To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 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 1st, 2010
Renesas Electronics Corporation

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

Send any inquiries to http://www.renesas.com/inquiry.

Notice

1. All information included in this document is current as of the date this document is issued. Such information, however, is subject to change without any prior notice. Before purchasing or using any Renesas Electronics products listed herein, please confirm the latest product information with a Renesas Electronics sales office. Also, please pay regular and careful attention to additional and different information to be disclosed by Renesas Electronics such as that disclosed through our website.
2. Renesas Electronics 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 Renesas Electronics products or technical information described in this document. No license, express, implied or otherwise, is granted hereby under any patents, copyrights or other intellectual property rights of Renesas Electronics or others.
3. You should not alter, modify, copy, or otherwise misappropriate any Renesas Electronics product, whether in whole or in part.
4. Descriptions of circuits, software and other related information in this document are provided only to illustrate the operation of semiconductor products and application examples. You are fully responsible for the incorporation of these circuits, software, and information in the design of your equipment. Renesas Electronics assumes no responsibility for any losses incurred by you or third parties arising from the use of these circuits, software, or information.
5. When exporting the products or technology described in this document, you should comply with the applicable export control laws and regulations and follow the procedures required by such laws and regulations. You should not use Renesas Electronics products or the technology described in this document for any purpose relating to military applications or use by the military, including but not limited to the development of weapons of mass destruction. Renesas Electronics products and technology may not be used for or incorporated into any products or systems whose manufacture, use, or sale is prohibited under any applicable domestic or foreign laws or regulations.
6. Renesas Electronics has used reasonable care in preparing the information included in this document, but Renesas Electronics does not warrant that such information is error free. Renesas Electronics assumes no liability whatsoever for any damages incurred by you resulting from errors in or omissions from the information included herein.
7. Renesas Electronics products are classified according to the following three quality grades: "Standard", "High Quality", and "Specific". The recommended applications for each Renesas Electronics product depends on the product's quality grade, as indicated below. You must check the quality grade of each Renesas Electronics product before using it in a particular application. You may not use any Renesas Electronics product for any application categorized as "Specific" without the prior written consent of Renesas Electronics. Further, you may not use any Renesas Electronics product for any application for which it is not intended without the prior written consent of Renesas Electronics. Renesas Electronics shall not be in any way liable for any damages or losses incurred by you or third parties arising from the use of any Renesas Electronics product for an application categorized as "Specific" or for which the product is not intended where you have failed to obtain the prior written consent of Renesas Electronics. The quality grade of each Renesas Electronics product is "Standard" unless otherwise expressly specified in a Renesas Electronics data sheets or data books, etc.

   "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.

   "High Quality": 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; medical equipment or systems for life support (e.g. artificial life support devices or systems), surgical implantations, or healthcare intervention (e.g. excision, etc.), and any other applications or purposes that pose a direct threat to human life.
8. You should use the Renesas Electronics products described in this document within the range specified by Renesas Electronics, especially with respect to the maximum rating, operating supply voltage range, movement power voltage range, heat radiation characteristics, installation and other product characteristics. Renesas Electronics shall have no liability for malfunctions or damages arising out of the use of Renesas Electronics products beyond such specified ranges.
9. Although Renesas Electronics endeavors to improve the quality and reliability of its products, semiconductor products have specific characteristics such as the occurrence of failure at a certain rate and malfunctions under certain use conditions. Further, Renesas Electronics products are not subject to radiation resistance design. Please be sure to implement safety measures to guard them against the possibility of physical injury, and injury or damage caused by fire in the event of the failure of a Renesas Electronics product, such as safety design for hardware and software including but not limited to redundancy, fire control and malfunction prevention, appropriate treatment for aging degradation or any other appropriate measures. Because the evaluation of microcomputer software alone is very difficult, please evaluate the safety of the final products or system manufactured by you.
10. Please contact a Renesas Electronics sales office for details as to environmental matters such as the environmental compatibility of each Renesas Electronics product. Please use Renesas Electronics products in compliance with all applicable laws and regulations that regulate the inclusion or use of controlled substances, including without limitation, the EU RoHS Directive. Renesas Electronics assumes no liability for damages or losses occurring as a result of your noncompliance with applicable laws and regulations.
11. This document may not be reproduced or duplicated, in any form, in whole or in part, without prior written consent of Renesas Electronics.
12. Please contact a Renesas Electronics sales office if you have any questions regarding the information contained in this document or Renesas Electronics products, or if you have any other inquiries.

