Datasheet
WiSmart™ EC19W01

econais

Internet of Things. Think WiSmart™

Revision History

Rev	Date	Comments
1	20-Jan-2014	Initial document release
2	23-Jan-2014	Added antenna area and pad dimensions
3	28-Jan-2014	Added information about MSL and height
4	23-May-2014	Operational Temperature range clarification
5	2-June-2014	Add Reference Design
6	10-June-2014	Updated the module footprint
7	19-June-2014	Updated Antenna Keep-Out area. Add "Output Power vs. Temperature" graph.
8	4-July-2014	Updated footprint and mechanical dimensions
9	21-July-2014	Updated Schematic and EXT_LFC
10	04-Aug-2014	Updated information on operational temperature range
11	22-Aug-2014	Updates for VDD_LDO and DCDC inductor
12	03-Sep-2014	Misc. Updates & Corrections
13	1-Oct-2014	Misc. Corrections
14	21-Oct-2014	Updates for Output power and current consumption
15	21-Nov-2014	Misc. Updates & Corrections
16	25-Nov-2014	Misc. Updates & Corrections

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1   Module Handling Guide

Precaution against Electrostatic Discharge

When using semiconductor devices, ensure that the environment is protected against static electricity:

1.   Wear antistatic clothes and use an earth band.
2.   All objects that are in direct contact with devices must be made of materials that do not produce static electricity.
3.   Ensure that the equipment and work table are connected to earth.
4.   Use ionizer to remove electron charges.

Contamination

Do not work with semiconductor products in an environment exposed to dust or dirt.

Temperature/Humidity

Semiconductor devices are sensitive to:

• Environment
• Temperature
• Humidity

High temperature and humidity deteriorate the characteristics of semiconductor devices. Therefore, do not store or use semiconductor devices in such conditions.

Mechanical Shock

Do not to apply excessive mechanical shock or force on semiconductor devices.

Chemical

Do not expose semiconductor devices to chemicals, exposure to chemicals leads to reactions that can deteriorate the characteristics of the devices.

Light Protection

In non-Epoxy Molding Compound (EMC) package, do not expose semiconductor IC to bright light. Exposure to bright light can cause malfunctioning of the devices.

Radioactive, Cosmic and X-ray

Radioactive substances, cosmic rays, or X-rays may harm semiconductor devices. These substances or rays may cause errors during device operation. Therefore, shield semiconductor devices in environments that may expose devices to radioactive substances, cosmic rays, or X-rays.

Electromagnetic Susceptibility (EMS)

Strong electromagnetic waves or magnetic fields may affect the characteristics of semiconductor devices during the operation under insufficient PCB circuit design for Electromagnetic Susceptibility (EMS).

2   List of Acronyms

Acronym	Description
802.11	WLAN specification defined by a working group within the IEEE
AP	WLAN Access Point
BOM	Bill of Material
BPSK	Binary Phase Shift Keying
CCK	Complementary Code Keying
COB	Chip on Board
DPSK	Differential Phase Shift Keying
DQPSK	Differential Quadrature Phase Shift Keying
DSSS	Direct Sequence Spread Spectrum
DTIM1	Delivery Traffic Indication Message – 100ms beacon interval
DTIM3	Delivery Traffic Indication Message – 300ms beacon interval
FCC	Federal Communication Commission
FW	Firmware
HFC	WLAN, High Frequency Clock, 26 or 40 MHz
I/O	Input/ Output
IC	Integrated Circuit or Industry Canada
LDO	Low-dropout regulator
LFC	Low Frequency Clock, 32.768 kHz Real Time Clock
LNA	Low Noise Amplifier
MIB	Management Information Base
MIMO	Multiple-In, Multiple-Out
OFDM	Orthogonal Frequency Division Multiplexing
PA	Power Amplifier
PLL	Phase Locked Loop
POR	Power On Reset
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature phase-shift keying
RAM	Random Access Memory
RF	Radio Frequency
RoHS	The Restriction of Hazardous Substances in Electrical and Electronic Equipment Directive (2002/95/EC)
ROM	Read Only Memory
STBC	Space-Time Block Coding
UART	Universal Asynchronous Receiver Transmitter
VCO	Voltage Controlled Oscillator
WLAN	Wireless Local Area Network

List 1: Common Acronyms

3   Device Details

General Description

The EC19W is an 802.11b/g/n WLAN module including an RF front-end circuitry, baseband, MAC, Clock Management and Power Management for direct battery operation. It also incorporates the balun and low pass filter 40MHz crystal, a 4MByte flash, the antenna and the matching circuit.

The EC19W is designed for direct PCB attach without under-fill and a low BOM cost for the total Wi-Fi solution.

Key Features

- Compliant with 802.11b/g/n.
- Supports direct attach to Li-Ion battery.
    - Supports VBAT 2.85 - 4.35V with on-module power management.
- On-module IP stack and web server.
- Wi-Fi legacy client support.
- Wi-Fi legacy AP support (SoftAP).
- Wi-Fi Direct (Group Owner and Client).
- Support for 802.11n up to MCS6, SGI 0.4us, STBC (Rx), L-SIG TXOP Protection, PSMP.
- 802.1x, 802.11i, WEP, WPA, WPA2 (PSK/Enterprise, EAP), WPS 2.0 security support, WAPI HW accelerator support.
- 802.11e including WMM/WMM-PS QoS support.
- 802.11d/h support.
- Support of SDIO 2.0 (25 MHz) (SDIO over SPI), SPI & UART host interface.
- I2C emulation through GPIO pins.
- TX output power pre-calibrated in production.
- High level of integration.
    - Use of on-module 40 MHz Crystal (tolerance +/- 20 ppm).
    - Use of internal 32 kHz LFC
    - Integrated TX/RX switches.
    - Fully integrated power management (DCDC).
    - Support external Power Management.
    - Integrated PA and LNA.
- 16x14mm package, 33 pins (plus 14 ground pads underneath the module).

4   Electrical Data

4.1   Absolute Maximum Ratings

The absolute maximum ratings specify the values beyond which the device may be damaged permanently. Exposure to absolute maximum rating conditions for extended periods of time may also affect reliability. Each condition is applied with all other values kept within the recommended operating condition.

Symbol	Parameter	Min.	Max.	Unit
VBAT	Direct battery connect Supply voltage	0	4.55[1]	V
VDD_IO, VDD_SDIO	Supply voltage I/O	-0.3	3.65	V
V_{in}	Input voltage on any digital pin	-0.3	VDD_IO+0.3, VDD_SDIO+0.3	V
T_{stg}	Storage temperature	-65	125	°C

Table 1: Absolute maximum ratings

[1]: 5.5V acceptable for duration less than 2 ms

4.2   ESD

The EC19W module withstands ESD voltages:

- 1000 V HBM (Human Body Model) according to ANSI/ESDA/JEDEC JS-001-2012
- 300 V CDM (Charge Device Model)

4.3   Recommended Operating Conditions

The recommended operating conditions specify the values under which the device operationally meets the specifications.

Symbol	Parameter	Min.	Typ.	Max.	Unit
T_{amb}	Operating ambient temperature	-20		70	°C
VBAT	Direct battery connect supply voltage. - All specs guaranteed.	2.85	3.6	4.35	V
VDD_IO, VDD_SDIO	I/O supply voltage	1.69		3.45	V
VBAT, VDD_IO, VDD_SDIO	Supply Voltages in OFF state			0.2	V

Table 2: Recommended operating conditions

4.4   Current Consumption

VBAT current consumption.

Conditions: VBAT= 3.6 V, Tamb = 25°C, internal DCDC for 1.5 Volt, software release v.1.1.3 (VDD_IO and VDD_SDIO = 2.8V). Current consumption is measured using the chip antenna.

Mode	Condition	Min	Typ	Max	Unit
Transmit 802.11b	CCK 11Mbps, Pout=18 dBm		192	230	mA
Transmit 802.11g	OFDM 54 Mbps, Pout=15 dBm		165	200	mA
	OFDM 54 Mbps, Pout=3 dBm		115		
Transmit 802.11n	OFDM 65 Mbps, Pout=12 dBm		140	170	mA
Receive 802.11b	Normal mode – Max sensitivity		51	59	mA
Receive 802.11g/n	Normal mode – Max sensitivity		54	64	mA
Power Save and Idle	Not connected		258		uA
Power Save & Connected DTIM3			1.8		mA
Shutdown			12.5		uA

Table 3: Typical power consumption values in different modes

4.5   Channel Frequencies

Supported 2.4 GHz channels and frequencies according to IEEE802.11 b/g/n standard.

Channel no.	Frequency MHz	Note	Channel no.	Frequency MHz	Note
1	2412		8	2447	
2	2417		9	2452	
3	2422		10	2457	
4	2427		11	2462	
5	2432		12	2467	
6	2437		13	2472	
7	2442				

Table 4: 2.4 GHz Channel and frequency table

4.6   Receiver Performance

Adjacent Channel Rejection (ACR) describes the ability to receive a wanted signal while strong interfering signals are present at an adjacent channel. It is specified as the power difference between the interfering channel and the desired channel.

All data for the receiver and the transmitter is measured using the on-module chip antenna.

Conditions: VBAT = 3.6V, VDD_IO and VDD_SDIO = 2.8V. Tamb = 25°C. Pwanted is the wanted signal's strength.

Mode	Condition	Min	Typ	Max	Unit
Input level	All data rates, CCK PER < 8%, OFDM PER < 10%			-20	dBm
Adjacent Channel Rejection	11 Mbit/s, Pwanted = - 70 dBm	35			dB
	6 Mbit/s, Pwanted = - 79 dBm	16			dB
	54 Mbit/s, Pwanted = - 62 dBm	-1			dB
	72.2 Mbit/s, Pwanted = - 64 dBm	-2			dB

Table 5: ACR Receiver performance

4.7   Receiver sensitivity

Conditions: VBAT = 3.6 V, VDD_IO and VDD_SDIO = 2.8V. Tamb = 25°C. Sensitivity is measured using the chip antenna.

Band	Standard	Rate Mbps	Modulation/Coding Rate		Conditions	Module Port Specification			Units
						Min	Typ	Max	
2.4GHz	802.11b	1	DSSS		@ PER<8%, 1024 bytes Full Battery Voltage Range; Load Z : 50 Ohms;		-94	-88.5	dBm
		2	DSSS				-93	-86.5	dBm
		5.5	CCK				-90	-84.5	dBm
		11	CCK				-87.5	-82.5	dBm
	802.11g/n (20 MHz OFDM)	6	BPSK 1/2		@ PER<10%, 1024 bytes Full Operating Temperature; Full Battery Voltage Range; Load Z : 50 Ohms;		-91	-85.5	dBm
		9	BPSK 3/4				-90	-84.5	dBm
		12	QPSK 1/2				-88.5	-82.5	dBm
		18	QPSK 3/4				-86.5	-80.5	dBm
		24	16QAM 1/2				-83.5	-77.5	dBm
		36	16QAM 3/4				-80.5	-73.5	dBm
		48	64QAM 2/3				-76	-69.5	dBm
		54	64QAM 3/4				-74.5	-68.5	dBm
	802.11n (OFDM, 20 MHz, Nss = 1)	7.2	MCS0	BPSK 1/2	@ PER<10%, 4096 bytes Full Operating Temperature; Full Battery Voltage Range; Load Z : 50 Ohms;		-90	-84.5	dBm
		14.4	MCS1	QPSK 1/2			-86.5	-81.5	dBm
		21.7	MCS2	QPSK 3/4			-84.5	-79.5	dBm
		28.9	MCS3	16QAM 1/2			-81.5	-76.5	dBm
		43.3	MCS4	16QAM 3/4			-78.5	-72.5	dBm
		57.8	MCS5	64QAM 2/3			-74	-68.5	dBm
		65	MCS6	64QAM 3/4			-72	-67.5	dBm

Table 6: 2.4 GHz Sensitivity (minimum input level)

4.8   Transmitter Performance

Conditions: VBAT = 3.6 V, VDD_IO and VDD_SDIO = 2.8V. Tamb = 25°C.

