

MM54HC155/MM74HC155 Dual 2-To-4 Line Decoder/Demultiplexers

General Description

The MM54HC155/MM74HC155 is a high speed silicon-gate CMOS decoder/demultiplexer. It utilizes advanced silicon-gate CMOS technology and features dual 1-line-to-4-line demultiplexers with independent strobes and common binary-address inputs. When both sections are enabled by the strobes, the common address inputs sequentially select and route associated input data to the appropriate output of each section. The individual strobes permit activating or inhibiting each of the 4-bit sections as desired. Data applied to input C1 is non-inverted at its outputs. The inverter following the C1 data input permits use as a 3-to-8-line decoder, or 1-to-8-line demultiplexer, without gating.

All inputs to the decoder are protected from damage due to electrostatic discharge by diodes to V_{CC} and Ground.

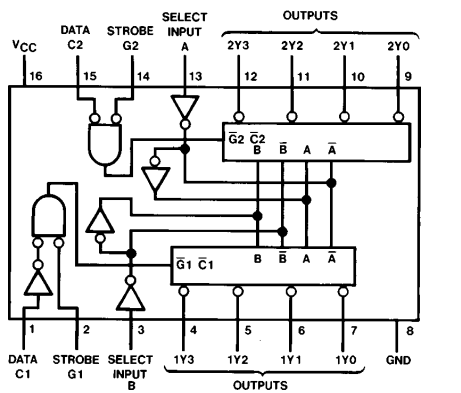
The device is capable of driving 10 low power Schottky TTL equivalent loads.

The MM54HC155/MM74HC155 is functionally and pin equivalent to the 54LS155/74LS155 with the advantage of reduced power consumption.

Features

- Applications
 - Dual 2-to-4-line decoder
 - Dual 1-to-4-line demultiplexer
 - 3-to-8-line decoder
 - 1-to-8-line demultiplexer
- Typical propagation delay: 22 ns
- Low quiescent current: 80 μA maximum (74HC series)
- Wide operating range: 2V–6V

Connect and Logic Diagram



Order Number MM54HC155 or MM74HC155

TL/F/8364-1

Truth Tables

2-to-4-Line Decoder or 1-Line to 4-line Demultiplexer

Inputs				Outputs			
Select	Strobe	Data		1Y0	1Y1	1Y2	1Y3
B	A	G1	C1				
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

Inputs				Outputs			
Select	Strobe	Data		2Y0	2Y1	2Y2	2Y3
B	A	G2	C2				
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

3-Line-to-8-Line Decoder or 1-Line-to-8-Line Demultiplexer

Inputs				Outputs							
Select	Strobe Or Data			(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)
IC B A	IG	2Y0	2Y1	2Y2	2Y3	1Y0	1Y1	1Y2	1Y3		
X	X	X	H	H	H	H	H	H	H	H	H
L	L	L	L	L	H	H	H	H	H	H	H
L	L	H	L	H	L	H	H	H	H	H	H
L	H	L	L	H	H	L	H	H	H	H	H
L	H	H	L	H	H	H	L	H	H	H	H
H	L	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	L	H	H
H	H	L	L	H	H	H	H	H	H	L	H
H	H	H	L	H	H	H	H	H	H	H	L

IC = inputs C1 and C2 connected together
 IG = inputs G1 and G2 connected together
 H = high level L = low level X = don't care

MM54HC155/MM74HC155 Dual 2-To-4 Line Decoder/Demultiplexers

Absolute Maximum Ratings (Notes 1 and 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage (V_{CC})	-0.5V to +7.0V
DC Input Voltage (V_{IN})	-1.5V to V_{CC} + 1.5V
DC Output Voltage (V_{OUT})	-0.5 to V_{CC} + 0.5V
Clamp Diode Current (I_{IK}, I_{OK})	20 mA
DC Output Current, per pin (I_{OUT})	25 mA
DC V_{CC} or GND Current, per Pin (I_{CC})	50 mA
Storage Temperature Range (T_{STG})	-65°C to +150°C
Power Dissipation (P_D) (Note 3)	600 mW
S.O. Package only	500 mW
Lead Temp. (T_l) (Soldering 10 sec)	260°C

