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# LM336Z5

## Programmable Shunt Regulator

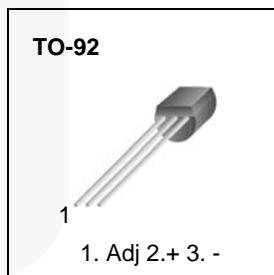
### Features

- Low Temperature Coefficient
- Adjustable 4 V to 6 V
- Wide Operating Range Current: 10 mA to 400 mA
- Three Lead Transistor Package (TO-92)
- 0.6 Ω Dynamic Impedance
- ±1.0% Initial Tolerance Available
- Guaranteed Temperature Stability
- Easily Trimmed for Minimum Temperature Drift
- Fast Turn On

### Description

The LM336Z5 integrated circuit is precision 5.0 V shunt regulator. The monolithic  $I_C$  voltage reference operates as a low temperature coefficient 5.0 V Zener with 0.6 Ω dynamic impedance. A third terminal on the LM336Z5 allows the reference voltage and temperature coefficient to be trimmed.

The LM336Z5 is useful as a precision 5.0 V low-voltage reference, which makes it convenient to obtain a stable reference from low-voltage supplies. Further, since the LM336Z5 operates as shunt regulator, it can be used as either a positive or negative voltage reference.



### Ordering Information

Part Number	Operating Temperature Range	Top Mark	Package	Packing Method
LM336Z5	0 ~ +70°C	LM336Z5	TO-92	Bulk
LM336Z5X		LM336Z5	TO-92	Tape and Reel

## Block Diagram

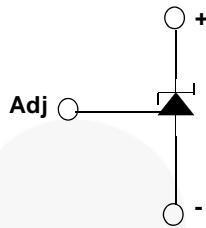


Figure 1. Block Diagram

## Schematic Diagram

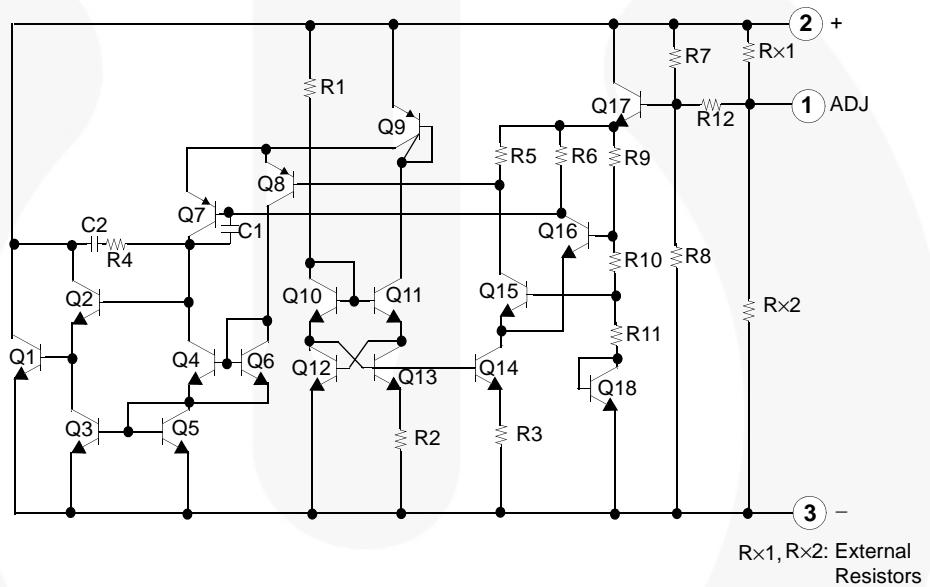


Figure 2. Schematic Diagram

## Absolute Maximum Ratings<sup>(1)</sup>

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only. Values are at  $T_A = 25^\circ\text{C}$  unless otherwise noted.

Symbol	Parameter	Value	Unit
$I_R$	Reverse Current	15	mA
$I_F$	Forward current	10	mA
$T_{OPR}$	Operating Temperature Range	0 ~ +70	°C
$T_{STG}$	Storage Temperature Range	-60 ~ +150	°C

### Note:

1. The Absolute Maximum Ratings are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the Electrical Characteristics tables are not guaranteed at the absolute maximum rating.

## Electrical Characteristics

0°C ≤  $T_A$  ≤ +70°C unless otherwise specified.

