Very High PSRR Low Noise 300mA LDO

General Description

The ET537XXY1B family are the high performance 300mA LDO with auto discharge function, it uses an advanced CMOS process and a PMOSFET pass device to achieve very high-power supply rejection ratio (PSRR), low noise, low dropout, low ground current, fast start-up and excellent output accuracy.

The ET537XXY1B family are stable with a 1.0μF ceramic input and output capacitor, uses a precision voltage reference and feedback loop to achieve high excellent Regulation and transient response.

The ET537XXY1B family are available in standard fixed output voltages of 1.1V (ET53711Y1B), 1.2V (ET53712Y1B), 1.8V (ET53718Y1B), 2.2V (ET53722Y1B), 2.8V (ET53728Y1B), 2.85V (ET537285Y1B), 3.0V (ET53730Y1B), 3.1V (ET53731Y1B), 3.3V (ET53733Y1B) and custom voltage options.

The ET537XXY1B family are offered small DFN4 (0.8mm x 0.8mm) package, which is ideal for small form factor portable equipment.

Features

- Wide Input Voltage from 1.6V to 5.5V
- Up to 300mA Load Current
- Standard Fixed Output Voltage Options are 1.1V, 1.2V, 1.8V, 2.2V, 2.8V, 3.0V, 3.1V, and 3.3V etc.
- Other Output Voltage Options Available on Request
- Very Low I_Q is 45μA Typical
- Low Dropout: 190mV at 300mA Load @V_{OUT} = 1.8V
- Very High PSRR up to 70dB at 1kHz
- Low Noise is 20uVrms
- With Auto Discharge Function
- OTP, OCP, SCP
- Part No. and Package Information

Part No.	Package	MSL
ET537XXY1B	DFN4 (0.8mm × 0.8mm)	1

Applications

- Smart Phones and Cellular Phones
- PDAs
- Digital Still Cameras
- Portable instrument
- Bluetooth, wireless handsets

Mark Specification

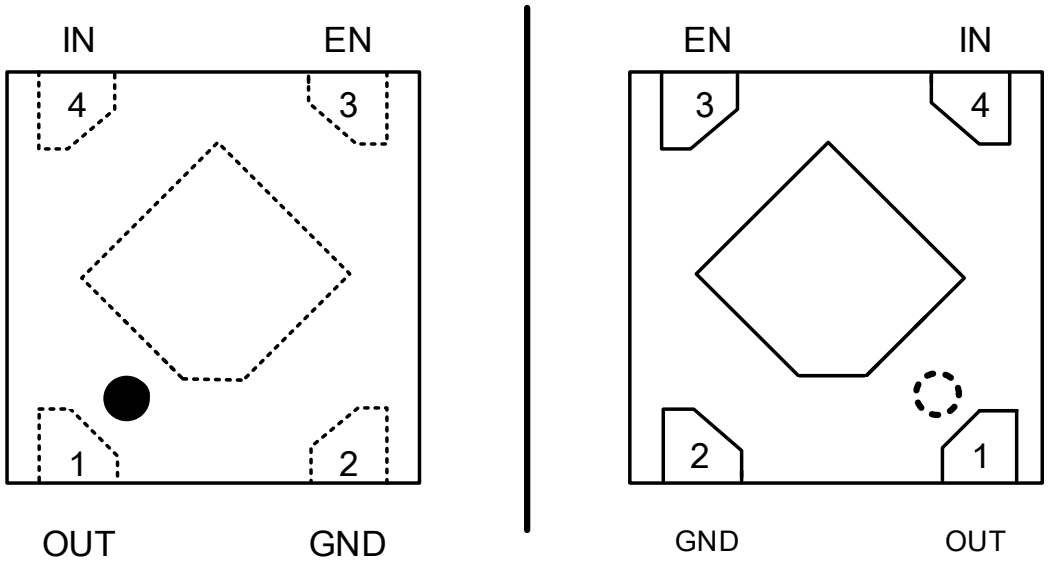
Part No.	Marking	V_{OUT}	Auto Discharge Function
ET53711Y1B	IX	1.1V	Y
ET53712Y1B	AX	1.2V	Y
ET53718Y1B	CX	1.8V	Y
ET53722Y1B	QX	2.2V	Y
ET53728Y1B	DX	2.8V	Y
ET537285Y1B	HX	2.85V	Y
ET53730Y1B	GX	3.0V	Y
ET53731Y1B	ZX	3.1V	Y
ET53733Y1B	EX	3.3V	Y

Device information

ET 537 XX Y1 B

XX Output Voltage		X Package		B Auto-discharge Function	
XX	V_{OUT} = X.XV	Y1	DFN4 (0.8mm × 0.8mm)	B	Auto-discharge

