

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 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.

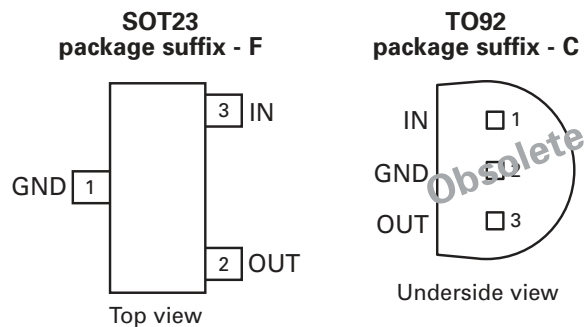
The device is designed with space saving in mind and is available in the small outline SOT23 package. The ZMR250 has expanded its input voltage range to 22.5V and the ZMR500 has expanded its input voltage range to 25V; equalling that of the ZMR25H and ZMR50H respectively.

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 (30µA)
- 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 |

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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 | $\text{mV}/^{\circ}\text{C}$ |

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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 |

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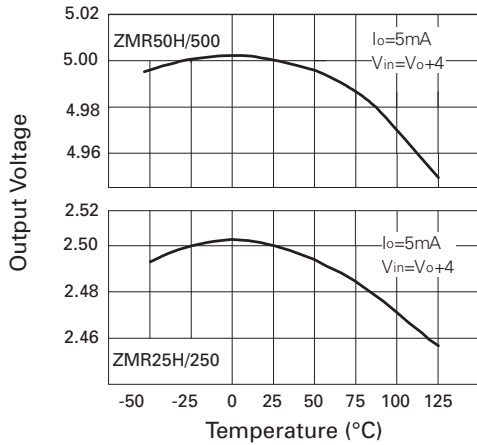
ZMR50H and ZMR500

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

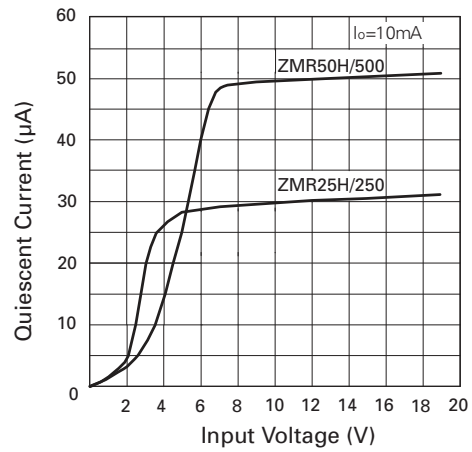
| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Units |
|----------------------------|---|--|-------|-------|----------|----------------------------|
| V_O | Output voltage | | 4.785 | 5 | 5.125 | V |
| | | $I_O=0$ to 50mA $T_j=-55$ to 125°C | 4.780 | | 5.160 | V |
| | | $V_{IN}=7$ to 25V $I_O=0$ 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