(Note 1) "Renesas Electronics" as used in this document means Renesas Electronics Corporation and also includes its majority-owned subsidiaries.

(Note 2) "Renesas Electronics product(s)" means any product developed or manufactured by or for Renesas Electronics.

2SC460, 2SC461

Silicon NPN Epitaxial Planar

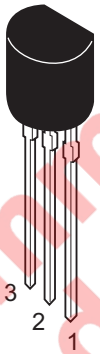
REJ03G0682-0200
(Previous ADE-208-1046)
Rev.2.00
Aug.10.2005

Application

- 2SC460 high frequency amplifier, mixer
- 2SC461 VHF amplifier, mixer

Outline

RENESAS Package code: PRSS0003DA-C
(Package name: TO-92 (2))



1. Emitter
2. Collector
3. Base

Absolute Maximum Ratings

(Ta = 25°C)

Item	Symbol	2SC460	2SC461	Unit
Collector to base voltage	V_{CBO}	30	30	V
Collector to emitter voltage	V_{CEO}	30	30	V
Emitter to base voltage	V_{EBO}	5	5	V
Collector current	I_C	100	100	mA
Collector power dissipation	P_C	200	200	mW
Junction temperature	Tj	150	150	°C
Storage temperature	Tstg	–55 to +150	–55 to +150	°C

Electrical Characteristics

(Ta = 25°C)

Item	Symbol	2SC460			2SC461			Unit	Test conditions
		Min	Typ	Max	Min	Typ	Max		
Collector to base breakdown voltage	$V_{(BR)CBO}$	30	—	—	30	—	—	V	I_C = 10 µA, I_E = 0
Collector to emitter breakdown voltage	$V_{(BR)CEO}$	30	—	—	30	—	—	V	I_C = 1 mA, R_{BE} = ∞
Emitter to base breakdown voltage	$V_{(BR)EBO}$	5	—	—	5	—	—	V	I_E = 10 µA, I_C = 0
Collector cutoff current	I_{CBO}	—	—	0.5	—	—	0.5	µA	V_{CB} = 18 V, I_E = 0
Emitter cutoff current	I_{EBO}	—	—	0.5	—	—	0.5	µA	V_{EB} = 2 V, I_C = 0
Base to emitter voltage	V_{BE}	—	0.63	0.75	—	0.63	0.75	V	V_{CE} = 12 V, I_C = 2 mA
DC current transfer ratio	h_{FE}*[1]	100	—	200	35	—	200		V_{CE} = 12 V, I_C = 2 mA
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	0.6	1.1	—	0.6	1.1	V	I_C = 10 mA, I_B = 1 mA
Gain bandwidth product	f_T	—	230	—	—	230	—	MHz	V_{CE} = 12 V, I_C = 2 mA
Collector output capacitance	C_{ob}	—	1.8	3.5	—	1.8	3.5	pF	V_{CB} = 10 V, I_E = 0, f = 1 MHz
10.7 MHz power gain	PG	26	29	—	—	—	—	dB	V_{CE} = 6 V, I_E = –1 mA f = 10.7 MHz
100 MHz power gain	PG	—	—	—	13	17	—	dB	V_{CE} = 6 V, I_E = –1 mA f = 100 MHz
Noise figure	NF	—	2.0	—	—	—	—	dB	V_{CE} = 6 V, I_E = –1 mA f = 1MHz R_g = 500Ω

Note: 1. The 2SC461 is grouped by h_{FE} as follows.

B	C
60 to 120	100 to 200

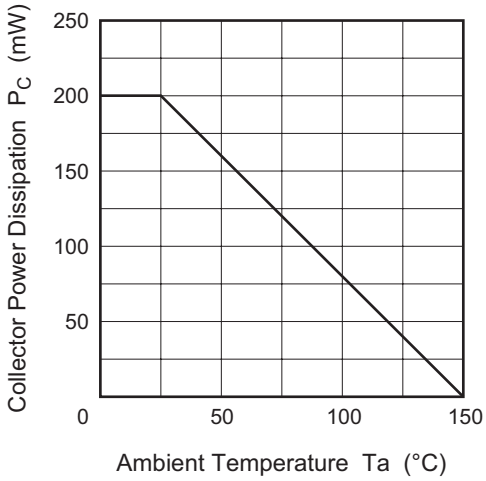
Small Signal y Parameters

(V_{CE} = 6 V, I_C = 1 mA, Emitter Common)

