Hardware Integration Guide

SDC-SSD30AG

version 2.4

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Revision History

Version	Revision Date	Change Description
1.0	11/19/09	Transitioned Application Notes documentation to Hardware Integration Guide format.
1.01	11/23/09	Updated Specifications table.
1.02	12/15/09	Updated Power Consumption values in the Specifications table.
1.03	01/10/10	Revised Operational Description. Added Regulatory section. Revised pinouts. Added RF Layout Guidelines section.
1.04	04/16/10	Revised pinouts and certification information. Added schematic.
1.05	04/26/10	Revised Required Documentation section. Revised pin definitions. Revised DC Electrical Characteristics table. Revised Power Sequence Operations information. Removed schematic.
1.06	05/04/10	Added I/O signal details.
1.07	05/27/10	Updated images; added SDIO Interface Timing information; revised pin definitions
1.08	08/24/10	Updated block diagram.
1.09	12/28/10	Revised mechanical drawings.
1.10	01/12/11	Revised Pinout table.
2.0	04/05/11	Corrections to BT pin descriptions on Pinout table.
2.1	04/15/11	Revised Block Diagram.
2.2	07/14/11	Added PCB footprint drawing.
2.3	08/09/11	Revised Mechanical drawings.
2.4	10/05/11	Added Appendix A: Schematic Added SSD30AG/SSD40NBT Pin Comparison table.

Contents

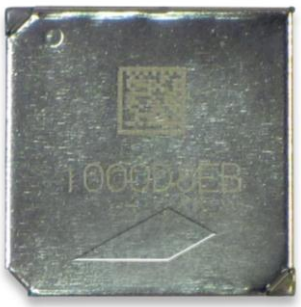
Scope

This document describes key hardware aspects of the Summit SSD30AG 802.11a/b/g SDIO (Secure Digital Input/Output) 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 includes information found in the Atheros AR6002 data sheet.

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-SSD30AG 802.11a/g SDIO (Secure Digital Input/Output) radio module, which 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, and 802.11g standards using Direct Sequence Spread Spectrum (DSSS) and Orthogonal Frequency Division Multiplexing (OFDM). The device supports all 802.11a, 802.11b, and 802.11g data rates and automatically adjusts data rates and operational modes based on various environmental factors.



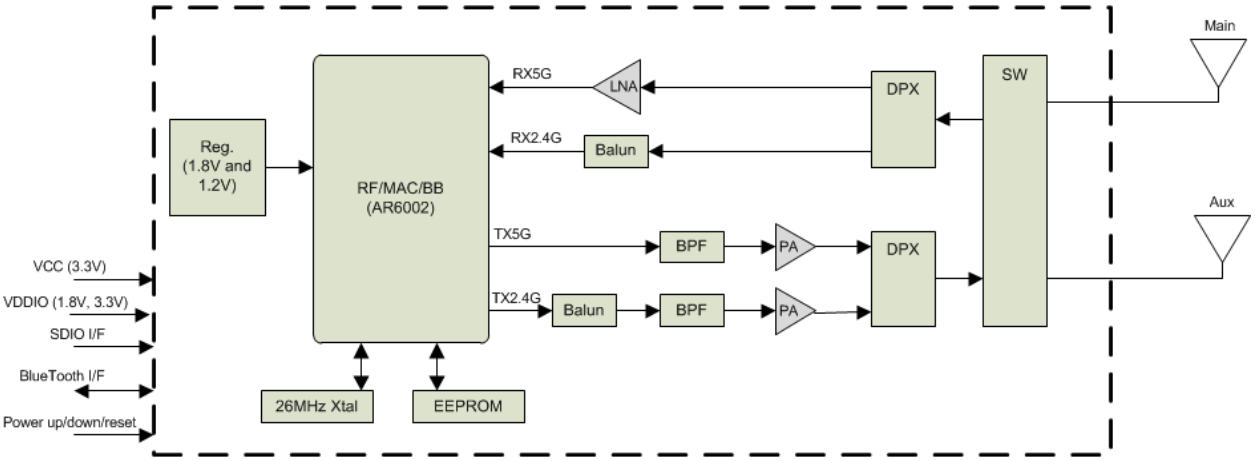
When operating on channels in the UNII-2 and UNII-2 extended bands that are in the 5 GHz portion of the frequency spectrum and are subject to Dynamic Frequency Selection (DFS) requirements, the SDC-SSD30AG fully conforms to applicable regulatory requirements. In the event that specified types of radar are detected by the network infrastructure, the SDC-SSD30AG will fully conform to commands from the infrastructure for radar avoidance.

The SDC-SSD30AG is a System in Package (SiP) Quad Flat pack, No leads (QFN) module and interfaces to host devices via 58 pads on the perimeter of the package. The device is based on the Atheros AR6002 chip which is an integrated device providing a Media Access Controller (MAC), a Physical Layer Controller (PHY or baseband processor), and 2.4 GHz and 5 GHz transceivers. To maximize operational range, the SDC-SSD30AG incorporates 2.4 GHz and 5 GHz power amplifiers (PA) to increase transmit power to as much as 18 dBm (63 mW) and a 5 GHz low-noise amplifier (LNA) to improve receiver sensitivity. The frequency stability for both 2.4 GHz (802.11b and 802.11g) and 5 GHz (802.11a) operation is +/- 20 ppm. The SDC-SSD30AG is powered by the host device into which it is installed. The SDC-SSD30AG provides two diplexed antenna interfaces to support dual band transmit and receive diversity. Supported host device antenna types include dipole and monopole antennas. Typical host devices include Portable Data Terminals (PDTs) and Vehicle Mounted Terminals (VMTs).

