TEXAS INSTRUMENTS
Data sheet acquired from Harris Semiconductor
SCHS029A – Revised March 2002

CD4019B Types

CMOS Quad AND/OR Select Gate

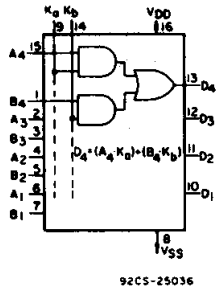
High-Voltage Types (20-Volt Rating)

■ CD4019B types consist of four AND/OR select gate configurations, each consisting of two 2-input AND gates driving a single 2-input OR gate. Selection is accomplished by control bits K_a and K_b. In addition to selection of either channel A or channel B information, the control bits can be applied simultaneously to accomplish the logical A + B function.

The CD4019B types are supplied in 16-lead hermetic dual-in-line ceramic packages (D and F suffixes), 16-lead dual-in-line plastic packages (E suffix), 16-lead small-outline package (NSR suffix), and in chip form (H suffix).

Features:

- Medium-speed operation . . . . . $t_{PHL} = t_{PLH}$ = 60 ns (typ.) at C_L = 50 pF, V_{DD} = 10 V
- Standardized, symmetrical output characteristics
- 100% tested for quiescent current at 20 V
- 5-V, 10-V, and 15-V parametric ratings
- Meets all requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"
- Maximum input current of 1 μA at 18 V over full package-temperature range; 100 nA at 18 V and 25°C
- Noise margin (full package-temperature range) = 1 V at V_{DD} = 5 V, 2 V at V_{DD} = 10 V, 2.5 V at V_{DD} = 15 V



CD4019B
FUNCTIONAL DIAGRAM

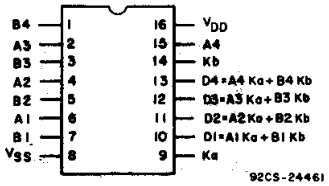
Applications:

- AND-OR select gating
- Shift-right/shift-left registers
- True/complement selection
- AND/OR/Exclusive-OR selection

MAXIMUM RATINGS, *Absolute-Maximum Values:*

DC SUPPLY-VOLTAGE RANGE, (V_{DD})
(Voltages referenced to V_{SS} Terminal) ..... -0.5V to +20V
INPUT VOLTAGE RANGE, ALL INPUTS ..... -0.5V to V_{DD} +0.5V
DC INPUT CURRENT, ANY ONE INPUT ..... ±10mA
POWER DISSIPATION PER PACKAGE (P_D):
For T_A = -55°C to +100°C 500mW
For T_A = +100°C to +125°C ..... Derate Linearity at 12mW/°C to 200mW
DEVICE DISSIPATION PER OUTPUT TRANSISTOR
FOR T_A = FULL PACKAGE-TEMPERATURE RANGE (All Package Types) 100mW
OPERATING-TEMPERATURE RANGE (T_A) ..... -55°C to +125°C
STORAGE TEMPERATURE RANGE (T_{stg}) ..... -65°C to +150°C
LEAD TEMPERATURE (DURING SOLDERING):
At distance 1/16 ± 1/32 inch (1.59 ± 0.79mm) from case for 10s max ..... +265°C

TERMINAL DIAGRAM
Top View



TRUTH TABLE

Ka	Kb	An	Bn	Dn
1	0	1	X	1
1	0	0	X	0
0	1	X	1	1
0	1	X	0	0
0	0	X	X	0
1	1	0	0	0
1	1	0	1	1
1	1	1	0	1
1	1	1	1	1

