

74ALVC245

Octal bus transceiver; 3-state

Rev. 4 — 10 July 2023

Product data sheet

1. General description

The 74ALVC245 is an 8-bit transceiver with 3-state outputs. The device features an output enable (\overline{OE}) and send/receive (DIR) for direction control. A HIGH on \overline{OE} causes the outputs to assume a high-impedance OFF-state.

Schmitt trigger action on all inputs makes the device tolerant of slow rise and fall times.

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.

2. Features and benefits

- Wide supply voltage range from 1.65 V to 3.6 V
- CMOS low power dissipation
- Overvoltage tolerant inputs to 3.6 V
- Direct interface with TTL levels
- I_{OFF} circuitry provides partial Power-down mode operation
- Latch-up performance exceeds 250 mA per JESD78 Class II.A
- Complies with JEDEC standard:
 - JESD8-7 (1.65 V to 1.95 V)
 - JESD8-5 (2.3 V to 2.5 V)
 - JESD8C/JESD36 (2.7 V to 3.6 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
- 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			Version
	Temperature range	Name	Description	
74ALVC245D	-40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74ALVC245PW	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74ALVC245BQ	-40 °C to +125 °C	DHVQFN20	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 × 4.5 × 0.85 mm	SOT764-1

4. Functional diagram

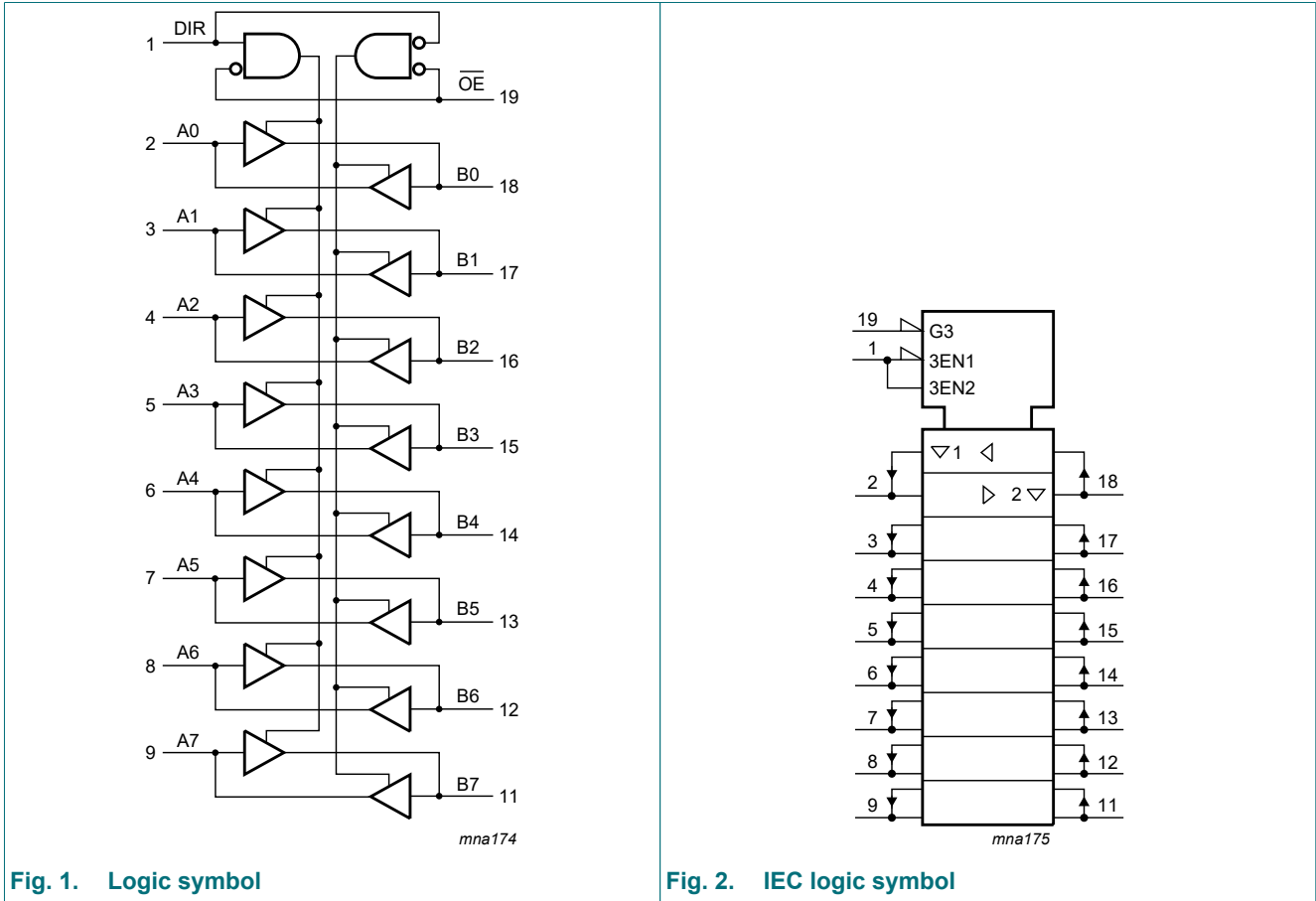
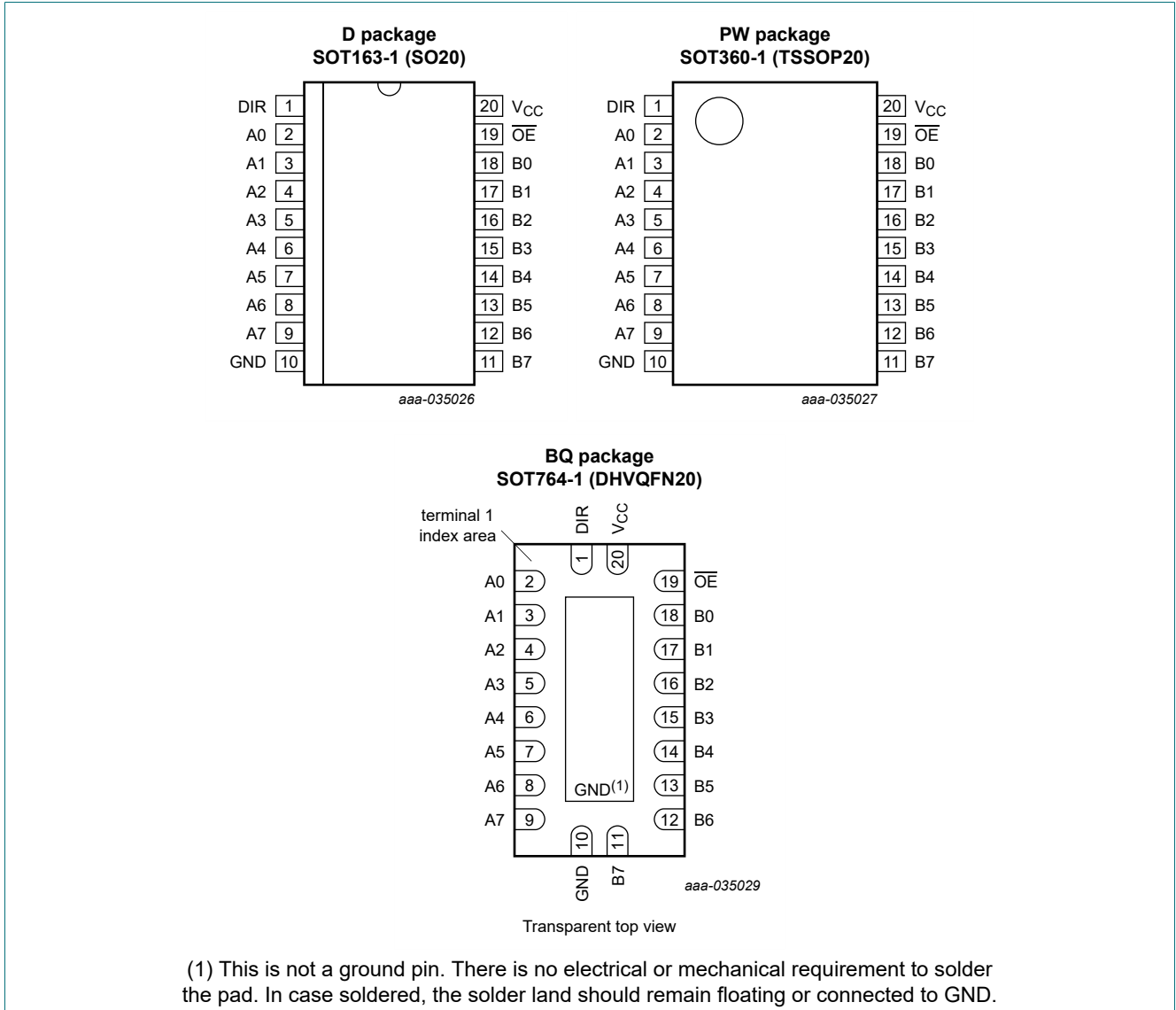


