



# MT6627 Data Sheet

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## Document Revision History

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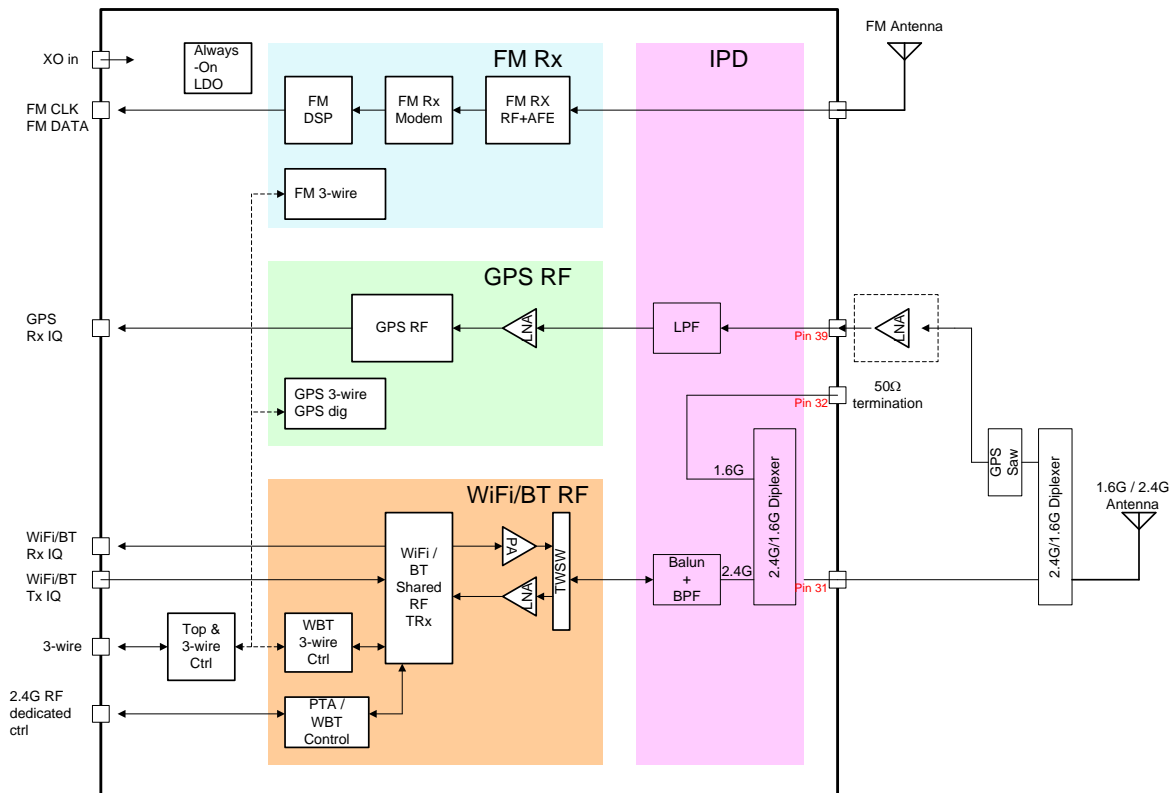
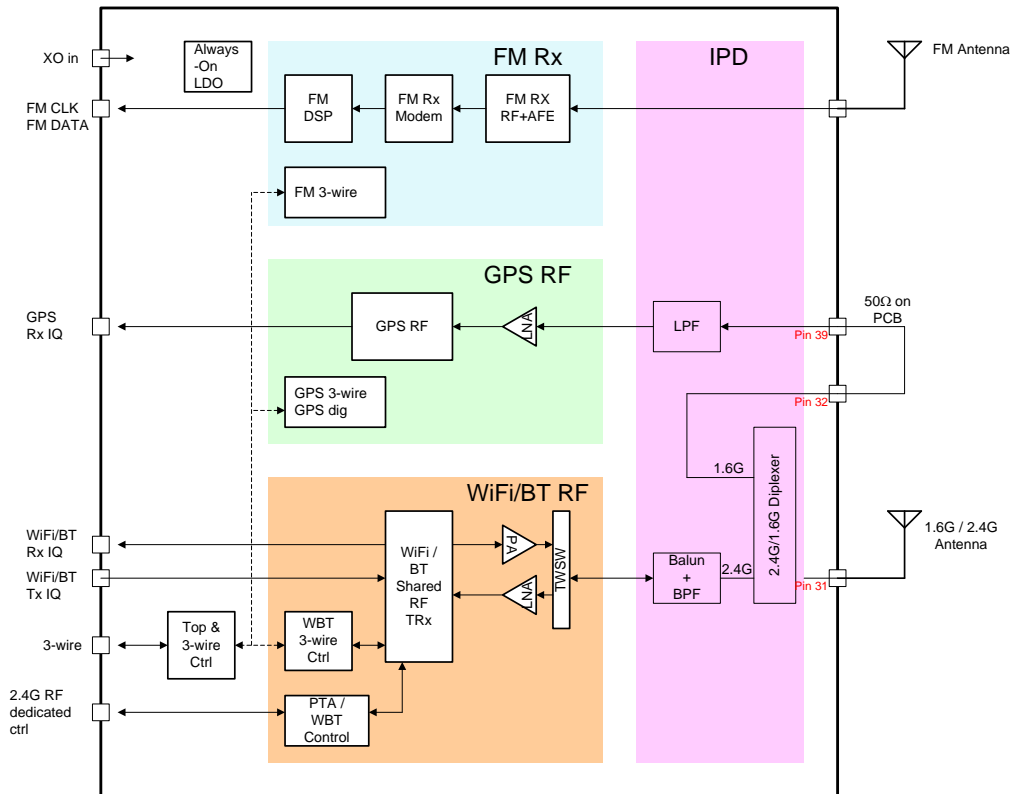
## 1 System Overview

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### 1.1 Functional Block Diagram

MT6627 is a 4-in-1 connectivity chip which contains a Wi-Fi/Bluetooth transceiver front-end, a GPS receiver front-end and a complete FM receiver, along with Integrated Passive Device (IPD) in a QFN40 package. Simplified block diagram and how MT6627 is used in two different scenarios are shown in Figure 1-1. An always-on low-dropout regulator (ALDO) provides supply voltage to top control logics in MT6627. The top control logics controls each subsystem independently. Each subsystem also has dedicated LDOs. A thermal sensor and a low-speed ADC (Analog-to-Digital Converter) is provided to monitor MT6627's temperature variation. MT6627 does not have its dedicated crystal oscillator. It uses either an external (maybe temperature compensated) oscillator or clock source from companion chips in the platform such as MT6166.

For Wi-Fi and Bluetooth, MT6627 provides an advanced switching mechanism which allows fast switching between Wi-Fi and BT modes. Hardware sharing and reuse is maximized. The transceiver front-ends are on MT6627 while the ADC/DAC (Analog-to-Digital Converter/Digital-to-Analog Converter) are in the companion modem chip. The interface driver/receiver buffer is designed to drive PCB trace loading. The GPS IP in MT6627 is similar to Wi-Fi/Bluetooth such that the ADC/DAC is in the companion modem chip. In contrast, the FM system integrates the modem and ADC in MT6627, and no interface drivers/buffers are required.



