

# 74HC245; 74HCT245

Octal bus transceiver; 3-state

Rev. 03 — 31 January 2005

Product data sheet

## 1. General description

The 74HC245; 74HCT245 is a high-speed Si-gate CMOS device and is pin compatible with Low-Power Schottky TTL (LSTTL).

The 74HC245; 74HCT245 is an octal transceiver featuring non-inverting 3-state bus compatible outputs in both send and receive directions. The 74HC245; 74HCT245 features an output enable input ( $\overline{OE}$ ) for easy cascading and a send/receive input (DIR) for direction control.  $\overline{OE}$  controls the outputs so that the buses are effectively isolated.

The 74HC245; 74HCT245 is similar to the 74HC640; 74HCT640 but has true (non-inverting) outputs.

## 2. Features

- Octal bidirectional bus interface
- Non-inverting 3-state outputs
- Multiple package options
- Complies with JEDEC standard no. 7A
- ESD protection:
  - ◆ HBM EIA/JESD22-A114-B exceeds 2000 V
  - ◆ MM EIA/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. Quick reference data

**Table 1: Quick reference data**  
 $GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $t_r = t_f = 6\text{ ns}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Type 74HC245</b>						
$t_{PHL}, t_{PLH}$	propagation delay An to Bn or Bn to An	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	-	7	-	ns
$C_I$	input capacitance		-	3.5	-	pF
$C_{I/O}$	input/output capacitance		-	10	-	pF
$C_{PD}$	power dissipation capacitance per transceiver	$V_I = GND\text{ to }V_{CC}$	[1]	30	-	pF
<b>Type 74HCT245</b>						
$t_{PHL}, t_{PLH}$	propagation delay An to Bn or Bn to An	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	-	10	-	ns

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**Table 1: Quick reference data ...continued**

$GND = 0\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ;  $t_r = t_f = 6\text{ ns}$ .

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$C_I$	input capacitance		-	3.5	-	pF
$C_{I/O}$	input/output capacitance		-	10	-	pF
$C_{PD}$	power dissipation capacitance per transceiver	$V_I = GND$ to $V_{CC} - 1.5\text{ V}$	[1]	-	30	pF

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

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

$f_i$  = 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.

## 4. Ordering information

**Table 2: Ordering information**

Type number	Package			
	Temperature range	Name	Description	Version
74HC245N	-40 °C to +125 °C	DIP20	plastic dual in-line package; 20 leads (300 mil)	SOT146-1
74HC245D	-40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74HC245PW	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74HC245DB	-40 °C to +125 °C	SSOP20	plastic shrink small outline package; 20 leads; body width 5.3 mm	SOT339-1
74HC245BQ	-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
74HCT245N	-40 °C to +125 °C	DIP20	plastic dual in-line package; 20 leads (300 mil)	SOT146-1
74HCT245D	-40 °C to +125 °C	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1
74HCT245PW	-40 °C to +125 °C	TSSOP20	plastic thin shrink small outline package; 20 leads; body width 4.4 mm	SOT360-1
74HCT245DB	-40 °C to +125 °C	SSOP20	plastic shrink small outline package; 20 leads; body width 5.3 mm	SOT339-1
74HCT245BQ	-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

