

## Description

The ZMR series of three terminal fixed positive voltage regulators feature internal current limit and will shut down under thermal overload conditions making the devices difficult to destroy.

The circuit design offers an exceptionally low quiescent current, only 30 $\mu$ A for the 2.5V device, ideal for low power applications. The initial devices in the series regulate to 2.5 or 5V with a drive capability up to 50mA.

The device is designed with space saving in mind and is available in the small outline SOT23 package. The ZMR250 has expanded its input voltage range to 22.5V and the ZMR500 has expanded its input voltage range to 25V; equaling that of the ZMR25H and ZMR50H respectively.

The ZMR330 provides a 3.3V output over an input range of 5V to 24V.

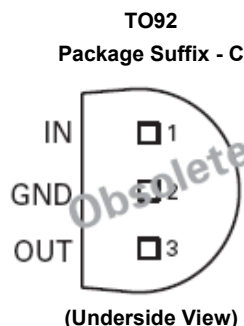
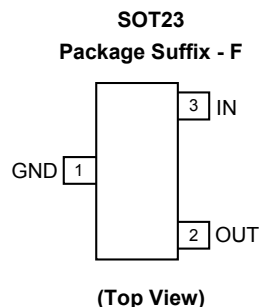
## Features

- Small Outline SOT23 Package
- 2.5V, 3.3V and 5V Output
- Output Current up to 50mA
- Very Low Quiescent Current (30 $\mu$ A)
- Unconditionally Stable
- Internal Short Circuit Current Limit
- **Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)**
- **Halogen and Antimony Free. "Green" Device (Note 3)**

Notes:

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.
2. See <http://www.diodes.com> for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and < 1000 ppm antimony compounds.

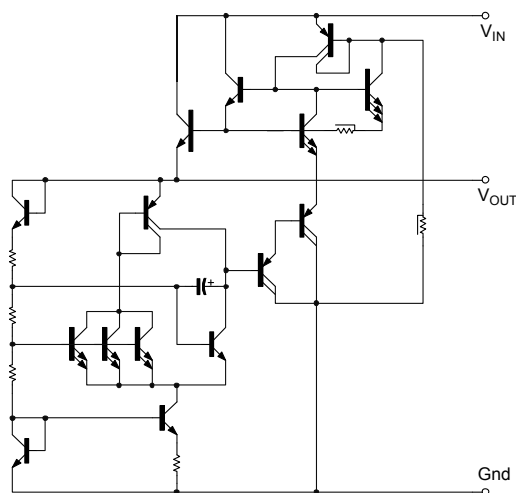
## Pin Assignments



## Applications

- Consumer Electronics
- DVD/Blu-Ray Player, CD-ROM, Set Top Box
- TV, Monitor, Security System
- Supply for Low Power Microcontroller
- Local Low Current Supply within Larger Systems

## Equivalent Circuit



**Absolute Maximum Ratings** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Parameter	Rating	Unit
Input Voltage		
ZMR250	22.5	V
ZMR330	24	
ZMR500	25	
Power Dissipation (T <sub>AMB</sub> = +25°C) (Note 6)		
SOT23	500	mW
Output Current (I <sub>O</sub> )	100	mA
Ambient Temperature	-55 to +125	°C
Maximum Junction Temperature	125	°C
Storage Temperature	-65 to +150	°C

- Notes:
- The maximum operating input voltage and output current of the device will be governed by the maximum power dissipation of the selected package. Maximum package power dissipation is specified at 25°C and must be linearly derated to zero at T<sub>AMB</sub> = +125°C.
  - The following data represents pulse test conditions with junction temperatures as indicated at the initiation of the test. Continuous operation of the devices with the stated conditions might exceed the power dissipation limits of the chosen package.
  - Maximum power dissipation for the SOT23 package, is calculated assuming that the device is mounted on a ceramic substrate measuring 15x15x0.6mm.

