150mA, High PSRR, Dual Output Low-Dropout Regulator

Description

The FP6121 is a dual output, low dropout, high PSRR, low quiescent current linear regulators. The FP6121 can supply 100mA output current with a lower dropout voltage about 150mV for each channel.

The FP6121 is suitable for portable and wireless application such as mobile phone and portable handsets. The FP6121 is designed and optimized to work with low-value, low cost ceramic capacitors. The FP6121 consumes less than 0.1uA during shutdown mode which is independent for each channel, allowing for flexibility in power management. Besides its current limit protection and on chip thermal shutdown features provide protection against any combination of overload or ambient temperature that could exceed junction temperature.

The FP6121 doesn't need external bypass capacitor and still could get better noise performance. The tiny SOT-23-6,TSOT-23-6 and VSON-6 packages are attractive for hand-held applications.

Features

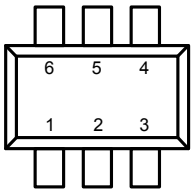
- Low Dropout Voltage：150mV at I_{OUT} = 100mA
- Guaranteed 150mA Output Current Per Channel
- Very Low Quiescent Current：25uA
- High Power Supply Rejection Ratio：65dB at 1KHz
- Highly Accurate：±2%
- Needs Only 1μF Ceramic Capacitor for Stability
- Thermal Shutdown and Current Limiting Protection
- Tiny SOT-23-6,TSOT-23-6 and VSON-6 Packages
- RoHS Compliant

Applications

- Mobile Phones
- Portable or Wireless Instruments
- Cameras
- PDA and Notebook Computers

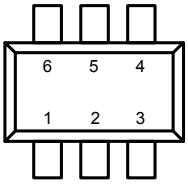
Pin Assignment

S6 Package (SOT-23-6)



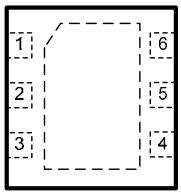
TOP VIEW
1. EN1
2. VIN
3. EN2
4. VOUT2
5. GND
6. VOUT1

S9 Package (TSOT-23-6)



TOP VIEW
1. EN1
2. VIN
3. EN2
4. VOUT2
5. GND
6. VOUT1

VS Package (VSON- 6)



TOP VIEW
1. EN2
2. VIN
3. EN1
4. GND
5. VOUT1
6. VOUT2

Figure 1. Pin Assignment of FP6121

Ordering Information

FP6121-□□□□

- TR: Tape / Reel
  Blank: Tube
- P: Pb Free with Commercial Standard (RoHS Compliant)
  G: Green
- Package Type
  S6: SOT-23-6
  S9: TSOT-23-6
  VS: VSON-6
- Output Voltage

	VOUT1	VOUT2		VOUT1	VOUT2
A	3.3V	2.8V	I	1.8V	3.3V
B	3.3V	2.5V	J	1.3V	2.8V
C	2.8V	1.8V	K	1.2V	2.8V
D	2.5V	1.8V	L	1.8V	2.6V
E	3.0V	1.8V	M	1.8V	3.0V
F	1.8V	2.8V	N	2.8V	3.3V
G	2.8V	2.8V	O	1.8V	1.8V
H	1.5V	2.8V	P	2.85V	2.85V

TSOT-23-6 Marking

Part Number	Product Code	Part Number	Product Code
FP6121-AS9P	fR	FP6121-IS9P	fi
FP6121-BS9P	fS	FP6121-JS9P	fm
FP6121-CS9P	fT	FP6121-KS9P	fr
FP6121-DS9P	fU	FP6121-LS9P	fv
FP6121-ES9P	fV	FP6121-MS9P	fw
FP6121-FS9P	fW	FP6121-NS9P	FM
FP6121-GS9P	fX	FP6121-OS9P	FN
FP6121-HS9P	fY	FP6121-PS9P	FU

VSON- 6 Marking

Part Number	Product Code	Part Number	Product Code
FP6121-AVSP	fx	FP6121-IVSP	f6
FP6121-BVSP	fz	FP6121-JVSP	f7
FP6121-CVSP	f0	FP6121-KVSP	f8
FP6121-DVSP	f1	FP6121-LVSP	fs
FP6121-EVSP	f2	FP6121-MVSP	f9
FP6121-FVSP	f3	FP6121-NVSP	FP
FP6121-GVSP	f4	FP6121-OVSP	FR
FP6121-HVSP	f5	FP6121-PVSP	FV

SOT-23-6 Marking

Part Number	Product Code	Part Number	Product Code
FP6121-AS6P	fA	FP6121-IS6P	fZ
FP6121-BS6P	fB	FP6121-JS6P	fk
FP6121-CS6P	fC	FP6121-KS6P	fn
FP6121-DS6P	fD	FP6121-LS6P	ft
FP6121-ES6P	fE	FP6121-MS6P	fu
FP6121-FS6P	fF	FP6121-NS6P	FK
FP6121-FS6G	fF=	FP6121-OS6P	FL
FP6121-GS6P	fG	FP6121-PS6P	FT
FP6121-HS6P	fH		

