

MMBV2101LT1 Series, MV2105, MV2101, MV2109, LV2209

Preferred Device

Silicon Tuning Diodes

These devices are designed in popular plastic packages for the high volume requirements of FM Radio and TV tuning and AFC, general frequency control and tuning applications. They provide solid-state reliability in replacement of mechanical tuning methods. Also available in a Surface Mount Package up to 33 pF.

Features

- High Q
- Controlled and Uniform Tuning Ratio
- Standard Capacitance Tolerance – 10%
- Complete Typical Design Curves
- Pb-Free Packages are Available

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|-----------|-------------|----------------------------|
| Reverse Voltage | V_R | 30 | Vdc |
| Forward Current | I_F | 200 | mAdc |
| Forward Power Dissipation @ $T_A = 25^\circ\text{C}$ MMBV21xx Derate above 25°C | P_D | 225 1.8 | mW mW/ $^\circ\text{C}$ |
| @ $T_A = 25^\circ\text{C}$ MV21xx Derate above 25°C LV2209 | | 280 2.8 | mW mW/ $^\circ\text{C}$ |
| Junction Temperature | T_J | +150 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{stg} | -55 to +150 | $^\circ\text{C}$ |

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.

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

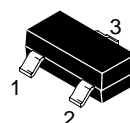
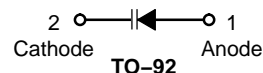
| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|-------------|----------|--------|--------|-----------------------|
| Reverse Breakdown Voltage ($I_R = 10 \mu\text{Adc}$) MMBV21xx, MV21xx LV2209 | $V_{(BR)R}$ | 30 25 | – – | – – | Vdc |
| Reverse Voltage Leakage Current ($V_R = 25 \text{ Vdc}$, $T_A = 25^\circ\text{C}$) | I_R | – | – | 0.1 | μAdc |
| Diode Capacitance Temperature Co-efficient ($V_R = 4.0 \text{ Vdc}$, $f = 1.0 \text{ MHz}$) | TC_C | – | 280 | – | ppm/ $^\circ\text{C}$ |



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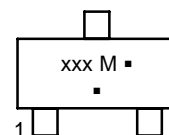
<http://onsemi.com>

6.8–100 pF, 30 VOLTS VOLTAGE VARIABLE CAPACITANCE DIODES



SOT-23 (TO-236)
CASE 318-08
STYLE 8

MARKING DIAGRAMS



xxx = Specific Device Code

M = Date Code*

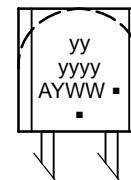
▪ = Pb-Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.



