

# FLC-WFMD481

## WiFi Module Specification

### **1. Features**

- Low cost, low power, highly integrated IEEE 802.11b/g WLAN module.
- Support Independent Basic Service Set (IBSS), e.g. *ad hoc*, BSS and Extended Service Set (ESS) network configurations.
- Support the following data rates with three different modulation modes:
  - 1 Mbps (BPSK modulation)
  - 2 Mbps (QPSK modulation)
  - 5.5 and 11 Mbps (CCK modulation)
  - 6 and 9 Mbps (OFDM with BPSK carrier modulation)
  - 12 Mbps (OFDM with QPSK carrier modulation)
  - 24 and 36 Mbps (OFDM with 16QAM carrier modulation)
  - 48 and 54 Mbps (OFDM with 64QAM carrier modulation)
- Intelligent power control, including IEEE802.11 power saving mode.
- SDIO and GSPI will be employed to interface with host device.
- Support open system and shared key authentication services.
- Internal WEP engine allows 64 or 128 bit Encryption with Temporal Key Integrity Protocol (TKIP)
- Support 802.11i security:
  - Advanced encryption standard (AES)/Counter Mode CBC-MAC Protocol (CCMP),
  - Flexible LED flashing scenario to indicate TX/RX activities.
- Support WPA (Wi-Fi protected access).
- Support 802.11e Quality of Service (QoS) for voice, video and multimedia applications.
- Three or four wires coexistence scheme with Bluetooth.

## 2. Applications

- Cellular handsets,
- PDA and consumer electronic devices that require low power consumption.

### 1.3. WLAN Specifications

#### 3.1 Module Summary

- Module size: 11.0mm x 11.0mm,
- WiFi chipset: Marvell8686 Rev B2,
- SDIO and SPI host interface,
- EEPROM is embedded in module containing calibration data and WLAN MAC address,
- Reference clocked is built in,
- Sleep clock is optional,
- RoHS compliant.

