600mA Low Dropout Linear Regulator

Description

The FP6130 is a low dropout and positive linear regulator with very low quiescent current. The FP6130 can supply 600mA output current with a low dropout voltage at about 600mV.

The FP6130 regulator is able to operate with output capacitors as small as 1μF for stability. The FP6130 also offers on chip thermal shutdown feature to provide protection against overload or any condition when the ambient temperature exceeds the junction temperature.

The FP6130 is available in space-saving SOT-223 package.

Features

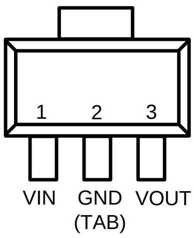
- Low Dropout Voltage of 600mV at 600mA
- Guaranteed 600mA Output Current
- Very Low Quiescent Current at about 30μA
- Max. ± 2%Output Accuracy
- Needs Only 1μF Capacitor for Stability
- Thermal Shutdown Protection
- Current Limit Protection
- Low-ESR Ceramic Capacitor for Output Stability
- RoHS Compliant

Applications

- DVD/CD-ROM, CD/RW
- Wireless Device
- LCD Module
- Battery Power System
- Card Reader
- XDSL Router

Pin Assignments

IR3 Package (SOT-223)



GR3 Package (SOT-223)

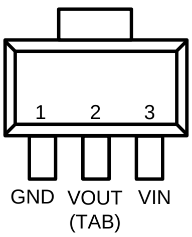


Figure 1. Pin Assignment of FP6130

Ordering Information

FP6130-□□□□

- TR: Tape/Reel
- P: Green
  G: Green
- Package Type
  IR3: SOT-223
  GR3: SOT-223
- Output Voltage
  18: 1.8V
  25: 2.5V
  27: 2.7V
  33: 3.3V

Note 1：Please consult Fitipower sales office or authorized distributor for availability of special output voltages.

Typical Application Circuit

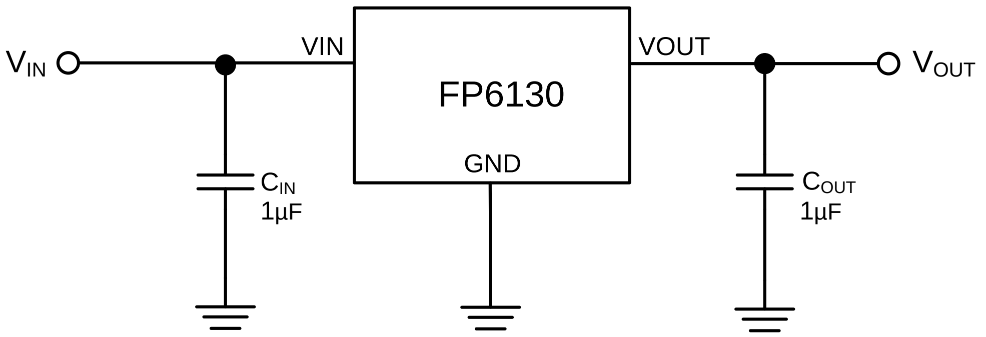


Figure 2. Typical Application Circuit of FP6130

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 Function
VIN	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.
VOUT	The output supplies power to loads. The output capacitor is required to prevent output voltage unstable. The FP6130 is stable with an output capacitor 1µF or greater. The larger output capacitor will be required for application with large transit load to limit peak voltage transits. Besides, it could reduce output noise, improve stability and PSRR.
GND	Common ground pin

