ET63AXX - Ultra-Low I_Q 300mA LDO

General Description

The ET63AXX series of CMOS low dropout regulators are designed specifically for portable battery-powered applications which require ultra-low quiescent current. The ultra-low consumption of type 1.0μA ensures long battery life and dynamic transient boost feature improves device transient response for wireless communication applications.

The device is available in small DFN4 (1mm × 1mm), SOT23-5 (1.6mm × 2.9mm) or SOT23-3 (1.6mm × 2.9mm) packages.

Features

- Operating Input Voltage Range From 1.7V to 5.5V
- Fixed Output Voltage : 1.2V, 1.5V, 1.6V, 1.8V, 2.5V, 2.8V, 3V and 3.3V
- Ultra-Low Quiescent Current Typical 1.0μA
- Low Noise is Typical 120μV_{RMS}@V_{OUT} = 1.8V
- Low Dropout is Typical 410mV at 300mA@V_{OUT} = 1.8V
- Reverse Leakage Current about 0.4uA
- Stable with Ceramic Capacitors 1μF
- Over-Current Protection
- Thermal Shutdown Protection
- With Auto-Discharge Function
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant
- Part No. and Package Information

Part No.	Package	Packing Option	MSL
ET63AXXYB	DFN4 (1mm × 1mm)	Tape and Reel, 10K	Level 1
ET63AXX	SOT23-5 (1.6mm × 2.9mm)	Tape and Reel, 3K	Level 3
ET63AXXS	SOT23-3 (1.6mm × 2.9mm)	Tape and Reel, 3K	Level 3

Applications

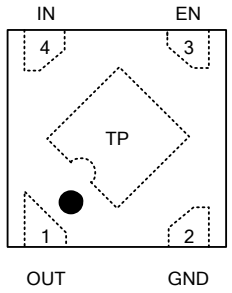
- Battery Powered Equipment
- Portable Communication Equipment
- Cameras, Image Sensors and Camcorders
- Label Information

Device Information

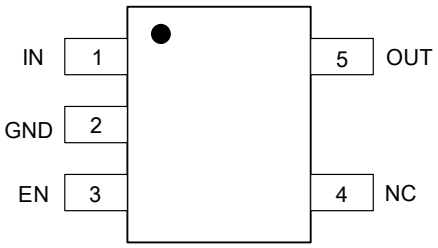
ET 63A XX XX

XX Output Voltage		XX Package	
XX	X.XV Output Voltage For Example, 18 is 1.8V Output	Blank	SOT23-5 (1.6mm × 2.9mm)
		S	SOT23-3 (1.6mm × 2.9mm)
		YB	DFN4 (1mm × 1mm)

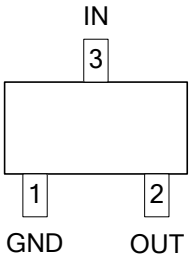
Pin Configuration



DFN4



SOT23-5



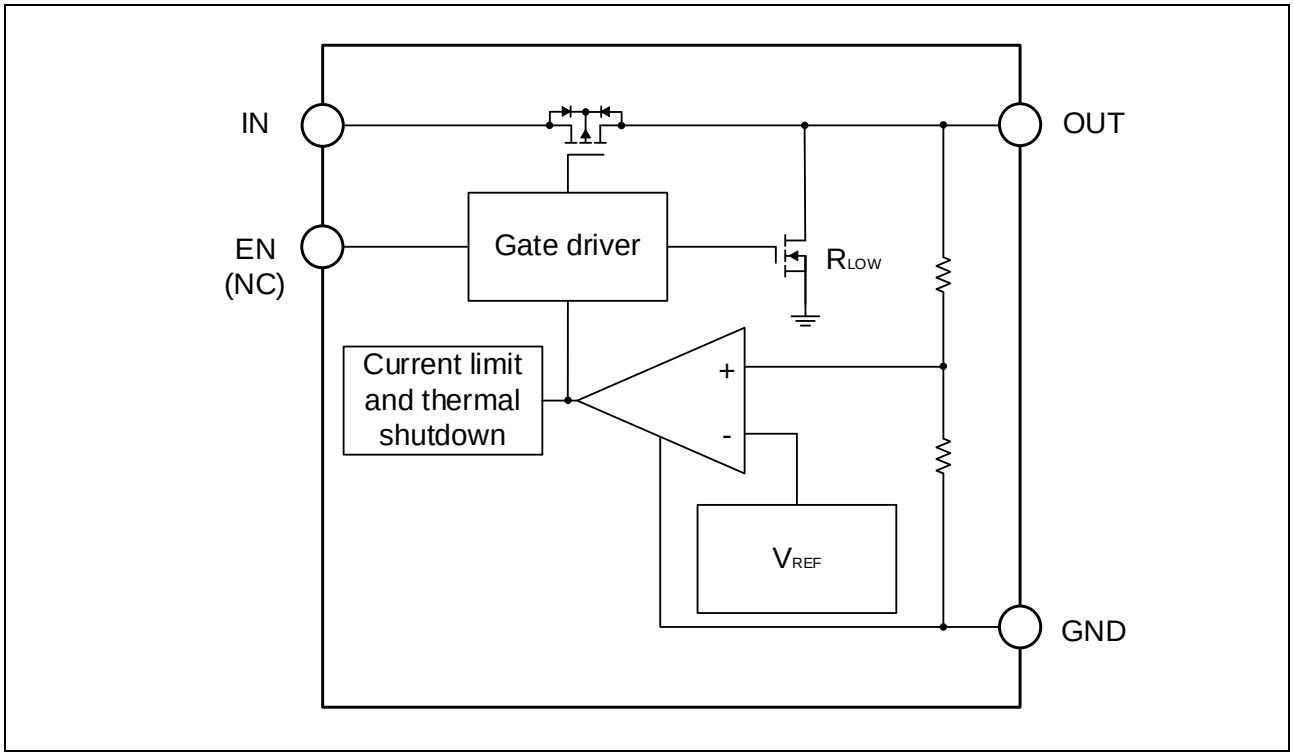
SOT23-3

Top View

Pin Function

Pin No.			Symbol	Pin Description
DFN4	SOT23-5	SOT23-3		
1	5	2	OUT	Output Pin
2	2	1	GND	Power Supply Ground
3	3	/	EN	Chip Enable Pin (Active “H”)
4	1	3	IN	Power Supply Input Voltage
TP	4	/	Thermal Pad / NC	Thermal Pad for DFN4 (1mm × 1mm) , Connect to GND or Floating. Do not connect to any potential other than GND. NC for SOT23-5 no connection.

