74AUP1G74-Q100

Low-power D-type flip-flop with set and reset; positive-edge trigger

Rev. 3 — 20 June 2022 Product data sheet

1. General description

The 74AUP1G74-Q100 is a single positive edge triggered D-type flip-flop with individual data (D), clock (CP), set ($\overline{SD}$) and reset ($\overline{RD}$) inputs, and complementary Q and $\overline{Q}$ outputs. Data at the D-input that meets the set-up and hold time requirements on the LOW-to-HIGH clock transition will be stored in the flip-flop and appear at the Q output.

Schmitt-trigger action at all inputs makes the circuit tolerant of slower input rise and fall times.

This device ensures 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 the potentially 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
- CMOS low power dissipation
- High noise immunity
- Overvoltage tolerant inputs to 3.6 V
- Low static power consumption; I_{CC} = 0.9 μA (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- 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)
  - JESD8C (2.7 V to 3.6 V)
- ESD protection:
  - MIL-STD-883, method 3015 Class 3A. Exceeds 5 kV
  - HBM JESD22-A114F Class 3A. Exceeds 5 kV
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AUP1G74DC-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]
74AUP1G74DC-Q100	p74

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

5. Functional diagram

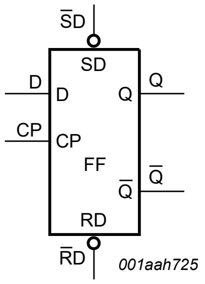


Fig. 1. Logic symbol

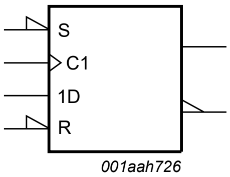


Fig. 2. IEC logic symbol

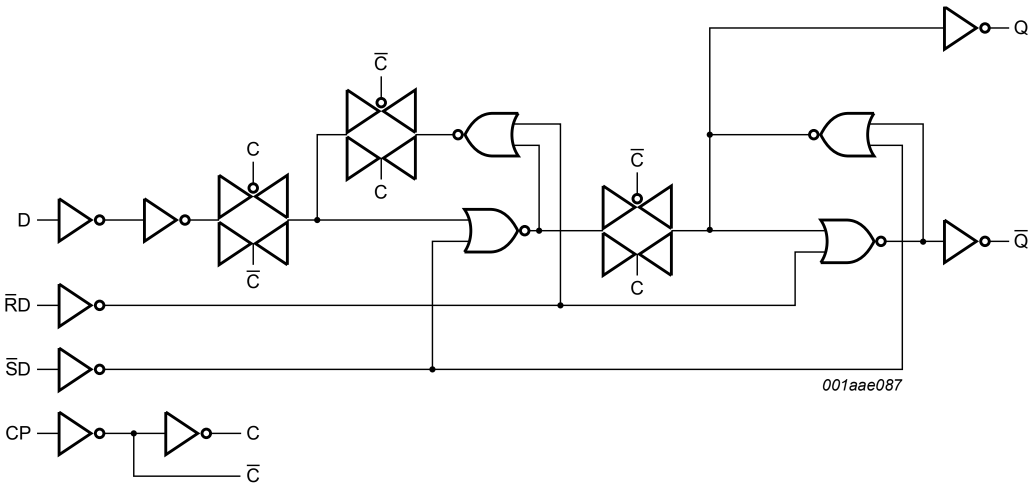


Fig. 3. Logic diagram

6. Pinning information

6.1. Pinning

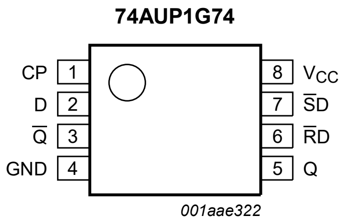


Fig. 4. Pin configuration SOT765-1 (VSSOP8)

6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
CP	1	clock input
D	2	data input
$\overline{Q}$	3	complement output
GND	4	ground (0 V)
Q	5	true output
$\overline{RD}$	6	asynchronous reset input (active LOW)
$\overline{SD}$	7	asynchronous set input (active LOW)
V_{CC}	8	supply voltage

7. Functional description

Table 4. Function table for asynchronous operation

H = HIGH voltage level; L = LOW voltage level; X = don't care.

