

74HC245; 74HCT245

Octal bus transceiver; 3-state

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
Type 74HC245						
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
Type 74HCT245						
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

PHILIPS

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 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.

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

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 $V_I > V_{CC} + 0.5\text{ V}$	-	± 20	mA
I_{OK}	output diode current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	± 20	mA
I_O	output source or sink current	$V_O = -0.5\text{ V}$ to $V_{CC} + 0.5\text{ V}$	-	± 35	mA
I_{CC}, I_{GND}	V_{CC} or GND current		-	± 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
Type 74HC245						
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
Type 74HCT245						
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
$T_{amb} = 25\text{ °C}$						
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 _{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 _{LI}	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}	quiescent supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 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
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 _{LI}	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}	quiescent supply current	V _I = V _{CC} or GND; I _O = 0 A; V _{CC} = 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
ΔI_{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	μ A
	\overline{OE} input		-	150	540	μ A
	DIR input		-	90	324	μ A
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				
		$I_O = -20$ μ 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				
		$I_O = 20$ μ 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	-	-	± 1.0	μ 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	-	-	± 5.0	μ A
I_{CC}	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0$ A; $V_{CC} = 5.5$ V	-	-	80	μ A
ΔI_{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	μ A
	\overline{OE} input		-	-	675	μ A
	DIR input		-	-	405	μ A
$T_{amb} = -40$ °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				
		$I_O = -20$ μ 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				
		$I_O = 20$ μ 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	-	-	± 1.0	μ 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	-	-	± 10	μ 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	μ A
ΔI_{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	μ A
	\overline{OE} input		-	-	735	μ A
	DIR input		-	-	441	μ A

11. Dynamic characteristics

Table 9: Dynamic characteristics type 74HC245GND = 0 V; test circuit see [Figure 7](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25$ °C						
t_{PHL} , t_{PLH}	propagation delay An to Bn or Bn to An	see Figure 5 $V_{CC} = 2.0$ 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 Figure 6 $V_{CC} = 2.0$ 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 Figure 6 $V_{CC} = 2.0$ 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 Figure 5 $V_{CC} = 2.0$ 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
$T_{amb} = -40$ °C to $+85$ °C						
t_{PHL} , t_{PLH}	propagation delay An to Bn or Bn to An	see Figure 5 $V_{CC} = 2.0$ V $V_{CC} = 4.5$ V $V_{CC} = 6.0$ V	-	- - -	115 23 20	ns ns ns

Table 10: Dynamic characteristics type 74HCT245

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{amb} = 25\text{ °C}$						
t_{PHL} , t_{PLH}	propagation delay An to Bn or Bn to An	see Figure 5 $V_{CC} = 4.5\text{ V}$	-	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 Figure 6	-	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 Figure 6	-	16	30	ns
t_{THL} , t_{TLH}	output transition time	$V_{CC} = 4.5\text{ V}$; see Figure 5	-	5	12	ns
C_{PD}	power dissipation capacitance per transceiver	$V_I = GND$ to $V_{CC} - 1.5\text{ V}$	[1]	30	-	pF
$T_{amb} = -40\text{ °C to }+85\text{ °C}$						
t_{PHL} , t_{PLH}	propagation delay An to Bn or Bn to An	$V_{CC} = 4.5\text{ V}$; see Figure 5	-	-	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 Figure 6	-	-	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 Figure 6	-	-	38	ns
t_{THL} , t_{TLH}	output transition time	$V_{CC} = 4.5\text{ V}$; see Figure 5	-	-	15	ns
$T_{amb} = -40\text{ °C to }+125\text{ °C}$						
t_{PHL} , t_{PLH}	propagation delay An to Bn or Bn to An	$V_{CC} = 4.5\text{ V}$; see Figure 5	-	-	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 Figure 6	-	-	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 Figure 6	-	-	45	ns
t_{THL} , t_{TLH}	output transition time	$V_{CC} = 4.5\text{ V}$; see Figure 5	-	-	18	ns

[1] 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;

