

ZMR series

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 30 μ 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.

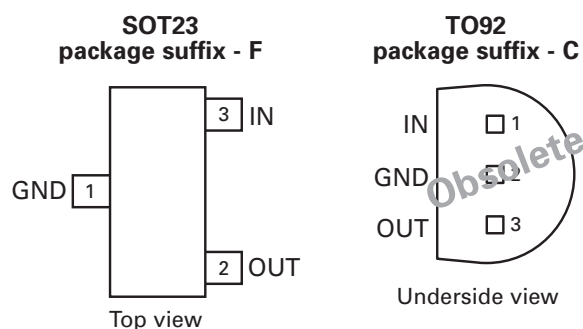
The device is designed with space saving in mind and is available in the small outline SOT23 package. The ZMR250 has expanded its input voltage range to 22.5V and the ZMR500 has expanded its input voltage range to 25V; equalling that of the ZMR25H and ZMR50H respectively.

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 μ A)
- Unconditionally stable
- Internal short circuit current limit

Pinout details



Ordering information

Order reference	Package	Part mark	Status	Reel size (inches)	Quantity per reel	Tape width (mm)
ZMR25HCL	TO92	ZMR25H	Obsolete	Loose	4000	-
ZMR25HCSTZ	TO92	ZMR25H	Obsolete	-	1500	-
ZMR25HFTA	SOT23	25X	Obsolete	7"	3000	8mm
ZMR250CL	TO92	ZMR250	Obsolete	Loose	4000	-
ZMR250CSTOB	TO92	ZMR250	Obsolete	12.5"	1500	-
ZMR250CSTZ	TO92	ZMR250	Obsolete	-	1500	-
ZMR250FTA	SOT23	25K	Active	7"	3000	8mm
ZMR330FTA	SOT23	330	Active	7"	3000	8mm
ZMR50HCL	TO92	ZMR50H	Obsolete	Loose	4000	-
ZMR50HCSTZ	TO92	ZMR50H	Obsolete	-	1500	-
ZMR50HFTA	SOT23	50R	Obsolete	7"	3000	8mm
ZMR500CL	TO92	ZMR500	Obsolete	Loose	4000	-
ZMR500CSTZ	TO92	ZMR500	Obsolete	Concertina	1500	-
ZMR500FTA	SOT23	50K	Active	7"	3000	8mm
ZMR500FTC	SOT23	50K	Obsolete	13"	10000	8mm

ZMR series

Absolute maximum ratings

Input voltage:	
ZMR25H, ZMR250	22.5V
ZMR330	24V
ZMR50H, ZMR500	25V
Package power dissipation	SOT23 500mW (Note 3)
(T _{amb} =25 °C)	TO92 600mW
Output current (I _O)	100mA
Operating temperature	-55 to 125°C
Storage temperature	-65 to 150°C

Note:

1. 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.
2. 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.
3. Maximum power dissipation for the SOT23 package, is calculated assuming that the device is mounted on a ceramic substrate measuring 15 x 15 x 0.6mm.

Recommended Operating Conditions

Input voltage range	Min	Max	Unit
ZMR25H/250	4.2	22.5	V
ZMR330	4.8	24	V
ZMR50H/500	7.0	25	V
Ambient temperature range	-55	125	°C

ZMR series

ZMR25H and ZMR250

Electrical characteristics test conditions (unless otherwise stated): $T_j = 25^\circ\text{C}$,
 $I_O = 10\text{mA}$, $V_{IN} = 6.5\text{V}$

