

SN74AS305 OCTAL DIVIDE-BY-2 CIRCUIT/CLOCK DRIVER

D3596, JUNE 1990—REVISED SEPTEMBER 1990

- Maximum Output Skew of 1 ns
- Maximum Pulse Skew of 1 ns
- Center Pin V_{CC} and GND Configurations Minimize High-Speed Switching Noise
- Package Options Include Plastic "Small Outline" Packages and Standard Plastic 300-mil DIPs

description

The SN74AS305 contains eight flip-flops designed to have low skew between outputs. The eight outputs (four in-phase with CLK and four out-of-phase) toggle on successive CLK pulses. PRE and CLR inputs are provided to set the Q and $\bar{Q}$ outputs high or low independent of the CLK pin.

The SN74AS305 has output and pulse skew parameters $t_{sk(o)}$ and $t_{sk(p)}$ to guarantee performance as a clock driver when a divide-by-two function is required.

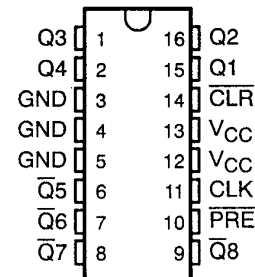
The SN74AS305 is characterized for operation from 0°C to 70°C.

FUNCTION TABLE

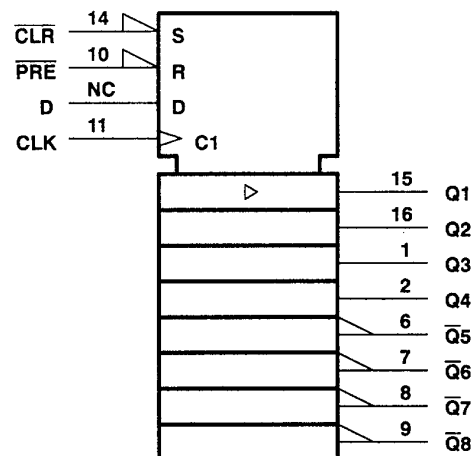
INPUTS			OUTPUTS	
CLR	PRE	CLK	Q1-Q4	Q5-Q8
L	H	X	L	H
H	L	X	H	L
L	L	X	L [†]	L [†]
H	H	L	Q ₀	$\bar{Q}_0$
H	H	↑	$\bar{Q}_0$	Q ₀

[†] This configuration will not persist when PRE or CLR returns to its inactive (high) level.

D OR N PACKAGE
(TOP VIEW)



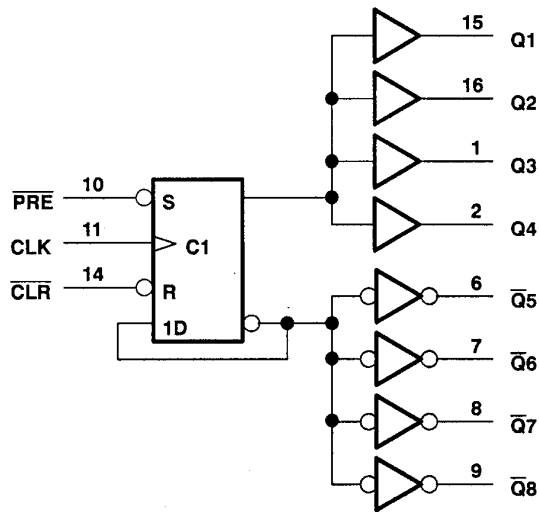
logic symbol[‡]



[‡] This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

SN74AS305
OCTAL DIVIDE-BY-2 CIRCUIT/CLOCK DRIVER

logic diagram (positive logic)



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage, V_{CC}	7 V
Input voltage, V_I	7 V
Operating free-air temperature range	0°C to 70°C
Storage temperature range	– 65°C to 150°C

[†] Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. This are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

recommended operating conditions

		MIN	NOM	MAX	UNIT
V_{CC}	Supply voltage	4.5	5	5.5	V
V_{IH}	High-level input voltage	2			V
V_{IL}	Low-level input voltage			0.8	V
I_{OH}	High-level output current			– 24	mA
I_{OL}	Low-level output current			48	mA
T_A	Operating free-air temperature	0		70	°C

