

# 74AUP1G175-Q100

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

Rev. 5 — 13 July 2023

Product data sheet

## 1. General description

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The 74AUP1G175 is a single positive edge triggered D-type flip-flop with individual data (D), clock (CP), master reset ( $\overline{MR}$ ) inputs, and Q output. 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. A LOW on  $\overline{MR}$  causes the flip-flop and output to be reset to LOW. 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

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- 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
- 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)
- Low static power consumption;  $I_{CC} = 0.9 \mu\text{A}$  (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Overvoltage tolerant inputs to 3.6 V
- Low noise overshoot and undershoot < 10 % of  $V_{CC}$
- $I_{OFF}$  circuitry provides partial Power-down mode operation
- 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			Version
	Temperature range	Name	Description	
<a href="#">74AUP1G175GW-Q100</a>	-40 °C to +125 °C	TSSOP6	plastic thin shrink small outline package; 6 leads; body width 1.25 mm	<a href="#">SOT363-2</a>

### 4. Marking

Table 2. Marking

Type number	Marking code [1]
74AUP1G175GW-Q100	aT

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

### 5. Functional diagram

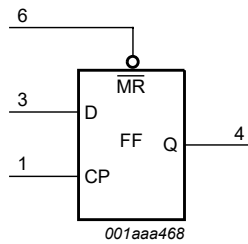


Fig. 1. Logic symbol

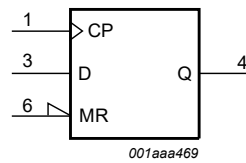


Fig. 2. IEC logic symbol

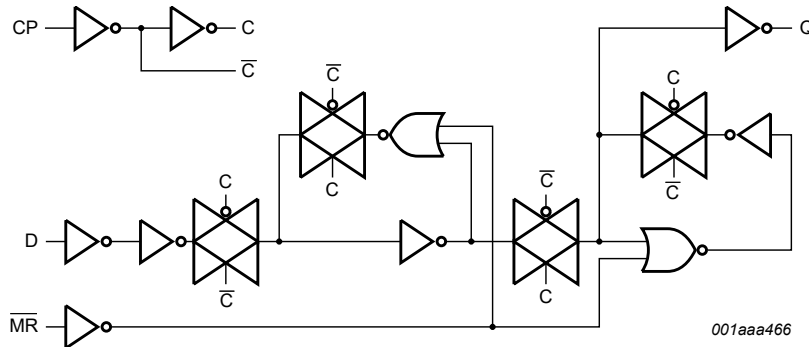


Fig. 3. Logic diagram

## 6. Pinning information

### 6.1. Pinning

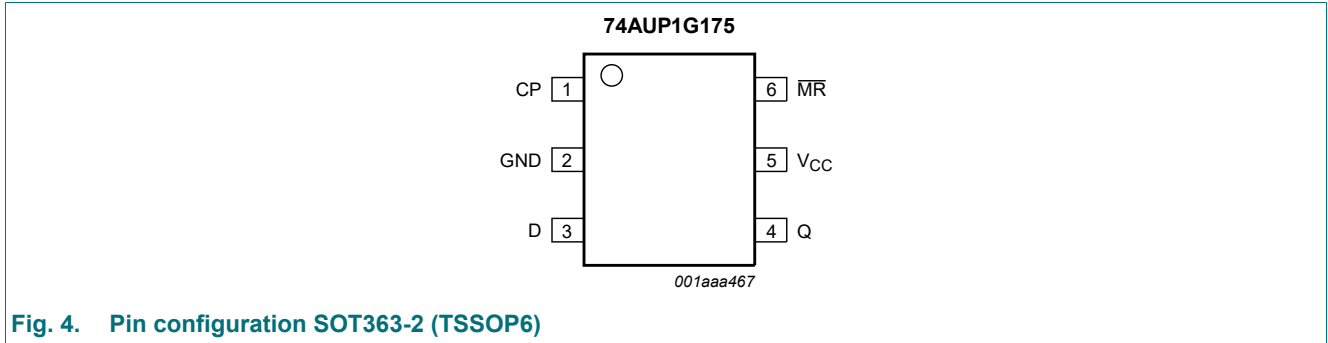


Fig. 4. Pin configuration SOT363-2 (TSSOP6)