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output voltage		2.438	2.5	2.563	V
		$I_O = 0$ to 50mA $T_j = -55$ to 125°C	2.360		2.640	V
		$V_{IN} = 4.5$ to 22.5V $I_O = 0$ to 50mA $T_j = -55$ to 125°C	2.360		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		20	30	mV
		$I_O = 0$ to 10mA		12		mV
I_S	Supply current	$T_j = -55$ to 125°C		30	40	μA
ΔI_S	Supply current change	$I_O = 0$ to 50mA		1	± 10	μA
		$V_{IN} = 4.5$ to 22.5V		2	10	μA
V_N	Output noise voltage	$f = 10\text{Hz}$ to 10kHz		65		$\mu\text{V rms}$
$\Delta V_{IN}/\Delta V_O$	Ripple rejection	$V_{IN} = 6.3$ to 18V $f = 120\text{Hz}$	55	75		dB
V_{IN}	Input voltage required to maintain regulation			3.9		V
$\Delta V_O / \Delta T$	Average temperature coefficient of V_O	$I_O = 5.0\text{mA}$ $T_j = -55$ to 125°C		0.275	0.700	$\text{mV}/^\circ\text{C}$

ZMR series

ZMR330

Electrical characteristics test conditions (unless otherwise stated): $T_j = 25^\circ\text{C}$,
 $I_O = 10\text{mA}$, $V_{IN} = 7\text{V}$

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output voltage		3.217	3.3	3.383	V
		$I_O = 0$ to 50mA $T_j = -55$ to 125°C	3.148		3.393	V
		$V_{IN} = 5$ to 24V $I_O = 0$ to 50mA $T_j = -55$ 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		20	50	mV
		$I_O = 0$ to 10mA		13		mV
I_S	Supply current	$T_j = -55$ to 125°C		120	170	μA
ΔI_S	Supply current change	$I_O = 0$ to 50mA		5	10	μA
		$V_{IN} = 5$ to 20V		2	10	μA
V_N	Output noise voltage	$f = 10\text{Hz}$ to 10kHz		80		$\mu\text{V rms}$
$\Delta V_{IN}/\Delta V_O$	Ripple rejection	$V_{IN} = 6$ to 20V $f = 120\text{Hz}$	55			dB
V_{IN}	Input voltage required to maintain regulation	$V_{OUT} = 3.217\text{V}$		4.74		V

ZMR series

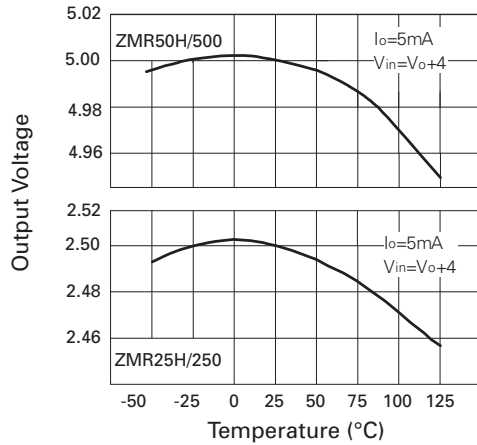
ZMR50H and ZMR500

Electrical characteristics test conditions (unless otherwise stated): $T_j = 25^\circ\text{C}$,
 $I_O = 10\text{mA}$, $V_{IN} = 10\text{V}$

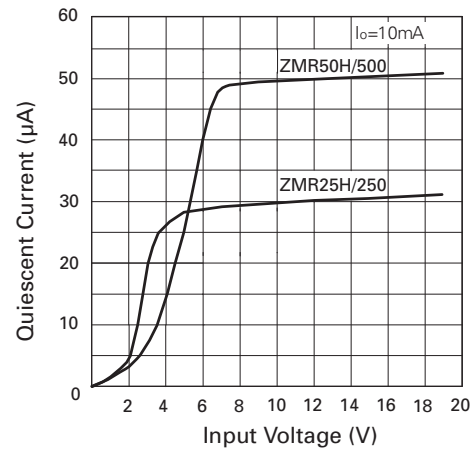
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
V_O	Output voltage		4.785	5	5.125	V
		$I_O = 0$ to 50mA $T_j = -55$ to 125°C	4.780		5.160	V
		$V_{IN} = 7$ to 25V $I_O = 0$ to 50mA $T_j = -55$ to 125°C	4.780		5.175	V
ΔV_O	Line regulation	$V_{IN} = 7$ to 25V		5	15	mV
ΔV_O	Load regulation	$I_O = 0$ to 50mA		25	40	mV
		$I_O = 0$ to 10mA		15		mV
I_S	Supply current	$T_j = -55$ to 125°C		50	70	μA
ΔI_S	Supply current change	$I_O = 0$ to 50mA		1	± 10	μA
		$V_{IN} = 7$ to 25V		2	10	μA
V_N	Output noise voltage	$f = 10\text{Hz}$ to 10kHz		90		$\mu\text{V rms}$
$\Delta V_{IN}/\Delta V_O$	Ripple rejection	$V_{IN} = 8$ to 18V $f = 120\text{Hz}$	55	72		dB
V_{IN}	Input voltage required to maintain regulation			6.7		V
$\Delta V_O / \Delta T$	Average temperature coefficient of V_O	$I_O = 5.0\text{mA}$ $T_j = -55$ to 125°C		0.275	0.700	$\text{mV}/^\circ\text{C}$

