NEC®

GaAs EPITAXIAL SCHOTTKY BARRIER DIODE

ND5000 SERIES

FEATURES

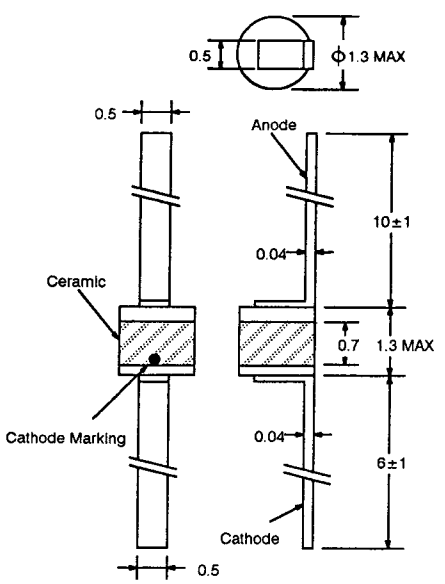
- LOW CONVERSION LOSS
- LOW SERIES RESISTANCE
- EXCELLENT DYNAMIC RANGE
- HERMETICALLY SEALED METAL/CERAMIC PACKAGES
- MICROSTRIP/WAVEGUIDE COMPATIBLE
- HIGH RELIABILITY

DESCRIPTION AND APPLICATIONS

The ND5000, GaAs Epitaxial Schottky Barrier diodes, offer low series resistance, low conversion loss, and excellent dynamic range through the millimeter wave frequencies. Applications include mixers, modulators, samplers, and detectors. These devices are available in ceramic package styles suitable for microstrip, coaxial, and waveguide applications.

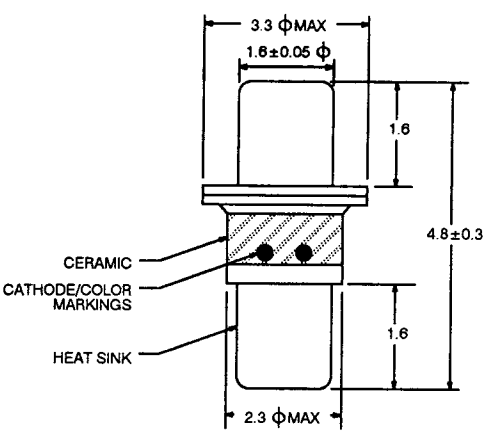
OUTLINE DIMENSIONS (Units in mm)

OUTLINE 3G



Cp = 0.13 pF
Lp = 0.2 nH

OUTLINE 5F



Cp = 0.35 pF
Lp = 0.06 nH

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER[1] / EIAJ[2] REGISTERED NUMBER / PACKAGE OUTLINE / CATHODE MARKING (S)			ND5051-3G 1SS105 3G BLACK			ND5052-3G 1SS105A 3G GREEN			ND5111-3G 1SS11 3G RED-ORANGE			ND5112-3G/5F 3G, 5F GREEN-ORANGE-BLACK			ND5113-3G/5F 3G, 5F GREEN-ORANGE-RED			ND5114-3G/5F 3G, 5F GREEN-ORANGE-GREEN		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
V_R	Reverse Voltage, I_R = 10 µA	V	4			6.5			4			4			4			4		
V_F	Forward Voltage, I_F = 50 mA	V			1			1			1			1			1			1
C_T	Total Capacitance, f = 1 MHz, V_R = 0 V	pF			0.4			0.3			0.4		0.44			0.44			0.44	
NF	Noise Figure, f = 9375 MHz, P_{LOC} = 2 mW, NF_{IF} = 1.5 dB	dB		5			5			5				6			5.5			5
α	Differential Figure, α = 1/(V_{F2} - V_{F1}), V_{F1}: I_F = 1 mA, V_{F2}: I_F = 2.7 mA	V^{-1}				31												31		
R_S	Series Resistance, R_S = 50 V_{F3} - 150.75 V_{F2} + 100.75 V_{F1} V_{F1}: I_F = 1 mA, V_{F2}: I_F = 2.7 mA, V_{F3}: I_F = 20 mA	Ω		1.5				1.3		1.3			1.3			1.3			1.3	

Notes:

1. All devices available in matched pairs. Place "M" after the ND part number (e.g. ND5111M-3G).
2. Electronic Industrial Association of Japan.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

