

# 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         | $T_j$     | 150         | 150         | °C   |
| Storage temperature          | $T_{stg}$ | -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       | $I_C = 10 \mu A, I_E = 0$                                                                |
| Collector to emitter breakdown voltage  | $V_{(BR)CEO}$ | 30     | —    | —    | 30     | —    | —    | V       | $I_C = 1 \text{ mA}, R_{BE} = \infty$                                                    |
| Emitter to base breakdown voltage       | $V_{(BR)EBO}$ | 5      | —    | —    | 5      | —    | —    | V       | $I_E = 10 \mu A, I_C = 0$                                                                |
| Collector cutoff current                | $I_{CBO}$     | —      | —    | 0.5  | —      | —    | 0.5  | $\mu A$ | $V_{CB} = 18 \text{ V}, I_E = 0$                                                         |
| Emitter cutoff current                  | $I_{EBO}$     | —      | —    | 0.5  | —      | —    | 0.5  | $\mu A$ | $V_{EB} = 2 \text{ V}, I_C = 0$                                                          |
| Base to emitter voltage                 | $V_{BE}$      | —      | 0.63 | 0.75 | —      | 0.63 | 0.75 | V       | $V_{CE} = 12 \text{ V}, I_C = 2 \text{ mA}$                                              |
| DC current transfer ratio               | $h_{FE}^{*1}$ | 100    | —    | 200  | 35     | —    | 200  |         | $V_{CE} = 12 \text{ V}, I_C = 2 \text{ mA}$                                              |
| Collector to emitter saturation voltage | $V_{CE(sat)}$ | —      | 0.6  | 1.1  | —      | 0.6  | 1.1  | V       | $I_C = 10 \text{ mA}, I_B = 1 \text{ mA}$                                                |
| Gain bandwidth product                  | $f_T$         | —      | 230  | —    | —      | 230  | —    | MHz     | $V_{CE} = 12 \text{ V}, I_C = 2 \text{ mA}$                                              |
| Collector output capacitance            | $C_{ob}$      | —      | 1.8  | 3.5  | —      | 1.8  | 3.5  | pF      | $V_{CB} = 10 \text{ V}, I_E = 0, f = 1 \text{ MHz}$                                      |
| 10.7 MHz power gain                     | PG            | 26     | 29   | —    | —      | —    | —    | dB      | $V_{CE} = 6 \text{ V}, I_E = -1 \text{ mA}$<br>$f = 10.7 \text{ MHz}$                    |
| 100 MHz power gain                      | PG            | —      | —    | —    | 13     | 17   | —    | dB      | $V_{CE} = 6 \text{ V}, I_E = -1 \text{ mA}$<br>$f = 100 \text{ MHz}$                     |
| Noise figure                            | NF            | —      | 2.0  | —    | —      | —    | —    | dB      | $V_{CE} = 6 \text{ V}, I_E = -1 \text{ mA}$<br>$f = 1 \text{ MHz}$<br>$R_g = 500 \Omega$ |

