

**2000 Volt and 3000 Volt
PIN Diodes**

**MA4PK2000, 3000
KILOVOLT™ Series**
V. 6

Features

- ◆ Reverse Voltage up to 3000 Volts
- ◆ 25 Ampere Current Rating
- ◆ Designed for HF, Multi-Throw Kilowatt Switches
- ◆ Low Loss, Low Distortion
- ◆ Rugged, Hermetically Sealed Packaging
- ◆ Convenient Solder Lug Attachment
- ◆ Low Magnetic Parts for MRI

Description

M/A-COM's Kilovolt PIN diodes utilize modern semiconductor and packaging technology that assures low loss, low distortion, and reliable performance in multi-kilowatt switch applications at frequencies as low as 1 MHz. The semiconductor chips employed have low resistance, high power dissipation and very high stand-off voltage capability. Kilovolt PIN diodes employ ultra high resistivity, long carrier lifetime, float zone silicon intrinsic material onto which P+ and N+ regions are deposited using an epitaxial process specifically designed at M/A-COM for high voltage PIN diodes. This process results in better preservation of the intrinsic carrier lifetime and superior junctions in comparison to the conventional double diffused process. The processing of the I-region width is tightly controlled using modern lapping techniques. Kilovolt PIN diode chips utilize M/A-COM's proprietary cermachip glass passivation. The hard glass covers all exposed junction and intrinsic region surfaces. This results in a hermetically sealed, passivated chip that has been accepted in many hi-rel military programs.

Applications

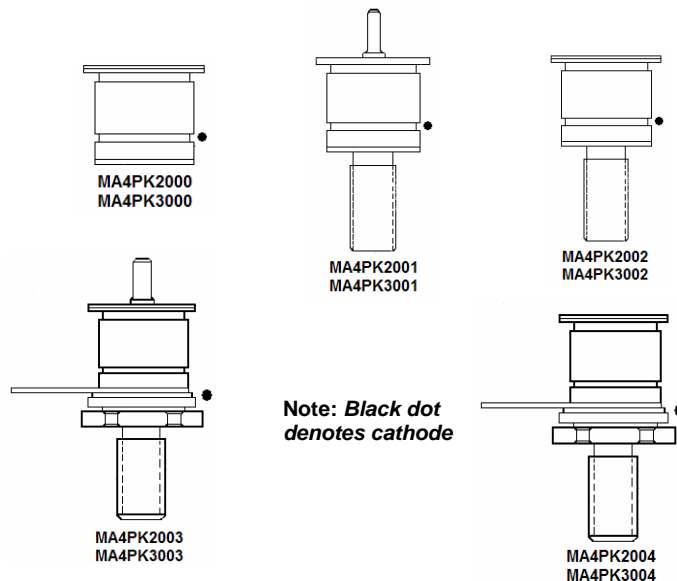
M/A-COM's Kilovolt PIN diodes are designed for use as high power switching elements in multi-kilowatt HF and VHF applications. These PIN diodes have been extensively characterized for their electrical and thermal properties to assure predictable low loss, high power handling, and low distortion performance. Some typical applications are as follows:

- ◆ Filter Switches
- ◆ Antenna Couplers
- ◆ Power Amplifier By-pass Switches
- ◆ MRI Switches

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Package Outlines



Applications

The metal-ceramic packages were developed specifically for the Kilovolt PIN diode series. The packages are designed to withstand extremely high voltages and currents and to be compatible with industry standard semiconductor chip and RF circuitry. These packages meet the environmental requirements of MIL-STD-202 and MIL-STD750. The PIN diode chip is bonded to the package and the anode strap is bonded to the chip at temperatures exceeding 300°C. The anode strap has a unique, large cross-sectional area design allowing for high current capability. The packages are sealed using a projection welding technique in an inert environment. Kilovolt PIN diodes are available with a solder lug on the anode electrode to allow for a convenient and reliable wrap-around wire connection.