Spectrum mask according to the IEEE 802.11 b/g/n specification, calibrated. Measured using the chip antenna and the ETSI regulatory domain in the software. The following values fulfill spectrum mask according to the CE specifications.

Band	Std	BW	MCS	Conditions	Output Power (2.4 GHz) Module Port Specification		EVM	
					Level	Units	Typ	Units
2.4 GHz	11b/g	20	DSSS/CCK	Requirements at T=25 degrees and VBAT >= 3.3V; Load Z: 50 Ohms; Meeting spectral mask and regulatory requirements	18	dBm	10	%
			BPSK 1/2		15	dBm	4	%
			BPSK 3/4		15	dBm	4	%
			QPSK 1/2		15	dBm	4	%
			QPSK 3/4		15	dBm	4	%
			16QAM 1/2		15	dBm	4	%
			16QAM 3/4		15	dBm	4	%
			64QAM 2/3		15	dBm	4	%
			64QAM 3/4		15	dBm	4	%
	11n	20	MCS 0-6		12	dBm	4	%

Table 7: Transmitter performance

4.8.1   Performance for FCC regions

Table 8 shows the output power per channel measured at the chip antenna using the FCC regulatory domain in the software. The following values fulfill spectrum mask according to the FCC / IC specifications.

Channel No.	Output Power 802.11b	Output Power 802.11g	Output Power 802.11n	Unit
1	14.3	8	8	dBm
2, 10	18	10	10	dBm
3, 9	18	13	12	dBm
4 - 8	18	15	12	dBm
11	16	8	8	dBm
12-13	Not Used			

Table 8: 802.11 b/g/n FCC Output Power

4.9   Output Power vs. Supply Voltage

Figure 1 shows the allowed output power variations dependent of the VBAT supply voltage. This is controlled by FW and MIB settings. Pout is the transmitted output power.
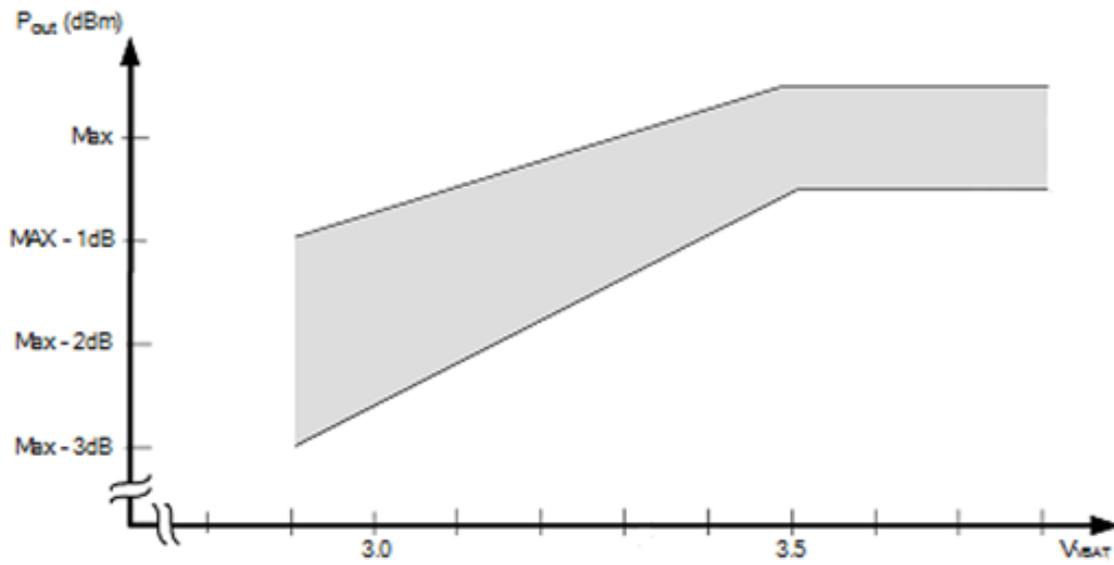
Figure 1: Output Power vs. Supply Voltage

4.10 Output Power vs. Temperature

Figure 2 shows the allowed variation of the output power versus temperature. The output power is managed internally in order to maximize the performance of the circuit without jeopardizing quality and function. The module will not be damaged if working in temperatures up to +85°C, however the RF performance may be degraded when working outside the range of -20 / +70°C.
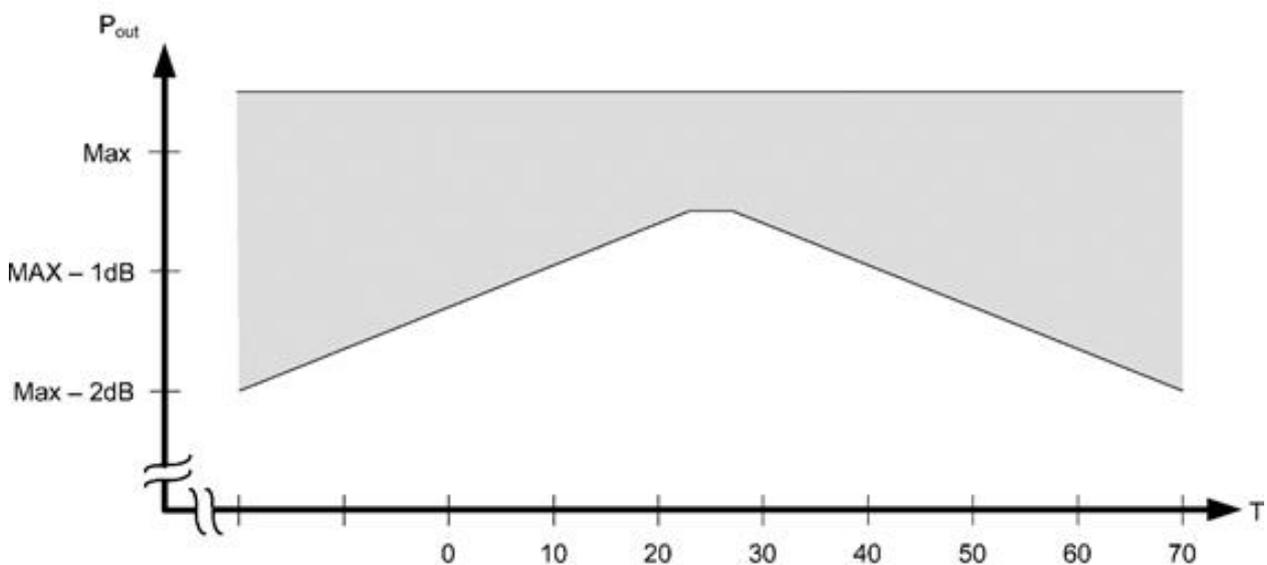

Figure 2: Output Power vs. Temperature

5　I/O Characteristics

5.1　SDIO timing characteristics

The SDIO/SPI-interface can run in three different modes;

1) SDIO 1-bit mode,
2) SDIO 4-bit mode, or
3) SDIO/SPI 1-bit mode.

Timing can be set for Default speed mode or High speed mode.

SDIO 1-bit Default speed mode is selected at Power On Reset. The host can change the mode by sending the corresponding command over the SDIO-interface.

The Default mode is shown in Figure 3 and Table 9. For high-speed mode, see Figure 4 and Table 10. Condition: VDDIO_SDIO= 1.7 – 3.45 V, Tamb= -20 – +70°C
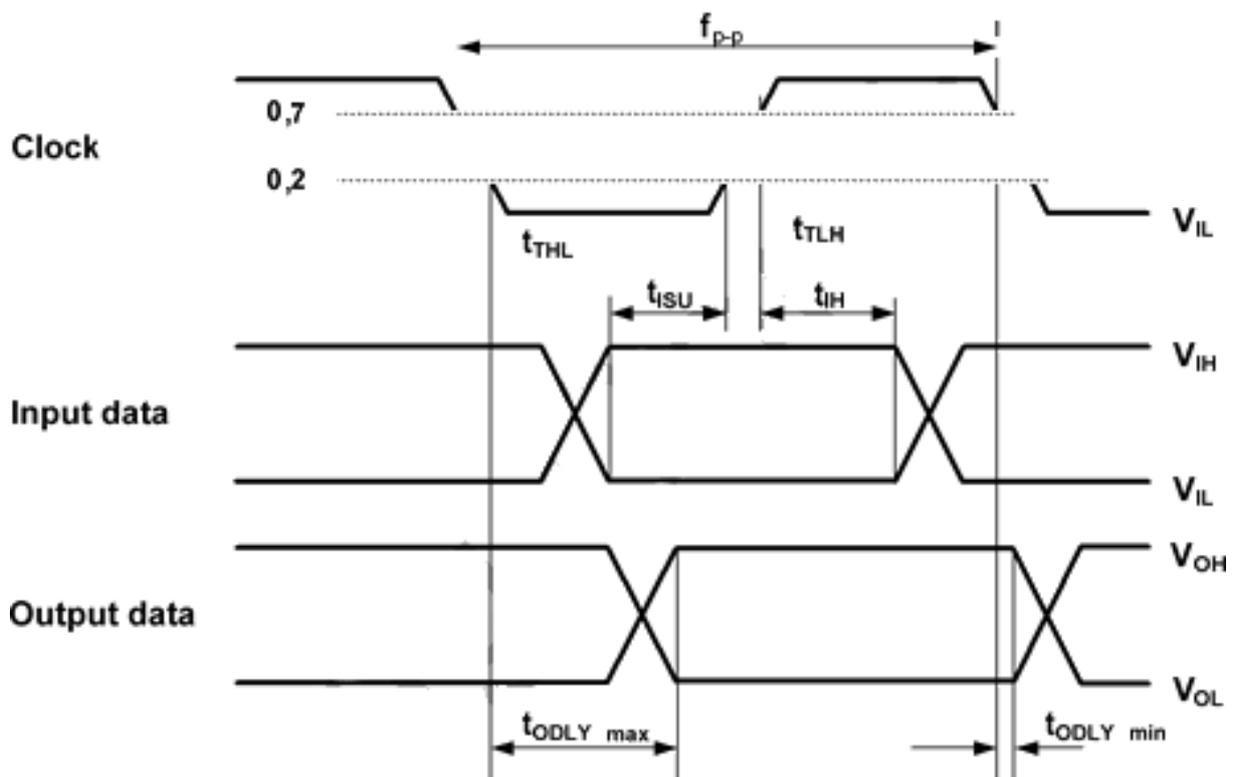

Figure 3: SDIO/SPI timing diagram (default mode SDIO 1-bit)

Parameter	Symbol	Min	Max	Unit	Comment
Input set-up time	t_{ISU}	5		ns	
Input hold time	t_{IH}	5		ns	
Clock fall time	t_{THL}		10	ns	
Clock rise time	t_{TLH}		10	ns	
Output delay time	t_{ODLY}	0	14	ns	
Clock Frequency	f_{SDIO_CL}		25	MHz	

