

# High Power MELF PIN Diodes Series

## MMP7072-127-1, MMP7076-127-1, MMP7080-127-1



### Features

- Higher Average Power Handling: >100 Watts CW
- Higher Voltage Rating: >600 Volts
- Lower  $R_s$ : <0.8 (Lower Insertion Loss & Higher IIP3)
- Lower Thermal Resistance: <20 °C / W for Higher Power
- Ceramic Surface Mount Package
- RoHS Compliant
- Hermetically Sealed



Case Style 127-1

### Description

The MMP7072-127-1, MMP7076-127-1, MMP7080-127-1 MELF PIN Diode Family is manufactured using Aeroflex/Metelics proprietary diode process which optimizes the anode and cathode bonding area of the diode to the adjacent heat spreading metal posts within the ceramic package. This unique geometry provides lower electrical and thermal resistance within the surface mount package to provide higher average power performance to comparable surface mount diode packages.

With lower Thermal Resistance ( < 20 °C/W ), RF C.W. incident power levels of + 50 dBm and RF peak incident power levels of + 60 dBm are very achievable in higher power UHF cold switching applications.

The low series resistance ( < 0.8  $\Omega$  ), coupled with the longer minority carrier lifetime, ( > 3  $\mu$ S ), provides better IIP3 distortion values > + 70 dBm, for SP2T Tx-Rx Switches.

These devices are hermetically sealed and are constructed with non-magnetic materials to meet stringent requirements for MRI systems. The devices are fully RoHS compliant.

### Applications

The MMP7072-127-1, MMP7076-127-1 , MMP7080-127-1 MELF PIN Diode Family is designed to be used in Higher Power Switch and Attenuator applications, operating from 1 MHz to 1 GHz. These devices are durable, reliable, and are capable of meeting all military, commercial, and industrial applications.

### Environmental Capabilities

The MMP7072-127-1, MMP7076-127-1 , and MMP7080-127-1 MELF PIN Diodes are capable of meeting the environmental requirements of MIL-STD-750.

### ESD Rating

PIN Diodes are susceptible to ESD conditions as with all semiconductors. The ESD rating for these devices is Class 1A, HBM.



## MMP7072-127-1, MMP7076-127-1, MMP7080-127-1

### Electrical Specifications @ $T_A = + 25\text{ }^{\circ}\text{C}$ ( Unless Otherwise Defined )

| Parameter                         | Symbol           | Units                | Test Conditions                                                                                           | Minimum Value | Typical Value | Maximum Value |
|-----------------------------------|------------------|----------------------|-----------------------------------------------------------------------------------------------------------|---------------|---------------|---------------|
| Voltage Breakdown<br>(See Note 1) | -V <sub>b</sub>  | Volts                | - 10 $\mu$ A   @ DC                                                                                       | - 100         | - 600         |               |
| Forward Voltage                   | V <sub>f</sub>   | Volts                | + 100 mA @ DC                                                                                             |               | 0.85          | 1.0           |
| Reverse Leakage Current           | - I <sub>r</sub> | $\eta$ A             | 80 % Min V <sub>b</sub>   @ DC                                                                            |               | -100          | -1000         |
| Series Resistance                 | R <sub>s</sub>   | $\Omega$             | + 100 mA @ 100MHz                                                                                         |               | 0.5           | 0.8           |
| Parallel Resistance               | R <sub>p</sub>   | K $\Omega$           | -100 V @ 100MHz                                                                                           | 200           | 250           |               |
| Capacitance                       | C <sub>t</sub>   | pF                   | -100 V @ 1 MHz                                                                                            |               | 0.62          | 0.70          |
| Minority Carrier Lifetime         | TL               | $\mu$ S              | ( 50% Control – 90 %<br>Output Voltage)<br>I <sub>f</sub> = +10 mA /-I <sub>r</sub> = - 6 mA<br>F = 1 KHz | 3             | 4.5           | 6             |
| C.W. Thermal Resistance           | $\theta$         | $^{\circ}\text{C/W}$ | I <sub>H</sub> = 1A, I <sub>L</sub> = 10mA                                                                |               | 15            | 20            |

