National Semiconductor

August 1996

MM74HCT245
Octal TRI-STATE® Transceiver

General Description

This TRI-STATE bi-directional buffer utilizes advanced silicon-gate CMOS technology and is intended for two-way asynchronous communication between data buses. It has high drive current outputs which enable high speed operation even when driving large bus capacitances. This circuit possesses the low power consumption of CMOS circuitry, yet has speeds comparable to low power Schottky TTL circuits.

This device is TTL input compatible and can drive up to 15 LS-TTL loads, and all inputs are protected from damage due to static discharge by diodes to V_{CC} and ground.

The MM74HCT245 has one active low enable input ($\overline{G}$), and a direction control (DIR). When the DIR input is high, data flows from the A inputs to the B outputs. When DIR is low, data flows from B to A.

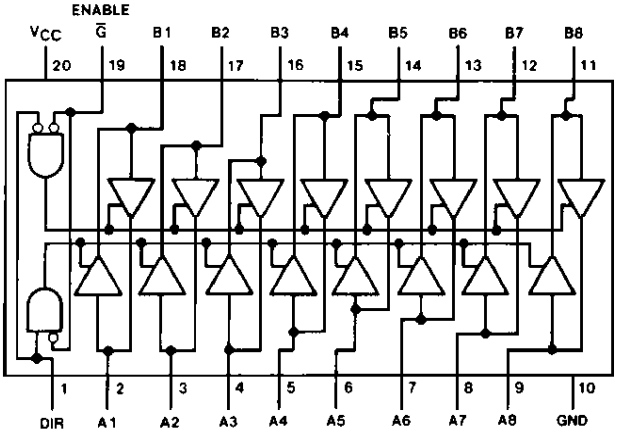
MM74HCT devices are intended to interface between TTL and NMOS components and standard CMOS devices. These parts are also plug-in replacements for LS-TTL devices and can be used to reduce power consumption in existing designs.

Features

- TTL input compatible
- TRI-STATE outputs for connection to system busses
- High output drive current: 6 mA (min)
- High speed: 16 ns typical propagation delay
- Low power: 80 μA (74HCT Series)

Connection Diagram

Dual-In-Line Package



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Top View

Order Number MM74HCT245

Truth Table

Control Inputs		Operation
$\overline{G}$	DIR	245
L	L	B data to A bus
L	H	A data to B bus
H	X	isolation

H = high level L = low level, X = irrelevant

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Absolute Maximum Ratings (Notes 1 & 2)

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

Supply Voltage (V_{CC})	−0.5 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})	±35 mA
DC V_{CC} or GND Current, per pin (I_{CC})	±70 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 Temperature (T_L)	
(Soldering 10 seconds)	260°C

Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})	4.5	5.5	V
DC Input or Output Voltage (V_{IN}, V_{OUT})	0	V_{CC}	V
Operating Temp. Range (T_A)			
MM74HCT	−40	+85	°C
Input Rise or Fall Times (t_r, t_f)		500	ns

DC Electrical Characteristics (V_{CC} = 5V ± 10%, unless otherwise specified.)

Symbol	Parameter	Conditions	T_A = 25°C	74HCT T_A = −40 to 85°C	T_A = 125°C	Units
			Typ	Guaranteed Limits		
V_{IH}	Minimum High Level Input Voltage			2.0	2.0	2.0	V
V_{IL}	Maximum Low Level Input Voltage			0.8	0.8	0.8	V
V_{OH}	Minimum High Level Output Voltage	V_{IN} = V_{IH} or V_{IL}					
		$\|I_{OUT}\|$ = 20 μA	V_{CC}	V_{CC} − 0.1	V_{CC} − 0.1	V_{CC} − 0.1	V
		$\|I_{OUT}\|$ = 6.0 mA, V_{CC} = 4.5V	4.2	3.98	3.84	3.7	V
		$\|I_{OUT}\|$ = 7.2 mA, V_{CC} = 5.5V	5.2	4.98	4.84	4.7	V
V_{OL}	Maximum Low Level Voltage	V_{IN} = V_{IH} or V_{IL}					
		$\|I_{OUT}\|$ = 20 μA	0	0.1	0.1	0.1	V
		$\|I_{OUT}\|$ = 6.0 mA, V_{CC} = 4.5V	0.2	0.26	0.33	0.4	V
		$\|I_{OUT}\|$ = 7.2 mA, V_{CC} = 5.5V	0.2	0.26	0.33	0.4	V
I_{IN}	Maximum Input Current	V_{IN} = V_{CC} or GND, V_{IH} or V_{IL}, Pin 1 or 19		±0.1	±1.0	±1.0	μA
I_{OZ}	Maximum TRI-STATE Output Leakage Current	V_{OUT} = V_{CC} or GND $\overline{G}$ = V_{IH}		±0.5	±5.0	±10	μA
I_{CC}	Maximum Quiescent Supply Current	V_{IN} = V_{CC} or GND I_{OUT} = 0 μA		8	80	160	μA
		V_{IN} = 2.4V or 0.5V (Note 4)	0.6	1.0	1.3	1.5	mA