Diode Part Numbers and Associated Packages

2000 Volts	3000 Volts	Package Type
MA4PK2000	MA4PK3000	Pill
MA4PK2001	MA4PK3001	Threaded Stud & Solder Lug
MA4PK2002	MA4PK3002	Threaded Stud Only
MA4PK2003	MA4PK3003	Insulated Threaded Stud & Solder Lug
MA4PK2004	MA4PK3004	Insulated Threaded Stud Only

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ABSOLUTE MAXIMUM RATINGS		MAXIMUM POWER DISSIPATION @ T _{CASE} = 25°C	
Operating and Storage Temp.	-65°C to +175°C	MA4PK2001 MA4PK2002	50 Watts
Installation Temperature	250°C/30 Seconds	MA4PK2003, MA4PK2004	37.5 Watts
Instantaneous Reverse Voltage	Voltage Rating	MA4PK3001 MA4PK3002	75 Watts
Forward Current (RF and DC)	25 Amperes	MA4PK3003 MA4PK3004	50 Watts

ELECTRICAL SPECIFICATIONS @ T_A = 25°C

PARAMETER	CONDITION	MA4PK2000 Series	MA4PK3000 Series
Reverse Voltage (Max) V _R	10 μA	2000 Volts	3000 Volts
Series Resistance (Max) R _S	F = 4 MHz, I = 0.5 A	0.20 Ω	0.25 Ω
Series Resistance (Typ.) R _S	F = 1.0 -100 MHz, I = 0.5 A	0.10 Ω	0.15 Ω
Total Capacitance (Max) C _T	F = 1 MHz, V = 100 V	3.2 pF	4.0 pF
Parallel Resistance (Typ.) R _P	F =100 MHz, V = 0 V	5K Ω	10K Ω
Carrier Lifetime (Min) T _L	IF = 10 mA	10 μs	20 μs
Forward Voltage (Max) V _F	IF = 1 A	1.2 V	1.2 V
Thermal Resistance (Max) Ø		3°C/W (Stud) 4°C/W (Ins Stud)	2°C/W (Stud) 3°C/W (Ins Stud)
I-Region Width (Nom)		200 μM	325 μM

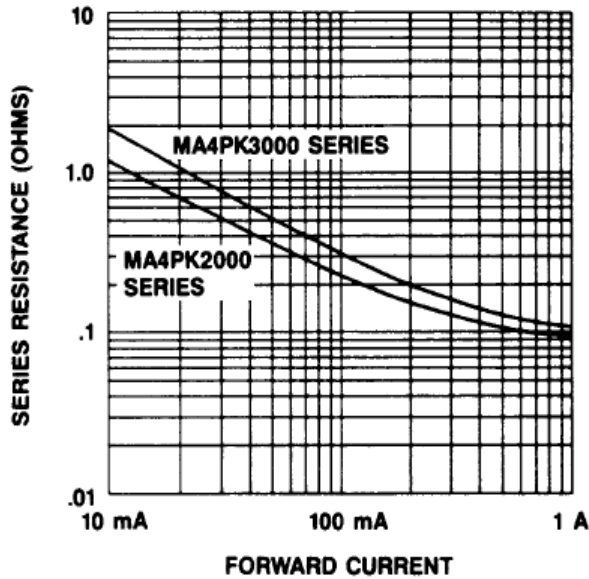
Specifications Subject to Change Without Notice.

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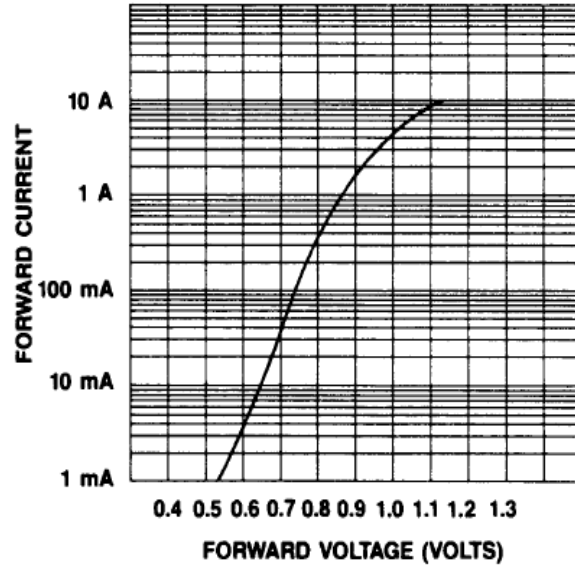
**MA4PK2000, 3000
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Typical Performance Curves

