74HCS08

Quad 2-input AND gate with Schmitt-trigger inputs

Rev. 1 — 24 June 2025 Product data sheet

1. General description

The 74HCS08 is a quad 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}.

All inputs are Schmitt-trigger inputs, capable of transforming slowly changing input signals into sharply defined, jitter-free output signals.

2. Features and benefits

- Wide supply voltage range from 2.0 V to 6.0 V
- Schmitt-trigger inputs
- Low power consumption
  - Typical supply current (I_{CC}) of 100 nA
  - Typical input leakage current (I_I) of ±10 nA
- ±7.8 mA output drive at 6 V
- Latch-up performance exceeds 100 mA per JESD 78 Class II Level B
- Complies with JEDEC standards:
  - JESD7A (2.0 V to 6.0 V)
- ESD protection:
  - HBM ANSI/ESDA/JEDEC JS-001 class 3A exceeds 4000 V
  - CDM ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1500 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HCS08D	-40 °C to +125 °C	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1
74HCS08PW	-40 °C to +125 °C	TSSOP14	plastic thin shrink small outline package; 14 leads; body width 4.4 mm	SOT402-1
74HCS08BQ	-40 °C to +125 °C	DHVQFN14	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 × 3 × 0.85 mm	SOT762-1

4. Functional diagram

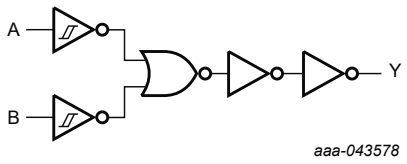


Fig. 1. Logic diagram (one gate)

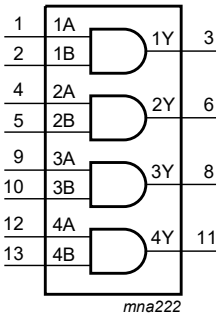


Fig. 2. Logic symbol

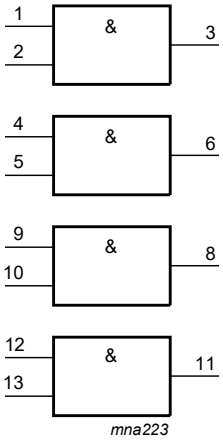
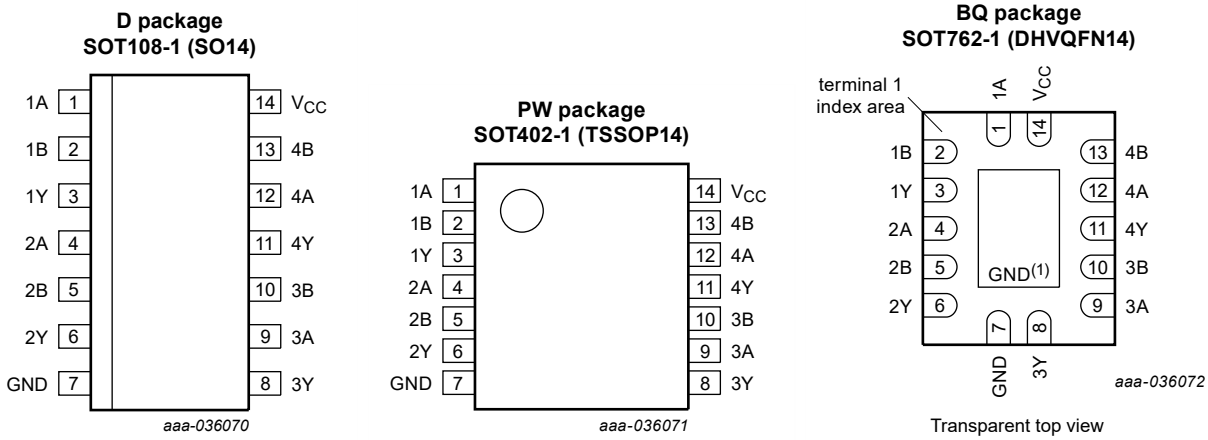


Fig. 3. IEC logic symbol

5. Pinning information

5.1. Pinning



(1) This is not a ground pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to GND.

