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# 2SC460, 2SC461

Silicon NPN Epitaxial Planar

# HITACHI

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## Application

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

## Outline

TO-92 (2)



1. Emitter
2. Collector
3. Base

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## 2SC460, 2SC461

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### 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	$h_{FE}^{*1}$	35	—	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	$V_{CE} = 6 \text{ V}, I_E = -1 \text{ mA}$ $f = 10.7 \text{ MHz}$
100 MHz power gain	PG	—	—	—	13	17	—	dB	$V_{CE} = 6 \text{ V}, I_E = -1 \text{ mA}$ $f = 100 \text{ MHz}$
Noise figure	NF	—	2.0	—	—	—	—	dB	$V_{CE} = 6 \text{ V}, I_E = -1 \text{ mA}$ $f = 1 \text{ MHz}$ $R_g = 500 \Omega$

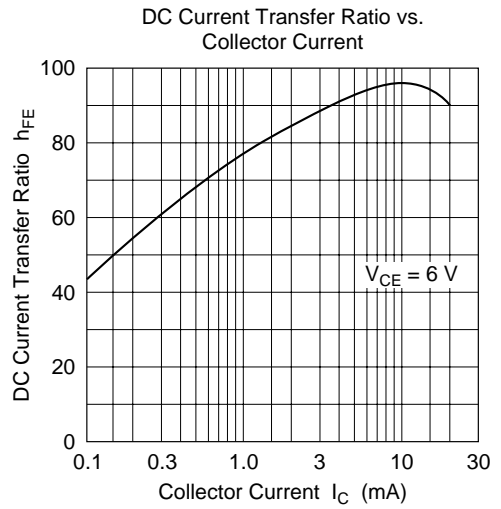
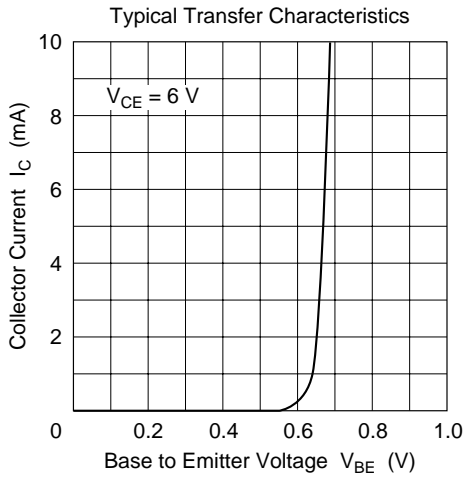
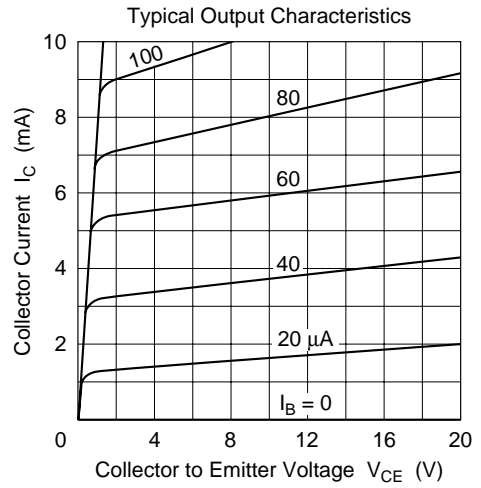
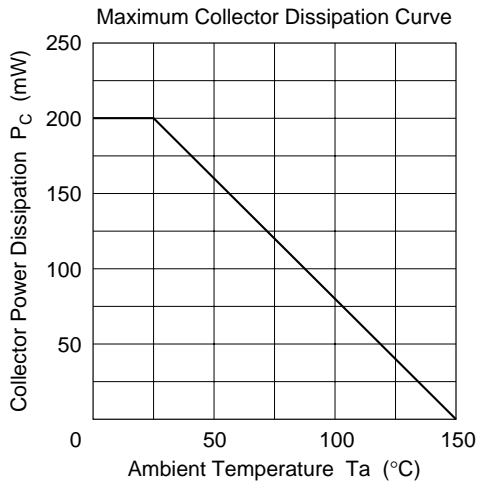
Note: 1. The 2SC460 and 2SC461 are grouped by  $h_{FE}$  as follows.

