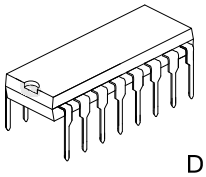
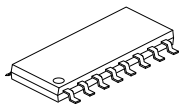
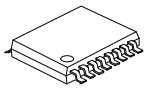
CMOS 8-STAGE STATIC SHIFT REGISTERS



DIP-16



SOP-16



TSSOP-16

■ DESCRIPTION

The **UCD4021B** 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. In **UCD4021B** serial entry is synchronous with the clock but parallel entry is asynchronous.

In **UCD4021B** 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, asynchronous parallel entry is made and the CLOCK input of the internal stage is isolated.

■ 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

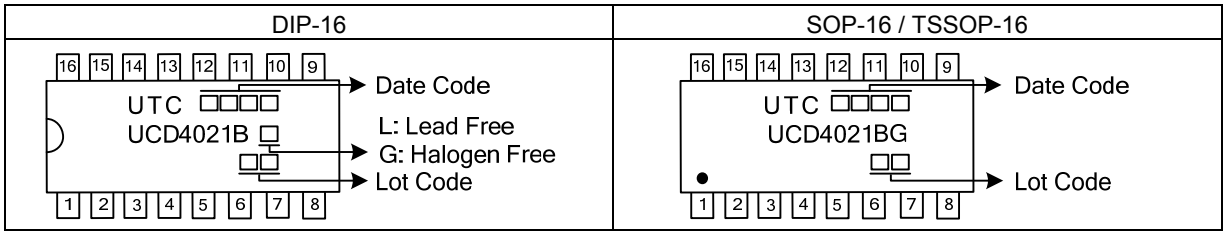
Ordering Number		Package	Packing
Lead Free	Halogen Free		
UCD4021BL-D16-T	UCD4021BG-D16-T	DIP-16	Tube
-	UCD4021BG-S16-R	SOP-16	Tape Reel
-	UCD4021BG-P16-R	TSSOP-16	Tape Reel

UCD4021BL-D16-T

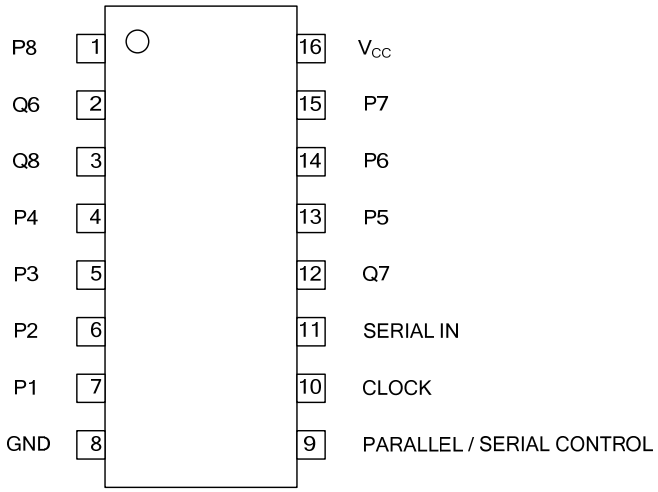
(1)Packing Type
(2)Package Type
(3)Green Package

(1) T: Tube, R: Tape Reel
(2) D16: DIP-16, S16: SOP-16, P16: TSSOP-16
(3) L: Lead Free, G: Halogen Free and Lead Free