## 5. Functional diagram

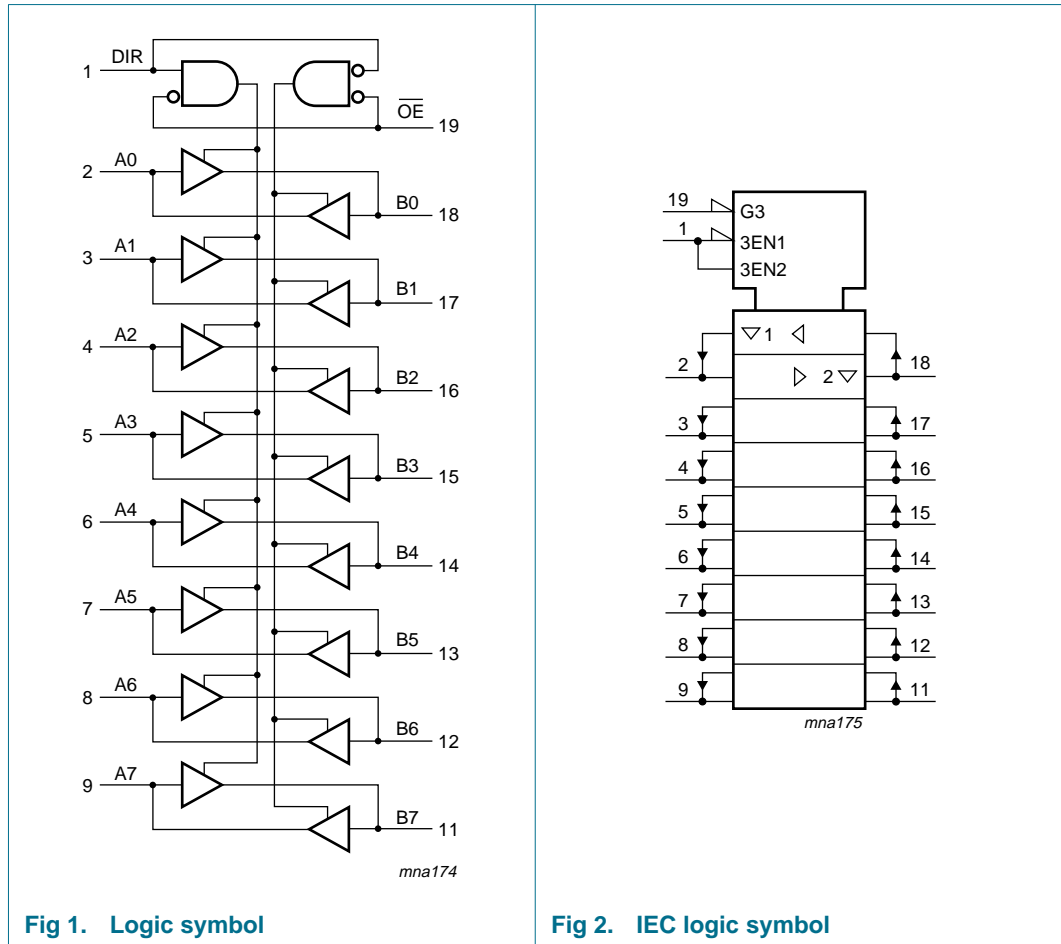
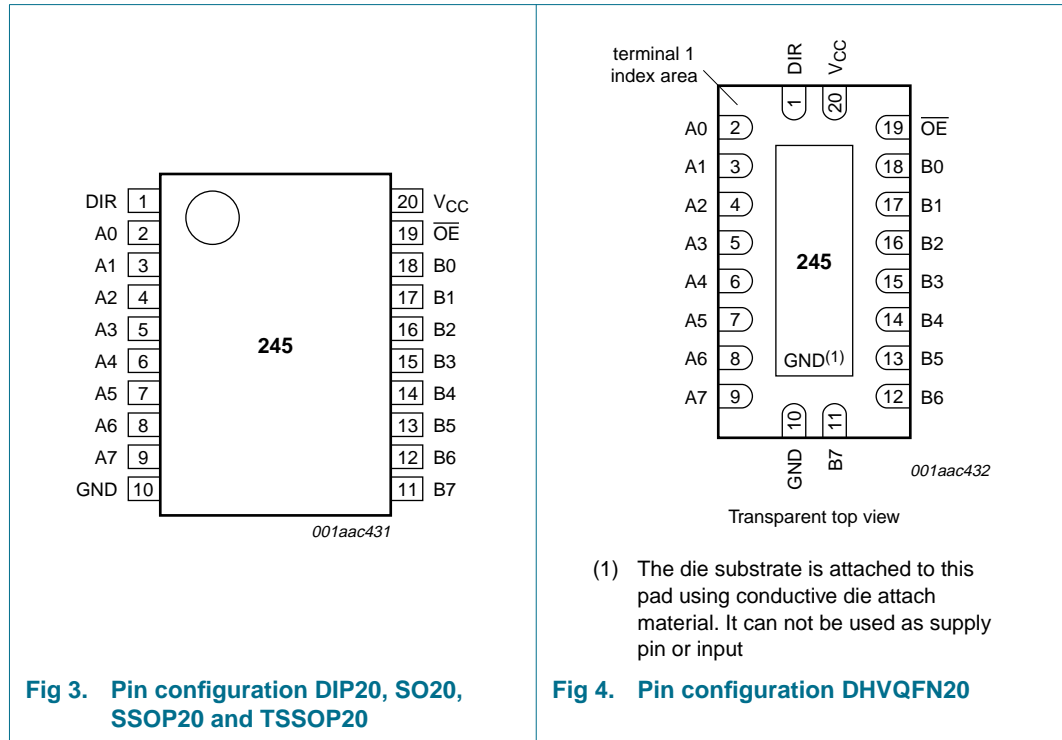


Fig 1. Logic symbol

Fig 2. IEC logic symbol

## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 3: Pin description

Symbol	Pin	Description
DIR	1	direction control
A0	2	data input/output
A1	3	data input/output
A2	4	data input/output
A3	5	data input/output
A4	6	data input/output
A5	7	data input/output
A6	8	data input/output
A7	9	data input/output
GND	10	ground (0 V)
B7	11	data input/output
B6	12	data input/output
B5	13	data input/output
B4	14	data input/output
B3	15	data input/output
B2	16	data input/output

**Table 3: Pin description ...continued**

Symbol	Pin	Description
B1	17	data input/output
B0	18	data input/output
$\overline{OE}$	19	output enable input (active LOW)
$V_{CC}$	20	supply voltage

## 7. Functional description

### 7.1 Function table

**Table 4: 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.

## 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).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+7	V
$I_{IK}$	input diode current	$V_I < -0.5 \text{ V}$ or $V_I > V_{CC} + 0.5 \text{ V}$	-	$\pm 20$	mA
$I_{OK}$	output diode current	$V_O < -0.5 \text{ V}$ or $V_O > V_{CC} + 0.5 \text{ V}$	-	$\pm 20$	mA
$I_O$	output source or sink current	$V_O = -0.5 \text{ V}$ to $V_{CC} + 0.5 \text{ V}$	-	$\pm 35$	mA
$I_{CC}, I_{GND}$	$V_{CC}$ or GND current		-	$\pm 70$	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation		[1]		
	DIP20 package		-	750	mW
	SO20, SSOP20, TSSOP20 and DHVQFN20 packages		-	500	mW

- [1] For DIP20 packages: above 70 °C,  $P_{tot}$  derates linearly with 12 mW/K.  
For SO20 packages: above 70 °C,  $P_{tot}$  derates linearly with 8 mW/K.  
For SSOP20 and TSSOP20 packages: above 60 °C,  $P_{tot}$  derates linearly with 5.5 mW/K.  
For DHVQFN20 packages: above 60 °C,  $P_{tot}$  derates linearly with 4.5 mW/K.

