National Semiconductor

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74F779
8-Bit Bidirectional Binary Counter with TRI-STATE® Outputs

General Description

The 'F779 is a fully synchronous 8-stage up/down counter with multiplexed TRI-STATE I/O ports for bus-oriented applications. All control functions (hold, count up, count down, synchronous load) are controlled by two mode pins (S_0, S_1). The device also features carry lookahead for easy cascading. All state changes are initiated by the rising edge of the clock.

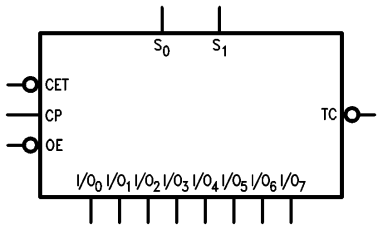
Features

- Multiplexed TRI-STATE I/O ports
- Built-in lookahead carry capability
- Count frequency 100 MHz typ
- Supply current 80 mA typ
- Guaranteed 4000V minimum ESD protection
- Available in SOIC (300 mil only)

Commercial	Package Number	Package Description
74F779PC	N16E	16-Lead (0.300″ Wide) Molded Dual-In-Line
74F779SC (Note 1)	M16B	16-Lead (0.300″ Wide) Molded Small Outline, JEDEC

Note 1: Devices also available in 13″ reel. Use suffix = SCX.

Logic Symbol



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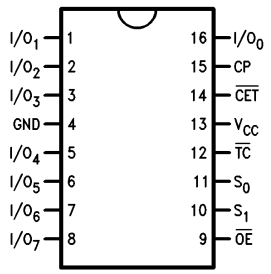
Connection Diagram

Pin Assignment for DIP and SOIC



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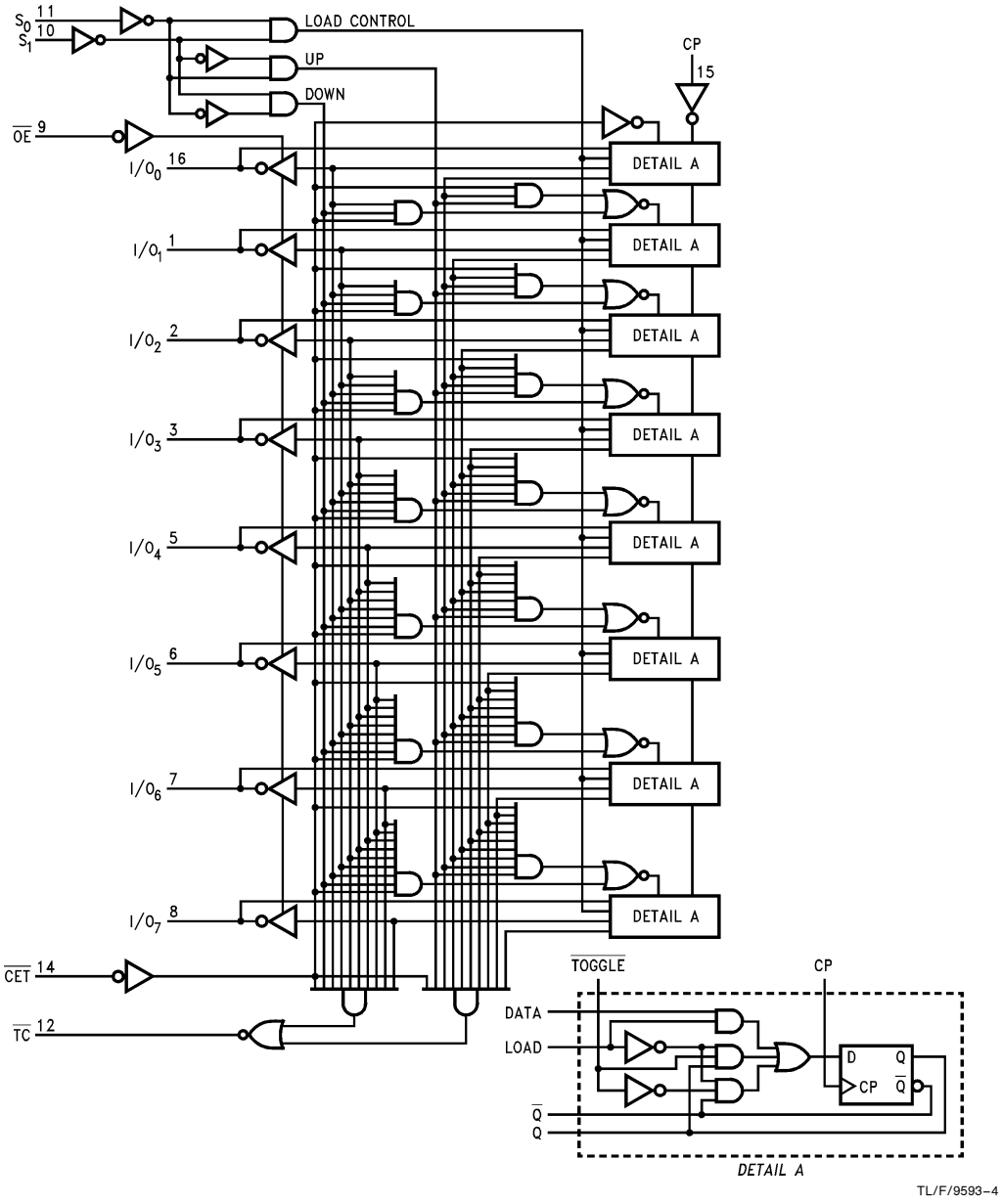
Logic Diagram



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Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

Unit Loading/Fan Out

Pin Names	Description	74F	
		U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
I/O_0–I/O_7	Data Inputs	0.25/0.33	5 μA/−0.2 mA
	Data Outputs	75/15 (12.5)	−3 mA/24 mA (20 mA)
S_0, S_1	Select Inputs	0.25/0.33	5 μA/−0.2 mA
$\overline{OE}$	Output Enable Input (Active LOW)	0.25/0.33	5 μA/−0.2 mA
$\overline{CET}$	Count Enable Trickle Input (Active LOW)	0.25/0.33	5 μA/−0.2 mA
CP	Clock Pulse Input (Active Rising Edge)	0.25/0.33	5 μA/−0.2 mA
$\overline{TC}$	Terminal Count Output (Active LOW)	25/12.5	−1 mA/20 mA

Function Table

S_1	S_0	$\overline{CET}$	$\overline{OE}$	CP	Function
X	X	X	H	X	I/O_0 to I/O_7 in High Z
X	X	X	L	X	Flip-Flop Outputs Appear on I/O Lines
L	L	X	H	⌐‾	Parallel Load All Flip-Flops
(Not LL)		H	X	⌐‾	Hold ($\overline{TC}$ Held HIGH)
H	H	X	X	⌐‾	Hold
H	L	L	X	⌐‾	Count Up
L	H	L	X	⌐‾	Count Down

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial
⌐‾ = LOW-to-HIGH Clock Transition
(Not LL) means S_0 and S_1 should never both be LOW level at the same time.

Absolute Maximum Ratings (Note 1)

Storage Temperature	−65°C to +150°C
Ambient Temperature under Bias	−55°C to +125°C
Junction Temperature under Bias	−55°C to +175°C
Plastic	−55°C to +150°C
V_{CC} Pin Potential to Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Output in HIGH State (with V_{CC} = 0V)	
Standard Output	−0.5V to V_{CC}
TRI-STATE Output	−0.5V to +5.5V
Current Applied to Output in LOW State (Max)	twice the rated I_{OL} (mA)
ESD Last Passing Voltage (Min)	4000V

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

Recommended Operating Conditions

Free Air Ambient Temperature	
Commercial	0°C to +70°C
Supply Voltage	
Commercial	+4.5V to +5.5V

