

# DATA SHEET

**74F779**

**8-bit bidirectional binary counter (3-State)**

Product specification

1989 Sep 20

IC15 Data Handbook

## 8-bit bidirectional binary counter (3-State)

74F779

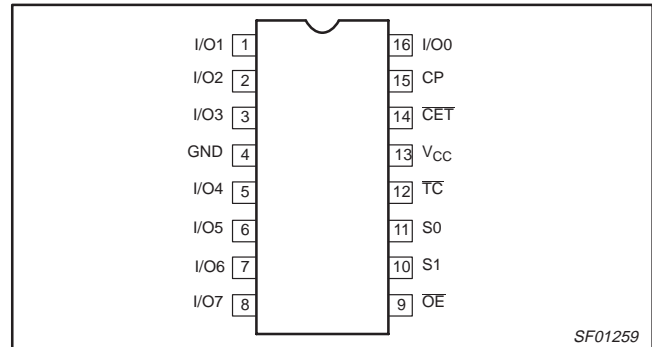
## FEATURES

- Multiplexed 3-State I/O ports for bus oriented applications
- Built-in look-ahead carry capability
- Center power pins to reduce effects of package inductance
- Count frequency 145MHz typical
- Supply current 90mA typical
- See 74F269 for 24-pin separate I/O port version
- See 74F579 for 20-pin version
- See 74F1779 for extended function version of the 74F799

## DESCRIPTION

The 74F779 is a fully synchronous 8-stage Up/Down Counter with multiplexed 3-State I/O ports for bus-oriented applications. All control functions (hold, count up, count down, synchronous load) are controlled by two mode pins (S0, S1). The device also features carry look-ahead for easy cascading. All state changes are initiated by the rising edge of the clock. When  $\overline{CET}$  is High the data outputs are held in their current state and  $\overline{TC}$  is held High. The  $\overline{TC}$  output is not recommended for use as a clock or asynchronous reset due to the possibility of decoding spikes.

## PIN CONFIGURATION



TYPE	TYPICAL $f_{MAX}$	TYPICAL SUPPLY CURRENT (TOTAL)
74F779	145MHz	90mA

## ORDERING INFORMATION

DESCRIPTION	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$ , $T_{amb} = 0^{\circ}C$ to $+70^{\circ}C$	PKG DWG #
16-Pin Plastic DIP	N74F779N	SOT38-4
16-Pin Plastic SOL	N74F779D	SOT 162-1

## INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

PINS	DESCRIPTION	74F(U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
I/On	Data inputs	3.5/1.0	70 $\mu$ A/0.6mA
	Data outputs	150/40	3.0mA/24mA
S0, S1	Select inputs	1.0/1.0	20 $\mu$ A/0.6mA
$\overline{OE}$	Output Enable input (active Low)	1.0/1.0	20 $\mu$ A/0.6mA
$\overline{CET}$	Count Enable Trickle input (active Low)	1.0/1.0	20 $\mu$ A/0.6mA
CP	Clock input (active rising edge)	1.0/1.0	20 $\mu$ A/0.6mA
$\overline{TC}$	Terminal Count output (active Low)	50/33	1.0mA/20mA

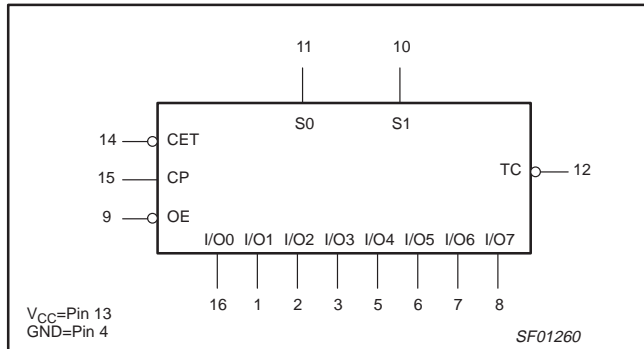
## NOTE:

One (1.0) FAST Unit Load is defined as: 20 $\mu$ A in the High state and 0.6mA in the Low state.

