# 2SC1472(K)

Silicon NPN Epitaxial, Darlington

HITACHI

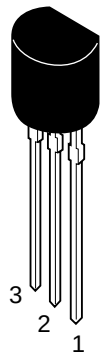
ADE-208-1054 (Z)
1st. Edition
Mar. 2001

## Application

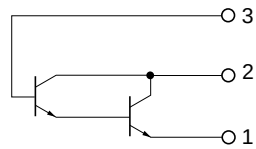
High gain amplifier

## Outline

TO-92 (1)




1. Emitter
2. Collector
3. Base




Hitachi semiconductor

## Absolute Maximum Ratings (Ta = 25°C)

| Item | Symbol | Ratings | Unit |
|---|---|---|---|
| Collector to base voltage | $V_{CBO}$ | 40 | V |
| Collector to emitter voltage | $V_{CEO}$ | 30 | V |
| Emitter to base voltage | $V_{EBO}$ | 10 | V |
| Collector current | $I_C$ | 300 | mA |
| Collector peak current | $i_{C(peak)}$ | 500 | mA |
| Collector power dissipation | $P_C$ | 500 | mW |
| Junction temperature | Tj | 150 | °C |
| Storage temperature | Tstg | –55 to +150 | °C |

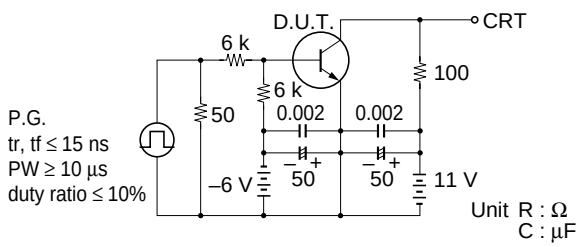
## Electrical Characteristics (Ta = 25°C)

| Item | Symbol | Min | Typ | Max | Unit | Test conditions |
|---|---|---|---|---|---|---|
| Collector to emitter breakdown voltage | $V_{(BR)CEO}$ | 30 | — | — | V | $I_C$ = 1 mA, $R_{BE}$ = ∞ |
| Collector cutoff current | $I_{CBO}$ | — | — | 100 | nA | $V_{CB}$ = 30 V, $I_E$ = 0 |
| Emitter cutoff current | $I_{EBO}$ | — | — | 100 | nA | $V_{EB}$ = 10 V, $I_C$ = 0 |
| DC current transfer ratio | $h_{FE1}$*[1] | 2000 | — | 100000 | | $I_C$ = 10 mA, $V_{CE}$ = 5 V |
| | $h_{FE2}$*[1] | 3000 | — | — | | $I_C$ = 100 mA, $V_{CE}$ = 5 V (Pulse Test) |
| | $h_{FE3}$*[1] | 3000 | — | — | | $I_C$ = 400 mA, $V_{CE}$ = 5 V (Pulse Test) |
| Collector to emitter saturation voltage | $V_{CE(sat)}$ | — | — | 1.5 | V | $I_C$ = 100 mA, $I_B$ = 0.1 mA |
| Base to emitter voltage | $V_{BE(sat)}$ | — | — | 2.0 | V | $I_C$ = 100 mA, $I_B$ = 0.1 mA |
| Gain bandwidth product | $f_T$ | 50 | — | — | MHz | $V_{CE}$ = 5 V, $I_C$ = 10 mA |
| Collector output capacitance | Cob | — | — | 10 | pF | $V_{CB}$ = 10 V, $I_E$ = 0, f = 1 MHz |
| Turn on time | $t_{on}$ | — | 60 | — | ns | $V_{CC}$ = 11 V<br>$I_C$ = 100 $I_{B1}$ = 100 mA<br>$I_{B2}$ = $-I_{B1}$ |
| Turn off time | $t_{off}$ | — | 800 | — | ns | |
| Storage time | $t_{stg}$ | — | 350 | — | ns | |

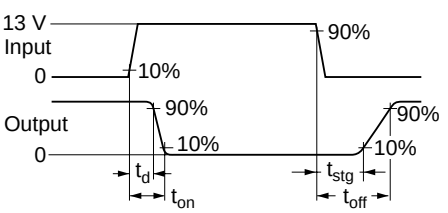
Note: 1. The 2SC1472(K) is grouped by $h_{FE}$ as follows.

