

# SKB360 Bluetooth 4.0 Low Energy Module Datasheet

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Module Datasheet	SKB360 (0919204)	

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## 1 General 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 based on Nordic nRF518xx radio Transceiver IC, has a 32 bit ARM Cortex-M0 CPU, Flash memory and analog and digital peripherals. The SKB360 provides a low power and ultra-low cost BLE solution for wireless transmission applications.

## 2 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
- ◆ Beacons
- ◆ Bluetooth Gateway
- ◆ Indoor Location
- ◆ Colourful LED Control

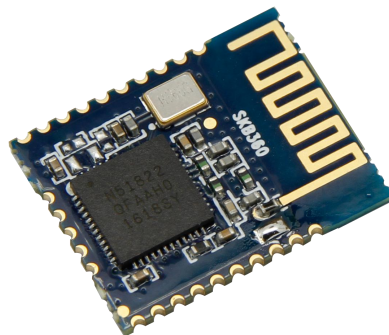


Figure 1: SKB360 Top View

## 3 Features

- ◆ Main Chip: nRF518xx
- ◆ 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

- ◆ Data rates up to 1Mbps
- ◆ 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
- ◆ RoHS compliance (Lead-free)
- ◆ CE, FCC compliance

## 4 Application Block Diagram

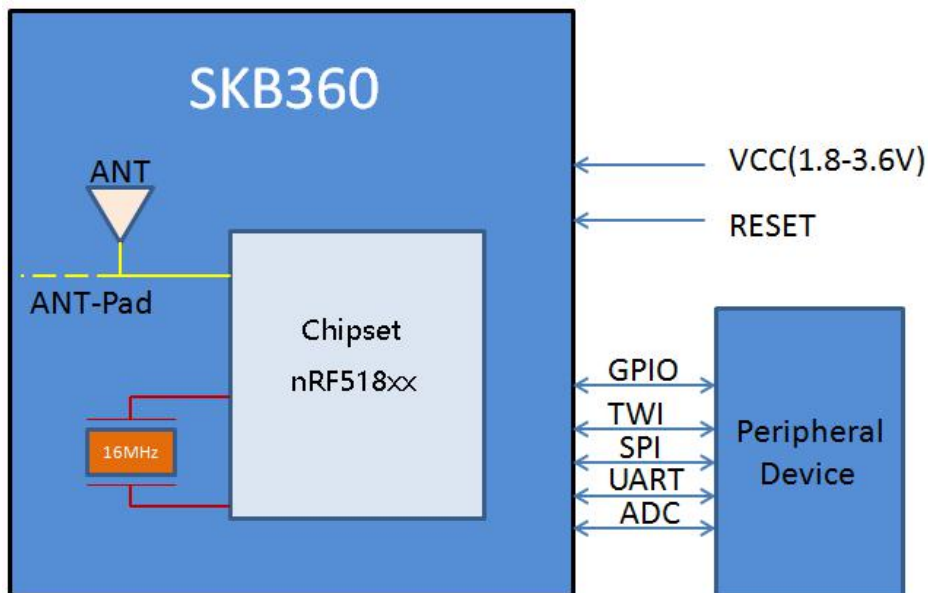


Figure 2: SKB360 Block Diagram

## 5 Interfaces

### 5.1 Power Supply

Regulated power for the SKB360 is required. The input voltage Vcc range should be 1.8V to 3.6V, current is not less than 20mA. Suitable decoupling must be provided by external decoupling circuitry (10uF and 0.1uF). It can reduce the noise from power supply and increase power stability.

### 5.2 System Function Interfaces

#### 5.2.1 GPIOs

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 accessed individually with the following user configurable features:

- 1、 Input/output direction
- 2、 Output drive strength
- 3、 Internal pull-up and pull-down resistors
- 4、 Wake-up from high or low level triggers on all pins
- 5、 Trigger interrupt on all pins
- 6、 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
- 7、 All pins can be individually configured to carry serial interface or quadrature demodulator signals
- 8、 All pins can be configured as PWM signal.
- 9、 There are 4 ADC/LPCOMP input in the 20 I/Os.

#### 5.2.2 Two-wire Interface (I2C Compatible)

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 has 2 TWI ports and they properties like following table.