#### Electrical Specification Notes:

1. Minimum V<sub>b</sub> values are as follows: MMP7072-127-1 > | -100 V |, MMP7076-127-1 > | -200 V |, MMP7080-127-1 > | -600 V |
2. Series Resistance, ( R<sub>s</sub> ) and Parallel Resistance ( R<sub>p</sub> ) are measured on the HP 4291 Impedance Analyzer.
3. Total Capacitance, ( C<sub>t</sub> ) is the summation of the Diode Junction Capacitance, ( C<sub>j</sub> ), and the Package Capacitance, C<sub>pkg</sub>.

### Absolute Maximum Ratings @ $T_A = + 25\text{ }^{\circ}\text{C}$ ( Unless Otherwise Defined )

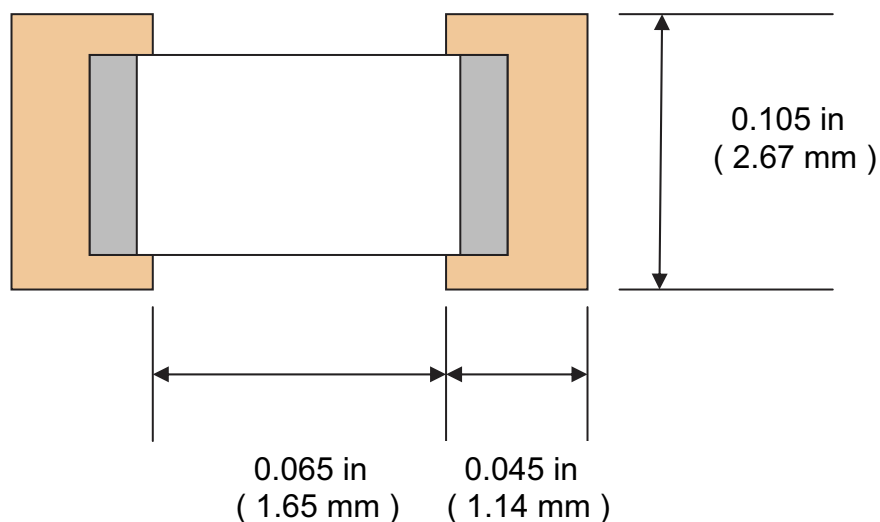
| Parameter                                                            | Absolute Maximum Value                                                                                               |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Forward Current                                                      | 1000 mA                                                                                                              |
| Reverse Voltage                                                      | -700   V (See Electrical Specification Note 1)                                                                       |
| Forward Voltage                                                      | 1.2 V @ 100 mA                                                                                                       |
| Operating Temperature                                                | - 65 $^{\circ}\text{C}$ to + 125 $^{\circ}\text{C}$                                                                  |
| Storage Temperature                                                  | - 65 $^{\circ}\text{C}$ to + 150 $^{\circ}\text{C}$                                                                  |
| Junction Temperature                                                 | + 175 $^{\circ}\text{C}$                                                                                             |
| Total Dissipated RF & D.C. Power<br>( Diode Case in Air Ambient )    | 3W @ + 25 $^{\circ}\text{C}$<br>De-Rate Linearly at -20 mW / $^{\circ}\text{C}$ to 0 W @ + 175 $^{\circ}\text{C}$    |
| Total Dissipated RF & D.C. Power<br>( Diode Case at Thermal Ground ) | 7.5 W @ + 25 $^{\circ}\text{C}$<br>De-Rate Linearly at -50 mW / $^{\circ}\text{C}$ to 0 W @ + 175 $^{\circ}\text{C}$ |
| Assembly Temperature                                                 | + 310 $^{\circ}\text{C}$ for 10 Seconds                                                                              |

