
HA17393/A Series

Dual Comparators

HITACHI

ADE-204-066A (Z)

Rev. 1

Mar. 2001

Description

The HA17393A and HA17393 series products are comparators designed for general purpose, especially for power control systems.

These ICs operate from a single power-supply voltage over a wide range of voltages, and feature a reduced power-supply current since the supply current is independent of the supply voltage.

These comparators have the merit which ground is included in the common-mode input voltage range at a single-voltage power supply operation. These products have a wide range of applications, including limit comparators, simple A/D converters, pulse/square-wave/time delay generators, wide range VCO circuits, MOS clock timers, multivibrators, and high-voltage logic gates.

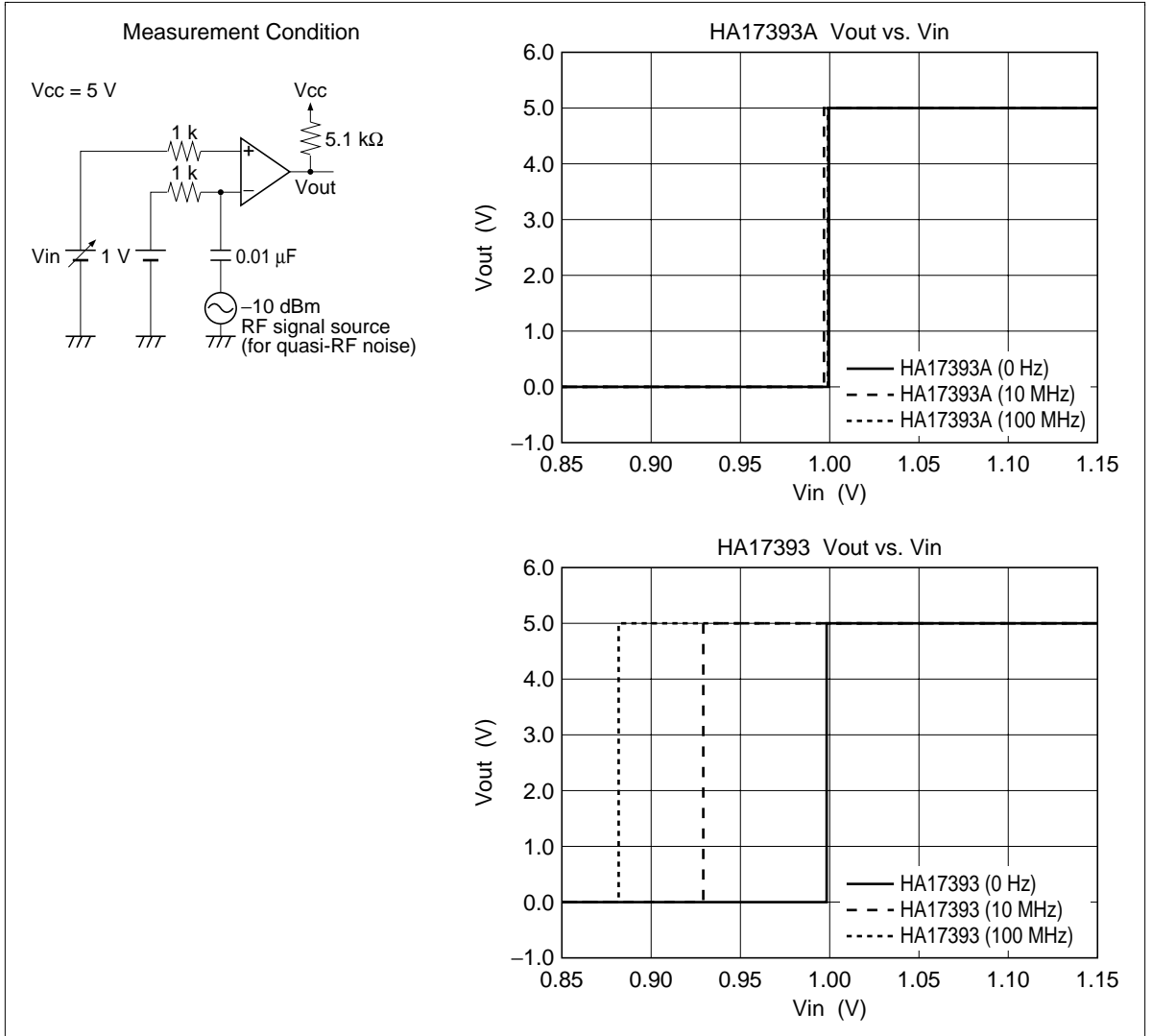
Features

- Wide supply voltage: 2 to 36 V
- Very low supply current: 0.8 mA
- Small input bias: 25 nA
- Small input offset current: 3 nA
- Small input offset voltage: 2 mV
- Common mode input voltage range including ground.
- Small output saturation voltage: 1 mV (5 μ A)
70 mV (1 mA)
- Output voltage is compatible with CMOS logic system.

HA17393/A Series

Features only for “A” series

- Low electro-magnetic susceptibility

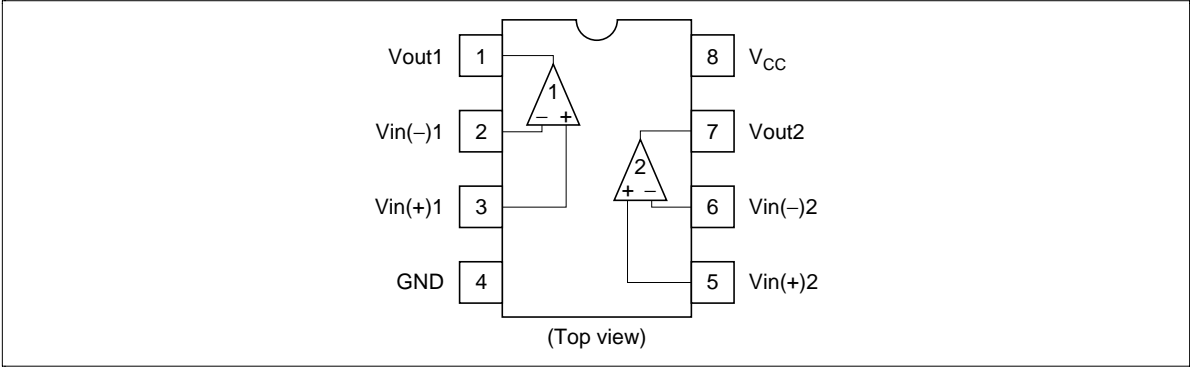


Ordering Information

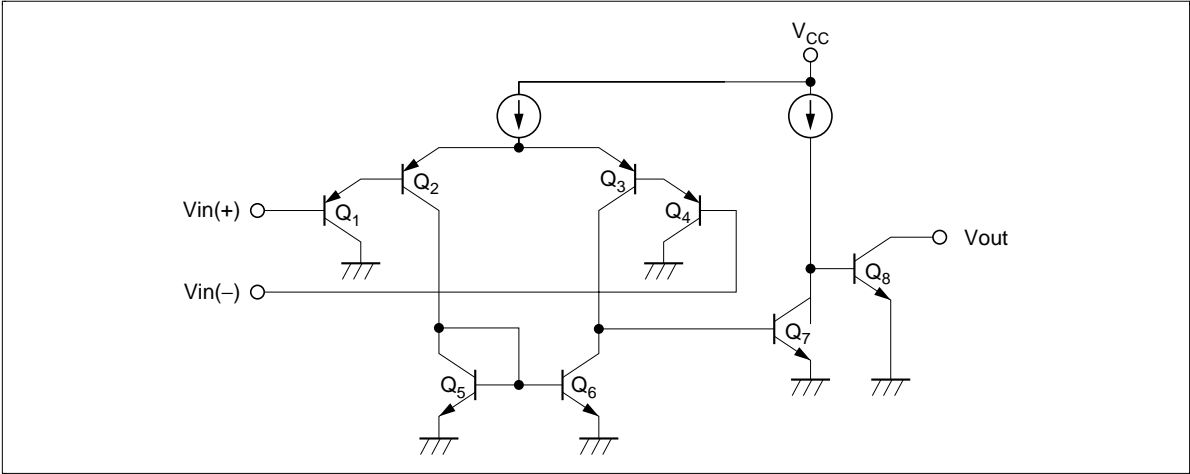
| Type No. | Application | Package |
|------------|----------------|---------|
| HA17393APS | Industrial use | DP-8B |
| HA17393ARP | Commercial use | FP-8DC |
| HA17393AFP | | FP-8D |
| HA17393 | Commercial use | DP-8B |
| HA17393F | | FP-8D |

