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TS9015

300mA CMOS LDO
0.9V Adjustable Voltage with Enable Function

SOT-25

Pin Definition:
1. Input
2. Ground
3. Enable
4. Adjustable
5. Output

General Description

The TS9015 is a low dropout voltage linear regulator. There are device designed specifically for battery-operated systems. Ground current is very small as 50uA(typ), that significantly extending battery life. Low power consumption and high accuracy is achieved through CMOS and programmable fuse technologies. Output voltage is able to adjust from 1V to 6V. The TS9015 consists of a high-precision voltage reference, and error correction circuit, and a current limited output driver. With good transient responses, output remains stable even during load changes. The EN input enables to be turned off, resulting in reduced power consumption.

TS9015 have high ripple rejection ratios, a 470pF capacitor from the Bypass pin to ground to reduces noise present on the internal reference, which in turn significantly reduces output noise. If output noise is not a concern, the Bypass pin may be left unconnected. Larger capacitor values can be used, but the results in a longer time period to rate output voltage when power is initially applied.

Features

- Output current is excess of 300mA
- Low power consumption: 50uA(typ.)
- Output voltage ±2%
- Internal current limit
- Thermal shutdown
- Power saving shutdown mode
- P-MOS output stage with low Rds(on)
- Adjustable output voltage from 1V to 5.4V

Applications

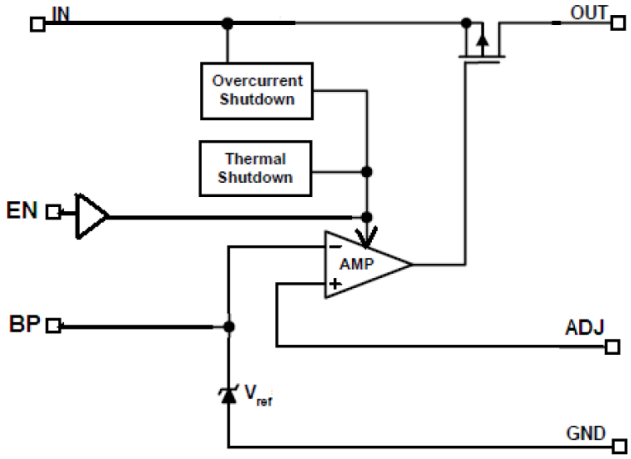
- Instrumentation
- Wireless device
- Battery powered equipment
- Electronic scales
- Cordless phone

Ordering Information

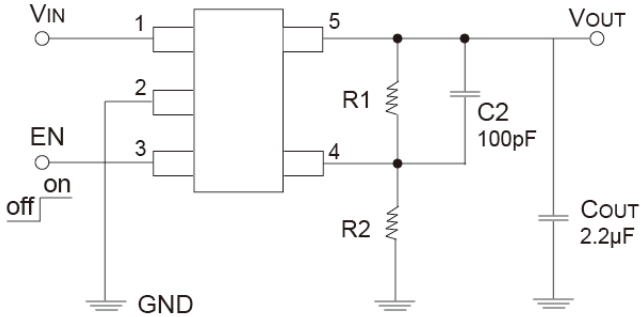
Part No.	Package	Packing
TS9015CX5 RFG	SOT-25	3Kpcs / 7” Reel

Note: “G” denote for Halogen Free Product

Block Diagram



Typical Application Circuit



V_{OUT} = 0.9 (1 + R1 / R2)

C2 is unnecessary when R1 or R2 < 20K

TS9015

300mA CMOS LDO
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Absolute Maximum Rating

Parameter	Symbol	Limit	Unit
Input Supply Voltage	V_{IN}	+2.0 ~ +7	V
Enable Input Voltage	V_{CE}	Gnd-0.3 ~ V_{IN} +0.3	V
Output Current	I_O	500	mA
Power Dissipation @ $T_A \leqq 25^oC$	P_D	400	mW
Thermal Resistance	Θ_{JA}	140	$^oC/W$
Operating Junction Temperature Range	T_J	-40 ~ +125	^oC
Storage Temperature Range	T_{STG}	-65 ~ +150	^oC
Lead Soldering Temperature (260^{o}C)		10	S

Notes 1: Stress above the listed absolute rating may cause permanent damage to the device.
Notes 2: Θ_{JA} is measured with the PCB copper area of approximately 1 in^2(multi-layer)

Electrical Characteristics (Vin=Vout +2V, Ta = 25°C, unless otherwise noted)

