GaAs Schottky Mixer Diodes

MA40400 Series

V3.00

Features

- Very Low Noise Figure from X through W-Band
- Low Junction Capacitance
- Low Series Resistance
- Wide Range of Available Product
  - Packaged Diodes
  - Chips
  - Beam Leads
  - Anti-Parallel Beam Leads
  - Bridge Quads
  - Ring Quads
  - Tees
- Superior Dynamic Range to Silicon Diodes
- Minimum Breakdown Voltage is 5 Volts
- Minimum 5 Gram Beam Strength For Beam Leads

Description

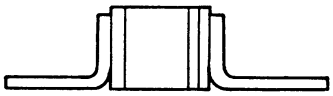
This family of Gallium Arsenide Schottky diodes is fabricated with noble metal metallization and silicon nitride passivation to assure good reliability and low series resistance.

These diodes are designed to give superior noise figure from X- through W-band. They are available in a wide range of packages, chip and beam lead configurations. The beam lead types include single beam leads, tees, anti-parallel pairs, ring and bridge quads.

These diodes have lower series resistance than equivalent junction capacitance silicon schottky diodes. This low series resistance results in superior conversion loss and noise figure.

The higher reverse voltage and low series resistance of Gallium Arsenide Bridge Quads make them particularly attractive for use in AM modulation and/or sampling circuits for signal processing and frequency generation.

Case Styles



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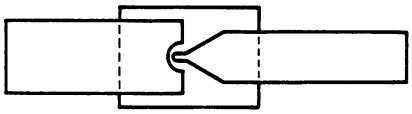

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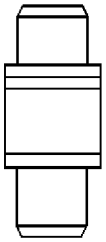

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Absolute Maximum Ratings at 25°C

Parameter	Absolute Maximum
Operating and Storage Temperature Range of Junctions	-65° to +150°C
Maximum Power Dissipation (Derate Linearity to 0 at 150°C)	at 25°C 75 mW/Junction
Soldering Temperature (Packaged Diodes)	235°C for 10 seconds
Beam Lead Strength	5 grams Min.

Electrical Specifications at 25°C

Packaged Diodes

Specifications						Typical Characteristics	
Model Number	**Case Style**	**LO Test Frequency (GHz)**	**Maximum[4] Noise Figure NF (dB)**	**I_F[4] Impedance Min./Max. (Ohms)**	**Minimum[5] Reverse Voltage V_B**	**Nominal[1, 3] Junction Capacitance Cj (pF)**	**Series Resistance R_S Min./Max. (Ohms)**
MA40403	119	24	6.5	250 / 500	5	0.07	3 / 6
MA40404	119	36	6.5	250 / 500	5	0.06	3 / 6
MA40407	120	24	6.5	250 / 500	5	0.07	3 / 6
MA40408	120	36	6.5	250 / 500	5	0.06	3 / 6
MA40411	276	24	6.5	250 / 500	5	0.07	3 / 6
MA40412	276	36	6.5	250 / 500	5	0.06	3 / 6

Beam Leads and Chips

Specifications						Typical Characteristics	
Model Number	**Case Style**	**Frequency Band**	**Series[3] Resistance Min./Max. (Ohms)**	**Junction[1] Capacitance Min./Max. (pF)**	**Minimum[5] Reverse Voltage V_R**	**I_F Impedance Mln./Max. (Ohms)**	**Nominal Noise Figure (dB)**
MA40414	135	Ka	3 / 6	0.050 / 0.060	5	250 / 500	6.5
MA40415	1010	K	3 / 6	0.055 / 0.075	5	250 / 500	6.5
MA40416	1010	Ka	3 / 6	0.050 / 0.070	5	250 / 500	6.5
MA40417	1010	W	4 / 10	0.030 / 0.055	5	250 / 500	7.0[10]

Anti-Parallel Beam Leads

Specifications								Typical Character-istics
Model Number	**Case Style**	**Frequency Band**	**Series[3] Resistance Min./Max. R_S (Ohms)**	**Junction[6] Capacitance Min./Max. C_j (pF)**	**Maximum[5] Junction Capacitance Difference ΔC_j (pF)**	**Minimum[5] Reverse Voltage V_R**	**Maximum[2] Forward Voltage Difference ΔV_F (Volts)**	**Nominal[2] Forward Voltage V_F (Volts)**
MA40422	1013	K-Ka	3 / 6	0.10 / 0.20	0.025	5.0	0.015	0.700

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Electrical Specifications at 25°C

Bridge Quad

Specifications								Typical Character-istics
Model[10] Number	Case Style	Frequency Band	Maximum[3] Series Resistance Min./Max. R_S (Ohms)	Junction[7, 8] Capacitance Min./Max Cj (pF)	Maximum[7, 8] Junction Capacitance Difference ΔCj (pF)	Minimum[5] Reverse Voltage V_R	Maximum[2] Forward Voltage Difference ΔV_F (Volts)	Nominal[2] Forward Voltage V_F (Volts)
MA40418	963	L-K	3 / 6	0.05 / 0.10	0.025	5	0.02	0.7

