



TG-12F_3133 Specification

Version V1.1
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Document development/revision/revocation resume

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1. Product Overview

TG-12F_3133 is a module based on Tmall TG7100C WiFi+ BLE chip, which is designed with 2.4 G frequency band, WiFi 802.11b/g/n and BLE5.0 baseband/MAC designed, with high performance, low cost, quick and easy development characteristics. Suitable for low power consumption and high performance application development, and is also an integrated solution that can connect Tmall Genie directly.

The micro controller subsystem consists of low power 32-bit RISC CPU、 cache and memory. It can control low power mode through power management unit. At the same time, it can support AES 256 bit encryption engine and has many security characteristics.

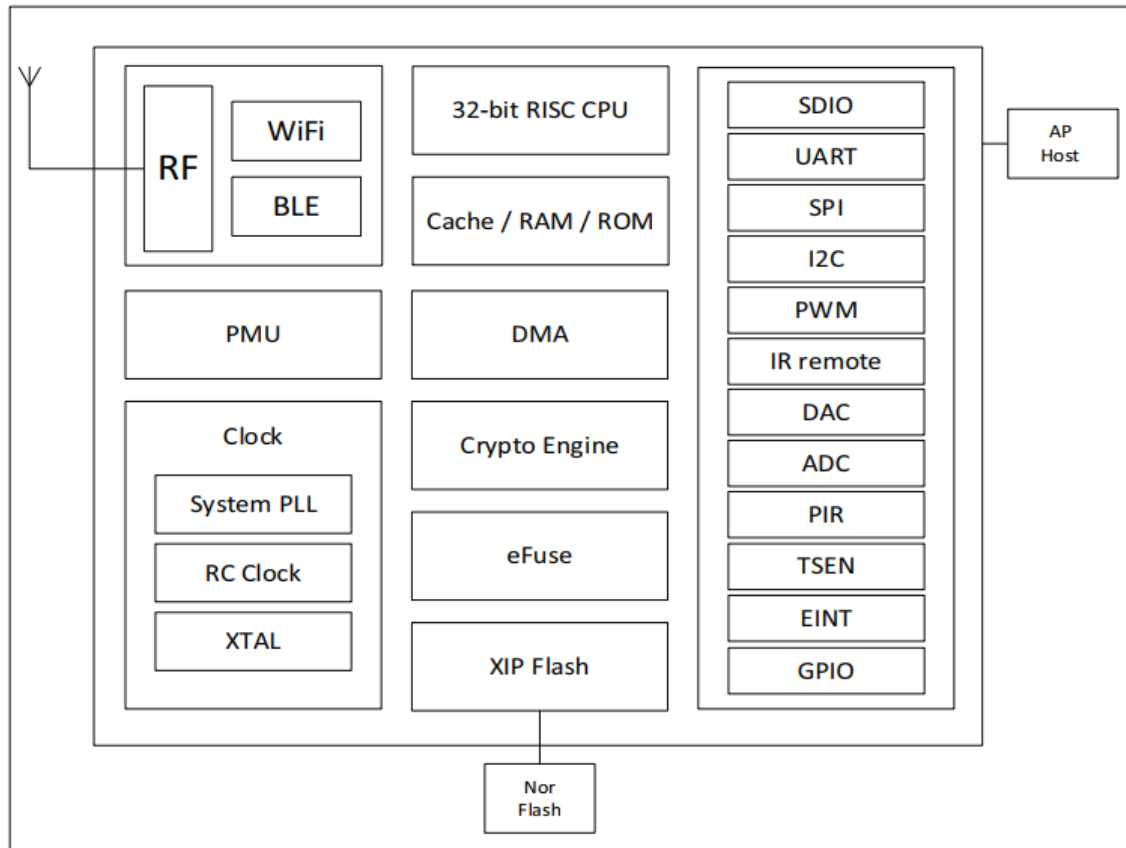
For Software, pre-integrated Tmall Giene standard firmware, support customizable SDK, and to assist terminal products through the Tmall giene control certification.

This chip Built-in 276 KB SRAM, 128KB ROM. TG-12F support a variety of low-power working states, can meet the power consumption requirements of various application scenarios.

TG-12F provide rich peripheral interfaces, including DSI0、SPI、I2C、IR remote、PWM、ADC、DAC、PIR and GPIO interfaces

TG-12F_3133 has a variety of unique hardware security mechanisms. The hardware encryption accelerator supports AES 128/192/256 bit encryption engine and SHA-1/224/256, support

Real random number generator (TRNG), public key accelerator (PKA) and so on, can be perfectly applied to various encryption products.