Parameter	Symbol	Test Condition		Min	Typ	Max	Units
Input Voltage	V_{IN}	(Note 1)		2.0	--	7	V
Dropout Voltage	V_{DROP}	I_O =300mA, V_O =$V_{O(NOM)}$ - 2.0%	1.0V< $V_{O(NOM}$ ≤2.0V	--	650	1000	mV
			2.0V< $V_{O(NOM}$ ≤2.8V	--	450	700	
			2.8V< $V_{O(NOM}$	--	300	500	
Output Current	I_O	V_O >0.96*Vrating		300	--	--	mA
Current Limit	I_{LIM}			--	500	--	mA
Ground Pin Current	I_{GND}	I_O =1mA to 150mA		--	50	85	uA
Line Regulation	REG_{LINE}	I_O =1mA	V_O < 2.0V	--	--	0.1	%
		V_{IN}= V_O +1 to V_O +2	V_O ≥ 2.0V	--	--	0.15	%
Load Regulation	REG_{LOAD}	I_O =10mA to 300mA		--	0.2	1	%
Over Temp. Shutdown	OTS			--	125	--	°C
Over Temp. Hysterisis	OTH			--	30	--	°C
Power Supply Rejection	PSRR	I_O =200mA, C_O=2.2mF	f=100Hz	--	60	--	dB
			f=1kHz	--	50	--	
			f=10kHz	--	35	--	
Output Voltage Noise	eN	f=10Hz to 100kHz, I_O =10mA	C_O =2.2nF	--	30	--	uVrms
ADJ Input Bias Current	I_{ADJ}			--	1	--	uA
ADJ Reference Voltage	V_{REF}			0.87	0.9	0.918	V
EN Input Threshold	V_{EH}	I_O =10mA		1.6	--	V_{IN}	V
	V_{EL}	I_O =10mA		0	--	0.4	V
EN Input Bias Current	I_{EH}	V_{EN}= V_{IN}, V_{IN} =2.5V to 7V		--	--	0.1	uA
	I_{EL}	V_{EN} =0V, V_{IN} =2.5V to 7V		--	--	1	uA

Note 1: $V_{IN(MIN)}$=V_{OUT}+$V_{DROPOUT}$
Note 2: 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 TS9015 of CMOS regulators contain a PMOS pass transistor, voltage reference, error amplifier, over-current protection and thermal shutdown. 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 300mA. During thermal shutdown, the output voltage remains low. Normal operation is restored when the junction temperature drops below 100 °C. The TS9015 switches from voltage mode to current mode when the load exceeds the rated output current.

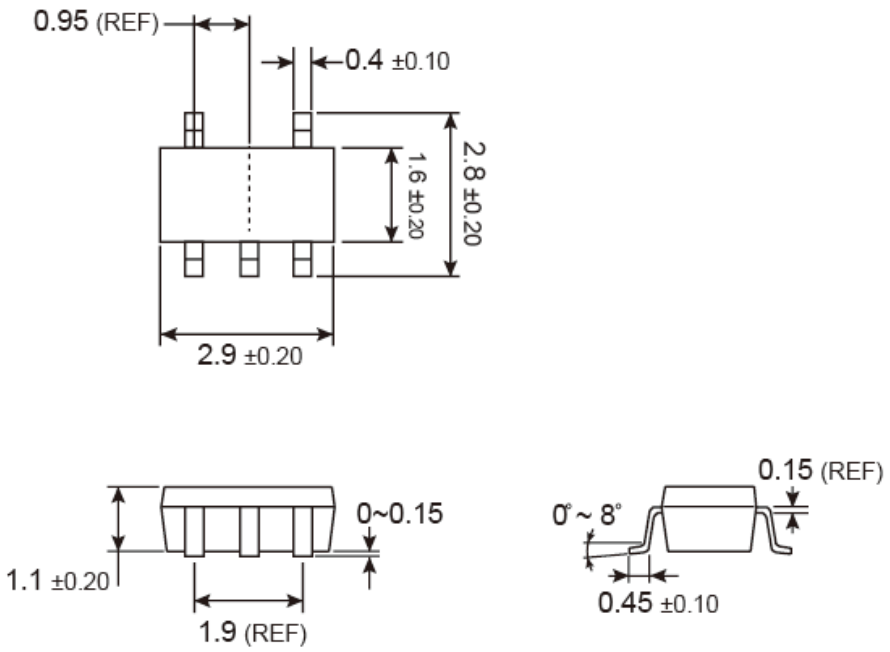
External Capacitors

The TS9015 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 V_{IN}. The input capacitor should be at least 0.1uF 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

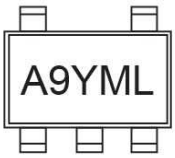
The Enable pin normally floats high. When actively, pulled low, the PMOS pass transistor shuts off, and all internal circuits are powered down. In this state, the quiescent current is less than 1mA. This pin behaves much like an electronic switch.

SOT-25 Mechanical Drawing



Unit: Millimeters

Marking Diagram



A9 = Device Code
Y = Year Code
M = Month Code for Halogen Free Product
(**O**=Jan, **P**=Feb, **Q**=Mar, **R**=Apl, **S**=May, **T**=Jun, **U**=Jul, **V**=Aug, **W**=Sep, **X**=Oct, **Y**=Nov, **Z**=Dec)
L = Lot Code

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