



### 650mA CMOS LDO

#### DESCRIPTION

The GP1107/GP1108 650mA Low Dropout and Low Noise micro-power Voltage Regulator series suitable for battery powered portable equipments or the application requires low quiescent current.

The GP1107/GP1108 designed for using with low ESR capacitors. The output remains stable with 1uF ceramic output capacitor.

The GP1107/GP1108 built-in with internal low R<sub>DS(on)</sub> PMOS as the pass device, which does not cause extra ground current in different load and high Dropout voltage condition. The shutdown mode of <0.1uA operation current makes the IC suitable for battery-powered devices.

Built-in Thermal shutdown and Current Limit circuits.

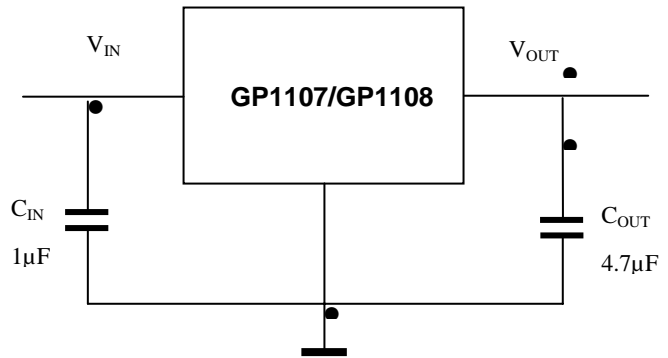
#### FEATURES

- **Guaranteed 650mA Output**
- **Stable with Low-ESR Output Capacitor**
- **Very Low Dropout Voltage**
- **Low Noise**
- **Output voltages range from 1.3V to 5.2V in 100mV increments**
- **Accuracy within 1.5%**
- **Low Operation Current - 70uA Typical**
- **Chip Enable Function (SO8 package),**
- **Low Temperature Coefficient**
- **Built in Current and Thermal protection**
- **SOT89/SOT223/SOP8 Packages**

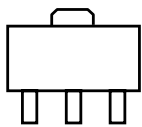
#### APPLICATIONS

- Wireless Devices
- Battery-powered Equipments
- Hand-held Electronics
- Laptop, Notebook, and Palmtop Computers
- ADD-On Card

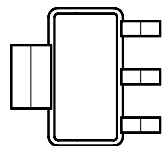
#### TYPICAL APPLICATION



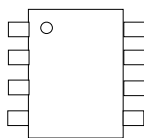
#### PACKAGE TYPE



SOT89

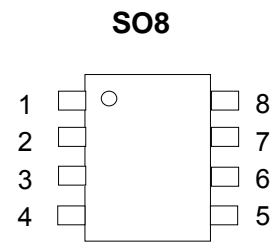
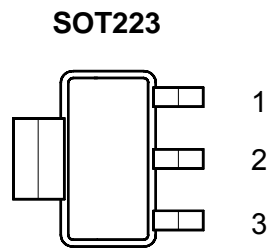
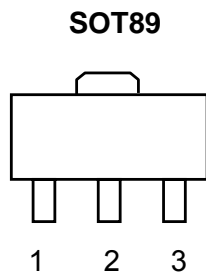


SOT223



SO8

## Package and Pin Configurations



	GP1107
1	VIN
2	GND
3	VOUT

	GP1107
1	VIN
2	GND
3	VOUT

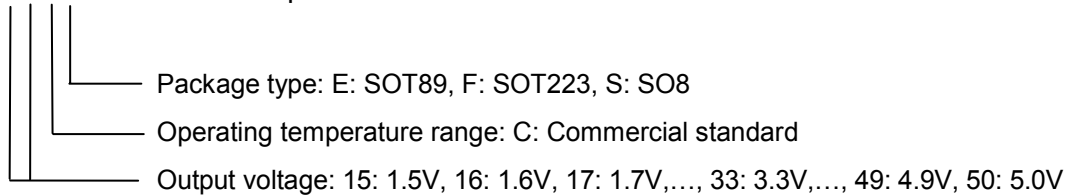
	GP1108
1	VOUT
2	ADJ
3	GND
4	BP
5	EN
6	NC
7	NC
8	VIN

