HD75159

Dual Differential Line Drivers With 3 State Outputs

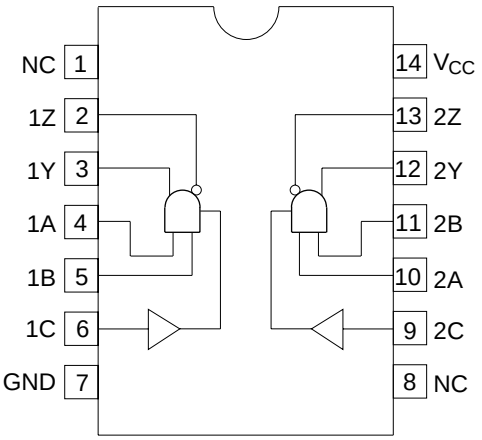
HITACHI

ADE-205-589 (Z)
1st. Edition
Dec. 2000

Description

The HD75159 features dual differential line drivers with three state outputs, which satisfy the requirements of EIA(standard) RS-422A. Each driver has an output control. When the output control is low, the associated outputs are in a high impedance state. This permits many devices to be connected together on the same transmission line for party line applications.

Pin Arrangement



(Top view)

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Absolute Maximum Ratings

Item	Symbol		Rating	Unit
Supply Voltage	V_{CC}		7	V
Input Voltage	V_{IN}		5.5	V
Powre Dissipation (Ta = 25°C)	P_T*[1]	DP	1150	mW
		FP	785	
Operating Temperature Range	Topr		0 to 70	°C
Storage Temperature Range	Tstg		–60 to +150	°C

Note: 1. The above date were taken by the ΔV_{BE} method, mounting on a glass epoxy board (40 × 40 × 1.6 mm) of 10 % wiring density.

2. 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	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	4.75	5.00	5.25	V
Output Current	I_{OH}	—	—	–40	mA
Output Current	I_{OL}	—	—	40	mA
Operating Temperature	Topr	0	70	°C	

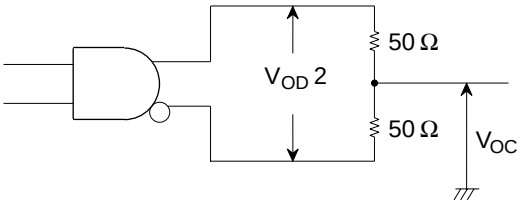
Electrical Characteristics (Ta = 0 to 70°C)

Item	Symbol	Min	Typ*[1]	Max	Unit	Conditions
Input Voltage	V_{IH}	2	—	—	V	
	V_{IL}	—	—	0.8		
Input Clamp Voltage	V_{IK}	—	–0.9	-1.5	V	V_{CC} = 4.75 V, I_I = –12 mA
Output Voltage	V_{OH}	2.5	3.0	—	V	V_{CC} = 4.75 V, V_{IL} = 0.8 V V_{IH} = 2 V, I_{OH} = –40 mA
	V_{OL}		–0.25	0.5		V_{CC} = 4.75 V, V_{IL} = 0.8 V V_{IH} = 2 V, I_{OL} = 40 mA
Output Clamp Voltage	V_{OK}	—	–1.1	–1.5	V	V_{CC} = 5.25 V, I_O = –40 mA
Differential Output Voltage	V_{OD1}	—	3.5	2 V_{OD2}	V	V_{CC} = 5.25 V, I_O = 0
	V_{OD2}	—	2	3.0		V_{CC} = 4.75 V, R_L = 100 Ω*[1]
Change In Magnitude Of Differential Output Voltage*[2]	$\Delta \lvert V_{OD} \rvert$	—	0.02	0.4	V	V_{CC} = 4.75 V, R_L = 100 Ω*[1]
Common-mode Output	V_{OC}	—	1.8	3	V	V_{CC} = 5.25 V, R_L = 100 Ω*[1]
Voltage*[3]		—	1.5	3		V_{CC} = 4.75 V, R_L = 100 Ω*[1]

Electrical Characteristics (Ta = 0 to 70°C) (cont)