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

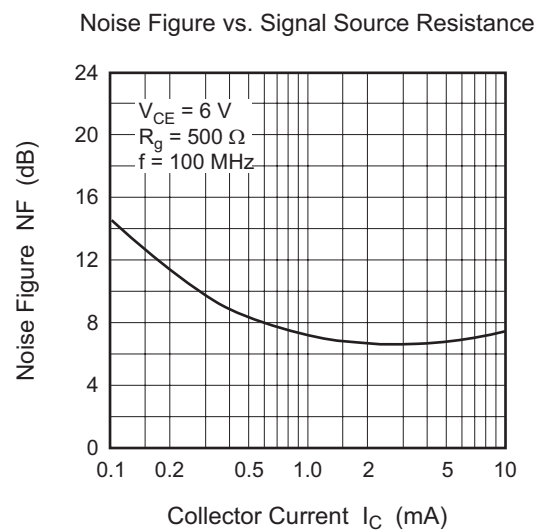
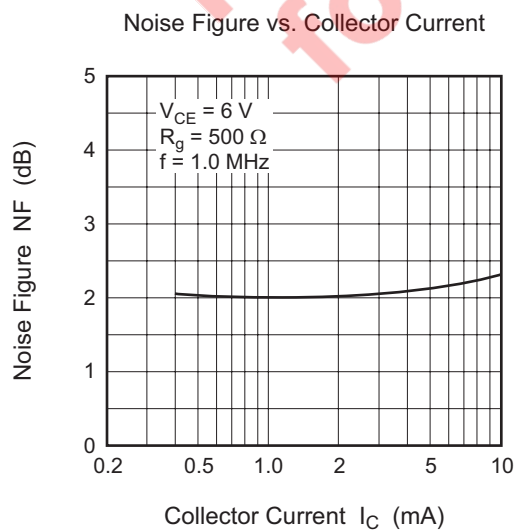
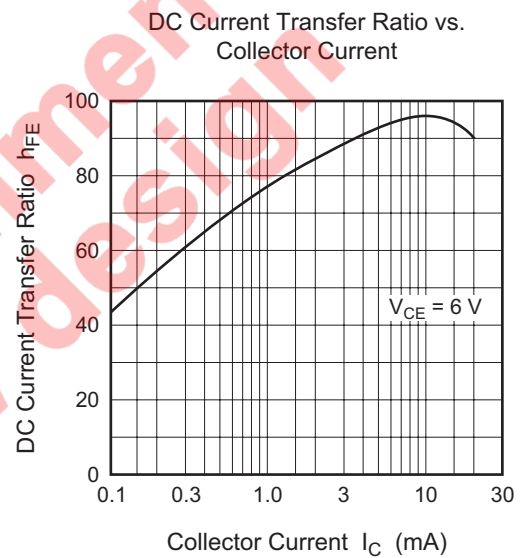
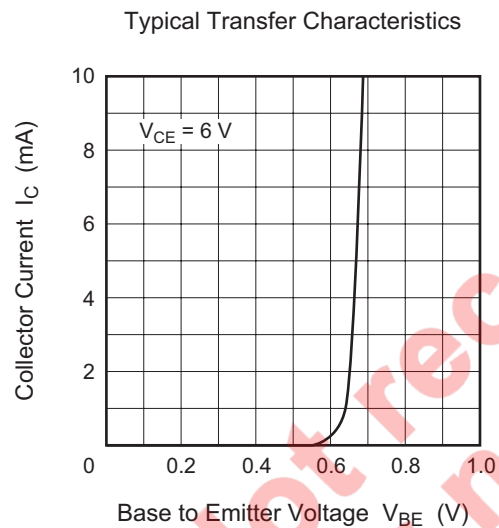
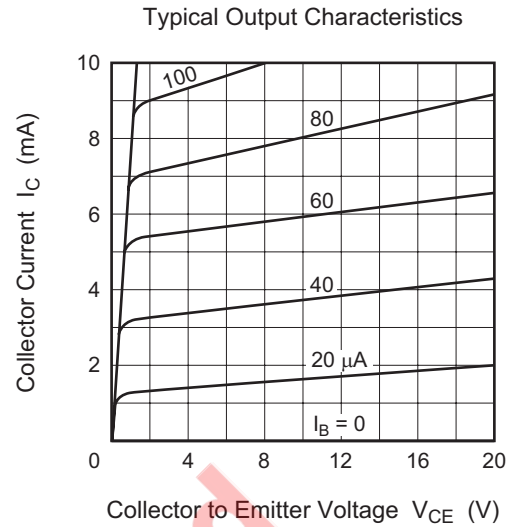
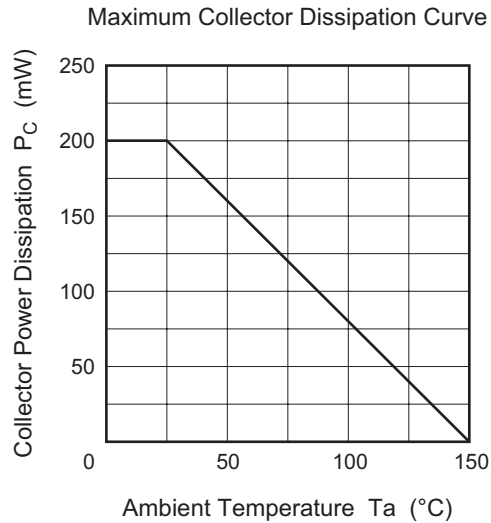
| B         | C          |
|-----------|------------|
| 60 to 120 | 100 to 200 |

