

CD4071BMS, CD4072BMS CD4075BMS

December 1992 CMOS OR Gate

Features

- High-Voltage Types (20V Rating)
- CD4071BMS Quad 2-Input OR Gate
- CD4072BMS Dual 4-Input OR Gate
- CD4075BMS Triple 3-Input OR Gate
- Medium Speed Operation:
 - tPHL, tPLH = 60ns (typ) at 10V
- 100% Tested for Quiescent Current at 20V
- Maximum Input Current of 1μA at 18V Over Full Package Temperature Range; 100nA at 18V and +25°C
- Standardized Symmetrical Output Characteristics
- Noise Margin (Over Full Package Temperature Range):
 - 1V at VDD = 5V
 - 2V at VDD = 10V
 - 2.5V at VDD = 15V
- 5V, 10V and 15V Parametric Ratings
- Meets All Requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

Description

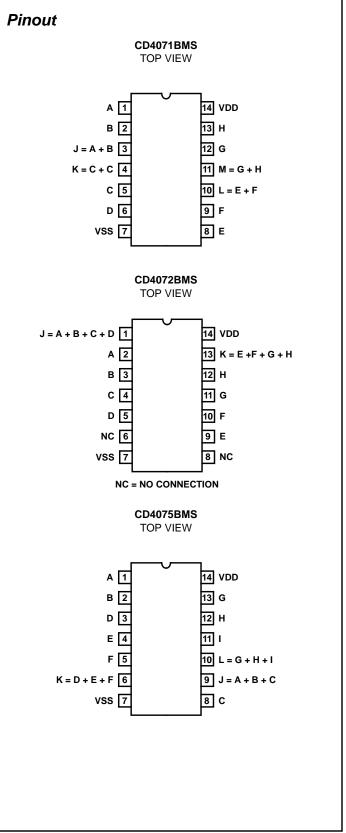
CD4071BMS, CD4072BMS and CD4075BMS OR gates provide the system designer with direct implementation of the positive-logic OR function and supplement the existing family of CMOS gates.

The CD4071BMS, CD4072BMS and CD4075BMS are supplied in these 14 lead outline packages:

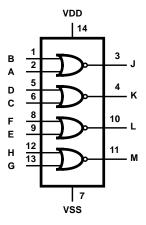
Braze Seal DIP *H4H †H4Q

Frit Seal DIP H1B

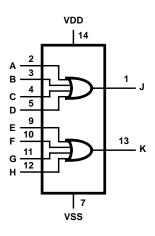
Ceramic Flatpack H3W



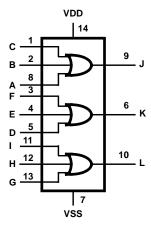
Functional Diagram



CD4071BMS



CD4072BMS



CD4075BMS

Absolute Maximum Ratings Reliability Information Thermal Resistance nermal Resistance θ_{ja} Ceramic DIP and FRIT Package 80° C/W DC Supply Voltage Range, (VDD) -0.5V to +20V $_{20^{o}\text{C/W}}^{\theta_{jc}}$ (Voltage Referenced to VSS Terminals) Input Voltage Range, All Inputs -0.5V to VDD +0.5V Flatpack Package 70°C/W 20°C/W DC Input Current, Any One Input±10mA Maximum Package Power Dissipation (PD) at +125°C Operating Temperature Range.....-55°C to +125°C For TA = -55° C to $+100^{\circ}$ C (Package Type D, F, K).....500mW Package Types D, F, K, H For TA = +100°C to +125°C (Package Type D, F, K) Derate Storage Temperature Range (TSTG) -65°C to +150°C Linearity at 12mW/°C to 200mW Lead Temperature (During Soldering) +265°C Device Dissipation per Output Transistor 100mW For TA = Full Package Temperature Range (All Package Types) At Distance 1/16 \pm 1/32 Inch (1.59mm \pm 0.79mm) from case for 10s Maximum

TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS

				GROUP A		LIMITS		
PARAMETER	SYMBOL	CONDITIONS (I	NOTE 1)	SUBGROUPS	TEMPERATURE	MIN	MAX	UNITS
Supply Current	IDD	VDD = 20V, VIN = VDD or GND		1	+25°C	-	0.5	μΑ
				2	+125°C	-	50	μΑ
		VDD = 18V, VIN = VD	D or GND	3	-55°C	-	0.5	μΑ
Input Leakage Current	IIL	VIN = VDD or GND	VDD = 20	1	+25°C	-100	-	nA
				2	+125°C	-1000	-	nA
			VDD = 18V	3	-55°C	-100	-	nA
Input Leakage Current	IIH	VIN = VDD or GND	VDD = 20	1	+25°C	-	100	nA
				2	+125°C	-	1000	nA
			VDD = 18V	3	-55°C	-	100	nA
Output Voltage	VOL15	VDD = 15V, No Load	!	1, 2, 3	+25°C, +125°C, -55°C	-	50	mV
Output Voltage	VOH15	VDD = 15V, No Load	(Note 3)	1, 2, 3	+25°C, +125°C, -55°C	14.95	-	V
Output Current (Sink)	IOL5	VDD = 5V, VOUT = 0.	.4V	1	+25°C	0.53	-	mA
Output Current (Sink)	IOL10	VDD = 10V, VOUT = 0	0.5V	1	+25°C	1.4	-	mA
Output Current (Sink)	IOL15	VDD = 15V, VOUT =	1.5V	1	+25°C	3.5	-	mA
Output Current (Source)	IOH5A	VDD = 5V, VOUT = 4.	.6V	1	+25°C	-	-0.53	mA
Output Current (Source)	IOH5B	VDD = 5V, VOUT = 2.	.5V	1	+25°C	-	-1.8	mA
Output Current (Source)	IOH10	VDD = 10V, VOUT = 9	9.5V	1	+25°C	-	-1.4	mA
Output Current (Source)	IOH15	VDD = 15V, VOUT =	13.5V	1	+25°C	-	-3.5	mA
N Threshold Voltage	VNTH	VDD = 10V, ISS = -10)μΑ	1	+25°C	-2.8	-0.7	V
P Threshold Voltage	VPTH	VSS = 0V, IDD = 10μ/	A	1	+25°C	0.7	2.8	V
Functional	F	VDD = 2.8V, VIN = VI	DD or GND	7	+25°C	VOH>	VOL <	V
		VDD = 20V, VIN = VD	D or GND	7	+25°C	VDD/2	VDD/2	
		VDD = 18V, VIN = VD	D or GND	8A	+125°C	1		
		VDD = 3V, VIN = VDD	or GND	8B	-55°C	1		
Input Voltage Low (Note 2)	VIL	VDD = 5V, VOH > 4.5	V, VOL < 0.5V	1, 2, 3	+25°C, +125°C, -55°C	-	1.5	V
Input Voltage High (Note 2)	VIH	VDD = 5V, VOH > 4.5	V, VOL < 0.5V	1, 2, 3	+25°C, +125°C, -55°C	3.5	-	V
Input Voltage Low (Note 2)	VIL	VDD = 15V, VOH > 13 VOL < 1.5V	3.5V,	1, 2, 3	+25°C, +125°C, -55°C	-	4	V
Input Voltage High (Note 2)	VIH	VDD = 15V, VOH > 13 VOL < 1.5V	3.5V,	1, 2, 3	+25°C, +125°C, -55°C	11	-	V

NOTES: 1. All voltages referenced to device GND, 100% testing being 3. For accuracy, voltage is measured differentially to VDD. Limit implemented.

2. Go/No Go test with limits applied to inputs.

is 0.050V max.

TABLE 2. AC ELECTRICAL PERFORMANCE CHARACTERISTICS

			GROUP A		LIM		
PARAMETER	SYMBOL	CONDITIONS (NOTES 1, 2)	SUBGROUPS	TEMPERATURE	MIN	MAX	UNITS
Propagation Delay	TPHL	VDD = 5V, VIN = VDD or GND	9	+25°C	-	250	ns
	TPLH		10, 11	+125°C, -55°C	-	338	ns
Transition Time	TTHL	VDD = 5V, VIN = VDD or GND	9	+25°C	-	200	ns
	TTLH		10, 11	+125°C, -55°C	i	270	ns

NOTES:

- 1. CL = 50pF, RL = 200K, Input TR, TF < 20ns.
- 2. -55° C and $+125^{\circ}$ C limits guaranteed, 100% testing being implemented.