### 6.2. Pin description

Table 3. Pin description

Symbol	Pin	Description
CP	1	clock input (LOW-to-HIGH, edge-triggered)
GND	2	ground (0 V)
D	3	data input
Q	4	flip-flop output
V <sub>CC</sub>	5	supply voltage
$\overline{\text{MR}}$	6	master reset input (active LOW)

## 7. Functional description

Table 4. Function table

*H = HIGH voltage level; h = HIGH voltage level one set-up time prior to the LOW-to-HIGH CP transition;  
 L = LOW voltage level; l = LOW voltage level one set-up time prior to the LOW-to-HIGH CP transition;  
 ↑ = LOW-to-HIGH CP transition; X = don't care.*

Operating mode	Input			Output
	$\overline{\text{MR}}$	CP	D	Q
Reset (clear)	L	X	X	L
Load '1'	H	↑	h	H
Load '0'	H	↑	l	L

## 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 $V_{CC}$	-	$\pm 20$	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 SOT363-2 (TSSOP6) package:  $P_{tot}$  derates linearly with 3.7 mW/K above 83 °C.

## 9. Recommended operating conditions

**Table 6. Recommended 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 7. Static characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.70 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.30 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.75 × V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	1.11	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.32	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	2.05	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.9	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.72	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.1	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.3 × V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.31	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.31	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.31	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.44	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.31	V
I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.44	V		
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.1	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±0.2	μA
ΔI <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.2	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.5	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V	[1]	-	40	μA
C <sub>I</sub>	input capacitance	V <sub>CC</sub> = 0 V to 3.6 V; V <sub>I</sub> = GND or V <sub>CC</sub>	-	0.8	-	pF
C <sub>O</sub>	output capacitance	V <sub>O</sub> = GND; V <sub>CC</sub> = 0 V	-	1.7	-	pF

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.70 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.65 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.30 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.35 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.1	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.7 × V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	1.03	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.30	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	1.97	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.85	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.67	-	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.55	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.1	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.3 × V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.37	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.35	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.33	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.45	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.33	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.45	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.5	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±0.5	μA
ΔI <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.6	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.9	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V	[1]	-	50	μA

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 0.8 V	0.75 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	0.70 × V <sub>CC</sub>	-	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.6	-	-	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 0.8 V	-	-	0.25 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 0.9 V to 1.95 V	-	-	0.30 × V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	V
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-	0.9	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	V <sub>CC</sub> - 0.11	-	-	V
		I <sub>O</sub> = -1.1 mA; V <sub>CC</sub> = 1.1 V	0.6 × V <sub>CC</sub>	-	-	V
		I <sub>O</sub> = -1.7 mA; V <sub>CC</sub> = 1.4 V	0.93	-	-	V
		I <sub>O</sub> = -1.9 mA; V <sub>CC</sub> = 1.65 V	1.17	-	-	V
		I <sub>O</sub> = -2.3 mA; V <sub>CC</sub> = 2.3 V	1.77	-	-	V
		I <sub>O</sub> = -3.1 mA; V <sub>CC</sub> = 2.3 V	1.67	-	-	V
		I <sub>O</sub> = -2.7 mA; V <sub>CC</sub> = 3.0 V	2.40	-	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.30	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>				
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	0.11	V
		I <sub>O</sub> = 1.1 mA; V <sub>CC</sub> = 1.1 V	-	-	0.33 × V <sub>CC</sub>	V
		I <sub>O</sub> = 1.7 mA; V <sub>CC</sub> = 1.4 V	-	-	0.41	V
		I <sub>O</sub> = 1.9 mA; V <sub>CC</sub> = 1.65 V	-	-	0.39	V
		I <sub>O</sub> = 2.3 mA; V <sub>CC</sub> = 2.3 V	-	-	0.36	V
		I <sub>O</sub> = 3.1 mA; V <sub>CC</sub> = 2.3 V	-	-	0.50	V
		I <sub>O</sub> = 2.7 mA; V <sub>CC</sub> = 3.0 V	-	-	0.36	V
		I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 3.0 V	-	-	0.50	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = GND to 3.6 V; V <sub>CC</sub> = 0 V to 3.6 V	-	-	±0.75	μA
I <sub>OFF</sub>	power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V	-	-	±0.75	μA
ΔI <sub>OFF</sub>	additional power-off leakage current	V <sub>I</sub> or V <sub>O</sub> = 0 V to 3.6 V; V <sub>CC</sub> = 0 V to 0.2 V	-	-	±0.75	μA
I <sub>CC</sub>	supply current	V <sub>I</sub> = GND or V <sub>CC</sub> ; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 0.8 V to 3.6 V	-	-	1.4	μA
ΔI <sub>CC</sub>	additional supply current	V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 3.3 V	[1]	-	75	μA

