Very-Low Dropout High PSRR 1A LDO

General Description

ET5A0XXYB is the fixed output 1A LDO with auto discharge function, it uses an advanced CMOS process and a PMOSFET pass device to achieve high power supply rejection ratio (PSRR), low noise, very low dropout, fast start-up and excellent output accuracy.

ET5A0XXYB is stable with a 1.0μF ceramic output capacitor, uses a precision voltage reference and feedback loop to achieve excellent Regulation and transient response. It can choose the output current between 500mA and 1A by setting the LCON pin to high or low.

ET5A0XXYB is offered in a small DFN8 (1.2mm × 1.6mm) package, which is ideal for small form factor portable equipment.

Features

- Wide Input Voltage Range from 1.8V to 5.5V
- Output Current 500mA/1A Optional
- Output Voltage is 1.2V 1.8V 2.8V 3.0V 3.3V etc
- Low I_Q is Typical 110μA
- Excellent Load/Line Transient Response
- Low Dropout Voltage is 135mV@1A/3.3V Output Current
- Built-in Over-current Protection and Thermal Shutdown Circuit
- Built-in Inrush Current Suppression Circuit and Current Limit Circuit
- Reverse Current Protection
- Part No. and Package Information

Part No.	Package	MSL
ET5A0XXY1B	DFN8 (1.2mm × 1.6mm)	Level 1

Applications

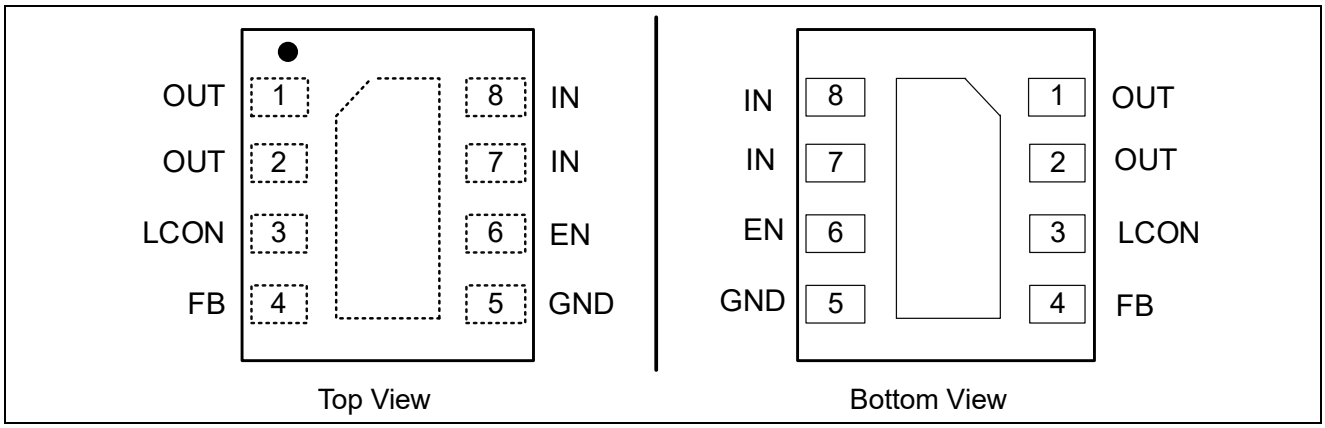
- Constant-voltage Power Supply for Battery-powered Device
- Constant-voltage Power Supply for TV, Notebook PC and Home Electric Appliance

Device Information

ET 5A0 XX Y B

Output Voltage		Package		Auto-discharging Function	
XX	X.XV fixed output	**Y**	DFN8 (1.2mm × 1.6mm)	**B**	Available

