

ZRG3M

DATASHEET

2.4GHz Wi-Fi/BLE Module

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1. Module Descriptions

1.1 Features

The ZRG3M is a Wi-Fi/BLE module that consists of the MT7697 Wi-Fi/BLE combo chip and G3 security chip. This module includes 2.4GHz chip antenna, Clock sources, and all RF components.



■ Wi-Fi

- IEEE 802.11 b/g/n (2.4GHz, 1x1)
- Supports 20MHz channels
- Wi-Fi security WEP, WPA2 and WPS
- Integrated 2.4GHz PA/LNA and RF switch

■ Bluetooth Low Energy

- Bluetooth 4.2 Low Energy

■ Platform

- 192MHz ARM Cortex-M4 with FPU
- Embedded 352 kB SRAM

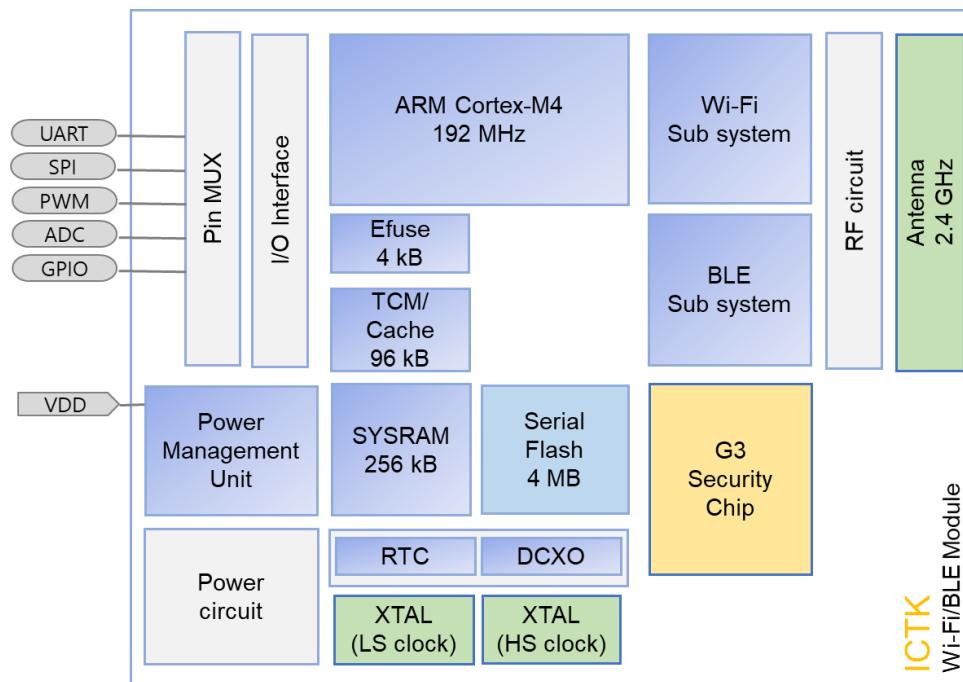
■ Module

- Integrated 2.4GHz Antenna
- Interfaces: UART, SPI, PWM, ADC, GPIO
- 26MHz crystal oscillator / 32KHz crystal oscillator for RTC
- Size: 32 mm x 20 mm x 3.4 mm, 26-Pin
- Operating temperature range : -30°C ~ 85°C
- Integrated PUF based security chip for secure authentication

1.2 Application

- IoT (Internet of Things)
- Home Appliances
- Sensor Networks
- Security/Access Control
- Smart Energy