Instance	Master/Slave
TWI0	Master
TWI1	Master

**Table5-1: TWI Pin Share Scheme**

**Note:** I2C:Inter—Integrated Circuit

### 5.2.3 Flash Program I/Os

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

SWDIO can also be used as system reset pin, the system reset pin is active low.

### 5.2.4 Serial Peripheral Interface

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 GPIOs are used for each SPI interface line can be chosen from any GPIOs on the device and configed independently. This enables great flexibility in device pinout and efficient use of printed circuit board space and signal routing.

The SPI peripheral support SPI mode 0,1,2,and 3.The module have 3 SPI ports and theirs they properties are as below:

Instance	Master/Slave
SPI0	Master
SPI1	Master
SPIS1	Slave

**Table5-2: SPI Properties**

### 5.2.5 UARTs

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.

The default P0.08 is UART\_TX, P0.09 is UART\_RX. Support the following baudrate in bps unit:

1200/2400/4800/9600/14400/19200/28800/38400/57600/76800/115200.

SKB360 Pin Number	Pin Name	UART	Pin Share
16	P0.08	UART_TX	UART(For Debug)
17	P0.09	UART_RX	

**Table5-3: UART Pin Share Scheme**

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

### 5.2.6 Analog to Digital Converter (ADC)

The 10 bit incremental Analog to Digital Converter (ADC) enables sampling of up to 8 external signals through a front-end multiplexer. The ADC has configurable input and reference prescaling, and sample resolution (8, 9, and 10 bit).

**Note:** The ADC module uses the same analog inputs as the LPCOMP module. Only one of the modules can be enabled at the same time.

SKB360 Pin Number	Pin Number	Description
12	P0.01	Digital I/O; Analog input 2
13	P0.02	Digital I/O; Analog input 3
14	P0.03	Digital I/O; Analog input 4
15	P0.04	Digital I/O; Analog input 5

**Table5-4: ADC Pins**

### 5.2.7 Low Power Comparator (LPCOMP)

In System ON, the block can generate separate events on rising and falling edges of a signal, or sample the current state of the pin as being above or below the threshold. The block can be configured to use any of the analog inputs on the device. Additionally, the low power comparator can be used as an analog wakeup source from System OFF or System ON. The comparator threshold can be programmed to a range of fractions of the supply voltage.

### 5.2.8 Reset

The reset pin of the SKB360 module is in the internal pull-high state , when the reset pin of the module is input to a low level , the module will be automatically reset .After the reset pin is used , the parameters of the current setting will not be reserved .

## 6 Module Specifications

Hardware Features	
Model	SKB360
Antenna Type	PCB Antenna
Chipset Solution	nRF518xx
Voltage	1.8V~3.6V



Dimension(L×W×H)	17.4×13.7×1.9 mm
<b>Wireless Features</b>	
Wireless Standards	Bluetooth ® 4.0
Frequency Range	2400MHz---2483.5MHz
Data Rates	1Mbps
Modulation Technique	GFSK Modulation
Wireless Security	AES HW Encryption
Transmit Power	Tx Power -30, -20, -16, -12, -8, -4, 0, and 4 dBm
Work Mode	Central/Peripheral
<b>Others</b>	
Certification	RoHS, FCC, CE
Environment	Operating Temperature: -25℃~75℃
	Storage Temperature: -40℃~85℃
	Operating Humidity: 10%~90% Non-condensing
	Storage Humidity: 5%~90% Non-condensing

