74HC245-Q100; 74HCT245-Q100

Octal bus tranceiver; 3-state

Rev. 1 — 22 July 2013 Product data sheet

1. General description

The 74HC245-Q100; 74HCT245-Q100 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. Inputs include clamp diodes that enable 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
- Octal bidirectional bus interface
- Non-inverting 3-state outputs
- Multiple package options
- Complies with JEDEC standard no. 7A
- ESD protection:
  - MIL-STD-883, method 3015 exceeds 2000 V
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V (C = 200 pF, R = 0 Ω)

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC245D-Q100	–40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74HCT245D-Q100				
74HC245PW-Q100	–40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74HCT245PW-Q100				
74HC245BQ-Q100	–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
74HCT245BQ-Q100				

4. Functional diagram

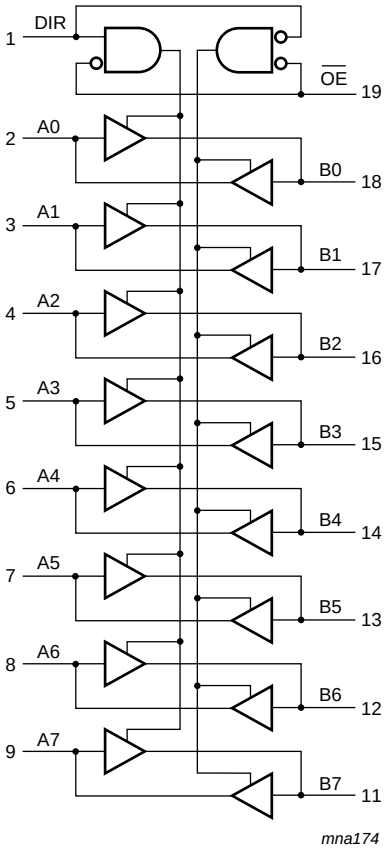


Fig 1. Logic symbol

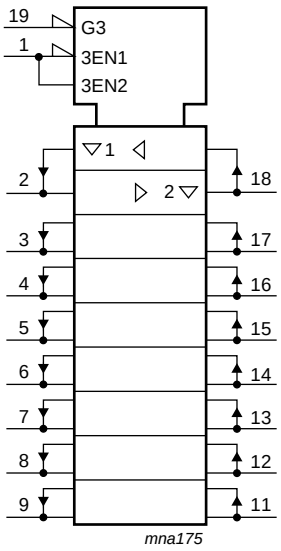


Fig 2. IEC logic symbol

5. Pinning information

5.1 Pinning

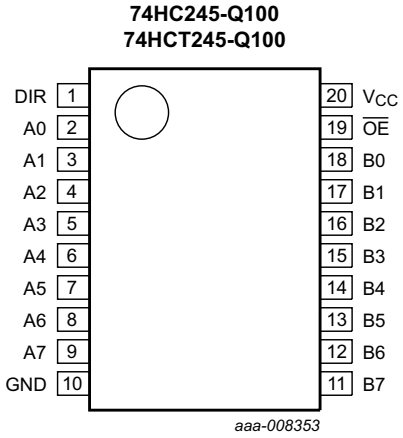
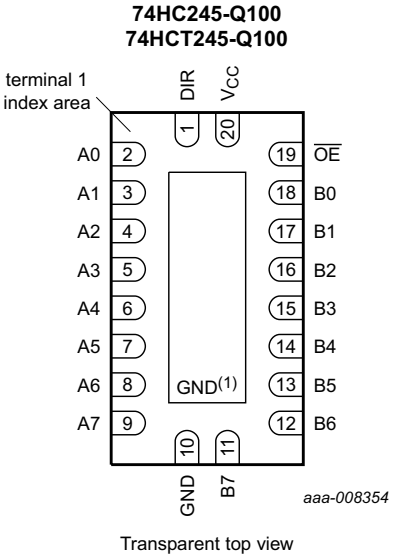


Fig 3. Pin configuration SO20 and TSSOP20



Transparent top view

(1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to GND.