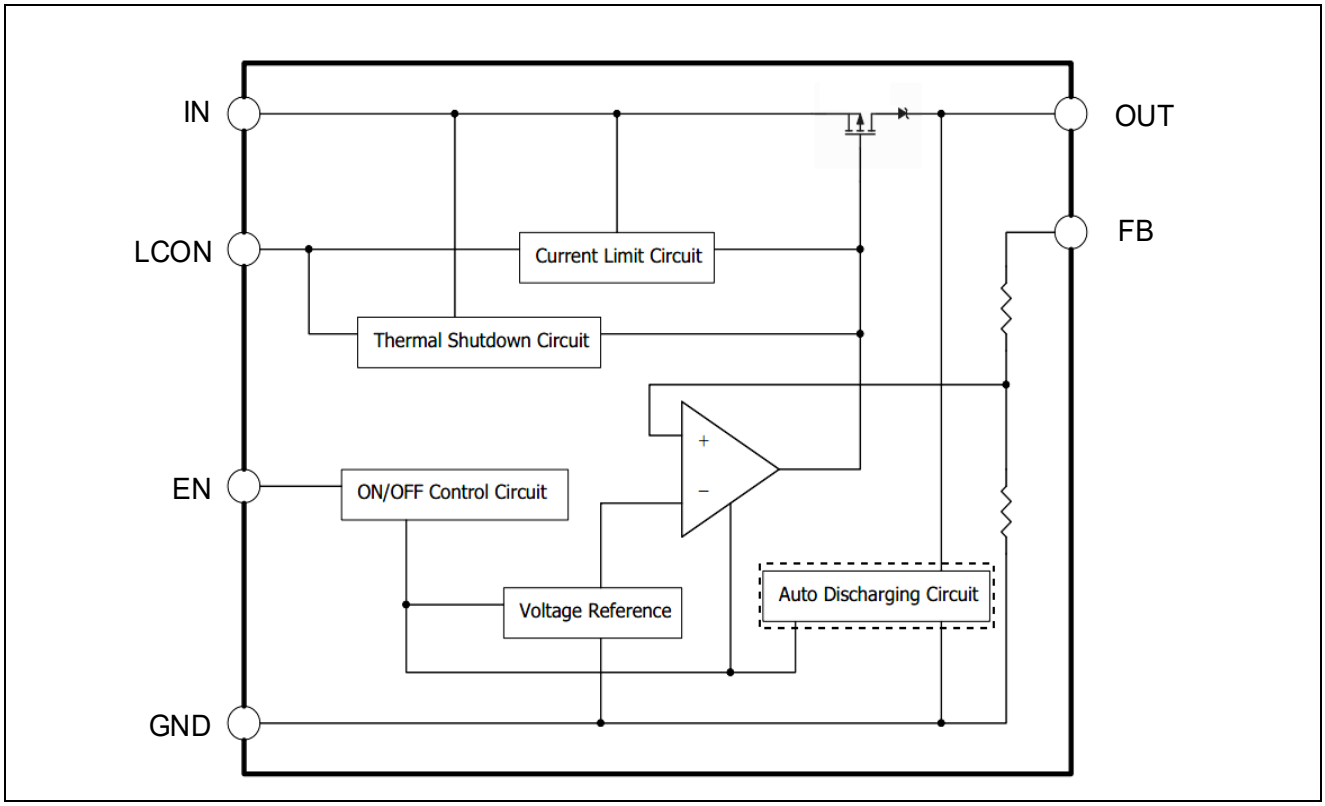
Pin Configuration



Pin Function

Pin	Symbol	Pin Description
1	OUT	Output Pin
2	OUT	Output Pin
3	LCON	Output Current Limit Alternate Pin (“H” = 1A, “L” = 500mA)
4	FB	Feedback Pin
5	GND	Ground Pin
6	EN	Chip Enable Pin
7	IN	Input Pin
8	IN	Input Pin

Block Diagram



Functional Description

Input Capacitor

A 1μF ceramic capacitor is recommended to connect between 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 IN and GND.

Please pay attention, in the case of high impedance of the power supply, the input capacitance of the IC is small or the capacitor is not connected, the oscillation may occur. When the capacitance value of the output capacitor is greater than the capacitance value of the input capacitor, it is possible to generate oscillation.

Output Capacitor

An output capacitor is required for the stability of the LDO. The recommended output capacitance is 1μF, ceramic capacitor is recommended, 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.

EN Pin Operation

The ET5A0XXYB is turned on by setting the EN pin to “H”. Since the EN pin is neither pulled down nor pulled up internally, do not set it in floating status. When the EN pin is not used, connect the EN pin with IN to keep the LDO in operating mode.

