NEC®

SILICON SCHOTTKY MIXER/DETECTOR DIODE | ND4000 SERIES

FEATURES

- LOW MEDIUM BARRIERS
- PASSIVATED CONSTRUCTION
- HIGH RELIABILITY

DESCRIPTION AND APPLICATIONS

This group of NEC microwave Schottky diodes includes both low barrier and medium barrier N-type and P-type passivated epitaxial diodes for use in mixer and detector applications. Applications are mixers, modulators, discriminators, samplers, detectors, switches and wave shaping circuits, all for use in industrial, military, hi-rel and space applications.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

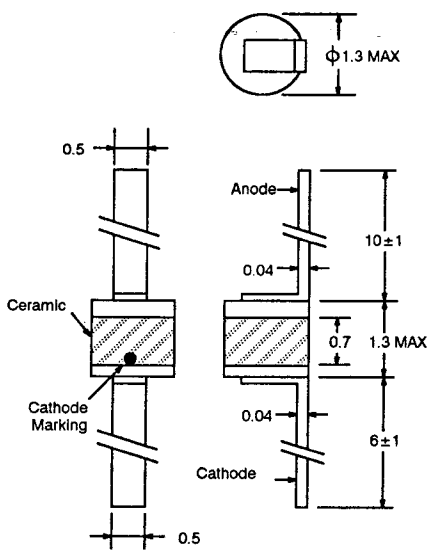
SYMBOLS	PARAMETERS	UNITS	RATINGS
P_T	Total Power Dissipation[1] N-Type Series P-Type Series	 mW mW	 200 100
T_{OP}	Operating Temperature	°C	−65 to +150
T_J	Junction Temperature	°C	150
T_{SDR}	Maximum Soldering Temperature	°C	230 for 10 sec.

Note:

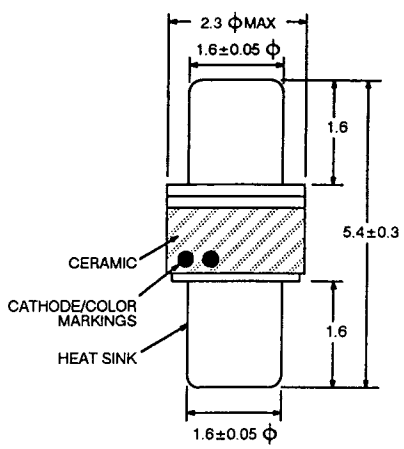
1. Derate linearly to zero at 150°C junction temperature.

OUTLINE DIMENSIONS** (Units in mm)

OUTLINE 3G

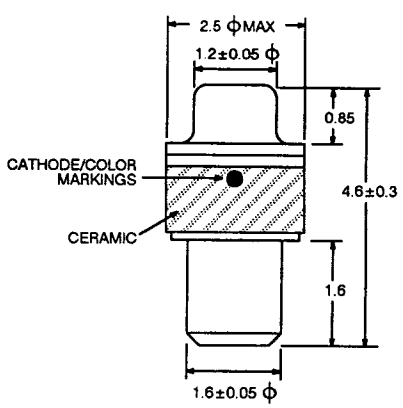


OUTLINE 5T*



Cp = 0.15 pF
Lp = 1.0 nH

OUTLINE 5W*



Cp = 0.15 pF
Lp = 1.0 nH

*Heatsink is cathode for N-type and anode for P-type Schottky diodes.
**All dimensions are typical unless noted.

PERFORMANCE SPECIFICATIONS (T_A = 25°C)