Fig 4. Pin configuration DHVQFN20

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
GND	10	ground (0 V)
B0, B1, B2, B3, B4, B5, B6, B7	18, 17, 16, 15, 14, 13, 12, 11	data input/output
$\overline{OE}$	19	output enable input (active LOW)
V_{CC}	20	supply voltage

6. Functional description

Table 3. Function table[1]

Input		Input/output	
$\overline{OE}$	DIR	An	Bn
L	L	A = B	input
L	H	input	B = A
H	X	Z	Z

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

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		-	±20	mA
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V		-	±20	mA
I_O	output current	$V_O = -0.5$ V to $V_{CC} + 0.5$ 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, TSSOP20 and DHVQFN20 packages	[1]	-	500	mW

[1] For SO20 package: above 70 °C, P_{tot} derates linearly with 8 mW/K.
For TSSOP20 package: above 60 °C, P_{tot} derates linearly with 5.5 mW/K.
For DHVQFN20 package: above 60 °C, P_{tot} derates linearly with 4.5 mW/K.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Voltages are referenced to GND (ground = 0 V)

Symbol	Parameter	Conditions	74HC245-Q100			74HCT245-Q100			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
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 2.0 V	-	-	625	-	-	-	ns/V
		V_{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V_{CC} = 6.0 V	-	-	83	-	-	-	ns/V

9. Static characteristics

Table 6. Static characteristics type 74HC245-Q100

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	1.2	-	V
		V_{CC} = 4.5 V	3.15	2.4	-	V
		V_{CC} = 6.0 V	4.2	3.2	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	0.8	0.5	V
		V_{CC} = 4.5 V	-	2.1	1.35	V
		V_{CC} = 6.0 V	-	2.8	1.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}				
		I_O = −20 μA; V_{CC} = 2.0 V	1.9	2.0	-	V
		I_O = −20 μA; V_{CC} = 4.5 V	4.4	4.5	-	V
		I_O = −20 μA; V_{CC} = 6.0 V	5.9	6.0	-	V
		I_O = −6.0 mA; V_{CC} = 4.5 V	3.98	4.32	-	V
		I_O = −7.8 mA; V_{CC} = 6.0 V	5.48	5.81	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}				
		I_O = 20 μA; V_{CC} = 2.0 V	-	0	0.1	V
		I_O = 20 μA; V_{CC} = 4.5 V	-	0	0.1	V
		I_O = 20 μA; V_{CC} = 6.0 V	-	0	0.1	V
		I_O = 6.0 mA; V_{CC} = 4.5 V	-	0.15	0.26	V
		I_O = 7.8 mA; V_{CC} = 6.0 V	-	0.16	0.26	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 6.0 V	-	-	±0.1	μA
I_{OZ}	OFF-state output current	V_I = V_{IH} or V_{IL}; V_O = V_{CC} or GND; V_{CC} = 6.0 V	-	-	±0.5	μA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 6.0 V	-	-	8.0	μA
C_I	input capacitance		-	3.5	-	pF
$C_{I/O}$	input/output capacitance		-	10	-	pF
T_{amb} = −40 °C to +85 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	-	-	V
		V_{CC} = 4.5 V	3.15	-	-	V
		V_{CC} = 6.0 V	4.2	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	-	0.5	V
		V_{CC} = 4.5 V	-	-	1.35	V
		V_{CC} = 6.0 V	-	-	1.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}				
		I_O = −20 μA; V_{CC} = 2.0 V	1.9	-	-	V
		I_O = −20 μA; V_{CC} = 4.5 V	4.4	-	-	V
		I_O = −20 μA; V_{CC} = 6.0 V	5.9	-	-	V
		I_O = −6.0 mA; V_{CC} = 4.5 V	3.84	-	-	V
		I_O = −7.8 mA; V_{CC} = 6.0 V	5.34	-	-	V

