

To our customers,

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## Old Company Name in Catalogs and Other Documents

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On April 1<sup>st</sup>, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: <http://www.renesas.com>

April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (<http://www.renesas.com>)

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NPN SILICON RF TRANSISTOR  
**2SC5507**

NPN SILICON RF TRANSISTOR  
 FOR LOW CURRENT, LOW-NOISE, HIGH-GAIN AMPLIFICATION  
 FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M04)

**FEATURES**

- Low noise and high gain with low collector current
- $NF = 1.2 \text{ dB TYP.}$ ,  $G_a = 16 \text{ dB TYP.}$  @  $V_{CE} = 2 \text{ V}$ ,  $I_c = 2 \text{ mA}$ ,  $f = 2 \text{ GHz}$
- Maximum stable power gain:  $MSG = 22 \text{ dB TYP.}$  @  $V_{CE} = 2 \text{ V}$ ,  $I_c = 5 \text{ mA}$ ,  $f = 2 \text{ GHz}$
- $f_T = 25 \text{ GHz}$  technology adopted
- Flat-lead 4-pin thin-type super minimold (M04) package

**ORDERING INFORMATION**

Part Number	Quantity	Supplying Form
2SC5507	50 pcs (Non reel)	<ul style="list-style-type: none"> <li>• 8 mm wide embossed taping</li> <li>• Pin 1 (Emitter), Pin 2 (Collector) face the perforation side of the tape</li> </ul>
2SC5507-T2	3 kpcs/reel	

**Remark** To order evaluation samples, contact your nearby sales office.  
 The unit sample quantity is 50 pcs.

**ABSOLUTE MAXIMUM RATINGS ( $T_A = +25^\circ\text{C}$ )**

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	$V_{CBO}$	15	V
Collector to Emitter Voltage	$V_{CEO}$	3.3	V
Emitter to Base Voltage	$V_{EBO}$	1.5	V
Collector Current	$I_c$	12	mA
Total Power Dissipation	$P_{tot}^{\text{Note}}$	39	mW
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$	-65 to +150	$^\circ\text{C}$

**Note** Free Air

**Caution** Observe precautions when handling because these devices are sensitive to electrostatic discharge.

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 Not all devices/types available in every country. Please check with local NEC Compound Semiconductor Devices representative for availability and additional information.

**THERMAL RESISTANCE**

Parameter	Symbol	Ratings	Unit
Junction to Case Resistance	$R_{th\ j-c}$	240	°C/W
Junction to Ambient Resistance	$R_{th\ j-a}$	650	°C/W

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
DC Characteristics						
Collector Cut-off Current	$I_{CBO}$	$V_{CB} = 5\text{ V}, I_E = 0\text{ mA}$	–	–	100	nA
Emitter Cut-off Current	$I_{EBO}$	$V_{EB} = 1\text{ V}, I_C = 0\text{ mA}$	–	–	100	nA
DC Current Gain	$h_{FE}$ <sup>Note 1</sup>	$V_{CE} = 2\text{ V}, I_C = 5\text{ mA}$	50	70	100	–
RF Characteristics						
Gain Bandwidth Product	$f_T$	$V_{CE} = 3\text{ V}, I_C = 10\text{ mA}, f = 2\text{ GHz}$	20	25	–	GHz
Insertion Power Gain	$ S_{21e} ^2$	$V_{CE} = 2\text{ V}, I_C = 5\text{ mA}, f = 2\text{ GHz}$	14	17	–	dB
Noise Figure	NF	$V_{CE} = 2\text{ V}, I_C = 2\text{ mA}, f = 2\text{ GHz}, Z_S = Z_{opt}$	–	1.2	1.5	dB
Reverse Transfer Capacitance	$C_{re}$ <sup>Note 2</sup>	$V_{CB} = 2\text{ V}, I_E = 0\text{ mA}, f = 1\text{ MHz}$	–	0.08	0.12	pF
Maximum Stable Power Gain	MSG <sup>Note 3</sup>	$V_{CE} = 2\text{ V}, I_C = 5\text{ mA}, f = 2\text{ GHz}$	–	22	–	dB
Gain 1 dB Compression Output Power	$P_{O(1\text{ dB})}$	$V_{CE} = 2\text{ V}, I_C = 5\text{ mA}$ <sup>Note 4</sup> , $f = 2\text{ GHz}$	–	5	–	dBm
3rd Order Intermodulation Distortion Output Intercept Point	OIP <sub>3</sub>	$V_{CE} = 2\text{ V}, I_C = 5\text{ mA}$ <sup>Note 4</sup> , $f = 2\text{ GHz}$	–	15	–	dBm

