NEC®

NPN MEDIUM POWER MICROWAVE TRANSISTOR

NE56900
NE56953E
NE56954
NE56987

FEATURES

- **AMPLIFIER PERFORMANCE:**
  550 mW with 11.5 dB Gain at 2 GHz
  425 mW with 7.5 dB Gain at 4 GHz
- **HIGH OSCILLATOR POWER OUTPUT:**
  500 mW at 2 GHz
  300 mW at 6 GHz
- **LOW DISTORTION**
- **12 VOLT OPERATION**
- **HIGH RELIABILITY**
- **HERMETIC PACKAGES**

DESCRIPTION AND APPLICATIONS

The NE569 NPN silicon transistor is designed for medium power linear amplifiers and oscillators up to 8 GHz.

Ideal for medium power applications, the NE569 is available in three package styles. The NE56987 is a common-collector stripline package for oscillator applications. The NE56953E and NE56954 are designed for medium power Class A amplifiers. The transistor is also available in chip form.

Designed with NEC's advanced Stepped Electrode Transistor Technology (SET), the NE569 provides superior performance and unusually high reliability.

The NE569 transistor is suitable for military, industrial and hi-rel applications and offers the engineer the very best in quality, performance and reliability.

PERFORMANCE CHARACTERISTICS (T_A = 25°C)

PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE			NE56900 00 (CHIP)			NE56953E 2SC2340 53			NE56954 54			NE56987 87		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
f_s	Frequency where $\|S_{21E}\|^2$ = 0 dB	GHz		4.5			4.5			4.5			4.5	
$\|S_{21E}\|^2$	Insertion Gain at V_{CE} = 14 V, I_C = 130 mA, f = 2 GHz	dB		6.5			6.5			6.5				
P_{OSC}	Oscillator Output Power at V_{CE} = 14 V, I_C = 130 mA f = 6 GHz	mW											300	
MAG	Maximum Available Gain[2] at V_{CE} = 14 V, I_C = 130 mA f = 2 GHz	dB		16.5			16.5			16.5				
P_{OUT}	Output Power at V_{CE} = 14 V, I_C = 130 mA P_{IN} = 16 dBm, f = 2 GHz	dB	27	28		27	28		27	28				
G_L	Linear Gain at V_{CE} = 14 V, I_C = 130 mA f = 2 GHz	dB		13			13			13				

Notes:

1. Electronic Industrial Association of Japan.
2. Maximum Available Gain (MAG) is calculated from the device S-Parameters using the equation,

$$MAG = \frac{|S_{21}|}{|S_{12}|}\left(K \pm \sqrt{K^2 - 1}\right) \quad K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{2|S_{12}|\,|S_{21}|} \quad \Delta = S_{11}S_{22} - S_{21}S_{12}$$

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE			NE56900 00 (CHIP)			NE56953E 2SC2340 53			NE56954 54			NE56987 87		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
I_{CBO}	Collector Cutoff Current at V_{CB} = 10 V, I_E = 0	µA			5			5			5			5
I_{EBO}	Emitter Cutoff Current at V_{EB} = 1 V, I_C = 0	µA			10			10			10			10
h_{FE}	Forward Current Gain at V_{CE} = 10 V, I_C = 140 mA		20	50	150	20	50	150	20	50	150	20	50	150
C_{OB}	Output Capacitance[2] at V_{CB} = 10 V, I_E = 0, f = 1 MHz	pF		1.5			1.5			1.5			1.5	
R_{TH}	Thermal Resistance (Junction-to-Case)	°C/W			16			20			20			19
P_T	Total Power Dissipation	W			6			6			6			6

Note:
1. Electronic Industrial Association of Japan.
2. Emitter is grounded.

