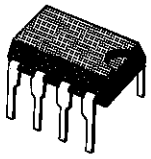
SGS-THOMSON MICROELECTRONICS

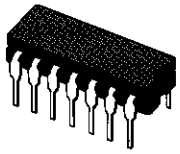
HCC/HCF40107B

DUAL 2-INPUT NAND BUFFER/DRIVER

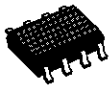
- 32 TIMES STANDARD B-SERIES OUTPUT CURRENT DRIVE SINKING CAPABILITY – 136mA TYP. @ V_{DD} = 10V, V_{DS} = 1V
- QUIESCENT CURRENT SPECIFIED AT 20V FOR HCC DEVICE
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N°. 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"



EY
(Plastic Package)



F
(Ceramic Frit Seal Package)



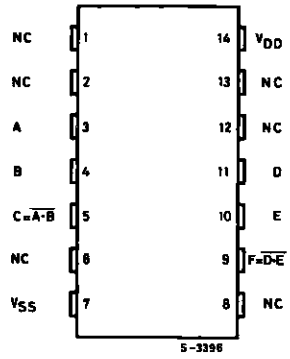
M1
(Micro Package)

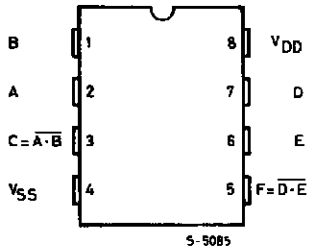
C1
(Plastic Chip Carrier)

ORDER CODES

HCC40107BF	HCF40107BM1
HCF40107BEY	HCF40107BC1

PIN CONNECTIONS



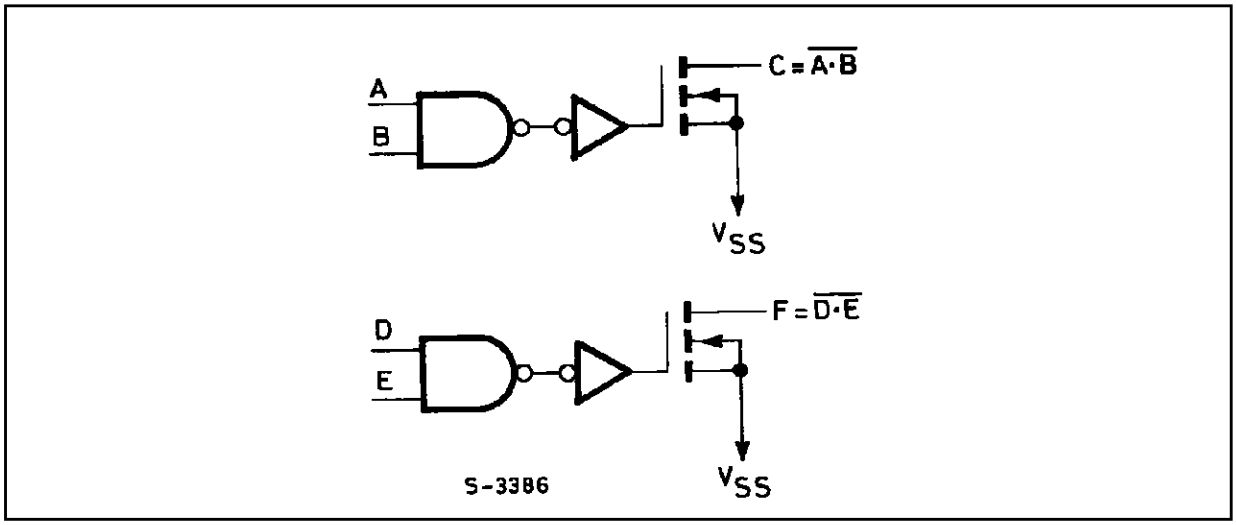


DESCRIPTION

The **HCC40107B** (extended temperature range) and **HCF40107B** (intermediate temperature range) are monolithic integrated circuits, available in 14-lead dual in-line ceramic package 8-lead minidip plastic package and 8-lead plastic micropackage.

The **HCC/HCF40107B** is a dual 2-input NAND buffer/driver containing two independent 2-input NAND buffers with open-drain single n-channel transistor outputs. This device features a wired-OR capability and high output sink current capability (136mA typ. at V_{DD} = 10V, V_{DS} = 1V).

FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATINGS

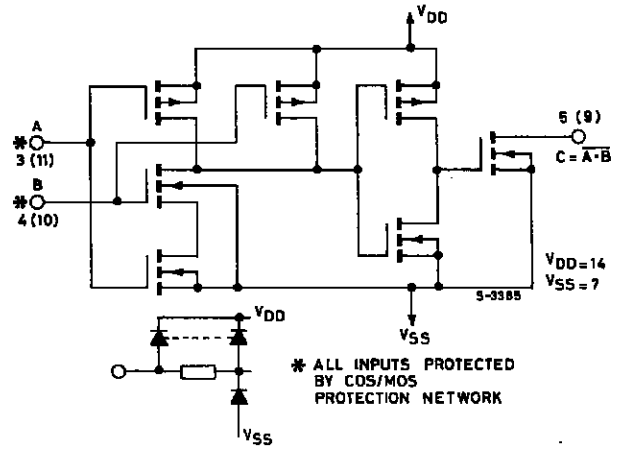
Symbol	Parameter	Value	Unit
V_{DD}*	Supply Voltage : **HCC** types **HCF** types	– 0.5 to + 20 – 0.5 to + 18	V
V_i	Input Voltage	– 0.5 to VDD + 0.5	V
I_I	DC Input Current (any one input)	± 10	mA
P_{tot}	Total Power Dissipation (per package) Dissipation per Output Transistor for T_{op} = full package-temperature Range	200 100	mW
T_{op}	Operating Temperature : **HCC** types **HCF** types	– 55 to + 125 – 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 voltages values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage : **HCC** Types **HCF** Types	3 to 18 3 to 15	V V
V_I	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature : **HCC** Types **HCF** Types	– 55 to + 125 – 40 to + 85	°C °C

SCHEMATIC DIAGRAM AND TRUTH TABLE



A	B	C	
0	0	1*	Z#
1	0	1*	Z#
0	1	1*	Z#
1	1	0	

* Requires external and pull-up resistor (R_L) to V_{DD}.
\# Without pull-up resistor (3-state).

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter		Test Conditions				Value							Unit
			V_I (V)	V_O (V)	$\|I_O\|$ (µA)	V_{DD} (V)	T_{Low}* Min.	T_{Low}* Max.	25°C Min.	25°C Typ.	25°C Max.	T_{High}* Min.	T_{High}* Max.	
I_L	Quiescent Current	HCC Types	0/ 5			5		1		0.02	1		30	µA
			0/10			10		2		0.02	2		60	
			0/15			15		4		0.02	4		120	
			0/20			20		20		0.04	20		600	
		HCF Types	0/ 5			5		4		0.02	4		30	
			0/10			10		8		0.02	8		60	
			0/15			15		16		0.02	16		120	
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	< 1	5		1.5			1.5		1.5	V
				9	< 1	10		3			3		3	
				13.5	< 1	15		4			4		4	

* 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, full package temperature range, R_L to V_{DD} = 10kΩ : 1V min with V_{DD} = 5V, 2V min with V_{DD} = 10V, 2.5V min with VDD = 15V.
** Measured with external pull-up resistor, R_L = 10kΩ to V_{DD}.
*** Forced output disabled.

STATIC ELECTRICAL CHARACTERISTICS (continued)

Symbol	Parameter		Test Conditions				Value							Unit
			V_I (V)	V_O (V)	$\|I_O\|$ (µA)	V_{DD} (V)	T_{Low}*		25°C			T_{High}*		
							Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
I_{OL}	Output Sink Current	HCC Types	5	0.4		5	21		16	32		12		mA
			5	1		5	44		30	68		25		
			10	0.5		10	49		37	74		28		
			10	1		10	89		68	136		51		
			15	0.5		15	66		50	100		38		
		HCF Types	5	0.4		5	17		13.6	32		12		
			5	1		5	35.7		25.5	68		22		
			10	0.5		10	39.1		31.4	74		27		
			10	1		10	72.2		57.8	136		51		
			15	0.5		15	53.5		42.5	100		37		
I_{OH}	Output Drive Current		No Internal Pull-up Device											mA
I_{IH}, I_{IL}	Input Leakage Current	HCC Types	0/18	Any Input		18		± 0.1		$\pm 10^{-5}$	± 0.1		± 1	µA
		HCF Types	0/15			15		± 0.3		$\pm 10^{-5}$	± 0.3		± 1	
I_{OH},I_{OL} ***	3-State Output Leakage Current	HCC Types	0/18	18		18		2		$\pm 10^{-4}$	2		20	µA
		HCF Types	0/15	15		15		2		$\pm 10^{-4}$	2		20	
C_I	Input Capacitance			Any Input						5	7.5			pF
C_O	Output Capacitance			Any Output						30				pF

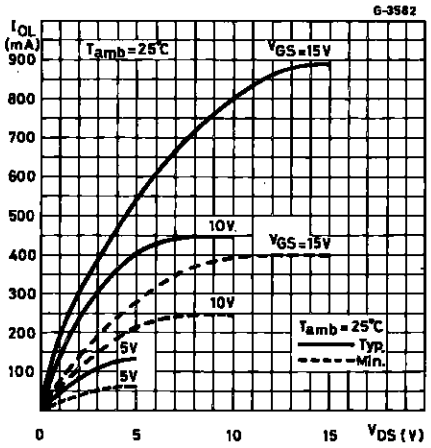
* T_{Low} = – 55°C for HCC device ; – 40°C for HCF device.
* T_{High} = + 125°C for HCC device ; + 85°C for HCF device.
The Noise Margin, full package temperature range, R_L to V_{DD} = 10kΩ : 1V min with V_{DD} = 5V, 2V min with V_{DD} = 10V, 2.5V min with VDD = 15V.
** Measured with external pull-up resistor, R_L = 10kΩ to V_{DD}.
*** Forced output disabled.

DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, C_L = 50pF, typical temperature coefficient for all V_{DD} values is 0.3%/°C, all input rise and fall time = 20ns)

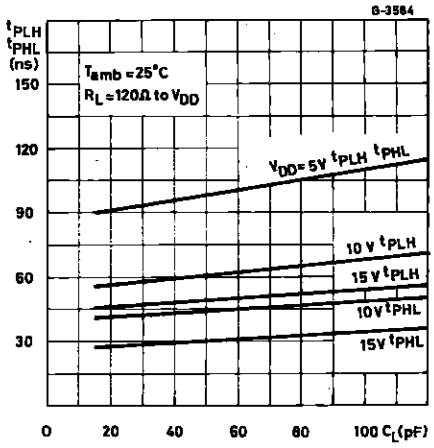
Symbol	Parameter	Test Conditions		Value			Unit
			V_{DD} (V)	Min.	Typ.	Max.	
t_{PHL}, t_{PLH}	Propagation Delay Time High to Low	R_L* = 120Ω	5		100	200	ns
			10		45	90	
			15		30	60	
	Low to High	R_L* = 120Ω	5		100	200	ns
			10		60	120	
			15		50	100	
t_{THL}, t_{TLH}	Transition Time High to Low	R_L* = 120Ω	5		50	100	ns
			10		20	40	
			15		10	20	
	Low to High	R_L* = 120Ω	5		50	100	ns
			10		35	70	
			15		25	50	

* R_L is external pull-up resistor to V_{DD}.

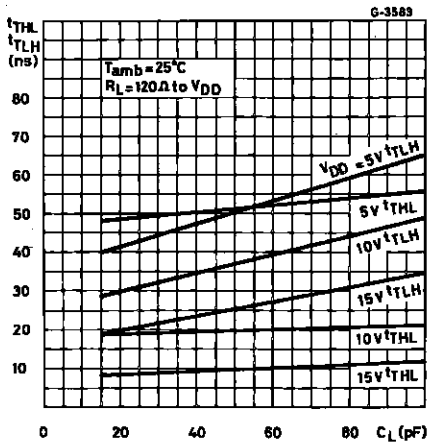
Output Low (sink) Current Characteristics.



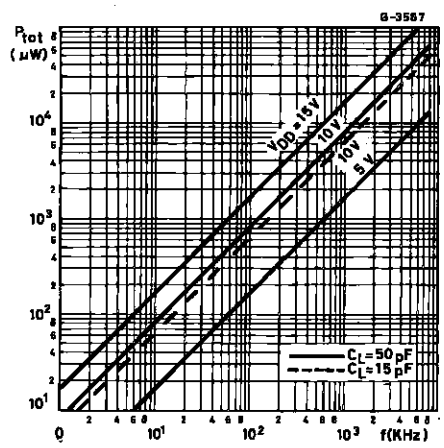
Typical Propagation Delay Time vs. Load Capacitance.



Typical Transition Time vs. Load Capacitance.



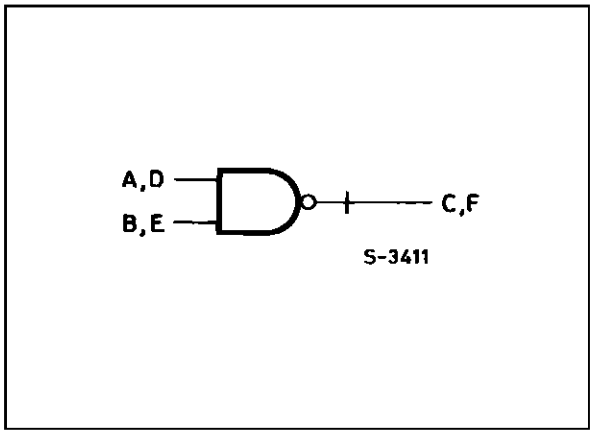
Typical Dynamic Power Dissipation vs. Input Frequency.



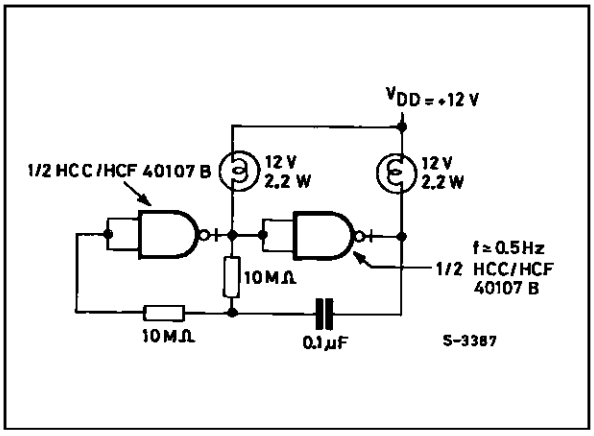
TYPICAL APPLICATIONS

The bar on the output line of this logic diagram indicates that the output is open drain as is shown in the previous schematic diagram and truth table.

