



**STATE GRID**

BEIJING SMARTCHIP MICROELECTRONICS TECHNOLOGY COMPANY LIMITED  
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# **SCR102J Bluetooth Low Energy Datasheet**

Version: V 1.1

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## Revision History

Date	Revision	Description
2019.8.27	V1.0	First preliminary draft
2019.10.9	V1.1	Second draft

SMARTCHIP MICROELECTRONICS

# 1. General Description

## 1.1. Overview

The SCR102J chip is a highly integrated Bluetooth 5.0 low energy single mode device, with 2 Mbps data rate option. It integrates a high-performance RF transceiver, baseband, MCU core, rich feature peripheral units, programmable protocol and profile to support BLE application. The Flash program memory makes it suitable for customized applications.

The SCR102J is designed with advanced technology process and integrated with switch DCDC regulator, that it has ultra-low power consumption and ultra-low leakage power. The embedded high order interference suppression filter and fast automatic gain control logic make it work well in high interference environment.

## 1.2. Block Diagram

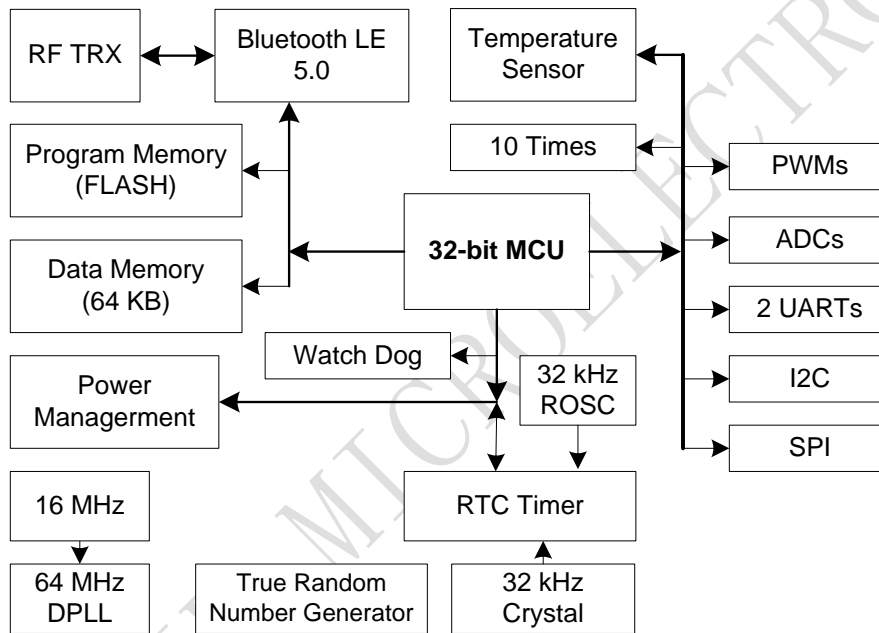


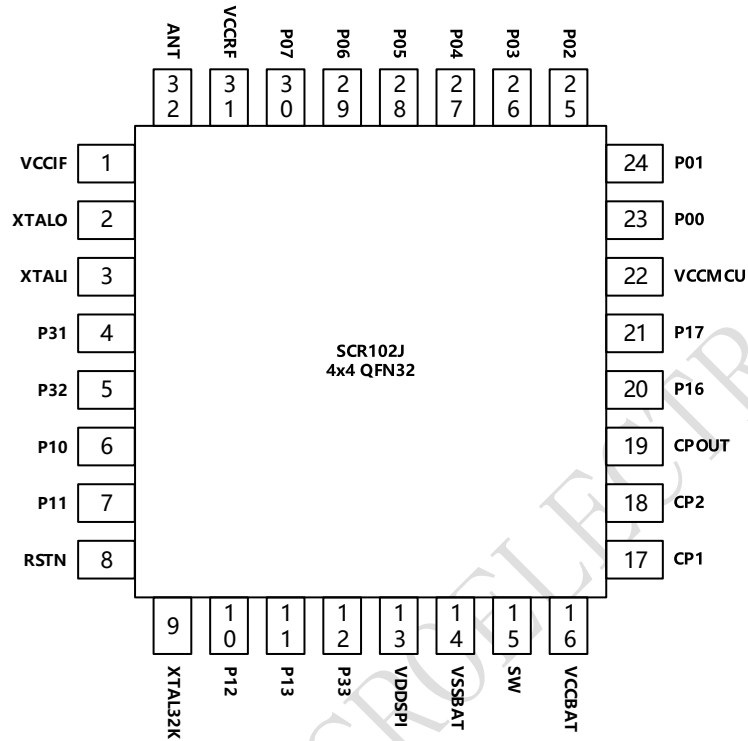
Figure 1 SCR102J Block Diagram

## 1.3. Features

- Bluetooth® SIG Bluetooth Low Energy Single-Mode (BLE) compliant
- Low-power 2.4GHz Transceiver
- 32-bit microprocessor integrated
- Typical 500 KB Flash for Program and 64 KB RAM for Data
- Operation voltage from 2.0 V to 3.6 V
- Clock
  - 16 MHz crystal reference clock
  - 64 MHz digital PLL clock
  - 32 kHz ring oscillator
  - External 32KHz crystal oscillator

