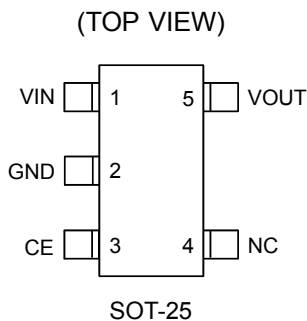


### DESCRIPTION

The TCS2109 series are highly precise, low noise, positive voltage LDO regulators manufactured using CMOS processes. The series achieves high ripple rejection and low dropout and consists of a standard voltage source, an error correction, current limiter and a phase compensation circuit plus a driver transistor. Output voltage is selectable in 100mV increments within a range of 2.0V ~ 5.5V. The series is also compatible with low ESR ceramic capacitors which give added output stability. This stability can be maintained even during load fluctuations due to the excellent transient response of the series.

The current limiter's foldback circuit also operates as a short protect for the output current limiter and the output pin. The CE function enables the output to be turned off, resulting in greatly reduced power consumption.

### Pin Configurations



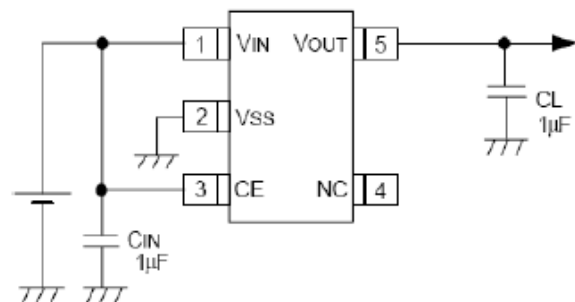
### FEATURES

- Output Voltage Range 2.0V to 5.5V (selectable in 100mV steps)
- Highly Accurate  $\pm 2\%$
- Dropout Voltage 300mV @ 100mA (3.0V type)
- High Ripple Rejection 70dB (10 kHz)
- Low Power Consumption 70  $\mu$  A (TYP)
- Maximum Output Current 500mA
- Standby Current less than 2 $\mu$ A
- Internal protector current limiter and short protector
- Small packages SOT-25

### APPLICATIONS

- Mobile phones
- Cordless phones
- Cameras, Video cameras
- Portable games
- Portable AV equipment
- Reference voltage
- Battery powered equipment

### TYPICAL APPLICATION CIRCUIT



### Order Information

Pd-Free Package	Temperature	Order Part Number	Quantity/Reel	Marking
SOT23-5	-40°C to 85 °C	TCS2109_Exx	3000PCS	In kind, whichever

### BLOCK DIAGRAM

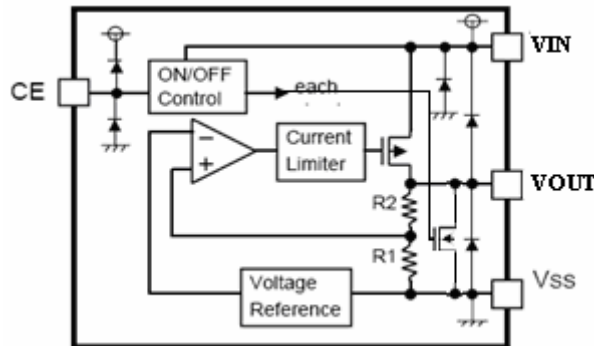


Figure 1

### ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	MAXIMUM RATING	UNIT
Input Voltage	$V_{IN}$	$V_{SS}-0.3 \sim V_{SS}+8$	V
	$V_{ON/OFF}$	$V_{SS}-0.3 \sim V_{IN}+0.3$	
Output Current	$V_{OUT}$	$V_{SS}-0.3 \sim V_{IN}+0.3$	
Power Dissipation	$P_D$	250	mW
Operating Ambient Temperature	$T_{opr}$	-40 ~ +85	°C
Storage Temperature	$T_{stg}$	-40 ~ +125	

**Caution:** The absolute maximum ratings are rated values exceeding which the product could suffer physical damage. These values must therefore not be exceeded under any conditions.

