300mA LOW DROPOUT LINEAR REGULATOR

Description

The FP6131 series are low dropout, positive linear regulators with very low quiescent current. The FP6131 can supply 300mA output current with a low dropout voltage at about 250mV.

The FP6131 regulator is able to operate with output capacitors as small as 1μF for stability. Other than the current limit protection FP6131 also offers on chip thermal shutdown feature providing protection against overload or any condition when the ambient temperature exceeds the junction temperature.

The FP6131 series are available in fixed output voltage ranging from 1.2V to 4.5V with 0.1V/100mV interval.

The FP6131 series are available in low-profile, space-saving 3-lead SOT-23 and SOT-89 packages.

Features

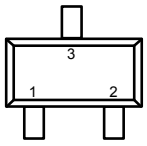
- Low Dropout Voltage of 250mV at 300mA
- Guaranteed 300mA Output Current
- Very Low Quiescent Current at about 30uA
- ±2% Output Voltage Accuracy for 1.2~4.5V
- Needs Only 1μF Capacitor for Stability
- Thermal Shutdown Protection
- Current Limit Protection
- Low-ESR Ceramic Capacitor for Output Stability.
- Tiny SOT-23 and SOT-89 packages
- RoHS Compliant

Applications

- DVD/CD-ROMs, CD/RWs
- Wireless Devices
- LCD Modules
- Battery Power Systems
- Card Readers
- XDSL Routers

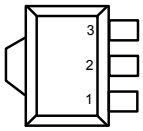
Pin Assignments

GS3 Package (SOT-23-3)



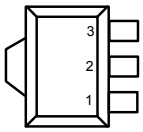
TOP VIEW
1. GND
2. VOUT
3. VIN

GB3 Package (SOT-89-3)



TOP VIEW
1. GND
2. VIN
3. VOUT

VB3 Package (SOT-89-3)



TOP VIEW
1. VOUT
2. GND
3. VIN

Figure 1. Pin Assignment of FP6131

Ordering Information

FP6131-□□□□

- TR: Tape / Real
  Blank: Tube
- P: Pb Free with Commercial Standard (RoHS Compliant)
  G: Green
- Package Type
  GS3: SOT-23-3
  GB3: SOT-89-3
  VB3: SOT-89-3
- Output Voltage
  18: 1.8V 30: 3.0V
  25: 2.5V 33: 3.3V
  27: 2.7V 36: 3.6V
  28: 2.8V

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

SOT-23-3 Marking

Part Number	Product Code	Part Number	Product Code
FP6131-18GS3P	Ba	FP6131-30GS3P	Bf
FP6131-25GS3P	Bb	FP6131-33GS3P	Bh
FP6131-27GS3P	Bd	FP6131-33GS3G	Bh =
FP6131-28GS3P	Be	FP6131-36GS3P	Bi

Typical Application Circuit

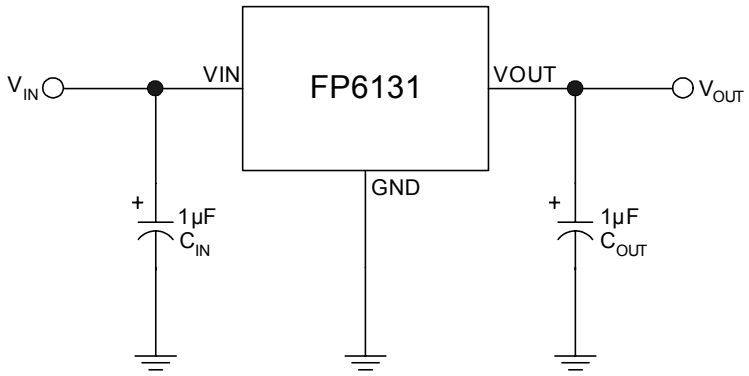


Figure 2. Typical Application Circuit of FP6131

Note：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 is required 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 FP6131 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 could reduce output noise, improve stability, PSRR.
GND	Common ground pin