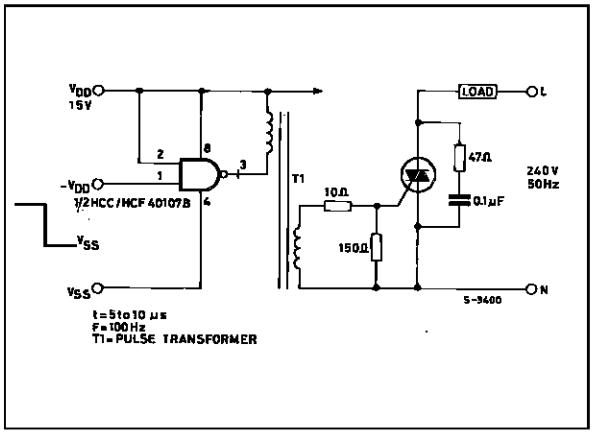
Logic Diagram of The **HCC/HCF40107B** nand Buffer.



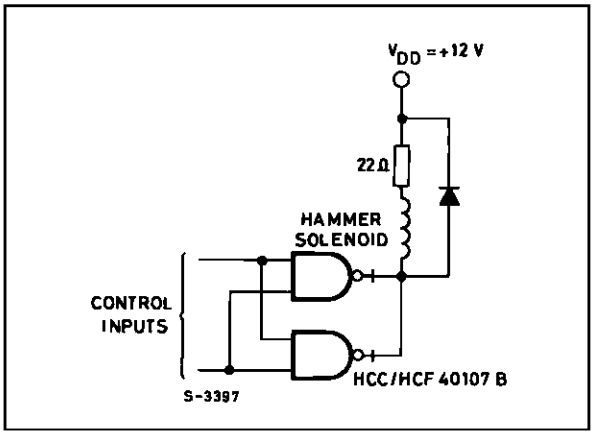
A 2.2-watt Incandescent Lamp-driver Circuit.



Interface of **40107B** with Triac, with COS/MOS Component and Triac isolated.

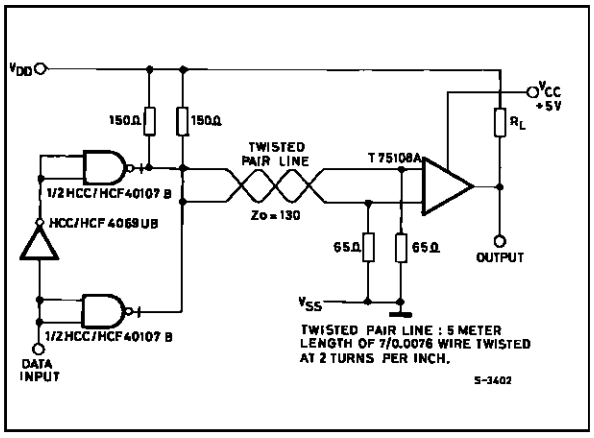


Solenoid Driver Circuit.

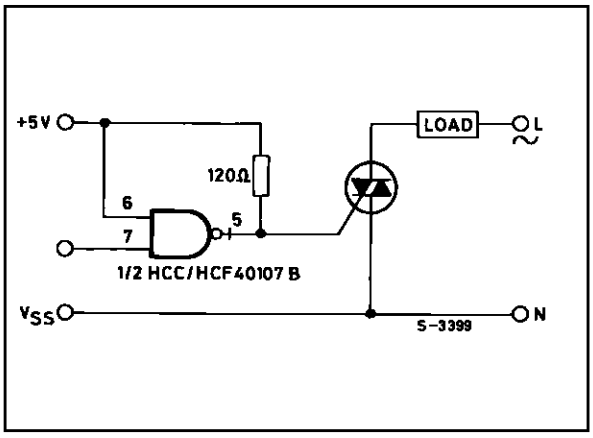


TYPICAL APPLICATIONS (continued)

