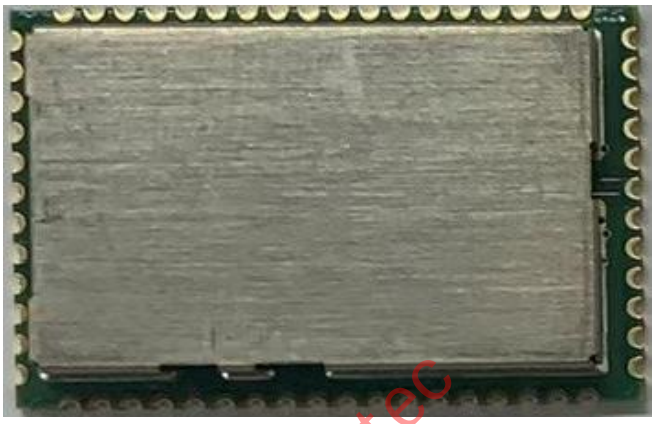
BM386P Wireless Audio Module

Features:

- Qualified to Bluetooth® v5.4 specification
- 240 MHz Qualcomm® Kalimba™ audio DSP
- 32/80MHz Developer Processor for applications
- Firmware Processor for system
- Flexible QSPI flash programmable platform
- Advanced audio algorithms
- High-performance 24bit stereo audio interface
- Digital and analog microphone interfaces
- Flexible LED controller and LED pins with PWM support
- Qualcomm® aptX™ and aptX HD Audio ,aptX Adaptive, enabled using license key
- Advanced audio algorithms
- Qualcomm® Broadcast Audio support
- Qualcomm True Wireless Stereo & Qualcomm True Wireless Stereo Plus
- Serial interfaces: UART, Bit Serializer (I^2C/SPI), USB 2.0
- Integrated PMU: Dual SMPS for system/digital circuits, Integrated Li-ion battery charger
- 27 PIOs, 4 LED pads with PWM or AIO
- Analog-to-digital converter (ADC)s support sample rates of 8 kHz, 16 kHz, 32 kHz, 44.1 kHz, 48 kHz, 96 kHz.
- Size: 210±0.5mm x 13±0.5mm x 3.2±0.5mm
- Weight: 1.4g



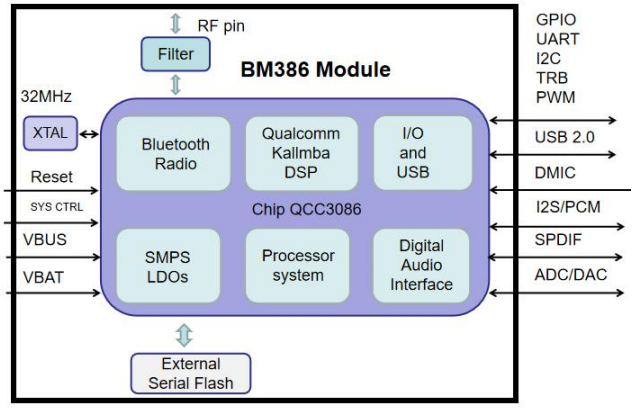
Product Description:

The BM386P module consumer audio platform for wired and wireless applications integrates an ultra-low-power DSP and application processor with embedded flash memory, a high-performance stereo codec, a power management subsystem, LED and LCD drivers and capacitive touch sensor inputs in a SOC IC. The dual-core architecture with flash memory enables manufacturers to easily differentiate their products with new features without extending development cycles.

Applications:

- Smart remote controllers
- Gaming headsets
- USB dongles and source devices

System Architecture



Specifications:

Operating Frequency Band	2.4GHz ~ 2.48GHz unlicensed ISM band
Bluetooth Specification	V5.4
Output Power Class	Class 1
Max. Output Power	15dBm
Date Rate	3Mbps
Channel No.	79
Modulation Type	GFSK π/4 DQPSK 8DPSK
Operating Voltage	3.3V~4.6V
Host Interface	USB 2.0 or UART or I2C
Audio Interface	PCM, I2S, SPDIF
Flash Memory Size	32 or 64Mbit or 128Mbit external SPI flash
Dimension	21mm (L) x 13 (W) mm x 1.8mm (H)

