MXCHIP® | 智能硬件解决方案提供商

Datasheet

MX1290/ MX1290V2

IoT WiFi SOC

Version : 1.6 Date : 2018-08-23 Serial number: DS0075EN

ABSTRACT

MX1290/MX1290V2 is a highly integrated IoT WiFi SoC chip that contains MCU, RAM, WiFi, and a variety of IO interfaces.

MCU

- ARM Cortex-M4F MCU, 32-bit
- Frequency： MX1290 133MHz, MX1290V2 62.5MHz

Storage Device

- 256KB SRAM
- 512KB ROM

Flash controller

- 32KB cache, support external SPI flash XIP
- Support SPI, Dual SPI, Quad SPI, QPI, DIO mode of NOR Flash

Interface

- 2x UART
- 1x SPI, support master mode
- 2x I2C, support master and slave mode
- 6x PWM
- 1x RTC
- 13x GPIO
- 1x SWD

WiFi

- 2.4GHz single frequency band, IEEE 802.11 b/g/n
- Support HT20@72.2Mbps
- Built-in power amplifier (PA), transceiver switch, and low noise amplifier
- Built-in OTP

Security

- WEP——Using WEP64 bit or 128 bit data encryption
- WPA-PSK — — Use WPA-PSK standard encryption, encrypt type TKIP.
- WPA2-PSK[AES] — — UseWPA2-PSK standard encryption, encrypt type AES.

Chip packaging

- 32-pin QFN, 5 mm x5mm

Temperature

- Working temperature: -20 to 85 degrees centigrade
- Storage temperature: -40 to 150 degrees centigrade

Application

- Smart home / home appliances - refrigerators, air conditioners, washing machines, microwave ovens, oven, dryer, water heater, intelligent sockets, etc.
- Commercial / industrial automation - lighting, smart meter, POS
- Personal health equipment - weight scale, sphygmomanometer, blood glucose meter
- Intelligent security - security door lock
- Personal wear - a smart Watch

Version update description

DATE	Version	Update content
2017-03-15	1.0	Initial document
2017-03-27	1.1	Update pin information
2017-04-21	1.2	Update MOQ information
2018-04-25	1.3	Update reflow temperature curve
2018-05-11	1.4	Add MX1290V2. It's pin to pin compatible with MX1290, and the power consumption is optimized, and MCU frequency is lower than MX1290
2018-07-16	1.5	Update power consumption
2018-08-23	1.6	Add IO status information when boot up in section 2.3

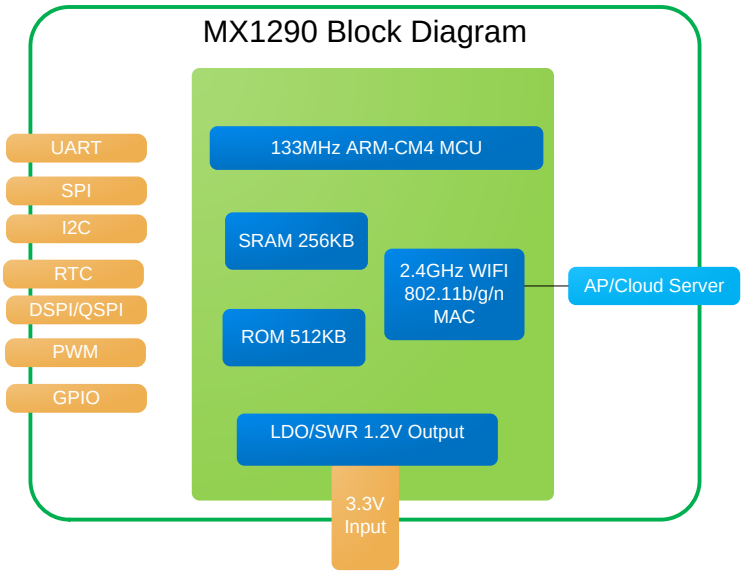
Contents

1. Overview

MX1290/MX1290V2 is a highly integrated, high-performance, low-power IoT WiFi SOC, which includes ARM Cortex-M4F core processor and 2.4GHz single frequency WiFi subsystem, and power management unit. The processor's main frequency is as high as 133MHz(MX1290)/ 62.5MHz(MX1290V2). At the same time, SoC integrated 256KB SRAM, 512KB ROM. It also contains rich peripheral interfaces such as UART, I2C and SPI. It only needs DC 3.3V voltage, and a single crystal oscillator can work. The WiFi subsystem consists of 802.11b/g/n radio frequency, baseband and multimedia access control (MAC) design to meet low power and high throughput applications.