SN74AS305

OCTAL DIVIDE-BY-2 CIRCUIT/CLOCK DRIVER

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER	TEST CONDITIONS	MIN	TYP†	MAX	UNIT
V_{IK}	$V_{CC} = 4.5\text{ V}$, $I_I = -18\text{ mA}$			-1.2	V
V_{OH}	$V_{CC} = 4.5\text{ V to } 5.5\text{ V}$, $I_{OH} = -2\text{ mA}$	$V_{CC} - 2$			V
	$V_{CC} = 4.5\text{ V}$, $I_{OH} = -24\text{ mA}$	2	2.8		
V_{OL}	$V_{CC} = 4.5\text{ V}$, $I_{OL} = 48\text{ mA}$		0.3	0.5	V
I_I	$V_{CC} = 5.5\text{ V}$, $V_I = 7.0\text{ V}$			0.1	mA
I_{IH}	$V_{CC} = 5.5\text{ V}$, $V_I = 2.7\text{ V}$			20	μA
I_{IL}	$V_{CC} = 5.5\text{ V}$, $V_I = 0.4\text{ V}$			-0.5	mA
$I_{O\ddagger}$	$V_{CC} = 5.5\text{ V}$, $V_O = 2.25\text{ V}$	-50		-150	mA
I_{CC}	$V_{CC} = 5.5\text{ V}$, See Note 1		40	70	mA

† All typical values are at $V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$.

‡ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS} .

NOTE 1: I_{CC} is measured with CLK and $\overline{\text{PRE}}$ grounded, then with CLK and $\overline{\text{CLR}}$ grounded.

timing requirements

PARAMETER	MIN	NOM	MAX	UNIT
f_{clock} Clock frequency	0		80	MHz
t_w Pulse duration	CLK high	4		ns
	CLK low	6		
	$\overline{\text{CLR}}$ or $\overline{\text{PRE}}$ low	5		
t_{su} Setup time before CLK†	$\overline{\text{CLR}}$ or $\overline{\text{PRE}}$ inactive	6		ns

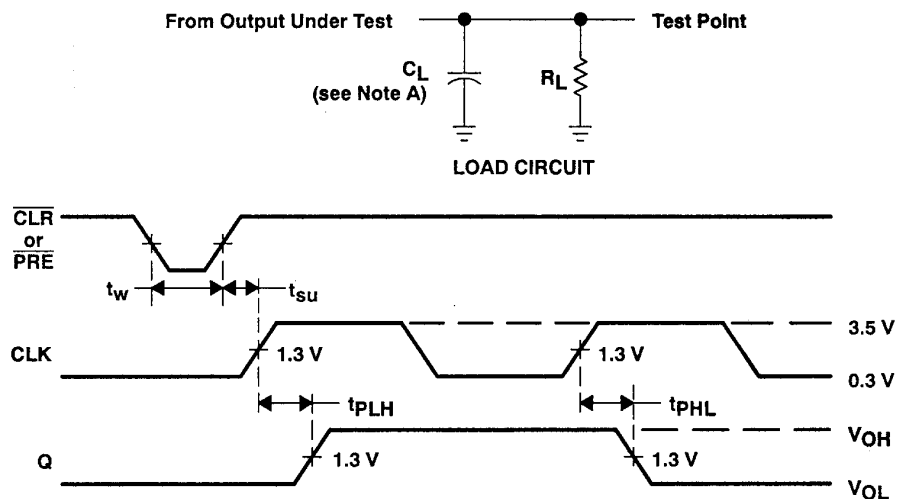
switching characteristics over recommended operating free-air temperature range

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
$f_{\text{max}}^{\ddagger}$			$R_L = 500\ \Omega$, $C_L = 50\ \text{pF}$, $V_{CC} = 4.5\ \text{V to } 5.5\ \text{V}$	80			MHz	
t_{PLH}	CLK	Q, $\overline{\text{Q}}$		2	6	9	ns	
t_{PHL}				2	6	9		
t_{PLH}	$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$	Q, $\overline{\text{Q}}$		3	7	12	ns	
t_{PHL}				3	7	12		
$t_{\text{sk}}(\text{O})$	CLK	Q, $\overline{\text{Q}}$	$R_L = 500\ \Omega$, $C_L = 10\text{-}30\ \text{pF}$, $V_{CC} = 4.5\ \text{V to } 5.5\ \text{V}$			1	ns	
	CLK	Q1 thru $\overline{\text{Q}}8$				1.5		
$t_{\text{sk}}(\text{p})$	CLK	Q1, $\overline{\text{Q}}8$				1.5	ns	
	CLK	Q2 thru $\overline{\text{Q}}7$				2		
t_r							4.5	ns
t_f							3.5	ns

‡ f_{max} minimum values are at $C_L = 0\text{ to } 30\text{ pF}$.

