CMOS Linear Integrated Circuits Silicon Monolithic

TC75S70L6X

1. Functional Description

- Single Comparator

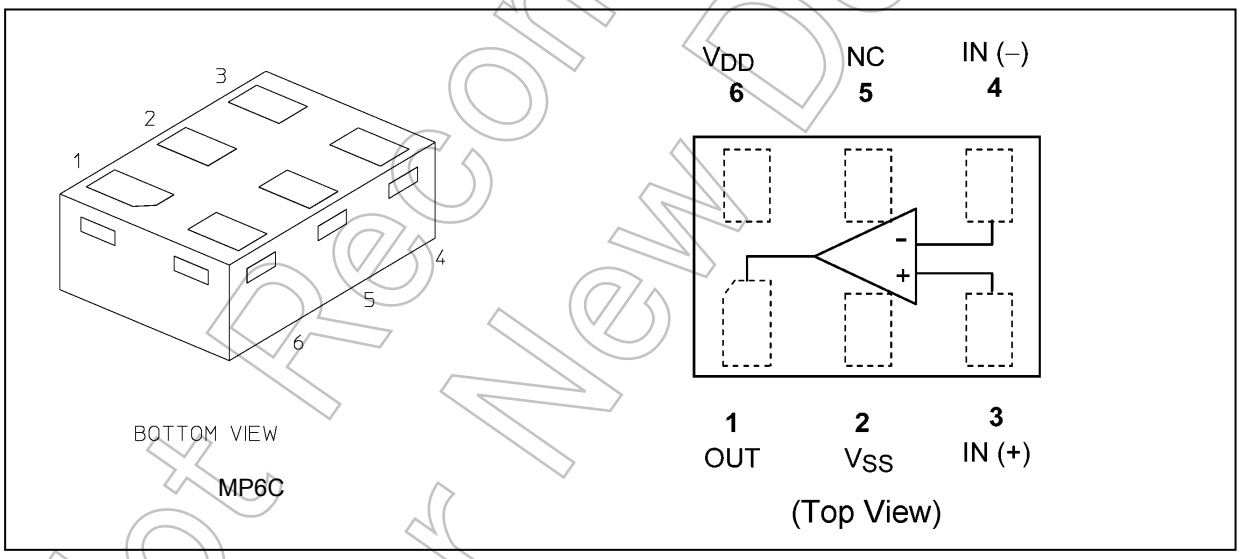
2. General

This is a CMOS Input/Output full swing comparator with low operating voltage and low supply current. The comparator have low operating voltage V_{DD} = 1.3 V to 5.5 V and low supply current I_{DD} = 18 μA (typ.) @V_{DD} = 1.5 V. Output circuit type is push-pull circuit. The package MP6C (1.0 mm × 1.45 mm, t: 0.55 mmMAX) is ultra small, so that it is ideal for high-density assembly such as cellular phone.

3. Features

(1) Single circuit, Input/Output full swing comparator
(2) Low operating voltage: V_{DD} = 1.3 V to 5.5 V
(3) Low supply current: I_{DD} = 18 μA (typ.) (@V_{DD} = 1.5 V)
(4) Ultra Small package: MP6C (1.0 mm × 1.45 mm, t = 0.55 mmMAX)
(5) Low input bias current: 1 pA (typ.)
(6) Push-pull output circuit
(7) Single power supply operation

4. Packaging and Pin Assignment



Start of commercial production
2013-12

5. Absolute Maximum Ratings (Note) (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Note	Rating	Unit
Supply voltage	V_{DD}		±3.0 or 6.0	V
Differential input voltage	ΔV_{IN}		±6.0	V
Input voltage	V_{IN}		V_{SS} to V_{DD}	V
Output current	I_{OUT}		±35	mA
Power dissipation	P_D	(Note 1)	250	mW
Operating temperature	T_{opr}		-40 to 85	°C
Storage temperature	T_{stg}		-55 to 125	°C
Junction temperature	T_j		125	°C

Note: Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings.
Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note: Since this device is susceptible to latch-up, a phenomenon inherent to CMOS devices, follow these considerations:
- Don't raise the voltage level of the output pins above V_{DD} or lower it below V_{SS}.
  Consider the power-on timing as well.
- Ensure that any abnormal noise is not introduced into the device.

