
# 74AUP2G80-Q100

## Low-power dual D-type flip-flop; positive-edge trigger

Rev. 1 — 16 October 2023 Product data sheet

## 1. General description

The 74AUP2G80-Q100 provides the dual positive-edge triggered D-type flip-flop. Information on the data input is transferred to the $\overline{Q}$ output on the LOW-to-HIGH transition of the clock pulse. The input pin D must be stable one setup time prior to the LOW-to-HIGH clock transition for predictable operation.

Schmitt trigger action at all inputs makes the circuit tolerant to slower input rise and fall times across the entire $V_{CC}$ range from 0.8 V to 3.6 V.

This device ensures a very low static and dynamic power consumption across the entire $V_{CC}$ range from 0.8 V to 3.6 V.

This device is fully specified for partial power-down applications using $I_{OFF}$. The $I_{OFF}$ circuitry disables the output, preventing a damaging backflow current through the device when it is powered down.

This product has been qualified to the Automotive Electronics Council (AEC) standard Q100 (Grade 1) and is suitable for use in automotive applications.

## 2. Features and benefits

- Automotive product qualification in accordance with AEC-Q100 (Grade 1)
  - Specified from -40 °C to +85 °C and from -40 °C to +125 °C
- Wide supply voltage range from 0.8 V to 3.6 V
- High noise immunity
- Low static power consumption; $I_{CC}$ = 0.9 µA (maximum)
- Latch-up performance exceeds 100 mA per JESD78 Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot < 10 % of $V_{CC}$
- $I_{OFF}$ circuitry provides partial Power-down mode operation
- Complies with JEDEC standards:
  - JESD8-12 (0.8 V to 1.3 V)
  - JESD8-11 (0.9 V to 1.65 V)
  - JESD8-7 (1.2 V to 1.95 V)
  - JESD8-5 (1.8 V to 2.7 V)
  - JESD8-B (2.7 V to 3.6 V)
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 3A exceeds 5000 V
  - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V

## 3. Ordering information

**Table 1. Ordering information**

| Type number | Package | | | |
|---|---|---|---|---|
| | Temperature range | Name | Description | Version |
| 74AUP2G80DC-Q100 | -40 °C to +125 °C | VSSOP8 | plastic very thin shrink small outline package; 8 leads; body width 2.3 mm | SOT765-1 |

# 4. Marking

**Table 2. Marking codes**

| Type number | Marking code[1] |
|---|---|
| 74AUP2G80DC-Q100 | p80 |

[1] The pin 1 indicator is located on the lower left corner of the device, below the marking code.

# 5. Functional diagram

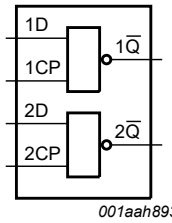



**Fig. 1. Logic symbol**

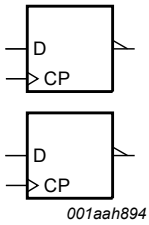



**Fig. 2. IEC logic symbol**

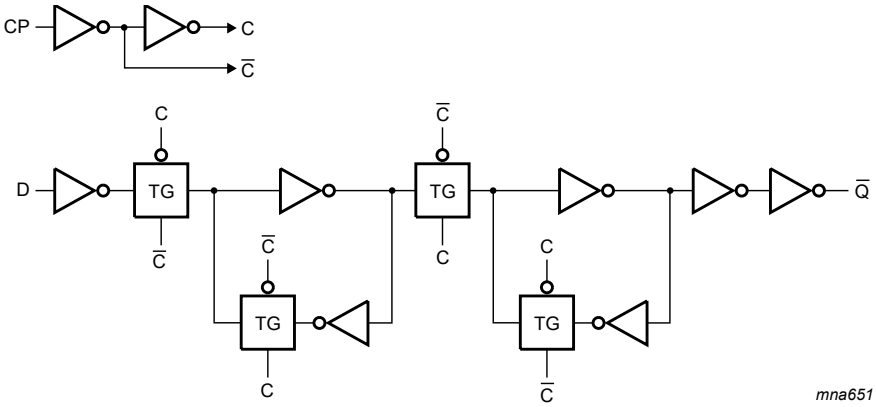
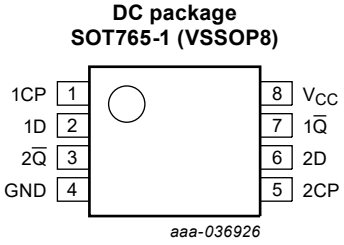



