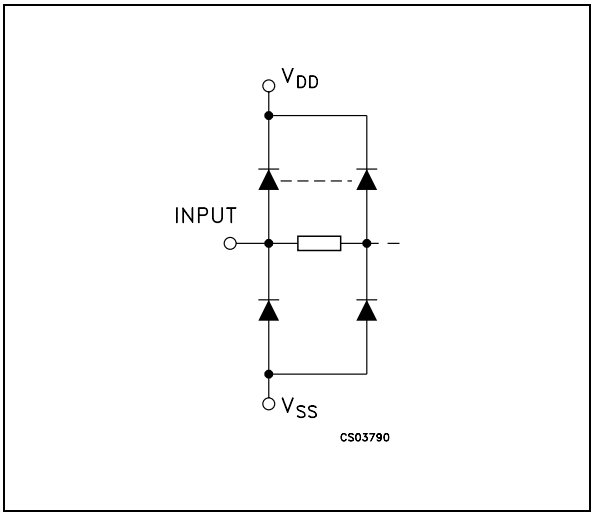
inputs are high at the time of zero count, the counters will jump to the maximum count, giving a counting sequence of 256 clock pulses long.

HCF40103B may be cascaded using the $\overline{CI/CE}$ input and the $\overline{CO/ZD}$ output, in either a synchronous or ripple mode.

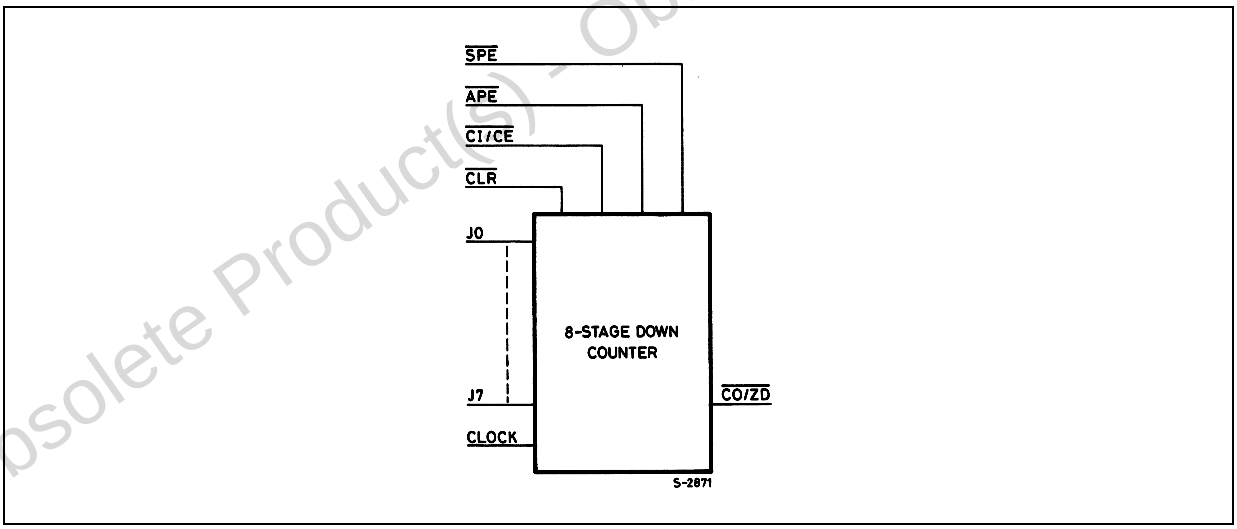
IINPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	CLOCK	Clock Input (LOW to HIGH edge triggered)
2	$\overline{CLEAR}$	Asynchronous Master Reset Input (Active Low)
3	$\overline{CI/CE}$	Terminal Enable Input
4, 5, 6, 7, 10, 11, 12, 13	J0 to J7	Jam Inputs
9	$\overline{APE}$	Asynchronous Preset Enable Inputs(Active Low)
14	$\overline{CO/ZD}$	Terminal Count Output (Active Low)
15	$\overline{SPE}$	Synchronous Preset Enable Input (Active Low)
8	V_{SS}	Negative Supply Voltage
16	V_{DD}	Positive Supply Voltage

