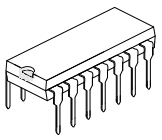
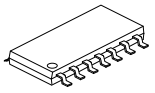
UTC4013

CMOS IC

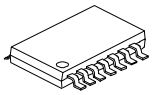
DUAL D-TYPE FLIP-FLOP



DIP-14



SOP-14



TSSOP-14

■ 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 $\overline{Q}$ output by rising edge of the clock pulse. When SET input is “H”, and RESET input is “L”, outputs become Q=”H” and $\overline{Q}$=”L”. When SET input is “L” and RESET input is “H”, outputs become Q=”L” and $\overline{Q}$=”H”. When both SET input and RESET input are at “H”, outputs become Q=”H” and $\overline{Q}$=”H”.

■ FEATURES

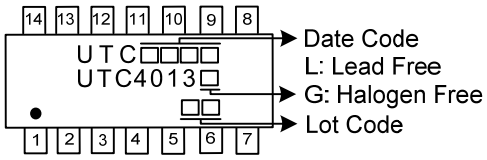
* Power supply voltage 3V to 18V
* Maximum quiescent supply current is 4μA

■ ORDERING INFORMATION

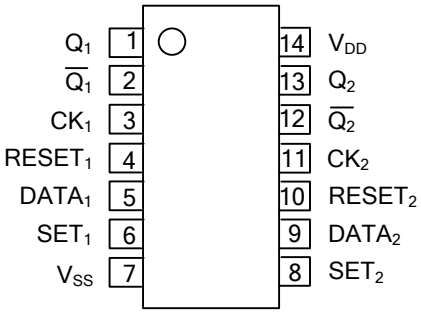
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UTC4013L-D14-T	UTC4013G-D14-T	DIP-14	Tube
UTC4013L-S14-R	UTC4013G-S14-R	SOP-14	Tape Reel
UTC4013L-P14-R	UTC4013G-P14-R	TSSOP-14	Tape Reel

UTC4013G-D14-T (1)Packing Type (2)Package Type (3)Green Package	(1) T: Tube, R: Tape Reel (2) D14: DIP-14, S14: SOP-14, P14: TSSOP-14 (3) G: Halogen Free and Lead Free, L: Lead Free

■ MARKING



■ PIN CONFIGURATION

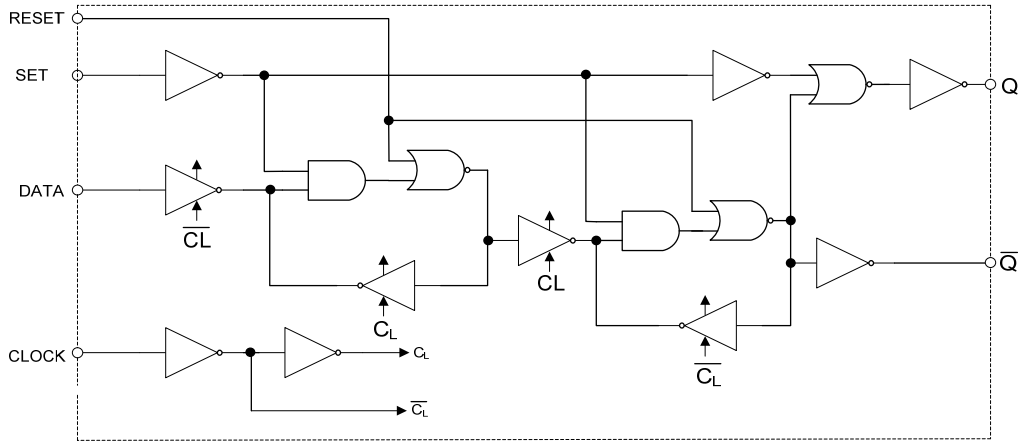


■ FUNCTION TABLE

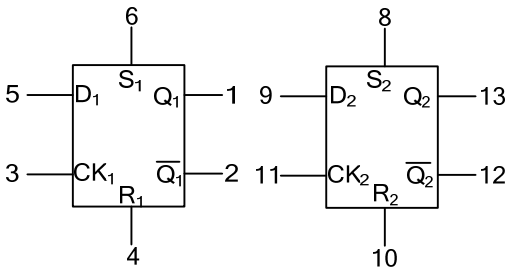
INPUTS				OUTPUTS	
RESET	SET	DATA	CK*	Qn+1	$\overline{Q}$ n+1
L	H	-	-	H	L
H	L	-	-	L	H
H	H	-	-	H	H
L	L	L	↑	L	H
L	L	H	↑	H	L
L	L	-	↓	No Change	No Change

Notes: - : Don't Care.
* : Level Change.

■ LOGIC DIAGRAM



■ BLOCK DIAGRAM



■ ABSOLUTE MAXIMUM RATING (T_A=25°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	DIP-14	P_D	750	mW
	SOP-14		550	mW
	TSSOP-14		450	
Operation Temperature		T_{OPR}	-40 ~ +85	°C
Storage Temperature		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 (V_{SS}=0, T_A=25°C, unless otherwise specified)

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°C, unless otherwise specified)

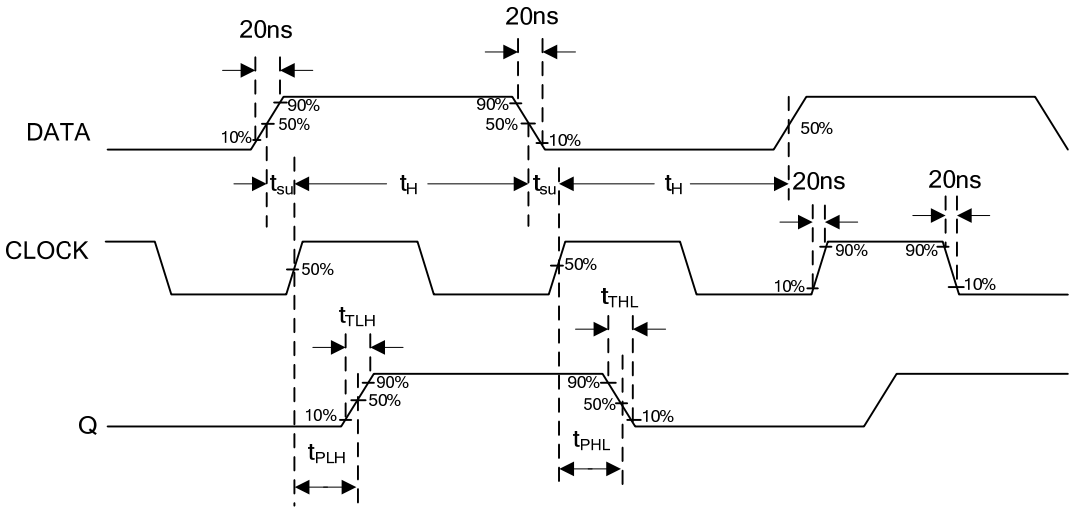
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Voltage	High	V_{IH}	V_{OUT}=0.5V, 4.5V;V_{DD}=5V, $\|I_{OUT}\|$<1μA	3.5			V
			V_{OUT}=1.0V, 9.0V; V_{DD}=10V, $\|I_{OUT}\|$<1μA	7.0			V
			V_{OUT}=1.5V, 13.5V; V_{DD}=15V, $\|I_{OUT}\|$<1μA	11.0			V
	Low	V_{IL}	V_{OUT}=0.5V, 4.5V; V_{DD}=5V, $\|I_{OUT}\|$<1μA			1.5	V
			V_{OUT}=1.0V, 9.0V; V_{DD}=10V, $\|I_{OUT}\|$<1μA			3.0	V
			V_{OUT}=1.5V, 13.5V; V_{DD}=15V, $\|I_{OUT}\|$<1μA			4.0	V
Output Voltage	High	V_{OH}	V_{IN}=V_{SS}, V_{DD}; $\|I_{OUT}\|$<1μA; V_{DD}=5V	4.95	5.00		V
			V_{IN}=V_{SS}, V_{DD}; $\|I_{OUT}\|$<1μA; V_{DD}=10V	9.95	10.00		V
			V_{IN}=V_{SS}, V_{DD}; $\|I_{OUT}\|$<1μA; V_{DD}=15V	14.95	15.00		V
	Low	V_{OL}	V_{IN}=V_{SS}, V_{DD}; $\|I_{OUT}\|$<1μA; V_{DD}=5V		0.00	0.05	V
			V_{IN}=V_{SS}, V_{DD}; $\|I_{OUT}\|$<1μA; V_{DD}=10V		0.00	0.05	V
			V_{IN}=V_{SS}, V_{DD}; $\|I_{OUT}\|$<1μA; V_{DD}=15V		0.00	0.05	V
Input Current	High	I_{IH}	V_{IH}=18V, V_{DD}=18V			0.1	μA
	Low	I_{IL}	V_{IL}=0V, V_{DD}=18V			-0.1	μA
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		mA
			V_{OH}=9.5, V_{IN}=V_{SS}, V_{DD}; V_{DD}=10V	-1.30	-2.2		mA
			V_{OH}=13.5, V_{IN}=V_SS, V_{DD}; V_{DD}=15V	-3.40	-9.0		mA
	Low	I_{OL}	V_{OL}=0.4, V_{IN}=V_{SS}, V_{DD}; V_{DD}=5V	0.51	1.2		mA
			V_{OL}=0.5, V_{IN}=V_{SS}, V_{DD}; V_{DD}=10V	1.30	3.2		mA
			V_{OL}=1.5, V_{IN}=V_{SS}, V_{DD}; V_{DD}=15V	3.40	12.0		mA
Quiescent Supply Current		I_{DD}	V_{IN}=V_{SS}, V_{DD}; V_{DD}=5V			1	μA
			V_{IN}=V_{SS}, V_{DD}; V_{DD}=10V			2	μA
			V_{IN}=V_{SS}, V_{DD}; V_{DD}=15V			4	μA

■ A.C. CHARACTERISTICS (V_{SS}=0, C_L=50pF, T_A=25°C, unless otherwise specified)

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	ns
			V_{DD}=15V		30	80	ns
	High to Low	t_{THL}	V_{DD}=5V		70	200	ns
			V_{DD}=10V		35	100	ns
			V_{DD}=15V		30	80	ns
Propagation Delay Time (CK – Q, $\overline{Q}$)		t_{pLH} t_{pHL}	V_{DD}=5V		130	300	ns
			V_{DD}=10V		65	130	ns
			V_{DD}=15V		50	90	ns
Propagation Delay Time (SET, RESET – Q, $\overline{Q}$)		t_{pLH}	V_{DD}=5V		110	300	ns
			V_{DD}=10V		50	130	ns
			V_{DD}=15V		40	90	ns
		t_{pHL}	V_{DD}=5V		110	300	ns
			V_{DD}=10V		50	130	ns
			V_{DD}=15V		40	90	ns
Max. Clock Frequency		f_{CL}	V_{DD}=5V	3.5	8.0		MHz
			V_{DD}=10V	8.0	16.0		MHz
			V_{DD}=15V	12.0	20.0		MHz
Clock Input Rise or Fall Time		t_{rCL} / t_{fCL}	V_{DD}=5V			15	μs
			V_{DD}=10V			10	μs
			V_{DD}=15V			5	μs
Min. Pulse Width (SET, RESET)		t_W	V_{DD}=5V		60	180	ns
			V_{DD}=10V		30	80	ns
			V_{DD}=15V		25	50	ns
Min. Clock Pulse Width		t_W	V_{DD}=5V		60	140	ns
			V_{DD}=10V		30	60	ns
			V_{DD}=15V		25	40	ns
Min. Set-up Time (DATA - CK)		t_{su}	V_{DD}=5V			40	ns
			V_{DD}=10V			20	ns
			V_{DD}=15V			15	ns
Min. Hold Time (DATA-CK)		t_H	V_{DD}=5V		20	40	ns
			V_{DD}=10V		10	20	ns
			V_{DD}=15V		6	15	ns
Min. Removal Time (SET, RESET-CK)		t_{rem}	V_{DD}=5V			40	ns
			V_{DD}=10V			20	ns
			V_{DD}=15V			15	ns
Input Capacitance		C_{IN}			5	7.5	pF

■ PARAMETER MEASUREMENT INFORMATION

1. DATA-CLOCK, Q



2. SET-RESET, Q