- Notes**
1. Pulse measurement:  $PW \leq 350\ \mu s$ , Duty Cycle  $\leq 2\%$
  2. Collector to base capacitance when the emitter grounded
  3.  $MSG = \left| \frac{S_{21}}{S_{12}} \right|$
  4. Collector current when  $P_{O(1\text{ dB})}$  is output

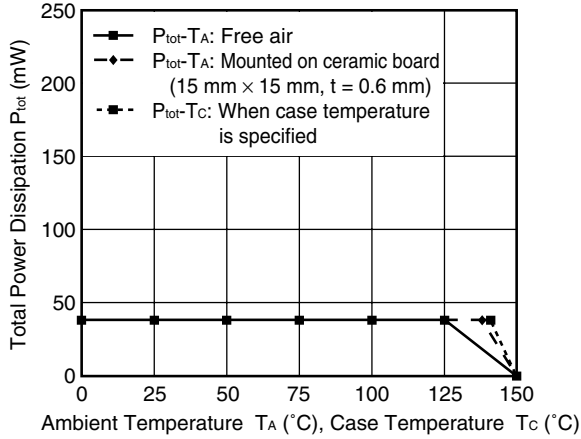
**h<sub>FE</sub> CLASSIFICATION**

Rank	FB
Marking	T78
h <sub>FE</sub> Value	50 to 100

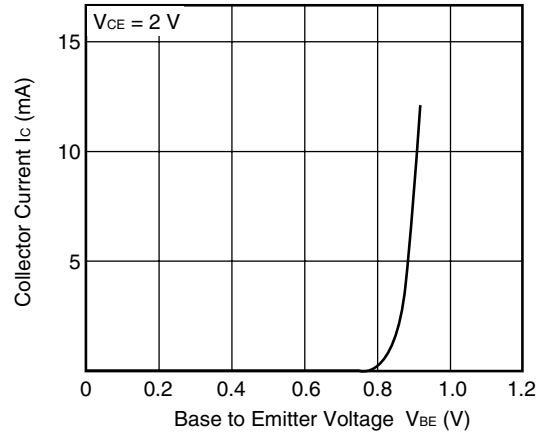
★ TYPICAL CHARACTERISTICS (T<sub>A</sub> = +25°C, unless otherwise specified)

Thermal/DC Characteristics

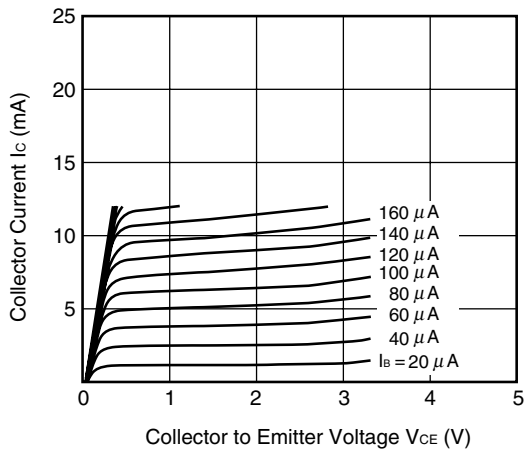
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE, CASE TEMPERATURE



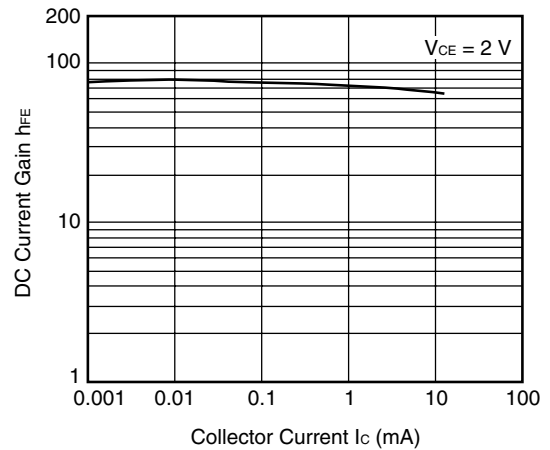
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