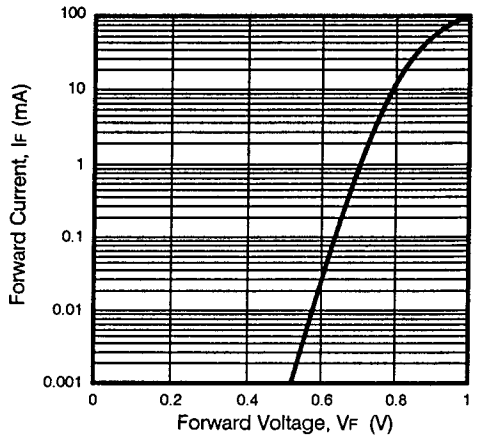
PART NUMBER[1] / EIAJ[2] REGISTERED NUMBER / PACKAGE OUTLINE			ND5051-3G 1SS105 3G	ND5052-3G 1SS105A 3G	ND5111-3G 1SS11 3G	ND5112-3G/5F 3G, 5F	ND5113-3G/5F 3G, 5F	ND5114-3G/5F 3G, 5F
SYMBOLS	PARAMETERS	UNITS	RATINGS	RATINGS	RATINGS	RATINGS	RATINGS	RATINGS
V_R	Reverse Voltage	V	4	6.5	4	4	4	4
V_{RM}	Peak Reverse Voltage	V	4.4	6.5	4.4	4	4	4
I_{FM}	Peak Forward Current	mA	150	150	150	150	150	150
I_F	Forward Current	mA	50	50	50	50	50	50
I_O	Rectified Current	mA	–	–	50	30	30	30
T_{STG}	Storage Temperature	°C	-65 to +150	-65 to +150	-65 to +150	-65 to +150	-65 to +150	-65 to +150
T_J	Junction Temperature	°C	150	150	150	150	150	150
T_{SDR}	Soldering Temperature	°C	230	230	230	230	230	230

Notes:

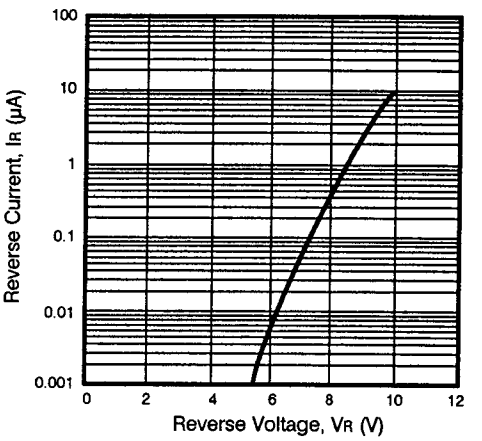
1. All devices available in matched pairs. Place "M" after the ND part number (e.g. ND5111M-3G).
2. Electronic Industrial Association of Japan.

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

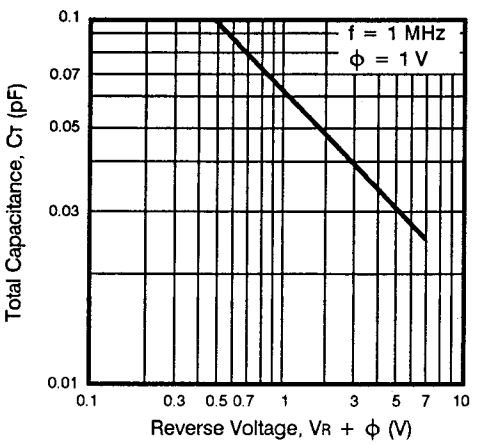
ND5051, ND5052
FORWARD CURRENT
vs. FORWARD VOLTAGE



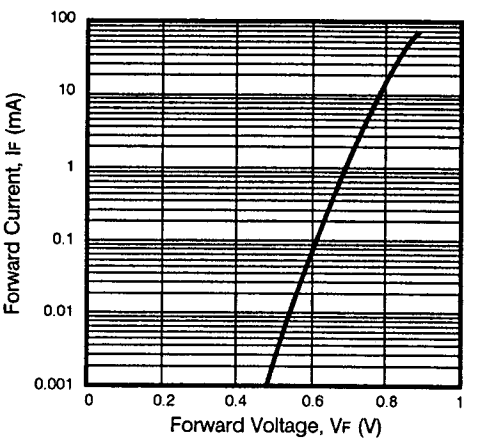
ND5051, ND5052
REVERSE CURRENT
vs. REVERSE VOLTAGE