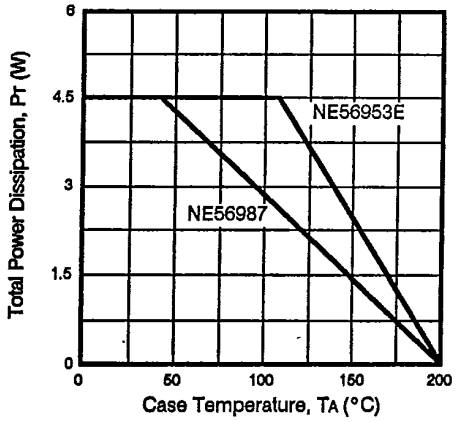
ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CBO}	Collector to Base Voltage	V	30
V_{CEO}*	Collector to Emitter Voltage	V	20
V_{EBO}	Emitter to Base Voltage	V	1.5
I_C	Collector Current	mA	300
T_J	Junction Temperature	°C	200
T_{STG}	Storage Temperature	°C	-65 to +200

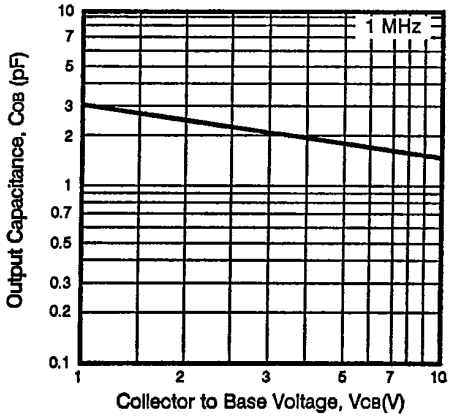
*Minimum V_{CER} = 25 V for $R_{EB} \leq 300\ \Omega$

TYPICAL DEVICE CHARACTERISTICS (T_A = 25°C)

POWER DERATING CURVE

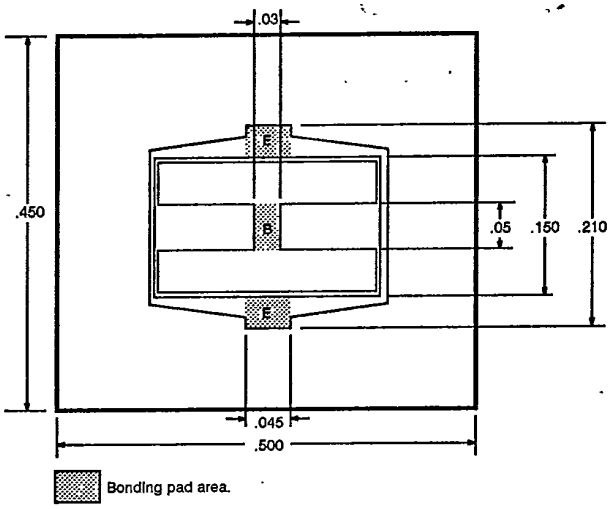


OUTPUT CAPACITANCE vs.
COLLECTOR TO BASE VOLTAGE

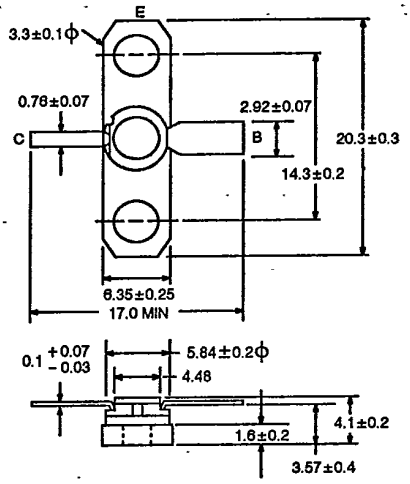


OUTLINE DIMENSIONS (Units in mm)

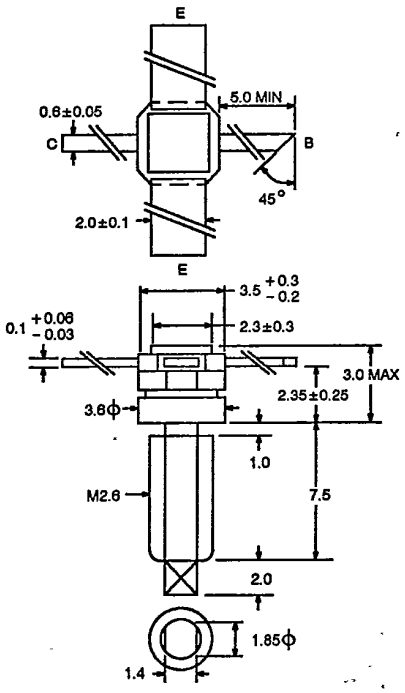
NE56900 (CHIP) (Units in μm)