ZMR series

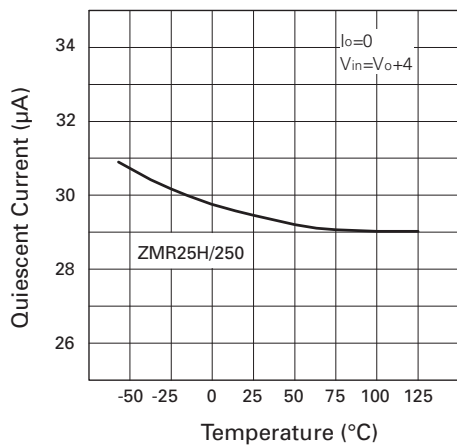
Typical characteristics



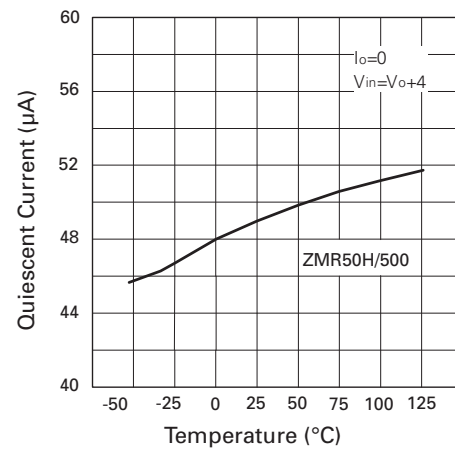
Output Voltage Temperature



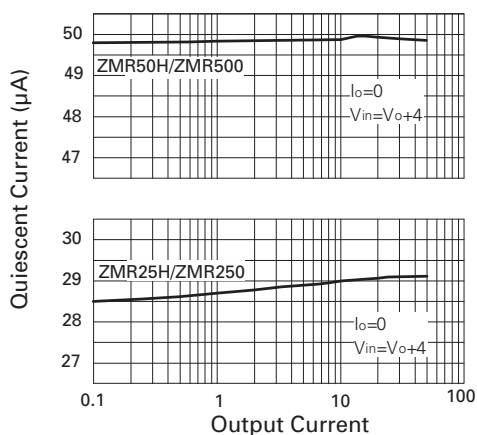
Quiescent Current v Voltage



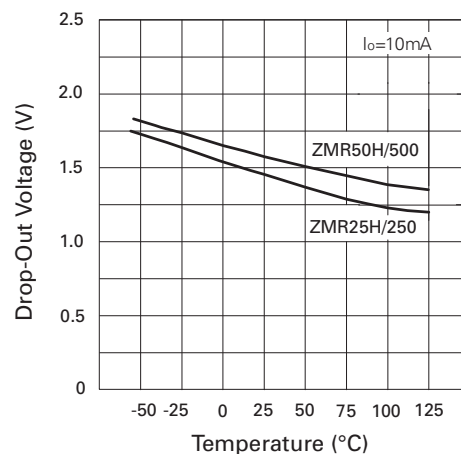
Quiescent Current v Temperature



Quiescent Current v Temperature



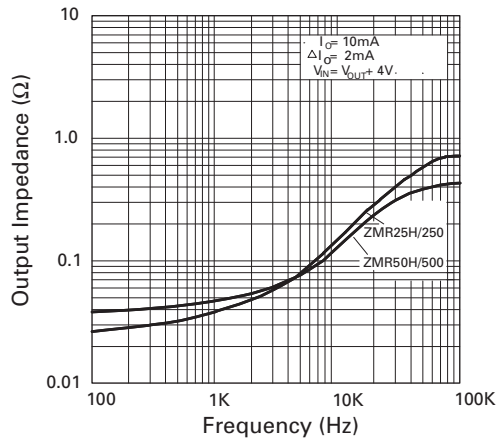
Quiescent Current v Output Current



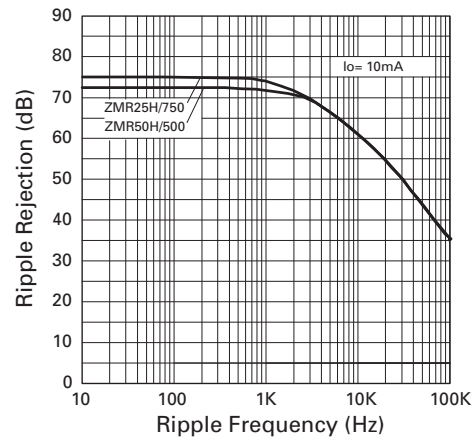
Drop-Out Voltage v Temperature

ZMR series

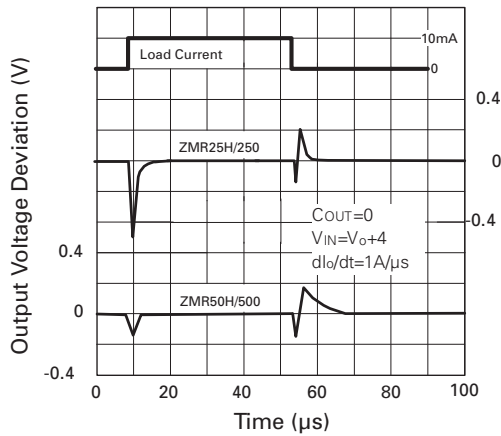
Typical characteristics



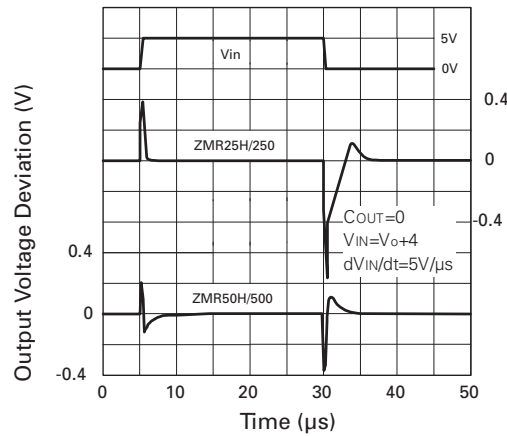
Output Impedance v Frequency



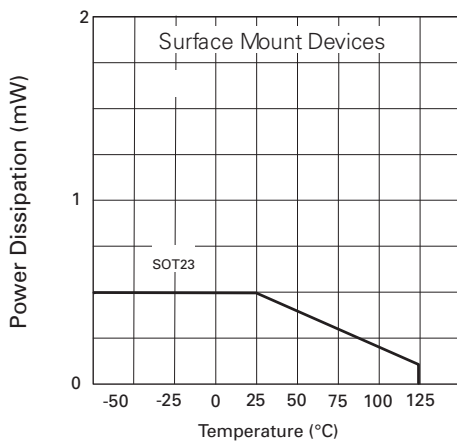
Ripple Rejection v Ripple Frequency



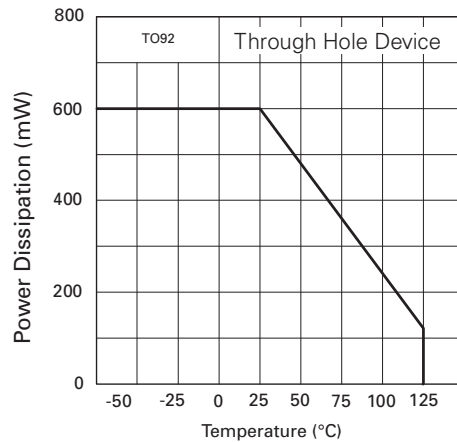
