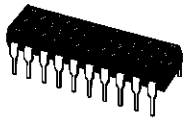
SGS-THOMSON MICROELECTRONICS

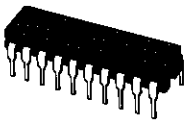
M54HC7240/7241/7244
M74HC7240/7241/7244

OCTAL BUS BUFFER WITH 3 STATE OUTPUTS
HC7240: INVERTED - HC7241/7244 NON INVERTED

- HIGH SPEED
  t_{PD} = 15 ns (TYP.) at V_{CC} = 5V
- LOW POWER DISSIPATION
  I_{CC} = 4 μA (MAX.) at T_A = 25 °C
- HIGH NOISE IMMUNITY
  V_H = 1.1 V(TYP.) at V_{CC} = 5V
- OUTPUT DRIVE CAPABILITY
  15 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE
  $|I_{OH}| = I_{OL}$ = 6 mA (MIN)
- BALANCED PROPAGATION DELAYS
  $t_{PLH} = t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE
  V_{CC} (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE
  WITH 54/74LS240/241/244



B1R
(Plastic Package)



F1R
(Ceramic Package)

M1R
(Micro Package)

C1R
(Chip Carrier)

ORDER CODES :

M54HCXXXXF1R M74HCXXXXM1R
M74HCXXXXB1R M74HCXXXXC1R

DESCRIPTION

The M54/74HC7240, HC7241 and HC7244 are high speed CMOS OCTAL BUS BUFFERs fabricated in silicon gate C^2MOS technology.

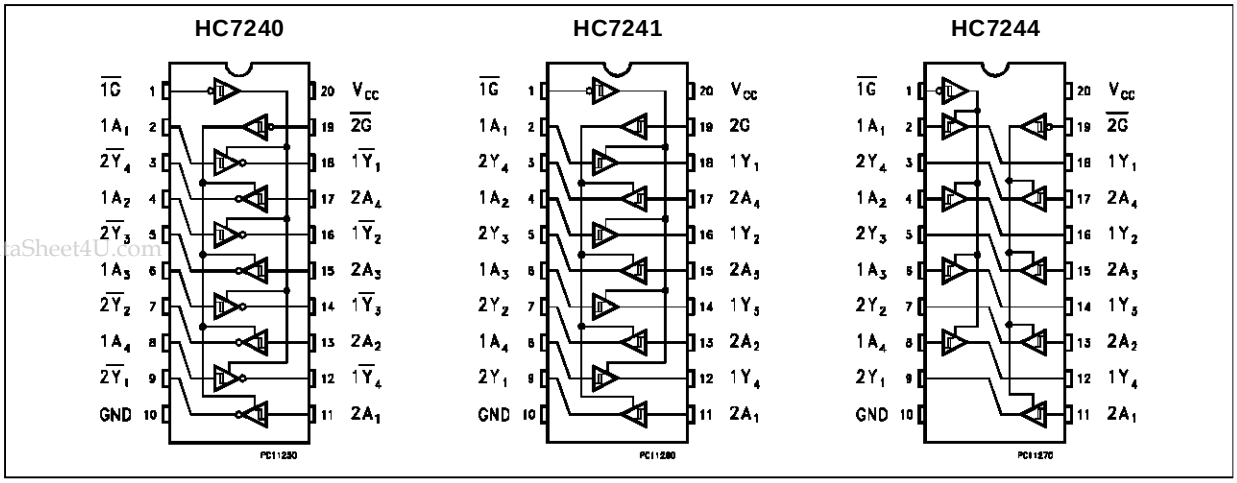
They have the same high speed performance of LSTTL combined with true CMOS low power consumption.

The designer has a choise of select combination of inverting and non-inverting outputs, symmetrical $\overline{G}$ (active low output control) input, and complementary G and $\overline{G}$ inputs. Each control input governs four BUS BUFFERs.

