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74VHC245

Octal Bidirectional Transceiver with 3-STATE Outputs

General Description

The VHC245 is an advanced high speed CMOS octal bus transceiver fabricated with silicon gate CMOS technology. It achieves high speed operation similar to equivalent Bipolar Schottky TTL while maintaining the CMOS low power dissipation. The VHC245 is intended for bidirectional asynchronous communication between data busses. The direction of data transmission is determined by the level of the T/R input. The enable input can be used to disable the device so that the busses are effectively isolated. All inputs are equipped with protection circuits against static discharge.

Features

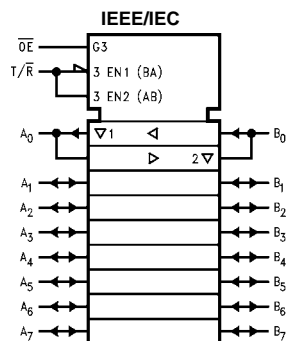
- High Speed: $t_{PD} = 4.0$ ns (typ) at $V_{CC} = 5V$
- High Noise Immunity: $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (Min)
- Power Down Protection is provided on all inputs
- Low Noise: $V_{OLP} = 0.9V$ (typ)
- Low Power Dissipation:
 $I_{CC} = 4 \mu A$ (Max) @ $T_A = 25^\circ C$
- Pin and Function Compatible with 74HC245

Ordering Code:

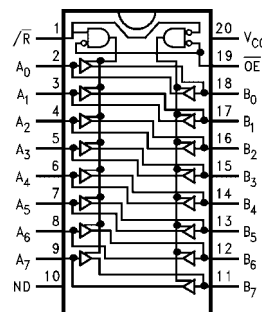
| Order Number | Package Number | Package Description |
|--------------|----------------|---|
| 74VHC245M | M20B | 20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300" Wide |
| 74VHC245SJ | M20D | Pb-Free 20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide |
| 74VHC245MTC | MTC20 | 20-Lead Thin Shrink Small Outline Package (TSSOP), JEDEC MO-153, 4.4mm Wide |
| 74VHC245N | N20A | 20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide |

Surface mount packages are also available on Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.
Pb-Free package per JEDEC J-STD-020B.

Logic Symbol



Connection Diagram



Pin Description

| Pin Names | Description |
|------------------|----------------------------------|
| \overline{OE} | Output Enable Input |
| T/\overline{R} | Transmit/Receive Input |
| A_0-A_7 | Side A Inputs or 3-STATE Outputs |
| B_0-B_7 | Side B Inputs or 3-STATE Outputs |

Truth Table

| Inputs | | Outputs |
|-----------------|------------------|---------------------|
| \overline{OE} | T/\overline{R} | |
| L | L | Bus B Data to Bus A |
| L | H | Bus A Data to Bus B |
| H | X | HIGH-Z State |

H = HIGH Voltage Level L = LOW Voltage Level X = Immaterial
Any unused bus terminals during HIGH-Z State must be held HIGH or LOW.

Absolute Maximum Ratings(Note 1)

| | |
|---|--------------------------|
| Supply Voltage (V_{CC}) | -0.5V to +7.0V |
| DC Input Voltage (V_{IN}) ($\overline{T/R}$, \overline{OE}) | -0.5V to 7.0V |
| DC Output Voltage (V_{OUT}) | -0.5V to $V_{CC} + 0.5V$ |
| Input Diode Current (I_{IK}) ($\overline{T/R}$, \overline{OE}) | -20 mA |
| Output Diode Current (I_{OK}) | ± 20 mA |
| DC Output Current (I_{OUT}) | ± 25 mA |
| DC V_{CC}/GND Current (I_{CC}) | ± 75 mA |
| Storage Temperature (T_{STG}) | -65°C to +150°C |
| Lead Temperature (T_L) (Soldering, 10 seconds) | 260°C |