Characteristics

- Complete 802.11b/g/n Wi-Fi + BLE SoC module, data rate up to 150Mbps
- TG-12F_3133 chip is 32-bit RISC CPU with FPU (floating point unit), operating frequency up to 192 MHz. The chip has built-in 276 KB SRAM and 128 KB ROM.
- Support SDIO/SPI/UART/I2C/IR remote/PWM/ADC/DAC/PIR/GPIO interface.
- SMD-22 package
- Integrated Wi-Fi MAC/ BB/RF/PA/LNA
- Support multiple sleep modes, deep sleep current is less than 30uA
- Support UART port local upgrade and remote firmware upgrade (FOTA)
- General AT commands can be quick and easy use
- Support secondary development, integrated Linux development environment

Main parameters

Table 1 main parameter descriptions

Model Name	TG-12F_3133
Package	SMD-22
Size	24.0*16.0*3.0(±0.2)MM
Antenna	On-board PCB antenna/IPEX
Frequency Range	2400 ~ 2483.5MHz
Operating Temperature	-40 °C ~ 85 °C
Store Temperature	-40 °C ~ 125 °C , < 90%RH
Power supply range	Voltage: 3.0V ~ 3.6V, electrical current:>500mA
Support Interface	SDIO/SPI/UART/I2C/IR remote/PWM/ADC/DAC/PIR/GPIO
IO	Support 110 ~ 4608000 bps , default 115200 bps
Security	AES/SHA/PKA
SPI Flash	2MB

2. Electrical parameters

Electrical characteristics

Parameters		Conditions	Min	Typ	Max	Unit
Supply voltage		VDD	3.0	3.3	3.6	V
I/O	V_{IL}/V_{IH}	—	$-0.3/0.75V_{IO}$	—	$0.25V_{IO}/3.6$	V
	V_{OL}/V_{OH}	—	$N/0.8V_{IO}$	—	$0.1V_{IO}/N$	V
	I_{MAX}	—	—	—	12	mA

RF parameters

Description	Typical values	Unit
Operating frequency	2400 – 2483.5	MHz
Output power		
11n mode HT20, PA output power	15 ± 2	dBm
11g mode, PA output power	16 ± 2	dBm
11b mode, PA output power	18 ± 2	dBm
Receiving sensitivity		
CCK, 1 Mbps	≤ -97	dBm
CCK, 11 Mbps	≤ -88	dBm

6 Mbps (1/2 BPSK)	≤ -92	dBm
54 Mbps (3/4 64-QAM)	≤ -75	dBm
HT20 (MCS7)	≤ -72	dBm

Power consumption

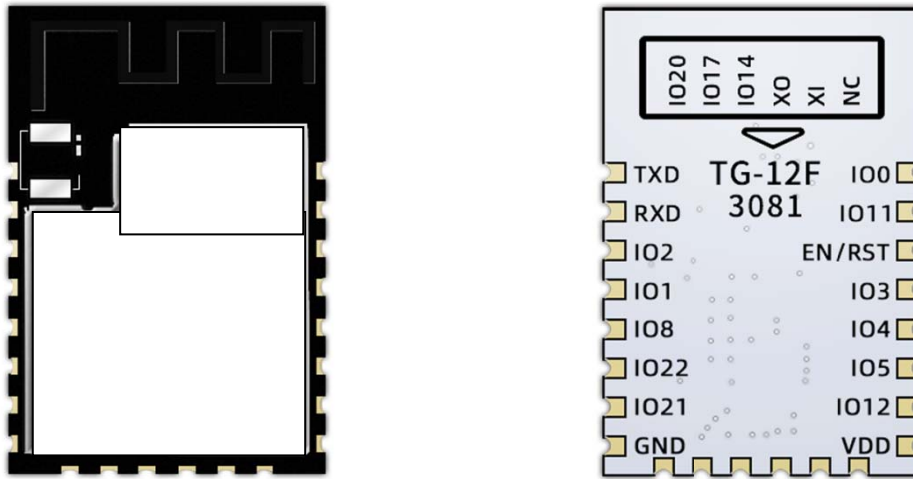
The following power consumption data are based on a 3.3 V power supply, 25° C ambient temperature and measured using an internal voltage regulator.

- All measurements were completed at the antenna interface without SAW filters
- All emission data are based on a duty cycle of 90%, measured in the mode of continuous emission.