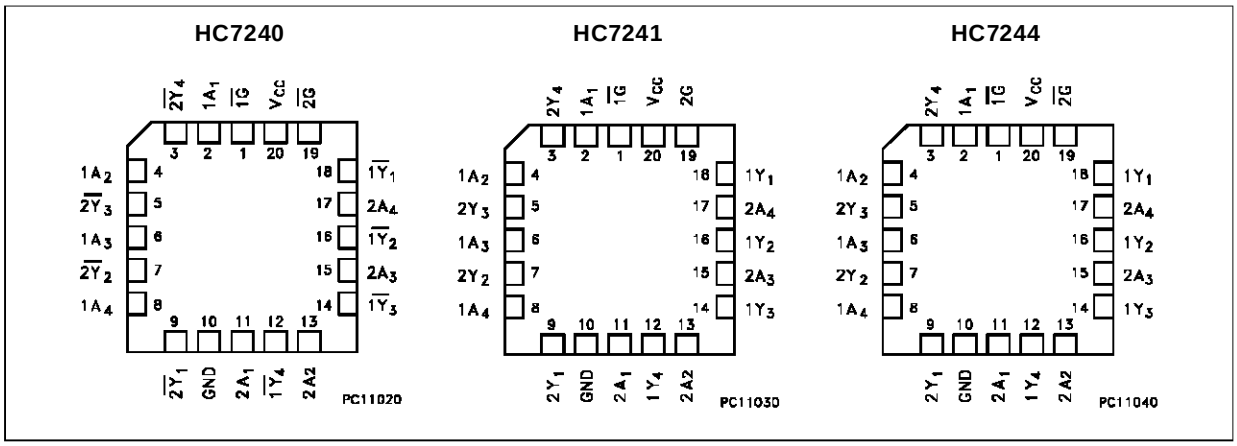
The HC7240, HC7241 and HC7244 have the same pin configuration and function as the HC240, HC241 and HC244 and they have a hysteresis characteristics with each input so can be used as a line receiver, etc.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

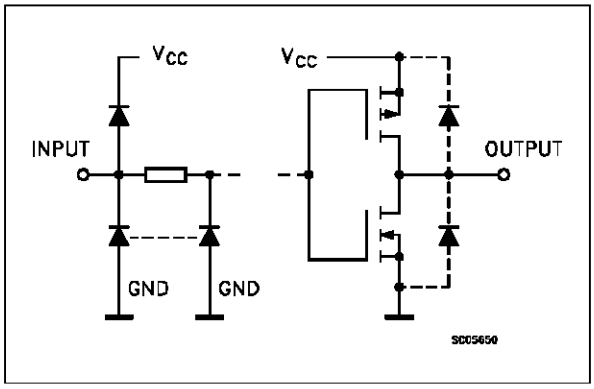
PIN CONNECTION (top view)



CHIP CARRIER



INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION (HC7240)

PIN No	SYMBOL	NAME AND FUNCTION
1	$\overline{1G}$	Output Enable Input
2, 4, 6, 8	1A1 to 1A4	Data Inputs
9, 7, 5, 3	$\overline{2Y1}$ to $\overline{2Y4}$	Data Outputs
11, 13, 15, 17	2A1 to 2A4	Data Inputs
18, 16, 14, 12	$\overline{1Y1}$ to $\overline{1Y4}$	Data Outputs
19	$\overline{2G}$	Output Enabel Input
10	GND	Ground (0V)
20	V_{CC}	Positive Supply Voltage

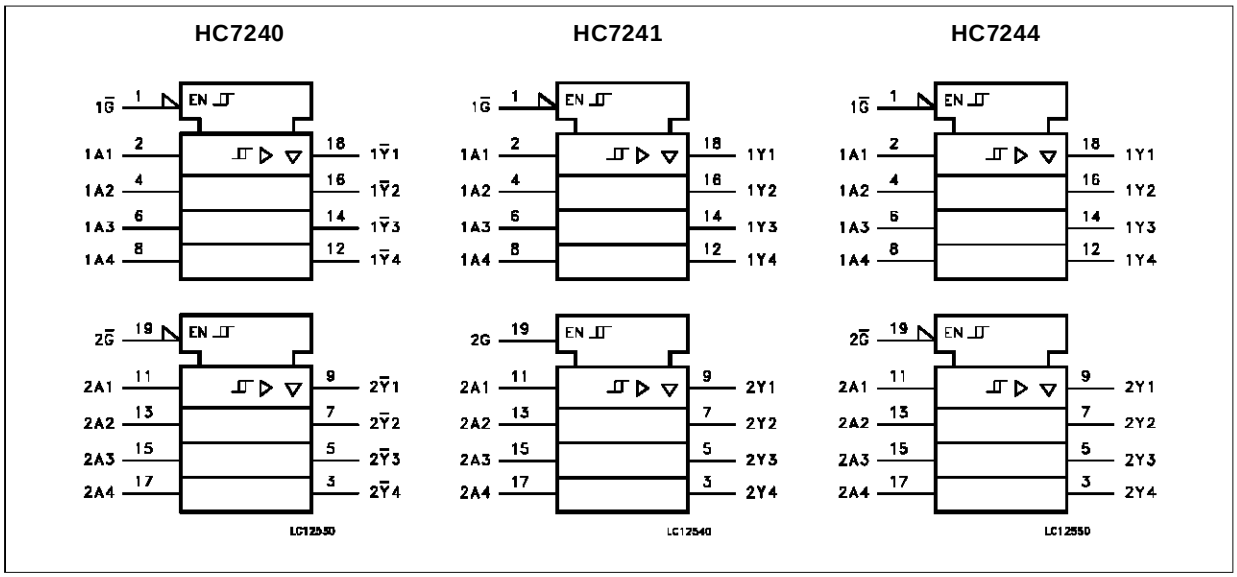
PIN DESCRIPTION (HC7241)

