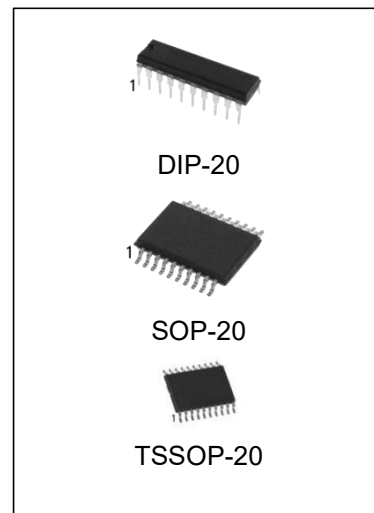


## Octal Buffer/Line Driver; 3-state

### Features:

- Input levels:  
For 74HC244: CMOS level  
For 74HCT244: TTL level
- Octal bus interface
- Non-inverting 3-state outputs
- Multiple package options
- Specified from -40°C to +85°C
- Packaging information:  
DIP-20/SOP-20/TSSOP-20



### Ordering Information

DEVICE	Package Type	MARKING	Packing	Packing Qty
74HC244PG	DIP-20	74HC244	TUBE	720pcs/box
74HCT244PG	DIP-20	74HCT244	TUBE	720pcs/box
74HC244DRG	SOP-20	74HC244	REEL	2000pcs/reel
74HCT244DRG	SOP-20	74HCT244	REEL	2000pcs/reel
74HC244PWRG	TSSOP-20	HC244	REEL	2500pcs/reel
74HCT244PWRG	TSSOP-20	HCT244	REEL	2500pcs/reel

### General Description

The 74HC/HCT244 is an 8-bit buffer/line driver with 3-state outputs. The device can be used as two 4-bit buffers or one 8-bit buffer. The device features two output enables ( $1\overline{OE}$  and  $2\overline{OE}$ ), each controlling four of the 3-state outputs. A HIGH on  $n\overline{OE}$  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 VCC.

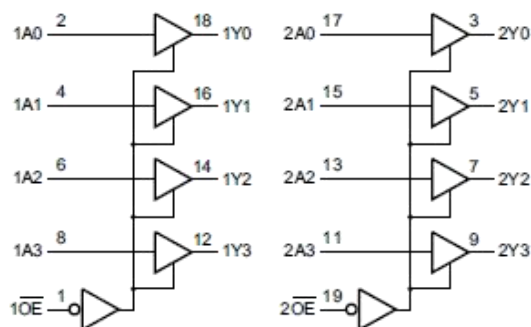
**Block Diagram**


Figure 1. Logic symbol

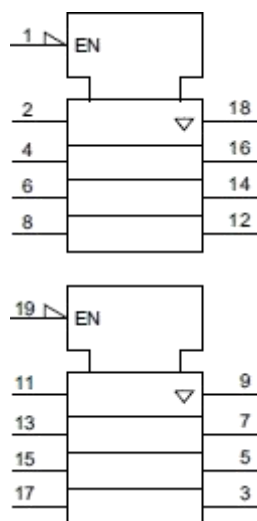


Figure 2. IEC logic symbol

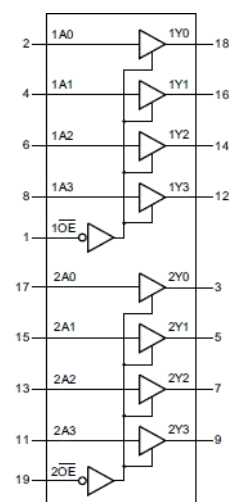
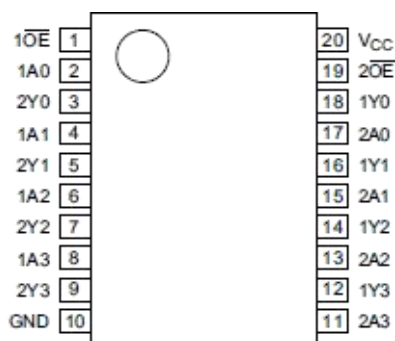


