Low-Voltage CMOS Octal Transceiver

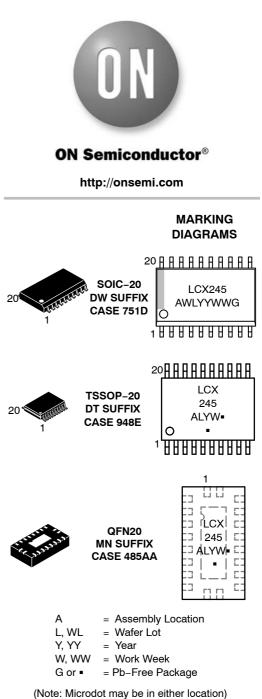
With 5 V–Tolerant Inputs and Outputs (3–State, Non–Inverting)

The MC74LCX245 is a high performance, non-inverting octal transceiver operating from a 2.0 to 5.5 V supply. High impedance TTL compatible inputs significantly reduce current loading to input drivers while TTL compatible outputs offer improved switching noise performance. A V_I specification of 5.5 V allows MC74LCX245 inputs to be safely driven from 5 V devices if V_{CC} is less than 5.0 V. The MC74LCX245 is suitable for memory address driving and all TTL level bus oriented transceiver applications.

Current drive capability is 24 mA at both A and B ports. The Transmit/Receive (T/\overline{R}) input determines the direction of data flow through the bi-directional transceiver. Transmit (active-HIGH) enables data from A ports to B ports; Receive (active-LOW) enables data from B to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a HIGH Z condition.

Features

- Designed for 2.0 to 5.5 V V_{CC} Operation
- 5 V Tolerant Interface Capability With 5 V TTL Logic
- Supports Live Insertion and Withdrawal
- I_{OFF} Specification Guarantees High Impedance When $V_{CC} = 0 V$
- LVTTL Compatible
- LVCMOS Compatible
- 24 mA Balanced Output Sink and Source Capability
- Near Zero Static Supply Current in All Three Logic States (10 μA) Substantially Reduces System Power Requirements
- Latchup Performance Exceeds 500 mA
- ESD Performance: Human Body Model >2000 V Machine Model >200 V
- NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable
- These Devices are Pb–Free, Halogen Free/BFR Free and are RoHS Compliant



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ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

^{*}For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

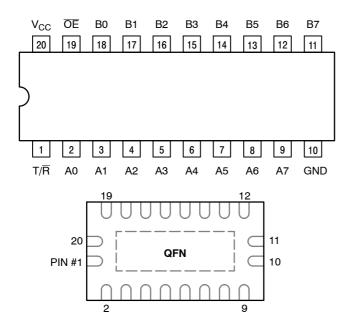


Figure 1. Pinout (Top View)

PIN NAMES

| PINS | FUNCTION |
|-------|--|
| ŌĒ | Output Enable Input |
| T/R | Transmit/Receive Input |
| A0-A7 | Side A 3-State Inputs or 3-State Outputs |
| B0-B7 | Side B 3–State Inputs or 3–StateOutputs |

TRUTH TABLE

| INF | PUTS | OPERATING MODE |
|-----|------|-----------------|
| ŌĒ | T/R | Non-Inverting |
| L | L | B Data to A Bus |
| L | Н | A Data to B Bus |
| н | х | Z |

H = High Voltage Level

L = Low Voltage Level

Z = High Impedance State

X = High or Low Voltage Level and Transitions are Acceptable For I_{CC} reasons, Do Not Float Inputs

