

Data Sheet

EMW3165

Embedded Wi-Fi module

V1.7

Date : 2017-03-31

NO:DS0007E

Overview

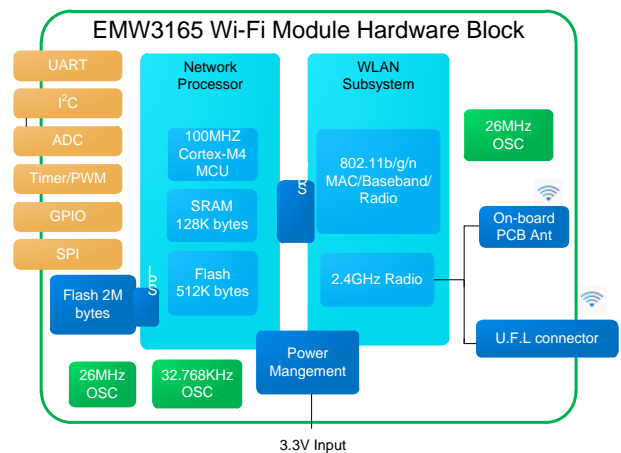
Features:

- Supports IEEE 802.11b/g/n
- Integrated ARM Cortex-M4 processor and WLAN MAC/Baseband/RF
 - Cortex-M4 core at 100MHz
 - 2M bytes on-board SOI flash and 512K bytes on-chip flash
 - 128K bytes RAM
- Operating voltage: DC 3V-3.6V
- Peripherals
 - 22 GPIOs
 - JTAG/SWD debug interfaces
- Wi-Fi features
 - 802.11 b/g/n available
 - WEP, WPA/WPA2, PS
 - TX Output Power 16.5dBm@802.11b, 14.5dBm@802.11g, 13.5dBm@802.11n
 - Receiver Sensitivity: -87dBm
 - Station, Soft AP and Wi-Fi Direct
 - Easylink available
 - On-board PCB antenna and IPEX connector for external antenna
 - CE, FCC compliant
- Operation Temperature: -30°C~+85°C

Product list:

Part number	Antenna type	
EMW3165	PCB antenna	Default
EMW316-E	IPX antenna	Optional

Hardware block:



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Applications:

- Smart LED
- Smart home appliances
- Medical/Health care
- Industrial automation systems
- Point of Sale system
- Auto electronics

Version Record

Date	Version	Update content
2015-1-26	1.0	Initial version
2015-7-3	1.1	1. Update “antenna types” 2. Update ”recommend packaging size”
2015-9-10	1.2	Update “ Function introduction”
2015-12-21	1.3	Update the power consumption
2016-5-31	1.4	Update 5V UART- 3.3V UART conversion reference circuit
2016-6-14	1.5	Update” WiFi connectivity”
2016-7-28	1.6	Update document format
2017-3-29	1.7	Update operating temperature in table 12

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1. Introduction

1.1 Product is introduced

EMW3165 is one embedded Wi-Fi module designed by MXCHIP of low-power, small-size and low-cost. It integrates one Cortex-M4 microcontroller of 128Kbytes RAM and 512Kbytes on-chip flash with another 2Mbytes on-board SPI flash added. Various peripheral interfaces of analog and digital are available. The power supply voltage is 3.3V. It applies half-hole footprint for hand-soldering. The module runs MICO, which is the IOT OS System of MXCHIP, and is available for secondary development. The TCP/IP protocols and security encryption algorithm could be applied in various Wi-Fi applications. In addition, several particular firmware are reserved for some typical applications, like UART to Wi-Fi DTU, easylink configuration and services for cloud interfacing.

1.2 Product appearance



Figure 1 EMW3165



Figure 2 EMW3165-E

1.3 Hardware block diagram

EMW3165 contains four main parts as showed in Figure 3:

- Cortex-M4 processor
 - WLAN MAC/BB/RF/ANT
 - Peripherals
 - Power management
1. Cortex-M4 CPU, up to 100MHz operating frequency, integrated 128KB SRAM, 512 KB Flash.
 2. 2MB SPI Flash for customized firmware

- 3. Supports PCB antenna or IPEX external antenna
- 4. Operating voltage: DC 3.3V

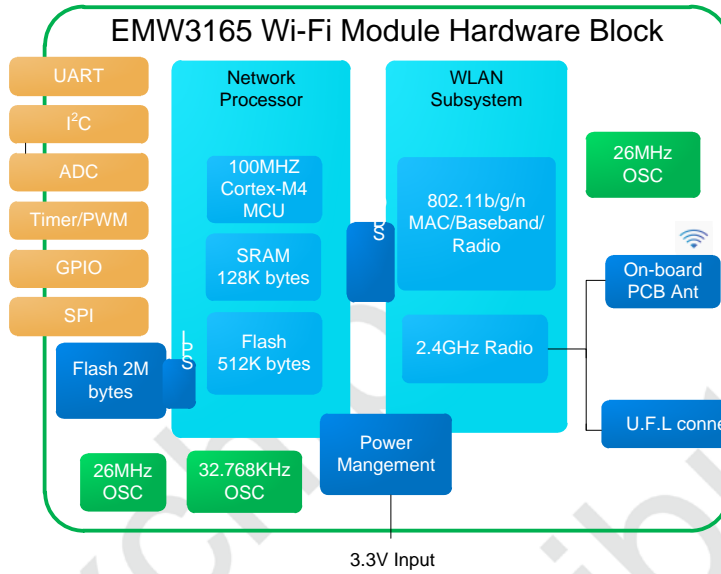


Figure 3 Hardware

2. Pins

2.1 Pin Designation

EMW3165 owns two groups of pins (1X20 + 1X21). The lead pitch is 1mm.