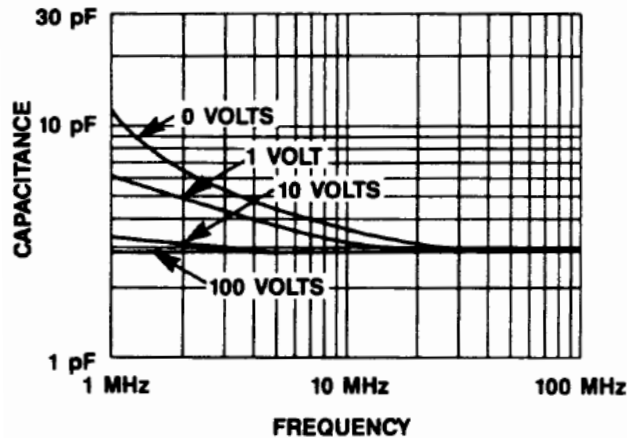
**SERIES RESISTANCE vs. CURRENT FREQUENCY AT 100 MHz
(MA4PK2000, MA4PK3000 SERIES)**



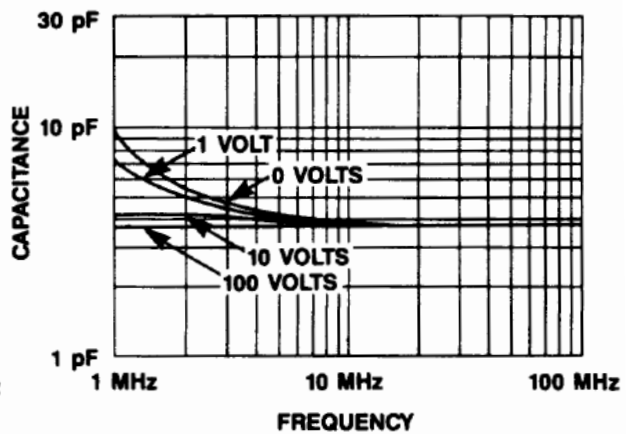
**DC FORWARD VOLTAGE vs. FORWARD CURRENT
(MA4PK2000, MA4PK3000 SERIES)**



**REVERSE BIAS CAPACITANCE vs. FREQUENCY AND
REVERSE VOLTAGE (MA4PK2000 SERIES)**



**REVERSE BIAS CAPACITANCE vs. FREQUENCY AND
REVERSE VOLTAGE (MA4PK3000 SERIES)**



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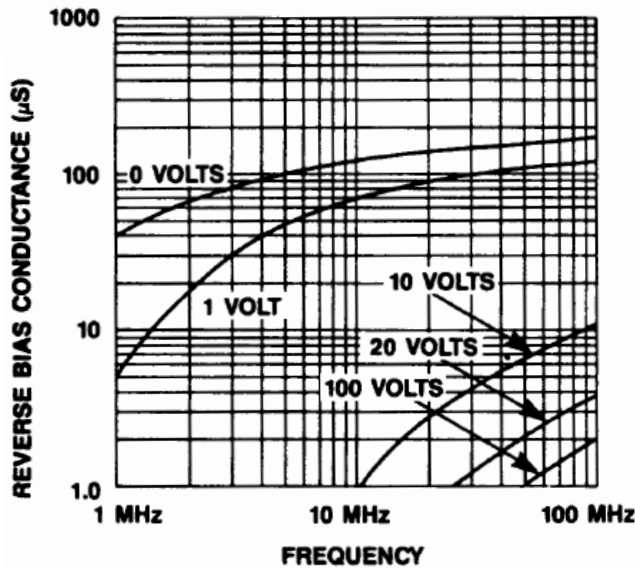
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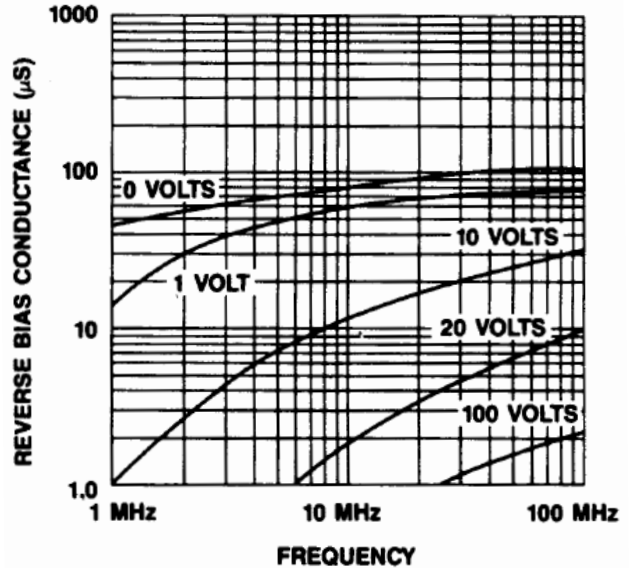
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Typical Performance Curves

