TTCIOTSDK

SR-2745020C1Q BLE Module Specification V1.1

(Suitable for automotive applications)

Version:V1.1

2025/09/05

Document Revision History

Version	Date	reviser	auditor	Revised content
V1.0	2025/08/22	XSP		First release
V1.1	2025/09/05	XSP		Update Hardware model description

CONTENTS

1. DESCRIPTION

The SR-2745020C1Q module is a single-mode device specifically designed for low-power sensors and accessories.

The SR-2745020C1Q module is 2.4GHz wireless microcontrollers (MCUs) supporting Bluetooth® Low Energy 5.4 for automotive applications. These devices are optimized for low-power wireless communication in applications such as car access, including passive entry passive start (PEPS), phone as a key (PaaK), and remote keyless entry (RKE).

BLE IC:CC2745R10-Q1 6*6*0.9mm 40pin.

1-1.Applications:

Automotive

- Car access and security systems
- Digital key
- Phone as a key (PaaK)
- Passive entry passive start (PEPS)
- Remote keyless entry (RKE)

1-2.Features:

- Arm® Cortex®-M33 processor (96MHz)
- Up to 1MB of in-system programmable flash
- Up to 162KB of SRAM
- 32KB of System ROM with secure boot root of trust (RoT) and a serial (SPI/UART) bootloader
- Algorithm Processing Unit (APU) (96MHz)

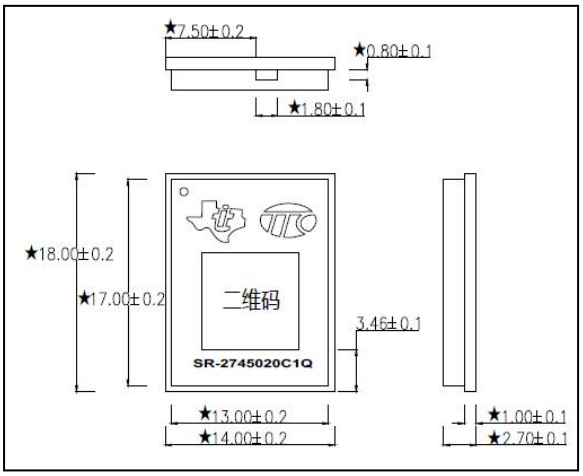
2. Hardware model and laser engraving instructions

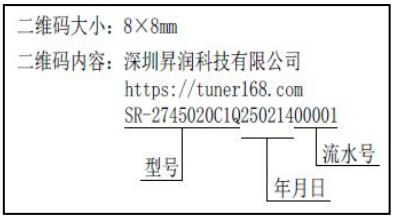
2-1.Hardware model description:

Use TI CC2745R10E1WRHARQ1 BLE IC,The module Optional with or without a shielding cover

No.	Hardware model	Description
1	SR-2745020C1Q	With a shielding cover
2	SR-274502001Q	Without a shielding cover

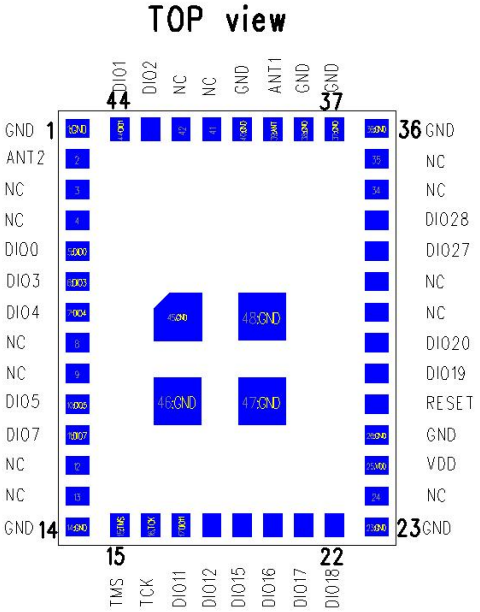
2-2.Shield Cover Laser Engraving Instructions:

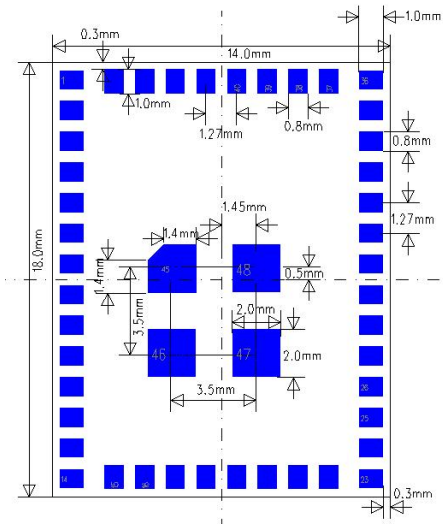




3. Dimension and PIN functions and Module picture

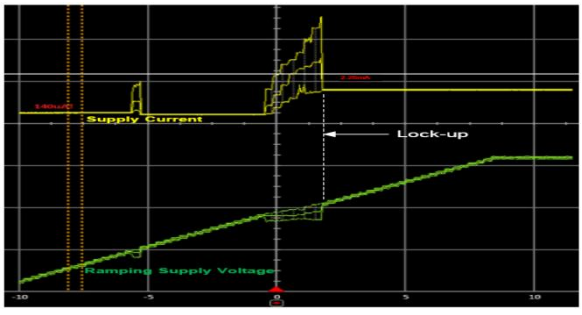
(PCBA Dimension : 18 * 14 * 2.0/2.7 mm).





