

## Non Magnetic SMQ MELF PIN Diode

Rev. V4

### Features

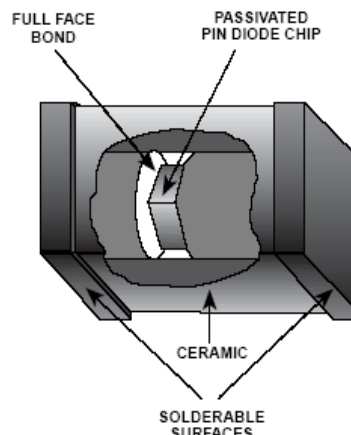
- ◆ Non-Magnetic Package Suitable for MRI Applications
- ◆ Rectangular MELF SMQ Ceramic Package
- ◆ Hermetically Sealed
- ◆ Low  $R_s$  for Low Series Loss
- ◆ Long  $\tau_L$  for Lower Intermodulation Distortion
- ◆ Low  $C_j$  for High Series Isolation
- ◆ High Average Incident Power Handling
- ◆ RoHS Compliant

### Description

The MA4P7446F-1091T is a surface mountable PIN diode in a non-magnetic, **Metal Electrode Leadless Faced (MELF)** package. The device incorporates M/A-COM Technology Solutions' time proven HIPAX technology to produce a low inductance ceramic package with no ribbons or whisker wires. Incorporated in the package is a hard glass passivated, CERMACHIP™ PIN chip that is full face bonded on both the cathode and anode to maximize surface area for the lowest electrical and thermal resistance. The package utilizes a non-magnetic plating process that provides for a package with extremely low permeability. The MA4P7446F-1091T has been comprehensively characterized both electrically and mechanically to ensure repeatable and predictable performance. The non-magnetic MA4P7446F-1091T is the electrical equivalent of its magnetic counterpart the MA4P4006F-1091T.

### Applications

This diode is well suited for use in low loss, low distortion, high power switching circuits and can be used in high magnetic field environments at HF through UHF frequencies. The low thermal resistance of this device provides excellent performance at high RF power incident levels, up to 500 watts CW. This device is designed to meet the most demanding electrical and mechanical MRI environments.



### Designed for Automated Assembly

These SMQ PIN diodes are designed for high volume tape and reel assembly. The rectangular package design provides for highly efficient automatic pick and place assembly techniques. The parallel flat surfaces are suitable for key jaw or vacuum pickup. All solderable surfaces are tin plated and compatible with industry standard reflow and vapor phase soldering methods.

### Absolute Maximum Ratings<sup>1</sup> @ 25°C

| Parameter                     | Absolute Maximum      |
|-------------------------------|-----------------------|
| Operating Temperature         | -65°C to +125°C       |
| Storage Temperature           | -65°C to +150°C       |
| Diode Junction Temperature    | +175 °C Continuous    |
| Diode Mounting Temperature    | +235°C for 10 seconds |
| RF C.W. Incident Power        | + 57dBm C.W.          |
| Forward D.C. Current          | +500 mA               |
| Reverse D.C. Voltage @ -10 uA | - 600V                |

1. Exceeding these limits may cause permanent damage.

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Electrical Specifications @  $T_{\text{AMBIENT}} = +25^{\circ}\text{C}$ 

