SDC-MSD40NBT

User's Guide

Version 1.0

Contents

Scope

This document describes key hardware aspects of the Summit SDC-MSD40NBT 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 is drawn from a number of sources and includes information found in the Broadcom BCM4329 data sheet issued in June of 2009.

The SDC-MSD40NBT is currently in pre-production and 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-MSD40NBT 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) and 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-MSD40NBT fully conforms to applicable regulatory requirements. In the event that specified types of radar are detected by the network infrastructure, the SDC-MSD40NBT fully conforms to commands from the infrastructure for radar avoidance.

The SDC-MSD40NBT interfaces to host devices via a 60-pin 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-MSD40NBT 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 SDC-MSD40NBT 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-MSD40NBTprovides two unique U.FL type antenna connectors tosupport 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-MSD40NBT is installed. The SDC-MSD40NBT 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.

Specifications

Feature	Description
Physical Interface	Molex 54722-0607 60-pin connector (mates to Molex 55560-0607 60-pin connector)
Wi-Fi Interface	1-bit or 4-bit Secure Digital I/O
Bluetooth Interface	Host Controller Interface (HCI) using High Speed UART
Antenna Interface	2 Hirose U.FL connectors for dual-band antenna diversity
	IMPORTANT: When using a single antenna, it MUST be connected to the Auxiliary (AUX) port. BT functions on the AUX port and not the Main port. For WiFi/BT single-antenna implementations, the AUX port must be used.
Main Chip	Broadcom BCM4329
Input Voltage Requirements	3.3 VDC ± 10% (core)
I/O Signaling Voltage	3.3 VDC ± 10%
Average Current Consumption, VDDIO = 3.3 volts (At maximum transmit power setting) **Note:** *Standby* refers to the radio operating in PM1 powersave mode.	**802.11a** (with BT in standby) Transmit: 282 mA (931 mW) Receive: 92 mA (304 mW) Standby: TBD **802.11b** (with BT in standby) Transmit: 314 mA (1036 mW) Receive: 92 mA (304 mW) Standby: TBD **802.11g** (with BT in standby) Transmit: 288 mA (950 mW) Receive: 92 mA (304 mW) Standby: TBD **802.11n (2.4 GHz)** (with BT in standby) Transmit: 292 mA (964 mW) Receive: 92 mA (304 mW) Standby: TBD **802.11n (5 GHz)** (with BT in standby) Transmit: 270 mA (891 mW) Receive: 92 mA (304 mW) Standby: TBD

Feature	Description
	Bluetooth (with Wi-Fi in standby) Transmit: TBD mA (TBD mW) Receive: TBD mA (TBD mW)
Operating Temperature	-25° to 80°C (-13° to 176°F)
Operating Humidity	10 to 90% (non-condensing)
Storage Temperature	-25° to 85°C (-13° to 185°F)
Storage Humidity	10 to 90% (non-condensing)
Maximum Electrostatic Discharge	8 kV
Length	32 mm (1.26 in.)
Width	22 mm (0.87 in.)
Thickness	5.05mm (0.17 in.)
Weight	3.0 g (0.11 oz.)
Mounting	60-pin connector, mounting holes (M2 screws)
Wi-Fi Media	Direct Sequence-Spread Spectrum (DSSS) Complementary Code Keying (CCK) Orthogonal Frequency Divisional Multiplexing (OFDM)
Bluetooth Media	Frequency Hopping Spread Spectrum (FSSS)
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
Wi-Fi Modulation	BPSK @ 1, 6, 6.5, 7.2 and 9 Mbps QPSK @ 2, 5.5, 11, 12, 13, 14.4,18, 19.5 and 21.7 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

Feature	Description
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)
Wi-Fi and Bluetooth 2.4 GHz Frequency Bands	**ETSI** 2.4 GHz to 2.483 GHz **FCC** 2.4 GHz to 2.483 GHz **MIC (Japan)** 2.4 GHz to 2.495 GHz **KC** 2.4 GHz to 2.483 GHz
Wi-Fi 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)** 5.15 GHz to 5.35 GHz **KC** 5.15 GHz to 5.35 GHz 5.47 GHz to 5.725 GHz 5.725 GHz to 5.82 GHz
Wi-Fi 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)
Wi-Fi 5 GHz Operating Channels	ETSI: 19 non-overlapping FCC: 23 non-overlapping MIC (Japan): 8 non-overlapping KCC: 23 non-overlapping

Feature	Description
Transmit Power *Note: 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 16 dBm (40 mW) 54 Mbps 16 dBm (40 mW) **802.11b** 1 Mbps 16 dBm (40 mW) 11 Mbps 16 dBm (40 mW) **802.11g** 6 Mbps 15 dBm (32 mW) 54 Mbps 14 dBm (25 mW) **802.11n** (2.4 GHz) 6.5 Mbps (MCS0) 13 dBm (20 mW) 65 Mbps (MCS7) 11 dBm (13 mW) **802.11n** (5 GHz) 6.5 Mbps (MCS0) 16 dBm (40 mW) 65 Mbps (MCS7) 13 dBm (20 mW) **Bluetooth** 1 Mbps -0.5 dBm (1.1 mW) 2 Mbps -0.5 dBm (1.1 mW) 3 Mbps -0.5 dBm (1.1 mW)
Typical Receiver Sensitivity *Note: All values nominal, +/-3 dBm.*	**802.11a:** 6 Mbps -89 dBm 54 Mbps -77 dBm (PER <= 10%) **802.11b:** 1 Mbps -95 dBm 11 Mbps -87 dBm (PER <= 8%) **802.11g:** 6 Mbps -90 dBm 54 Mbps -77 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 TBD 2 Mbps TBD 3 Mbps TBD