1.1 Block diagram

MX1290/MX1290V2 block diagram please refer to Figure 1.



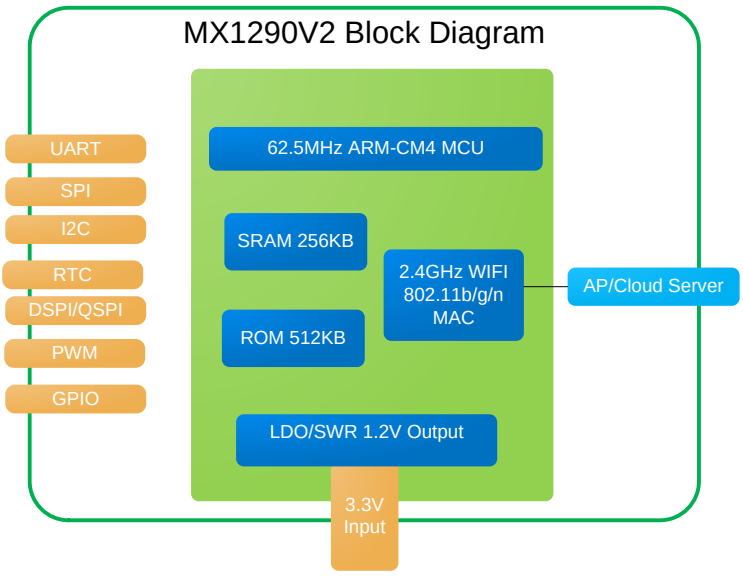


Figure 1 MX1290/MX1290V2 block diagram

3.3V single voltage input, MX1290/MX1290V2 chip internal voltage conversion circuit, the external supply of DC 3.3V conversion into 1.2V for the core processor.

1.2 WiFi standard

- 1x1 SISO IEEE 802.11b/g/n, support HT20
- 802.11e QoS Enhancement (WMM)
- Support WiFi WPS2.0
- Support WiFi Direct
- Support Easylink smart network configuration
- Support WEP/WPA-PSK (TKIP) /WPA2-PSK (AES) /WAPI security protocol

