



MG123 BLE Transceiver

Application Note

Revision History:

Rev. No.	History	Issue Date	Remark
0.1	Initial issue	Oct 9, 2017	Preliminary

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1. 概述

MG123 是低功耗、低成本的 BLE 收发器，内部集成了发射机、接收机、GFSK 调制解调器和 BLE 基带处理。MG123 采用 MSOP10 封装，只需搭配低成本 MCU 和少数外围被动器件，即可实现 BLE 遥控、蓝牙电子秤等应用。

- 电源电压 1.9~3.6，可以采用一个纽扣电池（3.0v）供电
- 3uA 待机电流
- 20mA@0dBm 持续发射
- MSOP10 封装，外围 BOM 很少
- 只需低成本 MCU 配合

2. 管脚描述

MG123 采用 MSOP10 封装。

Pin No.	Symbol	I/O	Function Description
1	SCK	DI	SPI Clock
2	DVDD	Power	Digital VDD 1.2v Output
3	MOSI	DI/DO	SPI Slave Data Input/Output
4	XTALO	AO	Crystal Pin
5	XTALI	AI	Crystal Pin
6	ANT	RF	Antenna interface
7	GND	Ground	Power ground
8	VBAT	Power	Power Supply
9	IRQ	DO	Interrupt pin
10	CSN	DI	SPI Chip Select

Table2.1 Pin Description



3. 数据和控制接口

MG123 通过 3 线 SPI 接口和 IRQ 信号与 MCU 进行通信，接口包括以下信号：

- IRQ (this signal is active low and is controlled by maskable interrupt sources)
- CSN (SPI signal)
- SCK (SPI signal)
- MOSI (SPI signal)