Block Diagram

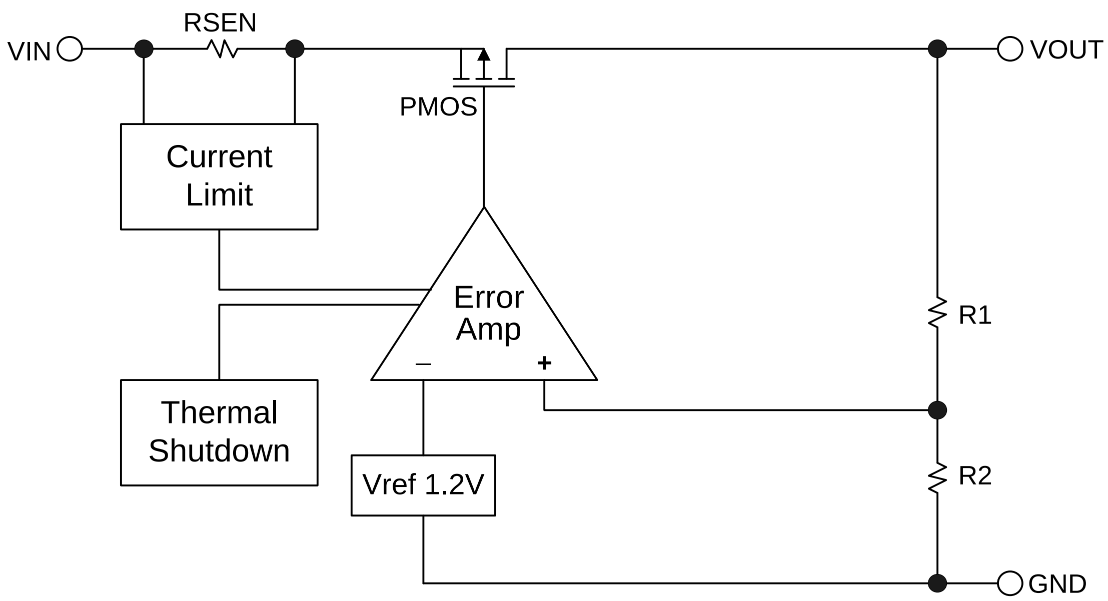


Figure 3. Block Diagram of FP6130

Absolute Maximum Ratings

- Supply Input Voltage (V_{IN}) -- +6V
- Power Dissipation @25ºC, SOT-223 (P_D) --- +0.74W
- Package Thermal Resistance, SOT-223 (θ_{JA}) -- +135ºC/W
- Maximum Junction Temperature (T_J) --- +150ºC
- Storage Temperature Range (T_S) -- -65ºC to +150ºC
- Lead Temperature (Soldering, 10 sec.) (T_{LEAD}) -- +260ºC

Note 3：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, C_{IN}=1µF, C_{OUT}=1µF, T_A=25ºC, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Output Voltage Accuracy	ΔV_{OUT}	I_O= 1mA	-2		+2	%
Current Limit	I_{LIMIT}	R_{Load}=1Ω	600			mA
Quiescent Current	I_Q	I_O= 0mA		30	50	µA
Dropout Voltage (Note4)	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	ΔV_{LINE}	I_O=1mA, V_{IN}=V_{OUT} +1V to 5V		1	5	mV
Load Regulation (Note5)	ΔV_{LOAD}	I_O=0mA to 600mA		13	50	mV
Ripple Rejection (Note6)	PSRR	V_{IN}=V_{OUT}+1V f_{RIPPLE} = 120Hz, C_{OUT} = 1µF		60		dB
Temperature Coefficient (Note6)	T.C.	I_{OUT} = 1mA, V_{IN} = 5V		50		ppm/ºC
Thermal Shutdown Temperature (Note6)	T_{SD}			160		ºC
	ΔT_{SD}	Hysteresis		25		ºC

