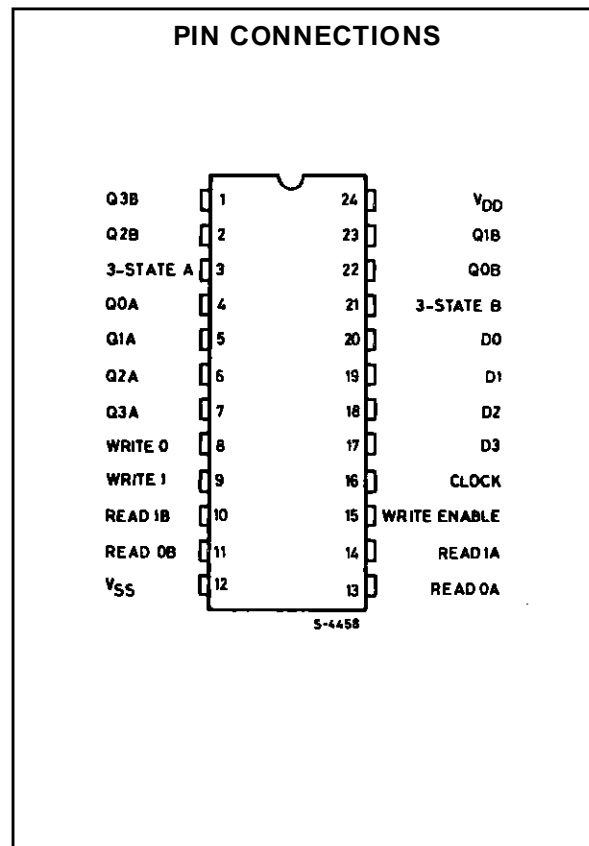
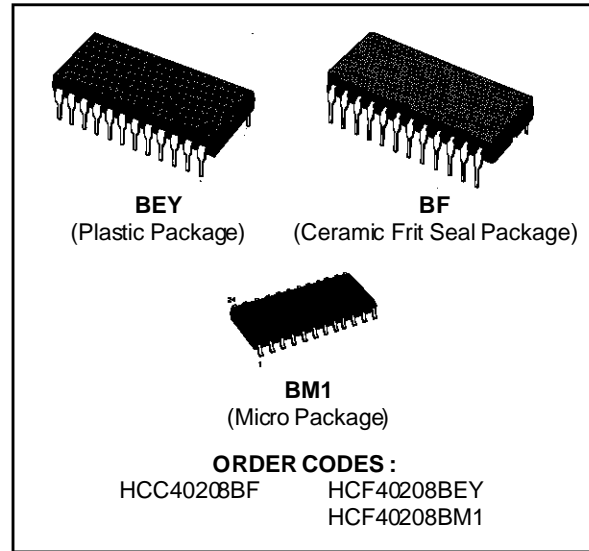


## 4 x 4 MULTIPOINT REGISTER

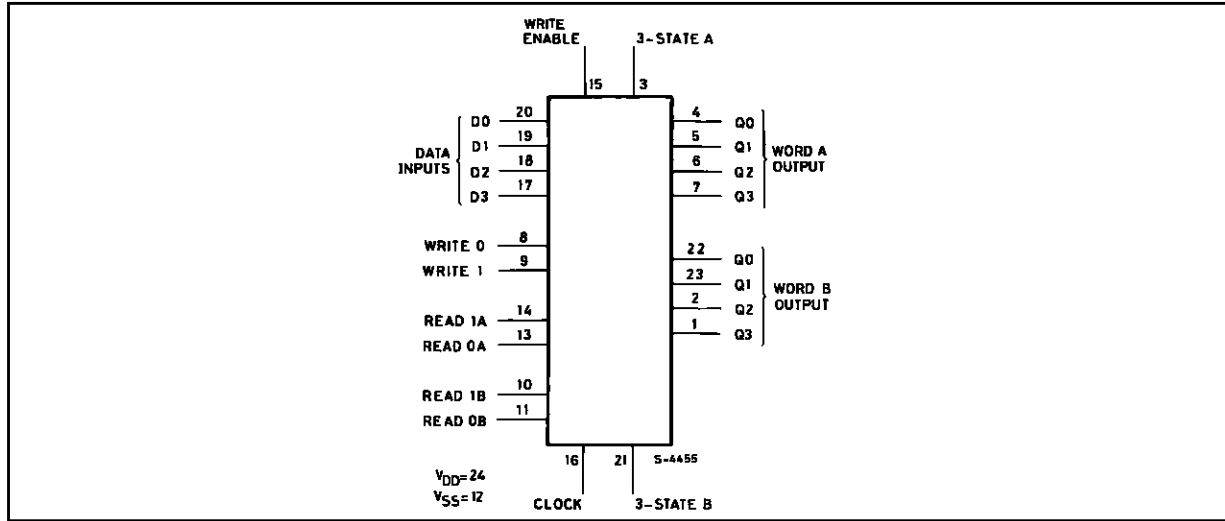
- FOUR 4-BIT REGISTERS
- ONE INPUT AND TWO OUTPUT BUSES
- UNLIMITED EXPANSION IN BIT AND WORD DIRECTIONS
- DATA LINES HAVE LATCHED INPUTS
- 3-STATE OUTPUTS
- SEPARATE CONTROL OF EACH BUS, ALLOWING SIMULTANEOUS INDEPENDENT READING OF ANY OF FOUR REGISTERS ON BUS A AND BUS B AND INDEPENDENT WRITING INTO 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 100nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N° 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

### DESCRIPTION

The **HCC40208B** (extended temperature range) and **HCF40208B** (intermediate temperature range) are monolithic integrated circuits, available in 24-lead dual in-line plastic or ceramic package and plastic micro package. The **HCC/HCF40208B** is a 4 x 4 multipoint register containing four 4-bit registers, 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 entered. In either case, the contents of any word may be accessed via the read address lines independent of the state of the CLOCK input.



FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATINGS

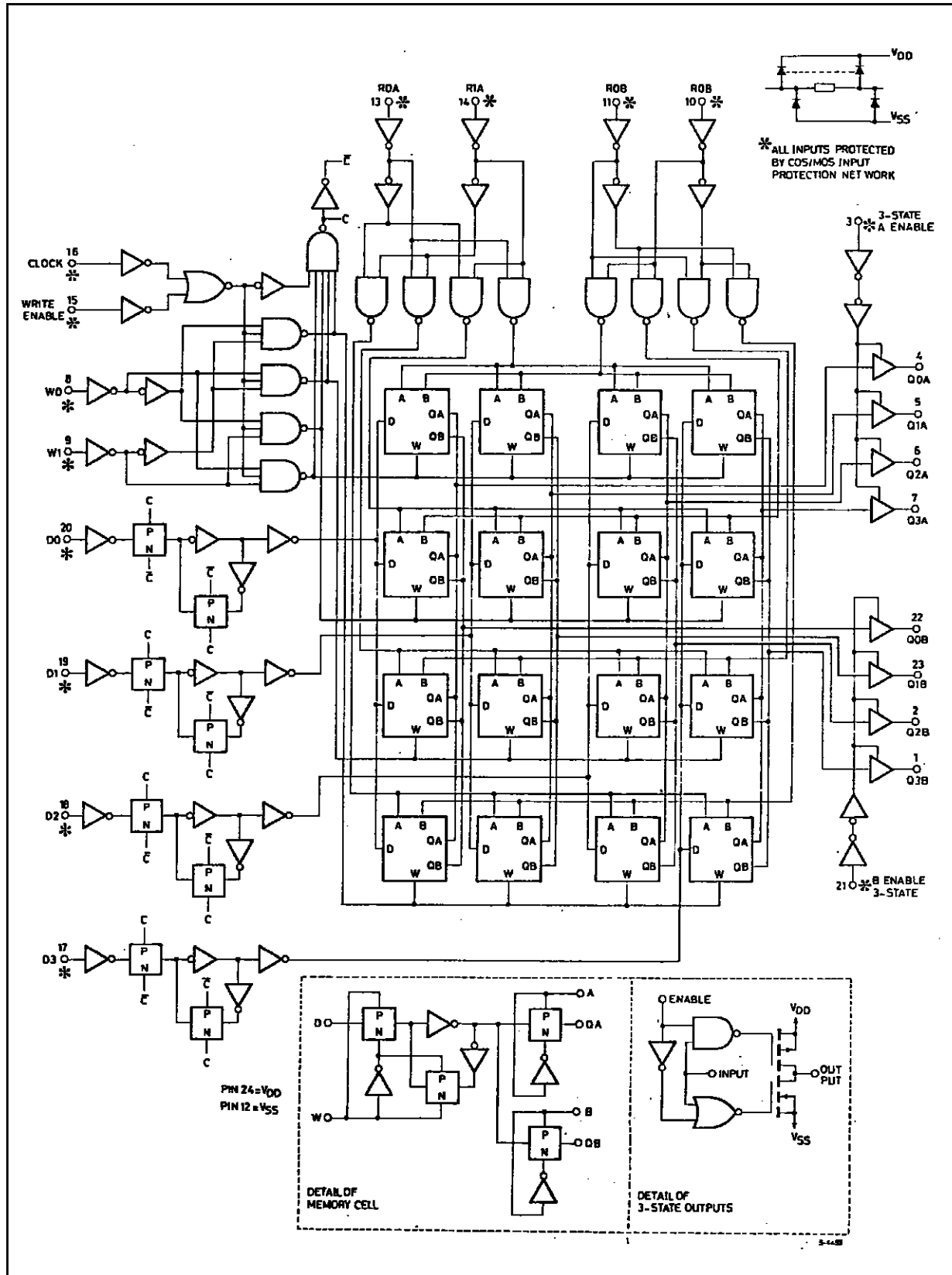
Symbol	Parameter	Value	Unit
$V_{DD}^*$	Supply Voltage : HCC Types HCF Types	- 0.5 to + 20	V
		- 0.5 to + 18	V
$V_i$	Input Voltage	- 0.5 to $V_{DD} + 0.5$	V
$I_i$	DC Input Current (any one input)	$\pm 10$	mA
$P_{tot}$	Total Power Dissipation (per package) Dissipation per Output Transistor for $T_{op}$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

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 voltages are with respect to  $V_{SS}$  (GND).

