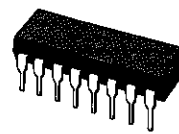


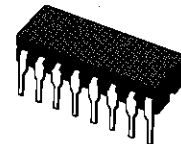
4 X 4 CROSSPOINT SWITCH WITH CONTROL MEMORY

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

Therefore, all switches must be turned off by putting the strobe high and data-in-low, and then addressing all switches in succession.



EY
(Plastic Package)



F
(Ceramic Package)

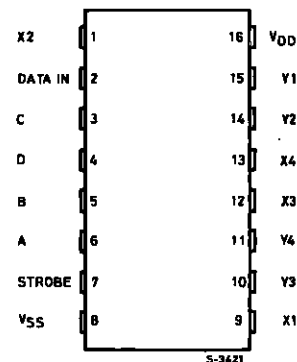
ORDER CODES :
M22100 B1 M22100 F1

DESCRIPTION

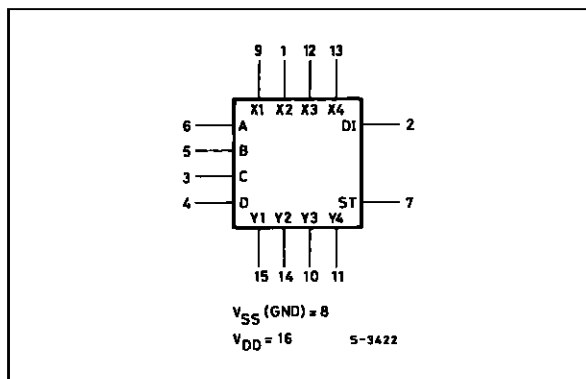
The M22100 combines a 4 x 4 array of crosspoints (transmission gates) with a 4-line-to-16-line decoder and 16 latch circuits. Any one of the sixteen transmission gates (crosspoints) can be selected by applying the appropriate four line address. The selected transmission gate can be turned on or off by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

PIN CONNECTIONS



FUNCTIONAL DIAGRAM



TRUTH TABLE

Address				Select		Address				Select	
A	B	C	D			A	B	C	D		
0	0	0	0	X1	Y1	0	0	0	1	X1	Y3
1	0	0	0	X2	Y1	1	0	0	1	X2	Y3
0	1	0	0	X3	Y1	0	1	0	1	X3	Y3
1	1	0	0	X4	Y1	1	1	0	1	X4	Y3
0	0	1	0	X1	Y2	0	0	1	1	X1	Y4
1	0	1	0	X2	Y2	1	0	1	1	X2	Y4
0	1	1	0	X3	Y2	0	1	1	1	X3	Y4
1	1	1	0	X4	Y2	1	1	1	1	X4	Y4

ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
V_{DD}^*	Supply Voltage: Ceramic Types	-0.5 to +20	V
	Plastic Types	-0.5 to +18	V
V_i	Input Voltage	-0.5 to $V_{DD} + 0.5$	V
I_i	DC Input Current (any one input)	± 10	mA
P_{tot}	Total Power Dissipation (per package)	200	mW
	Dissipation per Output Transistor for T_{op} = Full Package Temperature Range	100	mW
T_{op}	Operating Temperature: Ceramic Types	-55 to +125	$^{\circ}\text{C}$
	Plastic Types	-40 to +85	$^{\circ}\text{C}$
T_{stg}	Storage Temperature	-65 to +150	$^{\circ}\text{C}$

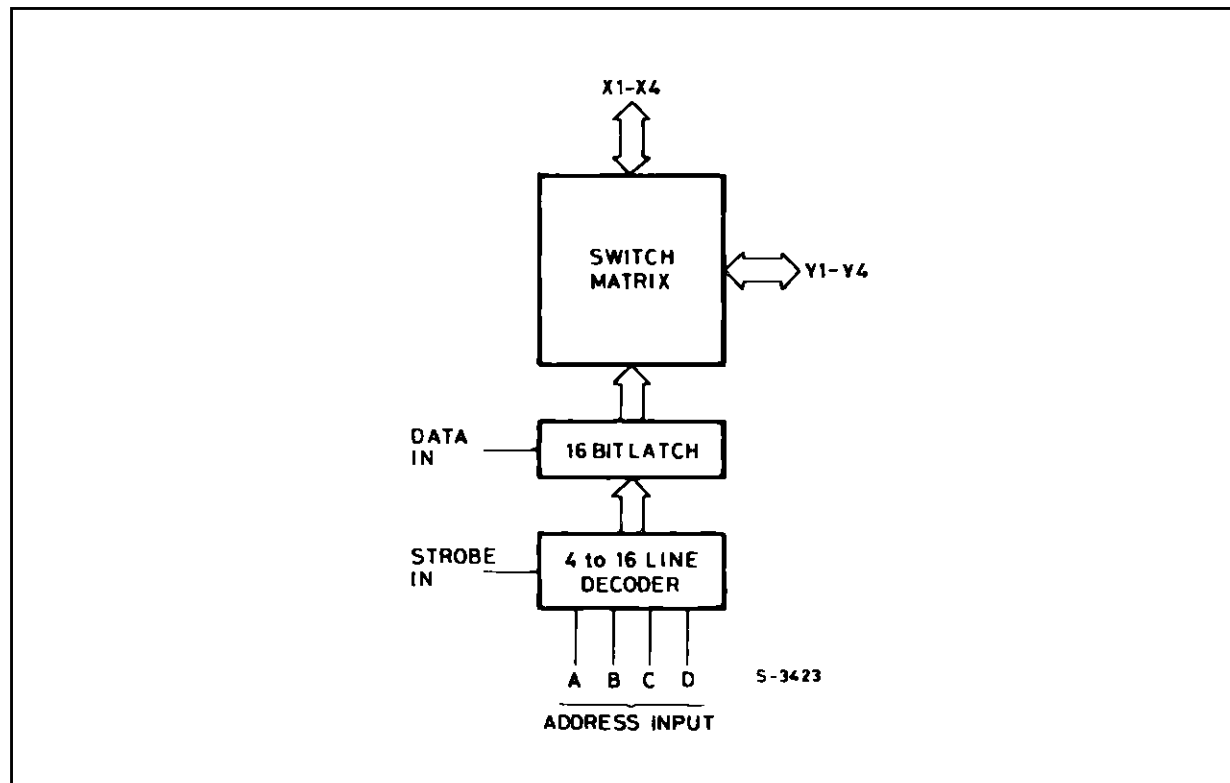
Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for external periods may affect device reliability.