The device is labeled with all applicable regulatory information in a manner that is compliant with all regulatory standards. Regulatory operational requirements are included with this document and are to be incorporated into the operating manual of any device into which the SDC-SSD30AG is installed. The SDC-SSD30AG 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

The block diagram for the SDC-SSD30 with Atheros AR6002 is as follows:



Specifications

Feature	Description
System Interface	1-bit or 4-bit Secure Digital I/O
Physical Interface	0.4 mm pitch QFN (Quad Flat No leads)
Antenna Interface	Pads for 2 dual-band antennas
Chip Set	Atheros AR6002
Input Voltage Requirements	3.3 VDC ± 10% (core)
I/O Signaling Voltage	1.8 or 3.3 VDC ± 10%
Current Consumption (At maximum transmit power setting)	**802.11a** Transmit: 380 mA (1254 mW) Receive: 115 mA (380 mW) Standby: 3 mA (10 mW) **802.11b/g** Transmit: 325 mA (1072 mW) Receive: 95 mA (314 mW) Standby: 2 mA (7 mW)
Operating Temperature	-30° to 70°C (-22° to 158°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	4 kV
Length	15.0 mm (0.59”)

Feature	Description
Width	15.0 mm (0.59”)
Thickness	2.6 mm (0.1”)
Weight	1.0 g (0.04 oz.)
Mounting	See the “Mounting” section for more information.
Wi-Fi Wireless Media	Direct Sequence-Spread Spectrum (DSSS) Orthogonal Frequency Divisional Multiplexing (OFDM)
Wi-Fi Media Access Protocol	Carrier sense multiple access with collision avoidance (CSMA/CA)
Network Architecture Types	Infrastructure and ad hoc
Network Standards	IEEE 802.11a, 802.11b, 802.11d, 802.11e, 802.11g, 802.11h, 802.11i
Wi-Fi Data Rates Supported	802.11a (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps 802.11b (DSSS) 1, 2, 5.5, 11 Mbps 802.11g (OFDM) 6, 9, 12, 18, 24, 36, 48, 54 Mbps
Wi-Fi Modulation	BPSK @ 1, 6, and 9 Mbps QPSK @ 2, 12, and 18 Mbps CCK @ 5.5 and 11 Mbps 16-QAM @ 24 and 36 Mbps 64-QAM @ 48 and 54 Mbps
Regulatory Domain Support	FCC (Americas, Parts of Asia, and Middle East) ETSI (Europe, Middle East, Africa, and Parts of Asia) TELEC (Japan) KCC (Korea)
2.4 GHz Frequency Bands	**ETSI** 2.4 GHz to 2.483 GHz **FCC** 2.4 GHz to 2.473 GHz **TELEC** 2.4 GHz to 2.495 GHz **KCC** 2.4 GHz to 2.483 GHz
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 **TELEC** 5.15 GHz to 5.25 GHz **KCC** 5.15 GHz to 5.35 GHz

Feature	Description
	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) TELEC 14 (4 non-overlapping) KCC: 13 (3 non-overlapping)
5 GHz Operating Channels	ETSI: 19 non-overlapping FCC: 23 non-overlapping TELEC: 4 non-overlapping KCC: 8 non-overlapping
Wi-Fi Transmit Power Settings ***Note:*** *Maximum transmit power varies according to individual country regulations. All values nominal, +/-2 dBm*	**802.11a** 15 dBm (30 mW) 13 dBm (20 mW) 10 dBm (10 mW) **802.11b** 18 dBm (63 mW) 17 dBm (50 mW) 15 dBm (30 mW) 13 dBm (20 mW) 10 dBm (10 mW) 7 dBm (5 mW) 0 dBm (1 mW) **802.11g** 18 dBm (63 mW) 17 dBm (50 mW) 15 dBm (30 mW) 13 dBm (20 mW) 10 dBm (10 mW) 7 dBm (5 mW) 0 dBm (1 mW)
Typical Receiver Sensitivity ***Note:*** *All values nominal, +/-3 dBm.* ***Note:*** *Receiver Sensitivity values are measured at the antenna interface pins on the SDC-SSD30AG. Integrators can expect a minimum routing loss such as 0.25 dB for 2.4 GHz operation and 0.5 dB for 5 GHz operation when mounting the SDC-SSD30AG on an appropriate PCB.*	**802.11a:** 6 Mbps -85 dBm 9 Mbps -83 dBm 12 Mbps -83 dBm 18 Mbps -81 dBm 24 Mbps -75 dBm 36 Mbps -73 dBm 48 Mbps -68 dBm 54 Mbps -67 dBm (PER <= 10%) **802.11b:** 1 Mbps -95 dBm 2 Mbps -94 dBm 5.5 Mbps -93 dBm 11 Mbps -89 dBm (PER <= 10%) **802.11g:** 6 Mbps -93 dBm 12 Mbps -88 dBm 18 Mbps -85 dBm 24 Mbps -83 dBm

Feature	Description
	36 Mbps -77 dBm 48 Mbps -74 dBm 54 Mbps -72 dBm (PER <= 10%)
Wi-Fi Delay Spread	600 ns @ 1 Mbps 500 ns @ 2 Mbps 400 ns @ 5.5 Mbps 400 ns @ 6 Mbps 400 ns @ 9 Mbps 200 ns @ 11 Mbps 350 ns @ 12 Mbps 350 ns @ 18 Mbps 250 ns @ 24 Mbps 250 ns @ 36 Mbps 150 ns @ 48 Mbps 150 ns @ 54 Mbps
Mean Time Between Failure (MTBF)	1,345,685 hours
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
Security	**Standards** ▪ Wireless Equivalent Privacy (WEP) ▪ Wi-Fi Protected Access (WPA) ▪ IEEE 802.11i (WPA2) **Encryption** ▪ Wireless Equivalent Privacey (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