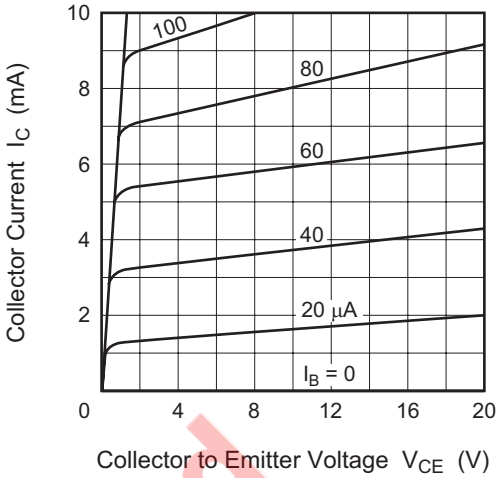
Item	Symbol	f	2SC460A, 2S461A	2SC460B, 2SC461B	2SC460C, 2SC461C	Unit
Input admittance	yie	455 kHz	0.58 + j0.074	0.42 + j0.068	0.30 + j0.051	mS
		4.5 MHz	0.65 + j0.79	0.50 + j0.7	0.35 + j0.57	
		10.7 MHz	0.91 + j2.0	0.61 + j1.9	0.39 + j1.3	
		100 MHz	7.4 + j14	5.6 + j12	3.8 + j6.0	
Reverse transfer admittance	yre	455 kHz	–j0.003	–j0.003	–j0.003	mS
		4.5 MHz	–j0.04	–j0.04	–j0.04	
		10.7 MHz	–j0.13	–j0.13	–j0.13	
		100 MHz	–j1.0	–j1.0	–j1.0	
Forward transfer admittance	yfe	455 kHz	38 – j0.1	37 – j0.1	37 – j0.2	mS
		4.5 MHz	35 – j1.0	35 – j1.2	34 – j1.8	
		10.7 MHz	34 – j2.5	34 – j2.5	33 – j4.5	
		100 MHz	28 – j20	28 – j19	20 – j19	
Output admittance	yoe	455 kHz	0.0098 + j0.009	0.013 + j0.009	0.016 + j0.012	mS
		4.5 MHz	0.02 + j0.09	0.023 + j0.092	0.03 + j0.10	
		10.7 MHz	0.11 + j0.4	0.11 + j0.4	0.12 + j0.4	
		100 MHz	0.40 + j1.7	0.50 + j2.0	0.83 + j2.0	

