



## SPX29150

### 1.5A High Current Low Dropout Voltage Regulator Adjustable & Fixed Output, Fast Response (ADVANCED INFORMATION)

#### FEATURES

- Adjustable Output Down To 1.2V
- 1% output accuracy @ 2.5V, 3.3V & 5.0V
- Output Current of 1.5A
- Low Dropout Voltage of 350mV @ 1.5A
- Extremely Tight Load And Line Regulation
- Extremely Fast Transient Response
- Reverse-battery and "Load Dump" Protection
- Standard 3-Terminal Low Cost TO-220, TO-263

#### APPLICATIONS

- Powering VGA & Sound Card
- LCD Monitors
- USB Power Supply
- Power PC™ Supplies
- SMPS Post-Regulator
- High Efficiency "Green" Computer Systems
- High Efficiency Linear Power Supplies
- Portable Instrumentation
- Constant Current Regulators
- Adjustable Power Supplies
- Battery Charger

#### PRODUCT DESCRIPTION

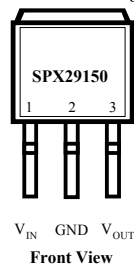
The SPX29150 is a 1.5A high accuracy, low dropout voltage regulator with only 350mV(Typ.)@ 1.5A). The SPX29150 is designed for low voltage application that requires lower dropout voltage and faster transient response. This device is an excellent choice for use in powering low voltage microprocessor that require a lower dropout, faster transient response to regulate from +2.5V to 3.8V supplies and as a post regulator for switching supplies applications.

The SPX29150 offers full protection against over-current faults, reversed input polarity, reversed load insertion, and positive and negative transient voltage. On-Chip trimming adjusts the reference voltage to 1%. Features such as Enable pin, Error Flag pin are also included in the 5 pin packages.

The SPX29150 is offered in a 3 & 5-pin TO-220 & TO-263 package compatible with other 3 terminal regulators. For a 3A low dropout regulator refer to the data sheet.

#### PIN CONNECTIONS

TO-263-3 Package



Front View

TO-220-3 Package



Front View

## ABSOLUTE MAXIMUM RATINGS

Lead Temperature (soldering, 5 seconds).....260°C  
 Storage Temperature Range.....-65°C +150°C  
 Operating Junction Temperature Range.....-40°C +125°C

Input Voltage).....260°C  
 Input Supply Voltage (Note 1) (Survival).....-20V to +60V

## ELECTRICAL CHARACTERISTICS at $I_{OUT} = 10\text{mA}$ , $T_A = 25^\circ\text{C}$ , unless otherwise specified. The Boldface applies over the junction temperature range.

