ET63H41XX - High Input Very-Low I_Q 300mA LDO

General Description

ET63H41XX series are the high voltage and low power consumption linear regulator. It is capable of supplying 300mA output current. The operating input voltage is up to 40V. The output voltage range is from 1.8V to 5V in fixed output version.

ET63H41XX series are offered SOT23-3, SOT23-5 and SOT89-3 packages.

Features

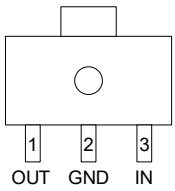
- High Input Voltage: 3.0 to 40V
- 300mA Output Current
- Fixed Output Voltage Options: 1.8V, 3.0V, 3.3V, 3.6V, and 5V
- Output Voltage Accuracy: ±2% at +25°C
- Low Dropout Voltage: 300mA@3.3V = 1500mV
- Low Power Consumption: 4.5μA (TYP)
- Low Temperature Coefficient
- Current Limiting and Thermal Protection
- Available in Green SOT23-3, SOT23-5 and SOT89-3 Packages

Device information

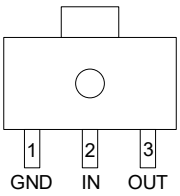
ET 63H41 XX X

XX Output Voltage		X Package		Packing Option	MSL
XX	Output X.X V	B	SOT89-3	Tape and Reel, 1K/Reel	3
		F	SOT89-3	Tape and Reel, 1K/Reel	3
		S	SOT23-3	Tape and Reel, 3K/Reel	3
		/	SOT23-5 (Default)	Tape and Reel, 3K/Reel	3

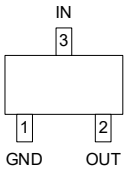
Pin Configuration



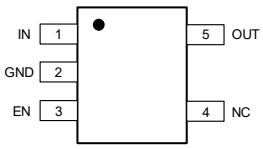
ET63H41XXF(SOT89-3)



ET63H41XXB(SOT89-3)



ET63H41XXS(SOT23-3)



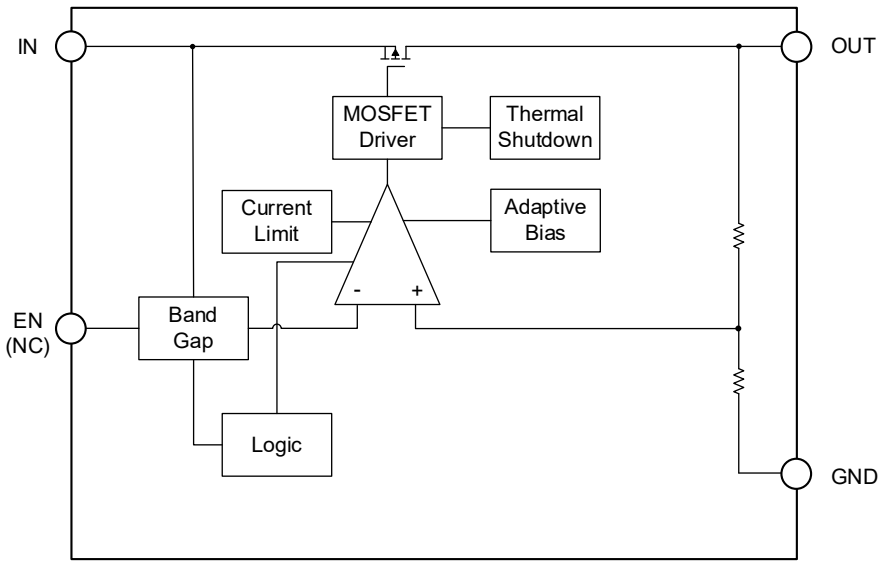
ET63H41XX(SOT23-5)

Top View

Pin Function

Pin No.				Pin Name	Pin Function
SOT89-3		SOT23-3	SOT23-5		
XXF	XXB	XXS	XX		
2	1	1	1	GND	Ground.
3	2	3	2	IN	Supply Input Pin.
1	3	2	5	OUT	Output Pin.
			3	EN	Enable Pin.
			4	NC	No Connection.

Block Diagram



Functional Description

Input Capacitor

A 1μF~10μF 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 from 1μF to 10μF, 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.

Dropout Voltage

The ET63H41XX uses a PMOS pass transistor to achieve low dropout. When (V_{IN} – V_{OUT}) is less than the dropout voltage (VDO), the PMOS pass device is in the linear region of operation and the input-to-output resistance is the $R_{DS(ON)}$ of the PMOS pass element. VDO scales approximately with output current because the PMOS device behaves like a resistor in dropout mode. As with any linear regulator, PSRR and transient response degrade as (V_{IN} – V_{OUT}) approaches dropout operation.

Low Quiescent Current

The ET63H41XX consuming only around 4.5μA for all input range, provides great power saving in portable and low power applications.

Short 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 short current limit protection will be triggered and clamp the output current to approximately 100mA to prevent over-current and to protect the regulator from damage due to overheating.

Layout Guidelines

- Place input and output capacitors as close to the device as possible.
- Use copper planes for device connections in order to optimize thermal performance.
- Place thermal vias around the device to distribute heat.
- Do not place a thermal via directly beneath the thermal pad of the DRV package. A via can wick solder or solder paste away from the thermal pad joint during the soldering process, leading to a compromised solder joint on the thermal pad.