**Fig. 3. Logic diagram (one flip-flop)**

# 6. Pinning information

## 6.1. Pinning



### 6.2. Pin description

**Table 3. Pin description**

| Symbol | Pin | Description |
|---|---|---|
| 1CP, 2CP | 1, 5 | clock input |
| 1D, 2D | 2, 6 | data input |
| GND | 4 | ground (0 V) |
| $1\overline{Q}$, $2\overline{Q}$ | 7, 3 | data output |
| $V_{CC}$ | 8 | supply voltage |

## 7. Functional description

**Table 4. Function table**

*H = HIGH voltage level; L = LOW voltage level; ↑ = LOW-to-HIGH CP transition; X = don't care;*
*$\overline{q}$ = lower case letter indicates the state of referenced input, one setup time prior to the LOW-to-HIGH CP transition.*

| Input | | Output |
|---|---|---|
| **nCP** | **nD** | **n$\overline{Q}$** |
| ↑ | L | H |
| ↑ | H | L |
| L | X | $\overline{q}$ |

## 8. Limiting values

**Table 5. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | | -0.5 | +4.6 | V |
| $I_{IK}$ | input clamping current | $V_I$ < 0 V | | -50 | - | mA |
| $V_I$ | input voltage | | [1] | -0.5 | +4.6 | V |
| $I_{OK}$ | output clamping current | $V_O$ < 0 V | | -50 | - | mA |
| $V_O$ | output voltage | Active mode and Power-down mode | [1] | -0.5 | +4.6 | V |
| $I_O$ | output current | $V_O$ = 0 V to $V_{CC}$ | | - | ±20 | mA |
| $I_{CC}$ | supply current | | | - | +50 | mA |
| $I_{GND}$ | ground current | | | -50 | - | mA |
| $T_{stg}$ | storage temperature | | | -65 | +150 | °C |
| $P_{tot}$ | total power dissipation | $T_{amb}$ = -40 °C to +125 °C | [2] | - | 250 | mW |

[1] The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] For SOT765-1 (VSSOP8) package: $P_{tot}$ derates linearly with 4.9 mW/K above 99 °C.

# 9. Recommended operating conditions

**Table 6. Operating conditions**

| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{CC}$ | supply voltage | | 0.8 | 3.6 | V |
| $V_I$ | input voltage | | 0 | 3.6 | V |
| $V_O$ | output voltage | Active mode | 0 | $V_{CC}$ | V |
| | | Power-down mode; $V_{CC}$ = 0 V | 0 | 3.6 | V |
| $T_{amb}$ | ambient temperature | | -40 | +125 | °C |
| Δt/ΔV | input transition rise and fall rate | $V_{CC}$ = 0.8 V to 3.6 V | - | 200 | ns/V |

