FIXED 2.5, 3.3 AND 5 VOLT MINIATURE VOLTAGE REGULATORS

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 30µA 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.

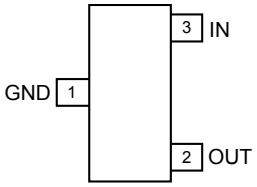
The ZMR330 provides a 3.3V output over an input range of 5V to 24V.

Features

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

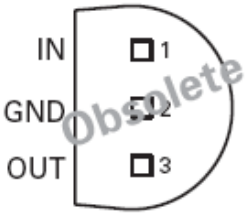
Pin Assignments

SOT23
Package Suffix - F



(Top View)

TO92
Package Suffix - C



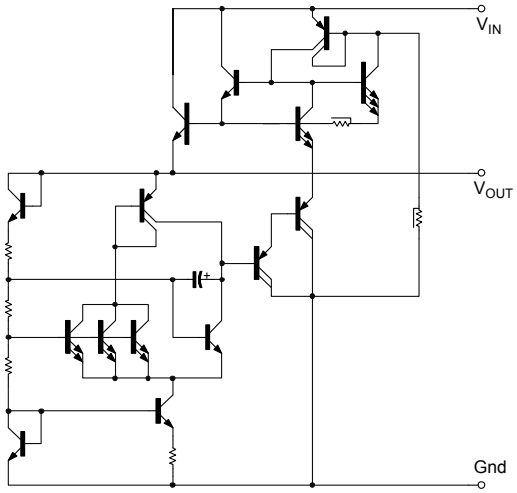
(Underside View)

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

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.

Equivalent Circuit



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Absolute Maximum Ratings (@T_A = +25°C, unless otherwise specified.)

Parameter	Rating	Unit
Input Voltage ZMR250 ZMR330 ZMR500	 22.5 24 25	V
Power Dissipation (T_{AMB} = +25°C) (Note 6) SOT23	 500	 mW
Output Current (I_O)	100	mA
Ambient Temperature	-55 to +125	°C
Maximum Junction Temperature	125	°C
Storage Temperature	-65 to +150	°C

Notes:
4. 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_{AMB} = +125°C.
5. 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.
6. 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_A = +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_A = +25°C, I_O = 10mA, V_{IN} = 6.5V, unless otherwise specified.)

ZMR250

Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_O	Output Voltage		2.438	2.5	2.563	V
		I_O = 0 to 50mA T_J = -55°C to +125°C	2.360		2.640	V
		V_{IN} = 4.5 to 22.5V I_O = 0 to 50mA T_J = -55°C to +125°C	2.630		2.640	V
ΔV_O	Line Regulation	V_{IN} = 4.5 to 22.5V		5	15	mV
ΔV_O	Load Regulation	I_O = 0 to 50mA I_O = 0 to 10mA		20 12	30	mV
I_S	Supply Current	T_J = -55°C to +125°C		30	40	µA
ΔI_S	Supply Current Change	I_O = 0 to 50mA V_{IN} = 4.5 to 22.5V		1 2	±10 10	µA
V_N	Output Noise Voltage	f = 10Hz to 10kHz		65		µVrms
$\Delta V_{IN}/\Delta V_O$	Ripple Rejection	V_{IN} = 6.3 to 18V f = 120Hz	55	75		dB
V_{IN}	Input Voltage Required to Maintain Regulation			3.9		V
$\Delta V_O/\Delta_T$	AverageTemperature Coeffcient V_O	I_O = 5.0mA T_J = -55°C to +125°C		0.275	0.700	mV/°C