Figure 3. Functional diagram

## Pin Configurations

DIP-20/SOP-20/TSSOP-20



## Pin Description

Pin No.	Pin Name	Description
1	1OE	output enable input (active LOW)
2	1A0	data input
3	2Y0	bus output
4	1A1	data input
5	2Y1	bus output
6	1A2	data input
7	2Y2	bus output
8	1A3	data input
9	2Y3	bus output
10	GND	ground (0V)
11	2A3	data input
12	1Y3	bus output
13	2A2	data input
14	1Y2	bus output
15	2A1	data input
16	1Y1	bus output
17	2A0	data input
18	1Y0	bus output
19	2OE	output enable input (active LOW)
20	V <sub>CC</sub>	supply voltage

## Function Table

Input		Output
nOE	nAn	nYn
L	L	L
L	H	H
H	X	Z

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

## Electrical Parameter

### Absolute Maximum Ratings

(Voltages are referenced to GND(ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Max.	Unit
supply voltage	V <sub>CC</sub>	-	-0.5	+7.0	V
input clamping current	I <sub>IK</sub>	V <sub>I</sub> < -0.5V or V <sub>I</sub> > V <sub>CC</sub> +0.5V	-	±20	mA
output clamping current	I <sub>OK</sub>	V <sub>O</sub> < -0.5V or V <sub>O</sub> > V <sub>CC</sub> +0.5V	-	±20	mA
output current	I <sub>o</sub>	-0.5V < V <sub>O</sub> < V <sub>CC</sub> +0.5V	-	±35	mA
supply current	I <sub>CC</sub>	-	-	70	mA
ground current	I <sub>GND</sub>	-	-70	-	mA
storage temperature	T <sub>stg</sub>	-	-65	+150	°C
total power dissipation	P <sub>tot</sub>	-	-	500	mW
Soldering temperature	T <sub>L</sub>	10s	DIP	245	°C
			SOP	245	°C

Note:1、 Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is intended to be functional, but specific performance is not ensured.

2、 For DIP20 packages: above 70°C the value of P<sub>tot</sub> derates linearly with 12mW/K.

3、 For SOP20 packages: above 70°C the value of P<sub>tot</sub> derates linearly with 8mW/K.

4、 For TSSOP20 packages: above 60°C the value of P<sub>tot</sub> derates linearly with 5.5mW/K.

### Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
<b>74HC244</b>						
supply voltage	V <sub>CC</sub>	-	2.0	5.0	6.0	V
input voltage	V <sub>I</sub>	-	0	-	V <sub>CC</sub>	V
output voltage	V <sub>O</sub>	-	0	-	V <sub>CC</sub>	V
input transition rise and fall rate	Δt/ΔV	V <sub>CC</sub> =2.0V	-	-	625	ns/V
		V <sub>CC</sub> =4.5V	-	1.67	139	ns/V
		V <sub>CC</sub> =6.0V	-	-	83	ns/V
ambient temperature	T <sub>amb</sub>	-	-40	-	+85	°C
<b>74HCT244</b>						
supply voltage	V <sub>CC</sub>	-	4.5	5.0	5.5	V
input voltage	V <sub>I</sub>	-	0	-	V <sub>CC</sub>	V
output voltage	V <sub>O</sub>	-	0	-	V <sub>CC</sub>	V
input transition rise and fall rate	Δt/ΔV	V <sub>CC</sub> =4.5V	-	1.67	139	ns/V
ambient temperature	T <sub>amb</sub>	-	-40	-	+85	°C

