

74HC574; 74HCT574

Octal D-type flip-flop; positive edge-trigger; 3-state

Rev. 7 — 4 March 2016

Product data sheet

1. General description

The 74HC574; 74HCT574 is an 8-bit positive-edge triggered D-type flip-flop with 3-state outputs. The device features a clock (CP) and output enable (\overline{OE}) inputs. The flip-flops will store the state of their individual D-inputs that meet the set-up and hold time requirements on the LOW-to-HIGH clock (CP) transition. A HIGH on \overline{OE} causes the outputs to assume a high-impedance OFF-state. Operation of the \overline{OE} input does not affect the state of the flip-flops. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

2. Features and benefits

- Input levels:
 - ◆ For 74HC574: CMOS level
 - ◆ For 74HCT574: TTL level
- 3-state non-inverting outputs for bus oriented applications
- 8-bit positive, edge-triggered register
- Common 3-state output enable input
- Complies with JEDEC standard no. 7 A
- Multiple package options
- ESD protection:
 - ◆ HBM JESD22-A114F exceeds 2000 V
 - ◆ MM JESD22-A115-A exceeds 200 V
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and from $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC574D	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74HCT574D				
74HC574DB	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	SSOP20	plastic shrink small outline package; 20 leads; body width 5.3 mm	SOT339-1
74HCT574DB				
74HC574PW	$-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74HCT574PW				