Note 1: Mounted on an FR4 board.

6. Operating Ratings (Unless otherwise specified, T_a = 25 °C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{DD}	1.3 to 5.5	V
Supply voltage	V_{DD},V_{SS}	±0.65 to 2.75	V

7. Thermal Characteristics

Characteristics		Symbol	Rating	Unit
Thermal resistance (junction-to-ambient)	(Note 1)	$R_{th(j-a)}$	400	°C/W

Note 1: Mounted on an FR4 board.

8. Electrical Characteristics

8.1. V_{DD} = 3.0 V (Unless otherwise specified, T_a = 25 °C, V_{SS} = GND)

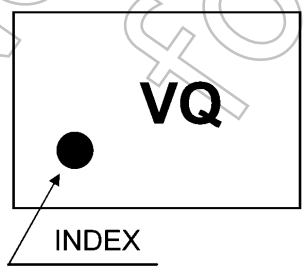
Characteristics	Symbol	Note	Test Condition	Test Circuit	Min	Typ.	Max	Unit
Input offset voltage	V_{IO}		—	—	—	±1	±6	mV
Input offset current	I_{IO}		—	—	—	1	—	pA
Input bias current	I_I		—	—	—	1	—	pA
Common-mode input voltage range	V_{ICM}		—	—	0	—	3.0	V
Supply current	I_{DD}	(Note 1)	—	Fig.11.3	—	20	35	μA
Sink current	I_{SINK}		V_{OL} = 0.5 V	Fig.11.2	9	18	—	mA
Source current	I_{SOURCE}		V_{OH} = 2.5 V	Fig.11.1	7	15	—	mA
Low-level output voltage	V_{OL}		I_{SINK} = 5.0 mA	Fig.11.2	—	0.15	0.30	V
High-level output voltage	V_{OH}		I_{SOURCE} = 5.0 mA	Fig.11.1	2.70	2.85	—	V
Propagation delay time (L/H)	t_{PLH}		Over drive = 100 mV	Fig.11.4	—	400	—	ns
Propagation delay time (H/L)	t_{PHL}		Over drive = 100 mV	Fig.11.4	—	800	—	ns
Response time (low-to-high)	t_{TLH}		Over drive = 100 mV	Fig.11.4	—	14	—	ns
Response time (high-to-low)	t_{THL}		Over drive = 100 mV	Fig.11.4	—	14	—	ns

8.2. V_{DD} = 1.5 V (Unless otherwise specified, T_a = 25 °C, V_{SS} = GND)

Characteristics	Symbol	Note	Test Condition	Test Circuit	Min	Typ.	Max	Unit
Input offset voltage	V_{IO}		—	—	—	±1	±6	mV
Input offset current	I_{IO}		—	—	—	1	—	pA
Input bias current	I_I		—	—	—	1	—	pA
Common-mode input voltage range	V_{ICM}		—	—	0	—	1.5	V
Supply current	I_{DD}	(Note 1)	—	Fig.11.3	—	18	34	μA
Sink current	I_{SINK}		V_{OL} = 0.5 V	Fig.11.2	2.5	6.0	—	mA
Source current	I_{SOURCE}		V_{OH} = 1.0 V	Fig.11.1	1.5	5.0	—	mA
Low-level output voltage	V_{OL}		I_{SINK} = 1.5 mA	Fig.11.2	—	0.10	0.25	V
High-level output voltage	V_{OH}		I_{SOURCE} = 1.5 mA	Fig.11.1	1.25	1.40	—	V
Propagation delay time (L/H)	t_{PLH}		Over drive = 100 mV	Fig.11.4	—	400	—	ns
Propagation delay time (H/L)	t_{PHL}		Over drive = 100 mV	Fig.11.4	—	720	—	ns
Response time (low-to-high)	t_{TLH}		Over drive = 100 mV	Fig.11.4	—	20	—	ns
Response time (high-to-low)	t_{THL}		Over drive = 100 mV	Fig.11.4	—	33	—	ns

Note 1: The current consumption of the device increases with its operating frequency. Ensure that its power dissipation does not exceed the rated allowable power dissipation.