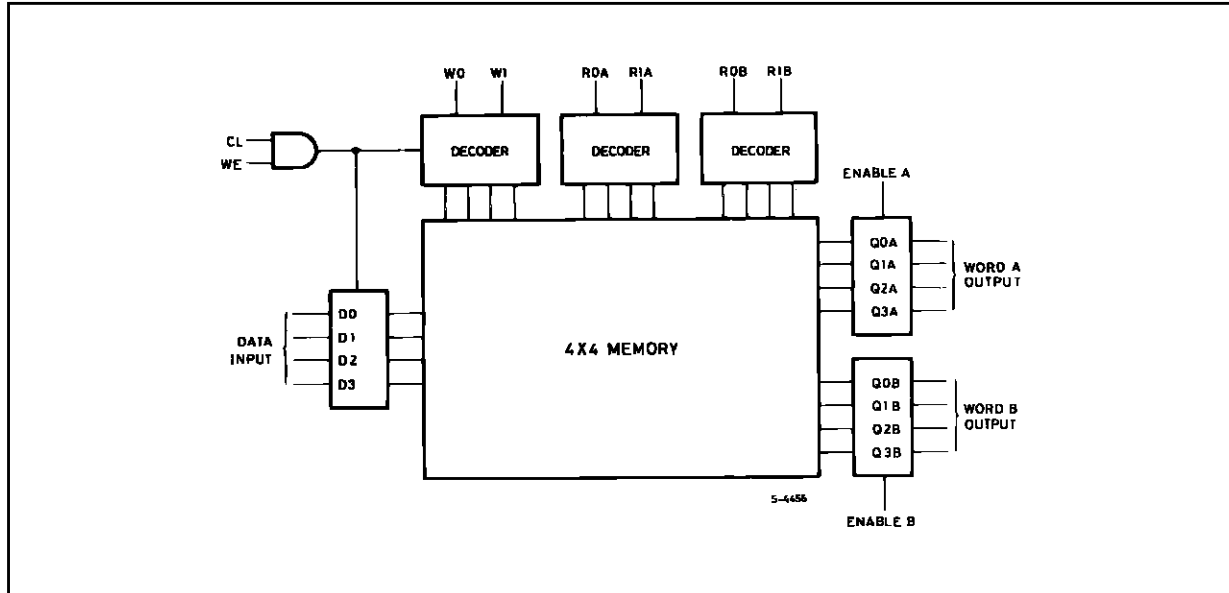
RECOMMENDED OPERATING CONDITIONS

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

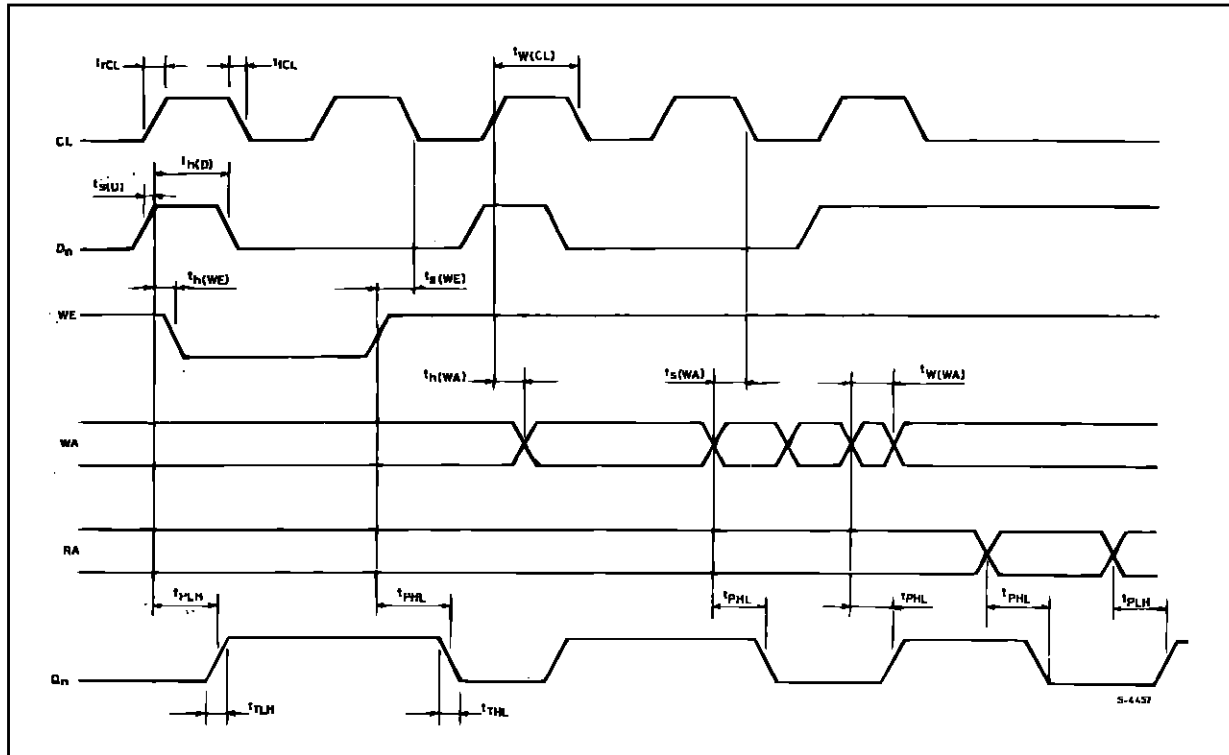
SCHEMATIC DIAGRAM



LOGIC DIAGRAM



TIMING DIAGRAM



TRUTH TABLE

Clock	Write Enable	Write 1	Write 0	Read 1A	Read 0A	Read 1B	Read 0B	Enable A	Enable B	D <sub>n</sub>	Q <sub>nA</sub>	Q <sub>nB</sub>
	1	S1	S2	S1	S2	S1	S2	1	1	1	1	1
	1	S1	S2	S1	S2	S1	S2	1	1	0	0	0
X	X	X	X	X	X	X	X	0	0	X	Z	Z
	1	0	0	0	1	1	0	1	1	D <sub>n</sub> 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	1	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 states of either 1 or 0.