Fig. 1. Logic symbol

Fig. 2. IEC logic symbol

5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
DIR	1	direction control
A0, A1, A2, A3, A4, A5, A6, A7	2, 3, 4, 5, 6, 7, 8, 9	data input/output
B0, B1, B2, B3, B4, B5, B6, B7	18, 17, 16, 15, 14, 13, 12, 11	data input/output
GND	10	ground (0 V)
OE	19	output enable input (active LOW)
V _{CC}	20	supply voltage

6. Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

Input		Input/output	
OE	DIR	An	Bn
L	L	A = B	input
L	H	input	B = A
H	X	Z	Z

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	+4.6	V
V_I	input voltage		[1] -0.5	+4.6	V
V_O	output voltage	output HIGH or LOW state	[1] -0.5	$V_{CC} + 0.5$	V
		output 3-state	[1] -0.5	+4.6	V
		power-down mode; $V_{CC} = 0$ V	-0.5	+4.6	V
I_{IK}	input clamping current	$V_I < 0$ V	-50	-	mA
I_{OK}	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	± 50	mA
I_O	output current	$V_O = 0$ V to V_{CC}	-	± 50	mA
I_{CC}	supply current		-	100	mA
I_{GND}	ground current		-100	-	mA
T_{stg}	storage temperature		-65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = -40$ °C to +125 °C	[2] -	500	mW

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

[2] For SOT163-1 (SO20) package: P_{tot} derates linearly with 12.3 mW/K above 109 °C.

For SOT360-1 (TSSOP20) package: P_{tot} derates linearly with 10.0 mW/K above 100 °C.

For SOT764-1 (DHVQFN20) package: P_{tot} derates linearly with 12.9 mW/K above 111 °C.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		1.65	3.6	V
V_I	input voltage		0	3.6	V
V_O	output voltage	output HIGH or LOW state	0	V_{CC}	V
		output 3-state	0	3.6	V
		power-down mode; $V_{CC} = 0$ V	0	3.6	V
T_{amb}	ambient temperature	in free air	-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{CC} = 1.65$ V to 2.7 V	-	20	ns/V
		$V_{CC} = 2.7$ V to 3.6 V	-	10	ns/V

9. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125°C		Unit
			Min	Typ [1]	Max	Min	Max	
V _{IH}	HIGH-level input voltage	V _{CC} = 1.65 V to 1.95 V	0.65 × V _{CC}	-	-	0.65 × V _{CC}	-	V
		V _{CC} = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V _{CC} = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
V _{IL}	LOW-level input voltage	V _{CC} = 1.65 V to 1.95 V	-	-	0.35 × V _{CC}	-	0.35 × V _{CC}	V
		V _{CC} = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V _{CC} = 2.7 V to 3.6 V	-	-	0.8	-	0.8	V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = -100 μA; V _{CC} = 1.65 V to 3.6 V	V _{CC} - 0.2	-	-	V _{CC} - 0.2	-	V
		I _O = -6 mA; V _{CC} = 1.65 V	1.25	-	-	1.25	-	V
		I _O = -12 mA; V _{CC} = 2.3 V	1.8	-	-	1.8	-	V
		I _O = -18 mA; V _{CC} = 2.3 V	1.7	-	-	1.7	-	V
		I _O = -12 mA; V _{CC} = 2.7 V	2.2	-	-	2.2	-	V
		I _O = -18 mA; V _{CC} = 3.0 V	2.4	-	-	2.4	-	V
		I _O = -24 mA; V _{CC} = 3.0 V	2.2	-	-	2.2	-	V
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}						
		I _O = 100 μA; V _{CC} = 1.65 V to 3.6 V	-	-	0.2	-	0.2	V
		I _O = 6 mA; V _{CC} = 1.65 V	-	-	0.3	-	0.3	V
		I _O = 12 mA; V _{CC} = 2.3 V	-	-	0.4	-	0.4	V
		I _O = 18 mA; V _{CC} = 2.3 V	-	-	0.6	-	0.6	V
		I _O = 12 mA; V _{CC} = 2.7 V	-	-	0.4	-	0.4	V
		I _O = 18 mA; V _{CC} = 3.0 V	-	-	0.4	-	0.45	V
		I _O = 24 mA; V _{CC} = 3.0 V	-	-	0.55	-	0.55	V
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _{CC} = 1.65 V to 3.6 V; V _O = 3.6 V or GND [2]	-	±0.1	±10.0	-	±80	μA
I _I	input leakage current	V _I = V _{CC} or GND; V _{CC} = 3.6 V	-	±0.1	±5.0	-	±20	μA
I _{OFF}	power-off leakage current	V _I or V _O = 0 V to 3.6 V; V _{CC} = 0 V	-	±0.1	±10.0	-	±80	μA
I _{CC}	supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 3.6 V	-	0.2	10	-	80	μA
ΔI _{CC}	additional supply current	per input pin; V _{CC} = 3.0 V to 3.6 V; V _I = V _{CC} - 0.6 V; I _O = 0 A	-	5	750	-	750	μA
C _I	input capacitance		-	3.5	-	-	-	pF
C _{I/O}	input/output capacitance		-	3.5	-	-	-	pF

[1] All typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.

[2] For transceivers, the parameter I_{OZ} includes the input leakage current.

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 5.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ [1]	Max	Min	Max	
t _{pd}	propagation delay	An to Bn; Bn to An; see Fig. 3 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	2.7	6.0	1.0	6.9	ns
		V _{CC} = 2.3 V to 2.7 V	1.0	2.1	3.5	1.0	4.0	ns
		V _{CC} = 2.7 V	1.0	3.0	3.6	1.0	4.1	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	2.3	3.4	1.0	3.9	ns
t _{en}	enable time	OE to An; OE to Bn; see Fig. 4 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	4.0	8.6	1.0	9.9	ns
		V _{CC} = 2.3 V to 2.7 V	1.0	3.0	6.0	1.0	6.9	ns
		V _{CC} = 2.7 V	1.0	2.6	6.3	1.0	7.2	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	2.9	5.5	1.0	6.3	ns
t _{dis}	disable time	OE to An; OE to Bn; see Fig. 4 [2]						
		V _{CC} = 1.65 V to 1.95 V	1.0	4.4	8.0	1.0	9.2	ns
		V _{CC} = 2.3 V to 2.7 V	1.0	2.3	4.8	1.0	5.5	ns
		V _{CC} = 2.7 V	1.0	3.3	5.3	1.0	6.1	ns
		V _{CC} = 3.0 V to 3.6 V	1.0	3.2	5.5	1.0	6.3	ns
C _{PD}	power dissipation capacitance	per buffer; V _I = GND to V _{CC} ; V _{CC} = 3.3 V [3]						
		outputs HIGH or LOW state	-	25	-	-	-	pF
		outputs 3-state	-	1	-	-	-	pF

[1] All typical values are measured at T_{amb} = 25 °C and V_{CC} = 1.8 V, 2.5 V, 2.7 V and 3.3 V.

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

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

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

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

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

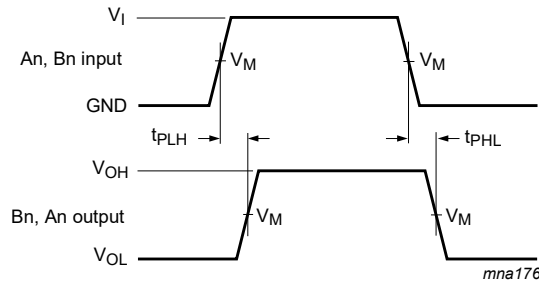
C_L = output load capacitance in pF;

V_{CC} = supply voltage in V;

N = number of inputs switching;