4. Functional diagram

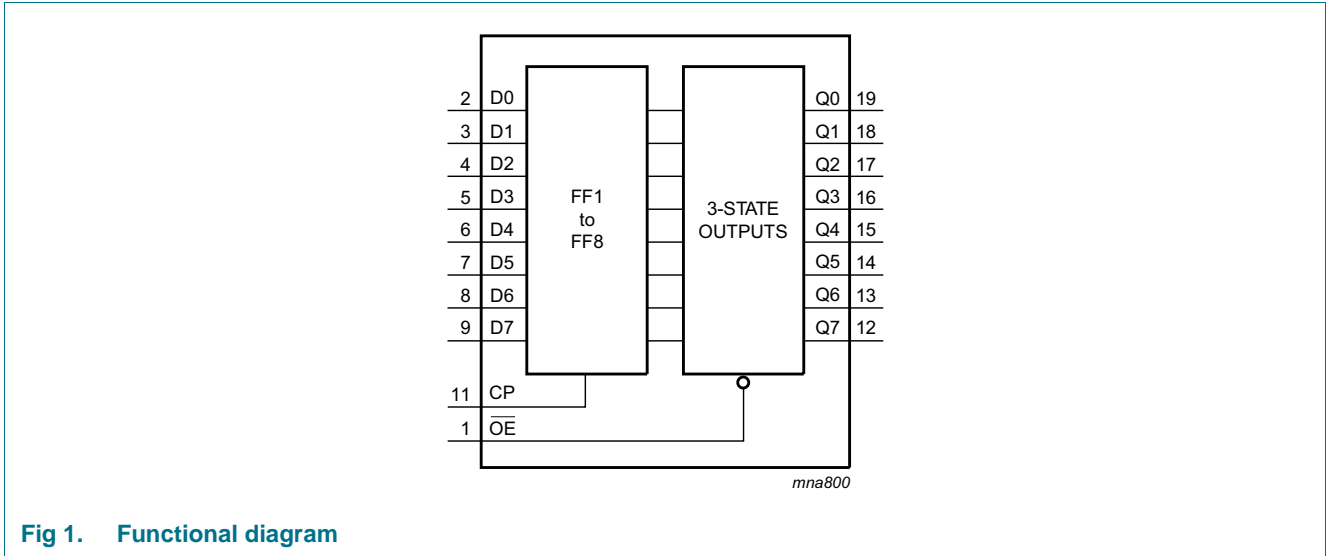


Fig 1. Functional diagram

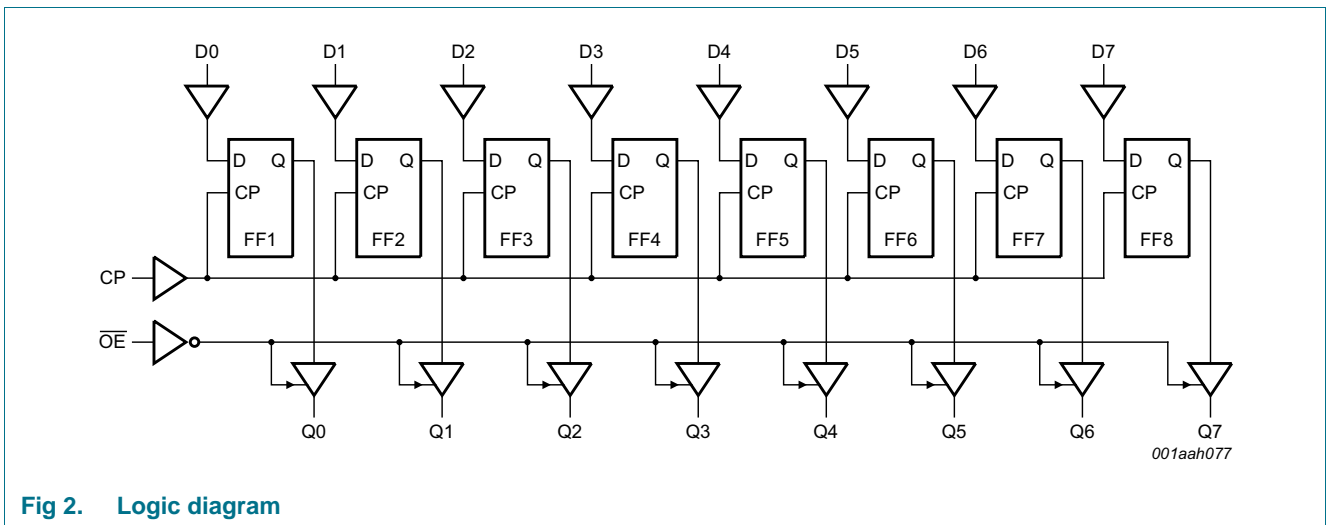


Fig 2. Logic diagram

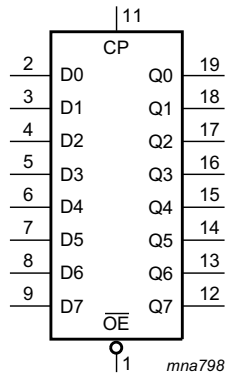


Fig 3. Logic symbol

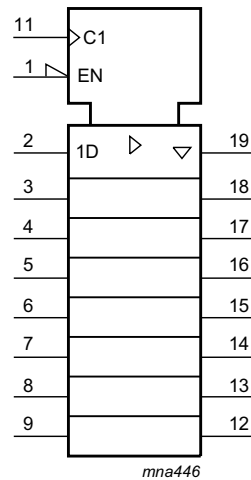


Fig 4. IEC logic symbol

5. Pinning information

5.1 Pinning

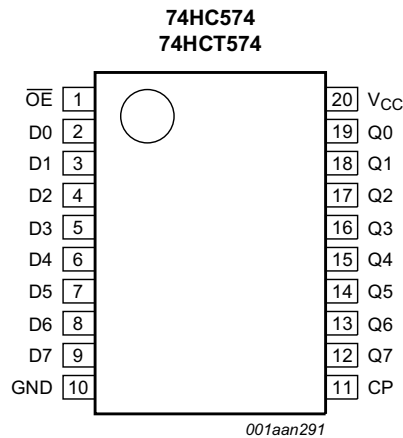


Fig 5. Pin configuration SO20, SSOP20 and TSSOP20

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
\overline{OE}	1	3-state output enable input (active LOW)
D[0:7]	2, 3, 4, 5, 6, 7, 8, 9	data input
GND	10	ground (0 V)
CP	11	clock input (LOW-to-HIGH, edge triggered)
Q[0:7]	19, 18, 17, 16, 15, 14, 13, 12	3-state flip-flop output
V _{CC}	20	supply voltage

6. Functional description

Table 3. Function table^[1]

Operating mode	Input			Internal flip-flop	Output Qn
	$\overline{\text{OE}}$	CP	Dn		
Load and read register	L	↑	l	L	L
	L	↑	h	H	H
Load register and disable output	H	↑	l	L	Z
	H	↑	h	H	Z

- [1] H = HIGH voltage level;
 h = HIGH voltage level one setup time prior to the HIGH-to-LOW CP transition;
 L = LOW voltage level;
 l = LOW voltage level one setup time prior to the HIGH-to-LOW CP transition;
 Z = high-impedance OFF-state;
 ↑ = LOW-to-HIGH clock transition.