9. Marking



(Top View)

10. Characteristics Curves (Note)

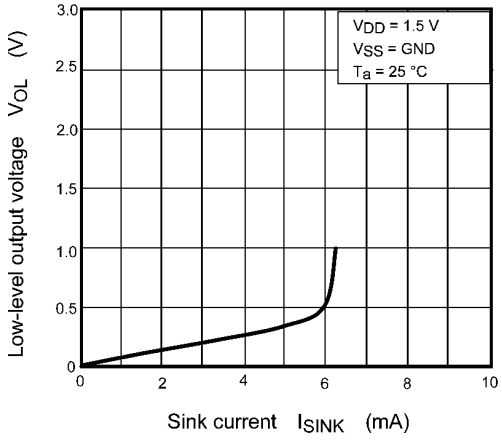


Fig. 10.1 V_{OL} - I_{SINK}

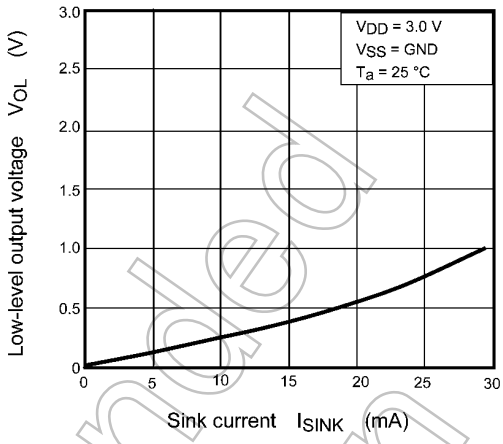


Fig. 10.2 V_{OL} - I_{SINK}

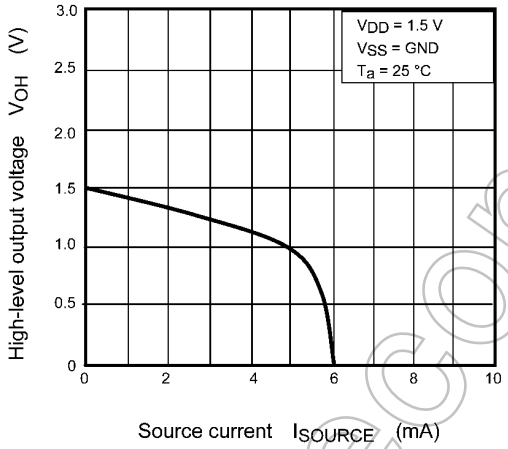


Fig. 10.3 V_{OH} - I_{SOURCE}

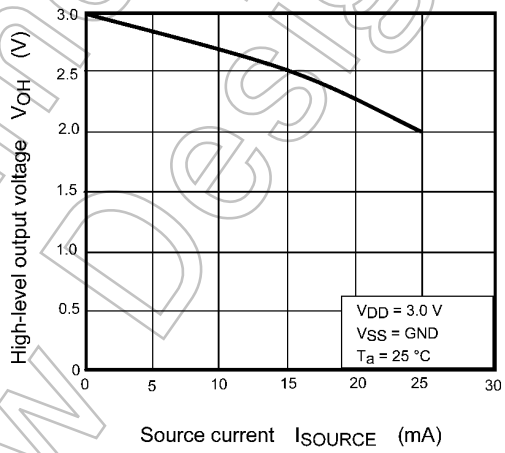


Fig. 10.4 V_{OH} - I_{SOURCE}

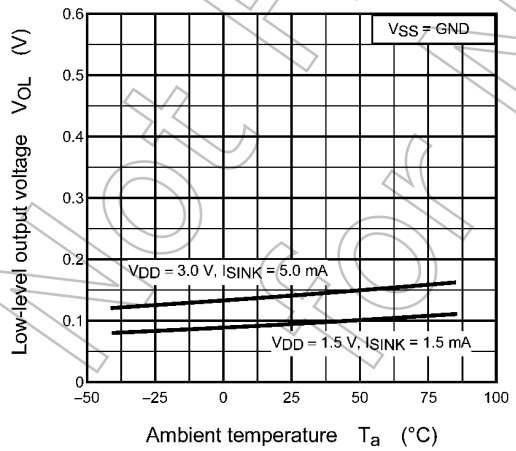