PARAMETER	CONDITIONS	Typ	SPX29150		Units
			Min	Max	
<b>2.5V Version</b>					
Output Voltage	$I_{OUT} = 10\text{mA}$ $10\text{mA} \leq I_{OUT} \leq 1.5\text{A}$ , $4.3\text{V} \leq V_{IN} \leq 16\text{V}$	2.5 <b>2.5</b>	2.475 <b>2.450</b>	2.525 <b>2.550</b>	V
<b>3.3V Version2.</b>					
Output Voltage	$I_{OUT} = 10\text{mA}$ $10\text{mA} \leq I_{OUT} \leq 1.5\text{A}$ , $4.3\text{V} \leq V_{IN} \leq 16\text{V}$	3.3 <b>3.3</b>	3.267 <b>3.234</b>	3.330 <b>3.366</b>	V
<b>5.0V Version</b>					
Output Voltage	$I_{OUT} = 10\text{mA}$ $10\text{mA} \leq I_{OUT} \leq 1.5\text{A}$ , $5.5\text{V} \leq V_{IN} \leq 16\text{V}$	5.0 <b>5.0</b>	4.95 <b>4.90</b>	5.05 <b>5.10</b>	V
<b>All Voltage Options</b>					
Line Regulation	$I_O = 10\text{mA}$ , $(V_{OUT} + 1\text{V}) \leq V_{IN} \leq 16\text{V}$	0.1		0.5	%
Load Regulation	$V_{IN} = V_{OUT} + 5\text{V}$ , $10\text{mA} \leq I_{OUT} \leq I_{FULLLOAD}$	0.2		1	%
$\frac{\Delta V}{\Delta T}$	Output Voltage Temperature Coef.	<b>50</b>		<b>100</b>	ppm/°C
Dropout Voltage (Note 1)	$I_O = 100\text{mA}$	90		<b>200</b>	mV
	$I_O = 750\text{mA}$	280			
	$I_O = 1.5\text{A}$	490		<b>690</b>	
Ground Current (Note 3)	$I_O = 750\text{mA}$ , $V_{IN} = V_{OUT} + 1\text{V}$	12		<b>25</b>	mA
	$I_O = 1.5\text{A}$	25			
$I_{GNDDO}$ Ground Pin Current at Dropout	$V_{IN} = 0.1\text{V}$ less than specified $V_{OUT}$ $I_{OUT} = 10\text{mA}$	0.9			mA
Current Limit	$V_{OUT} = 0\text{V}$ (Note 2)	2.2	1.7		A
Output Noise Voltage (10Hz to 100kHz) $I_L = 100\text{mA}$	$C_L = 10\mu\text{F}$	400			$\mu\text{V}_{RMS}$
	$C_L = 33\mu\text{F}$	260			
Reference Voltage		1.240	1.228 <b>1.215</b>	1.252 <b>1.265</b>	V
Adjust Pin Bias Current		40		80 <b>120</b>	nA
	(Note 4)	50			
Reference Voltage Temperature Coefficient	(Note 4)				ppm/°C
Adjust Pin Bias Current Temperature Coefficient		0.1			nA/°C

Upper Threshold Voltage	Device set for 3.3V (Note 5)	60	40 25		mV
Lower Threshold Voltage	Device set for 3.3V (Note 5)	75		95 140	mV
Hysteresis	Device set for 3.3V (Note 5)	15			mV

## NOTES:

Note 1: Dropout voltage is defined as the input-to output differential when the output voltage drops to 95% of its nominal value.

Note 2:  $V_{IN} = V_{OUT (NOMINAL)} + 1V$ . For example, use  $V_{IN} = 4.3V$  for a 3.3V regulator. Employ pulse-testing procedures to minimize temperature rise.

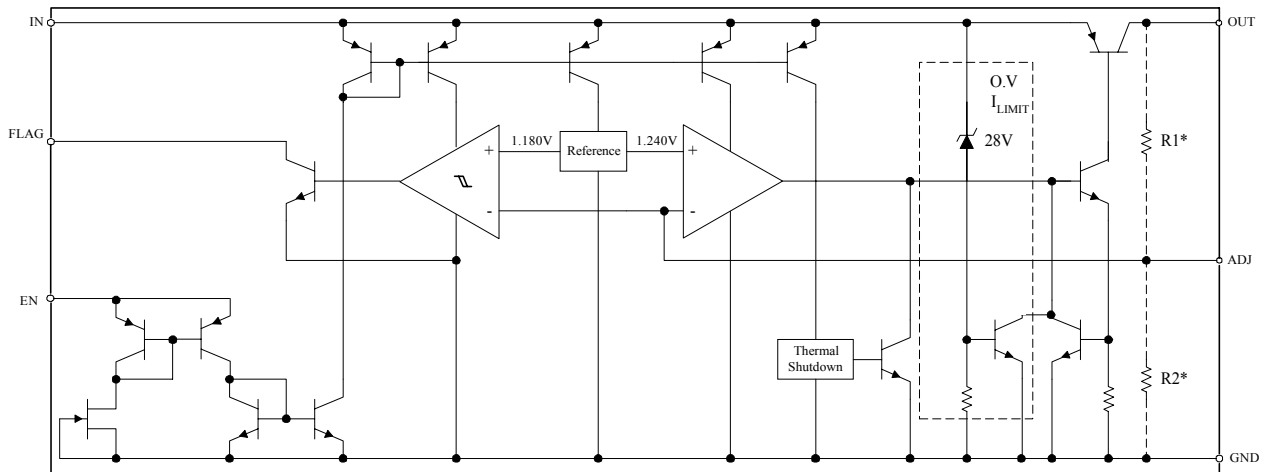
Note 3: Ground pin current is the regulator quiescent current. The total current drawn from the source is the sum of the load current to the ground current.

