



500mA CMOS LDO

DESCRIPTION

The GP1105/GP1106 are 500mA Low Dropout and Low Noise micro-power Voltage Regulator series suitable for battery powered portable equipments or the application requires low quiescent current.

The GP1105/GP1106 designed for using with low ESR capacitors. The output remains stable with 1uF ceramic output capacitor.

The GP1105/GP1106 built-in with internal low R_{DS(on)} 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.

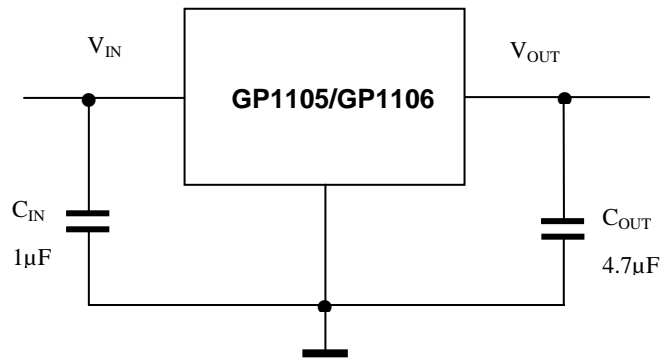
FEATURES

- **Guaranteed 500mA 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**
- **Chip Enable Function (SO8 package),**
- **Low Temperature Coefficient**
- **Built-in Current and Thermal protection**
- **SOT89/SOT223/SOP8 Packages**

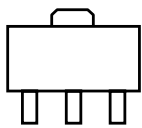
APPLICATIONS

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

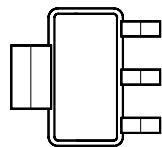
TYPICAL APPLICATION



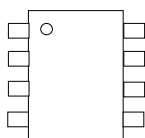
PACKAGE TYPE



SOT89

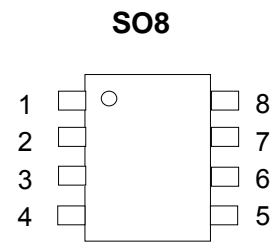
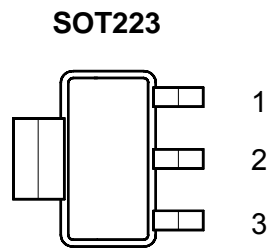
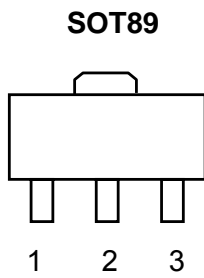


SOT223



SO8

Package and Pin Configurations



	<u>GP1105</u>
1	GND
2	VIN
3	VOUT

	<u>GP1115</u>
1	VIN
2	GND
3	VOUT

	<u>GP1105</u>
1	VIN
2	GND
3	VOUT

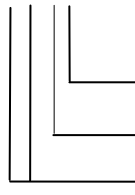
	<u>GP1115</u>
1	GND
2	VIN
3	VOUT

	<u>GP1106</u>
1	VOUT
2	ADJ
3	GND
4	BP
5	EN
6	NC
7	NC
8	VIN

ORDER INFORMATION

Ordering Information

GP1105 XXXX 500mA Output current
 GP1115 XXXX 500mA Output current
 GP1106 XXXX 500mA Output current, without enable and bypass

