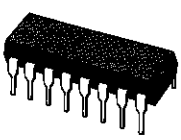
SGS-THOMSON MICROELECTRONICS

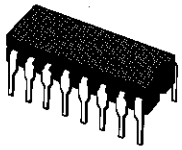
M54/M74HCT367
M54/M74HCT368

HEX BUS BUFFER (3-STATE)
HCT367 NON INVERTING, HCT368 INVERTING

- HIGH SPEED
  t_{PD} = 11 ns (TYP.) AT V_{CC} = 5 V
- LOW POWER DISSIPATION
  I_{CC} = 4 µA (MAX.) AT T_A = 25 °C
- COMPATIBLE WITH TTL OUTPUTS
  V_{IH} = 2V (MIN.) V_{IL} = 0.8V (MAX)
- OUTPUT DRIVE CAPABILITY
  15 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE
  $|I_{OH}| = I_{OL}$ = 6 mA (MIN.)
- BALANCED PROPAGATION DELAYS
  $t_{PLH} = t_{PHL}$
- PIN AND FUNCTION COMPATIBLE WITH 54/74LS367/368



B1R
(Plastic Package)



F1R
(Ceramic Package)

M1R
(Micro Package)

C1R
(Chip Carrier)

ORDER CODES :

M54HCTXXXF1R M74HCTXXXM1R
M74HCTXXXB1R M74HCTXXXC1R

DESCRIPTION

The M54/74HCT367 and the M54/74HCT368 are high speed CMOS HEX BUS BUFFER (3-STATE) fabricated in silicon gate C^2MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption. These devices contain six buffers, four buffers are controlled by an enable input ($\overline{G1}$) and the other two buffers are controlled by the other enable input ($\overline{G2}$) ; the outputs of each buffer group are enabled when $\overline{G1}$ and/or $\overline{G2}$ inputs are held low, and when held high these outputs are disabled to be high-impedance.

These outputs are capable of driving up to 15 LSTTL loads. The designer has a choice of non-inverting outputs (HCT367) and inverting outputs (HCT368).

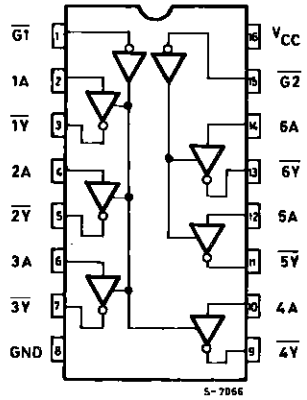
All inputs are equipped with protection circuits against static discharge and transient excess voltage.

This integrated circuit has input and output characteristics that are fully compatible with 54/74 LSTTL logic families. M54/74HCT devices are designed to directly interface HSC^2MOS systems with TTL and NMOS components. They are also plug in replacements for LSTTL devices giving a reduction of power consumption.

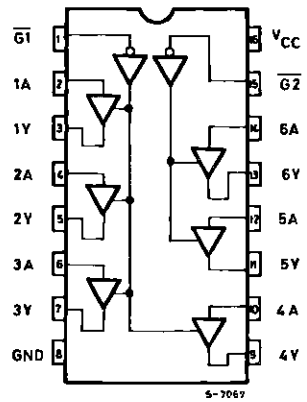
All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTIONS (top view)

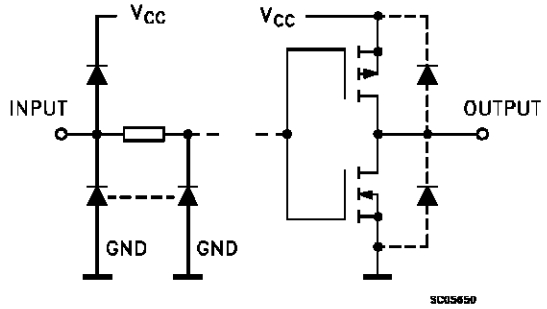
HCT368



HCT367

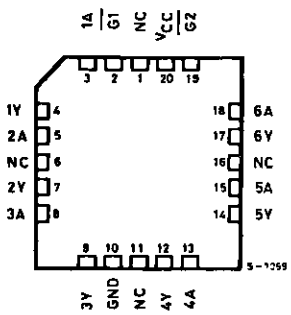


INPUT AND OUTPUT EQUIVALENT CIRCUIT

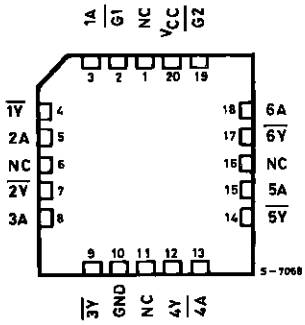


CHIP CARRIER

HCT367



HCT368



NC = No Internal Connection

TRUTH TABLE

INPUTS		OUTPUTS	
$\overline{G}$	An	Y n (367)	$\overline{Yn}$ (368)
L	L	L	H
L	H	H	L
H	X	Z	Z