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Electrical Characteristics (@T_A = +25°C, I_O = 10mA, V_{IN} = 7V, 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 50mA T_J = -55°C to +125°C	3.148		3.393	V
		V_{IN} = 5 to 24V I_O = 0 to 50mA T_J = -55°C to +125°C	3.148		3.408	V
ΔV_O	Line Regulation	V_{IN} = 5 to 24V		5	15	mV
ΔV_O	Load Regulation	I_O = 0 to 50mA I_O = 0 to 10mA		20 13	30	mV
I_S	Supply Current	T_J = -55°C to +125°C		120	170	µA
ΔI_S	Supply Current Change	I_O = 0 to 50mA V_{IN} = 5 to 20V		5 2	10 10	µA
V_N	Output Noise Voltage	f = 10Hz to 10kHz		80		µVrms
$\Delta V_{IN}/\Delta V_O$	Ripple Rejection	V_{IN} = 6 to 20V f = 120Hz	55			dB
V_{IN}	Input Voltage Required to Maintain Regulation			4.74		V

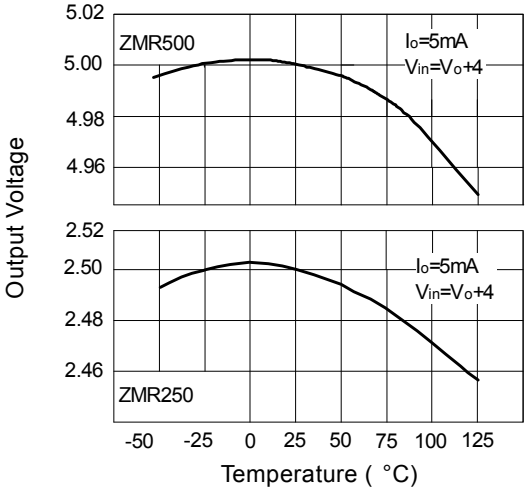
Electrical Characteristics (@T_A = +25°C, I_O = 10mA, V_{IN} = 10V, unless otherwise specified.)

ZMR500

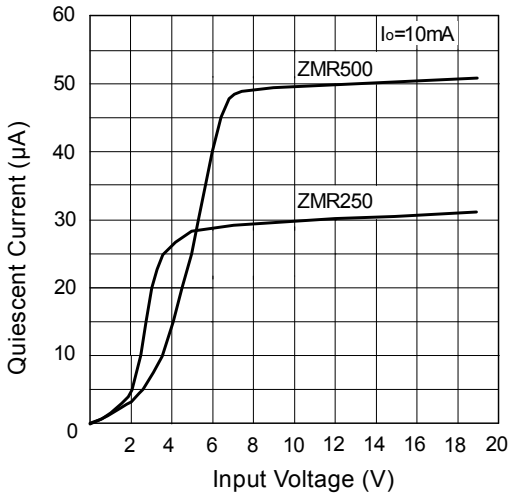
Symbol	Parameter	Condition	Min	Typ	Max	Unit
V_O	Output Voltage		4.785	5	5.125	V
		I_O = 0 to 50mA T_J = -55°C to +125°C	4.780		5.160	V
		V_{IN} = 7 to 25V I_O = 0 to 50mA T_J = -55°C to +125°C	4.780		5.175	V
ΔV_O	Line Regulation	V_{IN} = 7 to 25V		5	15	mV
ΔV_O	Load Regulation	I_O = 0 to 50mA I_O = 0 to 10mA		25 15	40	mV
I_S	Supply Current	T_J = -55°C to +125°C		50	70	µA
ΔI_S	Supply Current Change	I_O = 0 to 50mA V_{IN} = 7 to 25V		1 2	±10 10	µA
V_N	Output Noise Voltage	f = 10Hz to 10kHz		90		µVrms
$\Delta V_{IN}/\Delta V_O$	Ripple Rejection	V_{IN} = 8 to 18V f = 120Hz	55	72		dB
V_{IN}	Input Voltage Required to Maintain Regulation			6.2		V
$\Delta V_O/\Delta_T$	AverageTemperature Coeffcient V_O	I_O = 5.0mA T_J = -55°C to +125°C		0.275	0.700	mV/°C