- MCU can run with any clock source with internal frequency divider
- Interface and peripheral units
  - Quad IO FLASH programming
  - JTAG, I2C, SPI interface
  - Two UART interface
  - Multi-channels PWM output
  - On-chip high accurate temperature sensor
  - On-chip 10 bit general ADC
  - GPIO with multiplexed interface functions
  - True random number generator
- Typical Package Type
  - 32-pin QFN 4x4

## 2. PIN information



**Figure 2 SCR102J pin assignment**

**Table 1 SCR102J Pin Description**

PIN	Name	Pin Function	Description
1	VCCIF	Power	IF power
2	XTALO	Analog	16 MHz crystal output
3	XTALI	Analog	16 MHz crystal input
4	P31	Digital I/O	General purpose IO
5	P32	Digital I/O	General purpose IO
6	P10	Digital I/O	General purpose IO
7	P11	Digital I/O	General purpose IO
8	RSTN	Analog	Active low pin reset

<b>9</b>	XTAL32K	Analog	32kHz Crystal input
<b>10</b>	P12	Analog	Microphone bias voltage output
<b>11</b>	P13	Analog	Microphone input N
<b>12</b>	P33	Digital I/O	General purpose IO
<b>13</b>	VDDSPI	Analog	LDO output
<b>14</b>	VSSBAT	Ground	Ground
<b>15</b>	SW	Analog	Switch regulator pin for two battery mode
<b>16</b>	VCCBAT	Power	Power
<b>17</b>	CP1	Analog	Charge pump component for FLASH
<b>18</b>	CP2	Analog	Charge pump component for FLASH
<b>19</b>	CPOUT	Power	Charge pump output voltage for FLASH
<b>20</b>	P16	Digital I/O	General purpose IO
<b>21</b>	P17	Digital I/O	General purpose IO
<b>22</b>	VCCMCU	Power	Power
<b>23</b>	P00	Digital I/O	General purpose IO
<b>24</b>	P01	Digital I/O	General purpose IO
<b>25</b>	P02	Digital I/O	General purpose IO
<b>26</b>	P03	Digital I/O	General purpose IO
<b>27</b>	P04	Digital I/O	General purpose IO
<b>28</b>	P05	Digital I/O	General purpose IO
<b>29</b>	P06	Digital I/O	General purpose IO
<b>30</b>	P07	Digital I/O	General purpose IO
<b>31</b>	VCCRF	Power	RF power
<b>32</b>	ANT	RF	RF signal port

### 3. Functional Description

#### 3.1. GPIO

The SCR102J has many GPIO pins, which can be configured as either input or output. There are secondary functions available for GPIO pins and configurable by firmware.

At the beginning of the chip starts up, the chip will enter programming mode, JTAG mode or normal according received command from Mode Selecting Pin.

**Table 2 SCR102J GPIO function mapping**

	Description	I/O	PROGRAM Mode	Mode Selection Pin	Jtag mode	
P00	UART1	UART_TX	O			
P01		UART_RX	I			
P02	I2C	SCL-IR_TRX	I/O	HOLD_FL A		
P03		SDA	I/O	WP_FL A	JTAG_NTRST	
P04	SPI	SPI_SCK	I/O	SI_FL A ( Output To FLASH )	SPI_MOSI	JTAG_TDI
P05		SPI_MOSI	I/O	SO_FL A	SPI_MISO	JTAG_TDO
P06		SPI_MISO	I/O	SCK_FL A	SPI_SCK	JTAG_TCK
P07		SPI_NSS	I/O	CSN_FL A	SPI_CS	JTAG_TMS
P10	PWM	PWM[0] (20mA)	O			
P11		PWM[1] (20mA)	O			
P12		PWM[2]	O			
P13		PWM[3]	O			
P14		PWM[4]	O			
P15		PWM[5]	O			
P16	UART2	UART2_TX	O			
P17		UART2_RX	O			



P20	3DS	PWM_3DS	O			
P21		PWM_3DS	O			
P22		PWM_3DS	O			
P23		PWM_3DS	O			
P25	I2S	PCM_BCLK	O			
P26		PCM_SCLK	O			
P27		PCM_DOUT	O			
P30	ADC	Ch0/PCM_D IN	I			
P31		Ch1	I			
P32		Ch2	I			
P33		Ch3/CKAUD IO				
P34		Ch4	I			
P35		Ch5	I			
P36		Ch6	I			
P37		Ch7	I			

Each GPIO pin can be the source to wake up MCU from shut down state. In the shutdown state, any voltage level change on the pre-configured GPIO pin will trigger the wake-up procedure.

