GSC2127 750mA CMOS Positive Voltage Regulator

Description

The GSC2127 series of positive, linear regulators feature low quiescent current (45μA typ.) with low dropout voltage, making then ideal for battery applications.
Output voltages are set at the factory and trimmed to 1.5% accuracy.
These rugged devices have both Thermal Shutdown, and Current Fold-back to prevent device failure under the “Worst” of operating conditions.
An additional feature is a “Power Good” detector, which pulls low when the output is out of regulation.
The GSC2127 is stable with an output capacitance of 4.7μF or greater.

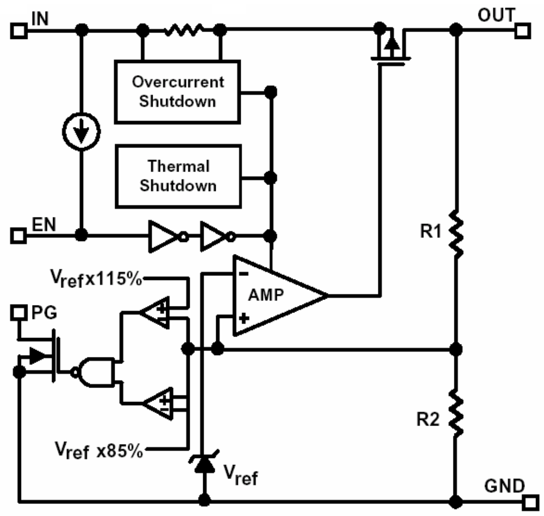
Features

- Very Low Dropout Voltage
- Guaranteed 750mA output
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Low Temperature Coefficient
- Noise Reduction Bypass Capacitor
- Power-saving Shutdown Mode
- Power Good Output Function

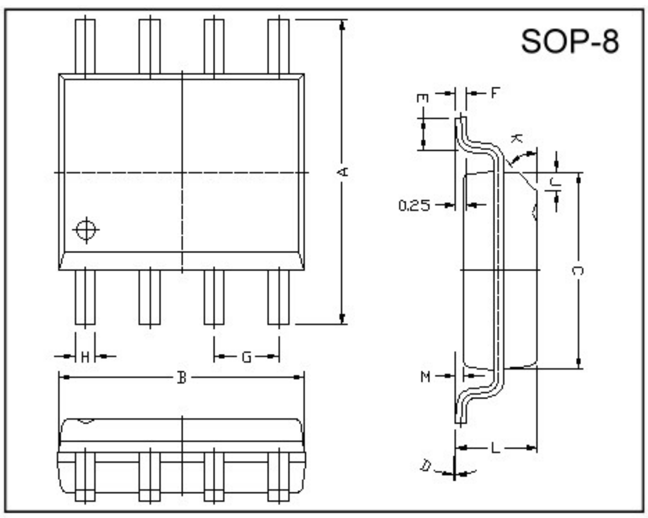
Applications

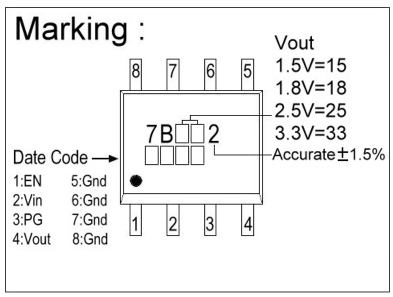
- Battery Powered Widgets
- Instrumentation
- Wireless Devices
- PC Peripherals
- Portable Electronics

Functional Block Diagram



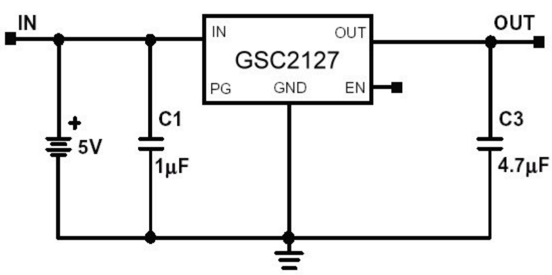
Package Dimensions





REF.	Millimeter		REF.	Millimeter	
	Min.	Max.		Min.	Max.
A	5.80	6.20	M	0.10	0.25
B	4.80	5.00	H	0.35	0.49
C	3.80	4.00	L	1.35	1.75
D	0°	8°	J	0.375 REF.	
E	0.40	0.90	K	45°	
F	0.19	0.25	G	1.27 TYP.	

