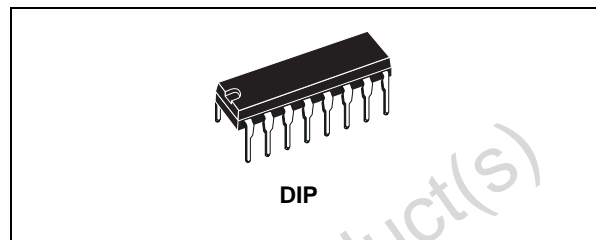


## 4x4 CROSSPOINT SWITCH WITH CONTROL MEMORY

- LOW ON RESISTANCE -  $75\Omega$  Typ. at  $V_{DD} = 12V$
- "BUILT IN" CONTROL LATCHES
- LARGE ANALOG SIGNAL CAPABILITY  $\pm V_{DD}/2$
- TRANSMITS SIGNALS UP TO 10 MHz
- MATCHED SWITCH CHARACTERISTICS  
 $\Delta_{RON} = 18\Omega$  Typ. at  $V_{DD}-V_{SS} = 12V$
- HIGH LINEARITY : - 0.5% DISTORTION Typ. at  $f = 1KHz, V_{IN} = 5 V_{pp}$   
 $V_{DD} - V_{SS} = 10V, R_L = 10K\Omega$
- STANDARD COS/MOS NOISE IMMUNITY
- 100% TESTED FOR QUIESCENT CURRENT



### ORDER CODES

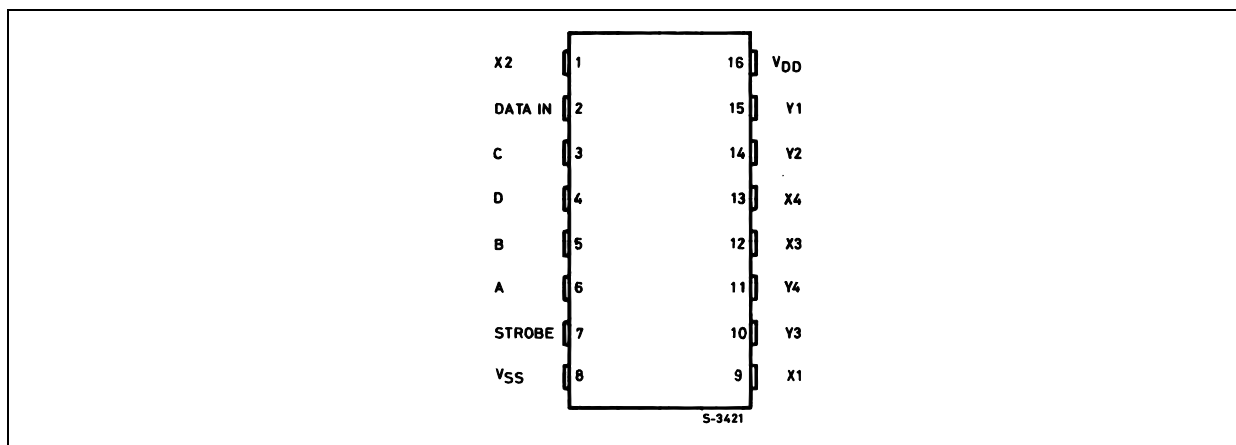
PACKAGE	TUBE	T & R
DIP	M22100B1	

### DESCRIPTION

The M22100 combines a 4 x 4 array of crosspoints (transmission gates) with a 4 line to 16 line decoder and 16 latch circuits. Any one of the sixteen transmission gates (crosspoints) can be selected by applying the appropriate four line address. The selected transmission gate can be turned on or off by applying a logical one or zero, respectively, to the data input and strobing the