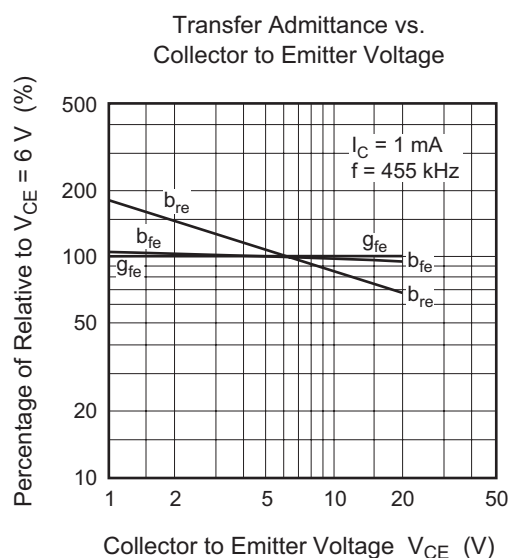
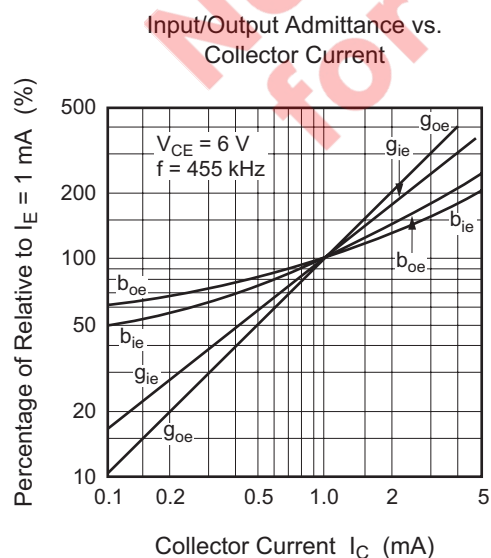
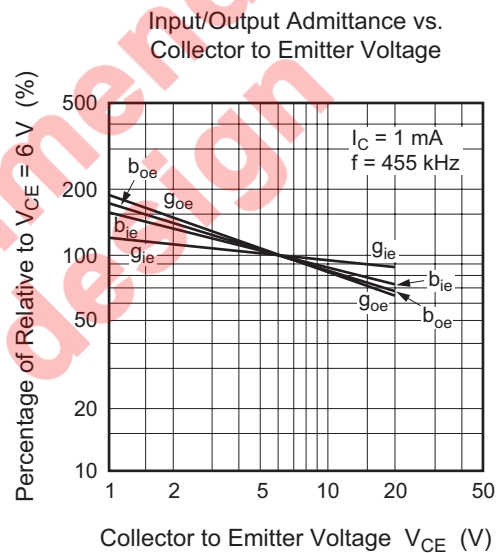
