深圳市富满电子有限公司
SHENZHEN FUMAN ELECTRONICS CO., LTD.

SC9167 (文件编号：S&CIC0661) 300mA CMOS LDO

General Description

The SC9167 family of positive, linear regulators feature low quiescent current (30uA typ.) with low dropout voltage, making them ideal for battery applications. The space-saving SOT-25 package is attractive for "Pocket" and "Hand Held" applications.

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

In applications requiring a low noise, regulated supply, place a 1000 pF capacitor between Bypass and Ground.

The SC9167 is stable with an output capacitance of 2.2uF or greater.

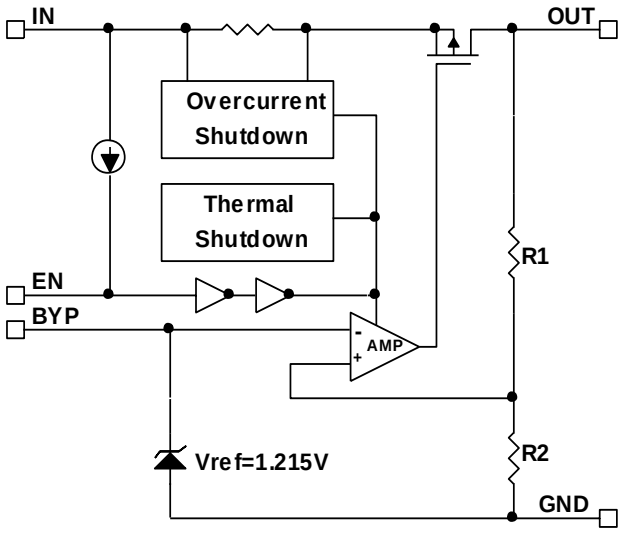
Features

- Very Low Dropout Voltage
- Guaranteed 300mA Output
- Accurate to within 1.5%
- 30 uA Quiescent Current
- Over-Temperature Shutdown
- Current Limiting
- Short Circuit Current Fold-back
- Noise Reduction Bypass Capacitor
- Power-Saving Shutdown Mode
- Space-Saving SOT-25 Packages
- Factory Pre-set Output Voltages
- Low Temperature Coefficient
- All DS's Lead Free Product Meet ROHS Standards

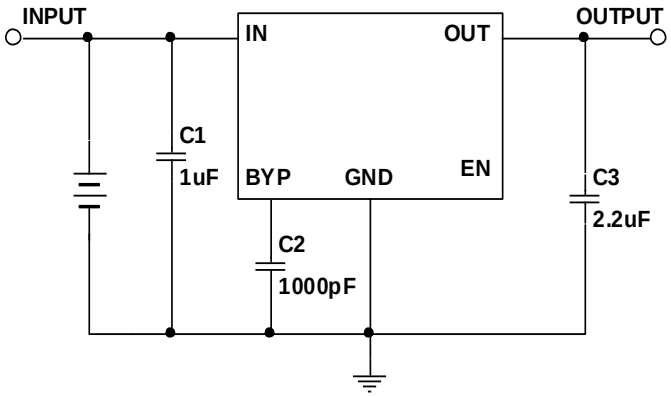
Applications

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

Functional Block Diagram



Typical Applications



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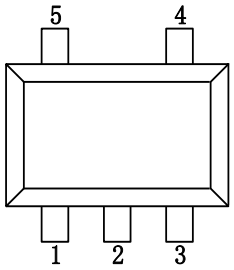
Pin Configuration

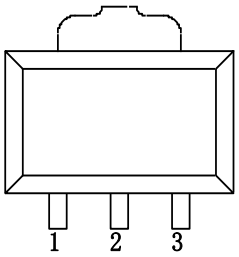
SC9167	
1	VIN
2	GND
3	EN
4	BYP
5	OUT

SOT-25



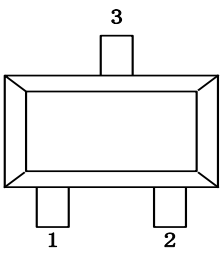
SC9167	
1	GND
2	VDD
3	OUT

SOT-89



SC9167	
1	GND
2	OUT
3	VDD

SOT-23



* Die Attach: Conductive Epoxy

Absolute Maximum Ratings

Parameter	Maximum	Unit
Input Voltage	5.5	V
Output Current	PD/(VIN-VO)	mA
Output Vltage	GND-0.3 to VIN +0.3	V
ESD Classification	3*	

Caution: Stress above the listed absolute maximum rating may cause permanent damage to the device.