## 3.2. Timers

### 3.2.1. 16bits Timers

There are six 16 bits PWM timers. The clock of PWM timers can be selected as 32 KHz clock or 16 MHz clock by register.

There are two modes of PWM timers. One is timer mode and another is PWM mode. The timer mode can generate interrupt to MCU. The PWM mode can generate PWM waveform and output to GPIO pins to drive external device such as LED. Four GPIO pins can be used to output PWM waveform separately.

### 3.2.2. 22bits Timers

There are four 22 bits timers, who run with 16 MHz clock.

### 3.2.3. Watch dog timer and RTC timer

The watch dog timer and RTC timer run on the always on power domain, whose clock source is 32 kHz clock.

The 16 bits watch dog timer runs with 4 kHz frequency that its period can be up to 16 second. After watch dog timer is expired, it will reset the whole chip.

The 32 bits RTC timer in always on power domain run with ROSC frequency that its period can be up to one day. After RTC timer is expired, it will wake up the MCU.

### 3.3. ADC

A 10-bit generic ADC is integrated in SCR102J. Total three external channels and two internal channels can be selected for ADC transfer. It supports both single and continuous mode.

ADC Channel Number	ADC Source
Channel 0	GPIO30
Channel 1	GPIO31
Channel 2	GPIO32
Channel 3	GPIO33
Channel 4	GPIO34
Channel 5	GPIO35
Channel 6	GPIO36
Channel 7	GPIO37
Channel 8	VCCBAT-pin
Channel 9 - Internal Channel	Temperature Sensor

### 3.4. UART, I2C and SPI

There are two set UARTs, one set I2C and one set SPI interface, which support both master and slave mode.

The UART baud rate can be up to 3.2 MHz, and the SPI clock speed can be up to 4 MHz.

### 3.5. True random number generator

By using device noise variation characteristic, it provides one bit true random number generator.

