

## GQ2141

### CMOS Positive Voltage Regulator

#### Description

The GQ2141 of positive, linear regulator feature low quiescent current (50 $\mu$ A typ.) with low dropout voltage and excellent PSRR, thus making them ideal for Telecommunications and other battery applications.

The GQ2141's output voltage can be adjusted with an external resistor divider.

These rugged devices have both Thermal Shutdown, and Current Fold-back to prevent device failure under the "Worst" of operating conditions.

As an additional feature, the GQ2141 is stable with an output capacitance of just extended 0.22 $\mu$ F or greater.

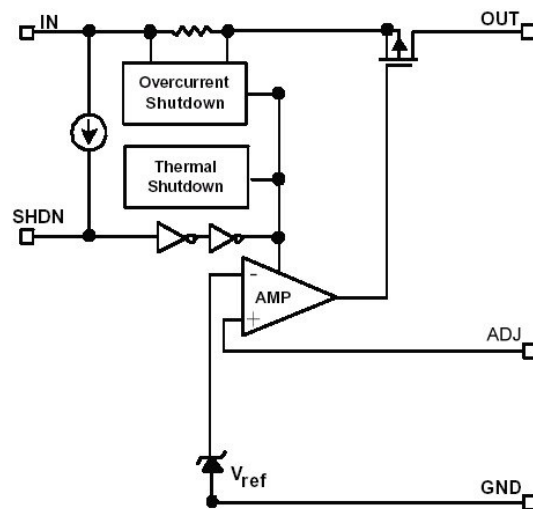
#### Features

- Very Low Dropout Voltage
- Guaranteed 150mA output
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Excellent PSRR Type 70dB
- Power-saving Shutdown Mode
- Factor Pre-set Output Voltage

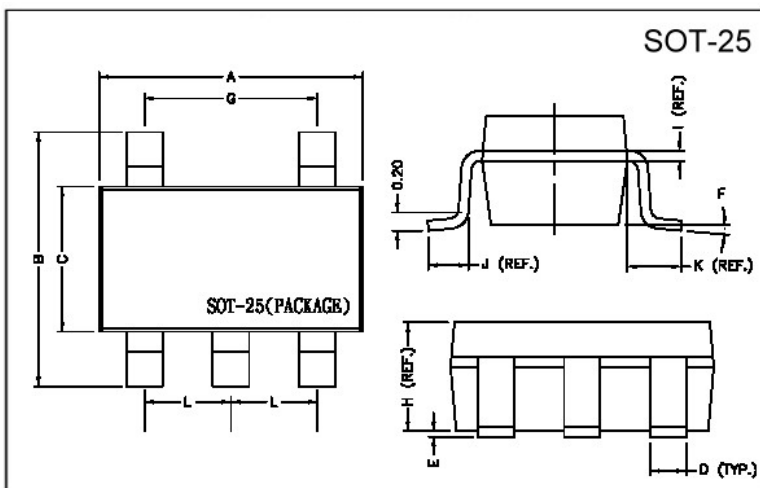
#### Applications

- Battery Powered Widgets
- Instrumentation
- Wireless Devices
- PC Peripherals
- Portable Electronics
- Cordless Phones
- Electronic Scales
- Cellular Phones
- Cameras
- Telecommunications

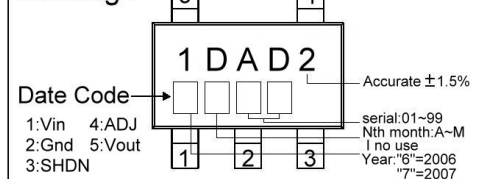
#### Functional Block Diagram



#### Package Dimensions

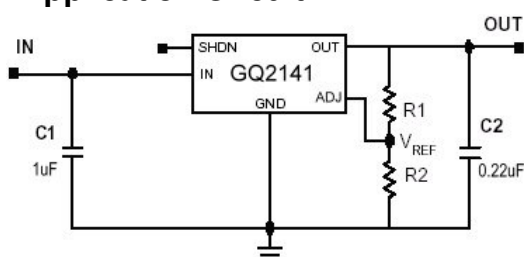


#### Marking :



REF.	Millimeter		REF.	Dimensions	
	Min.	Max.		Millimeter	
A	2.70	3.10	G	1.90 REF.	
B	2.60	3.00	H	1.20 REF.	
C	1.40	1.80	I	0.12 REF.	
D	0.30	0.55	J	0.37 REF.	
E	0	0.10	K	0.60 REF.	
F	0°	10°	L	0.95 REF.	