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	$V_I < -0.5 \text{ V}$ or $V_I > V_{CC} + 0.5 \text{ V}$	-	±20	mA
I_{OK}	output clamping current	$V_O < -0.5 \text{ V}$ or $V_O > V_{CC} + 0.5 \text{ V}$	-	±20	mA
I_O	output current	$V_O = -0.5 \text{ V}$ to $(V_{CC} + 0.5 \text{ V})$	-	±35	mA
I_{CC}	supply current		-	+70	mA
I_{GND}	ground current		-	-70	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	SO20, SSOP20 and TSSOP20 packages ^[1]	-	500	mW

- [1] For SO20: P_{tot} derates linearly with 8 mW/K above 70 °C.
 For SSOP20 and TSSOP20 packages: P_{tot} derates linearly with 5.5 mW/K above 60 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC574			74HCT574			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V_I	input voltage		0	-	V_{CC}	0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	0	-	V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C

Table 5. Recommended operating conditions ...continued
 Voltages are referenced to GND (ground = 0 V) ...continued

Symbol	Parameter	Conditions	74HC574			74HCT574			Unit
			Min	Typ	Max	Min	Typ	Max	
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 2.0\text{ V}$	-	-	625	-	-	-	ns/V
		$V_{CC} = 4.5\text{ V}$	-	1.67	139	-	1.67	139	ns/V
		$V_{CC} = 6.0\text{ V}$	-	-	83	-	-	-	ns/V

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	
74HC574										
V_{IH}	HIGH-level input voltage	$V_{CC} = 2.0\text{ V}$	1.5	1.2	-	1.5	-	1.5	-	V
		$V_{CC} = 4.5\text{ V}$	3.15	2.4	-	3.15	-	3.15	-	V
		$V_{CC} = 6.0\text{ V}$	4.2	3.2	-	4.2	-	4.2	-	V
V_{IL}	LOW-level input voltage	$V_{CC} = 2.0\text{ V}$	-	0.8	0.5	-	0.5	-	0.5	V
		$V_{CC} = 4.5\text{ V}$	-	2.1	1.35	-	1.35	-	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	2.8	1.8	-	1.8	-	1.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}								
		$I_O = -20\ \mu\text{A}$; $V_{CC} = 2.0\text{ V}$	1.9	2.0	-	1.9	-	1.9	-	V
		$I_O = -20\ \mu\text{A}$; $V_{CC} = 4.5\text{ V}$	4.4	4.5	-	4.4	-	4.4	-	V
		$I_O = -20\ \mu\text{A}$; $V_{CC} = 6.0\text{ V}$	5.9	6.0	-	5.9	-	5.9	-	V
		$I_O = -6.0\text{ mA}$; $V_{CC} = 4.5\text{ V}$	3.98	4.32	-	3.84	-	3.7	-	V
		$I_O = -7.8\text{ mA}$; $V_{CC} = 6.0\text{ V}$	5.48	5.81	-	5.34	-	5.2	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}								
		$I_O = 20\ \mu\text{A}$; $V_{CC} = 2.0\text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20\ \mu\text{A}$; $V_{CC} = 4.5\text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 20\ \mu\text{A}$; $V_{CC} = 6.0\text{ V}$	-	0	0.1	-	0.1	-	0.1	V
		$I_O = 6.0\text{ mA}$; $V_{CC} = 4.5\text{ V}$	-	0.15	0.26	-	0.33	-	0.4	V
		$I_O = 7.8\text{ mA}$; $V_{CC} = 6.0\text{ V}$	-	0.16	0.26	-	0.33	-	0.4	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0\text{ V}$	-	-	± 0.1	-	± 1.0	-	± 1.0	μA
I_{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL} ; $V_{CC} = 6.0\text{ V}$; $V_O = V_{CC}$ or GND	-	-	± 0.5	-	± 5.0	-	± 10.0	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; $I_O = 0\text{ A}$; $V_{CC} = 6.0\text{ V}$	-	-	8.0	-	80	-	160	μA
C_I	input capacitance		-	3.5	-	-	-	-	-	pF

Table 6. Static characteristics ...continued

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	
74HCT574										
V _{IH}	HIGH-level input voltage	V _{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		I _O = -20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I _O = -6 mA	3.98	4.32	-	3.84	-	3.7	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL} ; V _{CC} = 4.5 V								
		I _O = 20 μA	-	0	0.1	-	0.1	-	0.1	V
		I _O = 6.0 mA	-	0.16	0.26	-	0.33	-	0.4	V
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 5.5 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _{CC} = 5.5 V; V _O = V _{CC} or GND	-	-	±0.5	-	±5.0	-	±10	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 5.5 V	-	-	8.0	-	80	-	160	μA
ΔI _{CC}	additional supply current	V _I = V _{CC} - 2.1 V; other inputs at V _{CC} or GND; V _{CC} = 4.5 V to 5.5 V; I _O = 0 A								
		per input pin; Dn inputs	-	50	180	-	225	-	245	μA
		per input pin; \overline{OE} input	-	125	450	-	563	-	613	μA
		per input pin; CP input	-	150	540	-	675	-	735	μA
C _I	input capacitance		-	3.5	-	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); $C_L = 50$ pF unless otherwise specified; for test circuit see [Figure 9](#).

