



Ultra Fast High PSRR Low Noise CMOS Voltage Regulators

ZS6109 Series

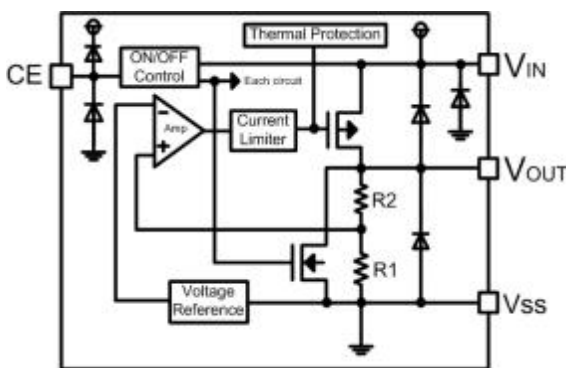
■ INTRODUCTION

The ZS6109 series are a group of positive voltage regulators manufactured by CMOS technology, which have high ripple rejection, ultra fast transient response and low dropout voltage, and can provide large output current even if the input and output voltage difference is small. Each of ZS6109 series consists of a high precision voltage reference, an error correction circuit and a current limiting output driver. Therefore, this series of products are very suitable for the following equipment application scenarios: industrial applications, battery power supply, wireless communication and so on.

■ APPLICATIONS

- CD/DVD-ROM, CD/RW
- Wireless devices
- Battery charger

■ BLOCK DIAGRAM



■ FEATURES

- Guaranteed Output Current: 1.0A (Typ.)
- Low Quiescent Current: 70μA (Typ.)
- Output Voltage Range: 0.9V~4.0V
- Input Voltage Range: 1.6V~6.0V
- High Accuracy: ±2% (Typ.)
- Dropout Voltage: 320mV@1.0A (3.3V Typ.)
- Excellent Line Regulation: 0.02%/V
- High PSRR : 70dB@10KHz
- Built-in Current Limiter & Thermal Protection
- Short Circuit Current Fold-back
- Output Capacitor: Ceramic Compatible

- Portable instrumentations
- PC peripherals
- Battery-Powered systems

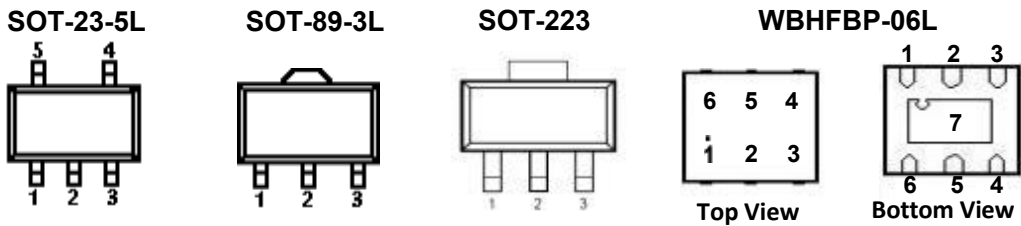
ORDER INFORMATION

ZS6109①②③④

DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Standard
	B	With Shutdown Function
②③	Integer	Output Voltage(0.8~5.0V) e.g:3.0V=②:3, ③:0
④	M	Package:SOT-23-5L
	P	Package:SOT-89-3L
	GW	Package:SOT-223
	FB	Package:WBHFBP-06L

Pin Configuration

PIN CONFIGURATION



SOT-223/SOT-89-3L

PIN NUMBER			PIN NAME	FUNCTION
ZS6109AxxGW	ZS6109AxxP/3/			
GW	P	PL		
1	1	2	V_{SS}	Ground
3	2	1	V_{IN}	Power input
2	3	3	V_{OUT}	Output

SOT-23-5L/WBHFBP-06L

PIN NUMBER		SYMBOL	FUNCTION
M	FB		
1	3	V_{IN}	Power Input Pin
2	2	V_{SS}	Ground
3	1	CE	Chip Enable Pin
4	5	NC	No Connection
5	4	V_{OUT}	Output Pin
-	6	NC	No Connection
-	7		Thermal Pad