* HBM CLASS 3:≥4000V

Recommended Operating Conditions

Parameter	Symbol	Rating	Unit
Ambient temperature range	T_A	-40 to +85	℃
Junction temperature range	T_J	-40 to +125	℃

Thermal Information

Parameter	Package	Die Attach	Symbol	Max	Unit
Thermal resistance (Junction to case)	*SOT-25	Conductive Epoxy	θ_{JC}	81	℃/W
Thermal resistance (Junction to ambient)	SOT-25	Conductive Epoxy	θ_{JA}	260	
Internal power Dissipation	SOT-25	Conductive Epoxy	P_D	400	mW
Maximum junction temperature				150	℃
Solder lron (10Sec)**				350	℃

* Measure θ_{JC} on center of molding compound if IC has no tab. ** MIL-STD-202G 210F

Electrical Specifications (TA=25℃ unless otherwise noted)

parameter	Symbol	Test Condition		Min	Typ	Max	Units
Input voltage	V_{IN}	--		Note 1	--	6.5	V
Output voltage accuracy	Vo	Io=1mA		-1.5	--	1.5	%
		Io=300mA		-2.5	--	2.5	
Dropout voltage	$V_{DROPOUT}$	Io=300mA Vo=$Vo_{(NOM)}$ -2.0%	1.2V≤$Vo_{(NOM)}$≤2.0V	--	--	1300	mV
			2.0V<$Vo_{(NOM)}$≤2.8V	--	--	400	
			2.8<$Vo_{(NOM)}$	--	--	300	
Output current	Io	Vo>1.2V		300	--	--	mA
Current limit	I_{LIM}	Vo>1.2V		300	450	--	mA
Short circuit current, Note2	Isc	Vo<0.8V		--	150	300	mA
Quiescent current	I_Q	Io=0mA		--	30	50	uA
Ground pin current	I_{GND}	Io=1mA to 300mA		--	35	--	uA
Line regulation	REG_{LINE}	Io=1mA VIN=Vo+1 to Vo+2	1.2V≤Vo≤1.4V	-0.2	--	0.2	%
			1.4V<Vo≤2.0V	-0.15	--	0.15	
			2.0V<Vo<4.0V	-0.1	0.02	0.1	
			4.0V<Vo	-0.4	0.2	0.4	
Load regulation	REG_{LOAD}	Io=1mA to 300mA		-1	0.2	1	%
Over temperature shutdown	OTS			--	150	--	℃
Over temperature hysterics	OTH			--	30	--	℃
Vo temperature coefficient	TC			--	30	--	ppm/℃
Power supply rejection	PSRR	Io=100mA Co=2.2uF	f=100Hz	--	60	--	dB
			f=1KHz	--	50	--	dB
			f=10KHz	--	20	--	dB
Output voltage noise	eN	f=10Hz to 100KHz Io=10mA	Co=2.2uF	--	30	--	uVrms

EN input threshold	V_{EH}	V_{IN}=2.7V to 5.5V	2	--	Vin	V
	V_{EL}	V_{IN}=2.7V to 5.5V	0	--	0.4	V
EN input bias current	I_{EH}	V_{EN}=V_{IN}, V_{IN}=2.7V to 5.5V	--	--	0.1	uA
	I_{EL}	V_{EN}=0V, V_{IN}=2.7V to 5.5V	--	--	0.5	uA
Shutdown supply current	I_{SD}	V_{IN}=5V, Vo=0V. V_{EN}<V_{EL}	--	0.5	1	uA
Shutdown output voltage	$V_{O,SD}$	Io=0.4mA, V_{EN}<V_{EL}	0	--	0.4	V

Note1: $V_{IN(MIN)}$=V_{OUT}+$V_{DROPOUT}$

Note2: To prevent the short circuit current protection feature from being prematurely activated, the input voltage must be applied before a current source load is applied.

