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 ±5% Max
- Package No. and MSL Level:

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

Applications

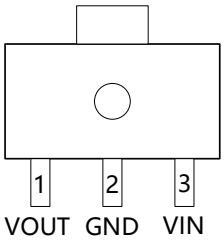
- Battery Chargers
- Portable Instrumentation
- LED Lighting
- Appliances

Device Information

ET78L 05 X

05 Output Voltage		**X Package**	
05	5.0V Fixed Output Voltage	P	SOT89-3

Pin Configuration

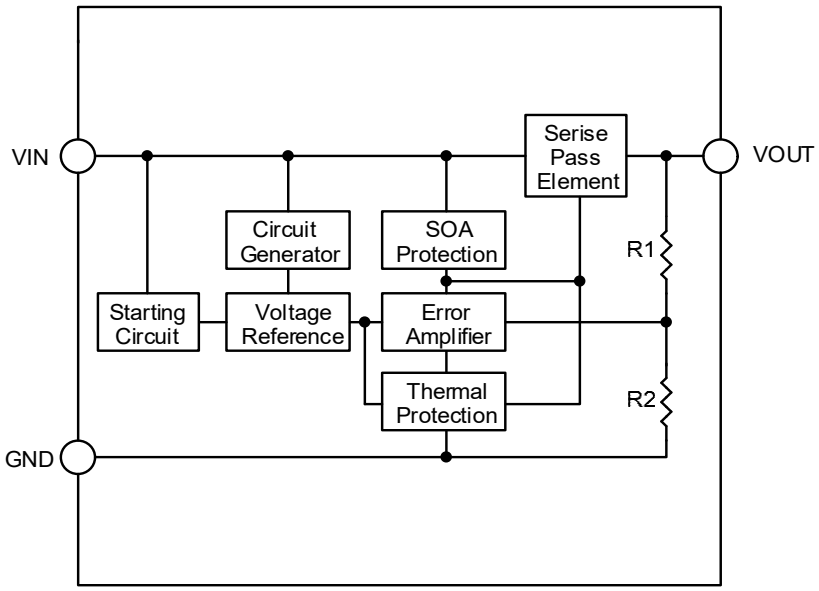


ET78L05P(SOT89-3)
TOP VIEW

Pin Function

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

Block Diagram



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 (JEDEC JS-001)		±5000	V
P_{DMAX}	Maximum Power Dissipation	SOT89-3	920	mW
$R_{\theta JA}$	Thermal Resistance, Junction-to-Air	SOT89-3	135	°C/W

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 920mW.

$$V_{IN(MAX)} = 920mW / I_{OUT} + V_{OUT}$$

For example:

If V_{OUT}= 5.0V, I_{OUT}=100mA, the maximum input voltage is $V_{IN(MAX)}$=920mW / 100mA + 5.0 = 14.2V

Electrical Characteristics

(C_{IN}=0.33μF, C_{OUT}=0.1μF, T_A=25°C, unless otherwise noted)

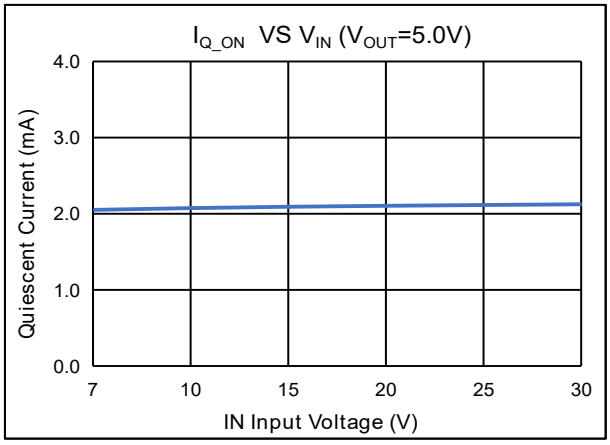
Symbol	Parameters	Conditions	Min	Typ	Max	Unit
V_{OUT}	Output Voltage	Io=40mA, V_{IN}=10V	4.82	5.0	5.18	V
		I_O=1mA~40mA, V_{IN}=7V~18V	4.8	5.0	5.2	
		I_O=1mA~10mA, V_{IN}=10V	4.75	5.0	5.25	
Reg_{LINE}	Line Regulation	V_{IN}=7V~18V, I_O=20mA	-20	-	20	mV
Reg_{LOAD}	Load Regulation	V_{IN}=10V, I_O=1mA~100mA	-50	-	50	mV
		V_{IN}=10V, I_O=1mA~40mA	-30	-	30	
V_{DROP}[(3)]	Dropout Voltage	T_A=25°C, I_O=100mA	-	2	-	V
e_N[(4)]	Output noise Voltage	f=10Hz to 100KHz	-	40	-	μV/V_O
PSRR[(4)]	Ripple Rejection	T_A=25°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~20V, I_O=1mA	-1.5	-	1.5	mA
		V_{IN}=10V, I_{OUT}=1mA~40mA	-1	-	1	