Ring Quads

Specifications								Typical Character-istics
Model[10] Number	Case Style	Frequency Band	Maximum[3] Series Resistance Min./Max. R_S (Ohms)	Junction[7, 8] Capacitance Min./Max Cj (pF)	Maximum[7, 8] Junction Capacitance Difference ΔCj (pF)	Minimum[5] Reverse Voltage V_R	Maximum[2] Forward Voltage Difference ΔV_F (Volts)	Nominal[2] Forward Voltage V_F (Volts)
MA40419	963	L-K	3 / 6	0.05 / 0.10	0.025	5.0	0.02	0.7
MA40419	1108	L-K	3 / 6	0.05 / 0.10	0.025	5.0	0.02	0.7

Specifications							Typical Characteristics		
Model[10] Number	Case Style	Frequency Band	Maximum[3] Series Resistance Min./Max. R_S (Ohms)	Junction[7, 8] Capacitance Min./Max. Cj (pF)	Maximum[7, 8] Junction Capacitance Difference ΔCj (pF)	Maximum[2] Forward Voltage Difference ΔV_F	Nominal[2] Forward Voltage V_F (Volts)	Nominal[5] Reverse Voltage V_R (Ohms)	Nominal[4] Noise Figure NF (dB)
MA40421	272	C-Ku	3 / 6	0.05 / 0.10	0.025	0.02	0.7	5	6

Tees

Notes:

1. C_j is measured at V_R = 0V and f = 1.0 MHz.
2. V_F is measured at I_F = 1.0 mA.
3. Series Resistance, R_S, is determined by subtracting the junction resistance Rj, from the measured value of 10 mA dynamic (slope) resistance, R_T:
   $R_S = R_T$ - Rj ohms
   Junction resistance is computed from:
   $Rj = 26/I_F$
   I_F = 10 mA
   I_F is the forward current in mA
4. Noise figure measurements are single sideband noise figure with N_{IF} = 1.5 dB minimum. The noise figure of chips and beam lead types are performed on a sample of the lot. Chips are tested in a package. Beam leads are tested in a stripline holder The test conditions are as follows:
   LO Power 6.0 dBm
   LO Frequency 16.0 GHz
   24.0 GHz
   35.0 GHz
   f_{if} = 30 MHz
   R_j = 22 Ohms
5. V_R is measured at I_R = 10 µA.
6. C_j is measured at V_R = 0V and f = 1.0 MHz. C_j of anti-parallel diodes is comprised of the capacitance of two diode junctions in parallel.
7. C_j is measured between adjacent leads of device at V_R = 0V and f = 1 MHz.
8. $C_T = C_j + C_P$
   C_T is total capacitance
   C_j is junction capacitance
   C_P is packaged capacitance
9. Conversion loss at 94 GHz with LO power ~ 8-12 dBm.
10. The part number includes the case style as a suffix. i.e. MA40418 - 1169 is a beam-lead Tee; MA40418-963 is the part in the case style 963.

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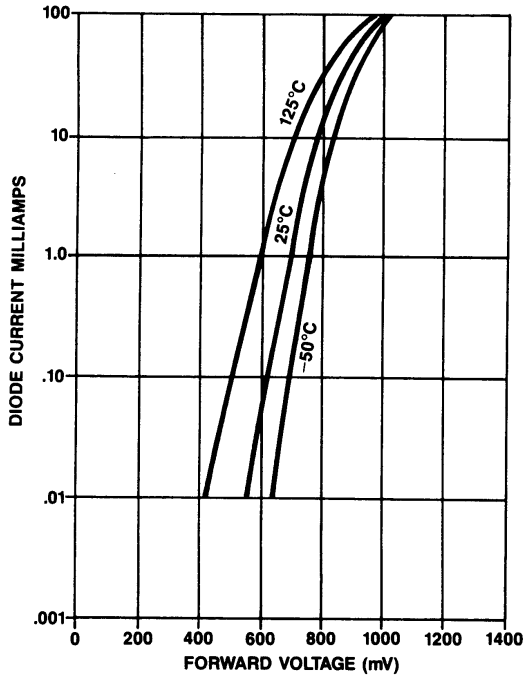
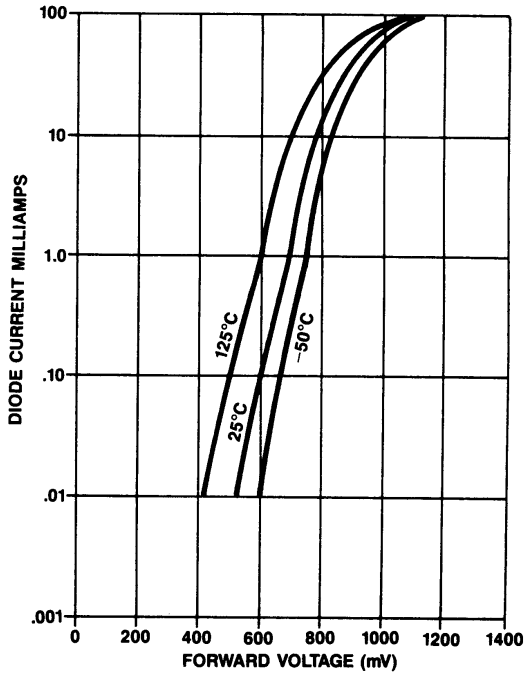
Typical Performance Curves