Symbol	Parameter	Conditions	LM336Z5			Unit
			Min.	Typ.	Max.	
$V_R$	Reverse Breakdown Voltage	$T_A = 25^\circ\text{C}$ , $I_R = 1 \text{ mA}$	4.8	5.0	5.2	V
$\Delta V_R/\Delta I_R$	Reverse Breakdown Change with Current	$T_A = 25^\circ\text{C}$ , 600 $\mu\text{A} \leq I_R \leq 10 \text{ mA}$		6	20	mV
$Z_D$	Reverse Dynamic Impedance	$T_A = 25^\circ\text{C}$ , $I_R = 1 \text{ mA}$		0.6	2.0	$\Omega$
$ST_T$	Temperature Stability	$I_R = 1 \text{ mA}$		4	12	mV
$\Delta V_R/\Delta I_R$	Reverse Breakdown Change with Current	600 $\mu\text{A} \leq I_R \leq 10 \text{ mA}$		6	24	mV
$Z_D$	Reverse Dynamic Impedance	$I_R = 1 \text{ mA}$		0.8	2.5	$\Omega$
ST	Long Term Stability In Reference Voltage	$I_R = 1 \text{ mA}$		20		ppm/Khr

## Typical Performance Characteristics

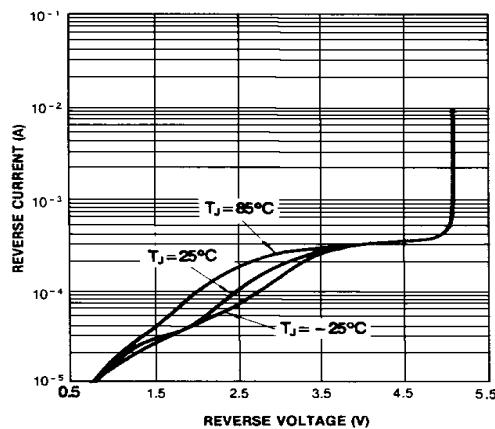


Figure 3. Reverse Characteristics

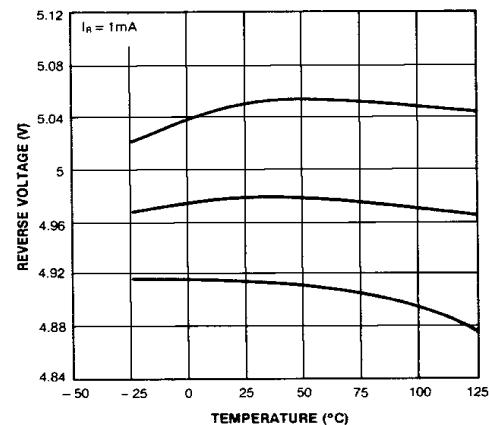


Figure 4. Temperature Drift

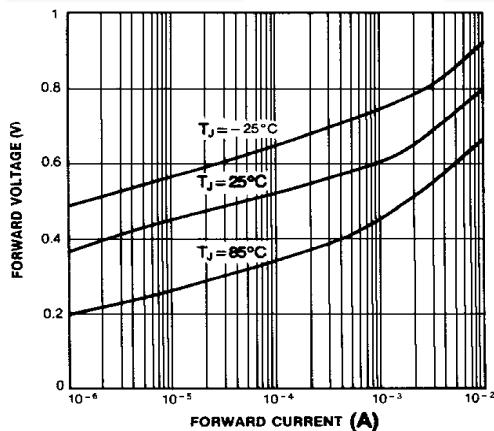


Figure 5. Forward Characteristics

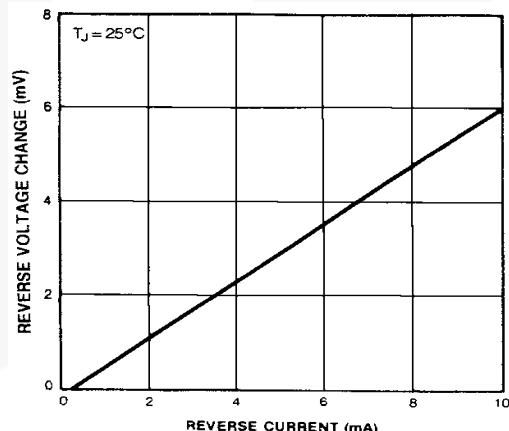
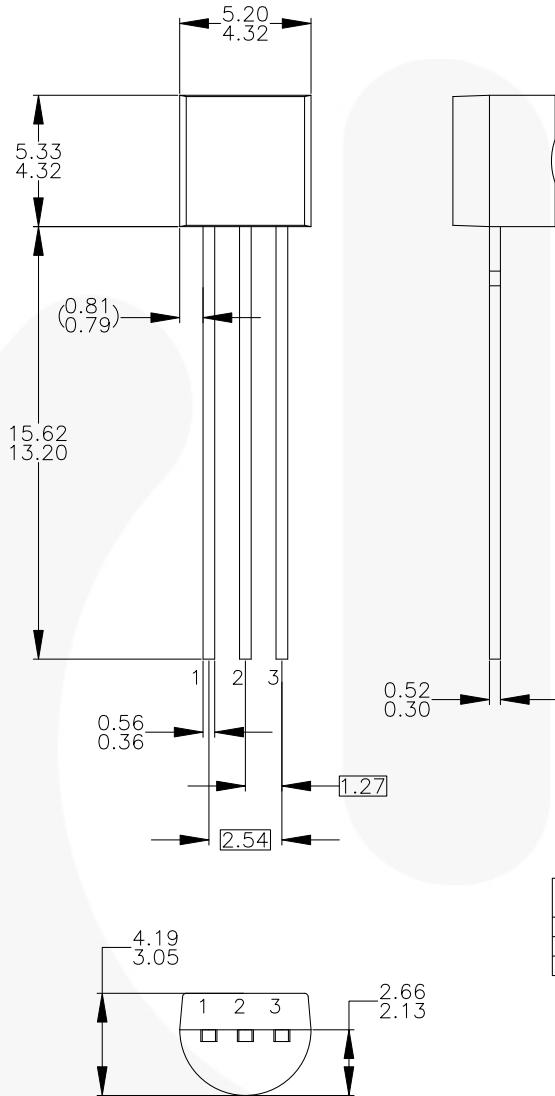


