SGS-THOMSON
MICROELECTRONICS

# 74AC74

DUAL D-TYPE FLIP FLOP WITH PRESET AND CLEAR

- HIGH SPEED:
  $f_{MAX} = 300$ MHz (TYP.) at $V_{CC} = 5V$
- LOW POWER DISSIPATION:
  $I_{CC} = 4 \mu A$ (MAX.) at $T_A = 25\ ^oC$
- HIGH NOISE IMMUNITY:
  $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN.)
- 50Ω TRANSMISSION LINE DRIVING CAPABILITY
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}| = I_{OL} = 24$ mA (MIN)
- BALANCED PROPAGATION DELAYS:
  $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:
  V_{CC} (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 74
- IMPROVED LATCH-UP IMMUNITY

DESCRIPTION

The AC74 is an advanced high-speed CMOS OCTAL D-TYPE FLIP FLOP WITH PRESET AND CLEAR NON INVERTING fabricated with sub-micron silicon gate and double-layer metal wiring C^{2}MOS technology.

B
(Plastic Package)

M
(Micro Package)

ORDER CODES :

74AC74B   74AC74M
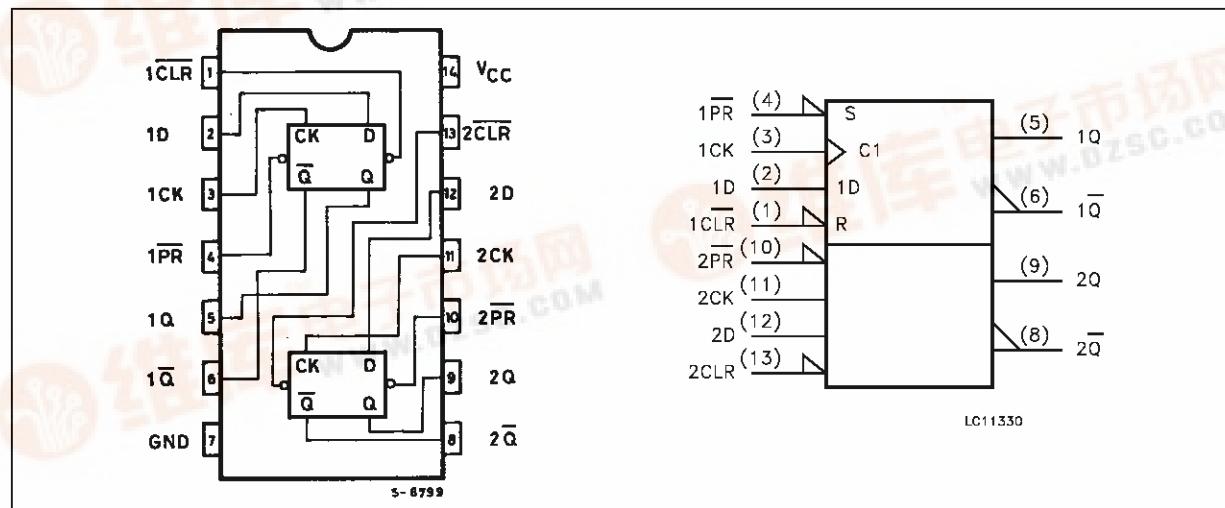
A signal on the D INPUT is transferred to the Q OUTPUT during the positive going transition of the clock pulse.

CLEAR and PRESET are independent of the clock and accomplished by a low setting on the appropriate input.

It is ideal for low power applications mantaining high speed operation similar to equivalent Bipolar Schottky TTL.
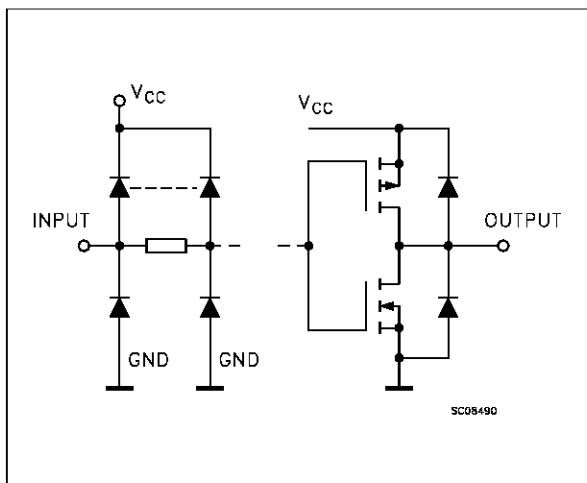
All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS

INPUT AND OUTPUT EQUIVALENT CIRCUIT

SC08490

## PIN DESCRIPTION
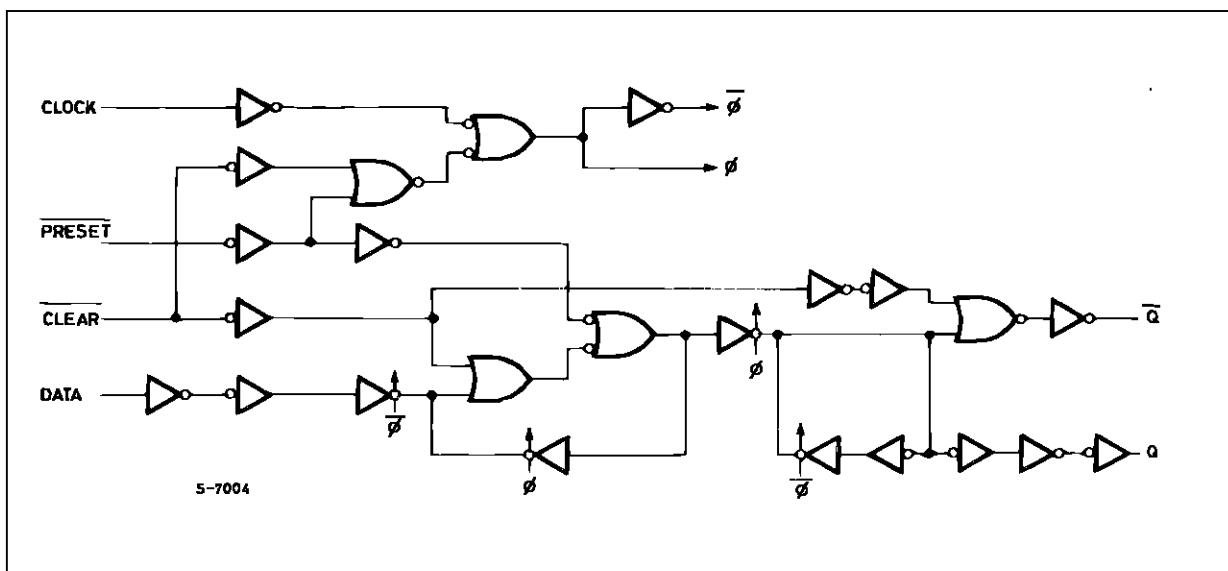
PIN No	SYMBOL	NAME AND FUNCTION
1, 13	1$\overline{\text{CLR}}$, 2$\overline{\text{CLR}}$	Asyncronous Reset - Direct Input
2, 12	1D, 2D	Data Inputs
3, 11	1CK, 2CK	Clock Input (LOW-to-HIGH, Edge-Triggered)
4, 10	1$\overline{\text{PR}}$, 2$\overline{\text{PR}}$	Asyncronous Set - Direct Input
5, 9	1Q, 2Q	True Flip-Flop Outputs
6, 8	1$\overline{\text{Q}}$, 2$\overline{\text{Q}}$	Complement Flip-Flop Outputs
7	GND	Ground (0V)
14	V_{CC}	Positive Supply Voltage

TRUTH TABLE

INPUTS				OUTPUTS		FUNCTION
$\overline{\text{CLR}}$	$\overline{\text{PR}}$	D	CK	Q	$\overline{\text{Q}}$	
L	H	X	X	L	H	CLEAR
H	L	X	X	H	L	PRESET
L	L	X	X	H	H	
H	H	L	⌐	L	H	
H	H	H	⌐	H	L	
H	H	X	⌐	Q_n	$\overline{Q}_n$	NO CHANGE

