



Ultra Fast High PSRR Low Noise CMOS Voltage Regulators

ZS6211 Series

■ INTRODUCTION

The ZS6211 series are a group of positive voltage regulators manufactured by CMOS technologies with high ripple rejection, ultra low noise, low power consumption and low dropout voltage, which can prolong battery life in portable electronics. The ZS6211 series work with low-ESR ceramic capacitors, reducing the amount of board space necessary for power applications. The ZS6211 series consume less than 0.1 μ A in shutdown mode and have fast turn-on time less than 50 μ s. The series are very suitable for the battery-powered equipments, such as RF applications and other systems requiring a quiet voltage source.

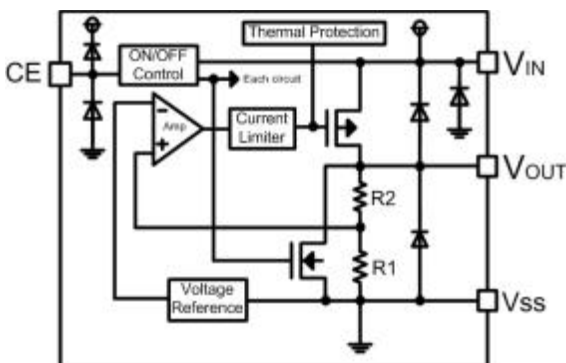
■ APPLICATIONS

- Cellular and Smart Phones
- Laptop, Palmtops and PDA
- Digital Still and Video Cameras

■ FEATURES

- High Ripple Rejection: 80dB@1kHz
- Low Dropout Voltage: 55mV@100mA
- Low Quiescent Current: 50 μ A
- Excellent Line and Load Transient Response
- Operating Voltage Range: 1.8V ~ 6.0V
- Output Voltage Range: 0.8V ~ 5.0V
- High Accuracy: \pm 2% (Typ.)
- Built-in Current Limiter, Short-Circuit Protection
- TTL- Logic-Controlled Shutdown Input

■ BLOCK DIAGRAM



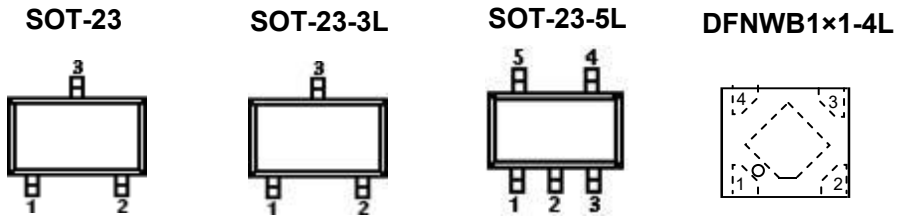
- Portable Audio Video Equipments
- Radio control systems
- Battery-Powered Equipments

ORDER INFORMATION

ZS6211①②③④

DESIGNATOR	SYMBOL	DESCRIPTION
①	A	Standard
	B	High Active, pull-down resistor built in, with C _{OUT} discharge resistor
②③	Integer	Output Voltage e.g. 1.8V=②:1, ③:8
④	N	Package:SOT-23
	M	Package:SOT-23-3L/5L
	F	Package:DFNWB1x1-4L

■ PIN CONFIGURATION



PIN NUMBER		PIN NAME	FUNCTION
SOT-23	SOT-23-3L		
AxxN	AxxM		
1	1	V_{SS}	Ground
2	2	V_{OUT}	Output
3	3	V_{IN}	Power input

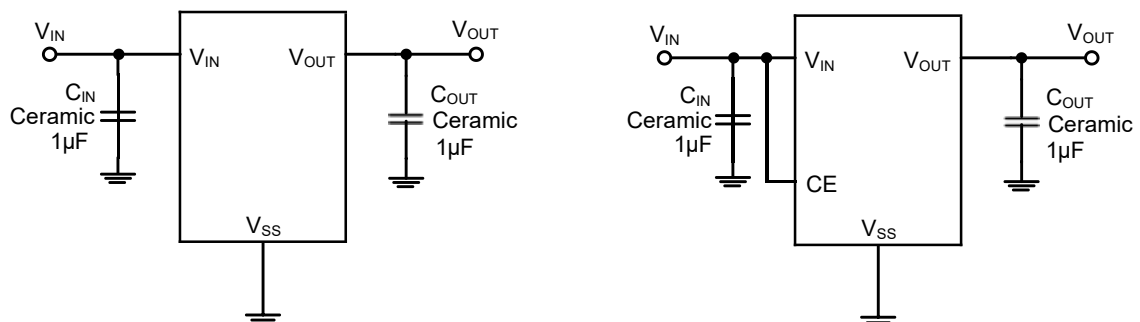
SOT-23-5L

PIN NUMBER	SYMBOL	FUNCTION
BxxM		
1	V_{IN}	Power Input Pin
2	V_{SS}	Ground
3	CE	Chip Enable Pin
4	NC	No Connection
5	V_{OUT}	Output Pin

