

## MM74HCT245 Octal 3-STATE Transceiver

### General Description

The MM74HCT245 3-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

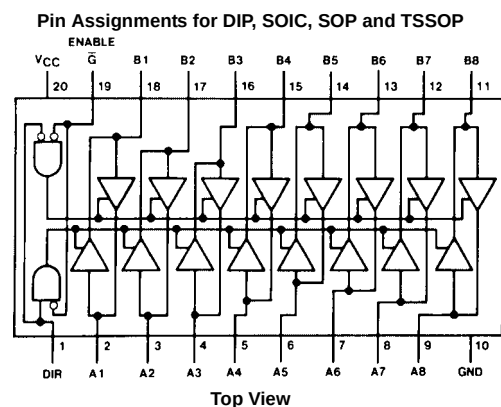
- TTL input compatible
- 3-STATE outputs for connection to system busses
- High output drive current: 6 mA (min)
- High speed: 16 ns typical propagation delay
- Low power: 80  $\mu$ A (74HCT Series)

### Ordering Code:

| Order Number  | Package Number | Package Description                                                         |
|---------------|----------------|-----------------------------------------------------------------------------|
| MM74HCT245WM  | M20B           | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  |
| MM74HCT245SJ  | M20D           | 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide               |
| MM74HCT245MTC | MTC20          | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| MM74HCT245N   | N20A           | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide      |

