

ET78L05P - High Input 150mA LDO

General Description

ET78L05P is three-terminal positive regulators. One of these regulators can deliver up to 150 mA of output current. The internal limiting and thermal shutdown features of the regulator make them essentially immune to overload. When used as a replacement for a zener diode-resistor combination, an effective improvement in output impedance can be obtained, together with lower quiescent current.

Features

- Output Current of 150mA
- Thermal Overload Protection
- Short Circuit Protection
- Output Transistor Safe Area Protection
- No External Components
- Output Voltage Accuracy: Tolerance $\pm 5\%$ Max
- Package No. and MSL Level:

Part No.	Package	Packing Option	MSL
ET78L05P	SOT89-3	Tape and Reel, 3K/Reel	Level 3

Applications

- Battery Chargers
- Portable Instrumentation
- LED Lighting
- Appliances

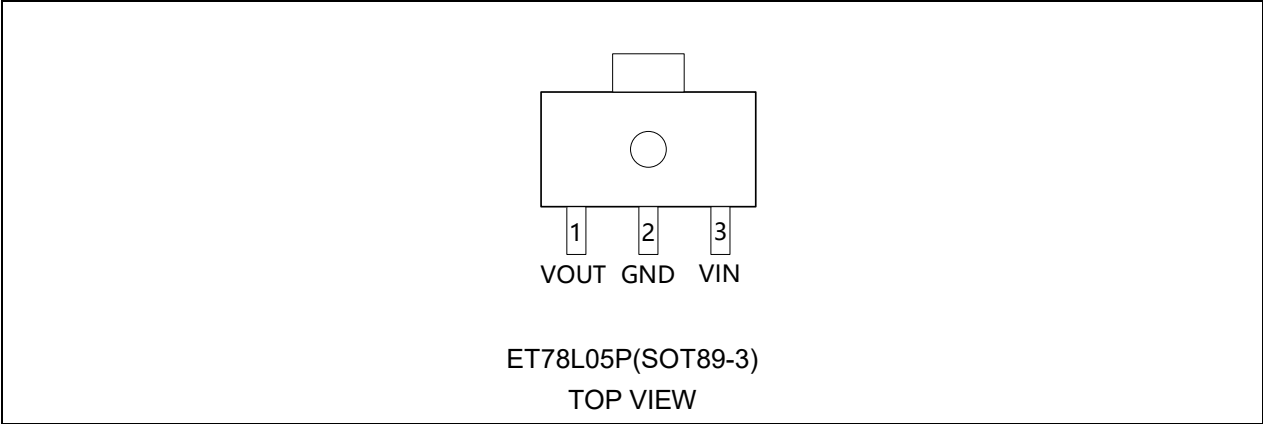
Device Information

ET78L 05 X

<u>05</u> Output Voltage		<u>X</u> Package	
05	5.0V Fixed Output Voltage	P	SOT89-3

