



NEC's NPN SILICON EPITAXIAL TRANSISTOR 3 PINS ULTRA SUPER MINI MOLD

NE58219

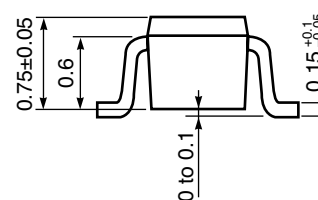
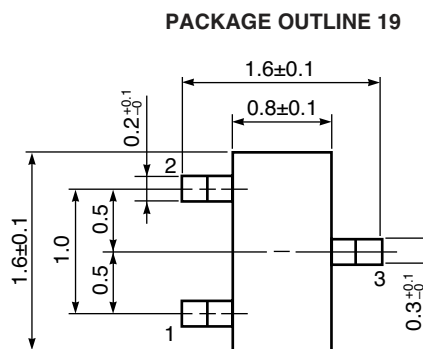
FEATURES

- **HIGH f_T :** 5 GHz TYP at $V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$, $f = 1\text{ GHz}$
- **LOW C_{re} :** 0.9 pF TYP at $V_{CB} = 5\text{ V}$, $I_E = 0$, $f = 1\text{ MHz}$
- **ULTRA SUPER MINI MOLD PACKAGE:** 1.6 x 0.8 mm

DESCRIPTION

NEC's NE58219 is a low supply voltage transistor designed for UHF Mixer and oscillator applications. The 3 pin ultra super mini mold package makes this device ideally suited for high density surface mount assembly.

OUTLINE DIMENSIONS (Units in mm)



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$)

PART NUMBER EIAJ ¹ REGISTERED NUMBER PACKAGE OUTLINE		NE58219 2SC5004 19			
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
I_{CBO}	Collector Cutoff Current at $V_{CB} = 15\text{ V}$, $I_E = 0$	μA			0.1
I_{EBO}	Emitter Cutoff Current at $V_{EB} = 1\text{ V}$, $I_C = 0$	μA			0.1
$V_{CE(sat)}$	Collector Saturation Voltage at $h_{FE} = 10$, $I_C = 5\text{ mA}$	V			0.5
h_{FE}	DC Current Gain at $V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}^2$		60		120
f_T	Gain Bandwidth at $V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$	GHz	3.0	5.0	
C_{RE}	Feedback Capacitance at $V_{CB} = 5\text{ V}$, $I_E = 0$, $f = 1\text{ MHz}^3$	pF		0.9	1.2
IS_{21EI}^2	Insertion Power Gain at $V_{CE} = 5\text{ V}$, $I_C = 5\text{ mA}$, $f = 1\text{ GHz}$	dB	5.0		

Notes:

1. Electronic Industrial Association of Japan
2. Pulsed measurement, pulse width $\leq 350\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.
3. The emitter terminal and the case shall be connected to the guard terminal of the three-terminal capacitance bridge.

ABSOLUTE MAXIMUM RATINGS¹ ($T_A = 25^\circ\text{C}$)