Feature	Description
	▪ LEAP
Compliance	**ETSI Regulatory Domain** EN 300 328 EN 301 489 EN 301 893 EN 60950-1 EU 2002/95/EC (RoHS) **FCC Regulatory Domain** Part 15.247 Subpart C ▪ Grant ▪ Test Report Part 15.407 Subpart E ▪ Grant ▪ Test Report ▪ DFS Test Report **Industry Canada** RSS-210/RSS-Gen Issue 2 ▪ Grant ▪ Test Report ▪ Test Report **TELEC Regulatory Domain** 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)
Certifications	**Wi-Fi Alliance** 802.11a, 802.11b, 802.11g WPA Enterprise WPA2 Enterprise **Cisco Compatible Extensions** (Version 4)
Warranty	**Limited Lifetime**
All specifications are subject to change without notice	

DC Electrical Characteristics

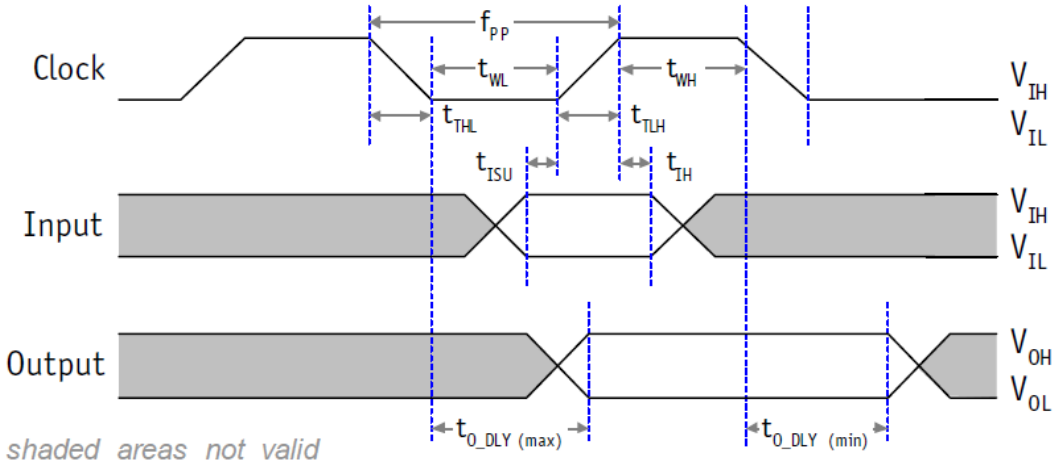
Note: VDDIO is the reference voltage for all chip IO and applies to the following pins: SDIO_DATA_0, SDIO_DATA_1, SDIO_DATA_2, SDIO_DATA_3, SDIO_CLK, SDIO_CMD, CHIP_PWD_L, SYS_RST_L, WL_LED_ACT, EX_GPIO, WLAN_ACTIVE, BT_ACTIVE, BT_PRIORITY, BT_FREQ, MODE_SEL

Symbol	Parameter	Min	Typ	Max	Unit
VCC	DC Supply Voltage	3.0	3.3	3.6	V
I_{VCC}	DC Supply Current, (max transmit power setting)			**802.11a** Transmit: 380 mA (1254 mW) Receive: 115 mA (380 mW) Standby: 3 mA (10 mW) **802.11b/g** Transmit: 325 mA (1072 mW) Receive: 95 mA (314 mW) Standby: 2 mA (7 mW)	mA
VDDIO	Digital I/O Reference Voltage	1.71	1.8	3.46	V
I_{VDDIO}	Digital I/O Current		0.05	0.40	mA
V_{IH}	High Level Input Voltage	0.8 x V_{DDIO}	-	V_{DD}+ 0.3	V
V_{IL}	Low Level Input Voltage	–0.3	-	0.2 x V_{DDIO}	V
V_{OH}	High Level Output Voltage	V_{DDIO} – 0.35	-	-	V
V_{OL}	Low Level Output Voltage	-	-	0.40	V
C_{IN}	Input Capacitance	-	6	-	pF

The SSD30AG has an internal pull-down on CHIP_PWD_L, so when the host pulls it high, the pad sinks current. The amount of current depends on VDDIO. ~10µA for VDDIO = 1.8V and ~40µA when VDDIO = 3.3V. As a result, the solution power consumption is at least 18-132µW higher than the chip power consumption in non-CHIP_PWD states.

The analog power-on reset circuit in the SSD30AG is also optimizer for VDDIO = 1.8V, thus the chip draws an extra 3.5µA when VDDIO = 3.3V. The SSD30AG has an internal pull-up on SYS_RST_L, thus to minimize CHIP_PWD power consumption, customer designs should not tie CHIP_PWD_L and SYS_RST_L together.