*Figure 1-1. MT6627 block diagram in two usage scenarios*

## 1.2 Features

- MT6627 is a 4-in-1 connectivity RF chip which contains front-ends of a 2.4GHz Wi-Fi and Bluetooth transceiver, a GPS receiver and an FM receiver.
- MT6627 supports integrated passive device to save footprint on PCB and cost due to Wi-Fi/Bluetooth/GPS external BoM (bill of materials) in a 40-pin QFN package.
- Supports Wi-Fi external LNA and GPS external LNA.

### 1.2.1 Wi-Fi/BT

#### WLAN

- Single-band (2.4GHz) single stream 802.11 b/g/n RF
- Supports Wi-Fi and Bluetooth TDD operation and single-antenna topology with integrated TR-switch
- Integrated PA with max. 19 dBm CCK output power
- Typical Rx sensitivity with companion chip modem: -75 dBm at 11g 54Mbps mode
- Supports external LNA with an auxiliary Rx input
- Integrated power detector to support per packet Tx power control
- Built-in calibrations for PVT variation
- One fully integrated frequency synthesizer for both Wi-Fi/BT to support multiple crystal clock frequencies

#### Bluetooth

- Bluetooth specification v2.1+EDR
- Bluetooth specification 3.0+HS compliance
- Bluetooth v4.0 Low Energy (LE)
- Integrated PA with 6dBm (class 1) transmit power
- Typical Rx sensitivity with companion chip modem: GFSK -92.5dBm, DQPSK -91.5dBm, 8-DPSK -86dBm
- Low-power scan function to reduce power consumption in scan modes

### 1.2.2 FM

- 65 -108MHz with 50kHz step
- Supports RDS/RBDS
- Digital stereo modulator/demodulator
- Digital audio interface (I2S)
- Fast seek time 30ms/channel
- Stereo noise reduction
- Audio sensitivity 3dB $\mu$ V<sub>emf</sub> (SINAD=26dB)

- Audio SINAD  $\geq 60\text{dB}$
- Anti-jamming
- Support short antenna

### 1.2.3 GPS

- Typical tracking sensitivity of  $-163\text{dBm}$
- Supports external LNA

### 1.2.4 IPD

#### WBT IPD

- Integrated matching network, balance band-pass filter, GPS-WBT diplexer
- Fully integrated in one IPD die
- Supports single and dual antenna operation

#### GPS IPD

- Integrated high-pass type matching network and low-pass filter
- Fully integrated in one IPD die
- Supports single and dual antenna operation



## 2 Pin Definitions

### 2.1 IO Definitions

The IO definitions used in 錯誤! 找不到參照來源。 are listed below.

**Table 2-1. I/O definitions used in 錯誤! 找不到參照來源。**

Pad attribute	
AI	Analog input (excluding pad circuitry)
AO	Analog output (excluding pad circuitry)
AIO	Analog bidirectional (excluding pad circuitry)
DIO	Bidirectional digital with CMOS input
DI	Digital input (CMOS)
DO	Digital output (CMOS)
Z	High-impedance (high-Z) output
NP	No internal pull
PU	Internal pull-high
PD	Internal pull-low
ADIO	Analog and digital IO (excluding pad circuitry)

### 2.2 Pin Definitions

Details pin descriptions of MT6627 are listed in 錯誤! 找不到參照來源。 -2.

**Table 2-2. MT6627 pin definitions**

		Catogories	PAD type	Descriptions
1	AVDD28_FSOURCE	2.8V Supply	AI	e-fuse 2.8V supply voltage. Connected to ground in normal operation.
2	PAD_HRST_B	Digital Control	DI	Hardware reset from companion modem.
3	PAD_FM_DBG	Digital Control	DO	FM debugging
4	PAD_F2W_DATA	Digital Control	DO	FM output date
5	PAD_F2W_CLK	Digital Control	DO	FM output clock
6	PAD_SCLK	Digital Control	DI	Enables 3-wire, clock and data connected to companion modem.
7	PAD_SDATA	Digital Control	DI	
8	PAD_SEN	Digital Control	DI	
9	PAD_CEXT	Analog IO	AIO	External cap for MT6627 always-on LDO
10	PAD_XO_IN	Analog IO	AI	Reference clock (26MHz) input for MT6627
11	PAD_GPS_RX_QN	Analog IQ	AO	GPS receiver IF IQ signals. Connected to companion modem.
12	PAD_GPS_RX_QP	Analog IQ	AO	
13	PAD_GPS_RX_IN	Analog IQ	AO	

		Catogories	PAD type	Descriptions
14	PAD_GPS_RX_IP	Analog IQ	AO	Wi-Fi and bluetooth IF transmitter IQ signals. Connected to companion modem.
15	PAD_WB_TX_QN	Analog IQ	AI	
16	PAD_WB_TX_QP	Analog IQ	AI	
17	PAD_WB_TX_IN	Analog IQ	AI	
18	PAD_WB_TX_IP	Analog IQ	AI	
19	PAD_WB_RX_QN	Analog IQ	AO	Wi-Fi and bluetooth IF receiver IQ signals. Connected to companion modem.
20	PAD_WB_RX_QP	Analog IQ	AO	
21	PAD_WB_RX_IN	Analog IQ	AO	
22	PAD_WB_RX_IP	Analog IQ	AO	
23	PAD_WB_CTRL0	Digital Control	DIO	Wi-Fi and bluetooth dedicated high speed control bus.
24	PAD_WB_CTRL1	Digital Control	DIO	
25	PAD_WB_CTRL2	Digital Control	DIO	
26	PAD_WB_CTRL3	Digital Control	DIO	
27	PAD_WB_CTRL4	Digital Control	DIO	
28	PAD_WB_CTRL5	Digital Control	ADIO	Selects Wi-Fi and bluetooth mode. Connected to companion modem.
29	AVDD18_WBT	1.8V Supply	AI	1.8V supply of Wi-Fi and Bluetooth radio
30	NC	RF IO	AI	Reserved
31	PAD_WB_GPS_RFIN	RF IO	AIO	2.4GHz Wi-Fi and and 1.6GHz input to diplexer in IPD
32	PAD_GPS_DPX_RFOUT	RF IO	AIO	1.6GHz output of the IPD diplexer
33	AVDD33_WBT	3.3V Supply	AI	Wi-Fi 3.3V supply for PA and Tx modulator
34	NC	RF IO	AIO	Reserved
35	NC	RF IO	AIO	
36	AVDD28_FM	2.8V Supply	AI	FM 2.8V supply. If the external VCTCXO is used as reference source, AVDD28_FM will also serve as its supply voltage.
37	PAD_FM_LANT_N	RF IO	AI	FM differential RF input, negative terminal.
38	PAD_FM_LANT_P	RF IO	AI	FM differential RF input, positive terminal.
39	PAD_GPS_RFIN	RF IO	AI	GPS RF input, single-ended
40	AVDD18_GPS	1.8V Supply	AI	1.8V supply to GPS IP; always on LDO for MT6627 top logic control.