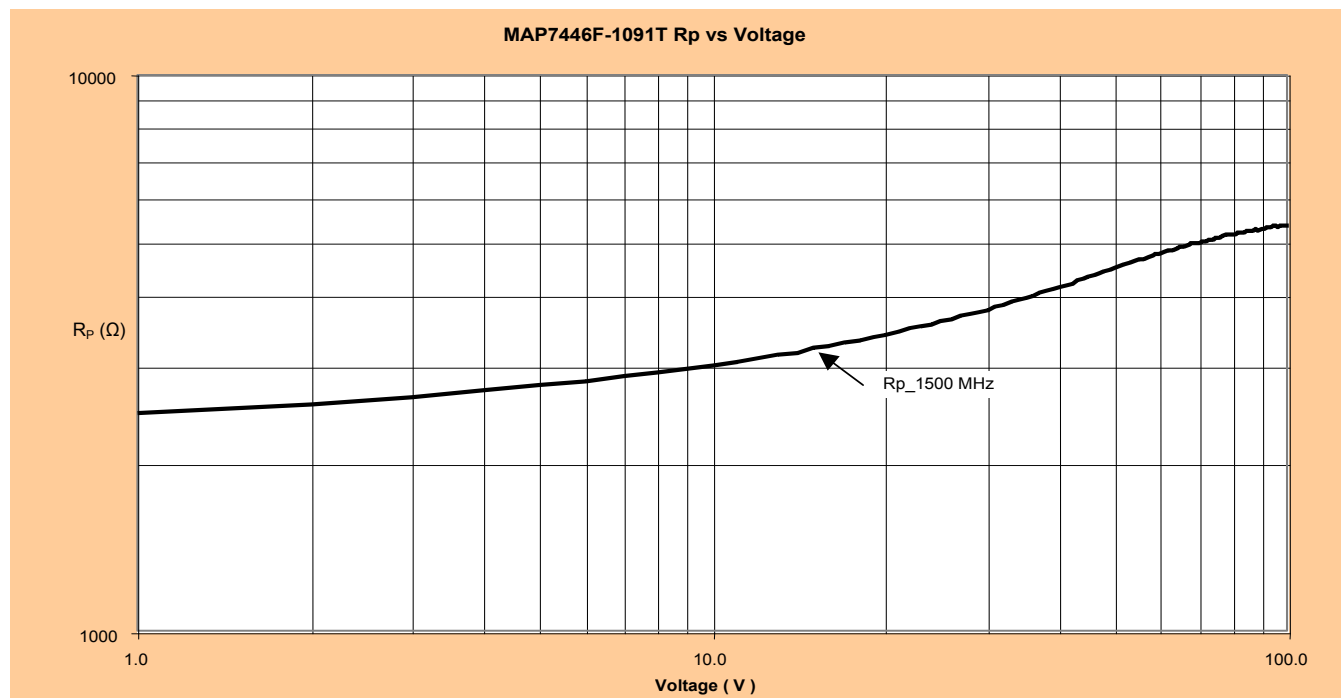
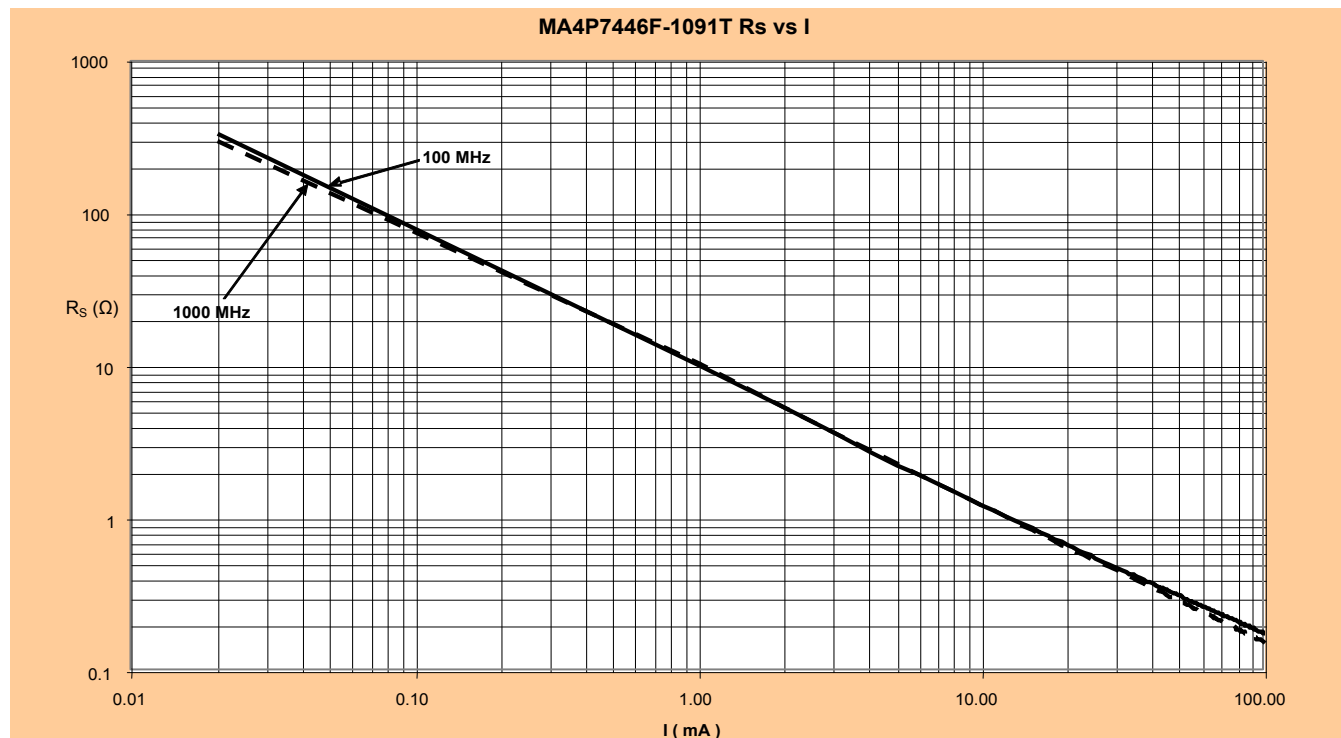
| Parameter                     | Symbol            | Condition  | Unit Value                    |
|-------------------------------|-------------------|--|-------------------------------|
| Forward Voltage               | $V_F$             | $I_F = +100\text{mA}$  | 1.0 $V_{DC}$ (Max.)           |
| Reverse Voltage               | $V_R$             | $I_R = -1\mu\text{A}$  | 600 $V_{DC}$ (Min.)           |
| Total Capacitance             | $C_T$             | -100V @ 1MHz   | 2.2pF (Max.)                  |
| Series Resistance             | $R_S$             | +100mA @ 100MHz  | 0.5 $\Omega$ (Max)            |
| Parallel Resistance           | $R_P$             | -10V @ 100MHz  | $\square$ 10k $\Omega$ (Min.) |
| Carrier Lifetime              | $t_L$             | $I_F = +6\text{mA}$ , $I_R = -10\text{mA}$<br>(50% - 90% Voltage)                    | 19 $\mu\text{s}$ (Typ.)       |
| I-Region Length               | $\mu\text{M}$     | —  | 175 $\mu\text{M}$ (Typ.)      |
| C.W. Thermal Resistance       | $\theta$          | $I_{\text{HIGH}} = 1\text{A}$ , $I_{\text{LOW}} = 10\text{mA}$ ,<br>$T = 1\text{mS}$ | 6 $^{\circ}\text{C/W}$ (Max.) |
| Power Dissipation in Free Air | $W$               | $I_F = +100\text{mA}$  | 8W (Max.)                     |
| Power Dissipation             | $P_{\text{DISS}}$ | $I_F = +100\text{mA}$  | 25W (Max.)                    |