4.Application Precautions

- Pay attention to electrostatic protection: During the operation, ensure that the instrument and equipment are completely grounded. Prevent poor grounding of the soldering iron and various equipment; avoid static electricity generated by packaging materials and human body contact, which will damage the IC or the program will be blown away; when manually soldering the module, pay attention to the temperature of the soldering iron to avoid peeling off of the PCB copper skin; The power supply damages the module; the operator must install the anti-static ring and implement the static protection inspection to prevent human contact from damaging the IC and the program. Good contact to avoid oxidation and poor contact; the electrostatic voltage of the environment and personnel is within 0±100V. Anti-static signs should be made in the work area.
- Pay attention to avoid program runaway or IC damage caused by abnormal voltage of the Bluetooth chip due to poor power supply circuit of the motherboard, soldering short circuit connection/open circuit.
- When burning the program firmware in the module flash memory, the VDDS DC power supply voltage must be between 2.4~3.3V.
- Avoid multiple occurrences of the power supply voltage falling within the range of the electrical detection threshold (1.76 V ~ 1.78 V) within the BOD Brown-Out Decect range,the below picture shows the power-off lock area, the firmware may be locked causing the boot code to pause and unable to connect to the JTAG protocol. In this state, the reset pin action can be used to eliminate this phenomenon below 1.0 V; the rechargeable battery is in the state of charging and discharging; while applying it, ensure the voltage setting of the protection system, and pay attention to the internal resistance and line impedance voltage drop caused by power supply; ensure The device operates from 2.0 V to 3.6 V with a guaranteed voltage slope greater than 0.5 V/ms (passing the BOD threshold).



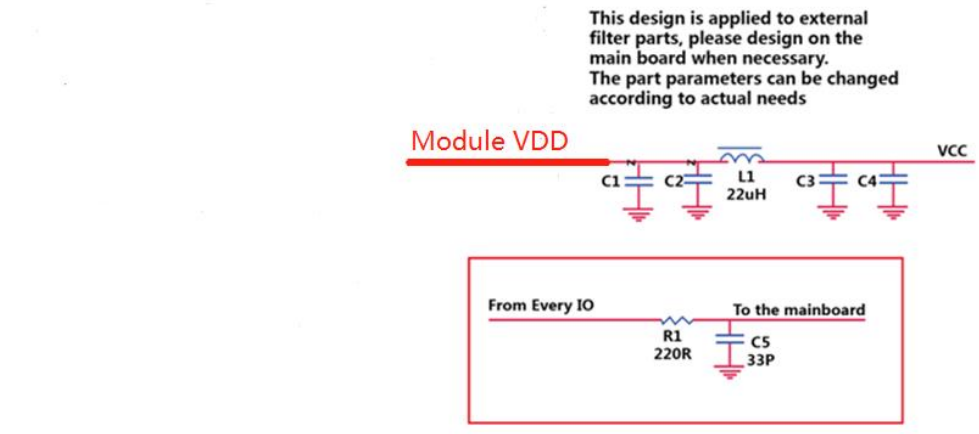
- During the production and transportation process, please take good measures to protect the module parts to prevent the precision parts on the module from being damaged (reflow furnace

outlet and assembly, testing, and transportation processes, it is recommended to use anti-collision materials for buffering, and do not collide with each other.

- This module is a humidity-sensitive component. If it is used in SMD reflow soldering operations, please strictly follow the regulations of IPC/JEDECJ-STD-020, and do a good job of drying and dehumidification first, and because this module has been placed after 2 processing operations In the functional test environment, the humidity inside the chip cannot be guaranteed at a certain ratio, please understand;

  The above precautions are as follows:

- The external filter parts on the module application schematic diagram should be connected to the main board when needed, and the values can be changed according to the actual needs of the whole board characteristics.



- Installation Suggestion 1: The PCB copper skin around the module antenna and under the RF circuit must be clear, and the module must be placed on the edge of the motherboard. There should be no metal parts or substances that hinder electromagnetic radiation near the antenna, which will affect the control distance.
- Installation suggestion 2: The layout of signal lines and power lines, do not cross the lines, avoid crosstalk, and affect the receiving sensitivity.

