

High-Voltage Types (20-Volt Rating)

CD4045B Types

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.	Typ.	Max.	
Quiescent Device Current, I _{DD} Max.	—	0,5	5	5	5	150	150	—	0.04	5	μA
	—	0,10	10	10	10	300	300	—	0.04	10	
	—	0,15	15	20	20	600	600	—	0.04	20	
	—	0,20	20	100	100	3000	3000	—	0.08	100	
Output Low (Sink) Current I _{OL} Min.	0.4	0,5	5	4.5	4.3	2.9	2.5	3.6	7	—	mA
	0.5	0,10	10	11.2	10.5	7.7	6.3	9.1	18	—	
	1.5	0,15	15	29.4	28	19.6	16.8	23.8	47	—	
Output High (Source) Current, I _{OH} Min.	4.6	0,5	5	-4.5	-4.3	-2.9	-2.5	-3.6	-7	—	mA
	9.5	0,10	10	-11.2	-10.5	-7.7	-6.3	-9.1	-18	—	
	13.5	0,15	15	-29.4	-28	-19.6	-16.8	-23.8	-47	—	
Pin 15 Output Low and High Current, I _{OL} , I _{OH}	0.4,4.6	0,5	5	—				±0.1	±0.18	—	mA
	0.5,9.5	0,10	10	—				±0.2	±0.3	—	
	1.5,13.5	0,15	15	—				±0.5	±1	—	
Output Voltage: Low-Level, V _{OL} Max.	—	0,5	5	0.05				—	—	0.05	V
	—	0,10	10	0.05				—	—	0.05	
	—	0,15	15	0.05				—	—	0.05	
Output Voltage: High-Level, V _{OH} Min.	—	0,5	5	4.95				4.95	5	—	V
	—	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	—	—	V
	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	—	±10 ⁻⁵	±0.1	μA

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)	LIMITS		UNITS
		Min.	Max.	
Supply-Voltage Range (For T _A = Full Package-Temperature Range)	—	3	18	V
Minimum Input-Pulse Width, t _W	5	—	100	ns
	10	—	50	
	15	—	40	
Maximum Input-Pulse Frequency, f _φ (External Pulse Source)	5	5	—	MHz
	10	12	—	
	15	15	—	

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DYNAMIC ELECTRICAL CHARACTERISTICS at $T_A = 25^\circ\text{C}$; Input $t_r, t_f = 20\text{ ns}$,
 $C_L = 50\text{ pF}$, $R_L = 200\text{ k}\Omega$

CHARACTERISTIC	TEST CONDITIONS	V_{DD} V	LIMITS			UNITS
			Min.	Typ.	Max.	
Propagation Delay Time: ϕ_1 to y or y+d out t_{PHL}, t_{PLH}		5 10 15	— — —	2.2 0.9 0.65	5.5 2.7 2	μs
Transition Time: t_{THL}, t_{TLH}		5 10 15	— — —	25 13 10	50 25 20	ns
Minimum Input-Pulse Width t_W		5 10 15	— — —	50 25 20	100 50 40	ns
Input-Pulse Rise or Fall Time: $t_r\phi, t_f\phi$		5 10 15	— — —	— — —	500 500 500	μs
Maximum Input-Pulse Frequency: (External Pulse Source) f_ϕ		5 10 15	5 12 15	10 25 30	— — —	MHz
Input Capacitance, C_{IN}	Any Input		—	5	7.5	pF
Variation of Output Frequency (Unit-to-Unit)	$f = 5\text{ MHz}$	5 10 15	— — —	0.05 0.03 0.1	— — —	%
RC Oscillator Operation						
Maximum Oscillator Frequency (See Fig. 11) f_{osc}	$R_X = 50\text{ k}\Omega$, $R_S = 560\text{ k}\Omega$, $C_X = 50\text{ pF}$	5 10 15	45 45 45	60 60 60	75 75 75	kHz

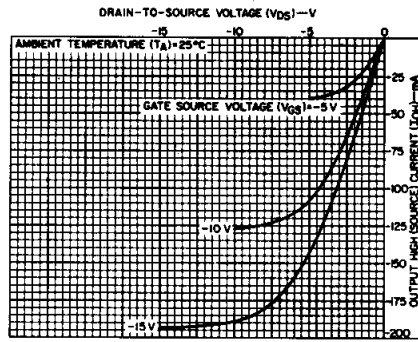


Fig. 4 - Typical output high (source) current characteristics.