## 10. Static characteristics

**Table 7. Static characteristics**

*At recommended operating conditions; voltages are referenced to GND (ground = 0 V).*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = 25 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 0.8 V | 0.70 × $V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 0.9 V to 1.95 V | 0.65 × $V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.6 | - | - | V |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 0.8 V | - | - | 0.30 × $V_{CC}$ | V |
| | | $V_{CC}$ = 0.9 V to 1.95 V | - | - | 0.35 × $V_{CC}$ | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | - | 0.9 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = -20 µA; $V_{CC}$ = 0.8 V to 3.6 V | $V_{CC}$ - 0.1 | - | - | V |
| | | $I_O$ = -1.1 mA; $V_{CC}$ = 1.1 V | 0.75 × $V_{CC}$ | - | - | V |
| | | $I_O$ = -1.7 mA; $V_{CC}$ = 1.4 V | 1.11 | - | - | V |
| | | $I_O$ = -1.9 mA; $V_{CC}$ = 1.65 V | 1.32 | - | - | V |
| | | $I_O$ = -2.3 mA; $V_{CC}$ = 2.3 V | 2.05 | - | - | V |
| | | $I_O$ = -3.1 mA; $V_{CC}$ = 2.3 V | 1.9 | - | - | V |
| | | $I_O$ = -2.7 mA; $V_{CC}$ = 3.0 V | 2.72 | - | - | V |
| | | $I_O$ = -4.0 mA; $V_{CC}$ = 3.0 V | 2.6 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = 20 µA; $V_{CC}$ = 0.8 V to 3.6 V | - | - | 0.1 | V |
| | | $I_O$ = 1.1 mA; $V_{CC}$ = 1.1 V | - | - | 0.30 × $V_{CC}$ | V |
| | | $I_O$ = 1.7 mA; $V_{CC}$ = 1.4 V | - | - | 0.31 | V |
| | | $I_O$ = 1.9 mA; $V_{CC}$ = 1.65 V | - | - | 0.31 | V |
| | | $I_O$ = 2.3 mA; $V_{CC}$ = 2.3 V | - | - | 0.31 | V |
| | | $I_O$ = 3.1 mA; $V_{CC}$ = 2.3 V | - | - | 0.44 | V |
| | | $I_O$ = 2.7 mA; $V_{CC}$ = 3.0 V | - | - | 0.31 | V |
| | | $I_O$ = 4.0 mA; $V_{CC}$ = 3.0 V | - | - | 0.44 | V |
| $I_I$ | input leakage current | $V_I$ = GND to 3.6 V; $V_{CC}$ = 0 V to 3.6 V | - | - | ±0.1 | µA |
| $I_{OFF}$ | power-off leakage current | $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC}$ = 0 V | - | - | ±0.2 | µA |
| $\Delta I_{OFF}$ | additional power-off leakage current | $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC}$ = 0 V to 0.2 V | - | - | ±0.2 | µA |
| $I_{CC}$ | supply current | $V_I$ = GND or $V_{CC}$; $I_O$ = 0 A; $V_{CC}$ = 0.8 V to 3.6 V | - | - | 0.5 | µA |
| $\Delta I_{CC}$ | additional supply current | $V_I$ = $V_{CC}$ - 0.6 V; $I_O$ = 0 A; $V_{CC}$ = 3.3 V [1] | - | - | 40 | µA |
| $C_I$ | input capacitance | $V_{CC}$ = 0 V to 3.6 V; $V_I$ = GND or $V_{CC}$ | - | 0.6 | - | pF |
| $C_O$ | output capacitance | $V_O$ = GND; $V_{CC}$ = 0 V | - | 1.3 | - | pF |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = -40 °C to +85 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 0.8 V | 0.70 × $V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 0.9 V to 1.95 V | 0.65 × $V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.6 | - | - | V |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 0.8 V | - | - | 0.30 × $V_{CC}$ | V |
| | | $V_{CC}$ = 0.9 V to 1.95 V | - | - | 0.35 × $V_{CC}$ | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | - | 0.9 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = -20 µA; $V_{CC}$ = 0.8 V to 3.6 V | $V_{CC}$ - 0.1 | - | - | V |
| | | $I_O$ = -1.1 mA; $V_{CC}$ = 1.1 V | 0.70 × $V_{CC}$ | - | - | V |
| | | $I_O$ = -1.7 mA; $V_{CC}$ = 1.4 V | 1.03 | - | - | V |
| | | $I_O$ = -1.9 mA; $V_{CC}$ = 1.65 V | 1.30 | - | - | V |
| | | $I_O$ = -2.3 mA; $V_{CC}$ = 2.3 V | 1.97 | - | - | V |
| | | $I_O$ = -3.1 mA; $V_{CC}$ = 2.3 V | 1.85 | - | - | V |
| | | $I_O$ = -2.7 mA; $V_{CC}$ = 3.0 V | 2.67 | - | - | V |
| | | $I_O$ = -4.0 mA; $V_{CC}$ = 3.0 V | 2.55 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = 20 µA; $V_{CC}$ = 0.8 V to 3.6 V | - | - | 0.1 | V |
| | | $I_O$ = 1.1 mA; $V_{CC}$ = 1.1 V | - | - | 0.30 × $V_{CC}$ | V |
| | | $I_O$ = 1.7 mA; $V_{CC}$ = 1.4 V | - | - | 0.37 | V |
| | | $I_O$ = 1.9 mA; $V_{CC}$ = 1.65 V | - | - | 0.35 | V |
| | | $I_O$ = 2.3 mA; $V_{CC}$ = 2.3 V | - | - | 0.33 | V |
| | | $I_O$ = 3.1 mA; $V_{CC}$ = 2.3 V | - | - | 0.45 | V |
| | | $I_O$ = 2.7 mA; $V_{CC}$ = 3.0 V | - | - | 0.33 | V |
| | | $I_O$ = 4.0 mA; $V_{CC}$ = 3.0 V | - | - | 0.45 | V |
| $I_I$ | input leakage current | $V_I$ = GND to 3.6 V; $V_{CC}$ = 0 V to 3.6 V | - | - | ±0.5 | µA |
| $I_{OFF}$ | power-off leakage current | $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC}$ = 0 V | - | - | ±0.5 | µA |
| $\Delta I_{OFF}$ | additional power-off leakage current | $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC}$ = 0 V to 0.2 V | - | - | ±0.6 | µA |
| $I_{CC}$ | supply current | $V_I$ = GND or $V_{CC}$; $I_O$ = 0 A; $V_{CC}$ = 0.8 V to 3.6 V | - | - | 0.9 | µA |
| $\Delta I_{CC}$ | additional supply current | $V_I$ = $V_{CC}$ - 0.6 V; $I_O$ = 0 A; $V_{CC}$ = 3.3 V [1] | - | - | 50 | µA |