## ORDER INFORMATION

### Ordering Information

GP1107 XXXX 650mA Output current, without enable and bypass

GP1108 XXXX 650mA Output current

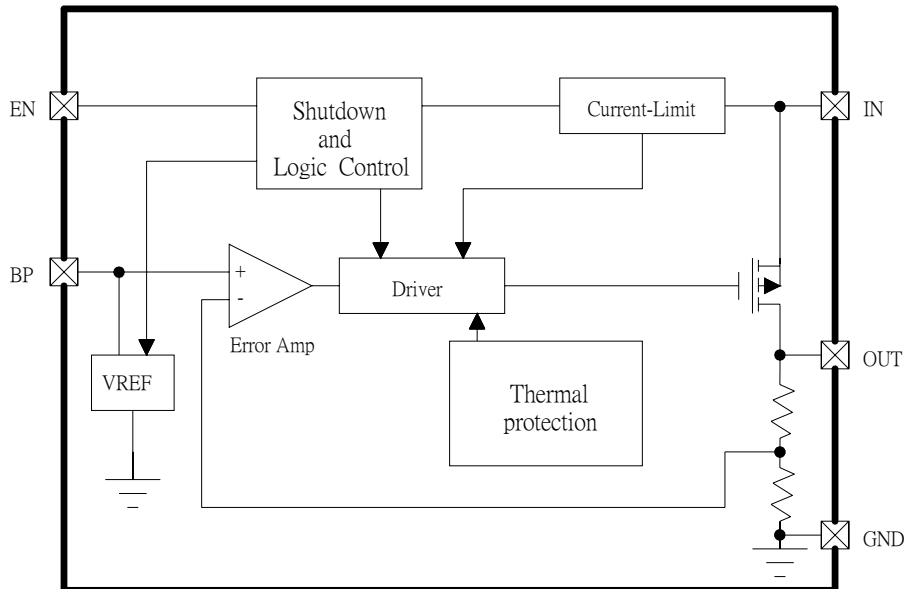


### Marking Information

Part Number/Marking	Output Voltage	Package	Operating temperature
GP1108-15	1.5V	SO8	Commercial standard
GP1108-18	1.8V	SO8	Commercial standard
GP1108-25	2.5V	SO8	Commercial standard
...	...	...	Commercial standard
GP1108-33	3.3V	SO8	Commercial standard
...	...	...	Commercial standard
GP1107-15	1.5V	SOT223	Commercial standard
GP1107-18	1.8V	SOT223	Commercial standard
GP1107-25	2.5V	SOT223	Commercial standard
...	...	...	Commercial standard
GP1107-33	3.3V	SOT223	Commercial standard
...	...	...	Commercial standard
1107-15	1.5V	SOT89	Commercial standard
1107-18	1.8V	SOT89	Commercial standard
1107-25	2.5V	SOT89	Commercial standard
...	...	...	Commercial standard
1107-33	3.3V	SOT89	Commercial standard
...	...	...	Commercial standard

ww: production date code

BLOCK DIAGRAM



Note : BP pin is an option for SO8 package. Leave it NC for the application that the noise is not sensitive.

<b>ABSOLUTE MAXIMUM RATINGS</b> (Note a)	
Input Voltage	8V
Power Dissipation, $P_D$ @ $T_A = 25^\circ\text{C}$	
SOT89	0.55W
SOT223	0.625W
Operating Junction Temperature Range	$-40^\circ\text{C}$ to $125^\circ\text{C}$
Storage Temperature Range	$-65^\circ\text{C}$ to $150^\circ\text{C}$
<b>Package Thermal Resistance</b>	
SOT89, $\theta_{JA}$	$180^\circ\text{C/W}$
SOT89, $\theta_{JC}$	$18^\circ\text{C/W}$
SOT223, $\theta_{JA}$	$160^\circ\text{C/W}$
SOT223, $\theta_{JC}$	$15^\circ\text{C/W}$
SO8, $\theta_{JA}$	$90^\circ\text{C/W}$
SO8, $\theta_{JC}$	$45^\circ\text{C/W}$
Lead Temperature (Soldering, 5 sec.)	$260^\circ\text{C}$

Note : Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground.

