2SA1190, 2SA1191

Silicon PNP Epitaxial

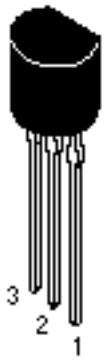
HITACHI

Application

- Low frequency low noise amplifier
- Complementary pair with 2SC2855 and 2SC2856

Outline

TO-92 (1)



1. Emitter
2. Collector
3. Base

Hitachi semiconductor

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	2SA1190	2SA1191	Unit
Collector to base voltage	V_{CBO}	–90	–120	V
Collector to emitter voltage	V_{CEO}	–90	–120	V
Emitter to base voltage	V_{EBO}	–5	–5	V
Collector current	I_C	–100	–100	mA
Emitter current	I_E	100	100	mA
Collector power dissipation	P_C	400	400	mW
Junction temperature	Tj	150	150	°C
Storage temperature	Tstg	–55 to +150	–55 to +150	°C

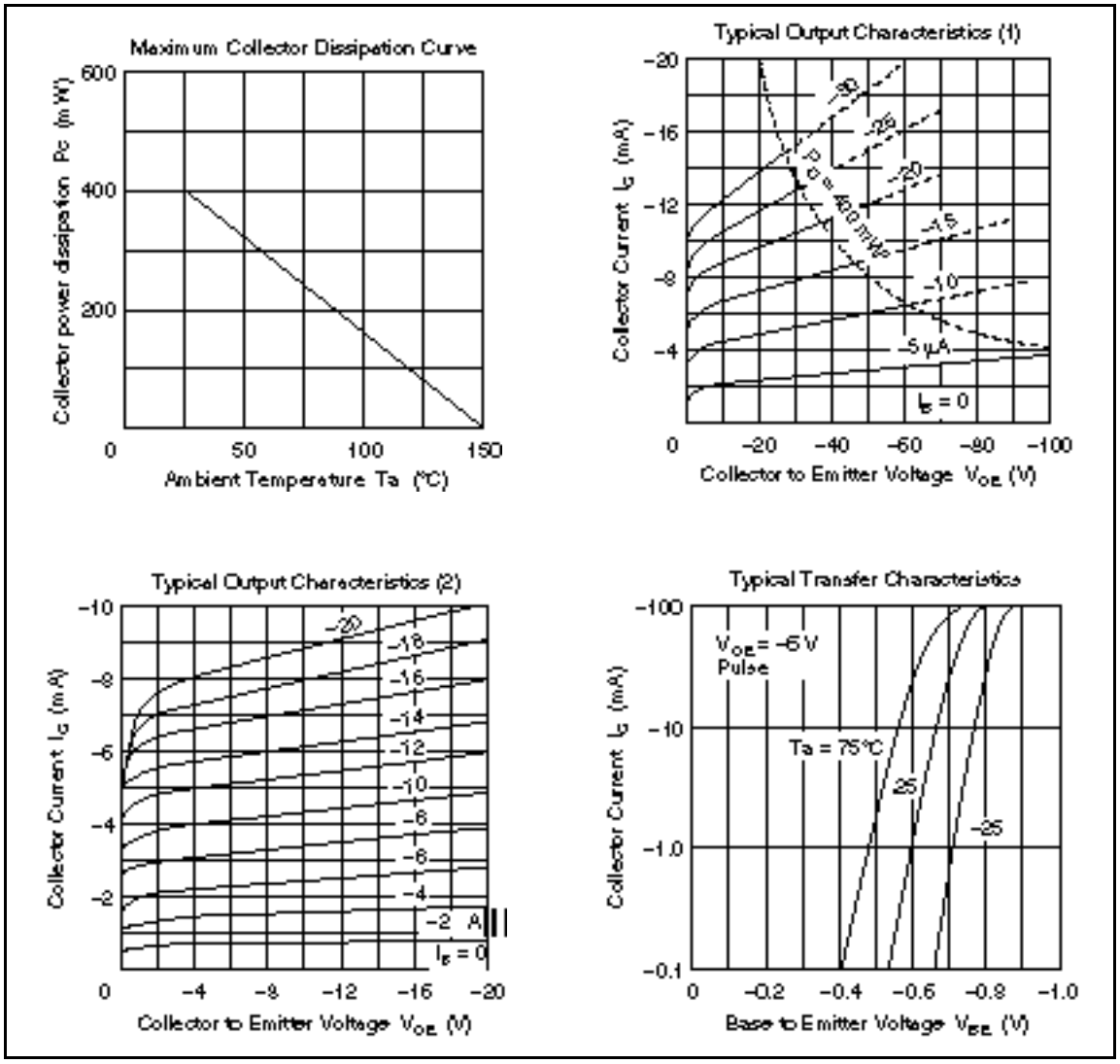
Electrical Characteristics (Ta = 25°C)

