



## Absolute Maximum Ratings (Notes 1 & 2)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage ( $V_{CC}$ )	-0.5 to +7.0V
DC Input Voltage ( $V_{IN}$ )	-1.5 to $V_{CC} + 1.5V$
DC Output Voltage ( $V_{OUT}$ )	-0.5 to $V_{CC} + 0.5V$
Clamp Diode Current ( $I_{IK}, I_{OK}$ )	$\pm 20$ mA
DC Output Current, per pin ( $I_{OUT}$ )	$\pm 25$ mA
DC $V_{CC}$ or GND Current, per pin ( $I_{CC}$ )	$\pm 50$ mA
Storage Temperature Range ( $T_{STG}$ )	-65°C to +150°C
Power Dissipation ( $P_D$ ) (Note 3)	600 mW
S.O. Package only	500 mW
Lead Temp. ( $T_L$ ) (Soldering 10 seconds)	260°C

## Operating Conditions

	Min	Max	Units
Supply Voltage ( $V_{CC}$ )	2	6	V
DC Input or Output Voltage ( $V_{IN}, V_{OUT}$ )	0	$V_{CC}$	V
Operating Temp. Range ( $T_A$ )			
MM74HC	-40	+85	°C
MM54HC	-55	+125	°C
Input Rise or Fall Times ( $t_r, t_f$ )			
$V_{CC} = 2.0V$		1000	ns
$V_{CC} = 4.5V$		500	ns
$V_{CC} = 6.0V$		400	ns

## DC Electrical Characteristics (Note 4)

Symbol	Parameter	Conditions	$V_{CC}$	$T_A = 25^\circ C$		74HC	54HC	Units
						$T_A = -40$ to $85^\circ C$	$T_A = -55$ to $125^\circ C$	
				Typ	Guaranteed Limits			
$V_{IH}$	Minimum High Level Input Voltage		2.0V		1.5	1.5	1.5	V
			4.5V		3.15	3.15	3.15	V
			6.0V		4.2	4.2	4.2	V
$V_{IL}$	Maximum Low Level Input Voltage**		2.0V		0.5	0.5	0.5	V
			4.5V		1.35	1.35	1.35	V
			6.0V		1.8	1.8	1.8	V
$V_{OH}$	Minimum High Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu A$	2.0V	2.0	1.9	1.9	1.9	V
			4.5V	4.5	4.4	4.4	4.4	V
			6.0V	6.0	5.9	5.9	5.9	V
		$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 4.0$ mA $ I_{OUT}  \leq 5.2$ mA	4.5V	4.3	3.98	3.84	3.7	V
			6.0V	5.2	5.48	5.34	5.2	V
$V_{OL}$	Maximum Low Level Output Voltage	$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 20 \mu A$	2.0V	0	0.1	0.1	0.1	V
			4.5V	0	0.1	0.1	0.1	V
			6.0V	0	0.1	0.1	0.1	V
		$V_{IN} = V_{IH}$ or $V_{IL}$ $ I_{OUT}  \leq 4.0$ mA $ I_{OUT}  \leq 5.2$ mA	4.5V	0.2	0.26	0.33	0.4	V
			6.0V	0.2	0.26	0.33	0.4	V
$I_{IN}$	Maximum Input Current	$V_{IN} = V_{CC}$ or GND	6.0V		$\pm 0.1$	$\pm 1.0$	$\pm 1.0$	$\mu A$
$I_{CC}$	Maximum Quiescent Supply Current	$V_{IN} = V_{CC}$ or GND $I_{OUT} = 0 \mu A$	6.0V		4.0	40	80	$\mu A$

**Note 1:** Absolute Maximum Ratings are those values beyond which damage to the device may occur.

**Note 2:** Unless otherwise specified all voltages are referenced to ground.

**Note 3:** Power Dissipation temperature derating — plastic "N" package: -12 mW/°C from 65°C to 85°C; ceramic "J" package: -12 mW/°C from 100°C to 125°C.