X = Don't Care

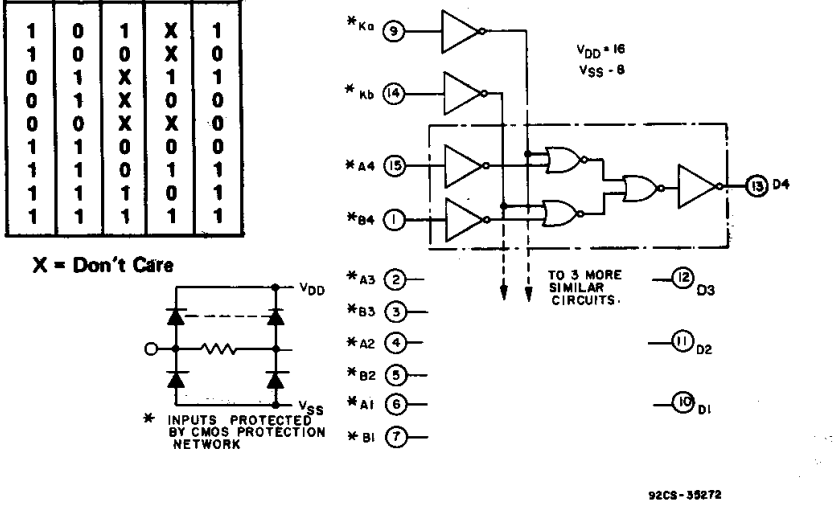


Fig. 1—Logic diagram.

RECOMMENDED OPERATING CONDITIONS

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC	V_{DD} (V)	Min.	Max.	Units
Supply-Voltage Range (For T_A = Full Package Temperature Range)	–	3	18	V

STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	CONDITIONS			LIMITS AT INDICATED TEMPERATURES (°C)							UNITS
	V_O (V)	V_{IN} (V)	V_{DD} (V)	−55	−40	+85	+125	+25 Min.	+25 Typ.	+25 Max.	
Quiescent Device Current, I_{DD} Max.	–	0,5	5	1	1	30	30	–	0.02	1	μA
	–	0,10	10	2	2	60	60	–	0.02	2	
	–	0,15	15	4	4	120	120	–	0.02	4	
	–	0,20	20	20	20	600	600	–	0.04	20	
Output Low (Sink) Current I_{OL} Min.	0.4	0,5	5	0.64	0.61	0.42	0.36	0.51	1	–	mA
	0.5	0,10	10	1.6	1.5	1.1	0.9	1.3	2.6	–	
	1.5	0,15	15	4.2	4	2.8	2.4	3.4	6.8	–	
Output High (Source) Current, I_{OH} Min.	4.6	0,5	5	−0.64	−0.61	−0.42	−0.36	−0.51	−1	–	
	2.5	0,5	5	−2	−1.8	−1.3	−1.15	−1.6	−3.2	–	
	9.5	0,10	10	−1.6	−1.5	−1.1	−0.9	−1.3	−2.6		
	13.5	0,15	15	−4.2	−4	−2.8	−2.4	−3.4	−6.8		
Output Voltage: Low-Level, V_{OL} Max.	–	0,5	5	0.05				–	0	0.05	V
	–	0,10	10	0.05				–		0.05	
	–	0,15	15	0.05				–	0	0.05	
Output Voltage: High-Level, V_{OH} Min.	–	0,5	5	4.95				4.95	5	–	
	–	0,10	10	9.95				9.95	10	–	
	–	0,15	15	14.95				14.95	15	–	
Input Low Voltage, V_{IL} Max.	0.5,4.5	–	5	1.5				–	–	1.5	V
	1,9	–	10	3				–	–	3	
	1.5,13.5	–	15	4				–	–	4	
Input High Voltage, V_{IH} Min.	0.5,4.5	–	5	3.5				3.5	–	–	
	1,9	–	10	7				7	–	–	
	1.5,13.5	–	15	11				11	–	–	
Input Current I_{IN} Max.	–	0,18	18	±0.1	±0.1	±1	±1	–	$\pm 10^{-5}$	±0.1	μA

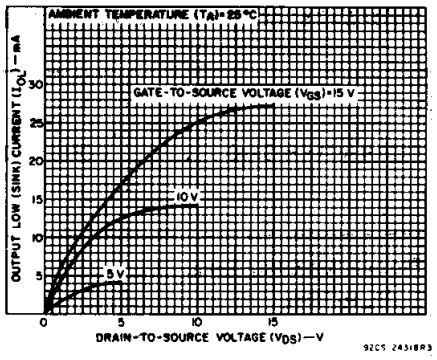


Fig. 2 – Typical output low (sink) current characteristics.

