

CMOS Linear Integrated Circuit Silicon Monolithic

TC75W71FU, TC75W72FU, TC75W73FU

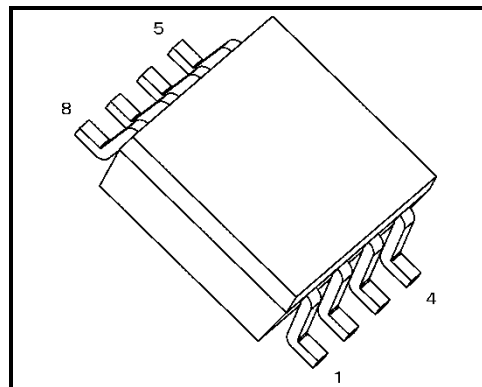
High speed Dual comparator

1. Description

The TC75W71FU, TC75W72FU, TC75W73FU are a CMOS type general-purpose dual comparator capable of single power supply operation and using lower supply currents than the conventional bipolar comparators.

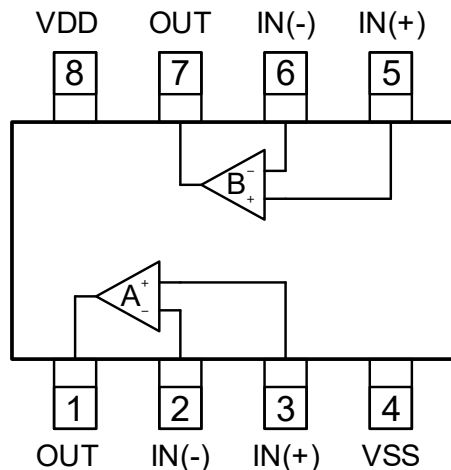
2. Features

- Propagation Delay at 3.3 V_{DD} @ 25 °C
 - 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
- Output type
 - TC75W71FU: Push-pull
 - TC75W72FU: Push-pull
 - TC75W73FU: Open-drain



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

3. Pin Connection (Top View)



4. Product list

| Part name | Input Hysteresis voltage | Output type | Top marking |
|-----------|--------------------------|-------------|-------------|
| TC75W71FU | None | Push-pull | 5W71 |
| TC75W72FU | Yes | Push-pull | 5W72 |
| TC75W73FU | Yes | Open-drain | 5W73 |

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} | TC75W71FU | $V_{SS} - 0.3$ to $V_{DD} + 0.3$ or 6.0 which is smaller | V |
| | | TC75W72FU | | |
| | | TC75W73FU | $V_{SS} - 0.3$ to 6.0 | |
| 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 _{IO} drift | V _{IN} = V _{SS} | - | ±2 | - | - | - | μV/°C |
| Input Hysteresis voltage (Note1) | V _{HYST} | TC75W72FU, TC75W73FU (Note2) V _{IN} = V _{SS} | 1.0 | 3.5 | 5.5 | - | - | mV |
| 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 | TC75W71FU, TC75W72FU 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.

Note 2: TC75W71FU does not incorporate input hysteresis voltage.

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 _{IO} drift | V _{IN} = V _{SS} | - | ±2 | - | - | - | μV/°C |
| Input Hysteresis voltage (Note1) | V _{HYST} | TC75W72FU, TC75W73FU (Note2) V _{IN} = V _{SS} | 1.0 | 3.5 | 5.5 | - | - | mV |
| 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 | TC75W71FU, TC75W72FU 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.

Note 2: TC75W71FU does not incorporate input hysteresis voltage.

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 _{IO} drift | V _{IN} = V _{SS} | - | ±2 | - | - | - | μV/°C |
| Input Hysteresis voltage (Note1) | V _{HYST} | TC75W72FU, TC75W73FU (Note2) V _{IN} = V _{SS} | 1.0 | 3.5 | 5.5 | - | - | mV |
| 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 | TC75W71FU, TC75W72FU 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.

Note 2: TC75W71FU does not incorporate input hysteresis voltage.