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.

Note 4: Measured per input. All other inputs at V_{CC} or ground.

AC Electrical Characteristics MM74HCT245

V_{CC}=5.0V, t_r=t_f=6 ns, T_A=25°C (unless otherwise specified)

Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
t_{PHL}, t_{PLH}	Maximum Output Propagation Delay	C_L=45 pF	16	20	ns
t_{PZL}, t_{PZH}	Maximum Output Enable Time	C_L=45 pF R_L=1 kΩ	29	40	ns
t_{PLZ}, t_{PHZ}	Maximum Output Disable Time	C_L=5 pF R_L=1 kΩ	20	25	ns

AC Electrical Characteristics MM74HCT245

V_{CC}=5.0V ±10%, t_r=t_f=6 ns (unless otherwise specified)

Symbol	Parameter	Conditions	T_A = 25°C	74HCT T_A = −40 to 85°C		T_A=125°C	Units
			Typ	Guaranteed Limits			
t_{PHL}, t_{PLH}	Maximum Output Propagation Delay	C_L = 50 pF	17	23	29	34	ns
		C_L = 150 pF	24	30	38	45	ns
t_{PZL}	Maximum Output Enable Time	R_L = 1 kΩ C_L = 50 pF	31	42	53	63	ns
t_{PZH}	Maximum Output Enable Time	R_L = 1 kΩ C_L = 50 pF	23	33	41	49	ns
t_{PHZ}, t_{PLZ}	Maximum Output Disable Time	R_L = 1 kΩ C_L = 50 pF	21	30	38	45	ns
t_{THL}, t_{TLH}	Maximum Output Rise and Fall Time	C_L = 50 pF	8	12	15	18	ns
C_{IN}	Maximum Input Capacitance		10	15	15	15	pF
C_{OUT}	Maximum Output/Input Capacitance		20	25	25	25	pF
C_{PD}	Power Dissipation Capacitance	(Note 5) $\overline{G}$ = V_{CC} GND $\overline{G}$ =	7 100				pF pF