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

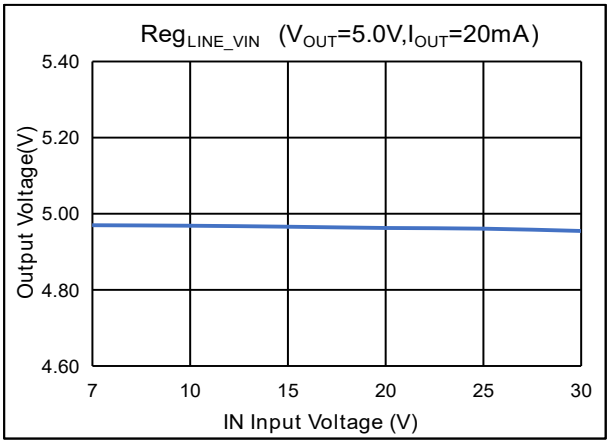
Notes4: Guaranteed by design and characterization. not a FT item.

Typical Characteristics

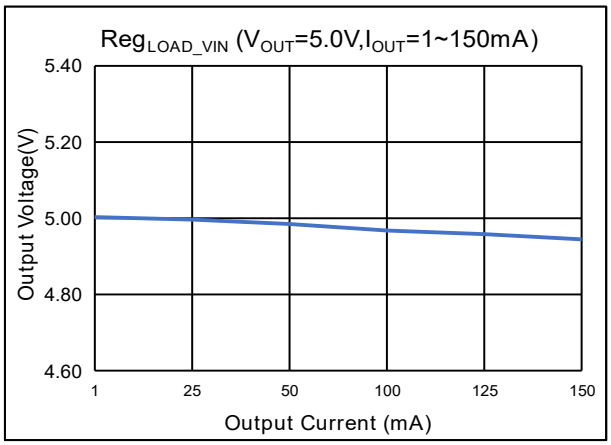
(V_{OUT}=5.0V, C_{IN}=0.33μF, C_{OUT}=0.1μF, unless otherwise noted, T_A = +25°C)