DFNWB1x1-4L

PIN NUMBER	SYMBOL	FUNCTION
BxxF		
1	V_{OUT}	Output Pin
2	V_{SS}	Ground
3	CE	Chip Enable Pin
4	V_{IN}	Power Input Pin

■ TYPICAL APPLICATION



Electrical Characteristics

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

PARAMETER		SYMBOL	RATINGS	UNITS
Input Voltage ⁽²⁾		V _{IN}	-0.3~7	V
Output Voltage ⁽²⁾		V _{OUT}	-0.3~V _{IN} +0.3	V
Output Current		I _{OUT}	700	mA
Power Dissipation	SOT-23	P _D	0.3	W
	SOT-23-3L/SOT-23-5L		0.4	W
	DFNWB1×1-4L		0.3	W
Operating free air temperature range		T _A	-40~85	°C
Operating Junction Temperature Range ⁽³⁾		T _J	-40~125	°C
Storage Temperature		T _{stg}	-40~125	°C
Lead Temperature(Soldering, 10 sec)		T _{solder}	260	°C
ESD rating ⁽⁴⁾		Human Body Model(HBM)	2	kV
		Machine Model(MM)	200	V

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

(4) ESD testing is performed according to the respective JESD22/JEDEC standard. The human body model is a 100pF capacitor discharged through a 1.5kΩ resistor into each pin. The machine model is a 200pF capacitor discharged directly into each pin.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	MIN.	NOM.	MAX.	UNITS
Supply Voltage at V _{IN}	1.8		6	V
Operating Junction Temperature Range, T _J	0		125	°C
Operating Free Air Temperature Range, T _A	0		85	°C

Electrical Characteristics

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

PARAMETER	SYMBOL	CONDITIONS	MIN.	TYP. ⁽³⁾	MAX.	UNITS
Output Voltage	$V_{OUT(E)}$ ⁽⁴⁾	$I_{OUT}=1mA$	$V_{OUT}^{(5)}$	$V_{OUT}^{(5)}$	$V_{OUT}^{(5)}$	V
Supply Current	I_{SS}	$I_{OUT}=0$		50	90	μA
Standby Current	I_{STBY}	$CE = V_{SS}$		0.1	1	μA
Output Current	I_{OUT}	$V_{OUT} \geq 1.8V$	500	700		mA
		$V_{OUT} \geq 0.8V$	300	500		
Dropout Voltage	$V_{DO}^{(6)}$	$V_{OUT} = 3.3V$ $I_{OUT} = 100mA$		55		mV
Load Regulation	ΔV_{OUT}	$V_{IN} = V_{OUT} + 1V$		1		mV
Line Regulation	ΔV_{OUT}	$I_{OUT} = 10mA$ $V_{OUT} + 1V \leq V_{IN} \leq 6V$		0.01	0.2	%V
	$V_{OUT} \times \Delta V_{IN}$					
Output Voltage Temperature	$\frac{\Delta V_{OUT}}{\Delta T \times V_{OUT}}$	$I_{OUT} = 10mA$ $-40 \leq T \leq +85^\circ C$		50		ppm
Short Current	I_{Short}	$V_{OUT} = V_{SS}$		100		mA
Input Voltage	V_{IN}	—	1.8		6.0	V
Power Supply Rejection Rate	100Hz	PSRR	$I_{OUT}=50mA$		75	dB
	1kHz				80	
	10kHz				70	
CE "High" Voltage	$V_{CE} "H"$		1.5		V_{IN}	V
CE "Low" Voltage	$V_{CE} "L"$				0.3	V
Thermal Shutdown	T_{SD}			160		$^\circ C$
Thermal Shutdown	ΔT_{SD}			20		$^\circ C$
C_{OUT} Auto-Discharge	$R_{DISCHRG}$	$V_{IN}=5V$		100		Ω