X = DON'T CARE Z = HIGH IMPEDANCE

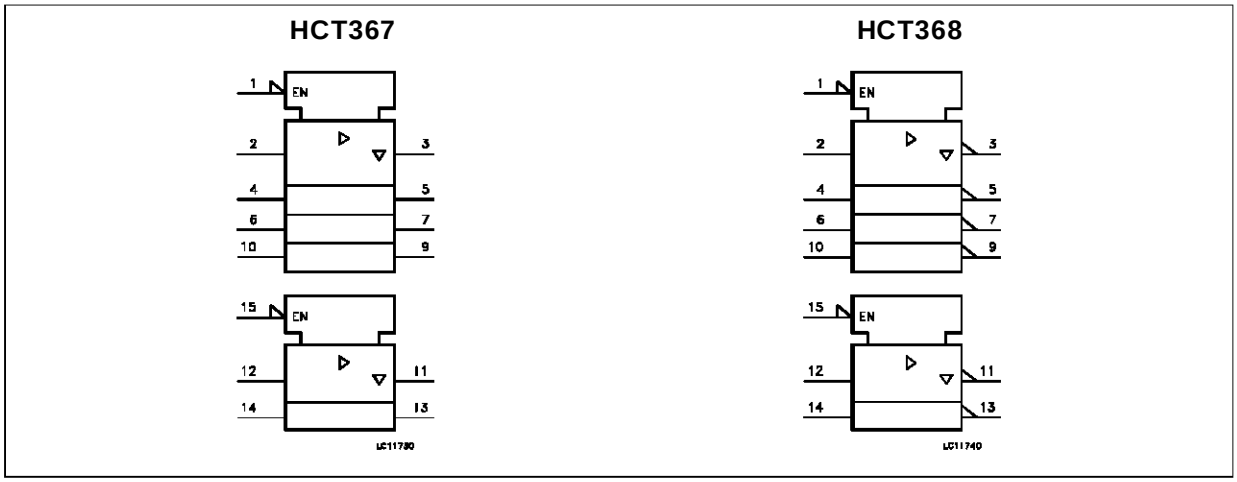
PIN DESCRIPTION (HCT367)

PIN No	SYMBOL	NAME AND FUNCTION
1, 15	$\overline{G1}$, $\overline{G2}$	Output Enable Inputs
2, 4, 6, 10, 12, 14	1A to 6A	Data Inputs
3, 5, 7, 9, 11, 13	1Y to 6Y	Data Outputs
8	GND	Ground (0V)
16	V_{CC}	Positive Supply Voltage

PIN DESCRIPTION (HCT368)

PIN No	SYMBOL	NAME AND FUNCTION
1, 15	$\overline{G1}$, $\overline{G2}$	Output Enable Inputs
2, 4, 6, 10, 12, 14	1A to 6A	Data Inputs
3, 5, 7, 9, 11, 13	$\overline{1Y}$ to $\overline{6Y}$	Data Outputs
8	GND	Ground (0V)
16	V_{CC}	Positive Supply Voltage

IEC LOGIC SYMBOL



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	4.5 to 5.5	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
t_r, t_f	Input Rise and Fall Time (V_{CC} = 4.5 to 5.5V)	0 to 500	ns