[1] One input at V<sub>CC</sub> - 0.6 V, other input at V<sub>CC</sub> or GND.

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
<b>C<sub>L</sub> = 5 pF</b>										
t <sub>pd</sub>	propagation delay	CP to Q; see Fig. 5 [2]								
		V <sub>CC</sub> = 0.8 V	-	21.1	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.4	5.9	11.7	2.2	11.9	2.2	12.0	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.0	4.1	6.8	1.8	7.3	1.8	7.6	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.6	3.3	5.4	1.3	5.9	1.3	6.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.3	2.5	3.6	1.1	4.0	1.1	4.2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.2	2.1	2.9	1.0	3.3	1.0	3.5	ns
		MR to Q; see Fig. 6 [2]								
		V <sub>CC</sub> = 0.8 V	-	17.4	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.4	5.2	9.7	2.2	10.0	2.2	12.0	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.3	3.8	5.2	2.1	6.4	2.1	6.6	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.8	3.1	4.9	1.7	5.4	1.7	5.6	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.8	2.6	3.6	1.5	4.0	1.5	4.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.6	2.4	3.1	1.3	3.3	1.3	3.6	ns
f <sub>max</sub>	maximum frequency	CP; see Fig. 5								
		V <sub>CC</sub> = 0.8 V	-	50	-	-	-	-	-	MHz
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	200	-	170	-	170	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	345	-	310	-	310	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	435	-	400	-	400	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	550	-	490	-	490	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	615	-	550	-	550	-	MHz



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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
<b>C<sub>L</sub> = 10 pF</b>										
t <sub>pd</sub>	propagation delay	CP to Q; see <a href="#">Fig. 5</a> [2]								
		V <sub>CC</sub> = 0.8 V	-	24.7	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.6	6.8	13.3	2.4	13.6	2.4	13.6	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.3	4.8	7.9	2.0	8.4	2.0	8.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.1	3.9	6.1	1.8	6.6	1.8	6.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	3.0	4.3	1.5	4.7	1.5	5.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.6	2.7	3.6	1.3	4.0	1.3	4.2	ns
		MR to Q; see <a href="#">Fig. 6</a> [2]								
		V <sub>CC</sub> = 0.8 V	-	21.0	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	2.6	6.2	11.5	2.6	11.7	2.6	13.6	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.5	4.4	6.1	2.4	7.6	2.4	7.8	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.5	3.7	5.7	2.2	6.3	2.2	6.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.1	3.2	4.3	1.9	4.7	1.9	4.9	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	3.0	3.9	1.8	4.1	1.8	4.3	ns
f <sub>max</sub>	maximum frequency	CP; see <a href="#">Fig. 5</a>								
		V <sub>CC</sub> = 0.8 V	-	50	-	-	-	-	MHz	
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	190	-	150	-	150	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	320	-	280	-	280	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	420	-	310	-	310	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	485	-	370	-	370	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	550	-	410	-	410	-	MHz