PIN No	SYMBOL	NAME AND FUNCTION
1	$\overline{1G}$	Output Enable Input
2, 4, 6, 8	1A1 to 1A4	Data Inputs
9, 7, 5, 3	2Y1 to 2Y4	Data Outputs
11, 13, 15, 17	2A1 to 2A4	Data Inputs
18, 16, 14, 12	1Y1 to 1Y4	Data Outputs
19	2G	Output Enabel Input
10	GND	Ground (0V)
20	V_{CC}	Positive Supply Voltage

PIN DESCRIPTION (HC7244)

PIN No	SYMBOL	NAME AND FUNCTION
1	$\overline{1G}$	Output Enable Input
2, 4, 6, 8	1A1 to 1A4	Data Inputs
9, 7, 5, 3	2Y1 to 2Y4	Data Outputs
11, 13, 15, 17	2A1 to 2A4	Data Inputs
18, 16, 14, 12	1Y1 to 1Y4	Data Outputs
19	$\overline{2G}$	Output Enabel Input
10	GND	Ground (0V)
20	V_{CC}	Positive Supply Voltage

IEC LOGIC SYMBOLS

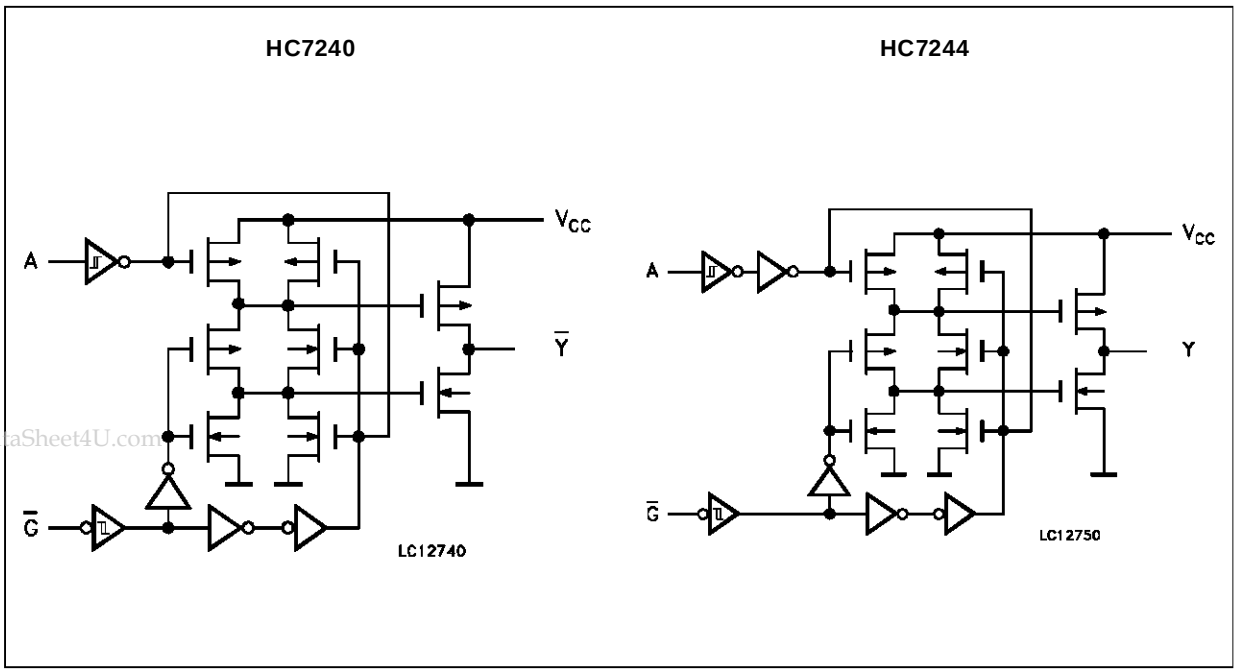


TRUTH TABLE

INPUT			OUTPUT		
$\overline{G}$	G (HC7241)	An	$\overline{Yn}$ (HC7240)	Yn (HC7241)	Yn (HC7244)
L	H	L	H	L	L
L	H	H	L	H	H
H	L	X	Z	Z	Z