#### Typical Application Circuit



**Absolute Maximum Ratings**

Parameter	Symbol	Ratings	Unit
Input Max Voltage	V <sub>IN</sub>	6	V
Output Current	I <sub>OUT</sub>	PD/(V <sub>IN</sub> -V <sub>O</sub> )	mA
Output Voltage	V <sub>OUT</sub>	GND-0.3 to V <sub>IN</sub> +0.3	V
Operating Ambient Temperature	T <sub>opr</sub>	-40 ~ +85	°C
Junction Temperature	T <sub>j</sub>	-40 ~ +125	°C
Maximum Junction Temperature	T <sub>j Max</sub>	150	°C
Power Dissipation(ΔT=100°C)	PD	380	mW
EDS Classification		B	

**Electrical Characteristics TA=25°C unless otherwise noted**

(V<sub>OUT</sub>(T)>2.0V V<sub>IN</sub>=V<sub>OUT</sub>(T)+0.5V; V<sub>OUT</sub>(T)≤2.0V V<sub>IN</sub>=V<sub>OUT</sub>(T)+1V; V<sub>SHDN</sub>=V<sub>IN</sub>, C<sub>IN</sub>=C<sub>OUT</sub>=1μF. GQ2141 is tested with 2.45V output.)

Parameter	Symbol	Condition	Min	TYP	Max	Unit	
Output Voltage	V <sub>OUT</sub> (E) (Note1)	I <sub>O</sub> =0.1mA	-1.5	V <sub>OUT</sub> (T) (Note2)	1.5	%	
		I <sub>O</sub> =150mA	-2.0		2.0		
Current Limit	I <sub>LIM</sub>	V <sub>O</sub> >800mV	150	200	-	mA	
Fold-back Current	I <sub>FB</sub>	V <sub>O</sub> =0V	-	80	-	μA	
Load Regulation	REG <sub>LOAD</sub>	I <sub>O</sub> =0.1 to 150mA	V <sub>OUT</sub> >2.0V V <sub>IN</sub> =V <sub>OUT</sub> (T)+0.5V	-1	0.5	1	%
			V <sub>OUT</sub> ≤2.0V V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V	-2	-	2	
Dropout Voltage	V <sub>DROPOUT</sub>	I <sub>O</sub> =150mA V <sub>O</sub> =V <sub>OUT</sub> (E)-2%	V <sub>OUT</sub> (T)≥2.0V	-	300	500	mV
			1.8V≤V <sub>OUT</sub> (T)<2.0V	-	700	1000	
			1.5V≤V <sub>OUT</sub> (T)<1.8V	-	900	1300	
Quiescent Current	I <sub>Q</sub>	V <sub>IN</sub> =5V, I <sub>O</sub> =0mA	-	60	-	μA	
Ground Pin Current	I <sub>GNL</sub>	V <sub>IN</sub> =5V, I <sub>O</sub> =1mA to 150mA	-	50	-	μA	
Line Regulation	REG <sub>LINE</sub>	I <sub>O</sub> =0.1mA, V <sub>OUT</sub> >2.0V V <sub>IN</sub> =V <sub>OUT</sub> (T)+0.5V to 5.5V	-0.2	0.1	0.2	%	
			I <sub>O</sub> =0.1mA, V <sub>OUT</sub> ≤2.0V V <sub>IN</sub> =V <sub>OUT</sub> (T)+1V to 5.5V	-0.4	-		0.4
Input Voltage	V <sub>IN</sub>		Note3	-	5.5	V	
Over Temperature Shutdown	OTS		-	137	-	°C	
Over Temperature Hysteresis	OTH		-	23	-	°C	
Output Voltage Temperature Coefficient	TC		-	30	-	ppm/°C	
Power Supply Rejection	PSRR	R <sub>o</sub> =100Ω, C <sub>o</sub> =2.2mF, f=1kHz	-	70	-	dB	
Output Voltage Noise	e <sub>N</sub>	f=10Hz~100kHz, I <sub>O</sub> =10mA, C <sub>o</sub> =2.2μF	-	30	-	μV <sub>rms</sub>	
SHDN Input Threshold	V <sub>SHDNH</sub>	V <sub>SHDN</sub> =0.8* V <sub>IN</sub>	0.8* V <sub>IN</sub>	-	V <sub>IN</sub>	V	
	V <sub>SHDNL</sub>	V <sub>SHDN</sub> =0.6V	0	-	0.6	V	
SHDN Input Bias Current		V <sub>IN</sub> =5V, EN=0v, or 5V	-	0.01	-	μA	
Shutdown Supply Current	I <sub>SD</sub>	V <sub>IN</sub> =5V, V <sub>O</sub> =0V	-	0.5	1	μA	
Shutdown Output Voltage	V <sub>O,SD</sub>	Output Loading≤1200Ω, V <sub>O</sub> =0V	0	-	0.4	V	
ADJ Reference Voltage	V <sub>REF</sub>		1.206	1.225	1.243	V	
ADJ Input Bias Current		V <sub>IN</sub> =5.5V, V <sub>ADJ</sub> =1.3V	-	0.05	0.1	μA	

