Octal Bidirectional Transceiver with 3-State Inputs/Outputs

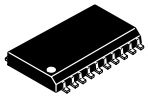
MC74AC245, MC74ACT245

The MC74AC245/74ACT245 contains eight non−inverting bidirectional buffers with 3−state outputs and is intended for bus−oriented applications. Current sinking capability is 24 mA at both the A and B ports. The Transmit/Receive (T/$\overline{R}$) input determines the direction of data flow through the bidirectional transceiver. Transmit (active−HIGH) enables data from A ports to B ports; Receive (active−LOW) enables data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a High Z condition.

Features

- Noninverting Buffers
- Bidirectional Data Path
- A and B Outputs Source/Sink 24 mA
- ′ACT245 has TTL Compatible Inputs
- These are Pb−Free Devices

MARKING DIAGRAMS



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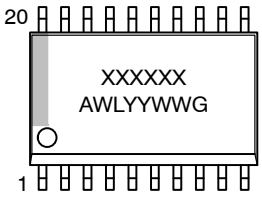
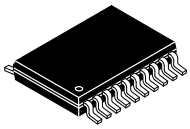
SOIC−20W
DW SUFFIX
CASE 751D





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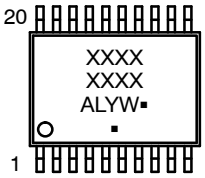
TSSOP−20
DT SUFFIX
CASE 948E



XXXXXX = Specific Device Code
A = Assembly Location
WL, L = Wafer Lot
YY, Y = Year
WW, W = Work Week
G or ▪ = Pb−Free Package
(Note: Microdot may be in either location)

ORDERING INFORMATION

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

PIN ASSIGNMENT

PIN	FUNCTION
$\overline{OE}$	Output Enable Input
T/$\overline{R}$	Transmit/Receive Input
A_0−A_7	Side A 3−State Inputs or 3−State Outputs
B_0−B_7	Side B 3−State Inputs or 3−State Outputs

TRUTH TABLES

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

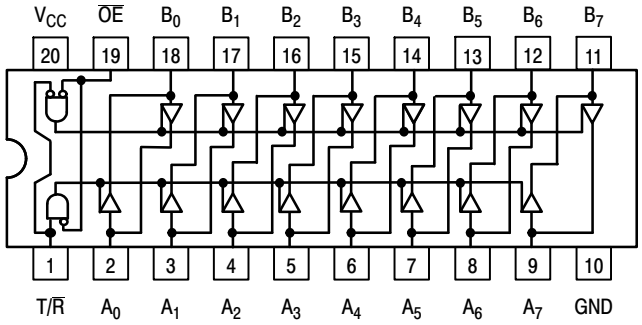


Figure 1.

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MAXIMUM RATINGS

Symbol	Parameter		Value	Unit
V_{CC}	DC Supply Voltage (Referenced to GND)		−0.5 to +6.5	V
V_{IN}	DC Input Voltage (Referenced to GND)		−0.5 to V_{CC} +0.5	V
V_{OUT}	DC Output Voltage (Referenced to GND) (Note 1)		−0.5 to V_{CC} +0.5	V
I_{IK}	DC Input Diode Current		±20	mA
I_{OK}	DC Output Diode Current		±50	mA
I_{OUT}	DC Output Sink/Source Current		±50	mA
I_{CC}	DC Supply Current, per Output Pin		±50	mA
I_{GND}	DC Ground Current, per Output Pin		±100	mA
T_{STG}	Storage Temperature Range		−65 to +150	°C
T_L	Lead temperature, 1 mm from Case for 10 Seconds		260	°C
T_J	Junction Temperature Under Bias		140	°C
θ_{JA}	Thermal Resistance (Note 2)	SOIC TSSOP	96 150	°C/W
MSL	Moisture Sensitivity		Level 1	
F_R	Flammability Rating	Oxygen Index: 30% − 35%	UL 94 V−0 @ 0.125 in	
V_{ESD}	ESD Withstand Voltage	Human Body Model (Note 3) Charged Device Model (Note 4)	> 2000 > 1000	V
$I_{Latchup}$	Latchup Performance	Above V_{CC} and Below GND at 85°C (Note 5)	±100	mA