### 3 Electrical Characteristics

#### 3.1 Absolute Maximum Ratings

**Table 3-1. Absolute maximum ratings**

Symbol	Parameter	Rating	Unit
AVDD33_WBT	Wi-Fi 3.3V supply for PA and Tx modulator	-0.3 to 3.6	V
AVDD28_FM	FM 2.8V supply. If the external VCTCXO is used as reference source, AVDD28_FM will also serve as its supply voltage.	-0.3 to 3.6	V
AVDD18_GPS	1.8V supply to GPS IP; always on LDO for MT6627 top logic control	-0.3 to 3.6	V
AVDD18_WBT	1.8V supply of Wi-Fi and Bluetooth radio	-0.3 to 3.6	V
T <sub>STG</sub>	Storage temperature	-60 to +120	°C
T <sub>A</sub>	Operating temperature	-40 to +85	°C

#### 3.2 Recommended Operating Range

**Table 3-2. Recommended operating range**

Symbol	Parameter	Min.	Typ.	Max.	Unit
AVDD33_WBT	Wi-Fi 3.3V supply for PA and Tx modulator	3.0	3.3	3.6	V
AVDD28_FM	FM 2.8V supply. If the external VCTCXO is used as reference source, AVDD28_FM will also serve as its supply voltage.	2.5	2.8	3.1	V
AVDD18_GPS	1.8V supply to GPS IP; always on LDO for MT6627 top logic control.	1.62	1.8	1.98	V
AVDD18_WBT	1.8V supply of Wi-Fi and Bluetooth radio	1.62	1.8	1.98	V
T <sub>j</sub>	Commercial junction operating temperature	0	25	115	°C
	Industry junction operating temperature	-20	25	125	°C
T <sub>a</sub>	Operation temperature	-40	25	85	°C
T <sub>stg</sub>	Storage temperature	-60	25	150	°C

#### 3.3 Power Consumption and Supply Specifications

The following tables list the power supply requirements for AVDD18\_WBT/AVDD18\_GPS, AVDD28\_FM and AVDD33\_WBT.

**Table 3-3. AVDD18 specifications**

Test item	Min.	Typ.	Max.	Unit	Notes
Output voltage, VDD	1.62	1.8	1.98	V	
Output current	120			mA	

Test item	Min.	Typ.	Max.	Unit	Notes
Output noise			550	nV/sqrt(Hz)	
PSRR	40			dB	< 1MHz
Load transient	-200		200	mV	Transient slewrate 100mA/us
Turn-on rising time	180		240	usec	10% -->90% output voltage
Power-off settling time		2	4	ms	90% -->10% output voltage

**Table 3-4. AVDD28 specifications**

Test item	Min.	Typ.	Max.	Unit	Notes
Output voltage	2.5	2.8	3.1	V	
Output current	30			mA	
PSRR	40			dB	< 1MHz
Load transient	-150		150	mV	Transient slew rate 15mA/us
Turn-on rising time	180		240	usec	10% -->90% output voltage
Turn-on overshoot			10	%	

**Table 3-5. AVDD33 specifications**

Test Item	Min	Typ	Max	Unit	Notes
Output voltage	3.0	3.3	3.6	V	
Output current	300			mA	
Output noise			550	nV/sqrt(Hz)	
PSRR	40			dB	< 1MHz
Load transient	-200		200	mV	Transient slew rate 100mA/us
Turn-on rising time	180		240	usec	10% -->90% output voltage
Turn-on overshoot			10	%	
Power-off settling time		2	4	ms	90% -->10% output voltage

### 3.4 Power-on/off Sequence

MT6627 uses three supply voltages, 1.8V, 2.8V and 3.3V. Specific power-on/off sequence must be followed as described below.

#### 1.8V

IO and internal control logic use 1.8V, and this supply voltage needs to be powered on prior to 2.8V and 3.3V for functioning properly. The functionality of MT6627 will not be guaranteed if 2.8V or 3.3V power is supplied prior to this 1.8V supply.

#### 2.8V and 3.3V

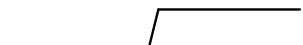

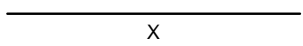

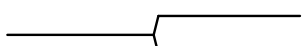
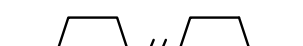
There is no specific power-on/off timing relationship between 2.8V (used by FM radio and external oscillator, if used) and 3.3V (Wi-Fi).

### 3.5 Digital Logic Characteristics

MT6627 timing characteristics and interface protocols are shown here, including some general comments.

#### 3.5.1 Timing Diagram Convention

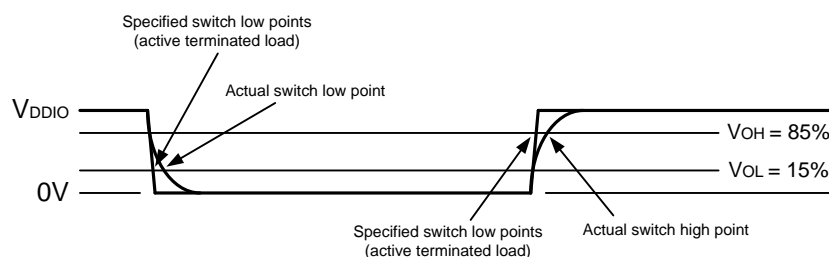
Figure 3-1 shows the conventions used with timing diagram throughout this document.

Waveform	Description
	Signal is changing from low to high
	Signal is changing from high to low
	Don't care or bus is driven
	Bus is changing from invalid to valid
	Bus is changing from high-Z to valid
	Denotes multiple clock periods

**Figure 3-1. Timing diagram conventions**

#### 3.5.2 Rising/Falling Time Definition

Figure 3-2 shows the rising and falling timing diagram. The actual signal timing curve is related to the external load conditions. The operating conditions of digital logics can be seen in Table 3-6.



**Figure 3-2. Rising and falling times diagram**

**Table 3-6. Operating Conditions of Digital Logics**

Parameter	Min.	Typ.	Max.	Unit	Notes
VDD, supply of core power	1.08	1.2	1.32	V	
VDDIO, supply of IO Power	1.62	1.8	1.98	V	
V <sub>IH</sub> , Input logic high voltage	0.75*VDDIO		VDDIO+0.3	V	
V <sub>IL</sub> , Input logic low voltage	-0.3		0.25*VDDIO	V	
V <sub>OH</sub> (DC), DC output high voltage	0.85*VDDIO			V	VDD=min, I <sub>OH</sub> =1.5mA
V <sub>OL</sub> (DC), DC output low voltage			0.15*VDDIO	V	VDD=min, I <sub>OL</sub> =1.5mA

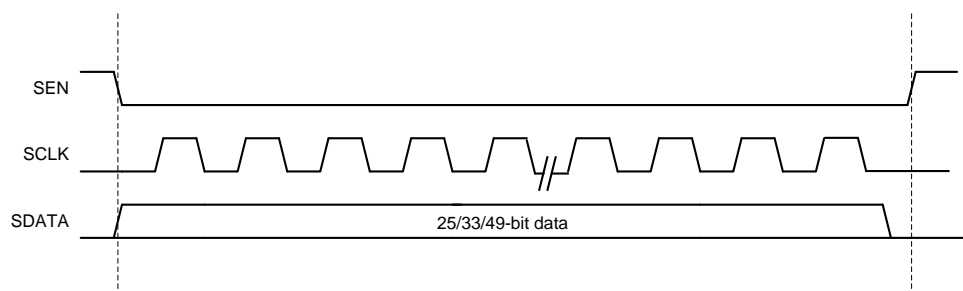
### 3.5.3 Protocols

There are 3 main interfaces for MT6627.