5. Pin and GPIO Function Descriptions

5-1. Pin definitions

Pin	Name	Type	Function Description
1	GND	Power GND	Ground
2	ANT2	RF	RF OUT
3	NC	NC	NC
4	NC	NC	NC
5	DIO_0	Digital I/O	GPIO
6	DIO_3	Digital I/O	GPIO, high-drive capability
7	DIO_4	Digital I/O	GPIO
8	NC	NC	NC
9	NC	NC	NC
10	DIO_5	Digital I/O	GPIO
11	DIO_7	Digital I/O	GPIO
12	NC	NC	NC
13	NC	NC	NC
14	GND	Power GND	Ground
15	JTAG TMSC	Digital I/O	JTAG TMSC; high-drive capability
16	JTAG TCKC	Digital I/O	JTAG TCKC
17	DIO_11	Digital I/O	GPIO
18	DIO_12	Digital I/O	GPIO
19	DIO_15	Digital I/O	GPIO
20	DIO_16	Digital I/O	GPIO
21	DIO_17	Digital or Analog I/O	GPIO, analog capability, high-drive capability
22	DIO_18	Digital or Analog I/O	GPIO, analog capability, high-drive capability
23	GND	Power GND	Ground
24	NC	NC	NC
25	VDD	Power Supply	+2.2V to +3.8V (Recommended 2.7~3.3V)
26	GND	Power GND	Ground
27	RESET	Digital input	Reset, active-low. Module have pull up.
28	DIO_19	Digital or Analog I/O	GPIO, analog capability,
29	DIO_20	Digital or Analog I/O	GPIO, analog capability,

30	NC	NC	NC
31	NC	NC	NC
32	DIO_27	Digital or Analog I/O	GPIO, analog capability,
33	DIO_28	Digital or Analog I/O	GPIO, analog capability,
34	NC	NC	NC
35	NC	NC	NC
36	GND	Power GND	Ground
37	GND	Power GND	Ground
38	GND	Power GND	Ground
39	ANT1	RF	RF OUT
40	GND	Power GND	Ground
41	NC	NC	NC
42	NC	NC	NC
43	DIO_2	Digital I/O	UART RX;GPIO
44	DIO_1	Digital I/O	UART TX;GPIO

5-2.Pin function mapping:

PIN NO. QFN40	PIN NAME	SIGNAL NAME	SIGNAL TYPE(1)	PIN MUX ENCODING	SIGNAL DIRECTION
1	VDDR	VDDR	—	N/A	N/A
2	VDDR	VDDR	—	N/A	N/A
3	DIO0	GPIO0	I/O	0	I/O
		T0C0		1	I/O
		T1F		2	O
		T3C0N		3	O
		LPCO		4	O
		T1C0		5	I/O

4	DIO1	GPIO1	I/O	0	I/O
		CAN0TX		1	O
		T1C0		2	I/O
		T2C0		3	I/O
		UART0TXD		4	O
		T1C1		5	I/O
		DTB15		7	O
5	DIO2	GPIO2	I/O	0	I/O
		CAN0RX		1	I
		T1C1		2	I/O
		T0PE		3	O
		UART0RXD		4	I
		T1C2		5	I/O
		DTB14		7	O
6	DIO3	GPIO3	I/O	0	I/O
		SPI0SCLK		1	I/O
		I2S0SCLK		2	I/O
		T2PE		3	O
		UART1TXD		4	O
		T2C0		5	I/O
		DTB13		7	O
7	DIO4	GPIO4	I/O	0	I/O
		SPI0PICO		1	I/O
		SPI0POCI		2	I/O
		T1C2		3	I/O
		UART1RXD		4	I
		T2C1		5	I/O
		DTB12		7	O
8	DIO5	GPIO5	I/O	0	I/O
		SPI0POCI		1	I/O
		SPI0PICO		2	I/O
		T2C1		3	I/O
		T3C1N		4	O
		T2C2		5	I/O
		DTB11		7	O

9	VDDIO	VDDIO	—	N/A	N/A
10	DIO7	GPIO7	I/O	0	I/O
		SPI0CSN		1	I/O
		T2C2		2	I/O
		I2S0WS		3	I/O
		T3C2N		4	O
		DTB10		7	O
11	DIO9_SWDIO	GPIO9	I/O	0	I/O
		T0C1		1	I/O
		T2C0N		2	O
		I2S0SD0		3	I/O
		T0PE		4	O
		I2C0SCL		5	I/O
12	DIO10_SWDCK	GPIO10	I/O	0	I/O
		T0C2		1	I/O
		T2C1N		2	O
		I2S0SD1		3	I/O
		T2PE		4	O
		I2C0SDA		5	I/O
13	DIO11	GPIO11	I/O	0	I/O
		SPI1POCI		1	I/O
		SPI1PICO		2	I/O
		SWO		3	O
		T3C0		4	I/O
		T1F		5	O
		DTB9		7	O
14	DIO12	GPIO12	I/O	0	I/O
		SPI1PICO		1	I/O
		SPI1POCI		2	I/O
		T2C2N		3	O
		T3C1		4	I/O
		T3C2		5	I/O
		DTB8		7	O
		GPIO15		0	I/O
		SPI1SCLK		1	I/O

