600mA Low Dropout Linear Regulator with Shutdown

Description

The FP6134 is a low dropout, positive linear regulator with very low quiescent current. The FP6134 can supply 600mA output current with low dropout voltage at about 600mV. The BP pin with a 0.1μF bypass capacitor can help reducing the output noise level. The shutdown function can provide remote control for the external signal to decide the on/off state of FP6134. With a logic high level at $\overline{\text{SHDN}}$ pin, the device is in the on state, and vice versa.

The FP6134 regulator is able to operate with output capacitors as small as 1μF for stability. The FP6134 also offers the on chip thermal shutdown feature to provide protection against overload or any condition when the ambient temperature exceeds the maximum junction temperature.

The FP6134 offers high precision output voltage of ±2%. It is available in fixed output voltages including 1.5V, 1.8V, 2.5V, 2.8V, 3.0V, 3.1V and 3.3V.

The FP6134 is housed in low-profile and space-saving 5-lead SOT-23-5 package.

Features

- Low Dropout Voltage of 600mV at 600mA
- High Ripple Rejection at 60dB
- Guaranteed 600mA Output Current
- Very Low Quiescent Current at 30μA
- Max. ±2% Output Voltage Accuracy
- Needs Only 1μF Capacitor for Stability
- Thermal Shutdown Protection
- Current Limit Protection
- Active Low Shutdown Control
- Low-ESR Ceramic Capacitor for Output Stability.
- Tiny package: SOT-23-5
- RoHS Compliant

Applications

- DSC
- Wireless Device
- LCD Module
- Battery Power System
- Card Reader
- PDA

Pin Assignments

S5 Package (SOT-23-5)

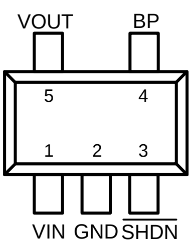


Figure 1. Pin Assignment of FP6134

SOT-23-5 Marking

Part Number	Product Code	Part Number	Product Code
FP6134-15S5P	**Fi**	FP6134-28S5G	**Fn=**
FP6134-15S5G	**Fi=**	FP6134-30S5P	**Fr**
FP6134-18S5P	**Fk**	FP6134-30S5G	**Fr=**
FP6134-18S5G	**Fk=**	FP6134-31S5P	**Fu**
FP6134-25S5P	**Fm**	FP6134-31S5G	**Fu=**
FP6134-25S5G	**Fm=**	FP6134-33S5P	**Fs**
FP6134-28S5P	**Fn**	FP6134-33S5G	**Fs=**

Ordering Information

FP6134-□□□□

TR: Tape/Reel

P: Green
G: Green

Package Type
S5: SOT-23-5

Output Voltage
15: 1.5V 30: 3.0V
18: 1.8V 31: 3.1V
25: 2.5V 33: 3.3V
28: 2.8V

Note1: Please consult Fitipower sales office or authorized distributors for availability of special output voltages.

Typical Application Circuit

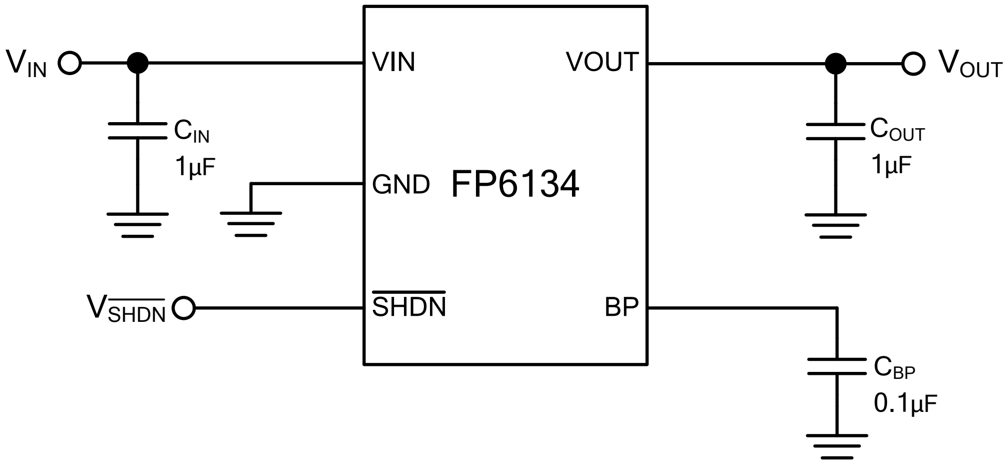


Figure 2. Typical Application Circuit of FP6134

Note 2：To prevent oscillation, it is recommended to use minimum 1μF X7R or X5R dielectric capacitors if ceramics are used as input/output capacitors.

