

# 74AUP1G175-Q100

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

Rev. 1 — 31 January 2013

Product data sheet

## 1. General description

The 74AUP1G175-Q100 provides a low-power, low-voltage positive-edge triggered D-type flip-flop with individual data (D) input, clock (CP) input, master reset ( $\overline{\text{MR}}$ ) input, and Q output. The master reset ( $\overline{\text{MR}}$ ) is an asynchronous active LOW input and operates independently of the clock input. Information on the data input is transferred to the Q output on the LOW-to-HIGH transition of the clock pulse. The D input must be stable one set-up 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  $V_{\text{CC}}$  range from 0.8 V to 3.6 V. This device ensures a very low static and dynamic power consumption across the entire  $V_{\text{CC}}$  range from 0.8 V to 3.6 V.

This device is fully specified for partial power-down applications using  $I_{\text{OFF}}$ . The  $I_{\text{OFF}}$  circuitry disables the output, preventing the 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  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$
- Wide supply voltage range from 0.8 V to 3.6 V
- 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)
  - ◆ JESD8-B (2.7 V to 3.6 V)
- ESD protection:
  - ◆ MIL-STD-883, method 3015 Class 3A. Exceeds 5000 V
  - ◆ HBM JESD22-A114F Class 3A. Exceeds 5000 V
  - ◆ MM JESD22-A115-A exceeds 200 V ( $C = 200\text{ pF}$ ,  $R = 0\text{ }\Omega$ )
- Low static power consumption;  $I_{\text{CC}} = 0.9\text{ }\mu\text{A}$  (maximum)
- Latch-up performance exceeds 100 mA per JESD 78 Class II
- Inputs accept voltages up to 3.6 V
- Low noise overshoot and undershoot  $< 10\%$  of  $V_{\text{CC}}$
- $I_{\text{OFF}}$  circuitry provides partial Power-down mode operation



### 3. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AUP1G175GW-Q100	-40 °C to +125 °C	SC-88	plastic surface-mounted package; 6 leads	SOT363

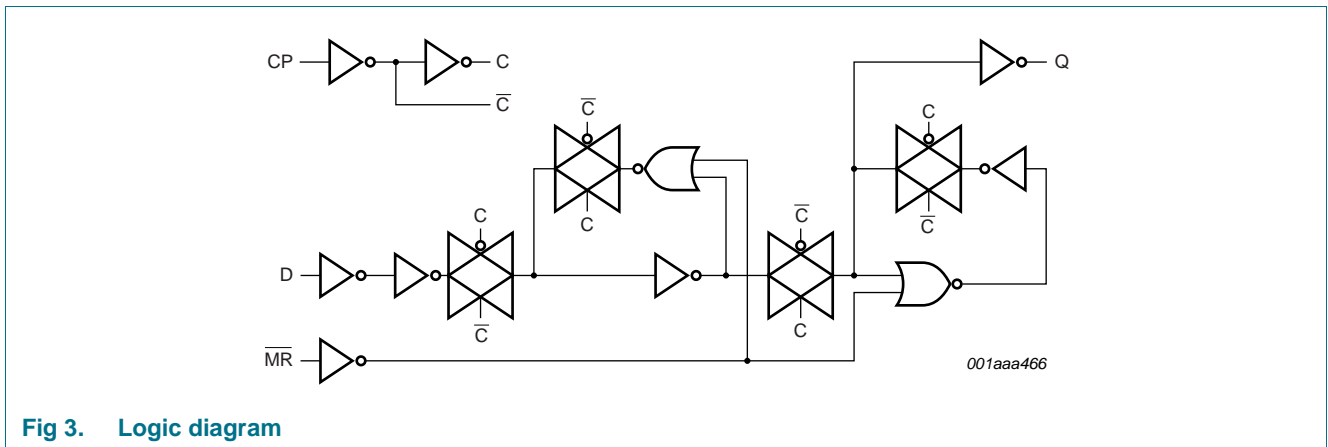
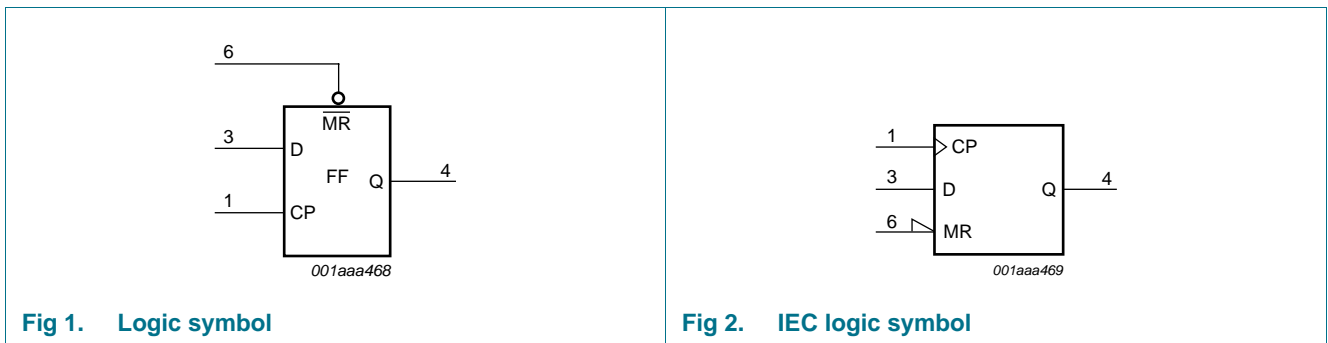
### 4. Marking

