Non-Magnetic MELF PIN Diode

MA4P7470F-1072T

Rev. V3

Features

- Non-Magnetic Package Suitable for MRI Applications
- Rectangular MELF SMQ Ceramic Package
- Hermetically Sealed
- Low R_S for Lower Series Loss
- Long t_L for Low Intermodulation Distortion
- Low C_J for High Series Isolation
- High Average Incident Power Handling Capability
- RoHS* Compliant

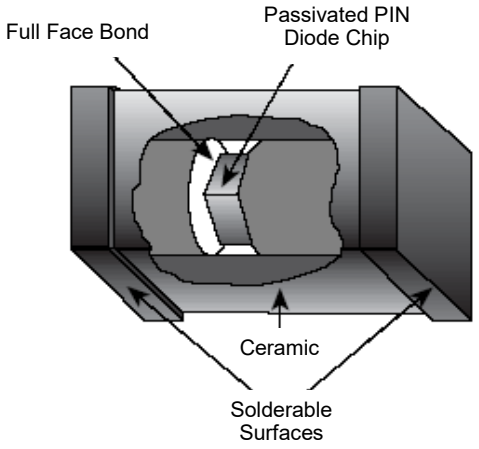
Applications

- MRI

Description

The MA4P7470F-1072T is a surface mountable PIN diode in a non-magnetic Metal Electrode Leadless Faced (MELF) package. The device incorporates a time proven HIPAX technology to produce a low inductance ceramic package with no ribbons or whisker wires. The package utilizes a non-magnetic plating process to provide an extremely low permeability, hermetically sealed package. Incorporated in the package is a passivated PIN diode that is full face bonded on both the cathode and anode of the chip to maximize surface area for low electrical and thermal resistance. The MA4P7470F-1072T has been comprehensively characterized both electrically and mechanically to ensure repeatable and predictable performance.

The MA4P7470-1072T diode is well suited for use in low loss, low distortion, and high power switching circuits applicable for high magnetic field environments from HF through UHF frequencies. The lower thermal resistance of this device provides excellent higher average performance at RF power incident levels up to 200 watts CW. This device is designed to meet the most rigorous electrical and mechanical requirements of MRI environments.



Designed for Automated Assembly

MELF 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 techniques. All solderable surfaces are tin plated and compatible with reflow and vapor phase soldering methods.

Ordering Information

Part Number	Package
MA4P7470F-1072T	Tape and Reel

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Electrical Specifications: +25°C

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Forward Voltage (V_F)	I_F = +100 mA	V_{DC}	—	—	1
Reverse Voltage (V_R)[1]	I_R = -10 µA	V_{DC}	800	—	—
Total Capacitance (C_T)	-100 V @ 100 MHz	pF	—	—	0.7
Series Resistance (R_S)	+100 mA @ 100 MHz	Ω	—	—	0.8
Parallel Resistance (R_P)	-10 V @ 100 MHz	kΩ	50	—	--
Carrier Lifetime (t_L)	+6 mA / -10 mA @ (50% - 90% Voltage)	µs	—	6.5	—
I-Region Length (µm)	—	µm	—	140	—
C.W. Thermal Resistance (q)	I_H = 1A, I_L = 10 mA, T = 1 ms	°C/W	—	—	13
Power Dissipation (W)	I_F = +100 mA In free air With heatsink	W	—	—	4 12

1. The minimum specified V_R (Reverse Voltage) is sourced and the resultant I_R (Reverse Leakage Current) is measured to be <10 µA.

Absolute Maximum Ratings[2,3]

Parameter	Absolute Maximum
RF CW Incident Power	53 dBm
Forward DC Current	150 mA
Reverse DC Voltage	- 800 V @ -10 µA
Operating Temperature	-65°C to +125°C
Storage Temperature	-65°C to +150°C
Diode Junction Temperature	+175°C Continuous
Diode Mounting Temperature	+265 °C for 10 seconds

2. Exceeding any one or combination of these limits may cause permanent damage to this device.
3. MACOM does not recommend sustained operation near these survivability limits.