Feature	Description
Operating Systems Supported	Windows Mobile 6.5 Windows Mobile 6.1 Windows Mobile 6.0 Windows Mobile 5.0 Windows Embedded CE 7.0 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, 3.x.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 ▪ PEAP-MSCHAPv2 ▪ PEAP-TLS ▪ LEAP

Feature	Description
Compliance **Note:** These agency approvals 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 **Cisco 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)	-1.8	-	-3.3	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_{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

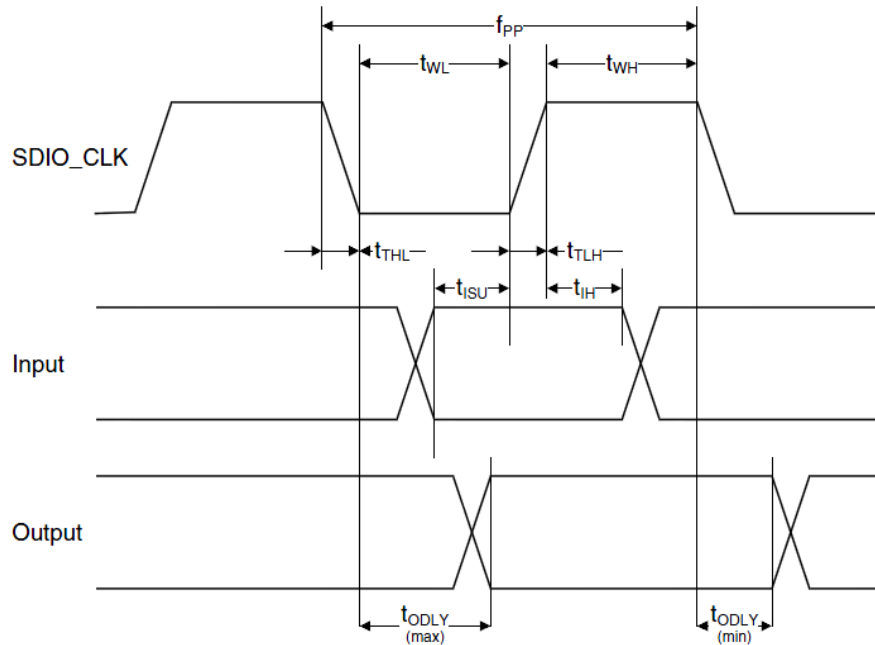The following figure (Figure 1) and table display SDIO default mode timing.

Figure 1: 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

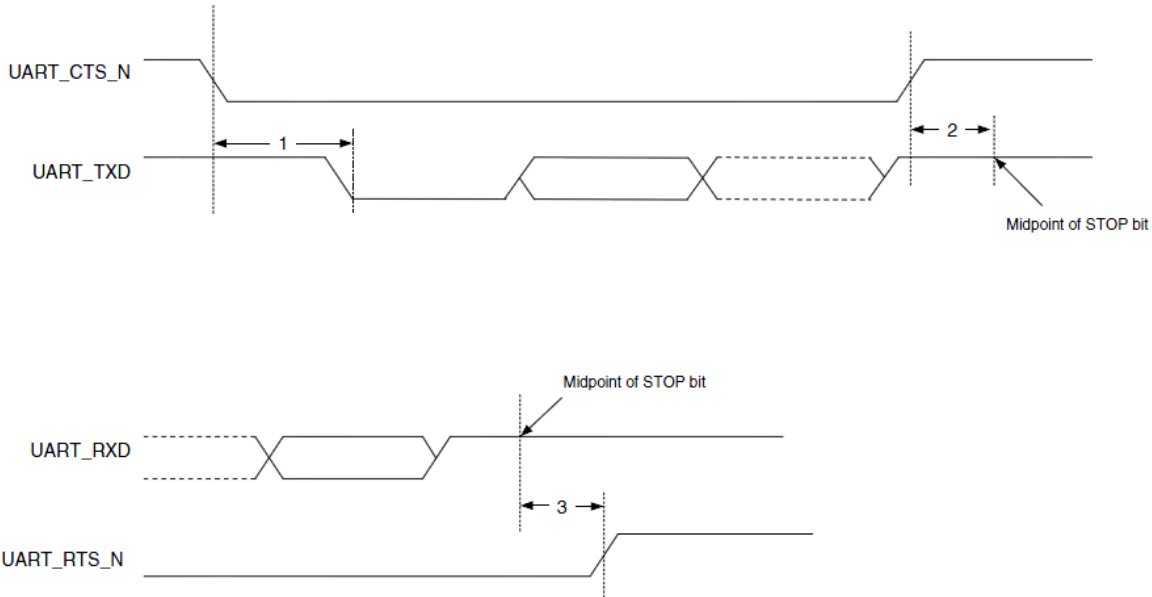The following figure (Figure 2) displays UART timing.