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

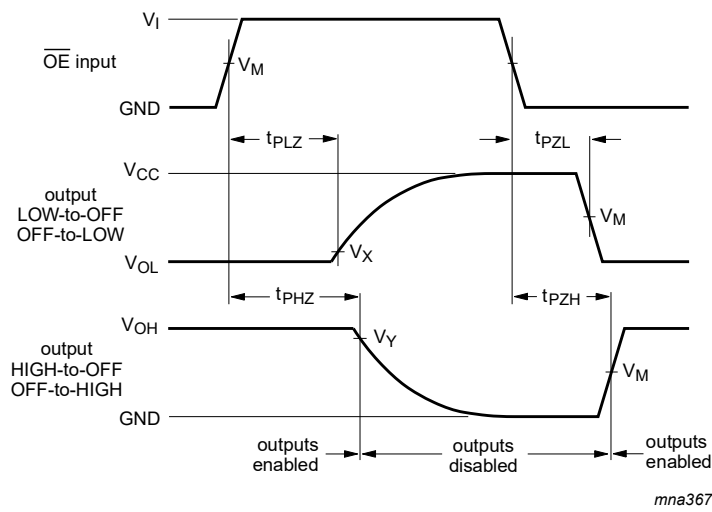
10.1. Waveforms and test circuit



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

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

Fig. 3. Propagation delay input (An, Bn) to output (Bn, An)



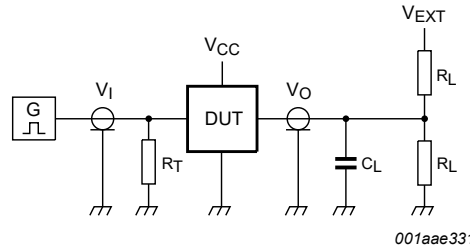
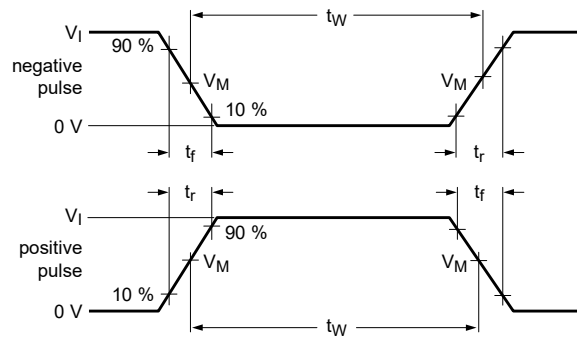
Measurement points are given in [Table 8](#).

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

Fig. 4. Enable and disable times

Table 8. Measurement points

Supply voltage	Input		Output		
V_{CC}	V_I	V_M	V_M	V_X	V_Y
1.65 V to 1.95 V	V_{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
2.3 V to 2.7 V	V_{CC}	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15 \text{ V}$	$V_{OH} - 0.15 \text{ V}$
2.7 V	2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$
3.0 V to 3.6 V	2.7 V	1.5 V	1.5 V	$V_{OL} + 0.3 \text{ V}$	$V_{OH} - 0.3 \text{ V}$



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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 resistor.

Fig. 5. Test circuit for measuring switching times

Table 9. Test data

Supply voltage	Input		Load		V_{EXT}		
V_{CC}	V_I	t_r, t_f	C_L	R_L	t_{PLH}, t_{PHL}	t_{PLZ}, t_{PZL}	t_{PHZ}, t_{PZH}
1.65 V to 1.95 V	V_{CC}	≤ 2.0 ns	30 pF	1 k Ω	open	$2 \times V_{CC}$	GND
2.3 V to 2.7 V	V_{CC}	≤ 2.0 ns	30 pF	500 Ω	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	6 V	GND
3.0 V to 3.6 V	2.7 V	≤ 2.5 ns	50 pF	500 Ω	open	6 V	GND