Electrical Characteristics

Absolute Maximum Rating	**Min**	**Max**
Storage Temperature	-40°C	+85°C
Supply Voltage, (VBAT)	-0.4V	+4.8V
Input Voltage, (SYS_CTRL)	-0.4V	+4.8V
Supply Voltage, (VDD_PADS)	-0.4V	+3.6V
Supply Voltage, (VBUS)	-0.4V	+6.5V
Other terminal voltages	VSS - 0.4	VDD + 0.4

Recommended Operating Conditions	**Min**	**Max**
Operating Temperature Range	-20°C	+70°C
Supply Voltage, (VBAT)	3.0V	+4.6V
Supply Voltage, (SYS_CTRL)	0	+4.6V
Supply Voltage, (VDD_PADS)	+1.7V	+3.6V
Supply Voltage, (VDD_MEM)	+1.7V	+1.9V
Supply Voltage, (VBUS)	4.5V	+5.75V

RF Characteristics

Receiver	**Units**	Min	Typ	Max	Bluetooth Spec
Sensitivity at 0.1% BER	dBm	-	-96	-94	≤-70
Maximum Receiver Signal	dBm	-20	-9	-	≥ -20
C/I Co-Channel	dB	-	6	11	≤11
Adjacent Channel Selectivity C/I -1MHz	dB	-	-6	0	≤0
2nd Adjacent Channel Selectivity C/I -2MHz	dB	-	-38	-20	≤-30
3rd Adjacent Channel Selectivity C/I -3MHz	dB	-	-45	-40	≤-40
Image Rejection C/I	dB	-	-16	-9	≤-9

VBAT = 3.7V; f = 2.4441GHz; T=25°C

Transmitter	**Units**	Min	Typ	Max	Bluetooth Spec
RF Output Power	dBm	13.5	15	-	0 to +20
RF Power Control Range	dB	16	24	-	> 16
RF Power Range Control Resolution	dB	-	0.5	-	-
20dB Bandwidth for Modulated Carrier	KHz	-	940	1000	<1000
2nd Adjacent Channel Power (+/- 2MHz)	dBm	-	-38	-20	≤-20
3rd Adjacent Channel Power (+/- 3MHz)	dBm	-	-45	-40	≤-40

VBAT = 3.7V; f = 2.4441GHz; T=25°C
All specifications including pinouts and electrical specifications may be changed without prior notice

