Product Specification

Product Name: Multi-protocol Cloud Module

Model Name: DSM-04D

Revision History

Specification		Sect.	Update Description	By
Rev	Date			
1.0	2022-11-2		New version release	Li

Approvals

Organization	*Name*	*Title*	*Date*

1 Introduction

1.1 Purpose& Description

DSM-04D is a low power-consuming embedded Zigbee/matter/BLE module developed By Dusun. It consists of the highly integrated wireless radio processor chip, EFR32MG24A020F1536IM40-B, and several peripherals, with a built-in 802.15.4 PHY/MAC Zigbee/matter/BLE network protocol stack and robust library functions.

This data terminal device is embedded with a low power-consuming 32-bit ARM Cortex-M33 core, 1024/1536 KB flash memory, 256 KB RAM data memory, and robust peripheral resources. Besides, it runs on the Free RTOS platform that integrates all Zigbee/matter/BLE MAC library functions. You can develop built-in Zigbee/matter/BLE products as required.

1.2 Product Feature Summary

- Low Power Wireless System-on-Chip
  - High Performance 32-bit 78 MHz ARM Cortex®-M33 with DSP instruction and floating-point unit for efficient signal processing
  - Up to 1536 kB flash program memory
  - Up to 256 kB RAM data memory
  - 2.4 GHz radio operation
  - Matrix Vector Processor for AI/ML acceleration
- Radio Performance
  - -105.4 dBm sensitivity @ 250 kbps O-QPSK DSSS
  - -105.7 dBm sensitivity @ 125 kbps GFSK
  - -97.6 dBm sensitivity @ 1 Mbps GFSK
  - -94.8 dBm sensitivity @ 2 Mbps GFSK
  - TX power up to 19.5 dBm
- Working voltage: 2.0 V to 3.8 V
- Working temperature: –40°C to +85°C
- Low System Energy Consumption
  - 4.4 mA RX current (1 Mbps GFSK)
  - 5.1 mA RX current (250 kbps O-QPSK DSSS)
  - 5 mA TX current @ 0 dBm output power
  - 19.1 mA TX current @ 10 dBm output power
  - 156.8 mA TX current @ 19.5 dBm output power
  - 33.4 µA/MHz in Active Mode (EM0) at 39.0 MHz
  - 1.3 µA EM2 Deep Sleep current (16 kB RAM retention and RTC running from LFRCO)
- Protocol Support
  - Matter
  - Open Thread
  - Zigbee
  - Bluetooth Low Energy (BLE 5.3)
  - Bluetooth Mesh
  - Proprietary 2.4 GHz
  - Multiprotocol
- Dimension: 17 x 22 x 2.8 mm