ET78L05P

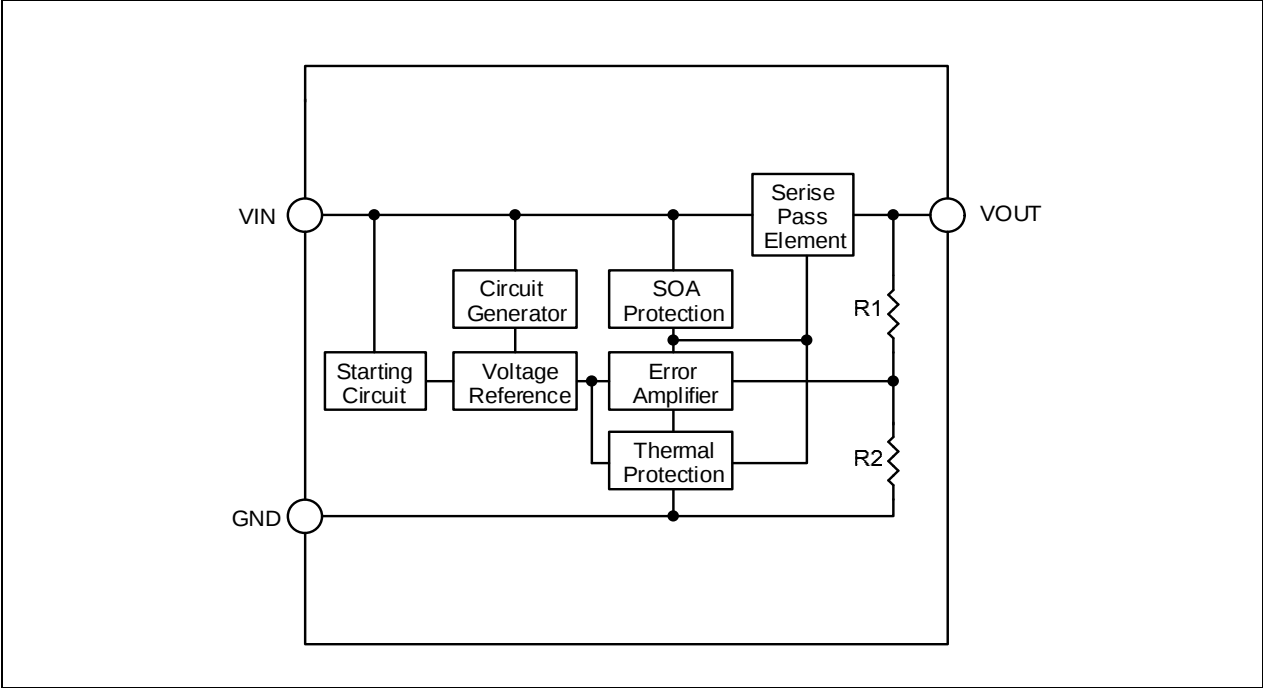
Pin Configuration



Pin Function

Pin No.	Symbol	Pin Description
SOT89-3		
1	VOUT	Output voltage pin
2	GND	GND pin
3	VIN	Input voltage pin

Block Diagram



ET78L05P

Operation Description

General

ET78L05P is designed with Thermal Overload Protection that shuts down the circuit when subjected to an excessive power overload condition, and output transistor Safe-Area Compensation that reduces the output short circuit current as the voltage across the pass transistor is increased.

Bypass Capacitor

In many low current applications, compensation capacitors are not required. However, it is recommended that the regulator input be bypassed with a capacitor if the regulator is connected to the power supply filter with long wire lengths, or if the output load capacitance is large. An input bypass capacitor should be selected to provide good high frequency characteristics to insure stable operation under all load conditions. A 0.33μF or larger tantalum, mylar, or other capacitor having low internal impedance at high frequencies should be chosen. The bypass capacitor should be mounted with the shortest possible leads directly across the regulator's input terminals. Normally good construction techniques should be used to minimize ground loops and lead resistance drops since the regulator has no external sense lead.

Dropout Voltage

A common ground is required between the input and the output voltages. The input voltage must remain typically 2.0 V above the output voltage even during the low point on the input ripple voltage.

Absolute Maximum Ratings⁽¹⁾

Symbol	Parameters (Items)		Value	Unit
V _{IN} ⁽²⁾	Input Voltage		-0.3 to 35	V
I _{OUT}	Maximum Load Current		150	mA
T _J	Junction Temperature		-65 to 150	°C
T _{STG}	Storage Temperature		-65 to 150	°C
T _L	Lead Temperature (Soldering, 10 sec)		260	°C
V _{ESD}	HBM (EIA/JESD22-A114-A)		±5.0	KV
P _{DMAX}	Maximum Power Dissipation	SOT89-3	500	mW

Notes:

1: The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

2: The maximum input voltage should take into account the maximum power consumption (P_{D(MAX)}).

The calculation formula is as follows:

$$P_{D(MAX)} = (V_{IN(MAX)} - V_{OUT}) \times I_{OUT}$$

The maximum power consumption of the IC is 500mW.

$$V_{IN(MAX)} = 500mW / I_{OUT} + V_{OUT}$$

For example:

If V_{OUT}= 5.0V, I_{OUT}=100mA, the maximum input voltage is V_{IN(MAX)}=500mW / 100mA + 5.0 = 10V

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Electrical Characteristics

($C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, $T_A=25^\circ C$, unless otherwise noted)

Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	$I_O=40mA$, $V_{IN}=10V$	4.82	5.0	5.18	V
		$I_O=1mA\sim 40mA$, $V_{IN}=7V\sim 18V$	4.8	5.0	5.2	
		$I_O=1mA\sim 10mA$, $V_{IN}=10V$	4.75	5.0	5.25	
Reg_{LINE}	Line Regulation	$V_{IN}=7V\sim 18V$, $I_O=20mA$	-20	-	20	mV
Reg_{LOAD}	Load Regulation	$V_{IN}=10V$, $I_O=1mA\sim 100mA$	-50	-	50	mV
		$V_{IN}=10V$, $I_O=1mA\sim 40mA$	-30	-	30	
$V_{DROP}^{(3)}$	Dropout Voltage	$T_A=25^\circ C$, $I_O=100mA$	-	2	-	V
$e_N^{(4)}$	Output noise Voltage	$f=10Hz$ to $100KHz$	-	40	-	$\mu V/V_O$
$PSRR^{(4)}$	Ripple Rejection	$T_A=25^\circ C$, $f=120Hz$, $I_O=40mA$, $V_{IN}=8V$	-	70	-	dB
I_Q	Quiescent Current to Ground	$V_{IN}=10V$, $I_{OUT}=40mA$	-	1.7	-	mA
I_{Q_CHANGE}	Quiescent Current to Ground Change	$V_{IN}=8V\sim 20V$, $I_O=1mA$	-1.5	-	1.5	mA
		$V_{IN}=10V$, $I_{OUT}=1mA\sim 40mA$	-1	-	1	

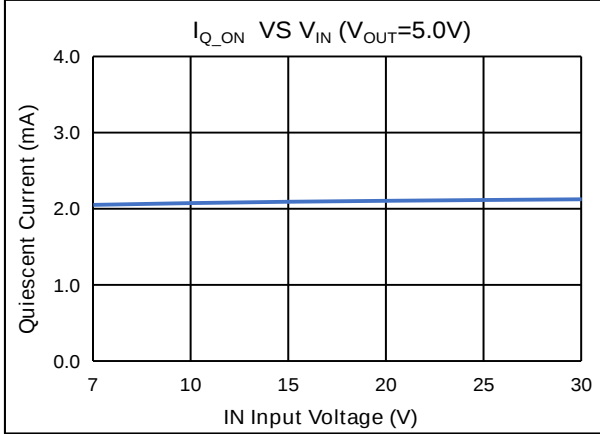
Notes3: V_{DROP} FT test method: test the V_{OUT} voltage at $V_{SET} + V_{DROP_{MAX}}$ with output current.

Notes4: Guaranteed by design and characterization. not a FT item.

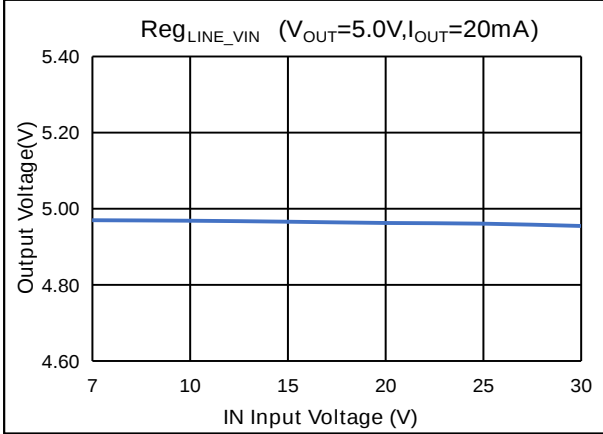
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Typical Characteristics

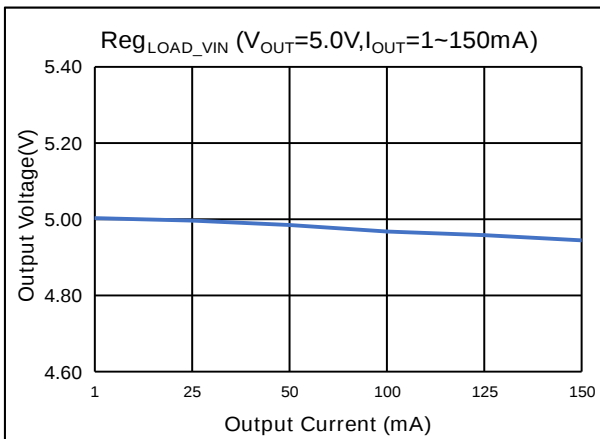
($V_{OUT}=5.0V$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, unless otherwise noted, $T_A = +25^\circ C$)



