SWB-QC30H Datasheet

QUALCOMM WCN3660 WLAN & BT & FM Solution

REV 7

Samsung Electro-Mechanics

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Summary

This datasheet presents the general performance and specifications of SWB-QC30H IEEE 802.11a/b/g/n Wireless LAN & Bluetooth 4.0 (BR/EDR+BLE) & FM combination module.

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1 General Description

1.1 Functional Description

SWB-QC30H is the combination module that integrates IEEE 802.11a/b/g/n wireless LAN(WLAN) and Bluetooth 4.0 (BR/EDR+BLE) and FM. This embedded module is optimized for WLAN/Bluetooth/FM enabled handheld mobile devices.

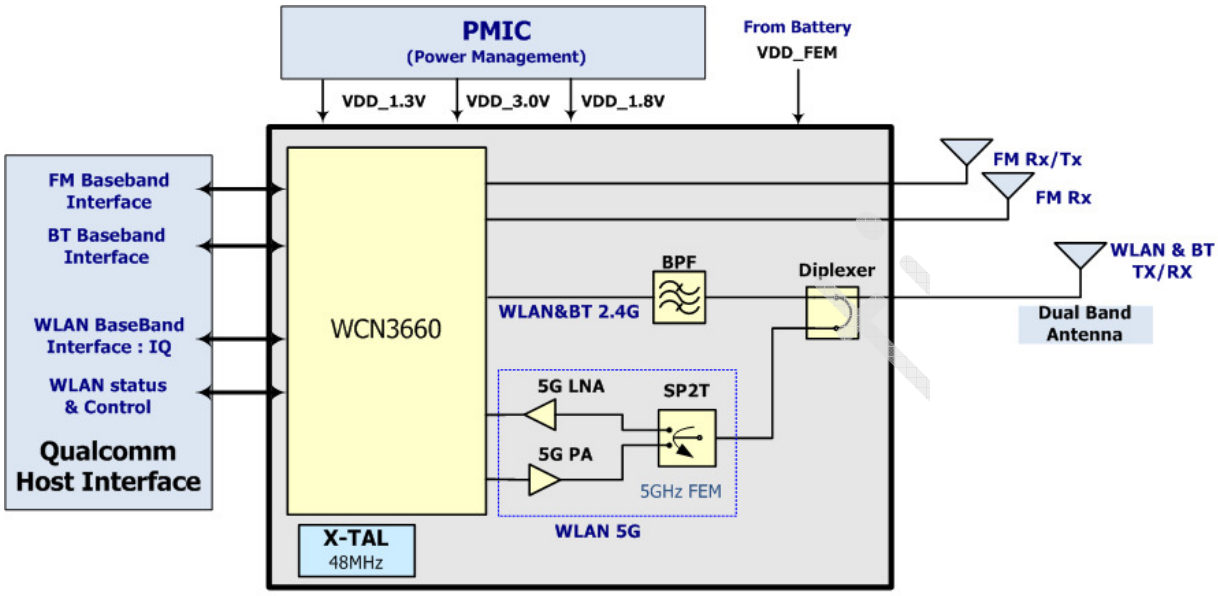
1.2 Features

- RF module the integrates WLAN, BT and FM radio functionality for Qualcomm MSM and APQ Platforms (MSM : 8960,8260A,8660A,8930,8974 / APQ : 8060A, 8030, 8064, 8074)
- WLAN - IEEE Std 802.11a/b/g, 802.11n(1x1)
- Bluetooth – Bluetooth specification Version 4.0 (BR/EDR+BLE)
- FM - RF transmit and receive functions (Rx, Tx / RDS,RBDS)
- WLAN Channel Bandwidths : 20MHz / 40MHz
- Support for MCS0 through 7 : up to 150Mbps
- Concurrent WLAN+BT reception in the 2.4GHz band.
- LTE/ISM coexistence support
- Small dimensions (10.0 x 6.0 x max 1.15 mm) with an LGA –52pin peripheral footprint
- Low power consumption
- One antenna configuration with WLAN and Bluetooth coexistence support
- Built-in reference clock : 48MHz Crystal (For dual-band 2.4GHz & 5GHz)
- Included 5GHz PA & LNA for better RF performance
- Included most external components in module (Bypass Capacitors, BPF, Diplexer etc.)
- Host interfaces
  - WLAN : 4-line analog baseband interface with Rx/Tx multiplexing
    5-line digital command and control interface
  - BT : Two-line digital data interface supports Rx and Tx
    Single wire serial bus interface (SSBI) for status and control
  - FM : Single-line digital data interface supports Rx and Tx
    SSBI for status and control
- RoHS compliant
- MSL 3

<Note> Some of the hardware features integrated within WCN3660 IC must be enabled by software. Please see the latest revision of the applicable software release notes to identify the enabled features

1.3 Block Diagram

The following SWB-QC30H block diagram highlights the major functional blocks and interfaces.



Qualcomm Platforms
* MSM : 8960, 8260A, 8660A, 8930, 8974
* APQ : 8060A, 8030, 8064, 8074

※Built-in reference clock : 48MHz X-TAL for dual band (2.4GHz & 5GHz)

※Included 5G FEM (PA+LNA) for better RF performance

※Included most external components in module (Bypass capacitors, 2.4G BPF, diplexer etc.)

: Bypass capacitors are important & critical for WiFi performance. they are included in module.

Figure1-1 Hardware block diagram

2 Dimension and Pin Assignments

2.1 Mechanical Dimension

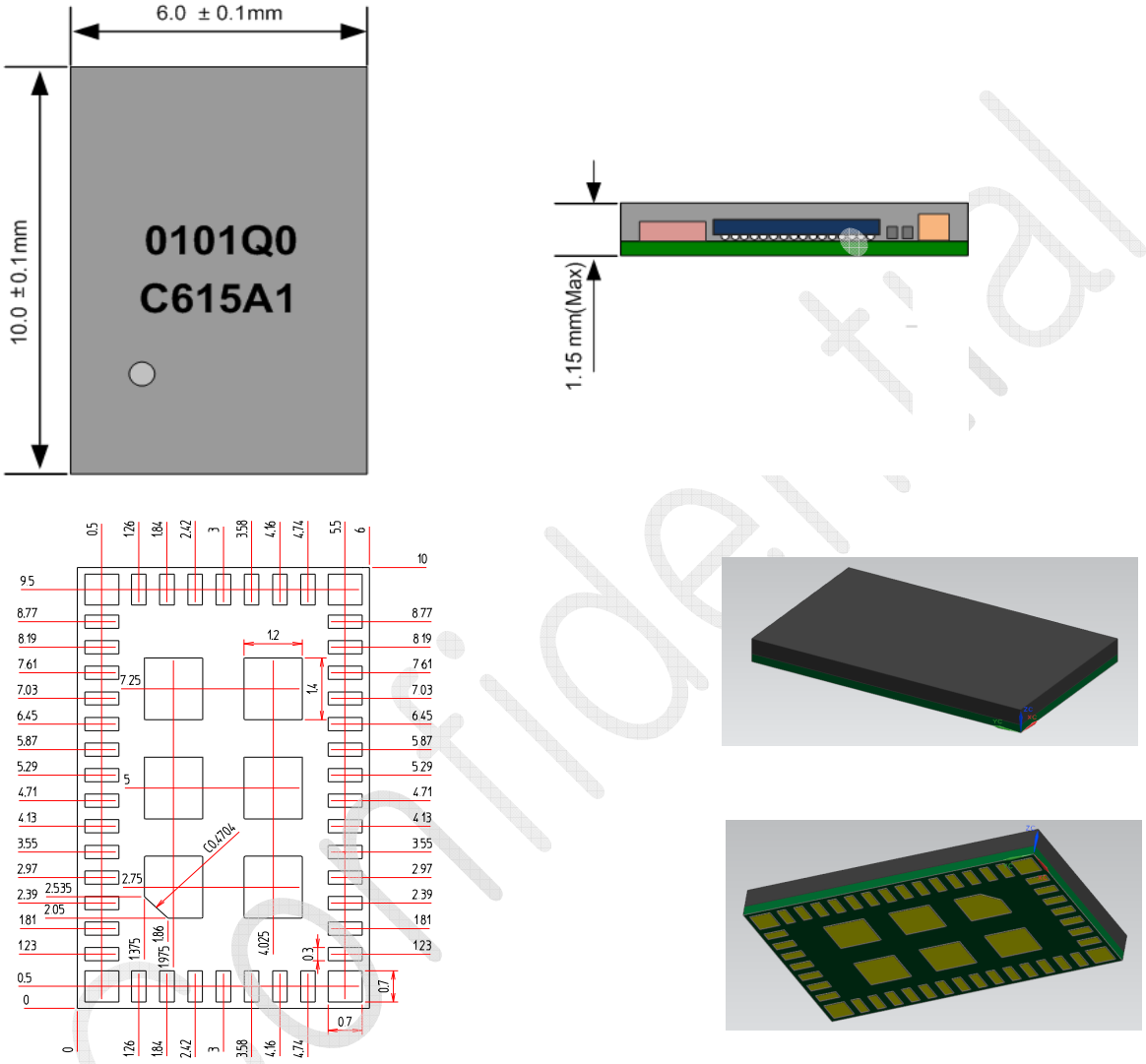


Figure2-1 Mechanical Dimension (Top View)