Figure 2: 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_CTShigh 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
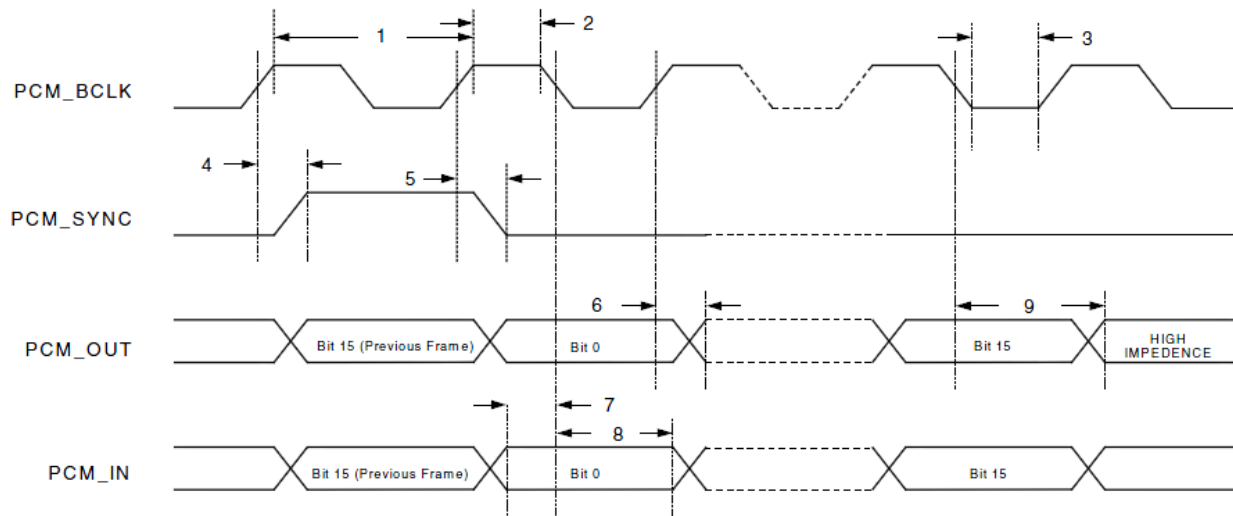
- PCM Defaults
- Short Frame Sync, Master Mode
- Short Frame Sync, Slave Mode
- Long Frame Sync, Master Mode
- Long Frame Sync, Slave Mode

PCM Defaults

SCO Routing	PCM
Clock Mode	Master
Sync Mode	Master
Frame Type	Short

Interface Rate	512
Sample Interval	8khz
16 bit mono	

Short Frame Sync, Master Mode

Figure 3: Short Frame Sync, Master Mode

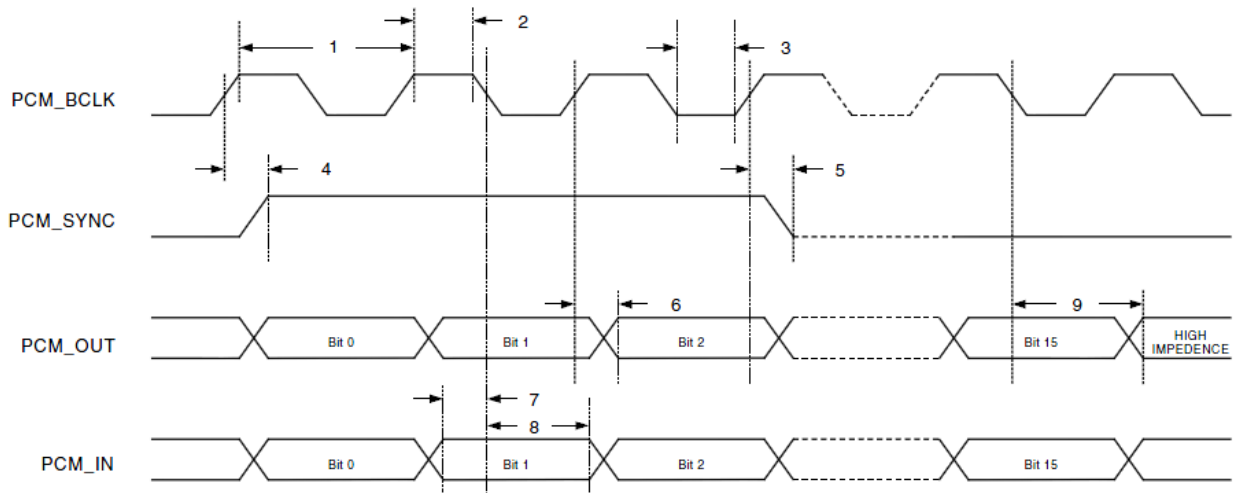| Reference	Description	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	128	-	2048	kHz
2	PCM bit clock high time	128	-	-	ns
3	PCM bit clock low time	209	-	-	ns
4	Delay from BT_PCM_CLK rising edge to BT_PCM_SYNC high	-	-	50	ns
5	Delay from BT_PCM_CLK rising edge to BT_PCM_SYNC low	-	-	50	ns
6	Delay from 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
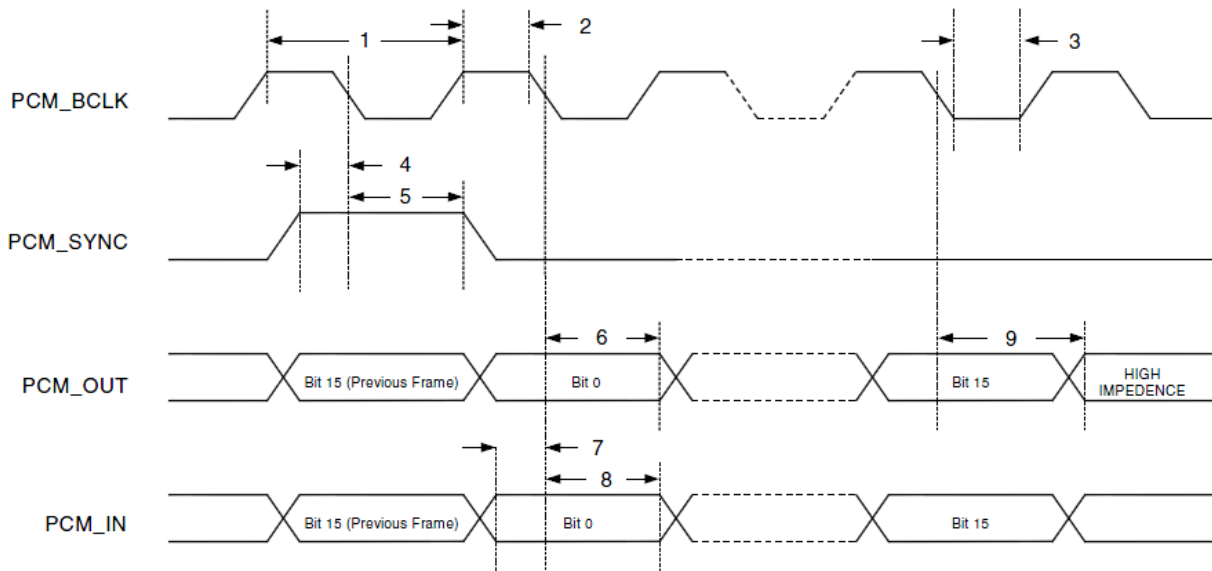
Figure 4: Short Frame Sync, Slave Mode