X: "H" or "L"
Z: High impedance

CIRCUIT SCHEMATIC (1/8 PACKAGE)



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +7	V
V_I	DC Input Voltage	-0.5 to V_{CC} + 0.5	V
V_O	DC Output Voltage	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Source Sink Current Per Output Pin	± 35	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 70	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.
(*) 500 mW: ≅ 65 °C derate to 300 mW by 10mW/°C: 65 °C to 85 °C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2 to 6	V
V_I	Input Voltage	0 to V_{CC}	V
V_O	Output Voltage	0 to V_{CC}	V
T_{op}	Operating Temperature: **M54HC** Series **M74HC** Series	-55 to +125 -40 to +85	°C °C

DC SPECIFICATIONS

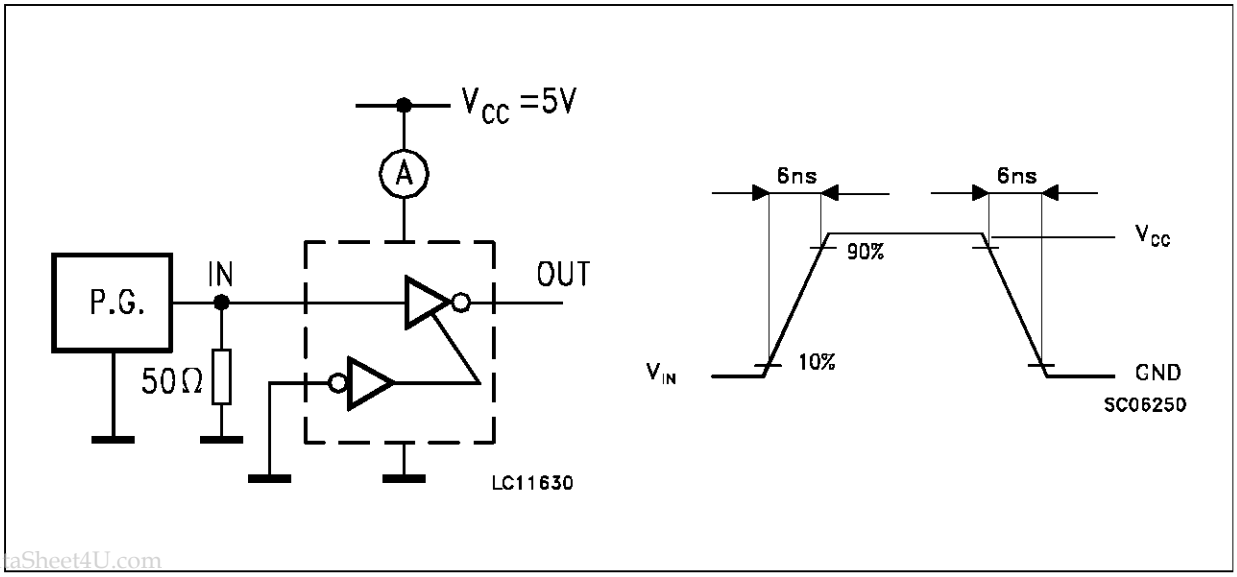
Symbol	Parameter	Test Conditions			Value							Unit
		V_{CC} (V)			T_A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_P	High Level Threshold Voltage	2.0			1.0	1.25	1.5	1.0	1.5	1.0	1.5	V
		4.5			2.3	2.7	3.15	2.3	3.15	2.3	3.15	
		6.0			3.0	3.5	4.2	3.0	4.2	3.0	4.2	
V_N	Low Level Threshold Voltage	2.0			0.3	0.65	0.9	0.3	0.9	0.3	0.9	V
		4.5			1.13	1.6	2.0	1.13	2.0	1.13	2.0	
		6.0			1.5	2.3	2.6	1.5	2.6	1.5	2.6	
V_H	Hysteresis Voltage	2.0			0.3	0.6	1.0	0.3	1.0	0.3	1.0	V
		4.5			0.6	1.1	1.4	0.6	1.4	0.6	1.4	
		6.0			0.8	1.2	1.7	0.8	1.7	0.8	1.7	
V_{OH}	High Level Output Voltage	2.0	V_I = V_{IH} or V_{IL}	I_O=-20 µA	1.9	2.0		1.9		1.9		V
		4.5			4.4	4.5		4.4		4.4		
		6.0			5.9	6.0		5.9		5.9		
		4.5		I_O=-6.0 mA	4.18	4.31		4.13		4.10		
		6.0		I_O=-7.8 mA	5.68	5.8		5.63		5.60		
V_{OL}	Low Level Output Voltage	2.0		I_O= 20 µA		0.0	0.1		0.1		0.1	V
		4.5				0.0	0.1		0.1		0.1	
		6.0				0.0	0.1		0.1		0.1	
		4.5		I_O= 6.0 mA		0.17	0.26		0.33		0.40	
		6.0		I_O= 7.8 mA		0.18	0.26		0.33		0.40	
I_I	Input Leakage Current	6.0	V_I = V_{IH} or V_{IL} V_O = V_{CC} or GND				±0.1		±1		±1	µA
I_{OZ}	3 State Output Off State Current	6.0	V_I = V_{CC} or GND				±0.5		±5		±10	µA
I_{CC}	Quiescent Supply Current	6.0	V_I = V_{CC} or GND				4		40		80	µA

AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input $t_r = t_f$ = 6 ns)

Symbol	Parameter	Test Conditions			Value							Unit
		V_{CC} (V)	C_L (pF)		T_A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	2.0	50			25	60		75			ns
		4.5				7	12		19			
		6.0				6	10		13			
t_{PLH} t_{PHL}	Propagation Delay Time	2.0	50			50	125		155			ns
		4.5				15	25		31			
		6.0				13	21		26			
t_{PZL} t_{PZH}	Output Enable Time	2.0	50	R_L = 1KΩ		68	150		190			ns
		4.5				21	30		38			
		6.0				16	26		32			
t_{PLZ} t_{PHZ}	Output Disable Time	2.0	50	R_L = 1KΩ		48	150		190			ns
		4.5				21	30		38			
		6.0				19	26		32			
C_{IN}	Input Capacitance					5	10		10		10	pF
C_{OUT}	Output Capacitance					10						pF
C_{PD} (*)	Power Dissipation Capacitance		HC7240 HC7241/7244			33 34						pF

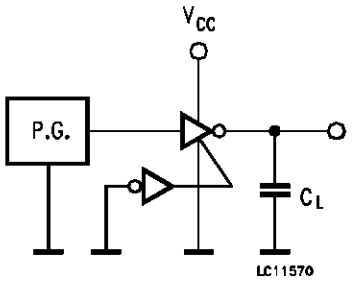
(*) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operting current can be obtained by the following equation. $I_{CC}(opr) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}/8$ (per channel)

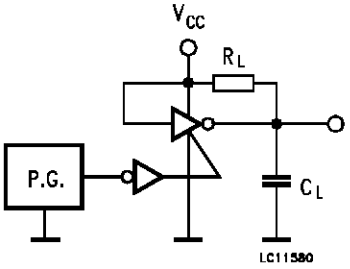
TEST CIRCUIT Icc (Opr.)

