

Description

The SQ2171 of positive, linear regulator feature low quiescent current (50 μ A typ.) with low dropout voltage and excellent PSRR, thus making them ideal for Telecommunications and other battery applications. 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 SQ2171 is stable with an output capacitance of 2.2 μ F or greater.

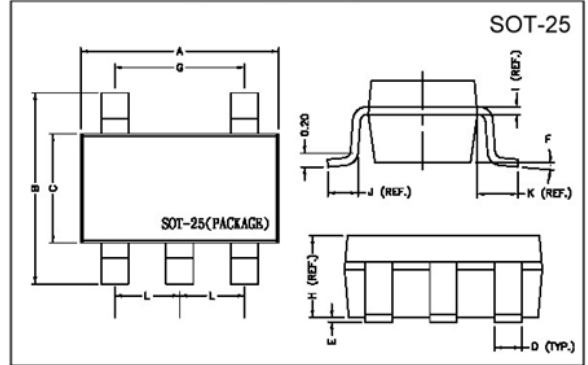
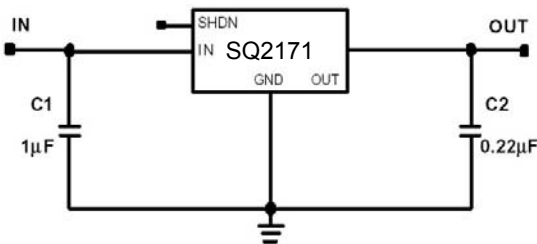
Features

- * 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

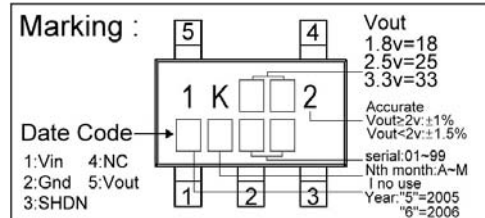
Applications

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

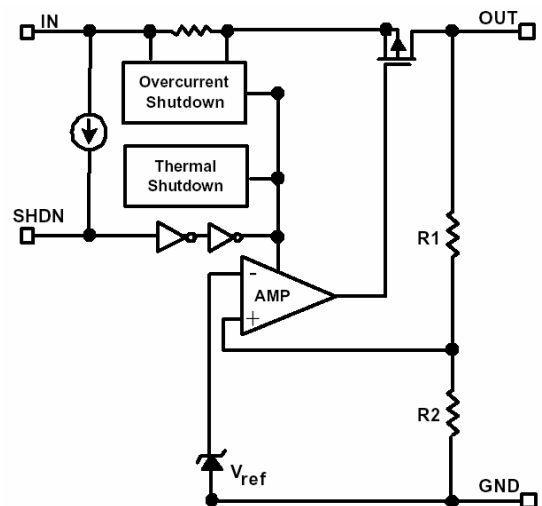
Typical Application Circuit



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.



Functional Block Diagram



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	T_{opr}	-40~+85	°C
Junction Temperature	T_j	-40~+125	°C
Max. Junction Temperature	$T_j \text{ Max.}$	150	°C
Power Dissipation ($\Delta T=100^\circ\text{C}$)	P_D	380	mW
EDS Classification		B	