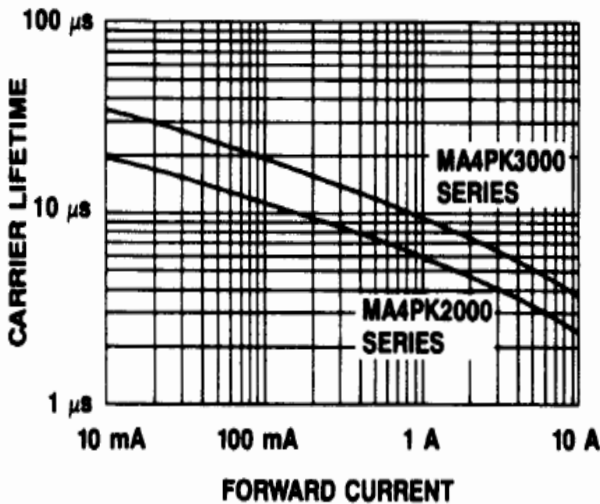
REVERSE BIAS CONDUCTANCE vs. FREQUENCY AND REVERSE VOLTAGE (MA4PK2000 SERIES)



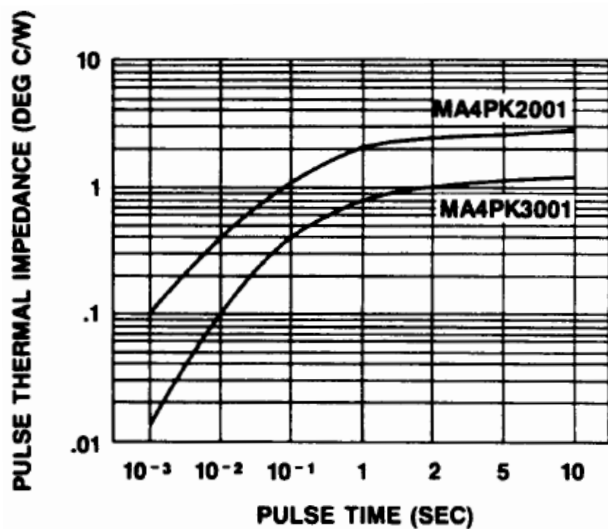
REVERSE BIAS CONDUCTANCE vs. FREQUENCY AND REVERSE VOLTAGE (MA4PK3000 SERIES)



CARRIER LIFETIME vs. FORWARD CURRENT



PULSED THERMAL RESISTANCE



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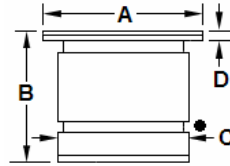
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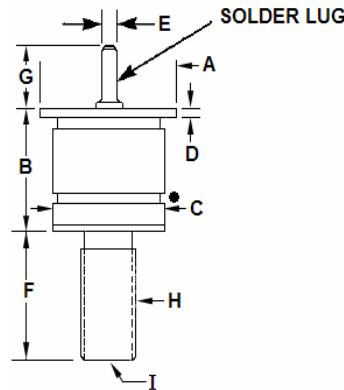
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Case Styles ● Black Dot Denotes Cathode



