



# FAST CMOS OCTAL LATCHED TRANSCEIVER

**IDT54/74FCT543/A/C**

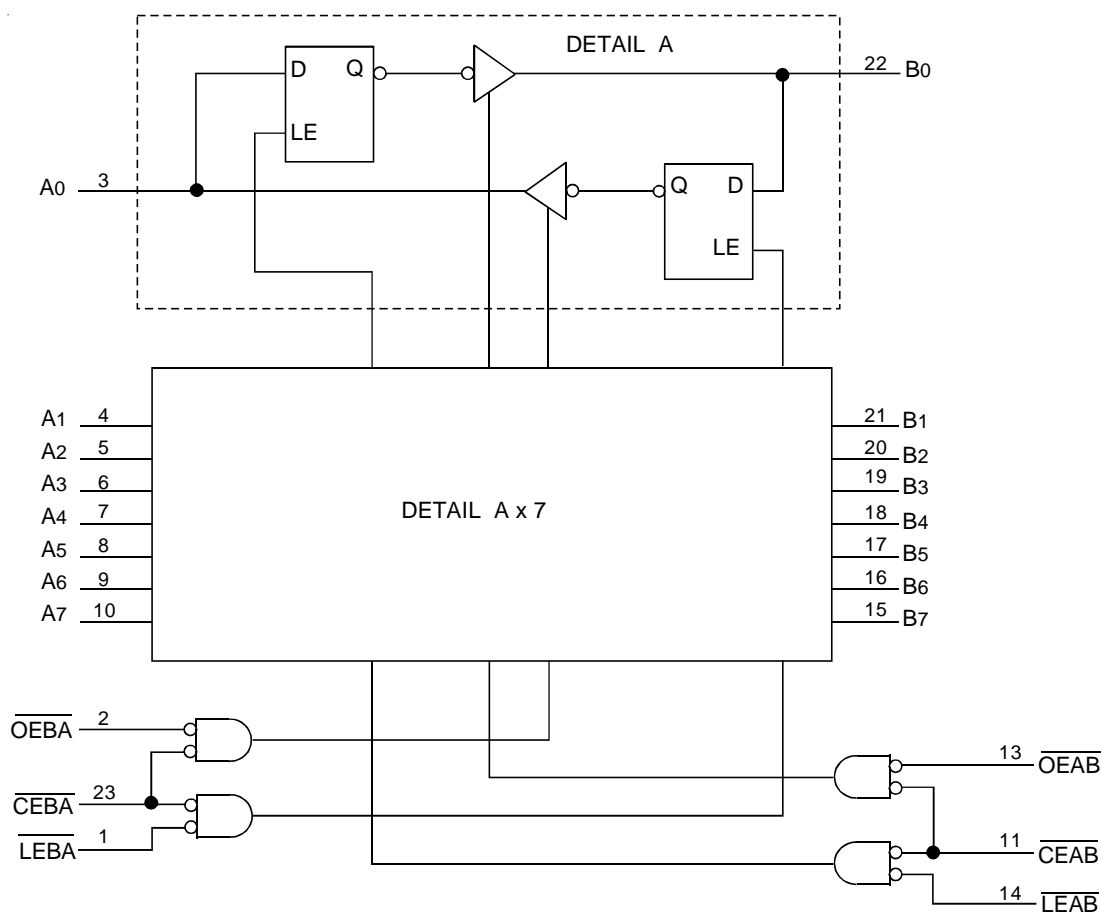
## FEATURES:

- IDT54FCT543 equivalent to FAST™ speed
- IDT54/74FCT543A up to 25% faster than FAST
- IDT74FCT543C up to 40% faster than FAST
- Equivalent to FAST output drive over full temperature and voltage supply extremes
- $I_{OL} = 64\text{mA}$  (commercial) and  $48\text{mA}$  (military)
- Separate controls for data flow in each direction
- Back-to-back latches for storage
- CMOS power levels (1mW typ. static)
- Substantially lower input current levels than FAST ( $5\mu\text{A}$  max.)
- TTL input and output level compatible
- CMOS output level compatible
- Military product compliant to MIL-STD-883, Class B
- Available in the following packages:
  - Commercial: SOIC
  - Military: CERDIP, LCC

