
HD74LVCR2245A

Octal Bidirectional Transceivers with 3-state Outputs

HITACHI

ADE-205-235A (Z)
Preliminary
2nd. Edition
January 1999

Description

The HD74LVCR2245A has eight buffers with three state outputs in a 20 pin package. When (T / \bar{R}) is high, data flows from the A inputs to the B outputs, and when (T / \bar{R}) is low, data flows from the B inputs to the A outputs. A and B bus are separated by making enable input (\overline{OE}) high level.

All outputs, which are designed to sink up to 12 mA, include equivalent 26 Ω resistors to reduce overshoot and undreshoot.

When V_{CC} is between 0 and 1.5 V, the device is in the high impedance state during power up or power down.

Low voltage and high speed operation is suitable at battery drive product (note type personal computer) and low power consumption extends the life of a battery for long time operation.

Features

- $V_{CC} = 1.65$ to 5.5 V
- All inputs $V_{IH}(\text{Max}) = 5.5$ V (@ $V_{CC} = 0$ to 5.5 V)
- All inputs / outputs $V_{I/O}(\text{Max}) = 5.5$ V (@ $V_{CC} = 0$ V or output off state)
- Typical V_{OL} ground bounce < 0.8 V (@ $V_{CC} = 3.3$ V, $T_a = 25^\circ\text{C}$)
- Typical V_{OH} undershoot > 2.0 V (@ $V_{CC} = 3.3$ V, $T_a = 25^\circ\text{C}$)
- High output current ± 12 mA (@ $V_{CC} = 3.0$ to 5.5 V)
- All outputs have equivalent 26 Ω series resistors, so no external resistors are required

HD74LVCR2245A

Function Table

Inputs		Operation
\overline{OE}	T / \overline{R}	
L	L	B data to A bus
L	H	A data to B bus
H	X	Z

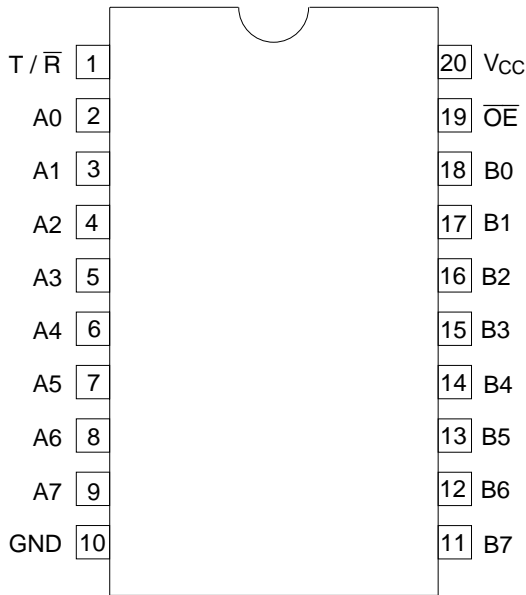
H : High level

L : Low level

X : Immaterial

Z : High impedance

Pin Arrangement



(Top view)

Absolute Maximum Ratings

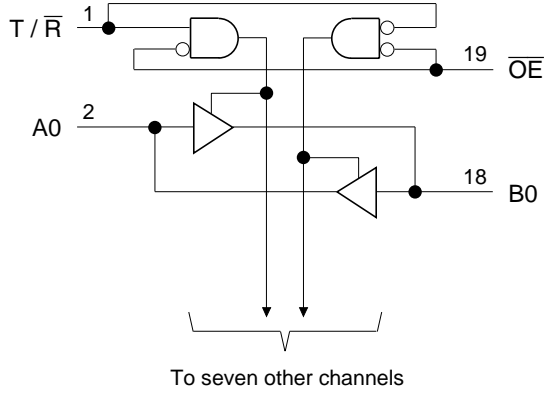
Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	-0.5 to 7.0	V	
Input voltage	V_I	-0.5 to 7.0	V	
Output voltage	V_O	-0.5 to 7.0 -0.5 to $V_{CC}+0.5$	V	Output "Z" or V_{CC} : OFF Output "H" or "L"
Input diode current	I_{IK}	-50	mA	$V_I < 0$
Output diode current	I_{OK}	-50	mA	$V_O < 0$
Output current	I_O	± 50	mA	
V_{CC} , GND current	I_{CC} or I_{GND}	± 100	mA	
Storage temperature	Tstg	-65 to 150	°C	

Note: The absolute maximum ratings are values which must not individually be exceeded, and furthermore no two of which may be realized at the same time.