Current Limit Protection

When output current of OUT pin is higher than current limit threshold or the OUT pin is direct short to GND, the current limit protection will be triggered and clamp the output current at a predesigned level to prevent over-current and thermal damage.

When setting the LCON pin to “H”， ET5A0XXYB output current limit will be 1A(min), When setting the LCON pin to “L”，ET5A0XXYB output current limit will be 500mA(min).

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 +120°C the output circuit 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.

LCON Pin Operation

ET5A0XXYB can be set to different current limit by alternating the LCON pin to “H” or “L”. When setting the LCON pin to “H”, the output current limit will be 1A(min), the short current limit will be 110mA, and the IRUSH 500mA; If “L” is set, the output current limit will change to 500mA(min), the short current limit and IRUSH will become 60mA and 300mA respectively.

Reverse Current Protection Circuit

If V_{OUT} is higher than V_{IN}, the parasitic diode of Pch output transistor becomes forward direction. As a result, the current flows from OUT pin to IN pin.

The ET5A0XXYB series switches the mode to the reverse current protection mode before V_{IN} becomes lower than V_{OUT} by connecting the parasitic diode of Pch output transistor to the backward direction, and connecting the gate to OUT pin. As a result, the Pch output transistor is turned off. However, from OUT pin to GND pin, via the internal divider resistors, very small current IREV flows.

Absolute Maximum Ratings

Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other condition beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	-0.3 to 6.0	V
V_{EN}	Input Voltage (EN Pin)	-0.3 to 6.0	V
V_{LCON}	Input Voltage (LCON Pin)	-0.3 to 6.0	V
V_{OUT}	Output Voltage	-0.3 to 6.0	V
P_D	Max Power Dissipation (Standard Land Pattern) T_A=25ºC	625	mW
T_J	Max Junction Temperature	+150	ºC
T_A	Operating Temperature Range	-40 to + 85	ºC
T_{STG}	Storage Temperature Range	-65 to + 150	ºC
V_{ESD}	Human Body Model (JEDEC JS-001)	±6000	V
	Charged Device Model (JEDEC JS-002)	±2000	V

Recommended Operating Conditions

Symbol	Item	Rating	Unit
V_{IN}	Input Voltage	1.8 to 5.5	V
I_{OUT}	Output Current	0 to 1000	mA
T_A	Operating Ambient Temperature	-40 to 85	°C
C_{IN}	Effective Input Ceramic Capacitor Value	1 to 10	µF
C_{OUT}	Effective Output Ceramic Capacitor Value	1 to 10	µF
ESR	Input and Output Capacitor Equivalent Series Resistance	5 to 100	mΩ

Electrical Characteristics

V_{IN} = V_{OUT} + 1.0V, I_{OUT} = 1mA, C_{IN} = C_{OUT} = 1uF, unless otherwise noted, T_A = 25ºC

Symbol	Item	Conditions		Min.	Typ.	Max.	Unit
V_{OUT}	Output Voltage			×0.98		×1.02	V
V_{IN}	Input Voltage (1)			1.8		5.5	V
I_{LIM}	Output Current Limit	V_{IN} = V_{OUT} + 0.5V	LCON = L	500			mA
			LCON = H	1000			mA
ΔV_{LINE}	Line Regulation	V_{OUT} + 0.5V ≤ V_{IN} ≤ 5.5V			0.02		%/V
ΔV_{LOAD}	Load Regulation	V_{IN} = V_{OUT} + 0.5V, 1mA ≤ I_{OUT} ≤ 1A			5	40	mV
V_{DIF}	Dropout Voltage (2)	1.2V ≤ V_{OUT} < 2.6V, I_{OUT} = 1A, V_{OUT} Dropping to 0.98 × V_{OUT}			170	220	mV
		2.6V ≤ V_{OUT} < 3.3V, I_{OUT} = 1A, V_{OUT} Dropping to 0.98 × V_{OUT}			150	185	mV
		3.3V ≤ V_{OUT} ≤ 4.3V, I_{OUT} = 1A, V_{OUT} Dropping to 0.98 × V_{OUT}			135	170	mV
I_{Q_ON}	Supply Current	I_{OUT} = 0mA			110		μA
I_{Q_OFF}	Standby Current	V_{EN} = 0V			1	3	μA
PSRR	Ripple Rejection (3)	f = 1kHz, Ripple 0.2Vp-p, V_{IN} = V_{OUT} + 1.0V, I_{OUT} = 30mA			70		dB
e_N	Output Noise (3)	10Hz to 100kHz, I_{OUT} = 30mA			50	80	μV_{RMS}
I_{SC}	Short Current Limit	V_{OUT} = 0V	LCON = L		60		mA
			LCON = H		110		
I_{RUSH}	Inrush Current Limit	LCON = L			300		mA
		LCON = H			500		mA
I_{EN}	EN Pull-down Current					1	μA
V_{IH_EN}	EN Input Voltage High			1.0			V
V_{IL_EN}	EN Input Voltage Low					0.3	V
V_{IH_LCON}	LCON Input Voltage High			1.0			V
V_{IL_LCON}	LCON Input Voltage Low					0.3	V
I_{LCON}	LCON Pull-down Current					1	μA
R_{DIS}	Auto-Discharge Resistance	V_{IN} = 4V, V_{EN} = 0V			60		Ω
T_{TSD}	Thermal Shutdown Temperature				155		ºC
T_{TSR}	Thermal Shutdown Released Temperature				120		ºC