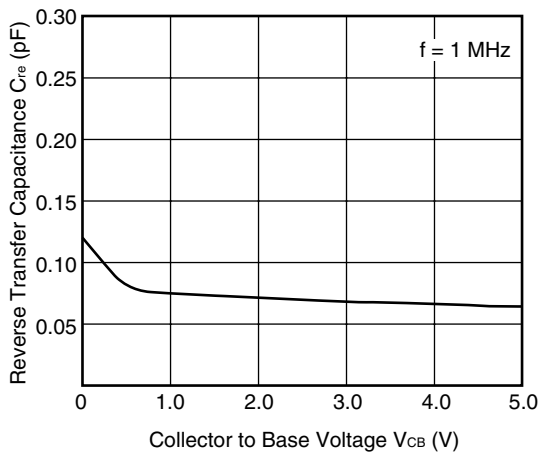


DC CURRENT GAIN vs. COLLECTOR CURRENT

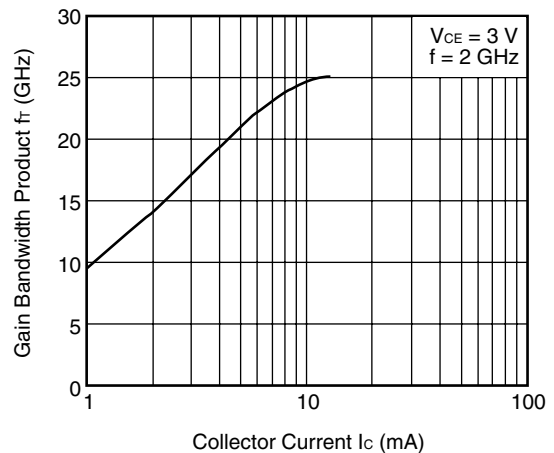


Capacitance/fr Characteristics

REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



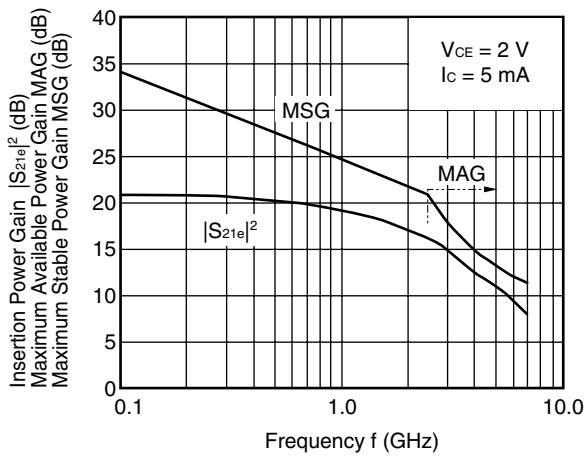
GAIN BANDWIDTH PRODUCT vs. COLLECTOR CURRENT



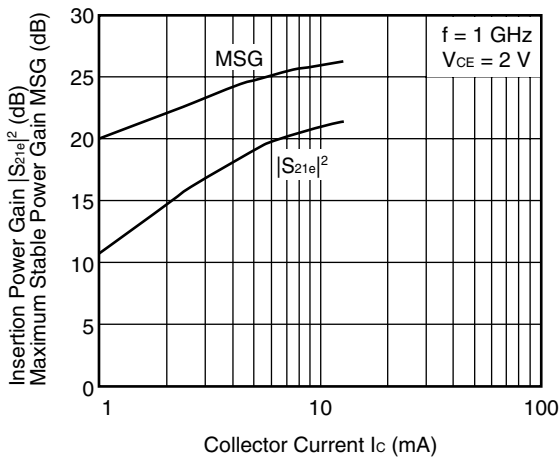
Remark The graphs indicate nominal characteristics.

