



# 74HC1G08-Q100; 74HCT1G08-Q100

## 2-input AND gate

Rev. 6 — 23 September 2024

Product data sheet

## 1. General description

The 74HC1G08-Q100; 74HCT1G08-Q100 is a single 2-input AND gate. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of  $V_{CC}$ .

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 2.0 V to 6.0 V
- CMOS low power dissipation
- High noise immunity
- Symmetrical output impedance
- Balanced propagation delays
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Input levels:
  - For 74HC1G08-Q100: CMOS level
  - For 74HCT1G08-Q100: TTL level
- Complies with JEDEC standards:
  - JESD8C (2.7 V to 3.6 V)
  - JESD7A (2.0 V to 6.0 V)
- ESD protection:
  - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 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="#">74HC1G08GW-Q100</a> <a href="#">74HCT1G08GW-Q100</a>	-40 °C to +125 °C	TSSOP5	plastic thin shrink small outline package; 5 leads; body width 1.25 mm		<a href="#">SOT353-1</a>
<a href="#">74HC1G08GV-Q100</a> <a href="#">74HCT1G08GV-Q100</a>	-40 °C to +125 °C	SC-74A	plastic surface-mounted package; 5 leads		<a href="#">SOT753</a>
<a href="#">74HC1G08GZ-Q100</a> <a href="#">74HCT1G08GZ-Q100</a>	-40 °C to +125 °C	XSON5	plastic thermal enhanced extremely thin small outline package with side-wettable flanks (SWF); no leads; 5 terminals; body 1.1 × 0.85 × 0.5 mm		<a href="#">SOT8065-1</a>

## 4. Marking

Table 2. Marking codes

Type number	Marking[1]
74HC1G08GW-Q100	HE
74HCT1G08GW-Q100	TE
74HC1G08GV-Q100	H08
74HCT1G08GV-Q100	T08
74HC1G08GZ-Q100	HE
74HCT1G08GZ-Q100	TE

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

## 5. Functional diagram

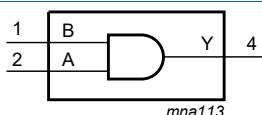


Fig. 1. Logic symbol

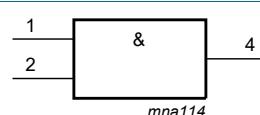


Fig. 2. IEC logic symbol

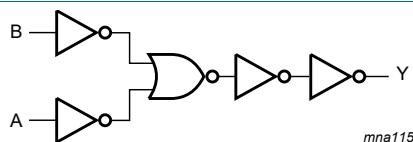
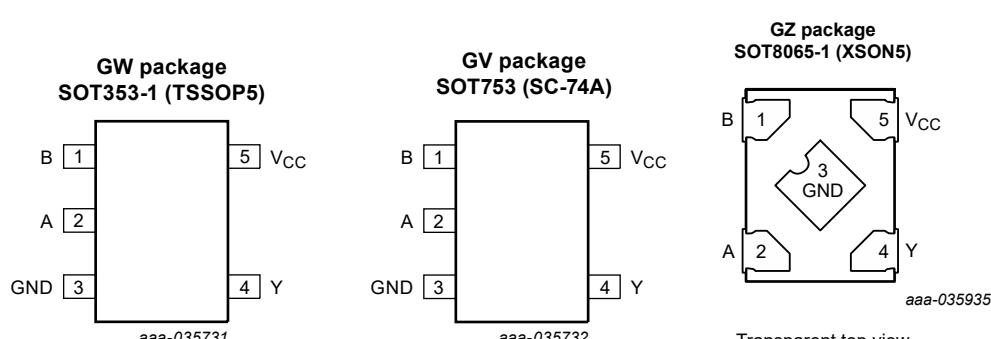


Fig. 3. Logic diagram

## 6. Pinning information

### 6.1. Pinning



## 6.2. Pin description

**Table 3. Pin description**

Symbol	Pin	Description
B	1	data input
A	2	data input
GND	3	ground (0 V)
Y	4	data output
V <sub>CC</sub>	5	supply voltage

## 7. Functional description

**Table 4. Function table**

*H* = HIGH voltage level; *L* = LOW voltage level.