# High Power MELF PIN Diodes

## Assembly Instructions

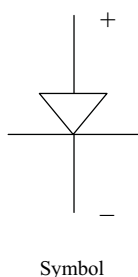
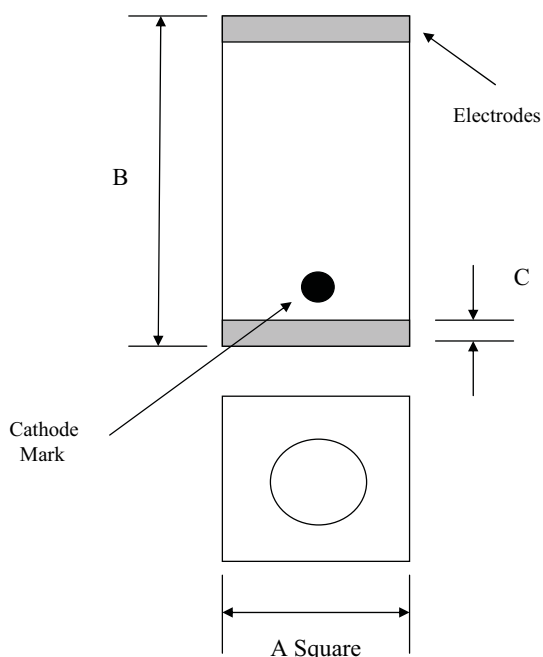
The MELF PIN Diodes are capable of being placed onto circuit boards with pick and place manufacturing equipment from tape-reel dispensing. The devices are attached to the circuit using conventional solder re-flow or wave soldering procedures with RoHS type or Sn 63 / Pb 37 type solders.

### Circuit Pad Layout for MMP7072-127-1 MELF PIN Diode



## Outline Drawing

### Case Style 127-1 Outline



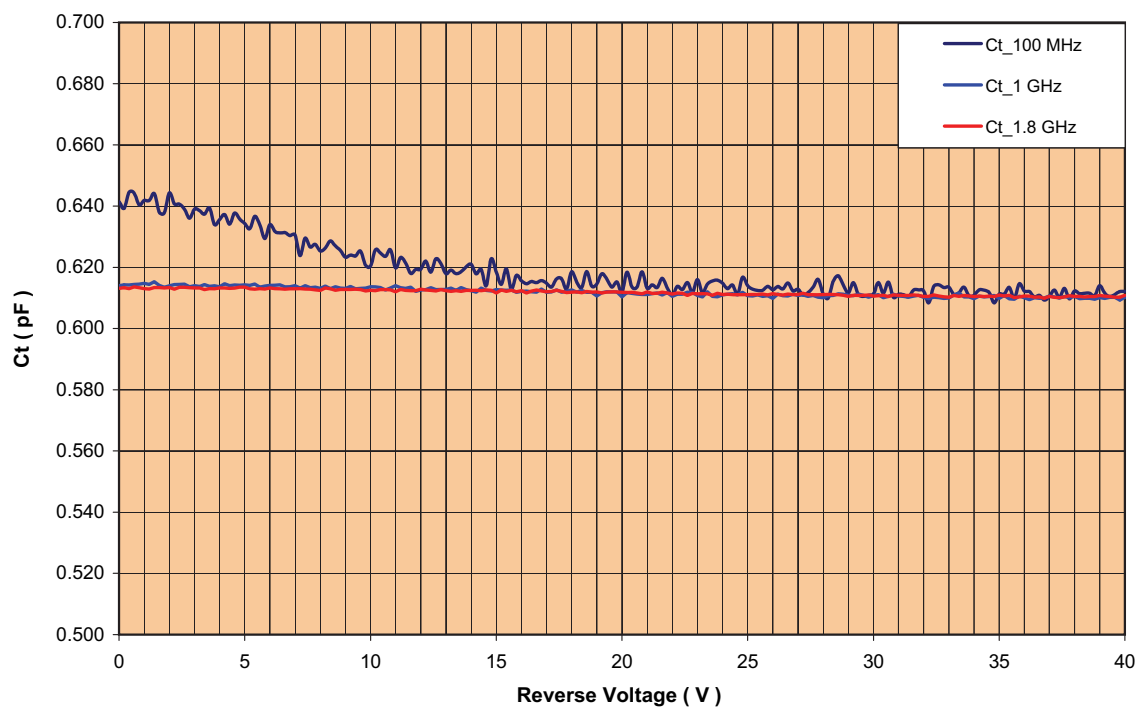
| Dimension A<br>Inches ( mm )         | Dimension B<br>Inches ( mm )         | Dimension C<br>Inches ( mm ) |
|--------------------------------------|--------------------------------------|------------------------------|
| 0.088 +/- 0.007<br>( 2.24 +/- 0.18 ) | 0.125 +/- 0.010<br>( 3.18 +/- 0.25 ) | 0.020 Typ<br>( 0.51 )        |