Input				Output	
$\overline{SD}$	$\overline{RD}$	CP	D	Q	$\overline{Q}$
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H

Table 5. Function table for synchronous operation

H = HIGH voltage level; L = LOW voltage level; ↑ = LOW-to-HIGH CP transition;
$\overline{Q}_{n+1}$, Q_{n+1} = state after the next LOW-to-HIGH CP transition.

Input				Output	
$\overline{SD}$	$\overline{RD}$	CP	D	Q_{n+1}	$\overline{Q}_{n+1}$
H	H	↑	L	L	H
H	H	↑	H	H	L

8. Limiting values

Table 6. 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
V_I	input voltage		[1]	-0.5	+4.6	V
V_O	output voltage	Active mode and Power-down mode	[1]	-0.5	+4.6	V
I_{IK}	input clamping current	$V_I < 0$ V		-50	-	mA
I_{OK}	output clamping current	$V_O < 0$ V		-50	-	mA
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				
		SOT765-1 (VSSOP8)	[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 7. 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
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 0.8 V to 3.6 V	-	200	ns/V

10. Static characteristics

Table 8. 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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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	-	-	0.3 × 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
ΔI_{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
ΔI_{CC}	additional supply current	$V_I = V_{CC}$ - 0.6 V; I_O = 0 A; V_{CC} = 3.3 V; per pin [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	0.7 × 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	-	-	0.3 × 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
ΔI_{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
ΔI_{CC}	additional supply current	V_I = V_{CC} - 0.6 V; I_O = 0 A; V_{CC} = 3.3 V; per pin [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	0.6 × 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
ΔI_{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
ΔI_{CC}	additional supply current	V_I = V_{CC} - 0.6 V; I_O = 0 A; V_{CC} = 3.3 V; per pin [1]	-	-	75	μA

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

11. Dynamic characteristics

Table 9. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 7.

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	CP to Q, $\overline{Q}$; see Fig. 5. [2]								
		V_{CC} = 0.8 V	-	25.4	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	2.9	6.7	14.0	2.6	14.2	2.6	14.2	ns
		V_{CC} = 1.4 V to 1.6 V	2.4	4.5	7.6	2.3	8.3	2.3	8.6	ns
		V_{CC} = 1.65 V to 1.95 V	1.9	3.5	5.7	1.7	6.5	1.7	6.8	ns
		V_{CC} = 2.3 V to 2.7 V	1.7	2.6	3.8	1.4	4.4	1.4	4.7	ns
		V_{CC} = 3.0 V to 3.6 V	1.5	2.2	3.1	1.2	3.4	1.2	3.7	ns
		$\overline{SD}$ to Q, $\overline{Q}$; see Fig. 6. [2]								
		V_{CC} = 0.8 V	-	19.6	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	2.7	5.6	11.0	2.5	11.4	2.5	11.5	ns
		V_{CC} = 1.4 V to 1.6 V	2.4	4.0	6.3	2.2	6.9	2.2	7.3	ns
		V_{CC} = 1.65 V to 1.95 V	2.0	3.3	4.9	1.7	5.6	1.7	5.9	ns
		V_{CC} = 2.3 V to 2.7 V	1.9	2.7	3.7	1.7	4.0	1.7	4.2	ns
		V_{CC} = 3.0 V to 3.6 V	1.8	2.5	3.2	1.5	3.6	1.5	3.8	ns
		$\overline{RD}$ to Q, $\overline{Q}$; see Fig. 6. [2]								
		V_{CC} = 0.8 V	-	19.2	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	2.6	5.5	11.0	2.5	11.3	2.5	11.5	ns
		V_{CC} = 1.4 V to 1.6 V	2.3	3.9	6.3	2.2	6.8	2.2	7.3	ns
		V_{CC} = 1.65 V to 1.95 V	1.9	3.2	5.0	1.8	5.6	1.8	5.9	ns
		V_{CC} = 2.3 V to 2.7 V	1.9	2.6	3.6	1.7	4.1	1.7	4.3	ns
		V_{CC} = 3.0 V to 3.6 V	1.8	2.4	3.3	1.5	3.6	1.5	3.8	ns
f_{max}	maximum frequency	CP; 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

