



UTC4013

Preliminary

CMOS IC

DAUL D-TYPE FLIP-FLOP

DESCRIPTION

The UTC4013 is a dual D-type flip-flop which has two independent circuits and each flip-flop features independent data, set, reset, and clock inputs and outputs. The input level applied to DATA input are transferred to Q and $\bar{Q}$ output by rising edge of the clock pulse. When SET input is "H", and RESET input is "L", outputs become Q="H" and $\bar{Q}$ ="L". When SET input is "L" and RESET input is "H", outputs become Q="L" and $\bar{Q}$ ="H". When both SET input and RESET input are at "H", outputs become Q="H" and $\bar{Q}$ ="H".

FEATURES

- * Power supply voltage 3V to 18V
- * Maximum Input Current of 1uA at 18V Over Full Package Temperature
- * Maximum quiescent supply current is 4μA

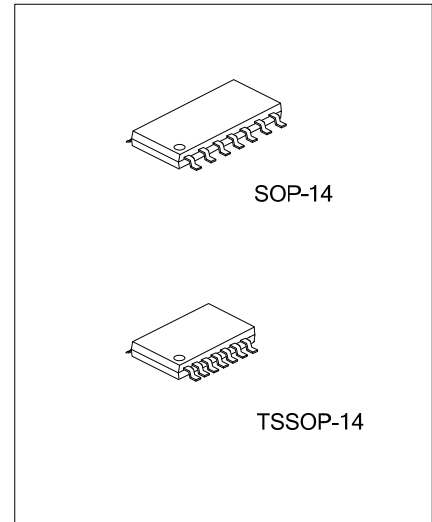
ORDERING INFORMATION

Ordering Number	Package	Packing
UTC4013G-S14-R	SOP-14	Tape Reel
UTC4013G-P14-R	TSSOP-14	Tape Reel

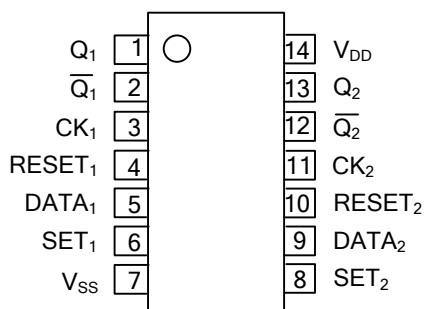
<p>UTC4013G-S14-R</p> <p>(1) Packing Type (2) Package Type (3) Green Package</p>	<p>(1) R: Tape Reel (2) S14: SOP-14, P14: TSSOP-14 (3) G: Halogen Free and Lead Free</p>
--	--

MARKING

SOP-14	TSSOP-14
<p>14 13 12 11 10 9 8 → Date Code</p> <p>UTC □□□□</p> <p>UTC4013G</p> <p>□□ → Lot Code</p> <p>1 2 3 4 5 6 7</p>	<p>14 13 12 11 10 9 8 → Date Code</p> <p>UTC □□□□</p> <p>UTC4013G</p> <p>□□ → Lot Code</p> <p>1 2 3 4 5 6 7</p>



