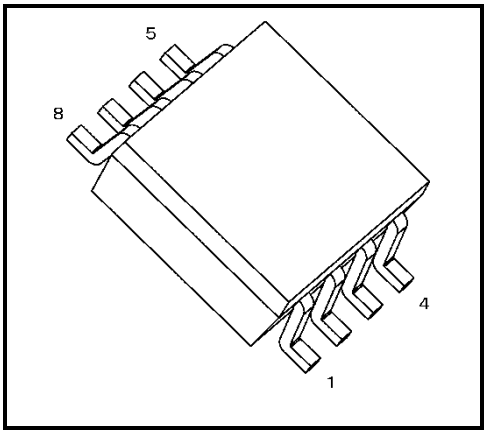
CMOS Linear Integrated Circuit Silicon Monolithic

TC75W71FU

High speed Dual comparator

1. Description

The TC75W71FU is a CMOS type general-purpose dual comparator capable of single power supply operation and using lower supply currents than the conventional bipolar comparators.

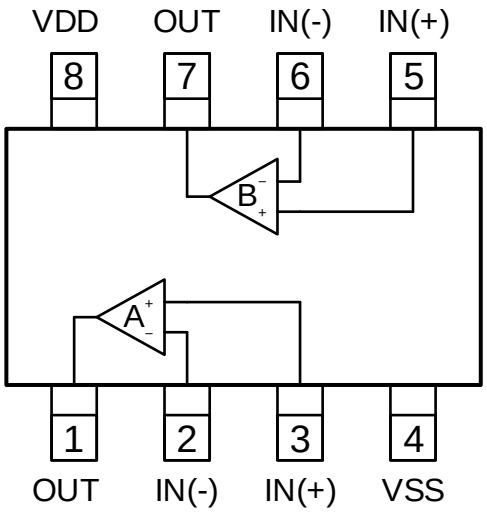


Weight:
SM8 (SOT-505) : 0.020 g (Typ.)

2. Features

- Propagation Delay at 3.3 V_{DD} @ 25 ºC
  - 45 ns (Max) high-to-low
  - 30 ns (Max) low-to-high
- Rail to Rail Input
- Wide supply voltage range: 1.8 V to 5.5 V
- Package: SM8 (SOT-505)
- Output type: Push-pull

3. Pin Connection (Top View)



4. Product list

Part name	Input Hysteresis voltage	Output type	Top marking
TC75W71FU	None	Push-pull	5W71

Start of commercial production
2025-09

5. Absolute Maximum Ratings (Note) (Ta = 25 °C)

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{DD} – V_{SS}	6.0	V
Analog input voltage	V_{IN}	V_{SS} - 0.3 to V_{DD} + 0.3 or 6.0 which is smaller	V
Output voltage	V_{OUT}	V_{SS} - 0.3 to V_{DD} + 0.3 or 6.0 which is smaller	V
Power dissipation	P_D	250	mW
Junction temperature	T_j	150	°C
Storage temperature	T_{stg}	-55 to 150	°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 and the operating ranges.
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 product sometimes brings about latch-up, which is peculiar to CMOS devices, note the following points:

- Don’t raise the voltage level of I/O pins beyond V_{DD}, nor lower it below V_{SS}.

Consider the timing for power supply, too.

- Don’t let any abnormal noise enter the device.

6. Operating Ratings

Characteristics	Symbol	Rating	Unit
Supply voltage	V_{DD}	1.8 to 5.5	V
Input voltage range	V_{IN}	V_{SS} – 0.2 V to V_{DD} + 0.2 V	V
Operation temperature	T_{opr}	-40 to 125	°C

