

FEATURES

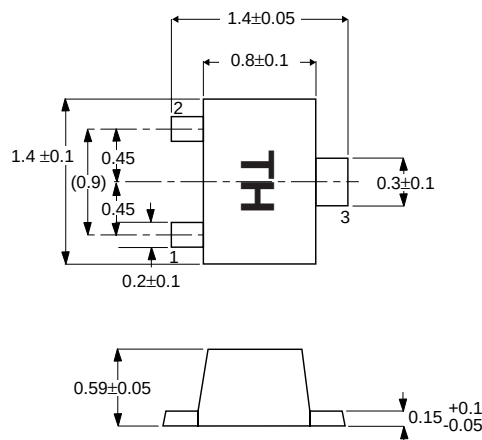
- **NEW M03 PACKAGE:**
 - Smallest transistor outline package available
 - Low profile/0.59 mm package height
 - Flat lead style for better RF performance
- **HIGH GAIN BANDWIDTH PRODUCT:**
 $f_T = 8 \text{ GHz}$
- **LOW NOISE FIGURE:**
 $NF = 1.9 \text{ dB at } 2 \text{ GHz}$

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)

PACKAGE OUTLINE M03



PIN CONNECTIONS

1. Emitter
2. Base
3. Collector

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

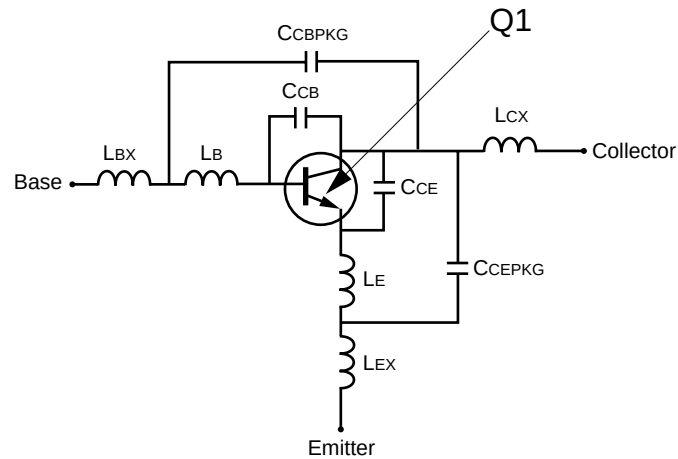
PART NUMBER EIAJ ¹ REGISTERED NUMBER PACKAGE OUTLINE		NE680M03 2SC5434 M03			
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
f_T	Gain Bandwidth at $V_{CE} = 3 \text{ V}$, $I_C = 5 \text{ mA}$, $f = 2 \text{ GHz}$	GHz	5.5	8.0	
NF	Noise Figure at $V_{CE} = 3 \text{ V}$, $I_C = 6 \text{ mA}$, $f = 2 \text{ GHz}$	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
CRE^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

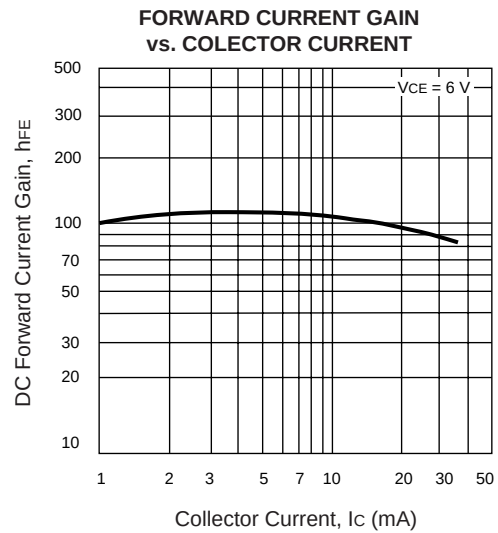
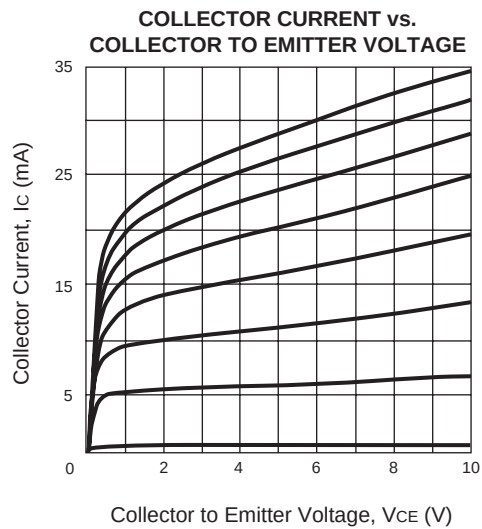
(1) Gummel-Poon Model

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

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