NEC®

SILICON CW IMPATT DIODE

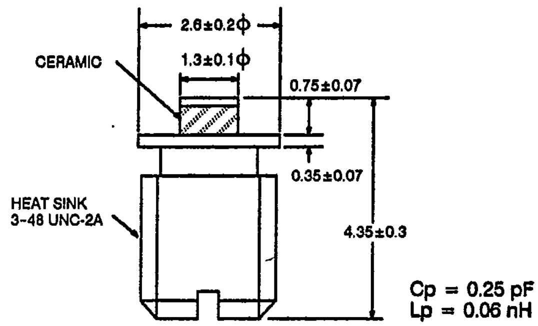
ND8 SERIES

FEATURES

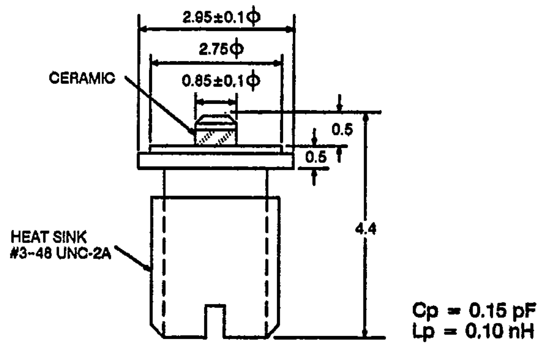
- **HIGH POWER OUTPUT AND WIDE FREQUENCY SELECTION**
  3.50 W at 8 GHz
  3.00 W at 11 GHz
  2.20 W at 15 GHz
  1.20 W at 20 GHz
  0.70 W at 30 GHz
  0.40 W at 40 GHz
  0.20 W at 60 GHz
  0.10 W at 80 GHz
  0.05 W at 94 GHz
- **HIGH EFFICIENCY**
  12% at 8 GHz
  4% at 94 GHz
- **SILICON SINGLE DRIFT REGION (SDR) AND DOUBLE DRIFT REGION (DDR)**
- **DIAMOND HEAT SINKS (DHS) COPPER HEAT SINKS (CHS)**
- **HIGH RELIABILITY FOR INDUSTRIAL AND MILITARY APPLICATIONS**

OUTLINE DIMENSIONS (Units in mm)

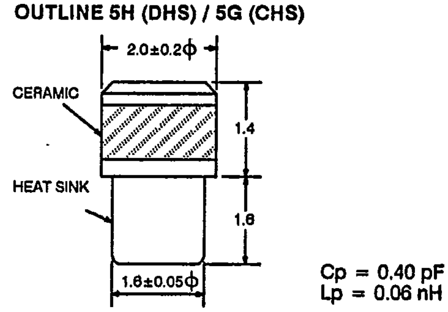
OUTLINE 1N (DHS) / 1P (CHS)



OUTLINE 1T



OUTLINE 5H (DHS) / 5G (CHS)



Note: Heatsinks are Anodes

DESCRIPTION AND APPLICATIONS

The NEC CW IMPATT diode series includes a broad spectrum of diodes from low cost SDR with CHS to high power DDR with DHS types covering the 6 GHz to 100 GHz microwave region. The single drift region (SDR) IMPATT diode is a flat profile $P^{+}NN^{+}$ epitaxial mesa with an integral heat sink, and the double drift region (DDR) diode is a flat profile $P^{+}PNN^{+}$ integral heat sink epitaxial mesa structure.

Applications are IMPATT amplifiers and oscillators for industrial, space, and military systems. These include point to point communications, radar, radiometers, jammers, fuses, DME, speed detectors, intrusion alarms, beacons, and height finders. Reliability screening is available upon request.

ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

IMPATT TYPE			DDR	SDR
SYMBOLS	PARAMETERS	UNITS	RATINGS	RATINGS
P_T	Total Power Dissipation	W	$(250-T_C)/R_{TH\,(J-C)}$	$(200-T_C)/R_{TH\,(J-C)}$
T_{OP}	Operating Temperature	°C	-65 to +250	-65 to +200
T_{STG}	Storage Temperature	°C	-65 to +200	-65 to +200
T_{SDR}	Soldering Temperature	°C	230 for 10 sec.	230 for 10 sec.
$\Delta T_{J\,(AVE)}$	Average Junction Temperature Rise	°C	250	200

