钍地半导体
Tudi Semiconductor

Product Specification

TUDI-SPX1587A

3A Low Dropout Voltage Regulator Adjustable & Fixed Output, Fast Response

网址 www.sztdbdt.com

用芯智造·卓越品质

semiconductor device manufacturer

- Design
- research and development
- production
- and sales

Features

- Fixed Output Voltages 3.3, 5.0V and Adjustable
- Output Current Of 3A
- Low Dropout Voltage 1.1V Typ
- Extremely Tight Load And Line Regulation
- Current & Thermal Limiting
- Standard 3-Terminal Low Cost TO-220, TO-263 & TO-25

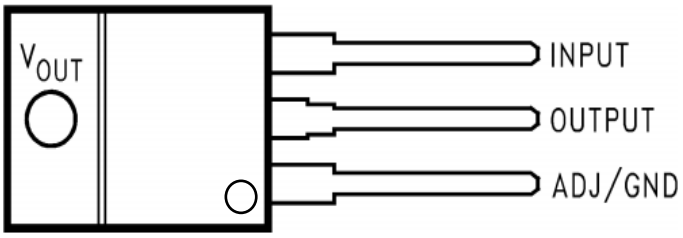


Figure 1. TO220 Pin Diagram

Description

The SPX1587 is a low power 3A adjustable and fixed voltage regulator that is very easy to use. It requires only 2 external resistors to set the output voltage for adjustable version. The SPX1587 are designed for low voltage applications that offers 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 SPX1587 features low dropout of a maximum 1.2 volts. The SPX1587 offers over current limit and full protection against reversed input polarity, reversed load insertion, and positive and negative transient voltage. The IQ of this device flows into the load, which increases efficiency.

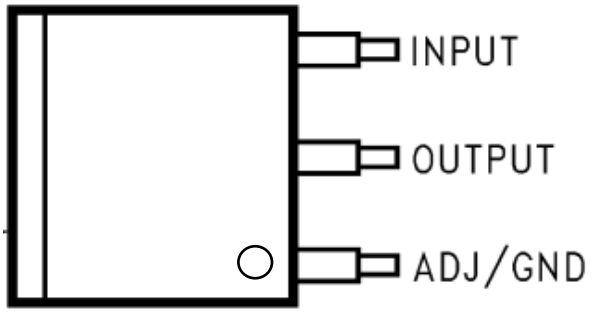
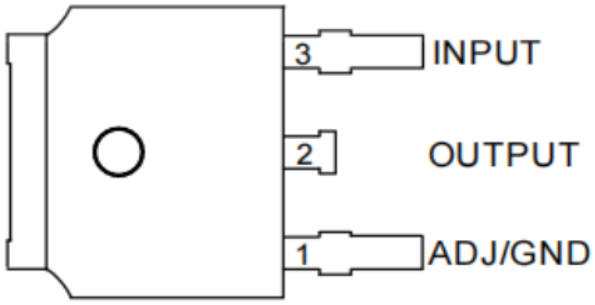