#### Notes:

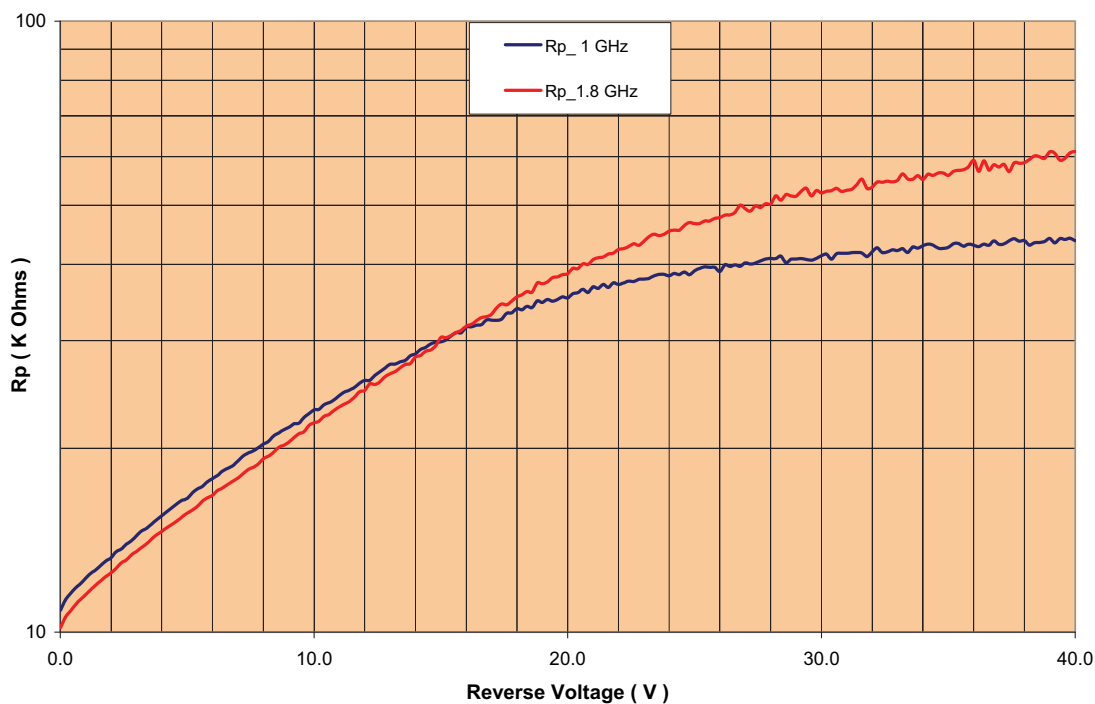
1. Anode and Cathode Electrodes are Electroplated as Follows: Minimum 70 u in Cu, followed by 100 u in minimum Sn per MIL-C-14550, Type I.