#### 3.2 Block Diagram

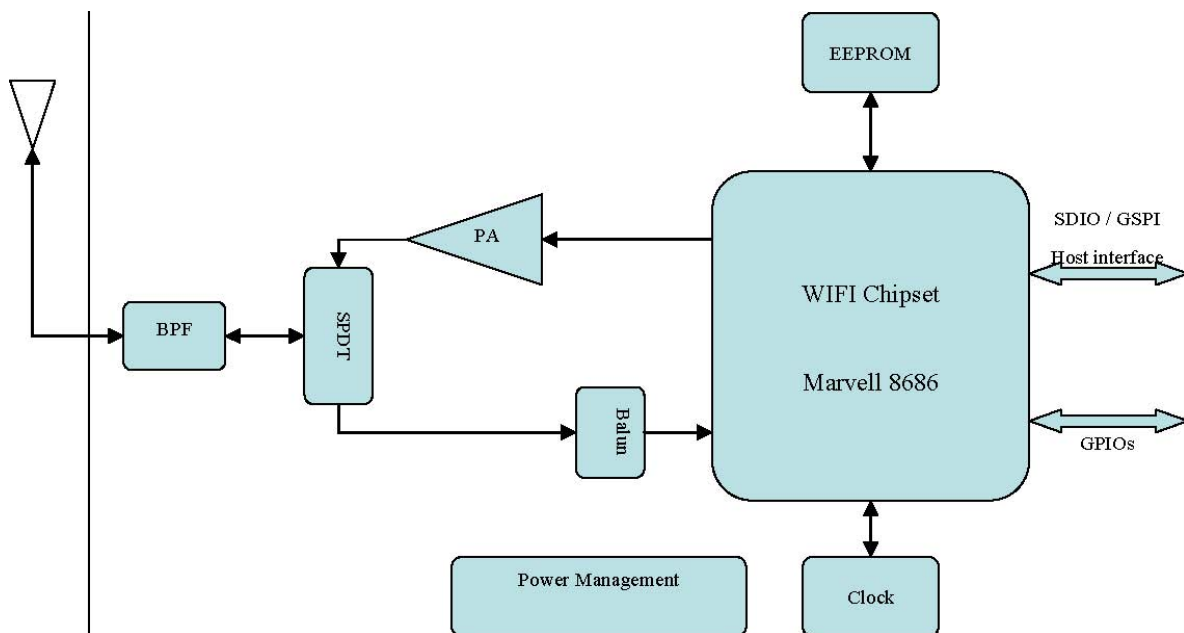


Figure 1 WFMD481 WLAN Module Block Diagram

### 3.3 Electrical Specifications

Table 1 WLAN Basic Specifications

Parameter	Min	Typical	Max	Units
Physical Layer Data Rate		1 – 54Mbps		Mbps
Channel Frequency Range	2412		2484	MHz
Carrier Frequency Suppression		30		dBc
Transmit power, 1-11 Mbps1	13	15	20	dBm
Transmit power, 12-36Mbps1	11	13	15	dBm
Transmit power, 48-54Mbps1	11	13	15	dBm
EVM, 54 Mbps	-25	-27		dB
Sensitivity, 1Mbps, 8% PER		-91	-90	dBm
2Mbps, 8% PER		-91	-89	dBm
11Mbps, 8% PER		-86	-84	dBm
6Mbps10% PER		- 86	-83	dBm
54 Mbps10% PER		-71	-68	dBm
Receiver maximum input level, 8%	-20			dBm
PER 11b, 10% PER 11g				
Adjacent channel rejection, 11 Mbps	35	48		dB
Adjacent channel rejection, 54 Mbps	-1	26		dB

### 3.4 DC Electrical Specifications

#### 3.4.1 Absolute Maximum Ratings

Table 2 Absolute Maximum Ratings

Parameters	Conditions	Min		Max	Units
V <sub>cc</sub>		-0.3		3.7	V
V <sub>-1.8</sub>		-0.4		2.2	V

### 3.4.2 Electrical Specifications

**Table 3 DC Electrical Specifications**

Parameter	Condition	Min	Typical	Max	Units
V <sub>1.8</sub>		1.7	1.8	1.9	V
V <sub>cc</sub>		3.0	3.3	3.6	V
Input sleep clock (option)		10	32.768	1000	KHz
		1.0		V <sub>1.8</sub>	V
WLAN_Deep sleep current	V <sub>cc</sub> = 3.3V		580		uA
WLAN receive current (CCK)	V <sub>cc</sub> = 3.3V		180		mA
WLAN receive current (OFDM)	V <sub>cc</sub> = 3.3V		205		mA
WLAN transmit current (CCK) (P <sub>out</sub> = 15dBm)	V <sub>cc</sub>		290		mA
WLAN transmit current (OFDM)(P <sub>out</sub> =13dBm)	V <sub>cc</sub>		200		mA
Input leakage current			-		μA
Output leakage current			-		μA
Logic high input		0.5V <sub>cc</sub>		V <sub>cc</sub> +0.5	V
Logic low input		-0.5		0.35V <sub>cc</sub>	V
Logic high output		2.4			V
Logic low output				0.4	V