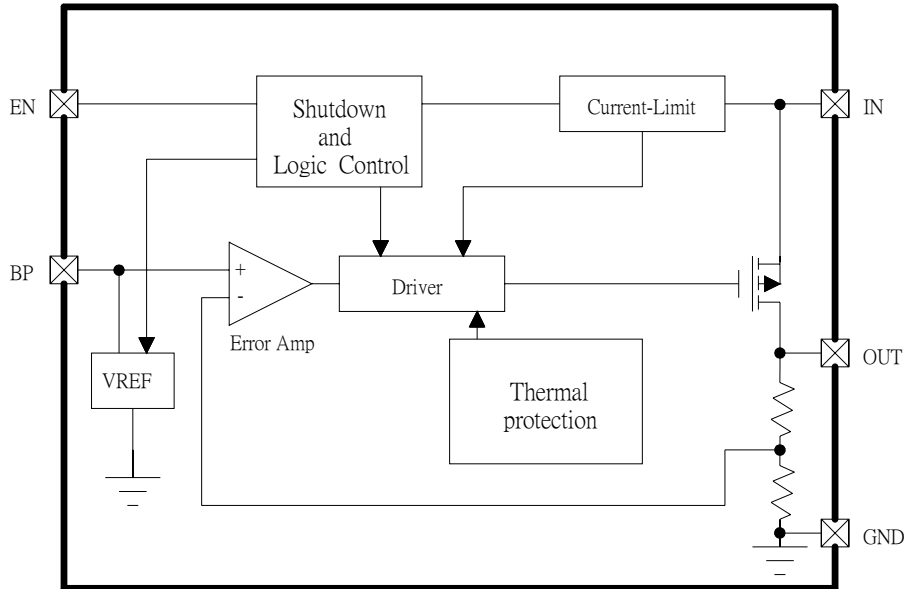

 Package type: E: SOT89, F: SOT223, S: SO8
 Operating temperature range: C: Commercial standard
 Output voltage: 15: 1.5V, 16: 1.6V, 17: 1.7V,..., 33: 3.3V,..., 49: 4.9V, 50: 5.0V

Marking Information

Part Number/Marking	Output Voltage	Package	Operating temperature
GP1106-15	1.5V	SO8	Commercial standard
GP1106-18	1.8V	SO8	Commercial standard
GP1106-25	2.5V	SO8	Commercial standard
...	...	...	Commercial standard
GP1106-33	3.3V	SO8	Commercial standard
...	...	...	Commercial standard
GP1105-15	1.5V	SOT223	Commercial standard
GP1105-18	1.8V	SOT223	Commercial standard
GP1105-25	2.5V	SOT223	Commercial standard
...	...	...	Commercial standard
GP1105-33	3.3V	SOT223	Commercial standard
...	...	...	Commercial standard
1105-15	1.5V	SOT89	Commercial standard
1105-18	1.8V	SOT89	Commercial standard
1105-25	2.5V	SOT89	Commercial standard
...	...	...	Commercial standard
1105-33	3.3V	SOT89	Commercial standard
...	...	...	Commercial standard
1115-15	1.5V	SOT89	Commercial standard
1115-18	1.8V	SOT89	Commercial standard
1115-25	2.5V	SOT89	Commercial standard
...	...	...	Commercial standard
1115-33	3.3V	SOT89	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.

ABSOLUTE MAXIMUM RATINGS (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°C to 125°C
Storage Temperature Range	-65°C to 150°C
Package Thermal Resistance	
SOT89, θ_{JA}	180°C/W
SOT89, θ_{JC}	18°C/W
SOT223, θ_{JA}	160°C/W
SOT223, θ_{JC}	15°C/W
SO8, θ_{JA}	90°C/W
SO8, θ_{JC}	45°C/W
Lead Temperature (Soldering, 5 sec.)	260°C