X: Don't Care

LOGIC DIAGRAMS

5-7004

This logic diagram has not be used to estimate propagation delays

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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +7	V
V_I	DC Input Voltage	-0.5 to V_{CC} + 0.5	V
V_O	DC Output Voltage	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Current	± 50	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 200	mA
T_{stg}	Storage Temperature	-65 to +150	^{o}C
T_L	Lead Temperature (10 sec)	300	^{o}C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2 to 6	V
V_I	Input Voltage	0 to V_{CC}	V
V_O	Output Voltage	0 to V_{CC}	V
T_{op}	Operating Temperature:	-40 to +85	^{o}C
dt/dv	Input Rise and Fall Time V_{CC} = 3.0, 4.5 or 5.5 V(note 1)	8	ns/V

1) V_{IN} from 30% to 70% of V_{CC}

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DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value					Unit
		V_{CC} (V)		$T_A = 25\ ^oC$			-40 to 85 ^oC		
				Min.	Typ.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	3.0	$V_O = 0.1\ V$ or $V_{CC} - 0.1\ V$	2.1	1.5		2.1		V
		4.5		3.15	2.25		3.15		
		5.5		3.85	2.75		3.85		
V_{IL}	Low Level Input Voltage	3.0	$V_O = 0.1\ V$ or $V_{CC} - 0.1\ V$		1.5	0.9		0.9	V
		4.5			2.25	1.35		1.35	
		5.5			2.75	1.65		1.65	
V_{OH}	High Level Output Voltage	3.0	$V_I^{(*)} =$ V_{IH} or V_{IL} $I_O=-50\ \mu A$	2.9	2.99		2.9		V
		4.5	$I_O=-50\ \mu A$	4.4	4.49		4.4		
		5.5	$I_O=-50\ \mu A$	5.4	5.49		5.4		
		3.0	$I_O=-12\ mA$	2.56			2.46		
		4.5	$I_O=-24\ mA$	3.86			3.76		
		5.5	$I_O=-24\ mA$	4.86			4.76		
V_{OL}	Low Level Output Voltage	3.0	$V_I^{(*)} =$ V_{IH} or V_{IL} $I_O=50\ \mu A$		0.002	0.1		0.1	V
		4.5	$I_O=50\ \mu A$		0.001	0.1		0.1	
		5.5	$I_O=50\ \mu A$		0.001	0.1		0.1	
		3.0	$I_O=12\ mA$			0.36		0.44	
		4.5	$I_O=24\ mA$			0.36		0.44	
		5.5	$I_O=24\ mA$			0.36		0.44	
I_I	Input Leakage Current	5.5	$V_I = V_{CC}$ or GND			±0.1		±1	μA
I_{CC}	Quiescent Supply Current	5.5	$V_I = V_{CC}$ or GND			4		40	μA
I_{OLD}	Dynamic Output Current (note 1, 2)	5.5	$V_{OLD} = 1.65\ V$ max					75	mA
I_{OHD}			$V_{OHD} = 3.85\ V$ min					-75	mA

1) Maximum test duration 2ms, one output loaded at time
2) Incident wave switching is guaranteed on transmission lines with impedances as low as 50 Ω.
(*) All outputs loaded.

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AC ELECTRICAL CHARACTERISTICS ($C_L = 50$ pF, $R_L = 500$ Ω, Input $t_r = t_f = 3$ ns)

Symbol	Parameter	Test Condition		Value					Unit
		V_{CC} (V)		$T_A = 25$ °C			-40 to 85 °C		
				Min.	Typ.	Max.	Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Time CK to Q	3.3(*)			7	13		14	ns
		5.0(**)			5	10		11	
t_{PLH} t_{PHL}	Propagation Delay Time PR or CLR to Q	3.3(*)			6	12		13	ns
		5.0(**)			4.5	9		10	
t_w	Pulse Width HIGH or LOW, CK or PR or CLR	3.3(*)			1.5	5		7	ns
		5.0(**)			1.5	4		5	
t_s	Setup Time D to CK HIGH or LOW	3.3(*)			-0.2	4		4	ns
		5.0(**)			-0.2	3		3	
t_h	Hold Time D to CK HIGH or LOW	3.3(*)			0.2	2		3	ns
		5.0(**)			0.2	2		3	
t_{REM}	Removal Time PR or CLR to CK	3.3(*)			-1	1		1	ns
		5.0(**)			-0.7	1		1	
f_{MAX}	Maximum Clock Frequency	3.3(*)		100	300		90		MHz
		5.0(**)		140	300		130		