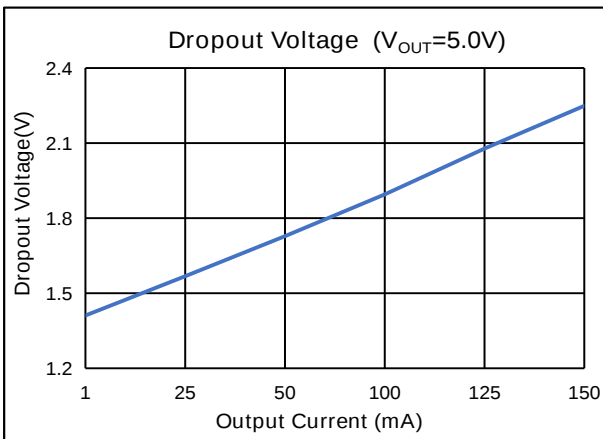
Quiescent Current VS Input Voltage



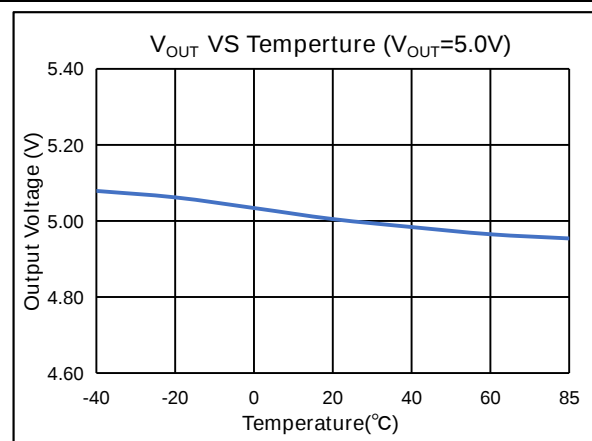
Output Voltage VS Input Voltage



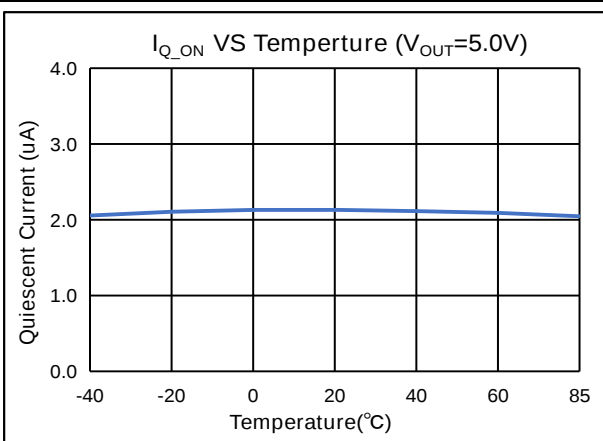
Output Voltage VS Output Current



Dropout Voltage VS Output Current



