

# 300mA High PSRR, Low Noise, LDO Regulators

## Features

- Low, 90 $\mu$ A No-Load Supply Current
- Guaranteed 300mA Output Current
- Dropout Voltage is 200mV @ 150mA Load
- PSRR=65dB @ 120Hz; 55dB @ 1kHz
- Over-Temperature Protection and Short-Circuit Protection
- Fixed Mode: 1.20V~5.00V (G916-XXX)
- Adjustable Mode: from 1.25V to 5.50V (G916)
- Max. Supply Current in Shutdown Mode < 1 $\mu$ A
- Low Output Noise at 28 $\mu$ V<sub>RMS</sub> with bypass Capacitor
- Stable with low cost ceramic capacitors

## Applications

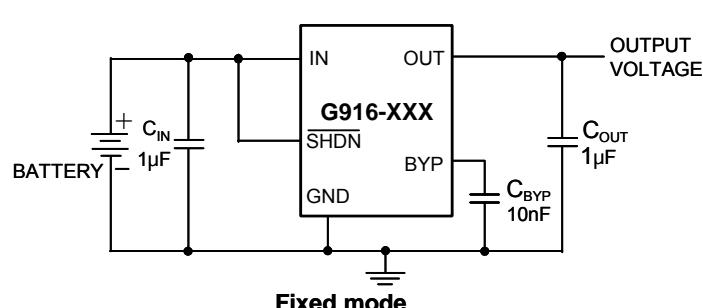
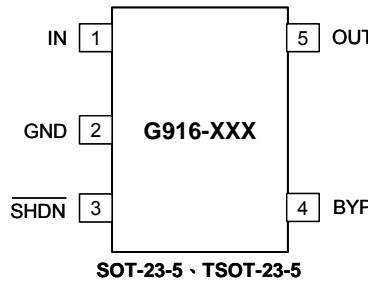
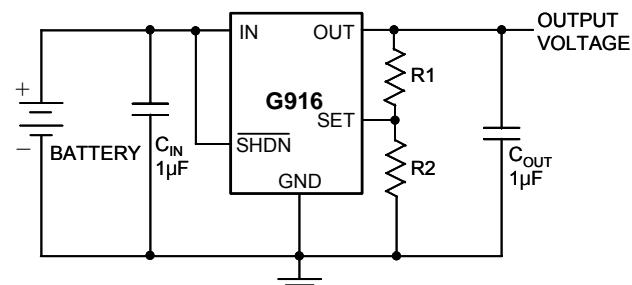
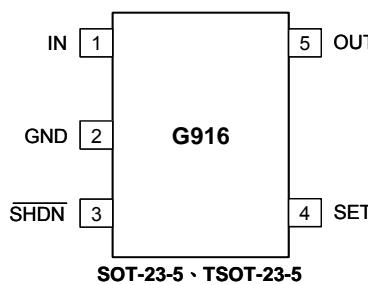
- Notebook Computers
- Cellular Phones
- PDAs
- Digital still Camera and Video Recorders
- Hand-Held Devices
- Audio Codec

## General Description

The G916 series is a low supply current, high PSRR, low noise, and low dropout linear regulator that comes in a space saving TSOT-23-5, SOT-23-5 package. The supply current at no-load is 90 $\mu$ A. In the shutdown mode, the maximum supply current is less than 1 $\mu$ A. Operating voltage range is from 2.5V to 6.0V. The over-current protection limit is set at 550mA typical. An over-temperature protection circuit is built-in in the Device to prevent thermal overload. These power saving features make the G916 series ideal for use in the battery-powered applications such as notebook computers, cellular phones, and PDA's.

The G916 has two modes of operation. When the SET pin is connected to ground, its output is a pre-set value: 3.3V. There is no external component needed. When an output other than the preset value is needed, two external resistors should be used as a voltage divider. The output voltage is then adjusted by the resistor ratio. G916-XXX is with fixed-mode output. The output voltage range is from 1.2V to 5.0V.

## Pin Configuration





## Ordering Information

ORDER NUMBER	ORDER NUMBER (Pb free)	MARKING	VOLTAGE	TEMP. RANGE	PACKAGE
G916-250TOU	G916-250TOUf	96ANx	2.50V	-40°C~ +85°C	TSOT-23-5
G916-270TOU	G916-270TOUf	96APx	2.70V	-40°C~ +85°C	TSOT-23-5
G916T1U	G916T1Uf	16xx	Adjustable	-40°C~ +85°C	SOT-23-5
G916-120T1U	G916-120T1Uf	96AAx	1.20V	-40°C~ +85°C	SOT-23-5
G916-330T1U	G916-330T1Uf	6Axx	3.30V	-40°C~ +85°C	SOT-23-5