Table 2. Marking

Type number	Marking code <sup>[1]</sup>
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



## 6. Pinning information

### 6.1 Pinning

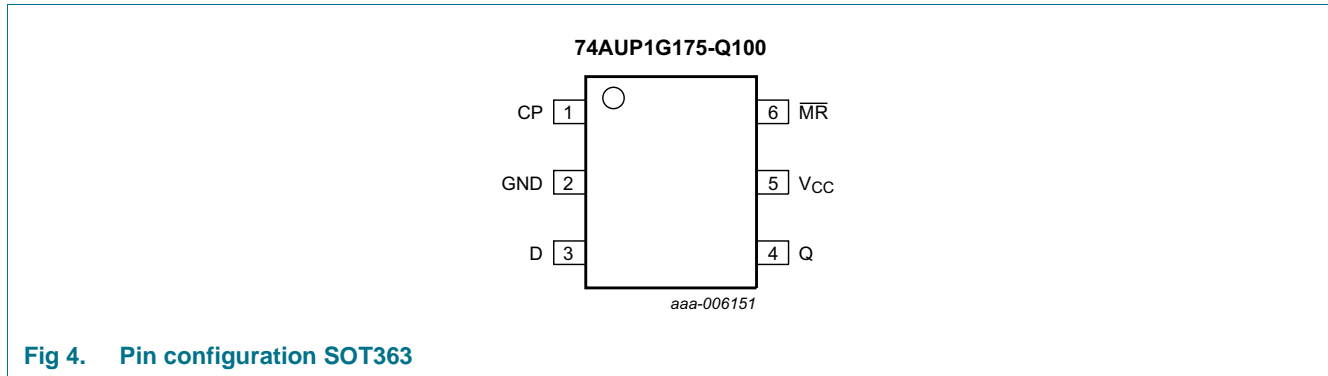


Fig 4. Pin configuration SOT363

### 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
MR	6	master reset input (active LOW)

## 7. Functional description

Table 4. Function table<sup>[1]</sup>

Operating mode	Input			Output Q
	MR	CP	D	
Reset (clear)	L	X	X	L
Load '1'	H	↑	h	H
Load '0'	H	↑	l	L

[1] 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.

## 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 SC-88 packages: above 87.5 °C the value of  $P_{tot}$  derates linearly with 4.0 mW/K.

## 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>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
		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	<a href="#">[1]</a>	-	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

**Table 7. Static characteristics ...continued**

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

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
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>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

**Table 7. Static characteristics ...continued**

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

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
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>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
		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 [Figure 7](#).