Operating Conditions

	Min	Max	Unit
Supply Voltage (V_{CC})	2	6	V
DC Input or Output Voltage (V_{IN}, V_{OUT})	0	V_{CC}	V
Operating Temperature Range (T_A)			
MM74HC	-40	+85	C
MM54HC	-55	+125	C
Input Rise/Fall Time (t_r, t_f)			
$V_{CC} = 2.0V$		1000	ns
$V_{CC} = 4.5V$		500	ns
$V_{CC} = 6.0V$		400	ns

DC Electrical Characteristics (Note 4)

Symbol	Parameter	Conditions	V_{CC}	$T_A = 25^\circ C$			Units	
				Typ	74HC $T_A = -40^\circ \text{ to } +85^\circ C$	54HC $T_A = -55^\circ \text{ to } +125^\circ C$		
V_{IH}	Minimum High Level Input Voltage		2.0V	1.5	1.5	1.5	V	
			4.5V	3.15	3.15	3.15	V	
			6.0V	4.2	4.2	4.2	V	
V_{IL}	Maximum Low Level Input Voltage**		2.0V	0.5	0.5	0.5	V	
			4.5V	1.35	1.35	1.35	V	
			6.0V	1.8	1.8	1.8	V	
V_{OH}	Minimum High Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL} $ I_{OUT} \leq 20 \mu A$	2.0V	2.0	1.9	1.9	V	
			4.5V	4.5	4.4	4.4	V	
			6.0V	6.0	5.9	5.9	V	
		$V_{IN} = V_{IH}$ or V_{IL} $ I_{OUT} \leq 4.0 \text{ mA}$ $ I_{OUT} \leq 5.2 \text{ mA}$	4.5V	4.2	3.98	3.84	3.7	V
			6.0V	5.7	5.48	5.34	5.2	V
V_{OL}	Maximum Low Level Output Voltage	$V_{IN} = V_{IH}$ or V_{IL} $ I_{OUT} \leq 20 \mu A$	2.0V	0	0.1	0.1	V	
			4.5V	0	0.1	0.1	V	
			6.0V	0	0.1	0.1	V	
		$V_{IN} = V_{IH}$ or V_{IL} $ I_{OUT} \leq 4.0 \text{ mA}$ $ I_{OUT} \leq 5.2 \text{ mA}$	4.5V	0.2	0.26	0.33	0.4	V
			6.0V	0.2	0.26	0.33	0.4	V
I_{IN}	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	6.0V		± 0.1	± 1.0	μA	
I_{CC}	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu A$	6.0V		8.0	80	μA	

Note 1: Absolute Maximum Ratings are those values beyond which damage to the device may occur.

Note 2: Unless otherwise specified, all voltages are referenced to ground.

Note 3: Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C; ceramic "J" package: -12 mW/°C from 100°C to 125°C.

Note 4: For a power supply of $5V \pm 10\%$ the worst case output voltages (V_{OH} and V_{OL}) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case V_{IH} and V_{IL} occur at $V_{CC} = 5.5V$ and 4.5V respectively. (The V_{IH} value at 5.5V is 3.85V.) The worst case leakage current (I_{IN} , I_{CC} and I_{OZ}) occur for CMOS at the higher voltage and so the 6.0V values should be used.

** V_{IL} limits are currently tested at 20% of V_{CC} . The above V_{IL} specification (30% of V_{CC}) will be implemented no later than Q1, CY'89.

AC Electrical Characteristics $V_{CC} = 5V, T_A = 25^{\circ}C, C_L = 15\text{ pF}, t_r = t_f = 6\text{ ns}$

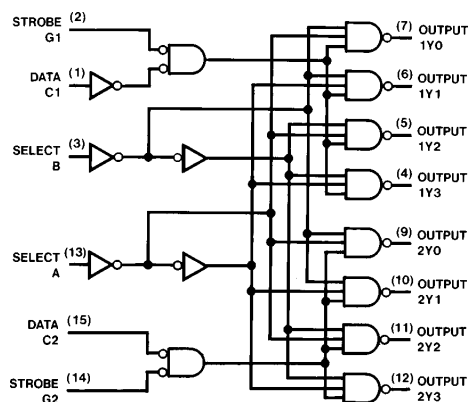
Symbol	Parameter	Conditions	Typ	Units
t_{PHL}, t_{PLH}	Maximum Propagation Delay, Binary Select to any Output 4 Levels of Delay		18	ns