**Recommended Operating Conditions** (@T<sub>A</sub> = +25°C, unless otherwise specified.)

Input Voltage Range	Min	Max	Unit
ZMR250	4.2	22.5	V
ZMR330	4.8	24	V
ZMR500	7.0	25	V

**Electrical Characteristics** (@T<sub>A</sub> = +25°C, I<sub>O</sub> = 10mA, V<sub>IN</sub> = 6.5V, unless otherwise specified.)

**ZMR250**

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V <sub>O</sub>	Output Voltage		2.438	2.5	2.563	V
		I <sub>O</sub> = 0 to 50mA T <sub>J</sub> = -55°C to +125°C	2.360		2.640	V
		V <sub>IN</sub> = 4.5 to 22.5V I <sub>O</sub> = 0 to 50mA T <sub>J</sub> = -55°C to +125°C	2.630		2.640	V
ΔV <sub>O</sub>	Line Regulation	V <sub>IN</sub> = 4.5 to 22.5V		5	15	mV
ΔV <sub>O</sub>	Load Regulation	I <sub>O</sub> = 0 to 50mA I <sub>O</sub> = 0 to 10mA		20 12	30	mV
I <sub>S</sub>	Supply Current	T <sub>J</sub> = -55°C to +125°C		30	40	μA
ΔI <sub>S</sub>	Supply Current Change	I <sub>O</sub> = 0 to 50mA V <sub>IN</sub> = 4.5 to 22.5V		1 2	±10 10	μA
V <sub>N</sub>	Output Noise Voltage	f = 10Hz to 10kHz		65		μVrms
ΔV <sub>IN</sub> /ΔV <sub>O</sub>	Ripple Rejection	V <sub>IN</sub> = 6.3 to 18V f = 120Hz	55	75		dB
V <sub>IN</sub>	Input Voltage Required to Maintain Regulation			3.9		V
ΔV <sub>O</sub> /ΔT	Average Temperature Coefficient V <sub>O</sub>	I <sub>O</sub> = 5.0mA T <sub>J</sub> = -55°C to +125°C		0.275	0.700	mV/°C

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ ,  $I_O = 10\text{mA}$ ,  $V_{IN} = 7\text{V}$ , unless otherwise specified.)

**ZMR330**

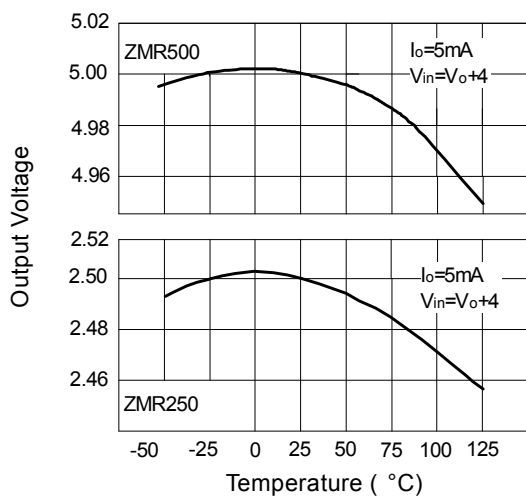
Symbol	Parameter	Condition	Min	Typ	Max	Unit
$V_O$	Output Voltage		3.217	3.3	3.383	V
		$I_O = 0$ to $50\text{mA}$ $T_J = -55^\circ\text{C}$ to $+125^\circ\text{C}$	3.148		3.393	V
		$V_{IN} = 5$ to $24\text{V}$ $I_O = 0$ to $50\text{mA}$ $T_J = -55^\circ\text{C}$ to $+125^\circ\text{C}$	3.148		3.408	V
$\Delta V_O$	Line Regulation	$V_{IN} = 5$ to $24\text{V}$		5	15	mV
$\Delta V_O$	Load Regulation	$I_O = 0$ to $50\text{mA}$ $I_O = 0$ to $10\text{mA}$		20 13	30	mV
$I_S$	Supply Current	$T_J = -55^\circ\text{C}$ to $+125^\circ\text{C}$		120	170	$\mu\text{A}$
$\Delta I_S$	Supply Current Change	$I_O = 0$ to $50\text{mA}$ $V_{IN} = 5$ to $20\text{V}$		5 2	10 10	$\mu\text{A}$
$V_N$	Output Noise Voltage	$f = 10\text{Hz}$ to $10\text{kHz}$		80		$\mu\text{Vrms}$
$\Delta V_{IN}/\Delta V_O$	Ripple Rejection	$V_{IN} = 6$ to $20\text{V}$ $f = 120\text{Hz}$	55			dB
$V_{IN}$	Input Voltage Required to Maintain Regulation			4.74		V