## 9. Recommended operating conditions

**Table 6: Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Type 74HC245</b>						
$V_{CC}$	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
$t_r, t_f$	input rise and fall times	$V_{CC} = 2.0\text{ V}$	-	-	1000	ns
		$V_{CC} = 4.5\text{ V}$	-	6.0	500	ns
		$V_{CC} = 6.0\text{ V}$	-	-	400	ns
$T_{amb}$	ambient temperature		-40	-	+125	°C
<b>Type 74HCT245</b>						
$V_{CC}$	supply voltage		4.5	5.0	5.5	V
$V_I$	input voltage		0	-	$V_{CC}$	V
$V_O$	output voltage		0	-	$V_{CC}$	V
$t_r, t_f$	input rise and fall times	$V_{CC} = 4.5\text{ V}$	-	6.0	500	ns
$T_{amb}$	ambient temperature		-40	-	+125	°C

## 10. Static characteristics

**Table 7: Static characteristics type 74HC245**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = 25\text{ °C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0\text{ V}$	1.5	1.2	-	V
		$V_{CC} = 4.5\text{ V}$	3.15	2.4	-	V
		$V_{CC} = 6.0\text{ V}$	4.2	3.2	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0\text{ V}$	-	0.8	0.5	V
		$V_{CC} = 4.5\text{ V}$	-	2.1	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	2.8	1.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 2.0\text{ V}$	1.9	2.0	-	V
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$	4.4	4.5	-	V
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 6.0\text{ V}$	5.9	6.0	-	V
		$I_O = -6.0\text{ mA}; V_{CC} = 4.5\text{ V}$	3.98	4.32	-	V
		$I_O = -7.8\text{ mA}; V_{CC} = 6.0\text{ V}$	5.48	5.81	-	V

**Table 7: Static characteristics type 74HC245 ...continued**  
At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
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	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	0	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	0	0.1	V
		I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	0.15	0.26	V
		I <sub>O</sub> = 7.8 mA; V <sub>CC</sub> = 6.0 V	-	0.16	0.26	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±0.1	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±0.5	μA
I <sub>CC</sub>	quiescent 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	-	-	8.0	μA
C <sub>I</sub>	input capacitance		-	3.5	-	pF
C <sub>I/O</sub>	input/output capacitance		-	10	-	pF
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	-	-	V
		V <sub>CC</sub> = 4.5 V	3.15	-	-	V
		V <sub>CC</sub> = 6.0 V	4.2	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	-	0.5	V
		V <sub>CC</sub> = 4.5 V	-	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	-	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	-	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	-	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	-	-	V
		I <sub>O</sub> = -6.0 mA; V <sub>CC</sub> = 4.5 V	3.84	-	-	V
		I <sub>O</sub> = -7.8 mA; V <sub>CC</sub> = 6.0 V	5.34	-	-	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	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	-	0.1	V
		I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	-	0.33	V
		I <sub>O</sub> = 7.8 mA; V <sub>CC</sub> = 6.0 V	-	-	0.33	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±1.0	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±5.0	μA
I <sub>CC</sub>	quiescent 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	-	-	80	μA
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	-	-	V
		V <sub>CC</sub> = 4.5 V	3.15	-	-	V
		V <sub>CC</sub> = 6.0 V	4.2	-	-	V

**Table 7: Static characteristics type 74HC245 ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	-	0.5	V
		V <sub>CC</sub> = 4.5 V	-	-	1.35	V
		V <sub>CC</sub> = 6.0 V	-	-	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	-	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V	4.4	-	-	V
		I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V	5.9	-	-	V
		I <sub>O</sub> = -6.0 mA; V <sub>CC</sub> = 4.5 V	3.7	-	-	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	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V	-	-	0.1	V
		I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V	-	-	0.1	V
		I <sub>O</sub> = 6.0 mA; V <sub>CC</sub> = 4.5 V	-	-	0.4	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±1.0	μA
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±10.0	μA
I <sub>CC</sub>	quiescent 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	-	-	160	μA

**Table 8: Static characteristics type 74HCT245**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	1.6	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	1.2	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V	-	-	-	-
		I <sub>O</sub> = -20 μA	4.4	4.5	-	V
		I <sub>O</sub> = -6 mA	3.98	4.32	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V	-	-	-	-
		I <sub>O</sub> = 20 μA	-	0	0.1	V
		I <sub>O</sub> = 6.0 mA	-	0.15	0.26	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V	-	-	±0.1	μA
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 5.5 V; V <sub>O</sub> = V <sub>CC</sub> or GND per input pin; other inputs at V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A	-	-	±0.5	μA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	8.0	μA



**Table 8: Static characteristics type 74HCT245 ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$\Delta I_{CC}$	additional quiescent 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	$\mu$ A
	$\overline{OE}$ input		-	150	540	$\mu$ A
	DIR input		-	90	324	$\mu$ A
$C_I$	input capacitance		-	3.5	-	pF
$C_{I/O}$	input/output capacitance		-	10	-	pF
<b><math>T_{amb} = -40</math> °C to <math>+85</math> °C</b>						
$V_{IH}$	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				
		$I_O = -20$ $\mu$ A	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				
		$I_O = 20$ $\mu$ A	-	-	0.1	V
		$I_O = 6.0$ mA	-	-	0.33	V
$I_{LI}$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5$ V	-	-	$\pm 1.0$	$\mu$ A
$I_{OZ}$	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	-	-	$\pm 5.0$	$\mu$ A
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	80	$\mu$ A
$\Delta I_{CC}$	additional quiescent 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	$\mu$ A
	$\overline{OE}$ input		-	-	675	$\mu$ A
	DIR input		-	-	405	$\mu$ A
<b><math>T_{amb} = -40</math> °C to <math>+125</math> °C</b>						
$V_{IH}$	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				
		$I_O = -20$ $\mu$ A	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				
		$I_O = 20$ $\mu$ A	-	-	0.1	V
		$I_O = 6.0$ mA	-	-	0.4	V
$I_{LI}$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 5.5$ V	-	-	$\pm 1.0$	$\mu$ A
$I_{OZ}$	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	-	-	$\pm 10$	$\mu$ A

**Table 8: Static characteristics type 74HCT245 ...continued**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	160	$\mu$ A
$\Delta I_{CC}$	additional quiescent 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	$\mu$ A
	$\overline{OE}$ input		-	-	735	$\mu$ A
	DIR input		-	-	441	$\mu$ A