Table 9: SDIO timing parameter values (default mode SDIO 1-bit)
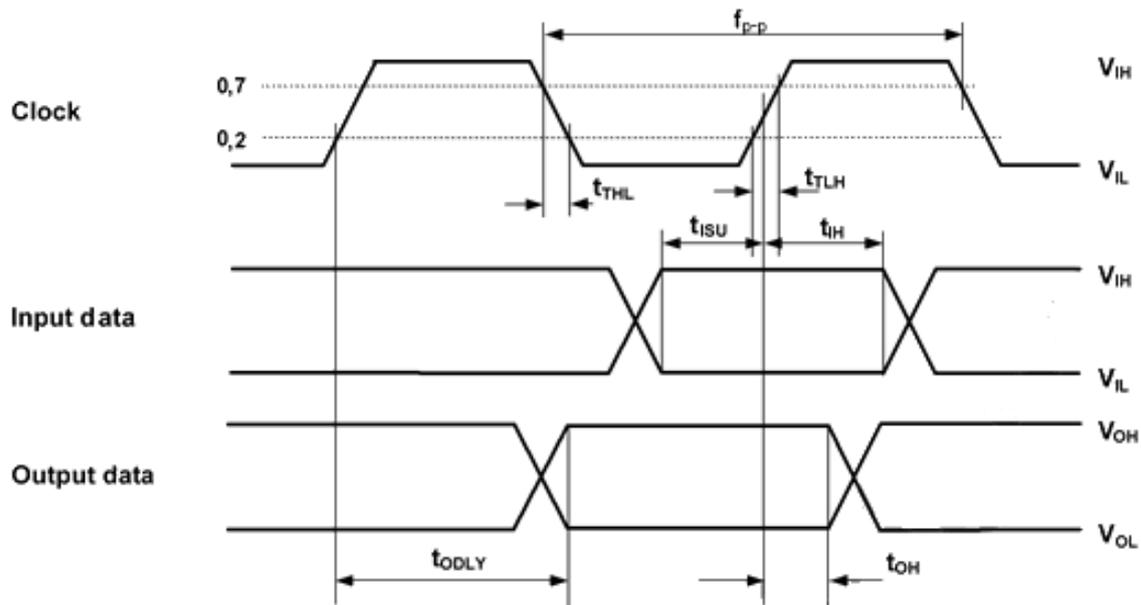
Figure 4: SDIO timing diagram (high speed mode)

Parameter	Symbol	Min	Max	Unit	Comment
Input set-up time	t_{ISU}	6		ns	
Input hold time	t_{IH}	2		ns	
Clock fall time	t_{THL}		3	ns	
Clock rise time	t_{TLH}		3	ns	
Output delay time	t_{ODLY}	2.5	14	ns	
Output hold time	t_{OH}	2.5		ns	
Clock Frequency	f_{SDIO_CL}		25	MHz	

Table 10: SDIO timing diagram (high speed mode)

5.2 SPI Timing Characteristics

The SPI interface is intended for application specific purposes, like communicating with an external memory, display or codec. There are two SPI interfaces available. One handles the flash memory and potentially other SPI slave devices, like a display, audio codec etc. as a master. The other SPI

interface allows a host to control the module as a slave device. The timing characteristics are shown in Figure 5 and Table 11.

The SPI Mode supported is Mode 0.

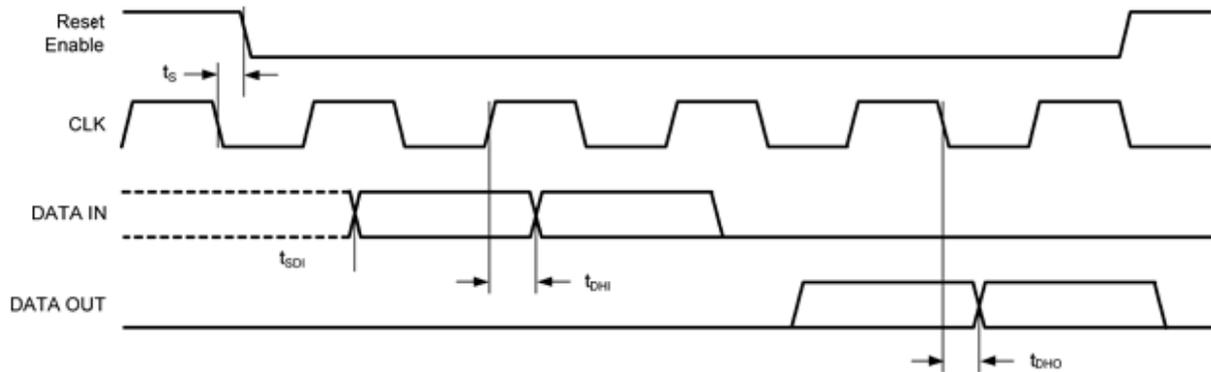**NOTE:** The IO-voltage of EC19W (VDD_IO and VDD_SDIO) must be the same as the host IO-voltage.

Figure 5: SPI timing diagram

Parameter	Symbol	Min	Max	Unit	Comment
SPI Clock Frequency	f_{SPI}		25	MHz	Master
SPI Clock Frequency	f_{SPI}		25	MHz	Slave
Enable delay time	t_S		15	ns	
Input setup time	t_{SDI}	11		ns	
Input hold time	t_{DHI}	0		ns	
Output delay time	t_{DHO}		15	ns	

Table 11: SPI timing parameter values

5.3   Digital I/O pad

The digital I/O pads are non-inverting three-state driver/receiver. The I/O pin functional schematic is shown in Figure 6. It includes an LVCMOS/LVTTL compatible input buffer and an output buffer with enable/disable control inputs. It also includes programmable Pull up, Pull down, and Hold functionality. When the I/O is neither driven by the internal nor by an external circuitry, the hold-function will hold the latest state of the I/O. The Pull up, Pull down or the Hold-function is selected by software. By default the outputs are all disabled, and the inputs are set at high impedance.

The hold-function resists a change of state on the pad. Therefore, an external driver that feeds the pad must overpower the hold function. The needed drive strength is low. The hold function resists a change of state on the pad only at the first part of the transition. In the last part, it assists the change of the state.
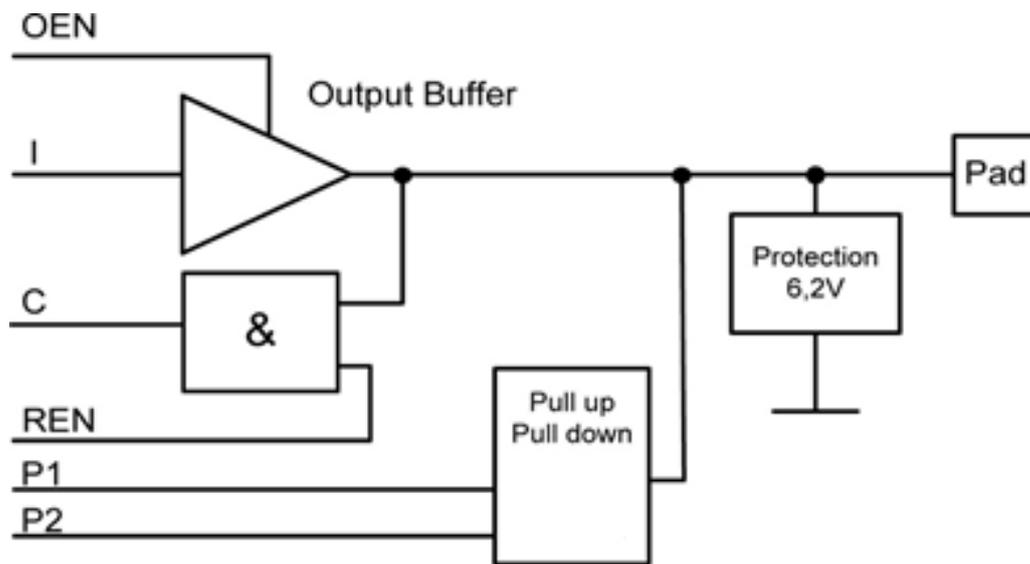
Figure 6: Functional schematic of the I/O pad

When in shutdown mode, the digital I/O pads enter high-Z state.

Parameter	Symbol	Min	Typ	Max	Unit	Comment
Input low voltage	V_{IL}	-0.3		$0.3* V_{IO}$	V	
Input high voltage	V_{IH}	$0.7* V_{IO}$		$V_{IO} +0.3$	V	
Input leakage current	I_{IL}		0.05	1	uA	IO in High Z state
Output sink current, $V_{OL} = 0.4$ Volt	I_{OL}	4	7		mA	V_{IO}=1.8 Volt,
		5	8		mA	V_{IO}=3.3 Volt
Output drive current, $V_{OH}= V_{IO}-0.4$ Volt	I_{OH}	4	6		mA	V_{IO}=1.8 Volt,
		5	7		mA	V_{IO}=3.3 Volt
Weak Pull Down current	I_{PD}	5	20	40	uA	V_{IO}=1.8 Volt
		45	75	100		V_{IO}=3.3 Volt
Weak Pull Up current	I_{PU}	5	30	40	uA	V_{IO}=1.8 Volt
		80	105	120		V_{IO}=3.3 Volt
Input Pin Capacitance	C_{IP}	0	5.5		pF	
Output sink current, Output Only pads, $V_{OL} = 0.4$ Volt	I_{OLOO}		1		mA	V_{IO}=1.8 Volt
			2		mA	V_{IO}=3.3 Volt
Output drive current, Output Only pads, $V_{OH}= V_{IO}-0.4$ Volt	I_{OHOO}		1		mA	V_{IO}=1.8 Volt
			2		mA	V_{IO}=3.3 Volt

Table 12: Digital I/O DC performance

5.4   Protection Digital Pins

All digital pins are protected against over-voltage with a "snap-back" circuit connected between the pad and GND. The "snap-back" voltage is 6.2 V and the holding voltage is 6 V. This provides protection against over voltages and ESD.

There is a diode included to protect against reversed voltages.

5.5 Shutdown

The WLAN_EN input uses an analog pad type A1 with a high impedance resistor in series with a diode to GND. Set the pin low or open to put EC19W in shutdown mode.

Pull the WLAN_EN pin high to initialize EC19W. If a pull up resistor is used, recommended value 1Mohm, connect it to VBAT with a 100 nF capacitor to GND.

Parameter	Symbol	Min	Typ	Max	Unit	Comment
Input low voltage	V_{IL}	-0.3		0.3* VIO	V	
Input high voltage	V_{IH}	1.65		VBAT +0.3	V	Include external series resistor of max 240 kohm
Input leakage current	I_{IL}	-1		2	uA	
Input resistance to GND	I_{IN}		2	4	Mohm	

Table 13: Shutdown pin DC Characteristics

Figure 7 shows how to connect the EC19W module when in stand-alone mode (when not connected to any host MCU). In this case the WLAN_EN must be connected through a 1Mohm pull-up to VBAT. The Reset button is used for manual reset of the module.

When a host MCU is used to enable/disable the EC19W module, then the circuit with the transistor should be used.

Alternatively a Resistor with value 1K- 220K Ohm can be used between the WLAN_EN and a host GPIO.

NOTE: Schematics are provided with the release as separate high resolution PDF files. Please check the "EC19W01-ConnectivityGuideline" document for more information.