Block Diagram

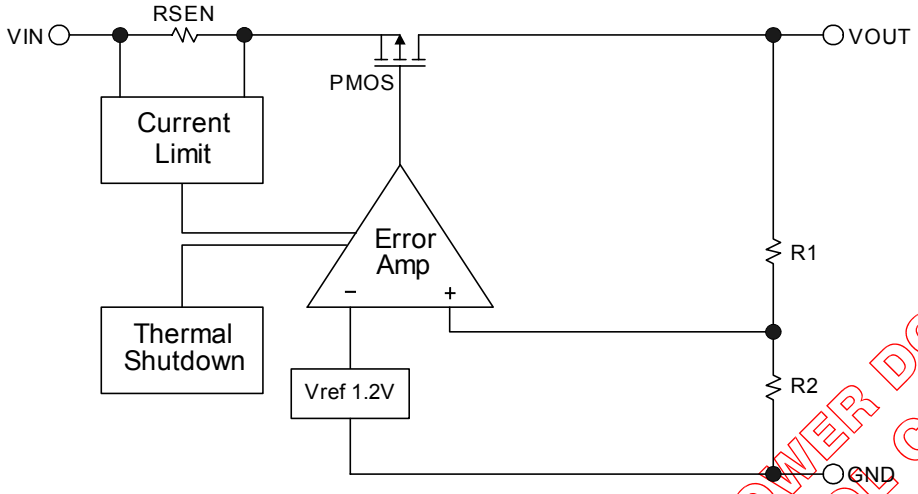


Figure 3. Block Diagram of FP6131

Absolute Maximum Ratings

Parameter	Symbol	Min	Max	Unit
Supply Input Voltage	V_{IN}		6	V
Maximum Junction Temperature	T_J		150	°C
Power Dissipation SOT-23	P_D		0.4	W
Power Dissipation SOT-89	P_D		0.57	W
Package Thermal Resistance SOT-23	θ_{JA}		250	°C/W
Package Thermal Resistance SOT-89	θ_{JA}		175	°C/W
Storage Temperature Range	T_S	-65	150	°C
Lead Temperature (Soldering, 10 sec.)	T_{LEAD}		260	°C

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

Recommended Operating Conditions

Parameter	Symbol	Min	Max	Unit
Input Voltage	V_{IN}	2.8	5.5	V
Operating Junction Temperature Range	T_J	-40	125	°C

Electrical Characteristics

(V_{IN}=V_{OUT}+1V or V_{IN}=2.8V whichever is greater, C_{IN}=1μF, C_{OUT}=1μF, T_A=25 °C, 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	300			mA
Quiescent Current	I_Q	I_O= 0mA		30	50	μA
Dropout Voltage (Note 1)	V_{DROP}	I_O=300mA, 1.2V ≤ V_{OUT} ≤ 2.0V		1100		mV
		I_O=300mA, 2.0V < V_{OUT} ≤ 2.8V		350		
		I_O=300mA, 2.8V < V_{OUT} ≤ 4.5V		250		
Line Regulation	ΔV_{LINE}	I_O=1mA, V_{IN}=V_{OUT} +1V to 5V		1	5	mV
Load Regulation (Note 2)	ΔV_{LOAD}	I_O=0mA to 300mA		6	20	mV
Ripple Rejection	PSRR	V_{IN}=V_{OUT}+1V f_{RIPPLE} = 120Hz, C_{OUT} = 1μF		60		dB
Temperature Coefficient	TC	I_{OUT} = 1mA, V_{IN} = 5V		50		ppm/ °C
Thermal Shutdown Temperature	TSD			160		°C
Thermal Shutdown Hysteresis	ΔTSD			25		°C

Note 1：The dropout voltage is defined as V_{IN}-V_{OUT}, which is measured when V_{OUT} drop about 100mV.

Note 2：Regulation is measured at a constant junction temperature by using 40ms current pulse and load regulation in the load range from 0mA to 300mA.