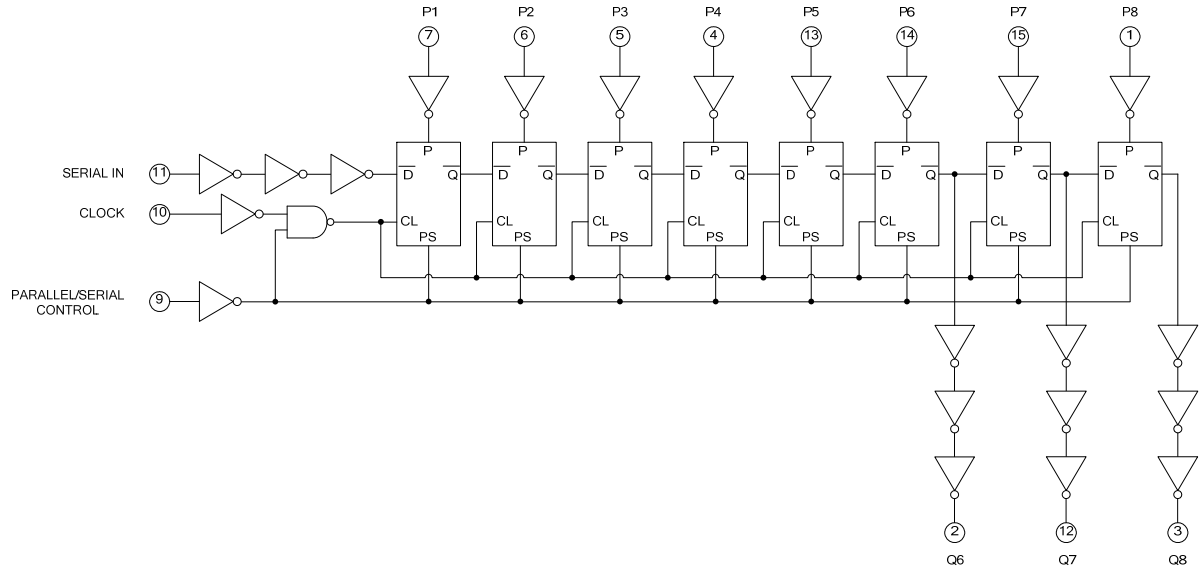
■ MARKING

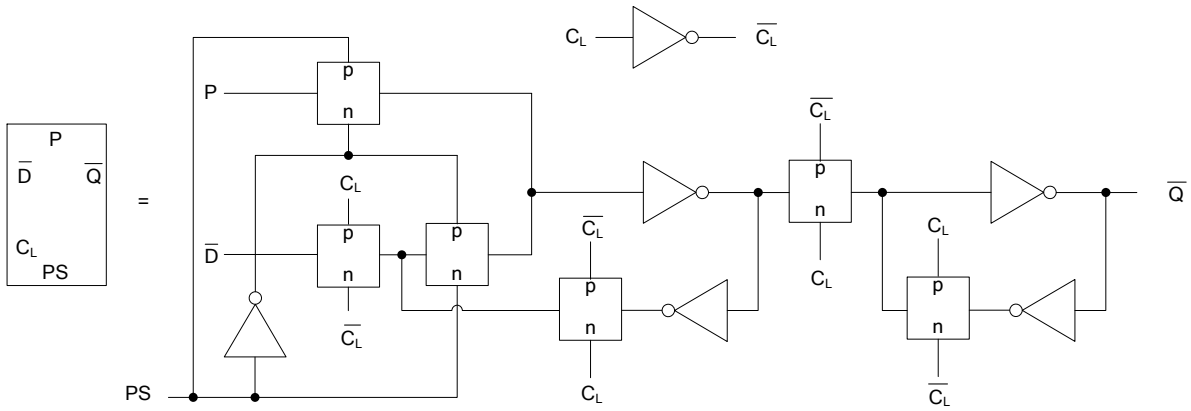


■ PIN CONFIGURATION



■ LOGIC DIAGRAM





■ TRUE TABLE

C_L	SER IN	PAR SER CONTROL	P_1	P_n	Q_1 (INTERNAL)	Q_n
X	X	1	0	0	0	0
X	X	1	0	1	0	1
X	X	1	1	0	1	0
X	X	1	1	1	1	1
↑	0	0	X	X	0	Q_{n-1}
↑	1	0	X	X	1	Q_{n-1}
↓	X	0	X	X	Q_1 (NC)	Q_n (NC)

NOTE: X = DON'T CARE CASE, NC = NO CHANGE

■ ABSOLUTE MAXIMUM RATING (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	DIP-16	P_D	750	mW
	SOP-16		500	mW
	TSSOP-16		450	mW
Operating Temperature		T_{OPR}	-40 ~ +125	°C
Storage Temperature		T_{STG}	-65 ~ +150	°C

Note: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. 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.