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 = 10 pF											
t_{pd}	propagation delay	CP to Q, $\overline{Q}$; see Fig. 5.	[2]								
		V_{CC} = 0.8 V		-	28.9	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.1	7.5	15.8	2.9	16.1	2.9	16.1	ns
		V_{CC} = 1.4 V to 1.6 V		2.7	5.1	8.7	2.4	9.4	2.4	9.8	ns
		V_{CC} = 1.65 V to 1.95 V		2.5	4.1	6.5	2.2	7.2	2.2	7.6	ns
		V_{CC} = 2.3 V to 2.7 V		2.0	3.2	4.6	1.8	5.3	1.8	5.6	ns
		V_{CC} = 3.0 V to 3.6 V		1.8	2.8	3.8	1.6	4.1	1.6	4.4	ns
		$\overline{SD}$ to Q, $\overline{Q}$; see Fig. 6.	[2]								
		V_{CC} = 0.8 V		-	23.2	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		2.9	6.5	12.9	2.8	13.3	2.8	13.5	ns
		V_{CC} = 1.4 V to 1.6 V		2.7	4.6	7.5	2.3	7.9	2.3	8.3	ns
		V_{CC} = 1.65 V to 1.95 V		2.6	3.9	5.6	2.3	6.3	2.3	6.6	ns
		V_{CC} = 2.3 V to 2.7 V		2.3	3.2	4.4	2.0	4.8	2.0	5.2	ns
		V_{CC} = 3.0 V to 3.6 V		2.2	3.0	3.9	1.9	4.2	1.9	4.4	ns
		$\overline{RD}$ to Q, $\overline{Q}$; see Fig. 6.	[2]								
		V_{CC} = 0.8 V		-	22.7	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		2.8	6.4	12.8	2.7	13.2	2.7	13.4	ns
		V_{CC} = 1.4 V to 1.6 V		2.6	4.5	7.5	2.3	8.1	2.3	8.4	ns
		V_{CC} = 1.65 V to 1.95 V		2.5	3.3	5.8	2.3	6.3	2.3	6.7	ns
		V_{CC} = 2.3 V to 2.7 V		2.2	3.2	4.4	2.0	4.9	2.0	5.2	ns
		V_{CC} = 3.0 V to 3.6 V		2.0	2.9	4.0	1.9	4.3	1.9	4.5	ns
f_{max}	maximum frequency	CP; 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	CP to Q, $\overline{Q}$; see Fig. 5.	[2]								
		V_{CC} = 0.8 V		-	32.4	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.5	8.3	17.6	3.3	17.8	3.3	18.0	ns
		V_{CC} = 1.4 V to 1.6 V		3.2	5.6	9.5	2.8	10.5	2.8	11.1	ns
		V_{CC} = 1.65 V to 1.95 V		2.7	4.6	7.2	2.5	8.1	2.5	8.6	ns
		V_{CC} = 2.3 V to 2.7 V		2.4	3.6	5.2	2.2	5.8	2.2	6.2	ns
		V_{CC} = 3.0 V to 3.6 V		2.2	3.2	4.4	2.0	4.9	2.0	5.2	ns
		$\overline{SD}$ to Q, $\overline{Q}$; see Fig. 6.	[2]								
		V_{CC} = 0.8 V		-	26.7	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.3	7.3	14.7	3.1	15.2	3.1	15.4	ns
		V_{CC} = 1.4 V to 1.6 V		3.2	5.2	8.3	2.9	9.0	2.9	9.5	ns
		V_{CC} = 1.65 V to 1.95 V		2.8	4.3	6.4	2.5	7.1	2.5	7.5	ns
		V_{CC} = 2.3 V to 2.7 V		2.8	3.7	5.1	2.2	5.5	2.2	5.8	ns
		V_{CC} = 3.0 V to 3.6 V		2.5	3.5	4.6	2.4	5.0	2.4	5.2	ns
		$\overline{RD}$ to Q, $\overline{Q}$; see Fig. 6.	[2]								
		V_{CC} = 0.8 V		-	26.1	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.2	7.2	14.5	3.1	15.0	3.1	15.2	ns
		V_{CC} = 1.4 V to 1.6 V		3.1	5.1	8.4	2.7	9.2	2.7	9.7	ns
		V_{CC} = 1.65 V to 1.95 V		2.7	4.3	6.5	2.6	7.3	2.6	7.7	ns
		V_{CC} = 2.3 V to 2.7 V		2.6	3.6	5.0	2.4	5.5	2.4	5.8	ns
		V_{CC} = 3.0 V to 3.6 V		2.4	3.4	4.6	2.3	5.0	2.3	5.2	ns
f_{max}	maximum frequency	CP; 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