Recommended Operating Conditions (Note 2)

| | |
|---|----------------|
| Supply Voltage (V_{CC}) | 2.0V to 5.5V |
| Input Voltage (V_{IN}) ($\overline{T/R}$, \overline{OE}) | 0V to 5.5V |
| Output Voltage (V_{OUT}) | 0V to V_{CC} |
| Operating Temperature (T_{OPR}) | -40°C to +85°C |
| Input Rise and Fall Time (t_r , t_f) | |
| $V_{CC} = 3.3V \pm 0.3V$ | 0 ~ 100 ns/V |
| $V_{CC} = 5.0V \pm 0.5V$ | 0 ~ 20 ns/V |

Note 1: Absolute Maximum Ratings are values beyond which the device may be damaged or have its useful life impaired. The databook specifications should be met, without exception, to ensure that the system design is reliable over its power supply, temperature, and output/input loading variables. Fairchild does not recommend operation outside databook specifications.

Note 2: Unused inputs or I/O pins must be held HIGH or LOW. They may not float.

DC Electrical Characteristics

| Symbol | Parameter | V_{CC} (V) | $T_A = 25^\circ\text{C}$ | | | $T_A = -40^\circ\text{C to } +85^\circ\text{C}$ | | Units | Conditions |
|--|-------------------------------------|------------------|--------------------------|-----|----------------------|---|----------------------|---------------|--|
| | | | Min | Typ | Max | Min | Max | | |
| V_{IH} | HIGH Level Input Voltage | 2.0 3.0 – 5.5 | 1.50 0.7 V_{CC} | | | 1.50 0.7 V_{CC} | | V | |
| V_{IL} | LOW Level Input Voltage | 2.0 3.0 – 5.5 | | | 0.50 0.3 V_{CC} | | 0.50 0.3 V_{CC} | V | |
| V_{OH} | HIGH Level Output Voltage | 2.0 | 1.9 | 2.0 | | 1.9 | | V | $V_{IN} = V_{IH}$ or V_{IL} $I_{OH} = -50 \mu\text{A}$ |
| | | 3.0 | 2.9 | 3.0 | | 2.9 | | | |
| | | 4.5 | 4.4 | 4.5 | | 4.4 | | V | $I_{OH} = -4 \text{ mA}$ $I_{OH} = -8 \text{ mA}$ |
| | | 3.0 4.5 | 2.58 3.94 | | | 2.48 3.80 | | | |
| V_{OL} | LOW Level Output Voltage | 2.0 | | 0.0 | 0.1 | | 0.1 | V | $V_{IN} = V_{IH}$ or V_{IL} $I_{OL} = 50 \mu\text{A}$ |
| | | 3.0 | | 0.0 | 0.1 | | 0.1 | | |
| | | 4.5 | | 0.0 | 0.1 | | 0.1 | V | $I_{OL} = 4 \text{ mA}$ $I_{OL} = 8 \text{ mA}$ |
| | | 3.0 4.5 | | | 0.36 0.36 | | 0.44 0.44 | | |
| I_{OZ} | 3-STATE Output Off-State Current | 5.5 | | | ± 0.25 | | ± 2.5 | μA | $V_{IN} = V_{CC}$ or GND $V_{OUT} = V_{CC}$ or GND $V_{IN} \overline{OE} = V_{IH}$ or V_{IL} |
| I_{IN} ($\overline{T/R}$, \overline{OE}) | Input Leakage Current | 0 – 5.5 | | | ± 0.1 | | ± 1.0 | μA | $V_{IN} = 5.5V$ or GND |
| I_{CC} | Quiescent Supply Current | 5.5 | | | 4.0 | | 40.0 | μA | $V_{IN} = V_{CC}$ or GND |

Noise Characteristics

| Symbol | Parameter | V _{CC} (V) | T _A = 25°C | | Units | Conditions |
|------------------------------|---|------------------------|-----------------------|--------|-------|------------------------|
| | | | Typ | Limits | | |
| V _{OLP} (Note 3) | Quiet Output Maximum Dynamic V _{OL} | 5.0 | 0.9 | 1.2 | V | C _L = 50 pF |
| V _{OLV} (Note 3) | Quiet Output Minimum Dynamic V _{OL} | 5.0 | -0.9 | -1.2 | V | C _L = 50 pF |
| V _{IHD} (Note 3) | Minimum HIGH Level Dynamic Input Voltage | 5.0 | | 3.5 | V | C _L = 50 pF |
| V _{ILD} (Note 3) | Maximum LOW Level Dynamic Input Voltage | 5.0 | | 1.5 | V | C _L = 50 pF |

Note 3: Parameter guaranteed by design.

