



U74AUP1G74

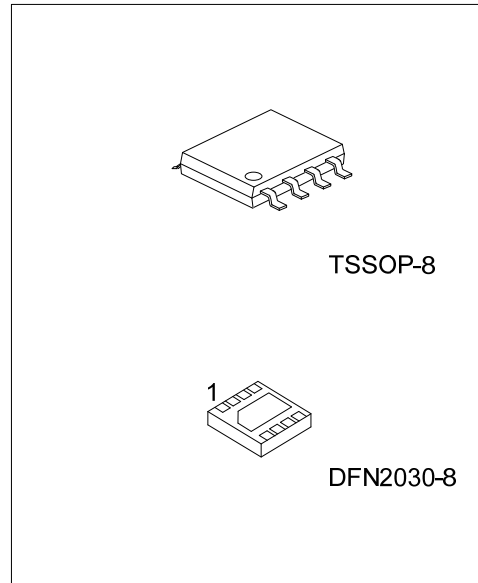
CMOS IC

LOW-POWER SINGLE POSITIVE EDGE TRIGGERED D-TYPE FLIP-FLOP WITH CLEAR AND PRESET

DESCRIPTION

This **U74AUP1G74** ensures a very low static- and dynamic-power consumption across the entire V_{CC} range of 0.8 V to 3.6 V.

This device is fully specified for partial power-down using I_{OFF} . The I_{OFF} circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.



FEATURES

- * Wide supply voltage range from 0.8V to 3.6V
- * Inputs accept voltages up to 3.6V
- * I_{OFF} supports partial-power-down mode
- * Low static power consumption; $I_{CC}=0.5\mu A$ (Max.)
- * Optimized for 3.3V Operation

ORDERING INFORMATION

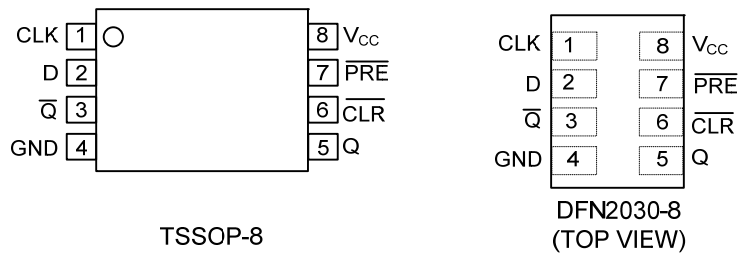
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74AUP1G74L-P08-R	U74AUP1G74G-P08-R	TSSOP-8	Tape Reel
U74AUP1G74L-K08-2030-R	U74AUP1G74G-K08-2030-R	DFN2030-8	Tape Reel

<p>U74AUP1G74G-P08-R</p> <ul style="list-style-type: none"> (1) Packing Type (2) Package Type (3) Green Package 	<ul style="list-style-type: none"> (1) R: Tape Reel (2) P08: TSSOP-8, K08-2030: DFN2030-8 (3) G: Halogen Free and Lead Free, L: Lead Free
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MARKING

TSSOP-8	DFN2030-8
<p> 1 • UTC □□□□ 2 AUP1G74 □ 3 □□ □□ 4 □□ □□ </p> <p> 5 → Date Code 6 → L: Lead Free → G: Halogen Free 7 → Lot Code </p>	<p> AUP 1G74 • □□□□ → Date Code </p>