Parameter	Conditions	Min.	Nom.	Max.	Unit
Dimension					
X		9.9	10.0	10.1	mm
Y		5.9	6.0	6.1	mm
Height				1.15	mm

Table2-2 Mechanical Dimension

2.2 Pin Assignments

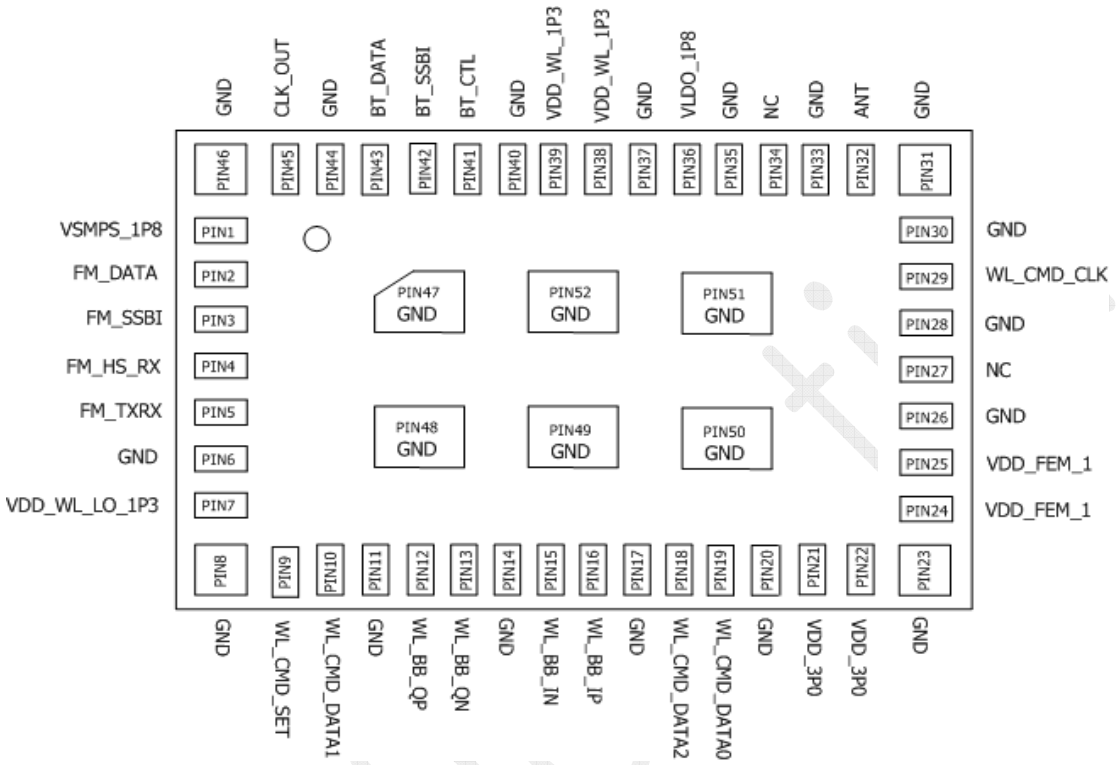


Figure2-3 Pin Assignments (Top View)

Pin#	Signal Name	Pin#	Signal Name	Pin#	Signal Name	Pin#	Signal Name
1	VSMPS_1P8	14	GND	27	NC	40	GND
2	FM_DATA	15	WL_BB_IN	28	GND	41	BT_CTL
3	FM_SSBI	16	WL_BB_IP	29	WL_CMD_CLK	42	BT_SSBI
4	FM_HS_RX	17	GND	30	GND	43	BT_DATA
5	FM_TXRX	18	WL_CMD_DATA2	31	GND	44	GND
6	GND	19	WL_CMD_DATA0	32	ANT	45	CLK_OUT
7	VDD_WL_LO_1P3	20	GND	33	GND	46	GND
8	GND	21	VDD_3P0	34	NC	47	GND (Center GND)
9	WL_CMD_SET	22	VDD_3P0	35	GND	48	GND (Center GND)
10	WL_CMD_DATA1	23	GND	36	VLDO_1P8	49	GND (Center GND)
11	GND	24	VDD_FEM_1	37	GND	50	GND (Center GND)
12	WL_BB_QP	25	VDD_FEM_1	38	VDD_WL_1P3	51	GND (Center GND)
13	WL_BB_QN	26	GND	39	VDD_WL_1P3	52	GND (Center GND)

Table 2-1 Pin Assignments

3 Pin Descriptions

Pin #	Signal Name	Type	Connection to IC Pin	Power Domain	Description
RF input/output (WLAN & BT RF, FM radio)					
32	ANT	AI/AO	WL_RFIO_5G WL_BT_RFIO	-	WLAN 802.11 a/b/g/n and Bluetooth Transmit/Receive. Antenna Port
4	FM_HS_RX	AI	FM_HS_RX	-	FM radio headset RF receiver input port
5	FM_TXRX	AI/AO	FM_TXRX	-	FM radio PCB RF Rx/Tx input/output port
Rx/Tx analog baseband interface with modem IC (WLAN)					
12	WL_BB_QP	AI/AO	WL_BB_QP	-	WLAN baseband differential quadrature -positive (multiplexed Rx/Tx)
13	WL_BB_QN	AI/AO	WL_BB_QN	-	WLAN baseband differential quadrature -negative (multiplexed Rx/Tx)
16	WL_BB_IP	AI/AO	WL_BB_IP	-	WLAN baseband differential in-phase -positive (multiplexed Rx/Tx)
15	WL_BB_IN	AI/AO	WL_BB_IN	-	WLAN baseband differential in-phase -negative (multiplexed Rx/Tx)
Command interface with modem IC (WLAN)					
18	WL_CMD_DATA2	DIO	WL_CMD_DATA2		In active mode, the CMD_DATA lines will be to DO-NP, then changes to DO-PD when CMD_SET signal changes state
10	WL_CMD_DATA1	DIO	WL_CMD_DATA1		In active mode, the CMD_DATA lines will be to DO-NP, then changes to DO-PD when CMD_SET signal changes state
19	WL_CMD_DATA0	DIO	WL_CMD_DATA0		In active mode, the CMD_DATA lines will be to DO-NP, then changes to DO-PD when CMD_SET signal changes state
29	WL_CMD_CLK	DI	WL_CMD_CLK		Z when WLAN/BT/FM is off or in power collapse, otherwise DI-PD
9	WL_CMD_SET	DI	WL_CMD_SET		Z when WLAN/BT/FM is off or in power collapse, otherwise DI-PD
Data interface with modem IC (Bluetooth)					
43	BT_DATA	B	BT_DATA	DIO	Z when WLAN is off or in power collapse, otherwise B-PD
41	BT_CTL	DI	BT_CTL	DIO	Z when WLAN is off or in power collapse, otherwise DI-PD
Status and control interface with modem IC (Bluetooth)					
42	BT_SSBI	B	BT_SSBI	DIO	Z when WLAN is off or in power collapse, otherwise B-PD
Data interface with modem IC (FM)					
2	FM_DATA	B	FM_DATA	DIO	
Status and control interface with modem IC (FM)					
3	FM_SSBI	B	FM_SSBI	DIO	
Clocks					
45	CLK_OUT	DO	CLK_OUT	DIO	24MHz clock output to WCN subsystem block in MSM8960 for synchronization.
Power Supplies					
24 25	VDD_FEM_1				Power for WLAN 5GHz FEM