DC Electrical Characteristics

Symbol	Parameter		74F			Units	V_{CC}	Conditions
			Min	Typ	Max			
V_{IH}	Input HIGH Voltage		2.0			V		Recognized as a HIGH Signal
V_{IL}	Input LOW Voltage				0.8	V		Recognized as a LOW Signal
V_{CD}	Input Clamp Diode Voltage				−1.2	V	Min	I_{IN} = −18 mA
V_{OH}	Output HIGH Voltage	74F 10% V_{CC} 74F 5% V_{CC}	2.4 2.7			V	Min	I_{OH} = −3 mA
V_{OL}	Output LOW Voltage	74F 10% V_{CC} 74F 5% V_{CC}			0.5 0.5	V	Min	I_{OL} = 20 mA I_{OL} = 20 mA
I_{IH}	Input HIGH Current	74F			5.0	μA	Max	V_{IN} = 2.7V (Non-I/O Pins)
I_{BVI}	Input HIGH Current Breakdown Test	74F			7.0	μA	Max	V_{IN} = 7.0V (Non-I/O Pins)
I_{BVIT}	Input HIGH Current Breakdown (I/O)	74F			0.5	mA	Max	V_{IN} = 5.5V (I/O_n)
I_{CEX}	Output HIGH Leakage Current	74F			50	μA	Max	V_{OUT} = V_{CC}
V_{ID}	Input Leakage Test	74F	4.75			V	0.0	I_{ID} = 1.9 μA All other pins grounded
I_{OD}	Output Leakage Circuit Current	74F			3.75	μA	0.0	V_{IOD} = 150 mV All other pins grounded
I_{ZZ}	Bus Drainage Test				500	μA	0.0	V_{OUT} = 5.25V
I_{IL}	Input LOW Current				−0.2	mA	Max	V_{IN} = 0.5V (Non I/O Pins)
$I_{IH} + I_{OZH}$	Output Leakage Current				70	μA	Max	V_{OUT} = 2.7V (I/O_n)
$I_{IL} + I_{OZL}$	Output Leakage Current				−200	μA	Max	V_{OUT} = 0.5V (I/O_n)
I_{OS}	Output Short-Circuit Current		−60		−150	mA	Max	V_{OUT} = 0V
I_{CCH}	Power Supply Current				90	mA	Max	V_O = HIGH
I_{CCL}	Power Supply Current				105	mA	Max	V_O = LOW
I_{CCZ}	Power Supply Current				110	mA	Max	V_O = HIGH Z

AC Electrical Characteristics

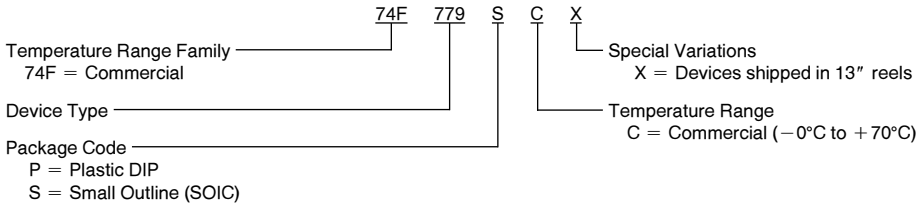
Symbol	Parameter	74F $T_A = +25°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF			74F T_A, V_{CC} = Com, $C_L = 50$ pF		Units
		Min	Typ	Max	Min	Max	
f_{max}	Maximum Clock Frequency	100	105		90		
t_{PLH} t_{PHL}	Propagation Delay CP to I/O_n	3.0 5.0	5.0 7.5	8.0 11.0	3.0 5.0	8.5 11.0	ns
t_{PLH} t_{PHL}	Propagation Delay CP to $\overline{TC}$	5.0 5.0	7.5 9.3	9.0 10.5	5.0 5.0	10.0 11.5	ns
t_{PLH} t_{PHL}	Propagation Delay $\overline{CET}$ to $\overline{TC}$	2.5 4.5	3.8 6.1	5.5 8.0	2.5 4.5	6.0 8.5	ns
t_{PLH} t_{PHL}	Propagation Delay SN to $\overline{TC}$	3.5 3.5	6.5 7.5	12.0 12.0	3.5 3.5	13.0 13.0	ns
t_{PZH} t_{PZL}	Output Enable Time $\overline{OE}$ to I/O_n	3.0 5.0	5.0 8.0	7.0 10.0	3.0 5.0	8.0 10.5	ns
t_{PHZ} t_{PLZ}	Output Disable Time $\overline{OE}$ to I/O_n	1.0 1.0	4.0 3.7	6.5 6.5	1.0 1.0	7.0 7.0	ns