Fig. 10.5 V_{OL} - T_a

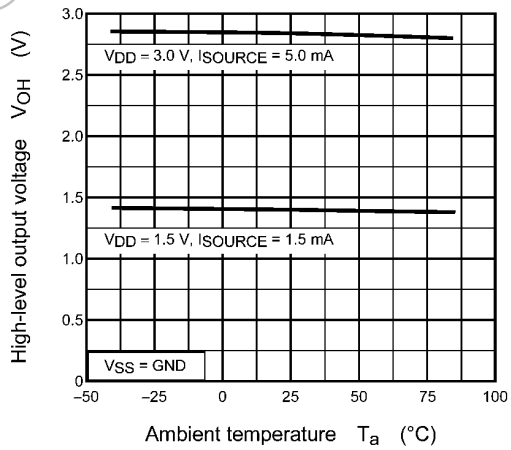


Fig. 10.6 V_{OH} - T_a

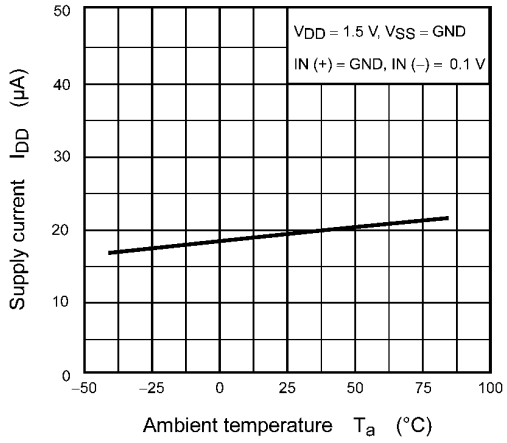


Fig. 10.7 I_{DD} - T_a

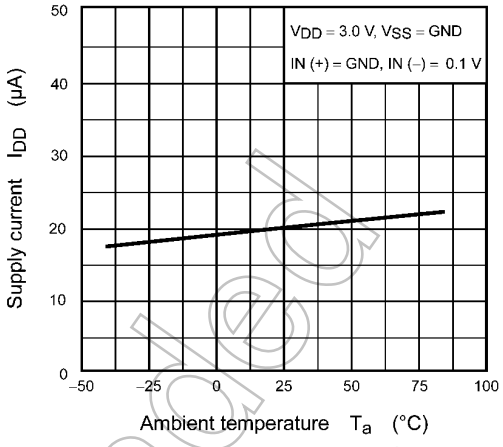


Fig. 10.8 I_{DD} - T_a

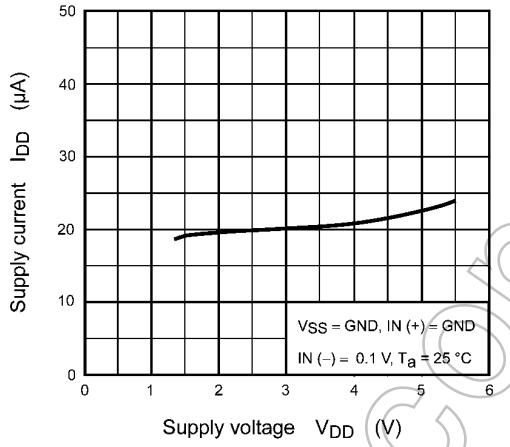


Fig. 10.9 I_{DD} - V_{DD}

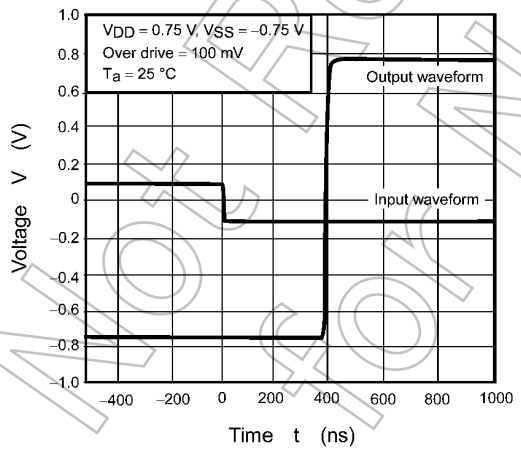


Fig. 10.10 Propagation delay time (L/H) t_{PLH}