7. Electrical Characteristics

7.1. DC Characteristics (V_{DD} = 3.3 V, V_{SS} = GND, Ta = -40 °C to 125 °C)

Characteristics	Symbol	Test condition	Ta = 25 °C			Ta = -40 °C to 125 °C (Note 1)		Unit
			Min	Typ.	Max	Min	Max	
Supply current	I_{DD}	V_{OUT} = High, V_{IN} = V_{SS}	–	294	370	–	508	μA
		V_{OUT} = Low, V_{IN} = V_{SS}	–	450	563	–	761	μA
Power supply rejection ratio	PSRR	V_{DD} = 1.8 V to 5.0 V, V_{IN} = V_{SS}	39	70	–	–	–	dB
Input offset voltage	V_{IO}	V_{SS} < V_{IN} < V_{DD}	-17	±3	17	–	–	mV
Input offset voltage drift	$V_{IOdrift}$	V_{IN} = V_{SS}	–	±2	–	–	–	μV/°C
Input offset current	I_{IO}	V_{IN} = V_{SS}	–	0	–	–	192	nA
Input bias current	I_I	V_{IN} = V_{DD}/2	–	0	–	–	196	nA
Common mode input voltage	CMV_{IN}	–	V_{SS}	–	V_{DD}	–	–	V
Common mode input signal rejection ratio	CMRR	V_{SS} < V_{IN} < V_{DD}	39	66	–	–	–	dB
High-Level Output Voltage	VOH	I_{OUT} = -1 mA	V_{DD} - 0.15	–	–	–	–	V
Low-Level Output Voltage	VOL	I_{OUT} = 1 mA	–	–	0.15	–	–	V
Short-Circuit Current	ISC	–	–	±25	–	–	–	mA

Note 1: This parameter is warranted by design.

7.2. DC Characteristics (V_{DD} = 1.8 V, V_{SS} = GND, Ta = -40 °C to 125 °C)

Characteristics	Symbol	Test condition	Ta = 25 °C			Ta = -40 °C to 125 °C (Note 1)		Unit
			Min	Typ.	Max	Min	Max	
Supply current	I_{DD}	V_{OUT} = High, V_{IN} = V_{SS}	–	276	349	–	476	μA
		V_{OUT} = Low, V_{IN} = V_{SS}	–	422	533	–	719	μA
Power supply rejection ratio	PSRR	V_{DD} = 1.8 V to 5.0 V, V_{IN} = V_{SS}	39	70	–	–	–	dB
Input offset voltage	V_{IO}	V_{SS} < V_{IN} < V_{DD}	-17	±3	17	–	–	mV
Input offset voltage drift	$V_{IOdrift}$	V_{IN} = V_{SS}	–	±2	–	–	–	μV/°C
Input offset current	I_{IO}	V_{IN} = V_{SS}	–	0	–	–	192	nA
Input bias current	I_I	V_{IN} = V_{DD}/2	–	0	–	–	196	nA
Common mode input voltage	CMV_{IN}	–	V_{SS}	–	V_{DD}	–	–	V
Common mode input signal rejection ratio	CMRR	V_{SS} < V_{IN} < V_{DD}	34	66	–	–	–	dB
High-Level Output Voltage	VOH	I_{OUT} = -1 mA	V_{DD} - 0.2	–	–	–	–	V
Low-Level Output Voltage	VOL	I_{OUT} = 1 mA	–	–	0.2	–	–	V
Short-Circuit Current	ISC	–	–	±6	–	–	–	mA

Note 1: This parameter is warranted by design.