Typical Application Circuit

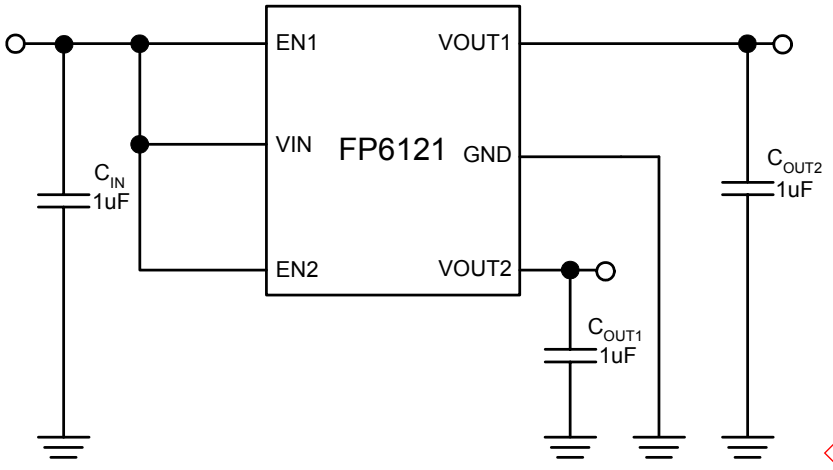


Figure 2. Typical Application Circuit of FP6121

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 requires an input filter capacitor. In general, the input capacitor in the range of 1μF to 10μF is sufficient.
VOUT1 VOUT2	The output supplies power to loads. The output capacitor is required to prevent output voltage unstable. The FP6121 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 and PSRR.
GND	Common ground pin
EN 1 EN 2	Logic input control this device active or shut off. The shutdown pin can't be left floating and must be tied to the Vin pin if not used. The shutdown mode which is independent for each channel, allowing for flexibility in power management.

Absolute Maximum Ratings

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

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

Recommended Operating Conditions

- Input Voltage (V_{IN})---------- + 2.0 to + 5.5V
- Operating Junction Temperature Range (T_J)---------- - 40 to + 85℃

Block Diagram

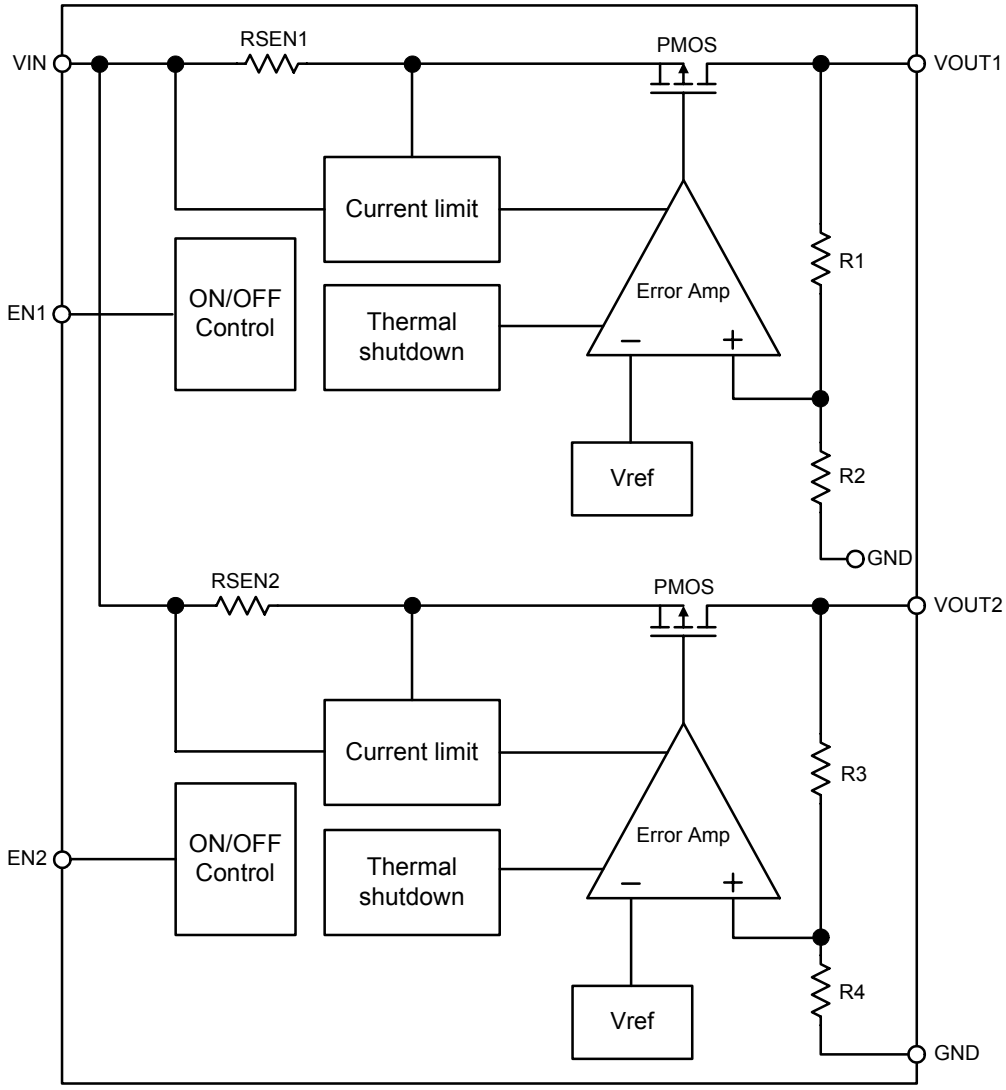


Figure 3. Block Diagram of FP6121

Electrical Characteristics

(V_{IN}=V_{OUT}+1V, SHDN=V_{IN}, C_{IN}=1μF, C_{OUT}=1μF, T_A=25 ºC, unless otherwise specified)