A	B	C
35 to 70	60 to 120	100 to 200

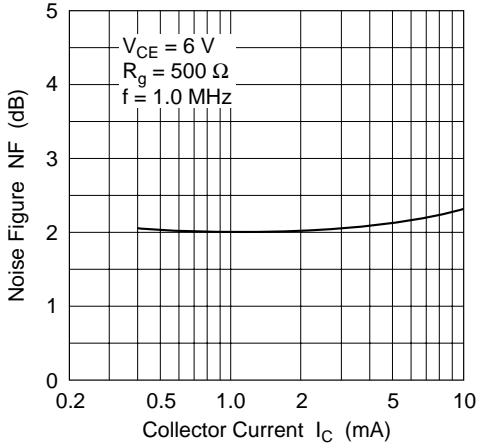
## 2SC460, 2SC461

### Small Signal y Parameters ( $V_{CE} = 6\text{ V}$ , $I_C = 1\text{ mA}$ , Emitter Common)

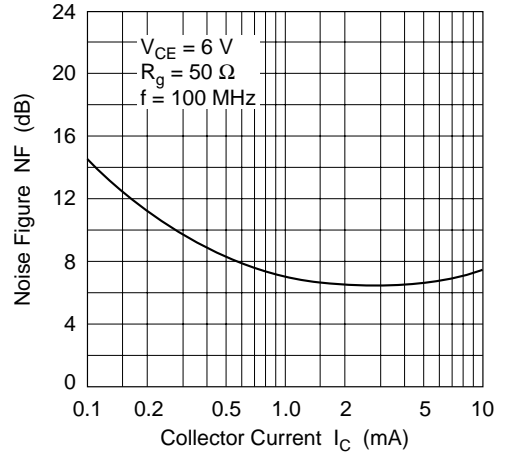
Item	Symbol	f	2SC460A, 2S461A	2SC460B, 2SC461B	2SC460C, 2SC461C	Unit
Input admittance	y <sub>ie</sub>	455 kHz	0.58 + j0.074	0.42 + j0.068	0.30 + j0.051	mS
		4.5 MHz	0.65 + j0.79	0.50 + j0.7	0.35 + j0.57	
		10.7 MHz	0.91 + j2.0	0.61 + j1.9	0.39 + j1.3	
		100 MHz	7.4 + j14	5.6 + j12	3.8 + j6.0	
Reverse 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	