## Electrical Characteristics

### DC Characteristics 1

(Tamb=25°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>74HC244</b>							
HIGH-level input voltage	V <sub>IH</sub>	V <sub>CC</sub> =2.0V	1.5	1.2	-	V	
		V <sub>CC</sub> =4.5V	3.15	2.4	-	V	
		V <sub>CC</sub> =6.0V	4.2	3.2	-	V	
LOW-level input voltage	V <sub>IL</sub>	V <sub>CC</sub> =2.0V	-	0.8	0.5	V	
		V <sub>CC</sub> =4.5V	-	2.1	1.35	V	
		V <sub>CC</sub> =6.0V	-	2.8	1.8	V	
HIGH-level output voltage	V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> =-20uA; V <sub>CC</sub> =2.0V	1.9	2.0	-	V
			I <sub>O</sub> =-20uA; V <sub>CC</sub> =4.5V	4.4	4.5	-	V
			I <sub>O</sub> =-20uA; V <sub>CC</sub> =6.0V	5.9	6.0	-	V
			I <sub>O</sub> =-6.0mA; V <sub>CC</sub> =4.5V	3.98	4.32	-	V
			I <sub>O</sub> =-7.8mA; V <sub>CC</sub> =6.0V	5.48	5.81	-	V
LOW-level output voltage	V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> =20uA; V <sub>CC</sub> =2.0V	-	0	0.1	V
			I <sub>O</sub> =20uA; V <sub>CC</sub> =4.5V	-	0	0.1	V
			I <sub>O</sub> =20uA; V <sub>CC</sub> =6.0V	-	0	0.1	V
			I <sub>O</sub> =6.0mA; V <sub>CC</sub> =4.5V	-	0.15	0.26	V
			I <sub>O</sub> =7.8mA; V <sub>CC</sub> =6.0V	-	0.16	0.26	V
input leakage current	I <sub>I</sub>	V <sub>I</sub> =V <sub>CC</sub> or GND; V <sub>CC</sub> =6.0V	-	-	±0.1	uA	
OFF-state output current	I <sub>OZ</sub>	V <sub>I</sub> =V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> =6.0V; V <sub>O</sub> =V <sub>CC</sub> or GND	-	-	±0.5	uA	
supply current	I <sub>CC</sub>	V <sub>I</sub> =V <sub>CC</sub> or GND; I <sub>O</sub> =0A; V <sub>CC</sub> =6.0V	-	-	8.0	uA	
Input capacitance	C <sub>I</sub>	-	-	3.5	-	pF	
<b>74HCT244</b>							
HIGH-level input voltage	V <sub>IH</sub>	V <sub>CC</sub> =4.5V to 5.5V	2.0	1.6	-	V	
LOW-level input voltage	V <sub>IL</sub>	V <sub>CC</sub> =4.5V to 5.5V	-	1.2	0.8	V	
HIGH-level output voltage	V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> =4.5V	I <sub>O</sub> =-20uA	4.4	4.5	-	V
			I <sub>O</sub> =-6.0mA	3.98	4.32	-	V
LOW-level output voltage	V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> =4.5V	I <sub>O</sub> =20uA	-	0	0.1	V
			I <sub>O</sub> =6.0mA	-	0.16	0.26	V
input leakage current	I <sub>I</sub>	V <sub>I</sub> =V <sub>CC</sub> or GND; V <sub>CC</sub> =5.5V	-	-	±0.1	uA	
OFF-state output current	I <sub>OZ</sub>	V <sub>I</sub> =V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> =5.5V; V <sub>O</sub> =V <sub>CC</sub> or GND	-	-	±0.5	uA	
supply current	I <sub>CC</sub>	V <sub>I</sub> =V <sub>CC</sub> or GND; I <sub>O</sub> =0A; V <sub>CC</sub> =5.5V	-	-	8.0	uA	
additional supply current	ΔI <sub>CC</sub>	per input pin; V <sub>I</sub> =V <sub>CC</sub> -2.1V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> =4.5V to 5.5V; I <sub>O</sub> =0A	-	70	252	uA	
Input capacitance	C <sub>I</sub>	-	-	3.5	-	pF	