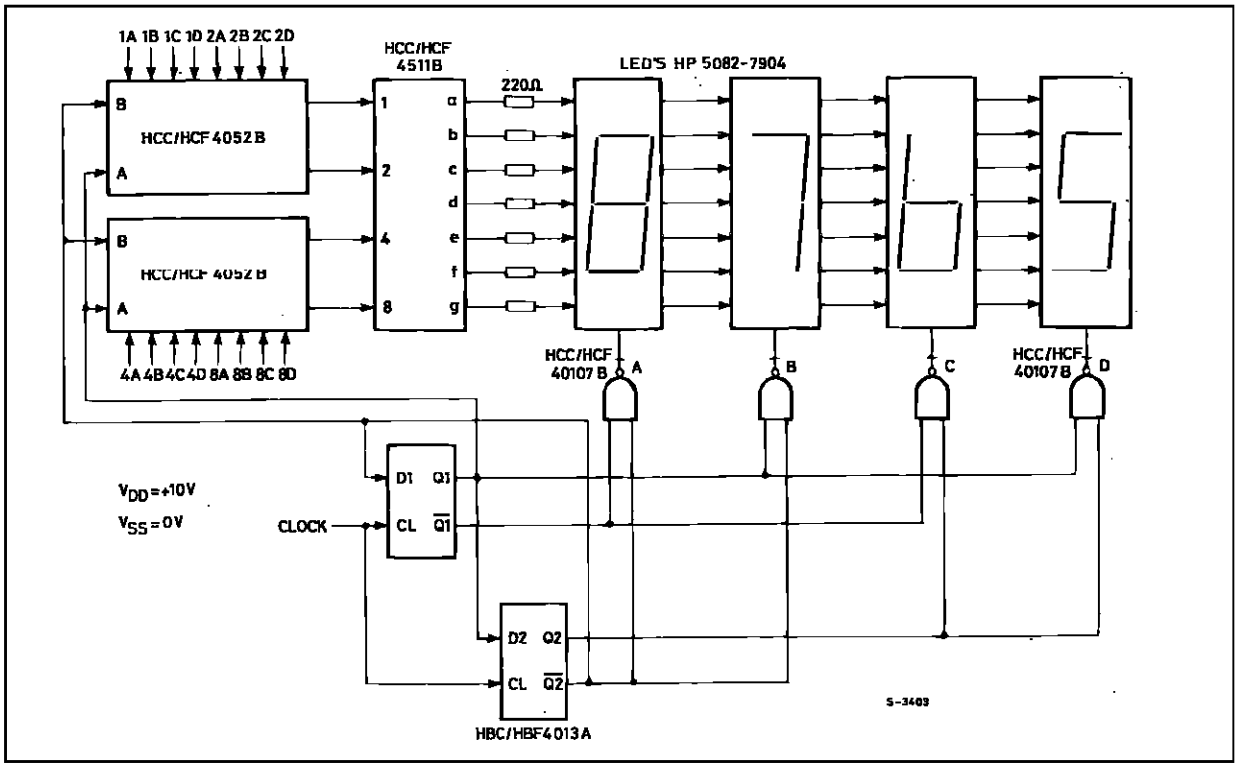
Line-driver Circuit.



Direct Dc Driver Interface of **40107B** with a Triac.

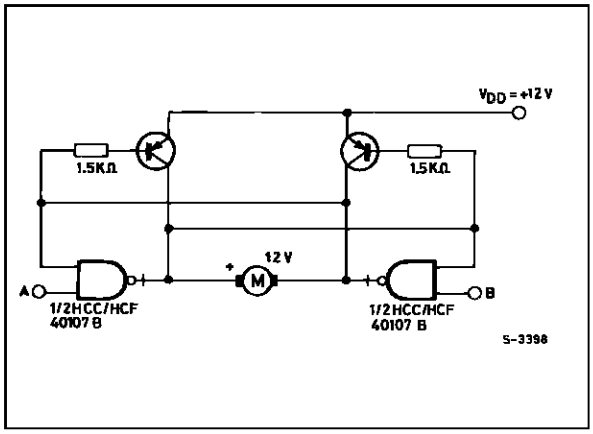


Multiplexed Led Circuit.



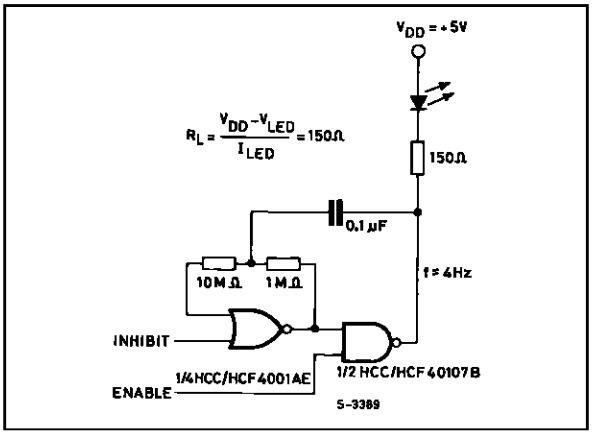
TYPICAL APPLICATIONS (continued)

Motor-controller Circuit.