- Certification CE, FCC, SRRC

1.3 Scenario

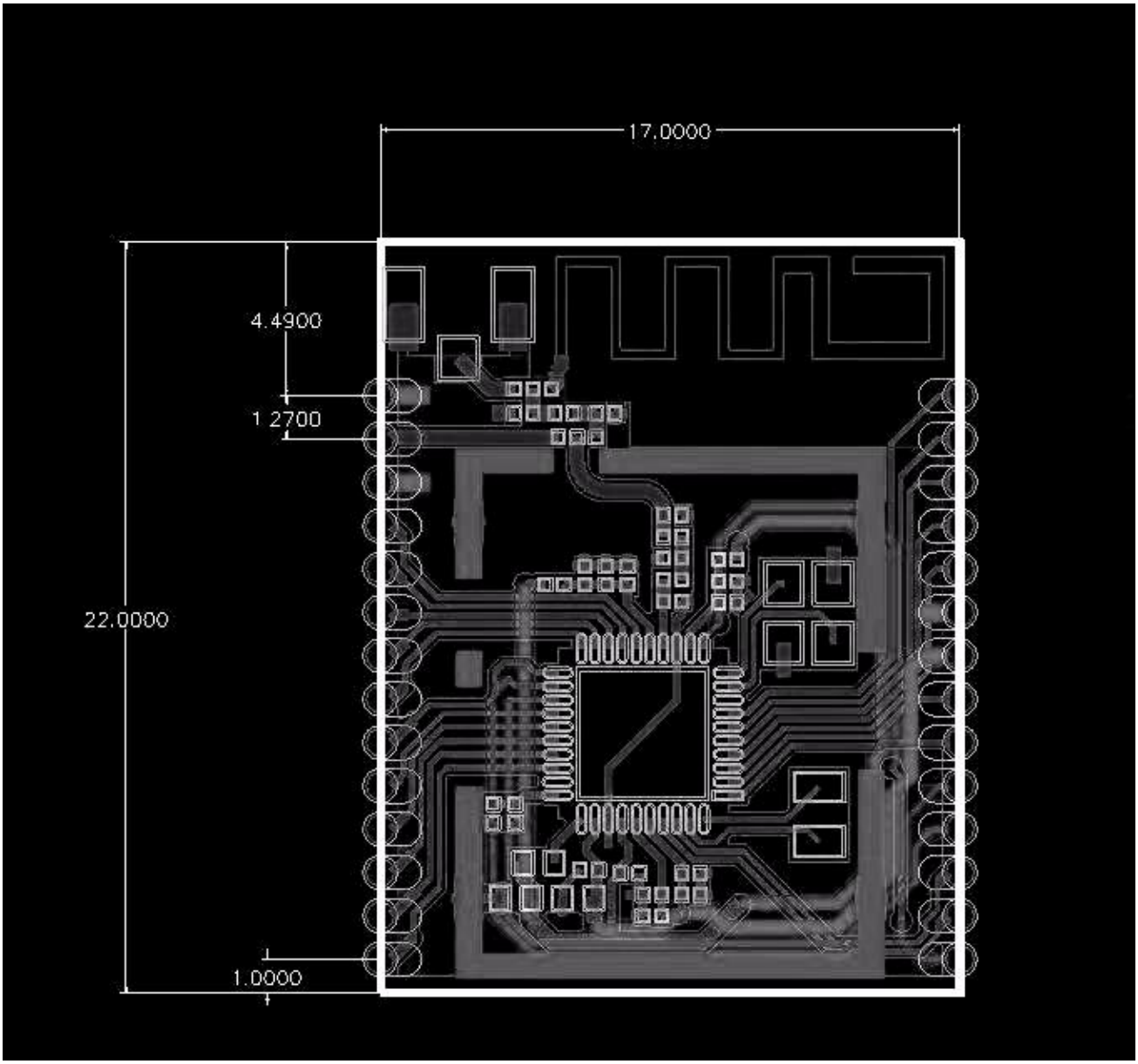
- Intelligent Building
- Intelligent Home And Household Applications
- Intelligent Socket And Smart Lighting
- Industrial Wireless Control
- Baby Monitor
- IP Camera
- Intelligent Public Traffic

2 Mechanical Requirement

2.1 Drawing

2.2 Dimensions

DSM-04D provides two rows of pins(2 *14) with the pin pitch of 1.27±0.1mm
Dimensions: 17±0.35 mm (W) x 22±0.35 mm (L) x 2.8±0.15 mm (H).



2.3 Pin Definition

Pin Number	Symbol	IO Type	Function
1	GND	P	Power supply reference ground pin
2	ANT	RF	RF signal input/output port, which corresponds to ANT of IC
3	GND	P	Power supply reference ground pin
4	PB04	I/O	Corresponding to PB04 of IC
5	PB03	I/O	Corresponding toPB03 of IC

6	PB02	I/O	Corresponding to PB02 of IC
7	PB01	I/O	Corresponding to PB01 of IC
8	PB00	I/O	Corresponding to PB00 of IC
9	PA00	I/O	Corresponding to PA00 of IC
10	PA03	I/O	Corresponding to PA03 of IC
11	PA04	I/O	Corresponding to PA04 of IC
12	PA05	I/O	Corresponding to PA05 of IC
13	PA06	I/O	Corresponding to PA06 of IC
14	PA07	I/O	Corresponding to PA07 of IC
15	RESET	I	Corresponding to reset of IC
16	PD03	I/O	Corresponding to PD03 of IC
17	PD02	I/O	Corresponding to PD02 of IC
18	SWCLK	I/O	Corresponding to SWCLKof IC
19	SWDIO	I/O	Corresponding to SWDIO of IC
20	PC00	I/O	Corresponding to PC00 of IC
21	PC01	I/O	Corresponding toPC01of IC
22	VCC	P	Power supply pin (3.3V)
23	GND	P	Power supply reference ground pin
24	PC02	I/O	Corresponding to PC02 of IC
25	PC03	I/O	Corresponding to PC03of IC
26	PC04	I/O	Corresponding to PC04 of IC
27	PC05	I/O	Corresponding toPC05of IC
28	PC06	I/O	Corresponding toPC06of IC

- P indicates power supply pins, I/O indicates input/output pins, and AI indicates analog input pins.