■ THERMAL DATA

PARAMETER		SYMBOL	RATINGS	UNIT
Junction to Ambient	DIP-16	θ_{JA}	67	°C/W
	SOP-16		73	°C/W
	TSSOP-16		108	°C/W

■ RECOMMENDED OPERATING COMDITIONS

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	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 Inputs		V_{CC} = 5V	50			ns
		V_{CC} = 10V	30			
		V_{CC} = 15V	20			
Parallel/Serial Pulse Width	t_W	V_{CC} = 5V	160			ns
		V_{CC} = 10V	80			
		V_{CC} = 15V	50			
Parallel/Serial Removal Time	t_{REM}	V_{CC} = 5V	280			ns
		V_{CC} = 10V	140			
		V_{CC} = 15V	100			

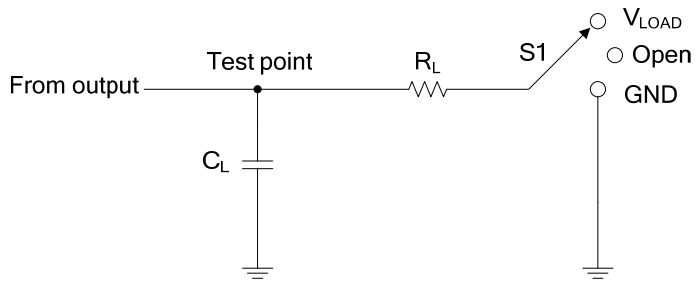
■ ELECTRICAL CHARACTERISTICS (T_A =25°C , unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Quiescent Supply Current	I_{DD}	V_{IN}=0, 5V, V_{DD}=5V		0.04	5	μA
		V_{IN}=0, 10V, V_{DD}= 0V		0.04	10	
		V_{IN}=0, 15V, V_{DD}=15V		0.04	20	
		V_{IN}=0, 20V, V_{DD}=20V		0.08	100	
Output Low (Sink) Current	I_{OL}	V_{OUT}=0.4V, V_{IN}=0, 5V, V_{DD}=5V	0.51	1		mA
		V_{OUT}=0.5V, V_{IN}=0, 10V, V_{DD}=10V	1.3	2.6		
		V_{OUT}=1.5V, V_{IN}=0, 15V, V_{DD}=15V	3.4	6.8		
Output High (Source) Current	I_{OH}	V_{OUT}=4.6V, V_{IN}=0, 5V, V_{DD}=5V	-0.51	-1		mA
		V_{OUT}=2.5V, V_{IN}=0, 5V, V_{DD}=5V	-1.6	-3.2		
		V_{OUT}=9.5V, V_{IN}=0, 10V, V_{DD}=10V	-1.3	-2.6		
		V_{OUT}=3.5V, V_{IN}=0, 15V, V_{DD}=15V	-3.4	-6.8		
Output Voltage: Low-Level	V_{OL}	V_{IN}=0, 5V, V_{DD}=5V		0	0.05	V
		V_{IN}=0, 10V, V_{DD}=10V		0	0.05	
		V_{IN}=0, 15V, V_{DD}=15V		0	0.05	
Output Voltage: High-Level	V_{OH}	V_{IN}=0, 5V, V_{DD}=5V	4.95	5		V
		V_{IN}=0, 10V, V_{DD}=10V	9.95	10		
		V_{IN}=0, 15V, V_{DD}=15V	14.95	15		
Input Low Voltage	V_{IL}	V_{OUT}=0.5, 4.5V, V_{DD}=5V			1.5	V
		V_{OUT}=1, 9V, V_{DD}=10V			3	
		V_{OUT}=1.5, 13.5V, V_{DD}=15V			4	
Input High Voltage	V_{IH}	V_{OUT}=0.5, 4.5V, V_{DD}=5V	3.5			V
		V_{OUT}=1, 9V, V_{DD}=10V	7			
		V_{OUT}=1.5, 13.5V, V_{DD}=15V	11			
Input Leakage Current	$I_{I(LEAK)}$	V_{IN}=0, 18 V, V_{DD}=18V		$\pm10^{-5}$	±0. 1	μA