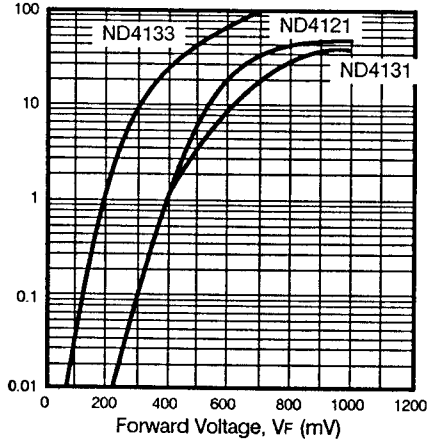
PART NUMBER PACKAGE OUTLINE AND CATHODE MARKING(S)	EIAJ PART NUMBER	BARRIER TYPE AND DIODE TYPE	FREQUENCY RANGE (GHz)	BREAKDOWN VOLTAGE			REVERSE CURRENT			FORWARD VOLTAGE		TERMINAL CAPACITANCE		NOISE FIGURE[3]				TANGENTIAL SENSITIVITY[4]			
				IR (μA)	BV (V)		VR (V)	IR (μA)		IF (mA)	VF (mV)	VR (V)	CT (pF)	fLO (GHz)	ZIF (Ω)	NF (dB)		f (GHz)	RV (KΩ)	γ (mV/(μW))	TSS (dBm)
					MIN	TYP		TYP	MAX		TYP		TYP		TYP	TYP	TYP		TYP	TYP	TYP
ND4121-3G[1,2] RED	1SS12	MEDIUM N-TYPE	~5	10	10	20	5	0.01		50	1000	0	0.70	2	375	5.5	7	2	1.5	5	-50
ND4131-3G[1,2] BLUE	1SS13	MEDIUM N-TYPE	~12	10	4	6	3	0.01		30	1000	0	0.35	9.375	375	6.5	7	10	1.5	6	-57
ND4131-5W[2] BLACK		MEDIUM N-TYPE	~12	10	4	6	3	0.01		30	1000	0	0.35	9.375	375	6.5	7	10	1.5	6	-57
ND4131-5T[2] RED		MEDIUM N-TYPE	~12	10	4	6	3	0.01		30	1000	0	0.35	9.375	375	6.5	7	10	1.5	6	-57
ND4132-5W RED	1SS124	MEDIUM P-TYPE	~26	10	5	9	2	0.01		1	420	0	0.22	9.375	400	7		10	1.3	8	-55
ND4133-5W BLUE	1SS156	LOW N-TYPE	~26	100	3	4	0.5	1	25	1	190	0.2	0.20	9.375	175	5.5	7	10	1.2	6	-58
ND4141-3G[1,2] BLUE-RED	1SS14	LOW P-TYPE	~12	100	3	4	2	6		50	1000	0.2	0.30	9.375	300	7		10	1.4	5	-58
ND4151-3G[1] BLUE-ORANGE	1SS15	LOW P-TYPE	~18	100	3	5	2	4		1	200	0.2	20	9.375	300	7		10	1.4	5	-58

Notes:

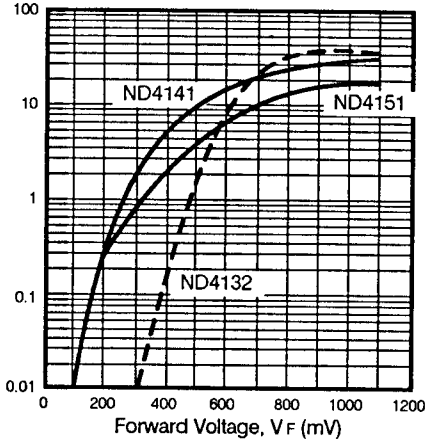
1. Available in MIL Grade (C) as well as Commercial Grade (D).
2. Matched Pairs add an 'M' to the end of the "ND Part Number," (e.g. ND4121M-3G), ΔV_F = 20 mV, ΔC_T = 20%).
3. P_{LO} = 1 mW, NF_{IF} = 1.5 dB, f_{IF} = 30 MHz, $R_{DC} \leq 10\ \Omega$, $V_{SWR} \leq$ 1.5:1 for noise figure test.
4. I_F = 20 μA, R_L = 100 KΩ, R_A = 500 Ω, BW = 2 MHz for TSS test.

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

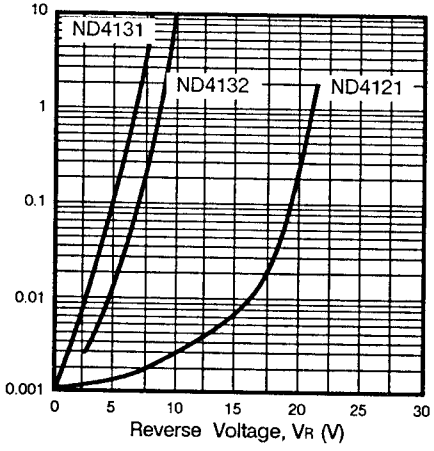
ND4121, ND4131, ND4133 FORWARD CHARACTERISTICS



