SKB360 Bluetooth 4.0 Low Energy Module User Manual

Name: Bluetooth 4.0 Low Energy Module

Model No.: SKB360

Version: V2.03

Revision History：

Revision	Description	Approved	Date
V1.01	Initial Release	Sunny	20140611
V2.01	Upgrade hardware	Sunny	20150117
V2.02	Added AT instruction	Sunny	20150528
V2.03	Upgrade hardware	Hogan	20160611

Product Description

The SKB360 is a highly integrated Bluetooth 4.0 BLE module, designed for high data rate, short-range wireless communication in the 2.4GHz ISM band. The module is designed base on Nordic nRF51822 radio Transceiver IC, has a 32 bit ARM Cortex-M0 CPU, flash memory and analog and digital peripherals. The SKB360E provides a low power and ultra-low cost BLE solution for wireless transmission applications.
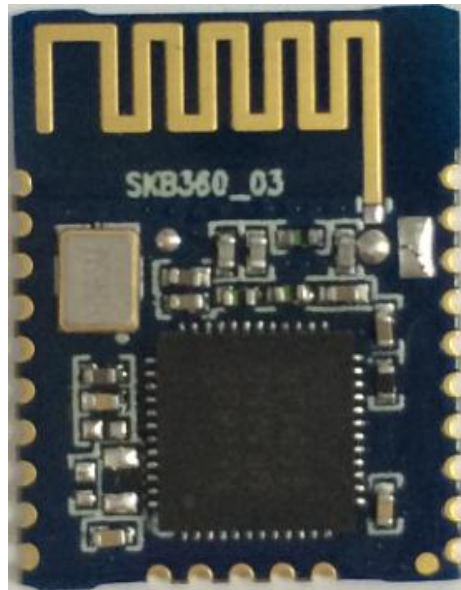

Figure 1: SKB360E Top View

Features

◆ Main Chip: nRF51822

◆ Bluetooth® 4.0 low energy single-mode protocol stack

     L2CAP, ATT, GAP,GATT and SM protocols

     Central and Peripheral roles

     GATT Client and Server

     Full SMP support including MITM and OOB pairing

◆ 2.4 GHz transceiver

     -93dBm sensitivity in Bluetooth low energy mode

     250Kbps, 1Mbps, 2Mbps supported data rates

     Tx Power -20 to +4 dBm in 4 dB steps

     Tx Power -30 dBm Whisper mode

     RSSI (1 dB resolution)

◆ Flexible Power Management

     Supply voltage range 1.8V to 3.6V

     4.2us wake-up using 16MHz RCOSC

     0.6uA at 3V OFF mode

     1.2uA at 3V in OFF mode +1 region RAM retention

     2.6uA at 3V ON mode, all blocks IDLE

◆ 8/9/10 bit ADC-4 configurable channels

- 20 General Purpose I/O pins

- SPI Master/Slave

- Two-wire Master (I2C compatible)

- UART (CTS/RTS)

- CPU independent Programmable Peripheral Interconnect (PPI)

- Quadrature Decoder (QDEC)