Typical Application Circuit



Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Input Max Voltage	V_{IN}	8	V
Output Current	I_{OUT}	$P_D/(V_{IN}-V_O)$	mA
Output Voltage	V_{OUT}	1.5~3.3	V
Operating Ambient Temperature	Topr	-40 ~ +85	℃
Junction Temperature	Tj	-40 ~ +125	℃
Maximum Junction Temperature	Tj Max	150	℃
Internal Power Dissipation(△T=100℃)	P_D	810	mW
EDS Classification		B	

Electrical Characteristics T_A=25℃ unless otherwise noted

($V_{IN}=V_{OUT}$ (T) +2V, $V_{EN}=V_{IN}$, C_{IN}=1μF, C_{OUT}=4.7μF)

Parameter	Symbol	Condition		Min	TYP	Max	Unit
Output Voltage	V_{OUT}(E) (Note1)	I_O=1mA, $V_{IN}=V_{OUT}$(T)+2V		-1.5	V_{OUT}(T) (Note2)	1.5	%
Output Current	I_O	V_O>1.2V		750	-	-	mA
Current Limit	I_{LIM}	V_O>1.2V		750	-	-	mA
Short Circuit Current	I_{SC}	$V_{IN}=V_{OUT}$(T)+1V, V_O < 0.4V		-	750	-	mA
Load Regulation	REG_{LOAD}	$V_{IN}=V_{OUT}$(T)+2V, I_O=1mA to 750mA		-1	0.2	1	%
Dropout Voltage	$V_{DROPOUT}$	I_O=750mA $V_O=V_{OUT}$(E)-2%	V_{OUT}(T)=1.5V	-	-	1000	mV
			V_{OUT}(T)=1.8V	-	-	650	
			V_{OUT}(T)≥2.0V	-	-	500	
Quiescent Current	I_Q	$V_{IN}=V_{OUT}$(T)+2V, I_O=0mA		-	45	70	μA
Ground Pin Current	I_{GND}	$V_{IN}=V_{OUT}$(T)+2V, I_O=1mA to 750mA		-	45	-	μA
Line Regulation	REG_{LINE}	I_O=1mA $V_{IN}=V_{OUT}$(T)+1 to V_{OUT}(T)+2	V_{OUT}(T)<2.0V	-0.15	-	0.15	%
			2.0V≤V_{OUT}(T)<4.0V	-0.1	0.02	0.1	
			4.0V≤V_{OUT}(T)	-0.4	-	0.4	
Input Voltage	V_{IN}			Note3	-	7	V
Over Temperature Shutdown	OTS			-	150	-	℃
Over Temperature Hysterisis	OTH			-	30	-	℃
Output Voltage Temperature Coefficient	TC			-	30	-	ppm/℃
Power Supply Rejection	PSRR	Io=100mA Co=4.7μF (ceramic)	f=1kHz	-	75	-	dB
			f=10kHz	-	55	-	
			f=100kHz	-	30	-	
Output Voltage Noise	eN	f=10Hz~100kHz, Io=10mA, Co=4.7μF		-	30	-	μVrms
EN Input Threshold	V_{EH}	V_{IN}=2.7V to 7V		2.0	-	V_{IN}	V
	V_{EL}	V_{IN}=2.7V to 7V		0	-	0.4	V
EN Input Bias Current	I_{EH}	$V_{EN}=V_{IN}$, V_{IN}=2.7V to 7V		-	-	1	μA
	I_{EL}	V_{EN}= 0V, V_{IN}=2.7V to 7V		-	-	1	μA
Shutdown Supply Current	I_{SD}	V_{IN}=5V, V_O=0V, $V_{EN}<V_{EL}$		-	0.5	2	μA
Output Under Voltage	V_{UV}	PG goes Low when V_{OUT} too Low		-	-	84	% V_{OUT}(T)
Output Over Voltage	V_{OV}	PG goes Low when V_{OUT} too High		105	-	-	% V_{OUT}(T)
PG Leakage Current	I_{LC}	V_{PG}=7V		-	-	1.0	μA
PG Voltage Low	V_{OL}	I_{SINK}=0.25mA		-	-	0.4	V

Note 1: V_{OUT} (E) =Effective Output Voltage (i.e. the output voltage when "V_{OUT} (T) + 2.0V" is provided at the V_{IN} pin while maintaining a certain I_{OUT} value).

2: V_{OUT} (T) =Specified Output Voltage

3: $V_{IN\ (MIN)}=V_{OUT}+V_{DROPOUT}$

Ordering Information (contd.)