PERFORMANCE SPECIFICATIONS (T_A = 25°C)

PART NUMBER / EIAJ[1] REGISTERED NUMBER / PACKAGE OUTLINE / IMPATT TYPE / HEAT SINK TYPE			ND8P08-5G 1ST11 5G SDR COPPER			ND8S08-5H 1ST15 5H SDR DIAMOND			ND8U08W-5H 1ST20 5H DDR DIAMOND			ND8O11-5G 1ST12 5G SDR COPPER			ND8R11-5H 1ST16 5H SDR DIAMOND			ND8T11W-5H 1ST21 5H DDR DIAMOND		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
f	Frequency Range[2]	GHz	6	8	9	6	8	9	6	8	9	9	11	12	9	11	12	9	11	12
P_{OUT}	Power Output	W	1	1.2		2	2.2		3.5	4		0.7	0.8		1.6	1.8		3	3.3	
η	Efficiency	%		7.6			8			12			7.1			7.8			11	
V_{OP}	Operating Voltage	V		120	135		125	140		170	180		85	95		95	105		120	140
I_{OP}	Operating Current	mA		130	150		220	260		190	200		140	160		240	260		200	240
BV	Breakdown Voltage, I_R = 1 mA	V		95			95			135			70			70			100	
$C_{J\,(BV-1)}$	Junction Capacitance, V_R = BV-1	pF		0.45			0.50			0.40			0.55			0.65			0.45	
$R_{TH\,(J-C)}$	Thermal Resistance	°C/W		10			6			6			14			6			6.5	

Notes:
1. Electronic Industrial Association of Japan.
2. $\Delta T_{J\,(AVE)} = (V_{OP} \times I_{OP} - P_{OUT})\,(R_{TH\,(J-A)})$

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PERFORMANCE SPECIFICATIONS (T_A = 25°C)

PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE IMPATT TYPE HEAT SINK TYPE			ND8N15-5G 1ST13 5G SDR COPPER			ND8P15-5H 1ST17 5H SDR DIAMOND			ND8S15W-1N, 5H 1ST22 1N, 5H DDR DIAMOND			ND8M20-5G 1ST14 5G SDR COPPER			ND8O20-5H 1ST18 5H SDR DIAMOND			ND8P20W-5H 1ST23 5H DDR DIAMOND		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
f	Frequency Range[2]	GHz	12	15	189	12	15	18	12	15	18	18	20	25	18	20	25	18	20	25
P_{OUT}	Power Output	W	0.5	0.7		1	1.2		2.2	2.5		0.3	0.4		0.7	0.8		1.2	1.5	
η	Efficiency	%		7.1			7.5			11			5			6.9			10.0	
V_{OP}	Operating Voltage	V		65	73		70	80		100	110		50	55		50	60		80	90
I_{OP}	Operating Current	mA		150	170		230	260		230	250		160	180		230	260		185	240
BV	Breakdown Voltage, I_R = 1 mA	V		52			52			80			38			38			65	
$C_{J\,(BV-1)}$	Junction Capacitance, V_R = BV-1	pF		0.45			0.55			0.40			0.40			0.45			0.35	
$R_{TH\,(J-C)}$	Thermal Resistance	°C/W		108			9			9			23			12			12	

Notes:
1. Electronic Industrial Association of Japan.
2. $\Delta T_{J\,(AVE)} = (V_{OP} \times I_{OP} - P_{OUT})\,(R_{TH\,(J-A)})$