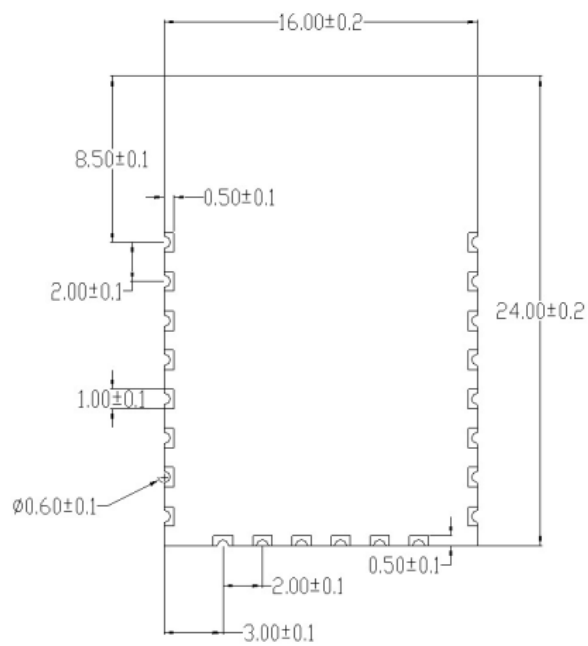
Mode	Min	Typ	Max	Unit
Tx 802.11b, CCK 1Mbps, POUT=+21dBm	–	180	320	mA
Tx 802.11g, OFDM 54Mbps, POUT=+18dBm	–	145	250	mA
Tx 802.11n, MCS7, POUT=+17dBm	–	135	250	mA
Rx 802.11b, 1024 byte, -80dBm	–	40	–	mA
Rx 802.11g, 1024 byte, -70dBm	–	40	–	mA
Rx 802.11n, 1024 byte, -65dBm	–	40	–	mA
Deep-Sleep③	–	30	–	μ A
Power Off	–	1	–	μ A

3. Appearance dimensions

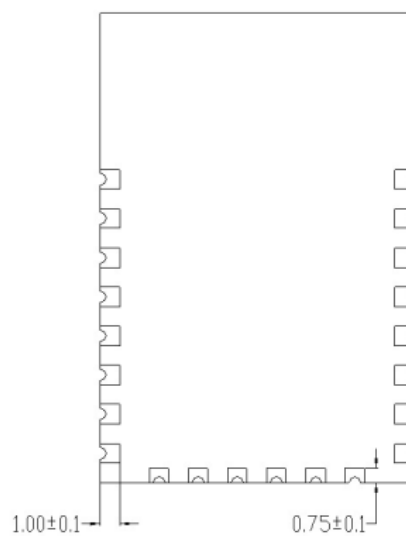
TG-12F_3133 Appearance Image



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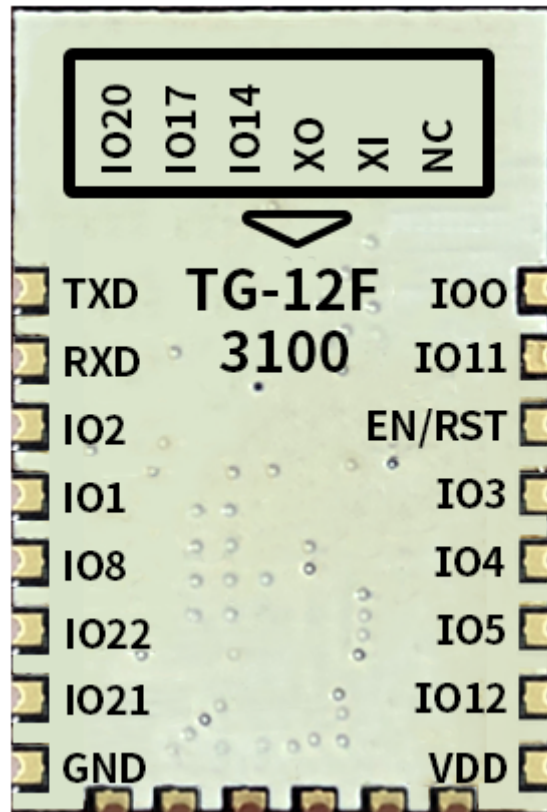


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4. Pin definition



((Picture and label printing are for reference only, subject to physical object))

TG-12F module is connected to 22 interfaces, refer to pin diagram, pin function definition table is interface definition.

TG-12F Pin diagram

Table Pin function definition

No.	Name	Function
1	IO0	SDIO, SFLASH, SPI, I2C, UART, PWM, GPIO
2	IO11	SPI, I2C, UART, PWM, AUXADC, GPIO
3	EN/RST	Chip enable