Note 4: Thermal regulation is defined as the change in the output voltage at a time T after a change in power dissipation is applied, excluding load or line regulation effects.

Note 5: Comparator threshold is expressed in terms of a voltage differential at the Adjust terminal below the nominal reference voltage measured 6V input. To express these thresholds in terms of output voltage change, multiply the error amplifier gain =  $V_{OUT}/V_{REF} = (R1 + R2)/R2$ . For example, at a programmable output voltage of 5V, the Error output is guaranteed to go low when the output drops by  $95mV \times 5V / 1.240V = 38mV$ . Threshold remains constant as a percent of  $V_{OUT}$  as  $V_{OUT}$  is varied, with the dropout warning occurring at typically 5% below nominal, 7.7% guaranteed.

Note 6:  $V_{EN} \leq 0.8V$  and  $V_{IN} \leq 16V$ ,  $V_{OUT} = 0$ .

## BLOCK DIAGRAM



## APPLICATION HINTS

The SPX29150 incorporates protection against over-current faults, reversed load insertion, over temperature operation, and positive and negative transient voltage. However, the use of an output capacitor is required in order to insure the stability and the performances.

### Thermal Consideration

Although the SPX29150 offers limiting circuitry for overload conditions, it is necessary not to exceed the maximum junction temperature, and therefore to be careful about thermal resistance. The heat flow will follow the lowest resistance path, which is the Junction-to-case thermal resistance. In order to insure the best thermal flow of the component, a proper mounting is required. Note that the case of the device is electrically connected to the output. The case has to be electrically isolated, a thermally conductive spacer can be used. However do not forget to consider its contribution to thermal resistance.

Assuming:

$$V_{IN} = 10V, V_{OUT} = 5V, I_{OUT} = 1.5A, T_A = 50^{\circ}C/W, \\ \theta_{Heatsink\ Case} = 6^{\circ}C/W, \theta_{Heatsink\ Case} = 0.5^{\circ}C/W, \theta_{JC} = 3^{\circ}C/W$$

Power dissipation under this condition

$$P_D = (V_{IN} - V_{OUT}) * I_{OUT} = 7.5W$$

Junction Temperature

$$T_J = T_A + P_D * (\theta_{Case - HS} + \theta_{HS} \theta_{JC})$$

For the Control Section

$$T_J = 50 + 7.5 * (0.5 + 6 = 3) = 121.25^{\circ}C$$

$121.25^{\circ}C < T_{J(max)}$  for the Control & Power Sections.

In both case reliable operation is insured by adequate junction temperature.

### Capacitor Requirements

The output capacitor is needed for stability and to minimize the output noise. The required value of the capacitor varies with the load. However, a minimum value of  $10\mu F$  Aluminum

will guarantee stability over load. A tantalum capacitor is recommended for a fast load transient response.

If the power source has high AC impedance, a  $0.1\mu F$  capacitor between input & ground is recommended. This capacitor should have good characteristics up to 250 kHz.

### Minimum Load Current

To ensure a proper behavior of the regulator at light load, a minimum load of 5mA for SPX29150 is required.