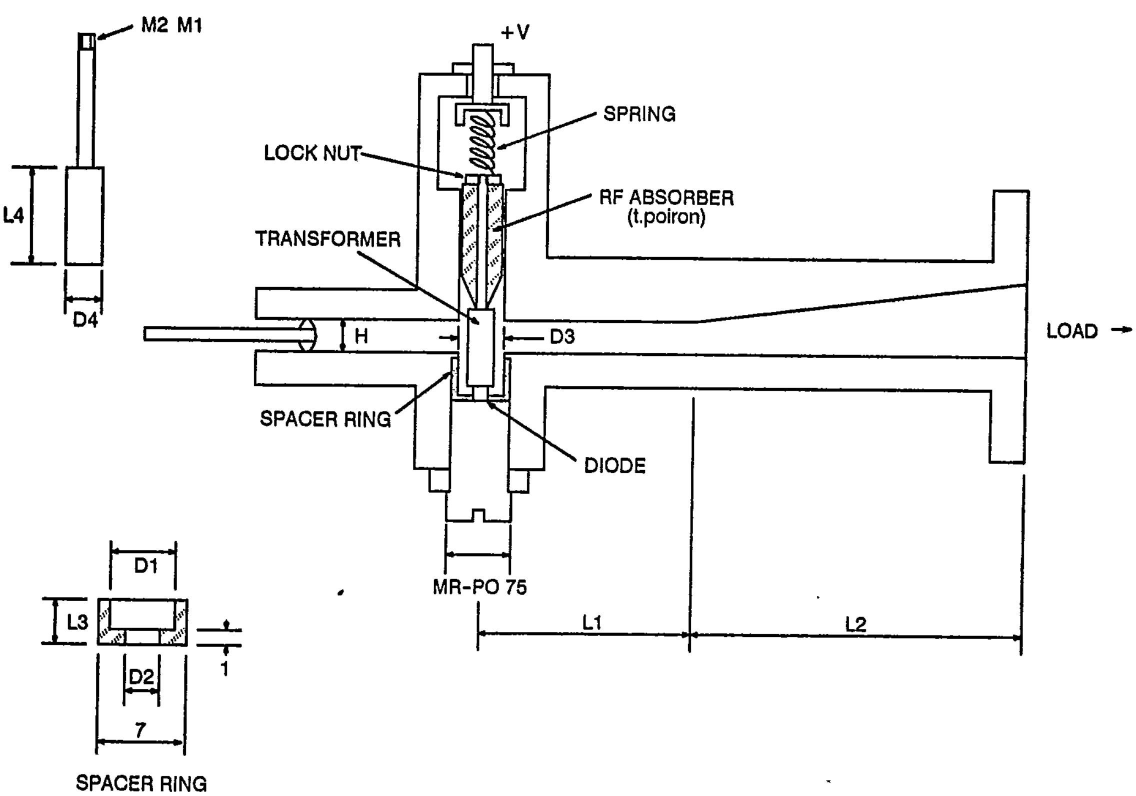
PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE IMPATT TYPE HEAT SINK TYPE			ND8M30-1N 1N SDR DIAMOND			ND8O30W-1N 1N DDR DIAMOND			ND8N40W-1N 1N DDR DIAMOND			ND8L60W-1T 1T DDR DIAMOND			ND8J80W-1T 1T DDR DIAMOND			ND8C96W-1T 1T DDR DIAMOND		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
f	Frequency Range[2]	GHz	25	30	35	25	30	35	35	40	50	50	60	70	70	80	87	87	96	100
P_{OUT}	Power Output	W	0.30	0.35		0.70	0.80		0.40	0.50		0.20	0.30		0.10	0.15		0.05	0.06	
η	Efficiency	%		6.5			10			8			6			4.5			4	
V_{OP}	Operating Voltage	V		40			55	60		54	55		32	35		21	23		20	22
I_{OP}	Operating Current	mA		135			145	170		115	180		160	200		160	200		100	160
BV	Breakdown Voltage, I_R = 1 mA	V		32			45			42			25			16			15	
$C_{J\,(BV-1)}$	Junction Capacitance, V_R = BV-1	pF		0.25			0.25			0.20			0.20			0.15			0.10	
$R_{TH\,(J-C)}$	Thermal Resistance	°C/W		30			25			35			40			60			80	

Notes:
1. Electronic Industrial Association of Japan.
2. $\Delta T_{J\,(AVE)} = (V_{OP} \times I_{OP} - P_{OUT})\,(R_{TH\,(J-A)})$