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter	Test Conditions				Value						Unit		
		V <sub>I</sub> (V)	V <sub>O</sub> (V)	I <sub>O</sub>   (μA)	V <sub>DD</sub> (V)	T <sub>Low</sub> *		25°C			T <sub>High</sub> *			
						Min.	Max.	Min.	Typ.	Max.	Min.		Max.	
I <sub>L</sub>	Quiescent Current	HCC Types	0/ 5			5		5		0.04	5		150	
			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 <sub>OH</sub>	Output High Voltage	0/ 5		< 1	5	4.95		4.95			4.95			
		0/10		< 1	10	9.95		9.95			9.95			
		0/15		< 1	15	14.95		14.95			14.95			
V <sub>OL</sub>	Output Low Voltage	5/0		< 1	5		0.05			0.05		0.05		
		10/0		< 1	10		0.05			0.05		0.05		
		15/0		< 1	15		0.05			0.05		0.05		
V <sub>IH</sub>	Input High Voltage		0.5/4.5	< 1	5	3.5		3.5			3.5			
			1/9	< 1	10	7		7			7			
			1.5/13.5	< 1	15	11		11			11			
V <sub>IL</sub>	Input Low Voltage		4.5/0.5	< 1	5		1.5			1.5		1.5		
			9/1	< 1	10		3			3		3		
			13.5/1.5	< 1	15		4			4		4		
I <sub>OH</sub>	Output Drive Current	HCC Types	0/ 5	2.5		5	- 2		- 1.6	- 3.2		- 1.15		
			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		
		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					

\* T<sub>Low</sub> = - 55°C for HCC device : - 40°C for HCF device.

\* T<sub>High</sub> = + 125°C for HCC device : + 85°C for HCF device.

The Noise Margin for both "1" and "0" level is : 1V min. with V<sub>DD</sub> = 5V, 2V min. with V<sub>DD</sub> = 10V, 2.5V min. with V<sub>DD</sub> = 15V.

\*\* Forced output disable.

STATIC ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter		Test Conditions				Value						Unit	
			V <sub>I</sub> (V)	V <sub>O</sub> (V)	I <sub>O</sub>   (μA)	V <sub>DD</sub> (V)	T <sub>Low</sub> *		25°C			T <sub>High</sub> *		
							Min.	Max.	Min.	Typ.	Max.	Min.		Max.
I <sub>OL</sub>	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 <sub>IH</sub> , I <sub>IL</sub>	Input Leakage Current	HCC Types	0/18	Any Input		18		± 0.1		±10 <sup>-5</sup>	± 0.1		± 1	μA
		HCF Types	0/15			15		± 0.3		±10 <sup>-5</sup>	± 0.3		± 1	
I <sub>OH</sub> , I <sub>OL</sub> **	3-State Output Leakage Current	HCC Types	0/18	0/18		18		± 0.4		±10 <sup>-4</sup>	± 0.4		± 12	μA
		HCF Types	0/15	0/15		15		± 1.0		±10 <sup>-4</sup>	± 1.0		± 7.5	
C <sub>I</sub>	Input Capacitance		Any Input						5	7.5			pF	

\* T<sub>Low</sub> = - 55°C for HCC device : - 40°C for HCF device.  
 \* T<sub>High</sub> = + 125°C for HCC device : + 85°C for HCF device.  
 The Noise Margin for both "1" and "0" level is : 1V min. with V<sub>DD</sub> = 5V, 2V min. with V<sub>DD</sub> = 10V, 2.5V min. with V<sub>DD</sub> = 15V.  
 \*\* Forced output disable.

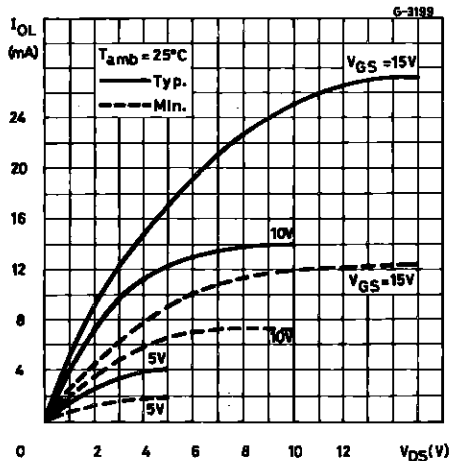
DYNAMIC ELECTRICAL CHARACTERISTICS (T<sub>amb</sub> = 25°C, C<sub>L</sub> = 50pF, R<sub>L</sub> = 200kΩ, typical temperature coefficient for all V<sub>DD</sub> values is 0.3%/°C, all input rise and fall time = 20ns)

Symbol	Parameter	Test Conditions	Value			Unit	
			V <sub>DD</sub> (V)	Min.	Typ.		Max.
t <sub>PHL</sub> , t <sub>PLH</sub>	Propagation Delay Time : Clock to Write Enable to Q		5		360	720	ns
			10		140	280	
			15		100	200	
	Read or Write Address to Q		5		300	600	ns
			10		120	240	
			15		85	170	
t <sub>PZH</sub> , t <sub>PHZ</sub>	3-state Disable Delay Time	5		100	200	ns	
		10		50	100		
		15		40	80		
t <sub>PZL</sub> , t <sub>PLZ</sub>	3-State Disable Delay time	5		130	260	ns	
		10		60	120		
		15		50	100		
t <sub>THL</sub> , t <sub>TLH</sub>	Output Transition Time	5		100	200	ns	
		10		50	100		
		15		40	80		
t <sub>setup</sub>	Setup Time Data to Clock t <sub>s(D)</sub>	5	0	- 95		ns	
		10	0	- 35			
		15	0	- 20			
	Write Enable to $\overline{\text{Clock}}$ t <sub>s(WE)</sub>	5	250	125		ns	
		10	100	50			
		15	70	35			
	Write Address to $\overline{\text{Clock}}$ t <sub>s(WA)</sub>	5	250	125		ns	
		10	100	50			
		15	70	35			

