E03-2G4M10S User Manual

TLSR8359 2.4GHz SoC Wireless Module



Chengdu Ebyte Electronic Technology Co.,Ltd.

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1 Overview

1.1 Brief Introduction



Developed and produced by Chengdu Ebyte based on TELINK TLSR8359 wireless SOC, E03-2G4M10S is with low volume, low power consumption, high reliability and working in the 2.4GHz frequency band. It comes with a 32-bit high-performance MCU with a maximum transmit power of 10dBm.

TLSR8359 is good for hardware OTA upgrade and a variety of start-up switching, which is convenient for product feature introduction and upgrade. It is a pure hardware SoC module, it needs to be programmed by the user.

1.2 Key Features

- Max power 10dBm，multiple levels configurable；
- Global ISM 2.4GHz band；
- 14 bit ADC and PGA;
- 6 channel PWM;
- One Quadrature decoder (QDEC);
- Abundant GPIO；
- 512KB FLASH，64KB RAM；
- 1.8～3.6V power supply，3.3V+ ensures good performance；
- Applied in -40～+85℃；
- Distance is up to 250m

1.3 Application

- Retail / Logistics
- Private network
- Lighthouse

2 Specification and parameter

2.1 Limit parameter

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Main parameter	Performance		Remark
	Min.	Max.	
Power supply（V）	0	3.6	Voltage over 3.6V will cause permanent damage to module
Blocking power（dBm）	-	10	Chances of burn is slim when modules are used in short distance
Operating temperature（℃）	-40	85	/

2.2 Operating parameter

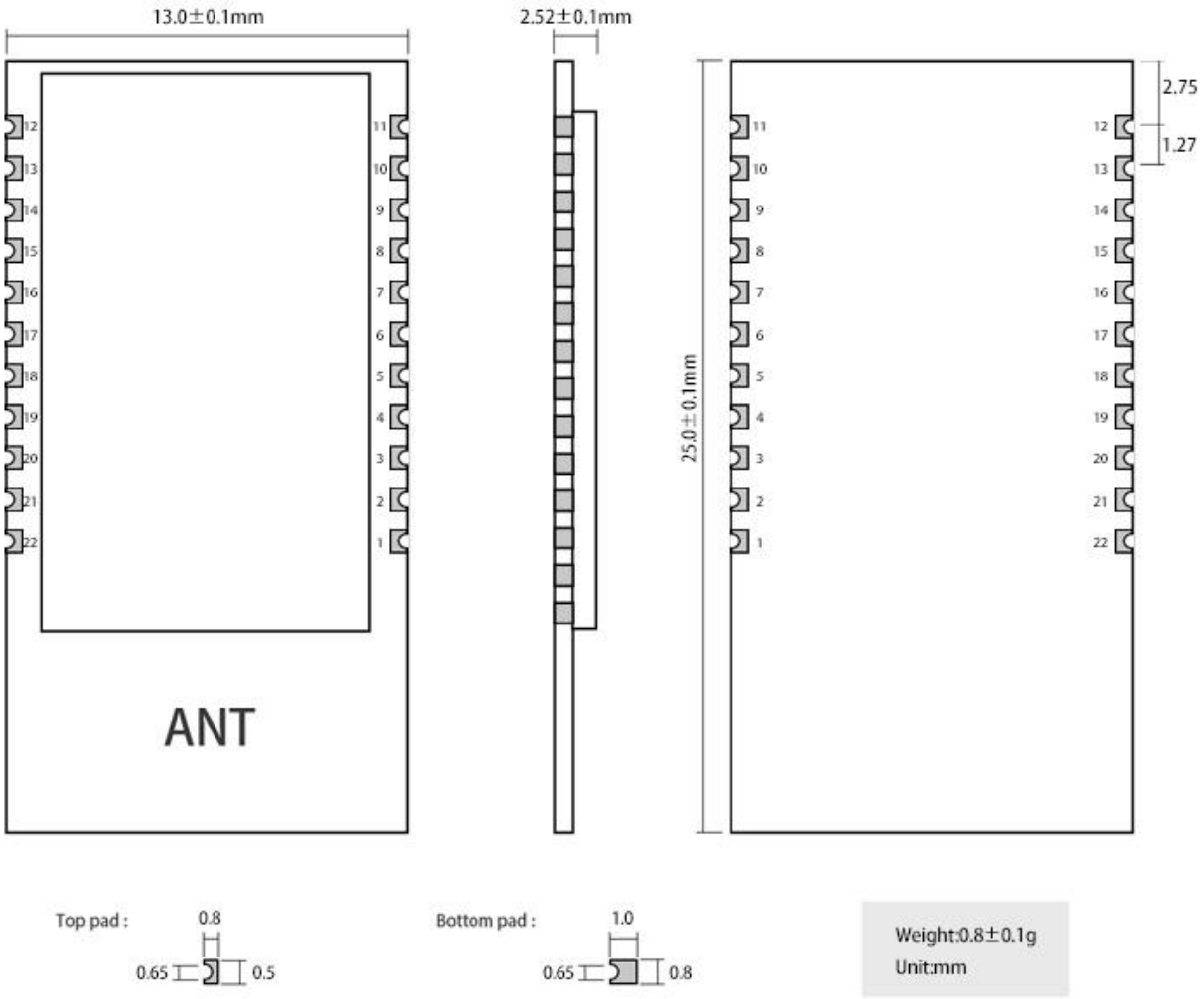
Main parameter		Performance			Remark
		Min.	Typ.	Max.	
Operating voltage（V）		1.8	3.3	3.6	≥3.3 V ensures output power
Communication level（V）			3.0		For 5V TTL, it may be at risk of burning down
Operating temperature（℃）		-40	-	+85	Industrial design
Operating frequency（MHz）		2380		2500	Support ISM band
Power consumption	TX current（mA）		20		Instant power consumption
	RX current（mA）		6.8		
	Sleep current （μA）		0.4		Software is shut down
Max Tx power（dBm）		9.5	10	10.5	
Receiving sensitivity（dBm）		-94	-95	-96	Air data rate is 1Mbps