Recommended Operating Conditions

Item	Symbol	Ratings	Unit	Conditions
Supply voltage	V_{CC}	1.65 to 5.5 1.5 to 5.5	V	At operation Data retention only
Input voltage	V_I	0 to 5.5	V	
Output voltage	V_O	0 to 5.5 0 to V_{CC}	V	Output "Z" or V_{CC} : OFF Output "H" or "L"
Output current	I_{OH}	-2 -4 -8 -12	mA	$V_{CC} = 1.65$ V $V_{CC} = 2.3$ V $V_{CC} = 2.7$ V $V_{CC} = 3.0$ to 5.5 V
	I_{OL}	2 4 8 12		$V_{CC} = 1.65$ V $V_{CC} = 2.3$ V $V_{CC} = 2.7$ V $V_{CC} = 3.0$ to 5.5 V
Input rise / fall time	t_r, t_f	0 to 6	ns / V	
Operating temperature	Ta	-40 to +85	°C	

Logic Diagram



Electrical Characteristics (Ta = -40 to 85°C)

Item	Symbol	V _{CC} (V)	Min	Typ	Max	Unit	Test Conditions
Input voltage	V _{IH}	1.65 to 1.95	V _{CC} ×0.65	—	—	V	
		2.3 to 2.7	1.7	—	—		
		2.7 to 3.6	2.0	—	—		
		4.5 to 5.5	V _{CC} ×0.7	—	—		
	V _{IL}	1.65 to 1.95	—	—	V _{CC} ×0.35		
		2.3 to 2.7	—	—	0.7		
		2.7 to 3.6	—	—	0.8		
		4.5 to 5.5	—	—	V _{CC} ×0.3		
Output voltage	V _{OH}	1.65 to 5.5	V _{CC} -0.2	—	—	V	I _{OH} = -100 μA
		1.65	1.2	—	—		I _{OH} = -2 mA
		2.3	1.7	—	—		I _{OH} = -4 mA
		2.7	2.2	—	—		
		3.0	2.4	—	—		I _{OH} = -6 mA
		2.7	2.0	—	—		I _{OH} = -8 mA
		3.0	2.0	—	—		I _{OH} = -12 mA
		4.5	3.6	—	—		
	V _{OL}	1.65 to 5.5	—	—	0.2		I _{OL} = 100 μA
		1.65	—	—	0.45		I _{OL} = 2 mA
		2.3	—	—	0.7		I _{OL} = 4 mA
		2.7	—	—	0.4		
		3.0	—	—	0.55		I _{OL} = 6 mA
		2.7	—	—	0.6		I _{OL} = 8 mA
3.0	—	—	0.8	I _{OL} = 12 mA			
4.5	—	—	0.8				
Input current	I _{IN}	0 to 5.5	—	—	±5	μA	V _{IN} = 0 to 5.5 V
Off state output current	I _{OZ}	1.65 to 5.5	—	—	±5	μA	V _{OUT} = 0 to 5.5 V
Output leak current	I _{OFF}	0	—	—	±5	μA	V _{IN} or V _O = 5.5 V
Quiescent supply current	I _{CC}	1.65 to 3.6	—	—	10	μA	V _{IN} = 3.6 to 5.5 V ¹⁾ , I _O = 0
		1.65 to 5.5	—	—	10		V _{IN} = V _{CC} or GND
	ΔI _{CC}	2.7 to 3.6	—	—	500		V _{IN} = one input at (V _{CC} -0.6)V, other inputs at V _{CC} or GND
Input capacitance	C _{IN}	3.3	—	TBD	—	pF	V _{IN} = V _{CC} or GND
Output capacitance	C _O	3.3	—	TBD	—	pF	V _{OUT} = V _{CC} or GND

Note: 1. This applies in the disabled state only.

