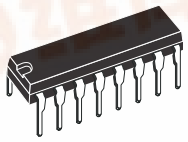
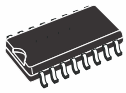
HCF4048B

MULTIFUNCTION EXPANDABLE 8-INPUT GATE

- THREE STATE OUTPUT
- MULTIPLE LOGIC FUNCTIONS AVAILABLE IN ONE PACKAGE
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT I_I = 100nA (MAX) AT V_{DD} = 18V T_A = 25°C
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B " STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"



DIP



SOP

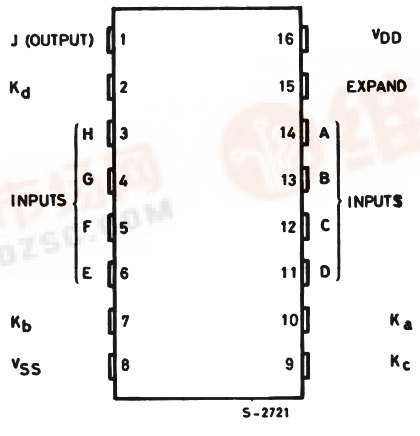
ORDER CODES

PACKAGE	TUBE	T & R
DIP	HCF4048BEY	
SOP	HCF4048BM1	HCF4048M013TR

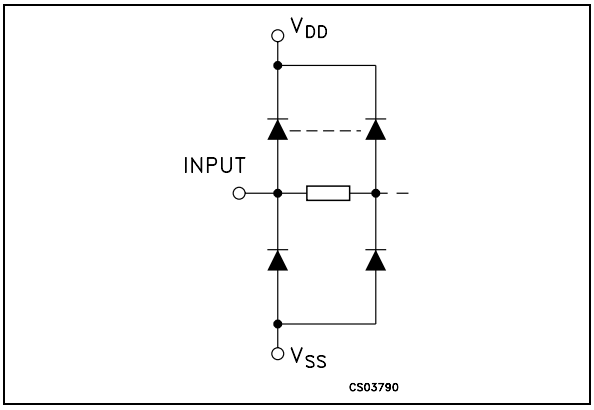
DESCRIPTION

HCF4048B is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages.
HCF4048B is an 8-input gate having four control inputs. Three binary control inputs K_a, K_b, and K_c provide the implementation of eight different logic functions. These functions are OR, NOR, AND, NAND, OR/AND, OR/NAND, AND/OR and AND/NOR. A fourth control input K_d provides the user with a 3 state output. When control input K_d is high the output is either a logic 1 or a logic 0 depending on the inner states. When control input K_d is low, the output is an open circuit. This feature enables the user to connect this device to a common bus line. In addition to the eight input lines, an EXPAND input is provided that permits the user to increase the number of inputs to one HCF4048B. For example, two HCF4048Bs can be cascaded to provide a 16 input multifunction gate. When the EXPAND input is not used, it should be connected to V_{SS}.

PIN CONNECTION



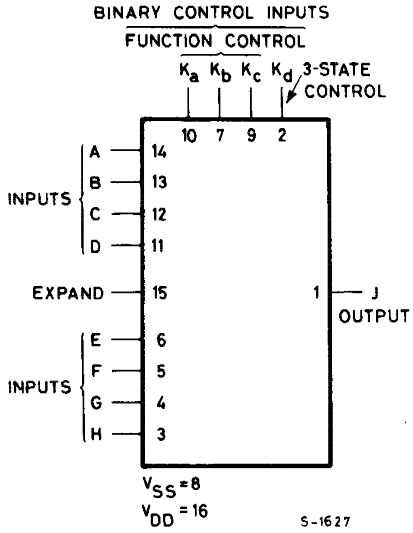
INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
14, 13, 12, 11	A, B, C, D	Data Inputs
6, 5, 4, 3	E, F, G, H	Data Inputs
10, 7, 9	K_a, K_b, K_c	Function Control Inputs
2	K_d	3-State Control Inputs
1	J	Data Output
15	EXPAND	Expand Input
8	V_{SS}	Negative Supply Voltage
16	V_{DD}	Positive Supply Voltage