Symbol	Parameter	Conditions	25 °C			−40 °C to +85 °C		−40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC574										
t_{pd}	propagation delay	CP to Qn; see Figure 6 ^[1]								
		$V_{CC} = 2.0$ V	-	47	150	-	190	-	225	ns
		$V_{CC} = 4.5$ V	-	17	30	-	35	-	45	ns
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	14	-	-	-	-	-	ns
		$V_{CC} = 6.0$ V	-	14	26	-	33	-	38	ns
t_{en}	enable time	OE to Qn; see Figure 8 ^[2]								
		$V_{CC} = 2.0$ V	-	44	140	-	175	-	210	ns
		$V_{CC} = 4.5$ V	-	16	28	-	35	-	42	ns
		$V_{CC} = 6.0$ V	-	13	24	-	30	-	36	ns
t_{dis}	disable time	OE to Qn; see Figure 8 ^[3]								
		$V_{CC} = 2.0$ V	-	39	125	-	155	-	190	ns
		$V_{CC} = 4.5$ V	-	14	25	-	31	-	38	ns
		$V_{CC} = 6.0$ V	-	11	21	-	26	-	32	ns
t_t	transition time	Qn; see Figure 6 ^[4]								
		$V_{CC} = 2.0$ V	-	14	60	-	75	-	90	ns
		$V_{CC} = 4.5$ V	-	5	12	-	15	-	18	ns
		$V_{CC} = 6.0$ V	-	4	10	-	13	-	15	ns
t_W	pulse width	CP HIGH or LOW; see Figure 7								
		$V_{CC} = 2.0$ V	80	14	-	100	-	120	-	ns
		$V_{CC} = 4.5$ V	16	5	-	20	-	24	-	ns
		$V_{CC} = 6.0$ V	14	4	-	17	-	20	-	ns
t_{su}	set-up time	Dn to CP; see Figure 7								
		$V_{CC} = 2.0$ V	60	6	-	75	-	90	-	ns
		$V_{CC} = 4.5$ V	12	2	-	15	-	18	-	ns
		$V_{CC} = 6.0$ V	10	2	-	13	-	15	-	ns
t_h	hold time	Dn to CP; see Figure 7								
		$V_{CC} = 2.0$ V	5	0	-	5	-	5	-	ns
		$V_{CC} = 4.5$ V	5	0	-	5	-	5	-	ns
		$V_{CC} = 6.0$ V	5	0	-	5	-	5	-	ns
f_{max}	maximum frequency	CP; see Figure 6								
		$V_{CC} = 2.0$ V	6.0	37	-	4.8	-	4.0	-	MHz
		$V_{CC} = 4.5$ V	30	112	-	24	-	20	-	MHz
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	123	-	-	-	-	-	MHz
		$V_{CC} = 6.0$ V	35	133	-	28	-	24	-	MHz

Table 7. Dynamic characteristics ...continued

Voltages are referenced to GND (ground = 0 V); $C_L = 50$ pF unless otherwise specified; for test circuit see [Figure 9](#).

Symbol	Parameter	Conditions	25 °C			−40 °C to +85 °C		−40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
C_{PD}	power dissipation capacitance	$C_L = 50$ pF; $f = 1$ MHz; $V_I = \text{GND to } V_{CC}$ [5]	-	22	-	-	-	-	-	pF
74HCT574										
t_{pd}	propagation delay	CP to Qn; see Figure 6 [1]								
		$V_{CC} = 4.5$ V	-	18	33	-	41	-	50	ns
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	15	-	-	-	-	-	ns
t_{en}	enable time	OE to Qn; see Figure 8 [2]								
		$V_{CC} = 4.5$ V	-	19	33	-	41	-	50	ns
t_{dis}	disable time	OE to Qn; see Figure 8 [3]								
		$V_{CC} = 4.5$ V	-	16	28	-	35	-	42	ns
t_t	transition time	Qn; see Figure 6 [4]								
		$V_{CC} = 4.5$ V	-	5	12	-	15	-	18	ns
t_W	pulse width	CP HIGH or LOW; see Figure 7								
		$V_{CC} = 4.5$ V	16	7	-	20	-	24	-	ns
t_{su}	set-up time	Dn to CP; see Figure 7								
		$V_{CC} = 4.5$ V	12	3	-	15	-	18	-	ns
t_h	hold time	Dn to CP; see Figure 7								
		$V_{CC} = 4.5$ V	5	-1	-	5	-	5	-	ns
f_{max}	maximum frequency	CP; see Figure 6								
		$V_{CC} = 4.5$ V	30	69	-	24	-	20	-	MHz
		$V_{CC} = 5$ V; $C_L = 15$ pF	-	76	-	-	-	-	-	MHz
C_{PD}	power dissipation capacitance	$C_L = 50$ pF; $f = 1$ MHz; $V_I = \text{GND to } V_{CC} - 1.5$ V [5]	-	25	-	-	-	-	-	pF

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

[2] t_{en} is the same as t_{PZH} and t_{PZL} .

