

**UCD4021B**

Preliminary

CMOS IC

**CMOS 8-STAGE STATIC
SHIFT REGISTERS**■ **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

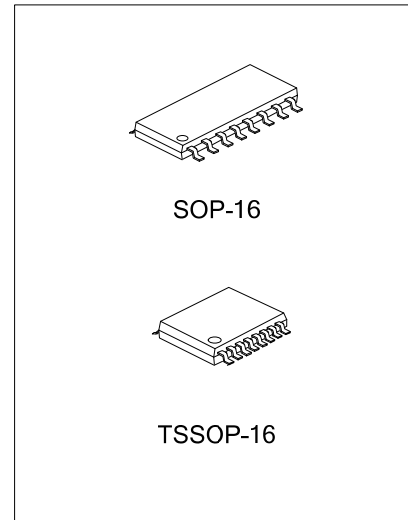
■ **ORDERING INFORMATION**

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

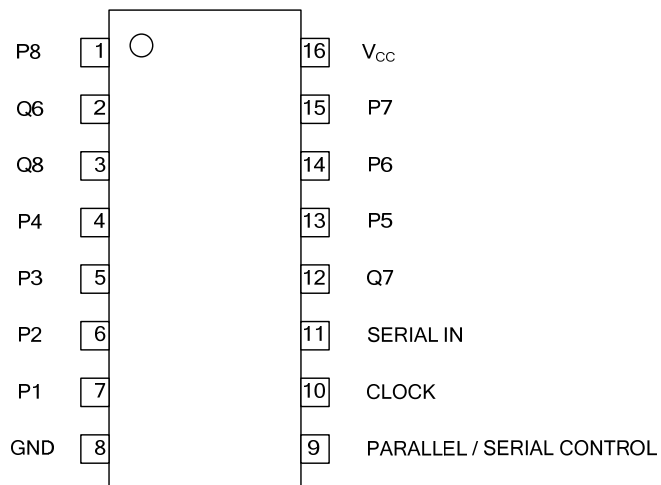
UCD4021BL-S16-R

- (1)Packing Type
- (2)Package Type
- (3)Lead Free

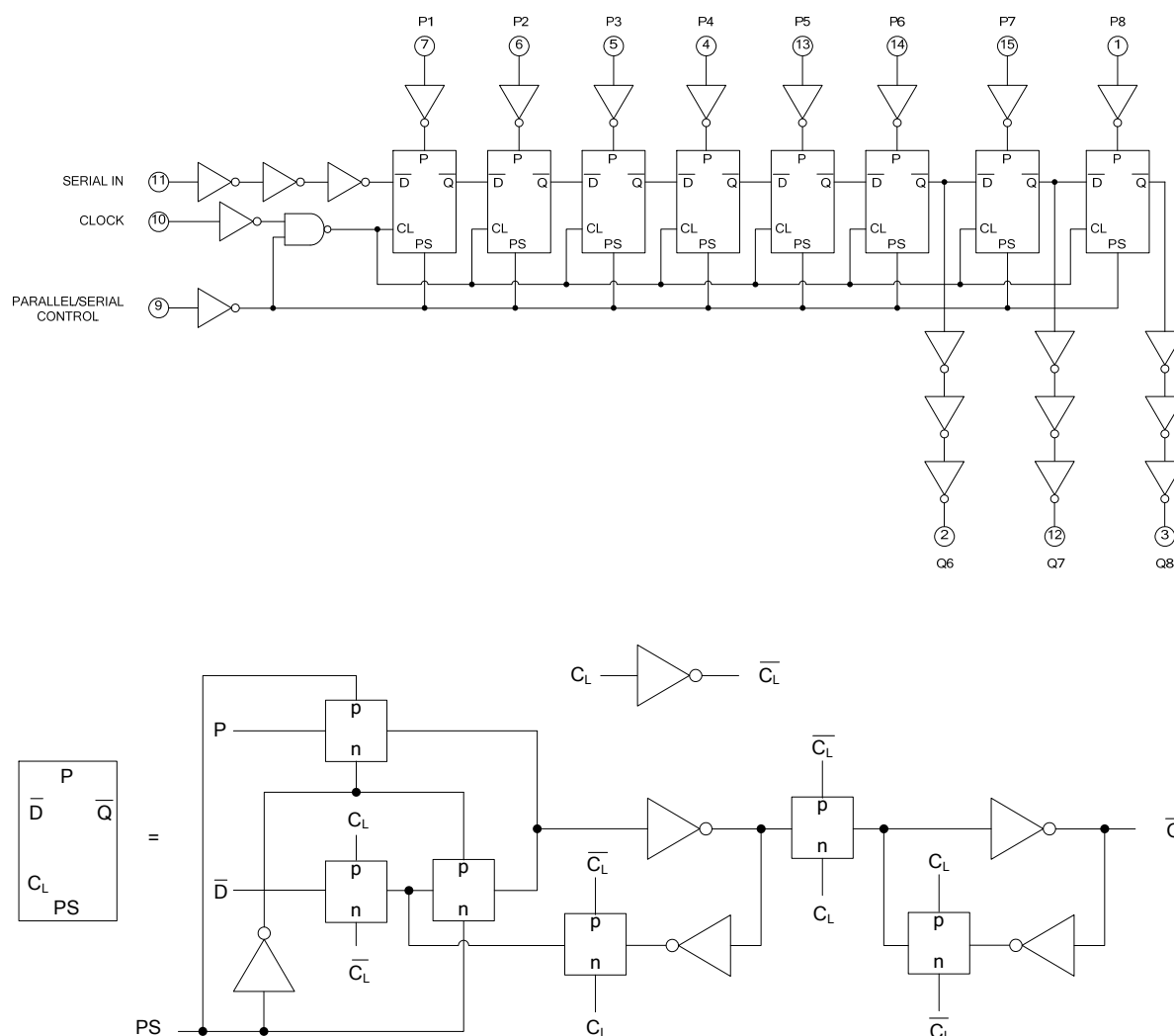
- (1) T: Tube, R: Tape Reel
- (2) S16: SOP-16, P16: TSSOP-16
- (3) L: Lead Free, G: Halogen Free



