# **CD40106BMS**

December 1992

# **CMOS Hex Schmitt Triggers**

#### **Features**

- High Voltage Type (20V Rating)
- Schmitt Trigger Action with No External Components
- Hysteresis Voltage (Typ.)
  - 0.9V at VDD = 5V
  - 2.3V at VDD = 10V
  - 3.5V at VDD = 15V
- Noise Immunity Greater than 50%
- · No Limit on Input Rise and Fall Times
- Low VDD to VSS Current During Slow Input Ramp
- 100% Tested for Quiescent Current at 20V
- 5V, 10V and 15V Parametric Ratings
- Maximum Input Current of 1μA at 18V Over Full Package Temperature Range; 100nA at 18V and +25°C
- Standardized Symmetrical Output Characteristics
- Meets All Requirements of JEDEC Tentative Standard No. 13B, "Standard Specifications for Description of 'B' Series CMOS Devices"

## **Applications**

- · Wave and Pulse Shapers
- High Noise Environment Systems
- · Monostable Multivibrators
- Astable Multivibrators

## Description

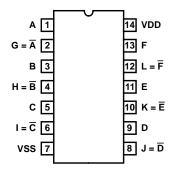
CD40106BMS consists of six Schmitt trigger circuits. Each circuit functions as an inverter with Schmitt trigger action on the input. The trigger switches at different points for positive and negative going signals. The difference between the positive going voltage (VP) and the negative going voltage (VN) is defined as hysteresis voltage (VH) (see Figure 17).

The CD40106BMS is supplied in these 14 lead outline packages:

Braze Seal DIP H4Q
Frit Seal DIP H1B
Ceramic Flatpack H3W

#### **Pinout**

#### CD40106BMS TOP VIEW



## Functional Diagram

$$A \xrightarrow{1} G = \overline{A}$$

$$B \xrightarrow{3} H = \overline{B}$$

$$C \xrightarrow{5} 6 I = \overline{C}$$

$$D = \frac{9}{\sqrt{8}}$$
  $J = \overline{D}$ 

# Logic Diagram

\* ALL INPUTS ARE PROTECTED BY CMOS PROTECTION NETWORK

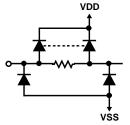


FIGURE 1. 1 OF 6 SCHMITT TRIGGERS

## **Absolute Maximum Ratings**

#### DC Supply Voltage Range, (VDD) . . . . . -0.5V to +20V (Voltage Referenced to VSS Terminals) Input Voltage Range, All Inputs . . . . . . . . -0.5V to VDD +0.5V DC Input Current, Any One Input ......±10mA Operating Temperature Range . . . . . . . . -55°C to +125°C Package Types D, F, K, H Storage Temperature Range (TSTG) . . . . . . . -65°C to +150°C Lead Temperature (During Soldering) . . . . . . . . +265°C At Distance 1/16 $\pm$ 1/32 Inch (1.59mm $\pm$ 0.79mm) from case for 10s Maximum

## **Reliability Information**

Thermal Resistance  Ceramic DIP and FRIT Package  Flatpack Package	θ <sub>ja</sub> 80°C/W 70°C/W	θ <sub>jc</sub> 20°C/W 20°C/W
Maximum Package Power Dissipation (PD	o) at +125°C	,
For $T_A = -55^{\circ}C$ to $+100^{\circ}C$ (Package Typ		
For $T_A = +100^{\circ}$ C to $+125^{\circ}$ C (Package T		
Lineari	ity at 12mW/	°C to 200mW
Device Dissipation per Output Transistor .		100mW
For T <sub>A</sub> = Full Package Temperature Rar Junction Temperature	•	0 11 /