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **$T_{amb}$ = -40 °C to +125 °C** | | | | | | |
| $V_{IH}$ | HIGH-level input voltage | $V_{CC}$ = 0.8 V | 0.75 × $V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 0.9 V to 1.95 V | 0.70 × $V_{CC}$ | - | - | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.6 | - | - | V |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 2.0 | - | - | V |
| $V_{IL}$ | LOW-level input voltage | $V_{CC}$ = 0.8 V | - | - | 0.25 × $V_{CC}$ | V |
| | | $V_{CC}$ = 0.9 V to 1.95 V | - | - | 0.30 × $V_{CC}$ | V |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | - | 0.7 | V |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | - | 0.9 | V |
| $V_{OH}$ | HIGH-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = -20 µA; $V_{CC}$ = 0.8 V to 3.6 V | $V_{CC}$ - 0.11 | - | - | V |
| | | $I_O$ = -1.1 mA; $V_{CC}$ = 1.1 V | 0.60 × $V_{CC}$ | - | - | V |
| | | $I_O$ = -1.7 mA; $V_{CC}$ = 1.4 V | 0.93 | - | - | V |
| | | $I_O$ = -1.9 mA; $V_{CC}$ = 1.65 V | 1.17 | - | - | V |
| | | $I_O$ = -2.3 mA; $V_{CC}$ = 2.3 V | 1.77 | - | - | V |
| | | $I_O$ = -3.1 mA; $V_{CC}$ = 2.3 V | 1.67 | - | - | V |
| | | $I_O$ = -2.7 mA; $V_{CC}$ = 3.0 V | 2.40 | - | - | V |
| | | $I_O$ = -4.0 mA; $V_{CC}$ = 3.0 V | 2.30 | - | - | V |
| $V_{OL}$ | LOW-level output voltage | $V_I$ = $V_{IH}$ or $V_{IL}$ | | | | |
| | | $I_O$ = 20 µA; $V_{CC}$ = 0.8 V to 3.6 V | - | - | 0.11 | V |
| | | $I_O$ = 1.1 mA; $V_{CC}$ = 1.1 V | - | - | 0.33 × $V_{CC}$ | V |
| | | $I_O$ = 1.7 mA; $V_{CC}$ = 1.4 V | - | - | 0.41 | V |
| | | $I_O$ = 1.9 mA; $V_{CC}$ = 1.65 V | - | - | 0.39 | V |
| | | $I_O$ = 2.3 mA; $V_{CC}$ = 2.3 V | - | - | 0.36 | V |
| | | $I_O$ = 3.1 mA; $V_{CC}$ = 2.3 V | - | - | 0.50 | V |
| | | $I_O$ = 2.7 mA; $V_{CC}$ = 3.0 V | - | - | 0.36 | V |
| | | $I_O$ = 4.0 mA; $V_{CC}$ = 3.0 V | - | - | 0.50 | V |
| $I_I$ | input leakage current | $V_I$ = GND to 3.6 V; $V_{CC}$ = 0 V to 3.6 V | - | - | ±0.75 | µA |
| $I_{OFF}$ | power-off leakage current | $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC}$ = 0 V | - | - | ±0.75 | µA |
| $\Delta I_{OFF}$ | additional power-off leakage current | $V_I$ or $V_O$ = 0 V to 3.6 V; $V_{CC}$ = 0 V to 0.2 V | - | - | ±0.75 | µA |
| $I_{CC}$ | supply current | $V_I$ = GND or $V_{CC}$; $I_O$ = 0 A; $V_{CC}$ = 0.8 V to 3.6 V | - | - | 1.4 | µA |
| $\Delta I_{CC}$ | additional supply current | $V_I$ = $V_{CC}$ - 0.6 V; $I_O$ = 0 A; $V_{CC}$ = 3.3 V [1] | - | - | 75 | µA |

[1] One input at $V_{CC}$ - 0.6 V, other input at $V_{CC}$ or GND.