5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
1A, 2A, 3A, 4A	1, 4, 9, 12	data input
1B, 2B, 3B, 4B	2, 5, 10, 13	data input
1Y, 2Y, 3Y, 4Y	3, 6, 8, 11	data output
GND	7	ground (0 V)
V_{CC}	14	supply voltage

6. Functional description

Table 3. Function table

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

Input		Output
nA	**nB**	**nY**
L	L	L
L	H	L
H	L	L
H	H	H

7. Limiting values

Table 4. 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	+7	V
I_{IK}	input clamping current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V [1]	-	±20	mA
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V [1]	-	±20	mA
I_O	output current	V_O = 0 V to V_{CC}	-	±35	mA
I_{CC}	supply current		-	70	mA
I_{GND}	ground current		-70	-	mA
T_j	junction temperature	[2]	-	+150	°C
T_{stg}	storage temperature		-65	+150	°C
V_{ESD}	electrostatic discharge	HBM ANSI/ESDA/JEDEC JS-001 class 3A exceeds 4000 V	-	±4000	V
		CDM ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1500 V	-	±1500	V
P_{tot}	total power dissipation	[3]	-	500	mW

[1] The minimum input and output voltage ratings may be exceeded if the input and output current ratings are observed.
[2] Guaranteed by design.
[3] For SOT108-1 (SO14) package: P_{tot} derates linearly with 10.1 mW/K above 100 °C.
For SOT402-1 (TSSOP14) package: P_{tot} derates linearly with 7.3 mW/K above 81 °C.
For SOT762-1 (DHVQFN14) package: P_{tot} derates linearly with 9.6 mW/K above 98 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CC}	supply voltage		2.0	5.0	6.0	V
V_I	input voltage		0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	°C

9. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
V_{T+}	positive-going threshold voltage	see Fig. 4 and Fig. 5								
		V_{CC} = 2.0 V	0.7	-	1.5	0.7	1.5	0.7	1.5	V
		V_{CC} = 4.5 V	1.7	-	3.15	1.7	3.15	1.7	3.15	V
		V_{CC} = 6 V	2.1	-	4.2	2.1	4.2	2.1	4.2	V
		V_{CC} = 3.0 V to 3.6 V	$0.4V_{CC}$	-	$0.7V_{CC}$	$0.4V_{CC}$	$0.7V_{CC}$	$0.4V_{CC}$	$0.7V_{CC}$	V
		V_{CC} = 4.5 V to 5.5 V	$0.38V_{CC}$	-	$0.7V_{CC}$	$0.38V_{CC}$	$0.7V_{CC}$	$0.38V_{CC}$	$0.7V_{CC}$	V
V_{T-}	negative-going threshold voltage	see Fig. 4 and Fig. 5								
		V_{CC} = 2.0 V	0.3	-	1.0	0.3	1.0	0.3	1.0	V
		V_{CC} = 4.5 V	0.9	-	2.2	0.9	2.2	0.9	2.2	V
		V_{CC} = 6 V	1.2	-	3.0	1.2	3.0	1.2	3.0	V
		V_{CC} = 3.0 V to 3.6 V	$0.2V_{CC}$	-	$0.5V_{CC}$	$0.2V_{CC}$	$0.5V_{CC}$	$0.2V_{CC}$	$0.5V_{CC}$	V
		V_{CC} = 4.5 V to 5.5 V	$0.2V_{CC}$	-	$0.49V_{CC}$	$0.2V_{CC}$	$0.49V_{CC}$	$0.2V_{CC}$	$0.49V_{CC}$	V
V_H	hysteresis voltage[1]	see Fig. 4 and Fig. 5								
		V_{CC} = 2.0 V	0.2	0.52	1.0	0.2	1.0	0.2	1.0	V
		V_{CC} = 4.5 V	0.4	0.85	1.4	0.4	1.4	0.4	1.4	V
		V_{CC} = 6 V	0.6	1.1	1.6	0.6	1.6	0.6	1.6	V
		V_{CC} = 3.0 V to 3.6 V	$0.1V_{CC}$	0.72	$0.38V_{CC}$	$0.1V_{CC}$	$0.38V_{CC}$	$0.1V_{CC}$	$0.38V_{CC}$	V
		V_{CC} = 4.5 V to 5.5 V	$0.09V_{CC}$	0.94	$0.29V_{CC}$	$0.09V_{CC}$	$0.29V_{CC}$	$0.09V_{CC}$	$0.29V_{CC}$	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}								
		I_{OH} = -20 µA; V_{CC} = 2.0 V to 6 V	V_{CC}-0.1	V_{CC}-0.002	-	V_{CC}-0.1	-	V_{CC}-0.1	-	V
		I_{OH} = -4 mA; V_{CC} = 3.0 V	2.7	2.85	-	2.7	-	2.7	-	V
		I_{OH} = -6 mA; V_{CC} = 4.5 V	4.0	4.3	-	4.0	-	4.0	-	V
		I_{OH} = -7.8 mA; V_{CC} = 6.0 V	5.48	5.75	-	5.4	-	5.4	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}								
		I_{OL} = 20 µA; V_{CC} = 2.0 V to 6 V	-	0.002	0.1	-	0.1	-	0.1	V
		I_{OL} = 4 mA; V_{CC} = 3.0 V	-	0.14	0.25	-	0.25	-	0.25	V
		I_{OL} = 6 mA; V_{CC} = 4.5 V	-	0.18	0.26	-	0.30	-	0.30	V
		I_{OL} = 7.8 mA; V_{CC} = 6.0 V	-	0.22	0.26	-	0.33	-	0.33	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 6.0 V	-	±0.01	±0.1	-	±0.25	-	±1.0	µA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 6.0 V	-	0.1	-	-	0.5	-	2.0	µA

