NPN SILICON HIGH FREQUENCY TRANSISTOR

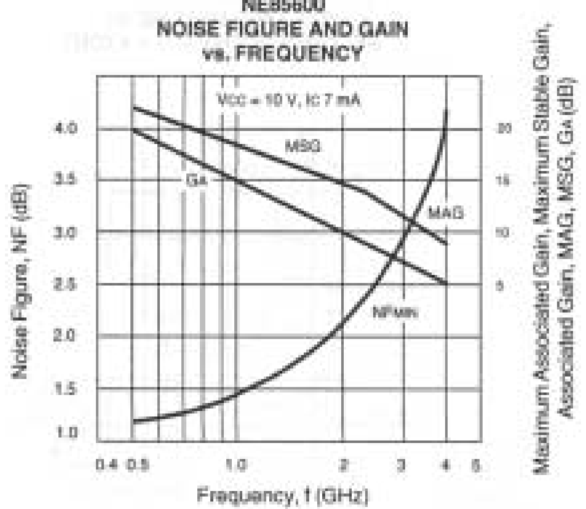
NE856 SERIES

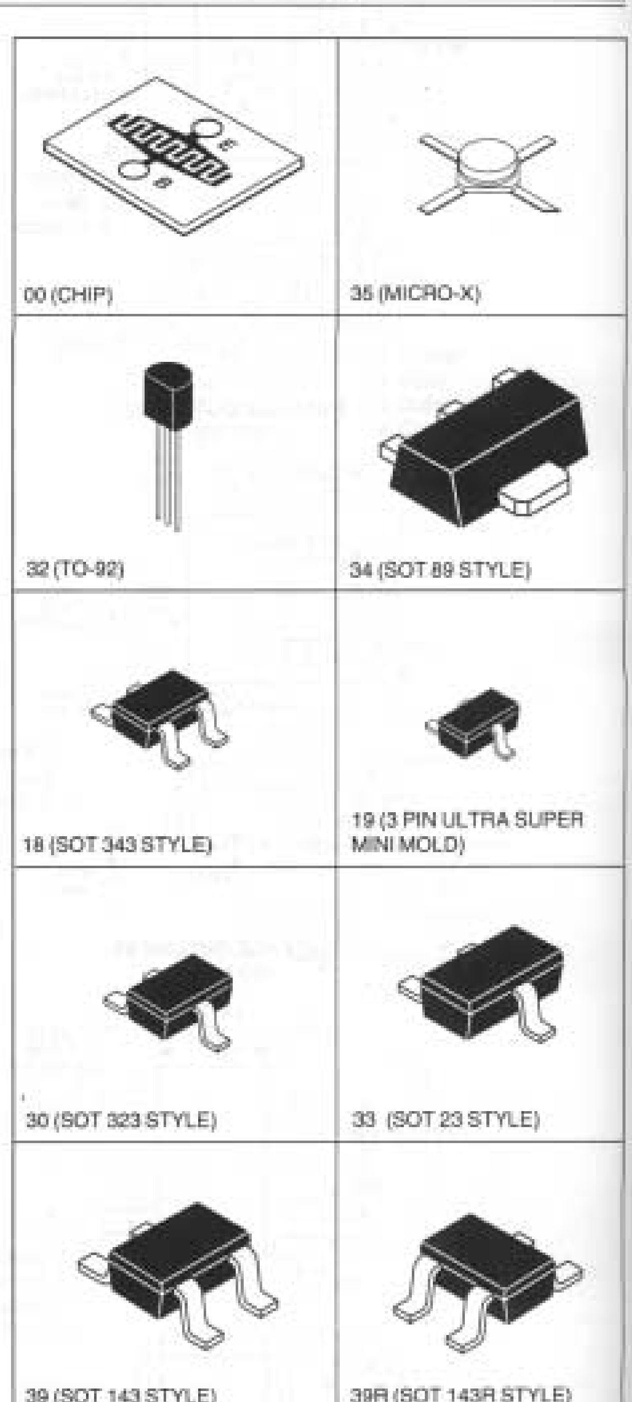
FEATURES

- **HIGH GAIN BANDWIDTH PRODUCT:** f_T = 7 GHz
- **LOW NOISE FIGURE:** 1.1 dB at 1 GHz
- **HIGH COLLECTOR CURRENT:** 100 mA
- **HIGH RELIABILITY METALLIZATION**
- **LOW COST**

DESCRIPTION

The NE856 series of NPN epitaxial silicon transistors is designed for low cost amplifier and oscillator applications. Low noise figures, high gain, and high current capability equate to wide dynamic range and excellent linearity. The NE856 series offers excellent performance and reliability at low cost. This is achieved by NEC's titanium/platinum/gold metallization system and their direct nitride passivated base surface process. The NE856 series is available in chip form and a Micro-x package for high frequency applications. It is also available in 8 different low cost plastic package styles.





Note: Also available in dual chip versions. See part number UPA801T on page 3-151, and UPA810T on page 3-157.