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
<b>C<sub>L</sub> = 15 pF</b>										
t <sub>pd</sub>	propagation delay	CP to Q; see <a href="#">Fig. 5</a> [2]								
		V <sub>CC</sub> = 0.8 V	-	28.1	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.0	7.6	14.8	2.8	15.2	2.8	15.4	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.7	5.3	8.7	2.3	9.4	2.3	9.9	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.3	4.4	6.8	2.1	7.4	2.1	7.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.1	3.5	5.0	1.9	5.3	1.9	5.6	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	3.1	4.3	1.7	4.7	1.7	4.9	ns
		MR to Q; see <a href="#">Fig. 6</a> [2]								
		V <sub>CC</sub> = 0.8 V	-	24.6	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.2	7.0	13.2	2.9	13.5	2.9	15.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.1	5.0	6.8	2.6	8.6	2.6	9.1	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.5	4.3	6.5	2.5	7.2	2.5	7.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.6	3.7	5.0	2.2	5.4	2.2	5.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.4	3.5	4.4	2.1	4.8	2.1	5.0	ns
f <sub>max</sub>	maximum frequency	CP; see <a href="#">Fig. 5</a>								
		V <sub>CC</sub> = 0.8 V	-	50	-	-	-	-	MHz	
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	180	-	120	-	120	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	300	-	190	-	190	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	405	-	240	-	240	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	420	-	300	-	300	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	480	-	320	-	320	-	MHz

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

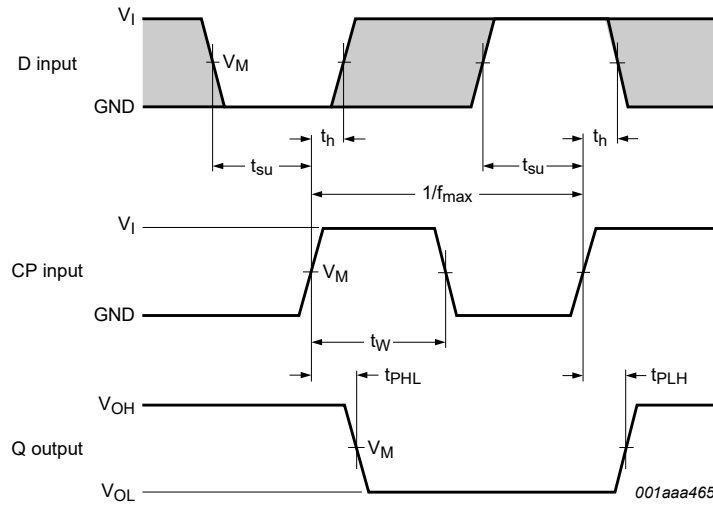
Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
<b>C<sub>L</sub> = 30 pF</b>										
t <sub>pd</sub>	propagation delay	CP to Q; see <a href="#">Fig. 5</a> [2]								
		V <sub>CC</sub> = 0.8 V	-	38.4	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.6	9.8	19.5	3.4	20.6	3.4	21.0	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.3	6.9	11.2	3.2	12.4	3.2	13.0	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.1	5.7	8.8	2.9	9.6	2.9	10.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.0	4.6	6.4	2.6	6.9	2.6	7.3	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.8	4.2	5.7	2.5	6.5	2.5	6.9	ns
		MR to Q; see <a href="#">Fig. 6</a> [2]								
		V <sub>CC</sub> = 0.8 V	-	35.1	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	3.9	9.3	18.0	3.7	18.6	3.7	19.8	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.9	6.6	8.9	3.6	11.6	3.6	12.2	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.6	5.6	8.6	3.4	9.6	3.4	9.7	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.5	4.8	6.4	2.9	7.2	2.9	7.2	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	3.3	4.6	5.7	3.1	6.4	3.1	6.9	ns
f <sub>max</sub>	maximum frequency	CP; see <a href="#">Fig. 5</a>								
		V <sub>CC</sub> = 0.8 V	-	35	-	-	-	-	MHz	
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	130	-	70	-	70	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	200	-	120	-	120	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	240	-	150	-	150	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	275	-	190	-	190	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	300	-	200	-	200	-	MHz
<b>C<sub>L</sub> = 5 pF, 10 pF, 15 pF and 30 pF</b>										
t <sub>w</sub>	pulse width	CP; HIGH or LOW; see <a href="#">Fig. 5</a>								
		V <sub>CC</sub> = 0.8 V	-	5.25	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	1.6	-	1.5	-	1.5	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	1.0	-	0.9	-	0.9	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.75	-	0.7	-	0.7	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.6	-	0.4	-	0.4	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.55	-	0.4	-	0.4	-	ns
		MR; LOW; see <a href="#">Fig. 6</a>								
		V <sub>CC</sub> = 0.8 V	-	9.0	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	3.0	-	4.9	-	4.9	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	1.75	-	2.5	-	2.5	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	1.35	-	1.8	-	1.8	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.9	-	1.1	-	1.1	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.8	-	0.8	-	0.8	-	ns