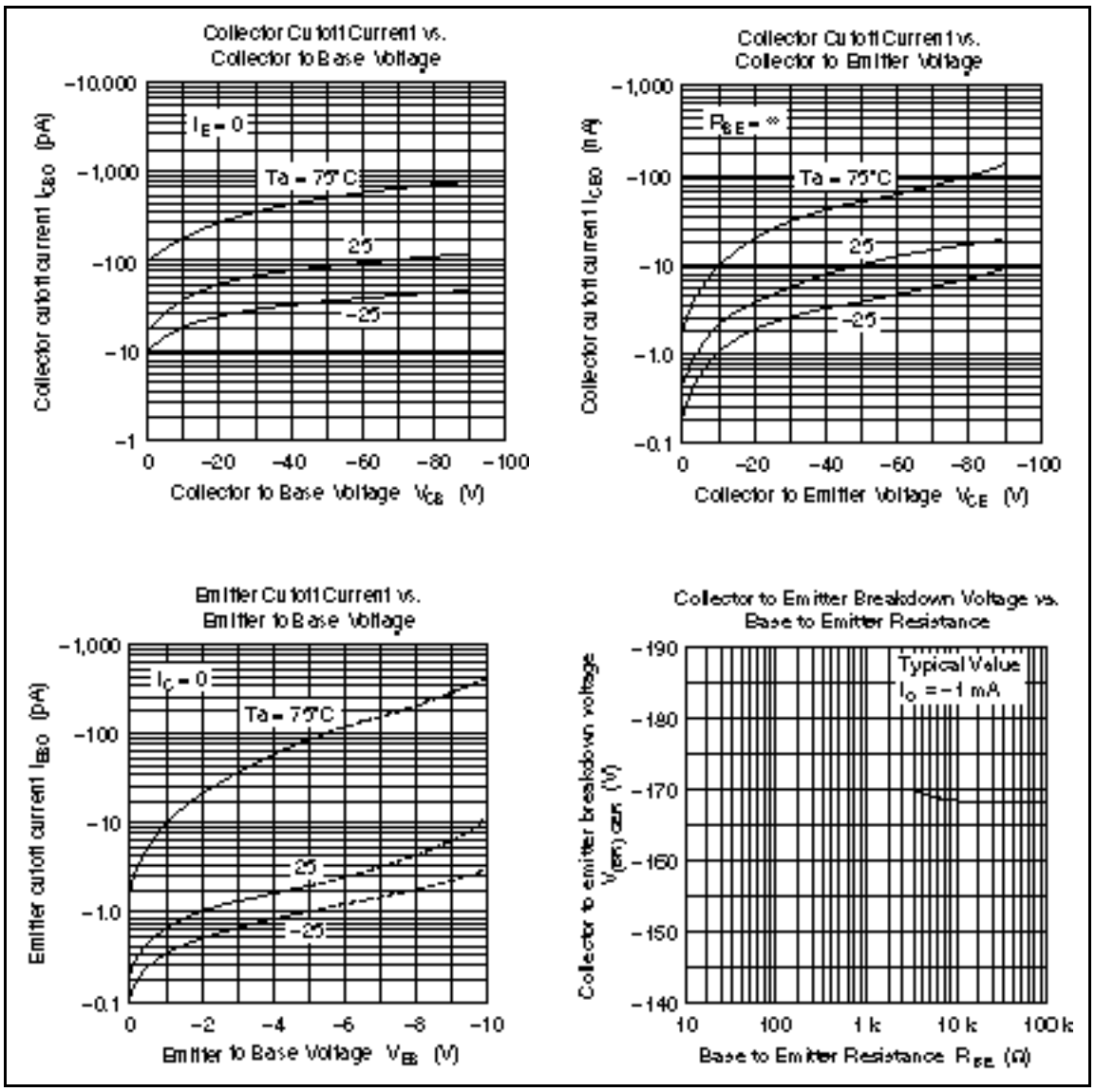
Item	Symbol	2SA1190 Min	2SA1190 Typ	2SA1190 Max	2SA1191 Min	2SA1191 Typ	2SA1191 Max	Unit	Test conditions
Collector to base breakdown voltage	$V_{(BR)CBO}$	–90	—	—	–120	—	—	V	I_C = –10 µA, I_E = 0
Collector to emitter breakdown voltage	$V_{(BR)CEO}$	–90	—	—	–120	—	—	V	I_C = –1 mA, R_{BE} = ∞
Emitter to base breakdown voltage	$V_{(BR)EBO}$	–5	—	—	–5	—	—	V	I_E = –10 µA, I_C = 0
Collector cutoff current	I_{CBO}	—	—	–0.1	—	—	–0.1	µA	V_{CB} = –70 V, I_E = 0
Emitter cutoff current	I_{EBO}	—	—	–0.1	—	—	–0.1	µA	V_{EB} = –2 V, I_C = 0
DC current trnsfer ratio	h_{FE}*[1]	250	—	800	250	—	800		V_{CE} = –12 V, I_C = –2 mA*[2]
Collector to emitter saturation voltage	$V_{CE(sat)}$	—	–0.05	–0.15	—	–0.05	–0.15	V	I_C = –10 mA, I_B = –1 mA*[2]
Base to emitter saturation voltage	$V_{BE(sat)}$	—	–0.7	–1.0	—	–0.7	–1.0	V	
Gain bandwidth product	f_T	—	130	—	—	130	—	MHz	V_{CE} = –6 V, I_C = –10 mA
Collector output capacitance	Cob	—	3.2	—	—	3.2	—	pF	V_{CB} = –10 V, I_E = 0, f = 1 MHz
Noise figure	NF	—	0.15	1.5	—	0.15	1.5	dB	V_{CE} = –6 V, I_C = –0.1 mA, R_g = 10 kΩ, f = 1 kHz
		—	0.2	2.0	—	0.2	2.0	dB	V_{CE} = –6 V, I_C = –0.1 mA, R_g = 10 kΩ, f = 10 Hz
Noise voltage reffered to input	e_n	—	0.7	—	—	0.7	—	nV/√Hz	V_{CB} = –6 V, I_C = –10 mA, Rg = 0, f = 1 kHz