Gain Characteristics

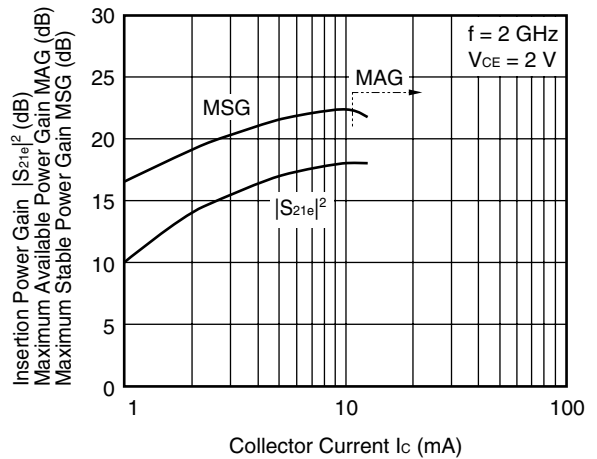
INSERTION POWER GAIN, MAG, MSG vs. FREQUENCY



INSERTION POWER GAIN, MSG vs. COLLECTOR CURRENT

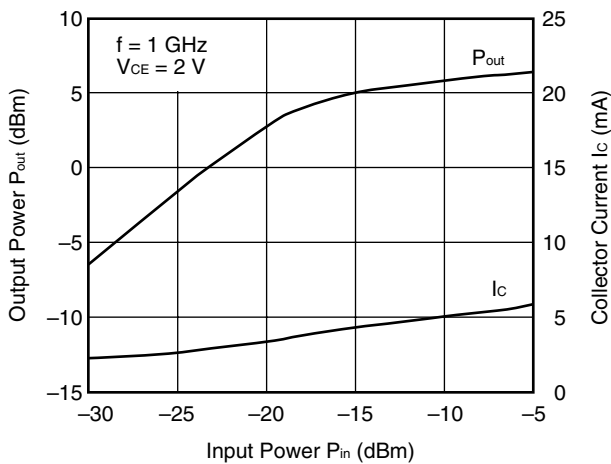


INSERTION POWER GAIN, MAG, MSG vs. COLLECTOR CURRENT

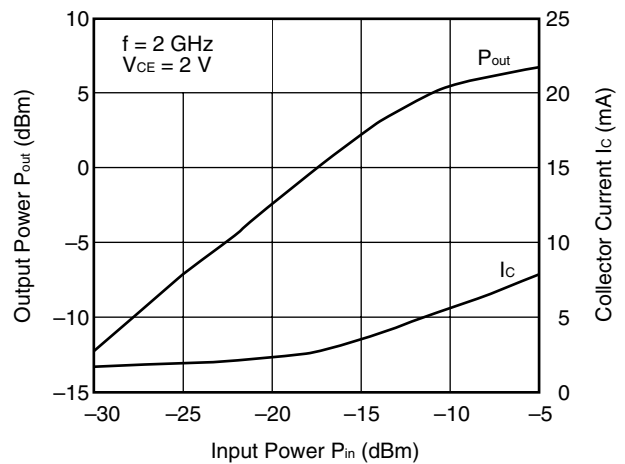


Output Characteristics

OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



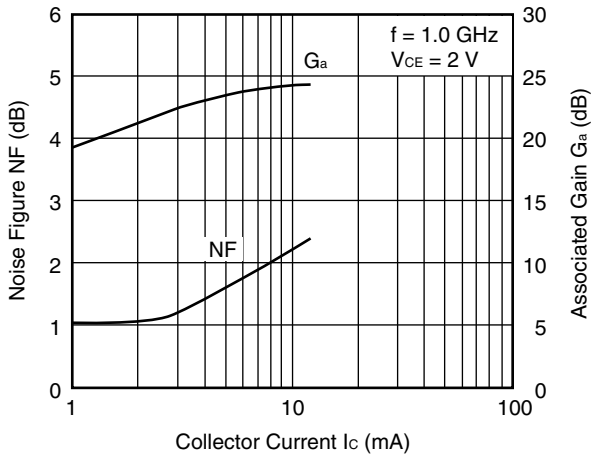
OUTPUT POWER, COLLECTOR CURRENT vs. INPUT POWER



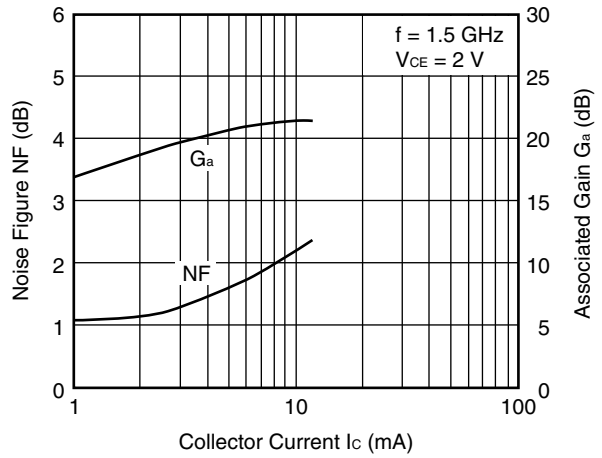
Remark The graphs indicate nominal characteristics.