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

### Connection Diagram

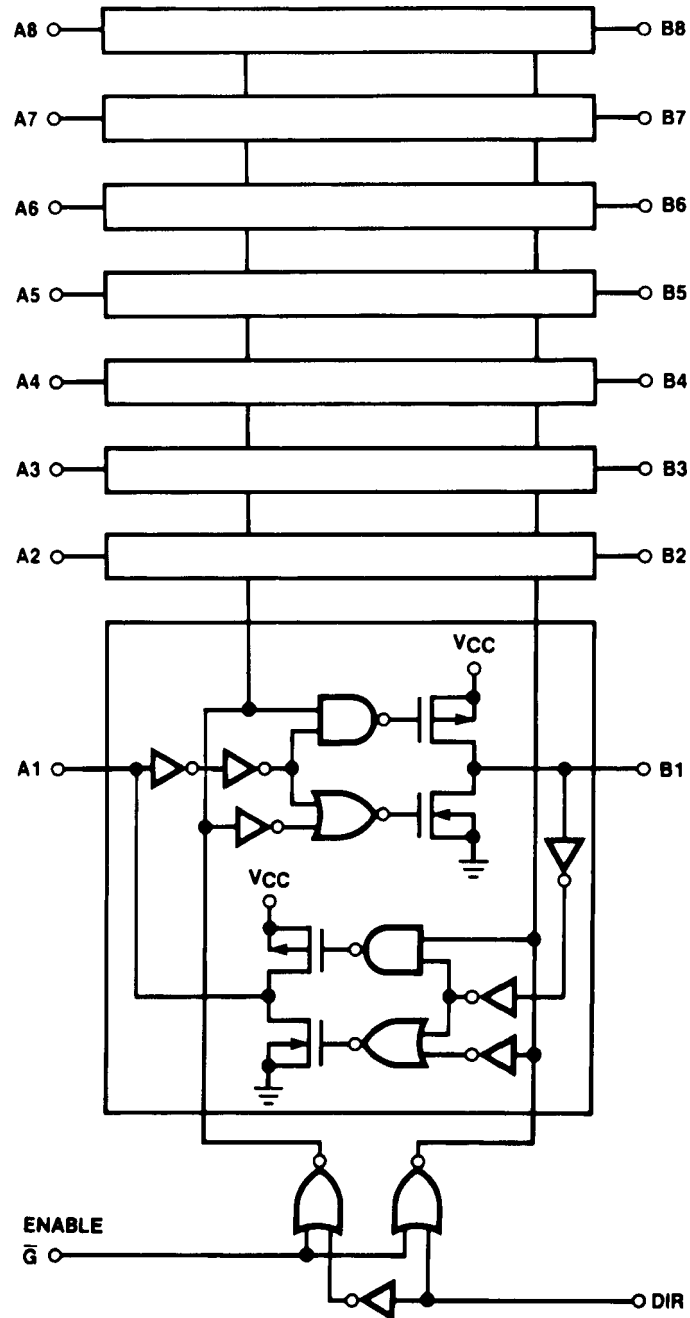


### Truth Table

| 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

## Logic Diagram



**Absolute Maximum Ratings**(Note 1)

(Note 2)

|                                                  |                         |
|--------------------------------------------------|-------------------------|
| 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 ( $I_{IK}, I_{OK}$ )         | $\pm 20$ mA             |
| DC Output Current,                               | $\pm 35$ mA             |
| DC $V_{CC}$ or GND Current, per pin ( $I_{CC}$ ) | $\pm 70$ 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                   |

**Recommended Operating Conditions**

|                                                     | Min | Max      | Units |
|-----------------------------------------------------|-----|----------|-------|
| Supply Voltage ( $V_{CC}$ )                         | 4.5 | 5.5      | V     |
| DC Input or Output Voltage<br>( $V_{IN}, V_{OUT}$ ) | 0   | $V_{CC}$ | V     |
| Operating Temperature Range ( $T_A$ )               | -40 | +85      | °C    |
| Input Rise or Fall Times<br>( $t_r, t_f$ )          |     | 500      | ns    |

**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.**DC Electrical Characteristics**( $V_{CC} = 5V \pm 10\%$ , unless otherwise specified.)

| Symbol          | Parameter                              | Conditions                                                                                    | T <sub>A</sub> = 25°C |                       | T <sub>A</sub> = -40 to 85°C | T <sub>A</sub> = -55 to 125°C | Units |
|-----------------|----------------------------------------|-----------------------------------------------------------------------------------------------|-----------------------|-----------------------|------------------------------|-------------------------------|-------|
|                 |                                        |                                                                                               | Typ                   | Guaranteed Limits     |                              |                               |       |
| V <sub>IH</sub> | Minimum HIGH Level Input Voltage       |                                                                                               |                       | 2.0                   | 2.0                          | 2.0                           | V     |
| V <sub>IL</sub> | Maximum LOW Level Input Voltage        |                                                                                               |                       | 0.8                   | 0.8                          | 0.8                           | V     |
| V <sub>OH</sub> | Minimum HIGH Level Output Voltage      | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                          |                       |                       |                              |                               |       |
|                 |                                        | I <sub>OUT</sub>   = 20 μA                                                                    | V <sub>CC</sub>       | V <sub>CC</sub> - 0.1 | V <sub>CC</sub> - 0.1        | V <sub>CC</sub> - 0.1         | V     |
|                 |                                        | I <sub>OUT</sub>   = 6.0 mA, V <sub>CC</sub> = 4.5V                                           | 4.2                   | 3.98                  | 3.84                         | 3.7                           | V     |
|                 |                                        | I <sub>OUT</sub>   = 7.2 mA, V <sub>CC</sub> = 5.5V                                           | 5.2                   | 4.98                  | 4.84                         | 4.7                           | V     |
| V <sub>OL</sub> | Maximum LOW Level Voltage              | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                          |                       |                       |                              |                               |       |
|                 |                                        | I <sub>OUT</sub>   = 20 μA                                                                    | 0                     | 0.1                   | 0.1                          | 0.1                           | V     |
|                 |                                        | I <sub>OUT</sub>   = 6.0 mA, V <sub>CC</sub> = 4.5V                                           | 0.2                   | 0.26                  | 0.33                         | 0.4                           | V     |
|                 |                                        | I <sub>OUT</sub>   = 7.2 mA, V <sub>CC</sub> = 5.5V                                           | 0.2                   | 0.26                  | 0.33                         | 0.4                           | V     |
| I <sub>IN</sub> | Maximum Input Current                  | V <sub>IN</sub> = V <sub>CC</sub> or GND,<br>V <sub>IH</sub> or V <sub>IL</sub> , Pin 1 or 19 |                       | ±0.1                  | ±1.0                         | ±1.0                          | μA    |
| I <sub>OZ</sub> | Maximum 3-STATE Output Leakage Current | V <sub>OUT</sub> = V <sub>CC</sub> or GND<br>G = V <sub>IH</sub>                              |                       | ±0.5                  | ±5.0                         | ±10                           | μA    |
| I <sub>CC</sub> | Maximum Quiescent Supply Current       | V <sub>IN</sub> = V <sub>CC</sub> or GND<br>I <sub>OUT</sub> = 0 μA                           |                       | 8                     | 80                           | 160                           | μA    |
|                 |                                        | V <sub>IN</sub> = 2.4V or 0.5V (Note 4)                                                       | 0.6                   | 1.0                   | 1.3                          | 1.5                           | mA    |

