



FAST CMOS 18-BIT REGISTER

IDT54/74FCT162823AT/BT/CT

FEATURES:

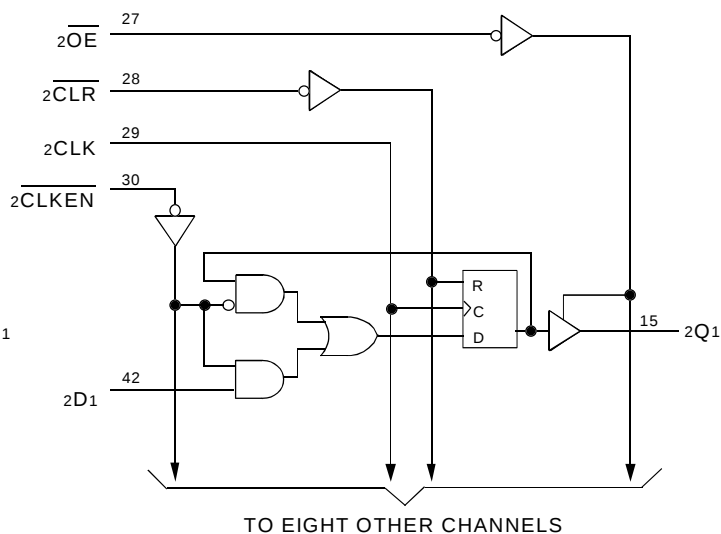
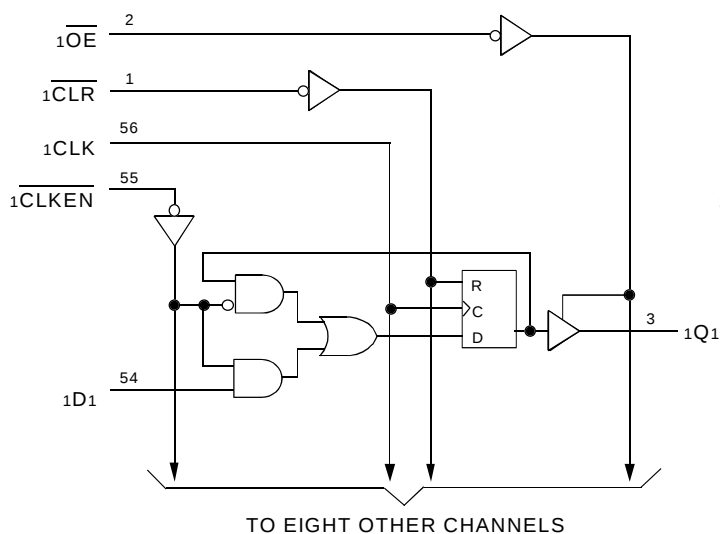
- 0.5 MICRON CMOS Technology
- High-speed, low-power CMOS replacement for ABT functions
- Typical $t_{sk(o)}$ (Output Skew) < 250ps
- Low input and output leakage $\leq 1\mu A$ (max.)
- ESD > 2000V per MIL-STD-883, Method 3015; > 200V using machine model (C = 200pF, R = 0)
- $V_{CC} = 5V \pm 10\%$
- Balanced Output Drivers:
 - $\pm 24mA$ (industrial)
 - $\pm 16mA$ (military)
- Reduced system switching noise
- Typical VOLP (Output Ground Bounce) < 0.6V at $V_{CC} = 5V, T_A = 25^\circ C$
- Available in the following packages:
 - Industrial: SSOP, TSSOP, TVSOP
 - Military: CERPACK

DESCRIPTION:

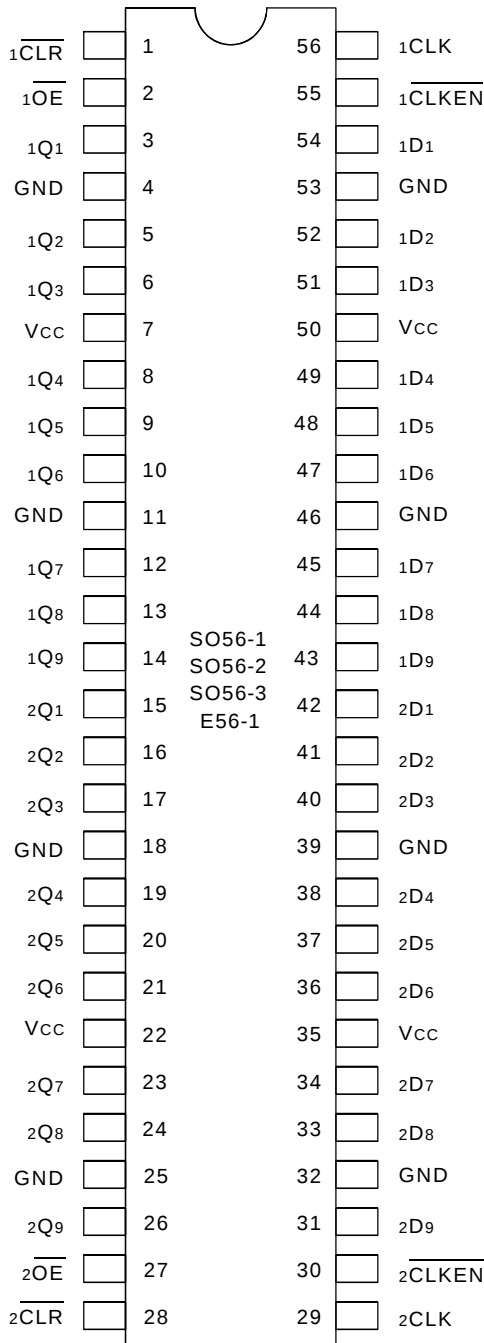
The FCT162823T 18-bit bus interface register is built using advanced, dual metal CMOS technology. These high-speed, low-power registers with clock enable ($\overline{xCLKEN}$) and clear ($\overline{xCLR}$) controls are ideal for parity bus interfacing in high-performance synchronous systems. The control inputs are organized to operate the device as two 9-bit registers or one 18-bit register. Flow-through organization of signal pins simplifies layout. All inputs are designed with hysteresis for improved noise margin.

The FCT162823T has balanced output drive with current limiting resistors. This offers low ground bounce, minimal undershoot, and controlled output fall times – reducing the need for external series terminating resistors. The FCT162823T is a plug-in replacement for the FCT16823T and ABT16823 for on-board interface applications.

FUNCTIONAL BLOCK DIAGRAM



PIN CONFIGURATION



SSOP/TSSOP/TVSOP/CERPACK
TOP VIEW

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 _{CC} +0.5	V
T _{STG}	Storage Temperature	−65 to +150	°C
I _{OUT}	DC Output Current	−60 to +120	mA

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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.
- All device terminals except FCT162XXX Output and I/O terminals.
- Output and I/O terminals for FCT162XXX.

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	8	pF

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NOTE:

- This parameter is measured at characterization but not tested.

PIN DESCRIPTION

Pin Names	Description
xDx	Data inputs
xCLK	Clock Inputs
x $\overline{\text{CLKEN}}$	Clock Enable Inputs (Active LOW)
x $\overline{\text{CLR}}$	Asynchronous clear Inputs (Active LOW)
x $\overline{\text{OE}}$	Output Enable Inputs (Active LOW)
xQx	3-State Outputs

FUNCTION TABLE⁽¹⁾

Inputs					Outputs	Function
x $\overline{\text{OE}}$	x $\overline{\text{CLR}}$	x $\overline{\text{CLKEN}}$	xCLK	xDx	xQx	
H	X	X	X	X	Z	High Z
L	L	X	X	X	L	Clear
L	H	H	X	X	Q ⁽²⁾	Hold
H	H	L	↑	L	Z	Load
H	H	L	↑	H	Z	
L	H	L	↑	L	L	
L	H	L	↑	H	H	

NOTES:

- H = HIGH Voltage Level
L = LOW Voltage Level
X = Don't Care
Z = High-Impedance
- Output level before indicated steady-state input conditions were established.