Electrical Characteristics $T_a=25^\circ\text{C}$ unless otherwise noted

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
Output Voltage	$V_{OUT}(E)^1$	-1.0	$V_{OUT}(E)^2$	1.0	V	$I_O=0.1\text{mA}$, $V_{OUT}(T) \geq 2.0\text{V}$
		-1.5		1.5		$I_O=0.1\text{mA}$, $V_{OUT}(T) < 2.0\text{V}$
		-2.0		2.0		$I_O=150\text{mA}$
Current Limit	I_{LIM}	150	200	-	mA	$V_O > 800\text{mV}$
Fold-Back Current	I_{FB}	-	80	-	μA	$V_O=0\text{V}$
Load Regulation	REG_{LOAD}	-1	0.5	1	%	$V_{OUT} > 2.0\text{V}$, $V_{IN}=V_{OUT}(T)+0.5\text{V}$
		-2	-	2		$V_{OUT} \leq 2.0\text{V}$, $V_{IN}=V_{OUT}(T)+1.0\text{V}$
Dropout Voltage	$V_{DROPOUT}$	-	300	500	mV	$V_{OUT}(T) \geq 2.0\text{V}$
		-	700	1000		$1.8\text{V} \leq V_{OUT}(T) < 2.0\text{V}$
		-	900	1300		$1.5\text{V} \leq V_{OUT}(T) < 1.8\text{V}$
Quiescent Current	I_Q	-	60	-	μA	$V_{IN}=5\text{V}$, $I_O=0\text{mA}$
Line Regulation	REG_{LINE}	-0.2	0.1	0.2	%	$I_O=0.1\text{mA}$, $V_{OUT} > 2.0\text{V}$ $V_{IN}=V_{OUT}(T)+0.5\text{V} \sim 5.5\text{V}$
		-0.4	-	0.4		$I_O=0.1\text{mA}$, $V_{OUT} \leq 2.0\text{V}$ $V_{IN}=V_{OUT}(T)+0.5\text{V} \sim 5.5\text{V}$
Input Voltage	V_{IN}	Note ³	-	5.5	V	
Over Temperature Shutdown	O_{TS}	-	137	-	°C	
Over Temperature Hysteresis	O_{TH}	-	23	-	°C	
Output Voltage Temperature Coefficient	T_C	-	30	-	ppm/°C	
Power Supply Rejection	PSRR	-	70	-	dB	$R_O=100\Omega$, $C_O=2.2\text{mF}$, $f=1\text{kHz}$
Output Voltage Noise	eN	-	30	-	μV_{rms}	$f=10\text{Hz} \sim 100\text{kHz}$, $I_O=10\text{mA}$, $C_O=2.2\mu\text{F}$
Ground Pin Current	I_{GND}	-	50	-	μA	$V_{IN}=5\text{V}$, $I_O=1\text{mA} \sim 150\text{mA}$
SHDN Input Threshold	V_{SHDNH}	$0.8 \cdot V_{IN}$	-	V_{IN}	V	$V_{SHDN}=0.8 \cdot V_{IN}$
	V_{SHDNL}	0	-	0.6		$V_{SHDN}=0.6\text{V}$
SHDN Input Bias Current		-	0.01	-	μA	$V_{IN}=5\text{V}$, $E_N=0\text{V}$, or 5V
Shutdown Supply Current	I_{SD}	-	0.5	1	μA	$V_{IN}=5\text{V}$, $V_O=0\text{V}$
Shutdown Output Voltage	$V_{O,SD}$	0	-	0.4	V	Output Loading $\leq 1200\Omega$, $V_O=0\text{V}$

Note 1: $V_{OUT}(E)$ =Effective Output Voltage (i.e. the output voltage when " $V_{OUT}(T) > 2.0\text{V}$, $V_{IN}=V_{OUT}(T)+0.5\text{V}$; $V_{OUT}(T) \leq 2.0\text{V}$, $V_{IN}=V_{OUT}(T)+1\text{V}$; $V_{SHDN}=V_{IN}$ " is provided at the V_{IN} pin while maintaining a certain I_{OUT} value).

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

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

Ordering Information(contd.)

Part Number	Marking	Output Voltage	Part Number	Marking	Output Voltage
SQ2171-15	1K152 XXXX	1.5V	SQ2171-18	1K182 XXXX	1.8V
SQ2171-20	1K202 XXXX	2.0V	SQ2171-25	1K252 XXXX	2.5V
SQ2171-27	1K272 XXXX	2.7V	SQ2171-28	1K282 XXXX	2.8V
SQ2171-2H	1K2H2 XXXX	2.85V	SQ2171-30	1K302 XXXX	3.0V
SQ2171-32	1K322 XXXX	3.2V	SQ2171-33	1K332 XXXX	3.3V

Detailed Description

The SQ2171 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 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 SQ2171 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The SQ2171 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 SQ2171 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 0.1µF 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 the state, the quiescent current is less than 1µA. This pin behaves much like an electronic switch.

Characteristics Curve

