

# Zener Voltage Regulators

## 225 mW SOT-23 Surface Mount

### MMBZ52xxELT1G Series, SZMMBZ52xxELT1G Series

This series of Zener diodes is offered in the convenient, surface mount plastic SOT-23 package. These devices are designed to provide voltage regulation with minimum space requirement. They are well suited for applications such as cellular phones, hand held portables, and high density PC boards.

#### Features

- 225 mW Rating on FR-4 or FR-5 Board
- Zener Voltage Range – 2.4 V to 91 V
- Package Designed for Optimal Automated Board Assembly
- Small Package Size for High Density Applications
- ESD Rating of Class 3 (>16 kV) per Human Body Model
- Peak Power – 225 W (8 x 20  $\mu$ s)
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- Pb-Free Packages are Available

#### Mechanical Characteristics:

**CASE:** Void-free, transfer-molded, thermosetting plastic case

**FINISH:** Corrosion resistant finish, easily solderable

#### MAXIMUM CASE TEMPERATURE FOR SOLDERING PURPOSES:

260°C for 10 Seconds

**POLARITY:** Cathode indicated by polarity band

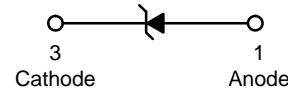
**FLAMMABILITY RATING:** UL 94 V-0

#### MAXIMUM RATINGS

Rating	Symbol	Max	Unit
Peak Power Dissipation @ 20 $\mu$ s (Note 1) @ $T_L \leq 25^\circ\text{C}$	$P_{pk}$	225	W
Total Power Dissipation on FR-5 Board, (Note 2) @ $T_A = 25^\circ\text{C}$ Derated above 25°C	$P_D$	225 1.8	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	556	$^\circ\text{C}/\text{W}$
Total Power Dissipation on Alumina Substrate, (Note 3) @ $T_A = 25^\circ\text{C}$ Derated above 25°C	$P_D$	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	417	$^\circ\text{C}/\text{W}$
Junction and Storage Temperature Range	$T_J, T_{stg}$	-65 to +150	$^\circ\text{C}$

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Nonrepetitive current pulse per Figure 9.
2. FR-5 = 1.0 X 0.75 X 0.62 in.
3. Alumina = 0.4 X 0.3 X 0.024 in., 99.5% alumina.



#### MARKING DIAGRAM



Bxx = Device Code

xx = (Refer to page 2)

M = Date Code\*

□ = Pb-Free Package

(Note: Microdot may be in either location)

\*Date Code orientation may vary depending upon manufacturing location.

#### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
MMBZ52xxELT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
SZMMBZ52xxELT1G	SOT-23 (Pb-Free)	3000 / Tape & Reel
MMBZ52xxELT3G	SOT-23 (Pb-Free)	10000 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

#### DEVICE MARKING INFORMATION

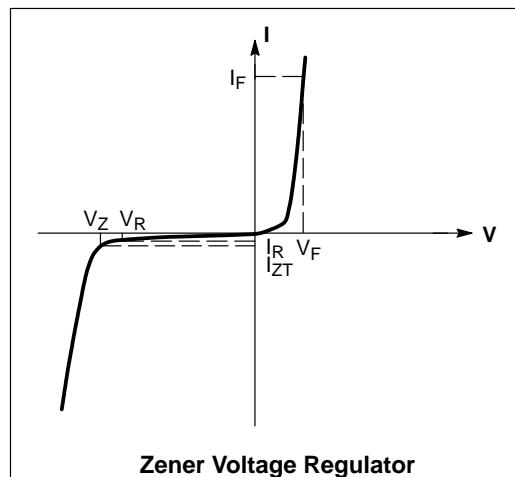
See specific marking information in the device marking column of the Electrical Characteristics table on page 2 of this data sheet.