Parameter	Symbol	Conditions		Min	Typ	Max	Unit
Output Voltage Accuracy		I_O= 1mA		-2		+2	%
Current Limit	I_{LIMIT}	R_{Load}=1Ω		200			mA
Quiescent Current	I_Q	I_O= 0mA			25	50	μA
Dropout Voltage (Note 1)	V_{DROP}	I_O=100mA	V_{OUT} ≤ 1.8V		550		mV
			1.9V ≤ V_{OUT} ≤ 2.4V		330		
			2.5V ≤ V_{OUT} ≤ 3.3V		170		
Line Regulation	$\frac{\Delta V_{OUT}}{\Delta V_{IN} \times V_{OUT}}$	I_O=1mA, V_{IN}=V_{OUT} +1V to 5V			0.01	0.20	% / V
Load Regulation (Note 2)	ΔV_{OUT}	I_O=1mA to 100mA			15	60	mV
Ripple Rejection	PSRR	V_{IN}=V_{OUT}+1V f_{RIPPLE} = 1KHz			65		dB
Standby Current	I_{STBY}	EN=GND, Shutdown				1	μA
EN Input Bias Current	I_{IB}	EN=V_{IN} or GND				100	nA
EN “High” Threshold	V_{IH}	Start-up		1.0			V
EN “Low”	V_{IL}	Shutdown				0.4	V
Temperature Coefficient	T_C	I_{OUT} = 1mA, V_{IN} = 5V			100		ppm/ ºC
Thermal Shutdown Temperature	T_{SD}				160		ºC
Thermal Shutdown Hysteresis	ΔT_{SD}				25		ºC

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 100mA.