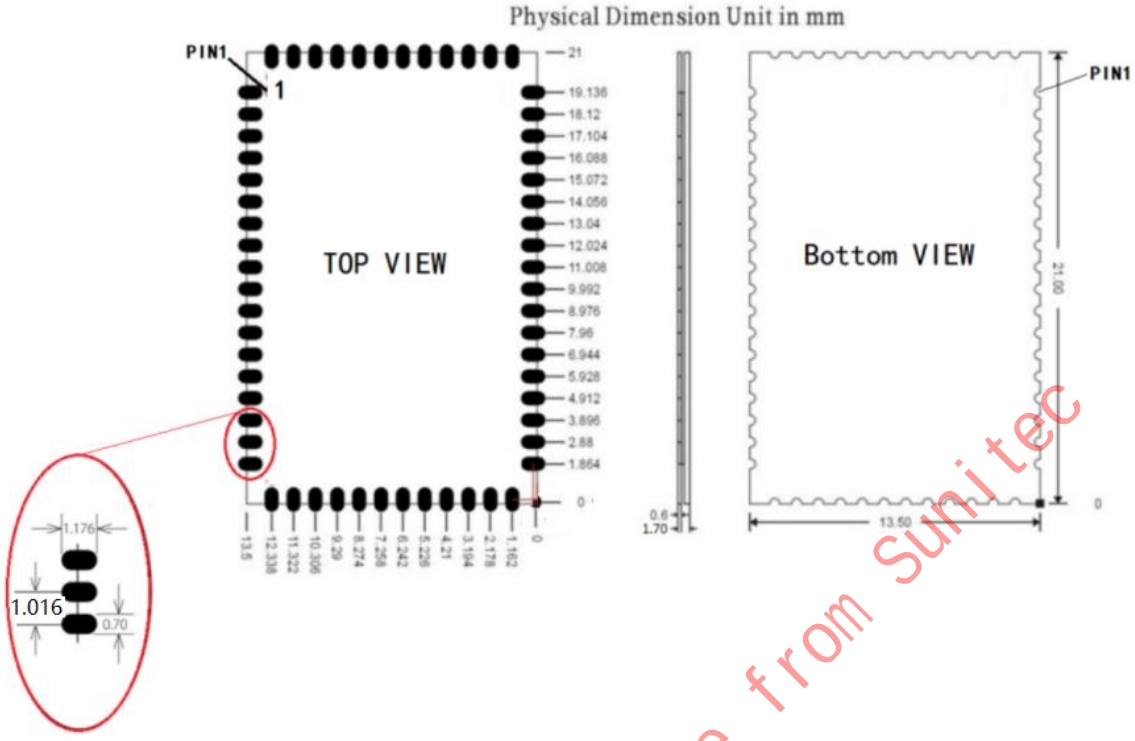
Pin Configurations

PIN NO.	NAME	TYPE	FUNCTION	Reset state
1	MIC4_P	Analogue	Microphone differential 4 input, positive. Alternative function: ■ Differential audio line input left, positive	
2	MIC4_N	Analogue	Microphone differential 4 input, negative. Alternative function: ■ Differential audio line input left, negative	
3	MIC3_P	Analogue	Microphone differential 3 input, positive. Alternative function: ■ Differential audio line input left, positive	
4	MIC3_N	Analogue	Microphone differential 3 input, negative. Alternative function: ■ Differential audio line input left, negative	
5	MIC2_P	Analogue	Microphone differential 2 input, positive. Alternative function: ■ Differential audio line input left, positive	
6	MIC2_N	Analogue	Microphone differential 2 input, negative. Alternative function: ■ Differential audio line input left, negative	
7	MIC1_P	Analogue	Microphone differential 1 input, positive. Alternative function: ■ Differential audio line input left, positive	
8	MIC1_N	Analogue	Microphone differential 1 input, negative. Alternative function: ■ Differential audio line input left, negative	
9	MBA	Power out	Microphone bias output	
10	GND	GND	Ground	
11	NC		No Function, do not connect	
12	NC		No Function, do not connect	
13	NC		No Function, do not connect	
14	NC		No Function, do not connect	
15	GND	GND	Ground	
16	GPIO8	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 8. Alternative function: ■ TBR_CLK	Weak pull-down
17	GPIO1	Digital: Bidirectional with programmable strength internal pull up/pull-down	Automatically defaults to RESET# mode when the device is unpowered, or in off modes.Reconfigurable as a PIO after boot. Alternative function: ■ Programmable I/O line 1	Strong pull-up
18	GND	GND	Ground	GND
19	GPIO5	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 5. Alternative function: ■ TBR_MISO[1]	Weak pull-down
20	GPIO2	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 2. Alternative function: ■ TBR_MISO[3]	Weak pull-down
21	GPIO4	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 4. Alternative function: ■ TBR_MOSI[1]	Weak pull-down
22	GPIO3	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 3. Alternative function: ■ TBR_MISO[2]	Strong pull-up
23	GPIO6	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 6. Alternative function: ■ TBR_MOSI[0]	Strong pull-up
24	GPIO7	Digital: Bidirectional with programmable strength internal pull	Programmable I/O line 7. Alternative function:	Strong pull-up