# MMBZ52xxELT1G Series, SZMMBZ52xxELT1G Series

## ELECTRICAL CHARACTERISTICS

(Pinout: 1-Anode, 2-No Connection, 3-Cathode) ( $T_A = 25^\circ\text{C}$  unless otherwise noted,  $V_F = 0.95 \text{ V Max.} @ I_F = 10 \text{ mA}$ )

Symbol	Parameter
$V_Z$	Reverse Zener Voltage @ $I_{ZT}$
$I_{ZT}$	Reverse Current
$Z_{ZT}$	Maximum Zener Impedance @ $I_{ZT}$
$I_{ZK}$	Reverse Current
$Z_{ZK}$	Maximum Zener Impedance @ $I_{ZK}$
$I_R$	Reverse Leakage Current @ $V_R$
$V_R$	Reverse Voltage
$I_F$	Forward Current
$V_F$	Forward Voltage @ $I_F$



## ELECTRICAL CHARACTERISTICS (Pinout: 1-Anode, 2-NC, 3-Cathode) ( $V_F = 0.9 \text{ V Max.} @ I_F = 10 \text{ mA}$ for all types.)

Device*	Device Marking	Zener Voltage (Note 4)			Zener Impedance			Leakage Current	
		V <sub>Z</sub> (V)		@ I <sub>ZT</sub>	Z <sub>ZT</sub> @ I <sub>ZT</sub>	Z <sub>ZK</sub> @ I <sub>ZK</sub>		I <sub>R</sub> @ V <sub>R</sub>	μA
		Min	Nom	Max	mA	Ω	Ω	mA	μA
MMBZ5221ELT1/T3G	BE2	2.28	2.4	2.52	20	30	1200	0.25	100
MMBZ5226ELT1/T3G	BE7	3.13	3.3	3.47	20	28	1600	0.25	25
MMBZ5228ELT1/T3G	BE9	3.70	3.9	4.10	20	23	1900	0.25	10
MMBZ5229ELT1/T3G	BF1	4.08	4.3	4.52	20	22	2000	0.25	5
MMBZ5230ELT1/T3G	BF2	4.46	4.7	4.94	20	19	1900	0.25	5
MMBZ5231ELT1/T3G	BF3	4.84	5.1	5.36	20	17	1600	0.25	5
MMBZ5232ELT1/T3G	BF4	5.32	5.6	5.88	20	11	1600	0.25	5
MMBZ5234ELT1/T3G	BF6	5.89	6.2	6.51	20	7	1000	0.25	5
MMBZ5235ELT1/T3G	BF7	6.46	6.8	7.14	20	5	750	0.25	3
MMBZ5236ELT1/T3G	BF8	7.12	7.5	7.88	20	6	500	0.25	3
MMBZ5237ELT1/T3G	BF9	7.79	8.2	8.61	20	8	500	0.25	3
MMBZ5239ELT1/T3G	BG2	8.65	9.1	9.55	20	10	600	0.25	3
MMBZ5240ELT1/T3G	BG3	9.50	10	10.50	20	17	600	0.25	3
MMBZ5242ELT1/T3G	BG5	11.40	12	12.60	20	30	600	0.25	1
MMBZ5243ELT1/T3G	BG6	12.35	13	13.65	9.5	13	600	0.25	0.5
MMBZ5244ELT1/T3G	BG7	13.30	14	14.70	9	15	600	0.25	0.1
MMBZ5245ELT1/T3G	BG8	14.25	15	15.75	8.5	16	600	0.25	0.1
MMBZ5246ELT1G†	BG9	15.20	16	16.80	7.8	17	600	0.25	0.1
MMBZ5248ELT1/T1G	BH2	17.10	18	18.90	7	21	600	0.25	0.1
MMBZ5250ELT1/T3G	BH4	19.00	20	21.00	6.2	25	600	0.25	0.1

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

4. Zener voltage is measured with a pulse test current  $I_Z$  at an ambient temperature of  $25^\circ\text{C}$ .

\*Includes SZ-prefix devices where applicable.

†MMBZ5246EL, MMBZ5252EL, and MMBZ5265EL Not Available in 10,000/Tape & Reel.



## MMBZ52xxELT1G Series, SZMMBZ52xxELT1G Series

**ELECTRICAL CHARACTERISTICS** (continued) (Pinout: 1-Anode, 2-NC, 3-Cathode) ( $V_F = 0.9$  V Max @  $I_F = 10$  mA for all types.)