Main parameter	Description	Remark
Distance for reference	600m	Test condition：clear and open area, antenna gain: 5dBi, antenna height: 2.5m， air data rate: 250kbps
Crystal frequency	24MHz	
Package	SMD	
Cpnnector	1.27mm	
IC	TLSR8359F512ET32/QFN32	
FLASH	512KB	
RAM	64KB	
Size	13*25mm	
Antenna	PCB	50 ohm impedance

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3 Size and pin definition



No.	Name	Direction	Function
1	PD2	Input/Output	MCU GPIO(check chipset datasheet)
2	PD3	Input/Output	MCU GPIO(check chipset datasheet)
3	GND	-	Ground
4	PD4	Input/Output	MCU GPIO(check chipset datasheet)
5	PD7	Input/Output	MCU GPIO(check chipset datasheet)
6	PA0	Input/Output	MCU GPIO(check chipset datasheet)
7	PA1	Input/Output	MCU GPIO(check chipset datasheet)
8	SWS	Input/Output	Single wire slave/PA7(check chipset datasheet)
9	PB1	Input/Output	MCU GPIO(check chipset datasheet)

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10	VCC	-	Power supply，1.8～3.6V DC（Note: higher than 3.6V will damage module）
11	GND	-	Ground
12	PB4	Input/Output	MCU GPIO(check chipset datasheet)
13	PB5	Input/Output	MCU GPIO(check chipset datasheet)
14	GND	-	0.9 VDigital power supply decoupling regulator (check chipset datasheet)
15	PB7	Input/Output	MCU GPIO(check chipset datasheet)
16	PB6	Input/Output	MCU GPIO(check chipset datasheet)
17	PC0	Input/Output	MCU GPIO(check chipset datasheet)
18	PC1	Input/Output	MCU GPIO(check chipset datasheet)
19	PC4	Input/Output	MCU GPIO(check chipset datasheet)
20	PC5	Input/Output	MCU GPIO(check chipset datasheet)
21	PC6	Input/Output	MCU GPIO(check chipset datasheet)
22	RST	Input/Output	RESET /Power on reset, active low (check chipset datasheet)

4 Basic operation

4.1 Hardware design

- It is recommended to use a DC stabilized power supply. The power supply ripple factor is as small as possible, and the module needs to be reliably grounded.；
- Please pay attention to the correct connection of the positive and negative poles of the power supply. Reverse connection may cause permanent damage to the module；
- Please check the power supply to ensure it is within the recommended voltage otherwise when it exceeds the maximum value the module will be permanently damaged；
- Please check the stability of the power supply, the voltage can not be fluctuated frequently；
- When designing the power supply circuit for the module, it is often recommended to reserve more than 30% of the margin, so the whole machine is beneficial for long-term stable operation.；
- The module should be as far away as possible from the power supply, transformers, high-frequency wiring and other parts with large electromagnetic interference.；
- High-frequency digital routing, high-frequency analog routing, and power routing must be avoided under the module. If it is necessary to pass through the module, assume that the module is soldered to the Top Layer, and the copper is spread on the Top Layer of the module contact part(well grounded), it must be close to the digital part of the module and routed in the Bottom Layer；
- Assuming the module is soldered or placed over the Top Layer, it is wrong to randomly route over the Bottom Layer or other layers, which will affect the module's spurs and receiving sensitivity to varying degrees；
- It is assumed that there are devices with large electromagnetic interference around the module that will greatly affect the performance. It is recommended to keep them away from the module according to the strength of the interference. If necessary, appropriate isolation and shielding can be done；
- Assume that there are traces with large electromagnetic interference (high-frequency digital, high-frequency analog, power traces) around the module that will greatly affect the performance of the module. It is recommended to stay

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away from the module according to the strength of the interference.If necessary, appropriate isolation and shielding can be done.