2. Pin assignment and dimension

2.1 Pin assignment

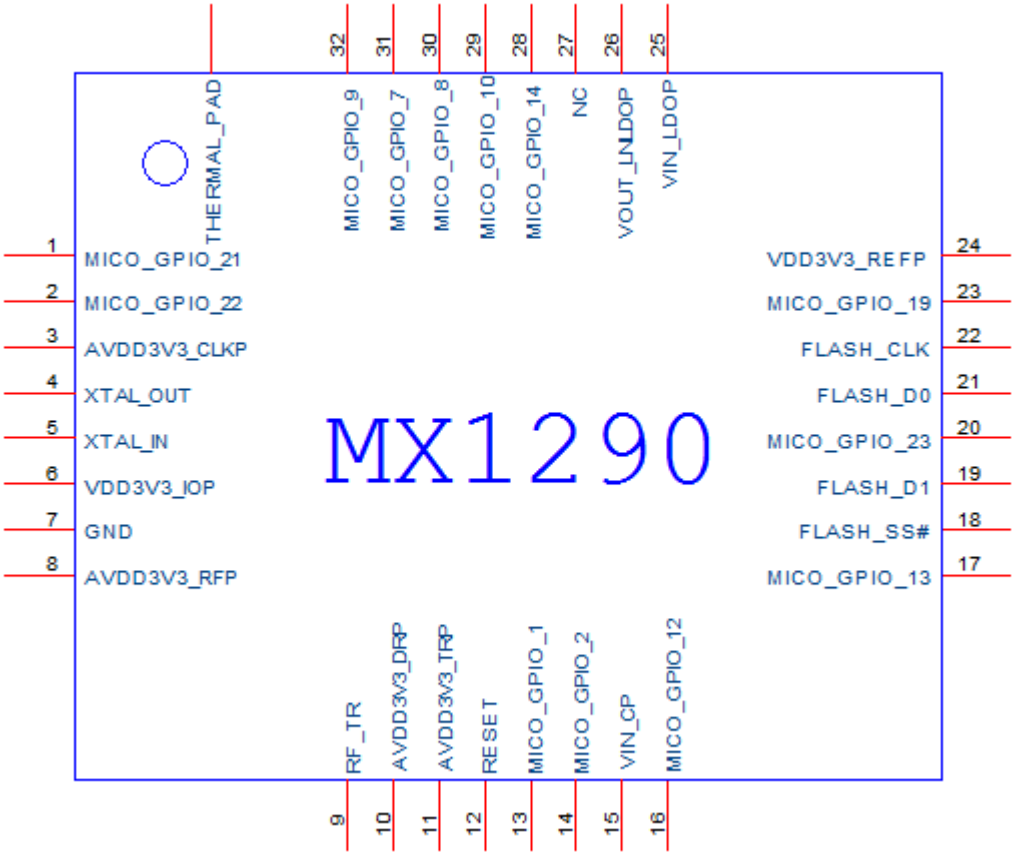


Figure 2 MX1290/MX1290V2 pin assignment

2.2 Pin definition

Figure 3 MX1290/MX1290V2 Pin definition table

PIN number	Pin name	Type	Description
XTAL			
3	AVDD3V3_CLKP	Power	Crystal 3.3V reference voltage
4	XTAL_OUT	O	40MHz crystal output
5	XTAL_IN	I	40MHz crystal input
GND			
7	GND	Ground	Ground
RF			

PIN number	Pin name	Type	Description
8	AVDD3V3_RFP	Power	power amplifier voltage
9	RF_TR	I/O	WIFI RF pin
10	AVDD3V3_DRP	Power	3.3V RF working voltage
11	AVDD3V3_TRP	Power	
Reset			
12	RESET	I	Chip reset，active low
Flash Controller			
18	FLASH_SS#	O	Flash SS
19	FLASH _D1	I	Flash Data 1
21	FLASH _D0	I	Flash Data 0
22	FLASH _CLK	O	Flash clock
24	VDD3V3_REFP	Power	Flash controller 3.3V reference voltage
LDO Regulator and Main Power			
25	VIN_LDOP	Power	Chip internal LDO input voltage，2.97V~3.6V
26	VOUT_LNLDOP	Power	Chip internal LDO output 1.2V voltage
6	VDD3V3_IOP	Power	3.3V IO reference voltage
15	VIN_CP	Power	1.2V chip core working voltage
27	NC	NC	NC
GPIO			
1	MICO_GPIO_21	I/O	Programmable multiplexer I/O
2	MICO_GPIO_22	I/O	
13	MICO_GPIO_1	I/O	
14	MICO_GPIO_2	I/O	
16	MICO_GPIO_12	I/O	
17	MICO_GPIO_13	I/O	
20	MICO_GPIO_23	I/O	
23	MICO_GPIO_19	I/O	
28	MICO_GPIO_14	I/O	

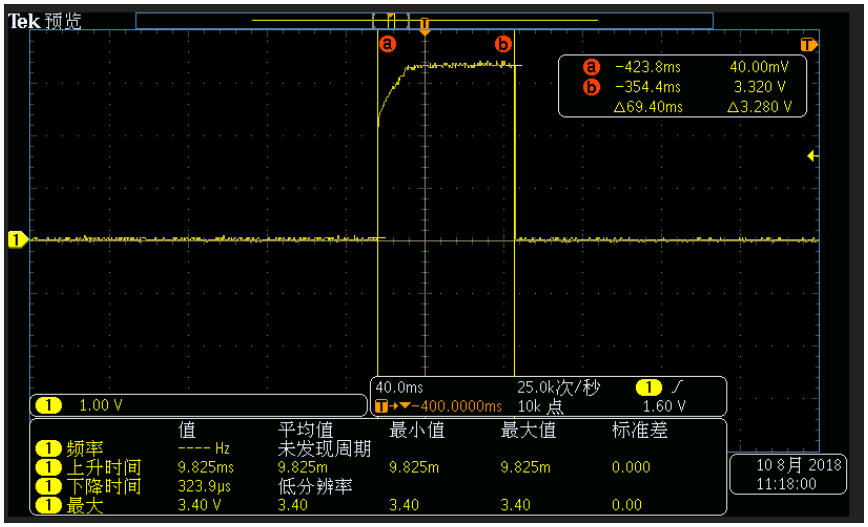
PIN number	Pin name	Type	Description
29	MICO_GPIO_10	I/O	
30	MICO_GPIO_8	I/O	
31	MICO_GPIO_7	I/O	
32	MICO_GPIO_9	I/O	