Figure 2. TO263 Pin Diagram



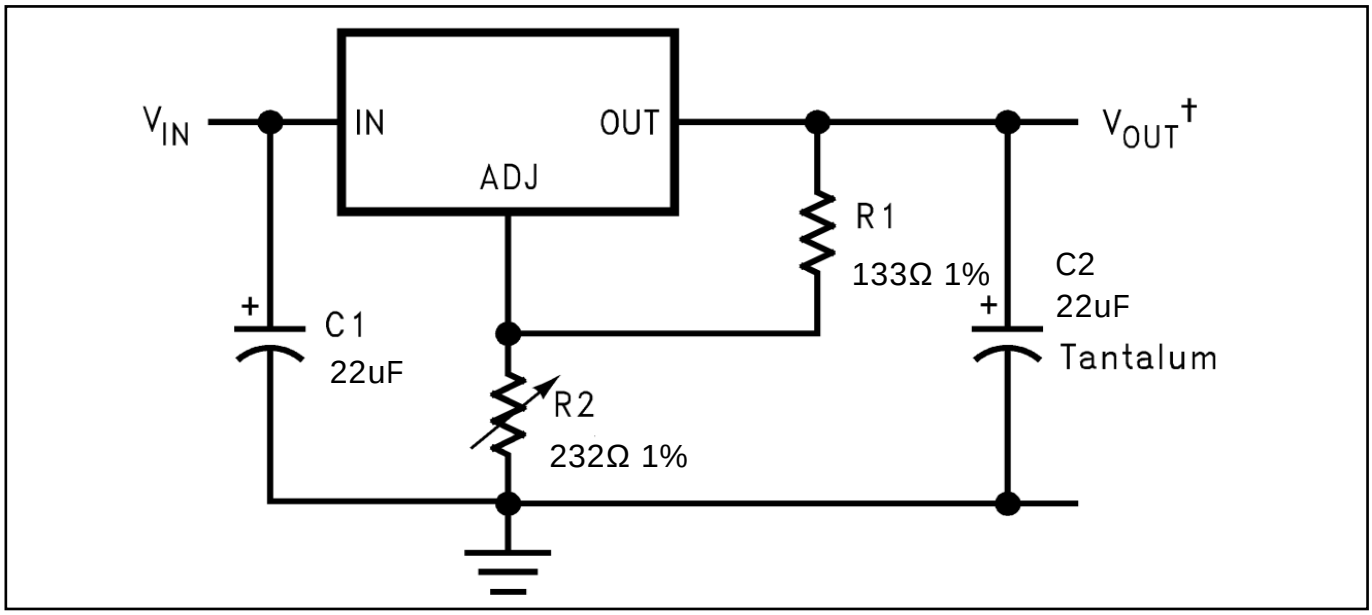
Applications

- Powering VGA & Sound Card
- Power PCTM Supplies
- SMPS Post-Regulator
- High Efficiency "Green" Computer Systems
- High Efficiency Linear Power Supplies
- Portable Instrumentation
- Constant Current Regulators
- Adjustable Power Supplies
- Battery charger

Pin description

PIN		I/O	DESCRIPTION
NAME	NO.		
ADJ/GND	1	-	Adjust pin for the adjustable output voltage version.Ground pin for the fixed output voltage
OUTPUT	2	0	Output voltage pin for the regulator.
INPUT	3	I	Input voltage pin for the regulator.

Typical Application



*NEEDED IF DEVICE IS FAR FROM FILTER CAPACITORS

$$\dagger V_{OUT} = 1.25V\left(1 + \frac{R2}{R1}\right)$$

NOTES:
- C1 needed if device far from filrer capacitors
- C2 minimum value required for srability

Absolute Maximum Ratings

Symbol	Parameter		Value	Unit
VCC	Power Dissipation		Internally Limited	W
VIN	Input Voltage		15	V
TJ	Operation Junction Temperature Range			
		Control Section	-40 to 125	℃
		Power Transistor	-40 to 150	
TSTG	Storage Temperature Range		-65 to +150	℃
TLEAD	Lead Temperature (Soldering 10 sec)	TO-220/TO-263	245	℃

Note:Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

Electrical Characteristics I_{LOAD} = 0mA and TJ = +25°C (unless otherwise noted)

Parameter	Device	Test Conditions		Min	Typ	Max.	Unit
Reference Voltage (Note 1)		V_{IN}=5V,I_{LOAD} =10mA		1.238	1.250	1.262	V
		V_{IN}-V_{OUT}=1.5V to 10V, I_{LOAD}=10mA to 3A	*	1.225	1.250	1.275	
Output Voltage (Note 1)	All fixedversions	V_{IN}-V_{OUT}=1.5V, Variator from nominal VOUT		-1	-	+1	%
		V_{IN}-V_{OUT}=1.5V to 10V I_{LOAD}=0mA to 3A, Vaniator from nominal V_{OUT}	*	-2	-	+2	
Line Regulation (Note 1)	All	I_{LOAD}=10mA, V_{IN}-V_{OUT}=1.5V to 10V	*	-	0.04	0.20	%
Load Regulation(Note 1)	All	V_{IN}-V_{OUT}=1.5V I_{LOAD} =10mA to 3A	*	-	0.2	0.40	
Minimum Load Current		V_{IN}=5V,V_{ADJ}=OV	*	-	3	7	mA
Ground Pin Current	All fixed versions	V_{IN}-V_{OUT}=1.5V I_{LOAD}=10mA to 3A	*	-	7	10	mA
Adjust Pin Current		V_{IN}-V_{OUT}=1.5V to 10V I_{LOAD}=10mA	*	-	40	90	μA
Current Limit	All	V_{IN}-V_{OUT}=1.5V	*	3	4.5	-	A
Ripple Rejection (Note 2)	All	V_{IN}-V_{OUT}=3V I_{LOAD}=3A	*	60	65	-	dB
Dropout Voltage (Note 1,3)	All	I_{LOAD} =3A	*	-	1.3	1.5	V
Temperature Coefficient	All	V_{IN}-V_{OUT}=1.5V, I_{LOAD} =10mA	*	-	0.005	-	%/℃