# 8-bit bidirectional binary counter (3-State)

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## LOGIC SYMBOL

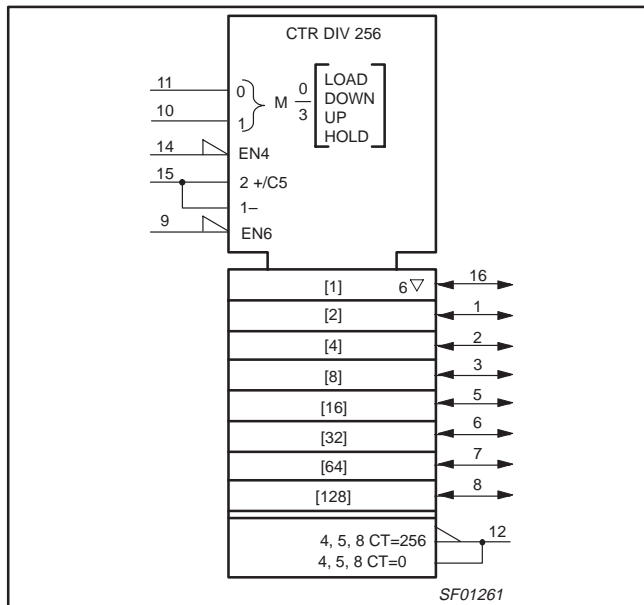


## FUNCTION TABLE

INPUTS					OPERATING MODE
S1	S0	CET	OE	CP	
X	X	X	H	X	I/O0 to I/O7 in High impedance
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 (TC held High)
H	L	L	X	↑	Count up
L	H	L	X	↑	Count down

H = High voltage level  
 L = Low voltage level  
 X = Don't care  
 ↑ = Low-to-High clock transition  
 (not LL) = S0 and S1 should never be Low voltage level at the same time in the hold mode only.

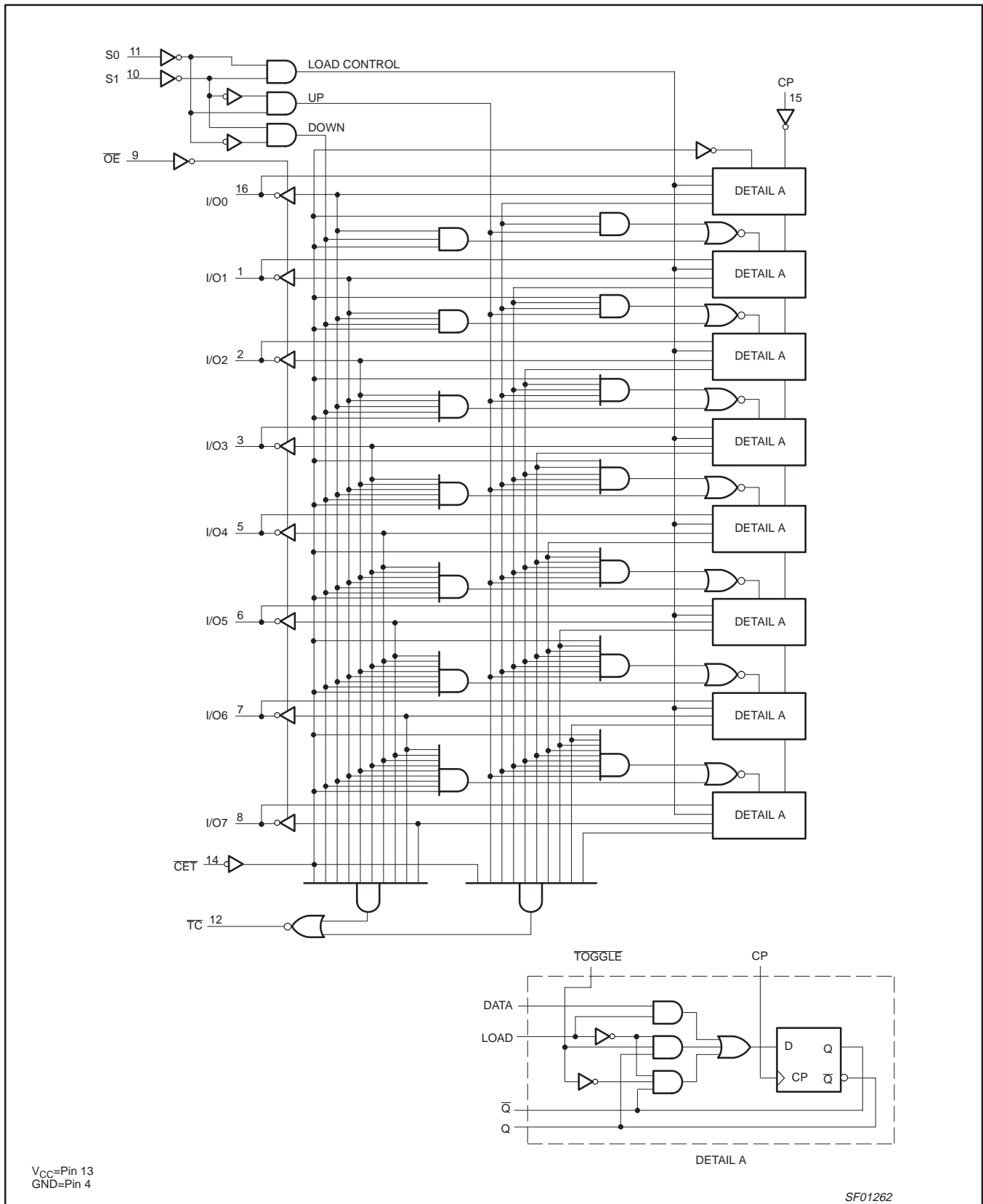
## LOGIC SYMBOL (IEEE/IEC)