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

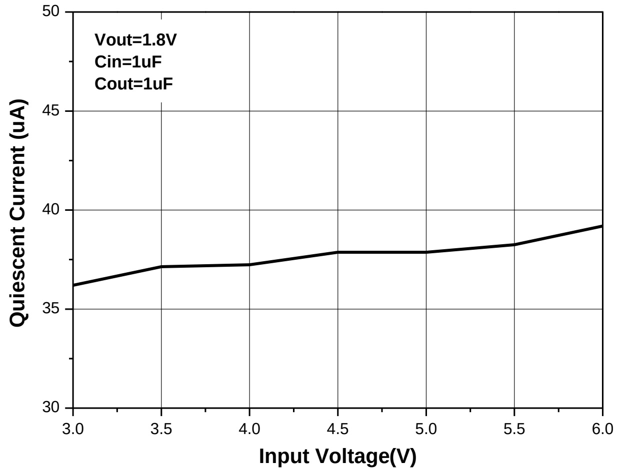


Figure 4. Quiescent Current vs. Input Voltage

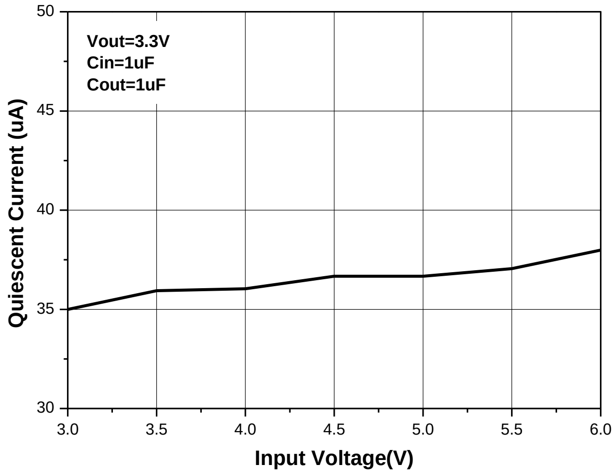


Figure 5. Quiescent Current vs. Input Voltage

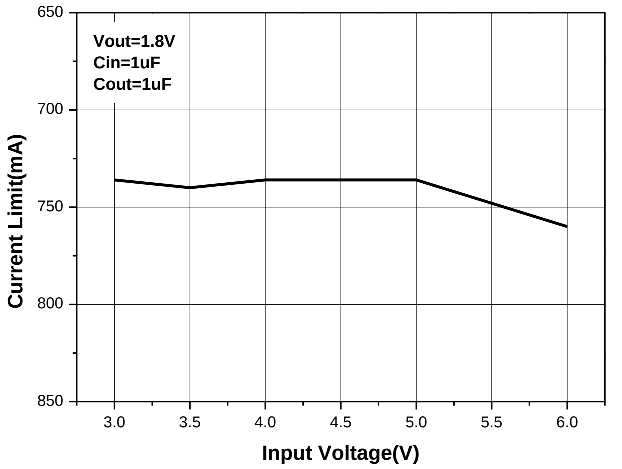


Figure 6. Current limit vs. Input Voltage

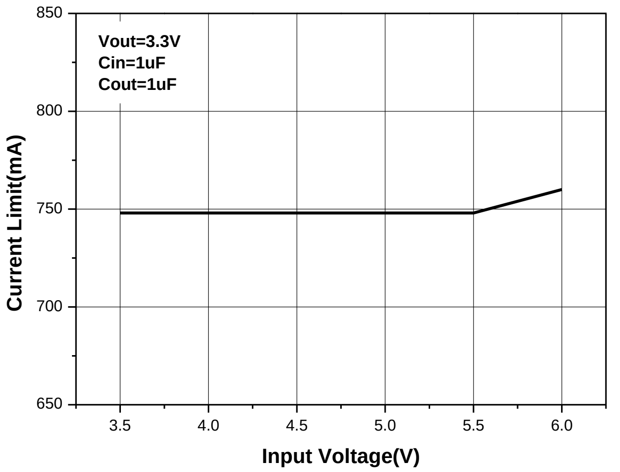


Figure 7. Current Limit vs. Input Voltage

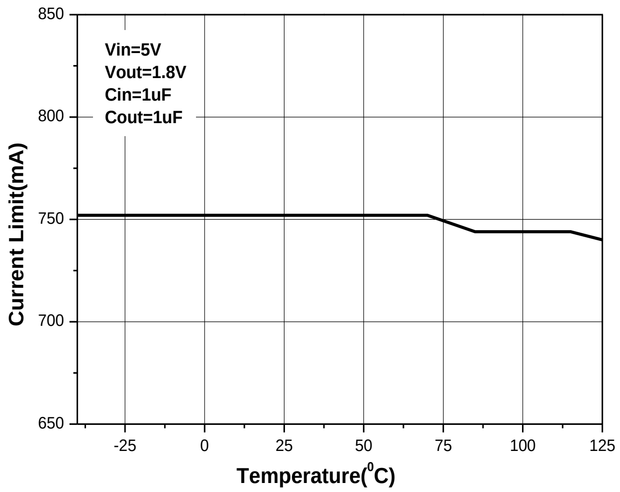


Figure 8. Current limit vs. Temperature

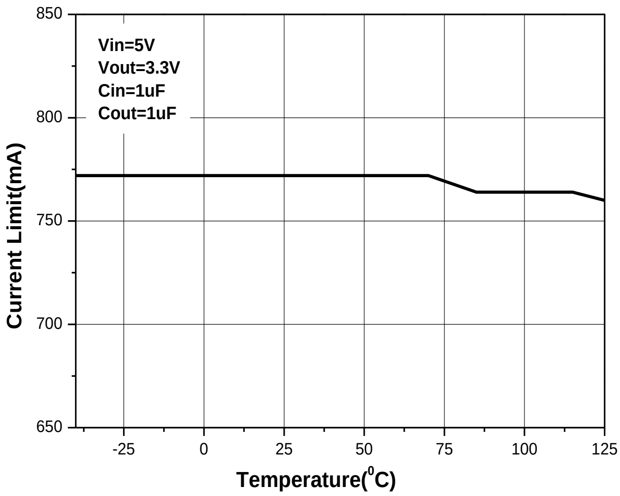


Figure 9. Current limit vs. Temperature

Typical Performance Curves (Continued)