■ 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
$\uparrow$	0	0	X	X	0	Q_{n-1}
$\uparrow$	1	0	X	X	1	Q_{n-1}
$\downarrow$	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	T _A =-40°C ~ +100°C	P _D	500	mW
	T _A =+100°C ~ +125°C		200	mW
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	SOP-16	θ_{JA}	73	°C/W
	TSSOP-16		108	°C/W

■ RECOMMENDED OPERATING CONDITIONS

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			

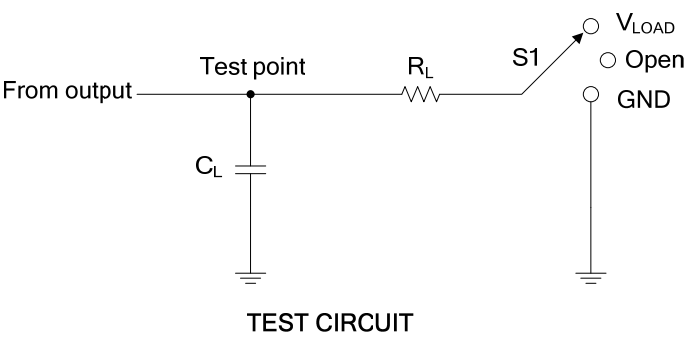
■ ELECTRICAL CHARACTERISTICS (T_A =25°C , unless otherwise specified)

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		±10 ⁻⁵	±0.1	μA

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

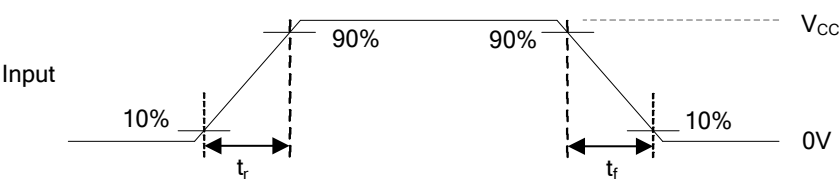
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay Time	t_{PLH} / t_{PHL}	$V_{DD}=5\text{V}$		160	320	ns
		$V_{DD}=10\text{V}$		80	160	
		$V_{DD}=15\text{V}$		60	120	
Transition Time	t_{THL} / t_{TLH}	$V_{DD}=5\text{V}$		100	200	ns
		$V_{DD}=10\text{V}$		50	100	
		$V_{DD}=15\text{V}$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