# 8-bit bidirectional binary counter (3-State)

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## LOGIC DIAGRAM



## 8-bit bidirectional binary counter (3-State)

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**ABSOLUTE MAXIMUM RATINGS**

(Operation beyond the limits set forth in this table may impair the useful life of the device.  
Unless otherwise noted these limits are over the operating free-air temperature range.)

SYMBOL	PARAMETER		RATING	UNIT
V <sub>CC</sub>	Supply voltage		-0.5 to +7.0	V
V <sub>IN</sub>	Input voltage		-0.5 to +7.0	V
I <sub>IN</sub>	Input current		-30 to +5	mA
V <sub>OUT</sub>	Voltage applied to output in High output state		-0.5 to V <sub>CC</sub>	V
I <sub>OUT</sub>	Current applied to output in Low output state	$\overline{TC}$	40	mA
		I/On	48	mA
T <sub>amb</sub>	Operating free-air temperature range		0 to +70	°C
T <sub>stg</sub>	Storage temperature		-65 to +150	°C

**RECOMMENDED OPERATING CONDITIONS**

SYMBOL	PARAMETER	LIMITS			UNIT
		MIN	NOM	MAX	
V <sub>CC</sub>	Supply voltage	4.5	5.0	5.5	V
V <sub>IH</sub>	High-level input voltage	2.0			V
V <sub>IL</sub>	Low-level input voltage			0.8	V
I <sub>IK</sub>	Input clamp current			-18	mA
I <sub>OH</sub>	High-level output current	$\overline{TC}$		-1	mA
		I/On		-3	mA
I <sub>OL</sub>	Low-level output current	$\overline{TC}$		20	mA
		I/On		24	mA
T <sub>amb</sub>	Operating free-air temperature range	0		70	°C

## 8-bit bidirectional binary counter (3-State)

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**DC ELECTRICAL CHARACTERISTICS**