Main Characteristics

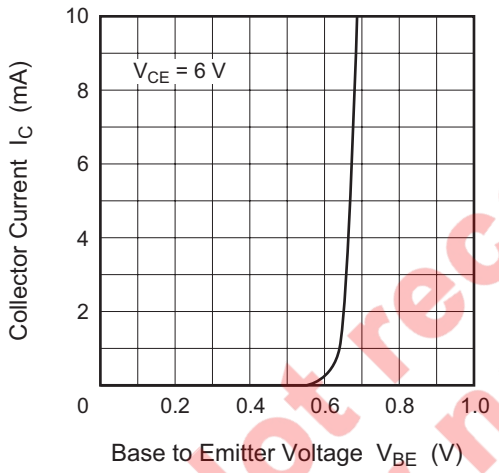
Maximum Collector Dissipation Curve



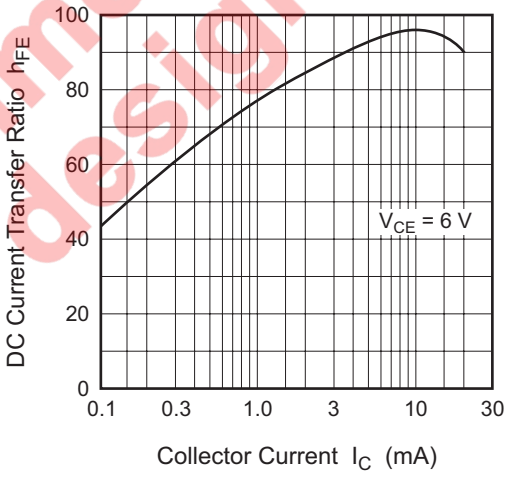
Typical Output Characteristics



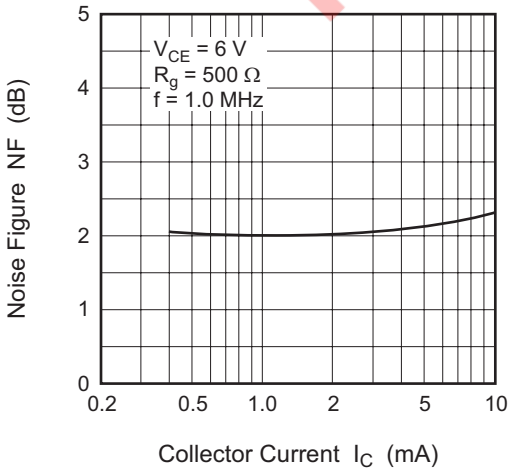
Typical Transfer Characteristics



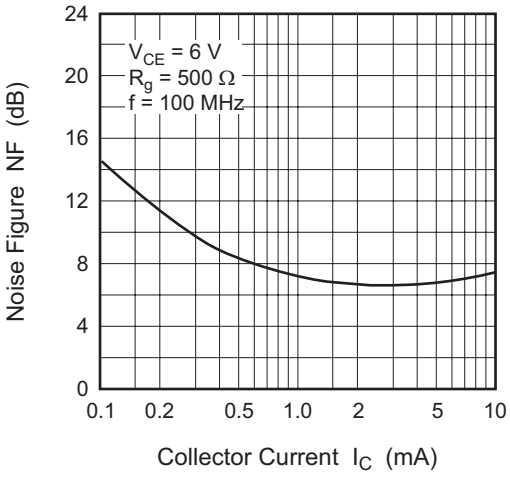
DC Current Transfer Ratio vs. Collector Current



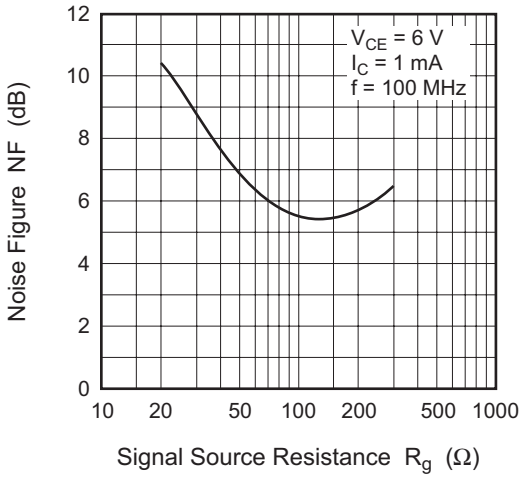
Noise Figure vs. Collector Current



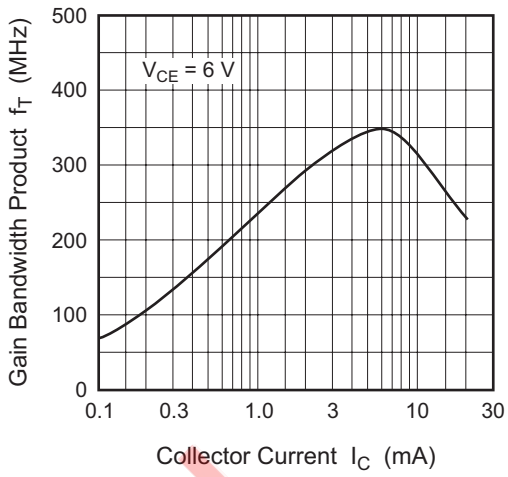
Noise Figure vs. Signal Source Resistance



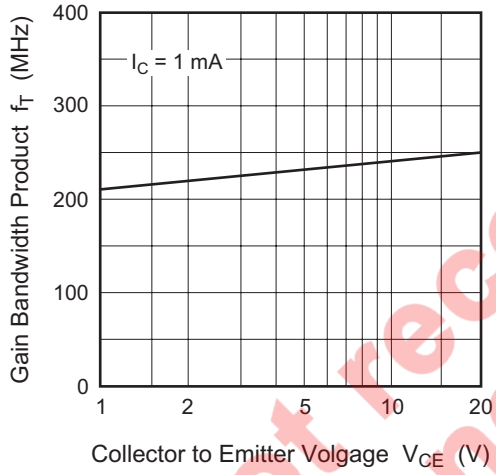
Noise Figure vs. Signal Source Resistance