Block Diagram



Functional Description

The ET63AXX is a high performance 300mA Linear Regulator with Ultra Low I_Q. This device delivers low Noise and High-Power Supply Rejection Ratio with excellent dynamic performance due to employing the Dynamic Quiescent Current adjustment which assure ultra-low I_Q consumption at no-load state. These parameters make this device very suitable for various battery powered applications.

Input Decoupling

It is recommended to connect at least a 1μF Ceramic X5R or X7R capacitor between IN and GND pins of the device. This capacitor will provide a low impedance path for any unwanted AC signals or Noise superimposed onto constant Input Voltage. The good input capacitor will limit the influence of input trace inductances and source resistance during sudden load current changes. Higher capacitance and lower ESR Capacitors will improve the overall line transient response.

Output Decoupling

The ET63AXX does not require a minimum Equivalent Series Resistance (ESR) for the output capacitor. The X5R and X7R types have the lowest capacitance variations over temperature thus they are recommended.

There is recommended connect the output capacitor as close as possible to the output pin of the regulator.

Enable Operation (If EN Pin Exist)

The ET63AXX uses the EN pin to enable /disable its device and to activate /deactivate the active discharge function at devices with this feature. If the EN pin voltage is pulled below 0.4V the device is guaranteed to be disable.

If the EN pin voltage is higher than 0.9V the device is guaranteed to be enabled. The internal active discharge circuitry is switched off and the desired output voltage is available at output pin. In case the Enable function is not required the EN pin should be connected directly to input pin.

Current Limit Protection

When output current at the OUT pin is higher than current limit threshold, the current limit protection will be triggered and clamp the output current to approximately 550mA to prevent over-current and to protect the regulator from damage due to overheating.

Reverse Current Protection

The ET63AXX incorporates reverse current protection circuit that prevents current flow backwards through the pass element when the output voltage is greater than the input voltage. A comparator senses the difference between the input and output voltages. When the difference between the output voltage and input voltage exceeds 20mV (TYP), the gate of the PFET is switched to V_{OUT} and the PFET is turned off. Otherwise, the gate voltage of the PFET is unfixed, and the reverse current may be (V_{OUT} - V_{IN}) / R_{ON}, R_{ON} = V_{DROP} / I_{OUT}.

The ET63AXX will activate the discharge function when VIN is in position and EN is set to low. Therefore, special attention should be paid in this state.

Thermal Shutdown

When the die temperature exceeds the Thermal Shutdown point (T_{TSD} = 150°C typical) the device goes to disabled state and the output voltage is not delivered until the die temperature decreases to 125°C. The Thermal Shutdown feature provides a protection from a catastrophic device failure at accidental overheating. This protection is not intended to be used as a substitute for proper heat sinking.

Power Dissipation and Heat sinking

The maximum power dissipation supported by the device is dependent upon board design and layout. Mounting pad configuration on the PCB, the board material and the ambient temperature affect the rate of junction temperature rise for the part. The maximum power dissipation the ET63AXX device can handle is given by:

$$P_{D(MAX)} = (T_{J(MAX)} - T_A) / \theta_{JA}$$

Absolute Maximum Ratings

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

Symbol	Parameter	Rating	Unit
V_{IN} (1)	Input Voltage	-0.3 to 6.0	V
V_{OUT}	Output Voltage	-0.3 to V_{IN} + 0.3	V
V_{EN}	Enable Voltage	-0.3 to V_{IN} + 0.3	V
$T_{J(MAX)}$	Maximum Junction Temperature	150	°C
T_{STG}	Storage Temperature	-65 to 150	°C
V_{ESD} (2)	Human Body Model	±2000	V
	Charged Device Model	±1500	V
I_{LU} (2)	Latch up Current Maximum Rating	±200	mA

Note1: Refer to ELECTRICAL CHARACTERISTIS for Safe Operating Area.

Note2: This device series incorporates ESD protection and is tested by the following methods:

--ESD Human Body Model tested per JEDEC JS-001

--ESD Charged Device Model tested per JEDEC JS-002

--Latch up Current Maximum Rating tested per JEDEC JESD78F.

Thermal Characteristics

Symbol	Package	Parameters	Value	Unit
$R_{\theta JA}$	DFN4	Thermal Resistance, Junction-to-Air	250	°C/W
	SOT23-5		166	
	SOT23-3		250	
P_{DMAX}	DFN4	Power Dissipation	400	mW
	SOT23-5		600	
	SOT23-3		400	

Recommended Operating Conditions

Symbol	Parameters	Rating	Unit
V_{IN}	Input Voltage	1.7 to 5.5	V
I_{OUT}	Output Current	0 to 300	mA
T_A	Operating Ambient Temperature	-40 to 85	ºC
C_{IN}	Effective Input Ceramic Capacitor Value	0.47 to 4.7	µF
C_{OUT}	Effective Output Ceramic Capacitor Value	0.47 to 4.7	µF
ESR	Input and Output Capacitor Equivalent Series Resistance (ESR)	5 to 100	mΩ