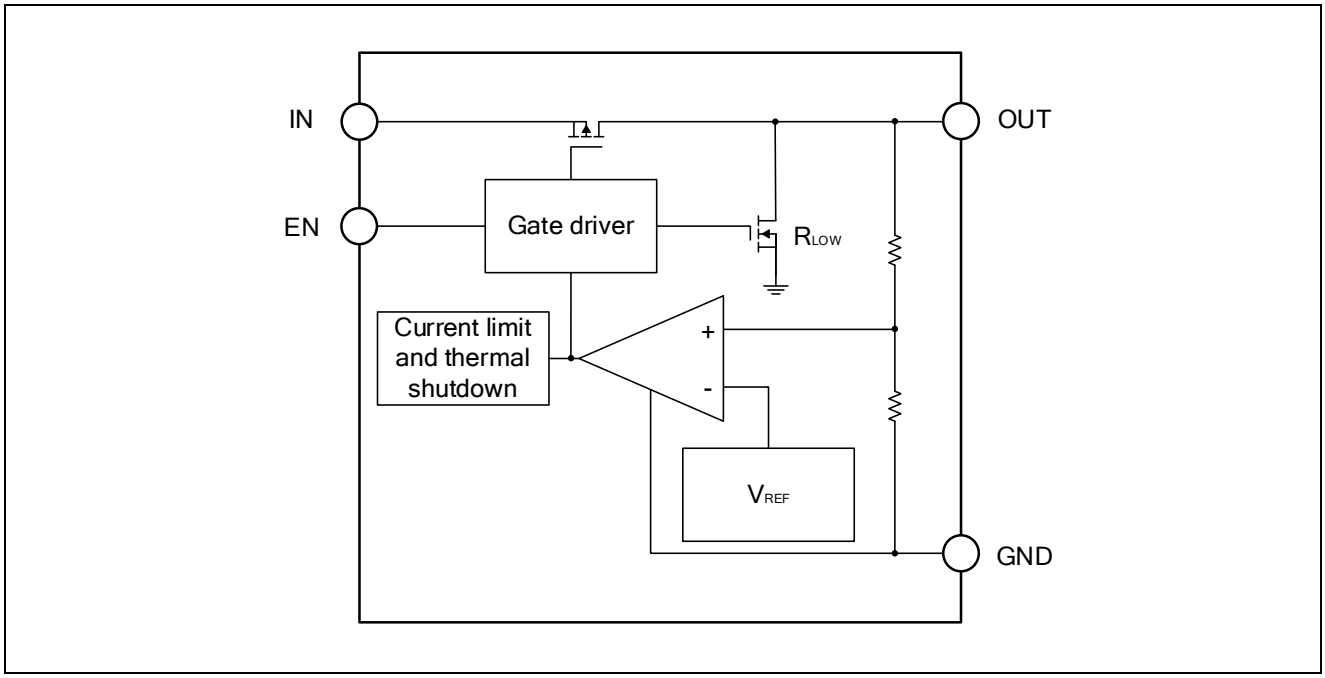
Pin Configuration



Pin Function

Pin No.	Pin Name	Pin Function
1	OUT	Output pin. Bypass a 1μF Ceramic Capacitor from This Pin to Ground.
2	GND	Ground Pin.
3	EN	Enable Control Input, Active High. Do not leave EN floating.
4	IN	Supply Input Pin. Must be closely decoupled to GND with a 1μF or greater ceramic capacitor.
-	Thermal Pad	Thermal Pad Connected to GND or Leave Floating. Do not connect to any potential other than GND.

Block Diagram



Functional Description

Input Capacitor

A 1μF ceramic capacitor is recommended to connect between V_{IN} and GND pins to decouple input power supply glitch and noise. The amount of the capacitance may be increased without limit. This input capacitor must be located as close as possible to the device to assure input stability and less noise. For PCB layout, a wide copper trace is required for both V_{IN} and GND.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is 1μF or larger, Equivalent Series Resistance (ESR) is from 5mΩ to 100mΩ, and temperature characteristics are X7R or X5R. Higher capacitance values help to improve load/line transient response. The output capacitance may be increased to keep low undershoot/overshoot. Place output capacitor as close as possible to OUT and GND pins.

ON/OFF Input Operation

The ET537XXY1B is turned on by setting the EN pin high, and is turned off by pulling it low. If this feature is not used, the EN pin should be tied to IN pin to keep the regulator output on at all time.

High PSRR and Low Noise

In order to provide good audio quality, the audio power supply for hand-free, game, MP3, and multimedia applications in cellular phones, require low-noise and high PSRR at audio frequency range (20Hz-20kHz).

The ET537XXY1B, with PSRR of 70dB at 1KHz, is suitable for most of these applications that require high PSRR and low noise.

Fast Transient Response

Fast transient response LDOs can also extend battery life. TDMA-based cell phone protocols such as Global System for Mobile Communications (GSM) have a transmit/receive duty factor of only 12.5 percent, enabling power savings by putting much of the baseband circuitry into standby mode in between transmit cycles. In baseband circuits, the load often transitions virtually instantaneously from 100μA to 100mA. To meet this load requirement, the LDO must react very quickly without a large voltage drop or overshoot - a requirement that cannot be met with conventional, general-purpose LDOs.

The ET537XXY1B's fast transient response from 1 to 300mA provides stable voltage supply for fast DSP and GSM chipset with fast changing load.

Low Quiescent Current

The ET537XXY1B consuming only around 45μA for all input range and output loading, provides great power saving in portable and low power applications.

Current Limit Protection

When output current at the OUT pin is higher than current limit threshold or the OUT pin is short circuit to GND, the current limit protection will be triggered and clamp the output current to approximately 500mA to prevent over-current and to protect the regulator from damage due to overheating.

Thermal Shutdown Protection

Thermal protection disables the output when the junction temperature rises to approximately +155°C, allowing the device to cool down. When the junction temperature reduces to approximately +130°C the output circuitry is enabled again. Depending on power dissipation, thermal resistance, and ambient temperature, the thermal protection circuit may cycle on and off. This cycling limits the heat dissipation of the regulator, protecting it from damage due to overheating.

Absolute Maximum Ratings

Symbol	Parameters (Items)	Value	Unit
V_{IN}	IN Voltage (IN Pin)	-0.3 to 6	V
V_{EN}	Input Voltage (EN Pin)	-0.3 to 6	V
V_{OUT}	Output Voltage	-0.3 to V_{IN}+0.3	V
I_{MAX}	Maximum Load Current	300	mA
P_D	Maximum Power Consumption	350	mW
ESD	Human Body Model (JEDEC JS-001)	±4000	V
	Charged Device Model (JEDEC JS-002)	±1500	V
$R_{\theta JA}$	Junction-to-ambient Thermal Resistance	285	°C/W
T_J	Operating Junction Temperature	-40 to 150	°C
T_{STG}	Storage Temperature	-65 to 150	°C
T_{SLOD}	Lead Temperature (Soldering, 10 sec)	300	°C

Recommended Operating Conditions

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	1.6 to 5.5	V
I_{OUT}	Output Current	0 to 300	mA
T_A	Operating Ambient Temperature	-40 to 85	°C
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	5 to 100	mΩ

Electrical Characteristics (1)

(V_{IN} = V_{EN} = V_{OUT} + 1.0V, I_{OUT} = 1mA, C_{IN} = 1μF, C_{OUT} = 1μF, Typical values are at T_A = 25°C unless otherwise noted)