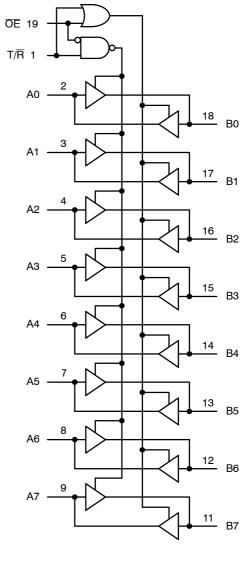


Figure 2. Logic Diagram

MAXIMUM RATINGS

| Symbol | Parameter | Value | Condition | Unit |
|------------------|----------------------------------|-----------------------------------|--------------------------------------|------|
| V _{CC} | DC Supply Voltage | -0.5 to +7.0 | | V |
| VI | DC Input Voltage | $-0.5 \leq V_I \leq +7.0$ | | V |
| Vo | DC Output Voltage | $-0.5 \leq V_O \leq +7.0$ | Output in 3-State | V |
| | | $-0.5 \leq V_O \leq V_{CC} + 0.5$ | Output in HIGH or LOW State (Note 1) | V |
| I _{IK} | DC Input Diode Current | -50 | V _I < GND | mA |
| I _{OK} | DC Output Diode Current | -50 | V _O < GND | mA |
| | | +50 | V _O > V _{CC} | mA |
| I _O | DC Output Source/Sink Current | ±50 | | mA |
| I _{CC} | DC Supply Current Per Supply Pin | ±100 | | mA |
| I _{GND} | DC Ground Current Per Ground Pin | ±100 | | mA |
| T _{STG} | Storage Temperature Range | -65 to +150 | | °C |
| MSL | Moisture Sensitivity | | Level 1 | |

Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.
1. I_O absolute maximum rating must be observed.

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | | Min | Тур | Max | Unit |
|---------------------|--|--|------------|----------------------|------------------------|------|
| V _{CC} | Supply Voltage | Operating Data Retention Only | 2.0 1.5 | 2.5, 3.3 2.5, 3.3 | 5.5 5.5 | V |
| VI | Input Voltage | | 0 | | 5.5 | V |
| V _O | Output Voltage | (HIGH or LOW State) (3–State) | 0 0 | | V _{CC} 5.5 | V |
| I _{OH} | HIGH Level Output Current | $V_{CC} = 3.0 \text{ V} - 3.6 \text{ V}$ $V_{CC} = 2.7 \text{ V} - 3.0 \text{ V}$ $V_{CC} = 2.3 \text{ V} - 2.7 \text{ V}$ | | | - 24 - 12 - 8 | mA |
| I _{OL} | LOW Level Output Current | $V_{CC} = 3.0 V - 3.6 V$ $V_{CC} = 2.7 V - 3.0 V$ $V_{CC} = 2.3 V - 2.7 V$ | | | + 24 + 12 + 8 | mA |
| T _A | Operating Free-Air Temperature | | -55 | | +125 | °C |
| $\Delta t/\Delta V$ | Input Transition Rise or Fall Rate, VIN from 0 | .8 V to 2.0 V, V_{CC} = 3.0 V | 0 | | 10 | ns/V |

DC ELECTRICAL CHARACTERISTICS

| | | | T _A = −55°C | to +125°C | |
|------------------|---------------------------------------|---|------------------------|-----------|------|
| Symbol | Characteristic | Condition | Min | Max | Unit |
| VIH | HIGH Level Input Voltage (Note 2) | $2.3~\text{V} \leq \text{V}_{CC} \leq 2.7~\text{V}$ | 1.7 | | V |
| | | $2.7~\text{V} \leq \text{V}_{CC} \leq 3.6~\text{V}$ | 2.0 | | |
| VIL | LOW Level Input Voltage (Note 2) | $2.3~\text{V} \leq \text{V}_{CC} \leq 2.7~\text{V}$ | | 0.7 | V |
| | | $2.7~\text{V} \leq \text{V}_{CC} \leq 3.6~\text{V}$ | | 0.8 | |
| V _{OH} | HIGH Level Output Voltage | 2.3 V \leq V_{CC} \leq 3.6 V; I_{OL} = 100 μA | V _{CC} – 0.2 | | V |
| | | $V_{CC} = 2.3 \text{ V}; \text{ I}_{OH} = -8 \text{ mA}$ | 1.8 | | |
| | | V_{CC} = 2.7 V; I_{OH} = -12 mA | 2.2 | | |
| | | $V_{CC} = 3.0 \text{ V}; \text{ I}_{OH} = -18 \text{ mA}$ | 2.4 | | |
| | | $V_{CC} = 3.0 \text{ V}; \text{ I}_{OH} = -24 \text{ mA}$ | 2.2 | | |
| V _{OL} | LOW Level Output Voltage | 2.3 V \leq V_{CC} \leq 3.6 V; I_{OL} = 100 μA | | 0.2 | V |
| | | $V_{CC} = 2.3 \text{ V}; \text{ I}_{OL} = 8 \text{ mA}$ | | 0.6 | |
| | | V_{CC} = 2.7 V; I_{OL} = 12 mA | | 0.4 | |
| | | $V_{CC} = 3.0 \text{ V}; \text{ I}_{OL} = 16 \text{ mA}$ | | 0.4 | |
| | | $V_{CC} = 3.0 \text{ V}; \text{ I}_{OL} = 24 \text{ mA}$ | | 0.55 | |
| I _{OZ} | 3-State Output Current | $\label{eq:VCC} \begin{array}{l} V_{CC} = 3.6 \; V, \; V_{IN} = V_{IH} \; or \; V_{IL}, \\ V_{OUT} = 0 \; to \; 5.5 \; V \end{array}$ | | ±5 | μA |
| I _{OFF} | Power Off Leakage Current | V_{CC} = 0, V_{IN} = 5.5 V or V_{OUT} = 5.5 V | | 10 | μA |
| I _{IN} | Input Leakage Current | V_{CC} = 3.6 V, V_{IN} = 5.5 V or GND | | ±5 | μA |
| I _{CC} | Quiescent Supply Current | V_{CC} = 3.6 V, V_{IN} = 5.5 V or GND | | 10 | μA |
| ΔI_{CC} | Increase in I _{CC} per Input | $2.3 \le V_{CC} \le 3.6 \text{ V}; \text{ V}_{IH} = V_{CC} - 0.6 \text{ V}$ | | 500 | μA |