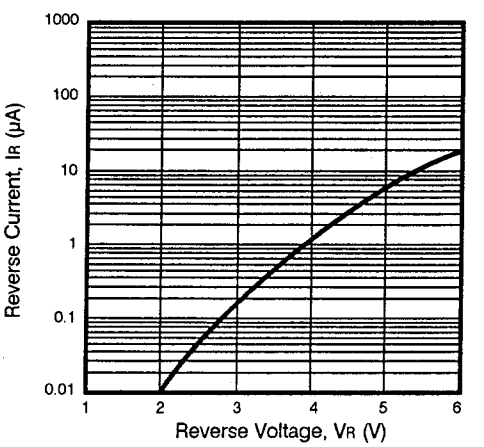
ND5051, ND5052
TERMINAL CAPACITANCE
vs. REVERSE VOLTAGE



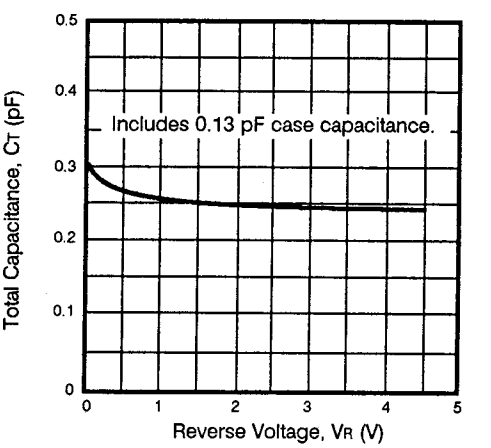
ND5111
FORWARD CURRENT
vs. FORWARD VOLTAGE



ND5111
REVERSE CURRENT
vs. REVERSE VOLTAGE

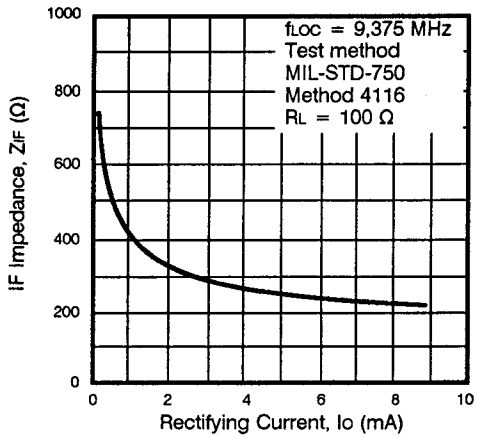


ND5111
TOTAL CAPACITANCE

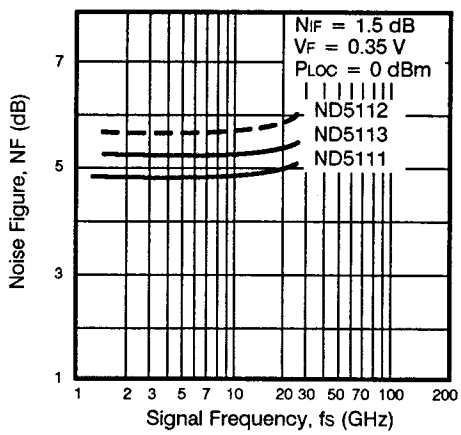


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

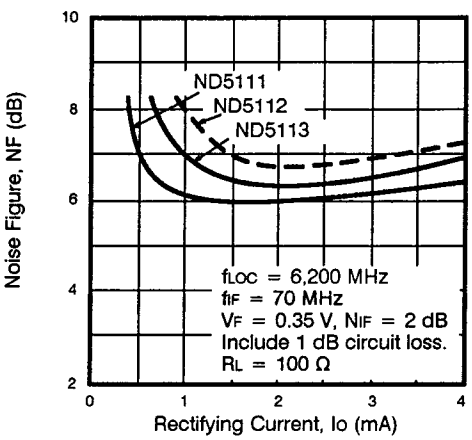
ND5111
IF IMPEDANCE vs.
RECTIFYING CURRENT



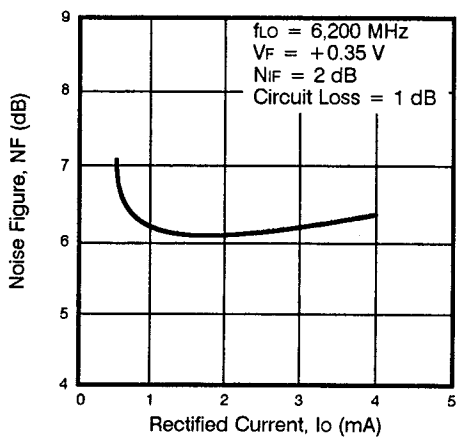
ND5111, ND5112, ND5113
NOISE FIGURE vs. FREQUENCY