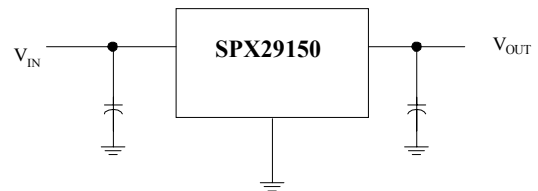
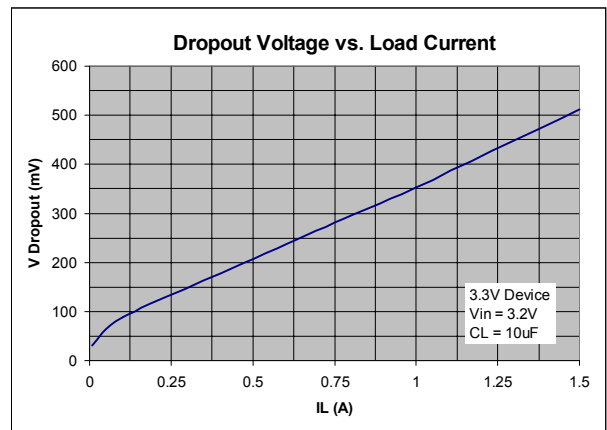
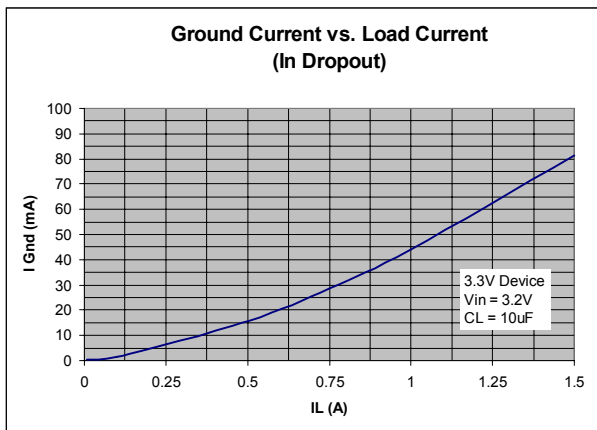
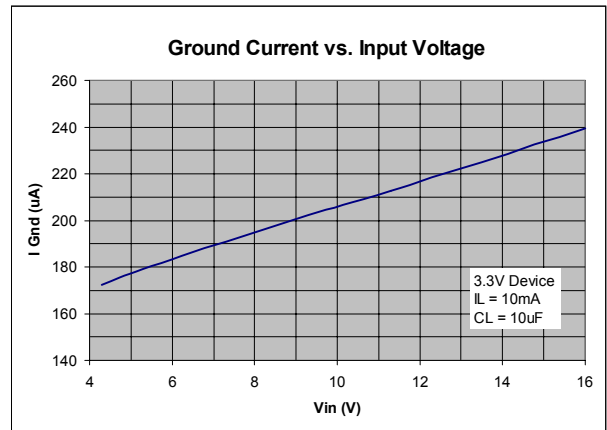
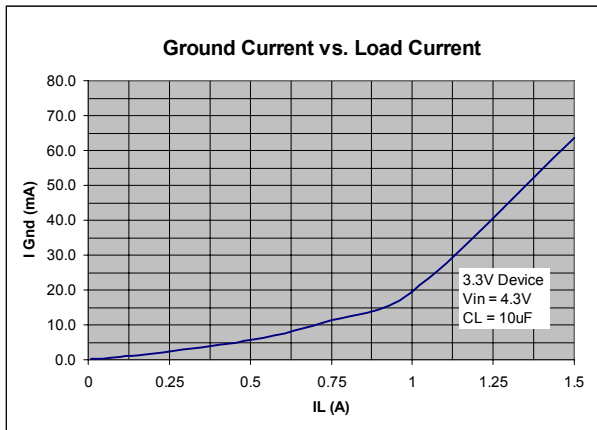
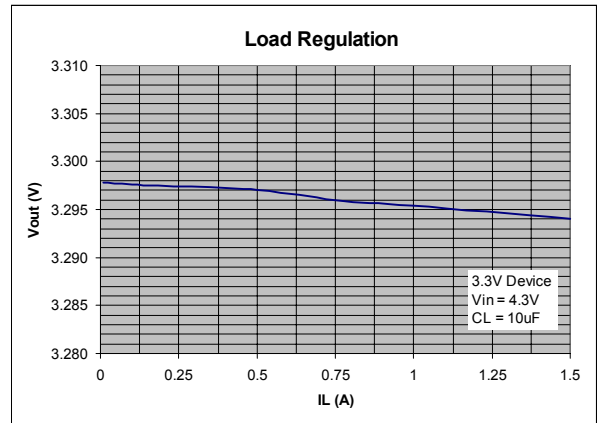
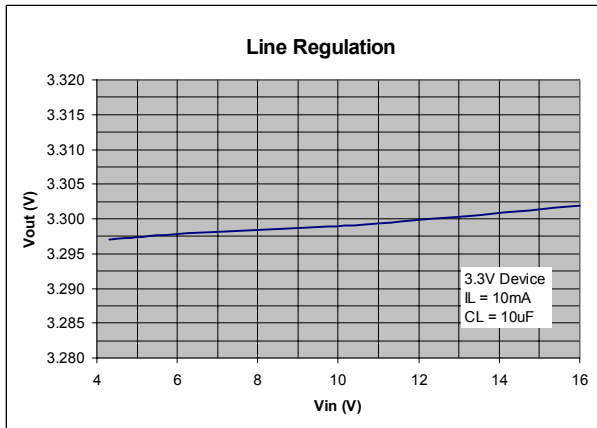