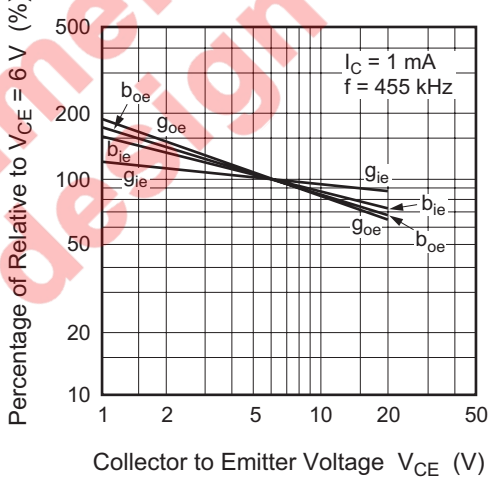
Gain Bandwidth Product vs. Collector Current



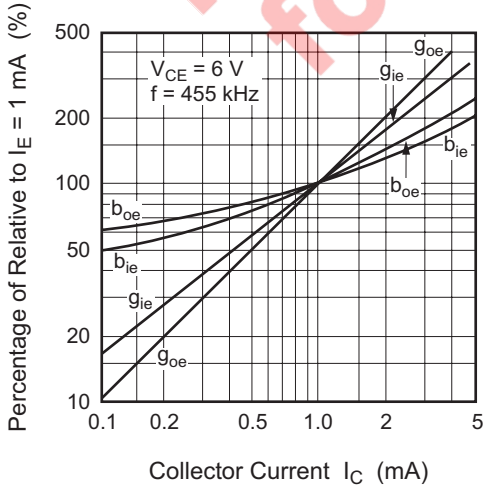
Gain Bandwidth Product vs. Collector to Emitter Voltage



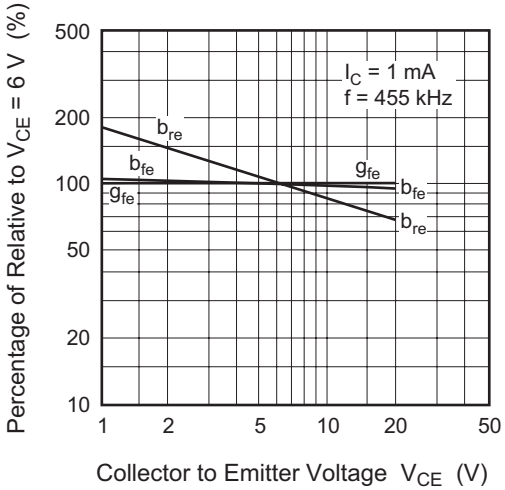
Input/Output Admittance vs. Collector to Emitter Voltage



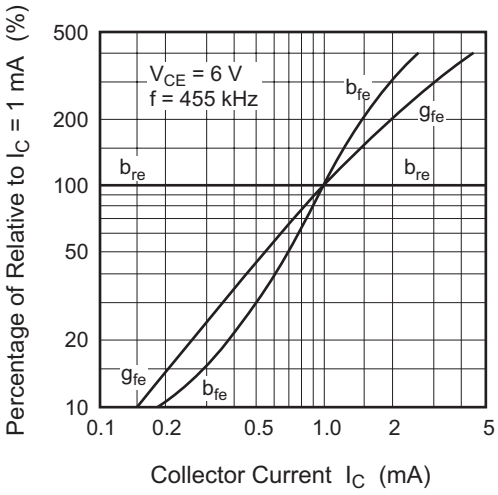
Input/Output Admittance vs. Collector Current



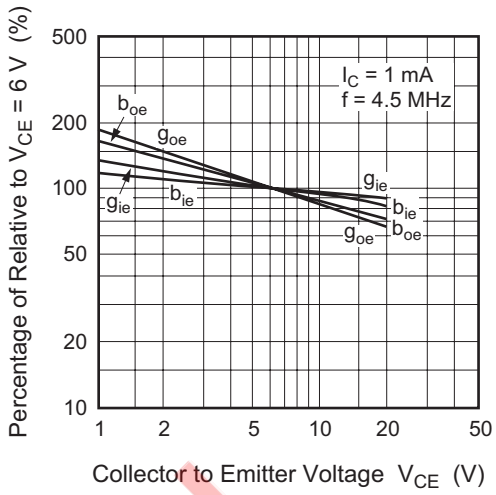
Transfer Admittance vs. Collector to Emitter Voltage