7.3. DC Characteristics (V_{DD} = 5.0 V, V_{SS} = GND, Ta = -40 °C to 125 °C)

Characteristics	Symbol	Test condition	Ta = 25 °C			Ta = -40 °C to 125 °C (Note 1)		Unit
			Min	Typ.	Max	Min	Max	
Supply current	I_{DD}	V_{OUT} = High, V_{IN} = V_{SS}	–	323	407	–	547	μA
		V_{OUT} = Low, V_{IN} = V_{SS}	–	497	622	–	827	μA
Power supply rejection ratio	PSRR	V_{DD} = 1.8 V to 5.0 V, V_{IN} = V_{SS}	39	70	–	–	–	dB
Input offset voltage	V_{IO}	V_{SS} < V_{IN} < V_{DD}	-17	±3	17	–	–	mV
Input offset voltage drift	$V_{IOdrift}$	V_{IN} = V_{SS}	–	±2	–	–	–	μV/°C
Input offset current	I_{IO}	V_{IN} = V_{SS}	–	0	–	–	192	nA
Input bias current	I_I	V_{IN} = V_{DD}/2	–	0	–	–	196	nA
Common mode input voltage	CMV_{IN}	–	V_{SS}	–	V_{DD}	–	–	V
Common mode input signal rejection ratio	CMRR	V_{SS} < V_{IN} < V_{DD}	43	66	–	–	–	dB
High-Level Output Voltage	VOH	I_{OUT} = -4 mA	V_{DD} - 0.3	–	–	–	–	V
Low-Level Output Voltage	VOL	I_{OUT} = 4 mA	–	–	0.3	–	–	V
Short-Circuit Current	ISC	–	–	±54	–	–	–	mA

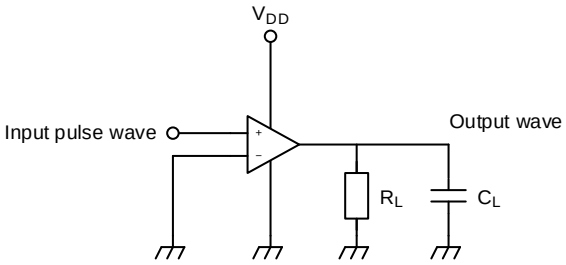
Note 1: This parameter is warranted by design.

7.4. AC Characteristics (Note 1)
(V_{DD} = 1.8 V to 5.0 V, V_{SS} = GND, Ta = 25 °C)

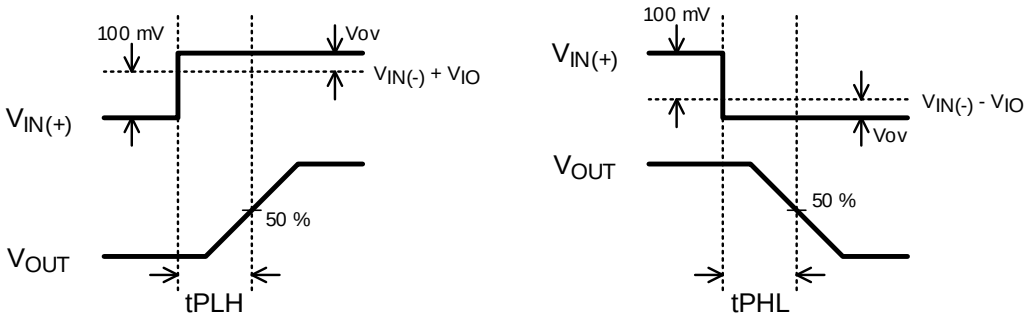
Characteristics	Symbol	Test condition	Min	Typ.	Max	Unit
Low to High, 100 mV Overdrive	tPLH	$V_{IN(+)}$ = -100mV to +100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 1.8 V, C_L = 50 pF, R_L = 10 kΩ	–	28	–	ns
		$V_{IN(+)}$ = -100mV to +100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 3.3 V, C_L = 50 pF, R_L = 10 kΩ	–	23	45	ns
		$V_{IN(+)}$ = -100mV to +100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 5.0 V, C_L = 50 pF, R_L = 10 kΩ	–	23	–	ns
High to Low, 100 mV Overdrive	tPHL	$V_{IN(+)}$ = +100mV to -100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 1.8 V, C_L = 50 pF, R_L = 10 kΩ	–	19	–	ns
		$V_{IN(+)}$ = +100mV to -100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 3.3 V, C_L = 50 pF, R_L = 10 kΩ	–	14	30	ns
		$V_{IN(+)}$ = +100mV to -100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 5.0 V, C_L = 50 pF, R_L = 10 kΩ	–	12	–	ns
Rise Time	tR	$V_{IN(+)}$ = -100mV to 100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 1.8 V, C_L = 50 pF, R_L = 10 kΩ	–	16	–	ns
		$V_{IN(+)}$ = -100mV to 100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 3.3 V, C_L = 50 pF, R_L = 10 kΩ	–	6	–	ns
		$V_{IN(+)}$ = -100mV to 100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 5.0 V, C_L = 50 pF, R_L = 10 kΩ	–	4	–	ns
Fall Time	tF	$V_{IN(+)}$ = +100mV to -100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 1.8 V, C_L = 50 pF, R_L = 10 kΩ	–	13	–	ns
		$V_{IN(+)}$ = +100mV to -100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 3.3 V, C_L = 50 pF, R_L = 10 kΩ	–	5	–	ns
		$V_{IN(+)}$ = +100mV to -100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 5.0 V, C_L = 50 pF, R_L = 10 kΩ	–	3	–	ns