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. I_{OUT} absolute maximum rating must be observed.
2. The package thermal impedance is calculated in accordance with JESD 51−7.
3. Tested to EIA/JESD22−A114−A.
4. Tested to JESD22−C101−A.
5. Tested to EIA/JESD78.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Min	Typ	Max	Unit
V_{CC}	Supply Voltage	′AC	2.0	5.0	6.0	V
		′ACT	4.5	5.0	5.5	
V_{IN}, V_{OUT}	DC Input Voltage, Output Voltage (Ref. to GND)		0	–	V_{CC}	V
t_r, t_f	Input Rise and Fall Time (Note 6) ′AC Devices except Schmitt Inputs	V_{CC} @ 3.0 V	–	150	–	ns/V
		V_{CC} @ 4.5 V	–	40	–	
		V_{CC} @ 5.5 V	–	25	–	
t_r, t_f	Input Rise and Fall Time (Note 7) ′ACT Devices except Schmitt Inputs	V_{CC} @ 4.5 V	–	10	–	ns/V
		V_{CC} @ 5.5 V	–	8.0	–	
T_A	Operating Ambient Temperature Range		−40	25	85	°C
I_{OH}	Output Current − High		–	–	−24	mA
I_{OL}	Output Current − Low		–	–	24	mA

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.

6. V_{IN} from 30% to 70% V_{CC}; see individual Data Sheets for devices that differ from the typical input rise and fall times.
7. V_{IN} from 0.8 V to 2.0 V; see individual Data Sheets for devices that differ from the typical input rise and fall times.

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DC CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	74AC T_A = +25°C	74AC T_A = –40°C to +85°C		Unit	Conditions
			Typ	Guaranteed Limits			
V_{IH}	Minimum High Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	2.1 3.15 3.85	2.1 3.15 3.85	V	V_{OUT} = 0.1 V or V_{CC} – 0.1 V
V_{IL}	Maximum Low Level Input Voltage	3.0 4.5 5.5	1.5 2.25 2.75	0.9 1.35 1.65	0.9 1.35 1.65	V	V_{OUT} = 0.1 V or V_{CC} – 0.1 V
V_{OH}	Minimum High Level Output Voltage	3.0 4.5 5.5	2.99 4.49 5.49	2.9 4.4 5.4	2.9 4.4 5.4	V	I_{OUT} = –50 μA
		3.0 4.5 5.5	– – –	2.56 3.86 4.86	2.46 3.76 4.76	V	*V_{IN} = V_{IL} or V_{IH} –12 mA I_{OH} –24 mA –24 mA
V_{OL}	Maximum Low Level Output Voltage	3.0 4.5 5.5	0.002 0.001 0.001	0.1 0.1 0.1	0.1 0.1 0.1	V	I_{OUT} = 50 μA
		3.0 4.5 5.5	– – –	0.36 0.36 0.36	0.44 0.44 0.44	V	*V_{IN} = V_{IL} or V_{IH} 12 mA I_{OL} 24 mA 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	–	±0.1	±1.0	μA	V_I = V_{CC}, GND
I_{OZT}	Maximum 3-State Current	5.5	–	±0.6	±6.0	μA	V_I (OE) = V_{IL}, V_{IH} V_I = V_{CC}, GND V_O = V_{CC}, GND
I_{OLD}	†Minimum Dynamic Output Current	5.5	–	–	75	mA	V_{OLD} = 1.65 V Max
I_{OHD}		5.5	–	–	–75	mA	V_{OHD} = 3.85 V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	–	8.0	80.0	μA	V_{IN} = V_{CC} or GND

*All outputs loaded; thresholds on input associated with output under test.
†Maximum test duration 2.0 ms, one output loaded at a time.
NOTE: I_{IN} and I_{CC} @ 3.0 V are guaranteed to be less than or equal to the respective limit @ 5.5 V V_{CC}.