TEST OSCILLATOR DIMENSIONS

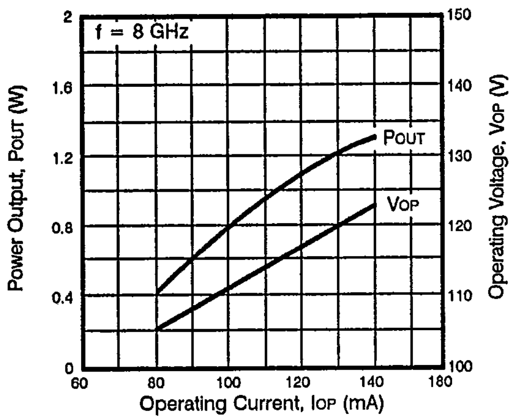
FREQUENCY	WAVEGUIDE	L1	L2	L3	L4	D1	D2	D3	D4	H
6-6 GHz	WR-159	nλg/2	nλg	15-5	25-18	6.5	4	6.5	6-5	6
7-8.2 GHz	WR-137	nλg/2	nλg	13-4	20-10	6.5	3.8	6.5	6-5	5
8-10 GHz	WR-112	nλg/2	nλg	10-3	16-9	6.4	3.6	6.4	6-5	4
10-12.4 GHz	WR-90	nλg/2	nλg	8-2	12-8	6	3.4	6	4.6-5	3
12-14 GHz	WR-75	nλg/2	nλg	7-1.5	10-5	5.5	3.4	5.5	4.4-4	2
13-18 GHz	WR-62	nλg/2	nλg	6-1.5	8-3.6	5	3	5	4-3.6	1.5
17-22 GHz	WR-51	nλg/2	nλg	6-1	6-3.6	4	2.4	4	3.4-2.8	1
22-33 GHz	WR-34	nλg/2	nλg	4-0.5	6-2.5	3.1	2.4	3.1	2.5-2	1
27-40 GHz	WR-28	nλg/2	nλg	2-0.5	5-2.5	3.1	1.2	3.1	2.5-2	1

COAXIAL-WAVEGUIDE TEST MOUNT

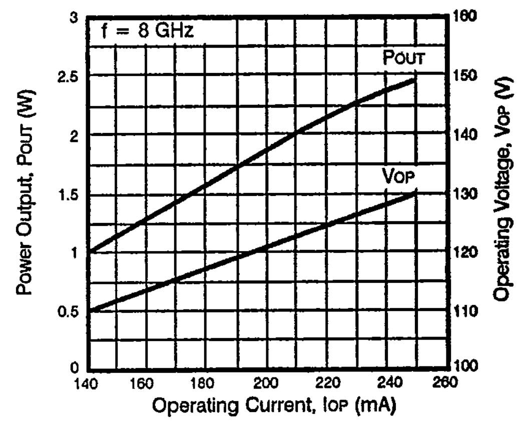


TYPICAL PERFORMANCE CHARACTERISTICS (TA = 25°C)

