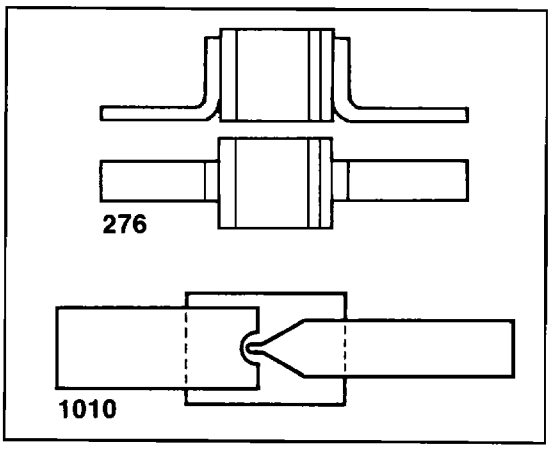
MA40401/MA40422 Series

GaAs Schottky Mixer Diodes



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, and 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.

Features

- **VERY LOW NOISE FIGURE X, 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**

MAXIMUM RATINGS

Operating and Storage Temperature Range of Junctions	−65° to 150°C
Maximum Power Dissipation (Derate Linearity to Zero at 150°C)	at 25°C 75 mW/Junction
Soldering Temperature (Packaged Diodes)	235°C for 10 seconds
Beam Strength	5 Grams Min.

Specifications @ $T_A = 25°C$

PACKAGED DIODES

SPECIFICATIONS						TYPICAL CHARACTERISTICS	
Model[9] Number	**Case Style**	**L.O. Test Frequency (GHz)**	**Maximum[4] Noise Figure NF (dB)**	**IF[4] Impedance Min./Max. (Ohms)**	**Minimum[5] Breakdown Voltage V_B**	**Nominal[1,8] Junction Capacitance C_j (pF)**	**Nominal[3] Series Resistance R_T (Ohms)**
MA40401	119	9.375	5.7	250 / 500	5	.10	3/6
MA40402	119	16.000	6.0	250 / 500	5	.10	3/6
MA40403	119	24.000	6.5	250 / 500	5	.07	3/6
MA40404	119	36.000	6.5	250 / 500	5	.06	3/6
MA40405	120	9.375	5.7	250 / 500	5	.10	3/6
MA40406	120	16.000	6.0	250 / 500	5	.10	3/6
MA40407	120	24.000	6.5	250 / 500	5	.07	3/6
MA40408	120	36.000	6.5	250 / 500	5	.06	3/6
MA40409	276	9.375	5.7	250 / 500	5	.10	3/6
MA40410	276	16.000	6.0	250 / 500	5	.10	3/6
MA40411	276	24.000	6.5	250 / 500	5	.07	3/6
MA40412	276	36.000	6.5	250 / 500	5	.06	3/6

BEAM LEADS AND CHIPS

SPECIFICATIONS						TYPICAL CHARACTERISTICS	
Model[9] Number	**Case Style**	**Frequency Band**	**Series[3] Resistance Min./Max. (Ohms)**	**Junction[1] Capacitance Min./Max. (pF)**	**Minimum[5] Breakdown Voltage (Volts)**	**IF Impedance Min./Max. (Ohms)**	**Nominal Noise Figure (dB)**
MA40413	135	X-K	3/6	.055 / .075	5	250 / 500	6.0
MA40414	135	Ka	3/6	.050 / .060	5	250 / 500	6.5
MA40415	1010	K	3/6	.055 / .075	5	250 / 500	6.5
MA40416	1010	Ka	3/6	.050 / .070	5	250 / 500	6.5
MA40417	1010	W	4/10	.030 / .055	5	250 / 500	7[10]

ANTI-PARALLEL BEAM LEADS

SPECIFICATIONS								TYPICAL CHARACTER-TERISTICS
Model Number	**Case Style**	**Frequency Band**	**Series[3] Resistance Min./Max. R_T (Ohms)**	**Junction[6] Capacitance Min./Max. C_j (pF)**	**Maximum[6] Junction Capacitance Difference ΔC_j (pF)**	**Minimum[5] Breakdown Voltage V_B (Volts)**	**Maximum[2] Forward Voltage Difference ΔV_F (Volts)**	**Nominal[2] Forward Voltage V_F (Volts)**
MA40422	1013	K-Ka	3/6	.10 / .20	.025	5.0	.015	.700

Specifications @ $T_A = 25°C$

PACKAGED TEES AND QUADS

Bridge Quad

SPECIFICATIONS								TYPICAL CHARACTERISTICS
Model Number	Case Style	Frequency Band	Maximum[3] Series Resistance Min./Max. R_T (Ohms)	Junction[7,8] Capacitance Min./Max. C_j (pF)	Maximum[7,8] Junction Capacitance Difference ΔC_j (pF)	Minimum[5] Breakdown Min./Max. V_B (Volts)	Maximum[2] Forward Voltage Difference ΔV_F (Volts)	Nominal[2] Forward Voltage V_F (Volts)
MA40418	963	L-K	3/6	.05 / .10	.025	5	.020	.700