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS

					LIMITS		
PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	MIN	MAX	UNITS
Supply Current	IDD	VDD = 5V, VIN = VDD or GND	1, 2	-55°C, +25°C	-	0.25	μА
				+125°C	-	7.5	μА
		VDD = 10V, VIN = VDD or GND	1, 2	-55°C, +25°C	-	0.5	μА
				+125°C	-	15	μА
		VDD = 15V, VIN = VDD or GND	1, 2	-55°C, +25°C	-	0.5	μА
				+125°C	-	30	μА
Output Voltage	VOL	VDD = 5V, No Load	1, 2	+25°C, +125°C, -55°C	-	50	mV
Output Voltage	VOL	VDD = 10V, No Load	1, 2	+25°C, +125°C, -55°C	-	50	mV
Output Voltage	VOH	VDD = 5V, No Load	1, 2	+25°C, +125°C, -55°C	4.95	-	V
Output Voltage	VOH	VDD = 10V, No Load	1, 2	+25°C, +125°C, -55°C	9.95	-	V
Output Current (Sink)	IOL5	VDD = 5V, VOUT = 0.4V	1, 2	+125°C	0.36	-	mA
				-55°C	0.64	-	mA
Output Current (Sink)	IOL10	VDD = 10V, VOUT = 0.5V	1, 2	+125°C	0.9	-	mA
				-55°C	1.6	-	mA
Output Current (Sink)	IOL15	VDD = 15V, VOUT = 1.5V	1, 2	+125°C	2.4	-	mA
				-55°C	4.2	-	mA
Output Current (Source)	IOH5A	VDD = 5V, VOUT = 4.6V	1, 2	+125°C	-	-0.36	mA
				-55°C	-	-0.64	mA
Output Current (Source)	IOH5B	IOH5B VDD = 5V, VOUT = 2.5V		+125°C	-	-1.15	mA
				-55°C	-	-2.0	mA
Output Current (Source)	IOH10	VDD = 10V, VOUT = 9.5V	1, 2	+125°C	-	-0.9	mA
				-55°C	-	-2.6	mA
Output Current (Source)	IOH15	VDD =15V, VOUT = 13.5V	1, 2	+125°C	-	-2.4	mA
				-55°C	-	-4.2	mA
Input Voltage Low	VIL	VDD = 10V, VOH > 9V, VOL < 1V	1, 2	+25°C, +125°C, -55°C	-	3	V
Input Voltage High	VIH	VDD = 10V, VOH > 9V, VOL < 1V	1, 2	+25°C, +125°C, -55°C	7	-	V
Propagation Delay	TPHL	VDD = 10V	1, 2, 3	+25°C	-	120	ns
	TPLH	VDD = 15V	1, 2, 3	+25°C	-	90	ns

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

					LIM	ITS	
PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	MIN	MAX	UNITS
Transition Time	TTHL	VDD = 10V	1, 2, 3	+25°C	-	100	ns
	TTLH	VDD = 15V	1, 2, 3	+25°C	-	80	ns
Input Capacitance	CIN	Any Input	1, 2	+25°C	-	7.5	pF

NOTES:

- 1. All voltages referenced to device GND.
- 2. The parameters listed on Table 3 are controlled via design or process and are not directly tested. These parameters are characterized on initial design release and upon design changes which would affect these characteristics.
- 3. CL = 50pF, RL = 200K, Input TR, TF < 20ns.

TABLE 4. POST IRRADIATION ELECTRICAL PERFORMANCE CHARACTERISTICS

					LIMITS		
PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	MIN	MAX	UNITS
Supply Current	IDD	VDD = 20V, VIN = VDD or GND	1, 4	+25°C	-	2.5	μΑ
N Threshold Voltage	VNTH	VDD = 10V, ISS = -10μA	1, 4	+25°C	-2.8	-0.2	V
N Threshold Voltage Delta	ΔVTN	VDD = 10V, ISS = -10μA	1, 4	+25°C	-	±1	V
P Threshold Voltage	VTP	VSS = 0V, IDD = 10μA	1, 4	+25°C	0.2	2.8	V
P Threshold Voltage Delta	ΔVTP	VSS = 0V, IDD = 10μA	1, 4	+25°C	-	±1	V
Functional	F	VDD = 18V, VIN = VDD or GND	1	+25°C	VOH >	VOL <	V
		VDD = 3V, VIN = VDD or GND			VDD/2	VDD/2	
Propagation Delay Time			1, 2, 3, 4	+25°C	-	1.35 x +25°C Limit	ns

NOTES: 1. All voltages referenced to device GND.

