To all our customers

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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

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HD29C3487

Quadruple Differential Line Drivers With 3 State Outputs

ADE-205-587 (Z)
1st. Edition
Dec. 2000

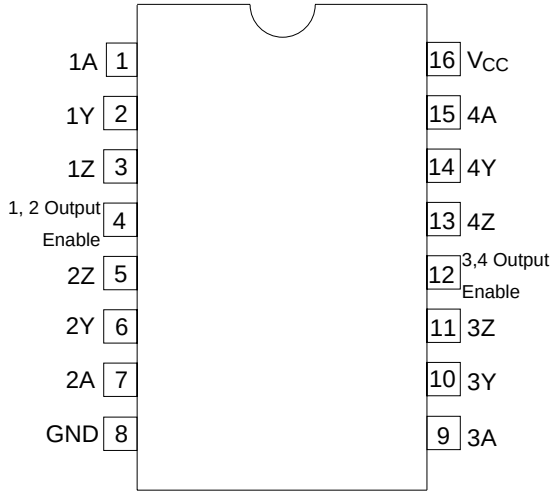
Description

The HD29C3487 features quadruple differential line drivers which satisfy the requirements of EIA standard RS-422A. This device is designed to provide differential signals with high current capability on bus lines. The enable input at low level permits the relate output in high impedance state. The output circuit has active pull up and pull down and is capable of sinking or sourcing 20 mA.

Features

- TTL input compatibility
- Propagation delay time: 6 ns typ
- Output to output skew: 0.5 ns typ
- High output impedance in power off conditions
- Meets EIA standard RS-422A
- Operates from a single 5 V supply
- Three state outputs
- Low power dissipation with CMOS process
- Power up and power down protection
- Pin to pin compatible with HD293487

Pin Arrangement



(Top view)

Function Table

Input A	Enables	Outputs	
	G	Y	Z
H	H	H	L
L	H	L	H
X	L	Z	Z

H : High level
L : Low level
Z : High impedance
X : Irrelevant

Absolute Maximum Ratings (Ta = 25°C)

Item	Symbol	Ratings	Unit
Supply Voltage*[2]	V_{CC}	–0.5 to 7.0	V
Input Voltage	V_{IN}	–1.5 to VCC + 1.5	V
Output Voltage	V_{OUT}	–0.5 to VCC + 0.5	V
Power Dissipation	PT	500	mW
Storage Temperature	Tstg	–65 to 150	°C
Lead Temperature*[3]	Tlead	260	°C
Output Current	IOUT	±150	mA
Supply Current	ICC	±150	mA

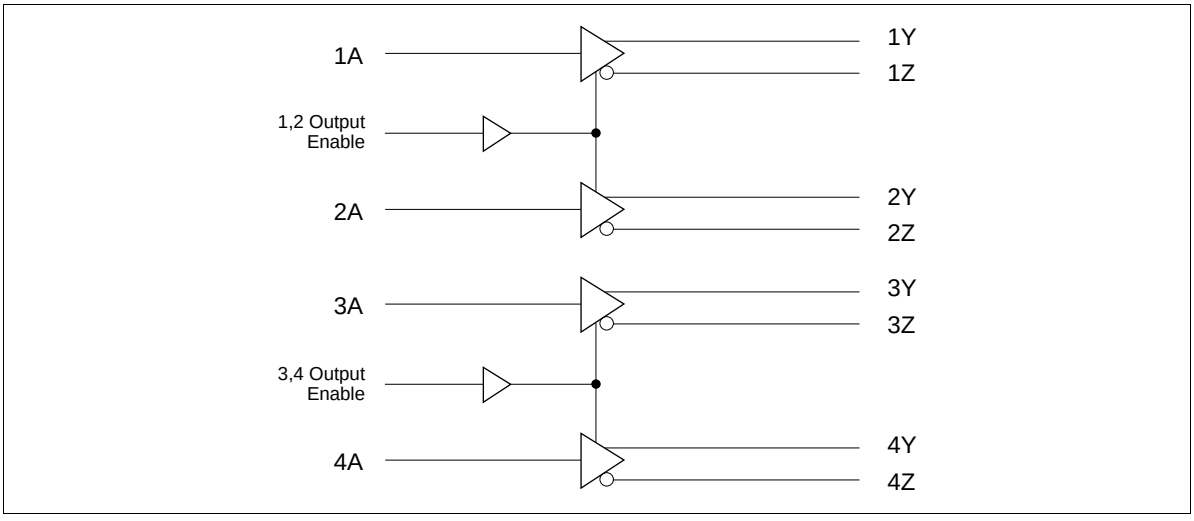
Notes: 1. The absolute maximum ratings are values which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.
2. The value is defined as of ground terminal .
3. The value at 1.6 mm away from the package within 10 second, when soldering.