Item	Symbol	Min	Typ*[1]	Max	Unit	Conditions
Change In Magnitude Of Differential Output Voltage*[2]	$\Delta \lvert V_{OC} \rvert$	—	0.01	0.4	V	V_{CC} = 4.75 V or 5.25 V
Output Current With Power Off	I_O	—	0.1	100	µA	V_{CC} = 0 V, V_O = 6 V
		—	–0.1	–100		V_{CC} = 0 V, V_O = –0.25 V
		—	—	±100		V_{CC} = 0 V, V_O = –0.25 V to 6 V
Off State (High Impedance State) Output Current	I_{OZ}	—	—	±10	µA	V_{CC} = 5.25 V Output Control 0.8 V Ta = 25°C, V_O = 0 to V_{CC}
		—	—	–20		V_{CC} = 5.25 V Output Control 0.8 V, Input Ta=70°C, V_O = 0 V
		—	—	±20		V_{CC} = 5.25 V Output Control 0.8 V, Input Ta=70°C, V_O = 0.4 V
		—	—	±20		V_{CC} = 5.25 V Output Control 0.8 V, Input Ta=70°C, V_O = 2.4 V
		—	—	20		V_{CC} = 5.25 V Output Control 0.8 V, Input Ta=70°C, V_O = V_{CC}
Input Current	I_I	—	—	1	mA	V_{CC} = 5.25 V, V_I = 5.5 V
	I_{IH}	—	—	40	µA	V_{CC} = 5.25 V, V_I = 2.4 V
	I_{IL}	—	–1	–1.6	mA	V_{CC} = 5.25 V, V_I = 0.4 V
Short Circuit Output Current*[4]	I_{OS}	–40	–90	–150	mA	V_{CC} = 5.25 V
Supply Current	I_{CC}	—	47	65	mA	V_{CC} = 5.25 V No Load, Inputs Grounded Ta = 25°C

Notes:
1. All typical values are at V_{CC} = 5 V, Ta = 25°C.
2. $\Delta \lvert V_{OD} \rvert$ and $\Delta \lvert V_{OC} \rvert$ are the changes in magnitudes of V_{OD} and V_{OC}, respectively, that occur when the input is changed from a high level to a low level.
3. In EIA standard RS-422A, V_{OC}, which is the average of the two output voltages with respect to ground, is called output offset voltage, V_{OS}.
4. Only one output should be shorted at a time, and duration of the short circuit should not exceed one second.



Note: 1. Differential and common mode output voltages.