Typical Performance Curves

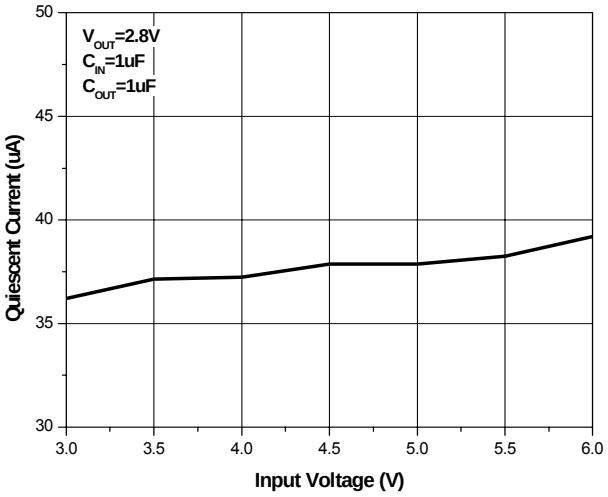


Figure 4. Quiescent Current vs. Input Voltage

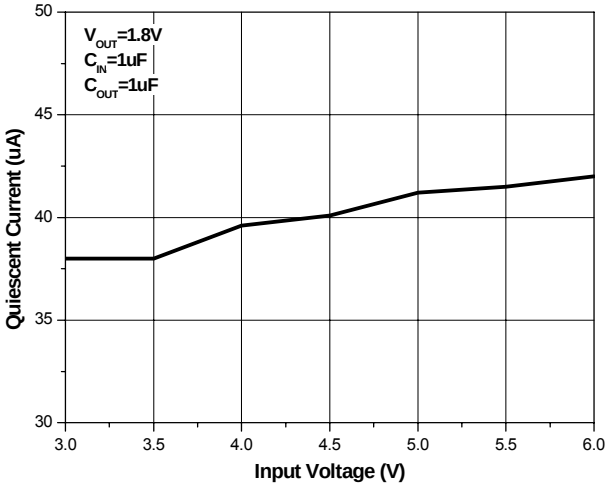


Figure 5. Quiescent Current vs. Input Voltage

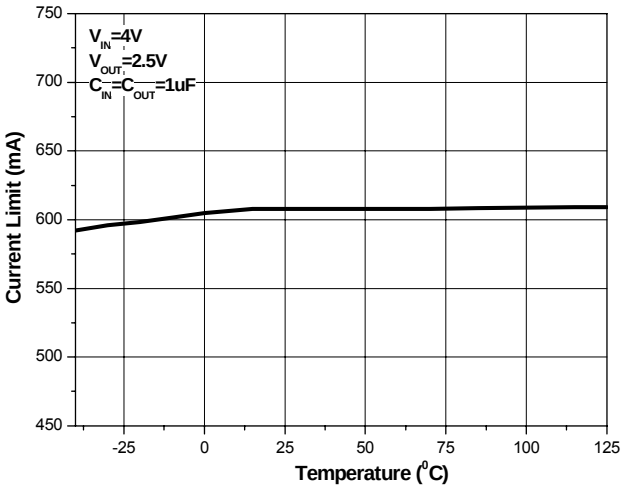


Figure 6. Current Limit vs. Temperature

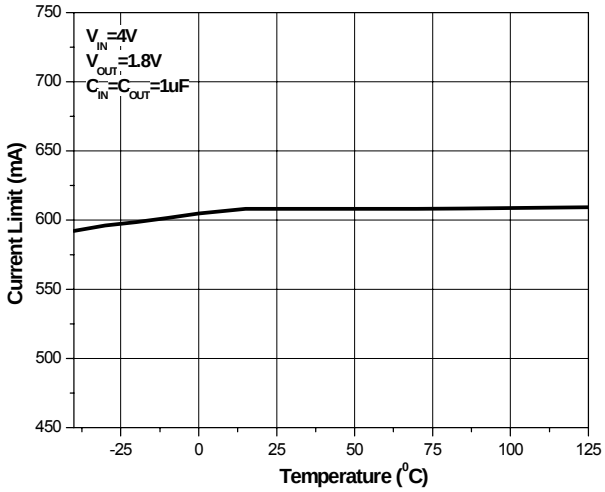


Figure 7. Current Limit vs. Temperature

VOUT1=2.8V VOUT2=1.8V

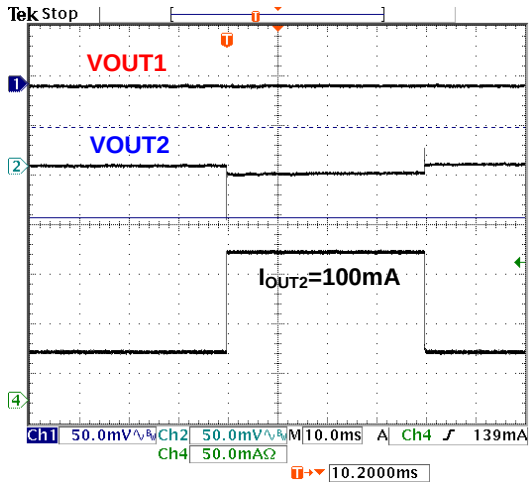


Figure 8. Dual Channel Crosstalk Test

VOUT1=3.3V VOUT2=2.5V

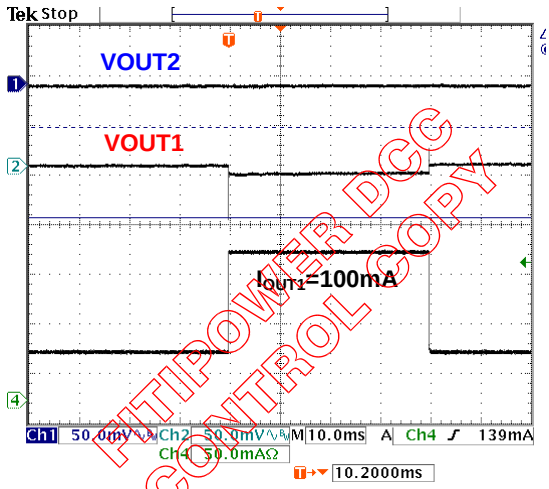


Figure 9. Dual Channel Crosstalk Test

Typical Performance Curves (Continued)

