

FEATURES:

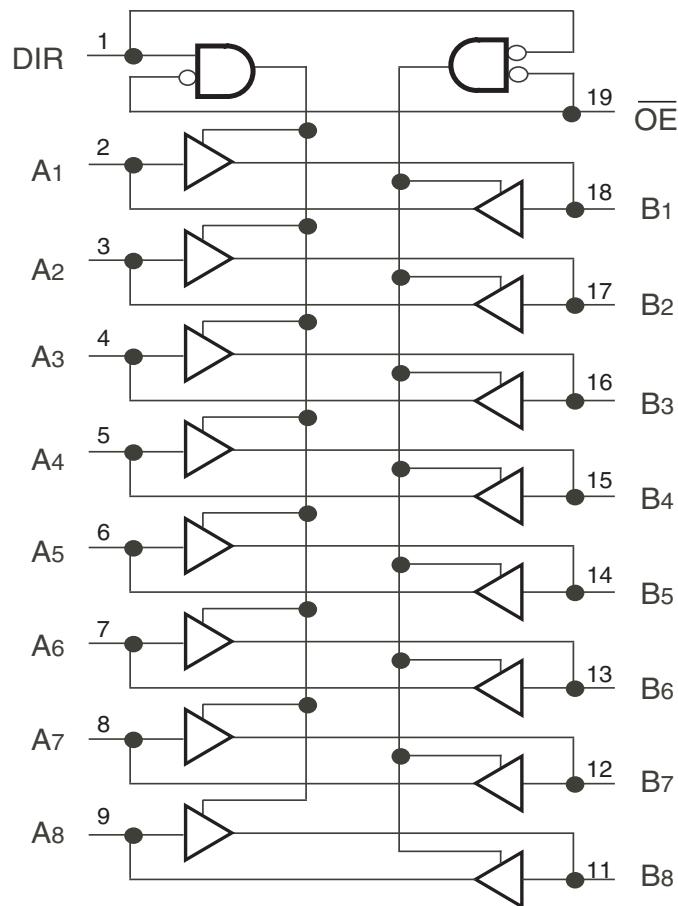
- 0.5 MICRON CMOS Technology
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model ($C = 200\text{pF}$, $R = 0$)
- $V_{cc} = 3.3V \pm 0.3V$, Normal Range
- $V_{cc} = 2.7V$ to $3.6V$, Extended Range
- CMOS power levels ($0.4\mu\text{W}$ typ. static)
- Rail-to-Rail output swing for increased noise margin
- Available in QSOP and TSSOP packages

DESCRIPTION:

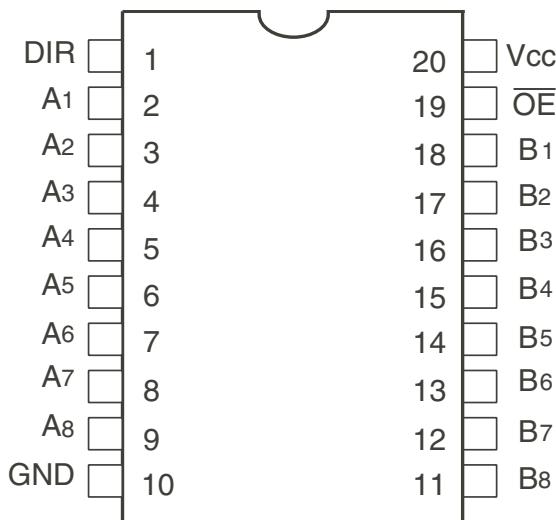
The FCT3245/A octal transceivers are built using advanced dual metal CMOS technology. These high-speed, low-power transceivers are ideal for asynchronous communication between two buses (A and B). The direction control pin (DIR) controls the direction of data flow. The output enable pin (\overline{OE}) overrides the direction control and disables both ports. All inputs are designed with hysteresis for improved noise margin.