AC Electrical Characteristics (Note 6) $C_L = 50\text{ pF}, t_r = t_f = 6\text{ ns}$ (unless otherwise specified)

Symbol	Parameter	Conditions	V_{CC}	$T_A = 25^{\circ}C$		74HC	54HC	Units	
				Typ		$T_A = -40\text{ to }+85^{\circ}C$	$T_A = -55\text{ to }+125^{\circ}C$		
t_{PHL}, t_{PLH}	Maximum Propagation Delay Binary Select to any Output 4 Levels of Delay		2.0V	Guaranteed Limits				ns	
				110	175	219	254		
				4.5V	22	35	44		
t_{TLH}, t_{TLH}	Maximum Output Rise and FallTime		2.0V	30	75	95	110	ns	
				4.5V	8	15	19	22	ns
				6.0V	7	13	16	19	ns
C_{IN}	Maximum Input Capacitance			3	10	10	10	pF	
C_{PD}	Power Dissipation Capacitance (Note 5)	(Note 5)		47				pF	

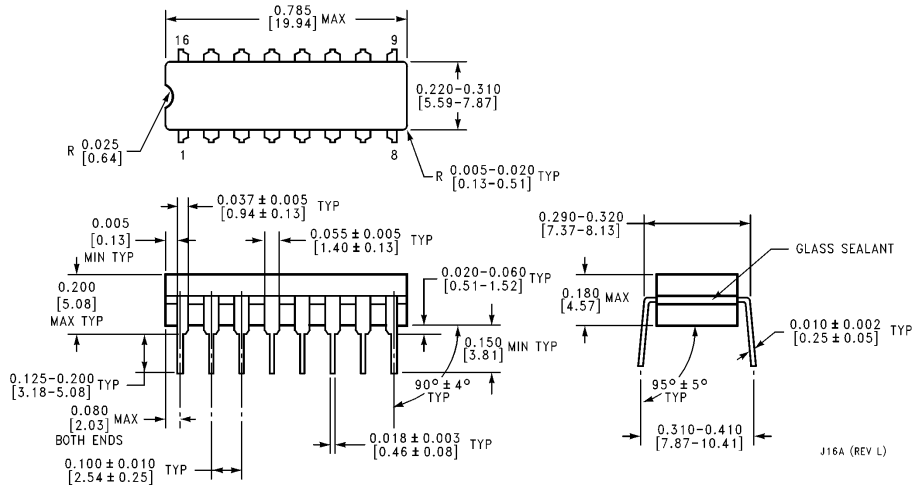
Note 5: CPC determines the no load dynamic power consumption, $P_d = C_{PD} V_{CC}^2 f + I_{CC}$, and the no load dynamic current consumption, $I_S Q C_{PD} V_{CC} f + I_{CC}$.

Logic Diagram

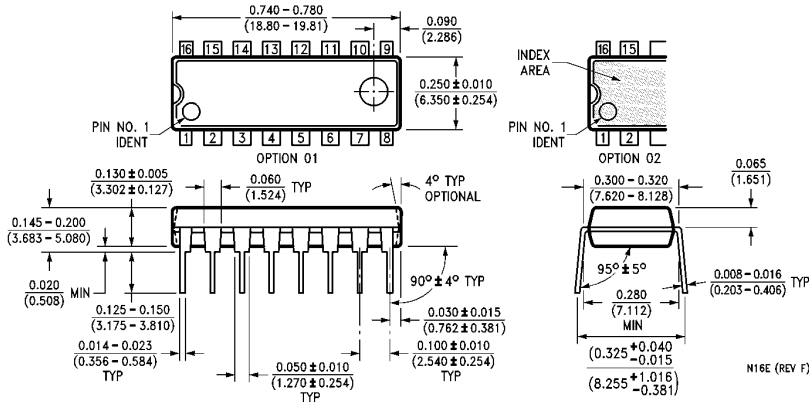


TL/F/8364-2

Physical Dimensions inches (millimeters)



Order Number MM54HC155J or MM74HC155J
NS Package Number J16A



Order Number MM74HC155N
NS Package Number N16E

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