Note 1: This parameter is warranted by design.

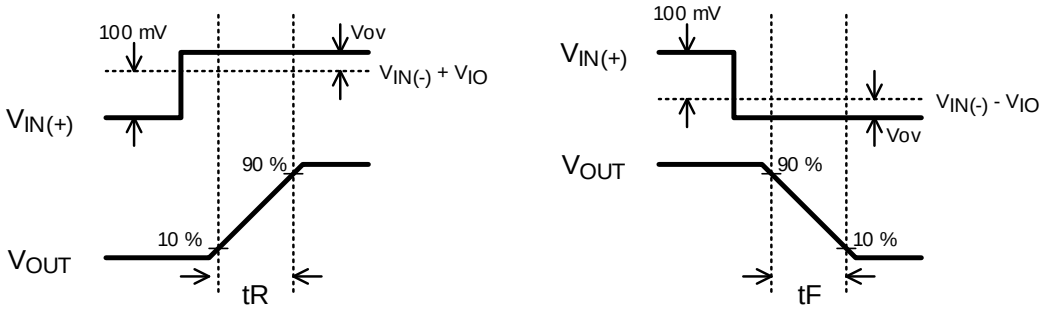
- AC Waveform



Propagation delay time tPLH, tPHL,
Rise time tR, Fall time tF



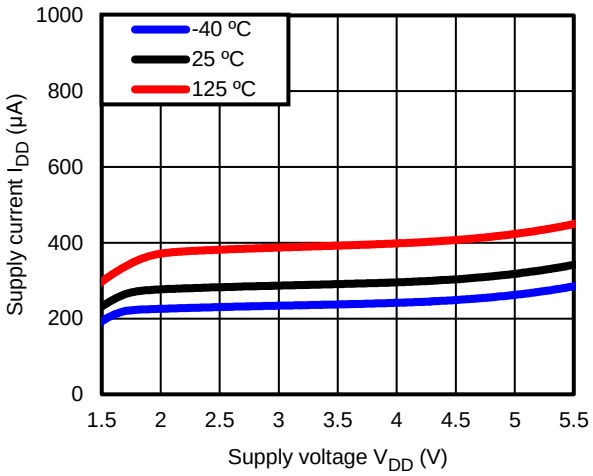
Propagation delay time tPLH, tPHL



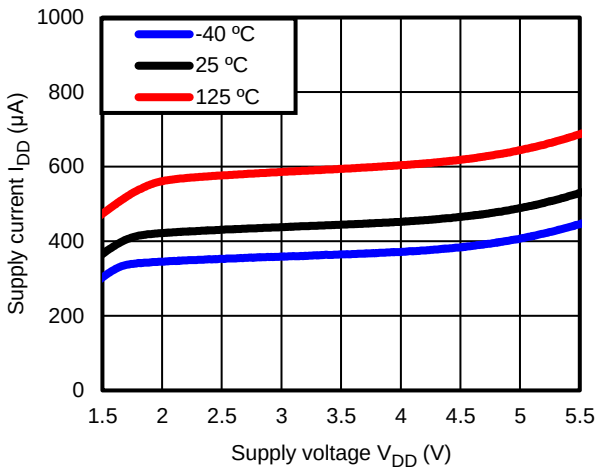
Rise time tR, Fall time tF

8. Representative characteristics (Note)