其中 MOSI 信号用于输入和输出。MCU 可以用 3 个 GPIO 模拟 SPI，我们提供 3 线 SPI 的参考 C 源码。

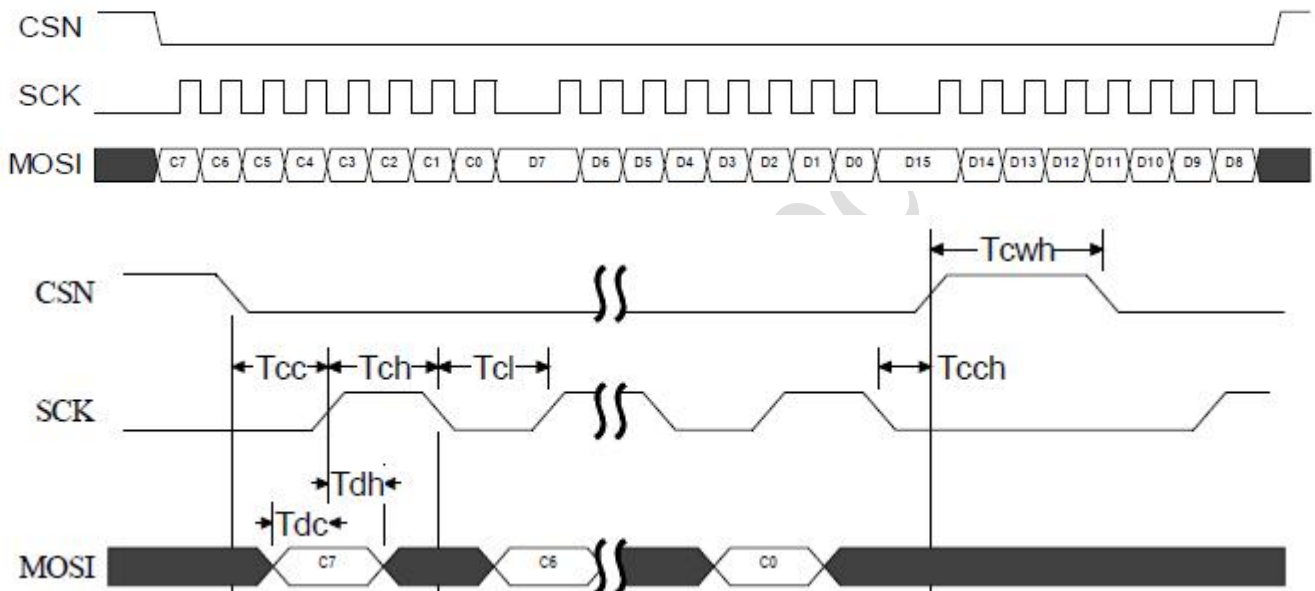


Figure3.1 SPI timing diagram

Symbol	Parameters	Min.	Max	Unit
T _{cc}	CSN to SCK setup	2	-	ns
T _{ch}	SCK high time	40	-	ns
T _{cl}	SCK low time	40	-	ns
T _{cwh}	CSN inactive time	50	-	ns
T _{cch}	SCK to CSN hold	2	-	ns
T _{dc}	Data to SCK setup	2	-	ns
T _{dh}	SCK to Data hold	2	-	ns



4. 寄存器信息

可以通过 SPI 访问这些寄存器。

Address (Hex)	Mnemonic	Bit	Reset Value	Description
01	CH_NO			BLE channel
		7:6	0	reserved
		5:0	0	BLE advertise channel number(37,38,39)
02	MODE_TYPE			ADV/Data Tx/Rx mode
		7:4	0	reserved
		3	1	Adv event
		2	0	Tx enable
		1:0	00	01 - Rx enable
03	ADV_HDR_TX			Advertise Pdu Header for Tx
		15:8	0	Pdu length
		7:0	0	Pdu type
04	ADV_HDR_RX			Advertise Pdu Header for Rx
		15:8	0	Pdu length
		7:0	0	Pdu type
07	START_TIME			Tx/Rx start time
		23:0	0	Start time
0E	INT_FLAG			Interrupt mask and flag
		15:8	0	Interrupt mask bit
		7:5	0	reserved
		4	0	Tx_Done
		3	0	reserved
		2	0	reserved
		1	0	Enter Sleep
		0	0	Woken up



0F	SLEEP_WAKE			Sleep / wakeup configuration
		31:8	0	Wake up time
		7:2	0	reserved
		1	0	Enable sleep
		0	0	Enable wakeup
10	CLK_CNT			LF clock counter and HF clock counter
		47:24	0	LF clock counter
		23:0	0	HF clock counter
11	TIMEOUT			TX/RX TimeOut (us)
		16	1	Disable Timeout
		15:8	1	Timeout time byte1
		7:0	2c	Timeout time byte0
A0	TX_PLD			TX Data Payload, MaxLen is 31 Bytes