#### TABLE 1. DC ELECTRICAL PERFORMANCE CHARACTERISTICS

PARAMETER   SYMBOL   CONDITIONS (NOTE 1)   SUBGROUPS   TEMPERATURE   MIN   MAX   UNITS					GROUP A		LIMITS		
VDD = 18V, VIN = VDD or GND   3   -55°C   -   200   μA	PARAMETER	SYMBOL	CONDITIONS (	NOTE 1)		TEMPERATURE	MIN	MAX	UNITS
VDD = 18V, VIN = VDD or GND   3   -55°C   - 2   µA	Supply Current	IDD	VDD = 20V, VIN = VD	VDD = 20V, VIN = VDD or GND		+25°C	-	2	μΑ
Input Leakage Current   III					2	+125°C	-	200	μА
Part			VDD = 18V, VIN = VD	D or GND	3	-55°C	-	2	μΑ
Input Leakage Current   IIIH	Input Leakage Current	IIL	VIN = VDD or GND	VDD = 20	1	+25°C	-100	-	nA
IIIH					2	+125°C	-1000	-	nA
2				VDD = 18V	3	-55°C	-100	-	nA
Output Voltage         VOL15         VDD = 15V, No Load         1, 2, 3         +25°C, +125°C, -55°C         - 100         nA           Output Voltage         VOH15         VDD = 15V, No Load (Note 2)         1, 2, 3         +25°C, +125°C, -55°C         - 50         mV           Output Current (Sink)         IOL5         VDD = 5V, VOUT = 0.4V         1         +25°C, +125°C, -55°C         14.95         - V           Output Current (Sink)         IOL10         VDD = 18V, VOUT = 0.5V         1         +25°C         1.4         - mA           Output Current (Sink)         IOL15         VDD = 15V, VOUT = 1.5V         1         +25°C         1.4         - mA           Output Current (Source)         IOH5A         VDD = 15V, VOUT = 1.5V         1         +25°C         3.5         - mA           Output Current (Source)         IOH5B         VDD = 5V, VOUT = 4.6V         1         +25°C        0.53         mA           Output Current (Source)         IOH5B         VDD = 5V, VOUT = 4.6V         1         +25°C        1.4         mA           Output Current (Source)         IOH16         VDD = 15V, VOUT = 9.5V         1         +25°C        1.4         mA           Output Current (Source)         IOH16         VDD = 15V, VOUT = 13.5V         1	Input Leakage Current	IIH	VIN = VDD or GND	VDD = 20	1	+25°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 2)         1, 2, 3         +25°C, +125°C, -55°C         1.4, 95         -         V           Output Current (Sink)         IOL5         VDD = 5V, VOUT = 0.4V         1         +25°C         0.53         -         mA           Output Current (Sink)         IOL10         VDD = 15V, VOUT = 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)         IOH6B         VDD = 5V, VOUT = 2.5V         1         +25°C         -         -1.8         mA           Output Current (Source)         IOH10         VDD = 15V, VOUT = 1.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH16         VDD = 15V, VOUT = 2.5V         1         +25°C         -         -1.4         mA </td <td></td> <td></td> <td></td> <td></td> <td>2</td> <td>+125°C</td> <td>-</td> <td>1000</td> <td>nA</td>					2	+125°C	-	1000	nA
Output Voltage         VOH15         VDD = 15V, No Load (Note 2)         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 = 0.5V         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 = 2.5V         1         +25°C         -         -0.53         mA           Output Current (Source)         IOH6B         VDD = 5V, VOUT = 2.5V         1         +25°C         -         -1.8         mA           Output Current (Source)         IOH10         VDD = 5V, VOUT = 9.5V         1         +25°C         -         -1.8         mA           Output Current (Source)         IOH15         VDD = 10V, VOUT = 9.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH16         VDD = 10V, VOUT = 9.5V         1         +25°C         -         -         -1.8         mA </td <td></td> <td></td> <td></td> <td>VDD = 18V</td> <td>3</td> <td>-55°C</td> <td>-</td> <td>100</td> <td>nA</td>				VDD = 18V	3	-55°C	-	100	nA