MA4PK2000 CASE STYLE 1027					MA4PK3000 CASE STYLE 1073				
DIM	INCHES		MILLIMETERS		INCHES		MILLIMETERS		
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
A	0.304	0.316	7.72	8.02	0.468	0.485	11.90	12.30	
B	0.286	0.292	7.26	7.42	0.387	0.411	9.83	10.40	
C	0.245	0.255	6.22	6.48	0.390	0.400	9.90	10.10	
D	0.023	0.031	0.58	0.79	0.028	0.042	0.71	1.06	
$C_P = .45pF$			$L_S = 2nH$		$C_P = .75pF$			$L_S = 3nH$	



MA4PK2001 CASE STYLE 1082					MA4PK3001 CASE STYLE 1084				
DIM	INCHES		MILLIMETERS		INCHES		MILLIMETERS		
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	
A	0.304	0.316	7.72	8.02	0.468	0.485	11.90	12.30	
B	0.286	0.292	7.26	7.42	0.387	0.411	9.83	10.40	
C	0.245	0.255	6.22	6.48	0.390	0.400	9.90	10.10	
D	0.023	0.031	0.58	0.79	0.028	0.042	0.71	1.06	
E	0.060	0.065	1.52	1.65	0.060	0.065	1.52	1.65	
F	0.281	0.305	7.14	7.75	0.425	0.445	10.80	11.30	
G	0.190	0.205	4.83	5.21	0.190	0.205	4.83	5.21	
H	6-40 UNF-3A				10-32 UNF-2A				
I	.072 SPLINE X .070 DP				.050 SLOT X .060 DP				
$C_P = .45pF$			$L_S = 2nH$		$C_P = .75pF$			$L_S = 3nH$	

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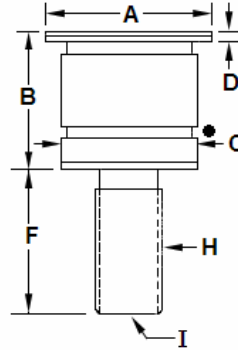
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MA4PK2002 CASE STYLE 1048					MA4PK3002 CASE STYLE 1074			
DIM	INCHES		MILLIMETERS		INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX
A	0.304	0.316	7.72	8.02	0.468	0.485	11.90	12.30
B	0.286	0.292	7.26	7.42	0.387	0.411	9.83	10.40
C	0.245	0.255	6.22	6.48	0.390	0.400	9.90	10.10
D	0.023	0.031	0.58	0.79	0.028	0.042	0.71	1.06
F	0.281	0.305	7.14	7.75	0.425	0.445	10.80	11.30
H	6-40 UNF-3A				10-32 UNF-2A			
I	.072 SPLINE X .070 DP				.050 SLOT X .060 DP			
	$C_P = .45pF$		$L_S = 2nH$		$C_P = .75pF$		$L_S = 3nH$	