TO-92 (TO-226AC)
CASE 182
STYLE 1



yyyyyy = Specific Device Code

A = Assembly Location

Y = Year

WW = Work Week

▪ = Pb-Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

MMBV2101LT1 Series, MV2105, MV2101, MV2109, LV2209

| Device | Marking | Package | Shipping [†] | C _T , Diode Capacitance V _R = 4.0 Vdc, f = 1.0 MHz pF | | | Q, Figure of Merit V _R = 4.0 Vdc, f = 50 MHz | TR, Tuning Ratio C ₂ /C ₃₀ f = 1.0 MHz | | |
|--------------|---------|---------------------|-----------------------|---|-----|------|---|--|-----|-----|
| | | | | Min | Nom | Max | | Min | Typ | Max |
| MMBV2101LT1 | M4G | SOT-23 | 3,000 / Tape & Reel | 6.1 | 6.8 | 7.5 | 450 | 2.5 | 2.7 | 3.2 |
| MMBV2101LT1G | M4G | SOT-23 (Pb-Free) | 3,000 / Tape & Reel | 6.1 | 6.8 | 7.5 | 450 | 2.5 | 2.7 | 3.2 |
| MMBV2101L | M4G | SOT-23 | Bulk (Note 1) | 6.1 | 6.8 | 7.5 | 450 | 2.5 | 2.7 | 3.2 |
| MV2101 | MV2101 | TO-92 | 1,000 per Box | 6.1 | 6.8 | 7.5 | 450 | 2.5 | 2.7 | 3.2 |
| MV2101G | MV2101 | TO-92 (Pb-Free) | 1,000 per Box | 6.1 | 6.8 | 7.5 | 450 | 2.5 | 2.7 | 3.2 |
| MMBV2103LT1 | 4H | SOT-23 | 3,000 / Tape & Reel | 9.0 | 10 | 11 | 400 | 2.5 | 2.9 | 3.2 |
| MMBV2105LT1 | 4U | SOT-23 | 3,000 / Tape & Reel | 13.5 | 15 | 16.5 | 400 | 2.5 | 2.9 | 3.2 |
| MMBV2105LT1G | 4U | SOT-23 (Pb-Free) | 3,000 / Tape & Reel | 13.5 | 15 | 16.5 | 400 | 2.5 | 2.9 | 3.2 |
| MMBV2105L | 4U | SOT-23 | Bulk (Note 1) | 13.5 | 15 | 16.5 | 400 | 2.5 | 2.9 | 3.2 |
| MV2105 | MV2105 | TO-92 | 1,000 per Box | 13.5 | 15 | 16.5 | 400 | 2.5 | 2.9 | 3.2 |
| MV2105G | MV2105 | TO-92 (Pb-Free) | 1,000 per Box | 13.5 | 15 | 16.5 | 400 | 2.5 | 2.9 | 3.2 |
| MMBV2107LT1 | 4W | SOT-23 | 3,000 / Tape & Reel | 19.8 | 22 | 24.2 | 350 | 2.5 | 2.9 | 3.2 |
| MMBV2107LT1G | 4W | SOT-23 (Pb-Free) | 3,000 / Tape & Reel | 19.8 | 22 | 24.2 | 350 | 2.5 | 2.9 | 3.2 |
| MMBV2107L | 4W | SOT-23 | Bulk (Note 1) | 19.8 | 22 | 24.2 | 350 | 2.5 | 2.9 | 3.2 |
| MMBV2108LT1 | 4X | SOT-23 | 3,000 / Tape & Reel | 24.3 | 27 | 29.7 | 300 | 2.5 | 3.0 | 3.2 |
| MMBV2108LT1G | 4X | SOT-23 (Pb-Free) | 3,000 / Tape & Reel | 24.3 | 27 | 29.7 | 300 | 2.5 | 3.0 | 3.2 |
| LV2209 | LV2209 | TO-92 | 1,000 per Box | 29.7 | 33 | 36.3 | 200 | 2.5 | 3.0 | 3.2 |
| MMBV2109LT1 | 4J | SOT-23 | 3,000 / Tape & Reel | 29.7 | 33 | 36.3 | 200 | 2.5 | 3.0 | 3.2 |
| MMBV2109LT1G | 4J | SOT-23 (Pb-Free) | 3,000 / Tape & Reel | 29.7 | 33 | 36.3 | 200 | 2.5 | 3.0 | 3.2 |
| MMBV2109L | 4J | SOT-23 | Bulk (Note 1) | 29.7 | 33 | 36.3 | 200 | 2.5 | 3.0 | 3.2 |
| MV2109 | MV2109 | TO-92 | 1,000 per Box | 29.7 | 33 | 36.3 | 200 | 2.5 | 3.0 | 3.2 |
| MV2109G | MV2109 | TO-92 (Pb-Free) | 1,000 per Box | 29.7 | 33 | 36.3 | 200 | 2.5 | 3.0 | 3.2 |

[†]For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

1. **MMBV2101LT1, MMBV2105LT1, MMBV2107LT1 thru MMBV2109LT1**, are also available in bulk. Use the device title and drop the "T1" suffix when ordering any of these devices in bulk.

PARAMETER TEST METHODS

1. C_T, DIODE CAPACITANCE

(C_T = C_C + C_J). C_T is measured at 1.0 MHz using a capacitance bridge (Boonton Electronics Model 75A or equivalent).

2. TR, TUNING RATIO

TR is the ratio of C_T measured at 2.0 Vdc divided by C_T measured at 30 Vdc.

3. Q, FIGURE OF MERIT

Q is calculated by taking the G and C readings of an admittance bridge at the specified frequency and substituting in the following equations:

$$Q = \frac{2\pi f C}{G}$$

(Boonton Electronics Model 33AS8 or equivalent). Use Lead Length $\approx 1/16''$.