ND5111, ND5112, ND5113
OVERALL NOISE FIGURE
vs. RECTIFYING CURRENT



ND5114-5F
NOISE FIGURE vs.
RECTIFIED CURRENT



NEC®

X TO K-BAND GaAs SCHOTTKY BARRIER MIXER DIODE

ND5051-3A
ND5051-3G
ND5051-5E

FEATURES

- **LOW NOISE FIGURE:** 5 dB TYP at f = 10 GHz
- **LOW TERMINAL CAPACITANCE:** .39 pF MAX for ND5051-3A
- **SMALL SIZE**
- **LOW COST**

DESCRIPTION AND APPLICATIONS

The ND5051 is a GaAs Schottky Barrier Diode which offers low noise figure and low terminal capacitance. The primary application of the ND5051 is X to K-Band mixers. This device is suitable for use in microwave sensors, instruments and communication systems. Three package styles are available.

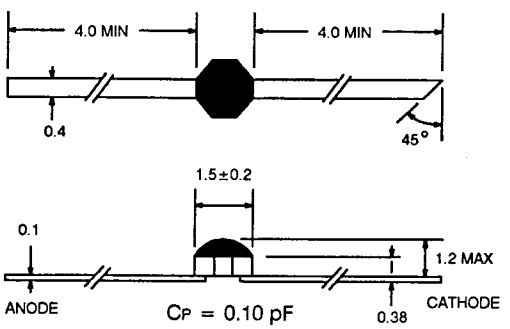
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_R	Reverse Voltage	V	4
V_{RM}	Peak Reverse Voltage	V	4.4
I_F	Forward Current	mA	50
I_{FM}	Peak Forward Current	mA	150
T_J	Junction Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to +150
T_{SDR}	Soldering Temperature	°C	230*

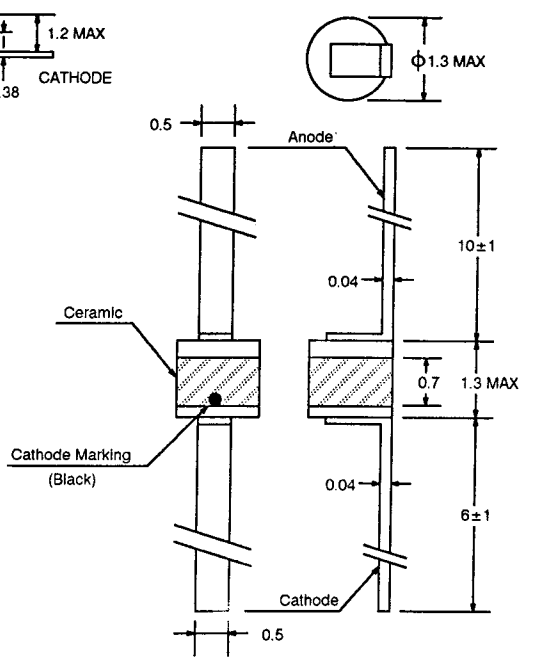
* One time within 10 seconds

OUTLINE DIMENSIONS (Units in mm)