EMW3165 has half-hole footprint fit for hand-soldering

EMW3165 pin outs :

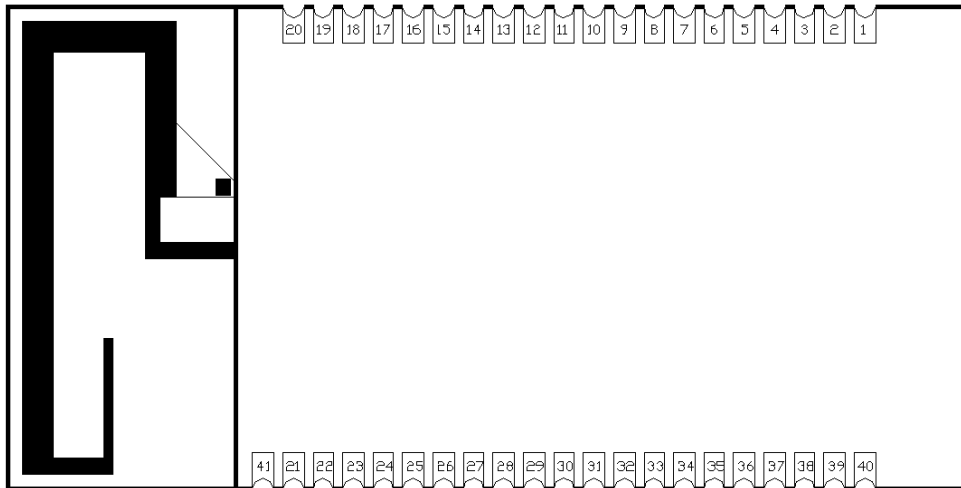


Figure 4 Half-hole package dimension

2.2 Recommended Footprint Design

Recommended footprint (Unit: mm):

Figure 5 Recommended Footprint

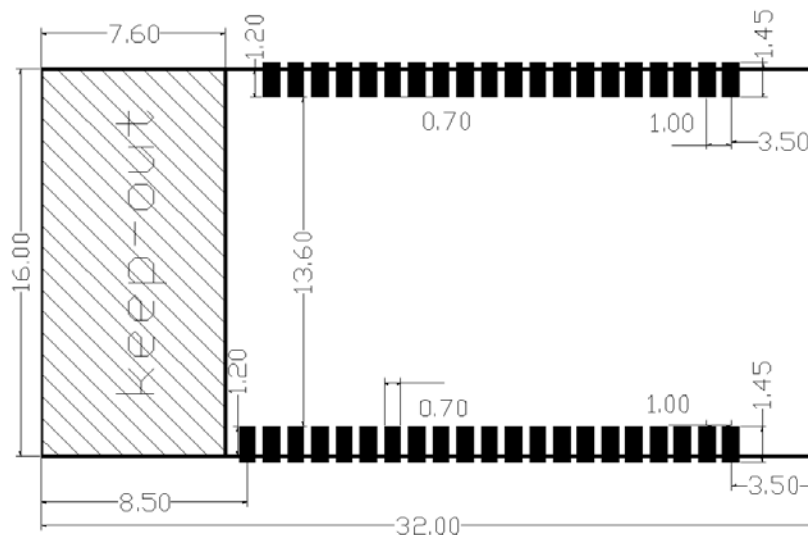


Figure 6 Recommended Footprint

2.3 Pin Arrangement

Table 1 EMW3165 pin arrangement

Pins	Name	Type	I/O level	Function	Note
1	-	-	-	Not connected	NC
2	PB2	I/O	FT	BOOT1	√
3	-	-	-	Not connected	NC
4	PA7	I/O	FT	Flash_SPI1_MOSI	×
5	PA15	I/O	FT	Flash_SPI1_NSS	×
6	PB3	I/O	FT	Flash_SPI1_SCK	×
7	PB4	I/O	FT	Flash_SPI1_MISO	×
8	PA2	I/O	FT	TIM2_CH3,TIM5_CH3,TIM9_CH1, I2S2_CKIN,USART2_TX, ADC1_2	× <i>DEBUG_OUT</i>
9	PA1	I/O	FT	TIM2_CH2,TIM5_CH2,SPI4_MOSI/I2S4_S D, USART2_RTS, ADC1_1	× (EasyLink)
10	VBAT	S	-	-	×
11	-	-	-	Not connected	NC
12	PA3	I/O	FT	TIM2_CH4,TIM5_CH4,TIM9_CH2, I2S2_MCK,USART2_RX, ADC1_3	× <i>DEBUG_IN</i>
13	NRST	I/O	FT	RESET	×

Pins	Name	Type	I/O level	Function	Note
14	PA0	I	TC	Wi-Fi wake up MCU	×
15	-	-	-	Not connected	NC
16	PC13	I/O	FT	RTC_AMP1, RTC_OUT, RTC_TS	√
17	PB10	I/O	FT	TIM2_CH3, I2C2_SCL,	√
18	PB9	I/O	FT	TIM4_CH4, TIM11_CH1, I2C1_SDA, SPI2_NSS/I2S2_WS, I2C2_SDA	√
19	PB12	I/O	FT	TIM1_BKIN, I2C2_SMBA, SPI2_NSS/I2S2_ WS,	√
20	GND	S	-	-	×
21	GND	S	-	-	×
22	-	-	-	Not connected	NC
23	-	-	-	Not connected	NC
24	-	-	-	Not connected	NC
25	PA14	I/O	FT	SWD_SWCLK	×
26	PA13	I/O	FT	SWD_SWDIO	×
27	PA12	I/O	FT	TIM1_ETR, SPI5_MISO, USART1_RTS,	√
28	-	-	-	Not connected	NC
29	PA10	I/O	FT	TIM1_CH3, SPI5_MOSI/I2S5_SD, USART1_RX, USB_FS_ID	√ USER_UART _RX
30	PB6	I/O	FT	TIM4_CH1, I2C1_SCL, USART1_TX	√ USER_UART TX
31	PB8	I/O	FT	TIM4_CH3, TIM10_CH1, I2C1_SCL, SPI5_MOSI/I2S5_SD, I2C3_SDA	√

Pins	Name	Type	I/O level	Function	Note
32	-	-	-	Not connected	NC
33	PB13	I/O	FT	TIM1_CH1N, SPI2_SCK/I2S2_CK, SPI4_SCK/I2S4_CK,	√
34	PA5	I/O	TC	TIM2_CH1/TIM2_ET, SPI1_SCK/I2S1_CK, ADC1_5	√
35	PA11	I/O	FT	TIM1_CH4, SPI4_MISO, USART1_CTS, USART6_TX, USB_FS_DM	√
36	PB1	I/O	FT	TIM1_CH3N, TIM3_CH4,	× (BOOT)
37	PB0	I/O	FT	TIM1_CH2N, TIM3_CH3,	×STATUS
38	PA4	I/O	TC	SPI1_NSS/I2S1_WS, SPI3_NSS/I2S3_WS,	√
39	VDD	S	-	-	×
40	VDD	S	-	-	×
41	ANT	-	-	External Antenna Pad	×

Notes:

- PIN10, PIN39, PIN40 need connect to VDD 3V3 power and PIN20, PIN21 connects to GND.
- PIN8 and PIN12 are used for secondary burning, ATE and QC auto detection.
- PIN29 and PIN30 are used as serial communication port for application.
- “S” indicates “power supply”, “I” indicates “input pin”, “I/O” indicates “input/output pin”.
- “FT” indicates the maximum tolerance input voltage is 5V. The maximum tolerance voltage could not be over VCC when configured as analog I/O or RTC.
- TC=standard 3.6V I/O.
- PIN4~7 could not be used as the other functions except for the SPI1 interface of on-board flash.
- Take SWD (PIN25, PIN26) as the replacement of JTAG to debug or download firmware.
- “√” indicates the pin which could be used for customized applications, while “×” could not be used besides two groups “serial” and one group “SPI”.
- Please refer to “STM32F411Xe reference” for more details of the pins.