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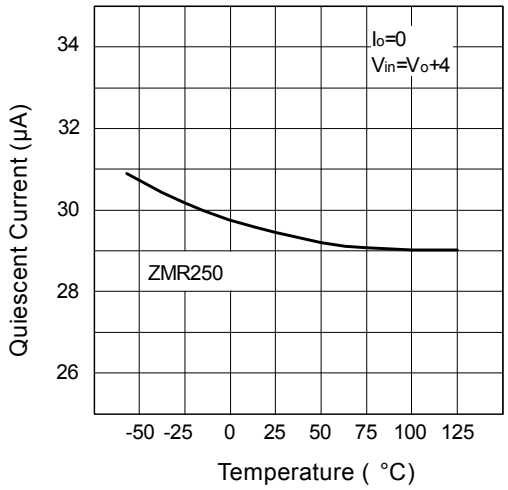
Typical Characteristics



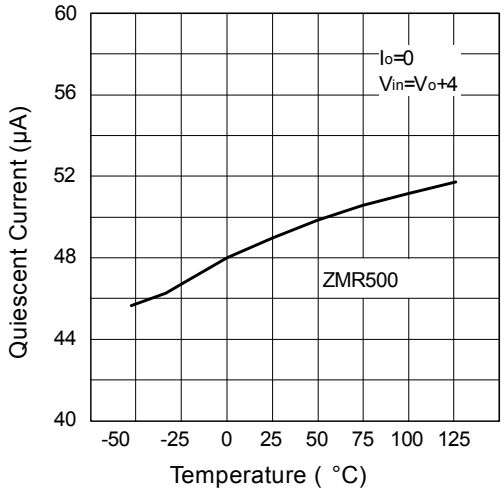
Output Voltage Temperature



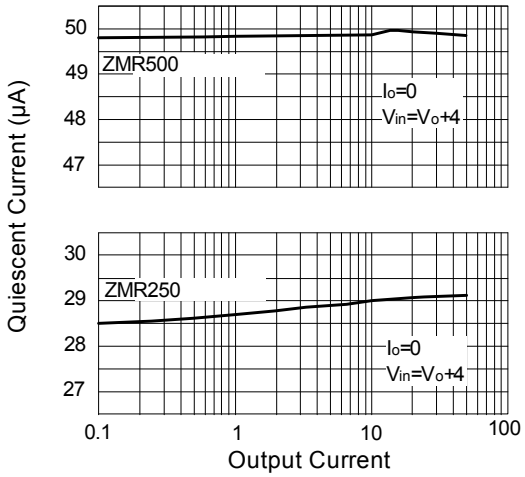
Quiescent Current v Voltage



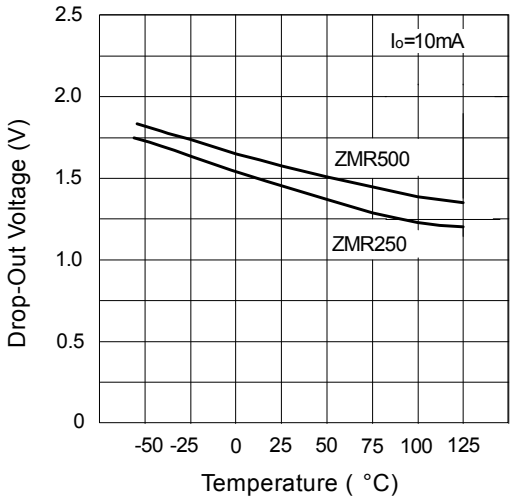
Quiescent Current v Temperature