A	B	Motor Function
O	O	OFF
I	O	COUNTER CLOCKWISE
I	I	AS PREVIOUS STATE
O	I	CLOCKWISE
I	I	AS PREVIOUS STATE

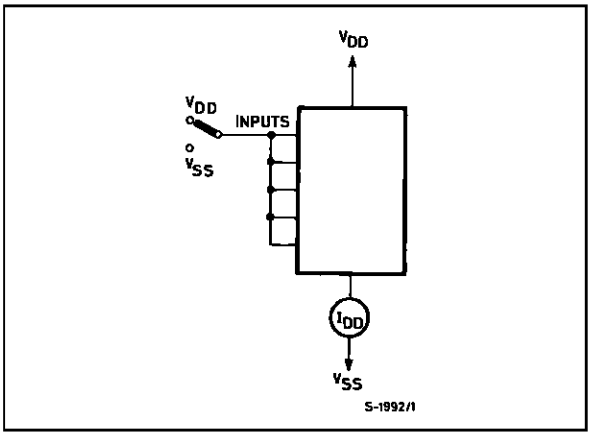
Led Driver Circuit.



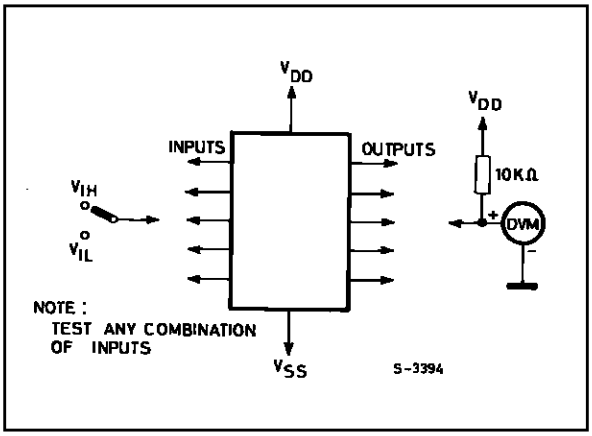
INHIBIT	ENABLE	OUTPUT
0	0	OFF
1	0	OFF
0	1	OFF
0	1	ON

TEST CIRCUITS

Quiescent Device Current.

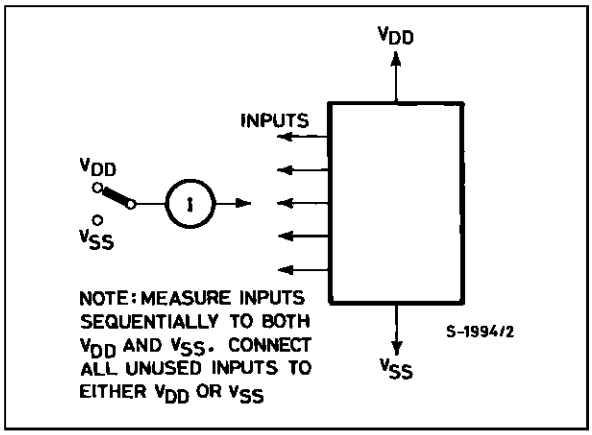


Input Voltage.

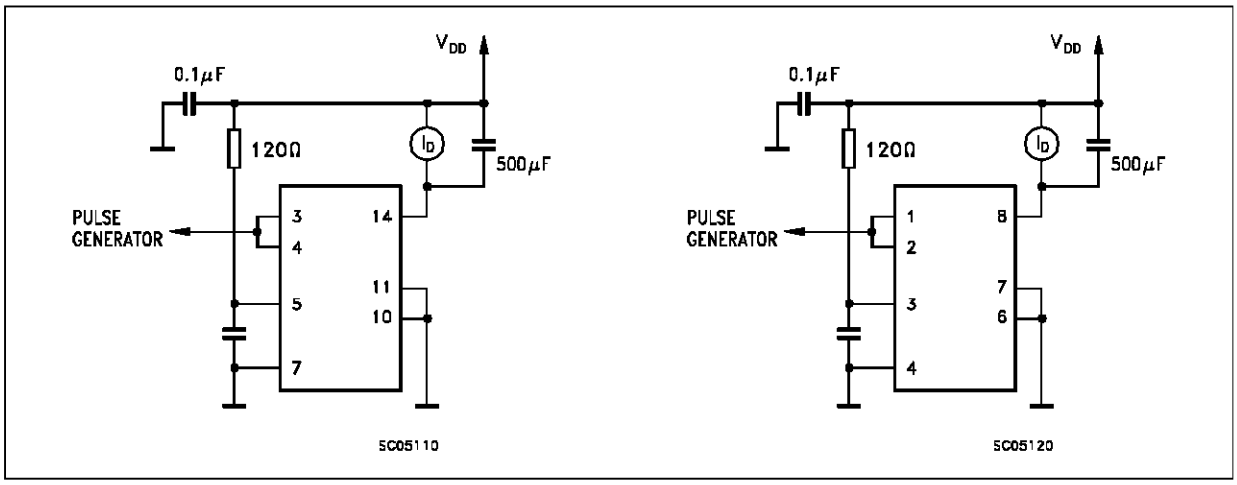


TEST CIRCUITS (continued)

Dynamic Power Dissipation.