For other output voltage, please contact us at sales@gmt.com.tw

Note: TO: TSOT-23-5      T1: SOT-23-5

U: Tape &amp; Reel

## Selector Guide

ORDER NUMBER	ORDER NUMBER (Pb free)	OUTPUT VOLTAGE (V)	MARKING
G916TOU	G916TOUf	Adjustable	16xx
G916-120TOU	G916-120TOUf	1.20	96AAx
G916-130TOU	G916-130TOUf	1.30	96ABx
G916-140TOU	G916-140TOUf	1.40	96ACx
G916-150TOU	G916-150TOUf	1.50	96ADx
G916-160TOU	G916-160TOUf	1.60	96AE <sub>x</sub>
G916-170TOU	G916-170TOUf	1.70	96AFx
G916-180TOU	G916-180TOUf	1.80	96AGx
G916-190TOU	G916-190TOUf	1.90	96AHx
G916-200TOU	G916-200TOUf	2.00	96AIx
G916-210TOU	G916-210TOUf	2.10	96AJx
G916-220TOU	G916-220TOUf	2.20	96AKx
G916-230TOU	G916-230TOUf	2.30	96ALx
G916-240TOU	G916-240TOUf	2.40	96AMx
G916-250TOU	G916-250TOUf	2.50	96ANx
G916-260TOU	G916-260TOUf	2.60	96AOx
G916-270TOU	G916-270TOUf	2.70	96APx
G916-280TOU	G916-280TOUf	2.80	96AQx
G916-285TOU	G916-285TOUf	2.85	96ARx
G916-290TOU	G916-290TOUf	2.90	96ASx
G916-300TOU	G916-300TOUf	3.00	96ATx
G916-310TOU	G916-310TOUf	3.10	96AUx
G916-315TOU	G916-315TOUf	3.15	96AVx
G916-320TOU	G916-320TOUf	3.20	96AWx
G916-330TOU	G916-330TOUf	3.30	6Axx
G916-340TOU	G916-340TOUf	3.40	96AYx
G916-350TOU	G916-350TOUf	3.50	96AZx
G916-360TOU	G916-360TOUf	3.60	96BAx
G916-370TOU	G916-370TOUf	3.70	96BBx
G916-380TOU	G916-380TOUf	3.80	96BCx
G916-390TOU	G916-390TOUf	3.90	96BDx
G916-400TOU	G916-400TOUf	4.00	96BEx
G916-410TOU	G916-410TOUf	4.10	96BFx
G916-420TOU	G916-420TOUf	4.20	96BGx
G916-430TOU	G916-430TOUf	4.30	96BHx
G916-440TOU	G916-440TOUf	4.40	96BIx
G916-450TOU	G916-450TOUf	4.50	96BJx
G916-460TOU	G916-460TOUf	4.60	96BKx
G916-470TOU	G916-470TOUf	4.70	96BLx
G916-475TOU	G916-475TOUf	4.75	96BMx
G916-480TOU	G916-480TOUf	4.80	96BNx
G916-490TOU	G916-490TOUf	4.90	96BOx
G916-500TOU	G916-500TOUf	5.00	96BPx

TO: TSOT-23-5



## Selector Guide

ORDER NUMBER	ORDER NUMBER (Pb free)	OUTPUT VOLTAGE (V)	MARKING
G916T1U	G916T1Uf	Adjustable	16xx
G916-120T1U	G916-120T1Uf	1.20	96AAx
G916-130T1U	G916-130T1Uf	1.30	96ABx
G916-140T1U	G916-140T1Uf	1.40	96ACx
G916-150T1U	G916-150T1Uf	1.50	96ADx
G916-160T1U	G916-160T1Uf	1.60	96AE <sub>x</sub>
G916-170T1U	G916-170T1Uf	1.70	96AF <sub>x</sub>
G916-180T1U	G916-180T1Uf	1.80	96AG <sub>x</sub>
G916-190T1U	G916-190T1Uf	1.90	96AH <sub>x</sub>
G916-200T1U	G916-200T1Uf	2.00	96AI <sub>x</sub>
G916-210T1U	G916-210T1Uf	2.10	96AJ <sub>x</sub>
G916-220T1U	G916-220T1Uf	2.20	96AK <sub>x</sub>
G916-230T1U	G916-230T1Uf	2.30	96AL <sub>x</sub>
G916-240T1U	G916-240T1Uf	2.40	96AM <sub>x</sub>
G916-250T1U	G916-250T1Uf	2.50	96AN <sub>x</sub>
G916-260T1U	G916-260T1Uf	2.60	96AO <sub>x</sub>
G916-270T1U	G916-270T1Uf	2.70	96AP <sub>x</sub>
G916-280T1U	G916-280T1Uf	2.80	96AQ <sub>x</sub>
G916-285T1U	G916-285T1Uf	2.85	96AR <sub>x</sub>
G916-290T1U	G916-290T1Uf	2.90	96AS <sub>x</sub>
G916-300T1U	G916-300T1Uf	3.00	96AT <sub>x</sub>
G916-310T1U	G916-310T1Uf	3.10	96AU <sub>x</sub>
G916-315T1U	G916-315T1Uf	3.15	96AV <sub>x</sub>
G916-320T1U	G916-320T1Uf	3.20	96AW <sub>x</sub>
G916-330T1U	G916-330T1Uf	3.30	96Ax <sub>x</sub>
G916-340T1U	G916-340T1Uf	3.40	96AY <sub>x</sub>
G916-350T1U	G916-350T1Uf	3.50	96AZ <sub>x</sub>
G916-360T1U	G916-360T1Uf	3.60	96BA <sub>x</sub>
G916-370T1U	G916-370T1Uf	3.70	96BB <sub>x</sub>
G916-380T1U	G916-380T1Uf	3.80	96BC <sub>x</sub>
G916-390T1U	G916-390T1Uf	3.90	96BD <sub>x</sub>
G916-400T1U	G916-400T1Uf	4.00	96BE <sub>x</sub>
G916-410T1U	G916-410T1Uf	4.10	96BF <sub>x</sub>
G916-420T1U	G916-420T1Uf	4.20	96BG <sub>x</sub>
G916-430T1U	G916-430T1Uf	4.30	96BH <sub>x</sub>
G916-440T1U	G916-440T1Uf	4.40	96BI <sub>x</sub>
G916-450T1U	G916-450T1Uf	4.50	96BJ <sub>x</sub>
G916-460T1U	G916-460T1Uf	4.60	96BK <sub>x</sub>
G916-470T1U	G916-470T1Uf	4.70	96BL <sub>x</sub>
G916-475T1U	G916-475T1Uf	4.75	96BM <sub>x</sub>
G916-480T1U	G916-480T1Uf	4.80	96BN <sub>x</sub>
G916-490T1U	G916-490T1Uf	4.90	96BO <sub>x</sub>
G916-500T1U	G916-500T1Uf	5.00	96BP <sub>x</sub>

T1: SOT-23-5

**Absolute Maximum Ratings**

IN to GND	-0.3V to 7V
Output Short-Circuit Duration	Infinite
SET, BYP to GND	-0.3V to 7V
SHDN to GND	-0.3V to 7V
SHDN to IN	-7V to 0.3V
OUT to GND	-0.3V to $(V_{IN} + 0.3V)$

Operating Temperature Range	-40°C to 85°C
Junction Temperature	150°C
Thermal Resistance Junction to Ambient, ( $\theta_{JA}$ )	
SOT-23-5	240°C/W <sup>(1)</sup>
TSOT-23-5	196°C/W
Storage Temperature Range	-65°C to 160°C
Reflow Temperature (soldering, 10sec)	260°C

Note <sup>(1)</sup>: See Recommended Minimum Footprint

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in the operational sections of the specifications is not implied. Exposure to absolute maximum rating conditions for extended periods may affect device reliability.