## 7 Module Pinout and Pin Description

### 7.1 Module Pinout

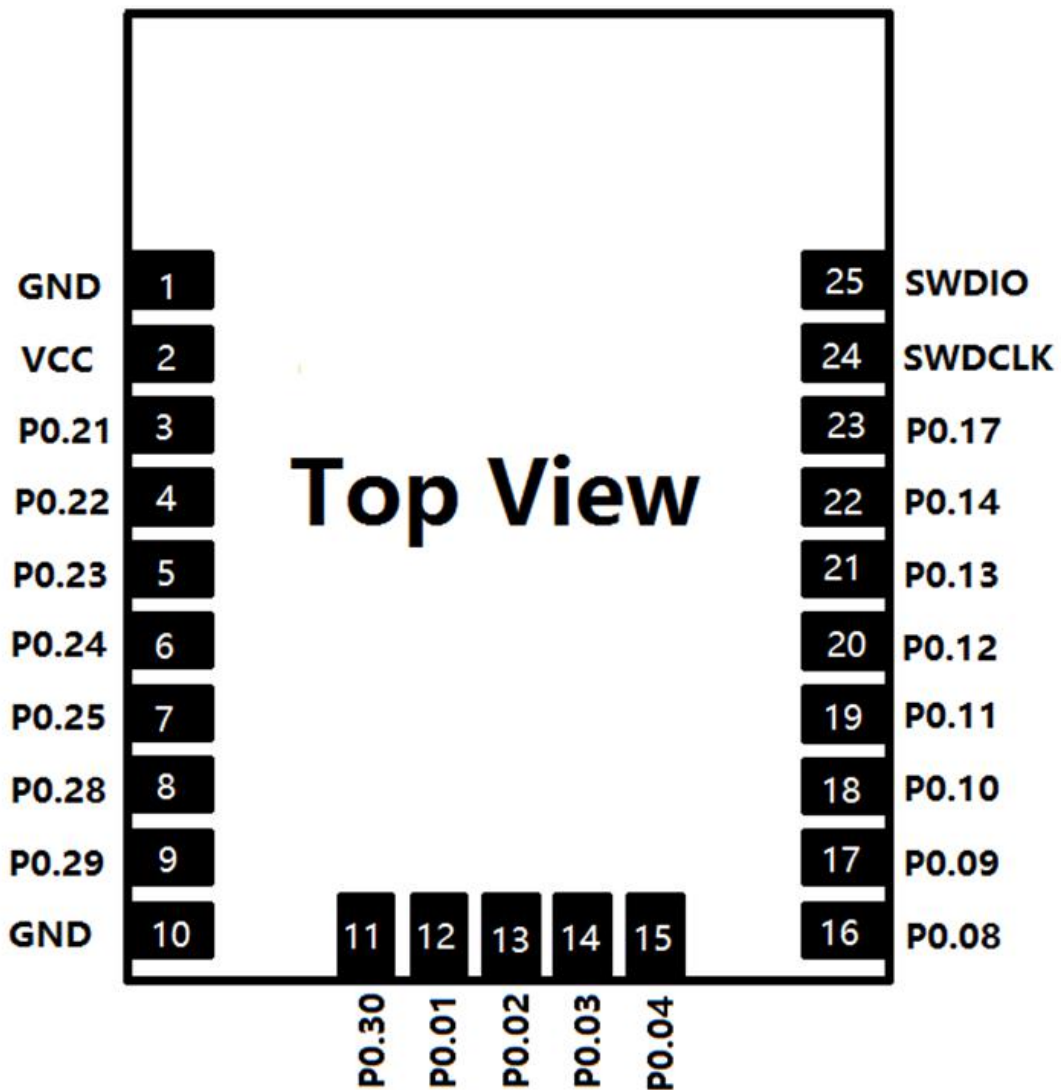


Figure 3: SKB360 Module Pinout

## 7.2 Pin Description

Pin No.	Pin Name	Description	Remark
1	GND	Ground	
2	VCC	Main Power Supply	1.8V to 3.6V
3	P0.21	General Purpose I/O	Digital I/O
4	P0.22	General Purpose I/O	Digital I/O
5	P0.23	General Purpose I/O	Digital I/O
6	P0.24	General Purpose I/O	Digital I/O
7	P0.25	General Purpose I/O	Digital I/O
8	P0.28	General Purpose I/O	Digital I/O
9	P0.29	General Purpose I/O	Digital I/O
10	GND	Ground	
11	P0.30	General Purpose I/O	Digital I/O
12	P0.01	Digital I/O; Analog input	ADC/LPCOMP input 2
13	P0.02	Digital I/O; Analog input	ADC/LPCOMP input 3
14	P0.03	Digital I/O; Analog input	ADC/LPCOMP input 4
15	P0.04	Digital I/O; Analog input	ADC/LPCOMP input 5
16	P0.08	General Purpose I/O	Default UART TX
17	P0.09	General Purpose I/O	Default UART RX
18	P0.10	General Purpose I/O	Digital I/O
19	P0.11	General Purpose I/O	Digital I/O
20	P0.12	General Purpose I/O	Digital I/O
21	P0.13	General Purpose I/O	Digital I/O
22	P0.14	General Purpose I/O	Digital I/O
23	P0.17	General Purpose I/O	Digital I/O
24	SWDCLK	Hardware debug and Flash program I/O	Digital input
25	SWDIO/n RESET	Hardware Debug and Flash Program I/O; System Reset (Active low)	Digital I/O

## 8 PCB Design Guide

Please reserve empty area for PCB antenna when you are going to design a board, the empty range device's minimum size :16.5\*6.6mm , please kindly check the "PCB footprint and Dimensions" for reference.