- 3-wire SPI: Generally used for all systems (BT/Wi-Fi/FM/GPS)
- 6-wire bus: High-speed interface, especially for BT and Wi-Fi
- FM 2-wire: Utilized as a simplified interface modified from I2S. This interface also defines MT6627 strap-pin modes. Do not add pull-up / pull-down to this interface. Failing to follow this recommendation will lead to unexpected MT6627 operation.

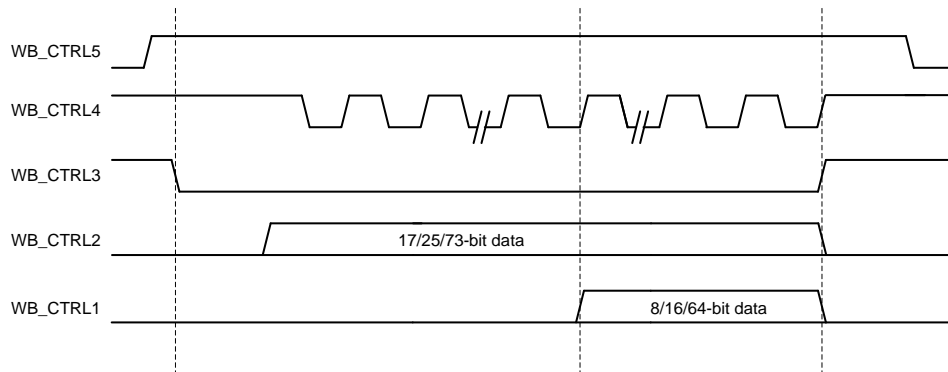
#### 3.5.3.1 3-Wire

The 3-wire SPI protocol of MT6627 is the main interface to access Wi-Fi/BT/FM/GPS/efuse command registers. The bit number of SDATA depends on different operating conditions, as shown in Figure 3-3.

**Figure 3-3. 3-wire SPI timing diagram**

#### 3.5.3.2 6-bit Bus

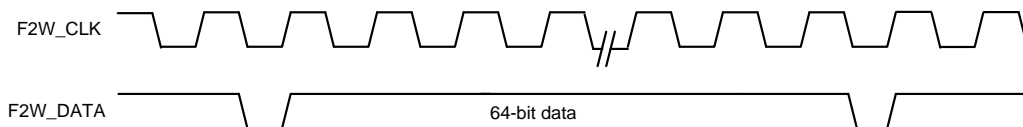
MT6627 has a dedicated 6-bit bus to control Wi-Fi and BT radios. The related control definitions depend on operating modes and conditions. One example BT operation scenario is shown in Figure 3-4.



**Figure 3-4. BT 5-wire SPI access**

### 3.5.3.3 FM 2-wire Bus

A modified 2-wire interface instead of standard I2S protocol for FM audio data stream is used in MT6627, as shown in Figure 3-5.



**Figure 3-5. FM 2-wire interface**

## 3.6 MT6627 TOP Building Blocks

### 3.6.1 Reference Clock

The reference clock source needs to satisfy 0.8 Vpp with rising/falling time of 5 nsec and phase noise of  $-149$  dBc/Hz at 100-kHz offset frequency. The clock buffers draw 90  $\mu$ A. The first stage buffer employs ac-coupled architecture to ensure proper amplification even with weak input clock whose swing is less than thresh voltage of transistors. There is a tie-low switch in the buffer to each block (i.e. WBT, GPS, FM, THADC and DIG) to guarantee well-defined voltage for input ports of blocks mentioned above.

### 3.6.2 Thermal ADC

A low-speed ADC converts the output of thermal sensor to 8-cycle-average or 16-cycle-average ADC code which represents the current chip temperature near the THADC. The temperature coverage range is between  $-40$  and  $120$  degree Celsius. The chip top control may do corresponding adjustment (such as PA/TX gain switching) based on such temperature information.

### 3.6.3 Always-on LDO

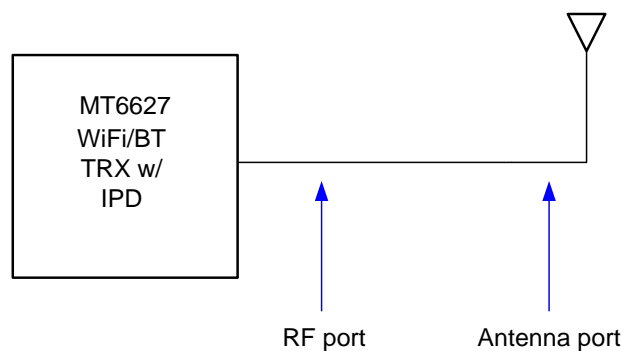
A low-power bandgap reference provides biasing currents for internal LDO as well as reference voltages for THADC's temperature sensing. An always-on LDO provides an internal 1.2V voltage to digital circuits from an external supply of 1.8V. In normal operation, the BG circuit generates the reference voltage for the LDO. In sleep mode, the BG+LDO consumes a small quiescent current of ~25uA. The LDO output voltage and driving capability are programmable.

## 3.7 Wi-Fi/BT

MT6627 Wi-Fi/BT is a high performance and highly-integrated RF transceiver fully compliant with IEEE 802.11 b/g/n and Bluetooth v2.1+EDR/v3.0+HS/v4.0 LE standards. A novel RF front-end topology is implemented to achieve maximum hardware sharing between Wi-Fi and Bluetooth with integrated TR-switch. MT6627 also features a self calibration scheme to compensate the process and temperature variation to maintain high performance. The calibration is performed automatically right after the system boot-up.

### 3.7.1 Wi-Fi/BT Specifications

The WLAN/BT radio characteristics are described in this section. Unless otherwise specified, all specifications are measured at the RF port which is depicted in the following figure. Unlike most devices available today which requires matching network or filters between antenna port and RF ports (defined in Figure 3-6), due to the integration of integrated passive device (IPD), the RF port and antenna port of MT6627 can be directly connected by a 50Ohm trace.



**Figure 3-6. Wi-Fi/BT spec. measurement diagram**

#### 3.7.1.1 Wi-Fi Receiver Specifications

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.



**Table 3-7. 2.4GHz receiver specifications**

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency range		2,412	-	2,484	MHz
Rx sensitivity	1 Mbps DSSS		-96.5		dBm
	2 Mbps DSSS		-93		dBm
	5.5 Mbps DSSS		-90.5		dBm
	11 Mbps DSSS		-88		dBm
Rx sensitivity	6 Mbps OFDM		-92		dBm
	9 Mbps OFDM		-90		dBm
	12 Mbps OFDM		-89		dBm
	18 Mbps OFDM		-86.5		dBm
	24 Mbps OFDM		-83.5		dBm
	36 Mbps OFDM		-79.5		dBm
	48 Mbps OFDM		-76		dBm
	54 Mbps OFDM		-75		dBm
Rx sensitivity BW = 20MHz Green field 800nS guard interval Non-STBC	MCS 0		-91.5		dBm
	MCS 1		-88		dBm
	MCS 2		-86		dBm
	MCS 3		-83		dBm
	MCS 4		-80		dBm
	MCS 5		-75.5		dBm
	MCS 6		-74		dBm
	MCS 7		-72.5		dBm
Rx sensitivity BW = 40MHz Green field 800nS guard interval Non-STBC	MCS 0		-88.5		dBm
	MCS 1		-85		dBm
	MCS 2		-83		dBm
	MCS 3		-80		dBm
	MCS 4		-77		dBm
	MCS 5		-72.5		dBm
	MCS 6		-71		dBm
	MCS 7		-69		dBm
Maximum receive level	11 Mbps DSSS			-4	dBm
	6 Mbps OFDM			-9	dBm
	54 Mbps OFDM			-9	dBm
	MCS0			-9	dBm
	MCS7			-9	dBm
Adjacent channel rejection (30MHz offset)	1 Mbps DSSS			43	dB
Adjacent channel rejection (25MHz offset)	11 Mbps DSSS			43	dB