**DC Characteristics 2**

(Tamb=-40°C to +85°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>74HC244</b>							
HIGH-level input voltage	V <sub>IH</sub>	V <sub>CC</sub> =2.0V	1.5	-	-	V	
		V <sub>CC</sub> =4.5V	3.15	-	-	V	
		V <sub>CC</sub> =6.0V	4.2	-	-	V	
LOW-level input voltage	V <sub>IL</sub>	V <sub>CC</sub> =2.0V	-	-	0.5	V	
		V <sub>CC</sub> =4.5V	-	-	1.35	V	
		V <sub>CC</sub> =6.0V	-	-	1.8	V	
HIGH-level output voltage	V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> =-20uA; V <sub>CC</sub> =2.0V	1.9	-	-	V
			I <sub>O</sub> =-20uA; V <sub>CC</sub> =4.5V	4.4	-	-	V
			I <sub>O</sub> =-20uA; V <sub>CC</sub> =6.0V	5.9	-	-	V
			I <sub>O</sub> =-6.0mA; V <sub>CC</sub> =4.5V	3.84	-	-	V
			I <sub>O</sub> =-7.8mA; V <sub>CC</sub> =6.0V	5.34	-	-	V
LOW-level output voltage	V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> =20uA; V <sub>CC</sub> =2.0V	-	-	0.1	V
			I <sub>O</sub> =20uA; V <sub>CC</sub> =4.5V	-	-	0.1	V
			I <sub>O</sub> =20uA; V <sub>CC</sub> =6.0V	-	-	0.1	V
			I <sub>O</sub> =6.0mA; V <sub>CC</sub> =4.5V	-	-	0.33	V
			I <sub>O</sub> =7.8mA; V <sub>CC</sub> =6.0V	-	-	0.33	V
input leakagecurrent	I <sub>I</sub>	V <sub>I</sub> =V <sub>CC</sub> or GND; V <sub>CC</sub> =6.0V	-	-	±1.0	uA	
OFF-state output current	I <sub>OZ</sub>	V <sub>I</sub> =V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> =6.0V; V <sub>O</sub> =V <sub>CC</sub> or GND	-	-	±5.0	uA	
supply current	I <sub>CC</sub>	V <sub>I</sub> =V <sub>CC</sub> or GND; I <sub>O</sub> =0A; V <sub>CC</sub> =6.0V	-	-	80	uA	
input capacitance	C <sub>I</sub>	-	-	-	-	pF	
<b>74HCT244</b>							
HIGH-level input voltage	V <sub>IH</sub>	V <sub>CC</sub> =4.5V to 5.5V	2.0	-	-	V	
LOW-level input voltage	V <sub>IL</sub>	V <sub>CC</sub> =4.5V to 5.5V	-	-	0.8	V	
HIGH-level output voltage	V <sub>OH</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> =4.5V	I <sub>O</sub> =-20uA	4.4	-	-	V
			I <sub>O</sub> =-6.0mA	3.84	-	-	V
LOW-level output voltage	V <sub>OL</sub>	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> =4.5V	I <sub>O</sub> =20uA	-	-	0.1	V
			I <sub>O</sub> =6.0mA	-	-	0.33	V
input leakagecurrent	I <sub>I</sub>	V <sub>I</sub> =V <sub>CC</sub> or GND; V <sub>CC</sub> =5.5V	-	-	±1.0	uA	
OFF-state output current	I <sub>OZ</sub>	V <sub>I</sub> =V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> =5.5V; V <sub>O</sub> =V <sub>CC</sub> or GND	-	-	±5.0	uA	
supply current	I <sub>CC</sub>	V <sub>I</sub> =V <sub>CC</sub> or GND; I <sub>O</sub> =0A; V <sub>CC</sub> =5.5V	-	-	80	uA	
additional supply current	ΔI <sub>CC</sub>	per input pin; V <sub>I</sub> =V <sub>CC</sub> -2.1V; other inputs at V <sub>CC</sub> or GND; V <sub>CC</sub> =4.5V to 5.5V; I <sub>O</sub> =0A	-	-	315	uA	
input capacitance	C <sub>I</sub>	-	-	-	-	pF	