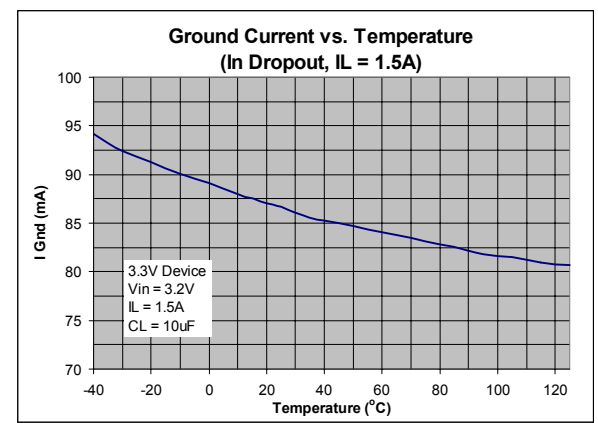
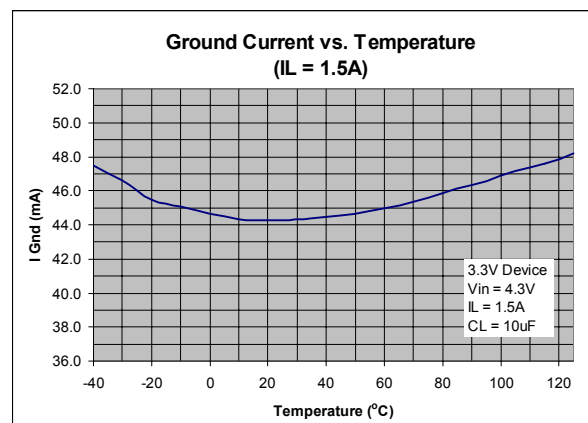
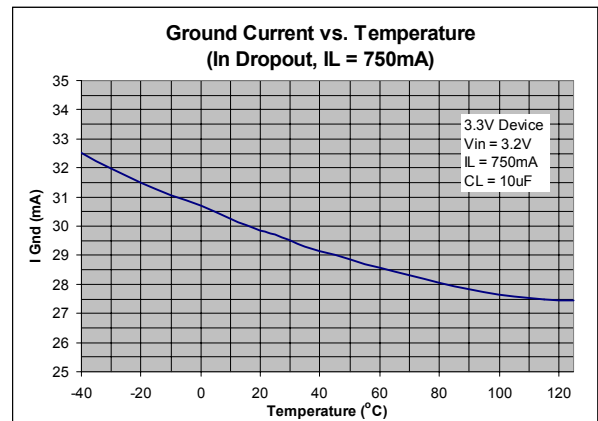
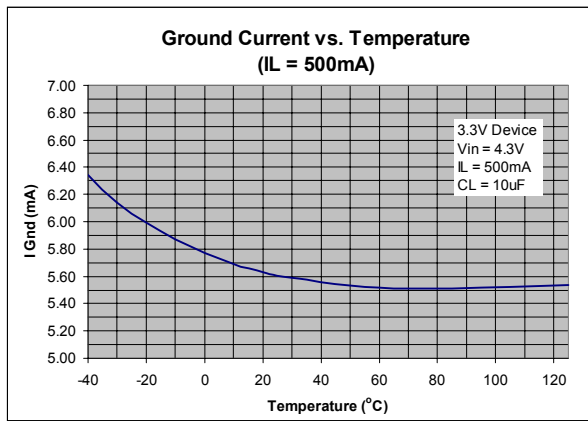
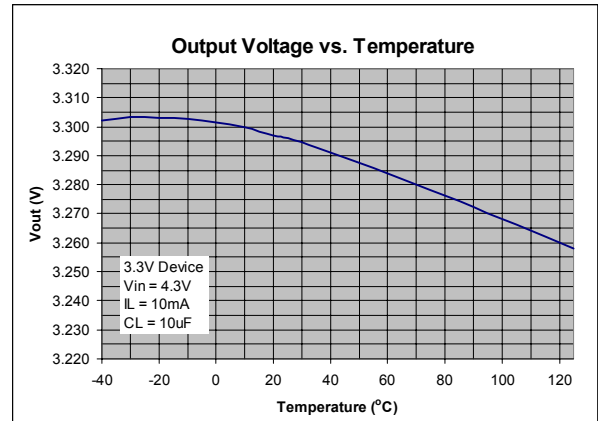
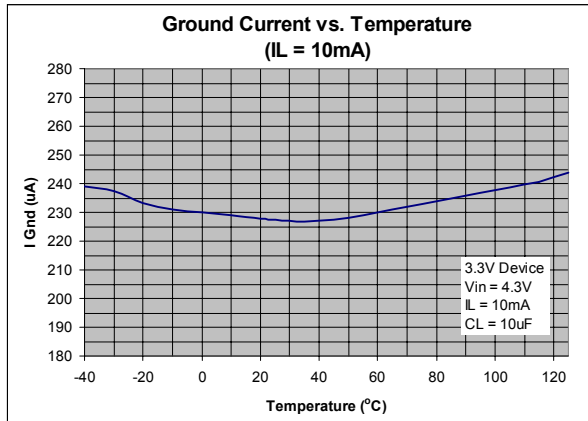
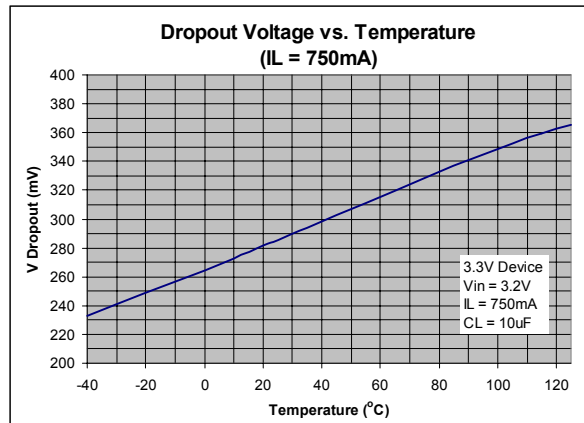