Symbol	Parameter	Test Conditions		Min	Typ	Max	Unit
V_{IN}	Input Voltage Operation Range			1.6		5.5	V
V_{DROP}	Dropout Voltage (2)	V_{OUT} = 1.2V, I_{OUT} = 300mA			320	400	mV
		V_{OUT} = 1.8V, I_{OUT} = 300mA			190	310	
		V_{OUT} = 2.8V, I_{OUT} = 300mA			155	280	
		V_{OUT} = 3.0V, I_{OUT} = 300mA			150	240	
		V_{OUT} = 3.3V, I_{OUT} = 300mA			140	220	
I_{Q_ON}	DC Supply Quiescent Current	Active Mode: V_{EN} = V_{IN}			45	80	μA
$I_{Q\ OFF}$	DC Supply Shutdown Current	V_{EN} = 0V			0.01	1	μA
V_{OUT}	Regulated Output Voltage	V_{OUT} ≥ 2.0V, V_{IN} = V_{OUT} + 1V, I_{OUT} = 1mA, T_A = 25°C		-1.5		1.5	%
		V_{OUT} < 2.0V, V_{IN} = V_{OUT} + 1V, I_{OUT} = 1mA, T_A = 25°C		-30		30	mV
Reg_{LINE}	Output Voltage Line Regulation	V_{IN} = V_{OUT} + 1V to 5.5V, I_{OUT} = 10mA				0.2	%/V
Reg_{LOAD}	Output Voltage Load Regulation	I_{OUT} from 1mA to 300mA			20	60	mV
I_{LIMIT}	Current Limit			350	650	850	mA
I_{SHORT}	Short Circuit Current Limit	V_{OUT} = 0V			120		mA
PSRR	Power Supply Rejection Ratio	V_{IN} = $V_{IN\text{-}set}$ + 200mVpp, C_{OUT} = 1μF, I_{OUT} = 10mA	f = 1kHz		70		dB
			f = 100kHz		54		dB
			f = 1MHz		45		dB
e_N	Output Noise	10Hz to 100kHz, I_{OUT} = 100mA, C_{OUT} = 1μF			20		$μV_{RMS}$
V_{ENL}	EN Low Threshold					0.4	V
V_{ENH}	EN High Threshold			0.9			V
R_{LOW}	Output Discharge FET Rdson	V_{IN} = 4V, I_{OUT} = 10mA			120		Ω
R_{EN}	EN pull-down Resistance				1		MΩ
t_S	Soft-start Time	From Enable to 90%V_{OUT_normal}			50		μs
T_{TSD}	Over-Temperature Shutdown Threshold	T_J Rising			155		°C
T_{HYS}	Over-Temperature Shutdown Hysteresis	T_J Falling from Shutdown			20		°C

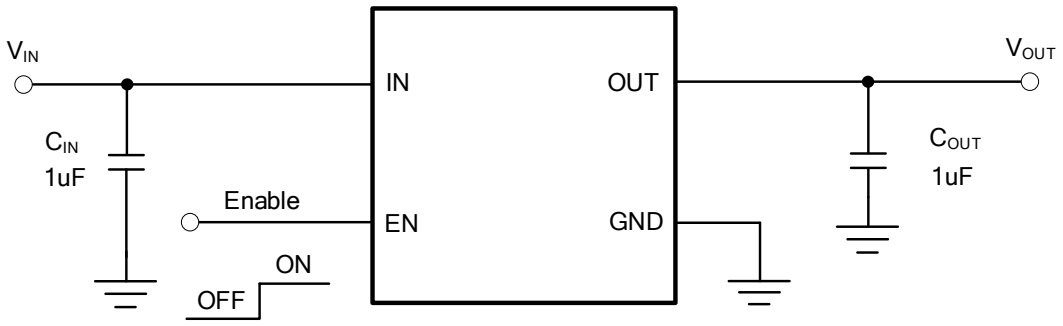
Notes:

1: Production test at +25°C. Specifications over the temperature range are guaranteed by design and characterization.

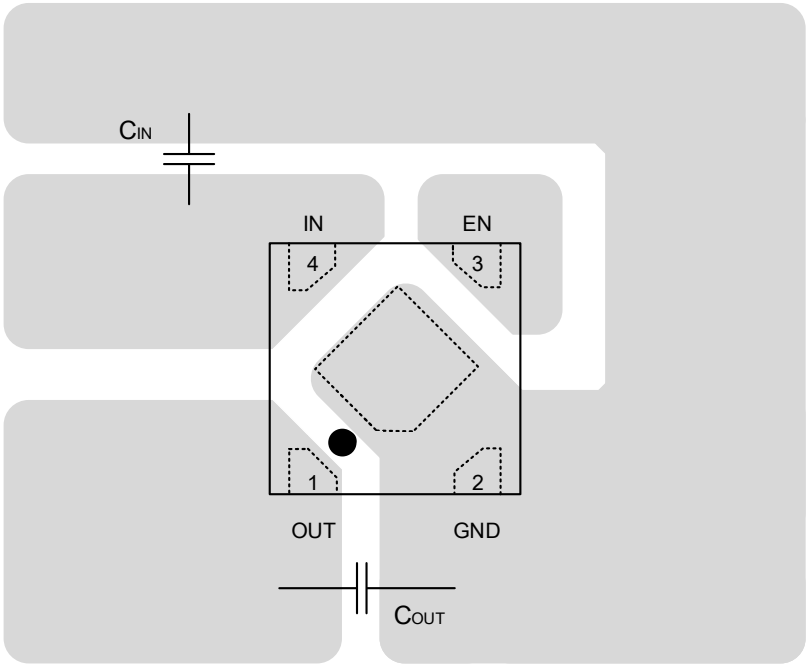
2: The minimum operating voltage is 1.6V. The calculation formula is as follows:

$$V_{DROP} = V_{IN(min)} - V_{OUT}$$

Application Circuits



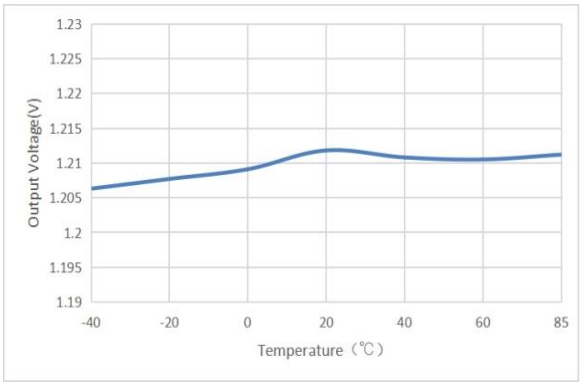
PCB Layout Guide



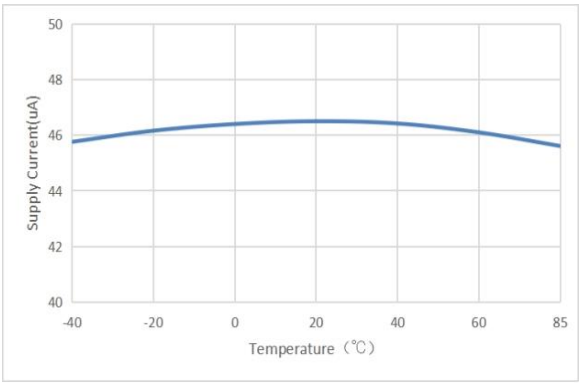
Typical Characteristics

(1) VOLTAGE VERSION 1.2 V

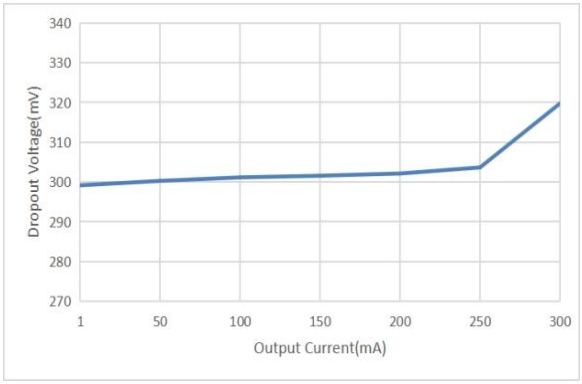
(V_{IN} = 2.2V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1.0μF, unless otherwise noted. Typical values are at T_A = 25°C.)



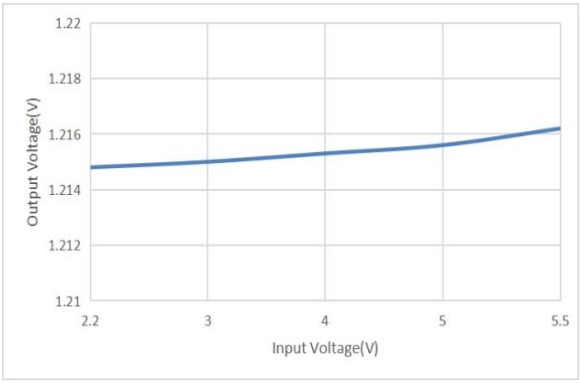
Output Voltage VS Temperature



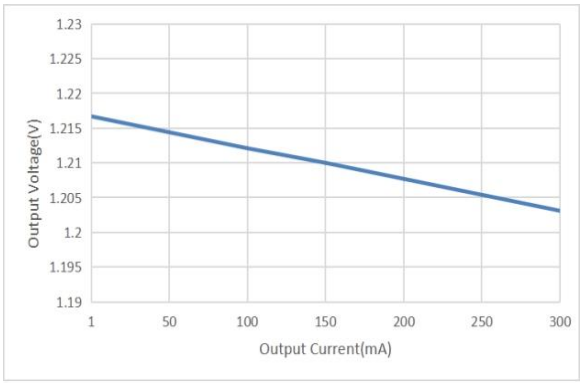
Supply Current VS Temperature



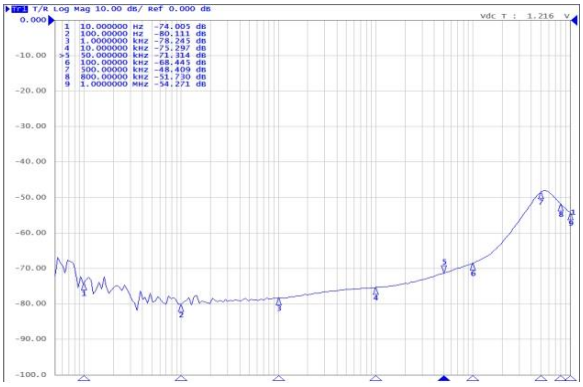
Dropout Voltage VS Output Current



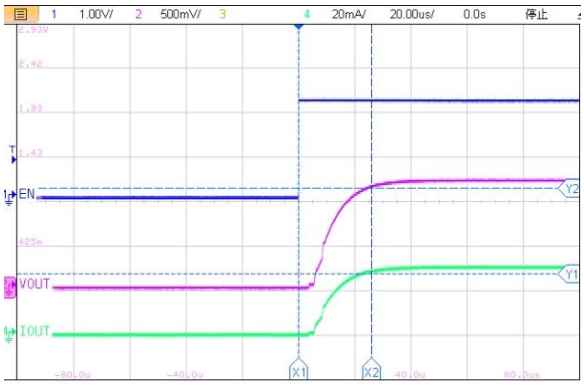
Output Voltage VS Input Voltage(I_{OUT} = 10mA)



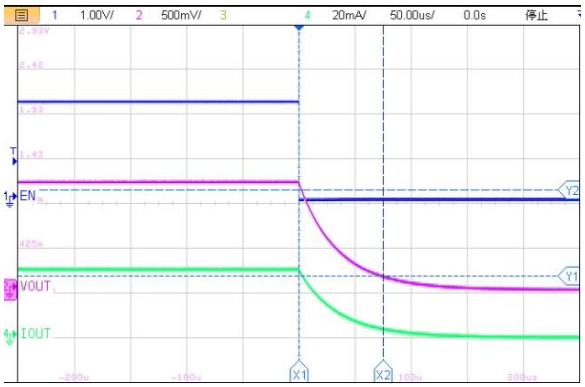
Output Voltage VS Output Current



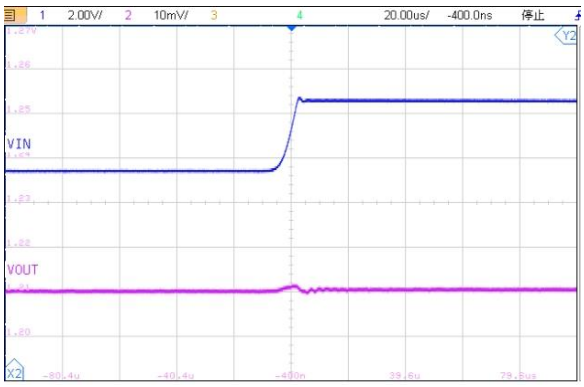
PSRR VS Output Current(I_{OUT} = 10mA)