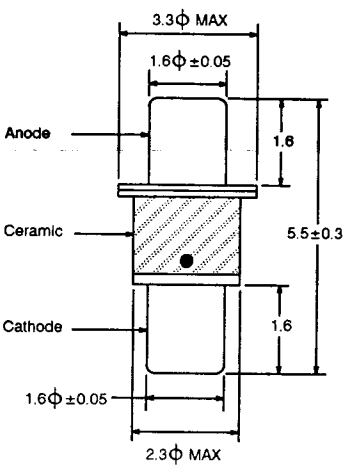
OUTLINE 3A



OUTLINE 3G



OUTLINE 5E



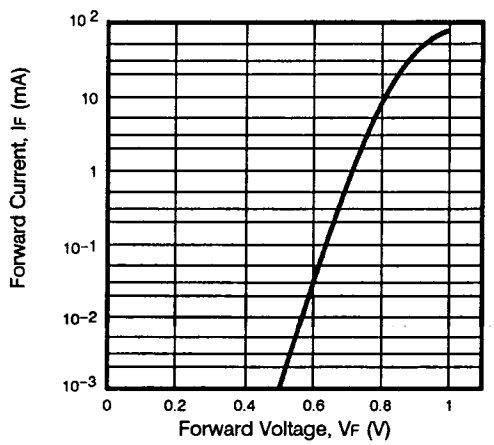
CP = 0.22 pF
LP = 1.0 nH

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

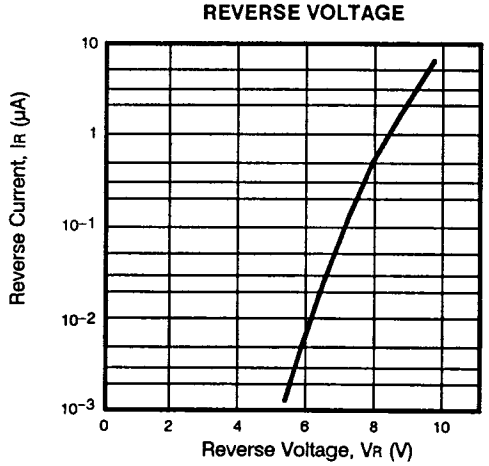
PART NUMBER PACKAGE OUTLINE			ND5051-3A 3A			ND5051-3G 3G			ND5051-5E 5E		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
V_R	Reverse Voltage at I_R = 10 µA	V	4			4			4		
I_R	Reverse Current at V_R = 3 V	nA									500
V_F	Forward Voltage at I_F = 50 mA	V			1			1			1
N_F	Noise Figure at f = 9375 mHz P_{IN} = 2 mW, N_{IF} = 1.5 dB	dB		5			5			5	
C_T	Terminal Capacitance at V_R = 0 f = 1 mHz	pF			0.39			0.4			0.5