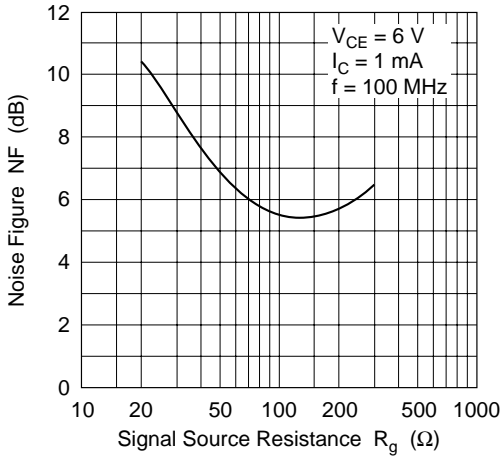
Noise Figure vs. Collector Current



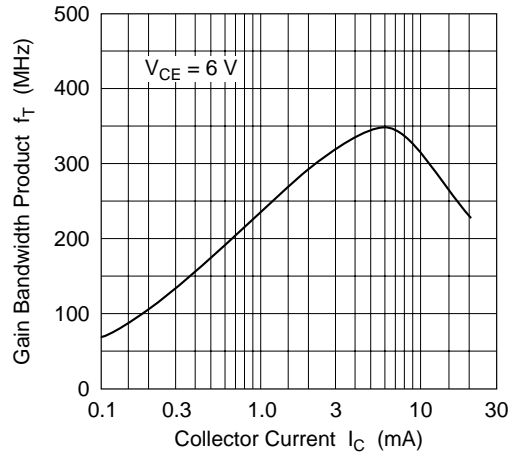
Noise Figure vs. Collector Current



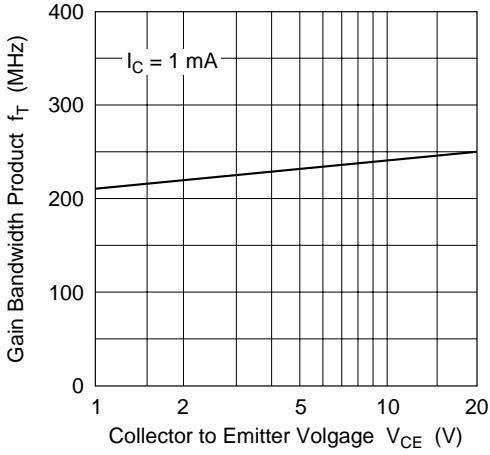
Noise Figure vs. Signal Source Resistance



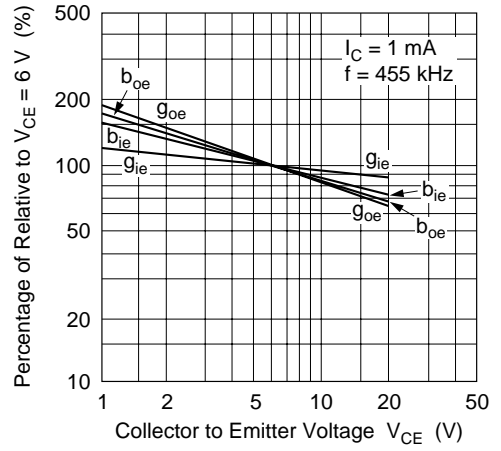
Gain Bandwidth Product vs. Collector Current



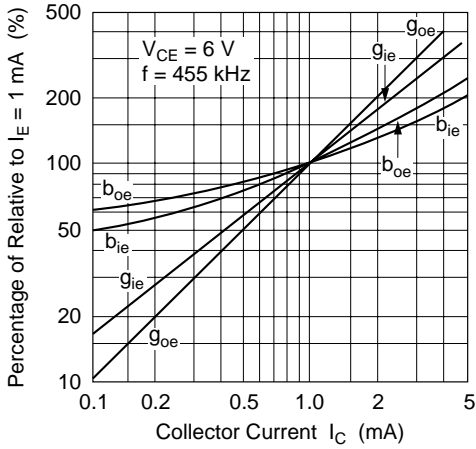
Gain Bandwidth Product vs. Collector to Emitter Voltage



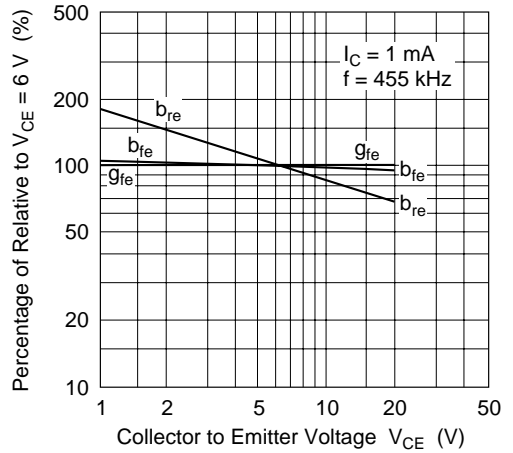
Input/Output Admittance vs. Collector to Emitter Voltage



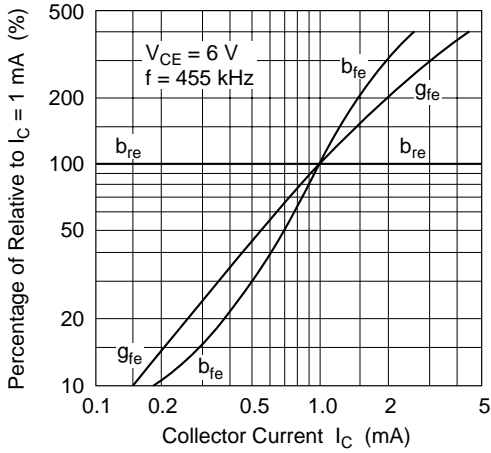
Input/Output Admittance vs. Collector Current



