

**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; equaling that of the ZMR25H and ZMR50H respectively.

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

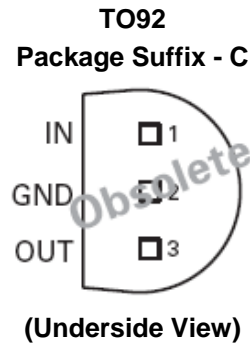
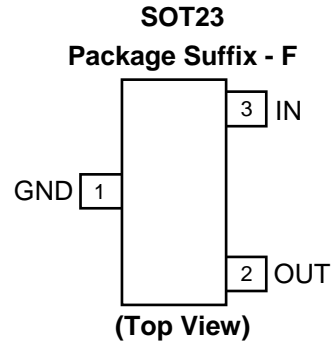
**Features**

- 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

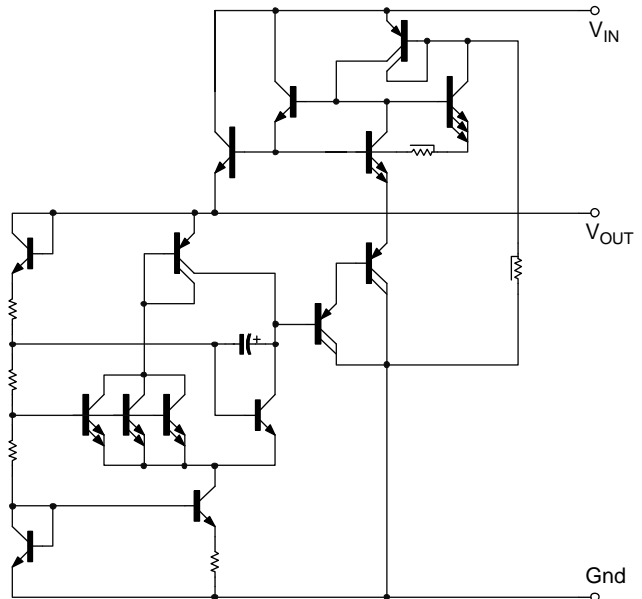
**Applications**

- Small outline SOT23 package
- 2.5V, 3.3V, 5V output
- Output current up to 50mA
- Very low quiescent current (30µA)
- Unconditionally stable
- Internal short circuit current limit
- "Green" molding compound (No Br, Sb)

**Pin Assignments**



**Typical Application Circuit**



## Absolute Maximum Ratings

Parameter	Rating	Unit
Input Voltage ZMR250 ZMR330 ZMR500	22.5 24 25	V
Power Dissipation ( $T_{AMB} = 25^{\circ}\text{C}$ ) (Note 3) SOT23	500	mW
Output Current ( $I_O$ )	100	mA
Ambient Temperature	-55 to 125	$^{\circ}\text{C}$
Maximum Junction Temperature	125	$^{\circ}\text{C}$
Storage Temperature	-65 to 150	$^{\circ}\text{C}$

- Notes:
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  $25^{\circ}\text{C}$  and must be linearly derated to zero at  $T_{amb} = 125^{\circ}\text{C}$ .
  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  $15 \times 15 \times 0.6\text{mm}$ .

## Recommended Operating Conditions

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

**Electrical Characteristics** (unless otherwise stated):  $T_J = 25^\circ\text{C}$ ,  $I_O = 10\text{mA}$ ,  $V_{IN} = 6.5\text{V}$

**ZMR250**

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
$V_O$	Output voltage		2.438	2.5	2.563	V
		$I_O = 0$ to 50mA $T_J = -55$ to $125^\circ\text{C}$	2.360		2.640	V
		$V_{IN} = 4.5$ to 22.5V $I_O = 0$ to 50mA $T_J = -55$ to $125^\circ\text{C}$	2.630		2.640	V
$\Delta V_O$	Line regulation	$V_{IN} = 4.5$ to 22.5V		5	15	mV
$\Delta V_O$	Load regulation	$I_O = 0$ to 50mA $I_O = 0$ to 10mA		20 12	30	mV
$I_S$	Supply current	$T_J = -55$ to $125^\circ\text{C}$		30	40	$\mu\text{A}$
$\Delta I_S$	Supply current change	$I_O = 0$ to 50mA $V_{IN} = 4.5$ to 22.5V		1 2	$\pm 10$ 10	$\mu\text{A}$
$V_N$	Output noise voltage	$f = 10\text{Hz}$ to 10kHz		65		$\mu\text{V rms}$
$\Delta V_{IN} / V_O$	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 $125^\circ\text{C}$		0.275	0.700	$\text{mV}/^\circ\text{C}$