Functional Pin Description

Pin Name	Pin No.	Pin Function
VIN	1	Power is supplied to this device from this pin which requires an input filter capacitor. In general, the input capacitor in the range of 1μF to 10μF is sufficient.
GND	2	Common ground pin
$\overline{\text{SHDN}}$	3	Pull this pin high to enable IC, and pull this pin low to shutdown IC
BP	4	Reference Noise Bypass
VOUT	5	The output supplies power to loads. The output capacitor is required to prevent output voltage from oscillation. The FP6134 is stable with an output capacitor which is 1μF or greater. The larger output capacitor will be required for application with larger load transients. The large output capacitor could reduce output noise, improve stability and PSRR.

Block Diagram

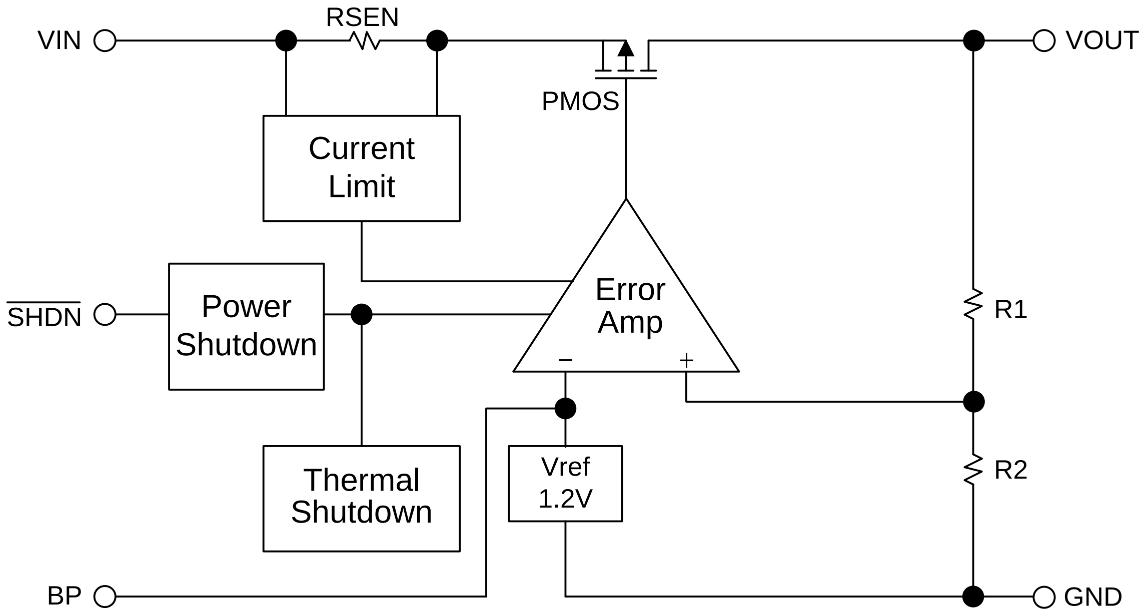


Figure 3. Block Diagram of FP6134

Absolute Maximum Ratings

- Supply Input Voltage (V_{IN}) -- +6V
- Power Dissipation SOT-23 (P_D) -- +0.4W
- Package Thermal Resistance SOT-23 (θ_{JA}) -- +250ºC/W
- Maximum Junction Temperature (T_J) -- +150ºC
- Storage Temperature Range (T_S) -- -65ºC to +150ºC
- Lead Temperature (Soldering, 10 sec.) (T_{LEAD}) -- +260ºC

Note：Stresses beyond those listed under “Absolute Maximum Ratings" may cause permanent damage to the device.

