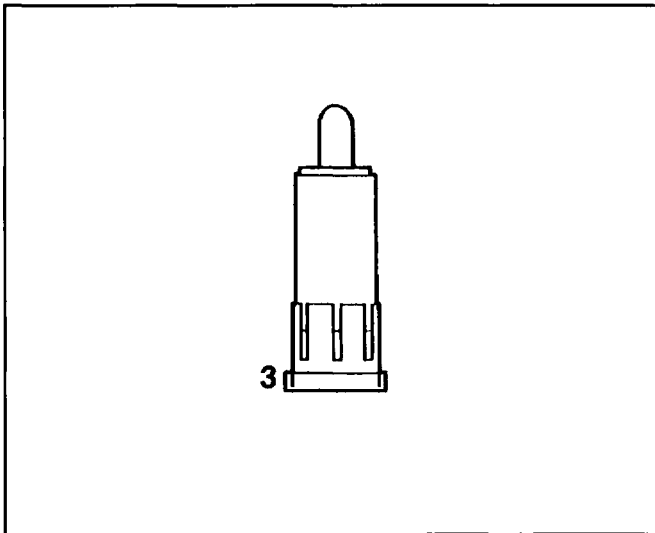


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# Point Contact Mixer and Detector Diodes

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## Description

This series of point contact mixer and detector diodes features good mechanical reliability, low noise figure and is designed for use in stripline, waveguide and coaxial mixers, detectors and power monitors. This series of diodes is offered in axial lead, ceramic or coaxial packages.

## Features

- PACKAGED CARTRIDGE POINT CONTACT MIXER DIODES
- COAXIAL POINT CONTACT MIXER DIODES
- AXIAL LEAD GLASS PACKAGED POINT CONTACT MIXER DIODES
- AXIAL LEAD GLASS PACKAGED POINT CONTACT DETECTOR DIODES

## Applications

These diodes are designed for mixer, detector and power monitors where good burnout and noise figure are major design criteria.

# Packaged Cartridge Point Contact Mixer Diodes

## Description

These packaged cartridge point contact mixer diodes feature low noise figure performance. Diodes in this series are available from S-band through X-band. JAN rated devices are also available. This special series of hermetically sealed point contact diodes has been carefully engineered for single or balanced mixer applications.

These diodes are useful for waveguide mixers from S-band through X-band, such as in marine radars, where good burnout resistance is required.

## Features

- LOW NOISE
- GOOD BURNOUT RESISTANCE TO SHORT NANOSECOND PULSES (i.e., TR TUBE LEAKAGE)
- SCREENABLE TO MILITARY SPECIFICATIONS

## Specifications @ $T_A = 25^\circ\text{C}$

Model Number <sup>1,2</sup>	Case Style	Test Frequency (GHz)	Maximum <sup>3</sup> Noise Figure (dB)	Z <sub>IF</sub> Range <sup>4</sup> (Ohms) Min./Max.	Maximum <sup>5</sup> SWR (Ratio)	MIL-STD-19500 <sup>6</sup> Detail Specification Number
1N416G	3	3	5.5	350-450	1.3	321
JAN1N21WG	3	3	5.5	350-450	1.3	
1N416F	3	3	6.0	350-450	1.3	
1N416E	3	3	7.0	350-450	1.3	
JAN1N21WE	3	3	7.0	350-450	1.3	
JAN1N3655A	3	3	7.0	350-450	1.3	
1N416D	3	3	7.5	325-475	1.5	
1N21G	7-1	3	5.5	350-450	1.3	
1N21F	7-1	3	6.0	350-450	1.3	
1N21E	7-1	3	7.0	350-450	1.3	
1N21D	7-1	3	7.5	325-475	1.5	
1N415H	3	9	6.0	335-465	1.3	322A
JAN1N23WG	3	9	6.5	335-465	1.3	
1N415G	3	9	6.5	335-465	1.3	
1N415F	3	9	7.0	335-465	1.3	
JAN1N23WE	3	9	7.5	335-465	1.3	
1N415E	3	9	7.5	335-465	1.3	
1N415D	3	9	8.2	325-475	1.3	
1N415C	3	9	9.5	325-475	1.5	322A
1N3745	3	9	9.5	325-475	1.5	
1N23H	7-1	9	6.0	335-465	1.3	
1N23G	7-1	9	6.5	335-465	1.3	
1N23F	7-1	9	7.0	335-465	1.3	
1N23E	7-1	9	7.5	335-465	1.3	
1N23D	7-1	9	8.2	325-475	1.3	
1N23C	7-1	9	9.5	325-475	1.5	

