



CD4014B

Preliminary

CMOS IC

CMOS 8-STAGE STATIC SHIFT REGISTERS

DESCRIPTION

The UTC CD4014 is a 8-stage synchronous parallel or serial input/serial output registers having common CLOCK and PARALLEL/SERIAL CONTROL inputs, a SERIAL data input, and individual parallel inputs to each register stage. Each register is a D-type master-slave flip-flop. Q6, Q7, and Q8 are outputs. With the positive clock line transition in the CD4014 parallel/serial entry is made into the register synchronously.

In CD4014 serial entry is controlled by the PARALLEL/SERIAL CONTROL input. When the PARALLEL/SERIAL CONTROL input is low, data is serially shifted into the 8-stage register synchronously with the positive transition of the clock line. When the PARALLEL/SERIAL CONTROL input is high, data is jammed into the 8-stage register via the parallel input lines and synchronous with the positive transition of the clock line.

FEATURES

- * Up to 20V operation voltage
* 12MHz (typ.) clock rate at 10V
* Maximum input current of 1µA at 18V
* Fully static operation
* 8 master-slave flip-flops plus output buffering and control gating

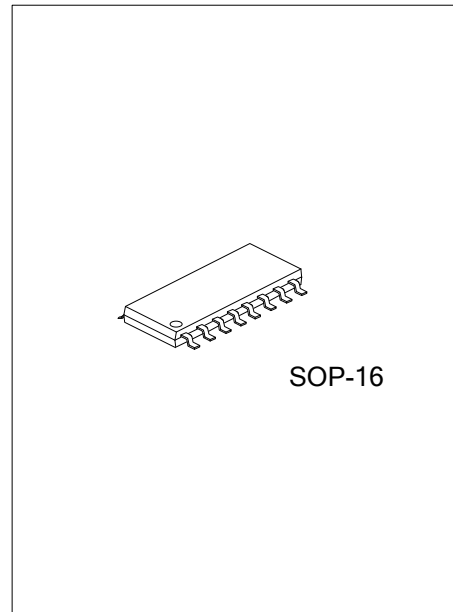
APPLICATIONS

- * General-purpose register
* Parallel input/serial output data queueing
* Parallel to serial data conversion

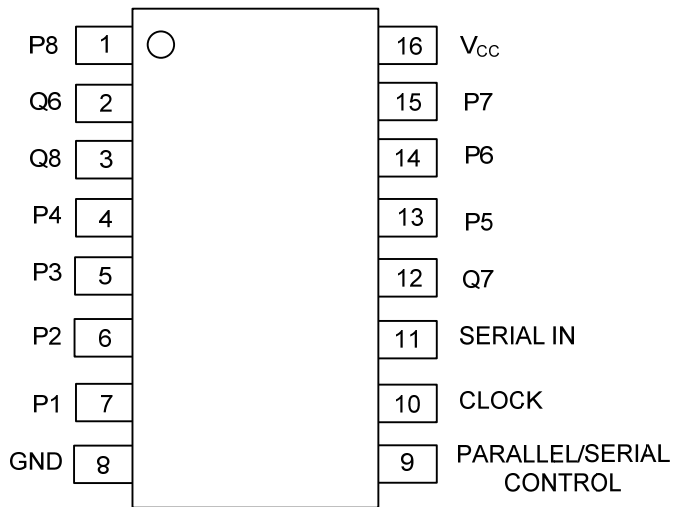
ORDERING INFORMATION

Table with 4 columns: Ordering Number (Lead Free, Halogen Free), Package, Packing. Rows include CD4014BL-S16-R and CD4014BG-S16-R.

Table explaining ordering information for CD4014BL-S16-R, detailing (1) Packing Type, (2) Package Type, and (3) Lead Free options.



■ PIN CONFIGURATION



■ LOGIC DIAGRAM

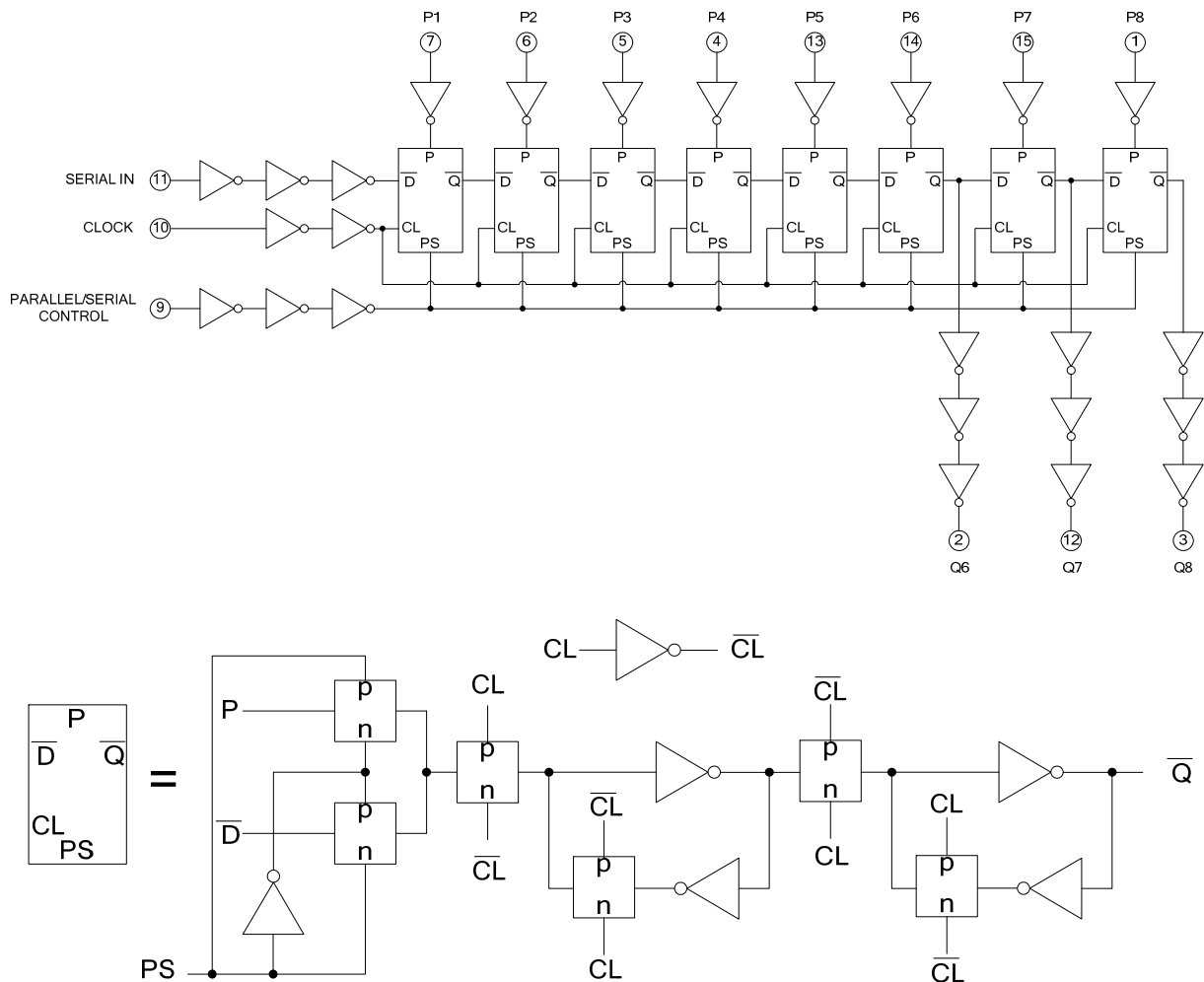


Fig.1 logic diagram

■ TRUE TABLE

CL	SER IN	PAR SER CONTROL	P ₁	P _n	Q ₁ (INTERNAL)	Q _n
	X	1	0	0	0	0
	X	1	1	0	1	0
	X	1	0	1	0	1
	X	1	1	1	1	1
	0	0	X	X	0	Q _{n-1}
	1	0	X	X	1	Q _{n-1}
	X	X	X	X	Q ₁ (NC)	Q _N (NC)

Note: X = Don't Care Case, NC = No Change

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

PARAMETER	SYMBOL	RATINGS	UNIT	
Supply Voltage	V_{CC}	-0.5 ~ 20	V	
Input Voltage	V_{IN}	-0.5 ~ $V_{CC} + 0.5$	V	
Output Voltage	V_{OUT}	-0.5 ~ $V_{CC} + 0.5$	V	
Input Clamp Current ($V_{IN} < 0$, or $V_{IN} > V_{CC}$)	I_{IK}	± 10	mA	
Power Dissipation	P_D	$T_A = -55^\circ\text{C}$ to $+100^\circ\text{C}$	500	mW
		$T_A = +100^\circ\text{C}$ to $+125^\circ\text{C}$	200	mW
Storage Temperature	T_{STG}	-65 ~ +150	$^\circ\text{C}$	

Note: 1. 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.

2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

■ RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	MAX	UNIT
Supply Voltage	V_{CC}		3	18	V
Clock Pulse Width	t_w	$V_{CC} = 5V$	180	-	ns
		$V_{CC} = 10V$	80	-	
		$V_{CC} = 15V$	50	-	
Clock Frequency	f_{CL}	$V_{CC} = 5V$	-	3	MHz
		$V_{CC} = 10V$	-	6	
		$V_{CC} = 15V$	-	8.5	
Clock Rise and Fall Time	t_r, t_f	$V_{CC} = 5V$	-	15	μs
		$V_{CC} = 10V$	-	15	
		$V_{CC} = 15V$	-	15	
Set-up Time, Serial Input	t_s	$V_{CC} = 5V$	120	-	ns
		$V_{CC} = 10V$	80	-	
		$V_{CC} = 15V$	60	-	
Set-up Time, Parallel Input		$V_{CC} = 5V$	80	-	ns
		$V_{CC} = 10V$	50	-	
		$V_{CC} = 15V$	40	-	
Set-up Time, Parallel/Serial Control		$V_{CC} = 5V$	180	-	ns
		$V_{CC} = 10V$	80	-	
		$V_{CC} = 15V$	60	-	

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

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Quiescent Supply Current	I_{CC}	$V_{IN} = 0, 5\text{V}, V_{CC} = 5\text{V}$		0.04	5	μA
		$V_{IN} = 0, 10\text{V}, V_{CC} = 10\text{V}$		0.04	10	
		$V_{IN} = 0, 15\text{V}, V_{CC} = 15\text{V}$		0.04	20	
		$V_{IN} = 0, 20\text{V}, V_{CC} = 20\text{V}$		0.08	100	
Output Low (Sink) Current	I_{OL}	$V_{OUT} = 0.4\text{V}, V_{IN} = 0, 5\text{V}, V_{CC} = 5\text{V}$	0.51	1		mA
		$V_{OUT} = 0.5\text{V}, V_{IN} = 0, 10\text{V}, V_{CC} = 10\text{V}$	1.3	2.6		
		$V_{OUT} = 1.5\text{V}, V_{IN} = 0, 15\text{V}, V_{CC} = 15\text{V}$	3.4	6.8		
Output High (Source) Current	I_{OH}	$V_{OUT} = 4.6\text{V}, V_{IN} = 0, 5\text{V}, V_{CC} = 5\text{V}$	-0.51	-1		mA
		$V_{OUT} = 2.5\text{V}, V_{IN} = 0, 5\text{V}, V_{CC} = 5\text{V}$	-1.6	-3.2		
		$V_{OUT} = 9.5\text{V}, V_{IN} = 0, 10\text{V}, V_{CC} = 10\text{V}$	-1.3	-2.6		
		$V_{OUT} = 13.5\text{V}, V_{IN} = 0, 15\text{V}, V_{CC} = 15\text{V}$	-3.4	-6.8		
Output Voltage: Low-Level	V_{OL}	$V_{IN} = 0, 5\text{V}, V_{CC} = 5\text{V}$		0	0.05	V
		$V_{IN} = 0, 10\text{V}, V_{CC} = 10\text{V}$		0	0.05	
		$V_{IN} = 0, 15\text{V}, V_{CC} = 15\text{V}$		0	0.05	
Output Voltage: High-Level	V_{OH}	$V_{IN} = 0, 5\text{V}, V_{CC} = 5\text{V}$	4.95	5		V
		$V_{IN} = 0, 10\text{V}, V_{CC} = 10\text{V}$	9.95	10		
		$V_{IN} = 0, 15\text{V}, V_{CC} = 15\text{V}$	14.95	15		
Input Low Voltage	V_{IL}	$V_{OUT} = 0.5, 4.5\text{V}, V_{CC} = 5\text{V}$			1.5	V
		$V_{OUT} = 1, 9\text{V}, V_{CC} = 10\text{V}$			3	
		$V_{OUT} = 1.5, 13.5\text{V}, V_{CC} = 15\text{V}$			4	
Input High Voltage	V_{IH}	$V_{OUT} = 0.5, 4.5\text{V}, V_{CC} = 5\text{V}$	3.5			V
		$V_{OUT} = 1, 9\text{V}, V_{CC} = 10\text{V}$	7			
		$V_{OUT} = 1.5, 13.5\text{V}, V_{CC} = 15\text{V}$	11			
Input Leakage Current	$I_{I(LEAK)}$	$V_{IN} = 0, 18\text{V}, V_{CC} = 18\text{V}$		$\pm 10^{-5}$	± 0.1	μA

■ SWITCHING CHARACTERISTICS ($T_A = 25^\circ\text{C}$, Input $t_r, t_f = 20\text{ns}$, $C_L = 50\text{pF}$, $R_L = 200\text{k}\Omega$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Time	t_{PLH} / t_{PHL}	$V_{CC}=5\text{V}$		160	320	ns
		$V_{CC}=10\text{V}$		80	160	
		$V_{CC}=15\text{V}$		60	120	
Transition Time	t_{THL} / t_{TLH}	$V_{CC}=5\text{V}$		100	200	ns
		$V_{CC}=10\text{V}$		50	100	
		$V_{CC}=15\text{V}$		40	80	
Maximum Clock Input Frequency	f_{CL}	$V_{CC}=5\text{V}$	3	6		MHz
		$V_{CC}=10\text{V}$	6	12		
		$V_{CC}=15\text{V}$	8.5	17		
Minimum Clock Pulse Width	t_w	$V_{CC}=5\text{V}$		90	180	ns
		$V_{CC}=10\text{V}$		40	80	
		$V_{CC}=15\text{V}$		25	50	
Clock Rise and Fall Time	t_r / t_f	$V_{CC}=5\text{V}$			15	μs
		$V_{CC}=10\text{V}$			15	
		$V_{CC}=15\text{V}$			15	
Minimum Setup Time, Serial Inputs	t_s	$V_{CC}=5\text{V}$		60	120	ns
		$V_{CC}=10\text{V}$		40	80	
		$V_{CC}=15\text{V}$		30	60	
Minimum Setup Time, Parallel Inputs	t_s	$V_{CC}=5\text{V}$		40	80	ns
		$V_{CC}=10\text{V}$		25	50	
		$V_{CC}=15\text{V}$		20	40	
Minimum Hold Time, Serial In, Parallel In, Parallel/Serial Control	t_H	$V_{CC}=5\text{V}$			0	ns
		$V_{CC}=10\text{V}$			0	
		$V_{CC}=15\text{V}$			0	
Average Input Capacitance	C_i	Any Input		5	7.5	pF

■ TEST CIRCUITS AND WAVEFORMS

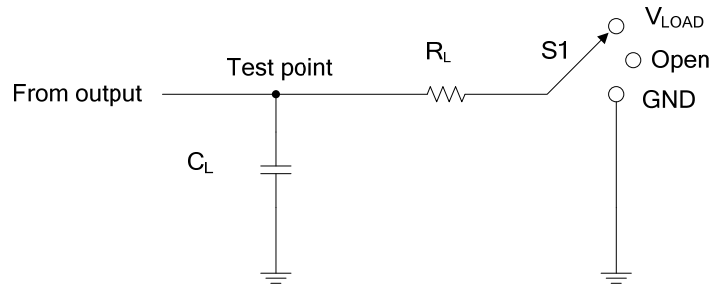


Fig 1. Test Circuit

Test	S1
t_{PLH}/t_{PHL}	GND

Inputs		V_M	V_{LOAD}	C_L	R_L
V_{IN}	t_r, t_f				
V_{CC}	20 ns	$V_{CC}/2$	V_{CC}	50 pF	200 K Ω

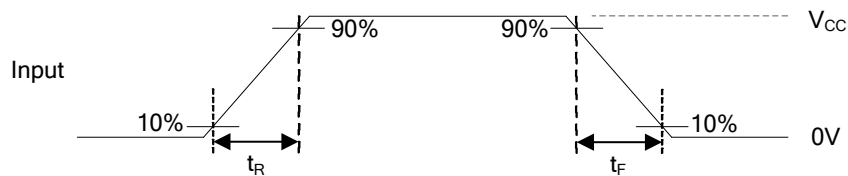


Fig 2. Voltage Waveforms Input Rise and Fall Times

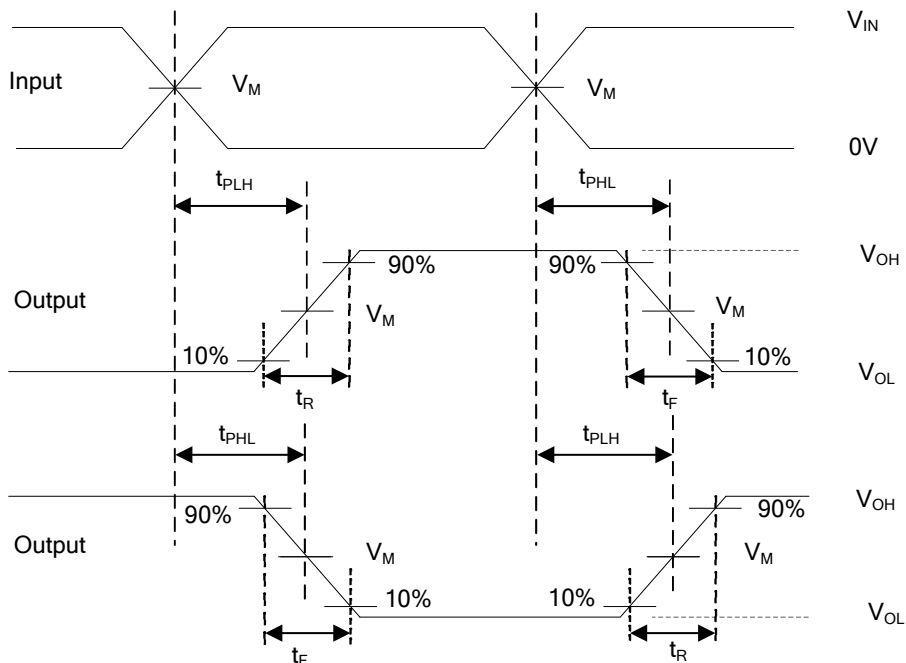


Fig 3. Voltage Waveforms Propagation Delay and Output Transition Times

Notes: 1. C_L includes probe and jig capacitance.

2. All input pulses are supplied by generators having the following characteristics: PRR \leq 1MHz, $Z_0 = 50\Omega$.

■ TEST CIRCUITS AND WAVEFORMS(Cont.)