Figure 7: WLAN_EN connection

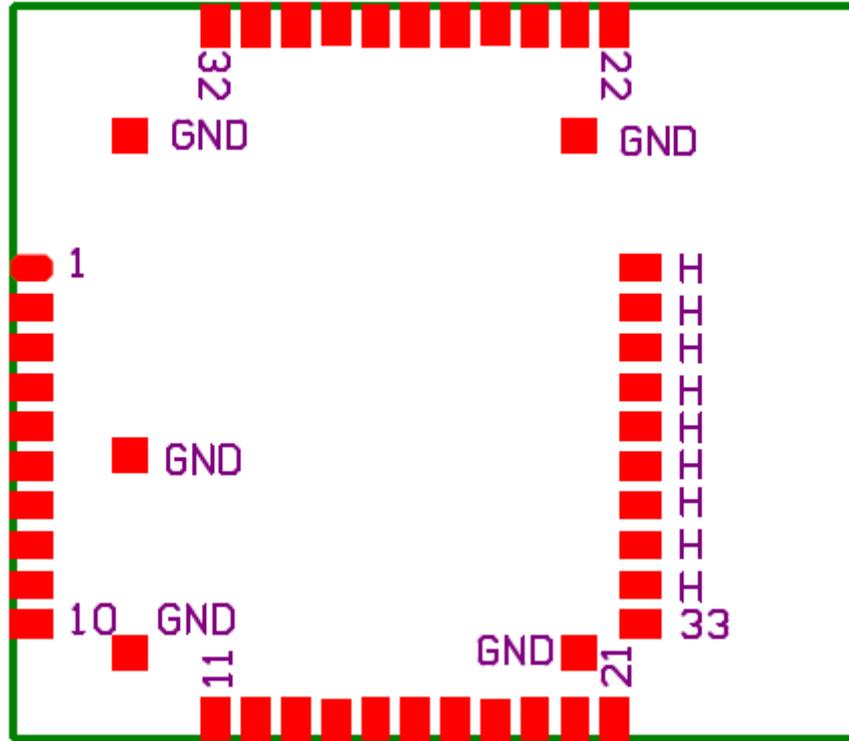# 6 PIN Configuration

6.1 Device Pin Out

Figure 8: EC19W package perimeter pin-out (top view)

6.2 Pin Assignments

Pad #	Assignment	Pad #	Assignment	Pad #	Assignment
1	GPIO0	16	SDIO_DAT1	31	ICE_TMS
2	GPIO1	17	VDD_SDIO	32	ICE_TDI
3	GPIO2	18	SDIO_DAT0	33	SPI_EN
4	GPIO3	19	SDIO_DAT3		
5	VDD_LDO	20	SDIO_DAT2		
6	GND	21	SDIO_CMD		
7	GPIO4	22	GPIO6		
8	GPIO5	23	EXT_LFC		
9	VBAT	24	SPI_CLK		
10	GND	25	WLAN_EN		
11	SDIO_CLK	26	SPI_DIN		
12	GND	27	SPI_DOUT		
13	VDD_DCDC	28	HFC_EN		
14	DCDC_OUT	29	ICE_TCK		
15	VDD_IO	30	ICE_TDO	H	GND

Table 14: Pin assignment list

6.3 Pin Functions and Configurations

Pin Name	Pin	Description	Pin Type	Pin state in Shutdown	Power Domain
Power					
VBAT	9	Main supply (battery) for DC/DC converter	S	ON	VBAT
VDD_IO	15	I/O supply voltage for GPIO1-GPIO6.	S	ON	VDD_IO
VDD_SDIO	17	I/O supply voltage for SDIO, ICE and SPI-buses	S	ON	VDD_SDIO
DCDC_OUT	14	DC/DC converter pulsing output.	S	OFF	VBAT
VDD_DCDC	13	DC/DC Voltage Sense. Connect to filtered side of inductor or to external VDD if DCDC is not used.	S	OFF	VDD_DCDC
VDD_LDO	5	1.8 – 3.6 Volt LDO Output. For use as I/O- voltage. Could drive up to 30mA. Could be connected to VDD_IO and VDD_SDIO for lowest power consumption	S	OFF	VBAT
Ground					
	6		GND	GND	
	10		GND	GND	
	12		GND	GND	
	H		GND	GND	

Pin Name	Pin	Description	Pin Type	Pin state in Shutdown	Power Domain
SDIO/Host Interface					
SDIO_CLK	11	SDIO Clock, SDIO/SPI CLK	I/O	High-Z	VDD_SDIO
SDIO_DAT0	18	SDIO Data 0, SDIO/SPI MISO, UART RxD	I/O	High-Z	VDD_SDIO
SDIO_DAT1	16	SDIO Data 1, SDIO/SPI IRQ, UART CTS	I/O	High-Z	VDD_SDIO
SDIO_DAT2	20	SDIO Data 2, SDIO/SPI N/A, UART RTS	I/O	High-Z	VDD_SDIO
SDIO_DAT3	19	SDIO Data 3, SDIO/SPI CS, UART TxD	I/O	High-Z	VDD_SDIO
SDIO_CMD	21	SDIO Command, SDIO/SPI MOSI	I/O	High-Z	VDD_SDIO
SPI Interface					
SPI_EN	33	SPI Enable output. Active low	I/O	High-Z	VDD_SDIO
SPI_DIN	26	SPI Data input pad	I/O	High-Z	VDD_SDIO
SPI_DOUT	27	SPI Data output pad	I/O	High-Z	VDD_SDIO
SPI_CLK	24	SPI Clock output	I/O	High-Z	VDD_SDIO
General Interfaces					
EXT_LFC	23	External Real Time Clock, 32kHz input	I/O	High-Z	VDD_SDIO
HFC_EN	28	External clock request	I/O	High-Z	VDD_SDIO
GPIO0	1	Host Wakeup or General purpose I/O	I/O	High-Z	VDD_SDIO
WLAN_EN	25	Shutdown input, Active low	A	LOW	VBAT
Debug/Test Interface					
ICE_TDO	30	ICE Test Data Output	I/O	High-Z	VDD_SDIO
ICE_TDI	32	ICE Test Data Input	I/O	High-Z	VDD_SDIO
ICE_TCK	29	ICE Test CLK	I/O	High-Z	VDD_SDIO
ICE_TMS	31	ICE Test Mode Select	I/O	High-Z	VDD_SDIO
General Purpose I/O					
GPIO1	2	General purpose I/O 1 Class D Head Phone Driver Left P AUD_CLK Audio I2S and PCM clock	I/O	High-Z	VDD_IO
GPIO2	3	General purpose I/O 2 Class D Head Phone Driver Left N AUD_LR/SYNC Audio I2S LR or PCM Sync	I/O	High-Z	VDD_IO
GPIO3	4	General purpose I/O 3 Class D Head Phone Driver Right P AUD_DOUT Audio Data Out	I/O	High-Z	VDD_IO
GPIO4	7	General purpose I/O 4 Class D Head Phone Driver Right N AUD_DIN Audio Data In	I/O	High-Z	VDD_IO
GPIO5	8	General purpose I/O 5 Digital Microphone Clock Output	I/O	High-Z	VDD_IO
GPIO6	22	General purpose I/O 6 Digital Microphone PDM Data Input	I/O	High-Z	VDD_IO

Table 15: Pin functions and configurations for EC19W

Legend - Pad Types:

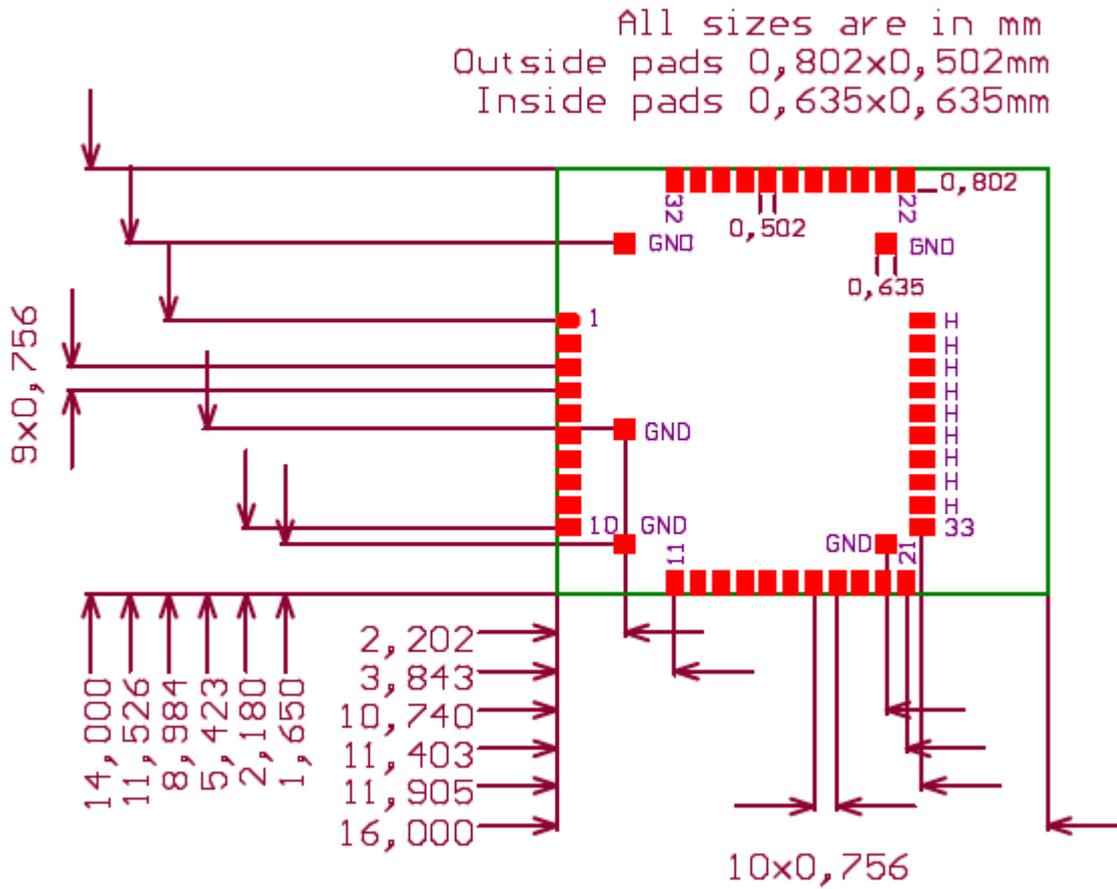|	
A	Analog
GND	Ground
I	Input
O	Output
RF	Radio Frequency driver, receiver
S	Supply Voltage

7 Mechanical Dimensions, Footprint (mm)

Figure 9: EC19W Mechanical dimensions, footprint (top view)

