

# TC74HC155AP, TC74HC155AF

## Dual 2-to-4 Line Decoder 3-to-8 Line Decoder

The TC74HC155A is a high speed CMOS DUAL 2-to-4 LINE DECODER fabricated with silicon gate C<sup>2</sup>MOS technology.

It achieves the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

It features dual 1-to-4 line demultiplexers with individual strobe input (1G and 2G), individual data inputs (1C and 2C) and common binary address inputs (A and B).

When both decoders are enabled by the strobes, the inverted output of 1C data and non-inverted output of 2C data will be brought to the selected output pins of each section.

A 1-to-8 line demultiplexer can be easily built up by providing a data signal to both the 1C and 2C inputs; the output order will be 1Y3 (MSB), 1Y2, 1Y1, 1Y0, 2Y3, 2Y2, 2Y1, 2Y0 (LSB).

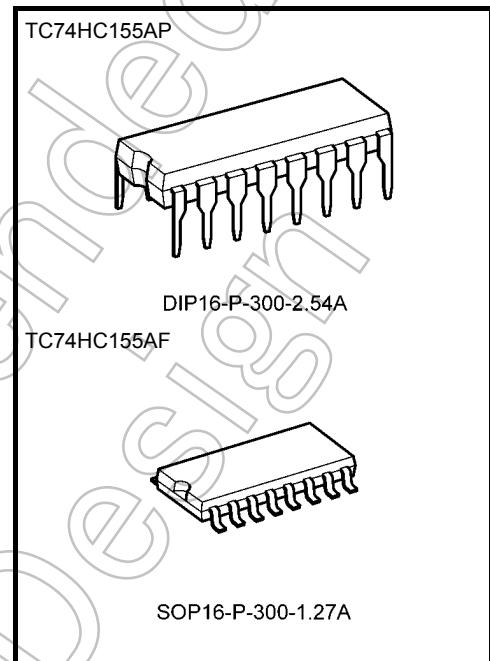
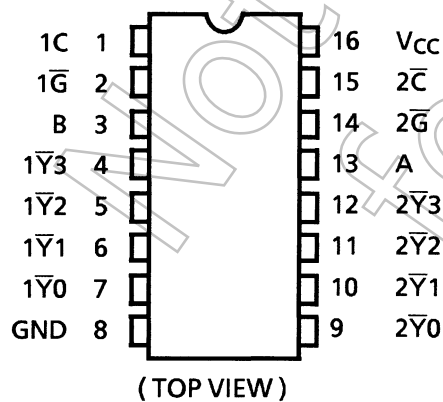
This device can be used as a 2-to-4 line decoder or a 3-to-8 line decoder when 1C is held high and 2C is held low.

All inputs are equipped with protection circuits against static discharge or transient excess voltage.

### Features

- High speed:  $t_{pd} = 12 \text{ ns (typ.)}$  at  $V_{CC} = 5 \text{ V}$
- Low power dissipation:  $I_{CC} = 4 \mu\text{A (max)}$  at  $T_a = 25^\circ\text{C}$
- High noise immunity:  $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (min)}$
- Output drive capability: 10 LSTTL loads
- Symmetrical output impedance:  $|I_{OH}| = I_{OL} = 4 \text{ mA (min)}$
- Balanced propagation delays:  $t_{pLH} \approx t_{pHL}$
- Wide operating voltage range:  $V_{CC} \text{ (opr)} = 2 \text{ to } 6 \text{ V}$
- Pin and function compatible with 74LS155

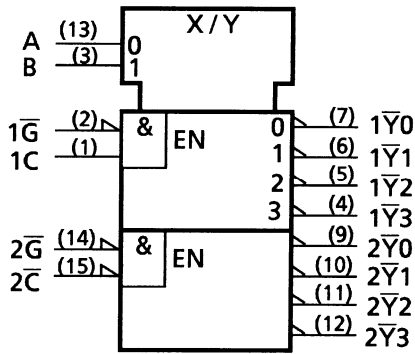
### Pin Assignment



Weight	
DIP16-P-300-2.54A	: 1.00 g (typ.)
SOP16-P-300-1.27A	: 0.18 g (typ.)