# 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

*Voltages are referenced to GND (ground = 0 V; for test circuit see Fig. 6.*

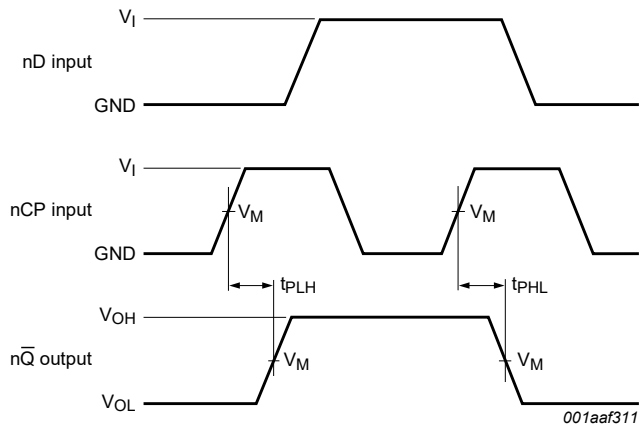
| Symbol | Parameter | Conditions | $T_{amb}$ = 25 °C | | | $T_{amb}$ = -40 °C to +85 °C | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | Min | Max | |
| **$C_L$ = 5 pF** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | nCP to n$\overline{Q}$; see Fig. 4 [2] | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 20.9 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 1.1 V to 1.3 V | 2.9 | 6.0 | 12.9 | 2.6 | 14.3 | 2.6 | 15.7 | ns |
| | | $V_{CC}$ = 1.4 V to 1.6 V | 1.9 | 4.2 | 7.6 | 2.0 | 8.9 | 2.0 | 9.8 | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | 1.7 | 3.4 | 5.9 | 1.6 | 7.0 | 1.6 | 7.7 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.4 | 2.6 | 4.3 | 1.2 | 5.6 | 1.2 | 6.2 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 1.2 | 2.2 | 3.6 | 1.0 | 4.4 | 1.0 | 4.8 | ns |
| $f_{max}$ | maximum frequency | nCP; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 53 | - | - | - | - | - | MHz |
| | | $V_{CC}$ = 1.1 V to 1.3 V | - | 203 | - | 170 | - | 170 | - | MHz |
| | | $V_{CC}$ = 1.4 V to 1.6 V | - | 347 | - | 310 | - | 300 | - | MHz |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 435 | - | 400 | - | 390 | - | MHz |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 550 | - | 490 | - | 480 | - | MHz |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 619 | - | 550 | - | 510 | - | MHz |
| **$C_L$ = 10 pF** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | nCP to n$\overline{Q}$; see Fig. 4 [2] | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 24.6 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 1.1 V to 1.3 V | 3.3 | 6.9 | 14.9 | 3.0 | 16.5 | 3.0 | 18.2 | ns |
| | | $V_{CC}$ = 1.4 V to 1.6 V | 2.6 | 4.8 | 8.8 | 2.3 | 10.3 | 2.3 | 11.3 | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | 2.3 | 3.9 | 6.8 | 2.0 | 8.1 | 2.0 | 8.9 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 1.9 | 3.1 | 5.1 | 1.7 | 6.3 | 1.7 | 6.9 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 1.8 | 2.7 | 4.4 | 1.4 | 4.9 | 1.4 | 5.4 | ns |
| $f_{max}$ | maximum frequency | nCP; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 52 | - | - | - | - | - | MHz |
| | | $V_{CC}$ = 1.1 V to 1.3 V | - | 192 | - | 150 | - | 150 | - | MHz |
| | | $V_{CC}$ = 1.4 V to 1.6 V | - | 324 | - | 280 | - | 230 | - | MHz |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 421 | - | 310 | - | 250 | - | MHz |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 486 | - | 370 | - | 360 | - | MHz |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 550 | - | 410 | - | 360 | - | MHz |