Parameter	Description	Min.	Typ.	Max.	Unit
Adjacent channel rejection (25MHz offset)	6 Mbps OFDM			40	dB
	54 Mbps OFDM			28	dB
Adjacent channel rejection (25MHz offset), BW = 20MHz	MCS 0			36	dB
	MCS 7			12	dB
Adjacent channel rejection (40MHz offset), BW = 40MHz	MCS 0			28	dB
	MCS 7			6	dB
Blocking level for 1dB Rx sensitivity degradation	824 ~ 849 MHz GSM		18		dBm
	880 ~ 915 MHz GSM		10		dBm
	1,710 ~ 1,785 MHz GSM		5		dBm
	1,850 ~ 1,910 MHz GSM		1		dBm
	1,850 ~ 1,910 MHz WCDMA		-1		dBm
	1,920 ~ 1,980 MHz WCDMA		0		dBm

### 3.7.1.2 Wi-Fi Transmitter Specifications

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.

**Table 3-8. 2.4GHz transmitter specifications**

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency range		2,412	-	2,484	MHz
Output power VBAT = 3.6V	802.11b, 1~11 Mbps DSSS		19		dBm
	802.11g, 6 ~54Mbps OFDM		16		dBm
	802.11n, HT20 MCS0~7		16		dBm
	802.11n, HT40 MCS0~7		15.5		dBm
EVM	802.11b, 1~11 Mbps DSSS @Pout=17dBm		25		%
	802.11g, 6 ~54Mbps OFDM @Pout=14dBm		-31		dB
	802.11n, HT20 MCS0~7 @Pout=14dBm		-31		dB
	802.11n, HT40 MCS0~7 @Pout=13.5dBm		-31		dB
TX power accuracy	-40~85 °C, 2~18dBm			±1.5	dB
Loadpull variation at VSWR = 2:1	Output power variation			±1.5	dB
	EVM degradation		4		dB
Transmitted power (Data rate = 1M, Pout =	76 ~ 108MHz			-148	dBm/Hz
	776 ~ 794MHz			-147	dBm/Hz

Parameter	Description	Min.	Typ.	Max.	Unit
20dBm)	869 ~ 960MHz			-148	dBm/Hz
	925 ~ 960MHz			-148	dBm/Hz
	1,570 ~ 1,580MHz			-148	dBm/Hz
	1,805 ~ 1,880MHz			-147	dBm/Hz
	1,930 ~ 1,990MHz			-145	dBm/Hz
	2,110 ~ 2,170MHz			-138	dBm/Hz
Harmonic output power (Data rate = 1M, Pout = 20dBm)	2 <sup>nd</sup> harmonic			-38	dBm/MHz
	3 <sup>rd</sup> harmonic			-40	dBm/MHz

### 3.7.1.3 Bluetooth BDR Receiver Specifications

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.

**Table 3-9. Basic data rate receiver specifications**

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency range		2,402		2,480	MHz
Receiver sensitivity	BER < 0.1%		-92.5		dBm
Max. usable signal	BER < 0.1%	-20	0		dBm
C/I co-channel	Co-channel selectivity (BER < 0.1%)	-	4	11	dB
C/I 1MHz	Adjacent channel selectivity (BER < 0.1%)	-	-13	0	dB
C/I 2MHz	2 <sup>nd</sup> adjacent channel selectivity (BER < 0.1%)	-	-39	-30	dB
C/I ≥ 3MHz	3 <sup>rd</sup> adjacent channel selectivity (BER < 0.1%)	-	-44	-40	dB
C/I image channel	Image channel selectivity (BER < 0.1%)	-	-29	-9	dB
C/I image 1MHz	1MHz adjacent to image channel selectivity (BER < 0.1%)	-	-46	-20	dB
Out-of-band blocking	30MHz to 2,000MHz	-10			dBm
	2,001MHz to 2,339MHz	-27			dBm
	2,501MHz to 3,000MHz	-27			dBm
	3,001MHz to 12.75GHz	-10			dBm
Intermodulation	Max. interference level to maintain 0.1% BER	-39	-25		dBm

### 3.7.1.4 Bluetooth BDR Transmitter Specifications

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.

**Table 3-10. Basic data rate transmitter specifications**

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency range		2,402	-	2,480	MHz
Output power	At max. power output level		6		dBm
Power control step		2	4	8	dB
ICFT	Initial carrier frequency drift	-75	5	75	kHz
Carrier frequency drift	One slot packet (DH1)	-	6	25	kHz
	Three slot packet (DH3)	-	6	40	kHz
	Five slot packet (DH5)	-	6	40	kHz
	Max. drift rate	-	180	400	Hz/us
Modulation characteristic	$\Delta f_{1\text{avg}}$	140	156	175	kHz
	$\Delta f_{2\text{max}}$ (for at least 99% of all $\Delta f_{2\text{max}}$ )	115	150	-	kHz
	$\Delta f_{2\text{avg}}/\Delta f_{1\text{avg}}$	0.8	0.98	-	
20-dB bandwidth		-	922	1,000	kHz
In-band spurious emission	$\pm 2\text{MHz}$ offset		-46	-20	dBm
	$\pm 3\text{MHz}$ offset		-48	-40	dBm
	$> \pm 3\text{MHz}$ offset		-45	-40	dBm
Out-of-band spurious emission	30MHz to 1GHz			-36	dBm
	1GHz to 12.75GHz			-30	dBm
	1.8GHz to 1.9GHz			-47	dBm
	5.15 to 5.3GHz			-47	dBm

### 3.7.1.5 Bluetooth EDR Receiver Specifications

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.

**Table 3-61. Enhanced data rate receiver specifications**

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency range		2,402	-	2,480	MHz
Receiver sensitivity	$\pi/4$ DQPSK (BER < 0.01%)	-	-91.5	-70	dBm
	8PSK (BER < 0.01%)	-	-86	-70	dBm
Max. usable signal	$\pi/4$ DQPSK (BER < 0.1%)	-20	-3	-	dBm
	8PSK (BER < 0.1%)	-20	-3	-	dBm

Parameter	Description	Min.	Typ.	Max.	Unit
C/I co-channel	$\pi/4$ DQPSK (BER < 0.1%)	-	8	13	dB
	8PSK (BER < 0.1%)	-	14	21	dB
C/I 1MHz	$\pi/4$ DQPSK (BER < 0.1%)	-	-12	0	dB
	8PSK (BER < 0.1%)	-	-7	5	dB
C/I 2MHz	$\pi/4$ DQPSK (BER < 0.1%)	-	-36	-30	dB
	8PSK (BER < 0.1%)	-	-33	-25	dB
C/I $\geq 3$ MHz	$\pi/4$ DQPSK (BER < 0.1%)	-	-44	-40	dB
	8PSK (BER < 0.1%)	-	-43	-33	dB
C/I image channel	$\pi/4$ DQPSK (BER < 0.1%)	-	-30	-7	dB
	8PSK (BER < 0.1%)	-	-25	0	dB
C/I image 1MHz	$\pi/4$ DQPSK (BER < 0.1%)	-	-47	-20	dB
	8PSK (BER < 0.1%)	-	-41	-13	dB

### 3.7.1.6 Bluetooth EDR Transmitter Specifications

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.