21 22	VDD_3P0		VDD_BT_TXRF_3P0 VDD_FM_TXDA_3P0 VDD_WL_2GPA_3P0 VDD_WL_5GPA_3P0		Power for WLAN 5GHz, 2.4GHz PA, , BT Tx and FM Tx driver amplifier circuits
36	VLDO_1P8		VDD_XO_1P8	-	Power for XO circuit (1.8V) and Internal 1.2V LDO input voltage.
1	VSMPS_1P8		VDD_IO_1P8		Power for WCN digital I/O circuits (1.8V)
38 39	VDD_WL_1P3		VDD_BT_FM_DIG_1P3 VDD_BT_BB_1P3 VDD_BT_PLL_1P3 VDD_BT_RXRF_1P3 VDD_BT_VCO_1P3 VDD_FM_PLL_1P3 VDD_FM_RXBB_1P3 VDD_FM_RXFE_1P3 VDD_FM_VCO_1P3 VDD_WL_2GLNA_1P3 VDD_WL_2GPA_1P3 VDD_WL_5GLNA_1P3 VDD_WL_5GPA_1P3 VDD_WL_BB_1P3 VDD_WL_LO_1P3 VDD_WL_PLL_1P3 VDD_WL_UPC_1P3	-	Power for WCN analog, digital, and RF core circuits
7	VDD_WL_LO_1P3		VDD_WL_LO_1P3		Just connect over 10uF capacitor
No Connection					
27	NC				No connection
Supplier Identification					
34	NC				No connection
Ground					
6	GND			-	Ground
8	GND			-	Ground
11	GND	-		-	Ground
14	GND	-		-	Ground
17	GND	-		-	Ground
20	GND	-		-	Ground
23	GND	-		-	Ground
26	GND	-		-	Ground
28	GND	-		-	Ground
30	GND	-		-	Ground
31	GND	-		-	Ground
33	GND	-		-	Ground
35	GND	-		-	Ground
37	GND	-		-	Ground
40	GND	-		-	Ground
44	GND	-		-	Ground
46	GND	-		-	Ground
47	GND	-		-	Ground
48	GND	-		-	Ground
49	GND	-		-	Ground

50	GND	-		-	Ground
51	GND	-		-	Ground
52	GND	-		-	Ground

Table 3-1 Pin Descriptions

"Type" Column

: AI=Analog input, AO=Analog output, B=Bi-directional, DI=Digital input, DO : Digital output

Z = High-impedance output

NP = Contains no internal pull, PU=Contains an internal pull-up device,

PD = Contains an internal pull-down device

DIO = Digital interfaces with modem IC (VDD_IO = 1.8V only),

4 Electrical Characteristics

4.1 DC Characteristics

4.1.1 Absolute Maximum Ratings

Symbol(Domain)	Parameter	min	Max	Unit
VDD_FEM_1	Power for WLAN 5GHz FEM (PA&LNA)	-0.3	5.5	V
VDD_3P0	Power for WLAN 5GHz, 2.4GHz PA, and FM Tx driver amplifier circuits	-0.5	3.2	V
VLDO_1P8	Power for WCN XO circuits	-0.5	3.0	V
VSMPS_1P8	Power for WCN digital I/O circuits	-0.5	3.0	V
VDD_WL_1P3	Power for WCN analog, digital, and RF core circuits	-0.5	3.0	V

Table 4-1 Absolute maximum ratings

4.1.2 Recommended Operating Conditions

Symbol(Domain)	Parameter	Min.	Typ	Max	Unit
VDD_FEM_1	Power for WLAN 5GHz FEM (PA&LNA)	3.2	3.6	4.5	V
VDD_3P0	Power for WLAN 5GHz, 2.4GHz PA, and FM Tx driver amplifier circuits	2.9	3.0	3.1	V
VLDO_1P8	Power for WCN XO circuits	1.7	1.8	1.9	V
VSMPS_1P8	Power for WCN digital I/O circuits	1.7	1.8	1.9	V
VDD_WL_1P3	Power for WCN analog, digital, and RF core circuits	1.25	1.3	1.35	V

Table 4-2 Recommended operating conditions

<Note> SEMCO recommend that the power lines are designed as below

- VDD_FEM_1 : thickness over 300um
- VDD_3P0 : thickness over 500um
- VDD_WL_1P3 : thickness over 500um

4.2 Environmental Characteristics

Symbol	Parameter	Conditions	Min.	Max.	Unit
ESD	Electro-static discharge voltage	HBM	Class 1C		
T_{OP}	Operating temperature		-20	70	°C
T_{STG}	Storage temperature		-30	85	°C

Table 4-3 Environmental characteristics

4.3 Power Consumption

Mode	VSMPS_1P8	VLDO_1P8	VDD_WL_1P3	VDD_3P0	VDD_FEM_1
WiFi Current consumption					
2.4GHz					
11Mbps (@18dBm)	0.91	6.7	97	175	-
54Mbps (@14dBm)	0.91	6.7	94	111	-
72Mbps (@13dBm)	0.91	6.7	93	102	-
Rx	0.96	6.7	54	0.0005	-
5GHz					
54Mbps (@15dBm)	0.91	6.9	184	0.13	165
72Mbps (@14dBm)	0.91	6.9	184	0.13	158
Rx	0.96	6.9	65	0.0022	8
BT Current consumption					
Power class 1 (@8dBm)	1.8	1.85	27	26	-
Rx	2.0	1.85	24	0.0006	-
FM Current consumption					
Rx		2	15		-

Unit : mA

5 RF Specifications

All measurements are made under nominal supply voltage and room temperature conditions.

5.1 WLAN RF Specification

5.1.1 WLAN 2.4GHz Receiver RF Specifications

Parameter	Conditions	Min.	Nom.	Max.	Unit
Minimum receiver sensitivity in 802.11b mode					
1Mbps	PER<8%, Packet size= 1024bytes			-80	dBm
2Mbps				-80*	dBm
5.5Mbps				-76	dBm
11Mbps			-89	-76*	dBm
Minimum receiver sensitivity in 802.11g mode					
6Mbps	PER<10%, Packet size= 1000bytes			-82*	dBm
9Mbps				-81*	dBm
12Mbps				-79*	dBm
18Mbps				-77*	dBm
24Mbps				-74*	dBm
36Mbps				-70*	dBm
48Mbps				-66*	dBm
54Mbps			-74	-65*	dBm
Minimum receiver sensitivity in 802.11n mode					
HT20, MCS7, 1stream, 1Tx, 1Rx	PER<10%		-71	-64*	dBm
Maximum input signal level					
802.11b mode	PER<8%	-10*			dBm
802.11g mode	PER<10%	-20*			dBm
802.11n mode	PER<10%	-20*			dBm
Adjacent channel rejection (ACR) in 802.11b mode					
1Mbps	PER<8%, Packet size= 1024bytes	35*			dB
2Mbps		35*			dB
5.5Mbps		35*			dB
11Mbps		35*			dB
Adjacent channel rejection (ACR) in 802.11g mode					
6Mbps	PER<10%, Packet size= 1024bytes	16*			dB
9Mbps		16*			dB
12Mbps		13*			dB
18Mbps		11*			dB
24Mbps		8*			dB
36Mbps		4*			dB
48Mbps		0*			dB
54Mbps		-1*			dB
Adjacent channel rejection (ACR) in 802.11n mode					
HT20, MCS0	PER<10%	16*			dB
HT20, MCS7		-2*			dB

Table 5-1 WLAN 2.4GHz receiver RF specifications

"" Indicates IEEE 802.11 standard specifications*

5.1.2 WLAN 2.4GHz Transmitter RF Specifications

Parameter	Conditions	Min	Typ	Max	Unit
Linear output power in 802.11b mode					
Output power@1~11Mbps	As specified in IEEE802.11		18		dBm
Linear output power in 802.11g mode					
Output power@6Mbps	As specified in IEEE802.11		14		dBm
Output power@54Mbps			14		dBm
Linear output power in 802.11n mode					
Output power@HT20,MCS7			13		dBm
Transmit spectrum mask					
Margin to 802.11b spectrum mask	Maximum output power	0			dBr
Margin to 802.11g spectrum mask		0			dBr
Margin to 802.11n spectrum mask		0			dBr
Transmit modulation accuracy in 802.11b mode					
1Mbps	As specified in IEEE802.11b	-		35	%
2Mbps		-		35	%
5.5Mbps		-		35	%
11Mbps		-		35	%
Transmit modulation accuracy in 802.11g mode					
6Mbps	**Mandatory**	**-**		**-5**	**dB**
9Mbps	Option	-		-8	dB
12Mbps	**Mandatory**	**-**		**-10**	**dB**
18Mbps	Option	-		-13	dB
24Mbps	**Mandatory**	**-**		**-16**	**dB**
36Mbps	Option	-		-19	dB
48Mbps	Option	-		-22	dB
54Mbps	Option	-	-28	-25	dB
Transmit modulation accuracy in 802.11n mode					
HT20,MCS7	Full packet		-32*	-28	dB
Transmit power-on and power-down ramp time in 802.11b mode					
Transmit power-on ramp time from 10% to 90% output power				2	usec
Transmit power-down ramp time from 90% to 10% output power				2	usec