4. TC_C, DIODE CAPACITANCE TEMPERATURE COEFFICIENT

TC_C is guaranteed by comparing C_T at V_R = 4.0 Vdc, f = 1.0 MHz, T_A = -65°C with C_T at V_R = 4.0 Vdc, f = 1.0 MHz, T_A = +85°C in the following equation, which defines TC_C:

$$TC_C = \left| \frac{C_T(+85^\circ C) - C_T(-65^\circ C)}{85 + 65} \right| \cdot \frac{10^6}{C_T(25^\circ C)}$$

Accuracy limited by measurement of C_T to ± 0.1 pF.

TYPICAL DEVICE CHARACTERISTICS

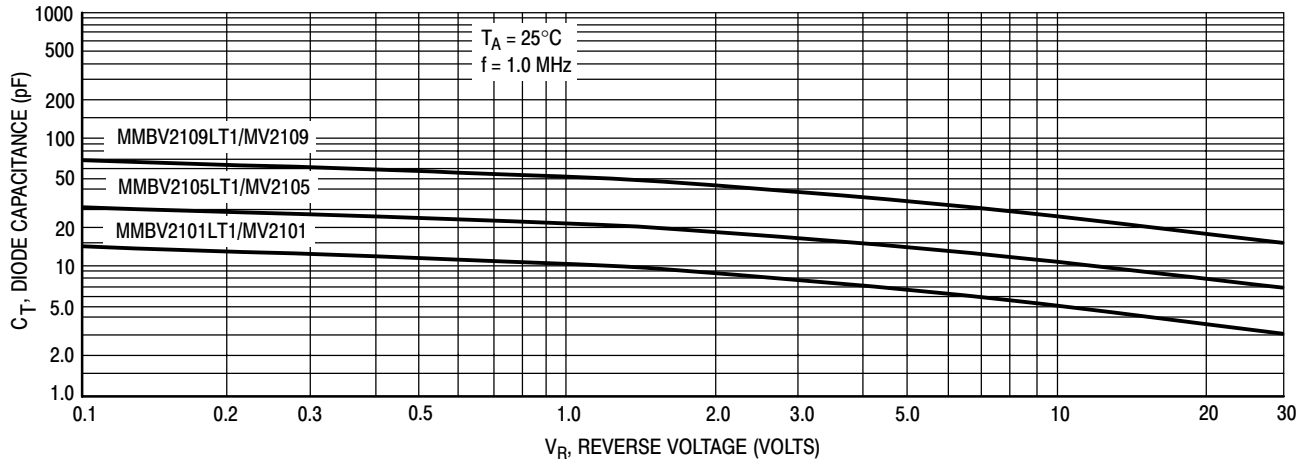


Figure 1. Diode Capacitance versus Reverse Voltage