## 1. 4. Pin Descriptions

No	Name	Pin type	I/O type	Description
1	GND	GND	-	Connect to Ground
2	ANT	ANT	O(RF)	ANT Port (50 ohm)
3	GND	GND	-	Connect to Ground
4	NC	-	-	No Connect
5	SD_DAT[1]/SPL_SDIO	SDIO	I/O	SDIO 4-bit mode: data line bit[1] G-SPI mode: G-SPI data output
6	SCLK	Config	I	No Connect. This is for boot setting of ROM
7	ECSn	Config	O	SDIO mode: pull down by 100k ohm G-SPI mode: No Connect This is for boot setting of ROM
8	GND	GND	-	Connect to Ground
9	VDD_HOST_IO	VDD	-	Connect to 3.3v power supply
10	GPIO[6]	Config	I/O	General I/O port: make it open if not use it.
11	GPIO[5]	Config	I/O	General I/O port: make it open if not use it
12	SD_DAT[3]	SDIO	I/O	SDIO 4-bit mode: Date line bit[3]
13	GPIO[2]	GPIO	I/O	General I/O port: make it open if not use it
14	SD_CLK/SPI_CLK	SDIO	I/O	SDIO 4-bit mode: Clock Input G-SPI mode: G-SPI Clock Input
15	GPIO[4]	GPIO	I/O	General I/O port: make it open if not use it
16	GPIO[1]	GPIO	I/O	Please connect to the cathode of LED and supply the power with the anode side. Make it open if not use it.
17	VDD1.8	VDD	-	1.8V terminal, need 1uF decoupling capacitor
18	VDD 1.2	VDD	-	Default: No need to connect to 1.2v power supply.
19	GND	GND	-	Connect to Ground
20	SD_CMD/SPI_SDI	SDIO	I/O	SDIO 4-bit mode: Command/Response G-SPI mode: G-SPI data input
21	SD_DAT[0]/SPL_SCSn	SDIO	I	SDIO 4-bit mode: data line bit[0] G-SPI mode: G-SPI chip select input(active low)
22	SD_DAT[2]/SPL_SINTn	SDIO	I/O	SDIO 4-bit mode: data line bit[2] G-SPI mode: G-SPI interrupt output(active low)
23	IF_SEL_1	Config	O	Select interface mode Pin SDIO mode: No Connect G-SPI mode: pull down by 100k ohm
24	IF_SEL_2	Config	O	Select interface mode Pin SDIO mode: No Connect G-SPI mode: pull down by 100k ohm
25	VDD1.8A	VDD	-	1.8V terminal, need 1uF decoupling capacitor
26	GND	GND	-	Connect to Ground
27	VDD3.3	VDD	-	Connect to 3.3v power

28	VDD3.3	VDD	-	Connect to 3.3v power
29	BT_STATE	BCA	-	Bluetooth state 0=normal priority, RX 1=high priority, TX Priority is signaled after BT_PRIORITY has been asserted. After priority signaling, BT_STATE indicated the TX/RX mode of the BT radio. Make it open if not use it.
30	WL_ACTIVE	BCA	O	WLAN active(active low) 2-wire BCA mode: When high, WLAN is transmitting or receiving packets. 3-wire BCA mode: 0=bluetooth device is allowed to transmit; 1=bluetooth device is not allowed to transmit. Internal 50k ohm pull-down, this pin drives low when PDn is asserted. In WLAN sleep mode, all I/O pads are powered down. This pad must stay at a low state even in power down mode; make it open if not use it.
31	PDn	Config	I	Pull up by 100k ohm, Full power down(active low)
32	RESETn	Config	I	Pull up by 100k ohm, Reset(active low)
	BT_PRIORITY	BCA	I	Bluetooth priority 2-wire BCA mode: when high, BT is transmitting or receiving high priority packets. 3-wire BCA mode: when high,BT is transmitting or receiving packets Make it open if not use it.
34	GPIO[0]	Config	I/O	General I/O port: make it open when do not use it.
35	SLEEP_CLK	Config	I	Clock input for external sleep clock: make it open if not use it
36	PW_SEL	Config	O	Select 1.2v power supply mode External 1.2v supply: open Internal 1.2v supply: 100k ohm pull down

# 5. Mechanical

- 1. 5.1 Module Dimension and weight
- 2. 5.2 Module Drawing (Top view)

Parameter	Description	Typical	Units
Dimension (LxWxH)		10.0 x 10.2 x 1.9	mm
Dimension tolerances (LxWxH)		+/- 0.1 x +/- 0.1 x +/- 0.1	mm