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

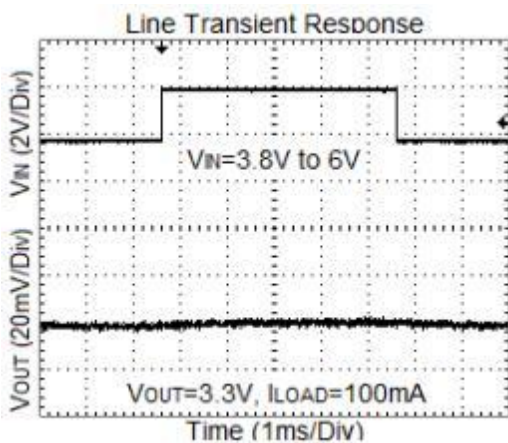
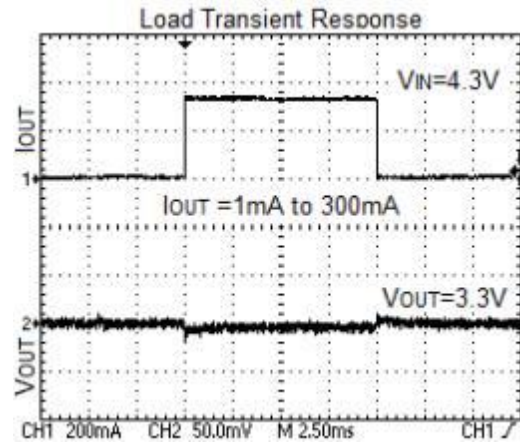
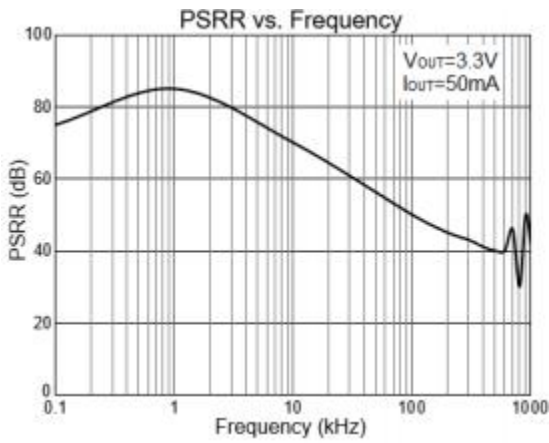
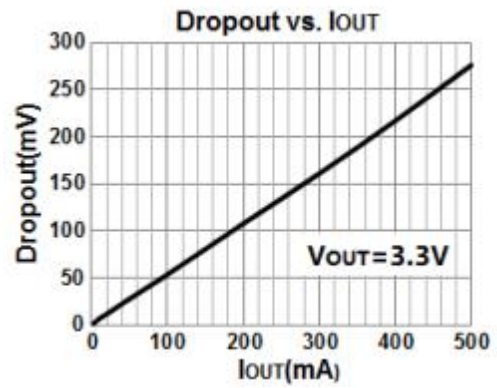
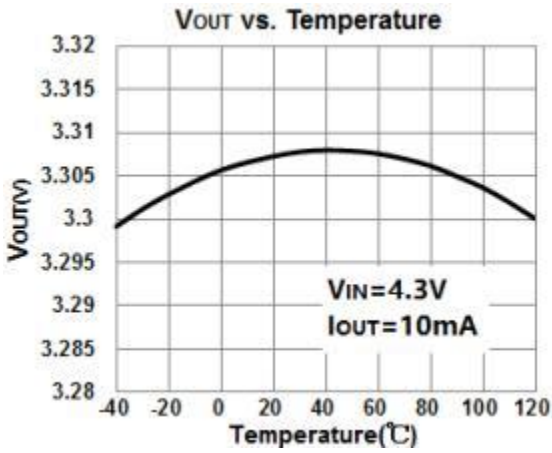
(4) $V_{OUT(E)}$: Effective output voltage (I.e. The output voltage when $V_{IN} = (V_{OUT} + 1.0V)$ and maintain a certain I_{OUT} value).

(5) V_{OUT} : Specified output voltage.