RECOMMENDED OPERATING CONDITIONS

DC SPECIFICATIONS

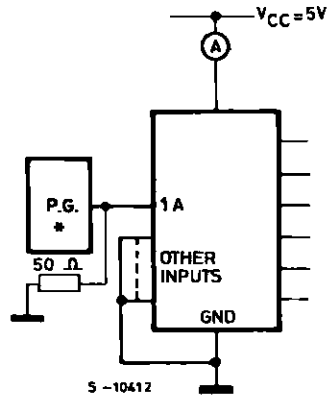
Symbol	Parameter	Test Conditions			Value							Unit
		V_{CC} (V)			T_A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	4.5 to 5.5			2.0			2.0		2.0		V
V_{IL}	Low Level Input Voltage	4.5 to 5.5					0.8		0.8		0.8	V
V_{OH}	High Level Output Voltage	4.5	V_I = V_{IH} or V_{IL}	I_O=-20 µA	4.4	4.5		4.4		4.4		V
				I_O=-6.0 mA	4.18	4.31		4.13		4.10		
V_{OL}	Low Level Output Voltage	4.5	V_I = V_{IH} or V_{IL}	I_O= 20 µA		0.0	0.1		0.1		0.1	V
				I_O= 6.0 mA		0.17	0.26		0.33		0.4	
I_I	Input Leakage Current	5.5	V_I = V_{CC} or GND				±0.1		±1		±1	µA
I_{CC}	Quiescent Supply Current	5.5	V_I = V_{CC} or GND				4		40		80	µA
ΔI_{CC}	Additional worst case supply current	5.5	Per Input pin V_I = 0.5V or V_I = 2.4V Other Inputs at V_{CC} or GND I_O= 0				2.0		2.9		3.0	mA

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			7	12		15		18	ns
t_{PLH} t_{PHL}	Propagation Delay Time (for HCT367 only)	2.0	50			14	22		28		33	ns
		2.0	150			18	28		35		42	
t_{PLH} t_{PHL}	Propagation Delay Time (for HCT368 only)	2.0	50			15	24		30		36	ns
		2.0	150			19	30		38		45	
t_{PZL} t_{PZH}	Output Enable Time	2.0	50			16	25		31		38	ns
		2.0	150			20	31		39		47	
t_{PLZ} t_{PHZ}	Output Disable Time	2.0	50			18	25		31		38	ns
C_{IN}	Input Capacitance					5	10		10		10	pF
C_{PD} (*)	Power Dissipation Capacitance		fot HCT367 for HCT368			47 55						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. $I_{CC}(opr) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}/6$ (per Channel)

TEST CIRCUIT I_{CC} (Opr.)



* INPUT WAVEFORM IS THE SAME AS THAT IN CASE OF SWITCHING CHARACTERISTICS TEST.