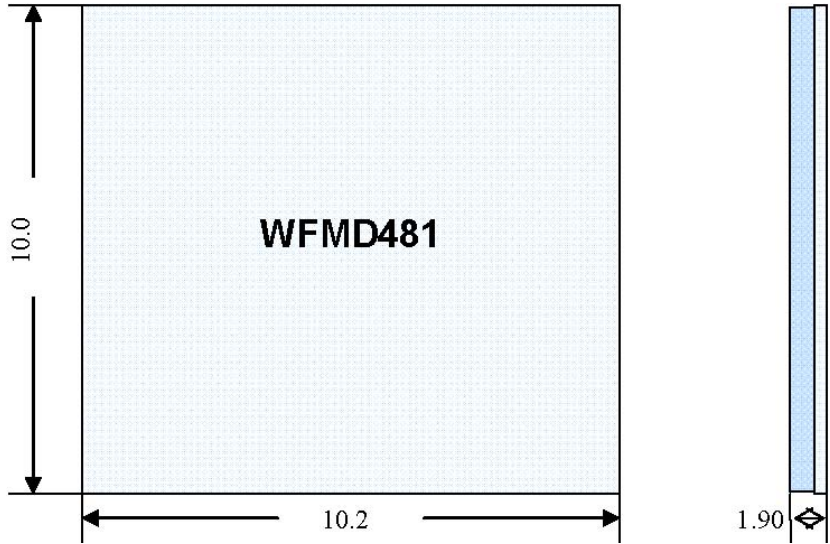
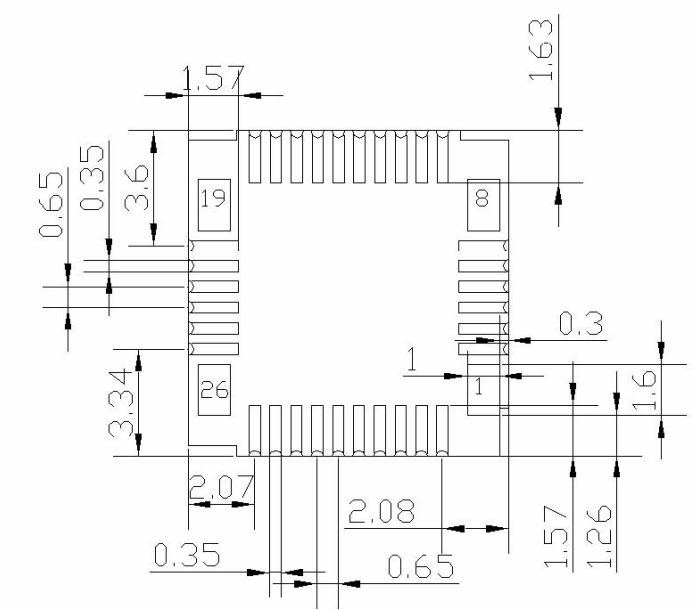
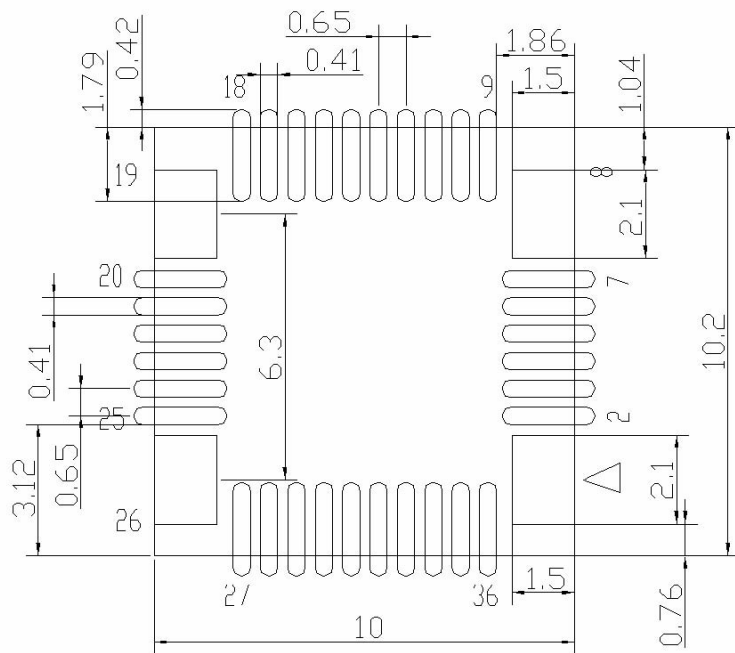


