Elektronische Bauelemente

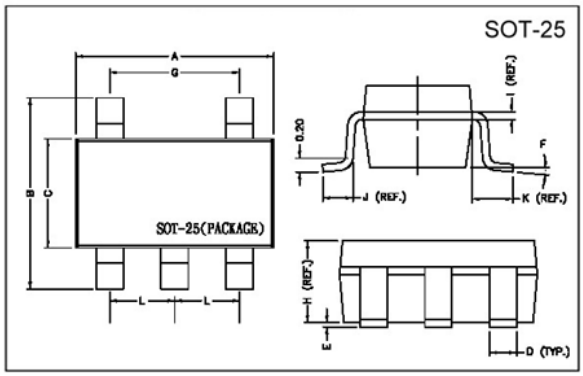
SQ2181

CMOS Positive Voltage Regulator

RoHS Compliant Product

Description

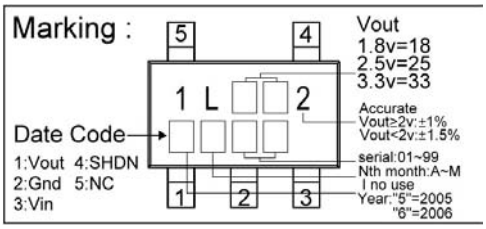
The SQ2181 of positive, linear requlator feature low quiescent current (50 µA typ.) with low dropout voltage and excellent PSRR, thus making them ideal for for Telecommunications and other battery applications. These rugged devices have both Thermal Shutdown, and Current Fold-back to prevent device failure under the "Worst" ofoperating conditions. As an additional feature, the SQ2181 is stable with an output capacitance of 2.2µF or greater.



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.

Features

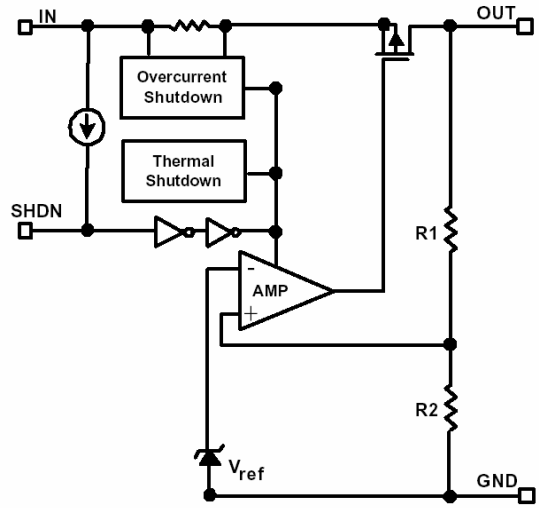
* Over-Temperature Shutdown
* Excellent PSRR Type 70 dB
* Very Low Dropout Voltage
* Factor Pre-set Output Voltage
* Short Circuit Current Fold-back
* Guaranteed 150mA output
* Current Limiting
* Power-Saving Shutdown Mode
* Noise Reduction Bypass Capacitor



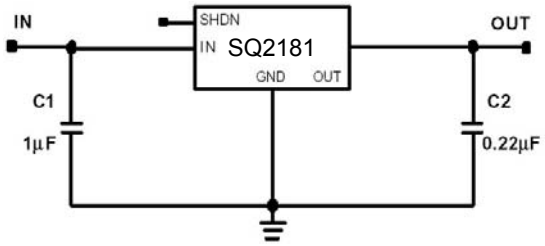
Applications

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

Functional Block Diagram



Typical Application Circuit



Absolute Maximum Ratings

Parameter	Symbol	Ratings	Unit
Input Voltage	V_{IN}	6	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	°C
Junction Temperature	Tj	-40~+125	°C
Max. Junction Temperature	Tj Max.	150	°C
Power Dissipation (△ T=100°C)	P_D	380	mW
EDS Classification		B	

