Integrated Device Technology, Inc.

FAST CMOS 10-BIT BUFFERS

IDT54/74FCT827AT/BT/CT/DT
IDT54/74FCT2827AT/BT/CT

FEATURES:

- **Common features:**
  - Low input and output leakage ≤1μA (max.)
  - CMOS power levels
  - True TTL input and output compatibility
    - V_{OH} = 3.3V (typ.)
    - V_{OL} = 0.3V (typ.)
  - Meets or exceeds JEDEC standard 18 specifications
  - Product available in Radiation Tolerant and Radiation Enhanced versions
  - Military product compliant to MIL-STD-883, Class B and DESC listed (dual marked)
  - Available in DIP, SOIC, SSOP, QSOP, CERPACK and LCC packages
- **Features for FCT827T:**
  - A, B, C and D speed grades
  - High drive outputs (-15mA I_{OH}, 48mA I_{OL})
- **Features for FCT2827T:**
  - A, B and C speed grades
  - Resistor outputs (-15mA I_{OH}, 12mA I_{OL} Com.)
    (-12mA I_{OH}, 12mA I_{OL} Mil.)
  - Reduced system switching noise

DESCRIPTION:

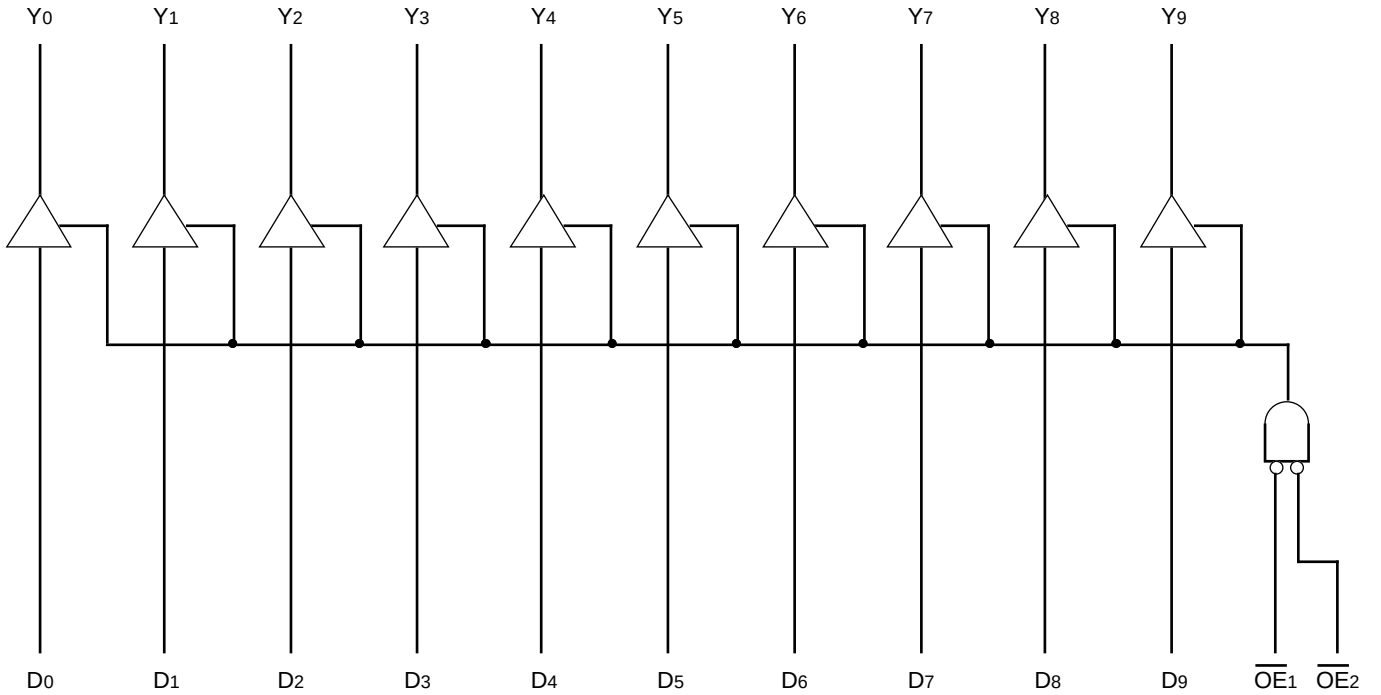
The FCT827T is built using an advanced dual metal CMOS technology.

The FCT827T/FCT2827T 10-bit bus drivers provide high-performance bus interface buffering for wide data/address paths or buses carrying parity. The 10-bit buffers have NAND-ed output enables for maximum control flexibility.

All of the FCT827T high-performance interface family are designed for high-capacitance load drive capability, while providing low-capacitance bus loading at both inputs and outputs. All inputs have clamp diodes to ground and all outputs are designed for low-capacitance bus loading in high-impedance state.

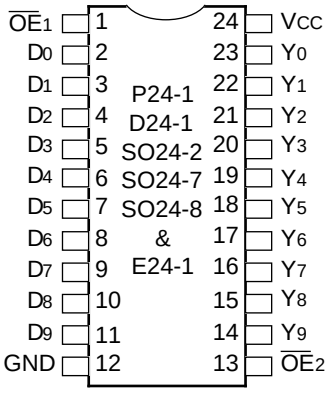
The FCT2827T has balanced output drive with current limiting resistors. This offers low ground bounce, minimal undershoot and controlled output fall times-reducing the need for external series terminating resistors. FCT2827T parts are plug-in replacements for FCT827T parts.

FUNCTIONAL BLOCK DIAGRAM



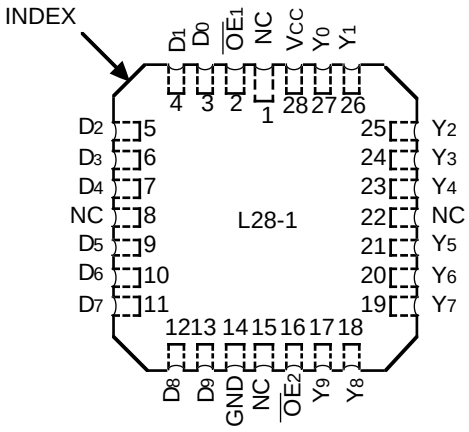
2573 drw 01

PIN CONFIGURATIONS



2573 drw 02

DIP/SOIC/SSOP/QSOP/CERPACK
TOP VIEW



2573 drw 03

LCC
TOP VIEW

PIN DESCRIPTION

Names	I/O	Description
$\overline{OE}_I$	I	When both are LOW the outputs are enabled. When either one or both are HIGH the outputs are High Z.
D_I	I	10-bit data input.
Y_I	O	10-bit data output.

2573 tbl 01

FUNCTION TABLE(1)

Inputs			Output	
$\overline{OE}_1$	$\overline{OE}_2$	D_I	Y_I	Function
L	L	L	L	Transparent
L	L	H	H	
H	X	X	Z	Three-State
X	H	X	Z	

NOTE:
1. H = HIGH, L = LOW, X = Don't Care, Z = High Impedance

2573 tbl 02

ABSOLUTE MAXIMUM RATINGS(1)

Symbol	Rating	Commercial	Military	Unit
V_{TERM}(2)	Terminal Voltage with Respect to GND	–0.5 to +7.0	–0.5 to +7.0	V
V_{TERM}(3)	Terminal Voltage with Respect to GND	–0.5 to V_{CC} +0.5	–0.5 to V_{CC} +0.5	V
T_A	Operating Temperature	0 to +70	–55 to +125	°C
T_{BIAS}	Temperature Under Bias	–55 to +125	–65 to +135	°C
T_{STG}	Storage Temperature	–55 to +125	–65 to +150	°C
P_T	Power Dissipation	0.5	0.5	W
I_{OUT}	DC Output Current	–60 to +120	–60 to +120	mA

NOTES:

2573 lnk 03

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. No terminal voltage may exceed V_{CC} by +0.5V unless otherwise noted.
2. Input and V_{CC} terminals only.
3. Outputs and I/O terminals only.

CAPACITANCE (T_A = +25°C, f = 1.0MHz)

Symbol	Parameter(1)	Conditions	Typ.	Max.	Unit
C_{IN}	Input Capacitance	V_{IN} = 0V	6	10	pF
C_{OUT}	Output Capacitance	V_{OUT} = 0V	8	12	pF

NOTE:

2573 lnk 04

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

DC ELECTRICAL CHARACTERISTICS OVER OPERATING RANGE

Following Conditions Apply Unless Otherwise Specified:

Commercial: T_A = 0°C to +70°C, V_{CC} = 5.0V ± 5%; Military: T_A = –55°C to +125°C, V_{CC} = 5.0V ± 10%

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
V_{IH}	Input HIGH Level	Guaranteed Logic HIGH Level		2.0	—	—	V
V_{IL}	Input LOW Level	Guaranteed Logic LOW Level		—	—	0.8	V
I_{IH}	Input HIGH Current[4]	V_{CC} = Max.	V_I = 2.7V	—	—	±1	µA
I_{IL}	Input LOW Current[4]		V_I = 0.5V	—	—	±1	
I_{OZH}	High Impedance Output Current	V_{CC} = Max.	V_O = 2.7V	—	—	±1	µA
I_{OZL}	(3-State Output pins)[4]		V_O = 0.5V	—	—	±1	
I_I	Input HIGH Current[4]	V_{CC} = Max., V_I = V_{CC} (Max.)		—	—	±1	µA
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18mA		—	–0.7	–1.2	V
V_H	Input Hysteresis	—		—	200	—	mV
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max., V_{IN} = GND or V_{CC}		—	0.01	1	mA

2573 lnk 05

OUTPUT DRIVE CHARACTERISTICS FOR FCT827T

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
V_{OH}	Output HIGH Voltage	V_{CC} = Min. V_{IN} = V_{IH} or V_{IL}	I_{OH} = –6mA MIL. I_{OH} = –8mA COM'L.	2.4	3.3	—	V
			I_{OH} = –12mA MIL. I_{OH} = –15mA COM'L.	2.0	3.0	—	V
V_{OL}	Output LOW Voltage	V_{CC} = Min. V_{IN} = V_{IH} or V_{IL}	I_{OL} = 32mA MIL. I_{OL} = 48mA COM'L.	—	0.3	0.5	V
I_{OS}	Short Circuit Current	V_{CC} = Max., V_O = GND[3]		–60	–120	–225	mA

2573 lnk 06

OUTPUT DRIVE CHARACTERISTICS FOR FCT2827T

Symbol	Parameter	Test Conditions[1]		Min.	Typ.[2]	Max.	Unit
I_{ODL}	Output LOW Current	V_{CC} = 5V, V_{IN} = V_{IH} or V_{IL}, V_{OUT} = 1.5V[3]		16	48	—	mA
I_{ODH}	Output HIGH Current	V_{CC} = 5V, V_{IN} = V_{IH} or V_{IL}, V_{OUT} = 1.5V[3]		–16	–48	—	mA
V_{OH}	Output HIGH Voltage	V_{CC} = Min. V_{IN} = V_{IH} or V_{IL}	I_{OH} = –12mA MIL. I_{OH} = –15mA COM'L.	2.4	3.3	—	V
V_{OL}	Output LOW Voltage	V_{CC} = Min. V_{IN} = V_{IH} or V_{IL}	I_{OL} = 12mA	—	0.3	0.50	V

2573 lnk 07

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 Vcc = 5.0V, +25°C ambient.
3. Not more than one output should be shorted at one time. Duration of the short circuit test should not exceed one second.
4. The test limit for this parameter is ±5µA at T_A = –55°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} = Max. V_{IN} = 3.4V[3]			—	0.5	2.0	mA
I_{CCD}	Dynamic Power Supply Current[4]	V_{CC} = Max. Outputs Open	V_{IN} = V_{CC} V_{IN} = GND	FCT827T	—	0.15	0.25	mA/ MHz
		$\overline{OE}_1$ = $\overline{OE}_2$ = GND One Input Toggling 50% Duty Cycle		FCT2827T	—	0.06	0.12	
I_C	Total Power Supply Current[6]	V_{CC} = Max.	V_{IN} = V_{CC}	FCT827T	—	1.5	3.5	mA
		Outputs Open fi = 10MHz	V_{IN} = GND	FCT2827T	—	0.6	2.2	
		50% Duty Cycle	V_{IN} = 3.4V	FCT827T	—	1.8	4.5	
		$\overline{OE}_1$ = $\overline{OE}_2$ = GND One Bit Toggling	V_{IN} = GND	FCT2827T	—	0.9	3.2	
		V_{CC} = Max.	V_{IN} = V_{CC}	FCT827T	—	3.0	6.0[5]	
		Outputs Open fi = 2.5MHz	V_{IN} = GND	FCT2827T	—	1.2	3.4[5]	
		50% Duty Cycle	V_{IN} = 3.4V	FCT827T	—	5.0	14.0[5]	
		$\overline{OE}_1$ = $\overline{OE}_2$ = GND Eight Bits Toggling	V_{IN} = GND	FCT2827T	—	3.2	11.4[5]	

2573 tbl 08

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} = 5.0V, +25°C ambient.
3. Per TTL driven input (V_{IN} = 3.4V). 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. $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$
   $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$
   I_{CC} = Quiescent Current
   ΔI_{CC} = Power Supply Current for a TTL High Input (V_{IN} = 3.4V)
   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)
   f_i = Input Frequency
   N_i = Number of Inputs at f_i
   All currents are in milliamps and all frequencies are in megahertz.

SWITCHING CHARACTERISTICS OVER OPERATING RANGE

			FCT827AT/FCT2827AT				FCT827BT/FCT2827BT				
			Com'l.		Mil.		Com'l.		Mil.		
Symbol	Parameter	Condition[1]	Min.[2]	Max.	Min.[2]	Max.	Min.[2]	Max.	Min.[2]	Max.	Unit
t_{PLH} t_{PHL}	Propagation Delay D_I to Y_I	C_L = 50pF R_L = 500Ω	1.5	8.0	1.5	9.0	1.5	5.0	1.5	6.5	ns
		C_L = 300pF[3] R_L = 500Ω	1.5	15.0	1.5	17.0	1.5	13.0	1.5	14.0	
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}_I$ to Y_I	C_L = 50pF R_L = 500Ω	1.5	12.0	1.5	13.0	1.5	8.0	1.5	9.0	ns
		C_L = 300pF[3] R_L = 500Ω	1.5	23.0	1.5	25.0	1.5	15.0	1.5	16.0	
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OE}_I$ to Y_I	C_L = 5pF[3] R_L = 500Ω	1.5	9.0	1.5	9.0	1.5	6.0	1.5	7.0	ns
		C_L = 50pF R_L = 500Ω	1.5	10.0	1.5	10.0	1.5	7.0	1.5	8.0	

2573 tbl 09

			FCT827CT/FCT2827CT				FCT827DT				
			Com'l.		Mil.		Com'l.		Mil.		
Symbol	Parameter	Condition[1]	Min.[2]	Max.	Min.[2]	Max.	Min.[2]	Max.	Min.[2]	Max.	Unit
t_{PLH} t_{PHL}	Propagation Delay D_I to Y_I	C_L = 50pF R_L = 500Ω	1.5	4.4	1.5	5.0	1.5	3.8	—	—	ns
		C_L = 300pF[3] R_L = 500Ω	1.5	10.0	1.5	11.0	1.5	7.5	—	—	
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}_I$ to Y_I	C_L = 50pF R_L = 500Ω	1.5	7.0	1.5	8.0	1.5	5.0	—	—	ns
		C_L = 300pF[3] R_L = 500Ω	1.5	14.0	1.5	15.0	1.5	9.0	—	—	
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OE}_I$ to Y_I	C_L = 5pF[3] R_L = 500Ω	1.5	5.7	1.5	6.7	1.5	4.3	—	—	ns
		C_L = 50pF R_L = 500Ω	1.5	6.0	1.5	7.0	1.5	4.3	—	—	

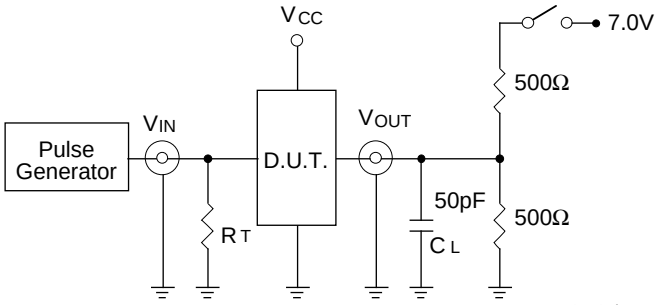
2573 tbl 10

NOTES:

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

TEST CIRCUITS AND WAVEFORMS

TEST CIRCUITS FOR ALL OUTPUTS



2573 drw 04

SWITCH POSITION

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

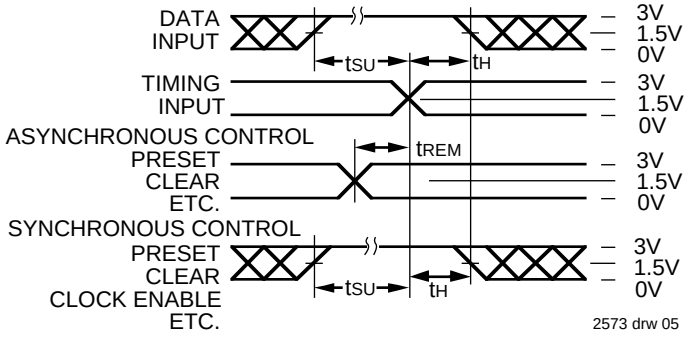
2573 lnk 11

DEFINITIONS:

C_L= Load capacitance: includes jig and probe capacitance.

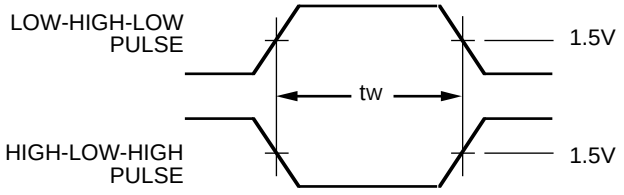
R_T = Termination resistance: should be equal to Z_{OUT} of the Pulse Generator.

SET-UP, HOLD AND RELEASE TIMES



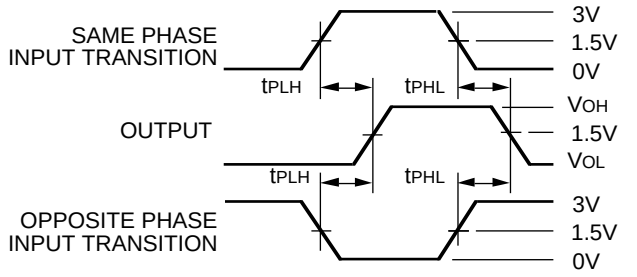
2573 drw 05

PULSE WIDTH



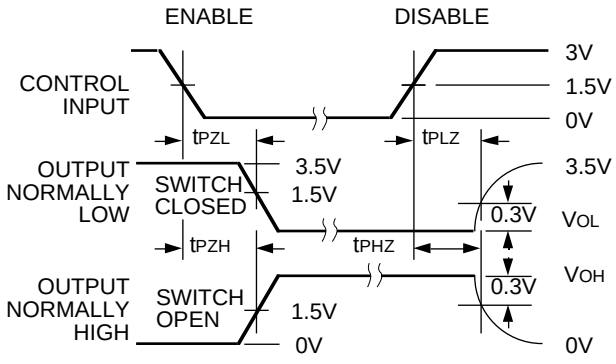
2573 drw 06

PROPAGATION DELAY



2573 drw 07

ENABLE AND DISABLE TIMES

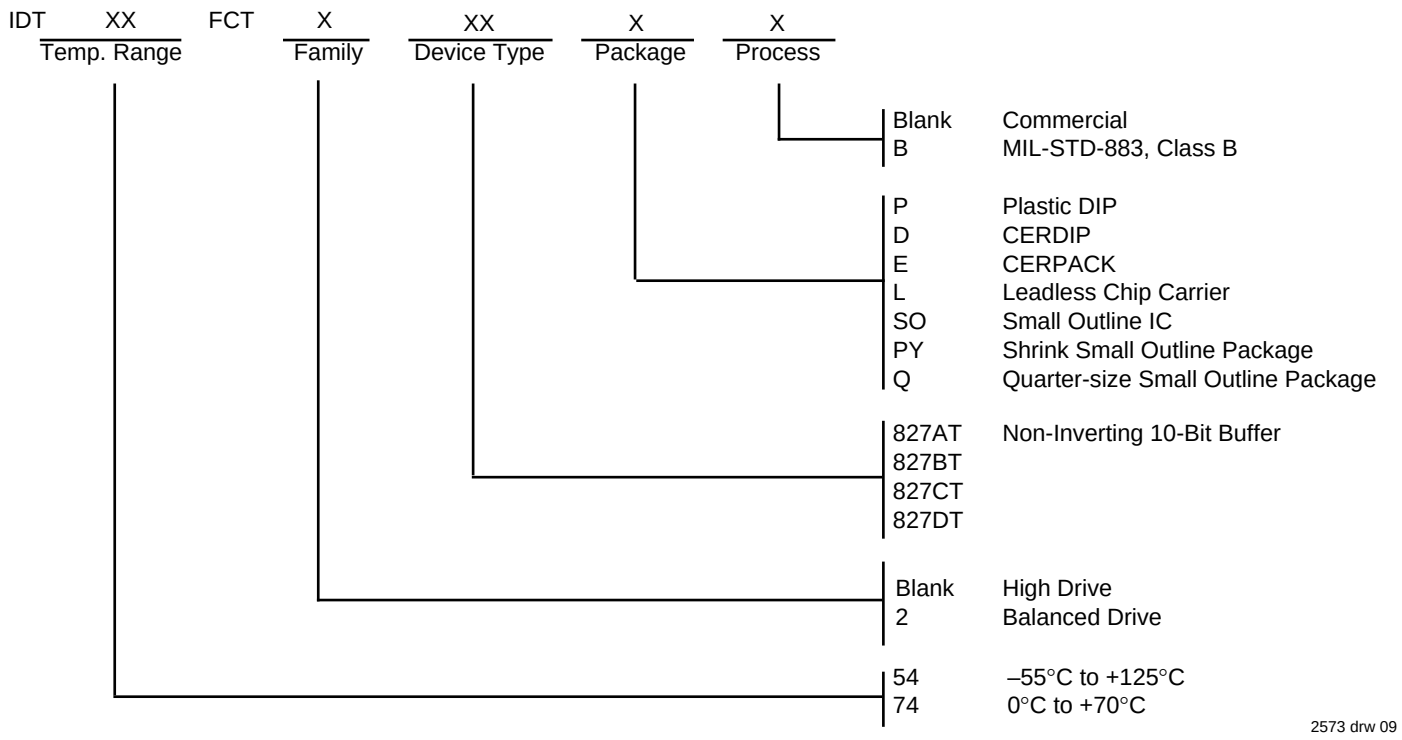


2573 drw 08

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

ORDERING INFORMATION



2573 drw 09