Table 6. Static characteristics type 74HC245-Q100 *…continued*

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}				
		I_O = 20 μA; V_{CC} = 2.0 V	-	-	0.1	V
		I_O = 20 μA; V_{CC} = 4.5 V	-	-	0.1	V
		I_O = 20 μA; V_{CC} = 6.0 V	-	-	0.1	V
		I_O = 6.0 mA; V_{CC} = 4.5 V	-	-	0.33	V
		I_O = 7.8 mA; V_{CC} = 6.0 V	-	-	0.33	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 6.0 V	-	-	±1.0	μA
I_{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL}; $V_O = V_{CC}$ or GND; V_{CC} = 6.0 V	-	-	±5.0	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 6.0 V	-	-	80	μA
T_{amb} = –40 °C to +125 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	-	-	V
		V_{CC} = 4.5 V	3.15	-	-	V
		V_{CC} = 6.0 V	4.2	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	-	0.5	V
		V_{CC} = 4.5 V	-	-	1.35	V
		V_{CC} = 6.0 V	-	-	1.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}		-		
		I_O = –20 μA; V_{CC} = 2.0 V	1.9	-	-	V
		I_O = –20 μA; V_{CC} = 4.5 V	4.4	-	-	V
		I_O = –20 μA; V_{CC} = 6.0 V	5.9	-	-	V
		I_O = –6.0 mA; V_{CC} = 4.5 V	3.7	-	-	V
		I_O = –7.8 mA; V_{CC} = 6.0 V	5.2	-	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}		-		
		I_O = 20 μA; V_{CC} = 2.0 V	-	-	0.1	V
		I_O = 20 μA; V_{CC} = 4.5 V	-	-	0.1	V
		I_O = 20 μA; V_{CC} = 6.0 V	-	-	0.1	V
		I_O = 6.0 mA; V_{CC} = 4.5 V	-	-	0.4	V
		I_O = 7.8 mA; V_{CC} = 6.0 V	-	-	0.4	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 6.0 V	-	-	±1.0	μA
I_{OZ}	OFF-state output current	$V_I = V_{IH}$ or V_{IL}; $V_O = V_{CC}$ or GND; V_{CC} = 6.0 V	-	-	±10.0	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 6.0 V	-	-	160	μA

Table 7. Static characteristics type 74HCT245-Q100

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
T_{amb} = 25 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	1.6	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	1.2	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	-	V
		I_O = −6 mA	3.98	4.32	-	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	V
		I_O = 6.0 mA	-	0.15	0.26	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 5.5 V	-	-	±0.1	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 per input pin; other inputs at V_{CC} or GND; I_O = 0 A	-	-	±0.5	μA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	8.0	μA
ΔI_{CC}	additional supply current	per input pin; V_I = V_{CC} − 2.1 V; other inputs at V_I = V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V; I_O = 0 A				
		An or Bn inputs	-	40	144	μA
		$\overline{OE}$ input	-	150	540	μA
		DIR input	-	90	324	μA
C_I	input capacitance		-	3.5	-	pF
$C_{I/O}$	input/output capacitance		-	10	-	pF
T_{amb} = −40 °C to +85 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	-	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	-	-	V
		I_O = −6 mA	3.84	-	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V				
		I_O = 20 μA	-	-	0.1	V
		I_O = 6.0 mA	-	-	0.33	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 5.5 V	-	-	±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 per input pin; other inputs at V_{CC} or GND; I_O = 0 A	-	-	±5.0	μA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	80	μA

Table 7. Static characteristics type 74HCT245-Q100 *...continued*

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
ΔI_{CC}	additional supply current	per input pin; $V_I = V_{CC} - 2.1$ V; other inputs at $V_I = V_{CC}$ or GND; V_{CC} = 4.5 V to 5.5 V; I_O = 0 A				
		An or Bn inputs	-	-	180	μA
		$\overline{OE}$ input	-	-	675	μA
		DIR input	-	-	405	μA
T_{amb} = –40 °C to +125 °C						
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	-	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	-	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	-	-	V
		I_O = –6 mA	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	-	-	0.1	V
		I_O = 6.0 mA	-	-	0.4	V
I_I	input leakage current	$V_I = V_{CC}$ or GND; V_{CC} = 5.5 V	-	-	±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 per input pin; other inputs at V_{CC} or GND; I_O = 0 A	-	-	±10	μA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	160	μA
ΔI_{CC}	additional supply current	per input pin; $V_I = V_{CC} - 2.1$ V; other inputs at $V_I = V_{CC}$ or GND; V_{CC} = 4.5 V to 5.5 V; I_O = 0 A				
		An or Bn inputs	-	-	196	μA
		$\overline{OE}$ input	-	-	735	μA
		DIR input	-	-	441	μA