7.4. AC Characteristics (Note 1)

(V_{DD} = 1.8 V to 5.0 V, V_{SS} = GND, Ta = 25 °C, TC75W71FU, TC75W72FU)

| Characteristics | Symbol | Test condition | Min | Typ. | Max | Unit |
|-------------------------------|------------------|--|-----|------|-----|------|
| Low to High, 100 mV Overdrive | t _{PLH} | 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 | t _{PHL} | 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 | t _R | 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 | t _F | 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.

7.5. AC Characteristics (Note 1)

($V_{DD} = 1.8\text{ V to }5.0\text{ V}$, $V_{SS} = \text{GND}$, $T_a = 25\text{ }^\circ\text{C}$, TC75W73FU)

| Characteristics | Symbol | Test condition | Min | Typ. | Max | Unit |
|-------------------------------|--------|--|-----|------|-----|------|
| High to Low, 100 mV Overdrive | tPHL | $V_{IN(+)} = +100\text{ mV to }-100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 1.8\text{ V}$, $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$ | - | 16 | - | ns |
| | | $V_{IN(+)} = +100\text{ mV to }-100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 3.3\text{ V}$, $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$ | - | 11 | 30 | ns |
| | | $V_{IN(+)} = +100\text{ mV to }-100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 5.0\text{ V}$, $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$ | - | 10 | - | ns |
| Fall Time | tF | $V_{IN(+)} = +100\text{ mV to }-100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 1.8\text{ V}$, $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$ | - | 13 | - | ns |
| | | $V_{IN(+)} = +100\text{ mV to }-100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 3.3\text{ V}$, $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$ | - | 4.6 | - | ns |
| | | $V_{IN(+)} = +100\text{ mV to }-100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 5.0\text{ V}$, $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$ | - | 3.4 | - | ns |

Note 1: This parameter is warranted by design.

7.6. AC Waveform

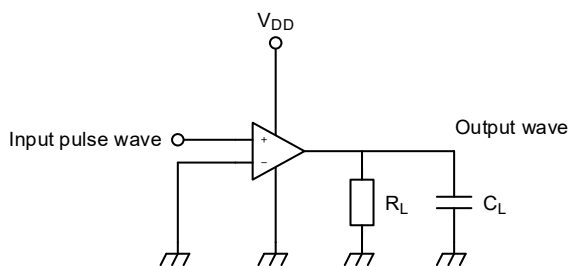


Fig. 7.6.1 Propagation delay time tPLH, tPHL, Rise time tR, Fall time tF (TC75W71FU, TC75W72FU)

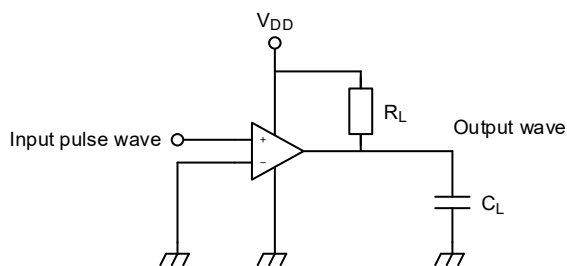


Fig. 7.6.2 Propagation delay time tPHL, Fall time tF (TC75W73FU)

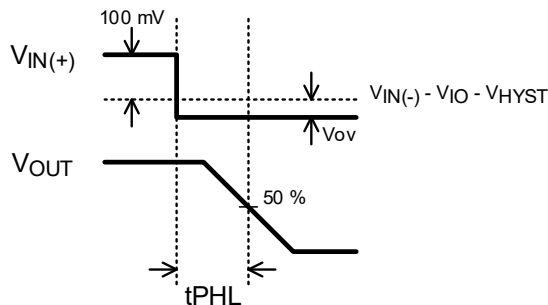
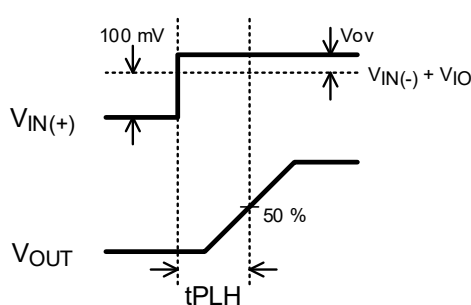