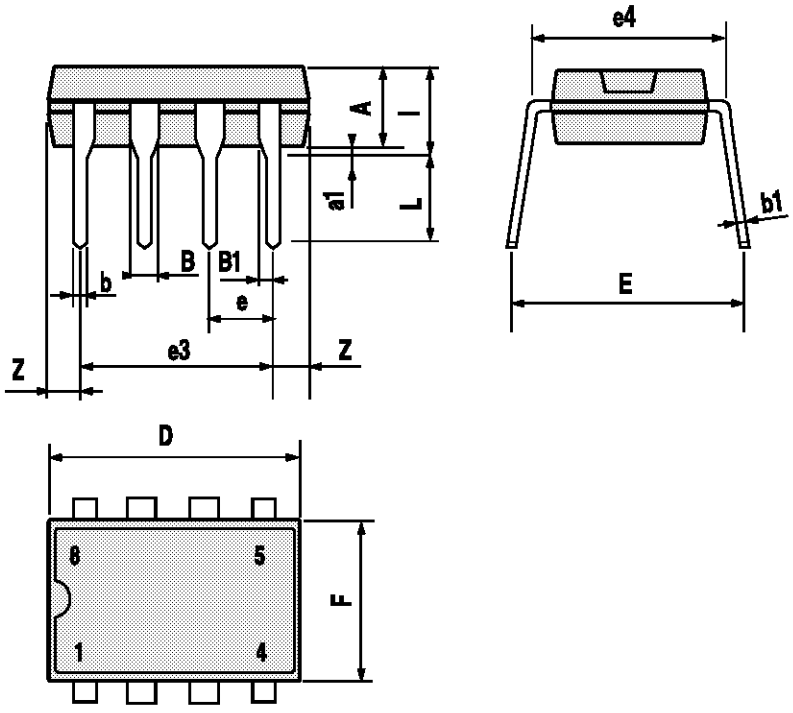


Dynamic Power Dissipation.



Minidip (0.4) MECHANICAL DATA

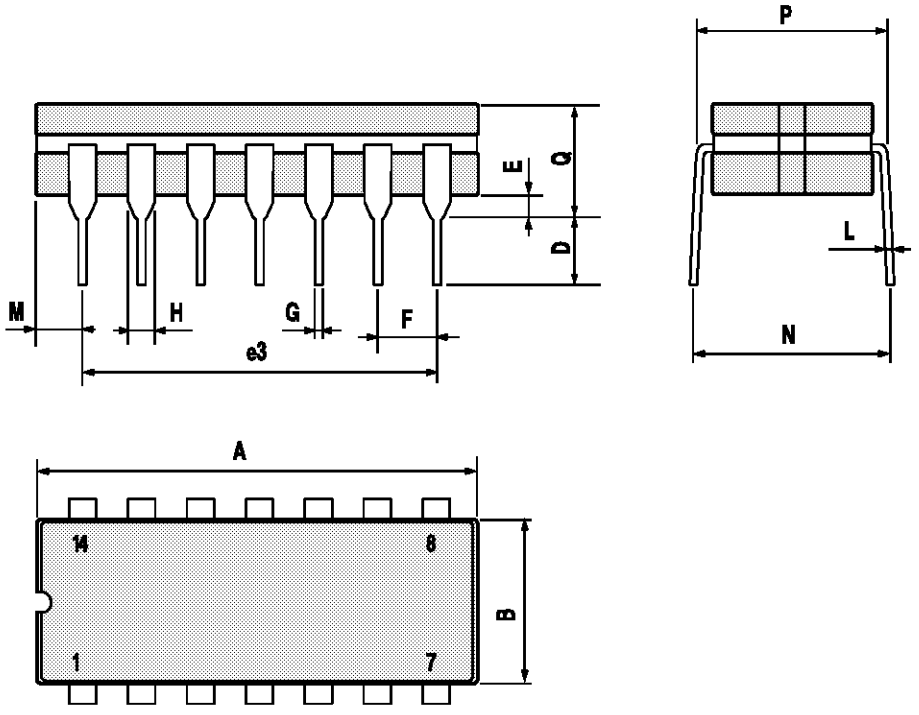
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A		3.3			0.130	
a1	0.7			0.028		
B	1.39		1.65	0.055		0.065
B1	0.91		1.04	0.036		0.041
b		0.5			0.020	
b1	0.38		0.5	0.015		0.020
D			9.8			0.386
E		8.8			0.346	
e		2.54			0.100	
e3		7.62			0.300	
e4		7.62			0.300	
F			7.1			0.280
I			4.8			0.189
L		3.3			0.130	
Z	0.44		1.6	0.017		0.063