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AC CHARACTERISTICS (For Figures and Waveforms – See AND8277/D at www.onsemi.com)

Symbol	Parameter	V_{CC}* (V)	74AC T_A = +25°C C_L = 50 pF			74AC T_A = –40°C to +85°C C_L = 50 pF		Unit	Fig. No.
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay A_n to B_n or B_n to A_n	3.3 5.0	1.5 1.5	5.0 3.5	8.5 6.5	1.0 1.0	9.0 7.0	ns	3–5
t_{PHL}	Propagation Delay A_n to B_n or B_n to A_n	3.3 5.0	1.5 1.5	5.0 3.5	8.5 6.0	1.0 1.0	9.0 7.0	ns	3–5
t_{PZH}	Output Enable Time	3.3 5.0	2.5 1.5	7.0 5.0	11.5 8.5	2.0 1.0	12.5 9.0	ns	3–7
t_{PZL}	Output Enable Time	3.3 5.0	2.5 1.5	7.5 5.5	12.0 9.0	2.0 1.0	13.5 9.5	ns	3–8
t_{PHZ}	Output Disable Time	3.3 5.0	2.0 1.5	6.5 5.5	12.0 9.0	1.0 1.0	12.5 10.0	ns	3–7
t_{PLZ}	Output Disable Time	3.3 5.0	2.0 1.5	7.0 5.5	11.5 9.0	1.5 1.0	13.0 10.0	ns	3–8

*Voltage Range 3.3 V is 3.3 V ±0.3 V.
Voltage Range 5.0 V is 5.0 V ±0.5 V.

DC CHARACTERISTICS

Symbol	Parameter	V_{CC} (V)	74ACT T_A = +25°C		74ACT T_A = –40°C to +85°C	Unit	Conditions
			Typ	Guaranteed Limits			
V_{IH}	Minimum High Level Input Voltage	4.5 5.5	1.5 1.5	2.0 2.0	2.0 2.0	V	V_{OUT} = 0.1 V or V_{CC} – 0.1 V
V_{IL}	Maximum Low Level Input Voltage	4.5 5.5	1.5 1.5	0.8 0.8	0.8 0.8	V	V_{OUT} = 0.1 V or V_{CC} – 0.1 V
V_{OH}	Minimum High Level Output Voltage	4.5 5.5	4.49 5.49	4.4 5.4	4.4 5.4	V	I_{OUT} = –50 μA
		4.5 5.5	– –	3.86 4.86	3.76 4.76	V	*V_{IN} = V_{IL} or V_{IH} I_{OH} –24 mA –24 mA
V_{OL}	Maximum Low Level Output Voltage	4.5 5.5	0.001 0.001	0.1 0.1	0.1 0.1	V	I_{OUT} = 50 μA
		4.5 5.5	– –	0.36 0.36	0.44 0.44	V	*V_{IN} = V_{IL} or V_{IH} I_{OL} 24 mA 24 mA
I_{IN}	Maximum Input Leakage Current	5.5	–	±0.1	±1.0	μA	V_I = V_{CC}, GND
ΔI_{CCT}	Additional Max. I_{CC}/Input	5.5	0.6	–	1.5	mA	V_I = V_{CC} – 2.1 V
I_{OZT}	Maximum 3–State Current	5.5	–	±0.6	±6.0	μA	V_I (OE) = V_{IL}, V_{IH} V_I = V_{CC}, GND V_O = V_{CC}, GND
I_{OLD}	†Minimum Dynamic Output Current	5.5	–	–	75	mA	V_{OLD} = 1.65 V Max
I_{OHD}		5.5	–	–	–75	mA	V_{OHD} = 3.85 V Min
I_{CC}	Maximum Quiescent Supply Current	5.5	–	8.0	80.0	μA	V_{IN} = V_{CC} or GND

*All outputs loaded; thresholds on input associated with output under test.
†Maximum test duration 2.0 ms, one output loaded at a time.

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AC CHARACTERISTICS (For Figures and Waveforms – See AND8277/D at www.onsemi.com)

Symbol	Parameter	V_{CC}* (V)	74ACT T_A = +25°C C_L = 50 pF			74ACT T_A = –40°C to +85°C C_L = 50 pF		Unit	Fig. No.
			Min	Typ	Max	Min	Max		
t_{PLH}	Propagation Delay, A_n to B_n or B_n to A_n	5.0	1.5	4.0	7.5	1.5	8.0	ns	3–5
t_{PHL}	Propagation Delay, A_n to B_n or B_n to A_n	5.0	1.5	4.0	8.0	1.0	9.0	ns	3–5
t_{PZH}	Output Enable Time	5.0	1.5	5.0	10	1.5	11.0	ns	3–7
t_{PZL}	Output Enable Time	5.0	1.5	5.5	10	1.5	12.0	ns	3–8
t_{PHZ}	Output Disable Time	5.0	1.5	5.5	10	1.0	11.0	ns	3–7
t_{PLZ}	Output Disable Time	5.0	2.0	5.0	10	1.5	11.0	ns	3–8

*Voltage Range 5.0 V is 5.0 V ±0.5 V.