Fig. 7.6.3 Propagation delay time tPLH, tPHL (Note 2)

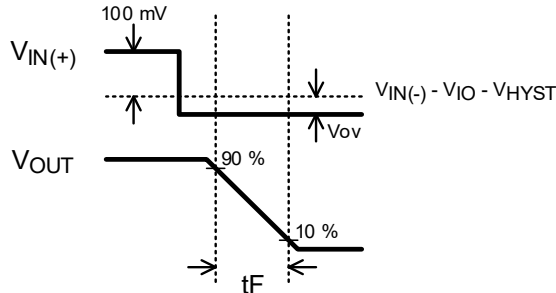
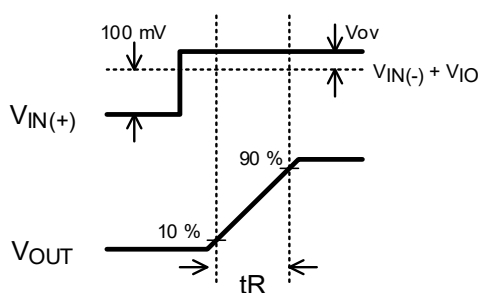


Fig. 7.6.4 Rise time tR, Fall time tF (Note 2)

Note 2: TC75W71FU does not incorporate input hysteresis voltage.