Input		Output
A	B	Y
L	L	L
L	H	L
H	L	L
H	H	H

## 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). [\[1\]](#)

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		-0.5	+7.0	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V	-	±20	mA
I <sub>OK</sub>	output clamping current	V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V	-	±20	mA
I <sub>O</sub>	output current	-0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V	-	±12.5	mA
I <sub>CC</sub>	supply current		-	25	mA
I <sub>GND</sub>	ground current		-25	-	mA
T <sub>stg</sub>	storage temperature		-65	+150	°C
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> = -40 °C to +125 °C	[2]	-	mW

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

[2] For SOT353-1 (TSSOP5) package: P<sub>tot</sub> derates linearly with 3.3 mW/K above 74 °C.

For SOT753 (SC-74A) package: P<sub>tot</sub> derates linearly with 3.8 mW/K above 85 °C.

For SOT8065-1 (XSON5) package: P<sub>tot</sub> derates linearly with 3.2 mW/K above 72 °C.

## 9. Recommended operating conditions

**Table 6. Recommended operating conditions**

Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	74HC1G08-Q100			74HCT1G08-Q100			Unit
			Min	Typ	Max	Min	Typ	Max	
V <sub>CC</sub>	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V <sub>I</sub>	input voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
V <sub>O</sub>	output voltage		0	-	V <sub>CC</sub>	0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 2.0 V	-	-	625	-	-	-	ns/V
		V <sub>CC</sub> = 4.5 V	-	-	139	-	-	139	ns/V
		V <sub>CC</sub> = 6.0 V	-	-	83	-	-	-	ns/V

## 10. Static characteristics

**Table 7. Static characteristics**

Voltages are referenced to GND (ground = 0 V). All typical values are measured at T<sub>amb</sub> = 25 °C.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C			Unit
			Min	Typ	Max	Min	Max	Unit	
<b>74HC1G08-Q100</b>									
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	1.2	-	1.5	-	V	
		V <sub>CC</sub> = 4.5 V	3.15	2.4	-	3.15	-	V	
		V <sub>CC</sub> = 6.0 V	4.2	3.2	-	4.2	-	V	
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	0.8	0.5	-	0.5	V	
		V <sub>CC</sub> = 4.5 V	-	2.1	1.35	-	1.35	V	
		V <sub>CC</sub> = 6.0 V	-	2.8	1.8	-	1.8	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> = 2.0 V	1.9	2.0	-	1.9	-	V	
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	V	
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	6.0	-	5.9	-	V	
		I <sub>O</sub> = -2.0 mA; V <sub>CC</sub> = 4.5 V	4.13	4.32	-	3.7	-	V	
		I <sub>O</sub> = -2.6 mA; V <sub>CC</sub> = 6.0 V	5.63	5.81	-	5.2	-	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> = 2.0 V	-	0	0.1	-	0.1	V	
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	V	
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	0	0.1	-	0.1	V	
		I <sub>O</sub> = 2.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.33	-	0.4	V	
		I <sub>O</sub> = 2.6 mA; V <sub>CC</sub> = 6.0 V	-	0.16	0.33	-	0.4	V	
I <sub>I</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	1.0	-	1.0	μA	
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V	-	-	10	-	20	μA	
C <sub>I</sub>	input capacitance		-	1.5	-	-	-	pF	

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
<b>74HCT1G08-Q100</b>								
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	2.0	1.6	-	2.0	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$	-	1.2	0.8	-	0.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}$						
		$I_O = -20 \mu\text{A}; V_{CC} = 4.5 \text{ V}$	4.4	4.5	-	4.4	-	V
		$I_O = -2.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	4.13	4.32	-	3.7	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH} \text{ or } V_{IL}$						
		$I_O = 20 \mu\text{A}; V_{CC} = 4.5 \text{ V}$	-	0	0.1	-	0.1	V
		$I_O = 2.0 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	0.15	0.33	-	0.4	V
$I_I$	input leakage current	$V_I = V_{CC} \text{ or GND}; V_{CC} = 5.5 \text{ V}$	-	-	1.0	-	1.0	$\mu\text{A}$
$I_{CC}$	supply current	$V_I = V_{CC} \text{ or GND}; I_O = 0 \text{ A}; V_{CC} = 5.5 \text{ V}$	-	-	10	-	20	$\mu\text{A}$
$\Delta I_{CC}$	additional supply current	per input; $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V}$ ; $V_I = V_{CC} - 2.1 \text{ V}; I_O = 0 \text{ A}$	-	-	500	-	850	$\mu\text{A}$
$C_I$	input capacitance		-	1.5	-	-	-	pF