8   Antenna Keep Out Area

Keep the motherboard underneath the antenna area, marked by the green box at the right, clear of signals, especially high frequency ones. Mount the module at the edge of the motherboard, with the antenna area sticking out of the motherboard. If the antenna is on the motherboard then follow the recommended keep out area on the PCB where the chip antenna resides. Figure 10 shows the keep-out area used in the EC19W01SD and meets all the requirements for FCC/IC/CE Certifications.
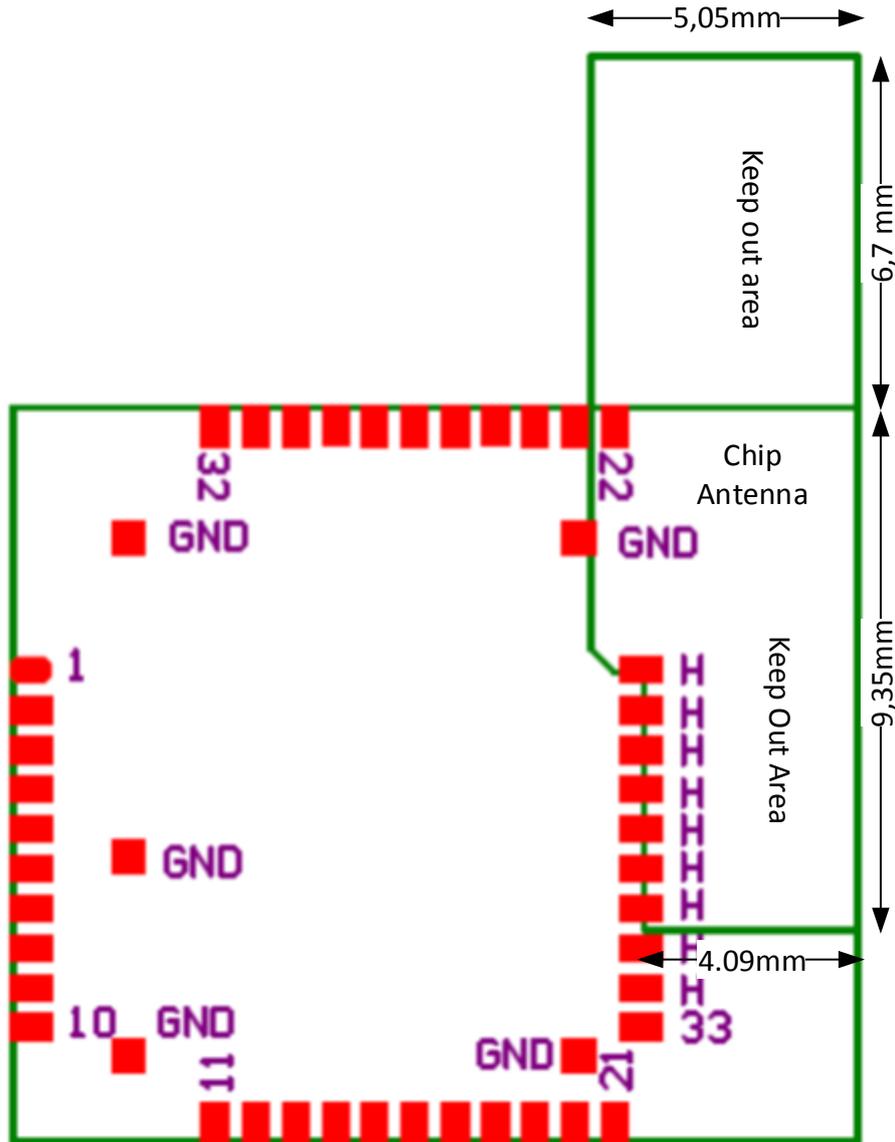

Figure 10: Antenna Keep Out area

9   Layout Considerations

9.1   DC-DC Converter

The DC/DC external inductor L1 (3.3 uH) is always required as it is used by an on module step down (buck) DC/DC regulator to generate a 1.5 Volt intermediate digital supply voltage for the entire EC19W. This voltage internally supplies a number of on chip LDOs for various digital domains of EC19W.

The DC/DC uses PWM modulation for high load currents with an efficiency of better than 88% over the load range for the Transmit and Receive modes.

For light load conditions such as idle mode, the DC/DC operates in PFM modulation with a lowered output voltage, ensuring the lowest current consumption while still maintaining the RAM content.

The DC/DC uses a soft-start sequence to prevent current spikes on the battery during power-up.

In order to minimize the risk for crosstalk to other parts of the chip, it is extremely important that the PCB guidelines are followed. For the inductor connected to the VDD_DCDC and DCDC_OUT (pins 13 & 14 respectively) please follow the reference design below which gives more detailed PCB guidelines:
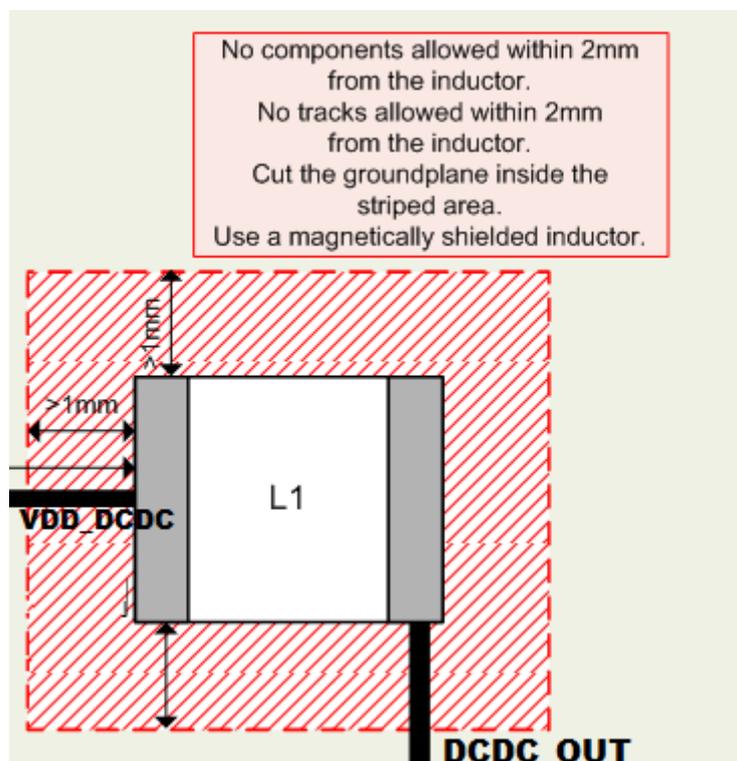

Figure 11: EC19W external DCDC inductor layout considerations

10 Reference Design

The EC19W requires minimum external BOM components for the motherboard to create a completely functional design. The additional required BOM component is just an inductor for internal DC-DC functionality.

10.1 Design directions

The design must be implemented according to good RF design considerations. All the leads shall be as short as possible. Pay special attention to the RF leads towards the antenna. On the initial designs always include a 0 ohm resistor in the VBAT supply line, to be removed for supply current measurements

Inductor characteristics: 3.3uH 20% LQM2HP (Murata LQM2HPN3R3MG0)

Connect VDD_LDO to VDD_IO and VDD_SDIO for maximum power save
If not connected to VDD_LDO then VDD_IO and VDD_SDIO can be connected to VBAT

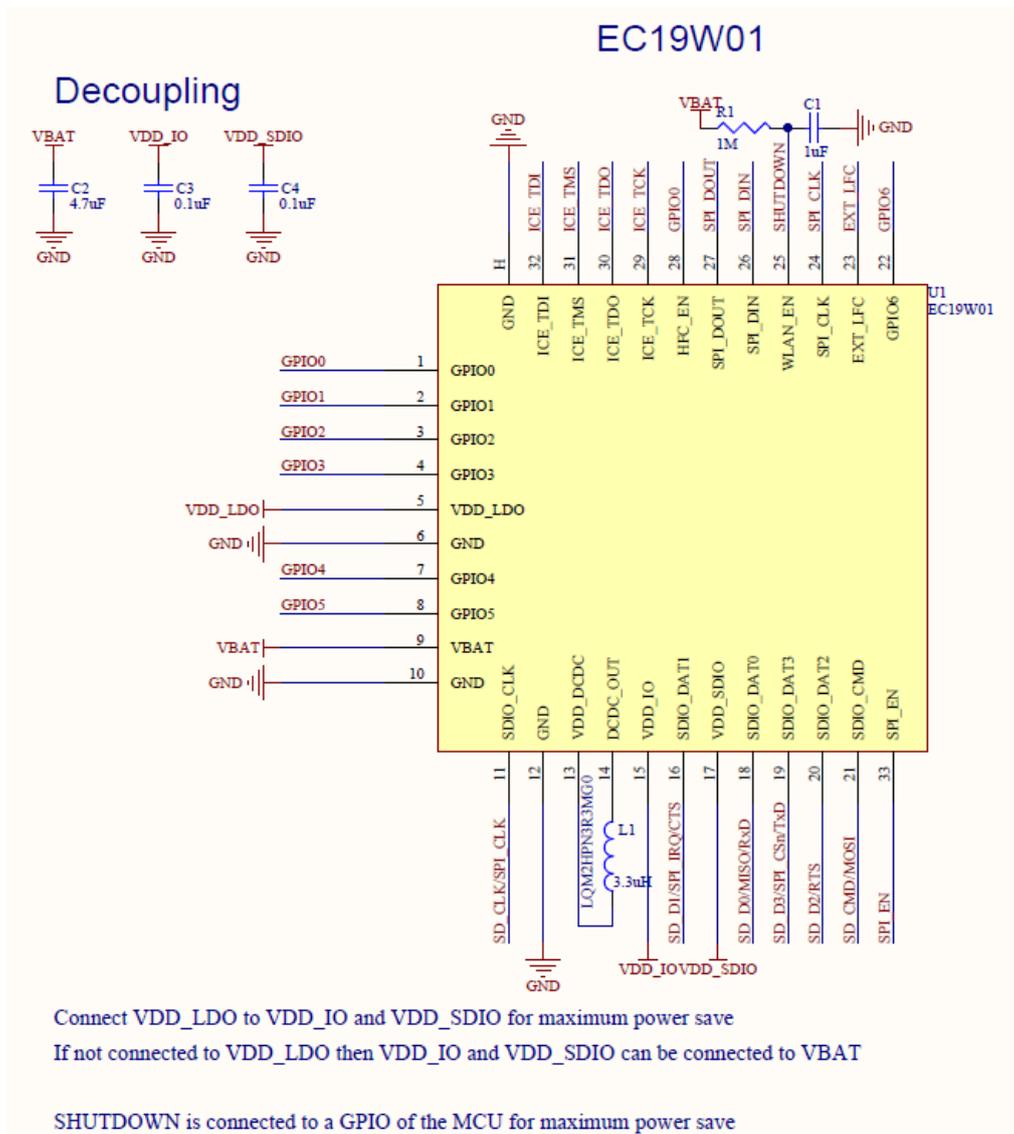SHUTDOWN is connected to a GPIO of the MCU for maximum power save

Figure 12: EC19W Reference design

Please refer to Figure 7 to see how to connect the WLAN_EN pin of the EC19W in host-less or in host-driven configurations.

EC19W uses 32 Mbit (4 MByte) Serial Flash and Over-the-Air (OTA) upgrade is supported (Winbond W25Q32FV).

10.2 Power Supply

1) Supply VBAT
2) Supply VDD_IO and VDD_SDIO either through a) VDD_LDO or b) from external LDO. By connecting the VDD_IO and VDD_SDIO to VDD_LDO, minimum current consumption is achieved at shutdown.

11 Device Operation Description

11.1 WLAN Radio

The EC19W contains a WLAN Radio. It is a fully integrated RF transceiver with a Zero-IF architecture, operating in the 2.4-2.5 GHz ISM band. The design uses differential RF input / output to optimize the RF performance. A Transmit/Receive switch is integrated on-module preventing signal leakage into the receiver path during RF transmit time.

11.1.1 WLAN RF Receiver

The receive section of the module is designed to work well in a noisy radio environment such as near or around cellular phone wireless signals. The RF signal is received and amplified by the on-module WLAN LNA.

11.1.2 RF Transmitter

The EC19W WLAN Radio provides an on module highly efficient RF Power amplifier to minimize overall solution cost. Output Power can be trimmed to meet IEEE standard requirements. Trim values can be stored in an on-module fuse memory which will be available throughout the application life time.

11.2 WLAN Baseband and MAC

11.2.1 Operational Modes

11.2.1.1 Shutdown

The EC19W can be placed into two different shutdown modes 1) HW SHUTDOWN and 2) Soft SHUTDOWN.

11.2.1.1.1 HW Shutdown

WLAN_EN is set high during normal operation. Pulling the WLAN_EN pin low sets the EC19W in HW Shutdown mode. This turns OFF most parts of the circuit and minimizes current consumption. All I/O interface pins are set to High-Z when in Shutdown mode. In shutdown, keep VBAT supply ON. The EC19W will automatically turn OFF all generated power supplies, including VDD_DCDC and VDD_LDO.

To end HW Shutdown mode, set the WLAN_EN pin high and reload the EC19W application.