(*) Voltage range is 3.3V ± 0.3V
(**) Voltage range is 5V ± 0.5V
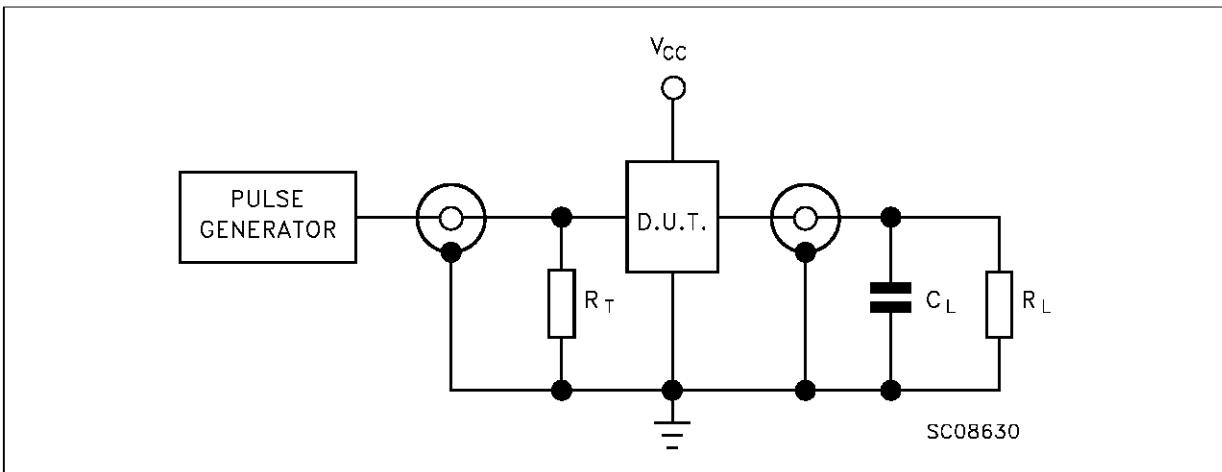
CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions		Value					Unit
		V_{CC} (V)		$T_A = 25$ °C			-40 to 85 °C		
				Min.	Typ.	Max.	Min.	Max.	
C_{IN}	Input Capacitance	5.0			4				pF
C_{PD}	Power Dissipation Capacitance (note 1)	5.0			35				pF

1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC}(opr) = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/n$ (per circuit)