Output Current (Sink)         IOL5         VDD = 5V, VOUT = 0.4V         1         +25°C         0.53         -         mA           Output Current (Sink)         IOL10         VDD = 10V, VOUT = 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 = 9.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH15         VDD = 15V, VOUT = 13.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH15         VDD = 15V, VOUT = 13.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH16         VDD = 15V, VOUT = 2.5V         1         +25°C         -         -3.5         mA <t< td=""><td>Output Voltage</td><td>VOL15</td><td>VDD = 15V, No Load</td><td>•</td><td>1, 2, 3</td><td>+25°C, +125°C, -55°C</td><td>-</td><td>50</td><td>mV</td></t<>	Output Voltage	VOL15	VDD = 15V, No Load	•	1, 2, 3	+25°C, +125°C, -55°C	-	50	mV
Output Current (Sink)         IOL10         VDD = 10V, VOUT = 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 = 2.5V         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 = 9.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH10         VDD = 15V, VOUT = 9.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH15         VDD = 15V, VOUT = 9.5V         1         +25°C         -         -3.5         mA           Output Current (Source)         IOH15         VDD = 15V, VOUT = 9.5V         1         +25°C         -         -3.5         mA           Output Current (Source)         IOH16         VDD = 15V, VOUT = 9.5V         1         +25°C         0.7         2.8         V	Output Voltage	VOH15	VDD = 15V, No Load	(Note 2)	1, 2, 3	+25°C, +125°C, -55°C	14.95	-	V
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 = 9.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH15         VDD = 15V, VOUT = 13.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH15         VDD = 15V, VOUT = 9.5V         1         +25°C         -         -1.4         mA           Output Current (Source)         IOH16         VDD = 15V, VOUT = 9.5V         1         +25°C         -         -3.5         mA           Output Current (Source)         IOH16         VDD = 15V, VOUT = 9.5V         1         +25°C         -         -2.8         -0.7         V           P Threshold Voltage         VPTH         VSS = 0V, IDD = 10µA         1         +25°C         VOH2         VDD/2         VDD/2	Output Current (Sink)	IOL5	VDD = 5V, VOUT = 0.	4V	1	+25°C	0.53	-	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 = 9.5V         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 = -10µA         1         +25°C         -         -3.5         mA           Functional         VPTH         VSS = 0V, IDD = 10µA         1         +25°C         0.7         2.8         V           Functional         F         VDD = 2.8V, VIN = VDD or GND         7         +25°C         VOH > VDD < VDL < VDD/2	Output Current (Sink)	IOL10	VDD = 10V, VOUT = 0	0.5V	1	+25°C	1.4	-	mA
Output Current (Source)         IOH5B         VDD = 5V, VOUT = 2.5V         1         +25°C         -         -1.8         mA           Output Current (Source)         IOH10         VDD = 10V, VOUT = 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 = -10μA         1         +25°C         -2.8         -0.7         V           P Threshold Voltage         VPTH         VSS = 0V, IDD = 10μA         1         +25°C         0.7         2.8         V           Functional         F         VDD = 2.8V, VIN = VDD or GND         7         +25°C         VOH> VOL < VDD/2 VDD = 18V, VIN = VDD or GND	Output Current (Sink)	IOL15	VDD = 15V, VOUT = 1	1.5V	1	+25°C	3.5	-	mA
Output Current (Source)         IOH10         VDD = 10V, VOUT = 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 = -10μA         1         +25°C         -2.8         -0.7         V           P Threshold Voltage         VPTH         VSS = 0V, IDD = 10μA         1         +25°C         VOH > VOL < VOL < VOL < VOL < VOL < VOL > VOL < VOL < VOL > VOL > VOL < VOL > V	Output Current (Source)	IOH5A	VDD = 5V, VOUT = 4.	6V	1	+25°C	-	-0.53	mA