11. Package outline

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

SOT163-1

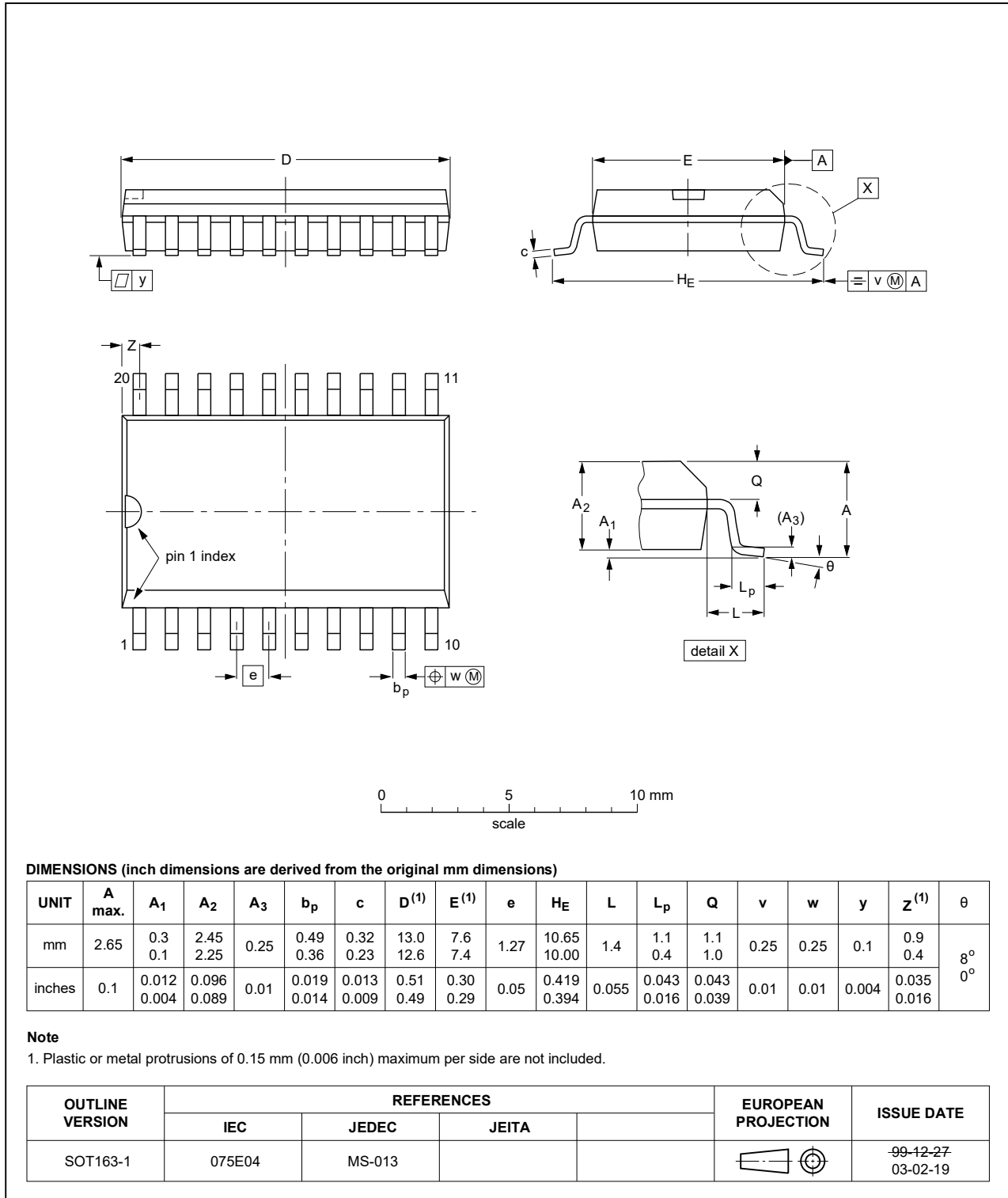


Fig. 6. Package outline SOT163-1 (SO20)