3. Electrical Parameters

3.1 Operating Ratings

EMW3165 enters an unstable condition whenever the input voltage dips below the minimum value of supply voltage. This condition must be considered during design of the power supply routing, especially if operating from a battery.

Table 2 Voltage Conditions

Symbol	Description	Conditions	Specification			
			Min.	Typical	Max.	Unit
VDD	Voltage		3.0	3.3	3.6	V

Voltage exceeding maximum ratings will cause hardware damage to the module, and working at the maximum ratings for a long time will affect the reliability of the module.

Current conditions:

Table 3 Current Conditions

Symbol	Note	Max	Unit
I_{VDD}	Total current into VDD power lines	320	mA
I_O	Output current sunk by any I/O and control pin	25	
	Output current sourced by any I/O and control pin	-25	

3.2 Absolute maximum ratings (voltage)

Stresses above the absolute maximum ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these conditions is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability.

Absolute maximum ratings:

Figure 7 Absolute Maximum Rating

Symbol	Note	Min	Max	Unit
V_{DD}	Power supply	-0.3	4.0	V
V_{OUT}	Output voltage on 5V tolerance pin	-0.3	5.5	V
V_{IN}	Input voltage on other pins	-0.3	$V_{DD}+0.3$	V

3.3 Current Consumption

3.3.1 Wi-Fi Subsystem

Current consumption on Wi-Fi Subsystem:

Table 4 Current Consumption on Wi-Fi Subsystem

Symbol	Note	Conditions	Typical	Unit
I_{RF}	OFF1		2	μ A
I_{RF}	SLEEP ⁴	-	200	μ A
I_{RF}	Rx(Listen) ²	-	52	mA
I_{RF}	Rx(Active) ³	-	59	mA
I_{RF}	Power Save ^{5, 6}	-	1.9	mA
I_{RF}	Tx CCK ^{7, 10}	11 Mbps at 18.5dBm	320	mA
I_{RF}	Tx OFDM ^{8, 10}	54 Mbps at 15.5dBm	270	mA
I_{RF}	Tx OFDM ^{9, 10}	65 Mbps at 14.5dBm	260	mA

- Power is off.
- Carrier Sense (CCA) when no carrier present
- Carrier Sense (CS) detect/Packet Rx
- Intra-beacon Sleep
- Beacon Interval = 102.4ms, DTIM = 1, Beacon duration = 1ms @ 1 Mbps. Integrated Sleep + wakeup + Beacon Rx current over 1 DTIM interval.
- In WLAN power-saving mode, the following blocks are powered down: Crystal oscillator, Baseband PLL, AFE, RF PLL and Radio.
- CCK power at chip port. Duty cycle is 100%. Includes PA contribution.
- OFDM power at chip port. Duty cycle is 100%. Includes PA contribution.
- OFDM power at chip port is 16dBm, duty cycle is 100%, includes PA contribution.
- Absolute junction temperature limits maintained through active thermal monitoring and dynamic TX duty cycle limiting.

3.3.2 Microcontroller Subsystem

Typical and maximum current consumption in Run mode, code with data processing running from Flash memory

(ART accelerator enabled) or RAM.

Typical and maximum current consumption in Run mode:

Table 5 Typical and Maximum Current Consumption in Run Mode

Symbol	Conditions	f _{HCLK} (MHz)	T _A =25°C		Unit
			Typical	Max	
I _{MCU}	External clock, all peripherals enabled	100	21.0	23.3	mA
		84	17.0	19.2	
		64	12.0	13.2	
		50	9.5	10.4	
		20	4.5	5.8	
I _{MCU}	External clock, all peripherals disabled	100	12.0	14.6	mA
		84	10.0	11.9	
		64	7.0	8.4	
		50	5.5	6.6	
		20	2.5	3.7	

Typical and maximum current consumption in Standby mode:

Table 6 Typical and Maximum Current Consumption in Standby Mode

Symbol	Item	Conditions	Typical	Unit
			T _A =25°C	
I _{MCU}	Supply current in Standby mode	Low-speed oscillator (LSE) and RTC ON	3.0	µA
		RTC and LSE OFF	2.1	

3.3.3 Power Consumption in Typical Operation Mode

Current consumption of EMW3165 in typical operation mode:

Table 7 Power Consumption in Typical Operation Mode

Symbol	Parameter	Conditions	Min	Average	Max	Unit
			T _A =25°C	T _A =25°C	T _A =25°C	
I _{module}	Total power consumption on EMW3165 module	No Wi-Fi data is transmitting ¹	2.8	7.2	75	mA
		Receive data in UDP mode, 20k bps ¹	2.8	12	262	mA
		Send data in UDP mode, 20k bps ¹	3	24	280	mA
		RF off, MCU enter standby mode ²	37	40	45	µA

Symbol	Parameter	Conditions	Min	Average	Max	Unit
			T _A =25°C	T _A =25°C	T _A =25°C	
I _{module}	Total power consumption on EMW3165 module	Connecting to AP	52	74	340	mA

Note 1: TA=25°C, MCU frequency=100MHz, with data processing running from Flash memory (ART accelerator enabled). Firmware process TCP/IP stack and IEEE 802.11 MAC every 250 ms, enter stop mode when no task is pending. Wi-Fi subsystem is connected to an access point and run under power save mode in IEEE 802.11n@14.5 dBm TX power. AP Beacon Interval = 100ms, DTIM = 1.

Note 2: Wi-Fi connection is disconnected.

Note 3: These data may not be the same depend on different firmware functions.