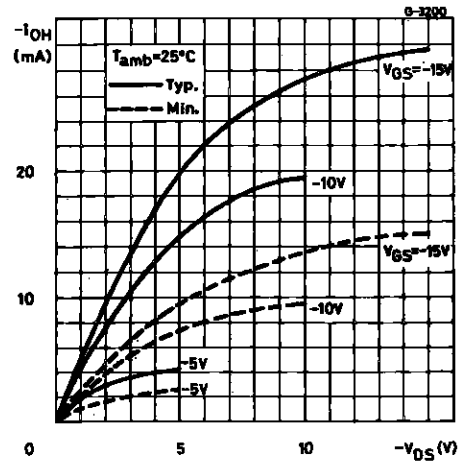
**DYNAMIC ELECTRICAL CHARACTERISTICS** (continued)

Symbol	Parameter	Test Conditions	Value			Unit	
			V <sub>DD</sub> (V)	Min.	Typ.		Max.
t <sub>r</sub> , t <sub>f</sub>	Clock Rise and Fall Time		5			15	μs
			10			5	
			15			5	
t <sub>hold</sub>	Hold Time Data to Clock t <sub>h(D)</sub>		5	220	110		ns
			10	100	50		
			15	80	40		
	Write Enable to Clock t <sub>h(WE)</sub>		5	270	135		ns
			10	130	65		
			15	80	40		
	Write Address to Clock t <sub>s(WA)</sub>		5	330	165		
			10	140	70		
			15	90	45		
t <sub>w</sub>	Clock Pulse Width Clock or Write Enable t <sub>w(CL)</sub>		5	350	175		ns
			10	130	65		
			15	90	45		
	Write Address t <sub>w(WA)</sub>		5	300	150		ns
			10	150	75		
			15	90	45		
f <sub>CL</sub>	Maximum Clock Input Frequency		5	1.5	3		MHz
			10	3.5	7		
			15	4.5	9		

Output Low (sink) Current Characteristics.

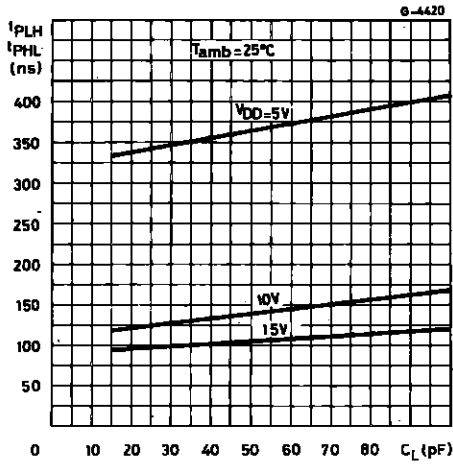


Output High (source) Current Characteristics.

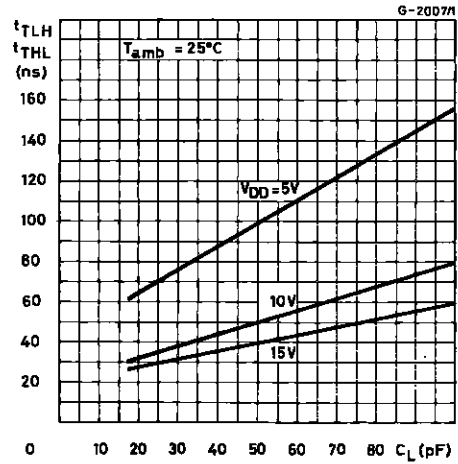


# HCC/HCF40208B

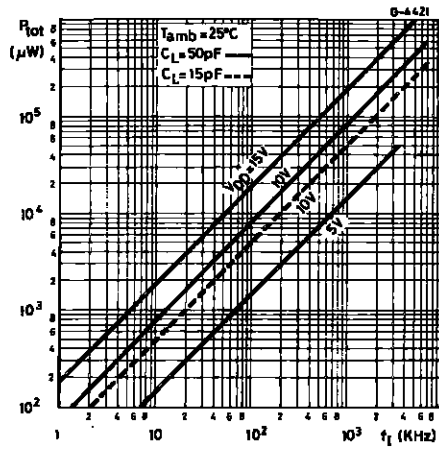
Typical Propagation Delay Time vs. Load Capacitance (CL or WE to Q).



Typical Transition Time vs. Load Capacitance.