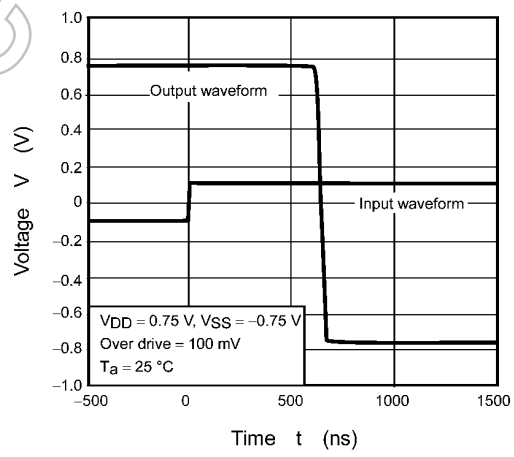


Fig. 10.11 Propagation delay time (H/L) t_{PHL}

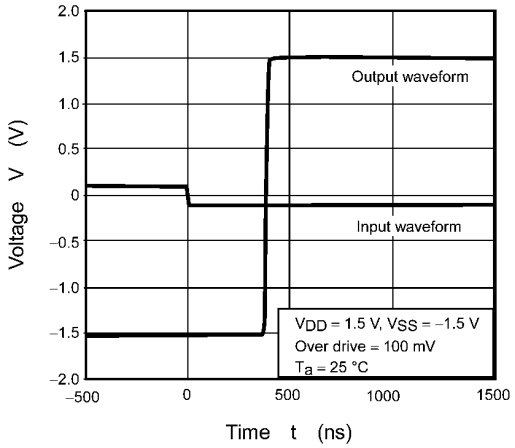


Fig. 10.12 Propagation delay time (L/H) t_{PLH}

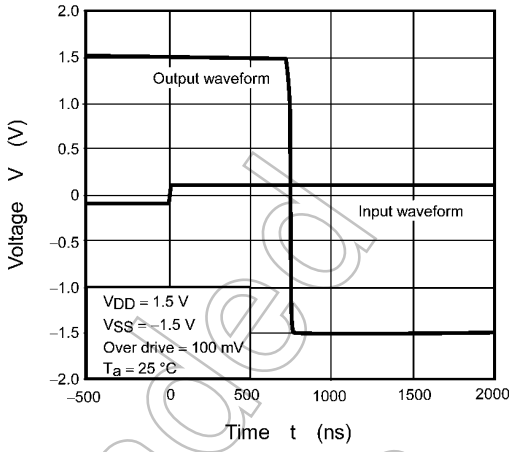


Fig. 10.13 Propagation delay time (H/L) t_{PHL}

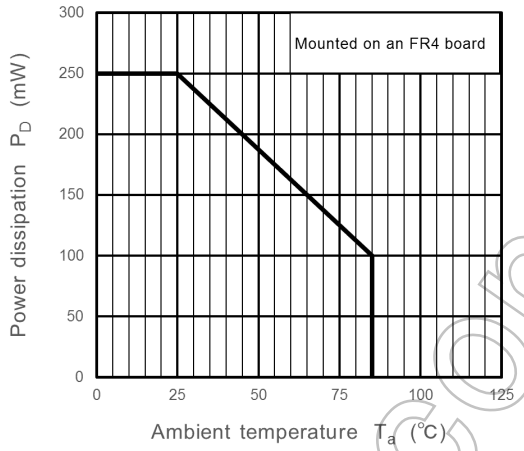


Fig. 10.14 P_D - T_a