Turn On Speed VS EN Voltage (I_{OUT} = 30mA)

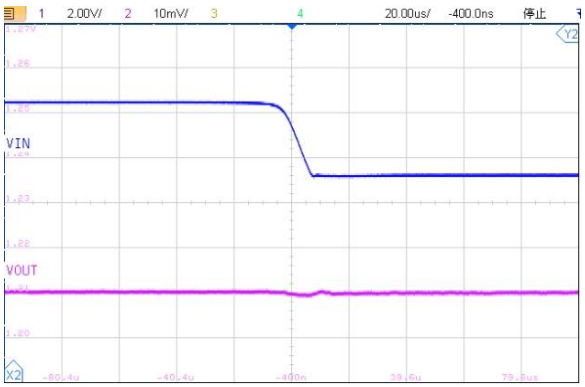


Turn Off Speed VS EN Voltage (I_{OUT} = 30mA)



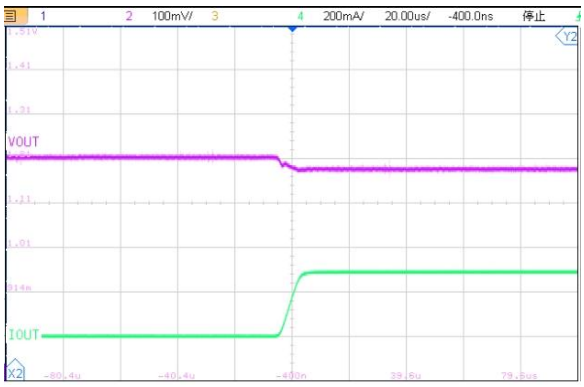
Line Transient Response

V_{IN} = 2.2V~5.5V, V_{OUT} = 1.2V, I_{OUT} = 1mA



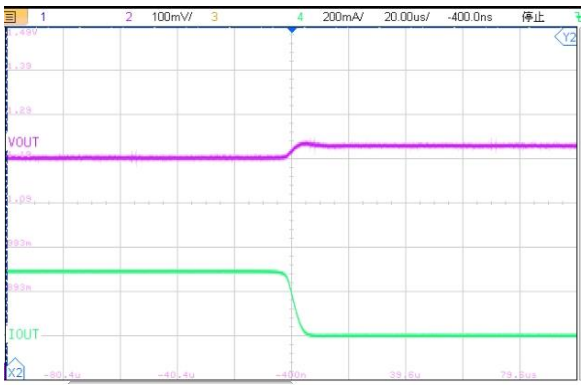
Line Transient Response

V_{IN} = 5.5V~2.2V, V_{OUT} = 1.2V, I_{OUT} = 1mA



Load Transient Response

V_{IN} = 2.2V, V_{OUT} = 1.2V, I_{OUT} = 1mA~300mA

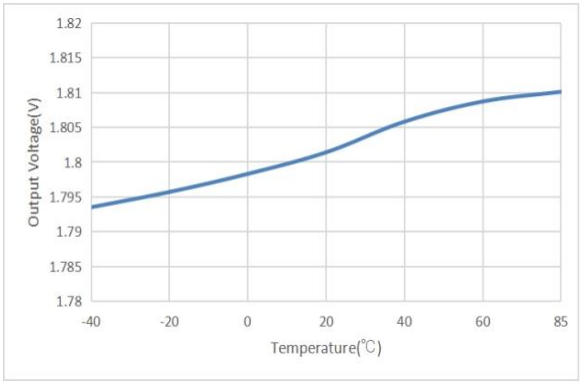


Load Transient Response

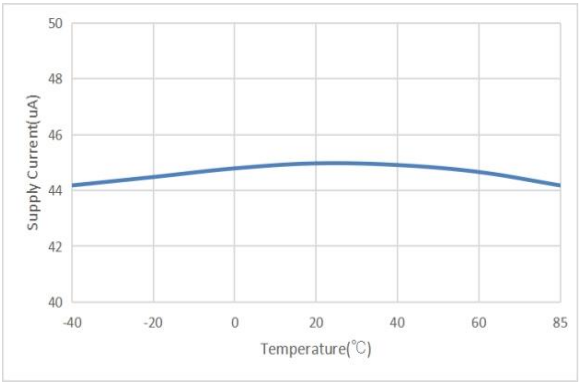
V_{IN} = 2.2V, V_{OUT} = 1.2V, I_{OUT} = 300mA~1mA

(2) VOLTAGE VERSION 1.8 V

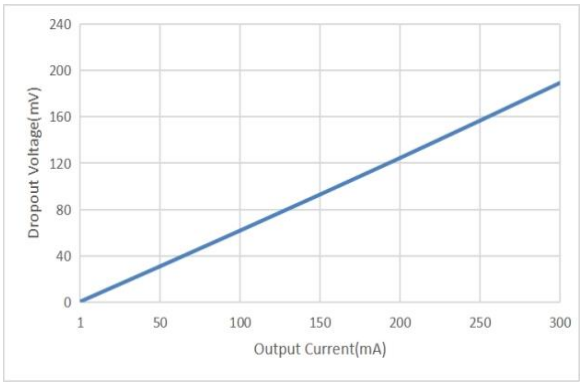
(V_{IN} = 2.8V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1.0μF, unless otherwise noted. Typical values are at T_A = 25°C.)