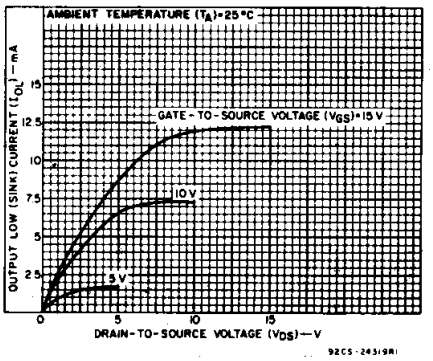


Fig. 3 – Minimum output low (sink) current characteristics.

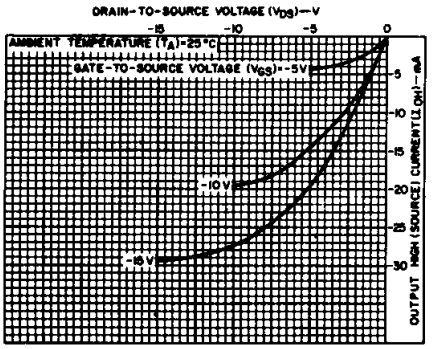


Fig. 4 – Typical output high (source) current characteristics.

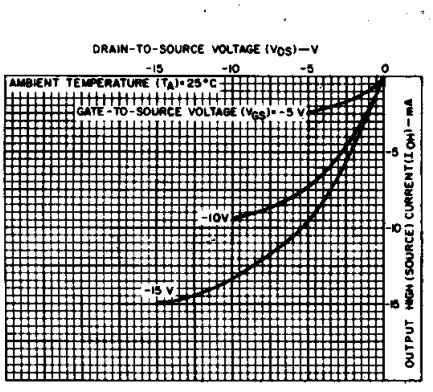


Fig. 5 – Minimum output high (source) current characteristics.

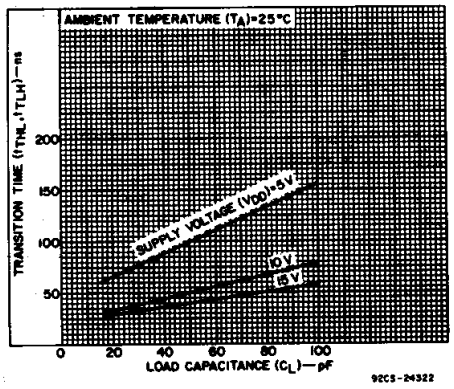


Fig. 6 – Typical transition time as a function of load capacitance.

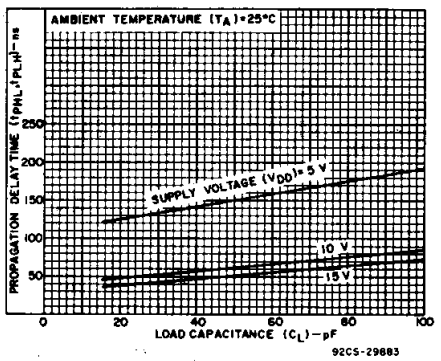


Fig. 7 – Propagation delay time as a function of load capacitance.