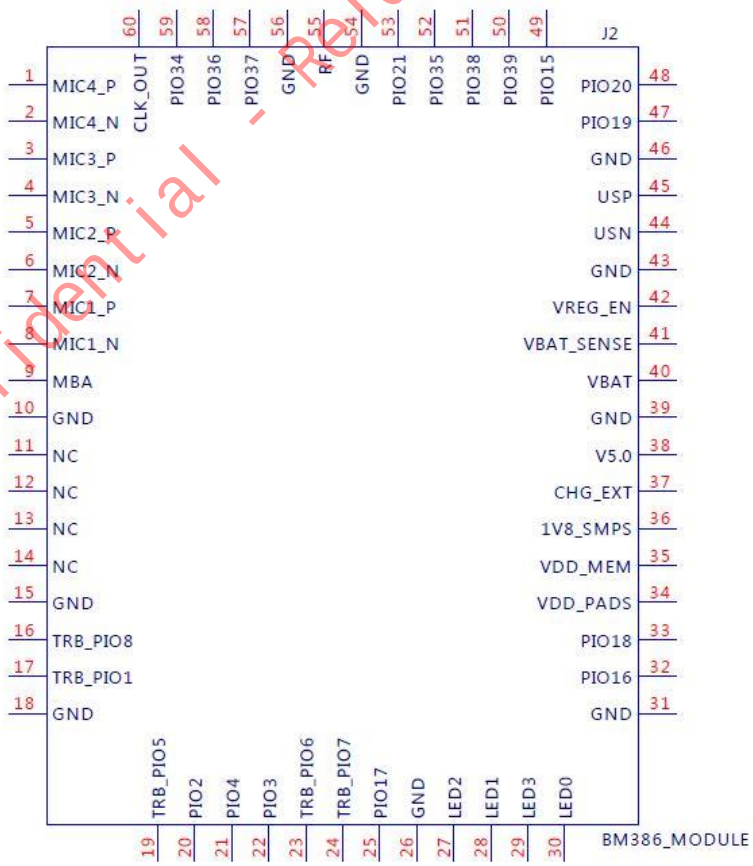
		up/pull-down	■ TBR_MISO[0]	
25	GPIO17	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 17. Alternative function: ■ PCM_SYNC	Weak pull-down
26	GND	GND	Ground	
27	LED2/AIO2	Analog or digital input/open drain output	General-purpose analog/digital input or open drain LED output. BT Chip AIO[2]/LED[2]	Open drain
28	LED1/AIO1	Analog or digital input/open drain output	General-purpose analog/digital input or open drain LED output. BT Chip AIO[1]/LED[1]	Open drain
29	LED3/AIO3	Analog or digital input/open drain output	General-purpose analog/digital input or open drain LED output. BT Chip AIO[3]/LED[3]	Open drain
30	LED0/AIO0	Analog or digital input/open drain output	General-purpose analog/digital input or open drain LED output. BT Chip AIO[0]/LED[0]	Open drain
31	GND	GND	Ground	
32	PIO16	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 16. Alternative function: ■ PCM_CLK	Weak pull-down
33	GPIO18	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 18. Alternative function: ■ PCM_DOUT[0]	Strong pull-up
34	VDD_PADS	Power(in)	1.7V to 3.6V positive supply input for input/output ports: ■RST# ■UART ■PCM ■I2C ■TRB ■ PIO ■ GPIO	
35	VDD_MEM	Power(in)	1.8V positive supply input for input/output ports: ■ Serial quad I/O flash port	
36	1V8_OUT	Power(out)	1.8V switch-mode power regulator output	
37	CHG_EXT	Analog	External charger transistor current control. Connect to base of external charger transistor as per application schematic.	
38	VBUS5V	Supply	Supply to SMPS power switch from charger input. Charger input to Bypass regulator.	
39	GND	GND	Ground	
40	VBAT	Power (in)	Battery positive terminal	
41	VBAT_SENSE	Supply	Battery voltage sense input	
42	VREG_EN	Digital input	Typically connected to an ON/OFF push button. Boots device in response to a button press when power is still present from battery and/or charger but software has placed the device in the OFF or DORMANT state. Additionally use able as a digital input in normal operation. No pull. Additional function: ■ PIO[0] input only	
43	GND	GND	Ground	
44	USB_DN	Digital	USB Full Speed device DN	

45	USB_DP	Digital	USB Full Speed device DP	
46	GND	GND	Ground	
47	GPIO19	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 19. Alternative function: ■ PCM_DIN[0]	Weak pull-down
48	GPIO20	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 20.	Strong pull-up
49	GPIO15	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 15. Alternative function: ■ MCLK_OUT	Strong pull-up
50	GPIO39	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 39.	Strong pull-up
51	GPIO38	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 38.	Strong pull-up
52	GPIO35	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 35.	Strong pull-down
53	GPIO21	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 21.	Weak pull-down
54	GND	GND	Ground	
55	RF-IN	RF	Bluetooth 50Ωtransmitter output /receiver input	
56	GND	GND	Ground	
57	GPIO37	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 37.	Weak pull-down
58	GPIO36	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 36.	Strong pull-up
59	GPIO34	Digital: Bidirectional with programmable strength internal pull up/pull-down	Programmable I/O line 34.	Weak pull-down
60	CLK_OUT	Analogue	Buffered clock output	