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Industrial: $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = 5.0\text{V} \pm 10\%$; Military: $T_A = -55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $V_{CC} = 5.0\text{V} \pm 10\%$

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	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 (Input pins) ⁽⁵⁾	$V_{CC} = \text{Max.}$	$V_I = V_{CC}$	—	—	± 1	μA
	Input HIGH Current (I/O pins) ⁽⁵⁾			—	—	± 1	
I_{IL}	Input LOW Current (Input pins) ⁽⁵⁾		$V_I = \text{GND}$	—	—	± 1	
	Input LOW Current (I/O pins) ⁽⁵⁾			—	—	± 1	
I_{OZH}	High Impedance Output Current	$V_{CC} = \text{Max.}$	$V_O = 2.7\text{V}$	—	—	± 1	μA
I_{OZL}	(3-State Output pins) ⁽⁵⁾		$V_O = 0.5\text{V}$	—	—	± 1	
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$		—	-0.7	-1.2	V
I_{OS}	Short Circuit Current	$V_{CC} = \text{Max.}, V_O = \text{GND}^{(3)}$		-80	-140	-250	mA
V_H	Input Hysteresis	—		—	100	—	mV
I_{CCL} I_{CCH} I_{CCZ}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$ $V_{IN} = \text{GND or } V_{CC}$		—	5	500	μA

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OUTPUT DRIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
I_{ODL}	Output LOW Current	$V_{CC} = 5\text{V}, V_{IN} = V_{IH} \text{ or } V_{IL}, V_O = 1.5\text{V}^{(3)}$		60	115	200	mA
I_{ODH}	Output HIGH Current	$V_{CC} = 5\text{V}, V_{IN} = V_{IH} \text{ or } V_{IL}, V_O = 1.5\text{V}^{(3)}$		-60	-115	-200	mA
V_{OH}	Output HIGH Voltage	$V_{CC} = \text{Min.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -16\text{mA MIL}$ $I_{OH} = -24\text{mA IND.}$	2.4	3.3	—	V
V_{OL}	Output LOW Voltage	$V_{CC} = \text{Min.}$ $V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 16\text{mA MIL}$ $I_{OL} = 24\text{mA IND.}$	—	0.3	0.55	V

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NOTES:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0\text{V}$, $+25^{\circ}\text{C}$ ambient.
- Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
- Duration of the condition can not exceed one second.
- The test limit for this parameter is $\pm 5\mu\text{A}$ at $T_A = -55^{\circ}\text{C}$.

POWER SUPPLY CHARACTERISTICS

Symbol	Parameter	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Unit
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$ $V_{IN} = 3.4V^{(3)}$		—	0.5	1.5	mA
I_{CCD}	Dynamic Power Supply Current ⁽⁴⁾	$V_{CC} = \text{Max.}$ Outputs Open $\overline{xOE} = \overline{xCLKEN} = \text{GND}$ One Input Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	75	120	$\mu A/\text{MHz}$
I_C	Total Power Supply Current ⁽⁶⁾	$V_{CC} = \text{Max.}$ Outputs Open $f_{CP} = 10\text{MHz}$ 50% Duty Cycle $\overline{xOE} = \overline{xCLKEN} = \text{GND}$ at $f_i = 5\text{MHz}$ 50% Duty Cycle One Bit Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	0.8	1.7	mA
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	1.3	3.2	
		$V_{CC} = \text{Max.}$ Outputs Open $f_{CP} = 10\text{MHz}$ 50% Duty Cycle $\overline{xOE} = \overline{xCLKEN} = \text{GND}$ at $f_i = 2.5\text{MHz}$ 50% Duty Cycle Eighteen Bits Toggling	$V_{IN} = V_{CC}$ $V_{IN} = \text{GND}$	—	4.2	7.1 ⁽⁵⁾	
			$V_{IN} = 3.4V$ $V_{IN} = \text{GND}$	—	9.2	22.1 ⁽⁵⁾	

NOTES:

- For conditions shown as Max. or Min., use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ ambient.
- Per TTL driven input ($V_{IN} = 3.4V$). All other inputs at V_{CC} 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 the I_{CC} formula. These limits are guaranteed but not tested.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$
 $I_C = I_{CC} + \Delta I_{CC} D_{HNT} + I_{CCD} (f_{CP} N_{CP}/2 + f_i N_i)$
 $I_{CC} = \text{Quiescent Current } (I_{CCL}, I_{CCH} \text{ and } I_{CCZ})$
 $\Delta I_{CC} = \text{Power Supply Current for a TTL High Input } (V_{IN} = 3.4V)$
 $D_H = \text{Duty Cycle for TTL Inputs High}$
 $N_T = \text{Number of TTL Inputs at } D_H$
 $I_{CCD} = \text{Dynamic Current Caused by an Input Transition Pair (HLH or LHL)}$
 $f_{CP} = \text{Clock Frequency for Register Devices (Zero for Non-Register Devices)}$
 $N_{CP} = \text{Number of Clock Inputs at } f_{CP}$
 $f_i = \text{Input Frequency}$
 $N_i = \text{Number of Inputs at } f_i$

