3.3V CMOS ONE-TO-FOUR ADDRESS/CLOCK DRIVER

IDT74FCT163344/A/C

FEATURES:

- 0.5 MICRON CMOS Technology
- Typical $t_{SK(o)}$ (Output Skew) < 250ps
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- V_{CC} = 3.3V ±0.3V, Normal Range or V_{CC} = 2.7V to 3.6V, Extended Range
- CMOS power levels (0.4µW typ. static)
- Rail-to-Rail output swing for increased noise margin
- Low Ground Bounce (0.3V typ.)
- Inputs (except I/O) can be driven by 3.3V or 5V components
- Available in SSOP, TSSOP and TVSOP Packages

DESCRIPTION:

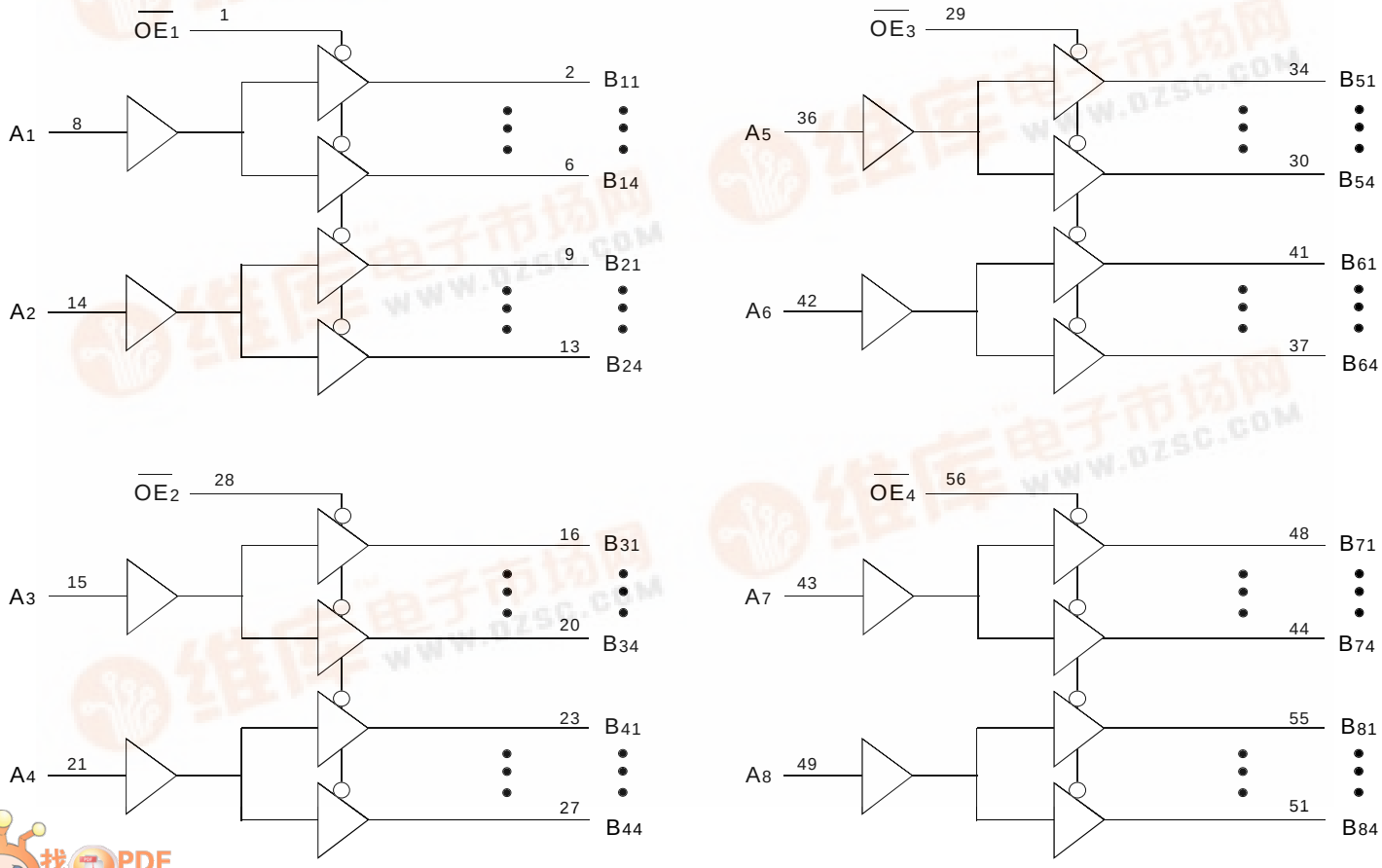
The FCT163344/A/C is a 1:4 address/clock driver built using advanced dual metal CMOS technology. This high-speed, low power device provides the ability to fanout to memory arrays. Eight banks, each with a fanout of 4, and 3-state control provide efficient address distribution. One or more banks may be used for clock distribution.