The * denotes the specifications which apply over the full temperature range (see previous table, T_J)

NOTES:
1. Low duty pulse testing with Kelvin connections required.
2. 120Hz input ripple (C_{ADJ} for ADJ = 25μF, C_{OUT} = 25μF)
3. △V_{OUT}, △VREF = 1%

Protection Diodes

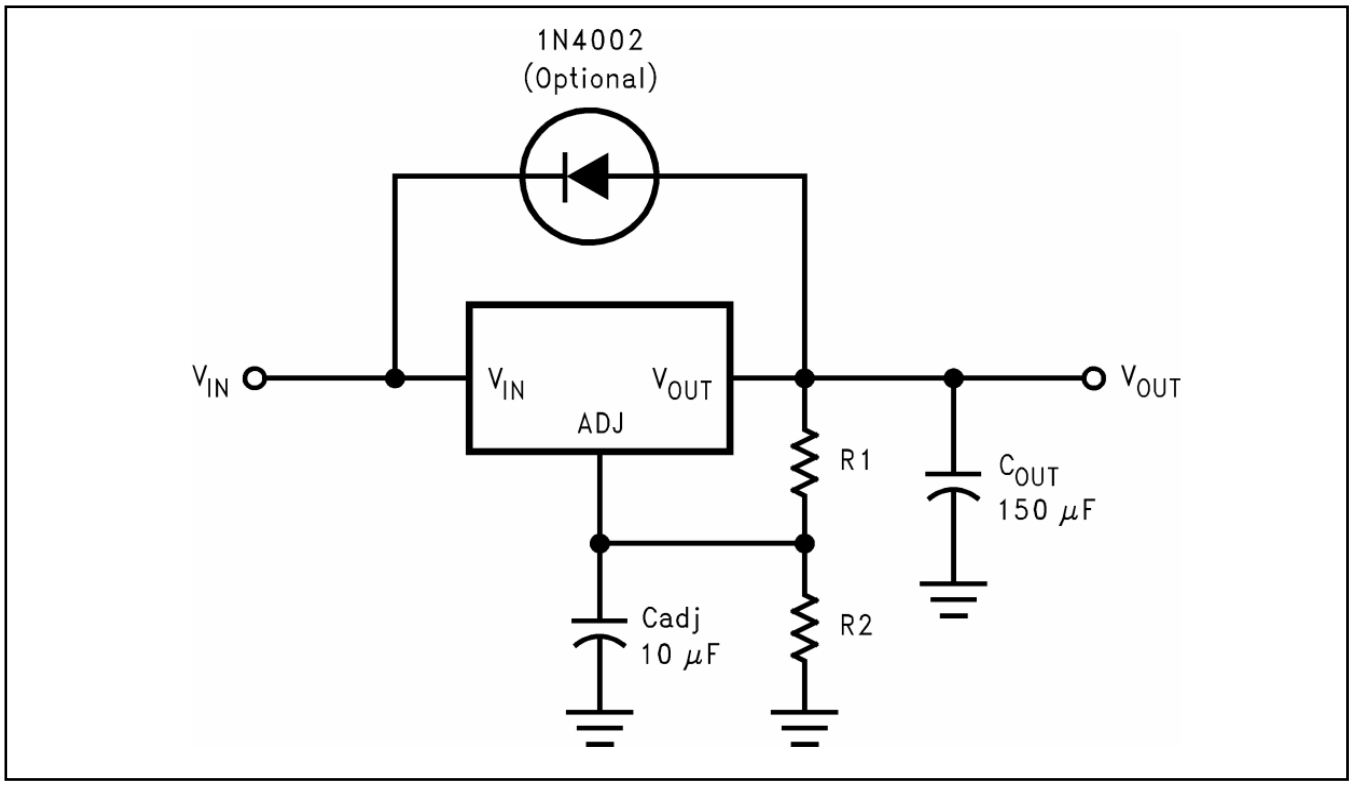


Figure 4.Regulator With Protection Diode

Unlike older regulators, the SPX1587 family does not need any protection diodes between the adjustment pin and the output and from the output to the input to prevent over-stressing the die.