The FCT3245/A has series current limiting resistors. These offer low ground bounce, minimal undershoot, and controlled output fall times-reducing the need for external series terminating resistors.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



QSOP/TSSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS⁽¹⁾

Symbol	Description	Max	Unit
VTERM ⁽²⁾	Terminal Voltage with Respect to GND	-0.5 to +4.6	V
VTERM ⁽³⁾	Terminal Voltage with Respect to GND	-0.5 to +7	V
VTERM ⁽⁴⁾	Terminal Voltage with Respect to GND	-0.5 to Vcc+0.5	V
TSTG	Storage Temperature	-65 to +150	°C
IOUT	DC Output Current	-60 to +60	mA

NOTES:

1. Stresses greater than those listed under ABSOLUTE MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
2. Vcc terminals.
3. Input terminals.
4. Outputs and I/O terminals.

CAPACITANCE (TA = +25°C, F = 1.0MHz)

Symbol	Parameter ⁽¹⁾	Conditions	Typ.	Max.	Unit
CIN	Input Capacitance	V _{IN} = 0V	3.5	6	pF
COUT	Output Capacitance	V _{OUT} = 0V	4	8	pF

NOTE:

1. This parameter is measured at characterization but not tested.

PIN DESCRIPTION

Pin Names	Description	
OE	3-State Output Enable Inputs (Active LOW)	
DIR	Direction Control Output	
A _x	Side A Inputs or 3-State Outputs	
B _x	Side B Inputs or 3-State Outputs	

FUNCTION TABLE⁽¹⁾

Inputs		Outputs
OE	DIR	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z State

NOTE:

1. H = HIGH Voltage Level
- X = Don't Care
- L = LOW Voltage Level
- Z = High Impedance

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$, $V_{CC} = 2.7\text{V}$ to 3.6V

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
V_{IH}	Input HIGH Level (Input pins)	Guaranteed Logic HIGH Level		2	—	5.5	V
	Input HIGH Level (I/O pins)			2	—	$V_{CC} + 0.5$	
V_{IL}	Input LOW Level (Input and I/O pins)	Guaranteed Logic LOW Level		-0.5	—	0.8	V
I_{IH}	Input HIGH Current (Input pins)	$V_{CC} = \text{Max.}$	$V_I = 5.5\text{V}$	—	—	± 1	μA
	Input HIGH Current (I/O pins)		$V_I = V_{CC}$	—	—	± 1	
	Input LOW Current (Input pins)		$V_I = \text{GND}$	—	—	± 1	
	Input LOW Current (I/O pins)		$V_I = \text{GND}$	—	—	± 1	
I_{OZH}	High Impedance Output Current	$V_{CC} = \text{Max.}$	$V_O = V_{CC}$	—	—	± 1	μA
I_{OZL}	(3-State Output pins)		$V_O = \text{GND}$	—	—	± 1	
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Min.}$, $I_{IN} = -18\text{mA}$		—	-0.7	-1.2	V
I_{ODH}	Output HIGH Current	$V_{CC} = 3.3\text{V}$, $V_{IN} = V_{IH}$ or V_{IL} , $V_O = 1.5\text{V}$ ⁽³⁾		-36	-60	-110	mA
I_{ODL}	Output LOW Current	$V_{CC} = 3.3\text{V}$, $V_{IN} = V_{IH}$ or V_{IL} , $V_O = 1.5\text{V}$ ⁽³⁾		50	90	200	mA
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}$	$I_{OH} = -0.1\text{mA}$	$V_{CC} - 0.2$	—	—	V
		$V_{IN} = V_{IH}$ or V_{IL}	$I_{OH} = -3\text{mA}$	2.4	3	—	
		$V_{CC} = 3\text{V}$	$I_{OH} = -8\text{mA}$	2.4 ⁽⁵⁾	3	—	
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}$	$I_{OL} = 0.1\text{mA}$	—	—	0.2	V
		$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 16\text{mA}$	—	0.2	0.4	
		$V_{CC} = 3\text{V}$	$I_{OL} = 24\text{mA}$	—	0.3	0.55	
		$V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 24\text{mA}$	—	0.3	0.5	
I_{OS}	Short Circuit Current ⁽⁴⁾	$V_{CC} = \text{Max.}$, $V_O = \text{GND}$ ⁽³⁾		-60	-135	-240	mA
V_H	Input Hysteresis	—		—	150	—	mV
I_{CCL} I_{CCH} I_{CCZ}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$, $V_{IN} = \text{GND}$ or V_{CC}		—	0.1	10	μA

NOTES:

1. For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 3.3\text{V}$, $+25^\circ\text{C}$ ambient and maximum loading.
3. Not more than one output should be tested at one time. Duration of the test should not exceed one second.
4. This parameter is guaranteed but not tested.
5. $V_{OH} = V_{CC} - 0.6\text{V}$ at rated current.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
I _{CC}	Quiescent Power Supply Current	V _{CC} = Max.	V _{IN} = V _{CC} - 0.6V	—	2	30	μA
I _{CCD}	Dynamic Power Supply Current ⁽⁴⁾	V _{CC} = Max. Outputs Open OĒ = DIR = GND One Input Toggling 50% Duty Cycle	V _{IN} = V _{CC} V _{IN} = GND	—	60	85	μA/MHz
I _C	Total Power Supply Current ⁽⁶⁾	V _{CC} = Max. Outputs Open f _i = 10MHz	V _{IN} = V _{CC} V _{IN} = GND	—	0.6	0.9	mA
		50% Duty Cycle OĒ = DIR = GND One Bit Toggling	V _{IN} = V _{CC} - 0.6V V _{IN} = GND	—	0.6	0.9	
		V _{CC} = Max. Outputs Open f _i = 2.5MHz	V _{IN} = V _{CC} V _{IN} = GND	—	1.2	1.7 ⁽⁵⁾	
		50% Duty Cycle OĒ = DIR = GND Eight Bits Toggling	V _{IN} = V _{CC} - 0.6V V _{IN} = GND	—	1.2	1.8 ⁽⁵⁾	

NOTES:

1. For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.

2. Typical values are at V_{CC} = 3.3V, +25°C ambient.

3. Per TTL driven input. All other inputs at V_{CC} or GND.

4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.

5. Values for these conditions are examples of ΔI_{CC} formula. These limits are guaranteed but not tested.

6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$

$$I_C = I_{CC} + \Delta I_{CC} D_{HNT} + I_{CCD} (f_{CP} N_{CP}/2 + f_i N_i)$$

I_{CC} = Quiescent Current (I_{CC}, I_{CCH}, and I_{CCZ})

ΔI_{CC} = Power Supply Current for a TTL High Input

D_H = Duty Cycle for TTL Inputs High

N_T = Number of TTL Inputs at D_H

I_{CCD} = Dynamic Current caused by an Input Transition Pair (HLH or LHL)

f_{CP} = Clock Frequency for register devices (zero for non-register devices)

N_{CP} = Number of clock inputs at f_{CP}

f_i = Input Frequency

N_i = Number of Inputs at f_i

SWITCHING CHARACTERISTICS OVER OPERATING RANGE⁽¹⁾

Symbol	Parameter	Condition ⁽²⁾	74FCT3245		74FCT3245A		Unit
			Min. ⁽³⁾	Max.	Min. ⁽³⁾	Max.	
t _{PLH}	Propagation Delay A to B, B to A	CL = 50pF RL = 500Ω	1.5	7	1.5	4.6	ns
			1.5	9.5	1.5	6.2	
t _{PZH}	Output Enable Time OĒ to A or B		1.5	7.5	1.5	5	ns
			1.5	9.5	1.5	6.2	
t _{PZL}	Output Disable Time OĒ to A or B ⁽⁴⁾		1.5	7.5	1.5	5	ns
			1.5	9.5	1.5	6.2	

NOTES:

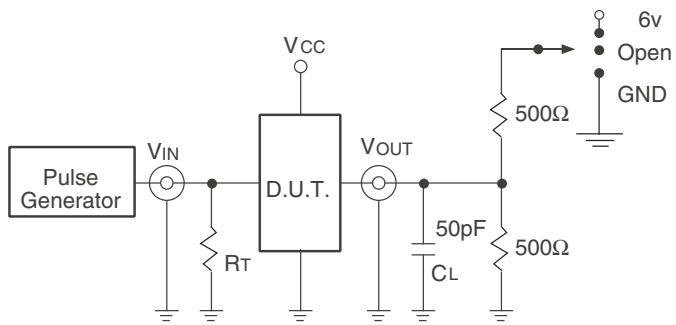
1. Propagation Delays and Enable/Disable times are with V_{CC} = 3.3V ± 0.3V, Normal Range. For V_{CC} = 2.7V to 3.6V, Extended Range, all Propagation Delays and Enable/Disable times should be degraded by 20%.