## 11. Dynamic characteristics

**Table 9: Dynamic characteristics type 74HC245**

GND = 0 V; test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = 25</math> °C</b>						
$t_{PHL}$ , $t_{PLH}$	propagation delay An to Bn or Bn to An	see <a href="#">Figure 5</a> $V_{CC} = 2.0$ V $V_{CC} = 4.5$ V $V_{CC} = 5.0$ V; $C_L = 15$ pF $V_{CC} = 6.0$ V	-	25 9 7 7	90 18 -	ns ns ns ns
$t_{PZH}$ , $t_{PZL}$	3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	see <a href="#">Figure 6</a> $V_{CC} = 2.0$ V $V_{CC} = 4.5$ V $V_{CC} = 6.0$ V	-	30 11 9	150 30 26	ns ns ns
$t_{PHZ}$ , $t_{PLZ}$	3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	see <a href="#">Figure 6</a> $V_{CC} = 2.0$ V $V_{CC} = 4.5$ V $V_{CC} = 6.0$ V	-	41 15 12	150 30 26	ns ns ns
$t_{THL}$ , $t_{TLH}$	output transition time	see <a href="#">Figure 5</a> $V_{CC} = 2.0$ V $V_{CC} = 4.5$ V $V_{CC} = 6.0$ V	-	14 5 4	60 12 10	ns ns ns
$C_{PD}$	power dissipation capacitance per transceiver	$V_I = GND$ to $V_{CC}$	[1] -	30	-	pF
<b><math>T_{amb} = -40</math> °C to <math>+85</math> °C</b>						
$t_{PHL}$ , $t_{PLH}$	propagation delay An to Bn or Bn to An	see <a href="#">Figure 5</a> $V_{CC} = 2.0$ V $V_{CC} = 4.5$ V $V_{CC} = 6.0$ V	-	- - -	115 23 20	ns ns ns

**Table 9: Dynamic characteristics type 74HC245 ...continued**  
*GND = 0 V; test circuit see Figure 7.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t <sub>PZH</sub> , t <sub>PZL</sub>	3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	see <a href="#">Figure 6</a>				
		V <sub>CC</sub> = 2.0 V	-	-	190	ns
		V <sub>CC</sub> = 4.5 V	-	-	38	ns
		V <sub>CC</sub> = 6.0 V	-	-	33	ns
t <sub>PHZ</sub> , t <sub>PLZ</sub>	3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	see <a href="#">Figure 6</a>				
		V <sub>CC</sub> = 2.0 V	-	-	190	ns
		V <sub>CC</sub> = 4.5 V	-	-	38	ns
		V <sub>CC</sub> = 6.0 V	-	-	33	ns
t <sub>THL</sub> , t <sub>TLH</sub>	output transition time	see <a href="#">Figure 5</a>				
		V <sub>CC</sub> = 2.0 V	-	-	75	ns
		V <sub>CC</sub> = 4.5 V	-	-	15	ns
		V <sub>CC</sub> = 6.0 V	-	-	13	ns
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
t <sub>PHL</sub> , t <sub>PLH</sub>	propagation delay An to Bn or Bn to An	see <a href="#">Figure 5</a>				
		V <sub>CC</sub> = 2.0 V	-	-	135	ns
		V <sub>CC</sub> = 4.5 V	-	-	27	ns
		V <sub>CC</sub> = 6.0 V	-	-	23	ns
t <sub>PZH</sub> , t <sub>PZL</sub>	3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	see <a href="#">Figure 6</a>				
		V <sub>CC</sub> = 2.0 V	-	-	225	ns
		V <sub>CC</sub> = 4.5 V	-	-	45	ns
		V <sub>CC</sub> = 6.0 V	-	-	38	ns
t <sub>PHZ</sub> , t <sub>PLZ</sub>	3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	see <a href="#">Figure 6</a>				
		V <sub>CC</sub> = 2.0 V	-	-	225	ns
		V <sub>CC</sub> = 4.5 V	-	-	45	ns
		V <sub>CC</sub> = 6.0 V	-	-	38	ns
t <sub>THL</sub> , t <sub>TLH</sub>	output transition time	see <a href="#">Figure 5</a>				
		V <sub>CC</sub> = 2.0 V	-	-	90	ns
		V <sub>CC</sub> = 4.5 V	-	-	18	ns
		V <sub>CC</sub> = 6.0 V	-	-	15	ns

[1] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW):  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$  where:  
 f<sub>i</sub> = input frequency in MHz;  
 f<sub>o</sub> = output frequency in MHz;  
 C<sub>L</sub> = output load capacitance in pF;  
 V<sub>CC</sub> = supply voltage in V;  
 N = number of inputs switching;  
 $\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

**Table 10: Dynamic characteristics type 74HCT245**

$GND = 0 V$ ; test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = 25\text{ }^{\circ}\text{C}</math></b>						
$t_{PHL}, t_{PLH}$	propagation delay An to Bn or Bn to An	see <a href="#">Figure 5</a> $V_{CC} = 4.5\text{ V}$	-	12	22	ns
		$V_{CC} = 5.0\text{ V}; C_L = 15\text{ pF}$	-	10	-	ns
$t_{PZH}, t_{PZL}$	3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	16	30	ns
$t_{PHZ}, t_{PLZ}$	3-state output disable time $\overline{OE}$ to An or OE to Bn	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	16	30	ns
$t_{THL}, t_{TLH}$	output transition time	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 5</a>	-	5	12	ns
$C_{PD}$	power dissipation capacitance per transceiver	$V_I = GND$ to $V_{CC} - 1.5\text{ V}$	[1]	30	-	pF
<b><math>T_{amb} = -40\text{ }^{\circ}\text{C}</math> to <math>+85\text{ }^{\circ}\text{C}</math></b>						
$t_{PHL}, t_{PLH}$	propagation delay An to Bn or Bn to An	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 5</a>	-	-	28	ns
$t_{PZH}, t_{PZL}$	3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	-	38	ns
$t_{PHZ}, t_{PLZ}$	3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	-	38	ns
$t_{THL}, t_{TLH}$	output transition time	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 5</a>	-	-	15	ns
<b><math>T_{amb} = -40\text{ }^{\circ}\text{C}</math> to <math>+125\text{ }^{\circ}\text{C}</math></b>						
$t_{PHL}, t_{PLH}$	propagation delay An to Bn or Bn to An	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 5</a>	-	-	33	ns
$t_{PZH}, t_{PZL}$	3-state output enable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	-	45	ns
$t_{PHZ}, t_{PLZ}$	3-state output disable time $\overline{OE}$ to An or $\overline{OE}$ to Bn	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	-	45	ns
$t_{THL}, t_{TLH}$	output transition time	$V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 5</a>	-	-	18	ns