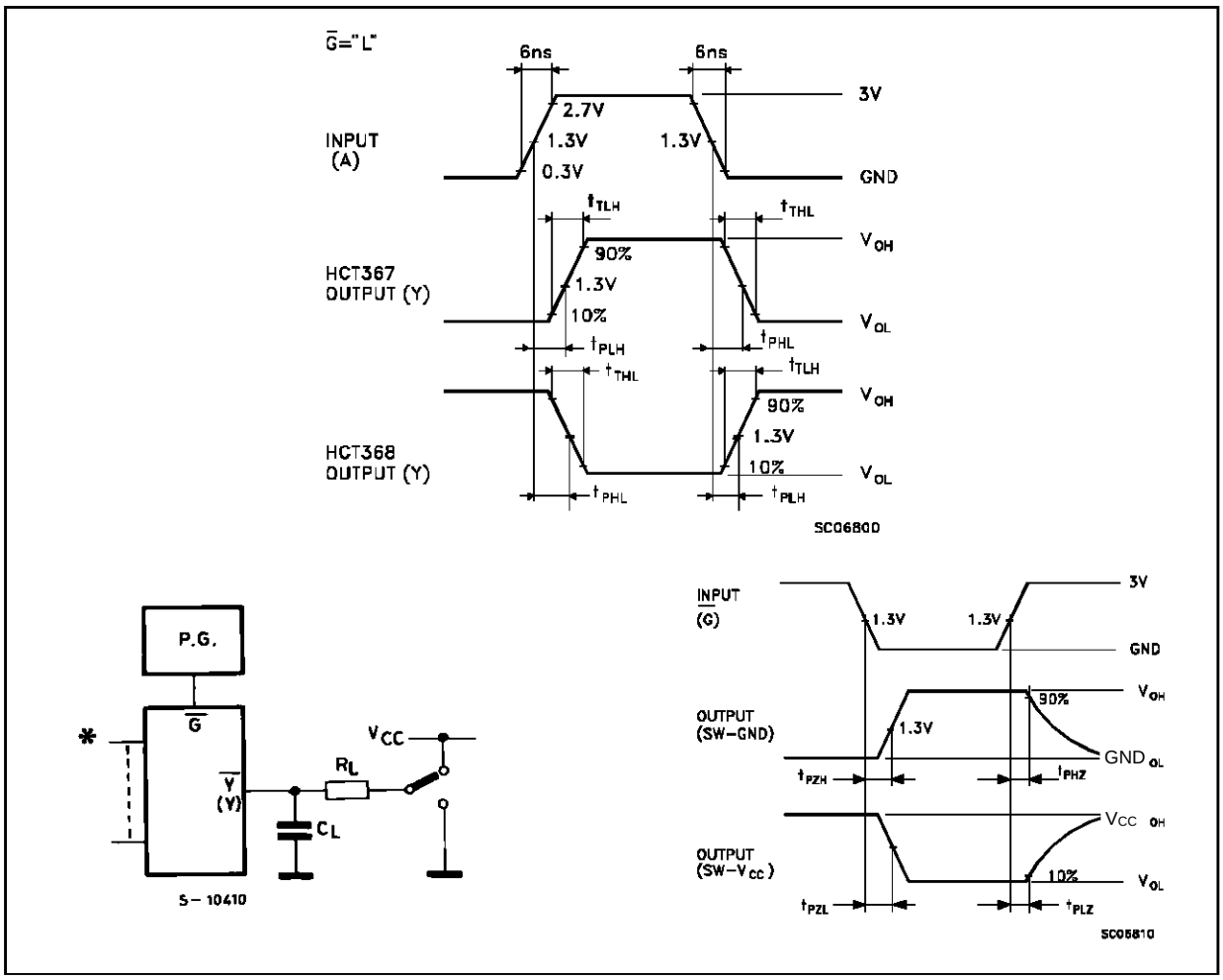
C_{PD} CALCULATION

C_{PD} is to be calculated with the following formula by using the measured value of I_{CC} (opr.) in the test circuit opposite.

$$C_{PD} = \frac{I_{CC}\,(opr)}{f_{IN} \times V_{CC}}$$

In determining the typical value of C_{PD}, a relatively high frequency of 1 MHz was applied to f_{IN}, in order to eliminate any error caused by the quiescent supply current.