Absolute Maximum Ratings

Symbol	Rating	Value	Unit
V_{IN}	Input Voltage [(1)]	-0.3~40	V
V_{EN}	Chip Enable Input	-0.3~40	V
V_{OUT}	Output Voltage	-0.3~6	V
T_J	Maximum Junction Temperature	-40 to 150	°C
T_{STG}	Storage Temperature	-65~150	°C
T_L	Lead Temperature (Soldering, 10 sec)	260	°C
V_{ESD}	Human Body Model Capability[(2)]	±4000	V

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.

Note1: Refer to Electrical Characteristics and Application Information 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.

Thermal Characteristics

Symbol	Package	Ratings	Value	Unit
$R_{\theta JA}$	SOT89-3	Thermal Characteristics, Thermal Resistance, Junction-to-Air	71	°C/W
	SOT23-5		204	
	SOT23-3		255	
P_D	SOT89-3	Power Dissipation@25°C PCB board dimension: 40mm x 40mm (2layer) Copper :1OZ	1760	mW
	SOT23-5		610	
	SOT23-3		490	

Recommended Operating Conditions

Symbol	Items	Rating	Unit
V_{IN}	Input Voltage	3 to 40	V
I_{OUT}	Output Current	0 to 300	mA
T_J	Operating Junction Temperature	-40 to 125	°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 (ESR)	5 to 100	mΩ

Electrical Characteristics

(V_{IN} = V_{OUT} + 2V, 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}[3]	Input Voltage Range		3		40	V
V_{OUT}	Output Voltage Accuracy	IOUT = 1mA, 25°C	-2		2	%
		IOUT = 1mA, -40~125°C	-3		3	
I_{Q_ON}	Quiescent Current	IOUT = 0mA, 25°C		4.5	7	μA
I_{Q_OFF}[6]	Standby Current	V_{EN} = 0V, 25°C		0.1	1	μA
I_{OUT}	Maximum Output Current				300	mA
I_{LIM}	Limit Current	V_{IN} = V_{OUT} + 2V		520		mA
I_{SHORT}	Short Current	V_{OUT} = 0V		210		mA
Reg_{Line}[7]	Line Regulation	V_{OUT} + 2 ≤ V_{IN} ≤ 40V I_{OUT} = 10mA		0.01	0.2	%/V
Reg_{LOAD}[7]	Load Regulation	1mA ≤ I_{OUT} ≤ 300mA, V_{IN} = V_{OUT} + 2V, T_A = 25°C		20	40	mV
V_{DROP}[4] [7]	Dropout Voltage	I_{OUT} = 300mA, V_{OUT} = 3.3V		1500	2800	mV
		I_{OUT} = 300mA, V_{OUT} = 5.0V		1400	2800	
PSRR[5]	Power Supply Rejection Ratio	f = 10kHz, V_{OUT} = 3.3V I_{OUT} = 10mA		50		dB
e_N[5]	Output Noise Voltage	V_{IN} = V_{OUT} + 2V, I_{OUT} = 1mA, f = 10Hz to 100KHz,		60* V_{OUT}		μVrms
V_{ENH}[6]	EN Pin Threshold Voltage	V_{EN} Rising Until the Output is Enabled	1.4			V
V_{ENL}[6]	EN Pin Threshold Voltage	V_{EN} Falling Until the Output is Disabled			0.4	V
T_{ON}[6]	Output Turn-on Time	From V_{EN} > V_{ENH} to 0.9 × $V_{OUT(NOM)}$, I_{OUT} = 30mA, C_{OUT} = 1μF		190		μs
I_{EN}[6]	EN Pin Current	V_{EN} = 0~40V		1		μA
T_{TSD}	Thermal Shutdown Temperature	Temperature Increasing from T_A = +25°C		150		°C
T_{HYS}	Thermal Shutdown Hysteresis	Temperature Falling from T_{TSD}		30		°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 150mA output current.

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

Note6: If EN Pin Exist.

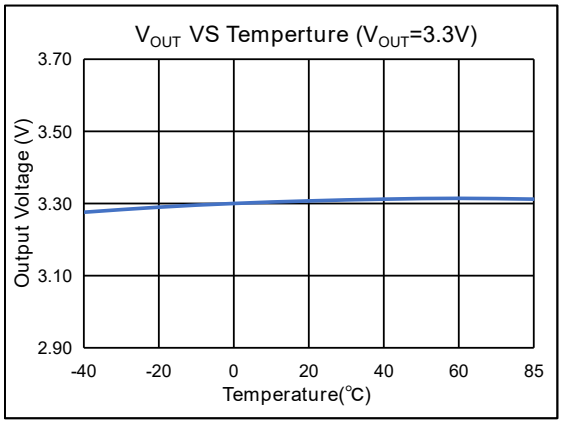
Note7: At high temperatures, the maximum load current can be calculated according to the following formula：