Detailed Description

The SC9167 family of CMOS 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℃, or the current exceeds 300mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 120℃.

The SC9167 switches from voltage mode to current mode when the load exceeds the rated output current. This prevents over-stress. The SC9167 also incorporates current foldback to reduce power dissipation when the output is short circuited. This feature becomes active when the output drops below 0.8volts, and reduces the current flow by 65%. Full current is restored when the voltage exceeds 0.8 volts.

External Capacitors

The SC9167 is stable with an output capacitor to ground of 2.2uF 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 0.1uF

ceramic capacitor with a 10uF 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 Vin. The input capacitor should be at least 0.1uF to have a beneficial effect.

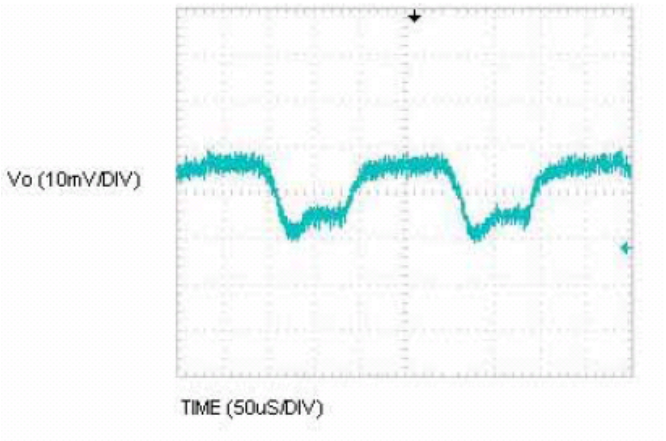
A third capacitor can be connected between the BYPASS pin and GND. This capacitor can be a low cost Polyester Film variety between the value of 0.001~0.01uF. A larger capacitor improves the AC ripple rejection, but also makes the output come up slowly. This "Soft" turn-on is desirable in some applications 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.

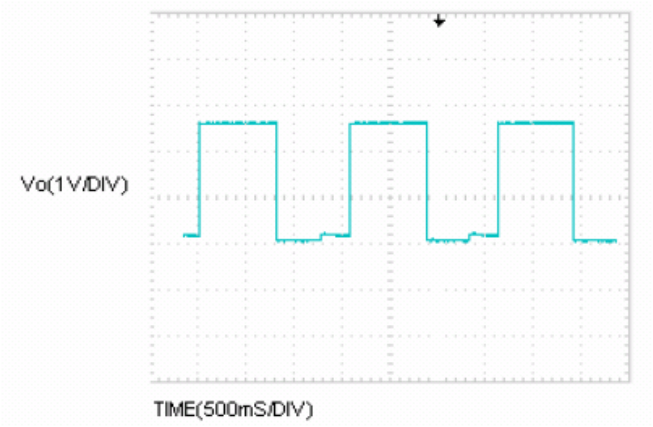
Enable

The Enable pin normally floats high. 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 1uA. This pin behaves much like an electronic switch.

Load Step (1mA—300mA)