3.4 Digital I/O port characteristics

3.4.1 Output voltage levels

GPIO static characteristics:

Table 8 I/O GPIO Static Characteristics

Symbol	Item	Conditions	Min	Typical	Max	Unit
VIL	FT and NRST I/O input low level voltage	1.7V ~ 3.6V	-	-	0.3VDD	V
	BOOT0 I/O input low level voltage		-	-	0.1VDD +0.1	
VIH	FT and NRST I/O input low level voltage	1.7V ~ 3.6V	0.7VDD	-	-	V
	BOOT0 I/O input low level voltage		0.17VDD+0.7	-	-	
VHYS	FT and NRST I/O input hysteresis	1.7V ~3.6V	0.1VDD	-	-	V
	BOOT0 I/O input hysteresis		0.1	-	-	
RPU	Weak pull-up equivalent resistor	All pins except for PA10	30	40	50	kΩ
		PA10	7	10	14	
RPD	Weak pull-down	All pins except for	30	40	50	kΩ

Symbol	Item		Conditions	Min	Typical	Max	Unit
	equivalent resistor	PA10					
		PA10		7	10	14	
CIO	I/O pin capacitance		-	-	5	-	pF

3.4.2 RESET pin characteristics

The RESET pin input driver uses CMOS technology. It is connected to a permanent pull-up resistor, RPU. EMW3165 contains RC (resistance-capacitance) reset circuit which ensures the module reset accurately when it powers up. If user need to reset manually, just connect the external control signals to the reset pins directly, but the control signal should be Open Drain Mode .

RESET pin characteristics:

Table 9 RESET Pin Characteristics

Symbol	Item	Conditions	Min	Typical	Max	Unit
VF(NRST)	NRST Input filtered pulse	-	-0.5	-	0.8	V
VNF(NRST)	NRST Input not filtered pulse	-	2	-	VDD+0.5	
RPU	Resistor for Pulling up	VIN= VSS	30	40	50	kΩ
TNRST_OUT	Generated reset pulse duration	Internal Reset source	20	-	-	us

3.5 Temperature and Humidity

Temperature and humidity condition of EMW 3165:

Table 10 Temperature and Humidity conditions

Symbol	Name	Range	Unit
TSTG	Storage Temperature	-55 to +85	°C
TA	Operating Temperature	-30 to +85	°C
Humidity	Non-condensing, relative humidity	<95	%

3.6 ESD

Absolute maximum ratings: The Electromagnetic Environment Electrostatic discharge.

Table 11 ESD parameters

Symbol	Ratings	Conditions	Class	Max	Unit
V _{ESD} (HBM)	Electrostatic discharge voltage (human body model)	TA= +25 °C conforming to JESD22-A114	2	2000	V

$V_{ESD}(CDM)$	Electrostatic discharge voltage (charge device model)	TA = +25 °C conforming to JESD22-C101	II	500	
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These tests are compliant with EIA/JESD 78A IC latch-up standard.

3.7 Static latch-up

These tests are compliant with EIA/JESD 78A IC latch-up standard.

Table 12 Static latch - up parameters

Symbol	Parameter	Class	Class
LU	Static latch-up class	TA= +105 °C conforming to JESD78A	II level A

3.8 Other MCU electrical parameters

Please refer to STM32F411xE datasheet for more information

4. RF characteristics

4.1 Basic RF characteristics

Table 13 RF basic attributes

Item	Specification
Operating Frequency	2.412~2.484GHz
Wi-Fi Standard	802.11b/g/n(single stream n)
Modulation Type	11b: DBPSK, DQPSK,CCK for DSSS 11g: BPSK, QPSK, 16QAM, 64QAM for OFDM 11n: MCS0~7,OFDM *
Data Rates	11b:1, 2, 5.5 and 11Mbps 11g:6, 9, 12, 18, 24, 36, 48 and 54 Mbps 11n: MCS0~7, up to 72Mbps
Antenna type	PCB printed ANT U.F.L connector for external antenna (Optional)

4.2 IEEE802.11b mode

Table 14 IEEE802.11b Mode Specification

Item	Specification
Modulation Type	DSSS / CCK
Frequency range	2400MHz~2484MHz
Channel	CH1 to CH14
Data rate	1, 2, 5.5, 11Mbps

Table 15 IEEE802.11b RF Send properties

TX Characteristics	Min.	Typical	Max.	Unit
Transmitter Output Power				
11bTarget Power	13.5	16.2	16.5	dBm
Spectrum Mask @ target power				
fc +/-11MHz to +/-22MHz	-	-41.73	-30	dBr
fc > +/-22MHz	-	-51.89	-50	dBr
Frequency Error	-20	3.9	+20	ppm
Constellation Error(peak EVM)@ target power				

1~11Mbps	-	-25.52	-9	dB
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Table 16 IEEE802.11b Mode RX Characteristic

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
1Mbps (FER \leq 8%)	-	-87	-83	dBm
2Mbps (FER \leq 8%)	-	-85	-80	dBm
5.5Mbps (FER \leq 8%)	-	-83	-79	dBm
11Mbps (FER \leq 8%)	-	-80	-76	dBm
Maximum Input Level (FER \leq 8%)	-	-87	-83	dBm

4.3 IEEE802.11g mode

IEEE802.11g mode specification:

Table 17 IEEE802.11g Mode Specification

Item	Specification
Modulation Type	OFDM
Frequency range	2400MHz~2484MHz
Channel	CH1 to CH14
Data rate	6, 9, 12, 18, 24, 36, 48, 54Mbps

IEEE802.11g mode TX characteristics:

Table 18 IEEE802.11g Mode TX Characteristics

TX Characteristics	Min.	Typical	Max.	Unit
Transmitter Output Power				
11gTarget Power	11.5	14.16	14.5	dBm
Spectrum Mask @ target power				
fc +/-11MHz	-	-31.61	-20	dBr
fc +/-20MHz	-	-40.73	-28	dBr
fc > +/-30MHz	-	-43.54	-40	dBr
Frequency Error	-20	3.9	+20	ppm
Constellation Error(peak EVM)@ target power				
54Mbps		-30	-25	dB

IEEE802.11g mode RX characteristics:

Table 19 IEEE802.11g Mode RX Characteristic

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
6Mbps (FER ≤ 10%)	-	-87	-82	dBm
9Mbps (FER ≤ 10%)	-	-85	-80	dBm
12Mbps (FER ≤ 10%)	-	-84	-79	dBm
18Mbps (FER ≤ 10%)	-	-82	-77	dBm
24Mbps (FER ≤ 10%)	-	-80	-74	dBm
36Mbps (FER ≤ 10%)	-	-79	-70	dBm
48Mbps (FER ≤ 10%)	-	-77	-66	dBm
54Mbps (FER ≤ 10%)	-	-75	-65	dBm