Typical Performance Curves

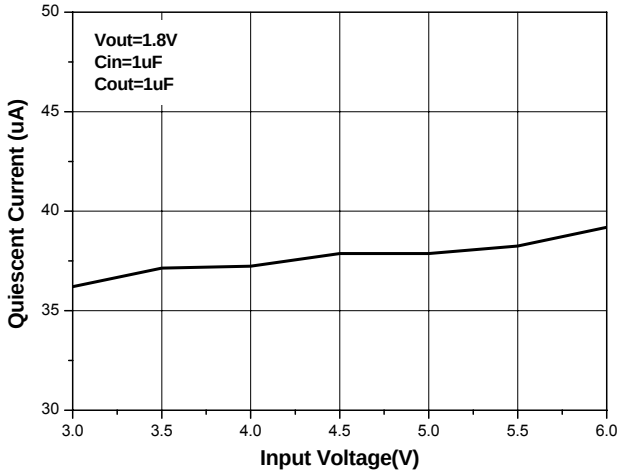


Figure 4. Quiescent Current vs. Input Voltage

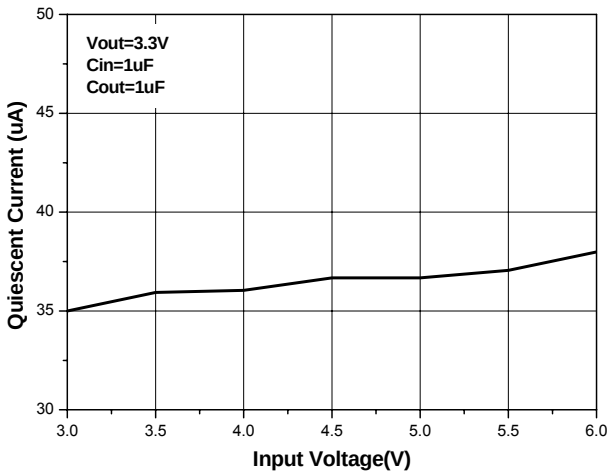


Figure 5. Quiescent Current vs. Input Voltage

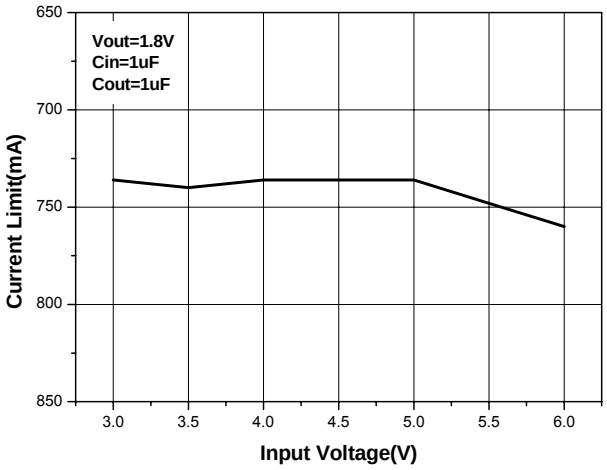


Figure 6. Current limit vs. Input Voltage