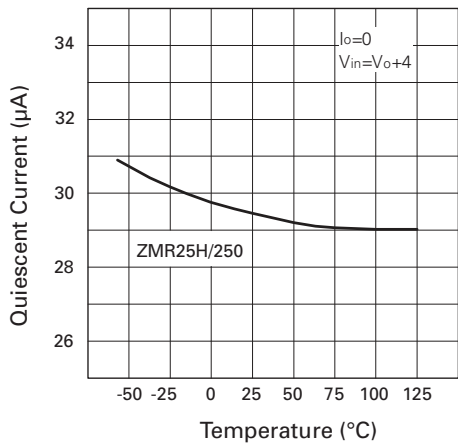
Typical characteristics



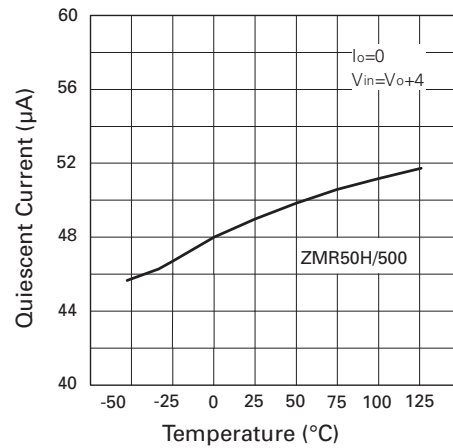
Output Voltage Temperature



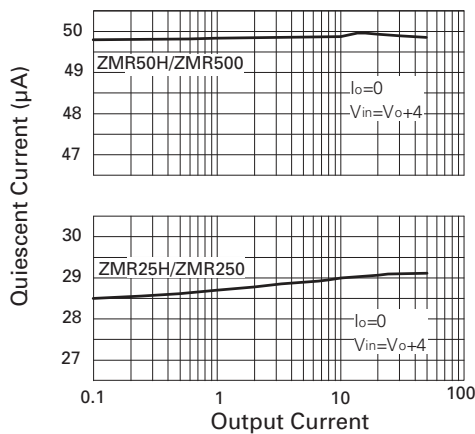
Quiescent Current v Voltage



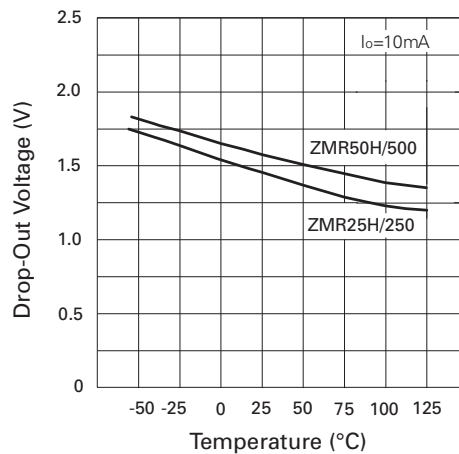
Quiescent Current v Temperature



Quiescent Current v Temperature



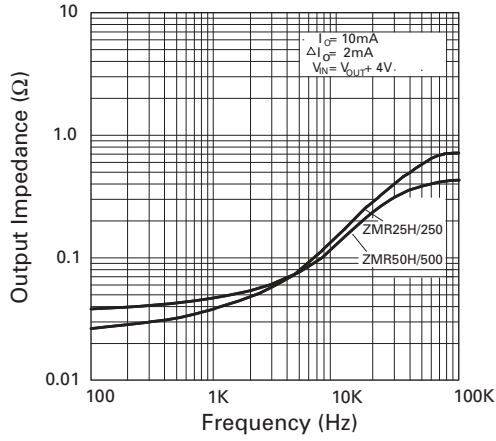
Quiescent Current v Output Current



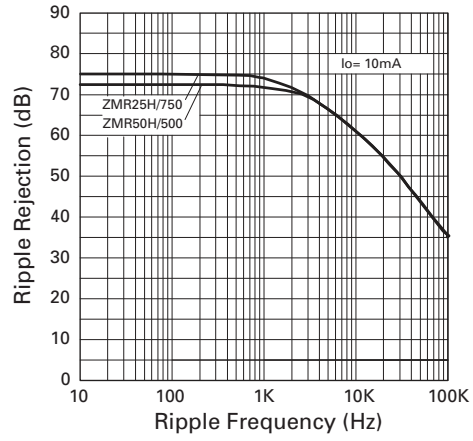
Drop-Out Voltage v Temperature

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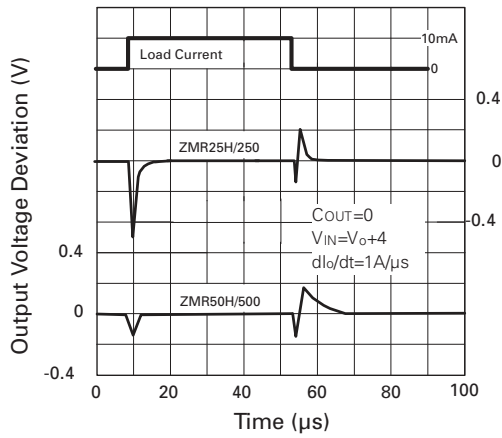
Typical characteristics