## 9 PCB Footprint and Dimensions

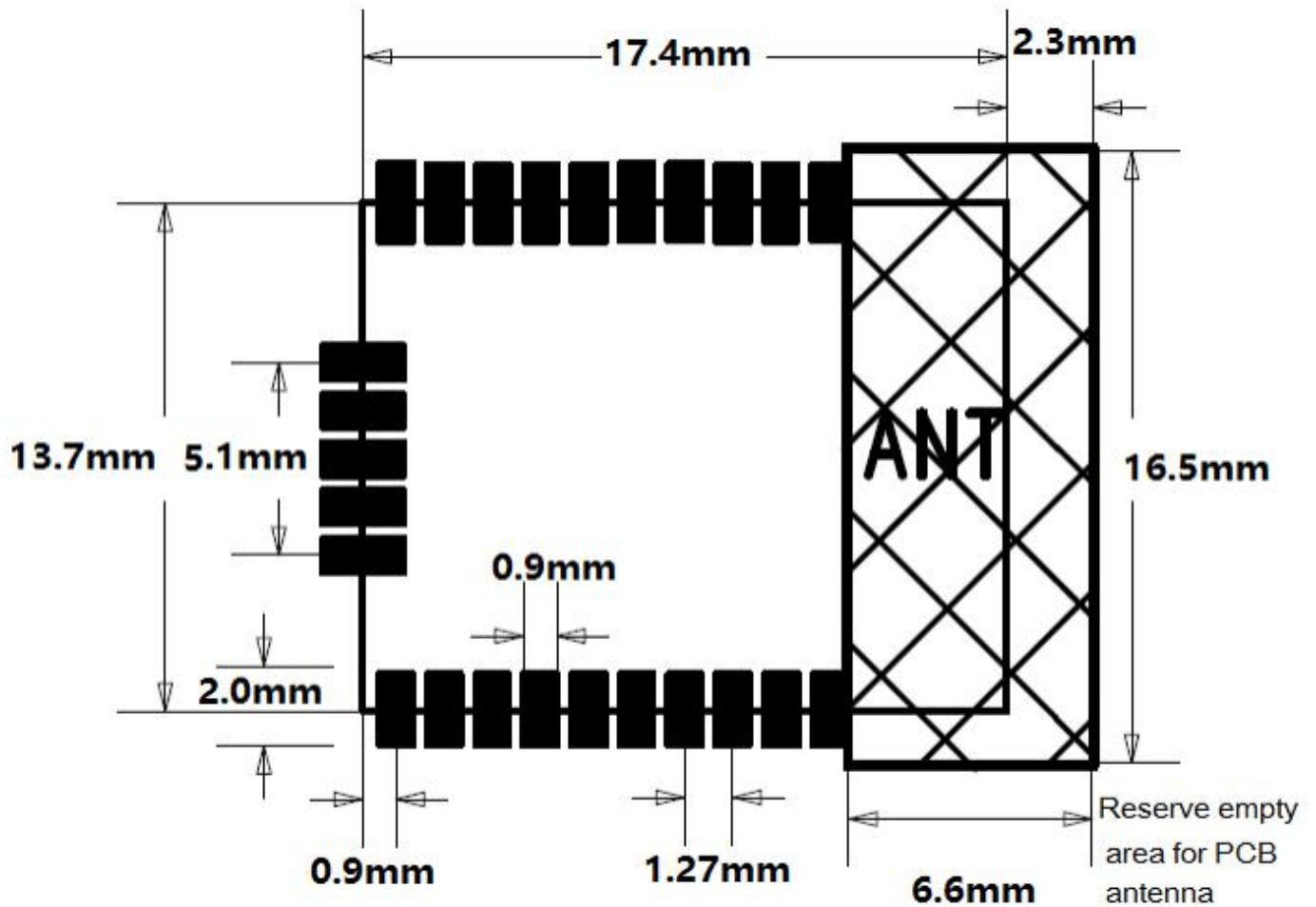


Figure 4: SKB360 Recommended PCB Footprint

## 10 Electrical Characteristics

### 10.1 Absolute Maximum Ratings

Parameter	Condition	Min.	Typ.	Max.	Unit
Storage Temperature Range		-40		85	°C

ESD Protection	VESD	/		4000	V
Supply Voltage	VCC	-0.3		3.9	V
Voltage On Any I/O Pin		-0.3		3.63	V

**Table10-1: Absolute Maximum Ratings**

Note: Absolute maximum ratings are stress ratings only, and functional operation at the maxims is not guaranteed. Stress beyond the limits specified in this table may affect device reliability or cause permanent damage to the device. For functional operating conditions, refer to the operating conditions tables as follow.

\*SKB360 series modules are Electrostatic Sensitive Devices and require special precautions while handling.



### ESD precautions

The SKB360 series modules contain highly sensitive electronic circuitry and are Electrostatic Sensitive Devices (ESD). Handling the SKB360 series modules without proper ESD protection may destroy or damage them permanently.