SDIO Interface Timing



SDIO Timing Definitions

Parameter	Description	Min	Max	Unit
SDIO CLK (All values are referred to minimum VIH and maximum VIL [b]				
f_{PP}	Clock frequency data transfer mode	0	25	MHz
t_{WL}	Clock low time	10	-	ns
t_{WH}	Clock high time	10	-	ns
t_{TLH}	Clock rise time	-	10	ns
t_{THL}	Clock fall time	-	10	ns
Inputs: CMD, Data (referenced to CLK)				
t_{ISU}	Input setup time	5	-	ns
t_{IH}	Input hold time	5	-	ns
Outputs: CMD, Data (referenced to CLK)				
$t_{O\_DLY\ (min)}$	Output delay time during data transfer mode	0	14	ns
$t_{O\_DLY\ (max)}$	Output delay time during data transfer mode	0	50	ns

a) Timing is based on CL ≤ 40pF load on CMD and Data
b) Min (Vih) = 0.7 x VDDIO and max (Vil) = 0.2 x VDDIO

Pin Definitions

Pin Number	Pin Name	I/O	Power Supply	Description
1	GND			Ground
2	GND			Ground
3	GND			Ground
4	GND			Ground
5	ANT_2			Antenna 2 (Auxiliary) 50 ohm coplanar wave guide to antenna or antenna connector
6	GND			Ground
7	GND			Ground
8	GND			Ground
9	GND			Ground
10	ANT_1			Antenna 1 (Main) 50 ohm coplanar wave guide to antenna or antenna connector
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	RSVD	N/C		Reserved – No Connect
20	RSVD	N/C		Reserved – No Connect
21	RSVD	N/C		Reserved – No Connect
22	RSVD	N/C		Reserved – No Connect
23	VCC3_3			3.3V Module Power
24	GND			Ground
25	RSVD	N/C		Reserved – No Connect
26	RSVD	N/C		Reserved – No Connect

Pin Number	Pin Name	I/O	Power Supply	Description
27	RSVD	N/C		Reserved – No Connect
28	RSVD	N/C		Reserved – No Connect
29	RSVD	N/C		Reserved – No Connect
30	RSVD	N/C		Reserved – No Connect
31	RSVD	N/C		Reserved – No Connect
32	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) See the LED Support note below.
34	WL_GPIO_1	O	VDDIO	Wake on Wireless. Internal pull-down. Wake on Wireless is not currently supported in the software. May be left open
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; 4.7K pull-up resistor to VDDIO is recommended
37	RSVD	N/C		Reserved – No Connect
38	SDIO_DATA_0	I/O	VDDIO	SDIO Data 0 – Internal pull-up. No external pull-up required
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 – Internal pull-up. No external pull-up resistor required
43	SDIO_DATA_3	I/O	VDDIO	SDIO Data 3 – Internal pull-up. No external pull-up resistor required
44	SDIO_DATA_2	I/O	VDDIO	SDIO Data 2 – Internal pull-up. No external pull-up resistor required
45	SDIO_CMD	I/O	VDDIO	SDIO Command – Internal pull-up. No external pull-up resistor required

Pin Number	Pin Name	I/O	Power Supply	Description
46	GND			Ground
47	RSVD	N/C		Reserved – No Connect
48	SDIO_SEL	I	VDDIO	SDIO Selection, hold high. External pull-up resistor required
49	WLAN_ACTIVE	O	VDDIO	Output to BT device. Internal pull-down. When high, indicates that WLAN is transmitting or receiving. When not in use, leave open (float).
50	BT_PRIORITY	I	VDDIO	Input from BT device. When high, indicates that Bluetooth is transmitting or receiving high priority packets, e.g. SCO and LMP. When not in use, leave open (float).
51	BT_FREQ	I	VDDIO	Input from BT device. When high, indicates that Bluetooth is operating on a channel used by WLAN (a restricted channel). BT_FREQ is not necessary when Bluetooth Adaptive Frequency Hopping is enabled. When not in use, leave open (float).
52	BT_ACTIVE	I	VDDIO	Input from BT device. When high, indicates that Bluetooth is transmitting or receiving. The Summit radio does not transmit when BT_ACTIVE is high. When not in use, leave open (float).
53	RSVD	N/C		Reserved – No Connect
54	RSVD	N/C		Reserved – No Connect
55	RSVD	N/C		Reserved – No Connect
56	RSVD	N/C		Reserved – No Connect

Notes on LED Support

- **WL_LED_ACT Implementation on the SSD30AG or MSD30AG** –
  - WL_LED_ACT has an internal pull-down, and thus is low when the radio is off (not powered).

  Note: The SSD30AG and MSD30AG devices require the SD30AG driver release 3.3.3 and greater.

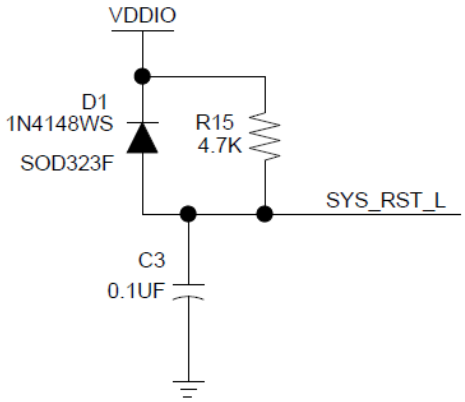
- **Driver control implementation (when enabled) –**
  - WL_LED_ACT is set to VDDIO when the radio is associated to an AP.
  - WL_LED_ACT is set low at all other times (not associated).

