DATA SHEET

NEC

NPN SILICON RF TWIN TRANSISTOR

μPA828TD

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

FEATURES

- Built-in low phase distortion transistor suited for OSC applications
  f_T = 9.0 GHz TYP., $|S_{21e}|^2$ = 7.5 dB TYP. @ V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz
  NF = 1.3 dB TYP. @ V_{CE} = 1 V, I_C = 3 mA, f = 2 GHz
- Built-in 2 transistors (2 × 2SC5436)
- 6-pin lead-less minimold (M16, 1208 package)

BUILT-IN TRANSISTORS

	Q1, Q2
3-pin thin-type ultra super minimold part No.	2SC5436

ORDERING INFORMATION

Part Number	Quantity	Supplying Form
μPA828TD	50 pcs (Non reel)	• 8 mm wide embossed taping
μPA828TD-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.

Document No. PU10402EJ02V0DS (2nd edition)
Date Published September 2003 CP(K)
Printed in Japan

The mark ★ shows major revised points.

ABSOLUTE MAXIMUM RATINGS (T_A = +25°C)

Parameter	Symbol	Ratings	Unit
Collector to Base Voltage	V_{CBO}	5	V
Collector to Emitter Voltage	V_{CEO}	3	V
Emitter to Base Voltage	V_{EBO}	2	V
Collector Current	I_C	30	mA
Total Power Dissipation	P_{tot} Note	90 in 1 element	mW
		180 in 2 elements	
Junction Temperature	T_j	150	°C
Storage Temperature	T_{stg}	–65 to +150	°C

Note Mounted on 1.08 $cm^2 \times 1.0$ mm (t) glass epoxy PCB

ELECTRICAL CHARACTERISTICS (T_A = +25°C)

Parameter	Symbol	Test Conditions	MIN.	TYP.	MAX.	Unit
Collector Cut-off Current	I_{CBO}	V_{CB} = 5 V, I_E = 0 mA	–	–	100	nA
Emitter Cut-off Current	I_{EBO}	V_{EB} = 1 V, I_C = 0 mA	–	–	100	nA
DC Current Gain	h_{FE} Note 1	V_{CE} = 2 V, I_C = 20 mA	70	–	140	–
Gain Bandwidth Product (1)	f_T	V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz	7.0	9.0	–	GHz
Gain Bandwidth Product (2)	f_T	V_{CE} = 2 V, I_C = 20 mA, f = 2 GHz	9.0	11.0	–	GHz
Insertion Power Gain (1)	$\lvert S_{21e} \rvert^2$	V_{CE} = 1 V, I_C = 10 mA, f = 2 GHz	6.0	7.5	–	dB
Insertion Power Gain (2)	$\lvert S_{21e} \rvert^2$	V_{CE} = 2 V, I_C = 20 mA, f = 2 GHz	7.0	8.5	–	dB
Noise Figure (1)	NF	V_{CE} = 1 V, I_C = 3 mA, f = 2 GHz, $Z_S = Z_{opt}$	–	1.3	2.0	dB
Noise Figure (2)	NF	V_{CE} = 2 V, I_C = 3 mA, f = 2 GHz, $Z_S = Z_{opt}$	–	1.3	2.0	dB
Reverse Transfer Capacitance	C_{re} Note 2	V_{CB} = 2 V, I_E = 0 mA, f = 1 MHz	–	0.4	0.8	pF
h_{FE} Ratio	f_T	V_{CE} = 2 V, I_C = 20 mA, h_{FE1} : Smaller value of Q1 and Q2, h_{FE2} : Larger value of Q1 and Q2	0.85	–	–	–