[3] t_{dis} is the same as t_{PLZ} and t_{PHZ} .

[4] t_t is the same as t_{THL} and t_{TLH} .

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

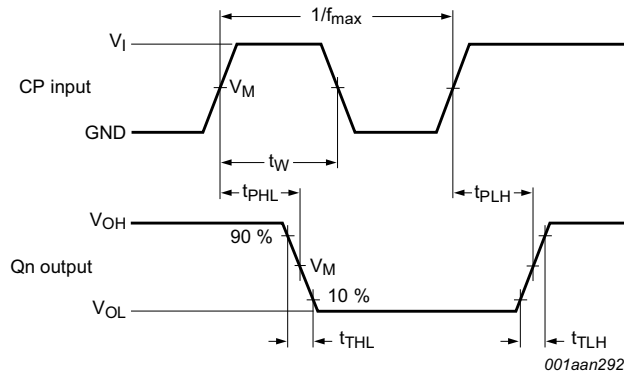
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

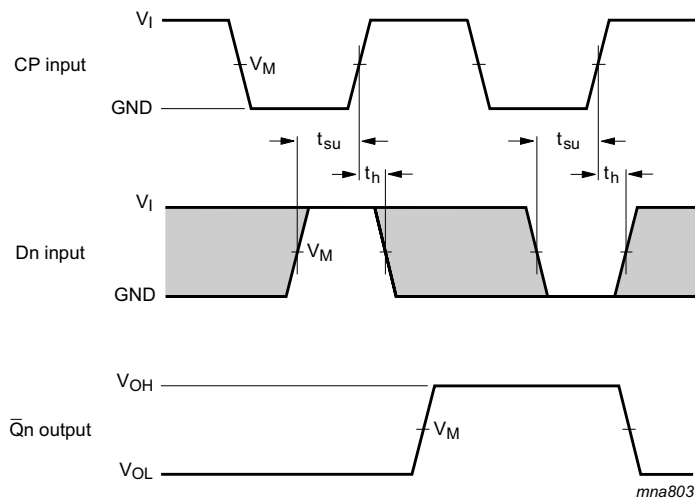
11. Waveforms



Measurement points are given in [Table 8](#).

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

Fig 6. Propagation delay input (CP) to output (Qn), output transition time, clock input (CP) pulse width and the maximum frequency (CP)



Measurement points are given in [Table 8](#).

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

Fig 7. The data input (D) to clock input (CP) set-up times and clock input (CP) to data input (D) hold times



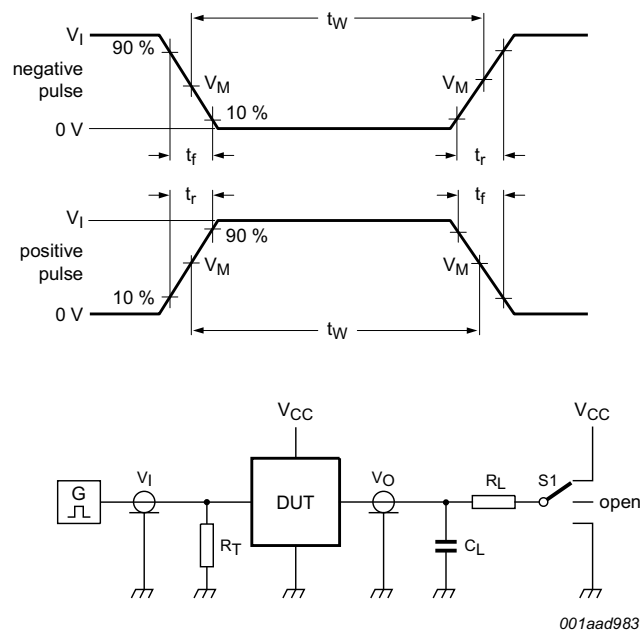
Measurement points are given in [Table 8](#).

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

Fig 8. Enable and disable times

Table 8. Measurement points

Type	Input	Output		
	V_M	V_M	V_X	V_Y
74HC574	$0.5V_{CC}$	$0.5V_{CC}$	$0.1V_{CC}$	$0.9V_{CC}$
74HCT574	1.3 V	1.3 V	$0.1V_{CC}$	$0.9V_{CC}$



Test data is given in [Table 9](#).

Definitions test circuit:

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

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

S1 = Test selection switch.

