

With the English version following the Chinese version

描述

SIMx100 系列单通道模块基于 IMPINJ 新一代射频芯片 E710/E510/310 研发的高性能超高频 RFID 读写器模块。

输出功率从 5dBm 到 33dBm 可设置，标签读取距离大于 12 米（取决于天线增益和标签尺寸），且具有卓越的多标签盘存性能。

SIMx100 模块大功率、功耗低、稳定可靠，采用先进的多标签识别算法，标签在移动或者静止状态下都能快速识别。

优越的抗干扰设计以及载波抵消功能，在各种环境下都能稳定工作。

多种配置模式，可广泛用于仓储，物流，产线，巡查等各种应用场合。



型号	灵敏度 @PER 10%	读标签速度 @96 bit EPC
SIM7100	-87dbm	>1000
SIM5100	-80dbm	>600
SIM3100	-73dbm	>350

应用

- 手持终端
- 发卡器
- 打印机
- 一体机

特点

- ARMv7-M 架构 32bit Cortex-M4 CPU，集成 FPU、MPU，DSP，最高工作主频 200MHz，512KByte 的 Flash
- 支持 UHF EPC Class1 Gen2/ISO 18000-6C
- 提供 Windows，Linux，Android SDK，以及基于 C，C#/.NET，JAVA 的 API
- 支持温度标签盘存，输出参数可包含标签

返回信号的 RSSI, 相位值

- 最大 33dBm 功率输出
- 优异的防冲突算法, 高灵敏度, 盘存标签
最快速度大于 1000tag/s
- 多种盘存模式适应大多数应用
- 可设置 UART 串口通信波特率 9600bp~
921600bps
- 两输入两输出 GPIO 口
- 北美、欧洲频段满功率 30dBm 功耗 5W
中国频段满功率 33dBm 功耗 6.75W
- 铝合金磨砂外壳, 重 21 克,
尺寸 55.9mm x 35.6mm x 6.0mm
- 获得 SRRC, CE, FCC 等认证
- 符合 ROHS 要求

绝对最大额定值

参数	符号	最小值	典型值	最大值	单位
输入电压	VCC	-0.3		6	V
使能电压	VEN	-0.3		6	V
复位(NRST) GPI (IN1 IN2)输入低电压	VIL			0.6	V
复位(NRST) GPI (IN1 IN2)输入高电压	VIH	2.7			V
GPO (OUT1 OUT2)输出电流	IOH			15	mA
模块输出电流	AVCC			20	mA
ESD 保护电压 ¹	VESD	-2		2	kV
天线口 (ANT) 驻波比 ²	VSWR			8	/
工作温度 ³	TC	-30		75	°C
存储温度	TS	-55		100	°C



ESD 注意事项

在搬运、包装和测试设备时必须遵守适当的预防措施。

1. 天线端口测试条件 IEC61000-4-2 等级 1，接触放电；其他接口为 HBM 模型，接触放电。
2. 防止功放芯片损坏的最大允许驻波比，为了保证性能，建议天线驻波比小于 1.5。
3. 环境温度，温度最大限值与模块散热条件有关。

通用工作条件

参数	符号	最小值	典型值	最大值	单位
输入电压	VCC	3.6	5	5.5	V
					V
掉电电压	VEN			0.4	V
使能电压		1.5			V
复位(NRST) GPI (IN1 IN2) 输入低电压	VIL			0.3	V
复位(NRST) GPI (IN1 IN2) 输入高电压	VIH	3			V
GPO (OUT1 OUT2) 输出电流	IOH		10		mA
模块输出电流	AVCC		10		mA
天线口 (ANT) 驻波比 ¹	VSWR			2.5	/
工作湿度 (未冷凝)	RH	5		95	%
工作温度	TC	-25		65	°C
存储温度	TS	-40		85	°C

通用电气参数

参数		条件	最小值	典型值	最大值	单位	
频率	频率范围 ¹		860		960	MHz	
	频率步进值 ²			250/500		KHz	
	频率误差	@25°C	-10		10	ppm	
输出	输出功率		5		33	dBm	
	功率步进			1		dB	
	输出功率精度	5dBm~33dBm	-1		1	dB	
	输出功率平坦度	5dBm~33dBm	-1		1	dB	
	邻道泄露比*	第 1 邻道			-45		dB
		第 2 邻道			-65		dB
	20dB 占用带宽*	RF_MODE 7			110		KHz
		RF_MODE 11			215		KHz
	发射频谱模板* ³	裕量	2			dB	
杂散发射（传导） ⁴	二次谐波			-55		dBm	
	三次谐波			-38		dBm	
测量	模块温度精度	-25°C~115°C ⁵	-4		4	°C	
	标签 RSSI 测试精度	@-60dBm	-3		3	dB	
	标签相位测试精度	@-60dBm	-5		5	degrees	
	负载回波损耗测试精度	RL>18dB 接衰减器	-4		4	dB	
UART	默认波特率	数据格式：8N1		115200		bps	
	可设置波特率		9600		921600	bps	
功耗	掉电模式			0.00025		W	
	低功耗待机模式			0.1		W	
	普通待机模式			0.6		W	
	工作模式 ⁶	北美、欧洲 @30dBm			5		W
中国@33dBm				6.75		W	

1. 频率区域选择频段，不能同时支持多个频率区域。
2. 可通根据频率区域配置所需频率步进。
3. 参考《ETSI EN 302 208》 4.3.5 Transmitter spectrum masks。
4. 全频段条件下测试。

5. 当温度超过 90℃时，模块强制停止模块盘存，需要手动重新发送命令启动盘存。
 6. 模块工作功耗会因负载天线匹配情况而有所变化。
- 标注 * 表示测试时采用盘存模式 为 RF_MODE 7, 频谱仪设置 MAXHOLD。

空口模式参数与性能

RF_MODE ID	Forward Link Modulation	Tari (us)	BLF (KHz)	Reverse Link Modulation	Receive Sensitivity Minimum ¹ (dBm)			Read Rate ² (tags/s)
					E710	E510	E310	
11	PR-ASK	7.5	640	FM0	-64.1	N/A	N/A	>900
1	PR-ASK	7.5	640	Miller M=2	-70.4	-65.4	N/A	>650
15	PR-ASK	7.5	640	Miller M=4	-76.2	-70.2	N/A	>450
12	PR-ASK	15	320	Miller M=2	-76.6	-71.4	-63	>350
3	PR-ASK	20	320	Miller M=2	-76.1	-71.4	-63	>300
5	PR-ASK	20	320	Miller M=4	-81.5	-75.5	-66.7	>200
7	PR-ASK	20	250	Miller M=4	-81.4	-76	-68	>150
13	PR-ASK	20	160	Miller M=8	-87.4	-81	-73.4	>70