Recommended Operating Conditions

- Input Voltage (V_{IN}) -- +2.8V to +5.5V
- Operating Temperature Range (T_{OPR}) -- -40ºC to +85ºC

Electrical Characteristics

(V_{IN}=V_{OUT}+1V or V_{IN}=2.8V whichever is greater, $\overline{SHDN}$ pin connected to V_{IN}, C_{IN}=1µF, C_{OUT}=1µF, T_A=25ºC, unless otherwise specified)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Current Limit	I_{LIMIT}	R_{Load}=1Ω		600			mA
Quiescent Current	I_Q	I_O= 0mA			30	50	µA
Standby Current	I_{STBY}	V_{IN}=2.8~5V, Output Off				0.1	µA
Output Voltage Accuracy	ΔV_{OUT}	I_O= 1mA		-2		+2	%
Dropout Voltage (Note 4)	V_{DROP}	I_O=600mA	V_{OUT}=1.5V		1550	1690	mV
			V_{OUT}=1.8V		1300	1420	
			V_{OUT}=2.5V		800	900	
			V_{OUT}=3.0V		650	730	
			V_{OUT}=3.3V		600	670	
Line Regulation	V_{LINE}	I_O=1mA, V_{IN}=V_{OUT} +1V to 5V			1	5	mV
Load Regulation (Note 5)	ΔV_{LOAD}	I_O=0mA to 600mA			13	50	mV
Ripple Rejection (Note6)	PSRR	V_{IN}=V_{OUT}+1V , C_{BP}=0.1µF f_{RIPPLE} = 120Hz, C_{OUT} = 1µF			60		dB
Temperature Coefficient (Note 6)	T.C.	I_{OUT} = 1mA, V_{IN} = 5V			50		ppm/ºC
Thermal Shutdown Temperature (Note 6)	T_{SD}				160		ºC
	ΔT_{SD}	Hysteresis			25		ºC
Shutdown Pin Current	$I_{\overline{SHDN}}$					0.1	µA
Noise Bypass Terminal Voltage (Note 6)	V_{REF}				1.23		V
Shutdown Pin Voltage	$V_{\overline{SHDN}(ON)}$	Output ON		1.4			V
	$V_{\overline{SHDN}(OFF)}$	Output OFF				0.4	V
Shutdown Exit Delay Time (Note 6)	ΔT	C_{BP}=0.1µF, C_{OUT}=1µF, I_{OUT}=30mA			300		µs

Note 4: The dropout voltage is defined as V_{IN}-V_{OUT}, which is measured when V_{OUT} drops 2% of its normal value with the specified output current.

Note 5: Load regulation and dropout voltage are measured at a constant junction temperature by using a 40ms low duty cycle current pulse.

Note 6: Guarantee by design.

Typical Performance Curves

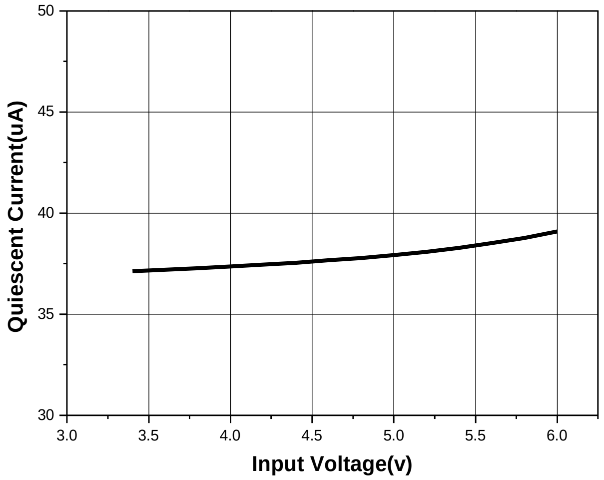


Figure 4. Quiescent Current vs. Input Voltage

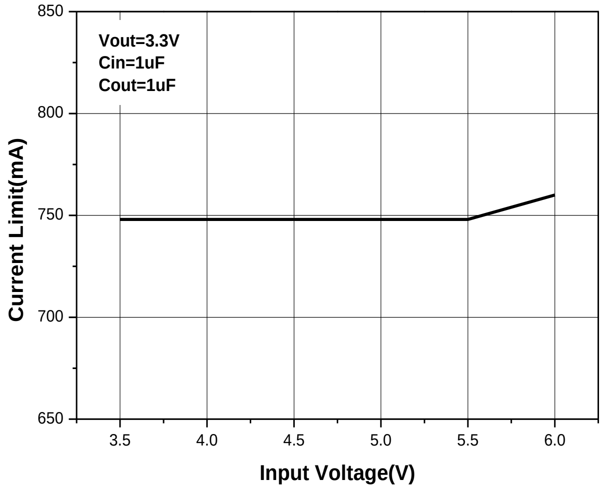


Figure 5. Current limit vs. Input Voltage

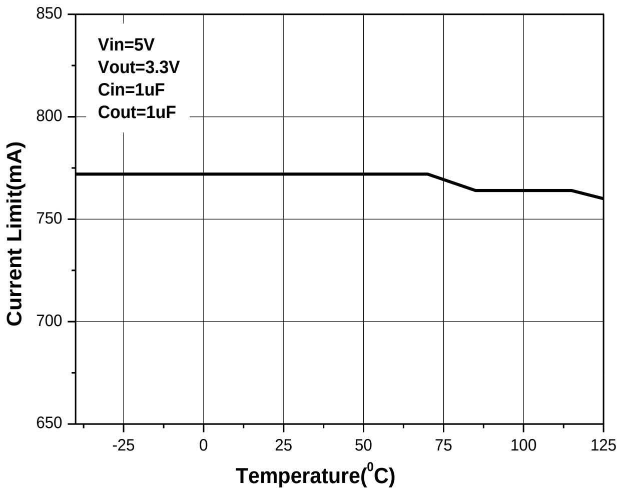


Figure 6. Current limit vs. Temperature

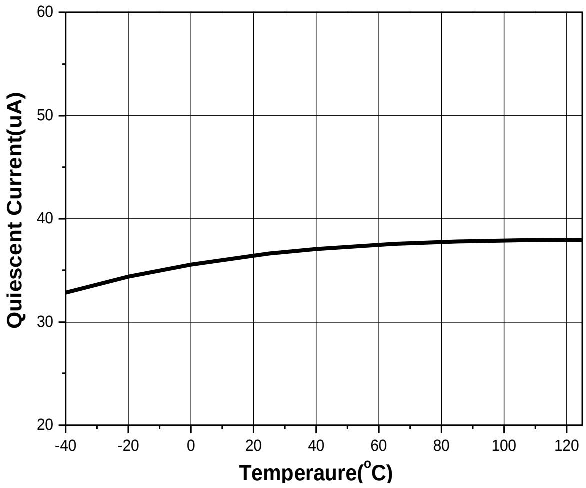


Figure 7. Quiescent Current vs. Temperature

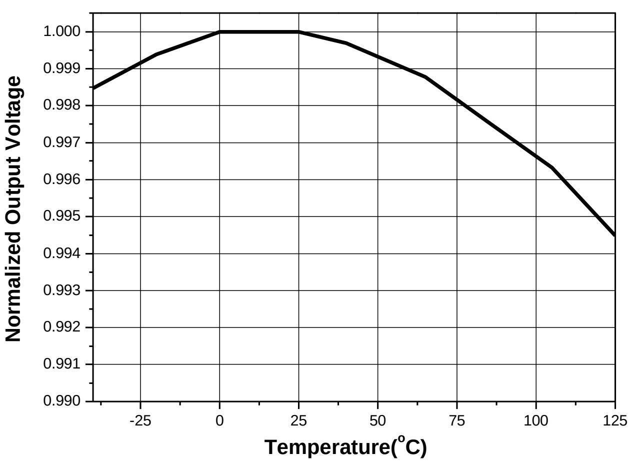


Figure 8. Output Voltage vs. Temperature

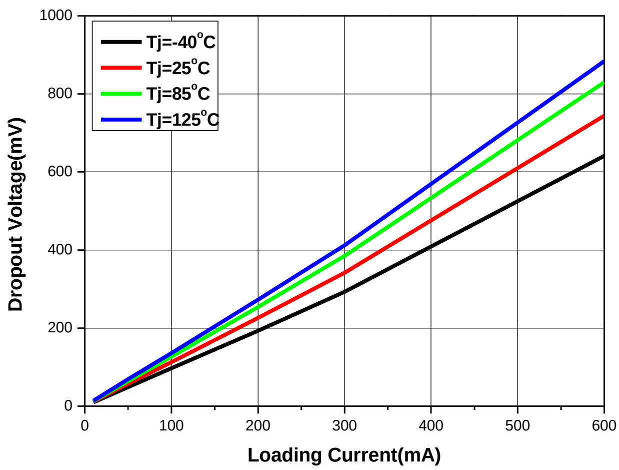


Figure 9. Dropout Voltage vs. Temperature (V_{OUT}=2.8V)

Typical Performance Curves (Continued)

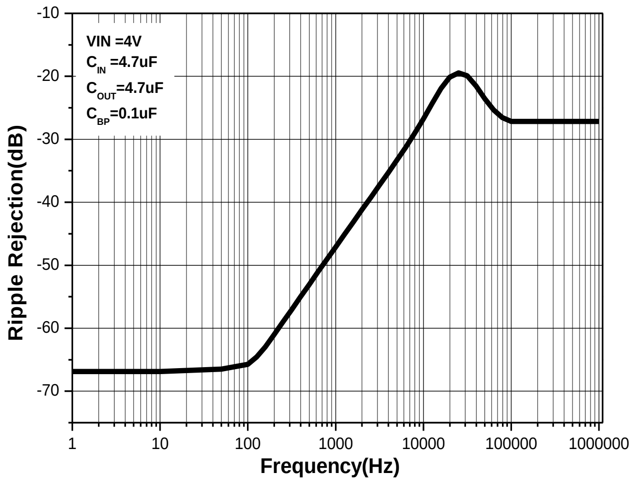


Figure 10. Ripple Rejection vs. Frequency

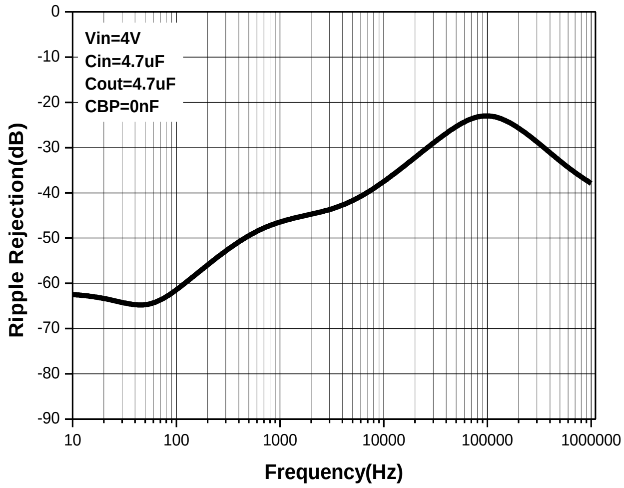


Figure 11. Ripple Rejection vs. Frequency

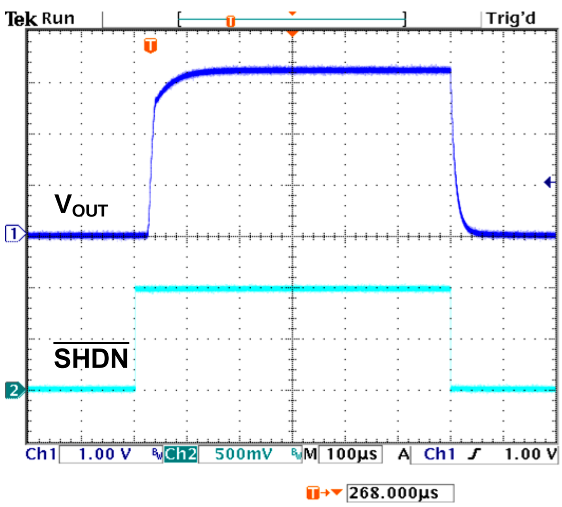


Figure 12. Shutdown Function

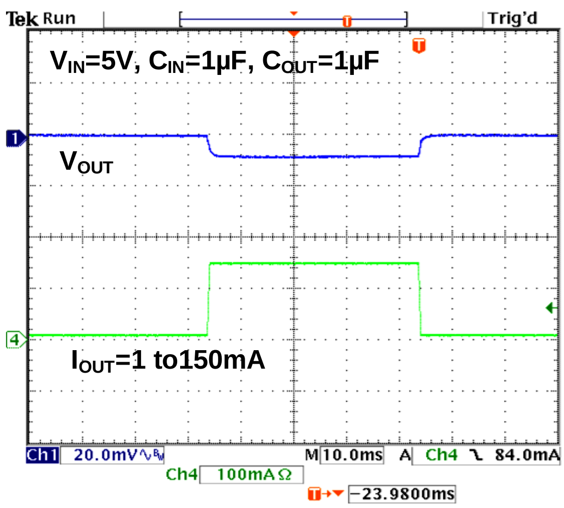


Figure 13. Load Transient Response

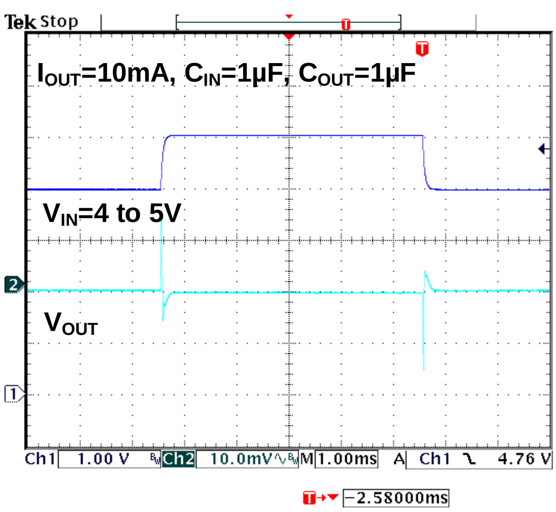


Figure 14. Line Transient Response

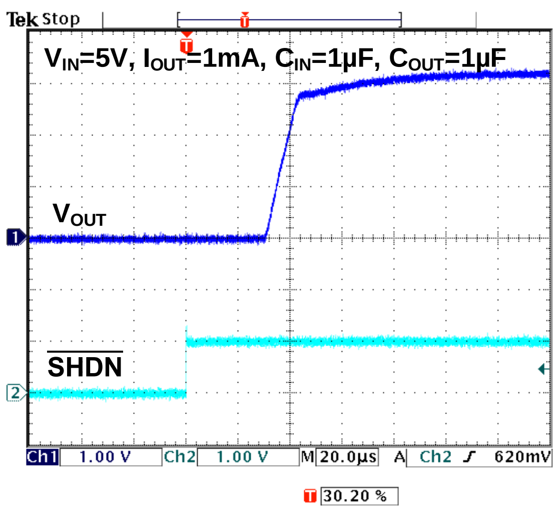


Figure 15. Shutdown Exit Delay Time

Application Information

The FP6134 is a low dropout linear regulator that could provide 600mA output current at dropout voltage about 600mV. Current limit and on chip thermal shutdown features provide protection against overload or any condition when the ambient temperature exceeds the maximum junction temperature.

Output and Input Capacitor

The FP6134 regulator is designed to be stable with a wide range of output capacitors. The ESR of the output capacitor affects stability. Larger value of the output capacitor decreases the peak deviations and improves transient response for larger current changes.

The capacitor types (aluminum, ceramic, and tantalum) have different characterizations such as temperature and voltage coefficients. All ceramic capacitors are manufactured with a variety of dielectrics, each with different behavior across temperature and applications. Common dielectrics used are X5R, X7R and Y5V. It is recommended to use 1µF to 10µF X5R or X7R dielectric ceramic capacitors with 30mΩ to 50mΩ ESR range between device outputs and ground for stability. The FP6134 is designed to be stable with low ESR ceramic capacitors and higher values of capacitors, and ESR could improve output stability. The ESR of output capacitor is very important because it generates a zero to provide phase lead for loop stability.

There are no requirements for the ESR on the input capacitor, but its voltage and temperature coefficient have to be considered for device application environment.