PIN CONFIGURATION

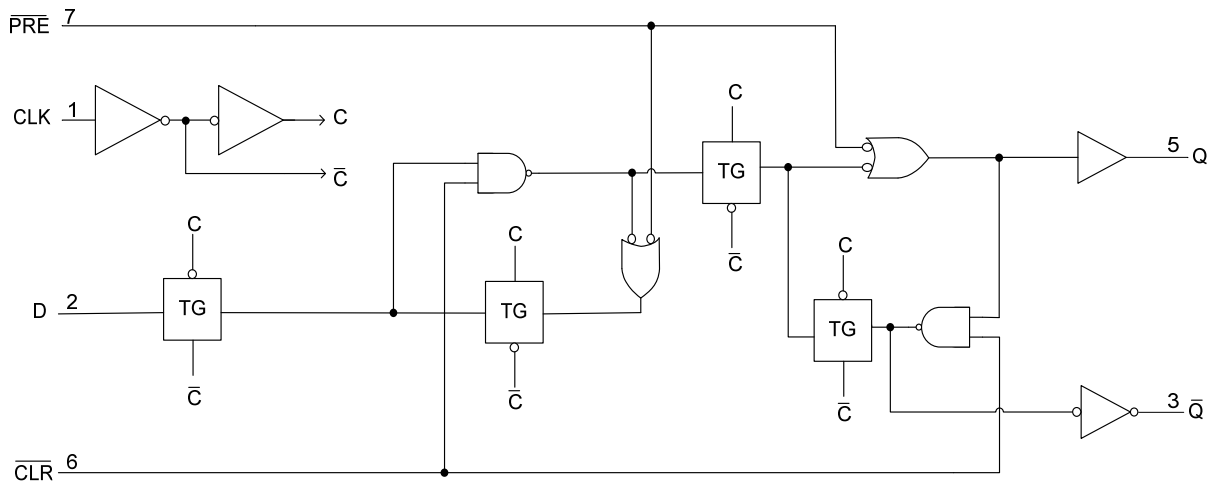


FUNCTION TABLE

INPUTS				OUTPUTS	
\overline{PRE}	\overline{CLR}	CLK	D	Q	\overline{Q}
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	\uparrow	H	H	L
H	H	\uparrow	L	L	H
H	H	L	X	Q_0	\overline{Q}_0

Note: H: HIGH voltage level; L: LOW voltage level; X: don't care; Z: high impedance state

LOGIC DIAGRAM (positive logic)



■ ABSOLUTE MAXIMUM RATING

PARAMETER	SYMBOL	CONDITIONS	RATINGS	UNIT
Supply Voltage	V_{CC}		-0.5 ~ +4.6	V
Input Voltage	V_{IN}		-0.5 ~ +4.6	V
Output Voltage	V_{OUT}	Output in the high or low state	-0.5 ~ $V_{CC} + 0.5$	V
		Output in the power-off state	-0.5 ~ +4.6	V
Continuous Output Current	I_{OUT}	$V_{OUT}=0 \sim V_{CC}$	± 20	mA
Continuous current through		V_{CC} or GND	± 50	mA
Input Clamp Current	I_{IK}	$V_{IN} < 0$	-50	mA
Output Clamp Current	I_{OK}	$V_{IN} < 0$	-50	mA
Storage Temperature Range	T_{STG}		-65 ~ +150	°C

Note: Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}	Operating	0.8		3.6	V
Input Voltage	V_{IN}		0		3.6	V
Output Voltage	V_{OUT}	High or low state	0		V_{CC}	V
Operating Temperature	T_A		-40		+85	°C
Input Transition Rise or Fall Rate	$\Delta t/\Delta v$	$V_{CC}=0.8V \sim 3.6V$			200	ns/V

■ ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ C$, unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
High-level Input Voltage	V_{IH}	$V_{CC}=0.8V$	V_{CC}			V	
		$V_{CC}=1.1V \sim 1.95V$	$0.7 \times V_{CC}$			V	
		$V_{CC}=2.3V \sim 2.7V$	1.6			V	
		$V_{CC}=3V \sim 3.6V$	2			V	
Low-level Input Voltage	V_{IL}	$V_{CC}=0.8V$			0	V	
		$V_{CC}=1.1V \sim 1.95V$			$0.3 \times V_{CC}$	V	
		$V_{CC}=2.3V \sim 2.7V$			0.7	V	
		$V_{CC}=3V \sim 3.6V$			0.9	V	
High-Level Output Voltage	V_{OH}	$V_{CC}=0.8 \sim 3.6V, I_{OH}=-20\mu A$	$V_{CC}-0.1$			V	
		$V_{CC}=1.1V, I_{OH}=-1.1mA$	$0.7 \times V_{CC}$			V	
		$V_{CC}=1.4V, I_{OH}=-1.7mA$	1.11			V	
		$V_{CC}=1.65V, I_{OH}=-1.9mA$	1.32			V	
		$V_{CC}=2.3V$	$I_{OH}=-2.3mA$	2.05			V
			$I_{OH}=-3.1mA$	1.9			V
		$V_{CC}=3V$	$I_{OH}=-2.7mA$	2.72			V
			$I_{OH}=-4mA$	2.6			V
Low-Level Output Voltage	V_{OL}	$V_{CC}=0.8 \sim 3.6V, I_{OL}=20\mu A$			0.1	V	
		$V_{CC}=1.1V, I_{OL}=1.1mA$			$0.3 \times V_{CC}$	V	
		$V_{CC}=1.4V, I_{OL}=1.7mA$			0.31	V	
		$V_{CC}=1.65V, I_{OL}=1.9mA$			0.31	V	
		$V_{CC}=2.3V$	$I_{OL}=2.3mA$			0.31	V
			$I_{OL}=3.1mA$			0.44	V
		$V_{CC}=3V$	$I_{OL}=2.7mA$			0.31	V
			$I_{OL}=4mA$			0.44	V