- AES HW encryption

- Plate antenna

- Dimension: 17.4x13.7 x1.9 mm

Applications

◆Computer peripherals and I/O devices

    Mouse

    Keyboard

    Multi-touch trackpad

◆Interactive entertainment devices

    Remote control

    3D Glasses

    Gaming controller

◆Personal Area Networks

    Health/fitness sensor and monitor devices

    Medical devices

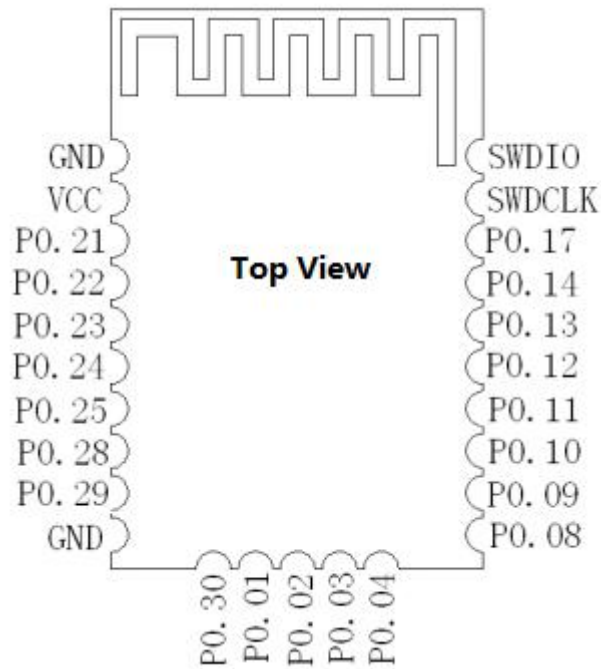   Key-fobs + wrist watches

◆Remote control toys

Pin Assignment

Figure 2: SKB360 Pin Assignment

Pin Description

Pin No.	Pin name	I/O	Description	Remark
1	GND	G	Ground	
2	VCC	P	Main power Supply	1.8V to 3.6V
3	P0.21	I/O	General Purpose I/O	
4	P0.22	I/O	General Purpose I/O	
5	P0.23	I/O	General Purpose I/O	
6	P0.24	I/O	General Purpose I/O	

7	P0.25	I/O	General Purpose I/O	
8	P0.28	I/O	General Purpose I/O	
9	P0.29	I/O	General Purpose I/O	
10	GND	G	Ground	
11	P0.30	I/O	General Purpose I/O	
12	P0.01	I/O	Digital I/O; Analog input	ADC/LPCOMP input 2
13	P0.02	I/O	Digital I/O; Analog input	ADC/LPCOMP input 3
14	P0.03	I/O	Digital I/O; Analog input	ADC/LPCOMP input 4
15	P0.04	I/O	Digital I/O; Analog input	ADC/LPCOMP input 5
16	P0.08	I/O	General Purpose I/O	Default UART TX
17	P0.09	I/O	General Purpose I/O	Default UART RX
18	P0.10	I/O	General Purpose I/O	
19	P0.11	I/O	General Purpose I/O	
20	P0.12	I/O	General Purpose I/O	
21	P0.13	I/O	General Purpose I/O	
22	P0.14	I/O	General Purpose I/O	
23	P0.17	I/O	General Purpose I/O	
24	SWCLK		Hardware debug ;Flash program I/O	

25	SWDIO/ nRESET	Hardware debug ;Flash program I/O; System reset (active low)	

Interfaces Configuration

Power Supply

Regulated power for the SKB360I is required. The input voltage Vcc should be 1.8V to 3.6V range, current is no less than 50mA. Suitable decoupling must be provided by external decoupling circuitry (10uF and 1uF). It can reduce the Noise from power supply and increase power stability.

Flash program I/Os

The module has two programmer pins, respectively SWCLK pin and SWDIO pin. The two pin Serial Wire Debug (SWD) interface provided as a part of the De bug Access Port (DAP) offers a flexible and powerful mechanism for non-intrusiv e debugging of program code. Breakpoints and single stepping are part of this support.

SWDIO can also be use as system reset pin,the system reset pin is avtive low.

GPIO

The general purpose I/O is organized as one port with up to 20 I/Os enabling access and control of up to 20 pins through one port. Each GPIO can be access ed individually with the following user configurable features:

•Input/output direction

•Output drive strength

•Internal pull-up and pull-down resistors

•Wake-up from high or low level triggers on all pins

•Trigger interrupt on all pins

•All pins can be used by the PPI task/event system; the maximum number of pins that can be interfaced through the PPI at the same time is limited by the number of GPIOTE channels

•All pins can be individually configured to carry serial interface or quadrature demodulator signals

•All pins can be configured as PWM signal.

There are 4 ADC/LPCOMP input in the 20 I/Os.

Serial Peripheral Interface(SPI/SPIS)

The SPI interfaces enable full duplex synchronous communication between devices. They support a three-wire (SCK, MISO, MOSI) bi-directional bus with fast data transfers. The SPI Master can communicate with multiple slaves using individual chip select signals for each of the slave devices attached to a bus. Control of chip select signals is left to the application through use of GPIO signals. SPI Master has double buffered I/O data. The SPI Slave includes EasyDMA for data transfer directly to and from RAM allowing Slave data transfers to occur while the CPU is IDLE.The SPI peripheral support SPI mode 0,1,2,and 3.The module have 3 SPI ports and they properties like following table.

Instance	Master/Slave
SPI0	Master
SPI1	Master
SPIS1	Slave

Two-wire Interface(TWI)

The two-wire interface can communicate with a bi-directional wired-AND bus with two lines (SCL, SDA). The protocol makes it possible to interconnect up to 127 individually addressable devices. The interface is capable of clock stretching, supporting data rates of 100 kbps and 400 kbps. The module have 2 TWI ports and they properties like following table.