4	I03	SDIO, SPI, I2C, UART, PWM, GPIO
5	I04	SDIO, SPI, I2C, UART, PWM, GPIO
6	I05	SDIO, SPI, I2C, UART, PWM, GPIO
7	I012	SPI, I2C, UART, PWM, AUXADC, GPIO
8	VDD	VDD
9	NC	Empty Pin
10	XI	Crystal oscillator Input 32.768KHz
11	X0	Crystal oscillator Input 32.768KHz
12	I014	SPI, I2C, UART, PWM, AUXADC, GPIO
13	I017	SFLASH, SPI, I2C, UART, PWM, GPIO
14	I020	SFLASH, SPI, I2C, UART, PWM, GPIO
15	GND	GND
16	I021	SFLASH, SPI, I2C, UART, PWM, GPIO
17	I022	SFLASH, SPI, I2C, UART, PWM, GPIO
18	I08	SPI, I2C, UART, PWM, AUXADC, GPIO
19	I01	SDIO, SFLASH, SPI, I2C, UART, PWM, GPIO
20	I02	SDIO, SFLASH, SPI, I2C, UART, PWM, GPIO
21	RXD	SPI, I2C, UART, PWM, AUXADC, GPIO
22	TXD	SPI, I2C, UART, PWM, GPIO

Table Module Start-up Mode Description

System start-up mode			
Pin	Default	SPI Start-up mode	Download Start-up Mode
EN/RST	Pull up	1	0
I08	Drop-down	N/A	0

The schematic diagram illustrates the PCB layout for the TQ100C module. Key components and connections include:

- Module (U1):** TQ100C, with pins connected to various board pads and components.
- Regulators:**
 - U2:** 3.3V regulator (LDO33) connected to VDD33 and GND.
 - U3:** 1.8V regulator (LDO18) connected to VDD18 and GND.
 - U4:** 1.2V regulator (LDO12) connected to VDD12 and GND.
- Power and Ground:**
 - VDD33, VDD18, VDD12, and GND pads are distributed across the board.
 - Capacitors (C1, C2, C3, C4, C5, C6, C7, C8, C9, C10, C11, C12, C13, C14, C15, C16, C17, C18, C19, C20, C21, C22, C23, C24, C25, C26, C27, C28, C29, C30, C31, C32, C33, C34, C35, C36, C37, C38, C39, C40, C41, C42, C43, C44, C45, C46, C47, C48, C49, C50, C51, C52, C53, C54, C55, C56, C57, C58, C59, C60, C61, C62, C63, C64, C65, C66, C67, C68, C69, C70, C71, C72, C73, C74, C75, C76, C77, C78, C79, C80, C81, C82, C83, C84, C85, C86, C87, C88, C89, C90, C91, C92, C93, C94, C95, C96, C97, C98, C99, C100, C101, C102, C103, C104, C105, C106, C107, C108, C109, C110, C111, C112, C113, C114, C115, C116, C117, C118, C119, C120, C121, C122, C123, C124, C125, C126, C127, C128, C129, C130, C131, C132, C133, C134, C135, C136, C137, C138, C139, C140, C141, C142, C143, C144, C145, C146, C147, C148, C149, C150, C151, C152, C153, C154, C155, C156, C157, C158, C159, C160, C161, C162, C163, C164, C165, C166, C167, C168, C169, C170, C171, C172, C173, C174, C175, C176, C177, C178, C179, C180, C181, C182, C183, C184, C185, C186, C187, C188, C189, C190, C191, C192, C193, C194, C195, C196, C197, C198, C199, C200, C201, C202, C203, C204, C205, C206, C207, C208, C209, C210, C211, C212, C213, C214, C215, C216, C217, C218, C219, C220, C221, C222, C223, C224, C225, C226, C227, C228, C229, C230, C231, C232, C233, C234, C235, C236, C237, C238, C239, C240, C241, C242, C243, C244, C245, C246, C247, C248, C249, C250, C251, C252, C253, C254, C255, C256, C257, C258, C259, C260, C261, C262, C263, C264, C265, C266, C267, C268, C269, C270, C271, C272, C273, C274, C275, C276, C277, C278, C279, C280, C281, C282