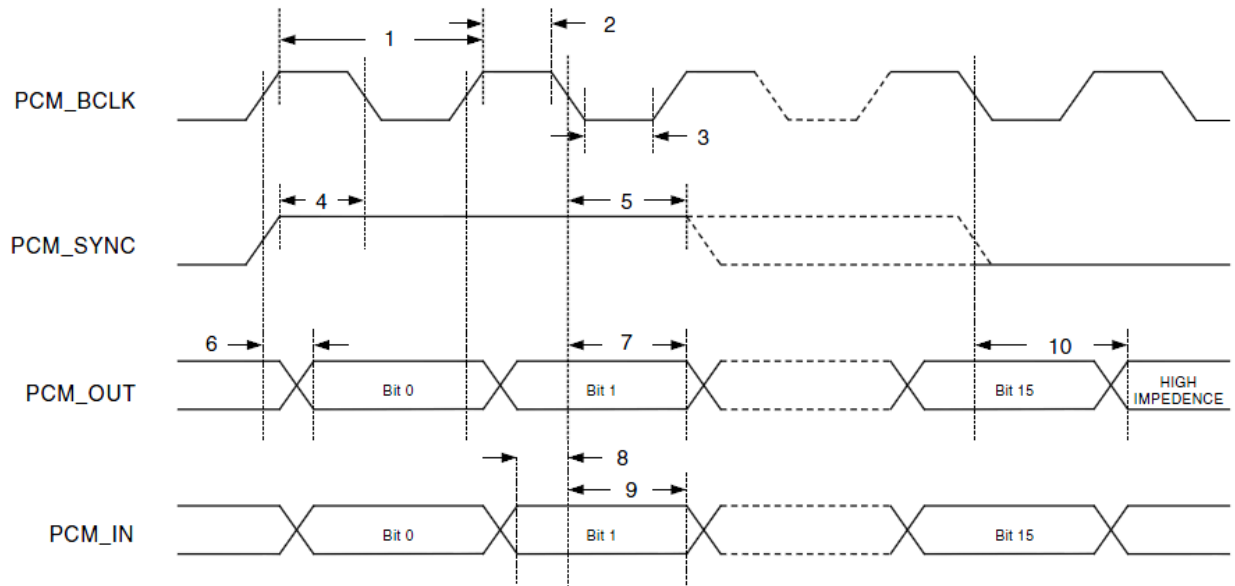| Reference	Description	Min.	Typ.	Max.	Unit
1	PCM bit clock frequency	128	-	2048	kHz
2	PCM bit clock high time	209	-	-	ns
3	PCM bit clock low time	209	-	-	ns
4	Setup time for BT_PCM_SYNC before falling edge of BT_PCM_BCLK	50	-	-	ns
5	Hold time for BT_PCM_SYNC after falling edge of BT_PCM_CLK	10	-	-	ns
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

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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

Pin Definitions

Wi-Fi	Bluetooth	Wi-Fi/Bluetooth

Pin Number	Pin Name	I/O	Voltage Reference	Description
1	GND	-		Ground
2	BT_UART_TXD	O	VDDIO	Bluetooth UART Serial Output.
3	BT_PRIORITY	I/O	VDDIO	No connect Not currently supported in the firmware. When not in use, leave open (float).
4	BT_GPIO_6	I/O	VDDIO	3.3V I/O Signaling
5	BT_UART_RTS_N	O	VDDIO	Request-to-send signal for the Bluetooth UART interface, active low.
6	BT_UART_RXD	I	VDDIO	Bluetooth UART Serial Input.
7	BT_HOST_WAKE_B	O		Host Wake-up Signal from the MSD40NBT 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 signal polarity is software configurable and can be asserted high or low. **Note:** The default is low but this is only applicable for specific Bluetooth Sleep mode settings. By default, the radio has "No Sleep Mode Set".
8	RSVD	O	VDDIO	Reserved for Wake on Wireless Wake on Wireless is not currently