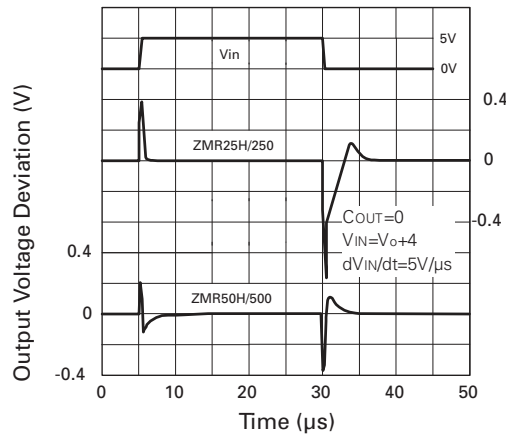
Output Impedance v Frequency



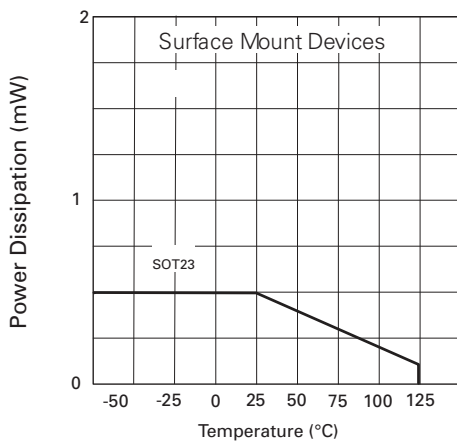
Ripple Rejection v Ripple Frequency



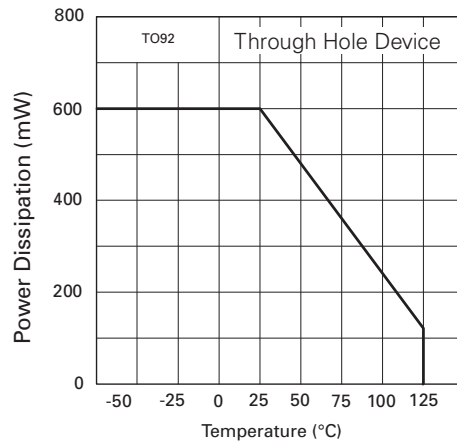
Load Transient Response



Line Transient Response



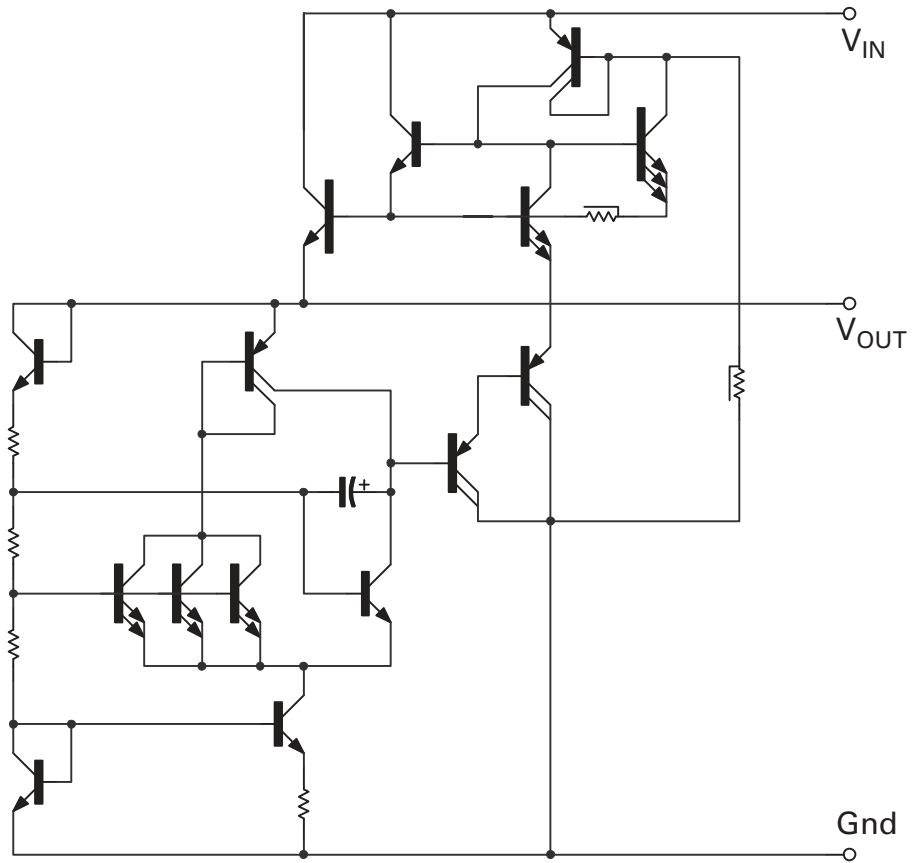
Power Derating



Power Derating

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Schematic diagram

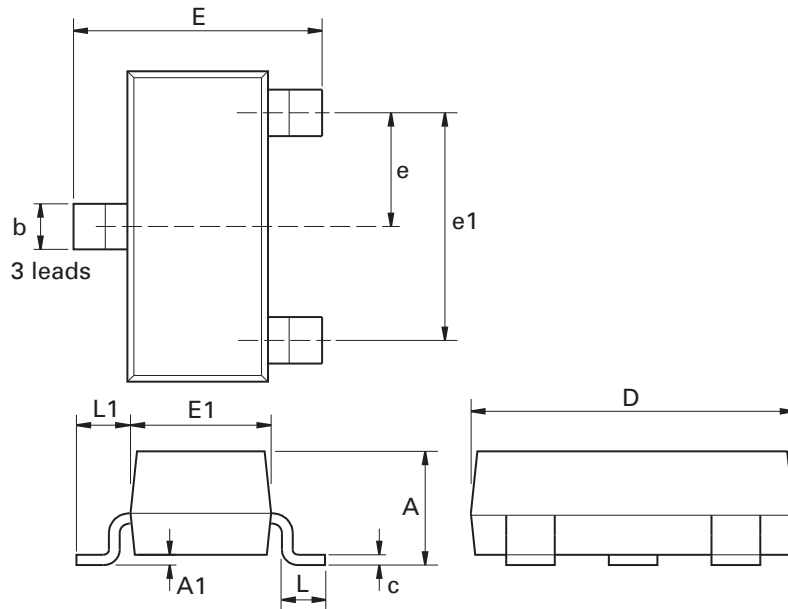


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Package outline - SOT23

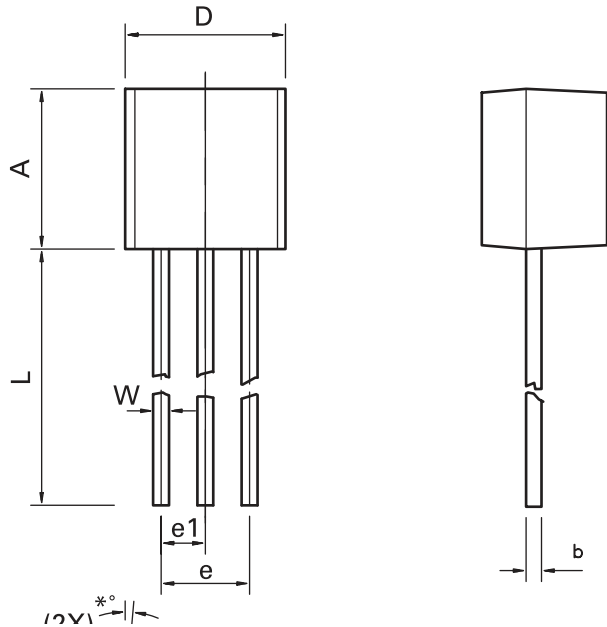


| Dim. | Millimeters | | Inches | | Dim. | Millimeters | | Inches | |
|------|-------------|-------|------------|-------|------|-------------|------|-----------|-------|
| | Min. | Max. | Min. | Max. | | Min. | Max. | Max. | Max. |
| A | - | 1.12 | - | 0.044 | e1 | 1.90 NOM | | 0.075 NOM | |
| A1 | 0.01 | 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

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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 |
| *° | 4° | 6° | 4° | 6° |

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

Definitions

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or

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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. |
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