1. 测试仪器 CISC XPLORER 200, PER 10%, 输出功率 30dBm, 天线端口回波小于-20dB
2. 测试天线增益 12dBi, 4000 个标签
3. N/A 表示不支持此模式

从上表可以看出来，SIMx100 提供了多达 8 种配置方式，列出了衡量读写器模块最重要的两项指标：灵敏度和读多标签速度。灵敏度与多标签速度之间需要作出权衡，因为灵敏度更好的模式下读标签速率低。在读得更好与读得更多之间，需要根据应用需求选择合适的模式。另一项需要注意的是当多阅读器同时工作时，会存在干扰。更小的 TARI 虽然加快了与标签的通信连接，但会增加发射信道的带宽，更容易干扰其他读写器。更高的标签的反向散射链路频率 (BLF) 提高了标签反向传输信号的速度，标签返回信号会落在相邻信道内，当有其他读写器正好工作在这个信道内时，读写器很可能无法解调出标签的返回信号。

盘存模式参数

针对不同的应用场景，SIMx100 提供了多种工作模式。除了控温多标签盘存模式，其他都由读写器模块自动完成，不仅节省了主机与读写器模块的命令交互时间，优秀的处理算法也大大增强了产品的应用适配性。

应用场景	工作模式	描述
少量标签 远距离盘存	普通模式	推荐 RF_MODE 13, session0, >50tag/s
	快速模式	推荐 RF_MODE 13, session0/1, 标志状态 A-B, >70tag/s
多标签盘存	EX10 快速模式	RF_MODE 自动调整, 推荐采用高波特率, 读全标签速度快, SIM7100: >700tag/s ; SIM5100: >500tag/s ; SIM3100: >300tag/s
控温多标签盘存	E7 控温模式	RF_MODE 自动调整, 当新增标签小于指定个数时, 自动调整工作占空比, 当新增标签超过指定个数时, 恢复全速模式, SIM7100: >700tag/s ; SIM5100: >500tag/s ; SIM3100: >300tag/s
高读速率 盘存	快速模式	推荐模式 RF_MODE 103(E710)、RF_MODE 120(E510)、RF_MODE 12(E310), session0, 标志状态 A-B, 静态 Q 值, SIM7100: >1000tag/s ; SIM5100: >700 tag/s ; SIM3100: >300 tag/s

引脚配置及功能



引脚编号	引脚名称	类型	描述
1	VCC	电源	供电电压, 3.6V-5.25V 输入
2	VCC	电源	供电电压, 3.6V-5.25V 输入
3	GND	电源	接地
4	GND	电源	接地
5	EN	数字输入	模块使能脚, 接高电平或者悬空时模块使能, 接低电平时模块掉电
6	OUT2	数字 I/O	通用 I/O 口输出, 推挽输出
7	IN1	数字 I/O	通用 I/O 口输入
8	IN2	数字 I/O	通用 I/O 口输入
9	RXD	数字输入	模块 UART 输入, 3.3V 电平
10	TXD	数字输出	模块 UART 输出, 3.3V 电平
11	NRST	数字输入	模块复位, 低电平使模块复位, 不用时可悬空
12	OUT1	数字 I/O	通用 I/O 口输出, 推挽输出
	ANT	射频	射频天线端口 (50 Ω)

引脚编号	引脚名称	类型	描述
1	GND	电源	接地
2	GND	电源	接地

3	VCC	电源	供电电压, 3.6V-5.25V 输入
4	VCC	电源	供电电压, 3.6V-5.25V 输入
5	EN	数字输入	模块使能脚, 接高电平或者悬空时模块使能, 接低电平时模块掉电
6	RXD	数字输入	模块 UART 输入, 3.3V 电平
7	TXD	数字输出	模块 UART 输出, 3.3V 电平
8	NRST	数字输入	模块复位, 接低电平时模块复位, 不使用时可悬空
9	OUT1	数字 I/O	通用 I/O 口输出, 推挽输出

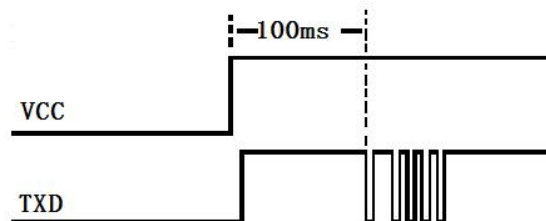
*接口 FFC/FPC 连接器: 间距 1mm P 数:12P 抽屉式 下接

*射频天线端口连接器: MMCX

应用说明

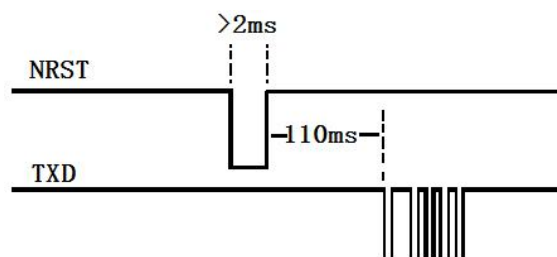
● 上电启动与 I/O 接口

模块上电后, 需要花费 100ms 进行初始化, 在这段时间内不要拉低复位引脚, 读写器模块也不会响应接收到的命令。



上电启动时间

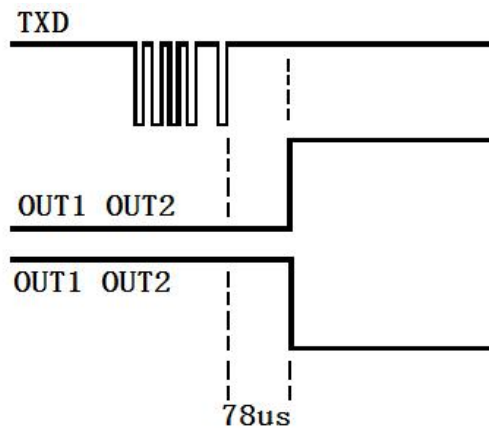
NRST 上电复位解除时间小于 3ms, 模块上电后, NRST 电平拉低会使内部模块的 MCU 重新启动。模块内 NRST 已接 100K 上拉电阻。如果模块已上电, 触发复位的低电平保持时间需大于 2ms。当复位发生时, 实际等待复位时间需大于 110ms。