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

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

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

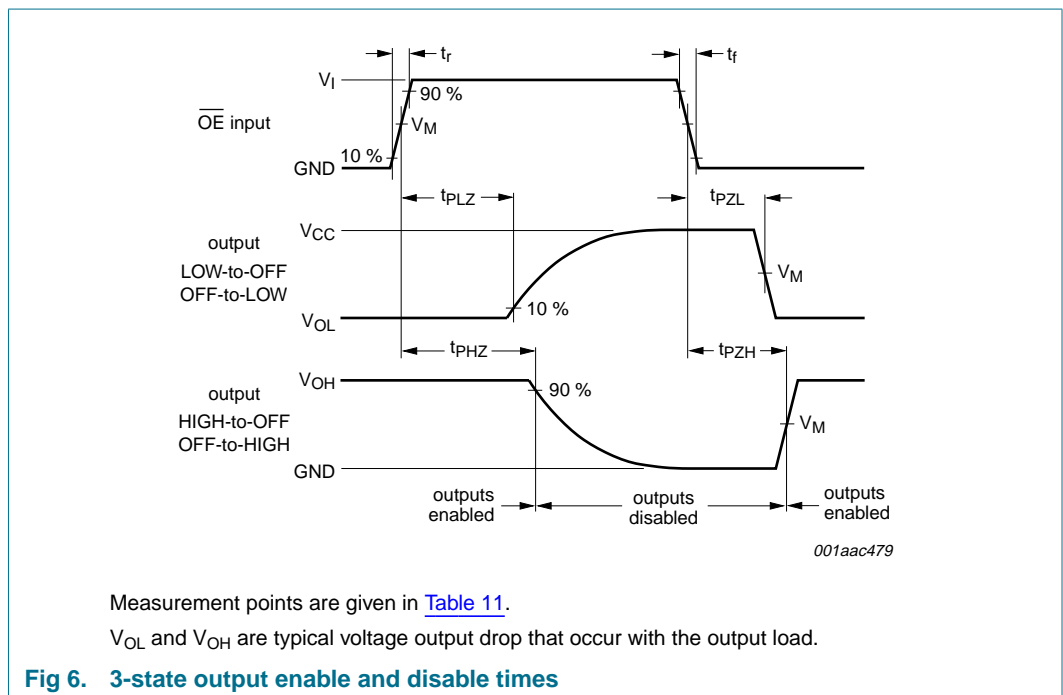
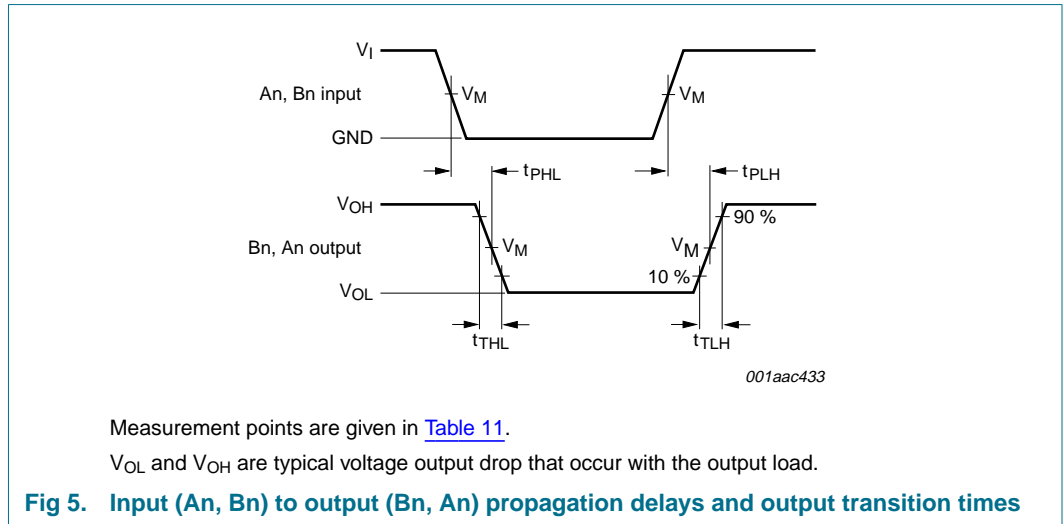
$C_L$  = output load capacitance in pF;

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

$N$  = number of inputs switching;

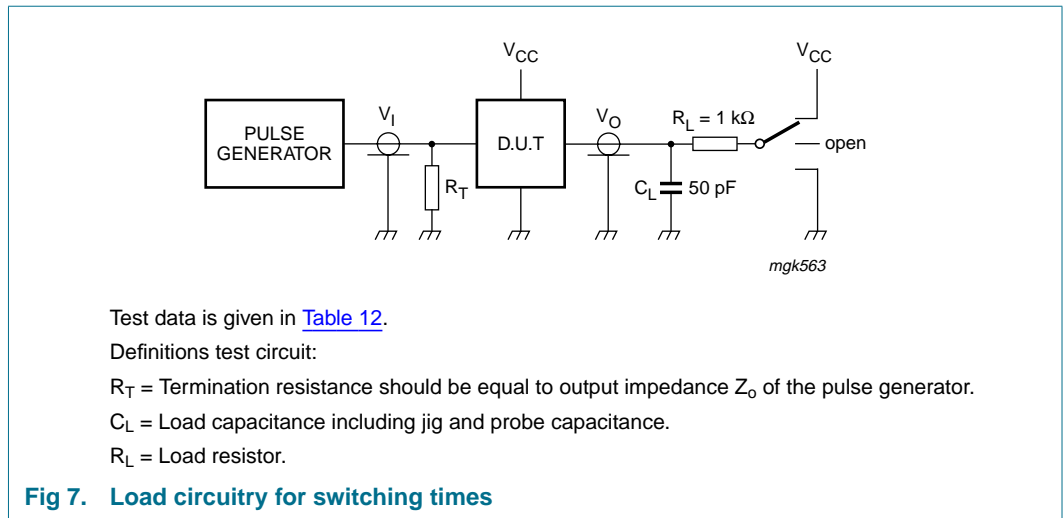
$\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