3 Electrical parameters

3.1 Absolute electrical parameters

Parameter	Description	Min.	Max.	Unit
Ts	Storage temperature	-40	85	℃
VCC	Power supply voltage	2.0	3.8	V

Static electricity voltage (human body model)	TAMB-25℃	-	2	KV
Static electricity voltage (machine model)	TAMB-25℃	-	0.5	KV

3.2 Working conditions

Parameter	Description	Min.	Typ.	Max.	Unit
Ta	Working temperature	-40	-85	-	℃
VCC	Power supply voltage	2.0	3.0	3.8	V
VIL	I/O low-level input	-	I0VDD*0.3		V
VIH	I/O high-level input	I0VDD*0.7	-	-	V
VOL	I/O low-level output	-	I0VDD*0.2	-	V
VOH	I/O high-level output	I0VDD*0.8	-	-	V

3.3 Radio current consumption at 3.0V

Working status	TX Power/ Receiving	Typ.	Max.	Unit
I_{TX}	f=2.4GHz, CW, 0dBm PA, 0dBm output power, VSCALE2	6	-	mA
	f=2.4GHz, CW, 10dBm PA, 10dBm output power, VSCALE2	20	-	mA
	f=2.4GHz, CW, 20dBm PA,19.5dBm output power,VSCALE2, VREGVDD = PAVDD= 3.3 V	158	-	mA
I_{RX}	125 kbit/s, 2GFSK, f = 2.4 GHz,VSCALE2	5.5	-	mA
	500 kbit/s, 2GFSK, f = 2.4 GHz,VSCALE2	5.5	-	mA
	1 Mbit/s, 2GFSK, f = 2.4 GHz,VSCALE2	5	-	mA
	2 Mbit/s, 2GFSK, f = 2.4 GHz,VSCALE2	6	-	mA
	802.15.4 receiving frame, f = 2.4GHz, VSCALE2	6	-	mA

3.4 MCU current consumption at 3.0 V

Working mode	Working status (Ta = 25℃)	Average	Max.	Unit
Current consumption in EM0mode with all peripherals dis-abled	78 MHz HFRCO w/ DPLL referenced to 39 MHz crystal, CPU running Core Mark loop from flash,VSCALE2	34	-	uA/MHz
Current consumption in EM1mode with all peripherals dis-abled	78 MHz HFRCO w/ DPLL referenced to 39 MHz crystal,VSCALE2	23	-	uA/MHz
Current consumption in EM2mode, VSCALE0	256 kB RAM and full Radio RAM retention, RTC running fromLFXO[1]	3	-	uA/MHz
Current consumption in EM3mode, VSCALE0	256 kB RAM and full Radio RAM retention, RTC running fromULFRCO[1]	3	-	mA

Note:

1. CPU cache retained, EM0/1 peripheral states retained

4 RF features

4.1 Basic RF feature

Parameter	Description
Frequency band	2.412~2.484GHz
Protocol standard	Zigbee 3.0/BLE 5.3/Matter/ Open Thread/ Proprietary 2.4 GHz
Antenna type	PCB antenna with a gain of 0.5dBi. IPEX (optional)

4.2 RF Transmitter Characteristics

4.2.1 RF Transmitter General Characteristics for the 2.4 GHz Band

Parameter	Test Condition	Min.	Typ.	Max.	Unit
RF tuning frequency range		2400	-	2483.5	MHz
Max. output power[2]	20 dBm PA, PAVDD = 3.3 V	-	19.5	-	dBm
Min. output power	20 dBm PA, PAVDD = 3.3 V	-	-34	-	dBm
Output power variation vs supply voltage variation, frequency=2450MHz	20 dBm PA P_{out} = $POUT_{MAX}$ out-put power with PAVDD voltage swept from 3.0 V to 3.8 V	-	0.75	-	dB
Output power variation vs temperature, Frequency=2450 MHz	PAVDD = 3.3 V supply, 20 dBm PA at $POUT_{MAX}$, (-40 to +125 °C)	-	0.7	-	dB
Output power variation vs RF frequency	20 dBm PA, $POUT_{MAX}$, PAVDD =3.3 V	-	0.17	-	dB
Spurious emissions of harmonics in restricted bands per FCC Part 15.205/15.209	Continuous transmission of CW carrier, P_{out}=$POUT_{MAX}$, Test Frequency=2450MHz.	-	-47	-	dBm
Spurious emissions of harmonics in non-restricted bands per FCC Part15.247/15.35	Continuous transmission of CW carrier. P_{out} = $POUT_{MAX}$. Test Frequency = 2450 MHz	-	-26	-	dBc
Spurious emissions out-of-band (above 2.483 GHz or below 2.4 GHz) in restricted bands, per FCC part15.205/15.209	Restricted bands 30-88MHz,Continuous transmission of CW carrier, P_{out}=$POUT_{MAX}$, Test Frequency = 2450 MHz	-	-61	-	dBm
	Restricted bands 88-216MHz,Continuous transmission of CW carrier, P_{out} = $POUT_{MAX}$, Test Frequency = 2450 MHz	-	-58	-	dBm
	Restricted bands 216-960MHz,Continuous transmission of CW carrier, P_{out} = $POUT_{MAX}$, Test Frequency = 2450 MHz	-	-55	-	dBm
	Restricted bands>960MHz, Continuous transmission of CW carrier, P_{out}= $POUT_{MAX}$, Test Frequency = 2450 MHz	-	-47	-	dBm

Spurious emissions out-of-band in non-restricted bands per FCC Part 15.247	Frequencies above 2.483GHz or below 2.4GHz,continuous transmission CW carrier, P_{out}=$POUT_{MAX}$, Test Frequency=2450 MHz	-	-26	-	dBm
Spurious emissions per ETSIEN300.440	47-74 MHz,87.5-108 MHz,174-230 MHz, 470-862 MHz, P_{out}= 10 dBm, Test Frequency = 2450MHz	-	-60	-	dBm
	25-1000 MHz, excluding above frequencies. P_{out} = 10 dBm, Test Frequency = 2450 MHz	-	-42	-	dBm
	1G-14G, P_{out} = 10 dBm, Test Frequency = 2450 MHz	-	-36	-	dBm
Spurious emissions out-of-band, per ETSI 300.328	[2400-2BW to 2400-BW],[2483.5+BW to 2483.5+2BW],P_{out} = 10 dBm, Test Frequency =2450 MHz	-	-26	-	dBm
	47-74 MHz, 87.5-118 MHz,174-230 MHz, 470-862 MHz, P_{out}= 10 dBm, Test Frequency = 2450MHz	-	-60	-	dBm
	30-47 MHz, 74-87.5 MHz,118-174 MHz, 230-470MHz,862-1000 MHz , P_{out}=10dBm,Test Frequency=2450 MHz	-	-42	-	dBm
	1G-12.75 GHz, excluding bands listed above, P_{out}=10dBm, Test Frequency = 2450 MHz	-	-36	-	dBm
	[2400-BW to 2400], [2483.5 to2483.5+BW] P_{out}=10dBm, Test Frequency=2450 MHz	-	-16	-	dBm
Frequency error		-15	-	15	ppm

Note:

1. Supply current to radio, supplied by DC-DC with 3.0 V, measured at VREGVDD.
2. Supported transmit power levels are determined by the ordering part number (OPN). Transmit power ratings for all devices covered in this data sheet can be found in the Max TX Power column of the Ordering Information Table.
3. The PA is capable of delivering higher than 10 dBm output power (refer to Output Power plots in 4.27.2 RF Characteristics). How-ever, all transmitter characteristics and recommended application circuits are specified at 10 dBm output. If used with the recommended application circuits above 10 dBm, harmonics may be higher than regulatory limits.

4.2.2 RF Transmitter Characteristics for 802.15.4 DSSS-OQPSK in the 2.4 GHz Band

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Error vector magnitude per802.15.4-2011(EVM)	Average across frequency, signal is DSSS-OQPSK reference pack-et, PAVDD=3.3 V, Pout=POUTMAX	-	-3	-	% rms
Power spectral density limit	Relative, at carrier ±3.5MHz,PAVDD=3.3V, Pout=$POUT_{MAX}$	-	-50.2	-	dBc/100kHz
Occupied channel bandwidth per ETSI EN300.328	99% BW at highest and lowest channels in band, Pout=10dBm	-	2.2	-	MHz

Note: 1.Per Bluetooth Core_5.1, Vol.6 Part A, Section 3.2.2, exceptions are allowed in up to three bands of 1 MHz width, centered on a frequency which is an integer multiple of 1 MHz. These exceptions shall have an absolute value of -20 dBm or less

4.2.3 RF Transmitter Characteristics for Bluetooth Low Energy in the 2.4 GHz Band 1 Mbps Data Rate

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Transmit 6 dB bandwidth	PAVDD=3.3 V, P_{out}=$POUT_{MAX}$	-	-718	-	KHz
Power spectral density limit	PAVDD=3.3 V, P_{out}=$POUT_{MAX}$, Per FCC part 15.24	-	-0.5	-	dBm/3kHz
Occupied channel bandwidth per ETSI EN300.328	P_{out}=10dBm 99% BW at highestand lowest channels in band	-	1	-	MHz
In-band spurious emissions, with allowed exceptions1	PAVDD=3.3V, P_{out}=$POUT_{MAX}$, Inband spurs at ± 2 MHz	-	-26	-	dBm
Note: 1.Per Bluetooth Core_5.1, Vol.6 Part A, Section 3.2.2, exceptions are allowed in up to three bands of 1 MHz width, centered on afrequency which is an integer multiple of 1 MHz. These exceptions shall have an absolute value of -20 dBm or less					

4.2.4 RF Transmitter Characteristics for Bluetooth Low Energy in the 2.4 GHz Band 2 Mbps Data Rate

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Transmit 6 dB bandwidth	PAVDD=3.3V, P_{out}=$POUT_{MAX}$	-	-1307	-	KHz
Power spectral density limit	PAVDD=3.3V, P_{out}=$POUT_{MAX}$, Per FCC part 15.24	-	-1.5	-	dBm/3kHz
Occupied channel bandwidth per ETSI EN300.328	P_{out}=10dBm 99% BW at highestand lowest channels in band	-	2.1	-	MHz
In-band spurious emissions, with allowed exceptions1	PAVDD=3.3 V, P_{out}=$POUT_{MAX}$, Inband spurs at ± 2 MHz	-	-33	-	dBm
Note: 1.Per Bluetooth Core_5.1, Vol.6 Part A, Section 3.2.2, exceptions are allowed in up to three bands of 1 MHz width, centered on a frequency which is an integer multiple of 1 MHz. These exceptions shall have an absolute value of -20 dBm or less					

4.2.5 RF Transmitter Characteristics for Bluetooth Low Energy in the 2.4 GHz Band 500 kbps Data Rate

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Transmit 6 dB bandwidth	PAVDD=3.3 V, P_{out}=$POUT_{MAX}$	-	-717	-	KHz
Power spectral density limit	PAVDD=3.3 V, P_{out}=$POUT_{MAX}$, Per FCC part 15.24	-	-0.5	-	dBm/3kHz
Occupied channel bandwidth per ETSI EN300.328	P_{out}=10dBm 99% BW at highestand lowest channels in band	-	1	-	MHz
In-band spurious emissions,	PAVDD=3.3 V, P_{out}=$POUT_{MAX}$, Inband spurs	-	-26	-	dBm

with allowed exceptions1	at ± 2 MHz				
Note: 1.Per Bluetooth Core_5.1, Vol.6 Part A, Section 3.2.2, exceptions are allowed in up to three bands of 1 MHz width, centered on a frequency which is an integer multiple of 1 MHz. These exceptions shall have an absolute value of -20 dBm or less					

4.2.6 RF Transmitter Characteristics for Bluetooth Low Energy in the 2.4 GHz Band 125 kbps Data Rate

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Transmit 6 dB bandwidth	PAVDD=3.3 V, P_{out}=$POUT_{MAX}$	-	-651	-	KHz
Power spectral density limit	PAVDD=3.3 V, P_{out}=$POUT_{MAX}$, Per FCC part 15.24	-	-14	-	dBm/3kHz
Occupied channel bandwidth per ETSI EN300.328	P_{out}=10dBm 99% BW at highestand lowest channels in band	-	1	-	MHz
In-band spurious emissions, with allowed exceptions1	PAVDD=3.3 V, P_{out}=$POUT_{MAX}$, Inband spurs at ± 2 MHz	-	-26	-	dBm
Note: 1.Per Bluetooth Core_5.1, Vol.6 Part A, Section 3.2.2, exceptions are allowed in up to three bands of 1 MHz width, centered on a frequency which is an integer multiple of 1 MHz. These exceptions shall have an absolute value of -20 dBm or less					

4.3 RF Receiver Characteristics

4.3.1 RF Receiver General Characteristics for the 2.4 GHz Band

Parameter	Test Condition	Min.	Typ.	Max.	Unit
RF tuning frequency range		2400	-	2483.5	MHz
Receive mode Max. spurious emission	30 MHz to 1 GHz	-	-63	-	dBm
	1 GHz to 12 GHz	-	-53	-	dBm
Max spurious emissions during active receive mode, per FCC Part 15.109(a)	216 MHz to 960 MHz, conducted measurement	-	-55	-	dBm
	Above 960 MHz, conducted measurement	-	-47	-	dBm
2GFSK Sensitivity	2 Mbps 2GFSK signal, 1% PER	-	-92.5	-	dBm
	250 kbps 2GFSK signal, 0.1%BER	-	-102.9	-	dBm
Note: 1.Supply current to radio, supplied by DC-DC with 3.0 V					

4.3.2 RF Receiver Characteristics for 802.15.4 DSSS-OQPSK in the 2.4 GHz Band

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Max usable receiver input level, 1% PER	Signal is reference signal[1], packet length is 20 octets	-	10	-	dBm
Sensitivity, 1% PER	Signal is reference signal, packet length is 20 octets	-	-105	-	dBm
Co-channel interferer rejection, 1% PER	Desired signal 3 dB above sensitivity limit	-	-0.7	-	dB

Adjacent channel rejection, Interferer is reference signal,1% PER, desired is reference signal at 3 dB above reference sensitivity level[2]	Interferer is reference signal at +1channel spacing	-	37	-	dB
	Interferer is reference signal at -1channel spacing	-	37.5	-	dB
Image rejection, 1% PER, desired is reference signal at3 dB above reference sensitivity level2	Interferer is CW in image band3	-	53.5	-	dB
Blocking rejection of all other channels, 1% PER, desired is reference signal at 3 dB above reference sensitivitylevel2, interferer is reference signal	Interferer frequency < desired frequency -3 channel spacing	-	55.3	-	dB
	Interferer frequency > desired frequency +3 channel spacing	-	55.1	-	dB

Note:

1. Reference signal is defined as O-QPSK DSSS per 802.15.4, Frequency range = 2400-2483.5 MHz, Symbol rate = 62.5 ksymbols/s.

2.Reference sensitivity level is -85 dBm.

3.Due to low-IF frequency, there is some overlap of adjacent channel and image channel bands. Adjacent channel CW blocker tests place the Interferer center frequency at the Desired frequency ± 5 MHz on the channel raster, whereas the image rejection test places the CW interferer near the image frequency of the Desired signal carrier, regardless of the channel raster.

4.3.3 RF Receiver Characteristics for Bluetooth Low Energy in the 2.4 GHz Band 1 Mbps Data Rate

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Max usable receiver input level	Signal is reference signal[1]	-	10	-	dBm
Sensitivity	Signal is reference signal, 37 bytepayload[2]	-	-95	-	dBm
Signal to co-channel interferer	(see notes)[1 4]	-	8.7	-	dB
N ± 1 Adjacent channel selectivity	Interferer is reference signal at +1MHz offset[1 5 4 6]	-	-5.4	-	dB
	Interferer is reference signal at -1MHz offset[1 5 4 6]	-	-5.3	-	dB
Selectivity to image frequency	Interferer is reference signal at image frequency with 1 MHz preci-sion[1 6]	-	-23.3	-	dB
Intermodulation performance	n = 3 (see note[7])	-	-17.3	-	dBm

Note:

1.0.017% Bit Error Rate.

2.0.1% Bit Error Rate.

3.With non-ideal signals as specified in Bluetooth Test Specification RF-PHY.TS.5.0.1 section 4.7.1

4.Desired signal -67 dBm.

5.Desired frequency 2402 MHz ≤ Fc ≤ 2480 MHz.

6.With allowed exceptions.

7.As specified in Bluetooth Core specification version 5.1, Vol 6, Part A, Section 4.4

4.3.4 RF Receiver Characteristics for Bluetooth Low Energy in the 2.4 GHz Band 2 Mbps

Parameter	Test Condition	Min.	Typ.	Max.	Unit

Max usable receiver input level	Signal is reference signal[1]	-	10	-	dBm
Sensitivity	Signal is reference signal, 37 bytepayload[2]	-	-93	-	dBm
Signal to co-channel interferer	(see notes)[1 4]	-	8.6	-	dB
N ± 1 Adjacent channel selectivity	Interferer is reference signal at +1MHz offset[1 5 4 6]		-5.3		dB
	Interferer is reference signal at -1MHz offset[1 5 4 6]		-5.8		dB
Selectivity to image frequency	Interferer is reference signal at image frequency with 1 MHz preci-sion[1 6]	-	-22.8	-	dB
Intermodulation performance	n = 3 (see note[7])	-	-18.3	-	dBm

Note:
1.0.017% Bit Error Rate.
2.0.1% Bit Error Rate.
3.With non-ideal signals as specified in Bluetooth Test Specification RF-PHY.TS.5.0.1 section 4.7.1
4.Desired signal -67 dBm.
5.Desired frequency 2402 MHz ≤ Fc ≤ 2480 MHz.
6.With allowed exceptions.
7.As specified in Bluetooth Core specification version 5.1, Vol 6, Part A, Section 4.4

4.3.5 RF Receiver Characteristics for Bluetooth Low Energy in the 2.4 GHz Band 500 kbps

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Max usable receiver input level	Signal is reference signal[1]	-	10	-	dBm
Sensitivity	Signal is reference signal, 37 bytepayload[2]	-	-99	-	dBm
Signal to co-channel interferer	(see notes)[1 4]	-	2.7	-	dB
N ± 1 Adjacent channel selectivity	Interferer is reference signal at +1MHz offset[1 5 4 6]	-	-7.1	-	dB
	Interferer is reference signal at -1MHz offset[1 5 4 6]	-	-7.4	-	dB
Selectivity to image frequency	Interferer is reference signal at image frequency with 1 MHz preci-sion[1 6]	-	-49	-	dB

Note:
1.0.017% Bit Error Rate.
2.0.1% Bit Error Rate.
3.With non-ideal signals as specified in Bluetooth Test Specification RF-PHY.TS.5.0.1 section 4.7.1
4.Desired signal -67 dBm.
5.Desired frequency 2402 MHz ≤ Fc ≤ 2480 MHz.
6.With allowed exceptions.

4.3.6 RF Receiver Characteristics for Bluetooth Low Energy in the 2.4 GHz Band 125 kbps

Parameter	Test Condition	Min.	Typ.	Max.	Unit
Max usable receiver input level	Signal is reference signal[1]	-	10	-	dBm
Sensitivity	Signal is reference signal, 37 bytepayload[2]	-	-104	-	dBm
Signal to co-channel interferer	(see notes)[1 4]	-	0.9	-	dB
N ± 1 Adjacent channel selectivity	Interferer is reference signal at +1MHz offset[1 5 4 6]	-	-12.4	-	dB
	Interferer is reference signal at -1MHz offset[1 5 4 6]	-	-12.8	-	dB
Selectivity to image frequency	Interferer is reference signal at image frequency	-	-53	-	dB

	with 1 MHz preci-sion[1 6]				

Note:

1.0.017% Bit Error Rate.

2.0.1% Bit Error Rate.

3.With non-ideal signals as specified in Bluetooth Test Specification RF-PHY.TS.5.0.1 section 4.7.1

4.Desired signal -67 dBm.

5.Desired frequency 2402 MHz ≤ Fc ≤ 2480 MHz.

6.With allowed exceptions.

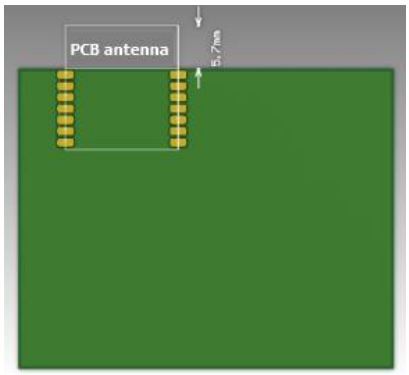
5 Antenna

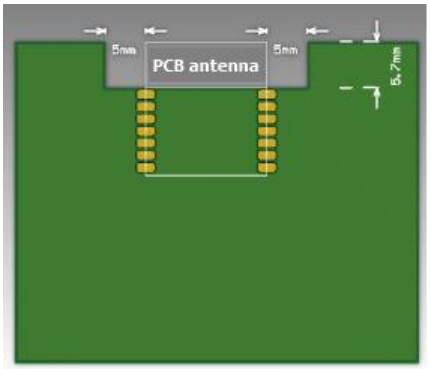
5.1 Antenna type

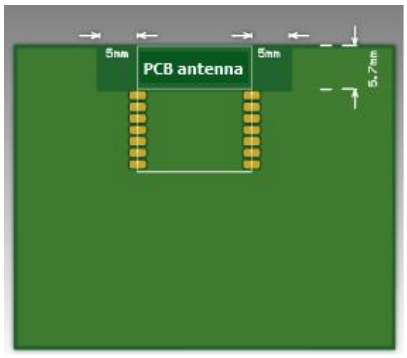
This product uses an onboard PCB antenna, whose gain is 1dBi

5.2 Antenna interference reduction

To ensure optimal RF performance, it is recommended that the antenna be at least 15 mm away from other metal parts. If metal materials are wrapped around the antenna, the wireless signals will be reduced greatly, deteriorating the RF performance.

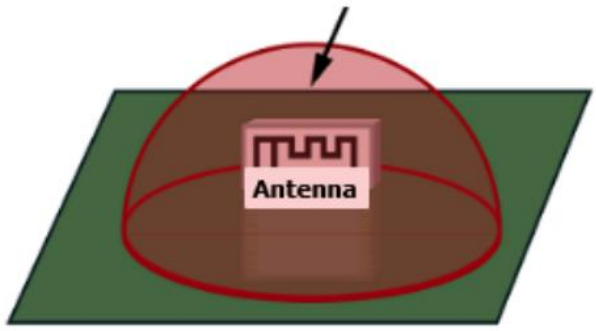






Do not place any metal in the red area above the antenna.

The recommended diameter of the circular arc is greater than 3cm.