Electrical Characteristics

(V_{IN} = V_{OUT} + 1V, I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1μF, unless otherwise noted. Typical values are at T_A = +25°C.) (3)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_{IN}	Operating Input Voltage			1.7		5.5	V
V_{OUT}	Output Voltage	I_{OUT} = 1mA		-1.5		1.5	%
Reg_{LINE}	Line Regulation	I_{OUT} = 1mA, V_{OUTNOM} + 1V ≤ V_{IN} ≤ 5.5V			0.04	0.2	%/V
Reg_{LOAD}	Load Regulation	V_{IN} = V_{OUTNOM} + 1V, T_A = +25°C, 1mA ≤ I_{OUT} ≤ 300mA			10	30	mV
V_{DROP} (4) (6)	Dropout Voltage	I_{OUT} = 300mA, T_A = +25°C	V_{OUT} = 1.8V		410	600	mV
			V_{OUT} = 3.3V		210	400	
I_{LIMIT}	Current Limit	V_{IN} = V_{OUTNOM} + 1V		350	550	750	mA
I_{short}	Short Current	V_{OUT} = 0V			100		
I_{Q_ON}	Quiescent Current	T_A = 25°C			1		μA
I_{Q_OFF}	Shutdown Current	T_A = 25°C			0.01	0.1	μA
V_{ENH}	EN Pin Threshold Voltage	EN Input Voltage “H”		0.9			V
V_{ENL}	EN Pin Threshold Voltage	EN Input Voltage “L”				0.4	V
I_{EN}	EN Pin Leakage Current	V_{EN} = 5.5V			0.02	1.0	μA
PSRR (5)	Power Supply Rejection Ratio	f = 1kHz, V_{IN} = 2.8V, C_{OUT} = 4.7uF, V_{OUT} = 1.8V, I_{OUT} = 20mA			70		dB
V_{RCB}	Reverse Current Protection Voltage	V_{OUT} - V_{IN}			20		mV
I_{RCB}	Reverse Leakage Current	V_{IN} = 1.7V, V_{OUT} = 5.5V			0.4		μA
e_N	Output Noise	10Hz to 100kHz, I_{OUT} = 20mA, V_{OUT} = 1.8V			120		μV_{RMS}
R_{LOW}	Discharge Resistance	V_{IN} = 4.3V, V_{EN} = 0V, I_{OUT} = 10mA			110		Ω
T_{TSD} (5)	Thermal Shutdown Temperature	Temperature Increasing From T_A= +25°C			150		°C
T_{SDH} (5)	Thermal Shutdown Hysteresis	Temperature Falling from T_{TSD}			25		°C

Note3: Here V_{IN} means internal circuit can work normal. If V_{IN} <V_{OUT}, Output voltage follow V_{IN} (I_{OUT} = 1mA), circuit is safety.

Note4: V_{DROP} FT test method: Test the V_{OUT} voltage at V_{SET} + $V_{DROPMAX}$ with 300mA output current.

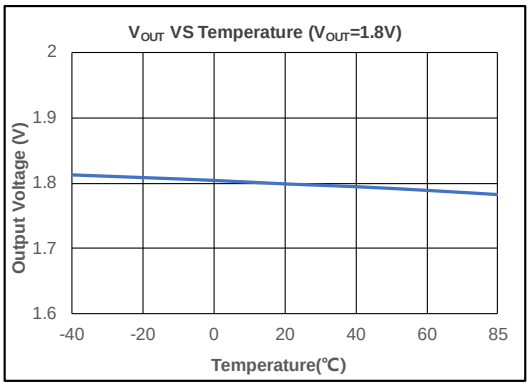
Note5: Guaranteed by design and characterization, not a FT item.

Note6: The minimum operating voltage is 1.7V, V_{DROP} = V_{IN} (min) - V_{OUT}.

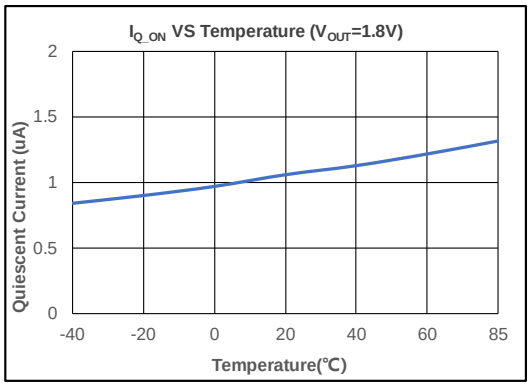
Typical Characteristics

VOLTAGE VERSION 1.8V

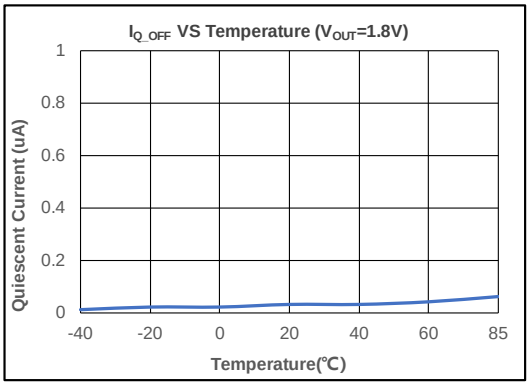
(V_{IN} = V_{OUT} + 1V, I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1μF, unless otherwise noted. Typical values are at T_A = +25°C.) [3]