10. Dynamic characteristics

Table 8. Dynamic characteristics type 74HC245-Q100

GND = 0 V; for test circuit, see Figure 7.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
T_{amb} = 25 °C							
t_{pd}	propagation delay	An to Bn or Bn to An; see Figure 5	[1]				
		V_{CC} = 2.0 V		-	25	90	ns
		V_{CC} = 4.5 V		-	9	18	ns
		V_{CC} = 5.0 V; C_L = 15 pF		-	7	-	ns
		V_{CC} = 6.0 V		-	7	15	ns
t_{en}	enable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; see Figure 6	[2]				
		V_{CC} = 2.0 V		-	30	150	ns
		V_{CC} = 4.5 V		-	11	30	ns
		V_{CC} = 6.0 V		-	9	26	ns
t_{dis}	disable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; see Figure 6	[3]				
		V_{CC} = 2.0 V		-	41	150	ns
		V_{CC} = 4.5 V		-	15	30	ns
		V_{CC} = 6.0 V		-	12	26	ns
t_t	transition time	An, Bn; see Figure 5	[4]				
		V_{CC} = 2.0 V		-	14	60	ns
		V_{CC} = 4.5 V		-	5	12	ns
		V_{CC} = 6.0 V		-	4	10	ns
C_{PD}	power dissipation capacitance	V_I = GND to V_{CC}	[5]	-	30	-	pF
T_{amb} = –40 °C to +85 °C							
t_{pd}	propagation delay	An to Bn or Bn to An; see Figure 5	[1]				
		V_{CC} = 2.0 V		-	-	115	ns
		V_{CC} = 4.5 V		-	-	23	ns
		V_{CC} = 6.0 V		-	-	20	ns
t_{en}	enable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; see Figure 6	[2]				
		V_{CC} = 2.0 V		-	-	190	ns
		V_{CC} = 4.5 V		-	-	38	ns
		V_{CC} = 6.0 V		-	-	33	ns
t_{dis}	disable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; see Figure 6	[3]				
		V_{CC} = 2.0 V		-	-	190	ns
		V_{CC} = 4.5 V		-	-	38	ns
		V_{CC} = 6.0 V		-	-	33	ns

Table 8. Dynamic characteristics type 74HC245-Q100 *…continued*

GND = 0 V; for test circuit, see Figure 7.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
t_t	transition time	An, Bn; see Figure 5	[4]				
		V_{CC} = 2.0 V		-	-	75	ns
		V_{CC} = 4.5 V		-	-	15	ns
		V_{CC} = 6.0 V		-	-	13	ns
T_{amb} = –40 °C to +125 °C							
t_{pd}	propagation delay	An to Bn or Bn to An; see Figure 5	[1]				
		V_{CC} = 2.0 V		-	-	135	ns
		V_{CC} = 4.5 V		-	-	27	ns
		V_{CC} = 6.0 V		-	-	23	ns
t_{en}	enable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; see Figure 6	[2]				
		V_{CC} = 2.0 V		-	-	225	ns
		V_{CC} = 4.5 V		-	-	45	ns
		V_{CC} = 6.0 V		-	-	38	ns
t_{dis}	disable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; see Figure 6	[3]				
		V_{CC} = 2.0 V		-	-	225	ns
		V_{CC} = 4.5 V		-	-	45	ns
		V_{CC} = 6.0 V		-	-	38	ns
t_t	transition time	An, Bn; see Figure 5	[4]				
		V_{CC} = 2.0 V		-	-	90	ns
		V_{CC} = 4.5 V		-	-	18	ns
		V_{CC} = 6.0 V		-	-	15	ns