Table 5-2 WLAN 2.4GHz transmitter RF specifications

"" Condition : Enable Full packet estimation*

5.1.3 WLAN 5GHz Receiver RF Specifications

Parameter	Conditions	Min.	Nom.	Max.	Unit
Minimum receiver sensitivity in 802.11a mode					
6Mbps	PER<10%, Packet size= 1000bytes			-82*	dBm
9Mbps				-81*	dBm
12Mbps				-79*	dBm
18Mbps				-77*	dBm
24Mbps				-74*	dBm
36Mbps				-70*	dBm
48Mbps				-66*	dBm
54Mbps			-76	-65*	dBm
Minimum receiver sensitivity in 802.11n mode					
HT20, MCS7, 1stream, 1Tx, 1Rx	PER<10%		-73	-64*	dBm
HT40, MCS7, 1stream, 1Tx, 1Rx	PER<10%		-70	-61*	dBm
Maximum input signal level					
802.11a mode	PER<10%	-30*			dBm
802.11n mode	PER<10%	-30*			dBm
Adjacent channel rejection (ACR) in 802.11a mode					
6Mbps	PER<10%, Packet size= 1024bytes	16*			dB
9Mbps		16*			dB
12Mbps		13*			dB
18Mbps		11*			dB
24Mbps		8*			dB
36Mbps		4*			dB
48Mbps		0*			dB
54Mbps		-1*			dB
Adjacent channel rejection (ACR) in 802.11n mode					
HT20, MCS0	PER<10%	16*			dB
HT20, MCS7		-2*			dB

Table 5-3 WLAN 5GHz receiver RF specifications

"" Indicates IEEE 802.11 standard specifications*

5.1.4 WLAN 5GHz Transmitter RF Specifications

Parameter	Conditions	Min.	Nom.	Max.	Unit
Linear output power in 802.11a mode					
Output power@6Mbps	As specified in IEEE802.11		15		dBm
Output power@54Mbps			15		dBm
Linear output power in 802.11n mode					
Output power@HT20,MCS0	As specified in IEEE802.11		14		dBm
Output power@HT20,MCS7			14		dBm
Output power@HT40,MCS0			13		dBm
Output power@HT40,MCS7			13		dBm
Transmit spectrum mask					
Margin to 802.11a spectrum mask	Maximum output power	0			dBr
Margin to 802.11n spectrum mask		0			dBr
Transmit modulation accuracy in 802.11a mode					
6Mbps	**Mandatory**	**-**		**-5**	**dB**
9Mbps	Option	-		-8	dB
12Mbps	**Mandatory**	**-**		**-10**	**dB**
18Mbps	Option	-		-13	dB
24Mbps	**Mandatory**	**-**		**-16**	**dB**
36Mbps	Option	-		-19	dB
48Mbps	Option	-		-22	dB
54Mbps	Option	-	-30	-25	dB
Transmit modulation accuracy in 802.11n mode					
HT20,MCS7	Full packet		-33*	-28	dB
HT40,MCS7	Full packet		-33*	-28	dB

Table 5-4 WLAN 5GHz transmitter RF specifications

"" Condition : Enable Full packet estimation*

5.2 Bluetooth

5.2.1 Bluetooth Receiver RF Specification (BR/EDR)

Parameter	Conditions	Min	Typ.	Max	Unit
Minimum receiver sensitivity					
GFSK	BER≤0.1%		-92	-70	dBm
DQPSK	BER ≤ 0.01%		-92	-70	dBm
8DPSK	BER ≤ 0.01%		-87	-70	dBm
Max Input Level					
GFSK	BER ≤0.1%	-20			dBm
DQPSK	BER ≤0.1%	-20			dBm
8DPSK	BER ≤0.1%	-20			dBm

Table 5-5 BT receiver RF specifications (BR/EDR)

5.2.1 Bluetooth Transmitter RF specification (BR/EDR)

Parameter	Conditions	Min	Typ.	Max	Unit
Output Power					
Output Power (BR)			8		dBm
Output Power (EDR)					
FrequencyRange					
DH5		2400	-	2500	MHz
-20dB Bandwidth					
DH5				1	MHz
ICFT (Initial Carrier Frequency Tolerance)					
ICFT		-75		75	KHz
Carrier Frequency Drift					
DH1		-25		25	KHz
DH3		-40		40	KHz
DH5		-40		40	KHz
Maximum Drift Rate		-20		20	KHz/50us
Modulation Characteristics					
Delta f1 average		140		175	KHz
Delta f2 max, Threshold:115.0 kHz		99.9			%
Delta2 Avg. / Delta f1 Avg.		0.8			-
DEVM for π/4-DQPSK (RMS)				20	%
DEVM for π/4-DQPSK (Peak)				35	%
DEVM for 8DPSK (RMS)				13	%
DEVM for 8DPSK (Peak)				25	%

Table 5-6 BT transmitter RF specifications (BR/EDR)

5.2.2 Bluetooth Receiver RF Specification (LE)

Parameter	Conditions	Min	Typ.	Max	Unit
Minimum receiver sensitivity					
	PER ≤ 30.8%		-92	-70	dBm
Max Input Level					
	PER ≤30.8%	-10			dBm

Table 5-7 BT receiver RF specifications (LE)

5.2.3 Bluetooth Transmitter RF specification (LE)

Parameter	Conditions	Min	Typ.	Max	Unit
Output Power					
Output Power			1		dBm
Modulation Characteristics					
Delta f1 average		225		275	KHz
Delta f2 max, Threshold:185.0 kHz		99.9			%
Delta2 Avg. / Delta f1 Avg.		0.8			-

Table 5-8 BT transmitter RF specifications (LE)

5.3 FM

5.3.1 FM Receiver RF Specification

Parameter	Conditions	Min	Typ.	Max	Unit
FM Receiver					
Frequency Range		76	-	108	MHz
Sensitivity	MONO, 22.5KHz dev, 1KHz Modulation			-	dBm
Total Harmonic Distortion (THD)	MONO, 75KHz dev, 1KHz modulation		0.25	1.0	%
Signal-to-noise ration (SNR)	MONO, 22.5KHz dev, 1KHz Modulation	26	66	-	dB

Table 5-9 FM receiver RF specifications

6 Assembly Recommendations

6.1 Printed Circuit Board and Stencil Design

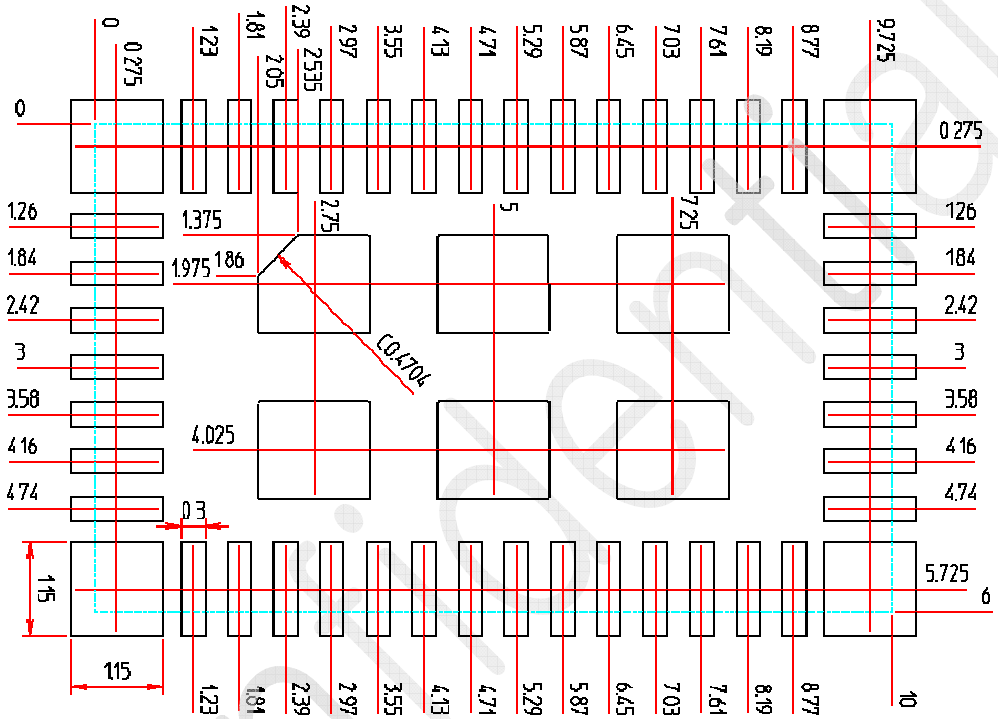


Figure 6-1 Recommended PCB and Land Patterns (Top View)

6.2 Reflow and Soldering

6.2.1 PCB Finish

The SWB-QC30H can be mounted on a variety of PCB finishes such as immersion gold (Ni/Au) or Hot air solder level (HASL) or Organic Surface Protection (OSP).
Ni/Au finish is recommended. OSP is not recommended in cases that OSP does not withstand a Pb-free or a double-sided reflow application.

6.2.2 Solder Paste

Standard (No-clean) Sn/Pb (63%/37%) or Pb-free solder pastes should be used for soldering the package. Solder pastes should be selected based on their printing and reflow behavior. For Pb-free solder paste it is recommended to use "SAC" type solder paste (e.g. SnAg3Cu0.5).

6.2.3 Reflow Profile

Industrial convection reflow oven should be used to mount the packages. The profile depends on the printed circuit board and other components that are used in the customer application.JEDEC specification should be followed for maximum peak temperature. Following reflow temperature profile and constraints are recommended for eutectic Lead-free reflow solders.