## Environmental Capability

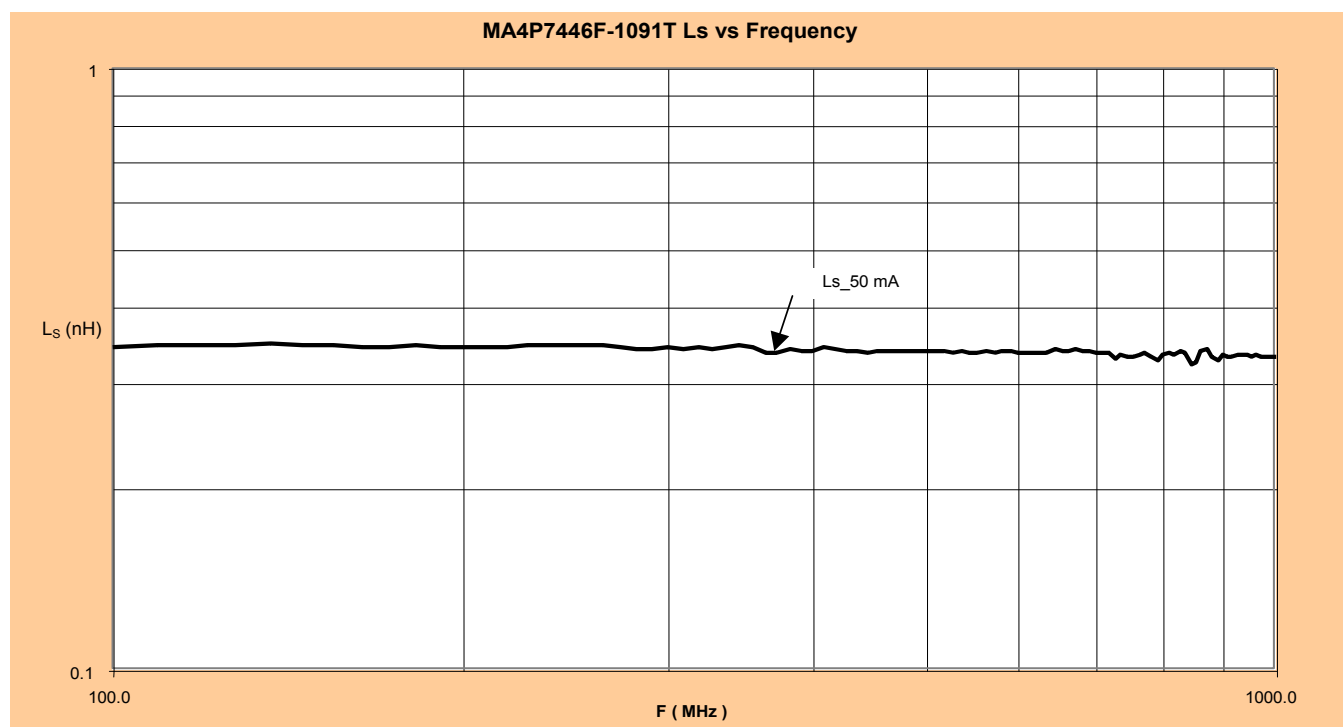
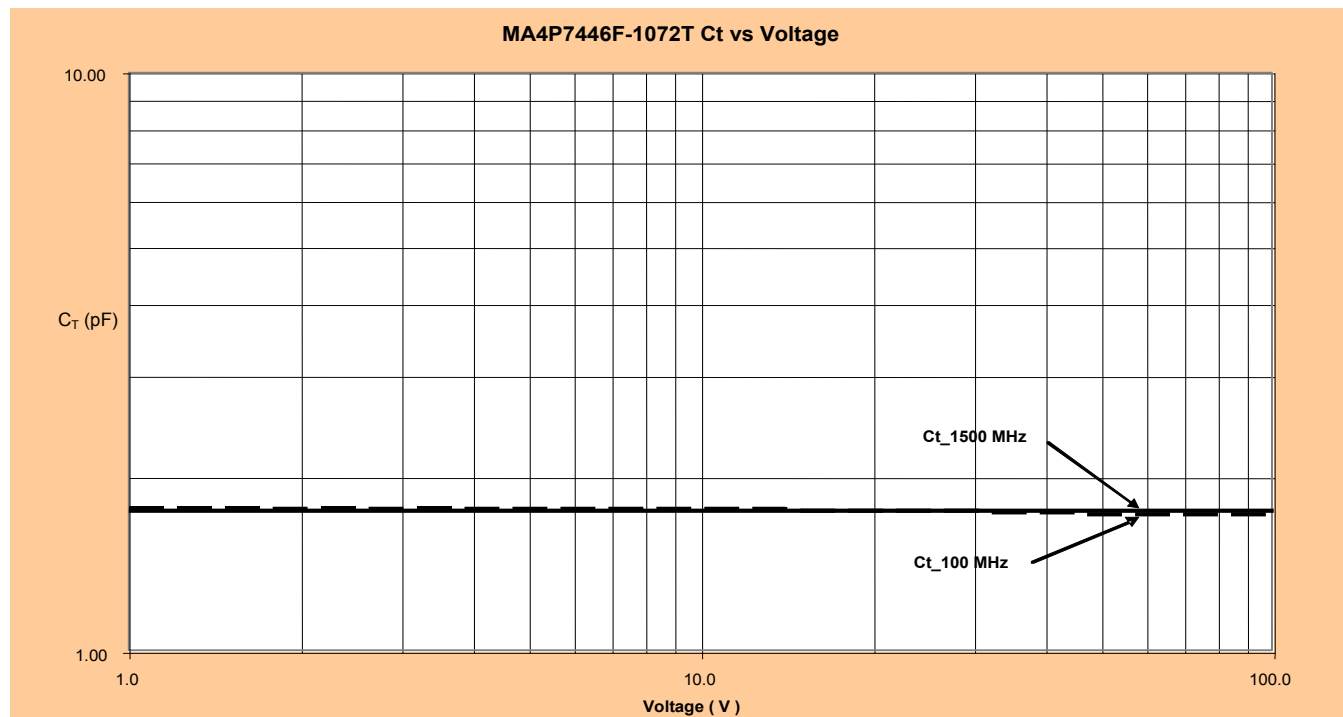
MELF devices are appropriate for use in industrial and military applications and can be screened to meet the environmental requirements of MIL-STD-750, MIL-STD-202 as well as other military standards. The table below lists some of the MIL-STD 750 tests the device is designed to meet.