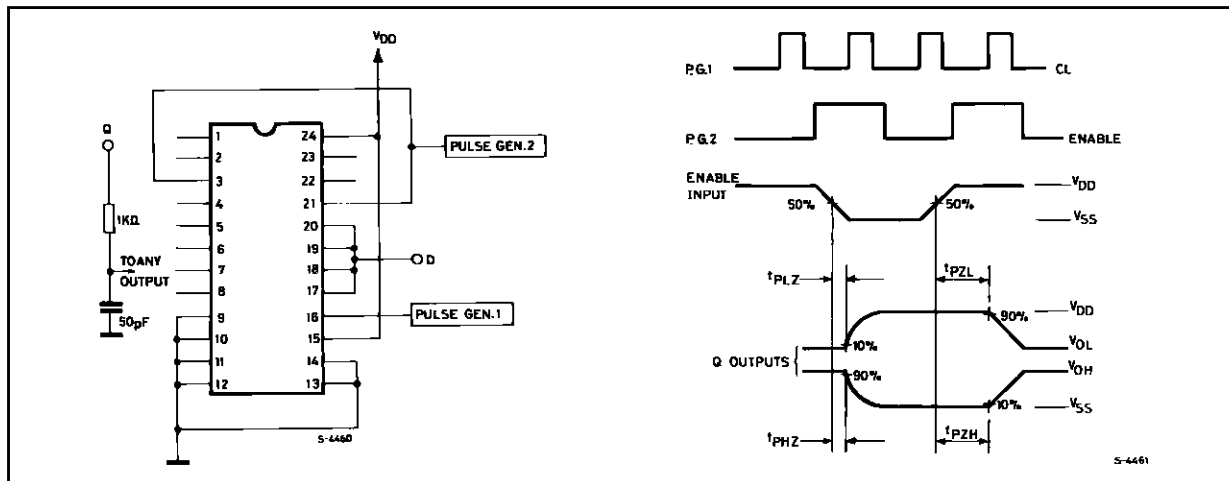


Typical Dynamic Power Dissipation vs. Input Frequency.



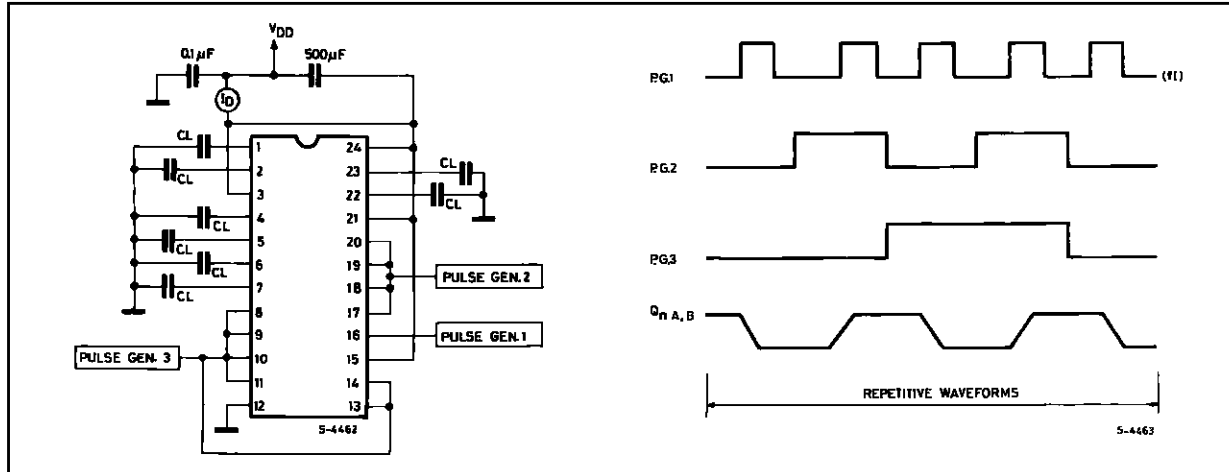
## TEST CIRCUITS

Output-enable-delay-times and Waveforms.

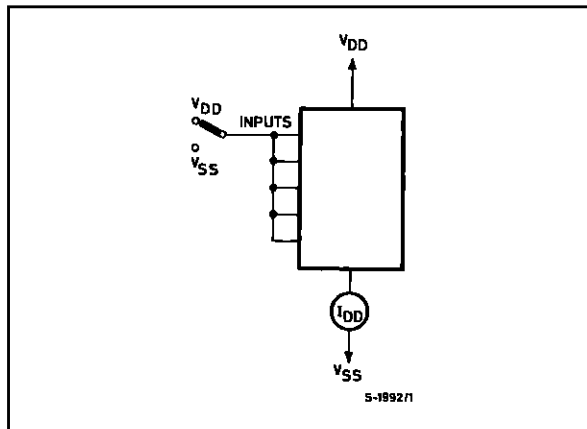




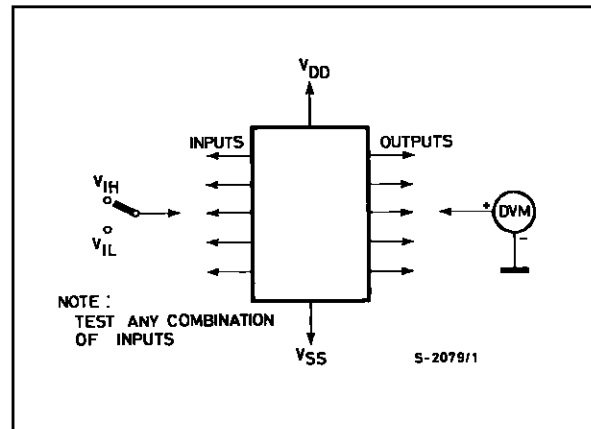
Power-dissipation and Waveforms.