Load Transient Response



Line Transient Response



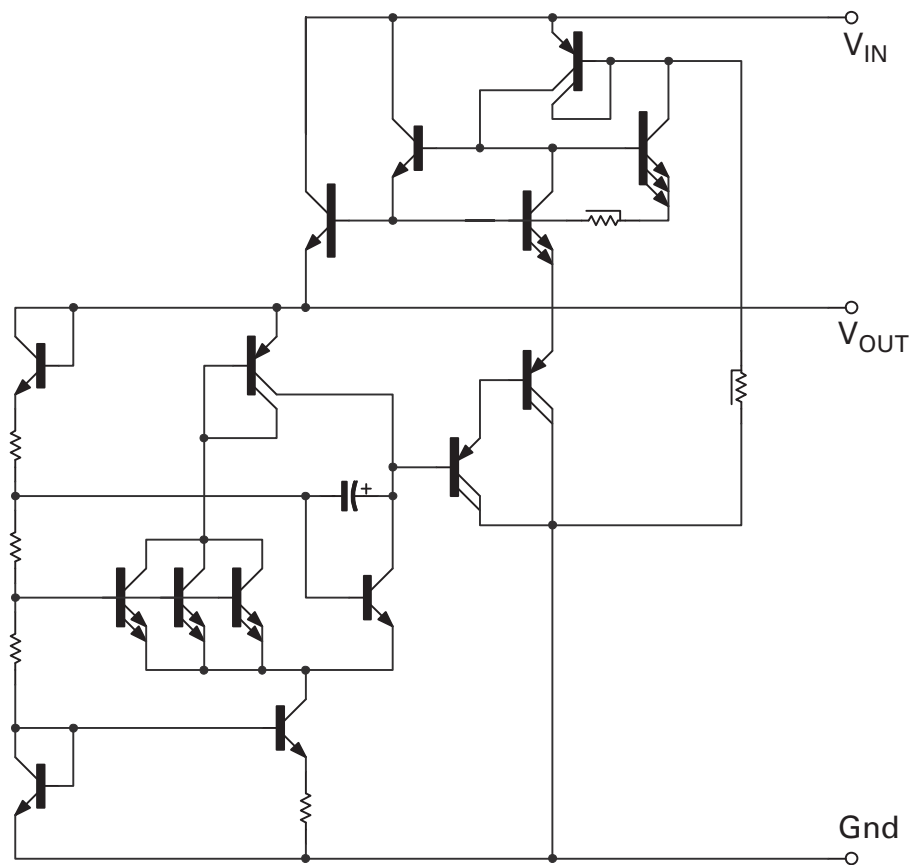
Power Derating



Power Derating

ZMR series

Schematic diagram

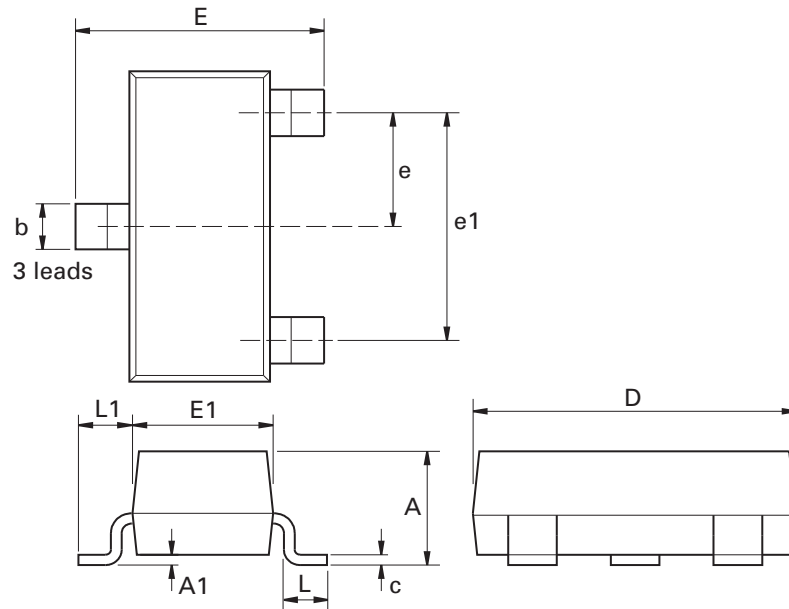


ZMR series

Intentionally left blank

ZMR series

Package outline - SOT23

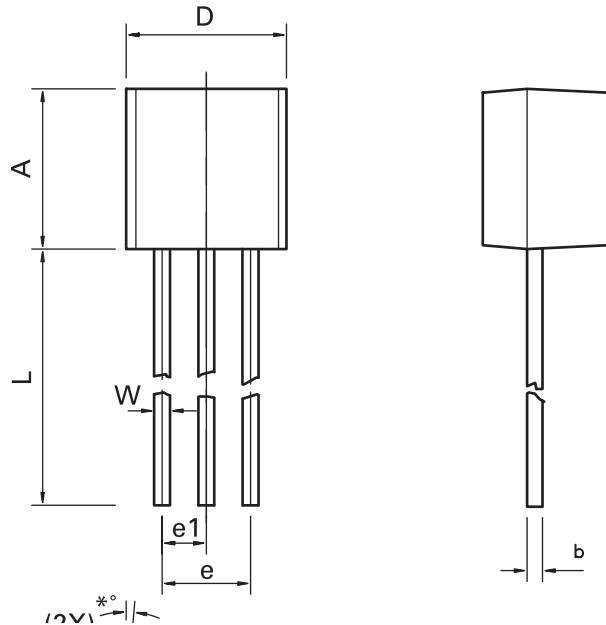


Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Max.	Max.
A	-	1.12	-	0.044	e1	1.90 NOM		0.075 NOM	
A1	0.01	0.10	0.0004	0.004	E	2.10	2.64	0.083	0.104
b	0.30	0.50	0.012	0.020	E1	1.20	1.40	0.047	0.055
C	0.085	0.120	0.003	0.008	L	0.25	0.62	0.018	0.024
D	2.80	3.04	0.110	0.120	L1	0.45	0.62	0.018	0.024
e	0.95 NOM		0.0375 NOM		-	-	-	-	-

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

ZMR series

Package outline - TO92



