement:

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.

Labeling Requirements

Because the SDC-SSD40NBT approvals are based on the SDC-MSD40NBT, the final end product must be labeled in a visible area with the following notice:

Contains FCC ID: TWG-SDCMSD40NBT

Industry Canada

User's Guide Requirements

When integrating the SDC-SSD40NBT into a host device, the integrator must include specific information in the user's guide for the device into which the SDC-SSD40NBT is integrated. The integrator must not provide information to the end user regarding how to install or remove this RF module in the user's manual of the device into which the SDC-SSD40NBT is integrated. In addition to the required FCC statements outlined above, the following IC statements must be added in their entirety and without modification into a prominent place in the user's guide for the device into which the SDC-SSD40NBT is integrated:

To prevent radio interference to the licensed service, this device is intended to be operated indoors and away from windows to provide maximum shielding. Equipment (or its transmit antenna) that is installed outdoors is subject to licensing.

The integrator must list out information for each antenna used with the host device into which the SDC-SSD40NBT is integrated. The following examples are based on antennas with which the SDC-SSD40NBT was tested and represent an acceptable format:

AIR-ANT 4941

- **Form Factor:** Whip
- **Type:** Dipole
- **Maximum 2.4 GHz Gain:** 2.2 dBi

Radiall Larson Dipole

- **Form Factor:** Whip
- **Type:** Dipole
- **Maximum 2.4 GHz Gain:** 1.6 dBi (not used during testing)
- **Maximum 5 GHz Gain:** 5 dBi

HUBER+SUHNER

- **Form Factor:** Whip
- **Type:** Monopole
- **Maximum 2.4 GHz Gain:** 3 dBi
- **Maximum 5 GHz Gain:** 6.5 dBi

Because the SDC-SSD40NBT approvals are based on the SDC-MSD40NBT, the final end product must be labeled in a visible area with the following notice:

Contains IC ID: 6616A-SDCMSD40NBT

European Union

User's Guide Requirements

The integrator must include specific information in the user's guide for the device into which the SDC-SSD40NBT is integrated. In addition to the required FCC and IC statements outlined above, the following R&TTE statements must be added in their entirety and without modification into a prominent place in the user's guide for the device into which the SDC-SSD40NBT is integrated:

This device complies with the essential requirements of the R&TTE Directive 1999/5/EC. The following test methods have been applied in order to prove presumption of conformity with the essential requirements of the R&TTE Directive 1999/5/EC:

- **EN60950-1:2001 A11:2004**

  Safety of Information Technology Equipment

- **EN 300 328 V1.7.1: (2006-10)**

  Electromagnetic compatibility and Radio spectrum Matters (ERM); Wideband Transmission systems; Data transmission equipment operating in the 2,4 GHz ISM band and using spread spectrum modulation techniques; Harmonized EN covering essential requirements under article 3.2 of the R&TTE Directive

- **EN 300 328 v1.7.1 (BT 2.1)**

- **EN 301 489-1 V1.6.1: (2005-09)**

  Electromagnetic compatibility and Radio Spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements

- **EN 301 489-17 V1.2.1 (2002-08)**

  Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2,4 GHz wideband transmission systems and 5 GHz high performance RLAN equipment

- **EN 301 893**

  Electromagnetic compatibility and Radio spectrum Matters (ERM); Broadband Radio Access Networks (BRAN); Specific conditions for 5 GHz high performance RLAN equipment

- **EU 2002/95/EC (RoHS)**

  Declaration of Compliance – EU Directive 2003/95/EC; Reduction of Hazardous Substances (RoHS)

This device is a 2.4 GHz wideband transmission system (transceiver), intended for use in all EU member states and EFTA countries, except in France and Italy where restrictive use applies.

In Italy the end-user should apply for a license at the national spectrum authorities in order to obtain authorization to use the device for setting up outdoor radio links and/or for supplying public access to telecommunications and/or network services.

This device may not be used for setting up outdoor radio links in France and in some areas the RF output power may be limited to 10 mW EIRP in the frequency range of 2454 – 2483.5 MHz. For detailed information the end-user should contact the national spectrum authority in France.

Česky [Czech]	*[Jméno výrobce]* tímto prohlašuje, že tento *[typ zařízení]* je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
Dansk [Danish]	Undertegnede *[fabrikantens navn]* erklærer herved, at følgende udstyr *[udstyrets typebetegnelse]* overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF.
Deutsch [German]	Hiermit erklärt *[Name des Herstellers]*, dass sich das Gerät *[Gerätetyp]* in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 1999/5/EG befindet.
Eesti [Estonian]	Käesolevaga kinnitab *[tootja nimi = name of manufacturer]* seadme *[seadme tüüp = type of equipment]* vastavust direktiivi 1999/5/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
English	Hereby, *[name of manufacturer]*, declares that this *[type of equipment]* is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.
Español [Spanish]	Por medio de la presente *[nombre del fabricante]* declara que el *[clase de equipo]* cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE.
Ελληνική [Greek]	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ *[name of manufacturer]* ΔΗΛΩΝΕΙ ΟΤΙ *[type of equipment]* ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ.
Français [French]	Par la présente *[nom du fabricant]* déclare que l'appareil *[type d'appareil]* est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Italiano [Italian]	Con la presente *[nome del costruttore]* dichiara che questo *[tipo di apparecchio]* è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.
Latviski [Latvian]	Ar šo *[name of manufacturer / izgatavotāja nosaukums]* deklarē, ka *[type of equipment / iekārtas tips]* atbilst Direktīvas 1999/5/EK būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lietuvių [Lithuanian]	Šiuo *[manufacturer name]* deklaruoja, kad šis *[equipment type]* atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
Nederlands [Dutch]	Hierbij verklaart *[naam van de fabrikant]* dat het toestel *[type van toestel]* in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG.
Malti [Maltese]	Hawnhekk, *[isem tal-manifattur]*, jiddikjara li dan *[il-mudel tal-prodott]* jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 1999/5/EC.

Magyar [Hungarian]	Alulírott, *[gyártó neve]* nyilatkozom, hogy a *[... típus]* megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
Polski [Polish]	Niniejszym *[nazwa producenta]* oświadcza, że *[nazwa wyrobu]* jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
Português [Portuguese]	*[Nome do fabricante]* declara que este *[tipo de equipamento]* está conforme com os requisitos essenciais e outras disposições da Directiva 1999/5/CE.
Slovensko [Slovenian]	*[Ime proizvajalca]* izjavlja, da je ta *[tip opreme]* v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 1999/5/ES.
Slovensky [Slovak]	*[Meno výrobcu]* týmto vyhlasuje, že *[typ zariadenia]* spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 1999/5/ES.
Suomi [Finnish]	*[Valmistaja = manufacturer]* vakuuttaa täten että *[type of equipment = laitteen tyyppimerkintä]* tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
Svenska [Swedish]	Härmed intygar *[företag]* att denna *[utrustningstyp]* står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

Labeling Requirements

The final end product must be labeled in a visible area with the following notice: