

EMC3589 Wi-Fi/BLE Module

Integrated Arm Cortex-M55 & Arm Cortex-M23 dual-core processors, Flash memory

Supports dual-band 2.4GHz/5GHz Wi-Fi and BLE 5.0 with extensive peripherals

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2025

Overview

- **Voltage Input: DC 3.0V–3.6V**
- **Operating Temperature: -40°C to 105°C**
- **Processor: Dual-core processor RTL8711DAF**
 - Performance Core KM4: Arm Cortex-M55, operating at up to 345MHz
 - Efficiency Core KM0: Arm Cortex-M23, operating at up to 115MHz
- **Memory**
 - 512KB SRAM: supporting system stack and application functions
 - 4MB XIP Flash
- **Wi-Fi**
 - 802.11 a/b/g/n 1x1 2.4G/5GHz dual-band
 - 802.11n MCS0–7, 40MHz bandwidth
 - Up to 150Mbps data rate
 - Supports Power-Saving operation mechanism
- **Bluetooth**
 - Bluetooth Low Energy (BLE) compliant with 5.0 standard
 - Compliant with Bluetooth LE 1M and 2M
 - Integrated internal Class 1, Class 2, and Class 3 power amplifiers
 - Maximum transmit power: 10 dBm, typical value: 8 dBm
 - Receive sensitivity: -99 dBm @ LE1M, -96 dBm @ LE2M
 - Wi-Fi and BLE time-division multiplexing, sharing the same PA and antenna
- **Security**
 - Supports secure boot functionality
 - Supports hardware encryption engine
 - Supports full or partial Flash memory decryption technology
 - Anti-read mechanism: SWD/JTAG interface protection
 - Supports hardware true random number generator (TRNG)
- **Extensive peripherals**
 - 18 x GPIO
 - 1 x SPI
 - 2 x UART
 - 1 x USB
 - 1 x SDIO
- **Interfaces and Dimensions**
 - Maintains pin compatibility with modules of the same package type
 - Supports IPEX connectors for external antenna
 - 18mm x 33mm x 3mm, pinhole, PCB-mounted antenna
 - 18mm x 23.5mm x 3mm, pinhole, IPEX external antenna
- **Typical Applications**
 - Smart home appliances
 - Smart electrical engineering
 - Industrial automation

- **Ordering Code**

Ordering Code	Description
EMC3589-DZJ7	PCB on-board antenna, 4MB flash, operating temperature: -40 to 105°C, 18mm x 33mm x 3mm
EMC3589-SZJ7	IPEX external antenna, 4MB flash, operating temperature: -40 to 105°C, 18mm x 23.5mm x 3mm

Accessories

Ordering Code	Description
MXKIT-Base	Development board motherboard, suitable for all EMC3589 modules
MXKIT-Core-C3589	Core board for EMC3589 development kits, incorporating the EMC3589 module. For use with MXKIT-Base
FX-3589	EMC3589 production fixture, includes test boards: MXKIT-Base, MXKIT-Core-3589

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1. Module Overview

The EMC3589 is a high-performance module series primarily designed for the Internet of Things (IoT). It incorporates a highly integrated dual-core microcontroller supporting dual-band 2.4GHz/5GHz Wi-Fi and BLE 5.0 wireless communication technologies, alongside substantial Flash and SRAM to accommodate diverse complex applications.

The high-performance core operates at a maximum frequency of 345MHz, based on the latest ARM v8-M architecture. It delivers low power consumption while supporting floating-point operations and DSP instruction processing, enabling efficient execution of audio codec algorithms and deep learning model matching. The high-efficiency core operates at 115MHz, providing a simplified instruction set for ultra-low-power applications, allowing the system to maintain extended standby periods.

Dual-band 2.4GHz/5GHz Wi-Fi ensures stable internet connectivity at all times. BLE 5.0 technology facilitates rapid product configuration for users, while local remote control enables intelligent mesh networking for large numbers of local devices via Mesh technology.

The EMC3589 module operates from a single 3.3V power supply and supports pinhole mounting, making it suitable for diverse smart home appliance applications.

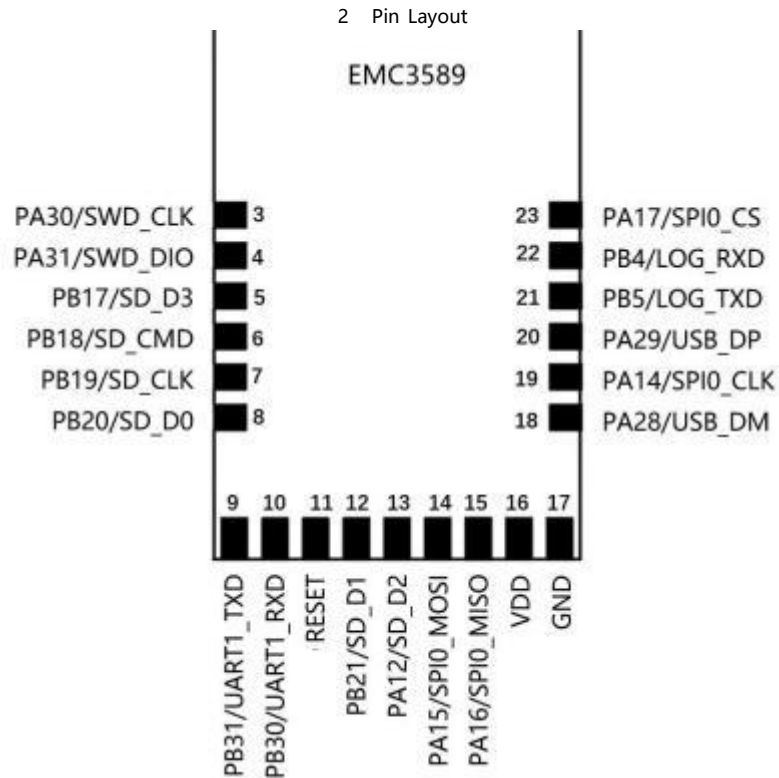
Shanghai MXCHIP provides the MXOS software platform to support the development of the EMC3589 series modules, offering an efficient development environment, access protocol stacks for major IoT cloud services, extensive sample programmes, and various typical applications.

The diagram below presents the hardware block diagram of the EMC3589 module, primarily comprising:

- Wi-Fi microcontroller RTL8711DAF
- IPEX external antenna (PCB-mounted antenna optional)
- Power supply and communication interfaces

2. Pin Definitions

2.1. Pin Distribution



2.2. Pin Definitions

Table1 Pin Definitions

Pin No.	Name	I/O Type	Recommended Usage
3	PA30	I/O	SWD_CLK: SWD debugging
4	PA31	I/O	SWD_DIO: SWD debugging
5	PB17	I/O	SD_D3
6	PB18	I/O	SD_CMD
7	PB19	I/O	SD_CLK
8	PB20	I/O	SD_D0
9	PB31	I/O	UART1_TXD, Application Serial Port
10	PB30	I/O	UART1_RXD, application serial port
11	REST	I/O	RESET
12	PB21	I/O	SD_D1
13	PA12	I/O	SD_D2
14	PA15	I/O	SPI0_MOSI
15	PA16	I/O	SPI0_MISO
16	VDD	I/O	VDD
17	GND	I/O	GND

Pin No.	Name	I/O Type	Recommended Usage
18	PA28	I/O	USB_DM
19	PA14	I/O	SPI0_CLK
20	PA29	I/O	USB_DP
21	PB5	I/O	LOG_TXD, Debug/Programming Serial Port
22	PB4	I/O	LOG_RXD, Debugging/Programming Serial Port
23	PA17	I/O	SPI0_CS

3. Electrical Parameters

3.1. Absolute Maximum Ratings

Operation beyond the absolute maximum ratings may cause permanent damage. Prolonged exposure to maximum ratings may also compromise module reliability.

Table2 Absolute Maximum Ratings: Voltage

Symbol	Ratings	Min	Max	Unit
$V_{DD} - V_{SS}$	Voltage	-0.3	3.6	V
V_{IN}	Input voltage on any other pin	$V_{SS} - 0.3$	$V_{DD} + 0.3$	V

Table3 Operating parameters: voltage and current

Symbol	Note	Specification			
		Min.	Typical	Max.	Unit
V_{DD}	Voltage	2.97	3.3	3.63	V
I_{VDD}	3.3V Rating Current (with internal regulator and integrated CMOS PA)	-	-	450	mA

3.2. Digital IO DC Characteristics

Electrical characteristics of the module's digital I/O ports under 3.3V supply.

Table4 Operating Parameters: Digital IO DC Characteristics (3.3V)

Symbol	Note	Conditions	Specification			
			Min.	Typical	Max.	Unit
V_{IH}	Input-High Voltage	LVTTL	2	-	-	V
V_{IL}	Input-Low Voltage	LVTTL	-0.3	-	0.8	V
V_{OH}	Output-High Voltage	LVTTL	2.8	-	-	V
V_{OL}	Output-Low Voltage	LVTTL	-	-	0.48	V

3.3. Typical Application Power Consumption

Module current testing environment based on $V_{DD} = 3.3V$, measured under typical office application conditions (values may vary under different testing environments).

Table5

Frequency Band	Condition	Typical Value	Unit
2.4G	1T-HT MCS7/BW40M (17dBm)	238	mA
	1T-HT MCS0/BW40M(19dBm)	271	
	1T-HT MCS7/BW20M (17dBm)	230	
	1T-HT MCS0/BW20M (19dBm)	262	
	1T-OFDM 54M (18dBm)	243	
	1T-OFDM 6M (19dBm)	262	

Frequency Band	Condition	Typical Value	Unit
	1T-CCK 1M (20dBm)	288	
	1R-HT MCS7/BW40M (Pin = -60dBm)	48	
	1R-HT MCS7/BW20M (Pin = -60dBm)	44	
	1R-OFDM 54M (Pin = -60dBm)	43	
	1R-CCK 1M (20dBm)	42	
	RF Idle	41	
	Beacon Mode	27.5	
	RF Standby	28	
5G	1T-HT MCS7/BW40M (15dBm)	280	mA
	1T-HT MCS0/BW40M (18dBm)	325	
	1T-HT MCS7/BW20M (15dBm)	283	
	1T-HT MCS0/BW20M (18dBm)	323	
	1T-OFDM 54M (16dBm)	295	
	1T-OFDM 6M (18dBm)	328	
	1R-HT MCS7/BW40M (Pin = -60dBm)	52	
	1R-HT MCS7/BW20M (Pin = -60dBm)	48	
	1R-OFDM 54M (Pin = -60dBm)	47	
	RF Idle	45	
	Beacon Mode	29	
	RF Standby	28	

3.4. Temperature

Table6 Operating Parameters: Digital IO DC Characteristics (3.3V)

Symbol	Ratings	Max	Unit
T _{STG}	Storage temperature	-55 to +125	°C
T _{work}	Ambient Operating Temperature	-40 to 105	°C
T _{Jun}	Junction Temperature	0 to +125	°C

3.5. Electrostatic Discharge

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Symbol	Name	Name	Grade	Maximum	Unit
V _{ESD} (HBM)	Electrostatic Discharge Voltage (Human Body Model)	TA = +25 °C Compliant with JESD22-A114	2	2000	V

$V_{ESD}(CDM)$	Electrostatic discharge voltage (Charged Device Model)	TA = +25 °C Compliant with JESD22-C101	II	500	

3.6. Radio Frequency Parameters

3.6.1. Basic RF Parameters

Table8

Item		Specification	
Operating Frequency		2.4G Band: 2400–2483.5 MHz 5G band: 5180–5240 MHz, 5260 MHz-5320 MHz, 5500 MHz-5700 MHz 5.8G band: 5745–5825 MHz	
Specification	Wi-Fi	IEEE 802.11b/g/n (2.4 GHz), 802.11a/n (5 GHz)	
	Bluetooth	Bluetooth 5.0	
Modulation Type	Wi-Fi	11b: DBPSK, DQPSK, CCK for DSSS 11g/a/n: BPSK, QPSK, 16QAM, 64QAM for OFDM 11g: BPSK, QPSK, 16QAM, 64QAM for OFDM 11n: MCS0–7, OFDM	
	Bluetooth	GFSK	
Data Rates	Wi-Fi	20MHz	11b: 1, 2, 5.5 and 11 Mbps 11g/a: 6, 9, 12, 18, 24, 36, 48, 54 Mbps 11n_HT20: MCS0–7, up to 72Mbps
		40MHz	11n_HT40 (2.4G & 5G): MCS 0–7, up to 150 Mbps
	Bluetooth	2 MHz	1Mbps, 2Mbps (BT 5.0)
Antenna type		One U.F.L connector for external antenna	
Antenna Interface		1T1R, single stream	

Note: The following Tx test data represents typical values recorded at ambient temperature with Tx transmission lasting approximately 20 seconds.

IEEE 802.11b mode

Table9 IEEE 802.11b Mode Transceiver Characteristics Parameters

Item	Description			
Mode	IEEE 802.11b			
Channel	CH1 to CH13			
Data Rates	1, 2, 5.5, 11Mbps			
Transmit Characteristics	Min.	Typical.	Max.	Unit
Transmitter Output Power				

11b Target Power@1Mbps	15	17	18	dBm
11b Target Power@11Mbps	15	17	18	dBm
Spectrum Mask @ target power				
fc $\pm$ 11MHz to $\pm$ 22MHz	-	-	-30	dB
fc > $\pm$ 22MHz	-	-	-50	dB
Frequency Error	-10	-2	+10	ppm
Constellation Error (peak EVM) @ target power				
1~11Mbps	-	-	35% (or -11dB)	
Receiver Characteristics	Min.	Typical.	Max.	Unit
Minimum Input Level Sensitivity				
1Mbps (FER $\leq$ 8%)	-98	-	-	dBm
11 Mbps (FER $\leq$ 8%)	-88	-	-	dBm

IEEE 802.11g mode

Table10 IEEE802.11g Mode Transceiver Characteristics Parameters

Item	Description			
Mode	IEEE 802.11g			
Channel	CH1 to CH13			
Data Rates	6, 9, 12, 18, 24, 36, 48, 54Mbps			
Transmit Characteristics	Min.	Typical.	Max.	Unit
Transmitter Output Power				
11g Target Power@6Mbps	15	16	17.5	dBm
11g Target Power@54Mbps	15	16	17.5	dBm
Spectrum Mask @ target power				
fc $\pm$ 11MHz	-	-	-20	dB
fc $\pm$ 20MHz	-	-	-28	dB
fc > $\pm$ 30MHz			-40	dB
Frequency Error	-10	-2	+10	ppm
Constellation Error (peak EVM) @ target power				
6Mbps	-	-30	-5	dBm
54 Mbps	-	-30	-25	dBm
Receive Characteristics	Min.	Typical.	Max.	Unit
Minimum Input Level Sensitivity				
6Mbps (FER $\leq$ 10%)	-93	-	-	dBm
54 Mbps (FER $\leq$ 10%)	-76	-	-	dBm

IEEE 802.11n HT20 (2.4 GHz) mode

Table11 IEEE802.11n-HT20 Mode Transmission and Reception Characteristics

Item	Description			
Mode	IEEE 802.11n HT20			
Channel	CH1 to CH13			
Data Rates	MCS0/1/2/3/4/5/6/7, up to 72.2Mbps			
Transmit Characteristics	Min.	Typical.	Max.	Unit
Transmitter Output Power				

11n Target Power@MCS0	13	14	16	dBm
11n Target Power@ MCS7	13	14	16	dBm
Spectrum Mask @ target power				
$f_c \pm 11\text{MHz}$	-	-	-20	dB
$f_c \pm 20\text{MHz}$	-	-	-28	dB
$f_c > \pm 30\text{MHz}$			-45	dB
Frequency Error	-10	-2	+10	ppm
Constellation Error (peak EVM) @ target power				
MCS0	-	-30	-5	dBm
MCS7	-	-31	-27	dBm
Receive Characteristics	Min.	Typical.	Max.	Unit
Minimum Input Level Sensitivity				
MCS0 (FER $\leq 10\%$)	-92	-	-	dBm
MCS7 (FER $\leq 10\%$)	-73	-	-	dBm

IEEE 802.11n HT40 (2.4 GHz) Mode

Table12 IEEE802.11n-HT40 Mode Transmission and Reception Characteristics

Item	Description			
Mode	IEEE802.11n HT40			
Channel	CH1 to CH13			
Data Rates	MCS0/1/2/3/4/5/6/7, up to 150Mbps			
Transmit Characteristics	Min.	Typical.	Max.	Unit
Transmitter Output Power				
11n Target Power@MCS0	12	13	14.5	dBm
11n Target Power@ MCS7	12	13	14.5	dBm
Spectrum Mask @ target power				
$f_c \pm 22\text{MHz}$	-	-	-20	dB
$f_c \pm 40\text{MHz}$	-	-	-28	dB
$f_c > \pm 60\text{MHz}$	-	-	-45	dB
Frequency Error	-10	-2	+10	ppm
Constellation Error (peak EVM) @ target power				
MCS0	-	-30	-5	dBm
MCS7	-	-32	-27	dBm
Receive Characteristics	Min.	Typical.	Max.	Unit
Minimum Input Level Sensitivity				
MCS0 (FER $\leq 10\%$)	-90	-	-	dBm
MCS7 (FER $\leq 10\%$)	-71	-	-	dBm

IEEE 802.11a mode

Table13 IEEE 802.11a Mode Transceiver Characteristics

Item	Description
Mode	IEEE 802.11a
Channel	CH36 to CH165
Data Rates	6, 9, 12, 18, 24, 36, 48, 54Mbps

TX Characteristics	Min.	Typical.	Max.	Unit
Transmitter Output Power				
11a Target Power@6Mbps	12.5	14	15.5	dBm
11a Target Power@54Mbps	11.5	13	14.5	dBm
Spectrum Mask @ target power				
$f_c \pm 11\text{MHz}$	-	-	-20	dBr
$f_c \pm 20\text{MHz}$	-	-	-28	dBr
$f_c > \pm 30\text{MHz}$			-40	dBr
Frequency Error	-10	-2	+10	ppm
Constellation Error (peak EVM) @ target power				
MCS0	-	-29	-5	dBm
MCS7	-	-29	-25	dBm
Receive Characteristics	Min.	Typical.	Max.	Unit
Minimum Input Level Sensitivity				
6Mbps (FER $\leq 10\%$)	-92	-	-	dBm
54 Mbps (FER $\leq 10\%$)	-74	-	-	dBm

IEEE 802.11n HT20 (5G) Mode

Table14 IEEE802.11n-HT20(5G) Mode Transceiver Characteristics

Item	Description			
Mode	IEEE 802.11n (5 GHz) HT20			
Channel	CH36 to CH165			
Data Rates	MCS0/1/2/3/4/5/6/7, maximum 72.2 Mbps			
TX Characteristics	Min.	Typical.	Max.	Unit
Transmitter Output Power				
11n Target Power@MCS0	11	13	14.5	dBm
11n Target Power@MCS7	11	12	13.5	dBm
Spectrum Mask @ target power				
$f_c \pm 11\text{MHz}$	-	-	-20	dB
$f_c \pm 20\text{MHz}$	-	-	-28	dB
$f_c > \pm 30\text{MHz}$	-	-	-45	dB
Frequency Error	-10	-2	+10	ppm
Constellation Error (peak EVM) @ target power				
MCS0	-	-28	-5	dBm
MCS7	-	-30	-27	dBm
Receive Characteristics	Min.	Typical.	Max.	Unit
Minimum Input Level Sensitivity				
MCS0 (FER $\leq 10\%$)	-92	-	-	dBm
MCS7 (FER $\leq 10\%$)	-72	-	-	dBm

IEEE 802.11n HT40 (5G) Mode

Table15 IEEE802.11n HT40 (5G) Mode Transceiver Characteristics

Item	Description
Mode	IEEE 802.11n (5 GHz) HT40

Channel	CH36 to CH165			
Data Rates	MCS0/1/2/3/4/5/6/7, maximum 150Mbps			
Transmit Characteristics	Min.	Typical.	Max.	Unit
Transmitter Output Power				
11n Target Power@MCS0	11.5	13	14.5	dBm
11n Target Power@MCS7	11	12	13.5	dBm
Spectrum Mask @ target power				
$f_c \pm 11\text{MHz}$	-	-	-20	dBr
$f_c \pm 20\text{MHz}$	-	-	-28	dBr
$f_c > \pm 30\text{MHz}$			-45	dBr
Frequency Error	-10	-2	+10	ppm
Constellation Error (peak EVM) @ target power				
MCS0	-	-28	-5	dBm
MCS7	-	-30	-27	dBm
Receive Characteristics	Min.	Typical.	Max.	Unit
Minimum Input Level Sensitivity				
MCS0 (FER $\leq 10\%$)	-89	-	-	dBm
MCS7 (FER $\leq 10\%$)	-69	-	-	dBm

3.6.2. Bluetooth RF Parameters

Table16 EMC3589 BLE5.0 TX/RX Characteristics

Item	Data Rate	Min	Typical	Max	Unit
POWER_AVERAGE	LE_1M	6	8	10	dBm
POWER_AVERAGE	LE_2M	6	8	10	dBm
Frequency Drift Error	LE_1M	-50	-7	50	kHz
Frequency Drift Error	LE_2M	-50	-7	50	kHz
Carrier frequency offset and drift at NOC:					
$\Delta F_n \text{ max}$	LE_1M	-150	5.8	150	kHz
$ F_0 - F_n $	LE_1M		3.7	50	kHz
$ F_1 - F_0 $	LE_1M		4.6	20	kHz
$ F_n - F_{n5} $	LE_1M		0.9	20	kHz
Modulation characteristics:					
$\Delta F_{1\text{avg}}$	LE_1M	225	247	275	kHz
$\Delta F_{2\text{avg}}$	LE_1M	185	225	275	kHz
$\Delta F_{2\text{avg}}/\Delta F_{1\text{avg}}$	LE_1M	0.8	0.92		kHz
$\Delta F_{2\text{max}}$	LE_1M	185	231		kHz
Receiver Characteristics					
Minimum Sensitivity PER $\leq 30.8\%$	LE_1M	-99	-	-	dBm
Minimum Sensitivity PER $\leq 30.8\%$	LE_2M	-96	-	-	dBm

4. Antenna Information

The EMC3589 is available in two specifications: PCB-mounted antenna and external IPEX antenna. Please refer to the ordering code when placing orders. Modules using the PCB-mounted antenna do not require soldering of the IPEX antenna connector.

4.1. PCB-mounted antenna specifications and usage

4.1.1. PCB-mounted antenna parameters

Table17 EMC3589 PCB-mounted antenna parameters (2.4GHz band)

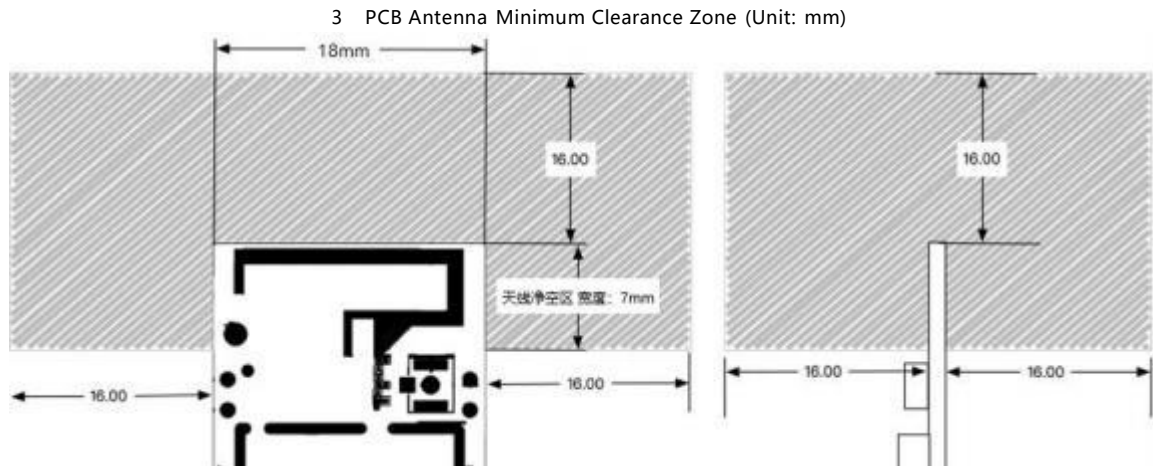
Item	Min.	Typical	Max.	Unit
Frequency	2400		2500	MHz
Impedance		50		Ω
VSWR			2	
Gain	-0.37 dBi			
Efficiency	47%			

Table18 PCB-mounted antenna parameters for EMC3589 (5GHz band)

Item	Min.	Typical	Max.	Unit
Frequency	5100		5800	MHz
Impedance		50		Ω
VSWR			2	
Gain	-0.69 dBi			
Efficiency	42%			

4.1.2. Key Considerations for PCB On-Board Antenna Usage

When utilising the PCB-mounted antenna on the module, ensure a minimum clearance of 16mm between the mainboard PCB and other metallic components, connectors, PCB vias, traces, and copper plating. The shaded areas indicated in the diagram below must be kept clear of metallic components, sensors, interference sources, and other materials that may cause signal interference.

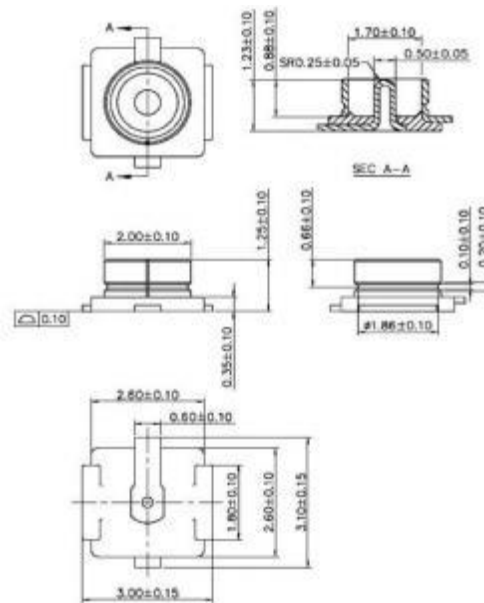


4.2. Introduction to IPEX External Antennas

EMC3589 offers an IPEX external antenna module for user selection. Users may choose antennas with different form factors and a gain not exceeding 2dBi, compatible with both 2.4GHz and 5GHz bands, based on their application environment.

External IPEX antenna connector dimensions:

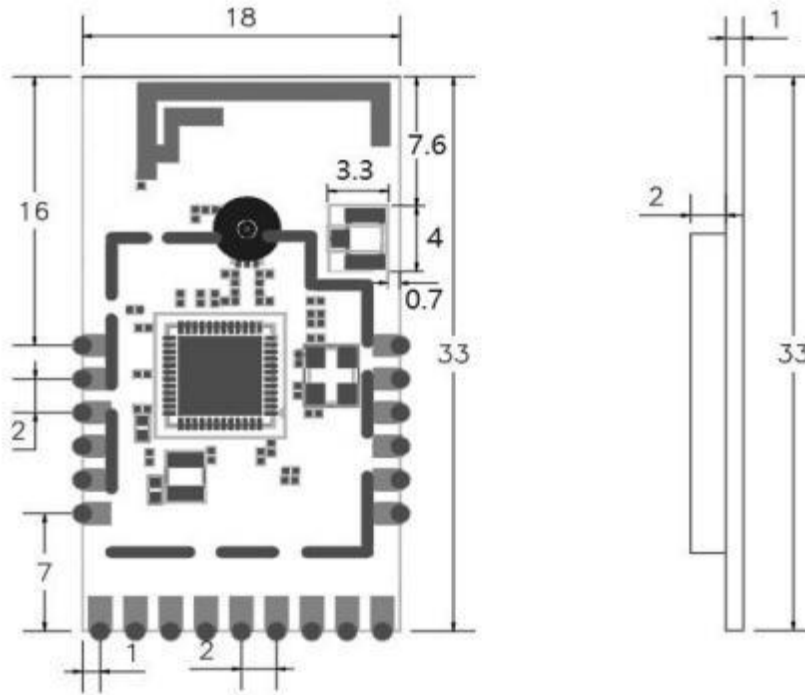
Figure:4 External Antenna Connector Dimensions



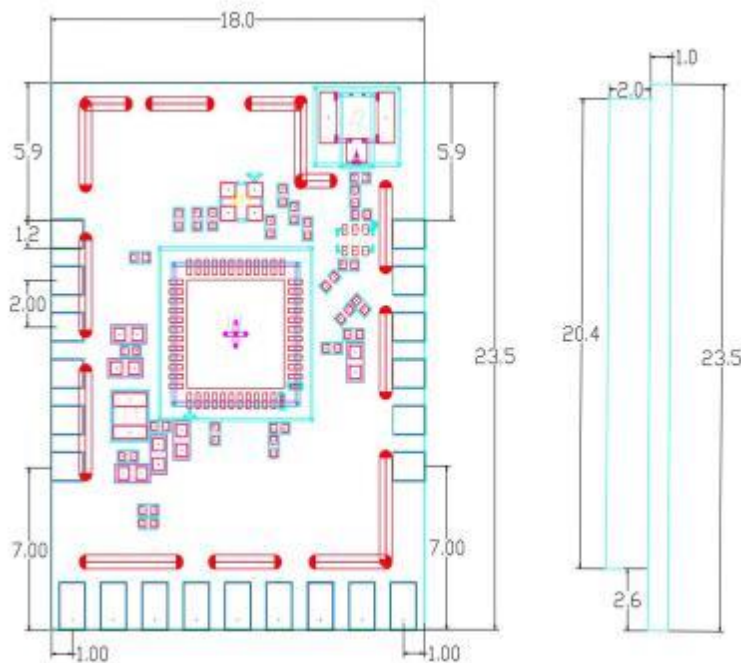
5. Overall assembly dimensions and PCB package

5.1. Assembly dimension diagram

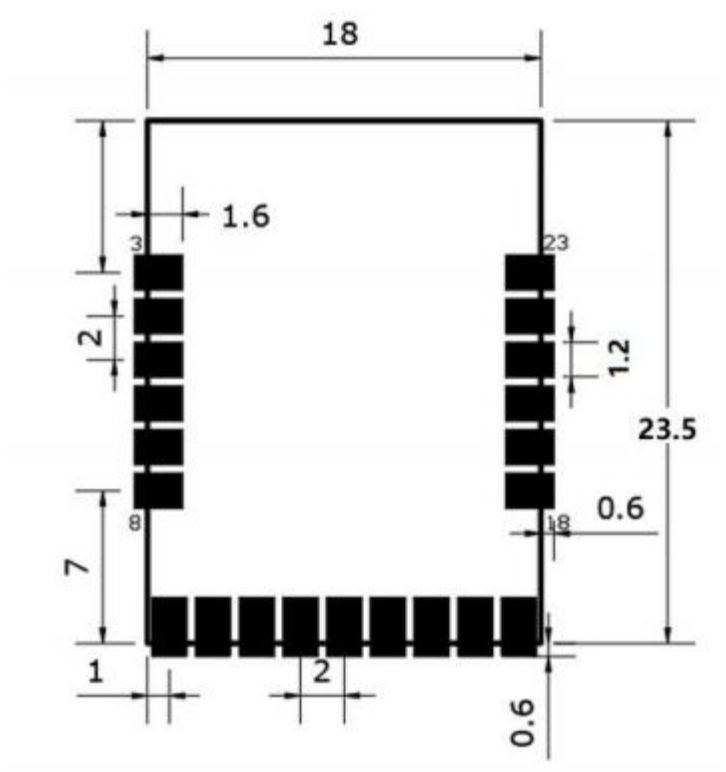
Figure5 PCB board-mounted antenna module overall assembly dimensions (Unit: mm, tolerance ± 0.1 , external dimensions tolerance ± 0.2)



6 IPEX External Antenna Module Overall Assembly Dimensions (Unit: mm, tolerance ± 0.1 , external dimensions tolerance ± 0.2)



8 IPEX External Antenna Module Pin Hole Package Dimensions (Mounting Pad, Unit: mm)



6. Production Guidelines

MXCHIP factory-supplied stamp hole-mounted modules must be placed by SMT machines. The modules have an MSL3 moisture sensitivity level; if unsealed for longer than the specified period, they must be baked prior to placement.

- SMT placement requires the following equipment

- (1) Reflow soldering machine
- (2) AOI inspection system
- (3) Nozzle with 6-8mm diameter

- Reflow oven placement requires equipment:

- (1) Cabinet-style baking oven
- (2) Anti-static, heat-resistant trays
- (3) Anti-static, heat-resistant gloves

Storage conditions for MXCHIP modules upon dispatch:

- Moisture-proof bags must be stored in an environment with temperature <30°C and humidity <85% RH.
- Sealed packaging contains humidity indicator cards.

Figure9 Humidity indicator card



Should the humidity indicator card display pink after module disassembly, baking is required.

Baking parameters are as follows:

- Baking temperature: 120°C ± 5°C; Baking time: 4 hours;
- Alarm temperature set to 130°C;
- Allow to cool naturally to below 36°C before proceeding with SMT placement;
- Number of drying cycles: 1;
- Should soldering not commence within 12 hours post-baking, repeat the baking process.

Should the unsealed period exceed three months, the use of SMT soldering for this batch of modules is strictly prohibited. Due to the PCB immersion gold plating process, pads will exhibit severe oxidation

after three months, significantly increasing the risk of cold solder joints or missed soldering during SMT placement. Our company shall not be held liable for any resulting issues.

Prior to SMT placement, implement ESD (Electrostatic Discharge) protection for the modules;

SMT placement must adhere to the reflow soldering profile, with a peak temperature of 250°C.

To ensure reflow soldering pass rate, conduct visual inspection and AOI testing on 10% of products during initial placement to verify oven temperature control, component pick-up method, and placement configuration. For subsequent batch production, sample 5-10 units per hour for visual inspection and AOI testing.

6.1. Precautions

- Operators at all workstations must wear anti-static gloves throughout production;
- Do not exceed the specified baking time during baking;
- Explosive, flammable, or corrosive substances must not be introduced during baking;
- During baking, modules must be placed in the oven using high-temperature trays, ensuring air circulation between each module while preventing direct contact with the oven interior walls;
- Ensure the oven door is securely closed during baking to maintain a sealed environment, preventing temperature loss that could compromise baking results;
- Whilst the oven is in operation, avoid opening the door whenever possible. Should it be necessary to open the door, minimise the duration of opening.
- After baking, allow the module to cool naturally to below 36°C before removing it with anti-static gloves to prevent burns;
- During operation, take strict precautions to prevent water or contaminants from coming into contact with the underside of the module.

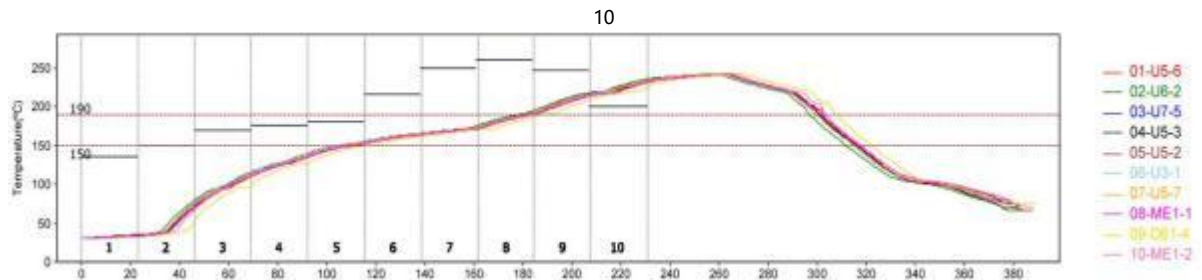
MXCHIP modules are shipped with Level 3 temperature and humidity control. Storage and baking conditions comply with IPC/JEDEC J-STD-020.

6.2. Secondary Reflow Temperature Profile

Recommended solder paste type: SAC305, lead-free. Reflow cycles should not exceed two. Peak temperature must not exceed 245 ° C. The following presents a typical furnace temperature profile configuration.

Table19 : Typical Oven Temperature Settings

Soldering	Z1	Z2	Z3	Z4	Z5	Z6	Z7	Z8	Z9	Z10
Upper	135	150	170	175	180	215	250	260	247	200
Lower	135	150	170	175	180	215	250	260	247	200



- Preheat ramp from 30°C to 150°C: 0–3°C/s, typical value: 1.2°C/s
- 150°C ~ 190°C soak time: 60-100 seconds, typical value: 72 seconds
- Peak temperature: 245°C, typical value: 242°C
- Time above 220°C: 50–90 seconds, typical value: 70 seconds
- Cooling rate from 217°C: -3 to 0°C/s, typical value: -2.0°C/s

6.3. Storage conditions

Figure11



CAUTION
This bag contains
MOISTURE-SENSITIVE DEVICES

LEVEL
3

If Blank, see adjacent bar code label

1. Calculated shelf life in sealed bag: 12 months at <40°C and <90% relative humidity (RH)
2. Peak package body temperature: 260 °C
If Blank, see adjacent bar code label
3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must
 - a) Mounted within: 168 hrs. of factory conditions
If Blank, see adjacent bar code label
≤30°C/60%RH, OR
 - b) Stored at <10% RH
4. Devices require bake, before mounting, if:
 - a) Humidity Indicator Card is > 10% when read at 23 ± 5°C
 - b) 3a or 3b not met.
5. If baking is required, devices may be baked for 48 hrs. at 125±5°C

Note: If device containers cannot be subjected to high temperature or shorter bake times are desired, reference IPC/JEDEC J-STD-033 for bake procedure

Bag Seal Date: _____
If Blank, see adjacent bar code label

Note: Level and body temperature defined by IPC/JEDEC J-STD-020

7. Label Information



1. MXCHIP: Company trademark
2. EMC3589-D: Product Model
3. CE: CE certification
4. CMIIT ID: SRRC model authorization ID
5. FCC ID:
6. ZJ7: Sub-model, details in ordering code.
7. X2605: Production batch number
8. B0F89379A184: Module MAC Address
9. QR Code: Module MAC Address
10. Shanghai MXCHIP Information Technology Co. Ltd. : Company name

Note: Due to variations in production batches and versions, the above label diagram is for reference only. Please refer to the actual product.

8. FCC Information

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.

8.1 FCC Warning

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.

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.

8.2 Notice

1. The module is limited to OEM installation ONLY.
2. The OEM integrators is responsible for ensuring that the end-user has no manual instructions to remove or install module.
3. That module is limited to installation in mobile or fixed applications, according to Part 2.1091(b).
4. That separate approval is required for all other operating configurations, including portable configurations with respect to Part 2.1093 and different antenna configurations.

Important Note:

In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC 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 FCC authorization.

End Product Labeling

The final end product must be labeled in a visible area with the following "Contains FCC ID: P53-EMC3589".

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 shown in this manual.

Integration instructions for host product manufactures according to KDB 996369 D03 OEM Manual v01**2.2 List of applicable FCC rules**

CFR 47 FCC PART 15 SUBPART C has been investigated. It is applicable to the modular transmitter

2.3 Specific operational use conditions

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system.

2.4 Limited module procedures

Not applicable.

2.5 Trace antenna designs

Not applicable.

2.6 RF exposure considerations

FCC Radiation Exposure Statement

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.

2.7 Antennas

This radio transmitter FCC ID: P53-EMC3589 been approved by Federal Communications Commission to operate with the antenna types listed below, with the maximum permissible gain indicated.

Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

BLE Antenna:

Operating Frequency: 2402-2480MHz

Antenna Type: PCB Antenna; Antenna Gain(Peak): -0.37 dBi.

IPEX Antenna; Antenna Gain(Peak): -0.19 dBi.

2.4G WiFi Antenna:

Operating Frequency: 2412-2462MHz

Antenna Type: PCB Antenna; Antenna Gain(Peak): -0.37 dBi.

IPEX Antenna; Antenna Gain(Peak): -0.19 dBi.

5G WiFi Antenna:

Operating Frequency: 5180-5825MHz

Antenna Type: PCB Antenna; Antenna Gain(Peak): -0.69 dBi.

IPEX Antenna; Antenna Gain(Peak): -0.31 dBi.

2.8 Label and compliance information

The final end product must be labeled in a visible area with the following " Contains TX FCC ID: P53-EMC3589".

If the size of the end product is larger than 8x10cm, then the following FCC part 15.19 statement has to also be available on the label:

This device complies with Part 15 of 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.

2.9 Information on test modes and additional testing requirements

Host manufacturer is strongly recommended to confirm compliance with FCC requirements for the transmitter when the module is installed in the host.

2.10 Additional testing, Part 15 Subpart B disclaimer

Host manufacturer is responsible for compliance of the host system with module installed with all other applicable requirements for the system such as Part 15 B.

2.11 Note EMI Considerations

Host manufacture is recommended to use D04 Module Integration Guide recommending as "best practice" RF design engineering testing and evaluation in case non-linear interactions generate additional noncompliant limits due to module placement to host components or properties.

2.12 How to make changes

This module is stand-alone modular. If the end product will involve the Multiple simultaneously transmitting condition or different operational conditions for a stand-alone modular transmitter in a host, host manufacturer have to consult with module manufacturer for the installation method in end system. According to the KDB 996369 D02 Q&A Q12, that a host manufacture only needs to do an evaluation (i.e., no C2PC required when no emission exceeds the limit of any individual device (including unintentional radiators) as a composite. The host manufacturer must fix any failure.

9. Sales and Technical Support Information

For enquiries or purchases regarding this product, please contact Shanghai MXCHIP Information Technology Co., Ltd. during office hours.

Office Hours:

Monday to Friday: 9:00–12:00, 13:00–18:00

Telephone: +86-21-52655026

Address: 9th Floor, No. 5, Lane 2145, Jinshajiang Road, Putuo District, Shanghai

Postcode: 200333

Email: sales@mxchip.com