(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER	TEST CONDITIONS <sup>NO TAG</sup>	LIMITS			UNIT			
			MIN	TYP NO TAG	MAX				
V <sub>OH</sub>	High-level output voltage	$\overline{TC}$	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX V <sub>IH</sub> = MIN	I <sub>OH</sub> = -1mA	±10%V <sub>CC</sub>	2.5		V	
					±5%V <sub>CC</sub>	2.7	3.4	V	
		I/On	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX V <sub>IH</sub> = MIN	I <sub>OH</sub> = -3mA	±10%V <sub>CC</sub>	2.4		V	
					±5%V <sub>CC</sub>	2.7	3.3	V	
V <sub>OL</sub>	Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = MAX V <sub>IH</sub> = MIN	I <sub>OL</sub> = MAX	±10%V <sub>CC</sub>		0.30	0.50	V	
				±5%V <sub>CC</sub>		0.35	0.50	V	
V <sub>IK</sub>	Input clamp voltage	V <sub>CC</sub> = MIN, I <sub>I</sub> = I <sub>IK</sub>				-0.73	-1.2	V	
I <sub>I</sub>	Input current at maximum input voltage	I/On	V <sub>CC</sub> = 5.5V, V <sub>I</sub> = 5.5V					1	mA
		others	V <sub>CC</sub> = 5.5V, V <sub>I</sub> = 7.0V					100	μA
I <sub>IH</sub>	High-level input current	except I/On	V <sub>CC</sub> = MAX, V <sub>I</sub> = 2.7V					20	μA
I <sub>IL</sub>	Low-level input current	I/On	V <sub>CC</sub> = MAX, V <sub>I</sub> = 0.5V					-0.6	mA
I <sub>IH</sub> +I <sub>OZH</sub>	Off-state output current High-level voltage applied	I/On	V <sub>CC</sub> = MAX, V <sub>O</sub> = 2.7V					70	μA
I <sub>IL</sub> +I <sub>OZL</sub>	Off-state output current Low-level voltage applied		V <sub>CC</sub> = MAX, V <sub>O</sub> = 0.5V					-600	μA
I <sub>OS</sub>	Short-circuit output current <sup>NO TAG</sup>	V <sub>CC</sub> = MAX			-60		-150	mA	
I <sub>CC</sub>	Supply current (total)	I <sub>CCH</sub>	V <sub>CC</sub> = MAX				82	116	mA
		I <sub>CCL</sub>					91	128	mA
		I <sub>CCZ</sub>					97	136	mA

**NOTES:**

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V<sub>CC</sub> = 5V, T<sub>amb</sub> = 25°C.
- Not more than one output should be shorted at a time. For testing I<sub>OS</sub>, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I<sub>OS</sub> tests should be performed last.

**AC ELECTRICAL CHARACTERISTICS**

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			T <sub>amb</sub> = +25°C V <sub>CC</sub> = +5V C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			T <sub>amb</sub> = 0°C to +70°C V <sub>CC</sub> = +5V ± 10% C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω		
			MIN	TYP	MAX	MIN	MAX	
f <sub>MAX</sub>	Maximum clock frequency	Waveform 1	125	145		115		MHz
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay CP to I/On	Waveform 1	4.5	7.0	10.5	4.5	11.0	ns
			5.5	8.0	10.5	5.5	11.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay CP to $\overline{TC}$	Waveform 1	4.5	7.0	9.0	4.5	10.0	ns
			4.5	7.0	9.0	4.5	10.0	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation delay $\overline{CET}$ to $\overline{TC}$	Waveform 2	3.0	4.5	6.5	2.5	7.5	ns
			3.0	5.5	7.5	2.5	8.0	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable time to High or Low level	Waveform 4	2.5	4.5	7.0	2.5	8.0	ns
		Waveform 5	4.5	6.5	9.0	4.5	9.5	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Enable time from High or Low level	Waveform 4	1.0	3.0	6.5	1.0	8.0	ns
		Waveform 5	1.0	4.0	7.0	1.0	8.0	ns

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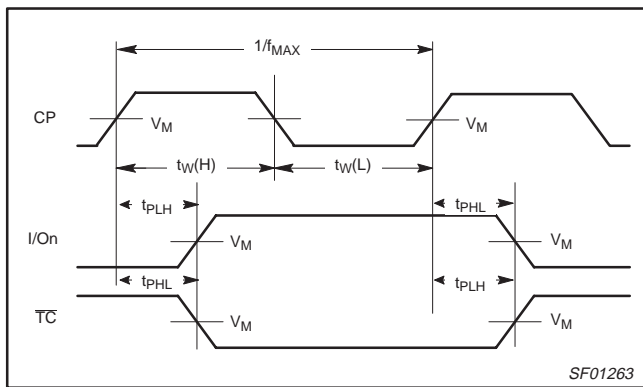
## AC SETUP REQUIREMENTS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS					UNIT
			T <sub>amb</sub> = +25°C V <sub>CC</sub> = +5V C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω			T <sub>amb</sub> = 0°C to +70°C V <sub>CC</sub> = +5V ± 10% C <sub>L</sub> = 50pF, R <sub>L</sub> = 500Ω		
			MIN	TYP	MAX	MIN	MAX	
t <sub>s</sub> (H) t <sub>s</sub> (L)	Setup time, High or Low I/O <sub>n</sub> to CP	Waveform 3	5.0 5.0			5.0 5.0		ns
t <sub>h</sub> (H) t <sub>h</sub> (L)	Hold time, High or Low I/O <sub>n</sub> to CP	Waveform 3	1.0 1.0			1.0 1.0		ns
t <sub>s</sub> (H) t <sub>s</sub> (L)	Setup time, High or Low CET to CP	Waveform 3	5.0 5.5			5.0 6.0		ns
t <sub>h</sub> (H) t <sub>h</sub> (L)	Hold time, High or Low CET to CP	Waveform 3	0 0			0 0		ns
t <sub>s</sub> (H) t <sub>s</sub> (L)	Setup time, High or Low Sn to CP	Waveform 3	8.0 8.0			8.5 8.5		ns
t <sub>h</sub> (H) t <sub>h</sub> (L)	Hold time, High or Low Sn to CP	Waveform 3	0 0			0 0		ns
t <sub>w</sub> (H) t <sub>w</sub> (L)	CP Pulse width, High or Low	Waveform 1	4.0 4.0			4.0 4.0		ns