SSD30AG and SSD40NBT Pin Comparison Table

	SSD30AG	SSD40NBT		SSD30AG	SSD40NBT
Pin #	**Pin Name**	**Pin Name**	**Pin #**	**Pin Name**	**Pin Name**
1	GND	GND	29	RSVD	BT_PCM_SYNC
2	GND	GND	30	RSVD	BT_PCM_IN
3	GND	GND	31	RSVD	BT_PCM_CLK
4	GND	GND	32	VDDIO	VDDIO
5	ANT_2	ANT_2	33	WL_LED_ACT	WL_LED_ACT
6	GND	GND	34	WL_GPIO_1	WL_GPIO_1
7	GND	GND	35	SYS_RST_L	SYS_RST_L
8	GND	GND	36	CHIP_PWD_L	CHIP_PWD_L
9	GND	GND	37	RSVD	BT_RST_L
10	ANT_1	ANT_1	38	SDIO_DATA_0	SDIO_DATA_0
11	GND	GND	39	GND	GND
12	GND	GND	40	SDIO_CLK	SDIO_CLK
13	GND	GND	41	GND	GND
14	GND	GND	42	SDIO_DATA_1	SDIO_DATA_1
15	GND	GND	43	SDIO_DATA_3	SDIO_DATA_3
16	GND	GND	44	SDIO_DATA_2	SDIO_DATA_2
17	GND	GND	45	SDIO_CMD	SDIO_CMD
18	GND	GND	46	GND	GND
19	RSVD	BT_PCM_OUT	47	RSVD	CLK_32K
20	RSVD	BT_WAKE_B	48	SDIO_SEL	SDIO_SEL
21	RSVD	BT_HOST_WAKE_B	49	WLAN_ACTIVE	WLAN_ACTIVE
22	RSVD	BT_LED_ACT	50	BT_PRIORITY	BT_PRIORITY
23	VCC3_3	VDD3_3	51	BT_FREQ	BT_GPIO_6
24	GND	GND	52	BT_ACTIVE	BT_ACTIVE
25	RSVD	BT_UART_CTS_N	53	RSVD	BT_GPIO_5
26	RSVD	BT_UART_RTS_N	54	RSVD	BT_GPIO_7
27	RSVD	BT_UART_TXD	55	RSVD	BT_GPIO_4
28	RSVD	BT_UART_RXD	56	RSVD	BT_GPIO_3

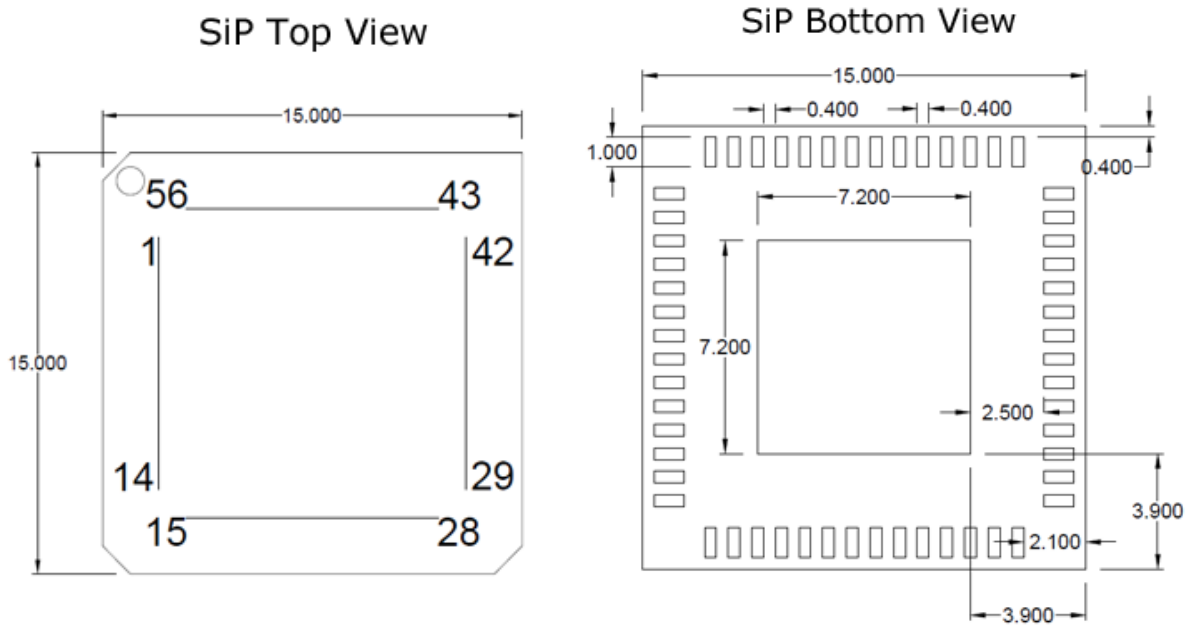
Electrical Considerations

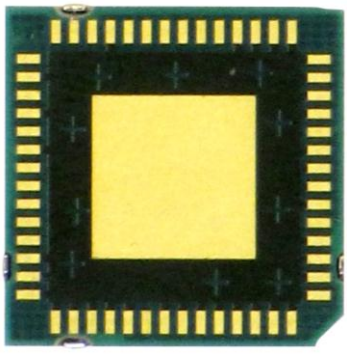
Below is a section of the schematic for the MSD30AG, a PCB module based on the SSD30AG. Summit provides this for your reference only to aid you in integrating the SSD30AG into your device.

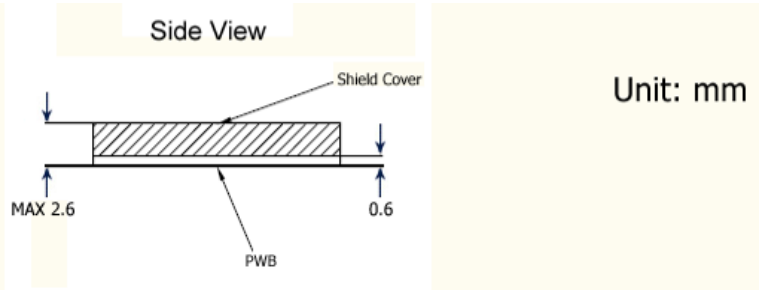


Mechanical Specifications

Note: DWG files are available from the Summit website. Please contact Summit for additional information or to request a different file type.