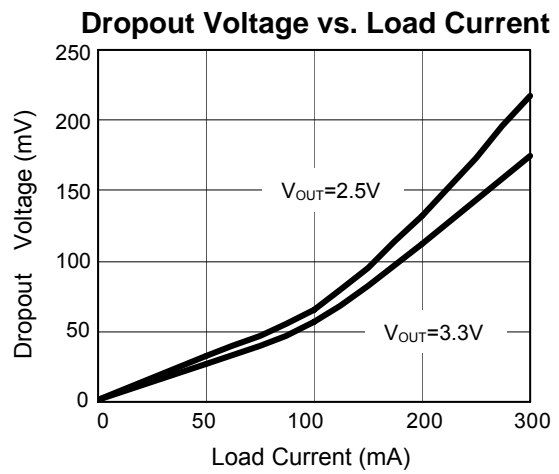
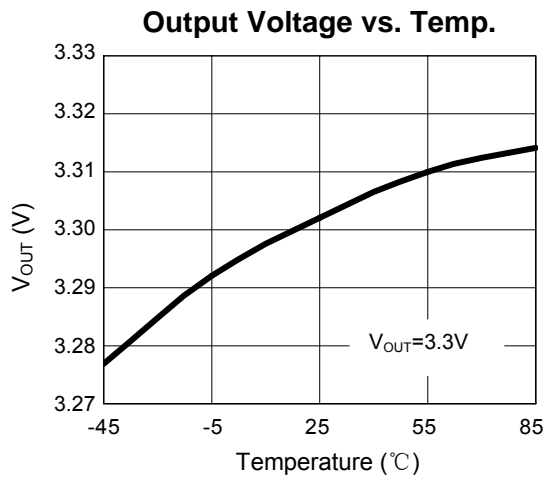
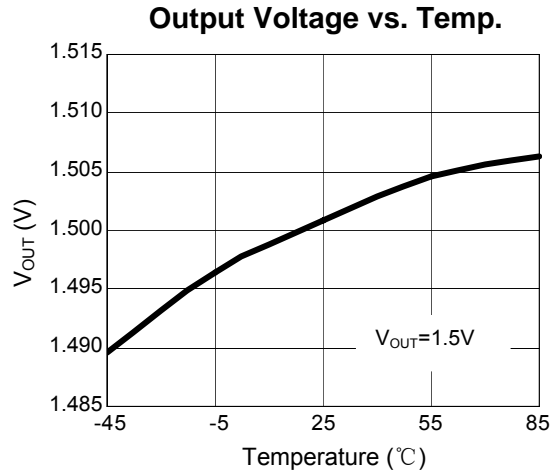
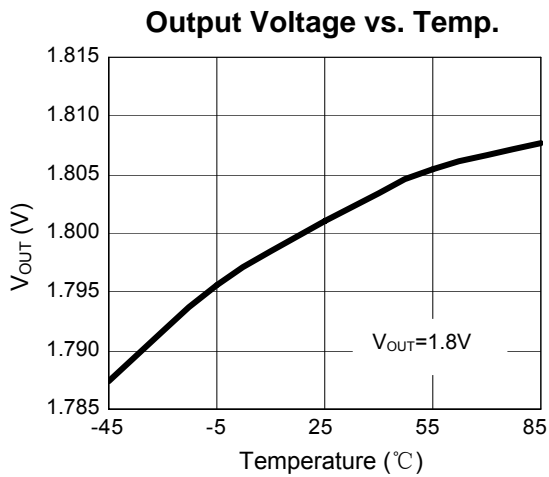
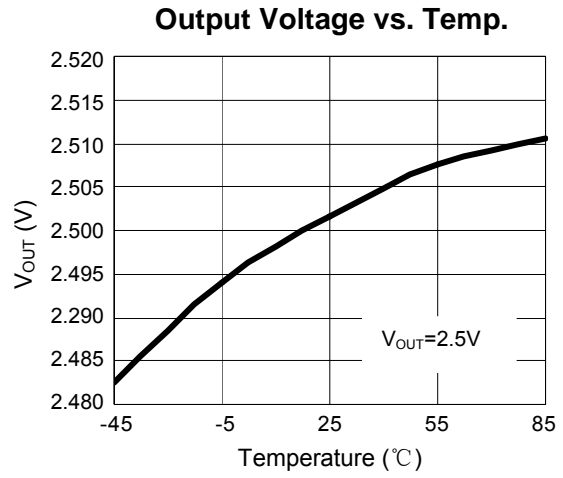
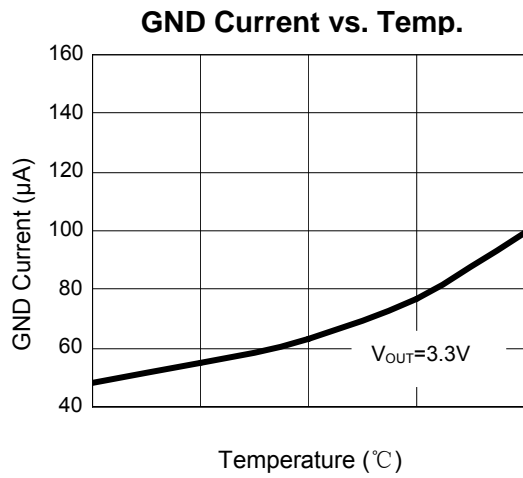
<b>RECOMMENDED OPERATING CONDITIONS</b>					
Parameter	Symbol	Recommended Operating			Units
		Min.	Typ.	Max.	
Input Voltage	$V_{IN}$	Note 1		7.0	V
Input Capacitor ( $V_{IN}$ to GND)		1.0			$\mu\text{F}$
Output Capacitor with ESR of $10\Omega$ max.,		1.0		10	$\mu\text{F}$
Ambient Temperature Range	$T_A$	- 40		85	$^\circ\text{C}$
Junction temperature	$T_J$	- 40		125	$^\circ\text{C}$
Note 1: $V_{IN(\text{min})} = V_{OUT} + V_{DROPOUT}$					