Protection Features

In order to prevent overloading or thermal condition from damaging the device, FP6134 has internal thermal and current limit functions designed to protect the device. It will rapidly shut off PMOS pass element during over temperature condition.

Thermal Consideration

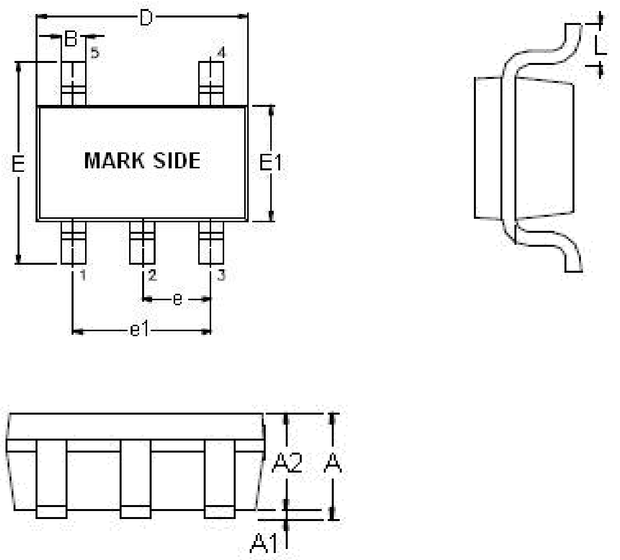
The power handling capability of the device will be limited by allowable operation junction temperature (125°C). The power dissipated by the device will be estimated by $P_D = I_{OUT} \times (V_{IN}-V_{OUT})$. The power dissipation should be lower than the maximum power dissipation listed in "Absolute Maximum Ratings" section.

Shutdown Operation

The FP6134 is shutdown by pulling the $\overline{\text{SHDN}}$ input low and turned on by driving the $\overline{\text{SHDN}}$ high. If this function is not used, the $\overline{\text{SHDN}}$ input should be tied to VIN to keep the regulator on all the time (the $\overline{\text{SHDN}}$ must not be left floating).

Outline Information

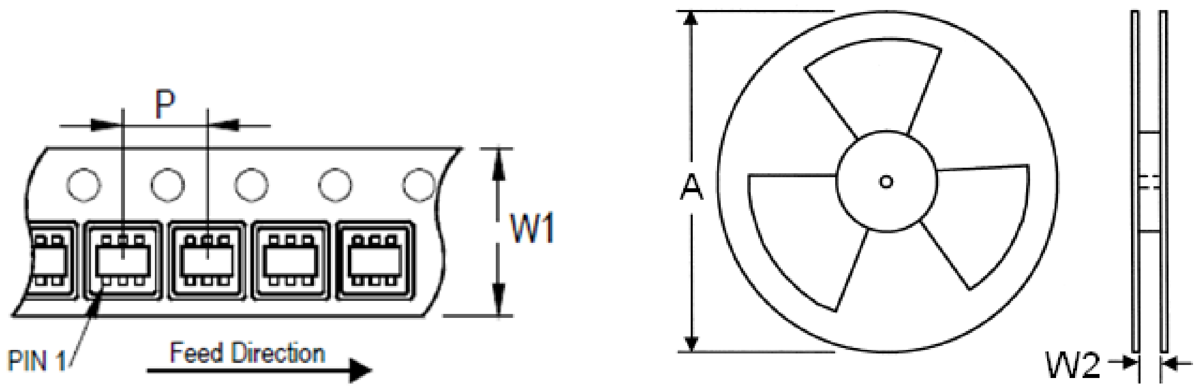
SOT-23-5 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	0.90	1.45
A1	0.00	0.15
A2	0.90	1.30
B	0.30	0.50
D	2.80	3.00
E	2.60	3.00
E1	1.50	1.70
e	0.90	1.00
e1	1.80	2.00
L	0.30	0.60

Note：Followed From JEDEC MO-178-C.

Carrier Dimensions



Tape Size (W1) mm	Pocket Pitch (P) mm	Reel Size (A)		Reel Width (W2) mm	Empty Cavity Length mm	Units per Reel
		in	mm			
8	4	7	180	8.4	300~1000	3,000

Life Support Policy
Fitipower's products are not authorized for use as critical components in life support devices or other medical systems.