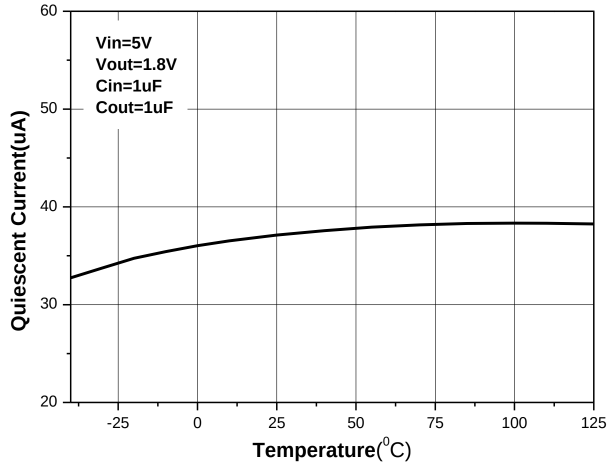


Figure 10. Quiescent Current vs. Temperature

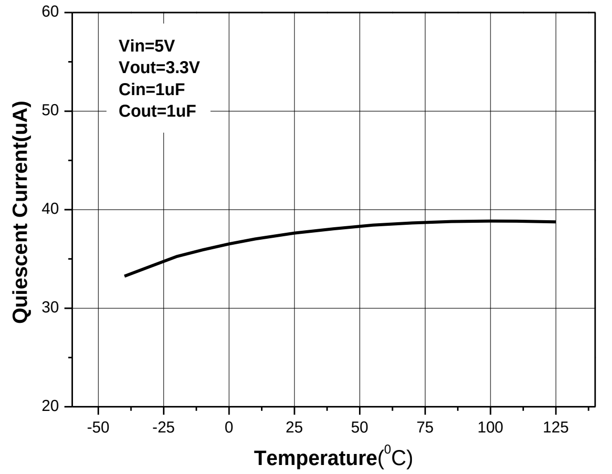


Figure 11. Quiescent Current vs. Temperature

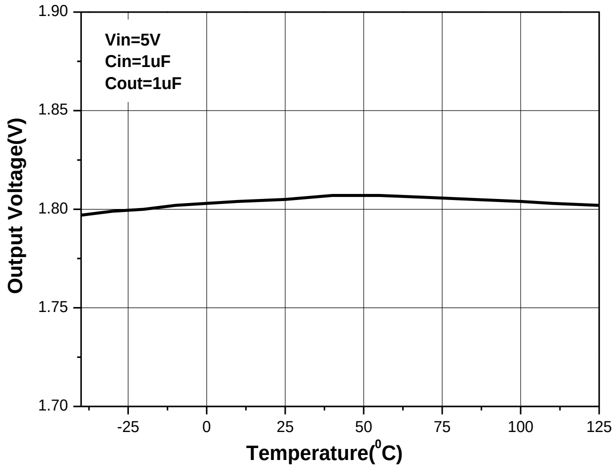


Figure 12. Temperature Stability

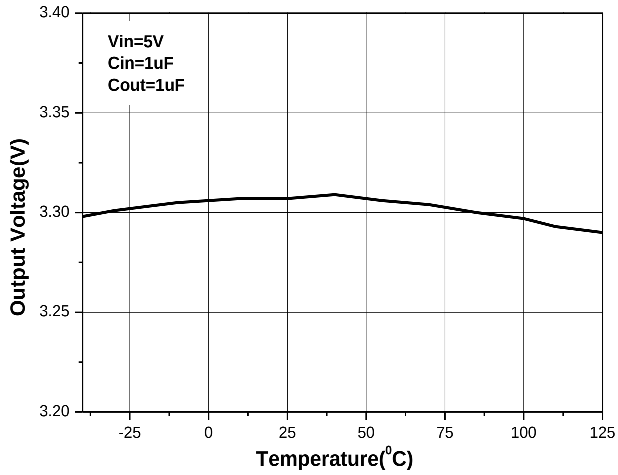


Figure 13. Temperature Stability

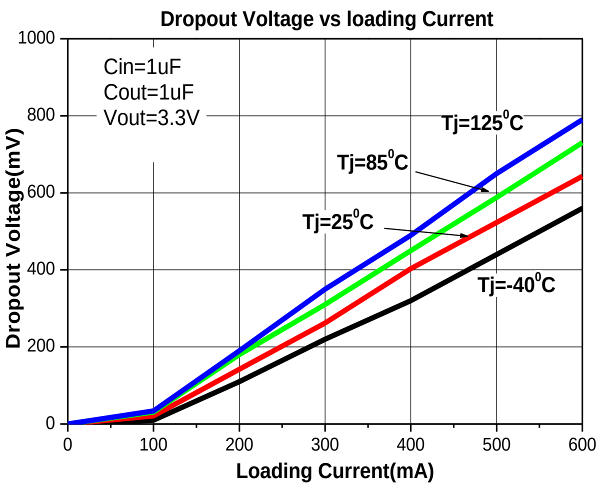


Figure 14. Dropout Voltage vs. Loading Current

Typical Performance Curves (Continued)

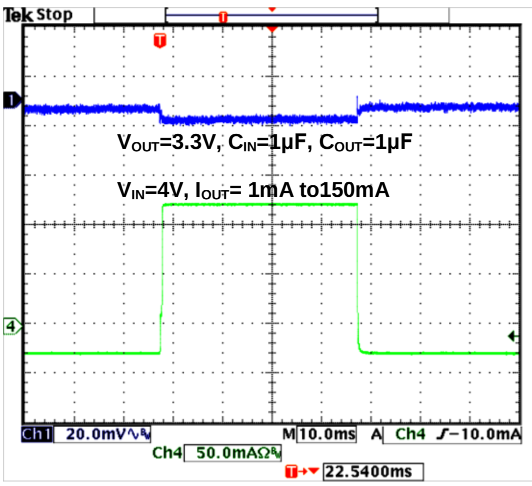


Figure 15. Load Transition Response