Note (1): Here V_{IN} means internal circuit can work normal. If V_{IN} < V_{OUT}, Reverse current protection circuit will work.

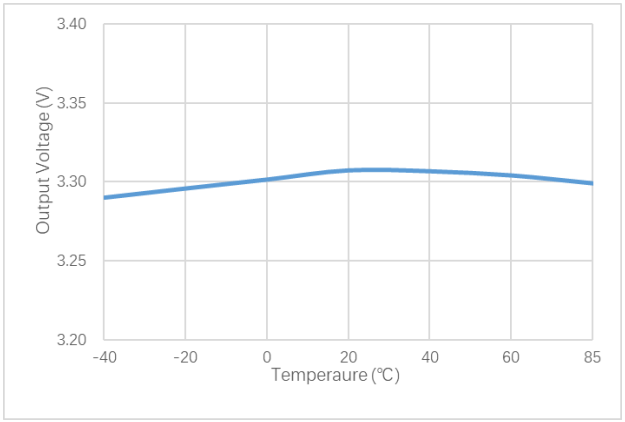
Note (2): V_{DROP} FT test method: test the V_{OUT} voltage at V_{SET} + $V_{DROPMAX}$ with output current.

Note (3): Guaranteed by design and characterization. not a FT item.

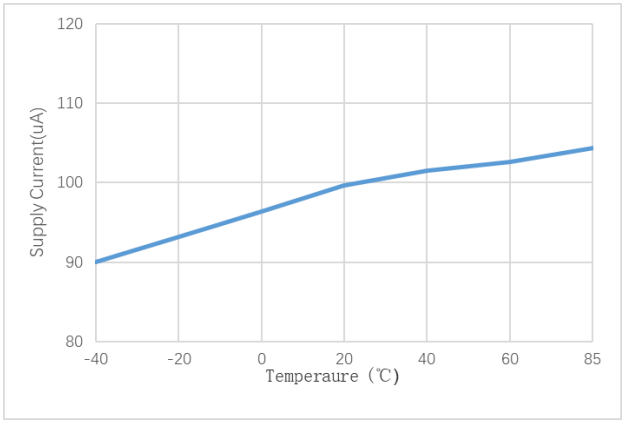
Typical Characteristics

Note: Typical Characteristics are intended to be used as reference data; they are not guaranteed.