| | A | B |
|---|---|---|
| $h_{FE1}$ | 2000 to 100000 | 5000 to 100000 |
| $h_{FE2}$ | 3000 min | 10000 min |
| $h_{FE3}$ | 3000 min | 10000 min |

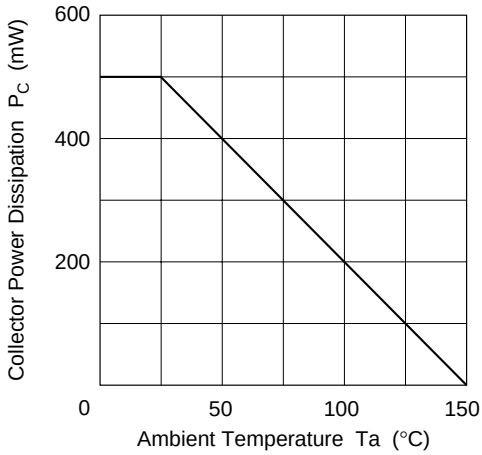
Switching Time Test Circuit



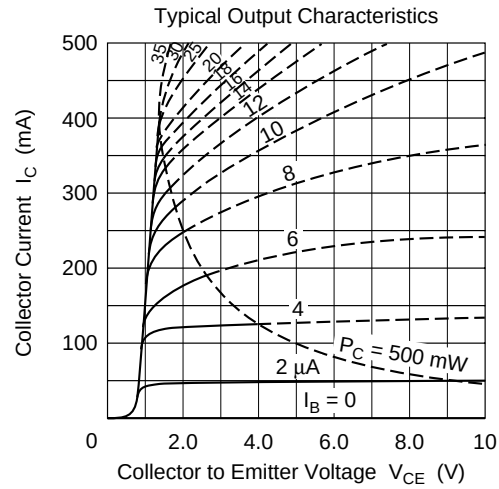

Response Waveform



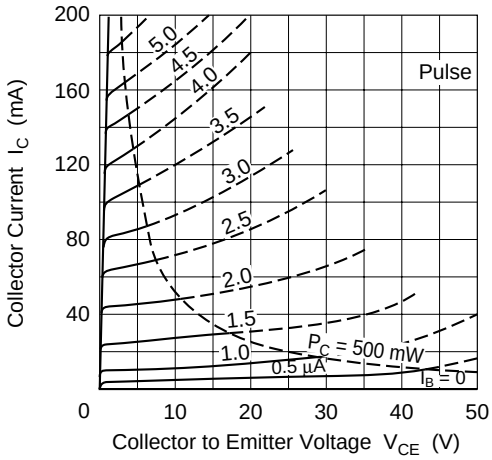
Maximum Collector Dissipation Curve



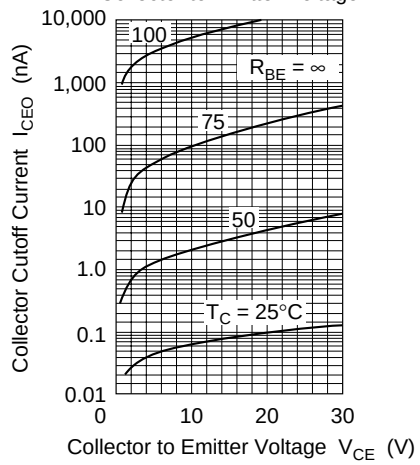

Typical Output Characteristics



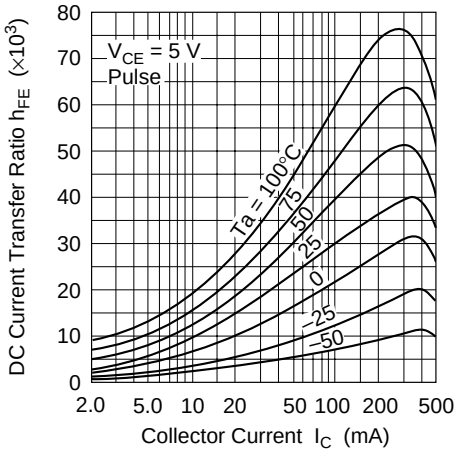

Typical Output Characteristics



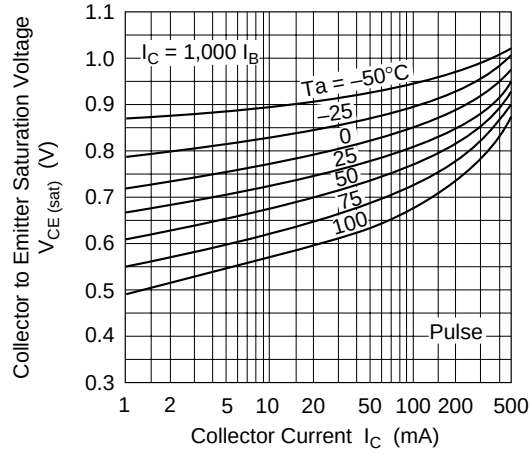

Collector Cutoff Current vs. Collector to Emitter Voltage



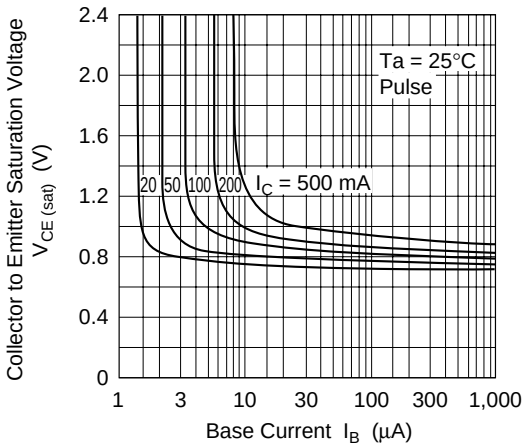
DC Current Transfer Ratio vs. Collector Current