15	DIO15	T3C2	I/O	2	I/O
		T1C0N		3	O
		LPCO		4	O
		T3C1		5	I/O
16	DIO16	GPIO16	I/O	0	I/O
		I2S0MCLK		1	O
		SPI1CSN		2	I/O
		EXTCI		3	I
		T1F		4	I
		T3C0		5	I/O
		DTB7		7	O
17	VDDIO	VDDIO	—	N/A	N/A
18	VDDS	VDDS	—	N/A	N/A
19	DIO17_A8	GPIO17	I/O	0	I/O
		I2S0SCLK		1	I/O
		UART0RTS		2	O
		CAN0TX		3	O
		T0C0		4	I/O
		LRFD0		5	O
		ADC8		6	I
		DTB6		7	O
20	DIO18_A7	GPIO18	I/O	0	I/O
		I2S0WS		1	I/O
		UART0CTS		2	I
		CAN0RX		3	I
		T0C1		4	I/O
		LRFD1		5	O
		ADC7		6	I
		DTB5		7	O
21	DIO19_A6	GPIO19	I/O	0	I/O
		SPI0CSN		1	I/O
		UART0TXD		2	O
		UART0RXD		3	I
		I2S0SD0		4	I/O
		LRFD2		5	O

		ADC6/LPC+		6	I
		DTB4		7	O
22	DIO20_A6	GPIO20	I/O	0	I/O
		SPI0SCLK		1	I/O
		UART0RXD		2	I
		UART0TXD		3	O
		I2S0SD1		4	I/O
		LRFD3		5	O
		ADC5/LPC+/LPC-		6	I
		DTB3		7	O
23	DIO21_A4	GPIO21	I/O	0	I/O
		SPI0PICO		1	I/O
		UART1TXD		2	O
		I2C0SCL		3	I/O
		T1C1N		4	O
		LRFD4		5	O
		ADC4/LPC+/LPC-		6	I
		DTB2		7	O
24	DIO22_A3	GPIO22	I/O	0	I/O
		SPI0POCI		1	I/O
		UART1RXD		2	I
		I2C0SDA		3	I/O
		T1C2N		4	O
		LRFD5		5	O
		ADC3		6	I
		DTB1		7	O
25	RTSN	RSTN	—	N/A	N/A
26	DIO23_X32P	GPIO23	I/O	0	I/O
		SPI1CSN		1	I/O
		UART1RTS		2	O
		LFCI		3	I
		T0C2		4	I/O
		T1C0		5	I/O
		LFXT_P		6	I
		GPIO24		0	I/O

27	DIO24_X32N	SPI1SCLK	I/O	1	I/O
		UART1CTS		2	I
		T0C0N		3	O
		LPCO		4	O
		T0C0		5	I/O
		LFXT_N		6	I
28	VDDD	VDDD	—	N/A	N/A
29	VDDS	VDDS	—	N/A	N/A
30	DCDC	DCDC	—	N/A	N/A
31	VDDS	VDDS	—	N/A	N/A
32	DIO27_A1	GPIO27	I/O	0	I/O
		SPI1PICO		1	I/O
		I2C0SCL		2	I/O
		CKMIN		3	I
		T0C1N		4	O
		LRFD6		5	O
		ADC1/AREF+		6	I
		DTB0		7	O
33	DIO28_A0	GPIO28	I/O	0	I/O
		SPI1POCI		1	I/O
		I2C0SDA		2	I/O
		T3C0N		3	O
		T0C2N		4	O
		LRFD7		5	O
		ADC0/AREF-		6	I
34	VDDR	VDDR	—	N/A	N/A
35	X48P	X48P	—	N/A	N/A
36	X48N	X48N	—	N/A	N/A
37	NC	NC	—	N/A	N/A
38	VDDS	VDDS	—	N/A	N/A
39	ANT	ANT	—	N/A	N/A
40	NC	NC	—	N/A	N/A
—	EGP	GND	—	N/A	N/A

6. Electrical Characteristic

(Test conditions: Ta = 25 ℃, VDD =3.0V internal DC-DC regulator, test standard :1Mbps GFSK modulation,FRF = 2440MHz BLE mode.)