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

Logic Diagram

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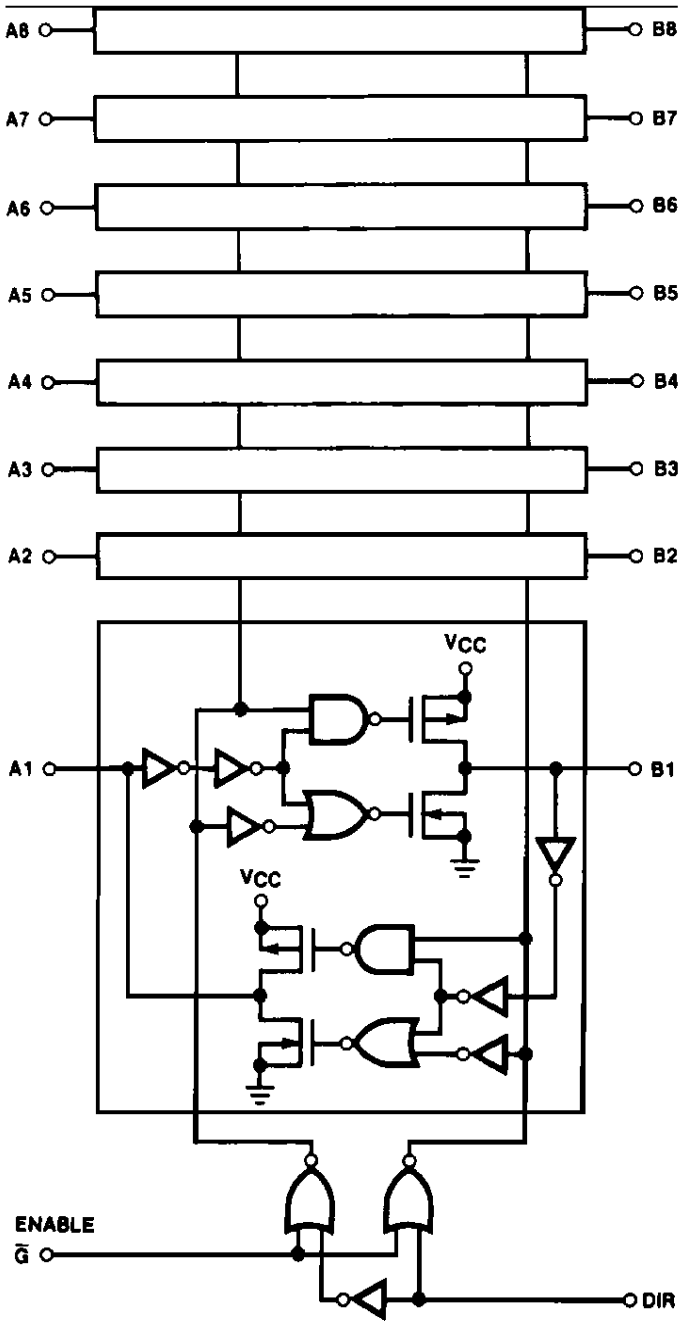