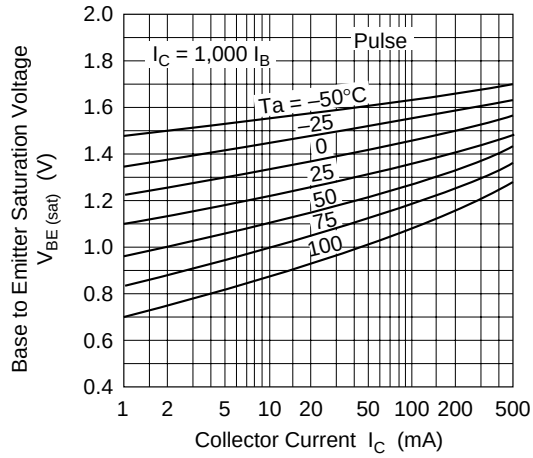

Collector to Emitter Saturation Voltage vs. Collector Current

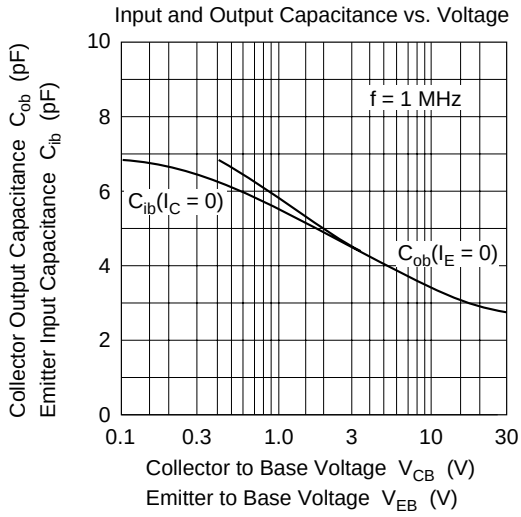


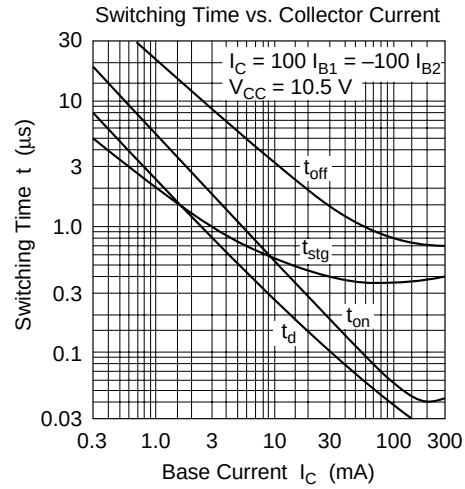

Collector to Emitter Saturation Voltage vs. Base Current

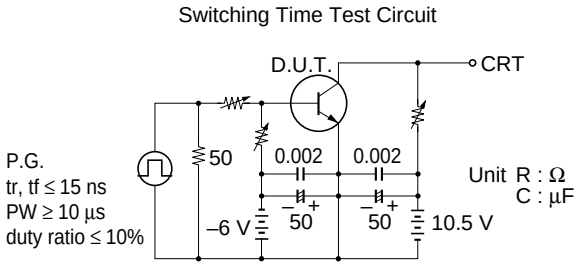


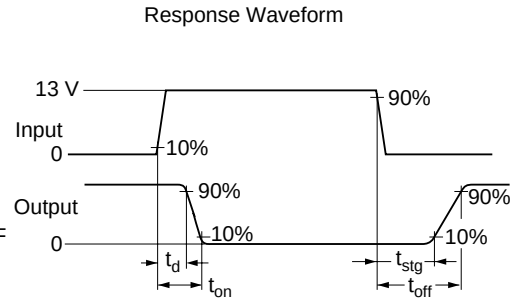

Base to Emitter Saturation Voltage vs. Collector Current




Input and Output Capacitance vs. Voltage