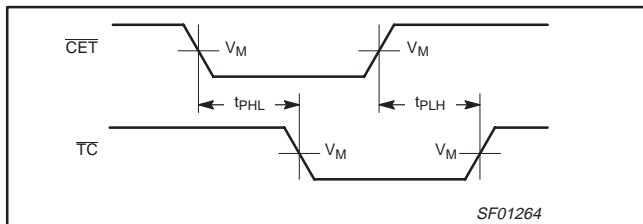
## AC WAVEFORMS

For all waveforms, V<sub>M</sub> = 1.5V.

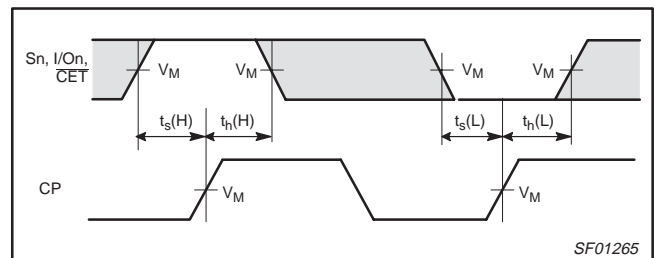
The shaded areas indicate when the input is permitted to change for predictable output performance.



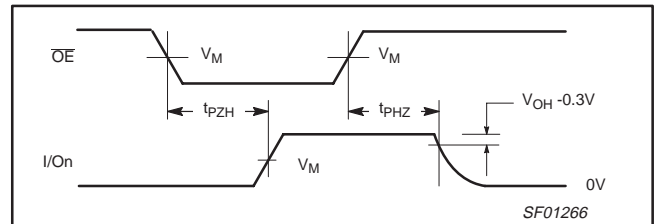
Waveform 1. Propagation Delay, Clock Input to Output, Clock Pulse Width, and Maximum Clock Frequency



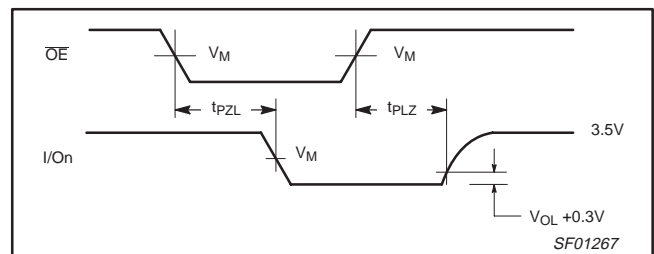
Waveform 2. Propagation Delay CET Input to Terminal Count Output



Waveform 3. Data Setup and Hold Times



Waveform 4. 3-State Output Enable Time to High Level and Output Disable Time from High Level

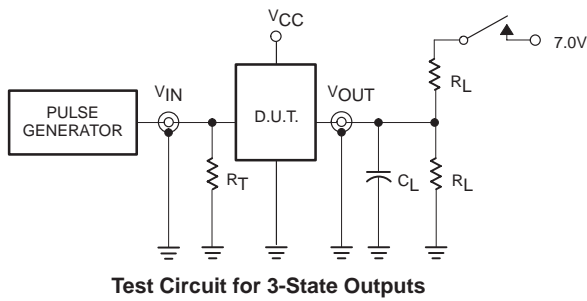


Waveform 5. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level

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## TEST CIRCUIT AND WAVEFORMS