**Electrical Characteristics**

( $V_{IN}=3.6V$ ,  $V_{SHDN}=V_{IN}$ ,  $T_A=25^\circ C$ , unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	
Input Voltage (Note 2)	$V_{IN}$		2.5	---	6.0	V	
Output Voltage Accuracy (adjustable mode)	$V_{OUT}$	Variation from specified $V_{OUT}$ , $I_{OUT}=1mA$	-2	---	2	%	
Output Voltage Accuracy (fixed mode)	$V_{OUT}$	$V_{OUT} \geq 2.50V$ , $I_{OUT}=1mA$	-2	---	2	% %	
		$2.50V > V_{OUT} \geq 1.80V$ , $I_{OUT}=1mA$	-3	---	3		
		$1.80V > V_{OUT} \geq 1.20V$ , $I_{OUT}=1mA$	-4	---	4		
Adjustable Output Voltage Range (Note 3)	$V_{OUT}$		$V_{SET}$	---	5.5	V	
Maximum Output Current			300	---	---	mA	
Current Limit (Note 4)	$I_{LIM}$		400	550	---	mA	
Short Circuit Current	$I_{SC}$		---	280	---	mA	
Ground Pin Current	$I_Q$		---	90	---	$\mu A$	
Dropout Voltage (Note 5)	$V_{DROP}$	$I_{OUT}=300mA$	$V_{OUT}=1.50V$ $V_{OUT}=1.80V$ $V_{OUT}=2.50V$ $V_{OUT}=3.00V$ $V_{OUT}=3.30V$ $V_{OUT}=4.75V$ $V_{OUT}=5.00V$	---	1.36 1.10 0.58 0.41 0.36 0.25 0.24	1.7 1.4 0.8 0.5 0.5 0.5 0.5	V
Line Regulation	$\Delta V_{LNR}$	$SET=GND$ , $V_{IN}=V_{(STD)}+0.1V$ to 6.2V $I_{OUT}=10mA$	---	0.06	0.12	%/V	
Load Regulation	$\Delta V_{LDR}$	$I_{OUT}=10mA$ to 300mA	---	---	0.02	%/mA	
Ripple Rejection	PSRR	$F=120Hz$ , $0.45V_{P-P}$ , $I_{OUT}=10mA$	---	65	---	dB	
Output Voltage Noise (10Hz to 100kHz)	$e_n$	$C_{OUT}=1\mu F$ , $I_{OUT}=1mA$ , $C_{BYP}=10nF$	---	28	---	$\mu V_{RMS}$	

**Electrical Characteristics (continued)**(V<sub>IN</sub>=3.6V, V<sub>SHDN</sub>=V<sub>IN</sub>, T<sub>A</sub>=25°C, unless otherwise noted.) (Note 1)

PARAMETER	SYMBOL	CONDITION		MIN	TYP	MAX	UNIT
<b>SHUTDOWN</b>							
SHDN Input Threshold	V <sub>IH</sub>	Regulator enabled		1.5	---	---	V
	V <sub>IL</sub>	Regulator shutdown		---	---	0.4	
SHDN Input Bias Current	I <sub>SHDN</sub>	V <sub>SHDN</sub> = V <sub>IN</sub>	T <sub>A</sub> = +25°C	---	0.003	0.1	μA
Shutdown Supply Current	I <sub>QSHDN</sub>	V <sub>OUT</sub> = 0V	T <sub>A</sub> = +25°C	---	0.2	1	μA
<b>SET INPUT</b>							
SET Reference Voltage (Note 3)	V <sub>SET</sub>	V <sub>IN</sub> = 2.5V to 5.5V, I <sub>OUT</sub> = 1mA	T <sub>A</sub> = +25°C	1.225	1.25	1.275	V
			T <sub>A</sub> = T <sub>MIN</sub> to T <sub>MAX</sub>	---	1.25	---	
SET Input Leakage Current (Note 3)	I <sub>SET</sub>	V <sub>SET</sub> = 1.3V	T <sub>A</sub> = +25°C	---	5	30	nA
<b>THERMAL PROTECTION</b>							
Thermal Shutdown Temperature	T <sub>SHDN</sub>			---	145	---	°C
Thermal Shutdown Hysteresis	ΔT <sub>SHDN</sub>			---	25	---	°C