Output Voltage VS Temperature

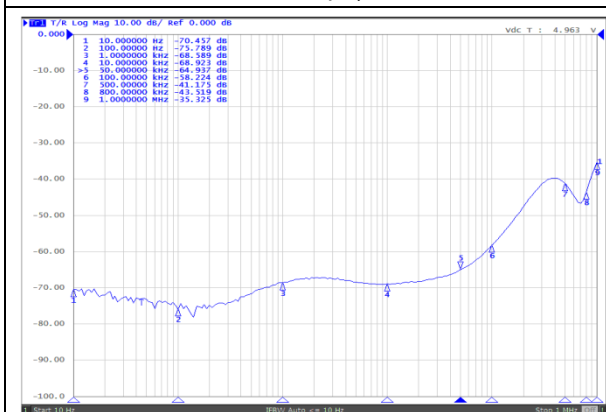
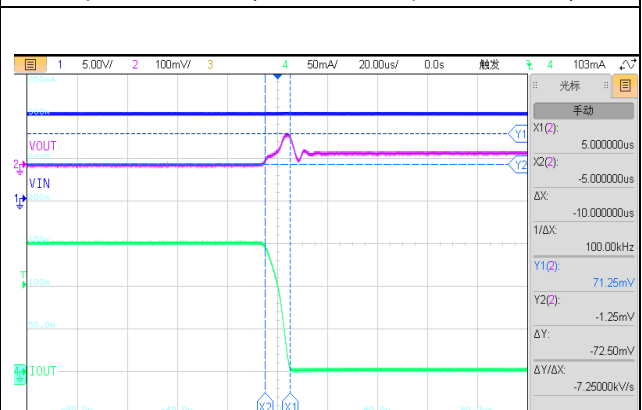
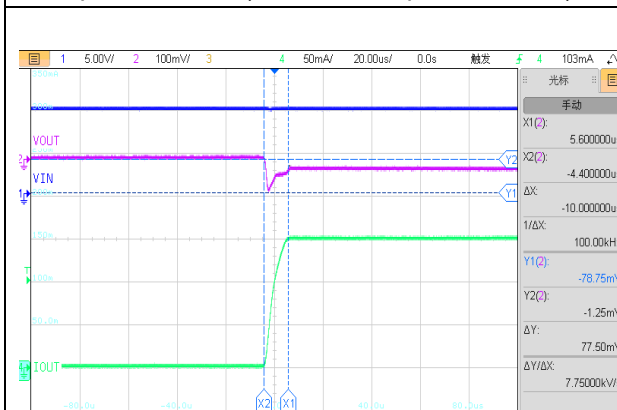
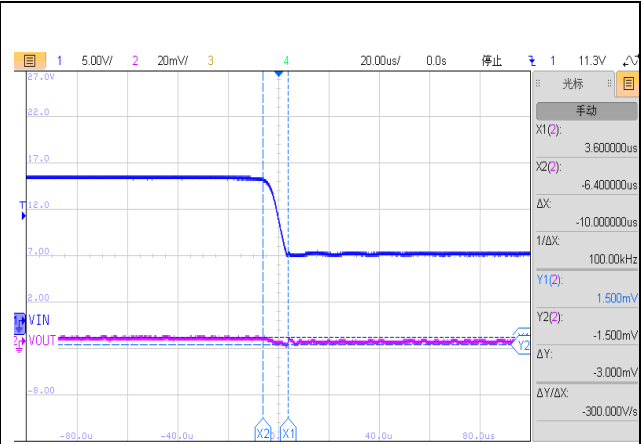
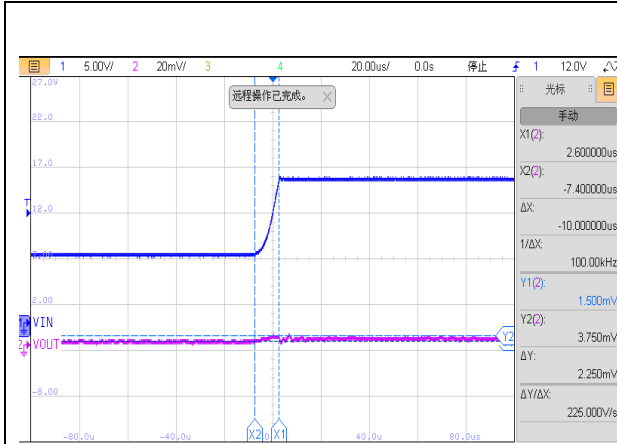