1.3 Block Diagram



Module block diagram

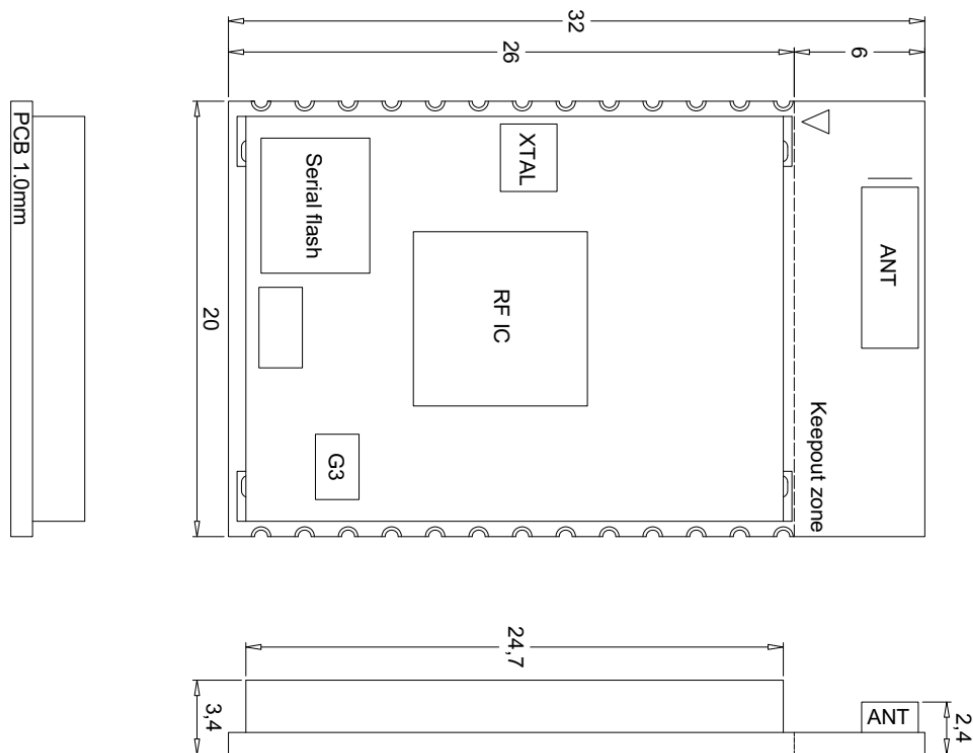
1.4 Pin map

Pin	Pin Name	Pin Type	Pin Description	Alternate Pin Functions
1	GND	Power	Ground	--
2	GND	Power	Ground	--
3	GND	Power	Ground	--
4	GND	Power	Ground	--
5	GPIO3	Digital In/Out	General purpose IO Boot mode UART	UART0 TXD
6	GPIO2	Digital In/Out	General purpose IO Boot mode UART	UART0 RXD
7	GPIO35	Digital In/Out	General purpose IO	PWM
8	GPIO37	Digital In/Out	General purpose IO	UART1 TXD, PWM, EINT
9	GPIO36	Digital In/Out	General purpose IO	UART1 RXD, PWM
10	GPIO0	Digital In/Out	General purpose IO	PWM, EINT
11	PMU_EN	Out	External PMU enable	--
12	GPIO32	Digital	General purpose IO	SPI CS