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TEST CIRCUIT
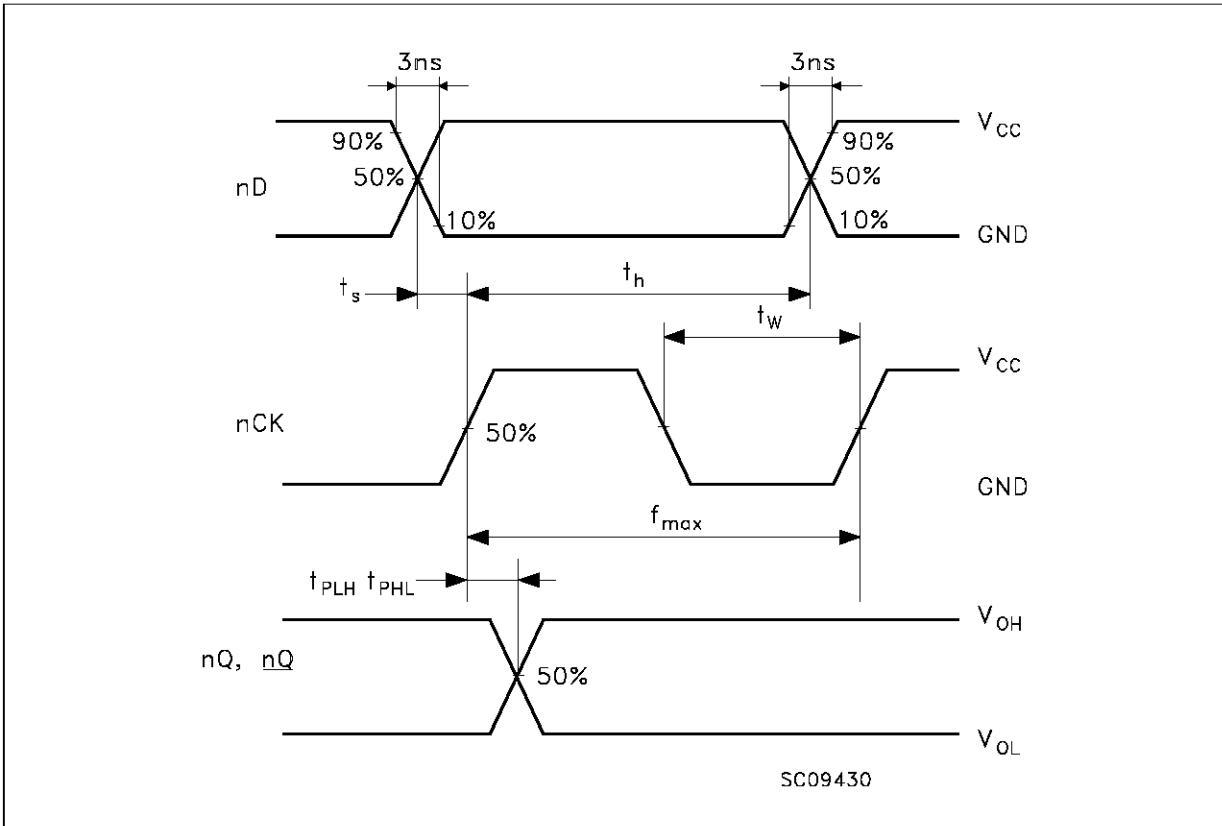
$C_L = 50$ pF or equivalent (includes jig and probe capacitance)
$R_L = R_1 = 500\Omega$ or equivalent
$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)
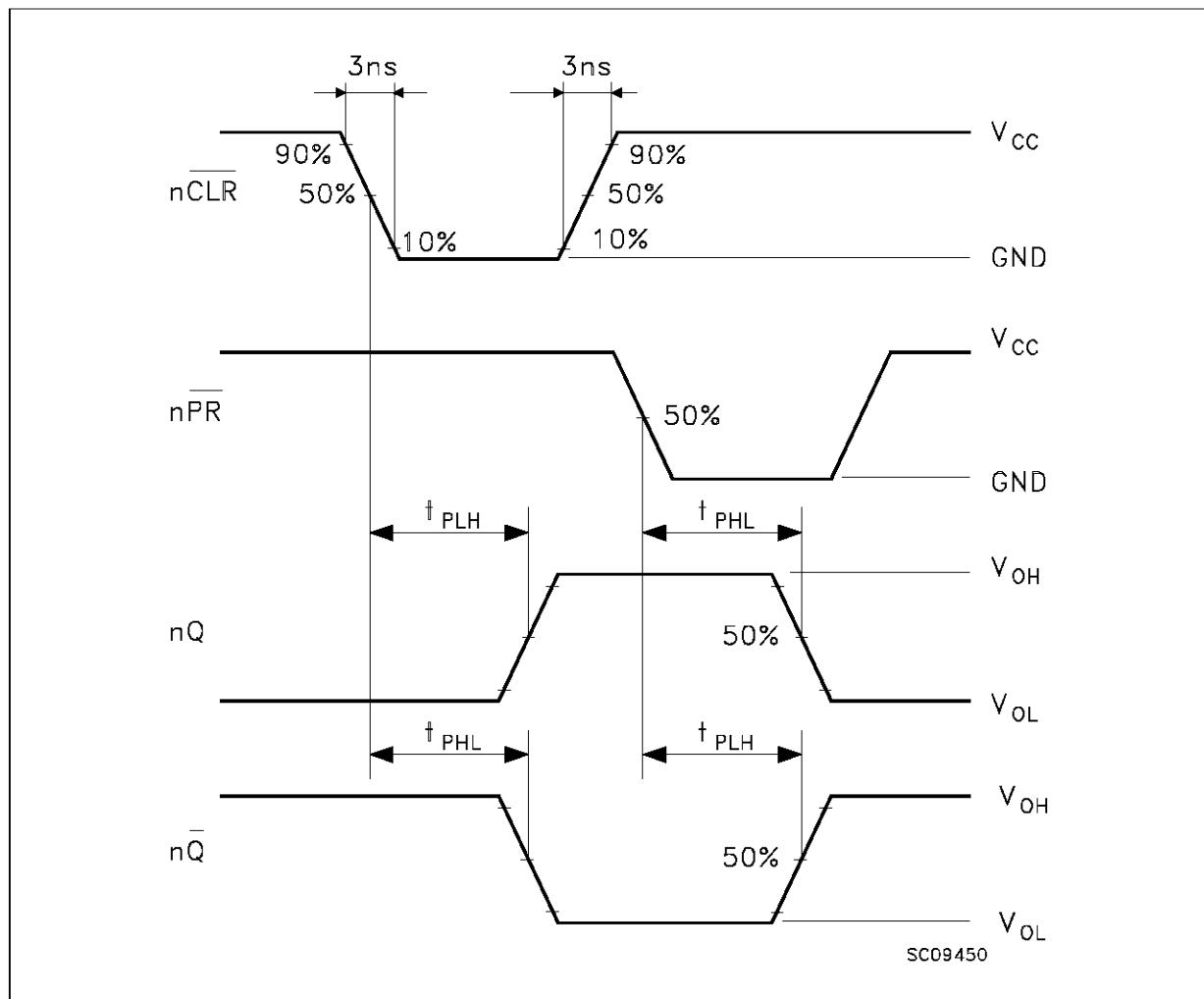
## WAVEFORM 1: PROPAGATION DELAYS, SETUP AND HOLD TIMES (f=1MHz; 50% duty cycle)