■ TEST CIRCUIT AND WAVEFORMS



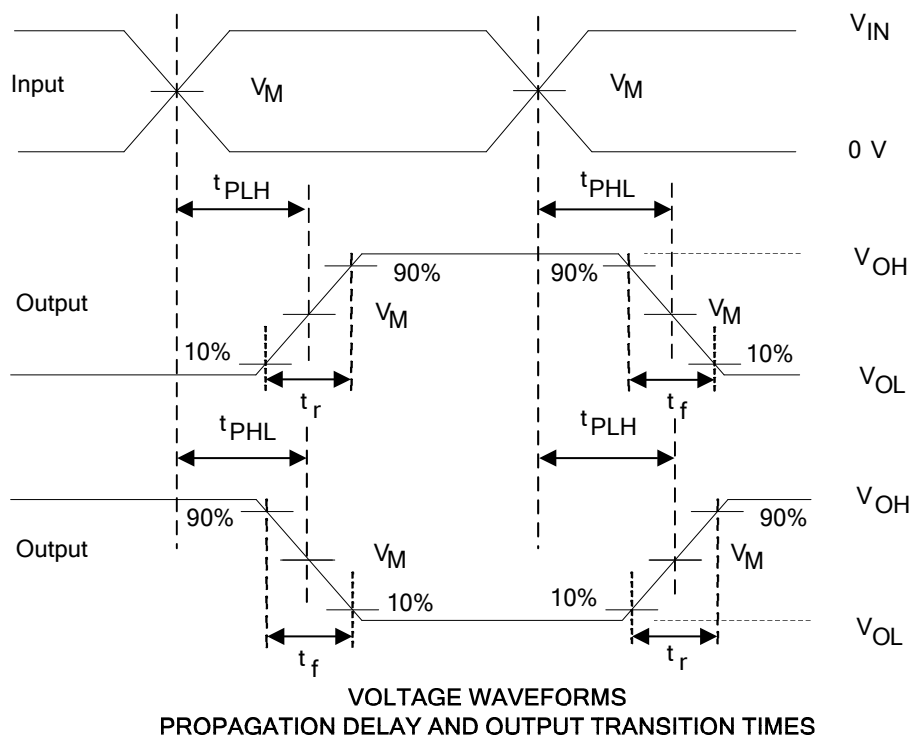
TEST	S1
t_{PLH}/t_{PHL}	GND

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 KΩ



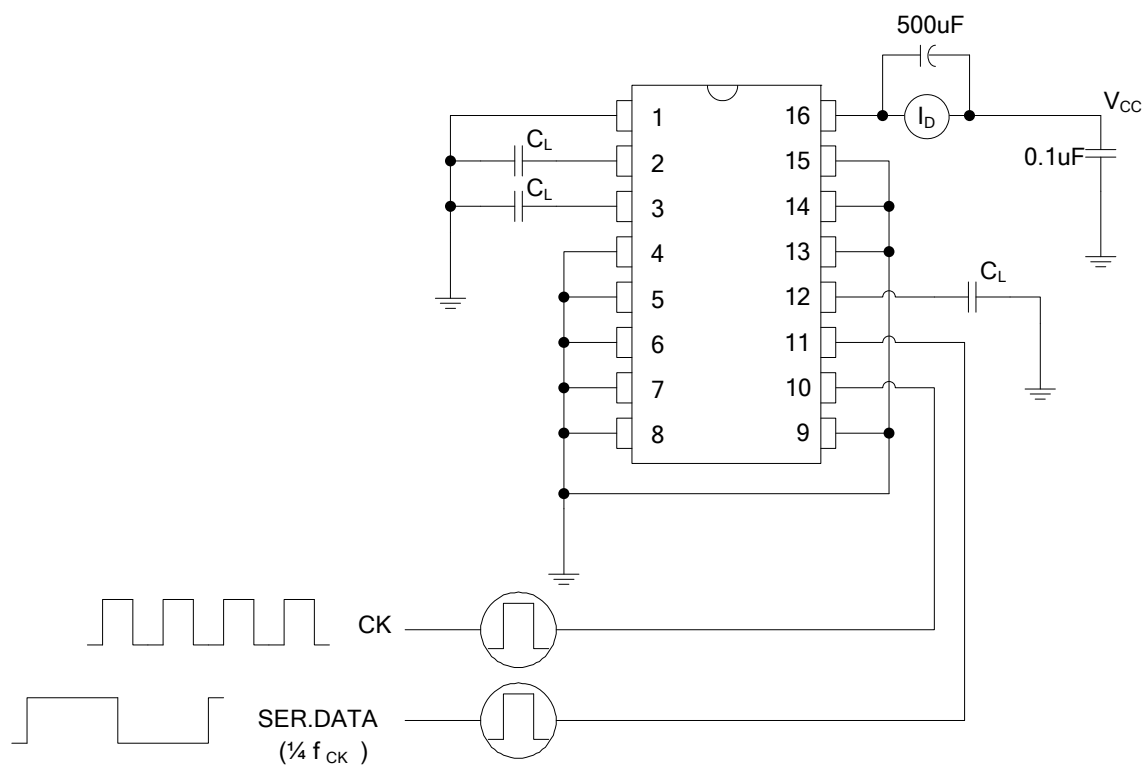
VOLTAGE WAVEFORMS
INPUT RISE AND FALL TIMES

■ TEST CIRCUIT AND WAVEFORMS(Cont.)