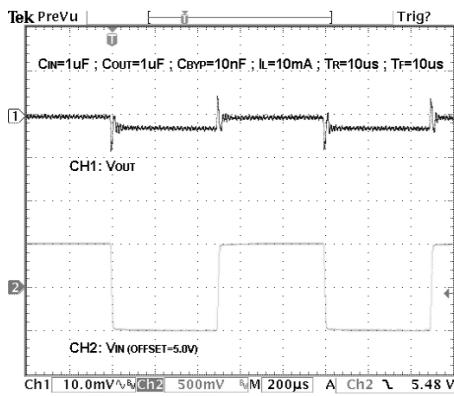
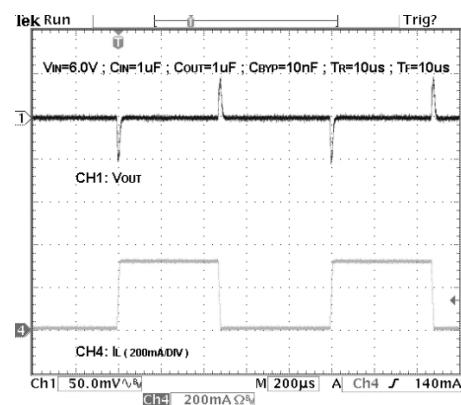
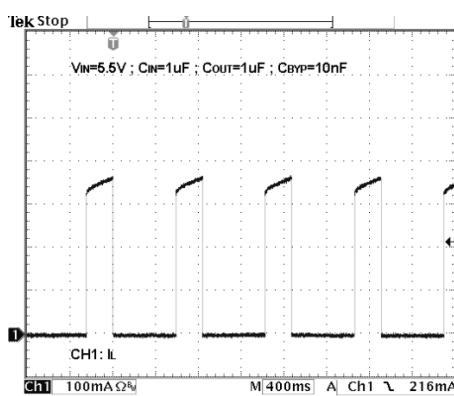
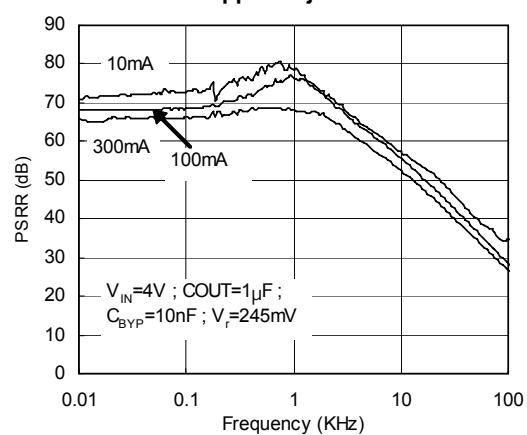
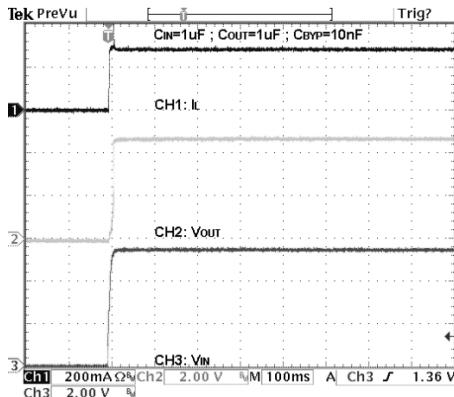
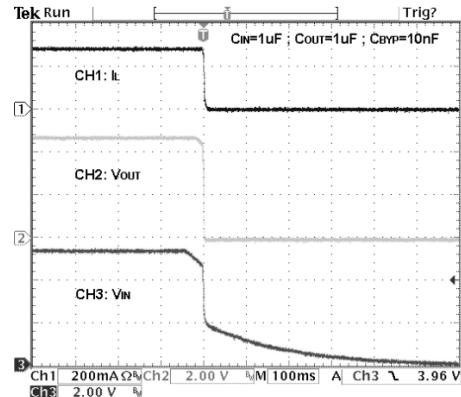
Note 1: Limits is 100% production tested at T<sub>A</sub>= +25°C. Low duty pulse techniques are used during test to maintain junction temperature as close to ambient as possible.

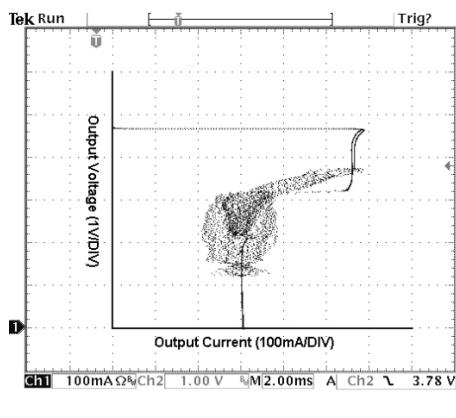
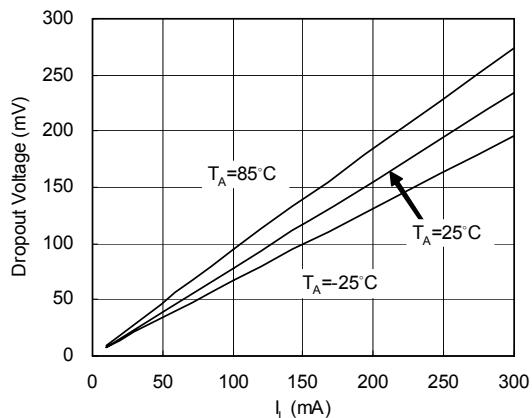
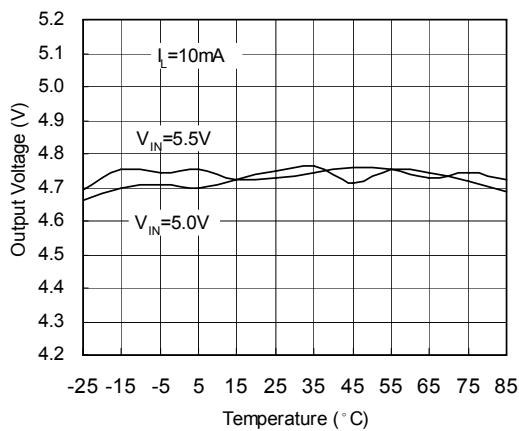
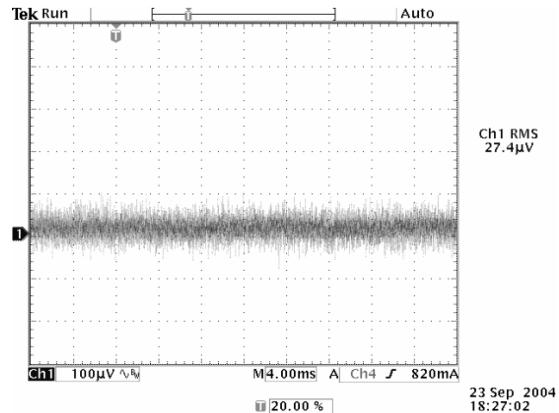
Note 2: Guaranteed by line regulation test.