## 11. Dynamic characteristics

**Table 8. Dynamic characteristics**

$GND = 0 \text{ V}$ ;  $t_r = t_f \leq 6.0 \text{ ns}$ ; All typical values are measured at  $T_{amb} = 25 \text{ }^\circ\text{C}$ . For test circuit see Fig. 5.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	
<b>74HC1G08-Q100</b>								
$t_{pd}$	propagation delay	A and B to Y; see Fig. 4 [1]						
		$V_{CC} = 2.0 \text{ V}; C_L = 50 \text{ pF}$	-	25	115	-	135	ns
		$V_{CC} = 4.5 \text{ V}; C_L = 50 \text{ pF}$	-	9	23	-	27	ns
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$	-	7	-	-	-	ns
		$V_{CC} = 6.0 \text{ V}; C_L = 50 \text{ pF}$	-	8	20	-	23	ns
$C_{PD}$	power dissipation capacitance	$V_I = GND \text{ to } V_{CC}$ [2]	-	19	-	-	-	pF
<b>74HCT1G08-Q100</b>								
$t_{pd}$	propagation delay	A and B to Y; see Fig. 4 [1]						
		$V_{CC} = 4.5 \text{ V}; C_L = 50 \text{ pF}$	-	11	23	-	27	ns
		$V_{CC} = 5.0 \text{ V}; C_L = 15 \text{ pF}$	-	11	-	-	-	ns
$C_{PD}$	power dissipation capacitance	$V_I = GND \text{ to } V_{CC} - 1.5 \text{ V}$ [2]	-	21	-	-	-	pF

[1]  $t_{pd}$  is the same as  $t_{PLH}$  and  $t_{PHL}$ .

[2]  $C_{PD}$  is used to determine the dynamic power dissipation  $P_D$  ( $\mu\text{W}$ ).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum(C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$  = input frequency in MHz;

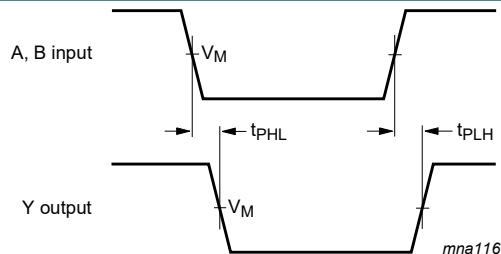
$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$$\sum(C_L \times V_{CC}^2 \times f_o) = \text{sum of outputs.}$$

### 11.1. Waveform and test circuit



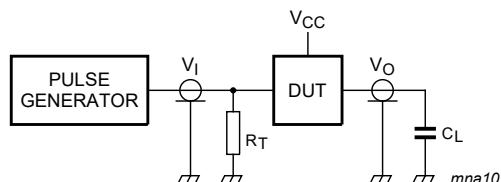
For 74HC1G08-Q100:  $V_M = 0.5V_{CC}$ ;

$V_I = \text{GND to } V_{CC}$

For 74HCT1G08-Q100:  $V_M = 1.3 \text{ V}$ ;

$V_I = \text{GND to } 3.0 \text{ V}$

**Fig. 4. The input (A and B) to output (Y) propagation delays**



Test data is given in [Table 8](#). Definitions for test circuit:

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

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

**Fig. 5. Test circuit for measuring switching times**

## 12. Package outline

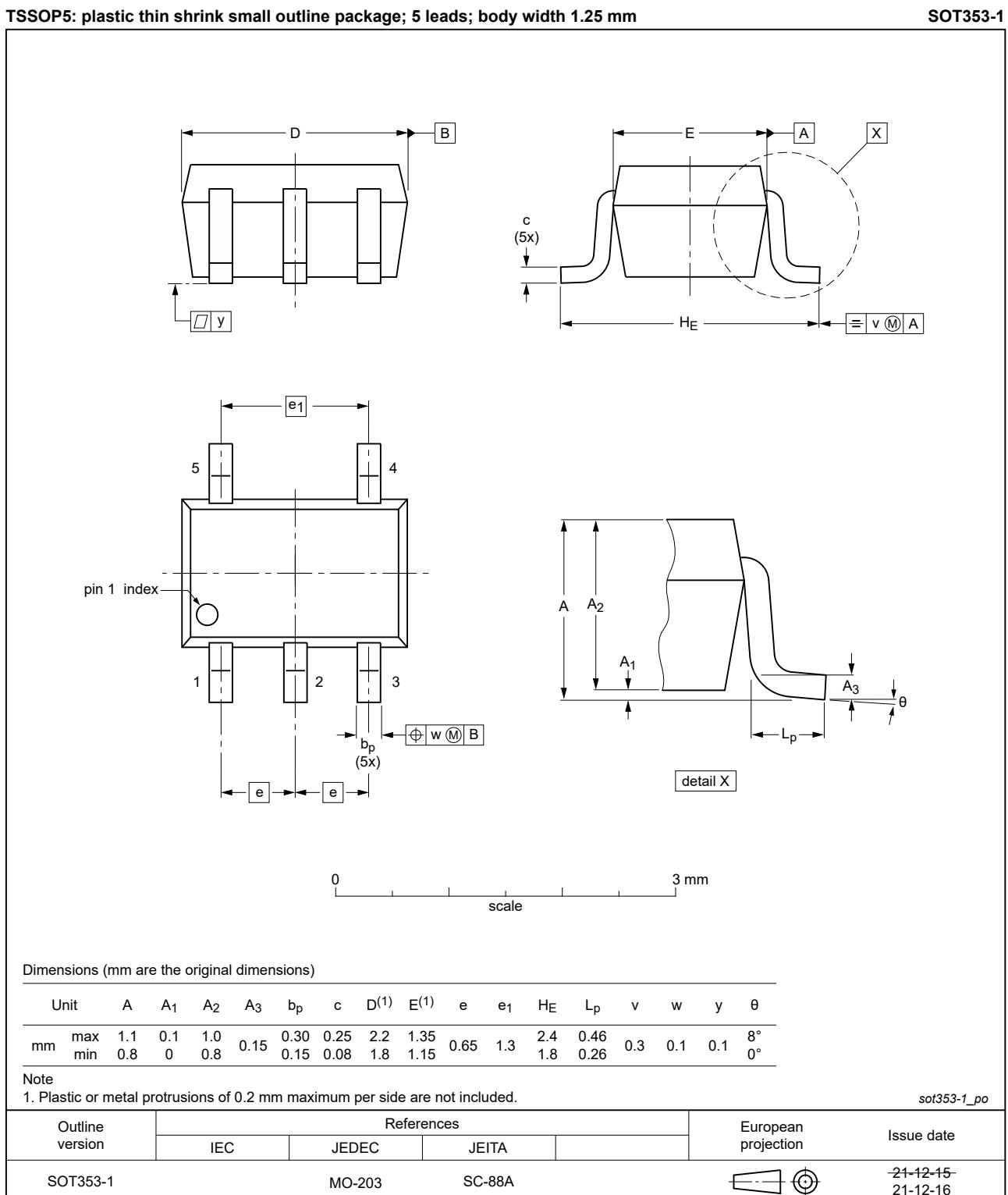


Fig. 6. Package outline SOT353-1 (TSSOP5)