- If the communication line uses a 5V level, a 1k-5.1k resistor must be connected in series (not recommended, there is still a risk of damage)；
- Try to stay away from some physical layers such as TTL protocol at 2.4GHz , for example: USB3.0；
- Onboard PCB antennas should avoid conductors or other sources of interference.

5. FAQ

5.1 Communication range is too short

- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Sea water has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- The power supply low voltage under room temperature is lower than 2.5V, the lower the voltage, the lower the transmitting power.
- Due to antenna quality or poor matching between antenna and module.

5.2 Module is easy to damage

- Please check the power supply source, ensure it is 2.0V~3.6V, voltage higher than 3.6V will damage the module.
- Please check the stability of power source, the voltage cannot fluctuate too much.
- Please make sure antistatic measure are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range, some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

5.3 BER(Bit Error Rate) is high

- There are co-channel signal interference nearby, please be away from interference sources or modify frequency and channel to avoid interference;
- Poor power supply may cause messy code. Make sure that the power supply is reliable.
- The extension line and feeder quality are poor or too long, so the bit error rate is high;

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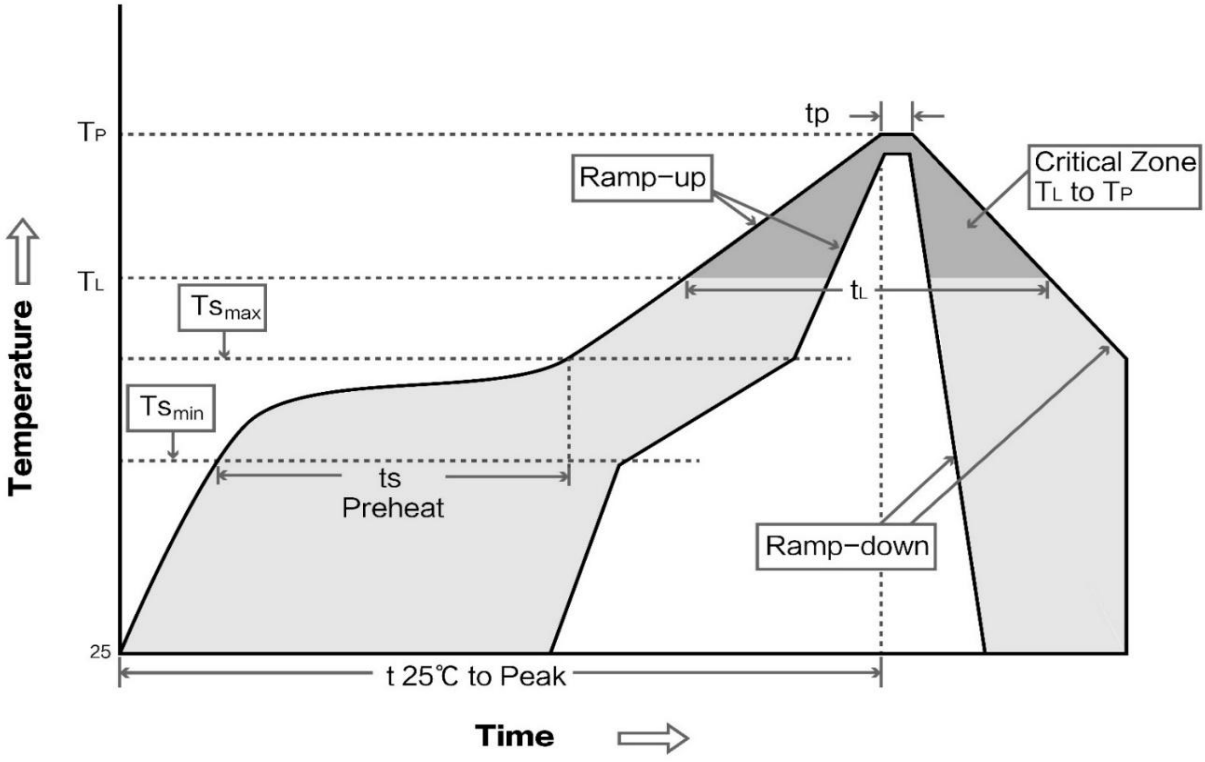
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6 Production guidance