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
t <sub>rec</sub>	recovery time	MR; see Fig. 6								
		V <sub>CC</sub> = 0.8 V	-	-	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	-1.1	-	-1.2	-	-1.2	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	-2.0	-	-0.8	-	-0.8	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	-0.5	-	-0.7	-	-0.7	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-0.9	-	-0.4	-	-0.4	-	ns
t <sub>su(H)</sub>	set-up time HIGH	D to CP; see Fig. 5								
		V <sub>CC</sub> = 0.8 V	-	-	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	0.5	-	1.2	-	1.2	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	0.4	-	0.8	-	0.8	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.3	-	0.6	-	0.6	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.3	-	0.5	-	0.5	-	ns
t <sub>su(L)</sub>	set-up time LOW	D to CP; see Fig. 5								
		V <sub>CC</sub> = 0.8 V	-	-	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	0.8	-	1.7	-	1.7	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	0.6	-	1.1	-	1.1	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.4	-	0.9	-	0.9	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.4	-	0.9	-	0.9	-	ns
t <sub>h</sub>	hold time	D to CP; see Fig. 5								
		V <sub>CC</sub> = 0.8 V	-	-	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	-0.7	-	0.2	-	0.2	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	-0.5	-	0	-	0	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	-0.5	-	0	-	0	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-0.3	-	0	-	0	-	ns
C <sub>PD</sub>	power dissipation capacitance	f <sub>i</sub> = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [3]								
		V <sub>CC</sub> = 0.8 V	-	1.6	-	-	-	-	-	pF
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	1.7	-	-	-	-	-	pF
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	1.8	-	-	-	-	-	pF
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	1.9	-	-	-	-	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	2.2	-	-	-	-	-	pF
V <sub>CC</sub> = 3.0 V to 3.6 V	-	2.7	-	-	-	-	-	-	pF	

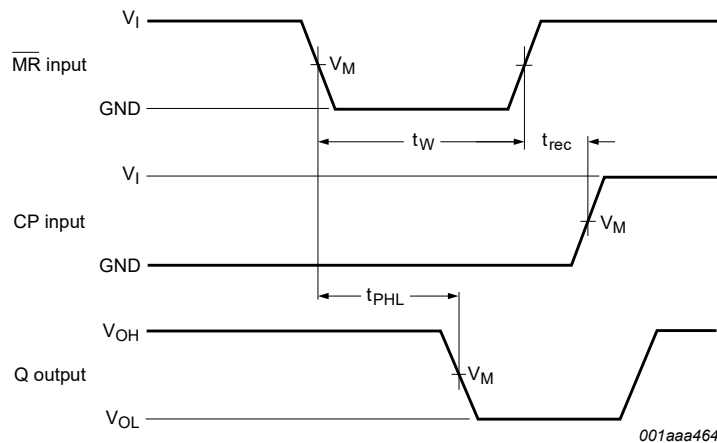
[1] All typical values are measured at nominal V<sub>CC</sub>.  
 [2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.  
 [3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times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

11.1. Waveforms and test circuit



Measurement points are given in [Table 9](#).  
 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) propagation delays, the clock pulse width, the D to CP set-up, the CP to D hold times and the maximum input clock frequency**