The FCT163344/A/C have series current limiting resistors. These offer low ground bounce, minimal undershoot and controlled output fall times, reducing the need for external series terminating resistors.

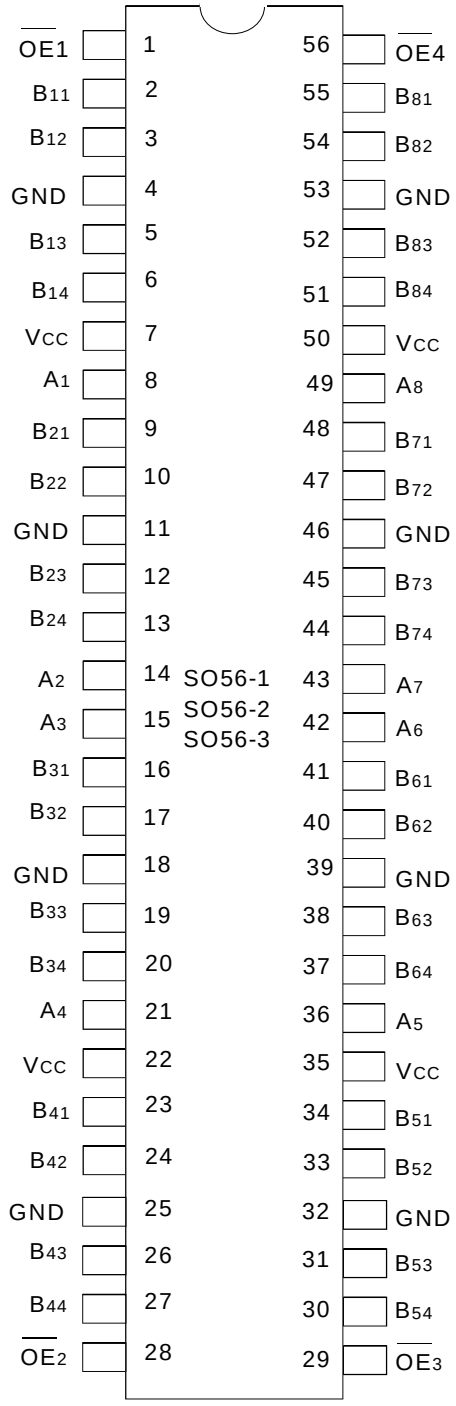
A large number of power and ground pins ensure reduced noise levels. All inputs are designed with hysteresis for improved noise margins.

The inputs of the FCT163344/A/C can be driven from either 3.3V or 5V device. This feature allows the use of these devices as translators in a mixed 3.3V/5V supply system.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



SSOP/ TSSOP/ TVSOP
TOP VIEW

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Description	Max	Unit
V_{TERM}(2)	Terminal Voltage with Respect to GND	–0.5 to +4.6	V
V_{TERM}(3)	Terminal Voltage with Respect to GND	–0.5 to +7	V
V_{TERM}(4)	Terminal Voltage with Respect to GND	–0.5 to V_{CC}+0.5	V
T_{STG}	Storage Temperature	–65 to +150	°C
I_{OUT}	DC Output Current	–60 to +60	mA

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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. V_{CC} terminals.
3. Input terminals.
4. Outputs and I/O terminals.

