



ZMR250Q/ ZMR330Q/ ZMR500Q

AUTOMOTIVE COMPLIANT 2.5V, 3.3V AND 5V SOT23 (Type DN) VOLTAGE REGULATORS

Description

The ZMR250Q/ZMR330Q/ZMR500Q 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 2.5V or 5V with a drive capability up to 50mA.

All three devices are designed with space saving in mind and are available in the small outline SOT23 (Type DN) package. All three have an input voltage range of at least 20V plus the output voltage.

The ZMR250Q, ZMR330Q and ZMR500Q have been qualified to AEC-Q100 Grade 1 and are Automotive Compliant supporting PPAPs.

Automotive Point of Load Regulation

Features

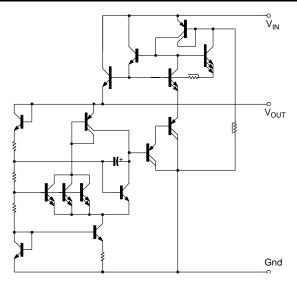
Notes:

- 2.5V, 3.3V and 5V Output
- Output Current up to 50mA
- Very Low Quiescent Current (30µA)
- Unconditionally Stable
- Internal Short Circuit Current Limit
- Green Molding in SOT23 (Type DN)
- Totally Lead-Free & Fully RoHS Compliant (Notes 1 & 2)
- Halogen and Antimony Free. "Green" Device (Note 3)
- Automotive Compliant
- Qualified to AEC-Q100 Standards for High Reliability
- PPAP Capable (Note 4)

1. No purposely added lead. Fully EU Directive 2002/95/EC (RoHS) & 2011/65/EU (RoHS 2) compliant.

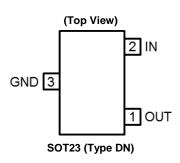
- 2. See http://www.diodes.com/quality/lead_free.html for more information about Diodes Incorporated's definitions of Halogen- and Antimony-free, "Green" and Lead-free.
- 3. Halogen- and Antimony-free "Green" products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.
- 4. Automotive products are AEC-Q100 qualified and are PPAP capable. http://www.diodes.com/product_compliance_definitions.html.

Equivalent Circuit



Pin Assignments

Applications





Absolute Maximum Ratings

Paramete	r	Rating	Unit
Input Voltage (Note 5)			
ZMR250Q		22.5	V
ZMR330Q		24	V
ZMR500Q		25	
Power Dissipation ($T_A = +25^{\circ}C$) (Note 6)			
SOT23 (Type DN)		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
ESD Rating			
НВМ	Human Body Model	1.5	kV
MM	Machine Model	350	V
CDM	Charged Device Model	1	kV

Caution:

Stresses greater than the 'Absolute Maximum Ratings' specified above, may cause permanent damage to the device. These are stress ratings only; functional operation of the device at conditions between maximum recommended operating conditions and absolute maximum ratings is not implied. Device reliability may be affected by exposure to absolute maximum rating conditions for extended periods of time.

(Semiconductor devices are ESD sensitive and may be damaged by exposure to ESD events. Suitable ESD precautions should be taken when handling and transporting these devices.)

Notes:

- 5. 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_A = T_J = +125°C.
- 6. Maximum power dissipation for the SOT23 (Type DN) package is calculated assuming that the device is mounted on a ceramic substrate measuring

Recommended Operating Conditions

Input Voltage Range	Min	Max	Unit
ZMR250Q	4.2	22.5	V
ZMR330Q	4.8	24	V
ZMR500Q	7.0	25	V
Junction Temperature Range	-40	+125	°C
Ambient Temperature Range	-40	+125	°C



Electrical Characteristics (@ $T_A = +25$ °C, $I_O = 10$ mA, $V_{IN} = 6.5$ V, unless otherwise specified.)

ZMR250Q							
Symbol	Parameter	Condition		Min	Тур	Max	Unit
		_		2.438	2.5	2.563	V
Vo	Output Voltage	_	$I_0 = 0$ to $50mA$	2.360		2.640	V
		$V_{IN} = 4.5V$ to 22.5V	$T_J = -40^{\circ}C \text{ to } +125^{\circ}C$	2.360	_	2.640	V
ΔV_{O}	Line Regulation	$V_{IN} = 4.5V$ to 22.5V		_	5	15	mV
۸۱/	Load Regulation	$I_O = 0$ to 50mA		_	20	30	mV
ΔVo	Load Regulation	I _O = 0 to 10mA		_	12	_	1110
Is	Supply Current	$T_J = -40^{\circ}\text{C to } +125^{\circ}\text{C}$		_	30	40	μΑ
Λ1	Supply Current Change	I _O = 0 to 50mA		_	1	±10	μΑ
ΔIS	ΔI _S Supply Current Change	V _{IN} = 4.5V to 22.5V		_	2	±10	
V _N	Output Noise Voltage	f = 10Hz to 10kHz		_	65	_	μVrms
$\Delta V_{IN}/\Delta V_{O}$	Ripple Rejection	V _{IN} = 6.3V to 18V, f = 120Hz		55	75	_	dB
V _{IN}	Input Voltage Required to Maintain Regulation	_		_	3.9	_	V
ΔV _O /Δ _T	Average Temperature Coefficient V-	I _O = 5.0mA		_	0.275	0.700	m\//°C
	Average Temperature Coefficient Vo	$T_J = -40^{\circ}\text{C to } +125^{\circ}\text{C}$					mV/°C