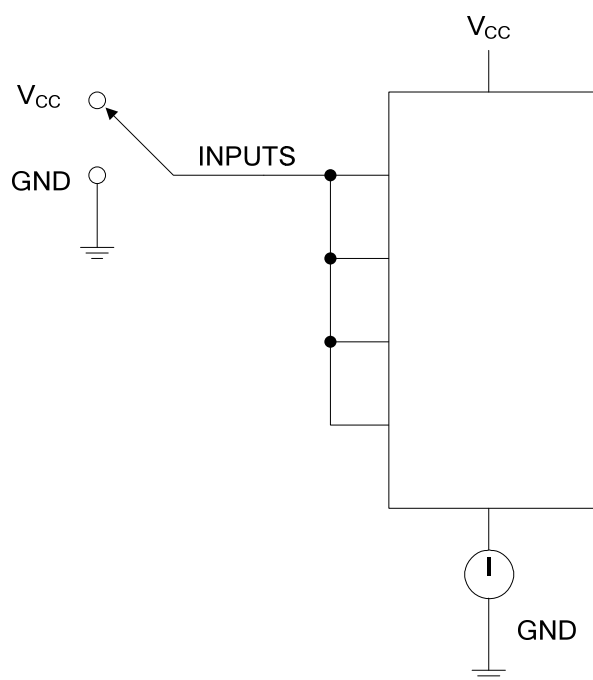


Notes: 1. C_L includes probe and jig capacitance.

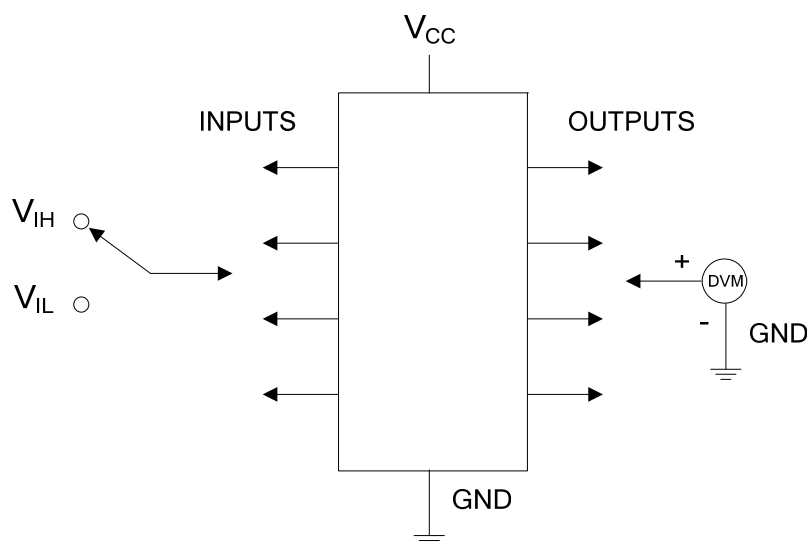
2. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, $Z_O = 50\Omega$.



■ TEST CIRCUIT AND WAVEFORMS(Cont.)

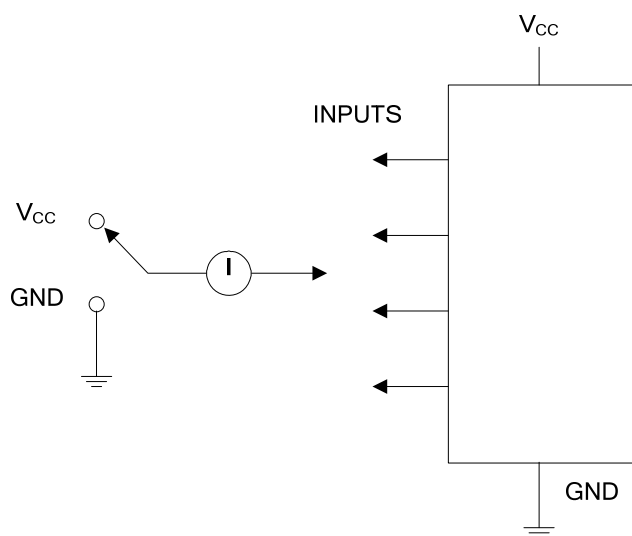


QUIESCENT DEVICE CURRENT TEST CIRCUIT



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.

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