Figure 6. Reverse Voltage Change

## Physical Dimensions

## TO-92 Bulk Type



NOTES: UNLESS OTHERWISE SPECIFIED

- A) DRAWING WITH REFERENCE TO JEDEC TO-92 RECOMMENDATIONS.
- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-1994.
- D) TO-92 (92,94,96,97,98) PIN CONFIGURATION:

Pin	92	94	96	97	98
1	P F M	P F M B F M	P B F M	P F M	P F M
2	E S S E S S B D G C G D C G D	B D G C G D E S S B D G E S S	B D G C G D E S S B D G E S S	B D G C G D E S S B D G E S S	B D G C G D E S S B D G E S S
3	C G D B D G C G D E S S B D G E S S	C G D B D G C G D E S S B D G E S S	C G D B D G C G D E S S B D G E S S	C G D B D G C G D E S S B D G E S S	C G D B D G C G D E S S B D G E S S

LEGEND:  
 P – BIPOLAR      E – Emitter      D – Drain  
 F – JFET      B – Base      S – Source  
 M – DMOS      C – Collector      G – Gate

- E) FOR PACKAGE 92, 94, 96, 97 AND 98:  
 PIN CONFIGURATION DRAIN "D" AND SOURCE "S"  
 ARE INTERCHANGEABLE AT JFET "F" OPTION.
- F) DRAWING FILENAME: MKT-ZA03DREV3.

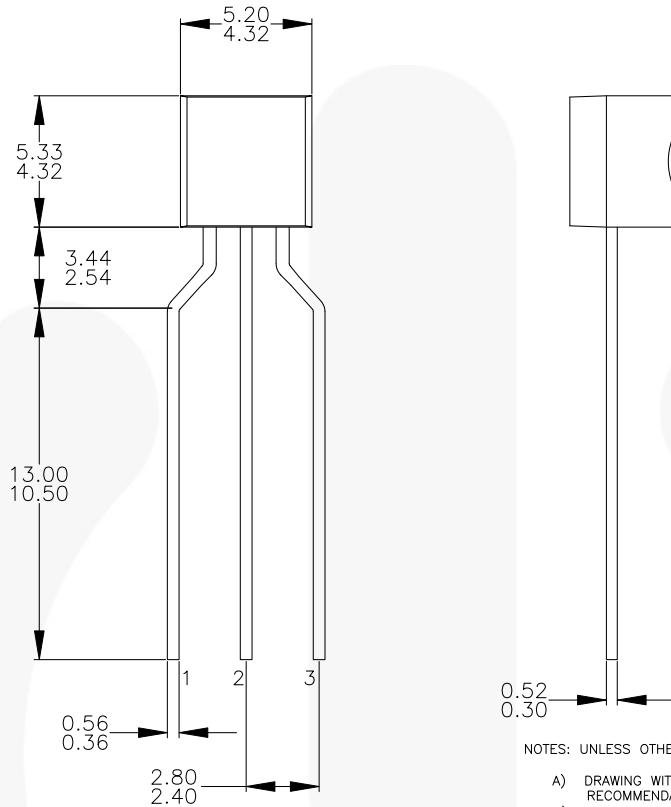
Figure 17. 3-Lead, TO-92, Molded, Standard Straight Lead

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## Physical Dimensions (Continued)

## TO-92 Tape and Reel Type



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- B) ALL DIMENSIONS ARE IN MILLIMETERS.
- C) DRAWING CONFORMS TO ASME Y14.5M-1994.
- D) TO-92 (92,94,96,97,98) PIN CONFIGURATION:

Part	92	94	96	97	98
P	F	M	P	F	M
1	E	S	S	B	D
2	B	D	G	C	G
3	C	G	D	E	S

LEGEND:  
 P - BIPOLAR      E - Emitter      D - Drain  
 F - JFET      B - Base      S - Source  
 M - DMOS      C - Collector      G - Gate

- E) FOR PACKAGE 92, 94, 96, 97 AND 98:  
 PIN CONFIGURATION DRAIN "D" AND SOURCE "S"  
 ARE INTERCHANGEABLE AT JFET "F" OPTION.
- F) DRAWING FILENAME: MKT-ZA03FREV2.

Figure 18. 3-Lead, TO-92, Molded, 0.200 in Line Spacing Lead Form

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Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

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