Instance	Master/Slave
TWI0	Master
TWI1	Master

Universal Asynchronous Receiver/Transmitter (UART)

The Universal Asynchronous Receiver/Transmitter offers fast, full-duplex, asynchronous serial communication with built-in flow control (CTS, RTS) support in hardware up to 1 Mbps baud. Parity checking is supported.

Notify: The GPIOs used for each SPI/TWI/UART interface line can be chosen from any GPIO on the device and are independently configurable.

Operating Conditions

The operating conditions are the physical parameters that the module can

operate within as defined in table

Parameter	Symbol	Min.	Typ.	Max.	Units
Supply voltage, normal mode	VCC	1.8	3.0	3.6	V
Supply rise time (0V to VCC)	Tr_vcc			100	ms
Operating temperature	Ta	-25	25	75	°C

General Purpose I/O(GPIO) specifications

Parameter	Symbol	Min.	Typ.	Max.	Units
Input high voltage	V_{IH}	0.7VDD		VDD	V
Input low voltage	V_{IL}	V_{SS}		0.3VDD	V
Output high voltage	V_{OH}	VDD-0.3		VDD	V
Output low voltage	V_{OL}	V_{SS}		0.3VDD	V
Pull-up resistance	R_{PU}	11	13	16	kΩ
Pull-down resistance	P_{PD}	11	13	16	kΩ

Absolute Maximum Rating

Maximum ratings are the extreme limits the module can be exposed to without causing permanent damage. Exposure to absolute maximum ratings for prolonged periods of time may affect the reliability of the module.

Parameter	Symbol	Min	Max	Units
Power Supply				
Power Supply Volt.	VCC	-0.3	+3.9	V
I/0 Pin voltage				
Input voltage on any input connection	V_{IO}	-0.3	VCC+0.3	V
Human Body Model	ESD HBM		4000	V
Charged Device Model	ESD CDM		750	V
Environment				
Storage Temperature	Tstg	-40	+125	°C
Flash memory Endurance	Write/erase		20000+	times
Number of times an address can be written between erase cycles			2	times