Fig 9. Test circuit for measuring switching times

Table 9. Test data

Type	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}
74HC574	V_{CC}	6 ns	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}
74HCT574	3 V	6 ns	15 pF, 50 pF	1 k Ω	open	GND	V_{CC}

12. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1

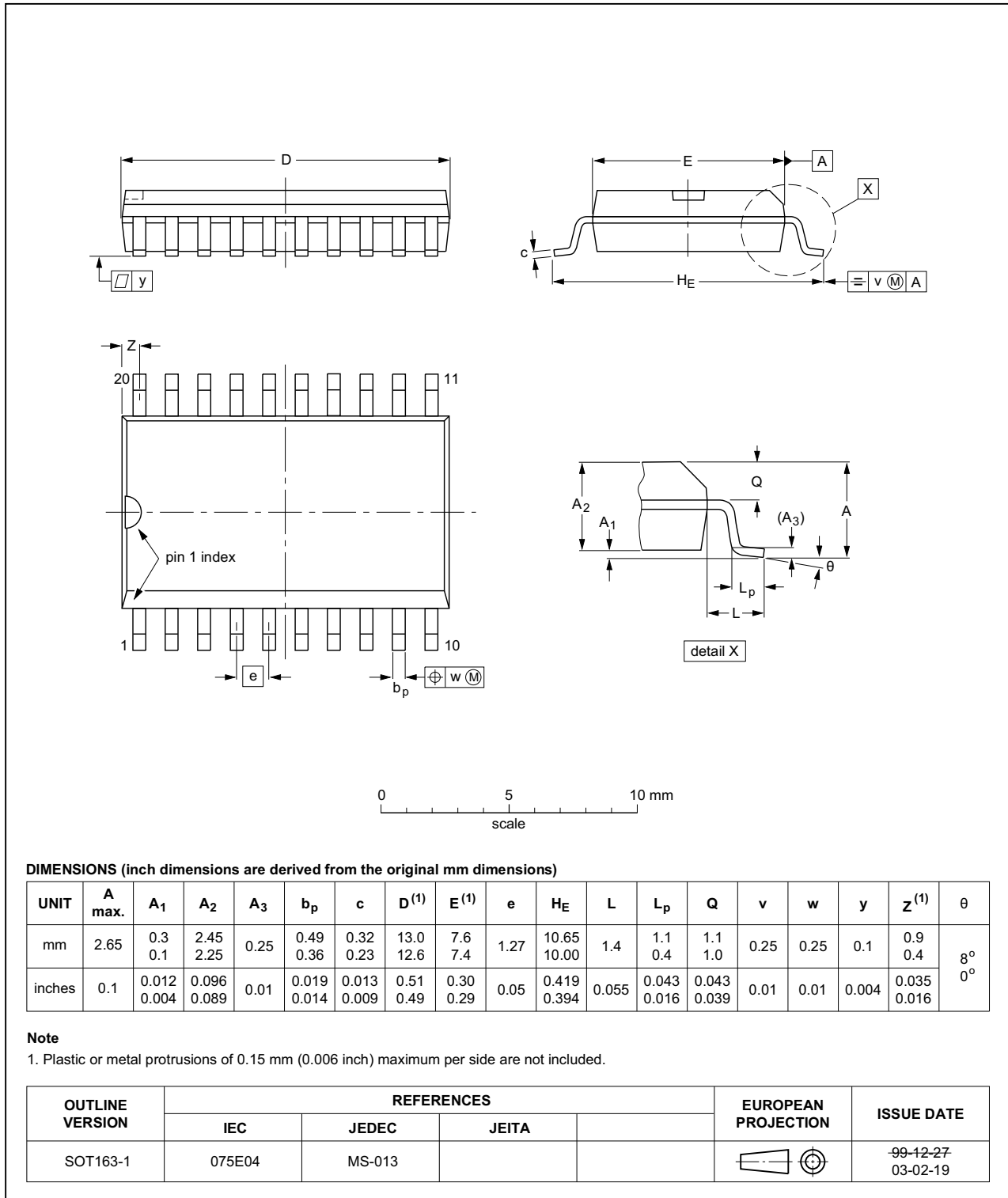


Fig 10. Package outline SOT163-1 (SO20)