VOUT1=3.3V VOUT2=2.5V

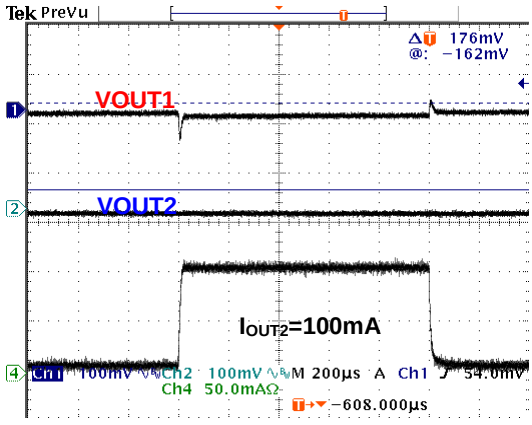


Figure 10. Dual Channel Crosstalk Test

VOUT1=2.8V VOUT2=1.8V

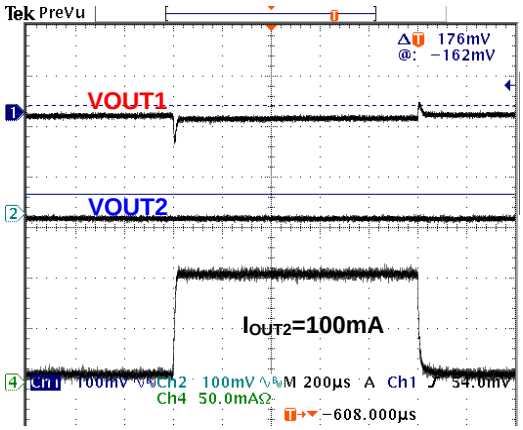


Figure 11. Dual Channel Crosstalk Test

V_{IN}=2.8V V_{OUT}=1.8V I_{OUT}=100mA

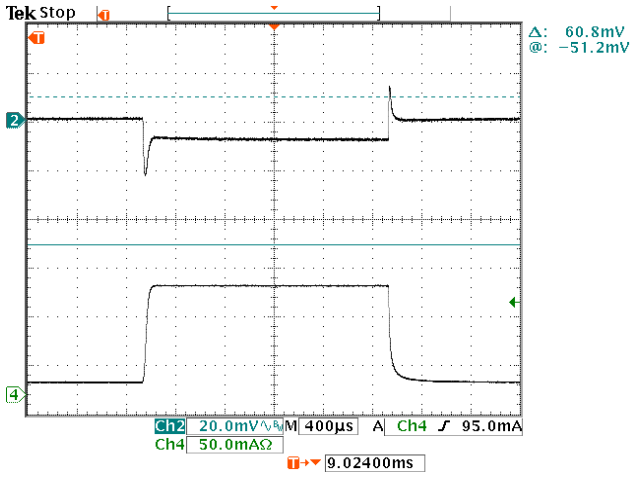


Figure 12. Load Transition Response

V_{IN}=3.8V V_{OUT}=2.8V I_{OUT}=100mA

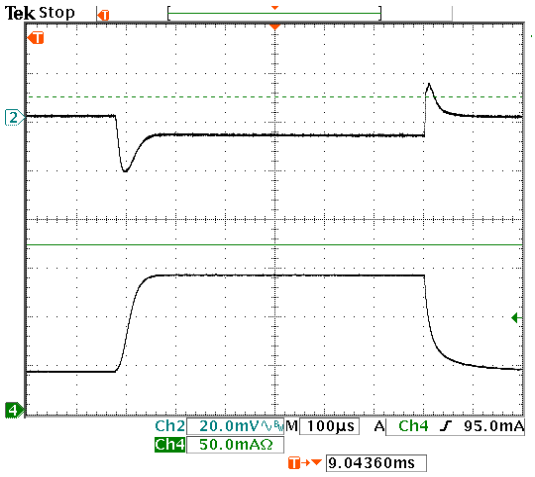


Figure 13. Load Transition Response

V_{IN}=4.3V V_{OUT}=3.3V I_{OUT}=100mA

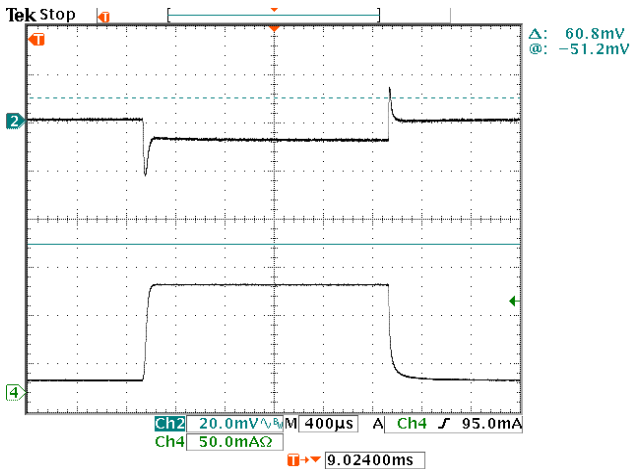


Figure 14. Load Transition Response

V_{IN}=3.5V V_{OUT}=2.5V I_{OUT}=100mA

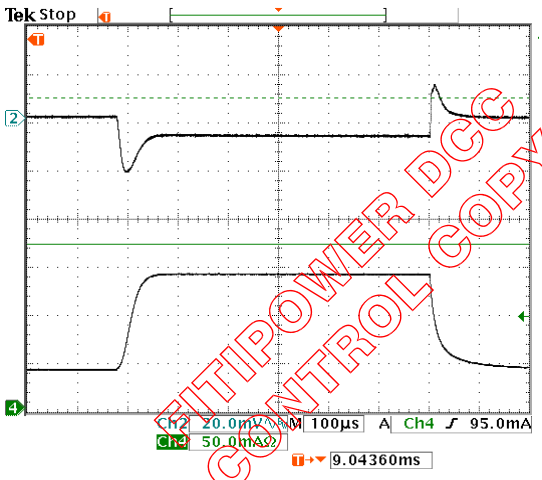


Figure 15. Load Transition Response

Typical Performance Curves (Continued)