Quiescent Current VS Temperature

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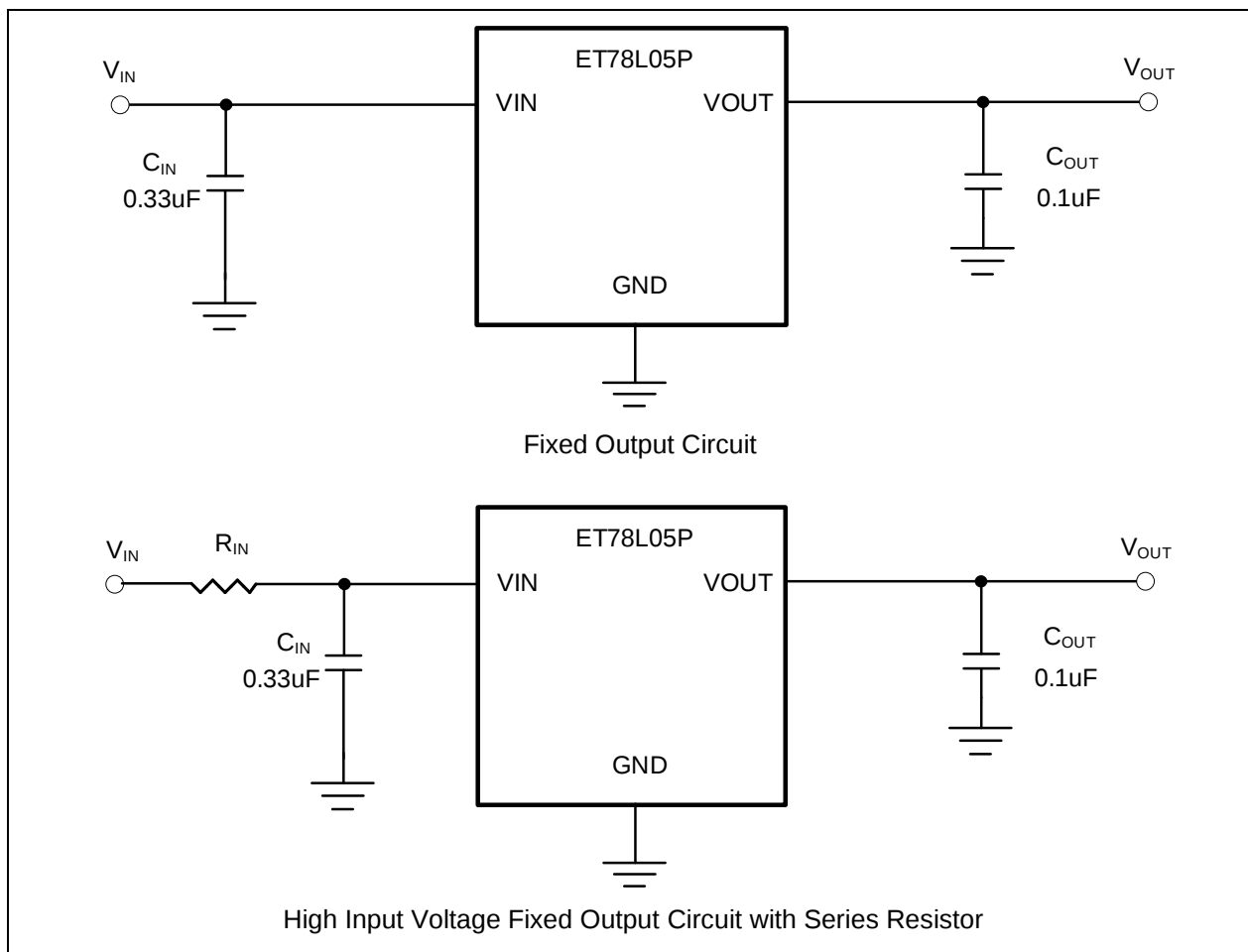
Typical Characteristics (Continued)

Voltage set 5V ($V_{IN}=V_{OUT}+2V$, $C_{IN}=0.33\mu F$, $C_{OUT}=0.1\mu F$, Typical values are at $T_A=+25^\circ C$.)



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Application Circuits



Note:

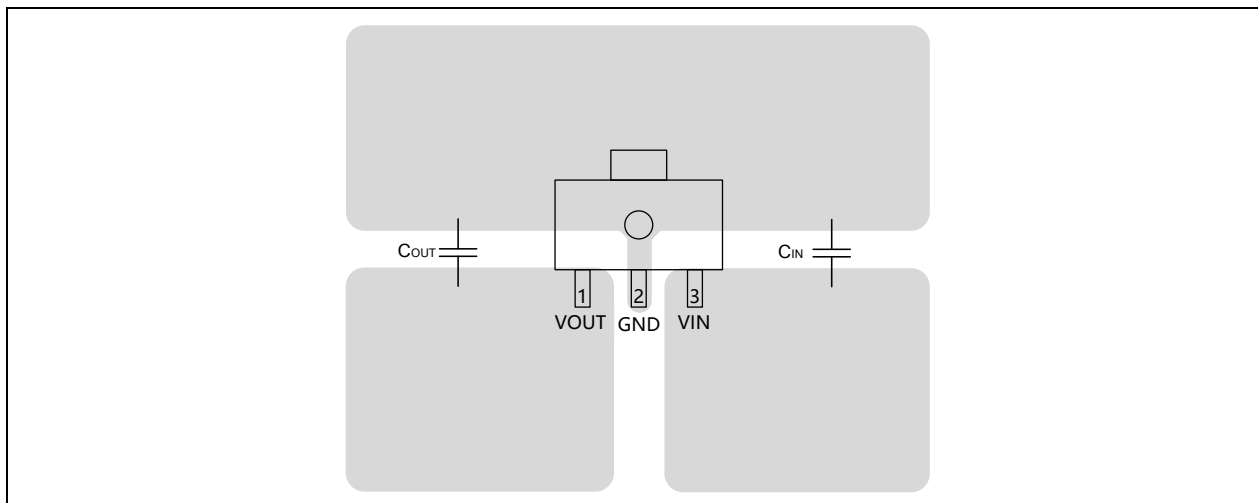
C_{IN} is required if regulator is located an appreciable distance from power supply filter.