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE			NE85600 00 (CHIP)			NE85618 2SC5011 18			NE85619 2SC5006 19			NE85630 2SC4226 30			NE85632 2SC3355 32		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
f_T	Gain Bandwidth Product at V_{CE} = 10 V, I_C = 20 mA V_{CE} = 3 V, I_C = 7 mA	 GHz GHz		 7.0			 6.5		 3.0	 4.5			 4.5			 6.5	
NF	Noise Figure at V_{CE} = 10 V, I_C = 7 mA, f = 1 GHz V_{CE} = 10 V, I_C = 7 mA, f = 2 GHz	 dB dB		 1.1 2.1			 1.4 2.1			 1.4 2.2			 1.3 2.2			 1.4	
G_A	Associated Gain at V_{CE} = 10 V, I_C = 7 mA, f = 1 GHz f = 2 GHz	 dB dB		 10			 13 7			 12.5 6.5			 12 6			 10	
$\|S_{21E}\|^2$	Insertion Power Gain at V_{CE} = 10 V, I_C = 20 mA, f = 1 GHz f = 2 GHz	 dB dB	 7	 9		 11	 13 7			 12			 12 6			 9.5	
h_{FE}	Forward Current Gain[2] at V_{CE} = 10 V, I_C = 20 mA V_{CE} = 3 V, I_C = 7 mA		 50	 120	 300	 50	 120	 300	 80	 120	 160	 40	 110	 250	 50	 120	 300
I_{CBO}	Collector Cutoff Current at V_{CB} = 15 V, I_E = 0 mA	 µA			 1.0			 1.0			 1.0			 1.0			 1.0
I_{EBO}	Emitter Cutoff Current at V_{EB} = 1 V, I_C = 0 mA	 µA			 1.0			 1.0			 1.0			 1.0			 1.0
C_{re}	Feedback Capacitance[3] at V_{CB} = 3 V, I_E = 0 mA, f = 1 MHz V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	 pF pF		 0.5	 1.0		 0.5	 0.9		 0.7	 1.5		 0.7	 1.5		 0.65	 1.0
P_T	Total Power Dissipation	mW			700			150			100			150			600
$R_{TH(J-A)}$	Thermal Resistance (J-A)	°C/W						833			1000			833			210

ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE			NE85633 2SC3356 33			NE85634 2SC3357 34			NE85635 2SC3603 35			NE85639/39R 2SC4093 39		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX
f_T	Gain Bandwidth Product at V_{CE} = 10 V, I_C = 20 mA	 GHz		 7.0			 6.5			 7.0			 9.0	
NF	Noise Figure at V_{CE} = 10 V, I_C = 7 mA, f = 1 GHz f = 2 GHz	 dB dB		 1.4	 2.0		 1.4			 2.1	 3.4		 1.5	 2.1
G_A	Associated Gain at V_{CE} = 10 V, I_C = 7 mA, f = 1 GHz f = 2 GHz	 dB dB		 9						 10			 13.5 8.5	
$\|S_{21E}\|^2$	Insertion Power Gain at V_{CE} = 10 V, I_C = 20 mA, f = 1 GHz f = 2 GHz	 dB dB		 11.5			 9.5		 7	 9			 13 7	
h_{FE}	Forward Current Gain[2] at V_{CE} = 10 V, I_C = 20 mA		 50	 120	 300	 50	 120	 300	 50	 120	 300	 50	 120	 300
I_{CBO}	Collector Cutoff Current at V_{CB} = 15 V, I_E = 0 mA	 µA			 1.0			 1.0			 1.0			 1.0
I_{EBO}	Emitter Cutoff Current at V_{EB} = 1 V, I_C = 0 mA	 µA			 1.0			 1.0			 1.0			 1.0
C_{re}	Feedback Capacitance[3] at V_{CB} = 10 V, I_E = 0 mA, f = 1 MHz	 pF		 0.55	 1.0		 0.65	 1.0		 0.5	 1.0		 0.5	 0.9
P_T	Total Power Dissipation	mW			200			2000[4]			580			200
$R_{TH(J-A)}$	Thermal Resistance (J to A)	°C/W			625			62.5[4]			590			500

Notes:
1. Electronic Industrial Association of Japan.
2. Pulse width ≤ 350 µs, duty cycle ≤ 2% pulsed.
3. C_{re} measurement employs a three terminal capacitance bridge incorporating a guard circuit. The emitter terminal shall be connected to the guard terminal.
4. With 2.5 cm² x 0.7 mm ceramic substrate (infinite heatsink).

ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°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	3.0
I_C	Collector Current	mA	100
T_J	Junction Temperature	°C	150[2]
T_{STG}	Storage Temperature	°C	-65 to +150

Notes:
1. Operation in excess of any one of these parameters may result in permanent damage.
2. Maximum T_J for the NE85600 and NE85635 is 200°C.

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

NE85633 AND NE85635 TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE

Total Power Dissipation, P_T (mW): 0, 100, 200, 300, 400

NE85635

NE85633

Ambient Temperature, T_A (°C): 0, 50, 100, 150, 200