Notes 1. Pulse measurement: PW ≤ 350 μs, Duty Cycle ≤ 2%

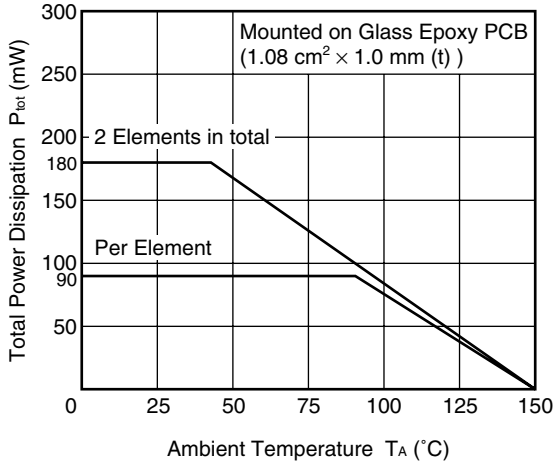
2. Collector to base capacitance when the emitter grounded

h_{FE} CLASSIFICATION

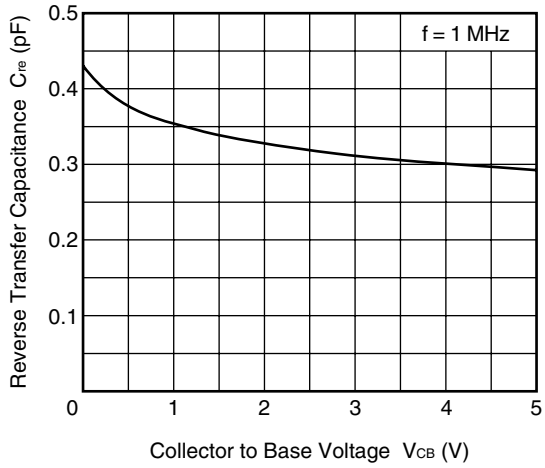
Rank	FB
Marking	kL
h_{FE} Value	70 to 140

★ TYPICAL CHARACTERISTICS (T_A = +25°C, unless otherwise specified)

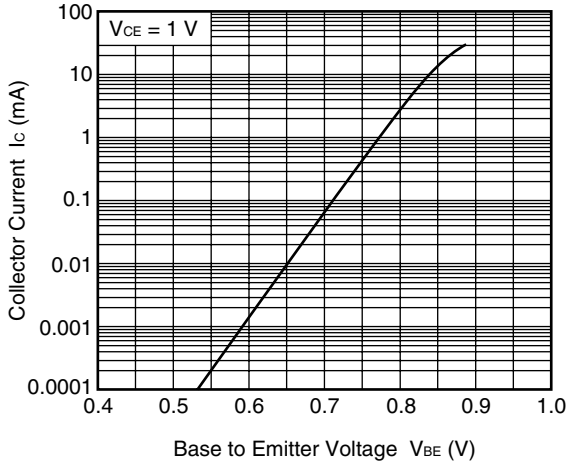
TOTAL POWER DISSIPATION vs. AMBIENT TEMPERATURE



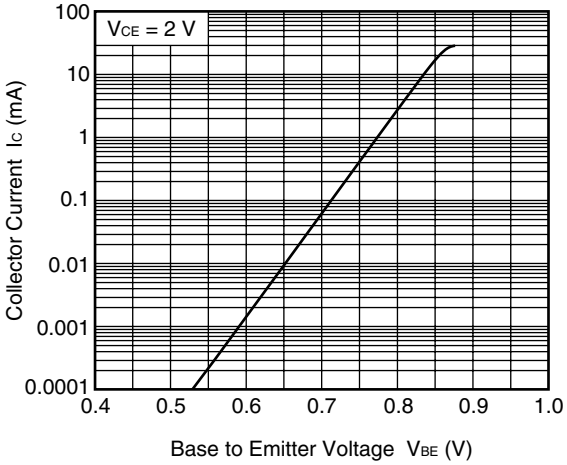
REVERSE TRANSFER CAPACITANCE vs. COLLECTOR TO BASE VOLTAGE



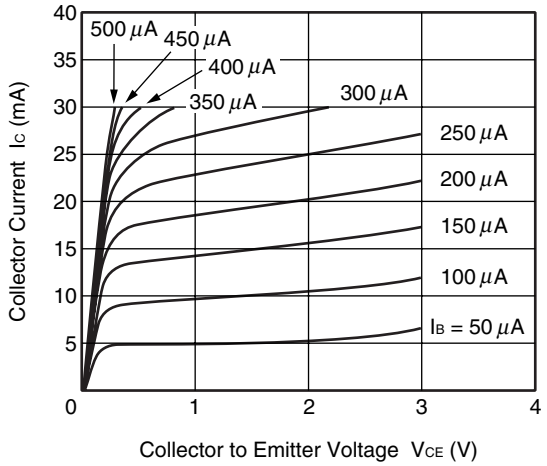
COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE



COLLECTOR CURRENT vs. BASE TO EMITTER VOLTAGE

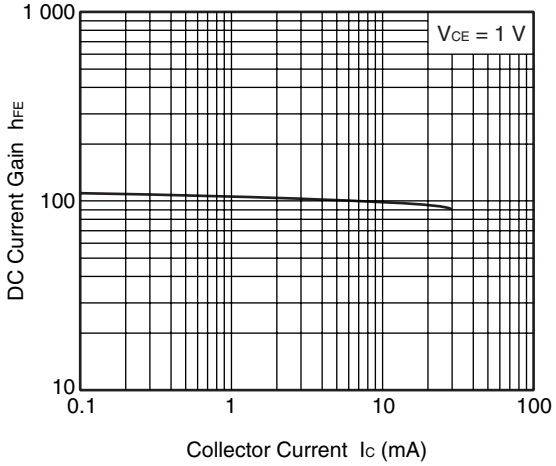


COLLECTOR CURRENT vs. COLLECTOR TO EMITTER VOLTAGE

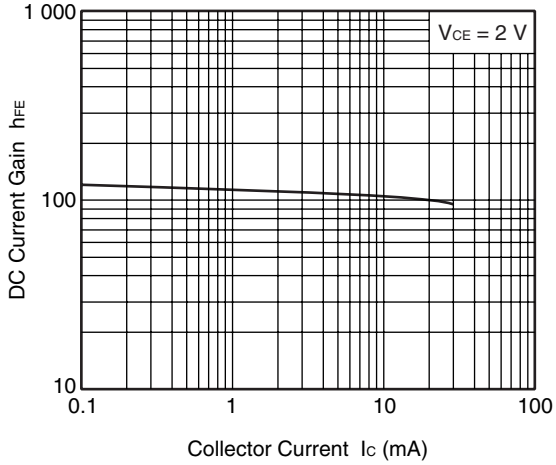


Remark The graphs indicate nominal characteristics.

DC CURRENT GAIN vs.
COLLECTOR CURRENT



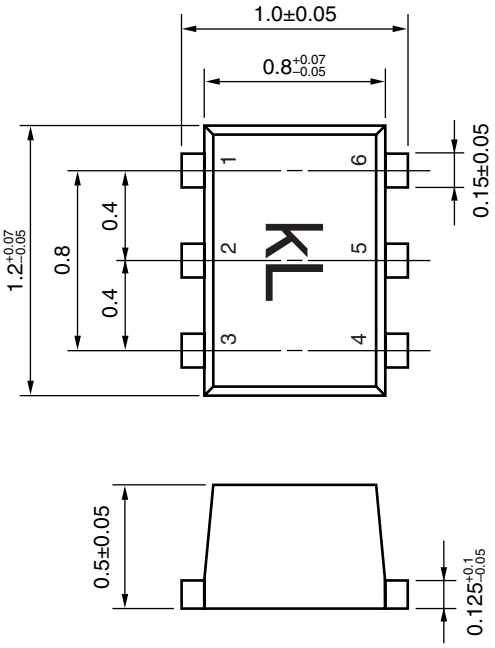
DC CURRENT GAIN vs.
COLLECTOR CURRENT



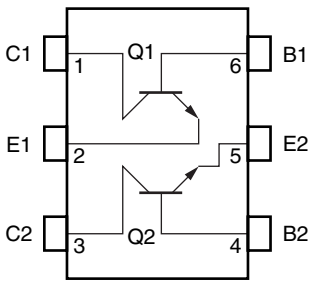
Remark The graphs indicate nominal characteristics.