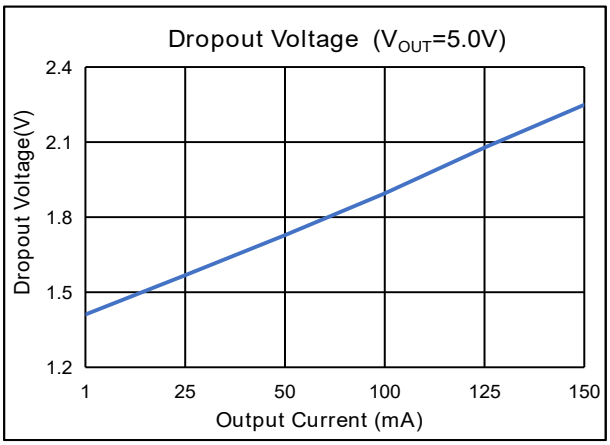
Quiescent Current VS Input Voltage



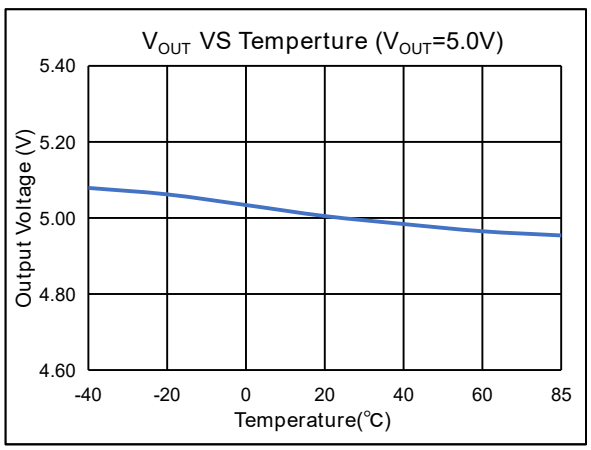
Output Voltage VS Input Voltage



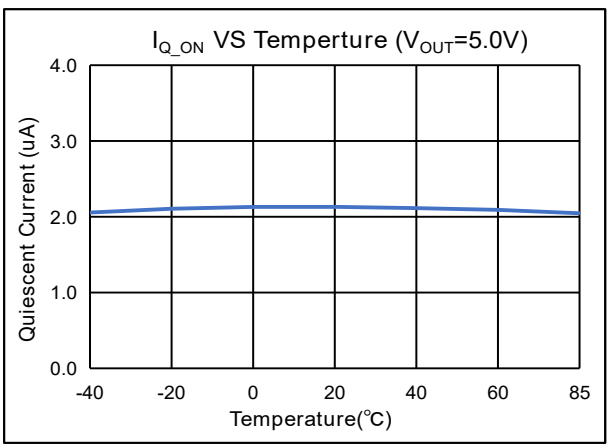
Output Voltage VS Output Current



Dropout Voltage VS Output Current



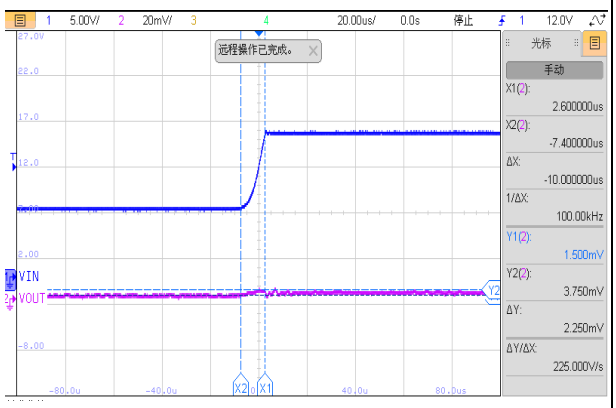
Output Voltage VS Temperature



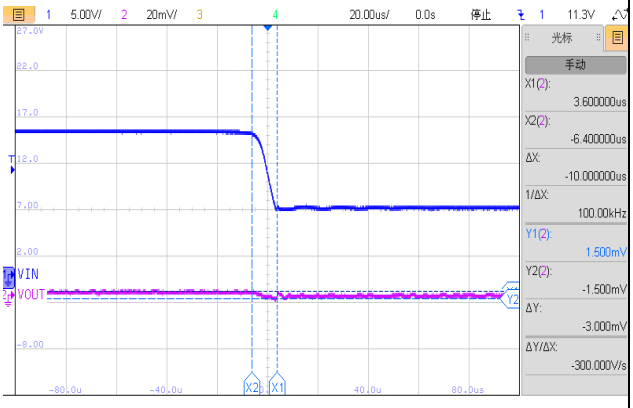
Quiescent Current VS Temperature

Typical Characteristics (Continued)