Handling Procedures

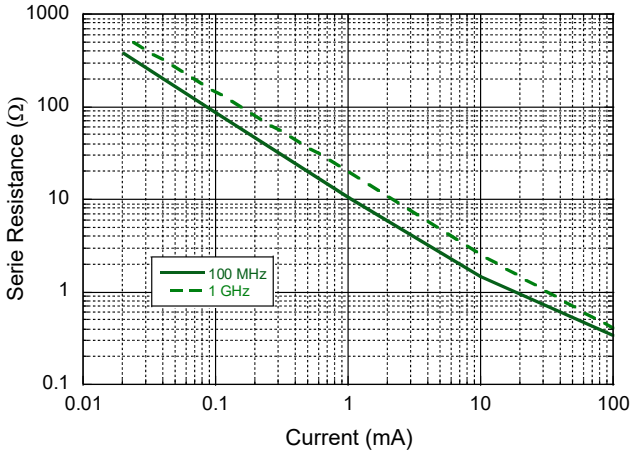
Please observe the following precautions to avoid damage:

Static Sensitivity

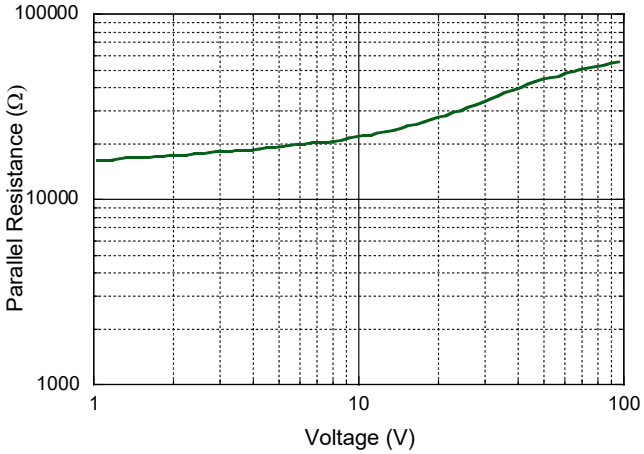
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

Typical Electrical Performance

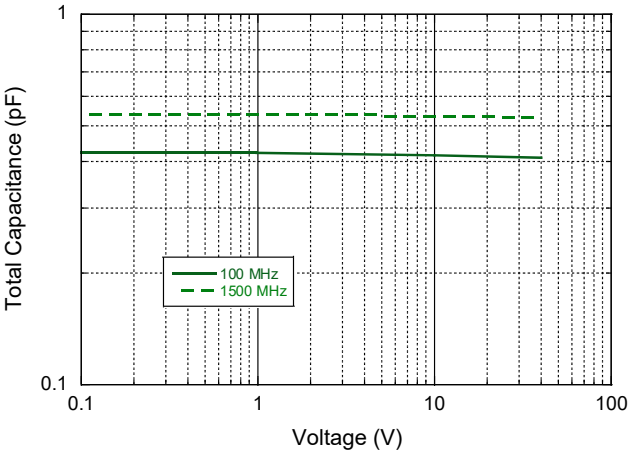
Series Resistance vs. Current



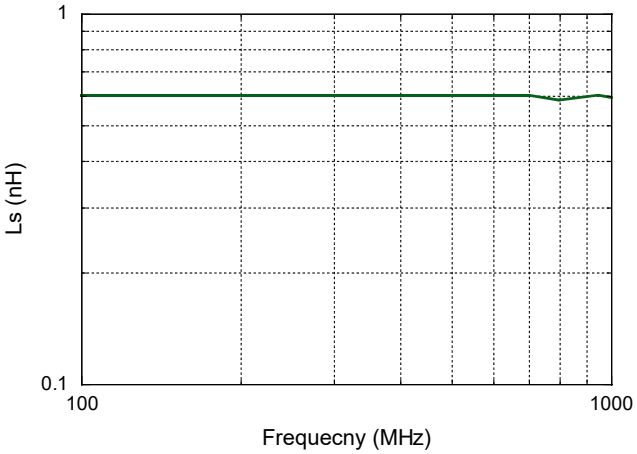
Parallel Resistance vs. Voltage @ 1.5 GHz