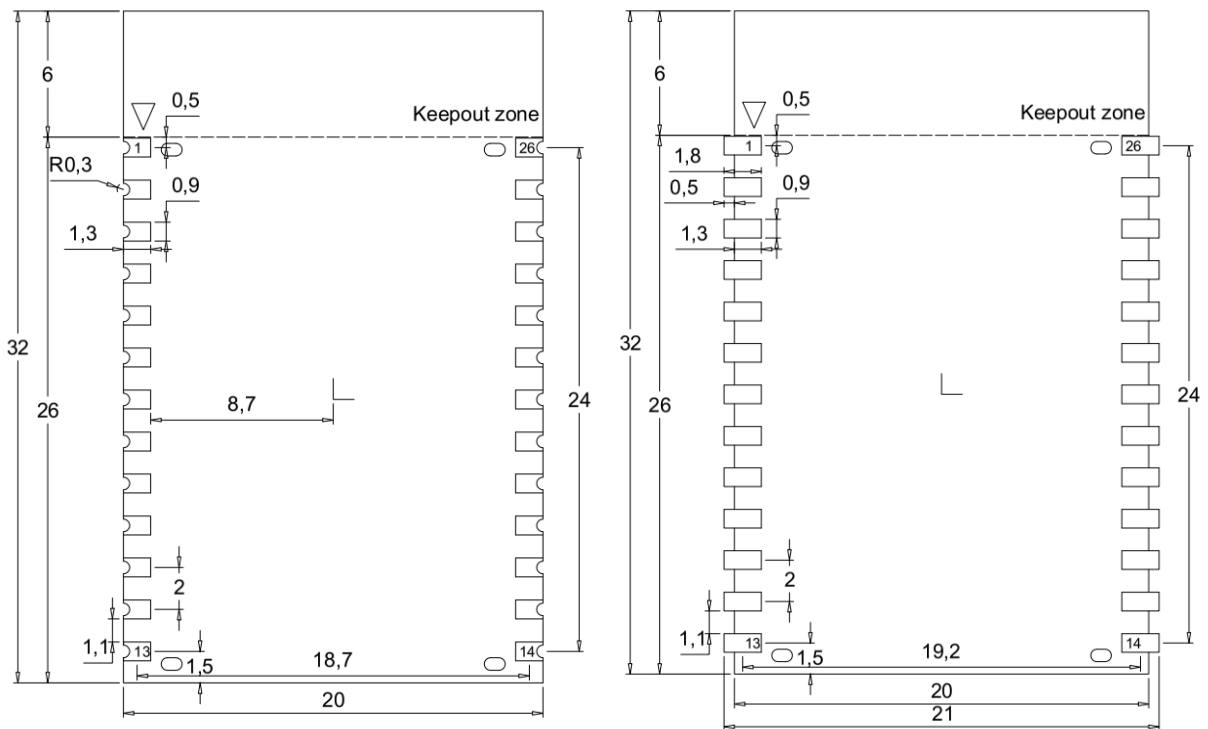
		In/Out		
13	GND	Power	Ground	--
14	GND	Power	Ground	--
15	VDD	Power	Power input	--
16	VRTC	Power	Power input for RTC domain	--
17	RESETB	Input	Module Enable	--
18	GPIO31	Digital In/Out	General purpose IO	SPI SCK
19	GPIO30	Digital In/Out	General purpose IO	SPI MISO
20	GPIO29	Digital In/Out	General purpose IO	SPI MOSI
21	SWDCLK	SWD Debug	Cortex M4 Debug	--
22	SWDIO	SWD Debug	Cortex M4 Debug	--
23	GND	Power	Ground	--
24	GND	Power	Ground	--
25	GND	Power	Ground	--
26	GND	Power	Ground	--

1.5 Module Dimension and Land Pattern

	Typical	Unit
Size(LxWxH)	32 x 20 x 3.4	mm
Tolerances	±0.2	mm



Module Dimension, Top view, Unit: mm



Module land pattern and recommended footprint, Top view, Unit: mm

All dimensions are in millimeters. The drawing is subject to change without notice.

2. Electrical Characteristics

2.1 Absolute maximum ratings

	Min.	Max.	Unit
Storage temperature	-40	85	°C
VDD, VRTC	-0.3	3.63	V
Other terminal voltages	-0.3	3.63	V

2.2 Recommended Operating Conditions

	Min.	Typ.	Max.	Unit
Operating temperature range	-30		85	°C
VDD, VRTC	3.0	3.3	3.6	V
Other terminal voltages	-0.3		VDD+0.3	V

2.3 Terminal Electrical Characteristics

Symbol	Description	Condition	Min.	Typ.	Max.	Unit
Input Voltage Levels						
V _{IL}	Input logic level low	VDD=3.3V	0	-	0.8	V
V _{IH}	Input logic level high	VDD=3.3V	2.0	-	VDD	V
Output Voltage Levels						
V _{OL}	Output logic level low	VDD = 3.3V	-	-	0.4	V
V _{OH}	Output logic level high	VDD = 3.3V	2.4	-	-	V

2.4 ESD electrical sensitivity

Test conditions : Ta=25°C

		Description	
HBM		All pins except RF pins	
(JESD22-A114-F)		RF pins	
CDM		All pins except RF pins	
(JESD22-C101-D)		RF pins	