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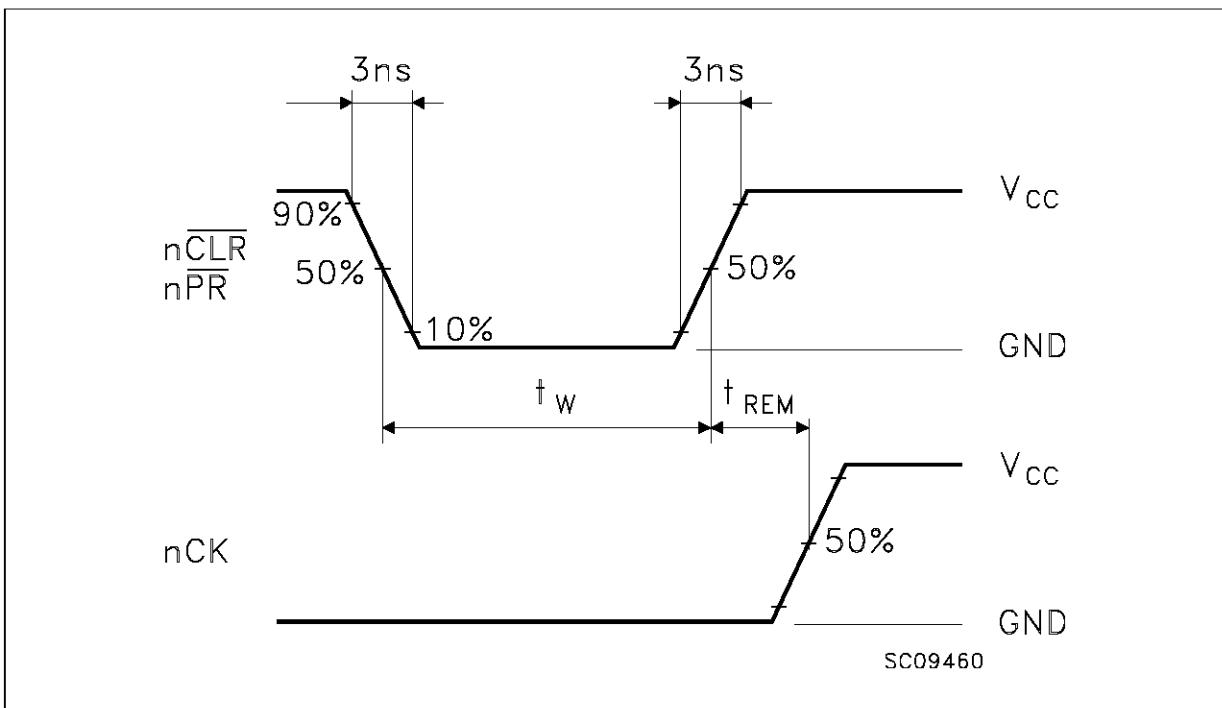
WAVEFORM 2: PROPAGATION DELAYS (f=1MHz; 50% duty cycle)