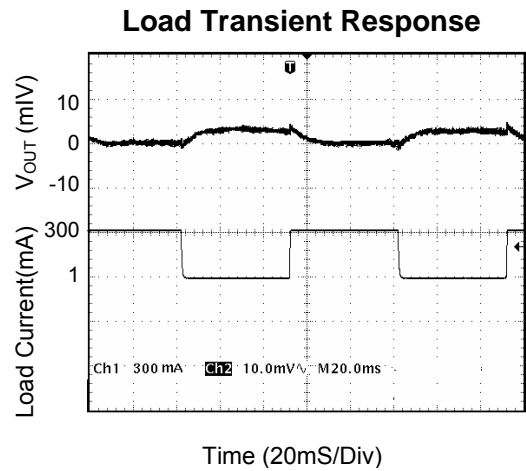
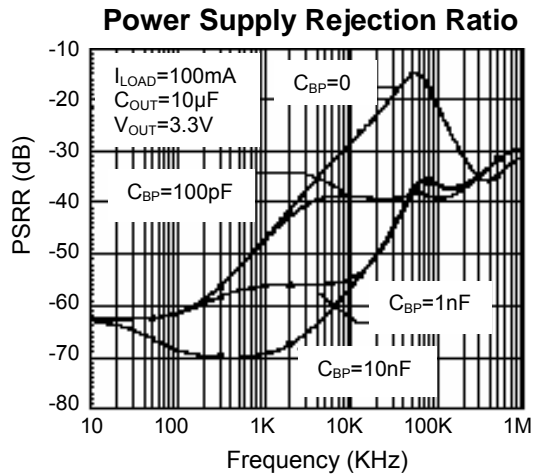
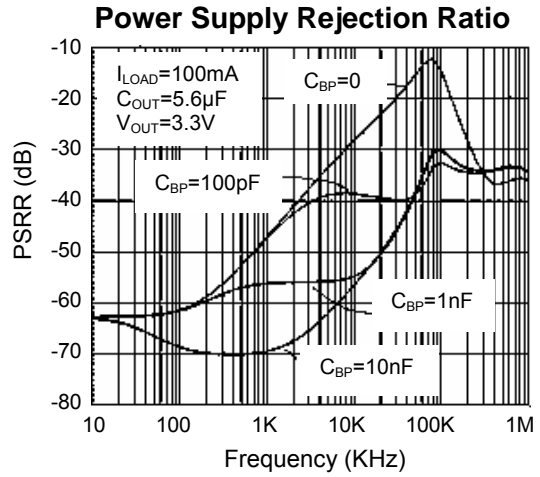
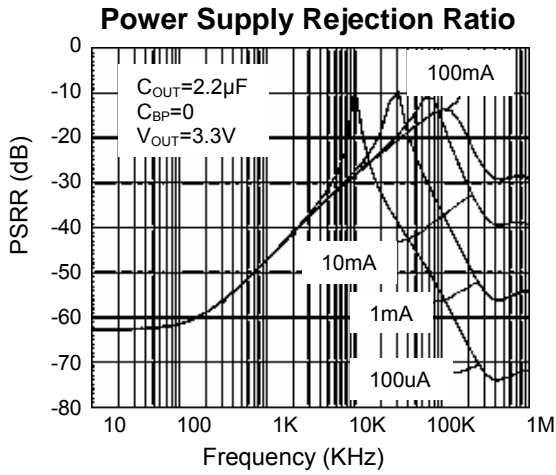
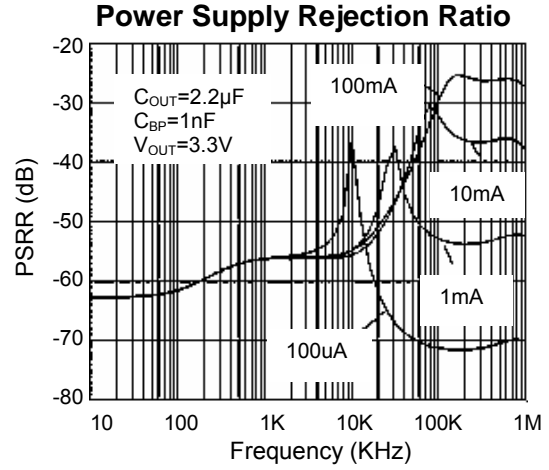
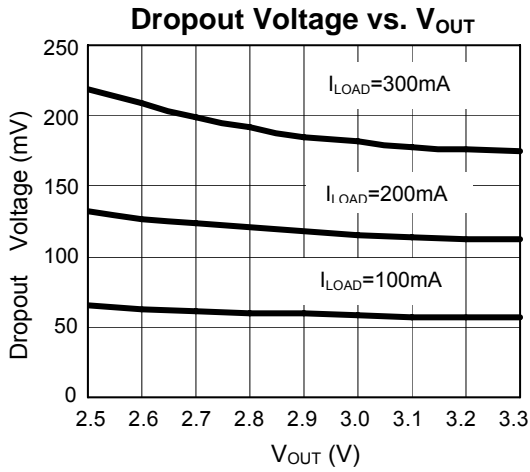
# GP1107/GP1108