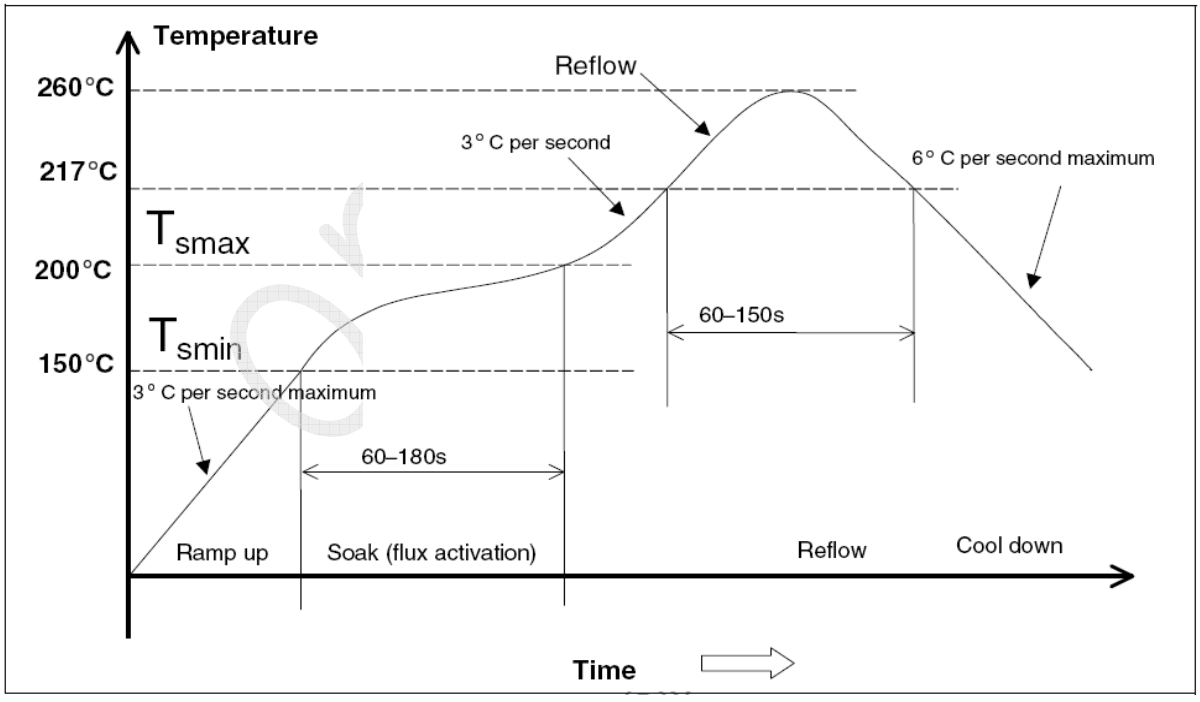


Figure 6-2 Recommended Reflow Temperature Profile

JEDEC J-STD-020B	Sn-Pb	Pb-Free
Average Ramp-up rate (T_L to Tp)	3℃/second max.	3℃/second max.
Preheat - Temperature Min (Ts_{min}) - Temperature Max (Ts_{max}) - Time (min to max) (ts)	 100℃ 150℃ 60~120 sec.	 150℃ 200℃ 60~180 sec.
Tsmax to T_L - Ramp-up Rate	-	3℃/second max.
Time maintained above: - Temperature (T_L) - Time (T_L)	 183℃ 60~150 sec.	 217℃ 60~150 sec.
Peak Temperature (Tp)	240 +0/-5℃	250 +0/-5℃
Time within 5℃ of actual Peak Temperature (Tp)	10~30 sec.	20~40 sec.
Ramp-down Rate	6℃/second max.	6℃/second max.
Time 25℃ to Peak Temperature	8 minutes max.	8 minutes max.

Table 6-1 Recommended Reflow Temperature Profile

7 Additional Information

7.1 Power Sequencing

The SWB-QC30H requires the following power up sequence:

1. Either VLDO_1P8 (VDD_XO_1P8) or VSMPS_1P8 (VDD_IO_1P8) can be turned on first.
2. VDD_WL_1P3
3. VDD_3P0

To power down the module, the reverse order must be applied.

7.2 Reference Clock

The reference clock source (Crystal) is embedded in SWB-QC30H. The frequency is 48MHz.

7.3 WLAN interface between MSM8960 and SWB-QC30H

7.3.1 Analog interface

The analog interface signals between the WLAN digital baseband of the wireless connectivity subsystem in the MSM8960 and SWB-QC30H device are listed in Table 7-1. The I/Q baseband analog interface consist of four transmission lines shared between the Tx and Rx paths. In Tx mode these four lines are used to connect DAC output pins to Tx BBF input pins; the ADC input pins and Rx BBF output pins are in high-Z mode. For Rx mode, conversely, the four lines are used to connect the Rx BBF output pins to ADC input pins as the DAC outputs and Tx BBF inputs are in high-Z mode.

Signal name	Direction	Description
WL_BB_IN	Analog I/O	Baseband analog I negative, multiplexed between TX_IN and RX_IN on the RF side.
WL_BB_IP	Analog I/O	Baseband analog I positive, multiplexed between TX_IP and RX_IP on the RF side.
WL_BB_QN	Analog I/O	Baseband analog Q negative, multiplexed between TX_QN and RX_QN on the RF side.
WL_BB_QP	Analog I/O	Baseband analog Q positive, multiplexed between TX_QP and RX_QP on the RF side.

Table 7-1 Analog interface signals

7.3.2 Digital interface

Signal name	Direction	Description
WL_CMD_DATA2	Bi-directional	WLAN command interface data bit 2 VSWR overload flag (no command active)
WL_CMD_DATA1	Bi-directional	WLAN command interface data bit 1 RF energy detection flag (no command active)
WL_CMD_DATA0	Bi-directional	WLAN command interface data bit 0 RF saturation flag (no command active)
WL_CMD_CLK	Digital Input	WLAN command interface synchronization clock
WL_CMD_SET	Digital Input	WLAN command interface H=command active, L=command finished

Table 7-2 Digital interface signals

7.4 Bluetooth interface between MSM8960 and SWB-QC30H

Signal name	Direction	Description
BT_DATA	Bi-directional	Bluetooth data
BT_CTL	Digital input	Bluetooth control
BT_SSBI	Bi-directional	Bluetooth single-wire serial bus interface

Table 7-3 Bluetooth interface signals

7.5 FM interface between MSM8960 and SWB-QC30H

Signal name	Direction	Description
FM_DATA	Bi-directional	FM radio data
FM_SSBI	Bi-directional	FM radio single-wire serial bus interface

Table 7-4 FM interface signals

7.5.1 FM RDS interrupt

At reset, the RDS interrupt signal is disabled. After reset, the host may enable the interrupt and set the NVM parameter associated with the interface. The software supports the following NVM parameters for configuring the interrupt behaviour.

- Inactive mode: tri-state or output;
- Internal pull (if inactive mode is set to tri-state): up, down, or-no-pull

The FM RDS interrupt uses a digital I/O pin that receives power from the VSMPS_1P8 (VDD_IO_1P8) supply.

8 Application Reference Design

8.1 Application Reference Schematic

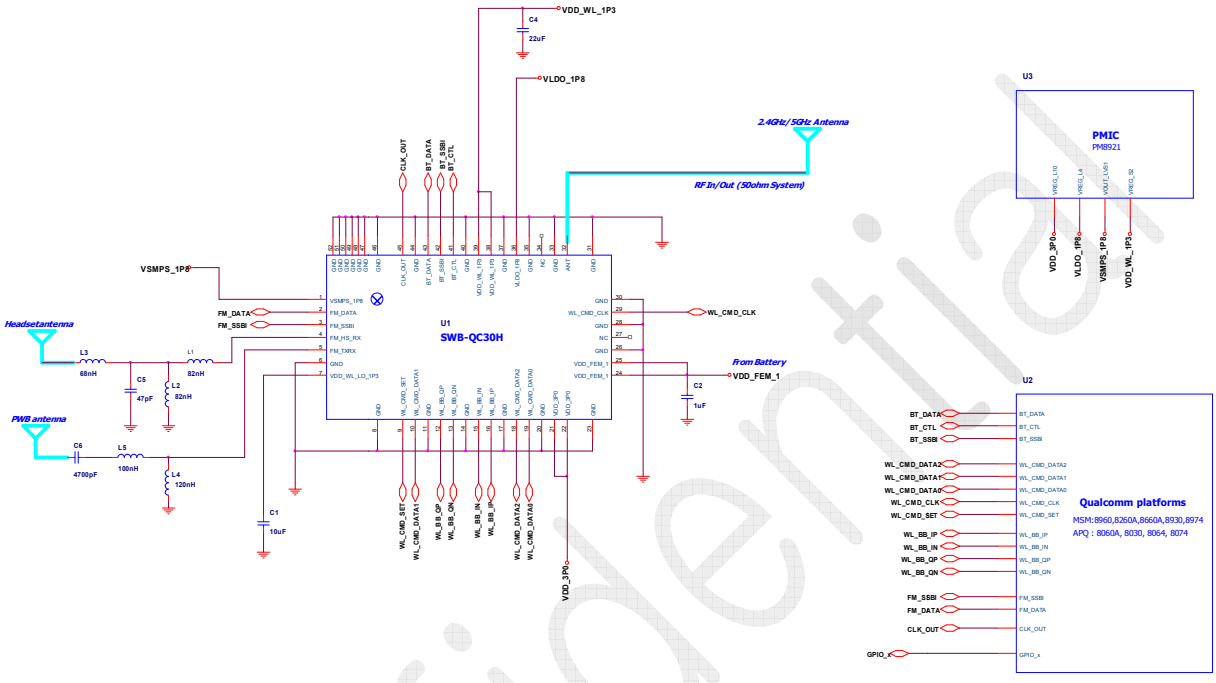


Figure 8-1 Reference schematic for SWB-QC30H

※Built-in reference clock : 48MHz X-TAL for dual band (2.4GHz & 5GHz)