6.1 Reflow soldering temperature

Profile Feature	Curve characteristics	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min （Tsmin）	Min preheating temp.	100℃	150℃
Preheat temperature max (Tsmax)	Mx preheating temp.	150℃	200℃
Preheat Time (Tsmin to Tsmax)(ts)	Preheating time	60-120 sec	60-120 sec
Average ramp-up rate(Tsmax to Tp)	Average ramp-up rate	3℃/second max	3℃/second max
Liquidous Temperature (TL)	Liquid phase temp.	183℃	217℃
Time（tL）Maintained Above（TL）	Time below liquid phase line	60-90 sec	30-90 sec
Peak temperature（Tp）	Peak temp.	220-235℃	230-250℃
Aveage ramp-down rate（Tp to Tsmax）	Aveage ramp-down rate	6℃/second max	6℃/second max
Time 25℃ to peak temperature	Time to peak temperature for 25℃	max 6 minutes	max 8 minutes

6.2 Reflow soldering curve



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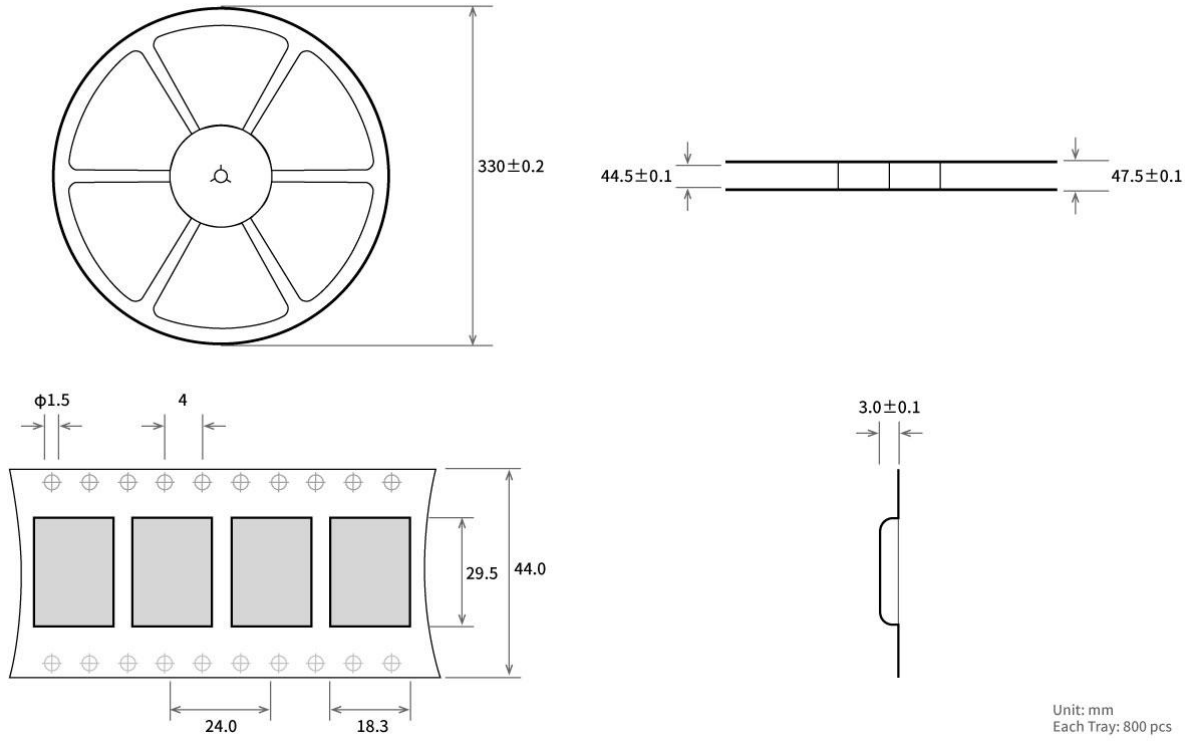
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7 Antenna guidance

7.1 Antenna recommendation

Model NO.	Type	Frequency	Gain	Size	Feeder	Connector	Feature
		Hz	dBi	mm	cm		
TX2400-NP-5010	Flexible	2.4G	2.0	10x50	-	IPEX	柔性 FPC 软天线
TX2400-JZ-3	Rubber	2.4G	2.0	30	-	SMA-J	超短直式，全向天线
TX2400-JZ-5	Rubber	2.4G	2.0	50	-	SMA-J	超短直式，全向天线
TX2400-JW-5	Rubber	2.4G	2.0	50	-	SMA-J	固定弯折，全向天线
TX2400-JK-11	Rubber	2.4G	2.5	110	-	SMA-J	可弯折胶棒，全向天线
TX2400-JK-20	Rubber	2.4G	3.0	200	-	SMA-J	可弯折胶棒，全向天线
TX2400-XPL-150	Sucker	2.4G	3.5	150	150	SMA-J	小型吸盘天线，性价比

8 Packing method for batch order



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Revision history

Version	Date	Remark	By
1.0	2020-03-27	First version	Ren
1.1	2020-06-16		Ren

About us

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