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

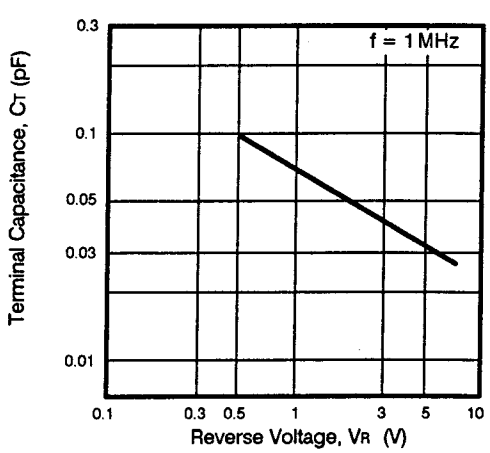
FORWARD CURRENT vs. FORWARD VOLTAGE



REVERSE CURRENT vs. REVERSE VOLTAGE

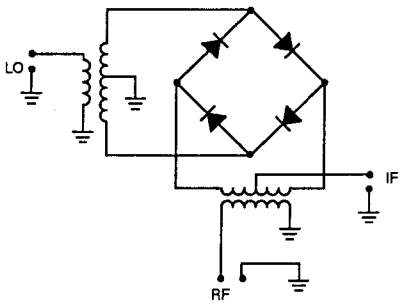


TERMINAL CAPACITANCE vs. REVERSE VOLTAGE

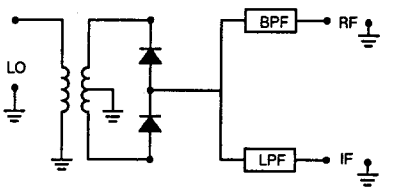


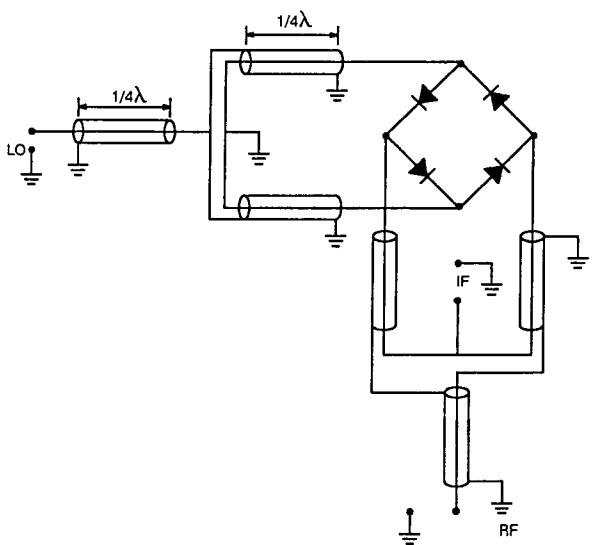
TYPICAL APPLICATION CIRCUITS

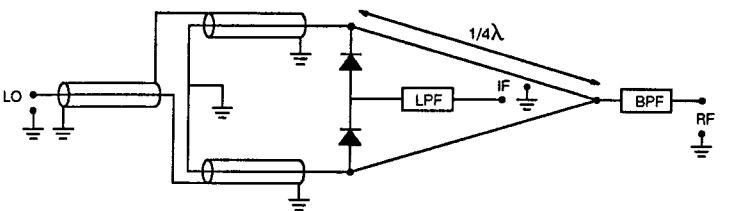
DOUBLE BALANCED MIXER

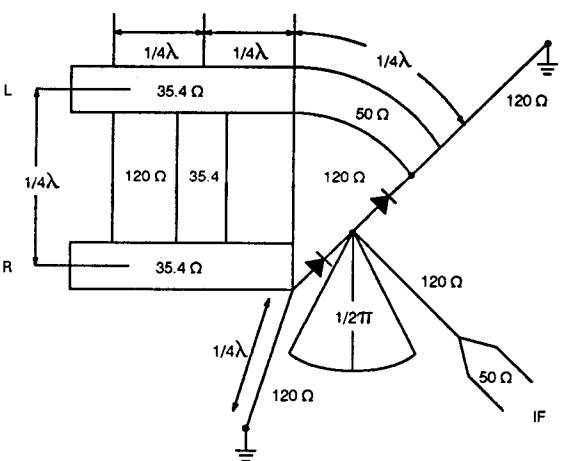


SINGLE BALANCED MIXER

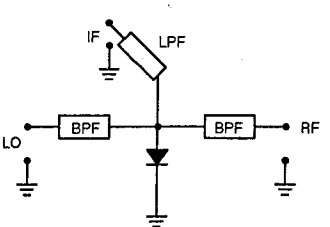








SINGLE DIODE MIXER



NEC®

X TO K-BAND GaAs SCHOTTKY BARRIER MIXER DIODE

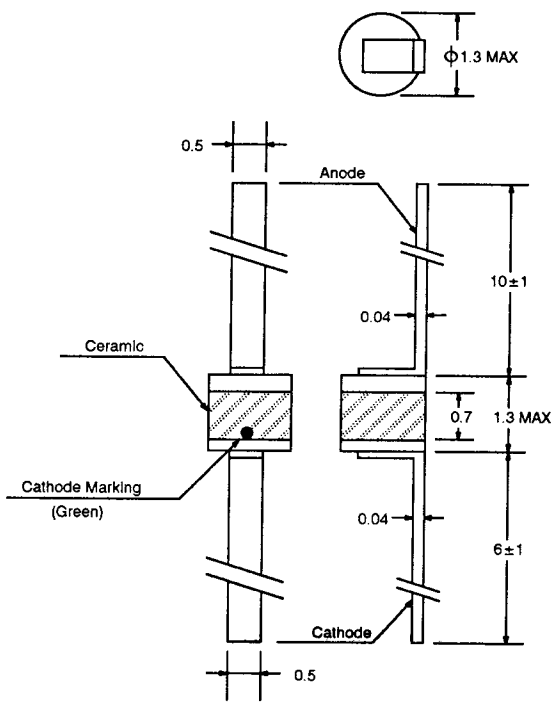
ND5052-3G

FEATURES

- **X BAND MIXER DIODE**
- **LOW NOISE GaAs SCHOTTKY DIODE**
  NF = 5 dB TYP at f = 10 GHz
- **LOW TERMINAL CAPACITANCE**
  C_T = 0.3 pF MAX at 1 MHz
- **SMALL SIZE**
- **LOW COST**

OUTLINE DIMENSIONS (Units in mm)

OUTLINE 3G



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_R	Reverse Voltage	V	6.5
V_{RM}	Peak Reverse Voltage	V	6.5
I_F	Forward Current	mA	50
I_{FM}	Peak Forward Current	mA	150
T_J	Junction Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to +150
T_{SDR}	Soldering Temperature	°C	230*

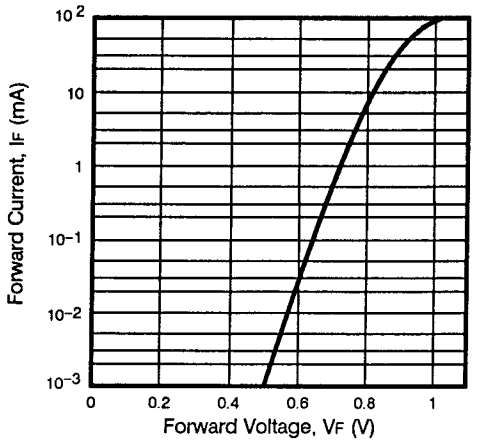
*One time within 10 seconds.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