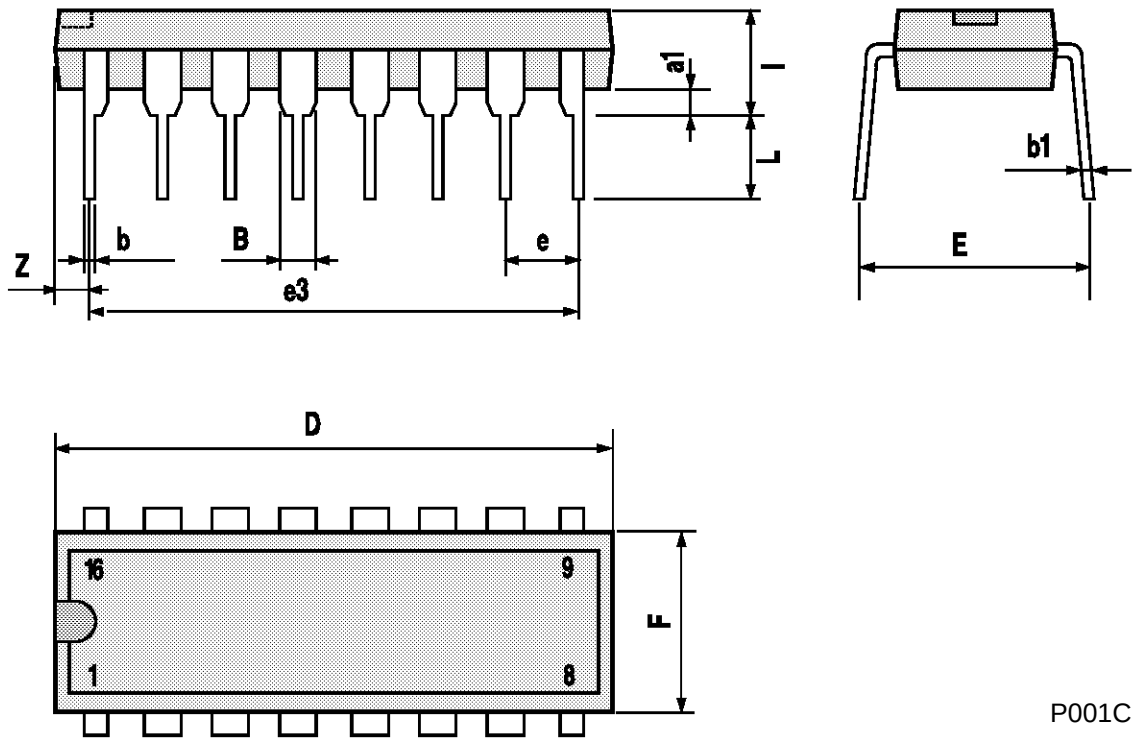
SWITCHING CHARACTERISTICS TEST WAVEFORM



Note : Such a logic level shall be applied to each input that the output voltage stays in the apposite side to the switch connection level, when the output is enabled.

Plastic DIP16 (0.25) MECHANICAL DATA

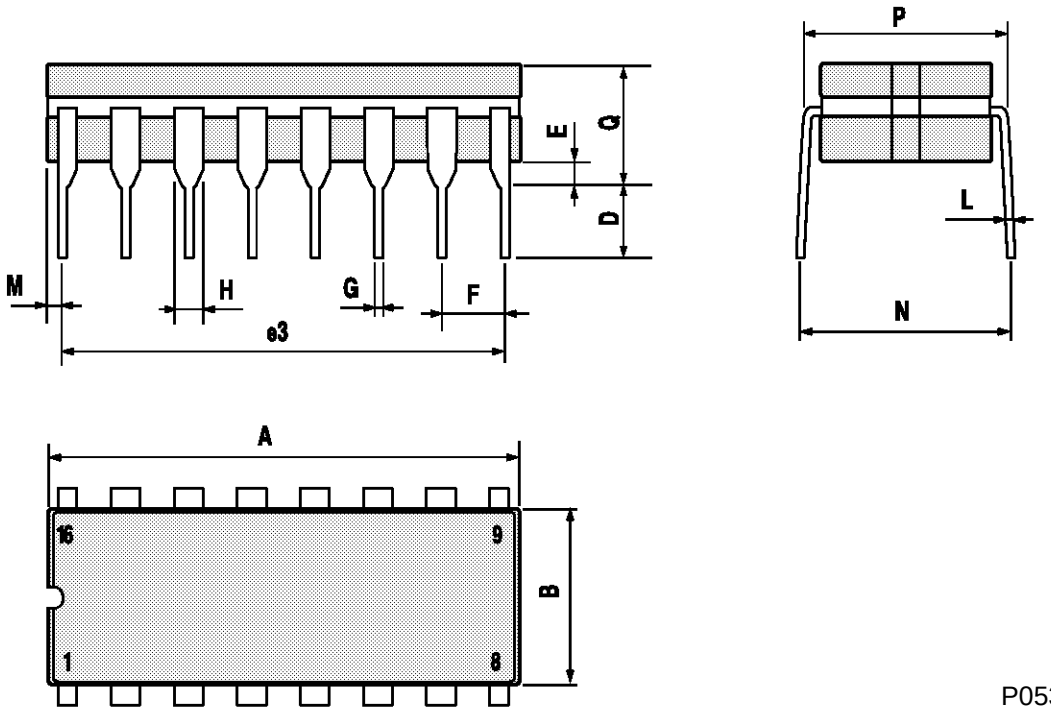
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