V_{IN}=4V V_{OUT}=2.8V I_{OUT}=100mA

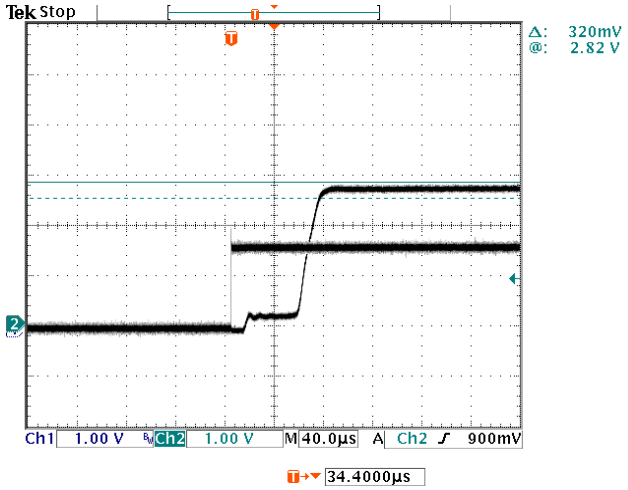


Figure 16. Shutdown /Enable Test

V_{IN}=4V V_{OUT}=2.8V I_{OUT}=100mA

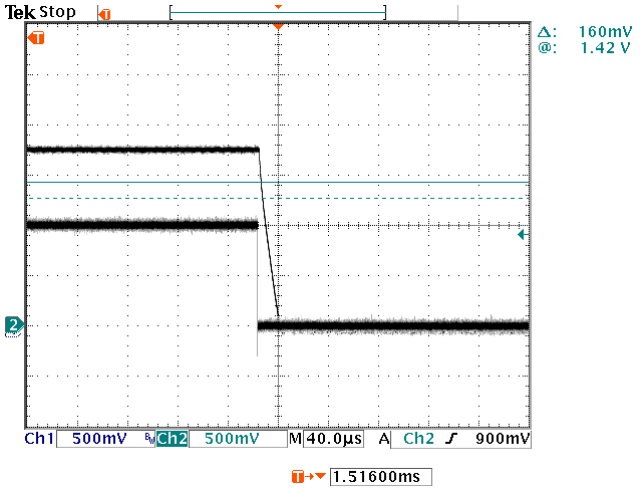


Figure 17. Shutdown /Enable Test

V_{IN}=3V→ 4V V_{OUT}=1.8V I_{OUT}=10mA

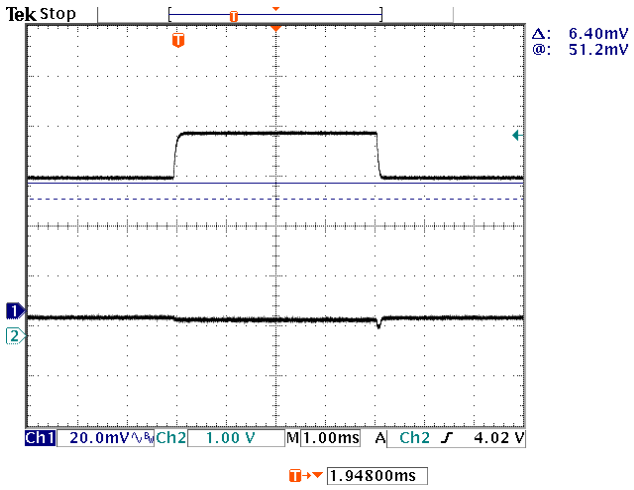


Figure 18. Line Transition Response

V_{IN}=4V→ 5V V_{OUT}=2.8V I_{OUT}=10mA

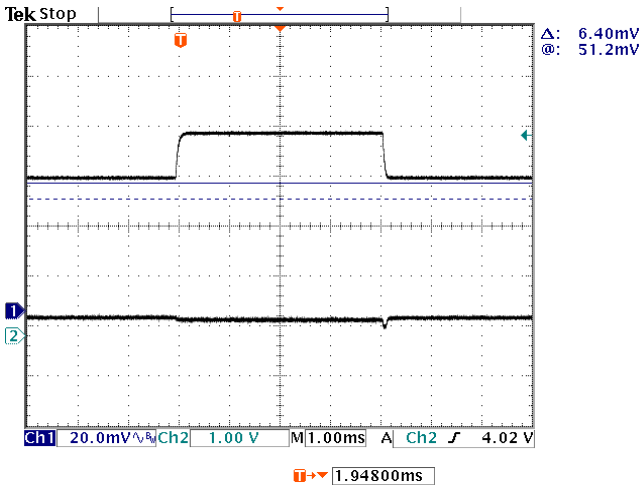


Figure 19. Line Transition Response

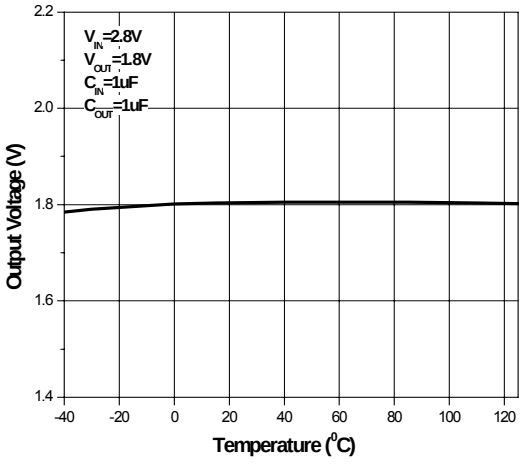


Figure 20. Output Voltage vs. Temperature

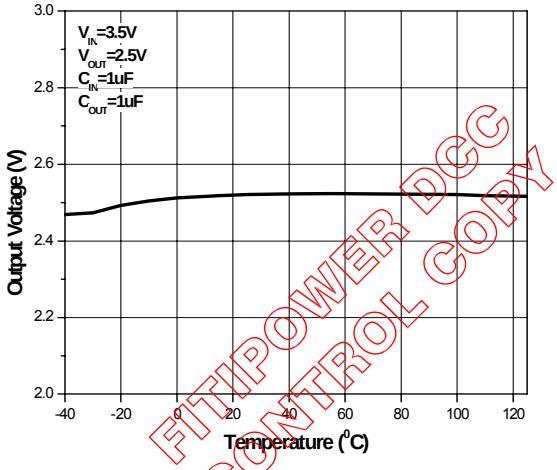


Figure 21. Output Voltage vs. Temperature

Typical Performance Curves (Continued)