Recommended Operating Conditions (Ta = –40°C to +85°C)

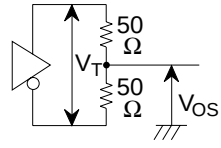
Item	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	4.5	5.0	5.5	V
Input Voltage	V_{IN}	0	—	V_{CC}	V
Output Voltage	V_{OUT}	0	—	V_{CC}	V
Operating Temperature	Ta	–40	25	85	°C
Input Rise/Fall Time*[1]	t_r, t_f	—	—	500	ns

Note: 1. This item guarantees maximum limit when one input switches.

Logic Diagram



Electrical Characteristics (Ta = –40°C to +85°C)

Item	Symbol	Min	Typ*[1]	Max	Unit	Conditions
Input Voltage	V_{IH}	2.0	—	—	V	
	V_{IL}	—	—	0.8	V	
Output Voltage	V_{OH}	2.4	3.4	—	V	$V_{IN} = V_{IH}$ or V_{IL}, I_{OH} = –20 mA
	V_{OL}	—	0.2	0.4	V	$V_{IN} = V_{IH}$ or V_{IL}, I_{OL} = 20 mA
Differential Output Voltage	VT	2.0	3.1	—	V	R_L = 100 Ω 
Change In Magnitude Of Differential Output Voltage	$\lvert V_T \rvert - \lvert \overline{V_T} \rvert$	—	—	0.4	V	
Common Mode Output Voltage	V_{OS}	—	1.8	3.0	V	
Magnitude Of Common Mode Output Voltage	$\lvert V_{OS} - \overline{V_{OS}} \rvert$	—	—	0.4	V	
Input Current	I_{IN}	—	—	±1.0	µA	$V_{IN} = V_{CC}$, GND, V_{IH} or V_{IL}
Supply Current	I_{CC}	—	200	500	µA	I_{OUT} = 0 mA, $V_{IN} = V_{CC}$ or GND
	I_{CC}*[2]	—	0.8	2.0	mA	I_{OUT} = 0 mA, V_{IN} = 2.4 V or 0.5 V
Off State Output Current	I_{OZ}	—	±0.5	±5.0	µA	$V_{OUT} = V_{CC}$ or GND, G = V_{IL}, $\overline{G} = V_{IH}$
Short Circuit Output Current	I_{SC}*[3]	–30	—	–150	mA	$V_{IN} = V_{CC}$ or GND
Output Current With Power Off	I_{OFF}	—	—	100	mA	V_{CC} = 0 V, V_{OUT} = 6 V
	I_{OFF}	—	—	–100	mA	V_{CC} = 0 V, V_{OUT} = –0.25 V

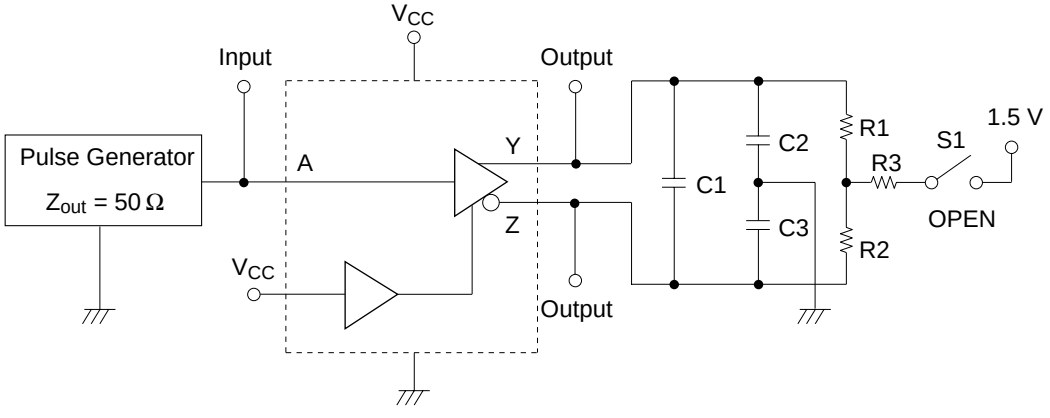
Notes: 1. All typical values are at V_{CC} = 5 V, Ta = 25°C.
2. 1 input: V_{IN} = 2.4 V or 0.5 V, other inputs: $V_{IN} = V_{CC}$ or GND

3. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.