AC Operating Requirements

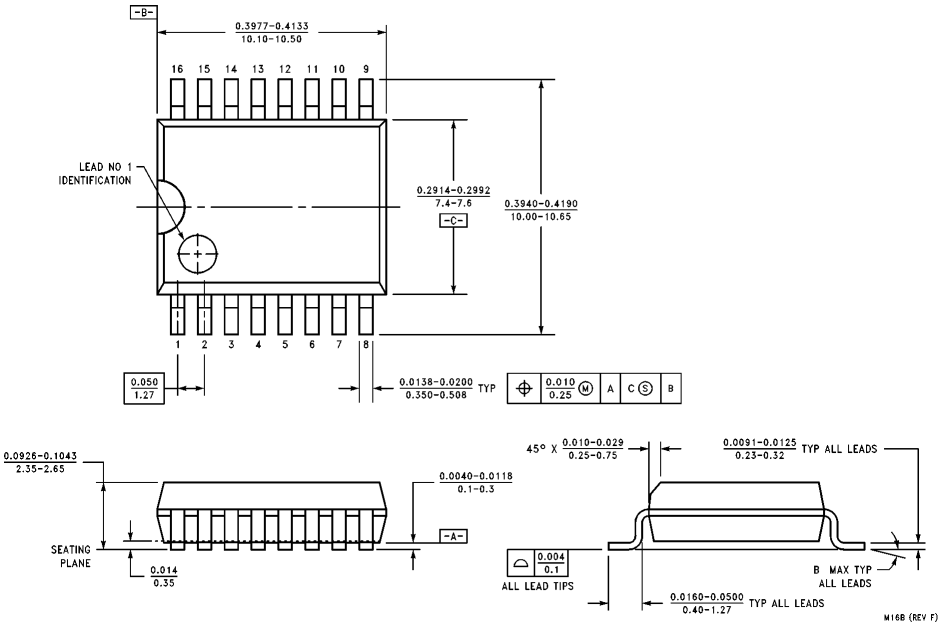
Symbol	Parameter	74F $T_A = +25°C$, $V_{CC} = +5.0V$		74F T_A, V_{CC} = Com		Units
		Min	Max	Min	Max	
$t_s(H)$ $t_s(L)$	Setup Time I/O_n to CP	5.0 5.0		5.0 5.0		ns
$t_h(H)$ $t_h(L)$	Hold Time I/O_n to CP	0.0 0.0		0.0 0.0		ns
$t_s(H)$ $t_s(L)$	Setup Time Sn to CP	9.5 9.5		10.0 10.0		ns
$t_h(H)$ $t_h(L)$	Hold Time Sn to CP	0.0 0.0		0.0 0.0		ns
$t_s(H)$ $t_s(L)$	Setup Time $\overline{CET}$ to CP	7.0 7.0		7.0 7.0		ns
$t_h(H)$ $t_h(L)$	Hold Time $\overline{CET}$ to CP	0.0 0.0		0.0 0.0		ns
$t_w(H)$ $t_w(L)$	Clock Pulse Width High or Low	4.0 4.0		4.0 4.0		ns

Ordering Information

The device number is used to form part of a simplified purchasing code where a package type and temperature range are defined as follows:

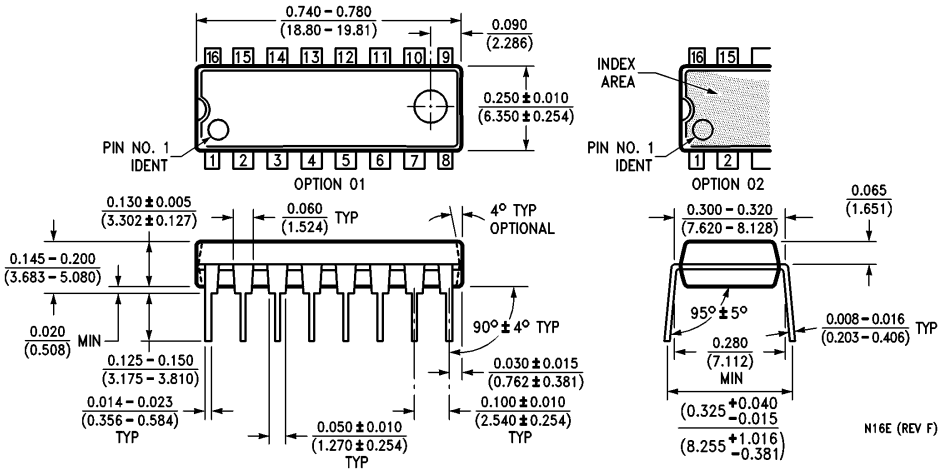


Physical Dimensions inches (millimeters)



16-Lead (0.300″ Wide) Small Outline Package, JEDEC
NS Package Number M16B

Physical Dimensions inches (millimeters) (Continued)



16-Lead (0.300″ Wide) Molded Dual-In-Line Package (P)
NS Package Number N16E

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