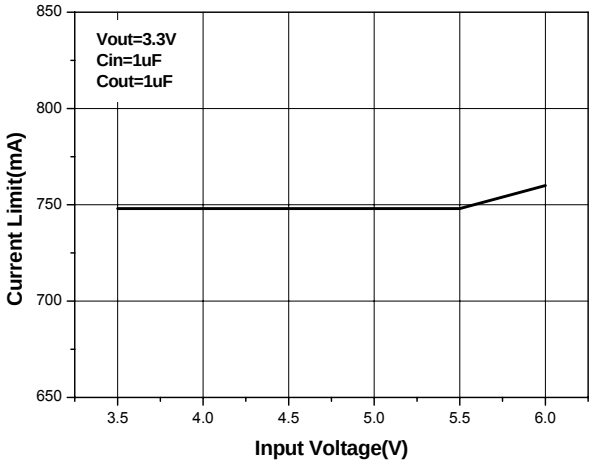


Figure 7. Current Limit vs. Input Voltage

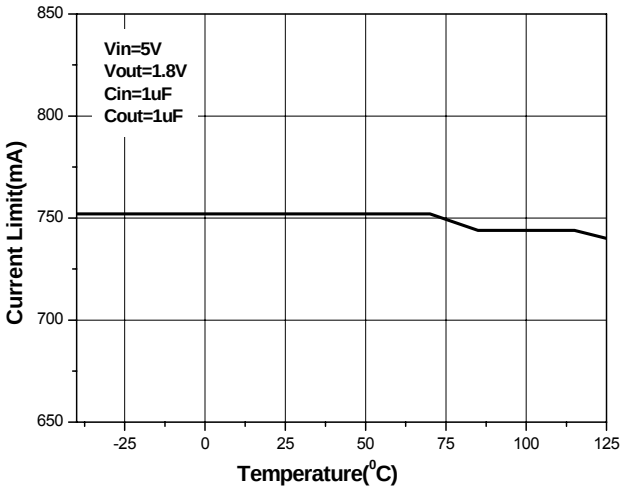


Figure 8. Current limit vs. Temperature

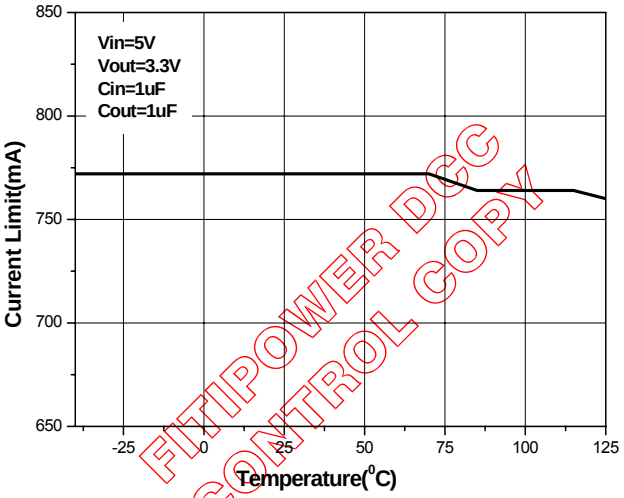


Figure 9. Current limit vs. Temperature

Typical Performance Curves (Continued)