■ ELECTRICAL CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Leakage Current (A or B Input)	$I_{I(LEAK)}$	$V_{CC}=0 \sim 3.6V, V_{IN}=GND \sim 3.6V$			± 0.1	μA
Power OFF Leakage Current	I_{off}	$V_{CC}=0V, V_{IN}$ or $V_{OUT}=0 \sim 3.6V$			± 0.2	μA
Additional Power OFF Leakage Current	ΔI_{off}	$V_{CC}=0V \sim 0.2V, V_{IN}$ or $V_{OUT}=0 \sim 3.6V$			± 0.2	μA
Quiescent Supply Current	I_{CC}	$V_{CC}=0.8 \sim 3.6V, V_{IN}=GND$ or $(V_{CC}$ or $3.6V), I_{OUT}=0$			0.5	μA
Additional Quiescent Supply Current Per Input Pin	ΔI_{CC}	$V_{CC}=3.3V, V_{IN}=V_{CC}-0.6V$ (Note), $I_{OUT}=0$			40	μA
Input Capacitance	C_I	$V_{CC}=0V, V_{IN}=V_{CC}$ or GND		1.5		pF
		$V_{CC}=3.6V, V_{IN}=V_{CC}$ or GND		1.5		pF
Output Capacitance	C_{OUT}	$V_{CC}=0V, V_{OUT}=GND$		3		pF

Note: One input at $V_{CC} - 0.6V$, other input at V_{CC} or GND.

■ TIMING REQUIREMENTS

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Clock frequency	f_{clock}	$V_{CC}=0.8V$		21		MHz	
		$V_{CC}=1.2V \pm 0.1V$			40	MHz	
		$V_{CC}=1.5V \pm 0.1V$			50	MHz	
		$V_{CC}=1.8V \pm 0.15V$			60	MHz	
		$V_{CC}=2.5V \pm 0.2V$			90	MHz	
		$V_{CC}=3.3V \pm 0.3V$			90	MHz	
Pulse duration	t_w	$V_{CC}=0.8V$	CLK High or Low		3.5		ns
			\overline{PRE} or \overline{CLR} Low		4.5		ns
		$V_{CC}=1.2V \pm 0.1V$	CLK High or Low	2			ns
			\overline{PRE} or \overline{CLR} Low	2			ns
		$V_{CC}=1.5V \pm 0.1V$	CLK High or Low	2			ns
			\overline{PRE} or \overline{CLR} Low	2			ns
		$V_{CC}=1.8V \pm 0.15V$	CLK High or Low	2			ns
			\overline{PRE} or \overline{CLR} Low	2			ns
		$V_{CC}=2.5V \pm 0.2V$	CLK High or Low	2			ns
			\overline{PRE} or \overline{CLR} Low	2			ns
		$V_{CC}=3.3V \pm 0.3V$	CLK High or Low	2			ns
			\overline{PRE} or \overline{CLR} Low	2			ns