CAPACITANCE (T_A = +25°C, f = 1.0MHz)

Symbol	Parameter(1)	Conditions	Typ.	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	3.5	6	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	3.5	7	pF

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

PIN DESCRIPTION

Pin Names	Description
$\overline{OE}$x	3–State Output Enable Inputs (Active LOW)
Ax	Inputs
Bxx	3-State Outputs

FUNCTION TABLE

Inputs		Outputs
$\overline{OE}$x	Ax	Bxx
L	L	L
L	H	H
H	X	Z

NOTE:

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

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:
Industrial: T_A = -40°C to +85°C, V_{CC} = 2.7V 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	—	Vcc+0.5	
V_{IL}	Input LOW Level (Input and I/O pins)	Guaranteed Logic HIGH Level		–0.5	—	0.8	V
I_{IH}	Input HIGH Current (Input pins)	V_{CC} = Max.	V_I = 5.5V	—	—	±1	µA
	Input HIGH Current (I/O pins)		V_I = V_{CC}	—	—	±1	
I_{IL}	Input LOW Current (Input pins)		V_I = GND	—	—	±1	
	Input LOW Current (I/O pins)		V_I = GND	—	—	±1	
I_{OZH}	High Impedance Output Current	V_{CC} = Max.	V_O = V_{CC}	—	—	±1	µA
I_{OZL}	(3-State Output pins)		V_O = GND	—	—	±1	
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18mA		—	–0.7	–1.2	V
I_{ODH}	Output HIGH Current	V_{CC} = 3.3V, V_{IN} = V_{IH} or V_{IL}, V_O = 1.5V[3]		–36	–60	–110	mA
I_{ODL}	Output LOW Current	V_{CC} = 3.3V, V_{IN} = V_{IH} or V_{IL}, V_O = 1.5V[3]		50	90	200	mA
V_{OH}	Output HIGH Voltage	V_{CC} = Min.	I_{OH} = –0.1mA	V_{CC}+0.2	—	—	V
		V_{IN} = V_{IH} or V_{IL}	I_{OH} = –3mA	2.4	3	—	
		V_{CC} = 3V V_{IN} = V_{IH} or V_{IL}	I_{OH} = –8mA	2.4[5]	3	—	
V_{OL}	Output LOW Voltage	V_{CC} = Min.	I_{OL} = 0.1mA	—	—	0.2	V
		V_{IN} = V_{IH} or V_{IL}	I_{OL} = 16mA	—	0.2	0.4	
			I_{OL} = 24mA	—	0.3	0.55	
		V_{CC} = 3V V_{IN} = V_{IH} or V_{IL}	I_{OL} = 24mA		0.3	0.5	
I_{OS}	Short Circuit Current[4]	V_{CC} = Max., V_O = GND[3]		–60	–135	–240	mA
V_H	Input Hysteresis	—		—	150	—	mV
I_{CCL} I_{CCH} I_{CCZ}	Quiescent Power Supply Current	V_{CC} = Max. V_{IN} = GND or V_{CC}		—	0.1	10	µA

NOTES:
1. For conditions shown as Max. or Min., 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. 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} = Vcc -0.6V at rated current.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	V_{CC} = Max. V_{IN} = V_{CC} -0.6V[3]		—	2	30	µA
I_{CCD}	Dynamic Power Supply Current[4]	V_{CC} = Max. Outputs Open $\overline{OE}$x = GND One Input Bit Toggling Four Output Bits Toggling 50% Duty Cycle	V_{IN} = V_{CC} V_{IN} = GND	—	230	320	µA/ MHz
I_C	Total Power Supply Current[6]	V_{CC} = Max. Outputs Open fi = 10MHz	V_{IN} = V_{CC} V_{IN} = GND	—	2.3	3.2	mA
		50% Duty Cycle $\overline{OE}$x = GND One Input Bit Toggling Four Output Bits Toggling	V_{IN} = V_{CC} -0.6V V_{IN} = GND	—	2.3	3.2	
		V_{CC} = Max. Outputs Open fi = 2.5MHz	V_{IN} = V_{CC} V_{IN} = GND	—	4.6	6.4	
		50% Duty Cycle $\overline{OE}$x = GND Eight Input Bits Toggling Thirty-Two Output Bits Toggling	V_{IN} = V_{CC} -0.6V V_{IN} = GND	—	4.6	6.5	

NOTES:

1. For conditions shown as Max. or Min., 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 the I_{CC} formula. These limits are guaranteed but not tested.
6. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP} N_{CP}/2 + f_i N_i)$
   I_{CC} = Quiescent Current (I_{CCL}, 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