Pin Number	Pin Name	I/O	Voltage Reference	Description
				supported in the radio firmware. Do not connect when not used
9	RSVD	O	VDDIO	Reserved. Bluetooth LED Activity Indicator, active high.
10	BT_PCM_OUT	O	VDDIO	PCM data output
11	BT_UART_CTS_N	I	VDDIO	Clear-to-send signal for the Bluetooth UART interface, active low.
12	RSVD	I	VDDIO	Bluetooth Device Wake-up Signal from the host to the SDC-MSD40NBT 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 signal polarity is software configurable and can be asserted high or low. **Note:** The default is low but this is only applicable for specific Bluetooth Sleep mode settings. By default, the radio has "No Sleep Mode Set".
13	VCC3_3	-		3.3V Module Power
14	No Connect			Not Used. Leave Open (Float)
15	No Connect			Not Used. Leave Open (Float)
16	No Connect			Not Used. Leave Open (Float)
17	No Connect			Not Used. Leave Open (Float)
18	No Connect			Not Used. Leave Open (Float)
19	No Connect			Not Used. Leave Open (Float)
20	BT_PCM_SYNC	I/O	VDDIO	PCM sync signal Default master (output); can be configured slave (input)
21	No Connect			Not Used. Leave Open (Float)
22	BT_PCM_IN	I	VDDIO	PCM data input
23	No Connect			Not Used. Leave Open (Float)

Pin Number	Pin Name	I/O	Voltage Reference	Description	
24	BT_PCM_CLK	I/O	VDDIO	PCM clock Default master (output): can be configured slave (input)	
25	No Connect			Not Used. Leave Open (Float)	
26	SYS_RST_L	I	VDDIO	Resets the Wi-Fi radio, active low. Must be asserted when power is first applied to the radio; then released before any transaction can start (see Note). See "Electrical Considerations" for the recommended SYS_RST_L circuitry)	
27	SDIO_DATA_2	I/O	VDDIO	SDIO Data 2	**Note:** See "Integration Considerations" for additional integration information.
28	RSVD	O	VDDIO	Reserved. No Connect.	
29	VCC3_3	-		3.3V Module Power	
30	GND	-		Ground	
31	GND	-		Ground	
32	BT_RST_L	I	VDDIO	Resets the BT radio, active low. Must be asserted when power is first applied to the radio; then released before any transaction can start.	
33	No Connect			Not Used. Leave Open (Float)	
34	No Connect			Not Used. Leave Open (Float)	
35	No Connect			Not Used. Leave Open (Float)	
36	RSVD	I/O	VDDIO	Reserved. No Connect.	
37	No Connect			Not Used. Leave Open (Float)	
38	No Connect			Not Used. Leave Open (Float)	
39	No Connect			Not Used. Leave Open (Float)	
40	No Connect			Not Used. Leave Open (Float)	
41	No Connect			Not Used. Leave Open (Float)	
42	RSVD	O	VDDIO	Reserved. No Connect.	
43	No Connect			Not Used. Leave Open (Float)	

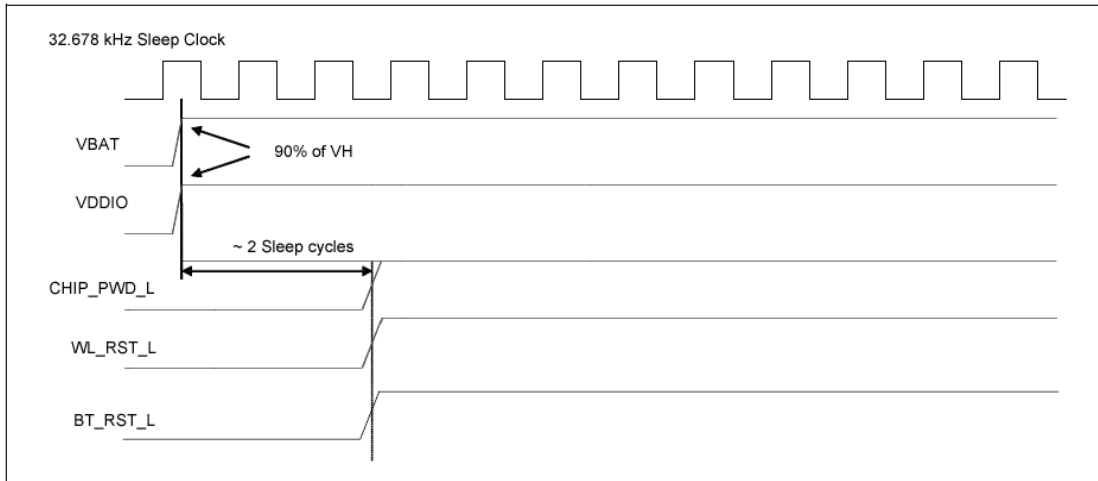| Pin Number	Pin Name	I/O	Voltage Reference	Description	
44	No Connect			Not Used. Leave Open (Float)	
45	No Connect			Not Used. Leave Open (Float)	
46	No Connect			Not Used. Leave Open (Float)	
47	No Connect			Not Used. Leave Open (Float)	
48	CHIP_PWD_L	I	VDDIO	Powers down both the BT and WLAN radios, active low (see Note).	
49	No Connect			Not Used. Leave Open (Float)	
50	RSVD	I/O	VDDIO	Reserved for GPIO	
51	No Connect			Not Used. Leave Open (Float)	
52	RSVD	I/O	VDDIO	Reserved for GPIO	
53	RSVD	I/O	VDDIO	Reserved for GPIO	
54	RSVD	I/O	VDDIO	Reserved for GPIO	
55	SDIO_CMD	I/O	VDDIO	SDIO Command	**Note:** See "Integration Considerations" for additional integration information.
56	SDIO_CLK	I	VDDIO	SDIO Clock (25MHz max)	
57	SDIO_DATA_0	I/O	VDDIO	SDIO Data 0	
58	SDIO_DATA_3	I/O	VDDIO	SDIO Data 3	
59	SDIO_DATA_1	I/O	VDDIO	SDIO Data 1	
60	GND	-		Ground	