复位等待时间

通过发送获取 GPIO 命令与响应的的时间差测得响应时间。OUT1, OUT2 设置命令动作时间大

于 78us（不含命令时间）。IN1，IN2 设置命令动作时间大于 88us（不含命令时间）。

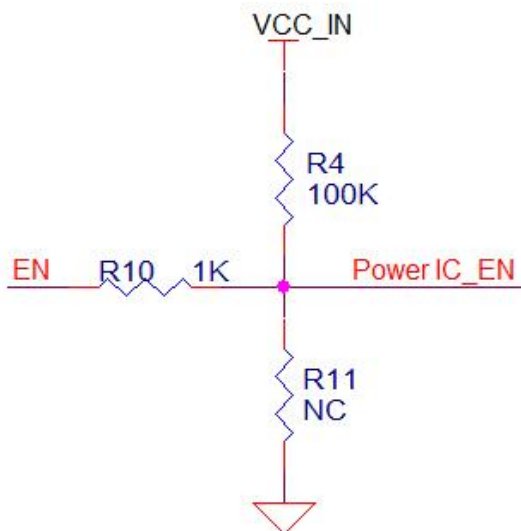


OUT1，OUT2 动作时间



IN1，IN2 动作时间

EN 脚内置 100K 上拉电阻，EN 脚接高电平或悬空时模块上电，EN 脚接低电平时模块掉电



● 输入电源

VCC 电源输入建议使用一个 22~100uF 的钽电容，如果尺寸限制，也可以改为小尺寸的陶瓷电容，并且至少并联一个 0.1uF 与一个 100pF 陶瓷电容。模块工作时的最大电流将近 1.4A（峰

值电流)，盘存标签时，模块内部功放会频繁开启和关闭，这会导致模块输入端电源电压也随着产生波动。增加大容量电容可以减小这些电压的波动幅度，滤除掉低频信号的干扰，同时也会引起瞬间流过大，根据模块供电电路的驱动能力，选择合适的大容量退耦电容。而 0.1 μ F 和 100pF 电容用于滤除高频段的电源纹波，因为高频段的干扰信号，特别是工作频段的干扰信号进入到模块，将会使模块的读标签性能下降，此外陶瓷电容的加入也能防止模块工作时产生的高频信号通过电源通路，干扰到其他电路系统。

由于模块工作电流较大，连接模块的排线要足够粗，否则连接线两端会产生过大的压差，将使模块无法正常工作；过细的连接线也更容易产生辐射的干扰信号。

如果电源输入是 DC-DC 转换电路，最好选择开关频率超过 1.5MHz 的电源转换芯片，避免对标签返回的微弱信号产生干扰。

● 通讯串口

读写器模块采用 3.3V UART 串口进行数据通信，数据格式配置为 1 位起始位，8 位数据，1 位停止位，无校验位（8N1）。

串口进行通信时，串口通信信号产生的频率与杂散和标签返回的 BLF 信号接近，有可能会通过传导与辐射的方式进入到模块射频芯片的接收端。由于标签散射回模块的信号一般很弱，当这样的干扰发生时，会使模块的接收性能急剧下降。如果串口的 PCB 走线较长，可将走线布在 PCB 的内层或者布在放置天线相反的 PCB 层上，同时预留用于串联的匹配电阻和到地的并联电容，这可以用于减小串口信号的振铃；当需要采用板间连接线连接时，连接线最好贴地布线。

串口的波特率需要满足模块上传标签数据的传输速率要求，盘存较多标签时，推荐波特率如下表所示：

RF_MODE ID	Forward Link Modulation	BLF (KHz)	Reverse Link Modulation	Baud Rate Select
103	DSB-ASK	640	FMO	921600
11	PR-ASK	640	FMO	921600
120	DSB-ASK	640	Miller M=2	>460800
1	PR-ASK	640	Miller M=2	>460800
345	PR-ASK	640	Miller M=4	>230400

15	PR-ASK	640	Miller M=4	>230400
12	PR-ASK	320	Miller M=2	>230400
3	PR-ASK	320	Miller M=2	>230400
5	PR-ASK	320	Miller M=4	>115200
7	PR-ASK	250	Miller M=4	>57600
13	PR-ASK	160	Miller M=8	>57600

● 天线端口

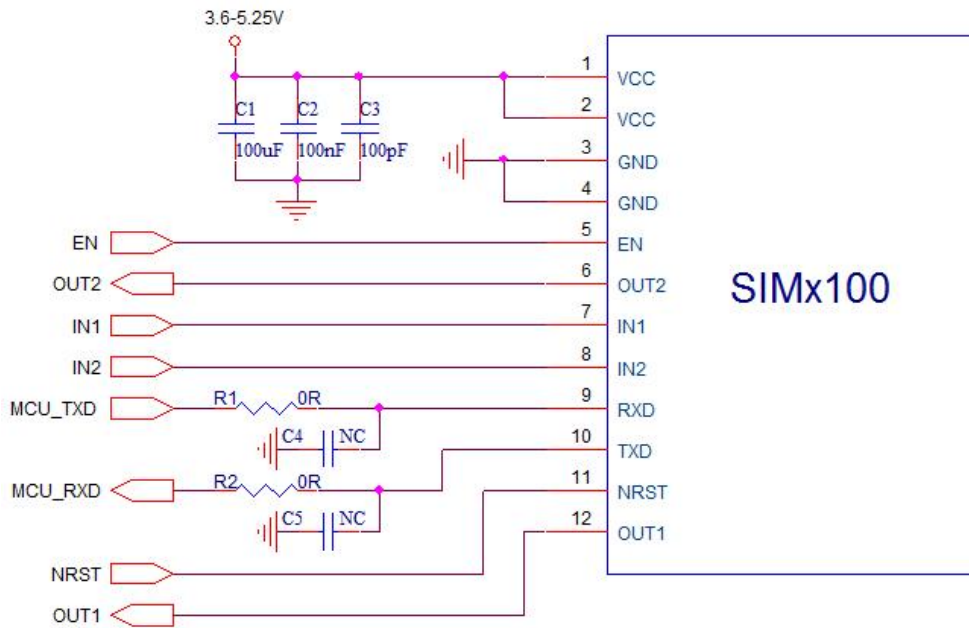
当模块与天线不匹配时，从天线反射回读写器模块信号过大，这会使接收灵敏度恶化，建议天线驻波比小于 1.5。当使用 E710 芯片的模块应用在需要快速读取大量标签的应用场合时，如果天线驻波较大导致接收灵敏度恶化后，会极大地增加读全标签的时间；对于距离近标签少的应用环境，选择使用 E510 或者 E310 的模块更加合适。

由于模块内的功放芯片与天线之间并未使用 RF 隔离器或者 RF 环形器进行隔离，当功放芯片与天线不匹配时，功放芯片输出的线性度与转换效率会发生变化。前者会使发射性能发生变化，比如功率输出减小，辐射杂散与频谱模板不符合当地无线电法规要求；后者则会使模块的功耗增加，工作温度更高，使用寿命减小，最差的情况下，功放芯片工作在匹配的不稳定区域产生自激，这种情况下，功放芯片很容易损坏。为保证模块工作的性能与稳定，建议将天线安装在应用环境中后，使用测试软件检测一下连接天线后的驻波比，天线驻波比要尽量小于 1.5。

