

# MMBZ5221BLT1 Series

Preferred Device

## Zener Voltage Regulators

### 225 mW SOT-23 Surface Mount

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

- Pb-Free Packages are Available
- 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

#### 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
Total Power Dissipation on FR-5 Board, (Note 1) @ T <sub>A</sub> = 25°C Derated above 25°C	P <sub>D</sub>	225 1.8	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	556	°C/W
Total Power Dissipation on Alumina Substrate, (Note 2) @ T <sub>A</sub> = 25°C Derated above 25°C	P <sub>D</sub>	300 2.4	mW mW/°C
Thermal Resistance, Junction-to-Ambient	R <sub>θJA</sub>	417	°C/W
Junction and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	-65 to +150	°C

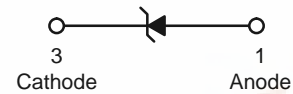
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

1. FR-5 = 1.0 X 0.75 X 0.62 in.
2. Alumina = 0.4 X 0.3 X 0.024 in, 99.5% alumina.

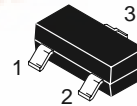


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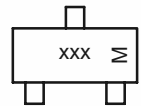
<http://onsemi.com>



#### MARKING DIAGRAM



SOT-23  
CASE 318  
STYLE 8



xxx = Specific Device Code  
M = Date Code

#### ORDERING INFORMATION

Device**	Package	Shipping†
MMBZ52xxBLT1	SOT-23	3000/Tape & Reel
MMBZ52xxBLT1G	SOT-23 (Pb-Free)	3000/Tape & Reel
MMBZ52xxBLT3	SOT-23	10,000/Tape & Reel
MMBZ52xxBLT3G	SOT-23 (Pb-Free)	10,000/Tape & Reel

\*\*The "T1" suffix refers to an 8 mm, 7 inch reel.  
The "T3" suffix refers to an 8 mm, 13 inch reel.

†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 3 of this data sheet.

Devices listed in **bold, italic** are ON Semiconductor **Preferred** devices. **Preferred** devices are recommended choices for future use and best overall value.