2.3 GPIO Multiplexer

Figure 4 MX1290/MX1290V2 I/O Multiplexer

Pin	Function 1	Function 2	Function 3	Function 4	Function 5	Function 6
1	MICO_GPIO_21	MICO_I2C0_SDA	MICO_UART1_TXD	MICO_PWM4		
2	MICO_GPIO_22	MICO_I2C0_SCL	MICO_UART1_RXD	MICO_PWM5		
13	MICO_GPIO_1			MICO_PWM1		SWCLK
14	MICO_GPIO_2			MICO_PWM2		SWDIO
16	MICO_GPIO_12			MICO_PWM3		
17	MICO_GPIO_13			MICO_PWM4		
20	MICO_GPIO_23					
23	MICO_GPIO_19					
28	MICO_GPIO_14			MICO_PWM5		
29	MICO_GPIO_10	MICO_I2C1_CLK	MICO_UART0_RXD		MICO_SPI1_CLK	
30	MICO_GPIO_8	MICO_I2C0_SDA	MICO_UART0_CTS		MICO_SPI1_CS	
31	MICO_GPIO_7	MICO_I2C0_SCL	MICO_UART0_RTS	MICO_PWM6	MICO_SPI1_MISO	
32	MICO_GPIO_9	MICO_I2C1_SDA	MICO_UART0_TXD	MICO_PWM1	MICO_SPI1_MOSI	MICO_GPIO_9

Note that IOs are in floating mode while module boot up running ROM code, and the internal pull-up or pull-down will not take effect until boot code is running. The floating time will be affected by flash. So if the IO need be in a certain status while module boot up, an external pull-up or pull-down resistor is needed, and the resistance should be less than 100Kohm. Please refer to the below picture, the IO is set as low, and from a point to b point it's in floating mode and be pulled up by an external 100k resistor.


Tek 预览
a -423.8ms 40.00mV
b -354.4ms 3.320 V
Δ69.40ms Δ3.280 V
1 1.00 V
40.0ms 25.0k次/秒
T -400.0000ms 10k 点
1 1.60 V
值 平均值 最小值 最大值 标准差
1 频率 ---- Hz 未发现周期
1 上升时间 9.825ms 9.825m 9.825m 9.825m 0.000
1 下降时间 323.9µs 低分辨率
1 最大 3.40 V 3.40 3.40 3.40 0.00
10 8月 2018
11:18:00