SN74AS305 **OCTAL DIVIDE-BY-2 CIRCUIT/CLOCK DRIVER**

PARAMETER MEASUREMENT INFORMATION

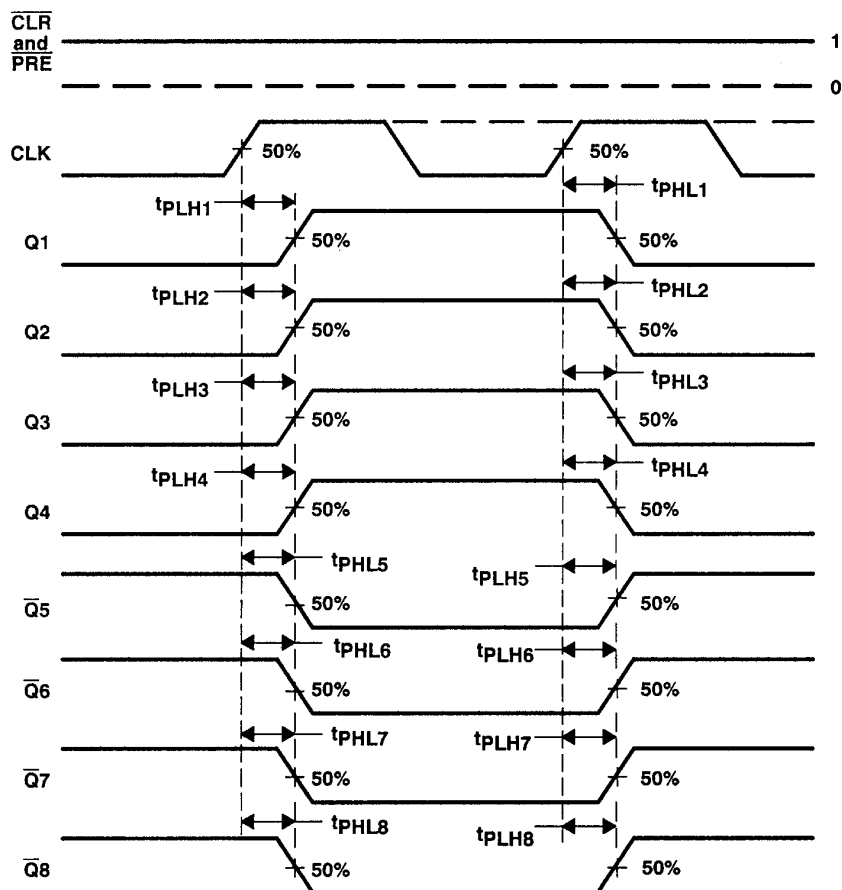


NOTES: A. C_L includes probe and jig capacitance.

B. Input pulses are supplied by generators having the following characteristics: PRR $\leq$ 10 MHz, $t_r = 2.5$ ns, $t_f = 2.5$ ns.

Figure 1. Load Circuit and Voltage Waveforms

SN74AS305 OCTAL DIVIDE-BY-2 CIRCUIT/CLOCK DRIVER



- NOTES: A. $t_{sk(o)}$ CLK to Q are calculated as the greater of:
- 1) The difference between the fastest and slowest of t_{PLHn} ($n = 1, 2, 3, 4$),
 - 2) the difference between the fastest and slowest of t_{PHLn} ($n = 1, 2, 3, 4$).
- B. $t_{sk(o)}$ CLK to $\bar{Q}$ are calculated as the greater of: 1) The difference between the fastest and slowest of t_{PLHn} ($n = 5, 6, 7, 8$), and 2) The difference between the fastest and slowest of t_{PHLn} ($n = 5, 6, 7, 8$).
- C. $t_{sk(o)}$ CLK to Q and $\bar{Q}$ are calculated as the greater of:
- 1) The difference between the fastest and slowest of t_{PLHn} ($n = 1, 2, 3, 4$), t_{PHLn} ($n = 5, 6, 7, 8$) and
 - 2) the difference between the fastest and slowest of t_{PHLn} ($n = 1, 2, 3, 4$), t_{PLHn} ($n = 5, 6, 7, 8$).
- D. $t_{sk(p)}$ is calculated as the greater of $|t_{PLHn} - t_{PHLn}|$ ($n = 1, 2, 3, \dots, 8$).

Figure 2. Waveforms for Calculation of t_{sk}

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