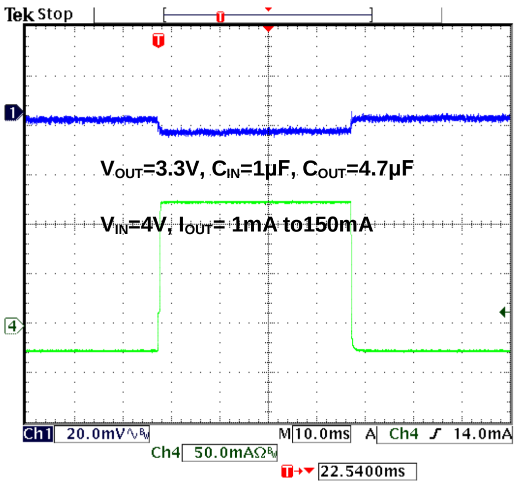


Figure 16. Load Transition Response

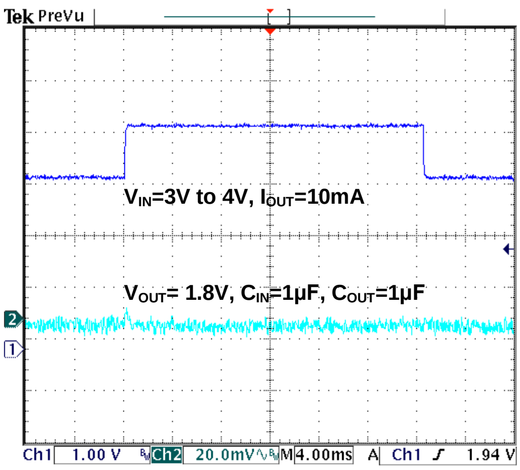


Figure 17. Line Transition Response

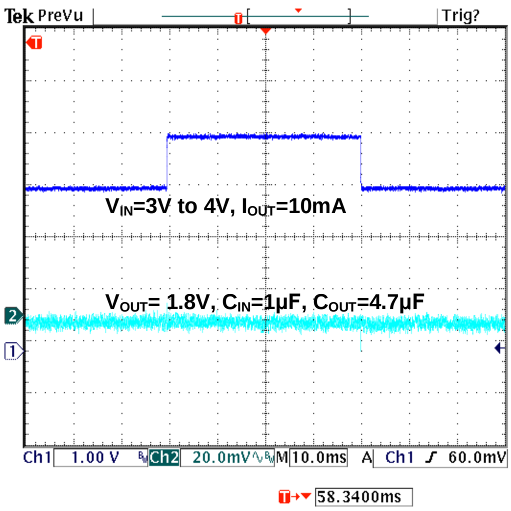


Figure 18. Line Transition Response

Application Information

The FP6130 series are low dropout linear regulators which could provide 600mA output current at dropout voltage about 600mV. Besides, current limit and on chip thermal shutdown features provide protection against overload or any condition when the ambient temperature exceeds the junction temperature.