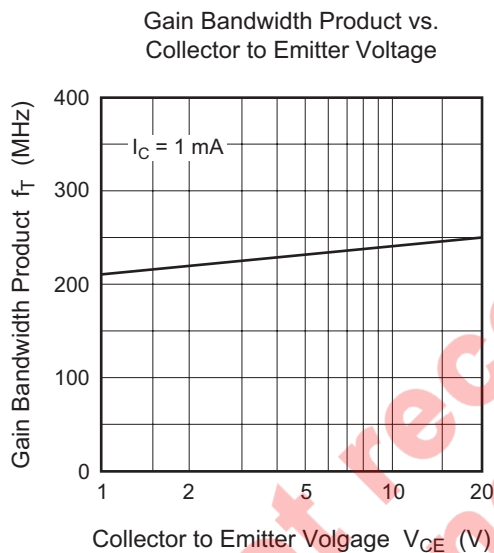
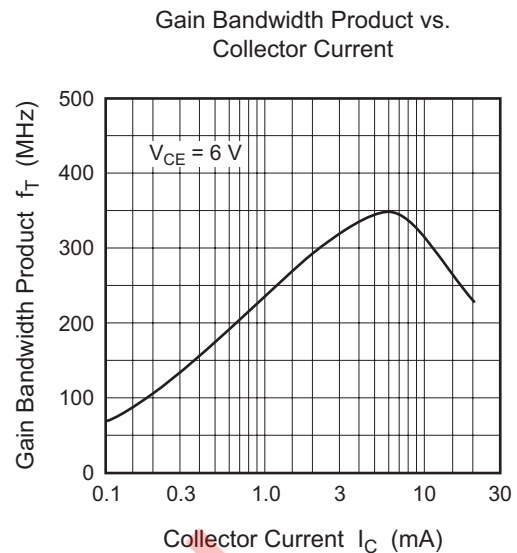
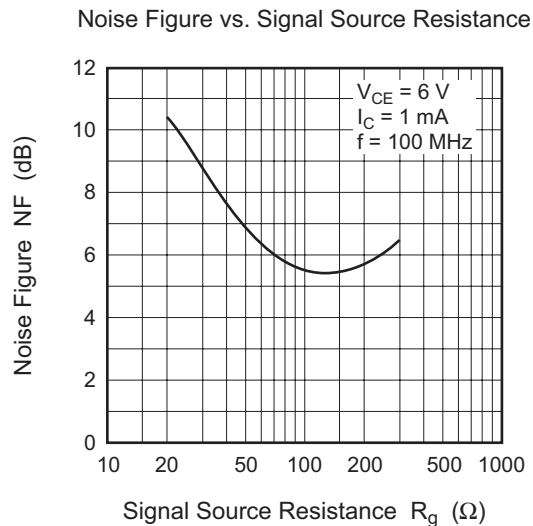
## Small Signal y Parameters