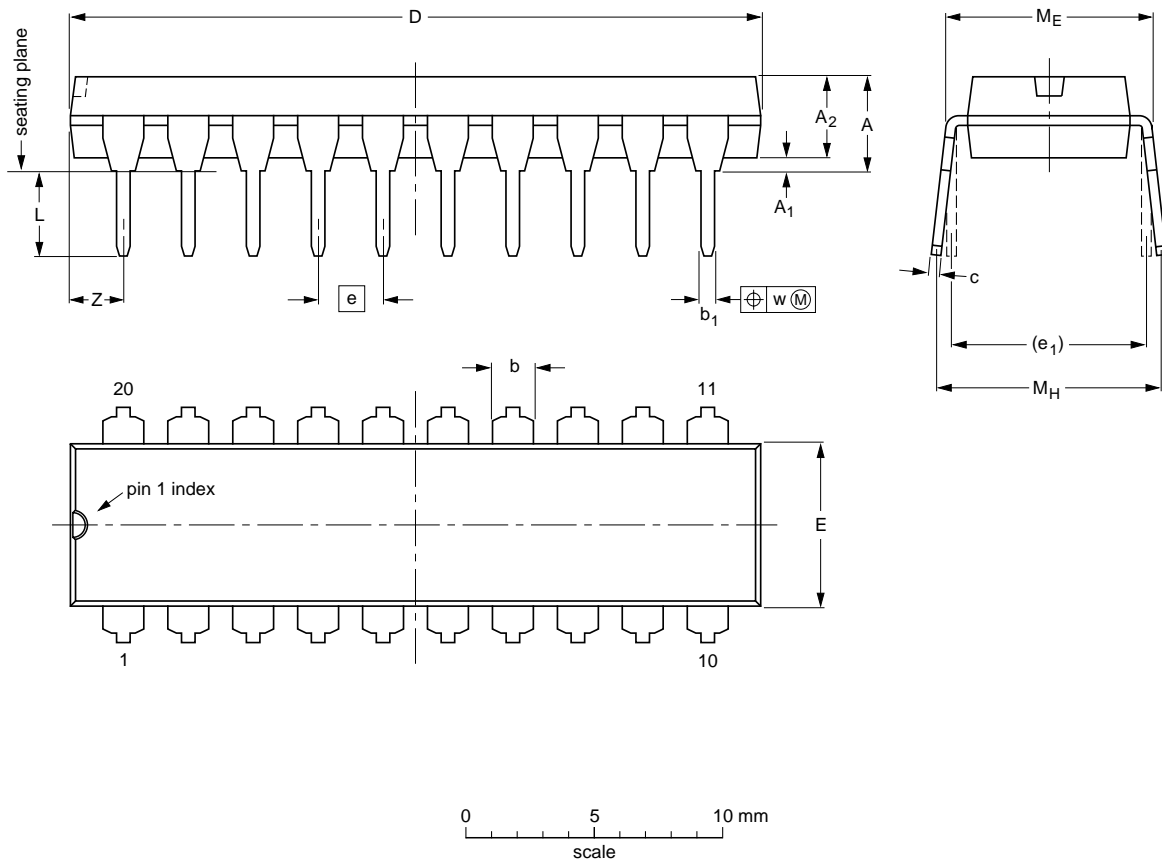
N = number of inputs switching;

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

13. Package outline

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

SOT146-1



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

UNIT	A max.	A ₁ min.	A ₂ max.	b	b ₁	c	D ⁽¹⁾	E ⁽¹⁾	e	e ₁	L	M _E	M _H	w	Z ⁽¹⁾ max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	0.36 0.23	26.92 26.54	6.40 6.22	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2
inches	0.17	0.02	0.13	0.068 0.051	0.021 0.015	0.014 0.009	1.060 1.045	0.25 0.24	0.1	0.3	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.078

Note

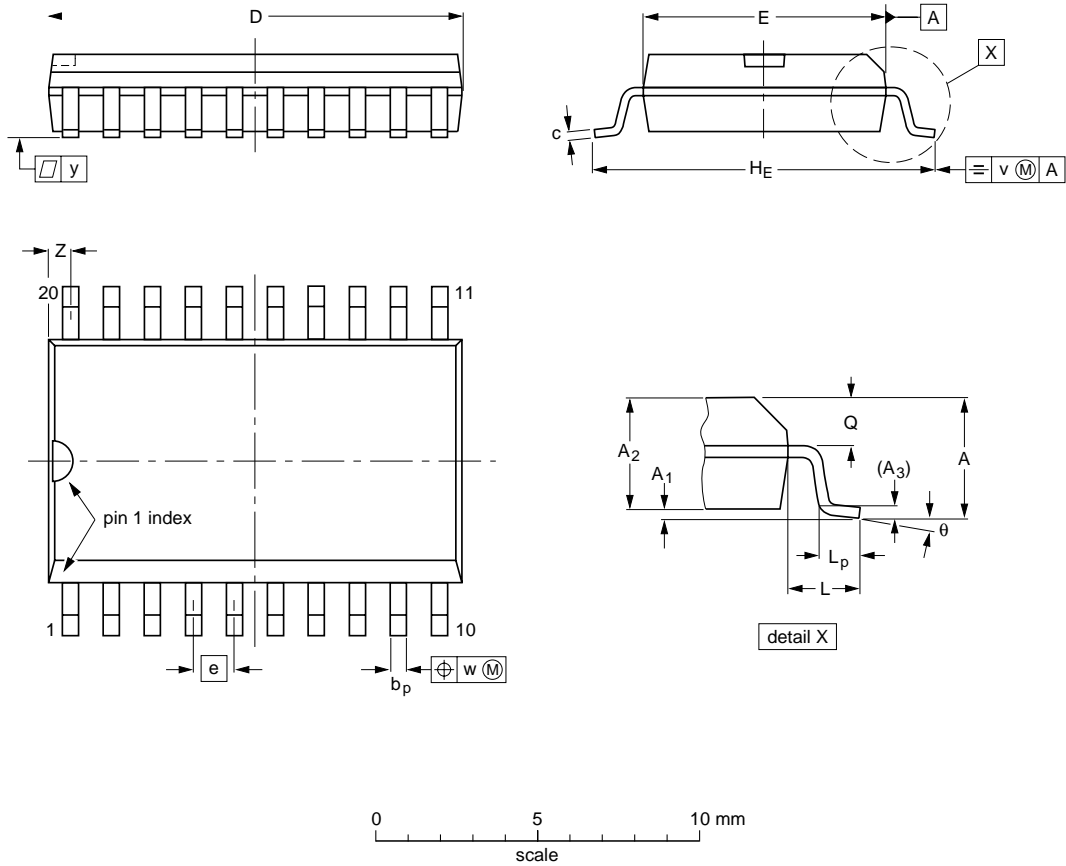
1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION
	IEC	JEDEC	JEITA		
SOT146-1		MS-001	SC-603		

Fig 8. Package outline SOT146-1 (DIP20)

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° 0°
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
	IEC	JEDEC	JEITA	
SOT163-1	075E04	MS-013		

Fig 9. Package outline SOT163-1 (SO20)