**Noise Characteristics**

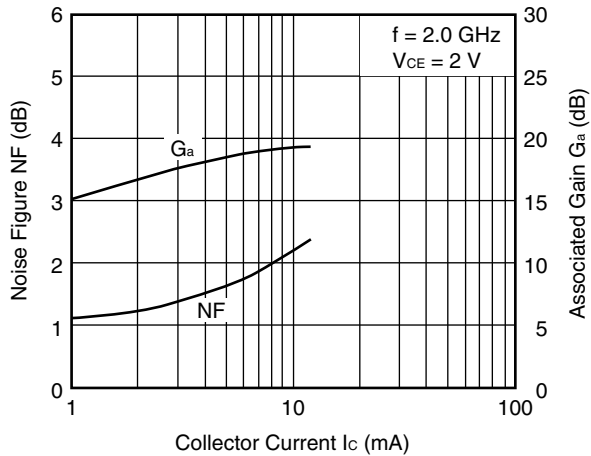
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



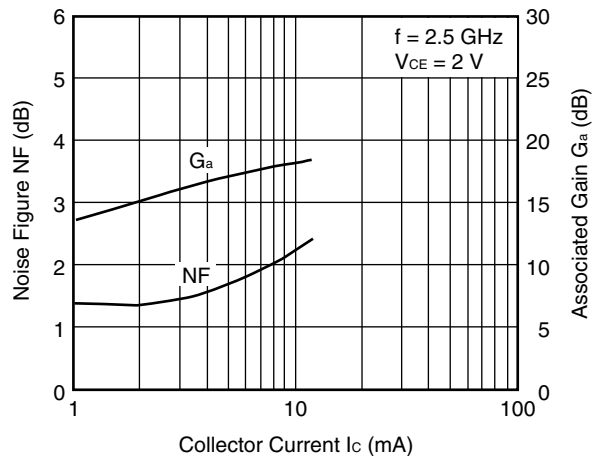
NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



NOISE FIGURE, ASSOCIATED GAIN vs. COLLECTOR CURRENT



**Remark** The graphs indicate nominal characteristics.

★ **S-PARAMETERS**

S-parameters/Noise parameters are provided on the NEC Compound Semiconductor Devices Web site in a form (S2P) that enables direct import to a microwave circuit simulator without keyboard input.

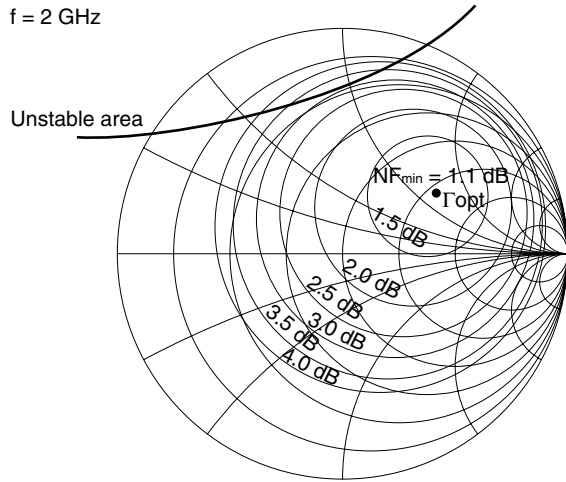
Click here to download S-parameters.