Switching Characteristics (Ta = –40°C to +85°C, V_{CC} = 5 V ± 10%)

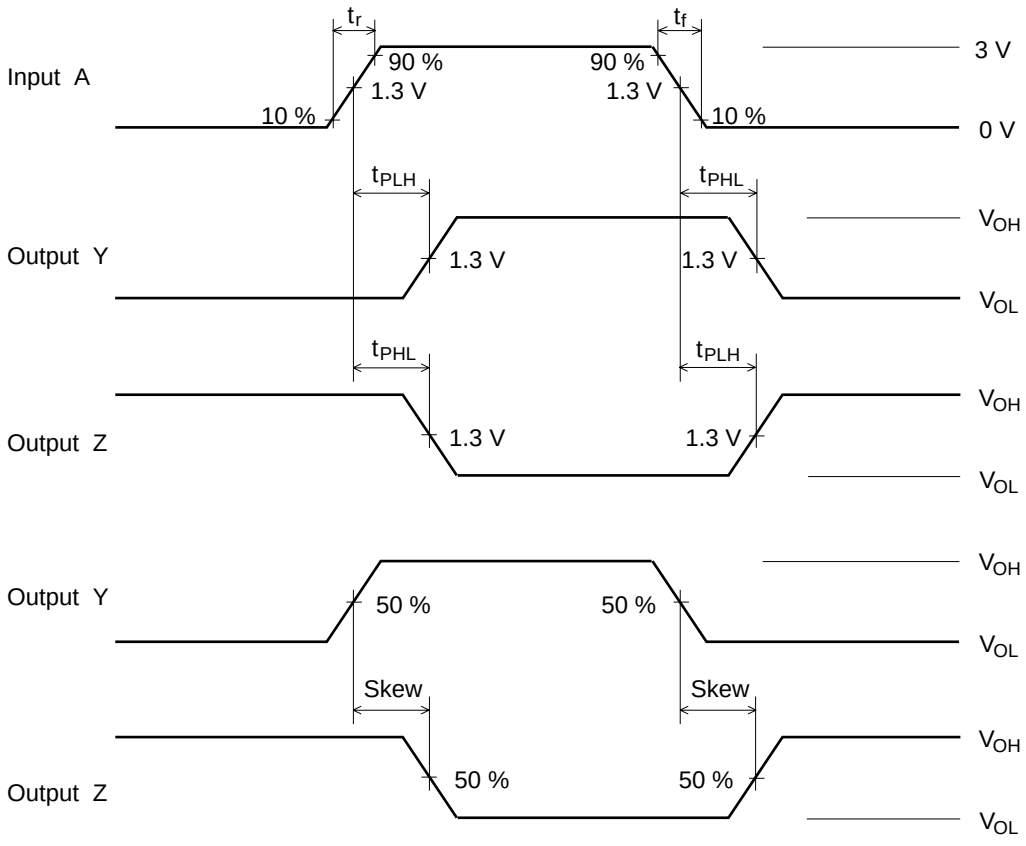
Item	Symbol	Min	Typ*[1]	Max	Unit	Conditions
Propagation Delay Time	t_{PLH}	2.0	6.0	11.0	ns	Test Circuit (1)
	t_{PHL}	2.0	6.0	11.0	ns	
Output To Output Skew	Skew	—	0.5	2.0	ns	
Differential Output Transition	t_{TLH}	—	6.0	10.0	ns	Test Circuit (3)
Time	t_{THL}	—	6.0	10.0	ns	
Output Enable Time	t_{ZL}	—	11.0	19.0	ns	Test Circuit (2)
	t_{ZH}	—	13.0	21.0	ns	
Output Disable Time	t_{LZ}	—	5.0	9.0	ns	
	t_{HZ}	—	7.0	11.0	ns	
Power Dissipation Capacitance	C_{PD}	—	50.0	—	pF	
Input Capacitance	C_{IN}	—	6.0	—	pF	