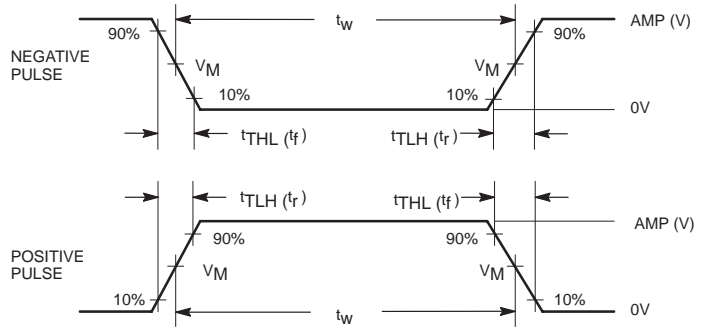


**SWITCH POSITION**

TEST	SWITCH
$t_{PLZ}$	closed
$t_{PZL}$	closed
All other	open

**DEFINITIONS:**

$R_L$  = Load resistor;  
 see AC electrical characteristics for value.  
 $C_L$  = Load capacitance includes jig and probe capacitance;  
 see AC electrical characteristics for value.  
 $R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of  
 pulse generators.



family	INPUT PULSE REQUIREMENTS					
	amplitude	$V_M$	rep. rate	$t_w$	$t_{TLH}$	$t_{THL}$
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

SF00777

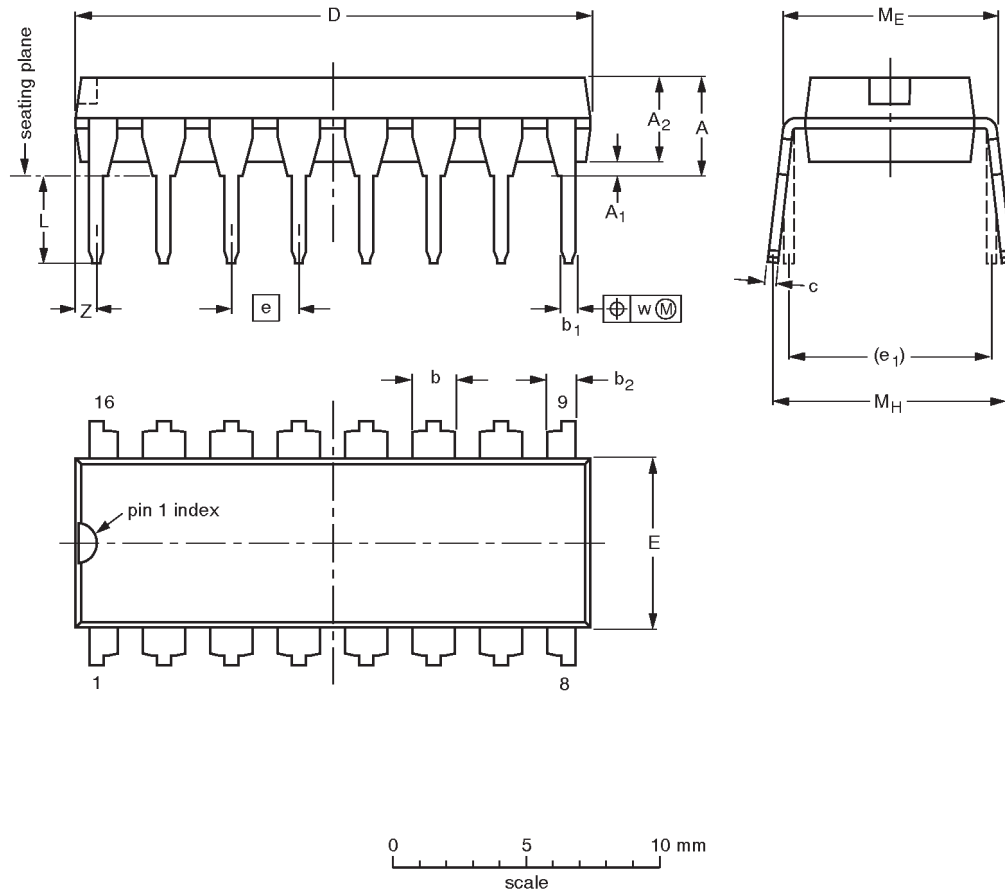


# 8-bit bidirectional binary counter (3-State)

74F779

DIP16: plastic dual in-line package; 16 leads (300 mil)