, C283, C284, C285, C286, C287, C288, C289, C290, C291, C292, C293, C294, C295, C296, C297, C298, C299, C300, C301, C302, C303, C304, C305, C306, C307, C308, C309, C310, C311, C312, C313, C314, C315, C316, C317, C318, C319, C320, C321, C322, C323, C324, C325, C326, C327, C328, C329, C330, C331, C332, C333, C334, C335, C336, C337, C338, C339, C340, C341, C342, C343, C344, C345, C346, C347, C348, C349, C350, C351, C352, C353, C354, C355, C356, C357, C358, C359, C360, C361, C362, C363, C364, C365, C366, C367, C368, C369, C370, C371, C372, C373, C374, C375, C376, C377, C378, C379, C380, C381, C382, C383, C384, C385, C386, C387, C388, C389, C390, C391, C392, C393, C394, C395, C396, C397, C398, C399, C400, C401, C402, C403, C404, C405, C406, C407, C408, C409, C410, C411, C412, C413, C414, C415, C416, C417, C418, C419, C420, C421, C422, C423, C424, C425, C426, C427, C428, C429, C430, C431, C432, C433, C434, C435, C436, C437, C438, C439, C440, C441, C442, C443, C444, C445, C446, C447, C448, C449, C450, C451, C452, C453, C454, C455, C456, C457, C458, C459, C460, C461, C462, C463, C464, C465, C466, C467, C468, C469, C470, C471, C472, C473, C474, C475, C476, C477, C478, C479, C480, C481, C482, C483, C484, C485, C486, C487, C488, C489, C490, C491, C492, C493, C494, C495, C496, C497, C498, C499, C500, C501, C502, C503, C504, C505, C506, C507, C508, C509, C510, C511, C512, C513, C514, C515, C516, C517, C518, C519, C520, C521, C522, C523, C524, C525, C526, C527, C528, C529, C530, C531, C532, C533, C534, C535, C536, C537, C538, C539, C540, C541, C542, C543, C544, C545, C546, C547, C548, C549, C550, C551, C552, C553, C554, C555, C556, C557, C558, C559, C560, C561, C562, C563, C564, C565, C566, C567, C568, C569, C570, C571, C572, C573, C574, C575, C576, C577, C578, C579, C580, C581, C582, C583, C584, C585, C586, C587, C588, C589, C590, C591, C592, C593, C594, C595, C596, C597, C598, C599, C600, C601, C602, C603, C604, C605, C606, C607, C608, C609, C610, C611, C612, C613, C614, C615, C616, C617, C618, C619, C620, C621, C622, C623, C624, C625, C626, C627, C628, C629, C630, C631, C632, C633, C634, C635, C636, C637, C638, C639, C640, C641, C642, C643, C644, C645, C646, C647, C648, C649, C650, C651, C652, C653, C654, C655, C656, C657, C658, C659, C660, C661, C662, C663, C664, C665, C666, C667, C668, C669, C670, C671, C672, C673, C674, C675, C676, C677, C678, C679, C680, C681, C682, C683, C684, C685, C686, C687, C688, C689, C690, C691, C692, C693, C694, C695, C696, C697, C698, C699, C700, C701, C702, C703, C704, C705, C706, C707, C708, C709, C710, C711, C712, C713, C714, C715, C716, C717, C718, C719, C720, C721, C722, C723, C724, C725, C726, C727, C728, C729, C730, C731, C732, C733, C734, C735, C736, C737, C738, C739, C740, C741, C742, C743, C744, C745, C746, C747, C748, C749, C750, C751, C752, C753, C754, C755, C756, C757, C758, C759, C760, C761, C762, C763, C764, C765, C766, C767, C768, C769, C770