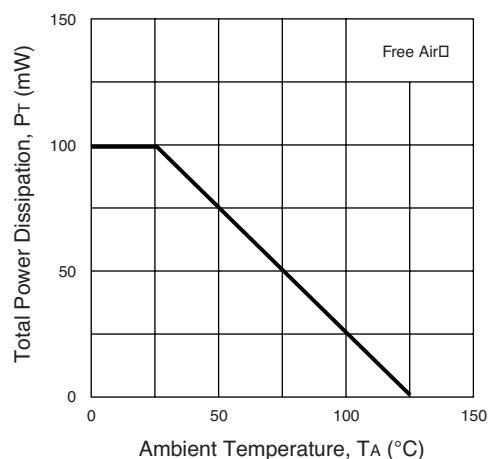
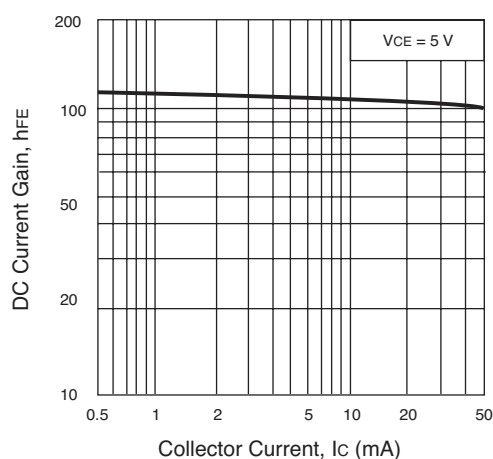
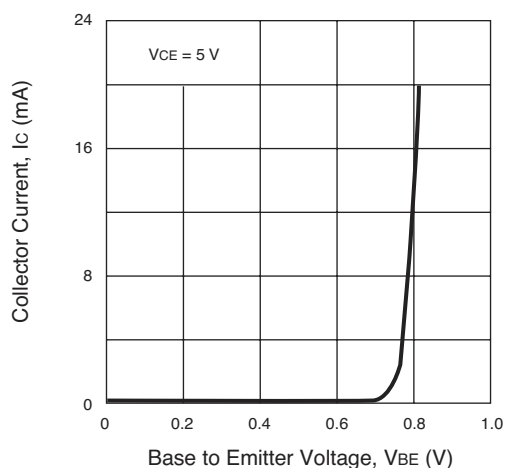
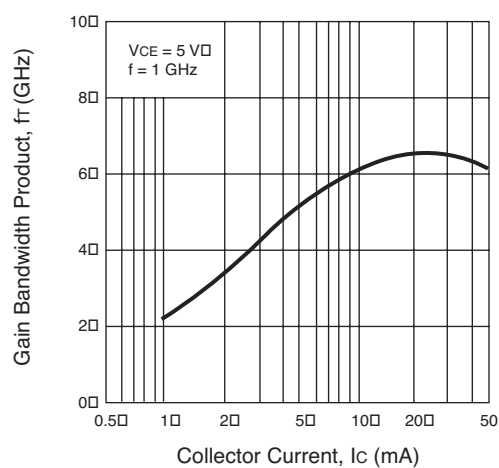
SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CBO}	Collector to Base Voltage	V	20
V_{CEO}	Collector to Emitter Voltage	V	12
V_{EBO}	Emitter to Base Voltage	V	3
I_C	Collector Current	mA	60
P_T	Total Power Dissipation	mW	100
T_J	Junction Temperature	$^\circ\text{C}$	125
T_{STG}	Storage Temperature	$^\circ\text{C}$	-55 to +125

Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.

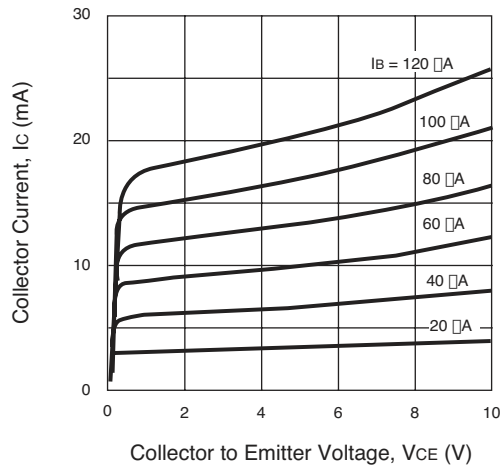
ORDERING INFORMATION

PART NUMBER	QUANTITY	PACKAGING
NE58219-T1-A	3000 pcs./reel	Embossed tape 8mm wide. Pin 3 (collector) face to perforation side of tape.

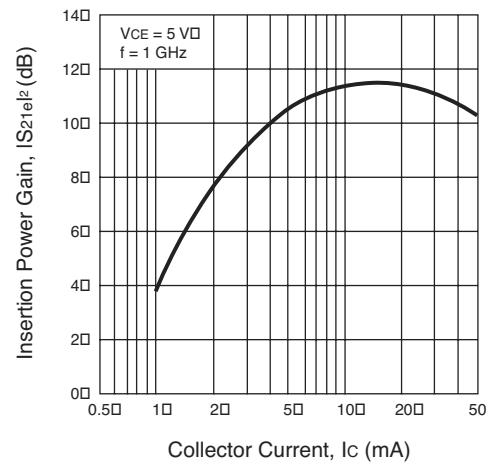
TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$)**TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE****DC CURRENT GAIN vs. COLLECTOR CURRENT****COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE****GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT**

TYPICAL PERFORMANCE CURVES (TA = 25°C)