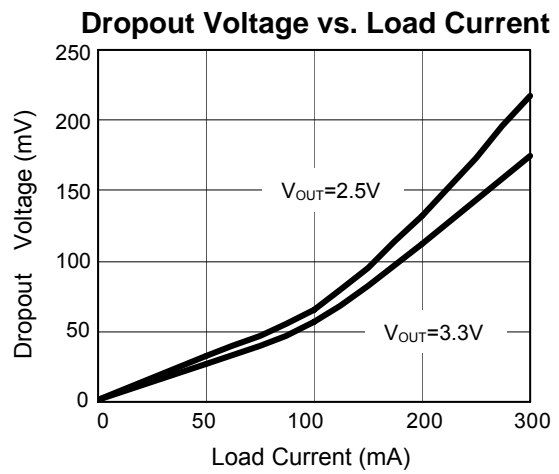
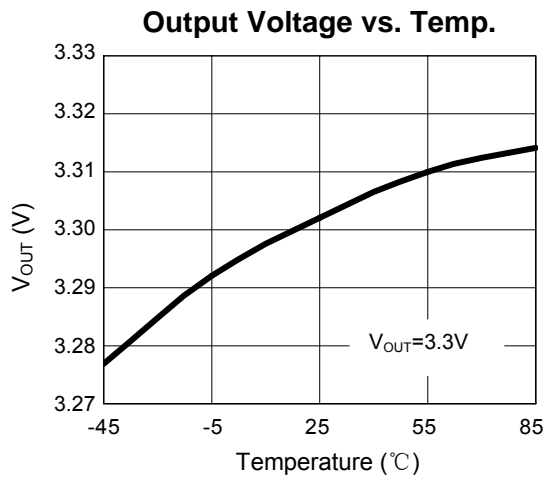
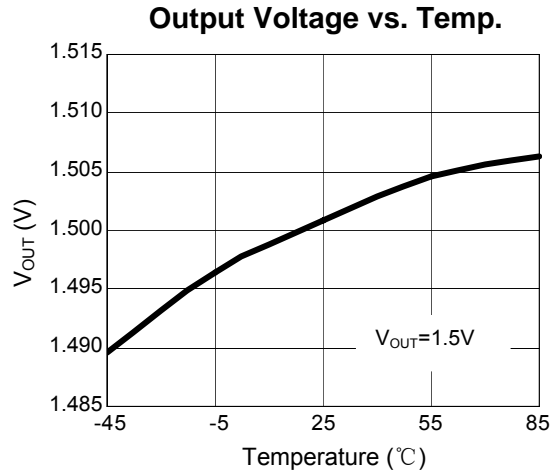
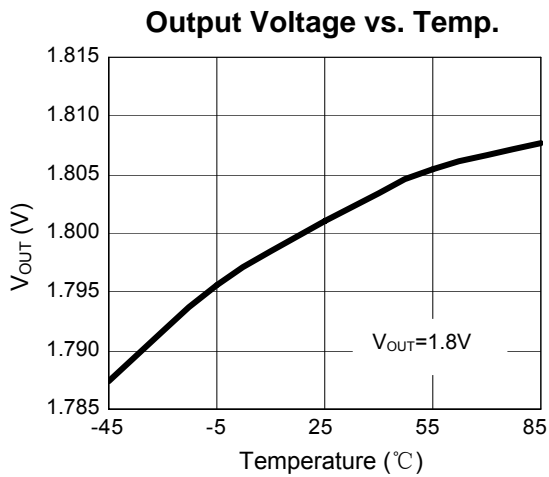
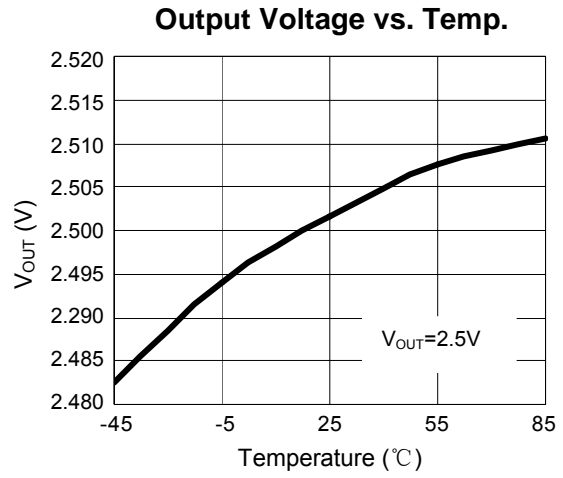
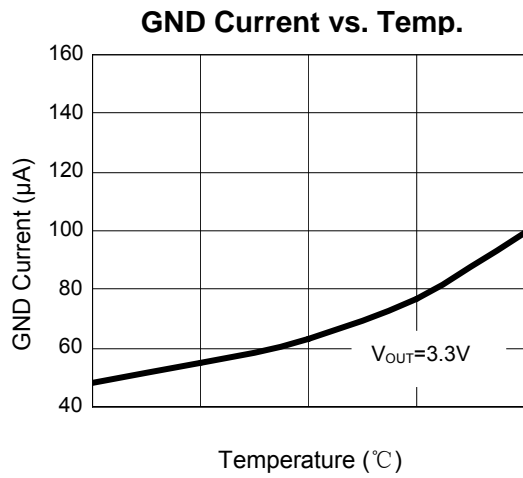
Note a: Exceeding these ratings could cause damage to the device. All voltages are with respect to Ground.