## AC Characteristics 1

(Tamb=25°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>74HC244</b>							
nAn to nYn propagation delay	t <sub>pd</sub>	see Figure 5	V <sub>CC</sub> =2.0V	-	30	110	ns
			V <sub>CC</sub> =4.5V	-	11	22	ns
			V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF	-	9	-	ns
			V <sub>CC</sub> =6.0V	-	9	19	ns
n $\overline{O}E$ to nYn enable time	t <sub>en</sub>	see Figure 6	V <sub>CC</sub> =2.0V	-	36	150	ns
			V <sub>CC</sub> =4.5V	-	13	30	ns
			V <sub>CC</sub> =6.0V	-	10	26	ns
n $\overline{O}E$ to nYn disable time	t <sub>dis</sub>	see Figure 6	V <sub>CC</sub> =2.0V	-	39	150	ns
			V <sub>CC</sub> =4.5V	-	14	30	ns
			V <sub>CC</sub> =6.0V	-	11	26	ns
transition time	t <sub>t</sub>	see Figure 5	V <sub>CC</sub> =2.0V	-	14	60	ns
			V <sub>CC</sub> =4.5V	-	5	12	ns
			V <sub>CC</sub> =6.0V	-	4	10	ns
Power dissipation capacitance	CPD	per buffer; V <sub>I</sub> =GND to V <sub>CC</sub>	-	35	-	pF	
<b>74HCT244</b>							
nAn to nYn propagationdelay	t <sub>pd</sub>	see Figure 5	V <sub>CC</sub> =4.5V	-	13	22	ns
			V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF	-	11	-	ns
n $\overline{O}E$ to nYn enable time	t <sub>en</sub>	V <sub>CC</sub> =4.5V; see Figure 6	-	15	30	ns	
n $\overline{O}E$ to nYn disable time	t <sub>dis</sub>	V <sub>CC</sub> =4.5V; see Figure 6	-	15	25	ns	
transition time	t <sub>t</sub>	V <sub>CC</sub> =4.5V; see Figure 5	-	5	12	ns	
power dissipation capacitance	CPD	per buffer; V <sub>I</sub> =GND to V <sub>CC</sub> -1.5V	-	35	-	pF	

### Note:

- t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.
- t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.
- t<sub>t</sub> is the same as t<sub>THL</sub> and t<sub>TLH</sub>.
- CPD is used to determine the dynamic power dissipation (PD in uW).  
 $PD = CPD \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$  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.

## AC Characteristics 2

(Tamb=-40°C to +85°C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit	
<b>74HC244</b>							
nAn to nYn propagation delay	t <sub>pd</sub>	see Figure 5	V <sub>CC</sub> =2.0V	-	-	145	ns
			V <sub>CC</sub> =4.5V	-	-	28	ns
			V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF	-	-	-	ns
			V <sub>CC</sub> =6.0V	-	-	24	ns
n $\overline{O}E$ to nYn enable time	t <sub>en</sub>	see Figure 6	V <sub>CC</sub> =2.0V	-	-	190	ns
			V <sub>CC</sub> =4.5V	-	-	38	ns
			V <sub>CC</sub> =6.0V	-	-	33	ns
n $\overline{O}E$ to nYn disable time	t <sub>dis</sub>	see Figure 6	V <sub>CC</sub> =2.0V	-	-	190	ns
			V <sub>CC</sub> =4.5V	-	-	38	ns
			V <sub>CC</sub> =6.0V	-	-	33	ns
transition time	t <sub>t</sub>	see Figure 5	V <sub>CC</sub> =2.0V	-	-	75	ns
			V <sub>CC</sub> =4.5V	-	-	15	ns
			V <sub>CC</sub> =6.0V	-	-	13	ns
Power dissipation capacitance	CPD	per buffer; V <sub>I</sub> =GND to V <sub>CC</sub>	-	-	-	pF	
<b>74HCT244</b>							
nAn to nYn propagation delay	t <sub>pd</sub>	see Figure 5	V <sub>CC</sub> =4.5V	-	-	22	ns
			V <sub>CC</sub> =5.0V; C <sub>L</sub> =15pF	-	-	-	ns
n $\overline{O}E$ to nYn enable time	t <sub>en</sub>	V <sub>CC</sub> =4.5V; see Figure 6	-	-	30	ns	
n $\overline{O}E$ to nYn disable time	t <sub>dis</sub>	V <sub>CC</sub> =4.5V; see Figure 6	-	-	25	ns	
transition time	t <sub>t</sub>	V <sub>CC</sub> =4.5V; see Figure 5	-	-	12	ns	
power dissipation capacitance	CPD	per buffer; V <sub>I</sub> =GND to V <sub>CC</sub> -1.5V	-	-	-	pF	