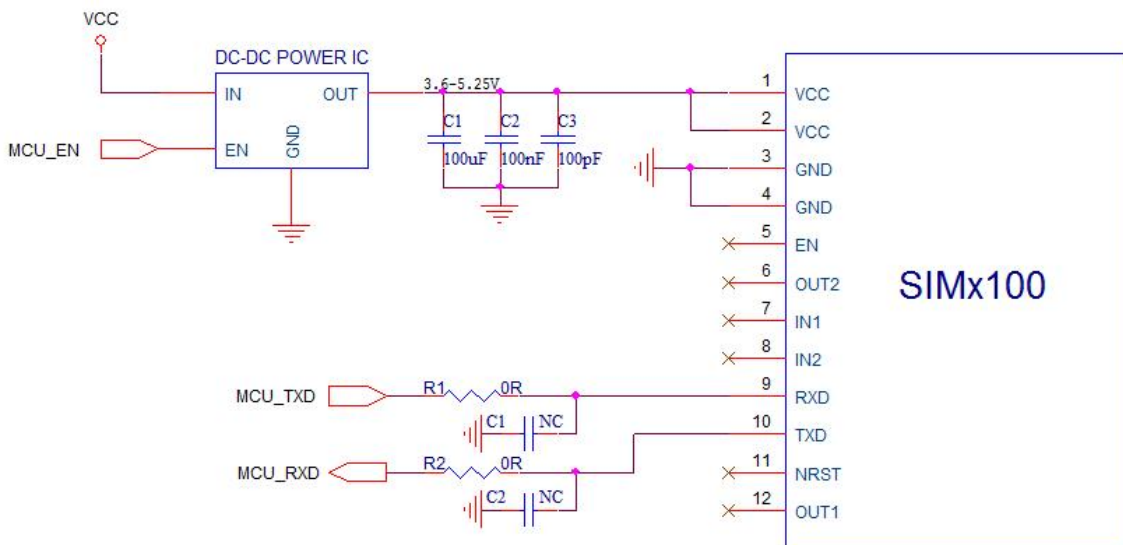
● 散热说明

SIMx100 模块最大功率快速模式工作时发热量大，自带铝合金外壳满足不了散热要求，需要将模块固定在更大的金属散热片上。为保证导热效果需要在模块与散热片接触位置使用导热硅胶或硅脂。为了保护模块，当模块的检测温度达到 90℃时，会自动停止读写器模块盘存标签，需要再次盘存标签时，要重新发送盘存命令。

● 参考电路



简化版参考电路



● 标记说明



— SN 二维码

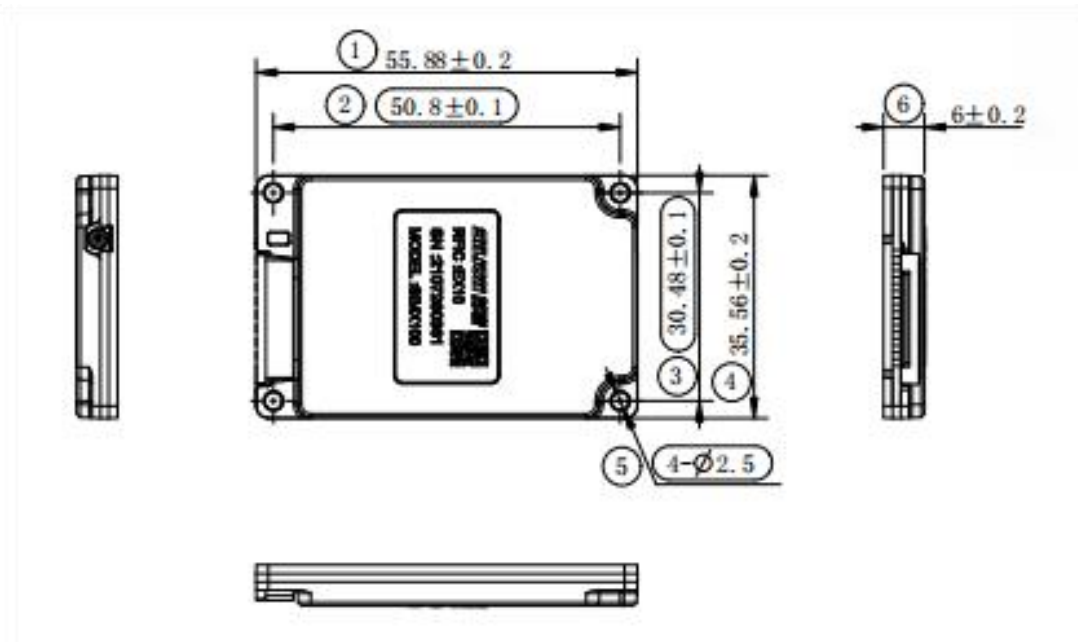
读写器芯片型号: ——— RFIC: EX10
 E710, E510, E310

SN: YYMMDDXXXX ——— SN 码:
 YYMMDD: 年 月 日
 XXXX: 模块生产编号

模块型号: ——— MODEL: SIMX100
 SIM7100
 SIM5100
 SIM3100

● 整体尺寸

55.9mm x 35.6mm x 6.0mm (长 x 宽 x 高), 重 21g



外观示意图



订购信息

产品型号	发射功率 (dBm)	支持频段	描述
SIM7100-0000	33	920MHz~925 MHz	SRRC
SIM7100-0100	30	902MHz~928 MHz	FCC
SIM7100-0300	30	865MHz~868 MHz	ETSI
SIM5100-0000	33	920MHz~925 MHz	SRRC
SIM5100-0100	30	902MHz~928 MHz	FCC
SIM5100-0300	30	865MHz~868 MHz	ETSI
SIM3100-0000	33	920MHz~925 MHz	SRRC
SIM3100-0100	30	902MHz~928 MHz	FCC
SIM3100-0300	30	865MHz~868 MHz	ETSI

订购前请与销售联系确认产品参数，可支持其他区域频段。

版本信息

版本	日期	修订内容
V1.0	2023/7/6	首版编辑
.....		

联系方式

如果您有产品需求或者在产品使用中有任何疑问，请随时与我们联系，我们将竭诚为您服务。

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Overview

SIMx100 a high-performance RFID single-port module is based on IMPINJ new E710/E510/310.

The output power is 5dBm to 33dBm(adjustable), max reading range more than 12 meters (depend on the gain of antenna and the size of tags) , and possesses outstanding multi-tag inventory performance

SIMx100 has high power output, low power consumption, high stability, It employs advanced multi-tag recognition algorithms, enabling rapid tag identification whether the tags are in motion or stationary.