V_{IN}=2.8V V_{OUT}=1.8V

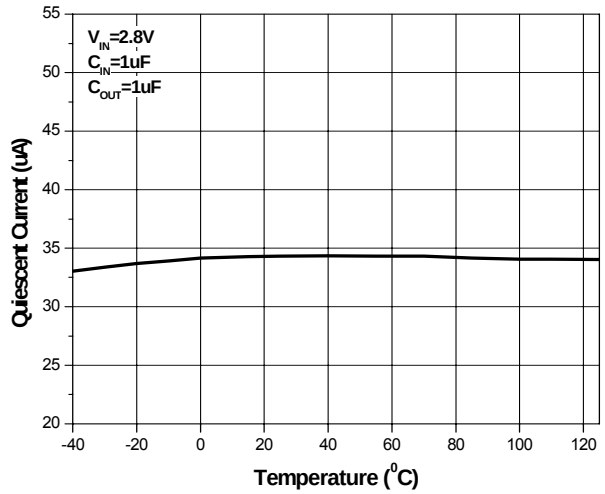


Figure 22. Quiescent Current vs. Temperature

V_{IN}=4V V_{OUT}=2.8V

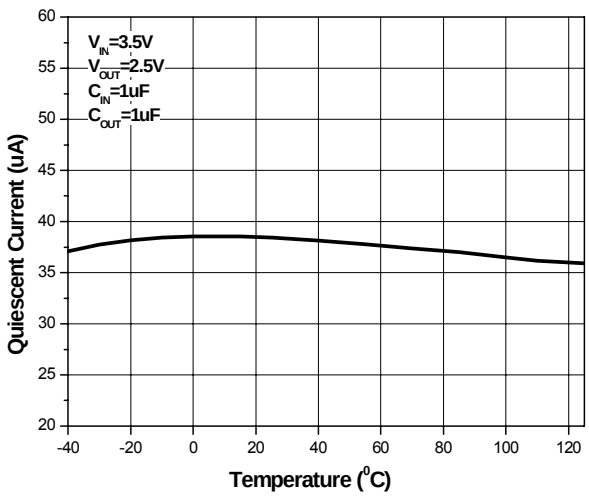


Figure 23. Quiescent Current vs. Temperature

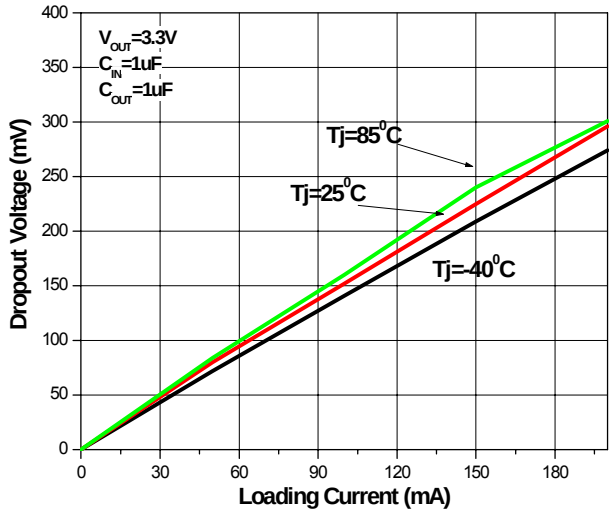


Figure 24. V_{OUT}=3.3V Dropout vs. Temperature

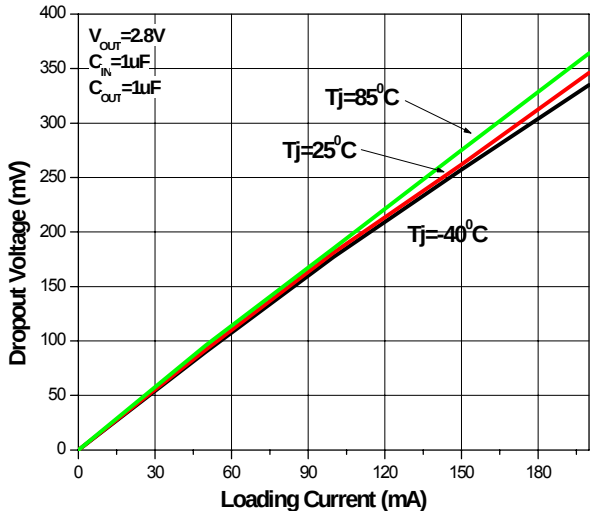


Figure 25. V_{OUT}=2.8V Dropout vs. Temperature

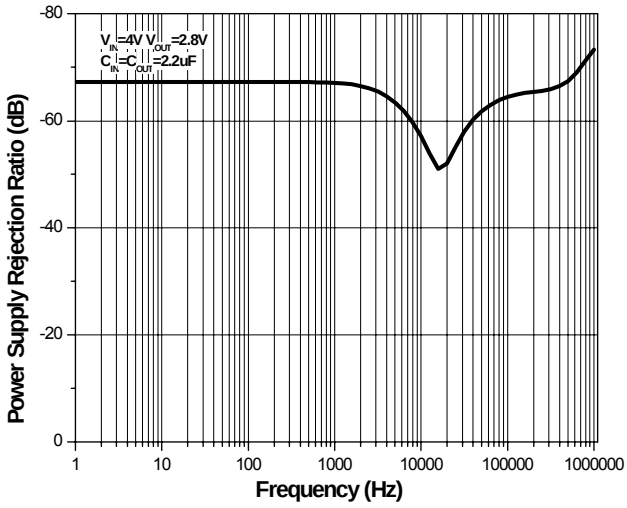


Figure 26. Power Supply Rejection Ratio vs. Frequency

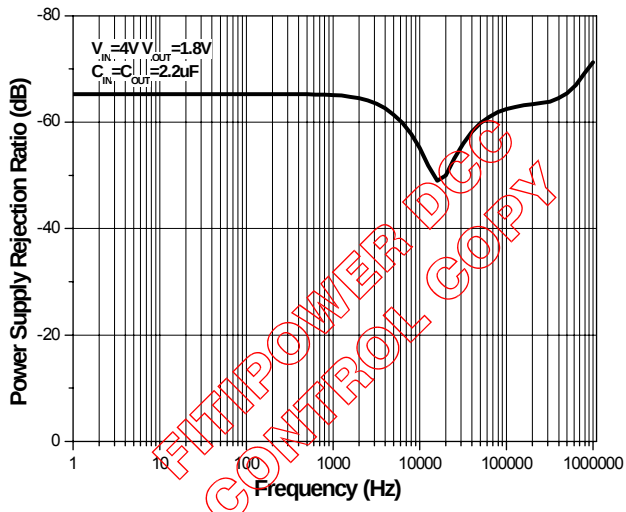
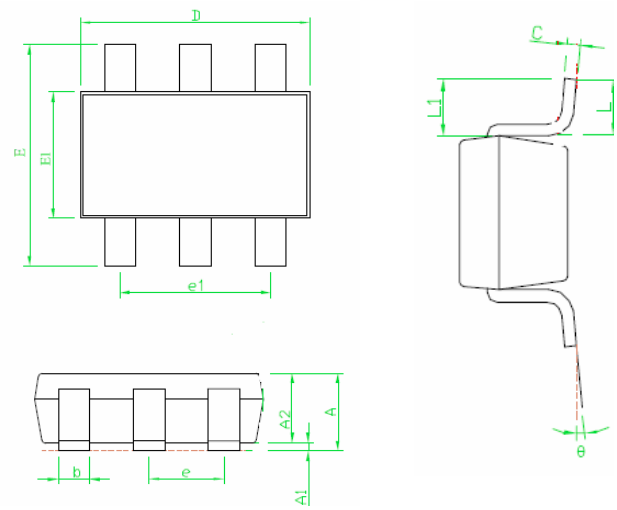