ND4132, ND4141, ND4151 FORWARD CHARACTERISTICS

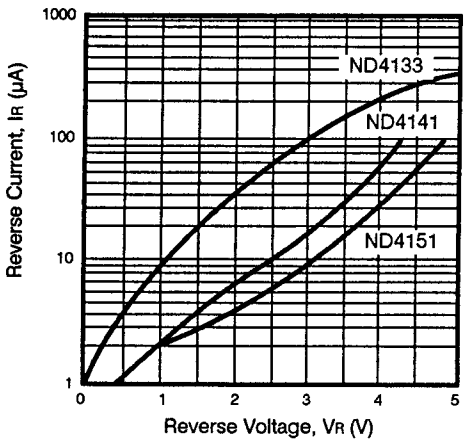


ND4121, ND4131, ND4132 REVERSE CHARACTERISTICS

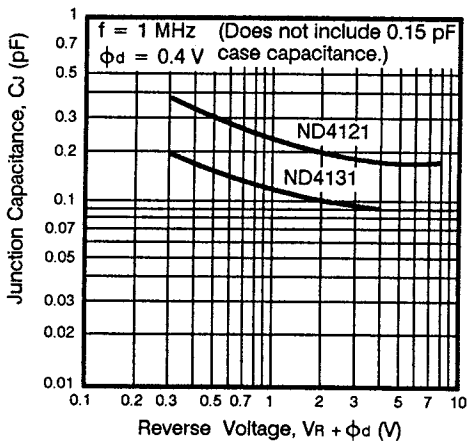


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

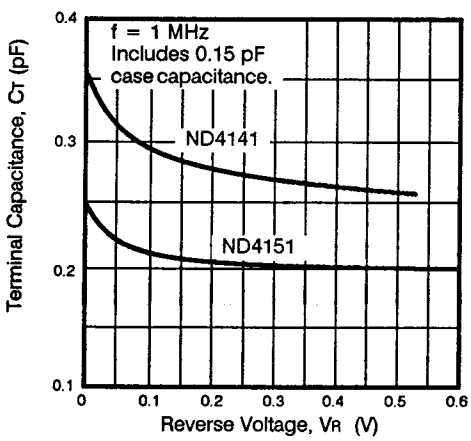
ND4133, ND4141, ND4151
REVERSE CHARACTERISTICS



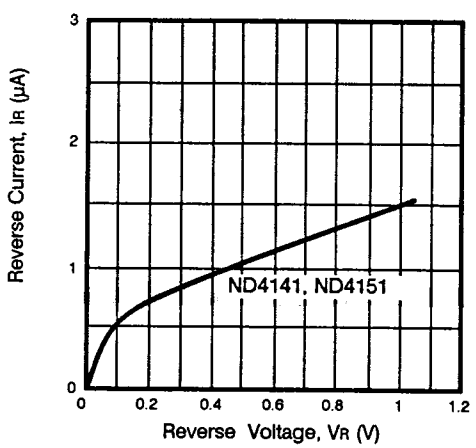
ND4121, ND4131
JUNCTION CAPACITANCE
vs. REVERSE VOLTAGE



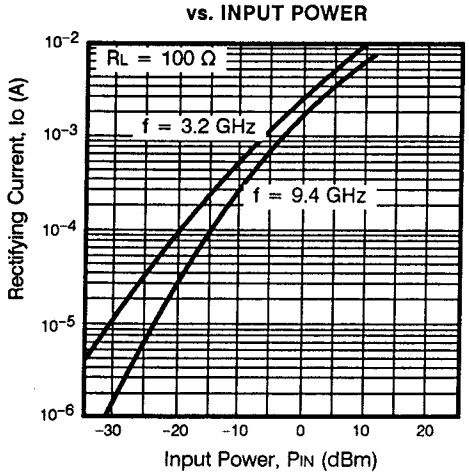
ND4141, ND4151
TERMINAL CAPACITANCE
vs. REVERSE VOLTAGE



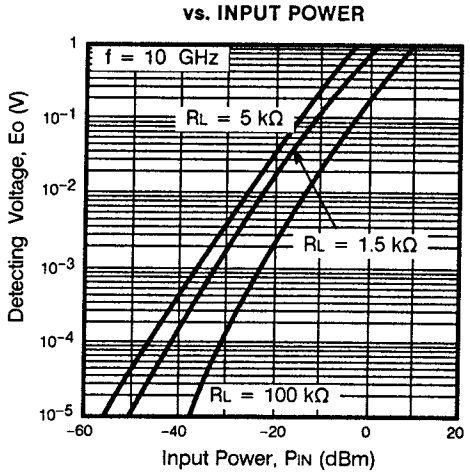
ND4141, ND4151
REVERSE CURRENT
vs. REVERSE VOLTAGE