**Electrical Characteristics** (@ $T_A = +25^\circ\text{C}$ ,  $I_O = 10\text{mA}$ ,  $V_{IN} = 10\text{V}$ , unless otherwise specified.)

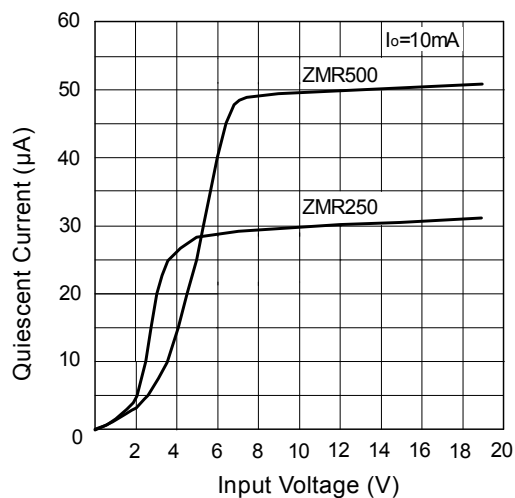
**ZMR500**

Symbol	Parameter	Condition	Min	Typ	Max	Unit
$V_O$	Output Voltage		4.785	5	5.125	V
		$I_O = 0$ to $50\text{mA}$ $T_J = -55^\circ\text{C}$ to $+125^\circ\text{C}$	4.780		5.160	V
		$V_{IN} = 7$ to $25\text{V}$ $I_O = 0$ to $50\text{mA}$ $T_J = -55^\circ\text{C}$ to $+125^\circ\text{C}$	4.780		5.175	V
$\Delta V_O$	Line Regulation	$V_{IN} = 7$ to $25\text{V}$		5	15	mV
$\Delta V_O$	Load Regulation	$I_O = 0$ to $50\text{mA}$ $I_O = 0$ to $10\text{mA}$		25 15	40	mV
$I_S$	Supply Current	$T_J = -55^\circ\text{C}$ to $+125^\circ\text{C}$		50	70	$\mu\text{A}$
$\Delta I_S$	Supply Current Change	$I_O = 0$ to $50\text{mA}$ $V_{IN} = 7$ to $25\text{V}$		1 2	$\pm 10$ 10	$\mu\text{A}$
$V_N$	Output Noise Voltage	$f = 10\text{Hz}$ to $10\text{kHz}$		90		$\mu\text{Vrms}$
$\Delta V_{IN}/\Delta V_O$	Ripple Rejection	$V_{IN} = 8$ to $18\text{V}$ $f = 120\text{Hz}$	55	72		dB
$V_{IN}$	Input Voltage Required to Maintain Regulation			6.2		V
$\Delta V_O/\Delta T$	Average Temperature Coefficient $V_O$	$I_O = 5.0\text{mA}$ $T_J = -55^\circ\text{C}$ to $+125^\circ\text{C}$		0.275	0.700	$\text{mV}/^\circ\text{C}$