Start of commercial production  
1987-07

**IEC Logic Symbol**



**Truth Table**

Inputs				Outputs			
B	A	$\bar{1}G$	1C	$\bar{1}Y0$	$\bar{1}Y1$	$\bar{1}Y2$	$\bar{1}Y3$
X	X	H	X	H	H	H	H
L	L	L	H	L	H	H	H
L	H	L	H	H	L	H	H
H	L	L	H	H	H	L	H
H	H	L	H	H	H	H	L
X	X	X	L	H	H	H	H

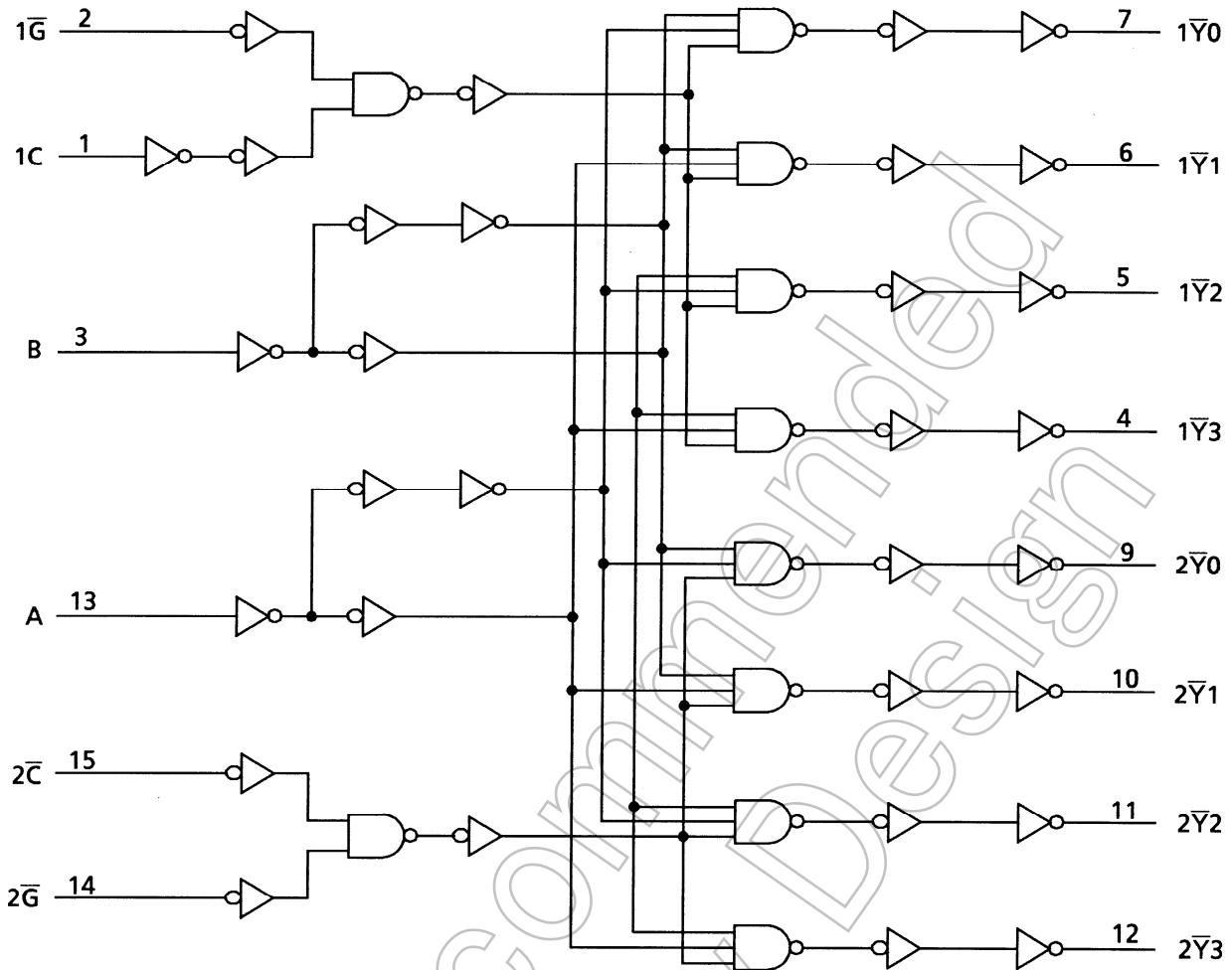
X: Don't care

Inputs				Outputs			
B	A	2G	2C	2Y0	2Y1	2Y2	2Y3
X	X	H	X	H	H	H	H
L	L	L	L	L	H	H	H
L	H	L	L	H	L	H	H
H	L	L	L	H	H	L	H
H	H	L	L	H	H	H	L
X	X	X	H	H	H	H	H