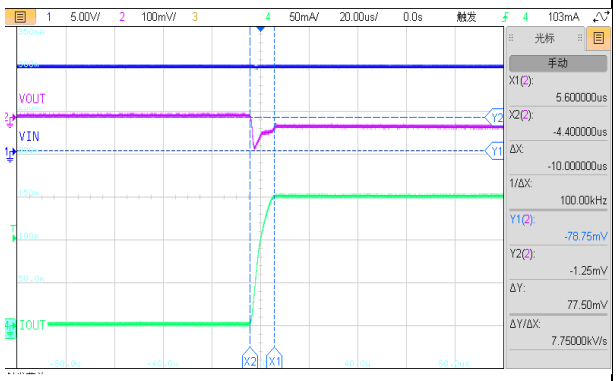
Voltage set 5V (V_{IN} =V_{OUT}+2V, C_{IN} =0.33uF， C_{OUT} = 0.1μF, Typical values are at T_A = +25°C.)



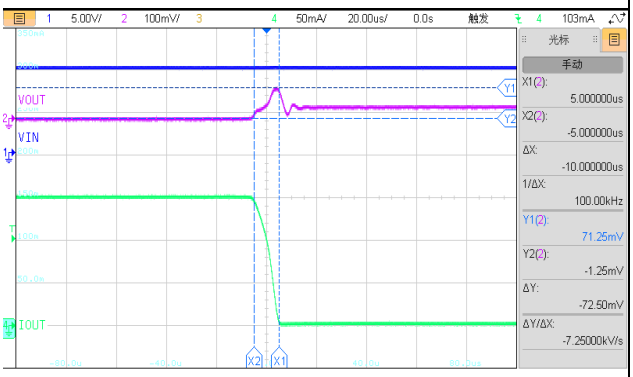
Input-Transient (7~15V, tr=10μs, I_{OUT}=1mA)



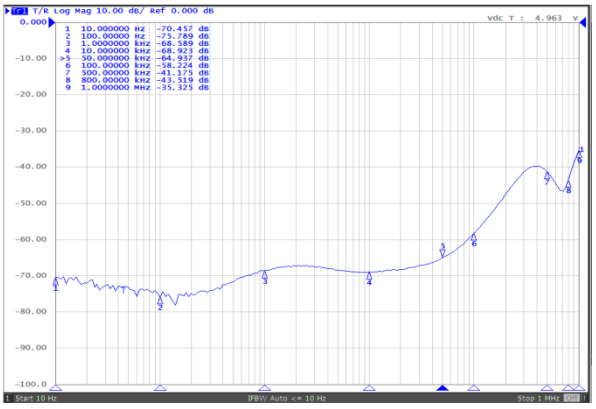
Input-Transient (15~7V, tf=10μs, I_{OUT}=1mA)



Load-Transient (V_{IN} =10V, I_{OUT}=1~150mA, tr=10μs)