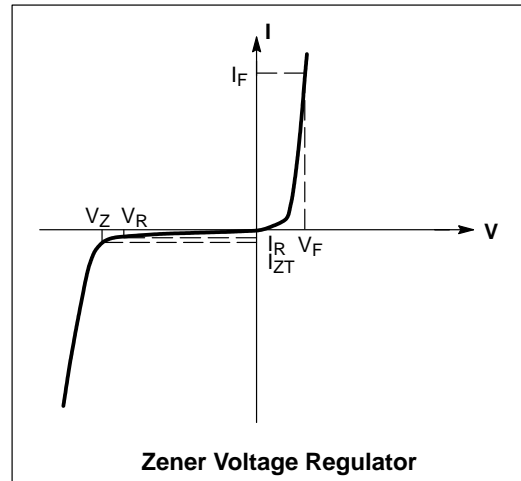


## MMBZ5221BLT1 Series

### 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 @ $I_F$



## MMBZ5221BLT1 Series

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

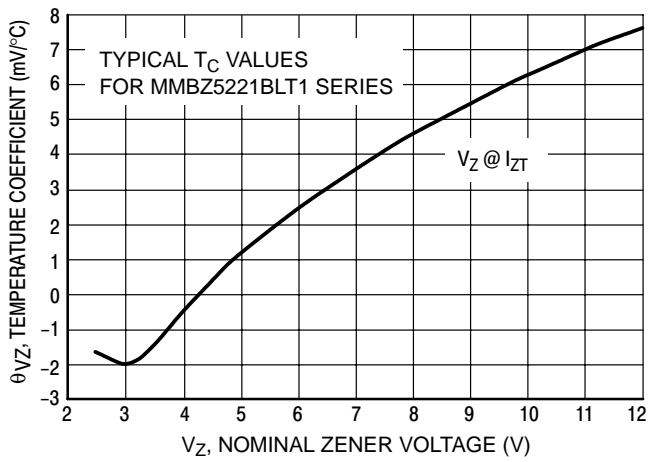
Device	Device Marking	Zener Voltage (Note 3)				Zener Impedance			Leakage Current	
		$V_Z$ (Volts)			@ $I_{ZT}$	$Z_{ZT}$ @ $I_{ZT}$	$Z_{ZK}$ @ $I_{ZK}$		$I_R$ @ $V_R$	
		Min	Nom	Max	mA	$\Omega$	$\Omega$	mA	$\mu\text{A}$	Volts
MMBZ5221BL	18A	2.28	2.4	2.52	20	30	1200	0.25	100	1
MMBZ5222BL	18B	2.37	2.5	2.63	20	30	1250	0.25	100	1
MMBZ5223BL	18C	2.56	2.7	2.84	20	30	1300	0.25	75	1
MMBZ5224BL	18D	2.66	2.8	2.94	20	30	1400	0.25	75	1
MMBZ5225BL	18E	2.85	3	3.15	20	29	1600	0.25	50	1
MMBZ5226BL	8A	3.13	3.3	3.47	20	28	1600	0.25	25	1
MMBZ5227BL	8B	3.42	3.6	3.78	20	24	1700	0.25	15	1
MMBZ5228BL	8C	3.70	3.9	4.10	20	23	1900	0.25	10	1
MMBZ5229BL	8D	4.08	4.3	4.52	20	22	2000	0.25	5	1
MMBZ5230BL	8E	4.46	4.7	4.94	20	19	1900	0.25	5	2
<b>MMBZ5231BL</b>	<b>8F</b>	<b>4.84</b>	<b>5.1</b>	<b>5.36</b>	<b>20</b>	<b>17</b>	<b>1600</b>	<b>0.25</b>	<b>5</b>	<b>2</b>
<b>MMBZ5232BL</b>	<b>8G</b>	<b>5.32</b>	<b>5.6</b>	<b>5.88</b>	<b>20</b>	<b>11</b>	<b>1600</b>	<b>0.25</b>	<b>5</b>	<b>3</b>
MMBZ5233BL	8H	5.70	6	6.30	20	7	1600	0.25	5	3.5
<b>MMBZ5234BL</b>	<b>8J</b>	<b>5.89</b>	<b>6.2</b>	<b>6.51</b>	<b>20</b>	<b>7</b>	<b>1000</b>	<b>0.25</b>	<b>5</b>	<b>4</b>
<b>MMBZ5235BL</b>	<b>8K</b>	<b>6.46</b>	<b>6.8</b>	<b>7.14</b>	<b>20</b>	<b>5</b>	<b>750</b>	<b>0.25</b>	<b>3</b>	<b>5</b>
MMBZ5236BL	8L	7.12	7.5	7.88	20	6	500	0.25	3	6
MMBZ5237BL	8M	7.79	8.2	8.61	20	8	500	0.25	3	6.5
MMBZ5238BL	8N	8.26	8.7	9.14	20	8	600	0.25	3	6.5
MMBZ5239BL	8P	8.64	9.1	9.56	20	10	600	0.25	3	7
<b>MMBZ5240BL</b>	<b>8Q</b>	<b>9.50</b>	<b>10</b>	<b>10.50</b>	<b>20</b>	<b>17</b>	<b>600</b>	<b>0.25</b>	<b>3</b>	<b>8</b>
MMBZ5241BL	8R	10.4	11	11.55	20	22	600	0.25	2	8.4