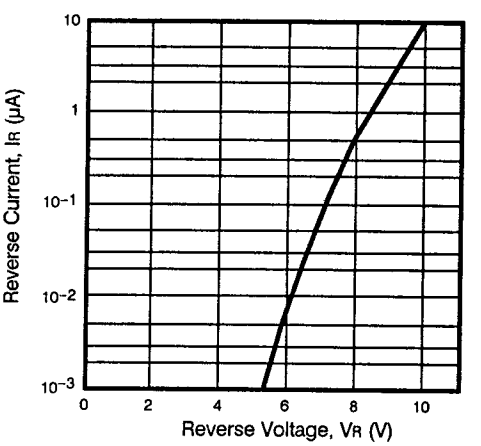
PART NUMBER PACKAGE OUTLINE			ND5052-3G 3G		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
V_R	Reverse Voltage at I_R = 10 μA	V	6.5		
V_F	Forward Voltage at I_F = 50 mA	V			1
C_T	Total Capacitance at V_R = 0, f = 1 MHz	pF			0.3
NF	Noise Figure at f_I = 9375 MHz, P_I = 2 mW, N_{IF} = 1.5 dB	dB		5	
R_S	Series Resistance, R_S = 50 V_{F3} - 150.75 V_{F2} + 100.75 V_{F1} V_{F1}: I_F = 1 mA, V_{F2}: I_F = 2.7 mA, V_{F3}: I_F = 20 mA	Ω			1.3
α	α = 1/(V_{F2} - V_{F1}) V_{F1}: I_F = 1 mA, V_{F2}: I_F = 2.7 mA	V-	31		

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

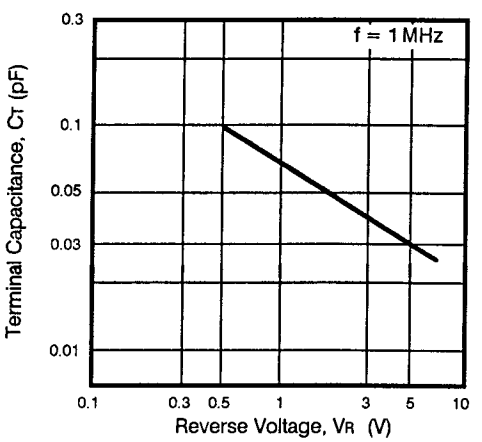
FORWARD CURRENT vs.
FORWARD VOLTAGE



REVERSE CURRENT vs.
REVERSE VOLTAGE



TERMINAL CAPACITANCE vs.
REVERSE VOLTAGE



NEC®

X-BAND GaAs SCHOTTKY MIXER/DETECTOR DIODE

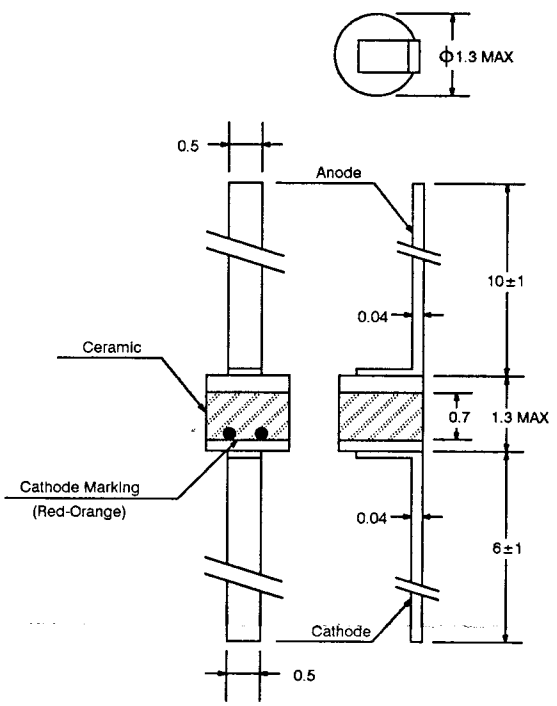
ND5111-3G

FEATURES

- **X-BAND MIXER DIODE**
- **LOW NOISE GaAs SCHOTTKY DIODE**
  NF = 5 dB TYP at f = 10 GHz
- **LOW TERMINAL CAPACITANCE**
  C_T = 0.4 pF MAX at f = 1 MHz
- **HIGH RELIABILITY**
- **SMALL SIZE**
- **LOW COST**

OUTLINE DIMENSIONS (Units in mm)

OUTLINE 3G



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_R	Reverse Voltage	V	4.0
V_{RM}	Peak Reverse Voltage	V	4.4
I_F	Forward Current	mA	50
I_{FM}	Peak Forward Current	mA	150
T_J	Junction Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to +150
T_{SDR}	Soldering Temperature	°C	230*