2.4 Dimension and package

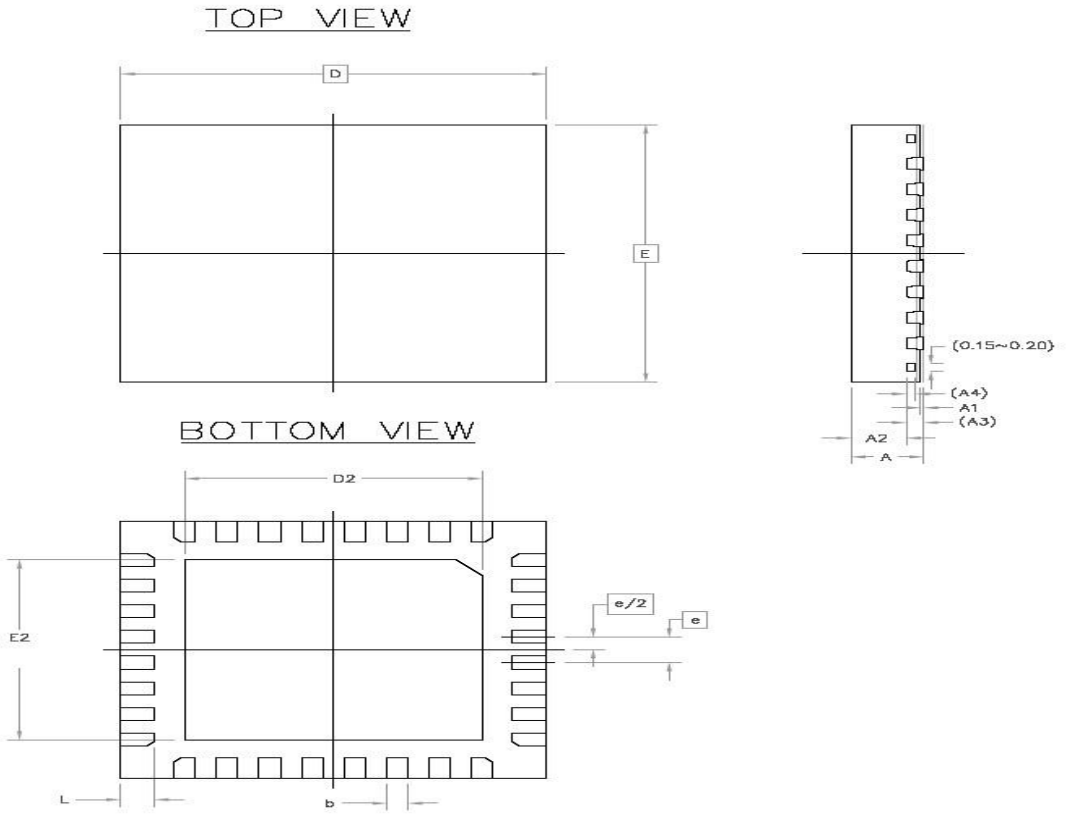


Figure 3 MX1290/MX1290V2 size package

Symbol	Size（mm）			Size（ inch）		
	Min	Type	Max	Min	Type	Max
A	0.80	0.85	0.90	0.031	0.033	0.035
A1	0.00	0.02	0.05	0.000	0.001	0.002
A3	0.20 REF			0.008 REF		
A4	0.10 REF			0.004 REF		
b	0.18	0.25	0.30	0.007	0.010	0.012
D/E	5.00 BSC			0.004 REF		
D2/E2	3.25	3.50	3.75	0.128	0.138	0.148
e	0.50 BSC			0.020 BSC		
L	0.30	0.40	0.50	0.012	0.016	0.020

Figure 4 MX1290/MX1290V2 size table

Note: 1. Unit：millimeter（mm）。2. Reference JEDEC document：JEDEC MO-220。

3. Core and storage

3.1 MCU

MX1290/MX1290V2 integrates a Cortex-M4F MCU, 32-bit, frequency up to 133MHz(MX1290)/ 62.5MHz(MX1290V2).

3.2 Storage

MX1290/MX1290V2 integrates 256KB SRAM and 512KB ROM.

Figure 8 Table of MX1290/MX1290V2 storage address allocation

Start address	Stop address	Size	Description
0x0000_0000	0x0007_FFFF	512KB	Internal ROM storage area
0x1000_0000	0x1001_FFFF	256KB	Internal SRAM storage area
0x0800_0000		32MB	External extended storage