SWITCHING CHARACTERISTICS OVER OPERATING RANGE - INDUSTRIAL

Symbol	Parameter	Condition ⁽¹⁾	FCT162823AT		FCT162823BT		FCT162823CT		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
tPLH tPHL	Propagation Delay xCLK to xQx	CL = 50pF RL = 500Ω	1.5	10	1.5	7.5	1.5	4.7	ns
		CL = 300pF ⁽⁵⁾ RL = 500Ω	1.5	20	1.5	15	1.5	8	
tPHL	Propagation Delay xCLR to xQx	CL = 50pF RL = 500Ω	1.5	14	1.5	9	1.5	4.7	ns
tPZH tPZL	Output Enable Time xOE to xQx	CL = 50pF RL = 500Ω	1.5	12	1.5	8	1.5	4.4	ns
		CL = 300pF ⁽⁵⁾ RL = 500Ω	1.5	23	1.5	15	1.5	9	
tPHZ tPLZ	Output Disable Time xOE to xQx	CL = 5pF ⁽⁵⁾ RL = 500Ω	1.5	7	1.5	6.5	1.5	3.6	ns
		CL = 50pF RL = 500Ω	1.5	8	1.5	7.5	1.5	3.6	
tsu	Set-up Time HIGH or LOW xDx to xCLK	CL = 50pF RL = 500Ω	3	—	3	—	1.5	—	ns
th	Hold Time HIGH or LOW xDx to xCLK		1.5	—	1.5	—	0	—	ns
tsu	Set-up Time HIGH or LOW xCLKEN to xCLK		3	—	3	—	2.5	—	ns
th	Hold Time HIGH or LOW xCLKEN to xCLK		0	—	0	—	0	—	ns
tw	xCLK Pulse Width HIGH or LOW		6	—	6	—	3	—	ns
tw	xCLR Pulse Width LOW		6	—	6	—	3	—	ns
tREM	Recovery Time xCLR to xCLK		6	—	6	—	3	—	ns
tsk(o)	Output Skew ⁽³⁾		—	0.5	—	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 limit is guaranteed but not tested.
5. This condition is guaranteed but not tested.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE-MILITARY

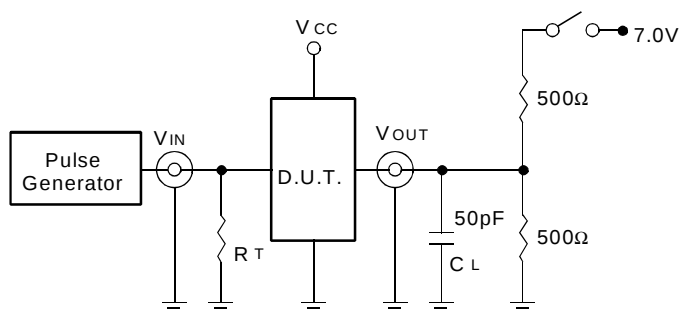
Symbol	Parameter	Condition ⁽¹⁾	FCT162823AT		FCT126823BT		FCT162823CT		Unit
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
t _{PLH} t _{PHL}	Propagation Delay xCLK to xQx	C _L = 50pF R _L = 500Ω	1.5	11.5	1.5	8.5	1.5	7	ns
		C _L = 300pF ⁽⁵⁾ R _L = 500Ω	1.5	20	1.5	16	1.5	13.5	
t _{PHL}	Propagation Delay xCLR to xQx	C _L = 50pF R _L = 500Ω	1.5	15	1.5	9.5	1.5	8.5	ns
t _{PZH} t _{PZL}	Output Enable Time xOE to xQx	C _L = 50pF R _L = 500Ω	1.5	13	1.5	9	1.5	8	ns
		C _L = 300pF ⁽⁵⁾ R _L = 500Ω	1.5	25	1.5	16	1.5	13.5	
t _{PHZ} t _{PLZ}	Output Disable Time xOE to xQx	C _L = 5pF ⁽⁵⁾ R _L = 500Ω	1.5	8	1.5	7	1.5	6.2	ns
		C _L = 50pF R _L = 500Ω	1.5	9	1.5	8	1.5	6.5	
t _{SU}	Set-up Time HIGH or LOW xDx to xCLK	C _L = 50pF R _L = 500Ω	4	—	3	—	3	—	ns
t _H	Hold Time HIGH or LOW xDx to xCLK		2	—	1.5	—	1.5	—	ns
t _{SU}	Set-up Time HIGH or LOW xCLKEN to xCLK		4	—	3	—	3	—	ns
t _H	Hold Time HIGH or LOW xCLKEN to xCLK		2	—	0	—	0	—	ns
t _W	xCLK Pulse Width HIGH or LOW		7	—	6	—	6	—	ns
t _W	xCLR Pulse Width LOW		7	—	6	—	6	—	ns
t _{REM}	Recovery Time xCLR to xCLK		7	—	6	—	6	—	ns
t _{SK(0)}	Output Skew ⁽³⁾		—	0.5	—	0.5	—	0.5	ns