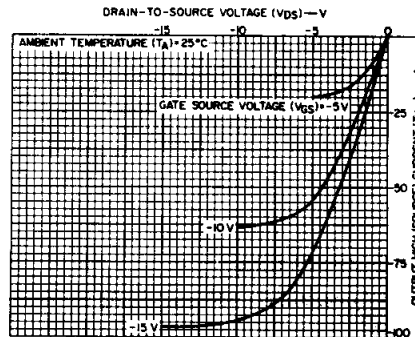


Fig. 5 - Minimum output high (source) current characteristics.

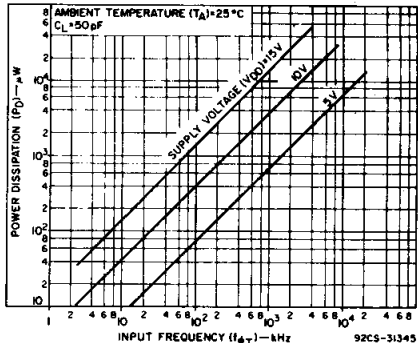


Fig. 7 - Typical power dissipation as a function of input frequency (21 counting stages).

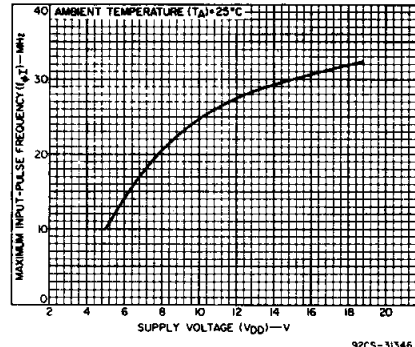


Fig. 8 - Typical maximum input-pulse frequency as a function of supply voltage.

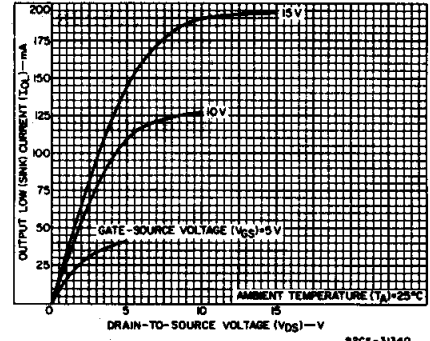


Fig. 2 - Typical output low (sink) current characteristics.

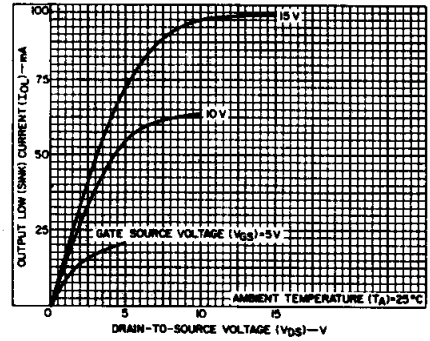


Fig. 3 - Minimum output low (sink) current characteristics.

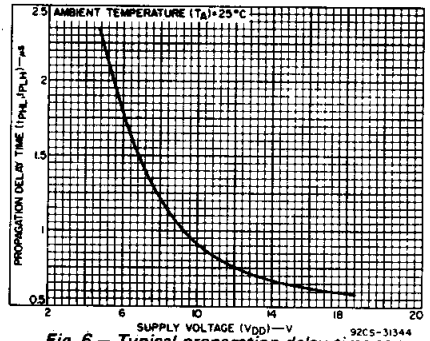


Fig. 6 - Typical propagation delay time as a function of supply voltage (ϕ_1 to y or y + d out vs. V_{DD}).

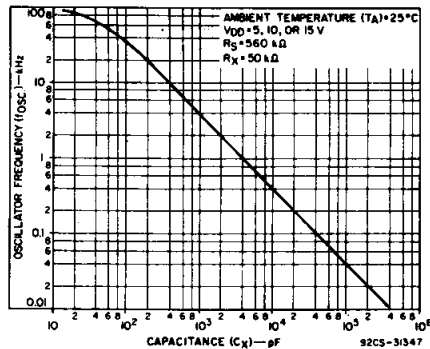


Fig. 9 - Typical RC oscillator frequency as a function of capacitance (C_X), See Fig. 11.