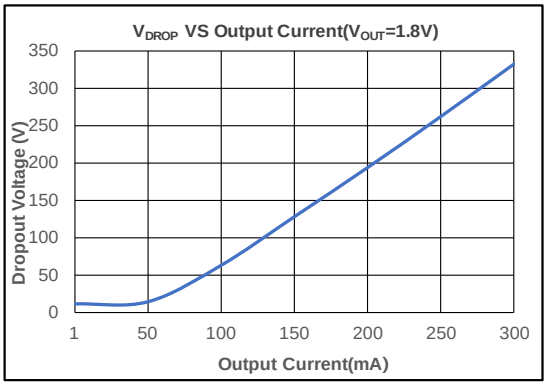
Output Voltage VS Temperature



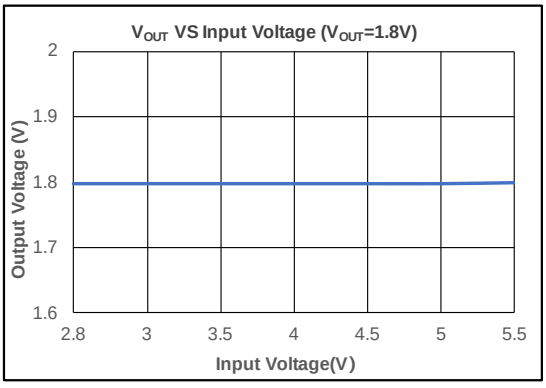
Supply Current VS Temperature



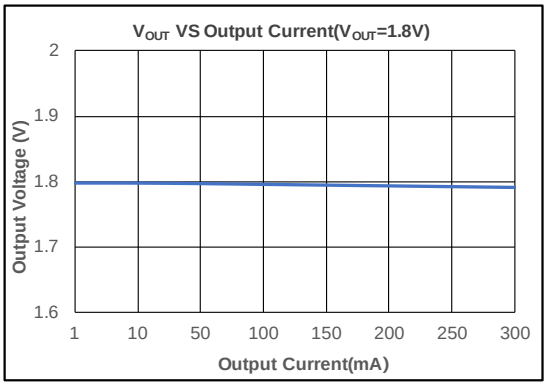
Shutdown Current VS Temperature



Dropout Voltage VS Output Current



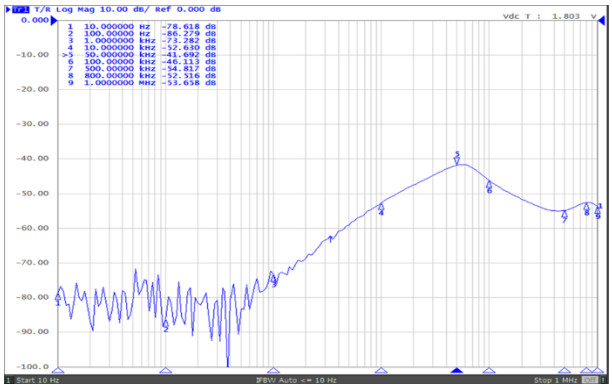
Output Voltage VS Input Voltage



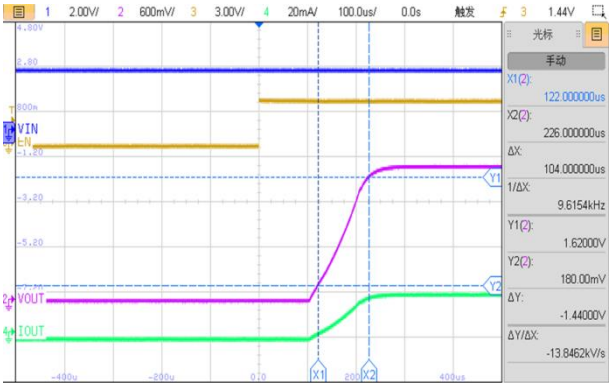
Output Voltage VS Output Current

Typical Characteristics(Continued)

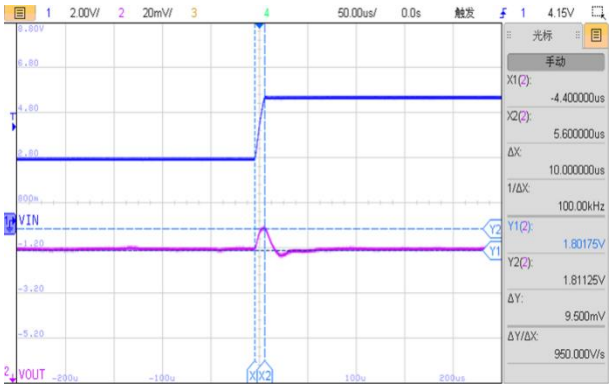
(V_{IN} = V_{OUT} + 1V, I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1μF, unless otherwise noted. Typical values are at T_A = +25°C.)[3]



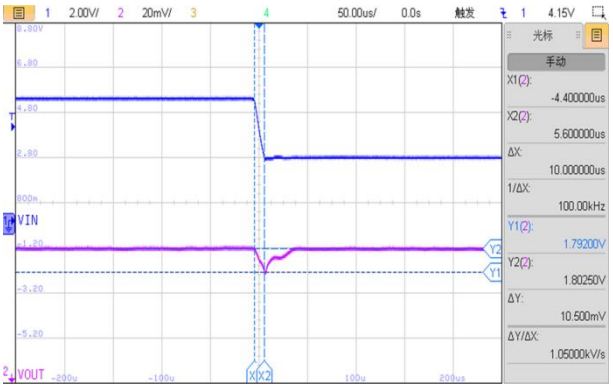
PSRR VS Output Current (I_{OUT} = 20mA)



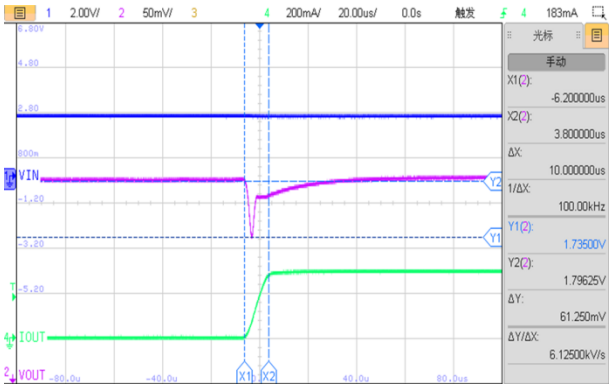
Turn On Speed VS EN Voltage (I_{OUT} = 20mA)



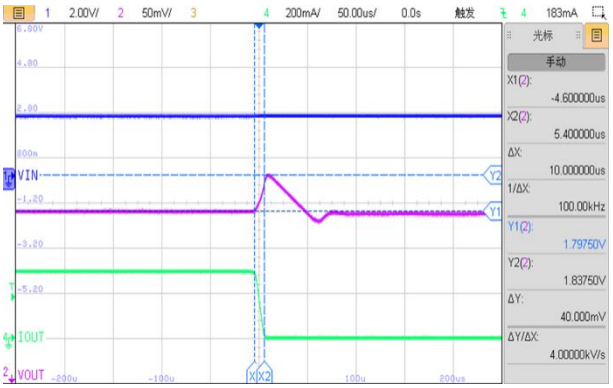
Line Transient Response
V_{IN} = 2.8V~5.5V, V_{OUT} = 1.8V, I_{OUT} = 1mA



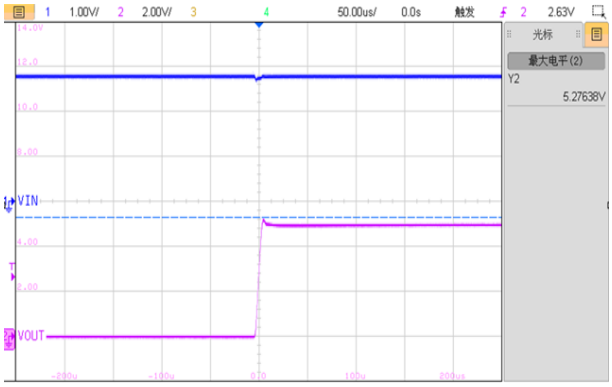
Line Transient Response
V_{IN} = 5.5V~2.8V, V_{OUT} = 1.8V, I_{OUT} = 1mA



