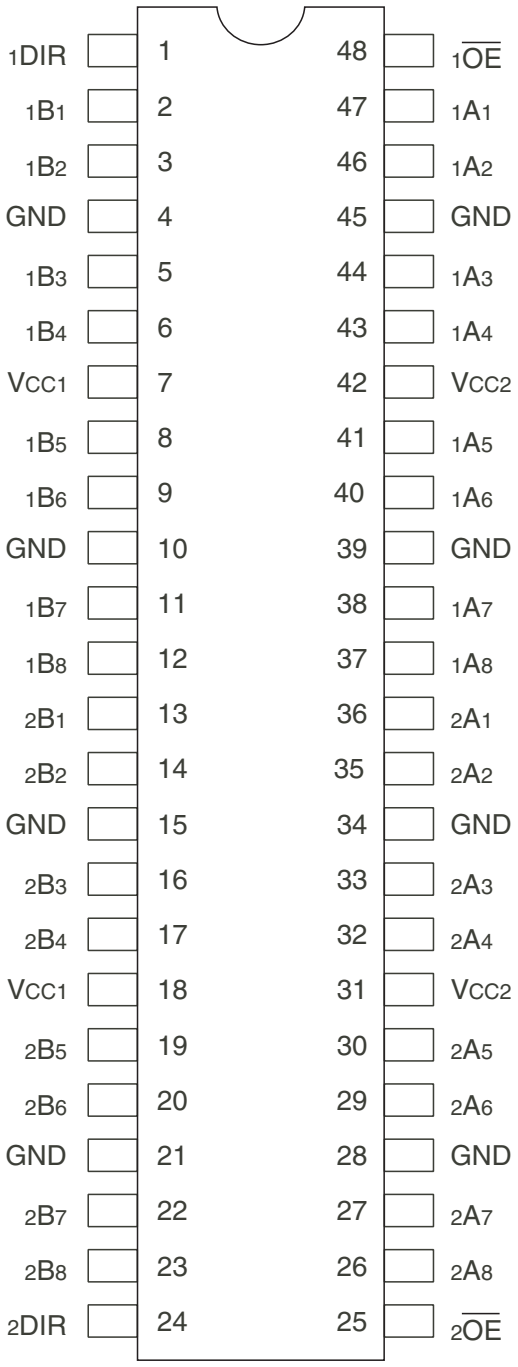
PIN CONFIGURATION



SSOP/ TSSOP
TOP VIEW

POWER SUPPLY SEQUENCING

In the 74FCT164245T, the condition of $V_{CC1} \geq (V_{CC2} - 0.5V)$ must be maintained at all times. For the range of $V_{CC1} = (V_{CC2} - 0.5V)$ to $V_{CC1} = (V_{CC2} + 0.9V)$, both the A and B ports will remain in a High-Impedance state.

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Description	Max	Unit
V_{TERM}(2)	Terminal Voltage with Respect to GND	–0.5 to +7	V
V_{TERM}(3)	Terminal Voltage with Respect to GND	–0.5 to V_{CC1}+0.5	V
T_A	Operating Temperature	–40 to +85	°C
T_{BIAS}	Temperature Under Bias	–55 to +125	°C
T_{STG}	Storage Temperature	–55 to +125	°C
P_T	Power Dissipation	1	W
I_{OUT}	DC Output Current	–60 to +120	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. All devices except V_{CC2}.
3. Power supply terminal V_{CC2}.

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
$C_{I/O}$	I/O Capacitance	V_{OUT} = 0V	3.5	8	pF

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

PIN DESCRIPTION

Pin Names	Description
x$\overline{OE}$	Output Enable Input (Active LOW)
xDIR	Direction Control Input
xAx	Side A Inputs or 3-State Outputs (3.3V Port)
xBx	Side B Inputs or 3-State Outputs (5V Port)

FUNCTION TABLE(1)

Inputs		Outputs
x$\overline{OE}$	xDIR	
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
   L = LOW Voltage Level
   X = Don't Care
   Z = High-Impedance