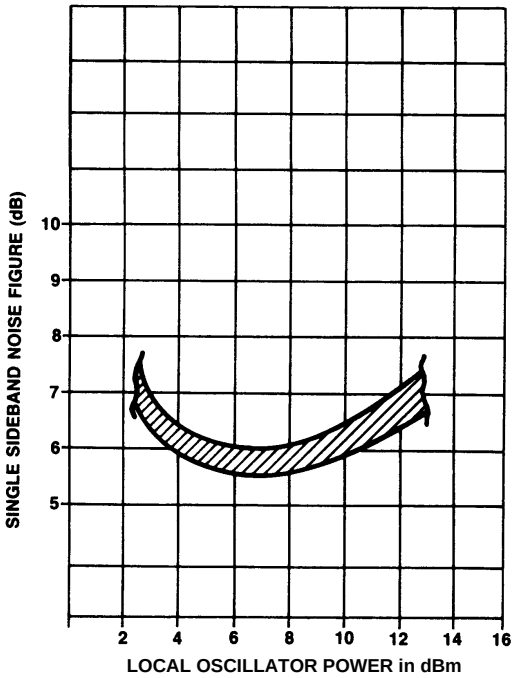
DIODE CURRENT vs FORWARD VOLTAGE
(MA40403 - 40412 PACKAGED GaAs CHIPS)



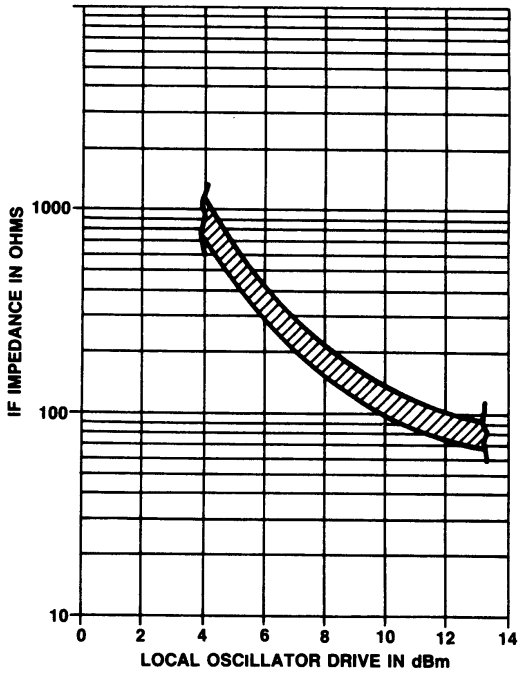
DIODE CURRENT vs FORWARD VOLTAGE
(MA40415, 40416 GaAs BEAM LEAD)



NOISE FIGURE vs LOCAL OSCILLATOR POWER
(MA40400 SERIES)



I_F IMPEDENCE vs LOCAL OSCILLATOR DRIVE
WITH R_L = 10 OHMS (MA40400 SERIES)



Specifications Subject to Change Without Notice.

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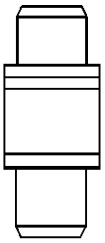
Case Styles (See appendix for complete styles)



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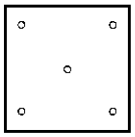

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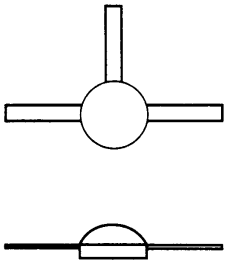

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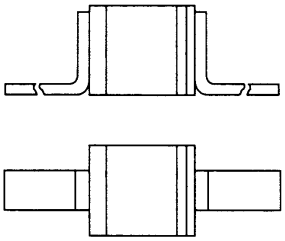

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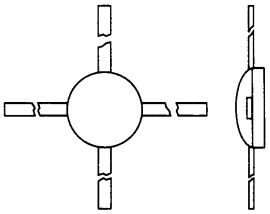

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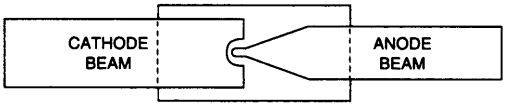

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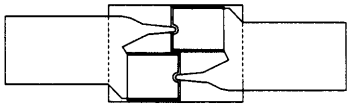

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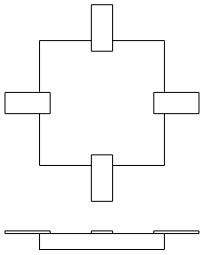

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