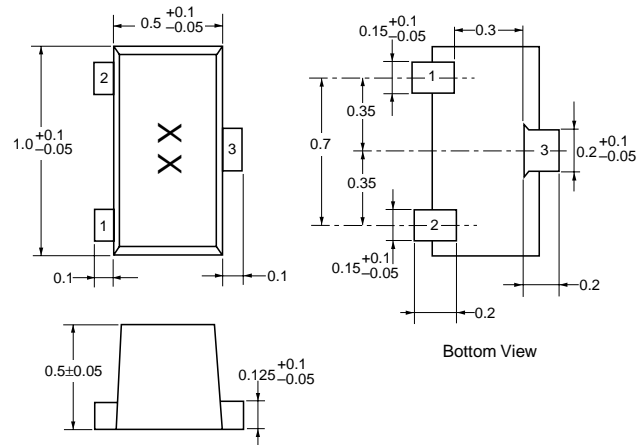


**NEC****NPN SILICON TRANSISTOR****NE688M13****FEATURES**

- **NEW MINIATURE M13 PACKAGE:**
  - Small transistor outline –  
1.0 X 0.5 X 0.5 mm
  - Low profile / 0.50 mm package height
  - Flat lead style for better RF performance
- **HIGH GAIN BANDWIDTH PRODUCT:**  
 $f_T = 9.5$  GHz
- **LOW NOISE FIGURE:**  
NF = 1.7 dB at 2 GHz
- **HIGH COLLECTOR CURRENT:**  
 $I_C \text{ MAX} = 100$  mA

**DESCRIPTION**

The NE688M13 transistor is designed for low cost amplifier and oscillator applications. Low noise figure, high gain and high current capability equate to wide dynamic range and excellent linearity. NEC's new low profile/flat lead style "M13" package is ideal for today's portable wireless applications. The NE688 is also available in chip and six different low cost plastic surface mount package styles.

**OUTLINE DIMENSIONS** (Units in mm)**PACKAGE OUTLINE M13****PIN CONNECTIONS**

1. Emitter
2. Base
3. Collector

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

PART NUMBER EIAJ <sup>1</sup> REGISTERED NUMBER PACKAGE OUTLINE		NE688M13 2SC5616 M13			
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
$f_T$	Gain Bandwidth at $V_{CE} = 1$ V, $I_C = 3$ mA, $f = 2$ GHz $V_{CE} = 3$ V, $I_C = 20$ mA, $f = 2$ GHz	GHz	4	5	
		GHz		9.5	
NF	Noise Figure at $V_{CE} = 1$ V, $I_C = 3$ mA, $f = 2$ GHz $V_{CE} = 3$ V, $I_C = 7$ mA, $f = 2$ GHz	dB		1.9	2.5
		dB		1.7	
$ S_{21E} ^2$	Insertion Power Gain at $V_{CE} = 1$ V, $I_C = 3$ mA, $f = 2$ GHz $V_{CE} = 3$ V, $I_C = 20$ mA, $f = 2$ GHz	dB	3	4	
		dB		8	
$h_{FE}^2$	Forward Current Gain at $V_{CE} = 1$ V, $I_C = 3$ mA		80		145
$I_{CBO}$	Collector Cutoff Current at $V_{CB} = 5$ V, $I_E = 0$	$\mu\text{A}$			0.1
$I_{EBO}$	Emitter Cutoff Current at $V_{EB} = 1$ V, $I_C = 0$	$\mu\text{A}$			0.1
$C_{RE}^3$	Feedback Capacitance at $V_{CB} = 1$ V, $I_E = 0$ , $f = 1$ MHz	pF		0.7	0.8

**Notes:**

1. Electronic Industrial Association of Japan.
2. Pulsed measurement, pulse width  $\leq 350$   $\mu\text{s}$ , duty cycle  $\leq 2\%$ .
3. Capacitance is measured with emitter and case connected to the guard terminal at the bridge.

**ABSOLUTE MAXIMUM RATINGS<sup>1</sup>** (T<sub>A</sub> = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V <sub>CBO</sub>	Collector to Base Voltage	V	9
V <sub>CEO</sub>	Collector to Emitter Voltage	V	6
V <sub>EB0</sub>	Emitter to Base Voltage	V	2
I <sub>C</sub>	Collector Current	mA	100
P <sub>T</sub> <sup>2</sup>	Total Power Dissipation	mW	140
T <sub>J</sub>	Junction Temperature	°C	150
T <sub>STG</sub>	Storage Temperature	°C	-65 to +150

Notes:

1. Operation in excess of any one of these parameters may result in permanent damage.
2. With device mounted on 1.08 cm<sup>2</sup> X 1.2 mm glass epoxy board.

**TYPICAL PERFORMANCE CURVES** (T<sub>A</sub> = 25°C)