Quiescent Current v Temperature



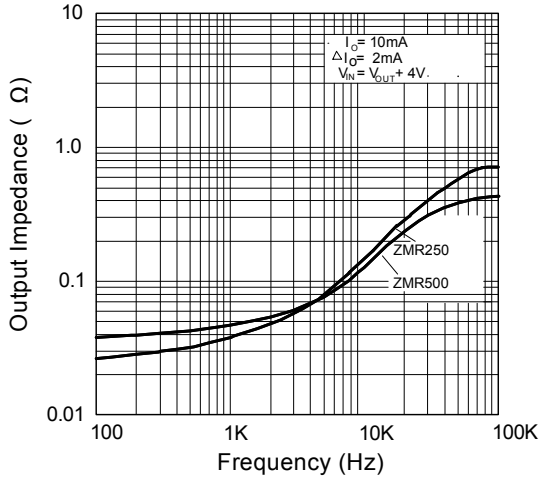
Quiescent Current v Output Current



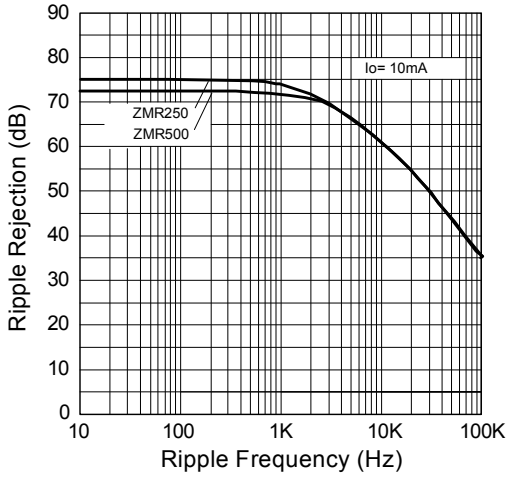
Drop-Out Voltage v Temperature

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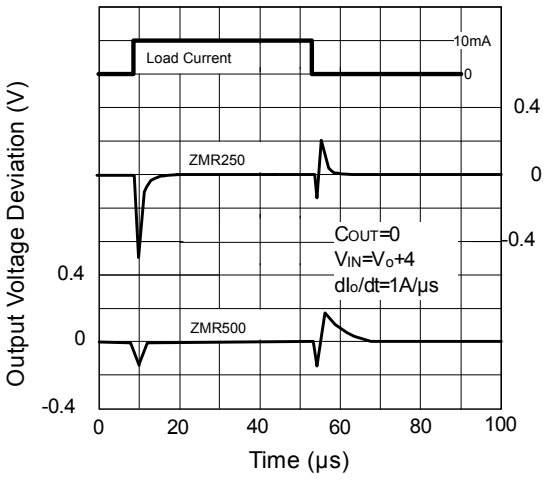
Typical Characteristics (cont.)