Part Number	Marking	Output Voltage	Part Number	Marking	Output Voltage
GSC2127-15	7B152 XXXX	1.5V	GSC2127-18	7B182 XXXX	1.8V
GSC2127-25	7B252 XXXX	2.5V	GSC2127-33	7B332 XXXX	3.3V

Detailed Description

The GSC2127 series of COMS regulators contain 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 140℃, or the current exceeds 2.2A. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120℃.
The GSC2127 behaves like a current source when the load reaches 2.2A. However, if the load impedance drops below 0.3ohms, the current drops back to 600mA to prevent excessive power dissipation. Normal operation is restored when the load resistance exceeds 0.75ohms.

External Capacitors

The GSC2127 is stable with an output capacitance to ground of 4.7μF 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. Unfortunately, large value ceramic capacitors are comparatively expensive. One option is to parallel a 0.1μF ceramic capacitor with a 10μF Aluminum Electrolytic. The benefit is low ESR, high capacitance, and low overall cost.
A second capacitor is recommended between the input and ground to stabilize V_{IN}. The input capacitor should be at least 0.1μF to have a beneficial effect.
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.

Enable

When EN pin is pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 2μA. This pin behaves much like an electronic switch.
100KΩ resistor is necessary between V_{EN} source and EN pin when V_{EN} is high than V_{IN}.
(Note: There is no internal pull-up for EN pin. It can not be floating.)

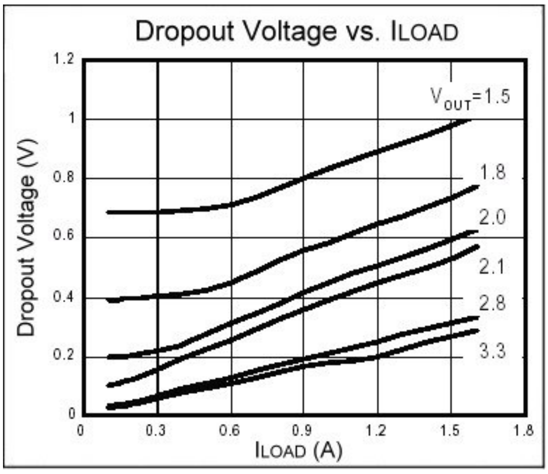
Power Good

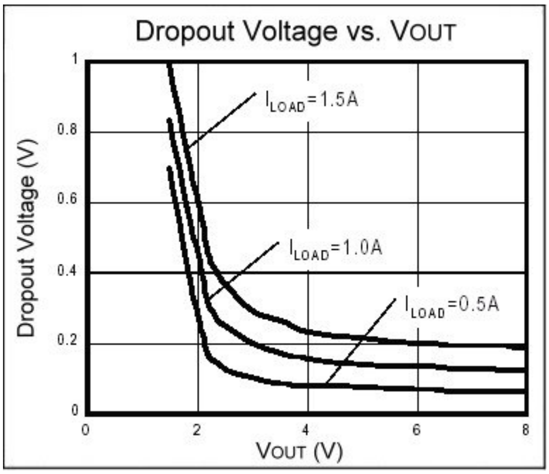
The GSC2127 includes the Power Good feature. When the output is not within ±15% of the specified voltage, it pulls low. This can occur under the following conditions:

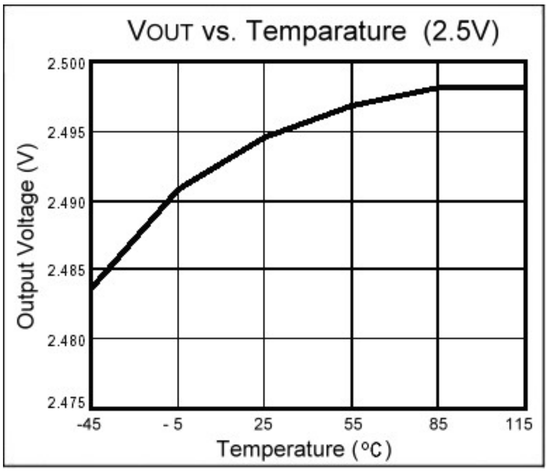
1) Input Voltage too low.
2) During Over-Temperature.
3) During Over-Current.
4) If output is pulled up.