| MIL-STD-750              |              |   |
|--------------------------|--------------|---|
| Test                     | Method       | Description   |
| High Temperature Storage | 1031         | +150 $^{\circ}\text{C}$ , for 340 Hours                       |
| Temperature Shock        | 1051         | -65 $^{\circ}\text{C}$ to +150 $^{\circ}\text{C}$ , 20 Cycles |
| HTRB                     | 1038         | 80% of rated $V_B$ , +150 $^{\circ}\text{C}$ , for 96 Hours   |
| Moisture Resistance      | 1021         | No Initial Conditioning, 85% RH, +85 $^{\circ}\text{C}$       |
| Gross Leak               | 1071 Cond. E | Dye Penetrant Visual  |
| Vibration Fatigue        | 2046         | 20,000G's, 60Hz, x, y, z axis                                 |
| Solderability            | 2026         | Test Temperature = +245 $^{\circ}\text{C}$                    |

### Typical Electrical Performance @ +25°C

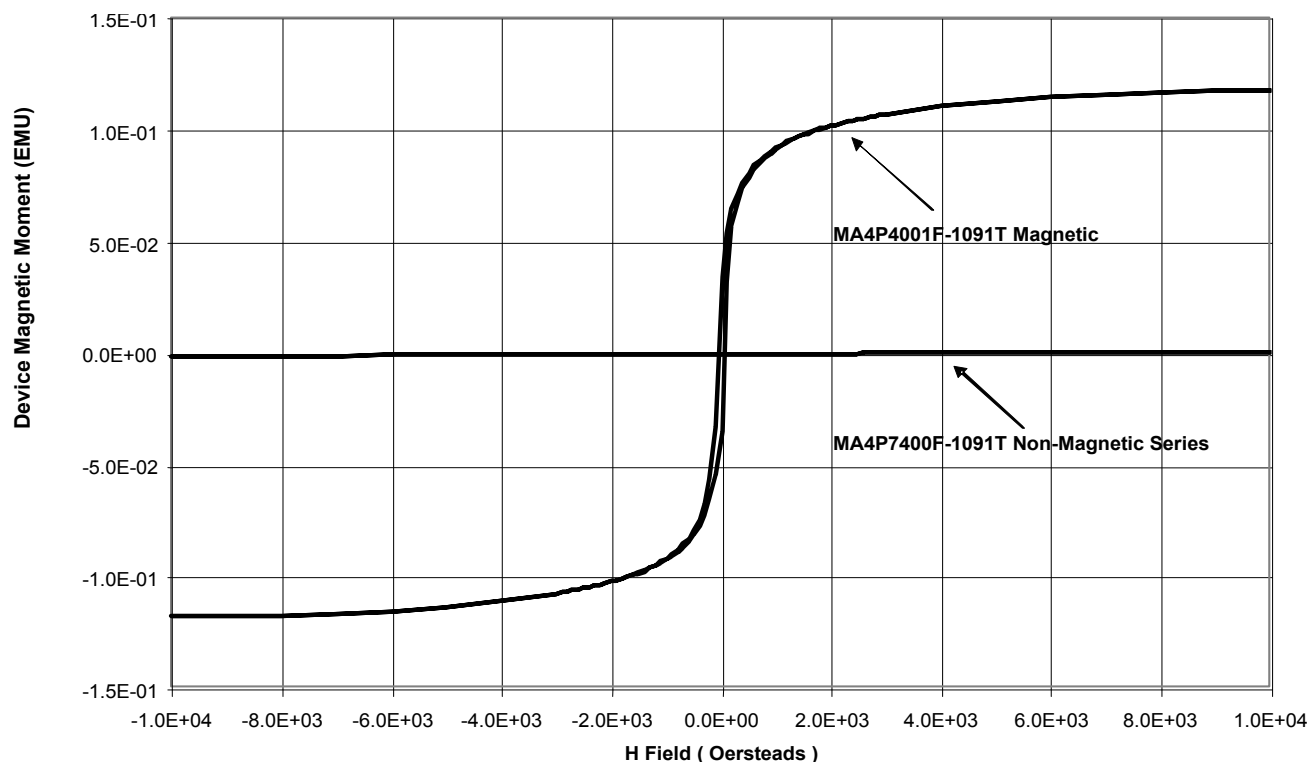


### Typical Electrical Performance @ +25°C



### Typical Magnetic vs. Non-Magnetic Performance

#### Magnetic Moment for MA4P7400F-1091T Non-Magnetic Series vs. MA4P4000F-1091T Series

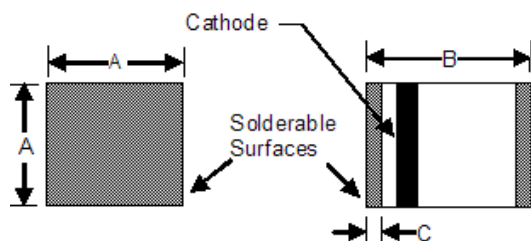


#### Typical Magnetic Properties of Non-Magnetic MA4P7400F-1091T Series vs. Conventional MA4P4000F-1091T Magnetic Series

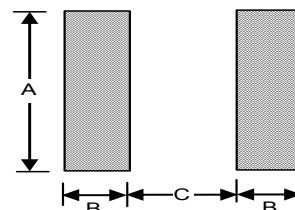
| Magnetic Property                                   | MA4P7400F-1091T Series Value | MA4P4000-1091T Series Value |
|---|------------------------------|-----------------------------|
| Saturation Moment (EMU)<br>@ $H = H_{MAX}$ Oersteds | $1.0 \times E-3$             | $1.2 \times E-1$            |