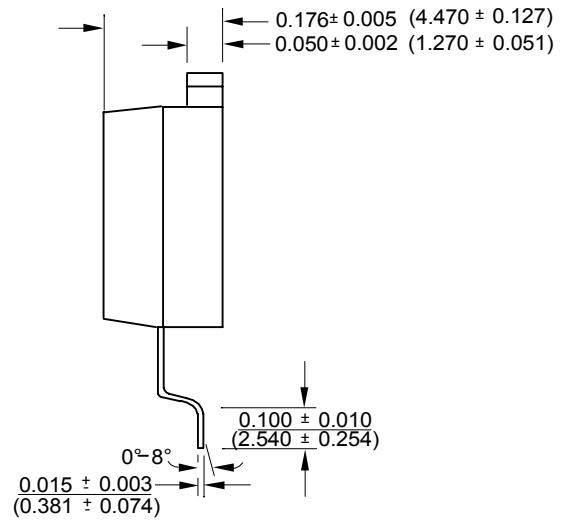
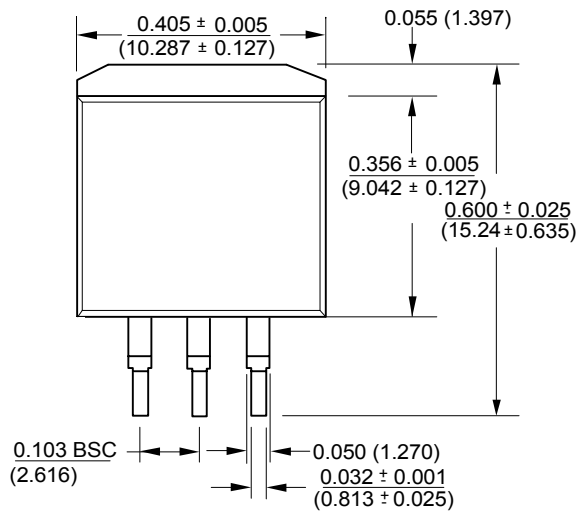
Fig.1 Basic Fixed Output Regulator