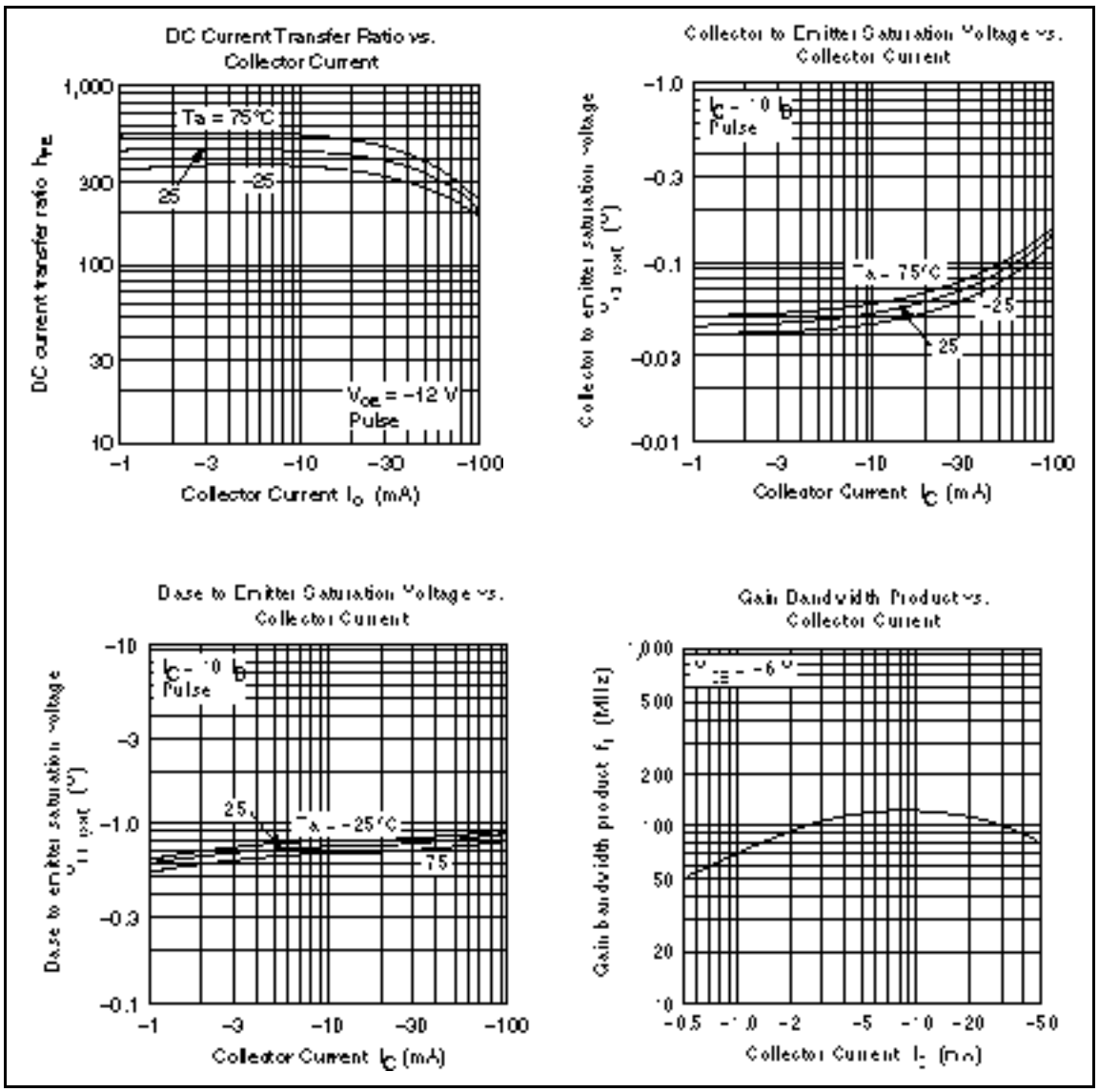
Notes: 1. The 2SA1190 and 2SA1191 are grouped by h_{FE} as follows.