The SKB360 series modules are electrostatic sensitive devices (ESD) and require special ESD precautions typically applied to ESD sensitive components. Proper ESD handling and packaging procedures must be applied throughout the processing, handling, transportation and operation of any application that incorporates the SKB360 series module. Don't touch the module by hand or solder with non-anti-static soldering iron to avoid damage to the mode.

## 10.2 Recommended Operation Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit
Extended Temp. Range	TA	-25		75	°C
Power Supply	VCC	1.8	3.3	3.6	V
Input Low Voltage	VIL	0		1	V
Input High Voltage	VIH	2.3		3.9	V

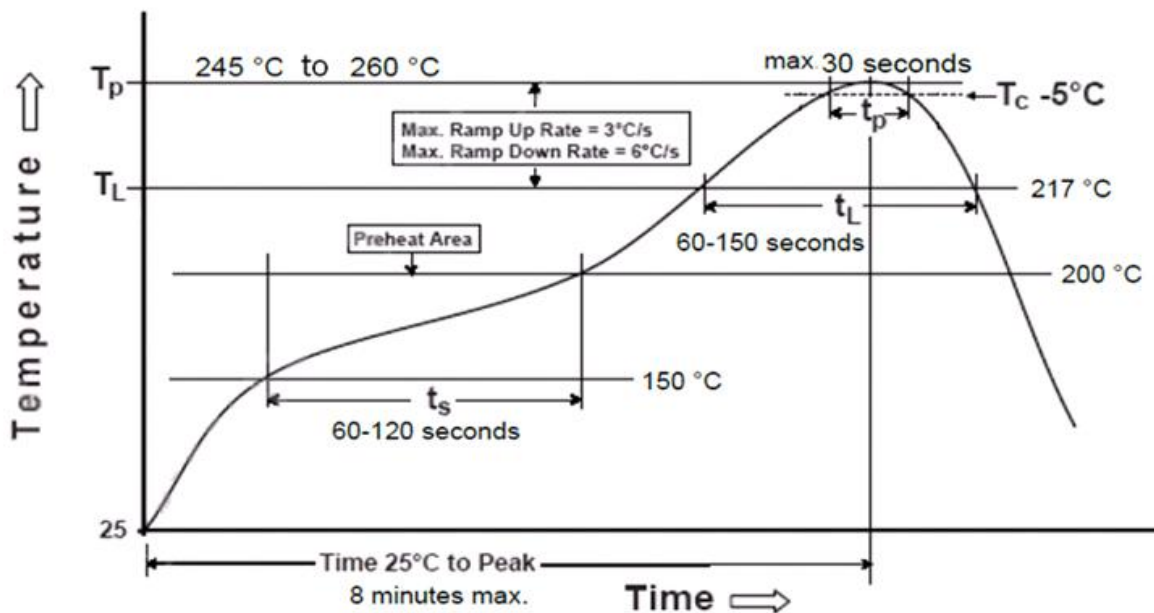
**Table10-2: Operating Conditions**

### 10.3 Current

System State	TX Peak @0dBm	RX Peak	Advertise Interval @100ms (0dBm)(avg)	Sleep Mode (avg)	Idle Mode (avg)
Current (peak)@3V	10.5 mA	13 mA	270uA	0.28uA	2.43uA