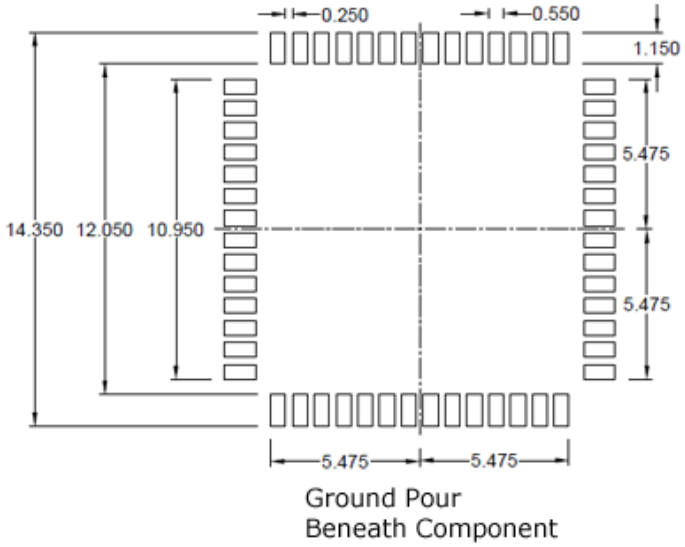






SiP Photo (Bottom View)

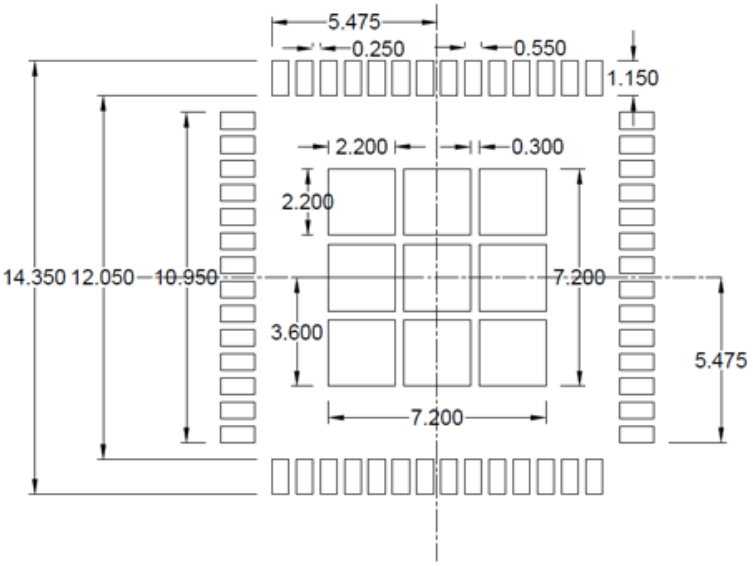
Host Land Pattern

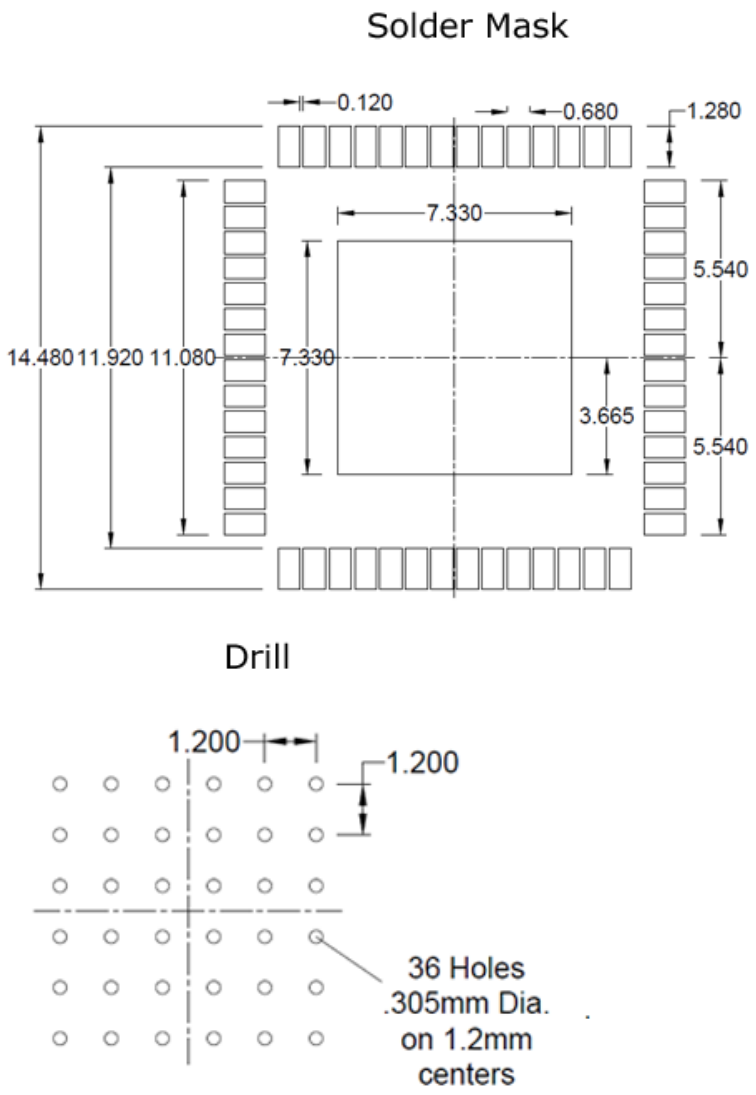


Ground Pour
Beneath Component

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 Paste





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

Mounting

The SDC-SSD30AG 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-MSD30AG. The following information results from Summit's experience in producing the SDC-MSD30AG. 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: 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.