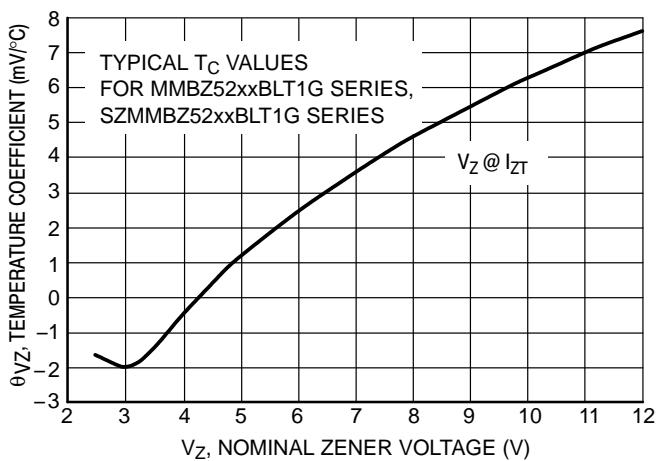
Device*	Device Marking	Zener Voltage (Note 5)			Zener Impedance			Leakage Current		
		V <sub>Z</sub> (V)			@ I <sub>ZT</sub>	Z <sub>ZT</sub> @ I <sub>ZT</sub>	Z <sub>ZK</sub> @ I <sub>ZK</sub>		I <sub>R</sub> @ V <sub>R</sub>	
		Min	Nom	Max	mA	Ω	Ω	mA	μA	V
MMBZ5252ELT1G†	BH6	22.80	24	25.20	5.2	33	600	0.25	0.1	18
MMBZ5253ELT1/T3G	BH7	23.75	25	26.25	5	35	600	0.25	0.1	19
MMBZ5254ELT1/T3G	BH8	25.65	27	28.35	4.6	41	600	0.25	0.1	21
MMBZ5255ELT1/T3G	BH9	26.60	28	29.40	4.5	44	600	0.25	0.1	21
MMBZ5256ELT1/T3G	BJ1	28.50	30	31.50	4.2	49	600	0.25	0.1	23
MMBZ5257ELT1/T3G	BJ2	31.35	33	34.65	3.8	58	700	0.25	0.1	25
MMBZ5258ELT1/T3G	BJ3	34.20	36	37.80	3.4	70	700	0.25	0.1	27
MMBZ5261ELT1G	BJ6	49.35	47	44.65	2.7	105	1000	0.25	0.1	36
MMBZ5262ELT1/T3G	BJ7	48.45	51	53.55	2.5	125	1100	0.25	0.1	37
MMBZ5263ELT1/T3G	BJ8	53.20	56	58.80	2.2	150	1300	0.25	0.1	43
MMBZ5265ELT1G†	BK1	58.90	62	65.10	2	185	1400	0.25	0.1	47

5. Zener voltage is measured with a pulse test current  $I_Z$  at an ambient temperature of 25°C.

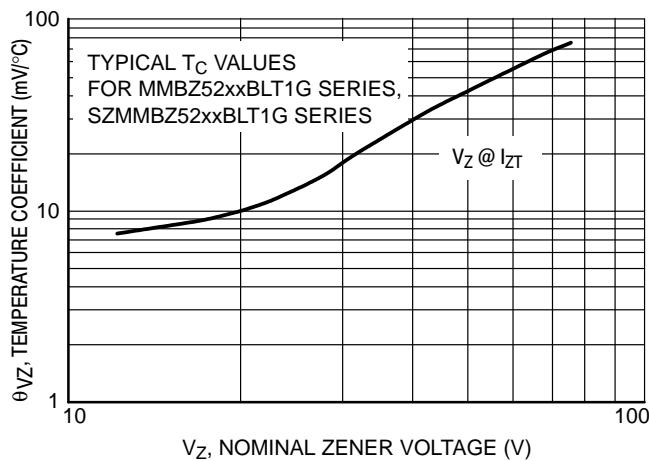
\*Includes SZ-prefix devices where applicable.

†MMBZ5246EL, MMBZ5252EL, and MMBZ5265EL Not Available in 10,000/Tape & Reel.