Table 4.1 Register Map

5. 应用电路原理图

下图是 MG123 的典型应用电路原理图。

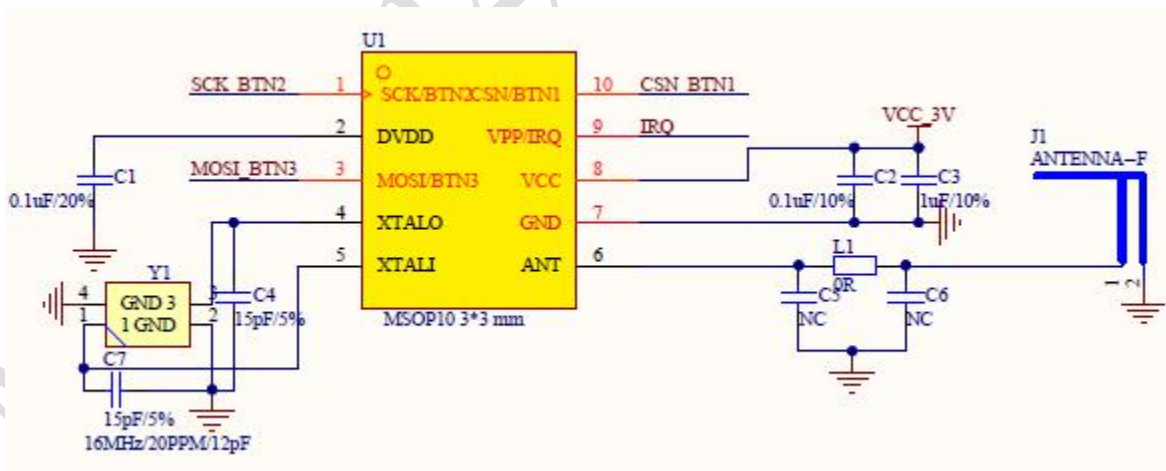


Figure5.1 example application schematic



6. 电气特性

Conditions: VDD = +3V, VSS = 0V, TA = - 40°C to + 85°C

Symbol	Parameter	Notes	Min.	Typ.	Max.	Unit
	Operating Conditions					
VDD	Supply voltage		1.9	3.0	3.6	V
TEMP	Operating Temperature		-40	+27	+85	°C
	Transmitter Operation condition					
P _{RF}	Maximum output power				+4	dBm

Table 6.1 Electrical Specification

7. 功耗指标

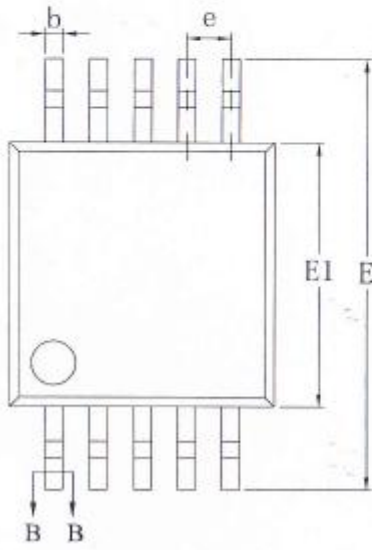
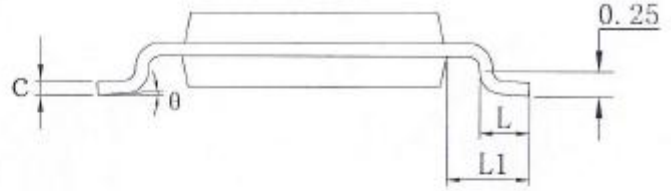
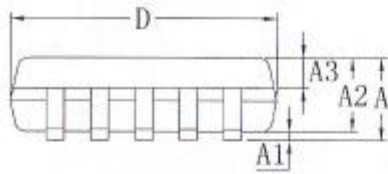
下表是在 3.0V 供电情况下，典型的功耗情况.

Mode	Description	Total Typical Current at 3.0v
Sleep	睡眠状态下电流，通过 spi 唤醒	3 uA
Standby	待机电流，不发射不接收	50 uA
TX active	持续发射	20 mA @ 0dBm output power