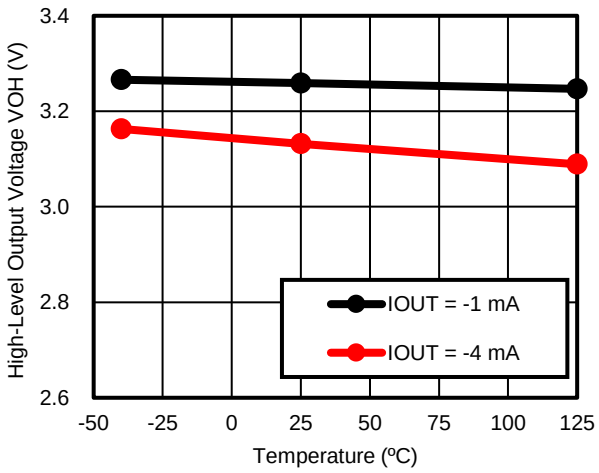
Supply current I_{DD}
V_{OUT} = High, V_{IN} = V_{SS}



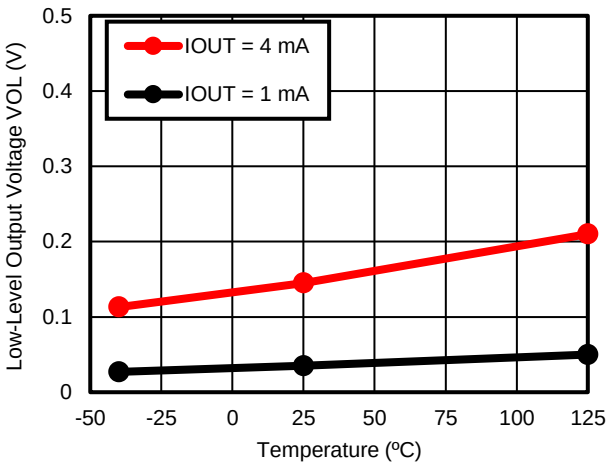
Supply current I_{DD}
V_{OUT} = Low, V_{IN} = V_{SS}



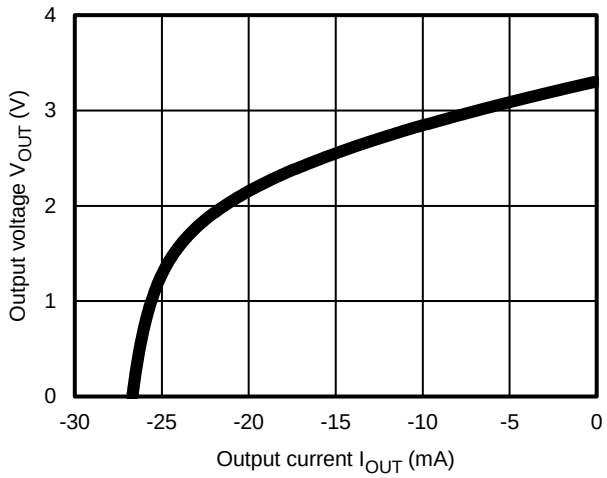
High-Level Output Voltage VOH
V_{DD} = 3.3 V



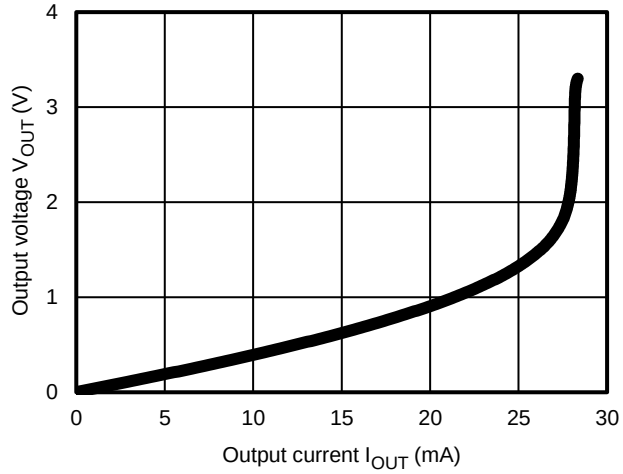
Low-Level Output Voltage VOL
V_{DD} = 3.3 V



