

# Octal 3-State Transceiver

## MM74HCT245

### 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.

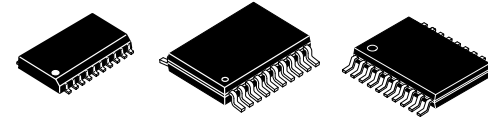
This device is TTL input compatible and can drive up to 15 LS-TTL loads, and all inputs are protected from damage due to static discharge by diodes to  $V_{CC}$  and ground.

The MM74HCT245 has one active low enable input ( $\bar{G}$ ), 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.

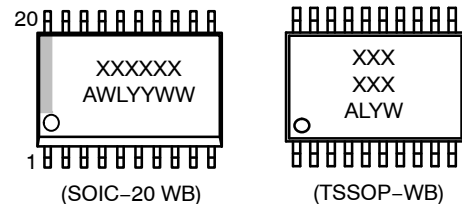
### Features

- 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: 160  $\mu$ A (74HCT Series)



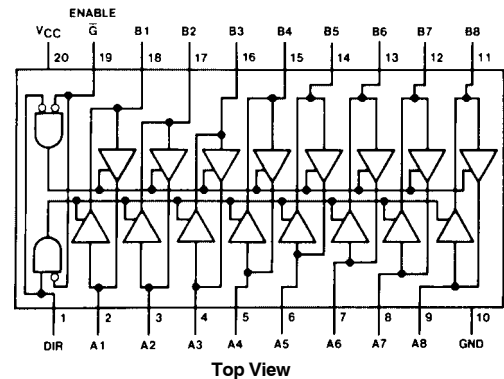
SOIC-20 WB CASE 751D-05 TSSOP-20 WB CASE 948E TSSOP-20 WB CASE 948AQ

### MARKING DIAGRAMS



XXXXXX = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week

### CONNECTION DIAGRAM



### TRUTH TABLE

| Control Inputs |     | Operation       |
|----------------|-----|-----------------|
| $\bar{G}$      | DIR | 245             |
| L              | L   | B data to A bus |
| L              | H   | A data to B bus |
| H              | H   | isolation       |

H = HIGH Level  
L = LOW Level  
X = Irrelevant

### ORDERING INFORMATION

See detailed ordering and shipping information on page 5 of this data sheet.