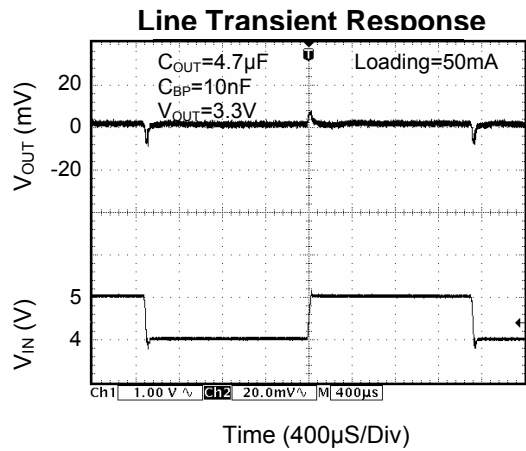
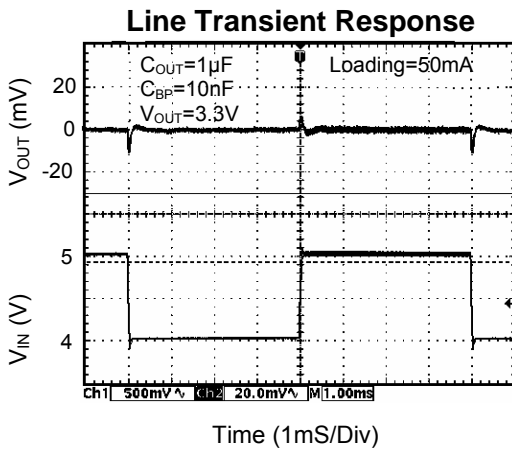
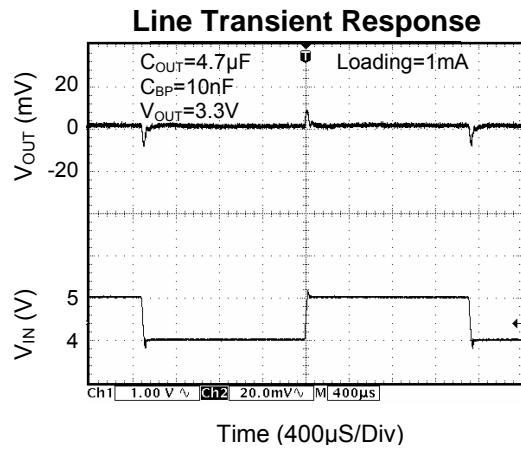
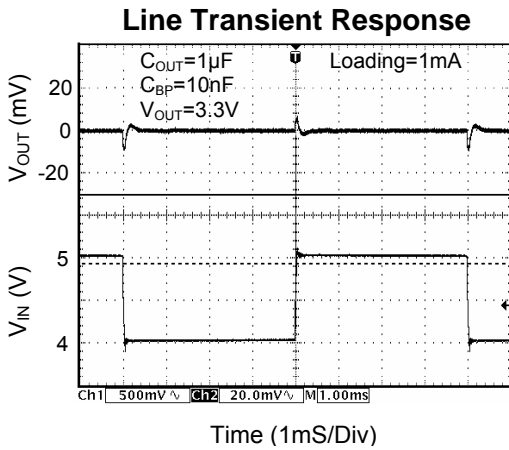
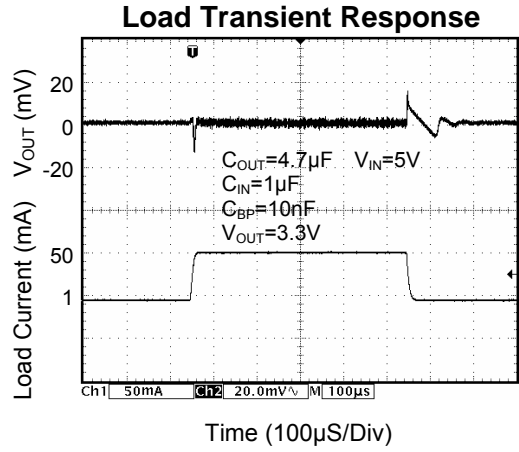
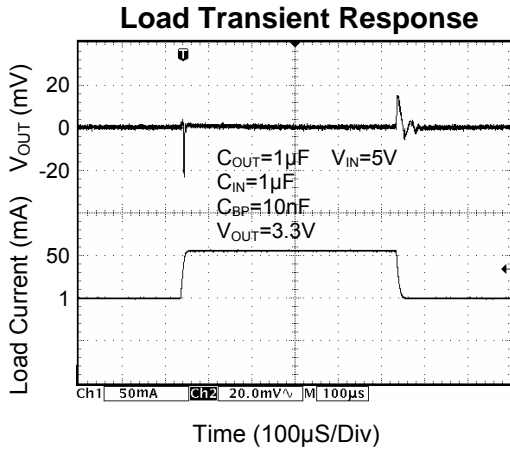
ELECTRICAL CHARACTERISTICS							
Unless otherwise specified, $V_{IN} = 5V$ , $C_{IN} = 1\mu F$ , $C_{OUT} = 1\mu F$ , $T_A = 25^\circ C$ .							
Parameter	Symbol	Test Conditions	GP1107/GP1108			Units	
			Min	Typ	Max		
Output Voltage Accuracy	$V_O$	$I_O = 10mA$	-1.5		1.5	%	
		$0 - 85^\circ C, 10mA < I_O < 650mA$	-2.0		2.0		
Output Current	$I_O$		650			mA	
Line Regulation	$\Delta V_{OI}$	$I_O = 1mA$ $V_{IN} = V_O + 1$ to $V_O + 2$	$1.3V \leq V_O \leq 1.4V$	-0.2		0.2	%
			$1.4V < V_O \leq 2.0V$	-0.15		0.15	
			$2.0V < V_O < 4.0V$	-0.1	0.02	0.1	
			$4.0V \leq V_O$	-0.4	0.2	0.4	
Load Regulation	$\Delta V_{OL}$	$I_O = 1mA$ to $650mA$	-1	0.2	1	%	
Dropout Voltage	$\Delta V$	$I_O = 650mA$ $V_O = V_O$ (nom) -2.0%	$1.3V \leq V_O$ (nom) $\leq 2.0V$			1500	mV
			$2.0V < V_O$ (nom) $\leq 2.8V$			860	
			$2.8V < V_O$ (nom)			690	
Quiescent Current	$I_Q$	$I_O = 0mA$		50	70	$\mu A$	
GND Pin Current	$I_G$	$1mA < I_O < 650mA$		50	70	$\mu A$	
Current Limit	$I_{CL}$	$R_{LOAD} = 1\Omega$	900			mA	
Over Temperature Shutdown	OTS			155		$^\circ C$	
Over Temperature Hysteresis	OTH			30		$^\circ C$	
EN Input Threshold	$V_{EH}$	$V_{IN} = 2.5V$ to $7V$	1.6			V	
	$V_{EL}$	$V_{IN} = 2.5V$ to $7V$			0.4		
EN Input Bias Current	$I_{EH}$	$V_{EN} = V_{IN}, V_{IN} = 2.5V$ to $7V$			0.1	$\mu A$	
EN Input Bias Current	$I_{EL}$	$V_{EN} = 0V, V_{IN} = 2.5V$ to $7V$			0.5	$\mu A$	
Shutdown Supply Current	$I_{GSD}$	$V_O = 0V, V_{EN} < V_{EL}$		0.1	1	$\mu A$	
Output Voltage Noise (Note a)	$e_{NO}$	$C_{BP} = 10nF, C_{OUT} = 10\mu F$		300		$nV/\sqrt{Hz}$	
Power Supply Rejection Ratio (Note a)	PSRR	$F = 100Hz, C_{BP} = 10nF, C_{OUT} = 10\mu F$		60		dB	