TYPICAL APPLICATION

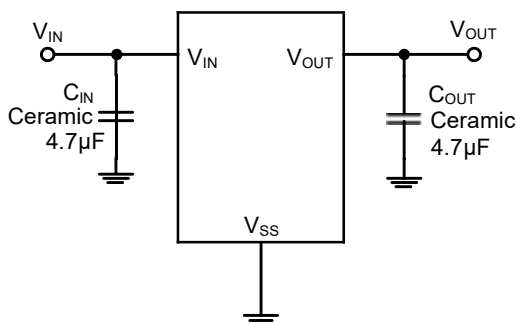


Figure1 ZS6109A Typical Application Circuit

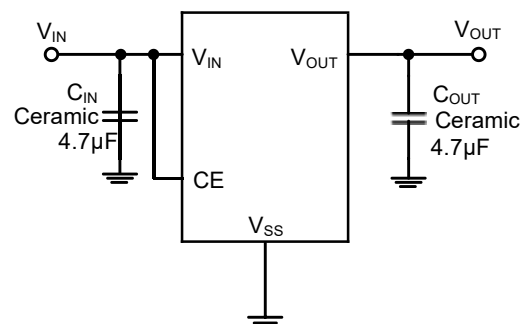


Figure2 ZS6109B Typical Application Circuit

Input capacitor (C_{IN}): 4.7µF or more;

Output capacitor (C_{OUT}): 4.7µF or more;

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.

Electrical Characteristics

■ ABSOLUTE MAXIMUM RATINGS⁽¹⁾ (Unless otherwise specified, T_A=25°C)

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage ⁽²⁾		V _{IN}	V _{SS} -0.3~V _{SS} +7	V
Output Current ⁽²⁾		I _{OUT}	1300	mA
Output Voltage		V _{OUT}	V _{SS} -0.3~V _{IN} +0.3	V
Power Dissipation	SOT-89-3L	P _d	600	mW
	SOT-23-5L	P _d	400	mW
	WBHFBP-06L	P _d	600	mW
	SOT-223	P _d	800	mW
Operating Ambient Temperature		T _A	-40~+85	°C
Operating Junction Temperature ⁽³⁾		T _J	-40~+125	°C
Storage Temperature		T _{stg}	-40~+125	°C
Soldering Temperature & Time		T _{solder}	260°C, 10s	

(1) Stresses beyond those listed under *absolute maximum ratings* may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under *recommended operating conditions* is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

(2) All voltages are with respect to network ground terminal.

(3) This IC includes overtemperature protection that is intended to protect the device during momentary overload. Junction temperature will exceed 125°C when overtemperature protection is active. Continuous operation above the specified maximum operating junction temperature may impair device reliability.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	MIN.	NOM.	MAX.	UNITS
Supply voltage at V _{IN}	1.6		6	V
Operating junction temperature range, T _J	-40		125	°C
Operating free air temperature range, T _A	-40		85	°C

Electrical Characteristics

ZS6109 Series ($V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=4.7\mu F$, $T_A=25^\circ C$, unless otherwise specified)