Test Circuit 1



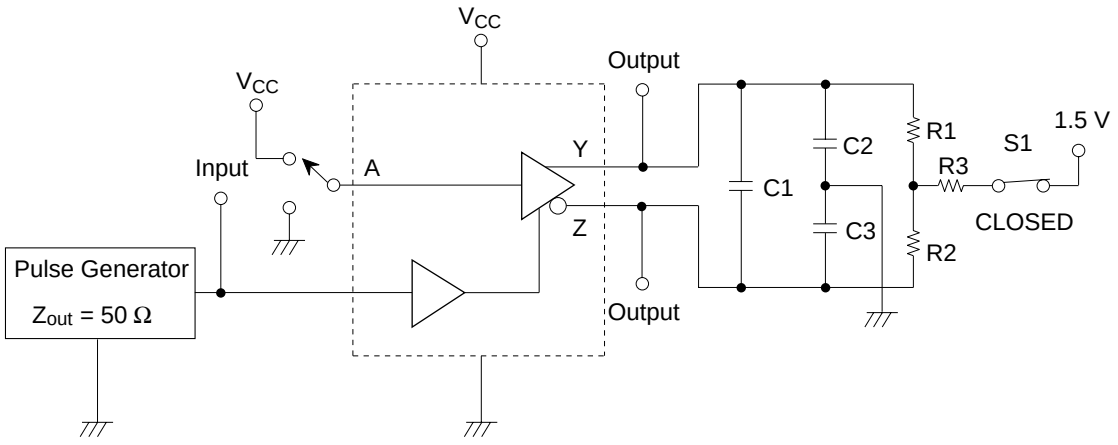
Note: 1. C1, C2 and C3 (40 pF) includes probe and jig capacitance.
R1 = R2 = 50 Ω, R3 = 500 Ω

Waveforms 1



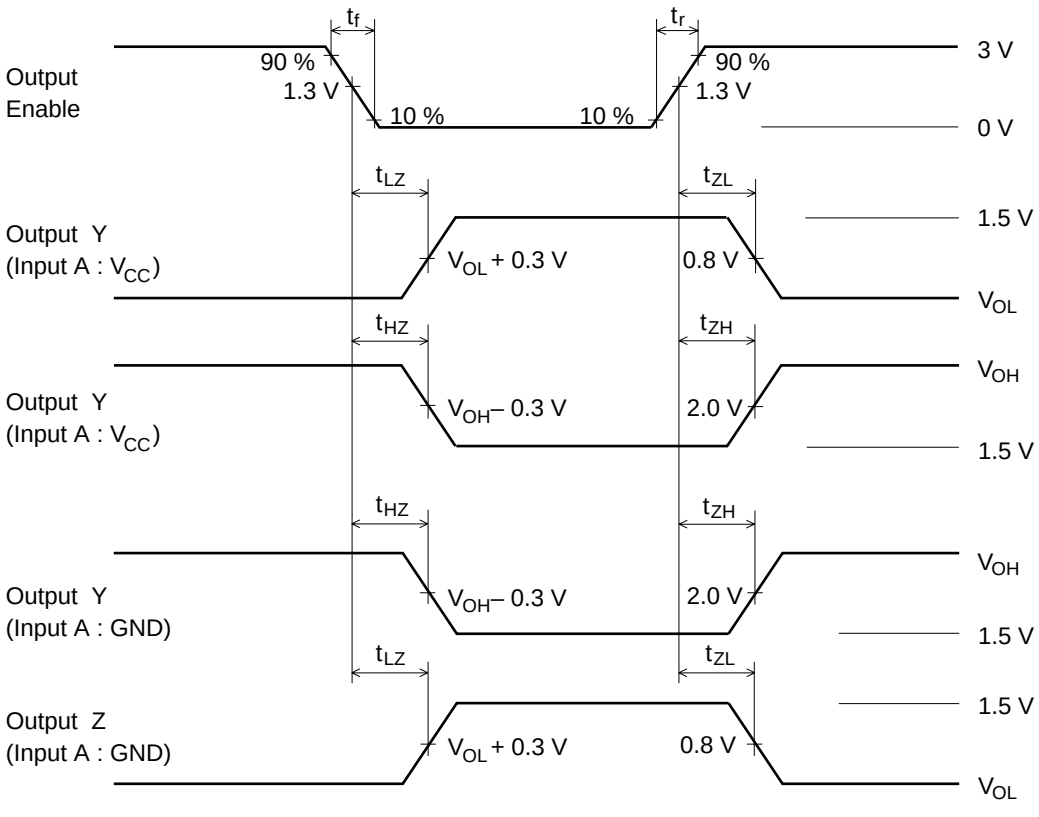
Notes: 1. $t_r \leq 6$ ns, $t_f \leq 6$ ns
2. Input waveforms: PRR = 1 MHz, duty cycle 50%