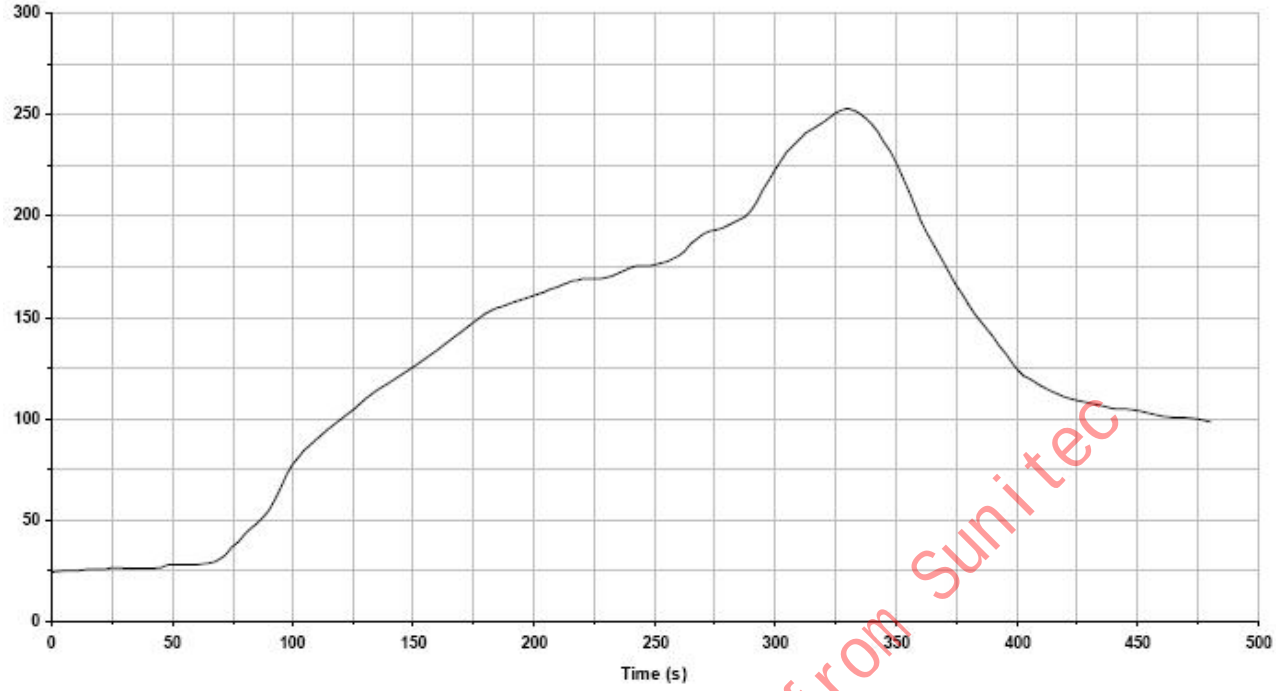
Recommended Layout patterns:



module pin assignment and pin description



Recommended Reflow Temperature Profile:



Key features of the profile:

-Initial Ramp=1-2.5℃/sec to 175℃ equilibrium
-Equilibrium time=60 to 80 seconds
-Ramp to Maximum temperature (250℃)=3℃/sec Max
-Time above liquidus temperature(217℃): 45 -90 seconds
-Device absolute maximum reflow temperature: 250℃
-Device maximum reflow times ≤2

MAC Address:

Each Module has his MAC Address
0CA6 94 XXXXXX

QR code label information:

◆ 3FABCA

MAC ID： XXXXXX (last 6 digits)

Length:7* Width:7 (mm)

(TBD)

Electrostatic discharge（ESD）：HBM ≥1000V，CDM≥500V

Un-opened reels Shelf life:

The module can be stored for 25±3°C 30-60%RH for 6 months. After unpacking, the finished patch should be used within 24 hours to avoid welding pad oxidation. Unused materials are returned to sealed packaging in time.

Reliability Test:

Test items	Test method
High Temperature Reliability Test	Temperature 60° C, time 4H, recovery 1H, test
Low Temperature Reliability Test	Temperature -20° C, time 4H, recovery 1H, test
Vibration ReliabilityTest	Vibration frequency 50Hz, vibration time 30min, vibration amplitude 0.5mm, for appearance inspection and functional testing
Drop Reliability Test	The product is less than 10g, the drop height is 100cm, and it has been dropped 6 times for appearance inspection and functional testing.