Note 3: Adjustable mode only.

Note 4: Not tested. For design purposes, the current limit should be considered 400mA minimum to 650mA maximum.

Note 5: The dropout voltage is defined as (V<sub>IN</sub>-V<sub>OUT</sub>) when V<sub>OUT</sub> is 100mV below the target value of V<sub>OUT</sub>. The performance of every G916 part, see "Typical Performance Characteristics".

**Typical Performance Characteristics**(V<sub>IN</sub>=5V, C<sub>IN</sub>=1μF, C<sub>OUT</sub>=1μF, V<sub>SHDN</sub> = V<sub>IN</sub>, G916-475, T<sub>A</sub> =25°C, unless otherwise noted.)**Line Transient****Load Transient****Short Circuit Current****Ripple Rejection****Turn-On****Turn-Off**

**Typical Performance Characteristics (continued)**
**Overcurrent Protection Characteristics**

**Dropout Voltage vs.  $I_L$** 

**Output Voltage vs. Temperature**

**Output Noise**




## Pin Description

PIN		NAME	FUNCTION
G916	G916-XXX		
1	1	IN	Regulator Input. Supply voltage can range from +2.5V to +6.0V. Bypass with 1 $\mu$ F to GND
2	2	GND	Ground. This pin also functions as a heatsink. Solder to large pads or the circuit board ground plane to maximize thermal dissipation.
3	3	SHDN	Active-Low Shutdown Input. A logic low reduces the supply current to less than 1 $\mu$ A. Connect to IN for normal operation.
4		SET	Feedback Input for Setting the Output Voltage. Connect to GND to set the output voltage to the preset output voltage. Connect to an external resistor divider for adjustable-output operation.
	4	BYP	This is a reference bypass pin. It should connect external 10nF capacitor to GND to reduce output noise. Bypass capacitor must be no less than 1nF. ( $C_{BYP} \geq 1nF$ )
5	5	OUT	Regulator Output. Sources up to 300mA. Bypass with a 1 $\mu$ F, $< 0.2\Omega$ typical ESR capacitor to GND.

## Detailed Description

The block diagram of the G916 is shown in Figure 1. It consists of an error amplifier, 1.25V bandgap reference, PMOS output transistor, internal feedback voltage divider, mode comparator, shutdown logic, over current protection circuit, and over temperature protection circuit.

The mode comparator compares the SET pin voltage with an internal 350mV reference. If the SET pin voltage is less than 350mV, the internal feedback voltage divider's central tap is connected to the non-inverting input of the error amplifier. The error amplifier compares non-inverting input with the 1.25V bandgap reference. If the feedback voltage is higher than 1.25V, the error amplifier's output becomes higher so that the PMOS output transistor has a smaller gate-to-source voltage ( $V_{GS}$ ). This reduces the current carrying capability of the PMOS output transistor, as a result the output voltage decreases until the feedback voltage is equal to 1.25V. Similarly, when the feedback voltage is less than 1.25V, the error amplifier causes the output PMOS to source more current to pull the feedback voltage up to 1.25V. Thus, through this feedback action, the error amplifier, output PMOS, and the voltage dividers effectively form a unity-gain amplifier with the

feedback voltage force to be the same as the 1.25V bandgap reference. The output voltage,  $V_{OUT}$ , is then given by the following equation:

$$V_{OUT} = 1.25 (1 + R1/R2). \quad (1)$$

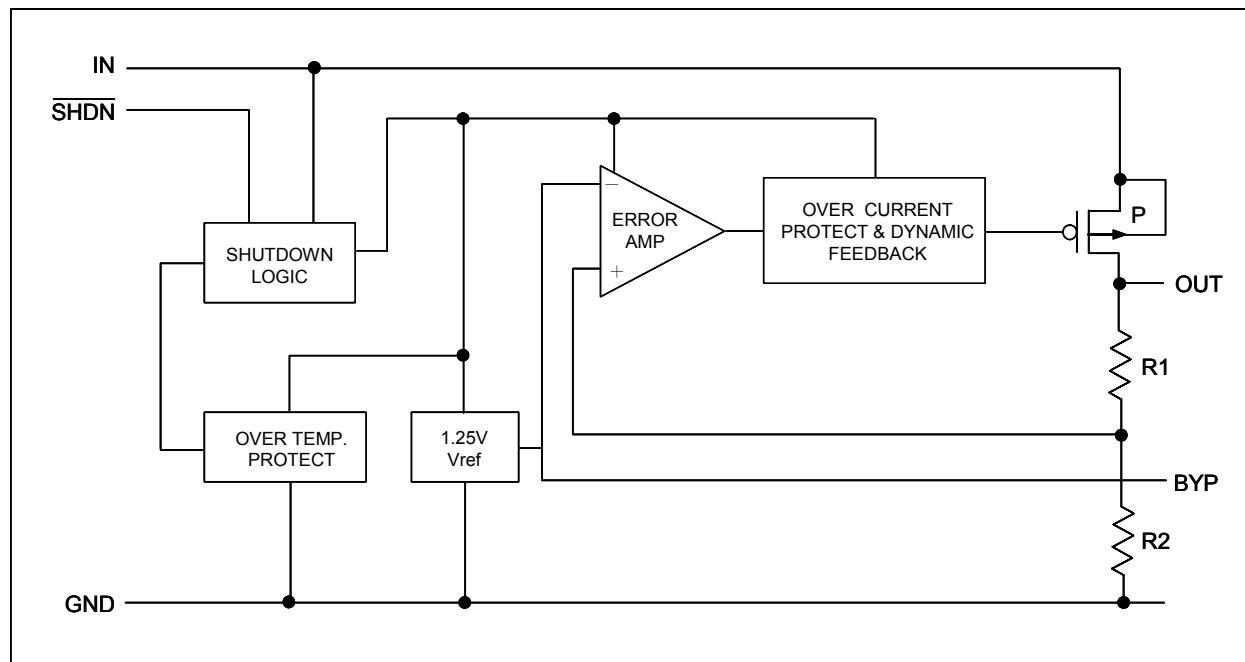
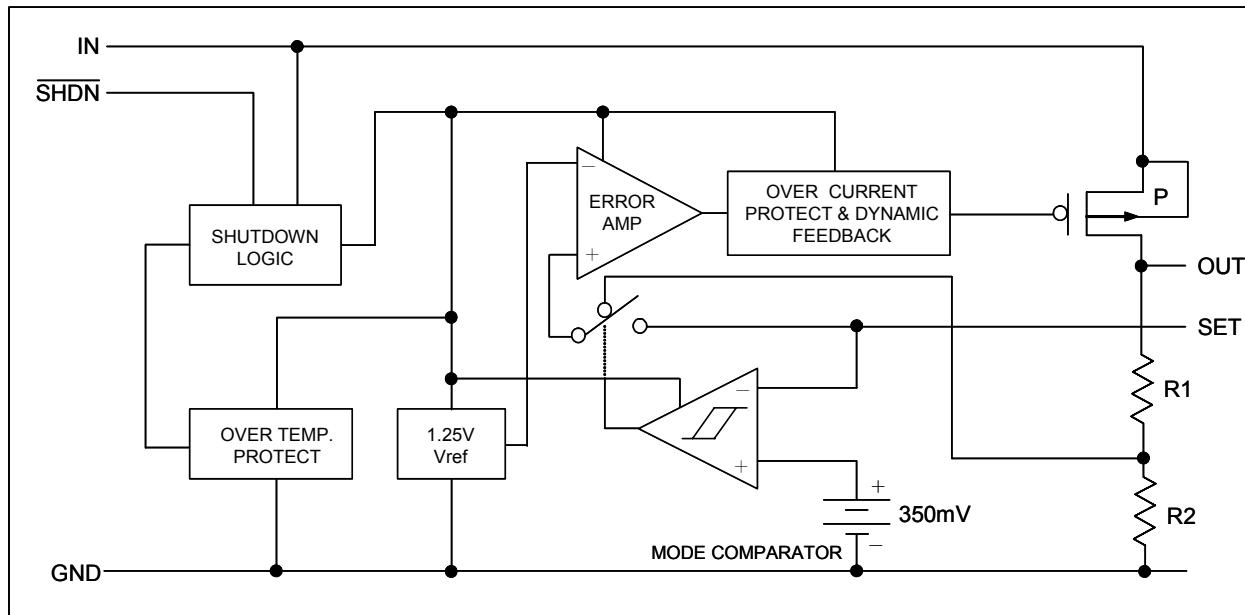
Alternatively, the relationship between R1 and R2 is given by:

$$R1 = R2 (V_{OUT} / 1.25 - 1). \quad (2)$$

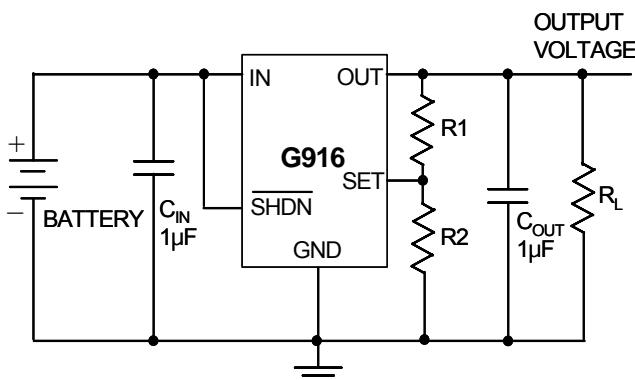
For the reasons of reducing power dissipation and loop stability, R2 is chosen to be 100K $\Omega$ . For G916, R1 is 164K, and the pre-set VOUT is 3.30V.

When external voltage divider is used, as shown in Figure 2, the SET pin voltage will be larger than 350mV. The non-inverting input of the amplifier will be connected to the external voltage divider. However, the operation of the feedback loop is the same, so that the conditions of Equations 1 and 2 are still true. The output voltage is still given by Equation 1.

For G916-XXX, adjust the internal reference and internal voltage divider. It provides a fixed mode output ranging from 1.2V to 5V.



**Figure 1. Functional Diagram of Adjustable-mode & Fixed mode**



**Figure 2. Adjustable Output Using External Feedback Resistors**

### Over Current Protection

The G916 uses a current sense-resistor to monitor the output current. A portion of the PMOS output transistor's current is mirrored to a resistor such that the voltage across this resistor is proportional to the output current. Once the output current exceeds limit threshold, G916 would be protected with a limited output current. Further more, when the output is short to ground, the output current would be folded-back to a less limit.

### Over Temperature Protection

To prevent abnormal temperature from occurring, the G916 has a built-in temperature monitoring circuit. When it detects the temperature is above 145°C, the output transistor is turned off. When the IC is cooled down to below 120°C, the output is turned on again. In this way, the G916 will be protected against abnormal junction temperature during operation.

### Shutdown Mode

When the SHDN pin is connected a logic low voltage, the G916 enters shutdown mode. All the analog circuits are turned off completely, which reduces the current consumption to only the leakage current. The G916 output pass transistor would get into high impedance level. There is an internal discharge path to help to shorten discharge delay time.

### Operating Region and Power Dissipation

Since the G916 is a linear regulator, its power dissipation is always given by  $P = I_{OUT} (V_{IN} - V_{OUT})$ . The maximum power dissipation is given by:

$$P_{D(MAX)} = (T_J - T_A) / \theta_{JA} = (150^\circ\text{C} - 25^\circ\text{C}) / 240^\circ\text{C/W} = 520\text{mW}$$

Where  $(T_J - T_A)$  is the temperature difference the G916 die and the ambient air,  $\theta_{JA}$  is the thermal resistance of the chosen package to the ambient air. For surface

mount device, heat sinking is accomplished by using the heat spreading capabilities of the PC board and its copper traces. In the case of a SOT-23-5 package, the thermal resistance is typically 240°C/Watt. (See Recommended Minimum Footprint). Refer to Figure 3a & 3b is the G916 valid operating region (Safe Operating Area) & refer to Figure 4 is maximum power dissipation of SOT-23-5.