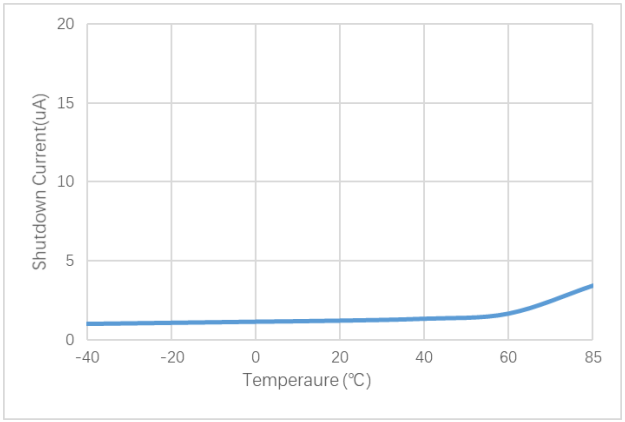
(V_{IN} = 4.3V, V_{OUT} = 3.3V, I_{OUT} = 1mA, C_{IN} = C_{OUT} = Ceramic 1.0μF)



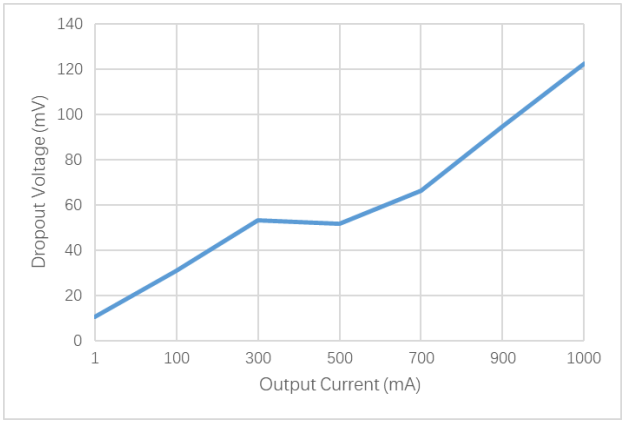
Output Voltage vs. Temperature



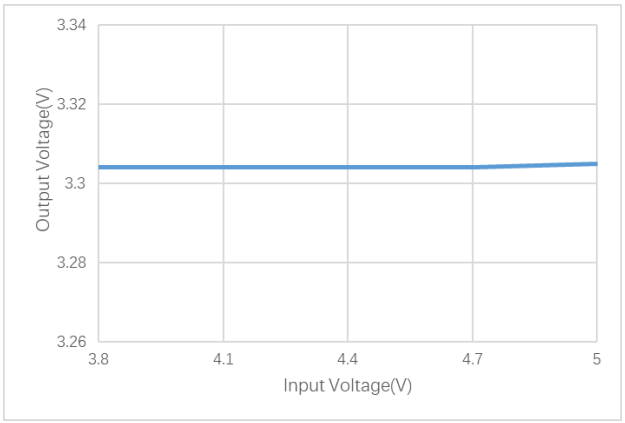
Supply Current vs. Temperature



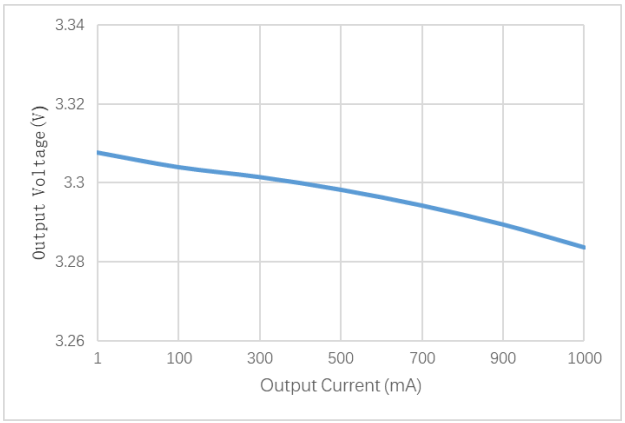