$$I_{OUT_MAX} = (T_J - T_A) / R_{\theta JA} / (V_{IN} - V_{OUT})$$

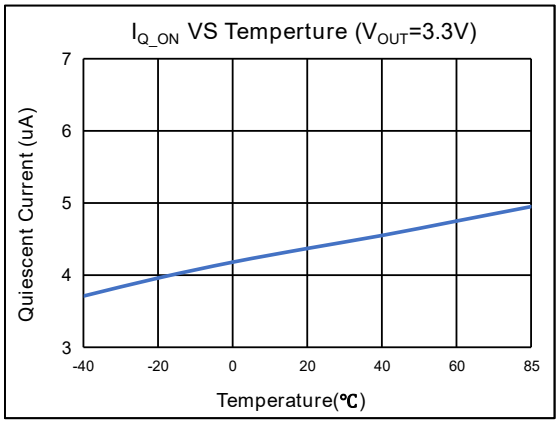
Typical Characteristics

Voltage Version 3.3V

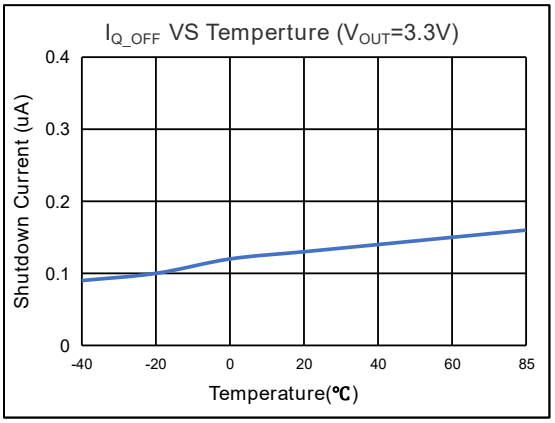
(V_{IN} = V_{OUT} + 2V, C_{IN} = 1μF, C_{OUT} = 1μF, typical values are at T_A = +25°C, unless otherwise noted.)



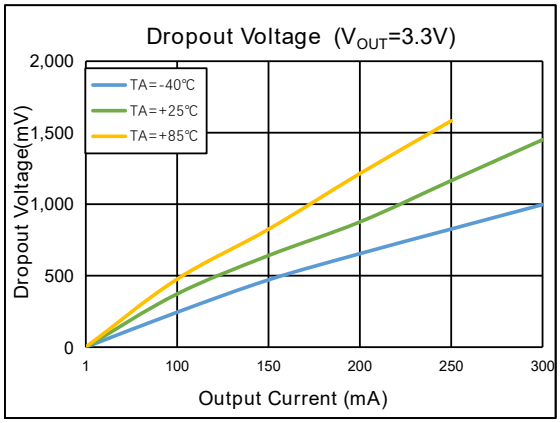
Output Voltage VS Temperature



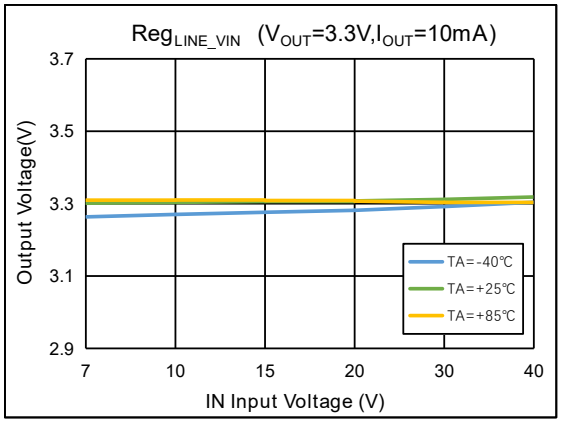
Quiescent Current VS Temperature



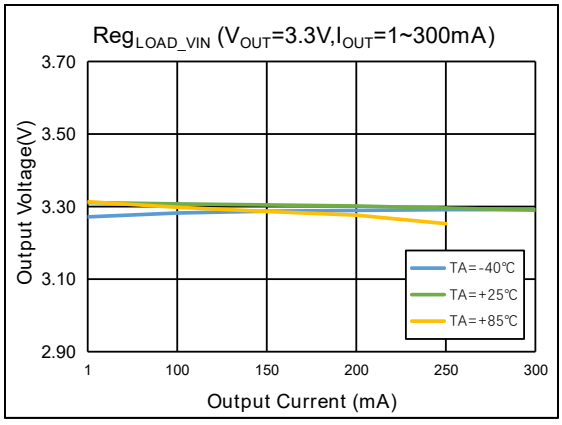
Standby Current VS Temperature



Dropout Voltage VS Output Current



Output Voltage VS Input Voltage

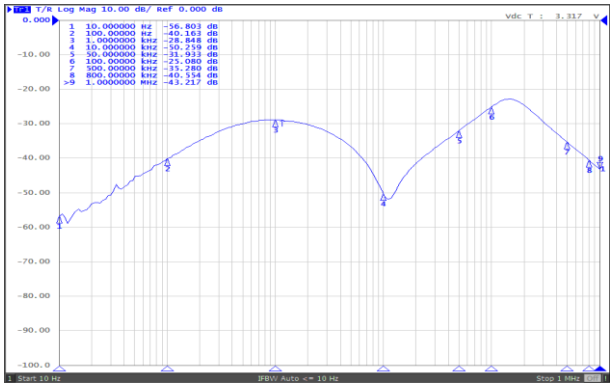


Output Voltage VS Output Current

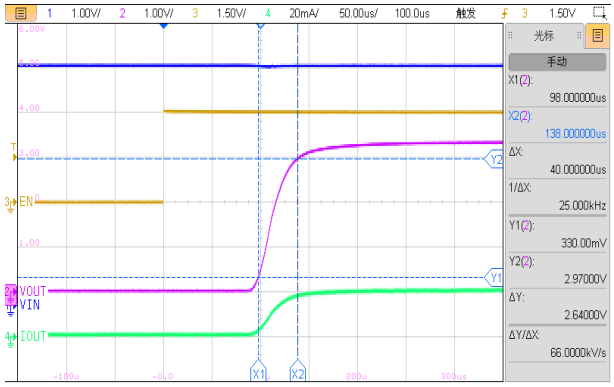
Typical Characteristics (Continued)