Note a: These parameters, although guaranteed, are not tested in production.

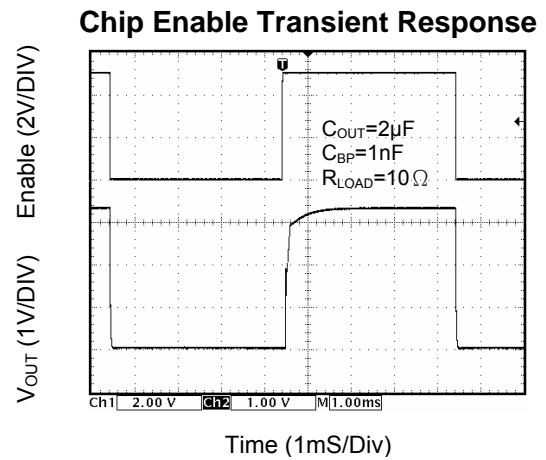
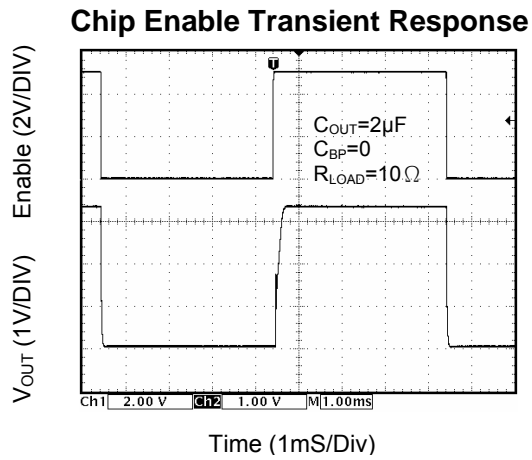
Characterization Curves











Note: For those of application concern the power on surge current, may increase the C<sub>BP</sub> to larger value will result “soft-start” to limit the current surge when power on.