## RF Performance

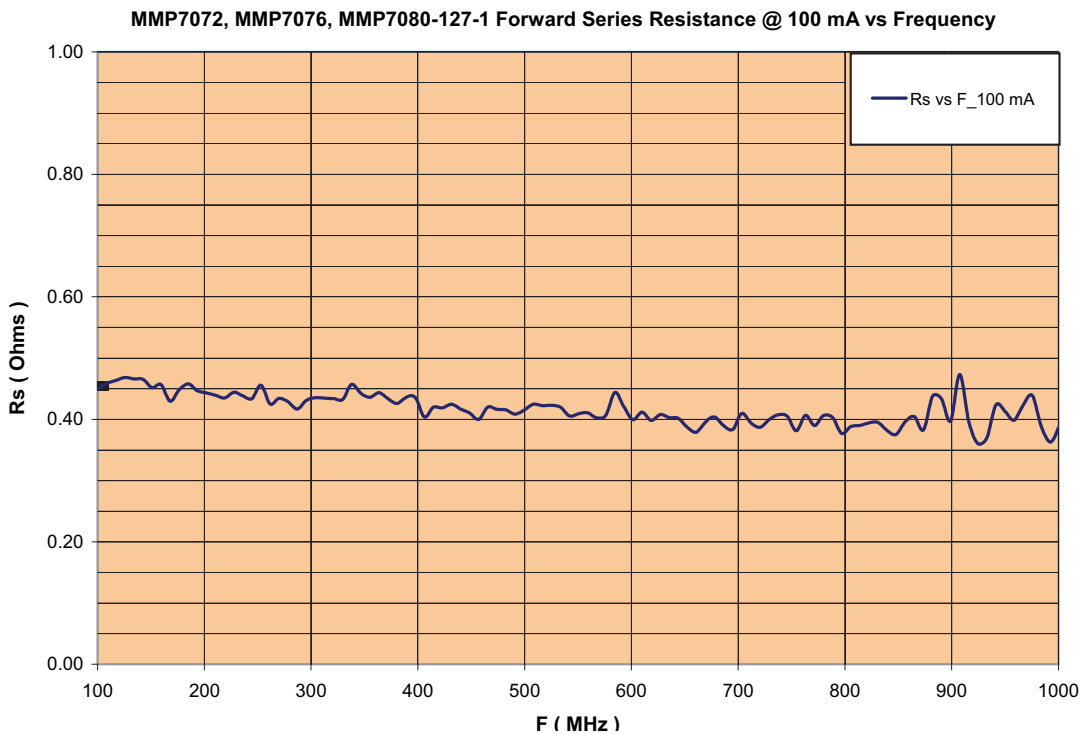
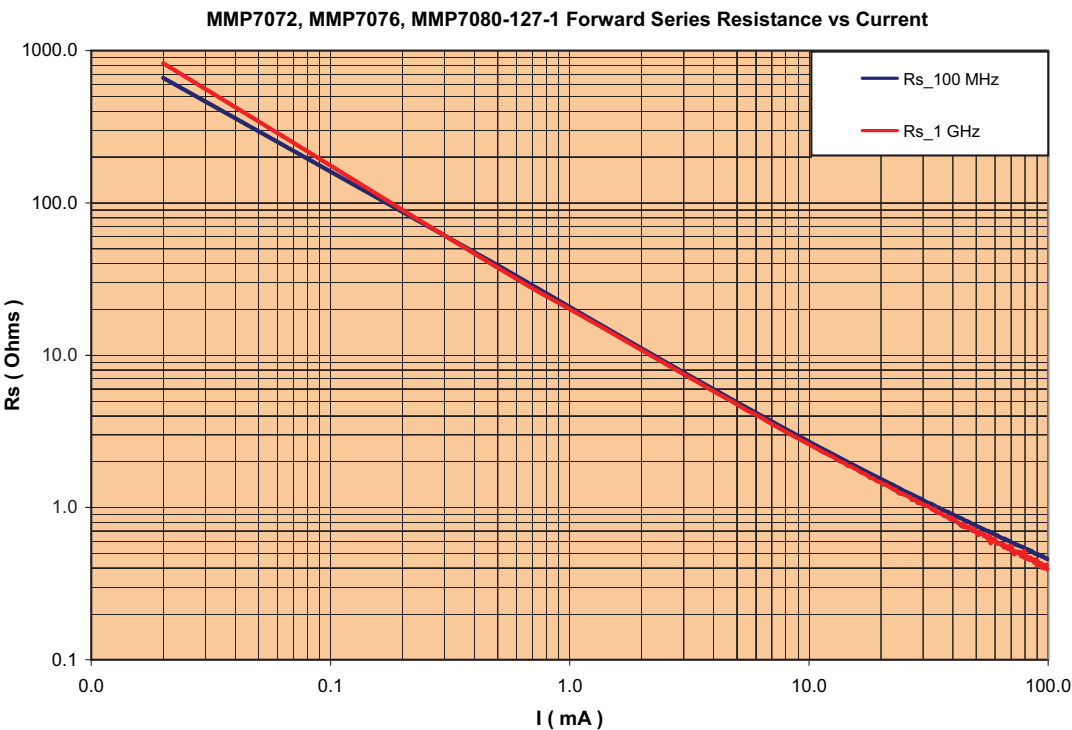
MMP7072, MMP7076, MMP7080-127-1 Capacitance vs Reverse Voltage