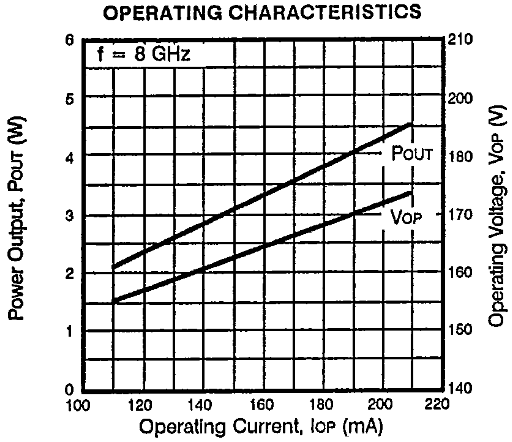
ND8P08-5G
OPERATING CHARACTERISTICS



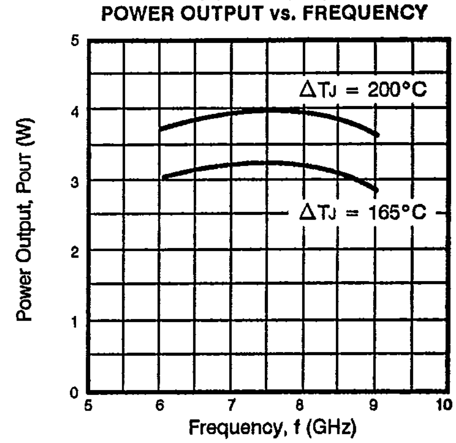
ND8S08-5H
OPERATING CHARACTERISTICS



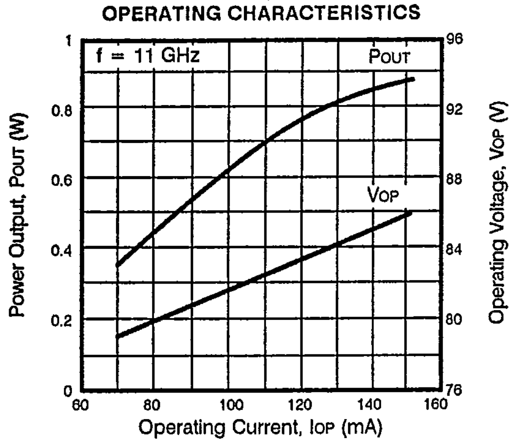
ND8U08W-5H
OPERATING CHARACTERISTICS



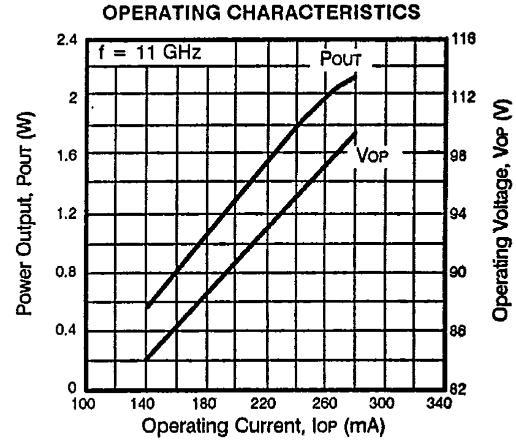
ND8U08W-5H
POWER OUTPUT vs. FREQUENCY



ND8O11-5G
OPERATING CHARACTERISTICS

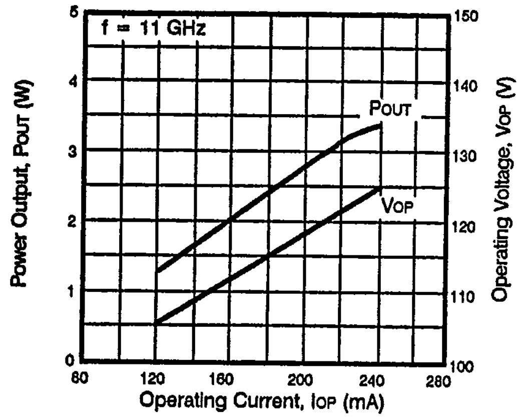


ND8R11-5H
OPERATING CHARACTERISTICS

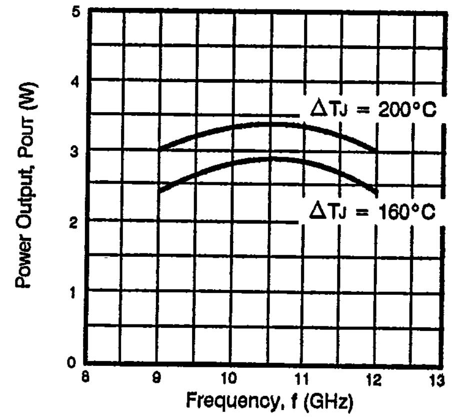


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