## 12. Waveforms



**Table 11: Measurement points**

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



**Table 12: Test data**

Type	Input		Test		
	$V_I$	$t_r, t_f$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
74HC245	$V_{CC}$	6 ns	open	GND	$V_{CC}$
74HCT245	3 V	6 ns	open	GND	$V_{CC}$

## 13. Package outline

DIP20: plastic dual in-line package; 20 leads (300 mil)

SOT146-1

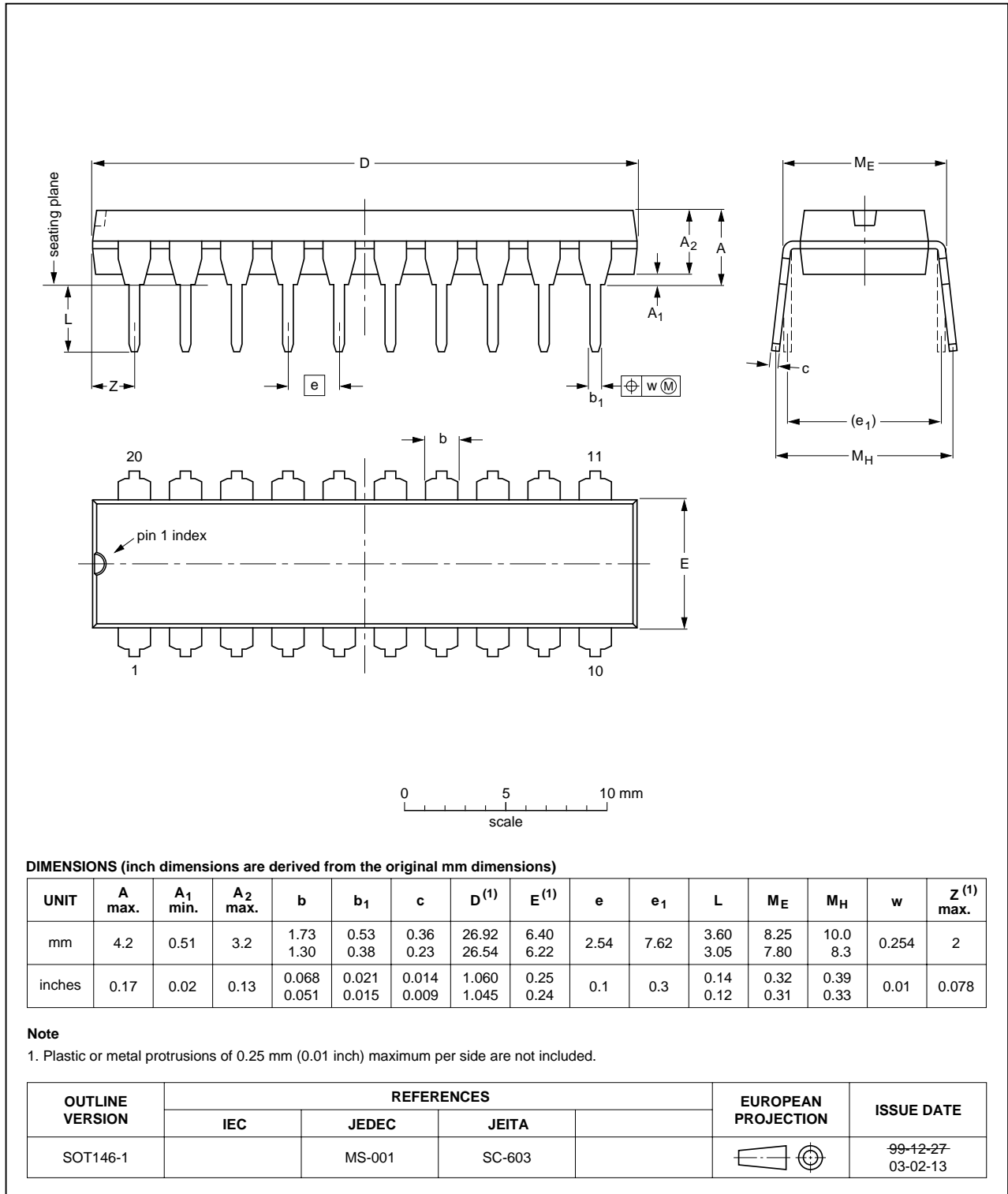


Fig 8. Package outline SOT146-1 (DIP20)

