

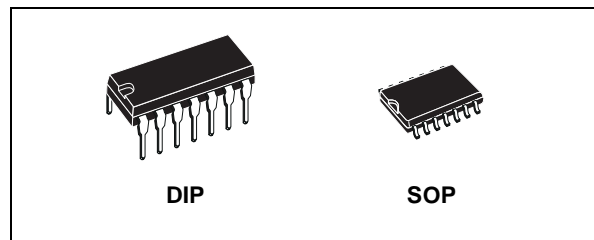


THE DATASHEET OF HCF4016BEY



QUAD BILATERAL SWITCH

- 20V DIGITAL OR $\pm 10V$ PEAK TO PEAK SWITCHING
- 280 Ω TYPICAL ON RESISTANCE FOR 15V OPERATION
- SWITCH ON RESISTANCE MATCHED TO WITHIN 10 Ω TYP. OVER 15V SIGNAL INPUT RANGE
- HIGH ON/OFF OUTPUT VOLTAGE RATIO : 65dB TYP. at $f_{IS} = 10KHz$, $R_L = 10K\Omega$
- HIGH DEGREE OF LINEARITY : < 0.5% DISTORTION TYP. at $f_{IS} = 1KHz$, $V_{IS} = 5 V_{pp}$, $V_{DD} - V_{SS} \geq 10V$, $R_L = 10K\Omega$
- EXTREMELY LOW OFF SWITCH LEAKAGE RESULTING IN VERY LOW OFFSET CURRENT AND HIGH EFFECTIVE OFF RESISTANCE : 100pA TYP. at $V_{DD} - V_{SS} = 18V$, $T_{amb} = 25^\circ C$
- EXTREMELY HIGH CONTROL INPUT IMPEDANCE (control circuit isolated from signal circuit 10¹² Ω typ.)
- LOW CROSSTALK BETWEEN SWITCHES : 50dB Typ. at $f_{IS} = 0.9MHz$, $R_L = 1K\Omega$
- MATCHED CONTROL - INPUT TO SIGNAL OUTPUT CAPACITANCE : REDUCES OUTPUT SIGNAL TRANSIENTS
- FREQUENCY RESPONSE SWITCH ON : 40MHz (Typ.)
- QUIESCENT CURRENT SPECIF. UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT
 $I_l = 100nA$ (MAX) AT $V_{DD} = 18V$ $T_A = 25^\circ C$



ORDER CODES

PACKAGE	TUBE	T & R
DIP	HCF4016BEY	
SOP	HCF4016BM1	HCF4016M013TR

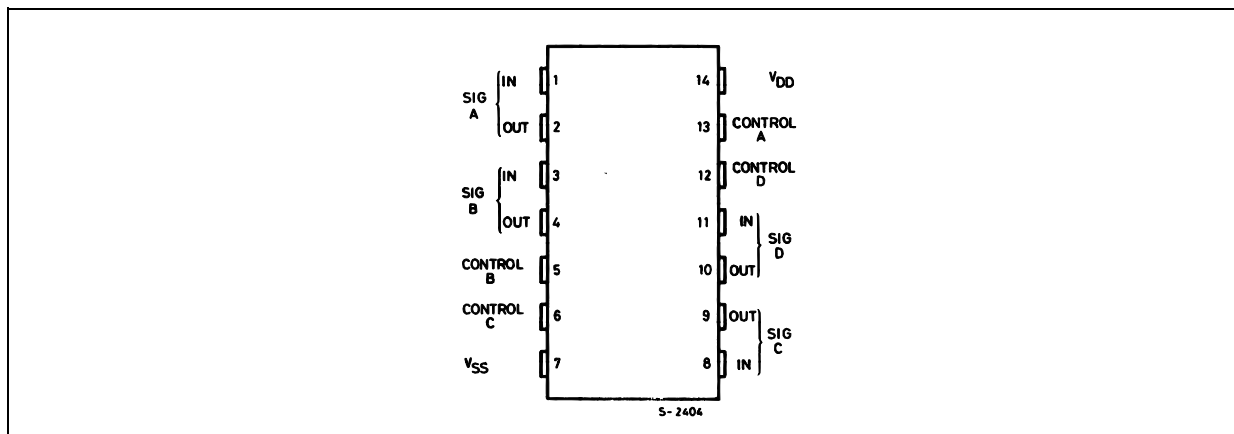
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B " STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"