The die attachment area of the G916's lead frame is connected to pin 2, which is the GND pin. Therefore, the GND pin of G916 can carry away the heat of the G916 die very effectively. To improve the maximum power providing capability, connect the GND pin to ground using a large ground plane near the GND pin.

## Applications Information

### Capacitor Selection and Regulator Stability

Normally, use a 1µF capacitor on the input and a 1µF capacitor on the output of the G916. Larger input capacitor values and lower ESR provide better supply-noise rejection and transient response. A higher-value input capacitor (10µF) may be necessary if large, fast transients are anticipated and the device is located several inches from the power source.

### Power-Supply Rejection and Operation from Sources Other than Batteries

The G916 is designed to deliver low dropout voltages and low quiescent currents in battery powered systems. Power-supply rejection is 65dB at low frequencies. As the frequency increases above 20kHz, the output capacitor is the major contributor to the rejection of power-supply noise.

When operating from sources other than batteries, improve supply-noise rejection and transient response by increasing the values of the input and output capacitors, and using passive filtering techniques.

### Load Transient Considerations

The G916 load-transient response graphs show two components of the output response: a DC shift of the output voltage due to the different load currents, and the transient response. Typical overshoot for step changes in the load current from 10mA to 300mA is 8mV. Increasing the output capacitor's value and decreasing its ESR attenuates transient spikes.

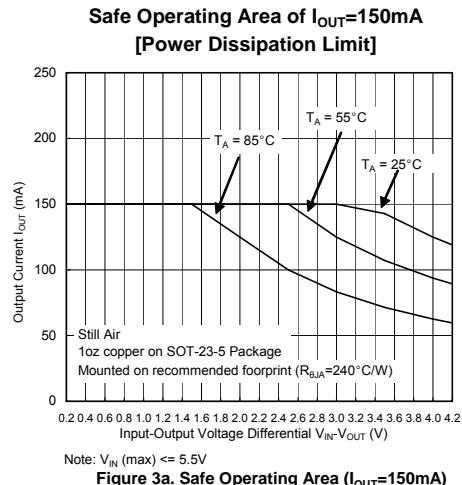
### Input-Output (Dropout) Voltage

A regulator's minimum input-output voltage differential (or dropout voltage) determines the lowest usable supply voltage. In battery-powered systems, this will determine the useful end-of-life battery voltage. Because the G916 use a P-channel MOSFET pass transistor, their dropout voltage is a function of  $R_{DS(ON)}$  multiplied by the load current.

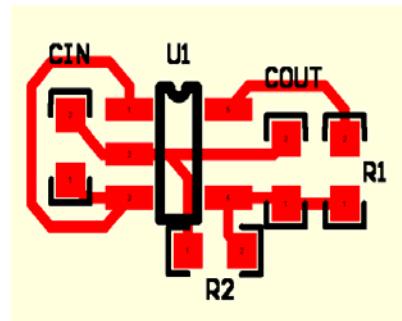
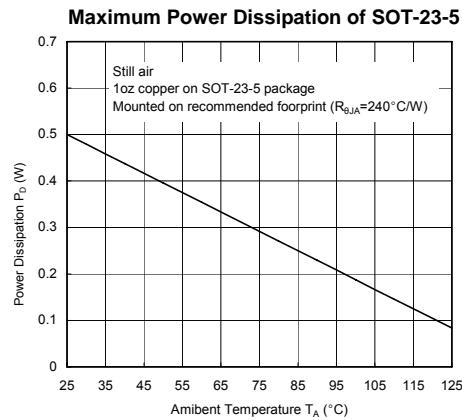
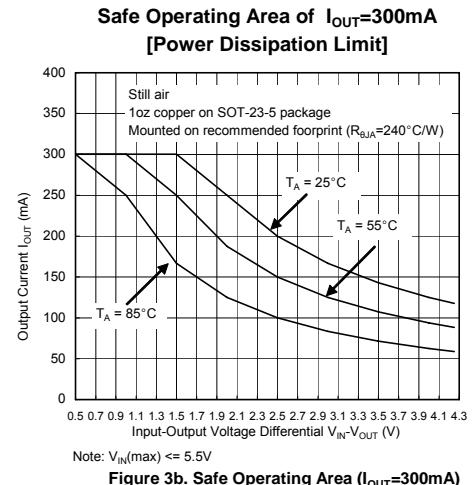
**Layout Guide**

An input capacitance of  $\geq 1\mu\text{F}$  is required between the G916 input pin and ground (the amount of the capacitance may be increased without limit). This capacitor must be located a distance of not more than 1cm from the input and return to a clean analog ground.

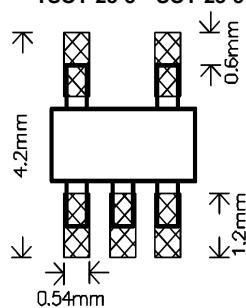
Input capacitor can filter out the input voltage spike caused by the surge current due to the inductive effect of the package pin and the printed circuit board's routing wire. Otherwise, the actual voltage at the IN pin may exceed the absolute maximum rating.