Ring Quad

SPECIFICATIONS								TYPICAL CHARACTERISTICS
Model Number	Case Style	Frequency Band	Maximum[3] Series Resistance Min./Max. R_T (Ohms)	Junction[7,8] Capacitance Min./Max. C_j (pF)	Maximum[7,8] Junction Capacitance Difference ΔC_j (pF)	Minimum[5] Breakdown Min./Max. V_B (Volts)	Maximum[2] Forward Voltage Difference ΔV_F (Volts)	Nominal[2] Forward Voltage V_F (Volts)
MA40419	963	L-K	3/6	.05 / .10	.025	5.0	.020	.700

Tees

SPECIFICATIONS							TYPICAL CHARACTERISTICS		
Model Number	Case Style	Frequency Band	Maximum[3] Series Resistance Min./Max. R_T (Ohms)	Junction[7,8] Capacitance Min./Max. C_j (pF)	Maximum[7,8] Junction Capacitance Difference ΔC_j (pF)	Maximum[2] Forward Voltage Difference ΔV_F (Volts)	Nominal[2] Forward Voltage V_F (Volts)	Nominal[5] Breakdown Voltage V_B (Volts)	Nominal[4] Noise Figure N_f (dB)
MA40420	270	C-Ku	3/6	.05 / .10	.025	.020	.700	5	6
MA40421	272	C-Ku	3/6	.05 / .10	.025	.020	.700	5	6

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 R_j, from the measured value of 10 mA dynamic (slope) resistance, R_T:

   $R_S = R_T - Rj$ ohms

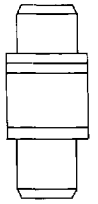
   Junction resistance is computed from:

   $R_j = 26/I_f$
   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:

L.O. Power	6.0 dBm
L.O. Frequency	3.0 GHz
	9.375 GHz
	16.0 GHz
	24.0 GHz
	35.0 GHz

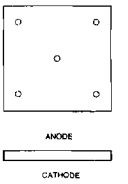
   f_{if} = 30 MHz
   R_l = 22 ohms
5. V_b is measured at I_r = 10 μA.
6. C_j is measured at V_r = 0V and F = 1.0 MHz. C_j of anti-parallel diodes is comprised of the capacitance of two diode junctions in parallel.
7. C_j is measured between adjacent leads of device at V_r = 0V and F = 1.0 MHz.
8. $C_t = C_j + C_p$
   C_t is total capacitance
   C_j is junction capacitance
   C_p is packaged capacitance
9. Match pairs are available by adding the suffix "M" to the part number.
10. Conversion loss at 94 GHz with Lo power ~ 8-12 dBm.