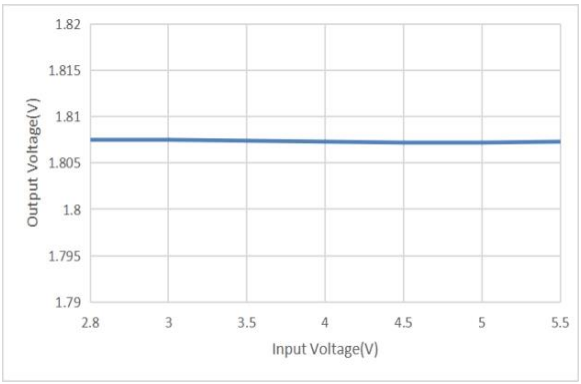
Output Voltage VS Temperature



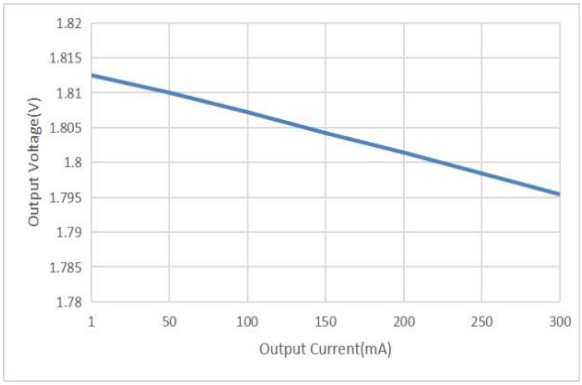
Supply Current VS Temperature



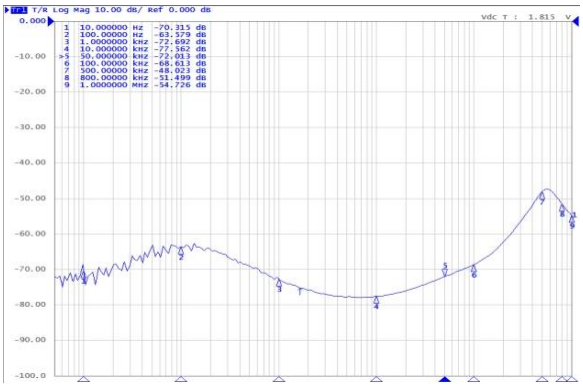
Dropout Voltage VS Output Current



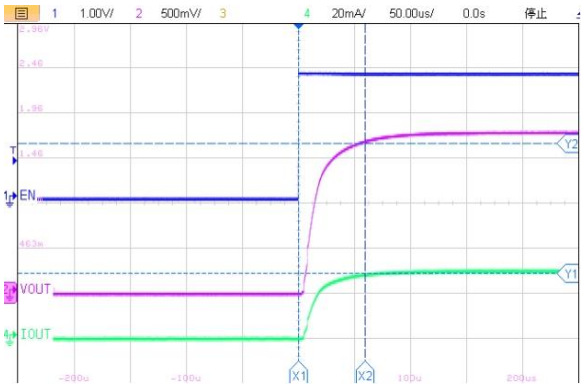
Output Voltage VS Input Voltage(I_{OUT} = 10mA)



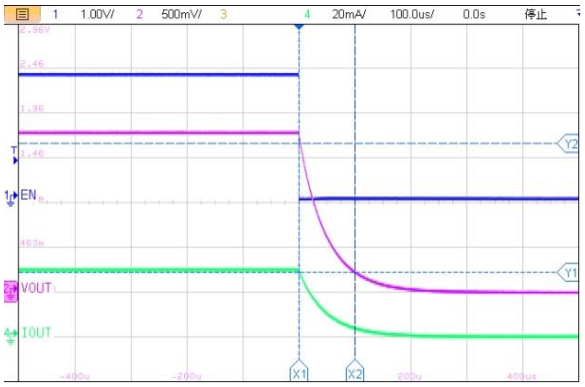
Output Voltage VS Output Current



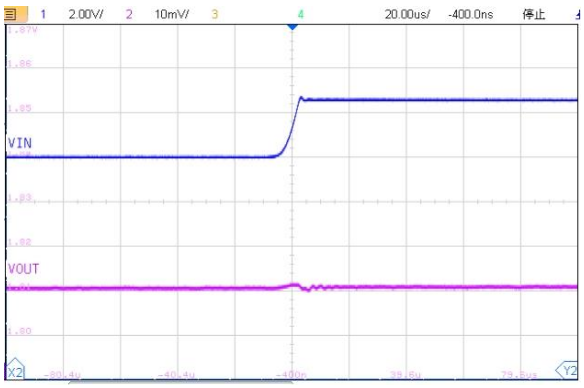
PSRR VS Output Current(I_{OUT} = 10mA)



Turn On Speed VS EN Voltage (I_{OUT} = 30mA)

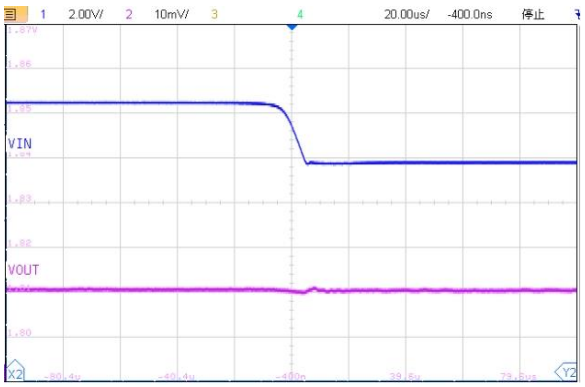


Turn Off Speed VS EN Voltage (I_{OUT} = 30mA)