With superior anti-interference design and carrier offset capabilities, it can operate reliably in various environments.

It offers multiple configuration modes, making it suitable for a wide range of applications, including warehouses, logistics, production lines, and inspections, among others.



Applications

Model.	Sensitivity @PER 10%	Read rate @96 bit EPC
SIM7100	-87dbm	>1000
SIM5100	-80dbm	>600
SIM3100	-73dbm	>350

- Handheld terminal
- Desktop reader
- Printers
- Integrated reader

Characteristics

- ARMv7-M structure 32bit Cortex-M4 CPU, integrated FPU、MPU, DSP, highest operating frequency is 200MHz, with 512KBytes of flash memory.
- Support UHF EPC Class1 Gen2/ISO 18000-6C
- Windows, Linux, Android SDK and API based on C,C#/.NET, JAVA are provided.
- Supports temperature tag inventory, and the output parameters can include the RSSI
- Max 33dBm output power
- Features an excellent anti-collision algorithm, high sensitivity, and a tag inventory speed exceeding 1000 tags per second.
- Multiple inventory modes are available to suit most applications.
- The UART serial communication baud rate can be configured from 9600 bps and above.
- 2 inputs and 2 outputs of GPIO
- North American and European frequency bands: Full power at 30dBm with a power consumption of 5W.
Chinese frequency band: Full power at 33dBm with a power consumption of 6.75W.
- Aluminum alloy matte finish casing, weighing 21 g.
Dimension 55.9mm x 35.6mm x 6.0mm
- SRRC,CE,FCC certificated
- Meet ROHS requirements

The absolute maximum rating value.

Parameter	Symbol	MIN	Typical	MAX	Unit
Input voltage	VCC	-0.3		6	V
Enable voltage	VEN	-0.3		6	V
Reset (NRST) GPI(IN1 IN2) input low voltage	VIL			0.6	V
Reset (NRST) GPI(IN1 IN2) input high voltage	VIH	2.7			V
GPO(OUT1 OUT2) output current	IOH			15	mA
Module output current.	AVCC			20	mA
ESD protection voltage ¹	VESD	-2		2	kV
Antenna port (ANT) SWR ²	VSWR			8	/
Operating temperature	TC	-30		75	°C
Storage temperature	TS	-55		100	°C



ESD note:

。 When handling, packaging, and testing equipment, it is essential to observe appropriate precautions.

1. The antenna port testing conditions follow IEC61000-4-2 level 1, using contact discharge, while other interfaces are tested using the HBM model with contact discharge.
2. To prevent damage to the power amplifier chip, it is important to consider the maximum allowable standing wave ratio (SWR). To ensure optimal performance, it is recommended to maintain an SWR of less than 1.5 for the antenna.
3. Environmental temperature is related to the module's heat dissipation conditions, and the maximum temperature limit depends on these factors.

General working conditions.

Parameter	Symbol	MIN	Typical	Max	Unit
Input voltage	VCC	3.6	5	5.5	V
					V
Dropout voltage	VEN			0.4	V
Enable voltage		1.5			V
Reset (NRST) GPI(IN1 IN2) input low voltage	VIL			0.3	V
Reset (NRST) GPI(IN1 IN2) input high voltage	VIH	3			V
GPO(OUT1 OUT2) input voltage	IOH		10		mA
Module output current	AVCC		10		mA
Antenna port (ANT) SWR	VSWR			2.5	/
Operating humidity (non-condensing).	RH	5		95	%
Operating temperature	TC	-25		65	°C
Storage temperature	TS	-40		85	°C

General electrical parameters.

Parameter		Condition	MIN	Typical	MAX	Unit	
Frequency	Frequency range		860		960	MHz	
	Frequency step size ²			250/500		KHz	
	Frequency error	@25°C	-10		10	ppm	
Output	Output power		5		33	dBm	
	Power step size			1		dB	
	Output power accuracy	5dBm~33dBm	-1		1	dB	
	Output power flatness	5dBm~33dBm	-1		1	dB	
	Adjacent channel leakage ratio (ACLR)*	First adjacent channel			-45		dB
		Second adjacent channel			-65		dB
	20 dB occupied bandwidth*	RF_MODE 7			110		KHz
		RF_MODE 11			215		KHz
	Transmit spectrum template* ³	Margin	2			dB	
	Spurious emissions (conducted) ⁴	Second harmonic			-55		dBm
Third harmonic				-38		dBm	
Measurement	Module temperature accuracy	-25°C~115°C ⁵	-4		4	°C	
	Tag RSSI measurement accuracy	@-60dBm	-3		3	dB	
	Tag phase measurement accuracy	@-60dBm	-5		5	degrees	
	Load return loss measurement accuracy	RL>18dB Attenuator connection.	-4		4	dB	
UART	Default baud rate	Data format:		115200		bps	
	Selectable baud rates	8N1	9600		921600	bps	
Power consumption	Power-down mode			0.00025		W	
	Low power consumption standby mode			0.1		W	
	Normal standby mode			0.6		W	

Operating mode ⁶	NA、EU @30dBm	5	W
	China@33dBm	6.75	W

1. Frequency region selection is limited to a single frequency band and cannot support multiple frequency regions simultaneously.
 2. Frequency step can be configured based on the selected frequency region.
 3. Reference "ETSI EN 302 208" 4.3.5 Transmitter spectrum masks.
 4. Testing conducted under full frequency conditions.
 5. When the temperature exceeds 90°C, the module will forcibly stop inventory operations, and manual command input is required to restart inventory.
 6. The module's operating power consumption may vary based on antenna matching conditions.
- Note: * indicates testing conducted in inventory mode with RF_MODE 7, and the spectrum analyzer set to MAXHOLD.

Air interface mode parameters and performance.

RF_MO DE ID	Forward Link Modulation	Tari (us)	BLF (KHz)	Reverse Link Modulation	Receive Sensitivity Minimum ¹ (dBm)			Read Rate ² (tag s/s)
					E710	E510	E310	
11	PR-ASK	7.5	640	FM0	-64.1	N/A	N/A	>900
1	PR-ASK	7.5	640	Miller M=2	-70.4	-65.4	N/A	>650
15	PR-ASK	7.5	640	Miller M=4	-76.2	-70.2	N/A	>450
12	PR-ASK	15	320	Miller M=2	-76.6	-71.4	-63	>350
3	PR-ASK	20	320	Miller M=2	-76.1	-71.4	-63	>300
5	PR-ASK	20	320	Miller M=4	-81.5	-75.5	-66.7	>200
7	PR-ASK	20	250	Miller M=4	-81.4	-76	-68	>150
13	PR-ASK	20	160	Miller M=8	-87.4	-81	-73.4	>70

1. Testing equipment: CISC XPLORER 200, PER (Packet Error Rate) 10%, output power 30dBm, antenna port return loss less than -20dB.2. Testing with a 12dBi antenna gain and 4000 tags.
3. "N/A" indicates that this mode is not supported.