Note: The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

11. Test Circuits

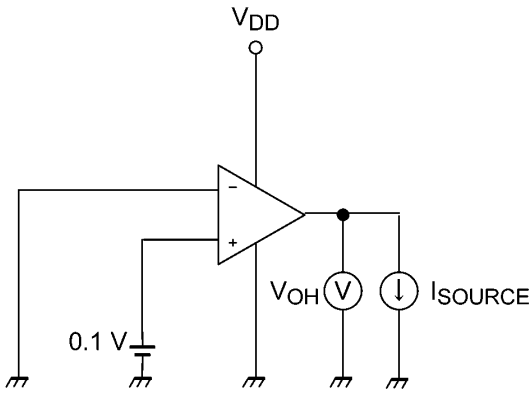


Fig. 11.1 I_{SOURCE},V_{OH}

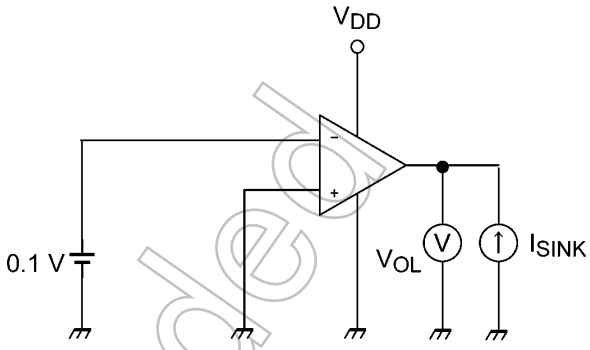


Fig. 11.2 I_{SINK},V_{OL}

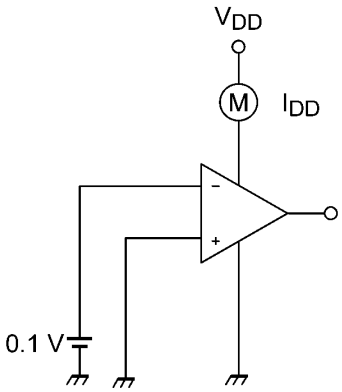


Fig. 11.3 I_{DD}

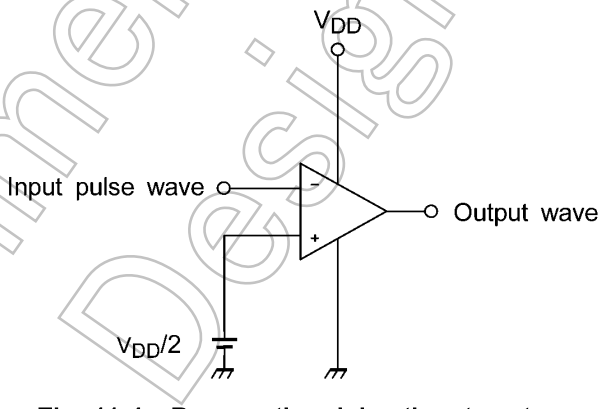


Fig. 11.4 Propagation delay time t_{PLH},t_{PHL}

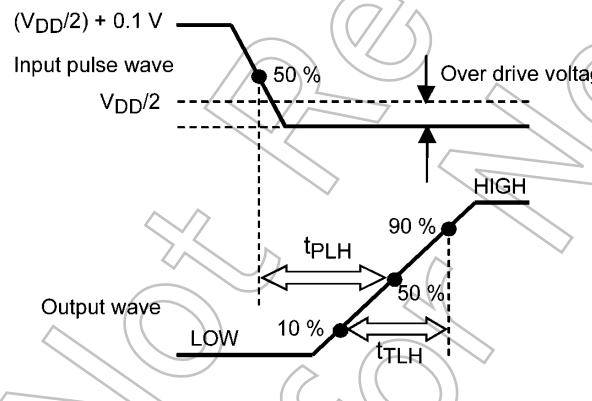