ND4141
RECTIFYING CURRENT
vs. INPUT POWER

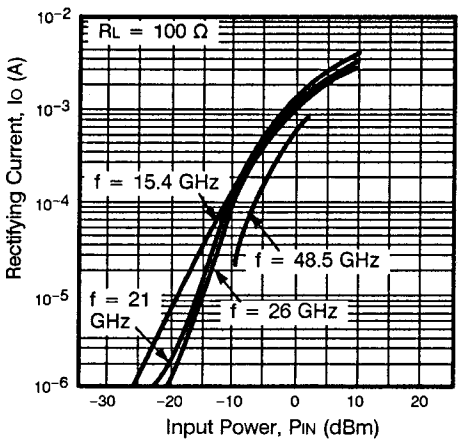


ND4141
DETECTING VOLTAGE
vs. INPUT POWER

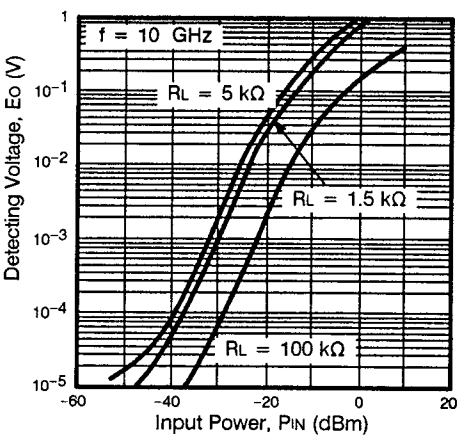


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

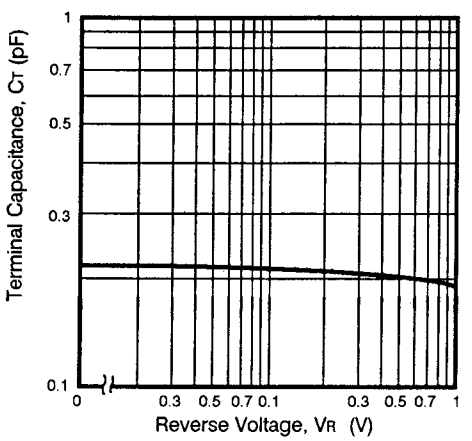
ND4151
RECTIFYING CURRENT
vs. INPUT POWER



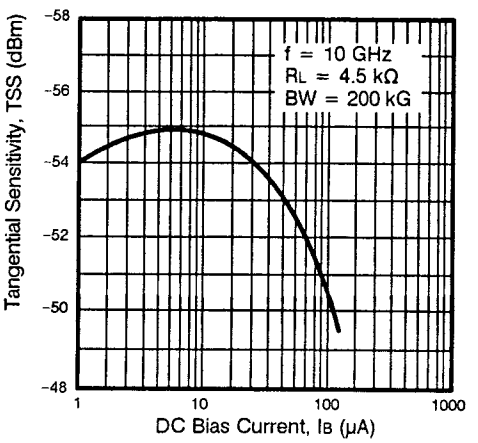
ND4151
DETECTING VOLTAGE
vs. INPUT POWER



ND4132
TERMINAL CAPACITANCE
vs. REVERSE VOLTAGE



ND4151
RECTIFYING CURRENT
vs. INPUT POWER



NEC®

X-BAND SILICON MIXER-DETECTOR SCHOTTKY DIODE

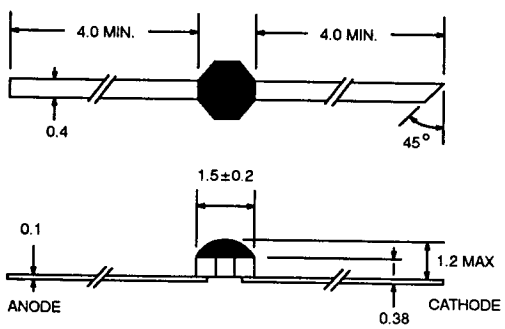
ND4131-3A ND4131-3D

FEATURES

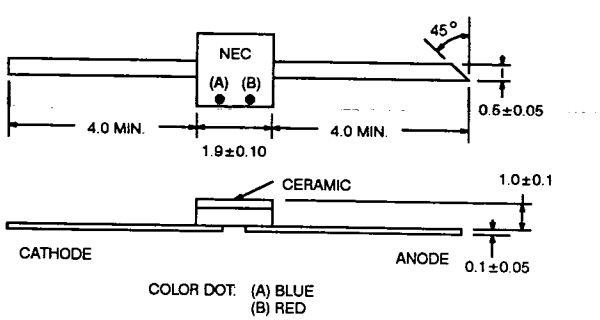
- HIGH SENSITIVITY
- LOW DRIVE LEVEL
- SMALL SIZE
- LOW COST

PHYSICAL DIMENSIONS (Units in mm)