| Remanance Moment (EMU)<br>@ $H = 0$ Oersteds        | $1.5 \times E-6$             | $3.4 \times E-2$            |
| Coercivity (Oersteds)<br>@ EMU = 0 Moment           | 3.0                          | 51.3                        |

### Mechanical Information

#### 1091 MELF Surface Mount Package



#### Circuit Pad Layout for MELF Diodes



| Case Style | Dimensions in Inches (mm)      |                                |                                |
|------------|--------------------------------|--------------------------------|--------------------------------|
| 1091       | A Square<br>Min / Max          | B<br>Min / Max                 | C<br>Min / Max                 |
|            | 0.138 / 0.155<br>(3.50 / 3.94) | 0.180 / 0.200<br>(4.57 / 5.08) | 0.008 / 0.030<br>(.203 / .762) |

| Dimension | Package Style<br>1091 |      |
|-----------|-----------------------|------|
|           | inches                | mm   |
| A         | 0.150                 | 3.81 |
| B         | 0.050                 | 1.27 |
| C         | 0.100                 | 2.54 |

### MELF Assembly Recommendations

- ◆ Devices may be soldered using standard 60Sn/40Pb or RoHS compliant solders. Axial leads and solderable surfaces of MELF devices are tin plated 50  $\mu$ m thick to ensure an optimum connection.
- ◆ For recommended Sn/Pb and RoHS soldering profiles See Application Note [M538](#) on the M/A-COM website.

### Ordering Information

| Part Number     | Package       | Quantity    |
|-----------------|---------------|-------------|
| MA4P7446F-1091T | Tape and Reel | 500pcs/Reel |

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