© 2019 Renesas Electronics Corporation

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE (A PORT, 3.3V)

Following Conditions Apply Unless Otherwise Specified:
V_{CC1} = 5V ±10%, V_{CC2} = 2.7V to 3.6V, Industrial: T_A = –40°C to +85°C

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
V_{IH}	Input HIGH Level (Input and I/O pins)	Guaranteed Logic HIGH Level		2	—	5.5	V
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_{CC1} = Max.	V_I = 5.5V	—	—	±5	µA
	Input HIGH Current (I/O pins)	V_{CC2} = Max.	V_I = V_{CC2}	—	—	±15	
I_{IL}	Input LOW Current (Input pins)		V_I = GND	—	—	±5	
	Input LOW Current (I/O pins)		V_I = GND	—	—	±15	
V_{IK}	Clamp Diode Voltage	V_{CC2} = Min., I_{IN} = –18mA		—	–0.7	–1.2	V
V_{OH}	Output HIGH Voltage	V_{CC1} = V_{CC2} = Min. V_{IN} = V_{IH} or V_{IL}	I_{OH} = –0.1mA	V_{CC2} –0.2	—	—	V
		V_{CC2} = 3V V_{IN} = V_{IH} or V_{IL}	I_{OH} = –8mA	2.4	3	—	
V_{OL}	Output LOW Voltage	V_{CC1} = Min.	I_{OL} = 0.1mA	—	—	0.2	V
		V_{CC2} = Min.	I_{OL} = 16mA	—	0.2	0.4	
		V_{IN} = V_{IH} or V_{IL}	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_{OFF}	Input/Output Power Off Leakage	V_{CC1} = 0V, V_{CC2} = 0V, V_{IN} or $V_O \leq$ 4.5V		—	—	±100	µA
I_{OS}	Short Circuit Current[4]	V_{CC1} = Max., V_{CC2} = Max., V_O = GND[3]		–70	–105	–150	mA
I_O	Output Drive Current	V_{CC1} = Max., V_{CC2} = Max., V_O = 1.5V[3]		–40	–60	–90	mA
V_H	Input Hysteresis	—		—	150	—	mV
I_{CC2L} I_{CC2H} I_{CC2Z}	Quiescent Power Supply Current	V_{CC1} = Max. V_{CC2} = Max. V_{IN} = GND or V_{CC2}		—	0.35	2	mA

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_{CC1} = 5V, V_{CC2} = 3.3V, +25°C ambient.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is guaranteed but not tested.

© 2019 Renesas Electronics Corporation

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE (B PORT, 5V)

Following Conditions Apply Unless Otherwise Specified:
V_{CC1} = 5V ±10%, V_{CC2} = 2.7V to 3.6V, Industrial: T_A = –40°C to +85°C

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
V_{IH}	Input HIGH Level (Input and I/O pins)	Guaranteed Logic HIGH Level		2	—	5.5	V
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_{CC1} = Max.	V_I = V_{CC1}	—	—	±5	µA
	Input HIGH Current (I/O pins)	V_{CC2} = Max.		—	—	±15	
I_{IL}	Input LOW Current (Input pins)		V_I = GND	—	—	±5	
	Input LOW Current (I/O pins)			—	—	±15	
V_{IK}	Clamp Diode Voltage	V_{CC1} = Min., I_{IN} = –18mA		—	–0.7	–1.2	V
V_{OH}	Output HIGH Voltage	V_{CC1} = Min.	I_{OH} = –3mA	2.5	3.5	—	V
		V_{CC2} = Min.	I_{OH} = –15mA	2.4	3.5	—	
		V_{IN} = V_{IH} or V_{IL}	I_{OH} = –32mA[5]	2	3	—	
V_{OL}	Output LOW Voltage	V_{CC1} = Min.	I_{OL} = 64mA	—	0.2	0.55	V
		V_{CC2} = Min.					
		V_{IN} = V_{IH} or V_{IL}					
I_{OFF}	Input/Output Power Off Leakage	V_{CC1} = 0V, V_{CC2} = 0V, V_{IN} or $V_O \leq$ 4.5V		—	—	±100	µA
I_{OS}	Short Circuit Current[4]	V_{CC1} = Max., V_{CC2} = Max., V_O = GND[3]		–80	–140	–225	mA
I_O	Output Drive Current	V_{CC1} = Max., V_{CC2} = Max., V_O = 2.5V[3]		–50	–75	–180	mA
V_H	Input Hysteresis	—		—	150	—	mV
I_{CC1L} I_{CC1H} I_{CC1Z}	Quiescent Power Supply Current	V_{CC1} = Max. V_{CC2} = Max. V_{IN} = GND or V_{CC2}		—	0.08	1.5	mA