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1

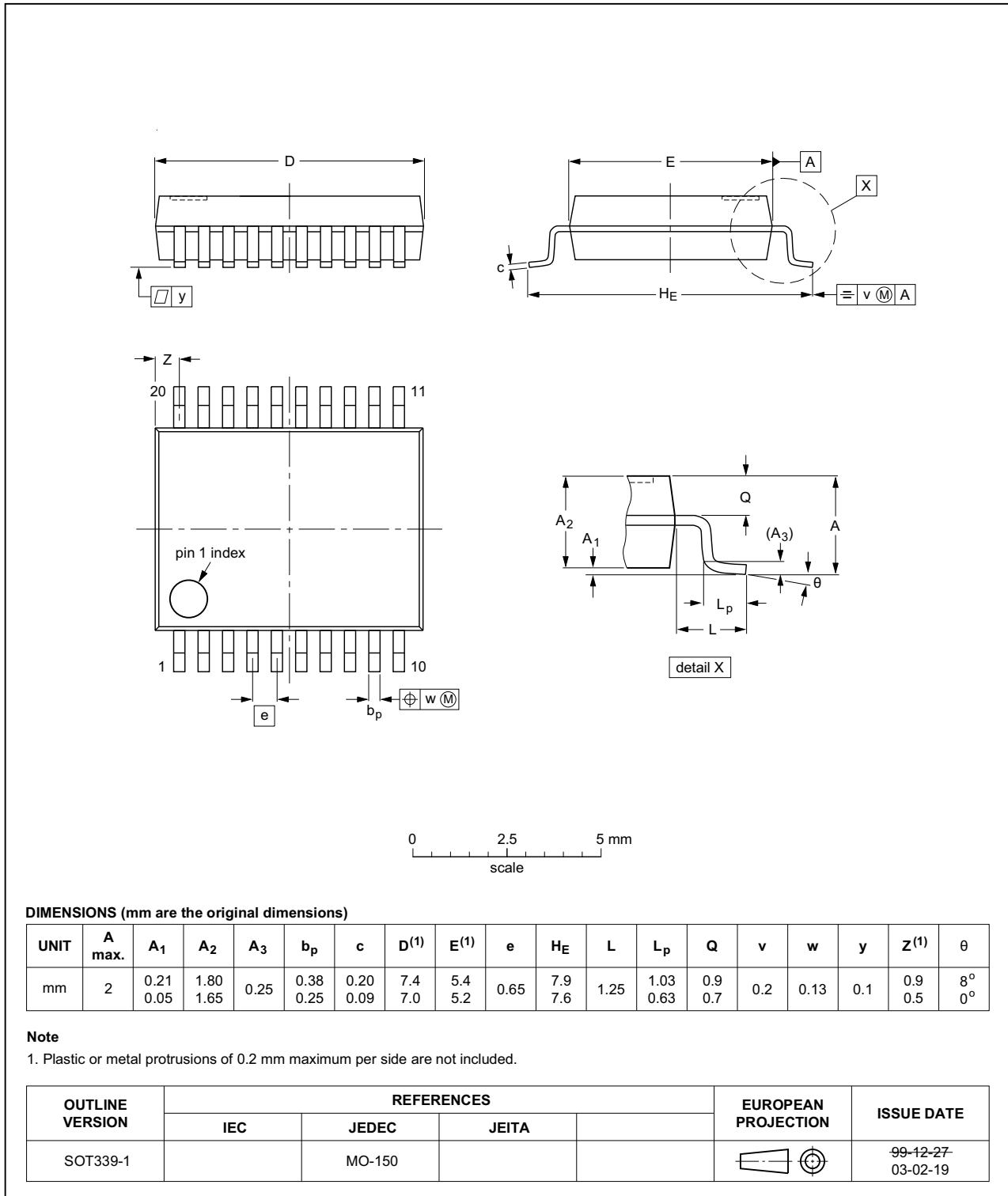


Fig 11. Package outline SOT339-1 (SSOP20)