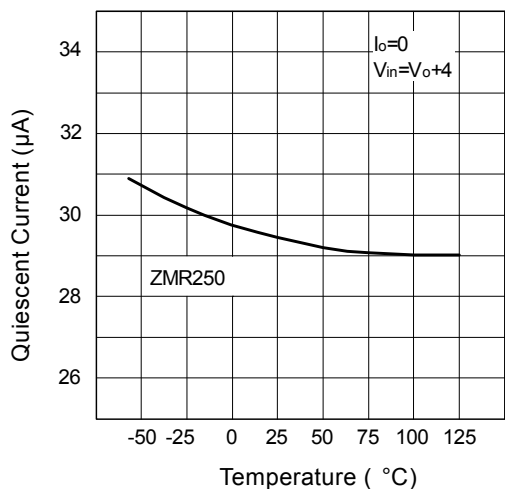
## Typical Characteristics



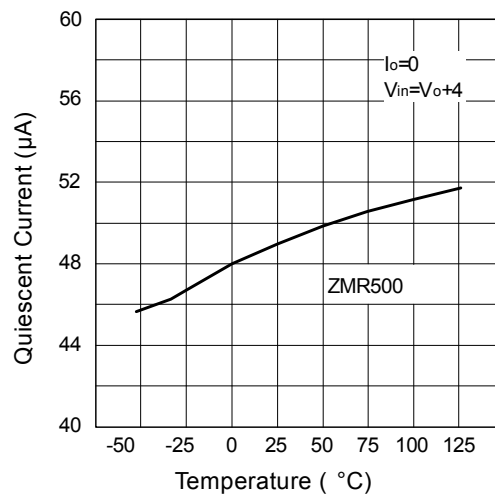
Output Voltage Temperature



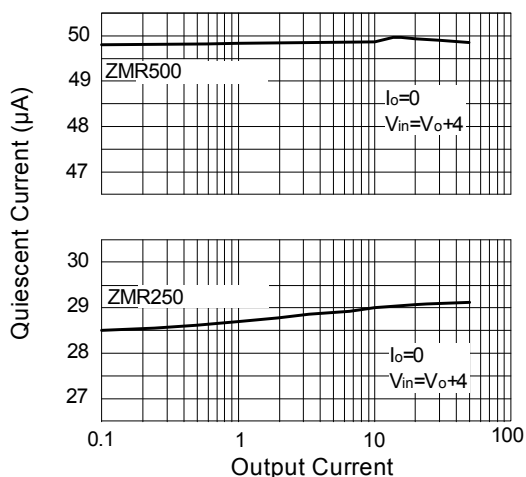
Quiescent Current v Voltage



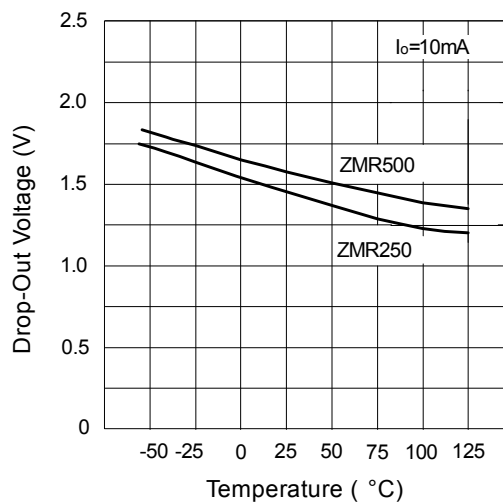
Quiescent Current v Temperature



Quiescent Current v Temperature

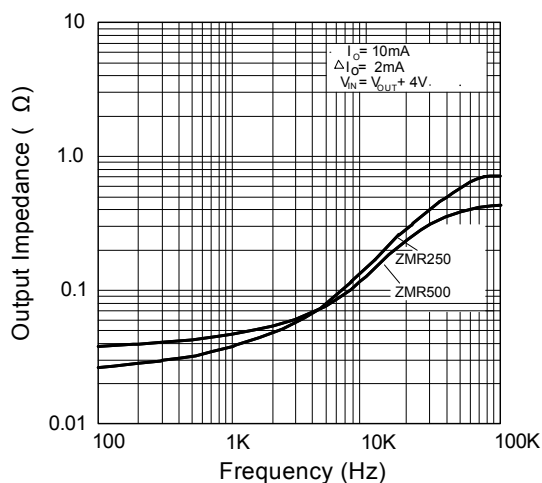


Quiescent Current v Output Current

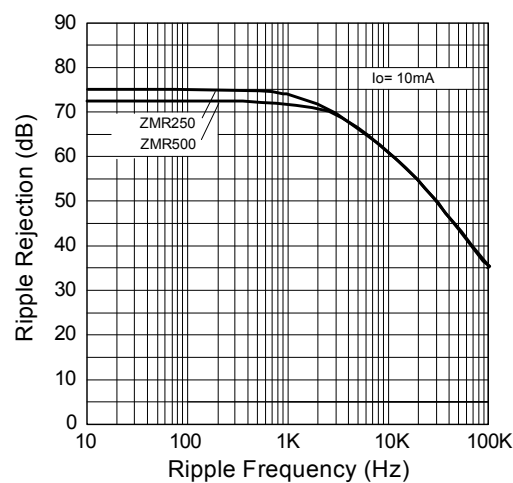


Drop-Out Voltage v Temperature

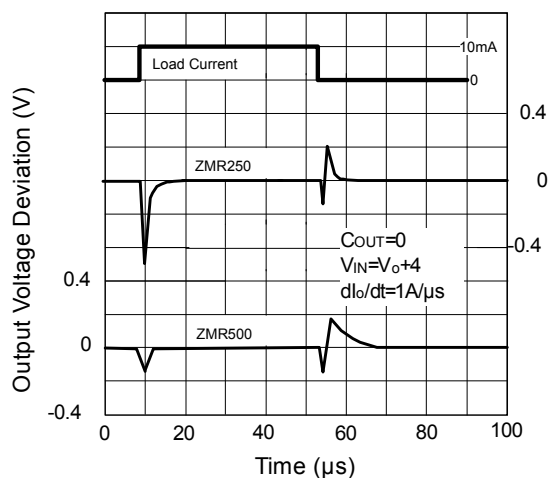
## Typical Characteristics (cont.)