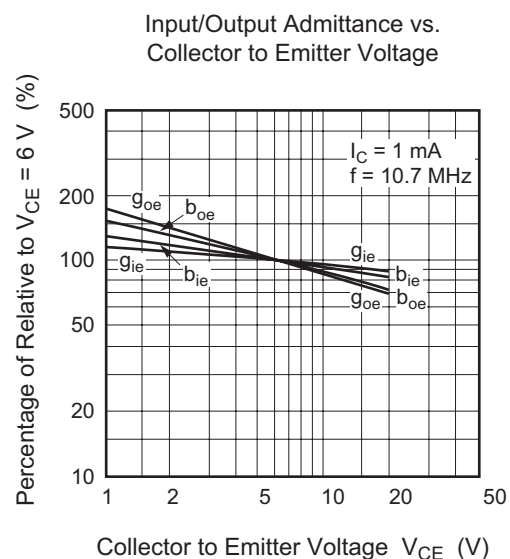
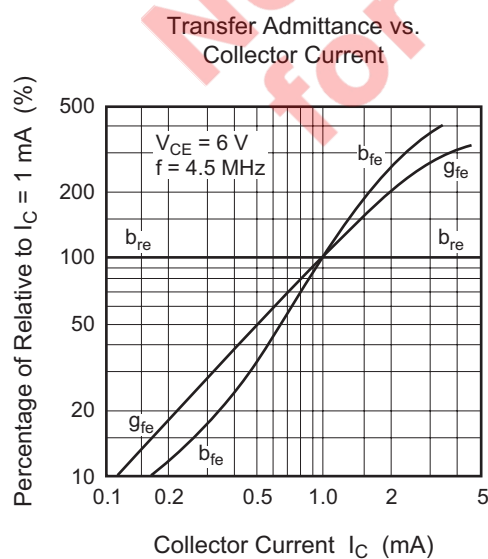
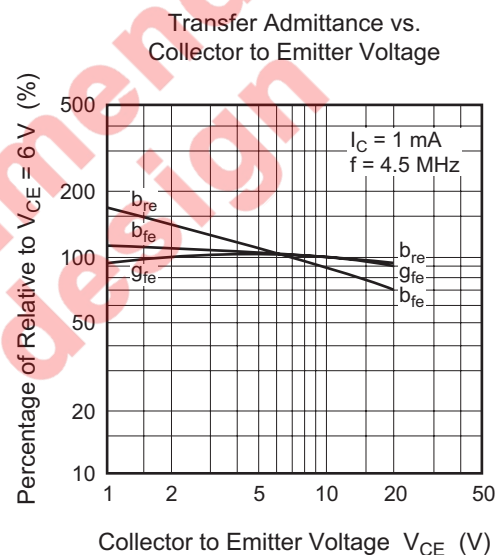
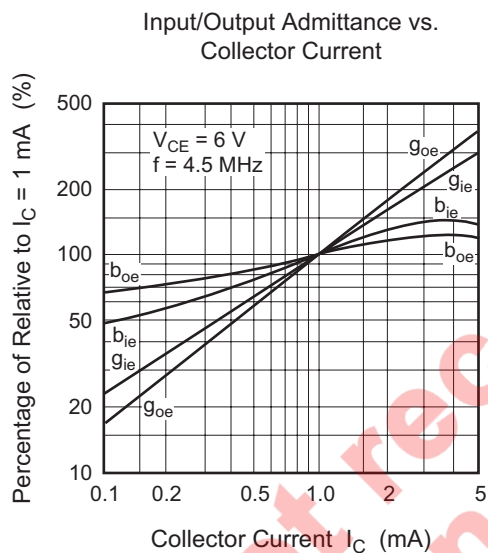
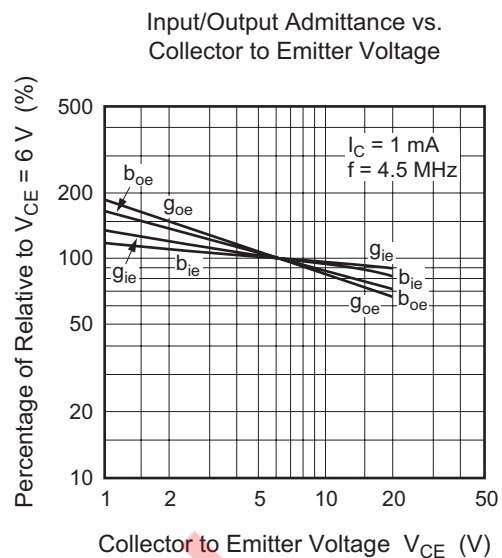
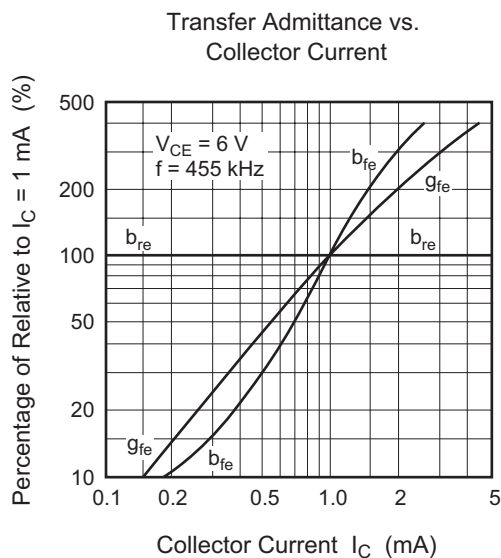
(V<sub>CE</sub> = 6 V, I<sub>C</sub> = 1 mA, Emitter Common)