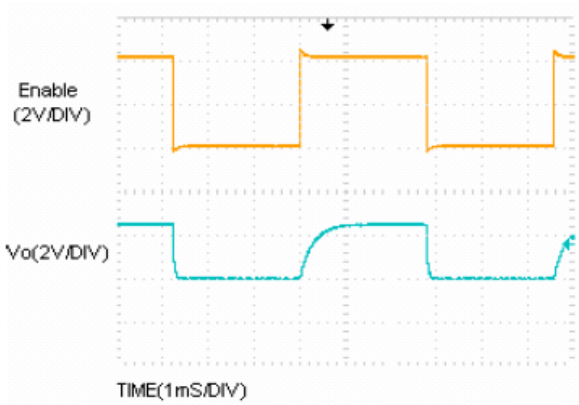


Overtemperature Shutdown



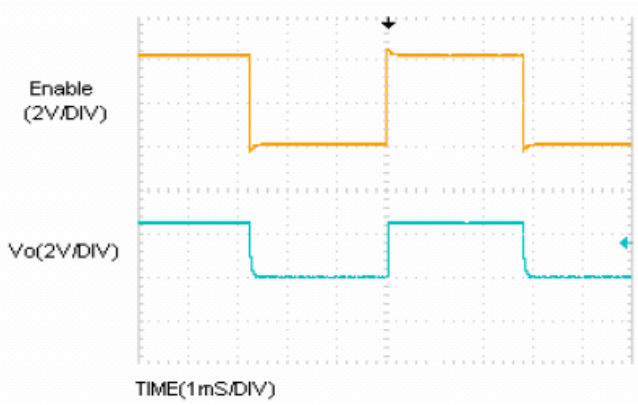
Vin=5V Io=300mA

Chip Enable Transient Response



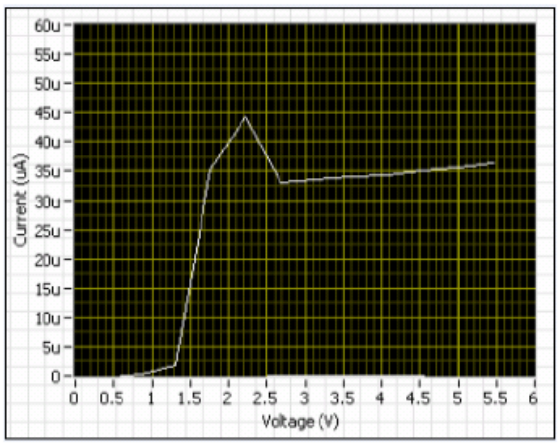
C_L=2.2uF R_L=10Ω C_{BYP}=1000pF

Chip Enable Transient Response



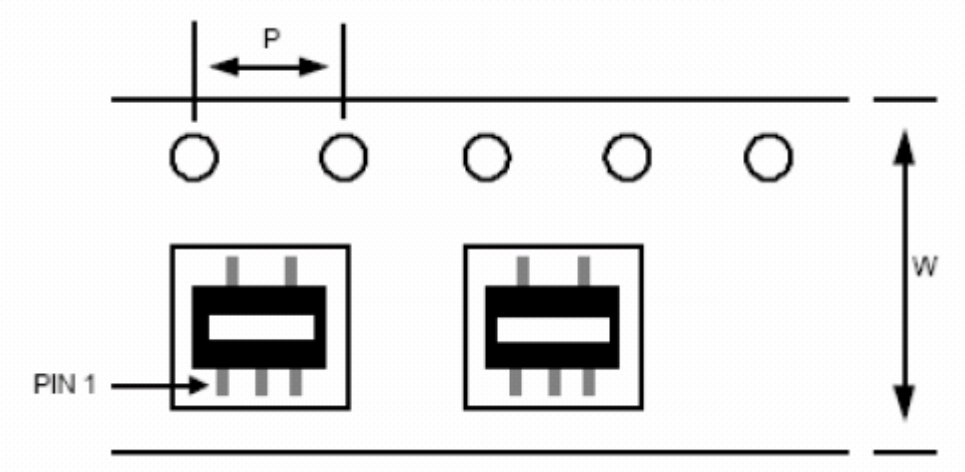
C_L=2.2uF R_L=10Ω

Ground Current vs. Input Voltage



Tape and Reel Dimension

SOT-25



Carrier Tape, Number of Components Per Reel and Reel Size

Package	Carrier Width (W)	Pitch (P)	Part Per Full Reel	Reel Size
SOT-25	8.0±0.1mm	4.0±0.1mm	3000PCS	180±1mm