PIN CONFIGURATION

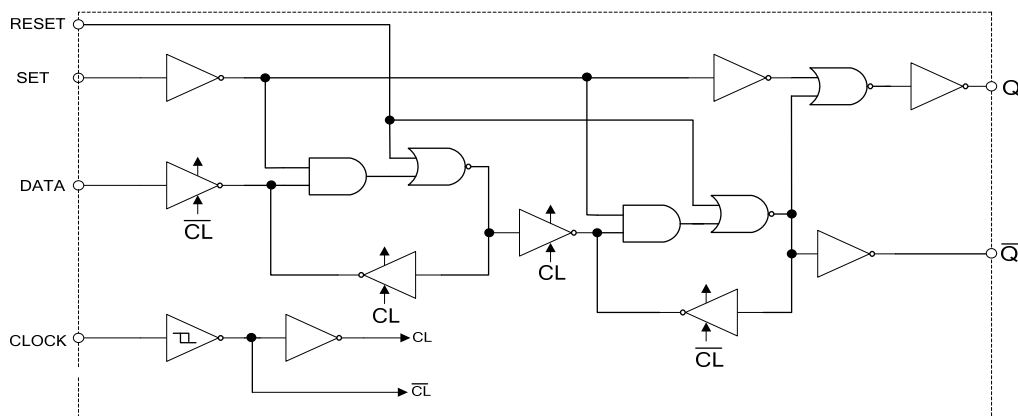


FUNCTION TABLE

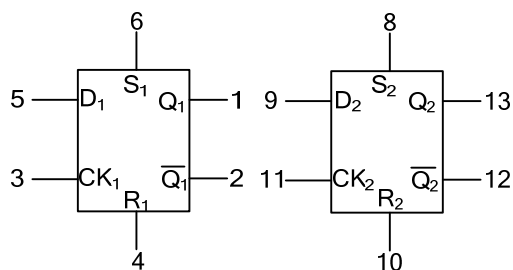
INPUTS				OUTPUTS	
RESET	SET	DATA	CK*	Q _{n+1}	Q̄ _{n+1}
L	H	-	-	H	L
H	L	-	-	L	H
H	H	-	-	H	H
L	L	L		L	H
L	L	H		H	L
L	L	-		No Change	No Change

Note: - : Don't care
*: Level Change

LOGIC DIAGRAM



BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING ($T_A = 25^\circ\text{C}$, unless otherwise specified)

PARAMETER	SYMBOL	RATINGS	UNIT
DC Supply Voltage	V_{DD}	$V_{SS}-0.5$ to $V_{SS}+20$	V
Input Voltage	V_{IN}	$V_{SS}-0.5$ to $V_{DD}+0.5$	V
Output Voltage	V_{OUT}	$V_{SS}-0.5$ to $V_{DD}+0.5$	V
DC Input Current	I_{IN}	± 10	mA
Power Dissipation	P_D	500	mW
Operation Temperature	T_{OPR}	$-40 \sim +85$	$^\circ\text{C}$
Storage Temperature	T_{STG}	$-65 \sim +150$	$^\circ\text{C}$

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 ($V_{SS}=0$, $T_A=25^\circ\text{C}$)

PARAMETER	SYMBOL	RATINGS	UNIT
DC Supply Voltage	V_{DD}	3 ~ 18	V
Input Voltage	V_{IN}	0 ~ V_{DD}	V