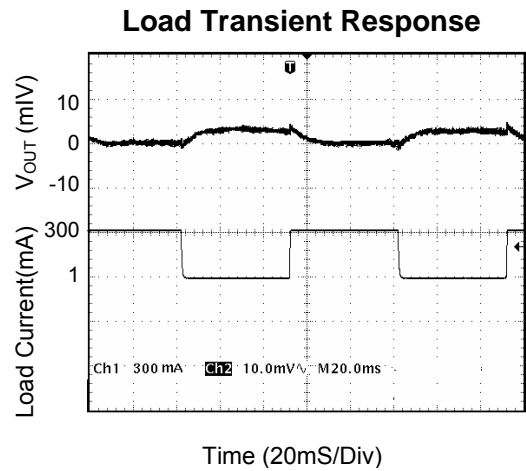
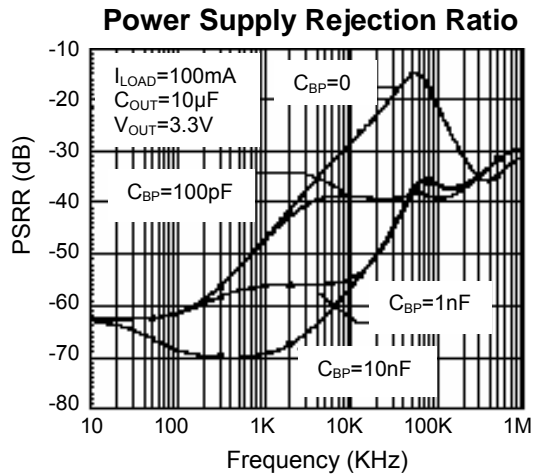
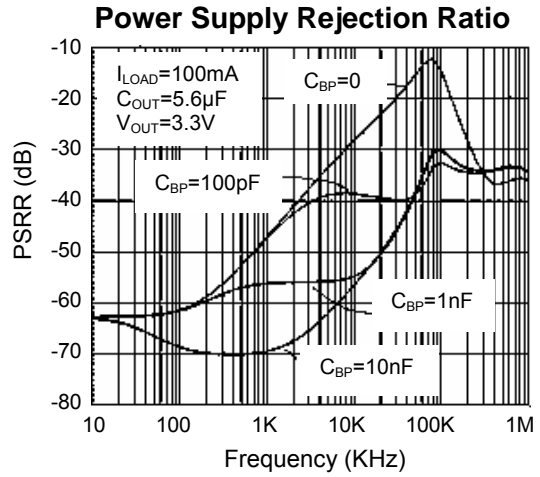
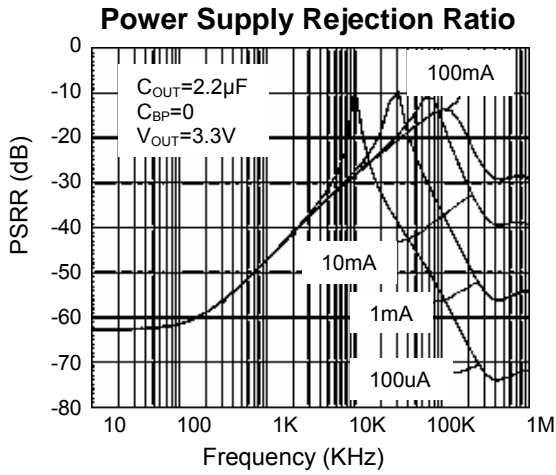
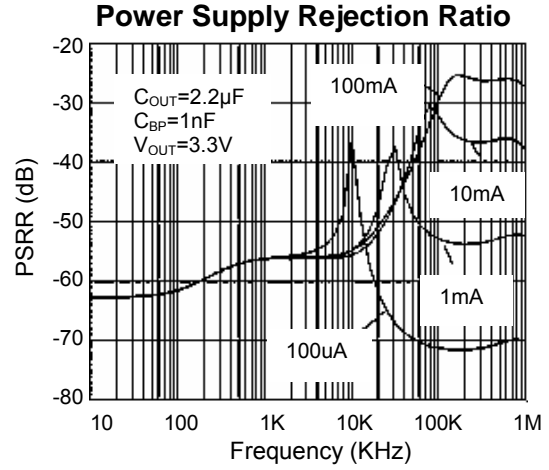
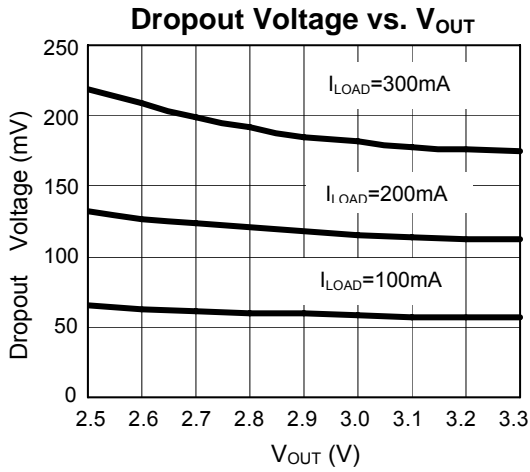
RECOMMENDED OPERATING CONDITIONS					
Parameter	Symbol	Recommended Operating			Units
		Min.	Typ.	Max.	
Input Voltage	V_{IN}	Note 1		7.0	V
Input Capacitor (V_{IN} to GND)		1.0			μF
Output Capacitor with ESR of 10Ω max.,		1.0		10	μF
Ambient Temperature Range	T_A	- 40		85	$^\circ\text{C}$
Junction temperature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