Fig. 11.5 Propagation delay time (L/H) t_{PLH} wave

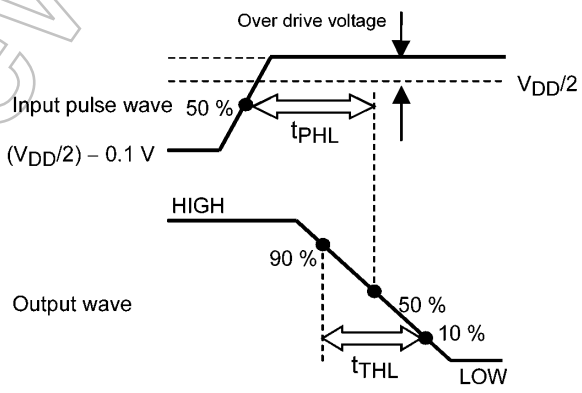
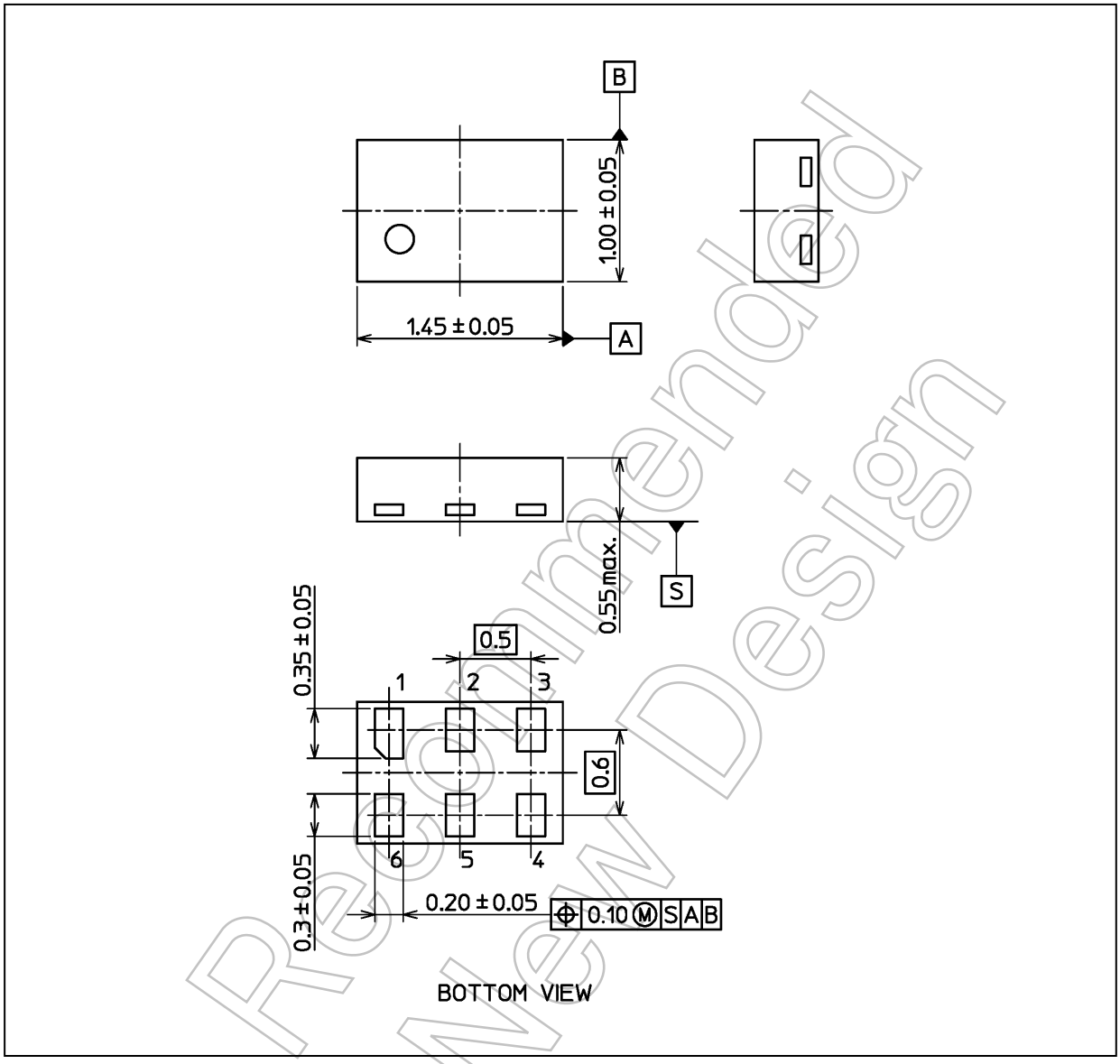


Fig. 11.6 Propagation delay time (H/L) t_{PHL} wave

Package Dimensions

Unit: mm



Weight: 0.0024 g (typ.)

Package Name(s)
TOSHIBA: P-UFLGA6-0102-0.50-003
Nickname: MP6C

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