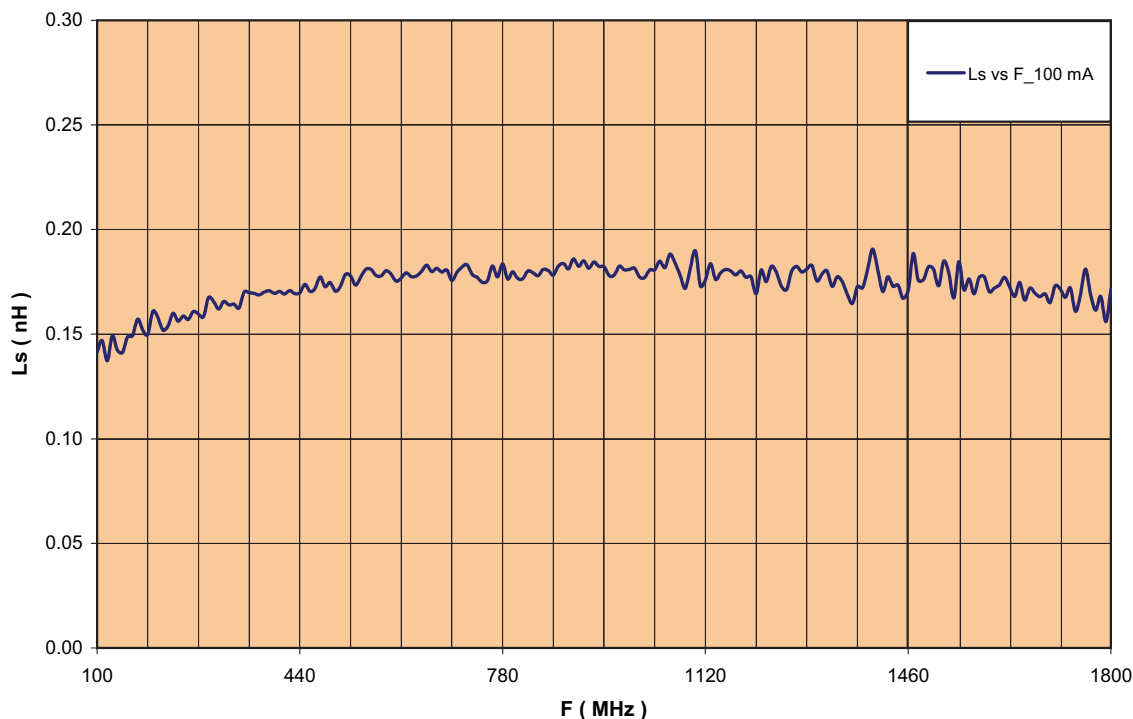
MMP7072, MMP7076, MMP7080-127-1 Parallel Resistance vs Reverse Voltage