## DESCRIPTION:

The FCT543 is a non-inverting octal transceiver built using an advanced dual metal CMOS technology. These devices contain two sets of eight D-type latches with separate input and output controls for each set. For data flow from A to B, for example, the A-to-B Enable ( $\overline{\text{CEAB}}$ ) input must be low in order to enter data from A0–A7 or to take data from B0–B7, as indicated in the Function Table. With  $\overline{\text{CEAB}}$  low, a low signal on the A-to-B Latch Enable ( $\overline{\text{LEAB}}$ ) input makes the A-to-B latches transparent; a subsequent low-to-high transition of the  $\overline{\text{LEAB}}$  signal puts the A latches in the storage mode and their outputs no longer change with the A inputs. With  $\overline{\text{CEAB}}$  and  $\overline{\text{OEAB}}$  both low, the 3-state B output buffers are active and reflect the data present at the output of the A latches. Control of data from B to A is similar, but uses the  $\overline{\text{CEBA}}$ ,  $\overline{\text{LEBA}}$  and  $\overline{\text{OEBA}}$  inputs.

## FUNCTIONAL BLOCK DIAGRAM

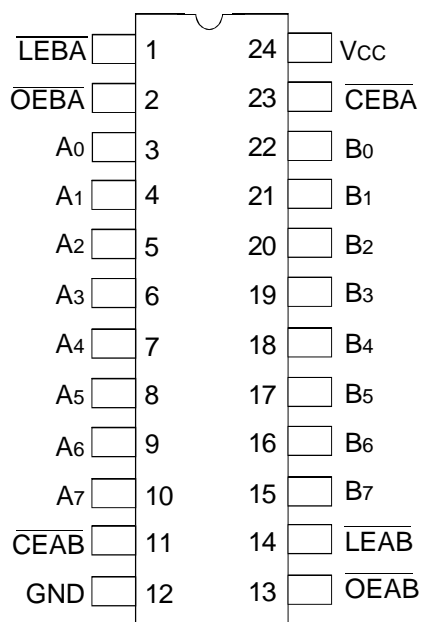


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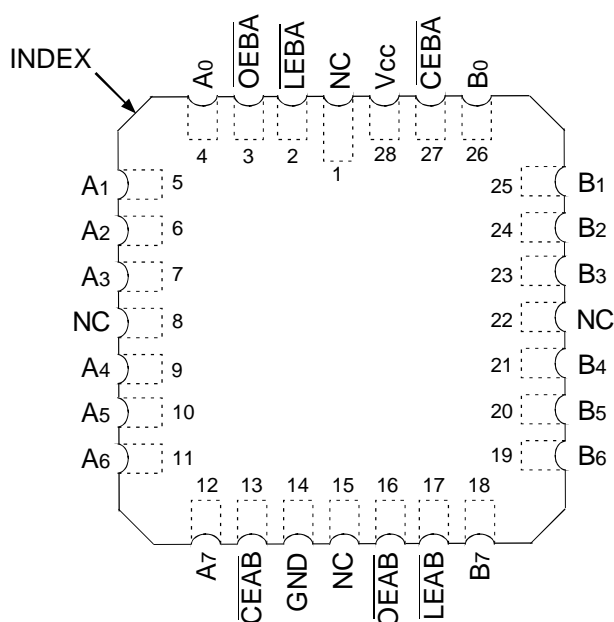
MILITARY AND COMMERCIAL TEMPERATURE RANGES

AUGUST 2003

## PIN CONFIGURATION



CERDIP/ SOIC  
TOP VIEW



LCC  
TOP VIEW

## ABSOLUTE MAXIMUM RATINGS<sup>(1)</sup>

Symbol	Rating	Commercial	Military	Unit
V <sub>TERM</sub> <sup>(2)</sup>	Terminal Voltage with Respect to GND	-0.5 to +7	-0.5 to +7	V
V <sub>TERM</sub> <sup>(3)</sup>	Terminal Voltage with Respect to GND	-0.5 to V <sub>CC</sub>	-0.5 to V <sub>CC</sub>	V
T <sub>A</sub>	Operating Temperature	0 to +70	-55 to +125	°C
T <sub>BIAS</sub>	Temperature under BIAS	-55 to +125	-65 to +135	°C
T <sub>STG</sub>	Storage Temperature	-55 to +125	-65 to +150	°C
P <sub>T</sub>	Power Dissipation	0.5	0.5	W
I <sub>OUT</sub>	DC Output Current	120	120	mA