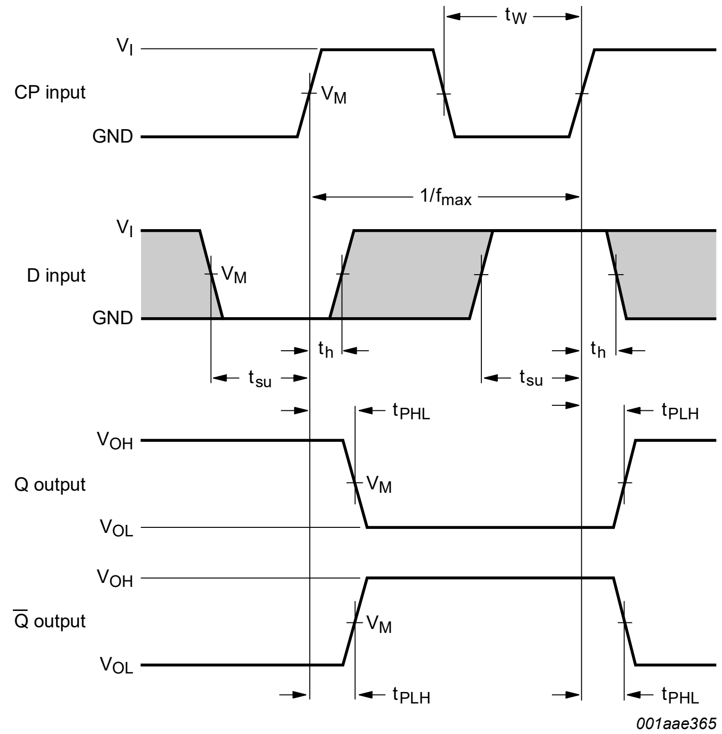
Symbol	Parameter	Conditions		Tamb = 25 °C			Tamb = -40 °C to +85 °C		Tamb = -40 °C to +125 °C		Unit
				Min	Typ[1]	Max	Min	Max	Min	Max	
C_L = 30 pF											
t_{pd}	propagation delay	CP to Q, $\overline{Q}$; see Fig. 5.	[2]								
		V_{CC} = 0.8 V		-	42.7	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		4.2	10.6	22.5	4.0	23.0	4.0	23.3	ns
		V_{CC} = 1.4 V to 1.6 V		3.7	7.2	12.0	3.7	13.3	3.7	14.0	ns
		V_{CC} = 1.65 V to 1.95 V		3.5	5.8	9.2	3.4	10.4	3.4	11.0	ns
		V_{CC} = 2.3 V to 2.7 V		3.3	4.7	6.6	3.0	7.3	3.0	7.8	ns
		V_{CC} = 3.0 V to 3.6 V		3.0	4.3	5.8	2.8	6.8	2.8	7.3	ns
		$\overline{SD}$ to Q, $\overline{Q}$; see Fig. 6.	[2]								
		V_{CC} = 0.8 V		-	37.0	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		4.0	9.5	19.8	3.8	20.8	3.8	21.1	ns
		V_{CC} = 1.4 V to 1.6 V		3.8	6.7	10.9	3.7	12.0	3.7	12.7	ns
		V_{CC} = 1.65 V to 1.95 V		3.7	5.6	8.4	3.5	9.3	3.5	9.9	ns
		V_{CC} = 2.3 V to 2.7 V		3.7	4.8	6.6	3.2	7.2	3.2	7.6	ns
		V_{CC} = 3.0 V to 3.6 V		3.4	4.6	6.0	3.1	6.8	3.1	7.1	ns
		$\overline{RD}$ to Q, $\overline{Q}$; see Fig. 6.	[2]								
		V_{CC} = 0.8 V		-	36.4	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V		3.9	9.4	19.5	3.8	20.2	3.8	20.5	ns
		V_{CC} = 1.4 V to 1.6 V		3.6	6.6	10.9	3.7	12.0	3.7	12.6	ns
		V_{CC} = 1.65 V to 1.95 V		3.5	5.5	8.5	3.5	9.5	3.5	10.1	ns
		V_{CC} = 2.3 V to 2.7 V		3.5	4.7	6.5	3.2	7.1	3.2	7.6	ns
		V_{CC} = 3.0 V to 3.6 V		3.3	4.4	6.1	3.1	7.1	3.1	7.5	ns
f_{max}	maximum frequency	CP; see Fig. 5.									
		V_{CC} = 0.8 V		-	28	-	-	-	-	-	MHz
		V_{CC} = 1.1 V to 1.3 V		-	145	-	70	-	70	-	MHz
		V_{CC} = 1.4 V to 1.6 V		-	185	-	120	-	110	-	MHz
		V_{CC} = 1.65 V to 1.95 V		-	270	-	150	-	120	-	MHz
		V_{CC} = 2.3 V to 2.7 V		-	290	-	190	-	170	-	MHz
		V_{CC} = 3.0 V to 3.6 V		-	315	-	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}	set-up time	D to CP HIGH; see Fig. 5.								
		V_{CC} = 0.8 V	-	3.4	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	0.6	-	1.2	-	1.2	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	0.3	-	0.6	-	0.6	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	0.4	-	0.5	-	0.5	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.2	-	0.4	-	0.4	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.3	-	0.4	-	0.4	-	ns
		D to CP LOW; see Fig. 5.								
		V_{CC} = 0.8 V	-	3.0	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	0.5	-	1.2	-	1.2	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	0.3	-	0.7	-	0.7	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	0.4	-	0.7	-	0.7	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.5	-	0.7	-	0.7	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.6	-	0.8	-	0.8	-	ns
t_h	hold time	D to CP; see Fig. 5.								
		V_{CC} = 0.8 V	-	-1.9	-	-	-	-	-	ns
		V_{CC} = 1.1 V to 1.3 V	-	-0.3	-	0.5	-	0.5	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	-0.2	-	0.2	-	0.2	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	-0.2	-	0.1	-	0.1	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	-0.2	-	0.1	-	0.1	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	-0.2	-	0.1	-	0.1	-	ns
t_{rec}	recovery time	$\overline{RD}$; see Fig. 6								
		V_{CC} = 1.1 V to 1.3 V	-	-0.5	-	-0.9	-	-0.9	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	-0.2	-	-0.6	-	-0.6	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	-0.2	-	-0.4	-	-0.4	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	-0.1	-	-0.1	-	-0.1	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	-0.1	-	-0.1	-	-0.1	-	ns
		$\overline{SD}$; see Fig. 6.								
		V_{CC} = 1.1 V to 1.3 V	-	-0.5	-	-0.3	-	-0.3	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	-0.4	-	-0.1	-	-0.1	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	-0.3	-	0	-	0	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	-0.2	-	0.1	-	0.1	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	-0.1	-	0.1	-	0.1	-	ns