Voltage Version 3.3V

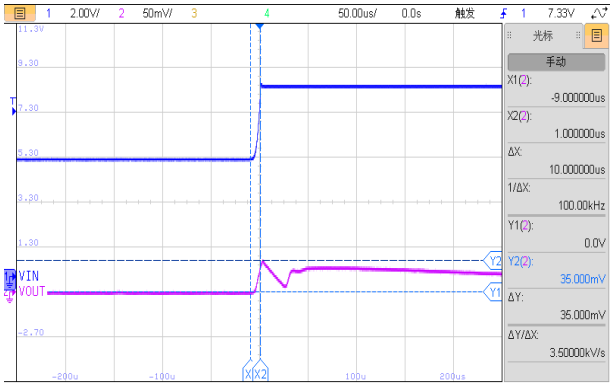
(V_{IN} = V_{OUT} + 2V, C_{IN} = 1μF, C_{OUT} = 1μF, typical values are at T_A = +25°C, unless otherwise noted.)



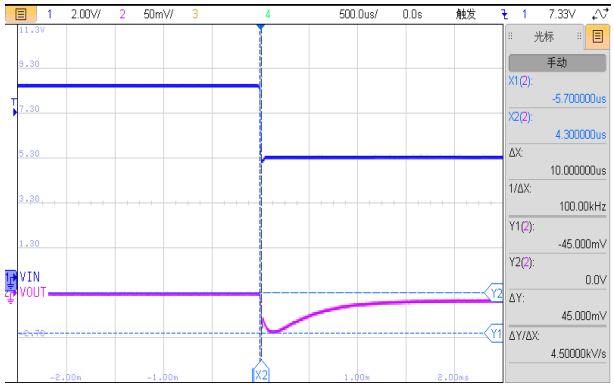
PSRR (I_{OUT} = 20mA)



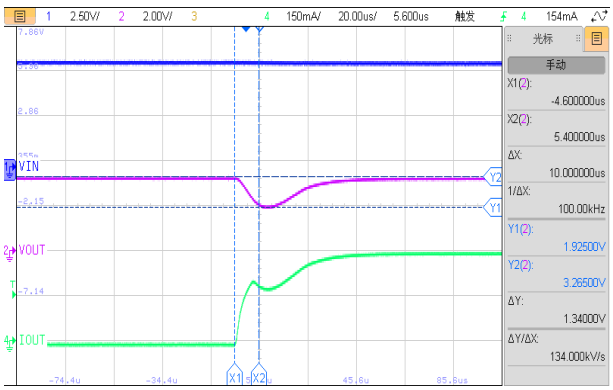
T_{ON} (I_{OUT} = 20mA)



Input-Transient (5.3~8.3V, tr = 10μs, I_{OUT} = 1mA)

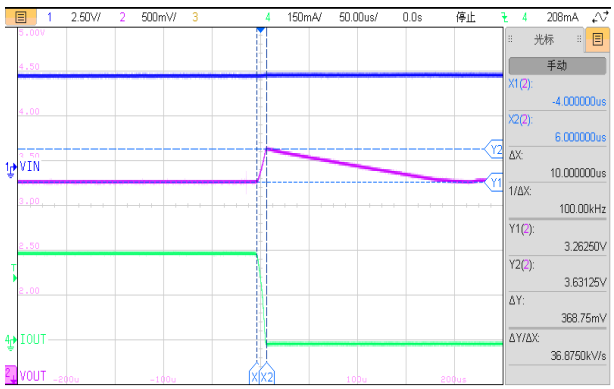


Input-Transient (8.3~5.3V, tf = 10μs, I_{OUT} = 1mA)



Load-Transient

(V_{IN} = 5.3V, I_{OUT} = 1~300mA, tr = 10μs)



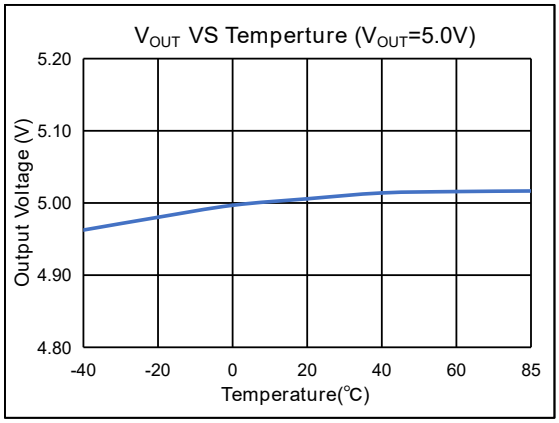
Load-Transient

(V_{IN} = 5.3V, I_{OUT} = 300~1mA, tf = 10μs)

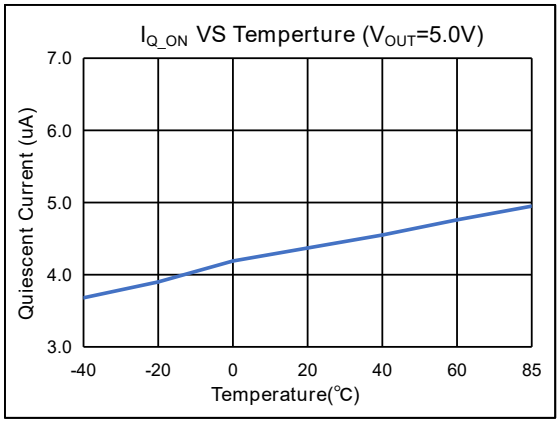
Typical Characteristics (Continued)