Figure 2 Package Drawing 5.3 Module Pin Location (top view)



**Figure 3 Pin numbers**



**Figure 4 Land Pattern**

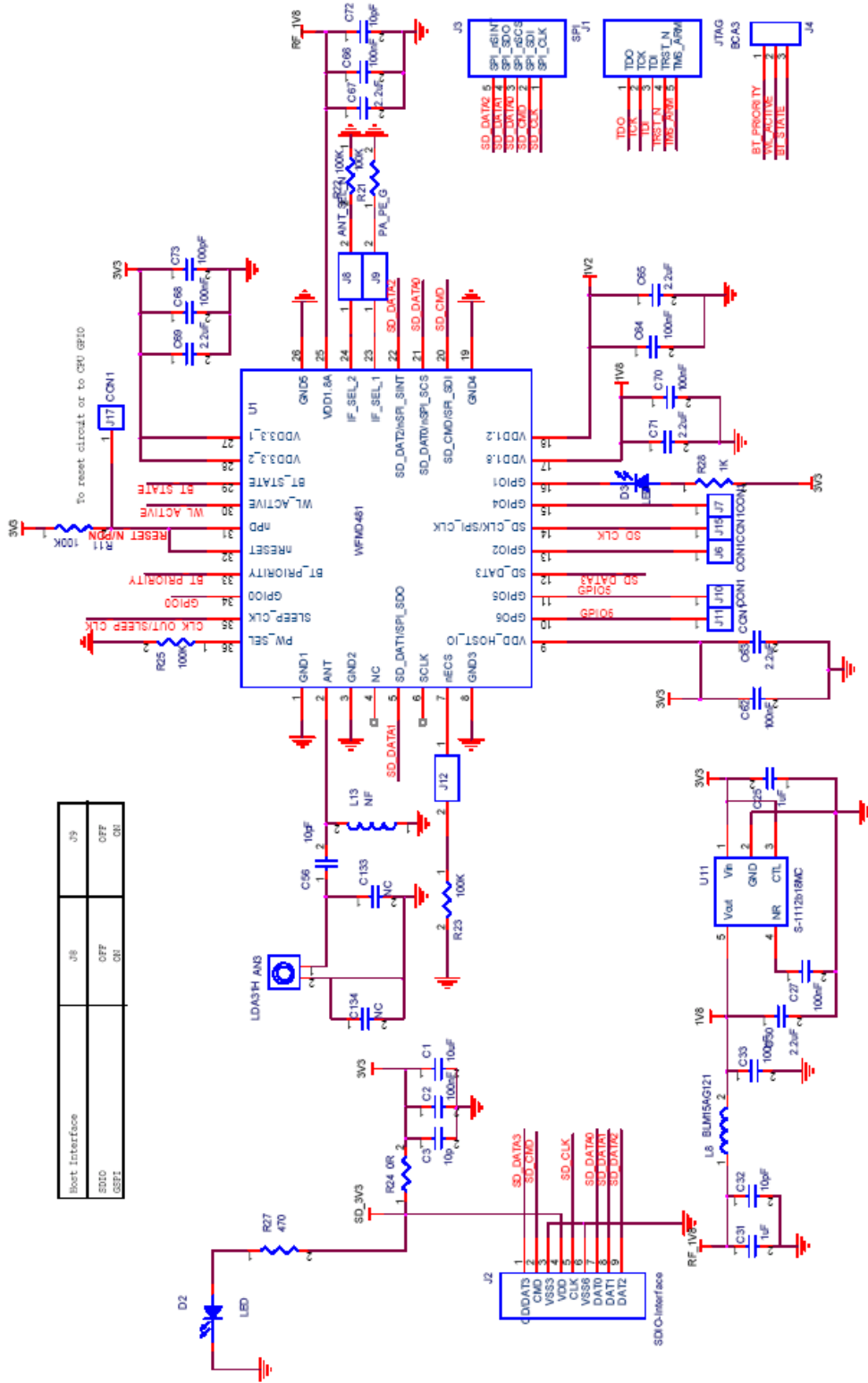
# 6. Application Information

## 6.1 Environment ratings

Parameter	Condition	Min	Typical	Max	Units
Operating temperature range <sup>1</sup>		-30		+70	°C
Storage Temperature		-30		+85	°C
Moisture Absorption			JEDEC Level 4		