DESCRIPTION

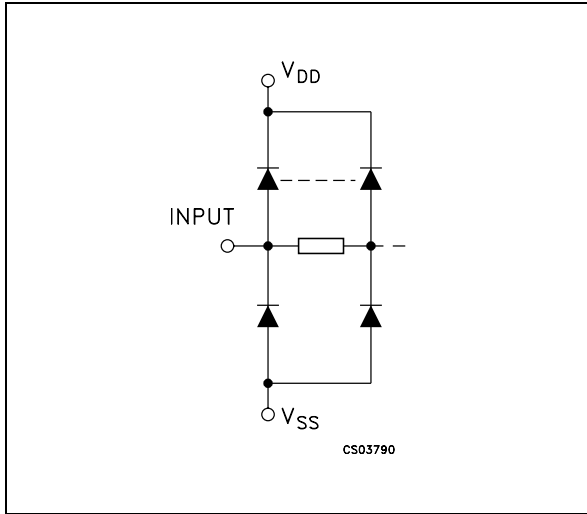
The HCF4016B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages. The HCF4016B is a QUAD BILATERAL SWITCH intended for the transmission or multiplexing of analog or digital signals.

Each of the four independent bilateral switches has a single control signal input which simultaneously biases both the p and n device in a given switch ON or OFF.

PIN CONNECTION



INPUT EQUIVALENT CIRCUIT



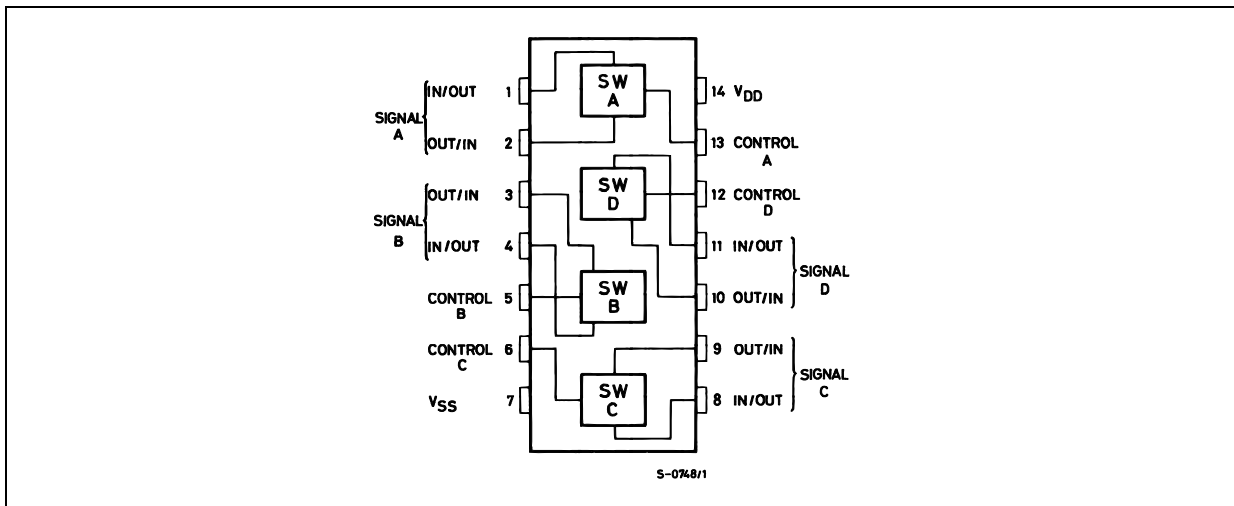
PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 4, 8, 11	A to D I/O	Independent Inputs/Outputs
2, 3, 9, 10	A to D O/I	Independent Outputs/Inputs
13, 5, 6, 12	CONTROL A to D	Enable Inputs
7	V _{SS}	Negative Supply Voltage
14	V _{DD}	Positive Supply Voltage