3. See Table 2 for +25°C limit.

2. CL = 50pF, RL = 200K, Input TR, TF < 20ns.

4. Read and Record

TABLE 5. BURN-IN AND LIFE TEST DELTA PARAMETERS +25°C

PARAMETER	SYMBOL	DELTA LIMIT
Supply Current - SSI	IDD	±0.1μA
Output Current (Sink)	IOL5	± 20% x Pre-Test Reading
Output Current (Source)	IOH5A	± 20% x Pre-Test Reading

TABLE 6. APPLICABLE SUBGROUPS

CONFORMANCE GROUP	MIL-STD-883 METHOD	GROUP A SUBGROUPS	READ AND RECORD
Initial Test (Pre Burn-In)	100% 5004	1, 7, 9	IDD, IOL5, IOH5A
Interim Test 1 (Post Burn-In)	100% 5004	1, 7, 9	IDD, IOL5, IOH5A
Interim Test 2 (Post Burn-In)	100% 5004	1, 7, 9	IDD, IOL5, IOH5A
PDA (Note 1)	100% 5004	1, 7, 9, Deltas	
Interim Test 3 (Post Burn-In)	100% 5004	1, 7, 9	IDD, IOL5, IOH5A
PDA (Note 1)	100% 5004	1, 7, 9, Deltas	
Final Test	100% 5004	2, 3, 8A, 8B, 10, 11	
Group A	Sample 5005	1, 2, 3, 7, 8A, 8B, 9, 10, 11	

TABLE 6. APPLICABLE SUBGROUPS (Continued)

CONFORMANCE GROUP		MIL-STD-883 METHOD	GROUP A SUBGROUPS	READ AND RECORD
Group B	Subgroup B-5	Sample 5005	1, 2, 3, 7, 8A, 8B, 9, 10, 11, Deltas	Subgroups 1, 2, 3, 9, 10, 11
	Subgroup B-6	Sample 5005	1, 7, 9	
Group D		Sample 5005	1, 2, 3, 8A, 8B, 9	Subgroups 1, 2 3

NOTE: 1.5% Parameteric, 3% Functional; Cumulative for Static 1 and 2.

TABLE 7. TOTAL DOSE IRRADIATION

	MIL-STD-883	TE	TEST		RECORD
CONFORMANCE GROUPS	METHOD	PRE-IRRAD	POST-IRRAD	PRE-IRRAD	POST-IRRAD
Group E Subgroup 2	5005	1, 7, 9	Table 4	1, 9	Table 4

TABLE 8. BURN-IN AND IRRADIATION TEST CONNECTIONS

		GROUND	VDD	9V ± -0.5V	OSCILLATOR		
FUNCTION	OPEN				50kHz	25kHz	
PART NUMBER	CD4071BMS				•		
Static Burn-In 1 Note 1	3, 4, 10, 11	1, 2, 5 - 9, 12 - 13	14				
Static Burn-In 2 Note 1	3, 4, 10, 11	7	1, 2, 5, 6, 8, 9, 12 - 14				
Dynamic Burn- In Note 1	-	7	14	3, 4, 10, 11	1, 2, 5, 6, 8, 9, 12, 13		
Irradiation Note 2	3, 4, 10, 11	7	1, 2, 5, 6, 8, 9, 12 - 14				
PART NUMBER	CD4072BMS				•		
Static Burn-In 1 Note 1	1, 6, 8, 13	2 - 5, 7, 9 - 12	14				
Static Burn-In 2 Note 1	1, 6, 8, 13	7	2 - 5, 9 - 12, 14				
Dynamic Burn- In Note 1	6, 8	7	14	1, 13	2 - 5, 9 - 12		
Irradiation Note 2	1, 6, 8, 13	7	2 - 5, 9 - 12, 14				
PART NUMBER	CD4075BMS						
Static Burn-In 1 Note 1	6, 9, 10	1 - 5, 7, 8, 11 - 13	14				
Static Burn-In 2 Note 1	6, 9, 10	7	1 - 5, 8, 11 - 14				
Dynamic Burn- In Note 1	-	7	14	6, 9, 10	1 - 5, 8, 11 - 13		
Irradiation Note 2	6, 9, 10	7	1 - 5, 8, 11 - 14				