<b>MMBZ5242BL</b>	<b>8S</b>	<b>11.40</b>	<b>12</b>	<b>12.60</b>	<b>20</b>	<b>30</b>	<b>600</b>	<b>0.25</b>	<b>1</b>	<b>9.1</b>
MMBZ5243BL	8T	12.35	13	13.65	9.5	13	600	0.25	0.5	9.9
MMBZ5244BL	8U	13.30	14	14.70	9	15	600	0.25	0.1	10
<b>MMBZ5245BL</b>	<b>8V</b>	<b>14.25</b>	<b>15</b>	<b>15.75</b>	<b>8.5</b>	<b>16</b>	<b>600</b>	<b>0.25</b>	<b>0.1</b>	<b>11</b>
MMBZ5246BL	8W	15.20	16	16.80	7.8	17	600	0.25	0.1	12
MMBZ5247BL	8X	16.15	17	17.85	7.4	19	600	0.25	0.1	13
<b>MMBZ5248BL</b>	<b>8Y</b>	<b>17.10</b>	<b>18</b>	<b>18.90</b>	<b>7</b>	<b>21</b>	<b>600</b>	<b>0.25</b>	<b>0.1</b>	<b>14</b>
MMBZ5249BL	8Z	18.05	19	19.95	6.6	23	600	0.25	0.1	14
<b>MMBZ5250BL</b>	<b>81A</b>	<b>19.00</b>	<b>20</b>	<b>21.00</b>	<b>6.2</b>	<b>25</b>	<b>600</b>	<b>0.25</b>	<b>0.1</b>	<b>15</b>
MMBZ5251BL	81B	20.90	22	23.10	5.6	29	600	0.25	0.1	17
MMBZ5252BL	81C	22.80	24	25.20	5.2	33	600	0.25	0.1	18
MMBZ5253BL	81D	23.75	25	26.25	5	35	600	0.25	0.1	19
<b>MMBZ5254BL</b>	<b>81E</b>	<b>25.65</b>	<b>27</b>	<b>28.35</b>	<b>4.6</b>	<b>41</b>	<b>600</b>	<b>0.25</b>	<b>0.1</b>	<b>21</b>
MMBZ5255BL	81F	26.60	28	29.40	4.5	44	600	0.25	0.1	21
MMBZ5256BL	81G	28.50	30	31.50	4.2	49	600	0.25	0.1	23
<b>MMBZ5257BL</b>	<b>81H</b>	<b>31.35</b>	<b>33</b>	<b>34.65</b>	<b>3.8</b>	<b>58</b>	<b>700</b>	<b>0.25</b>	<b>0.1</b>	<b>25</b>
MMBZ5258BL	81J	34.20	36	37.80	3.4	70	700	0.25	0.1	27
MMBZ5259BL	81K	37.05	39	40.95	3.2	80	800	0.25	0.1	30
MMBZ5260BL	81L	40.85	43	45.15	3	93	900	0.25	0.1	33
MMBZ5261BL	81M	44.65	47	49.35	2.7	105	1000	0.25	0.1	36
MMBZ5262BL	81N	48.45	51	53.55	2.5	125	1100	0.25	0.1	39
MMBZ5263BL	81P	53.20	56	58.80	2.2	150	1300	0.25	0.1	43
MMBZ5264BL	81Q	57.00	60	63.00	2.1	170	1400	0.25	0.1	46
MMBZ5265BL	81R	58.90	62	65.10	2	185	1400	0.25	0.1	47
MMBZ5266BL	81S	64.60	68	71.40	1.8	230	1600	0.25	0.1	52
MMBZ5267BL	81T	71.25	75	78.75	1.7	270	1700	0.25	0.1	56
MMBZ5268BL	81U	77.90	82	86.10	1.5	330	2000	0.25	0.1	62
MMBZ5269BL	81V	82.65	87	91.35	1.4	370	2200	0.25	0.1	68
MMBZ5270BL	81W	86.45	91	95.55	1.4	400	2300	0.25	0.1	69