Load Transient Response
V_{IN} = 2.8V, V_{OUT} = 1.8V, I_{OUT} = 1mA~300mA

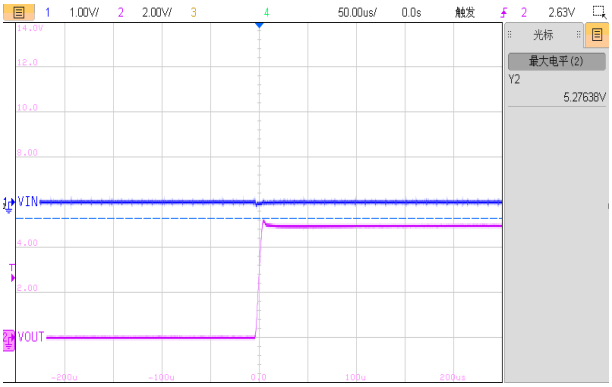


Load Transient Response
V_{IN} = 2.8V, V_{OUT} = 1.8V, I_{OUT} = 300mA~1mA



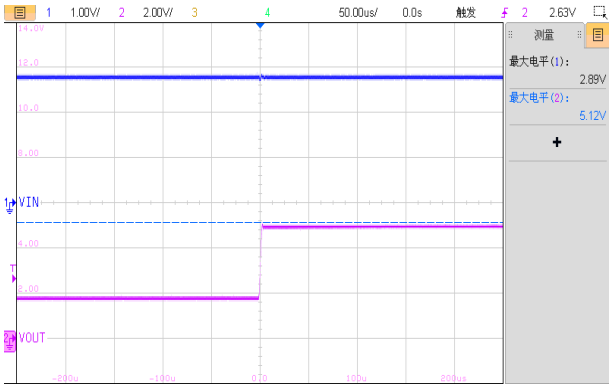
RCB Test

V_{IN} = 2.8V, EN = 0V, V_{OUT} = 0V to 5V



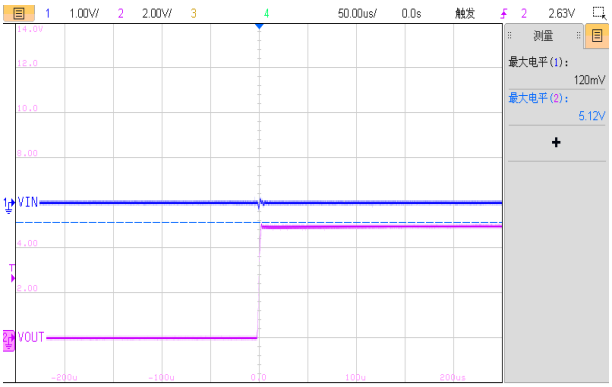
RCB Test

V_{IN} = EN = 0V, V_{OUT} = 0V to 5V



RCB Test

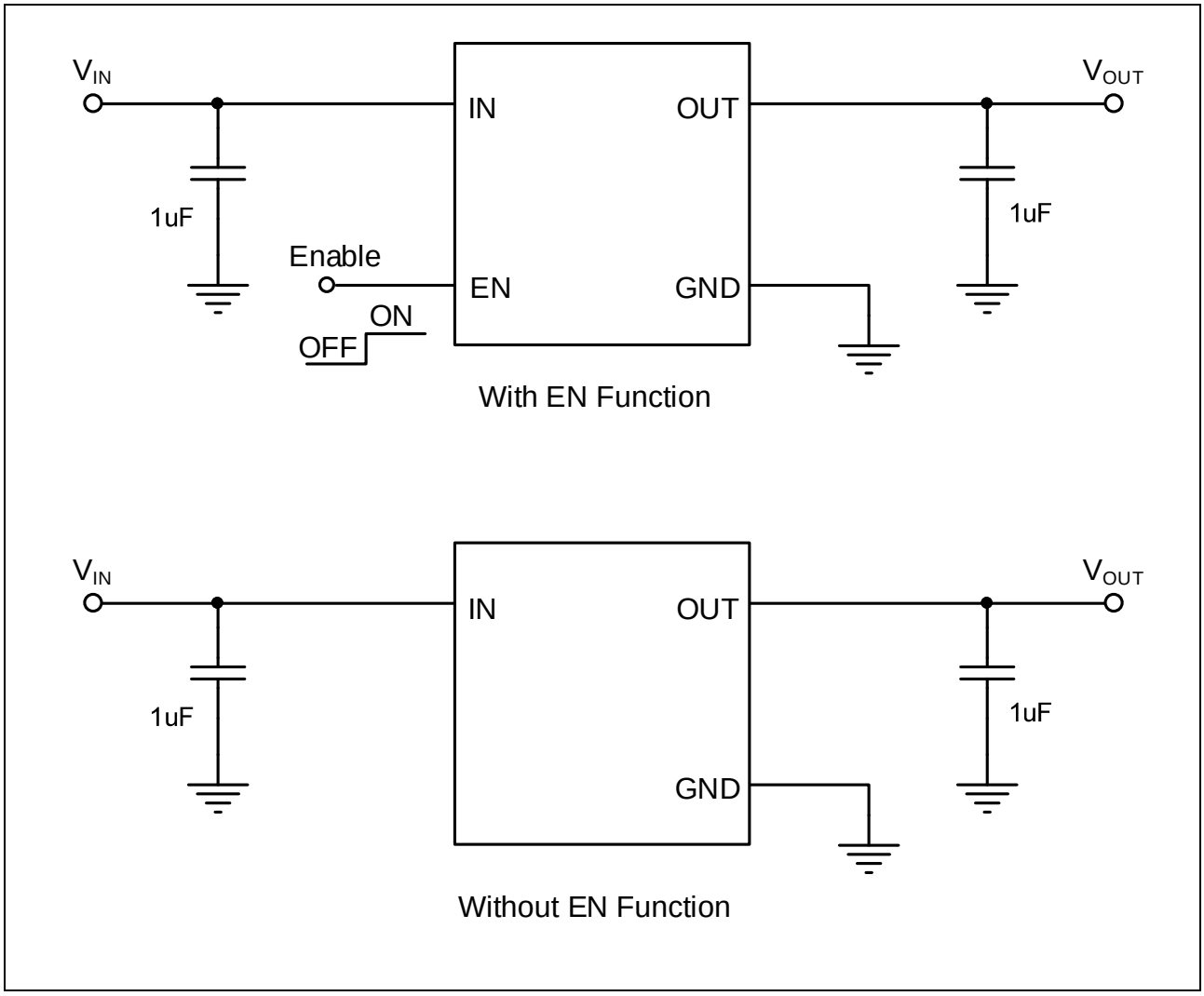
V_{IN} = 2.8V, EN = 1.2V, V_{OUT} = 1.8V to 5V