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

SOT360-1

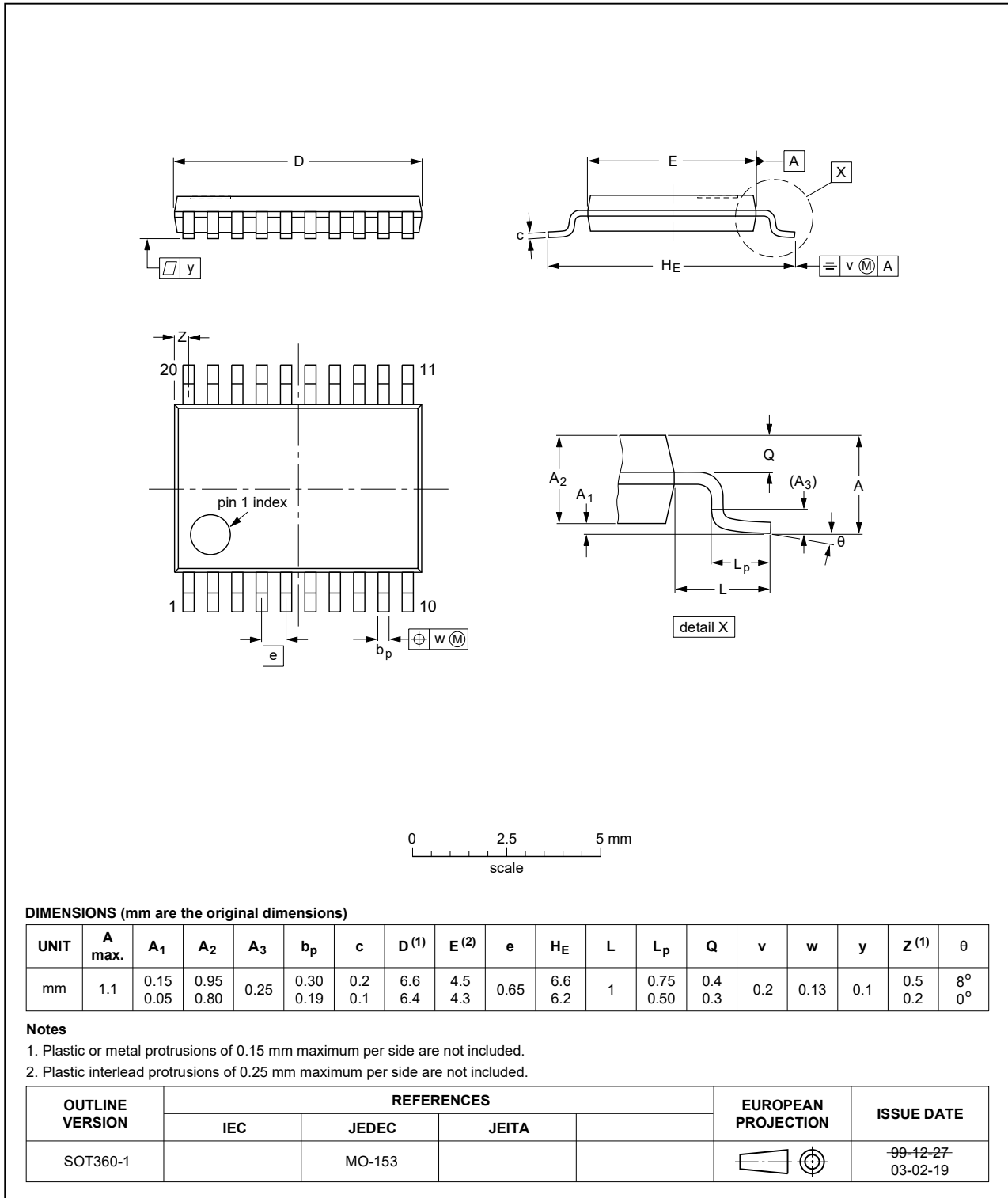


Fig. 7. Package outline SOT360-1 (TSSOP20)

DHVQFN20: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 20 terminals; body 2.5 x 4.5 x 0.85 mm