※Included 5G FEM (PA+LNA) for better RF performance

※Included most external components in module (Bypass capacitors, 2.4G BPF, diplexer etc.)

: Bypass capacitors are important & critical for WiFi performance. they are included in module.

※ SWB-QC30H used internal Coupler as the default for 2.4GHz and used PA detector for 5GHz power accuracy.

※ If FM is not used, the pins (pin2,3,4,5) for FM are NC.

9 Marking Information

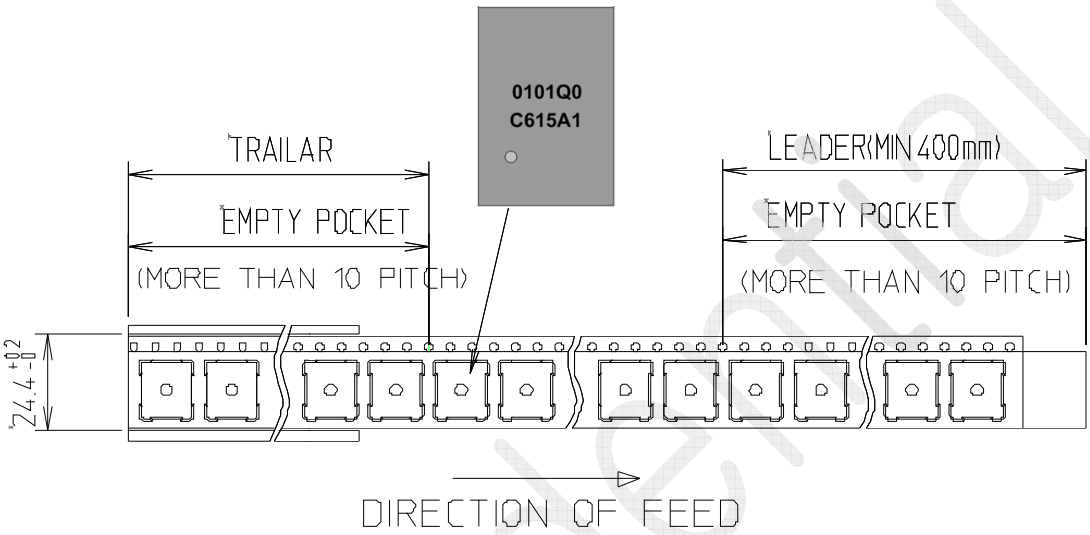
①	②	③		
01	01	Q0		
④	⑤	⑥	⑦	
C	6	15	A1	

No	Remark
①	PCB strip number
②	PCB unit number in an array
③	Model name : Q0 (SWB-QC30H)
④	Manufacturing year (ex; C:2012, D:2013)
⑤	Manufacturing month (ex; 1:Jan, 9:Sep, A:Oct, B:Nov, C:Dec)
⑥	Manufacturing day : 1~31
⑦	Daily lot number : A1, A2, A3, ..., Z8, Z9