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

Table 9. Dynamic characteristics type 74HCT245-Q100

GND = 0 V; for test circuit, see Figure 7.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
T_{amb} = 25 °C							
t_{pd}	propagation delay	An to Bn or Bn to An; see Figure 5	[1]				
		V_{CC} = 4.5 V		-	12	22	ns
		V_{CC} = 5.0 V; C_L = 15 pF		-	10	-	ns
t_{en}	enable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; V_{CC} = 4.5 V; see Figure 6	[2]	-	16	30	ns
t_{dis}	disable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; V_{CC} = 4.5 V; see Figure 6	[3]	-	16	30	ns
t_t	transition time	An, Bn; V_{CC} = 4.5 V; see Figure 5	[4]	-	5	12	ns
C_{PD}	power dissipation capacitance	V_I = GND to V_{CC} − 1.5 V	[5]	-	30	-	pF
T_{amb} = –40 °C to +85 °C							
t_{pd}	propagation delay	V_{CC} = 4.5 V; see Figure 5	[1]	-	-	28	ns
t_{en}	enable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; V_{CC} = 4.5 V; see Figure 6	[2]	-	-	38	ns
t_{dis}	disable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; V_{CC} = 4.5 V; see Figure 6	[3]	-	-	38	ns
t_t	transition time	An, Bn; V_{CC} = 4.5 V; see Figure 5	[4]	-	-	15	ns
T_{amb} = –40 °C to +125 °C							
t_{pd}	propagation delay	V_{CC} = 4.5 V; see Figure 5	[1]	-	-	33	ns
t_{en}	enable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; V_{CC} = 4.5 V; see Figure 6	[2]	-	-	45	ns
t_{dis}	disable time	$\overline{OE}$ to An or $\overline{OE}$ to Bn; V_{CC} = 4.5 V; see Figure 6	[3]	-	-	45	ns
t_t	transition time	An, Bn; V_{CC} = 4.5 V; see Figure 5	[4]	-	-	18	ns

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

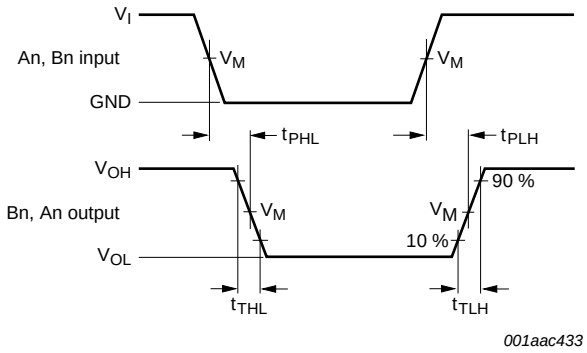
[2] t_{en} is the same as t_{PZH} and t_{PZL}.

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

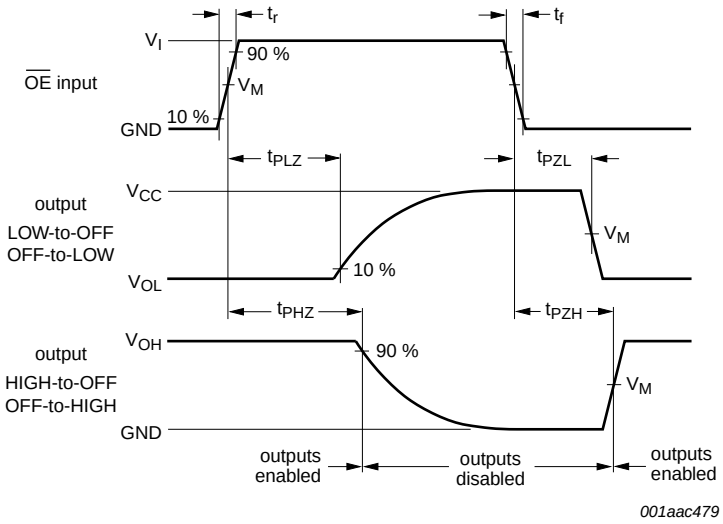
11. Waveforms



Measurement points are given in Table 10.

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

Fig 5. Input (An, Bn) to output (Bn, An) propagation delays and output transition times