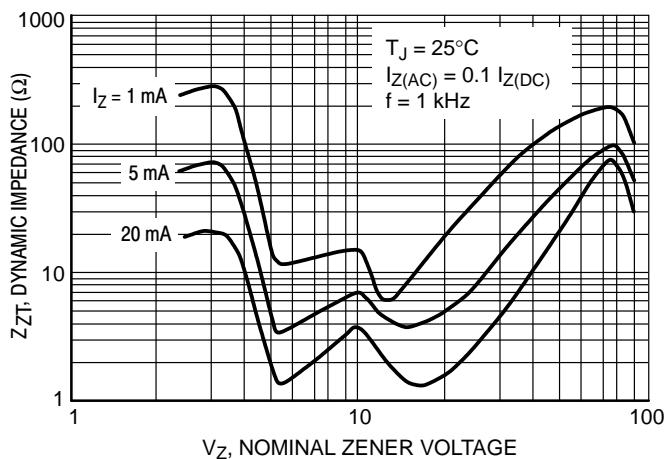
**TYPICAL CHARACTERISTICS**



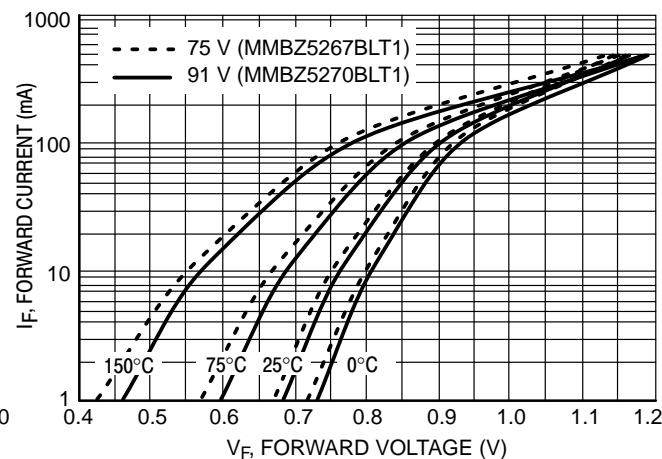
**Figure 1. Temperature Coefficients**  
(Temperature Range  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ )



**Figure 2. Temperature Coefficients**  
(Temperature Range  $-55^{\circ}\text{C}$  to  $+150^{\circ}\text{C}$ )



**Figure 3. Effect of Zener Voltage on**  
Zener Impedance



**Figure 4. Typical Forward Voltage**

TYPICAL CHARACTERISTICS

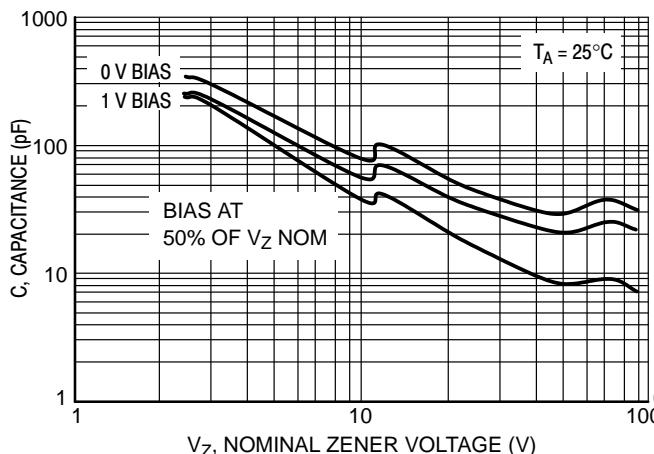


Figure 5. Typical Capacitance

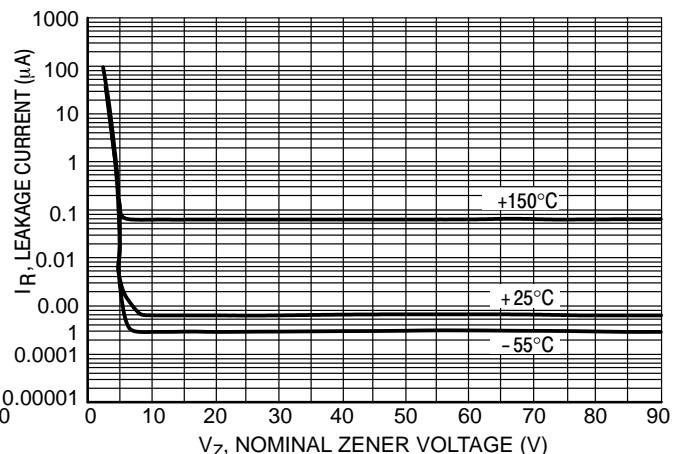


Figure 6. Typical Leakage Current

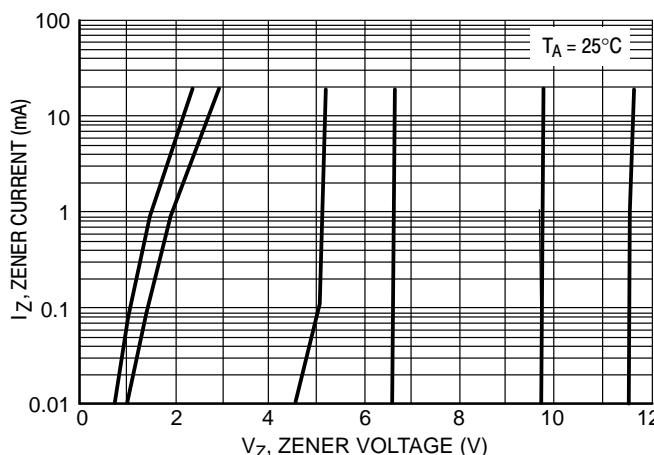


Figure 7. Zener Voltage versus Zener Current  
(Vz Up to 12 V)

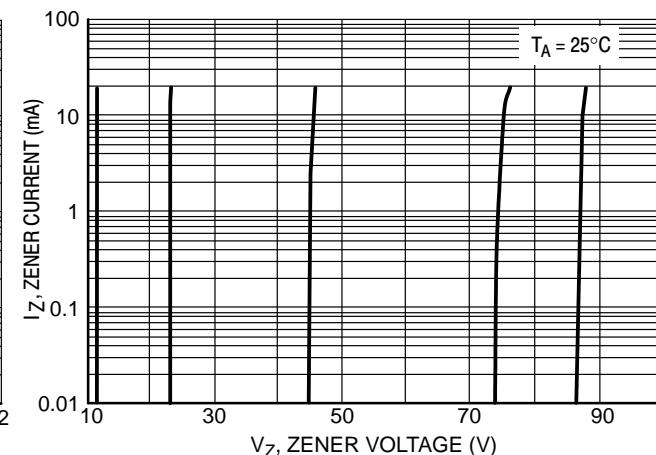


Figure 8. Zener Voltage versus Zener Current  
(12 V to 91 V)

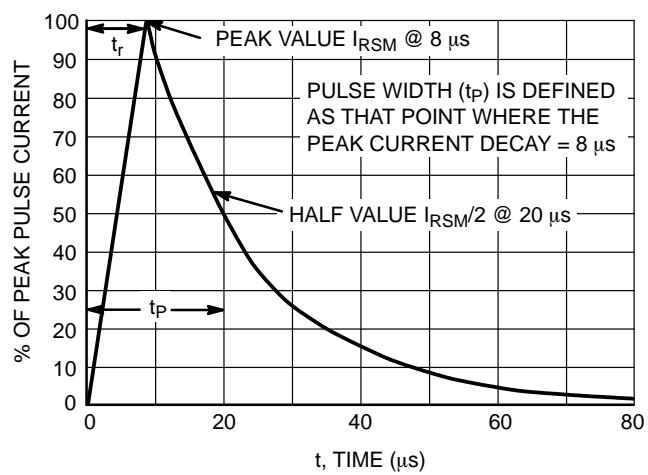
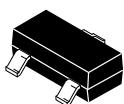


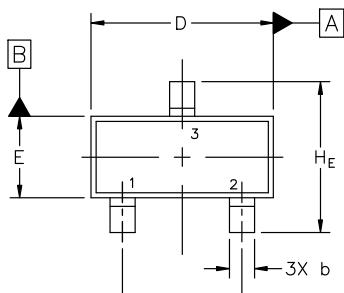
Figure 9. 8 × 20 μs Pulse Waveform



SCALE 4:1

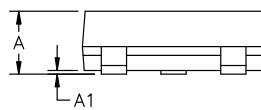
SOT-23 (TO-236) 2.90x1.30x1.00 1.90P  
CASE 318  
ISSUE AU