* All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage: Ceramic Types	3 to 18	V
	Plastic Types	3 to 15	V
V_i	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature: Ceramic Types	-55 to +125	$^{\circ}\text{C}$
	Plastic Types	-40 to +85	$^{\circ}\text{C}$

LOGIC DIAGRAM



STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter		Test Conditions			Value							Unit
				V _I (V)	V _{DD} (V)	T _{LOW} *		25 °C			T _{HIGH} *		
						Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
CROSSPOINT													
I _L	Quiescent Supply Current	F1			5				0.04	5		150	μA
					10				0.04	10		300	
					15				0.04	20		600	
					20				0.08	100		3000	
		B1			5				0.04	20		150	
					10				0.04	40		300	
					15				0.04	80		600	
R _{ON}	On Resistance	F1	Any Switch		5		450		225	1250		1625	Ω
					10		135		85	180		230	
					12		100		75	135		175	
					15		70		65	95		125	
		B1	V _{IS} = 0 to V _{DD}		5		1000		225	1250		1440	
					10		145		85	180		205	
					12		110		75	135		155	
					15		75		65	95		110	
ΔON	Resistance ΔR _{ON} (Between any two channels)				5				35				Ω
					10				20				
					12				18				
					15				15				
OFF Channel Leakage Current		F1	All Switch OFF	0/18	18		±0.1		±10 ⁻³	±0.1•		±1	μA
		B1		0/15	15		±0.3		±10 ⁻³	±0.3		±1	
CONTROL													
V _{IL}	Input Low Voltage		OFF Switch I _L < 0.2 μA		5		1.5			1.5		1.5	V
					10		3			3		3	
					15		4			4		4	
V _{IH}	Input High Voltage		ON Switch see R _{ON} Characteristics		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		±0.1		±10 ⁻⁵	±0.1•		±1	μA
		B1		0/15	15		±0.3		±10 ⁻⁵	±0.3		±1	
C _I	Input Capacitance		Any Input						5	7.5			pF

• Determined by minimum feasible leakage measurement for automatic testing

* T_{LOW} = -55 °C for **HCC** device: -40 °C for **HCF** device.

* T_{HIGH} = +125 °C for **HCC** device: +85 °C for **HCF** device.

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

DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}C$, $C_L = 50$ pF, all input rise and fall times = 20 ns)

Symbol	Parameter	Test Conditions				Value			Unit	
		f_i (KHz)	R_L (KW)	$V_{IS} \bullet$ (V)	V_{DD} (V)	Min.	Typ.	Max.		
CROSSPOINT										
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 Input $20 \text{ Log } \frac{V_{OS}}{V_{IS}} = -3 \text{ dB}$								
	Sine Wave Distortion	1	1	5	10		0.5		%	
	Feedthrough (All Switches OFF)	1.6	1	5	10		80		dB	
		Sine Wave Input								
	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	
CONTROLS										
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			

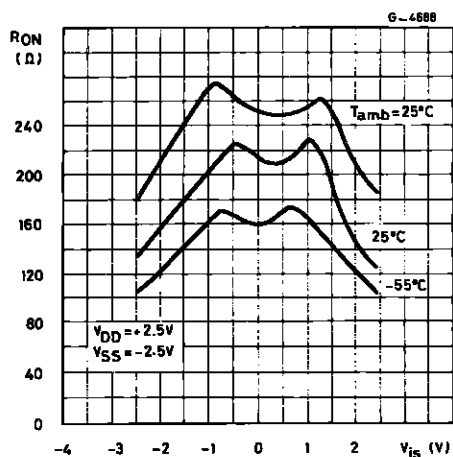
• Peak to peak voltage symmetrical about $V_{DD}/2$

DYNAMIC ELECTRICAL CHARACTERISTICS (continued)

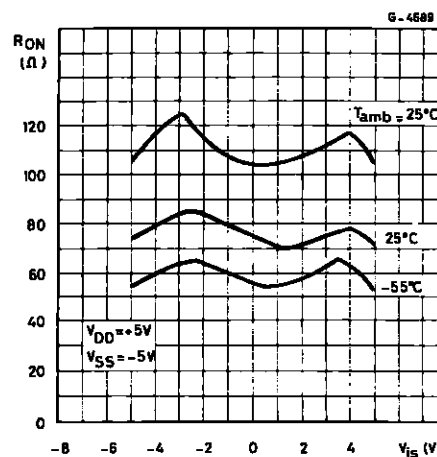
Symbol	Parameter	Test Conditions					Value			Unit
			f _i (KHz)	R _L (KW)	V _{IS} • (V)	V _{DD} (V)	Min.	Typ.	Max.	
CONTROLS (continued)										
t _{hold}	Hold Time Data-In to Strobe, Address	R _L = 1 KΩ C _L = 50 pF t _r , t _f = 20 ns			5		180		ns	
					10		110			
					15		35			
f _φ	Switching Frequency				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)

• Peak to peak voltage symmetrical about $V_{DD}/2$

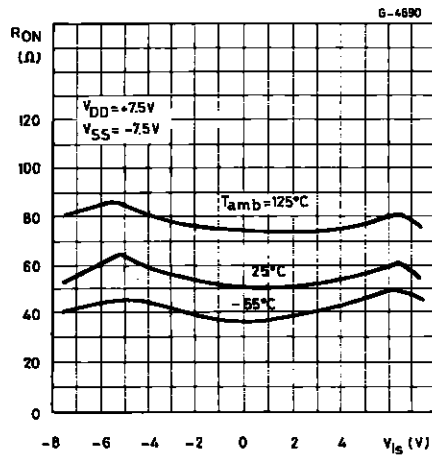
Typical ON Resistance vs. Input Signal Voltage at $V_{DD} = -V_{SS} = 2.5\text{ V}$.



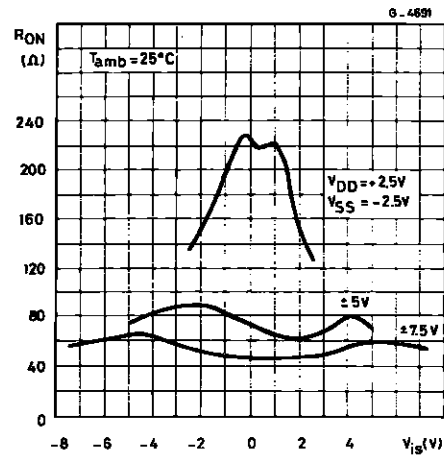
Typical ON Resistance vs. Input Signal Voltage at $V_{DD} = -V_{SS} = 5\text{ V}$.



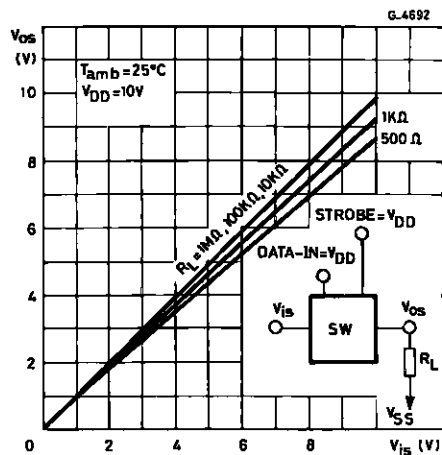
Typical ON Resistance vs. Input Signal Voltage at $V_{DD} = -V_{SS} = 7.5\text{ V}$.



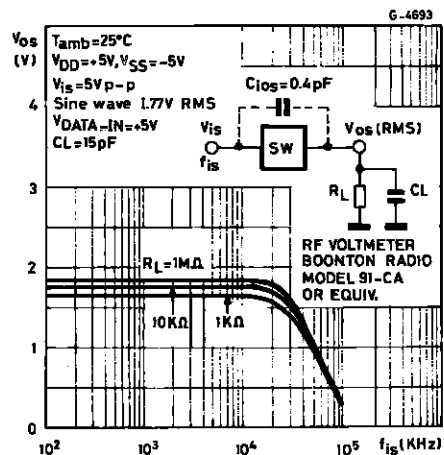
Typical ON Resistance vs.. Input Signal Voltage at $T_{amb} = 25^\circ\text{C}$.



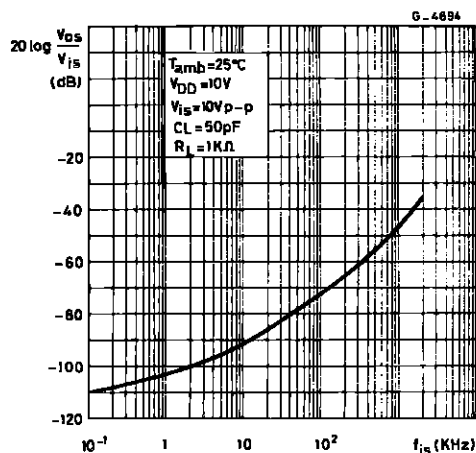
Typical Switch ON Transfer Characteristics (1 of 16 switches).



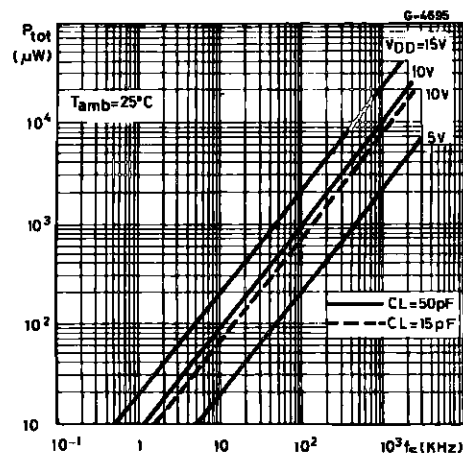
Typical Switch ON Frequency Response Characteristics.



Typical Crosstalk Between switches vs. Signal Frequency.

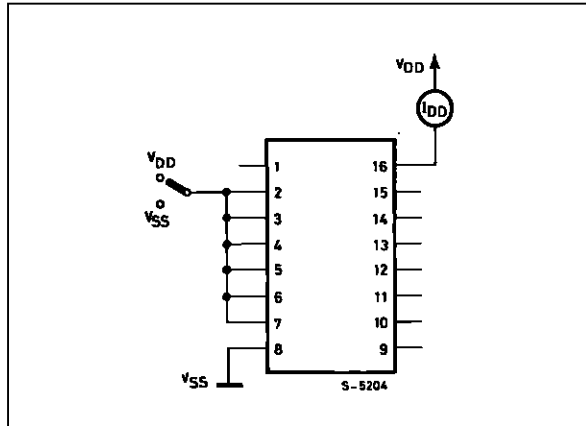


Typical Dynamic Power Dissipation vs. Switching Frequency..

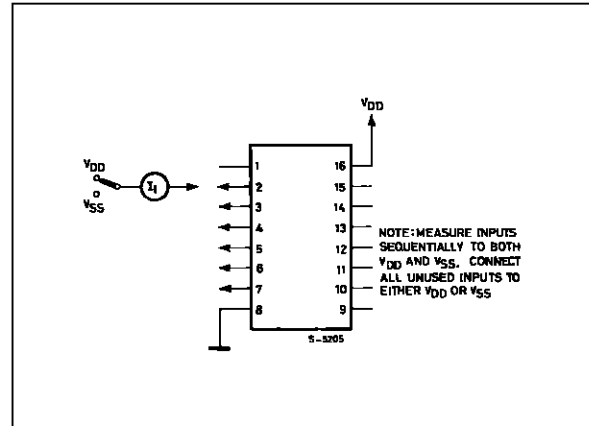


TEST CIRCUITS

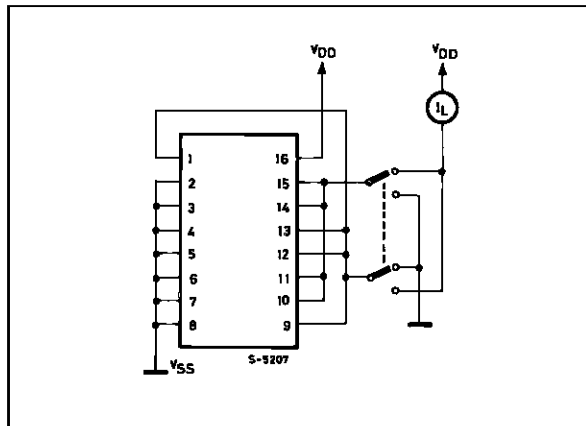
Quiescent Current.



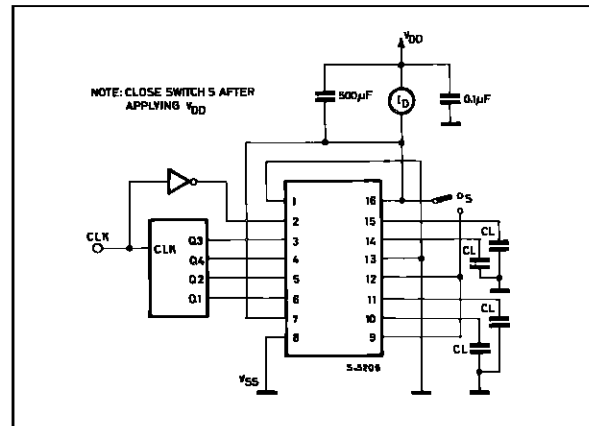
Input Current.



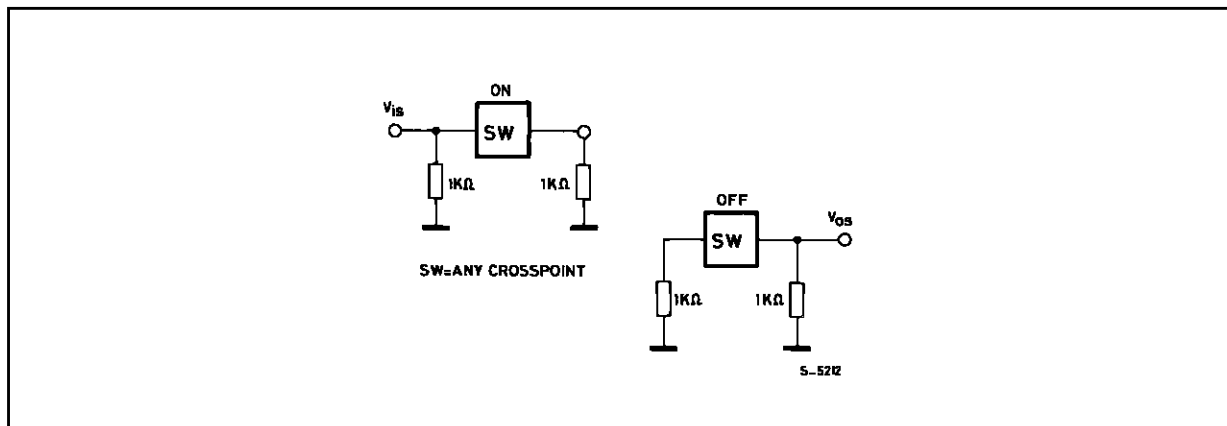
Off Switch Input or Output Leakage Current.



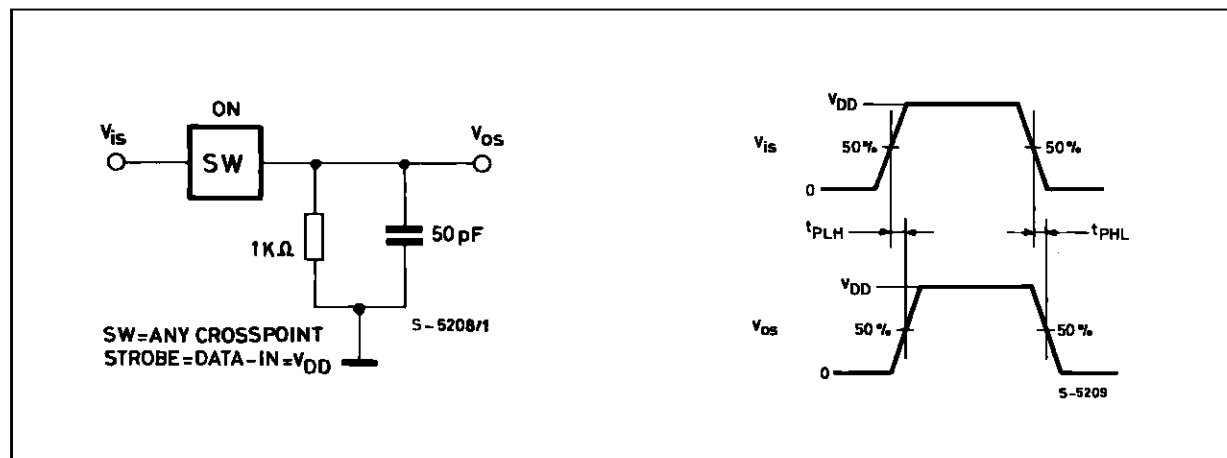
Dynamic Power Dissipation.



Croostalk Between Switch Circuits in the Same Package.



Propagation Delay Time and Waveforms (signal input to signal output, switch ON).



Waveforms for Crosstalk (control input to signal output).

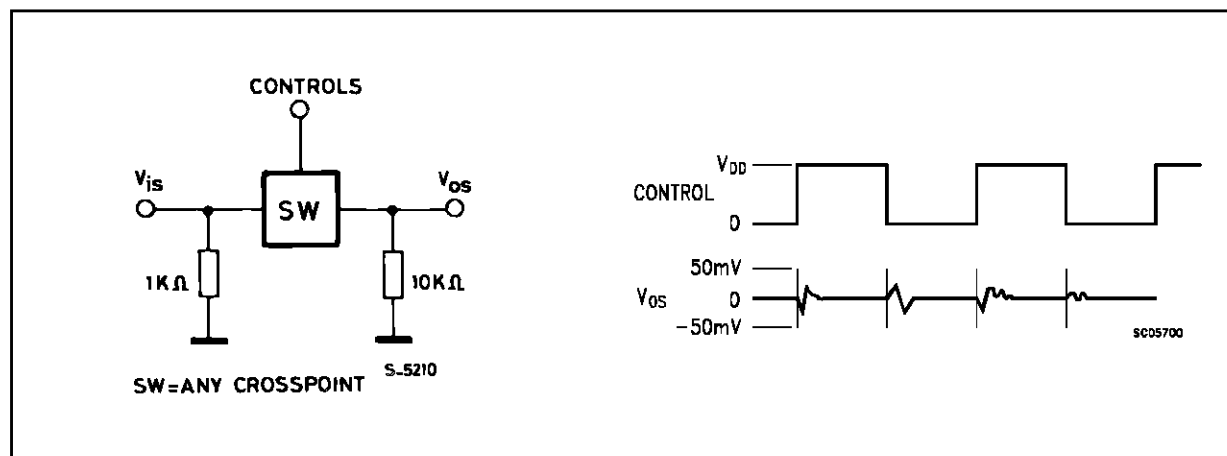


Figure 1 : Propagation Delay Time and Waveforms (strobe to signal output, switch Turn-ON or Turn-OFF).

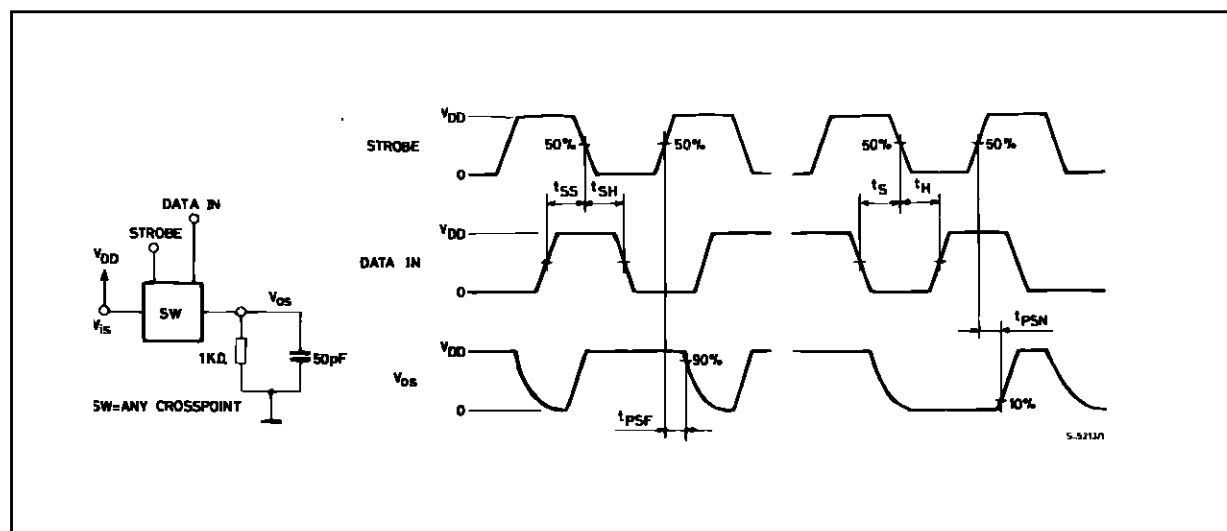


Figure 2 : Propagation Delay Time and Waveforms (data-in to signal output, switch Turn-ON to high or low level).

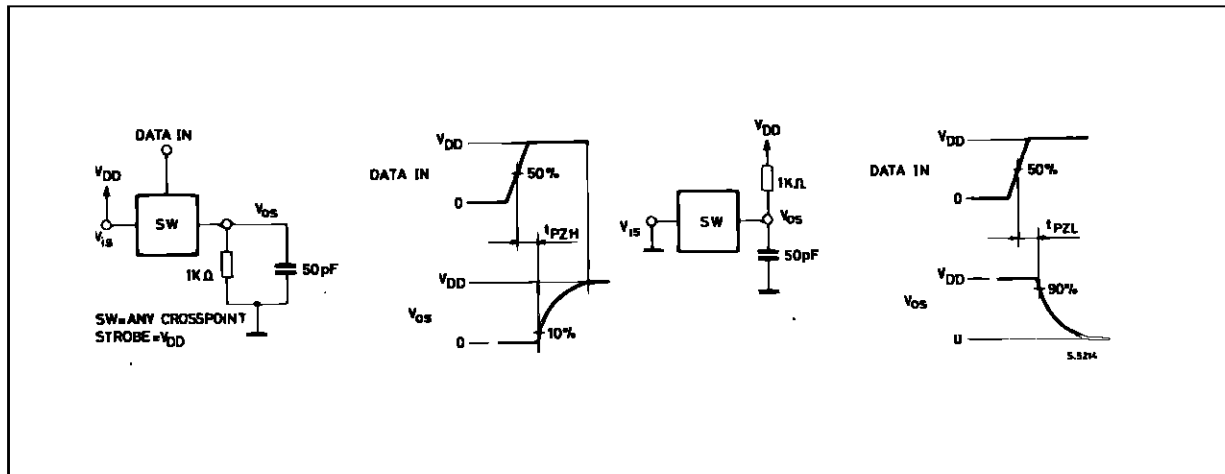
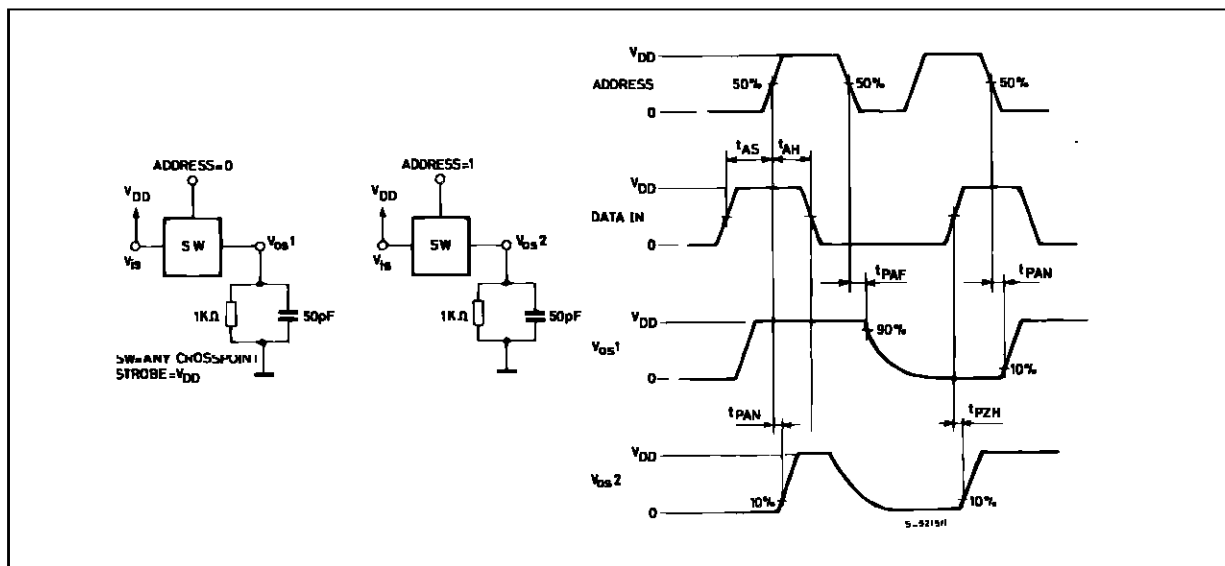
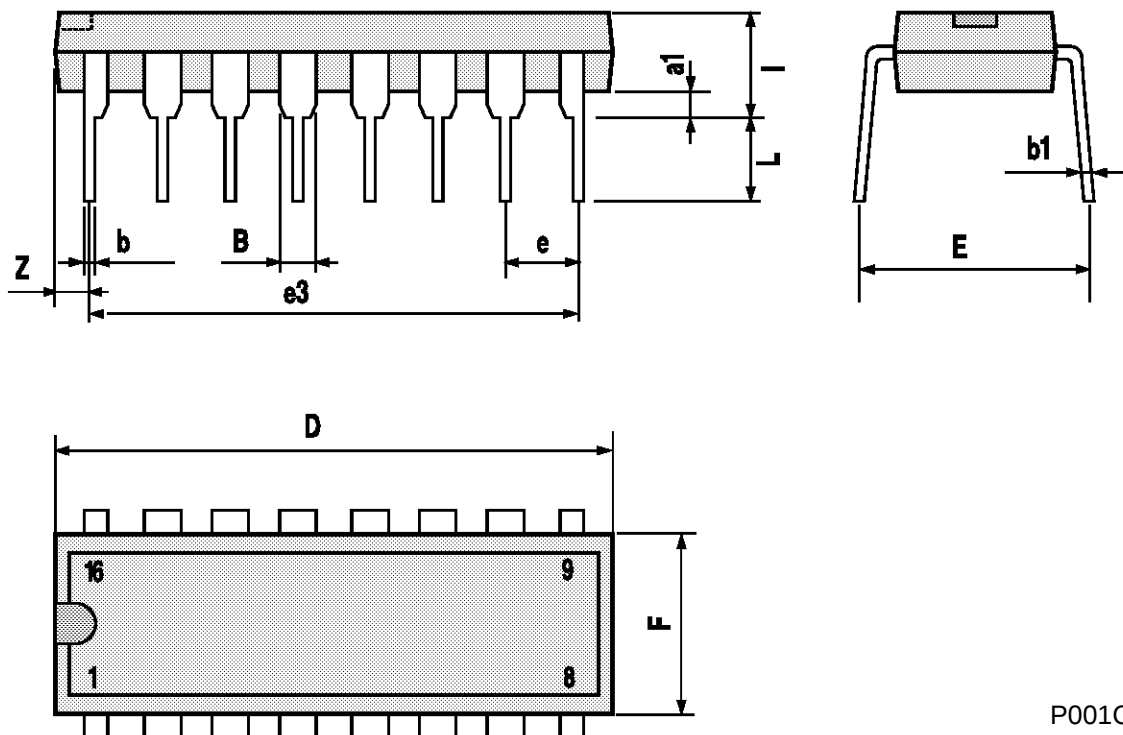


Figure 3 : Propagation Delay Time and Waveforms (address to signal output switch Turn-ON or Turn-OFF).



Plastic DIP16 (0.25) MECHANICAL DATA

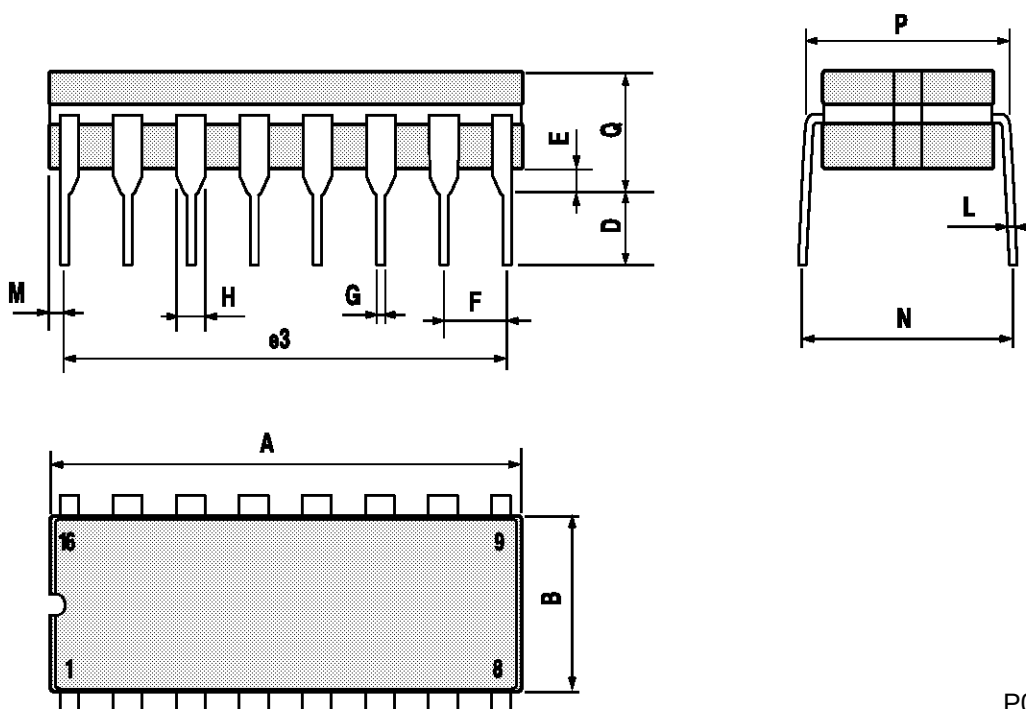
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

Ceramic DIP16/1 MECHANICAL DATA

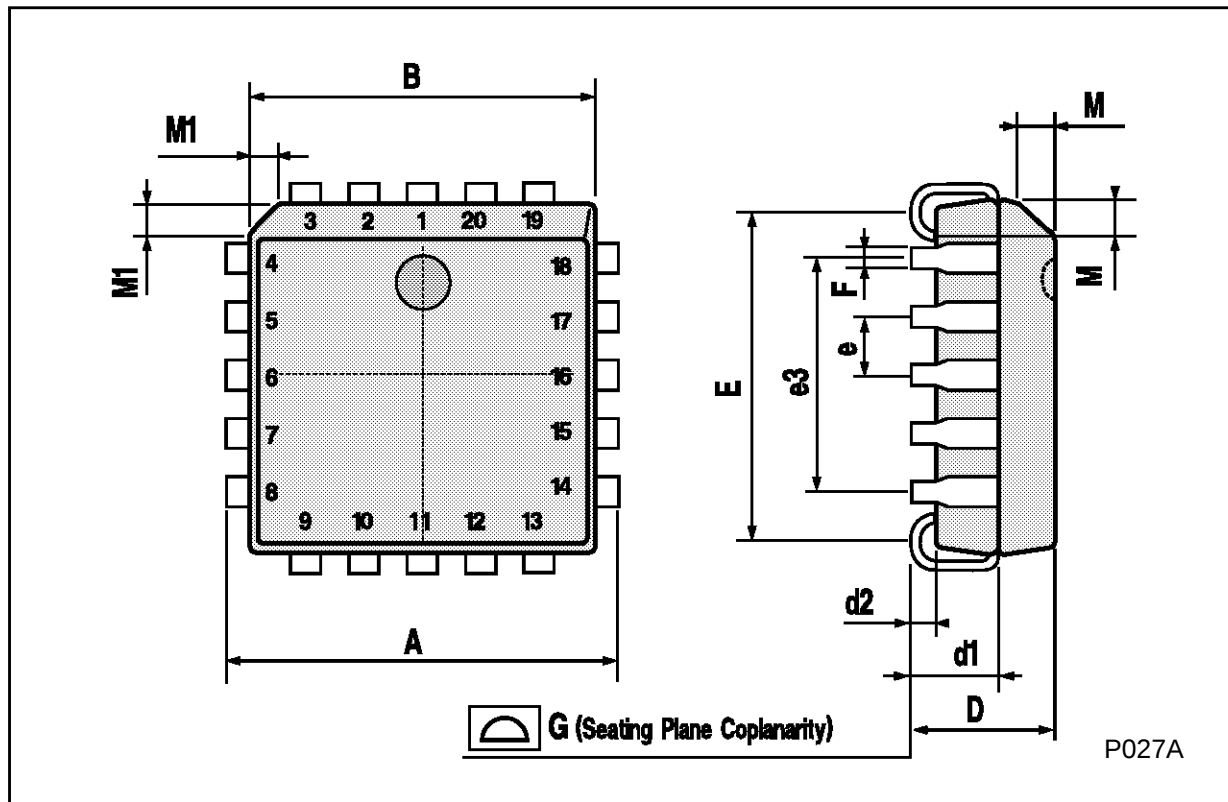
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		17.78			0.700	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200



P053D

PLCC20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045	



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