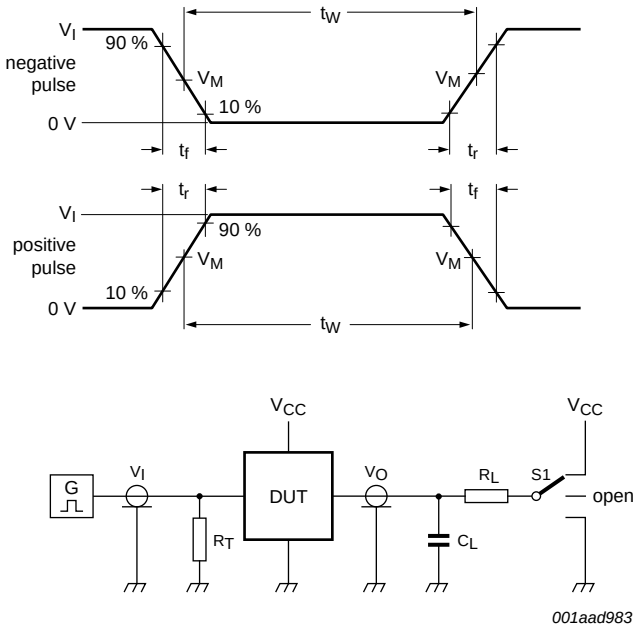
Measurement points are given in Table 10.

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

Fig 6. 3-state output enable and disable times

Table 10. Measurement points

Type	Input	Output
	V_M	V_M
74HC245-Q100	$0.5V_{CC}$	$0.5V_{CC}$
74HCT245-Q100	1.3 V	1.3 V



Test data is given in Table 11.

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.

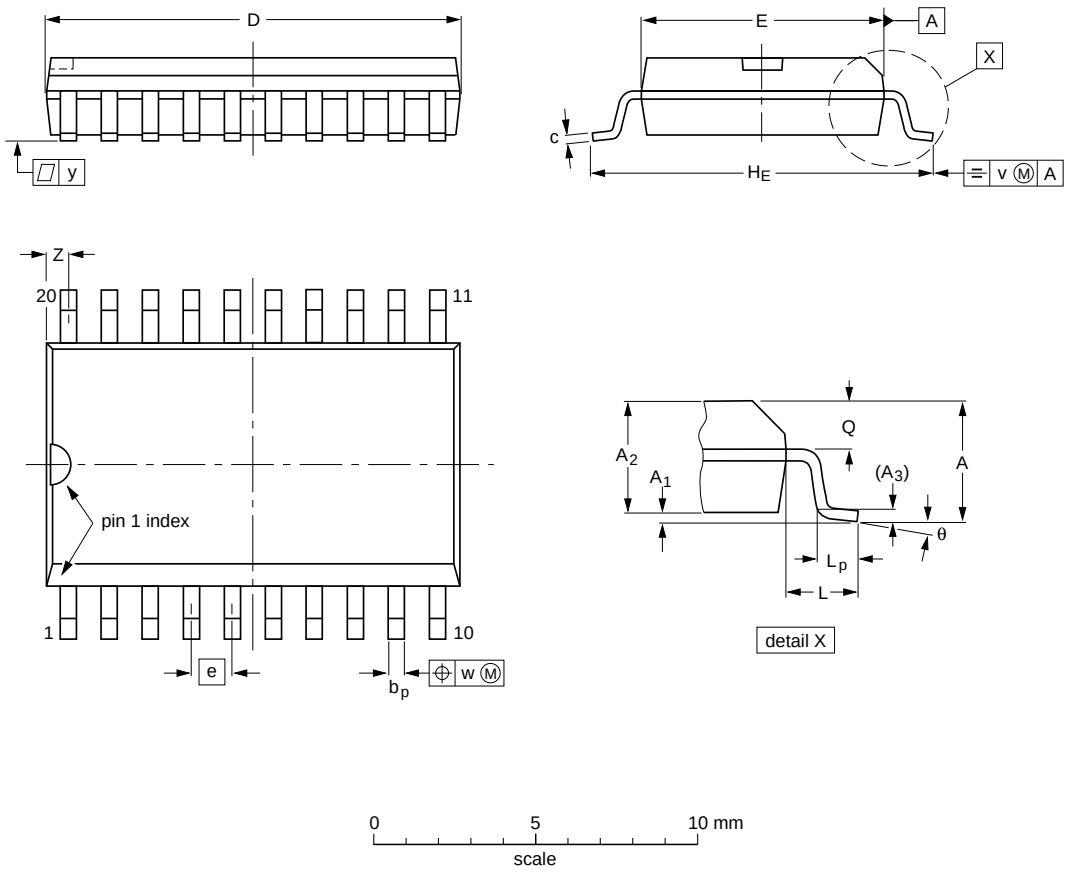
Fig 7. Test circuit for measuring switching times