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP. ⁽³⁾	MAX.	UNITS
Output Voltage	$V_{OUT(E)}$ ⁽⁴⁾	$I_{OUT}=100mA$	$V_{OUT}*0.98^{(5)}$	$V_{OUT}^{(5)}$	$V_{OUT}*1.02^{(5)}$	V
Supply Current	I_{SS}	$I_{OUT}=0$		70	140	μA
Shutdown Current	I_{SHDN}	$CE = V_{SS}$		0.1	1.0	μA
Output Current	I_{OUT}	–	1000	1300		mA
Dropout Voltage ⁽⁶⁾	V_{Dif1}	$I_{OUT} = 300mA$		90		mV
	V_{Dif2}	$I_{OUT} = 1000mA$		320		mV
Load Regulation	$\bar{\Delta}V_{OUT}$	$V_{IN}= V_{OUT} + 1V$ $1mA \leq I_{OUT} \leq 1.0A$		30		mV
Line Regulation	$\frac{\Delta V_{OUT}}{V_{OUT} \times \Delta V_{IN}}$	$I_{OUT} = 100mA$ $V_{OUT} + 1V \leq V_{IN} \leq 6V$		0.02	0.2	%/V
Output Voltage Temperature Characteristics	$\frac{\Delta V_{OUT}}{\Delta T \times V_{OUT}}$	$I_{OUT} = 10mA$ $-40. C \leq T \leq +85. C$		50		ppm/ $^\circ C$
Short Current	I_{Short}	$V_{OUT} = V_{SS}$		120		mA
Input Voltage	V_{IN}	–	1.6		6.0	V
Power Supply Rejection Rate	1kHz	PSRR	$I_{OUT}=100mA$		75	dB
	10kHz				70	
CE "High" Voltage	$V_{CE} \text{ "H"}$		1.5		V_{IN}	V
CE "Low" Voltage	$V_{CE} \text{ "L"}$				0.3	V
Thermal Shutdown Temperature	T_{SD}			150		$^\circ C$
Thermal Shutdown Temperature Hysteresis	ΔT_{SD}			30		$^\circ C$

NOTE:

(3) Typical numbers are at $25^\circ C$ and represent the most likely norm.

(4) $V_{OUT(E)}$: Effective Output Voltage (i.e. The output voltage when $V_{IN} = (V_{OUT} + 1.0V)$ and maintain a certain I_{OUT} Value).

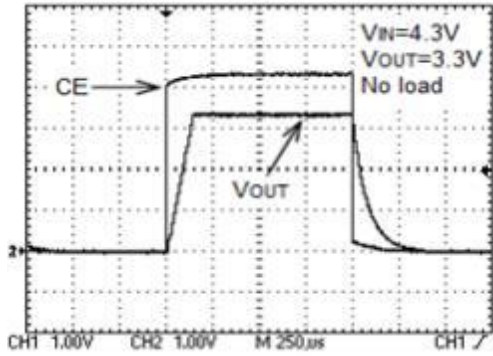
(5) V_{OUT} : Specified Output Voltage.

(6) V_{Dif} : The Difference Of Output Voltage And Input Voltage When Input Voltage Is Decreased Gradually Till Output Voltage Equals To 98% Of $V_{OUT(E)}$.

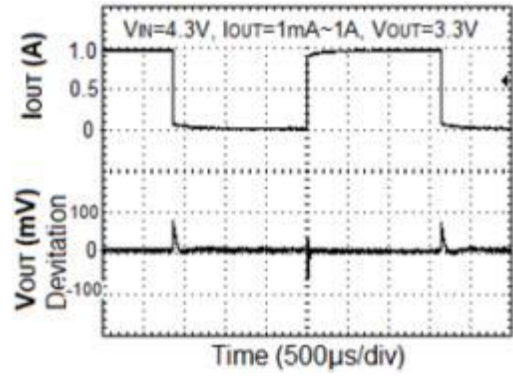
Typical Characteristics

($V_{CE}=V_{IN}=V_{OUT}+1V$, $C_{IN}=C_{OUT}=1\mu F$, $T_A=25^\circ C$, unless otherwise specified)