X: Don't care

Not Recommended for New Design

**System Diagram**



**Absolute Maximum Ratings (Note 1)**

Characteristics	Symbol	Rating	Unit
Supply voltage range	$V_{CC}$	-0.5 to 7	V
DC input voltage	$V_{IN}$	-0.5 to $V_{CC} + 0.5$	V
DC output voltage	$V_{OUT}$	-0.5 to $V_{CC} + 0.5$	V
Input diode current	$I_{IK}$	$\pm 20$	mA
Output diode current	$I_{OK}$	$\pm 20$	mA
DC output current	$I_{OUT}$	$\pm 25$	mA
DC $V_{CC}$ /ground current	$I_{CC}$	$\pm 50$	mA
Power dissipation	$P_D$	500 (DIP) (Note 2)/180 (SOP)	mW
Storage temperature	$T_{stg}$	-65 to 150	$^{\circ}C$

Note 1: Exceeding any of the absolute maximum ratings, even briefly, lead to deterioration in IC performance or even destruction.

Using continuously under heavy loads (e.g. the application of high temperature/current/voltage and the significant change in temperature, etc.) may cause this product to decrease in the reliability significantly even if the operating conditions (i.e. operating temperature/current/voltage, etc.) are within the absolute maximum ratings and the operating ranges.

Please design the appropriate reliability upon reviewing the Toshiba Semiconductor Reliability Handbook ("Handling Precautions"/"Derating Concept and Methods") and individual reliability data (i.e. reliability test report and estimated failure rate, etc).

Note 2: 500 mW in the range of  $T_a = -40$  to  $65^{\circ}C$ . From  $T_a = 65$  to  $85^{\circ}C$  a derating factor of  $-10$  mW/ $^{\circ}C$  shall be applied until 300 mW.

## Operating Ranges (Note)

Characteristics	Symbol	Rating	Unit
Supply voltage	$V_{CC}$	2 to 6	V
Input voltage	$V_{IN}$	0 to $V_{CC}$	V
Output voltage	$V_{OUT}$	0 to $V_{CC}$	V
Operating temperature	$T_{opr}$	-40 to 85	°C
Input rise and fall time	$t_r, t_f$	0 to 1000 ( $V_{CC} = 2.0$ V) 0 to 500 ( $V_{CC} = 4.5$ V) 0 to 400 ( $V_{CC} = 6.0$ V)	ns

Note: The operating ranges must be maintained to ensure the normal operation of the device. Unused inputs must be tied to either  $V_{CC}$  or GND.

## Electrical Characteristics

### DC Characteristics

Characteristics	Symbol	Test Condition	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $85^\circ\text{C}$		Unit		
			$V_{CC}$ (V)	Min	Typ.	Max	Min		Max	
High-level input voltage	$V_{IH}$	—	2.0	1.50	—	—	1.50	—	V	
			4.5	3.15	—	—	3.15	—		
			6.0	4.20	—	—	4.20	—		
Low-level input voltage	$V_{IL}$	—	2.0	—	—	0.50	—	0.50	V	
			4.5	—	—	1.35	—	1.35		
			6.0	—	—	1.80	—	1.80		
High-level output voltage	$V_{OH}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -20 \mu\text{A}$	2.0	1.9	2.0	—	1.9	—	V
				4.5	4.4	4.5	—	4.4	—	
				6.0	5.9	6.0	—	5.9	—	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 20 \mu\text{A}$	2.0	—	0.0	0.1	—	0.1	V
				4.5	—	0.0	0.1	—	0.1	
				6.0	—	0.0	0.1	—	0.1	
Low-level output voltage	$V_{OL}$	$V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 4 \text{ mA}$	4.5	—	0.17	0.26	—	0.33	V
				6.0	—	0.18	0.26	—	0.33	
				6.0	—	0.18	0.26	—	0.33	
Input leakage current	$I_{IN}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu\text{A}$	
Quiescent supply current	$I_{CC}$	$V_{IN} = V_{CC}$ or GND	6.0	—	—	4.0	—	40.0	$\mu\text{A}$	