HITACHI

Pin Arrangement



Circuit Schematic (1/2)



Absolute Maximum Ratings (Ta = 25°C)

| Item | Symbol | Ratings | | | | | Unit |
|-----------------------------|-----------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|------|
| | | 17393APS | 17393AFP | 17393ARP | 17393 | 17393F | |
| Power supply voltage | V _{CC} | 36 | 36 | 36 | 36 | 36 | V |
| Differential input voltage | V _{in(diff)} | V _{CC} | V _{CC} | V _{CC} | V _{CC} | V _{CC} | V |
| Input voltage | V _{in} | -0.3 to +V _{CC} | -0.3 to +V _{CC} | -0.3 to +V _{CC} | -0.3 to +V _{CC} | -0.3 to +V _{CC} | V |
| Output short current | I _{os} *3 | constant | constant | constant | constant | constant | |
| Allowable power dissipation | P _T | 570 *1 | 385 *2 | 385 *2 | 570 *1 | 385 *2 | mW |
| Operating temperature | T _{opr} | -40 to +85 | -40 to +85 | -40 to +85 | -20 to +75 | -20 to +75 | °C |
| Storage temperature | T _{stg} | -55 to +125 | -55 to +125 | -55 to +125 | -55 to +125 | -55 to +125 | °C |

- Notes: 1. These are the allowable values up to Ta = 55°C. Derate by 8.3mW/°C above that temperature.
2. These are the allowable values up to Ta = 25°C mounting in air.
When it is mounted on glass epoxy board of 40 mm × 40 mm × 1.5 mm with 30% wiring density, the allowable value is 570 mW up to Ta = 45°C. If Ta > 45°C, derate by 7.14 mW/°C.
3. Short circuit between the output and V_{CC} will be a cause to destroy the circuit. The maximum output current is about 20 mA for any supply voltage.

Electrical Characteristics ($V_{CC} = 5\text{ V}$, $T_a = 25^\circ\text{C}$)

| Item | Symbol | Min | Typ | Max | Unit | Test condition |
|------------------------------|-------------------|-----|-----|-----|---------------|--|
| Input offset voltage *1 | V_{IO} | — | 2.0 | 5.0 | mV | |
| Input bias current *2 | I_{IB} | — | 25 | 250 | nA | $I_{IN(+)}$ or $I_{IN(-)}$ |
| Input offset current | I_{IO} | — | 3 | 50 | nA | $ I_{IN(+)} - I_{IN(-)} $ |
| Common mode input voltage *3 | V_{CM+} | 3.5 | — | — | V | |
| | V_{CM-} | — | — | 0 | V | |
| Supply current | I_{CC} | — | 0.8 | 2.0 | mA | All comparators: $R_L = \infty$, All channels on |
| Voltage gain | A_V | — | 200 | — | V/mV | $V_{CC} = 15\text{V}$, $R_L \geq 15\text{k}\Omega$ |
| Response time *4 | t_R | — | 1.3 | — | μs | $V_{RL} = 5\text{V}$, $R_L = 5.1\text{k}\Omega$ |
| Large signal response time | t_{RI} | — | 300 | — | ns | $V_{IN} = \text{TTL Threshold width}$, $V_{REF} = 1.4\text{V}$ |
| Out put sink current | I_{OSINK} | 6 | 16 | — | mA | $V_{IN(-)} \geq 1\text{V}$, $V_{IN(+)} = 0$, $V_O \leq 1.5\text{V}$ |
| Output saturation voltage | $V_O(\text{sat})$ | — | — | 400 | mV | $V_{IN(-)} \geq 1\text{V}$, $V_{IN(+)} = 0$, $I_{OSINK} = 4\text{mA}$ |
| Output leak current | I_{LO} | — | 0.1 | — | nA | $V_{IN(-)} = 0$, $V_{IN(+)} \geq 1\text{V}$, $V_O = 5\text{V}$ |