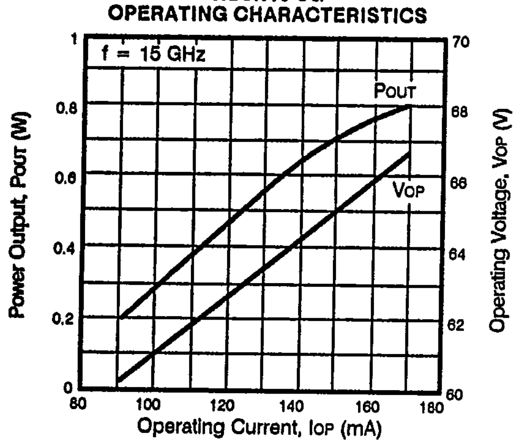
ND8T11W-5H
OPERATING CHARACTERISTICS



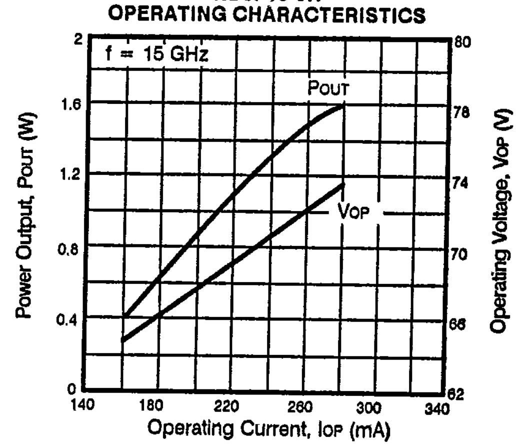
ND8T11W-5H
POWER OUTPUT vs. FREQUENCY



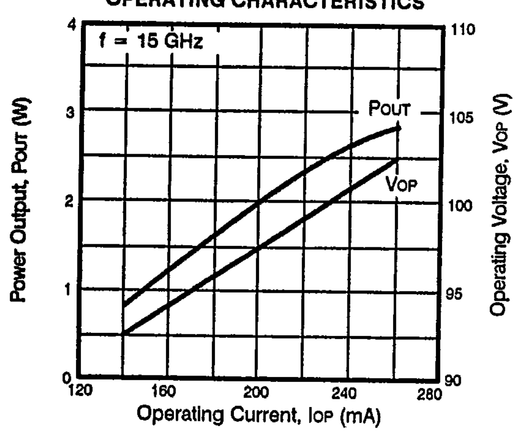
ND8N15-5G
OPERATING CHARACTERISTICS



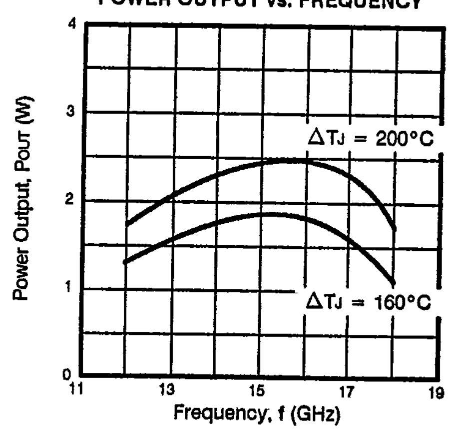
ND8P15-5H
OPERATING CHARACTERISTICS



ND8S15W-1N, ND8S15W-5H
OPERATING CHARACTERISTICS

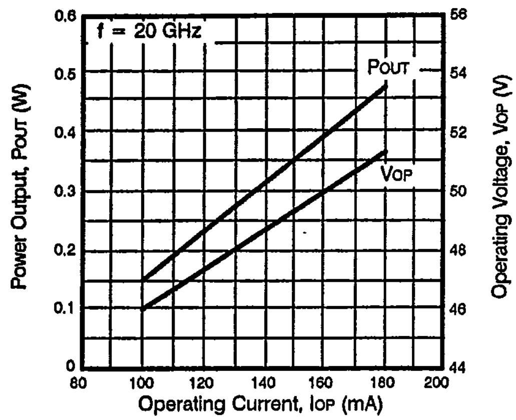


ND8S15W-1N, ND8S15W-5H
POWER OUTPUT vs. FREQUENCY

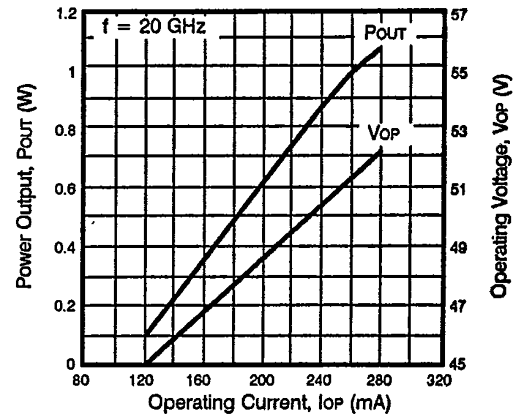


TYPICAL PERFORMANCE CHARACTERISTICS (TA = 25°C)