## 4. Electrical Specifications

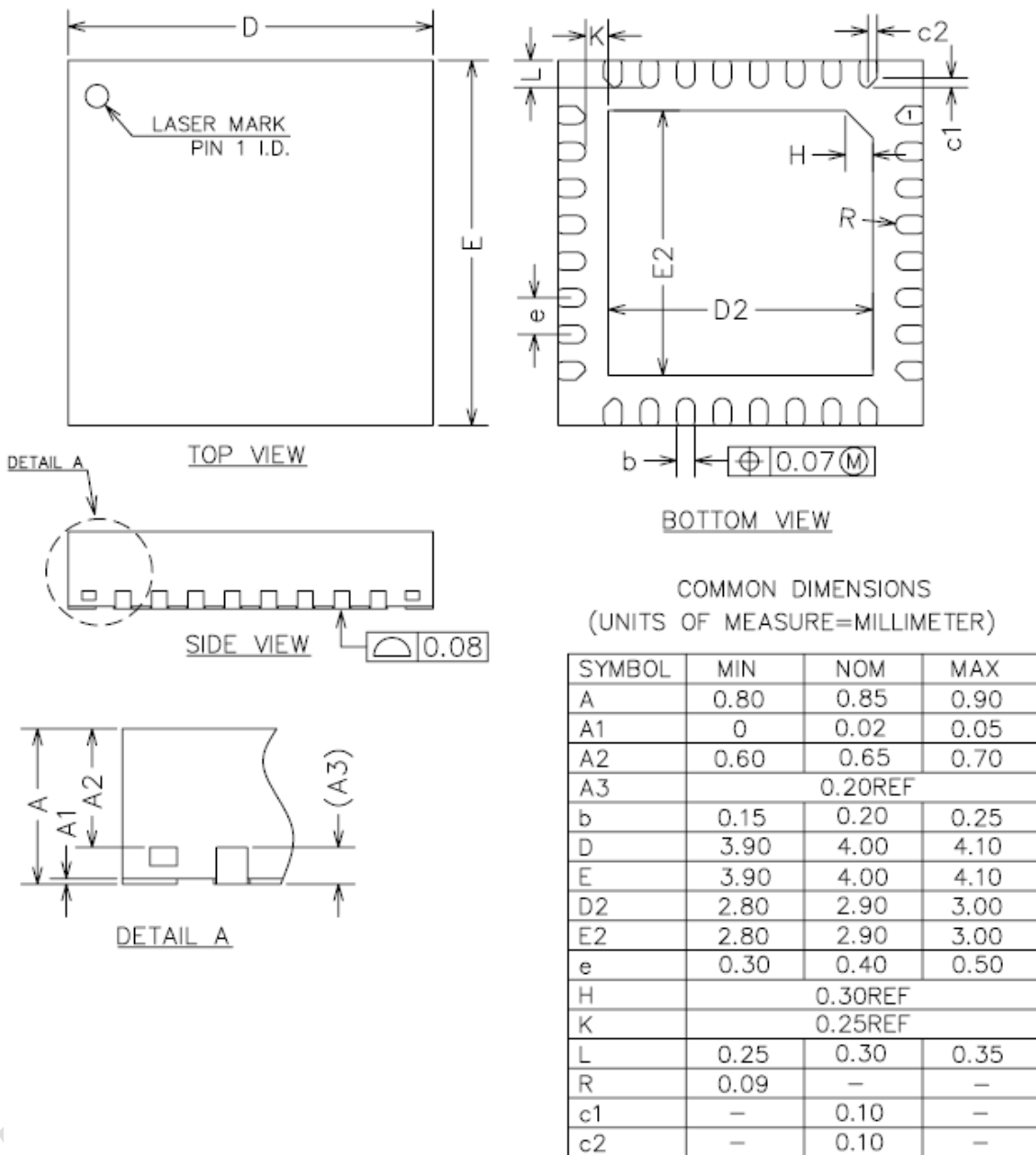
**Table 3 SCR102J RF Characteristics**

Name	Parameter (Condition)	Min	Typical	Max	Unit	Comment
<b>Operating Condition</b>						
VCC	Voltage	2.0	3.0	3.6	V	
TEMP	Temperature	-40	+27	+125	°C	
<b>Digital input Pin</b>						
VIH	High level	VCC-0.3		VCC+0.3	V	
VIL	Low level	VSS		VSS+0.3	V	
<b>Digital output Pin</b>						
VOH	High level (IOH=-0.25mA)	VCC- 0.3		VCC	V	
VOL	Low level (IOL=0.25mA)	VSS		VSS+0.3	V	
<b>Normal condition</b>						
IVDD	Deep sleep		TBD		µA	
IVDD	Sleep current (RF OFF, 32 kHz clock, DIG Retention)		2		µA	
IVDD	Active RX (3.3 V)		5.2		mA	With DCDC regulator
IVDD	Active TX @ -1 dBm (3.3 V)		5		mA	With DCDC regulator
<b>Normal RF condition</b>						
FOP	Operating frequency	2400		2480	MHz	
FXTAL	Crystal frequency		16		MHz	
RFSK	Air data rate		1	2	Mbps	
<b>Transmitter (1 Mbps mode)</b>						

PRF	Output power	-20	-1	+4	dBm	
PBW	Modulation 20 dB bandwidth			1	MHz	
PRF1	Out of band emission 2 MHz		-53		dB	
PRF2	Out of band emission 3 MHz		-58		dB	
Dev	Transmit FM deviation	185	250	300	kHz	
Drift	Transmit drift in any position			400	Hz/us	
<b>Receiver</b>						
Max Input	1 E-3 BER		-10		dBm	
RXSENS	1 E-3 BER sensitivity		-96	-97	dBm	
Intermodulation	Pin=-64 dBm; Punwant=-50 dBm; f0=2f1-f2, f2-f1=3 MHz or 4 MHz or 5 MHz		-25	-22	dBm	
C/ICO	Co-channel C/I		7		dB	
C/I1ST	ACS C/I 1MHz	-9		-6	dB	
C/I2ND	ACS C/I 2MHz		-44		dB	
C/I3RD	ACS C/I 3MHz		-50		dB	
C/I1STI	ACS C/I Image channel		-25		dB	
C/I2NDI	ACS C/I 1 MHz 9 adjacent to image channel		-35		dB	
Block	Block @ 2399, and 2484		-15		dBm	
Block	Block @ 2 GHz and 3 GHz		-15		dBm	
Leakage	Leakage @ < 1GHz		-71		dBm	
Leakage	Leakage @ >1GHz		-56		dBm	

## 5. Package Information

The SCR102J uses the 4mmx4mm QFN package.





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