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

SOT163-1

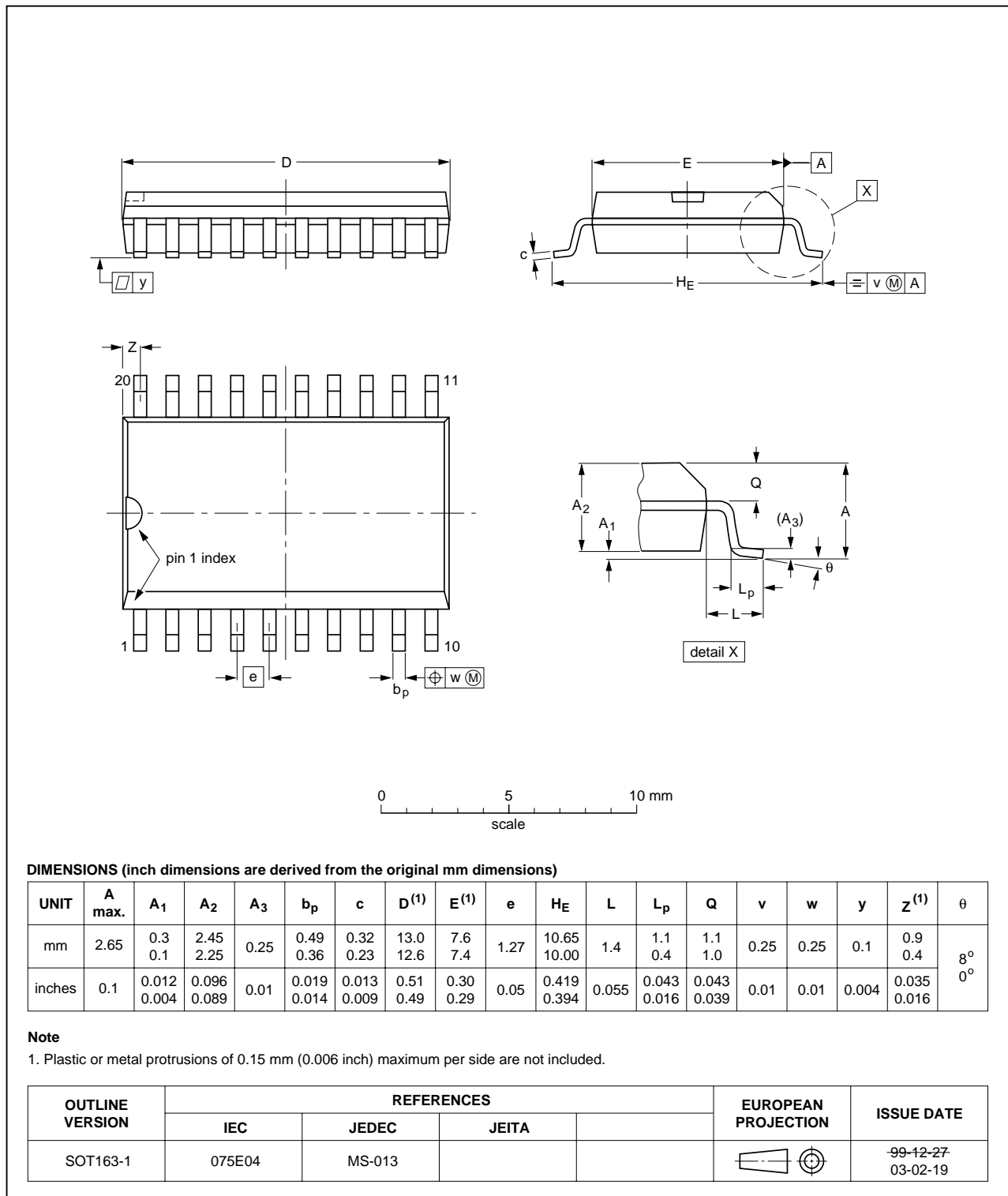


Fig 9. Package outline SOT163-1 (SO20)