NOTE:

- 1. Each pin except VDD and GND will have a series resistor of 10K \pm 5%, VDD = 18V \pm 0.5V
- 2. Each pin except VDD and GND will have a series resistor of 47K \pm 5%; Group E, Subgroup 2, sample size is 4 dice/wafer, 0 failures, VDD = 10V \pm 0.5V

CD4071BMS, CD4072BMS, CD4075BMS

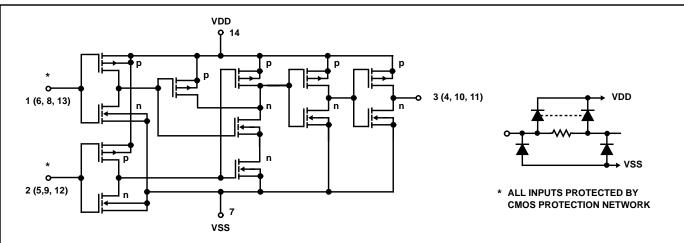


FIGURE 1. SCHEMATIC DIAGRAM FOR CD4071BMS (1 OF 4 IDENTICAL GATES)

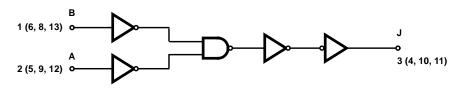
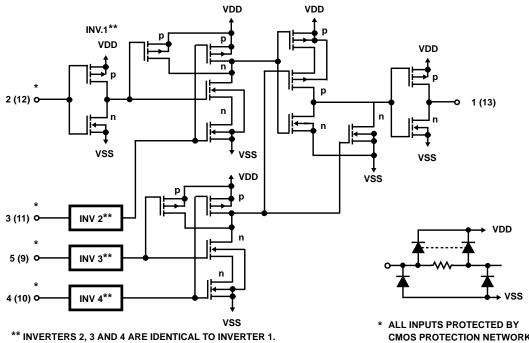


FIGURE 2. LOGIC DIAGRAM FOR CD4071BMS (1 OF 4 IDENTICAL GATES)



CMOS PROTECTION NETWORK

FIGURE 3. SCHEMATIC DIAGRAM FOR CD4072BMS (1 OF 2 IDENTICAL GATES)

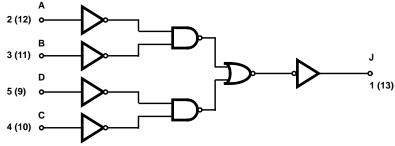


FIGURE 4. LOGIC DIAGRAM FOR CD4072BMS (1 OF 2 IDENTICAL GATES)

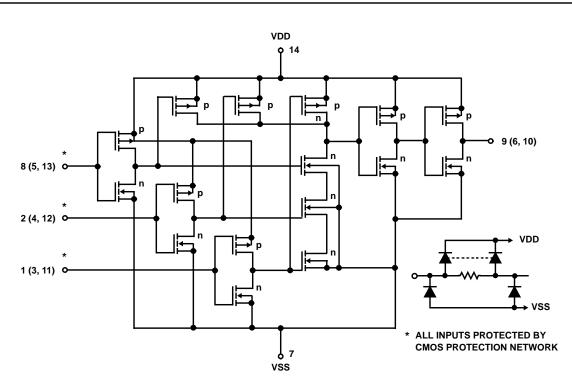


FIGURE 5. SCHEMATIC DIAGRAM FOR CD4075BMS (1 OF 3 IDENTICAL GATES)

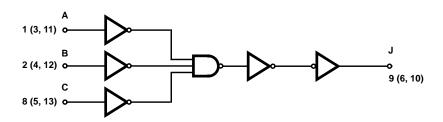


FIGURE 6. LOGIC DIAGRAM FOR CD4075BMS (1 OF 3 IDENTICAL GATES)