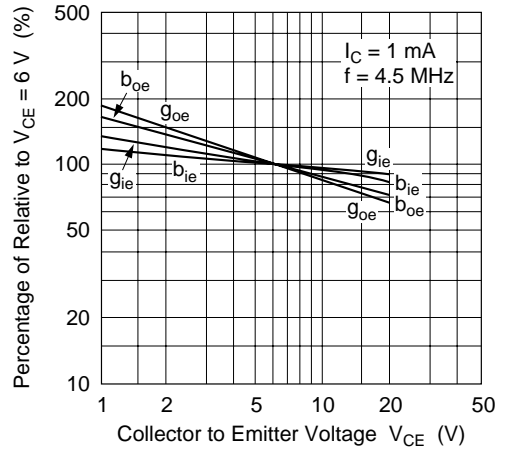
Transfer Admittance vs. Collector to Emitter Voltage



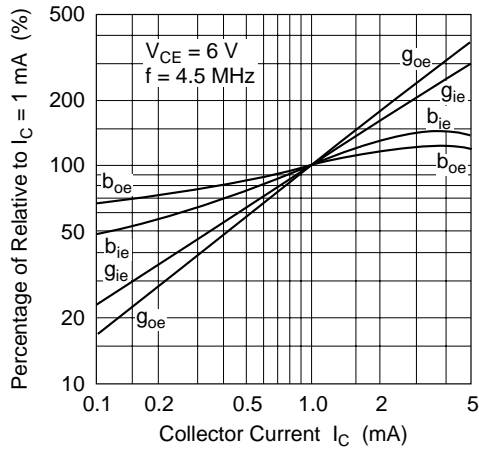
Transfer Admittance vs. Collector Current



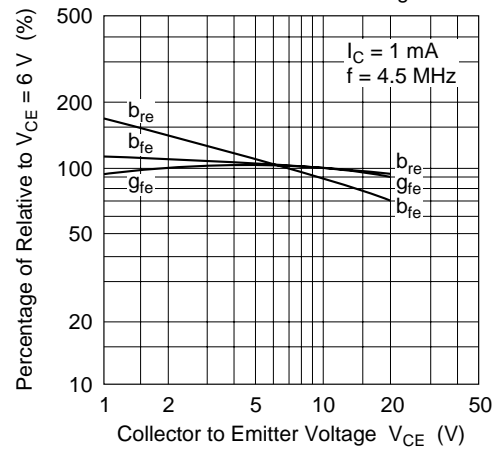
Input/Output Admittance vs. Collector to Emitter Voltage