Collector Output Capacitance $C_{ob}$ (pF)
Emitter Input Capacitance $C_{ib}$ (pF)
f = 1 MHz
$C_{ib}(I_C = 0)$
$C_{ob}(I_E = 0)$
Collector to Base Voltage $V_{CB}$ (V)
Emitter to Base Voltage $V_{EB}$ (V)

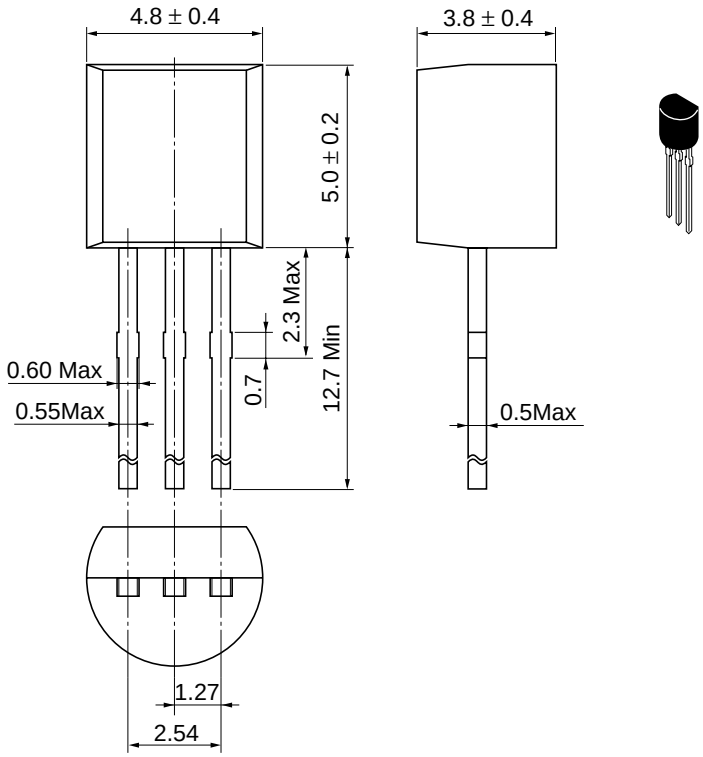

Switching Time vs. Collector Current
$I_C$ = 100 $I_{B1}$ = –100 $I_{B2}$
$V_{CC}$ = 10.5 V
$t_{off}$
$t_{stg}$
$t_{on}$
$t_d$
Switching Time t (µs)
Base Current $I_C$ (mA)