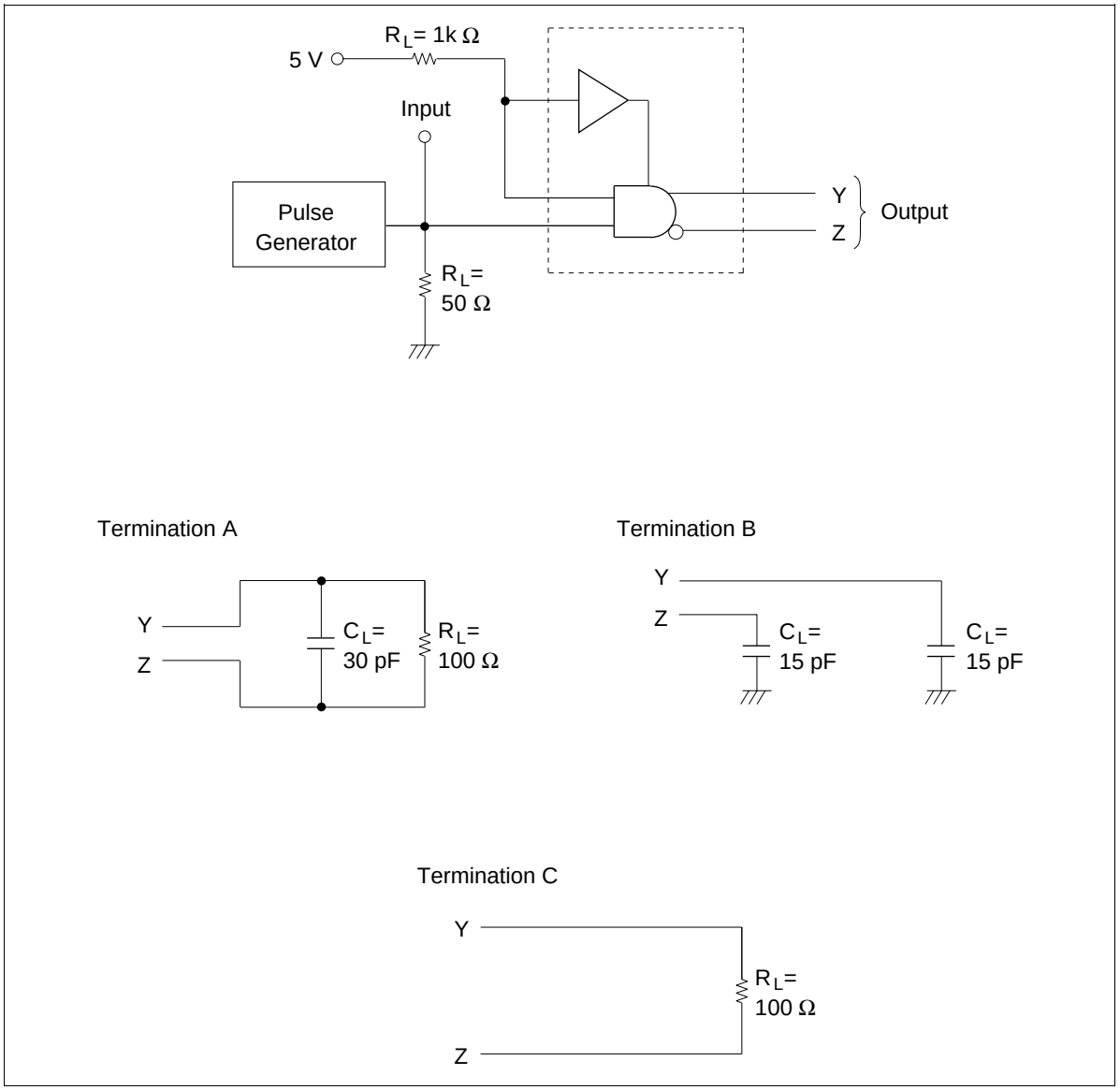
Switching Characteristics (V_{CC} = 5.0 V, Ta = 25°C)

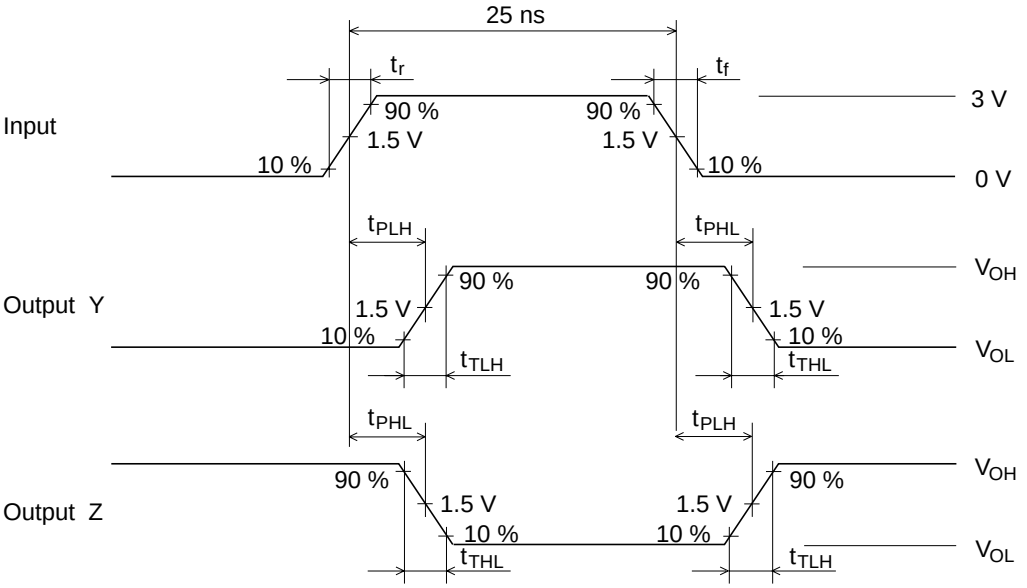
Item	Symbol	Min	Typ	Max	Unit	Test Circuit	Conditions
Propagation Delay Time	t_{PLH}	—	16	25	ns	1	C_L = 30 pF, R_L = 100 Ω
	t_{PHL}	—	11	20		Termination A	
	t_{PLH}	—	13	20		1	C_L = 15 pF
	t_{PHL}	—	9	15		Termination B	
Transition Time	t_{TLH}	—	4	20		1	C_L = 30 pF, R_L = 100 Ω
	t_{THL}	—	4	20		Termination A	
Output Enable Time	t_{ZH}	—	7	20		2	C_L = 30 pF, R_L = 180 Ω
	t_{ZL}	—	14	40		3	C_L = 30 pF, R_L = 250 Ω
Output Disable Time	t_{HZ}	—	10	30		2	C_L = 30 pF, R_L =180 Ω
	t_{LZ}	—	17	35		3	C_L = 30 pF, R_L = 250 Ω
Overshoot Output Factor		—	—	10	%	1 Termination C	R_L = 100 Ω