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

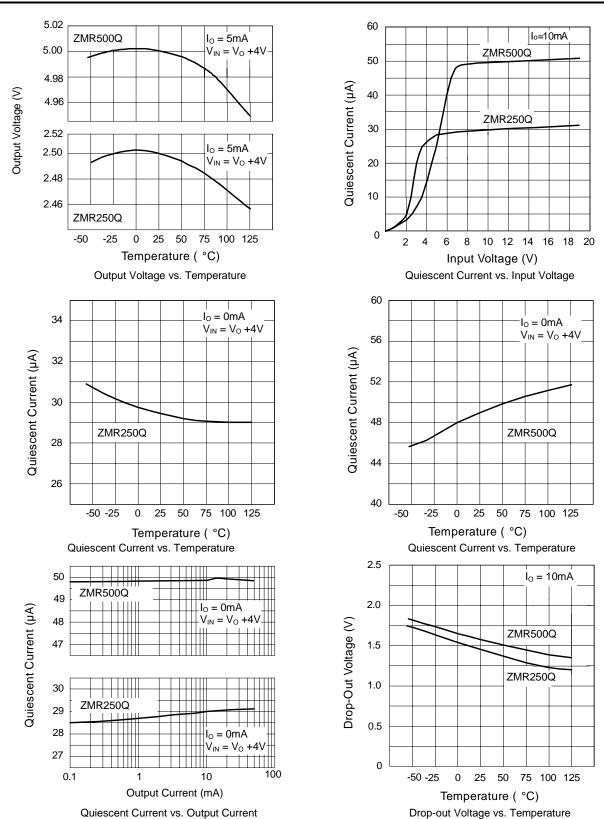
Symbol	Parameter	Condition		Min	Тур	Max	Unit
		_		3.217	3.3	3.383	V
Vo	Output Voltage	_	$I_O = 0$ to $50mA$	3.148	_	3.393	V
		$V_{IN} = 5V \text{ to } 24V$	$T_J = -40^{\circ}C \text{ to } +125^{\circ}C$	3.148	_	3.408	V
ΔV_{O}	Line Regulation	V _{IN} = 5V to 24V		_	5	15	mV
ΔV _O Load I	oad Regulation	I _O = 0 to 50mA		_	20	50	mV
		$I_O = 0$ to 10mA		_	13	_	IIIV
Is	Supply Current	$T_J = -40^{\circ}\text{C to } +125^{\circ}\text{C}$		_	120	170	μΑ
A.I.	Al Occasion Comment Observe	I _O = 0 to 50mA		_	5	±10	
ΔIs	Supply Current Change	V _{IN} = 5V to 20V		_	2	±10	μA
VN	Output Noise Voltage	f = 10Hz to 10kHz		_	80	_	μVrms
$\Delta V_{IN}/\Delta V_{O}$	Ripple Rejection	V _{IN} = 6V to 20V, f = 120Hz		55	_	_	dB
V _{IN}	Input Voltage Required to Maintain Regulation	<u> </u>		_	4.74	_	V

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

ZMR500Q							
Symbol	Parameter	Condition		Min	Тур	Max	Unit
		_		4.875	5	5.125	V
Vo	Output Voltage	tput Voltage —		4.780	_	5.160	V
		$V_{IN} = 7V$ to 25V	$T_J = -40^{\circ}\text{C to } +125^{\circ}\text{C}$	4.780	_	5.175	V
ΔV _O	Line Regulation	V _{IN} = 7V to 25V		_	5	15	mV
ΔV _O Load Regulation	Lond Population	I _O = 0 to 50mA		_	25	40	mV
	Load Regulation	$I_O = 0$ to $10mA$		_	15	_	IIIV
Is	Supply Current	$T_{J} = -40^{\circ}\text{C to } +125^{\circ}\text{C}$		_	50	70	μΑ
Α.Ι.	Al Complex Company Change		I _O = 0 to 50mA		1	±10	
ΔI_{S}	Supply Current Change	V _{IN} = 7V to 25V		_	2	±10	μA
V _N	Output Noise Voltage	f = 10Hz to 10kHz		_	90	_	μVrms
$\Delta V_{IN}/\Delta V_{O}$	Ripple Rejection	V _{IN} = 8V to 18V, f = 120Hz		55	72	_	dB
V _{IN}	Input Voltage Required to Maintain Regulation	_		_	6.7	_	V
$\Delta V_O/\Delta_T$	Average Temperature Coefficient Vo	$I_0 = 5.0 \text{mA}, T_J = -40^{\circ}\text{C to } +125^{\circ}\text{C}$		_	0.275	0.700	mV/°C