TRUTH TABLE

CONTROL	SWITCH FUNCTION
H	ON
L	OFF

FUNCTIONAL DIAGRAM



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DD}	Supply Voltage	-0.5 to +22	V
V _I	DC Input Voltage	-0.5 to V _{DD} + 0.5	V
I _I	DC Input Current	± 10	mA
P _D	Power Dissipation per Package	200	mW
	Power Dissipation per Output Transistor	100	mW
T _{op}	Operating Temperature	-55 to +125	°C
T _{stg}	Storage Temperature	-65 to +150	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied. All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage	3 to 20	V
V_I	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature	-55 to 125	°C

DC SPECIFICATIONS

Symbol	Parameter	Test Condition			Value						Unit		
		$V_C = V_{DD}$	V_{SS} (V)	V_{DD} (V)	$T_A = 25^\circ\text{C}$			-40 to 85°C		-55 to 125°C			
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
I_L	Quiescent Device Current (all switches ON or all switches OFF)			5		0.01	0.25		7.5		7.5	μA	
				10		0.01	0.5		15		15		
				15		0.01	1		30		30		
				20		0.02	5		150		150		
SWITCH													
R_{ON}	Resistance	$R_L = 10\text{K}\Omega$	+7.5	-7.5	+7.5		200	400		600		600	Ω
					-7.5		200	400		600		600	
					± 0.25		280	850		1230		1230	
			+5	-5	+5		250	660		840		840	
					-5		250	660		840		840	
					± 0.25		580	2000		2380		2380	
			+15	0	+15		200	400		520		520	
					+0.25		200	400		520		520	
					+9.3		300	800		1080		1080	
			+10	0	+10		250	660		840		840	
					+0.25		250	660		840		840	
					+5.6		560	2000		2380		2380	
Δ_{ON}	Resistance Δ_{RON} (between any 2 of 4 switches)	$R_L = 10\text{K}\Omega$	+7.5	-7.5	± 7.5		10					Ω	
			+5	-5	± 5		15						
	Input or Output Leakage Current Switch OFF (effective off resistance)		$V_{DD} +15$	$V_C = V_{SS} 0$		10^{-5}	± 0.3		± 1		± 1	μA	
C_I	Input Capacitance	$V_{CC} = V_{SS} = -5$			+5		4					pF	
C_O	Output Capacitance						4						
C_{IO}	Feedthrough						0.2						
CONTROL (V_C)													
V_{TH}	Switch Threshold Voltage	$I_{IS} = 10 \mu\text{A}$			5		2.25		1		1		V
					10		4.5		2		2		
					15		6.75		2		2		
I_I	Input Current	$V_{IS} \leq V_{DD}$			18		$\pm 10^{-5}$	± 0.1		± 1		μA	
C_I	Input Capacitance						5	7.5				pF	

HCF4016B

DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{pF}$, all input square wave rise and fall time = 20 ns)

Parameter	Test Condition						Value			Unit	
	V_C (V)	R_L (K Ω)	f_1 (KHz)	V_I (V)	V_{SS} (V)	V_{DD} (V)	Min.	Typ.	Max.		
Propagation Delay Time (signal input to output)	$= V_{DD}$	10		10sq. Wave	GND	5		40	100	ns	
						10		20	50		
						15		15	40		
Crosstalk Between any 2 of 4 Switches (f at -50dB) $20 \log_{10} V_{O(B)}/V_{I(A)} = -50\text{dB}$	$V_{C(A)} = V_{DD} = +5$ $V_{C(B)} = V_{SS} = -5$	1		$V_{I(A)} \Delta = 5\text{p-p}$				0.9		MHz	
Feedthrough(switch OFF) at $20 \log_{10} V_O/V_I = -50\text{dB}$	$= V_{DD} = +5$	1		5p-p		5		1.25		MHz	
Frequency Response Switch"ON" (sine wave input) at $20 \log_{10} V_O/V_I = -3\text{dB}$	$= V_{SS} = -5$	1		-5p-p	-5			40		MHz	
Sine Wave Distortion	$= V_{DD} = 5$	10	1	5p-p	-5			0.4		%	
CONTROL (V_C)											
Propagation Delay Time (turn on control to output)	$V_{DD} - V_{SS}$ (sq. wave)	1		V_{DD} or V_{SS}		5	$V_{DD} - V_{SS} = 10\text{V}$		35	70	ns
						10			20	40	
						15			15	30	
Max. Allowable Control Input Repetition Rate	10 (sq. wave)	1		V_{DD}	GND	10		10		MHz	
Crosstalk (control Input to signal output)	10 (sq. wave)	10			GND	10		50		mV	