(6) V_{DO} : Test 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

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



C_{OUT} Auto-Discharge Function

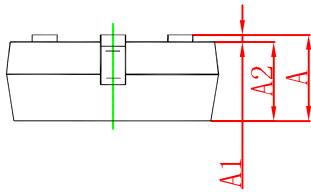
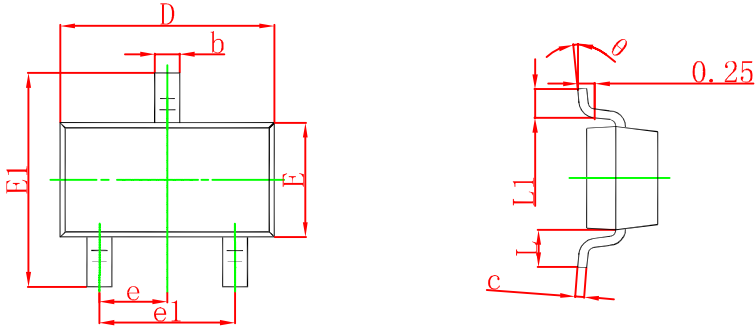
ZS6211 series can discharge the electric charge in the output capacitor (C_{OUT}), when a low signal to the CE pin, which enables a whole IC circuit turn off, is inputted via the N-channel transistor located between the V_{OUT} pin and the V_{SS} pin (cf. BLOCK DIAGRAM). The C_{OUT} auto-discharge resistance value is set at 60Ω (V_{OUT}=3.0V @ V_{IN}=5.0V at typical). The discharge time of the output capacitor (C_{OUT}) is set by the C_{OUT} auto-discharge resistance (R) and the output capacitor (C_{OUT}). By setting time constant of a C_{OUT} auto-discharge resistance value [R_{DISCHRG}] and an output capacitor value (C_{OUT}) as τ ($\tau = C \times R_{DISCHRG}$), the output voltage after discharge via the N-channel transistor is calculated by the following formulas.

$$V = V_{OUT(E)} \times e^{-t/T} \text{ or } t = \tau \ln(V/V_{OUT(E)})$$

(V : Output voltage after discharge, V_{OUT(E)} : Output voltage, t: Discharge time,

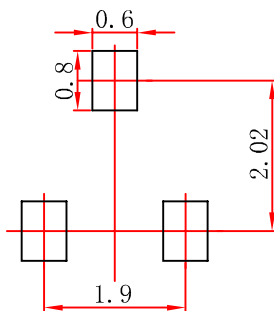
τ : C_{OUT} auto-discharge resistance R_{DISCHRG} × Output capacitor (C_{OUT}) value C)

SOT-23 Package Outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.150	0.035	0.045
A1	0.000	0.100	0.000	0.004
A2	0.900	1.050	0.035	0.041
b	0.300	0.500	0.012	0.020
c	0.080	0.150	0.003	0.006
D	2.800	3.000	0.110	0.118
E	1.200	1.400	0.047	0.055
E1	2.250	2.550	0.089	0.100
e	0.950 TYP.		0.037 TYP.	
e1	1.800	2.000	0.071	0.079
L	0.550 REF.		0.022 REF.	
L1	0.300	0.500	0.012	0.020
θ	0°	8°	0°	8°

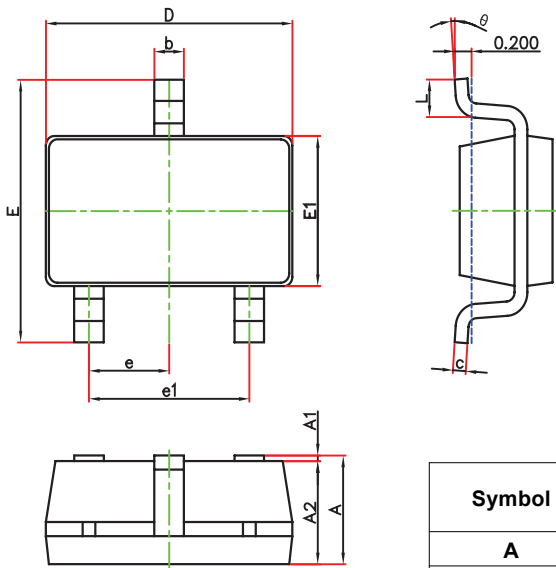
SOT-23 Suggested Pad Layout



NOTE:

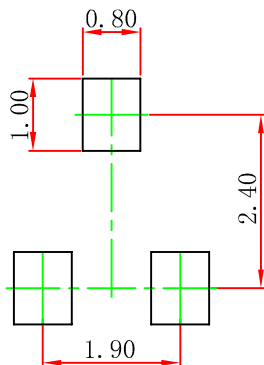
1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

SOT-23-3L 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
θ	0°	8°	0°	8°

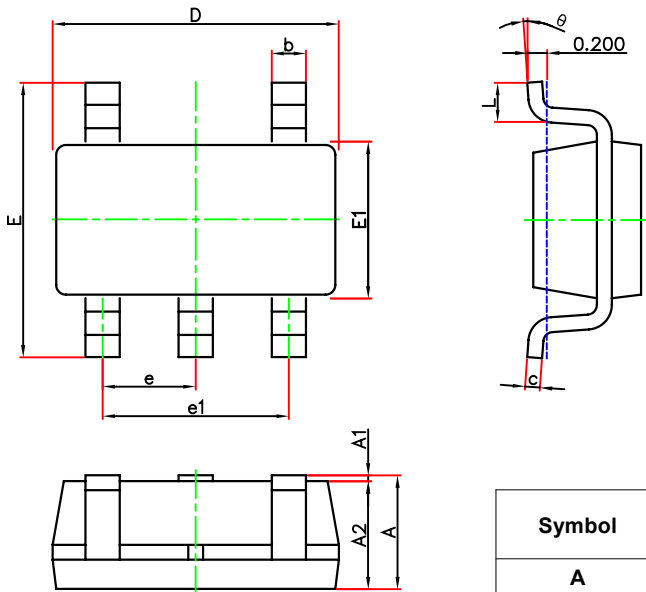
SOT-23-3L Suggested pad Layout



NOTE:

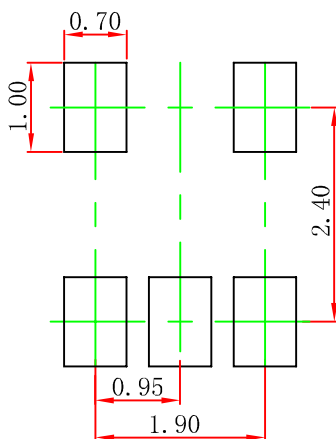
1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

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°

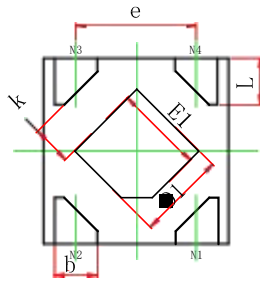
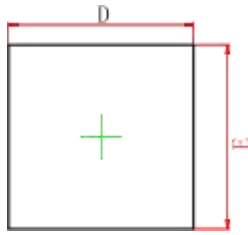
SOT-23-5L Suggested Pad Layout



NOTE:

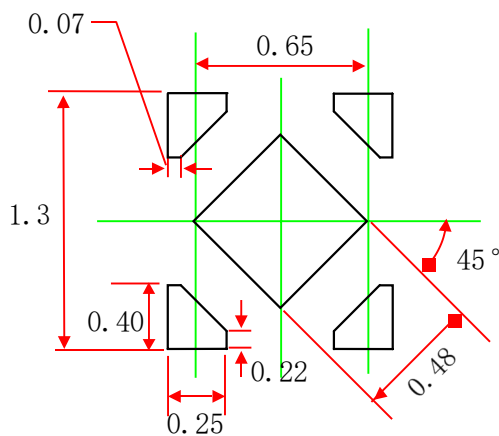
1. Controlling dimension: in millimeters.
2. General tolerance: $\pm 0.05\text{mm}$.
3. The pad layout is for reference purposes only.

DFNWB1*1-4L Package outline Dimensions



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.320	0.400	0.013	0.016
A1	0.000	0.050	0.000	0.002
A2	0.100 REF.		0.004 REF.	
D	0.950	1.050	0.037	0.041
E	0.950	1.050	0.037	0.041
D1	0.430	0.530	0.017	0.021
E1	0.430	0.530	0.017	0.021
k	0.150 MIN.		0.006 MIN.	
b	0.180	0.280	0.007	0.011
e	0.650 TYP.		0.026 TYP.	
L	0.200	0.300	0.008	0.012
L1	0.200	0.300	0.008	0.012

DFNWB1*1-4L Suggested pad Layout



Note:

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

DISCLAIMER

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