**Electrical Characteristics** (unless otherwise stated):  $T_J = 25^\circ\text{C}$ ,  $I_O = 10\text{mA}$ ,  $V_{IN} = 7\text{V}$

**ZMR330**

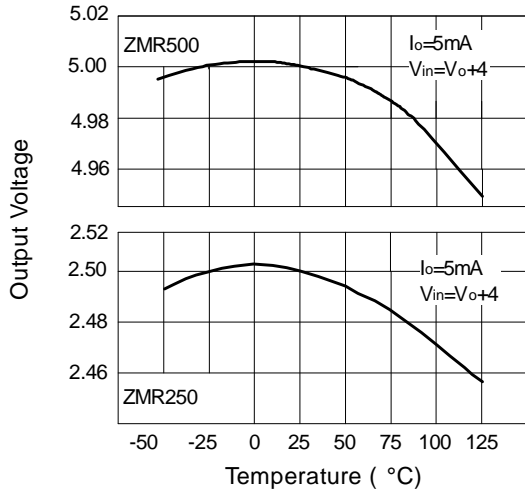
Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
$V_O$	Output voltage		3.217	3.3	3.383	V
		$I_O = 0$ to 50mA $T_J = -55$ to $125^\circ\text{C}$	3.148		3.393	V
		$V_{IN} = 5$ to 24V $I_O = 0$ to 50mA $T_J = -55$ to $125^\circ\text{C}$	3.148		3.408	V
$\Delta V_O$	Line regulation	$V_{IN} = 5$ to 24V		5	15	mV
$\Delta V_O$	Load regulation	$I_O = 0$ to 50mA $I_O = 0$ to 10mA		20 13	30	mV
$I_S$	Supply current	$T_J = -55$ to $125^\circ\text{C}$		120	170	$\mu\text{A}$
$\Delta I_S$	Supply current change	$I_O = 0$ to 50mA $V_{IN} = 5$ to 20V		5 2	10 10	$\mu\text{A}$
$V_N$	Output noise voltage	$f = 10\text{Hz}$ to $10\text{kHz}$		80		$\mu\text{V rms}$
$\Delta V_{IN} / V_O$	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

**Electrical Characteristics** (unless otherwise stated):  $T_J = 25^\circ\text{C}$ ,  $I_O = 10\text{mA}$ ,  $V_{IN} = 10\text{V}$