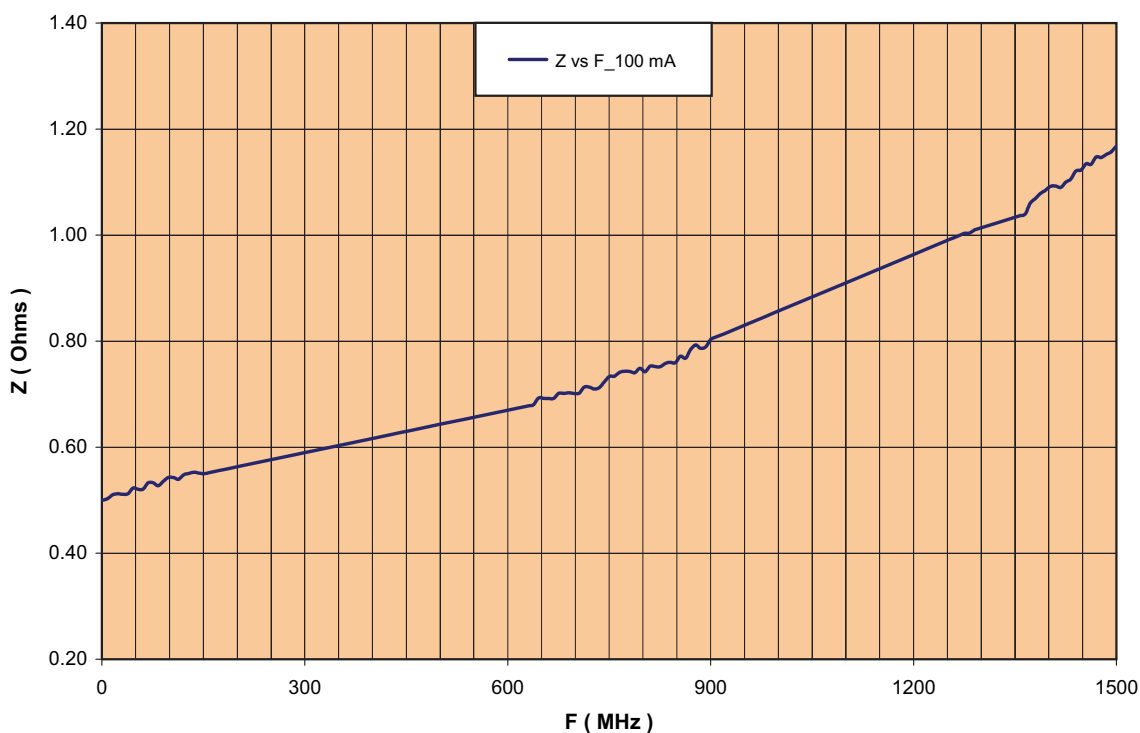
# High Power MELF PIN Diodes



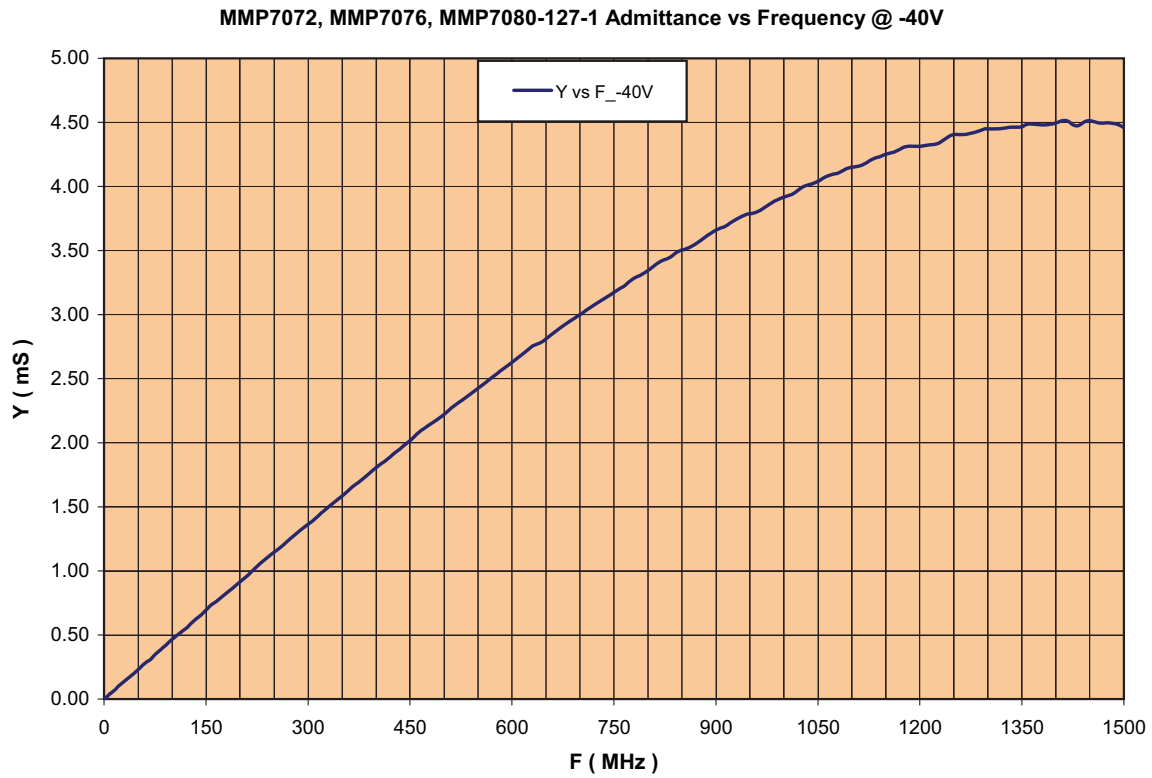
MMP7072, MMP7076, MMP7080-127-1 Ls vs Frequency at 100 mA