Table 9: Pin Definitions

Note Regarding SYS_RST_L and CHIP_PWD_L:

Simply releasing **SYS_RST_L** and **CHIP_PWD_L** does not guarantee that the BCM4329 chip in the SSD40NBT module comes out of reset. Ensure that both VDD and VDDIO have been applied to the SSD40NBT for at least 110 ms before attempting to initiate SDIO communications. A slightly longer delay is better (safer).
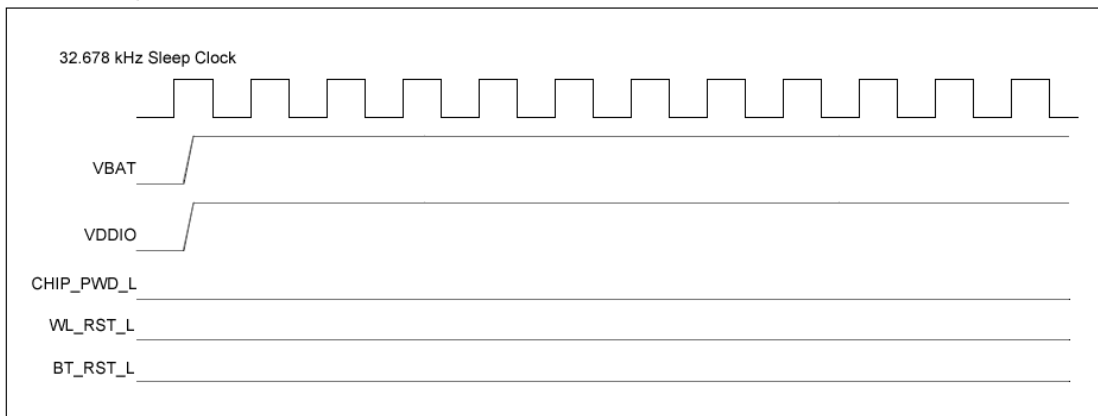
Control Signal Timing Diagrams

Figure 7: WLAN = ON, Bluetooth = ON

Figure 8: WLAN = OFF, Bluetooth = OFF

MSD30AG and MSD40NBT Pin Comparison Table

Note: Click here for a pin comparison table for the MSD10AG, MSD30AG, and MSD40NBT devices.

	MSD30AG	MSD40NBT		SSD30AG	SSD40NBT
Pin #	Pin Name	Pin Name	Pin #	Pin Name	Pin Name
1	GND	GND	31	GND	GND
2	RSVD	BT_UART_TXD	32	RSVD	BT_RST_L
3	BT_PRIORITY	BT_PRIORITY	33	No Connect	No Connect
4	BT_FREQ	BT_GPIO_6	34	No Connect	No Connect
5	RSVD	BT_UART_RTS_N	35	No Connect	No Connect
6	RSVD	BT_UART_RXD	36	BT_ACTIVE	BT_ACTIVE
7	RSVD	BT_HOST_WAKE_B	37	No Connect	No Connect
8	WL_GPIO_1	RSVD	38	No Connect	No Connect
9	RSVD	RSVD	39	No Connect	No Connect
10	RSVD	BT_PCM_OUT	40	No Connect	No Connect
11	RSVD	BT_UART_CTS_N	41	No Connect	No Connect
12	RSVD	RSVD	42	WL_LED_ACT	WL_LED_ACT
13	VCC3_3	VCC3_3	43	No Connect	No Connect
14	No Connect	No Connect	44	No Connect	No Connect
15	No Connect	No Connect	45	No Connect	No Connect
16	No Connect	No Connect	46	No Connect	No Connect
17	No Connect	No Connect	47	No Connect	No Connect
18	No Connect	No Connect	48	CHIP_PWD_L	CHIP_PWD_L
19	No Connect	No Connect	49	No Connect	No Connect
20	RSVD	BT_PCM_SYNC	50	RSVD	RSVD
21	No Connect	No Connect	51	No Connect	No Connect
22	RSVD	BT_PCM_IN	52	RSVD	RSVD
23	No Connect	No Connect	53	RSVD	BT_GPIO_7
24	RSVD	BT_PCM_CLK	54	RSVD	RSVD
25	No Connect	No Connect	55	SDIO_CMD	SDIO_CMD
26	SYS_RST_L	SYS_RST_L	56	SDIO_CLK	SDIO_CLK
27	SDIO_DATA_2	SDIO_DATA_2	57	SDIO_DATA_0	SDIO_DATA_0
28	WLAN_ACTIVE	RSVD	58	SDIO_DATA_3	SDIO_DATA_3
29	VCC3_3	VCC3_3	59	SDIO_DATA_1	SDIO_DATA_1
30	GND	GND	60	GND	GND

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Integration Considerations

The following Wi-Fi information should be taken into consideration when integrating the SSD40NBT.