Case Styles

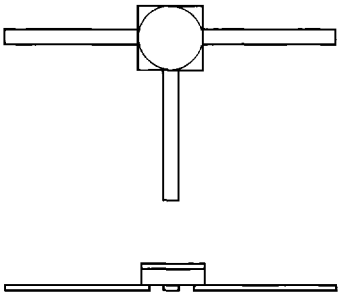


119

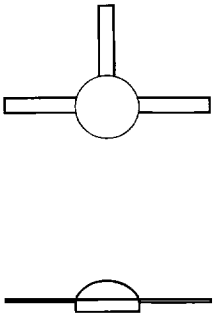
120



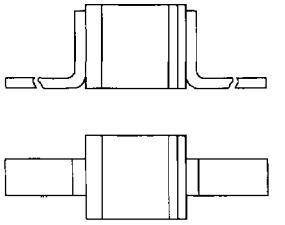
135



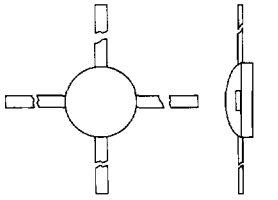
270



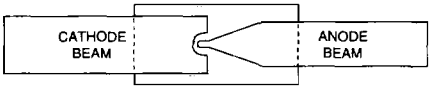
272



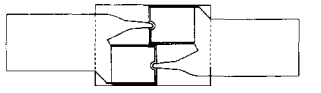
276



963



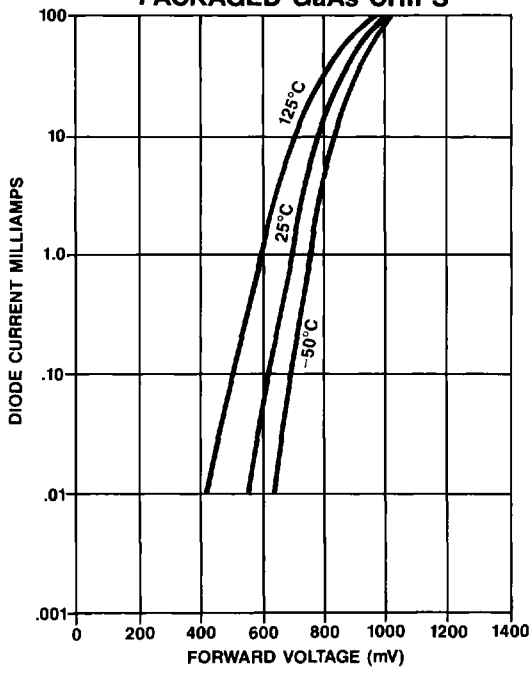
1010



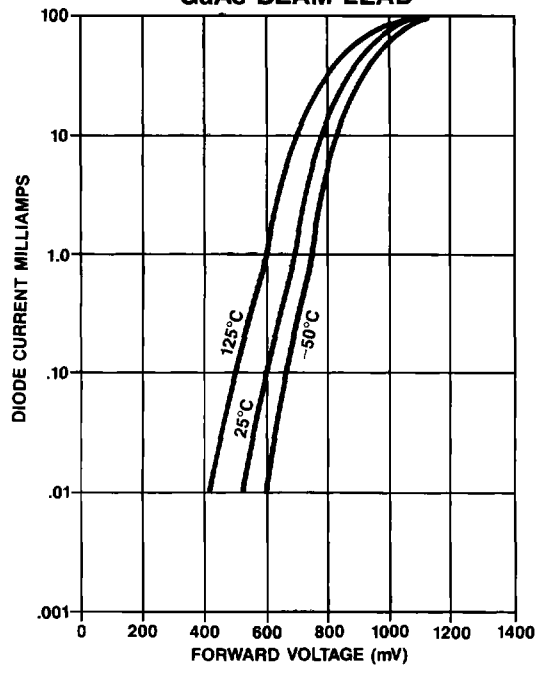
1013

Typical Performance Curves

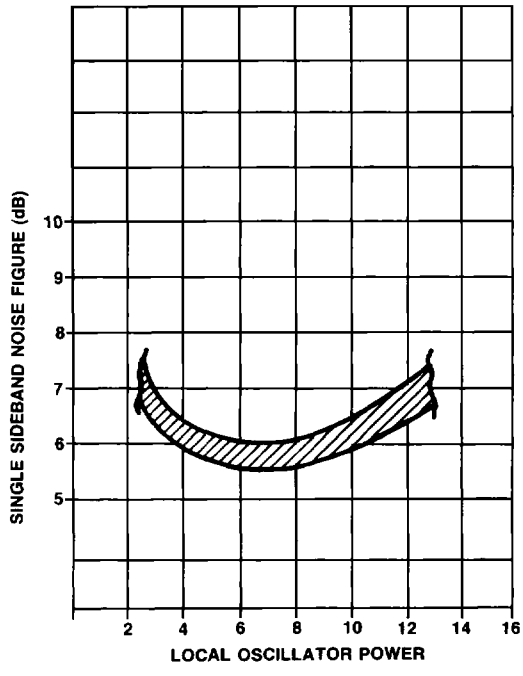
MA40401-40412
PACKAGED GaAs CHIPS



MA40413
GaAs BEAM LEAD

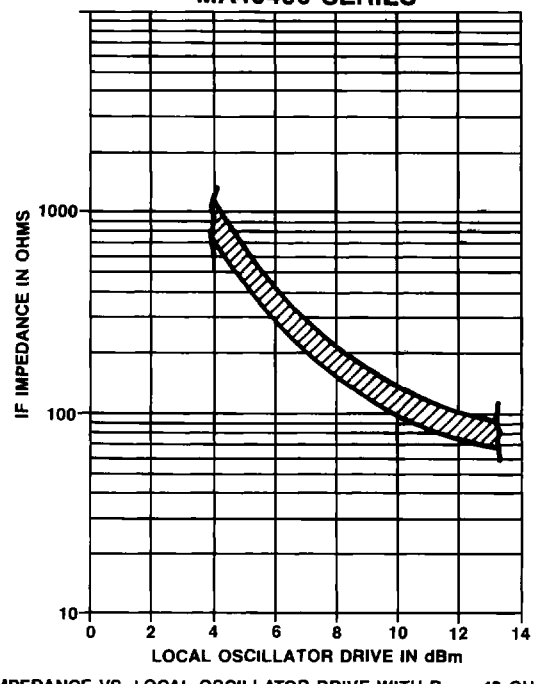


MA-40400 SERIES



NOISE FIGURE VS. LOCAL OSCILLATOR POWER

MA40400 SERIES



IF IMPEDANCE VS. LOCAL OSCILLATOR DRIVE WITH R_L = 10 OHMS