From the table, it's evident that the SIMx100 offers up to 8 different configuration modes, highlighting the two most critical metrics for the reader module: sensitivity and multi-tag read speed. There's a trade-off between sensitivity and multi-tag read speed because modes with better sensitivity tend to have lower tag read rates. Choosing between reading better or reading more tags should be based on the specific requirements of the application. Another important consideration is the

interference that can occur when multiple readers are operating simultaneously. Smaller TARI values, while accelerating the communication connection to the tag, can increase the bandwidth of the transmission channel, making them more likely to interfere with other readers. Additionally, a higher tag backscatter link frequency (BLF) to improve the speed of the tag's reverse transmission signal may cause the tag's return signal to fall within adjacent channels. When other readers are operating in these adjacent channels, there is a higher likelihood that the reader may not be able to effectively demodulate the tag's return signal.

Inventory mode parameter

For different application scenarios, SIMx100 offers a variety of operating modes. Except for the temperature-controlled multi-tag inventory mode, all other modes are automatically handled by the reader module. This not only saves time on command interaction between the host and the reader module but also greatly enhances the product's versatility through excellent processing algorithms.

Scenario	Working mode	Description
Few tags Distance inventory	Normal mode	Recommend RF_MODE 13, session0, >50tag/s
	Fast mode	Recommend RF_MODE 13, session0/1, Status indicator A-B, >70tag/s
Multi-tag inventory	EX10 fast mode	RF_MODE auto-adjustment, recommended to use a higher baud rate for faster reading of all tags. SIM7100: >700tag/s ; SIM5100: >500tag/s ; SIM3100: >300tag/s
Temperature-controlled multi-tag inventory	E7 temperature controlled mode	RF_MODE auto-adjustment, when there are fewer tags added than the specified quantity, it will automatically adjust the operational duty cycle. When the number of added tags exceeds the specified quantity, it will return to full-speed mode. SIM7100: >700tag/s ; SIM5100: >500tag/s ; SIM3100: >300tag/s
High read rate Inventory	Fast mode	Recommended mode RF_MODE 103 (E710) 、RF_MODE 120 (E510) 、RF_MODE 12 (E310) , session0, status indicator A-B, static Q value. SIM7100: >1000tag/s ; SIM5100: >700 tag/s ; SIM3100: >300 tag/s

Pin configuration and functions.



Pin No.	Name	Type	Description
1	VCC	Power	Supply voltage: Input from 3.6V to 5.25V.
2	VCC	Power	Supply voltage: Input from 3.6V to 5.25V.
3	GND	Power	GND
4	GND	Power	GND
5	EN	Digital input	Module Enable Pin: Module is enabled when connected to a high-level signal or left floating; the module powers down when connected to a low-level signal.
6	OUT2	Digital I/O	General I/O Port Output: Push-pull output.
7	IN1	Digital I/O	General I/O Port Input.
8	IN2	Digital I/O	General I/O Port Input.
9	RXD	Digital input	Module UART Input, 3.3V logic level
10	TXD	Digital output	Module UART Input, 3.3V logic level
11	NRST	Digital input	Module Reset: Module is reset when connected to a low-level signal and can be left floating when not in use.
12	OUT1	Digital I/O	General I/O Port Output: Push-pull output.
	ANT	RF	RF Antenna Port (50Ω).

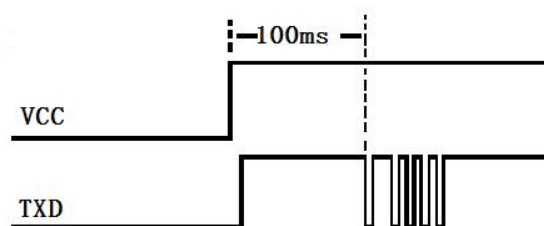
Pin No.	Name	Type	Description
1	GND	Power	GND
2	GND	Power	GND
3	VCC	Power	Supply voltage: Input from 3.6V to 5.25V.
4	VCC	Power	Supply voltage: Input from 3.6V to 5.25V.
5	EN	Digital input	Module Enable Pin: Module is enabled when connected to a high-level signal or left floating; the module powers down when connected to a low-level signal.
6	RXD	Digital input	Module UART Input, 3.3V logic level
7	TXD	Digital output	Module UART Input, 3.3V logic level
8	NRST	Digital input	模 Module Reset: Module is reset when connected to a low-level signal and can be left floating when not in use.
9	OUT1	Digital I/O	General I/O Port Output: Push-pull output.

- FFC/FPC Connector Interface: 1mm pitch, 12 pins, drawer-type, downward-facing.
- RF Antenna Port Connector: MMCX.

Application instruction

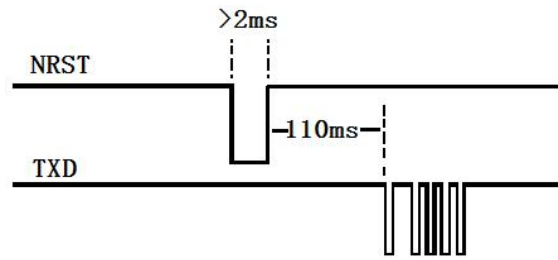
● Power-On Start and IO Interface

After powering on the module, it requires approximately 100ms for initialization. During this period, it's important not to pull the reset pin low, and the reader module will not respond to received commands.



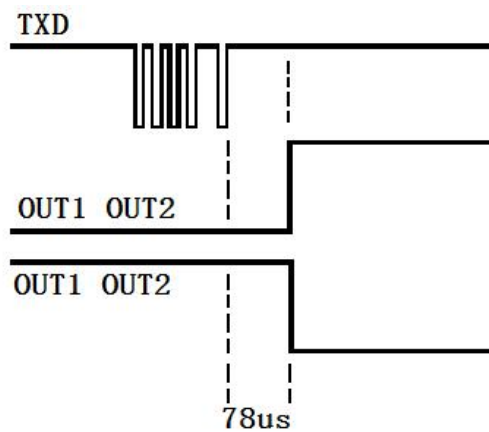
Power-on startup time

After powering up, NRST release time is less than 3ms. If NRST is pulled low after power-on, it will restart the internal MCU. A 100K pull-up resistor is already connected to NRST. If the module is already powered, the reset trigger should be held low for more than 2ms. The actual reset time should be greater than 110ms.