■ D.C. CHARACTERISTICS ($V_{SS}=0$, $T_A=25^\circ\text{C}$)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage	High	V_{IH}	$V_{OUT}=0.5V, 4.5V; V_{DD}=5V, I_{OUT} < 1\mu A$	3.5	2.75		V
			$V_{OUT}=1.0V, 9.0V; V_{DD}=10V, I_{OUT} < 1\mu A$	7.0	5.5		
			$V_{OUT}=1.5V, 13.5V; V_{DD}=15V, I_{OUT} < 1\mu A$	11.0	8.25		
	Low	V_{IL}	$V_{OUT}=0.5V, 4.5V; V_{DD}=5V, I_{OUT} < 1\mu A$		2.25	1.5	
			$V_{OUT}=1.0V, 9.0V; V_{DD}=10V, I_{OUT} < 1\mu A$		4.50	3.0	
			$V_{OUT}=1.5V, 13.5V; V_{DD}=15V, I_{OUT} < 1\mu A$		6.75	4.0	
Output Voltage	High	V_{OH}	$V_{IN}=V_{SS}, V_{DD}; I_{OUT} < 1\mu A; V_{DD}=5V$	4.95	5.00		V
			$V_{IN}=V_{SS}, V_{DD}; I_{OUT} < 1\mu A; V_{DD}=10V$	9.95	10.00		
			$V_{IN}=V_{SS}, V_{DD}; I_{OUT} < 1\mu A; V_{DD}=15V$	14.95	15.00		
	Low	V_{OL}	$V_{IN}=V_{SS}, V_{DD}; I_{OUT} < 1\mu A; V_{DD}=5V$		0.00	0.05	
			$V_{IN}=V_{SS}, V_{DD}; I_{OUT} < 1\mu A; V_{DD}=10V$		0.00	0.05	
			$V_{IN}=V_{SS}, V_{DD}; I_{OUT} < 1\mu A; V_{DD}=15V$		0.00	0.05	
Input Current	High	I_{IH}	$V_{IH}=18V, V_{DD}=18V$		10^{-5}	0.1	uA
	Low	I_{IL}	$V_{IL}=0V, V_{DD}=18V$		-10^{-5}	-0.1	
Output Current	High	I_{OH}	$V_{OH}=4.6, V_{IN}=V_{SS}, V_{DD}; V_{DD}=5V$	-0.51	-1.0		mA
			$V_{OH}=2.5, V_{IN}=V_{SS}, V_{DD}; V_{DD}=5V$	-2.10	-4.0		
			$V_{OH}=9.5, V_{IN}=V_{SS}, V_{DD}; V_{DD}=10V$	-1.30	-2.2		
			$V_{OH}=13.5, V_{IN}=V_{SS}, V_{DD}; V_{DD}=15V$	-3.40	-9.0		
	Low	I_{OL}	$V_{OL}=0.4, V_{IN}=V_{SS}, V_{DD}; V_{DD}=5V$	0.51	1.2		
			$V_{OL}=0.5, V_{IN}=V_{SS}, V_{DD}; V_{DD}=10V$	1.30	3.2		
			$V_{OL}=1.5, V_{IN}=V_{SS}, V_{DD}; V_{DD}=15V$	3.40	12.0		
Quiescent Supply Current		I_{DD}	$V_{IN}=V_{SS}, V_{DD}(\text{Note}); V_{DD}=5V$		0.002	1	uA
			$V_{IN}=V_{SS}, V_{DD}(\text{Note}); V_{DD}=10V$		0.004	2	
			$V_{IN}=V_{SS}, V_{DD}(\text{Note}); V_{DD}=15V$		0.008	4	

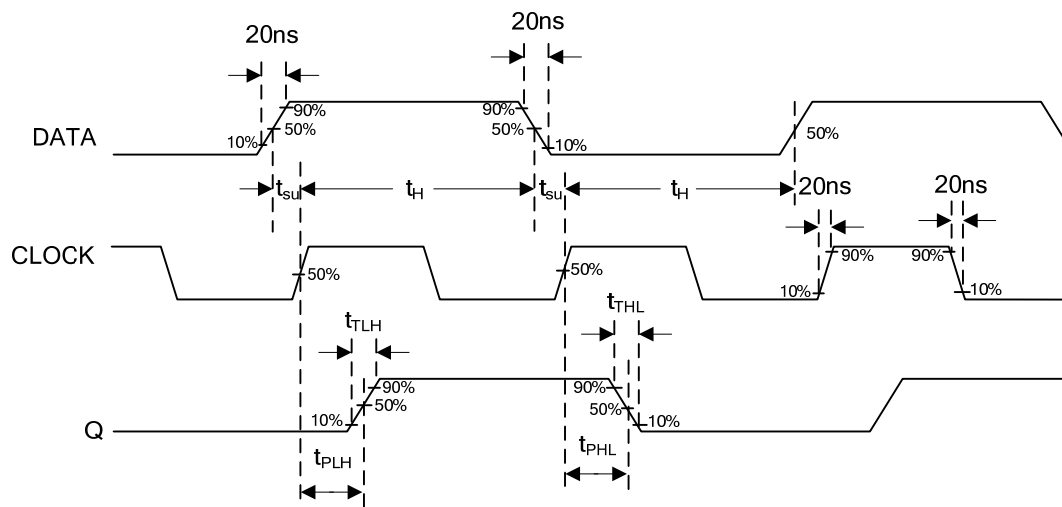
Note: All valid input combinations.