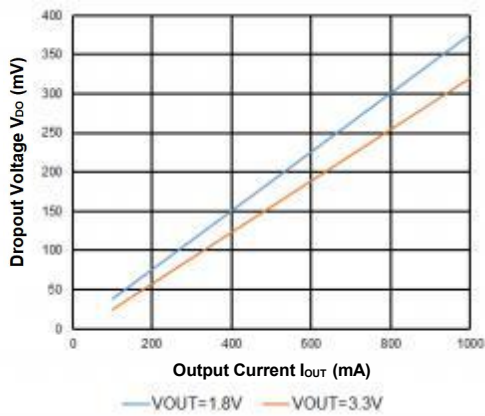
CE Start & Shutdown Response



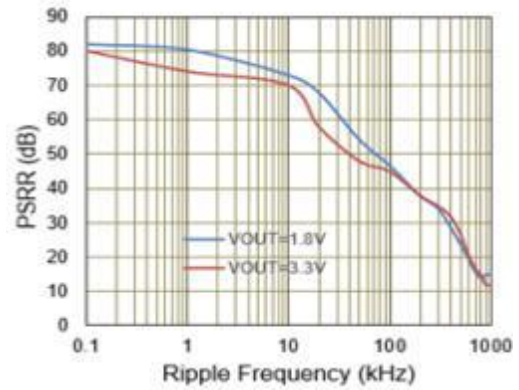
Load Transient Response



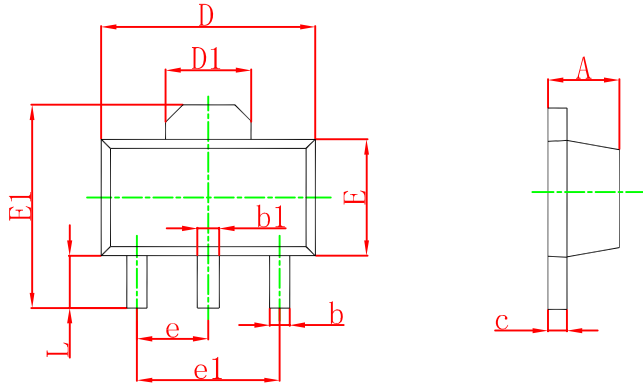
Dropout Voltage vs. Output Current



Power Supply Rejection Ratio

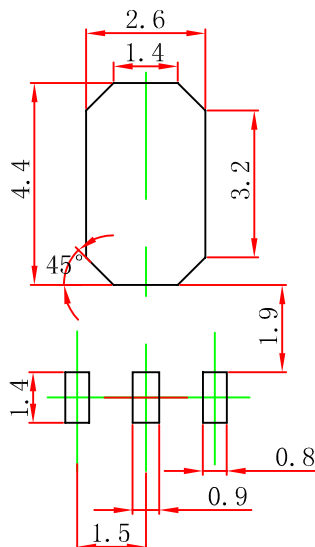


SOT-89-3L Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.400	1.600	0.055	0.063
b	0.320	0.520	0.013	0.197
b1	0.400	0.580	0.016	0.023
c	0.350	0.440	0.014	0.017
D	4.400	4.600	0.173	0.181
D1	1.550 REF		0.061 REF	
E	2.300	2.600	0.091	0.102
E1	3.940	4.250	0.155	0.167
e	1.500 TYP		0.060 TYP	
e1	3.000 TYP		0.118 TYP	
L	0.900	1.200	0.035	0.047

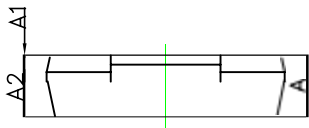
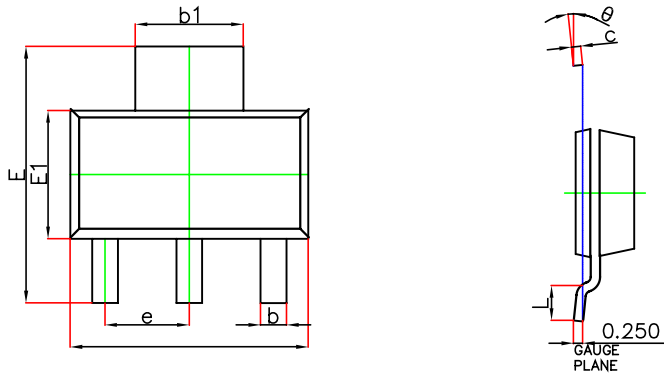
SOT-89-3L Suggested Pad Layout



Note:

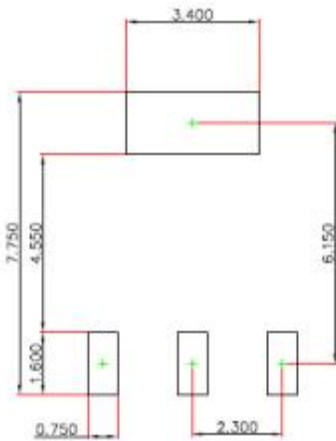
1. Controlling dimension in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purpose only.