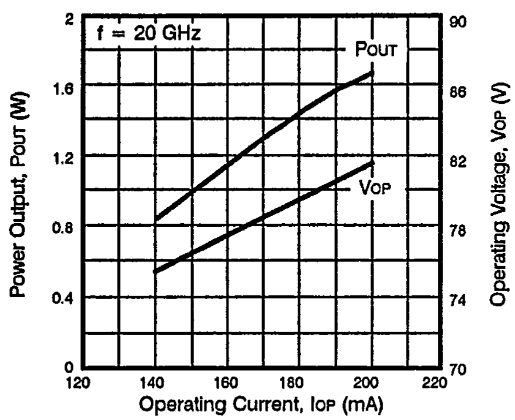
ND8M20-5G
OPERATING CHARACTERISTICS



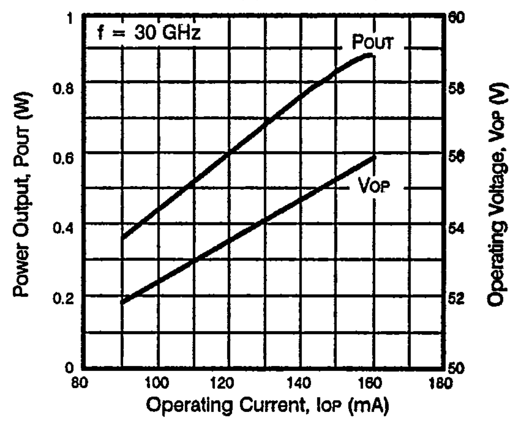
ND8O20-5H
OPERATING CHARACTERISTICS



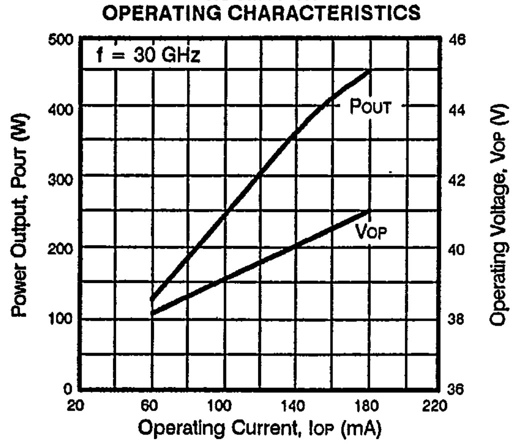
ND8P20W-5H
OPERATING CHARACTERISTICS



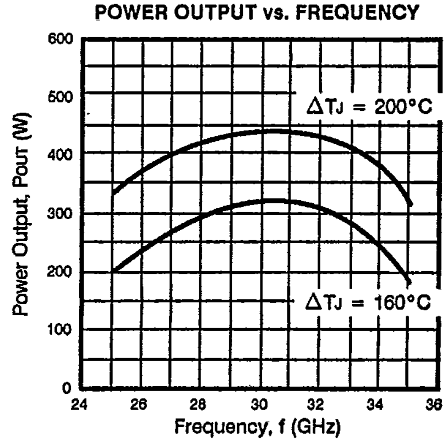
ND8O30W-1N
OPERATING CHARACTERISTICS



ND8M30-1N
OPERATING CHARACTERISTICS

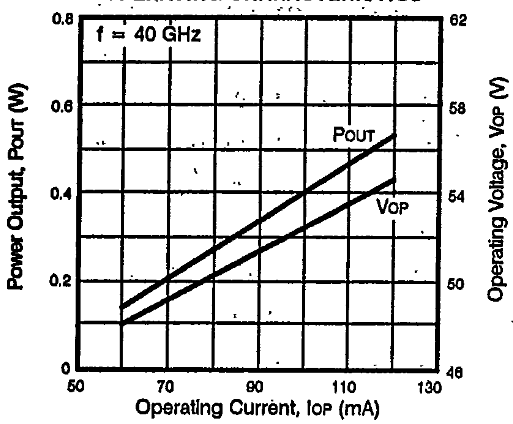


ND8M30-1N
POWER OUTPUT vs. FREQUENCY

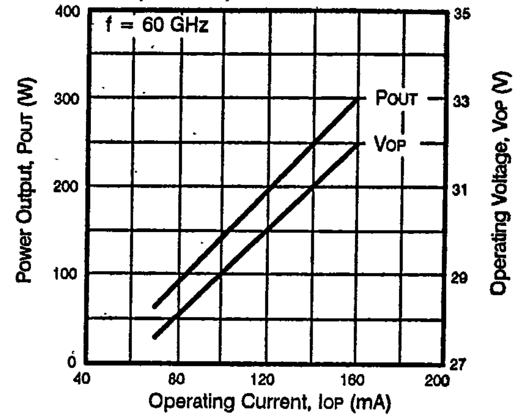


TYPICAL PERFORMANCE CHARACTERISTICS (TA = 25°C)