■ TIMING REQUIREMENTS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Setup time before CLK↑ from Data to $\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ inactive	tsu	V _{CC} =0.8V	Data High		3	ns
			Data Low		1	ns
			$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ Inactive		1	ns
		V _{CC} =1.2V±0.1V	Data High	1.3		ns
			Data Low	1.2		ns
			$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ Inactive	0.5		ns
		V _{CC} =1.5V±0.1V	Data High	1		ns
			Data Low	1		ns
			$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ Inactive	0.5		ns
		V _{CC} =1.8V±0.15V	Data High	1		ns
			Data Low	1		ns
			$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ Inactive	0.5		ns
		V _{CC} =2.5V±0.2V	Data High	0.5		ns
			Data Low	1		ns
			$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ Inactive	0.5		ns
		V _{CC} =3.3V±0.3V	Data High	0.5		ns
			Data Low	1		ns
			$\overline{\text{PRE}}$ or $\overline{\text{CLR}}$ Inactive	0.5		ns
Hold time, data after CLK↑	t _h	V _{CC} =0.8V		0		ns
		V _{CC} =1.2V±0.1V	0		ns	
		V _{CC} =1.5V±0.1V	0		ns	
		V _{CC} =1.8V±0.15V	0		ns	
		V _{CC} =2.5V±0.2V	0		ns	
		V _{CC} =3.3V±0.3V	0		ns	

■ SWITCHING CHARACTERISTICS (T_A =25°C , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
Maximum Frequency Response	f _{Max}	C _L =5pF, R _L =5KΩ	V _{CC} =0.8V		60		MHz
			V _{CC} =1.2V±0.1V		80		MHz
			V _{CC} =1.5V±0.1V		125		MHz
			V _{CC} =1.8V±0.15V		150		MHz
			V _{CC} =2.5V±0.2V		180		MHz
			V _{CC} =3.3V±0.3V		190		MHz
		C _L =10pF, R _L =5KΩ	V _{CC} =0.8V		46		MHz
			V _{CC} =1.2V±0.1V		65		MHz
			V _{CC} =1.5V±0.1V		95		MHz
			V _{CC} =1.8V±0.15V		110		MHz
			V _{CC} =2.5V±0.2V		170		MHz
			V _{CC} =3.3V±0.3V		180		MHz
		C _L =15pF, R _L =5KΩ	V _{CC} =0.8V		41		MHz
			V _{CC} =1.2V±0.1V		75		MHz
			V _{CC} =1.5V±0.1V		95		MHz
			V _{CC} =1.8V±0.15V		100		MHz
			V _{CC} =2.5V±0.2V		150		MHz
			V _{CC} =3.3V±0.3V		200		MHz
		C _L =30pF, R _L =5KΩ	V _{CC} =0.8V		21		MHz
			V _{CC} =1.2V±0.1V		50		MHz
			V _{CC} =1.5V±0.1V		60		MHz
			V _{CC} =1.8V±0.15V		75		MHz
			V _{CC} =2.5V±0.2V		100		MHz
			V _{CC} =3.3V±0.3V		100		MHz
Propagation delay from input(CLK) to output(Q)	t _{PD}	C _L =5pF, R _L =5KΩ	V _{CC} =0.8V		31		MHz
			V _{CC} =1.2±0.1V	2	10	20	ns
			V _{CC} =1.5±0.1V	2	6	12	ns
			V _{CC} =1.8±0.15V	2	5	9	ns
			V _{CC} =2.5±0.2V	2	3	6	ns
			V _{CC} =3.3±0.3V	2	3	4	ns
		C _L =10pF, R _L =5KΩ	V _{CC} =0.8V		33		ns
			V _{CC} =1.2±0.1V	2	10	22	ns
			V _{CC} =1.5±0.1V	2	7	13	ns
			V _{CC} =1.8±0.15V	2	6	10	ns
			V _{CC} =2.5±0.2V	2	4	6	ns
			V _{CC} =3.3±0.3V	2	3	5	ns
		C _L =15pF, R _L =5KΩ	V _{CC} =0.8V		35		ns
			V _{CC} =1.2±0.1V	2	12	23.1	ns
			V _{CC} =1.5±0.1V	2	8	14.1	ns
			V _{CC} =1.8±0.15V	2	6	10.7	ns
			V _{CC} =2.5±0.2V	2	4	7	ns
			V _{CC} =3.3±0.3V	2	4	5.4	ns
		C _L =30pF, R _L =5KΩ	V _{CC} =0.8V		32		ns
			V _{CC} =1.2±0.1V	3	14	27	ns
			V _{CC} =1.5±0.1V	3	10	17	ns
			V _{CC} =1.8±0.15V	3	8	13	ns
			V _{CC} =2.5±0.2V	3	6	9	ns
			V _{CC} =3.3±0.3V	3	5	7	ns