## Detailed Description

The GP1107/GP1108 are 650mA CMOS LDO series designed by advanced CMOS technology with a Low  $R_{DS(on)}$  PMOS pass transistor, Bandgap voltage reference, Error amplifier, Current limit, and Thermal shutdown protection function. The P-channel pass transistor receives control signal from the Error amplifier, Current limit, and Thermal shutdown circuits. During normal operation, the Error amplifier compares the output voltage to an internal trimmed precision Bandgap reference to regulate and output a preset voltage.

## External Capacitor Selection

The GP1107/GP1108 is stable with an output capacitor to ground of 1 $\mu$ F or greater and > 100m ohm ESR. Ceramic or tantalum capacitors can be used. The capacitor with larger value and lower ESR provides better PSRR and line-transient response.

Fig.1 shows the curves of allowable ESR range. Ceramic capacitors have the lowest ESR, and will offer the best AC performance. Aluminum Electrolytic capacitors present the highest ESR and resulting in the poorest AC response.

A 1nF~10nF capacitor can be connected between the BYPASS pin and GND pin for lower output voltage noise. This capacitor can be a low cost Polyester Film variety. A larger capacitor improves the AC ripple rejection, but also makes the output voltage raise up slowly. This "Soft" turn-on is desirable in some applications to limit turn-on surges in the applications.

In addition to the >1 $\mu$ F capacitor connect to  $V_{IN}$ , recommend to add a >0.1 $\mu$ F capacitor between  $V_{IN}$  to Ground to bypass the noise from supply  $V_{IN}$ .

## Enable

The GP1107/GP1108 enter shutdown mode by pulling the EN pin lower than 0.4V, and turn on the chip by driving the EN input to higher than 1.6V.

If this feature is not used the EN input should

tie to the  $V_{IN}$  to turn on the regulator all the time.

## Thermal Protection

A thermal-shutdown protection circuit (over-temperature protection circuit) is built-in to prevent the IC from thermal breakdown when using the IC over the thermal dissipation allowed to the package. In case of the IC is left running over the allowable power dissipation, the chip junction temperature rises, and the thermal-shutdown circuit activate when the junction temperature over 155 $^{\circ}$ C (typ.) (the shutdown logic turning off the pass transistor). When the junction temperature drops to below 125 $^{\circ}$ C (typ.), the IC start operating again.

## Current Limit

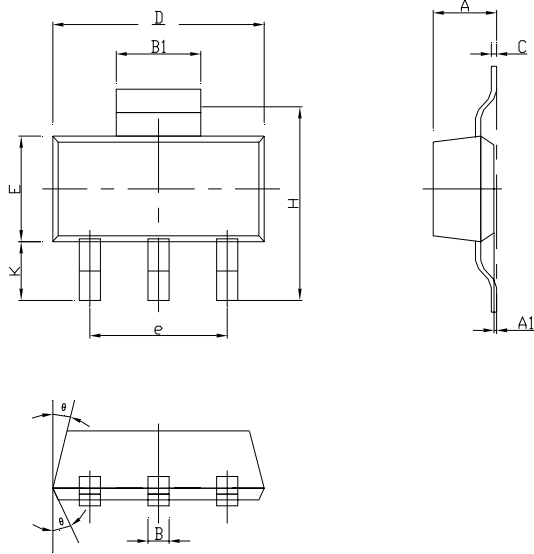
GP1107/GP1108 built in with Current Limit protection circuit, which monitors and controls the gate of the pass transistor and limiting the output current to 900mA (Min.).