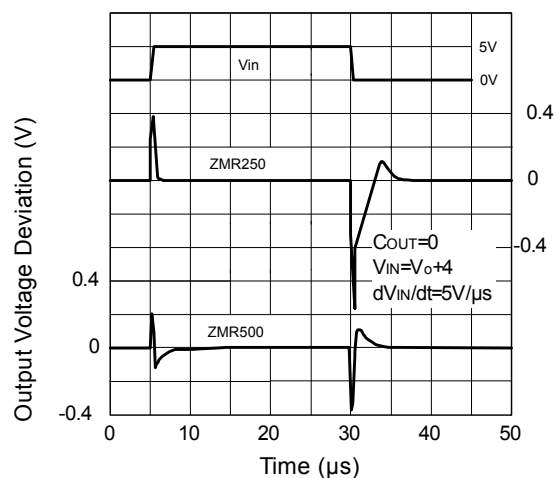
Output Impedance v Frequency



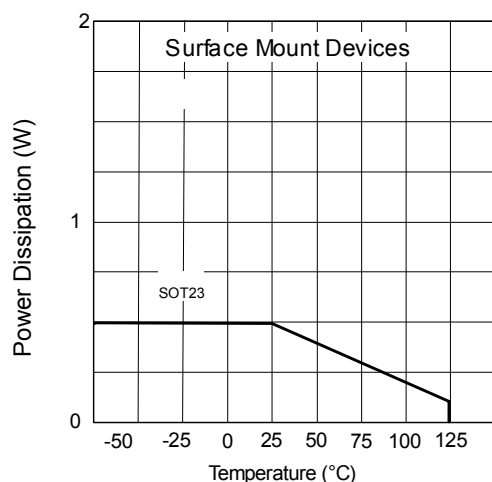
Ripple Rejection v Ripple Frequency



Load Transient Response



Line Transient Response



Power Derating

## Ordering Information

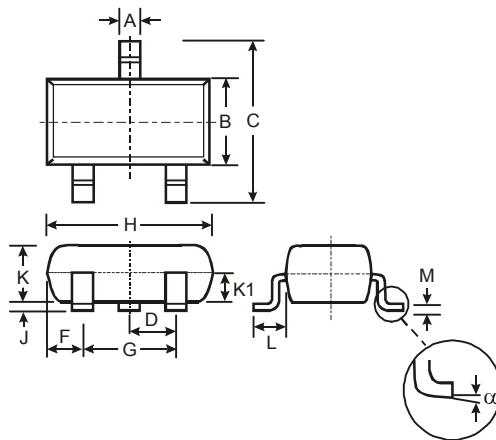
Part Number	Package	Part Mark	Status	Reel Size (inches)	Quantity per reel	Tape Width (mm)
ZMR25HFTA	SOT23	25X	Obsolete replaced by ZMR250FTA	7"	3000	8mm
ZMR50HFTA	SOT23	50R	Obsolete replaced by ZMR500FTA	7"	3000	8mm
ZMR250FTA	SOT23	25K	Released	7"	3000	8mm
ZMR330FTA	SOT23	330	Released	7"	3000	8mm
ZMR330F-7*	SOT23	330	Released	7"	3000	8mm
ZMR500FTA	SOT23	50K	Released	7"	3000	8mm

\* All TO92 variants (ZMRxxxC) are obsolete. Closest replacements are the ZMRxxxFTA.

## Package Outline Dimensions (All dimensions in mm.)

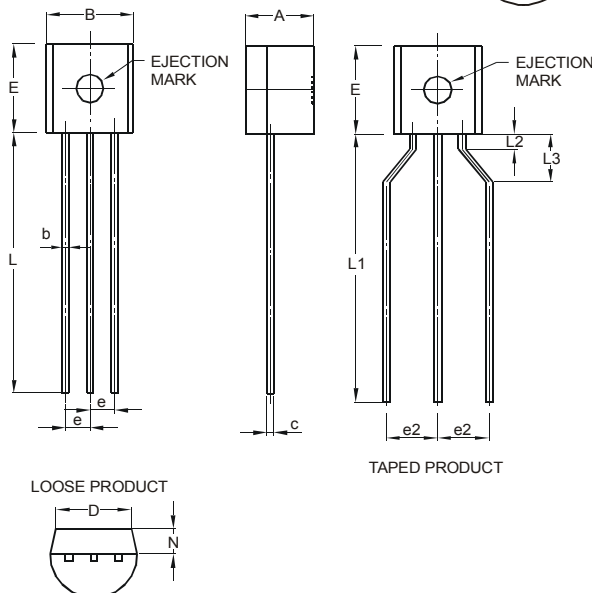
