FAIRCHILD SEMICONDUCTOR™

September 1983
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MM74HC154
4-to-16 Line Decoder

General Description

The MM74HC154 decoder utilizes advanced silicon-gate CMOS technology, and is well suited to memory address decoding or data routing applications. It possesses high noise immunity, and low power consumption of CMOS with speeds similar to low power Schottky TTL circuits.

The MM74HC154 have 4 binary select inputs (A, B, C, and D). If the device is enabled these inputs determine which one of the 16 normally HIGH outputs will go LOW. Two active LOW enables ($\overline{G1}$ and $\overline{G2}$) are provided to ease cascading of decoders with little or no external logic.

Each output can drive 10 low power Schottky TTL equivalent loads, and is functionally and pin equivalent to the 74LS154. All inputs are protected from damage due to static discharge by diodes to V_{CC} and ground.

Features

- Typical propagation delay: 21 ns
- Power supply quiescent current: 80 μA
- Wide power supply voltage range: 2–6V
- Low input current: 1 μA maximum

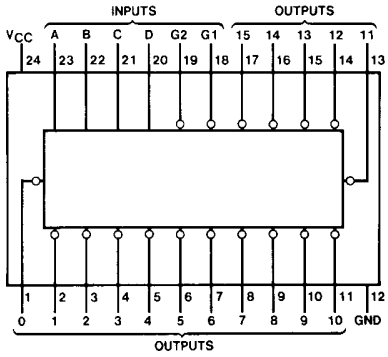
Ordering Code:

Order Number	Package Number	Package Description
MM74HC154WM	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide Body
MM74HC154MTC	MTC24	24-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
MM74HC154N	N24C	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-100, 0.300" Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagram

Pin Assignments for DIP, SOIC and TSSOP



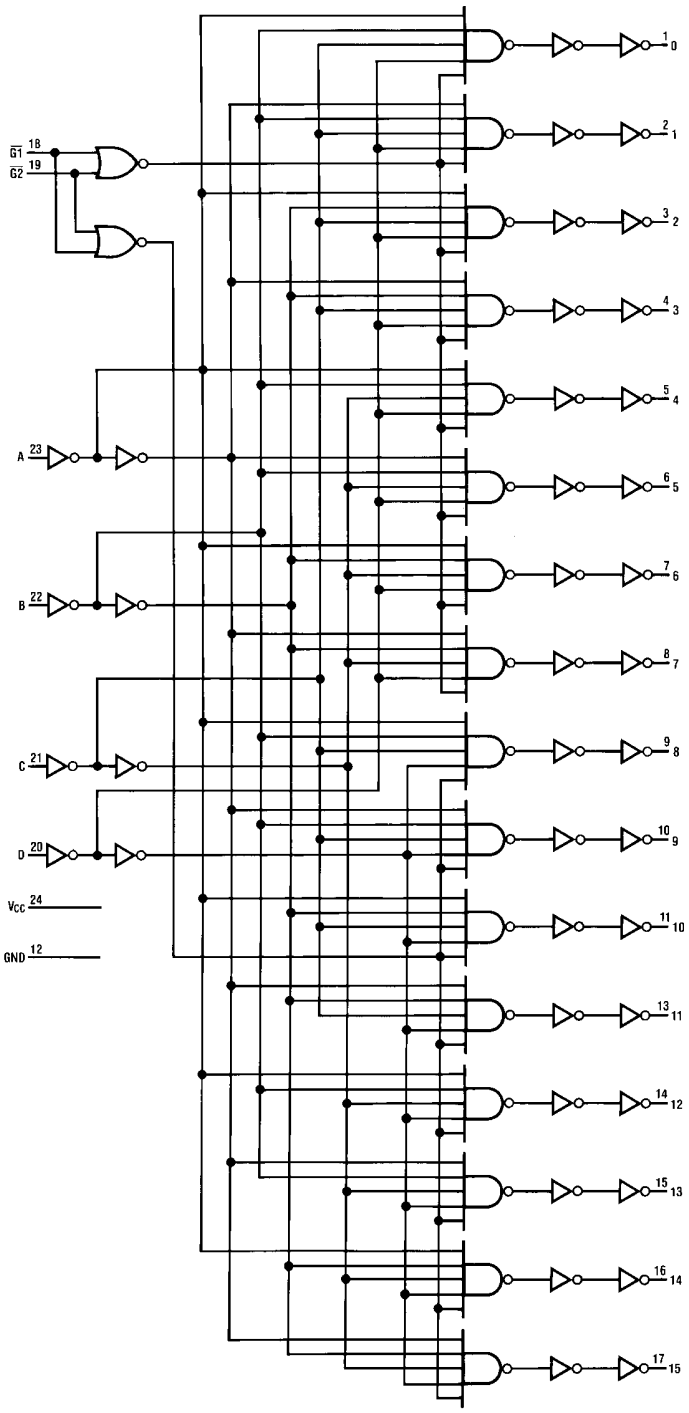
Top View

Truth Table

Inputs						Low
$\overline{G1}$	$\overline{G2}$	D	C	B	A	Output (Note 1)
L	L	L	L	L	L	0
L	L	L	L	L	H	1
L	L	L	L	H	L	2
L	L	L	L	H	H	3
L	L	L	H	L	L	4
L	L	L	H	L	H	5
L	L	L	H	H	L	6
L	L	L	H	H	H	7
L	L	H	L	L	L	8
L	L	H	L	L	H	9
L	L	H	L	H	L	10
L	L	H	L	H	H	11
L	L	H	H	L	L	12
L	L	H	H	L	H	13
L	L	H	H	H	L	14
L	L	H	H	H	H	15
L	H	X	X	X	X	—
H	L	X	X	X	X	—
H	H	X	X	X	X	—

Note 1: All others HIGH

Logic Diagram



Absolute Maximum Ratings (Note 2)

(Note 3)

Supply Voltage (V_{CC})	−0.5 to +7.0V
DC Input Voltage (V_{IN})	−1.5 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 4)	600 mW
S.O. Package only	500 mW
Lead Temperature (T_L)	
(Soldering 10 seconds)	260°C

Recommended Operating Conditions

	Min	Max	Units
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)	−40	+85	°C
Input Rise or Fall Times			
(t_r, t_f) V_{CC} = 2.0V		1000	ns
V_{CC} = 4.5V		500	ns
V_{CC} = 6.0V		400	ns

Note 2: Absolute Maximum Ratings are those values beyond which damage to the device may occur.

Note 3: Unless otherwise specified all voltages are referenced to ground.

Note 4: Power Dissipation temperature derating — plastic "N" package: −12 mW/°C from 65°C to 85°C.

DC Electrical Characteristics (Note 5)

Symbol	Parameter	Conditions	V_{CC}	T_A = 25°C	T_A = −40 to 85°C		Units
				Typ	Guaranteed Limits		
V_{IH}	Minimum HIGH		2.0V		1.5	1.5	V
	Level Input		4.5V		3.15	3.15	V
	Voltage		6.0V		4.2	4.2	V
V_{IL}	Maximum LOW		2.0V		0.5	0.5	V
	Level Input		4.5V		1.35	1.35	V
	Voltage		6.0V		1.8	1.8	V
V_{OH}	Minimum HIGH	V_{IN} = V_{IH} or V_{IL}					
	Level Output	$\|I_{OUT}\| \le 20$ µA	2.0V	2.0	1.9	1.9	V
	Voltage		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}					
		$\|I_{OUT}\| \le 4.0$ mA	4.5V	4.2	3.98	3.84	V
		$\|I_{OUT}\| \le 5.2$ mA	6.0V	5.7	5.48	5.34	V
V_{OL}	Maximum LOW	V_{IN} = V_{IH} or V_{IL}					
	Level Output	$\|I_{OUT}\| \le 20$ µA	2.0V	0	0.1	0.1	V
	Voltage		4.5V	0	0.1	0.1	V
			6.0V	0	0.1	0.1	V
		V_{IN} = V_{IH} or V_{IL}					
		$\|I_{OUT}\| \le 4.0$ mA	4.5V	0.2	0.26	0.33	V
		$\|I_{OUT}\| \le 5.2$ mA	6.0V	0.2	0.26	0.33	V
I_{IN}	Maximum	V_{IN} = V_{CC} or GND	6.0V		±0.1	±1.0	µA
	Input Current						
I_{CC}	Maximum	V_{IN} = V_{CC} or GND	6.0V		8.0	80	µA
	Quiescent	I_{OUT} = 0 µA					
	Supply Current						

Note 5: For a power supply of 5V ±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.