NOTES:

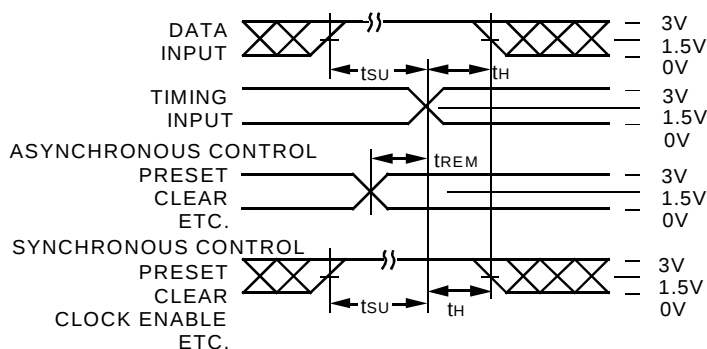
1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.
4. This limit is guaranteed but not tested.
5. This condition is guaranteed but not tested.

TEST CIRCUITS AND WAVEFORMS

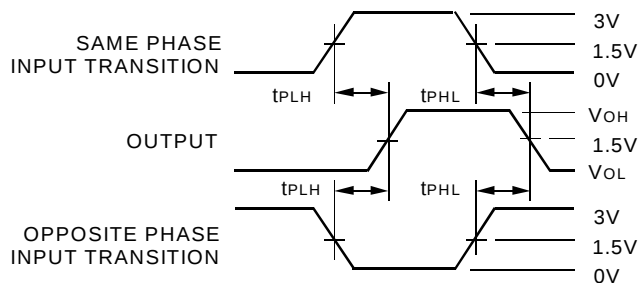
TEST CIRCUITS FOR ALL OUTPUTS



SET-UP, HOLD, AND RELEASE TIMES



PROPAGATION DELAY



SWITCH POSITION

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

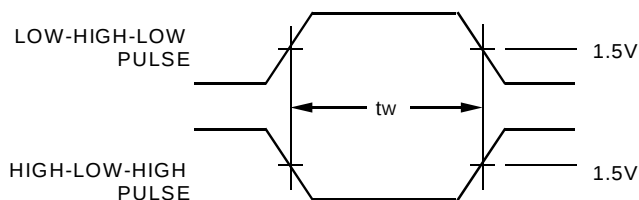
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DEFINITIONS:

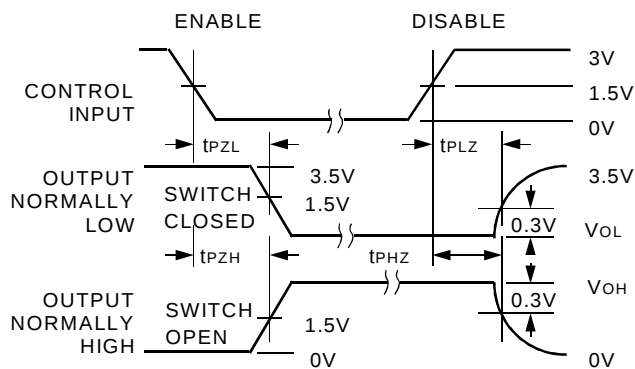
C_L = Load capacitance: includes jig and probe capacitance.