FUNCTIONAL DIAGRAM

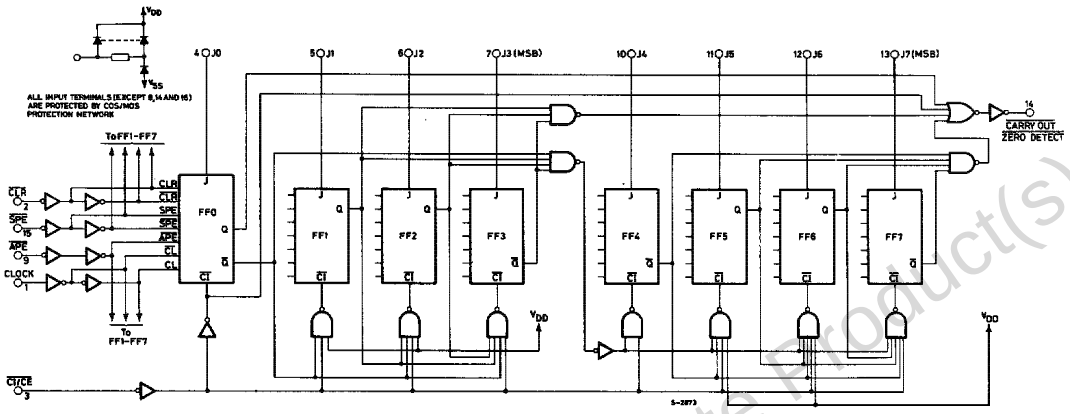


TRUTH TABLES

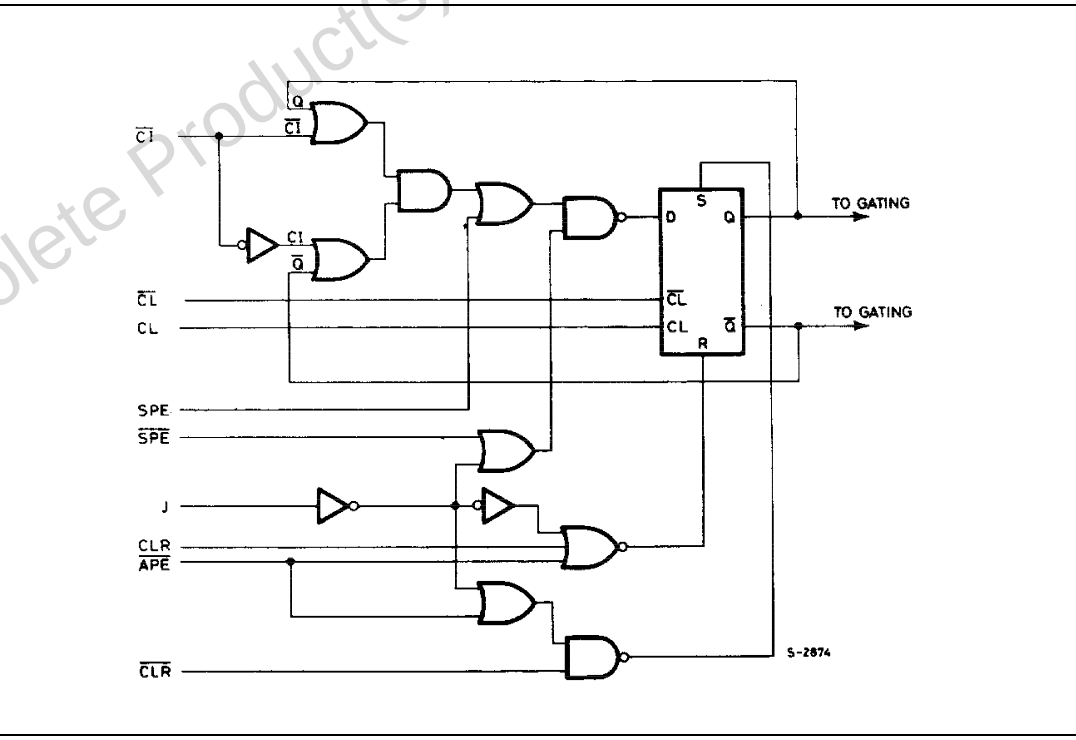
CONTROL INPUTS				PRESET MODE	ACTION
$\overline{CLR}$	$\overline{APE}$	$\overline{SPE}$	$\overline{CI/CE}$		
H	H	H	H	Synchronous	Inhibit Counter
H	H	H	L		Count Down
H	H	L	X		Preset on Next Positive Clock Transition
H	L	X	X	Asynchronous	Preset Asynchronously
L	X	X	X		Clear to Maximum Count

X : Don't Care
Clock connected to Clock input
Synchronous Operation : changes occur on negative to positive clock transitions.

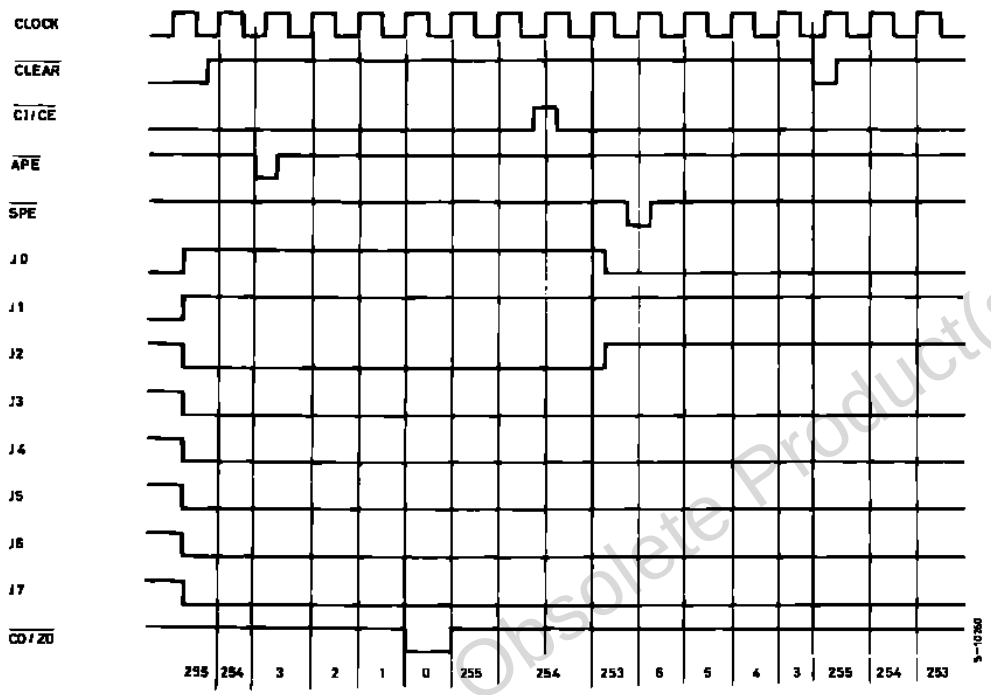
LOGIC DIAGRAM



LOGIC DIAGRAM FOR FLIP-FLOPS, FF0-FF7



TIMING CHART



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	-0.5 to +22	V
V_I	DC Input Voltage	-0.5 to V_{DD} + 0.5	V
I_I	DC Input Current	± 10	mA
P_D	Power Dissipation per Package	200	mW
	Power Dissipation per Output Transistor	100	mW
T_{op}	Operating Temperature	-55 to +125	°C
T_{stg}	Storage Temperature	-65 to +150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied.
All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	3 to 20	V
V_I	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature	-55 to 125	°C

DC SPECIFICATIONS

Symbol	Parameter	Test Condition				Value							Unit
		V_I (V)	V_O (V)	$\|I_O\|$ (μA)	V_{DD} (V)	T_A = 25°C			-40 to 85°C		-55 to 125°C		
						Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
I_L	Quiescent Current	0/5			5		0.04	5		150		150	μA
		0/10			10		0.04	10		300		300	
		0/15			15		0.04	20		600		600	
		0/20			20		0.08	100		3000		3000	
V_{OH}	High Level Output Voltage	0/5		<1	5	4.95			4.95		4.95		V
		0/10		<1	10	9.95			9.95		9.95		
		0/15		<1	15	14.95			14.95		14.95		
V_{OL}	Low Level Output Voltage	5/0		<1	5		0.05			0.05		0.05	V
		10/0		<1	10		0.05			0.05		0.05	
		15/0		<1	15		0.05			0.05		0.05	
V_{IH}	High Level Input Voltage		0.5/4.5	<1	5	3.5			3.5		3.5		V
			1/9	<1	10	7			7		7		
			1.5/13.5	<1	15	11			11		11		
V_{IL}	Low Level Input Voltage		4.5/0.5	<1	5			1.5		1.5		1.5	V
			9/1	<1	10			3		3		3	
			13.5/1.5	<1	15			4		4		4	
I_{OH}	Output Drive Current	0/5	2.5	<1	5	-1.36	-3.2		-1.1		-1.1		mA
		0/5	4.6	<1	5	-0.44	-1		-0.36		-0.36		
		0/10	9.5	<1	10	-1.1	-2.6		-0.9		-0.9		
		0/15	13.5	<1	15	-3.0	-6.8		-2.4		-2.4		
I_{OL}	Output Sink Current	0/5	0.4	<1	5	0.44	1		0.36		0.36		mA
		0/10	0.5	<1	10	1.1	2.6		0.9		0.9		
		0/15	1.5	<1	15	3.0	6.8		2.4		2.4		
I_I	Input Leakage Current	0/18	Any Input		18		$\pm 10^{-5}$	±0.1		±1		±1	μA
C_I	Input Capacitance		Any Input				5	7.5					pF

The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD}=5V, 2V min. with V_{DD}=10V, 2.5V min. with V_{DD}=15V

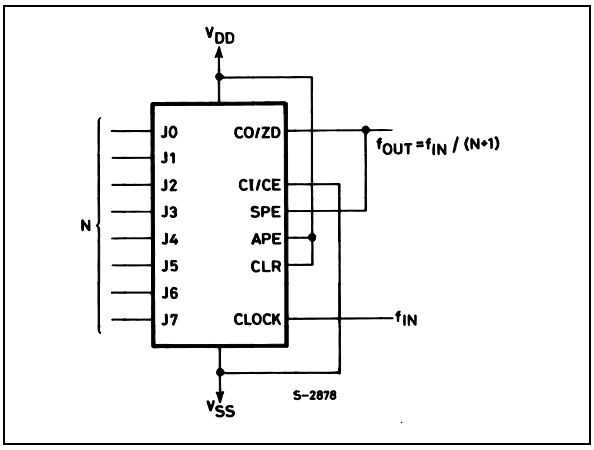
DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, C_L = 50pF, R_L = 200KΩ, $t_r = t_f$ = 20 ns)

Symbol	Parameter	Test Condition		Value (*)			Unit
		V_{DD} (V)		Min.	Typ.	Max.	
t_{PHL} t_{PLH}	Propagation Delay Time Clock To Out	5			300	600	ns
		10			130	260	
		15			95	190	
t_{PHL} t_{PLH}	Propagation Delay Time Carry In/counter Enable To Output	5			200	400	ns
		10			90	180	
		15			65	130	
t_{PHL} t_{PLH}	Propagation Delay Time Asynchronous Preset Enable To Output	5			650	1300	ns
		10			300	600	
		15			200	400	
t_{PHL} t_{PLH}	Propagation Delay Time $\overline{\text{Clear}}$ To Output	5			375	750	ns
		10			180	360	
		15			100	200	
t_{THL} t_{TLH}	Transition Time	5			100	200	ns
		10			50	100	
		15			40	80	
t_W	Clock Pulse Width	5		300	150		ns
		10		180	90		
		15		80	40		
t_W	$\overline{\text{Clear}}$ Pulse Width	5		320	160		ns
		10		160	80		
		15		100	50		
t_W	$\overline{\text{APE}}$ Pulse Width	5		360	180		ns
		10		160	80		
		15		120	60		
t_{setup}	$\overline{\text{SPE}}$ Setup Time	5		280	140		ns
		10		140	70		
		15		100	50		
t_{setup}	JAM Setup Time	5		200	100		ns
		10		80	40		
		15		60	30		
f_{CL}	Maximum Clock Input Frequency	5		0.7	1.4		MHz
		10		1.8	3.6		
		15		2.4	4.8		

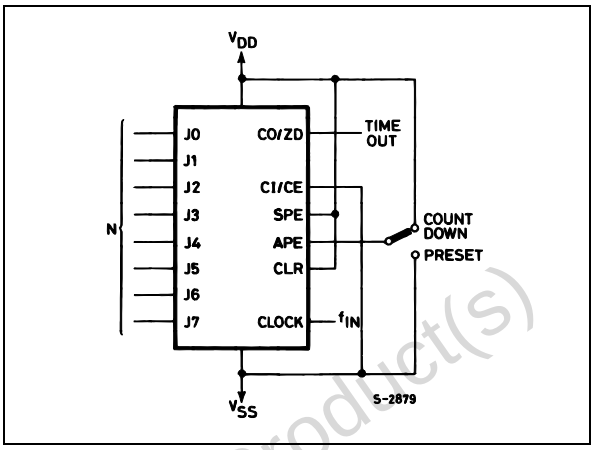
(*) Typical temperature coefficient for all V_{DD} value is 0.3 %/°C.

TYPICAL APPLICATIONS

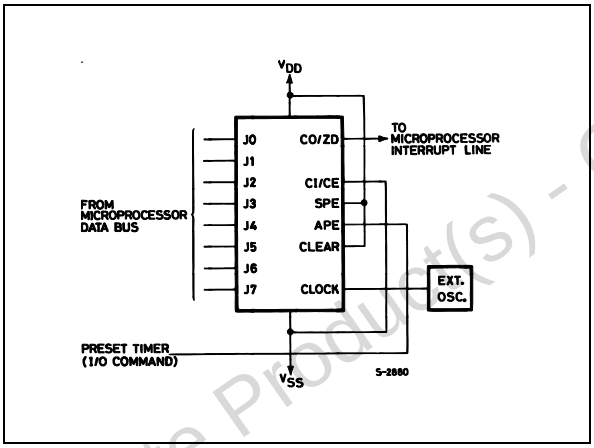
DIVIDE BY "N" COUNTER



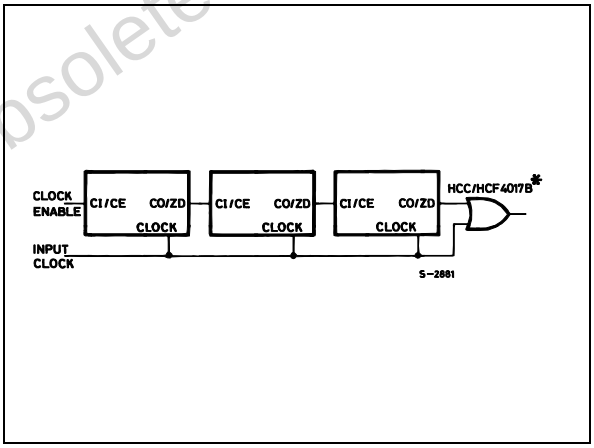
SYNCHRONOUS CASCADING



MICROPROCESSOR INTERRUPT TIMER

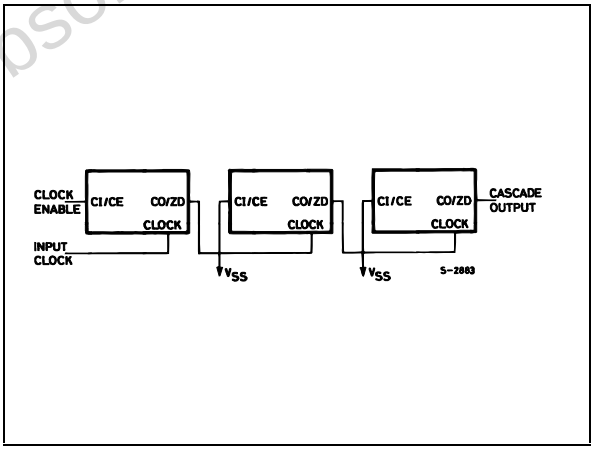


SYNCHRONOUS CASCADING

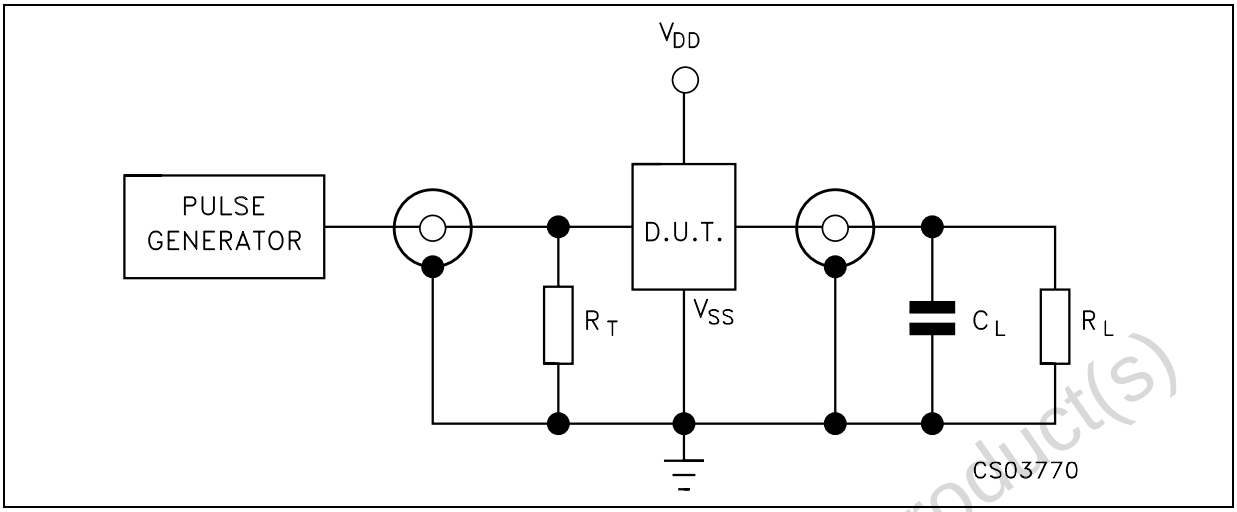


* An Output spike (160ns at V_{DD} = 5V) occurs whenever two or more devices are cascaded in the parallel clocked mode because the clock-to-carry out delay is greater than the carry-in-to-carry-out delay. This spike is eliminated by gating the output of the last device with the clock as shown.

MICROPROCESSOR INTERRUPT TIMER

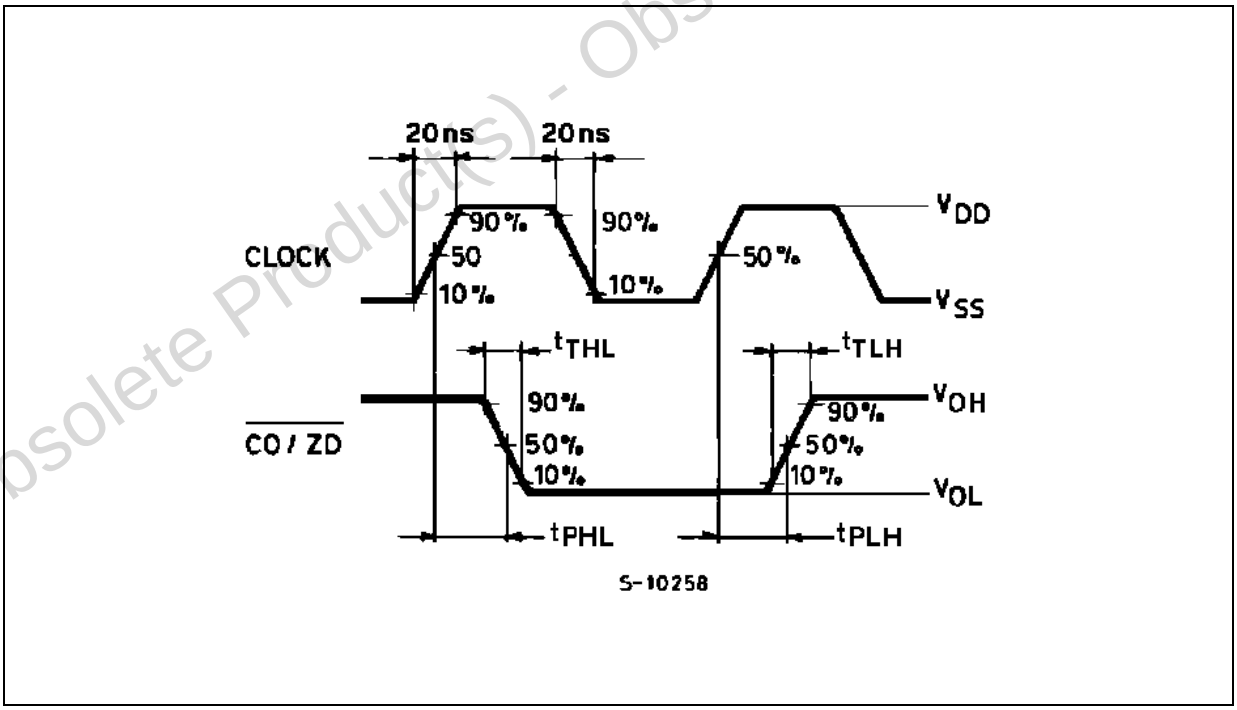


TEST CIRCUIT

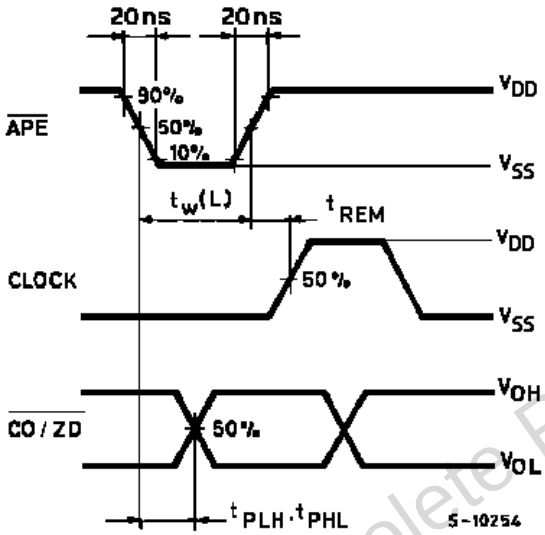


C_L = 50pF or equivalent (includes jig and probe capacitance)
R_L = 200KΩ
R_T = Z_{OUT} of pulse generator (typically 50Ω)

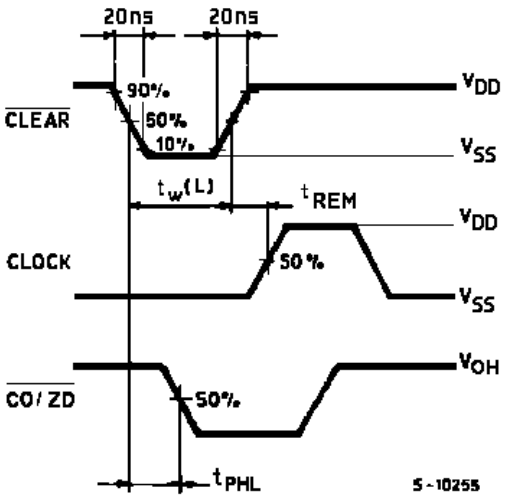
WAVEFORM 1 : PROPAGATION DELAY TIME (f=1MHz; 50% duty cycle)



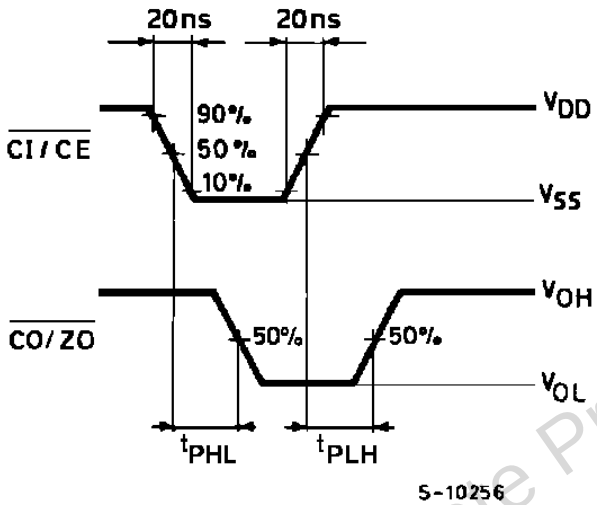
WAVEFORM 2 : PROPAGATION DELAY, MINIMUM PULSE WIDTH AND REMOVAL TIME (f=1MHz; 50% duty cycle)



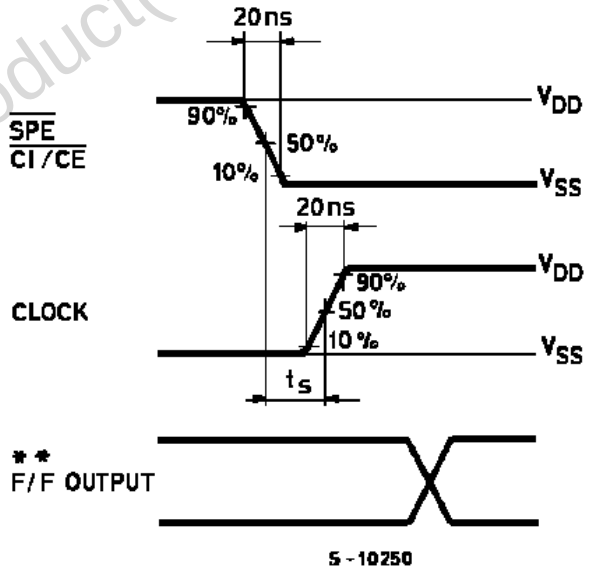
WAVEFORM 3 : PROPAGATION DELAY, MINIMUM PULSE WIDTH AND REMOVAL TIME (f=1MHz; 50% duty cycle)



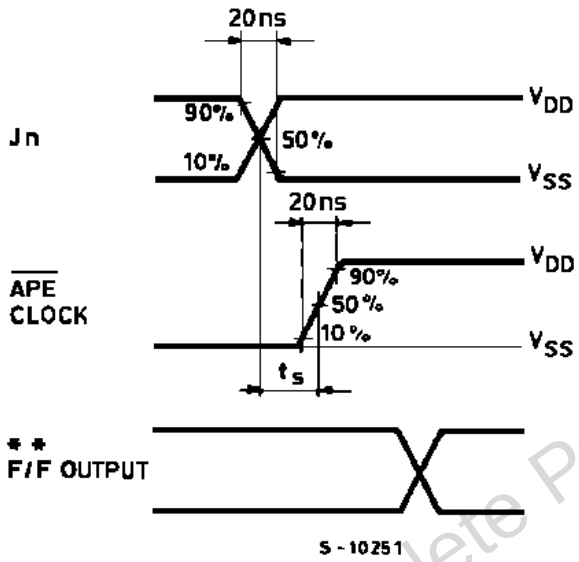
WAVEFORM 4 : PROPAGATION DELAY TIME (f=1MHz; 50% duty cycle)



WAVEFORM 5 : MINIMUM SETUP TIME (f=1MHz; 50% duty cycle)

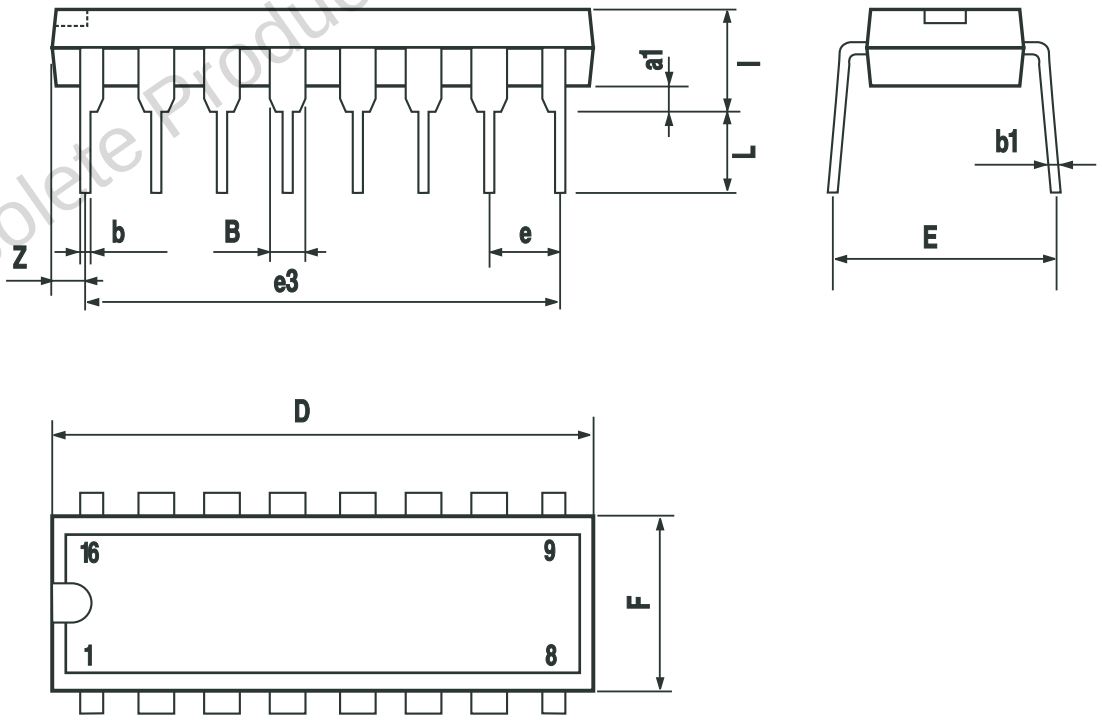


WAVEFORM 6 : MINIMUM SETUP TIME (f=1MHz; 50% duty cycle)



Plastic DIP-16 (0.25) MECHANICAL DATA

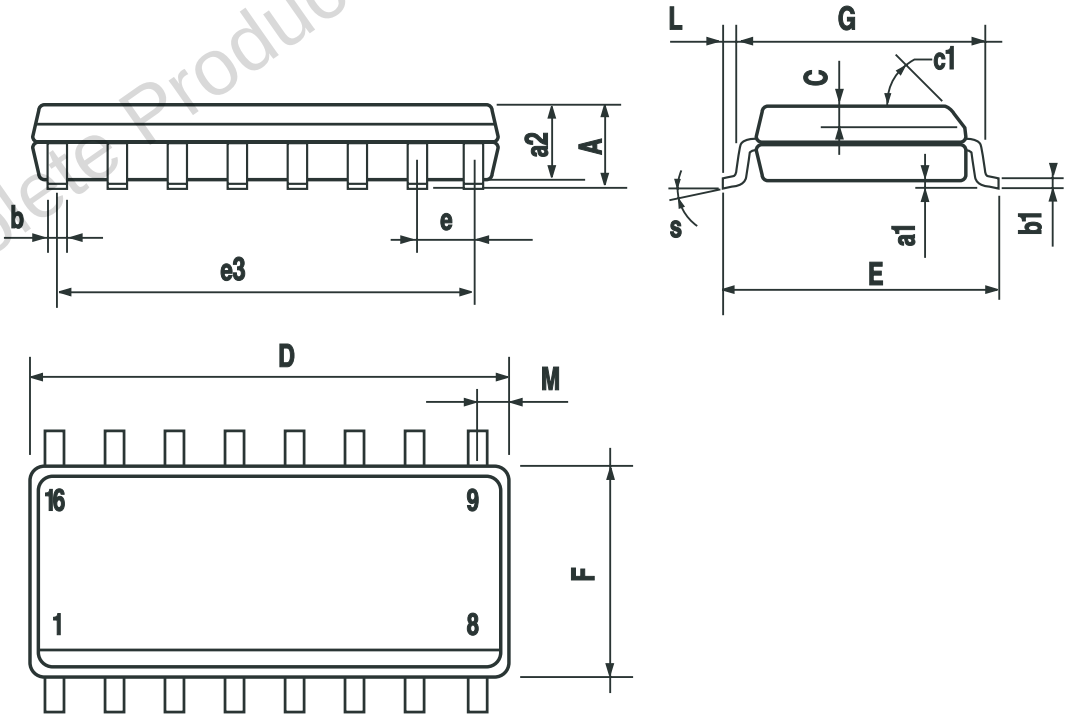
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

SO-16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



PO13H