11.2.1.1.2 Soft Shutdown

Soft Shutdown is an API function that stops all functions and sets the EC19W in a deep sleep state. All I/O-pins are set to predefined states. During Soft Shutdown, keep all power supplies ON and set

WLAN_EN pin high.

To end Soft Shutdown mode, toggle the WLAN_EN pin low-high and reload the EC19W application.

11.2.1.2 Power Save

Power save is an energy saving mode where EC19W is only listening at regular intervals for the beacons transmitted from an access point and is set in sleep mode in between. During sleep mode, code patches are kept in RAM with all optional functions turned off. Since the receive time is very short compared to the listening interval, the average current consumption is reduced significantly.

The timing of the listening interval is based on the LFC (32 kHz) clock. The LFC is implemented internally.

11.2.1.3 Power ON Sequence internal DCDC

Figure 13 shows a typical Power ON sequence used for the EC19W module. VDD, 1.5 V is supplied from the internal DCDC converter and the 40MHz on-module crystal. The program code is loaded from an external flash memory connected to the SPI interface. See the timing diagram Figure 13 and Table 16.

VBAT should not be applied with a faster rise time than according to table below.

VDDIO should be turned ON after VBAT. If the rise time of VDDIO is the same or slower than VBAT rise time, VDDIO should be turned on at the same time as VBAT.

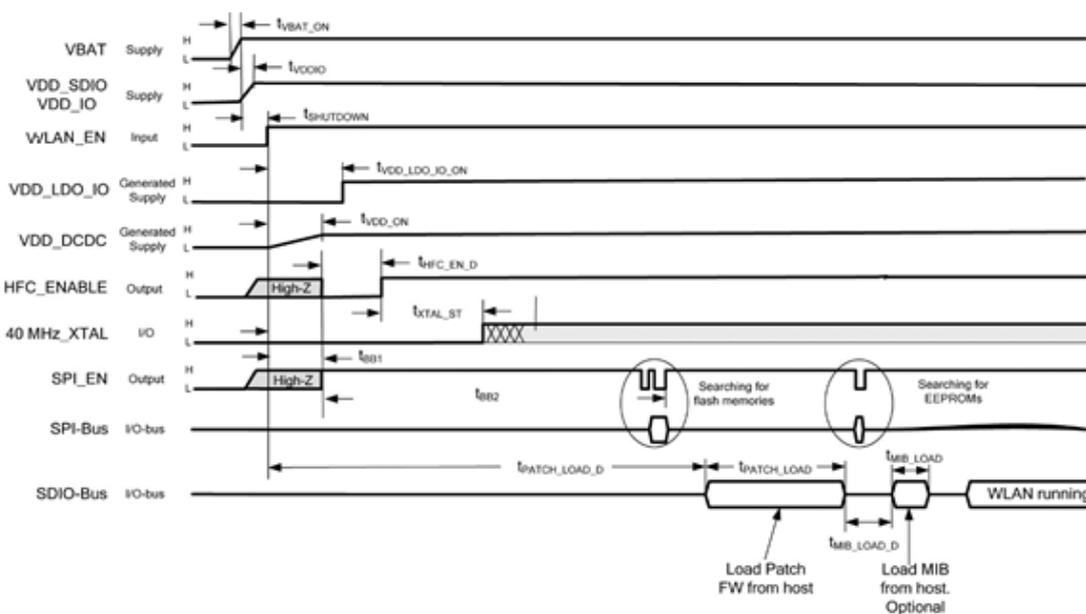The Boot time of the EC19W to load all the code is 1 sec.

Figure 13: Timing diagram Power ON sequence

Parameter	Symbol	Min	Typ	Max	Unit	Comment
VBAT rise time	t_{VBAT_ON}	2			µs	
VDDIO turn on time	t_{VDDIO}	0			µs	
Ctrl shutdown time	$t_{SHUTDOWN}$	1			ms	
Digital supply ramp time	t_{VDD_ON}		150		µs	
IO Supply ramp time	$t_{VDD\_LDO\_IO\_ON}$		360		µs	
40MHz OSC start-up time	t_{XTAL_ST}		1.5	1.8	ms	
BB1 startup time	t_{BB1}		0.1		ms	
BB2 startup time	t_{BB2}		2.6		ms	
HFC_ENABLE delay time	$t_{HFC\_EN\_D}$		0,17		ms	
Patch load delay	$t_{PATCH\_LOAD\_D}$	10			ms	
Patch loading time	t_{PATCH_LOAD}					Patch size dependent
MIB load delay	$t_{MIB\_LOAD\_D}$	10			ms	Patch dependent
MIB load time	t_{MIB_LOAD}					MIB size dependent

Table 16: Timing parameters Power ON sequence

11.2.2 Shutdown Sequence

The following figure shows a typical shutdown sequence for the EC19W module, when VDD_DCDC 1.5 V, is supplied from the internal DCDC converter and the 40MHz on-module crystal.

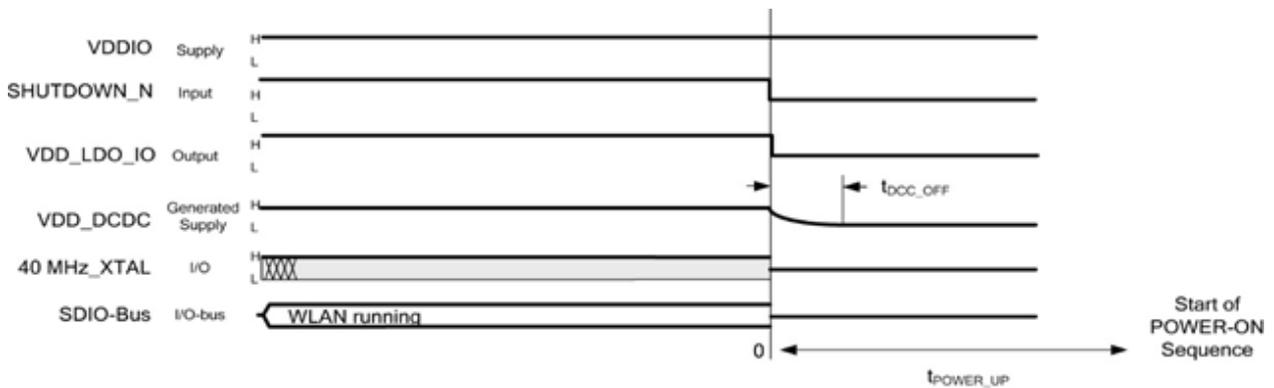To end Shutdown mode, use the Power ON Sequence described above.

Figure 14: Shutdown Sequence

Parameter	Symbol	Min	Typ	Max	Unit	Comment
DCDC turn off time	t_{DCDC_OFF}	0	2		ms	
Power-up after Shutdown time	t_{POWER_UP}	1			ms	

Table 17: Timing parameters Shutdown Sequence

11.2.3 Power OFF Sequence

All power supplies can be turned OFF at the same time or in sequence as shown in Figure 15.

1) Enter Shutdown. This will automatically turn OFF the internal DCDC converter
2) Turn OFF VDD_SDIO and VDD_IO
3) Turn OFF all VBAT

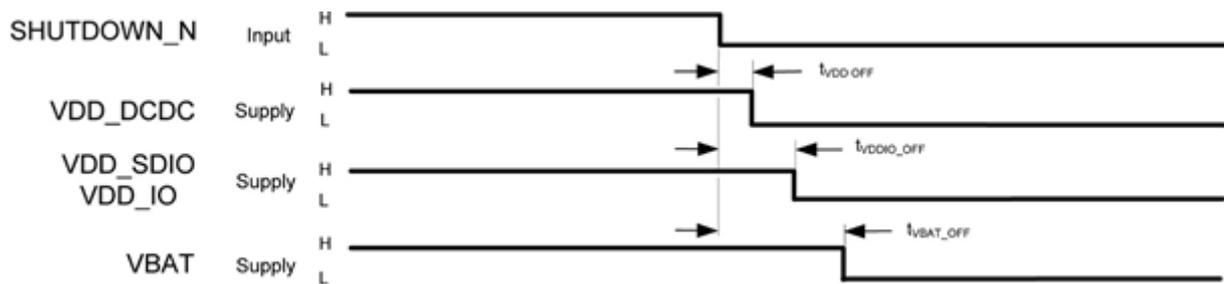**Figure 15: Power off Sequence**

Parameter	Symbol	Min	Typ	Max	Unit	Comment
VDD 1.5V supply off time	t_{VDD_OFF}	0			ms	
VDDIO supply off time	t_{VDDIO_OFF}	t_{VDD_OFF}		t_{VBAT_OFF}	ms	
VBAT supply off time	t_{VBAT_OFF}	t_{VDDIO_OFF}			ms	

Table 18: Timing parameters Power OFF sequence

11.2.4 Interfaces

The EC19W is equipped with a number of interfaces that can be configured in various ways.

11.2.4.1 External Interface (SDIO, SDIO/SPI, UART)

These I/O pins can be set in two different modes SDIO/SPI or UART.

For SDIO mode, the default after Power ON Reset is 1-bit mode with default speed. An application can select SDIO 4-bit mode or SDIO-SPI at initialization time.

For UART mode, the default speed is 115200bps, 8 bits, no parity, 1 stop bit. The Maximum speed for the UART is 2 Mbps.

External interface mode selection is done by the application after Power ON Reset and/or after WLAN_EN goes high.

Let host send a valid SDIO/SPI 1-bit command, this will set the interface to the desired SDIO/SPI-mode.

In UART mode SDIO_CLK and SDIO_CMD should be connected to GND.

All unused interface pins should be connected to GND.

11.2.4.2 SPI Interface

The SPI master interface is used for controlling the flash memory where the code is stored and other SPI slave devices.

SPI_EN is used as an enable signal to a serial flash memory for downloading application/patch code and/or MIB data to the baseband in an embedded application.

SPI_EN is active low, it should be left open if not used.

At this interface the flash memory holding the code is attached. The size of the flash memory is 4MByte.

EEPROMs with I2C interface are supported by using SPI_CLK as SCL and SPI_EN as SDA-signal. EEPROMs are typically used for MIB-data in hosted applications.

Table 19 provides supported EEPROM memories, additional types can be supported by code patches.

Vendor	EEPROM	Interface	Size
Seiko Instruments	S-24CS16A	I2C	16kbit
Seiko Instruments	S-25C080A	SPI	8kbit
Seiko Instruments	S-25C160A	SPI	16kbit
AKM	AK6506C	SPI	8kbit
STMicroelectronics	M24C08-F	I2C	8kbit
STMicroelectronics	M95160	SPI	16kbit

Table 19: Supported EEPROMs

11.2.4.3 Host Wakeup

The Wake Up command via the SDIO interface is the normal wake up.

If a dedicated pin is needed to wake up the host, use GPIO0. It belongs to the VDD_SDIO domain.

11.2.4.4 General Purpose I/O (GPIO)

There are six pins designated as a General Purpose I/O pins GPIO1 to GPIO6.

They belong to the VDD_IO domain and can be assigned to various functions by the application.

These GPIOs can be used as Head Phone drivers (Class D) and digital microphone interface signals. The GPIOs can also be used to emulate I2C interface. GPIOs should be left open if not used.

11.2.4.5 HFC_EN Pin

HFC_EN is used from the EC19W01DK (Development Kit of EC19W) to indicate that the chip is enabled. The HFC_EN goes high during power on sequence. Please see section 11.2.1.3 for more details.

11.2.4.6 Test Interface

An In Circuit Emulator test bus (ICE_TMS, ICE_TDI, ICE_TDO and ICE_TCK) is available. It is a standard JTAG IEEE 1149 test access port.

TDI, TDO have on chip drivers with parasitic diodes to VDD_SDIO. Do not drive these pins above the voltage of VDD_SDIO.