6. Design guidance

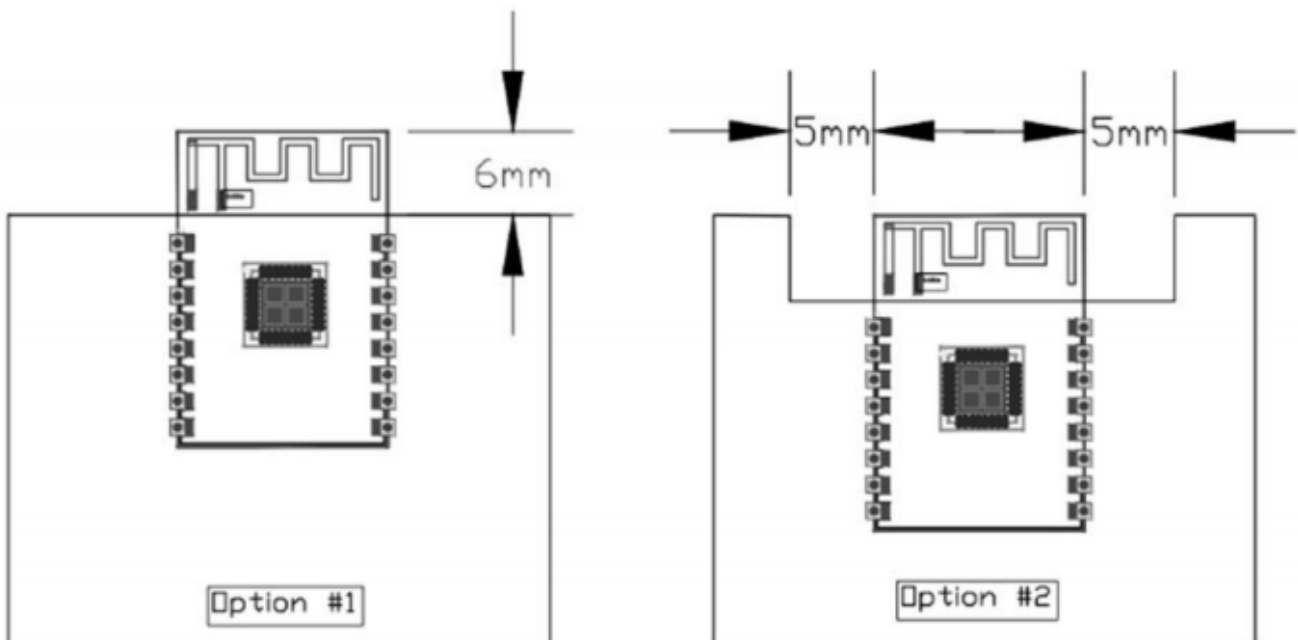
1、Antenna layout requirements

(1)、The installation position on the motherboard is recommended in the following two ways:

Scheme 1: put the module on the edge of the motherboard, and the antenna area extends out of the edge of the motherboard.

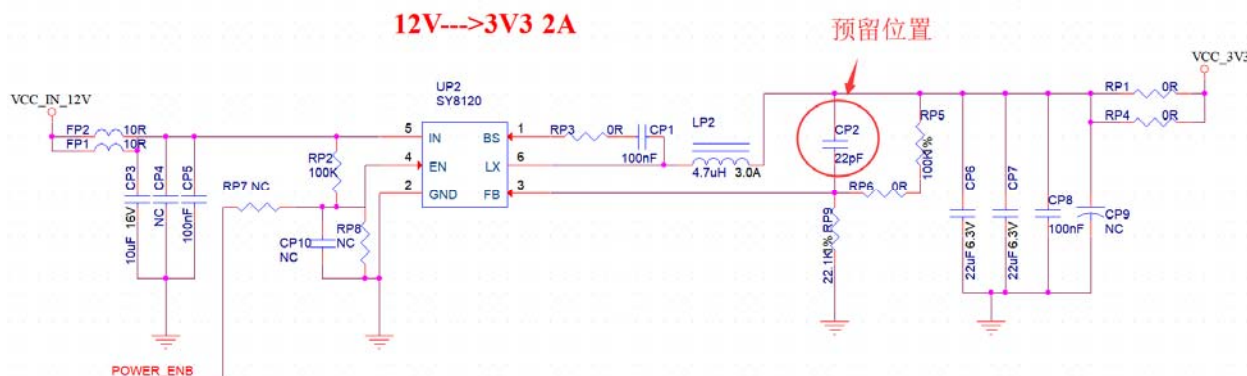
Scheme two: put the module on the edge of the motherboard, the edge of the motherboard in the antenna position to make an empty area.

(2)、In order to meet the performance of on-board antenna, metal parts are forbidden to be placed around the antenna, away from high frequency devices.



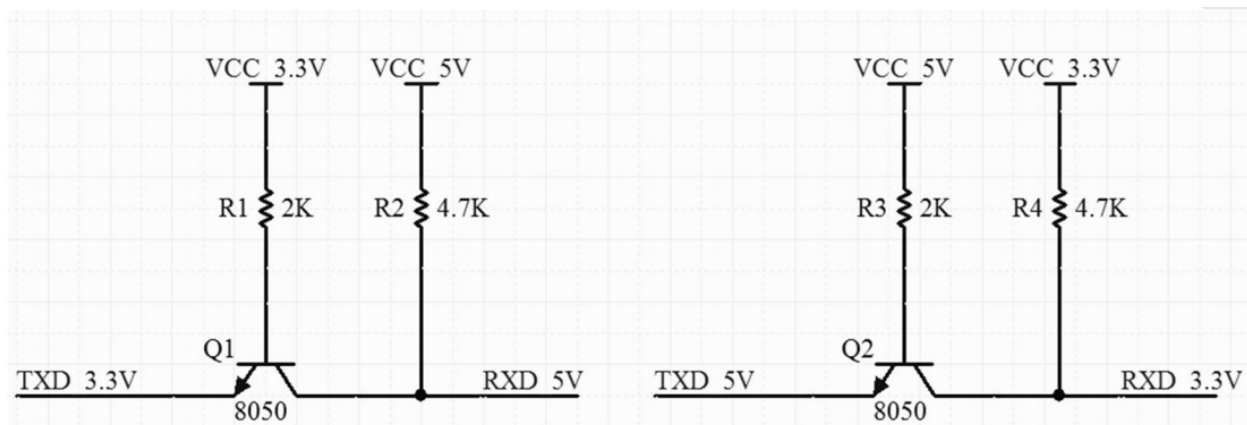
2、Power supply

- (1)、Recommend 3.3V voltage, peak current above 50mA
- (2)、It is recommended to use LDO for power supply; if DC-DC is used, the ripple is recommended to be controlled within 30mV.
- (3)、DC-DC the power supply circuit, it is suggested to reserve the position of output ripple can be optimized when the load changes greatly.
- (4)、It is recommended to add ESD devices to the 3.3V power interface.