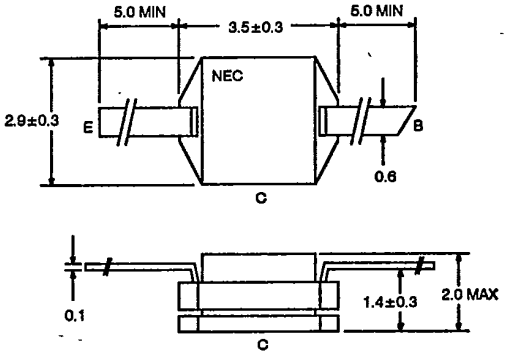
OUTLINE 53



OUTLINE 54

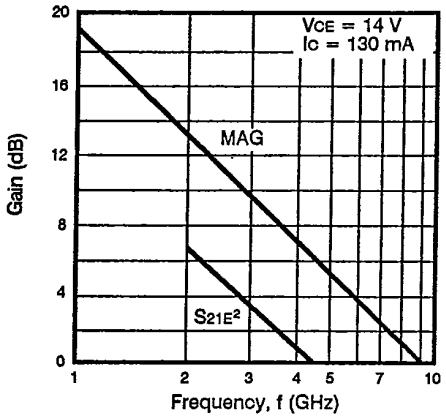


OUTLINE 87

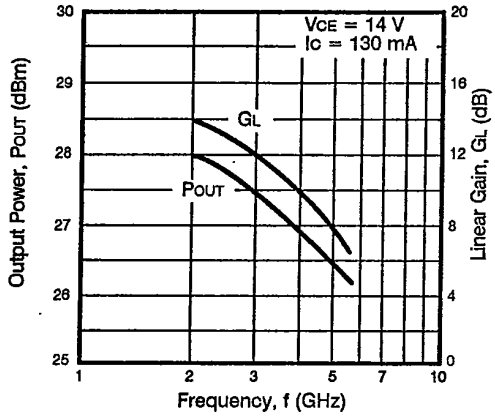


TYPICAL PERFORMANCE CHARACTERISTICS (T_A = 25°C)

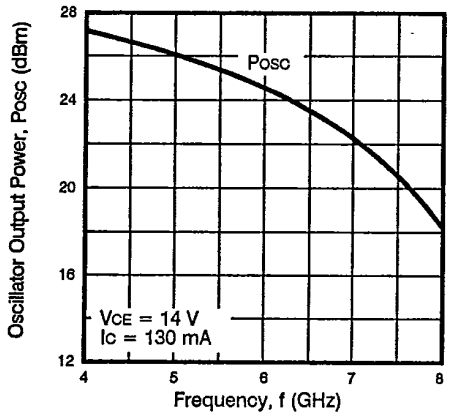
NE56953
INSERTION GAIN AND MAXIMUM AVAILABLE GAIN vs. FREQUENCY



NE56953
OUTPUT POWER AND LINEAR GAIN vs. FREQUENCY

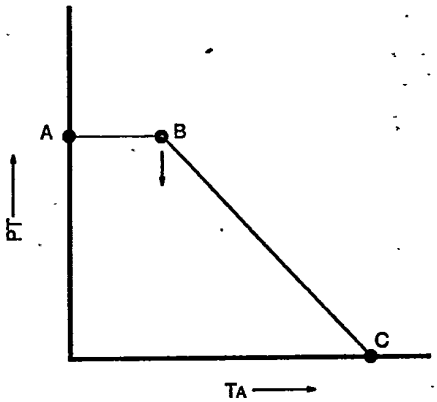


NE56987
OSCILLATOR OUTPUT POWER vs. FREQUENCY



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DERATING CURVE VALUES



PRODUCT	A	B	C
56900	6 W	104°C	200°C
56953	6 W	80°C	200°C
56987	6 W	86°C	200°C
56954	6 W	80°C	200°C

S-MAGN AND ANGLES:
VCE = 14 V IC = 130 mA

FREQUENCY (MHz)	S_{11}		S_{21}		S_{12}		S_{22}	
100	.79	-142	36	116	.02	36	.48	-81
200	.85	-162	19	100	.02	29	.30	-109
500	.87	-178	7	84	.02	36	.22	-140
1000	.86	173	4	70	.04	51	.22	-150
2000	.87	160	2	46	.06	58	.29	-155
3000	.86	150	2	25	.09	56	.38	-164
4000	.87	138	1	7	.12	49	.47	-174
5000	.86	127	1	-9	.15	41	.55	174