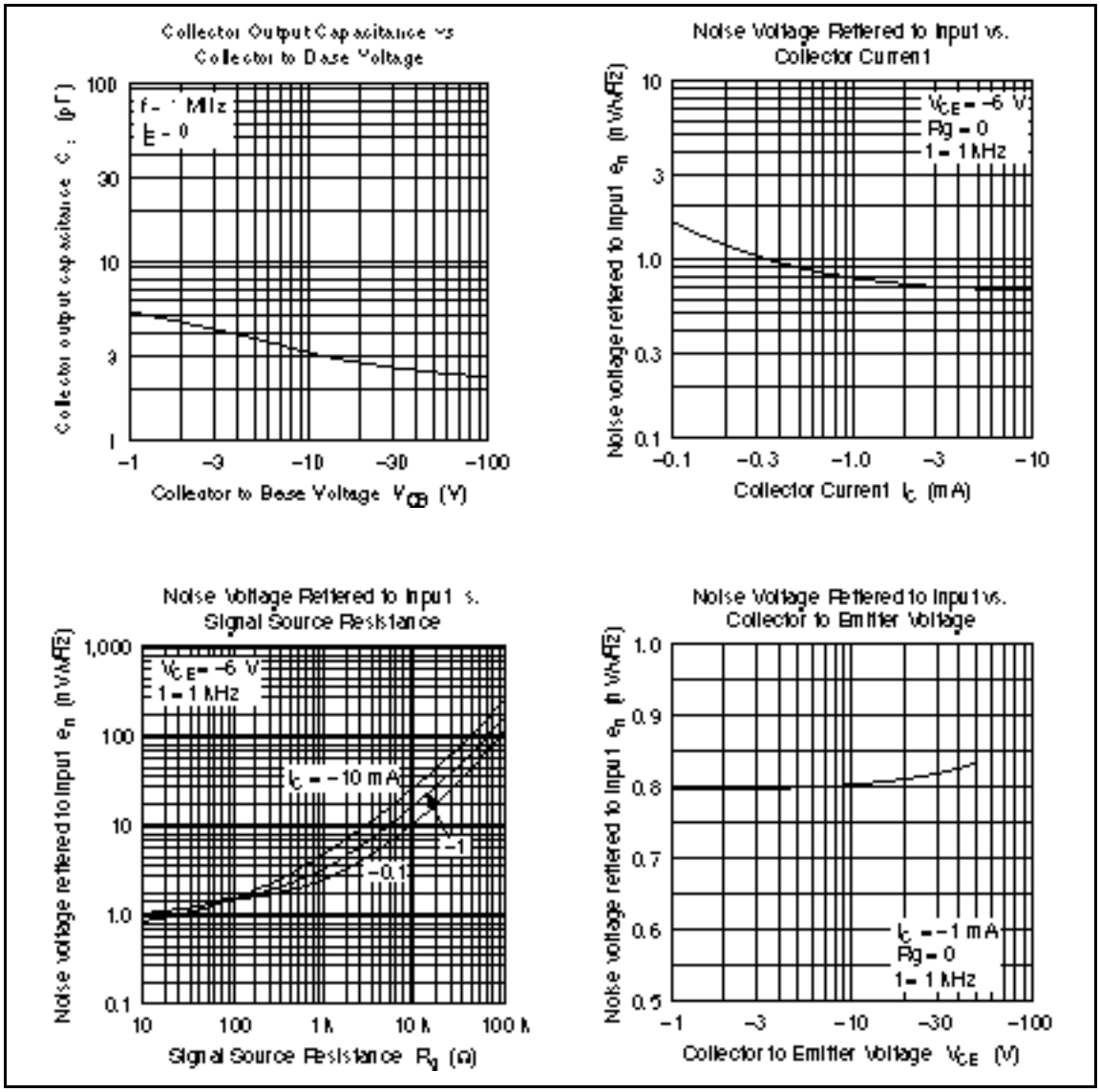
2. Pulse test

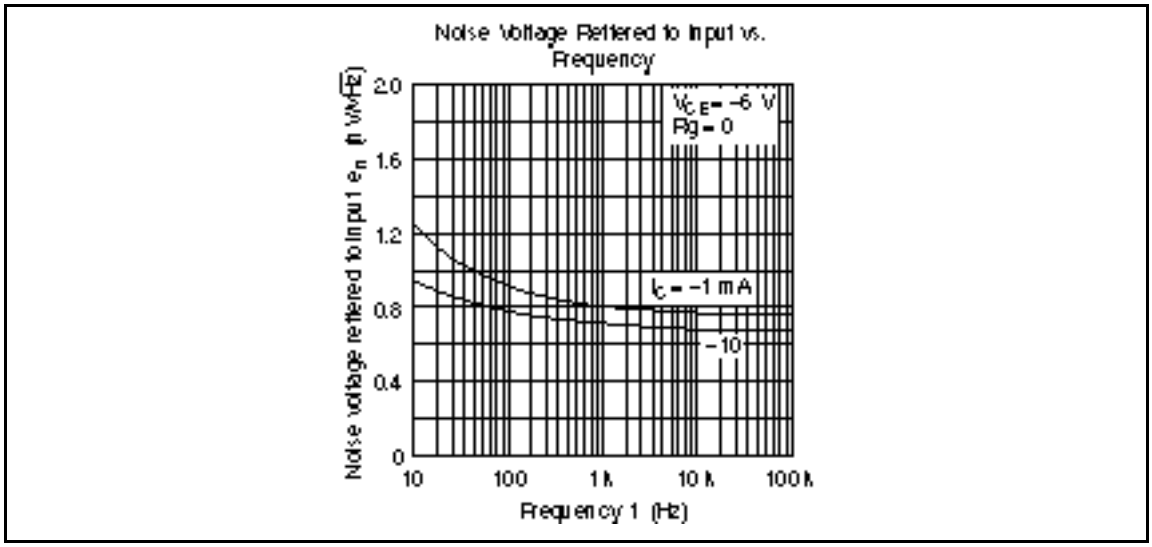
D	E
250 to 500	400 to 800


Maximum Collector Dissipation Curve
Collector power dissipation Pc (mW)
600
400
200
0
50
100
150
Ambient Temperature Ta (°C)
Typical Output Characteristics (1)
Collector Current I_C (mA)
−20
−16
−12
−8
−4
Pc = 400 mW
−30
−25
−20
−15
−10
−5 µA
I_B = 0
0
−20
−40
−60
−80
−100
Collector to Emitter Voltage V_{CE} (V)
Typical Output Characteristics (2)
Collector Current I_C (mA)
−10
−8
−6
−4
−2
−20
−18
−16
−14
−12
−10
−8
−6
−4
−2 A
I_B = 0
0
−4
−8
−12
−16
−20
Collector to Emitter Voltage V_{CE} (V)
Typical Transfer Characteristics
Collector Current I_C (mA)
−100
−10
−1.0
−0.1
V_{CE} = −6 V
Pulse
Ta = 75°C
25
−25
0
−0.2
−0.4
−0.6
−0.8
−1.0
Base to Emitter Voltage V_{BE} (V)


Collector Cutoff Current vs.
Collector to Base Voltage
Collector cutoff current I_{CBO} (pA)
$I_E = 0$
Ta = 75°C
25
−25
−10,000
−1,000
−100
−10
−1
0
−20
−40
−60
−80
−100
Collector to Base Voltage V_{CB} (V)
Collector Cutoff Current vs.
Collector to Emitter Voltage
Collector cutoff current I_{CEO} (mA)
$R_{BE} = \infty$
