

To our customers,

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## Old Company Name in Catalogs and Other Documents

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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 + SiGe RF TWIN TRANSISTOR  
**μPA869TD**

NPN SILICON + SiGe RF TRANSISTOR (WITH 2 DIFFERENT ELEMENTS)  
 IN A 6-PIN LEAD-LESS MINIMOLD (M16, 1208 PACKAGE)

**FEATURES**

- 2 different built-in transistors (NESG2046M33, 2SC5800)
  - Q1: High gain SiGe transistor  
 $f_T = 18 \text{ GHz TYP.}, |S_{21e}|^2 = 13 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_C = 15 \text{ mA, } f = 2 \text{ GHz}$
  - Q2: Low phase distortion transistor suited for OSC applications  
 $f_T = 6.5 \text{ GHz TYP.}, |S_{21e}|^2 = 5.5 \text{ dB TYP. @ } V_{CE} = 1 \text{ V, } I_C = 15 \text{ mA, } f = 2 \text{ GHz}$
- 6-pin lead-less minimold (M16, 1208 package)

**BUILT-IN TRANSISTORS**

	Q1	Q2
3-pin super lead-less minimold part No.	NESG2046M33	–
3-pin thin-type ultra super minimold part No.	–	2SC5800

**ORDERING INFORMATION**

Part Number	Quantity	Supplying Form
μPA869TD	50 pcs (Non reel)	• 8 mm wide embossed taping
μPA869TD-T3	10 kpcs/reel	• Pin 1 (Q1 Collector), Pin 6 (Q1 Base) face the perforation side of the tape

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

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

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**ABSOLUTE MAXIMUM RATINGS (T<sub>A</sub> = +25°C)**

Parameter	Symbol	Ratings		Unit
		Q1	Q2	
Collector to Base Voltage	V <sub>CBO</sub>	13	13	V
Collector to Emitter Voltage	V <sub>CEO</sub>	5	5	V
Emitter to Base Voltage	V <sub>EBO</sub>	1.5	1.5	V
Collector Current	I <sub>C</sub>	40	100	mA
Total Power Dissipation	P <sub>tot</sub> <sup>Note</sup>	190	190	mW
		210 in 2 elements		
Junction Temperature	T <sub>j</sub>	150		°C
Storage Temperature	T <sub>stg</sub>	-65 to +150		°C

**Note** Mounted on 1.08 cm<sup>2</sup> × 1.0 mm (t) glass epoxy PCB

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

**(1) Q1**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA	–	–	100	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 0.5 V, I <sub>C</sub> = 0 mA	–	–	100	nA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 2 mA	140	180	220	–
Gain Bandwidth Product	f <sub>T</sub>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 15 mA, f = 2 GHz	15	18	–	GHz
Insertion Power Gain	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 15 mA, f = 2 GHz	11	13	–	dB
Noise Figure	NF	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 3 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>opt</sub>	–	0.8	1.5	dB
Associated Gain	G <sub>a</sub>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 3 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>opt</sub>	9.5	11.5	–	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 1 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	0.2	0.4	pF

**(2) Q2**

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I <sub>CBO</sub>	V <sub>CB</sub> = 5 V, I <sub>E</sub> = 0 mA	–	–	600	nA
Emitter Cut-off Current	I <sub>EBO</sub>	V <sub>EB</sub> = 0.5 V, I <sub>C</sub> = 0 mA	–	–	600	nA
DC Current Gain	h <sub>FE</sub> <sup>Note 1</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA	100	120	145	–
Gain Bandwidth Product (1)	f <sub>T</sub>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz	3	4.5	–	GHz
Gain Bandwidth Product (2)	f <sub>T</sub>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 15 mA, f = 2 GHz	5	6.5	–	GHz
Insertion Power Gain (1)	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 5 mA, f = 2 GHz	3	4	–	dB
Insertion Power Gain (2)	S <sub>21e</sub>   <sup>2</sup>	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 15 mA, f = 2 GHz	4.5	5.5	–	dB
Noise Figure	NF	V <sub>CE</sub> = 1 V, I <sub>C</sub> = 10 mA, f = 2 GHz, Z <sub>S</sub> = Z <sub>opt</sub>	–	1.9	2.5	dB
Reverse Transfer Capacitance	C <sub>re</sub> <sup>Note 2</sup>	V <sub>CB</sub> = 0.5 V, I <sub>E</sub> = 0 mA, f = 1 MHz	–	0.6	0.8	pF

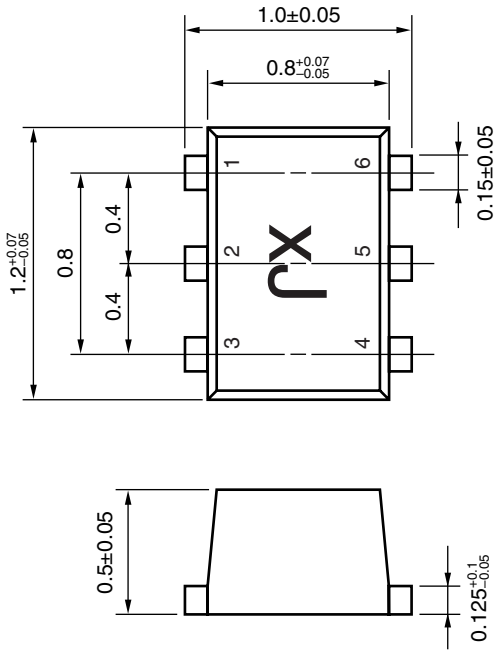
- Notes 1.** Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%  
**2.** Collector to base capacitance when the emitter grounded

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

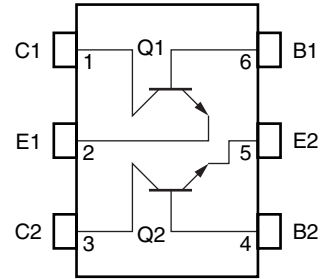
Rank	FB
Marking	xJ
h <sub>FE</sub> Value of Q1	140 to 220
h <sub>FE</sub> Value of Q2	100 to 145

PACKAGE DIMENSIONS

6-PIN LEAD-LESS MINIMOLD (M16, 1208 PACKAGE) (UNIT: mm)



(Top View)



PIN CONNECTIONS

- 1. Collector (Q1)
- 2. Emitter (Q1)
- 3. Collector (Q2)
- 4. Base (Q2)
- 5. Emitter (Q2)
- 6. Base (Q1)

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