[1] Guaranteed by design.

9.1. Transfer characteristic waveforms and graphs

9.1.1. For inputs

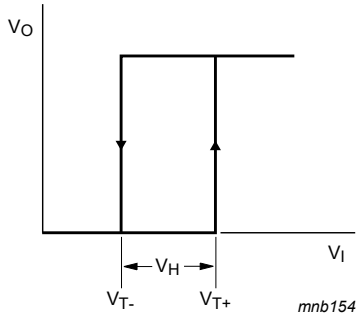


Fig. 4. Transfer characteristic

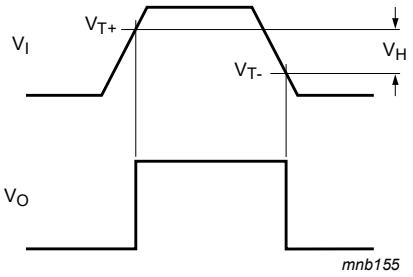
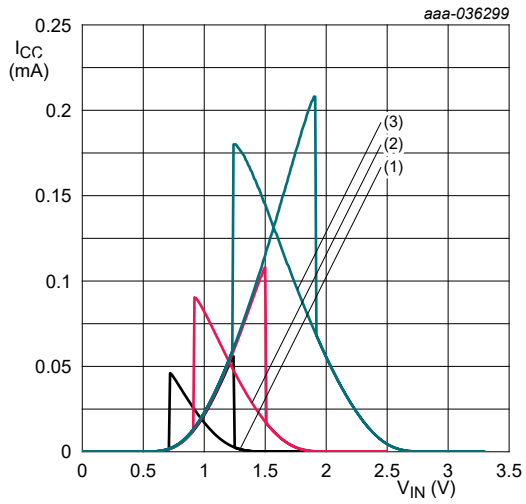
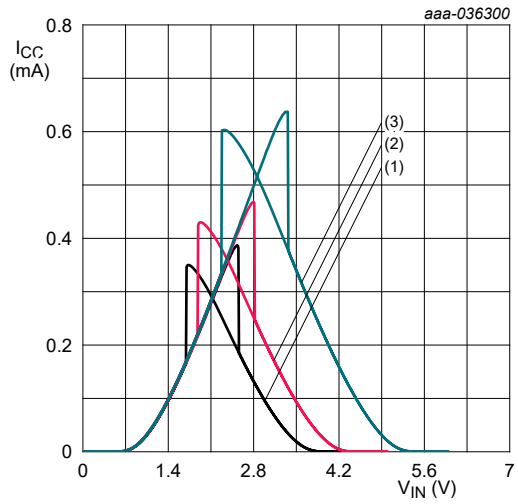