| Symbol | Parameter | Conditions | $T_{amb}$ = 25 °C | | | $T_{amb}$ = -40 °C to +85 °C | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | Min | Max | |
| **$C_L$ = 15 pF** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | nCP to n$\overline{Q}$; see Fig. 4 [2] | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 28.2 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 1.1 V to 1.3 V | 3.0 | 7.6 | 16.7 | 3.4 | 18.6 | 3.4 | 20.5 | ns |
| | | $V_{CC}$ = 1.4 V to 1.6 V | 3.0 | 5.3 | 9.8 | 2.6 | 11.5 | 2.6 | 12.7 | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | 2.6 | 4.4 | 7.6 | 2.3 | 9.1 | 2.3 | 10.0 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 2.2 | 3.5 | 5.7 | 2.0 | 6.9 | 2.0 | 7.6 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 1.9 | 3.1 | 5.0 | 1.8 | 5.5 | 1.8 | 6.1 | ns |
| $f_{max}$ | maximum frequency | nCP; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 50 | - | - | - | - | - | MHz |
| | | $V_{CC}$ = 1.1 V to 1.3 V | - | 181 | - | 120 | - | 120 | - | MHz |
| | | $V_{CC}$ = 1.4 V to 1.6 V | - | 301 | - | 190 | - | 160 | - | MHz |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 407 | - | 240 | - | 190 | - | MHz |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 422 | - | 300 | - | 270 | - | MHz |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 481 | - | 320 | - | 300 | - | MHz |
| **$C_L$ = 30 pF** | | | | | | | | | | |
| $t_{pd}$ | propagation delay | nCP to n$\overline{Q}$; see Fig. 4 [2] | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 38.8 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 1.1 V to 1.3 V | 4.9 | 9.8 | 20.7 | 4.4 | 24.7 | 4.4 | 27.2 | ns |
| | | $V_{CC}$ = 1.4 V to 1.6 V | 4.0 | 6.8 | 12.7 | 3.5 | 15.0 | 3.5 | 16.5 | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | 3.5 | 5.6 | 9.9 | 2.2 | 11.9 | 2.2 | 13.1 | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | 3.1 | 4.5 | 7.5 | 2.8 | 9.3 | 2.8 | 10.2 | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | 2.9 | 4.1 | 6.4 | 2.7 | 7.5 | 2.7 | 8.3 | ns |
| $f_{max}$ | maximum frequency | nCP; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 28 | - | - | - | - | - | MHz |
| | | $V_{CC}$ = 1.1 V to 1.3 V | - | 128 | - | 70 | - | 70 | - | MHz |
| | | $V_{CC}$ = 1.4 V to 1.6 V | - | 206 | - | 120 | - | 110 | - | MHz |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 262 | - | 150 | - | 120 | - | MHz |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 269 | - | 190 | - | 170 | - | MHz |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 309 | - | 200 | - | 190 | - | MHz |

| Symbol | Parameter | Conditions | $T_{amb}$ = 25 °C | | | $T_{amb}$ = -40 °C to +85 °C | | $T_{amb}$ = -40 °C to +125 °C | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Min | Typ[1] | Max | Min | Max | Min | Max | |
| **$C_L$ = 5 pF, 10 pF, 15 pF and 30 pF** | | | | | | | | | | |
| $t_{su(H)}$ | set-up time HIGH | nD to nCP; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 2.5 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 1.1 V to 1.3 V | - | 0.5 | - | 2.3 | - | 2.3 | - | ns |
| | | $V_{CC}$ = 1.4 V to 1.6 V | - | 0.3 | - | 1.2 | - | 1.2 | - | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 0.3 | - | 0.8 | - | 0.8 | - | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 0.2 | - | 0.6 | - | 0.6 | - | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 0.2 | - | 0.4 | - | 0.4 | - | ns |
| $t_{su(L)}$ | set-up time LOW | nD to nCP; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 1.7 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 1.1 V to 1.3 V | - | 0.3 | - | 1.9 | - | 1.9 | - | ns |
| | | $V_{CC}$ = 1.4 V to 1.6 V | - | 0.2 | - | 1.3 | - | 1.3 | - | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 0.2 | - | 1.1 | - | 1.1 | - | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 0.3 | - | 0.8 | - | 0.8 | - | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 0.3 | - | 0.7 | - | 0.7 | - | ns |
| $t_h$ | hold time | nD to nCP; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | -2.1 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 1.1 V to 1.3 V | - | -0.4 | - | 0.1 | - | 0.1 | - | ns |
| | | $V_{CC}$ = 1.4 V to 1.6 V | - | -0.3 | - | 0 | - | 0 | - | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | -0.2 | - | 0 | - | 0 | - | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | -0.2 | - | 0 | - | 0 | - | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | -0.3 | - | 0 | - | 0 | - | ns |
| $t_W$ | pulse width | nCP HIGH or LOW; see Fig. 5 | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 5.2 | - | - | - | - | - | ns |
| | | $V_{CC}$ = 1.1 V to 1.3 V | - | 1.0 | - | 3.0 | - | 3.0 | - | ns |
| | | $V_{CC}$ = 1.4 V to 1.6 V | - | 0.8 | - | 2.0 | - | 2.0 | - | ns |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 0.6 | - | 2.0 | - | 2.0 | - | ns |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 0.5 | - | 2.0 | - | 2.0 | - | ns |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 0.5 | - | 2.0 | - | 2.0 | - | ns |
| $C_{PD}$ | power dissipation capacitance | f = 1 MHz; $V_I$ = GND to $V_{CC}$ [3] | | | | | | | | |
| | | $V_{CC}$ = 0.8 V | - | 1.8 | - | - | - | - | - | pF |
| | | $V_{CC}$ = 1.1 V to 1.3 V | - | 1.8 | - | - | - | - | - | pF |
| | | $V_{CC}$ = 1.4 V to 1.6 V | - | 1.9 | - | - | - | - | - | pF |
| | | $V_{CC}$ = 1.65 V to 1.95 V | - | 2.0 | - | - | - | - | - | pF |
| | | $V_{CC}$ = 2.3 V to 2.7 V | - | 2.4 | - | - | - | - | - | pF |
| | | $V_{CC}$ = 3.0 V to 3.6 V | - | 2.9 | - | - | - | - | - | pF |