P001F

Ceramic DIP14/1 MECHANICAL DATA

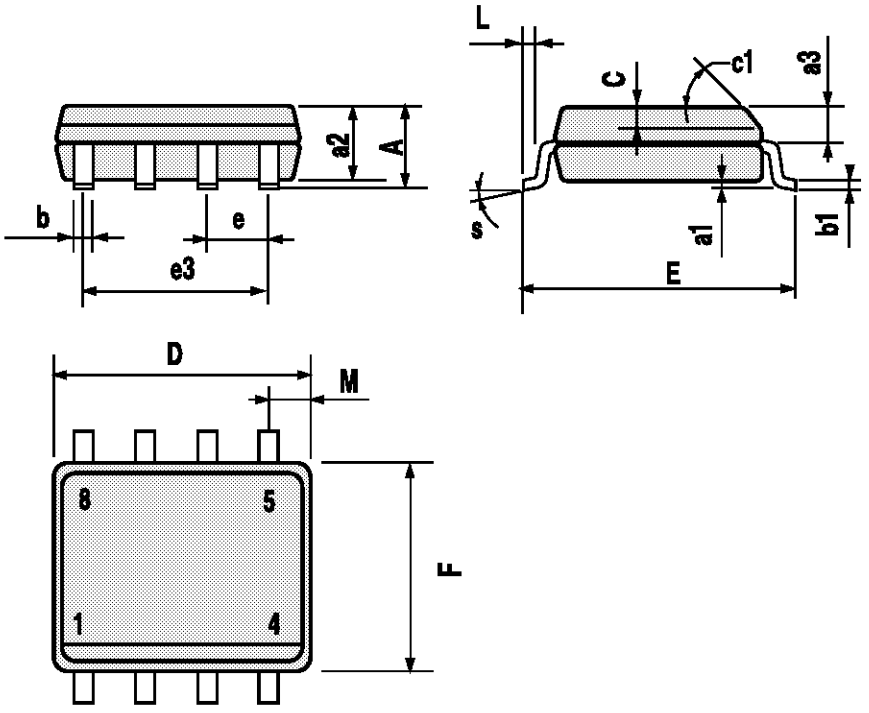
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7.0			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		15.24			0.600	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	1.52		2.54	0.060		0.100
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200



P053C

SO8 MECHANICAL DATA

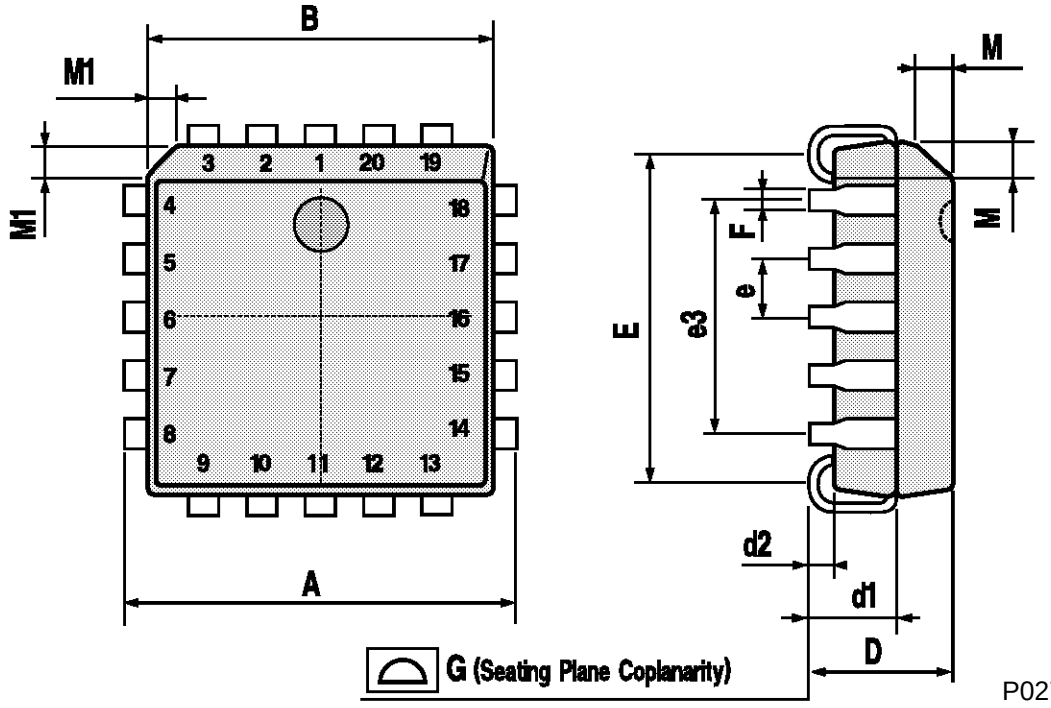
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.25	0.003		0.009
a2			1.65			0.064
a3	0.65		0.85	0.025		0.033
b	0.35		0.48	0.013		0.018
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.019
c1	45° (typ.)					
D	4.8		5.0	0.188		0.196
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.14		0.157
L	0.4		1.27	0.015		0.050
M			0.6			0.023
S	8° (max.)					



P013M

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	



P027A