Ceramic DIP16/1 MECHANICAL DATA

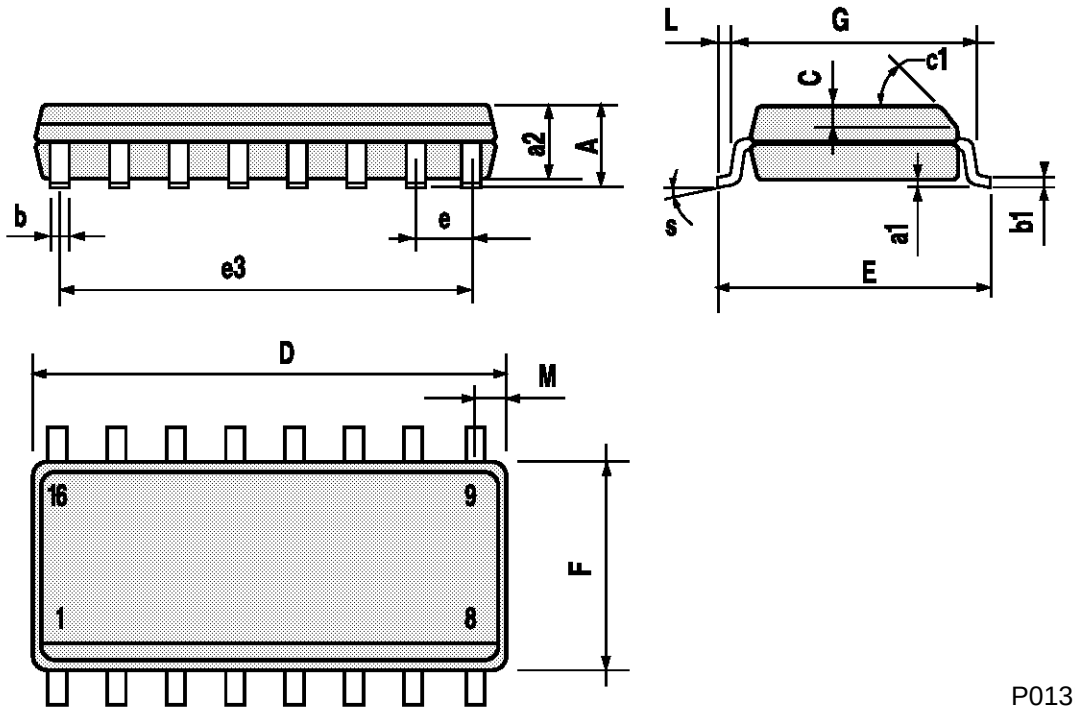
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		17.78			0.700	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q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



P053D

SO16 (Narrow) MECHANICAL DATA

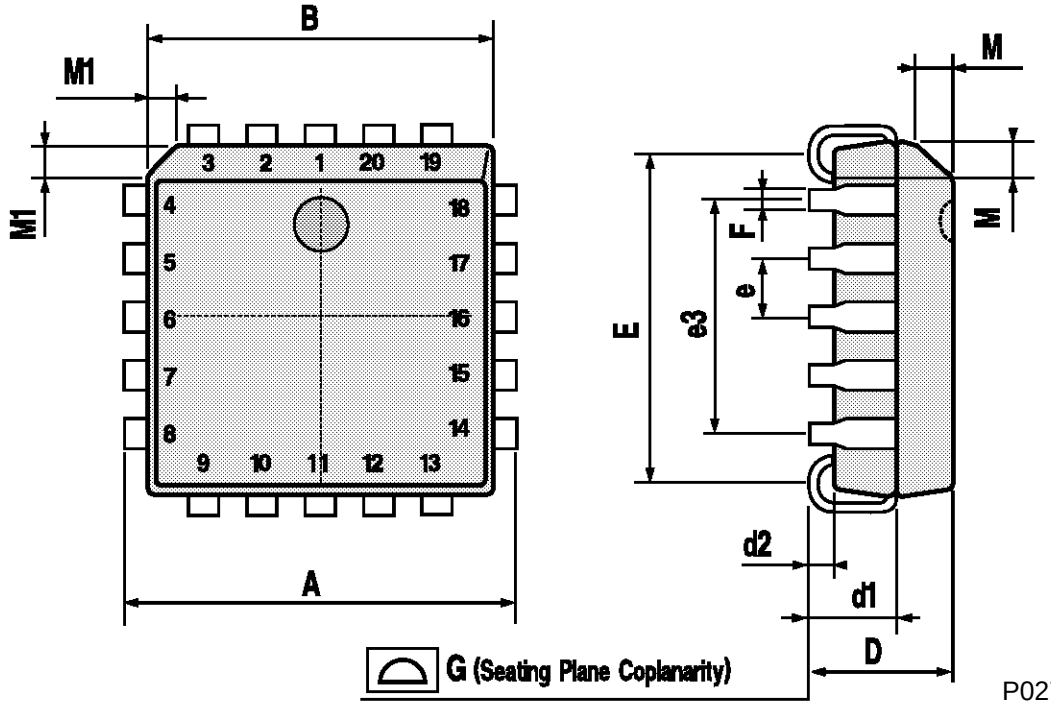
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					



P013H

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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