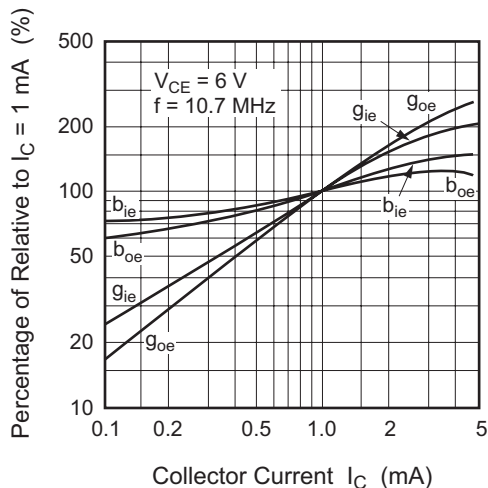
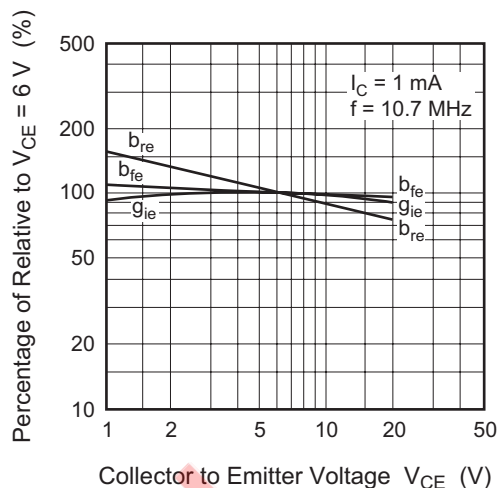
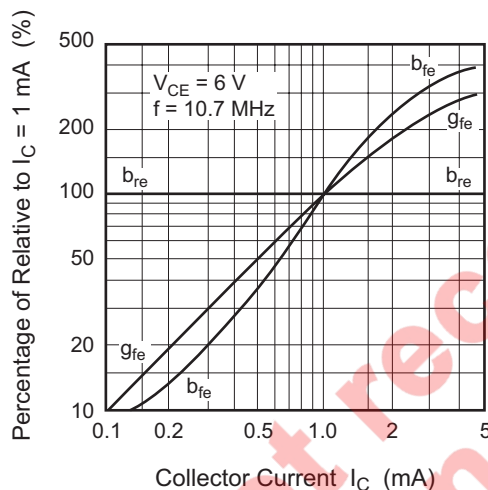
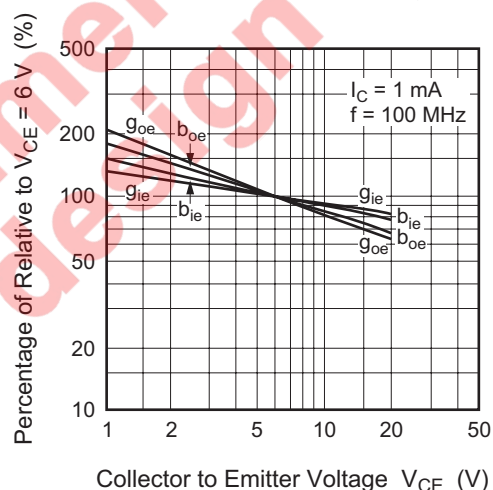
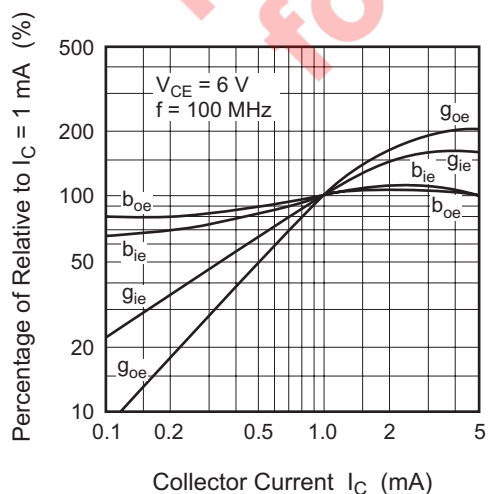
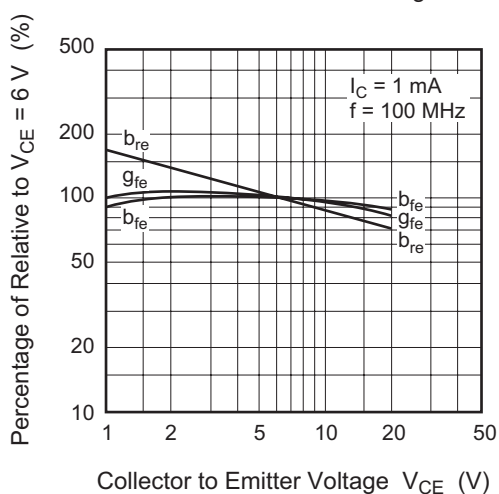
| Item                        | Symbol          | f        | 2SC460A,<br>2S461A | 2SC460B,<br>2SC461B | 2SC460C,<br>2SC461C | Unit |
|-----------------------------|-----------------|----------|--------------------|---------------------|---------------------|------|
| Input admittance            | y <sub>ie</sub> | 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 | y <sub>re</sub> | 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 | y <sub>fe</sub> | 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           | y <sub>oe</sub> | 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         |      |