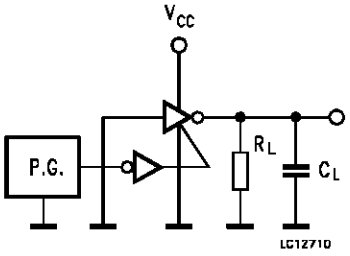


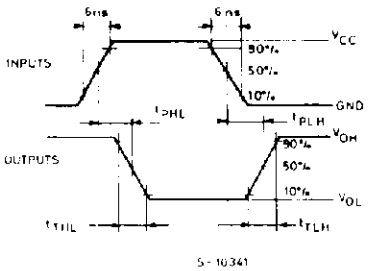
SWITCHING CHARACTERISTICS TEST CIRCUIT

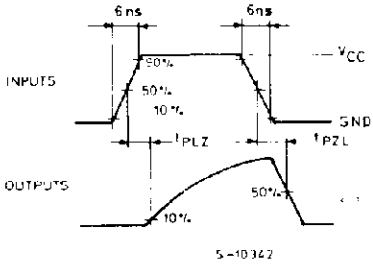
HC7240

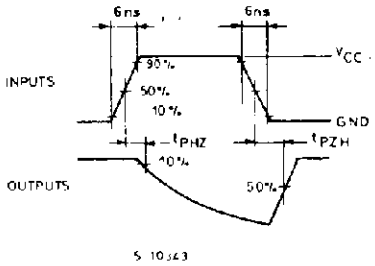




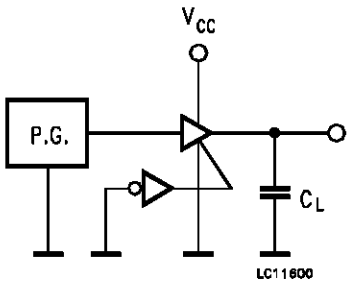


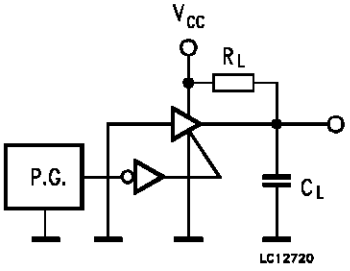


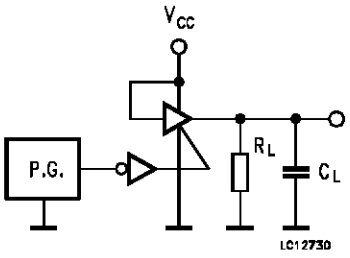


