



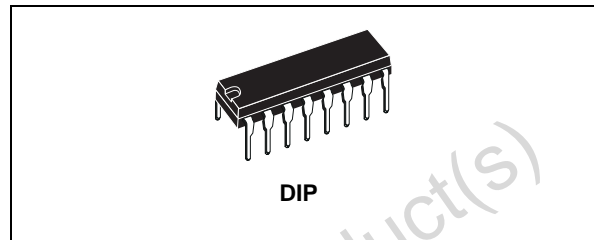
# THE DATASHEET OF M22100B1





## 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

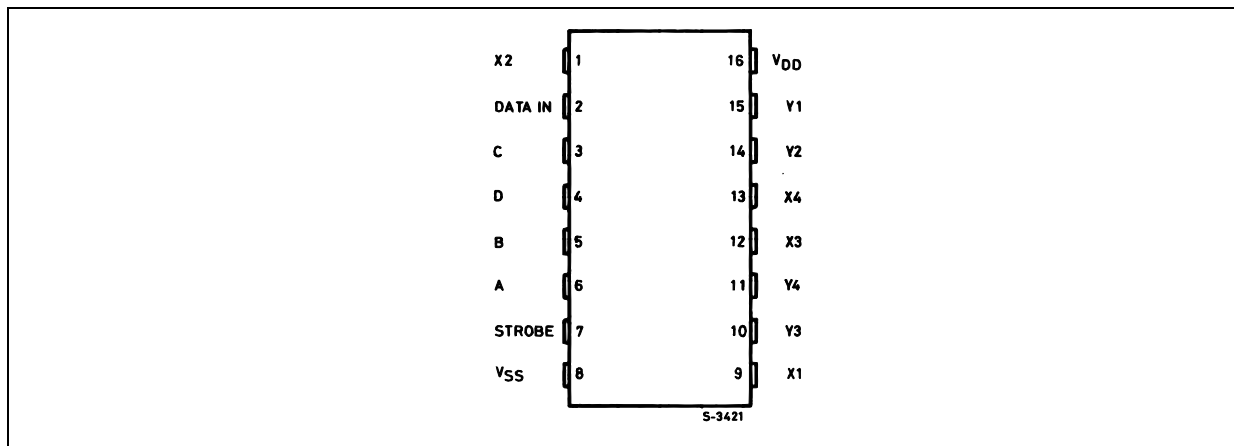
PACKAGE	TUBE	T & R
DIP	M22100B1	

### 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

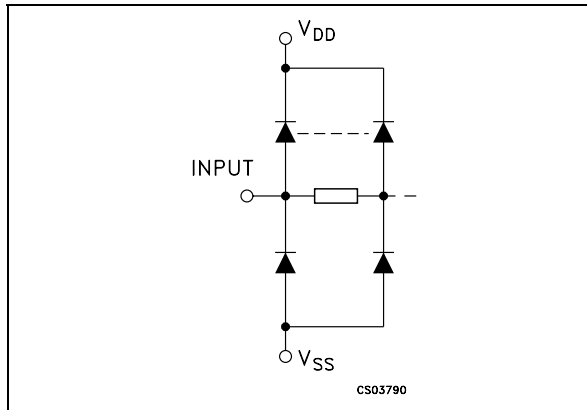
strobe input to a logical one. Any number of the transmission gates can be ON simultaneously. When the required operating power is applied to the 22100, the states of the 16 switches are indeterminate. Therefore, all switches must be turned off by putting the strobe high and data in low, and the addressing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