### NOTES:

- 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. No terminal voltage may exceed V<sub>CC</sub> by +0.5V unless otherwise noted.
- Input and V<sub>CC</sub> terminals only.
- Output and I/O terminals only.

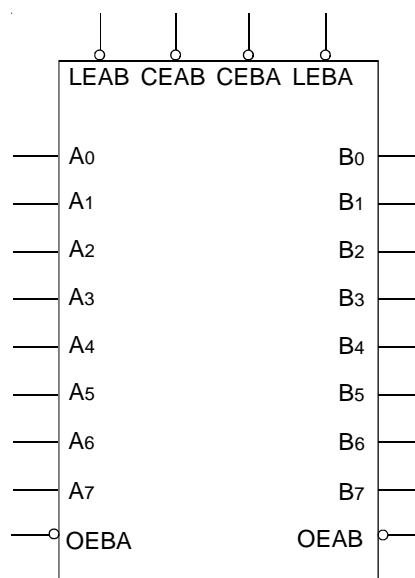
## CAPACITANCE (T<sub>A</sub> = +25°C, F = 1.0MHz)

Symbol	Parameter <sup>(1)</sup>	Conditions	Typ.	Max.	Unit
C <sub>IN</sub>	Input Capacitance	V <sub>IN</sub> = 0V	6	10	pF
C <sub>OUT</sub>	Output Capacitance	V <sub>OUT</sub> = 0V	8	12	pF

### NOTE:

- This parameter is measured at characterization but not tested.

## LOGIC SYMBOL



## PIN DESCRIPTION

Pin Names	Description
$\overline{OEAB}$	A-to-B Output Enable Input (Active LOW)
$\overline{OEBA}$	B-to-A Output Enable Input (Active LOW)
$\overline{CEAB}$	A-to-B Enable Input (Active LOW)
$\overline{CEBA}$	B-to-A Enable Input (Active LOW)
$\overline{LEAB}$	A-to-B Latch Enable Input (Active LOW)
$\overline{LEBA}$	B-to-A Latch Enable Input (Active LOW)
A0-A7	A-to-B Data Inputs or B-to-A 3-State Outputs
B0-B7	B-to-A Data Inputs or A-to-B 3-State Outputs

## FUNCTION TABLE<sup>(1, 2)</sup>

For A-to-B (Symmetric with B-to-A)

Inputs			Latch Status	Output Buffers
$\overline{CEAB}$	$\overline{LEAB}$	$\overline{OEAB}$	A-to-B	B0-B7
H	X	X	Storing	High Z
X	H	X	Storing	X
X	X	H	X	High Z
L	L	L	Transparent	Current A Inputs
L	H	L	Storing	Previous* A Inputs

### NOTES:

- \* Before  $\overline{LEAB}$  LOW-to-HIGH Transition  
H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Don't Care
- A-to-B data flow shown; B-to-A flow control is the same, except using  $\overline{CEBA}$ ,  $\overline{LEBA}$  and  $\overline{OEBA}$ .

## DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:  $V_{LC} = 0.2V$ ;  $V_{HC} = V_{CC} - 0.2V$

Commercial:  $T_A = 0^\circ C$  to  $+70^\circ C$ ,  $V_{CC} = 5.0V \pm 5\%$ , Military:  $T_A = -55^\circ C$  to  $+125^\circ C$ ,  $V_{CC} = 5.0V \pm 10\%$