SOT-223 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	—	1.800	—	0.071
A1	0.020	0.100	0.001	0.004
A2	1.500	1.700	0.059	0.067
b	0.660	0.840	0.026	0.033
b1	2.900	3.100	0.114	0.122
c	0.230	0.350	0.009	0.014
D	6.300	6.700	0.248	0.264
E	6.700	7.300	0.264	0.287
E1	3.300	3.700	0.130	0.146
e	2.300(BSC)		0.091(BSC)	
L	0.750	—	0.030	—
θ	0°	10°	0°	10°

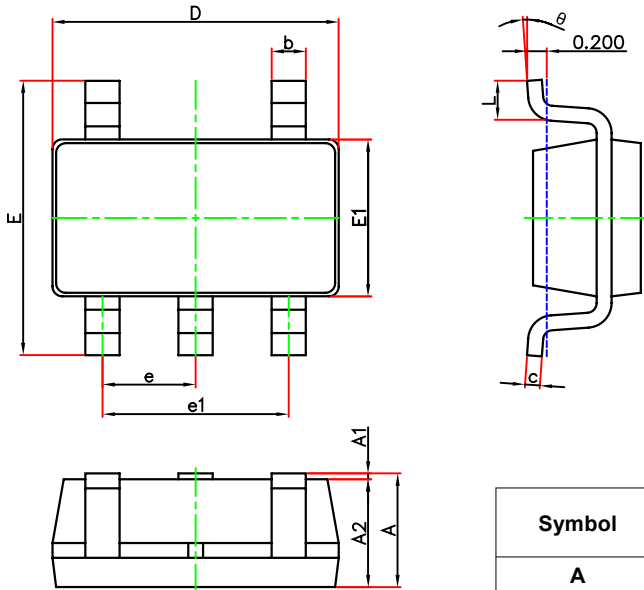
SOT-223 Suggested Pad Layout



Note:

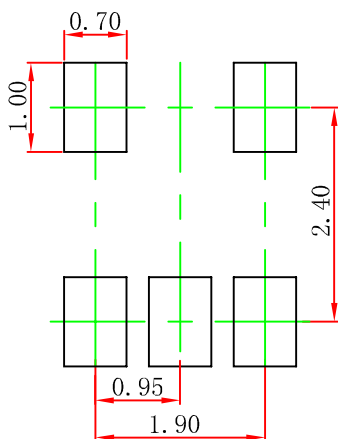
1. Controlling dimension in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purpose only.

SOT-23-5L Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	1.050	1.250	0.041	0.049
A1	0.000	0.100	0.000	0.004
A2	1.050	1.150	0.041	0.045
b	0.300	0.500	0.012	0.020
c	0.100	0.200	0.004	0.008
D	2.820	3.020	0.111	0.119
E	2.650	2.950	0.104	0.116
E1	1.500	1.700	0.059	0.067
e	0.950(BSC)		0.037(BSC)	
e1	1.800	2.000	0.071	0.079
L	0.300	0.600	0.012	0.024
theta	0°	8°	0°	8°