Voltage Version 5.0V

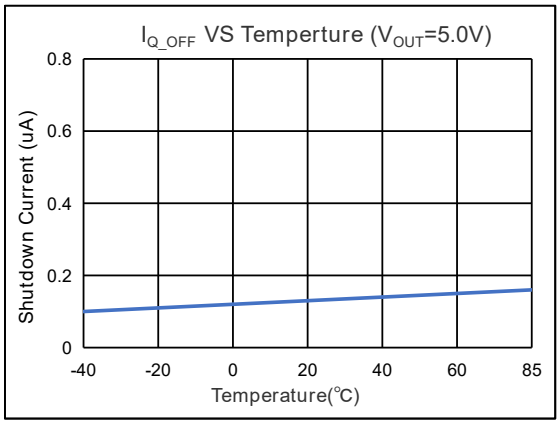
(V_{IN} = V_{OUT} + 2V, C_{IN} = 1μF, C_{OUT} = 1μF, typical values are at T_A = +25°C, unless otherwise noted.)



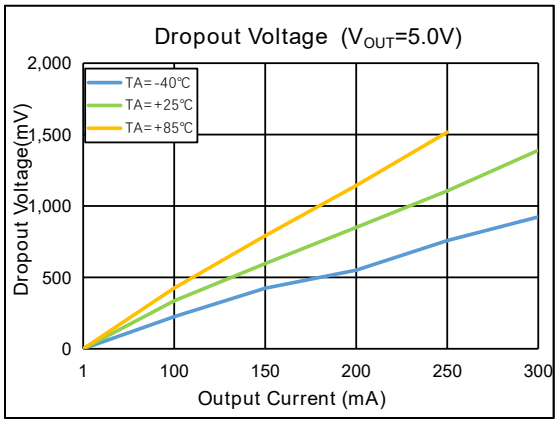
Output Voltage VS Temperature



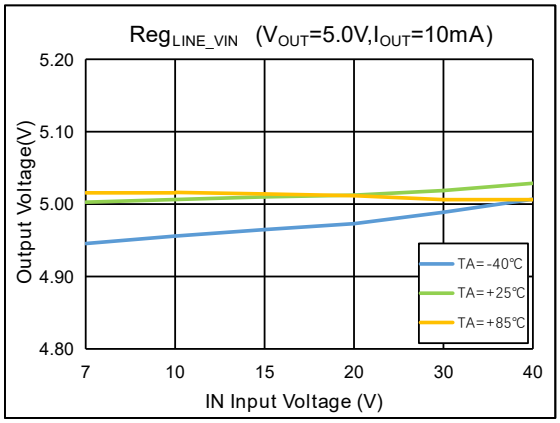
Quiescent Current VS Temperature



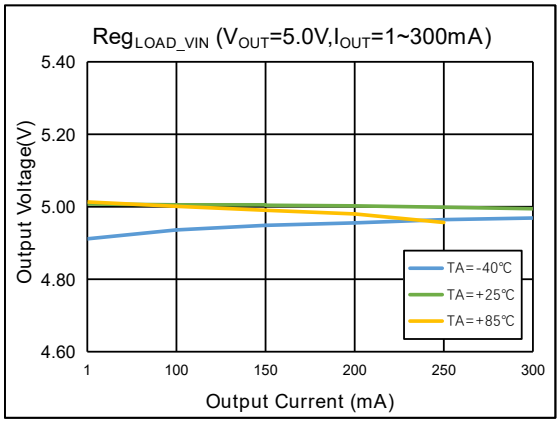
Standby Current VS Temperature



Dropout Voltage VS Output Current



Output Voltage VS Input Voltage

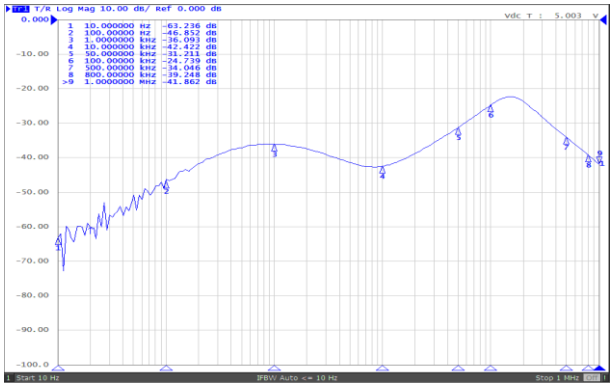


Output Voltage VS Output Current

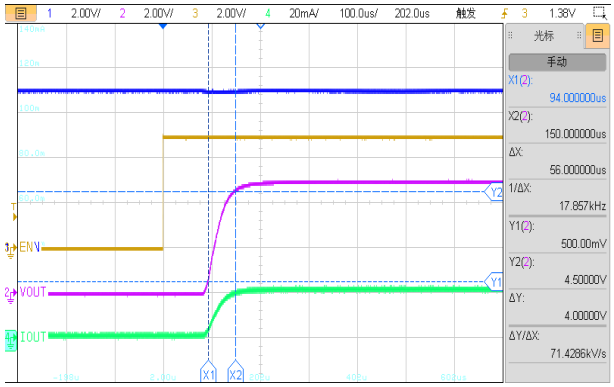
Typical Characteristics (Continued)

Voltage Version 5.0V

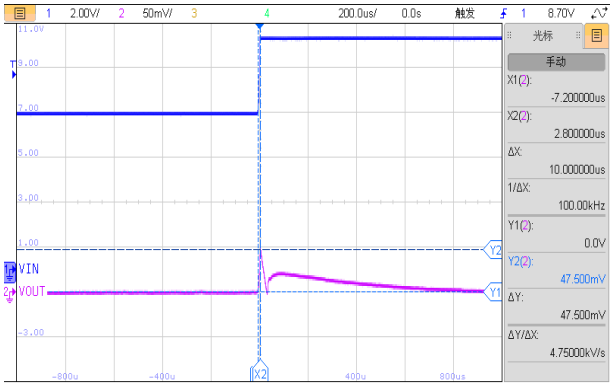
(V_{IN} = V_{OUT} + 2V, C_{IN} = 1μF, C_{OUT} = 1μFC, typical values are at T_A = +25°C, unless otherwise noted.)