Switching Characteristics (Ta = -40 to 85°C)

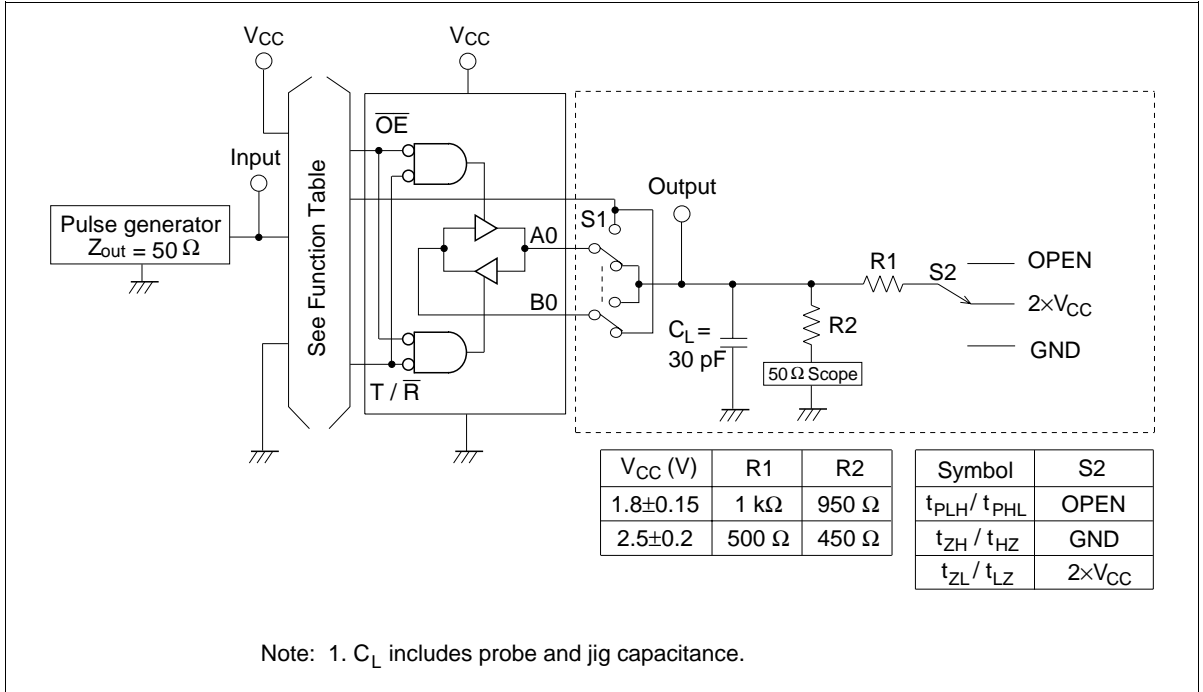
Item	Symbol	V _{CC} (V)	Min	Typ	Max	Unit	FROM (Input)	TO (Output)
Propagation delay time	t _{PLH}	1.8±0.15	—	—	15.0	ns	A or B	B or A
	t _{PHL}	2.5±0.2	—	—	9.0			
		2.7	—	—	7.3			
		3.3±0.3	1.5	—	6.3			
		5.0±0.5	—	—	4.8			
Output enable time	t _{ZH}	1.8±0.15	—	—	18.0	ns	\overline{OE}	A or B
	t _{ZL}	2.5±0.2	—	—	11.0			
		2.7	—	—	9.5			
		3.3±0.3	1.5	—	8.2			
		5.0±0.5	—	—	6.8			
Output disable time	t _{HZ}	1.8±0.15	—	—	16.0	ns	\overline{OE}	A or B
	t _{LZ}	2.5±0.2	—	—	10.0			
		2.7	—	—	8.5			
		3.3±0.3	1.7	—	7.8			
		5.0±0.5	—	—	6.6			
Between output pin skew ^{*1}	t _{OSLH}	1.8±0.15	—	—	2.0	ns		
	t _{OSHL}	2.5±0.2	—	—	2.0			
		2.7	—	—	1.5			
		3.3±0.3	—	—	1.0			
		5.0±0.5	—	—	1.0			

Note : 1. This parameter is characterized but not tested.