10 Package Information

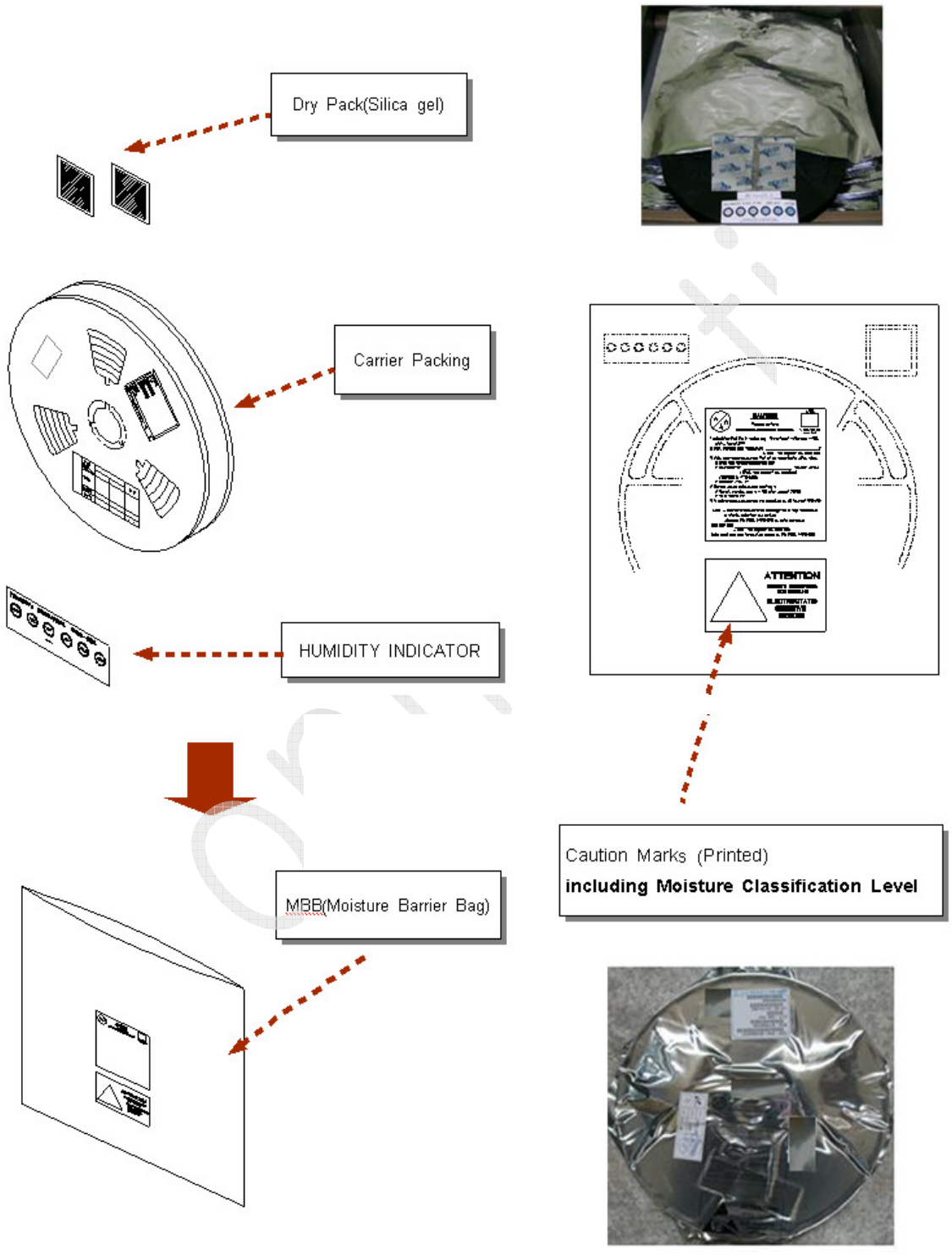
10.1 Packing method

10.1.1 Reel Tape Packing

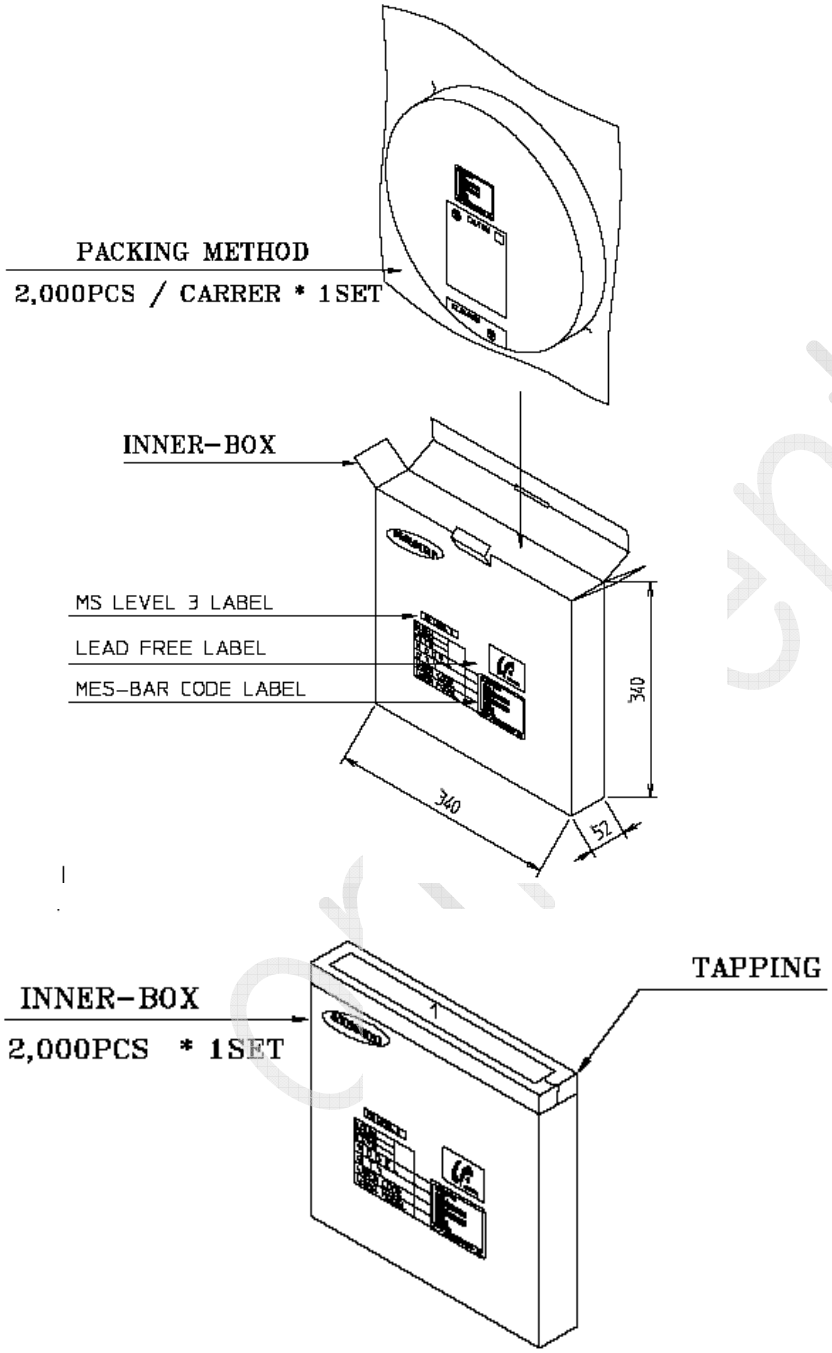


10.1.2 Vacuum Packing

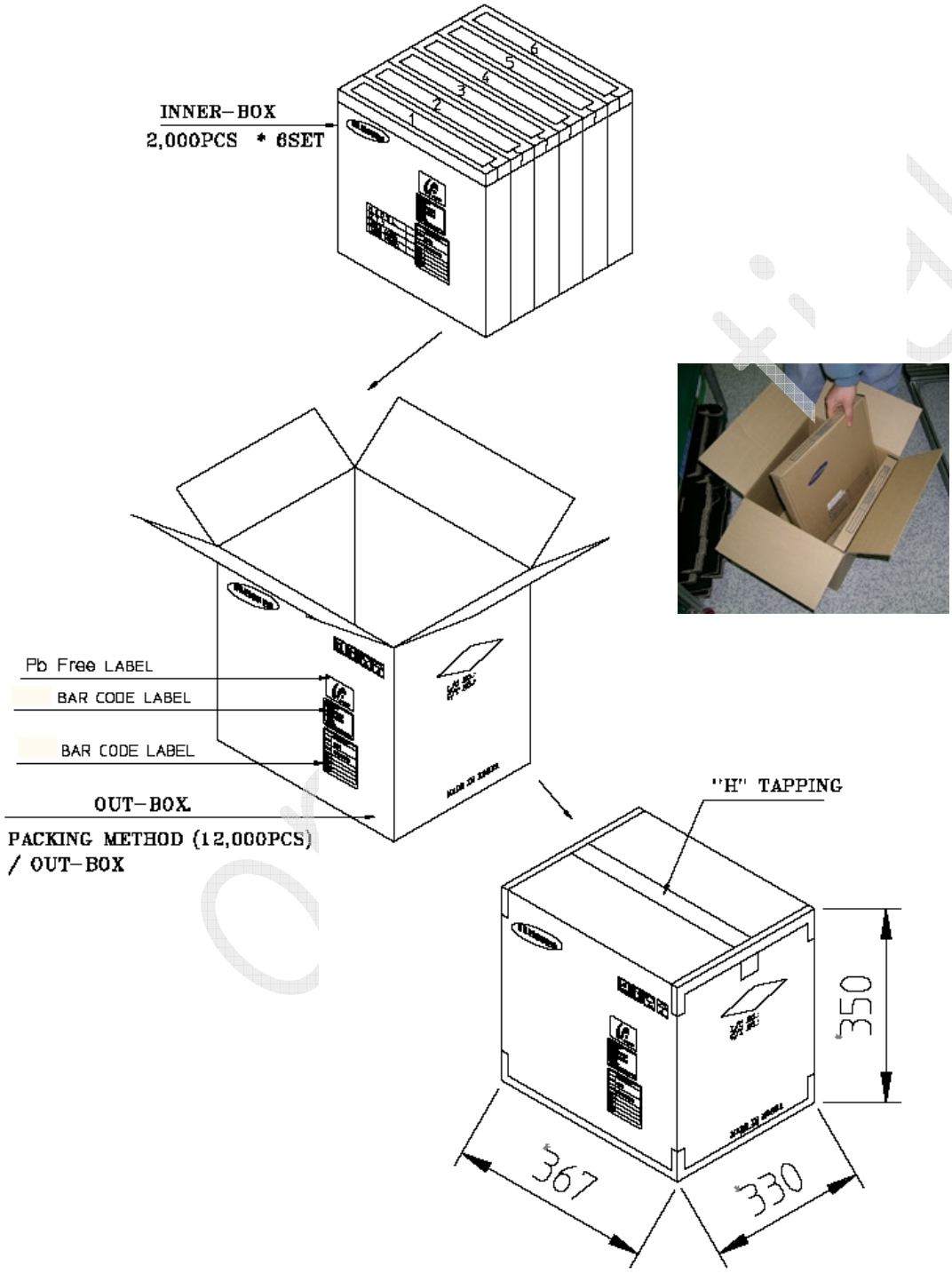
Packed in MBB(Moisture Barrier Bag) and related parts.