Note 1: V<sub>OUT</sub>(E) =Effective Output Voltage (i.e. the output voltage when "V<sub>OUT</sub>(T)>2.0V V<sub>IN</sub>=V<sub>OUT</sub>(T)+0.5V; V<sub>OUT</sub>(T)≤2.0V V<sub>IN</sub>=V<sub>OUT</sub>(T)+1V; V<sub>SHDN</sub>=V<sub>IN</sub>" is provided at the V<sub>IN</sub> pin while maintaining a certain I<sub>OUT</sub> value).

2: V<sub>OUT</sub>(T) =Specified Output Voltage

3: V<sub>IN</sub>(MIN) =V<sub>OUT</sub>+V<sub>DROPOUT</sub>

## Ordering Information ( contd. )

Part Number	Marking	Output Voltage	Part Number	Marking	Output Voltage
GQ2141-AD	1DAD2 XXXX	Adjustable			

## Detailed Description

The GQ2141 of COMS regulator contains a PMOS pass transistor, voltage reference, error amplifier, over-current protection, and thermal shutdown.

The P-channel pass transistor receives data from the error amplifier, over-current shutdown, and thermal protection circuits. During normal operation, the error amplifier compares the output voltage to a precision reference. Over-current and Thermal shutdown circuits become active when the junction temperature exceeds 150°C, or the current exceeds 150mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120°C.

The GQ2141 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The GQ2141 also incorporates current fold-back to reduce power dissipation when the output is short circuited. This feature becomes active when the output drops below 0.8 volts, and reduces the current flow by 65%. Full current is restored when the voltage exceeds 0.8 volts.

## External Capacitors

The GQ2141 is stable with an output capacitance to ground of 0.22µF or greater. Ceramic capacitors have the lowest ESR, and will offer the best AC performance. Conversely, Aluminum Electrolytic capacitors exhibit the highest ESR, resulting in the poorest AC response.

A second capacitor is recommended between the input and ground to stabilize Vin. The input capacitor should be at least 1µF to have a beneficial effect.

A large capacitor improves the AC ripple rejection, but also makes the output come up slowly. This "Soft" turn-on is desirable in some applications to limit turn-on surges.

All capacitors should be placed in close proximity to the pins. A "Quiet" ground termination is desirable. This can be achieved with a "Star" connection.

## Shutdown

When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 1µA. This pin behaves much like an electronic switch.