## Dropout Voltage

Current flow through regulator's pass PMOS transistor cause Input-Output voltage drop, it determines the lowest usable supply voltage. The GP1107/GP1108 internal low  $R_{DS(on)}$  PMOS pass switch only present 200mV dropout voltage at 200mA  $I_{OUT}$ , it further extend the battery useful end-of-life voltage. The minimum input supply voltage follow the following equation :

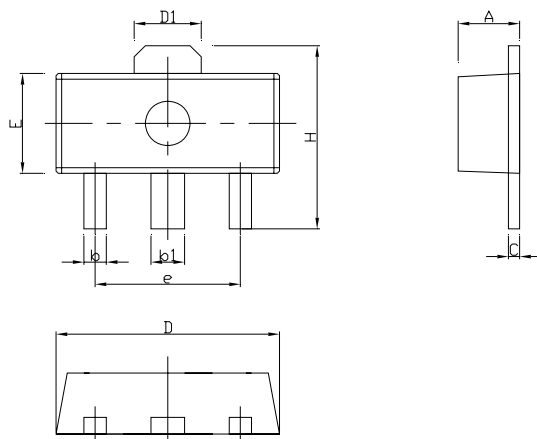
$$V_{IN(min)} = V_{OUT} + V_{DROPOUT}$$

**SOT-223 DIMENSION**



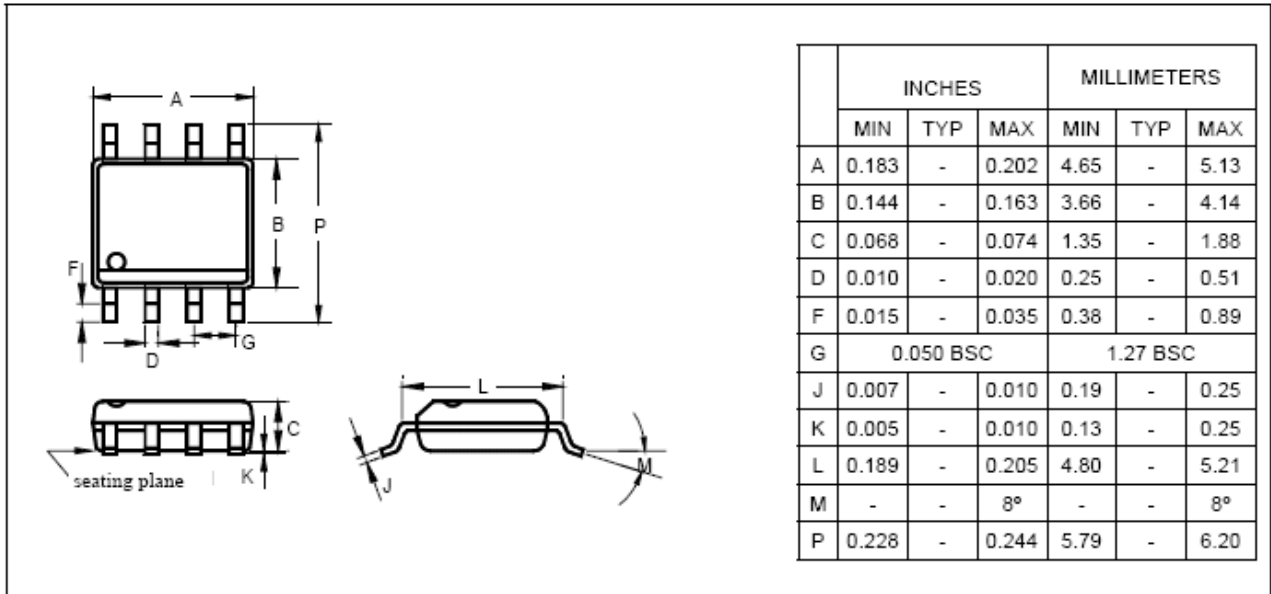
Symbol	Dimensions in millimeters			Dimensions in inches		
	Min	Nom	Max	Min	Nom	Max
A	1.5	1.65	1.80	0.059	0.065	0.071
A1	0.02	0.05	0.08	0.001	0.002	0.003
B	0.60	0.70	0.80	0.024	0.028	0.031
B1	2.90	3.00	3.15	0.114	0.118	0.124
C	0.28	0.30	0.32	0.011	0.012	0.013
D	6.30	6.50	6.70	0.248	0.265	0.264
E	3.30	3.50	3.70	0.130	0.138	0.146
e	---	4.60	---	---	0.181	---
H	6.70	7.00	7.30	0.264	0.276	0.287
K	1.50	1.75	2.00	0.059	0.069	0.079
$\theta$	0°	---	13°	0°	---	13°

**SOT89 DIMENSION**



Symbol	Dimensions in millimeters			Dimensions in inches		
	Min	Nom	Max	Min	Nom	Max
A	1.30	1.50	1.70	0.051	0.059	0.067
b	0.25	0.40	0.55	0.010	0.016	0.022
b1	0.40	0.50	0.60	0.016	0.020	0.024
C	0.30	0.40	0.50	0.012	.0016	0.020
D	4.30	4.50	4.70	0.169	0.177	0.185
D1	1.45	1.65	1.85	0.057	0.065	0.073
E	2.30	2.50	2.70	0.091	0.098	1.106
e	2.90	3.00	3.10	0.114	0.118	0.122
H	3.90	4.10	4.30	0.154	0.161	0.169

**SO8 DIMENSION**



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