Electrical Characteristics Ta=25°C unless otherwise noted

($V_{OUT}(T)$>2.0V, $V_{IN}=V_{OUT}(T)+0.5V$; $V_{OUT}(T) \leq 2.0V$, $V_{IN}=V_{OUT}(T)+1V$; $V_{SHDN}=V_{IN}$, $C_{IN}=C_{OUT}$=1uF)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition	
Output Voltage	$V_{OUT}(E)$[1]	-1.0	$V_{OUT}(E)$[2]	1.0	V	Io=0.1mA,$V_{OUT}(T) \geq 2.0V$	
		-1.5		1.5		Io=0.1mA,$V_{OUT}(T)$<2.0V	
		-2.0		2.0		Io=150mA	
Current Limit	I_{LIM}	150	200	–	mA	Vo>800mV	
Fold-Back Current	I_{FB}	–	80	–	uA	Vo=0V	
Load Regulation	REG_{LOAD}	-1	0.5	1	%	V_{OUT}>2.0V, $V_{IN}=V_{OUT}(T)+0.5V$	Io=0.1~150mA
		-2	–	2		$V_{OUT} \leq 2.0V$, $V_{IN}=V_{OUT}(T)+1.0V$	
Dropout Voltage	$V_{DROPOUT}$	–	300	500	mV	$V_{OUT}(T) \geq 2.0V$	Io=150mA
		–	700	1000		$1.8V \leq V_{OUT}(T)< 2.0V$	Vo=V_{OUT}(E)-2%
		–	900	1300		$1.5V \leq V_{OUT}(T)<1.8V$	
Quiescent Current	I_Q	–	60	–	uA	V_{IN}=5V,Io=0mA	
Line Regulation	REG_{LINE}	-0.2	0.1	0.2	%	Io=0.1mA,V_{OUT}>2.0V $V_{IN}=V_{OUT}(T)+0.5V$~5.5V	
		-0.4	–	0.4		Io=0.1mA,$V_{OUT} \leq 2.0V$ $V_{IN}=V_{OUT}(T)+0.5V$~5.5V	
Input Voltage	V_{IN}	Note[3]	–	5.5	V		
Over Temperature Shutdown	O_{TS}	–	137	–	°C		
Over Temperature Hystersis	O_{TH}	–	23	–	°C		
Output Voltage Temperature Coefficient	T_C	–	30	–	ppm/°C		
Power Supply Rejection	PSRR	–	70	–	dB	Ro=100Ω ,Co=2.2mF,f=1kHz	
Output Voltage Noise	eN	–	30	–	uVrms	f=10Hz~100kHz,Io=10mA,Co=2.2uF	
Ground Pin Current	I_{GND}	–	50	–	uA	V_{IN}=5V,Io=1mA~150mA	
SHDN Input Threshold	V_{SHDNH}	0.8*V_{IN}	–	V_{IN}	V	V_{SHDN}=0.8*V_{IN}	
	V_{SHDNL}	0	–	0.6		V_{SHDN}=0.6V	
SHDN Input Bias Current		–	0.01	–	uA	V_{IN}=5V,EN=0V,or 5V	
Shutdown Supply Current	I_{SD}	–	0.5	1	uA	V_{IN}=5V,Vo=0V	
Shutdown Output Voltage	Vo,SD	0	–	0.4	V	Output Loading ≤1200Ω,Vo=0V	

Note 1: V_{OUT}(E) =Effective Output Voltage (i.e. the output voltage when "V_{OUT}(T) >2.0V, $V_{IN}=V_{OUT}(T)+0.5V$; $V_{OUT}(T) \leq 2.0V$, $V_{IN}=V_{OUT}(T)+1V$; $V_{SHDN}=V_{IN}$" 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
SQ2181-15	1L152 XXXX	1.5V	SQ2181-18	1L182 XXXX	1.8V
SQ2181-20	1L202 XXXX	2.0V	SQ2181-25	1L252 XXXX	2.5V
SQ2181-27	1L272 XXXX	2.7V	SQ2181-28	1L282 XXXX	2.8V
SQ2181-2H	1L2H2 XXXX	2.85V	SQ2181-30	1L302 XXXX	3.0V
SQ2181-32	1L322 XXXX	3.2V	SQ2181-33	1L332 XXXX	3.3V

Detailed Description

The SQ2181 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 exceeds150°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 SQ2181 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress.

The SQ2181 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.