DATE 14 AUG 2024

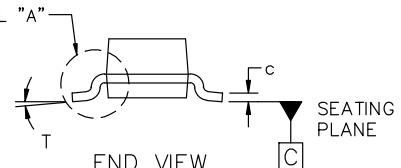


TOP VIEW

A



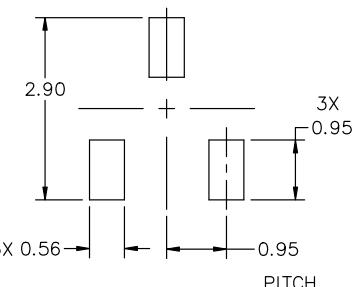
SIDE VIEW

DETAIL "A"  
Scale 3:1

MILLIMETERS			
DIM	MIN	NOM	MAX
A	0.89	1.00	1.11
A1	0.01	0.06	0.10
b	0.37	0.44	0.50
c	0.08	0.14	0.20
D	2.80	2.90	3.04
E	1.20	1.30	1.40
e	1.78	1.90	2.04
L	0.30	0.43	0.55
L1	0.35	0.54	0.69
HE	2.10	2.40	2.64
T	0°	---	10°

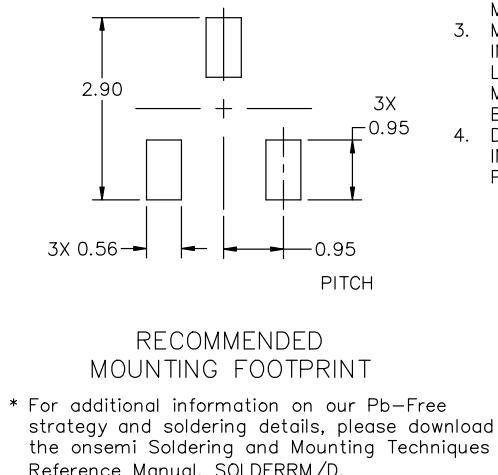
## NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
2. CONTROLLING DIMENSIONS: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF THE BASE MATERIAL.
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS.

GENERIC  
MARKING DIAGRAM\*

XXX = Specific Device Code  
M = Date Code  
■ = Pb-Free Package

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "■", may or may not be present. Some products may not follow the Generic Marking.

RECOMMENDED  
MOUNTING FOOTPRINT

\* For additional information on our Pb-Free strategy and soldering details, please download the onsemi Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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CASE 318

ISSUE AU

DATE 14 AUG 2024

STYLE 1 THRU 5:  
CANCELLEDSTYLE 6:  
PIN 1. BASE  
2. Emitter  
3. CollectorSTYLE 7:  
PIN 1. Emitter  
2. Base  
3. CollectorSTYLE 8:  
PIN 1. Anode  
2. No Connection  
3. CathodeSTYLE 9:  
PIN 1. Anode  
2. Anode  
3. CathodeSTYLE 10:  
PIN 1. Drain  
2. Source  
3. GateSTYLE 11:  
PIN 1. Anode  
2. Cathode  
3. Cathode-AnodeSTYLE 12:  
PIN 1. Cathode  
2. Cathode  
3. AnodeSTYLE 13:  
PIN 1. Source  
2. Drain  
3. GateSTYLE 14:  
PIN 1. Cathode  
2. Gate  
3. AnodeSTYLE 15:  
PIN 1. Gate  
2. Cathode  
3. AnodeSTYLE 16:  
PIN 1. Anode  
2. Cathode  
3. CathodeSTYLE 17:  
PIN 1. No Connection  
2. Anode  
3. CathodeSTYLE 18:  
PIN 1. No Connection  
2. Cathode  
3. AnodeSTYLE 19:  
PIN 1. Cathode  
2. Anode  
3. Cathode-AnodeSTYLE 20:  
PIN 1. Cathode  
2. Anode  
3. GateSTYLE 21:  
PIN 1. Gate  
2. Source  
3. DrainSTYLE 22:  
PIN 1. Return  
2. Output  
3. InputSTYLE 23:  
PIN 1. Anode  
2. Anode  
3. CathodeSTYLE 24:  
PIN 1. Gate  
2. Drain  
3. SourceSTYLE 25:  
PIN 1. Anode  
2. Cathode  
3. GateSTYLE 26:  
PIN 1. Cathode  
2. Anode  
3. No ConnectionSTYLE 27:  
PIN 1. Cathode  
2. Cathode  
3. CathodeSTYLE 28:  
PIN 1. Anode  
2. Anode  
3. Anode

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