High-Level Output Voltage VOH
V_{DD} = 3.3 V, Ta = 25 °C

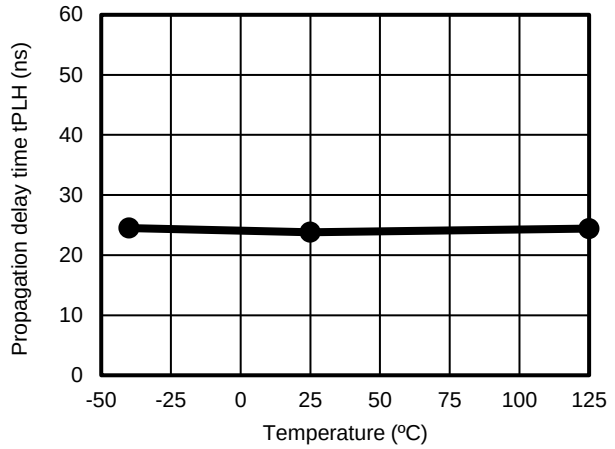


Low-Level Output Voltage VOL
V_{DD} = 3.3 V, Ta = 25 °C



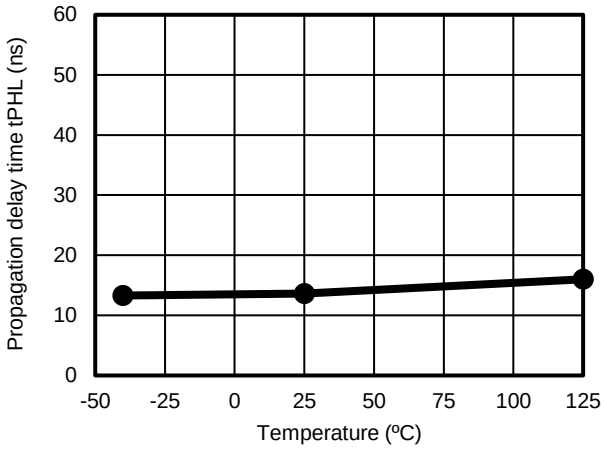
Propagation delay time tPLH

$V_{IN(+)}$ = -100mV to +100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 3.3 V, CL = 50 pF, RL = 10 kΩ



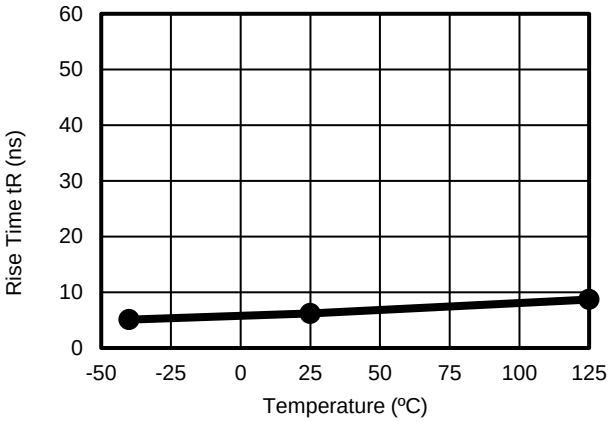
Propagation delay time tPHL

$V_{IN(+)}$ = +100mV to -100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 3.3 V, CL = 50 pF, RL = 10 kΩ



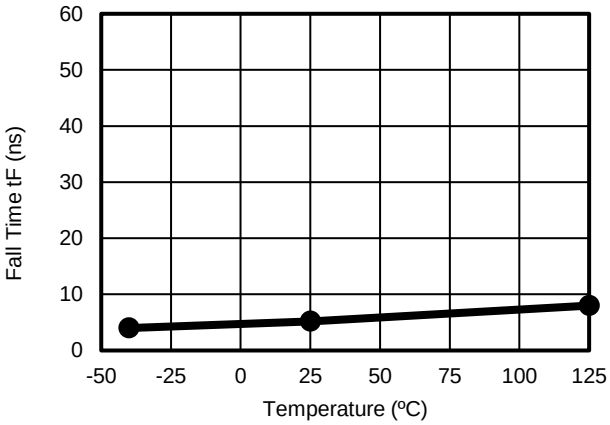
Rise time tR

$V_{IN(+)}$ = -100mV to +100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 3.3 V, CL = 50 pF, RL = 10 kΩ