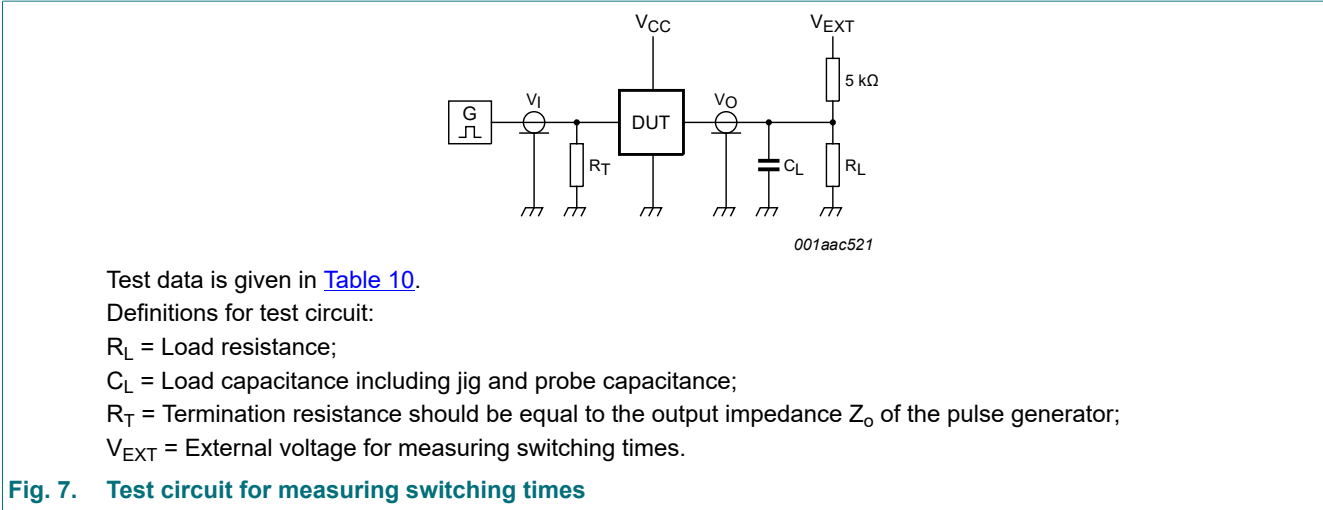
Measurement points are given in [Table 9](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage levels that occur with the output load.

**Fig. 6. The master reset ( $\overline{MR}$ ) input to output (Q) propagation delays, the master reset pulse width and the  $\overline{MR}$  to CP recovery time**

**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	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{CC}$	$\leq 3.0$ ns

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



**Fig. 7. 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	$2 \times V_{CC}$

[1] For measuring enable and disable times  $R_L = 5 \text{ k}\Omega$ .  
 For measuring propagation delays, setup and hold times and pulse width  $R_L = 1 \text{ M}\Omega$ .