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



**Table 8. Dynamic characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	
<b>C<sub>L</sub> = 10 pF</b>									
t <sub>pd</sub>	propagation delay	CP to Q; see <a href="#">Figure 5</a>	<a href="#">[2]</a>						
		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	13.6	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.3	4.8	7.9	2.0	8.4	8.7	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.1	3.9	6.1	1.8	6.6	6.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	3.0	4.3	1.5	4.7	5.0	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.6	2.7	3.6	1.3	4.0	4.2	ns
		MR to Q; see <a href="#">Figure 6</a>	<a href="#">[2]</a>						
		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	13.6	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.5	4.4	6.1	2.4	7.6	7.8	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.5	3.7	5.7	2.2	6.3	6.3	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.1	3.2	4.3	1.9	4.7	4.9	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	3.0	3.9	1.8	4.1	4.3	ns
f <sub>max</sub>	maximum frequency	CP; see <a href="#">Figure 5</a>							
		V <sub>CC</sub> = 0.8 V	-	50	-	-	-	-	MHz
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	190	-	150	-	-	MHz
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	320	-	280	-	-	MHz
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	420	-	310	-	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	485	-	370	-	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	550	-	410	-	-	MHz
<b>C<sub>L</sub> = 15 pF</b>									
t <sub>pd</sub>	propagation delay	CP to Q; see <a href="#">Figure 5</a>	<a href="#">[2]</a>						
		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	15.4	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	2.7	5.3	8.7	2.3	9.4	9.9	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.3	4.4	6.8	2.1	7.4	7.9	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.1	3.5	5.0	1.9	5.3	5.6	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	3.1	4.3	1.7	4.7	4.9	ns
		MR to Q; see <a href="#">Figure 6</a>	<a href="#">[2]</a>						
		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	15.2	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.1	5.0	6.8	2.6	8.6	9.1	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.5	4.3	6.5	2.5	7.2	7.4	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	2.6	3.7	5.0	2.2	5.4	5.5	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.4	3.5	4.4	2.1	4.8	5.0	ns

**Table 8. Dynamic characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C			Unit		
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)			
f <sub>max</sub>	maximum frequency	CP; see <a href="#">Figure 5</a>									
		V <sub>CC</sub> = 0.8 V	-	50	-	-	-	-	MHz		
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	180	-	120	-	-	MHz		
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	300	-	190	-	-	MHz		
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	405	-	240	-	-	MHz		
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	420	-	300	-	-	MHz		
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	480	-	320	-	-	MHz		
<b>C<sub>L</sub> = 30 pF</b>											
t <sub>pd</sub>	propagation delay	CP to Q; see <a href="#">Figure 5</a>									
		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	21.0	ns		
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.3	6.9	11.2	3.2	12.4	13.0	ns		
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.1	5.7	8.8	2.9	9.6	10.2	ns		
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.0	4.6	6.4	2.6	6.9	7.3	ns		
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.8	4.2	5.7	2.5	6.5	6.9	ns		
		MR to Q; see <a href="#">Figure 6</a>									
		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	19.8	ns		
		V <sub>CC</sub> = 1.4 V to 1.6 V	3.9	6.6	8.9	3.6	11.6	12.2	ns		
		V <sub>CC</sub> = 1.65 V to 1.95 V	3.6	5.6	8.6	3.4	9.6	9.7	ns		
		V <sub>CC</sub> = 2.3 V to 2.7 V	3.5	4.8	6.4	2.9	7.2	7.2	ns		
		V <sub>CC</sub> = 3.0 V to 3.6 V	3.3	4.6	5.7	3.1	6.4	6.9	ns		
		f <sub>max</sub>	maximum frequency	CP; see <a href="#">Figure 5</a>							
				V <sub>CC</sub> = 0.8 V	-	35	-	-	-	-	MHz
				V <sub>CC</sub> = 1.1 V to 1.3 V	-	130	-	70	-	-	MHz
V <sub>CC</sub> = 1.4 V to 1.6 V	-			200	-	120	-	-	MHz		
V <sub>CC</sub> = 1.65 V to 1.95 V	-			240	-	150	-	-	MHz		
V <sub>CC</sub> = 2.3 V to 2.7 V	-			275	-	190	-	-	MHz		
V <sub>CC</sub> = 3.0 V to 3.6 V	-			300	-	200	-	-	MHz		