4. Wi-Fi RF specification

4.1 WIFI subsystem block diagram

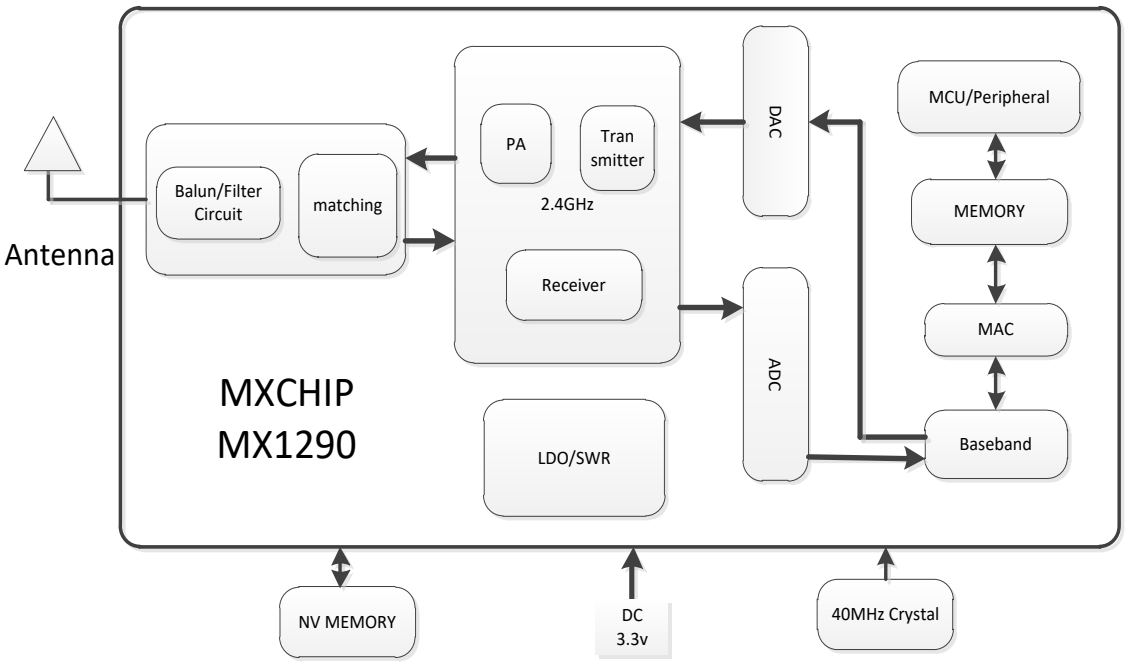


Figure 9 WIFI subsystem block diagram

4.2 WiFi 2.4 GHz Tx specification

Figure 5 MX1290/MX1290V2 2.4GHz Tx spec

Parameter	Condition	Min	Typ.	Max.	Unit
Frequency	-	2400	-	2500	MHz
Output power	1Mbps	-	17	22	dBm
	11Mbps	-	17	20	dBm
	6Mbps	-	15	18	dBm
	54Mbps	-	15	17	dBm
	HT20,MCS0	-	14	16	dBm
	HT20,MCS7	-	14	16	dBm
EVM	1Mbps	-	-	-13	dB
	11Mbps	-	-	-13	dB
	6Mbps	-	-	-5	dB
	54Mbps	-	-	-25	dB

Parameter	Condition	Min	Typ.	Max.	Unit
	HT20,MCS0	-	-	-5	dB
	HT20,MCS7	-	-	-27	dB
Frequency error		-10	-	10	ppm
Spurious emission	30MHz<f<1GHz	-	-	-60	dBm/100kHz
	2.4-2.4835	-	-	-50	dBm/100kHz
	3.4-3.53GHz	-	-	-50	dBm/1MHz
	5.725-5.85GHz	-	-	-50	dBm/1MHz
	1-12.75GHz	-	-	-45	dBm/1MHz

4.3 WiFi 2.4 GHz Rx specification

Figure 6 MX1290/MX1290V2 2.4GHz Rx spec

Parameter	Condition	Min.	Typ.	Max	Unit
Frequency	-	2400	-	2500	MHz
Minimum receive sensitivity	1Mbps	-99	-	-	dBm
	11Mbps	-90	-	-	dBm
	6Mbps	-91	-	-	dBm
	54Mbps	-75	-	-	dBm
	HT20,MCS0	-90	-	-	dBm
	HT20,MCS7	-73	-	-	dBm

5. Electrical parameters

5.1 Rated working condition

Figure 7 MX1290/MX1290V2 rated working condition

Symbol	Description	Min.	Max.	Unit
VDD_IN_3V3	Power supply voltage range	–0.3	3.6	V
T_{STG}	Storage temperature	-40	125	℃
VESD	ESD @HMB mode	-	2000	V