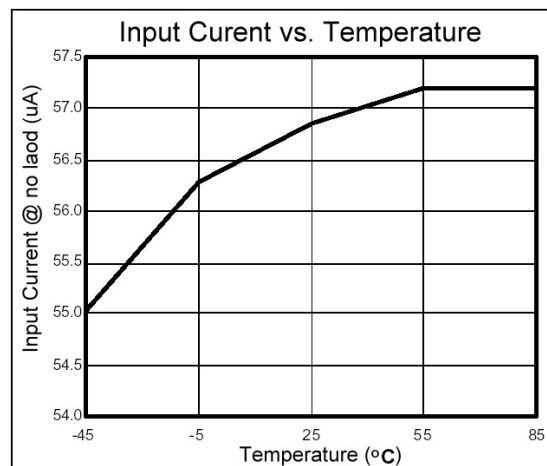
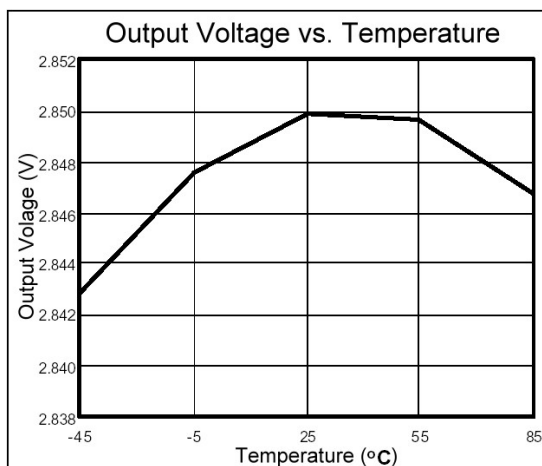
## Adjustable Version