**Table 8. Dynamic characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

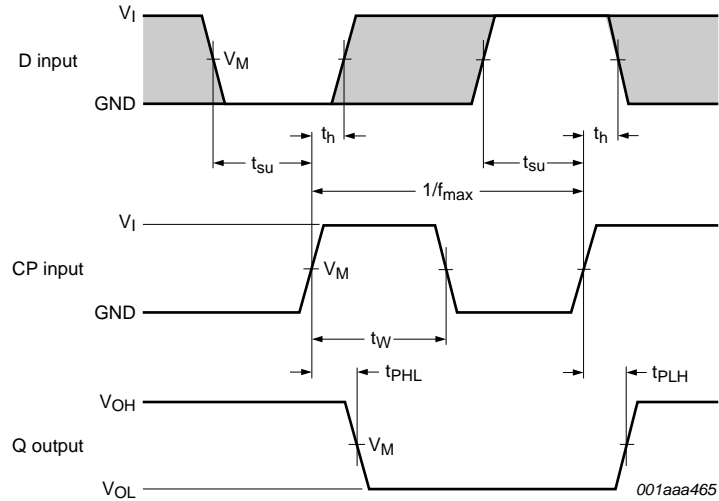
Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	
<b>C<sub>L</sub> = 5 pF, 10 pF, 15 pF and 30 pF</b>									
t <sub>W</sub>	pulse width	CP; HIGH or LOW; see <a href="#">Figure 5</a>							
		V <sub>CC</sub> = 0.8 V	-	5.25	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	1.6	-	1.5	-	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	1.0	-	0.9	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.75	-	0.7	-	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.6	-	0.4	-	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.55	-	0.4	-	-	ns
		MR; LOW; see <a href="#">Figure 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	-	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	1.75	-	2.5	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	1.35	-	1.8	-	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.9	-	1.1	-	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.8	-	0.8	-	-	ns
t <sub>rec</sub>	recovery time	MR; see <a href="#">Figure 6</a>							
		V <sub>CC</sub> = 0.8 V	-	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	-1.1	-	-1.2	-	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	-2.0	-	-0.8	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	-0.5	-	-0.7	-	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-0.9	-	-0.4	-	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-1.0	-	-0.2	-	-	ns
t <sub>su(H)</sub>	set-up time HIGH	D to CP; see <a href="#">Figure 5</a>							
		V <sub>CC</sub> = 0.8 V	-	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	0.5	-	1.2	-	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	0.4	-	0.8	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.3	-	0.6	-	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.3	-	0.5	-	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.2	-	0.5	-	-	ns
t <sub>su(L)</sub>	set-up time LOW	D to CP; see <a href="#">Figure 5</a>							
		V <sub>CC</sub> = 0.8 V	-	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	0.8	-	1.7	-	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	0.6	-	1.1	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	0.4	-	0.9	-	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	0.4	-	0.9	-	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	0.5	-	0.9	-	-	ns

**Table 8. Dynamic characteristics ...continued**  
 Voltages are referenced to GND (ground = 0 V); for test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	25 °C			-40 °C to +125 °C			Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max (85 °C)	Max (125 °C)	
t <sub>h</sub>	hold time	D to CP; see <a href="#">Figure 5</a>							
		V <sub>CC</sub> = 0.8 V	-	-	-	-	-	-	ns
		V <sub>CC</sub> = 1.1 V to 1.3 V	-	-0.7	-	+0.2	-	-	ns
		V <sub>CC</sub> = 1.4 V to 1.6 V	-	-0.5	-	0	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	-0.5	-	0	-	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-0.3	-	0	-	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	-0.4	-	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> <sup>[3]</sup>							
		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

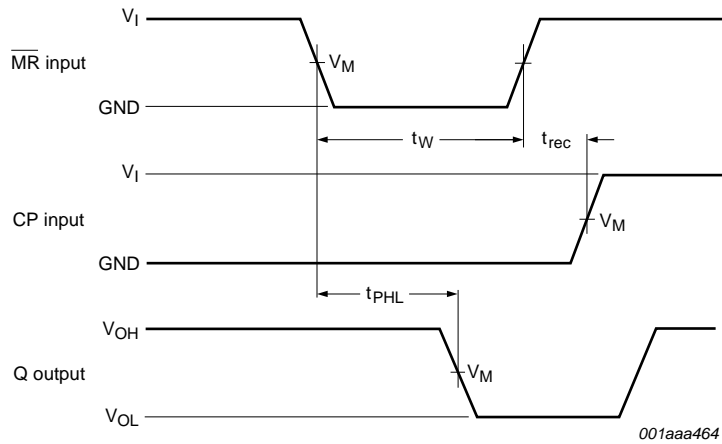
[1] All typical values are measured at nominal V<sub>CC</sub>.  
 [2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.  
 [3] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$  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;  
 $\Sigma(C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

12. Waveforms



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 drop that occur with the output load.

**Fig 5. Clock input (CP) to output (Q) propagation delays, clock pulse width and maximum input frequency, the D to CP set-up and the CP to D hold times**

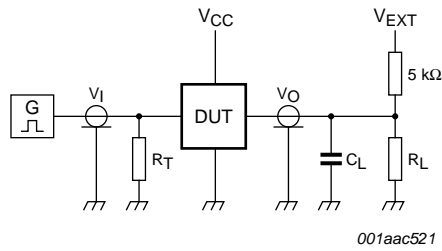


Measurement points are given in [Table 9](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage drop that occur with the output load.