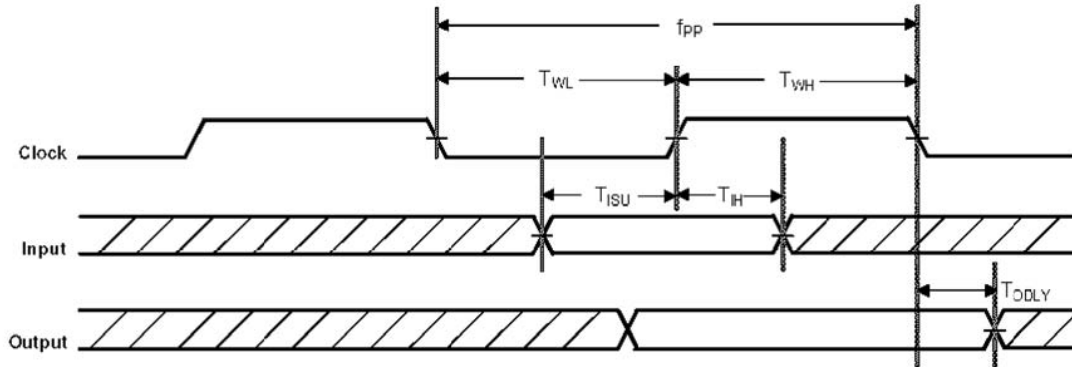
<sup>1</sup> Device may operate safely over this temperature range.

## 6.2 Reference design



Boot Interface		J8	J9
SDIO	OFF	GR	GR
UART	OFF	GR	GR

### 6.3 Interface Specification



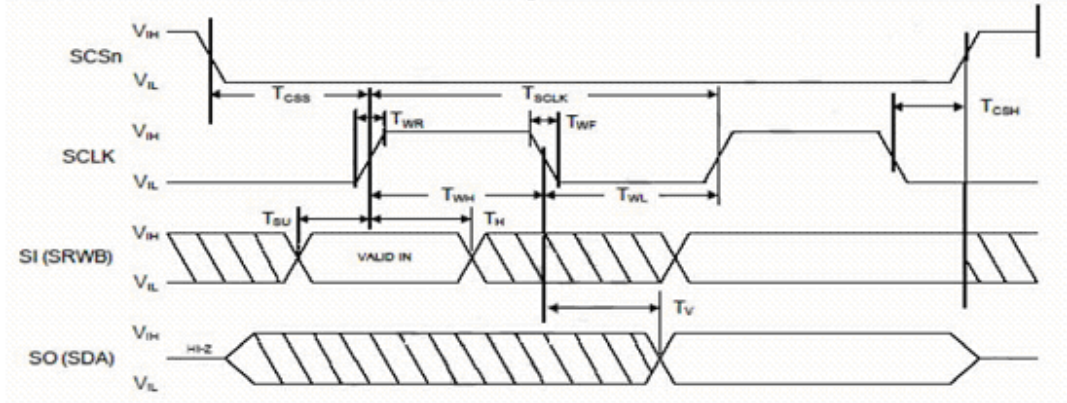
**SDIO Timing Data**

Symbol	Parameter	Condition	Min	Typ	Max	Units
$f_{pp}$	CLK Freq	-	0	-	50	MHz
$T_{WL}$	CLK Low time	-	12	-	-	ns
$T_{WH}$	CLK High time	-	12	-	-	ns
$T_{ISU}$	Input Setup time	-	6	-	-	ns
$T_{IH}$	Input hold time	-	6	-	-	ns
$T_{ODLY}$	Output delay time	-	0	-	14	ns