5.2 Recommended working condition

Figure 13 MX1290/MX1290V2 recommended working condition

Symbol	Description	Min.	Typ.	Max.	Unit
VIN_LDOP	Chip Power supply voltage	2.97	3.3	3.6	V
AVDD3V3_DRP	RF power supply voltage	2.97	3.3	3.6	V
AVDD3V3_TRP	RF power supply voltage	2.97	3.3	3.6	V
AVDD3V3_RFP	Power amplifier voltage	2.97	3.3	3.6	V
VDD3V3_REFP	FLASH I/O reference voltage	2.97	3.3	3.6	V
VDD3V3_IOP	IO reference voltage	2.97	3.3	3.6	V
AVDD3V3_CLKP	3.3V crystal reference voltage	2.97	3.3	3.6	V
VIN_CP	Core supply voltage	1.08	1.2	1.32	V
Vreset	Reset voltage	2.97	3.3	3.6	V
Toperating	Working temperature	-20	-	85	℃

Figure 14 MX1290/MX1290V2 TTL electrical level

	Description	Condition	Min	Max	Unit
VIL	Input low voltage	LVTTL	-0.2	0.8	V
VIH	Input high voltage	LVTTL	2.0	3.6	V
VOL	Output low voltage	LVTTL	-0.2	0.4	V
VOH	Output high voltage	LVTTL	2.4	3.6	V

5.3 Power consumption

Figure 8 MX1290/MX1290V2 power consumption

Mode	MX1290 current		MX1290V2 current		Note
	Average	Max	Average	Max	
Wi-Fi off	28.329mA	28.348mA	20.903mA	21.209mA	CPU idle
Wi-Fi off	3.45mA	3.453mA	3.704mA	3.450mA	CPU idle and in low power mode
Wi-Fi off	24.672mA	24.730mA	19.610mA	20.295mA	CPU run at full speed
Wi-Fi initialization	114.119 mA	121.398 mA	110.603mA	126.092mA	Wi-Fi and MCU low power mode OFF
Wi-Fi keep connected with router	114.043 mA	147.086mA	109.447 mA	124.086 mA	Wi-Fi and MCU low power mode OFF
Wi-Fi keep connected with router	14.005 mA	172.128 mA	9.059 mA	282.791 mA	Wi-Fi and MCU low power mode ON
SoftAP	118.691mA	198.92 mA	116.698 mA	306.078 mA	SoftAP
Monitor	114.734 mA	122.779mA	114.699mA	126.954mA	Monitor mode for WiFi configuration
Standby	10.445 uA	12.07 uA	4.642 uA	20.323 uA	MCU/RAM/Peripherals/RTC OFF, wake up by IO or internal Timer
Iperf	160.001mA	336.61mA	115.697mA	345.190mA	Wi-Fi and MCU low power mode OFF
Iperf	164.315mA	332.78mA	115.030mA	353.832mA	Wi-Fi and MCU low power mode ON

Note： The test data is for reference, and it differs by firmware and RF environment.

6. Peripherals

6.1 UART

MX1290/MX1290V2 supports 2 UARTs, one UART supports low power mode (max baud rate up to 6000000, default 921600), the other UART is used for debug and non-low power mode (max baud rate up to 1500000, default 921600).

baud rate up to 6Mbps

support 7 or 8 bit data

support odd /even/none check

support 1 or 2 stop bit

support FIFO

support interruption control

Figure 9 MX1290/MX1290V2 supported baud rate list

Supported baud rate：	
1200	9600
14400	19200
28800	38400
57600	76800
115200	128000
153600	230400
406800	500000
921600	1000000
1382400	1444400
1500000	1843200
2000000	2100000
2764800	3000000
3250000	3692300
3750000	4000000
6000000	

6.2 SPI

MX1290/MX1290V2 supports 4-line Motorola SPI protocol:

- Support master mode
- Max clock frequency up to 31.25MHz

6.3 I2C

MX1290/MX1290V2 supports two I2C interfaces, and supports master and slave mode.

Support standard（0-100kb/s） and fast（<400kb/s） two speed mode. High speed mode (3.4Mb/s) is not supported.