**Fig 6. Master reset (MR) input to output (Q) propagation delays, pulse width and the 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



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 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,  $R_L = 1 \text{ M}\Omega$ .

13. Package outline

Plastic surface-mounted package; 6 leads

SOT363

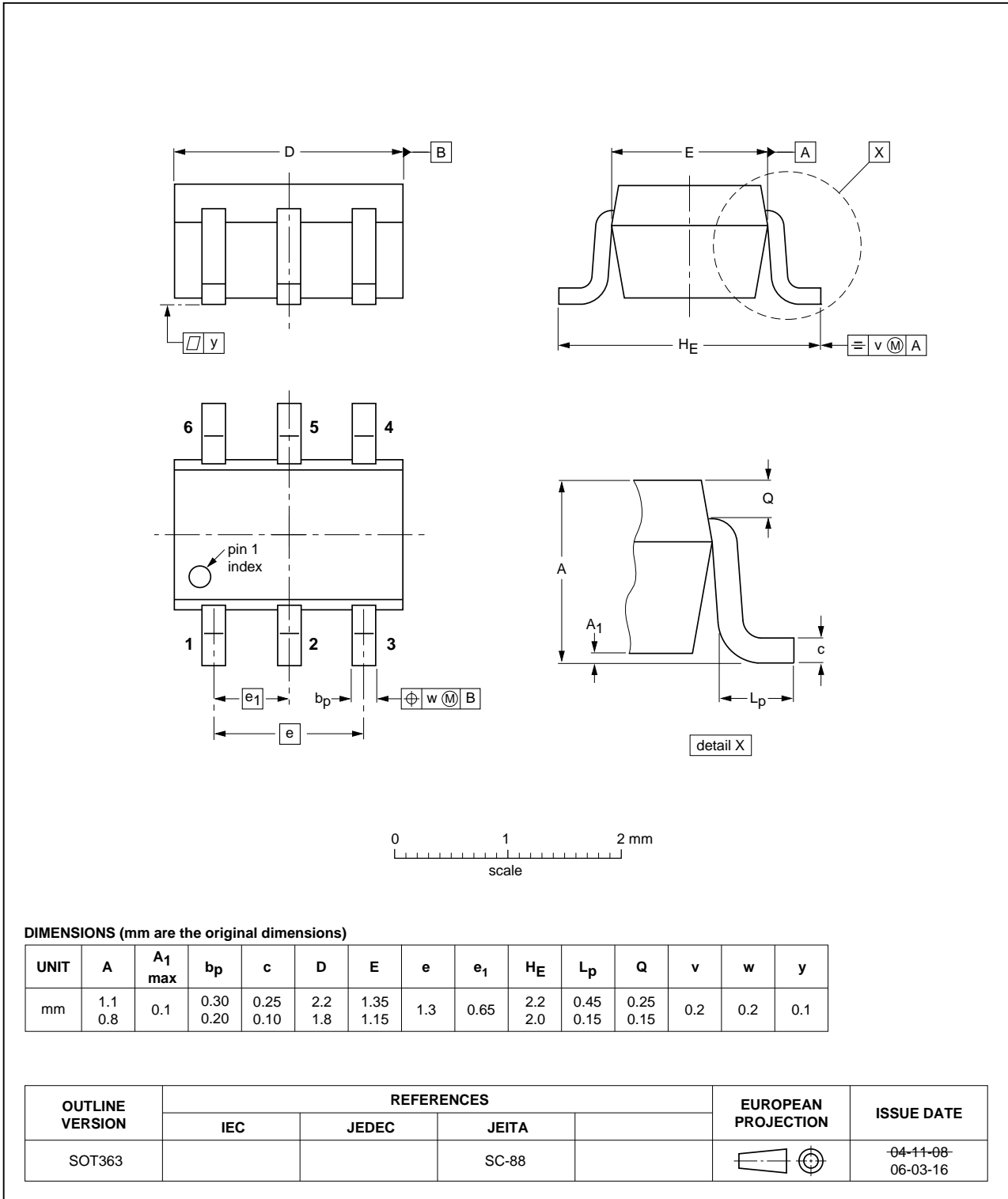


Fig 8. Package outline SOT363 (SC-88)

## 14. Abbreviations

Table 11. Abbreviations

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

## 15. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AUP1G175_Q100 v.1	20130131	Product data sheet	-	-



## 16. Legal information

### 16.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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".

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