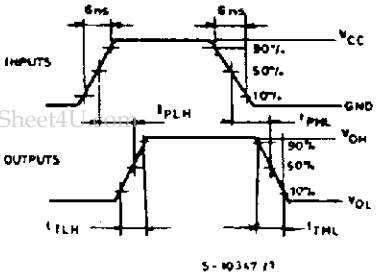


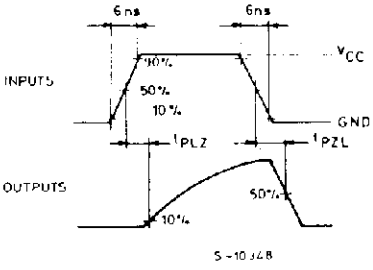
HC7241/HC7244

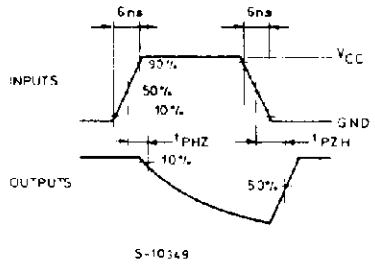






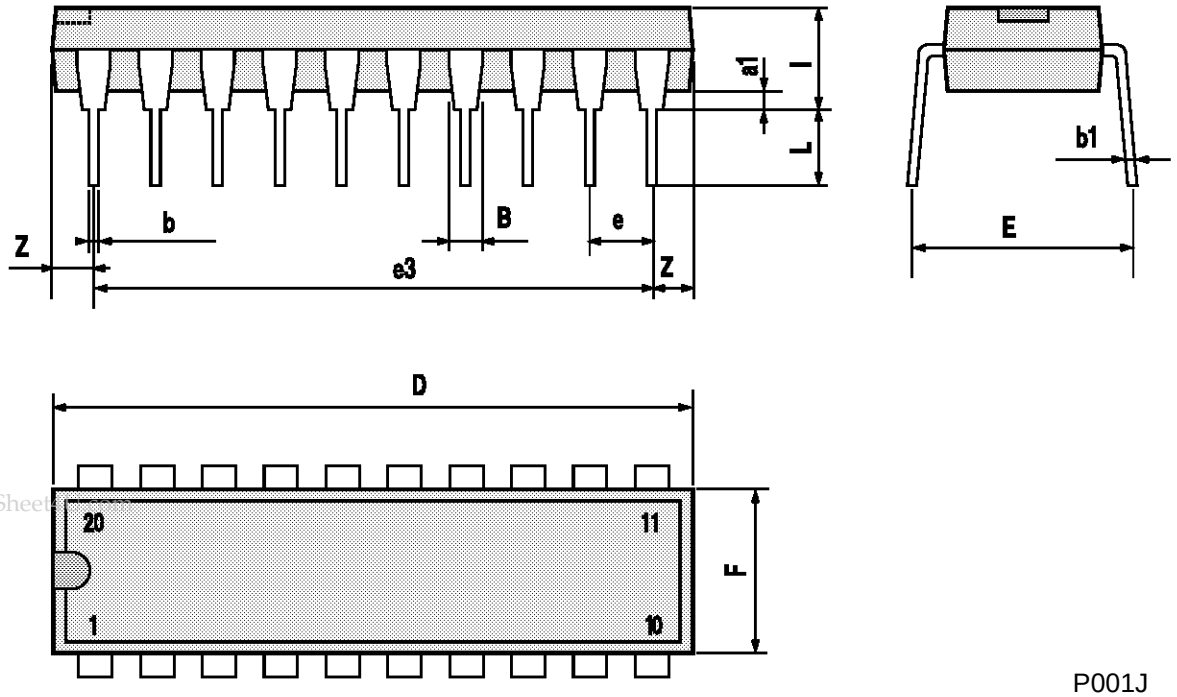






Plastic DIP20 (0.25) MECHANICAL DATA

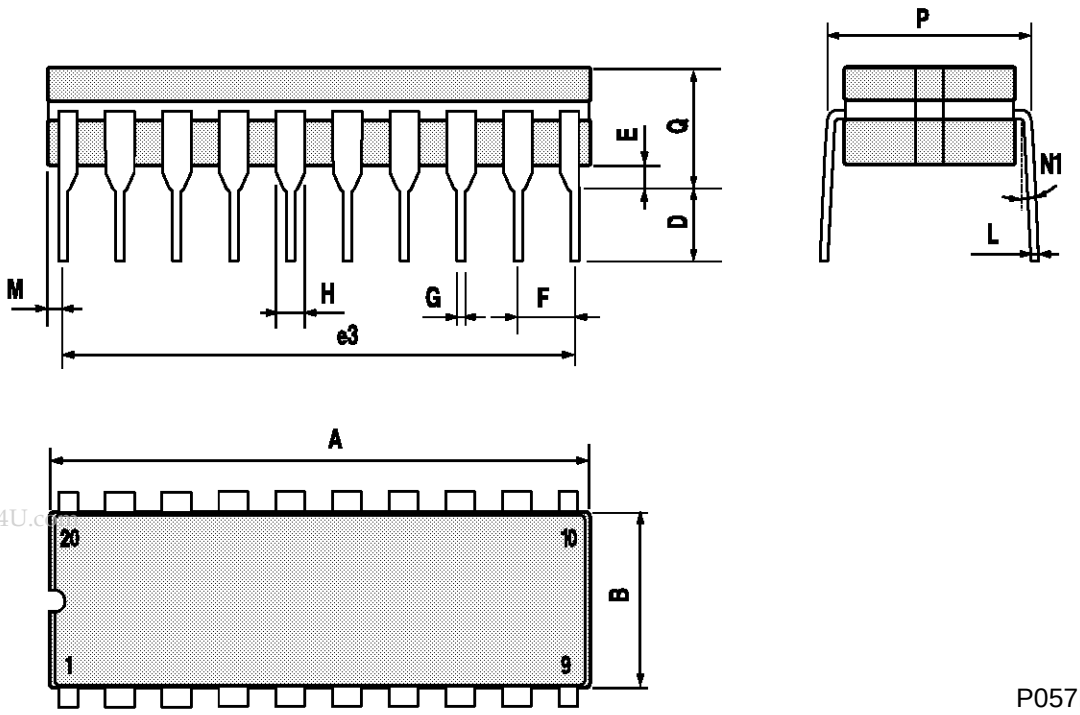
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053