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

## AC Electrical Characteristics

$V_{CC} = 5.0V$ ,  $t_r = t_f = 6\text{ ns}$ ,  $T_A = 25^\circ\text{C}$  (unless otherwise specified)

| Symbol             | Parameter                        | Conditions                                       | Typ | Guaranteed Limit | Units |
|--------------------|----------------------------------|--------------------------------------------------|-----|------------------|-------|
| $t_{PHL}, t_{PLH}$ | Maximum Output Propagation Delay | $C_L = 45\text{ pF}$                             | 16  | 20               | ns    |
| $t_{PZL}, t_{PZH}$ | Maximum Output Enable Time       | $C_L = 45\text{ pF}$<br>$R_L = 1\text{ k}\Omega$ | 29  | 40               | ns    |
| $t_{PLZ}, t_{PHZ}$ | Maximum Output Disable Time      | $C_L = 5\text{ pF}$<br>$R_L = 1\text{ k}\Omega$  | 20  | 25               | ns    |

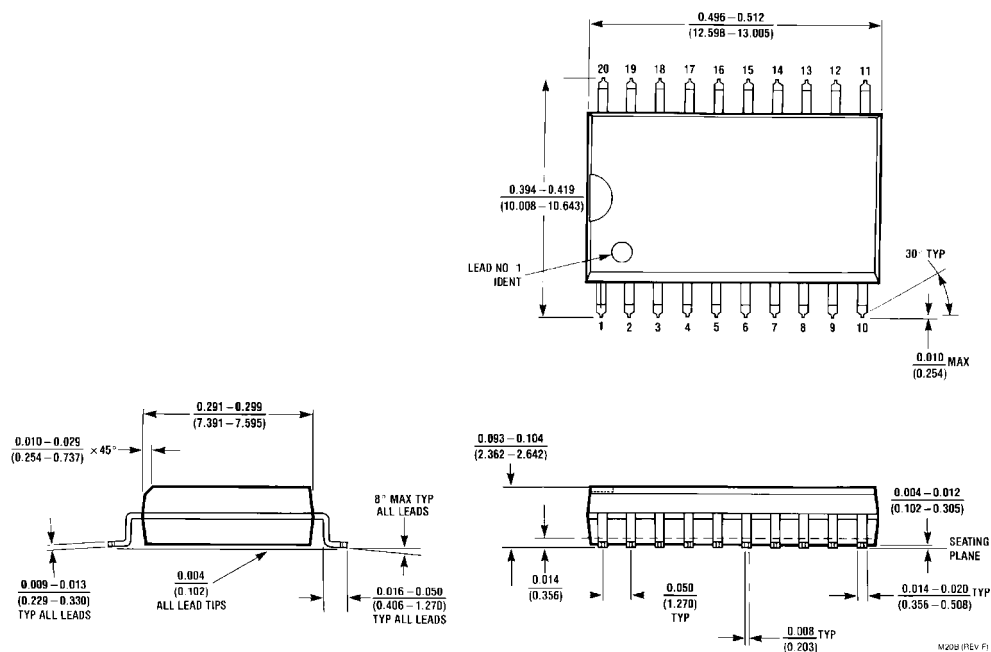
## AC Electrical Characteristics

$V_{CC} = 5.0V \pm 10\%$ ,  $t_r = t_f = 6\text{ ns}$  (unless otherwise specified)