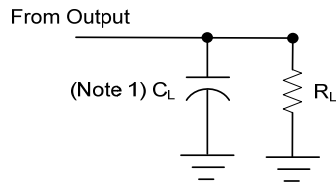
SWITCHING CHARACTERISTICS (Cont.)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT		
Propagation delay from input(CLK) to output(\bar{Q})	t_{PD}	$C_L=5pF, R_L=5K\Omega$	$V_{CC}=0.8V$		28		ns	
			$V_{CC}=1.2\pm 0.1V$	2	9	19	ns	
			$V_{CC}=1.5\pm 0.1V$	2	6	11	ns	
			$V_{CC}=1.8\pm 0.15V$	2	5	9	ns	
			$V_{CC}=2.5\pm 0.2V$	2	3	6	ns	
			$V_{CC}=3.3\pm 0.3V$	2	3	4	ns	
		$C_L=10pF, R_L=5K\Omega$	$V_{CC}=0.8V$			30		ns
			$V_{CC}=1.2\pm 0.1V$	2	10	20	ns	
			$V_{CC}=1.5\pm 0.1V$	2	7	12	ns	
			$V_{CC}=1.8\pm 0.15V$	2	5	9	ns	
			$V_{CC}=2.5\pm 0.2V$	2	4	6	ns	
			$V_{CC}=3.3\pm 0.3V$	2	3	5	ns	
		$C_L=15pF, R_L=5K\Omega$	$V_{CC}=0.8V$			32		ns
			$V_{CC}=1.2\pm 0.1V$	2	11	21.8	ns	
			$V_{CC}=1.5\pm 0.1V$	2	7	13.5	ns	
			$V_{CC}=1.8\pm 0.15V$	2	6	10.4	ns	
			$V_{CC}=2.5\pm 0.2V$	2	4	7.1	ns	
			$V_{CC}=3.3\pm 0.3V$	2	3	5.4	ns	
		$C_L=30pF, R_L=5K\Omega$	$V_{CC}=0.8V$			40		ns
			$V_{CC}=1.2\pm 0.1V$	3	13	26	ns	
			$V_{CC}=1.5\pm 0.1V$	3	9	16	ns	
			$V_{CC}=1.8\pm 0.15V$	3	7	13	ns	
			$V_{CC}=2.5\pm 0.2V$	3	5	9	ns	
			$V_{CC}=3.3\pm 0.3V$	3	5	7	ns	
Propagation delay from input(\bar{PRE} or \bar{CLR}) to output(Q or \bar{Q})	t_{PD}	$C_L=5pF, R_L=5K\Omega$	$V_{CC}=0.8V$		26		ns	
			$V_{CC}=1.2\pm 0.1V$	2	9	20	ns	
			$V_{CC}=1.5\pm 0.1V$	2	6	12	ns	
			$V_{CC}=1.8\pm 0.15V$	2	5	9	ns	
			$V_{CC}=2.5\pm 0.2V$	2	3	6	ns	
			$V_{CC}=3.3\pm 0.3V$	2	3	5	ns	
		$C_L=10pF, R_L=5K\Omega$	$V_{CC}=0.8V$			29		ns
			$V_{CC}=1.2\pm 0.1V$	2	10	21	ns	
			$V_{CC}=1.5\pm 0.1V$	2	7	13	ns	
			$V_{CC}=1.8\pm 0.15V$	2	5	10	ns	
			$V_{CC}=2.5\pm 0.2V$	2	4	7	ns	
			$V_{CC}=3.3\pm 0.3V$	2	3	5	ns	
		$C_L=15pF, R_L=5K\Omega$	$V_{CC}=0.8V$			31		ns
			$V_{CC}=1.2\pm 0.1V$	2	11	23	ns	
			$V_{CC}=1.5\pm 0.1V$	2	7	14	ns	
			$V_{CC}=1.8\pm 0.15V$	2	6	11	ns	
			$V_{CC}=2.5\pm 0.2V$	2	4	7	ns	
			$V_{CC}=3.3\pm 0.3V$	2	4	6	ns	
		$C_L=30pF, R_L=5K\Omega$	$V_{CC}=0.8V$			38		ns
			$V_{CC}=1.2\pm 0.1V$	3	13	26	ns	
			$V_{CC}=1.5\pm 0.1V$	3	9	17	ns	
			$V_{CC}=1.8\pm 0.15V$	3	8	13	ns	
			$V_{CC}=2.5\pm 0.2V$	3	6	9	ns	
			$V_{CC}=3.3\pm 0.3V$	3	5	7	ns	