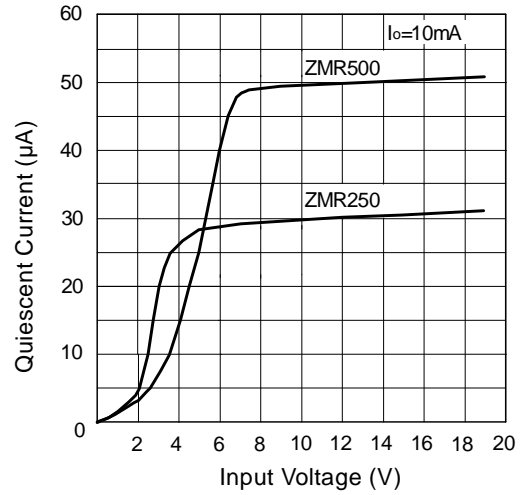
**ZMR500**

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

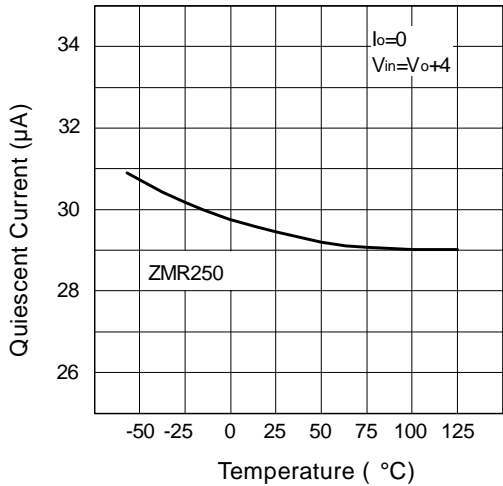
**Typical Characteristics**



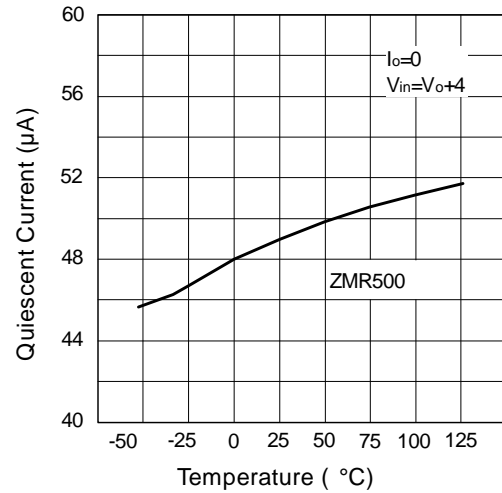
Output Voltage Temperature



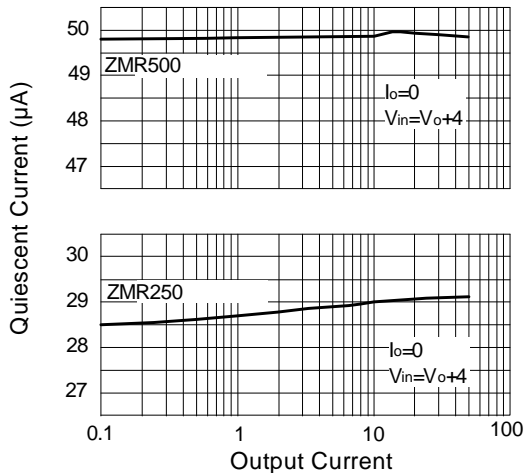
Quiescent Current v Voltage



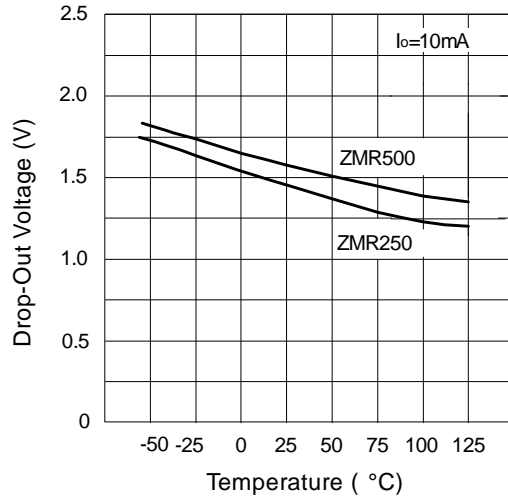
Quiescent Current v Temperature



Quiescent Current v Temperature

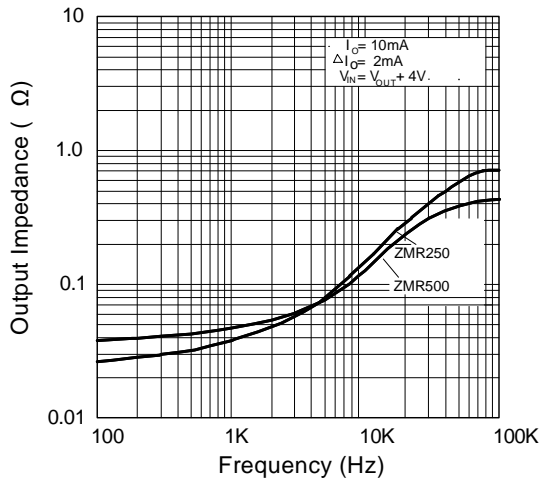


Quiescent Current v Output Current

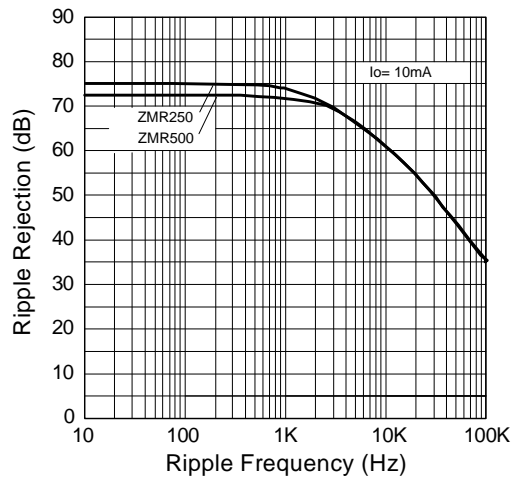


Drop-Out Voltage v Temperature

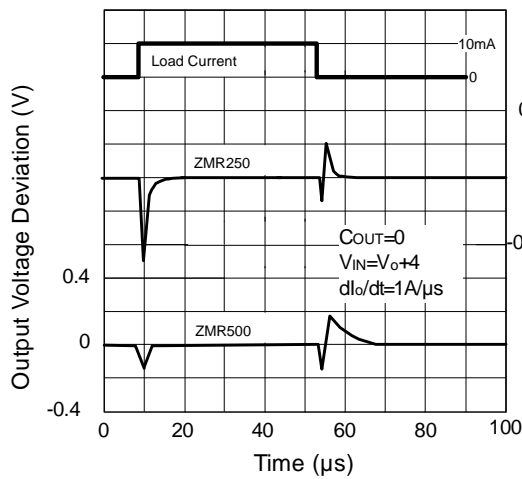
**Typical Characteristics (cont.)**



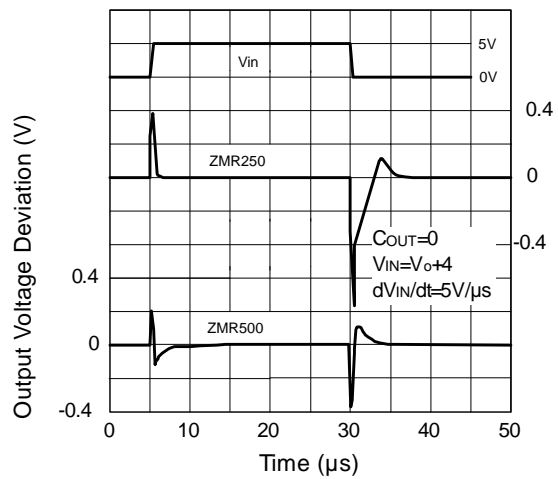
Output Impedance v Frequency