Ta = 75°C
25
−25
−1,000
−100
−10
−1.0
−0.1
0
−20
−40
−60
−80
−100
Collector to Emitter Voltage V_{CE} (V)
Emitter Cutoff Current vs.
Emitter to Base Voltage
Emitter cutoff current I_{EBO} (pA)
$I_C = 0$
Ta = 75°C
25
−25
−1,000
−100
−10
−1.0
−0.1
0
−2
−4
−6
−8
−10
Emitter to Base Voltage V_{EB} (V)
Collector to Emitter Breakdown Voltage vs.
Base to Emitter Resistance
Collector to emitter breakdown voltage $V_{(BR)CER}$ (V)
Typical Value
$I_C = -1$ mA
−190
−180
−170
−160
−150
−140
10
100
1 k
10 k
100 k
Base to Emitter Resistance R_{BE} (Ω)


DC Current Transfer Ratio vs.
Collector Current
1,000
300
100
30
10
Ta = 75°C
25
–25
V_{CE} = –12 V
Pulse
–1
–3
–10
–30
–100
Collector Current I_C (mA)
Collector to Emitter Saturation Voltage vs.
Collector Current
–1.0
–0.3
–0.1
–0.03
–0.01
Pulse
Ta = 75°C
25
–25
–1
–3
–10
–30
–100
Collector Current I_C (mA)
Base to Emitter Saturation Voltage vs.
Collector Current
–10
–3
–1.0
–0.3
–0.1
Pulse
25
Ta = –25°C
75
–1
–3
–10
–30
–100
Collector Current I_C (mA)
Gain Bandwidth Product vs.
Collector Current
500
200
100
50
20
10
–0.5
–1.0
–2
–5
–10
–20
–50
Collector Current I_C (mA)