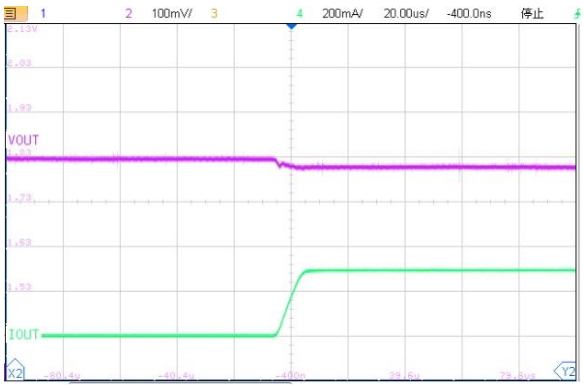
Line Transient Response

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



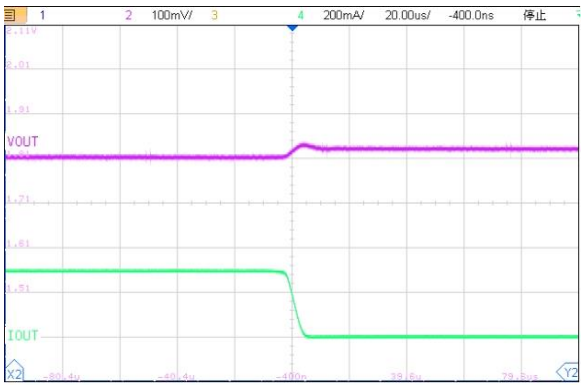
Line Transient Response

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

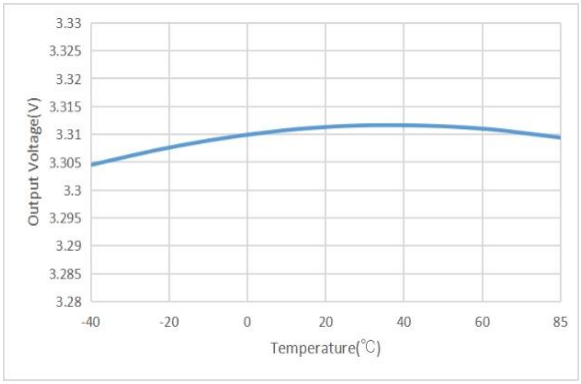


Load Transient Response

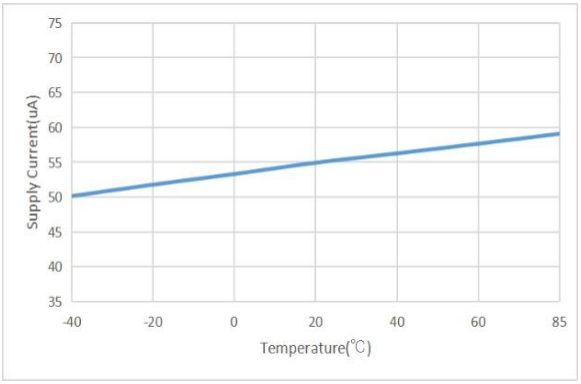
V_{IN}=2.8V, V_{OUT} = 1.8V, I_{OUT} = 300mA~1mA

(3) VOLTAGE VERSION 3.3 V

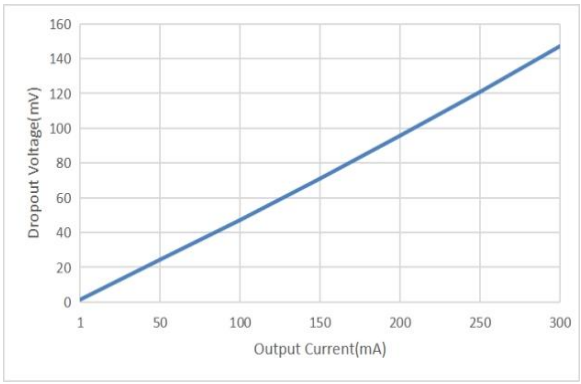
(V_{IN} = 3.3V; I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1.0μF, unless otherwise noted. Typical values are at T_A = 25°C.)