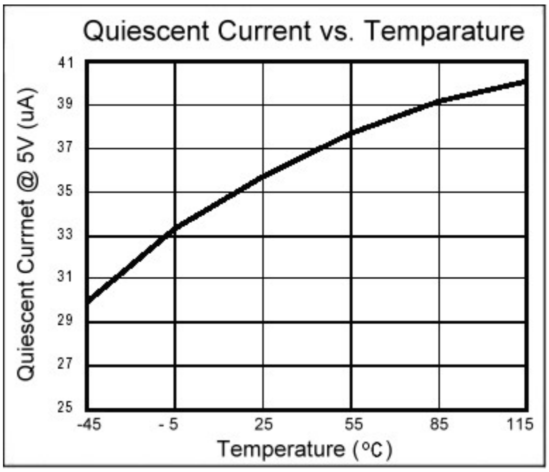
(Note: PG pin is an open-drain output.)

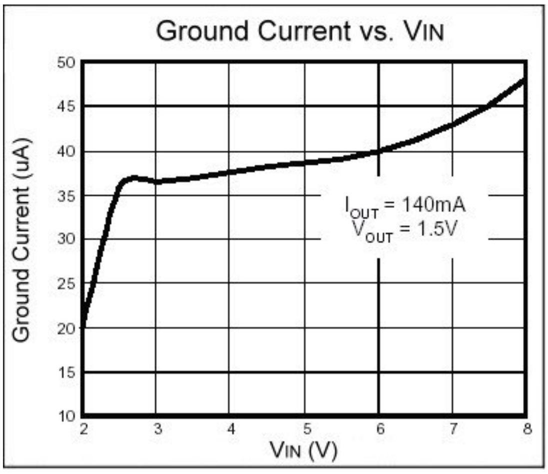
Characteristics Curve

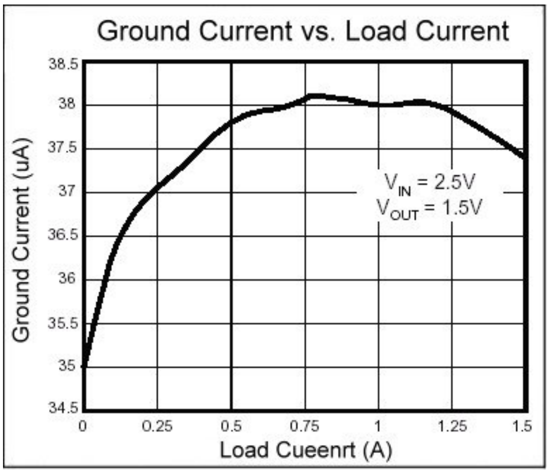


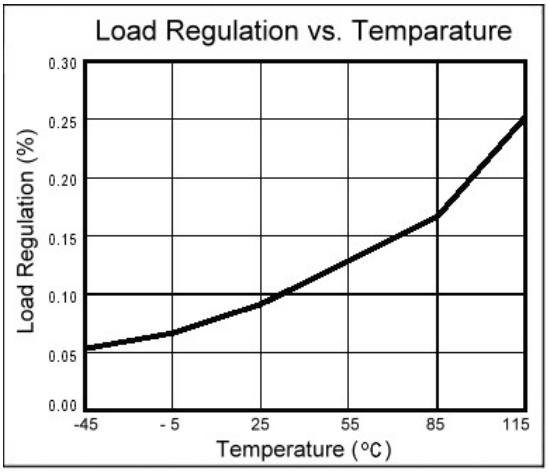


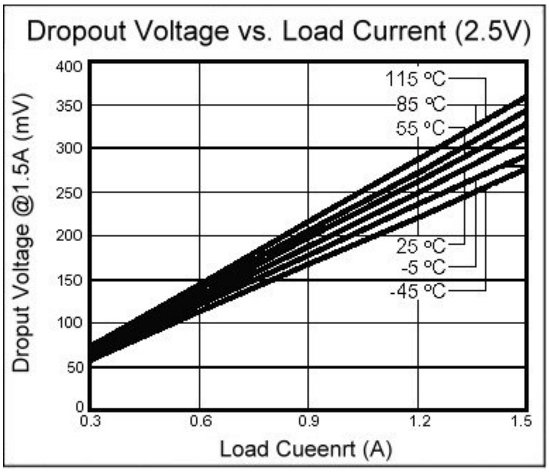


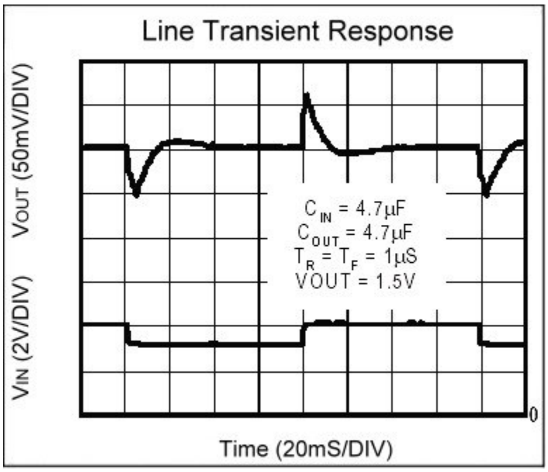


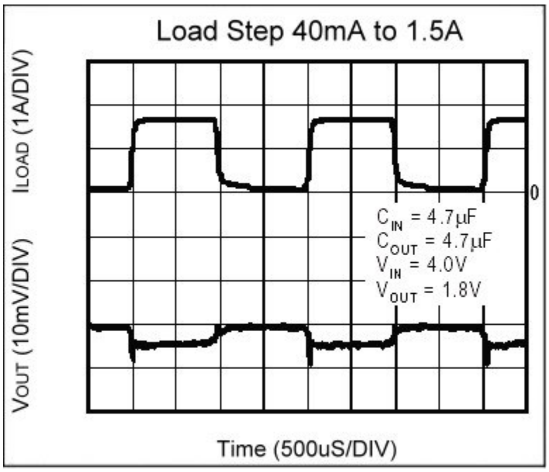


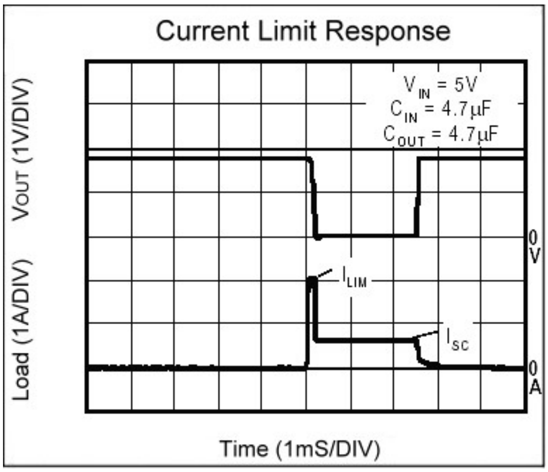