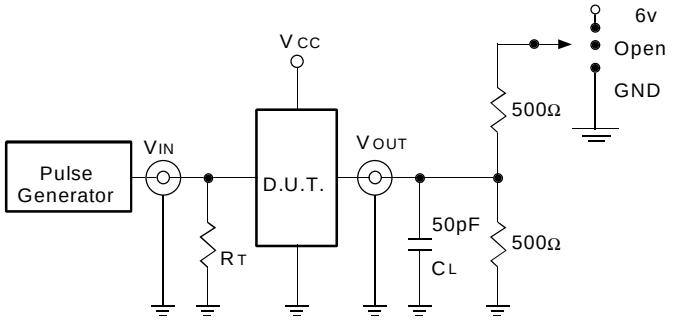
SWITCHING CHARACTERISTICS OVER OPERATING RANGE(5)

Symbol	Parameter	Condition(1)	FCT163344		FCT163344A		FCT163344C		Unit
			Mil.(2)	Max.	Mil.(2)	Max.	Mil.(2)	Max.	
t_{PLH} t_{PHL}	Propagation Delay Ax to Bxx	C_L = 50pF R_L = 500Ω	1.5	6.5	1.5	4.8	1.5	4.3	ns
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}$x to Bxx		1.5	8	1.5	6.2	1.5	5.8	ns
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OE}$x to Bxx		1.5	7	1.5	5.6	1.5	5.2	ns
$t_{SK\ (b)}$	Skew between outputs of same bank and same package (same transition)(3,4)		—	0.75	1.5	0.5	—	0.35	ns
$t_{SK\ (o)}$	Skew between outputs of all banks of same package (A1 thru A8 tied together)(3,4)		—	1	1.5	0.5	—	0.5	ns

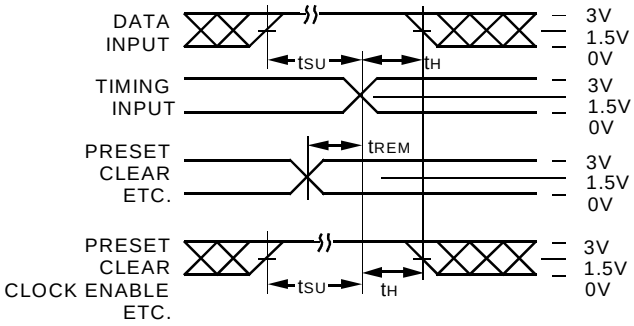
NOTES:
1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.
4. This parameter is guaranteed but not tested. Skew is not guaranteed when V_{CC} <0.3V.
5. 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%.

TEST CIRCUITS AND WAVEFORMS

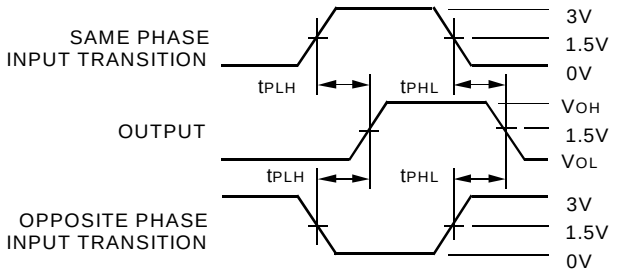
TEST CIRCUITS FOR ALL OUTPUTS



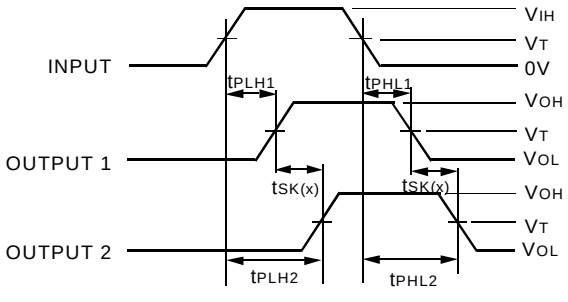
SET-UP, HOLD, AND RELEASE TIMES



PROPAGATION DELAY



OUTPUT SKEW - tSK (x)



$t_{SK(x)} = |t_{PLH2} - t_{PLH1}|$ or $|t_{PHL2} - t_{PHL1}|$

NOTES:
1. For $t_{SK(o)}$ OUTPUT1 and OUTPUT2 are any two outputs.
2. For $t_{SK(b)}$ OUTPUT1 and OUTPUT2 are in the same bank.