**Table 3-72. Enhanced data rate transmitter specifications**

Parameter	Description		Min.	Typ.	Max.	Unit
Frequency range			2,402		2,480	MHz
Output power	$\pi/4$ DQPSK			3		dBm
	8PSK			3		dBm
Relative transmit power	$\pi/4$ DQPSK		-4	-1.5	1	dB
	8PSK		-4	-1.5	1	dB
Frequency stability	$\omega_0$	$\pi/4$ DQPSK	-10	3	10	kHz
		8PSK	-10	3	10	kHz
	$\omega_i$	$\pi/4$ DQPSK	-75	3	75	kHz
		8PSK	-75	3	75	kHz
	$ \omega_0+\omega_i $	$\pi/4$ DQPSK	-75	4	75	kHz
		8PSK	-75	4	75	kHz
Modulation accuracy	RMS DEVM	$\pi/4$ DQPSK	-	4	20	%
		8PSK	-	4	13	%
	99% DEVM	$\pi/4$ DQPSK	-	8	30	%
		8PSK	-	8	20	%
	Peak DEVM	$\pi/4$ DQPSK	-	9	35	%
		8PSK	-	13	25	%
In-band spurious	$\pm 1$ MHz offset	$\pi/4$ DQPSK		-32	-26	dB

Parameter	Description		Min.	Typ.	Max.	Unit
emission		8PSK		-30	-26	dB
	±2MHz offset	π/4 DQPSK		-28	-20	dBm
		8PSK		-28	-20	dBm
	±3MHz offset	π/4 DQPSK		-42	-40	dBm
		8PSK		-42	-40	dBm

### 3.7.1.7 Bluetooth LE Receiver Specifications

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.

**Table 3-83. Bluetooth LE receiver specifications**

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency range		2,402		2,480	MHz
Receiver sensitivity (*)	PER < 30.8%		-95.5	-70	dBm
Max. usable signal	PER < 30.8%	-10	-4		dBm
C/I co-channel	Co-channel selectivity (PER < 30.8%)		4	21	dB
C/I 1MHz	Adjacent channel selectivity (PER < 30.8%)		-12	15	dB
C/I 2MHz	2 <sup>nd</sup> adjacent channel selectivity (PER < 30.8%)		-30	-17	dB
C/I ≥ 3MHz	3 <sup>rd</sup> adjacent channel selectivity (PER < 30.8%)		-33	-27	dB
C/I Image channel	Image channel selectivity (PER < 30.8%)		-25	-9	dB
C/I Image 1MHz	1MHz adjacent to image channel selectivity (PER < 30.8%)		-35	-15	dB
Out-of-band blocking	30MHz to 2,000MHz			-30	dBm
	2,001MHz to 2,339MHz			-35	dBm
	2,501MHz to 3,000MHz			-35	dBm
	3,001MHz to 12.75GHz			-30	dBm

### 3.7.1.8 Bluetooth LE Transmitter Specifications

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.

**Table 3-94. Bluetooth LE transmitter specifications**

Parameter	Description	Min.	Typ.	Max.	Unit
Frequency range		2,402	-	2,480	MHz
Output power(*)	At max. power output level	-20	-1	6	dBm
Carrier frequency offset and drift	Frequency offset	-150	-2	150	kHz
	Frequency drift	-50	2	50	kHz
	Max. drift rate	-20	3	20	Hz/us
Modulation characteristic	$\Delta f_{1_{avg}}$	225	251	275	kHz
	$\Delta f_{2_{max}}$ (For at least 99% of all $\Delta f_{2_{max}}$ )	185	215		kHz
	$\Delta f_{2_{avg}}/\Delta f_{1_{avg}}$	0.8	0.88		
In-band spurious emission	$\pm 2M$ offset		-50	-20	dBm
	$>\pm 3MHz$ offset		-54	-30	dBm

(\*): Chip RF terminals

### 3.7.2 Wi-Fi/BT Tx

The circuits in the Tx path of MT6627 are shared between Wi-Fi and Bluetooth to achieve minimum area. The data are digitally modulated in the baseband processor from the companion chip, then up-converted to 2.4GHz RF channels through the DA converter, filter, IQ up-converter and power amplifier. The power amplifier is capable of transmitting 19dBm CCK power and 6dBm BDR power for Bluetooth class 1 operation.

### 3.7.3 Wi-Fi/BT Rx

For Bluetooth, MT6627 uses a low IF receiver architecture. An image-rejecting mixer down-converts the RF signal to the IF with the LO from the synthesizer, which supports different clock frequencies. The mixer output is then converted to digital signal, down-converted to baseband for demodulation. A fast AGC enables the effective discovery of device within the dynamic range of the receiver.

For Wi-Fi, a direct down-conversion receiver architecture is used, which includes a high linearity and low noise figure LNA, and a quadrature passive mixer and a bandwidth-programmable low-pass filter with DC offset cancellation embedded.

### 3.7.4 Wi-Fi/BT Sx

A fractional-N frequency synthesizer is implemented to support both Wi-Fi and Bluetooth LO signal. The frequency synthesizer is capable of supporting various crystal clock frequencies. VCO operates at 2.5 times of RF frequency to avoid any coupling with RF front-end circuitry. An LO generation is employed to divide the VCO signal by 2.5 and generate I/Q quadrature signals.

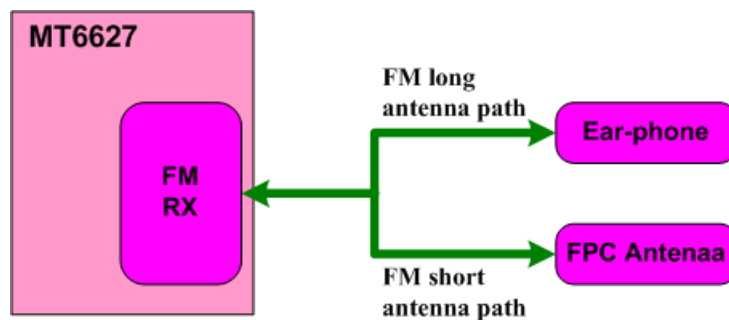
## 3.8 FM

### 3.8.1 FM Radio Descriptions

FM radio subsystem integrates complete receiver supporting 65-108 MHz bands with 50kHz tuning step. MT6627 performs fast channel seek/scan algorithm to validate 206 carrier frequencies (87.5 ~ 108MHz) in 6 seconds. In addition to receiving FM audio broadcasting, the digital RDS/RBDS data system is supported as well. The integrated FM receiver utilizes state-of-the-art digital demodulation/modulation technique to achieve excellent performance.

In order to achieve high SINAD, good sensitivity and excellent noise suppression, the FM receiver adopts adaptive demodulation scheme to optimize the Rx system performance in all ranges of signal quality by referring to the Channel Quality Index (CQI). When receiving poor signals, MT6627 not only enhances the ACI rejection capability but also soft-mutes annoying noise to provide good perception quality.