### PIN CONNECTION



# M22100B

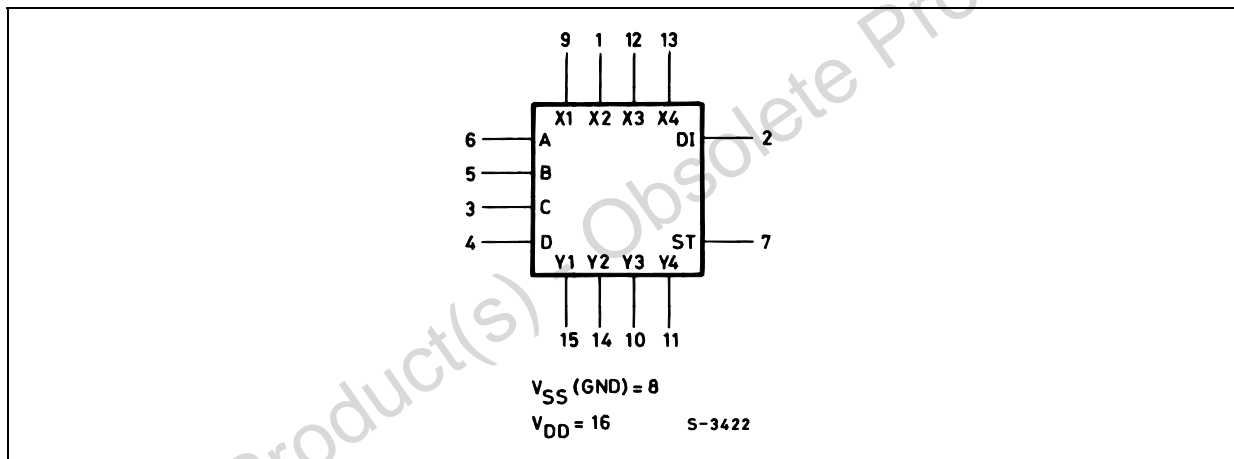
## INPUT EQUIVALENT CIRCUIT



## 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

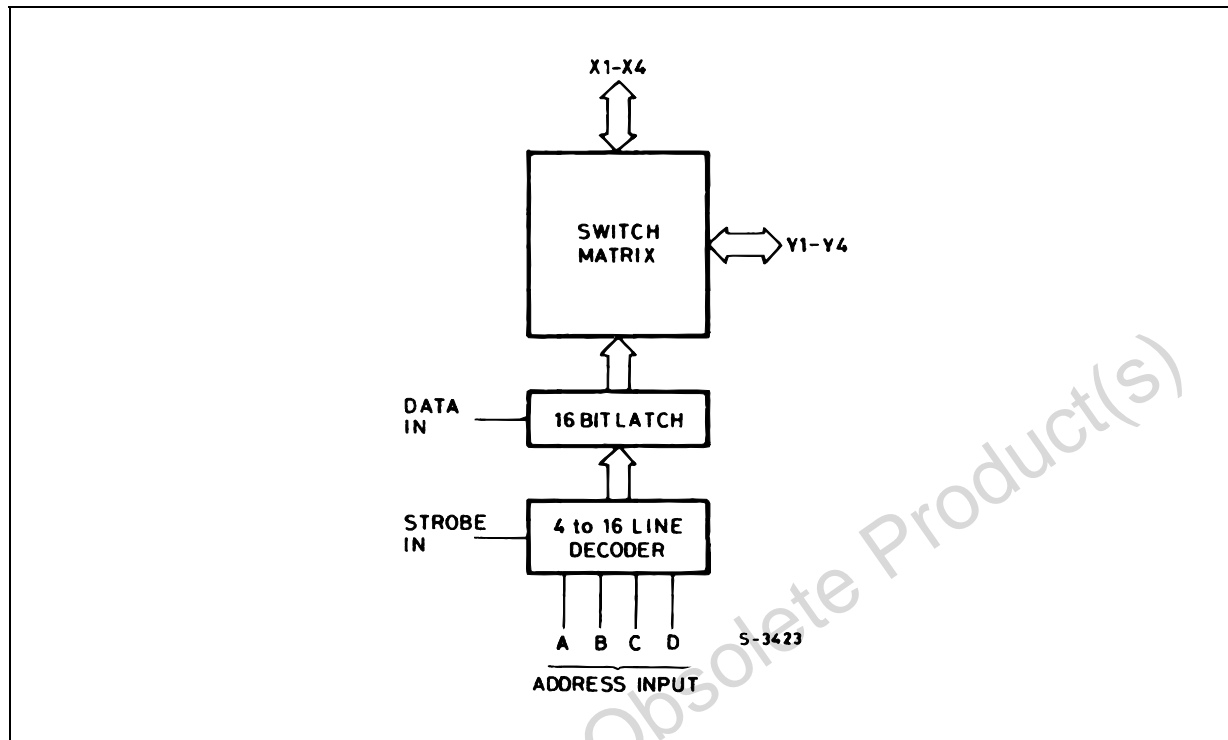
## FUNCTIONAL DIAGRAM



## TRUTH TABLE

ADDRESS				SELECT		ADDRESS				SELECT	
A	B	C	D			A	B	C	D		
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	
	15				0.04	80		600		600			
$R_{ON}$	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	$V_{IS} = 0 \text{ to } V_{DD}$		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		$\pm 10^{-3}$	$\pm 0.1^*$		$\pm 1$		$\pm 1$	$\mu\text{A}$
		B1		0/15	15		$\pm 10^{-3}$	$\pm 0.3$		$\pm 1$		$\pm 1$	