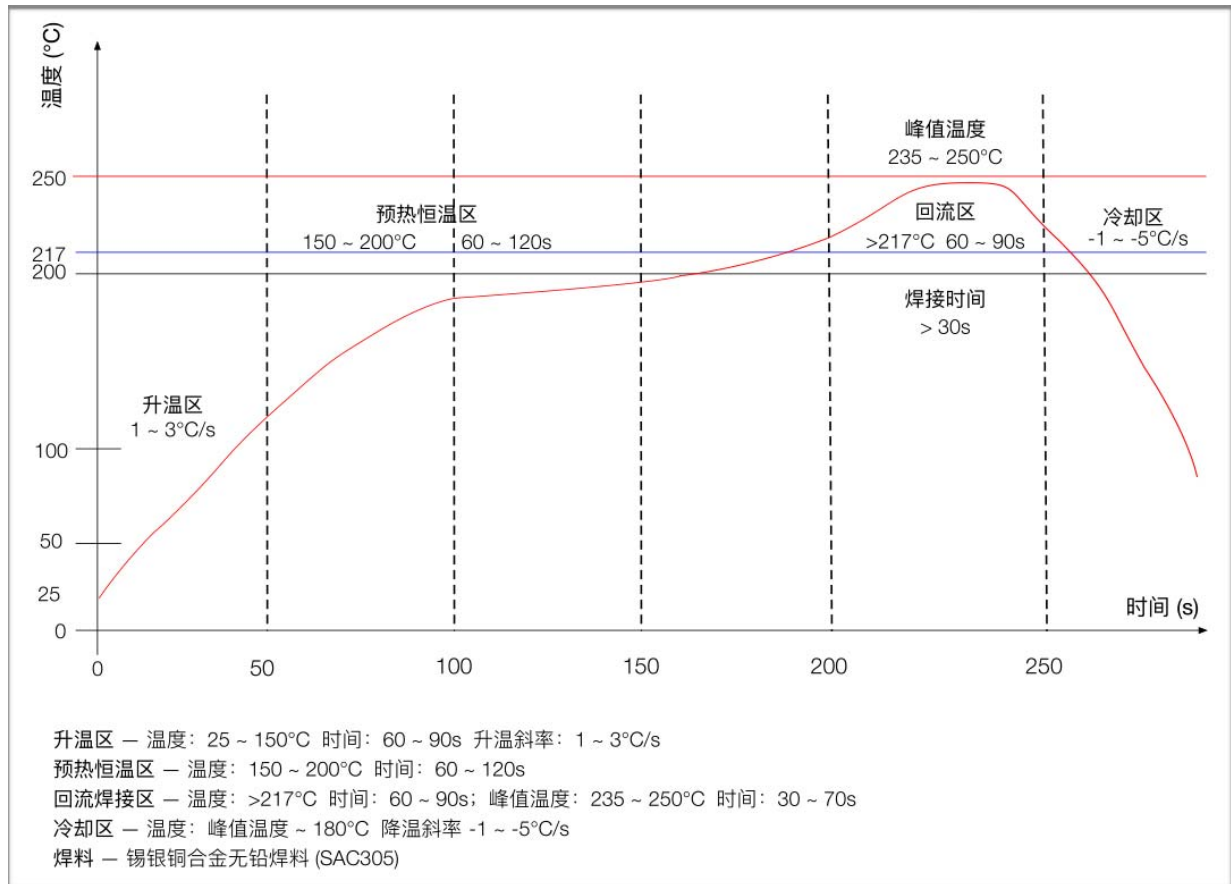
3、GPIO Interface

- (1)、The module periphery leads to some GPIO ports, such as the recommended resistance of 10-100 Ohms in series on the IO port. This can suppress overshoot, to ensure both sides of the level more stable. helpful for both EMI and ESD.
- (2)、For special IO, please refer to the specification, which will affect the starting configuration of the module.
- (3)、The IO port of the module voltage is 3.3 V, if the main control does not match the IO level of the module, require to add the level conversion circuit.
- (4)、When the IO port is connected directly to the peripheral interface, or the pin header and other terminals, it is recommended to reserve ESD device near the terminal.



Electrical level conversion circuit

7. Reflow soldering



8. Packaging information

Refer to below image, the TG-12F package is in Tape/Reel.