Output Current (Source)         IOH15         VDD = 15V, VOUT = 13.5V         1         +25°C         - 3.5         mA           N Threshold Voltage         VNTH         VDD = 10V, ISS = -10μA         1         +25°C         -2.8         -0.7         V           P Threshold Voltage         VPTH         VSS = 0V, IDD = 10μA         1         +25°C         0.7         2.8         V           Functional         F         VDD = 2.8V, VIN = VDD or GND         7         +25°C         VOH> VDD > V	Output Current (Source)	IOH5B	VDD = 5V, VOUT = 2.5V		1	+25°C	-	-1.8	mA
N Threshold Voltage	Output Current (Source)	IOH10	VDD = 10V, VOUT = 9	9.5V	1	+25°C	-	-1.4	mA
P Threshold Voltage  Functional  Function	Output Current (Source)	IOH15	VDD = 15V, VOUT = 1	13.5V	1	+25°C	-	-3.5	mA
Functional  Functi	N Threshold Voltage	VNTH	VDD = 10V, ISS = -10	μΑ	1	+25°C	-2.8	-0.7	V
VDD = 20V, VIN = VDD or GND   7	P Threshold Voltage	VPTH	VSS = 0V, IDD = 10μ/	4	1	+25°C	0.7	2.8	V
VDD = 20V, VIN = VDD or GND   7	Functional	F	VDD = 2.8V, VIN = VI	DD or GND	7	+25°C		-	V
Positive Trigger Threshold Voltage (See Figure 17)  VP10			VDD = 20V, VIN = VD	D or GND	7	+25°C	VDD/2	VDD/2	
Positive Trigger Threshold Voltage (See Figure 17)  VP10			VDD = 18V, VIN = VDD or GND		8A	+125°C			
Threshold Voltage (See Figure 17)  VP10			VDD = 3V, VIN = VDD	or GND	8B	-55°C			
(See Figure 17) VDD = 10V 1, 2, 3 +25°C, +125°C, -55°C 4.6 7.1 V  VP15 VDD = 15V 1, 2, 3 +25°C, +125°C, -55°C 6.8 10.8 V  Negative Trigger Threshold Voltage (See Figure 17) VN10 VDD = 10V 1, 2, 3 +25°C, +125°C, -55°C 2.5 5.2 V  VN10 VDD = 15V 1, 2, 3 +25°C, +125°C, -55°C 2.5 5.2 V  Hysteresis Voltage (See Figure 17) VH10 VDD = 5V 1, 2, 3 +25°C, +125°C, -55°C 0.3 1.6 V  VH10 VDD = 10V 1, 2, 3 +25°C, +125°C, -55°C 1.2 3.4 V	Positive Trigger	VP5	VDD = 5V		1, 2, 3	+25°C, +125°C, -55°C	2.2	3.6	V
VP15       VDD = 15V       1, 2, 3       +25°C, +125°C, -55°C       6.8       10.8       V         Negative Trigger Threshold Voltage (See Figure 17)       VN5       VDD = 5V       1, 2, 3       +25°C, +125°C, -55°C       0.9       2.8       V         VN10       VDD = 10V       1, 2, 3       +25°C, +125°C, -55°C       2.5       5.2       V         VN15       VDD = 15V       1, 2, 3       +25°C, +125°C, -55°C       4       7.4       V         Hysteresis Voltage (See Figure 17)       VH5       VDD = 5V       1, 2, 3       +25°C, +125°C, -55°C       0.3       1.6       V         VH10       VDD = 10V       1, 2, 3       +25°C, +125°C, -55°C       1.2       3.4       V		VP10	VDD = 10V		1, 2, 3	+25°C, +125°C, -55°C	4.6	7.1	V
Threshold Voltage (See Figure 17)  VN10 VDD = 10V  1, 2, 3 +25°C, +125°C, -55°C  2.5 5.2 V  VN15 VDD = 15V  1, 2, 3 +25°C, +125°C, -55°C  4 7.4 V  Hysteresis Voltage (See Figure 17)  VH10 VDD = 10V  1, 2, 3 +25°C, +125°C, -55°C  1, 2, 3 +25°C, +125°C, -55°C  1.2 3.4 V	(Goo'r igure 17)	VP15	VDD = 15V		1, 2, 3	+25°C, +125°C, -55°C	6.8	10.8	V
(See Figure 17) VN10 VDD = 10V 1, 2, 3 +25°C, +125°C, -55°C 2.5 5.2 V  VN15 VDD = 15V 1, 2, 3 +25°C, +125°C, -55°C 4 7.4 V  Hysteresis Voltage (See Figure 17) VH5 VDD = 5V 1, 2, 3 +25°C, +125°C, -55°C 0.3 1.6 V  VH10 VDD = 10V 1, 2, 3 +25°C, +125°C, -55°C 1.2 3.4 V	Negative Trigger	VN5	VDD = 5V		1, 2, 3	+25°C, +125°C, -55°C	0.9	2.8	V
VN15 VDD = 15V	ı	VN10	VDD = 10V		1, 2, 3	+25°C, +125°C, -55°C	2.5	5.2	V
(See Figure 17) VH10 VDD = 10V 1, 2, 3 +25°C, +125°C, -55°C 1.2 3.4 V	(Cooringato 17)	VN15	VDD = 15V		1, 2, 3	+25°C, +125°C, -55°C	4	7.4	V
VH10 VDD = 10V 1, 2, 3 +23 C, +123 C, -53 C 1.2 3.4 V	Hysteresis Voltage	VH5	VDD = 5V		1, 2, 3	+25°C, +125°C, -55°C	0.3	1.6	V
VH15 VDD = 15V 1, 2, 3 +25°C, +125°C, -55°C 1.6 5.0 V	(See Figure 17)	VH10	VDD = 10V		1, 2, 3	+25°C, +125°C, -55°C	1.2	3.4	V
		VH15	VDD = 15V		1, 2, 3	+25°C, +125°C, -55°C	1.6	5.0	V