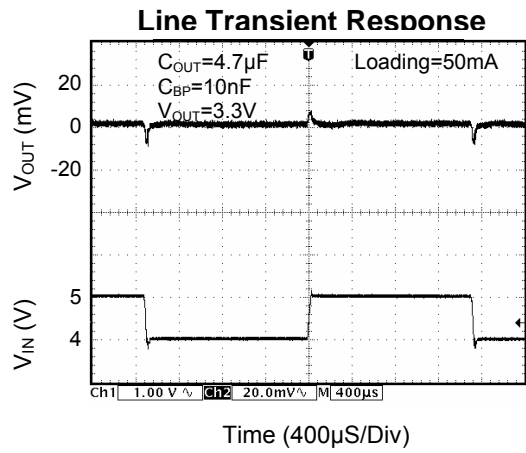
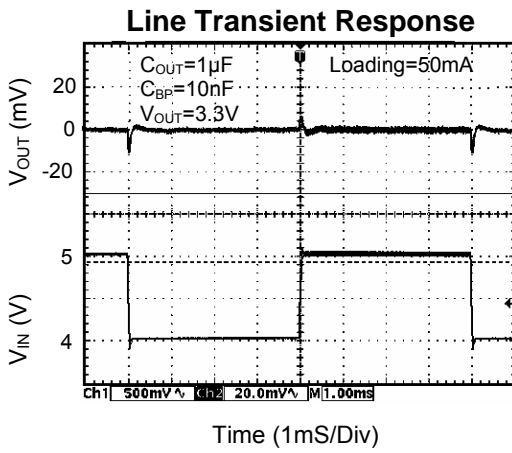
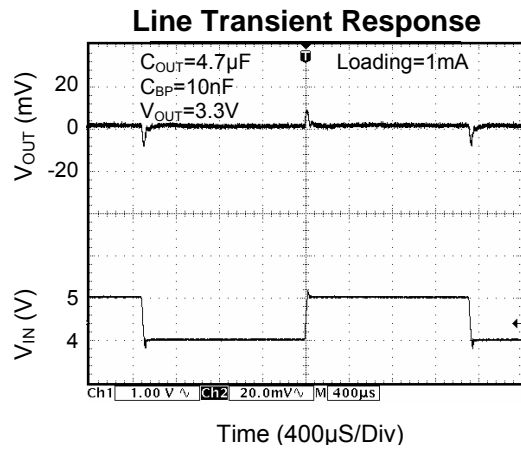
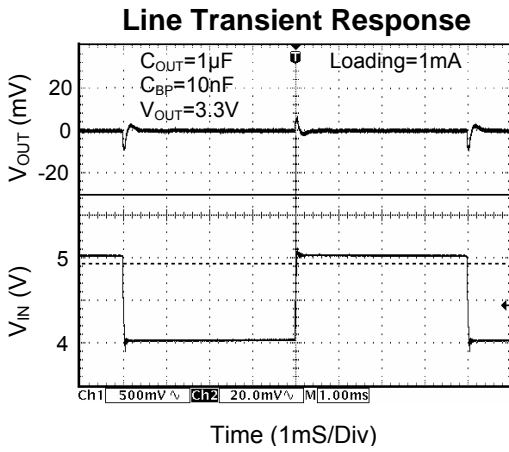
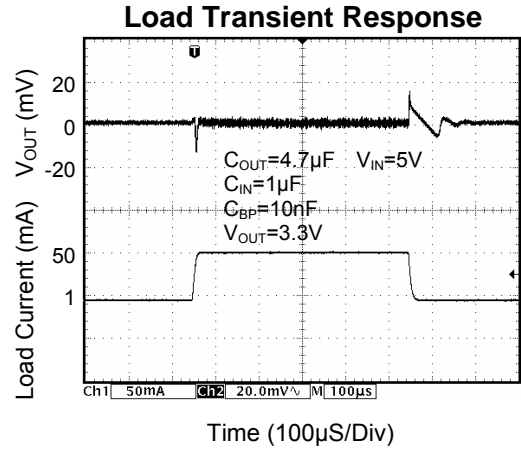
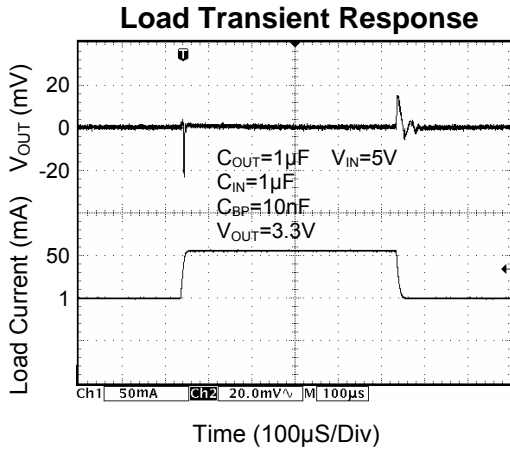
ELECTRICAL CHARACTERISTICS							
Unless otherwise specified, $V_{IN} = 5V$, $C_{IN} = 1\mu F$, $C_{OUT} = 1\mu F$, $T_A = 25^\circ C$.							
Parameter	Symbol	Test Conditions	GP1105/GP1106			Units	
			Min	Typ	Max		
Output Voltage Accuracy	V_O	$I_O = 10mA$	-1.5		1.5	%	
		$0 - 85^\circ C, 10mA < I_O < 500mA$	-2.0		2.0		
Output Current	I_O		500			mA	
Line Regulation	ΔV_{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	ΔV_{OL}	$I_O = 1mA$ to $500mA$	-1	0.2	1	%	
Dropout Voltage	ΔV	$I_O = 500mA$ $V_O = V_O (nom)$ -2.0%	$1.3V \leq V_O (nom) \leq 2.0V$			1250	mV
			$2.0V < V_O (nom) \leq 2.8V$			750	
			$2.8V < V_O (nom)$			600	
Quiescent Current	I_Q	$I_O = 0mA$		50	70	μA	
GND Pin Current	I_G	$1mA < I_O < 500mA$		50	70	μA	
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	μA	
EN Input Bias Current	I_{EL}	$V_{EN} = 0V, V_{IN} = 2.5V$ to $7V$			0.5	μA	
Shutdown Supply Current	I_{GSD}	$V_O = 0V, V_{EN} < V_{EL}$		0.1	1	μA	
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	