Test Circuit 2



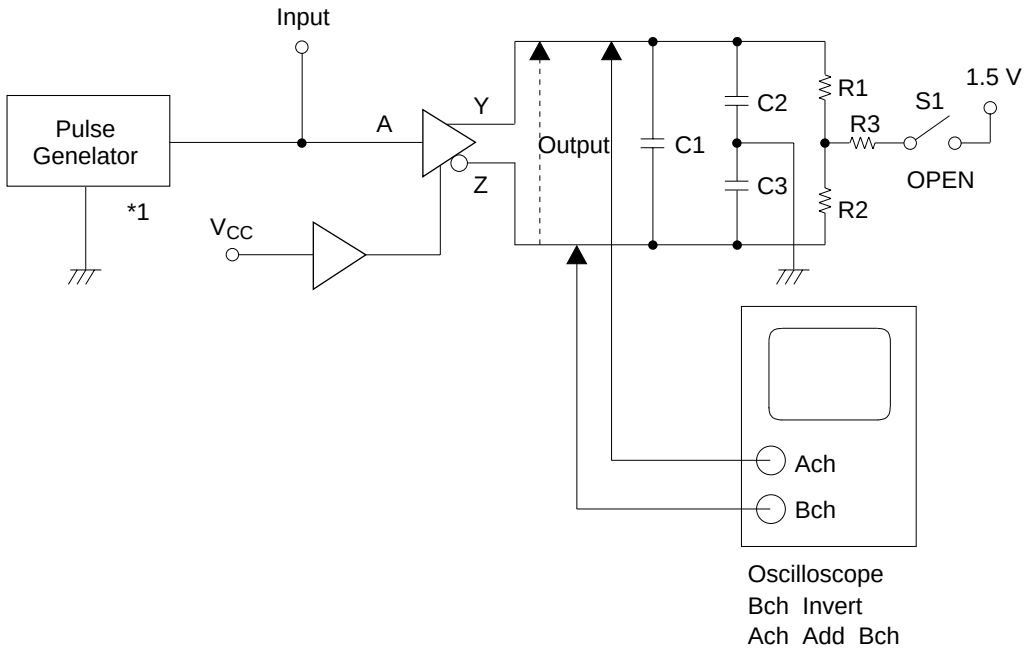
Note: 1. C1, C2 and C3 (40 pF) includes probe and jig capacitance.
R1 = R2 = 50 Ω, R3 = 500 Ω

Waveforms 2



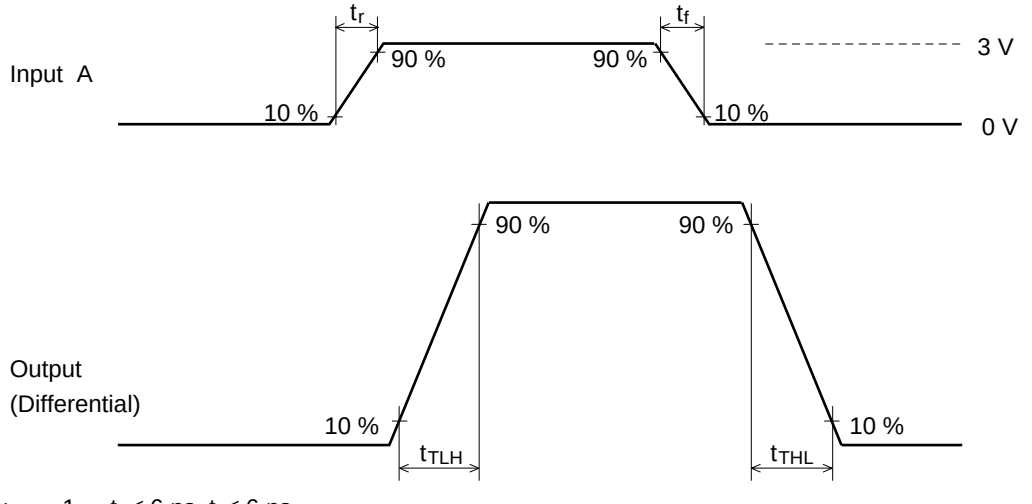
Notes: 1. $t_r \leq 6$ ns, $t_f \leq 6$ ns
2. Input waveforms: PRR = 1 MHz, duty cycle 50Ω