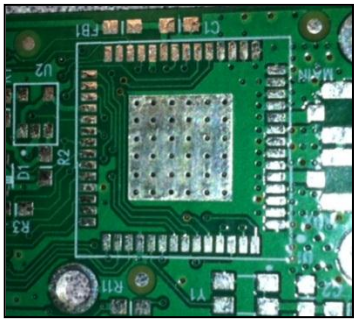
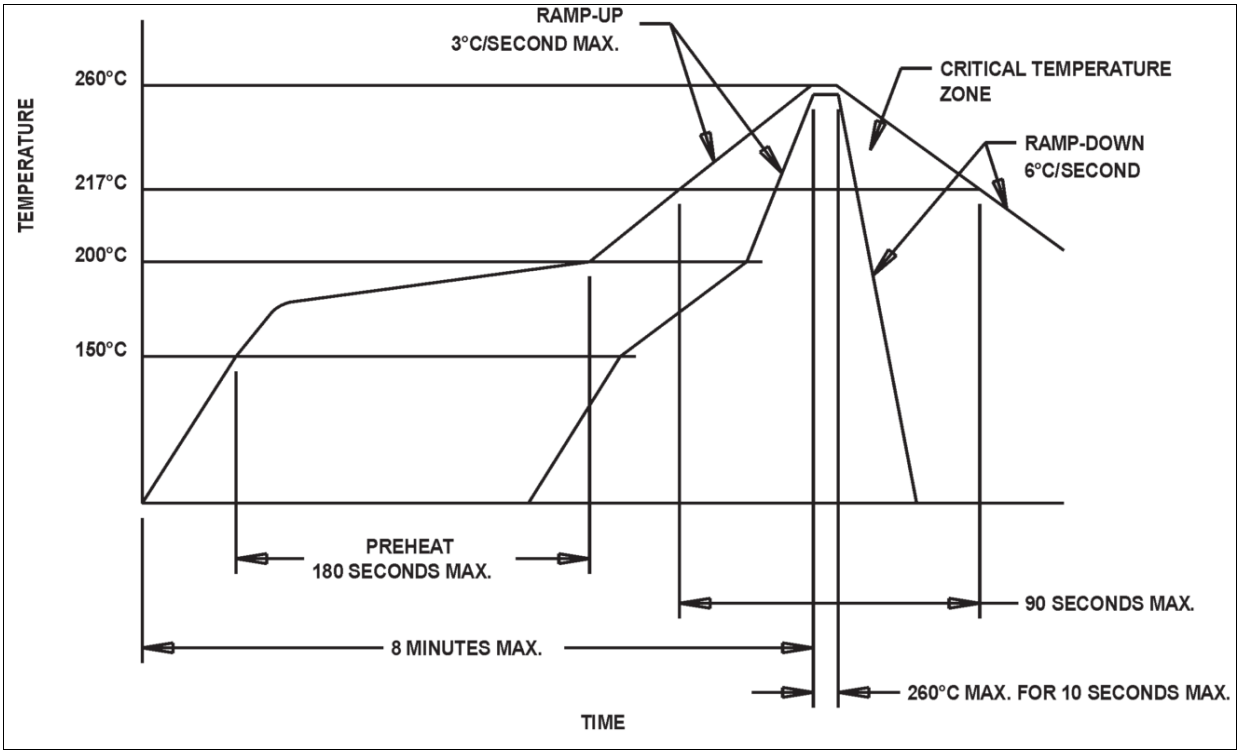


Figure 1: Footprint from the Summit MSD30/40 PCB

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

Solder Pad Size: 1 mm long by 0.4 mm wide. Solder pads longer than 1 mm may contact portions of the SSD30AG metal shield resulting in a short circuit.

Reflow: The SDC-SSD30AG is RoHS compliant and as such is sensitive to heat. The following graphic details a typical profile for such and device and is provided for reference purposes.



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.

Regulatory

Certified Antennas

The SDC-SSD30AG provides two antenna interfaces to support transmit and receive diversity. For single antenna, non-diversity applications, OEMs are advised to use the Main (pin 10) antenna interface and should disable transmit and receive diversity from the Global tab of the Summit Client Utility (SCU) software utility.

Summit does not have specific regulatory approvals for the SDC-SSD30AG. Summit has regulatory approvals for the SDC-MSD30AG which is a PCB module that is based on the SDC-SSD30AG. As such, the ETSI, FCC, Industry Canada and TELEC final test reports for the SDC-MSD30AG may be leveraged when pursuing approvals for host devices that incorporate the SDC-SSD30AG. The SDC-MSD30AG tests were conducted with the following antennas:

CiscoAIR-ANT 4941 (click for datasheet)

- **Form Factor:** Whip
- **Type:** Dipole
- **Maximum 2.4 GHz Gain:** 2.2 dBi
- **Tested and Certified 2.4 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 2.4 GHz band)

Summit SDC-CF22G Antenna (click for datasheet)

- **Form Factor:** Chip Antenna on PCB
- **Type:** Dipole
- **Maximum 2.4 GHz Gain:** 0 dBi
- **Tested and Certified 2.4 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 2.4 GHz band)

Radiall Larson Dipole (click for datasheet)

- **Form Factor:** Whip
- **Type:** Dipole
- **Maximum 2.4 GHz Gain:** 1.6 dBi*
- **Maximum 5 GHz Gain:** 5 dBi
- **Tested and Certified 5 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 5 GHz band)

Note: This antenna was only used for 802.11a (5 GHz) testing.