11.2.5 Memory

11.2.5.1 System RAM

There are four 64kB SRAM banks used to store data and for other internal uses.

11.3 I2S/PCM

This is a 16-bit the I2S/PCM interface, mapped on pins GPIO1-4, for connections to an external codec. Standard sampling rates up to 48 ksps are supported, custom sampling rates can be provided by FW. Both Master and Slave modes are supported.

11.4 Power Management

The EC19W is a true single chip Wi-Fi module solution with fully integrated power management. The module is intended to be supplied directly from a Lithium Ion-type battery. It is also possible to supply the module via external power management supporting a custom I/O supply set-up.

11.4.1 IO Supply

There are two main IO domains:

VDD_IO	IO supply voltage for pins GPIO1-6
VDD_SDIO	IO supply voltage for all other pins

Note that IO-supplies must never be higher than VBAT. Damage to the module will occur if any IO-supply exceeds VBAT with more than an internal diode drop.

11.4.2 VDD_LDO Linear Regulator

The on module LDO, VDD_LDO can be used as IO-supply if no IO-supply is available from the host. VDD_LDO voltage is set to 2.7 Volt at power ON Reset. Voltages in the range 1.8V to 3.3V can be

set by the application. This LDO can typically source up to 30 mA.

The Dropout Voltage of the VDD_LDO is 100mV at 10 mA current and 300mV at 30 mA current.

11.4.3 Ground

The module has one common ground connection for all the various power domains. There are several digital ground bumps, labeled GND, they should be treated as equal and all should be connected together on the PCB. Similar to the digital grounds, the I/O ground bumps, should all be connected to GND on the PCB.

The main ESD ground in the module is the digital ground GND.

11.5   Clock Management

11.5.1 External Reference Requirements

The high frequency clock on the EC19W module is used as a general clock reference in the chip. It supports both the RF PLL and the Digital PLL with a reference frequency. The RF PLL generates the Radio VCO frequency and the digital PLL generates frequencies to the Digital Baseband, MAC and I/Q ADC and DAC. An on-module 40 MHz crystal is used to generate the clock signal.

The Parameters of the on-module crystal are shown in Table 20

Parameter	Condition	Min	Typ	Max	Unit
Frequency			40		MHz
CL			8		pF
Cm		3.5		6.0	fF
C0 (shunt cap)		0.5		2.0	pF
Equiv Rs		0		60	Ohm
Frequency tolerance	Connected to AP, T_{amb} = 25°C	-15		15	ppm
	Soft AP or Wi-Fi Direct, T_{amb} = 25°C	-10		10	ppm
Freq vs temp	Connected to AP, Tamb = 25°C	-15		15	ppm
	Soft AP or Wi-Fi Direct, T_{amb} = 25°C	-10		10	ppm

Table 20: On-module Crystal parameters

11.5.2 Low Frequency Clock I/O, EXT_LFC

The EC19W has an internal 32 kHz Low Frequency Clock oscillator, LFC, which is used at chip start-up and during the Power Save scheme. EC19W can also utilize an external 32 kHz clock, connected to the EXT_LFC pin. The chip will always initiate from Power ON Reset with the internal LFC, and then use external LFC if so configured via a setting in the MIB file. For timing calculations the LFC frequency is calibrated against the more accurate HFC frequency by FW.

The EXT_LFC pin uses the standard type of GPIO-cell; signal swing should comply with the

VDD_SDIO supply.

The EXT_LFC pin can be set as an output by FW for external use of the 32 kHz clock or as a Chip Select for an SPI device.

The external reference shall comply with the requirements outlined in Table 21.

Parameter	Symbol	Min	Typ	Max	Unit
LFC Frequency	f_{LFC}	30	32	34	MHz
Clock accuracy		2000	8	20000	ppm
Duty Cycle		30	50	70	%

Table 21: External LFC requirements

11.6 Core Software

The core software is executed in on-module ROM. Patches are loaded into RAM from a serial Flash Memory connected to the SPI interface. The core software implements the full IEEE 802.11 b/g/n wireless LAN MAC protocol, an embedded IP stack, and a few commonly used applications, that can be easily configured and controlled via the module interface.

The wireless LAN MAC stack supports Basic Service Set (BSS), Mobile AP and Wi-Fi Direct. Low-level protocol functions such as RTS/CTS, acknowledgement, fragmentation, defragmentation, frame encapsulation (802.11h/RFC1042) and automatic beacon monitoring/scanning are handled by the EC19W baseband MAC without host intervention. Passive or active scanning is performed autonomously once initiated by a host command.

The IP stack supports TCP, UDP, RTP, and ICMP over IPv4. On top of the IP stack there is a web server with support for Server-Side Includes (SSI) and Common Gateway Interface (CGI). The web pages can be customized via the serial interface.

Power management is handled with minimum host interaction to minimize active duty periods.

11.7 Features

- 802.11 b/g/n/d/e/i/support
- Infrastructure mode support
- Supports Wi-Fi Direct, Group Owner (GO) and Client
- Supports Legacy AP mode (Soft AP without routing capabilities) supporting WPS2/WPA2 and 802.11 legacy power save for the clients
- IPv4 stack with TCP, UDP and ICMP support
- Web server with Server-Side Includes (SSI) and Common Gateway Interface (CGI)
- Zero config support through support of the mDNS protocol
- Hardware accelerators (software managed hardware) for CCM (CBC-MAC, Counter Mode), TKIP (MIC, RC4), WAPI (SMS4) and WEP (RC4) along with CRC
- Supports WPA/WPA2, PSK and Enterprise
- Supports WPS 2.0
- Supports SSL
- Supports 802.11n up to MCS6 (Tx/Rx). Supporting block ACK, MIMO 1x1, STBC, A-MPDU aggregation and 0.4us guard interval
- WMM Power Save U-APSD
- Multiple queue management to fully utilize traffic prioritization defined by the 802.11e standard
- 802.1h/RFC1042 Frame encapsulation
- Scattered DMA for optimal CPU off load on Zero Copy data transfers operations
- Clock/Power gating combined with 802.11-compliant power management dynamically adapted to the current connection condition providing minimal power consumption
- Adaptive rate fallback algorithm that sets the optimum transmission rate and TX power based on actual signal-to-noise ratio and packet-loss information.
- Over-the-air downlink back-pressure to avoid packet discarding on slow host environment
- Seamless roaming support

12 Reflow profile

Refer to IPC/JEDEC standard (IPC/JEDEC J-STD-020C, July 2004).

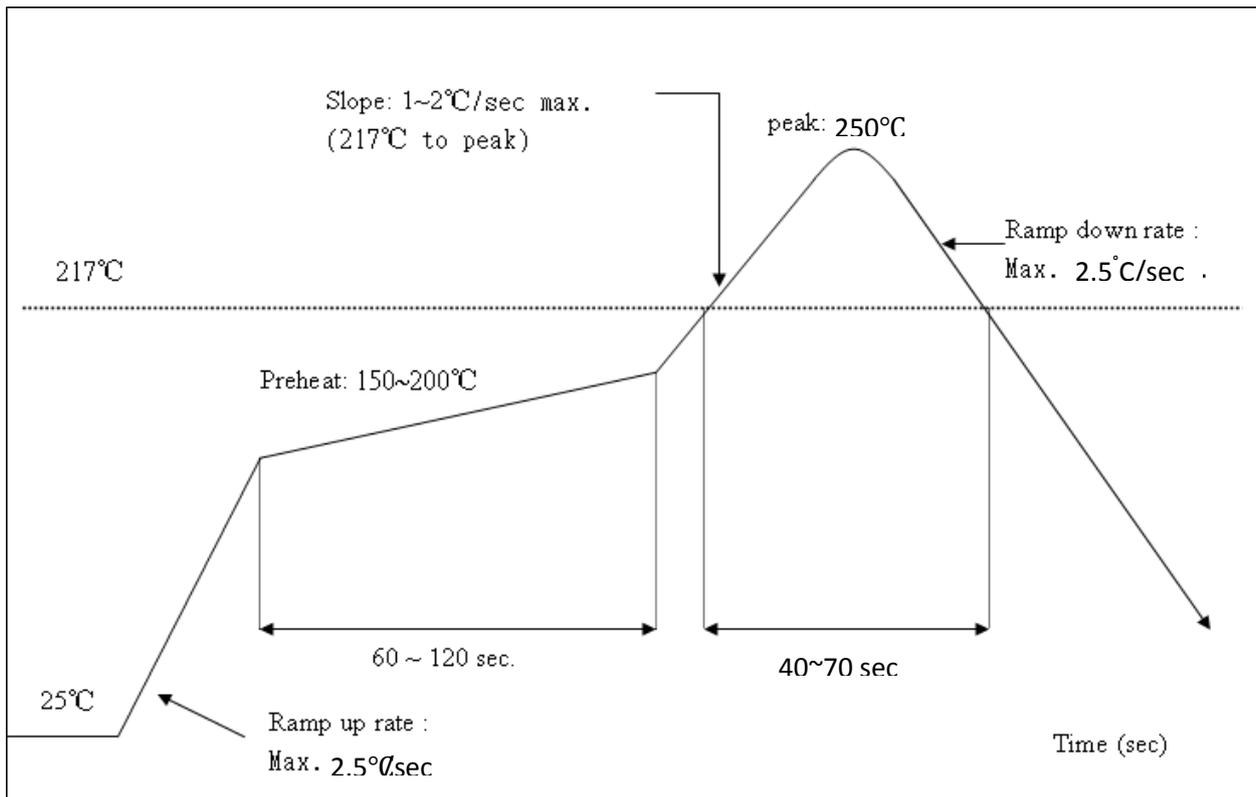Peak Temperature : <250°C

Number of times : ≤2 times

Slope: 1~2°C/sec max.
(217°C to peak)

peak: 250°C

Ramp down rate :
Max. 2.5°C/sec .

217°C

Preheat: 150~200°C

60 ~ 120 sec.

40~70 sec

25°C

Ramp up rate :
Max. 2.5°C/sec

Time (sec)

Figure 16: Reflow Time and Temperature Profile

The recommended thickness of stencil is 0.12 – 0.15mm.

13 Moisture Sensitivity Level (MSL)

The MSL is an electronic standard for the time period in which a moisture sensitive device can be exposed to ambient room conditions (approximately 30 °C/60%RH). The expansion of trapped moisture can result in internal separation (delamination) of the plastic from the die or lead-frame, wire bond damage, die damage, and internal cracks. Most of this damage is not visible on the component surface. In extreme cases, cracks will extend to the component surface.

The moisture sensitivity level (MSL) of the module is "4" -- MSL4.

Components must be mounted and reflowed within the allowable period of time (floor life out of the bag) which in the case of MSL 4 is 72 hours.
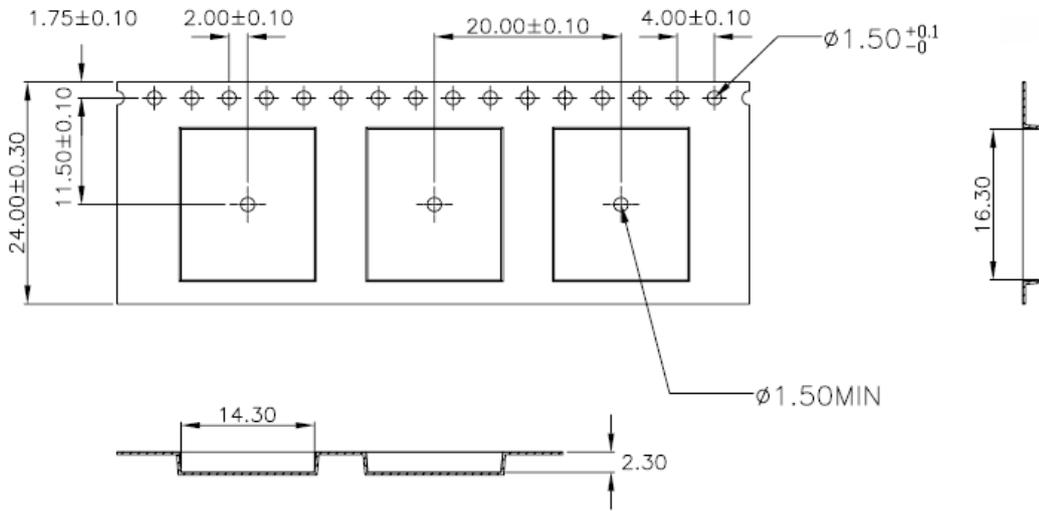
14 Environmental statement

The EC19W module is designed and manufactured to comply with the RoHS and Green directives.