Symbol	Parameter	Test Conditions <sup>(1)</sup>	Min.	Typ. <sup>(2)</sup>	Max.	Unit	
$V_{IH}$	Input HIGH Level	Guaranteed Logic HIGH Level	2	—	—	V	
$V_{IL}$	Input LOW Level	Guaranteed Logic LOW Level	—	—	0.8	V	
$I_{IH}$	Input HIGH Current	$V_{CC} = \text{Max.}$	$V_i = V_{CC}$	—	—	5	$\mu A$
$I_{IL}$	Input LOW Current		$V_i = 2.7V$	—	—	5 <sup>(4)</sup>	
			$V_i = 0.5V$	—	—	-5 <sup>(4)</sup>	
			$V_i = GND$	—	—	-5	
$I_{OZH}$	Off State (High Impedance) Output Current	$V_{CC} = \text{Max.}$	$V_o = V_{CC}$	—	—	10	$\mu A$
$I_{OZL}$			$V_o = 2.7V$	—	—	10 <sup>(4)</sup>	
			$V_o = 0.5V$	—	—	-10 <sup>(4)</sup>	
			$V_o = GND$	—	—	-10	
$V_{IK}$	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18mA$	—	-0.7	-1.2	V	
$I_{OS}$	Short Circuit Current	$V_{CC} = \text{Max.}, V_o = GND^{(3)}$	-60	-120	—	mA	
$V_{OH}$	Output HIGH Voltage	$V_{CC} = 3V, V_{IN} = V_{LC}$ or $V_{HC}, I_{OH} = -32\mu A$	$V_{HC}$	$V_{CC}$	—	V	
		$V_{CC} = \text{Min}$ $V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OH} = -300\mu A$	$V_{HC}$	$V_{CC}$		
			$I_{OH} = -12mA$ MIL	2.4	4.3		
			$I_{OH} = -15mA$ COM'L	2.4	4.3		
$V_{OL}$	Output LOW Voltage	$V_{CC} = 3V, V_{IN} = V_{LC}$ or $V_{HC}, I_{OL} = 300\mu A$	—	GND	$V_{LC}$	V	
		$V_{CC} = \text{Min}$ $V_{IN} = V_{IH}$ or $V_{IL}$	$I_{OL} = 300\mu A$	—	GND		$V_{LC}^{(4)}$
			$I_{OL} = 48mA$ MIL	—	0.3		0.55
			$I_{OL} = 64mA$ COM'L	—	0.3		0.55

### NOTES:

- For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0V$ ,  $+25^\circ C$  ambient and maximum loading.
- Not more than one output should be tested at one time. Duration of the test should not exceed one second.
- This parameter is guaranteed but not tested.

## POWER SUPPLY CHARACTERISTICS

$V_{LC} = 0.2V$ ;  $V_{HC} = V_{CC} - 0.2V$

Symbol	Parameter	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Unit
I <sub>CC</sub>	Quiescent Power Supply Current	V <sub>CC</sub> = Max. V <sub>IN</sub> ≥ V <sub>HC</sub> ; V <sub>IN</sub> ≤ V <sub>LC</sub>		—	0.2	1.5	mA
ΔI <sub>CC</sub>	Quiescent Power Supply Current TTL Inputs HIGH	V <sub>CC</sub> = Max. V <sub>IN</sub> = 3.4V <sup>(3)</sup>		—	0.5	2	mA
I <sub>CCD</sub>	Dynamic Power Supply Current <sup>(4)</sup>	V <sub>CC</sub> = Max. Outputs Open $\overline{CEAB}$ and $\overline{OEAB}$ = GND $\overline{CEBA}$ = V <sub>CC</sub> One Input Toggling 50% Duty Cycle	V <sub>IN</sub> ≥ V <sub>HC</sub> V <sub>IN</sub> ≤ V <sub>LC</sub>	—	0.15	0.25	mA/ MHz
I <sub>C</sub>	Total Power Supply Current <sup>(6)</sup>	V <sub>CC</sub> = Max. Outputs Open f <sub>CP</sub> = 10MHz ( $\overline{LEAB}$ ) 50% Duty Cycle $\overline{CEAB}$ and $\overline{OEAB}$ = GND $\overline{CEBA}$ = V <sub>CC</sub> One Bit Toggling at f <sub>i</sub> = 5MHz	V <sub>IN</sub> ≥ V <sub>HC</sub> V <sub>IN</sub> ≤ V <sub>LC</sub> (FCT)	—	1.7	4	mA
			V <sub>IN</sub> = 3.4V V <sub>IN</sub> = GND	—	2.2	6	
		V <sub>CC</sub> = Max. Outputs Open f <sub>CP</sub> = 10MHz ( $\overline{LEAB}$ ) 50% Duty Cycle $\overline{CEAB}$ and $\overline{OEAB}$ = GND $\overline{CEBA}$ = V <sub>CC</sub> Eight Bits Toggling at f <sub>i</sub> = 5MHz	V <sub>IN</sub> ≥ V <sub>HC</sub> V <sub>IN</sub> ≤ V <sub>LC</sub> (FCT)	—	7	12.8 <sup>(5)</sup>	
			V <sub>IN</sub> = 3.4V V <sub>IN</sub> = GND	—	9.2	21.8 <sup>(5)</sup>	