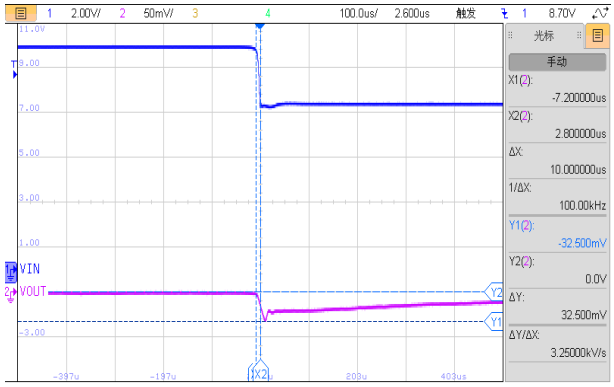
PSRR (I_{OUT} = 20mA)



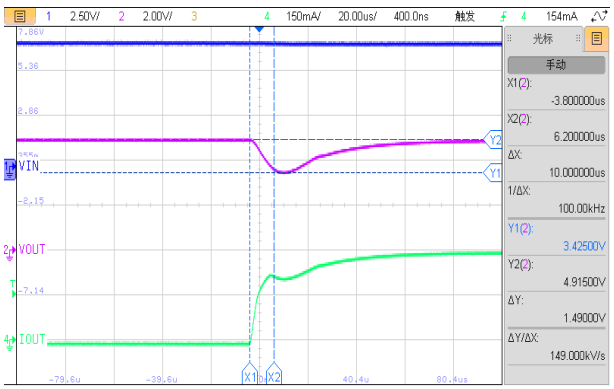
T_{ON} (I_{OUT} = 20mA)



Input-Transient (7.0~10.0V, tr = 10μs, I_{OUT} = 1mA)

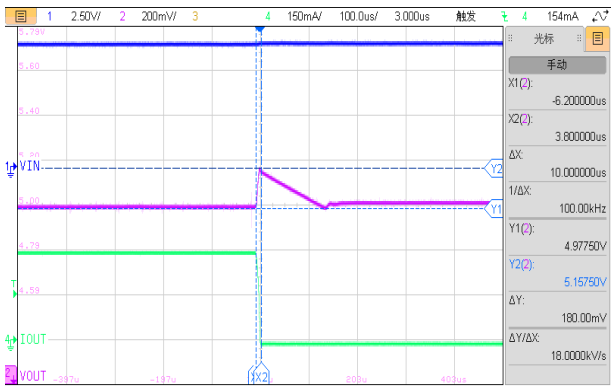


Input-Transient (10.0~7.0V, tf = 10μs, I_{OUT} = 1mA)



Load-Transient

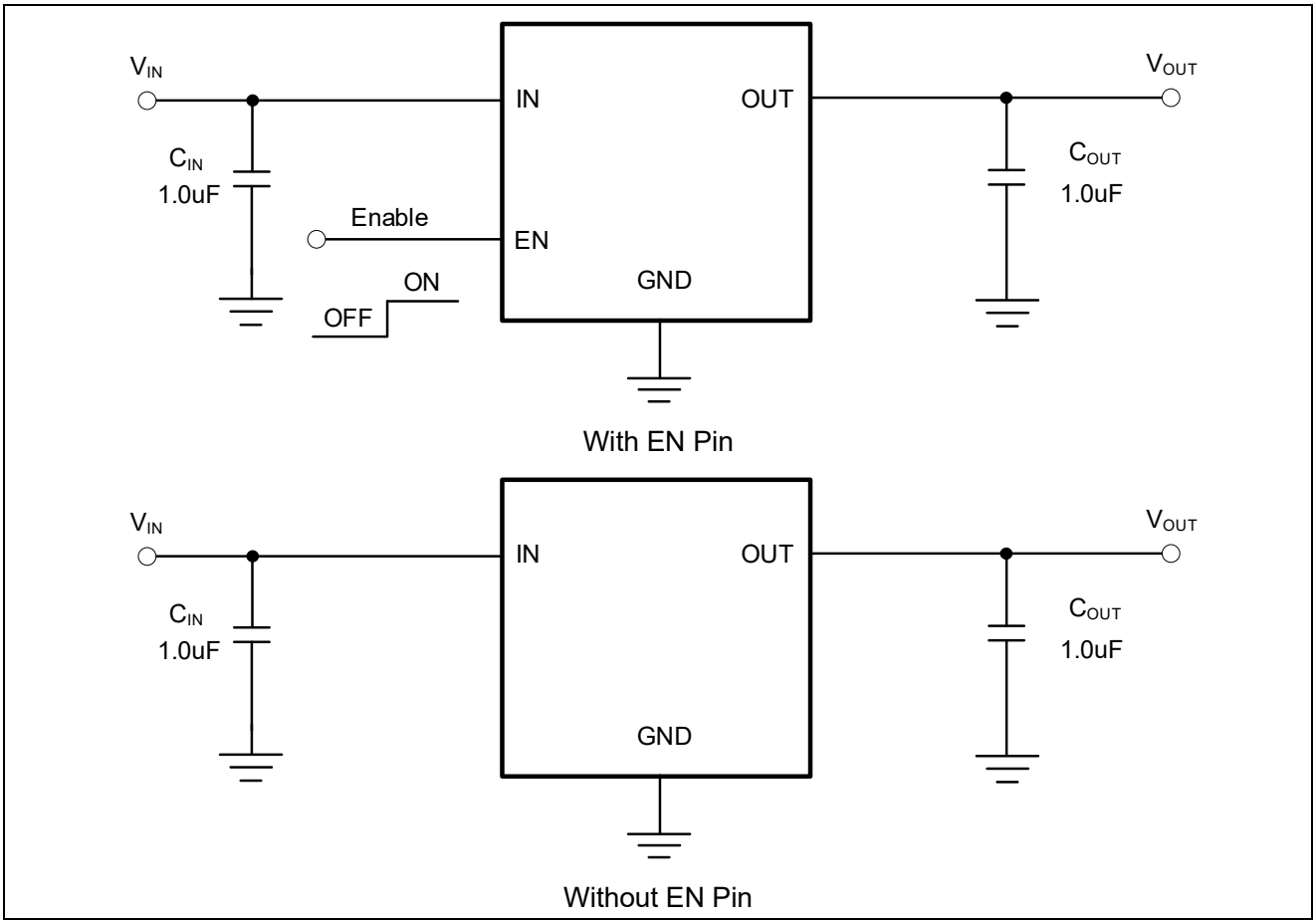
(V_{IN} = 7.0V, I_{OUT} = 1~300mA, tr = 10μs)