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_{CC1} = 5V, V_{CC2} = 3.3V, +25°C ambient.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is guaranteed but not tested.
5. Duration of the condition cannot exceed one second.

© 2019 Renesas Electronics Corporation

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	V_{CC1} = Max., V_{CC2} = Max. V_{IN} = V_{CC2} - 0.6V[3]		—	12	30	µA
I_{CCD}	Dynamic Power Supply Current[4]	V_{CC1} = Max., V_{CC2} = Max. Outputs Open $x\overline{OE}$ = xDIR = GND One Input Toggling 50% Duty Cycle	V_{IN} = V_{CC2} V_{IN} = GND	—	75	120	µA/ MHz
I_C	Total Power Supply Current[6]	V_{CC1} = Max., V_{CC2} = Max. Outputs Open f_i = 10MHz 50% Duty Cycle $x\overline{OE}$ = xDIR = GND One Bit Toggling	V_{IN} = V_{CC2} - 0.6V V_{IN} = GND	—	1.2	4.7	mA
		V_{CC1} = Max., V_{CC2} = Max. Outputs Open f_i = 2.5MHz 50% Duty Cycle $x\overline{OE}$ = xDIR = GND Sixteen Bits Toggling	V_{IN} = V_{CC2} - 0.6V V_{IN} = GND	—	3.5	8.5[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_{CC1} = 5V, V_{CC2} = 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. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC1} + I_{CC2} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP} N_{CP}/2 + f_i N_i)$
   I_{CC1} = Quiescent Current (I_{CC1L}, I_{CC1H} and I_{CC1Z})
   I_{CC2} = Quiescent Current (I_{CC2L}, I_{CC2H} and I_{CC2Z})
   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

© 2019 Renesas Electronics Corporation

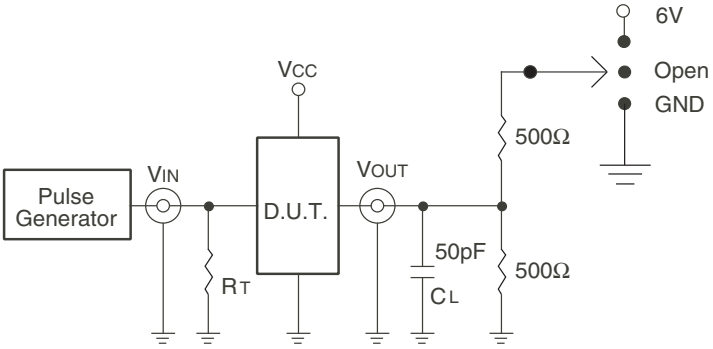
SWITCHING CHARACTERISTICS OVER OPERATING RANGE(1)

Symbol	Parameter	Condition(1)	Min.(2)	Max.	Unit
t_{PLH} t_{PHL}	Propagation Delay A to B	C_L = 50pF R_L = 500Ω	1.5	5	ns
t_{PLH} t_{PHL}	Propagation Delay B to A		1.5	5	ns
t_{PZH} t_{PZL}	Output Enable Time x$\overline{OE}$ to B		1.5	6.5	ns
t_{PHZ} t_{PLZ}	Output Disable Time x$\overline{OE}$ to B		1.5	6	ns
t_{PZH} t_{PZL}	Output Enable Time x$\overline{OE}$ to A		1.5	6.5	ns
t_{PHZ} t_{PLZ}	Output Disable Time x$\overline{OE}$ to A		1.5	6	ns
t_{PZH} t_{PZL}	Output Enable Time xDIR to B(3)		1.5	6.5	ns
t_{PHZ} t_{PLZ}	Output Disable Time xDIR to B(3)		1.5	6	ns
t_{PZH} t_{PZL}	Output Enable Time xDIR to A(3)		1.5	6.5	ns
t_{PHZ} t_{PLZ}	Output Disable Time xDIR to A(3)		1.5	6	ns