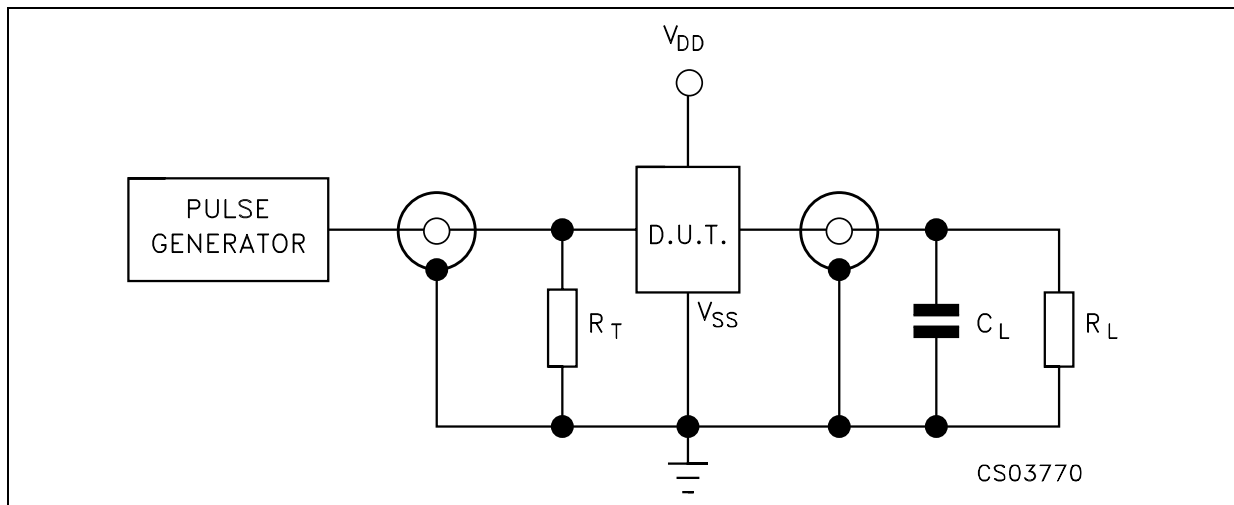
(Δ) Symmetrical about OV

TYPICAL "ON" RESISTANCE CHARACTERISTICS, $T_{amb} = 25^{\circ}\text{C}$

Characteristics*	Supply Conditions		Load Conditions					
			RL = 1KΩ		RL = 10KΩ		RL = 100KΩ	
	V _{DD} (V)	V _{SS} (V)	Value (Ω)	V _{is} (V)	Value (Ω)	V _{is} (V)	Value (Ω)	V _{is} (V)
R _{ON}	+ 15	0	200	+ 15	200	+ 15	180	+ 15
			200	0	200	0	200	0
R _{ON} (max.)	+ 15	0	300	+ 11	300	+ 9.3	300	+ 9.2
R _{ON}	+ 10	0	290	+ 10	250	+ 10	240	+ 10
			290	0	250	0	300	0
R _{ON} (max.)	+ 10	0	500	+ 7.4	560	+ 5.6	610	+ 5.5
R _{ON}	+ 5	0	860	+ 5	470	+ 5	450	+ 5
			600	0	580	0	800	0
R _{ON} (max.)	+ 5	0	1.7K	+ 4.2	7K	+ 2.9	33K	+ 2.7
R _{ON}	+ 2.5	- 2.5	590	+ 2.5	450	+ 2.5	490	+ 2.5
			720	- 2.5	520	- 2.5	520	- 2.5
R _{ON} (max.)	+ 2.5	- 2.5	232K	± 0.25	300K	± 0.25	870K	± 0.25