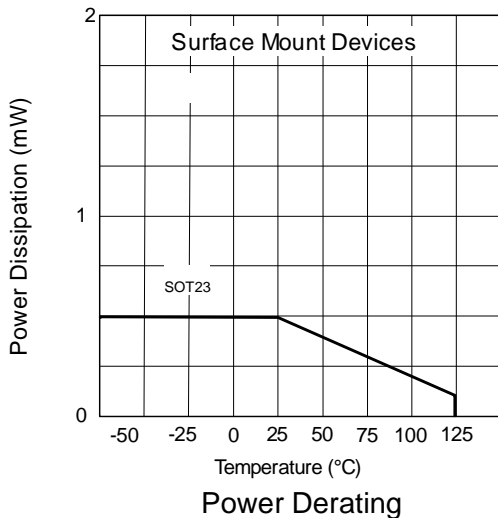
Ripple Rejection v Ripple Frequency



Load Transient Response



Line Transient Response



Power Derating

## Ordering Information

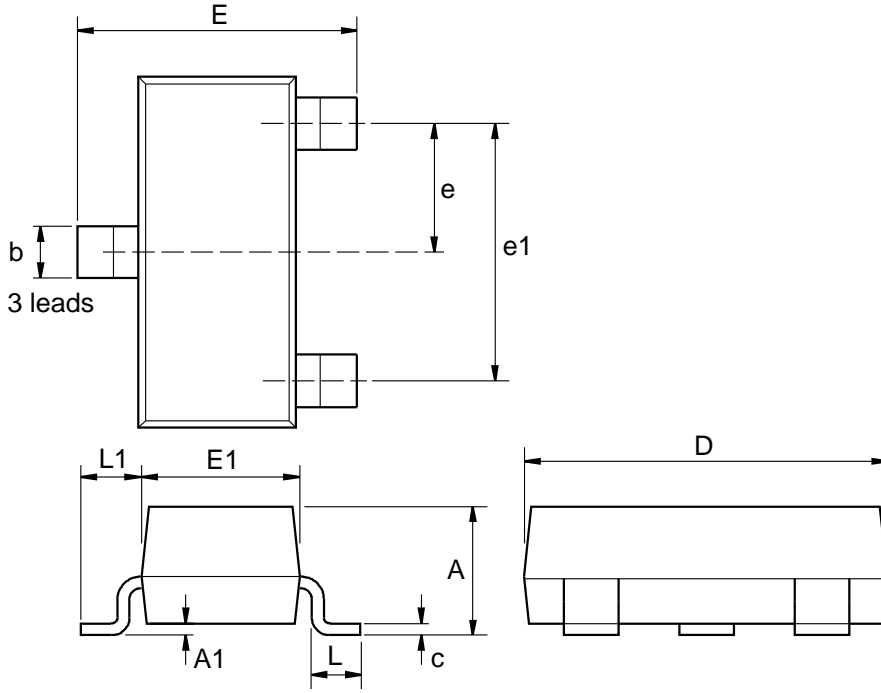
Part Number	Package	Part Mark	Status	Reel Size (inches)	Quantity per reel	Tape Width (mm)
ZMR25HFTA	SOT23	25X	Obsolete replaced by ZMR250FTA	7"	3000	8mm
ZMR50HFTA	SOT23	50R	Obsolete replaced by ZMR500FTA	7"	3000	8mm
ZMR250FTA	SOT23	25K	Released	7"	3000	8mm
ZMR330FTA	SOT23	330	Released	7"	3000	8mm
ZMR330F-7*	SOT23	330	Released	7"	3000	8mm
ZMT500FTA	SOT23	50K	Released	7"	3000	8mm

Notes: \*ZMR330F-7 is in Halogen free molding compound  
All TO92 variants (ZMRxxxC) are obsolete. Closest replacements are the ZMRxxxFTA.