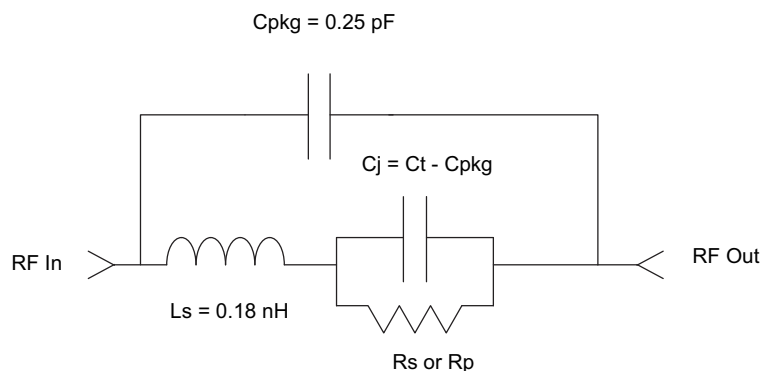
MMP7072, MMP7076, MMP7080-127-1 Impedance vs Frequency at 100 mA



# High Power MELF PIN Diodes



## DEVICE MODEL



| Parameter | Description                                    | Value    | Unit                 |
|-----------|------------------------------------------------|----------|----------------------|
| Is        | Saturation Current                             | 1.0 E-14 | Amps                 |
| Vi        | I-region Forward Bias Voltage Drop             | 0.00     | Volts                |
| BV        | Breakdown Voltage                              | 600      | Volts                |
| UN        | Electron Mobility                              | 900      | cm <sup>2</sup> /V-s |
| WI        | I – Region Width                               | 1.25 E-4 | Meters               |
| Rr        | I-region 0V Bias Resistance                    | 1.0 E+4  | Ω                    |
| Cmin      | PIN Punchthrough Capacitance                   | 3.5 E-13 | Farads               |
| TAU       | Am bipolar I-region Lifetime                   | 4.5 E-6  | Sec                  |
| Rs        | Ohmic Resistance                               | 0.8      | Ω                    |
| CJO       | Junction Capacitance @ 0V                      | 3.7 E-13 | Farads               |
| Vj        | Junction Potential                             | 0.70     | Volts                |
| M         | Grading Coefficient                            | 1.0      | None                 |
| KF        | Flicker Noise Coefficient                      | 0        | None                 |
| AF        | Flicker Noise Exponent                         | 1.0      | None                 |
| FC        | Forward Bias Depletion Capacitance Coefficient | 0.5      | None                 |
| FFE       | Flicker Noise Frequency Exponent               | 1.0      | None                 |

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