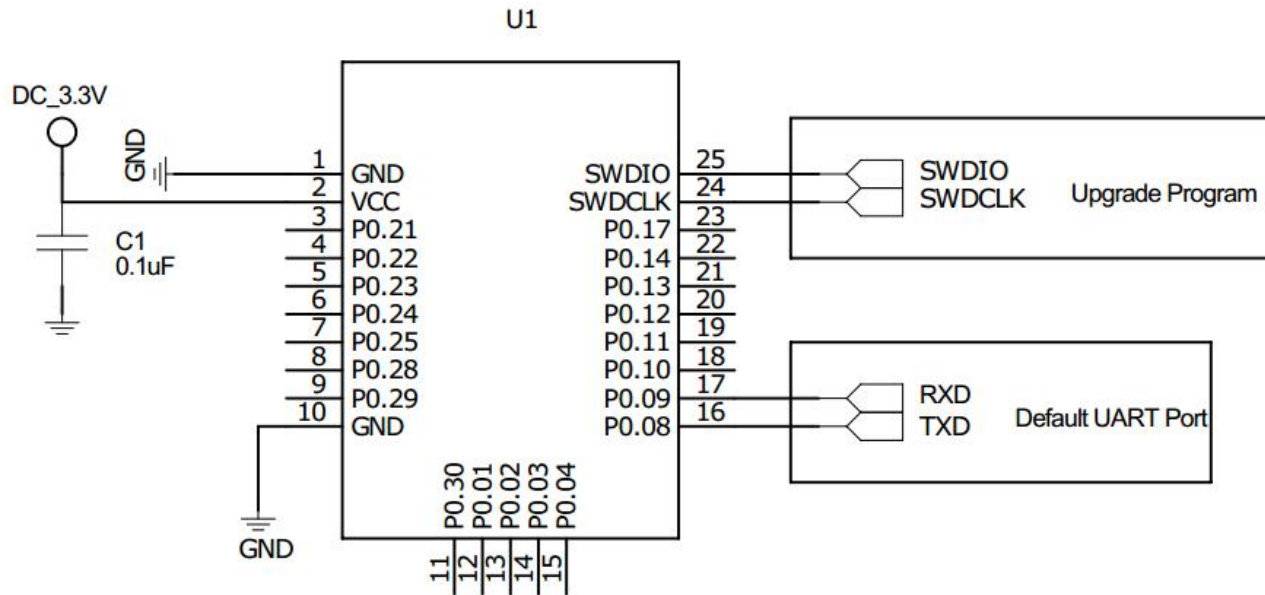# Reference design schematic

Figure 3: SKB360 schematic

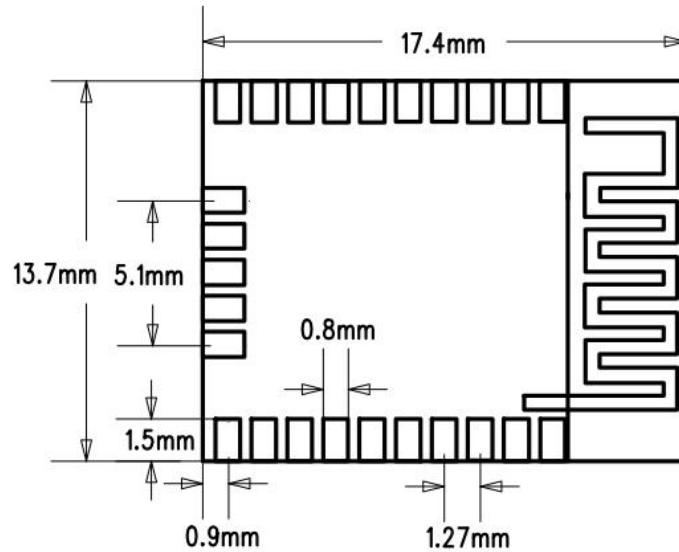## Package Outline

Figure 4: SKB360   Dimensions

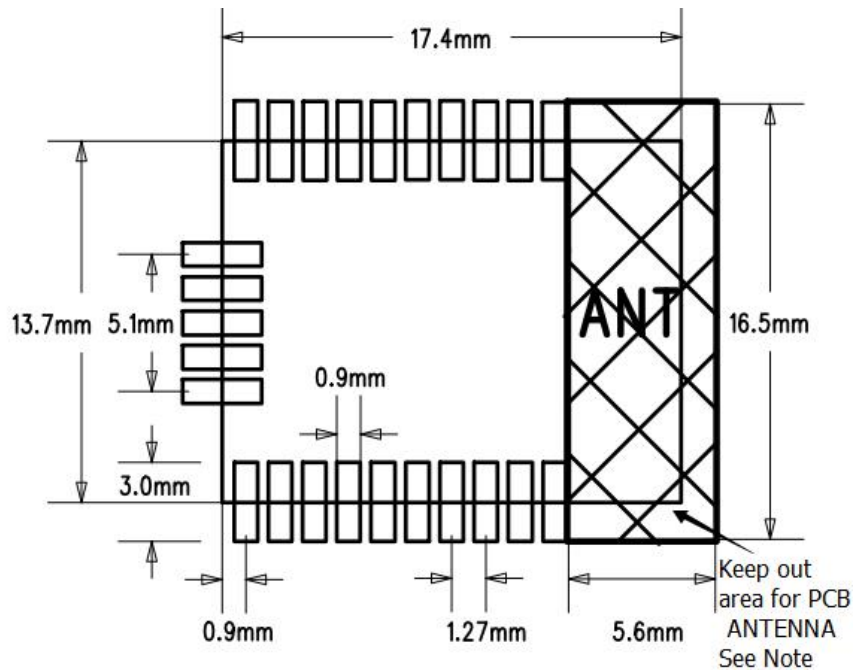## Recommended PCB pad pattern

Figure 5: SKB360   Layout Package
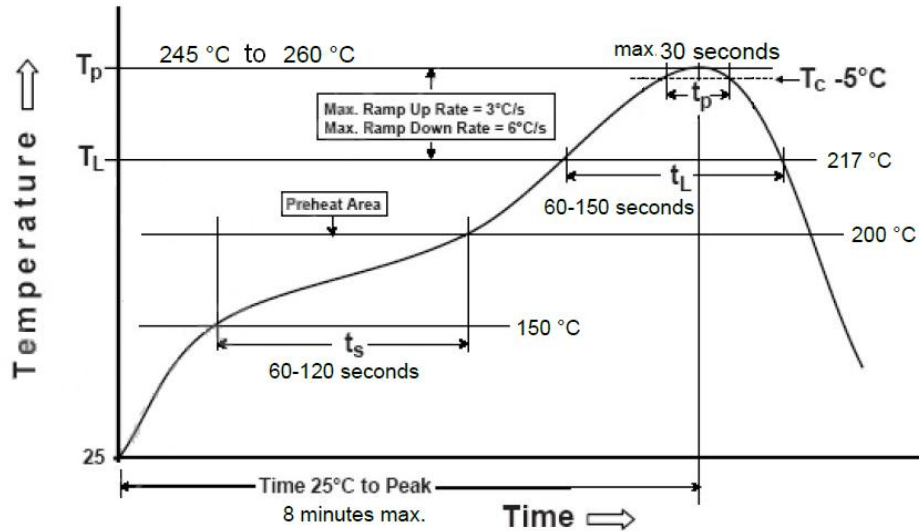
Manufacturing Process Recommendations