15 Ordering Information

Ordering Code	Package Type
EC19W01	In sample quantities
EC19W01-R2	Reel of 200 pieces
EC19W01-RL	Reel of 1000 pieces

16 Pick and Place and Packing information

The modules are sent in tape & reel format.

1. 10 sprocket hole pitch cumulative tolerance ±0.20.
2. Carrier camber is within 1 mm in 250 mm.
3. Material : Black Conductive Polystyrene Alloy.
4. All dimensions meet EIA-481-D requirements.
5. Thickness : 0.30±0.05mm.
6. Packing length per 19" reel : 62.5 Meters.(1:3)(覆捲206.5M 1:10)(紙管寬度105mm)
7. Component load per 13" reel : 1000 pcs.

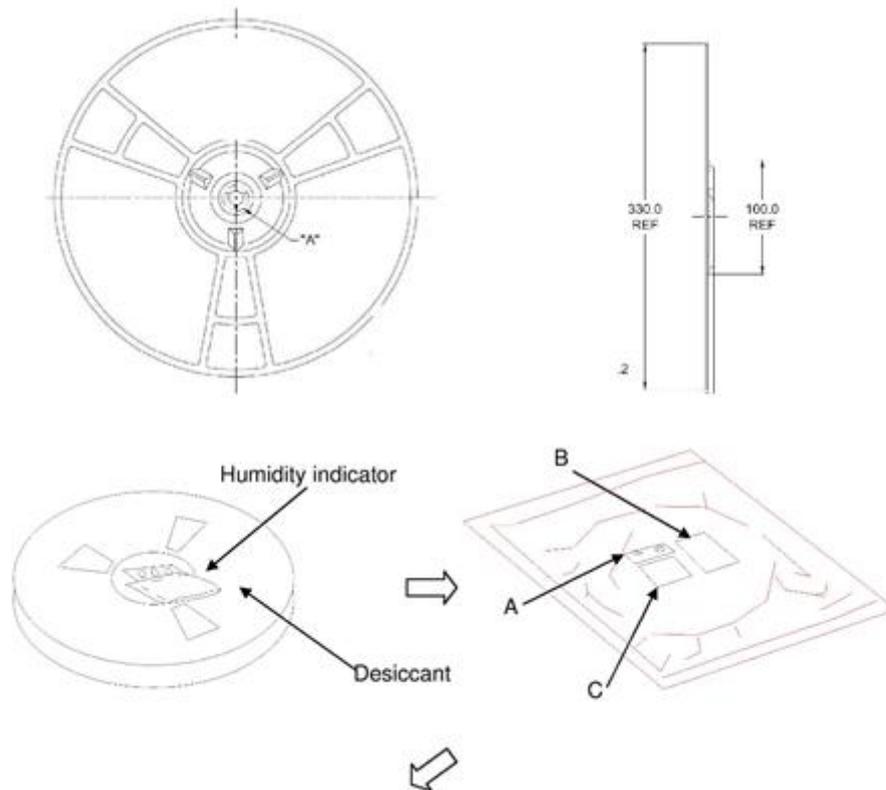Taiwan Patent No : 157713
China Patent No : 01224591.7

W	24.00±0.30
A0	14.30±0.10
B0	16.30±0.10
K0	2.30±0.10

Figure 17: Tape and Reel Packaging Specification
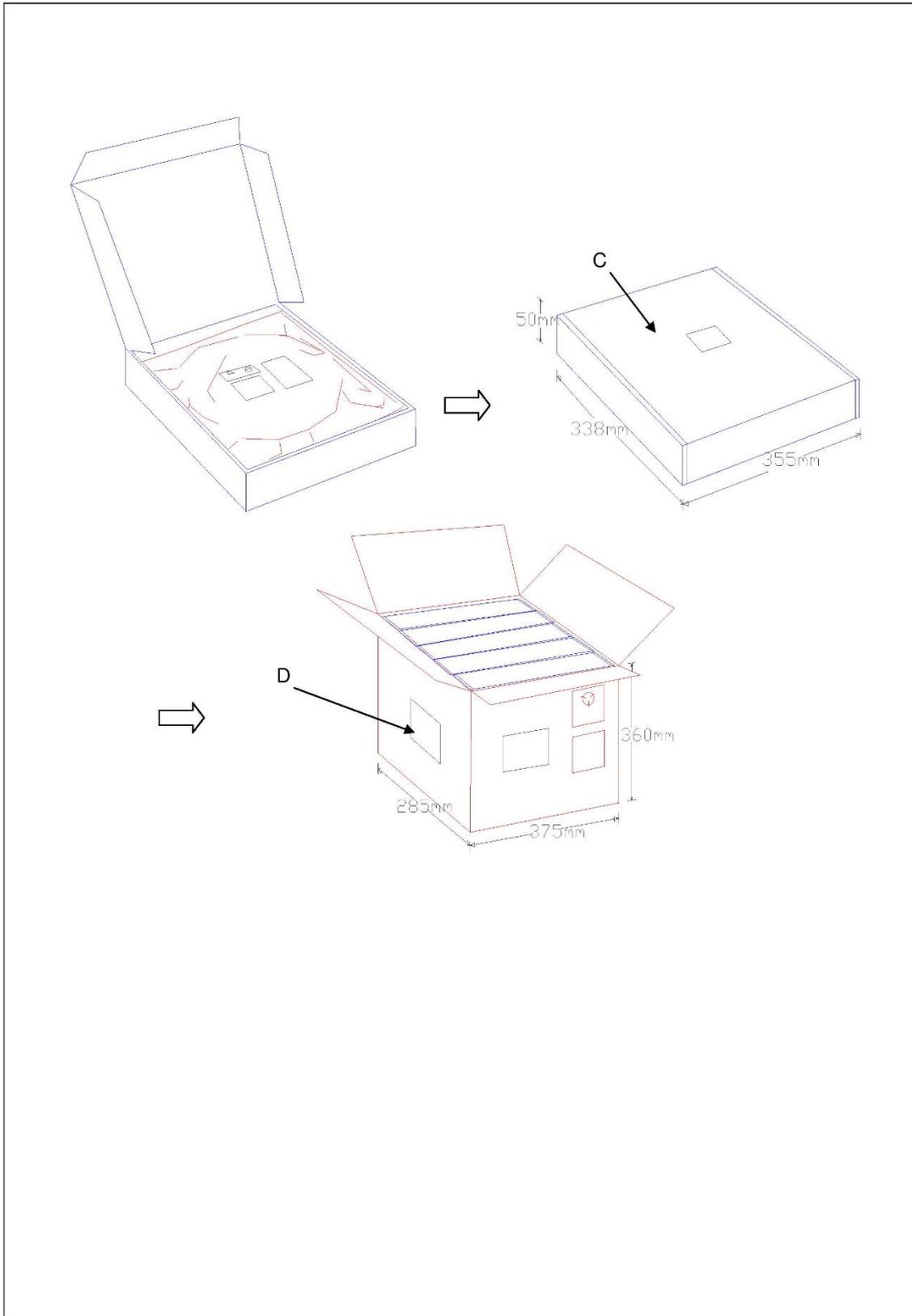
Figure 18: Tape and Reel Boxing Specification

17 Contact Information

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Internet: www.econais.com

Federal Communication Commission (FCC) 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:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- 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:

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.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Country Code selection feature to be disabled for products marketed to the US/CANADA

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
2) The transmitter module may not be co-located with any other transmitter or antenna,
3) For all products market in US, OEM has to limit the operation channels in CH1 to CH11 for 2.4G band by supplied firmware programming tool. OEM shall not supply any tool or info to the end-user regarding to Regulatory Domain change.

As long as 3 conditions above are met, further <u>transmitter</u> test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed

IMPORTANT NOTE

In the event that these conditions <u>cannot be met</u> (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID <u>cannot</u> be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains FCC ID: S67-EC19W01".

Manual Information to the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Industry Canada (IC) Statement

This device complies with Industry Canada licence-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.

Radiation Exposure Statement:

This equipment complies with IC 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.

Déclaration d'exposition aux radiations:
Cet équipement est conforme aux limites d'exposition aux rayonnements IC établies pour un environnement non contrôlé. Cet équipement doit être installé et utilisé avec un minimum de 20 cm de distance entre la source de rayonnement et votre corps.

This device is intended only for OEM integrators under the following conditions:

1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and

2) The transmitter module may not be co-located with any other transmitter or antenna.

As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed.

Cet appareil est conçu uniquement pour les intégrateurs OEM dans les conditions suivantes:

1) L'antenne doit être installée de telle sorte qu'une distance de 20 cm est respectée entre l'antenne et les utilisateurs, et

2) Le module émetteur peut ne pas être coïmplanté avec un autre émetteur ou antenne.

Tant que les 2 conditions ci-dessus sont remplies, des essais supplémentaires sur l'émetteur ne seront pas nécessaires. Toutefois, l'intégrateur OEM est toujours responsable des essais sur son produit final pour toutes exigences de conformité supplémentaires requis pour ce module installé.

IMPORTANT NOTE:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Canada authorization is no longer considered valid and the IC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate Canada authorization.

NOTE IMPORTANTE:

Dans le cas où ces conditions ne peuvent être satisfaites (par exemple pour certaines configurations d'ordinateur portable ou de certaines co-localisation avec un autre émetteur), l'autorisation du Canada n'est plus considéré comme valide et l'ID IC ne peut pas être utilisé sur le produit final. Dans ces circonstances, l'intégrateur OEM sera chargé de réévaluer le produit final (y compris l'émetteur) et l'obtention d'une autorisation distincte au Canada.

End Product Labeling

This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains IC: 11069A-EC19W01".

Plaque signalétique du produit final

Ce module émetteur est autorisé uniquement pour une utilisation dans un dispositif où l'antenne peut être installée de telle sorte qu'une distance de 20cm peut être maintenue entre l'antenne et les utilisateurs. Le produit final doit être étiqueté dans un endroit visible avec l'inscription suivante: "Contient des IC: 11069A-EC19W01".

Manual Information To the End User

The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module.

The end user manual shall include all required regulatory information/warning as show in this manual.

Manuel d'information à l'utilisateur final

L'intégrateur OEM doit être conscient de ne pas fournir des informations à l'utilisateur final quant à la façon d'installer ou de supprimer ce module RF dans le manuel de l'utilisateurdu produit final qui intègre ce module.
Le manuel de l'utilisateur final doit inclure toutes les informations réglementaires requises et avertissements comme indiqué dans ce manuel.

This radio transmitter (IC: 11069A-EC19W01) 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: 11069A-EC19W01) 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.

Antenna Model	Antenna Type	Gain	Connector
SLDA31-2R800G-S1TF	Multilayer Chip	0.5	NA