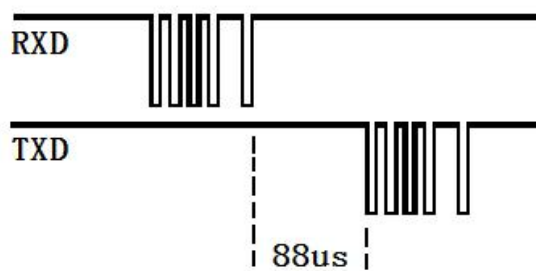


Reset waiting time

The response time is measured by sending a command to obtain GPIO and measuring the time difference until the response is received. For OUT1 and OUT2 setting commands, the action time is greater than 78us (excluding command time). For IN1 and IN2 setting commands, the action time is greater than 88us (excluding command time).

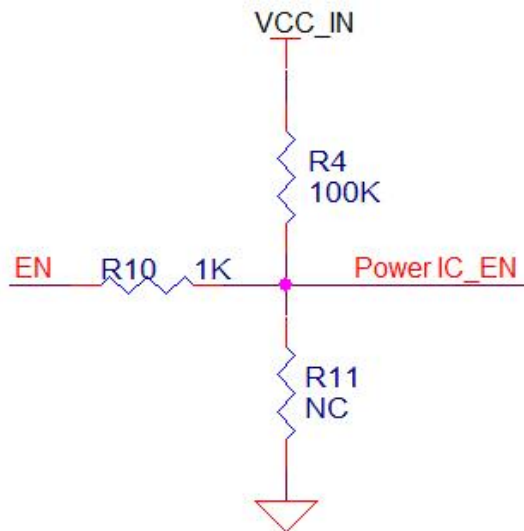


OUT1, OUT2 action time



IN1, IN2 action time

The EN (Enable) pin has an internal 100K pull-up resistor. When the EN pin is connected to a high-level signal or left floating, the module powers on. When the EN pin is connected to a low-level signal, the module powers down.



● Input power

For the VCC power input, it's recommended to use a tantalum capacitor between 22 μ F to 100 μ F. If space is limited, you can use smaller ceramic capacitors, but always include at least one 0.1 μ F and one 100pF ceramic capacitor in parallel. Since the module can draw a peak current of approximately 1.4A during tag inventory, it's crucial to minimize voltage fluctuations in the input caused by the internal power amplifier switching on and off. Using larger capacitors helps achieve this and filters out low-frequency interference. Additionally, employ 0.1 μ F and 100pF capacitors to filter out high-frequency power supply ripples. High-frequency interference, especially within the module's operating frequency range, can degrade tag reading performance and potentially interfere with other circuits. Due to the module's high operating current, use sufficiently thick wires for connections to prevent excessive voltage drops. Thin wires may lead to radiated interference. If you're using a DC-DC conversion circuit for power input, opt for a converter chip with a switching frequency above 1.5MHz to avoid interfering with the module's sensitive tag signals.

● Communication Serial Port

The reader module uses a 3.3V UART serial port for data communication, configured with a data format of 1 start bit, 8 data bits, 1 stop bit, and no parity (8N1). When communicating via the serial port, the signal frequencies generated can be close to the noise and tag return Backscatter Link Frequency (BLF) signals, potentially entering the module's RF chip's receive end through conduction and radiation. Since the signals returned by tags are generally weak, such interference can significantly degrade the module's reception performance. If the PCB traces for the serial port are

long, consider routing them on inner layers of the PCB or on the PCB layer opposite to where the antenna is placed. Additionally, reserve matching resistors for series connection and capacitors connected to ground to reduce ringing in the serial port signal. When using inter-board connection cables, it's best to route the cables close to the ground.

The serial port's baud rate should meet the requirements for transmitting tag data from the module. For inventorying a larger number of tags, the recommended baud rates are as shown in the table below:

RF_MODE ID	Forward Link Modulation	BLF(KHz)	Reverse Link Modulation	Baud Rate Select
103	DSB-ASK	640	FM0	921600
11	PR-ASK	640	FM0	921600
120	DSB-ASK	640	Miller M=2	>460800
1	PR-ASK	640	Miller M=2	>460800
345	PR-ASK	640	Miller M=4	>230400
15	PR-ASK	640	Miller M=4	>230400
12	PR-ASK	320	Miller M=2	>230400
3	PR-ASK	320	Miller M=2	>230400
5	PR-ASK	320	Miller M=4	>115200
7	PR-ASK	250	Miller M=4	>57600
13	PR-ASK	160	Miller M=8	>57600

● Antenna Port:

Mismatch between the module and antenna can lead to excessive signal reflection from the antenna to the reader module, causing a degradation in receiver sensitivity. It is recommended to maintain an antenna VSWR (Voltage Standing Wave Ratio) below 1.5. In applications requiring rapid reading of a large number of tags, especially when using modules based on the E710 chip, a high antenna VSWR that degrades receiver sensitivity can significantly increase the time required for reading all tags. For applications with fewer tags at closer distances, choosing modules based on the E510 or E310 may be more suitable.

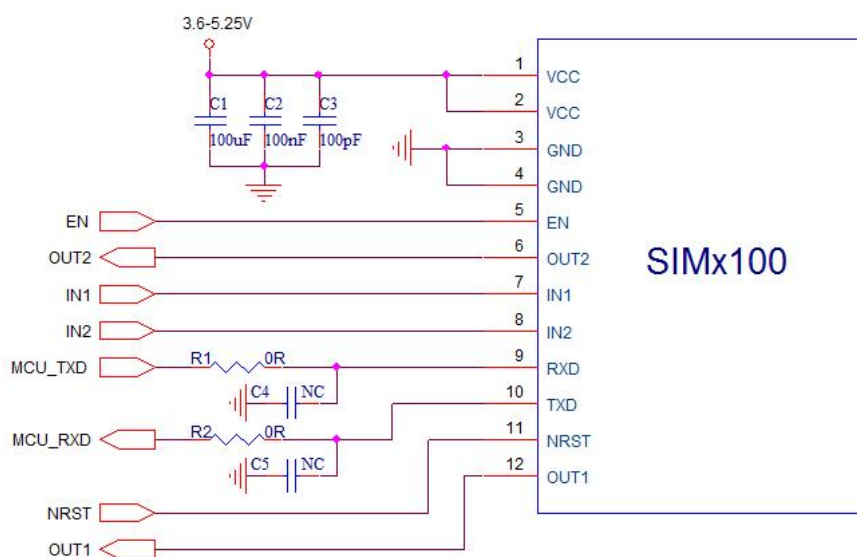
Since there is no RF isolator or RF circulator used between the power amplifier chip in the

module and the antenna, mismatches between the power amplifier chip and the antenna can affect linearity and conversion efficiency. The former can result in changes in transmission performance, such as reduced power output, radiation of spurious signals, and non-compliance with local radio regulations regarding spectrum masks. The latter can increase the module's power consumption, operating temperature, and reduce its lifespan. In the worst-case scenario, the power amplifier chip may operate in an unstable region due to mismatches, leading to self-excitation, which can easily damage the power amplifier chip. To ensure optimal module performance and stability, it is recommended to install the antenna in the application environment and use testing software to measure the VSWR after connecting the antenna. The VSWR should ideally be below 1.5.