■ SWITCHING CHARACTERISTICS (T_A =25°C, Input t_r, t_f =20ns, C_L =50Pf, R_L = 200KΩ)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Time	t_{PLH} / t_{PHL}	V_{DD}=5V		160	320	ns
		V_{DD}=10V		80	160	
		V_{DD}=15V		60	120	
Transition Time	t_{THL}/ t_{TLH}	V_{DD}=5V		100	200	ns
		V_{DD}=10V		50	100	
		V_{DD}=15V		40	80	
Maximum Clock Input Frequency	f_{CL}	V_{DD}=5V	3	6		MHz
		V_{DD}=10V	6	12		
		V_{DD}=15V	8.5	17		
Minimum Clock Pulse Width	t_W	V_{DD}=5V		90	180	ns
		V_{DD}=10V		40	80	
		V_{DD}=15V		25	50	
Clock Rise and Fall Time	t_r / t_f	V_{DD}=5V			15	μs
		V_{DD}=10V			15	
		V_{DD}=15V			15	
Minimum Setup Time, Serial Inputs	t_S	V_{DD}=5V		60	120	ns
		V_{DD}=10V		40	80	
		V_{DD}=15V		30	60	
Minimum Setup Time, Parallel Inputs	t_S	V_{DD}=5V		25	50	ns
		V_{DD}=10V		15	30	
		V_{DD}=15V		10	20	
Minimum Setup Time, Parallel/Serial Control	t_S	V_{DD}=5V		90	180	ns
		V_{DD}=10V		40	80	
		V_{DD}=15V		30	60	
Minimum Hold Time, Serial In, Parallel In, Parallel/Serial Control	t_H	V_{DD}=5V			0	ns
		V_{DD}=10V			0	
		V_{DD}=15V			0	
Minimum P/S Pulse Width	t_{WH}	V_{DD}=5V		80	160	ns
		V_{DD}=10V		40	80	
		V_{DD}=15V		25	50	
Minimum P/S Removal Time	t_{REM}	V_{DD}=5V		140	280	ns
		V_{DD}=10V		70	140	
		V_{DD}=15V		50	100	
Average Input Capacitance	C_I	Any Input		5	7.5	pF