Test Circuit 3



Note: 1. C1, C2 and C3 (40 pF) includes probe and jig capacitance.
R1 = R2 = 50 Ω, R3 = 500 Ω

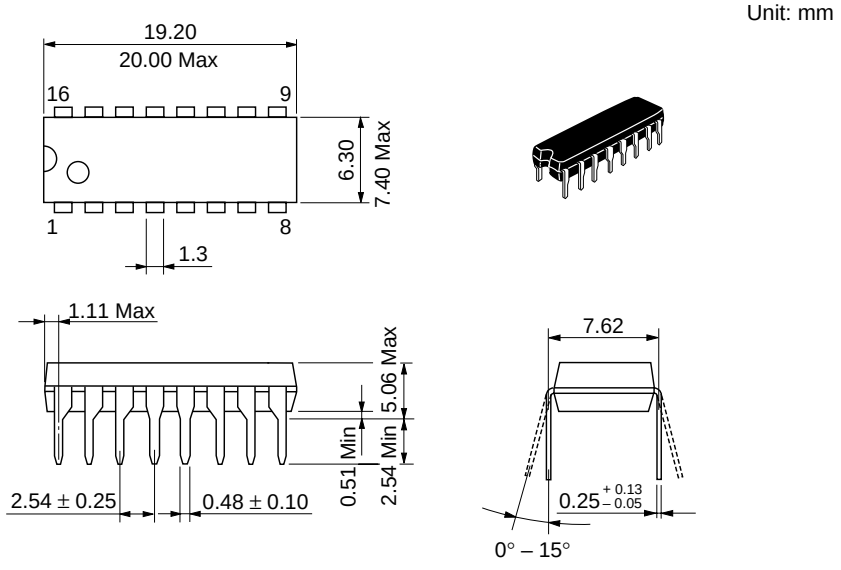
Waveforms–3



Notes: 1. $t_r \leq 6$ ns, $t_f \leq 6$ ns
2. Input waveforms: PRR = 1 MHz, duty cycle 50%

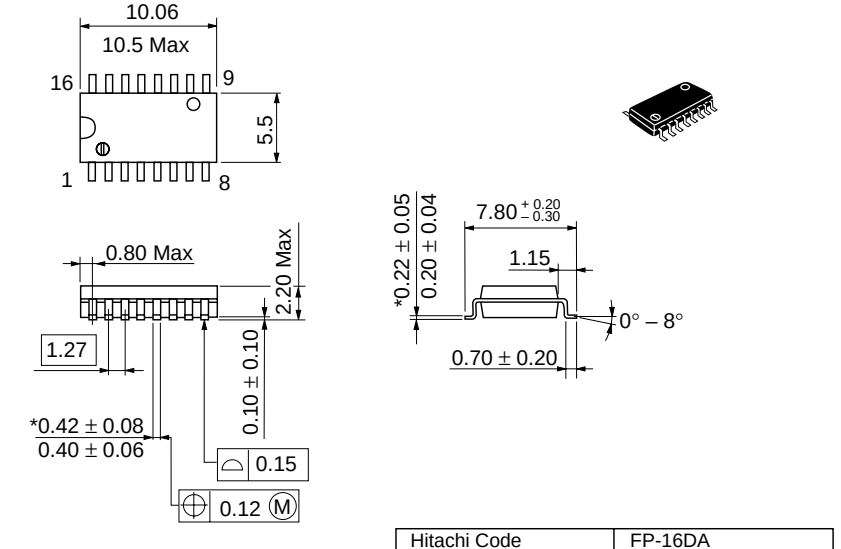
Package Dimensions

Unit: mm



Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	1.07 g

Unit: mm



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Mass (reference value)	0.24 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 NorthAmerica : http://semiconductor.hitachi.com/
Europe : http://www.hitachi-eu.com/hel/ecg
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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 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
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