■ OPERATING CHARACTERISTICS (f=10MHz, T_A =25°C, unless otherwise specified)

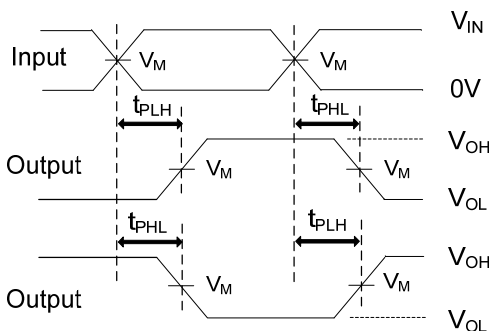
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Power Dissipation Capacitance	C _{PD}	V _{CC} =0.8V		5.5		pF
		V _{CC} =1.2±0.1V		5.5		pF
		V _{CC} =1.5±0.1V		5.5		pF
		V _{CC} =1.8±0.15V		5.5		pF
		V _{CC} =2.5±0.2V		5.5		pF
		V _{CC} =3.3±0.3V		5.5		pF

■ TEST CIRCUIT AND WAVEFORMS

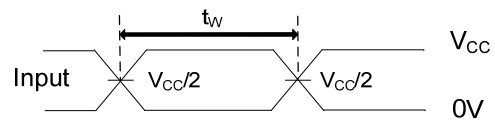


TEST CIRCUIT

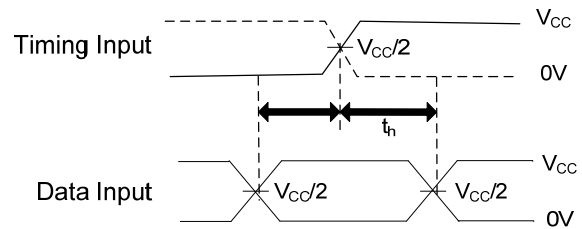
V_{CC}	V_{IN}	V_M	C_L	V_{Δ}
0.8	V_{CC}	$V_{CC}/2$	5, 10, 15, 30pF	0.1V
$1.2 \pm 0.1V$	V_{CC}	$V_{CC}/2$	5, 10, 15, 30pF	0.1V
$1.5 \pm 0.1V$	V_{CC}	$V_{CC}/2$	5, 10, 15, 30pF	0.1V
$1.8 \pm 0.15V$	V_{CC}	$V_{CC}/2$	5, 10, 15, 30pF	0.15V
$2.5 \pm 0.2V$	V_{CC}	$V_{CC}/2$	5, 10, 15, 30pF	0.15V
$3.3 \pm 0.3V$	V_{CC}	$V_{CC}/2$	5, 10, 15, 30pF	0.3V



PROPAGATION DELAY TIMES



PULSE DURATION



SETUP AND HOLD TIMES

Notes: 1. C_L includes probe and jig capacitance.

2. All input pulses are supplied by generators having the following characteristics: PRR $\leq 10\text{MHz}$, $Z_0 = 50\Omega$, $t_r/t_f = 3\text{ns}$.

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