AC Electrical Characteristics

V_{CC} = 5V, T_A = 25°C, C_L = 15 pF, t_r = t_f = 6 ns

Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
t_{PHL}, t_{PLH}	Maximum Propagation Delay, $\overline{G1}$, $\overline{G2}$ or A, B, C, D		21	32	ns

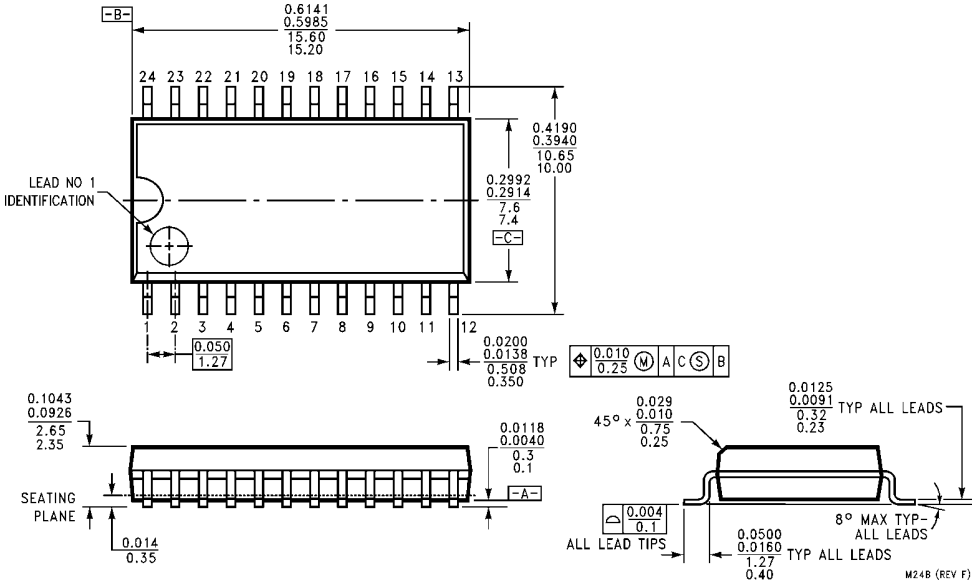
AC Electrical Characteristics

V_{CC} = 2.0V to 6.0V, C_L = 50 pF, t_r = t_f = 6 ns (unless otherwise specified)

Symbol	Parameter	Conditions	V_{CC}	T_A = 25°C	T_A = −40 to 85°C		Units
				Typ	Guaranteed Limits		
t_{PHL}, t_{PLH}	Maximum Propagation		2.0V	63	160	190	ns
	Delay, $\overline{G1}$ or $\overline{G2}$		4.5V	24	36	42	ns
	or A, B, C, D		6.0V	20	30	35	ns
t_{TLH}, t_{THL}	Maximum Output		2.0V	25	75	95	ns
	Rise and Fall Time		4.5V	7	15	19	ns
			6.0V	6	13	16	ns
C_{PD}	Power Dissipation			90			pF
	Capacitance (Note 6)						
C_{IN}	Maximum Input			5	10	10	pF
	Capacitance						