DIM	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.32	4.95	0.170	0.195
b	0.36	0.51	0.014	0.020
E	3.30	3.94	0.130	0.155
e	2.41	2.67	0.095	0.105
e1	1.14	1.40	0.045	0.055
L	12.70	15.49	0.500	0.610
R	2.16	2.41	0.085	0.095
S1	1.14	1.52	0.045	0.060
W	0.41	0.56	0.016	0.022
D	4.45	4.95	0.175	0.195
$\ast^{\circ}$	4°	6°	4°	6°

Note: Controlling dimensions are in millimeters. Approximate dimensions are provided in inches

Definitions

Product change

Zetex Semiconductors reserves the right to alter, without notice, specifications, design, price or conditions of supply of any product or service. Customers are solely responsible for obtaining the latest relevant information before placing orders.

Applications disclaimer

The circuits in this design/application note are offered as design ideas. It is the responsibility of the user to ensure that the circuit is fit for the user's application and meets with the user's requirements. No representation or warranty is given and no liability whatsoever is assumed by Zetex with respect to the accuracy or use of such information, or infringement of patents or other intellectual property rights arising from such use or otherwise. Zetex does not assume any legal responsibility or will not be held legally liable (whether in contract, tort (including negligence), breach of statutory duty, restriction or otherwise) for any damages, loss of profit, business, contract, opportunity or consequential loss in the use of these circuit applications, under any circumstances.