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	
t_W	pulse width	CP HIGH or LOW; see Fig. 5.								
		V_{CC} = 1.1 V to 1.3 V	-	2.1	-	2.7	-	2.7	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	1.1	-	1.5	-	1.5	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	0.9	-	1.6	-	1.6	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	0.6	-	1.7	-	1.7	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	0.6	-	1.9	-	1.9	-	ns
		$\overline{SD}$ or $\overline{RD}$ LOW; see Fig. 6.								
		V_{CC} = 1.1 V to 1.3 V	-	4.2	-	11.3	-	11.5	-	ns
		V_{CC} = 1.4 V to 1.6 V	-	2.3	-	6.2	-	6.4	-	ns
		V_{CC} = 1.65 V to 1.95 V	-	1.8	-	4.8	-	5.0	-	ns
		V_{CC} = 2.3 V to 2.7 V	-	1.2	-	3.3	-	3.5	-	ns
		V_{CC} = 3.0 V to 3.6 V	-	1.1	-	2.6	-	2.8	-	ns
C_{PD}	power dissipation capacitance	f_i = 1 MHz; V_I = GND to V_{CC} [3]								
		V_{CC} = 0.8 V	-	2.8	-	-	-	-	-	pF
		V_{CC} = 1.1 V to 1.3 V	-	2.9	-	-	-	-	-	pF
		V_{CC} = 1.4 V to 1.6 V	-	3.0	-	-	-	-	-	pF
		V_{CC} = 1.65 V to 1.95 V	-	3.0	-	-	-	-	-	pF
		V_{CC} = 2.3 V to 2.7 V	-	3.5	-	-	-	-	-	pF
		V_{CC} = 3.0 V to 3.6 V	-	3.9	-	-	-	-	-	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 outputs.