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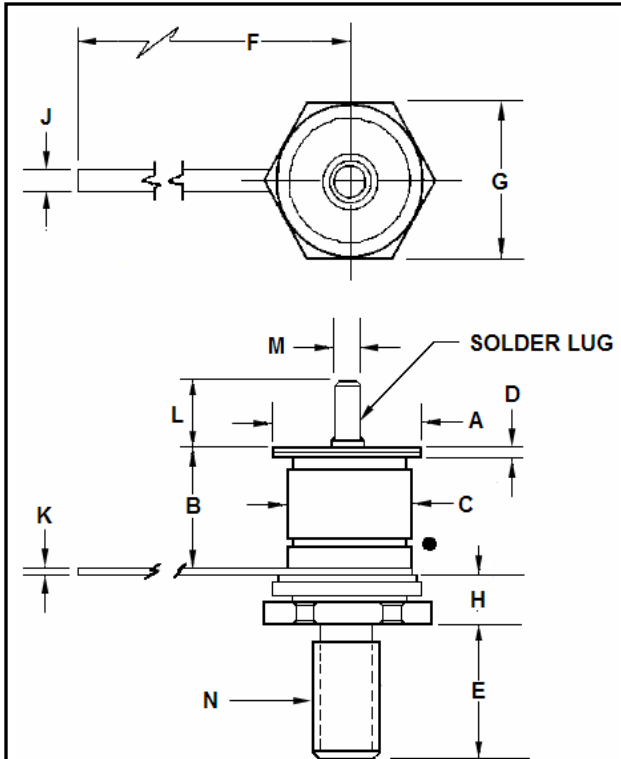
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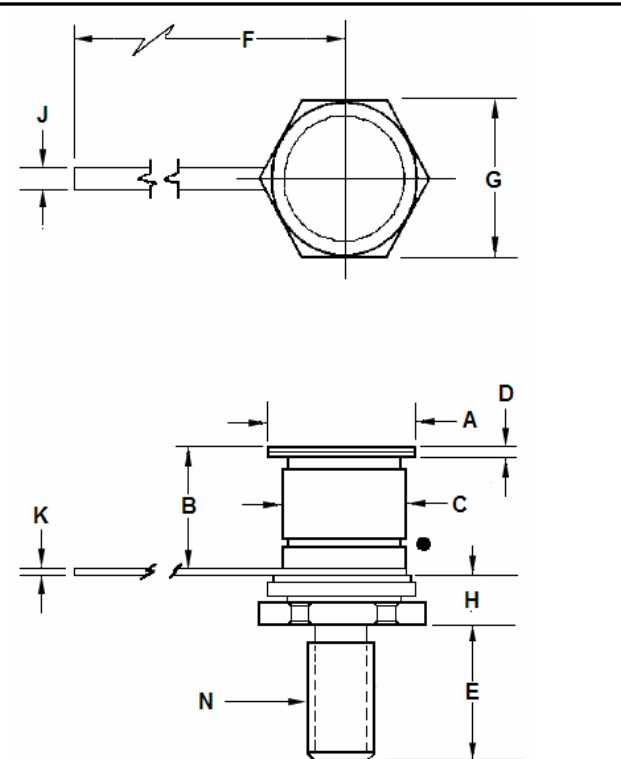
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MA4PK2003 CASE STYLE 1080				
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.304	.316	7.72	8.02
B	.254	.270	6.45	6.86
C	.245	.255	6.22	6.48
D	.023	.031	0.58	0.79
E	.221	.252	5.61	6.40
F	.780	.790	19.8	20.1
G	.245	.255	6.22	6.48
H	.128	.137	3.25	3.48
J	.120	.130	3.05	3.30
K	.007	.009	0.18	0.23
L	.190	.205	4.83	5.21
M	.060	.065	1.52	1.65
N	6-32 UNF-3A			
$C_{GND} = 1.1pF$ $C_P = .45pF$ $L_S = 2nH$				



MA4PK2004 CASE STYLE 1038				
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.304	.316	7.72	8.02
B	.254	.270	6.45	6.86
C	.245	.255	6.22	6.48
D	.023	.031	0.58	0.79
E	.221	.252	5.61	6.40
F	.780	.790	19.8	20.1
G	.245	.255	6.22	6.48
H	.128	.137	3.25	3.48
J	.120	.130	3.05	3.30
K	.007	.009	0.18	0.23
N	6-32 UNF-3A			
$C_{GND} = 1.1pF$ $C_P = .45pF$ $L_S = 2nH$				