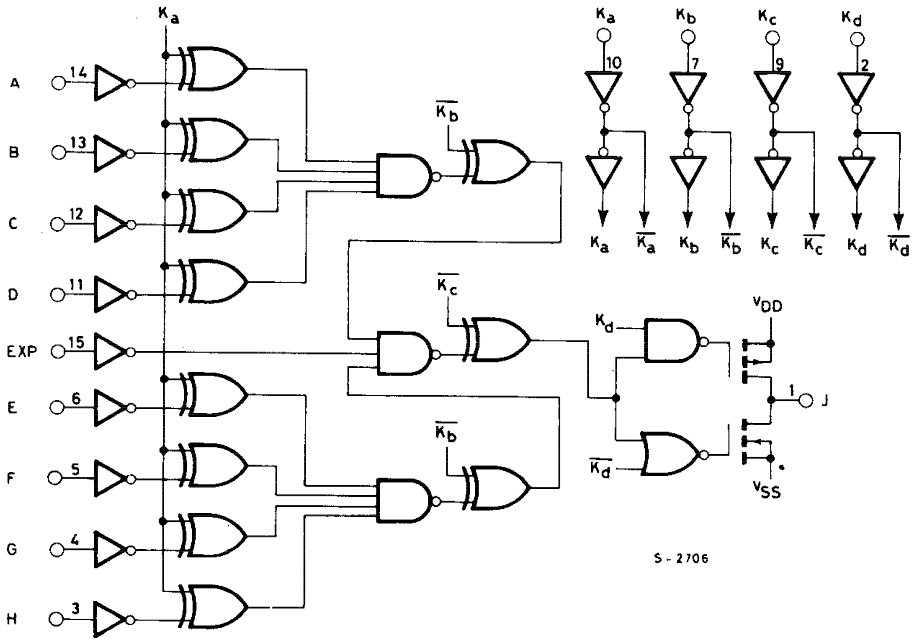
FUNCTIONAL DIAGRAM



TRUTH TABLE

Output Function	Boolean Expression	K_a	K_b	K_c	Unused Input
NOR	$J = \overline{A + B + C + D + E + F + G + H}$	0	0	0	V_{SS}
OR	$J = A + B + C + D + E + F + G + H$	0	0	1	V_{SS}
OR/AND	$J = (A + B + C + D) \bullet (E + F + G + H)$	0	1	0	V_{SS}
OR/NAND	$J = \overline{(A + B + C + D) \bullet (E + F + G + H)}$	0	1	1	V_{SS}
AND	$J = ABCDEFGH$	1	0	0	V_{DD}
NAND	$J = \overline{ABCDEFGH}$	1	0	1	V_{DD}
AND/NOR	$J = \overline{ABCD} + \overline{EFGH}$	1	1	0	V_{DD}
AND/OR	$J = ABCD + EFGH$	1	1	1	V_{DD}
$K_d = 1$ - NORMAL INVERTER ACTION $K_d = 0$ - HIGH IMPEDANCE OUTPUT					

LOGIC 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_I (V)	V_O (V)	$\|I_O\|$ (μA)	V_{DD} (V)	T_A = 25°C			-40 to 85°C		-55 to 125°C		
						Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
I_L	Quiescent Current	0/5			5		0.01	0.25		7.5		7.5	μA
		0/10			10		0.01	0.5		15		15	
		0/15			15		0.01	1		30		30	
		0/20			20		0.02	5		150		150	
V_{OH}	High Level Output Voltage	0/5		<1	5	4.95			4.95		4.95		V
		0/10		<1	10	9.95			9.95		9.95		
		0/15		<1	15	14.95			14.95		14.95		
V_{OL}	Low Level Output Voltage	5/0		<1	5		0.05			0.05		0.05	V
		10/0		<1	10		0.05			0.05		0.05	
		15/0		<1	15		0.05			0.05		0.05	
V_{IH}	High Level Input 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}	Low Level Input Voltage		4.5/0.5	<1	5			1.5		1.5		1.5	V
			9/1	<1	10			3		3		3	
			13.5/1.5	<1	15			4		4		4	
I_{OH}	Output Drive Current	0/5	2.5	<1	5	-1.36	-3.2		-1.15		-1.1		mA
		0/5	4.6	<1	5	-0.44	-1		-0.36		-0.36		
		0/10	9.5	<1	10	-1.1	-2.6		-0.9		-0.9		
		0/15	13.5	<1	15	-3.0	-6.8		-2.4		-2.4		
I_{OL}	Output Sink Current	0/5	0.4	<1	5	0.44	1		0.36		0.36		mA
		0/10	0.5	<1	10	1.1	2.6		0.9		0.9		
		0/15	1.5	<1	15	3.0	6.8		2.4		2.4		
I_I	Input Leakage Current	0/18	Any Input		18		$\pm 10^{-5}$	±0.1		±1		±1	μA
I_{OZ}	3-State Output Current	0/18	Any Input		18		$\pm 10^{-4}$	±0.4		±1		±12	μA
C_I	Input Capacitance		Any Input				5	7.5					pF