CAPACITANCE

Symbol	Parameter	Value Typ	Unit	Test Conditions
C_{IN}	Input Capacitance	4.5	pF	V_{CC} = 5.0 V
$C_{I/O}$	Input/Output Capacitance	15	pF	V_{CC} = 5.0 V
C_{PD}	Power Dissipation Capacitance	45	pF	V_{CC} = 5.0 V

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ORDERING INFORMATION

Device	Marking	Package	Shipping†
MC74AC245DWG	AC245	SOIC−20	38 Units / Rail
MC74AC245DWR2G	AC245	SOIC−20	1000 / Tape & Reel
MC74ACT245DWG	ACT245	SOIC−20	38 Units / Rail
MC74ACT245DWR2G	ACT245	SOIC−20	1000 / Tape & Reel
MC74AC245DTG	AC 245	TSSOP−20	75 Units / Rail
MC74AC245DTR2G	AC 245	TSSOP−20	2500 / Tape & Reel
MC74ACT245DTR2G	ACT 245	TSSOP−20	2500 / 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.

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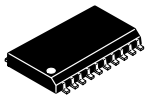
SOIC−20 WB
CASE 751D−05
ISSUE H

DATE 22 APR 2015



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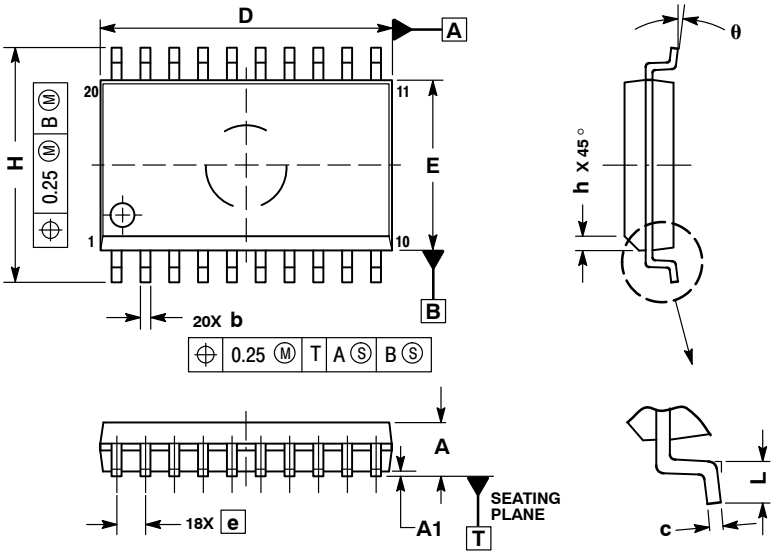
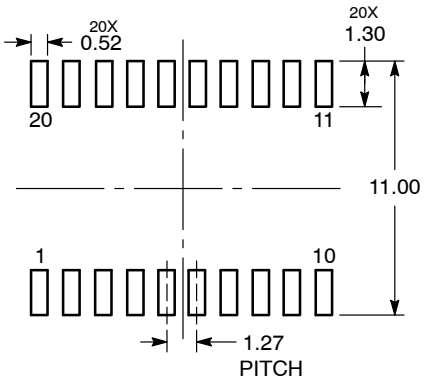


NOTES:
1. DIMENSIONS ARE IN MILLIMETERS.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSIONS D AND E DO NOT INCLUDE MOLD PROTRUSION.
4. MAXIMUM MOLD PROTRUSION 0.15 PER SIDE.
5. DIMENSION B DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE PROTRUSION SHALL BE 0.13 TOTAL IN EXCESS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

	MILLIMETERS	
DIM	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
θ	0°	7°

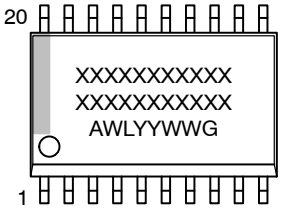
RECOMMENDED SOLDERING FOOTPRINT*



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.

GENERIC MARKING DIAGRAM*



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

*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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