Fig. 5. Definitions of V_{T+}, V_{T-} and V_H



(1) V_{CC} = 2.0 V
(2) V_{CC} = 2.5 V
(3) V_{CC} = 3.3 V

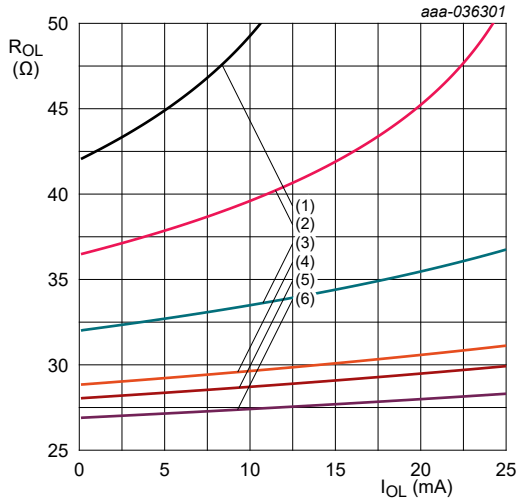
Fig. 6. Typical supply current vs the input voltage



(1) V_{CC} = 4.5 V
(2) V_{CC} = 5.0 V
(3) V_{CC} = 6.0 V

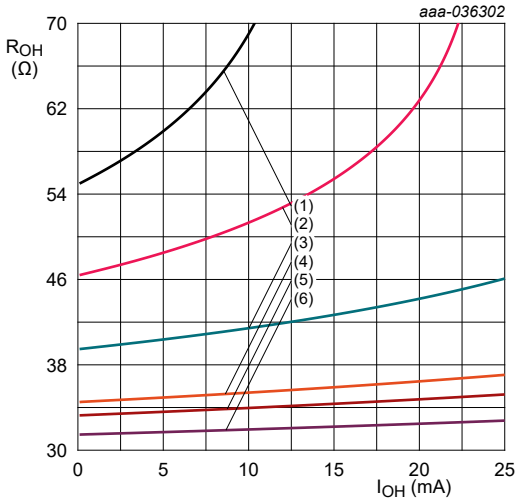
Fig. 7. Typical supply current vs the input voltage

9.1.2. For outputs



(1) V_{CC} = 2.0 V
(2) V_{CC} = 2.5 V
(3) V_{CC} = 3.3 V
(4) V_{CC} = 4.5 V
(5) V_{CC} = 5.0 V
(6) V_{CC} = 6.0 V

Fig. 8. Typical LOW-level output resistance as function of the output current



(1) V_{CC} = 2.0 V
(2) V_{CC} = 2.5 V
(3) V_{CC} = 3.3 V
(4) V_{CC} = 4.5 V
(5) V_{CC} = 5.0 V
(6) V_{CC} = 6.0 V

Fig. 9. Typical HIGH-level output resistance as function of the output current

10. Dynamic characteristics

Table 7. Dynamic characteristics

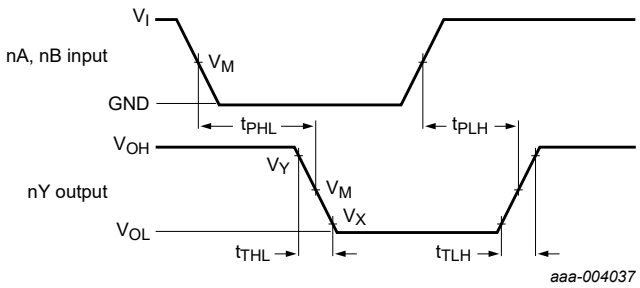
Voltages are referenced to GND (ground = 0 V); for test circuit see Section 10.1.