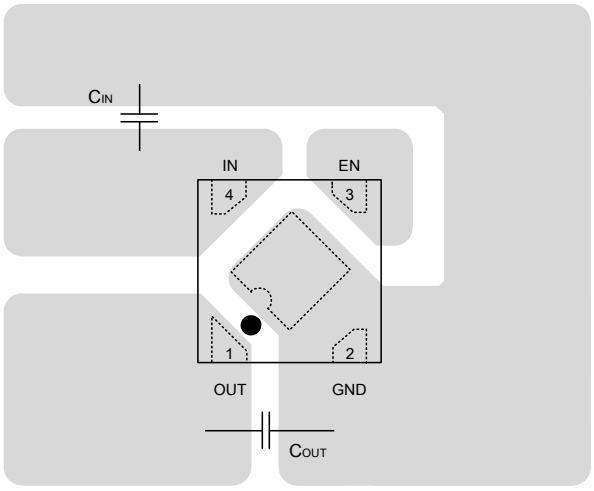
RCB Test

V_{IN} = 0V, EN = 1.2V, V_{OUT} = 0V to 5V

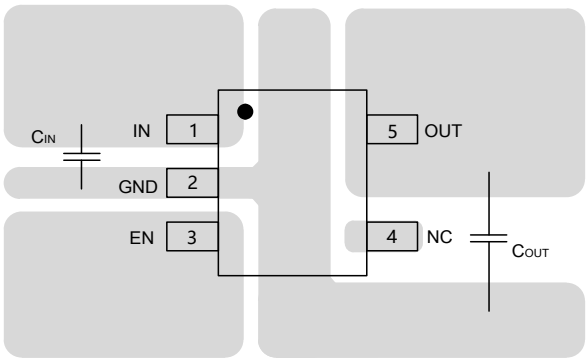
Applications Information



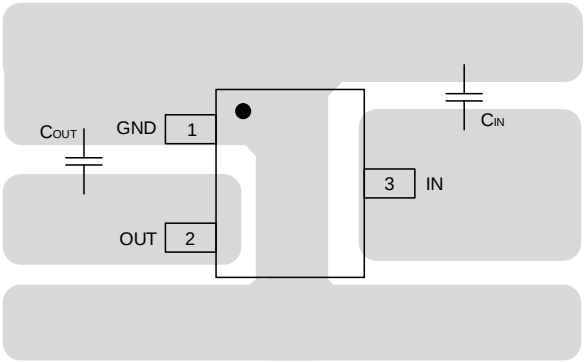
PCB Layout Guide



DFN4



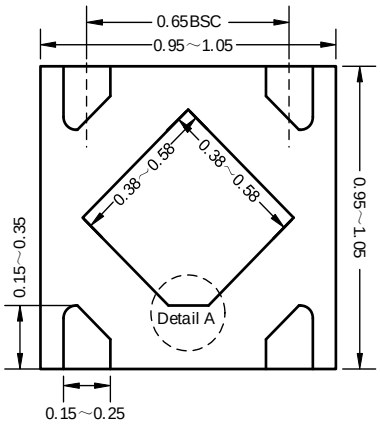
SOT23-5

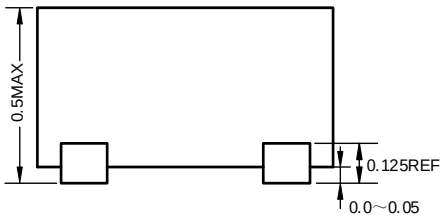


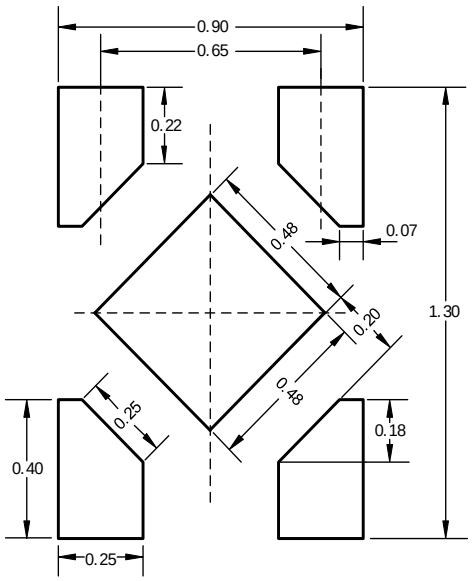
SOT23-3

Package Dimension

DFN4 (1mm × 1mm)

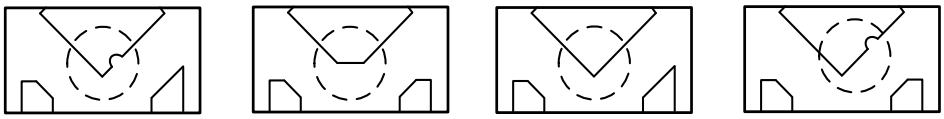






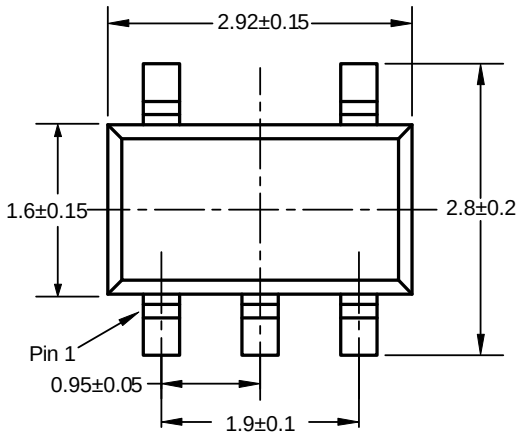
Recommended Land Pattern

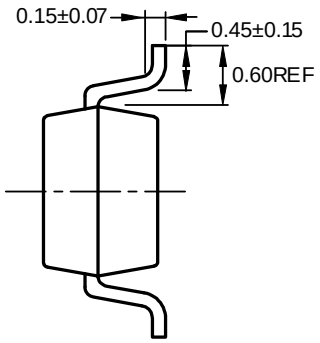
Detail A: (PIN1 shape)