9. Contact us

Official website: <https://www.ai-thinker.com>

Development DOCS : <http s : //d ocs.ai-thinker.com>

Official Forum: <http://bbs.ai-thinker.com>

Sample purchase: <https://anxinke.taobao.com>

Business cooperation: sales@aithinker.com

Technical support: support@aithinker.com



Company Address: Building C, Huafeng Intelligent Innovation Port, Xixiang, Baoan District,
Shenzhen

Tel : 0755-29162996

Integration instructions for host product manufacturers according to KDB 996369 D03 OEM Manual v01

2.2 List of applicable FCC rules

The TG-12F_3133 is an WIFI & BT Module with digitally modulated systems using an DSSS with DBPSK/DQPSK/CCK for 802.11b; OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n; modulation and BLE GFSK modulation. It operates on the 2400-2483.5MHz band and, therefore, is within U.S. FCC part 15.247 standard

2.3 Specific operational use conditions

The EUT is a WIFI & BT Module

Operation Frequency: 2412-2462MHz for 802.11b/g/11n(HT20);

Modulation Type: DSSS with DBPSK/DQPSK/CCK for 802.11b;

OFDM with BPSK/QPSK/16QAM/64QAM for 802.11g/n;

Number Of Channel: 11 channels for 802.11b/g/11n(HT20);

Antenna Designation: PCB Antenna

Antenna Gain: 0.5dBi

BLE:

Operation Frequency: 2402-2480MHz for BLE;

Modulation Type: GFSK

Number Of Channel: 40 channels

Antenna Designation: PCB Antenna

Antenna Gain: 0.5dBi

TG-12F_3133 is a WIFI & BT module developed by Ensink Technology. The core processor TG7100C of this module is a highly integrated low-power Wi-Fi& BT system-on-chip (SoC) designed for the Internet of Things (IoT) , Mobile devices, wearable electronic devices, smart home and other applications. TG7100C has industry-leading low-power performance and RF performance, supports IEEE802.11b / g / n protocol, integrates Wi-Fi MAC, Wi-Fi RF and baseband, RF switch, RF Balun, power amplifier, low noise Amplifier, etc.

2.4 Limited module procedures

not applicable; Single Modular Approval Request

2.5 Trace antenna designs

Not applicable;

2.6 RF exposure considerations

To maintain compliance with FCC's RF Exposure guidelines, This equipment should be installed and operated with minimum distance between 20cm the radiator your body. Use only the supplied antenna.

2.7 Antennas

The TG-12F_3133 is an Wi-Fi Module beams signals and communicates with its antenna, which is PCB Antenna. The PCB Antenna gain is 0.5dBi. Antenna could not be in no-load state when module is working. During debugging, it is suggested to add 50 ohms load to the antenna port to avoid damage or performance degradation of the module under long-time no-load condition.

2.8 Label and compliance information

The final end product must be label in a visible area with the following

Host must Contains FCC ID: 2ATPO-TG12F. If the size of the end product is larger than 24x16mm, then the following FCC part 15.19 statement has to also be available on the label: This device complies with Part 15 of FCC rules. Operation is subject to the following two conditions:

(1) this device may not cause harmful interference and

(2) this device must accept any interference received, including interference that may cause undesired operation.

2.9 Information on test modes and additional testing requirements

Data transfer module demo board can control the EUT work in RF test mode at specified test channel.

2.10 Additional testing, Part 15 Subpart B disclaimer

The module without unintentional-radiator digital circuit, so the module does not required an evaluation by FCC Part 15 Subpart B. The host should be evaluated by the FCC Subpart B.

ATTENTION

This device is intended only for OEM integrators under the following conditions:

- 1) The antenna must be installed such that 20 cm is maintained between the antenna and users, and
- 2) This device and its antenna(s) must not be co - located with any other transmitters except in accordance with FCC multi - transmitter product procedures. Referring to the multi - transmitter policy, multiple transmitter(s) and module(s) can be operated simultaneously without C2P.
- 3) For all products market in US, OEM has to limit the Operating Frequency: 2412-2462 MHz /2402-2480MHz by supplied firmware programming tool. OEM shall not supply any tool or info to the end - user regarding to Regulatory Domain change.

USERS MANUAL OF THE END PRODUCT:

In the user manual of the end product, the end user has to be informed to keep at least 20cm separation with the antenna while this end product is installed and operated. The end user has to be informed that the FCC radio - frequency exposure guidelines for an uncontrolled environment can be satisfied. The end user has to also be informed that any changes or modifications not expressly approved by the manufacturer could void the user's authority to operate this equipment.

If the size of the end product is smaller than 8x10cm, then additional FCC part 15.19 statement is required to be available in the users manual: This device complies with Part 15 of FCC rules.

Operation is subject to the following two conditions:

- (1) this device may not cause harmful interference and
- (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC WARNING

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generate, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.