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_{pd}	propagation delay	nA, nB to nY; see Fig. 10 [2]								
		V_{CC} = 2 V	-	14	28	-	34	-	36	ns
		V_{CC} = 4.5 V	-	7	11	-	12	-	13	ns
		V_{CC} = 6 V	-	6	10	-	11	-	12	ns
		V_{CC} = 3.0 V to 3.6 V	-	8	14	-	17	-	18	ns
		V_{CC} = 4.5 V to 5.5 V	-	6	11	-	12	-	13	ns
t_t	transition time	nY; see Fig. 10 [3]								
		V_{CC} = 2 V	-	9	13	-	15	-	16	ns
		V_{CC} = 4.5 V	-	5	7	-	8	-	8	ns
		V_{CC} = 6 V	-	4	6	-	7	-	7	ns
		V_{CC} = 3.0 V to 3.6 V	-	5	8	-	9	-	10	ns
		V_{CC} = 4.5 V to 5.5 V	-	4	7	-	8	-	8	ns
C_I	input capacitance		-	1.5	-	-	5	-	5	pF

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
C_{PD}	power dissipation capacitance	f_i = 1 MHz; C_L = 0 pF; V_I = GND to V_{CC}; V_{CC} = 2.0 V to 6.0 V [4]	-	10	-	-	-	-	-	pF

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

10.1. Waveforms and test circuit

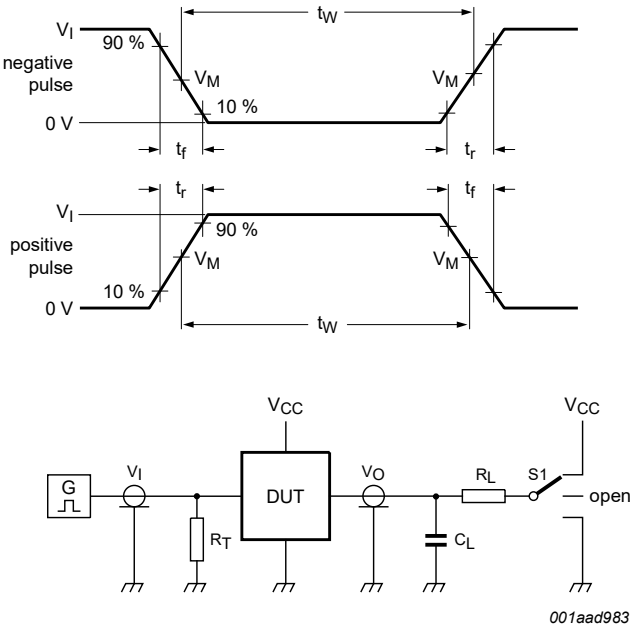


Measurement points are given in Table 8.
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 10. Propagation delay input (nA) to output (nY)

Table 8. Measurement points

Input	Output		
V_M	V_M	V_X	V_Y
$0.5V_{CC}$	$0.5V_{CC}$	10 %	90 %



Test data is given in Table 9.

Definitions for test circuit:

C_L = load capacitance including jig and probe capacitance.

R_L = load resistance.

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

S1 = test selection switch.

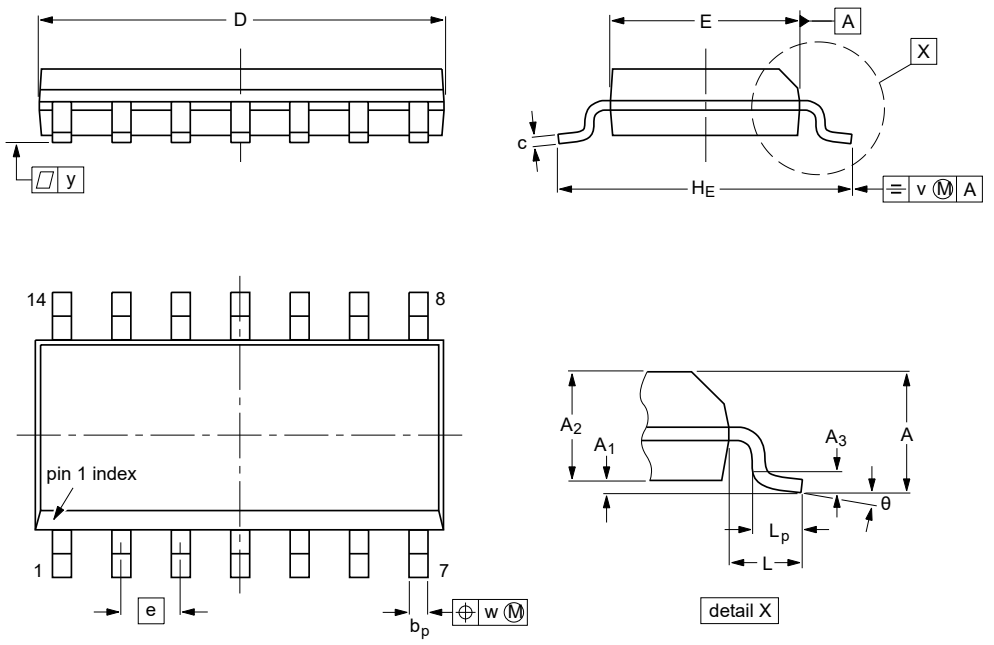
Fig. 11. Test circuit for measuring switching times