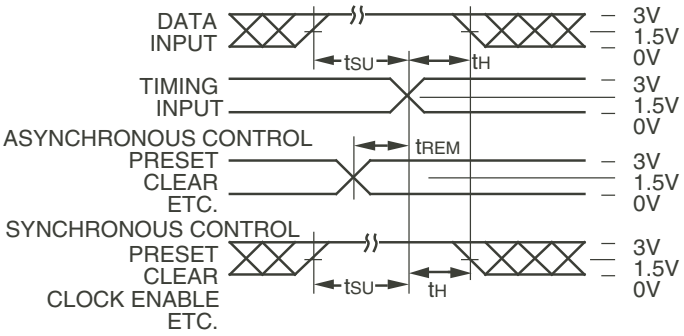
NOTES:
1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not tested.

© 2019 Renesas Electronics Corporation

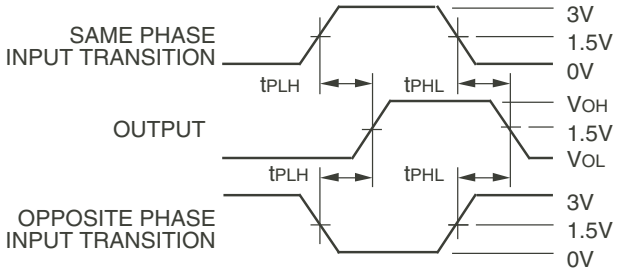
TEST CIRCUITS AND WAVEFORMS



Test Circuits for All Outputs



Set-up, Hold, and Release Times



Propagation Delay

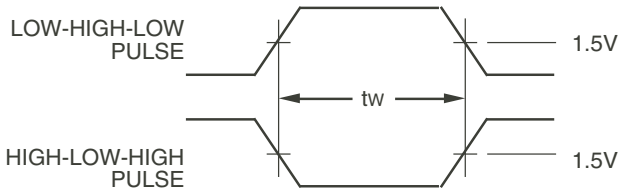
SWITCH POSITION

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

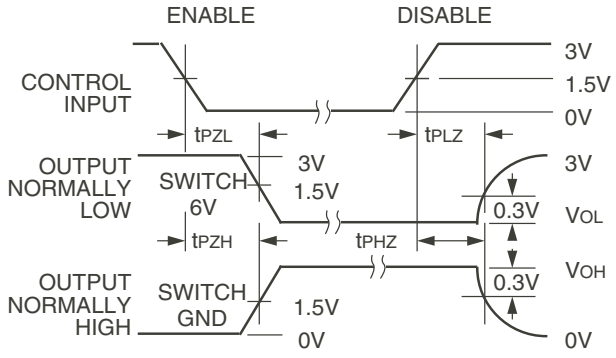
DEFINITIONS:

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



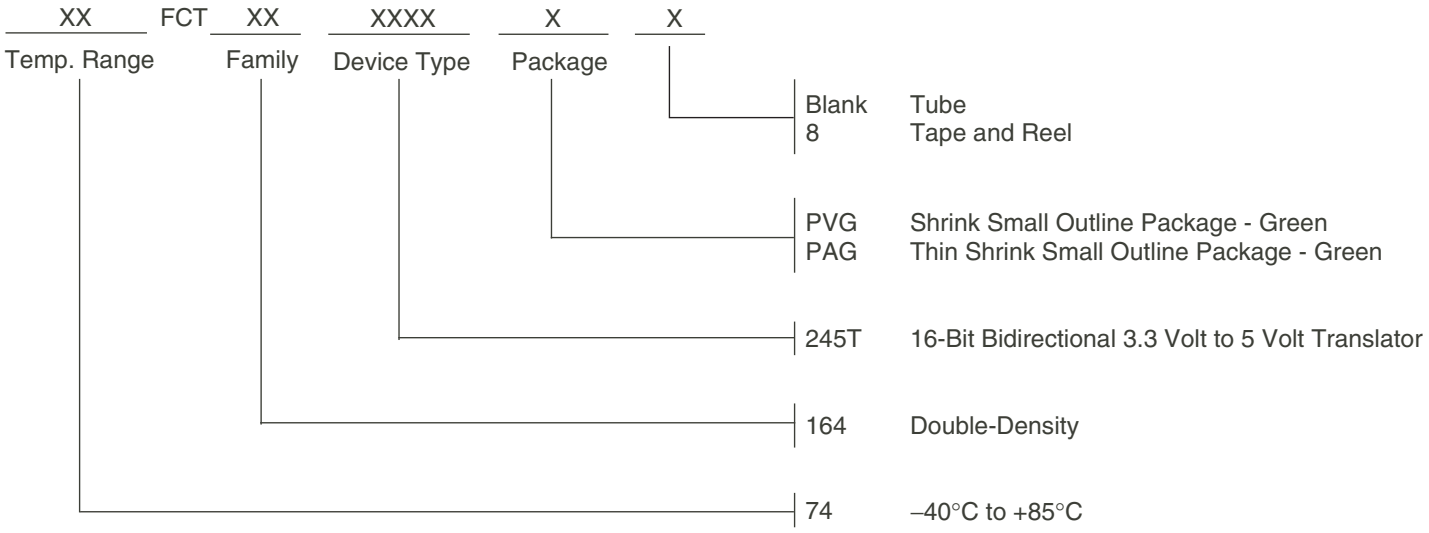
Enable and Disable Times

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.

© 2019 Renesas Electronics Corporation

ORDERING INFORMATION



DATASHEET DOCUMENT HISTORY

09/28/2009	pg. 8	Updated the ordering information by removing the "IDT" notation and non RoHS part.
04/30/2015	pgs. 3, 4 and 8	Updated typo in DC Electrical Characteristics table and updated ordering information by adding Tape & Reel.
05/12/2016	pgs. 8	Corrected temperature symbol and removed Tray from ordering information.

IMPORTANT NOTICE AND DISCLAIMER

RENESAS ELECTRONICS CORPORATION AND ITS SUBSIDIARIES (“RENESAS”) PROVIDES TECHNICAL SPECIFICATIONS AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES “AS IS” AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for developers skilled in the art designing with Renesas products. You are solely responsible for (1) selecting the appropriate products for your application, (2) designing, validating, and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. Renesas grants you permission to use these resources only for development of an application that uses Renesas products. Other reproduction or use of these resources is strictly prohibited. No license is granted to any other Renesas intellectual property or to any third party intellectual property. Renesas disclaims responsibility for, and you will fully indemnify Renesas and its representatives against, any claims, damages, costs, losses, or liabilities arising out of your use of these resources. Renesas' products are provided only subject to Renesas' Terms and Conditions of Sale or other applicable terms agreed to in writing. No use of any Renesas resources expands or otherwise alters any applicable warranties or warranty disclaimers for these products.

(Rev.1.0 Mar 2020)

Corporate Headquarters

TOYOSU FORESIA, 3-2-24 Toyosu,
Koto-ku, Tokyo 135-0061, Japan
www.renesas.com

Contact Information

For further information on a product, technology, the most up-to-date version of a document, or your nearest sales office, please visit:
www.renesas.com/contact/

Trademarks

Renesas and the Renesas logo are trademarks of Renesas Electronics Corporation. All trademarks and registered trademarks are the property of their respective owners.

© 2020 Renesas Electronics Corporation. All rights reserved.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Renesas Electronics:

74FCT164245TPAG8 74FCT164245TPVG8 74FCT164245TPAG 74FCT164245TPVG