6.4 GPIO

- MX1290/MX1290V2 supports up to 13 GPIOs.
- GPIO multiplexer refer to 2.3 节
- Support external interruption by high/low electrical level, or rising/falling edge
- Internally pull up by default
- Some GPIOs can wake up system from low power mode

6.5 PWM

MX1290/MX1290V2 supports 6 PWMs, with frequency up to 4MHz.

7. Reflow circuit information

Tp: 260 +0/-5℃

Stage	Note	Pb-free assembly
Average ramp-up rate	T_L to Tp	3 ℃/ second max.
Preheat	Temperature min (T_{smin})	150℃
	Temperature max (Tsmax)	200℃
	Time (t_{smin} to t_{smax})	60 – 120 seconds
Time maintained above	Temperature(T_L)	217℃
	Time (t_L)	60 – 150 seconds
Peak package body temperature (Tp)		See following table. Tp must not exceed the specified classification temp in following table.
Time(tp) within 5℃ of the specified classification temperature (Tc)		30 seconds
Ramp-down rate (Tp to T_L)		6 ℃ / seconds max.
Time 25℃ to peak temperature		8 minutes max.

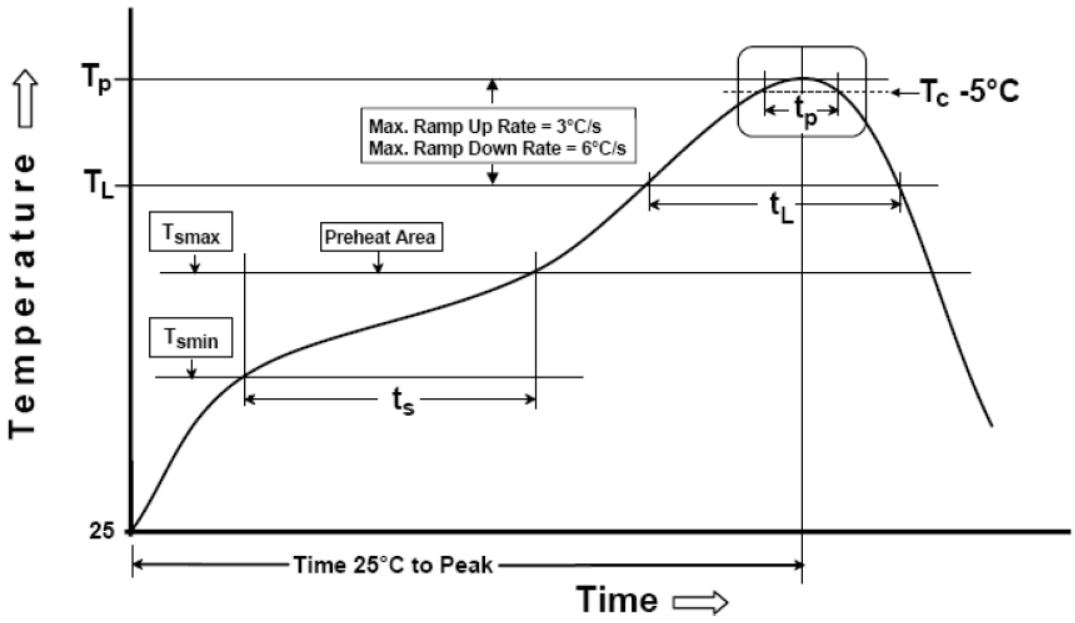


Figure 10 Reflow temperature curve

Notice about storage

1. Storage condition: storage temperature should be below 40℃, and relative humidity below 90%, and max 12 months in vacuum bag.

2. After the vacuum bag is opened, below condition should be followed when the chip is under reflow:

The factory environment: temperature below 40℃, relative humidity below 60%, reflow within 168 hours

RoHS

By 2002/95/EC(RoHS) rule, this product is free from Pb, Hg, Cd, Cr6, PBB, and PBDE.

ESD

IC are ESD sensitive, so it’s required to take right ESD protection when touch the IC.

8. MOQ and package

Part Number	Package	MOQ(pcs)	Shipping package
MX1290 MX1290V2	QFN32_5X5	4900	Tray

9. Sales Information and Technical Support

For consultation or purchase the product, please contact Mxchip during working hours:

From Monday to Friday, morning 9:00~12:00, afternoon 13:00~18:00

Telephone: +86-21-52655026

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