Shutdown Current VS Temperature



Dropout Voltage vs. Output Current

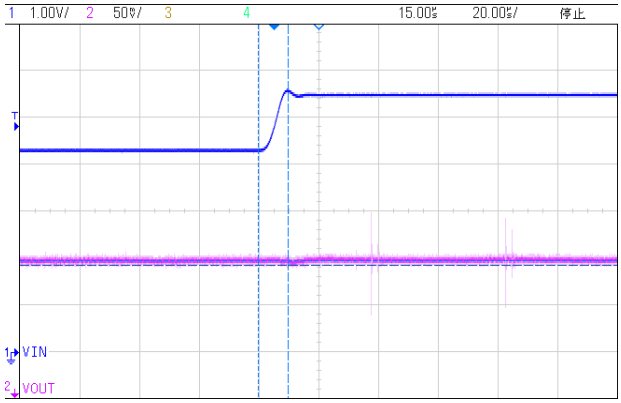


Output Voltage VS Input Voltage

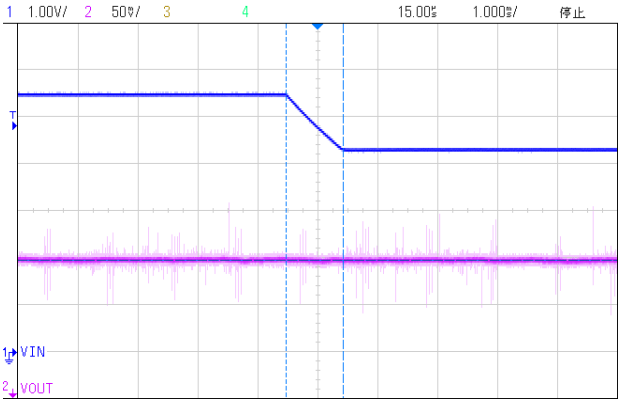


Output Voltage VS Output Current

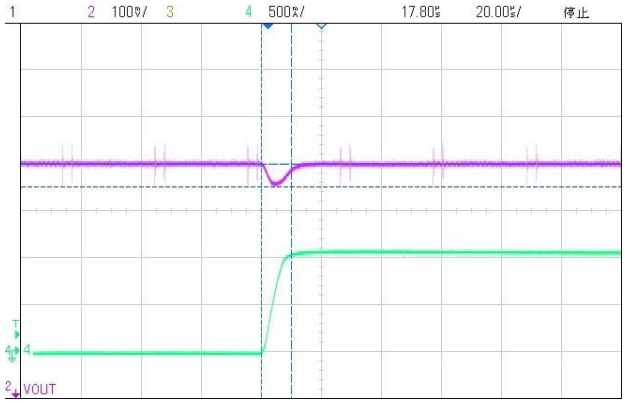
Typical Characteristics(Continued)