Table 9. Test data

Input		Load		S1 position		
V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}	t_{PZH}, t_{PHZ}	t_{PZL}, t_{PLZ}
V_{CC}	2.5 ns	50 pF	1 kΩ	open	GND	V_{CC}

11. Package outline

SO14: plastic small outline package; 14 leads; body width 3.9 mm **SOT108-1**



Dimensions (inch dimensions are derived from the original mm dimensions)

Unit		A	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	v	w	y	θ
mm	max	1.75	0.25			0.51	0.25	8.75	4.0		6.2		1.27				8°
	nom				0.25					1.27		1.05		0.2	0.25	0.1	
	min		0.10	1.25		0.31	0.10	8.55	3.8		5.8		0.4				0°
inches	max	0.069	0.010			0.020	0.010	0.344	0.16		0.244		0.05				8°
	nom				0.01					0.05		0.041		0.008	0.01	0.004	
	min		0.004	0.049		0.012	0.004	0.337	0.15		0.228		0.016				0°

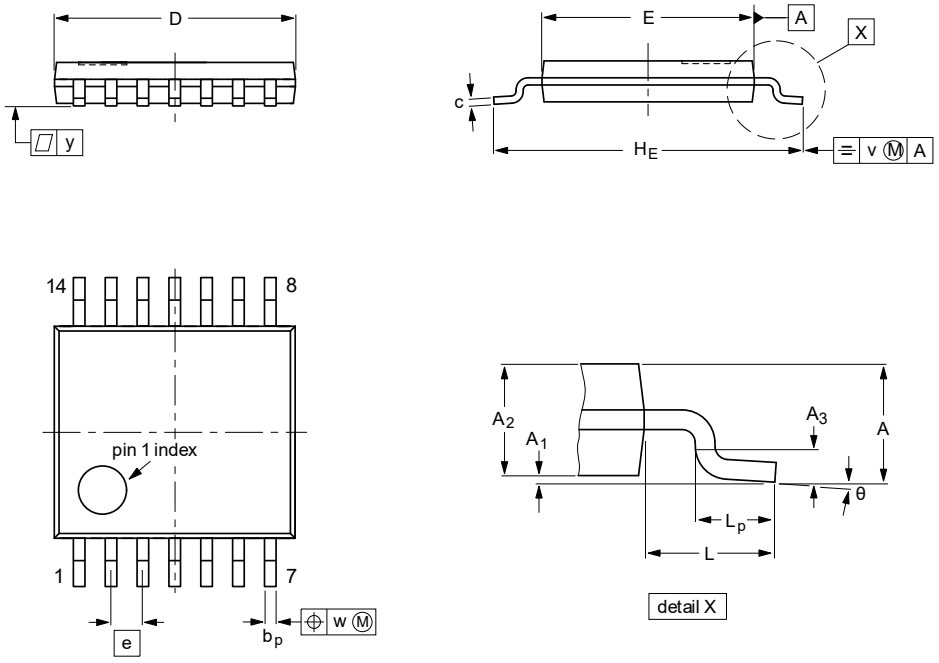
Note
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