[RF and Microwave] → [Device Parameters]

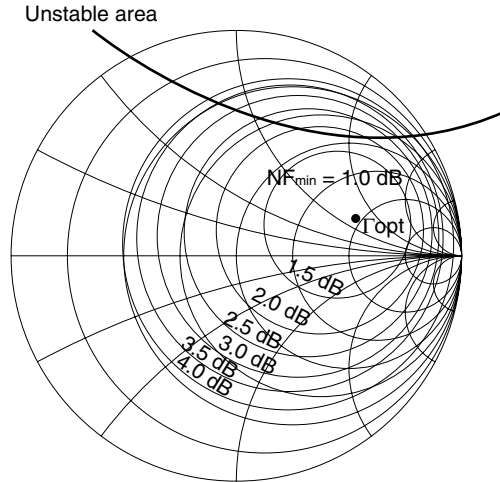
URL <http://www.ncsd.necel.com/>

EQUAL NF CIRCLE

$V_{CE} = 2\text{ V}$   
 $I_C = 2\text{ mA}$   
 $f = 2\text{ GHz}$



$V_{CE} = 2\text{ V}$   
 $I_C = 2\text{ mA}$   
 $f = 1\text{ GHz}$





**NOISE PARAMETERS**

$V_{CE} = 2\text{ V}$ ,  $I_c = 2\text{ mA}$

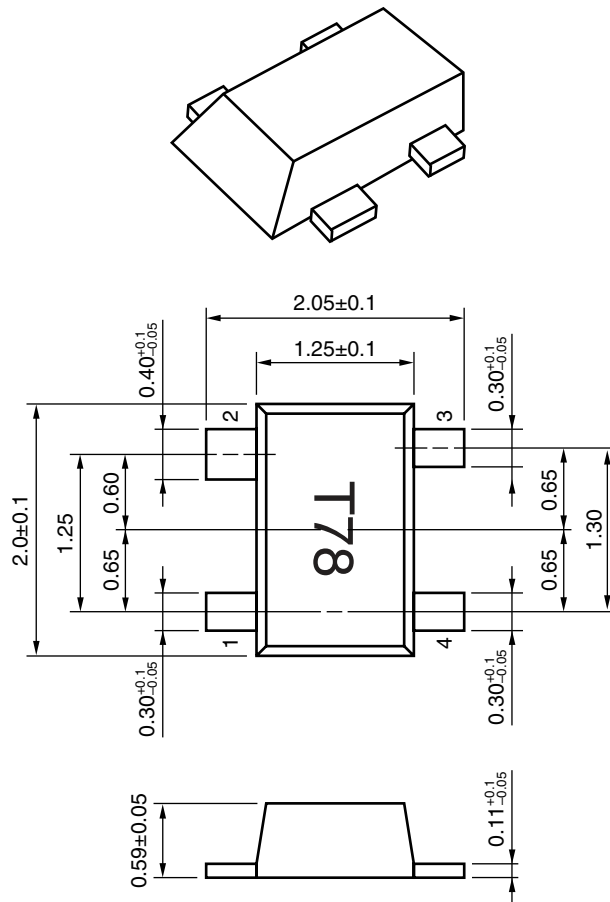
f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	0.93	22.9	0.54	13.3	0.47
0.9	0.95	22.2	0.54	14.9	0.47
1.0	0.97	21.6	0.54	16.4	0.47
1.5	1.08	18.8	0.53	24.6	0.45
1.8	1.14	17.5	0.51	30.3	0.43
1.9	1.16	17.1	0.50	32.4	0.42
2.0	1.18	16.7	0.49	34.6	0.41
2.5	1.29	15.2	0.44	47.7	0.35

$V_{CE} = 2\text{ V}$ ,  $I_c = 5\text{ mA}$

f (GHz)	NF <sub>min</sub> (dB)	G <sub>a</sub> (dB)	Γ <sub>opt</sub>		Rn/50
			MAG.	ANG.	
0.8	1.59	24.7	0.38	10.7	0.43
0.9	1.60	24.1	0.38	11.9	0.43
1.0	1.60	23.4	0.38	13.2	0.43
1.5	1.62	20.7	0.36	20.5	0.41
1.8	1.63	19.3	0.34	25.7	0.38
1.9	1.63	18.9	0.33	27.5	0.38
2.0	1.63	18.5	0.32	29.4	0.37
2.5	1.65	16.9	0.26	40.1	0.32

★ PACKAGE DIMENSIONS

FLAT-LEAD 4-PIN THIN-TYPE SUPER MINIMOLD (M04) PACKAGE (UNIT: mm)



**PIN CONNECTIONS**

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

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