$$t_{OSLH} = |t_{PLHm} - t_{PLHn}|, t_{OSHL} = |t_{PHLm} - t_{PHLn}|$$

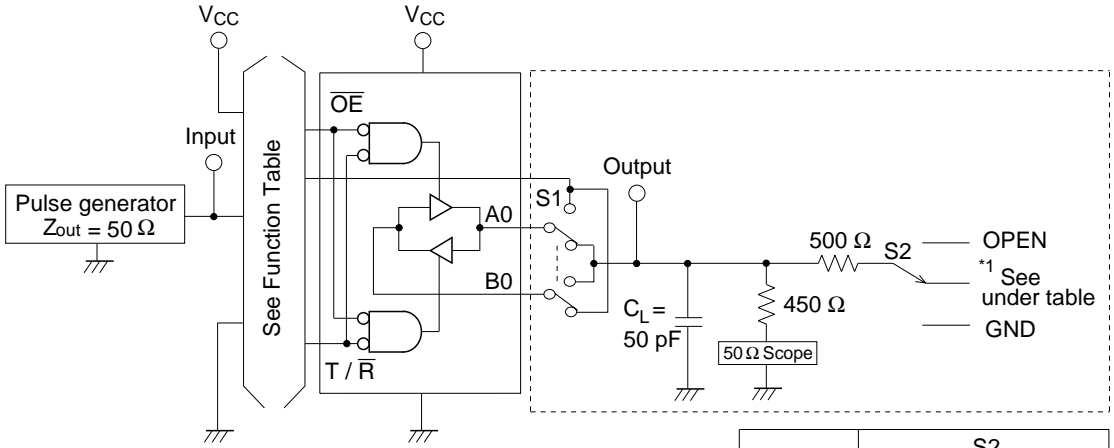
Test Circuit

($V_{CC} = 1.8 \pm 0.15 \text{ V}$, $V_{CC} = 2.5 \pm 0.2 \text{ V}$)



HD74LVCR2245A

($V_{CC} = 2.7\text{ V}$, $V_{CC} = 3.3 \pm 0.3\text{ V}$, $V_{CC} = 5.0 \pm 0.5\text{ V}$)

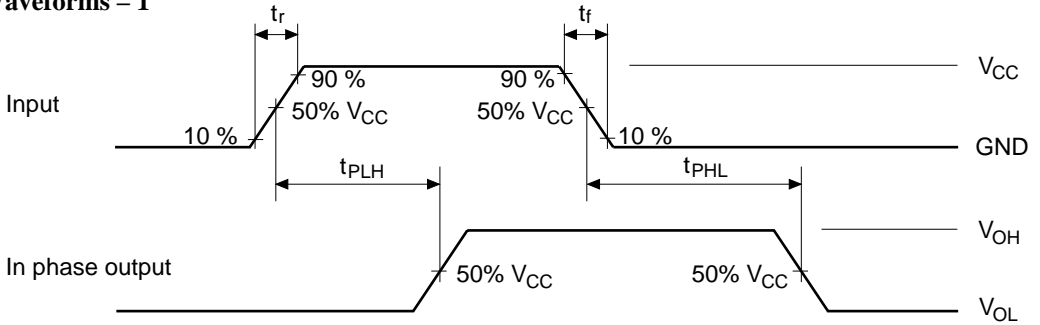


Symbol	S2	
	$V_{CC}=2.7\text{ V}$, $3.3 \pm 0.3\text{ V}$	$V_{CC}=5.0 \pm 0.5\text{ V}$
t_{PLH}/t_{PHL}	OPEN	OPEN
t_{ZH}/t_{HZ}	GND	GND
t_{ZL}/t_{LZ}	6 V	$2 \times V_{CC}$