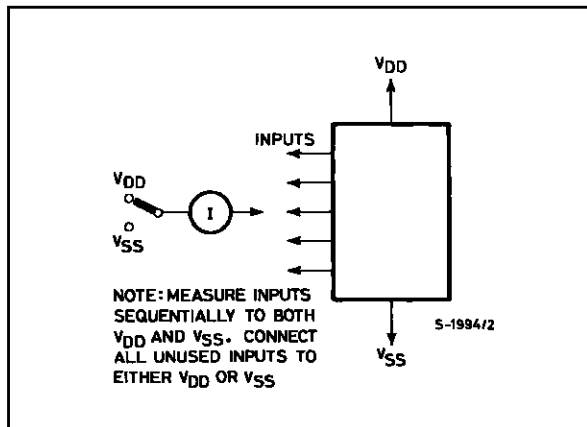
Quiescent Device Current



Input Voltage

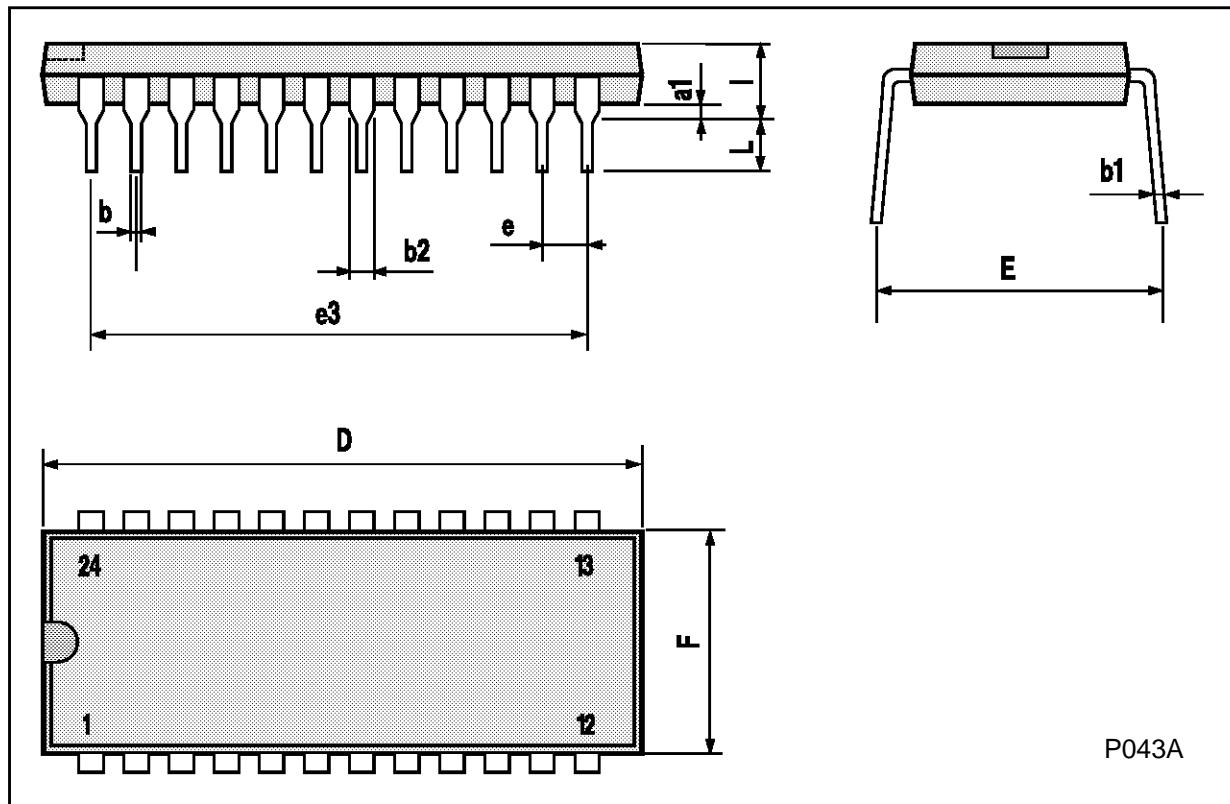


Input Current



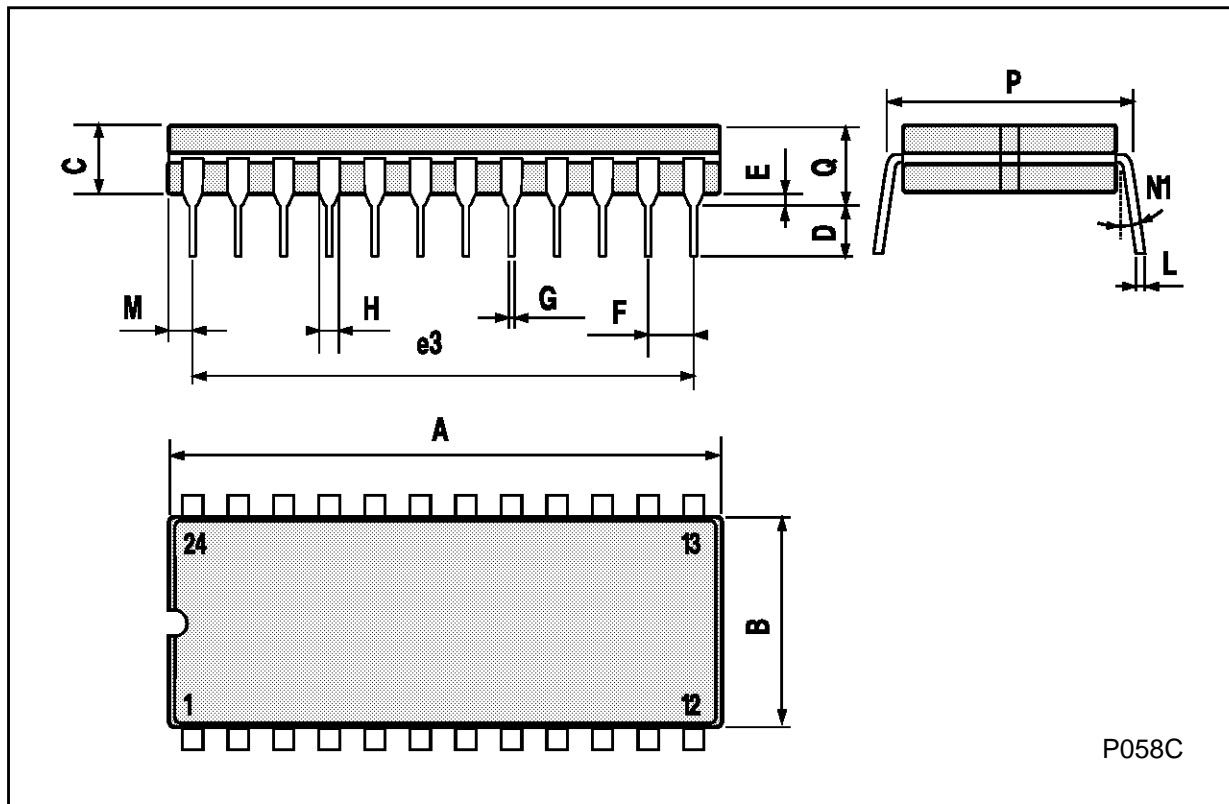
**Plastic DIP24 (0.25) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1		0.63			0.025	
b		0.45			0.018	
b1	0.23		0.31	0.009		0.012
b2		1.27			0.050	
D			32.2			1.268
E	15.2		16.68	0.598		0.657
e		2.54			0.100	
e3		27.94			1.100	
F			14.1			0.555
l		4.445			0.175	
L		3.3			0.130	