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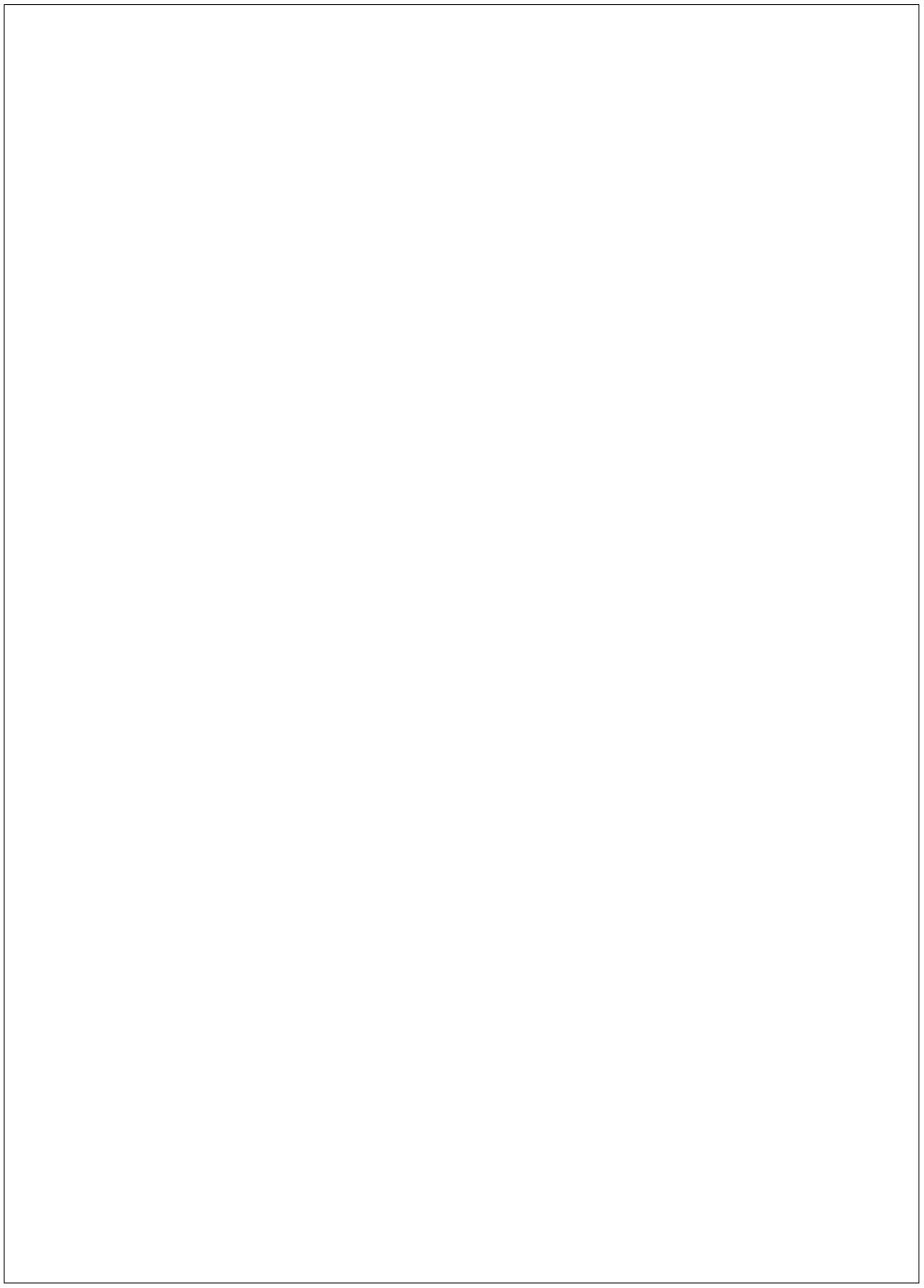
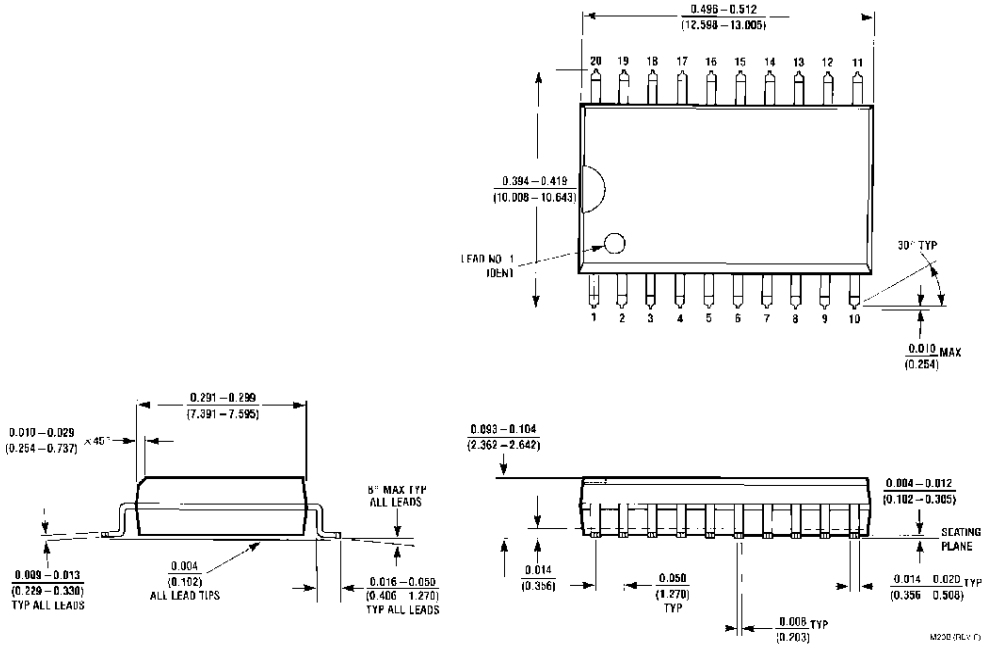
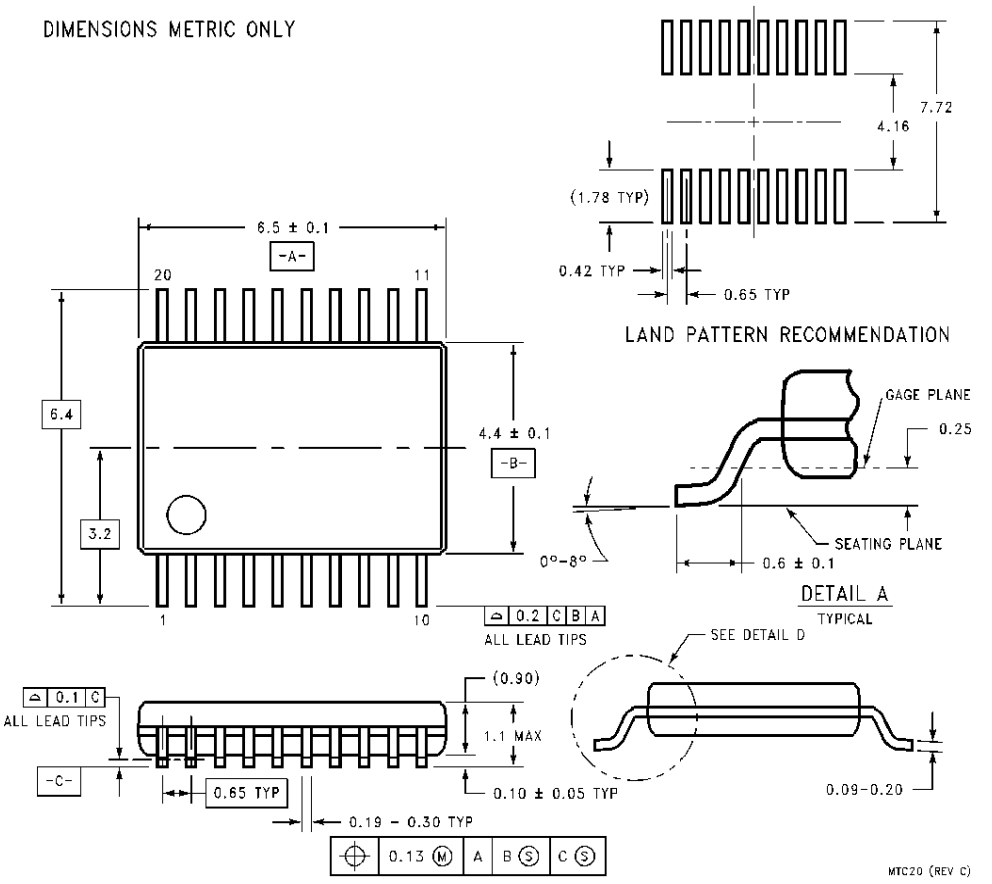