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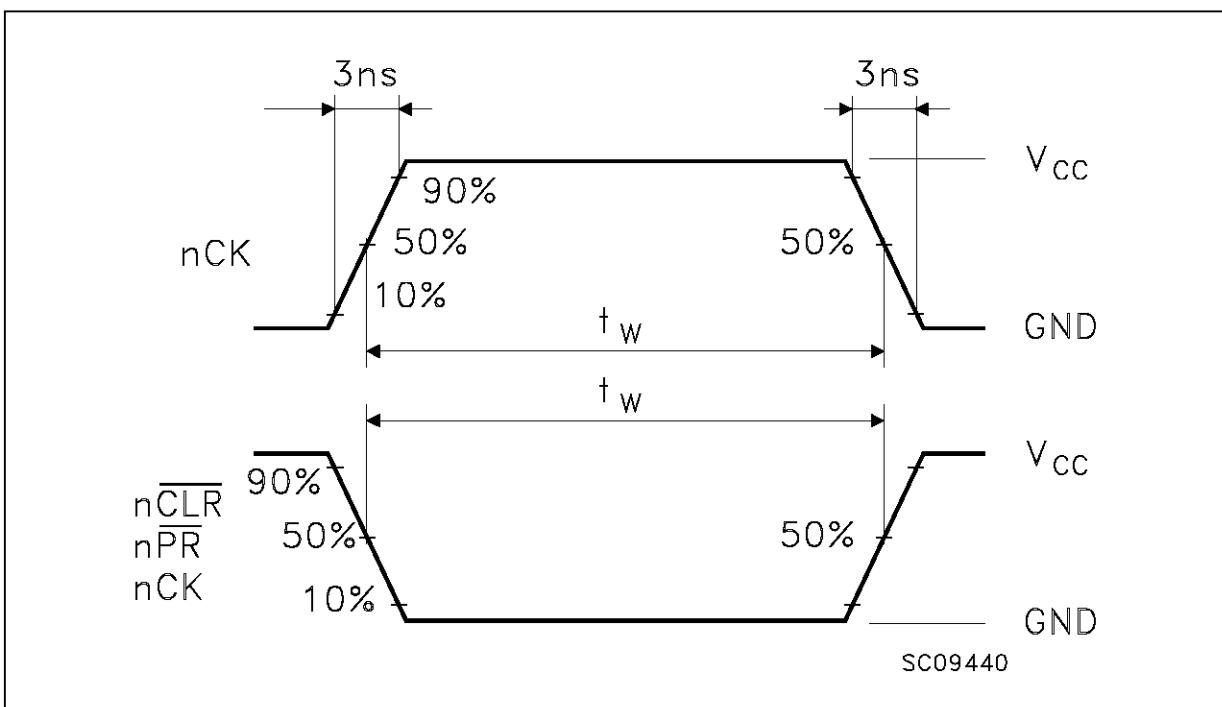
WAVEFORM 3: RECOVERY TIMES (f=1MHz; 50% duty cycle)