# MM74HCT245

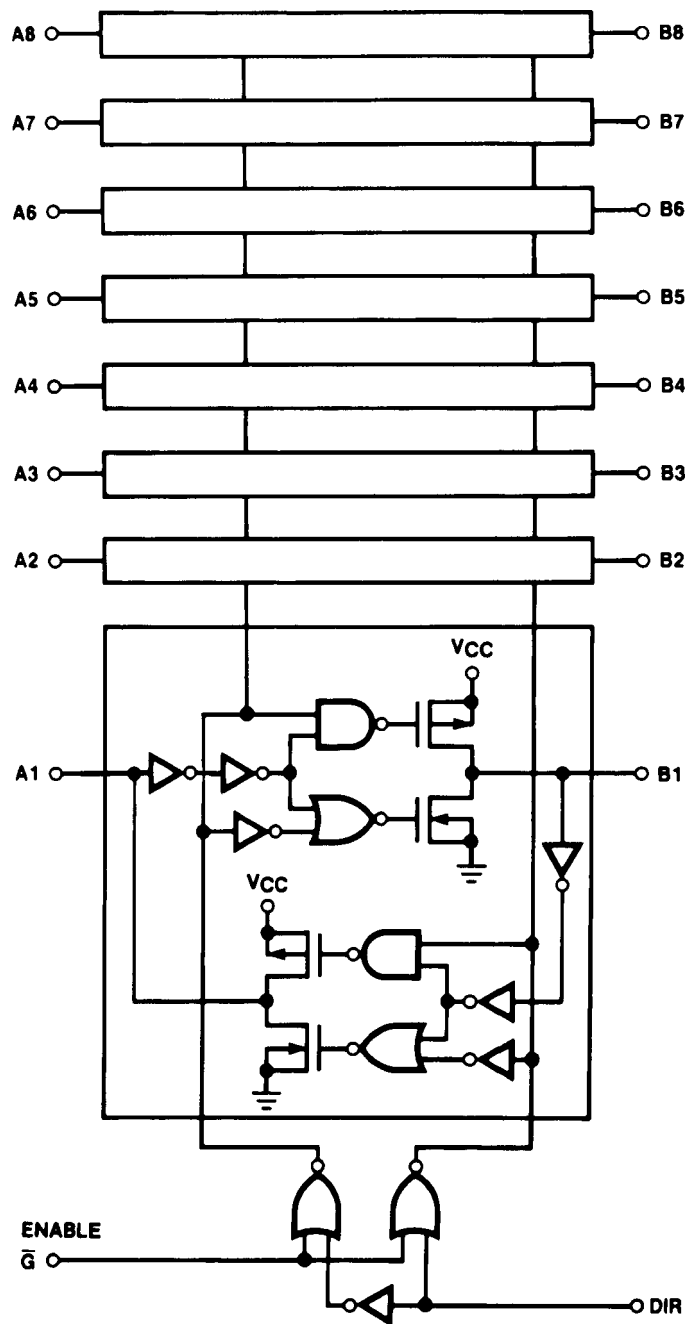


Figure 1. Logic Diagram

# MM74HCT245

## ABSOLUTE MAXIMUM RATINGS (Note 1) (Note 2)

| Symbol           | Parameter                               | Rating                       | Unit |
|------------------|-----------------------------------------|------------------------------|------|
| $V_{CC}$         | Supply Voltage                          | -0.5 to +6.5                 | V    |
| $V_{IN}$         | DC Input Voltage                        | -0.5 to $V_{CC}+0.5$         | V    |
| $V_{OUT}$        | DC Output Voltage                       | -0.5 to $V_{CC}+0.5$         | V    |
| $I_{IK}, I_{OK}$ | Clamp Diode Current                     | $\pm 20$                     | mA   |
| $I_{OUT}$        | DC Output Current, per pin              | $\pm 35$                     | mA   |
| $I_{CC}$         | Maximum Junction Temperature            | $\pm 70$                     | mA   |
| $T_{STG}$        | Storage Temperature Range               | -65 to +150                  | °C   |
| $P_D$            | Power Dissipation                       | SOIC<br>TSSOP<br>1302<br>833 | mW   |
| $T_L$            | Lead Temperature (Soldering 10 seconds) | 260                          | °C   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Absolute Maximum Ratings are those values beyond which damage to the device may occur.
2. Unless otherwise specified all voltages are referenced to ground.

## RECOMMENDED OPERATING RANGES

| Symbol            | Parameter                   | Min. | Max.     | Unit |
|-------------------|-----------------------------|------|----------|------|
| $V_{CC}$          | Supply Voltage              | 4.5  | 5.5      | V    |
| $V_{IN}, V_{OUT}$ | DC Input or Output Voltage  | 0    | $V_{CC}$ | V    |
| $T_A$             | Operating Temperature Range | -55  | +125     | °C   |
| $t_r, t_f$        | Input Rise or Fall Times    | -    | 500      | ns   |

Functional operation above the stresses listed in the Recommended Operating Ranges is not implied. Extended exposure to stresses beyond the Recommended Operating Ranges limits may affect device reliability.



# MM74HCT245

## DC ELECTRICAL CHARACTERISTICS ( $V_{CC} = 5\text{ V} \pm 10\%$ , unless otherwise specified.)

| Symbol          | Parameter                              | Test Conditions                                                                                                                                                                                         | T <sub>A</sub> = 25°C         |                                       | T <sub>A</sub> = −40°C<br>to 85°C     | T <sub>A</sub> = −55°C<br>to 125°C  | Unit |
|-----------------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|---------------------------------------|---------------------------------------|-------------------------------------|------|
|                 |                                        |                                                                                                                                                                                                         | 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> ,<br> I <sub>OUT</sub>   = 20 μA<br> I <sub>OUT</sub>   = 6.0 mA, V <sub>CC</sub> = 4.5 V<br> I <sub>OUT</sub>   = 7.2 mA, V <sub>CC</sub> = 5.5 V | V <sub>CC</sub><br>4.2<br>5.2 | V <sub>CC</sub> − 0.1<br>3.98<br>4.98 | V <sub>CC</sub> − 0.1<br>3.84<br>4.84 | V <sub>CC</sub> − 0.1<br>3.7<br>4.7 | V    |
| V <sub>OL</sub> | Maximum LOW Level Output Voltage       | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub> ,<br> I <sub>OUT</sub>   = 20 μA<br> I <sub>OUT</sub>   = 6.0 mA, V <sub>CC</sub> = 4.5 V<br> I <sub>OUT</sub>   = 7.2 mA, V <sub>CC</sub> = 5.5 V | 0<br>0.2<br>0.2               | 0.1<br>0.26<br>0.26                   | 0.1<br>0.33<br>0.33                   | 0.1<br>0.4<br>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>G̅ = 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> = 2.4 V or 0.5 V (Note 4)                                                                                                                                                               | 0.6                           | 1.0                                   | 1.3                                   | 1.5                                 | mA   |