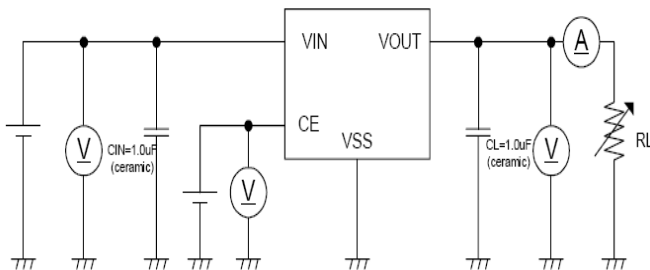
### Electrical Characteristics

PARAMETER	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	CIRCUIT
Output Voltage	$V_{OUT(E)}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , $I_{OUT} = 30 \text{ mA}$	$V_{OUT(S)} \times 0.98$	$V_{OUT(S)}$	$V_{OUT(S)} \times 1.02$	V	1
Output Current	$I_{OUT}$	$V_{IN} \geq V_{OUT(S)} + 1.0 \text{ V}$	450	500	—	mA	1
Dropout Voltage	$V_{drop}$	$I_{OUT} = 50 \text{ mA}$	—	0.12	0.20	V	1
		$I_{OUT} = 100 \text{ mA}$	—	0.30	0.45		
Line Regulations	$\frac{\Delta V_{OUT1}}{\Delta V_{IN} \cdot V_{OUT}}$	$V_{OUT(S)} + 0.5 \text{ V} \leq V_{IN} \leq 8 \text{ V}$ $I_{OUT} = 30 \text{ mA}$	—	0.10	0.2	%/V	1
Load Regulation	$\Delta V_{OUT2}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ $1.0 \text{ mA} \leq I_{OUT} \leq 100 \text{ mA}$	—	50	100	mV	1
Output Voltage Temperature	$\frac{\Delta V_{OUT}}{\Delta T_a \cdot V_{OUT}}$	$V_{IN} = V_{OUT(S)} + 1.0 \text{ V}$ , $I_{OUT} = 10 \text{ mA}$	—	$\pm 100$	—	ppm/°C	1

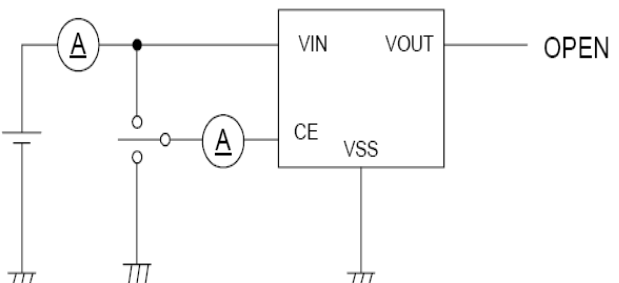
Characteristics		$-40^{\circ}\text{C} \leq T_a \leq 85^{\circ}\text{C}$					
Supply Current	$I_{SS1}$	$V_{IN}=V_{OUT(S)}+1.0\text{ V}$	—	70		$\mu\text{ A}$	2
Input Voltage	$V_{IN}$	—	2.0	—	8	V	—
Ripple-Rejection	PSRR	$V_{IN}=V_{OUT(S)}+1.0\text{ V}$ , $f=10\text{ kHz}$ $V_{rip}=0.5\text{ Vrms}$ , $I_{OUT}=50\text{ mA}$	—	70	—	dB	1
Short-circuit Current	$I_{short}$	$V_{IN}=V_{OUT(S)}+1.0\text{ V}$ , $V_{CE}$ on $V_{OUT}=\text{gnd}$	—	40	—	mA	1
CE “High” Voltage	$V_{CEH}$		1.6		$V_{IN}$	V	1
CE “Low” Voltage	$V_{CEL}$				0.25	V	1
CE “High” Current	$I_{CEH}$	$V_{IN}=V_{CE}=V_{OUT(T)}+1.0\text{ V}$	-0.1		0.1	$\mu\text{ A}$	2
CE “Low” Current	$I_{CEL}$	$V_{IN}=V_{OUT(T)}+1.0\text{ V}$ , $V_{CE}=V_{SS}$	-0.1		0.1	$\mu\text{ A}$	2

### TEST CIRCUITS

1、



2、



### Application Conditions

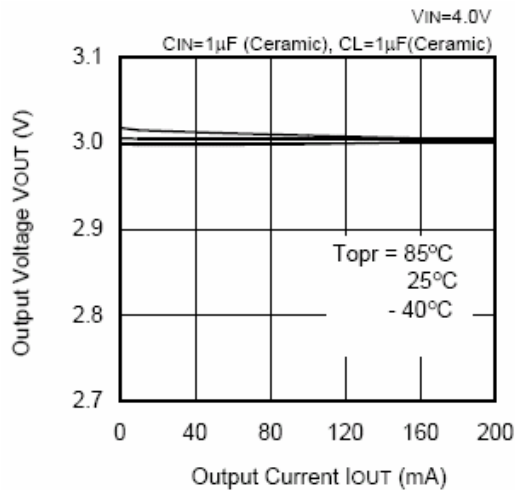
Input capacitor (CIN): 1.0 $\mu\text{F}$  or more

Output capacitor (CL): 1.0  $\mu\text{F}$  or more (tantalum capacitor)

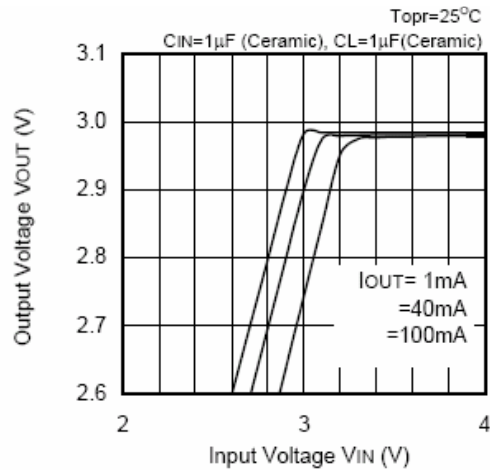
**Caution** A general series regulator may oscillate, depending on the external components selected. Check that no oscillation occurs with the application using the above capacitor.