6-1.Radio Characteristics And Current Consumption

- Modulation mode:GFSK.
- Frequency range:2400~2483.5MHz(2.4G ISM Frequency band).
- IC Transmitting power range:-20~+10dBm typical(Controlled by software programming).
- RF transmit power at antenna feed:+9 dBm typical. (RF TX Set at +10dBm maximum feature).
- RF receiving sensitivity of antenna feeder: -93dBm typical (In PER <30.8% characteristic).
- Frequency offset :RF ± 60ppm, MCU clock 32.768KHz ± 350ppm (using crystal mode)..
- Ultra-low current consumption
  - RF TX Current: 7.7mA (0dBm).
  - RF TX current: 24.5mA (10dBm).
  - RF RX current: 6.1mA.
  - Standby state current: 0.9uA (RTC run and RAM/CPU hold).
  - Shutdown state current: 160nA (no clock running, no storage)

6-2. Absolute Maximum Ratings

(1) Stresses beyond those listed under Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under Recommended Operating Conditions is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltage values are with respect to ground, unless otherwise noted

Rated value	MIN	MAX	Unit
VDDS	-0.3	4.1	V
Other terminal voltage	VSS-0.3	VDDS+0.3	V
Storage temperature	-40	+125	℃

6-3. ESD Ratings

			Value	Unit
VESD Electrostatic discharge	Human body model (HBM), per AEC Q100-002	pins except ANT	±2000	V
		ANT pin	±1000	
	Charged device model (CDM), per AEC Q100-011	pins except ANT	±500	
		ANT pin	±250	

6-4. Recommended Operating Conditions

Power supply voltage noise should be less than 10mVpp, too large power supply noise, will reduce the RF performance.

Rated value	MIN	MAX	Unit
VDD(Bluetooth operating time)	2.2	3.8	V
VDD(Flash memory burning program firmware)	2.4	3.6	V
Operating temperature	-40	+105	°C

Notes:

(1).VDD DC power supply recommended voltage: 2.7~3.3V DC.

(2).When the module flash memory is burning the program firmware, the VDDS DC power supply voltage should be between 2.4 and 3.3V to avoid incomplete or abnormal conditions when burning.

(3).In the worst case, the battery equivalent source resistance will cause a power supply voltage drop, and the VDDS must use a 10μF input capacitor to strengthen the power supply capacity to ensure that the conversion rate (6-6 timing requirements) is met.

6-5.GPIO DC Characteristics

Parameter	Test Condition	MIN	TYP	MAX	Unit
GPIO VOH at 10 mA load	high-drive GPIOs only, max drive setting	2.47			V
PIO VOL at 10 mA load	high-drive GPIOs only, max drive setting			0.25	V
GPIO VOH at 2 mA load	standard drive GPIOs	2.52			V
GPIO VOL at 2 mA load	standard drive GPIOs			0.20	V

6-6. Timing Requirement

State	MIN	Standard	MAX	Unit
Rising power supply voltage conversion rate	0		100	mV/μs
Decrease the power supply voltage conversion rate(1)	0		1	mV/μs
Characteristics of the input control				
Reset Duration for which RESET_N remains low	1			μs

(1) In the worst case, the battery equivalent source resistance will cause a power supply voltage drop, and the VDDS must use a 10μF input capacitor to strengthen the power supply capacity to ensure that the conversion rate (3-6 timing requirements) is met.

6-7. Wakeup Timing

Measurement conditions Tc = 25°C, VDDS = 3.0 V, unless otherwise stated

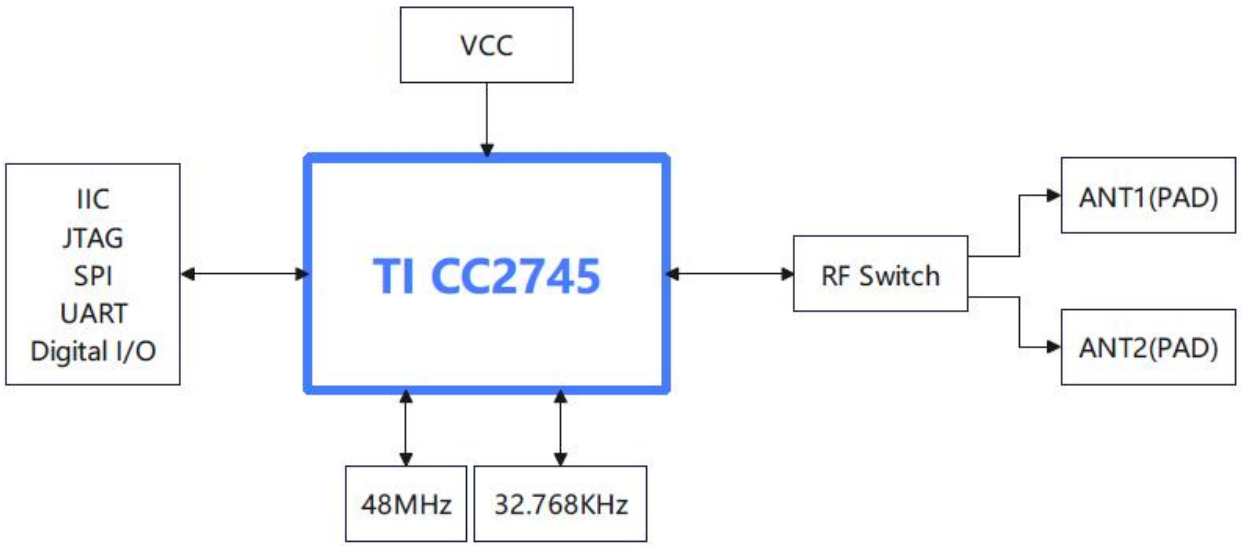
PARAMETER		TEST CONDITIONS	MIN	TYP	MAX	UNIT
MCU, Reset/Shutdown to Active(1)		GLDO default charge current setting, VDDR capacitor fully charged (2)		350-450		μs
MCU, Standby to Active	MCU, Standby to Active (3)(ready to execute code from flash), VGM disabled coming out of standby mode	DC/DC enabled, default recharge current configuration		43		μs
MCU, Standby to Active	MCU, Standby to Active (3) (ready to execute code from flash), VGM disabled coming out of standby mode	GLDO enabled, default recharge current configuration		43		μs
MCU, Standby to Active	MCU, Standby to Active (ready to execute code from flash), VGM enabled coming out of standby mode	DC/DC enabled, default recharge current configuration		80		μs
MCU, Standby to Active	MCU, Standby to Active (ready to execute code from flash), VGM enabled coming out of standby mode	GLDO enabled, default recharge current configuration		80		μs
MCU, Idle to Active		Flash enabled in idle mode		3		μs
		Flash disabled in idle mode		15		μs