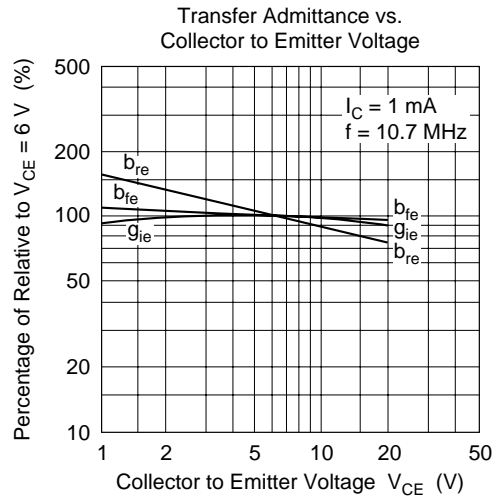
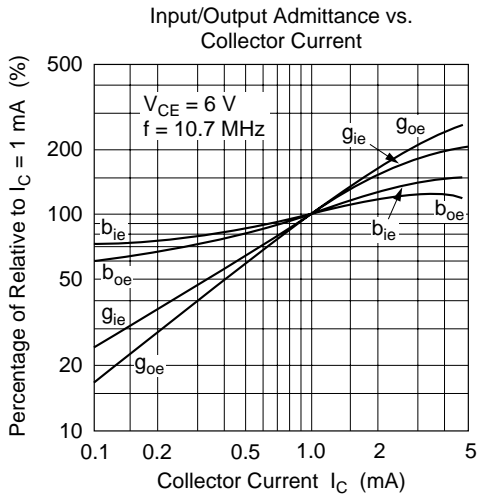
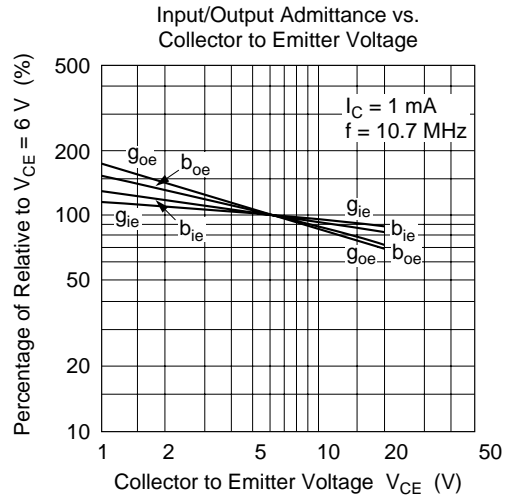
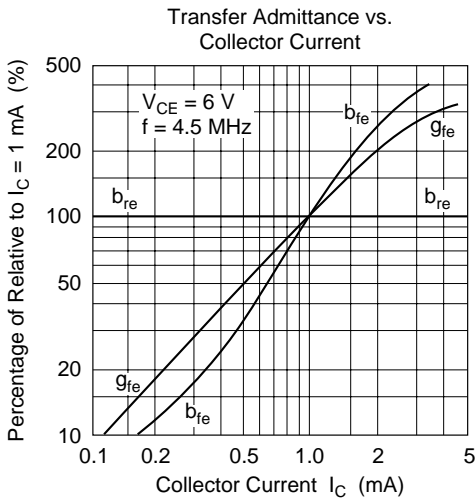
Input/Output Admittance vs. Collector Current

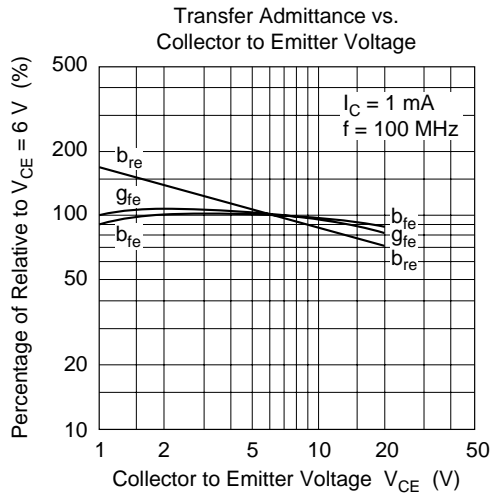
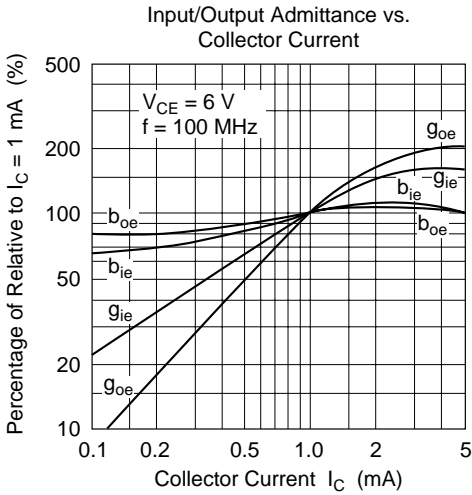
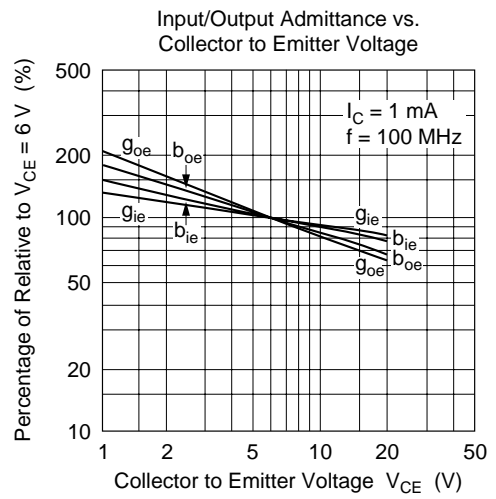
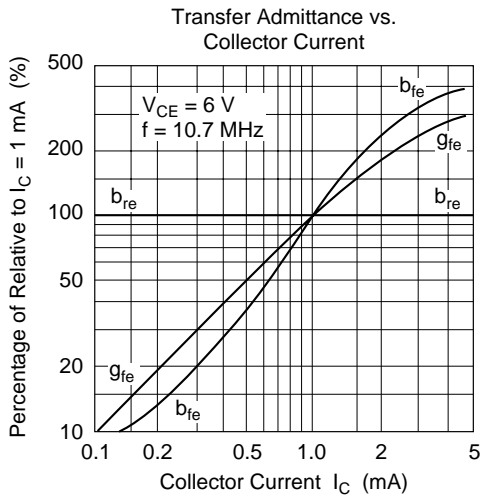