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

SOT339-1

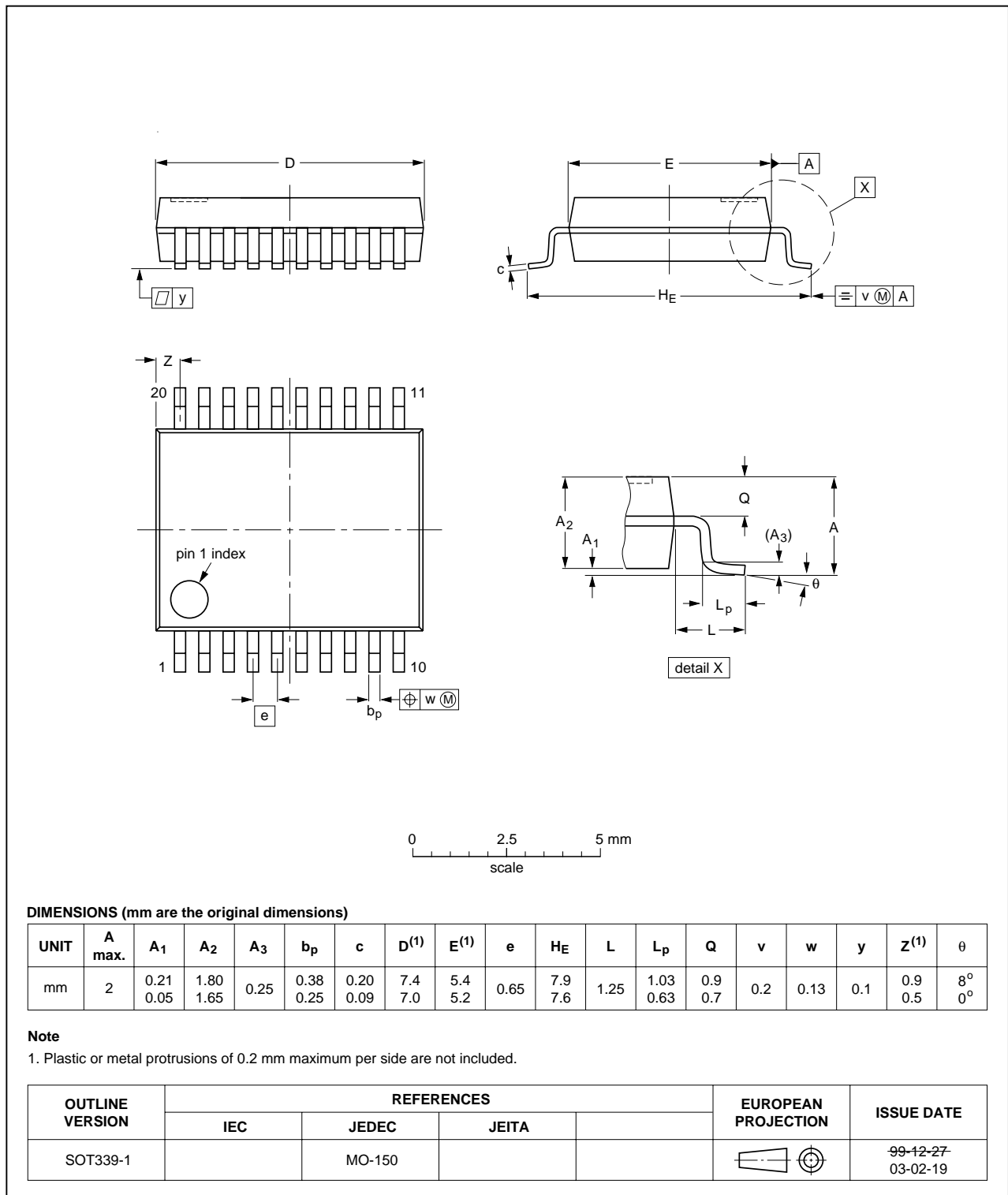


Fig 10. Package outline SOT339-1 (SSOP20)

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

SOT360-1

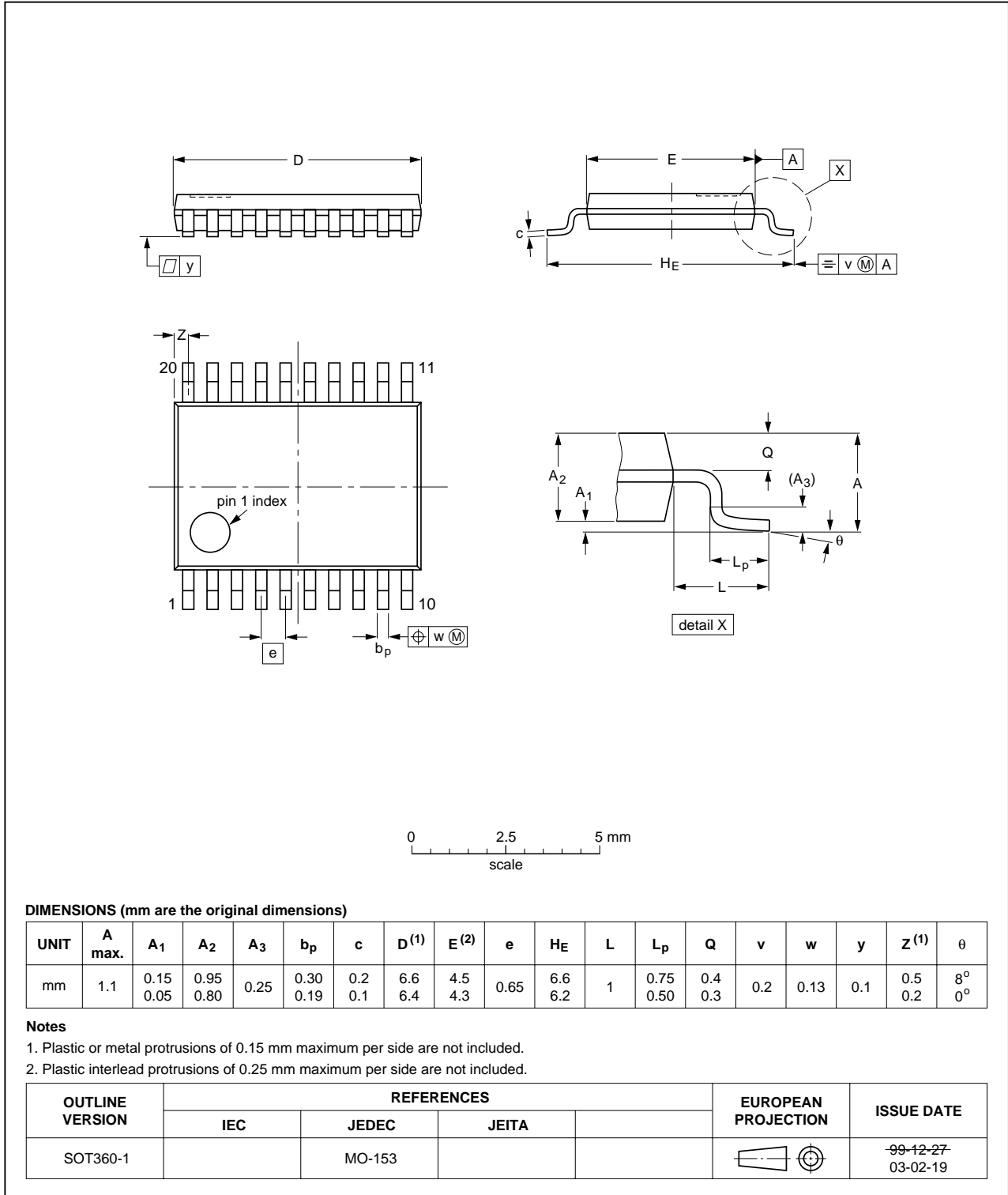


Fig 11. Package outline SOT360-1 (TSSOP20)

**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 12. Package outline SOT764-1 (DHVQFN20)**

## 14. Revision history

Table 13: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
74HC_HCT245_3	20050131	Product data sheet	-	9397 750 14502	74HC_HCT245_CNV_2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet is redesigned to comply with the new presentation and information standard of Philips Semiconductors</li> <li><a href="#">Section 4 "Ordering information"</a>, <a href="#">Section 6 "Pinning information"</a> and <a href="#">Section 13 "Package outline"</a> are modified to include the DHVQFN20 package.</li> </ul>				
74HC_HCT245_CNV_2	19930930	Product specification	-	-	-

## 15. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## 16. Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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