2. See test circuit and waveforms.

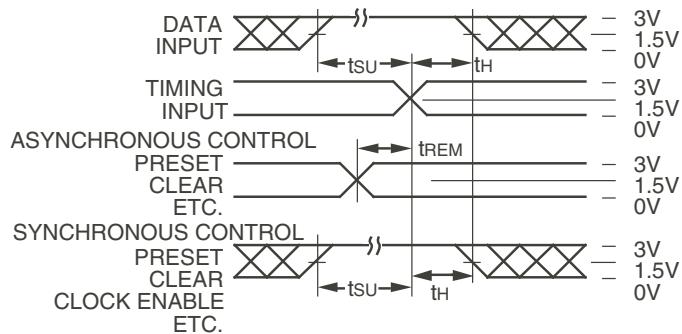
3. Minimum limits are guaranteed but not tested on Propagation Delays.

4. This parameter is guaranteed but not tested.

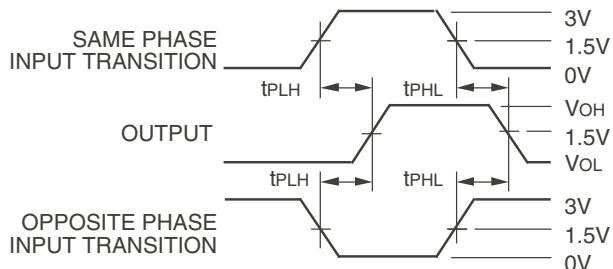
TEST CIRCUITS AND WAVEFORMS



Test Circuits for All Outputs



Set-Up, Hold, and Release Times



Propagation Delay

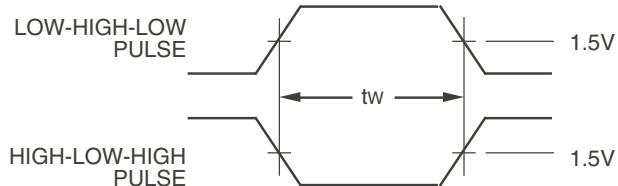
SWITCH POSITION

Test	Switch
Open Drain	6V
Disable Low	GND
Enable Low	Open
Disable High	GND
Enable High	Open
All Other Tests	Open

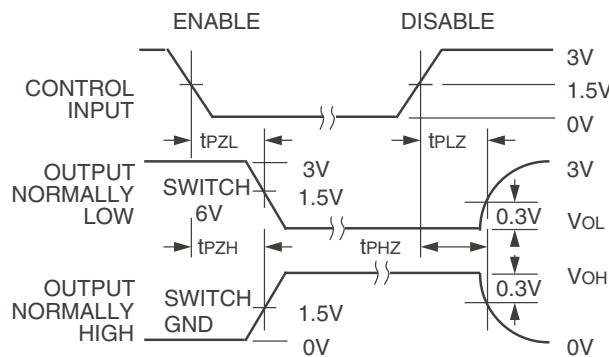
DEFINITIONS:

CL = Load capacitance: includes jig and probe capacitance.

R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.



Pulse Width



Enable and Disable Times

NOTES:

1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
2. Pulse Generator for All Pulses: Rate $\leq 1.0\text{MHz}$; $Z_0 \leq 50\Omega$; $t_f \leq 2.5\text{ns}$; $t_r \leq 2.5\text{ns}$.
3. If V_{CC} is below 3V, input voltage swings should be adjusted not to exceed V_{CC}.

ORDERING INFORMATION

XX	FCT	X	XXXX	XX	X		
Temp. Range		Family	Device Type	Package			
					Blank	Tube	
					8	Tape and Reel	
					QG	Quarter-size Small Outline Package - Green	
					PGG	Thin Shrink Small Outline Package - Green	
				245		Octal Bidirectional Transceiver	
				245A			
					3	3.3 Volt	
					74	-40°C to +85°C	

Datasheet Document History

10/03/2009	Pg. 6	Updated the ordering information by removing the "IDT" notation and non RoHS part.
05/10/2018	Pg. 6	Updated the ordering information by adding Tape and Reel.

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