PRELIMINARY DATA SHEET

NEC

NPN SILICON TRANSISTOR | NE680M03

FEATURES

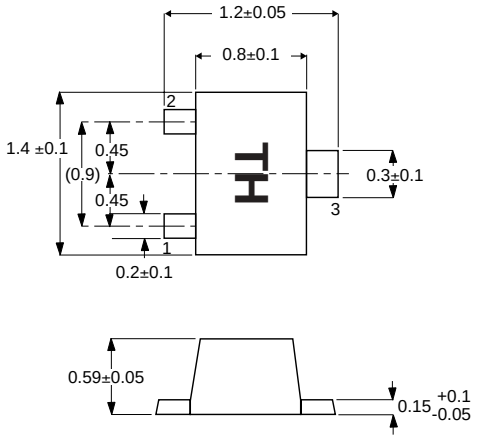
- **NEW M03 PACKAGE:**
  - Smallest transistor outline package available
  - Low profile/0.59 mm package height
  - Flat lead style for better RF performance
- **HIGH GAIN BANDWIDTH PRODUCT:**
  f_T = 8 GHz
- **LOW NOISE FIGURE:**
  NF = 1.9 dB at 2 GHz

DESCRIPTION

The NE680M03 transistor is designed for low noise, high gain, and low cost applications. This high f_T part is ideal for low voltage/low current applications. NEC's new low profile/flat lead style "M03" package is ideal for today's portable wireless applications. The NE680 is also available in chip, Micro-x, and six different low cost plastic surface mount package styles.

OUTLINE DIMENSIONS (Units in mm)

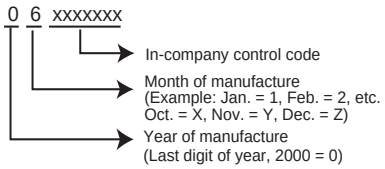
PACKAGE OUTLINE M03



Note:
1. This dimension was changed effective 04/2000 from 1.4 mm to 1.2 mm. Products with "04" or a higher number indicated for month of manufacture in lot numbers have the new dimension.

PIN CONNECTIONS
1. Emitter
2. Base
3. Collector

Example of Lot No. Identification



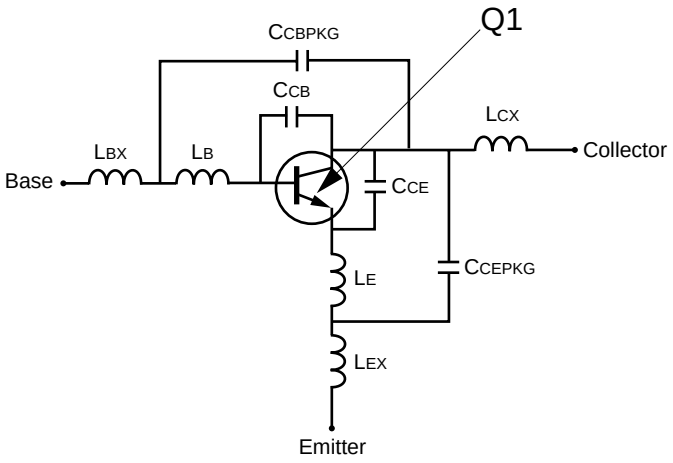
ELECTRICAL CHARACTERISTICS (T_A = 25°C)

PART NUMBER EIAJ[1] REGISTERED NUMBER PACKAGE OUTLINE		NE680M03 2SC5434 M03			
SYMBOLS	**PARAMETERS AND CONDITIONS**	**UNITS**	**MIN**	**TYP**	**MAX**
f_T	Gain Bandwidth at V_{CE} = 3 V, I_C = 5 mA, f = 2 GHz	GHz	5.5	8.0	
NF	Noise Figure at V_{CE} = 3 V, I_C = 6 mA, f = 2 GHz	dB		1.9	3.2
$\|S_{21E}\|^2$	Insertion Power Gain at V_{CE} = 3 V, I_C = 5 mA, f = 2 GHz	dB	5.5	7.5	
h_{FE}[2]	Forward Current Gain at V_{CE} = 3 V, I_C = 5 mA		80		145
I_{CBO}	Collector Cutoff Current at V_{CB} = 10 V, I_E = 0	μA			1.0
I_{EBO}	Emitter Cutoff Current at V_{EB} = 1 V, I_C = 0	μA			1.0
C_{RE}[3]	Feedback Capacitance at V_{CB} = 3 V, I_E = 0, f = 1 MHz	pF		0.3	0.7

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.

NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS (1)

Parameters	Q1	Parameters	Q1
IS	5.98e-16	MJC	0.15
BF	179	XCJC	1
NF	1.04	CJS	0
VAF	17	VJS	0.75
IKF	0.02	MJS	0
ISE	1.0e-6	FC	0.5
NE	30	TF	8.7e-12
BR	16	XTF	20
NR	1.04	VTF	0.3
VAR	100	ITF	0.04
IKR	6.85e-3	PTF	120
ISC	1.5e-9	TR	0.635e-9
NC	20	EG	1.11
RE	0.50	XTB	0
RB	8.54	XTI	3
RBM	2	KF	0
IRB	4e-4	AF	1
RC	10		
CJE	0.358e-12		
VJE	0.86		
MJE	0.5		
CJC	0.162e-12		
VJC	0.52		

(1) Gummel-Poon Model

UNITS

Parameter	Units
time	seconds
capacitance	farads
inductance	henries
resistance	ohms
voltage	volts
current	amps

ADDITIONAL PARAMETERS

Parameters	680M03
C_{CB}	0.08e-12
C_{CE}	0.08e-12
L_B	0.4e-9
L_E	0.8e-9
C_{CBPKG}	0.08e-12
C_{CEPKG}	0.08e-12
L_{BX}	0.12e-9
L_{CX}	0.10e-9
L_{EX}	0.12e-9

MODEL RANGE

Frequency: 0.1 to 3.0 GHz

Bias: V_{CE} = 0.5 V to 6 V, I_C = 0.5 mA to 15 mA

Date: 11/98

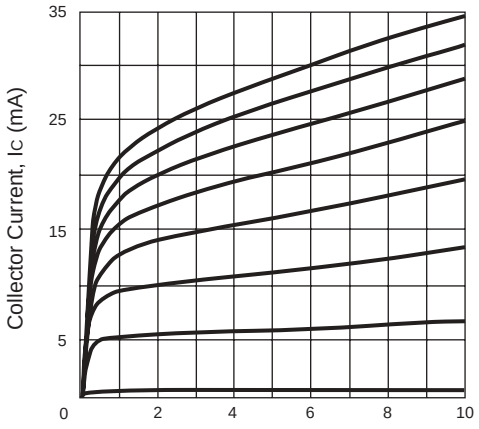
ABSOLUTE MAXIMUM RATINGS[1] (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V_{CBO}	Collector to Base Voltage	V	20
V_{CEO}	Collector to Emitter Voltage	V	10
V_{EBO}	Emitter to Base Voltage	V	1.5
I_C	Collector Current	mA	35
P_T	Total Power Dissipation	mW	125
T_J	Junction Temperature	°C	150
T_{STG}	Storage Temperature	°C	-65 to +150

Note:
1. Operation in excess of any one of these parameters may result in permanent damage.

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE



FORWARD CURRENT GAIN vs. COLECTOR CURRENT