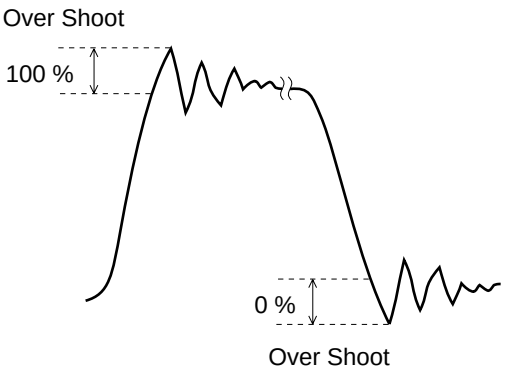
Switching Time Test Method

Test Circuit

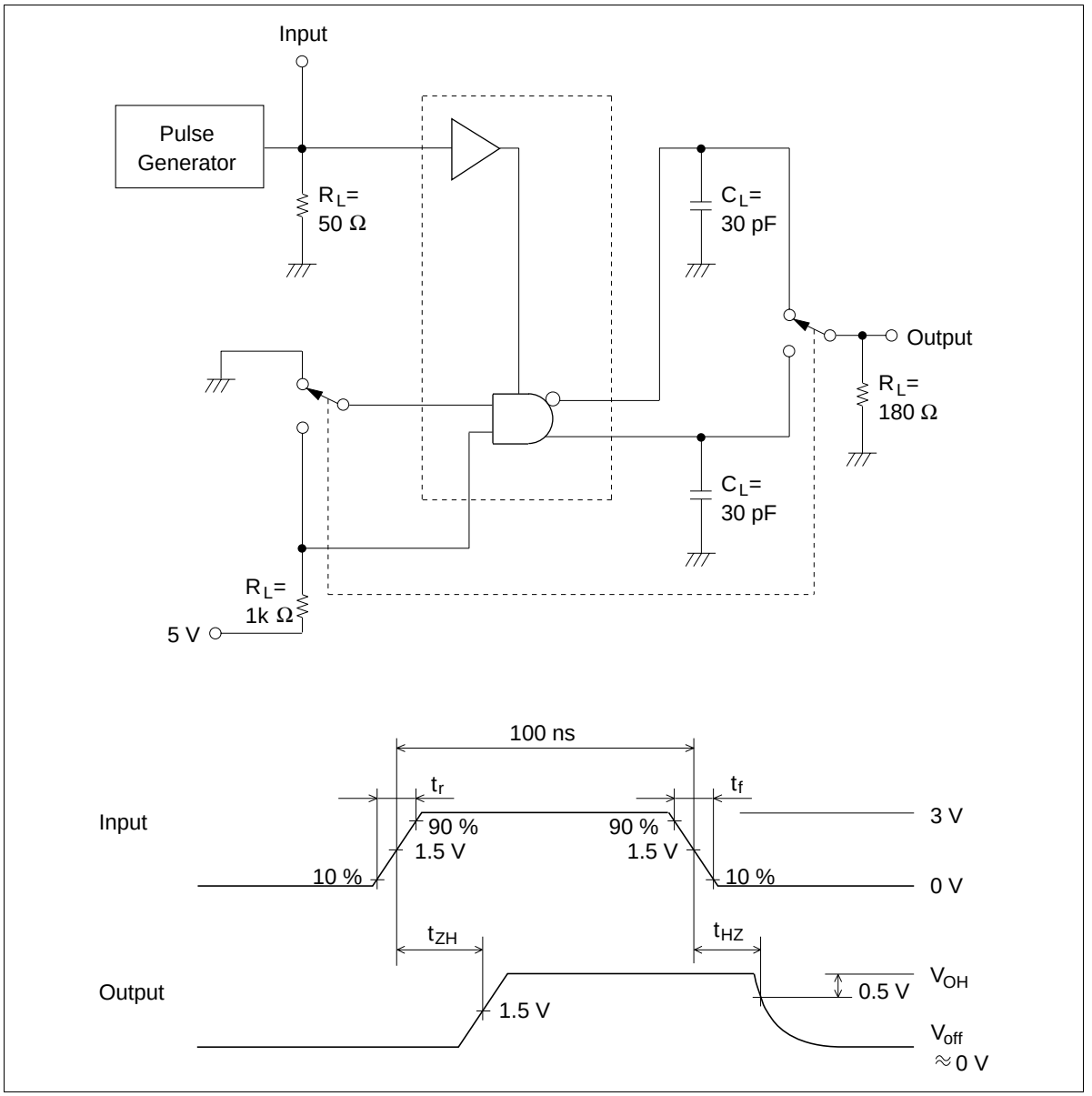
1. t_{PLH}, t_{PHL}, t_{TLH}, t_{THL}, and overshoot factor