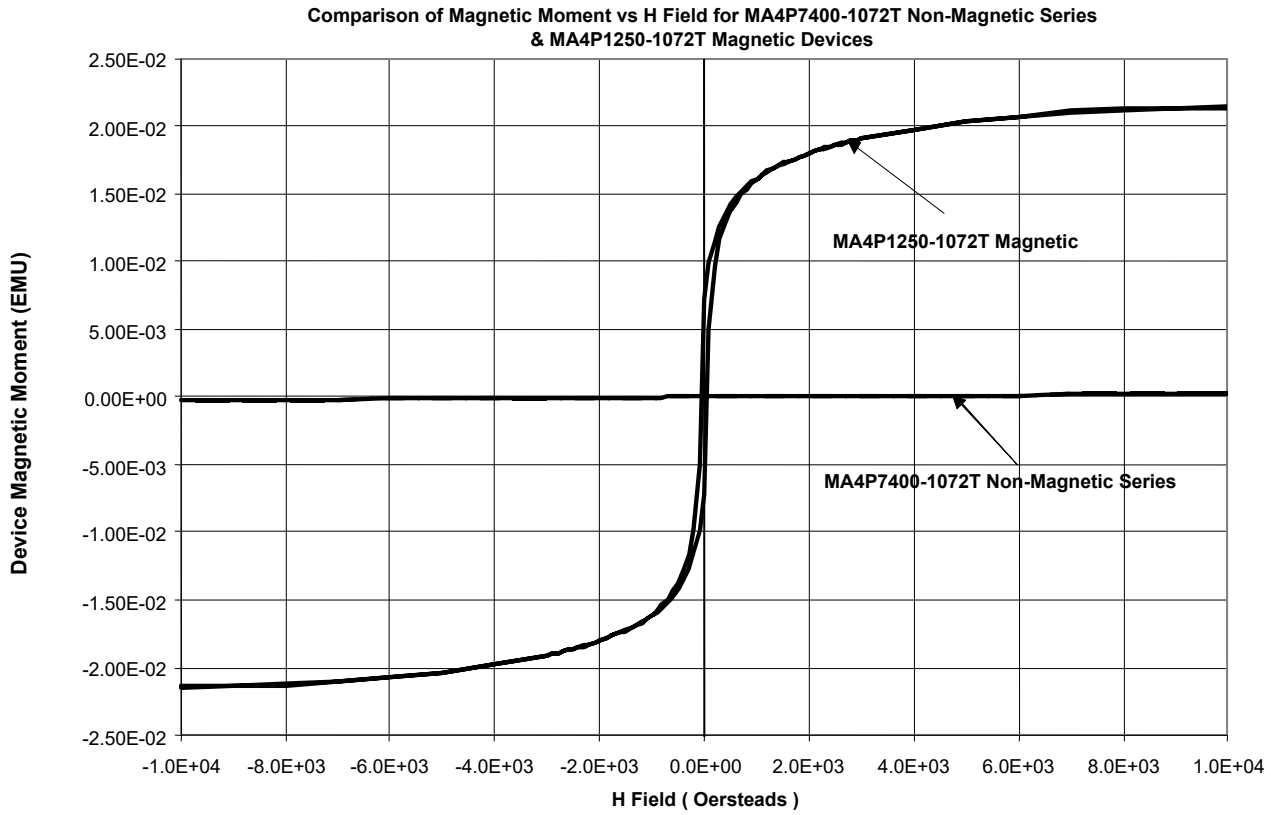
Total Capacitance vs. Voltage



Ls vs. Frequency @ 50 mA



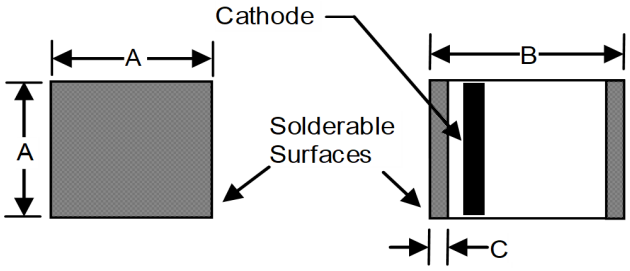
Typical Non-Magnetic Performance



Typical Magnetic Properties:
Non-Magnetic (MA4P7470F-1072T) vs. Magnetic (MA4P1250-1072T)

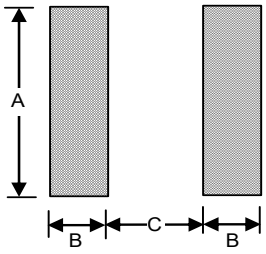
Magnetic Property	MA4P7470F-1072T	MA4P1250-1072T
Saturation Moment (EMU) @ H = H_{MAX} Oersted's	2.3 x E-4	2.1 x E-2
Remanence Moment (EMU) @ H = 0 Oersted's	4.2 x E-8	7.1 x E-3
Coercivity (Oersted's) @ EMU = 0 Moment	1	59.2

Outline (ODS -1072)



Dimension	inches		mm	
	Min.	Max.	Min.	Max.
A	0.080	0.095	2.032	2.413
B	0.115	0.135	2.921	3.429
C	0.008	0.030	0.203	0.762

Circuit Pad Layout (ODS-172)



Dimension	inches	mm
A	0.093	2.36
B	0.050	1.27
C	0.060	1.52

Environmental Screening Capability

HIPAX devices are applicable 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°C, for 340 Hours
Temperature Shock	1051	-65°C to +125°C, 20 Cycles
HTRB	1038	80% of rated V_B, +150°C, for 96 Hours
Moisture Resistance	1021	No Initial Conditioning, 85% RH, +85°C
Gross Leak	1071 Cond. E	Dye Penetrant Visual
Vibration Fatigue	2046	20,000 G's, 60 Hz, x, y, z axis
Solderability	2026	Test Temperature = +245°C