Collector Output Capacitance vs
Collector to Base Voltage
f = 1 MHz
IE = 0
Collector output capacitance Cob (pF)
100
30
10
3
1
−1
−3
−10
−30
−100
Collector to Base Voltage VCB (V)
Noise Voltage Referred to Input vs.
Collector Current
VCE = −6 V
Rg = 0
f = 1 kHz
Noise voltage referred to input en (nV/√Hz)
10
3
1.0
0.3
0.1
−0.1
−0.3
−1.0
−3
−10
Collector Current IC (mA)
Noise Voltage Referred to Input vs.
Signal Source Resistance
VCE = −6 V
f = 1 kHz
IC = −10 mA
−1
−0.1
Noise voltage referred to input en (nV/√Hz)
1,000
100
10
1.0
0.1
10
100
1 k
10 k
100 k
Signal Source Resistance Rg (Ω)
Noise Voltage Referred to Input vs.
Collector to Emitter Voltage
IC = −1 mA
Rg = 0
f = 1 kHz
Noise voltage referred to input en (nV/√Hz)
1.0
0.9
0.8
0.7
0.6
0.5
−1
−3
−10
−30
−100
Collector to Emitter Voltage VCE (V)


Noise Voltage Referred to Input vs.
Frequency
VCE = −6 V
Rg = 0
IC = −1 mA
−10
Noise voltage referred to input en (nV/√Hz)
2.0
1.6
1.2
0.8
0.4
0
10
100
1 k
10 k
100 k
Frequency f (Hz)

When using this document, keep the following in mind:

1. This document may, wholly or partially, be subject to change without notice.
2. All rights are reserved: No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without Hitachi's permission.
3. Hitachi will not be held responsible for any damage to the user that may result from accidents or any other reasons during operation of the user's unit according to this document.
4. Circuitry and other examples described herein are meant merely to indicate the characteristics and performance of Hitachi's semiconductor products. Hitachi assumes no responsibility for any intellectual property claims or other problems that may result from applications based on the examples described herein.
5. No license is granted by implication or otherwise under any patents or other rights of any third party or Hitachi, Ltd.
6. MEDICAL APPLICATIONS: Hitachi's products are not authorized for use in MEDICAL APPLICATIONS without the written consent of the appropriate officer of Hitachi's sales company. Such use includes, but is not limited to, use in life support systems. Buyers of Hitachi's products are requested to notify the relevant Hitachi sales offices when planning to use the products in MEDICAL APPLICATIONS.

HITACHI

Hitachi, Ltd.
Semiconductor & IC Div.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100, Japan
Tel: Tokyo (03) 3270-2111
Fax: (03) 3270-5109

For further information write to:

Hitachi America, Ltd.
Semiconductor & IC Div.
2000 Sierra Point Parkway
Brisbane, CA. 94005-1835
U.S.A.
Tel: 415-589-8300
Fax: 415-583-4207

Hitachi Europe GmbH
Electronic Components Group
Continental Europe
Dornacher Straße 3
D-85622 Feldkirchen
München
Tel: 089-9 91 80-0
Fax: 089-9 29 30 00

Hitachi Europe Ltd.
Electronic Components Div.
Northern Europe Headquarters
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA
United Kingdom
Tel: 0628-585000
Fax: 0628-778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 0104
Tel: 535-2100
Fax: 535-1533

Hitachi Asia (Hong Kong) Ltd.
Unit 706, North Tower,
World Finance Centre,
Harbour City, Canton Road
Tsim Sha Tsui, Kowloon
Hong Kong
Tel: 27359218
Fax: 27306071