

FEATURES

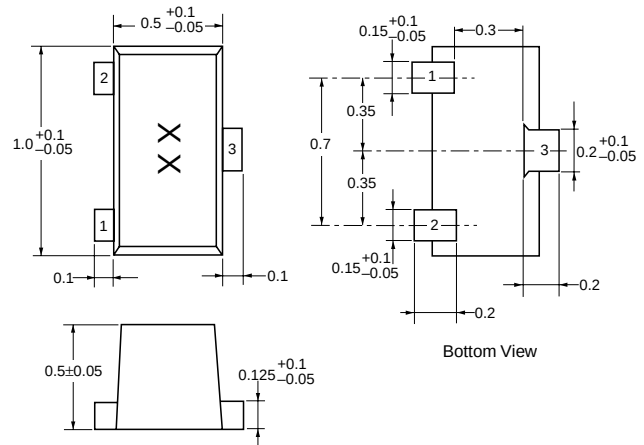
- **NEW MINIATURE M13 PACKAGE:**
 - Small transistor outline –
1.0 X 0.5 X 0.5 mm
 - Low profile / 0.50 mm package height
 - Flat lead style for better RF performance
- **HIGH GAIN BANDWIDTH PRODUCT:**
 $f_T = 9.5 \text{ GHz}$
- **LOW NOISE FIGURE:**
 $NF = 1.7 \text{ dB at } 2 \text{ GHz}$
- **HIGH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

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 ¹ REGISTERED NUMBER PACKAGE OUTLINE		NE688M13 2SC5616 M13			
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
f_T	Gain Bandwidth at $V_{CE} = 1 \text{ V}$, $I_C = 3 \text{ mA}$, $f = 2 \text{ GHz}$ $V_{CE} = 3 \text{ V}$, $I_C = 20 \text{ mA}$, $f = 2 \text{ GHz}$	GHz	4	5	
		GHz		9.5	
NF	Noise Figure at $V_{CE} = 1 \text{ V}$, $I_C = 3 \text{ mA}$, $f = 2 \text{ GHz}$ $V_{CE} = 3 \text{ V}$, $I_C = 7 \text{ mA}$, $f = 2 \text{ GHz}$	dB		1.9	2.5
		dB		1.7	
$ S_{21E} ^2$	Insertion Power Gain at $V_{CE} = 1 \text{ V}$, $I_C = 3 \text{ mA}$, $f = 2 \text{ GHz}$ $V_{CE} = 3 \text{ V}$, $I_C = 20 \text{ mA}$, $f = 2 \text{ GHz}$	dB	3	4	
		dB		8	
h_{FE}^2	Forward Current Gain at $V_{CE} = 1 \text{ V}$, $I_C = 3 \text{ mA}$		80		145
I_{CBO}	Collector Cutoff Current at $V_{CB} = 5 \text{ V}$, $I_E = 0$	μA			0.1
I_{EBO}	Emitter Cutoff Current at $V_{EB} = 1 \text{ V}$, $I_C = 0$	μA			0.1
C_{RE}^3	Feedback Capacitance at $V_{CB} = 1 \text{ V}$, $I_E = 0$, $f = 1 \text{ MHz}$	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 RATINGS¹ (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CBO}	Collector to Base Voltage	V	9
V _{CEO}	Collector to Emitter Voltage	V	6
V _{EB0}	Emitter to Base Voltage	V	2
I _C	Collector Current	mA	100
P _T ²	Total Power Dissipation	mW	140
T _J	Junction Temperature	°C	150
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. With device mounted on 1.08 cm² X 1.2 mm glass epoxy board.

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