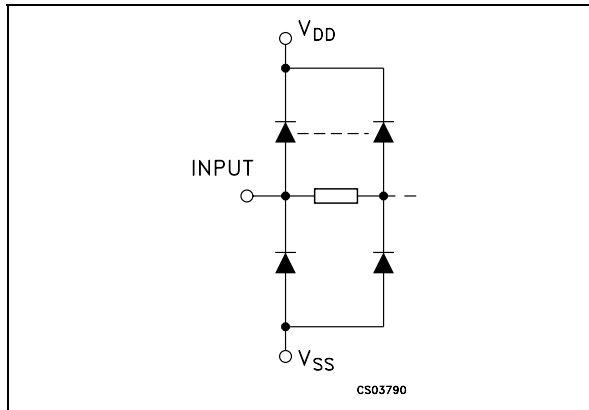
strobe input to a logical one. Any number of the transmission gates can be ON simultaneously. When the required operating power is applied to the 22100, the states of the 16 switches are indeterminate. Therefore, all switches must be turned off by putting the strobe high and data in low, and the addressing all switches in succession.

### PIN CONNECTION



# M22100B

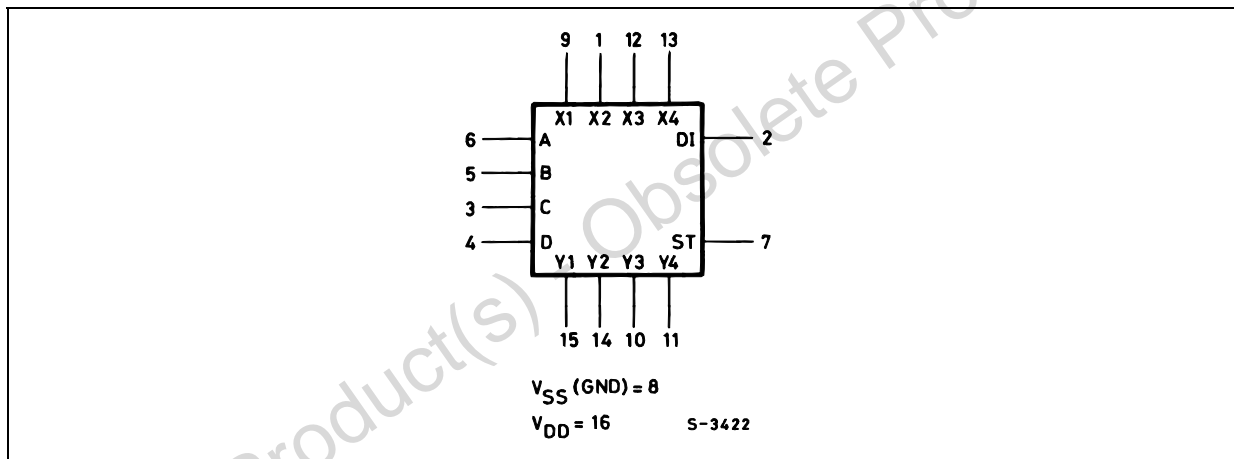
## IINPUT EQUIVALENT CIRCUIT



## PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
9, 1, 12, 13	X1 to X4	Select X
15, 14, 10, 11	Y1 to Y4	Select Y
6, 5, 3, 4	A, B, C, D	Address Input
2	DI	Data In
7	ST	Strobe In
8	$V_{SS}$	Negative Supply Voltage
16	$V_{DD}$	Positive Supply Voltage