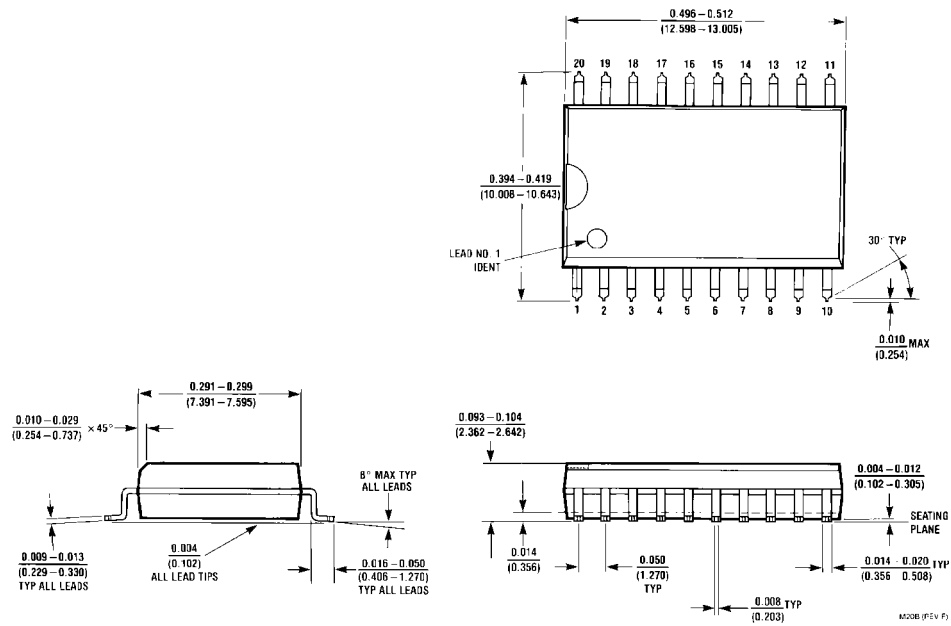
AC Electrical Characteristics

| Symbol | Parameter | V _{CC} (V) | T _A = 25°C | | | T _A = -40°C to +85°C | | Units | Conditions | |
|---|----------------------------------|------------------------|-----------------------|------|------|---------------------------------|------|-------|------------------------|------------------------|
| | | | Min | Typ | Max | Min | Max | | | |
| t _{PLH} | Propagation Delay Time | 3.3 ± 0.3 | | 5.8 | 8.4 | 1.0 | 10.0 | ns | | C _L = 15 pF |
| t _{PHL} | | | | 8.3 | 11.9 | 1.0 | 13.5 | | | C _L = 50 pF |
| | | 5.0 ± 0.5 | | 4.0 | 5.5 | 1.0 | 6.5 | ns | | C _L = 15 pF |
| | | | | 5.5 | 7.5 | 1.0 | 8.5 | | | C _L = 50 pF |
| t _{PZL} | 3-STATE Output Enable Time | 3.3 ± 0.3 | | 8.5 | 13.2 | 1.0 | 15.5 | ns | R _L = 1 kΩ | C _L = 15 pF |
| t _{PZH} | | | | 11.0 | 16.7 | 1.0 | 19.0 | | | C _L = 50 pF |
| | | 5.0 ± 0.5 | | 5.8 | 8.5 | 1.0 | 10.0 | ns | | C _L = 15 pF |
| | | | | 7.3 | 10.6 | 1.0 | 12.0 | | | C _L = 50 pF |
| t _{PLZ} | 3-STATE Output Disable Time | 3.3 ± 0.3 | | 11.5 | 15.8 | 1.0 | 18.0 | ns | R _L = 1 kΩ | C _L = 50 pF |
| t _{PHZ} | | 5.0 ± 0.5 | | 7.0 | 9.7 | 1.0 | 11.0 | | | C _L = 50 pF |
| t _{OSLH} | Output to Output | 3.3 ± 0.3 | | | 1.5 | | 1.5 | ns | (Note 4) | C _L = 50 pF |
| t _{OSHL} | Skew | 5.0 ± 0.5 | | | 1.0 | | 1.0 | | | C _L = 50 pF |
| C _{IN} (T/R, $\overline{\text{OE}}$) | Input Capacitance | | | 4 | 10 | | 10 | pF | V _{CC} = Open | |
| C _{I/O} | Output Capacitance | | | 8 | | | | pF | V _{CC} = 5.0V | |
| C _{PD} | Power Dissipation Capacitance | | | 21 | | | | pF | (Note 5) | |