10.1.3 Inner Box Packing



10.1.4 Out Box Packing



10.2 Packing Specification

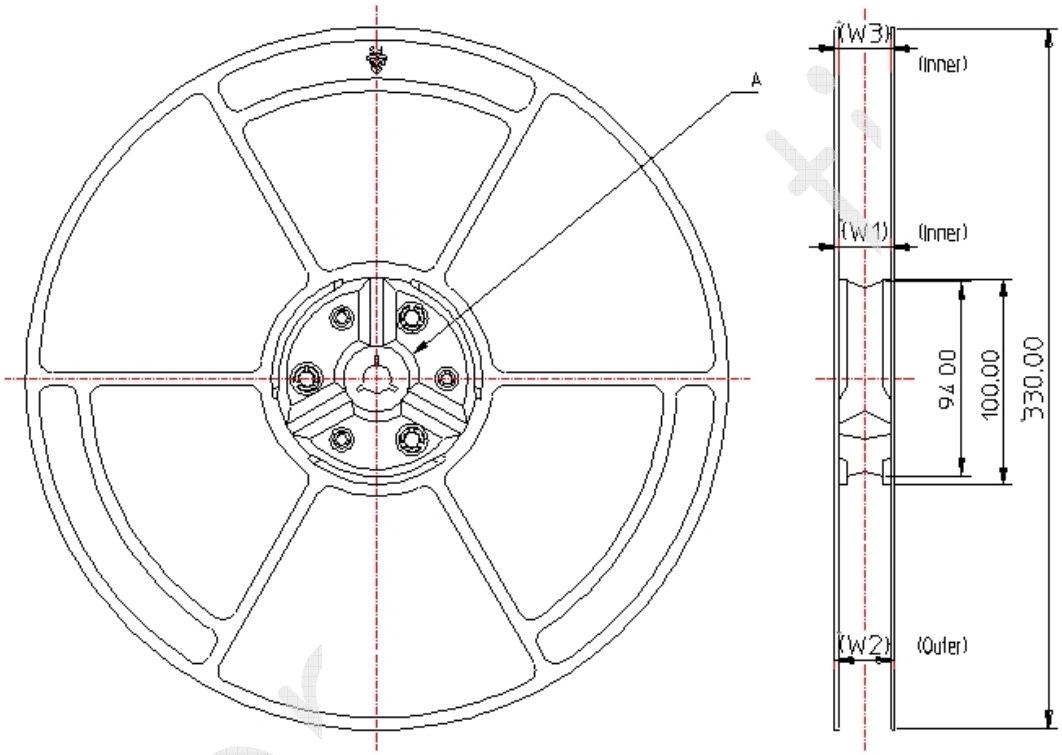
10.2.1 Reel Type Carrier Tape

TBD

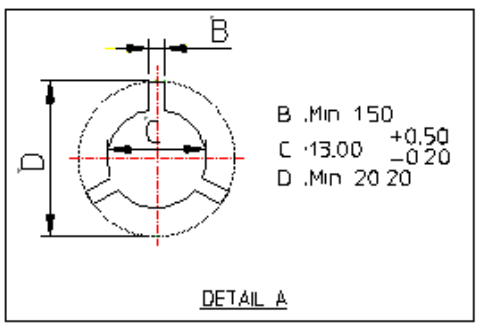
Cover Tape

TBD

Embossed Carrier Tape

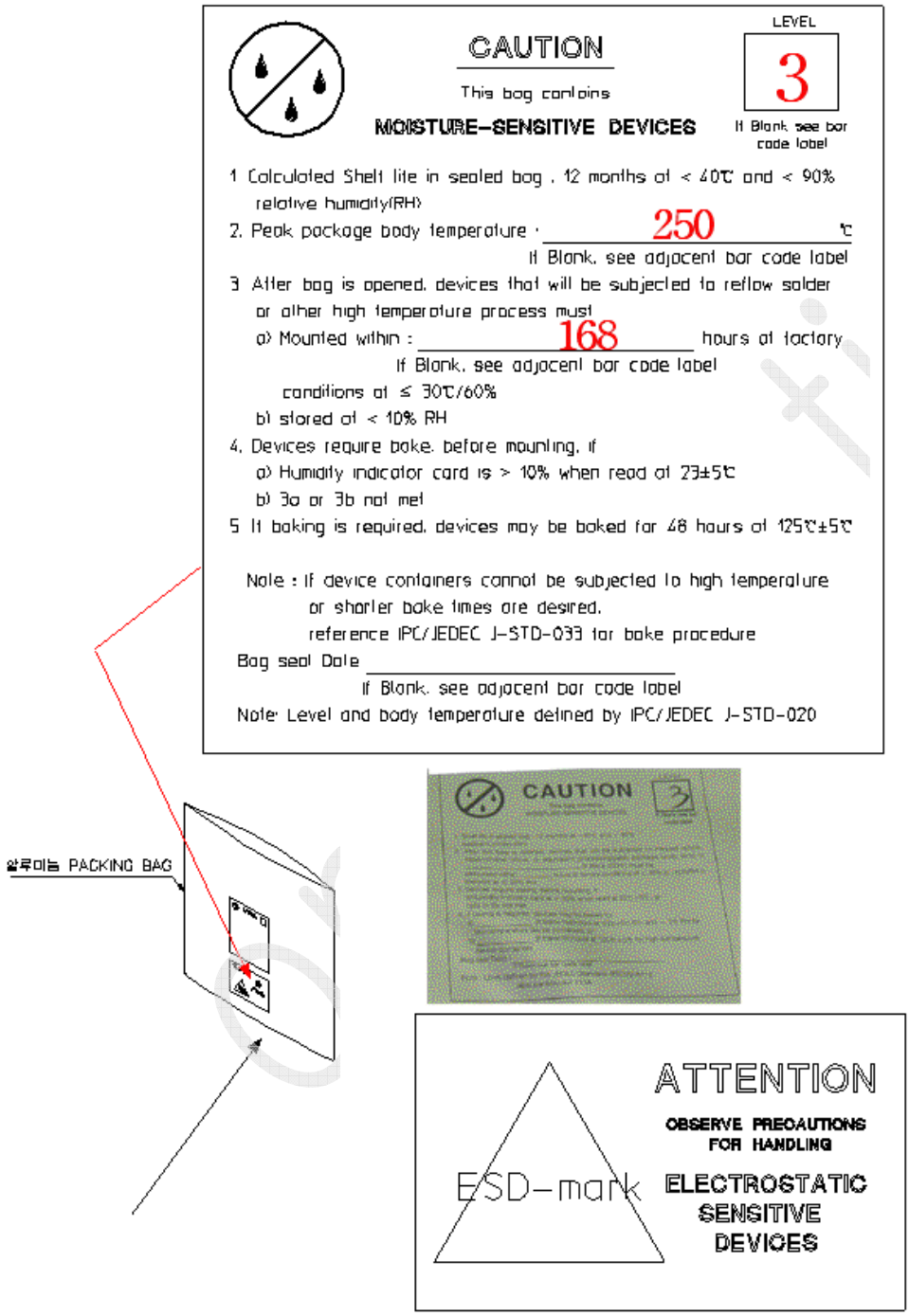


Carrier Reel



NOMIMAL WIDTH	W1 +2 -0	W2 Max	W3 +3 -0.5
24 mm	24.4mm	30.4mm	24.4mm

10.2.2 Shield Bag



10.3 Packing Box ESD Specification

- ESD Control for each packing box: Under 100V
- Packing Box's surface resistance: Max +7 ohms/SQ

11 Handling Moisture Sensitivity

The user must take responsibility during storage and board mount assembly to avoid package overexposure to moisture by following certain precautions explained here.

11.1 Moisture Sensitivity Level

SEMCO follows the latest revision **IPC/JEDEC J-STD-020** standards in determining the module moisture sensitivity level **(MSL)**. To ensure proper SMT assembly, procedures must abide by the MSL and maximum reflow temperature specified on the ESD shipping bag labels.
SWB-QC30H is qualified as **MSL 3** and peak package body temperature **250 °C**

11.2 Storage Condition of Moisture Barrier Bag

SWB-QC30H, as delivered in tape-and-reel carriers, must be stored in sealed, moisture barrier, antistatic bags. Shelf life in a properly sealed bag is 12 months; this specification requires an ambient temperature less than 40 °C and relative humidity less than 90%.

11.3 Out-Of-Bag Duration

After removing from the dry bag, SWB-QC30H must be soldered onto the PCB within the time listed on the moisture bag label. SWB-QC30H can be exposed for **168 hours** to an environment with a maximum temperature of 30 °C and a maximum relative humidity of 60%, as specified in the **IPC/JEDEC J-STD-033** standard.

11.4 Baking Requirements

Baking prior to solder reflow is required if

- The HIC (Humidity Indicator Card) is > 10% when read at 23 +/- 5 °C, or
- Floor life time (the maximum allowable time period) has been exceeded, or
- Storage condition of < 10% RH has not been met.

For SWB-QC30H, following baking conditions should be used.

- **Baking condition : 24 hours at 125 °C**

CAUTION: SWB-QC30H cannot be baked in the tape-and-reel carriers supplied by SEMCO at the temperature stated on the MSL label.

Revision History

Revision	Date	Descriptions
1	2012-02-20	1st revision
2	2012-03-05	Updated Figure 2-1 Mechanical Dimension (Top view) - Add pad dimension of bottom GND Updated Figure 6-1 Recommended PCB and Land Patterns (Top View) - Add Land pattern dimension of bottom GND
3	2012-03-23	Changed Section 4 Electrical characteristics - Delete VDD_FEM_2 Updated Section 5 RF Specifications Changed Section 8 Application Reference Design - Delete VDD_FEM_2
4	2012-05-15	Updated Section 4.2 Recommended Operating conditions - Add <Note> Recommended power line design Updated Section 4.3 Power consumption. Updated Section 5 RF Specifications Updated Section 8.1 Application reference schematic - C1 : 10uF -> 10uF ~ 22uF
5	2012-05-22	Changed Section 2.2 Pin assignments - Pin 27 VDD_FEM_2 => NC - Pin 34 GND => Supplier_Identification Changed Section 3 Pin Descriptions - Pin 27 VDD_FEM_2 => NC - Pin 34 GND => Supplier_Identification Changed Section 8.1 Application Reference Schematic - Pin 27 VDD_FEM_2 => NC - Pin 34 GND => Supplier_Identification
6	2012-06-13	Changed marking information as Section 9 Changed Section 2.1 Mechanical Dimension - Changed Marking Changed Section 9 Marking Information Changed Section 10.1.1 Reel Tape Packing
7	2012-07-17	Updated Section 4.2 Environmental Characteristics - ESD : Class 1C Updated Section 5.3.1 FM Receiver RF Specification Deleted Table 7 2 Analog I/Q interface specifications Changed Section 10.1.1 Reel Tape Packing - Changed module direction (180˚)