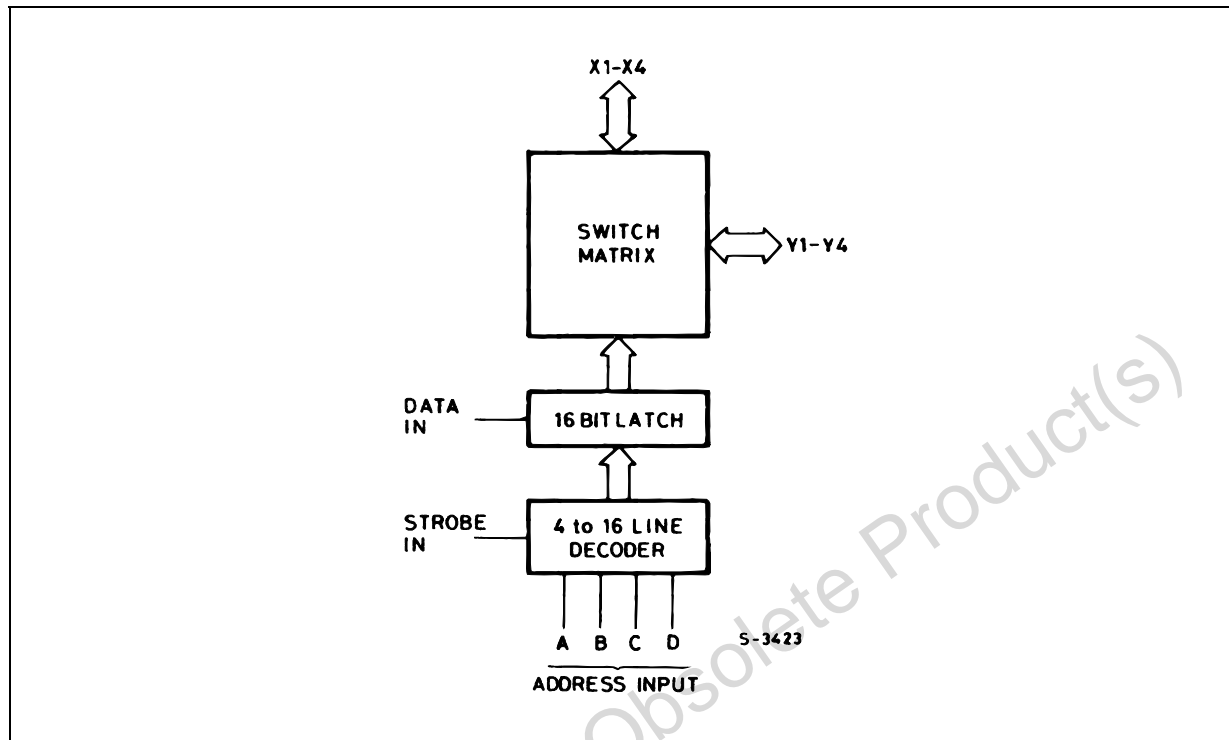
## FUNCTIONAL DIAGRAM



## TRUTH TABLE

ADDRESS				SELECT		ADDRESS				SELECT	
A	B	C	D	X1	Y1	A	B	C	D	X1	Y3
L	L	L	L	X1	Y1	L	L	L	H	X1	Y3
H	L	L	L	X2	Y1	H	L	L	H	X2	Y3
L	H	L	L	X3	Y1	L	H	L	H	X3	Y3
H	H	L	L	X4	Y1	H	H	L	H	X4	Y3
L	L	H	L	X1	Y2	L	L	H	H	X1	Y4
H	L	H	L	X2	Y2	H	L	H	H	X2	Y4
L	H	H	L	X3	Y2	L	H	H	H	X3	Y4
H	H	H	L	X4	Y2	H	H	H	H	X4	Y4

## LOGIC DIAGRAM



## 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	$\pm 10$	mA
$P_D$	Power Dissipation per Package	200	mW
	Power Dissipation per Output Transistor	100	mW
$T_{op}$	Operating Temperature	-55 to +125	$^{\circ}\text{C}$
$T_{stg}$	Storage Temperature	-65 to +150	$^{\circ}\text{C}$

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	$^{\circ}\text{C}$

## DC SPECIFICATIONS

Symbol	Parameter		Test Condition			Value						Unit	
				$V_I$ (V)	$V_{DD}$ (V)	$T_A = 25^\circ\text{C}$			-40 to 85°C		-55 to 125°C		
						Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$I_L$	Quiescent Supply Current	F1		5	0.04	5		150		150	$\mu\text{A}$		
				10	0.04	10		300		300			
				15	0.04	20		600		600			
				20	0.08	100		3000		3000			
		B1		5	0.04	20		150		150			
				10	0.04	40		300		300			
$R_{ON}$	Resistance	F1	Any Switch	5	225	1250		1625		1625	$\Omega$		
				10	85	180		230		230			
				12	75	135		175		175			
				15	65	95		125		125			
		B1	$V_{IS} = 0$ to $V_{DD}$	5	225	1250		1440		1440			
				10	85	180		205		205			
				12	75	135		155		155			
				15	65	95		110		110			
		$\Delta_{ON}$	Resistance $\Delta_{RON}$ (between any two channels)			5	35						$\Omega$
						10	20						
						12	18						
						15	15						
	OFF Channel Leakage Current	F1	All Switch OFF	0/18	18		$\pm 10^{-3}$	$\pm 0.1^*$		$\pm 1$	$\mu\text{A}$		
		B1		0/15	15		$\pm 10^{-3}$	$\pm 0.3$		$\pm 1$			
<b>CONTROL</b>													
$V_{IL}$	Low Level Input Voltage			5			1.5		1.5		1.5	V	
				10			3		3		3		
				15			4		4		4		
$V_{IH}$	High Level Input Voltage			5	3.5			3.5		3.5		V	
				10	7			7		7			
				15	11			11		11			
$I_I$	Input Current	F1	Any Control Input	0/18	18		$\pm 10^{-5}$	$\pm 0.1^*$		$\pm 1$		$\mu\text{A}$	
		B1		0/15	15		$\pm 10^{-5}$	$\pm 0.3$		$\pm 1$			
$C_I$	Input Capacitance	Any Input				5	7.5				$\text{pF}$		

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

\* : Determined by minimum feasible leakage measurement for automating testing

**DYNAMIC ELECTRICAL CHARACTERISTICS** ( $T_{amb} = 25^{\circ}\text{C}$ ,  $C_L = 50\text{pF}$ ,  $R_L = 200\text{K}\Omega$ ,  $t_r = t_f = 20\text{ ns}$ )

