PRELIMINARY DATA SHEET

NEC

NPN SILICON TRANSISTOR | NE688M13

FEATURES

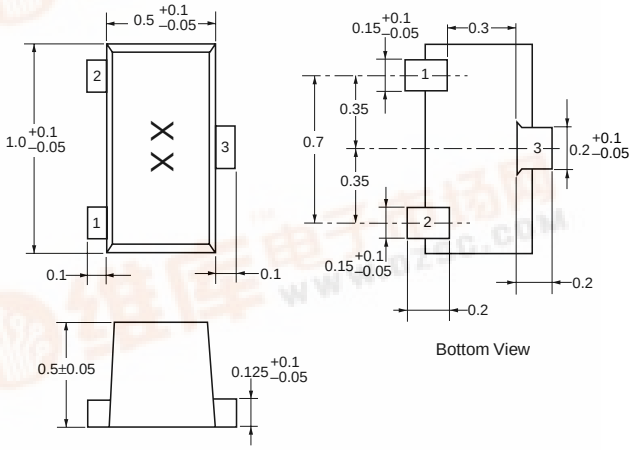
- **NEW MINIATURE M13 PACKAGE:**
  - Small transistor outline – 1.0 X 0.5 X 0.5 mm
  - Low profile / 0.50 mm package height
  - Flat lead style for better RF performance
- **HIGH GAIN BANDWIDTH PRODUCT:** f_T = 9.5 GHz
- **LOW NOISE FIGURE:** NF = 1.7 dB at 2 GHz
- **HIGH COLLECTOR CURRENT:** I_C MAX = 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°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 V, I_C = 3 mA, f = 2 GHz	GHz	4	5	
	V_{CE} = 3 V, I_C = 20 mA, f = 2 GHz	GHz		9.5	
NF	Noise Figure at V_{CE} = 1 V, I_C = 3 mA, f = 2 GHz	dB		1.9	2.5
	V_{CE} = 3 V, I_C = 7 mA, f = 2 GHz	dB		1.7	
$\|S_{21E}\|^2$	Insertion Power Gain at V_{CE} = 1 V, I_C = 3 mA, f = 2 GHz	dB	3	4	
	V_{CE} = 3 V, I_C = 20 mA, f = 2 GHz	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	µA			0.1
I_{EBO}	Emitter Cutoff Current at V_{EB} = 1 V, I_C = 0	µA			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 ≤ 350 µs, duty cycle ≤ 2 %.
3. Capacitance is measured with emitter and case connected to the guard terminal at the bridge.

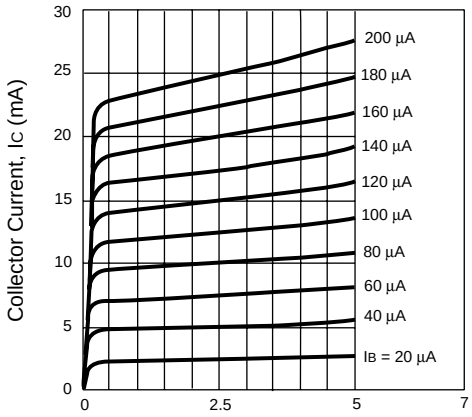
ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CBO}	Collector to Base Voltage	V	9
V_{CEO}	Collector to Emitter Voltage	V	6
V_{EBO}	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 cm^2 X 1.2 mm glass epoxy board.

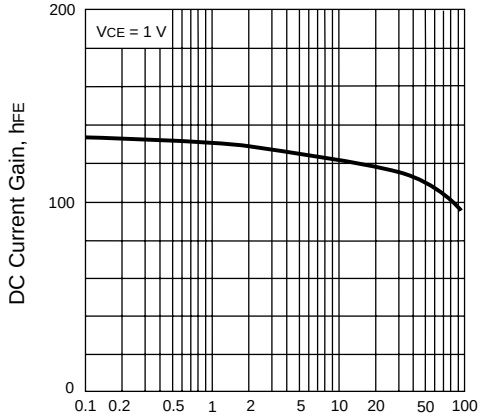
TYPICAL PERFORMANCE CURVES (T_A = 25°C)

COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



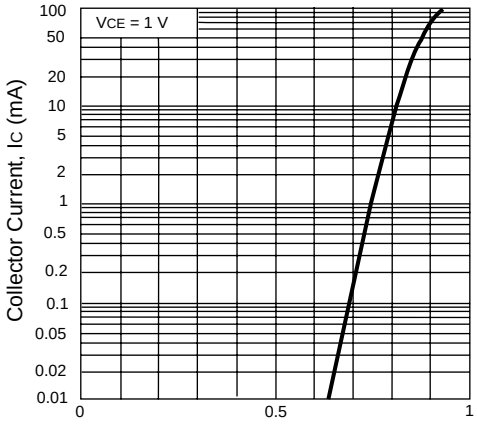
Collector to Emmiter Voltage, V_{CE} (V)

D.C. CURRENT GAIN vs. COLLECTOR CURRENT



Collector Current, I_C (mA)

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



Base to Emmiter Voltage, V_{BE} (V)