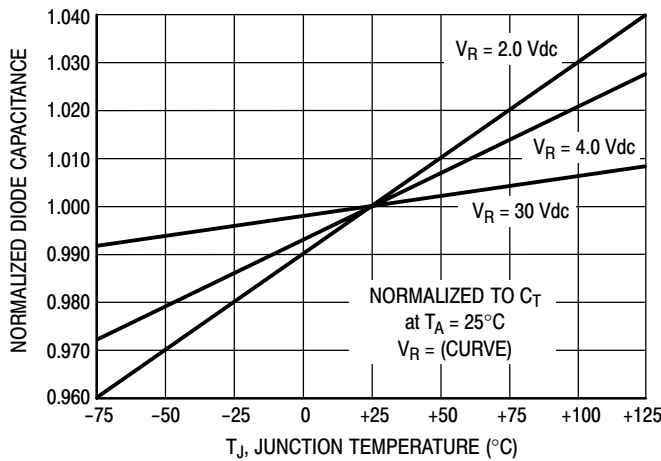


Figure 2. Normalized Diode Capacitance versus Junction Temperature

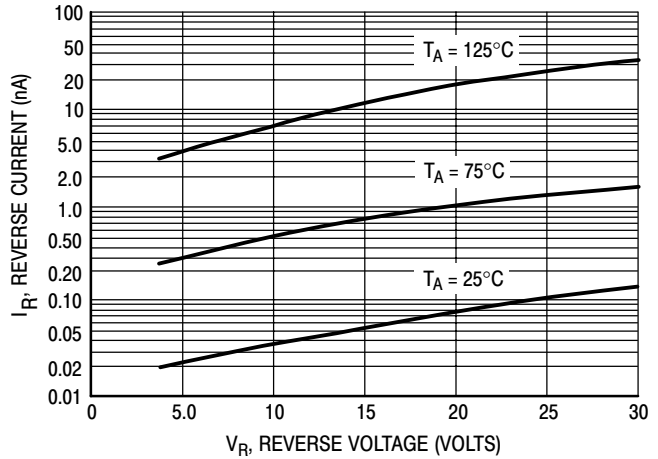


Figure 3. Reverse Current versus Reverse Bias Voltage

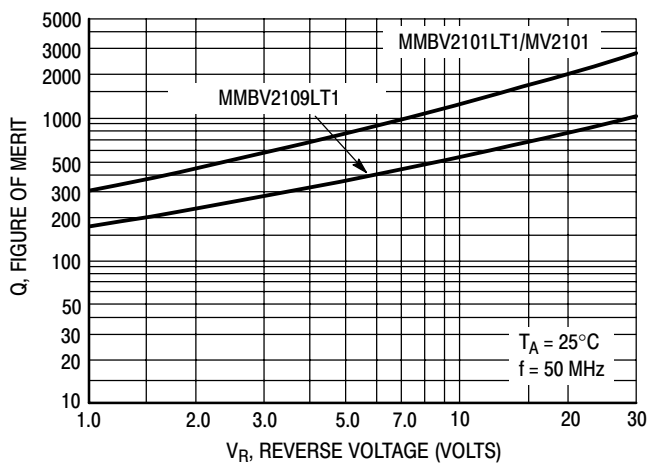


Figure 4. Figure of Merit versus Reverse Voltage

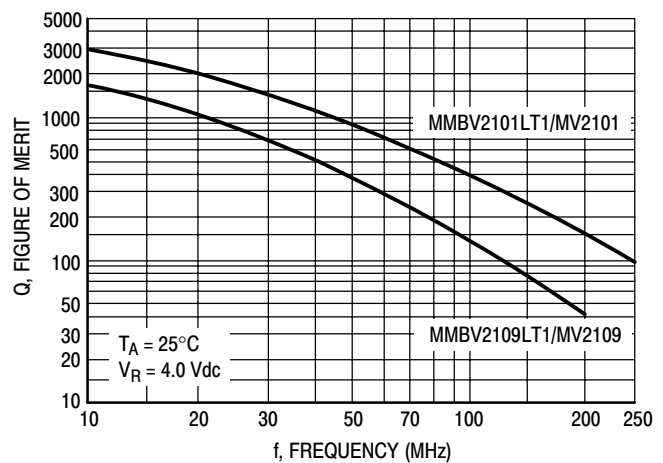
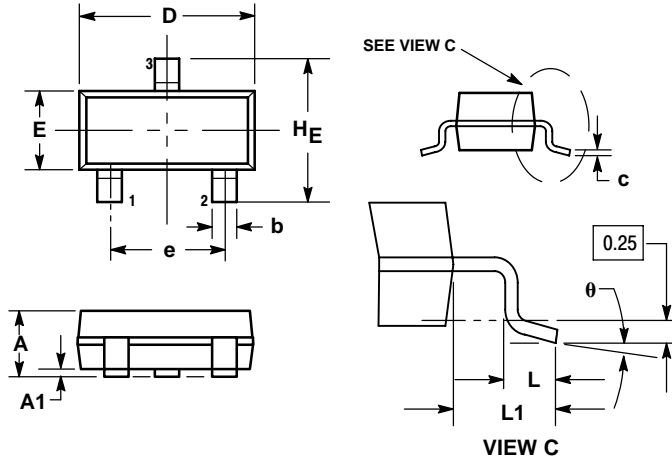


Figure 5. Figure of Merit versus Frequency

MMBV2101LT1 Series, MV2105, MV2101, MV2109, LV2209

PACKAGE DIMENSIONS

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



NOTES:

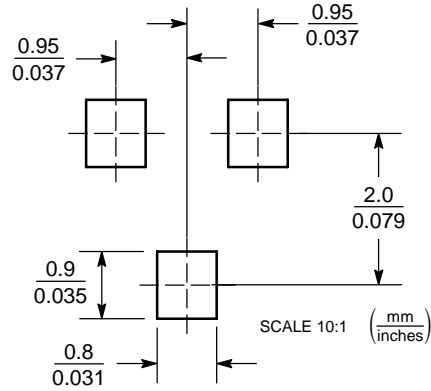
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH THICKNESS. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. 318-01 THRU -07 AND -09 OBSOLETE, NEW STANDARD 318-08.

| DIM | MILLIMETERS | | | INCHES | | |
|-----|-------------|------|------|--------|-------|-------|
| | MIN | NOM | MAX | MIN | NOM | MAX |
| A | 0.89 | 1.00 | 1.11 | 0.035 | 0.040 | 0.044 |
| A1 | 0.01 | 0.06 | 0.10 | 0.001 | 0.002 | 0.004 |
| b | 0.37 | 0.44 | 0.50 | 0.015 | 0.018 | 0.020 |
| c | 0.09 | 0.13 | 0.18 | 0.003 | 0.005 | 0.007 |
| D | 2.80 | 2.90 | 3.04 | 0.110 | 0.114 | 0.120 |
| E | 1.20 | 1.30 | 1.40 | 0.047 | 0.051 | 0.055 |
| e | 1.78 | 1.90 | 2.04 | 0.070 | 0.075 | 0.081 |
| L | 0.10 | 0.20 | 0.30 | 0.004 | 0.008 | 0.012 |
| L1 | 0.35 | 0.54 | 0.69 | 0.014 | 0.021 | 0.029 |
| HE | 2.10 | 2.40 | 2.64 | 0.083 | 0.094 | 0.104 |

STYLE 8:

1. ANODE
2. NO CONNECTION
3. CATHODE

SOLDERING FOOTPRINT*

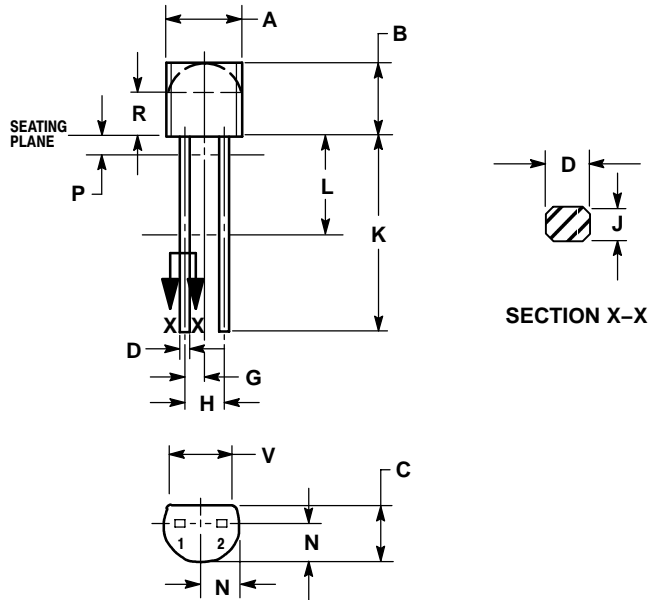


*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

MMBV2101LT1 Series, MV2105, MV2101, MV2109, LV2209

PACKAGE DIMENSIONS

TO-92 (TO-226AC)
CASE 182-06
ISSUE L




NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND ZONE R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.175 | 0.205 | 4.45 | 5.21 |
| B | 0.170 | 0.210 | 4.32 | 5.33 |
| C | 0.125 | 0.165 | 3.18 | 4.19 |
| D | 0.016 | 0.021 | 0.407 | 0.533 |
| G | 0.050 BSC | | 1.27 BSC | |
| H | 0.100 BSC | | 2.54 BSC | |
| J | 0.014 | 0.016 | 0.36 | 0.41 |
| K | 0.500 | --- | 12.70 | --- |
| L | 0.250 | --- | 6.35 | --- |
| N | 0.080 | 0.105 | 2.03 | 2.66 |
| P | --- | 0.050 | --- | 1.27 |
| R | 0.115 | --- | 2.93 | --- |
| V | 0.135 | --- | 3.43 | --- |

STYLE 1:

- PIN 1. ANODE
- CATHODE

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MMBV2101LT1/D