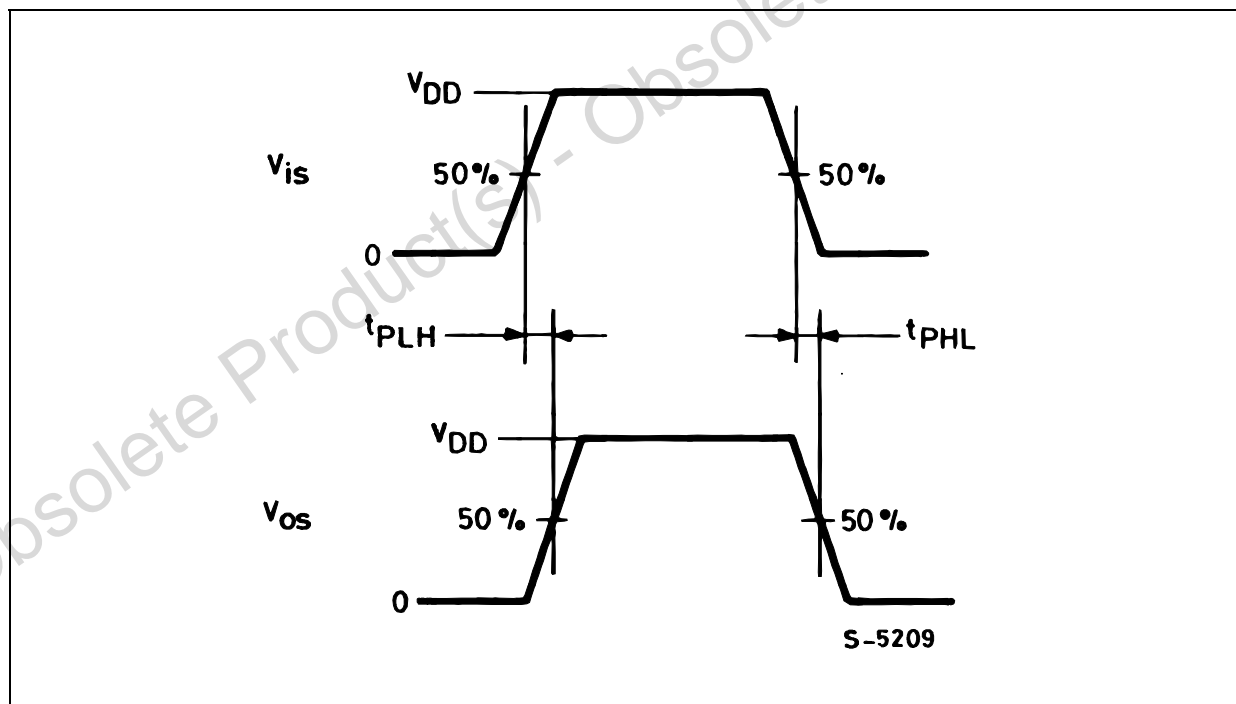
Symbol	Parameter	Test Condition				Value (*)			Unit		
		$f_i$ (KHz)	$R_L$ (K $\Omega$ )	$V_{IS}^{(1)}$ (V)	$V_{DD}$ (V)	Min.	Typ.	Max.			
<b>CROSSPOINT</b>											
$t_{PHL}$ $t_{PLH}$	Propagation Delay Time (Address or Strobe Inputs to Output)		10	5	5		30	60	ns		
				10	10		15	30			
				15	15		10	20			
	Frequency Response (Any Switch ON)		1	1	5	10		40	MHz		
			Sine Wave Input 20 Log $V_{OS}/V_{IS} = -3\text{dB}$								
	Sine Wave Distortion		1	1	5	10		0.5	%		
	Feedthrough (All Switches OFF)		1.6	1	5	10		80	dB		
	Frequency for Signal Crosstalk Attenuation of 40 dB			1	10	10		1.5	MHz		
			Sine Wave Input								
	Frequency for Signal Crosstalk Attenuation of 110 dB			1	10	10		0.1	KHz		
			Sine Wave Input								
C	Capacitance Xn to Ground, Yn to Ground, Feedthrough					5 / 15		18 30 0.4	pF		
<b>CONTROLS</b>											
$t_{PHZ}$	Propagation Delay Time Strobe to Output (Switch Turn-ON to High Level)	$R_L = 1\text{K}\Omega$ $C_L = 50\text{pF}$ $t_r, t_f = 20\text{ns}$	See Figure 1			5		500	1000	ns	
						10		230	460		
						15		145	290		
$t_{PZH}$	Propagation Delay Time Data-In to Output (Switch Turn-ON to High Level)			See Figure 2			5		500	1000	ns
			10					220	440		
			15					135	270		
$t_{PZH}$	Propagation Delay Time Address to Output (Switch Turn-ON to High Level)			See Figure 3			5		480	960	ns
			10					225	450		
			15					150	300		
$t_{PHZ}$	Propagation Delay Time Strobe to Output (Switch Turn-OFF)			See Figure 1			5		450	900	ns
			10					200	400		
			15					165	330		
$t_{PZL}$	Propagation Delay Time Data-In to Output (Switch Turn-ON to Low Level)			See Figure 2			5		500	1000	ns
			10					220	440		
		15					135	270			
$t_{PHZ}$	Propagation Delay Time Address to Output (Switch Turn-OFF)		See Figure 3			5		425	850	ns	
		10					190	380			
		15					145	290			
$t_{setup}$	Setup Time Data-In to Strobe, Address					5		200	400	ns	
		10					80	160			
		15					50	100			

# M22100B

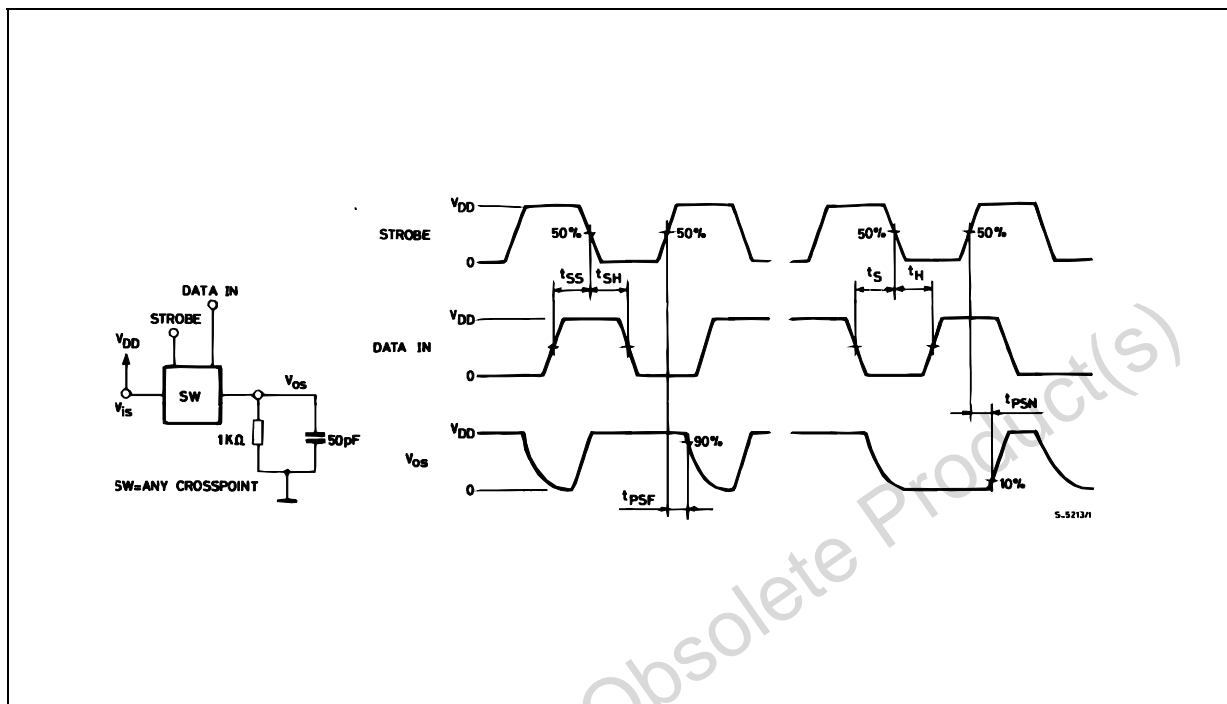
Symbol	Parameter	Test Condition				Value (*)			Unit	
		$f_i$ (KHz)	$R_L$ (K $\Omega$ )	$V_{IS}^{(1)}$ (V)	$V_{DD}$ (V)	Min.	Typ.	Max.		
<b>CONTROLS</b>										
$t_{hold}$	Data Input Disable Setup Time	$R_L = 1K\Omega$ $C_L = 50pF$ $t_r, t_f = 20ns$				5		180		ns
						10		110		
						15		35		
$f_\phi$	Switching Frequency					5	0.6	1.2		MHz
						10	1.6	3.2		
						15	2.5	5		
$t_w$	Strobe Pulse Width					5		300	600	ns
						10		120	240	
						15		90	180	
	Control Crosstalk Data-In, Address, or Strobe to Output			10	10	10	75		mV peak	

(\*) Typical temperature coefficient for all  $V_{DD}$  value is 0.3 %/°C.  
 (1) Peak to Peak voltage symmetrical about  $V_{DD}/2$

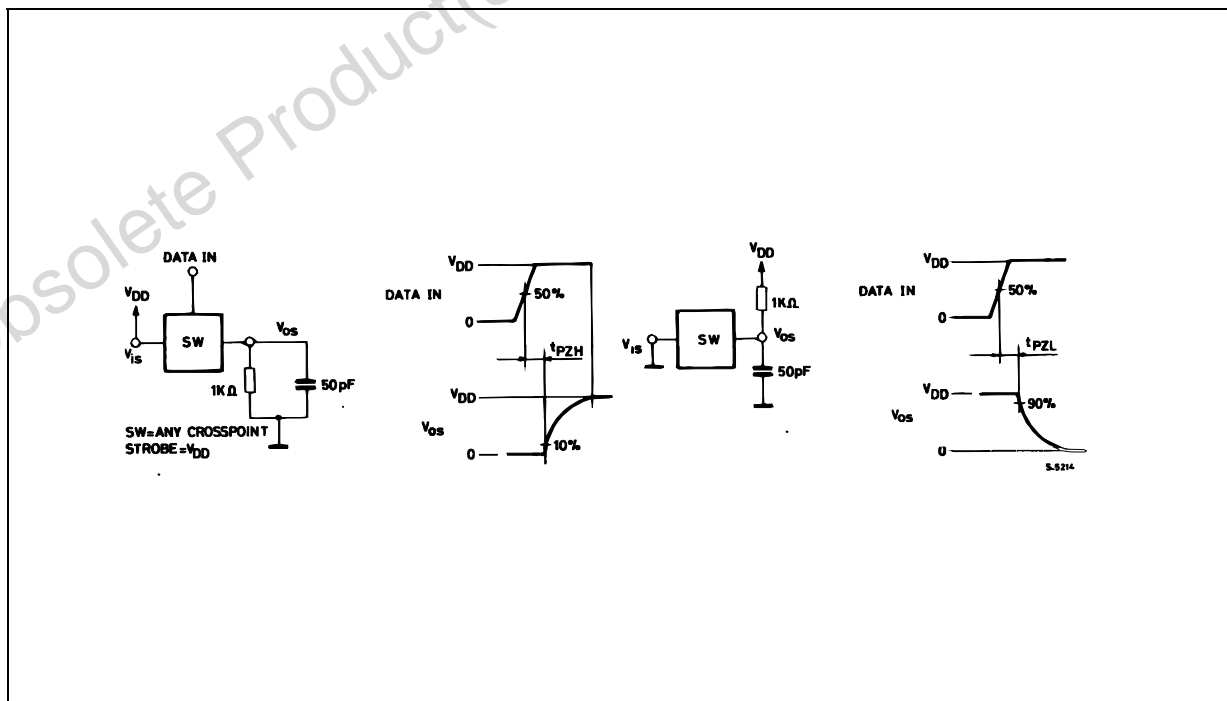
## WAVEFORM 1 : PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)



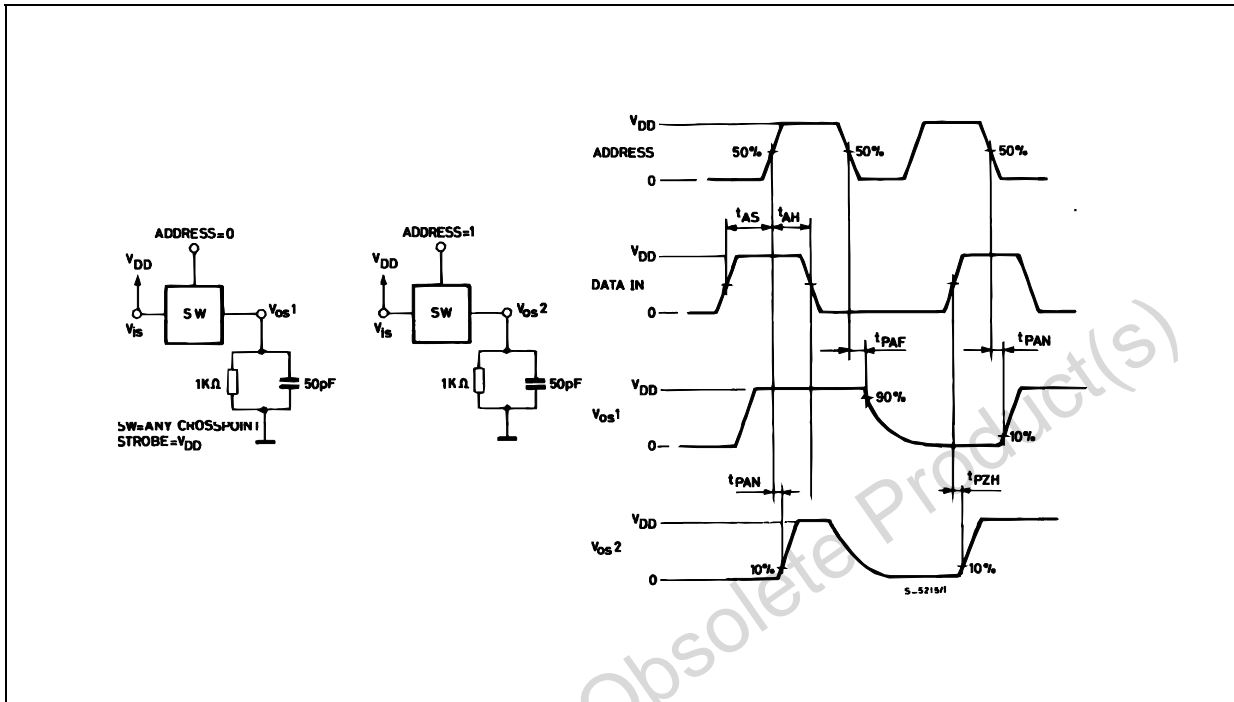
**WAVEFORM 2 : Propagation Delay Time (strobe to signal output, switch turn-ON or turn OFF)**  
 (f=1MHz; 50% duty cycle)



**WAVEFORM 3 : PROPAGATION DELAY TIME (DATA IN TO SIGNAL OUTPUT, SWITCH TURN ON TO HIGH OR LOW LEVEL)**  
 (f=1MHz; 50% duty cycle)



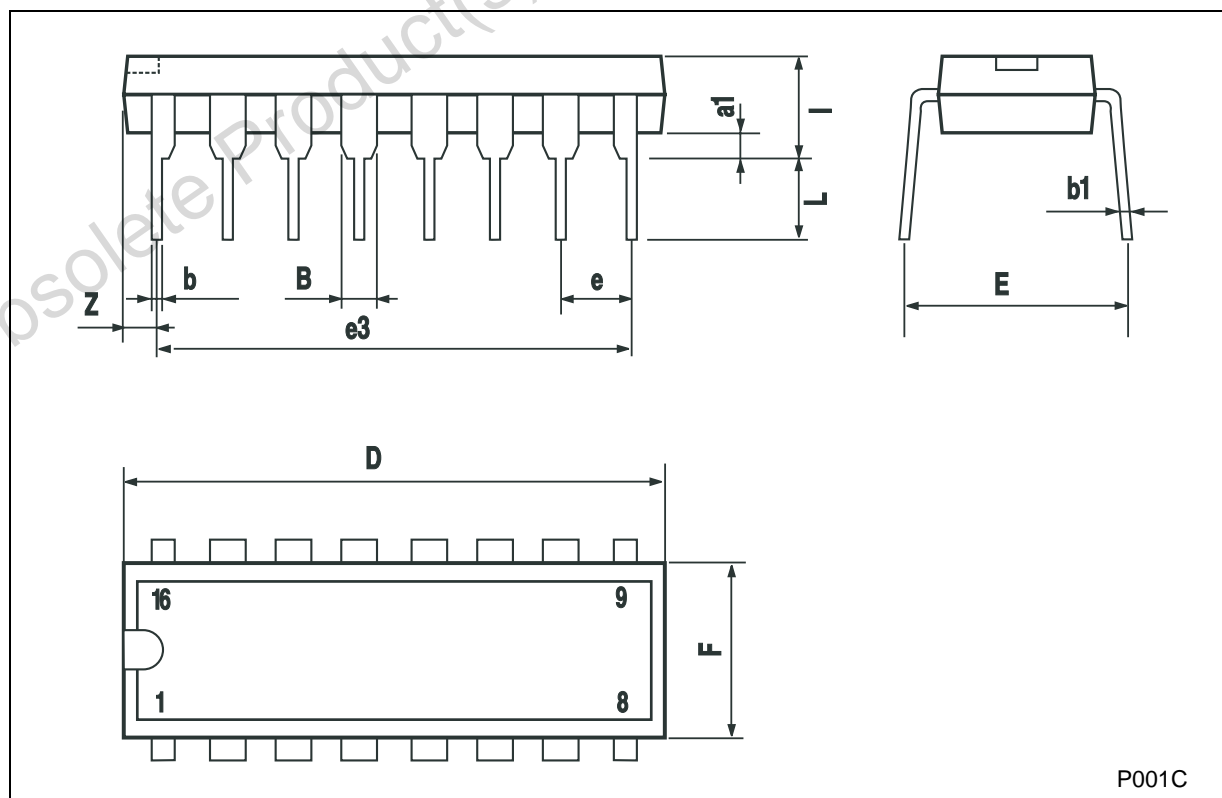
WAVEFORM 4 : PROPAGATION DELAY TIME (ADDRESS TO SIGNAL OUTPUT SWITCH TURN ON OR TURN OFF) (f=1MHz; 50% duty cycle)





### 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



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