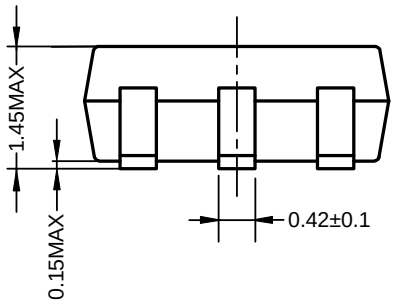


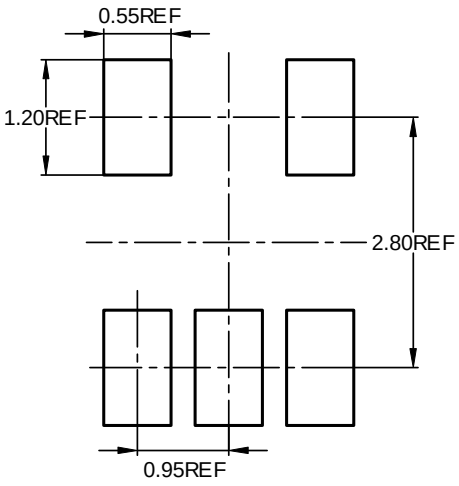
Unit: mm

SOT23-5 (1.6mm × 2.9mm)





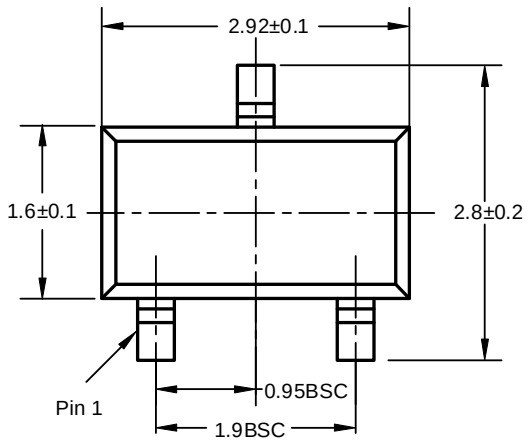


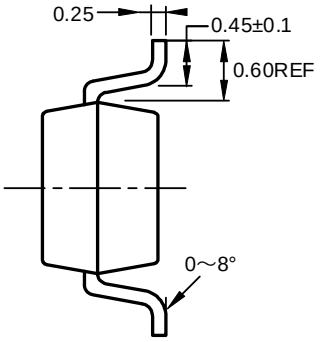


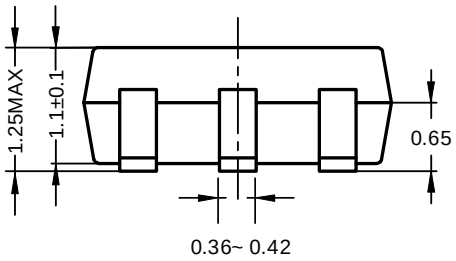
Recommended Land Pattern

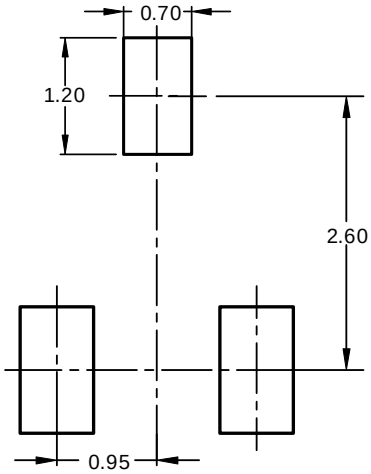
Unit: mm

SOT23-3







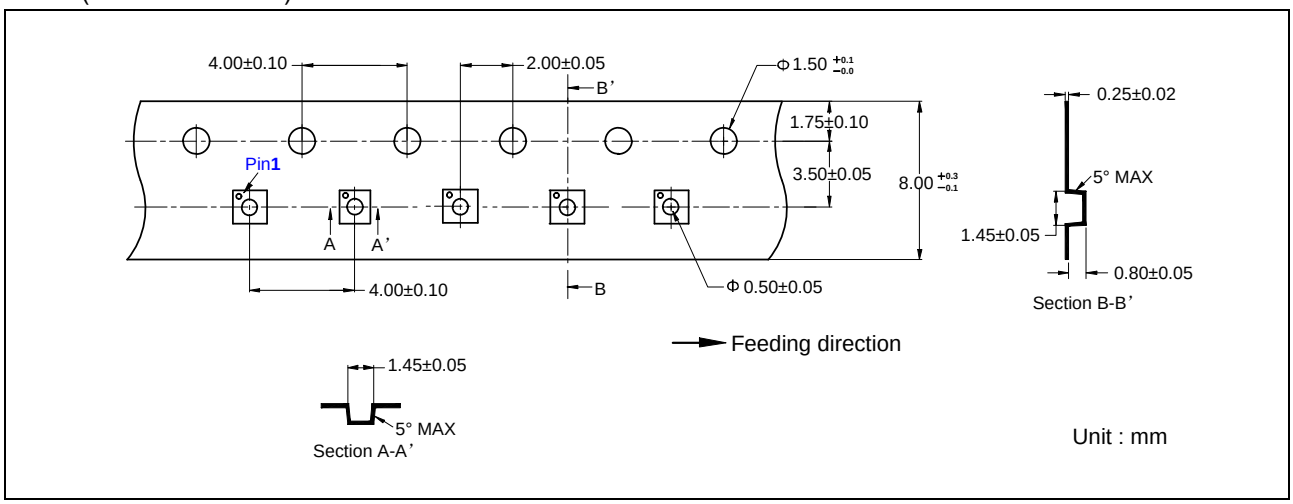