Internal resistors are limiting the internal current paths on the SPX1587 adjustment pin, therefore even with capacitors on the adjustment pin no protection diode is needed to ensure device safety under short-circuit conditions.

Diodes between the input and output are not usually needed. Microsecond surge currents of 50A to 100A can be handled by the internal diode between the input and output pins of the device. In normal operations it is difficult to get those values of surge currents even with the use of large output capacitances. If high value output capacitors are used, such as 1000 µF to 5000µF and the input pin is instantaneously shorted to ground, damage can occur. A diode from output to input is recommended, when a crowbar circuit at the input of the SPX1587 is used. Normal power supply cycling or even plugging and unplugging in the system will not generate current large enough to do any damage.

The adjustment pin can be driven on a transient basis ±25V, with respect to the output without any device degradation. As with any IC regulator, none the protection circuitry will be functional and the internal transistors will break down if the maximum input to output voltage differential is exceeded.

Application Information

The SPX1587 series of adjustable and fixed regulators are easy to use and have all the protection features expected in high performance voltage regulators: short circuit protection and thermal shut-down. Pin compatible with older three terminal adjustable regulators, these devices offer the advantage of a lower dropout voltage, more precise reference tolerance and improved reference stability with temperature.

Ripple Rejection Enhancement

The ripple rejection values are measured with the adjustment pin bypassed. The impedance of the adjust pin capacitor at the ripple frequency should be less than the value of R1 (normally 100Ω to 120Ω) for a proper bypassing and ripple rejection approaching the values shown. The size of the required adjust pin capacitor is a function of the input ripple frequency. If R1=100Ω at 120Hz the adjust pin capacitor should be 25μF. At 10 kHz only 0.22 μF is needed.
The ripple rejection will be a function of output voltage, in circuits without an adjust pin bypass capacitor. The output ripple will increase directly as a ratio of the output voltage to the reference voltage (VOUT / VREF).

Thermal Considerations

The SPX1587 series have internal power and thermal limiting circuitry designed to protect the device under overload conditions. However maximum junction temperature ratings should not be exceeded under continuous normal load conditions.
Careful consideration must be given to all sources of thermal resistance from junction to ambient, including junction-to-case, case-to-heat sink interface and heat sink resistance itself. To ensure safe operating temperatures and reflect more accurately the device temperature, new thermal resistance specifications have been developed. Unlike older regulators with a single junction-to-case thermal resistance specification, the data section for these new regulators provides a separate thermal resistance and maximum junction temperature for both the Control Section and the Power Transistor. Calculations for both temperatures under certain conditions of ambient temperature and heat sink resistance and to ensure that both thermal limits are met.
Junction-to-case thermal resistance is specified from the IC junction to the bottom of the case directly below the die. This is the lowest resistance path for the heat flow. In order to ensure the best possible thermal flow from this area of the package to the heat sink proper mounting is required. Thermal compound at the case-to-heat sink interface is recommended. A thermally conductive spacer can be used, if the case of the device must be electrically isolated, but its added contribution to thermal resistance has to be considered.

Load Regulation

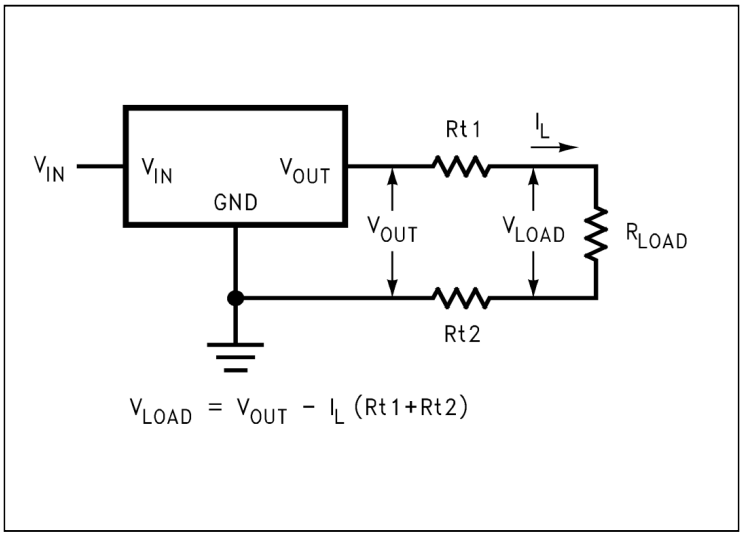


Figure 5 Typical Application Using Fixed Output Regulator

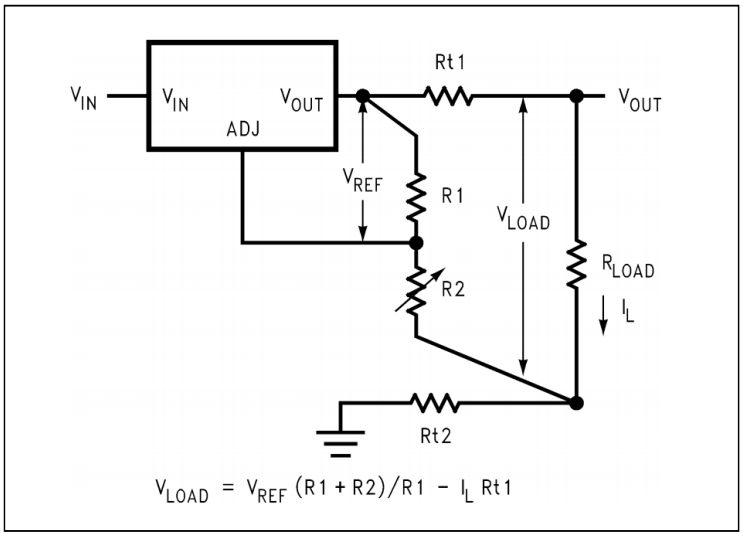


Figure 6 Best Load Regulation Using Adjustable Output Regulator

The SPX1587 regulates the voltage that appears between its output and ground pins, or between its output and adjust pins. In some cases, line resistances can introduce errors to the voltage across the load. To obtain the best load regulation, a few precautions are needed. Figure 5 shows a typical application using a fixed output regulator. Rt1 and Rt2 are the line resistances. VLOAD is less than the VOUT by the sum of the voltage drops along the line resistances. In this case, the load regulation seen at the RLOAD would be degraded from the data sheet specification. To improve this, the load should be tied directly to the output terminal on the positive side and directly tied to the ground terminal on the negative side. When the adjustable regulator is used (Figure 6), the best performance is obtained with the positive side of the resistor R1 tied directly to the output terminal of the regulator rather than near the load. This eliminates line drops from appearing effectively in series with the reference and degrading regulation. For example, a 5V regulator with 0.05 resistance between the regulator and load will have a load regulation due to line resistance of 0.05 x IL . If R1 (= 125) is connected near the load the effective line resistance will be 0.05 (1 + R2/R1) or in this case, it is 4 times worse. In addition, the ground side of the resistor R2 can be returned near the ground of the load to provide remote ground sensing and improve load regulation.