## Plastic surface-mounted package; 5 leads

SOT753

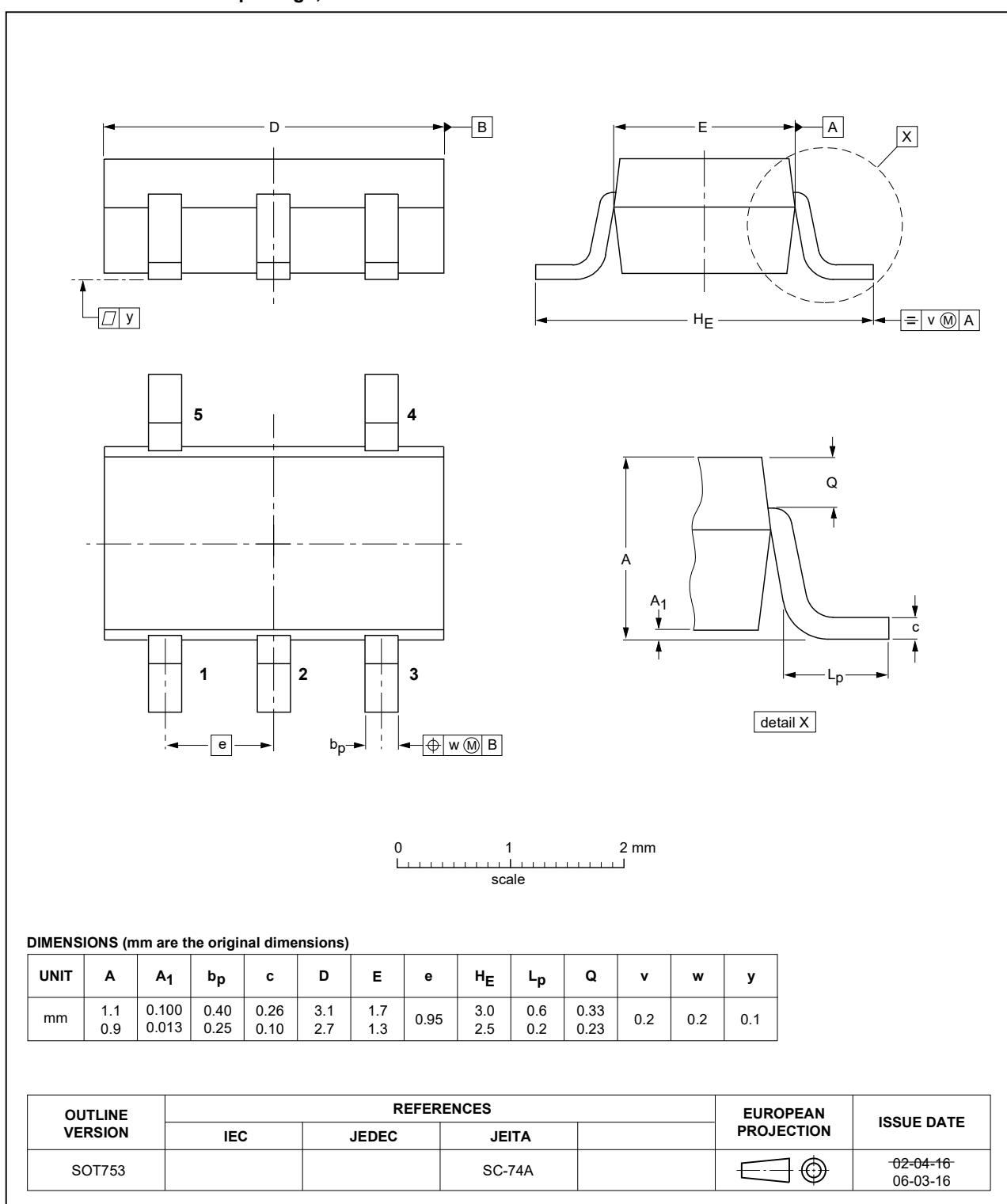


Fig. 7. Package outline SOT753 (SC-74A)

**XSON5: Plastic thermal enhanced extremely thin small outline package with side-wettable flanks (SWF); no leads; 5 terminals; body  $1.1 \times 0.85 \times 0.5$  mm**