[1] All typical values are measured at nominal $V_{CC}$.
[2] $t_{pd}$ is the same as $t_{PLH}$ and $t_{PHL}$
[3] $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
$f_i$ = input frequency in MHz; $f_o$ = output frequency in MHz; $C_L$ = output load capacitance in pF;
$V_{CC}$ = supply voltage in V; N = number of inputs switching; $\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of the outputs.

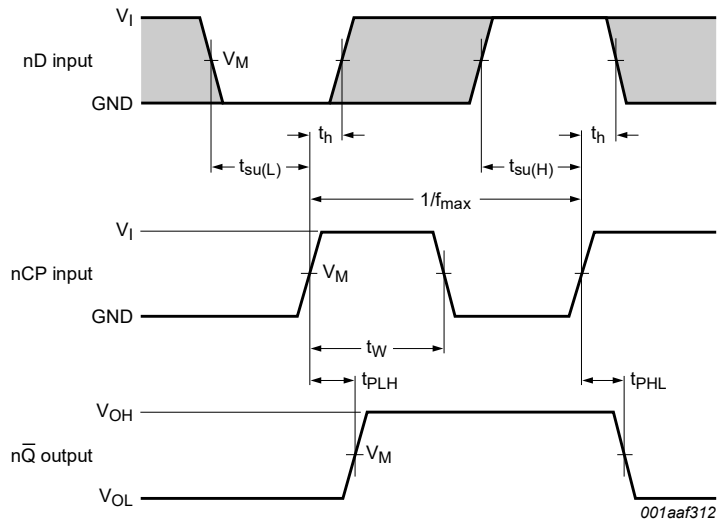
## 11.1. Waveforms and test circuit




Measurement points are given in Table 9.

Logic levels: $V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.

**Fig. 4. The clock input (nCP) to output (nQ̄) propagation delays**



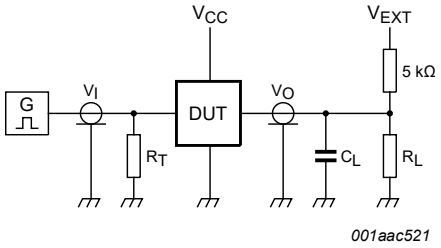

Measurement points are given in Table 9.

Logic levels: $V_{OL}$ and $V_{OH}$ are typical output voltage levels that occur with the output load.

**Fig. 5. The clock input (nCP) to output (nQ̄) propagation delays, clock pulse width, nD to nCP setup and hold times and the nCP maximum frequency**

**Table 9. Measurement points**

| Supply voltage | Output | Input | | |
|---|---|---|---|---|
| $V_{CC}$ | $V_M$ | $V_M$ | $V_I$ | $t_r = t_f$ |
| 0.8 V to 3.6 V | 0.5 × $V_{CC}$ | 0.5 × $V_{CC}$ | $V_{CC}$ | ≤ 3.0 ns |




Test data is given in Table 10.

Definitions for test circuit:

$R_L$ = Load resistance;

$C_L$ = Load capacitance including jig and probe capacitance;

$R_T$ = Termination resistance should be equal to the output impedance $Z_o$ of the pulse generator;

$V_{EXT}$ = External voltage for measuring switching times.