Output Voltage

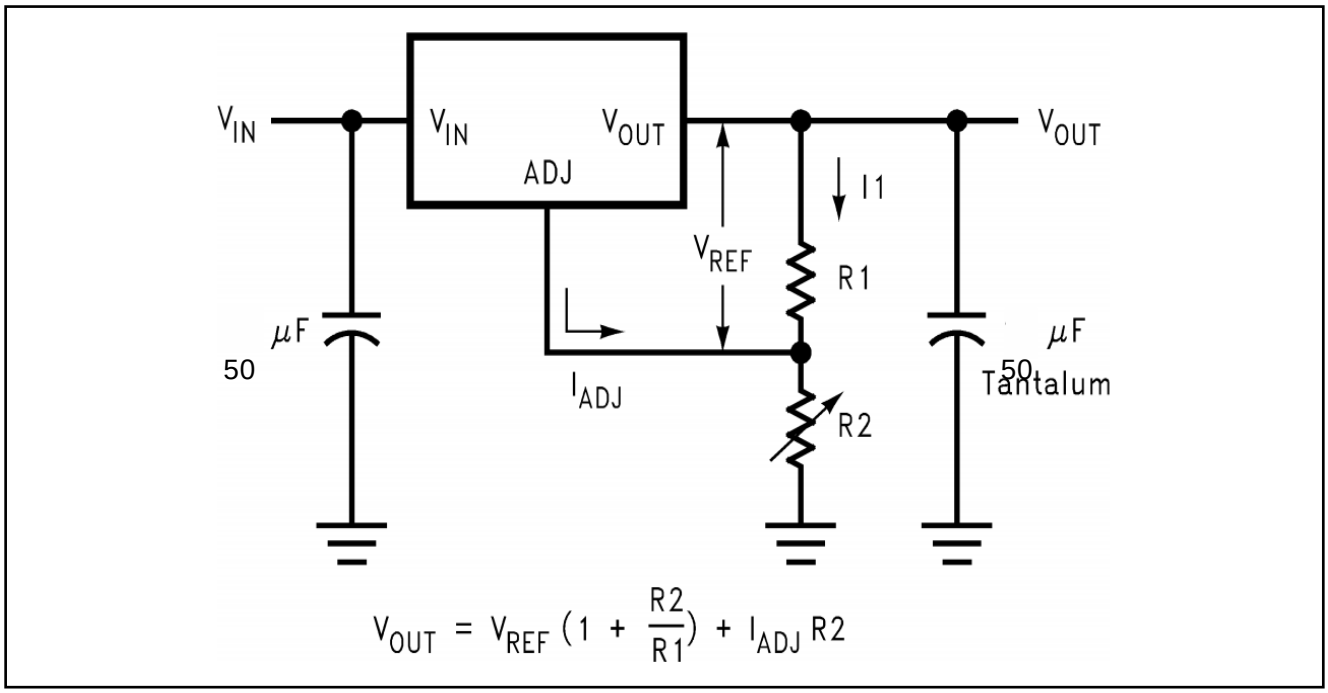


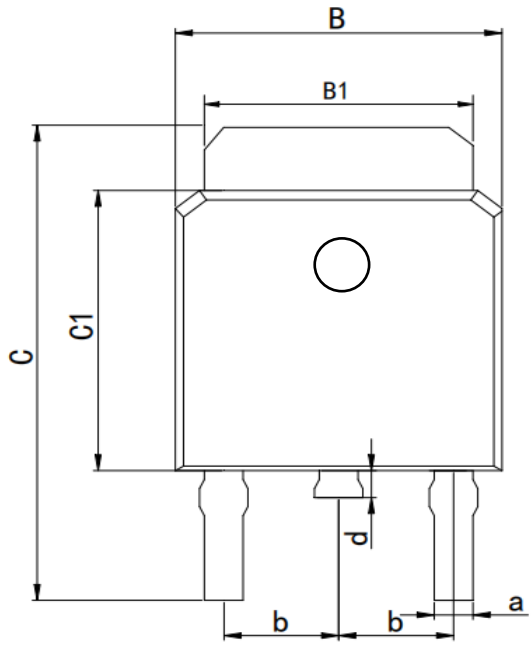
Figure 7 Basic Adjustable Regulator

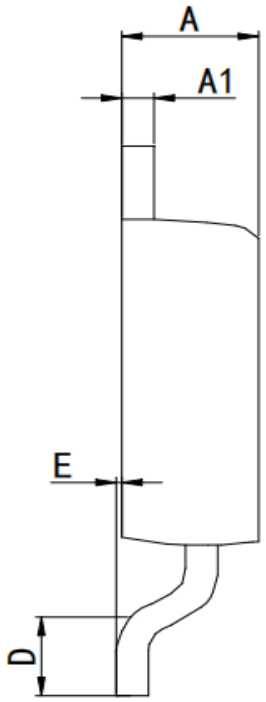
The SPX1587 series develops a 1.25V reference voltage between the output and the adjust terminal. Placing a resistor between these two terminals causes a constant current to flow through R1 and down through R2 to set the overall output voltage.
This current is normally the specified minimum load current of 10mA. Because I_{ADJ} is very small and constant it represents a small error and it can usually be ignored.

Order information

Order Number	Package	Package Quantity	Marking On The park	Temperature
SPX1587AT-TUDI	TO263	Tape,Reel,500	SPX1587AT	-40℃ to 125℃
SPX1587AT-L-3-3/TR-TUDI	TO263	Tape,Reel,500	SPX1587AT-3.3	
SPX1587AT-L-5-0/TR-TUDI	TO263	Tape,Reel,500	SPX1587AT-5.0	
SPX1587AU-L-TUDI	TO220	Tube,50,A box of 1000	SPX1587AU	
SPX1587AU-L-3-3-TUDI	TO220	Tube,50,A box of 1000	SPX1587AU-3.3	
SPX1587AU-L-5-0-TUDI	TO220	Tube,50,A box of 1000	SPX1587AU-5.0	
SPX1587AR-TUDI	TO-252	Tape,Reel,2500	1587AR	
SPX1587AR-3.3-TUDI	TO-252	Tape,Reel,2500	1587AR-3.3	
SPX1587AR-5.0-TUDI	TO-252	Tape,Reel,2500	1587AR-5.0	