2. These values of V_I are used to test DC electrical characteristics only.

AC CHARACTERISTICS t_R = t_F = 2.5 ns; R_L = 500 Ω

| | | | | Limits | | | | | | | |
|--|--|----------|-----------------------------|----------------------------------|--------------------|------------|-----------------------|--------------|--------------------|------------|------|
| | | | | T _A = −55°C to +125°C | | | | | | | |
| | | | V_{CC} = 3.3 V \pm 0.3V | | V _{CC} = | 2.7 V | V _{CC} = 2.5 | $V \pm 0.2V$ | V _{CC} = | 5.0 V | |
| | | | C _L = 5 | 50 pF | C _L = 5 | 50 pF | C _L = 3 | 30 pF | C _L = 5 | 50 pF | |
| Symbol | Parameter | Waveform | Min | Max | Min | Max | Min | Max | Min | Max | Unit |
| t _{PLH} t _{PHL} | Propagation Delay Input to Output | 1 | 1.5 1.5 | 7.0 7.0 | 1.5 1.5 | 8.0 8.0 | 1.5 1.5 | 8.4 8.4 | 1.5 1.5 | 5.0 5.0 | ns |
| t _{PZH} t _{PZL} | Output Enable Time to High and Low Level | 2 | 1.5 1.5 | 8.5 8.5 | 1.5 1.5 | 9.5 9.5 | 1.5 1.5 | 10.5 10.5 | 1.5 1.5 | 7.0 7.0 | ns |
| t _{PHZ} t _{PLZ} | Output Disable Time From High and Low Level | 2 | 1.5 1.5 | 7.5 7.5 | 1.5 1.5 | 8.5 8.5 | 1.5 1.5 | 9.0 9.0 | 1.5 1.5 | 6.0 6.0 | ns |
| t _{OSHL} t _{OSLH} | Output-to-Output Skew (Note 3) | | | 1.0 1.0 | | 1.0 1.0 | | 1.0 1.0 | | 1.0 1.0 | ns |

 Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH-to-LOW (t_{OSHL}) or LOW-to-HIGH (t_{OSLH}); parameter guaranteed by design.

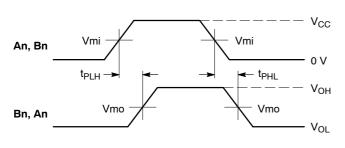
DYNAMIC SWITCHING CHARACTERISTICS

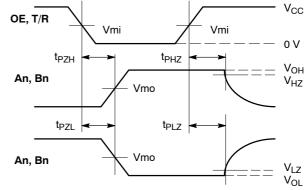
| | | | T _A = +25°C | | | |
|------------------|-------------------------------------|---|------------------------|--------------|-----|--------|
| Symbol | Characteristic | Condition | Min | Тур | Max | Unit |
| V _{OLP} | Dynamic LOW Peak Voltage (Note 4) | $ \begin{array}{l} V_{CC} = 3.3 \text{ V}, \ C_L = 50 \text{ pF}, \ V_{IH} = 3.3 \text{ V}, \ V_{IL} = 0 \text{ V} \\ V_{CC} = 2.5 \text{ V}, \ C_L = 30 \text{ pF}, \ V_{IH} = 2.5 \text{ V}, \ V_{IL} = 0 \text{ V} \end{array} $ | | 0.8 0.6 | | V V |
| V _{OLV} | Dynamic LOW Valley Voltage (Note 4) | $ \begin{array}{l} V_{CC} = 3.3 \text{ V}, C_L = 50 \text{ pF}, V_{IH} = 3.3 \text{V}, V_{IL} = 0 \text{V} \\ V_{CC} = 2.5 \text{V}, C_L = 30 \text{pF}, V_{IH} = 2.5 \text{V}, V_{IL} = 0 \text{V} \end{array} $ | | -0.8 -0.6 | | V V |