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

PULSE WIDTH



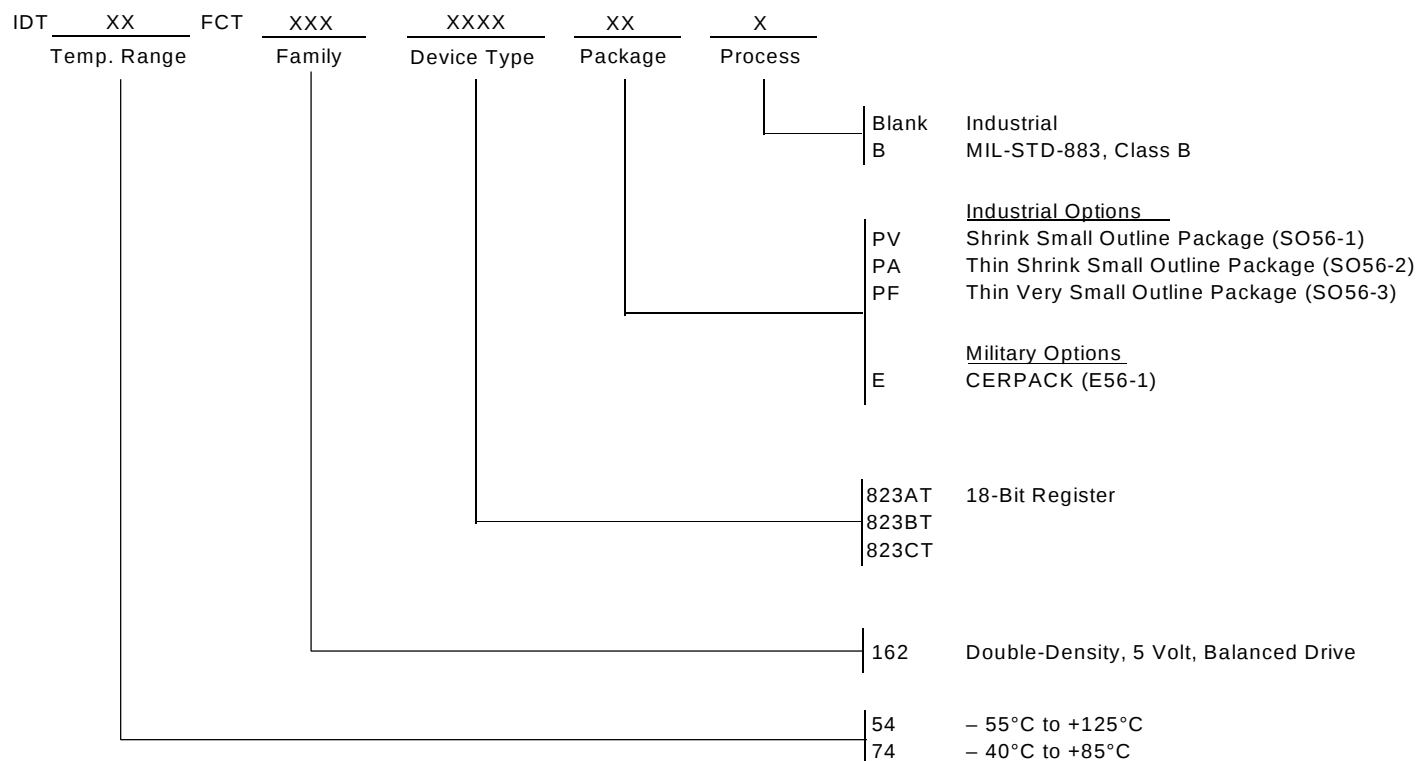
ENABLE AND DISABLE TIMES



NOTES:

- Diagram shown for input Control Enable-LOW and input Control Disable-HIGH.
- Pulse Generator for All Pulses: Rate $\leq 1.0\text{MHz}$; $t_F \leq 2.5\text{ns}$; $t_R \leq 2.5\text{ns}$.

ORDERING INFORMATION



NOTE:

New, tighter specs listed in the table below were changed effective with date code "0101" (parts shipped after January 1, 2001).

Device	Parameter	Description	Condition	Old (ns)	New (ns)
74FCT162823C	t_{PLH} , t_{PHL}	Prop Delay xCLK to xQx	50pF/500 Ω	6.0	4.7
			300pF/500 Ω	12.5	8.0
	t_{PHL}	Prop Delay xCLR to xQx	50pF/500 Ω	6.1	4.7
	t_{PZH} , t_{PZL}	Output Enable xOE to xQx	50pF/500 Ω	5.5	4.4
			300pF/500 Ω	12.5	9.0
	t_{PHZ} , t_{PLZ}	Output Disable time xOE to xQx	5pF/500 Ω	5.2	3.6
			50pF/500 Ω	6.5	3.6



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