Notes: 1. $V_{REF} = 1.4\text{ V}$ and $R_S = 50\ \Omega$, when $V_O = 1.4\text{ V}$ at output switching point.

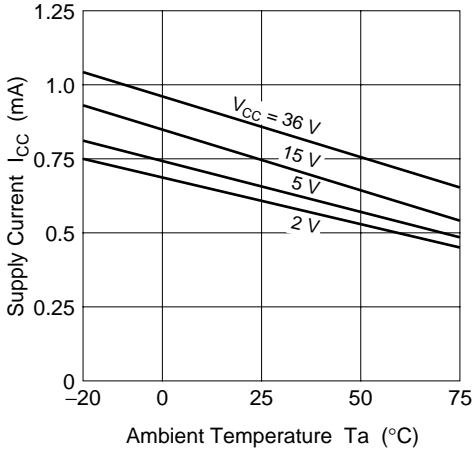
2. Under linear operation.

3. Common mode input voltage or each one of the input signal should not be less than -0.3 V .

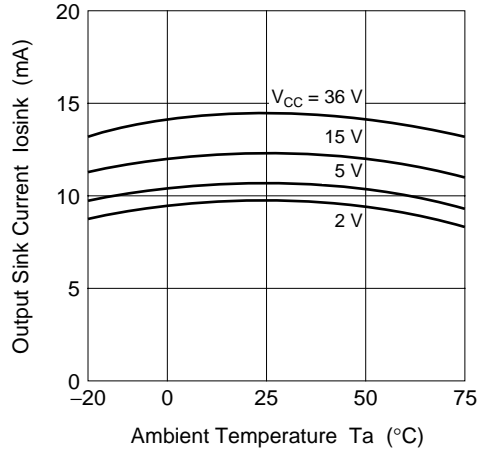
4. This is a value to 100 mV input step voltage with 5 mV over drive.

Characteristic Curves

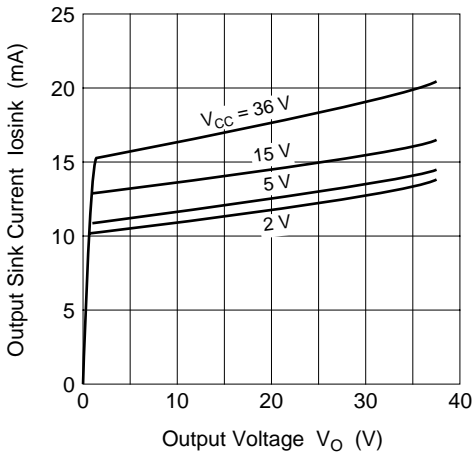
Supply Current vs. Ambient Temperature



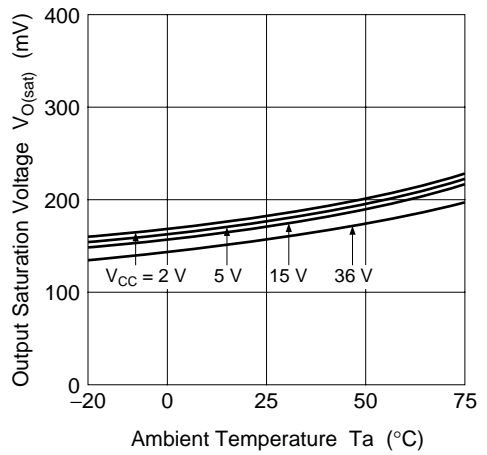
Output Sink Current vs. Ambient Temperature