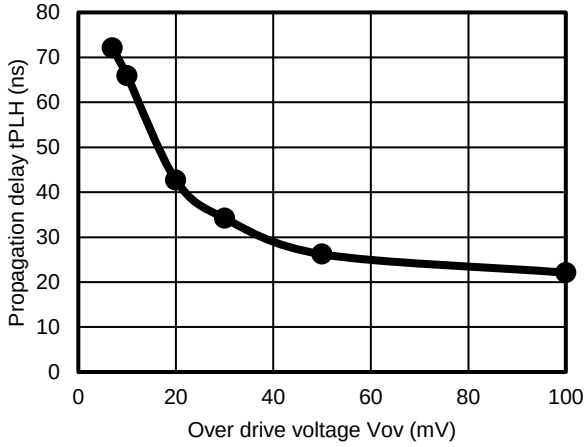
Fall time tF

$V_{IN(+)}$ = +100mV to -100 mV, $V_{IN(-)}$ = V_{SS}, V_{DD} = 3.3 V, CL = 50 pF, RL = 10 kΩ



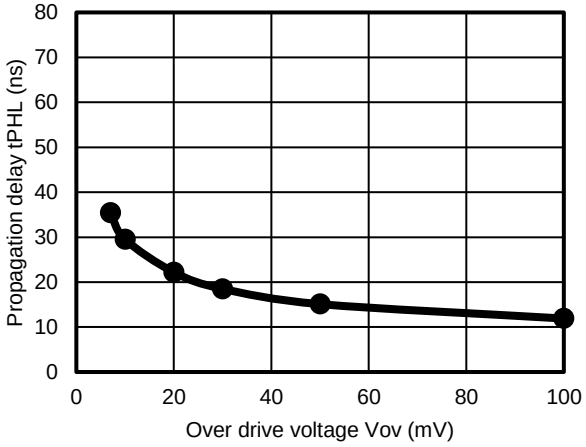
Propagation delay time tPLH

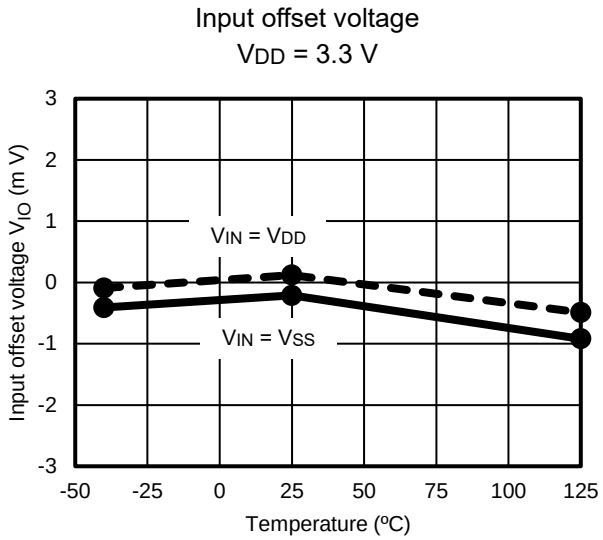
$V_{IN(+)}$ = -100mV to Vov, $V_{IN(-)}$ = VSS, V_{DD} = 3.3 V, CL = 50 pF, RL = 10 kΩ, Ta = 25 ºC



Propagation delay time tPHL

$V_{IN(+)}$ = +100mV to Vov, $V_{IN(-)}$ = V_{SS}, V_{DD} = 3.3 V, CL = 50 pF, RL = 10 kΩ, Ta = 25 ºC