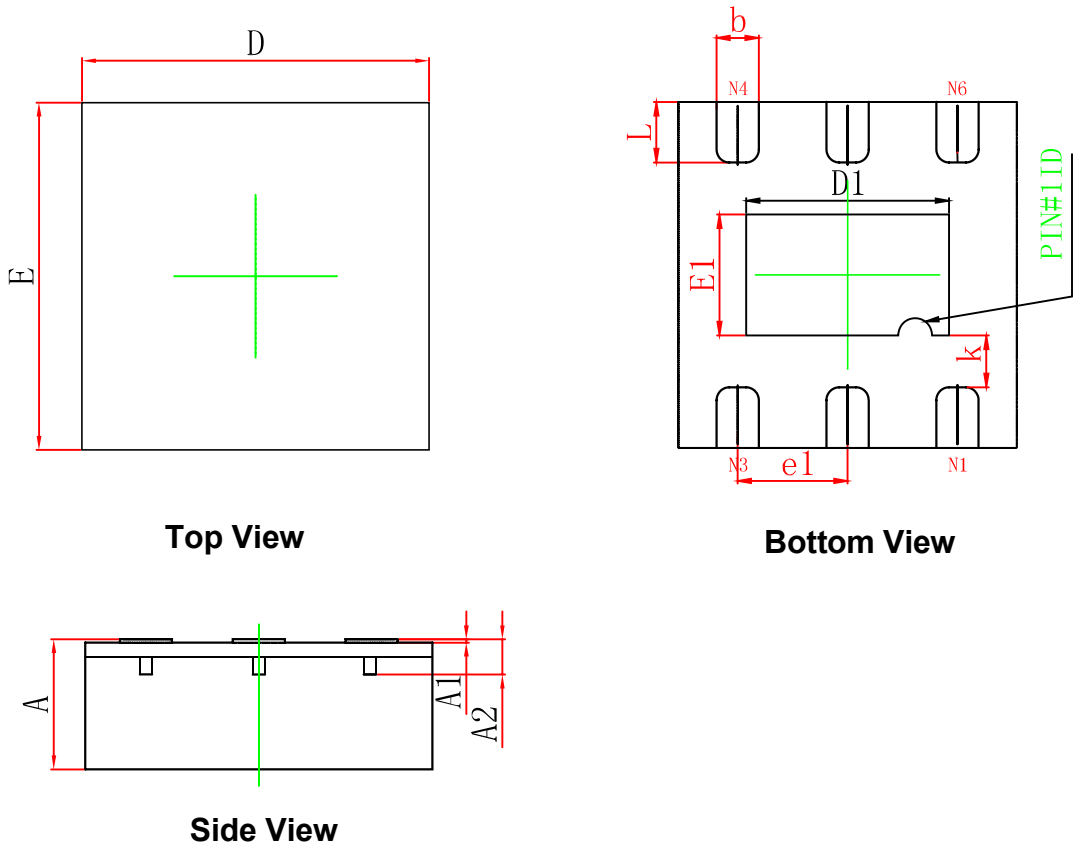
SOT-23-5L Suggested Pad Layout



Note:

1. Controlling dimension in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purpose only.

WBHFBP-06L Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimension In Inches	
	Min.	Max.	Min.	Max.
A	0.700	0.800	0.028	0.031
A1	0.000	0.050	0.000	0.002
A2	0.203REF		0.008REF	
D	1.950	2.050	0.077	0.081
E	1.950	2.050	0.077	0.081
D1	1.150	1.250	0.045	0.049
E1	0.650	0.750	0.026	0.030
b	0.200	0.300	0.008	0.012
e1	0.650TYP		0.026TYP	
k	0.200MIN		0.008MIN	
L	0.300	0.400	0.012	0.016

DISCLAIMER

IMPORTANT NOTICE, PLEASE READ CAREFULLY

The information in this data sheet is intended to describe the operation and characteristics of our products. ZS has the right to make any modification, enhancement, improvement, correction or other changes to any content in this data sheet, including but not limited to specification parameters, circuit design and application information, without prior notice.

Any person who purchases or uses ZS products for design shall: 1. Select products suitable for circuit application and design; 2. Design, verify and test the rationality of circuit design; 3. Procedures to ensure that the design complies with relevant laws and regulations and the requirements of such laws and regulations. ZS makes no warranty or representation as to the accuracy or completeness of the information contained in this data sheet and assumes no responsibility for the application or use of any of the products described in this data sheet.

Without the written consent of ZS, this product shall not be used in occasions requiring high quality or high reliability, including but not limited to the following occasions: medical equipment, automotive electronics, military facilities and aerospace. ZS shall not be responsible for casualties or property losses caused by abnormal use or application of this product.