3A PACKAGE*



3D PACKAGE



*Moisture resistance of 3A package diode is about 500 HR HHT (85°C, 85%), because 3A package has small mold potting structure. If you need hermetic package diode, 3D package is suitable.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_R	Reverse Voltage	V	4.0
V_{RM}	Peak Reverse Voltage	V	4.2
I_F	Forward Current	mA	30
I_{FM}	Peak Forward Current	mA	90
I_O	Average Rectified Current	mA	30
T_{STG}	Storage Temperature	°C	-65 to +150
T_J	Junction Temperature	°C	+150
T_{SDR}	Soldering Temperature	°C	+230*

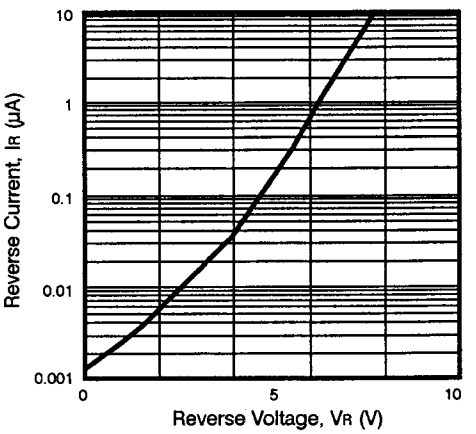
*One time within 10 seconds.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

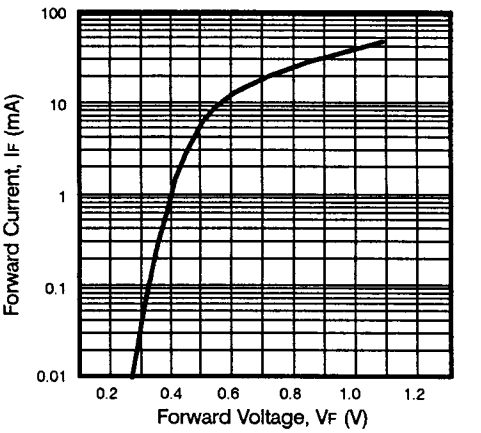
PART NUMBER PACKAGE CODE			ND4131-3A 3A			ND4131-3D 3D		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
V_R	Reverse Voltage At I_R = 10 μA	V	4.0			4.0		
V_F	Forward Voltage at I_F = 30 mA	V			1.0			1.0
C_T	Terminal Capacitance at f = 1 MHz, V_R = 0 V	pF			0.35			0.32
NF	Noise Figure at f = 9375 MHz, P_{IN} = 1 mW, N_{IF} = 1.5 dB	dB		6.5			6.5	