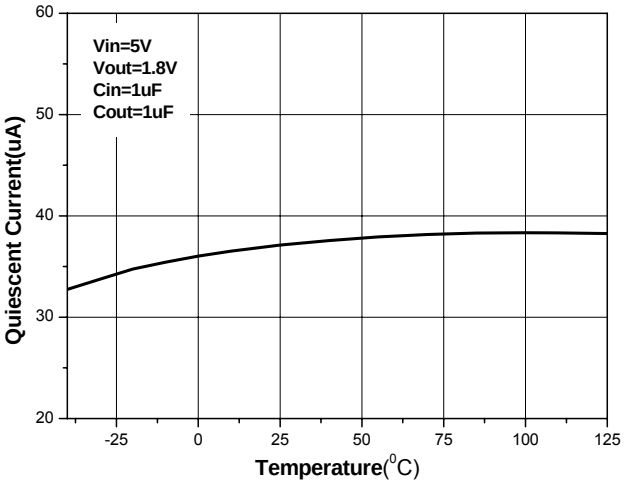


Figure 10. Quiescent Current vs. Temperature

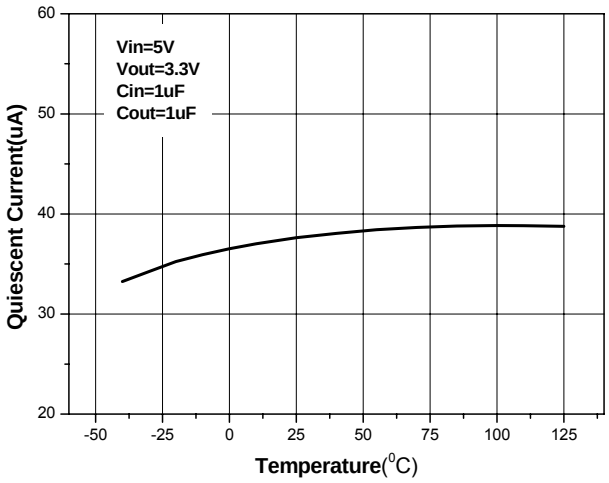


Figure 11. Quiescent Current vs. Temperature

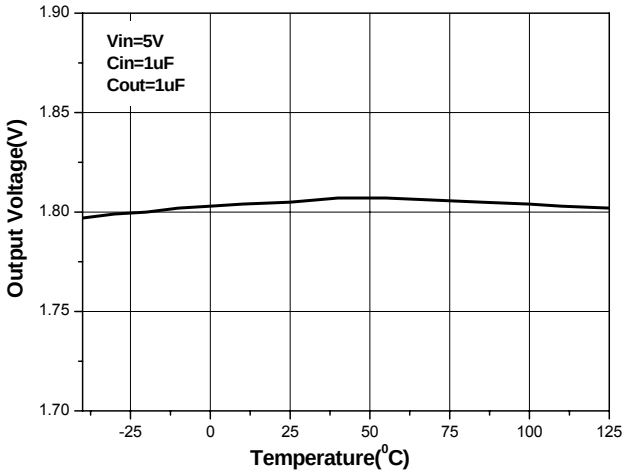


Figure 12. Temperature Stability

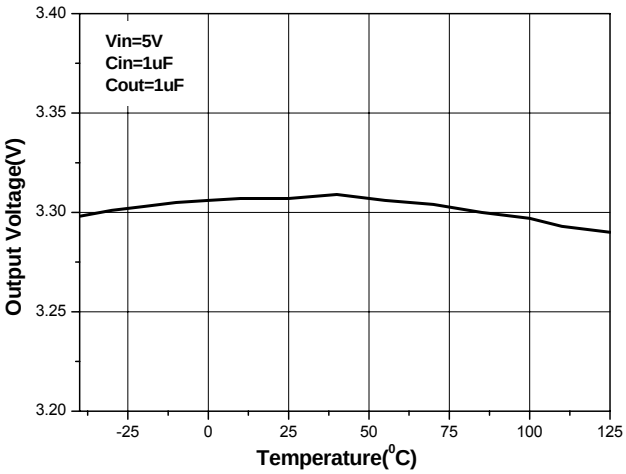


Figure 13. Temperature Stability

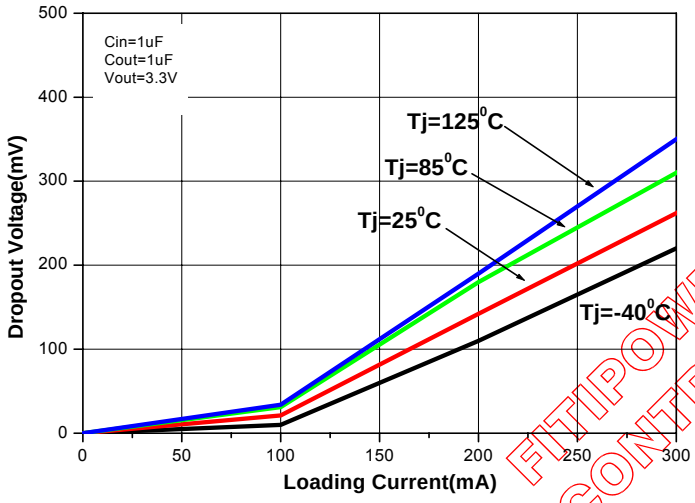


Figure 14. Dropout Voltage vs. Loading Current

Typical Performance Curves (Continued)