### AC Characteristics ( $C_L = 15 \text{ pF}$ , $V_{CC} = 5 \text{ V}$ , $T_a = 25^\circ\text{C}$ , input: $t_r = t_f = 6 \text{ ns}$ )

Characteristics	Symbol	Test Condition	Min	Typ.	Max	Unit
Output transition time	$t_{TLH}$	—	—	4	8	ns
	$t_{THL}$	—	—	4	8	ns
Propagation delay time	$t_{pLH}$	—	—	12	22	ns
	$t_{pHL}$	—	—	12	22	ns

**AC Characteristics (C<sub>L</sub> = 50 pF, input: t<sub>r</sub> = t<sub>f</sub> = 6 ns)**

Characteristics	Symbol	Test Condition	V <sub>CC</sub> (V)	Ta = 25°C			Ta = -40 to 85°C		Unit
				Min	Typ.	Max	Min	Max	
Output transition time	t <sub>TLH</sub>	—	2.0	—	30	75	—	95	ns
	t <sub>THL</sub>		4.5	—	8	15	—	19	
			6.0	—	7	13	—	16	
Propagation delay time	t <sub>pLH</sub>	—	2.0	—	45	130	—	165	ns
	t <sub>pHL</sub>		4.5	—	15	26	—	33	
			6.0	—	13	22	—	28	
Input capacitance	C <sub>IN</sub>	—	—	5	10	—	10	pF	
Power dissipation capacitance	C <sub>PD</sub> (Note)	—	—	53	—	—	—	pF	

Note: C<sub>PD</sub> is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load.

Average operating current can be obtained by the equation:

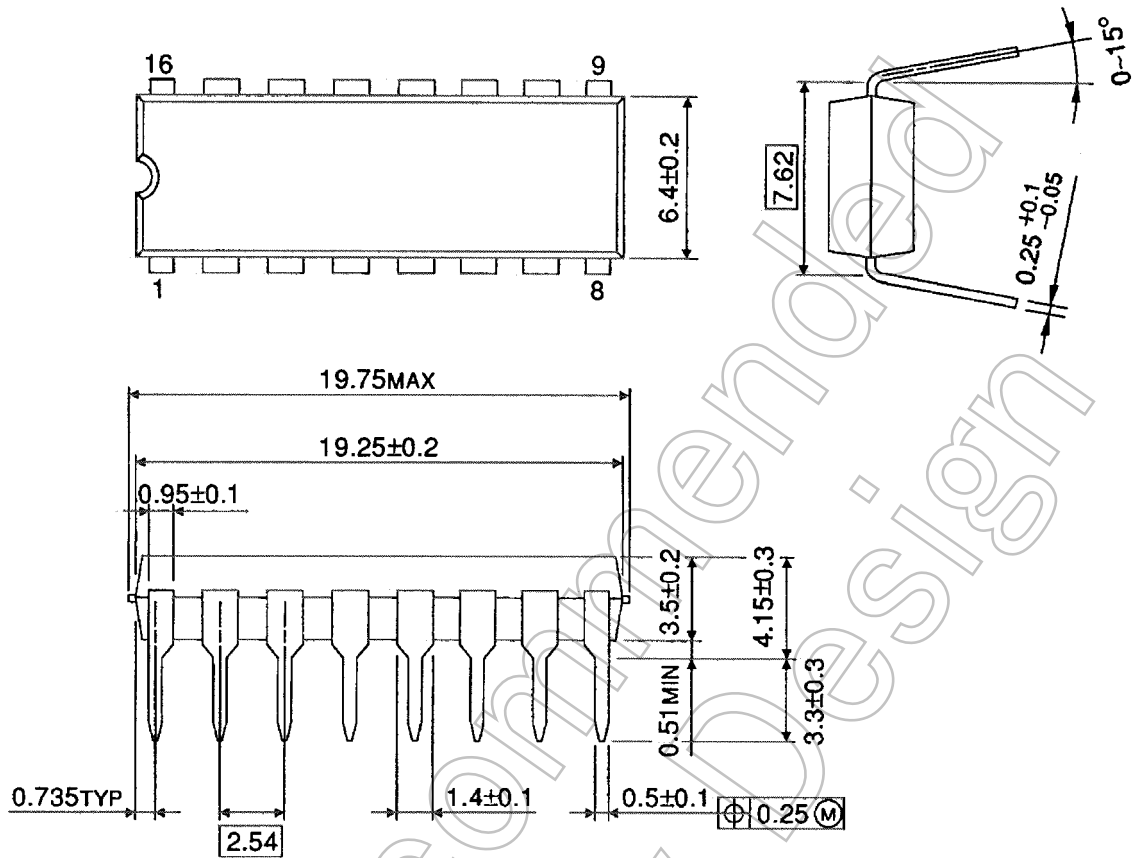
$$I_{CC (opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$$