### NOTES:

- For conditions shown as Min. or Max., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at V<sub>CC</sub> = 5.0V, +25°C ambient.
- Per TTL driven input; (V<sub>IN</sub> = 3.4V). All other inputs at V<sub>CC</sub> or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of ΔI<sub>CC</sub> formula. These limits are guaranteed but not tested.
- I<sub>C</sub> = I<sub>QUIESCENT</sub> + I<sub>INPUTS</sub> + I<sub>DYNAMIC</sub>  
I<sub>C</sub> = I<sub>CC</sub> + ΔI<sub>CC</sub> D<sub>H</sub>N<sub>T</sub> + I<sub>CCD</sub> (f<sub>CP</sub>/2 + f<sub>i</sub>N<sub>i</sub>)  
I<sub>CC</sub> = Quiescent Current  
ΔI<sub>CC</sub> = Power Supply Current for a TTL High Input (V<sub>IN</sub> = 3.4V)  
D<sub>H</sub> = Duty Cycle for TTL Inputs High  
N<sub>T</sub> = Number of TTL Inputs at D<sub>H</sub>  
I<sub>CCD</sub> = Dynamic Current caused by an Input Transition Pair (HLH or LHL)  
f<sub>CP</sub> = Clock Frequency for Register Devices (Zero for Non-Register Devices)  
f<sub>i</sub> = Output Frequency  
N<sub>i</sub> = Number of Outputs at f<sub>i</sub>  
All currents are in milliamps and all frequencies are in megahertz.