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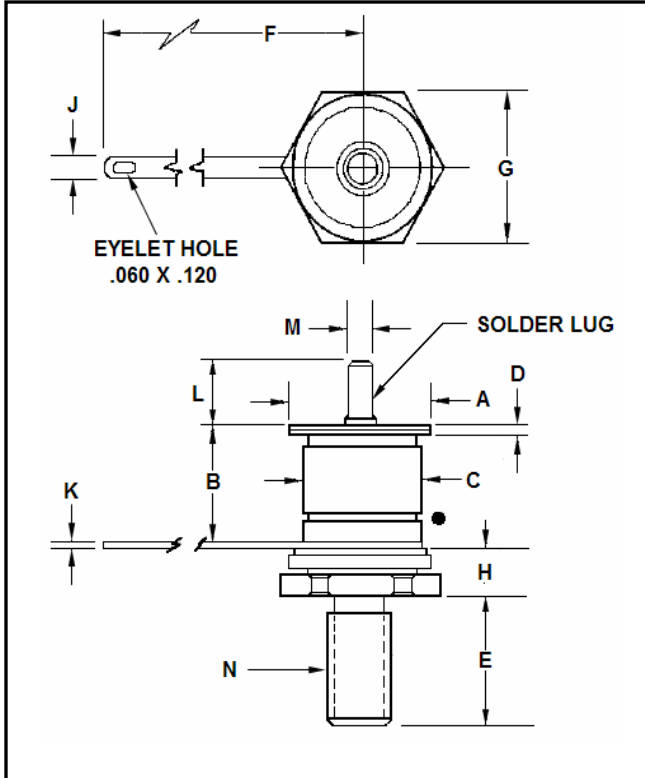
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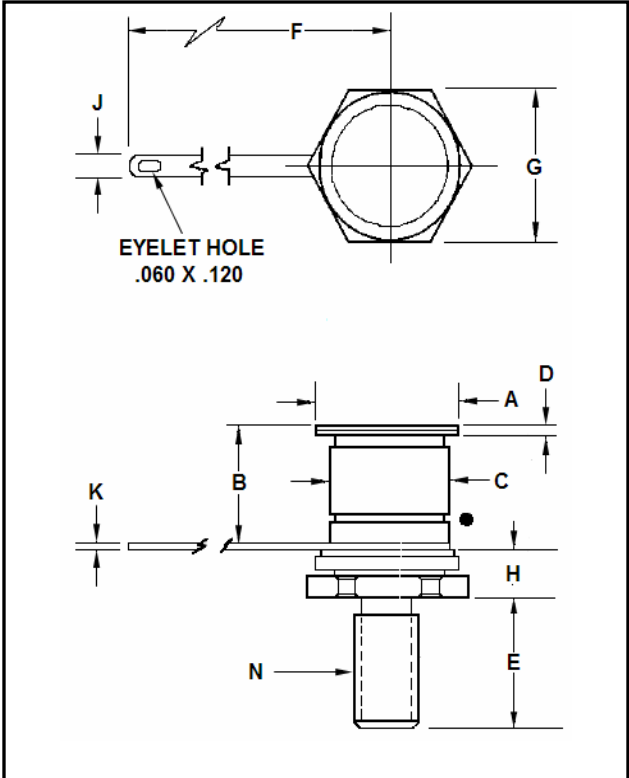
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MA4PK3003 CASE STYLE 1085				
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.468	.485	11.9	12.3
B	.387	.411	9.83	10.4
C	.390	.400	9.90	10.1
D	.028	.042	0.71	1.06
E	.060	.065	1.52	1.65
F	.425	.445	10.8	11.3
G	.190	.205	4.83	5.21
H	.148	.170	3.76	4.32
J	.120	.130	3.05	3.30
K	.022	.026	.550	.660
L	.190	.205	4.83	5.21
M	.060	.065	1.52	1.65
N	10-32 UNF-2A			
$C_{GND} = 1.1pF$ $C_P = .75pF$ $L_S = 3nH$				



MA4PK3004 CASE STYLE 1075				
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.468	.485	11.9	12.3
B	.387	.411	9.83	10.4
C	.390	.400	9.90	10.1
D	.028	.042	0.71	1.06
E	.060	.065	1.52	1.65
F	.425	.445	10.8	11.3
G	.190	.205	4.83	5.21
H	.148	.170	3.76	4.32
J	.120	.130	3.05	3.30
K	.022	.026	.550	.660
N	10-32 UNF-2A			
$C_{GND} = 1.1pF$ $C_P = .75pF$ $L_S = 3nH$				

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