* Variation from a perfect switch, R_{ON} = 0Ω

TEST CIRCUIT



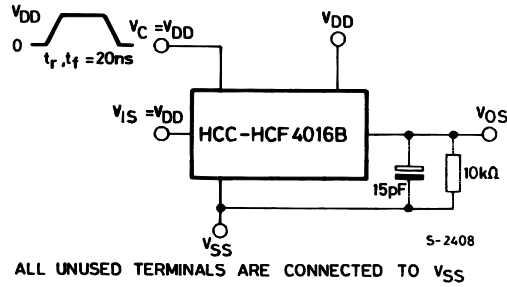
C_L = 50pF or equivalent (includes jig and probe capacitance)

R_L = 200KΩ

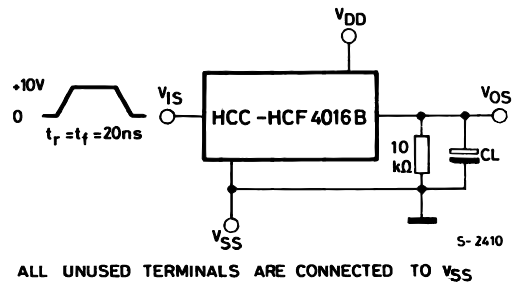
R_T = Z_{OUT} of pulse generator (typically 50Ω)

SWITCHING CHARACTERISTICS TEST CIRCUIT

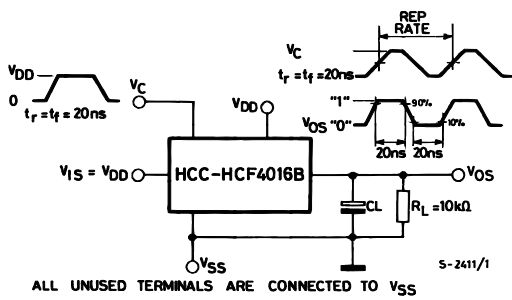
SQUARE-WAVE RESPONSE



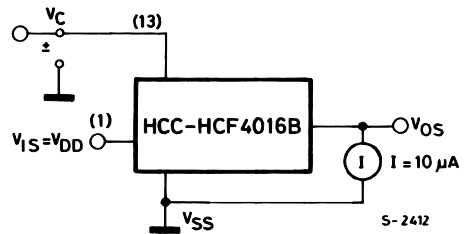
PROPAGATION DELAY TIME SIGNAL INPUT (V_I) TO SIGNAL OUTPUT (V_O)



MAX ALLOWABLE CONTROL-INPUT REPETITION RATE

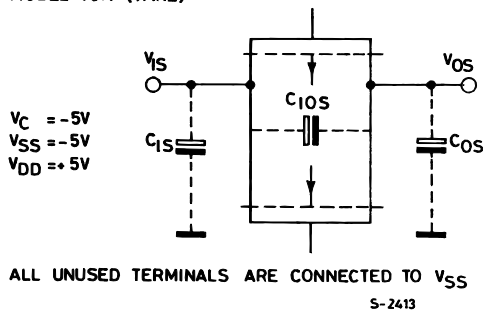


SWITCH TRESHOLD VOLTAGE

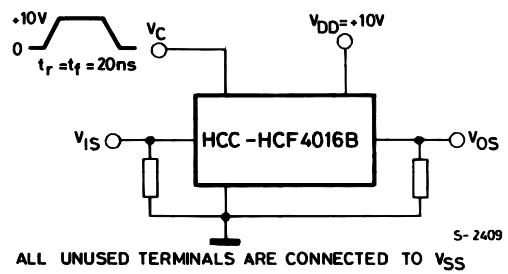


CAPACITANCE C_{I0S} AND C_{O0S}

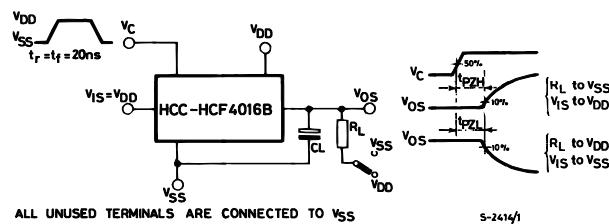
MEASURED ON BOONTON CAPACITANCE BRIDGE MODEL 75A (1MHz)