Packing Information:·

Standard Packing Information （TBD)

PCBA packing bag dimension: 350.0mm x 195.0mm

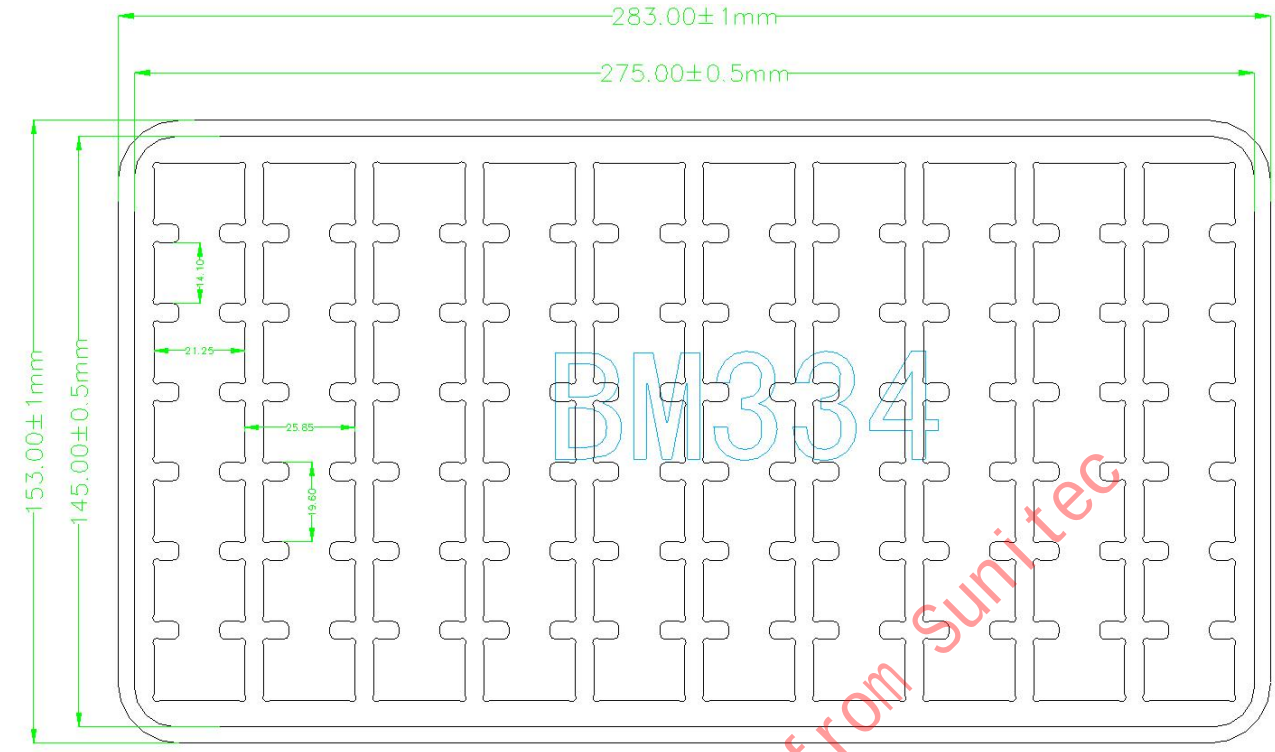
Delivering carton box (TBD)

Delivery Carton Box dimension: 415.0mm x 350.0mm x 175.0mm (L xW x H)

ESD tray dimension: 283mm x 153.0mm x 5.0mm (L xW x H)

ESD tray dimension（Single grid）：21.25mm x 14.1mm（Max）

Packaging Quantity	1 pc per cavity
	70pcs per tray
	10 trays per packing bag
	10 bag per carton
Total Quantity	7000 pcs（Full box）



QDL Certificate

TBD

Ordering Information

No	Items	Ordering Code	Description
1	QCC3086 Module	BM386P	64Mbit internal SPI flash operating voltage is 1.8V, without license

Document References

References	Version
Specifications of the Bluetooth System	Bluetooth Specification Version 5.4
QCC3086 WLCSP Data Sheet	80-49022-1_REV_AC_QCC3086_WLCSP_Data_Sheet.pdf

Document History

Revision	Date	History
V0.1	2024-08-22	First release

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