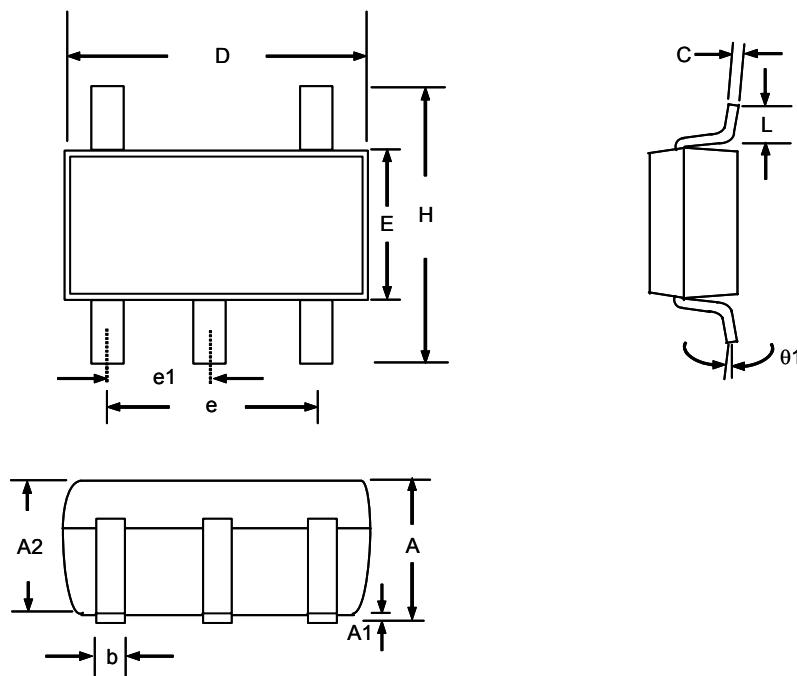


The output capacitor also must be located a distance of not more than 1cm from output to a clean analog ground. Because it can filter out the output spike caused by the surge current due to the inductive effect of the package pin and the printed circuit board's routing wire. Figure 5 is adjustable mode of G916 PCB layout.



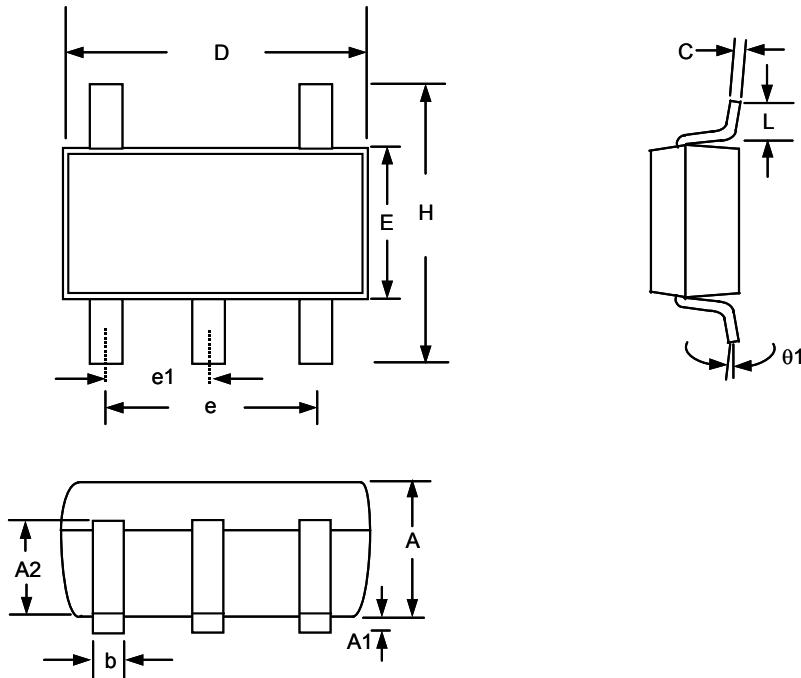
**Figure 5. Adjustable Mode**

**Recommend Minimum Footprint**
**TSOT-23-5 • SOT-23-5**


**Package Information**

**TSOT-23-5 Package**
**Note:**

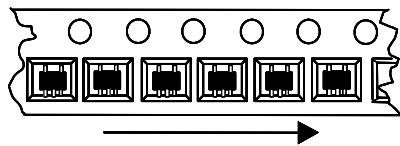
1. Package body sizes exclude mold flash protrusions or gate burrs
2. Tolerance  $\pm 0.1000$  mm (4mil) unless otherwise specified
3. Coplanarity: 0.1000mm
4. Dimension L is measured in gage plane

SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	----	----	1.00	----	----	0.039
A1	0.00	----	0.10	0.000	----	0.004
A2	----	----	0.90	----	----	0.035
b	0.35	0.40	0.50	0.014	0.016	0.020
C	0.10	0.15	0.25	0.004	0.006	0.010
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.40	1.60	1.80	0.055	0.063	0.071
e	----	1.90(TYP)	----	----	0.075(TYP)	----
e1	----	0.95	----	----	0.037	----
H	2.60	2.80	3.00	0.102	0.110	0.118
L	0.37	----	----	0.015	----	----
$\theta_1$	1°	5°	9°	1°	5°	9°


**SOT-23-5 Package**
**Note:**

1. Package body sizes exclude mold flash protrusions or gate burrs
2. Tolerance  $\pm 0.1000$  mm (4mil) unless otherwise specified
3. Coplanarity: 0.1000mm
4. Dimension L is measured in gage plane

SYMBOL	DIMENSION IN MM			DIMENSION IN INCH		
	MIN.	NOM.	MAX.	MIN.	NOM.	MAX.
A	1.00	1.10	1.30	0.039	0.043	0.051
A1	0.00	-----	0.10	0.000	-----	0.004
A2	0.70	0.80	0.90	0.028	0.031	0.035
b	0.35	0.40	0.50	0.014	0.016	0.020
C	0.10	0.15	0.25	0.004	0.006	0.010
D	2.70	2.90	3.10	0.106	0.114	0.122
E	1.40	1.60	1.80	0.055	0.063	0.071
e	-----	1.90(TYP)	-----	-----	0.075(TYP)	-----
e1	-----	0.95	-----	-----	0.037	-----
H	2.60	2.80	3.00	0.102	0.110	0.118
L	0.37	-----	-----	0.015	-----	-----
theta 1	1°	5°	9°	1°	5°	9°

**Taping Specification**

**TSOT-23-5 & SOT-23-5 Package Orientation**

PACKAGE	Q'TY/REEL
TSOT-23-5	3,000 ea
SOT-23-5	3,000 ea

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