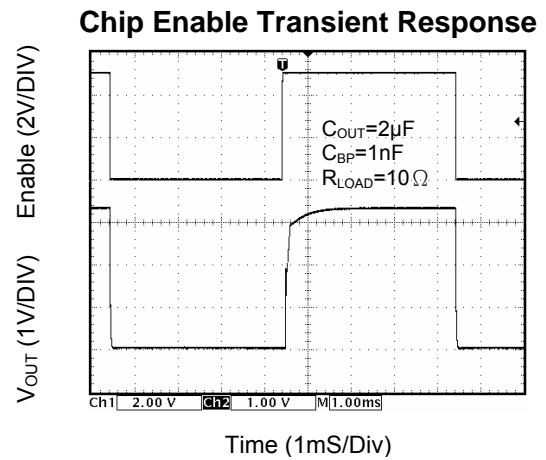
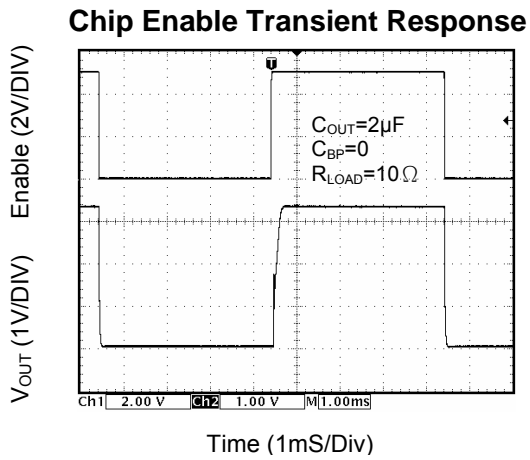
Note a: These parameters, although guaranteed, are not tested in production.