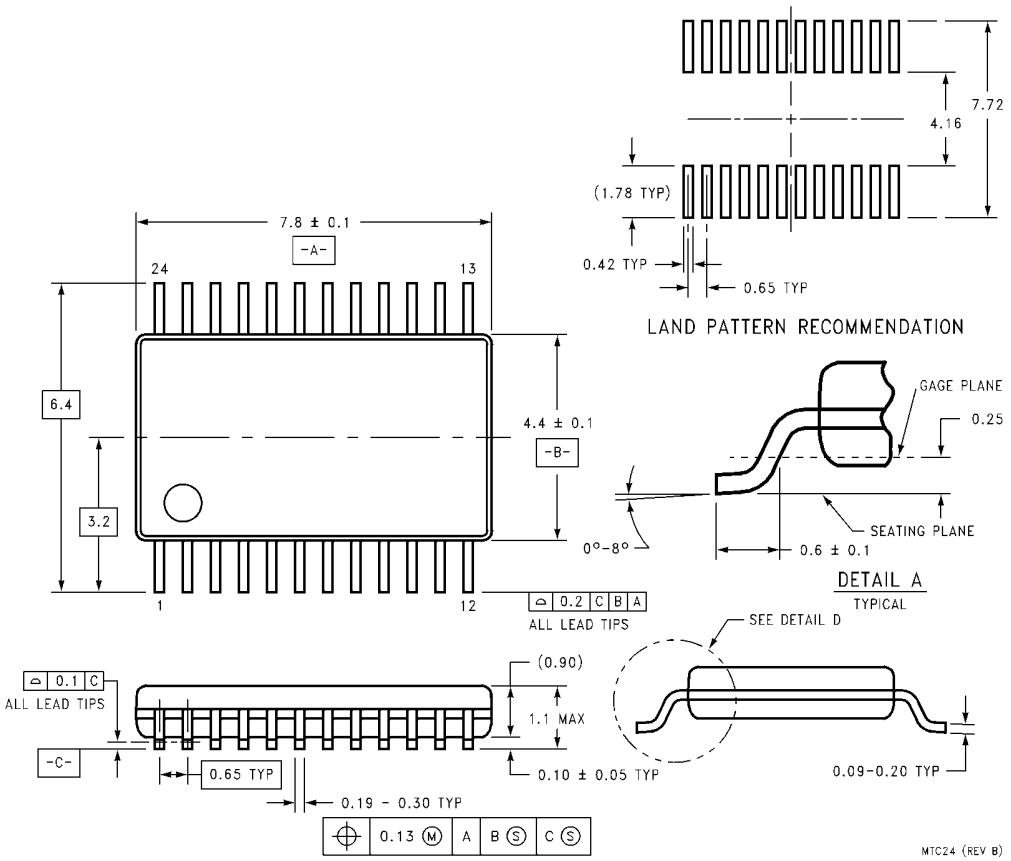
Note 6: C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.

Physical Dimensions inches (millimeters) unless otherwise noted



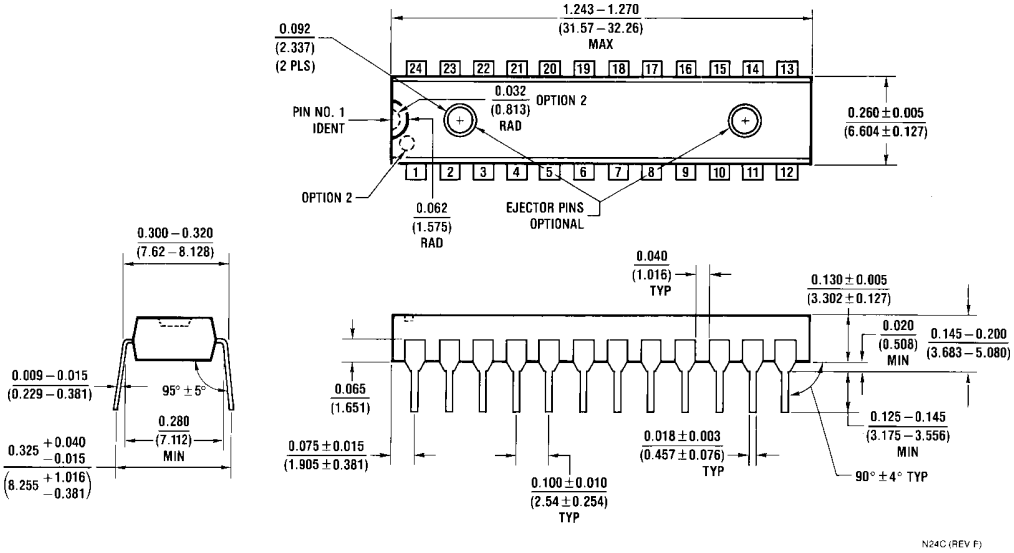
24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300” Wide Body
Package Number M24B

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



24-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide
Package Number MTC24

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-100, 0.300" Wide
Package Number N24C

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