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

is 0.050V max.

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

TABLE 2. AC ELECTRICAL PERFORMANCE CHARACTERISTICS

			GROUP A		LIM	ITS	
PARAMETER	SYMBOL	CONDITIONS (NOTE 1, 2)	SUBGROUPS	TEMPERATURE	MIN	MAX	UNITS
Propagation Delay	TPHL	VDD = 5V, VIN = VDD or GND	9	+25°C	-	280	ns
	TPLH		10, 11	+125°C, -55°C	-	378	ns
Transition Time	TTHL	VDD = 5V, VIN = VDD or GND	9	+25°C	-	200	ns
	TTLH		10, 11	+125°C, -55°C	-	270	ns

## NOTES:

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

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS

					LIN	IITS	
PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	MIN	MAX	UNITS
Supply Current	IDD	VDD = 5V, VIN = VDD or GND	1, 2	-55°C, +25°C	-	1	μΑ
				+125°C	-	30	μА
		VDD = 10V, VIN = VDD or GND	1, 2	-55°C, +25°C	-	2	μА
				+125°C	-	60	μА
		VDD = 15V, VIN = VDD or GND	1, 2	-55°C, +25°C	-	2	μА
				+125°C	-	120	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	VDD = 5V, VOUT = 2.5V	1, 2	+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	-	-1.6	mA
Output Current (Source)	IOH15	VDD =15V, VOUT = 13.5V	1, 2	+125°C	-	-2.4	mA
				-55°C	-	-4.2	mA
Propagation Delay	TPHL	VDD = 10V	1, 2, 3	+25°C	-	140	ns
	TPLH	VDD = 15V	1, 2, 3	+25°C	-	120	ns
Transition Time	TTHL	VDD = 10V	1, 2, 3	+25°C	-	100	ns
	TTLH	VDD = 15V	1, 2, 3	+25°C	-	80	ns

TABLE 3. ELECTRICAL PERFORMANCE CHARACTERISTICS (Continued)

					LIMITS		
PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE MIN		MAX	UNITS
Input Capacitance	CIN	Any Input	1, 2	+25°C	i	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

				LIM	IITS		
PARAMETER	SYMBOL	CONDITIONS	NOTES	TEMPERATURE	MIN	MAX	UNITS
Supply Current	IDD	VDD = 20V, VIN = VDD or GND	1, 4	+25°C	-	7.5	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	ΔVΤΡ	VSS = 0V, IDD = 10μA	1, 4	+25°C	-	±1	V
Functional	F	VDD = 18V, VIN = VDD or GND	18V, VIN = VDD or GND 1		VOH >	VOL <	V
		VDD = 3V, VIN = VDD or GND			VDD/2	VDD/2	
Propagation Delay Time	TPHL TPLH	VDD = 5V	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 - MSI-1	IDD	± 0.2μA
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** 