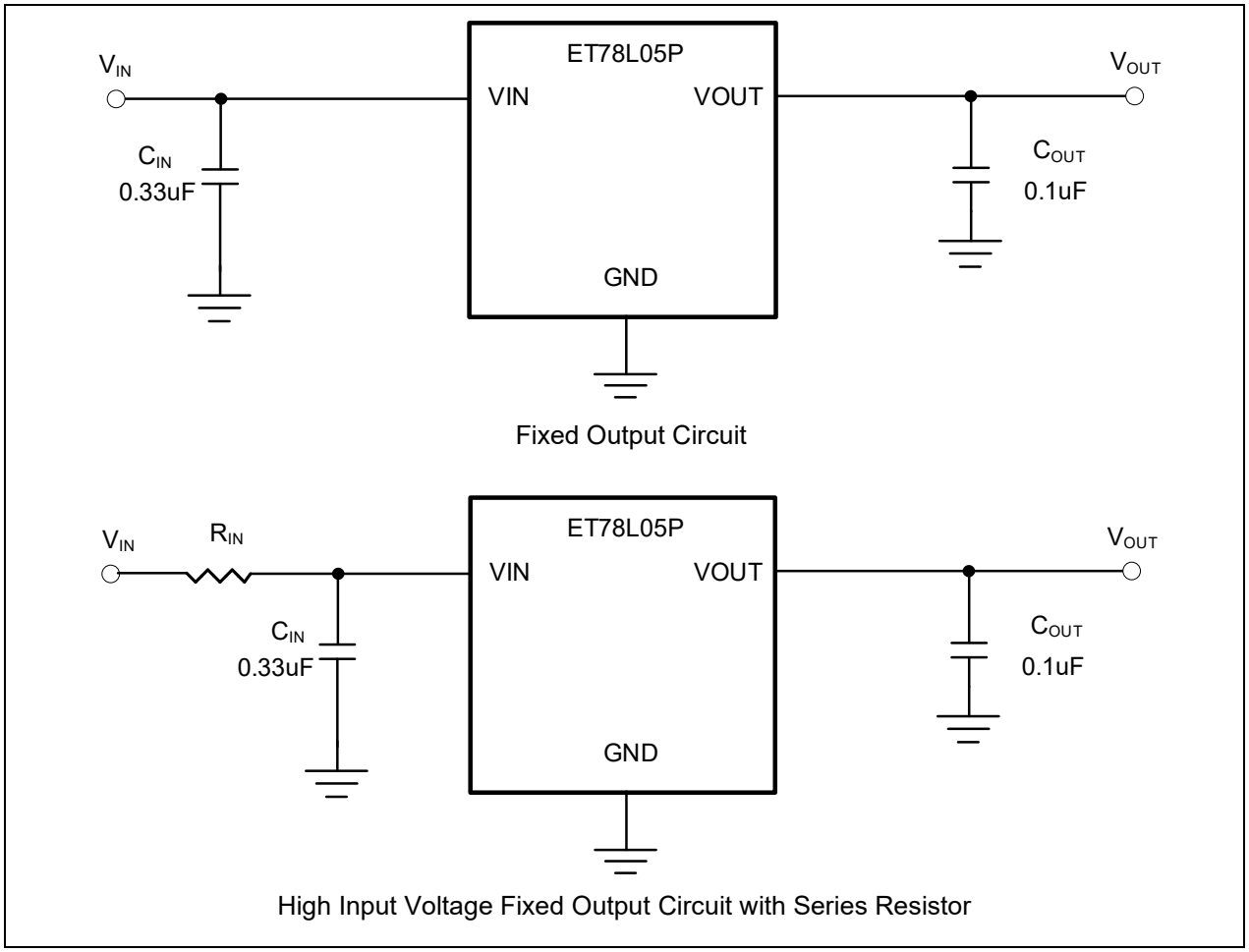


Load-Transient (V_{IN} =10V, I_{OUT}=150~1mA, tf=10μs)



PSRR (I_{OUT}=40mA)

Application Circuits



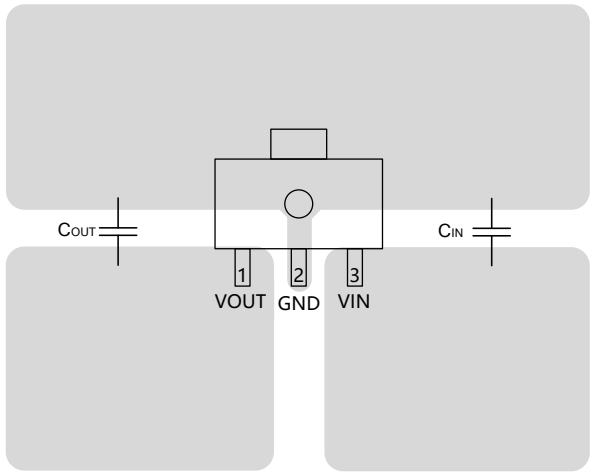
Note:

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.