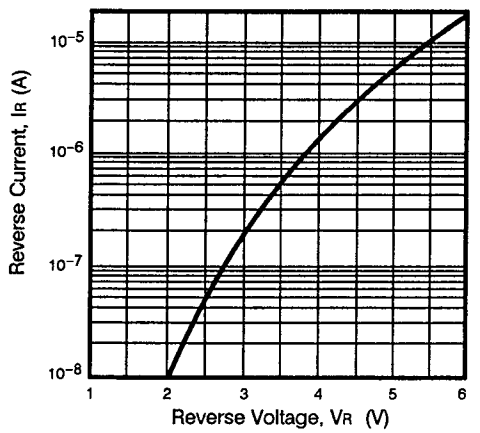
*One time within 10 seconds.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

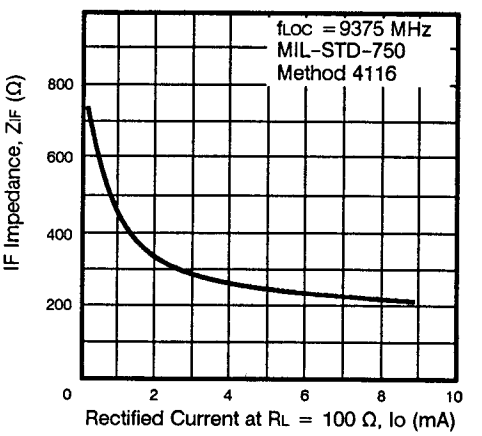
PART NUMBER PACKAGE OUTLINE			ND5111-3G 3G		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
V_R	Reverse Voltage at I_R = 10 μA	V	4		
V_F	Forward Voltage at I_F = 50 mA	V			1
C_T	Total Capacitance at V_R = 0, f = 1 MHz	pF			0.4
NF	Noise Figure at f_I = 9375 MHz, P_I = 2 mW, N_{IF} = 1.5 dB	dB		5	

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

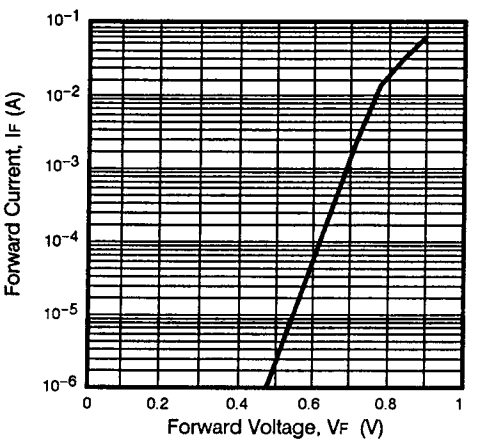
REVERSE CURRENT vs. REVERSE VOLTAGE



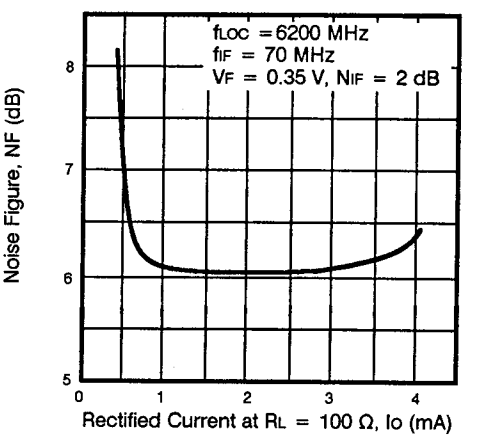
IF IMPEDANCE vs. RECTIFIED CURRENT



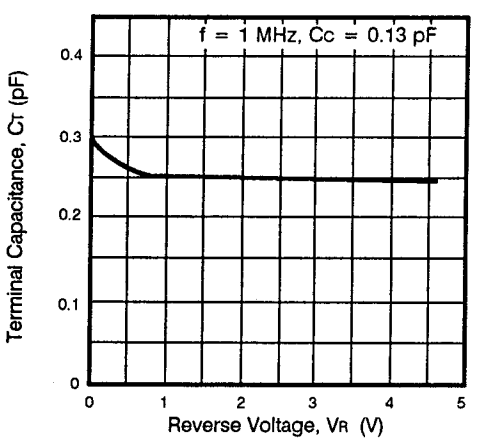
FORWARD CURRENT vs. FORWARD VOLTAGE



NOISE FIGURE vs. RECTIFIED CURRENT



TERMINAL CAPACITANCE vs. REVERSE VOLTAGE



NOISE FIGURE vs. SIGNAL FREQUENCY