3. Measured per input. All other inputs at  $V_{CC}$  or ground.

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

| Symbol                | Parameter                        | Test Conditions                                  | Typ. | Guaranteed Limit | Unit |
|-----------------------|----------------------------------|--------------------------------------------------|------|------------------|------|
| $t_{PHL}$ , $t_{PLH}$ | 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   |



# MM74HCT245

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

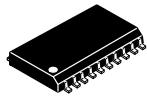
| Symbol                              | Parameter                         | Test Conditions                                 | T <sub>A</sub> = 25°C |                   | T <sub>A</sub> = −40°C<br>to 85°C | T <sub>A</sub> = −55°C<br>to 125°C | Unit     |
|-------------------------------------|-----------------------------------|-------------------------------------------------|-----------------------|-------------------|-----------------------------------|------------------------------------|----------|
|                                     |                                   |                                                 | 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                                 |          |
| t <sub>PZL</sub>                    | Maximum Output Enable Time        | R <sub>L</sub> = 1 kQ<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 kQ<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 kQ<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     | G̅ = V <sub>CC</sub> (Note 5)<br>G̅ = GND       | 7<br>100              | –                 | –                                 | –                                  | pF<br>pF |

4.  $C_{PD}$  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,  $I_S = C_{PD} V_{CC} f + I_{CC}$ .

## ORDERING INFORMATION

| Product Number | Marking     | Package                              | Shipping <sup>†</sup>      |
|----------------|-------------|--------------------------------------|----------------------------|
| MM74HCT245MTC  | HCT<br>245A | TSSOP–20 WB, Case, 948E<br>(Pb–Free) | 75 Units / Tube            |
| MM74HCT245MTCX | HCT<br>245A | TSSOP–20 WB, 948AQ<br>(Pb–Free)      | 2500 Units / Tape and Reel |
| MM74HCT245WM   | HCT245A     | SOIC–20 WB<br>(Pb–Free)              | 38 Units / Tube            |
| MM74HCT245WMX  | HCT245A     | SOIC–20 WB<br>(Pb–Free)              | 1000 Units / Tape and Reel |

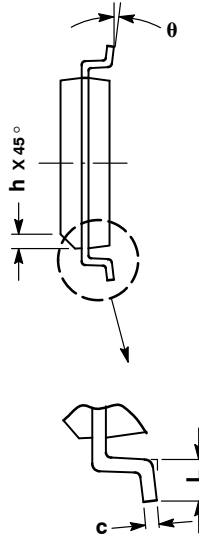
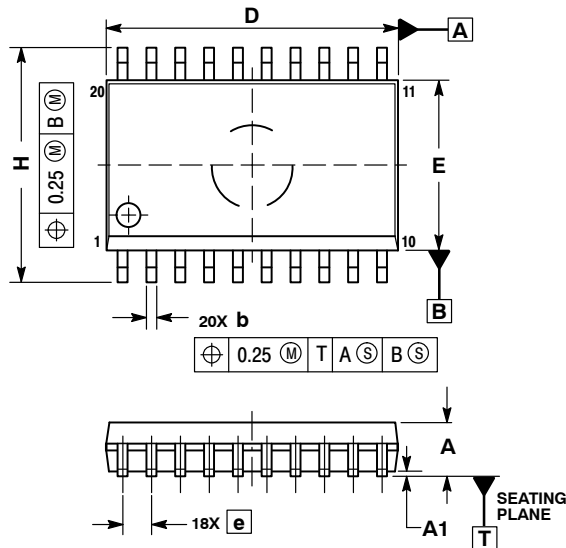
<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, [BRD8011/D](#).



SCALE 1:1

SOIC-20 WB  
CASE 751D-05  
ISSUE H

DATE 22 APR 2015

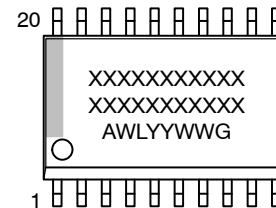


NOTES:

1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS OF B DIMENSION AT MAXIMUM MATERIAL CONDITION.