Not Recommended for New Design

**Package Dimensions**

DIP16-P-300-2.54A

Unit : mm



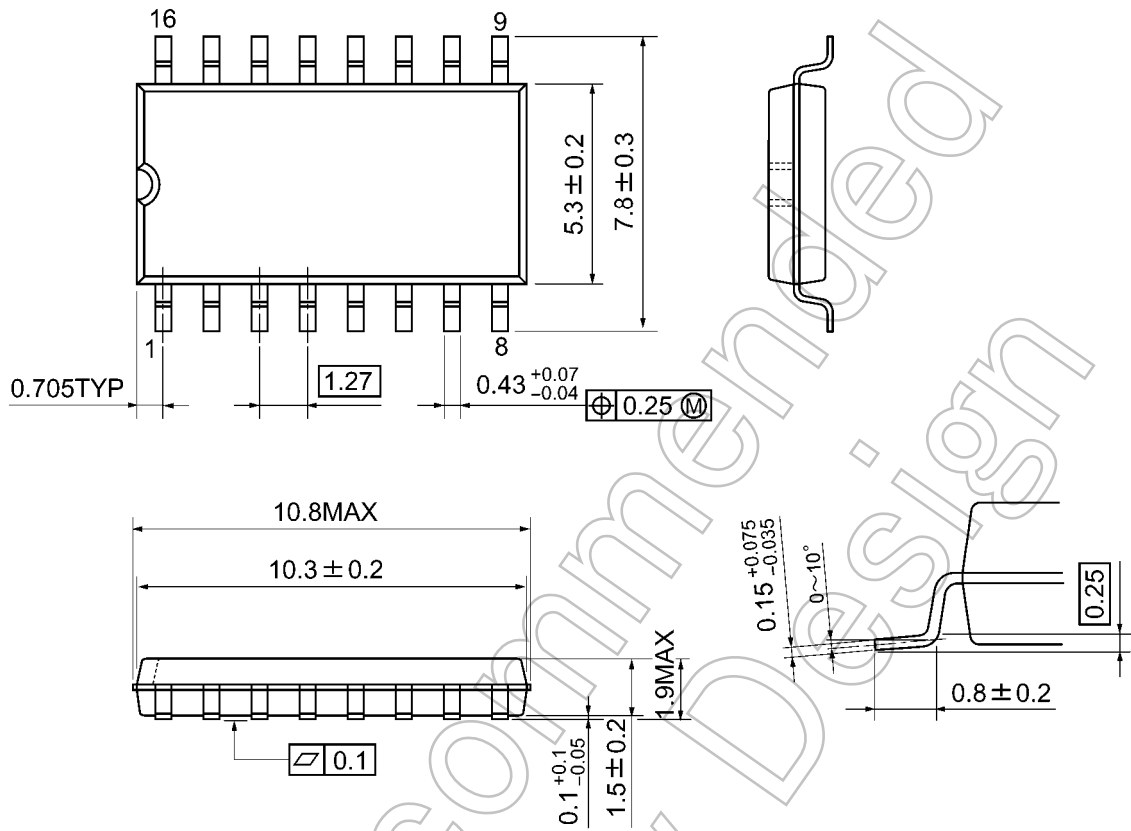
Weight: 1.00 g (typ.)

Not Recommended for New Design

**Package Dimensions**

SOP16-P-300-1.27A

Unit: mm



Weight: 0.18 g (typ.)

Not Recommended for New Design

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