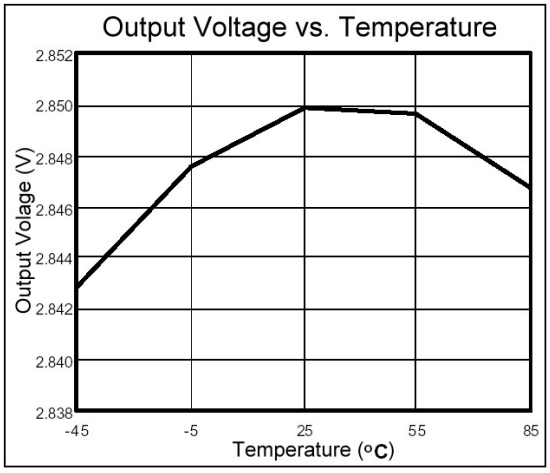
External Capacitors

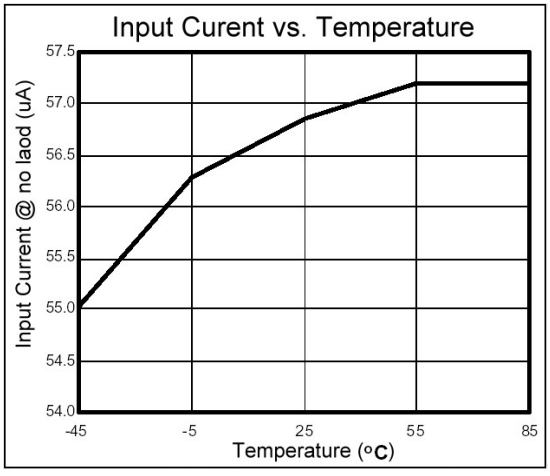
The SQ2181 is stable with an output capacitance to ground of 0.22uF or greater. Ceramic capacitors have the lowest ESR, and will offer the best AC performance. Conversely, Aluminum Elertrolytic capacitors exhibit the highest ESR, resulting in the poorest AC response. A second capacitor is recommended between the input and ground to stabilize Vin. The input capacitor should be at least 0.1uF 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 . The can be achieved with a "Star" connection.

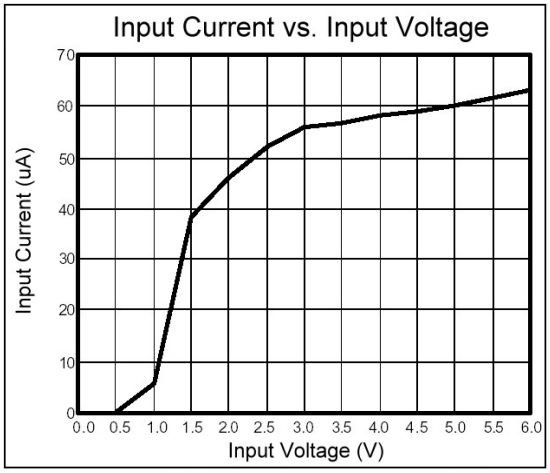
Shutdown

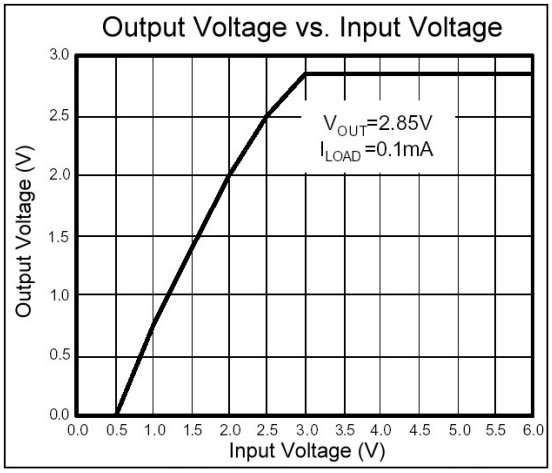
When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In the state, the quiescent current is less than 1uA. This pin behaves much like an electronic switch.