### TYPICAL PERFORMANCE CHARACTERISTICS (3.0V output)

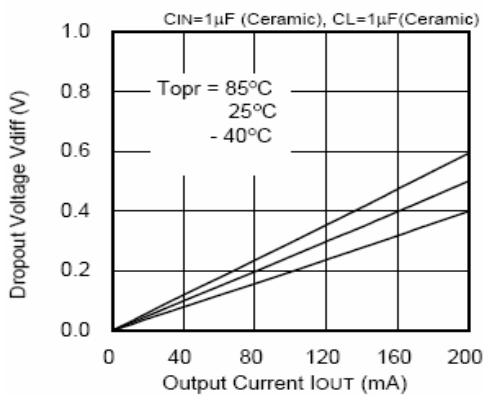
1、 Output Voltage vs. Output Current



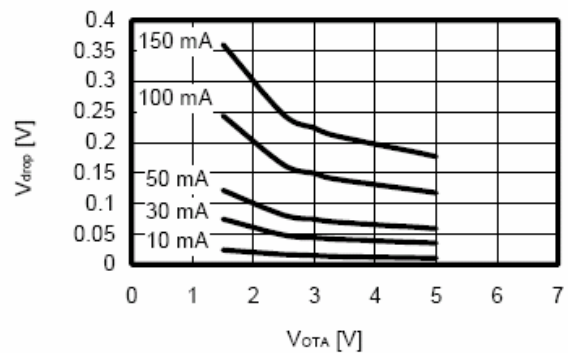
2、 Output Voltage vs. Input Voltage (Contd.)



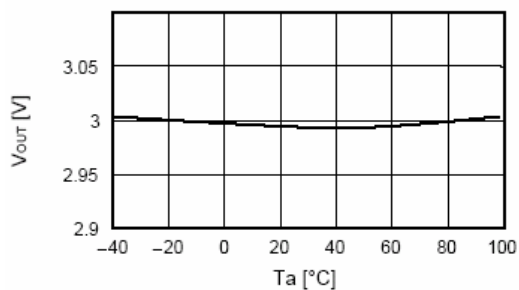
3、 Dropout Voltage vs. Output Current



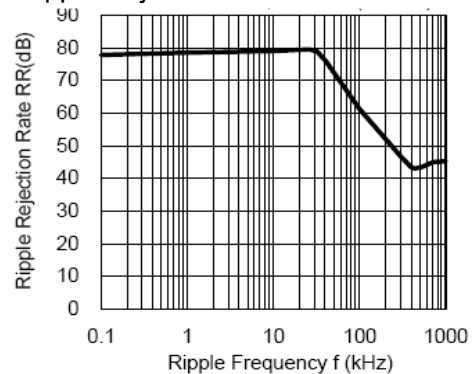
4、 Dropout Voltage vs. Output Voltage



5、 Output Voltage vs. Ambient Temperature

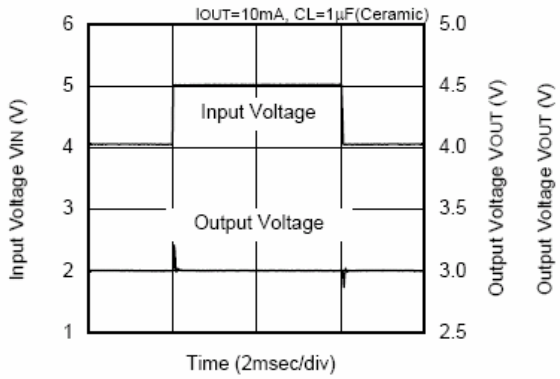


6、 Ripple Rejection Rate

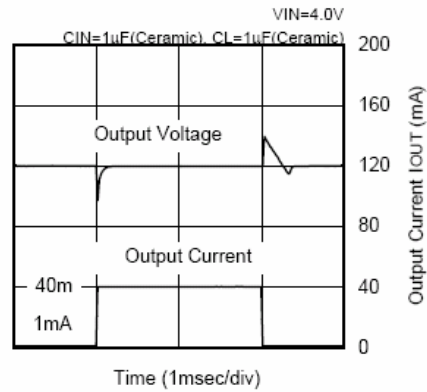


7. Transient Response

Input Transient Response



Load Transient Response



PACKAGE INFORMATION

- SOT23-5