The FM radio subsystem supports long antenna, which is usually in the earphone on the mobile device and short antenna, which is usually a FPC short antenna or shared antenna with GSM.



**Figure 3-7. Long/short antenna application scenario**

#### 3.8.1.1 FM Specifications

Unless otherwise stated, all receiver characteristics are applicable to both long and short antenna ports when operated under the recommended operating conditions. Typical specifications are for channel 98MHz, default register settings and under recommended operating conditions. The min./max. specifications are for extreme operating voltage and temperature conditions, unless otherwise stated.

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.

**Table 3-10. FM current consumption**

Description	Condition	Min.	Typ.	Max.	Unit
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Description	Condition	Min.	Typ.	Max.	Unit
Input frequency range		65		108	MHz
Sensitivity (long antenna) <sup>1,3</sup>	SINAD = 26dB, unmatched		3		dB $\mu$ Vemf
	SINAD = 26dB, matched		2		dB $\mu$ Vemf
RDS sensitivity (long antenna)	$\Delta f$ = 2kHz, BLER < 5%, unmatched		18		dB $\mu$ Vemf
RDS sensitivity (short antenna)	$\Delta f$ = 2kHz, BLER < 5%, unmatched		19		dB $\mu$ Vemf
LNA input resistance <sup>4</sup>	Antenna port		2.4k		Ohm
LNA input capacitance <sup>4</sup>	Antenna port		8		pF
AM suppression <sup>1,4</sup>	m = 0.3		60		dB
Adjacent channel selectivity <sup>1,4</sup>	$\pm 200$ kHz		53		dB
Alternate channel selectivity <sup>1,4</sup>	$\pm 400$ kHz		66		dB
Spurious response rejection <sup>4</sup>	In-band		55		dB
Maximum input level				130	dB $\mu$ Vemf
Audio mono SINAD <sup>1,3,4</sup>		56	60		dB
Audio stereo SINAD <sup>2,3,4</sup>		51	55		dB
Audio stereo separation <sup>4</sup>	$\Delta f$ = 75kHz		45		dB
Audio output load resistance	Single-ended at AFR/AFL outputs		10k		Ohm
Audio output load capacitance	Single-ended at AFR/AFL outputs		12.5		pF
Audio output voltage <sup>1,4</sup>	At AFR/AFL outputs		80		mVrms
Audio output THD <sup>1,4</sup>			0.05	0.1	%
Audio output frequency range	3dB corner frequency	30		15k	Hz
<sup>1</sup> $\Delta f$ = 22.5kHz, fm = 1kHz, mono, L = R					
<sup>2</sup> $\Delta f$ = 22.5kHz, fm = 1kHz, 50 s de-emphasis, stereo					
<sup>3</sup> A-weighting, BW = 300Hz to 15kHz					
<sup>4</sup> Vin = 60dB $\mu$ Vemf					
<sup>5</sup> Reference clock accuracy assumes ideal FM source. If the input FM source has less frequency error, it is recommended to use a reference clock of accuracy within $\pm 100$ ppm so as not to affect the quality of channel scan.					

Description	Performance	
	Typ.	Unit
FM receive	13	mA

## 3.9 GPS

### 3.9.1 GPS Radio Descriptions

The GPS RF consists of a low-IF receiver and a fractional-N frequency synthesizer. GPS LO is set to 1571.42MHz resulting in an IF frequency of 4.0MHz, with the baseband filter configured as complex BPF. All RF/analog blocks operate under a 1.3V supply voltage.

#### 3.9.1.1 GPS Specifications

Note:

- (1) The specification value is valid at room temperature (25°C).
- (2) All specifications are measured at the RF port unless otherwise specified.

**Table 3-11. GPS RF specifications**

Parameter	Condition	Min.	Typ.	Max.	Unit
RF input frequency			1575.42		MHz
LO frequency	LO frequency is 4.0MHz lower than RF		1571.42		MHz
LO leakage	Measured at balun matching network input at LNA high gain		-70		dBm
Input return loss	Single-ended input and external matched to 50 source using balun matching network for all gain	-10			dB
Gain (Av) (Note 1)	High current mode with max. PGA gain	79.5	77.5	75.5	dB
PGA Gain range			24		dB
PGA Gain step			2		dB
Gain compression	Blocker -24.5dBm CW at 1710MHz, relative to uncompressed gain, max. PGA gain		1	2	dB
NF	High current mode with max PGA gain		4		dB
NF under compression	Blocker -24.5dBm CW at 1,710MHz, max gain		9	12	dB
Input IP3, inband	max gain, 5M/10M offset@-60dBm	-33	-28		dBm
Input IP3, outband	max gain, ~2000M/2400M@-40dBm	-13	-8		dBm
Input IP2, outband	max gain, ~800M/2400M@-40dBm	+32	+37		dBm
Input P1 dB, inband	PGA gain=0dB, offset 500k	-56	-53		
Frequency response, relative to 4.0MHz, (GPS)	At offset +-3MHz		-12/-6		
	At offset +-10MHz		-40/-34		
	At offset +-20MHz		-60/-54		
	At offset +-100MHz		-100/-94		
Gain ripple, GPS	4.0+-1MHz		1.0	1.5	dB
Delay ripple, GPS	4.092+-1MHz		60	110	ns
Image rejection	All modes		35		dB

Parameter	Condition	Min.	Typ.	Max.	Unit
DC offset			±50	±100	mV
Rx current			7.2		mA