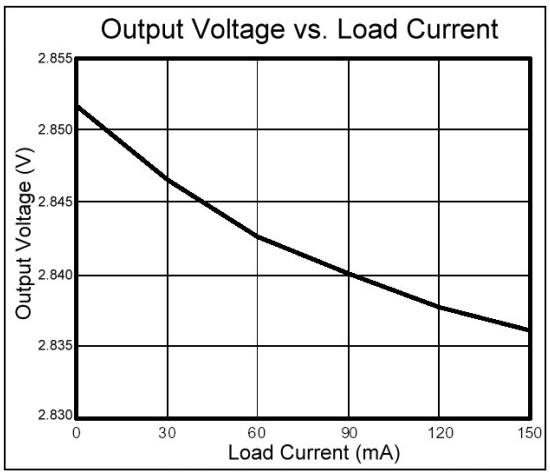
Characteristics Curve

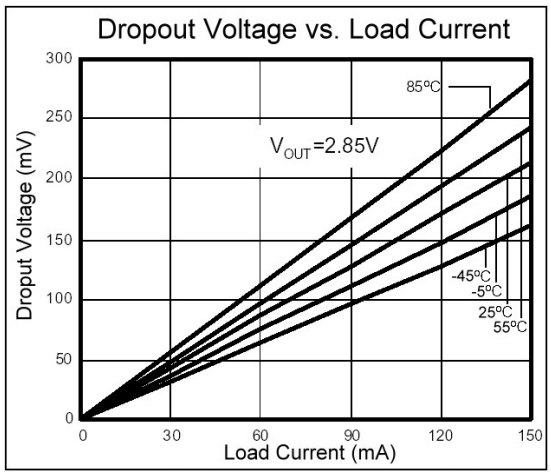


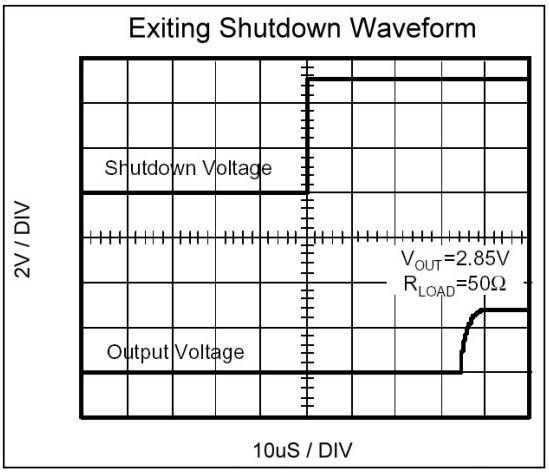


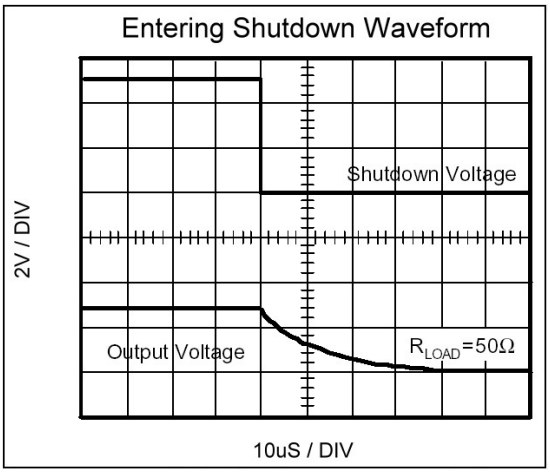

Input Current vs. Input Voltage
Input Current (uA)
Input Voltage (V)
0 10 20 30 40 50 60 70
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0

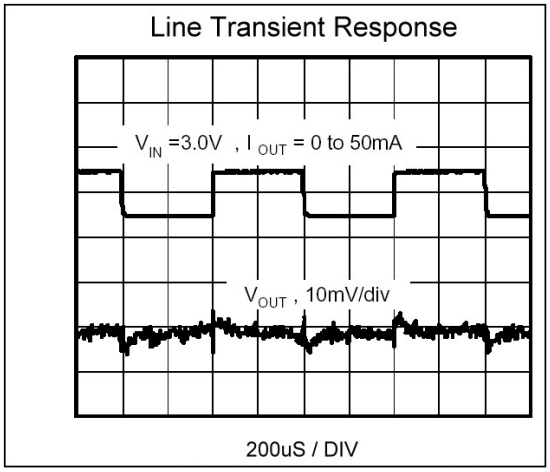

Output Voltage vs. Input Voltage
Output Voltage (V)
Input Voltage (V)
V_{OUT}=2.85V
I_{LOAD}=0.1mA
0.0 0.5 1.0 1.5 2.0 2.5 3.0
0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0

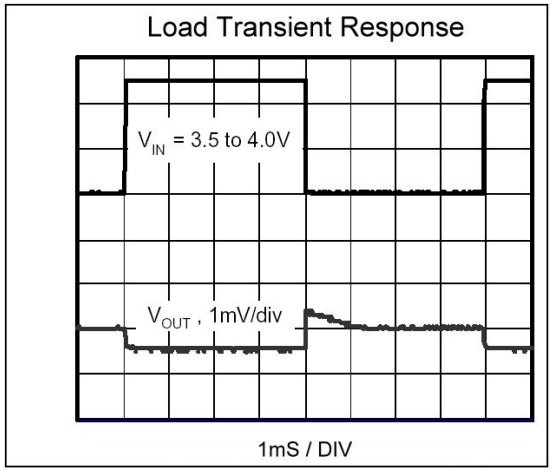

Output Voltage vs. Load Current
Output Voltage (V)
Load Current (mA)
2.830 2.835 2.840 2.845 2.850 2.855
0 30 60 90 120 150