Figure 6: SKB360   Typical Leadfree Soldering Profile

Note ：The final soldering temperature chosen at the factory depends on additional external factors like choice of soldering paste，size，thickness and properties of the baseboard，etc.   Exceeding the maximum soldering temperature in the recommended soldering profile may permanently damage the module.

Packaging Specification

SKB360 modules are shipped in reel and with 660 units per reel. Each tray is
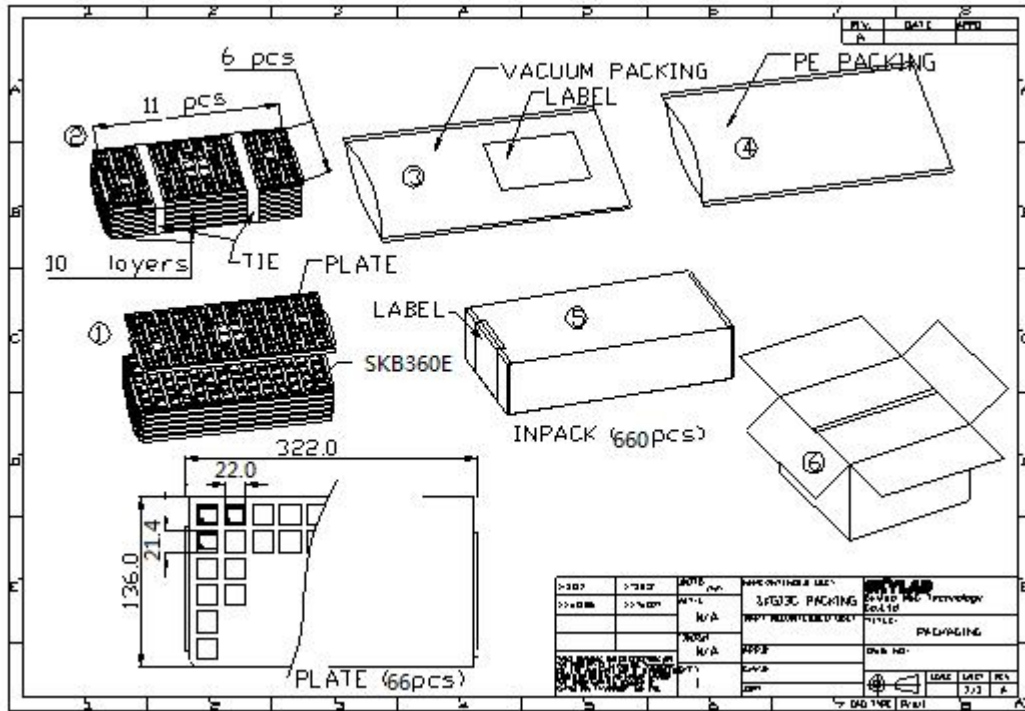
'dry' package.

Figure 7: SKB360   Packaging

FCC Statement

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

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 generates 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

This device complies with part 15 of the 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

SKB360E-Datasheet

Skylab M&C Technology Co., Ltd.

FCC Radiation Exposure Statement
The modular can be installed or integrated in mobile or fix devices only. This modular cannot be installed in any portable device, for example, USB dongle like transmitters is forbidden. This modular complies with FCC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be collocated or operating in conjunction with any other antenna or transmitter.
If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module.
This exterior label can use wording such as the following:
"Contains Transmitter Module FCC ID:2ACOE-SKB360 Or Contains FCC ID:2ACOE-SKB360" when the module is installed inside another device, the user manual of this device must contain below warning statements;
1. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:
(1) This device may not cause harmful interference.
(2) This device must accept any interference received, including interference that may cause undesired operation.
2. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
The devices must be installed and used in strict accordance with the manufacturer's instructions as described in the user documentation that comes with the product.