DYNAMIC ELECTRICAL CHARACTERISTICS at $T_A = 25^oC$, Input t_r, $t_f = 20$ ns, $C_L = 50$ pF, $R_L = 200$ kΩ

CHARACTERISTIC	TEST CONDITIONS	V_{DD} (V)	LIMITS Min.	Typ.	Max.	UNITS
Propagation Delay Time; t_{PLH}, t_{PHL}		5	–	150	300	ns
		10	–	60	120	
		15	–	50	100	
Transition Time; t_{THL}, t_{TLH}		5	–	100	200	ns
		10	–	50	100	
		15	–	40	80	
Input Capacitance, C_{IN}	All A and B Inputs		–	5	7.5	pF
	K_a and K_b Inputs		–	10	15	pF

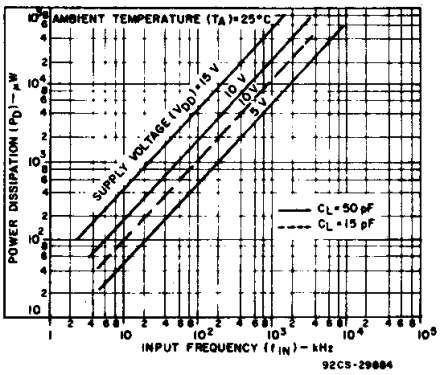


Fig. 8 – Typical dynamic power dissipation as a function of input frequency.

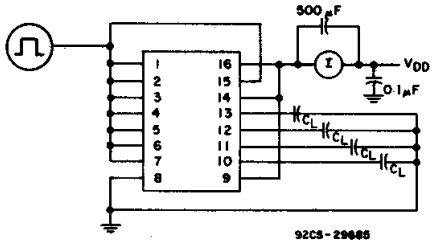


Fig. 9 – Dynamic power dissipation test circuit.

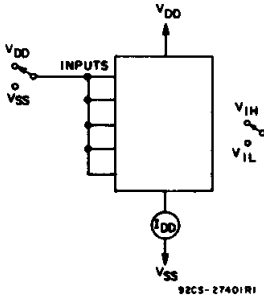


Fig. 10 – Quiescent device current test circuit.

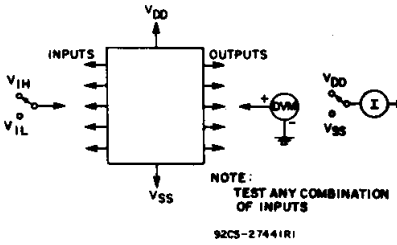


Fig. 11 – Input voltage test circuit.

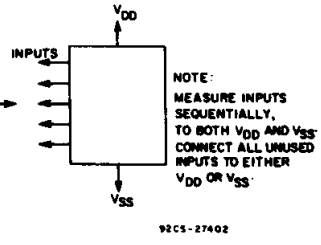


Fig. 12 – Input current test circuit.

TYPICAL APPLICATIONS

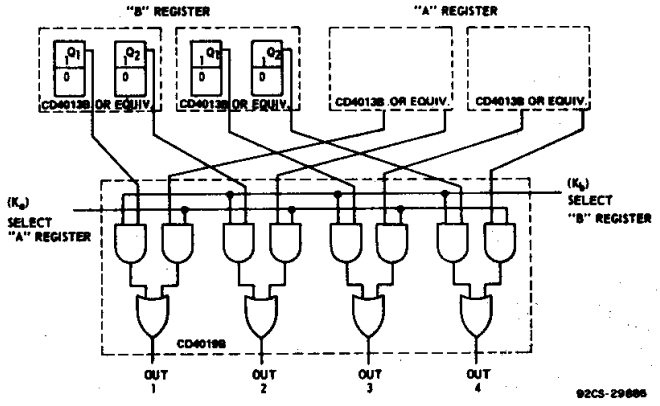


Fig. 13 – AND/OR select gating.

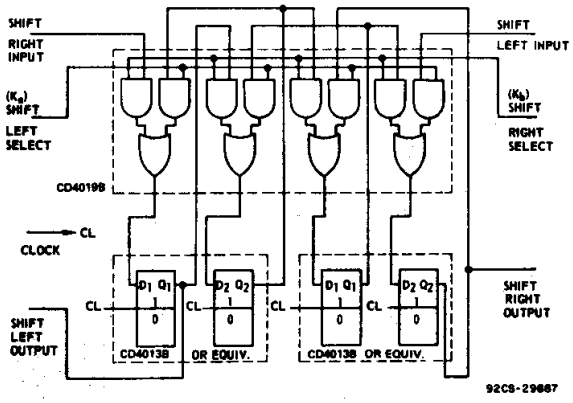


Fig. 14 – "Shift left/shift right" register.