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

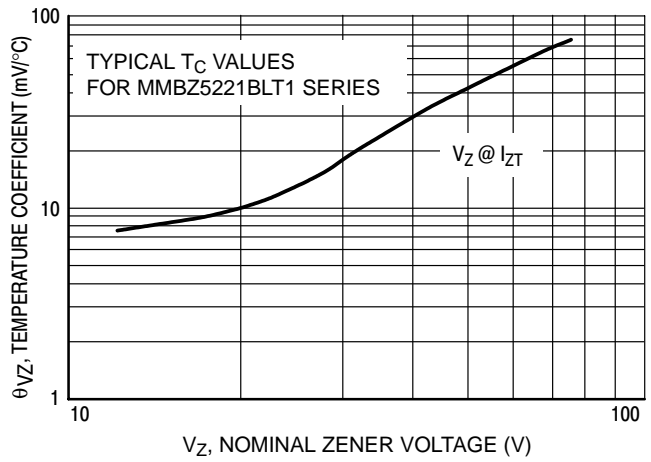
NOTE: MMBZ5233BLT1, MMBZ5246BLT1, MMBZ5251BLT1, and MMBZ5252BLT1 Not Available in 10,000/Tape & Reel.

# MMBZ5221BLT1 Series

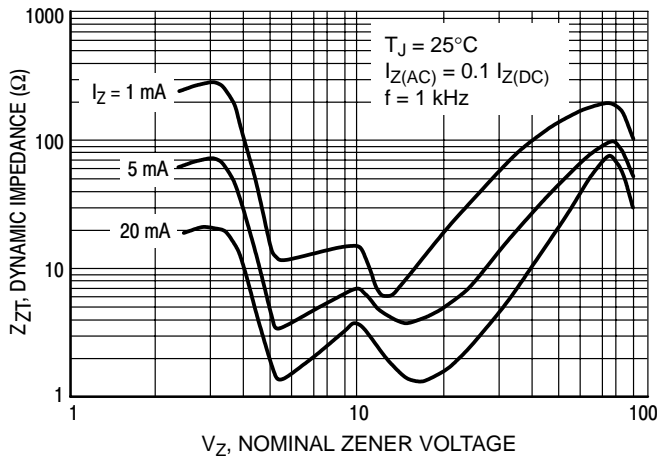
## TYPICAL CHARACTERISTICS



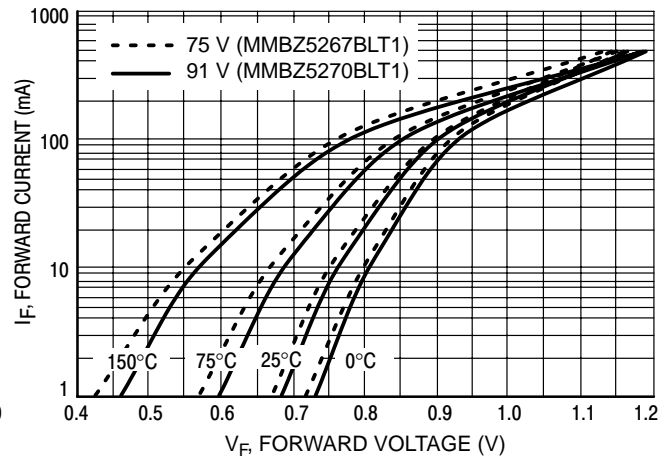
**Figure 1. Temperature Coefficients (Temperature Range -55°C to +150°C)**