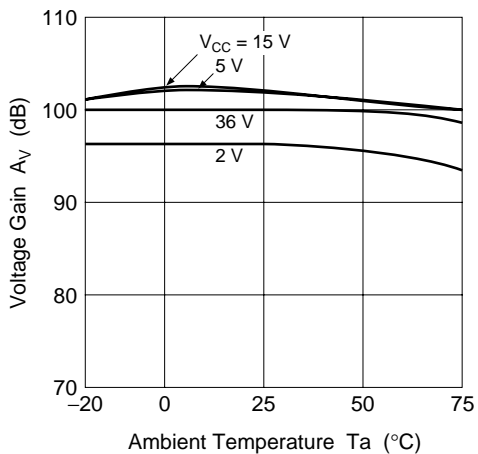
Output Sink Current vs. Output Voltage



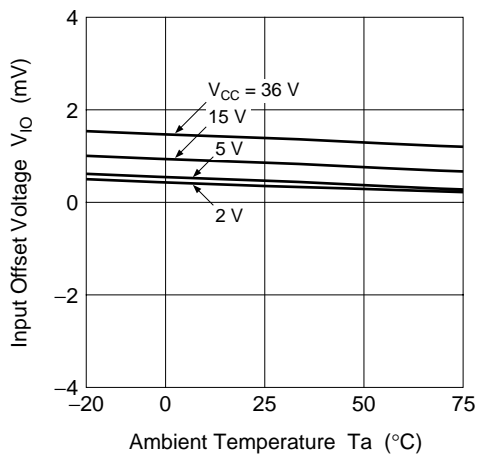
Output Saturation Voltage vs. Ambient Temperature



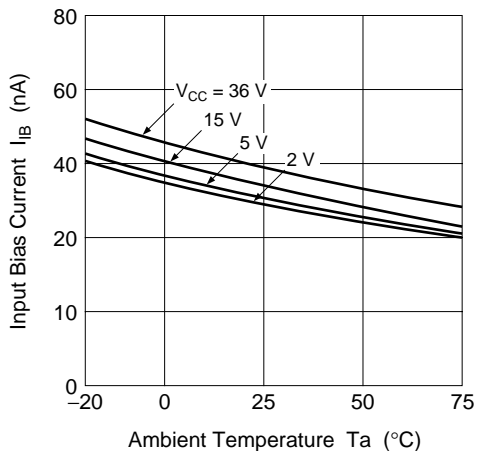
Voltage Gain vs. Ambient Temperature



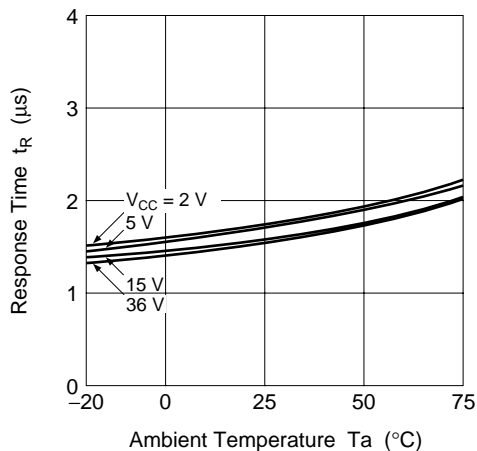
Input Offset Voltage vs. Ambient Temperature