Recommended Land Pattern

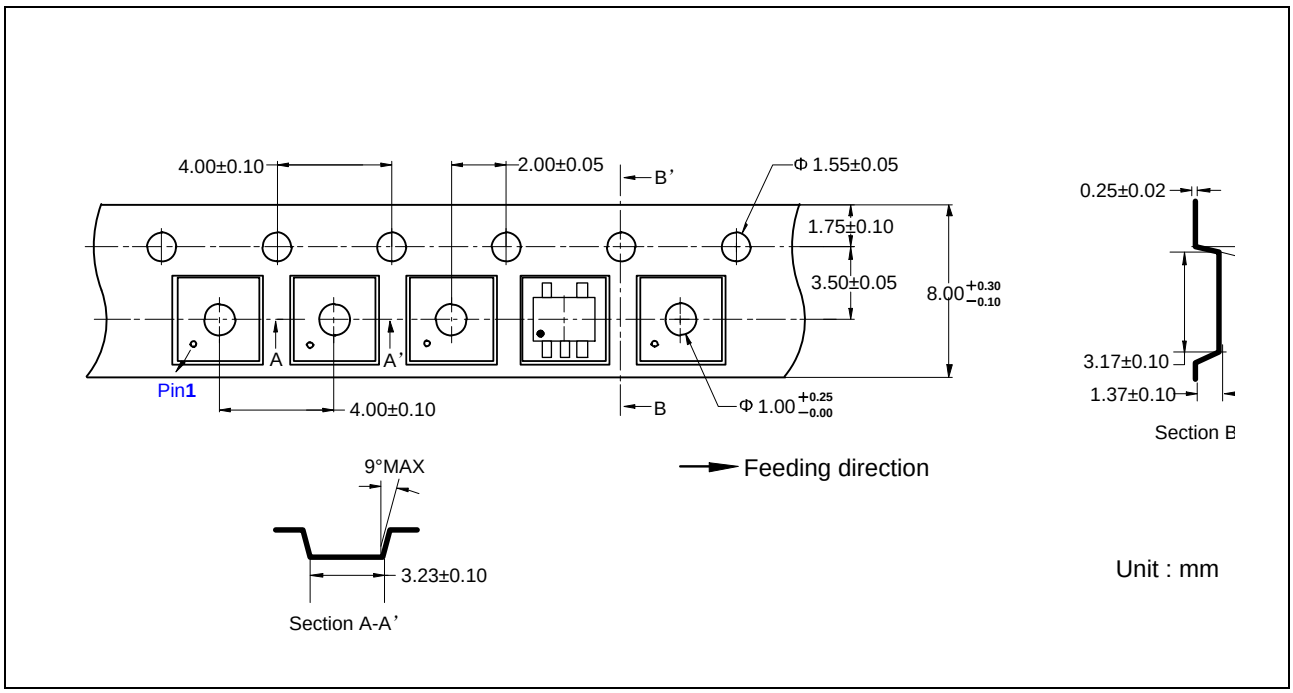
Unit: mm

Tape Information

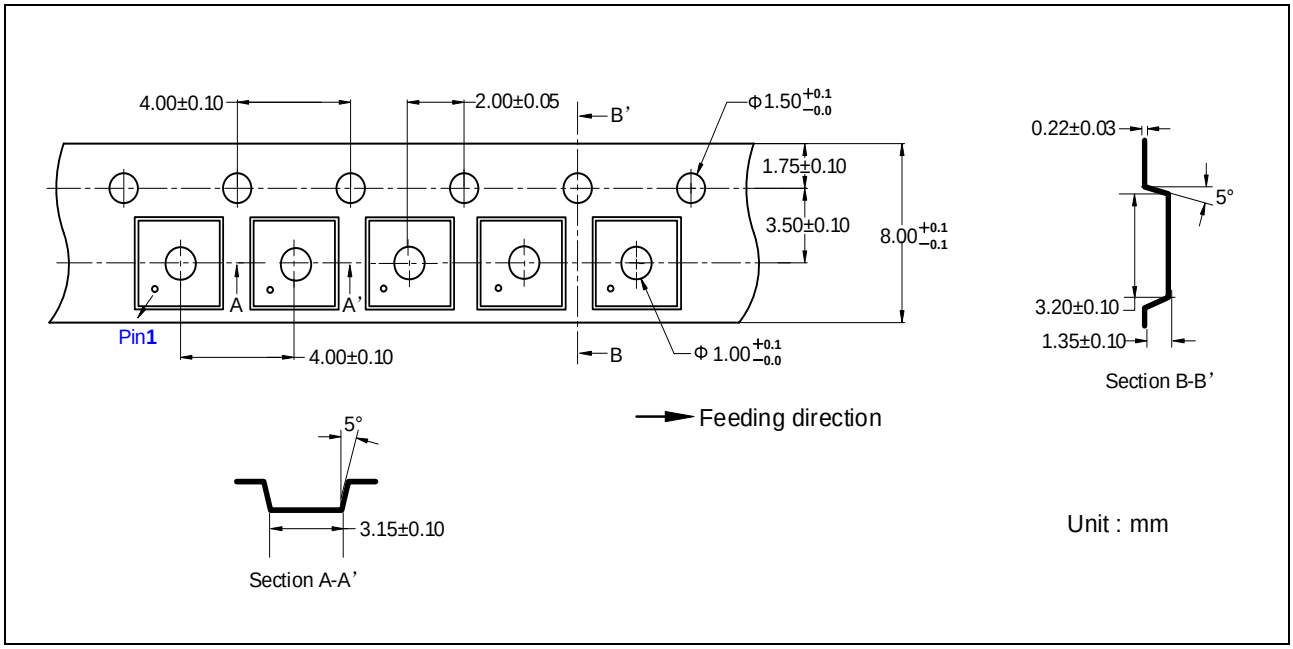
DFN4 (1.0mm × 1.0mm)



SOT23-5



SOT23-3



Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2026-06-05	Preliminary Version	Yangxiaoxu	Liuxm	Liujy
1.0	2026-08-03	Official Version	Yangxiaoxu	Liuxm	Liujy
1.0.a	2026-08-18	Update RCB Description	Yangxiaoxu	Liuxm	Liujy