(1) Wakeup time includes system ROM bootcode execution time (excluding any system ROM secure boot operations). The wakeup time is dependent on the remaining charge on VDDR capacitor when starting the device, and thus how long the device has been in Reset or Shutdown before starting up again.

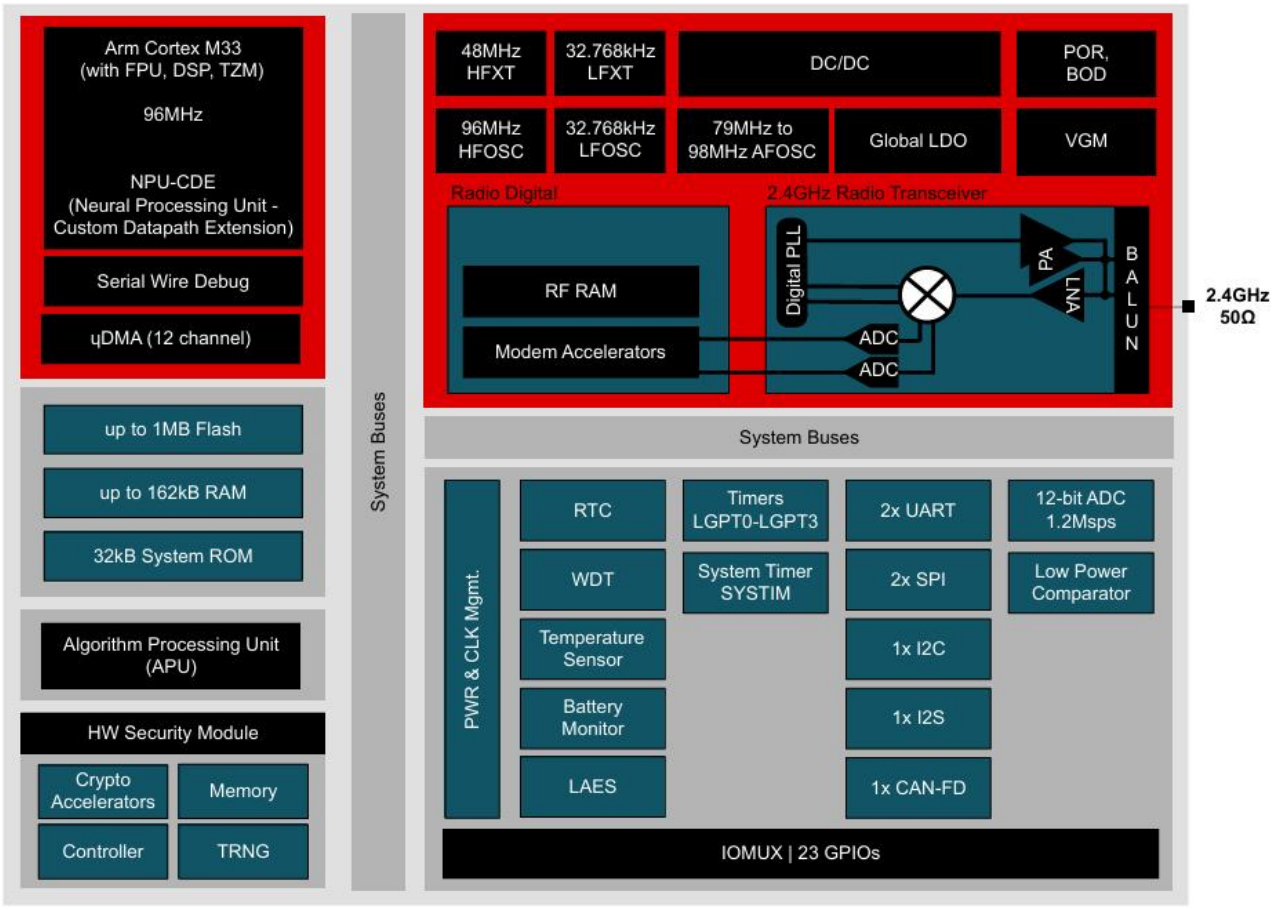
(2) This is the best case Reset/Shutdown mode to Active mode time including system ROM bootcode operation (excluding any system ROM secure boot operations) for the specified GLDO charge current setting considering the VDDR capacitor is fully charged and is not discharged during the reset and shutdown events; that is, when the device is in reset / shutdown modes for only a very short period of time.