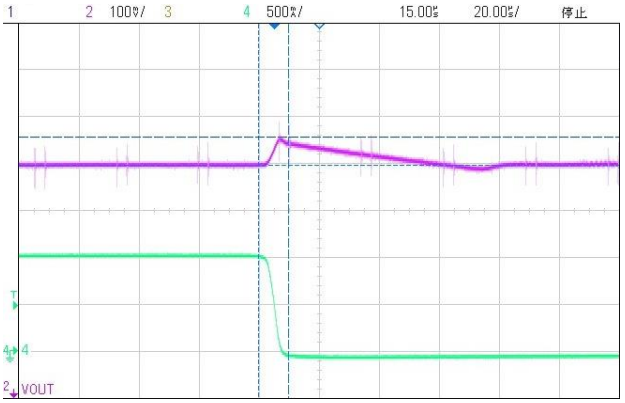
Input Transient Response



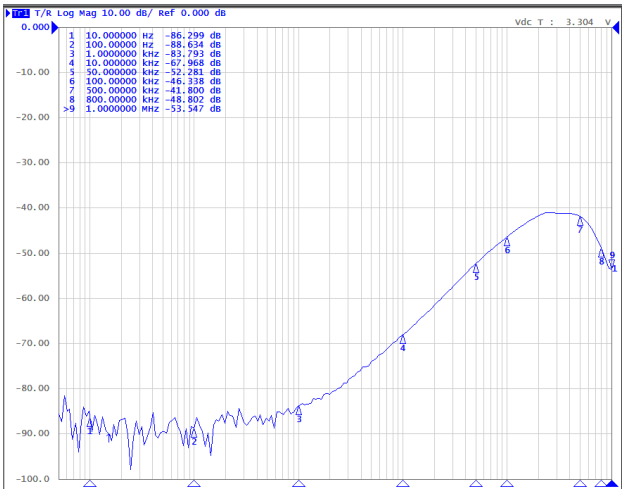
Input Transient Response



Load Transient Response

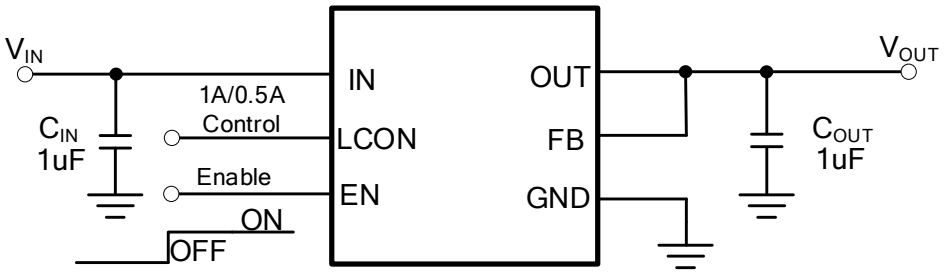


Load Transient Response



PSRR

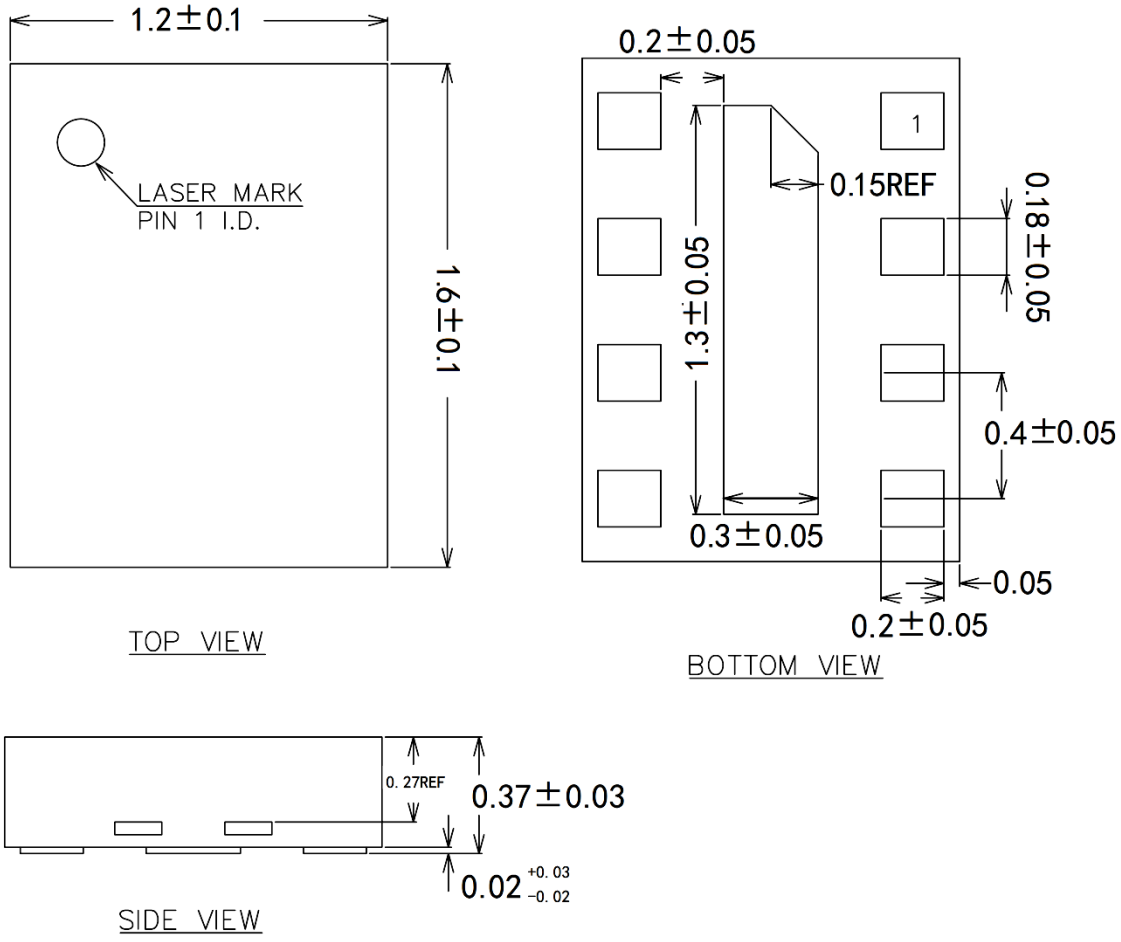
Application Circuits



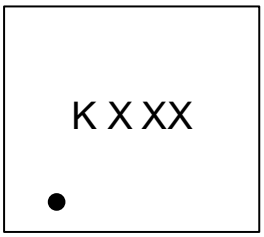
*: This application circuit only supplies for reference.