V_{IN}=4V I_{OUT}= 1mA to150mA
V_{OUT}=3.3V C_{IN}=1uF C_{OUT}=1uF

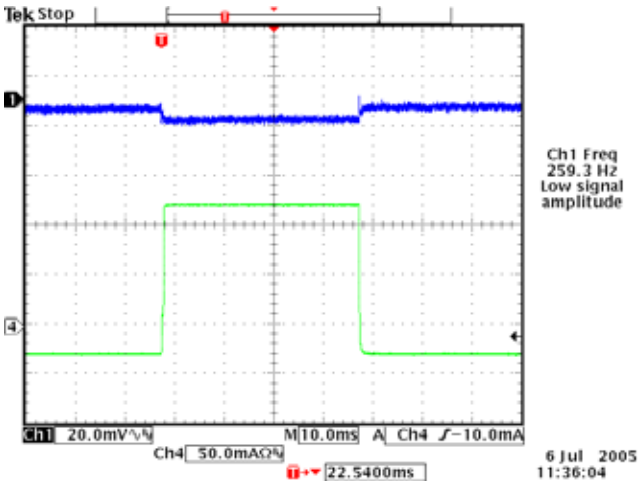


Figure 15. Load Transition Response

V_{IN}=4V I_{OUT}=1mA to 150mA
V_{OUT}=3.3V C_{IN}=1uF C_{OUT}=4.7uF

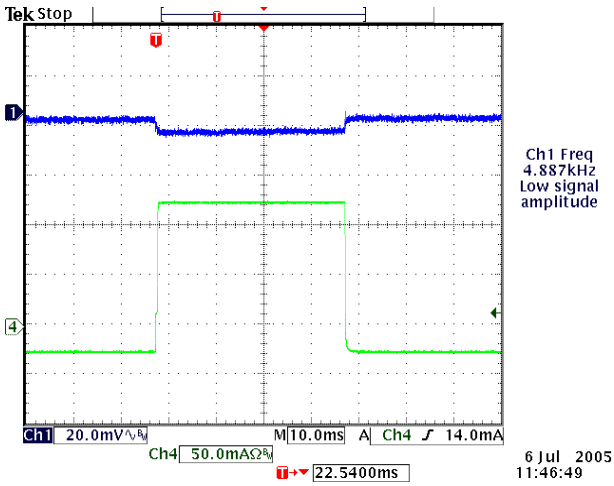


Figure 16. Load Transition Response

V_{IN}=3V to 4V I_{OUT}=10mA V_{OUT}= 1.8V C_{IN}=1uF C_{OUT}=1uF

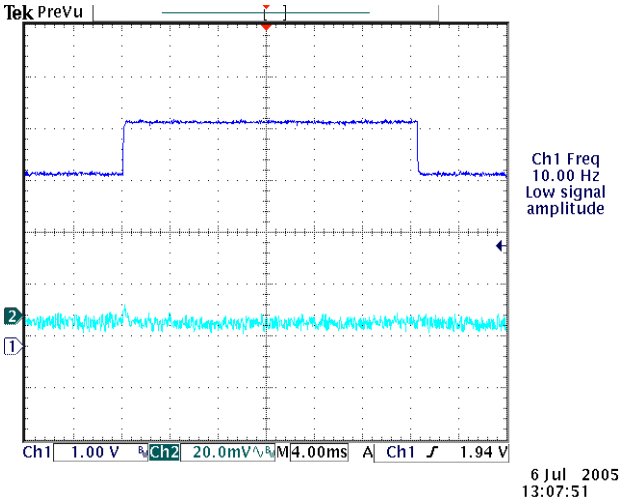


Figure 17. Line Transition Response

V_{IN}=3V to 4V I_{OUT}=10mA V_{OUT}= 1.8V C_{IN}=1uF C_{OUT}=4.7uF

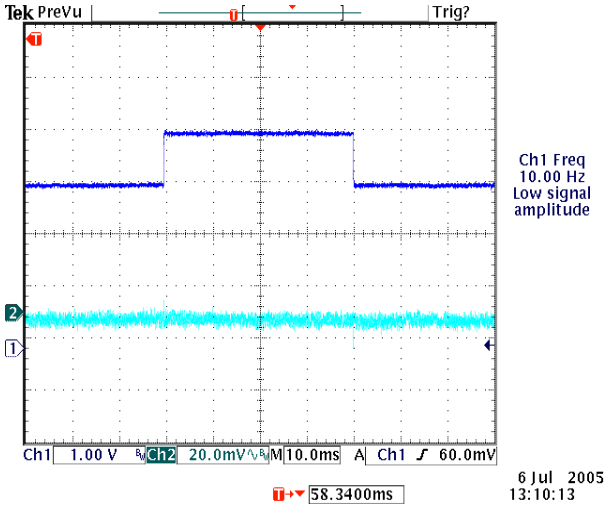


Figure 18. Line Transition Response

Application Information

The FP6131 series are low dropout linear regulators that could provide 300mA output current at dropout voltage about 300mV. Besides, current limit and on chip thermal shutdown features provide protection against any combination of overload or ambient temperature that could exceed junction temperature.