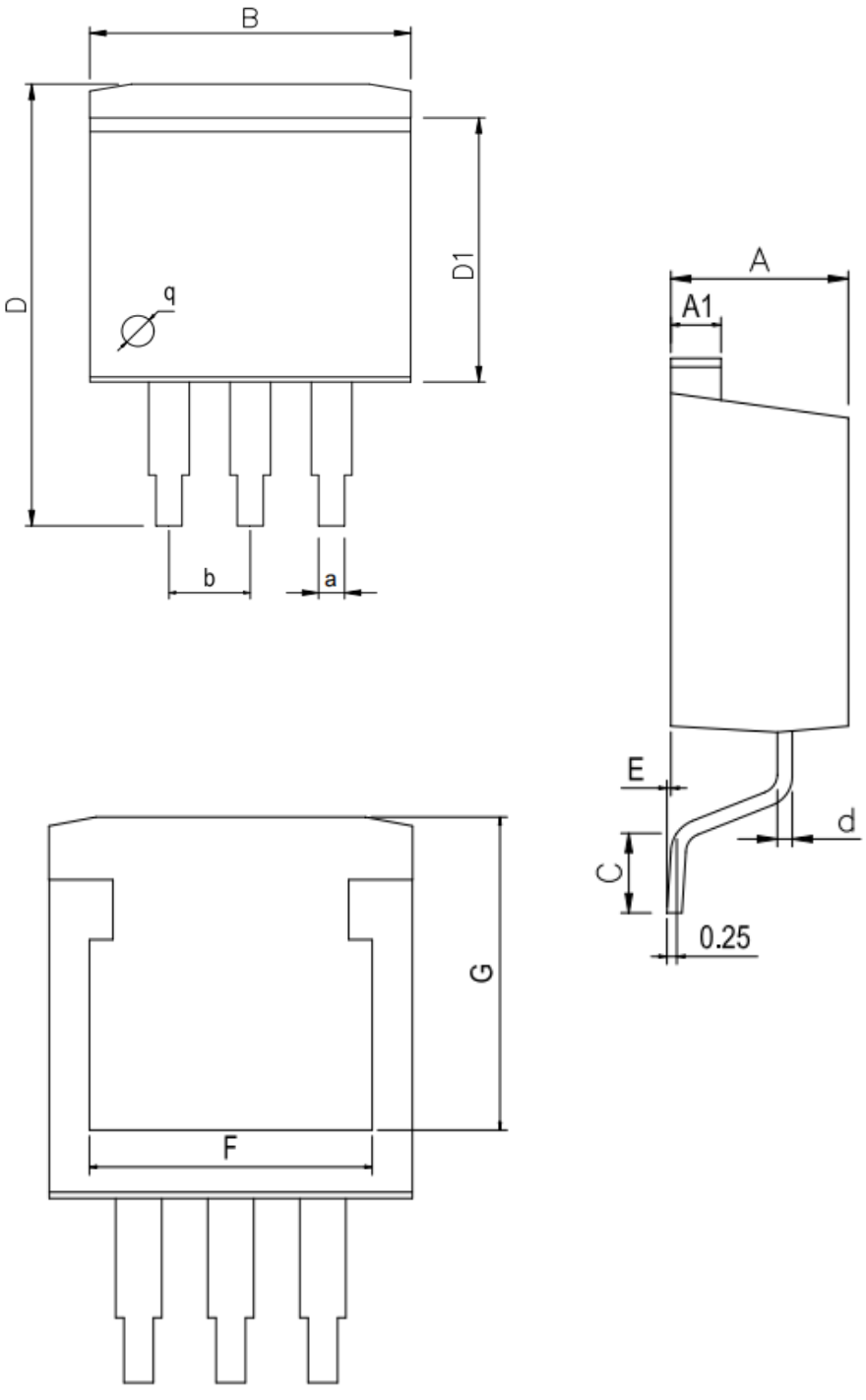
Package TO252-2





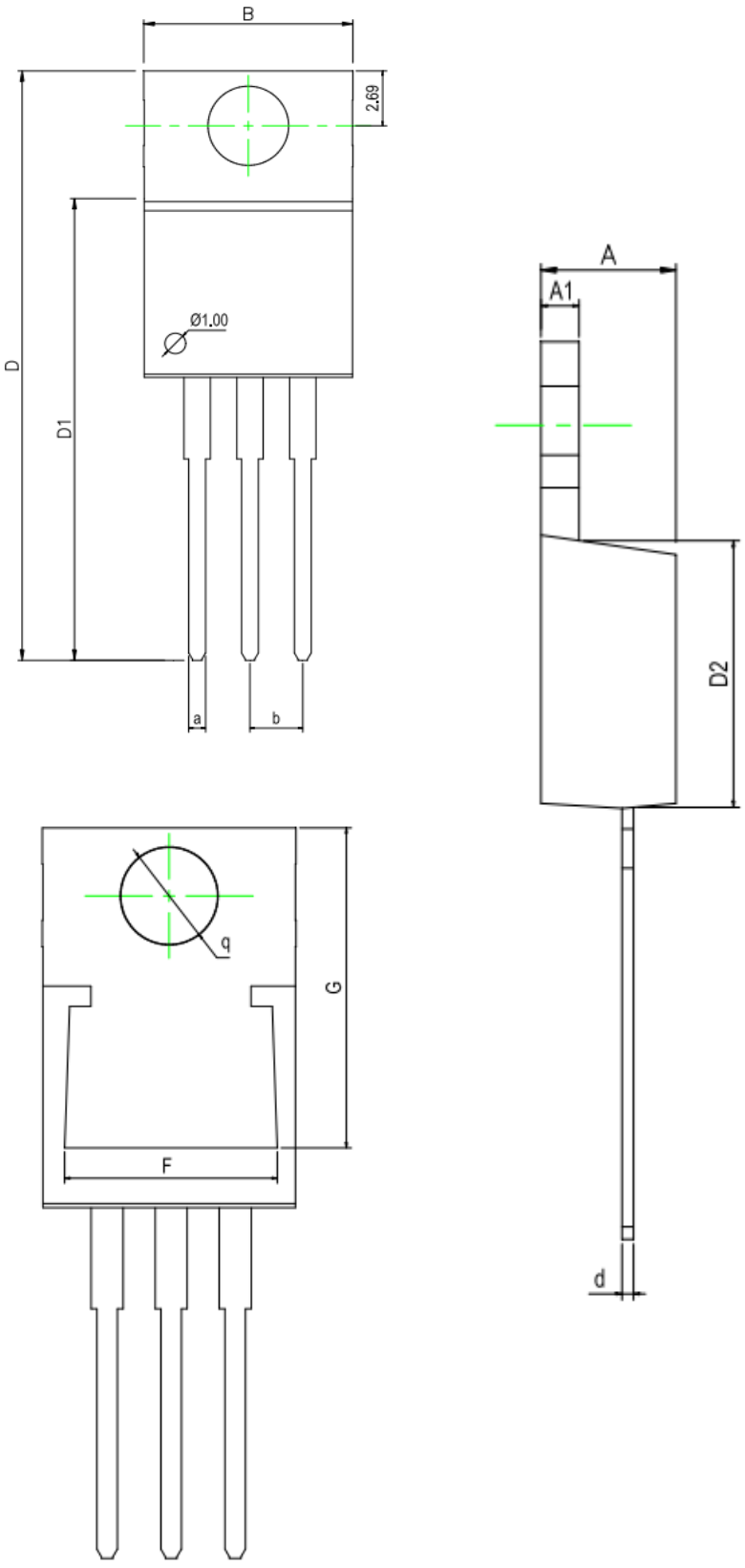
Symbol:	Min:	Max:
A	2.1	2.5
A1	0.45	0.7
B	6.4	6.8
B1	5.1	5.5
C	9.2	10.6
C1	5.3	6.3
D	0.9	1.75
E	0	0.23
a	0.5	0.8
d	0.6	1.2
b	2.28BSC	

Package TO263-3



Symbol:	Min:	Max:
A	4.45	4.62
A1	1.22	1.32
B	10	10.4
C	1.89	2.19
D	13.7	14.6
D1	8.38	8.89
E	0	0.305
F	8.332	8.552
G	7.7	8.1
a	0.71	0.97
b	2.54BSC	

Package TO220-3



Symbol:	Min:	Max:
A	4.45	4.62
A1	1.22	1.32
B	10	10.4
D	28.2	28.9
D1	22.22	22.62
D2	8.5	9.1
F	8.3	8.55
G	12.55	12.75
a	0.71	0.97
d	0.33	0.42
b	2.54BSC	
q	3.8TYP	

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