**Table10-3: Power Consumption in Different States**

## 11 Manufacturing Process Recommendations



**Figure 5: SKB360 Typical Lead-free Soldering Profile**

**Note:** The final re-flow soldering temperature map chosen at the factory depends on additional external factors, for example, choice of soldering paste, size, thickness and properties of the module's baseboard etc.

Exceeding the maximum soldering temperature in the recommended soldering profile may permanently damage the module.

## 12 Ordering Information

Module No.	Type number	Chipset	Certification
SKB360	09192	nRF51822	RoHS, FCC, CE
SKB360	0919204	nRF51802	RoHS, FCC, CE

## 13 Packaging Specification

SKB360 modules are put into tray and 528 units per tray. Each tray is 'dry' and vacuum packaging.

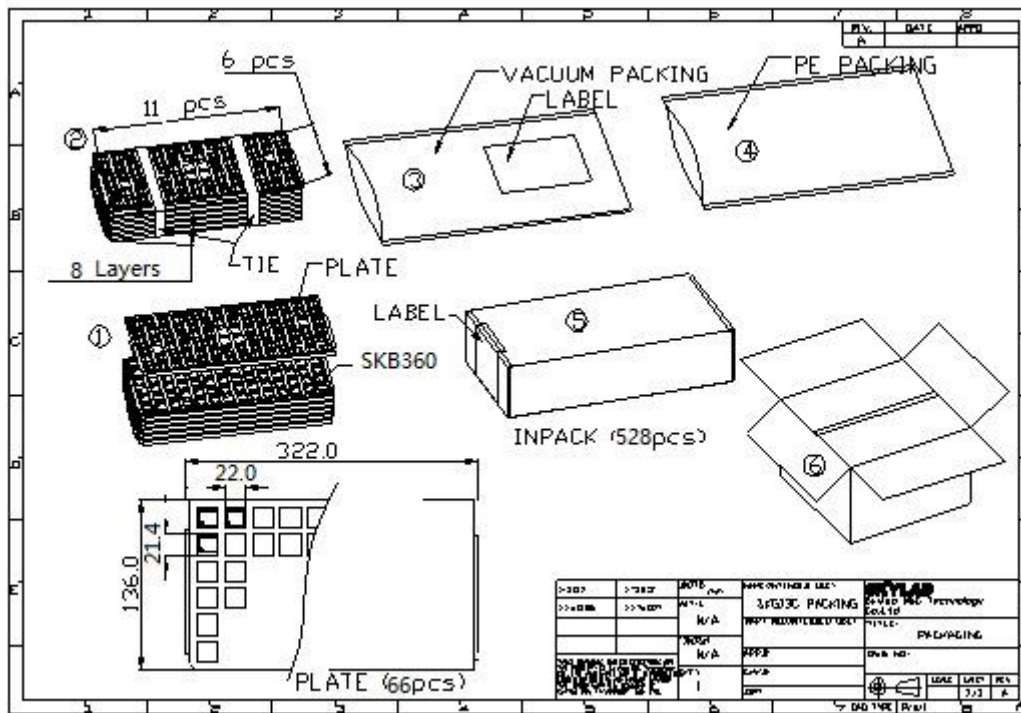


Figure 6: SKB360 Packaging

## 14 Revision History

Revision	Description	Approved	Date
V1.01	Initial Release	Sunny	20140611
V2.01	Upgrade Hardware	Sunny	20150117
V2.02	Add AT Instruction	Sunny	20150528
V2.03	Upgrade hardware	Hogan	20160611
V3.01	Upgrade format	Hogan	20161211
V3.02	Upgrade product image	Hogan	20170504
V3.03	Update certification information	George	20170831
V4.01	Add order information	George	20180209

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V4.02	Add part number information	George	20180515
V4.03	Update PCB Footprint and Dimensions	Sherman	20191012
V4.04	Update Transmit Power	George	20191217

## 15 Contact Information

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