SC09460
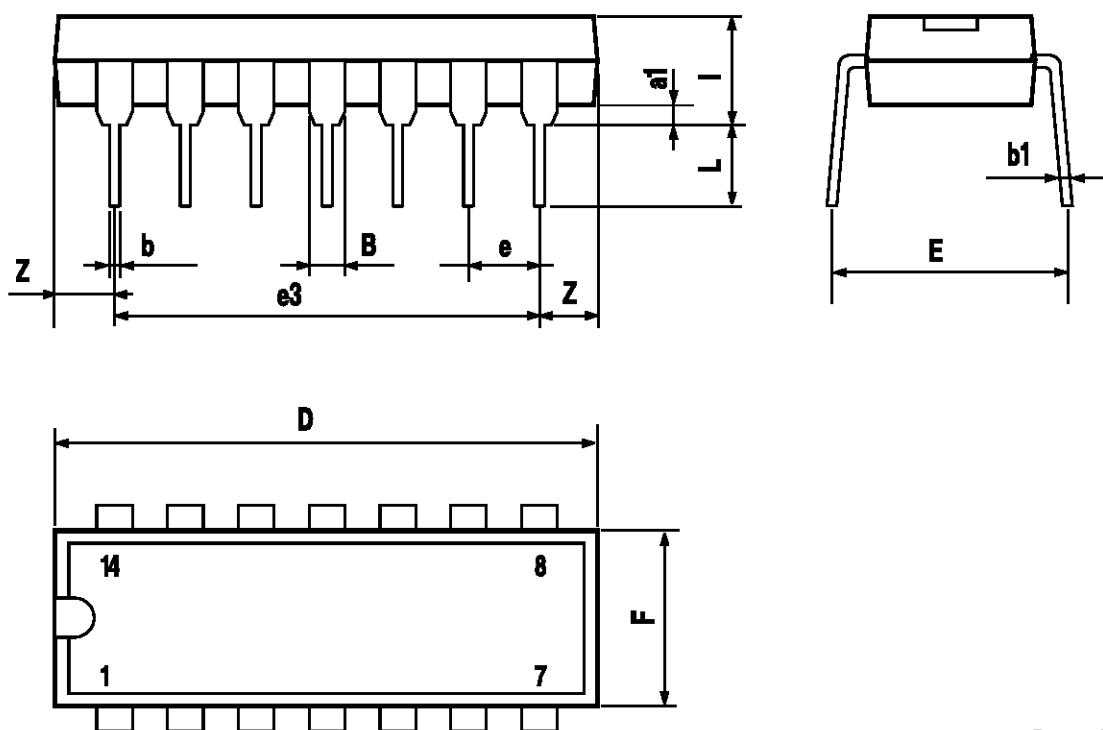
WAVEFORM 3: PULSE WIDTH

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Plastic DIP14 MECHANICAL DATA
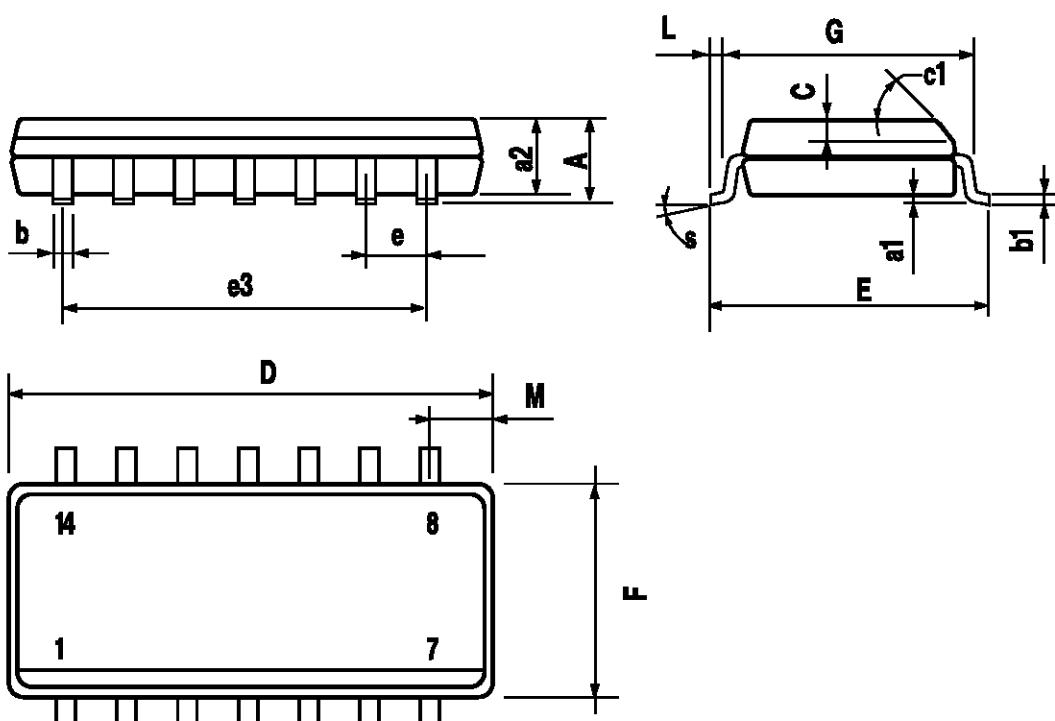
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100

P001A

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SO14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45 (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8 (max.)					

P013G

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