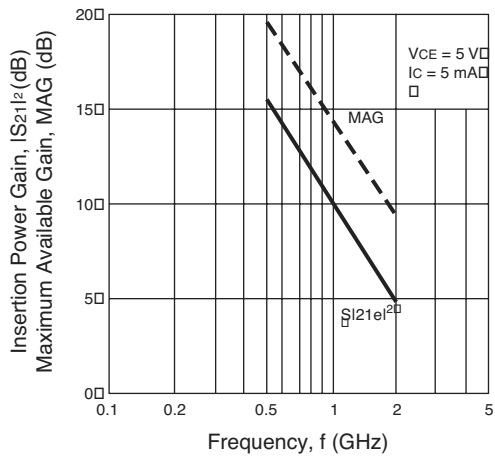
**COLLECTOR CURRENT vs.
COLLECTOR TO EMITTER VOLTAGE**



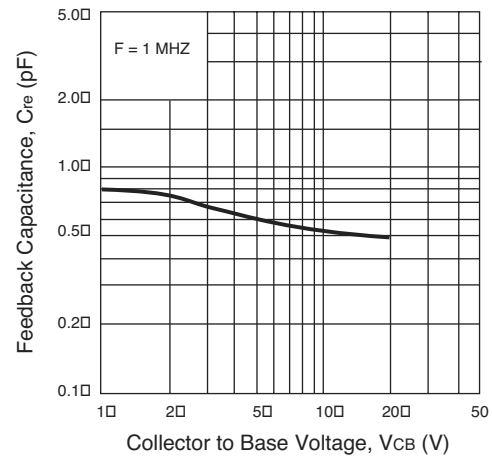
**INSERTION POWER GAIN vs.
COLLECTOR CURRENT**



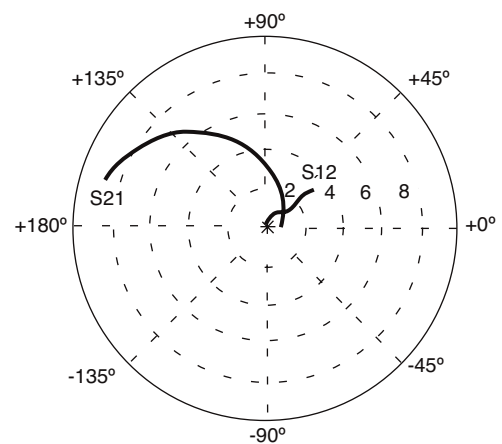
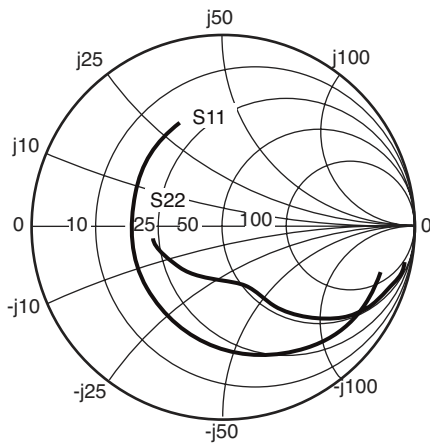
**INSERTION POWER GAIN AND
MAXIMUM AVAILABLE GAIN vs.
FREQUENCY**



**FEEDBACK CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE**



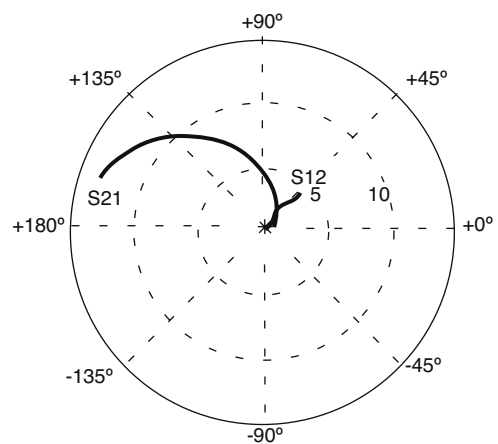
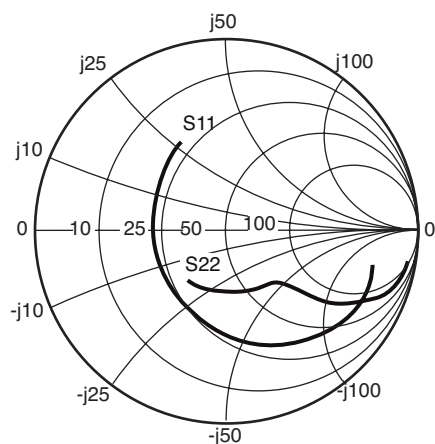
SCATTERING PARAMETERS (T_A = 25°C)