8. Representative characteristics (Note)

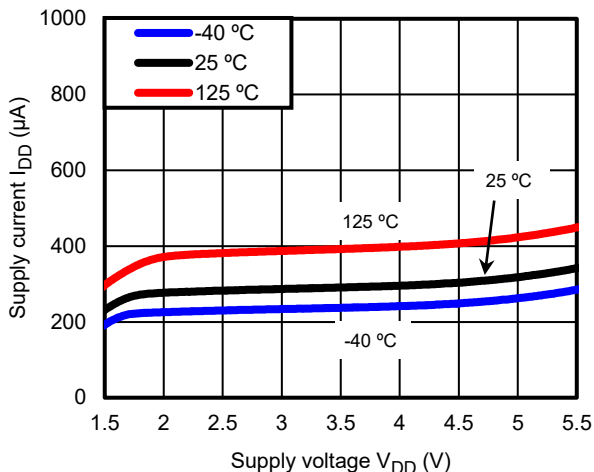


Fig. 8.1 Supply current I_{DD}
 $V_{OUT} = \text{High}, V_{IN} = V_{SS}$

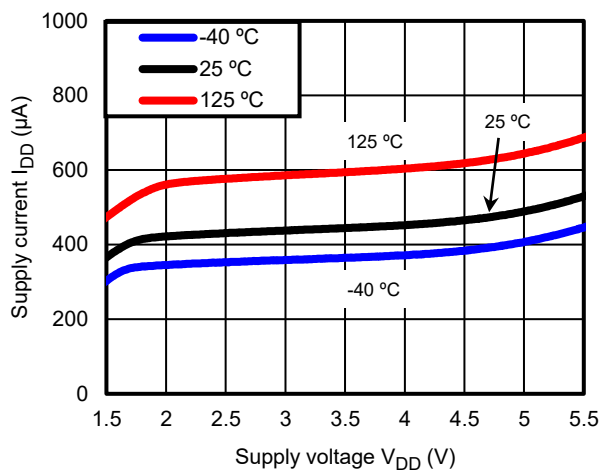


Fig. 8.2 Supply current I_{DD}
 $V_{OUT} = \text{Low}, V_{IN} = V_{SS}$

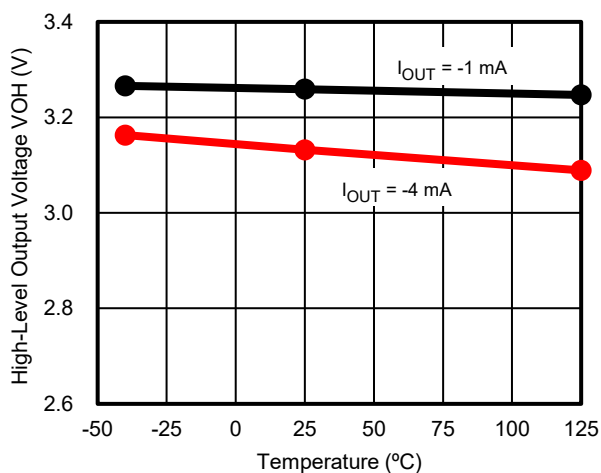


Fig. 8.3 High-Level Output Voltage V_{OH}
 $V_{DD} = 3.3 \text{ V}$

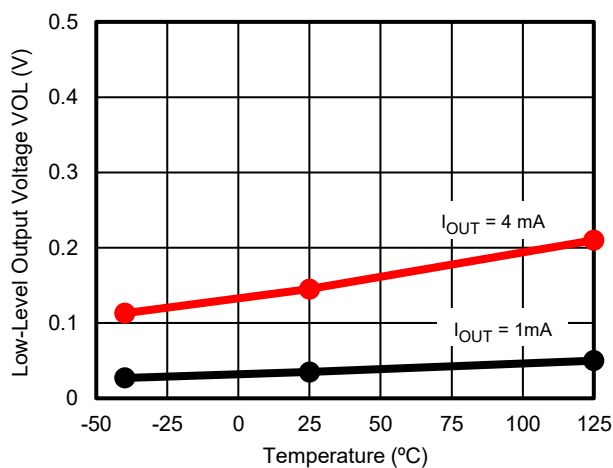


Fig. 8.4 Low-Level Output Voltage V_{OL}
 $V_{DD} = 3.3 \text{ V}$

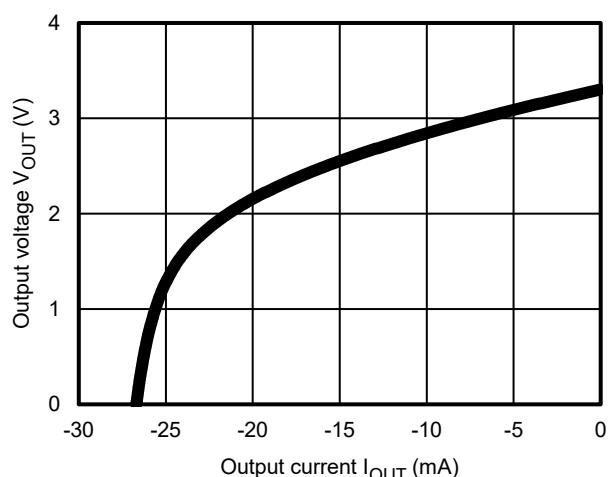


Fig. 8.5 High-Level Output Voltage V_{OH}
 $V_{DD} = 3.3 \text{ V}, T_a = 25 \text{ °C}$

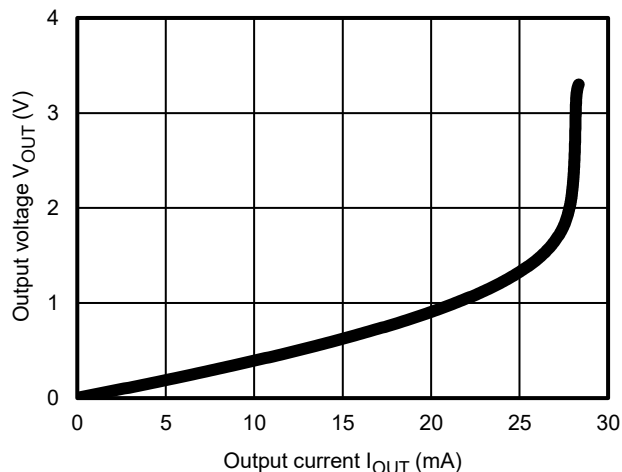


Fig. 8.6 Low-Level Output Voltage V_{OL}
 $V_{DD} = 3.3 \text{ V}, T_a = 25 \text{ °C}$