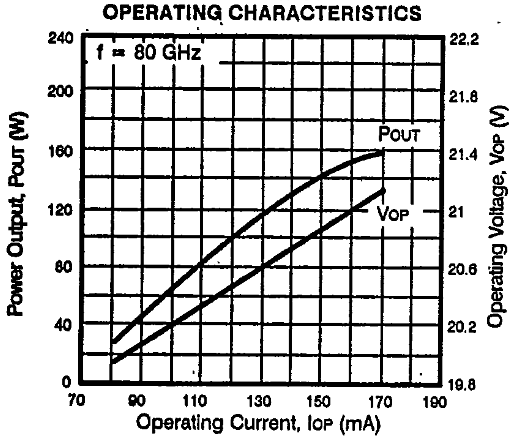
**ND8N40W-1N
OPERATING CHARACTERISTICS**



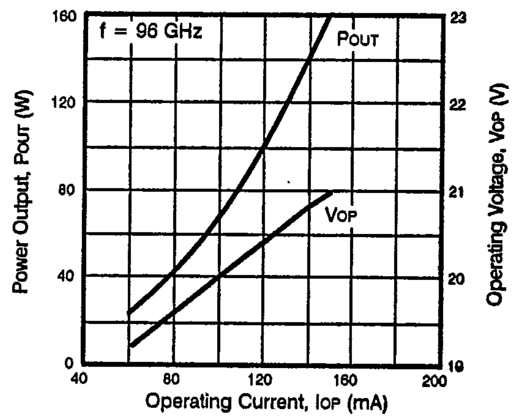
**ND8L60W-1T
OPERATING CHARACTERISTICS**



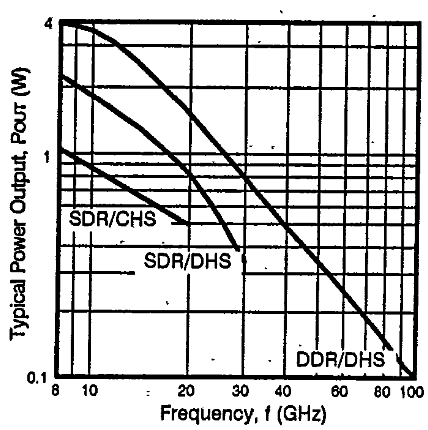
**ND8J80W-1T
OPERATING CHARACTERISTICS**



**ND8G96W-1T
OPERATING CHARACTERISTICS**



CW IMPATT SELECTION GRAPH



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Additional Diode Products

T-07-07

SILICON SCHOTTKY BARRIER DIODES

SERIES	PART NUMBER	QUANTITY-CONFIGURATION	PACKAGE CODE	ABSOLUTE MAXIMUM RATINGS				ELECTRICAL CHARACTERISTICS				
				P_T (mW)	I_F (mA)	I_F (mA) PEAK	T_{STG} (C)	@I_F (mA)	V_F (mV) MAX	DELTA V_F (mV) MAX	C_T (pf) MAX	DELTA C_T (pf) MAX
ND411	ND4116-2	pair-tee	4-pin MM	150	30		-55 to +125	1	230	10	1.2	0.2
ND412	ND4126-2	pair-tree	4-pin MM	150	35		-55 to +125	10	550	10	1.2	0.2
ND434	ND434G	quad-array	8-pin MF	200	50		-55 to +125	10	550	15	1.2	0.2
ND487	ND487C1-00	quad-cross	chip		50	150	-65 to +150	1	300	20		
	ND487C1-3P	quad-cross	3P	300	50	150	-65 to +150	1	300	20	1.0	0.1
	ND487C1-3R	quad-cross	3R	300	50	150	-65 to +150	1	300	20	1.2	0.2
	ND487C2-00	quad-cross	chip		50	150	-65 to +150	1	500	20		
	ND487C2-3P	quad-cross	3P	300	50	150	-65 to +150	1	500	20	1.0	0.1
	ND487C2-3R	quad-cross	3R	300	50	150	-65 to +150	1	500	20	1.2	0.2
	ND487R1-00	quad-ring	chip		50	150	-65 to +150	1	300	20		
	ND487R1-3P	quad-ring	3P	300	50	150	-65 to +150	1	300	20	1.0	0.1
	ND487R1-3R	quad-ring	3R	300	50	150	-65 to +150	1	300	20	1.2	0.2
	ND487R2-00	quad-ring	chip		50	150	-65 to +150	1	500	20		
	ND487R2-3P	quad-ring	3P	300	50	150	-65 to +150	1	500	20	1.0	0.1
	ND487R2-3R	quad-ring	3R	300	50	150	-65 to +150	1	500	20	1.2	0.2