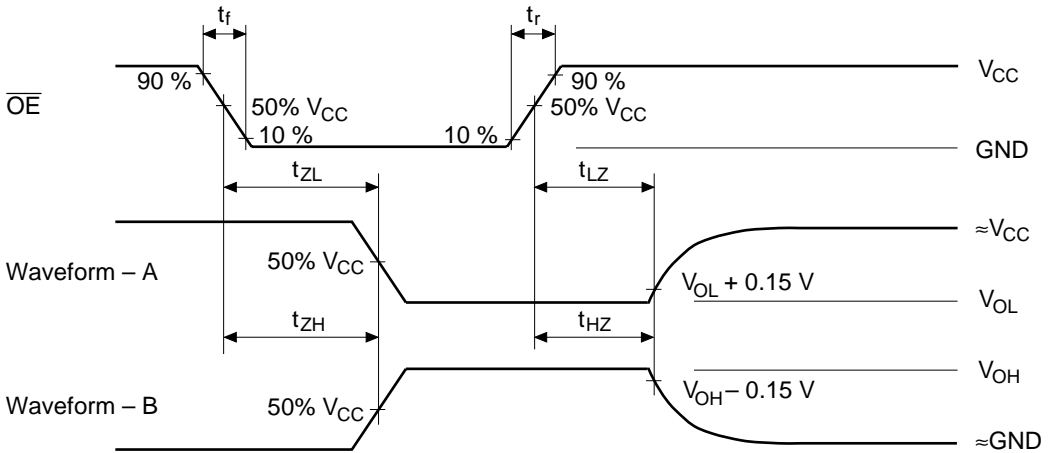
Note: 1. C_L includes probe and jig capacitance.

($V_{CC} = 1.8 \pm 0.15 \text{ V}$, $V_{CC} = 2.5 \pm 0.2 \text{ V}$)

• Waveforms – 1



• Waveforms – 2

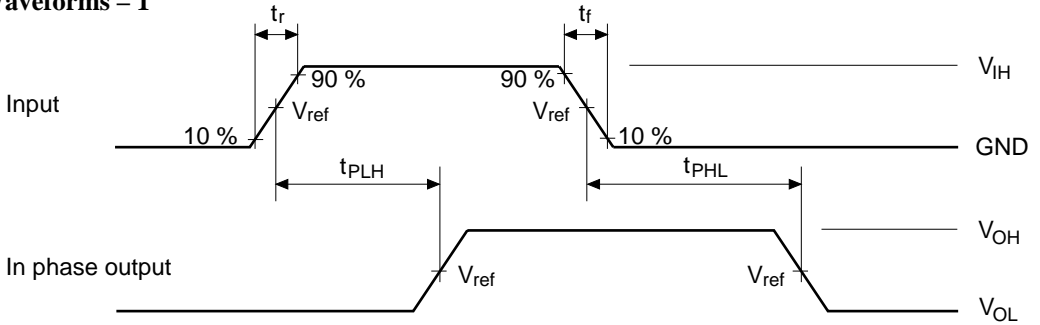


- Notes:
1. Input waveform : PRR = 10 MHz, duty cycle 50%, $t_r = 2.0 \text{ ns}$, $t_f = 2.0 \text{ ns}$
 2. Waveform – A shows input conditions such that the output is "L" level when enabled by the output control.
 3. Waveform – B shows input conditions such that the output is "H" level when enabled by the output control.

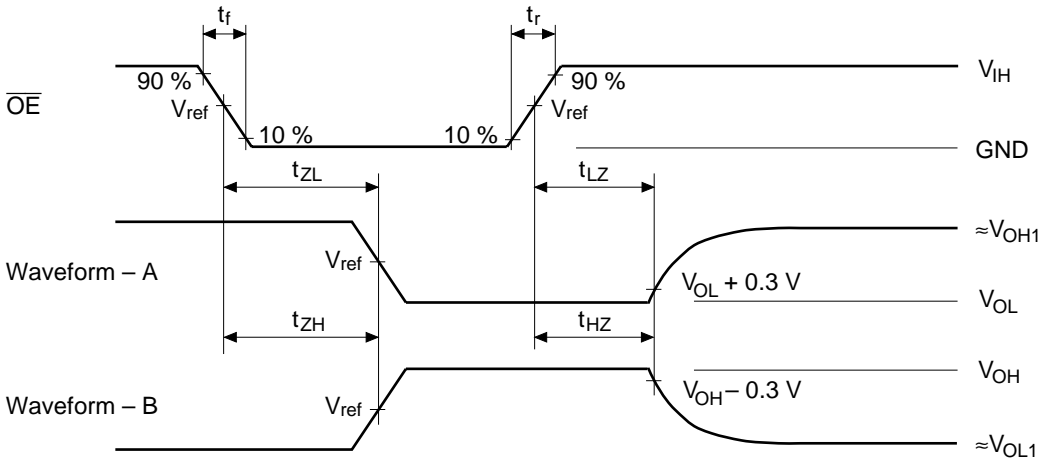
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($V_{CC} = 2.7\text{ V}$, $V_{CC} = 3.3 \pm 0.3\text{ V}$, $V_{CC} = 5.0 \pm 0.5\text{ V}$)