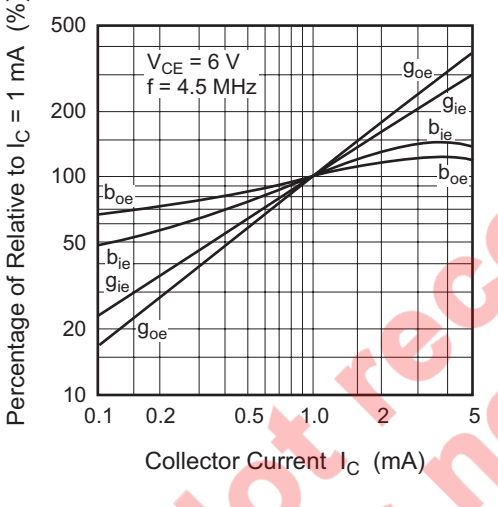
Transfer Admittance vs. Collector Current



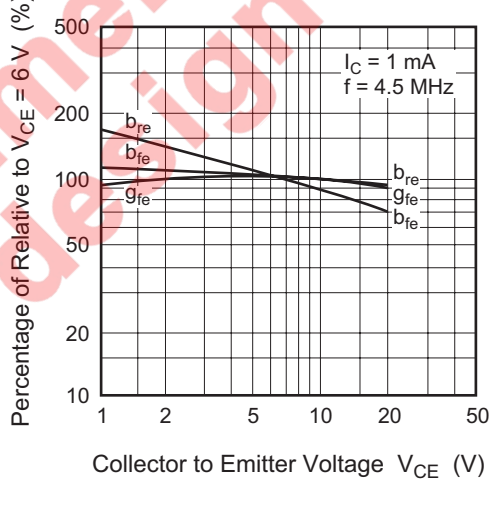
Input/Output Admittance vs. Collector to Emitter Voltage



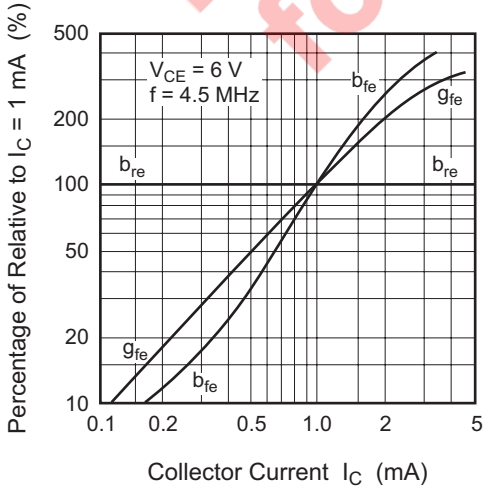
Input/Output Admittance vs. Collector Current



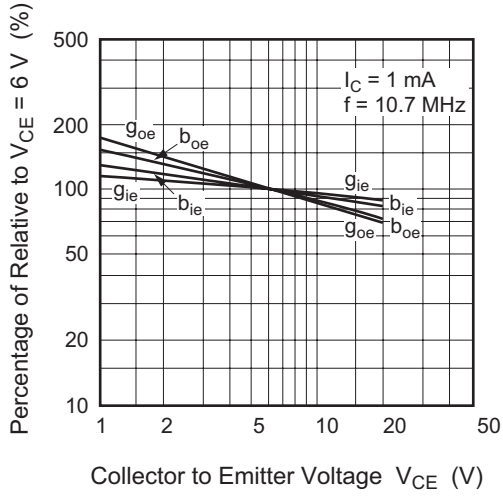
Transfer Admittance vs. Collector to Emitter Voltage