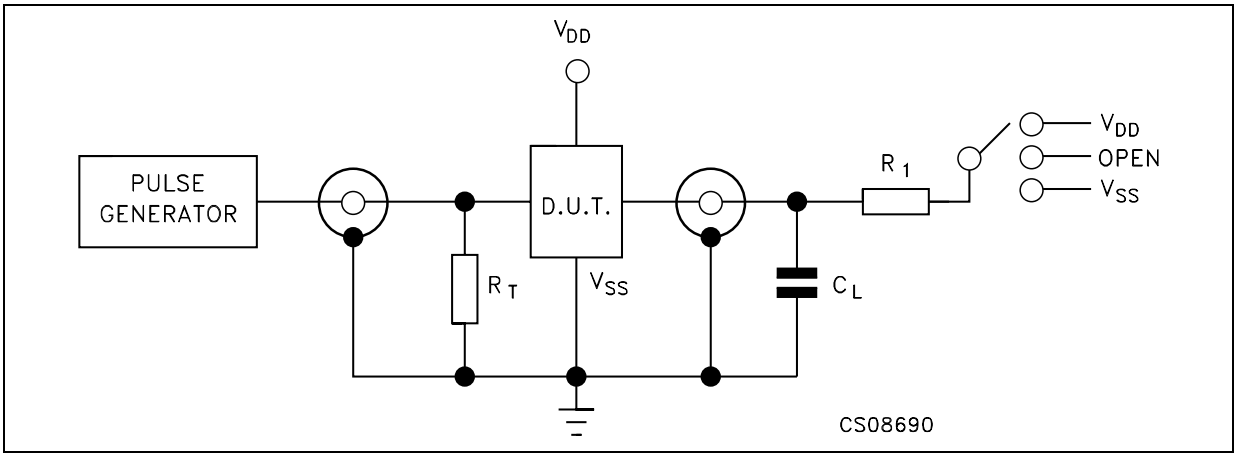
The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD}=5V, 2V min. with V_{DD}=10V, 2.5V min. with V_{DD}=15V

DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, C_L = 50pF, R_L = 200KΩ, $t_r = t_f$ = 20 ns)

Symbol	Parameter	Test Condition		Value (*)			Unit
		V_{DD} (V)		Min.	Typ.	Max.	
t_{PHL} t_{PLH}	Propagation Delay Time Inputs to Output and K_a to Output	5			300	600	ns
		10			150	300	
		15			120	240	
	Propagation Delay Time K_b to Output	5			225	450	ns
		10			85	170	
		15			55	110	
	Propagation Delay Time K_c to Output	5			140	280	ns
		10			50	100	
		15			40	80	
	Propagation Delay Time EXPAND Input to Output	5			190	380	ns
		10			90	180	
		15			65	130	
t_{PHZ}, t_{PLZ} t_{PZH}, t_{PZL}	3 - State Propagation Delay Time K_d to Output	5	RL = 1KΩ		80	160	ns
		10			35	70	
		15			25	50	
t_{TLH} t_{THL}	Output Transition Time	5			100	200	ns
		10			50	100	
		15			40	80	
3-State Output Capacitance					5	10	pF

(*) Typical temperature coefficient for all V_{DD} value is 0.3 %/°C.