• Waveforms – 1



• Waveforms – 2

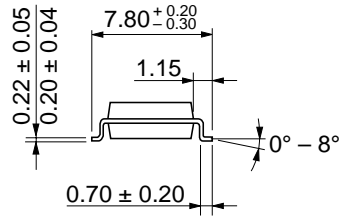
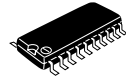
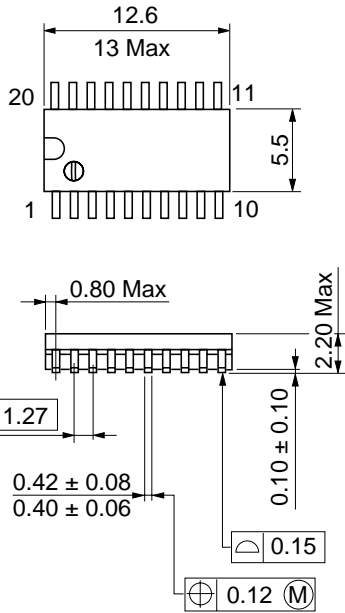


TEST	$V_{CC}=2.7\text{ V}$ $3.3 \pm 0.3\text{ V}$	$V_{CC}=5.0 \pm 0.5\text{ V}$
V_{IH}	2.7 V	V_{CC}
V_{ref}	1.5 V	$50\%V_{CC}$
V_{OH1}	3 V	V_{CC}
V_{OL1}	GND	GND

- Notes:
1. Input waveform : PRR = 10 MHz, duty cycle 50%, $t_r = 2.5\text{ ns}$, $t_f = 2.5\text{ ns}$
 2. Waveform – A shows input conditions such that the output is "L" level when enabled by the output control.
 3. Waveform – B shows input conditions such that the output is "H" level when enabled by the output control.

Package Dimensions

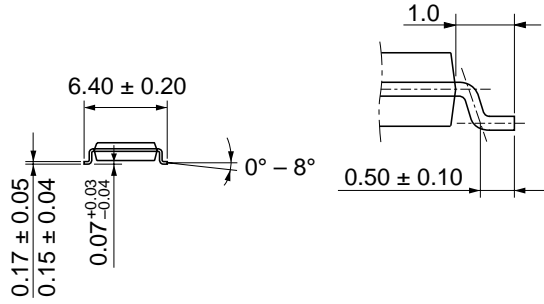
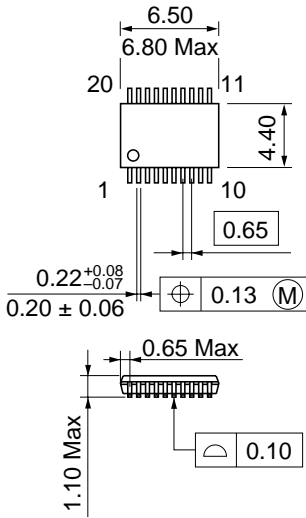
Unit : mm



Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-20DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.31 g

HD74LVCR2245A



Dimension including the plating thickness
 Base material dimension

Hitachi Code	TTP-20DA
JEDEC	—
EIAJ	—
Weight (reference value)	0.07 g

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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 North America : <http://semiconductor.hitachi.com/>
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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 Straße 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) 778322

Hitachi Asia Pte. Ltd.
16 Collyer Quay #20-00
Hitachi Tower
Singapore 049318
Tel: 535-2100
Fax: 535-1533

Hitachi Asia Ltd.
Taipei Branch Office
3F, Hung Kuo Building, No.167,
Tun-Hwa North Road, Taipei (105)
Tel: <886> (2) 2718-3666
Fax: <886> (2) 2718-8180

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
Telex: 40815 HITEC HX

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