SOT38-4



**DIMENSIONS** (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	b <sub>2</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	1.25 0.85	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	0.76
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.049 0.033	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.030

**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

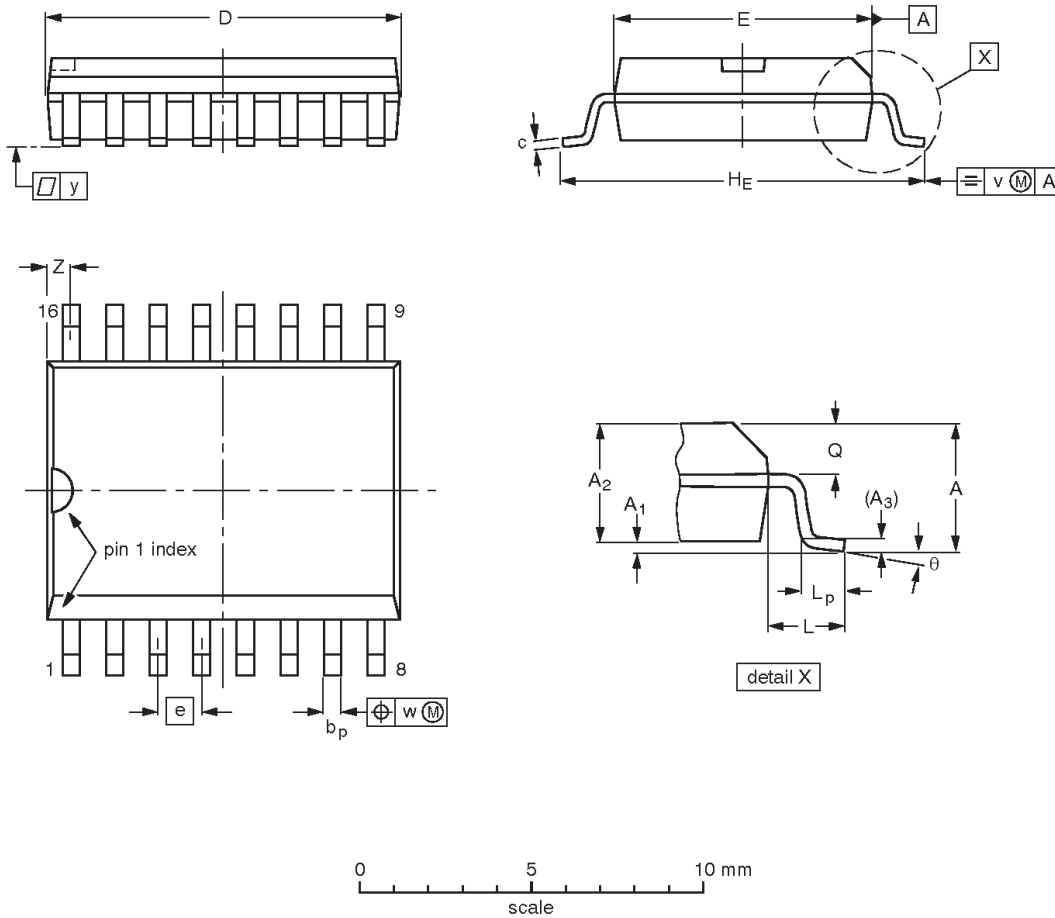
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT38-4						92-11-17 95-01-14

# 8-bit bidirectional binary counter (3-State)

74F779

SO16: plastic small outline package; 16 leads; body width 7.5 mm

SOT162-1



**DIMENSIONS (inch dimensions are derived from the original mm dimensions)**

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	z <sup>(1)</sup>	θ
mm	2.65	0.30 0.10	2.45 2.25	0.25	0.49 0.36	0.32 0.23	10.5 10.1	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10	0.012 0.004	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.41 0.40	0.30 0.29	0.050	0.419 0.394	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT162-1	075E03	MS-013AA				95-01-24 97-05-22

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8-bit bidirectional binary counter (3-State)

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**NOTES**

## 8-bit bidirectional binary counter (3-State)

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## Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
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[1] Please consult the most recently issued datasheet before initiating or completing a design.

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