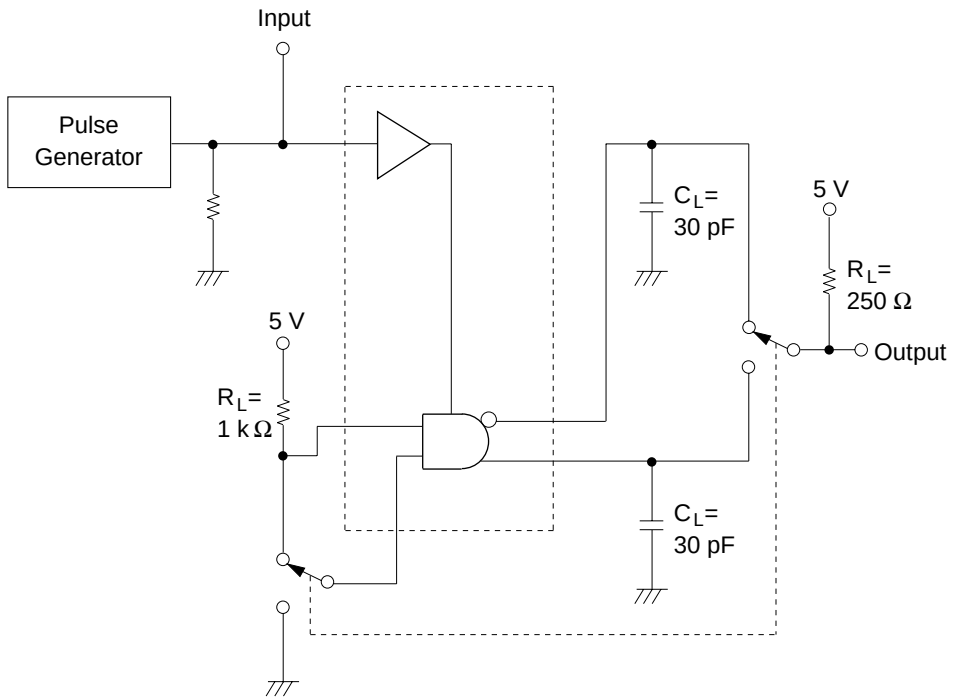

25 ns
t_r
t_f
Input
3 V
0 V
90 %
1.5 V
10 %
t_{PLH}
t_{PHL}
Output Y
V_{OH}
V_{OL}
t_{TLH}
t_{THL}
Output Z