C_{OUT} is not needed for stability; it does improve transient response.

R_{IN} recommended value: $R_{IN} = (V_{IN} - 8V) / I_{OUT_MAX}$

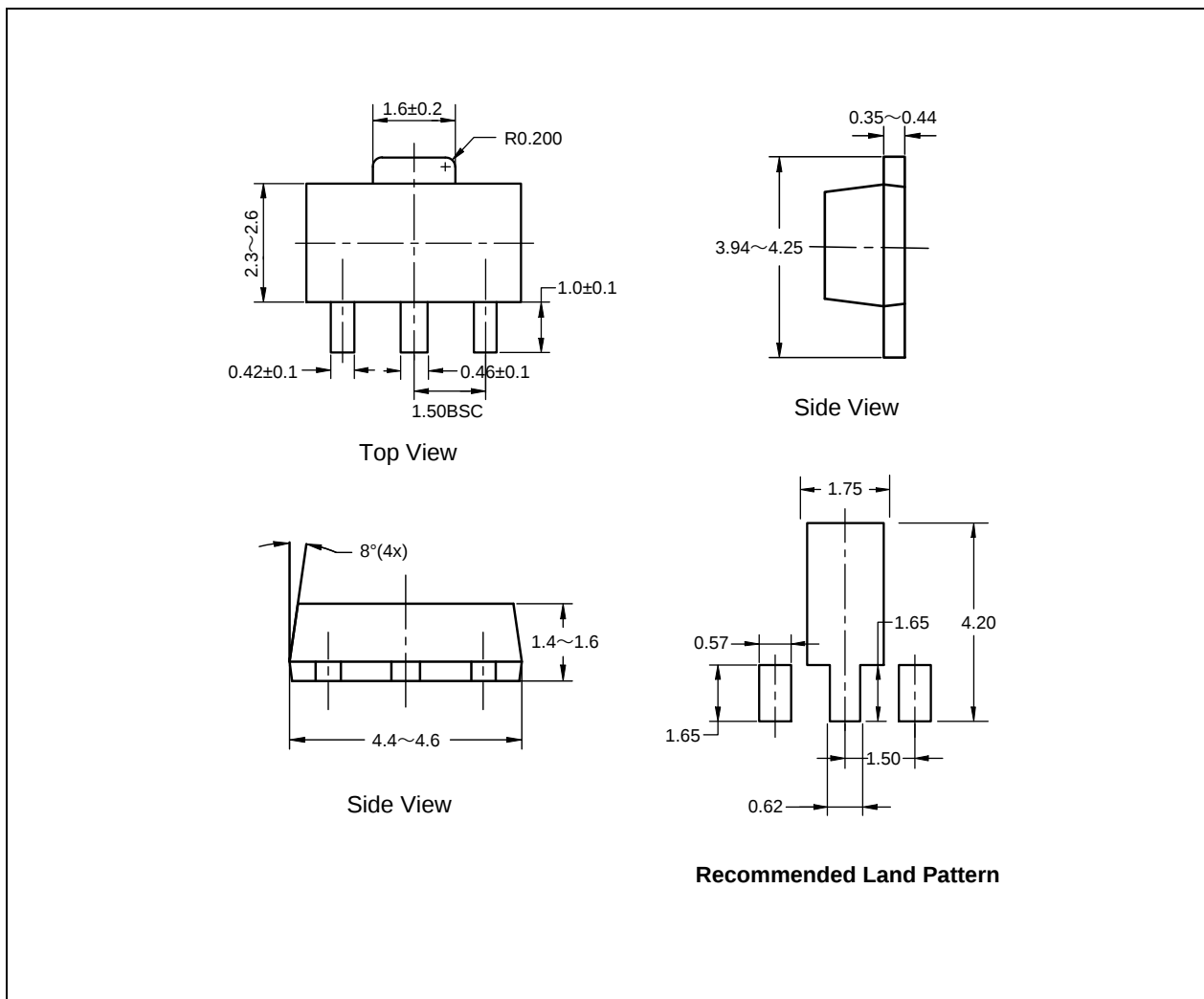
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PCB Layout Guide