Physical Dimensions inches (millimeters) unless otherwise noted



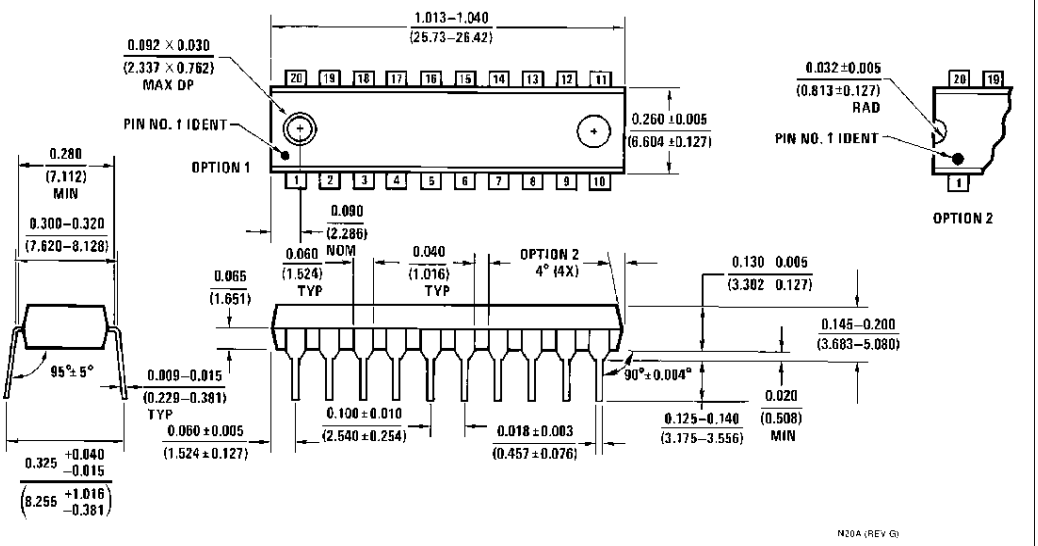
Order Number MM74HCT245WM
NS Package M20B

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



Order Number MM74HCT245MTC
NS Package MTC20

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



Order Number MM74HCT245N
NS Package N20A

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