(3) Dependent on VDDR capacitor voltage level.

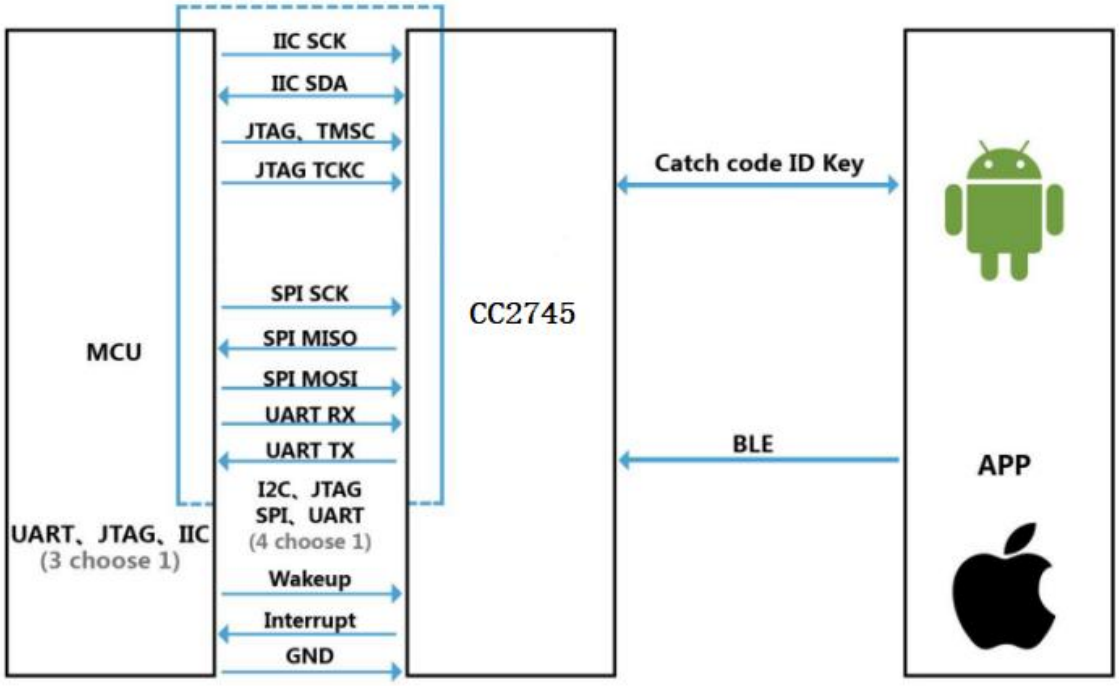
7. Block Diagram



8. IC Functional Block Diagram



9.Work mode architecture diagram



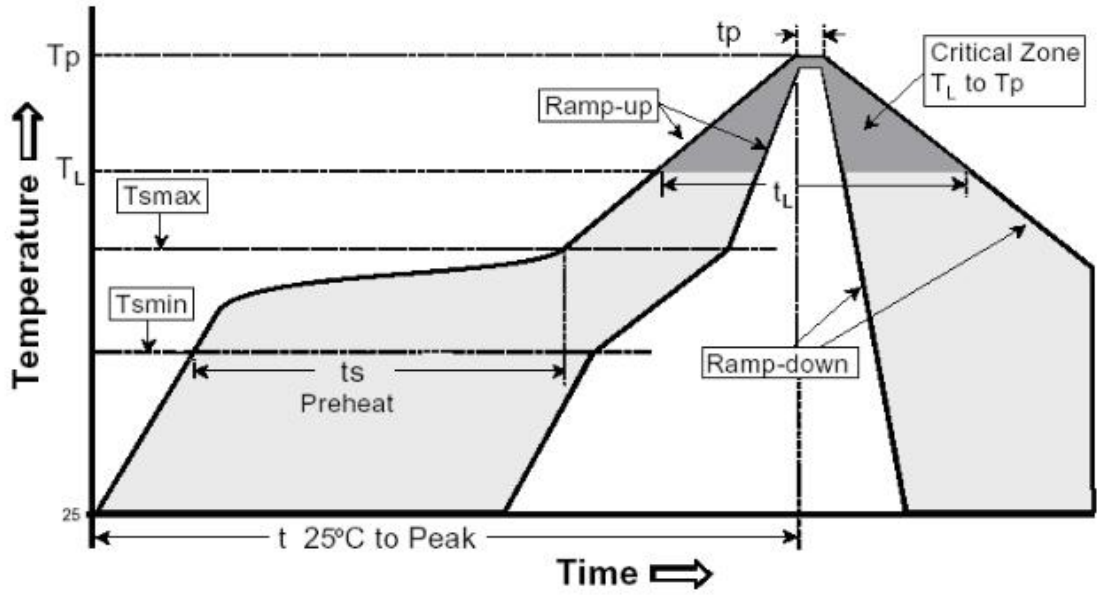
10.Recommended Reflow Curve

Profile Feature	Pb-Free Assembly	
	Large Body	Small Body
Average ramp-up rate(T_L to T_P)	3˚C/second max	
Preheat -Temperature Min (Ts_{min}) -Temperature Max (Ts_{max}) -Time (min to max)(ts)	150˚C 200˚C 60-180 seconds	
$Ts_{max}$to T-$_L$ -Ramp-up Rate	3˚C/second max	
Time maintained above -Temperature (T_L)-Time (t_L)	217˚C 60-150 seconds	
Peak Temperature (T_P)	245 +0/-5˚C	250 +0/-5˚C
Time within 5˚C of actual Peak Temperature (t_p)	10-30 seconds	20-40 seconds