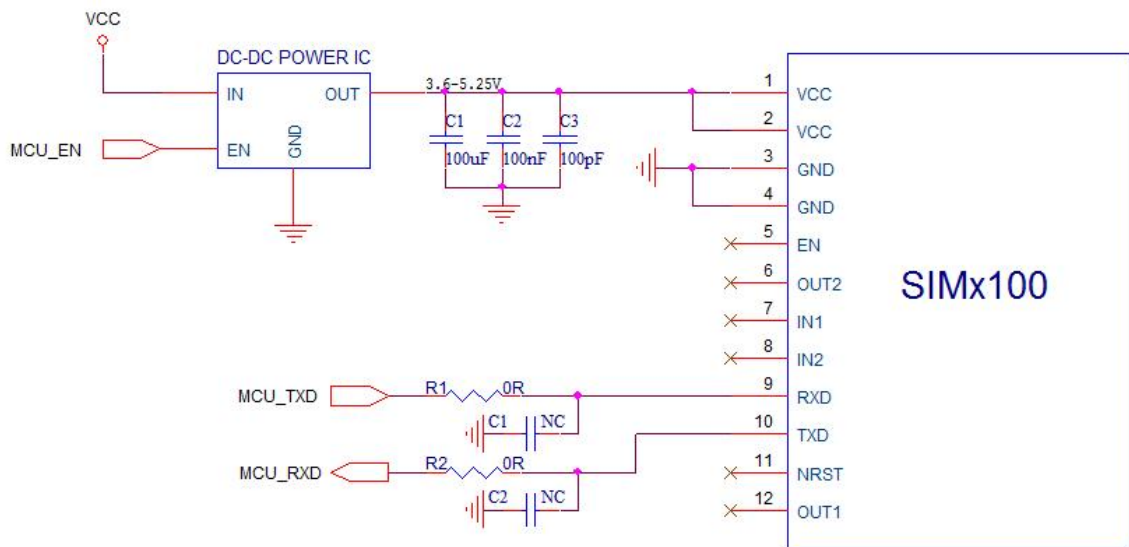
● Heat Dissipation

During high-power operation in fast mode, the SIMx100 module generates significant heat, and its built-in aluminum alloy casing may not provide sufficient heat dissipation. Therefore, it is necessary to mount the module on a larger metal heatsink. To ensure efficient heat conduction, it is recommended to use thermal conductive silicone gel or grease at the contact points between the module and the heatsink. To protect the module, it will automatically halt tag inventory when the detected temperature of the module reaches 90°C. If you need to resume tag inventory, you will need to resend the inventory command.

● Reference



Simplified Reference



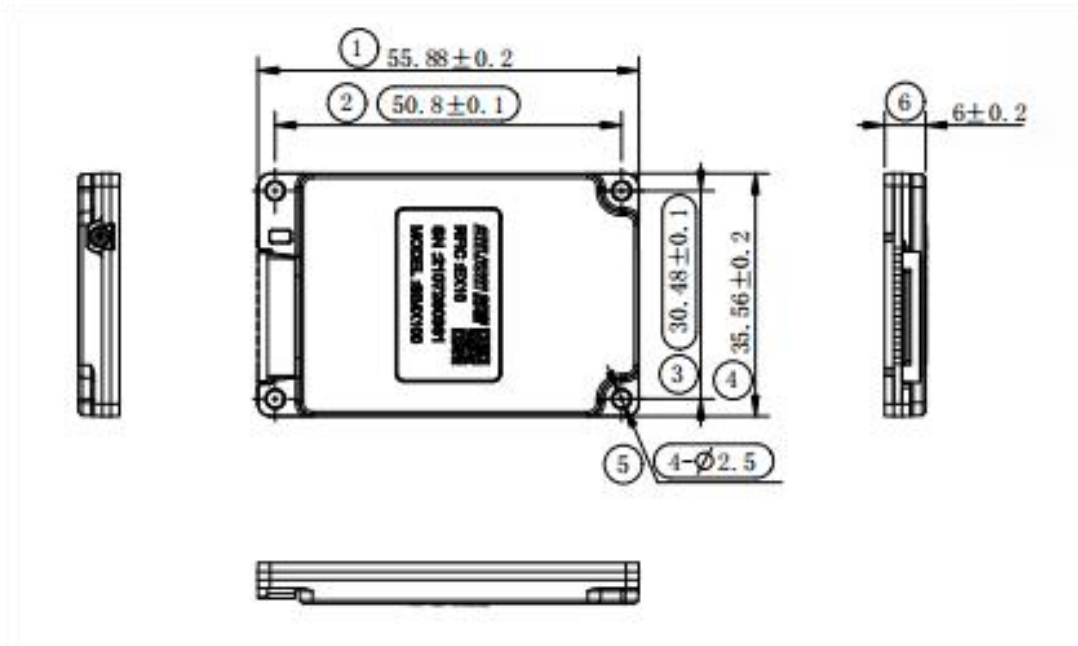
Circuit

● Label Explanation

	SILION 芯联		SN QR code
Chipset: E710, E510, E310	RFIC: EX10		SN NO.:
	SN: YYMMDDXXXX		YYMMDD: year/month/date
Model no.	MODEL: SIMX100		XXXX: Module
SIM7100			Production Serial
SIM5100			
SIM3100			

● **Dimension**

55.9mm x 35.6mm x 6.0mm, weight: 21g



Appearance



Order information

Model no.	Output (dBm)	Supported frequency	Description
SIM7100-0000	33	920MHz~925 MHz	SRRC
SIM7100-0100	30	902MHz~928 MHz	FCC
SIM7100-0300	30	865MHz~868 MHz	ETSI
SIM5100-0000	33	920MHz~925 MHz	SRRC
SIM5100-0100	30	902MHz~928 MHz	FCC
SIM5100-0300	30	865MHz~868 MHz	ETSI
SIM3100-0000	33	920MHz~925 MHz	SRRC
SIM3100-0100	30	902MHz~928 MHz	FCC
SIM3100-0300	30	865MHz~868 MHz	ETSI

Please contact our sales team to confirm product specifications before placing an order. We can support other regional frequency bands as well.

Version

Version	Date	Modify content
V1.0	2023/7/6	First edition
.....		

Contact

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