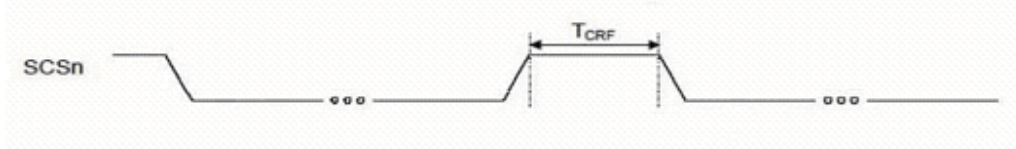
**DC Electricals G-SPI Timing Data**

	Symbol	Min	Typ	Max	Units
3.3V Signal Level	$V_{IH}$	$0.6 \times V_{DD}$	-	$V_{DD} + 0.4$	V
	$V_{IL}$	-0.3	-	$0.25 \times V_{DD}$	V
	$V_{OH}$	2.6	-	-	V
	$V_{OL}$	-	-	0.4	V

## G-SPI Host interface Protocol Timing



## G-SPI Host Interface Inter-Transaction Timing



Symbol	Parameter	Condition	Min	Typ	Max	Units
T <sub>SCLK</sub>	Clock Period	-	20	-	-	ns
T <sub>WH</sub>	Clock High	-	5	-	-	ns
T <sub>WL</sub>	Clock Low	-	9	-	-	ns
T <sub>WR</sub>	Clock Rise Time	-	-	-	1	ns
T <sub>WF</sub>	Clock Fall Time	-	-	-	1	ns
T <sub>H</sub>	SDI Hold Time	-	2.5	-	-	ns
T <sub>SU</sub>	SDI Setup Time	-	2.5	-	-	ns
T <sub>V</sub>	SDO Hold Time	-	5	-	-	ns
T <sub>CSS</sub>	SCSn Fall to Clock	-	5	-	-	ns
T <sub>Csh</sub>	Clock to SCSn Rise	-	0	-	-	ns
T <sub>CRF</sub>	SCSn Rise to SCSn Fall	-	400	-	-	ns

## DC Electrical

	Symbol	Min	Typ	Max	Units
3.3V Signal Level	V <sub>IH</sub>	0.6×V <sub>DD</sub>	-	V <sub>DD</sub> +0.4	V
	V <sub>IL</sub>	-0.3	-	0.25×V <sub>DD</sub>	V
	V <sub>OH</sub>	2.6	-	-	V
	V <sub>OL</sub>	-	-	0.4	V

## 7. Assembly Information

### 7.1 RoHS

The module is RoHS compliant. A letter of declaration can be supplied.

### 7.2 Soldering Reflow Profile

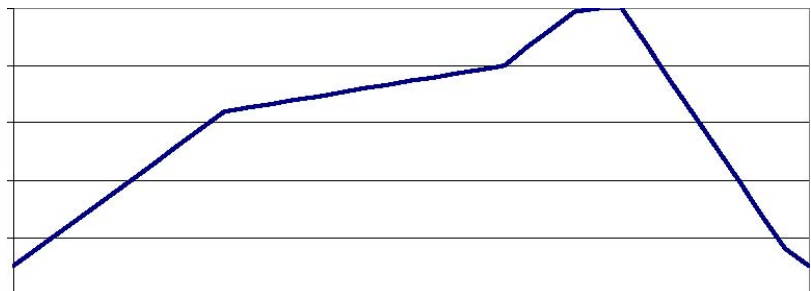
The solder reflow profile is provided in the table & graph below. The profile is used to attach the module to its host PCB.

Ramp up rate	3C/second max
Maximum time maintained above 217C	120 seconds
Peak temperature	250C
Maximum time within 5C of peak temperature	20 seconds
Ramp down rate	6C/second max

**Reflow Profile**

Temperature, C

250  
200  
150  
100  
50  
0



Time, seconds

**Figure 4 Reflow profile**

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