11.1. Waveforms and test circuit

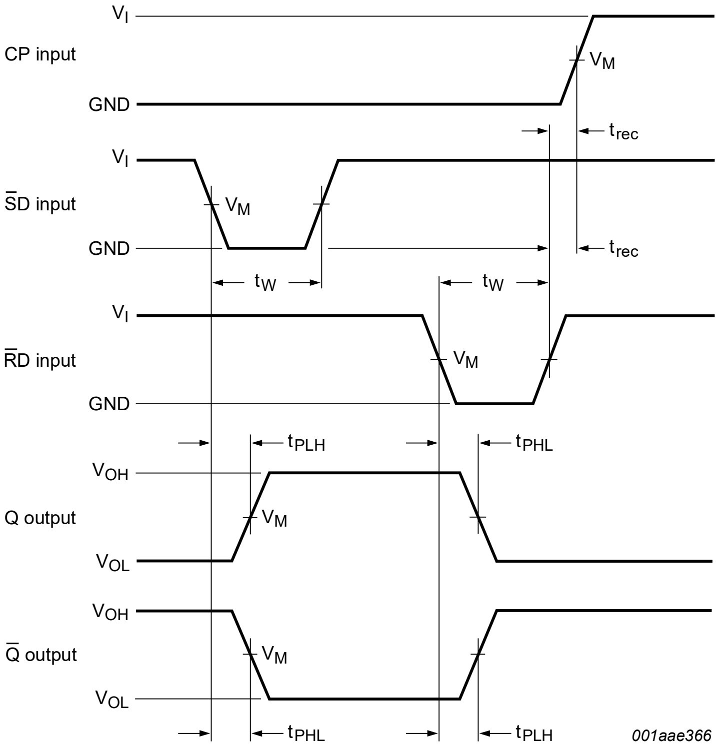


Measurement points are given in Table 10.

The shaded areas indicate when the input is permitted to change for predictable output performance.

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

Fig. 5. The clock input (CP) to output (Q, $\overline{Q}$) propagation delays, the data input (D) to clock input (CP) set-up and hold times and the clock input (CP) pulse width and maximum frequency



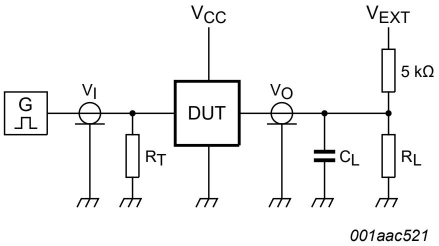
Measurement points are given in Table 10.