Input Bias Current vs. Ambient Temperature

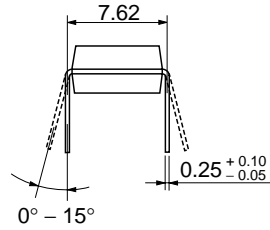
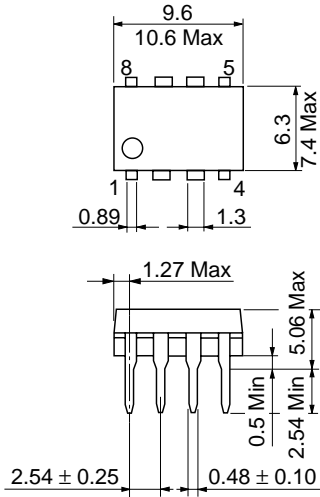


Response Time vs. Ambient Temperature



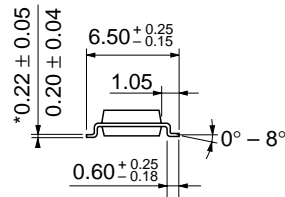
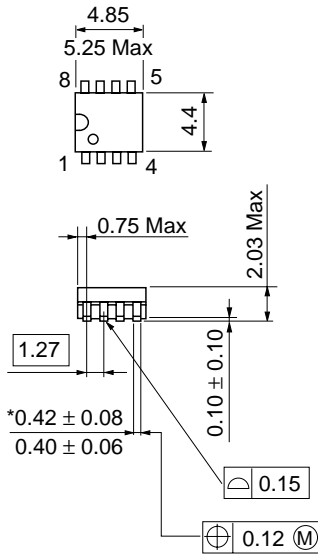
Package Dimensions

Unit: mm



| | |
|------------------------|----------|
| Hitachi Code | DP-8B |
| JEDEC | Conforms |
| EIAJ | Conforms |
| Mass (reference value) | 0.51 g |

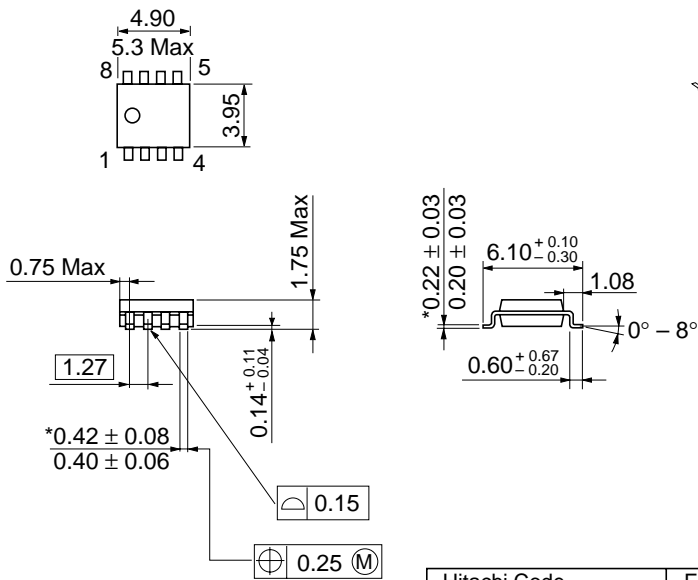
Unit: mm



*Dimension including the plating thickness
Base material dimension

| | |
|------------------------|----------|
| Hitachi Code | FP-8D |
| JEDEC | — |
| EIAJ | Conforms |
| Mass (reference value) | 0.10 g |

Unit: mm



*Dimension including the plating thickness
Base material dimension

| | |
|------------------------|----------|
| Hitachi Code | FP-8DC |
| JEDEC | Conforms |
| EIAJ | — |
| Mass (reference value) | 0.085 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 Ltd.
Electronic Components Group.
Whitebrook Park
Lower Cookham Road
Maidenhead
Berkshire SL6 8YA, United Kingdom
Tel: <44> (1628) 585000
Fax: <44> (1628) 585200

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

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://semiconductor.hitachi.com.hk>

Copyright © Hitachi, Ltd., 2001. All rights reserved. Printed in Japan.

Colophon 3.0

HITACHI