



# TS9013

## 500mA CMOS Low Dropout Voltage Regulator

SOT-89



SOT-223



### Pin assignment

#### SOT-89

1. Gnd
2. Input
3. Output

#### SOT-223

1. Input
2. Gnd
3. Output

**Low Power Consumption 2uA(typ)**  
**Low Drop Out Voltage 0.6V**

### General Description

The TS9013 series is a positive voltage regulator developed utilizing CMOS technology featured very low power consumption, low dropout voltage and high output voltage accuracy. Built in low on-resistor provides low dropout voltage and large output current. A 1uF or greater can be used as an output capacitor.

The TS9013 series are prevented device failure under the worst operation condition with both thermal shutdown and current fold-back. These series are recommended for configuring portable devices and large current application, respectively.

This series are offered in 3-pin SOT-89 and SOT-223 package.

### Features

- ◇ Dropout voltage typically 0.4V @Io=500mA (Vo=5V)
- ◇ Output current up to 500mA
- ◇ Low power consumption, 2uA(typ) @Vo=5V
- ◇ Output voltage +/-2%
- ◇ Internal current limit
- ◇ Thermal shutdown protection

### Applications

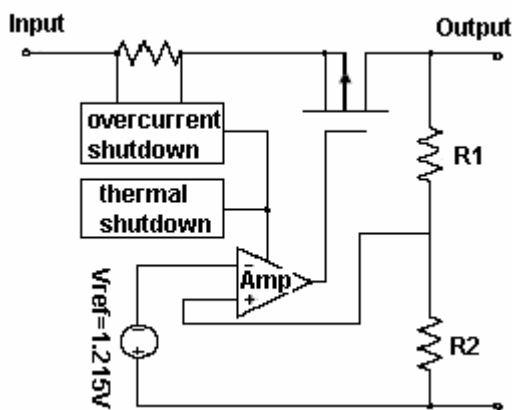
- ◇ Palmtops
- ◇ Video recorders
- ◇ Battery powered equipment
- ◇ PC peripherals
- ◇ CD-ROM, DVD ROM
- ◇ Digital signal camera

### Ordering Information

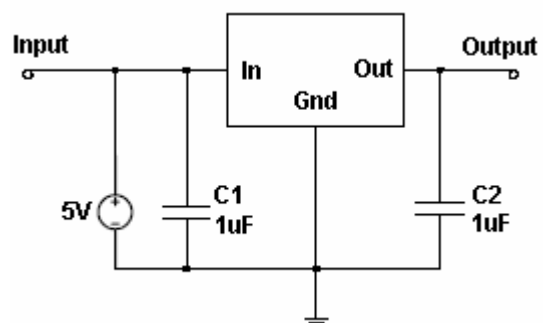
Part No.	Operating Temp. (Ambient)	Package
TS9013xCW	-20 ~ +85 °C	SOT-223
TS9013xCY		SOT-89

Note: Where **x** denotes voltage option, available are A=1.5V, D=1.8V, K=2.5V, S=3.3V, 5=5.0V. Contact factory for additional voltage options.

### Block Diagram



### Typical Application Circuit





Absolute Maximum Rating				
Input Supply Voltage	Vin(max.)	+12	V	
Input Operating Voltage	Vin(opr. Typ.)	+10		
Output Current	Io	PD / (Vin – Vo)	V	
Power Dissipation (without heat sink)	SOT-89	PD	0.55	W
	SOT-223		0.625	
Thermal Resistance	SOT-89	Rθja	180	°C/W
	SOT-223		160	
Thermal Resistance	SOT-89	Rθjc	18	°C/W
	SOT-223		15	
Operating Junction Temperature Range	Tj	-40 ~ +125	°C	
Storage Temperature Range	TSTG	-65 ~ +150	°C	
Lead Soldering Temperature (260 °C)		10	S	

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

### Electrical Characteristics

Ta = 25 °C unless otherwise specified.