Ramp-down Rate	6˚C/second max	
Time 25˚C to Peak Temperature	8 minutes max	

Notes:

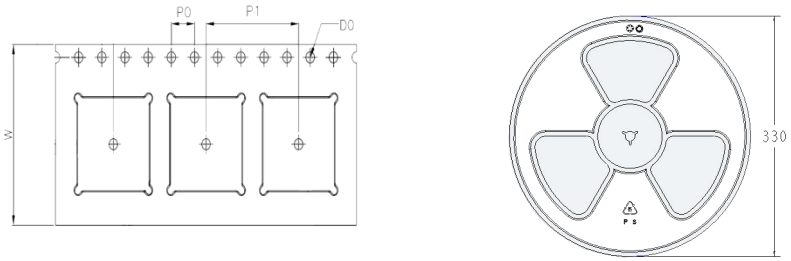
1、lead-free solder paste: Sn 96.5%, Ag 3%, Cu 0.5%);

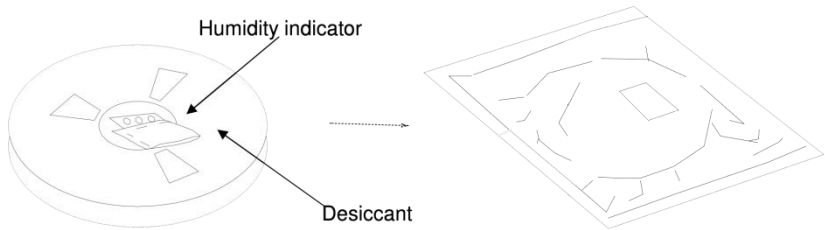
2、The furnace temperature curve is for reference only, please adjust according to the actual effect;

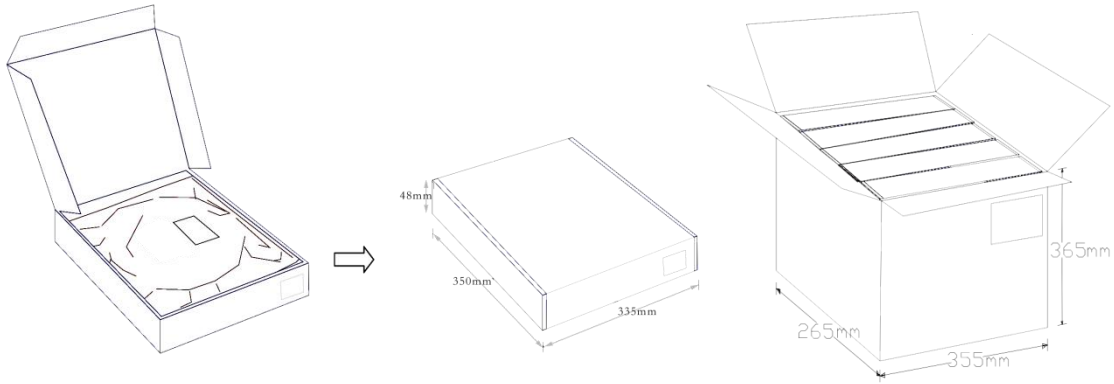


11.Packing Information

The module is delivered to the customer in tape packing(900pcs/package), packing method and size are as follows:







Humidity Sensitivity Level

Modules are delivered in packing that conforms to moisture sensitivity level 3 (MSL3) requirements.

12.Contact Us

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