**Note 4:** For a power supply of  $5V \pm 10\%$  the worst case output voltages ( $V_{OH}$  and  $V_{OL}$ ) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst case  $V_{IH}$  and  $V_{IL}$  occur at  $V_{CC} = 5.5V$  and 4.5V respectively. (The  $V_{IH}$  value at 5.5V is 3.85V.) The worst case leakage current ( $I_{IN}$ ,  $I_{CC}$ , and  $I_{OZ}$ ) occur for CMOS at the higher voltage and so the 6.0V values should be used.

\*\* $V_{IL}$  limits are currently tested at 20% of  $V_{CC}$ . The above  $V_{IL}$  specification (30% of  $V_{CC}$ ) will be implemented no later than Q1, CY'89.

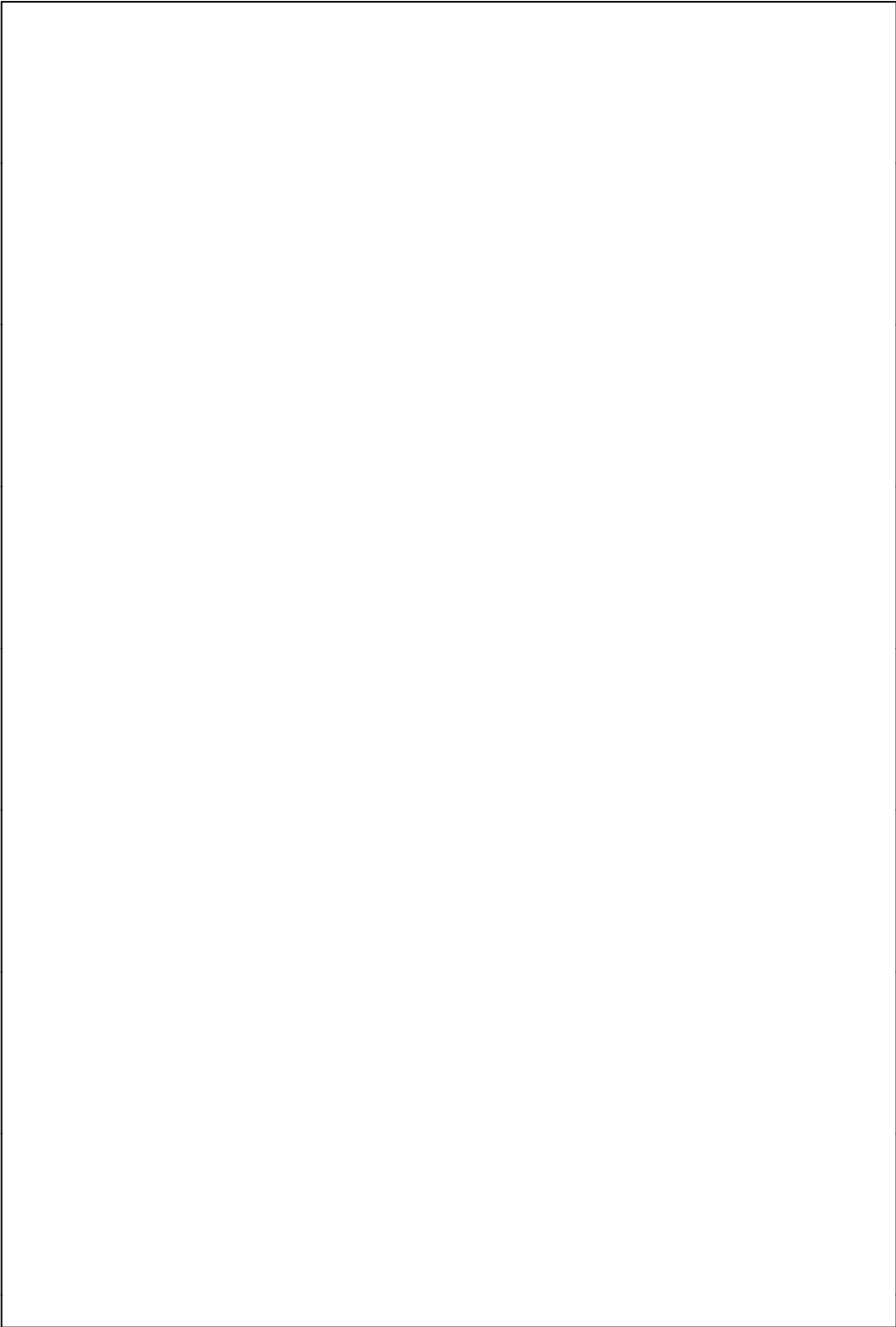
## AC Electrical Characteristics $V_{CC}=5V, T_A=25^{\circ}C, C_L=15\text{ pF}, t_r=t_f=6\text{ ns}$