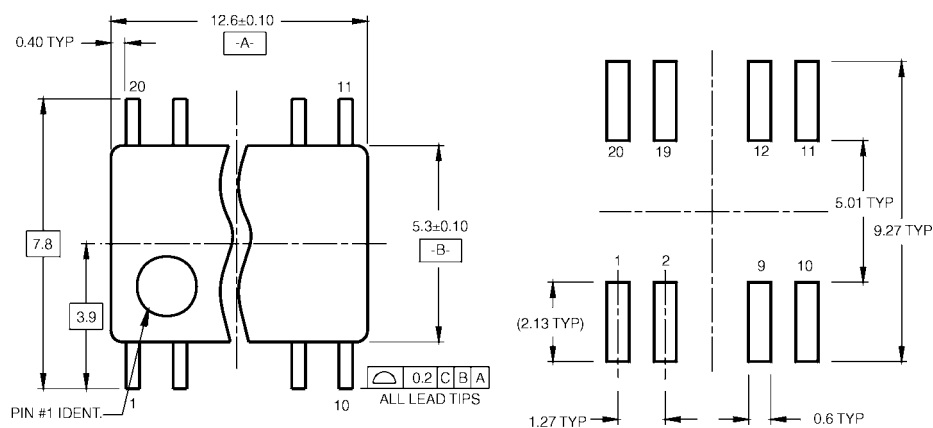
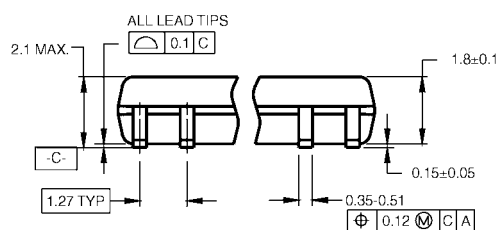
Note 4: Parameter guaranteed by design. t_{OSLH} = |t_{PLH} max - t_{PLH} min|; t_{OSHL} = |t_{PHL} max - t_{PHL} min|

Note 5: C_{PD} is defined as the value of the internal equivalent capacitance which is calculated from the operating current consumption without load. Average operating current can be obtained by the equation: I_{CC} (opr.) = C_{PD} * V_{CC} * f_{IN} + I_{CC}/8 (per Bit).

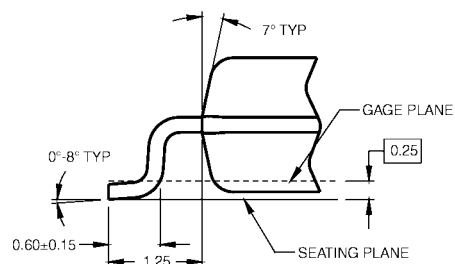
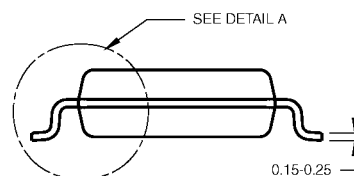
Physical Dimensions inches (millimeters) unless otherwise noted