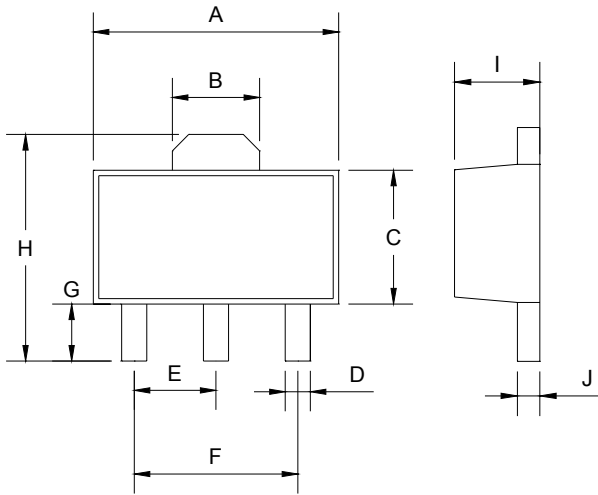
Parameter	Conditions	Min	Typ	Max	Unit	
Output Voltage	Vin=Vo + 1V, Io =10mA,	TS90135	4.900	5.0	5.100	V
		TS9013S	3.234	3.3	3.366	
		TS9013K	2.450	2.5	2.550	
		TS9013D	1.764	1.8	1.836	
		TS9013A	1.47	1.5	1.575	
Maximum Output Current	Vin=Vo+1V,	500	--	--	mA	
Input Stability	Vo+1V ≤ Vin ≤ Vo+2V, Io=1mA	--	0.2	0.3	%	
Load Regulation (Note1)	Vin=Vo+1V, 1mA ≤ IL ≤ 500mA	TS90135	--	40	80	mV
		TS9013S	--	40	80	
	Vin=Vo+1V, 1mA ≤ IL ≤ 400mA	TS9013K	--	40	90	
		TS9013D	--	40	90	
Dropout Voltage (Note 2)	Io=500mA	TS90135	--	600	750	mV
		TS9013S	--	600	750	
	Io=400mA	TS9013K	--	600	850	
		TS9013D	--	600	850	
		TS9013A	--	850	1100	
Quiescent Current	Vin=Vo+1V, Io=0A	--	2	5	uA	
Output Current Limit	Vout < 0.4V	--	550	--	mA	
Power Supply Rejection Ratio	At f=100KHz, Io=10mA,	--	30	--	dB	
Output Voltage Temperature Coefficient (Note 3)		--	100	--	ppm/°C	

Note: 1. Regulation is measured at constant junction temperature, using pulsed ON time.

2. Dropout is measured at constant junction temperature, using pulsed ON time, and the criterion is Vout inside target value +/-2%.

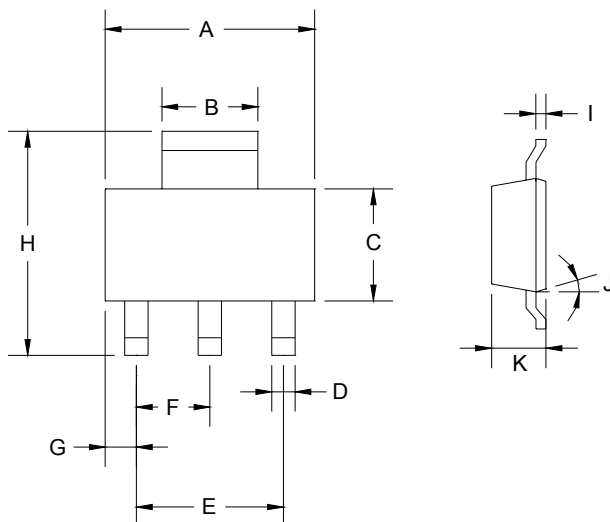
3. Guaranteed by design.

## SOT-89 Mechanical Drawing



SOT-89 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	4.40	4.60	0.173	0.181
B	1.50	1.7	0.059	0.070
C	2.30	2.60	0.090	0.102
D	0.40	0.52	0.016	0.020
E	1.50	1.50	0.059	0.059
F	3.00	3.00	0.118	0.118
G	0.89	1.20	0.035	0.047
H	4.05	4.25	0.159	0.167
I	1.4	1.6	0.055	0.068
J	0.35	0.44	0.014	0.017

## SOT-223 Mechanical Drawing



SOT-223 DIMENSION				
DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	6.350	6.850	0.250	0.270
B	2.900	3.100	0.114	0.122
C	3.450	3.750	0.136	0.148
D	0.595	0.635	0.023	0.025
E	4.550	4.650	0.179	0.183
F	2.250	2.350	0.088	0.093
G	0.835	1.035	0.032	0.041
H	6.700	7.300	0.263	0.287
I	0.250	0.355	0.010	0.014
J	10°	16°	10°	16°
K	1.550	1.800	0.061	0.071