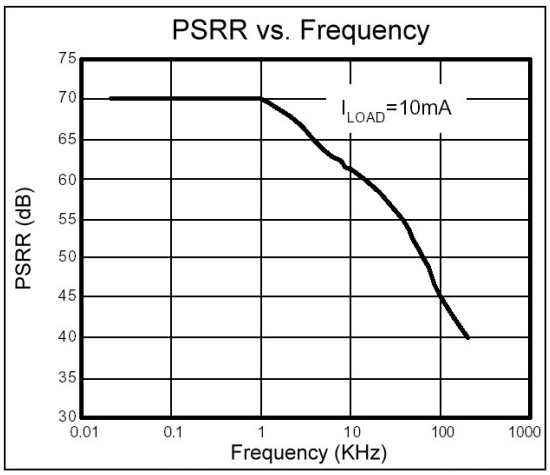

Dropout Voltage vs. Load Current
Droput Voltage (mV)
Load Current (mA)
V_{OUT}=2.85V
85ºC
-45ºC
-5ºC
25ºC
55ºC
0 50 100 150 200 250 300
0 30 60 90 120 150

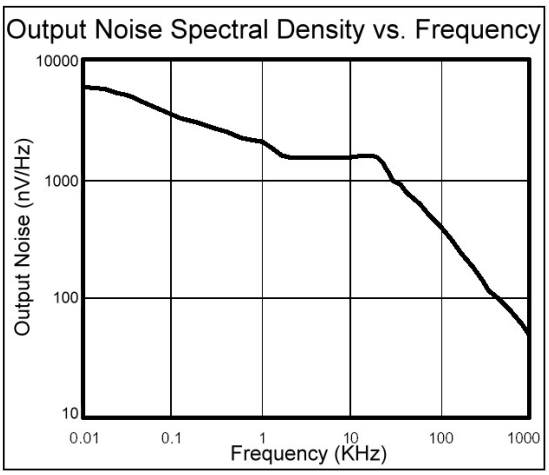

Exiting Shutdown Waveform
Shutdown Voltage
V_{OUT}=2.85V
R_{LOAD}=50Ω
Output Voltage
2V / DIV
10uS / DIV

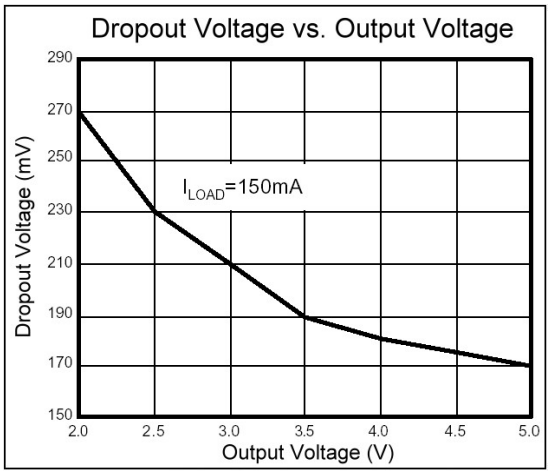

Entering Shutdown Waveform
Shutdown Voltage
Output Voltage
R_{LOAD}=50Ω
2V / DIV
10uS / DIV

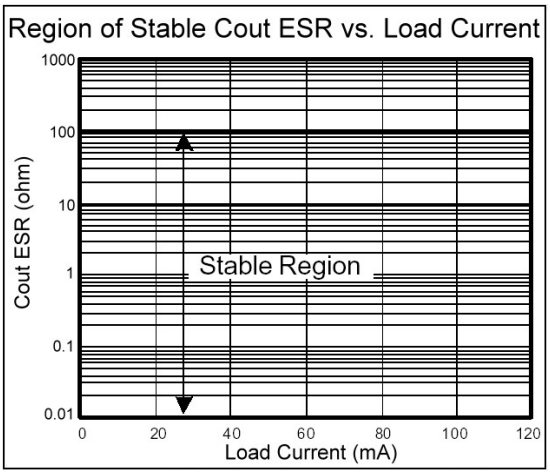

Line Transient Response
V_{IN} =3.0V , I_{OUT} = 0 to 50mA
V_{OUT} , 10mV/div
200uS / DIV


Load Transient Response
V_{IN} = 3.5 to 4.0V
V_{OUT} , 1mV/div
1mS / DIV


PSRR vs. Frequency
I_{LOAD}=10mA
PSRR (dB)
75
70
65
60
55
50
45
40
35
30
0.01
0.1
1
10
100
1000
Frequency (KHz)


Output Noise Spectral Density vs. Frequency
Output Noise (nV/Hz)
10000
1000
100
10
0.01
0.1
1
10
100
1000
Frequency (KHz)


Dropout Voltage vs. Output Voltage
I_{LOAD}=150mA
Dropout Voltage (mV)
290
270
250
230
210
190
170
150
2.0
2.5
3.0
3.5
4.0
4.5
5.0
Output Voltage (V)


Region of Stable Cout ESR vs. Load Current
Cout ESR (ohm)
1000
100
10
1
0.1
0.01
Stable Region
0
20
40
60
80
100
120
Load Current (mA)