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)

- **The information in this document is current as of September, 2003. The information is subject to change without notice. For actual design-in, refer to the latest publications of NEC's data sheets or data books, etc., for the most up-to-date specifications of NEC semiconductor products. Not all products and/or types are available in every country. Please check with an NEC sales representative for availability and additional information.**
- No part of this document may be copied or reproduced in any form or by any means without prior written consent of NEC. NEC assumes no responsibility for any errors that may appear in this document.
- NEC does not assume any liability for infringement of patents, copyrights or other intellectual property rights of third parties by or arising from the use of NEC semiconductor products listed in this document or any other liability arising from the use of such products. No license, express, implied or otherwise, is granted under any patents, copyrights or other intellectual property rights of NEC or others.
- Descriptions of circuits, software and other related information in this document are provided for illustrative purposes in semiconductor product operation and application examples. The incorporation of these circuits, software and information in the design of customer's equipment shall be done under the full responsibility of customer. NEC assumes no responsibility for any losses incurred by customers or third parties arising from the use of these circuits, software and information.
- While NEC endeavours to enhance the quality, reliability and safety of NEC semiconductor products, customers agree and acknowledge that the possibility of defects thereof cannot be eliminated entirely. To minimize risks of damage to property or injury (including death) to persons arising from defects in NEC semiconductor products, customers must incorporate sufficient safety measures in their design, such as redundancy, fire-containment, and anti-failure features.
- NEC semiconductor products are classified into the following three quality grades:
  "Standard", "Special" and "Specific". The "Specific" quality grade applies only to semiconductor products developed based on a customer-designated "quality assurance program" for a specific application. The recommended applications of a semiconductor product depend on its quality grade, as indicated below. Customers must check the quality grade of each semiconductor product before using it in a particular application.
  "Standard": Computers, office equipment, communications equipment, test and measurement equipment, audio and visual equipment, home electronic appliances, machine tools, personal electronic equipment and industrial robots
  "Special": Transportation equipment (automobiles, trains, ships, etc.), traffic control systems, anti-disaster systems, anti-crime systems, safety equipment and medical equipment (not specifically designed for life support)
  "Specific": Aircraft, aerospace equipment, submersible repeaters, nuclear reactor control systems, life support systems and medical equipment for life support, etc.
  The quality grade of NEC semiconductor products is "Standard" unless otherwise expressly specified in NEC's data sheets or data books, etc. If customers wish to use NEC semiconductor products in applications not intended by NEC, they must contact an NEC sales representative in advance to determine NEC's willingness to support a given application.
  (Note)
  (1) "NEC" as used in this statement means NEC Corporation, NEC Compound Semiconductor Devices, Ltd. and also includes its majority-owned subsidiaries.
  (2) "NEC semiconductor products" means any semiconductor product developed or manufactured by or for NEC (as defined above).

M8E 00.4-0110

▶For further information, please contact

NEC Compound Semiconductor Devices, Ltd. **http://www.ncsd.necel.com/**
E-mail: salesinfo@csd-nec.com (sales and general)
techinfo@csd-nec.com (technical)
5th Sales Group, Sales Division TEL: +81-44-435-1588 FAX: +81-44-435-1579

NEC Compound Semiconductor Devices Hong Kong Limited
E-mail: ncsd-hk@elhk.nec.com.hk (sales, technical and general)
Hong Kong Head Office TEL: +852-3107-7303 FAX: +852-3107-7309
Taipei Branch Office TEL: +886-2-8712-0478 FAX: +886-2-2545-3859
Korea Branch Office TEL: +82-2-558-2120 FAX: +82-2-558-5209

NEC Electronics (Europe) GmbH **http://www.ee.nec.de/**
TEL: +49-211-6503-01 FAX: +49-211-6503-487

California Eastern Laboratories, Inc. **http://www.cel.com/**
TEL: +1-408-988-3500 FAX: +1-408-988-0279

0307