Please see AP02002 at <http://www.diodes.com/datasheets/ap02002.pdf> for latest version.

### SOT23



SOT23			
Dim	Min	Max	Typ
A	0.37	0.51	0.40
B	1.20	1.40	1.30
C	2.30	2.50	2.40
D	0.89	1.03	0.915
F	0.45	0.60	0.535
G	1.78	2.05	1.83
H	2.80	3.00	2.90
J	0.013	0.10	0.05
K	0.903	1.10	1.00
K1	-	-	0.400
L	0.45	0.61	0.55
M	0.085	0.18	0.11
α	0°	8°	-
All Dimensions in mm			

### TO92

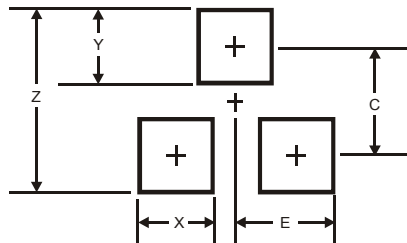


TO92			
Dim	Min	Max	Typ
A	3.45	3.66	—
B	4.27	4.78	—
b	—	—	0.38
c	—	—	0.38
D	—	—	3.87
E	4.32	4.83	—
e	—	—	1.27
e2	2.40	2.90	—
L	12.98	15.00	—
L1	12.80	15.00	—
L2	0.80	-	—
L3	2.00	3.00	—
N	1.22	1.37	—
All Dimensions in mm			

## Suggested Pad Layout

Please see AP02001 at <http://www.diodes.com/datasheets/ap02001.pdf> for the latest version.

### SOT23



Dimensions	Value (in mm)
Z	2.9
X	0.8
Y	0.9
C	2.0
E	1.35

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