Package Dimension

DFN8 (1.2mm x 1.6mm) Package



Marking

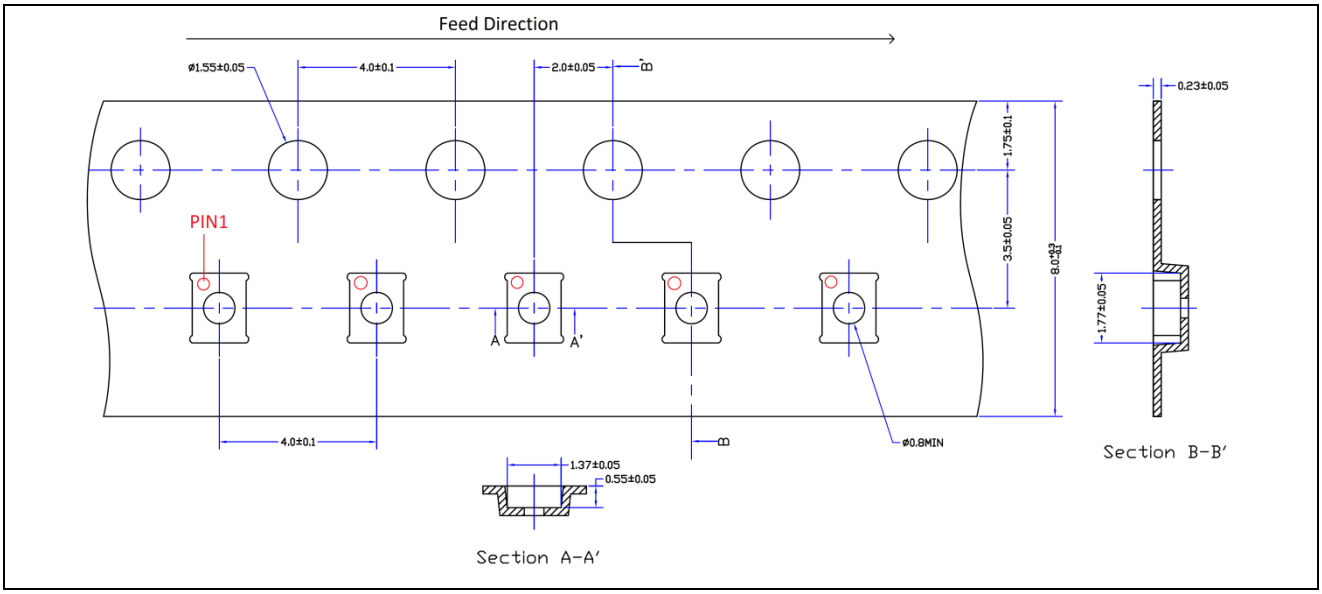


K = Part Number (ET5A0XXYB)

X = V_{OUT} Version

XX = Tracking Number

Tape Information



Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2017-07-28	Original Version	Liuyg	Liuyg	Zhujl
1.1	2018-06-20	Chang the Input Voltage to 5.5V	Liuyg	Liuyg	Liujy
1.2	2020-03-11	Documents Check and Formalize	Shib	Shib	Liujy
1.3	2020-03-18	Add Marking	Shib	Shib	Zhujl
1.4	2021-02-03	Add Typical Characteristic Graph	Shib	Shib	Liujy
1.5	2021-09-24	Add Tape Information	Shib	Shib	Liujy
1.6	2021-09-30	Correct Typo	Liuyg	Liuyg	Liujy
1.7	2022-06-29	Update Fomat	Shib	Liuyg	Liujy
1.8	2023-03-24	Add ESD level	Wangp	Liuyg	Liujy
1.8.a	2026-03-12	Update Fomat	Yuyf	Liuyg	Liujy