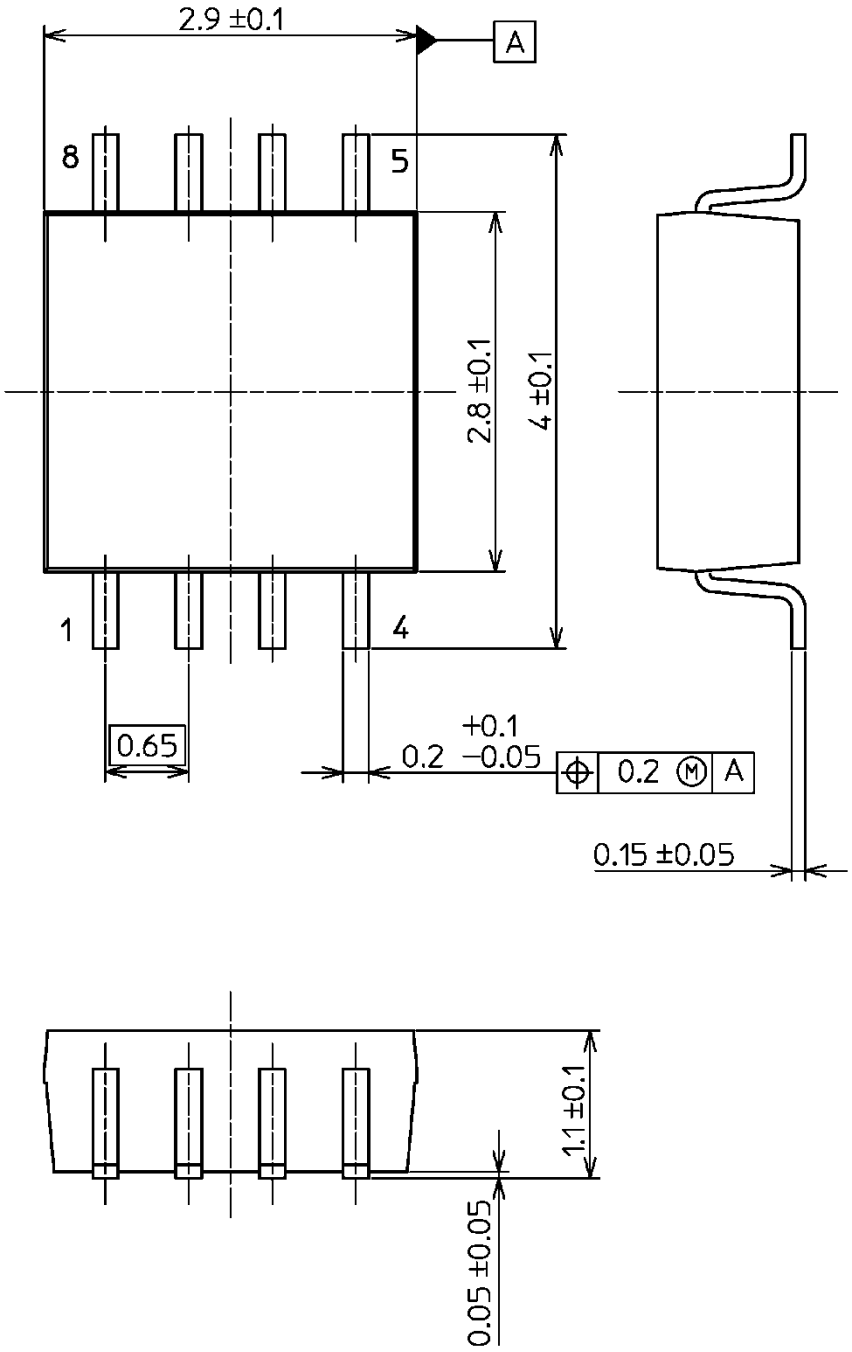
Note : The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

9. Package Information

9.1. Package Dimensions

SM8 (SOT-505)

Unit: mm



Weight: 0.020 g (Typ.)

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