Load-Transient

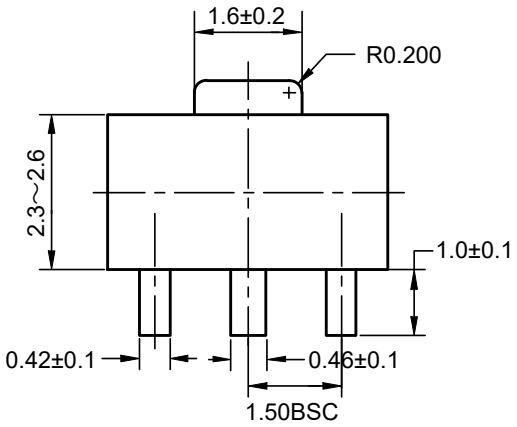
(V_{IN} = 7.0V, I_{OUT} = 300~1mA, tf = 10μs)

Application Circuits

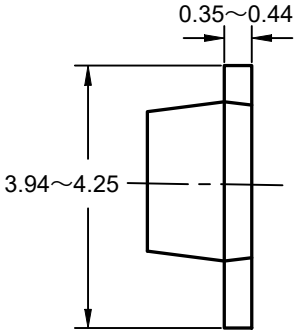


Package Dimension

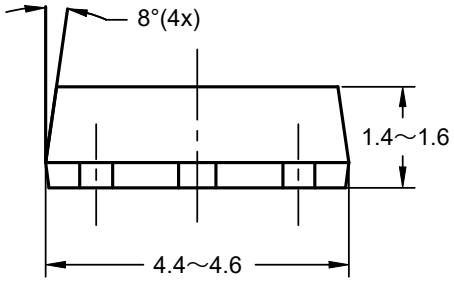
SOT89-3



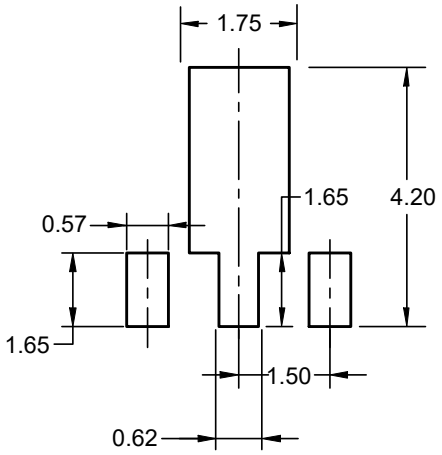
Top View



Side View



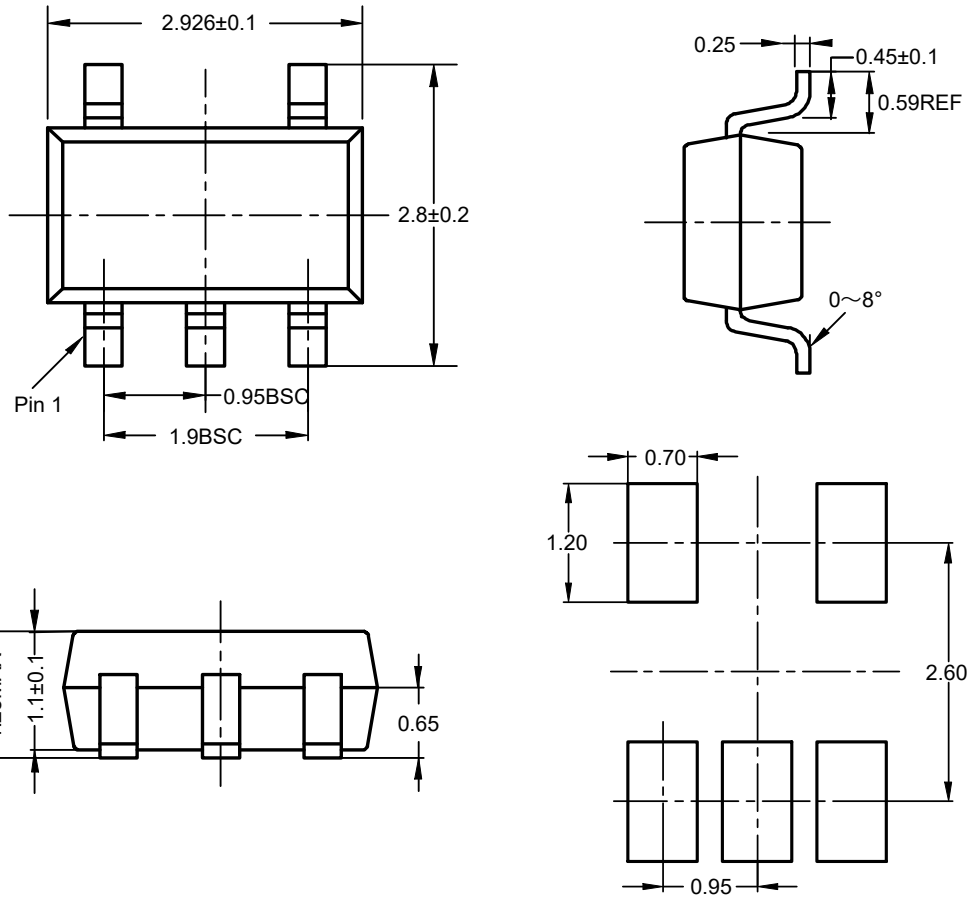
Side View



Recommended Land Pattern

Unit: mm

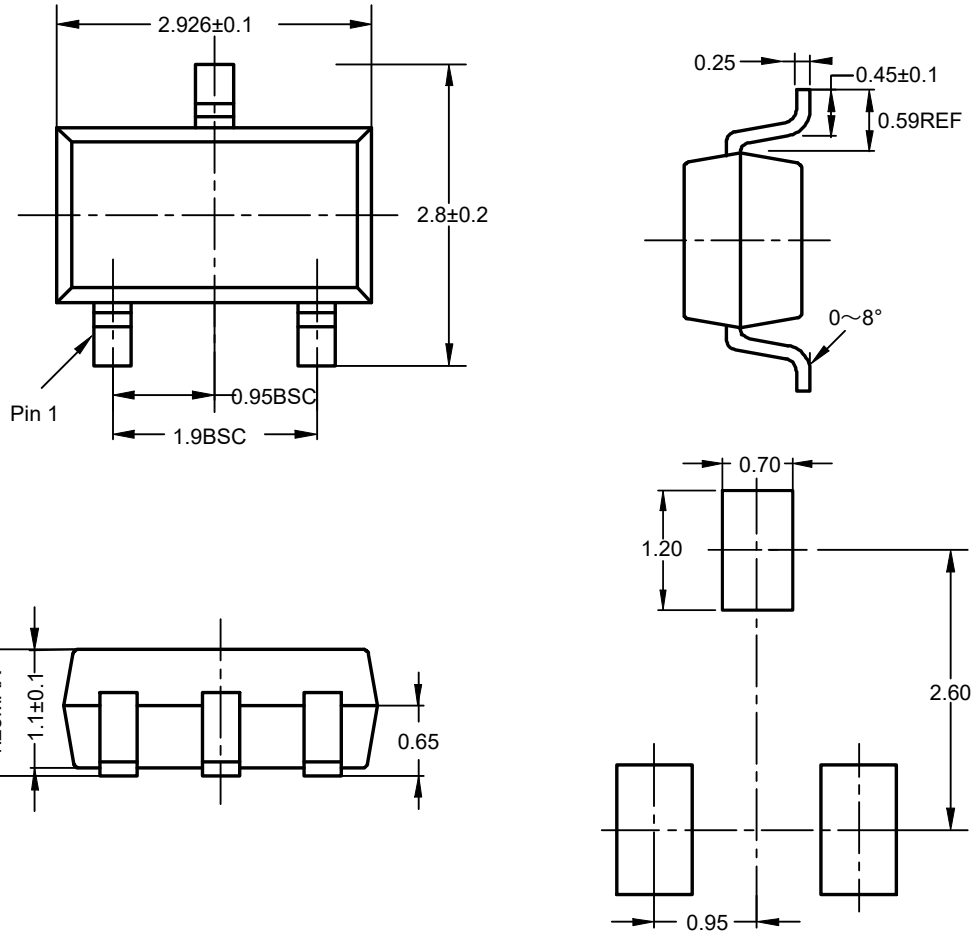
SOT23-5



Recommended Land Pattern

Unit: mm

SOT23-3



Recommended Land Pattern

Unit: mm

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
0.0	2025-03-13	Preliminary Version	Li zihao	Yang xiaoxu	Yang xiaoxu
0.1	2025-05-23	Update Electrical Characteristics & Typical Characteristics	Peng junjie	Yang xiaoxu	Yang xiaoxu
1.0	2025-09-25	Official Version	Peng junjie	Yang xiaoxu	Yang xiaoxu
1.1	2025-09-30	Update Electrical Characteristics	Peng junjie	Yang xiaoxu	Yang xiaoxu
1.1.a	2025-10-30	Update Package	Peng junjie	Yang xiaoxu	Yang xiaoxu
1.1.b	2026-07-20	Update Recommended Operating Conditions	Yang xiaoxu	Yang xiaoxu	Liu jiaying
1.1.c	2026-08-07	Correct Words	Xu tao	Yang xiaoxu	Liu jiaying