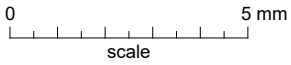
sot108-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT108-1		MS-012				~~03-02-19~~ 23-10-27

Fig. 12. Package outline SOT108-1 (SO14)

TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm **SOT402-1**





Dimensions (mm are the original dimensions)

Unit		A	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	v	w	y	θ
mm	max	1.20	0.15	1.05		0.30	0.2	5.1	4.5		6.6		0.75				8°
	nom				0.25					0.65		1		0.2	0.1	0.1	
	min		0.05	0.80		0.19	0.09	4.9	4.3		6.2		0.45				0°

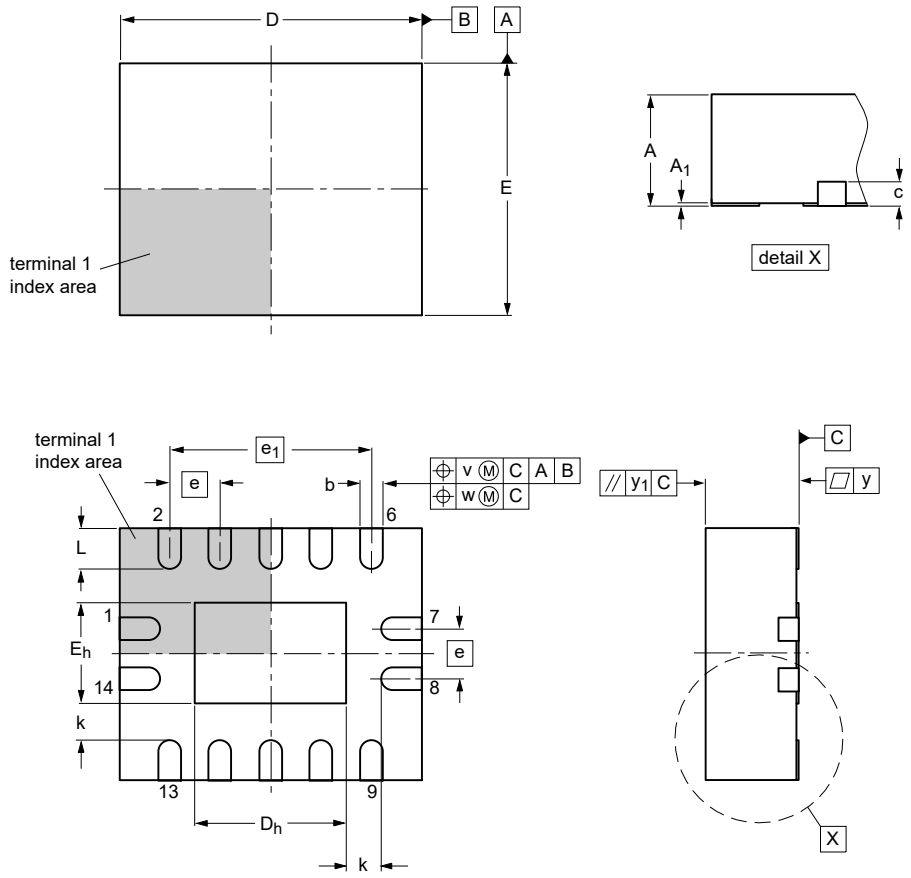
Note
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

sot402-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT402-1		MO-153				~~03-02-18~~ 23-10-27

Fig. 13. Package outline SOT402-1 (TSSOP14)

DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm **SOT762-1**



Dimensions (mm are the original dimensions)

Unit		$A^{(1)}$	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	k	L	v	w	y	y_1
	max	1	0.05	0.30		3.1	1.65	2.6	1.15				0.5				
mm	nom		0.02	0.25	0.2	3.0	1.50	2.5	1.00	0.5	2		0.4	0.1	0.05	0.05	0.1
	min		0.00	0.18		2.9	1.35	2.4	0.85			0.2	0.3				

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

sot762-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT762-1		MO-241				~~15-04-10~~ 15-05-05

Fig. 14. Package outline SOT762-1 (DHVQFN14)

12. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charge Device Model
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HCS08 v.1	20250624	Product data sheet	-	-

14. 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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