Series resistors are recommended in all six SDIO lines (27-56 ohms typically):

- SDIO_CLK
- SDIO_CMD
- SDIO_DATA_0
- SDIO_DATA_1
- SDIO_DATA_2
- SDIO_DATA_3

Note: Although these values may vary with the properties of your host interface and the PCB, they are a reasonable starting point.

Note: The series resistors in the SDIO bus provide several design benefits:

- If a host controller has too high of a drive strength, then bus ringing may result. Series resistors can reduce this ringing on the I/O lines.

- Adding 27-56 ohms of series resistance on the SDIO bus will reduce sharp transitional edges, which may reduce EMI.

- Having the series resistors in the PCB layout allows for design flexibility; If they are later found to be unnecessary, zero (0) ohm jumpers may be used in their place

The following are also recommended:

- 47 K ohm pull-ups on the CMD line and four data lines: SDIO_CMD, SDIO_DATA_0, SDIO_DATA_1, SDIO_DATA_2, SDIO_DATA_3

Note: No pull-up is required on the CLK line.

Note: Make sure to apply the proper voltage on the VDDIO input to the SiP to match the signaling voltage of the SDIO host interface (1.8V or 3.3V typically, but it can be anything in between these values).

Note: The SDIO host must wait a minimum of 110 ms before initiating access to the SDC-MSD40NBT after VDD ramps up and settles.

Mechanical Specifications

Connector Overview

MSD40NBT connector: Molex 54722-0607 60-pin connector

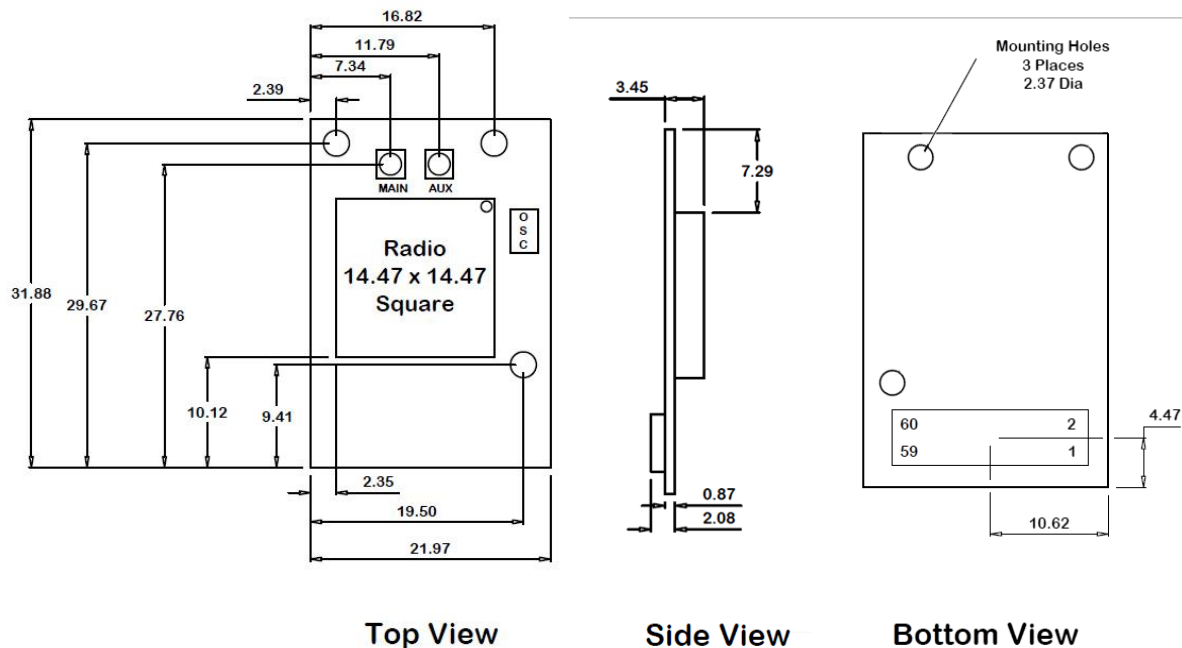**Mating connector (on board):**   Molex 55560-0607 60-pin connector