### NOTES:

- The 1N21D through G, and 1N23C through H series diodes are housed in the fixed base package, case style 7-1. All other diodes in this series are housed in case style 3. Case style 3 has a removable-reversible base adapter.
- All diodes in this series are available as matched pairs for balanced mixer circuits. There are two types of matched pairs:  
To order two match pairs with the same polarity, "forward pairs" add the suffix "M" to the part number, i.e., 1N23EM  
To order two match diodes with opposite polarity, "reverse pairs" add the suffix "MR" to the part number, i.e., 1N23MR.  
The matching criteria is:  
 $\Delta L_c = 0.3$  dB maximum  
 $\Delta Z_{IF} = 25$  ohms maximum

### 3. Noise Figure Test Conditions:

I<sub>RECT</sub> = 1.0 mA  
 IF = 30 MHz  
 NF<sub>IF</sub> = 1.5 dB minimum  
 R<sub>L</sub> = 22 ohms

- IF impedance is measured by modulating the specified test frequency with a 1000 Hz signal, R<sub>L</sub> = 22 ohms, at an incident power level of 1.0 mW.
- SWR is tested at a peak power of 1.0 mW, R<sub>L</sub> = 22 ohms.
- These diodes are available as JAN MIL qualified types.

# Coaxial Point Contact Mixer Diodes

## Description

This series of coaxial silicon point contact mixer diodes is especially designed for low noise figure performance. Two case styles are offered: case style 11 for X-, Ku- and K-band and case style 10 for Ka-band.

These diodes are used as waveguide mixers in X- through Ka-band.

## Features

- WIDER BANDWIDTH THAN CARTRIDGE DIODES IN X BAND

## Specifications @ $T_A = 25^\circ\text{C}$

Model Number <sup>1,2</sup>	Case Style	Test <sup>3</sup> Frequency (GHz)	Maximum <sup>3</sup> Noise Figure (dB)	Z <sub>IF</sub> Range <sup>4</sup> (Ohms) Min./Max.	Maximum SWR (Ratio)	MIL-STD-19500 <sup>6</sup> Detail Specification Number
MA492F	11	9	7.0	250-450	1.3	
MA492E	11	9	7.5	250-450	1.3	
MA492D	11	9	8.5	250-450	1.7	
MA492C	11	9	9.5	250-450	1.7	
MA490G	11	16	7.0	400-565	1.5	
1N78G	11	16	7.0	400-565	1.5	
JAN1N78F	11	16	7.5	400-565	1.5	130C
1N78F	11	16	7.5	400-565	1.5	
MA490F	11	16	7.5	400-565	1.5	
MA490E	11	16	8.0	400-565	1.5	
1N78E	11	16	8.0	400-565	1.5	
1N78D	11	16	8.5	400-565	1.5	
MA490D	11	16	8.5	400-565	1.5	
1N78C	11	16	9.5	400-565	1.5	
MA490C	11	16	9.5	400-565	1.5	
JAN1N78C	11	16	9.5	400-565	1.5	130B
MA490B	11	16	10.0	365-565	1.6	
1N78B	11	16	10.0	365-565	1.6	
1N26C	11	24	9.5	400-600	1.6	
1N493C	11	24	9.5	400-600	1.5	
JAN1N26B	11	24	11.0	400-600	1.5	128A
1N26B	11	24	11.0	400-600	1.5	
1N53D(5)	10	35	9.0	400-800	1.6	
MA494C	10	35	9.0	400-800	1.6	
1N53C	10	35	9.0	400-800	1.6	
MA494D	10	35	9.0	400-800	1.6	
MA494B	10	35	10.0	400-800	1.6	
JAN1N53B	10	35	10.0	400-800	1.6	186B
1N53B	10	35	10.0	400-800	1.6	
MA494A	10	35	11.0	400-800	1.6	
1N53A	10	35	11.0	400-800	1.6	
MA494	10	35	13.0	400-800	1.6	
1N53	10	35	13.0	400-800	1.6	