4.4 IEEE802.11n 20MHz bandwidth mode

IEEE802.11n mode specification:

Table 20 IEEE802.11n Mode Specification

Item	Specification
Modulation Type	MIMO-OFDM
Channel	CH1 to CH14
Data rate	MCS0/1/2/3/4/5/6/7

IEEE802.11n mode TX characteristics:

Table 21 IEEE802.11n mode TX characteristics

TX Characteristics	Min.	Typical	Max.	Unit
Transmitter Output Power				
11n HT20 Target Power	10.5	13.43	13.5	dBm
Spectrum Mask @ target power				
fc +/-11MHz	-	-30.23	-20	dBr
fc +/-20MHz	-	-38.48	-28	dBr
fc > +/-30MHz	-	-44.8	-40	dBr
Frequency Error	-20	3.9	+20	ppm
Constellation Error(peak EVM)@ target power				
MCS7	-	-28.59	-28	dBm

Table 22 IEEE802.11n mode RX characteristic

RX Characteristics	Min.	Typical	Max.	Unit
Minimum Input Level Sensitivity				
MCS0 (FER ≤ 10%)	-	-85	-82	dBm
MCS1 (FER ≤ 10%)	-	-83	-79	dBm
MCS2 (FER ≤ 10%)	-	-82	-77	dBm
MCS3 (FER ≤ 10%)	-	-80	-74	dBm
MCS4 (FER ≤ 10%)	-	-78	-70	dBm
MCS5 (FER ≤ 10%)	-	-74	-66	dBm
MCS6 (FER ≤ 10%)	-	-72	-65	dBm
MCS7 (FER ≤ 10%)	-	-69	-64	dBm

5. Antenna information

5.1 Type of antenna

There are three types of antenna include PCB antenna, external antenna and antenna pad. The default type is PCB antenna. Users can modify the antenna type with the method below but MXCHIP would not take any responsibility for this behavior.

EMW3165 loads the resistance ($0\Omega/0402$) in the red box, it means user can use PCB antenna. If user want to use U.F.L RF connector for external antenna, just need switch the resistance from red box to blue box and solder an U.F.L RF connector. If user switch the resistance from red box to yellow box, user can use antenna pad (pin 41).

Type of antenna:



Figure 8 EWM3165



Figure 9 EMW3165-E



Figure 10 EMW3165-B

5.2 Minimizing radio interference

When integrating the Wi-Fi module with on board PCB printed antenna, make sure the area around the antenna end

the module protrudes at least 15mm from the mother board PCB and any metal enclosure. If this is not possible use the on board U.FL connector to route to an external antenna. The area under the antenna end of the module should be keep clear of metallic components, connectors, vias, traces and other materials that can interfere with the radio signal.

Minimum size of keep-out zone around antenna :

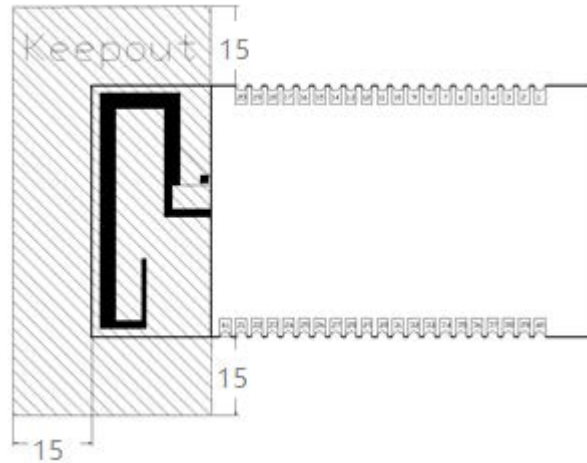


Figure 11 Antenna minimum clearance zone

5.3 U.F.L RF Connector

This module use U.F.L type RF connector for external antenna connection.

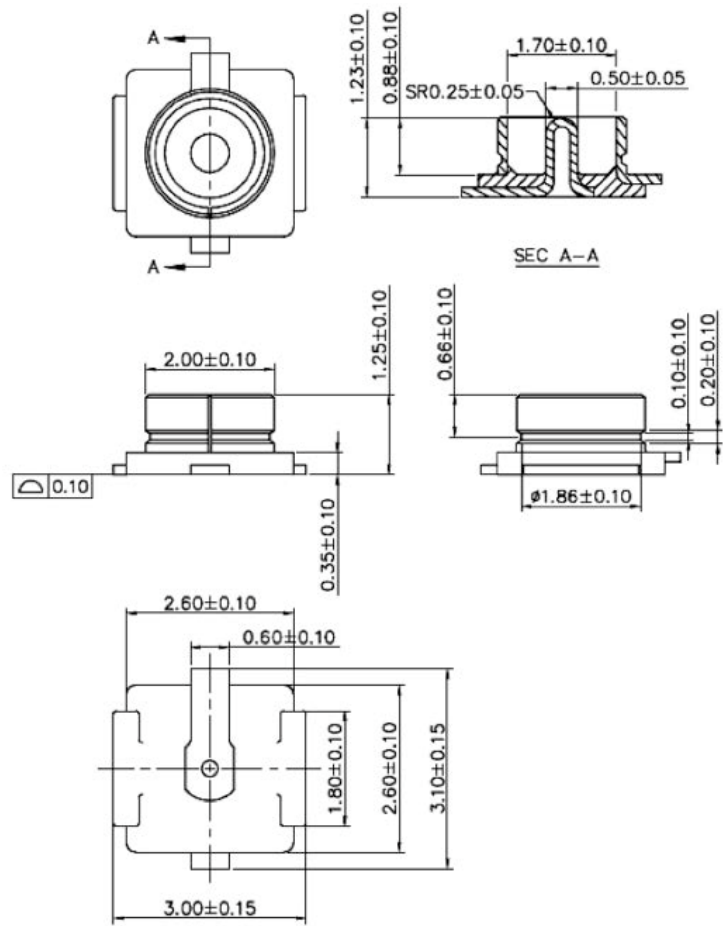


Figure 12 An external antenna connector size diagram

6. Mechanical Dimensions

6.1 EMW3165 Mechanical Dimensions

EMW3165 top view (Unit: mm):