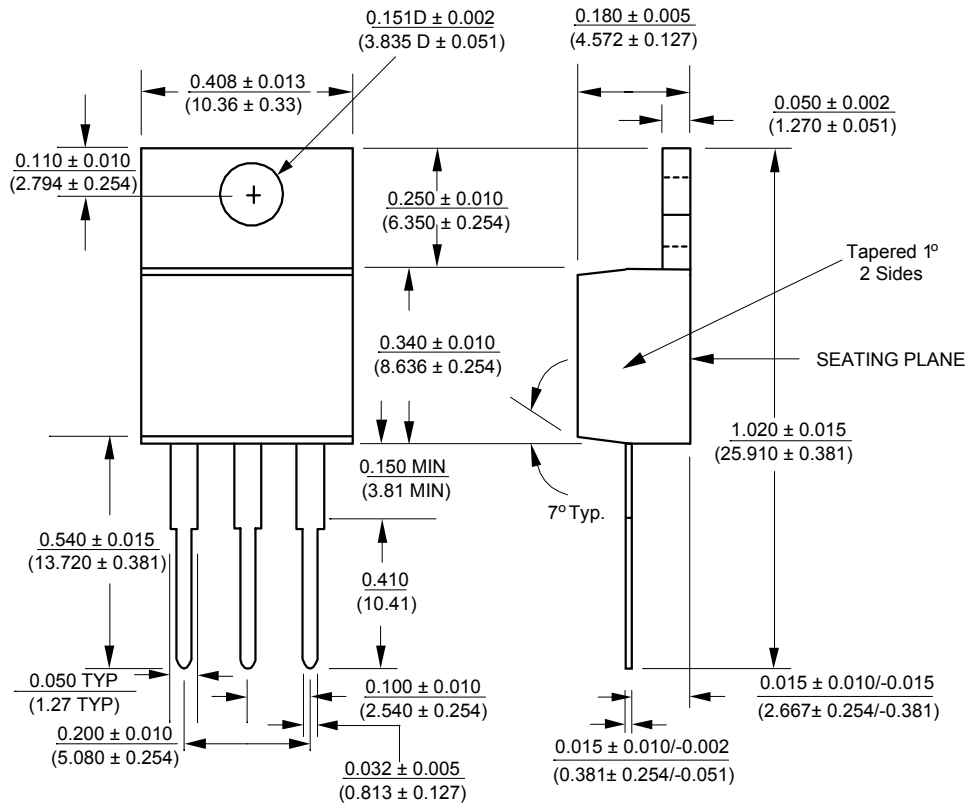


PACKAGE DRAWING  
TO-263-3L (T)





PACKAGE DRAWING  
TO-220-3L (U)



## ORDERING INFORMATION

Ordering No.	Output Voltages	Packages
SPX29150U	Adj	5 Lead TO-220
SPX29150U-2.5	2.5V	3 Lead TO-220
SPX29150U-3.3	3.3V	3 Lead TO-220
SPX29150U-5.0	5.0V	3 Lead TO-220
SPX29150T	Adj	5 Lead TO-263
SPX29150T-2.5	2.5V	3 Lead TO-263
SPX29150T-3.3	3.3V	3 Lead TO-263
SPX29150T-5.0	5.0V	3 Lead TO-263



SIGNAL PROCESSING EXCELLENCE

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