Table 11. 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}
74HC245-Q100	V_{CC}	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}
74HCT245-Q100	3 V	6 ns	15 pF, 50 pF	1 kΩ	open	GND	V_{CC}

12. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm **SOT163-1**



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

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2.65	0.3 0.1	2.45 2.25	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8^o 0^o
inches	0.1	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.05	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

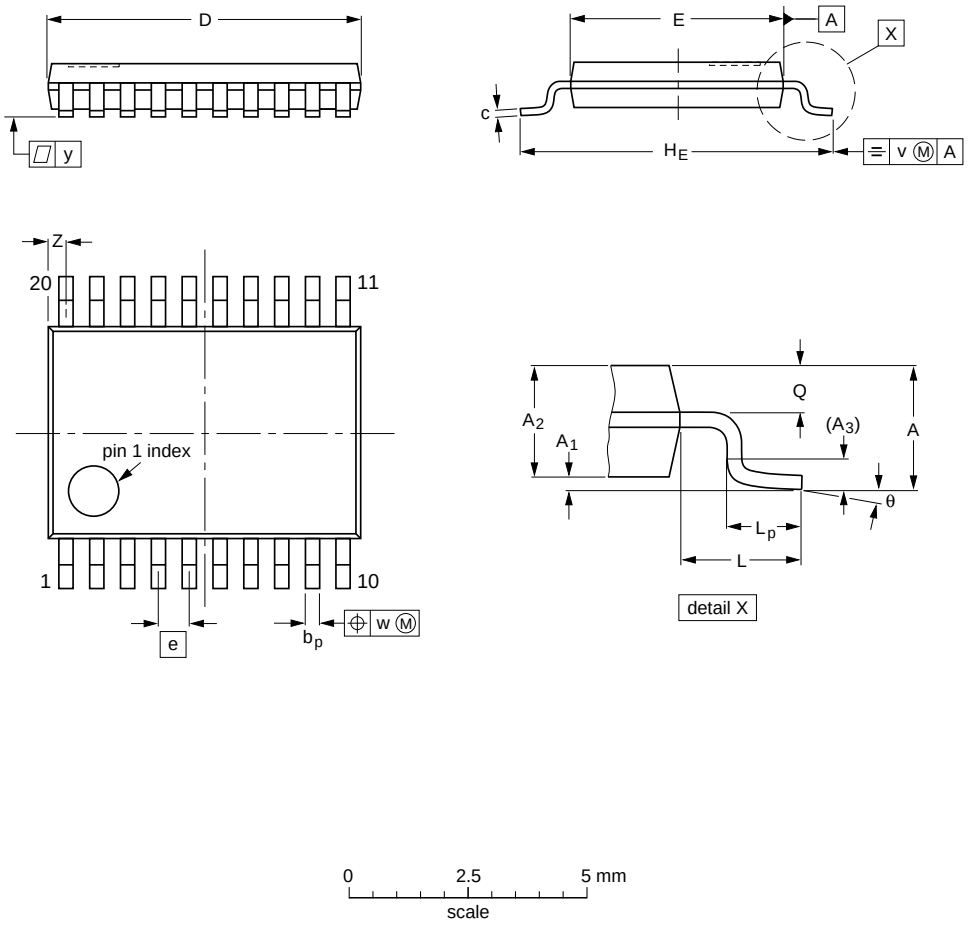
Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT163-1	075E04	MS-013				~~99-12-27~~ 03-02-19

Fig 8. Package outline SOT163-1 (SO20)

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm **SOT360-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	8^o 0^o