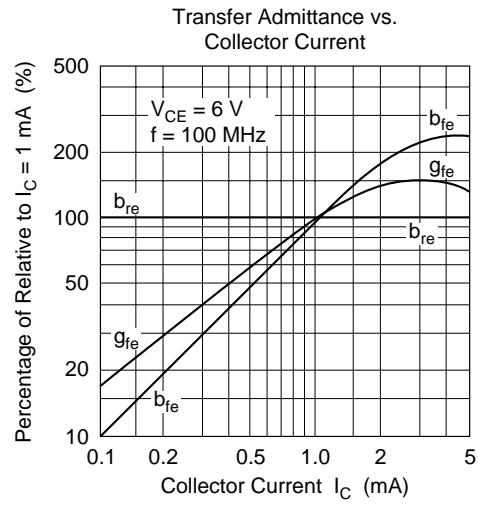
Transfer Admittance vs. Collector to Emitter Voltage

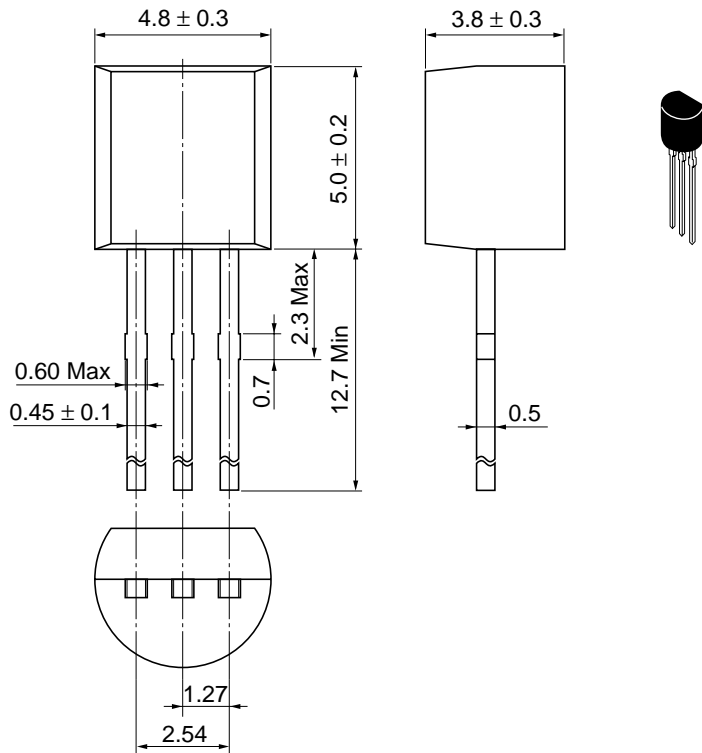












Hitachi Code	TO-92 (2)
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.25 g

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