

PRELIMINARY DATA SHEET

NEC

NPN SILICON TRANSISTOR

NE680M03

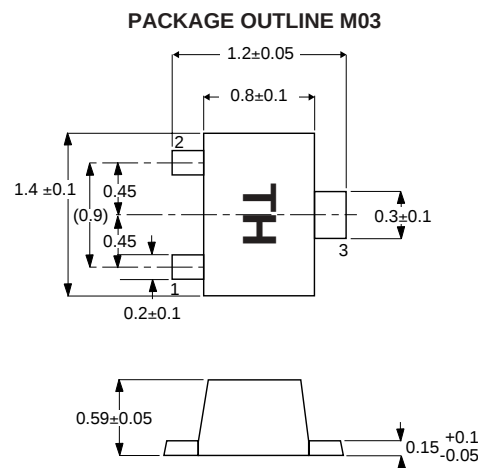
FEATURES

- **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:**
 $f_T = 8 \text{ GHz}$
- **LOW NOISE FIGURE:**
 $NF = 1.9 \text{ dB at } 2 \text{ GHz}$

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)



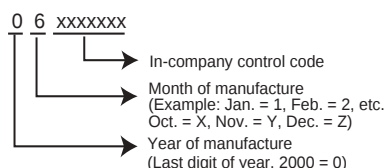
Note:

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

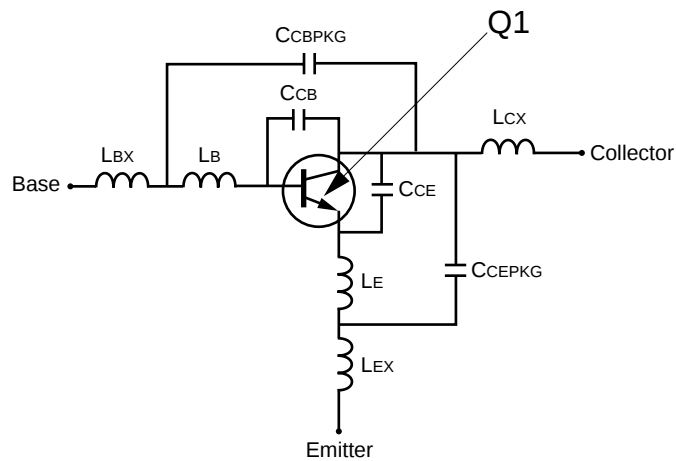
PART NUMBER EIAJ ¹ REGISTERED NUMBER PACKAGE OUTLINE		NE680M03 2SC5434 M03			
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
f_T	Gain Bandwidth at $V_{CE} = 3 \text{ V}$, $I_C = 5 \text{ mA}$, $f = 2 \text{ GHz}$	GHz	5.5	8.0	
NF	Noise Figure at $V_{CE} = 3 \text{ V}$, $I_C = 6 \text{ mA}$, $f =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

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.

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		

UNITS

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

ADDITIONAL PARAMETERS

Parameters	680M03
CCB	0.08e-12
CCE	0.08e-12
LB	0.4e-9
LE	0.8e-9
CCBPKG	0.08e-12
CCEPKG	0.08e-12
LBX	0.12e-9
LCX	0.10e-9
LEX	0.12e-9

MODEL RANGE

Frequency: 0.1 to 3.0 GHz
Bias: VCE = 0.5 V to 6 V, IC = 0.5 mA to 15 mA
Date: 11/98

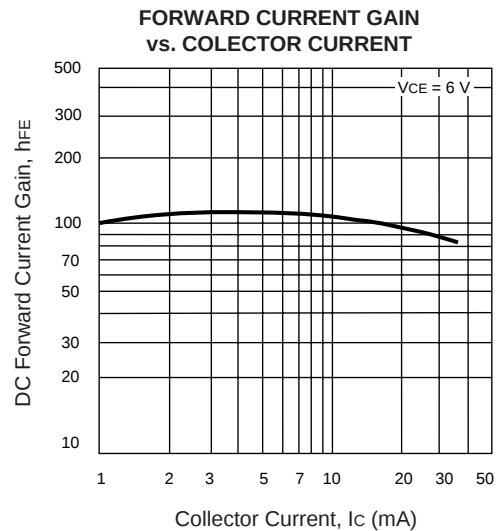
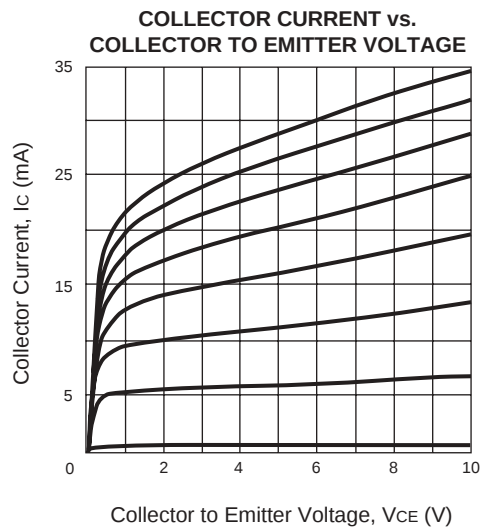
(1) Gummel-Poon Model

ABSOLUTE MAXIMUM RATINGS¹ ($T_A = 25^\circ\text{C}$)

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	$^\circ\text{C}$	150
T_{STG}	Storage Temperature	$^\circ\text{C}$	-65 to +150

Note:

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

TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$)

Life Support Applications

These NEC products are not intended for use in life support devices, appliances, or systems where the malfunction of these products can reasonably be expected to result in personal injury. The customers of CEL using or selling these products for use in such applications do so at their own risk and agree to fully indemnify CEL for all damages resulting from such improper use or sale.

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