HUBER+SUHNER (click for datasheet)

- **Form Factor:** Whip
- **Type:** Monopole
- **Maximum 2.4 GHz Gain:** 3 dBi
- **Maximum 5 GHz Gain:** 6.5 dBi
- **Tested and Certified 2.4 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 2.4 GHz band)
- **Tested and Certified 5 GHz Transmit Power:** 100% of maximum setting (no reduction of power is required in the 5 GHz band)

Note: The formal test reports for the SDC-MSD30AG show that transmit power was decreased to less than 100% on 2.4 GHz edge channels. Summit has made 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 account for 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-SSD30AG 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-SSD30AG 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 must be included in the user's guide and external labels for the host devices into which the SDC-SSD30AG is integrated.

FCC

User's Guide Requirements

When integrating the SDC-SSD30AG into a host device, the integrator must include specific information in the user's guide for the device into which the SDC-SSD30AG 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-SSD30AG 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-SSD30AG 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.

Industry Canada

User's Guide Requirements

When integrating the SDC-SSD30AG into a host device, the integrator must include specific information in the user's guide for the device into which the SDC-SSD30AG 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-SSD30AG 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-SSD30AG 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-SSD30AG is integrated. The following examples are based on antennas with which the SDC-SSD30AG 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
- **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

European Union

User's Guide Requirements

The integrator must include specific information in the user's guide for the device into which the SDC-SSD30AG 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-SSD30AG 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 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]	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.
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]	*[Meno výrobcu]* týmto vyhlasuje, že *[typ zariadenia]* spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 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.

Appendix A: Schematic

Because the SDC-MSD30AG is a PCB module that is based on the SDC-SSD30AG, the following SDC-MSD30AG schematic may be used as a reference.

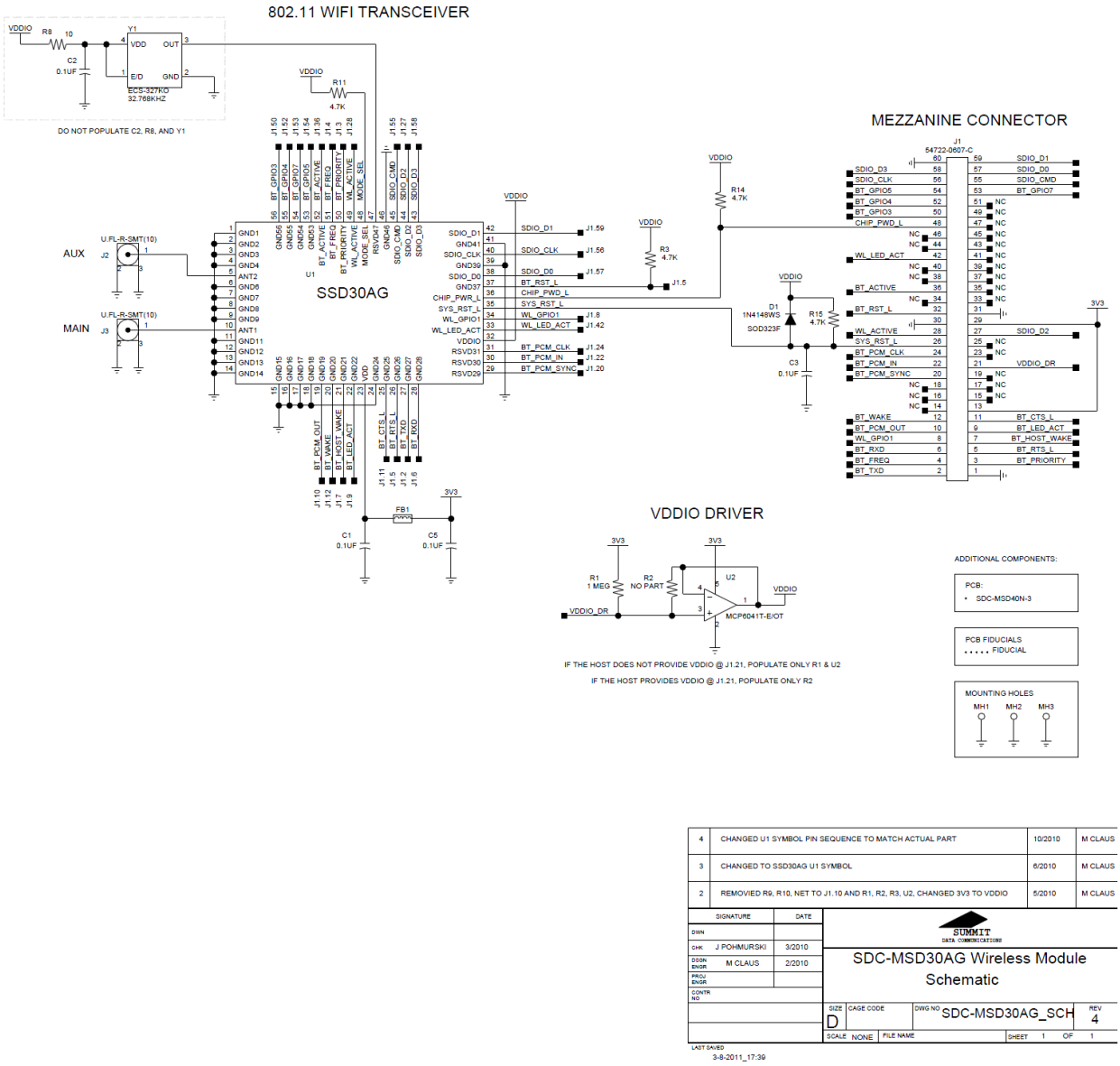


Figure 2: MSD30AG Schematic