 Number of outputs defined as "n". Measured with "n-1" outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Condition | Typical | Unit |
|------------------|-------------------------------|---|---------|------|
| C _{IN} | Input Capacitance | V_{CC} = 3.3 V, V_{I} = 0 V or V_{CC} | 7 | pF |
| C _{I/O} | Input/Output Capacitance | V_{CC} = 3.3 V, V_{I} = 0 V or V_{CC} | 8 | pF |
| C _{PD} | Power Dissipation Capacitance | 10 MHz, V_{CC} = 3.3 V, V_{I} = 0 V or V_{CC} | 25 | pF |



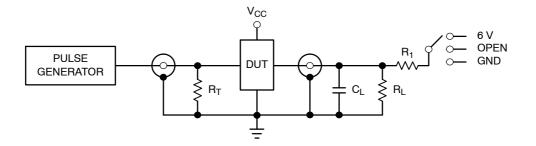


WAVEFORM 1 – PROPAGATION DELAYS $t_{B} = t_{F} = 2.5 \text{ ns}, 10\% \text{ to } 90\%; f = 1 \text{ MHz}; t_{W} = 500 \text{ ns}$

WAVEFORM 2 – OUTPUT ENABLE AND DISABLE TIMES $t_B = t_F = 2.5$ ns, 10% to 90%; f = 1 MHz; $t_W = 500$ ns

| r | | | | | | | |
|-----------------|-------------------------|-------------------------|--------------------------|--------------------------|--|--|--|
| | | V _{CC} | | | | | |
| Symbol | 3.3 V ± 0.3 V | 2.7 V | $2.5 V \pm 0.2 V$ | 5.0 V | | | |
| Vmi | 1.5 V | 1.5 V | V_{CC} /2 | V _{CC} /2 | | | |
| Vmo | 1.5 V | 1.5 V | V_{CC} /2 | V_{CC} /2 | | | |
| V _{HZ} | V _{OL} + 0.3 V | V _{OL} + 0.3 V | V _{OL} + 0.15 V | V _{OL} + 0.15 V | | | |
| V _{LZ} | V _{OH} – 0.3 V | V _{OH} – 0.3 V | V _{OH} – 0.15 V | V _{OH} – 0.15 V | | | |

Figure 3. AC Waveforms



| TEST | SWITCH |
|--|--|
| t _{PLH} , t _{PHL} | Open |
| tpzL, tpLZ | 6 V at V _{CC} = 3.3 \pm 0.3 V 6 V at V _{CC} = 2.5 \pm 0.2 V |
| Open Collector/Drain t_{PLH} and t_{PHL} | 6 V |
| t _{PZH} , t _{PHZ} | GND |

 C_L = 50 pF at V_{CC} = 3.3 \pm 0.3 V or equivalent (includes jig and probe capacitance) C_L = 30 pF at V_{CC} = 2.5 \pm 0.2 V or equivalent (includes jig and probe capacitance) R_L = R_1 = 500 Ω or equivalent

 $R_T = Z_{OUT}$ of pulse generator (typically 50 Ω)