### NOTES:

- These diodes are available in two polarities. One is a "forward" diode with a center conductor in the anode. To order a "forward" diode, specify the model number only, i.e. 1N78D. The other available polarity is a "reverse" diode. To order a "reverse" diode, add the suffix "R" to the basic model number, i.e., 1N78DR.
- These diodes can be supplied in matched pairs for balanced mixer circuits. There are two types of pairs:
  - Two matched "forward" polarity diodes. To order a "forward" pair add the suffix "M" to the basic model number, i.e., 1N78DM.
  - Two matched, 1 "forward" and 1 "reversed" diodes. To order, a reverse pair add the suffix "MR" to the basic model number, i.e., 1N78DMR.
 The matching criteria for all pairs is:
  - $\Delta L_C = 0.3$  dBm maximum
  - $\Delta Z_{IF} = 25$  ohms maximum
- The noise figure of these diodes are all measured in a fixed tuned "JAN" specified test holder at the following frequencies:
  - F = 9.375 GHz
  - F = 16.00 GHz
  - F = 23.98 GHz
  - F = 36.80 GHz
 Local oscillator power = 1.0 mW  
 IF = 30 MHz  
 $R_L = 100$  ohms  
 $NF_{IF} = 1.5$  dB maximum
- IF impedance is measured by modulating the specified test frequency with a 1000 Hz signal. IF impedance and SWR are tested at an incident power level of 1.0 mW,  $R_L = 100$  ohms.
- The 1N53D (MA494D) is rated for an operating temperature of 150°C vs. 70°C for other types.
- These diodes are JAN MIL qualified types.

# Axial Lead Glass Packaged Point Mixer Diodes

## Description

This series of glass axial lead point contact mixer diodes features low capacitance, good mechanical reliability, low noise figure and is designed for use in stripline, microstrip and coaxial mixers from 500 MHz and 12.4 GHz. Each device in this series is housed in an axial lead glass package, case style 4.

These diodes are designed for usage where bandwidth, good burnout and noise figure are major design criteria.

## Features

- HIGH SENSITIVITY
- UNIFORM AND REPEATABLE RF CHARACTERISTICS
- BROADBAND
- HIGH BURNOUT RESISTANCE

## Specifications @ $T_A = 25^\circ\text{C}$

Model Number <sup>1</sup>	Case Style	Test Frequency (GHz)	Maximum <sup>2,3</sup> Noise Figure (dB)	$Z_{IF}^2$ Range (Ohms) Min./Max.	Nominal <sup>2</sup> Conversion Loss, $L_c$ (dB)
1N831C	4	3	6.0	350-450	4.0
1N831B	4	3	6.5	350-550	4.5
1N831A	4	3	7.0	350-550	5.0
1N831	4	3	8.3	350-450	5.5
1N832C	4	9	6.5	335-465	4.5
1N832B	4	9	7.0	335-465	5.0
1N832A	4	9	7.5	335-465	6.0
1N832	4	9	9.5	325-475	7.0

### NOTES:

1. All diode models are available as matched pairs. To order, add the suffix "M" to the model number.

Matching criteria:  $\Delta L_c = 0.3$  dB maximum  
 $\Delta Z_{IF} = 25$  ohms maximum

2. The 1N831 series is tested at 3.06 GHz and LO power of 0.5 mW. The 1N832 series is tested at 9.375 GHz and LO power of 1.0 mW. Both series of diodes are tested in a fixed, tuned JAN holder with an appropriate fixed adapter. The other test conditions are:

$I_F = 30$  MHz  
 $NF_{IF} = 1.5$  dB minimum  
 $R_L = 100$  ohms

## MAXIMUM RATINGS

**Operating Temperature** - 65°C to +150°C  
**Storage Temperature** - 65°C to +150°C  
**Incident CW RF Power** 75 mW  
**Incident Pulse RF Power** 1 W  
 (3 ns pulse width, .001 duty cycle)

# Axial Lead Glass Package Point Contact Detector Diodes

## Description

This series of point contact detector diodes is offered in axial lead glass packages. These devices are useful as detectors and power monitors where bandwidth, high burnout resistance and sensitivity are the major design criteria. These diodes do not require DC bias to obtain the specified sensitivity.

These diodes are intended for coaxial and stripline detectors from VHF through X-band, where operation without external bias is required.