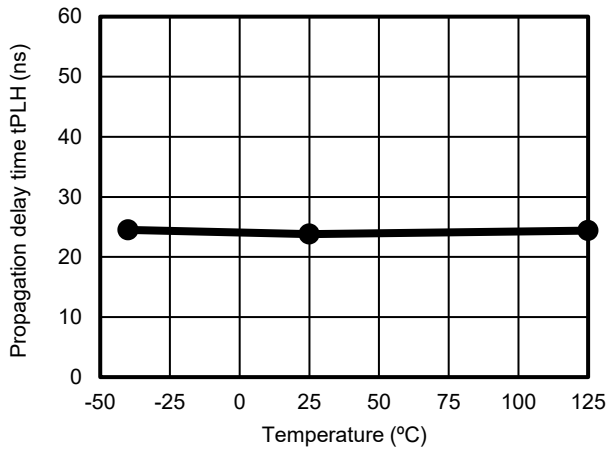


Fig. 8.7 Propagation delay time tPLH
 $V_{IN(+)} = -100\text{mV to } +100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 3.3\text{ V}$,
 $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$

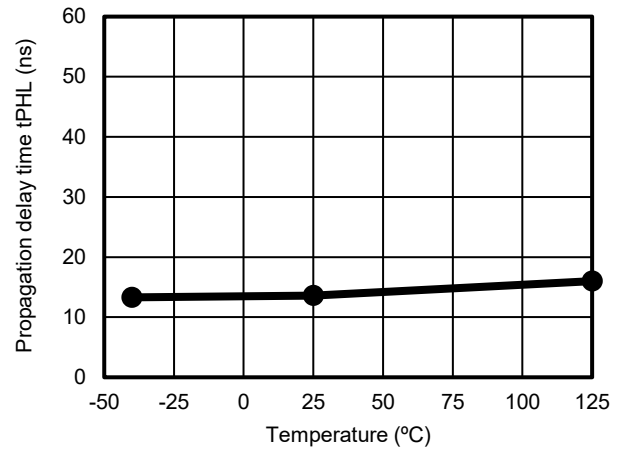


Fig. 8.8 Propagation delay time tPHL
 $V_{IN(+)} = +100\text{mV to } -100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 3.3\text{ V}$,
 $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$

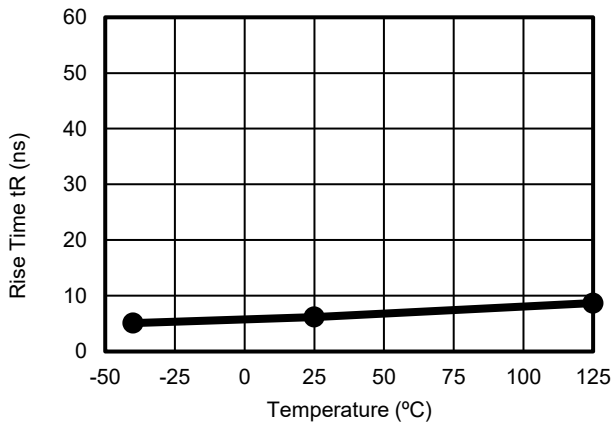


Fig. 8.9 Rise time tR
 $V_{IN(+)} = -100\text{mV to } +100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 3.3\text{ V}$,
 $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$

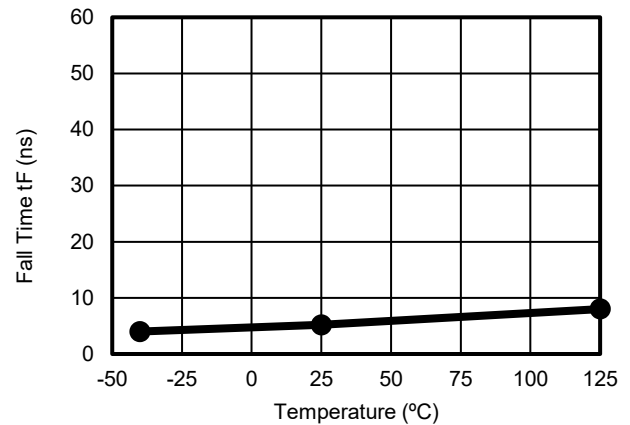


Fig. 8.10 Fall time tF
 $V_{IN(+)} = +100\text{mV to } -100\text{ mV}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 3.3\text{ V}$,
 $C_L = 50\text{ pF}$, $R_L = 10\text{ k}\Omega$