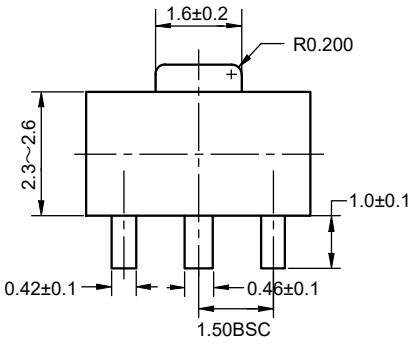
R_{IN} recommended value：$R_{IN} = (V_{IN}-8V) / I_{OUT_MAX}$

PCB Layout Guide

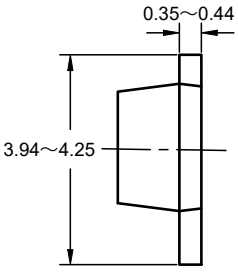


Package Dimension

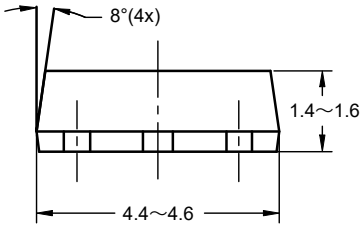
SOT89-3



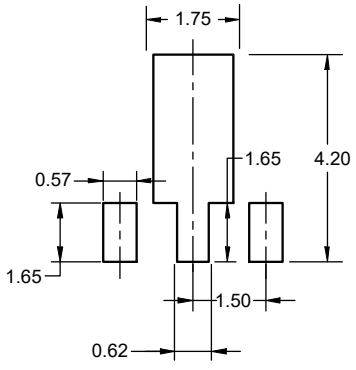
Top View



Side View



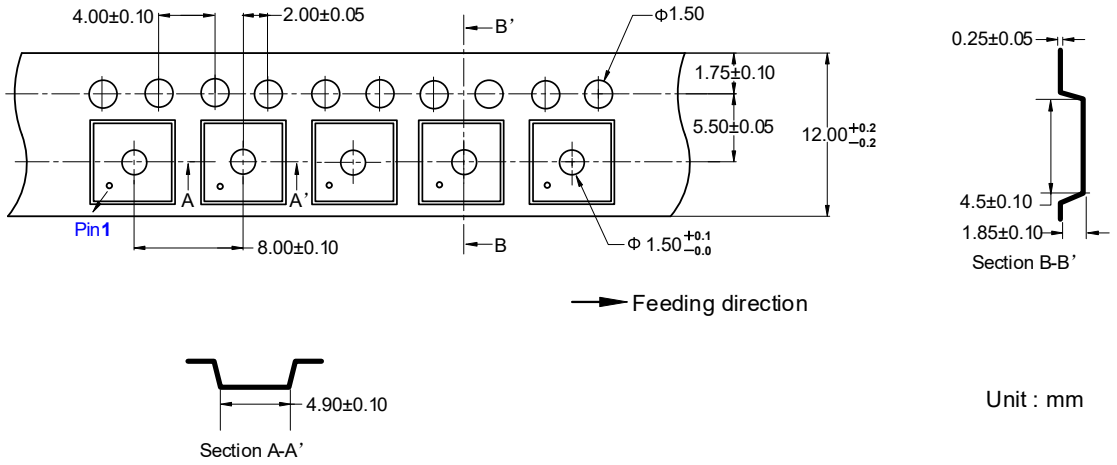
Side View



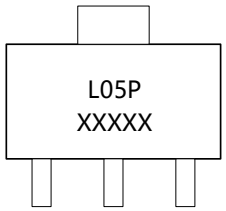
Recommended Land Pattern

Tape Information

SOT89-3



Marking Information



L05P- Part Number

XXXXX- Tracking Number

Revision History and Checking Table

Version	Date	Revision Item	Modifier	Function & Spec Checking	Package & Tape Checking
1.0	2020-06-11	Initial Version	Liujy	Liuxm	Liujy
1.1	2023-01-14	Update Typeset	Tugz	Liuxm	Liujy
1.2	2024-07-14	Update Electrical Characteristics & Typical Characteristics	Pengjj	Liuxm	Liujy
1.3	2025-08-15	Update Typical Characteristics	Caoyz	Liuxm	Liujy
1.4	2025-12-8	Update Typeset	Shib	Liuxm	Liujy
1.4.a	2026-04-18	Update Package Information	Yangxx	Liuxm	Liujy
1.5	2026-09-08	Update Maximum Power Dissipation	CuiZw	Liuxm	Liujy