## Features

- MODERATE VIDEO IMPEDANCE AT ZERO BIAS

## Specifications @ $T_A = 25^\circ\text{C}$

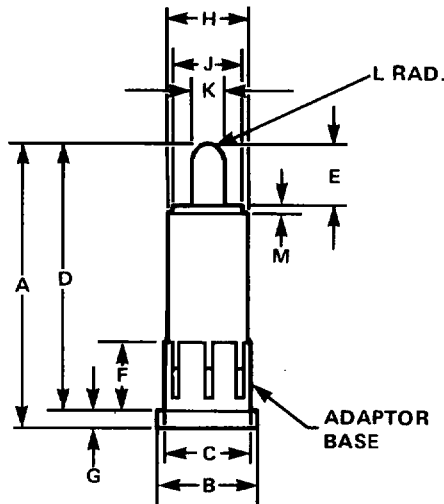
Model Number <sup>1</sup>	Case Style	Test Frequency (GHz)	Minimum $T_{SS}^{2,3,4}$ (dBm)	Video Resistance <sup>4</sup> Range (kilohms)
MA4123	4	3	-45	5.0-25.0
MA41511	54	3	-48	4.5-18.0
MA41512	54	3	-50	4.5-18.0
MA4123A	4	3	-48	5.0-25.0
MA4123B	4	3	-50	4.5-18.0
MA41510	54	3	-45	4.5-18.0
1N833A	4	9	-48	4.5-18.0
MA41515	54	9	-50	4.5-18.0
MA41513	54	9	-45	4.5-18.0
MA41514	54	9	-48	4.5-18.0
1N833	4	9	-45	4.5-18.0
1N833B	4	9	-50	4.5-18.0

### NOTES:

1. Matched pairs are available by adding the suffix "M" to the model number. The matching criteria is:
  - Output voltage is matched at a delta input power of 0.5 dBm maximum.
  - Video resistance is matched to a delta to a percentage maximum of the incident power level.
  - The matching is done at -30 dBm incident power.
2. Bandwidth of the video amplifier = 2 MHz; amplifier noise figure = 3.5 dB maximum with an input impedance of 10,000 ohms. Low frequency cut-off is approximately 10 kHz.
3. The test holders used to make the  $T_{SS}$  measurements are:
  - Test holder JAN264 with adaptor for MA4123 through MA4123B
  - Test holder JAN 1908 for MA41510 through MA41512
  - Test holder JAN 105 (modified) for 1N833B
  - Test holder JAN JD 2078 for MA41513 through MA41515.
4.  $T_{SS}$  is tested with no external bias current.

# Case Styles

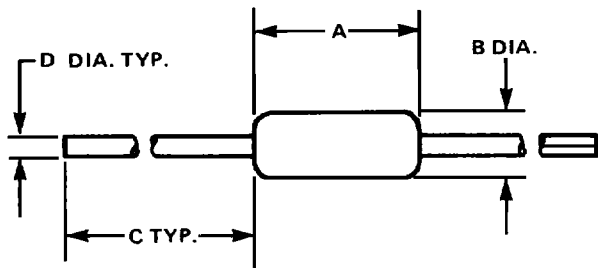
3



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.800	0.840	20,32	21,34
B	0.292	0.296	7,42	7,52
C	0.246	0.250	6,25	6,35
D	0.753	0.783	19,13	19,89
E	0.180	0.190	4,57	4,83
F	0.193	0.199	4,90	5,05
G	0.047	0.057	1,19	1,45
H	0.222	0.240	5,64	6,10
J	0.195	0.215	4,95	5,46
K	0.092	0.094	2,34	2,39
L	0.030	0.046	0,76	1,17
M	0.020	0.030	0,51	0,76

Adaptor base optional.  
 $C_p = 0.12 \text{ pF}$  Typical  
 $L_s = 0.50 \text{ nH}$  Typical

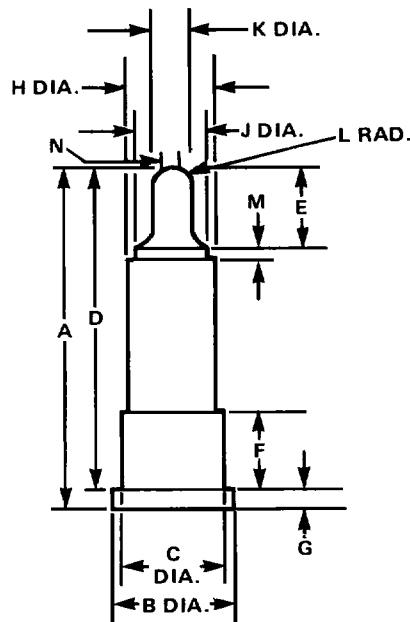
4



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.230	0.300	5,84	7,62
B	0.085	0.107	2,16	2,72
C	1.000	—	25,40	—
D	0.018	0.022	0,46	0,56