3. RF Characteristics

3.1 RF receiver specifications

Test conditions : Ta=25°C, VDD=3.3V, VRTC=3.3V

	Description	Min.	Typ.	Max	Unit
Frequency range	Channel center frequency	2412	-	2484	MHz
Receiver sensitivity	1 Mbps CCK	-	-92	-	dBm
	11 Mbps CCK	-	-84	-	dBm
	BPSK rate 1/2, 6 Mbps OFDM	-	-90	-	dBm
	64QAM rate 3/4, 54 Mbps OFDM	-	-72	-	dBm
Receive sensitivity 20MHz bandwidth Mixed mode 800ns guard interval Non-STBC	MCS 0, BPSK rate 1/2	-	-88	-	dBm
	MCS 7, 64QAM rate 5/6	-	-70	-	dBm
Maximum receive level	6 Mbps OFDM	-	-10	-	dBm
	54 Mbps OFDM	-	-10	-	dBm
	MCS 0	-	-10	-	dBm
	MCS 7	-	-20	-	dBm

3.2 RF transmitter specifications

Test conditions : Ta=25°C, VDD=3.3V, VRTC=3.3V

	Description	Min.	Typ.	Max	Unit
Frequency range	Channel center frequency	2412	-	2484	MHz
Output power	1 Mbps CCK	-	18	-	dBm
	11 Mbps CCK	-	18	-	dBm

	6 Mbps OFDM	-	16	-	dBm
	54 Mbps OFDM	-	15	-	dBm
	HT20, MCS 0	-	14	-	dBm
	HT20, MCS 7	-	14	-	dBm
Transmitter EVM	6 Mbps OFDM	-	-	-5	dB
	54 Mbps OFDM	-	-	-25	dB
	HT20, MCS 0	-	-	-5	dB
	HT20, MCS 7	-	-	-28	dB

3.3 Bluetooth LE RF receiver specifications

Test conditions : Ta=25°C, VDD=3.3V, VRTC=3.3V

	Description	Min.	Typ.	Max	Unit
Frequency range	Channel center frequency	2402	-	2480	MHz
Receiver sensitivity	PER < 30.8%		-90		dBm

3.4 Bluetooth LE RF transmitter specifications

Test conditions : Ta=25°C, VDD=3.3V, VRTC=3.3V

	Description	Min.	Typ.	Max	Unit
Frequency range	Channel center frequency	2412	-	2484	MHz
Output power		-20	-	4	dBm
Carrier Frequency Offset and Drift	Frequency offset	-150	-	150	kHz
	Frequency drift	-50	-	50	kHz
	Max. drift rate	-20		20	kHz
Modulation Characteristic	$\Delta f_{1\text{avg}}$	225	-	275	kHz
	$\Delta f_{2\text{max}}$ (For at least 99% of all $\Delta f_{2\text{max}}$)	185	-	-	kHz
	$\Delta f_{2\text{avg}} / \Delta f_{1\text{avg}}$	0.8	0.94		Hz/Hz

4. G3 Security IC

4.1 G3 Overview

The G3 is an ICTK's PUF based-security chip that performs authentication and cryptography operations. It is suited for performing secure authentication, protecting firmware, preventing counterfeiting, and storing secure data. With ICTK's PUF technology, the G3 can generate more secure and reliable crypto key.

4.2 G3 Key features

Physical Unclonable Function (PUF):

- The PUF supports key generation.
- The data stored in G3 is encrypted using a PUF key and it is decrypted when using the data.
- The private key of ECC is generated by PUF and a key received from external site can be used.
- When using AES and SM4 algorithms, a PUF key supports encryption and decryption.

Supported cryptographic algorithms:

- Symmetric key algorithm: AES and SM4
- Asymmetric key algorithm:
 - ECC (ECDSA and ECDH) with secp256r1 (NIST P256)
 - ECC sm2p256 curve and SM2 signature algorithm
- Hash algorithm: SHA256
- TLS 1.2

4.3 G3 Applications

- Secure Authentication
 - Identifies and authenticates devices with strong cryptographic algorithms and PKI(Public Key Infrastructure)
- Protecting Firmware
 - Protects the firmware copy of devices not to manufacture counterfeit products
 - Performs secure boot function that protects against attacks by changing firmware codes
- Preventing Counterfeiting

Prevents the counterfeiting of electronic devices

- Secure Data

Encrypts data with a random key and store it in a non-secure memory when the random key is stored in G3, the encrypted data can be kept confidential even if the non-secure memory is lost or stolen.