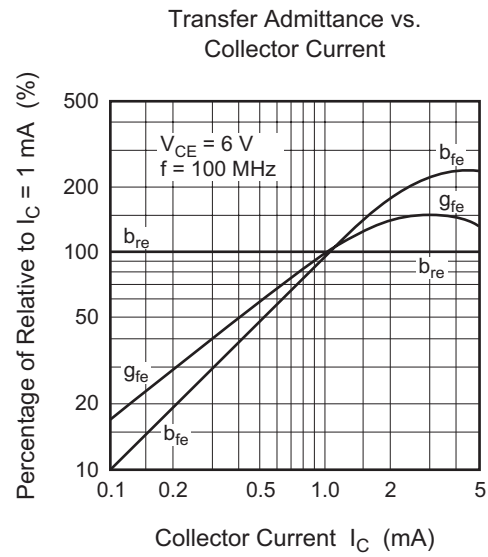
## Main Characteristics





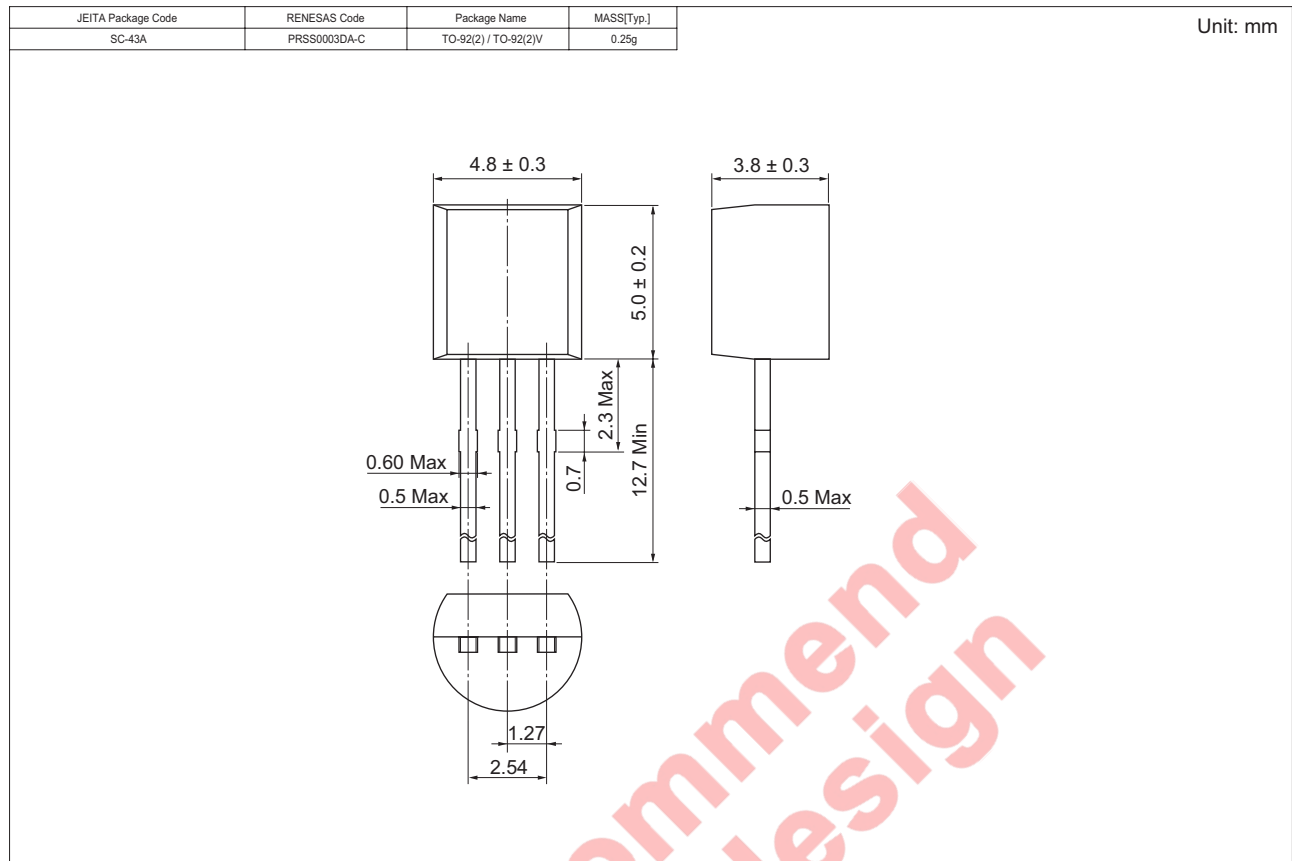


Input/Output Admittance vs.  
Collector CurrentTransfer Admittance vs.  
Collector to Emitter VoltageTransfer Admittance vs.  
Collector CurrentInput/Output Admittance vs.  
Collector to Emitter VoltageInput/Output Admittance vs.  
Collector CurrentTransfer Admittance vs.  
Collector to Emitter Voltage



Not recommended  
for new design

## Package Dimensions



## Ordering Information

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

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