SOT8065-1

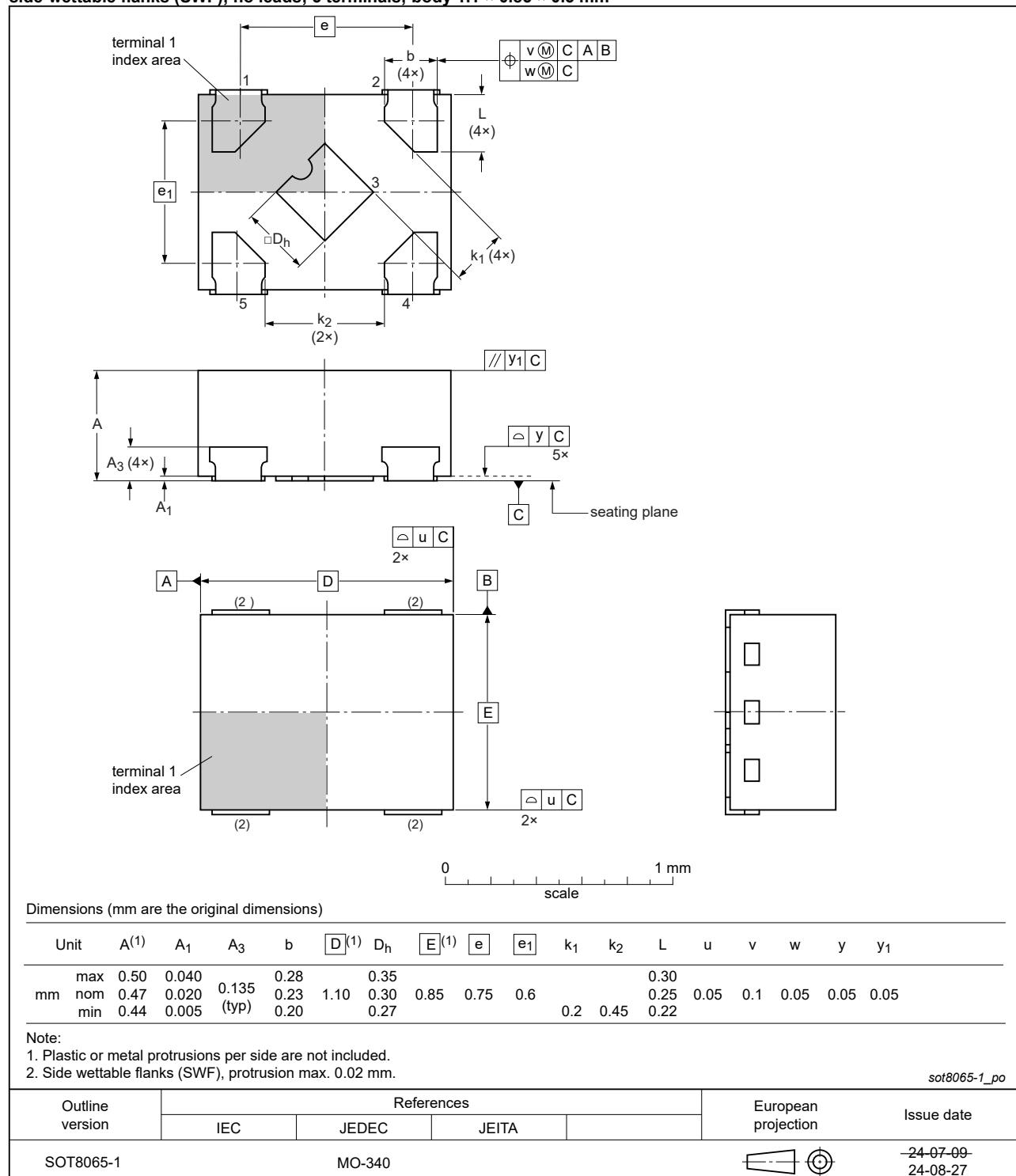


Fig. 8. Package outline SOT8065-1 (XSON5)

## 13. Abbreviations

**Table 9. Abbreviations**

Acronym	Description
ANSI	American National Standards Institute
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
HBM	Human Body Model
JEDEC	Joint Electron Device Engineering Council
TTL	Transistor-Transistor Logic

## 14. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT1G08_Q100 v.6	20240923	Product data sheet	-	74HC_HCT1G08_Q100 v.4
Modifications:				<ul style="list-style-type: none"> <li>Type number 74HC1G08GZ-Q100 (SOT8065-1/XSON5) added.</li> </ul>
74HC_HCT1G08_Q100 v.5.1	20240830	Product data sheet	-	74HC_HCT1G08_Q100 v.5
Modifications:				<ul style="list-style-type: none"> <li><a href="#">Fig. 8</a>: Added JEDEC reference MO-340 to SOT8065-1 package outline drawing.</li> </ul>
74HC_HCT1G08_Q100 v.5	20240715	Product data sheet	-	74HC_HCT1G08_Q100 v.4
Modifications:				<ul style="list-style-type: none"> <li>Type number 74HCT1G08GZ-Q100 (SOT8065-1/XSON5) added.</li> </ul>
74HC_HCT1G08_Q100 v.4	20240621	Product data sheet	-	74HC_HCT1G08_Q100 v.3
Modifications:				<ul style="list-style-type: none"> <li><a href="#">Section 2</a>: ESD specifications updated according to the latest JEDEC standard.</li> </ul>
74HC_HCT1G08_Q100 v.3	20220117	Product data sheet	-	74HC_HCT1G08_Q100 v.2
Modifications:				<ul style="list-style-type: none"> <li><a href="#">Section 1</a> and <a href="#">Section 2</a> updated.</li> <li><a href="#">Section 8</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> <li><a href="#">Fig. 6</a>: Package outline drawing SOT353-1 (TSSOP5) has changed.</li> </ul>
74HC_HCT1G08_Q100 v.2	20120816	Product data sheet	-	74HC_HCT1G08_Q100 v.1
Modifications:				<ul style="list-style-type: none"> <li>Added pin 1 location note (<a href="#">Table 2</a>)</li> </ul>
74HC_HCT1G08_Q100 v.1	20120605	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".
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