Figure 9: Mechanical Drawing

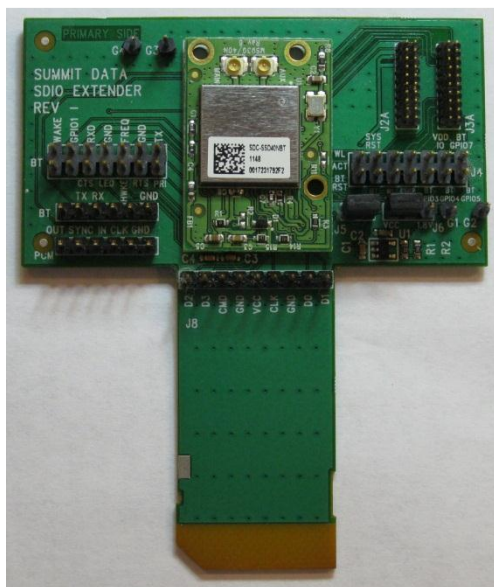## *MSD40NBT Attached to T-Board*

Figure 10: MSD40NBT attached to T-board

Mounting

Three through-hole mounting with a 60-pin connector. Summit recommends a 1.5 mm bushing with a conductive mounting screw to connect the exposed ground pads of the radio circuit board to the host ground plane. A 1.5 mm conductive bushing with a maximum OD of 3.5 mm will maximize grounding of the radio and help to reduce emissions from the radio circuit board.
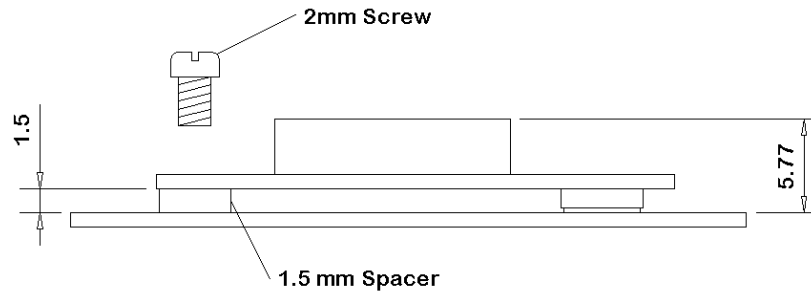
Figure 11: Mounting Recommendations

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.
- Summit has provided three plated mounting holes that can be used for grounding. When additional ground plane is required, you may use some or all of these grounded mounting holes.
- Use proper electro-static-discharge (ESD) procedures when installing the Summit radio module.

Regulatory

Certified Antennas

The SDC-MSD40NBT 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

Note: If the formal test reports for the SDC-MSD40NBTshow 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-MSD40NBT 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-MSD40NBT 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-MSD40NBT is integrated.

FCC

Note: You must place "Contains FCC ID: TWG-SDCMSD40NBT" on the host product in such a location that it can be seen by an operator at the time of purchase.

User's Guide Requirements

When integrating the SDC-MSD40NBT into a host device, the integrator must include specific information in the user's guide for the device into which the SDC-MSD40NBT 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-MSD40NBT 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-MSD40NBT 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

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

Contains FCC ID: TWG-SDCMSD40NBT

Industry Canada

Note: You must place "Contains IC ID: 6616A-SDCMSD40NBT" on the host product in such a location that it can be seen by an operator at the time of purchase.

User's Guide Requirements (for Model # SDC-MSD40NBT)

RF Radiation Hazard Warning

To ensure compliance with FCC and Industry Canada RF exposure requirements, this device must be installed in a location where the antennas of the device will have a minimum distance of at least 20 cm from all persons. Using higher gain antennas and types of antennas not certified for use with this product is not allowed. The device shall not be co-located with another transmitter.

Installez l'appareil en veillant à conserver une distance d'au moins 20 cm entre les éléments rayonnants et les personnes. Cet avertissement de sécurité est conforme aux limites d'exposition définies par la norme CNR-102 at relative aux fréquences radio.

Maximum Antenna Gain – If the integrator configures the device such that the antenna is detectable from the host product.

This radio transmitter (IC ID: 6616A-SDCMSD40NBT) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Le présent émetteur radio (IC ID: 6616A-SDCMSD40NBT) a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés ci-dessous et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.
Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

European Union

User's Guide Requirements

The integrator must include specific information in the user's guide for the device into which the SDC-MSD40NBT 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-MSD40NBT 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.

cs **Česky** **[Czech]**	*[Jméno výrobce]* tímto prohlašuje, že tento *[typ zařízení]* je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 1999/5/ES.
da **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.
de **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.
et **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.
en **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.
es **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.
el **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.
fr **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.
it **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]**	Aršo*[name of manufacturer /izgatavotājanosaukums]* deklarē, ka*[type of equipment / iekārtas tips]*atbilstDirektīvas 1999/5/EK būtiskajāmprasībām un citiemar to saistītajiemnoteikumiem.
Lietuvių **[Lithuanian]**	Šiuo *[manufacturer name]* deklaruoja, kad šis *[equipment type]* atitinka esminius reikalavimus ir kitas 1999/5/EB Direktyvos nuostatas.
nl **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.
mt **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.

hu **Magyar [Hungarian]**	Alulírott, *[gyártó neve]* nyilatkozom, hogy a *[... típus]* megfelel a vonatkozó alapvetõ követelményeknek és az 1999/5/EC irányelv egyéb elõírásainak.
pl **Polski [Polish]**	Niniejszym *[nazwa producenta]* oświadcza, że *[nazwa wyrobu]* jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 1999/5/EC.
pt **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.
sl **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]	*[Menovýrobcu]* týmtovyhlasuje, že *[typzariadenia]* spĺňazákladnépožiadavky a všetkypríslušnéustanoveniaSmernice 1999/5/ES.
fi **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.
sv **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.

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Labeling Requirements

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

SDC-MSD40NBT_UsersGuide