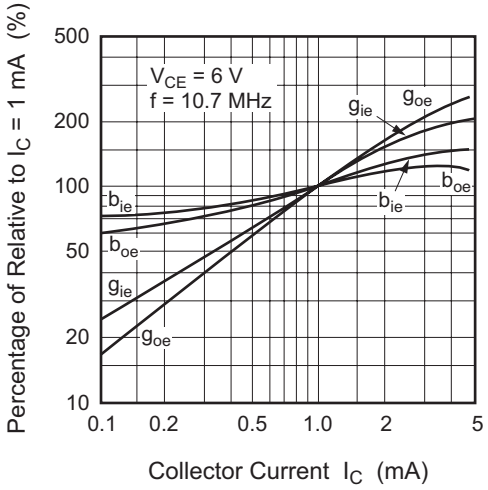
Transfer Admittance vs. Collector Current



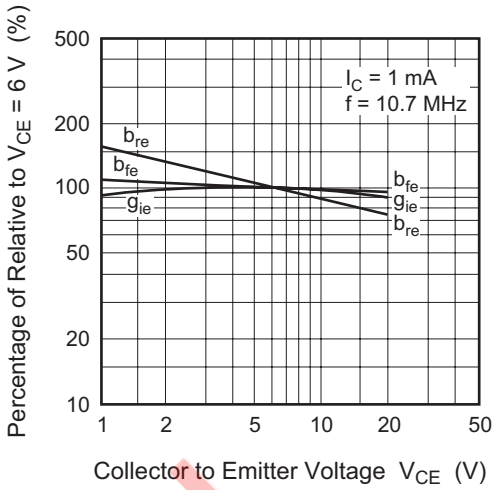
Input/Output Admittance vs. Collector to Emitter Voltage



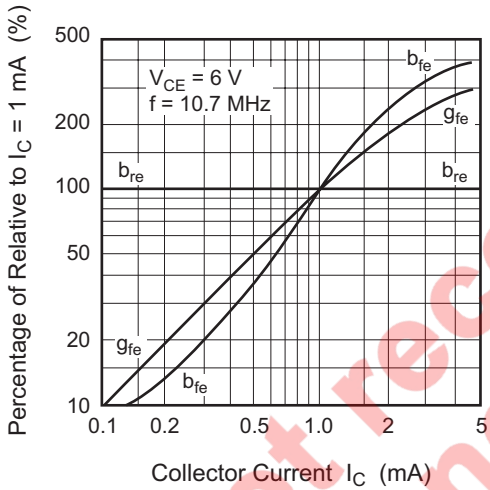
Input/Output Admittance vs. Collector Current



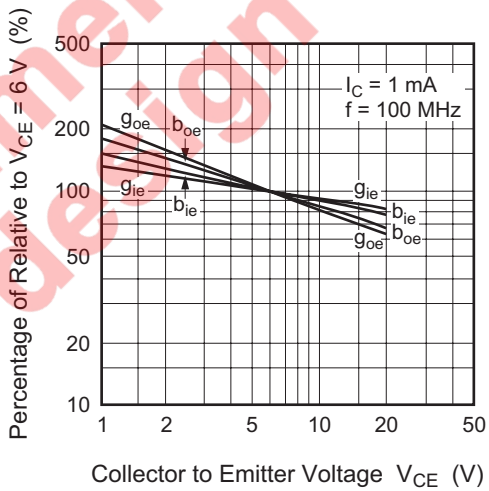
Transfer Admittance vs. Collector to Emitter Voltage



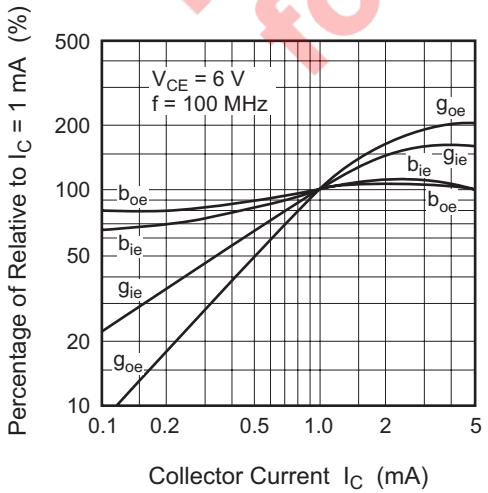
Transfer Admittance vs. Collector Current