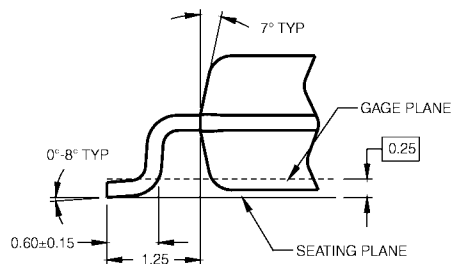
| Symbol                              | Parameter                         | Conditions                                      | T <sub>A</sub> = 25°C |                   | T <sub>A</sub> = -40 to 85°C | T <sub>A</sub> = -55 to 125°C | Units |
|-------------------------------------|-----------------------------------|-------------------------------------------------|-----------------------|-------------------|------------------------------|-------------------------------|-------|
|                                     |                                   |                                                 | Typ                   | Guaranteed Limits |                              |                               |       |
| t <sub>PHL</sub> , t <sub>PLH</sub> | Maximum Output Propagation Delay  | C <sub>L</sub> = 50 pF                          | 17                    | 23                | 29                           | 34                            | ns    |
|                                     |                                   | C <sub>L</sub> = 150 pF                         | 24                    | 30                | 38                           | 45                            | ns    |
| t <sub>PZL</sub>                    | Maximum Output Enable Time        | R <sub>L</sub> = 1 kΩ<br>C <sub>L</sub> = 50 pF | 31                    | 42                | 53                           | 63                            | ns    |
| t <sub>PZH</sub>                    | Maximum Output Enable Time        | R <sub>L</sub> = 1 kΩ<br>C <sub>L</sub> = 50 pF | 23                    | 33                | 41                           | 49                            | ns    |
| t <sub>PHZ</sub> , t <sub>PLZ</sub> | Maximum Output Disable Time       | R <sub>L</sub> = 1 kΩ<br>C <sub>L</sub> = 50 pF | 21                    | 30                | 38                           | 45                            | ns    |
| t <sub>THL</sub> , t <sub>TLH</sub> | Maximum Output Rise and Fall Time | C <sub>L</sub> = 50 pF                          | 8                     | 12                | 15                           | 18                            | ns    |
| C <sub>IN</sub>                     | Maximum Input Capacitance         |                                                 | 10                    | 15                | 15                           | 15                            | pF    |
| C <sub>OUT</sub>                    | Maximum Output/Input Capacitance  |                                                 | 20                    | 25                | 25                           | 25                            | pF    |
| C <sub>PD</sub>                     | Power Dissipation Capacitance     | $\overline{G} = V_{CC}$ (Note 5)                | 7                     |                   |                              |                               | pF    |
|                                     |                                   | $\overline{G} = \text{GND}$                     | 100                   |                   |                              |                               | 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,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

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



**20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide  
Package Number M20B**



DETAIL A

NOTES:

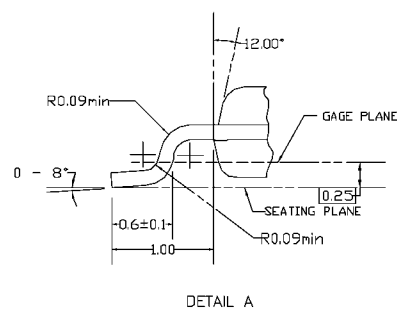
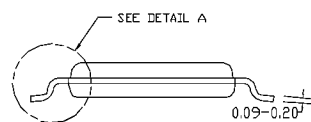
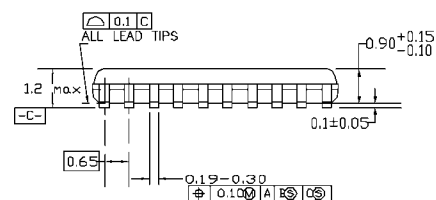
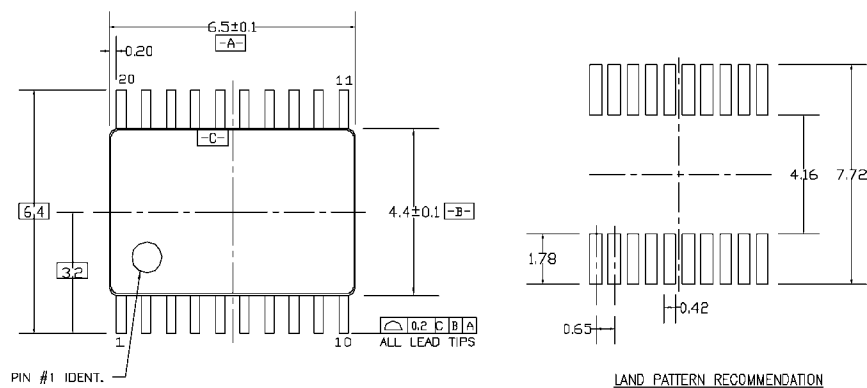
A. CONFORMS TO EIAJ EDR-7320 REGISTRATION,  
ESTABLISHED IN DECEMBER, 1998.

B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

**20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M20D**



DIMENSIONS ARE IN MILLIMETERS

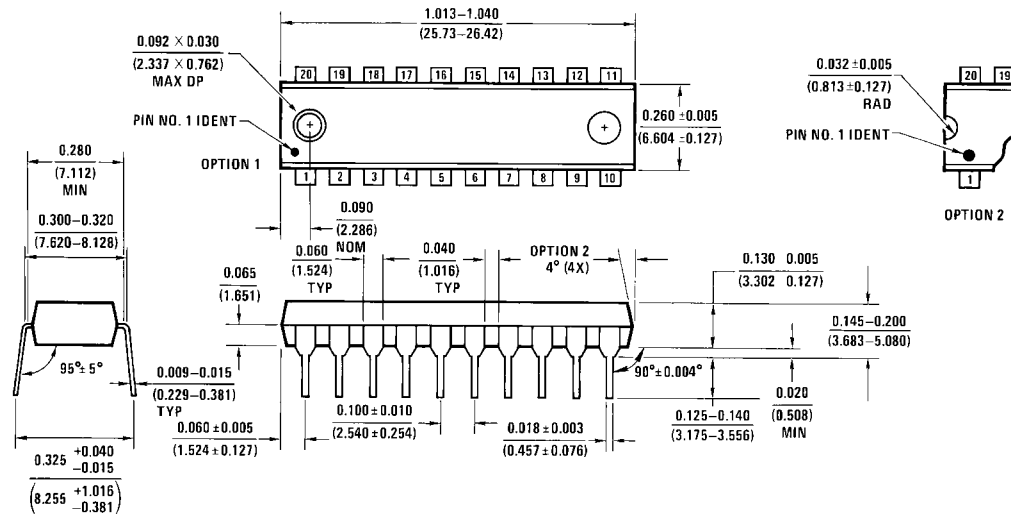
NOTES:

- A. CONFORMS TO JEDEC REGISTRATION MO-153, VARIATION AC,  
REF NOTE 6, DATE 7/93.
- B. DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLDS FLASH,  
AND TIE BAR EXTRUSIONS.
- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REVD1

**20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide  
Package Number MTC20**

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



N20A (REV G)

20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide  
Package Number N20A

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