### 3.9.1.2 GPS Block Diagram

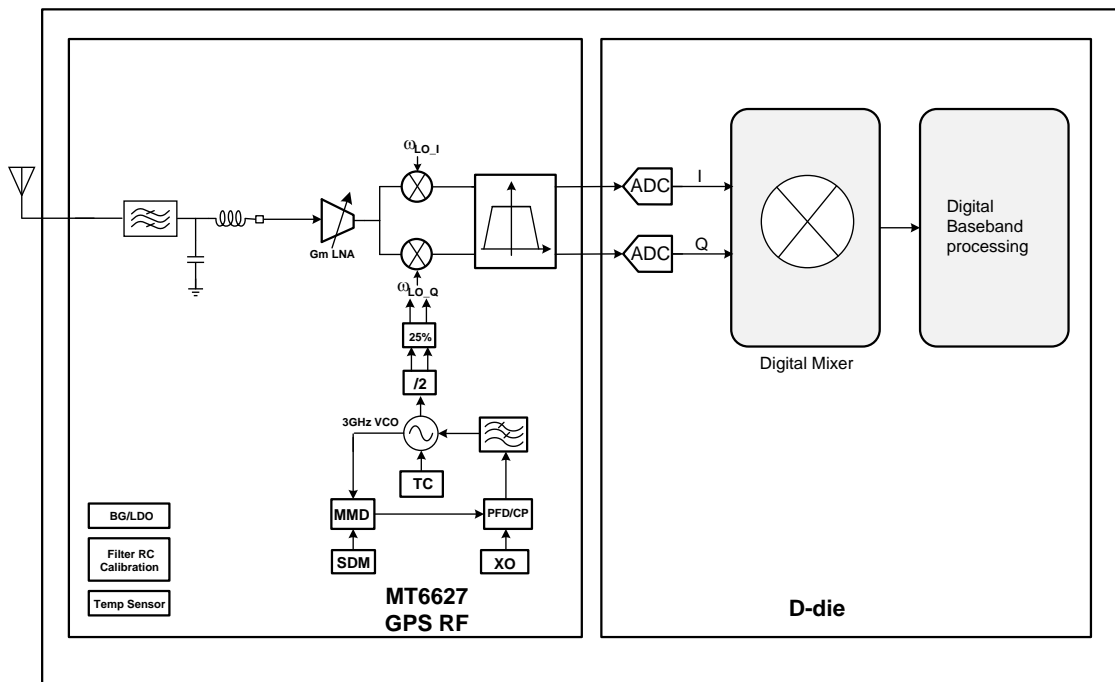


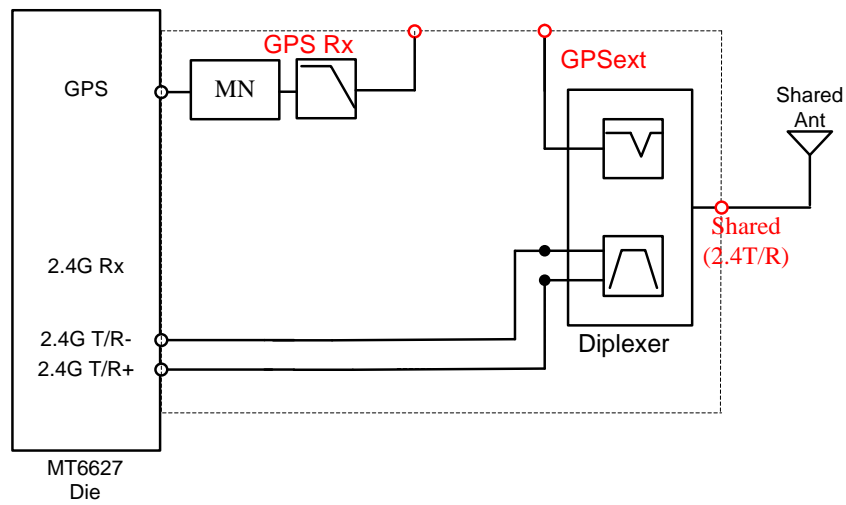
Figure 3-8. GPS block diagram

## 3.10 IPD

### 3.10.1 IPD Block Diagram

#### Integrated matching networks and filter functions

- Integrated 1.6GHz/2.4GHz diplexer
- Integrated ISM balun-filter
- Diplexer-GPS path provides isolation to ISM band (0.85dB IL from antenna port to GPS port).
- GPS LPF provides filtering for co-existence.
- Diplexer-GPS port can be open for ISM filter only.
- IPD configuration supports single and dual antenna.



**Figure 3-9. IPD block diagram**

## 4 Mechanical Information

### 4.1 Device Physical Dimension/Part Number

MT6627 uses QFN40 package. The physical dimension is shown in Figure 4-1. MT6627's top view and part number information are shown in Figure 4-2.

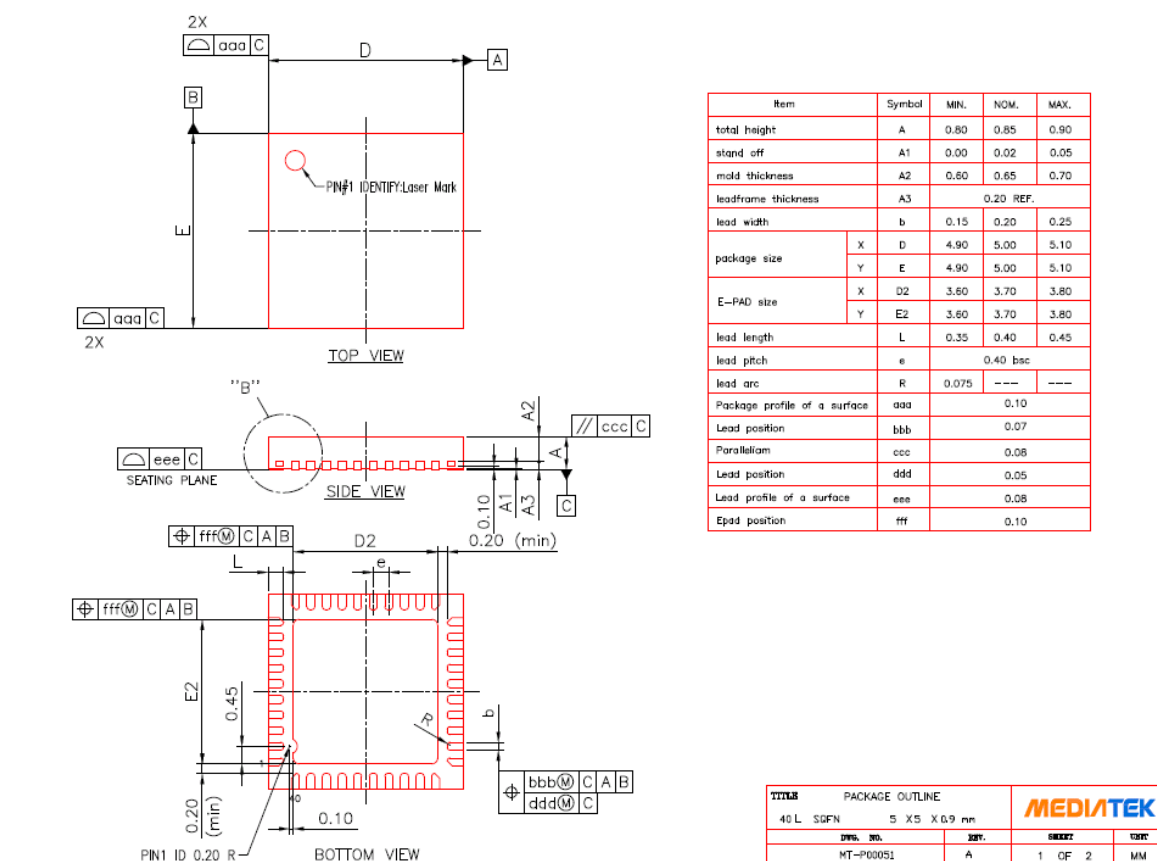


Figure 4-1. Physical dimension of MT6627

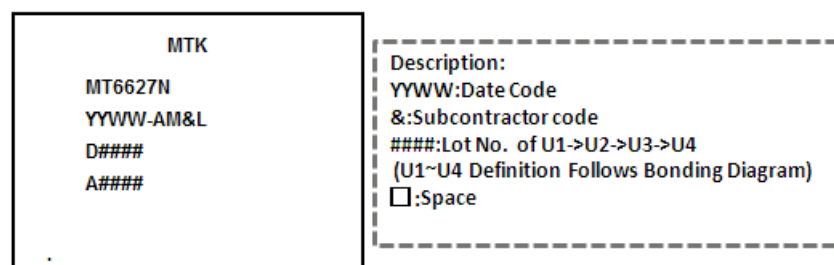


Figure 4-2. Top view of MT6627

**ESD CAUTION**

MT6627 is ESD (electrostatic discharge) sensitive device and may be damaged with ESD or spike voltage. Although MT6627 is with built-in ESD protection circuitry, please handle with care to avoid the permanent malfunction or the performance degradation.