P001J

Ceramic DIP20 MECHANICAL DATA

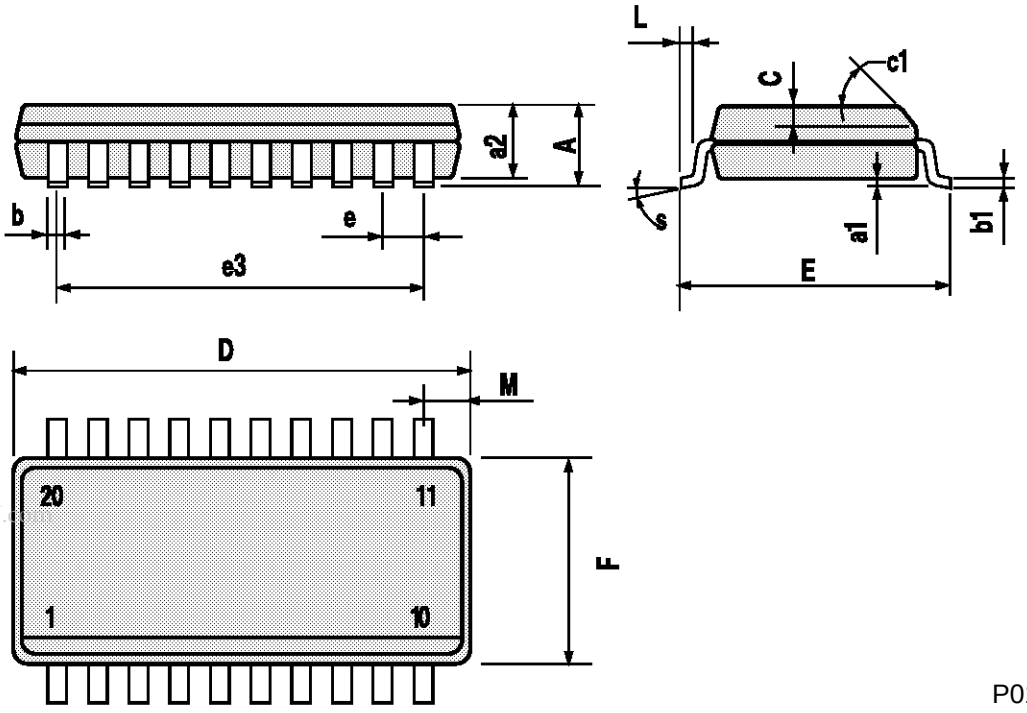
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			25			0.984
B			7.8			0.307
D		3.3			0.130	
E	0.5		1.78	0.020		0.070
e3		22.86			0.900	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
I	1.27		1.52	0.050		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N1	4° (min.), 15° (max.)					
P	7.9		8.13	0.311		0.320
Q			5.71			0.225



P057H

SO20 MECHANICAL DATA

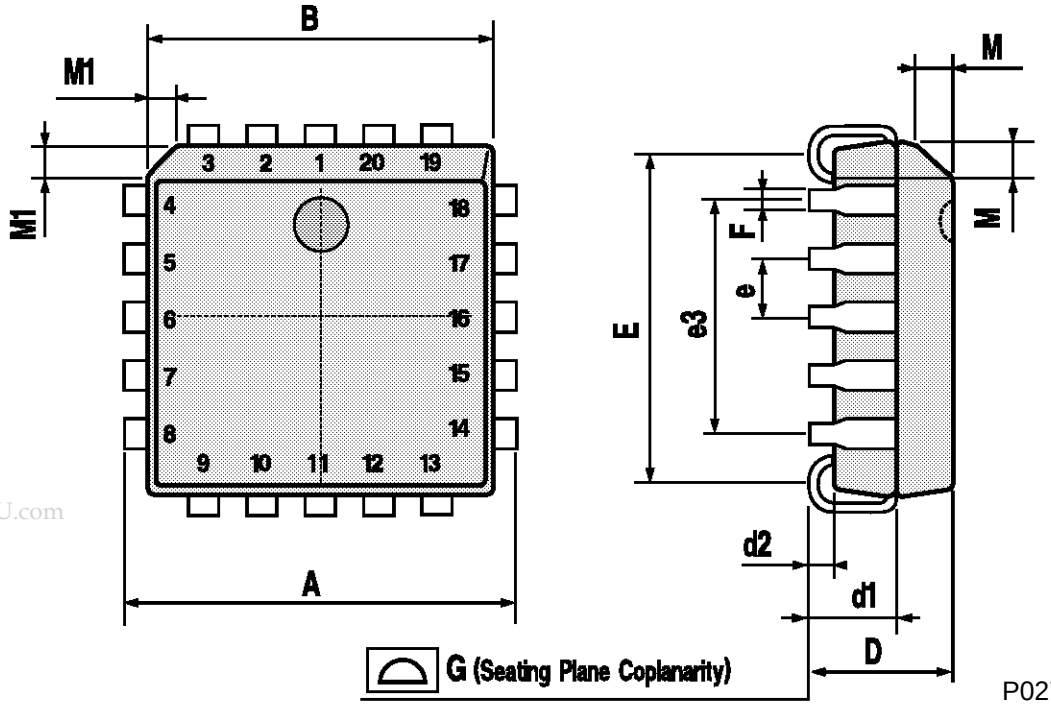
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.10		0.20	0.004		0.007
a2			2.45			0.096
b	0.35		0.49	0.013		0.019
b1	0.23		0.32	0.009		0.012
C		0.50			0.020	
c1	45° (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60	0.291		0.299
L	0.50		1.27	0.19		0.050
M			0.75			0.029
S	8° (max.)					



P013L

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