SOT764-1

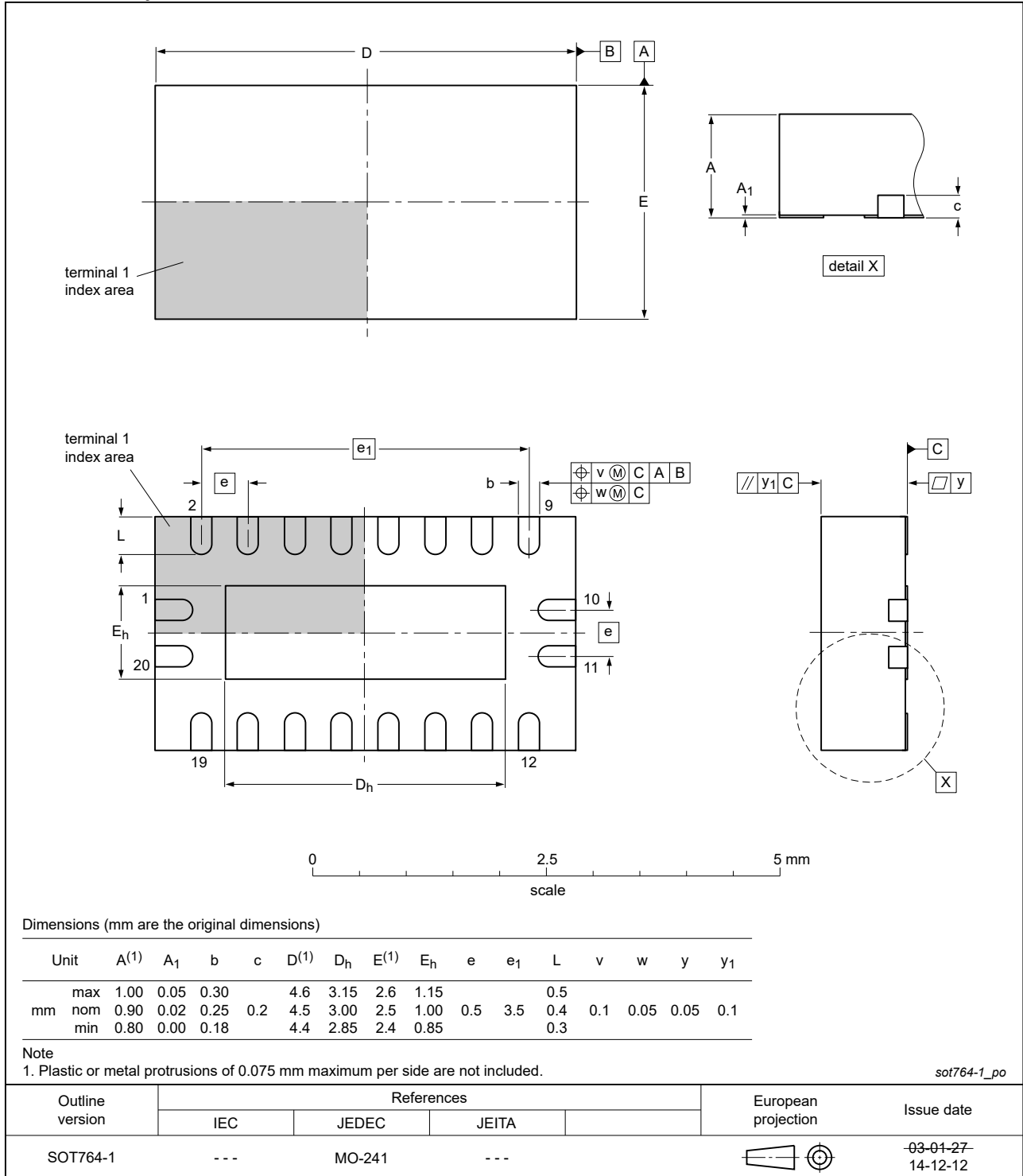


Fig. 8. Package outline SOT764-1 (DHVQFN20)

12. Abbreviations

Table 10. Abbreviations

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

13. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74ALVC245 v.4	20230710	Product data sheet	-	74ALVC245 v.3
Modifications:	<ul style="list-style-type: none"> Specifications for -40 °C to +125 °C added. Section 1 updated. Section 2: ESD specification updated according to the latest JEDEC standard. Table 6: errata. 			
74ALVC245 v.3	20210430	Product data sheet	-	74ALVC245 v.2
Modifications:	<ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. Legal texts have been adapted to the new company name where appropriate. Section 2: Reference to JESD36 removed. Section 7: Derating values for P_{tot} total power dissipation removed (errata). Package outline drawing SOT764-1 (DHVQFN20) updated. 			
74ALVC245 v.2	20080107	Product data sheet		74ALVC245 v.1
Modifications:	<ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. Legal texts have been adapted to the new company name where appropriate. Section 3: DHVQFN20 package added. Section 7: derating values added for DHVQFN20 package. Section 11: outline drawing added for DHVQFN20 package. 			
74ALVC245 v.1	20030710	Product specification	-	-

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.
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- [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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Date of release: 10 July 2023