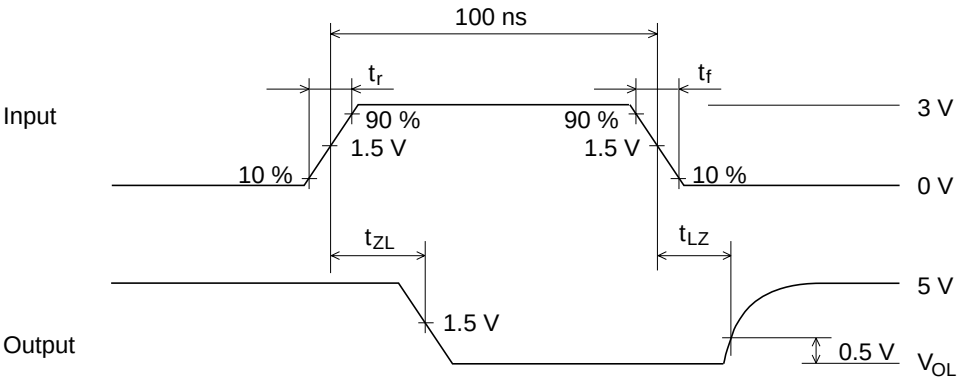

Over Shoot
100 %
0 %
Over Shoot

2. t_{ZH}, t_{HZ}


Input
Pulse Generator
R_L= 50 Ω
C_L= 30 pF
Output
R_L= 180 Ω
C_L= 30 pF
R_L= 1k Ω
5 V
100 ns
t_r
t_f
Input
90 %
1.5 V
90 %
1.5 V
10 %
10 %
3 V
0 V
t_{ZH}
t_{HZ}
Output
1.5 V
0.5 V
V_{OH}
V_{off}
≈ 0 V

3. t_{ZL}, t_{LZ}

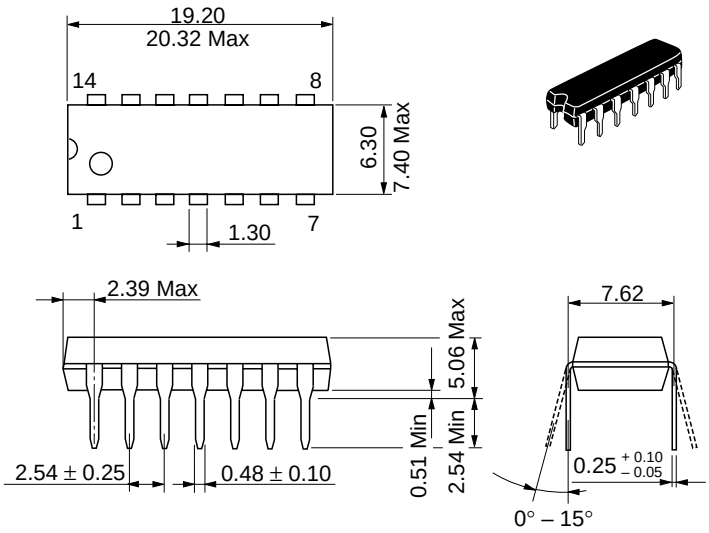




Notes:
1. The pulse generator has the following characteristics:
   Zout = 50 Ω, PRR = 500 kHz
2. C_L includes probe and jig capacitance.

Package Dimensions

Unit: mm



Hitachi Code	DP-14
JEDEC	Conforms
EIAJ	Conforms
Mass (reference value)	0.97 g

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