Symbol	Parameter	Conditions	Typ	Guaranteed Limit	Units
$f_{MAX}$	Maximum Operating Frequency		72	30	MHz
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay Clock to Q or $\bar{Q}$		10	30	ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay Preset or Clear to Q or $\bar{Q}$		17	40	ns
$t_{REM}$	Minimum Removal Time, Preset or Clear to Clock		6	5	ns
$t_S$	Minimum Setup Time Data to Clock		10	20	ns
$t_H$	Minimum Hold Time Clock to Data		0	0	ns
$t_W$	Minimum Pulse Width Clock, Preset or Clear		8	16	ns

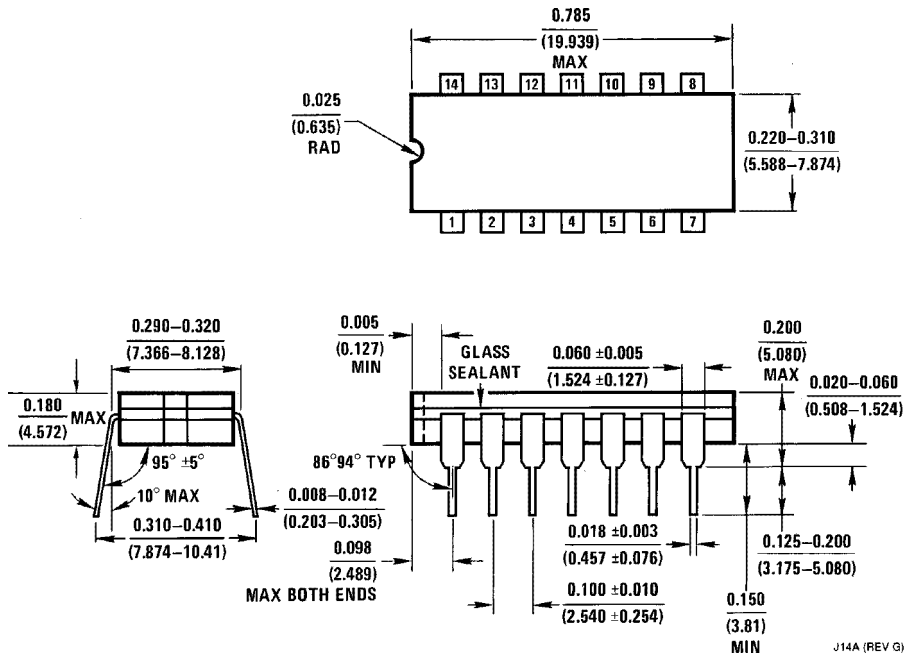
## AC Electrical Characteristics $C_L=50\text{ pF}, t_r=t_f=6\text{ ns}$ Unless otherwise specified