Package Dimension

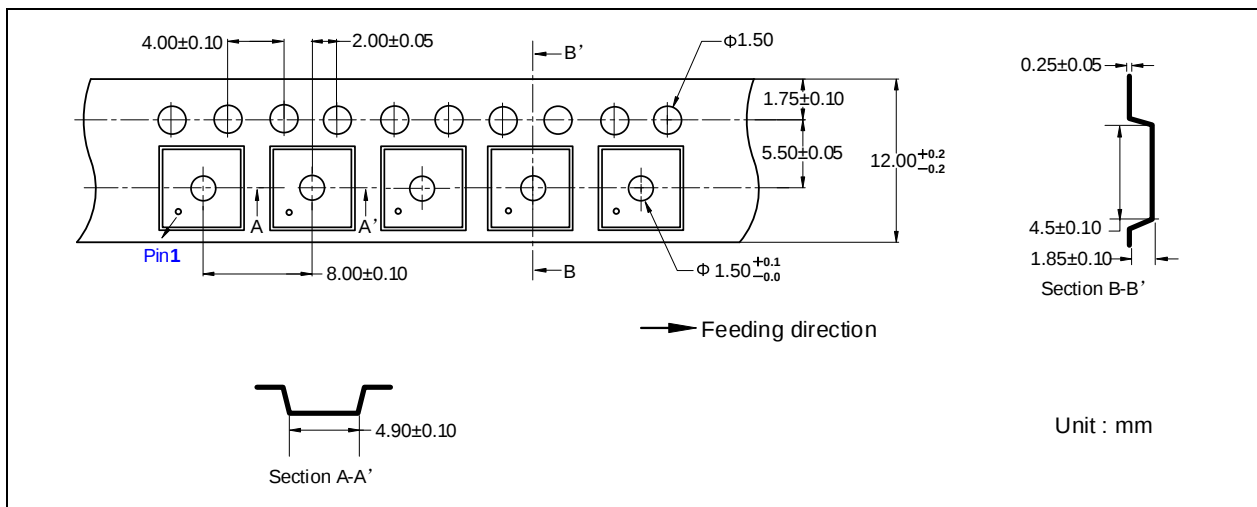
SOT89-3



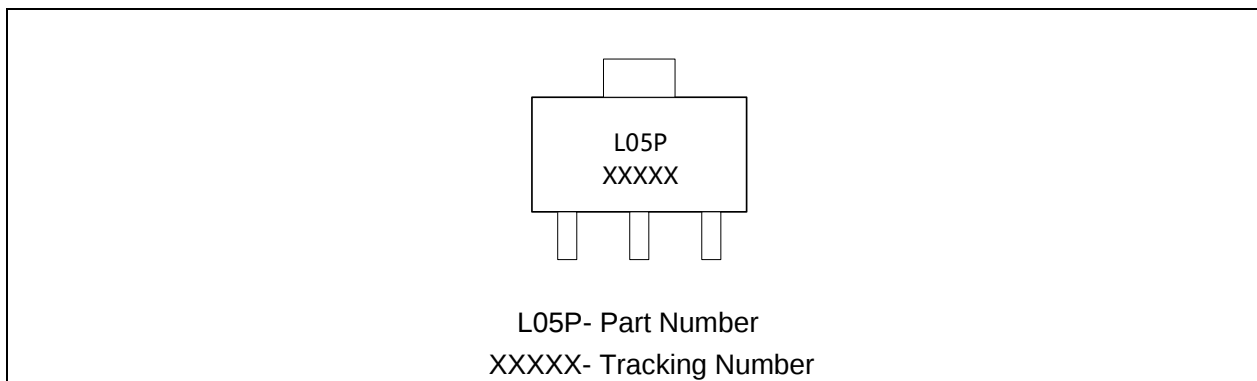
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Tape Information

SOT89-3



Marking Information



Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2020-06-11	Initial Version	Liuzy	Liuxm	Liuzy
1.1	2023-01-14	Update Typeset	Tugz	Liuxm	Liuzy
1.2	2024-07-14	Update Electrical Characteristics & Typical Characteristics	Pengjj	Liuxm	Liuzy
1.3	2025-08-15	Update Typical Characteristics	Caoyz	Liuxm	Liuzy
1.4	2025-12-8	Update Typeset	Shib	Liuxm	Liuzy
1.4.a	2026-04-18	Update Package Information	Yangxx	Liuxm	Liuzy