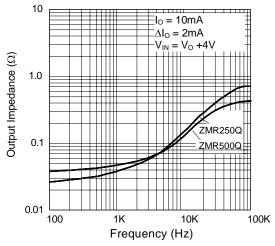


Typical Characteristics

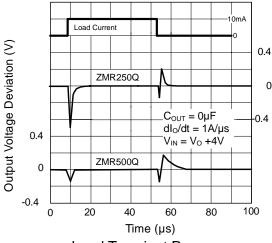




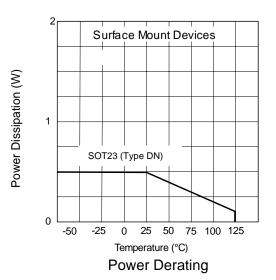
Typical Characteristics (Cont.)

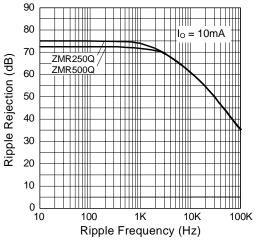


Output Impedance v Frequency

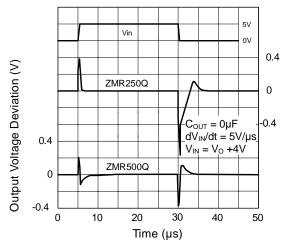


Load Transient Response





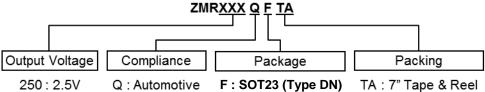
Ripple Rejection v Ripple Frequency



Line Transient Response



Ordering Information



330: 3.3V 500:5.0V

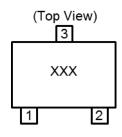
Compliant

		Package	Identification	Pack	ing: 7" Tape	and Reel	Qualification Grade
Part Number	Package	Code	Code	Quantity	Tape Width	Part Number Suffix	(Note 7)
ZMR250QFTA	SOT23 (Type DN)	F	25K	3000	8mm	TA	Automotive Compliant
ZMR330QFTA	SOT23 (Type DN)	F	330	3000	8mm	TA	Automotive Compliant
ZMR500QFTA	SOT23 (Type DN)	F	50K	3000	8mm	TA	Automotive Compliant

Note: 7. ZMR250Q, ZMR330Q and ZMR500Q have been qualified to AEC-Q100 grade 1 and are classified as "Automotive Compliant" which supports PPAP documentation. See ZMR250/330/500 datasheet for commercial qualified versions.

Marking Information

SOT23 (Type DN)



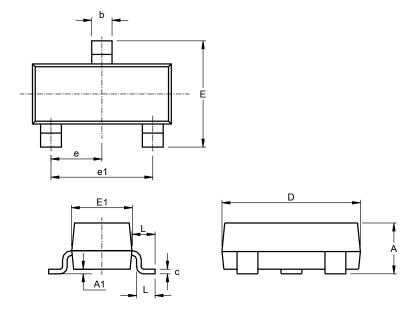
XXX: Identification Code



Package Outline Dimensions

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT23 (Type DN)

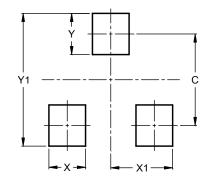


SOT23 (Type DN)						
Dim	Min Max Typ					
Α	0.89	1.12	1.00			
A1	0.01	0.10	0.05			
b	0.30	0.51	0.45			
С	0.08	0.20	0.10			
D	2.80	3.04	3.00			
Е	2.10	2.64	2.42			
E1	1.20	1.40	1.37			
е	0.95 REF					
e1	1.90 REF					
L	0.25	0.60	0.30			
L1	0.45	0.62	0.54			
All Dimensions in mm						

Suggested Pad Layout

Please see http://www.diodes.com/package-outlines.html for the latest version.

SOT23 (Type DN)



Dimensions	Value (in mm)
C	2.0
X	0.8
X1	1.35
Y	0.9
V1	2.0

ZMR250Q/ ZMR330Q/ ZMR500Q



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