SWITCH POSITION

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

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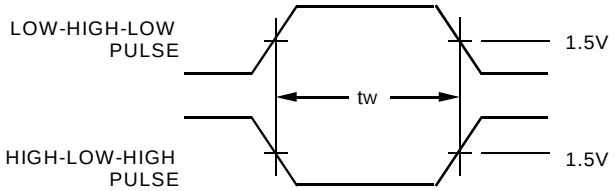
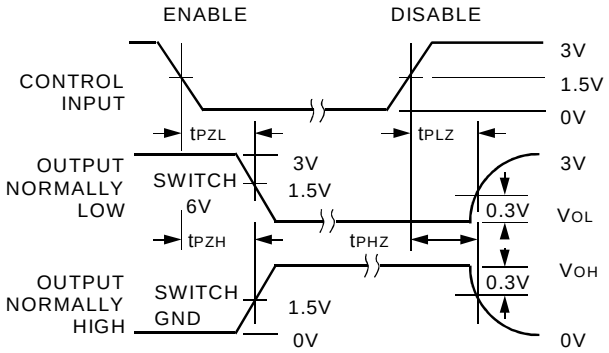
DEFINITIONS:
C_L = Load capacitance: includes jig and probe capacitance.
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

PULSE WIDTH

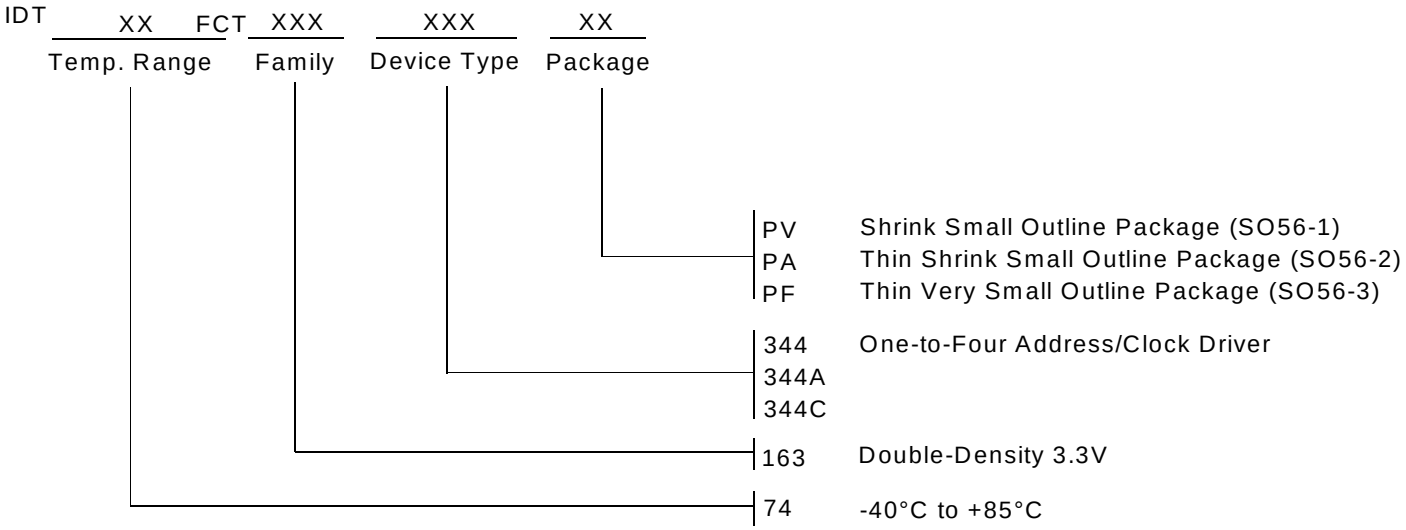


ENABLE AND DISABLE TIMES



NOTES:
1. Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
2. Pulse Generator for All Pulses: Rate ≤ 1.0MHz; t_F ≤ 2.5ns; t_R ≤ 2.5ns.
3. If Vcc is below 3V, input voltage swings should be adjusted not to exceed Vcc.

ORDERING INFORMATION



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