NE58219

V_c = 1 V, I_c = 3 mA

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₂₂		S ₁₂		K (unitless)	MAG (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		
0.050	0.84	-16.28	8.69	162.16	0.95	-11.12	0.03	71.19	0.31	25.05
0.100	0.84	-33.14	8.22	155.75	0.93	-20.33	0.05	70.75	0.12	22.03
0.200	0.74	-61.59	7.05	136.55	0.79	-34.69	0.09	57.41	0.24	19.10
0.300	0.65	-84.29	5.92	122.15	0.66	-44.45	0.11	48.65	0.36	17.38
0.400	0.59	-102.61	5.00	111.38	0.57	-51.15	0.12	43.53	0.45	16.14
0.500	0.55	-117.08	4.28	102.97	0.50	-55.78	0.13	40.52	0.55	15.15
0.600	0.53	-129.02	3.72	96.03	0.44	-59.22	0.14	38.95	0.64	14.29
0.700	0.51	-138.97	3.29	90.09	0.40	-62.35	0.14	38.03	0.72	13.57
0.800	0.49	-147.58	2.94	84.92	0.37	-64.76	0.15	37.73	0.79	12.91
0.900	0.49	-155.03	2.66	80.24	0.35	-67.47	0.16	37.81	0.85	12.33
1.000	0.48	-161.81	2.44	75.92	0.33	-70.19	0.16	37.99	0.91	11.78
1.100	0.48	-167.71	2.25	71.90	0.32	-72.91	0.17	38.27	0.96	11.28
1.200	0.48	-173.05	2.09	68.18	0.31	-75.58	0.17	38.83	1.00	10.69
1.300	0.48	-177.95	1.95	64.62	0.30	-78.51	0.18	39.27	1.04	9.20
1.400	0.48	177.41	1.83	61.29	0.29	-81.48	0.19	39.74	1.07	8.34
1.500	0.48	173.15	1.73	58.09	0.28	-84.48	0.19	40.16	1.10	7.66
1.600	0.48	168.99	1.64	55.02	0.28	-87.73	0.20	40.55	1.12	7.10
1.700	0.49	165.21	1.56	52.11	0.28	-91.11	0.21	40.82	1.13	6.60
1.800	0.49	161.56	1.49	49.31	0.27	-94.65	0.21	41.19	1.14	6.16
1.900	0.49	158.14	1.43	46.56	0.27	-98.18	0.22	41.44	1.15	5.77
2.000	0.50	154.96	1.37	43.96	0.27	-101.84	0.23	41.49	1.16	5.41
2.100	0.50	152.01	1.32	41.45	0.27	-105.68	0.24	41.65	1.16	5.10
2.200	0.51	149.18	1.27	38.97	0.28	-109.36	0.24	41.72	1.15	4.81
2.300	0.51	146.47	1.23	36.71	0.28	-113.26	0.25	41.69	1.15	4.56
2.400	0.52	143.90	1.19	34.45	0.28	-117.01	0.26	41.63	1.15	4.30
2.500	0.52	141.49	1.16	32.27	0.29	-120.76	0.27	41.48	1.14	4.06
2.600	0.53	139.05	1.12	30.21	0.29	-124.41	0.28	41.14	1.14	3.83
2.700	0.53	136.85	1.09	28.21	0.29	-128.09	0.29	40.97	1.13	3.64
2.800	0.54	134.56	1.06	26.30	0.30	-131.59	0.29	40.70	1.12	3.47
2.900	0.54	132.43	1.03	24.45	0.31	-135.17	0.30	40.33	1.11	3.28
3.000	0.55	130.33	1.01	22.68	0.31	-138.54	0.31	39.92	1.11	3.11
3.100	0.55	128.52	0.98	20.96	0.32	-141.89	0.32	39.46	1.10	2.98
3.200	0.56	126.66	0.96	19.34	0.32	-145.28	0.33	38.97	1.09	2.84
3.300	0.56	124.92	0.94	17.77	0.33	-148.51	0.34	38.44	1.08	2.72
3.400	0.57	123.18	0.92	16.22	0.34	-151.84	0.35	37.80	1.07	2.59
3.500	0.57	121.66	0.90	14.75	0.34	-154.93	0.36	37.19	1.06	2.52
3.600	0.58	120.12	0.88	13.34	0.35	-158.22	0.37	36.50	1.05	2.39
3.700	0.58	118.56	0.87	12.03	0.36	-161.09	0.38	35.74	1.05	2.30
3.800	0.58	117.13	0.85	10.73	0.36	-164.14	0.39	35.00	1.04	2.19
3.900	0.59	115.69	0.84	9.51	0.37	-166.91	0.40	34.23	1.03	2.11
4.000	0.59	114.19	0.83	8.33	0.38	-169.73	0.41	33.42	1.03	2.03