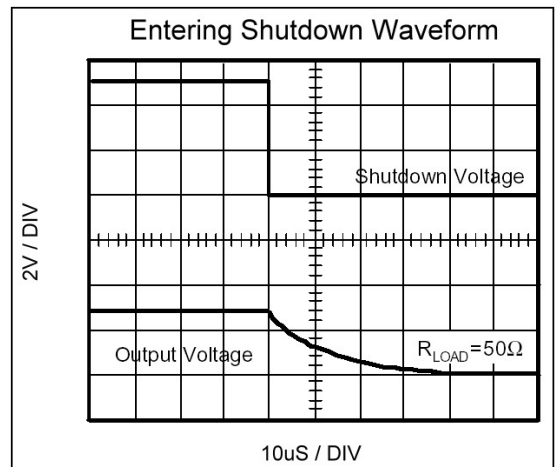
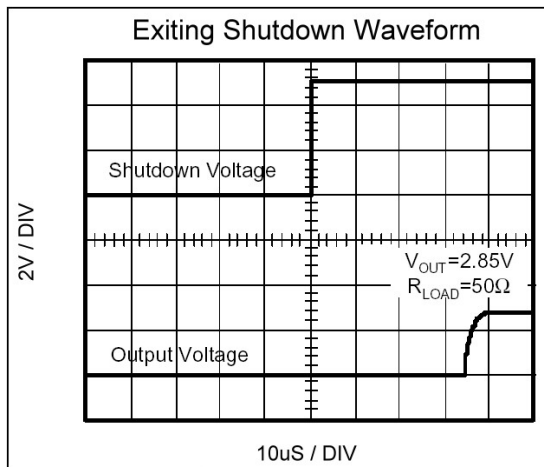
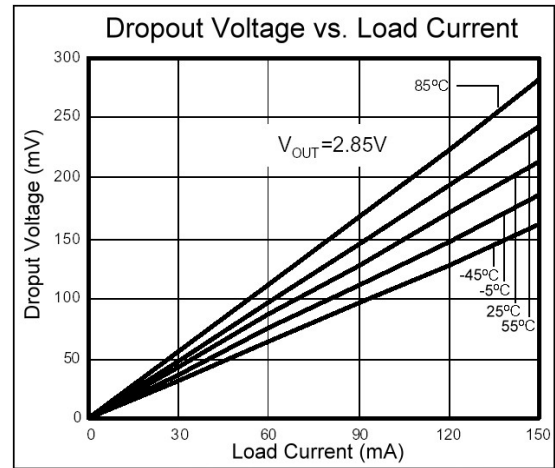
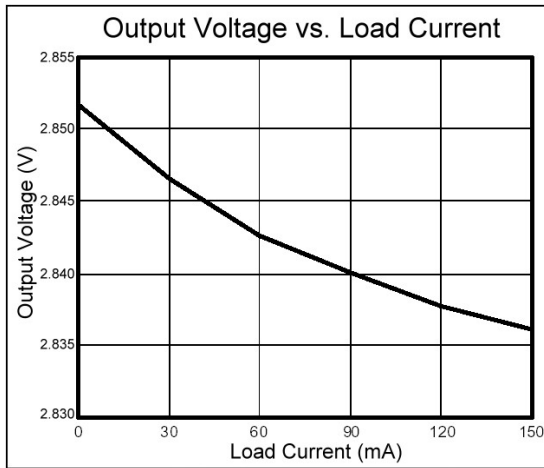
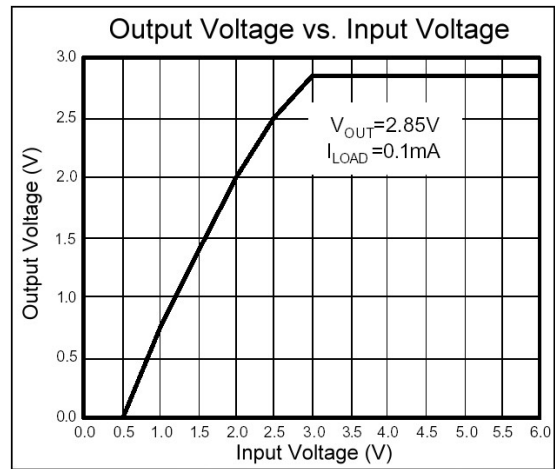
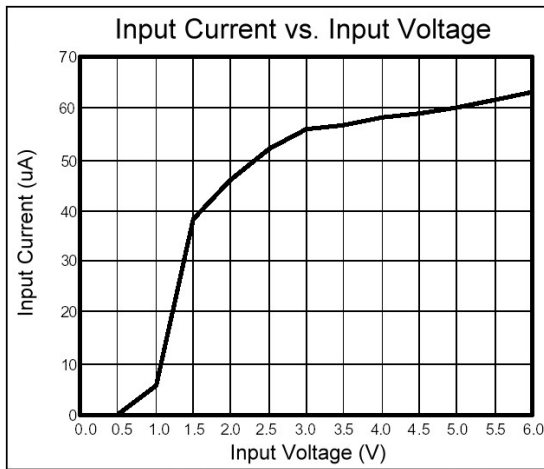
The GQ2141 features a user-adjustable output through an external feedback resistor divider. To set the output of GQ2141 use the following equation:

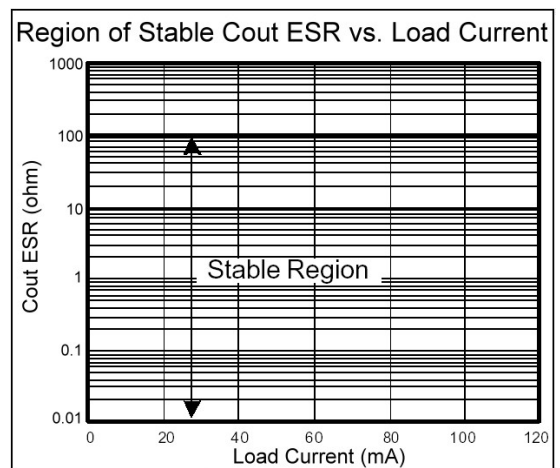
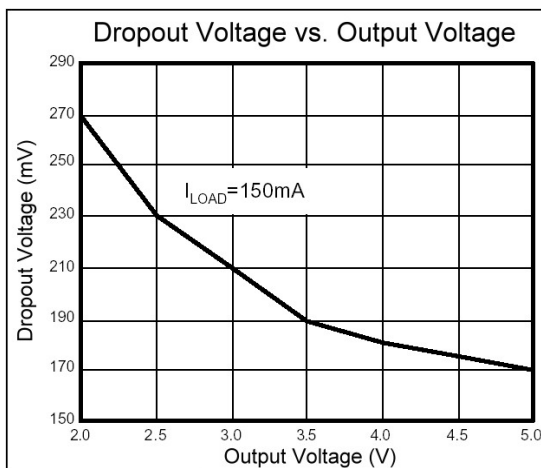
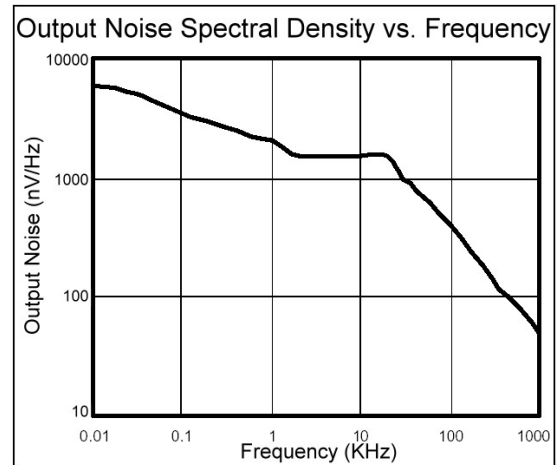
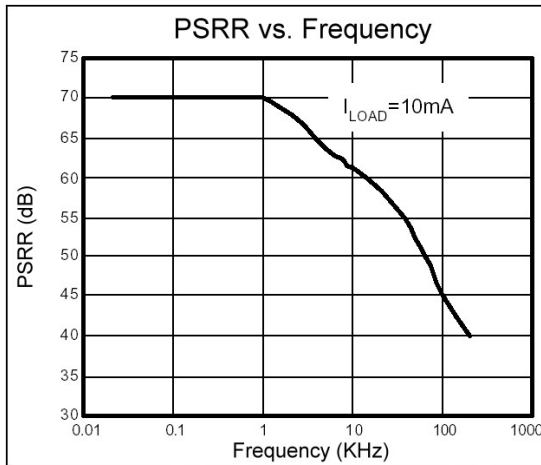
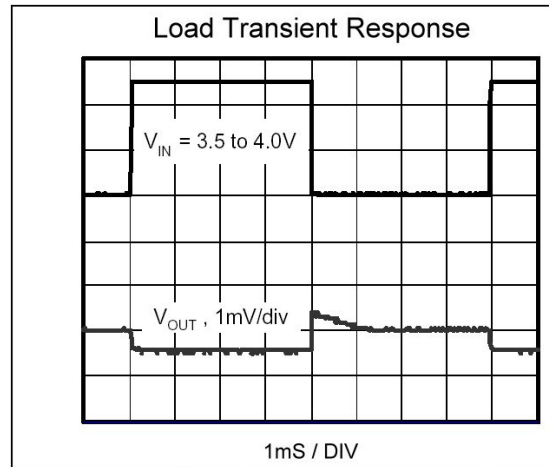
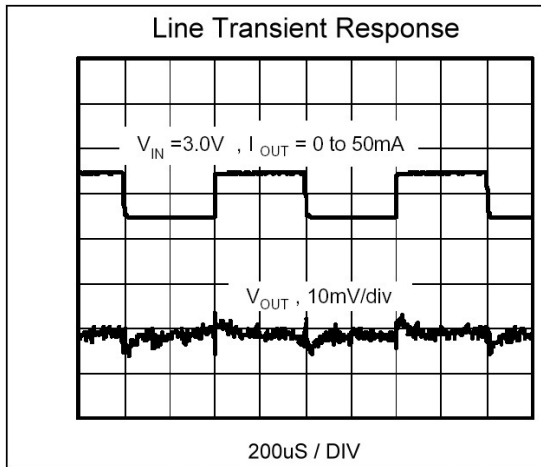
$$V_{OUT} = V_{ADJ} * (1 + R1/R2)$$

$V_{ADJ} = 1.225$ , use 1% or better resistors

## Characteristics Curve







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