Life support

Zetex products are specifically not authorized for use as critical components in life support devices or systems without the express written approval of the Chief Executive Officer of Zetex Semiconductors plc. As used herein:

A. Life support devices or systems are devices or systems which:

1. are intended to implant into the body

or

2. support or sustain life and whose failure to perform when properly used in accordance with instructions for use provided in the labelling can be reasonably expected to result in significant injury to the user.

B. A critical component is any component in a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or to affect its safety or effectiveness.

Reproduction

The product specifications contained in this publication are issued to provide outline information only which (unless agreed by the company in writing) may not be used, applied or reproduced for any purpose or form part of any order or contract or be regarded as a representation relating to the products or services concerned.

Terms and Conditions

All products are sold subjects to Zetex' terms and conditions of sale, and this disclaimer (save in the event of a conflict between the two when the terms of the contract shall prevail) according to region, supplied at the time of order acknowledgement.

For the latest information on technology, delivery terms and conditions and prices, please contact your nearest Zetex sales office.

Quality of product

Zetex is an ISO 9001 and TS16949 certified semiconductor manufacturer.

To ensure quality of service and products we strongly advise the purchase of parts directly from Zetex Semiconductors or one of our regionally authorized distributors. For a complete listing of authorized distributors please visit: www.zetex.com/salesnetwork

Zetex Semiconductors does not warrant or accept any liability whatsoever in respect of any parts purchased through unauthorized sales channels.

ESD (Electrostatic discharge)

Semiconductor devices are susceptible to damage by ESD. Suitable precautions should be taken when handling and transporting devices. The possible damage to devices depends on the circumstances of the handling and transporting, and the nature of the device. The extent of damage can vary from immediate functional or parametric malfunction to degradation of function or performance in use over time. Devices suspected of being affected should be replaced.

Green compliance

Zetex Semiconductors is committed to environmental excellence in all aspects of its operations which includes meeting or exceeding regulatory requirements with respect to the use of hazardous substances. Numerous successful programs have been implemented to reduce the use of hazardous substances and/or emissions.

All Zetex components are compliant with the RoHS directive, and through this it is supporting its customers in their compliance with WEEE and ELV directives.

Product status key:

"Preview"	Future device intended for production at some point. Samples may be available
"Active"	Product status recommended for new designs
"Last time buy (LTB)"	Device will be discontinued and last time buy period and delivery is in effect
"Not recommended for new designs"	Device is still in production to support existing designs and production
"Obsolete"	Production has been discontinued

Datasheet status key:

"Draft version"	This term denotes a very early datasheet version and contains highly provisional information, which may change in any manner without notice.
"Provisional version"	This term denotes a pre-release datasheet. It provides a clear indication of anticipated performance. However, changes to the test conditions and specifications may occur, at any time and without notice.
"Issue"	This term denotes an issued datasheet containing finalized specifications. However, changes to specifications may occur, at any time and without notice.

Zetex sales offices

Europe	Americas	Asia Pacific	Corporate Headquarters
Zetex GmbH Kustermannpark Balanstraße 59 D-81541 München Germany Telefon: (49) 89 45 49 49 0 Fax: (49) 89 45 49 49 49 europe.sales@zetex.com	Zetex Inc 700 Veterans Memorial Highway Hauppauge, NY 11788 USA Telephone: (1) 631 360 2222 Fax: (1) 631 360 8222 usa.sales@zetex.com	Zetex (Asia Ltd) 3701-04 Metroplaza Tower 1 Hing Fong Road, Kwai Fong Hong Kong Telephone: (852) 26100 611 Fax: (852) 24250 494 asia.sales@zetex.com	Zetex Semiconductors plc Zetex Technology Park, Chadderton Oldham, OL9 9LL United Kingdom Telephone: (44) 161 622 4444 Fax: (44) 161 622 4446 hq@zetex.com

© 2007 Published by Zetex Semiconductors plc