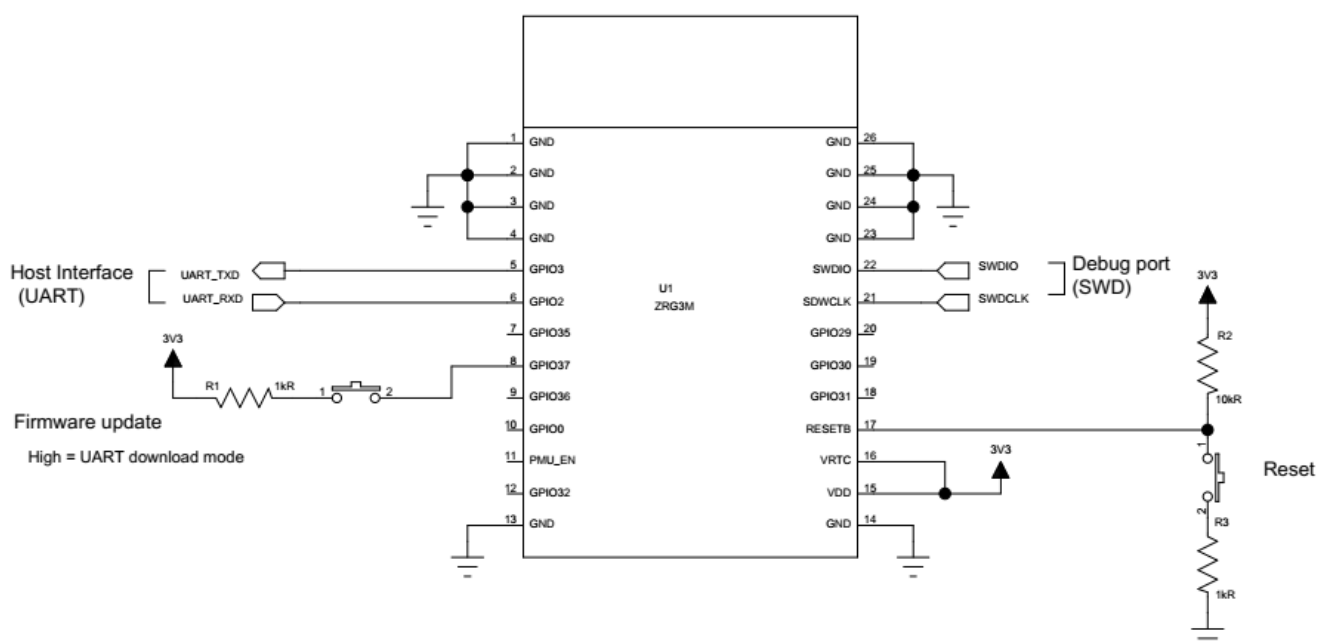
4.4 G3 Internal connection

G3 is internally connected to MT7697 via I2C interface.