1.Output and Input Capacitor

The FP6131 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 provides to improve 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 1uF to 10uF X5R or X7R dielectric ceramic capacitors with 30mΩ to 50mΩ ESR range between device outputs to ground for transient stability. The FP6131 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.

2.Protection Features

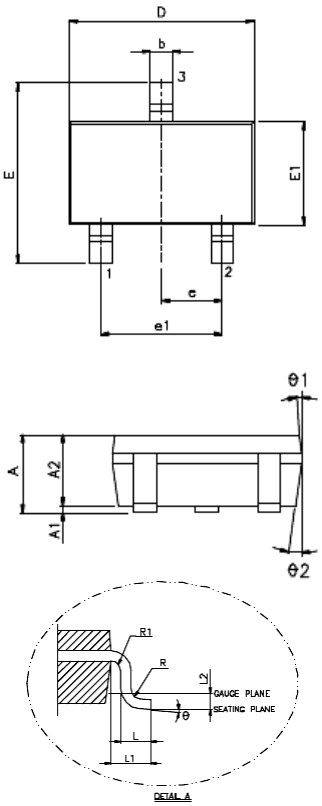
In order to prevent overloading or thermal condition from damaging the device, FP6131 regulator has internal thermal and current limiting functions designed to protect the device. It will rapidly shut off PMOS pass element during overloading or over temperature condition.

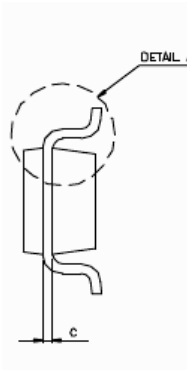
3.Thermal Consideration

The power handling capability of the device will be limited by maximum operation junction temperature (125°C). The power dissipated by the device will be estimated by PD = IOUT × (VIN-VOUT). The power dissipation should be lower than the maximum power dissipation listed in “Absolute Maximum Ratings” section.

Outline Information

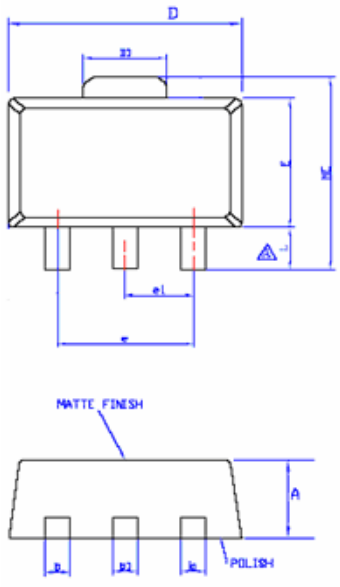
SOT-23-3 Package (Unit: mm)

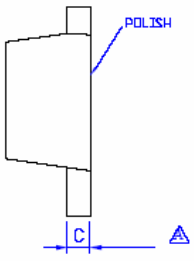




SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	---	---	1.45
A1	0.00	---	0.15
A2	0.90	1.15	1.30
b	0.30	---	0.50
c	0.08	---	0.22
D	---	2.90	---
E	---	2.80	---
E1	---	1.60	---
e		0.95	
e1		1.90	
L	0.3	0.45	0.60
L1		0.60	
L2		0.25	
R	0.1		
R1	0.1		0.25
θ	0°	4°	8°
θ1	5	10	15

SOT- 89-3 Package (Unit: mm)





SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	1.40	---	1.60
L	0.89	---	1.20
b	0.36	---	0.48
b1	0.44	---	0.56
C	0.35	---	0.44
D	4.40	---	4.60
D1	1.62	---	1.83
HE	3.94	---	4.25
E	2.29	---	2.60
e	---	3.0	---
S	0.65	---	0.85
e1	---	1.5	---

Note 1:Followed From JEDEC TO-243-F.

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