Typical Performance Characteristics

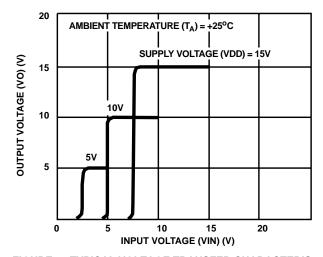


FIGURE 7. TYPICAL VOLTAGE TRANSFER CHARACTERISTICS

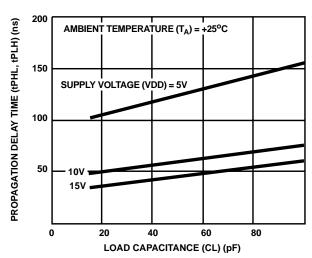


FIGURE 8. TYPICAL PROPAGATION DELAY TIME AS A FUNCTION OF LOAD CAPACITANCE

Typical Performance Characteristics (Continued)

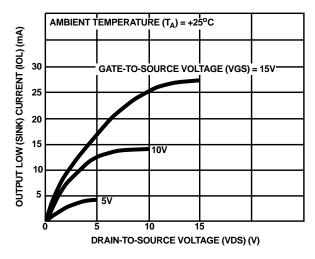


FIGURE 9. TYPICAL OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

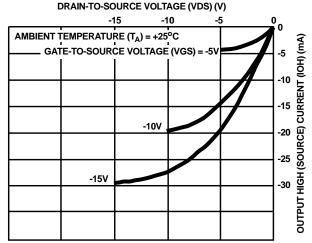


FIGURE 11. TYPICAL OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

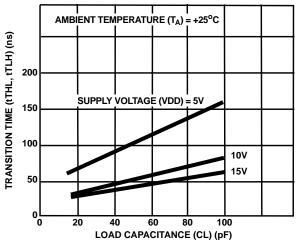


FIGURE 13. TYPICAL TRANSITION TIME AS A FUNCTION OF LOAD CAPACITANCE

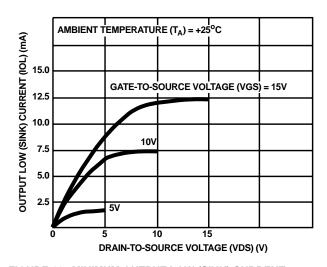


FIGURE 10. MINIMUM OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

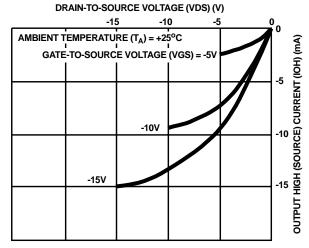


FIGURE 12. MINIMUM OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

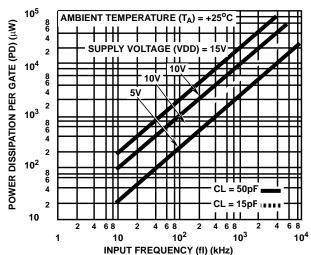
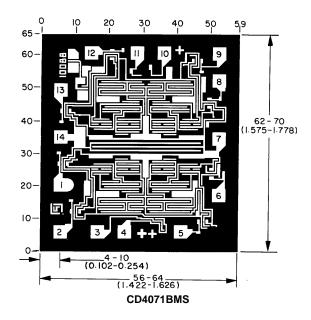
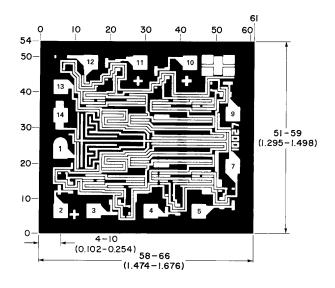


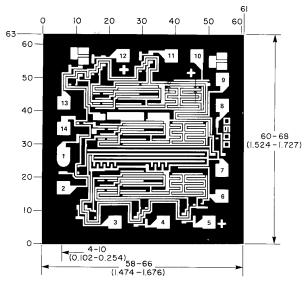
FIGURE 14. TYPICAL DYNAMIC POWER DISSIPATIONAS A FUNCTION OF FREQUENCY

Chip Dimensions and Pad Layouts





CD4072BMS



CD4075BMS

Dimensions in parentheses are in millimeters and are derived from the basic inch dimensions as indicated.

Grid graduations are in mils (10⁻³ inch)

METALLIZATION: Thickness: 11kÅ – 14kÅ, AL.

PASSIVATION: 10.4kÅ - 15.6kÅ, Silane

BOND PADS: 0.004 inches X 0.004 inches MIN **DIE THICKNESS:** 0.0198 inches - 0.0218 inches

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