

NEC's NPN SILICON TRANSISTOR

NE687M03

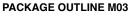
FEATURES

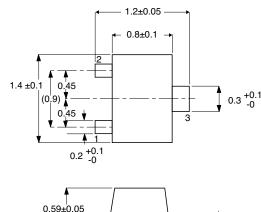
- NEW M03 PACKAGE:
 - · Smallest transistor outline package available
 - · Low profile/0.59 mm package height
 - Flat lead style for better RF performance
- HIGH GAIN BANDWIDTH PRODUCT: ft = 14 GHz
- LOW NOISE FIGURE:
 NF = 1.4 dB at 2 GHz

DESCRIPTION

NEC's NE687M03 transistor is designed for low noise, high gain, and low cost requirements. This high fT part is well suited for very low voltage/low current designs for portable wireless communications and cellular radio applications. NEC's new low profile/flat lead style "M03" package is ideal for today's portable wireless applications. The NE687 is also available in six different low cost plastic surface mount package styles.

OUTLINE DIMENSIONS (Units in mm)





PIN CONNECTIONS

- 1. Emitter
- 2. Base
- 3. Collector

ELECTRICAL CHARACTERISTICS (TA = 25°C)

PART NUMBER EIAJ¹ REGISTERED NUMBER PACKAGE OUTLINE		NE687M03 2SC5436 M03			
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX
fτ	Gain Bandwidth at VcE = 2 V, Ic = 20 mA, f = 2 GHz	GHz	9	14	
	VcE = 1 V, Ic = 10 mA, f = 2 GHz	GHz	7	12	
NF	Noise Figure at $VCE = 2 \text{ V}$, $IC = 3 \text{ mA}$, $f = 2 \text{ GHz}$	dB		1.3	2
	Vce = 1 V, Ic = 3 mA, f = 2 GHz	dB		1.3	2
IS21El ²	Insertion Power Gain at VcE = 2 V, Ic = 20 mA, f = 2 GHz	dB	8.5	10	
	Vce = 1 V, lc = 10 mA, f = 2 GHz	dB	6	9.0	
hFE ²	Forward Current Gain at VcE = 2 V, Ic = 20 mA		70		130
Ісво	Collector Cutoff Current at VcB = 5 V, IE = 0	μА			0.1
Ієво	Emitter Cutoff Current at VEB = 1 V, IC = 0	μА			0.1
CRE ³	Feedback Capacitance at VcB = 2 V, IE = 0, f = 1 MHz	pF		0.4	0.8

Notes:

- 1. Electronic Industrial Association of Japan.
- 2. Pulsed measurement, pulse width \leq 350 μ s, duty cycle \leq 2 %.
- 3. Capacitance is measured with emitter and case connected to the guard terminal at the bridge.

ABSOLUTE MAXIMUM RATINGS¹ (TA = 25°C)

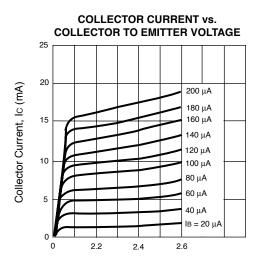
SYMBOLS	PARAMETERS	UNITS	RATINGS
Vсво	Collector to Base Voltage	٧	5
VCEO	Collector to Emitter Voltage	V	3
VEBO	Emitter to Base Voltage	٧	2
Ic	Collector Current	mA	30
Рт	Total Power Dissipation	mW	90
TJ	Junction Temperature	°C	150
Тѕтс	Storage Temperature	°C	-65 to +150

Note:

ORDERING INFORMATION

PART NUMBER	QUANTITY
NE687M03-A	
NE687M03-T1-A	

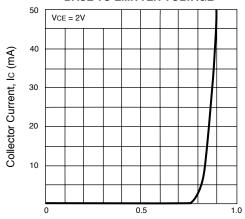
TYPICAL PERFORMANCE CURVES (TA = 25°C)



Collector to Emmiter Voltage, VCE (V)

Collector Current, Ic (mA)

COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

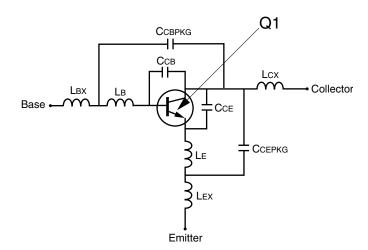


Base to Emmiter Voltage, VBE (V)

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

NE687M03 NONLINEAR MODEL

SCHEMATIC



BJT NONLINEAR MODEL PARAMETERS(1)

Parameters	Q1	Parameters	Q1
IS	302.3e-18	MJC	0.53
BF	104	XCJC	0.27
NF	1.038	CJS	0
VAF	10	VJS	0.75
IKF	0.370	MJS	0
ISE	1e-6	FC	0.37
NE	31.19	TF	5e-12
BR	17.54	XTF	8
NR	1.023	VTF	0.06
VAR	30	ITF	1.0
IKR	8.369e-3	PTF	69.1
ISC	81.93e-12	TR	1.e-9
NC	4.986	EG	1.11
RE	0.80	XTB	0
RB	11.10	XTI	3
RBM	2.46	KF	0
IRB	17e-3	AF	1
RC	4.477		
CJE	0.415e-12		
VJE	0.68		
MJE	0.53		
CJC	0.102e-12		
VJC	0.8		

UNITS

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

ADDITIONAL PARAMETERS

Parameters	687M03
Ссв	0.26e-12
CCE	0.19e-12
LB	0.4e-9
LE	0.7e-9
Ссврка	0.08e-12
Ссерка	0.08e-12
LBX	0.12e-9
Lcx	0.10e-9
LEX	0.12e-9

MODEL TEST CONDITIONS

Frequency: 0.1 to 5.0 GHz

Bias: VCE = 0.5 V to 2.5 V, IC = 0.5 mA to 30 mA

Date: 11/98 hFE = 108 at 2 V, 20 mA

(1) Gummel-Poon Model

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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Subject: Compliance with EU Directives

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CEL Pb-free products have the same base part number with a suffix added. The suffix –A indicates that the device is Pb-free. The –AZ suffix is used to designate devices containing Pb which are exempted from the requirement of RoHS directive (*). In all cases the devices have Pb-free terminals. All devices with these suffixes meet the requirements of the RoHS directive.

This status is based on CEL's understanding of the EU Directives and knowledge of the materials that go into its products as of the date of disclosure of this information.

Restricted Substance per RoHS	Concentration Limit per RoHS (values are not yet fixed)		ation contained EL devices	
Lead (Pb)	< 1000 PPM	-A Not Detected	-AZ (*)	
Mercury	< 1000 PPM	Not Detected		
Cadmium	< 100 PPM	Not Detected		
Hexavalent Chromium < 1000 PPM Not		Not De	Detected	
PBB	< 1000 PPM	Not Detected		
PBDE	< 1000 PPM Not Detected		etected	

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