### Note:

- t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.
- t<sub>en</sub> is the same as t<sub>PZL</sub> and t<sub>PZH</sub>.
- t<sub>dis</sub> is the same as t<sub>PLZ</sub> and t<sub>PHZ</sub>.
- t<sub>t</sub> is the same as t<sub>THL</sub> and t<sub>TLH</sub>.
- CPD is used to determine the dynamic power dissipation (PD in uW).  
 $PD = CPD \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o)$  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.



## Testing Circuit

### AC Testing Circuit

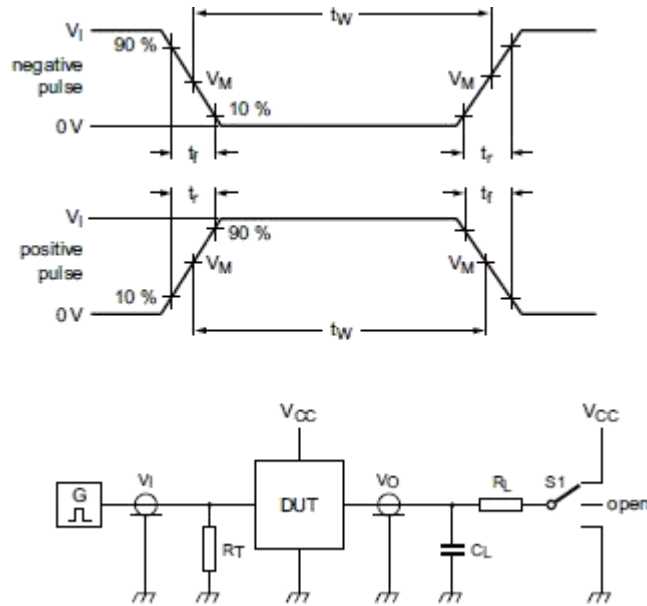


Figure 4. Test circuit for measuring switching times

Definitions for test circuit:

$R_L$ =Load resistance.

$C_L$ =Load capacitance including jig and probe capacitance.

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

$S_1$ =Test selection switch.

### AC Testing Waveforms

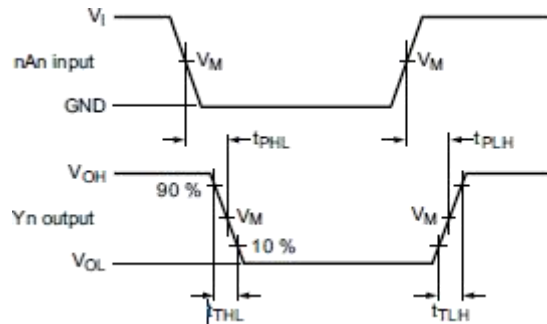


Figure 5. Input (nAn) to output (nYn) propagation delays and output transition times