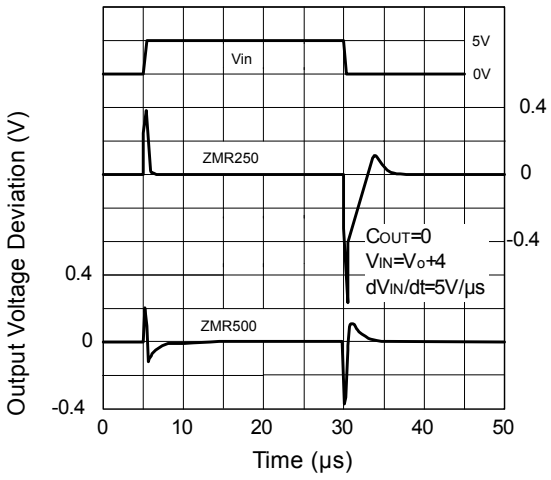
Output Impedance v Frequency



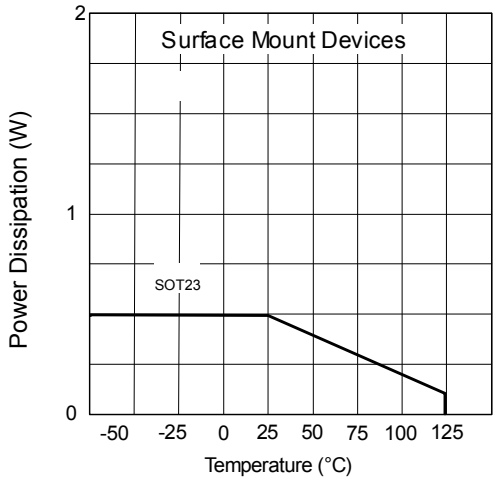
Ripple Rejection v Ripple Frequency



Load Transient Response



Line Transient Response



Power Derating

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Ordering Information

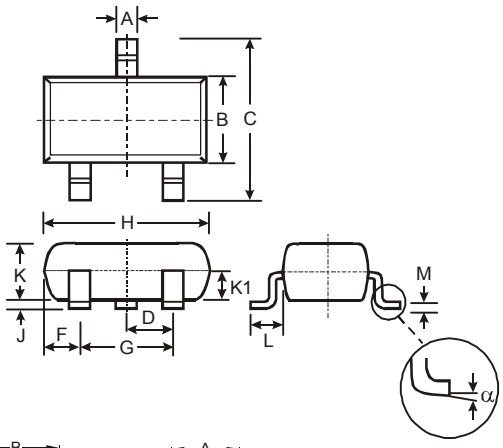
Part Number	Package	Part Mark	Status	Reel Size (inches)	Quantity per reel	Tape Width (mm)
ZMR25HFTA	SOT23	25X	Obsolete replaced by ZMR250FTA	7”	3000	8mm
ZMR50HFTA	SOT23	50R	Obsolete replaced by ZMR500FTA	7”	3000	8mm
ZMR250FTA	SOT23	25K	Released	7”	3000	8mm
ZMR330FTA	SOT23	330	Released	7”	3000	8mm
ZMR330F-7*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

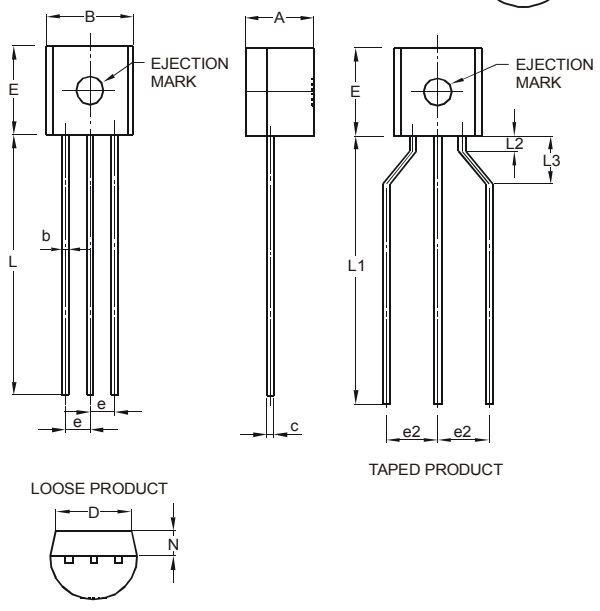
Please see AP02002 at http://www.diodes.com/datasheets/ap02002.pdf for latest version.

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



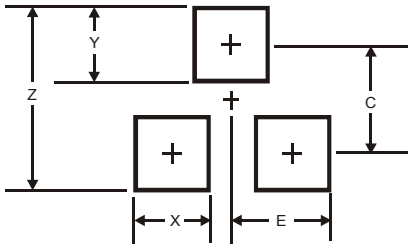
TO92			
Dim	Min	Max	Typ
A	3.45	3.66	—
B	4.27	4.78	—
b	—	—	0.38
c	—	—	0.38
D	—	—	3.87
E	4.32	4.83	—
e	—	—	1.27
e2	2.40	2.90	—
L	12.98	15.00	—
L1	12.80	15.00	—
L2	0.80	-	—
L3	2.00	3.00	—
N	1.22	1.37	—
All Dimensions in mm			

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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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