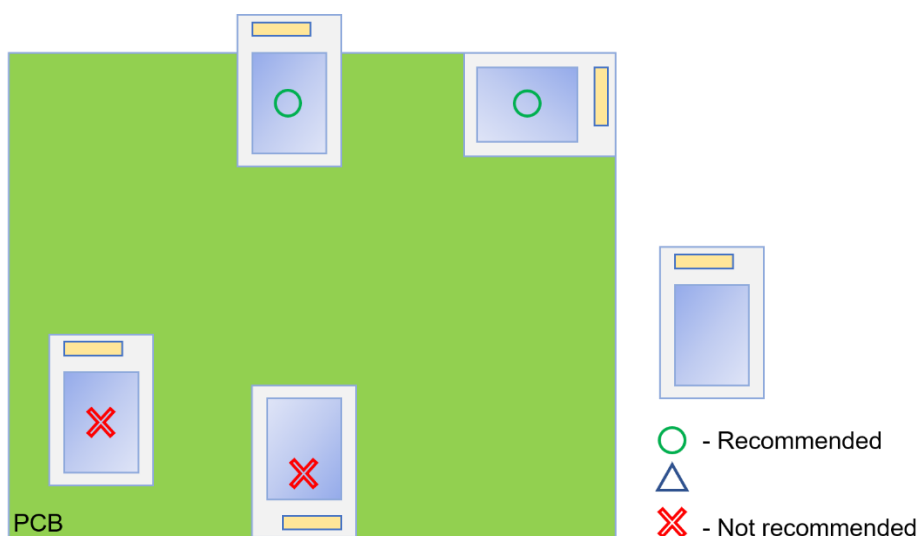
G3 pin	MT7697 pin	
SCL	GPIO27	
SDA	GPIO28	

5. Application

5.1 Application schematic



5.2 Recommended application PCB layout



Recommended application PCB layout

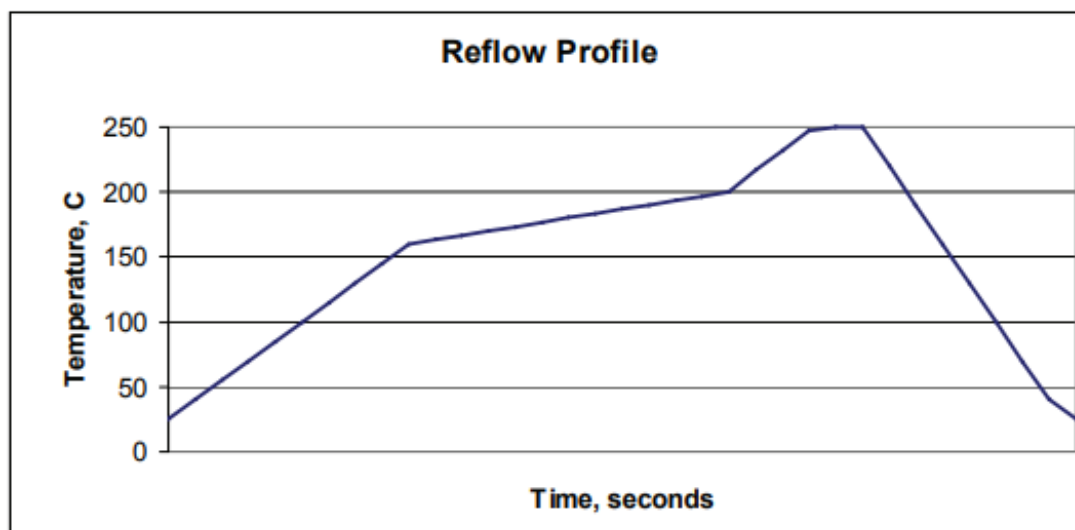
- There must be no signal traces or metallic components under the antenna area.
- Ensure that all ground is cleared on all layers of the PCB where the module is mounted.
- Do not route signal traces underneath the module

6. Reflow Profile

6.1 Reflow profile

Ramp up rate	3°C/second max
Maximum time maintained above 217 °C	120 seconds
Peak temperature	250°C
Maximum time within 5 °C of peak temperature	20 seconds
Ramp down rate	6°C/second max