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

Fig. 6. The set input ($\overline{SD}$) and reset input ($\overline{RD}$) to output (Q, $\overline{Q}$) propagation delays, the set input ($\overline{SD}$) and reset input ($\overline{RD}$) pulse widths and the reset input ($\overline{RD}$) to clock input (CP) recovery time

Table 10. 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 11.
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 Zo of the pulse generator;
V_{EXT} = External voltage for measuring switching times.

Fig. 7. Test circuit for measuring switching times

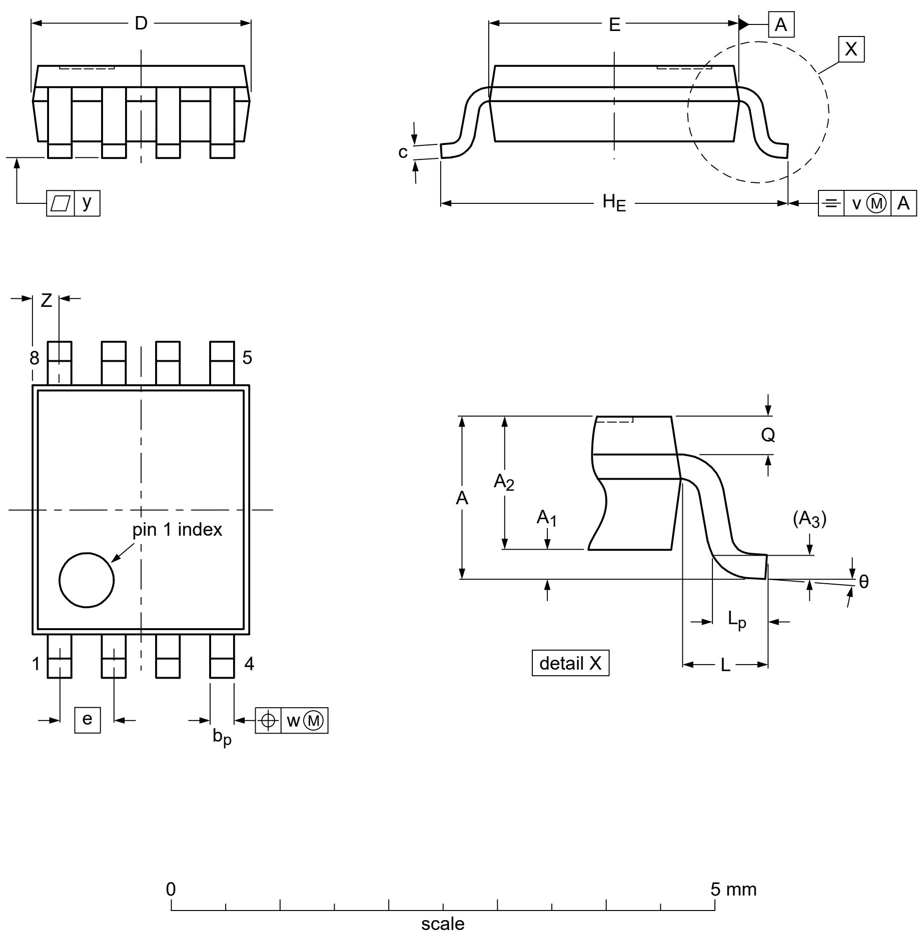
Table 11. Test data

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
mm	max		0.15	0.85		0.27	0.23	2.1	2.4		3.2		0.40	0.21				0.4	8°
	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. 8. Package outline SOT765-1 (VSSOP8)

13. Abbreviations

Table 12. Abbreviations

Acronym	Description
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MIL	Military
MM	Machine Model

14. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1G74_Q100 v.3	20220620	Product data sheet	-	74AUP1G74_Q100 v.2
Modifications:	• Section 1 and Section 2 updated. • Table 6: Derating values for P_{tot} total power dissipation have been updated.			
74AUP1G74_Q100 v.2	20170410	Product data sheet	-	74AUP1G74_Q100 v.1
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate.			
74AUP1G74_Q100 v.1	20150527	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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