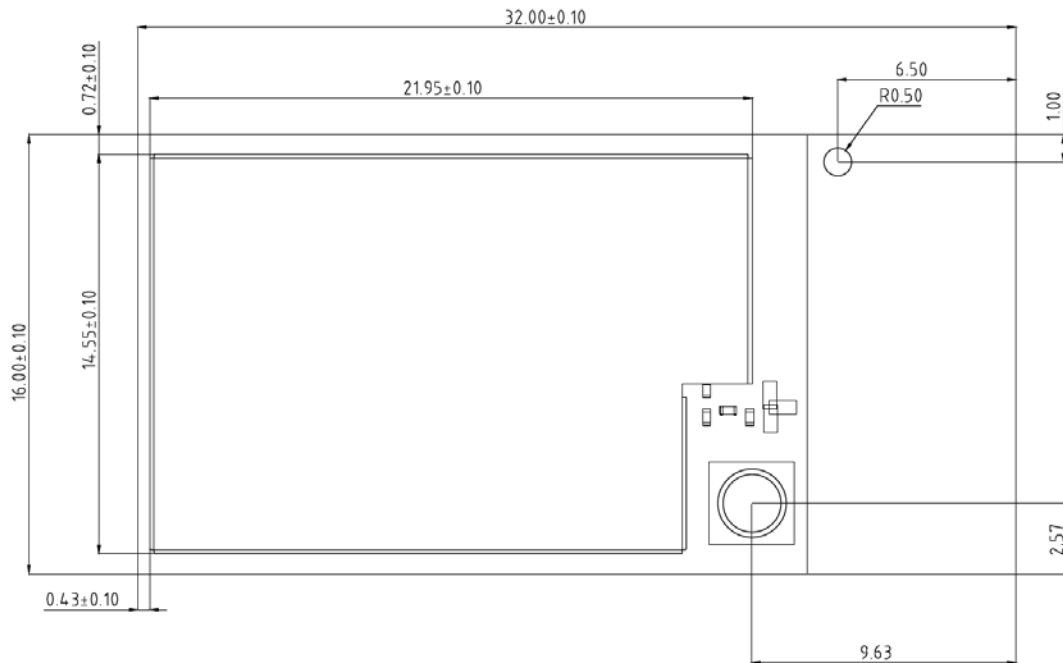


Figure 13 EMW3162 top view(Metric units)

EMW3165 side view (Unit: mm):

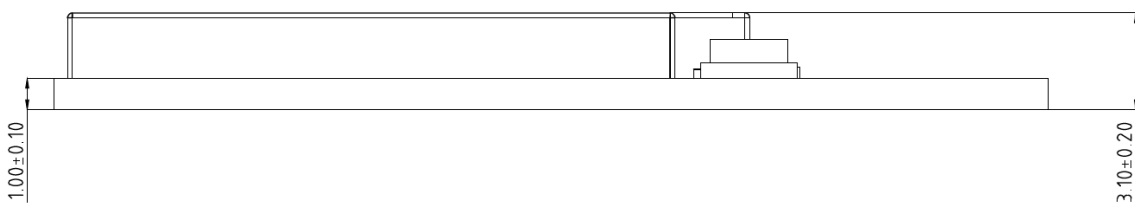


Figure 14 EMW3165 Side View

6.2 Use guidelines (Please read carefully)

- Stamps port Wi-Fi modules which factory from MXCHIP are welding must by SMT machine.
 1. SMT need machine:
 - Reflow soldering SMT machine
 - The AOI detector
 - 6-8 mm diameter suction nozzle
 2. baking need equipment:
 - Cabinet baking box

- The antistatic, high temperature resistant tray
- The antistatic high temperature resistant gloves
- Storage conditions as follows
 - Moisture bag must be stored in a temperature $< 30^{\circ}\text{C}$, humidity 85% RH of the environment.
 - Dry packaging products, the guarantee period should be from 6 months from the date of packing seal.
 - Sealed packaging is equipped with humidity indicator card, as shown in Figure 13.
- Humidity indicator CARDS and baking several ways as follows:

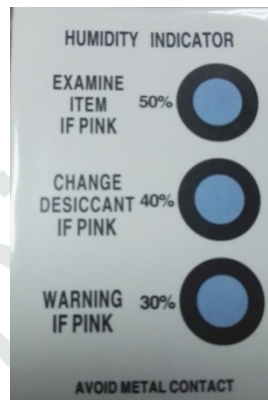


Figure 15 Temperature and humidity indicator CARDS

- When opened, if the temperature and humidity indicator CARDS read 10%, 20%, 30%, 40% three color ring are blue, to continue to bake for 2 hours for module;
- When opened, if the humidity indicator CARDS read 10% color ring into pink, need to continue to bake module 4 hours;
- When opened, if the humidity indicator CARDS read into 10%, 20%, color ring into pink, need to continue to bake for 6 hours module;
- When opened, if the humidity indicator CARDS read into 10%, 20%, 30% are pink color ring, need to continue to bake for 12 hours module;
- When opened, if the humidity indicator CARDS read into 10%, 20%, 30%, 40% are pink color ring, need to continue to bake for 14 hours module;
- Baking parameters are as follows:
 - Baking temperature: $125^{\circ}\text{C} \pm 5^{\circ}\text{C}$;
 - Set the alarm temperature as 130°C ;
 - Under the condition of natural cooling $< 36^{\circ}\text{C}$, SMT placement can be made;
 - Dry times: 1 times;
- If opened the time more than 3 months, please ban the use of SMT process welding this batch module, zedoary because PCB process, more than 3 months bonding pad oxidation, SMT is likely to cause virtual welding, welding, the resulting problems we do not assume corresponding responsibility.
- Please to ESD (static discharge, static electricity discharge) protection module before SMT;
- Please according to the SMT reflow soldering curve, peak temperature 245°C , reflow soldering, temperature curve as shown in figure 14, section 7.6;
- For the first time in order to ensure the qualified rate of reflow soldering, first SMT please extraction 10% product to visual analysis, AOI inspection, to ensure that the furnace temperature control, device adsorption method, the rationality of the put way; Suggestions: when batch production per hour 5-10 pieces of visual analysis, AOI test;

6.3 The matters needing attention

- In the entire production, Each station of the operator must wear anti-static gloves;
- When baking, no more than baking time;
- When roasting, it is forbidden to join explosive, flammable, corrosive substances;
- When baking, high temperature module application tray in the oven, keep the air circulation between each module, at the same time avoid direct contact with the oven wall module;
- Baking, please will bake the door is closed, the guarantee baking box sealing, prevent leakage, temperature influence the baking effect;
- Don't open the door, as far as possible when baking box running if must open, shortening the time of can open the door as far as possible;
- After baking, must be natural cooling modules to $< 36\text{ }^{\circ}\text{C}$ before wear anti-static gloves out, so as not to burn.
- Operation, forbidden module bottom touch water or dirt;
- Temperature and humidity control level for Level3, storage and baking conditions based on IPC/JEDEC J-STD - 020.