**Package Outline Dimensions**

**SOT23**

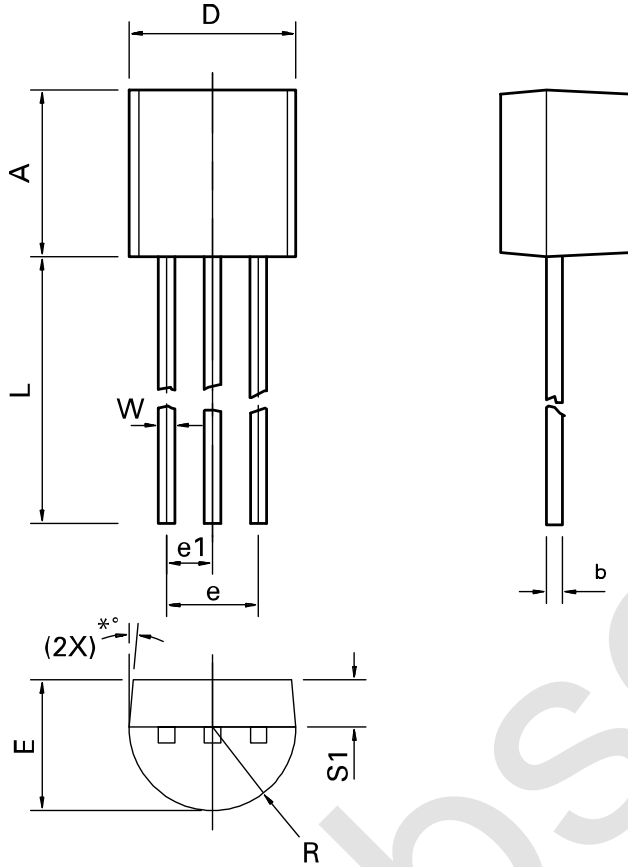


Dim.	Millimeters		Inches		Dim.	Millimeters		Inches	
	Min.	Max.	Min.	Max.		Min.	Max.	Min.	Max.
A	-	1.12	-	0.044	e1	1.90 NOM		0.075 NOM	
A1	0.01	0.10	0.0004	0.004	E	2.10	2.64	0.083	0.104
b	0.30	0.50	0.012	0.020	E1	1.20	1.40	0.047	0.055
c	0.085	0.20	0.003	0.008	L	0.25	0.60	0.0098	0.0236
D	2.80	3.04	0.110	0.120	L1	0.45	0.62	0.018	0.024
e	0.95 NOM		0.037 NOM		-	-	-	-	-

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

**Package Outline Dimensions (cont.)**

**T092**



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

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

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