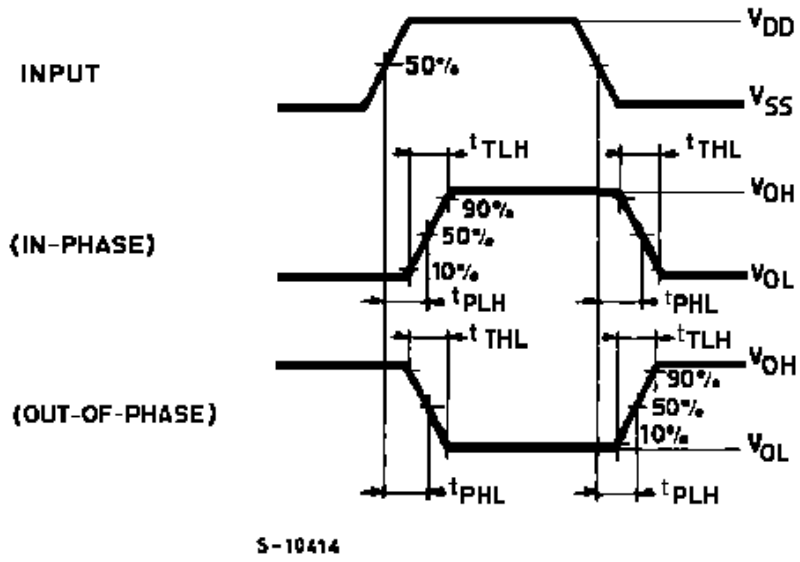
TEST CIRCUIT



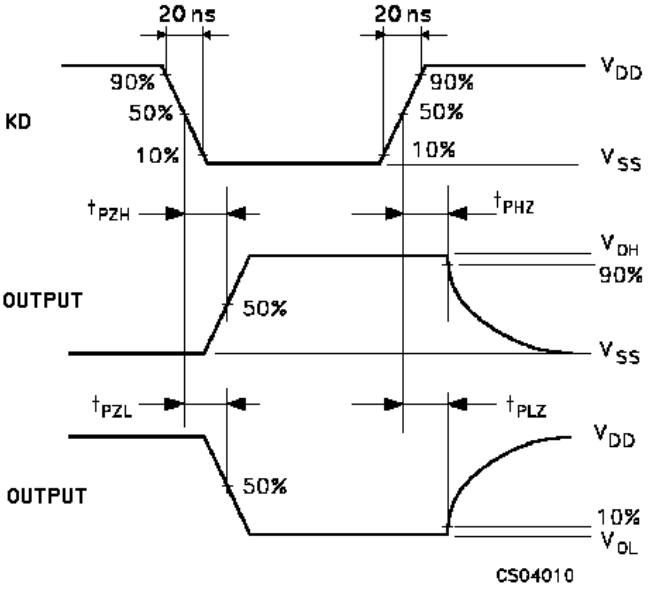
TEST	SWITCH
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	V_{DD}
t_{PZH}, t_{PHZ}	V_{SS}

C_L = 50pF or equivalent (includes jig and probe capacitance)
R_L = 200KΩ
R_T = Z_{OUT} of pulse generator (typically 50Ω)

WAVEFORM 1 : PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)