SCATTERING PARAMETERS (T_A = 25°C)

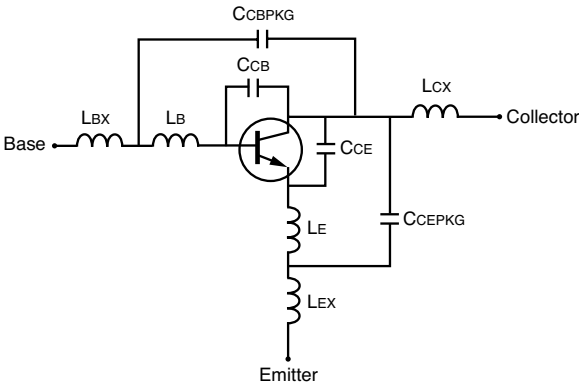
NE58219

V_c = 5 V, I_c = 5 mA

FREQUENCY	S ₁₁		S ₂₁		S ₂₂		S ₁₂		K	MAG
(GHz)	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG	(unitless)	(dB)
0.050	0.78	-15.97	13.43	162.03	0.95	-9.31	0.01	80.11	0.23	29.98
0.100	0.78	-32.63	12.68	155.23	0.93	-16.92	0.03	71.25	0.18	26.35
0.200	0.67	-60.08	10.68	136.09	0.79	-27.63	0.05	61.51	0.32	23.37
0.300	0.57	-81.72	8.83	122.20	0.68	-33.64	0.06	55.73	0.45	21.52
0.400	0.51	-99.23	7.37	112.16	0.59	-36.97	0.07	52.31	0.57	20.14
0.500	0.46	-113.17	6.27	104.46	0.53	-38.75	0.08	51.51	0.67	19.02
0.600	0.43	-125.01	5.42	98.23	0.49	-39.79	0.09	51.49	0.75	18.03
0.700	0.41	-134.99	4.76	92.93	0.46	-40.85	0.09	51.76	0.83	17.15
0.800	0.39	-143.77	4.24	88.36	0.44	-41.52	0.10	52.53	0.89	16.35
0.900	0.38	-151.46	3.83	84.26	0.42	-42.56	0.11	53.26	0.93	15.61
1.000	0.38	-158.46	3.49	80.48	0.40	-43.81	0.11	53.98	0.97	14.94
1.100	0.38	-164.56	3.21	76.95	0.39	-45.13	0.12	54.45	1.00	13.91
1.200	0.37	-170.14	2.97	73.66	0.38	-46.52	0.13	55.14	1.03	12.72
1.300	0.37	-175.24	2.77	70.53	0.37	-48.11	0.13	55.52	1.05	11.85
1.400	0.37	-180.00	2.60	67.57	0.37	-49.82	0.14	55.92	1.06	11.14
1.500	0.38	-175.58	2.44	64.71	0.36	-51.66	0.15	56.20	1.07	10.50
1.600	0.38	-171.25	2.31	61.94	0.35	-53.64	0.16	56.38	1.08	9.95
1.700	0.38	-167.32	2.19	59.30	0.35	-55.69	0.17	56.44	1.08	9.46
1.800	0.39	-163.57	2.09	56.73	0.34	-58.05	0.17	56.48	1.09	9.03
1.900	0.39	-160.04	2.00	54.20	0.34	-60.48	0.18	56.51	1.09	8.62
2.000	0.40	-156.80	1.91	51.76	0.33	-63.18	0.19	56.29	1.08	8.27
2.100	0.40	-153.84	1.84	49.40	0.33	-65.85	0.20	56.10	1.08	7.96
2.200	0.41	-151.04	1.77	47.03	0.33	-68.79	0.21	55.83	1.08	7.64
2.300	0.42	-148.44	1.71	44.86	0.32	-71.69	0.22	55.65	1.07	7.41
2.400	0.42	-145.82	1.65	42.67	0.32	-74.76	0.22	55.31	1.06	7.15
2.500	0.43	-143.48	1.59	40.50	0.32	-77.76	0.23	54.82	1.05	6.96
2.600	0.43	-141.09	1.54	38.43	0.32	-80.98	0.24	54.43	1.05	6.74
2.700	0.44	-138.92	1.50	36.38	0.32	-84.11	0.25	54.02	1.04	6.56
2.800	0.45	-136.72	1.46	34.42	0.32	-87.35	0.26	53.50	1.03	6.42
2.900	0.45	-134.69	1.42	32.47	0.31	-90.64	0.27	52.95	1.02	6.31
3.000	0.46	-132.66	1.38	30.58	0.31	-93.92	0.28	52.41	1.01	6.24
3.100	0.47	-130.89	1.35	28.73	0.31	-97.19	0.29	51.85	1.00	6.35
3.200	0.47	-129.12	1.31	26.92	0.32	-100.72	0.30	51.17	0.99	6.45
3.300	0.48	-127.48	1.28	25.16	0.32	-103.97	0.31	50.59	0.98	6.21
3.400	0.48	-125.87	1.25	23.43	0.32	-107.52	0.32	49.80	0.98	5.98
3.500	0.49	-124.41	1.23	21.73	0.32	-110.78	0.33	49.17	0.96	5.75
3.600	0.50	-122.98	1.20	20.08	0.32	-114.26	0.34	48.41	0.96	5.53
3.700	0.50	-121.52	1.18	18.49	0.32	-117.44	0.35	47.56	0.95	5.31
3.800	0.51	-120.14	1.15	16.93	0.33	-120.69	0.36	46.79	0.94	5.11
3.900	0.51	-118.81	1.13	15.44	0.33	-123.76	0.37	46.00	0.93	4.90
4.000	0.52	-117.39	1.11	13.94	0.33	-126.88	0.38	45.16	0.93	4.70

NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS (1)

Parameters	Q1	Parameters	Q1
IS	2.3e-16	MJC	0.28
BF	100.3	XCJC	0.2
NF	0.9917	CJS	0
VAF	31.6	VJS	0.75
IKF	2.2	MJS	0
ISE	3.5e-11	FC	0.7
NE	30	TF	12e-12
BR	13.5	XTF	4
NR	0.9899	VTF	4
VAR	3.9	ITF	0.01
IKR	0.05	PTF	50
ISC	15.4e-12	TR	1.0e-9
NC	30	EG	1.11
RE	1.4	XTB	0
RB	14	XTI	3
RBM	9	KF	0
IRB	0.003	AF	1
RC	1.6		
CJE	1.3e-12		
VJE	0.87		
MJE	0.36		
CJC	0.6e-12		
VJC	0.59		

(1) Gummel-Poon Model

ADDITIONAL PARAMETERS

Parameters	NE58219
CCB	0.03e-12
CCE	0.2e-12
LB	0.75e-9
LE	0.65e-9
CCBPKG	0.17e-12
CCEPKG	0.15e-12
LBX	0.19e-9
LCX	0.7e-9
LEX	0.19e-9

MODEL RANGE

Frequency: 0.05 to 4 GHz
Bias: $V_{CE} = 1\text{ V to }8\text{ V}$, $I_C = 3\text{ mA to }10\text{ mA}$
Date: 2/2002

Life Support Applications
These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

CEL California Eastern Laboratories, Your source for NEC RF, Microwave, Optoelectronic, and Fiber Optic Semiconductor Devices.
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DATA SUBJECT TO CHANGE WITHOUT NOTICE

03/03/03

Subject: Compliance with EU Directives

CEL certifies, to its knowledge, that semiconductor and laser products detailed below are compliant with the requirements of European Union (EU) Directive 2002/95/EC Restriction on Use of Hazardous Substances in electrical and electronic equipment (RoHS) and the requirements of EU Directive 2003/11/EC Restriction on Penta and Octa BDE.

CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)	Concentration contained in CEL devices	
		-A	-AZ
Lead (Pb)	< 1000 PPM	Not Detected	(*)
Mercury	< 1000 PPM	Not Detected	
Cadmium	< 100 PPM	Not Detected	
Hexavalent Chromium	< 1000 PPM	Not Detected	
PBB	< 1000 PPM	Not Detected	
PBDE	< 1000 PPM	Not Detected	

If you should have any additional questions regarding our devices and compliance to environmental standards, please do not hesitate to contact your local representative.

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In no event shall CEL's liability arising out of such information exceed the total purchase price of the CEL part(s) at issue sold by CEL to customer on an annual basis.

See CEL Terms and Conditions for additional clarification of warranties and liability.