Figure 27. Power Supply Rejection Ratio vs. Frequency

Outline Information

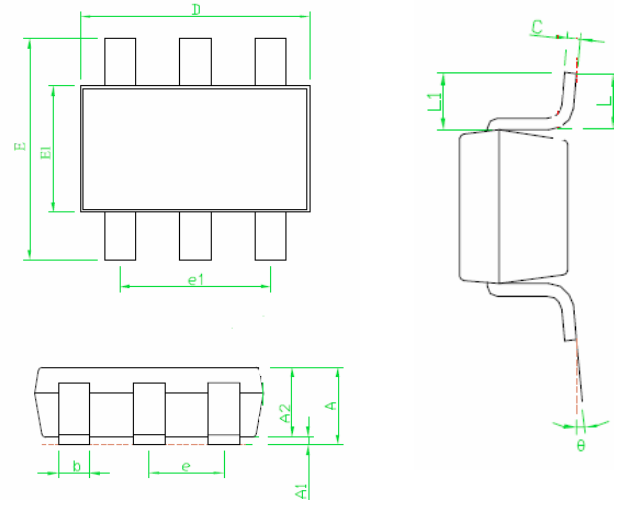
SOT-23-6 Package (Unit: mm)



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	
θ	0°	4°	8°

Note 1: Followed From JEDEC MO-178-C.

TSOT-23-6 Package (Unit: mm)

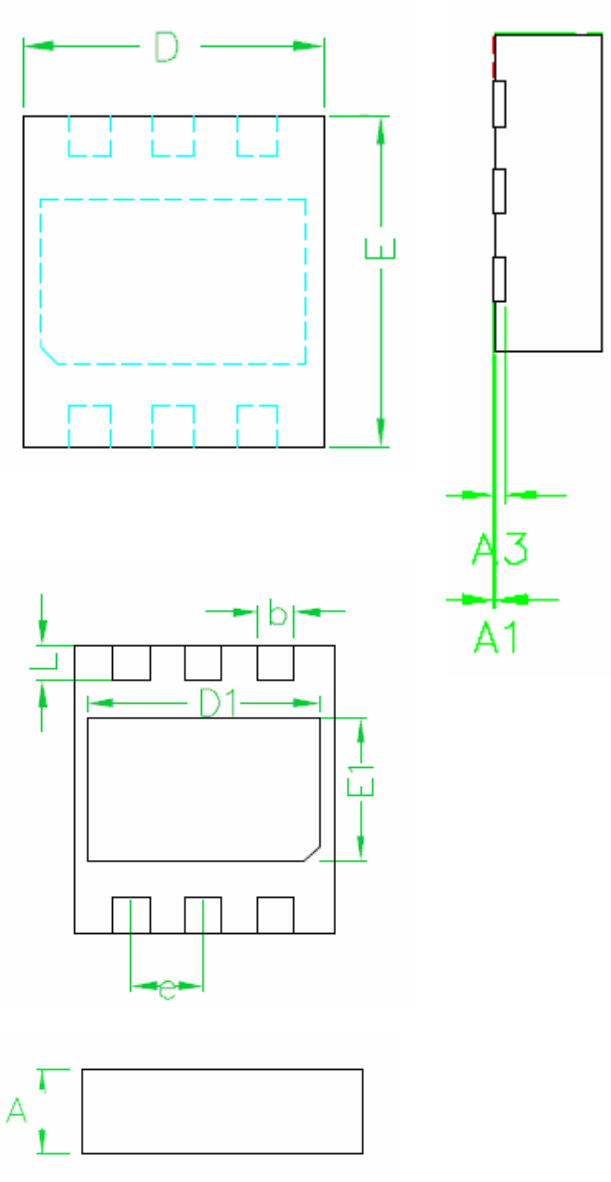


SYMBOLS / UNIT	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	---	---	1.10
A1	0.00	---	0.10
A2	0.70	0.90	1.00
b	0.30	---	0.50
c	0.08	---	0.20
D	---	2.90	---
E	---	2.80	---
E1	---	1.60	---
e		0.95	
e1		1.90	
L	0.3	0.45	0.60
L1		0.60	
θ	0°	4°	8°

Note 1: Followed From JEDEC MO-193-C.

Outline Information (Continued)

VSON- 6 Package (Unit: mm)



SYMBOLS UNIT	DIMENSION IN MILLIMETER		
	MIN	NOM	MAX
A	0.5	0.55	0.60
A1	0.000	0.002	0.005
A3	---	0.152REF	---
b	0.20	0.25	0.30
D	1.75	1.80	1.85
D1	---	1.5BSC	---
E	1.95	2.00	2.05
E1	---	1.0BSC	---
e	---	0.50BSC	---
L	0.20	0.25	0.30

Note 1: Followed From JEDEC MO-287-A.