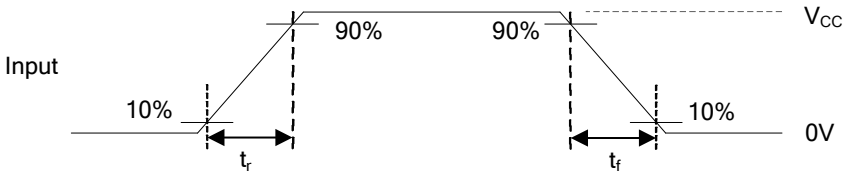
■ TEST CIRCUIT AND WAVEFORMS



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

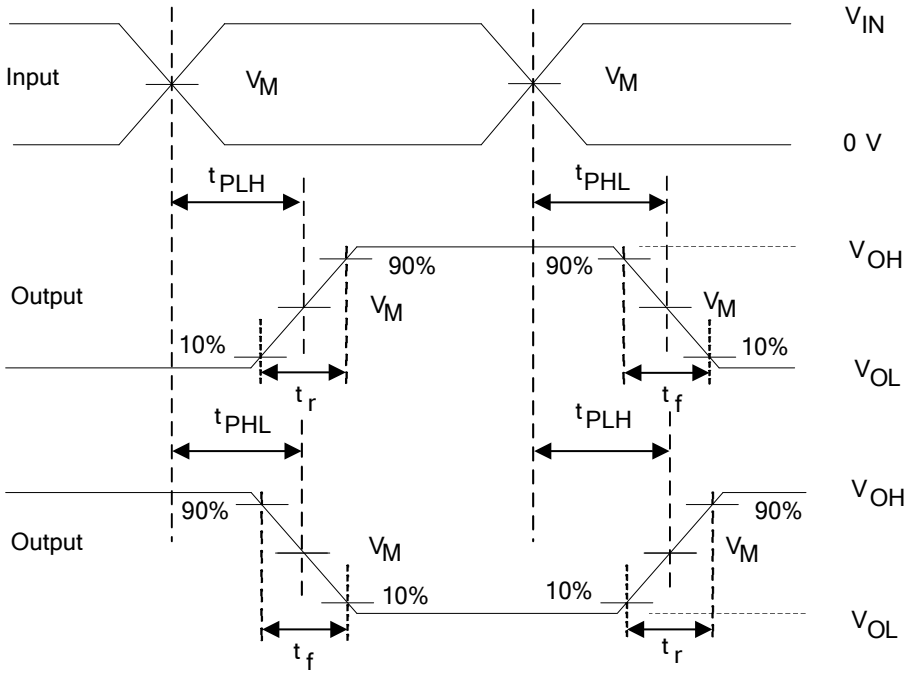
TEST CIRCUIT

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 KΩ



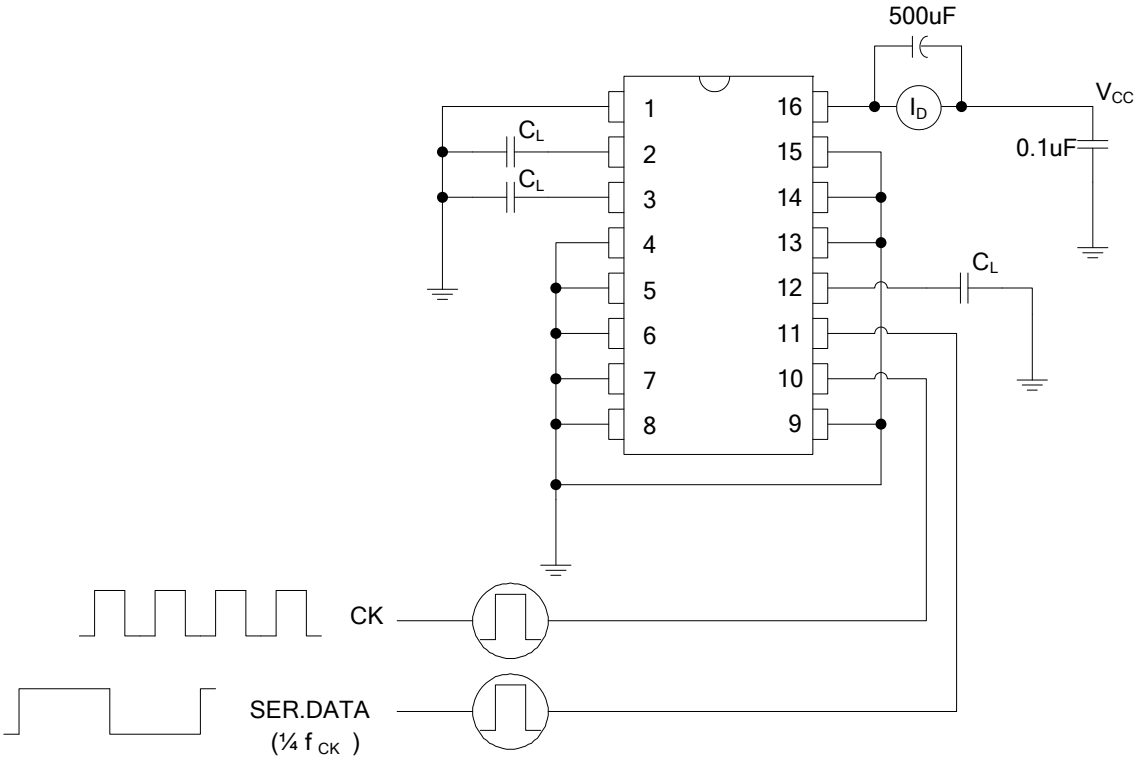
VOLTAGE WAVEFORMS
INPUT RISE AND FALL TIMES

■ TEST CIRCUIT AND WAVEFORMS(Cont.)