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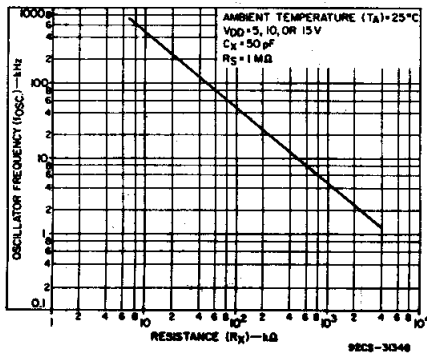


Fig. 10 - Typical RC oscillator frequency as a function of resistance (R_X). See Fig. 11.

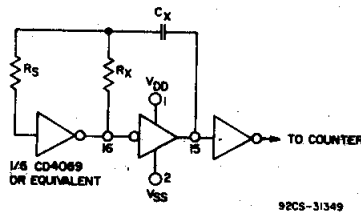


Fig. 11 - Typical RC circuit.

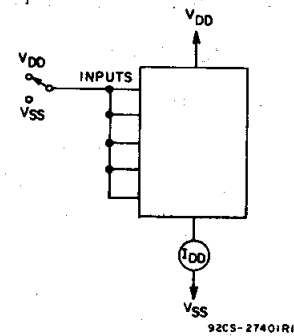


Fig. 12 - Quiescent-device-current test circuit.

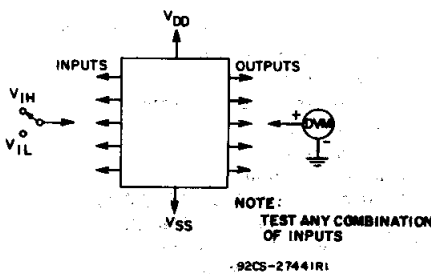


Fig. 13 - Noise-immunity test circuit.

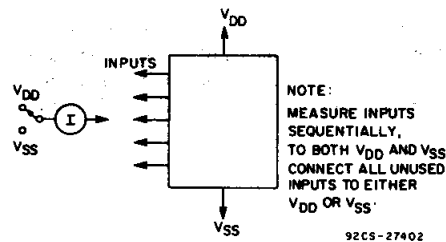


Fig. 14 - Input-leakage-current test circuit.

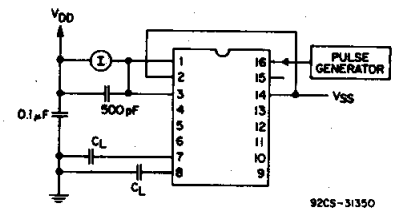
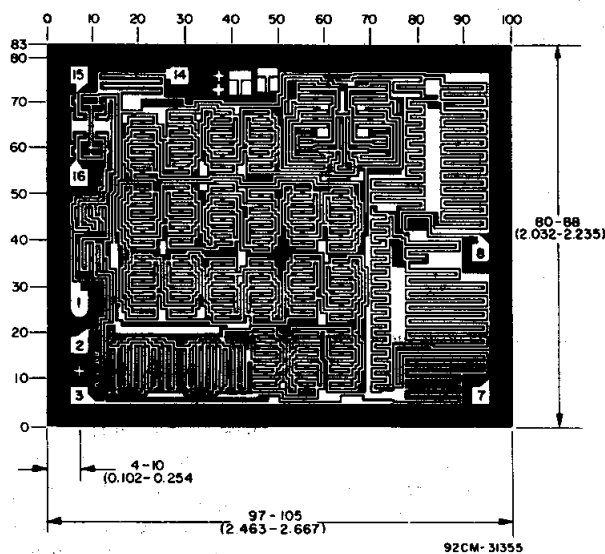


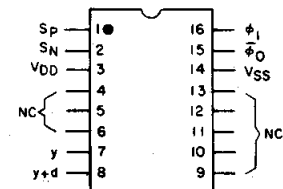
Fig. 15 - Dynamic power dissipation test circuit.



Chip dimensions and pad layout for CD4045B

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

TERMINAL DIAGRAM Top View



NC = NO CONNECTION

NOTE Observe power-supply terminal connections, V_{DD} is terminal No. 3 and V_{SS} is terminal No. 14 (not 16 and 8 respectively, as in other CD4000B Series 16-lead devices).

PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
CD4045BE	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD4045BEE4	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
CD4045BNSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD4045BNSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD4045BPW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD4045BPWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD4045BPWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
CD4045BPWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

TBD: The Pb-Free/Green conversion plan has not been defined.

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



4040049/E 12/2002

NOTES:

- A. All linear dimensions are in inches (millimeters).
B. This drawing is subject to change without notice.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 The 20 pin end lead shoulder width is a vendor option, either half or full width.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

PW (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-153

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