TYPICAL APPLICATIONS (CONT'D)

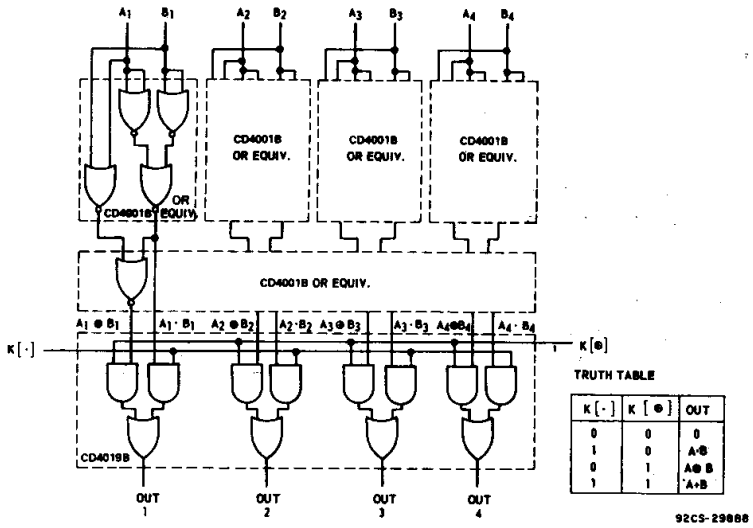


Fig. 15 – AND/OR Exclusive-OR selector.

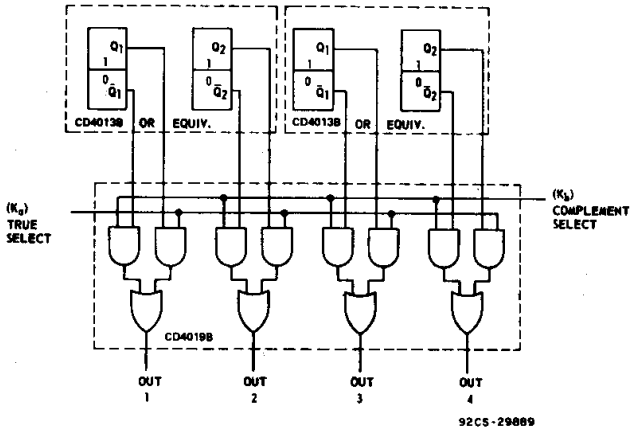
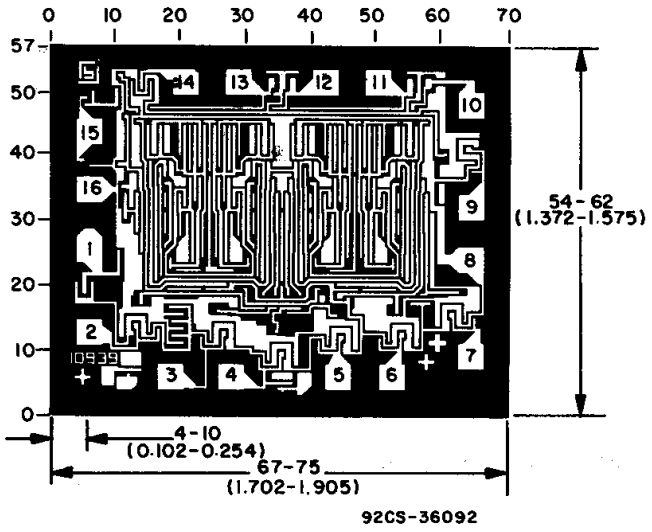


Fig. 16 – "True complement" selector.



Dimensions and pad layout for CD4019BH

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated. Grid graduations are in mils (10^{-3} inch).

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