$C_p = 0.15 \text{ pF}$  Typical  
 $L_s = 2.50 \text{ nH}$  Typical

7-1

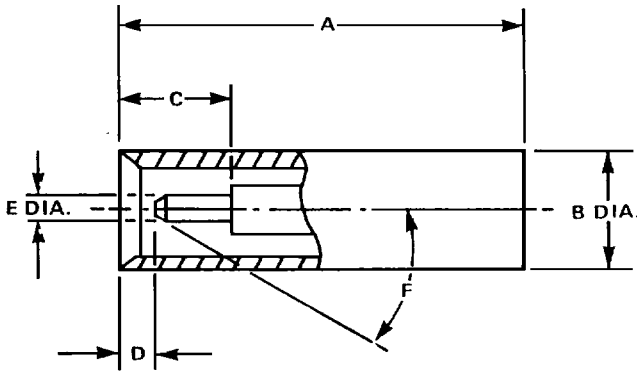


DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.800	0.840	20,32	21,34
B	0.290	0.296	7,37	7,52
C	0.246	0.250	6,25	6,35
D	0.753	0.783	19,13	19,89
E	0.180	0.190	4,57	4,83
F	0.193	0.199	4,90	5,05
G	0.047	0.057	1,19	1,45
H	0.222	0.240	5,64	6,10
J	0.195	0.215	4,95	5,46
K	0.092	0.094	2,34	2,39
L	0.030	0.046	0,76	1,17
M	0.020	0.030	0,51	0,76
N	—	0.030	—	0,76

$C_p = 0.12 \text{ pF}$  Typical  
 $L_s = 0.50 \text{ nH}$  Typical

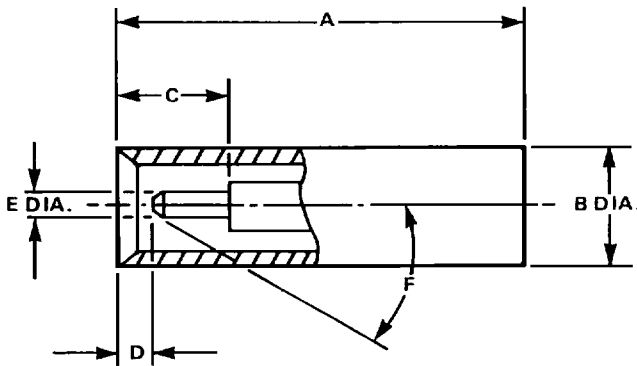
## Case Styles (Cont'd)

10



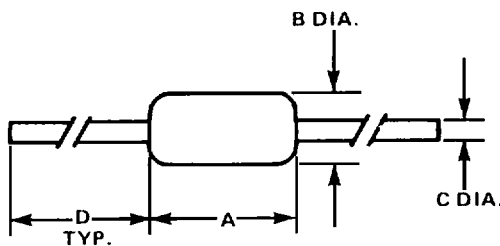
DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.545	0.555	13,84	14,10
B	0.158	0.162	4,01	4,11
C	0.099	— —	2,51	— —
D	0.010	0.018	0,25	0,46
E	0.019	0.021	0,48	0,53
F	42°	48°	42°	48°

11



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.734	0.766	18,64	19,46
B	0.215	0.220	5,46	5,59
C	0.147	— —	3,73	— —
D	0.011	0.028	0,28	0,71
E	0.031	0.033	0,79	0,84
F	42°	48°	42°	48°

54



DIM.	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.145	0.165	3,68	4,19
B	0.068	0.075	1,72	1,91
C	0.014	0.016	0,35	0,41
D	1.000	1.500	25,40	38,10

$C_P = 0.05$  pF Typical  
 $L_S = 1.00$  nH Typical

## Ordering Information

Orders for products from M/A-COM Semiconductor Products Operation should be placed with our local sales office. Should there be a need for factory sales or applications engineering assistance, contact M/A-COM directly.