6.4 MSL/Storage Condition

	CAUTION This bag contains MOISTURE-SENSITIVE DEVICES	LEVEL 3 <small>If Blank, see adjacent bar code label</small>
<p>1. Calculated shelf life in sealed bag: 12 months at $< 40^{\circ}\text{C}$ and $< 90\%$ relative humidity (RH)</p> <p>2. Peak package body temperature: <u>260</u> $^{\circ}\text{C}$ <small>If Blank, see adjacent bar code label</small></p> <p>3. After bag is opened, devices that will be subjected to reflow solder or other high temperature process must</p> <p>a) Mounted within: <u>168</u> hrs. of factory conditions <small>If Blank, see adjacent bar code label</small> $\leq 30^{\circ}\text{C}/60\%\text{RH}$, OR</p> <p>b) Stored at $<10\%$ RH</p> <p>4. Devices require bake, before mounting, if:</p> <p>a) Humidity Indicator Card is $> 10\%$ when read at $23 \pm 5^{\circ}\text{C}$</p> <p>b) 3a or 3b not met.</p> <p>5. If baking is required, devices may be baked for 48 hrs. at $125 \pm 5^{\circ}\text{C}$</p> <p>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</p> <p>Bag Seal Date: _____ <small>If Blank, see adjacent bar code label</small></p> <p>Note: Level and body temperature defined by IPC/JEDEC J-STD-020</p>		

Figure 16 storage Condition

6.5 Recommended Reflow Profile

Solder paste recommendations: SAC305, Lead -Free solder paste.

Reflow times ≤ 2 times (Max.)

- 1. Max Rising Slope : $3^{\circ}\text{C}/\text{sec}$
- 2. Max Falling Slope: $-3^{\circ}\text{C}/\text{sec}$
- 3. Soaking Time ($150^{\circ}\text{C} \sim 180^{\circ}\text{C}$): 60sec~120sec
- 4. Over 217°C Time: 60sec~120sec;
- 5. Peak Temp. $240^{\circ}\text{C} \sim 250^{\circ}\text{C}$

Recommended reflow profile:

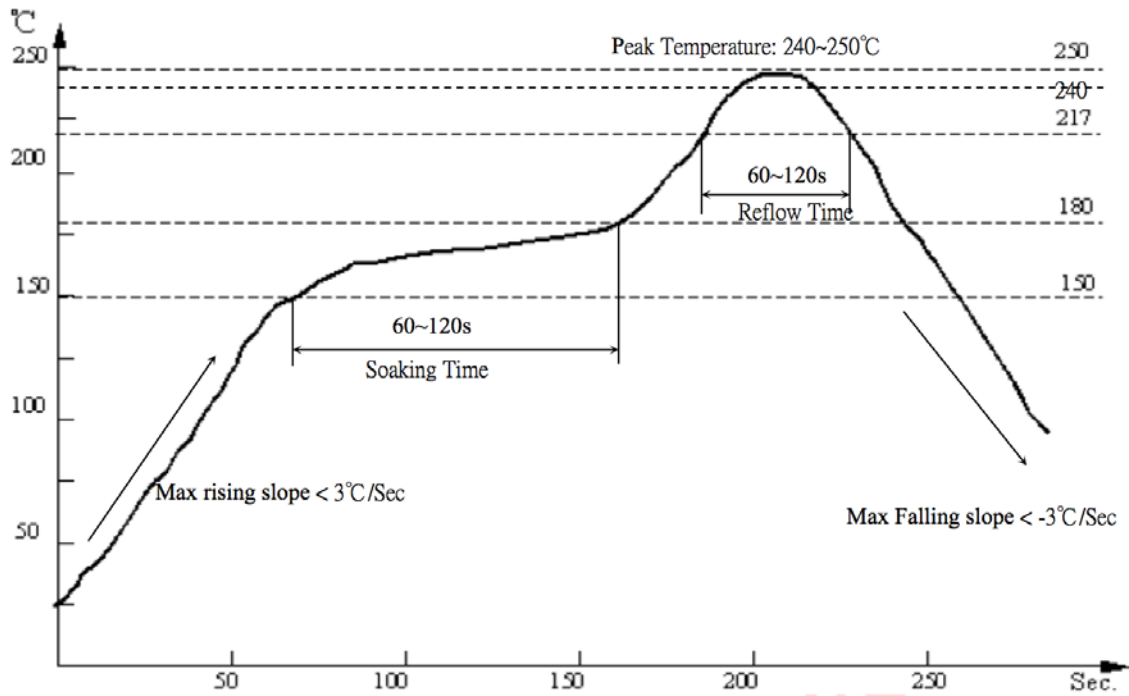


Figure 17 Temperature Curve

7. Reference circuit

The recommended power supply circuit for EMW3165:

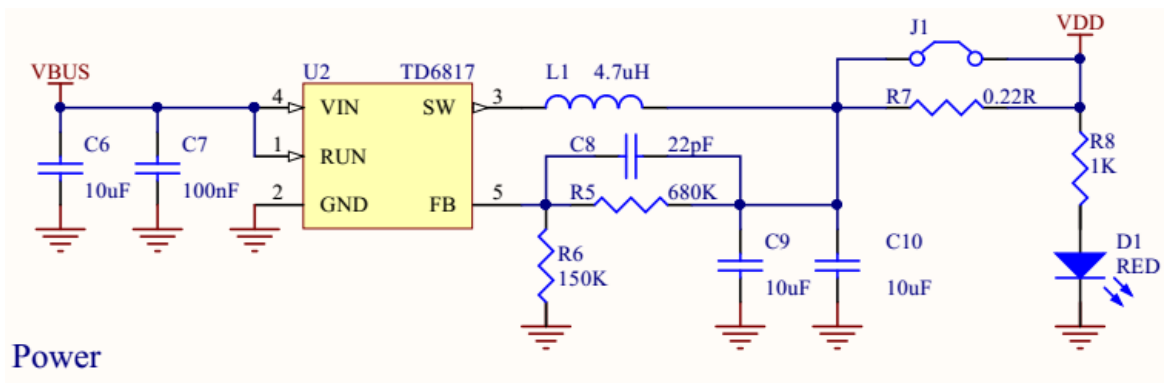


Figure 18 Power reference circuit

The recommended USB to Serial circuit for EMW3165:

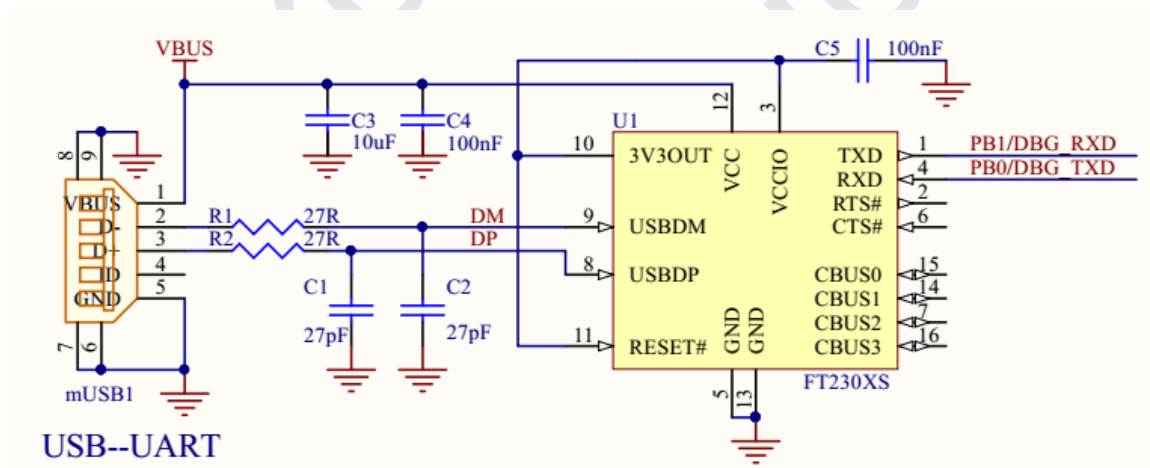


Figure 19 USB to serial reference circuit

The recommended external circuit design for EMW3165:

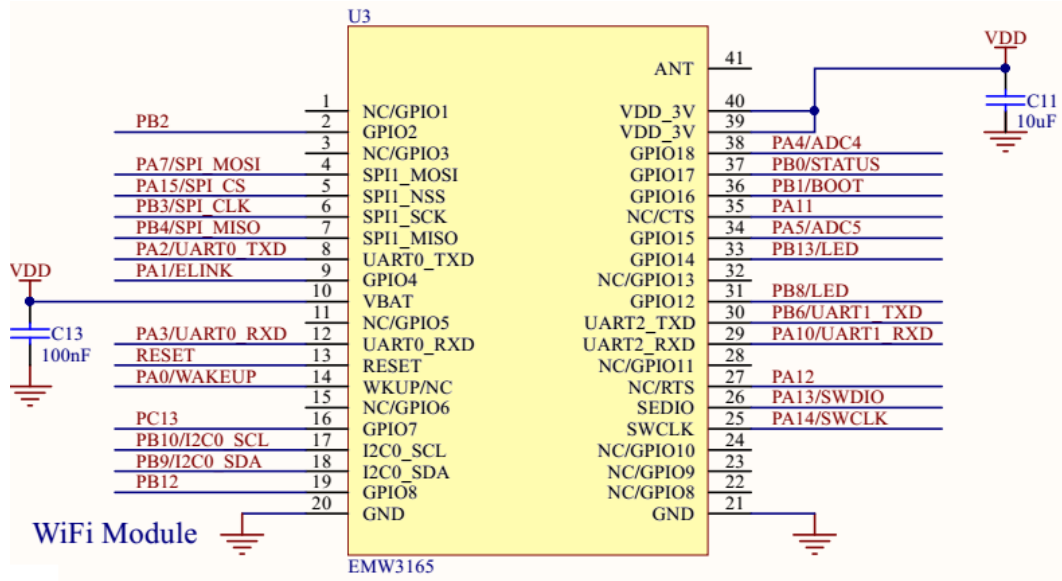


Figure 20 External Circuit Design

EMW3165 UART is 3.3 V, if the user use UART chip is 5 V, the need to convert the voltage, can with EMW3162 UART communication, please refer to the 5 V to 3.3 V UART conversion circuit Figure 21.

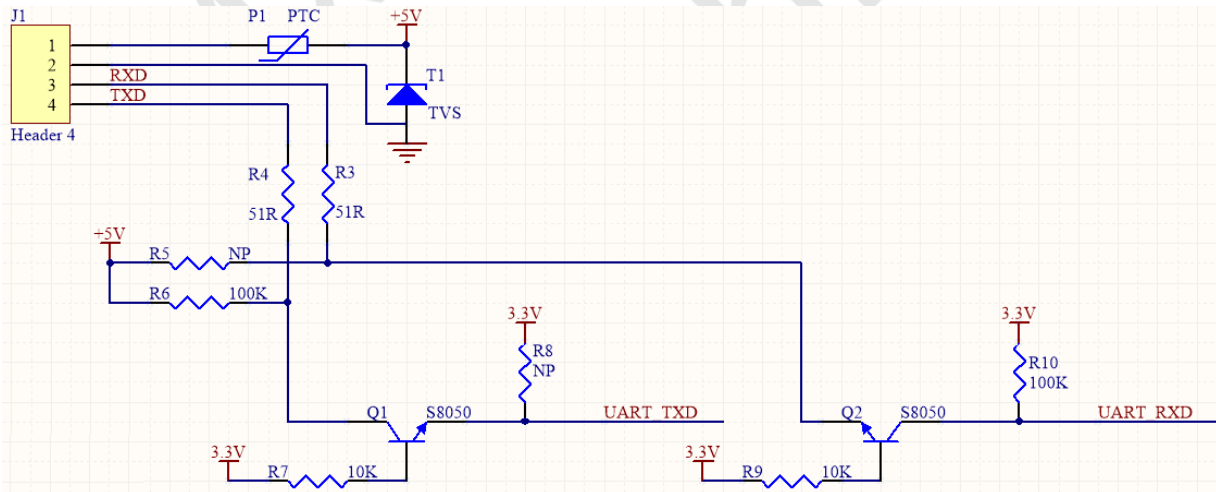


Figure 21 UART 5 V - 3.3 V conversion circuit

8. Sales Information and Technical Support

If you need to get the latest information on this product or our other product information, you can visit:
<http://www.mxchip.com/>.

If you need to get technical support, please call us during the working hours.

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

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