

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 (TA = 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 |
| fs | 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 | | | | |
| GL | 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,

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

ELECTRICAL CHARACTERISTICS (TA = 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 |
| ICBO | Collector Cutoff Current at Vcb = 10 V, IE = 0 | μA | | | 5 | | | 5 | | | 5 | | | 5 |
| IEBO | Emitter Cutoff Current at VEB = 1 V, IC = 0 | μA | | | 10 | | | 10 | | | 10 | | | 10 |
| hFE | Forward Current Gain at VCE = 10 V, IC = 140 mA | | 20 | 50 | 150 | 20 | 50 | 150 | 20 | 50 | 150 | 20 | 50 | 150 |
| COB | Output Capacitance ² at Vcb = 10 V, IE = 0, f = 1 MHz | pF | | 1.5 | | | 1.5 | | | 1.5 | | | 1.5 | |
| RTH | Thermal Resistance (Junction-to-Case) | °C/W | | | 16 | | | 20 | | | 20 | | | 19 |
| PT | Total Power Dissipation | W | | | 6 | | | 6 | | | 6 | | | 6 |

Note:

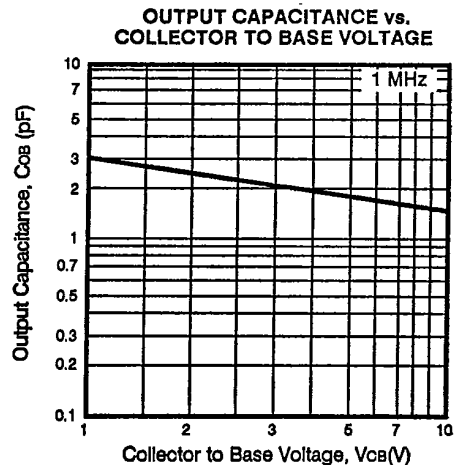
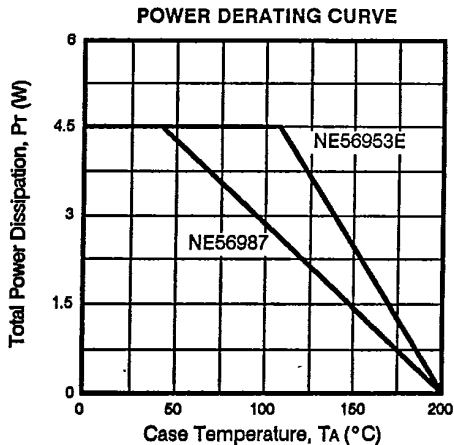
1. Electronic Industrial Association of Japan.
2. Emitter is grounded.

ABSOLUTE MAXIMUM RATINGS (TA = 25°C)

| SYMBOLS | PARAMETERS | UNITS | RATINGS |
|---------|------------------------------|-------|-------------|
| Vcbo | Collector to Base Voltage | V | 30 |
| Vce0* | Collector to Emitter Voltage | V | 20 |
| VEBO | Emitter to Base Voltage | V | 1.5 |
| IC | Collector Current | mA | 300 |
| TJ | Junction Temperature | °C | 200 |
| TSTG | Storage Temperature | °C | -65 to +200 |

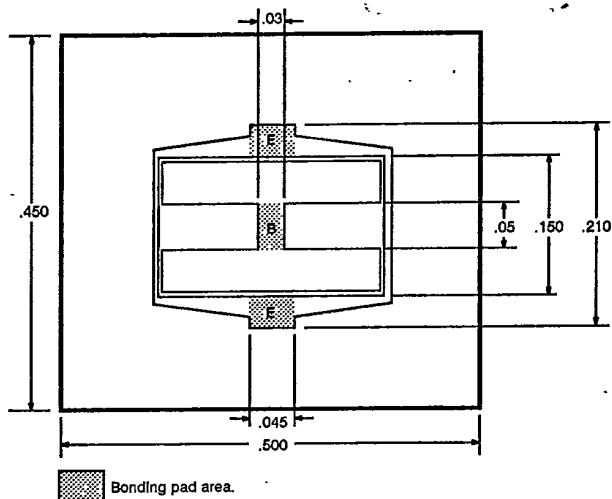
*Minimum VCEB = 25 V for REB ≤ 300 Ω

TYPICAL DEVICE CHARACTERISTICS (TA = 25°C)

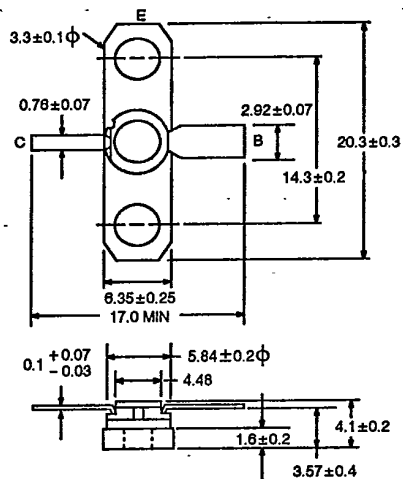


OUTLINE DIMENSIONS (Units in mm)