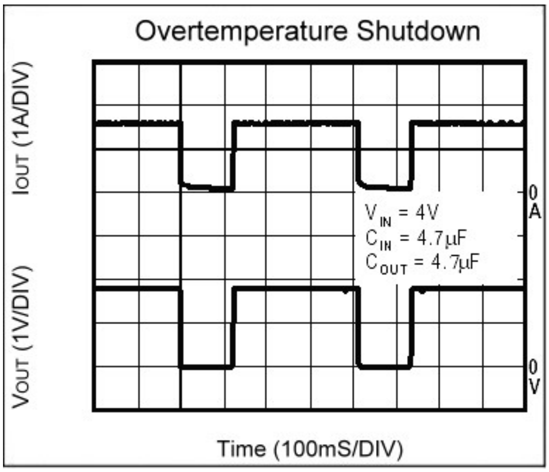

Load Regulation vs. Temparature
Load Regulation (%)
0.30
0.25
0.20
0.15
0.10
0.05
0.00
-45
- 5
25
55
85
115
Temperature (°C)

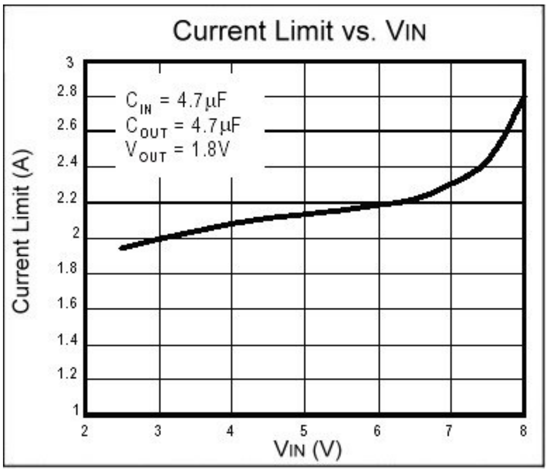

Dropout Voltage vs. Load Current (2.5V)
Droput Voltage @1.5A (mV)
400
350
300
250
200
150
100
50
0
115 °C
85 °C
55 °C
25 °C
-5 °C
-45 °C
0.3
0.6
0.9
1.2
1.5
Load Cueenrt (A)