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1

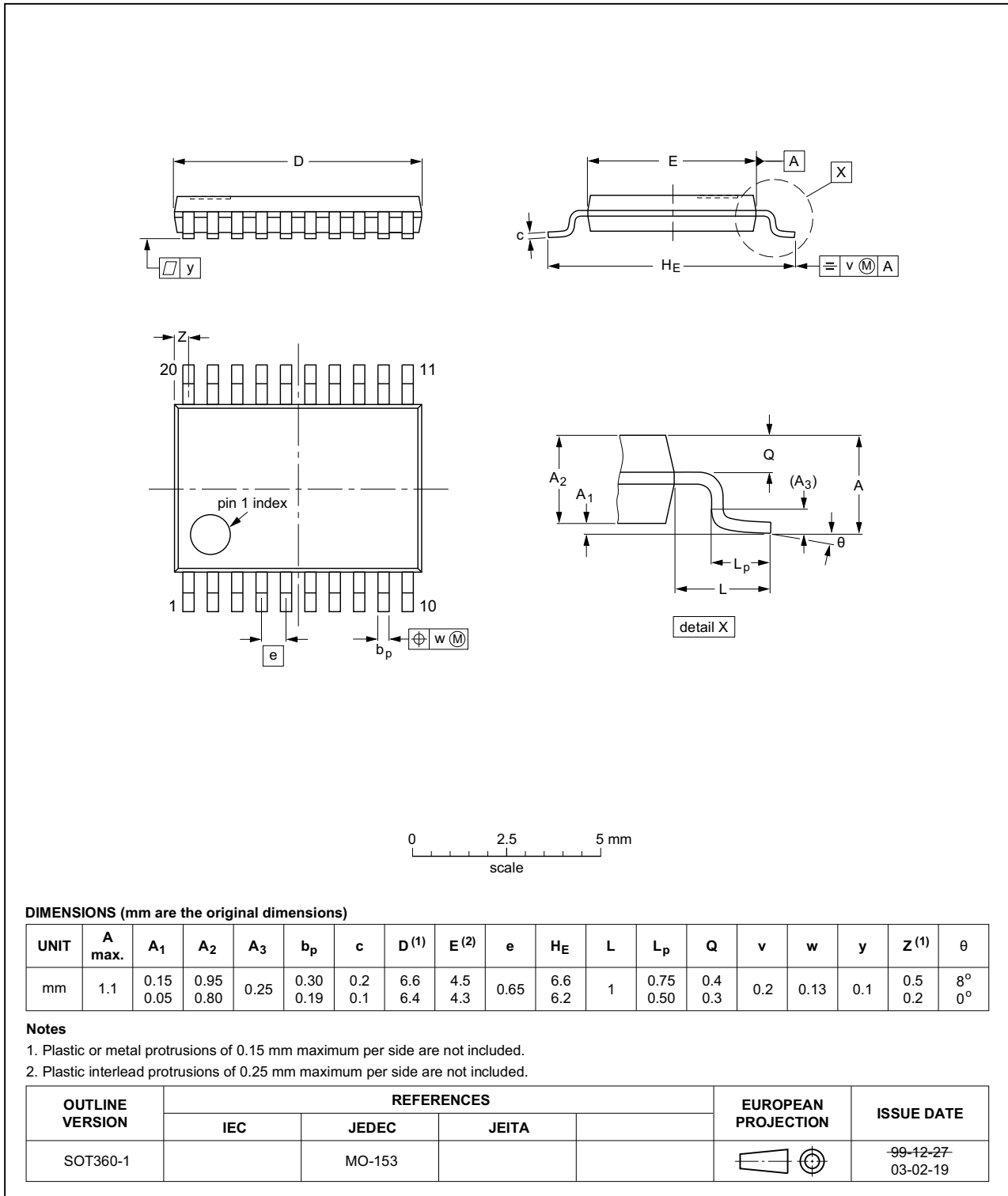


Fig 12. Package outline SOT360-1 (TSSOP20)

13. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model
TTL	Transistor-Transistor Logic

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT574 v.7	20160304	Product data sheet	-	74HC_HCT574 v.6
Modifications:	<ul style="list-style-type: none"> Type numbers 74HC574N and 74HCT574N (SOT146-1) removed. 			
74HC_HCT574 v.6	20150126	Product data sheet	-	74HC_HCT574 v.5
Modifications:	<ul style="list-style-type: none"> Table 7: Power dissipation capacitance condition for 74HCT574 is corrected. 			
74HC_HCT574 v.5	20120425	Product data sheet	-	74HC_HCT574 v.4
Modifications:	<ul style="list-style-type: none"> V_X and V_Y measurement points added to Table 8. 			
74HC_HCT574 v.4	20111219	Product data sheet	-	74HC_HCT574 v.3
Modifications:	<ul style="list-style-type: none"> Legal pages updated. 			
74HC_HCT574 v.3	20101215	Product data sheet	-	74HC_HCT574_CNV v.2
74HC_HCT574_CNV v.2	19970827	Product specification	-	-

15. Legal information

15.1 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 URL <http://www.nexperia.com>.

15.2 Definitions

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In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond

Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

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16. Contact information

For more information, please visit: <http://www.nexperia.com>

For sales office addresses, please send an email to: salesaddresses@nexperia.com

17. Contents

1	General description	1
2	Features and benefits	1
3	Ordering information	1
4	Functional diagram	2
5	Pinning information	3
5.1	Pinning	3
5.2	Pin description	3
6	Functional description	4
7	Limiting values	4
8	Recommended operating conditions	4
9	Static characteristics	5
10	Dynamic characteristics	7
11	Waveforms	9
12	Package outline	12
13	Abbreviations	15
14	Revision history	15
15	Legal information	16
15.1	Data sheet status	16
15.2	Definitions	16
15.3	Disclaimers	16
15.4	Trademarks	17
16	Contact information	17
17	Contents	18