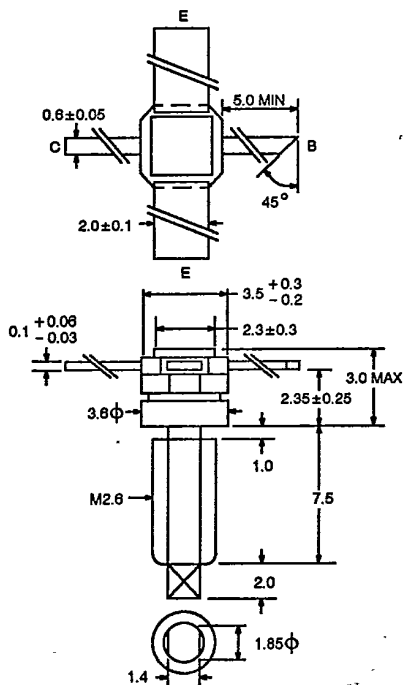
NE56900 (CHIP) (Units in μm)



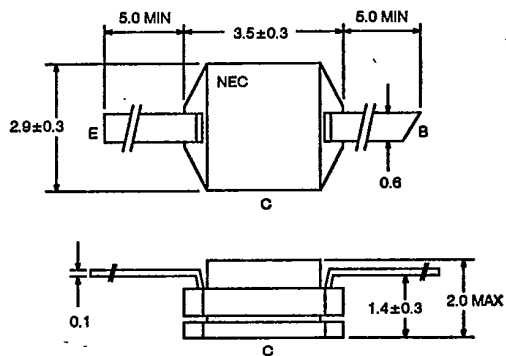
OUTLINE 53



OUTLINE 54

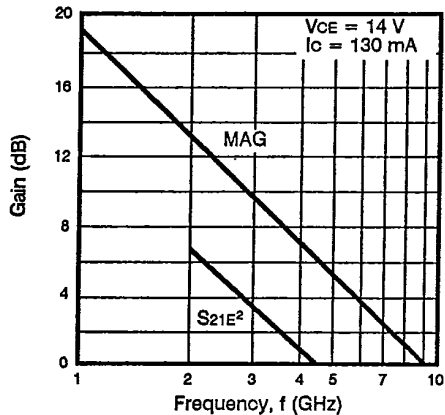


OUTLINE 87

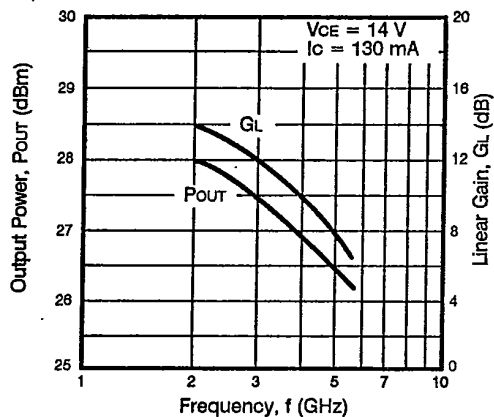


TYPICAL PERFORMANCE CHARACTERISTICS (TA = 25°C)

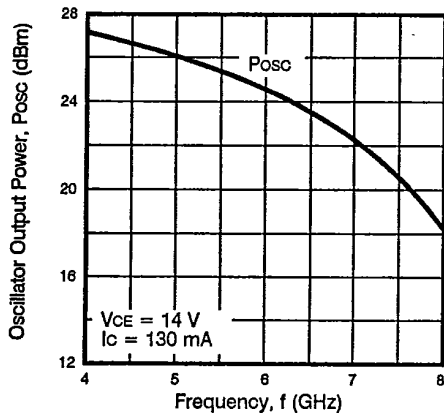
NE56953
INSERTION GAIN AND MAXIMUM AVAILABLE GAIN vs. FREQUENCY



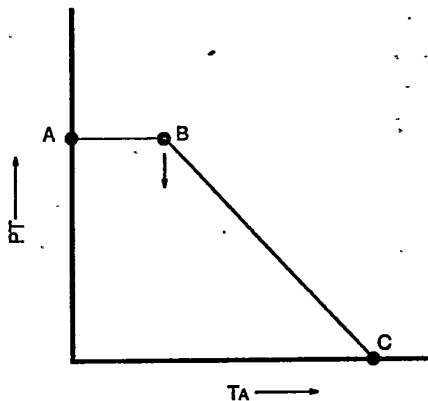
NE56953
OUTPUT POWER AND LINEAR GAIN vs. FREQUENCY



NE56987
OSCILLATOR OUTPUT POWER vs. FREQUENCY



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)

| | S11 | | S21 | | S12 | | S22 | |
|------|-----|------|-----|-----|-----|----|-----|------|
| 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 |