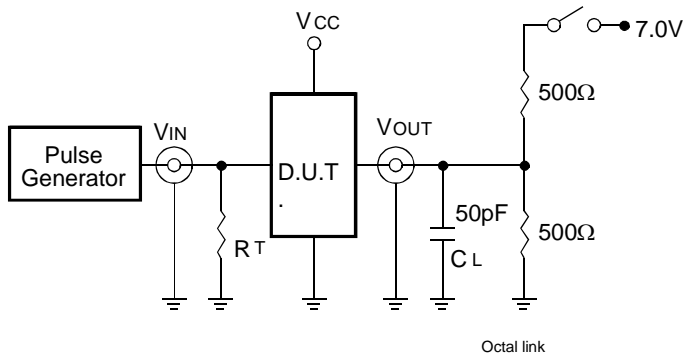
SWITCHING CHARACTERISTICS OVER OPERATING RANGE

Symbol	Parameter	Condition <sup>(1)</sup>	54FCT543		54/74FCT543A				74FCT543C		Unit
			Mil.		Com'l.		Mil.		Com'l.		
			Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	Min. <sup>(2)</sup>	Max.	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Transparent Mode Ax to Bx or Bx to Ax	C <sub>L</sub> = 50pF R <sub>L</sub> = 500Ω	2.5	10	2.5	6.5	2.5	7.5	2.5	5.3	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay $\overline{LEBA}$ to Ax, $\overline{LEAB}$ to Bx		2.5	14	2.5	8	2.5	9	2.5	7	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time $\overline{OEBA}$ or $\overline{OEAB}$ to Ax or Bx $\overline{CEBA}$ or $\overline{CEAB}$ to Ax or Bx		2	14	2	9	2	10	2	8	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time $\overline{OEBA}$ or $\overline{OEAB}$ to Ax or Bx $\overline{CEBA}$ or $\overline{CEAB}$ to Ax or Bx		2	13	2	7.5	2	8.5	2	6.5	ns
t <sub>SU</sub>	Set-up Time, HIGH or LOW Ax or Bx to $\overline{LEBA}$ or $\overline{LEAB}$		3	—	2	—	2	—	2	—	ns
t <sub>H</sub>	Hold Time, HIGH or LOW Ax or Bx to $\overline{LEBA}$ or $\overline{LEAB}$		2	—	2	—	2	—	2	—	ns
t <sub>w</sub>	$\overline{LEBA}$ or $\overline{LEAB}$ Pulse Width LOW		5	—	5	—	5	—	5	—	ns

NOTES:

1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.

TEST CIRCUITS AND WAVEFORMS



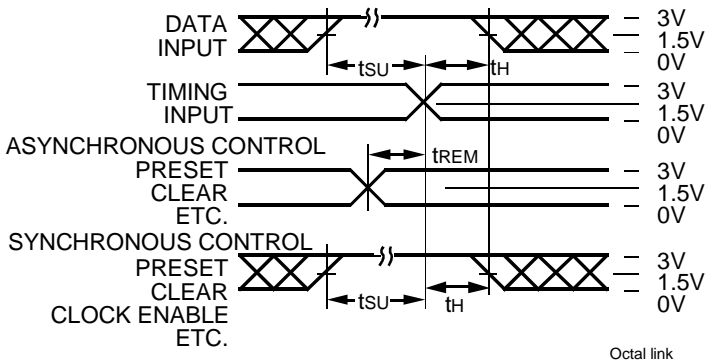
Test Circuits for All Outputs

SWITCH POSITION

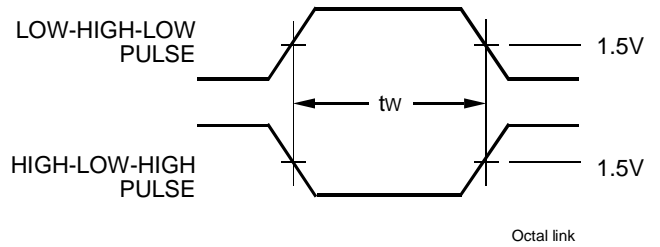
Test	Switch
Open Drain Disable Low Enable Low	Closed
All Other Tests	Open

DEFINITIONS:

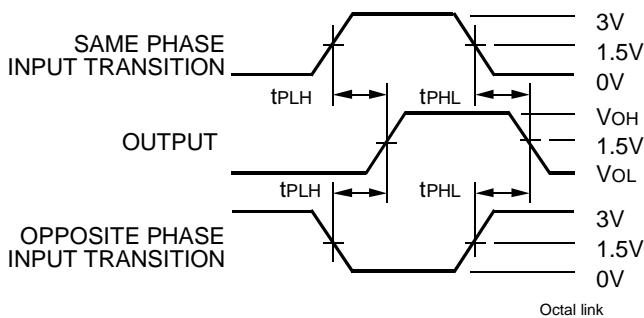
CL = Load capacitance: includes jig and probe capacitance.  
RT = Termination resistance: should be equal to ZOUT of the Pulse Generator.