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

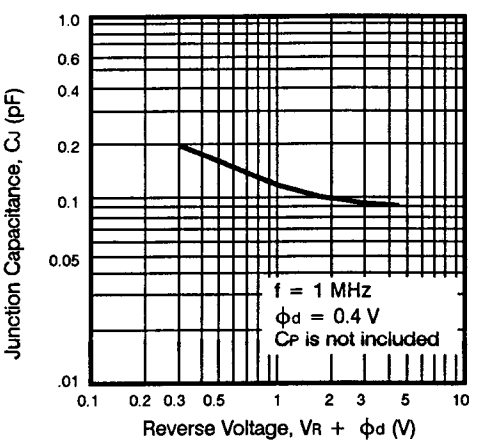
REVERSE CURRENT vs. REVERSE VOLTAGE



FORWARD CURRENT vs. FORWARD VOLTAGE



JUNCTION CAPACITANCE vs. REVERSE VOLTAGE



NEC®

X-BAND SILICON MIXER-DETECTOR SCHOTTKY DIODE

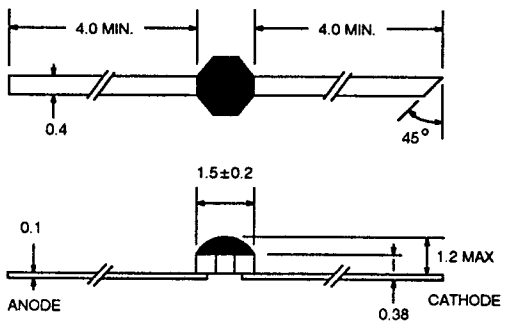
ND4141-3A ND4141-3D

FEATURES

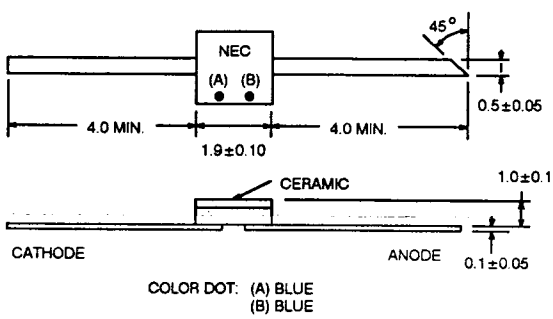
- HIGH SENSITIVITY
- LOW DRIVE LEVEL
- SMALL SIZE
- LOW COST

OUTLINE DIMENSIONS (Units in mm)

OUTLINE 3A



OUTLINE 3D



COLOR DOT: (A) BLUE
(B) BLUE

*Moisture resistance of 3A package diode is about 500 HR HHT (85°C, 85%), because 3A package has small mold potting structure. If you need hermetic package diode, 3D package is suitable.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_R	Reverse Voltage	V	3.0
V_{RM}	Peak Reverse Voltage	V	3.3
I_F	Forward Current	mA	25
I_{FM}	Peak Forward Current	mA	75
Io	Average Rectified Current	mA	25
T_{STG}	Storage Temperature	°C	-65 to +150
T_J	Junction Temperature	°C	+150
T_{SDR}	Soldering Temperature	°C	+230*

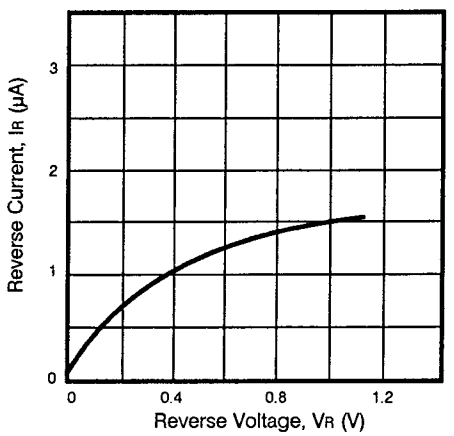
*One time within 10 seconds.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

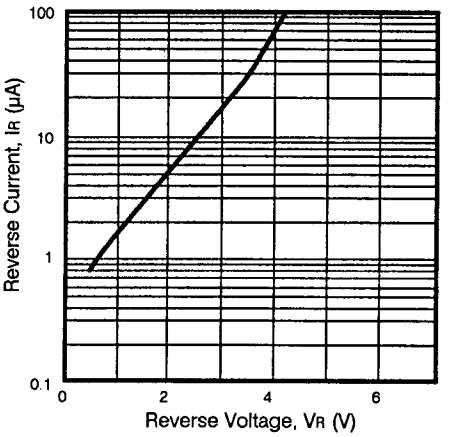
	PART NUMBER PACKAGE OUTLINE		ND4141-3A 3A			ND4141-3D 3D		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
V_R	Reverse Voltage At I_R = 100 µA	V	3.0			3.0		
V_F	Forward Voltage at I_F = 25 mA	V			1.0			1.0
C_T	Terminal Capacitance at f = 1 MHz, V_R = 0.2 V	pF			0.35			0.32
Eo	Detected Voltage at f = 10 GHz, P_{IN} = -4 dBm, R_L = 1.5 KΩ	V	0.25			0.25		