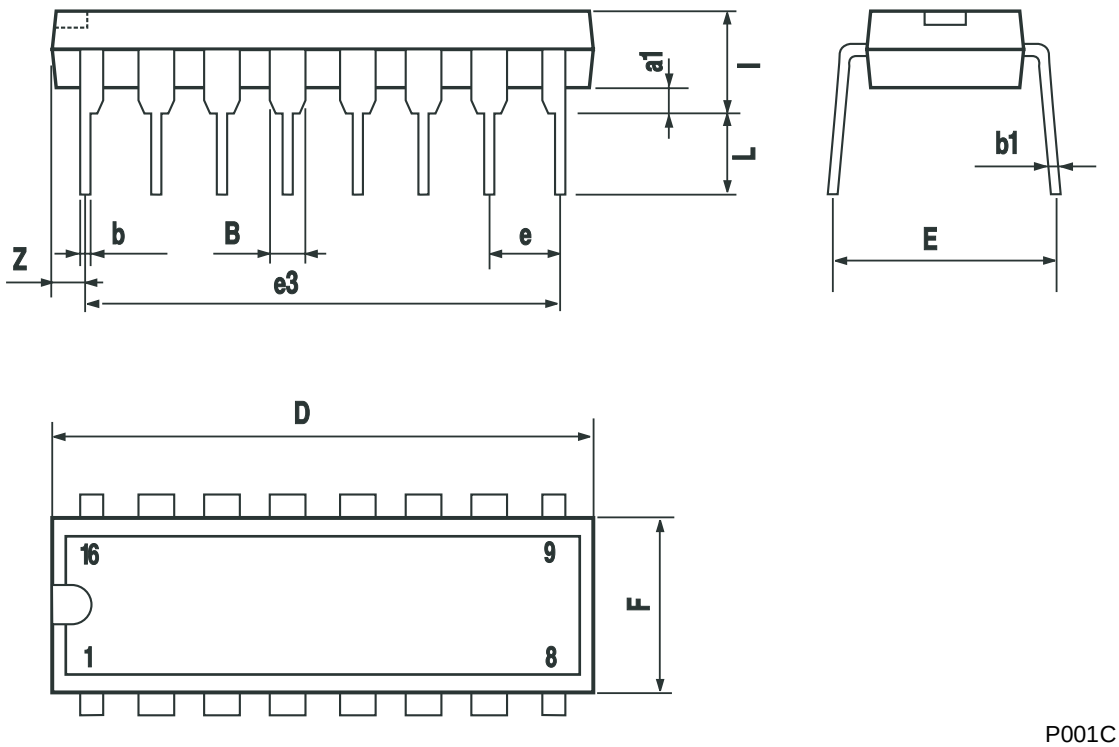


WAVEFORM 2 : OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)



Plastic DIP-16 (0.25) MECHANICAL DATA

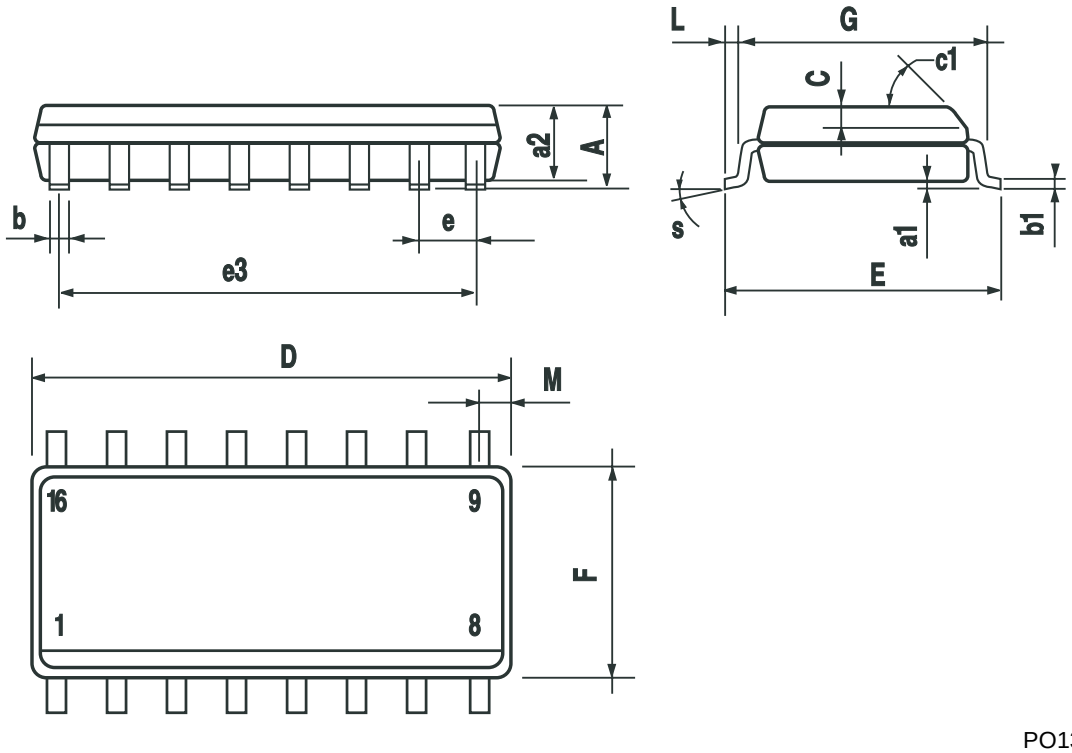
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

SO-16 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	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.)					



PO13H