CONFORM	=		CONFORMANCE GROUP 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 TEST		READ AND 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

					OSCILLATOR	
FUNCTION	OPEN	GROUND	VDD	9V $\pm$ -0.5V	50kHz	25kHz
Static Burn-In 1 Note 1	2, 4, 6, 8, 10, 12	1, 3, 5, 7, 9, 11, 13	14			
Static Burn-In 2 Note 1	2, 4, 6, 8, 10, 12	7	1, 3, 5, 9, 11, 13, 14			
Dynamic Burn- In Note 1	-	7	14	2, 4, 6, 8, 10, 12	1, 3, 5, 9, 11, 13	
Irradiation Note 2	2, 4, 6, 8, 10, 12	7	1, 3, 5, 9, 11, 13, 14			

## NOTES:

- 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 =  $10V \pm 0.5V$

## **Typical Performance Characteristics**

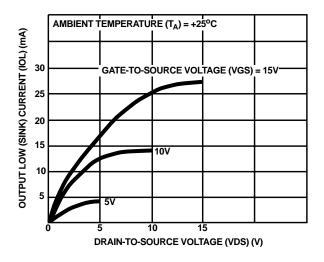


FIGURE 2. TYPICAL OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

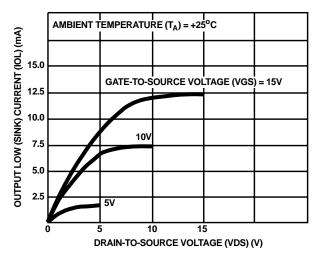


FIGURE 3. MINIMUM OUTPUT LOW (SINK) CURRENT CHARACTERISTICS

# Typical Performance Characteristics (Continued)

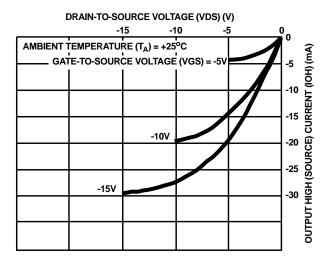


FIGURE 4. TYPICAL OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

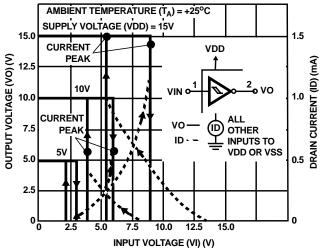


FIGURE 6. TYPICAL CURRENT AND VOLTAGE TRANSFER CHARACTERISTICS

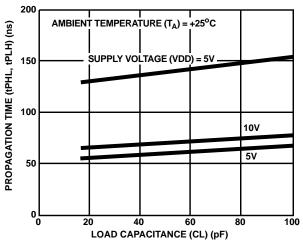


FIGURE 8. TYPICAL PROPAGATION DELAY TIME AS A FUNC-TION OF LOAD CAPACITANCE

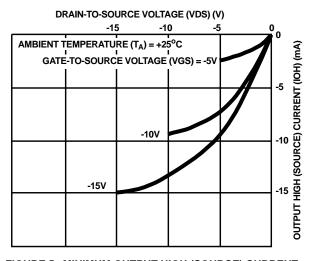


FIGURE 5. MINIMUM OUTPUT HIGH (SOURCE) CURRENT CHARACTERISTICS

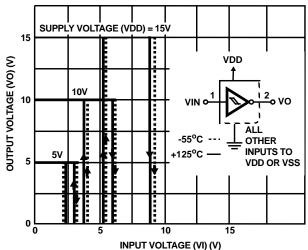


FIGURE 7. TYPICAL VOLTAGE TRANSFER CHARACTERIS-TICS AS A FUNCTION OF TEMPERATURE

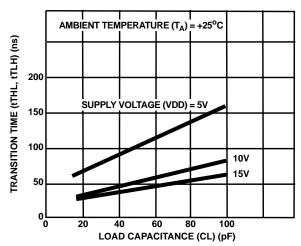