**Figure 2. Temperature Coefficients (Temperature Range -55°C to +150°C)**



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



**Figure 4. Typical Forward Voltage**

# MMBZ5221BLT1 Series

## TYPICAL CHARACTERISTICS

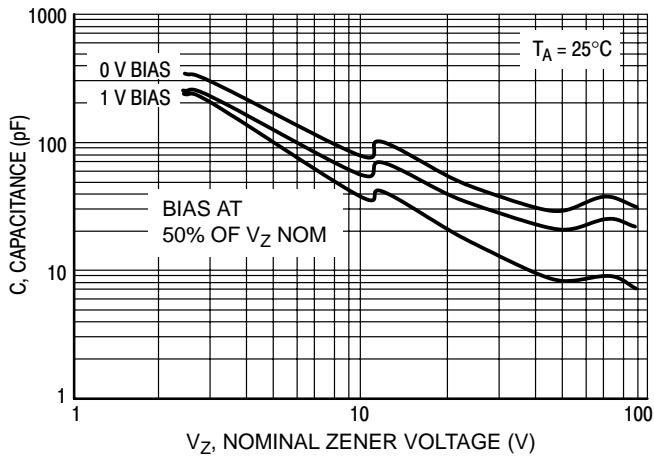


Figure 5. Typical Capacitance

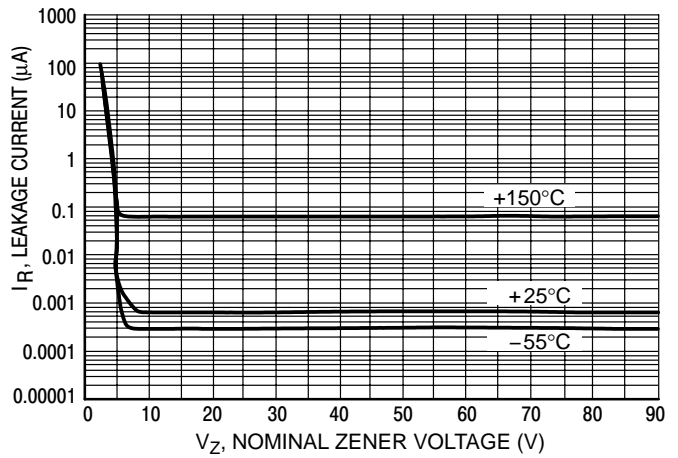


Figure 6. Typical Leakage Current

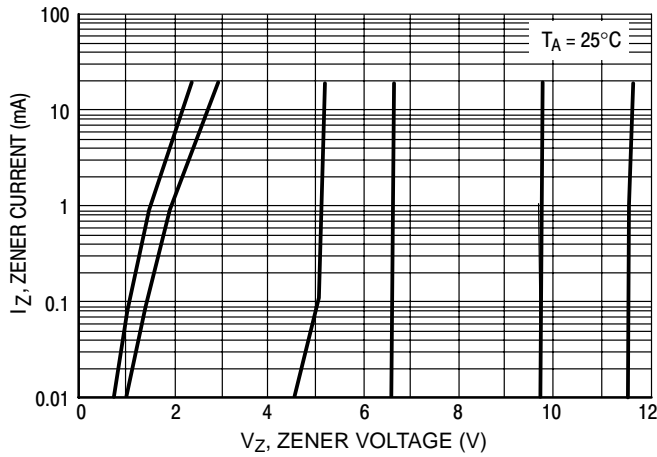


Figure 7. Zener Voltage versus Zener Current  
( $V_Z$  Up to 12 V)

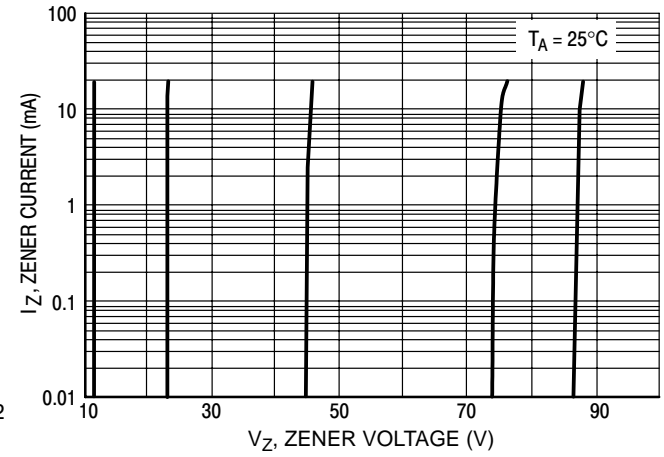
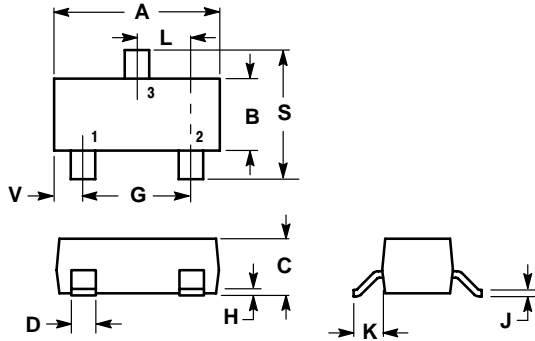


Figure 8. Zener Voltage versus Zener Current  
(12 V to 91 V)

# MMBZ5221BLT1 Series

## PACKAGE DIMENSIONS

SOT-23 (TO-236)  
CASE 318-08  
ISSUE AJ



**NOTES:**

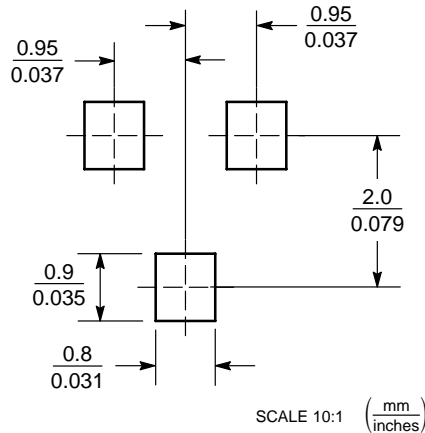
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-03 AND -07 OBSOLETE, NEW STANDARD 318-08.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.1102	0.1197	2.80	3.04
B	0.0472	0.0551	1.20	1.40
C	0.0350	0.0440	0.89	1.11
D	0.0150	0.0200	0.37	0.50
G	0.0701	0.0807	1.78	2.04
H	0.0005	0.0040	0.013	0.100
J	0.0034	0.0070	0.085	0.177
K	0.0140	0.0285	0.35	0.69
L	0.0350	0.0401	0.89	1.02
S	0.0830	0.1039	2.10	2.64
V	0.0177	0.0236	0.45	0.60

**STYLE 8:**

1. ANODE
2. NO CONNECTION
3. CATHODE

### SOLDERING FOOTPRINT\*



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

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