12. Package outline

TSSOP6: plastic thin shrink small outline package; 6 leads; body width 1.25 mm

SOT363-2

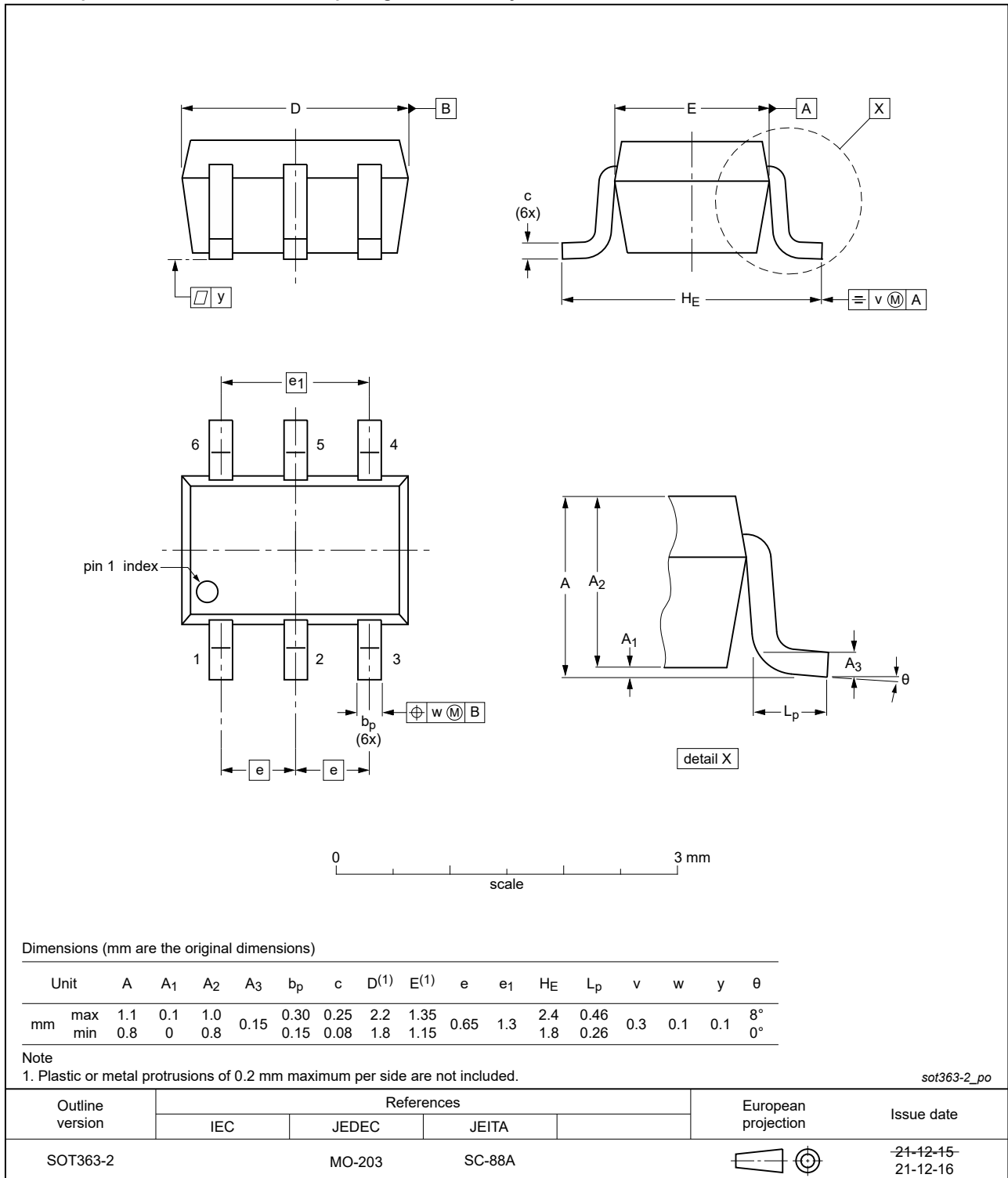


Fig. 8. Package outline SOT363-2 (TSSOP6)

## 13. Abbreviations

Table 11. Abbreviations

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

## 14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1G175_Q100 v.5	20230713	Product data sheet	-	74AUP1G175_Q100 v.4
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Section 2</a>: ESD specification updated according to the latest JEDEC standard.</li> </ul>			
74AUP1G175_Q100 v.4	20220118	Product data sheet	-	74AUP1G175_Q100 v.3
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li> <li>Package SOT363 (SC-88) changed to SOT363-2 (TSSOP6).</li> </ul>			
74AUP1G175_Q100 v.3	20210402	Product data sheet	-	74AUP1G175_Q100 v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate. (Remark: Legal page was accidentally removed in previous version)</li> <li><a href="#">Section 8</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul>			
74AUP1G175_Q100 v.2	20170310	Product data sheet	-	74AUP1G175_Q100 v.1
Modifications:	<ul style="list-style-type: none"> <li><a href="#">Section 8</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul>			
74AUP1G175_Q100 v.1	20130131	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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