FIGURE 9. TYPICAL TRANSITION TIME AS A FUNCTION OF LOAD CAPACITANCE

## Typical Performance Characteristics (Continued)

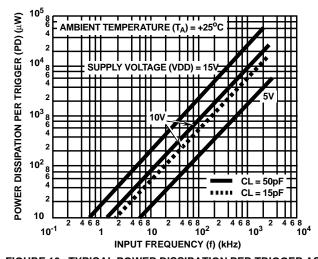


FIGURE 10. TYPICAL POWER DISSIPATION PER TRIGGER AS A FUNCTION OF INPUT FREQUENCY

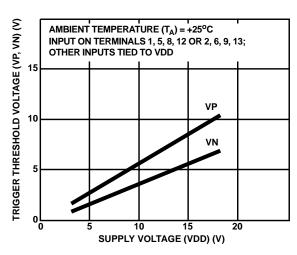


FIGURE 11. TYPICAL TRIGGER THRESHOLD VOLTAGE AS A FUNCTION OF SUPPLY VOLTAGE

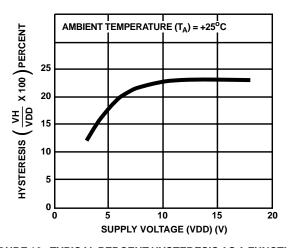


FIGURE 12. TYPICAL PERCENT HYSTERESIS AS A FUNCTION OF SUPPLY VOLTAGE

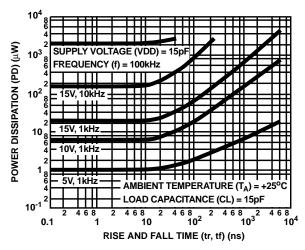


FIGURE 13. TYPICAL POWER DISSIPATION AS A FUNCTION OF RISE AND FALL TIMES

## **Applications**



FREQUENCY RANGE OF WAVE SHAPE IS FROM DC TO 1MHz

VDD VSS  $tM = RC \ \ n \left( \frac{VDD}{VDD-VP} \right)$   $tM = RC \ \ n \left( \frac{VDD}{VDD-VP} \right)$   $tM = RC \ \ n \left( \frac{VDD}{VDD-VP} \right)$ 

FOR THE RANGE OF R AND C GIVEN  $5\mu s < tM < 1s$ 

FIGURE 14. WAVE SHAPER

FIGURE 15. MONOSTABLE MULTIVIBRATOR

# **Applications** (Continued)

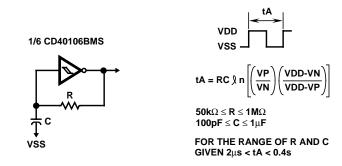


FIGURE 16. ASTABLE MULTIVIBRATOR

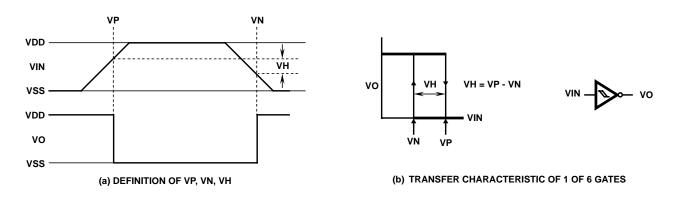


FIGURE 17. HYSTERESIS DEFINITION, CHARACTERISTICS, AND TEST SETUP

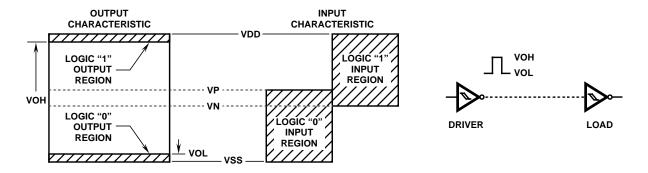
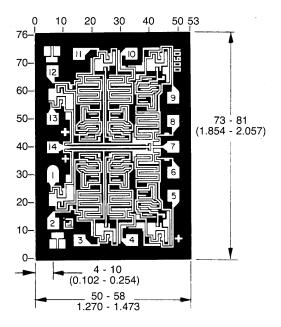


FIGURE 18. INPUT AND OUTPUT CHARACTERISTICS

## Chip Dimensions and Pad Layout



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

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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