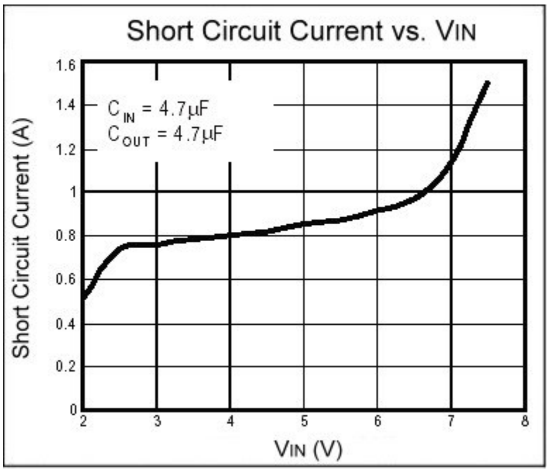

Line Transient Response
VOUT (50mV/DIV)
VIN (2V/DIV)
CIN = 4.7μF
COUT = 4.7μF
TR = TF = 1μS
VOUT = 1.5V
0
Time (20mS/DIV)

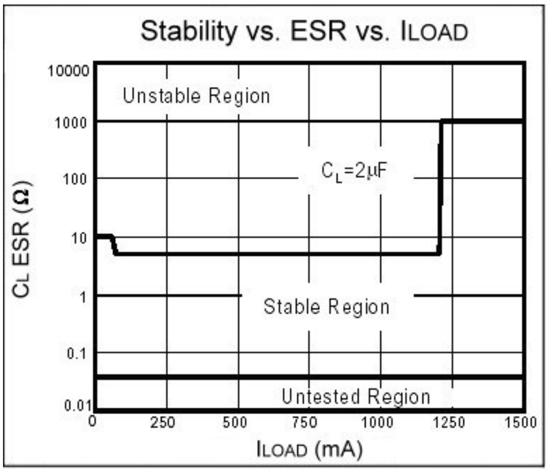

Load Step 40mA to 1.5A
ILOAD (1A/DIV)
VOUT (10mV/DIV)
0
CIN = 4.7μF
COUT = 4.7μF
VIN = 4.0V
VOUT = 1.8V
Time (500uS/DIV)

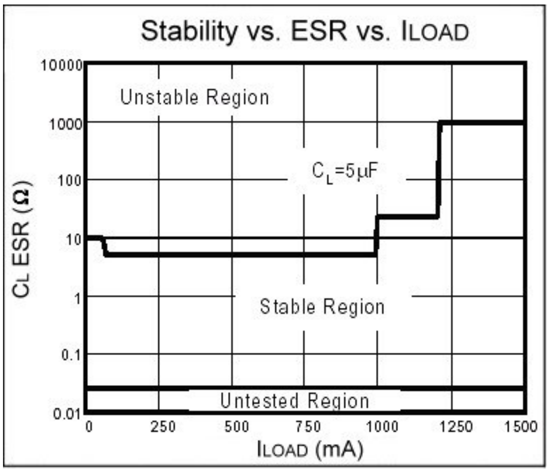

Current Limit Response
VOUT (1V/DIV)
Load (1A/DIV)
VIN = 5V
CIN = 4.7μF
COUT = 4.7μF
ILIM
ISC
0
V
0
A
Time (1mS/DIV)

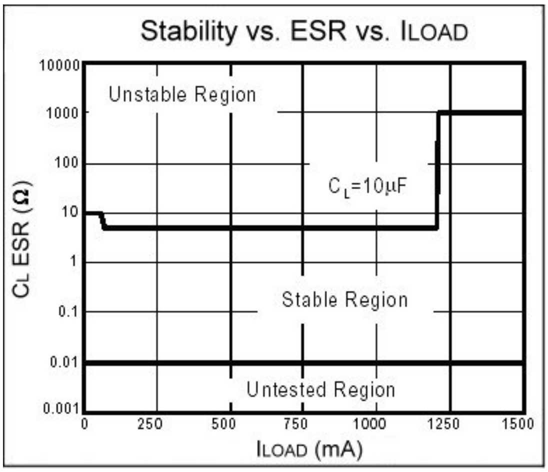

Overtemperature Shutdown
IOUT (1A/DIV)
VOUT (1V/DIV)
VIN = 4V
CIN = 4.7μF
COUT = 4.7μF
0
A
0
V
Time (100mS/DIV)











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