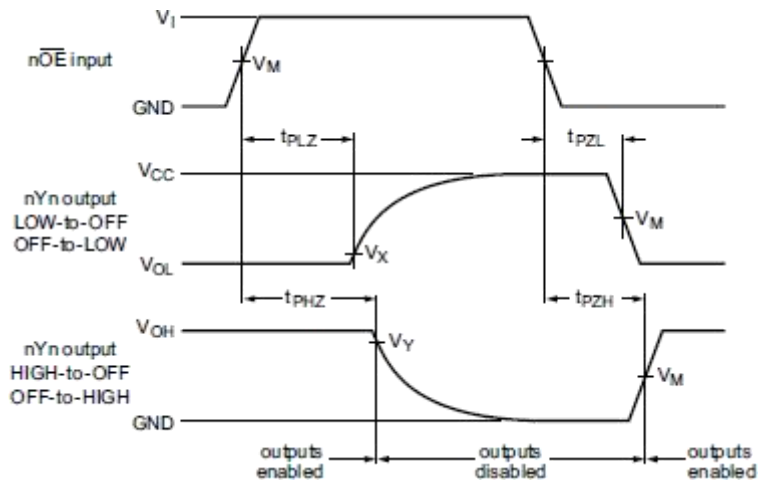


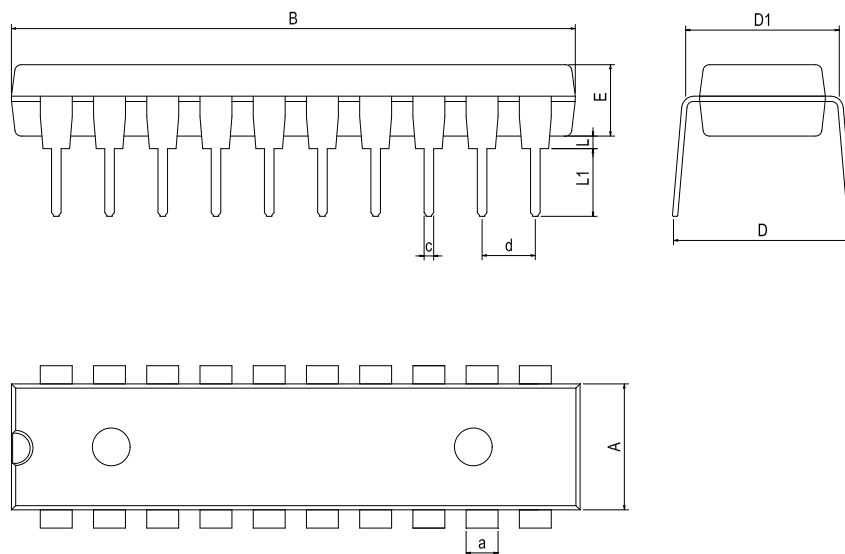
Figure 6. 3-state enable and disable times

## Measurement Points

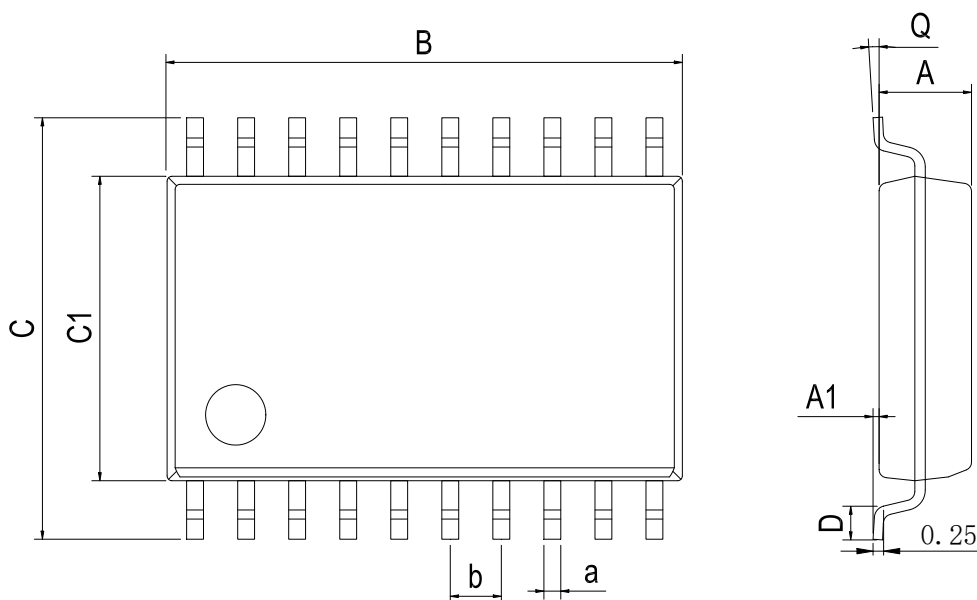
Type	Input		Output	
	$V_M$	$V_M$	$V_X$	$V_Y$
74HC244	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$0.1 \times V_{CC}$	$0.9 \times V_{CC}$
74HCT244	1.3V	1.3V	$0.1 \times V_{CC}$	$0.9 \times V_{CC}$