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

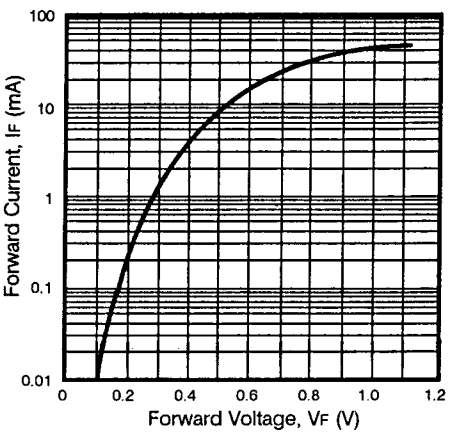
REVERSE CURRENT vs. REVERSE VOLTAGE



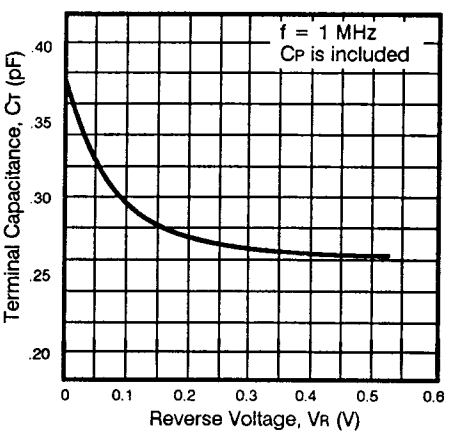
REVERSE CURRENT vs. REVERSE VOLTAGE



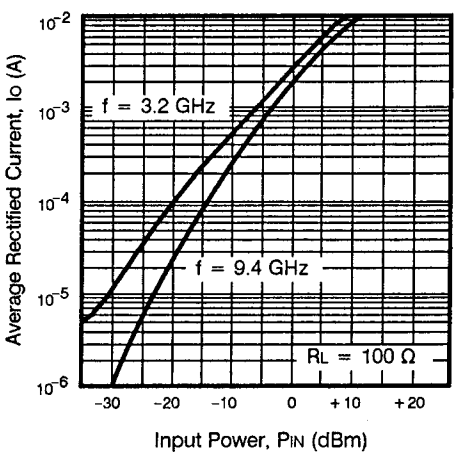
FORWARD CURRENT vs. FORWARD VOLTAGE



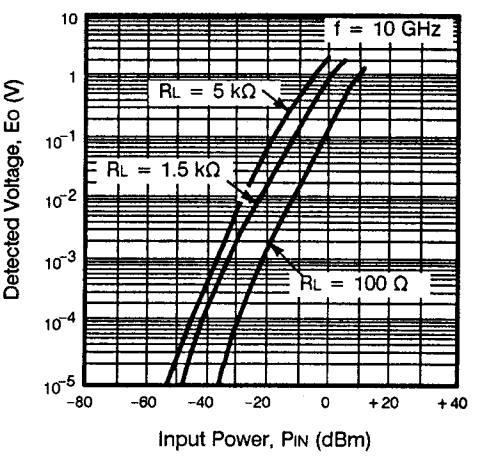
TERMINAL CAPACITANCE vs. REVERSE VOLTAGE



AVERAGE RECTIFIED CURRENT vs. INPUT POWER



DETECTED VOLTAGE vs. INPUT POWER



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K-BAND SILICON MIXER-DETECTOR SCHOTTKY DIODE

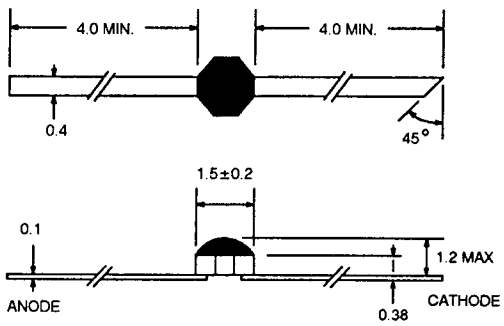
ND4151-3A ND4151-3D

FEATURES

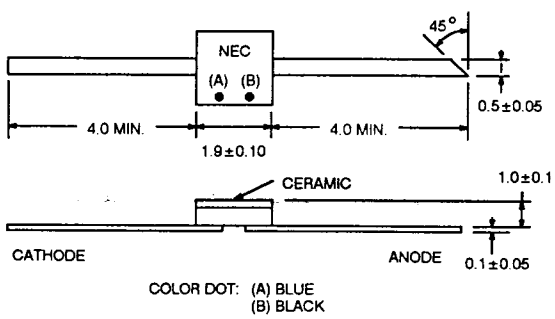
- HIGH SENSITIVITY
- LOW DRIVE LEVEL
- SMALL SIZE
- LOW COST

OUTLINE DIMENSIONS (Units in mm)

OUTLINE 3A



OUTLINE 3D



COLOR DOT: (A) BLUE
(B) BLACK

*Moisture resistance of 3A package diode is about 500 HR HHT (85°C, 85%), because 3A package has small mold potting structure. If you need hermetic package diode, 3D package is suitable.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_R	Reverse Voltage	V	3.0
V_{RM}	Peak Reverse Voltage	V	3.3
I_F	Forward Current	mA	10
I_{FM}	Peak Forward Current	mA	30
Io	Average Rectified Current	mA	10
T_{STG}	Storage Temperature	°C	-65 to +150
T_J	Junction Temperature	°C	+150
T_{SDR}	Soldering Temperature	°C	+230*