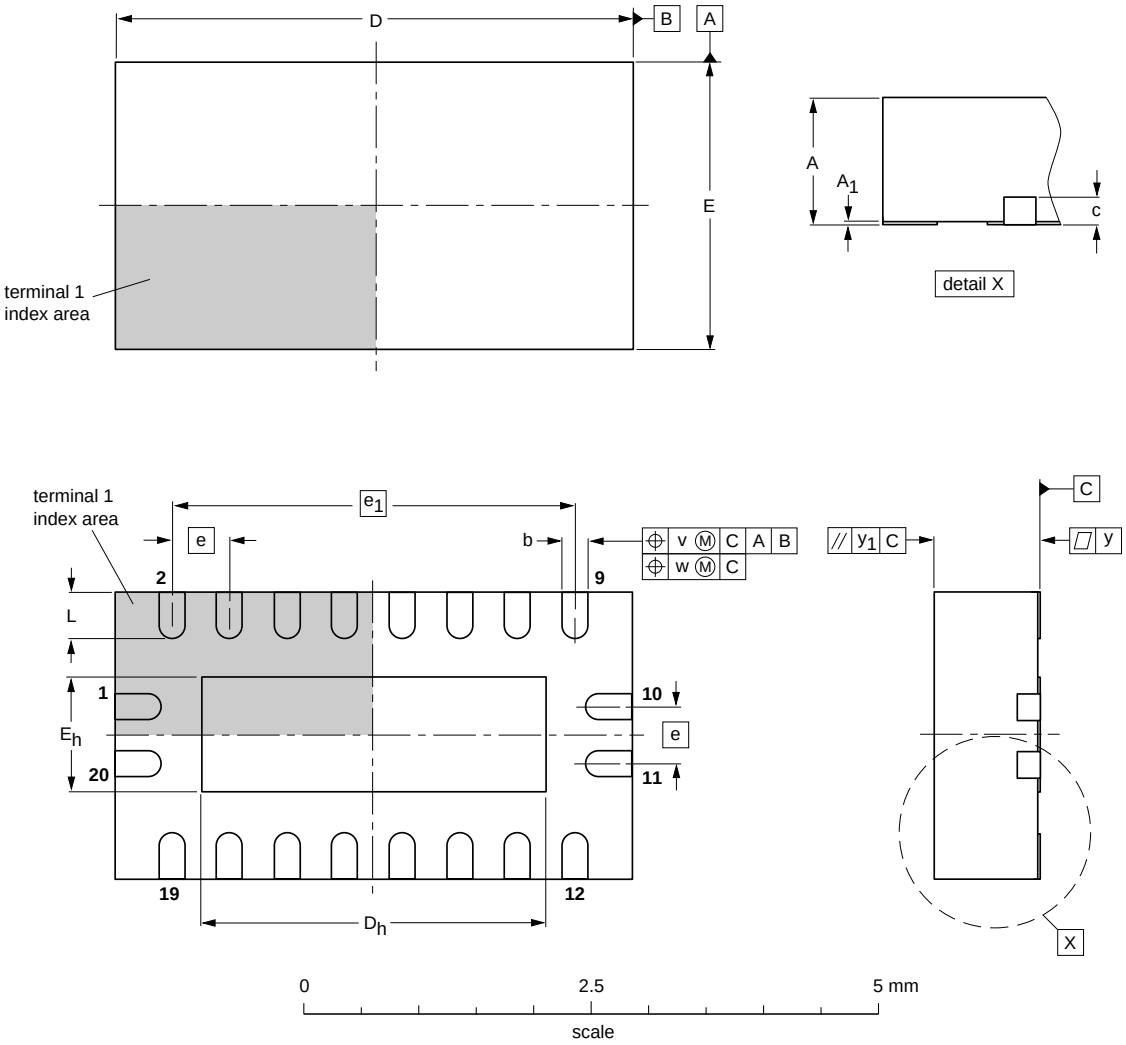
Notes

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.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT360-1		MO-153				~~99-12-27~~ 03-02-19

Fig 9. 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**



DIMENSIONS (mm are the original dimensions)

UNIT	A(1) max.	A_1	b	c	D(1)	D_h	E(1)	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	4.6 4.4	3.15 2.85	2.6 2.4	1.15 0.85	0.5	3.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT764-1	- - -	MO-241	- - -			~~02-10-17~~ 03-01-27

Fig 10. Package outline SOT764-1 (DHVQFN20)

13. Abbreviations

Table 12. Abbreviations

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

14. Revision history

Table 13. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT245_Q100 v.1	20130722	Product data sheet	-	-

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.nxp.com.

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Date of release: 22 July 2013
Document identifier: 74HC_HCT245_Q100

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