## Test Data

Type	Input		Load		S1 position		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	tPHL, tPLH	tPZH, tPHZ	tPZL, tPLZ
74HC244	$V_{CC}$	6ns	15pF, 50pF	1k $\Omega$	open	GND	$V_{CC}$
74HCT244	3V	6ns	15pF, 50pF	1k $\Omega$	open	GND	$V_{CC}$

**Physical Dimensions**
**DIP-20**


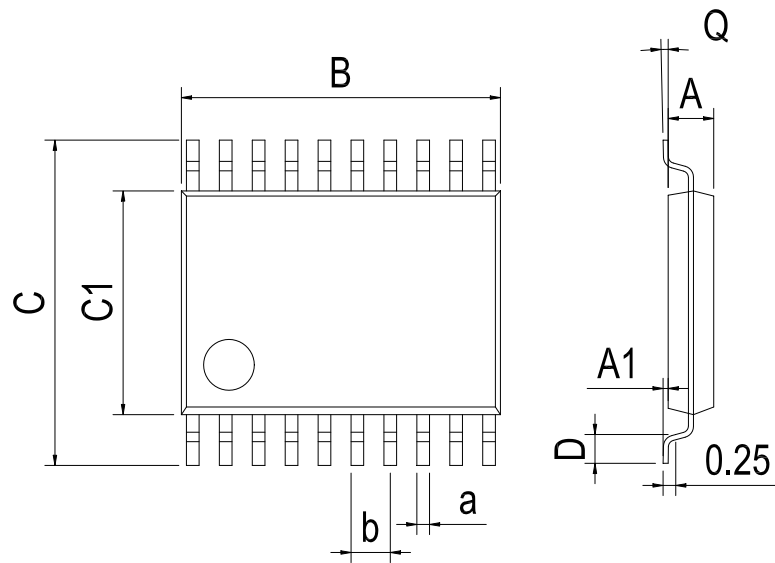
Dimensions In Millimeters(DIP-20)										
Symbol:	A	B	D	D1	E	L	L1	a	c	d
Min:	6.10	24.95	8.10	7.42	3.10	0.50	3.00	1.50	0.40	2.54 BSC
Max:	6.68	26.55	10.9	7.82	3.55	0.70	3.60	1.55	0.50	

**SOP-20**


Dimensions In Millimeters(SOP-20)									
Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	2.10	0.05	12.50	10.21	7.40	0.45	0°	0.35	1.27 BSC
Max:	2.50	0.25	13.00	10.61	7.60	1.25	8°	0.45	

**Physical Dimensions**

TSSOP-20


**Dimensions In Millimeters(TSSOP-20)**

Symbol:	A	A1	B	C	C1	D	Q	a	b
Min:	0.85	0.05	6.40	6.20	4.30	0.40	0°	0.20	0.65 BSC
Max:	1.05	0.20	6.60	6.60	4.50	0.80	8°	0.25	

## Revision History

DATE	REVISION	PAGE
2020-3-8	New	1-14
2023-9-8	Update Lead Temperature, Update encapsulation type, Updated DIP-20 dimension, Add annotation for Maximum Ratings.	1, 4, 11

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