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

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

LAND PATTERN RECOMMENDATION


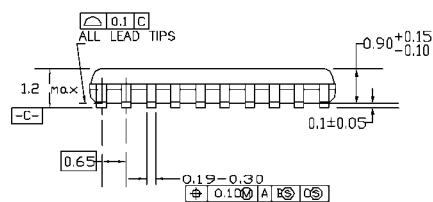
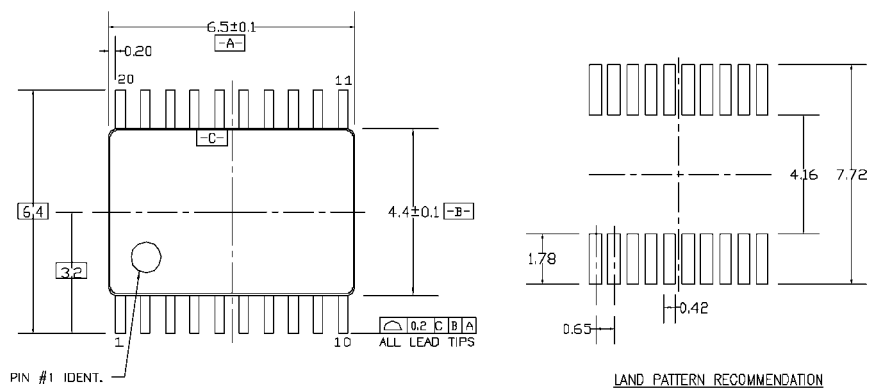
DIMENSIONS ARE IN MILLIMETERS


DETAIL A
NOTES:

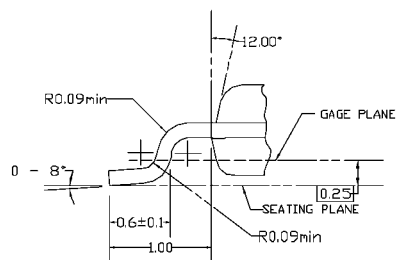
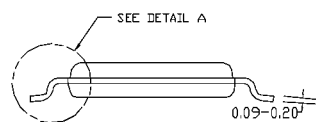
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M20DRevB1

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



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DETAIL A

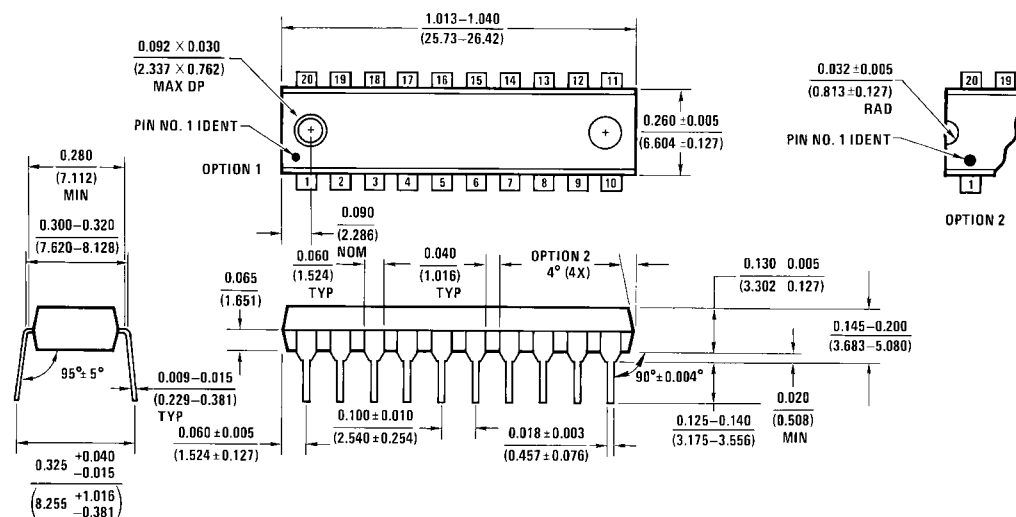
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- D. DIMENSIONS AND TOLERANCES PER ANSI Y14.5M, 1982.

MTC20REV D1

**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)



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

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