■ A.C. CHARACTERISTICS ($V_{SS}=0$, $T_A=25^\circ\text{C}$, $C_L=50\text{pF}$)

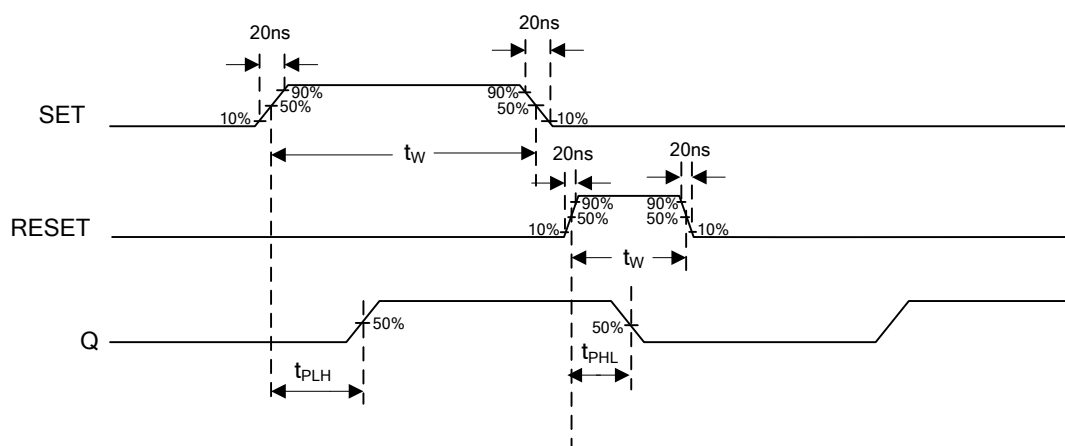
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Output Transition Time	Low to High	t _{TLH}	V _{DD} =5V		70	200	ns
			V _{DD} =10V		35	100	
			V _{DD} =15V		30	80	
	High to Low	t _{THL}	V _{DD} =5V		70	200	
			V _{DD} =10V		35	100	
			V _{DD} =15V		30	80	
Propagation Delay Time (CK – Q, $\overline{Q}$)		t _{pLH} t _{pHL}	V _{DD} =5V		130	300	
			V _{DD} =10V		65	130	
			V _{DD} =15V		50	90	
Propagation Delay Time (SET, RESET – Q, $\overline{Q}$)		t _{pLH}	V _{DD} =5V		110	300	
			V _{DD} =10V		50	130	
			V _{DD} =15V		40	90	
		t _{pHL}	V _{DD} =5V		110	300	
			V _{DD} =10V		50	130	
			V _{DD} =15V		40	90	
Max. Clock Frequency		f _{CL}	V _{DD} =5V	3.5	8.0		MHz
			V _{DD} =10V	8.0	16.0		
			V _{DD} =15V	12.0	20.0		
Max. Clock Input Rise Time		t _{rCL}	V _{DD} =5V	No Limit			μs
			V _{DD} =10V				
			V _{DD} =15V				
Max. Clock Input Fall Time		t _{fCL}	V _{DD} =5V	No Limit			μs
			V _{DD} =10V				
			V _{DD} =15V				
Min. Pulse Width (SET, RESET)		t _W	V _{DD} =5V		60	180	ns
			V _{DD} =10V		30	80	
			V _{DD} =15V		25	50	
Min. Clock Pulse Width		t _W	V _{DD} =5V		60	140	
			V _{DD} =10V		30	60	
			V _{DD} =15V		25	40	
Min. Set-up Time (DATA - CK)		t _{su}	V _{DD} =5V			40	ns
			V _{DD} =10V			20	
			V _{DD} =15V			15	
Min. Hold Time (DATA-CK)		t _H	V _{DD} =5V		20	40	
			V _{DD} =10V		10	20	
			V _{DD} =15V		6	15	
Min. Removal Time (SET, RESET-CK)		t _{rem}	V _{DD} =5V			40	
			V _{DD} =10V			20	
			V _{DD} =15V			15	
Input Capacitance		C _{IN}			5	7.5	pF

■ PARAMETER MEASUREMENT INFORMATION

1. DATA-CLOCK, Q



2. SET-RESET, Q



UTC assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all UTC products described or contained herein. UTC products are not designed for use in life support appliances, devices or systems where malfunction of these products can be reasonably expected to result in personal injury. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice.