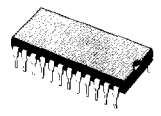
4 x 4 MULTIPORT REGISTER

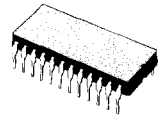
- FOUR 4-BIT REGISTERS
- ONE INPUT AND TWO OUTPUT BUSES
- UNLIMITED EXPANSION IN BIT AND WORD DIRECTION
- DATA LINES HAVE LATCHED INPUTS
- 3-STATE OUTPUTS
- SEPARATE CONTROL OF EACH BUS, ALLOWING SIMULTANEOUS INDEPENDET READING AND ANY OF FOUR REGISTERS ON BUS A AND BUS B AND INDEPENDENT WRITING INTO ANY ANY OF THE FOUR REGISTERS
- 40108B IS PIN COMPATIBLE WITH INDUSTRY TYPE MC14580
- STANDARDIZED, SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED AT 20V FOR HCC DEVICE
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100 nA AT 18V AND 25oC FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD No 13a, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"

DESCRIPTION

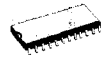
The HCC40108B (extended temperature range) and HCF40108B (intermediate temperature range) are monolithic integrated circuits, available in 24 lead dual in line plastic or ceramic packageand plastic micropackage. The HCC/HCF40108B is a 4 X 4 multiport register containing four 4-bit register, write address decoder, two separate read address decoders, and two 3-state output buses. When the ENABLE input is low, the corresponding output bus is switched, independently of the clock, to a high impedance state. The high impedance third state provides the outputs with the capability of being connected to the bus lines in a bus organized system without the need for interface or pull-up components. When the WRITE ENABLE input is high, all data input lines are latched on the positive transition of the CLOCK and the data is entered into the word selected by the write address lines. When WRITE ENABLE is low, the CLOCK is inhibited and no new data is netered. In either case, the contents of any word may be accessed via the read address lines independent of the state of the CLOCK input.



EY
(Plastic Package)



F
(Ceramic Package)



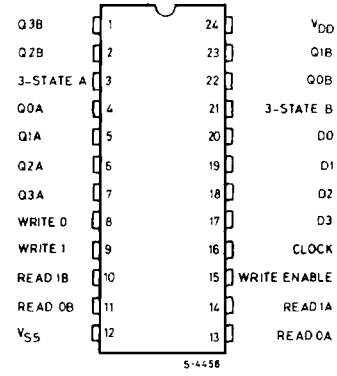
M1
(Micro Package)

C1
(Chip Carrier)

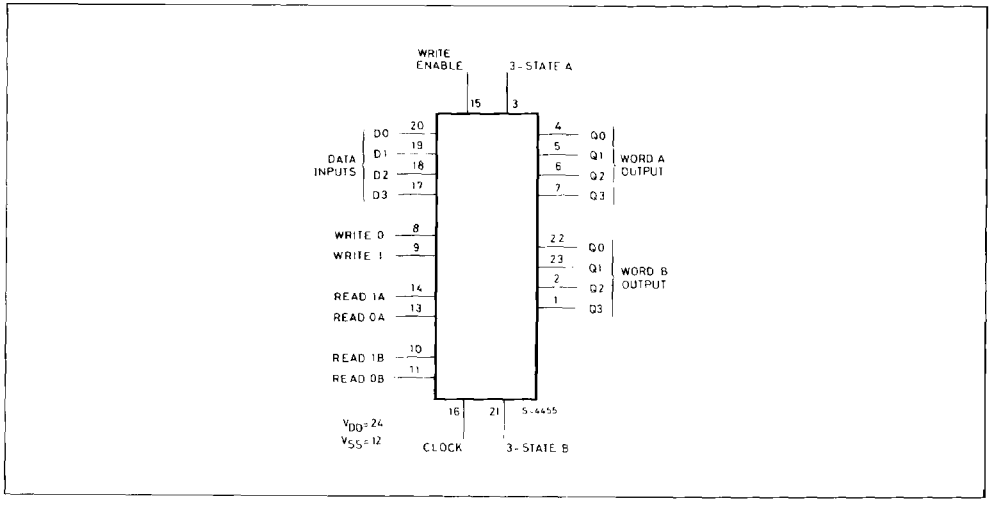
ORDER CODES :

HCC40108BF HCF40108BM1
HCF40108BEY HCF40108BC1

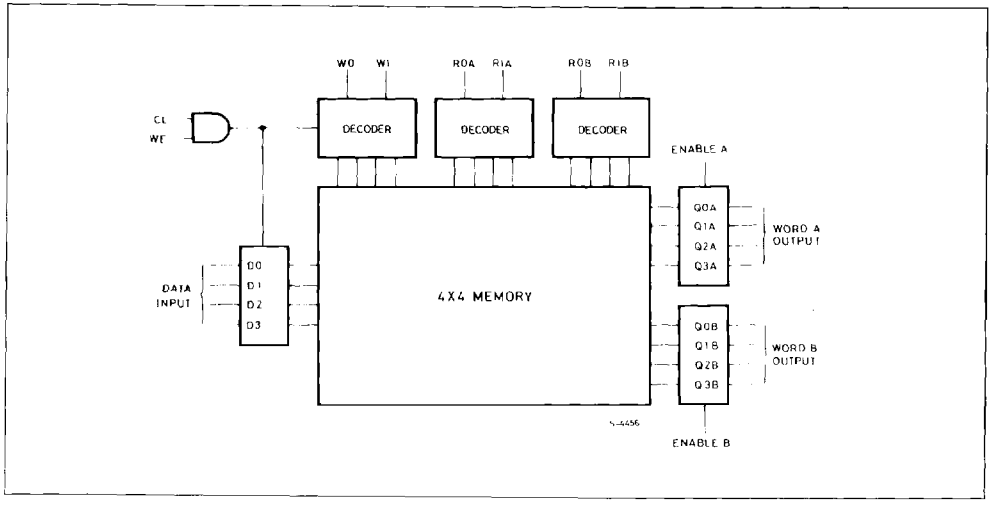
PIN CONNECTIONS



FUNCTIONAL DIAGRAM



LOGIC DIAGRAM



ABSOLUTE MAXIMUM RATING

Symbol	Parameter	Value	Unit
V_{DD} *	Supply Voltage: **HCC** Types	-0.5 to +20	V
	HCF 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 Top = Full Package Temperature Range	100	mW
T_{op}	Operating Temperature: **HCC** Types	-55 to +125	°C
	HCF Types	-40 to +85	°C
T_{stg}	Storage Temperature	-65 to +150	°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: **HCC** Types	3 to 18	V
	HCF Types	3 to 15	V
V_I	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature: **HCC** Types	-55 to +125	°C
	HCF Types	-40 to +85	°C

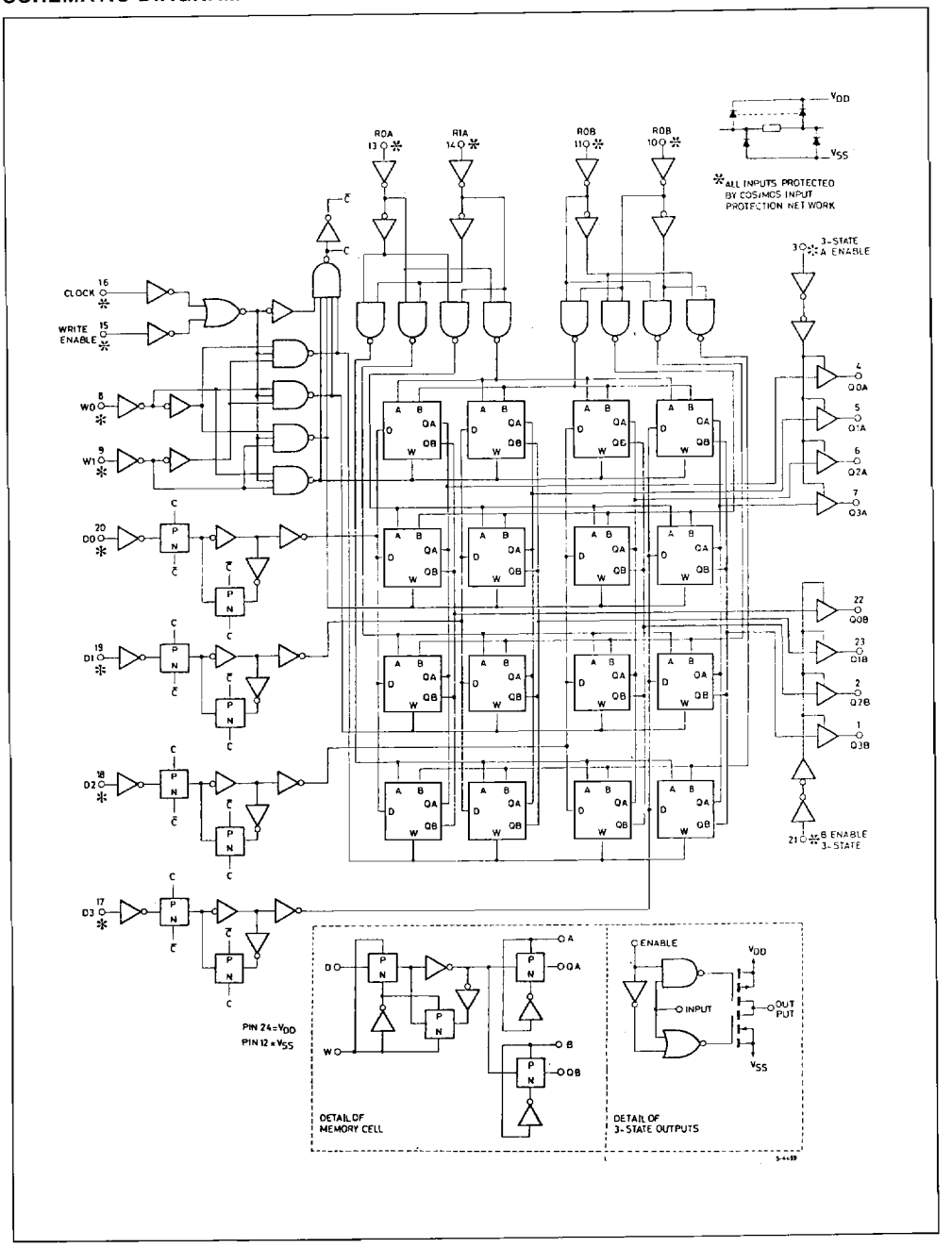
TRUTH TABLE

CLOCK	Write Enable	Write 1	Write 2	Read 1A	Read 0A	Read 1B	Read 0B	En-able A	En-able B	D_n	Q_{nA}	Q_{nB}
⎍	1	S1	S2	S1	S2	S1	S2	1	1	1	1	1
⎍	1	S1	S2	S1	S2	S1	S2	1	0	0	0	0
X	X	X	X	X	X	X	X	0	X	Z	Z	Z
⎍	1	0	0	0	1	1	0	1	1	D_n to word 0	Word 1 Out	Word 2 Out
⎍	0	0	0	0	1	1	0	1	1	Word 0 not altered	Word 1 Out	Word 2 Out
X	X	X	X	1	0	0	1	1	X	X	Word 2 Out	Word 1 Out
⎍	X	X	X	X	X	X	X	1	1	X	NC	NC

1 = HIGH LEVEL, 0 = LOW LEVEL, X = DON'T CARE, Z = HIGH IMPEDANCE

S1 and S2 refer to input strates of either 1 or 0

SCHEMATIC DIAGRAM



STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter		Test Conditios V_I (V)	V_O (V)	$\|I_O\|$ (μA)	V_{DD} (V)	Value T_{LOW} * Min.	T_{LOW} * Max.	25 °C Min.	25 °C Typ.	25 °C Max.	T_{HIGH} * Min.	T_{HIGH} * Max.	Unit
I_L	Quiescent Current	HCC Types	0/5			5		5		0.04	5		150	μA
			0/10			10		10		0.04	10		300	
			0/15			15		20		0.04	20		600	
			0/20			20		100		0.08	100		3000	
		HCF Types	0/5			5		20		0.04	20		150	
			0/10			10		40		0.04	40		300	
			0/15			15		80		0.04	80		600	
V_{OH}	Output High 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}	Output Low 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}	Input High 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}	Input Low 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	HCC Types	0/5	2.5		5	-2		-1.6	-3.2		-1.15		mA
			0/5	4.6		5	-0.64		-0.51	-1		-0.36		
			0/10	9.5		10	-1.6		-1.3	-2.6		-0.9		
			0/15	13.5		15	-4.2		-3.4	-6.8		-2.4		
		HCF Types	0/5	2.5		5	-1.53		-1.36	-3.2		-1.1		
			0/5	4.6		5	-0.52		-0.44	-1		-0.36		
			0/10	9.5		10	-1.3		-1.1	-2.6		-0.9		
			0/15	13.5		15	-3.6		-3.0	-6.8		-2.4		
I_{OL}	Output Sink Current	HCC Types	0/5	0.4		5	0.64		0.51	1		0.36		mA
			0/10	0.5		10	1.6		1.3	2.6		0.9		
			0/15	1.5		15	4.2		3.4	6.8		2.4		
		HCF Types	0/5	0.4		5	0.52		0.44	1		0.36		
			0/10	0.5		10	1.3		1.1	2.6		0.9		
			0/15	1.5		15	3.6		3.0	6.8		2.4		
I_{IH}, I_{IL}	Input Leakage Current	HCC Types	0/18	Any Input		18		±0.1		$±10^{-5}$	±0.1		±1	μA
		HCF Types	0/15			15		±0.3		$±10^{-5}$	±0.3		±1	
I_{OH}, I_{OL} **	3-Sate Output Leakage Current	HCC Types	0/18	0/18		18		±0.4		$±10^{-4}$	±0.4		±12	μA
		HCF Types	0/15	0/15		15		±1.0		$±10^{-4}$	±1.0		±7.5	
C_I	Input Capacitance			Any Input						5	7.5			pF

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

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

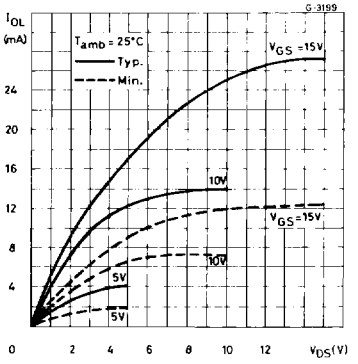
The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD} = 5 V, 2 V min. with V_{DD} = 10 V, 2.5 V min. with V_{DD} = 15 V

** Forced output disable

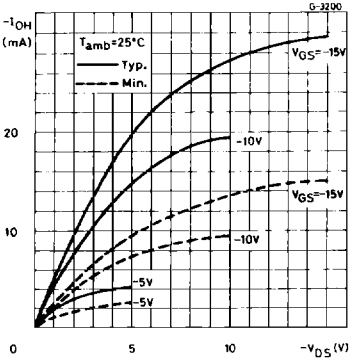
DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25 °C, C_L = 50 pF, R_L = 200 KΩ, typical temperature coefficent for all V_{DD} values is 03 %/°C, all input rise and fall times= 20 ns)

Symbol	Parameter	Test Conditions	Value			Unit
		V_{DD} (V)	Min.	Typ.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Time Clock or Write Enable to Q	5		360	720	ns
		10		140	280	
		15		100	200	
	Propagation Delay Time Read or Write Address to Q	5		300	600	
		10		120	240	
		15		85	170	
t_{PZH} t_{PHZ}	3-State Disable Delay Time	5		100	200	ns
		10		50	100	
		15		40	80	
t_{PZL} t_{PLZ}	3-State Display Delay Time	5		130	260	ns
		10		60	120	
		15		50	100	
t_{TLH} t_{THL}	Output Transition Time	5		100	200	ns
		10		50	100	
		15		40	80	
t_{setup}	Setup Time Data to Clock $t_{s(D)}$	5	0	-95		ns
		10	0	-35		
		15	0	-20		
	Setup Time Write Enable to Clock $t_{s(WE)}$	5	250	125		
		10	100	50		
		15	70	35		
	Setup Time Write Address to Clock $t_{s(WA)}$	5	250	125		
		10	100	50		
		15	70	35		
t_r, t_s	Clock Rise and Fall Time	5			15	µs
		10			5	
		15			5	
t_{hold}	Hold Time Data to Clock $t_{s(D)}$	5	220	110		ns
		10	100	50		
		15	80	40		
	Hold Time Write Enable to Clock $t_{s(WE)}$	5	270	135		
		10	130	65		
		15	80	40		
	Hold Time Write Address to Clock $t_{s(WA)}$	5	330	165		
		10	140	70		
		15	90	45		
t_W	Clock Pulse Width Clock or Write Enable $t_{W(CL)}$	5	350	175		ns
		10	130	65		
		15	90	45		
	Clock Pulse Width Write Address $t_{W(WA)}$	5	300	150		
		10	150	75		
		15	90	45		
f_{CL}	Maximum Clock Input Frequency	5	1.5	3		MHz
		10	3.5	7		
		15	4.5	9		

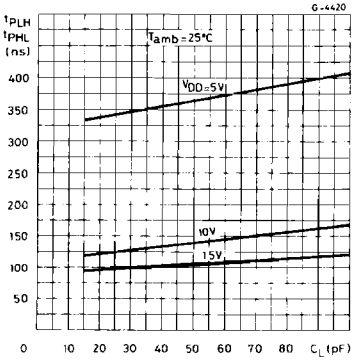
Output Low (sink) Current Characteristics



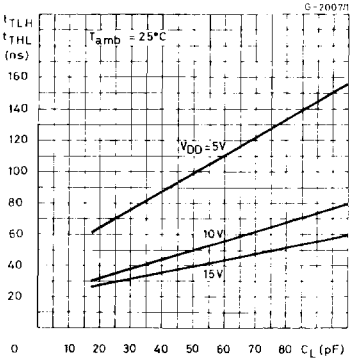
Output High (source) Current Characteristics



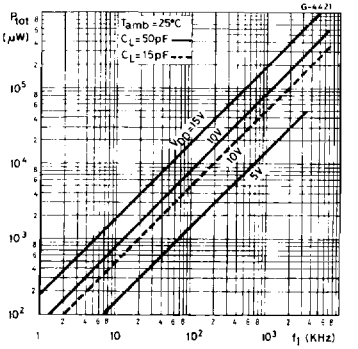
Typical Propagation Delay Time vs Load Capacitance (CL or WE to Q)



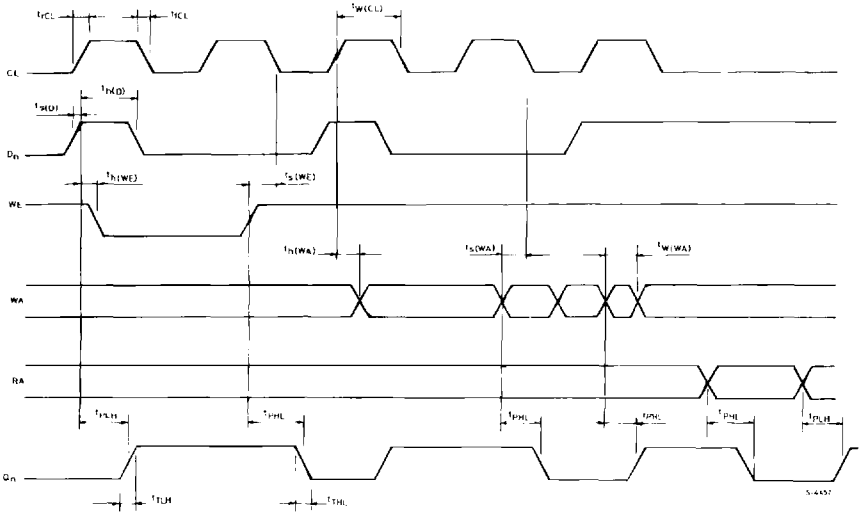
Typical Transition Time vs Load Capacitance



Typical Dynamic Power Dissipation vs Input Frequency

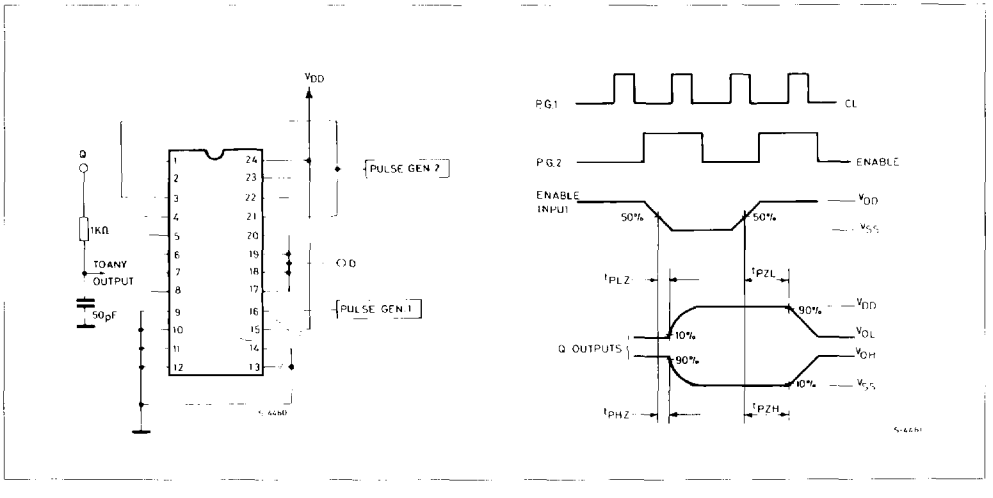


TIMING DIAGRAM

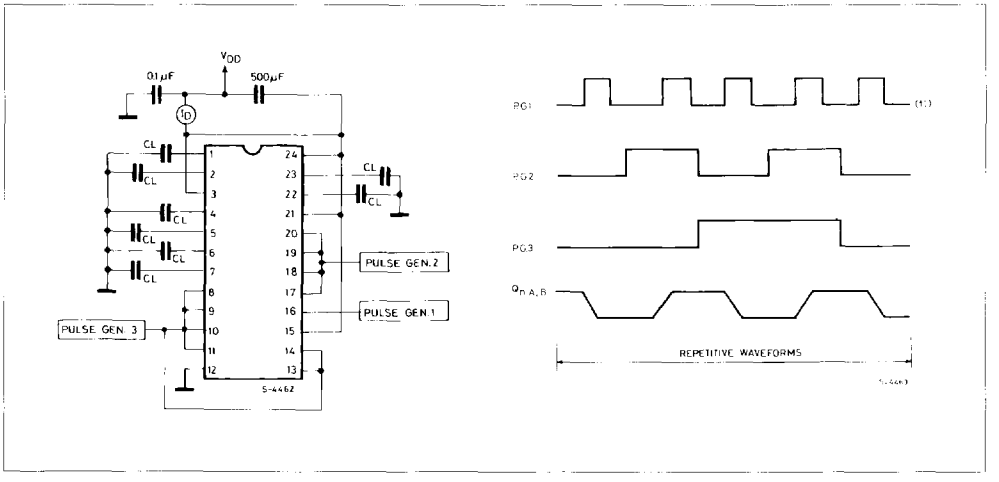


TEST CIRCUITS

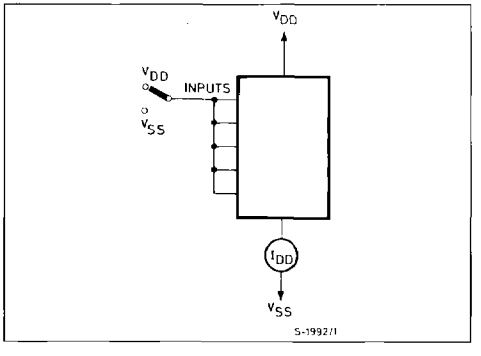
Output Enable Delay Times and Waveforms



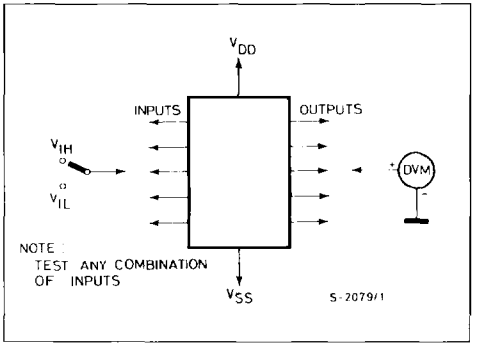
Power Dissipation and Waveforms



Quiescent Device Current.



Noise Immunity.



Input Leakage Current.