**Fig. 6. Test circuit for measuring switching times**

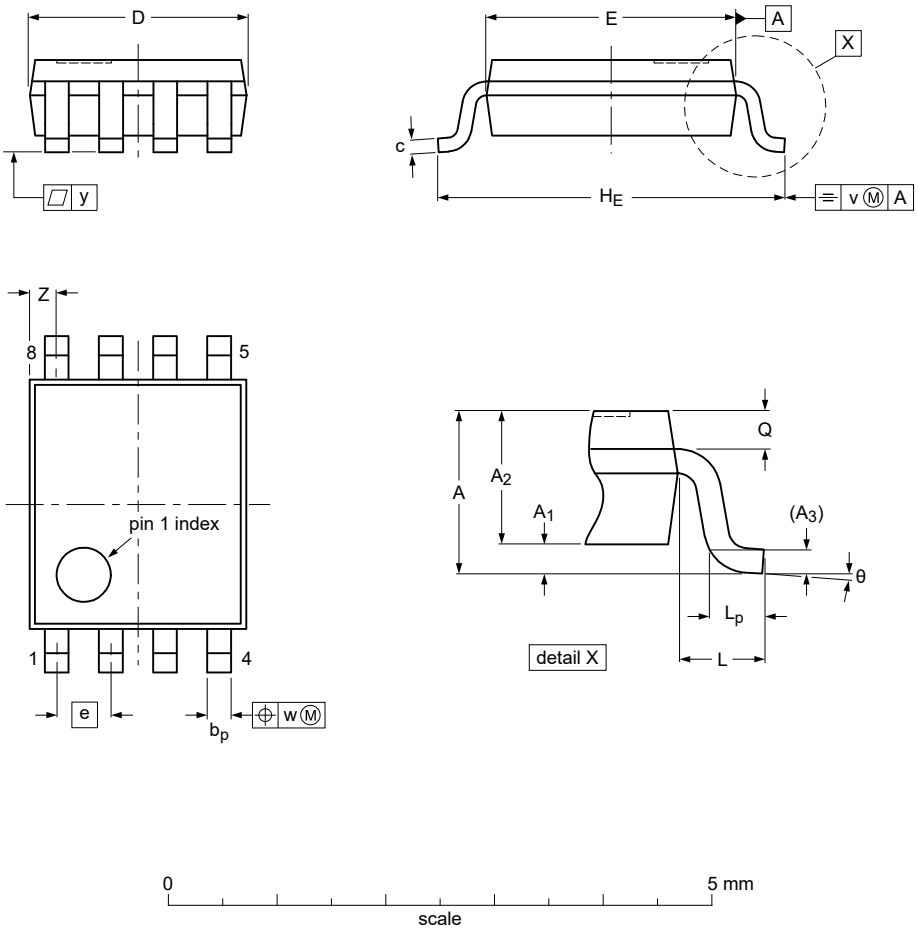
**Table 10. Test data**

| Supply voltage | Load | | $V_{EXT}$ | | |
|---|---|---|---|---|---|
| $V_{CC}$ | $C_L$ | $R_L$ [1] | $t_{PLH}$, $t_{PHL}$ | $t_{PZH}$, $t_{PHZ}$ | $t_{PZL}$, $t_{PLZ}$ |
| 0.8 V to 3.6 V | 5 pF, 10 pF, 15 pF and 30 pF | 5 kΩ or 1 MΩ | open | GND | 2 × $V_{CC}$ |

[1] For measuring enable and disable times $R_L$ = 5 kΩ
For measuring propagation delays, setup and hold times and pulse width $R_L$ = 1 MΩ.

## 12. Package outline

**VSSOP8: plastic very thin shrink small outline package; 8 leads; body width 2.3 mm** **SOT765-1**




Dimensions (mm are the original dimensions)

| Unit | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(2)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| max | | 0.15 | 0.85 | | 0.27 | 0.23 | 2.1 | 2.4 | | 3.2 | | 0.40 | 0.21 | | | | 0.4 | 8° |
| mm nom | 1 | | | 0.12 | | | | | 0.5 | | 0.4 | | | 0.2 | 0.08 | 0.1 | | |
| min | | 0.00 | 0.60 | | 0.17 | 0.08 | 1.9 | 2.2 | | 3.0 | | 0.15 | 0.19 | | | | 0.1 | 0° |

Note
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

*sot765-1_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT765-1 | | MO-187 | | | | ~~07-06-02~~ 16-05-31 |

**Fig. 7. Package outline SOT765-1 (VSSOP8)**

# 13. Abbreviations

**Table 11. Abbreviations**

| Acronym | Description |
|---|---|
| CDM | Charged Device Model |
| DUT | Device Under Test |
| ESD | ElectroStatic Discharge |
| HBM | Human Body Model |

# 14. Revision history

**Table 12. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| 74AUP2G80_Q100 v.1 | 20231016 | Product data sheet | - | - |

# 15. Legal information

## Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|---|---|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification | This document contains data from the preliminary specification. |
| Product [short] data sheet | Production | This document contains the product specification. |

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term 'short data sheet' is explained in section "Definitions".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com.

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**Date of release: 16 October 2023**

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