Output and Input Capacitor

The FP6130 regulator is designed to be stable with 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 transition 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 to ground for transient stability. The FP6130 is designed to be stable with low ESR ceramic capacitors and higher values of capacitors, and ESR could improve output stability.

So 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 Feature

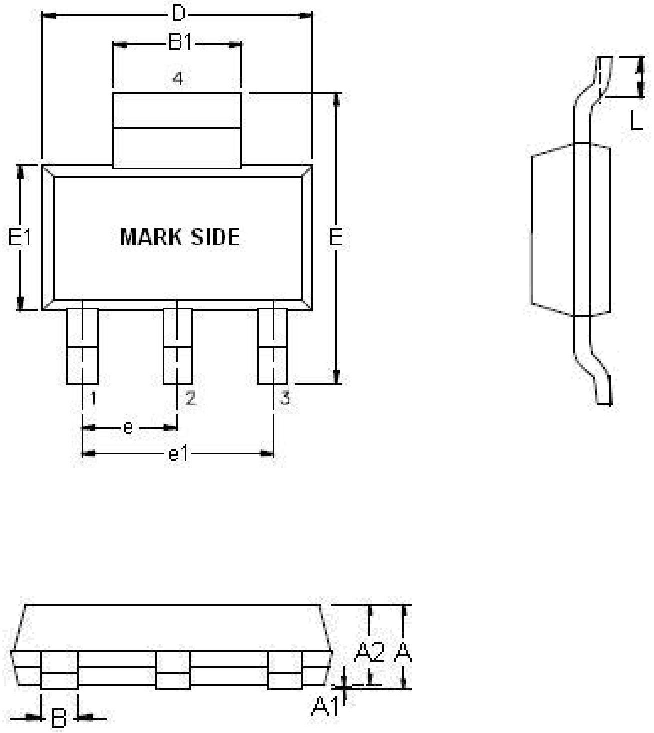
In order to prevent overloading or thermal condition from damaging device, FP6130 regulator has internal thermal and current limit functions designed to protect the device. It will rapidly shut off PMOS pass element during over temperature condition.

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.

Outline Information

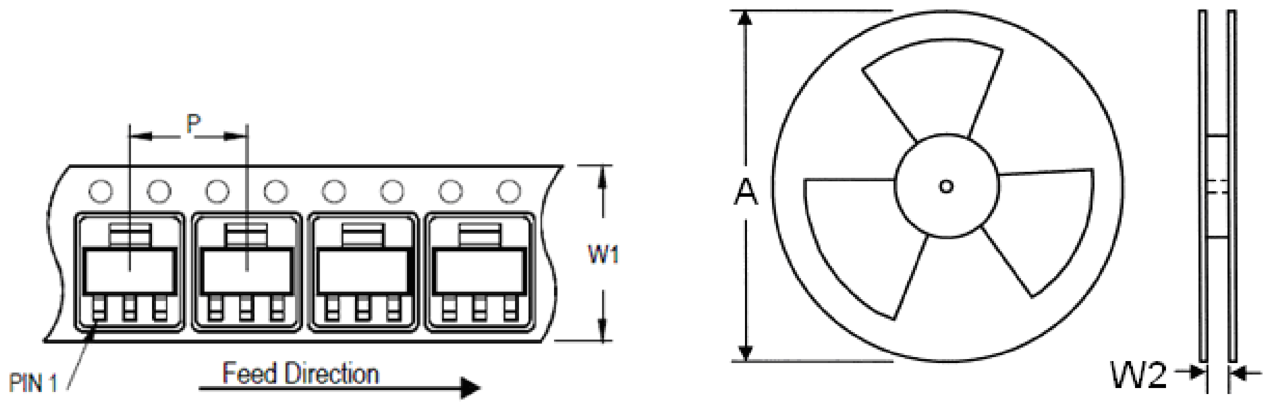
SOT-223 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER	
	MIN	MAX
A	1.55	1.80
A1	0.05	0.10
A2	1.50	1.70
B	0.60	0.84
B1	2.85	3.10
D	6.30	6.70
E1	3.30	3.70
E	6.70	7.30
e	2.20	2.40
e1	4.50	4.70
L	0.75	0.85

Note：Followed From JEDEC TO-261-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			
12	8	13	330	12.4	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.