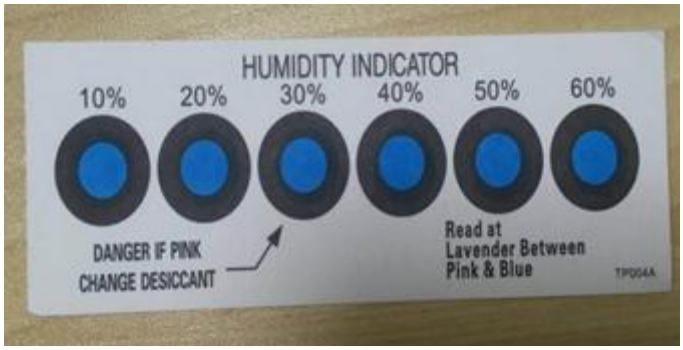
6 Production instructions

1. Use an SMT placement machine to mount components to the stamp hole module that Dusun produces within 24 hours after the module is unpacked and the firmware is burned. If not, vacuum packs the module again. Bake the module before mounting components to the module.

- SMT placement equipment:
  - Reflow soldering machine
  - Automated optical inspection (AOI) equipment
  - Nozzle with a 6 mm to 8 mm diameter
- Baking equipment:
  - Cabinet oven
  - Anti-static heat-resistant trays
  - Anti-static heat-resistant gloves

2. Storage conditions for a delivered module are as follows:

- The moisture-proof bag is placed in an environment where the temperature is below 30℃ and the relative humidity is lower than 70%.
- The shelf life of a dry-packaged product is six months from the date when the product is packaged and sealed.
- The package contains a humidity indicator card (HIC).

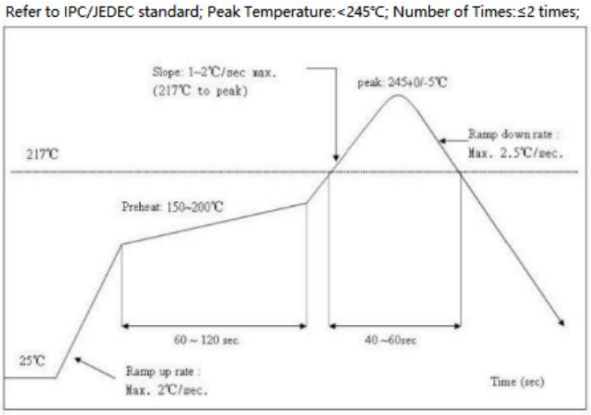


3. Bake a module based on HIC status as follows when you unpack the module package:
   - If the 30%, 40%, and 50% circles are blue, bake the module for 2 consecutive hours.
   - If the 30% circle is pink, bake the module for 4 consecutive hours.
   - If the 30% and 40% circles are pink, bake the module for 6 consecutive hours.
   - If the 30%, 40%, and 50% circles are pink, bake the module for 12 consecutive hours.
4. Baking settings:
   - Baking temperature: 125±5℃
   - Alarm temperature: 130℃
   - SMT placement ready temperature after natural cooling: < 36℃
   - Number of drying times: 1
   - Rebaking condition: The module is not soldered within 12 hours after baking.
5. Do not use SMT to process modules that have been unpacked for over three months.
6. Electroless nickel immersion gold (ENIG) is used for the PCBs. If the solder pads are exposed to the air for over three months, they will be oxidized severely and dry joints or solder skips may occur. Dusun is not liable for such problems and consequences.
7. Before SMT placement, take electrostatic discharge (ESD) protective measures.
8. To reduce the reflow defect rate, draw 10% of the products for visual inspection and AOI before first SMT placement to determine a proper oven temperature and component placement method. Draw 5 to 10 modules every hour from subsequent batches for visual inspection and AOI.

7 Recommended oven temperature curve

Perform SMT placement based on the following reflow oven temperature curve. The highest temperature is 245℃.

Based on the IPC/JEDEC standard, perform reflow soldering on a module at most twice.



8 Storage conditions

9 Ordering information

DSM-04D- 1

Type

Flash size （1=1024KB；2=1536KB）

10 MOQ and packing

Product model	MOQ（pcs）	Packing method	Number of Modules in each reel pack	Number of reel packs in each box
DSM-04D	2800	Carrier tape and reel packing	700	4

FCC Statement

FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

Device is equipped with PCB antenna, Antenna gain 0.5dBi

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.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: 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 or more 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 Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices . This modular cannot be installed in any portable device if without further certification such as C2PC with SAR. This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: 2AWWFDSM-04D Or Contains FCC ID: 2AWWFDSM-04D”

When the module is installed inside another device, the user manual of the host must contain below warning statements;

1. 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;

(2) This device must accept any interference received, including interference that may cause undesired operation.

Note: 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 or more 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.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.
Any company of the host device which install the modular with limit modular approval should perform the test of radiated & conducted emission and spurious emission, etc. according to FCC part 15C : 15.407, 15.247 and 15.209 & 15.207 ,15B Class B requirement, Only if the test result comply with FCC part 15C : 15.407, 15.247 and 15.209 & 15.207 ,15B Class B requirement, then the host can be sold legally.