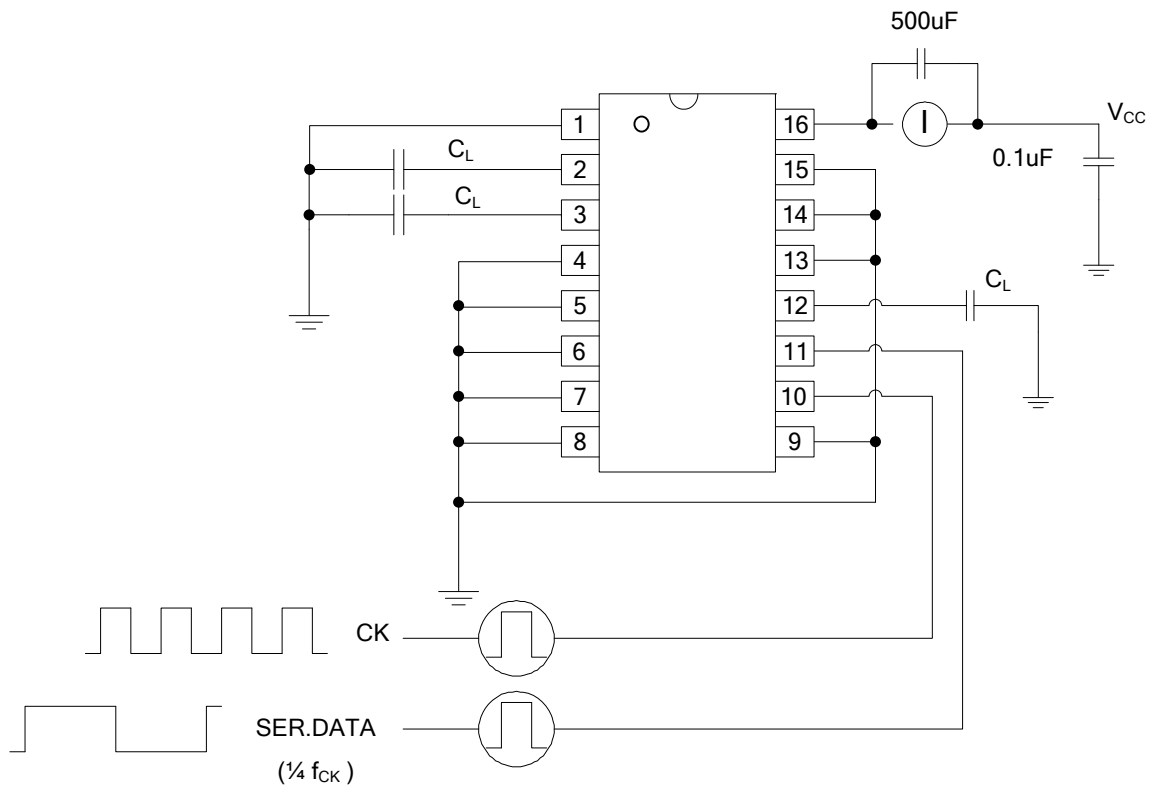


Fig 4. Dynamic power dissipation test circuit

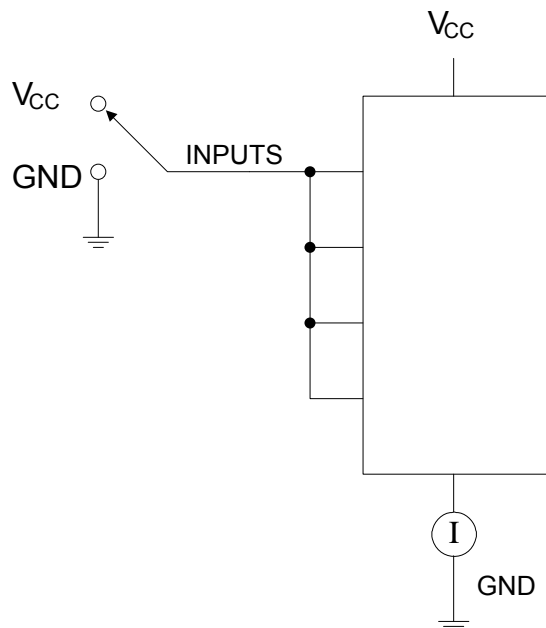


Fig 5. Quiescent device current test circuit

■ TEST CIRCUITS AND WAVEFORMS(Cont.)

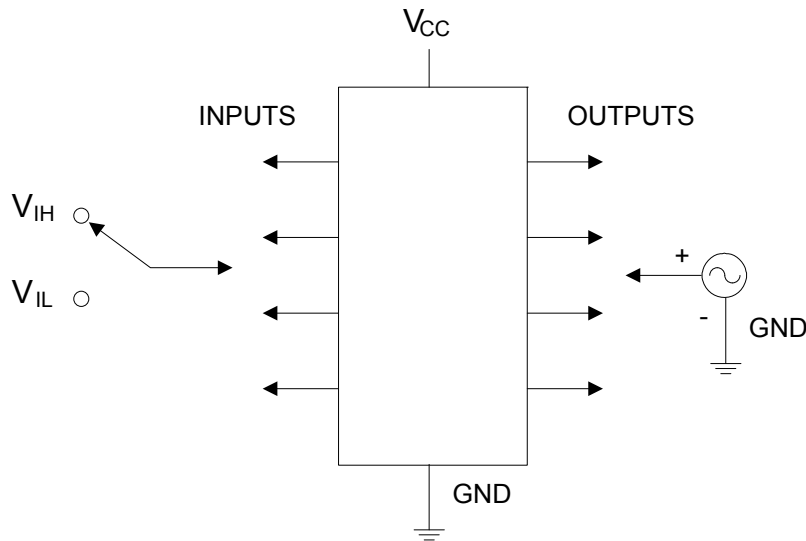


Fig 6. Input voltage test circuit

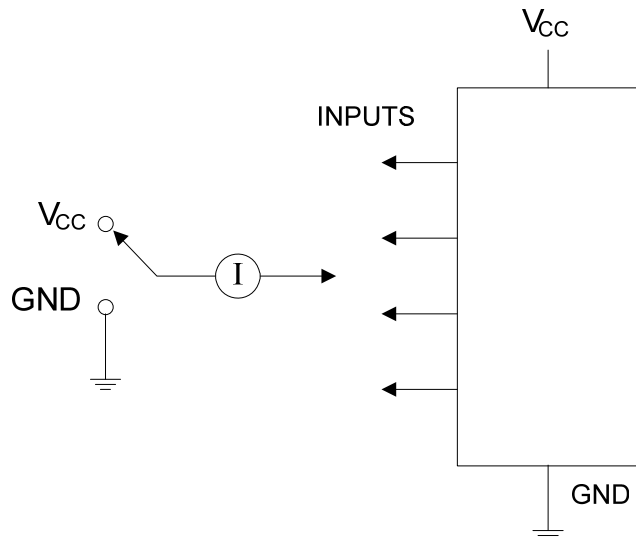


Fig 7. Input current test circuit

Note: measure inputs sequentially, to both V_{CC} and GND; connect all unused inputs to either V_{CC} or GND.

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.