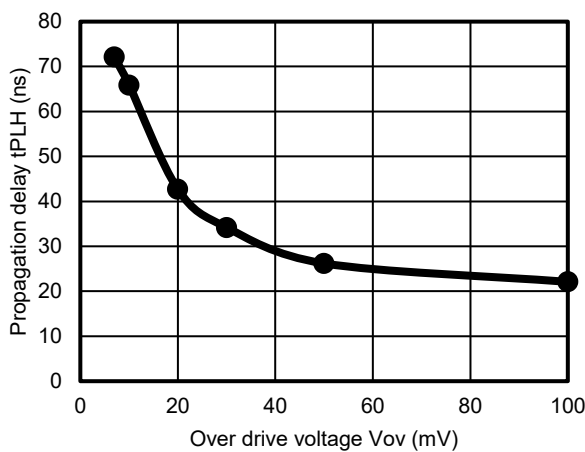


Fig. 8.11 Propagation delay time tPLH
 $V_{IN(+)} = -100\text{mV to } V_{ov}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 3.3\text{ V}$, $C_L = 50\text{ pF}$,
 $R_L = 10\text{ k}\Omega$, $T_a = 25\text{ }^\circ\text{C}$

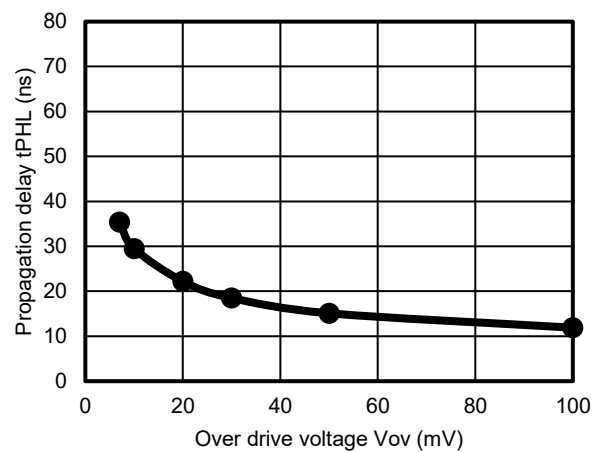


Fig. 8.12 Propagation delay time tPHL
 $V_{IN(+)} = +100\text{mV to } V_{ov}$, $V_{IN(-)} = V_{SS}$, $V_{DD} = 3.3\text{ V}$, $C_L = 50\text{ pF}$,
 $R_L = 10\text{ k}\Omega$, $T_a = 25\text{ }^\circ\text{C}$