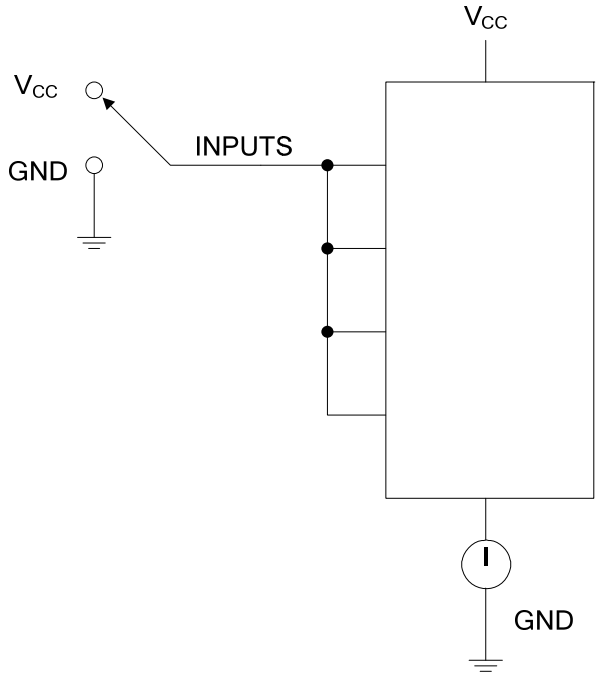
VOLTAGE WAVEFORMS
PROPAGATION DELAY AND OUTPUT TRANSITION TIMES

Notes: 1. C_L includes probe and jig capacitance.
2. All input pulses are supplied by generators having the following characteristics: PRR ≤1MHz, Z_O = 50Ω.

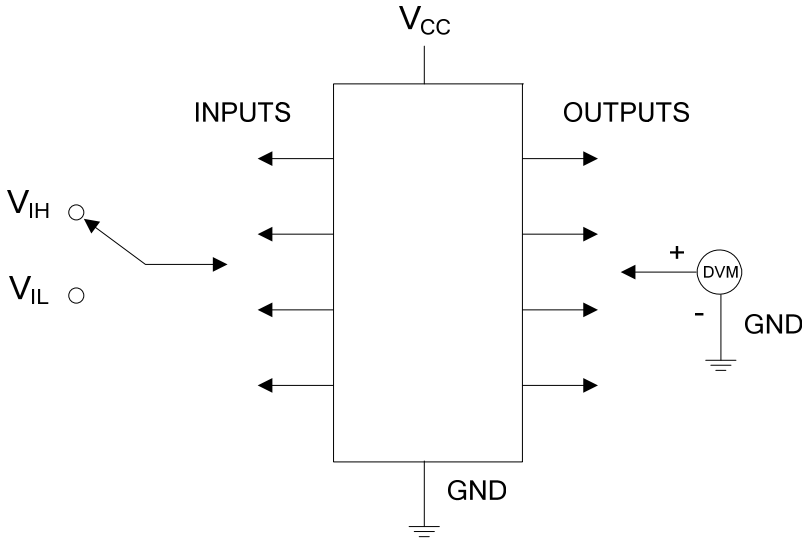


DYNAMIC POWER DISSIPATION TEST CIRCUIT

■ TEST CIRCUIT AND WAVEFORMS(Cont.)

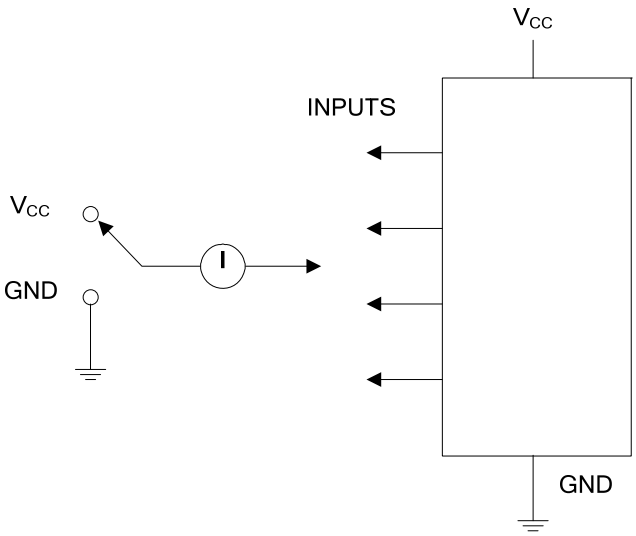


QUIESCENT DEVICE CURRENT TEST CIRCUIT



INPUT VOLTAGE TEST CIRCUIT

■ TEST CIRCUIT AND WAVEFORMS(Cont.)



INPUT CURRENT TEST CIRCUIT

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