Symbol	Parameter	Conditions	$V_{CC}$	$T_A=25^{\circ}C$		74HC $T_A=-40^{\circ}C\text{ to }+85^{\circ}C$		54HC $T_A=-55^{\circ}C\text{ to }+125^{\circ}C$		Units
				Typ	Guaranteed Limits					
$f_{MAX}$	Maximum Operating Frequency		2.0V	22	6	5		4		MHz
			4.5V	72	30	24		20		MHz
			6.0V	94	35	28		24		MHz
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay Clock to Q or $\bar{Q}$		2.0V	34	110	140		165		ns
			4.5V	12	22	28		33		ns
			6.0V	10	19	24		28		ns
$t_{PHL}, t_{PLH}$	Maximum Propagation Delay Preset or Clear To Q or $\bar{Q}$		2.0V	66	150	190		225		ns
			4.5V	20	30	38		45		ns
			6.0V	16	26	33		38		ns
$t_{REM}$	Minimum Removal Time Preset or Clear To Clock		2.0V	20	50	65		75		ns
			4.5V	6	10	13		15		ns
			6.0V	5	9	11		13		ns
$t_S$	Minimum Setup Time Data to Clock		2.0V	35	100	126		149		ns
			4.5V	10	30	25		30		ns
			6.0V	8	17	21		25		ns
$t_H$	Minimum Hold Time Clock to Data		2.0V		0	0		0		ns
			4.5V		0	0		0		ns
			6.0V		0	0		0		ns
$t_W$	Minimum, Pulse Width Clock, Preset or Clear		2.0V	30	80	101		119		ns
			4.5V	9	16	20		24		ns
			6.0V	8	14	17		20		ns
$t_{TLH}, t_{THL}$	Maximum Output Rise and Fall Time		2.0V	25	75	95		110		ns
			4.5V	7	15	19		22		ns
			6.0V	6	13	16		19		ns
$t_r, t_f$	Maximum Input Rise and Fall Time		2.0V		1000	1000		1000		ns
			4.5V		500	500		500		ns
			6.0V		400	400		400		ns
$C_{PD}$	Power Dissipation Capacitance (Note 5)	(per flip-flop)		80					pF	
$C_{IN}$	Maximum Input Capacitance			5	10	10		10		pF

**Note 5:**  $C_{PD}$  determines the no load dynamic power consumption,  $P_D=C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$ , and the no load dynamic current consumption,  $I_S=C_{PD} V_{CC} f + I_{CC}$ .



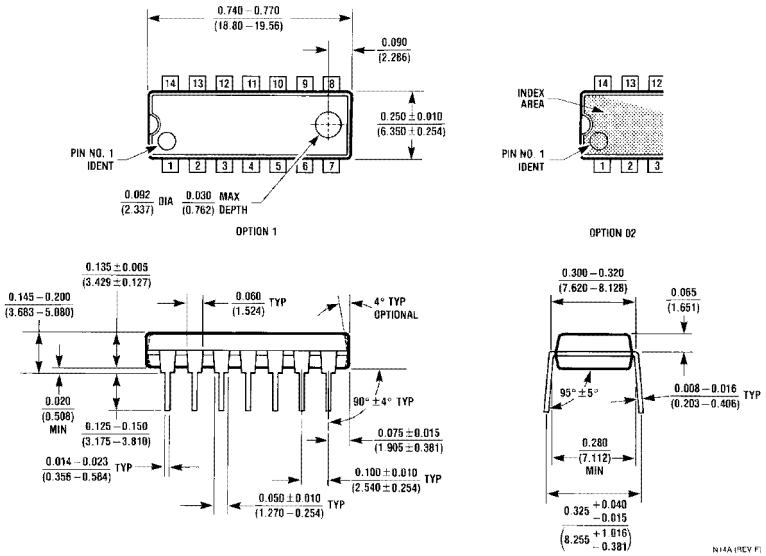
**Physical Dimensions** inches (millimeters)



Order Number MM54HC74J or MM74HC74J  
NS Package Number J14A

J14A (REV G)

**Physical Dimensions** inches (millimeters) (Continued)




**Order Number MM74HC74N**  
**NS Package Number N14A**

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