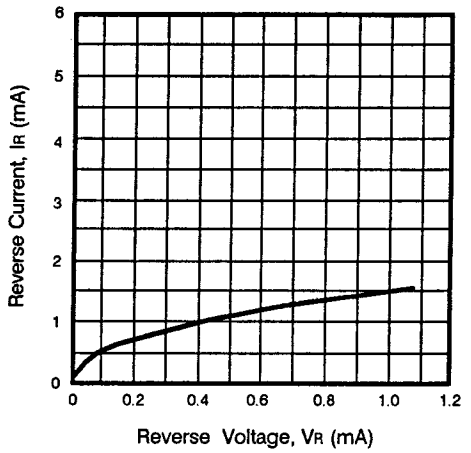
*One time within 10 seconds.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

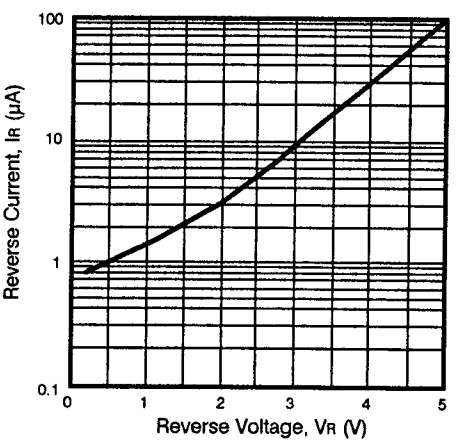
PART NUMBER PACKAGE OUTLINE			ND4151-3A 3A			ND4151-3D 3D		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
V_R	Reverse Voltage At I_R = 100 μA	V	3.0			3.0		
V_F	Forward Voltage at I_F = 10 mA	V			1.0			1.0
C_T	Terminal Capacitance at f = 1 MHz, V_R = 0.2 V	pF			0.23			0.20
Eo	Detected Voltage at f = 21 GHz, P_{IN} = -4 dBm, R_L = 1.5 KΩ	V	0.2			0.2		

TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

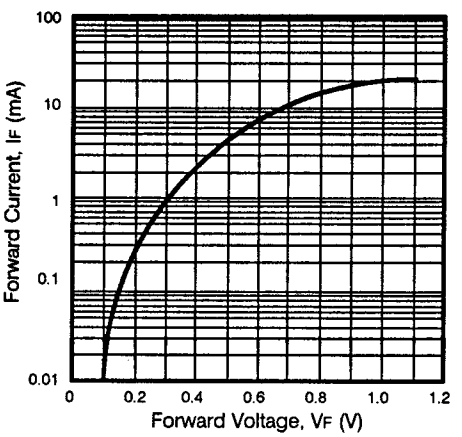
REVERSE CURRENT vs. REVERSE VOLTAGE



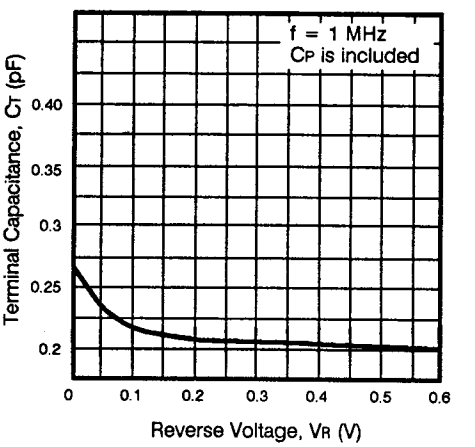
REVERSE CURRENT vs. REVERSE VOLTAGE



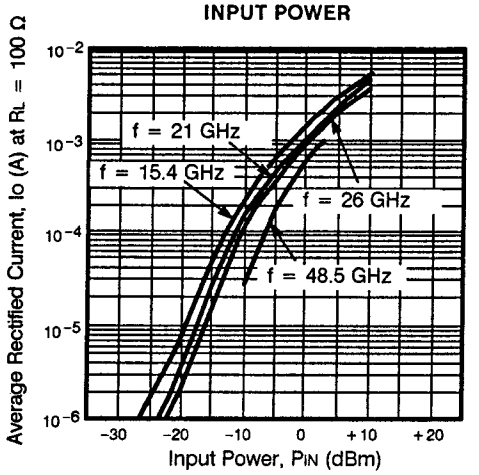
FORWARD CURRENT vs. FORWARD VOLTAGE



TERMINAL CAPACITANCE vs. REVERSE VOLTAGE



AVERAGE RECTIFIED CURRENT vs. INPUT POWER



DETECTED VOLTAGE vs. INPUT POWER