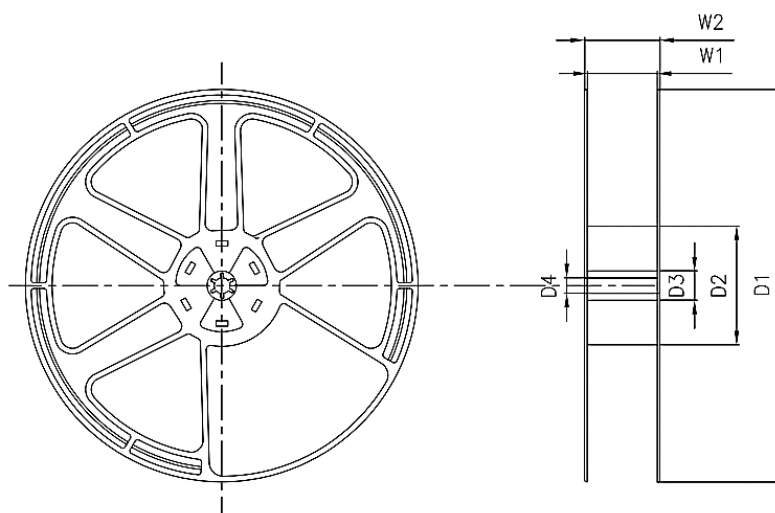
Reflow profile recommendation



Reflow profile pattern

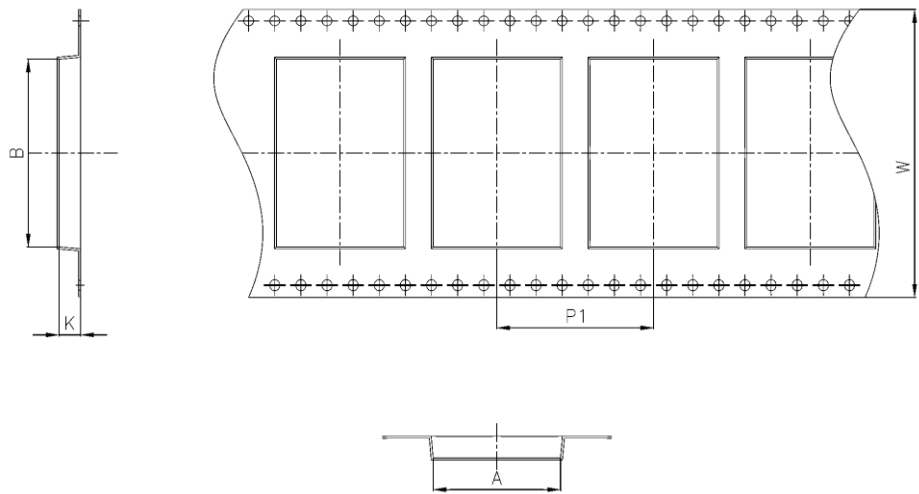
7. Packaging

7.1 Reel Tape / Reel / Reel Box



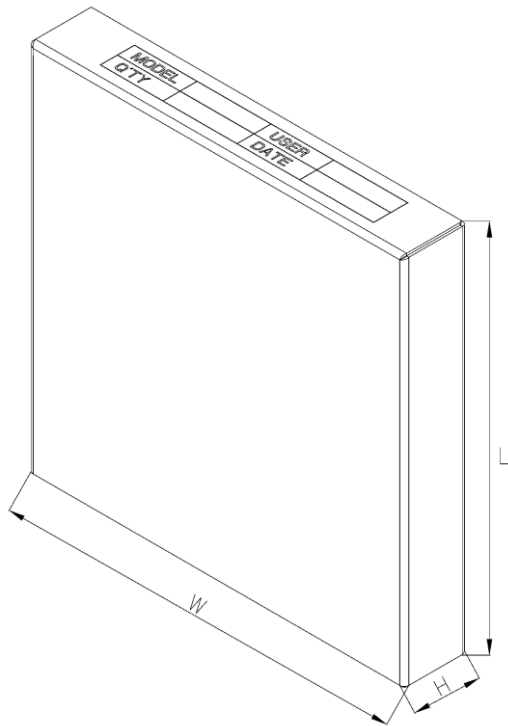
D1(mm)	D2(mm)	D3(mm)	D4(mm)	W1(mm)	W2(mm)
$\Phi 330 \pm 2.0$	$\Phi 80$	$\Phi 20$	$\Phi 13 \pm 0.5$	TBD	TBD

Reel dimensions



A(mm)	B(mm)	K(mm)	W(mm)	P1(mm)
TBD	TBD	TBD	TBD	TBD

Tape dimensions



L(mm)	W(mm)	H(mm)
360	360	70

Box dimensions

8. Document Version History

Version	Date	Description
0.1	2020.08.10	Draft*

*The features and specifications are subject to change without prior notification.

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