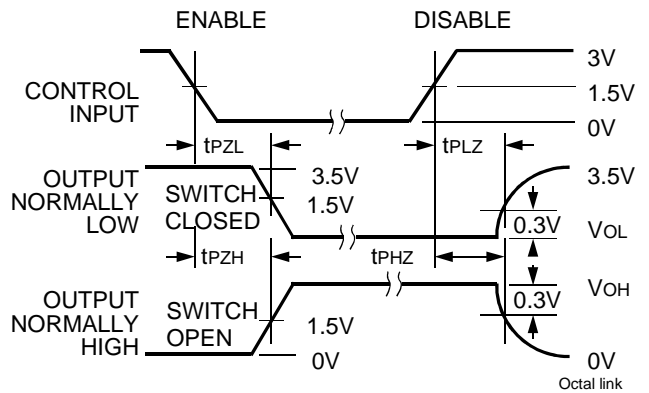
Set-Up, Hold, and Release Times



Pulse Width



Propagation Delay

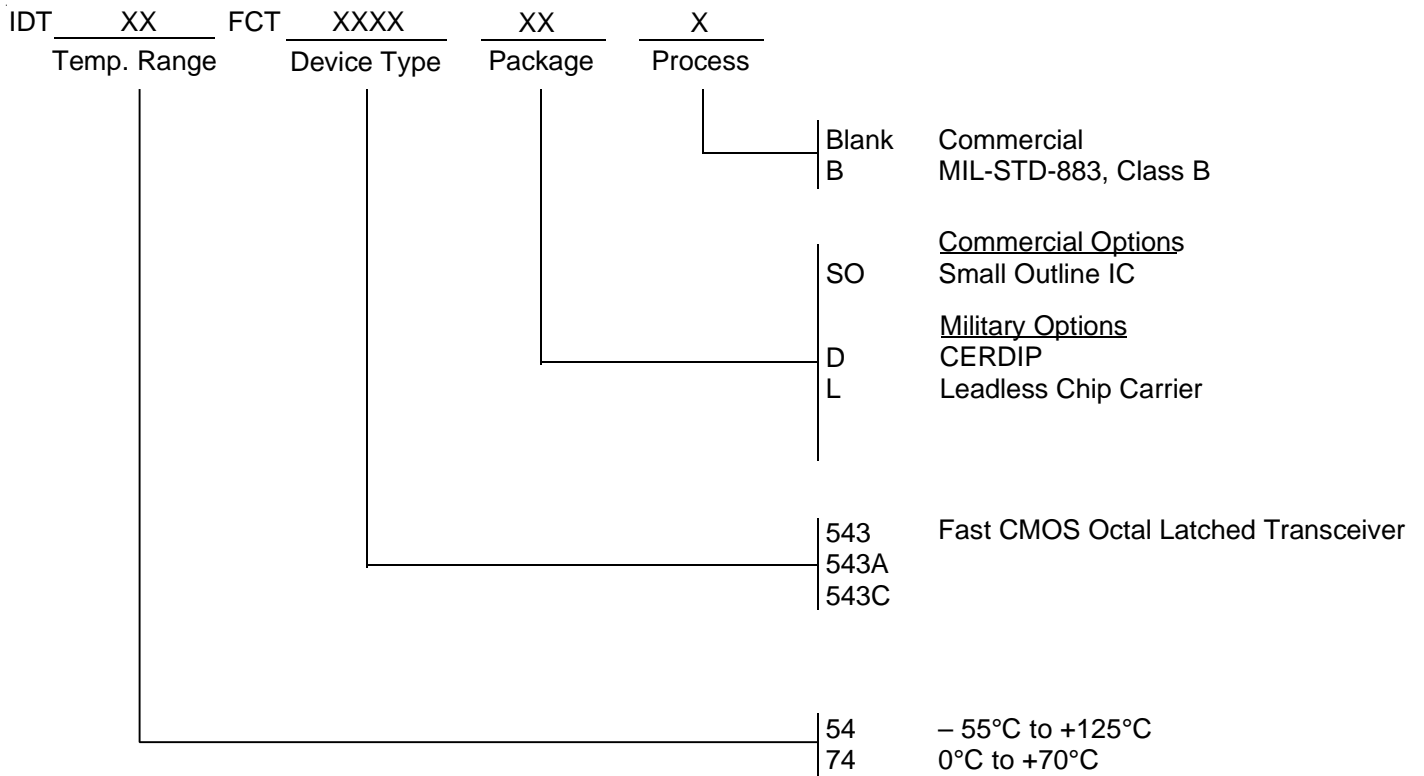


Enable and Disable Times

NOTES:

- Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
- Pulse Generator for All Pulses: Rate ≤ 1.0MHz; Zo ≤ 50Ω; tr ≤ 2.5ns; tr ≤ 2.5ns.

ORDERING INFORMATION



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