Switching Time Test Circuit
D.U.T.
CRT
P.G.
tr, tf ≤ 15 ns
PW ≥ 10 µs
duty ratio ≤ 10%
50
0.002
0.002
–6 V
50
50
10.5 V
Unit R : Ω
C : µF


Response Waveform
13 V
Input
0
10%
90%
Output
0
90%
10%
90%
10%
$t_d$
$t_{on}$
$t_{stg}$
$t_{off}$

## Package Dimensions

As of January, 2001
Unit: mm




| | |
|---|---|
| Hitachi Code | TO-92 (1) |
| JEDEC | Conforms |
| EIAJ | Conforms |
| Mass (reference value) | 0.25 g |

## Cautions

1. Hitachi neither warrants nor grants licenses of any rights of Hitachi's or any third party's patent, copyright, trademark, or other intellectual property rights for information contained in this document. Hitachi bears no responsibility for problems that may arise with third party's rights, including intellectual property rights, in connection with use of the information contained in this document.
2. Products and product specifications may be subject to change without notice. Confirm that you have received the latest product standards or specifications before final design, purchase or use.
3. Hitachi makes every attempt to ensure that its products are of high quality and reliability. However, contact Hitachi's sales office before using the product in an application that demands especially high quality and reliability or where its failure or malfunction may directly threaten human life or cause risk of bodily injury, such as aerospace, aeronautics, nuclear power, combustion control, transportation, traffic, safety equipment or medical equipment for life support.
4. Design your application so that the product is used within the ranges guaranteed by Hitachi particularly for maximum rating, operating supply voltage range, heat radiation characteristics, installation conditions and other characteristics. Hitachi bears no responsibility for failure or damage when used beyond the guaranteed ranges. Even within the guaranteed ranges, consider normally foreseeable failure rates or failure modes in semiconductor devices and employ systemic measures such as fail-safes, so that the equipment incorporating Hitachi product does not cause bodily injury, fire or other consequential damage due to operation of the Hitachi product.
5. This product is not designed to be radiation resistant.
6. No one is permitted to reproduce or duplicate, in any form, the whole or part of this document without written approval from Hitachi.
7. Contact Hitachi's sales office for any questions regarding this document or Hitachi semiconductor products.

HITACHI

**Hitachi, Ltd.**
Semiconductor & Integrated Circuits.
Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan
Tel: Tokyo (03) 3270-2111 Fax: (03) 3270-5109

URL
NorthAmerica : http://semiconductor.hitachi.com/
Europe : http://www.hitachi-eu.com/hel/ecg
Asia : http://sicapac.hitachi-asia.com
Japan : http://www.hitachi.co.jp/Sicd/indx.htm

**For further information write to:**

Hitachi Semiconductor (America) Inc.
179 East Tasman Drive,
San Jose,CA 95134
Tel: <1> (408) 433-1990
Fax: <1>(408) 433-0223

Hitachi Europe GmbH
Electronic Components Group
Dornacher Straβe 3
D-85622 Feldkirchen, Munich
Germany
Tel: <49> (89) 9 9180-0
Fax: <49> (89) 9 29 30 00

Hitachi Europe Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 585160

Hitachi Asia Ltd.
Hitachi Tower
16 Collyer Quay #20-00,
Singapore 049318
Tel : <65>-538-6533/538-8577
Fax : <65>-538-6933/538-3877
URL : http://www.hitachi.com.sg

Hitachi Asia Ltd.
(Taipei Branch Office)
4/F, No. 167, Tun Hwa North Road,
Hung-Kuo Building,
Taipei (105), Taiwan
Tel : <886>-(2)-2718-3666
Fax : <886>-(2)-2718-8180
Telex : 23222 HAS-TP
URL : http://www.hitachi.com.tw

Hitachi Asia (Hong Kong) Ltd.
Group III (Electronic Components)
7/F., North Tower,
World Finance Centre,
Harbour City, Canton Road
Tsim Sha Tsui, Kowloon,
Hong Kong
Tel : <852>-(2)-735-9218
Fax : <852>-(2)-730-0281
URL : http://www.hitachi.com.hk

Copyright © Hitachi, Ltd., 2000. All rights reserved. Printed in Japan.
Colophon 2.0