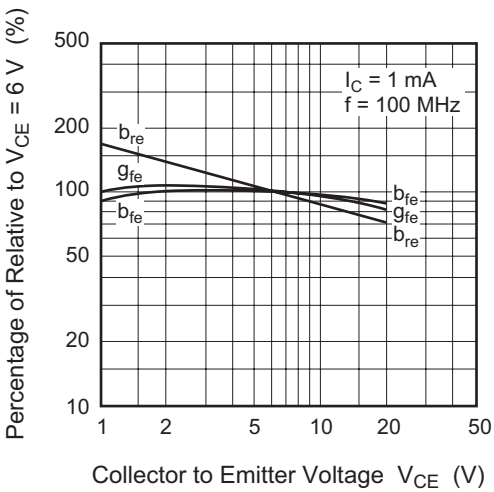
Input/Output Admittance vs. Collector to Emitter Voltage



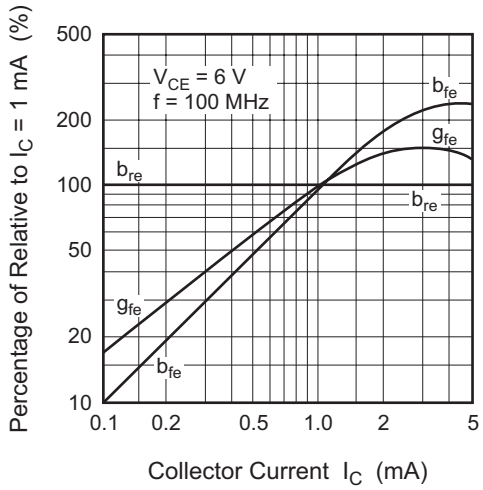
Input/Output Admittance vs. Collector Current



Transfer Admittance vs. Collector to Emitter Voltage



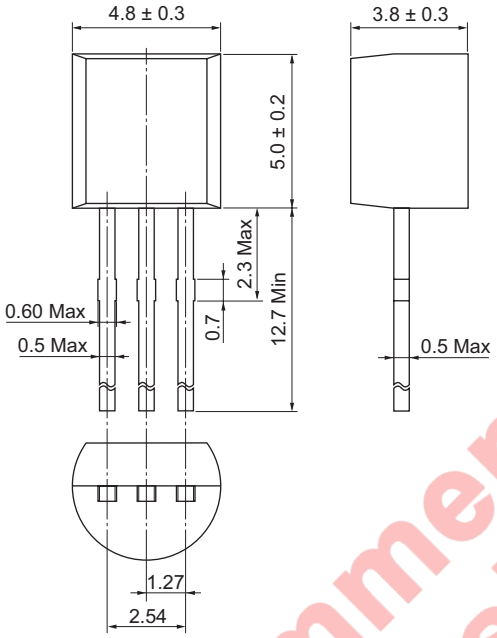
Transfer Admittance vs.
Collector Current



Package Dimensions

JEITA Package Code	RENESAS Code	Package Name	MASS[Typ.]
SC-43A	PRSS0003DA-C	TO-92(2) / TO-92(2)V	0.25g

Unit: mm



Ordering Information

Part Name	Quantity	Shipping Container
2SC460CTZ 2SC461BTZ 2SC461CTZ	2500	Hold Box, Radial Taping

Note: For some grades, production may be terminated. Please contact the Renesas sales office to check the state of production before ordering the product.

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

RENESAS SALES OFFICES

http://www.renesas.com

Refer to "**http://www.renesas.com/en/network**" for the latest and detailed information.

Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

Renesas Technology Europe Limited
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

Renesas Technology Hong Kong Ltd.
7th Floor, North Tower, World Finance Centre, Harbour City, 1 Canton Road, Tsimshatsui, Kowloon, Hong Kong
Tel: <852> 2265-6688, Fax: <852> 2730-6071

Renesas Technology Taiwan Co., Ltd.
10th Floor, No.99, Fushing North Road, Taipei, Taiwan
Tel: <886> (2) 2715-2888, Fax: <886> (2) 2713-2999

Renesas Technology (Shanghai) Co., Ltd.
Unit2607 Ruijing Building, No.205 Maoming Road (S), Shanghai 200020, China
Tel: <86> (21) 6472-1001, Fax: <86> (21) 6415-2952

Renesas Technology Singapore Pte. Ltd.
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Renesas Technology Korea Co., Ltd.
Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea
Tel: <82> 2-796-3115, Fax: <82> 2-796-2145

Renesas Technology Malaysia Sdn. Bhd.
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jalan Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia
Tel: <603> 7955-9390, Fax: <603> 7955-9510

Colophon .3.0