Table 7.1 Current Consumption



8. 封装

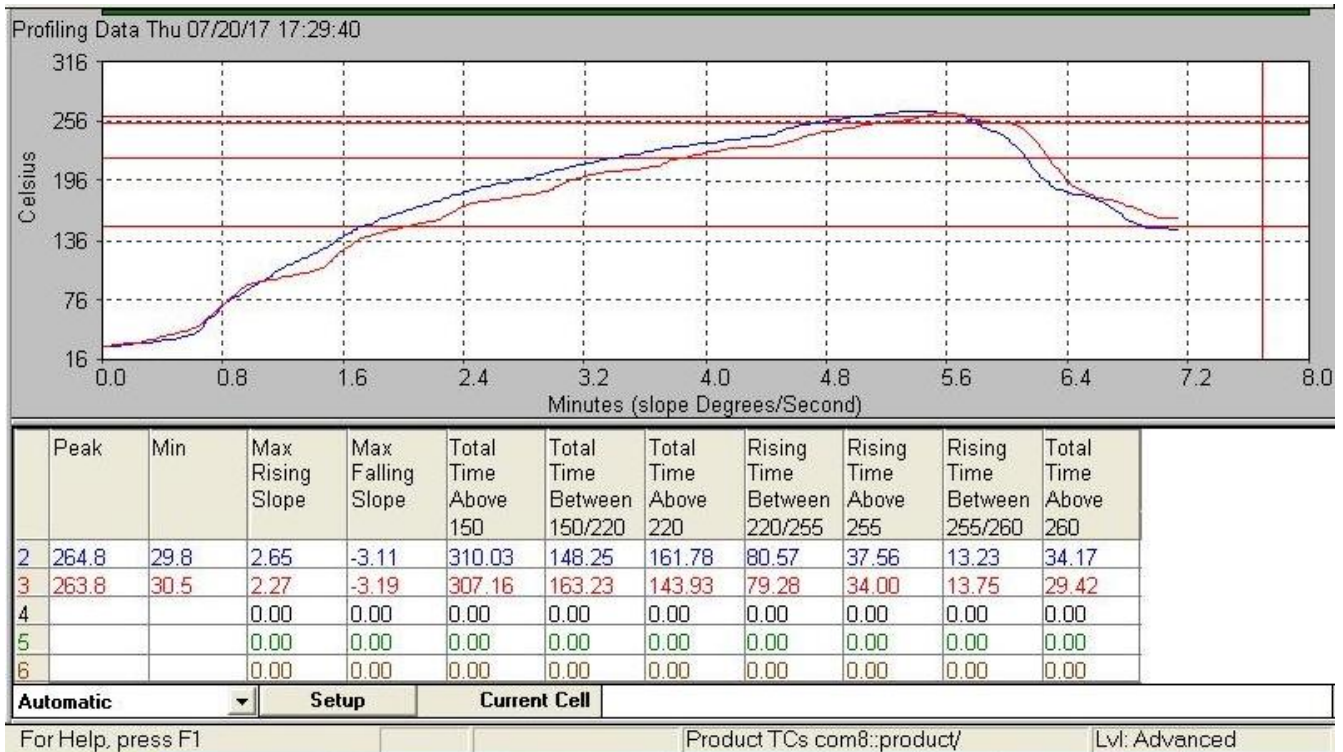


Symbol	Dimensions in Millimeters		
	Min.	NOM	Max.
A	-	-	1.10
A1	0.05	-	0.15
A2	0.75	-	0.95
A3	0.30	0.35	0.40
D	2.90	3.00	3.10
E	4.70	4.90	5.10
E1	2.90	3.00	3.10
e	0.50BSC		
L	0.40	-	0.70
L1	0.95REF		

Table 8.1 Package outline



9. Reflow Profile



符合 RoHS 标准

按照 2002/95/EC(RoHS)标准, 该产品不含有铅、汞、镉、六价铬、PBB 和 PBDE 这些物质。

ESD 敏感度

集成电路都是 ESD 敏感的, 他们会被静电破坏。所以在接触这些器件时必须使用正确的 ESD 保护技术。

10. PCB 布线注意事项

● 电源

电源线、地线的布线直接关系到产品的性能, 把噪声干扰降到最低。布线时要尽量加宽地线、电源线宽度, 地线 > 电源线 > 信号线, 通常信号线宽 0.2~0.3mm, 电源线宽 1.2~2.5mm, 用大面积铜层做地线用, 在 PCB 上把没有用的空间都铺成地。

电源加两个电容, 如果用 LDO 供电, 分别取值 1uF 和 0.1uF 用以滤波; 如果用纽扣电池供电, 电容分别取值 10uF 和 10uF 用以稳压。



- 晶振

晶振电路要尽量短和对称，靠近芯片，以减少噪声干扰以及分布电容的影响。晶振外壳要良好接地。

- 天线

天线对通信影响很大，请使用成熟的 2.4GHz 天线结构，或者严格按照天线要求制板。一般 PCB 天线需要净空，天线与地（铺铜）之间距离应大于 0.5mm。天线周围不要有元器件或金属结构。

芯片 ANT 到天线之间的走线不能太长，线宽要考虑阻抗匹配要求。