CROSSTALK CONTROL INPUT TO SIGNAL OUTPUT

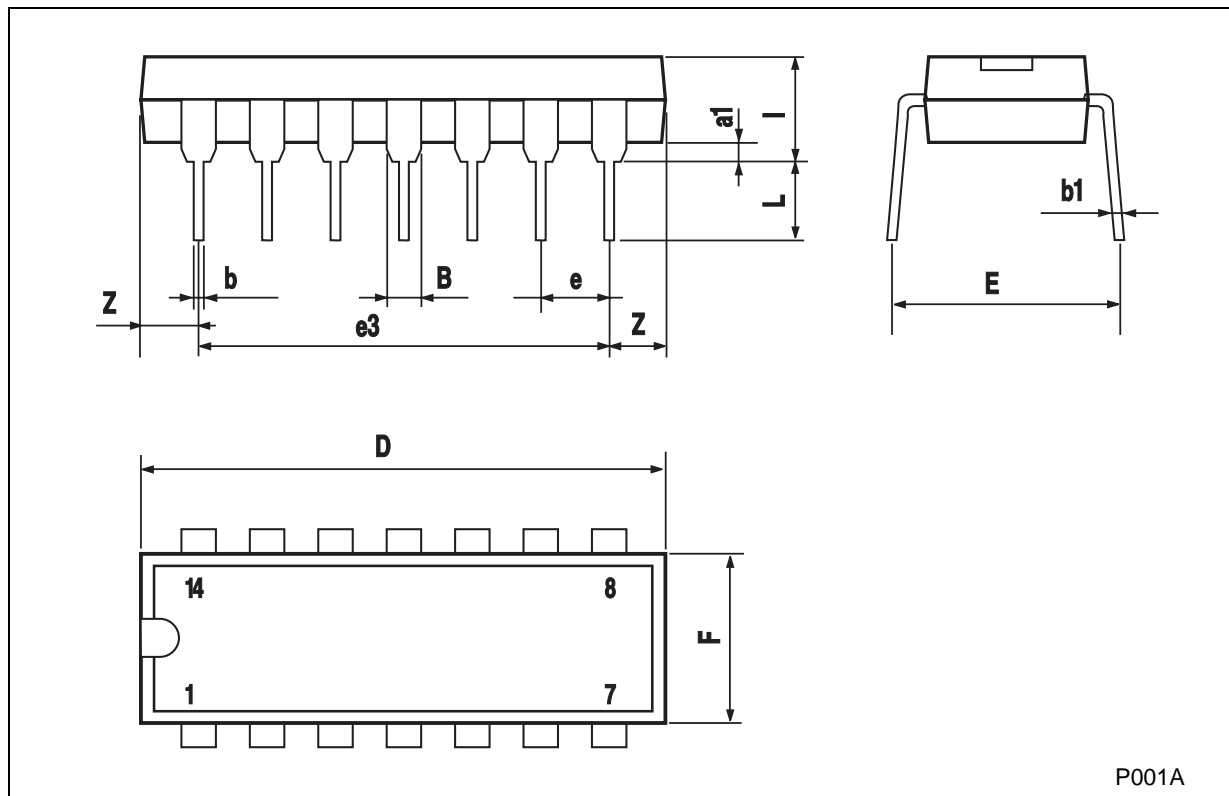


TURN-ON PROPAGATION DELAY-CONTROL INPUT TO OUTPUT



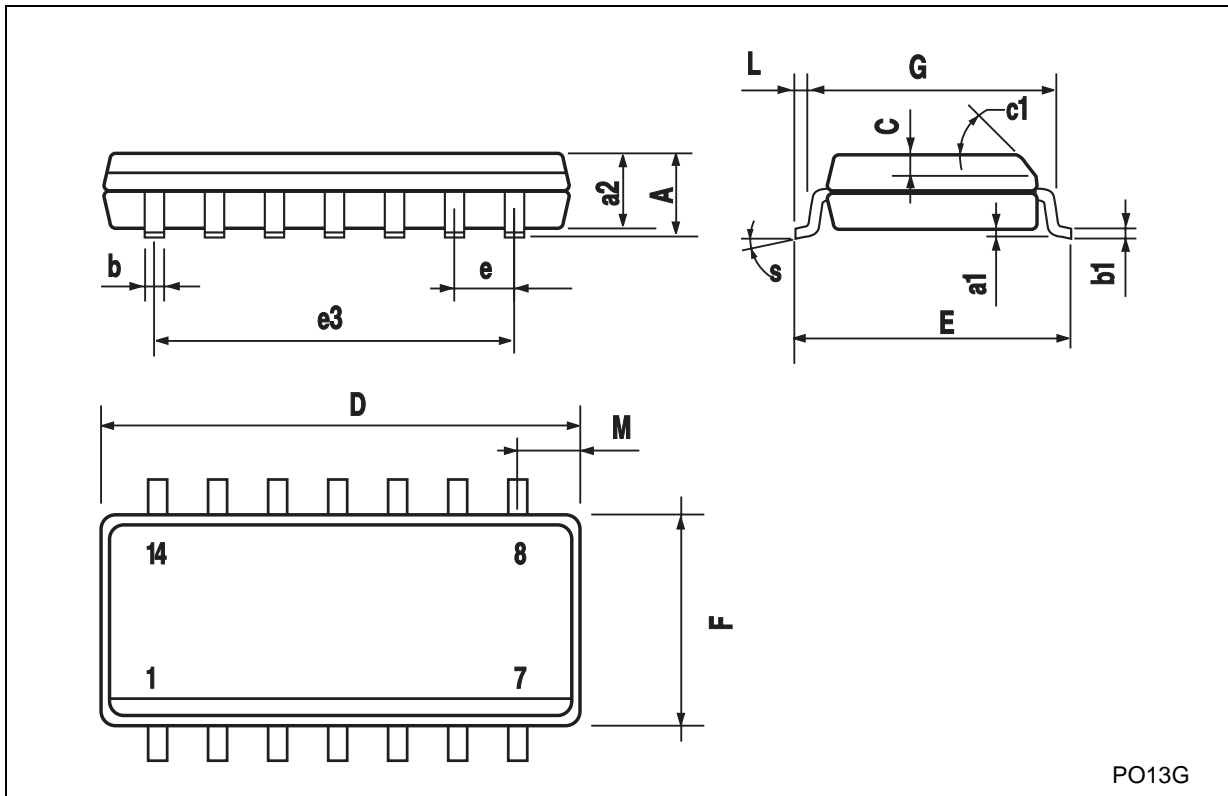
Plastic DIP-14 MECHANICAL DATA						
---------------------------------------	--	--	--	--	--	--

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		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		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



SO-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		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	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
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			0.68			0.026
S	8° (max.)					



PO13G

Information furnished is believed to be accurate and reliable. However, STMicroelectronics assumes no responsibility for the consequences of use of such information nor for any infringement of patents or other rights of third parties which may result from its use. No license is granted by implication or otherwise under any patent or patent rights of STMicroelectronics. Specifications mentioned in this publication are subject to change without notice. This publication supersedes and replaces all information previously supplied. STMicroelectronics products are not authorized for use as critical components in life support devices or systems without express written approval of STMicroelectronics.

© The ST logo is a registered trademark of STMicroelectronics

© 2001 STMicroelectronics - Printed in Italy - All Rights Reserved
STMicroelectronics GROUP OF COMPANIES

Australia - Brazil - China - Finland - France - Germany - Hong Kong - India - Italy - Japan - Malaysia - Malta - Morocco
Singapore - Spain - Sweden - Switzerland - United Kingdom

© <http://www.st.com>



Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- ⊖ [View HCF4016BEY on WIN SOURCE](#)
- ⊖ [STMicroelectronics Information](#)

Optimize Your Supply Chain with WIN SOURCE Solutions

- ✓ Global Sourcing Solution
- ✓ Obsolete Management
- ✓ Cost Control Management
- ✓ Shortage Management
- ✓ Alternative Solution
- ✓ Excess Inventory Management