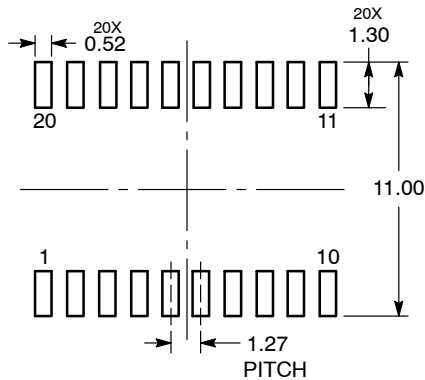
| DIM      | MILLIMETERS |       |
|----------|-------------|-------|
|          | MIN         | MAX   |
| A        | 2.35        | 2.65  |
| A1       | 0.10        | 0.25  |
| b        | 0.35        | 0.49  |
| c        | 0.23        | 0.32  |
| D        | 12.65       | 12.95 |
| E        | 7.40        | 7.60  |
| e        | 1.27 BSC    |       |
| H        | 10.05       | 10.55 |
| h        | 0.25        | 0.75  |
| L        | 0.50        | 0.90  |
| $\theta$ | 0°          | 7°    |

GENERIC  
MARKING DIAGRAM\*



XXXXXX = Specific Device Code  
A = Assembly Location  
WL = Wafer Lot  
YY = Year  
WW = Work Week  
G = Pb-Free Package

RECOMMENDED  
SOLDERING FOOTPRINT\*



DIMENSIONS: MILLIMETERS

\*For additional information on our Pb-Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

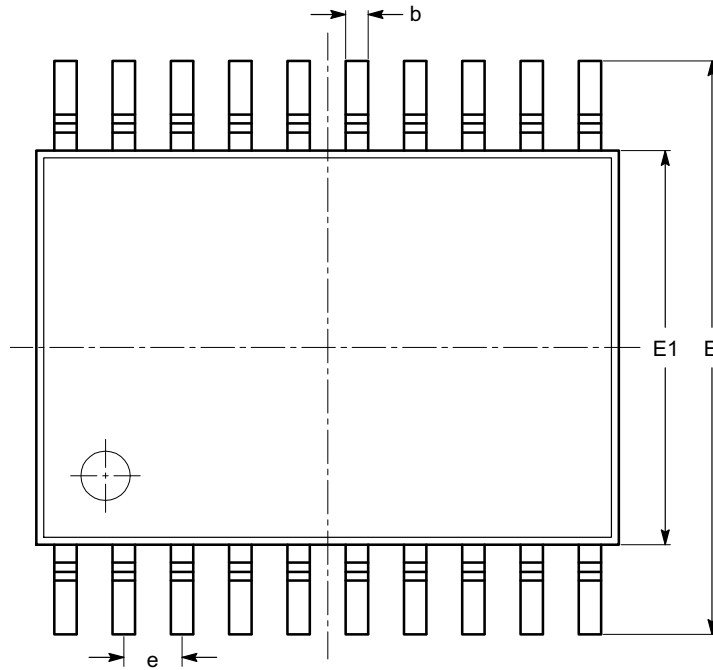
\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present. Some products may not follow the Generic Marking.

|                  |             |                                                                                                                                                                                     |
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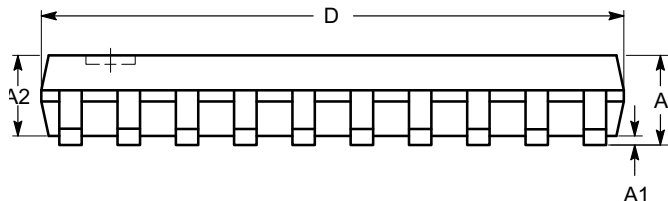
**TSSOP20, 4.4x6.5**  
CASE 948AQ  
ISSUE A

DATE 19 MAR 2009

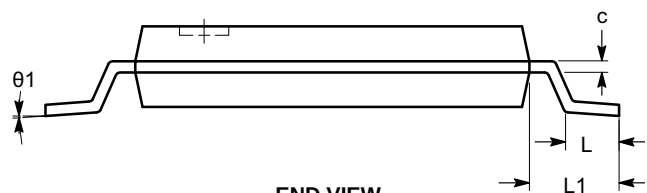


TOP VIEW

| SYMBOL | MIN      | NOM  | MAX  |
|--------|----------|------|------|
| A      |          |      | 1.20 |
| A1     | 0.05     |      | 0.15 |
| A2     | 0.80     |      | 1.05 |
| b      | 0.19     |      | 0.30 |
| c      | 0.09     |      | 0.20 |
| D      | 6.40     | 6.50 | 6.60 |
| E      | 6.30     | 6.40 | 6.50 |
| E1     | 4.30     | 4.40 | 4.50 |
| e      | 0.65 BSC |      |      |
| L      | 0.45     | 0.60 | 0.75 |
| L1     | 1.00 REF |      |      |
| θ      | 0°       |      | 8°   |



SIDE VIEW



END VIEW

**Notes:**

- (1) All dimensions are in millimeters. Angles in degrees.
- (2) Complies with JEDEC MO-153.

|                         |                         |                                                                                                                                                                                     |
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