<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		$\pm 10^{-5}$	$\pm 0.1^*$		$\pm 1$		$\pm 1$	$\mu\text{A}$
		B1		0/15	15		$\pm 10^{-5}$	$\pm 0.3$		$\pm 1$		$\pm 1$	
$C_I$	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  $V_{DD}=15V$

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

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

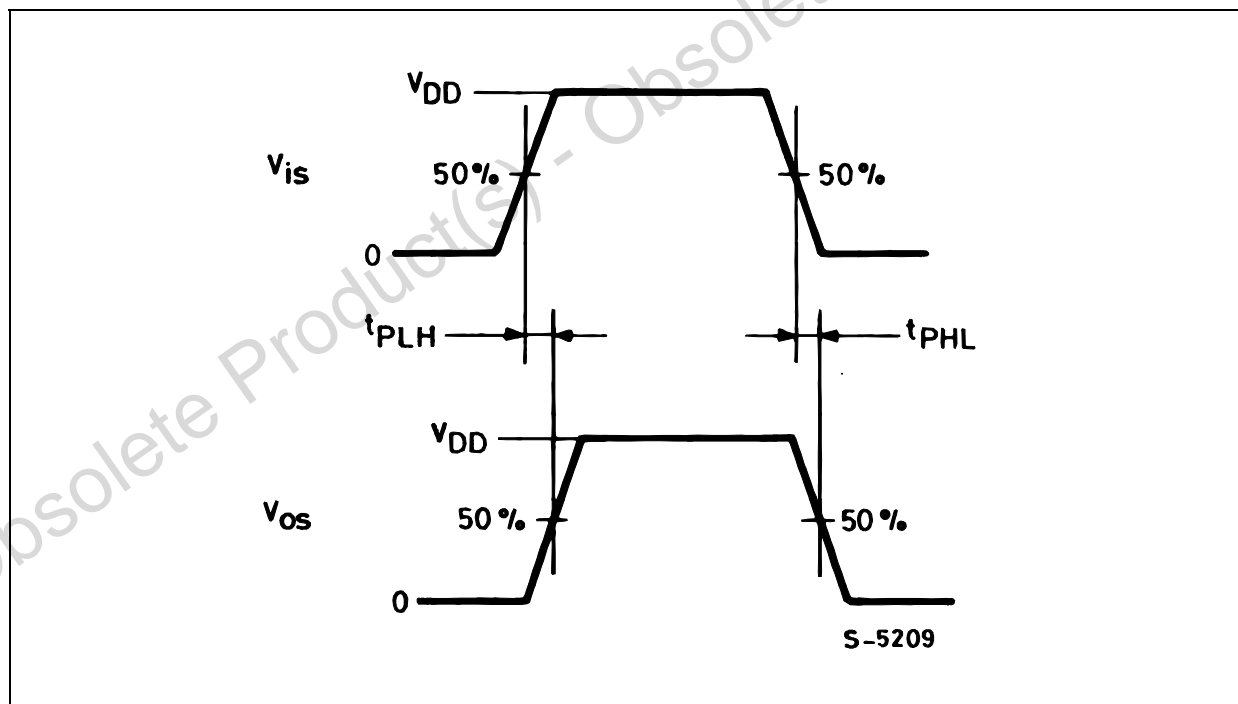
Symbol	Parameter	Test Condition				Value (*)			Unit	
		$f_i$ (KHz)	$R_L$ (K $\Omega$ )	$V_{IS}^{(1)}$ (V)	$V_{DD}$ (V)	Min.	Typ.	Max.		
<b>CROSSPOINT</b>										
$t_{PHL}$ $t_{PLH}$	Propagation Delay Time (Address or Strobe Inputs to Output)		10	5 10 15	5 10 15		30 15 10	60 30 20	ns	
	Frequency Response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

# M22100B

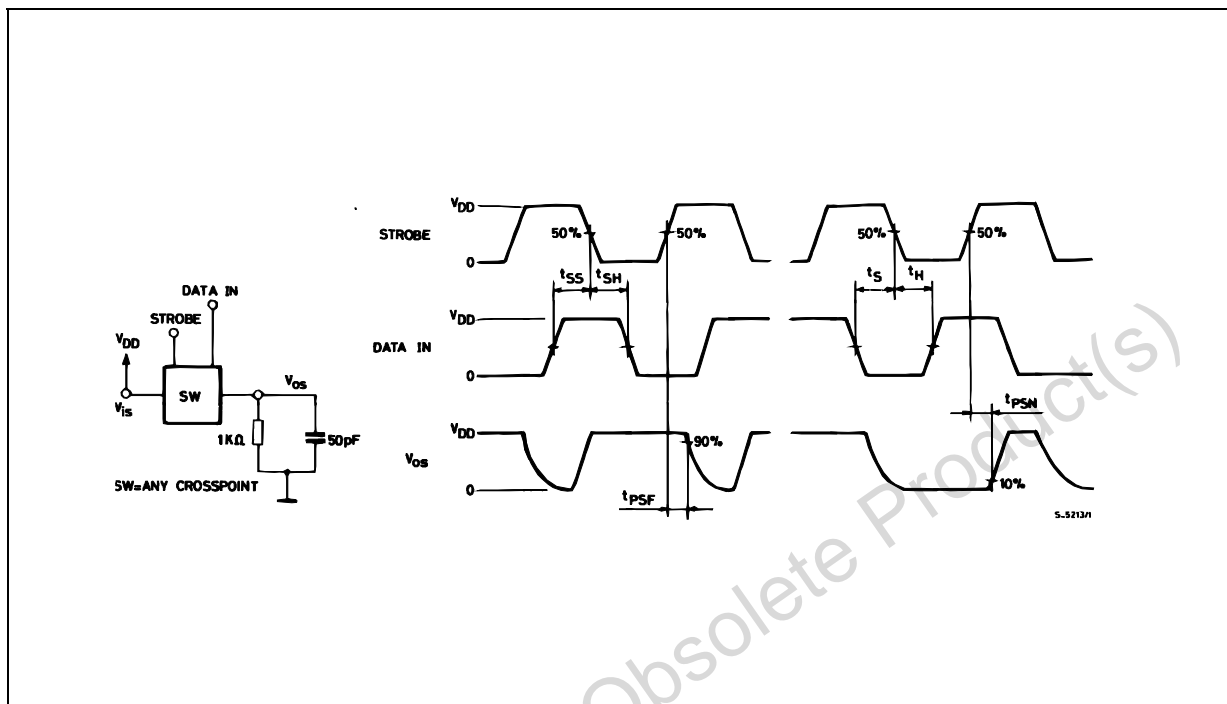
Symbol	Parameter	Test Condition				Value (*)			Unit					
		$f_i$ (KHz)	$R_L$ (K $\Omega$ )	$V_{IS}^{(1)}$ (V)	$V_{DD}$ (V)	Min.	Typ.	Max.						
<b>CONTROLS</b>														
$t_{hold}$	Data Input Disable Setup Time	$R_L = 1K\Omega$ $C_L = 50pF$ $t_r, t_f = 20ns$				5		180		ns				
$f_\phi$	Switching Frequency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

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

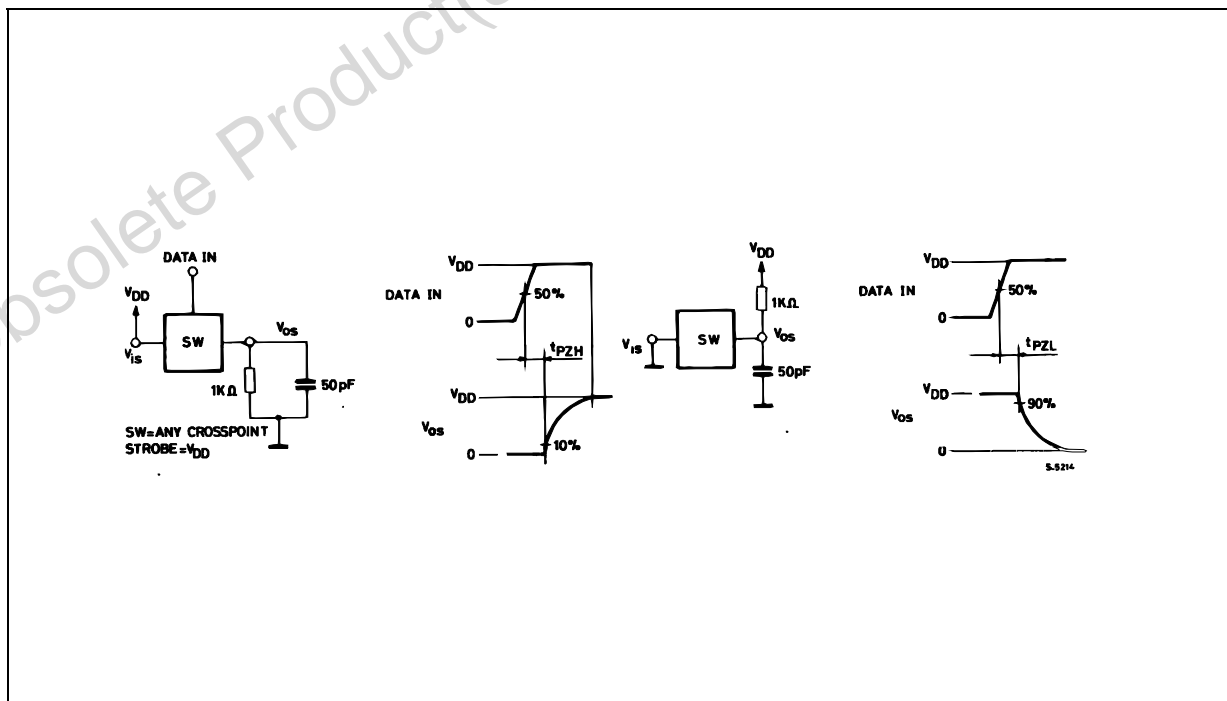
## WAVEFORM 1 : PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)



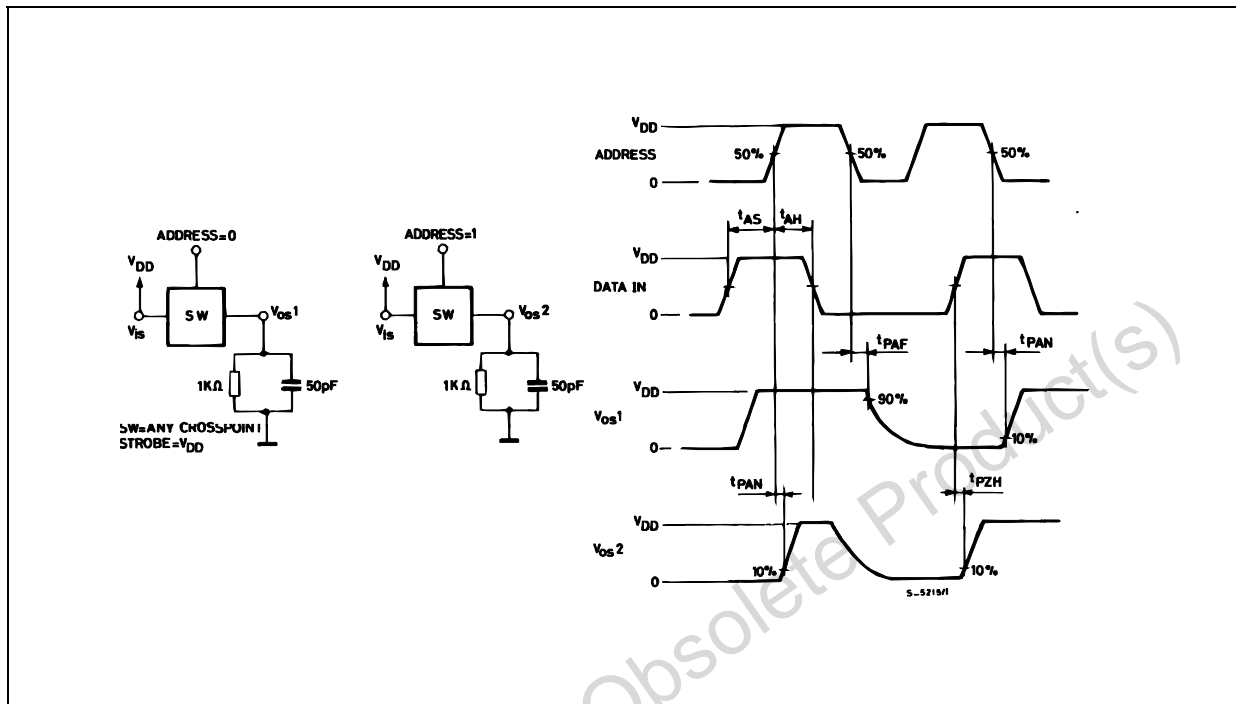
**WAVEFORM 2 : Propagation Delay Time (strobe to signal output, switch turn-ON or turn OFF)**  
 (f=1MHz; 50% duty cycle)



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

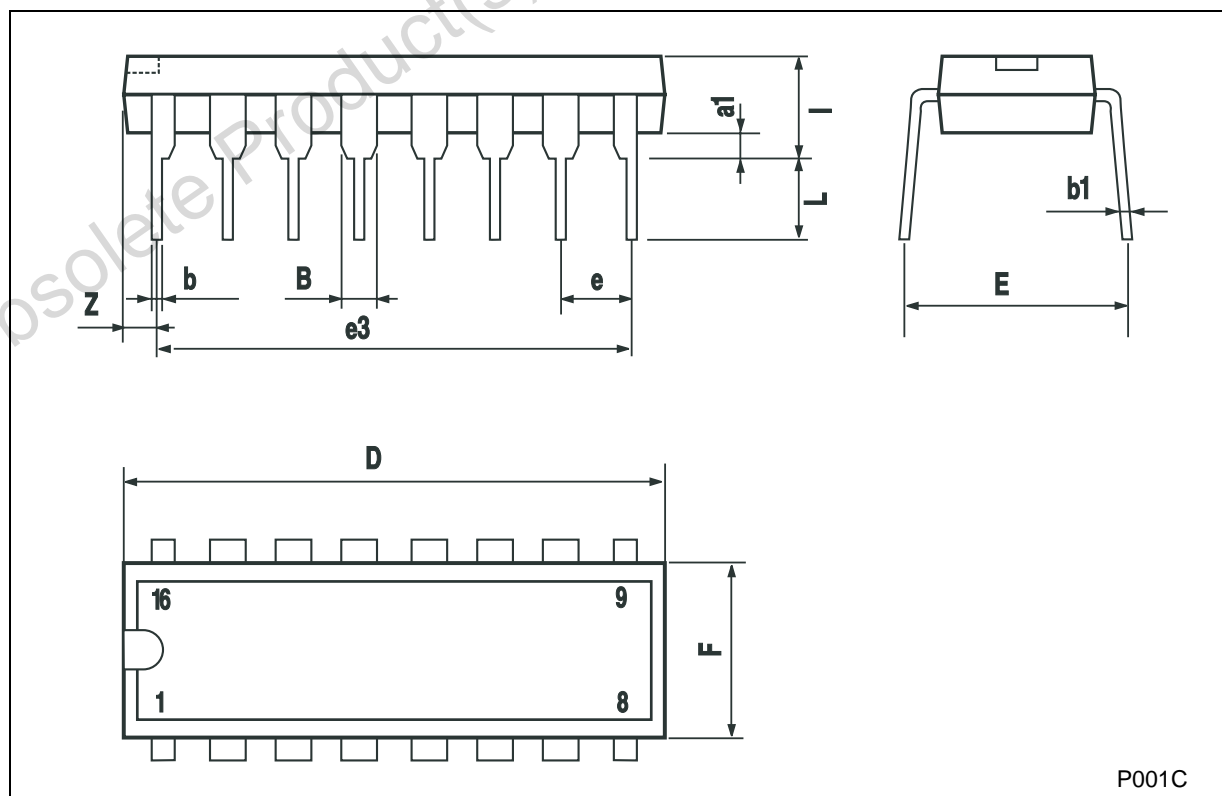


WAVEFORM 4 : PROPAGATION DELAY TIME (ADDRESS TO SIGNAL OUTPUT SWITCH TURN ON OR TURN OFF) (f=1MHz; 50% duty cycle)



### 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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