Characterization Curves









Note: For those of application concern the power on surge current, may increase the C_{BP} to larger value will result “soft-start” to limit the current surge when power on.

Detailed Description

The GP1105/GP1106 are 500mA 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 GP1105/GP1106 is stable with an output capacitor to ground of 1 μ 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 μ F capacitor connect to V_{IN} , recommend to add a >0.1 μ F capacitor between V_{IN} to Ground to bypass the noise from supply V_{IN} .

Enable

The GP1105/GP1106 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°C (typ.) (the shutdown logic turning off the pass transistor). When the junction temperature drops to below 125°C (typ.), the IC start operating again.

Current Limit

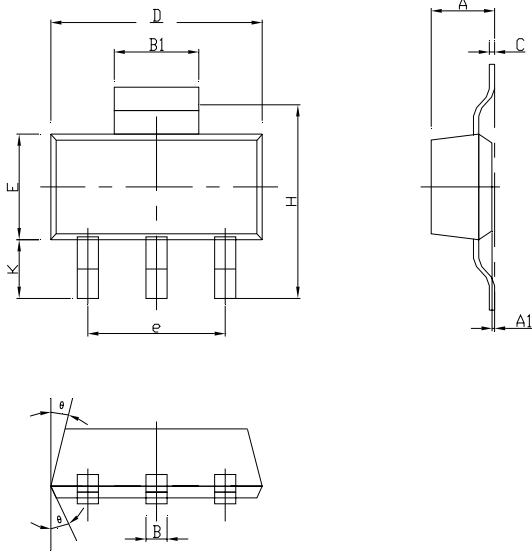
GP1105/GP1106 built in with Current Limit protection circuit, which monitors and controls the gate of the pass transistor and limiting the output current to 900mA (Min.).

Dropout Voltage

Current flow through regulator's pass PMOS transistor cause Input-Output voltage drop, it determines the lowest usable supply voltage. The GP1105/GP1106 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 :

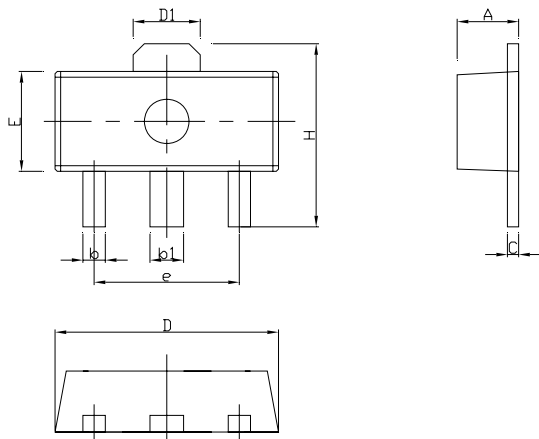
$$V_{IN(min)} = V_{OUT} + V_{DROPOUT}$$

SOT-223 DIMENSION



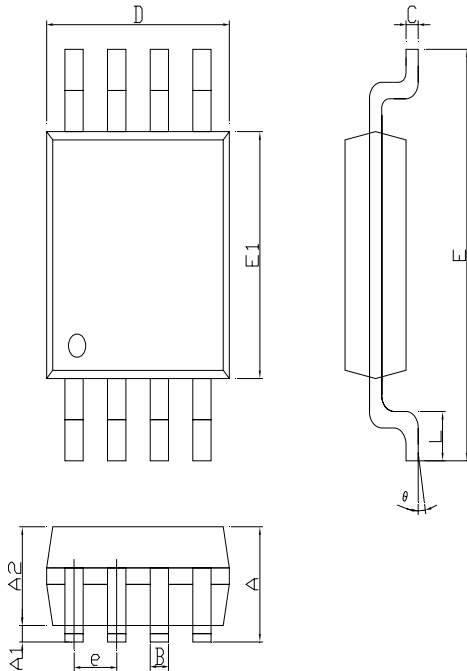
Symbol	Dimensions in millimeters			Dimensions in inches		
	Min	Nom	Max	Min	Nom	Max
A	1.5	1.65	1.80	0.059	0.065	0.071
A1	0.02	0.05	0.08	0.001	0.002	0.003
B	0.60	0.70	0.80	0.024	0.028	0.031
B1	2.90	3.00	3.15	0.114	0.118	0.124
C	0.28	0.30	0.32	0.011	0.012	0.013
D	6.30	6.50	6.70	0.248	0.265	0.264
E	3.30	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
θ	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



Symbol	Dimensions in millimeters		Dimensions in inches	
	Min	Max	Min	Max
A	1.05	1.20	0.041	0.047
A1	0.05	0.15	0.002	0.006
A2	---	1.05	---	0.04
B	0.20	0.28	0.008	0.011
C	0.127		0.005	
D	2.90	3.20	0.114	0.125
E	6.20	6.60	0.244	0.260
E1	4.30	4.50	0.169	0.177
e	0.65BSC		0.025BSC	
L	0.50	0.70	0.020	0.028
theta	0°	8°	0°	8°

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