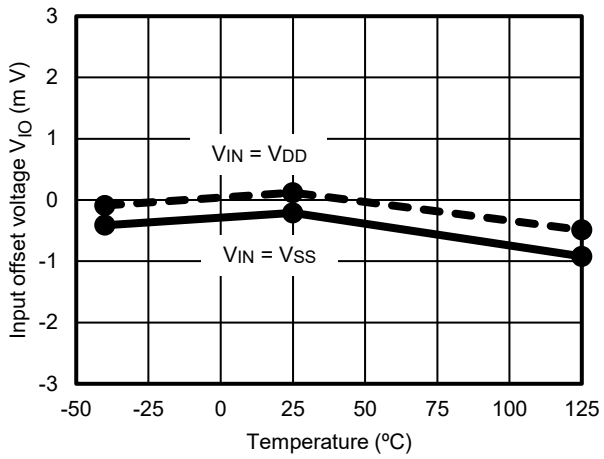


Fig. 8.13 Input offset voltage
 $V_{DD} = 3.3\text{ V}$

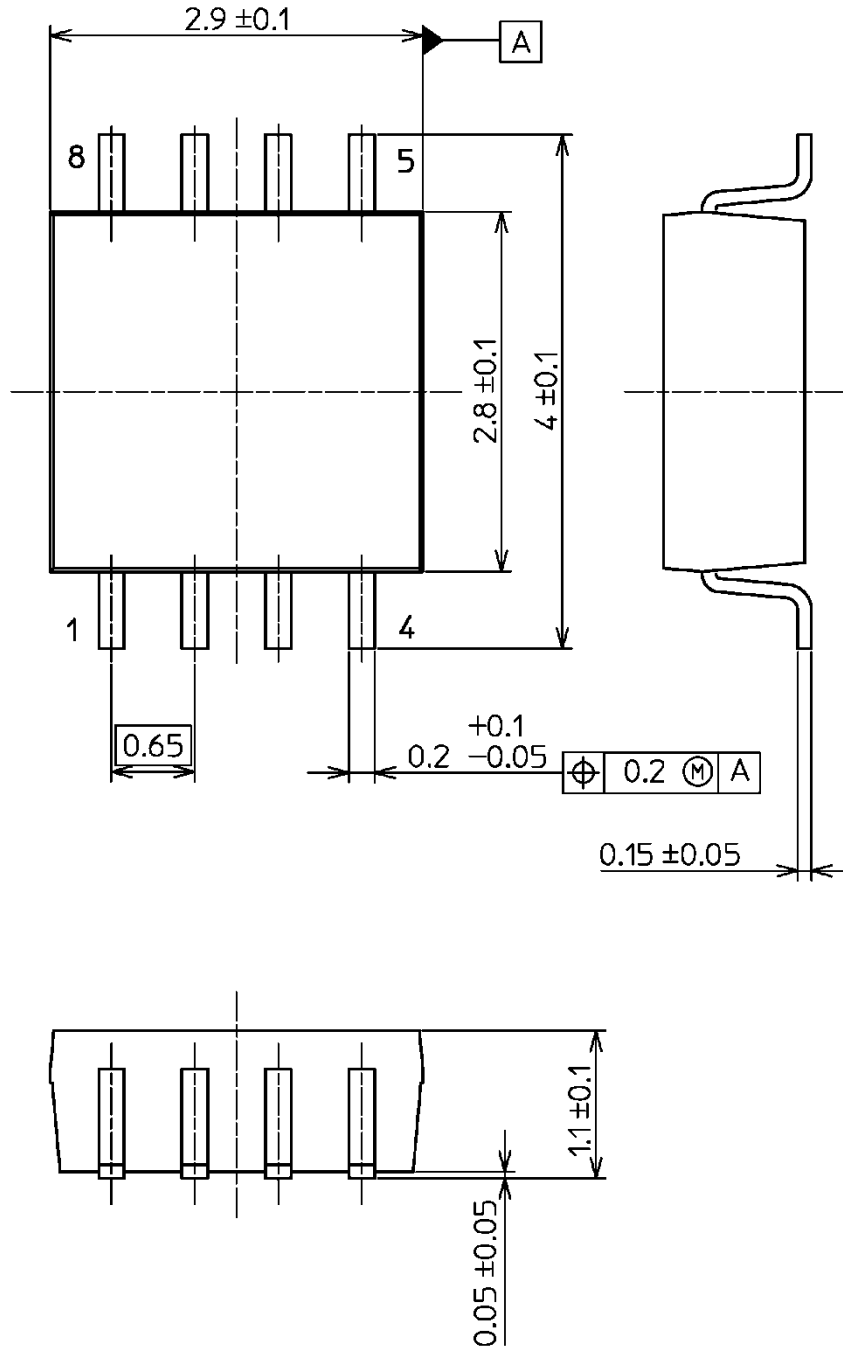
Note : The above characteristics curves are presented for reference only and not guaranteed by production test, unless otherwise noted.

9. Package Information

9.1. Package Dimensions

SM8 (SOT-505)

Unit: mm



Weight: 0.020 g (Typ.)

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