Figure 4. Test Circuit

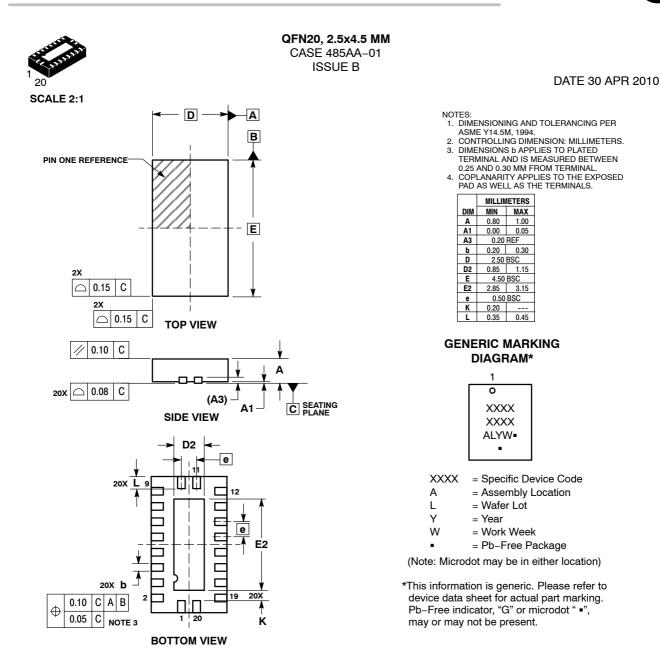
ORDERING INFORMATION

| Device | Package | Shipping [†] |
|-------------------|-----------------------|-----------------------|
| MC74LCX245DWR2G | SOIC-20 (Pb-Free) | 1000 Tape & Reel |
| MC74LCX245DWG | SOIC-20 (Pb-Free) | 38 Units / Rail |
| MC74LCX245DTG | TSSOP-20 (Pb-Free) | 75 Units / Rail |
| MC74LCX245DTR2G | TSSOP-20 (Pb-Free) | 2500 Tape & Reel |
| NLV74LCX245DTR2G* | TSSOP-20 (Pb-Free) | 2500 Tape & Reel |
| MC74LCX245MNTWG | QFN20 (Pb–Free) | 3000 Tape & Reel |

+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.

*NLV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q100 Qualified and PPAP Capable.





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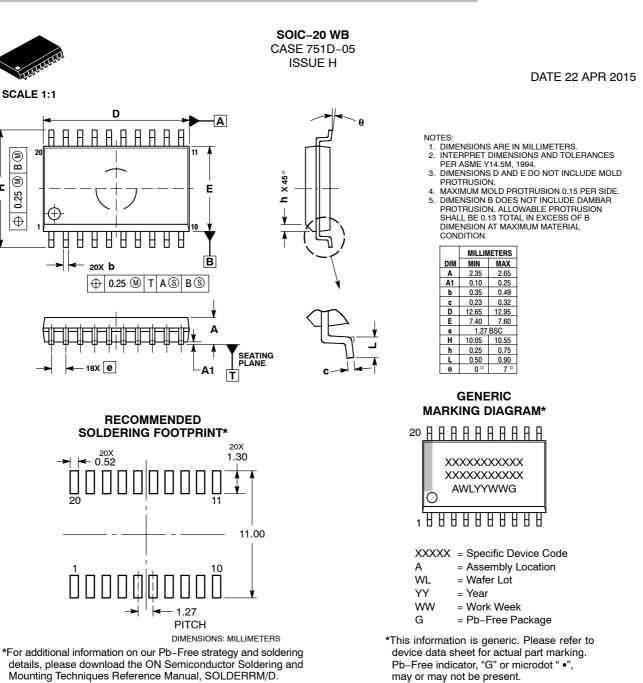
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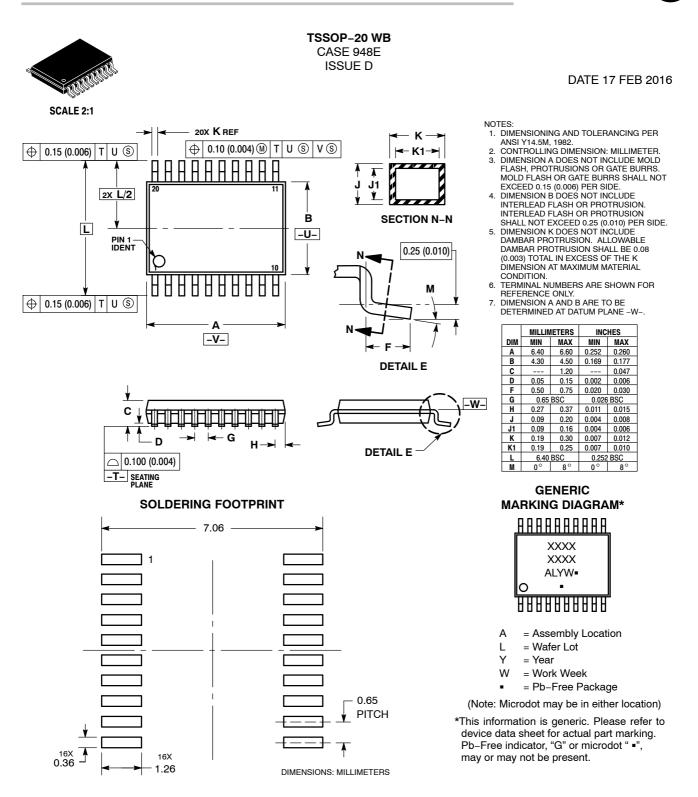
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 AP54RHC506BLT-R
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