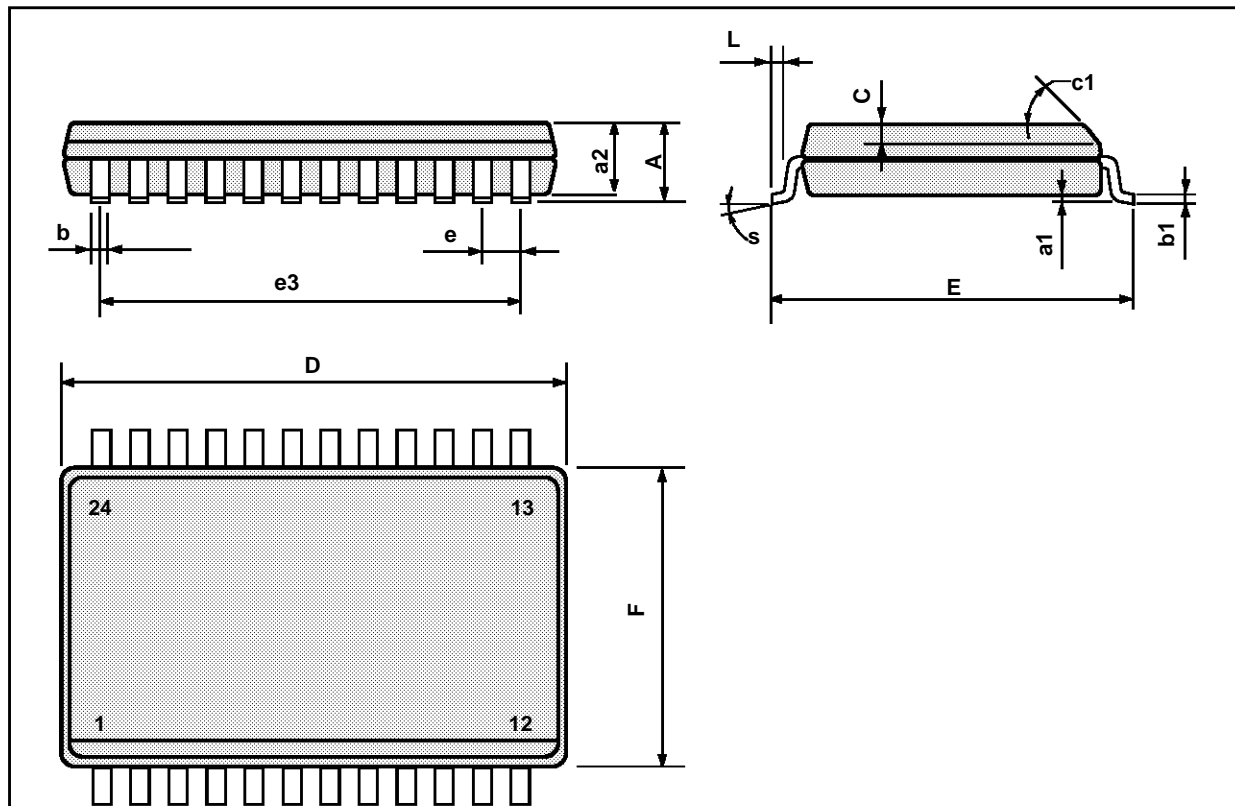
**Ceramic DIP24 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			32.3			1.272
B	13.05		13.36	0.514		0.526
C	3.9		5.08	0.154		0.200
D	3			0.118		
E	0.5		1.78	0.020		0.070
e3		27.94			1.100	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
I	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	1.52		2.49	0.060		0.098
N1	4° (min.), 15° (max.)					
P	15.4		15.8	0.606		0.622
Q			5.71			0.225



**SO24 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.10		0.20	0.004		0.007
a2			2.45			0.096
b	0.35		0.49	0.013		0.019
b1	0.23		0.32	0.009		0.012
C		0.50			0.020	
c1	45° (typ.)					
D	15.20		15.60	0.598		0.614
E	10.00		10.65	0.393		0.420
e		1.27			0.05	
e3		13.97			0.55	
F	7.40		7.60	0.291		0.299
L	0.50		1.27	0.19		0.050
S	8° (max.)					



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