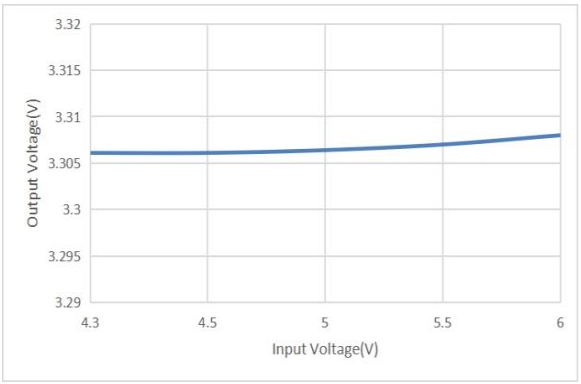
Output Voltage VS Temperature



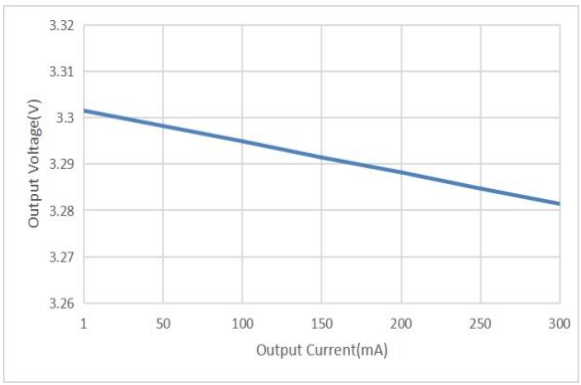
Supply Current VS Temperature



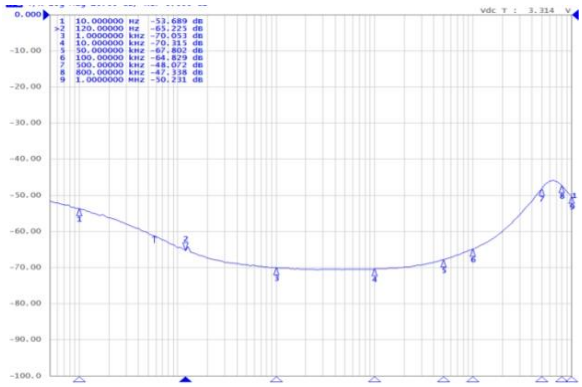
Dropout Voltage VS Output Current



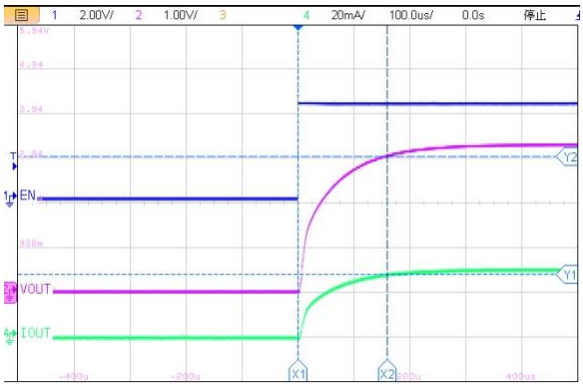
Output Voltage VS Input Voltage



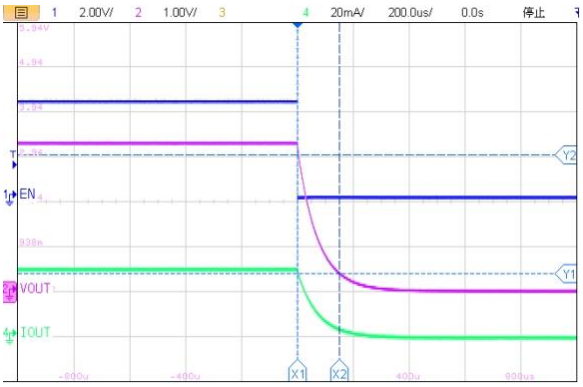
Output Voltage VS Output Current



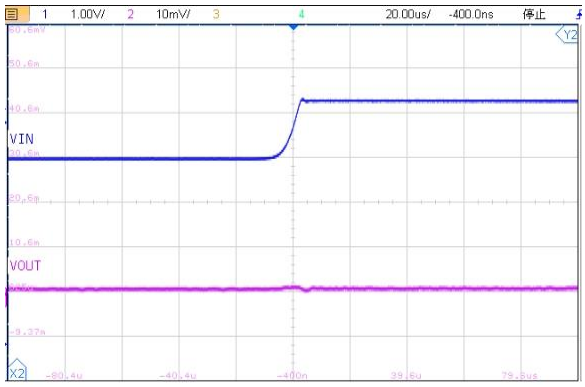
PSRR VS Output Current(I_{OUT} = 10mA)



Turn On Speed VS EN Voltage (I_{OUT} = 30mA)

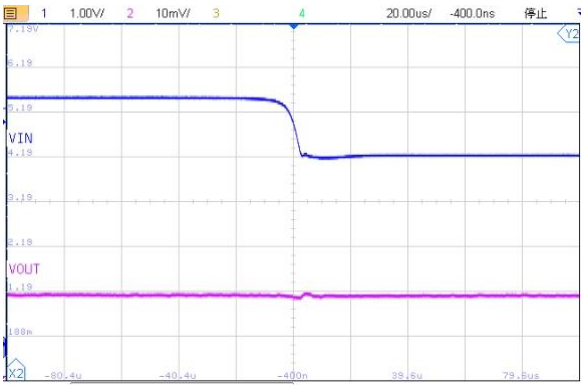


Turn Off Speed VS EN Voltage (I_{OUT} = 30mA)



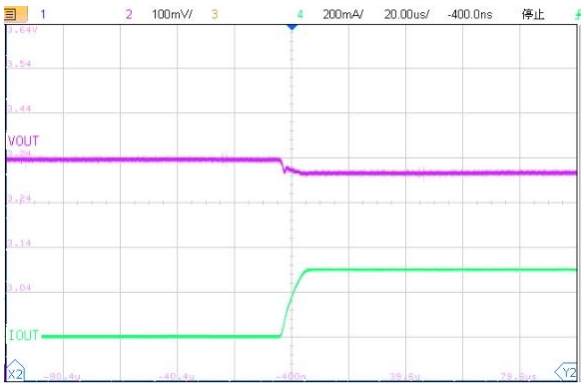
Line Transient Response

V_{IN} = 4.3V~5.5V, V_{OUT} = 3.3V, I_{OUT} = 1mA



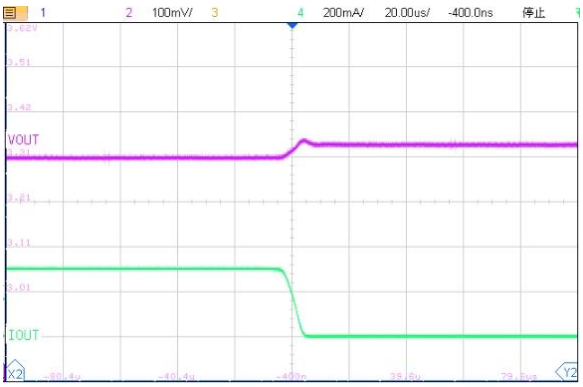
Line Transient Response

V_{IN} = 5.5V~4.3V, V_{OUT} = 3.3V, I_{OUT} = 1mA



Load Transient Response

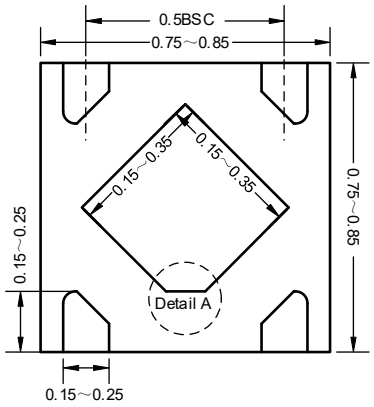
V_{IN} = 4.3V, V_{OUT} = 3.3V, I_{OUT} = 1mA~300mA

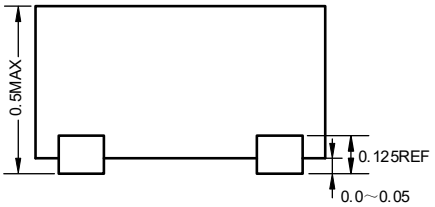


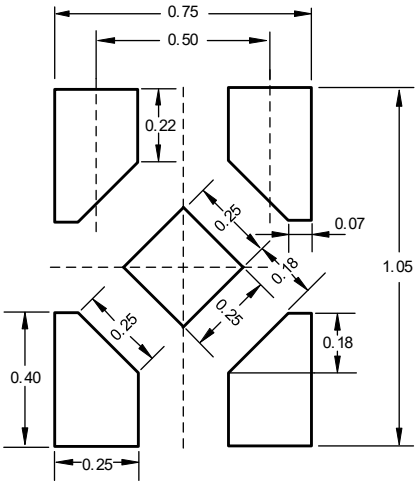
Load Transient Response

V_{IN} = 4.3V, V_{OUT} = 3.3V, I_{OUT} = 300mA~1mA

Package Dimension

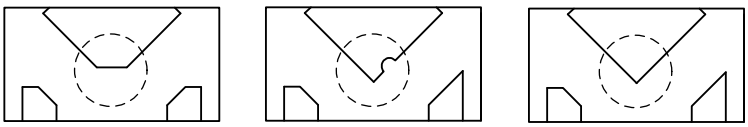






Recommended Land Pattern

Detail A: (PIN1 shape)



Unit: mm

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2025-04-27	Preliminary Version	Hucy	Liuxm	Liujy
0.1	2025-12-20	Update EC Table	Yangxx	Liuxm	Liujy
0.2	2026-01-07	Update I_{LIMIT} Value	Yangxx	Liuxm	Liujy
1.0	2026-03-11	Official Version	Yangxx	Liuxm	Liujy