



U74HC4052

CMOS IC

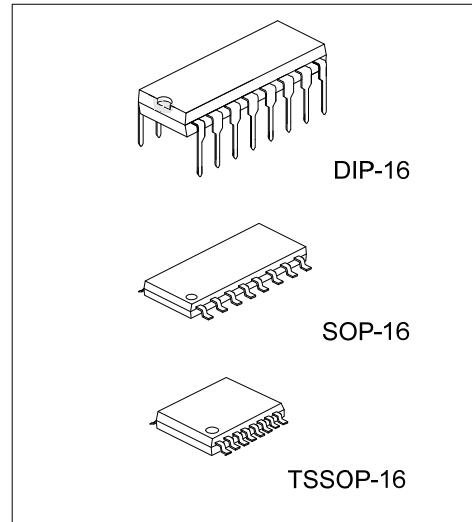
DUAL 4-CHANNEL ANALOG MULTIPLEXER, DEMULTIPLEXER

DESCRIPTION

The **U74HC4052** provides common select logic. Each multiplexer has four independent inputs/outputs and a common input/output.

FEATURES

- * Wide analog input voltage range from -5V to +5V
- * Low on-resistance
- * Logic level translation: to enable 5V logic to communicate with ±5V analog signals
- * Typical "break before make" built in

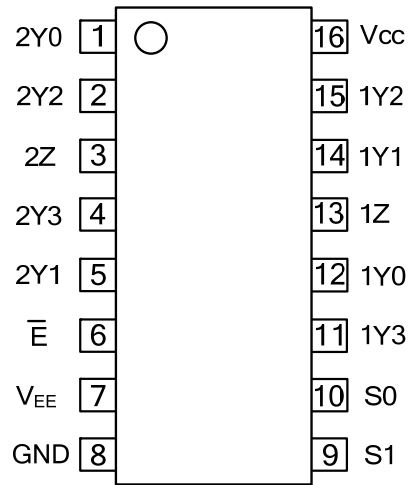


ORDERING INFORMATION

Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HC4052L-D16-T	U74HC4052G-D16-T	DIP-16	Tube
U74HC4052L-S16-R	U74HC4052G-S16-R	SOP-16	Tape Reel
U74HC4052L-P16-R	U74HC4052G-P16-R	TSSOP-16	Tape Reel

<p>U74HC4052L-D16-T</p> <p>(1) Packing Type (2) Package Type (3) Lead Plating</p>	<p>(1) R: Tape Reel, T: Tube (2) D16: DIP-16, S16: SOP-16, P16: TSSOP-16 (3) G: Halogen Free, L: Lead Free</p>
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■ PIN CONFIGURATION

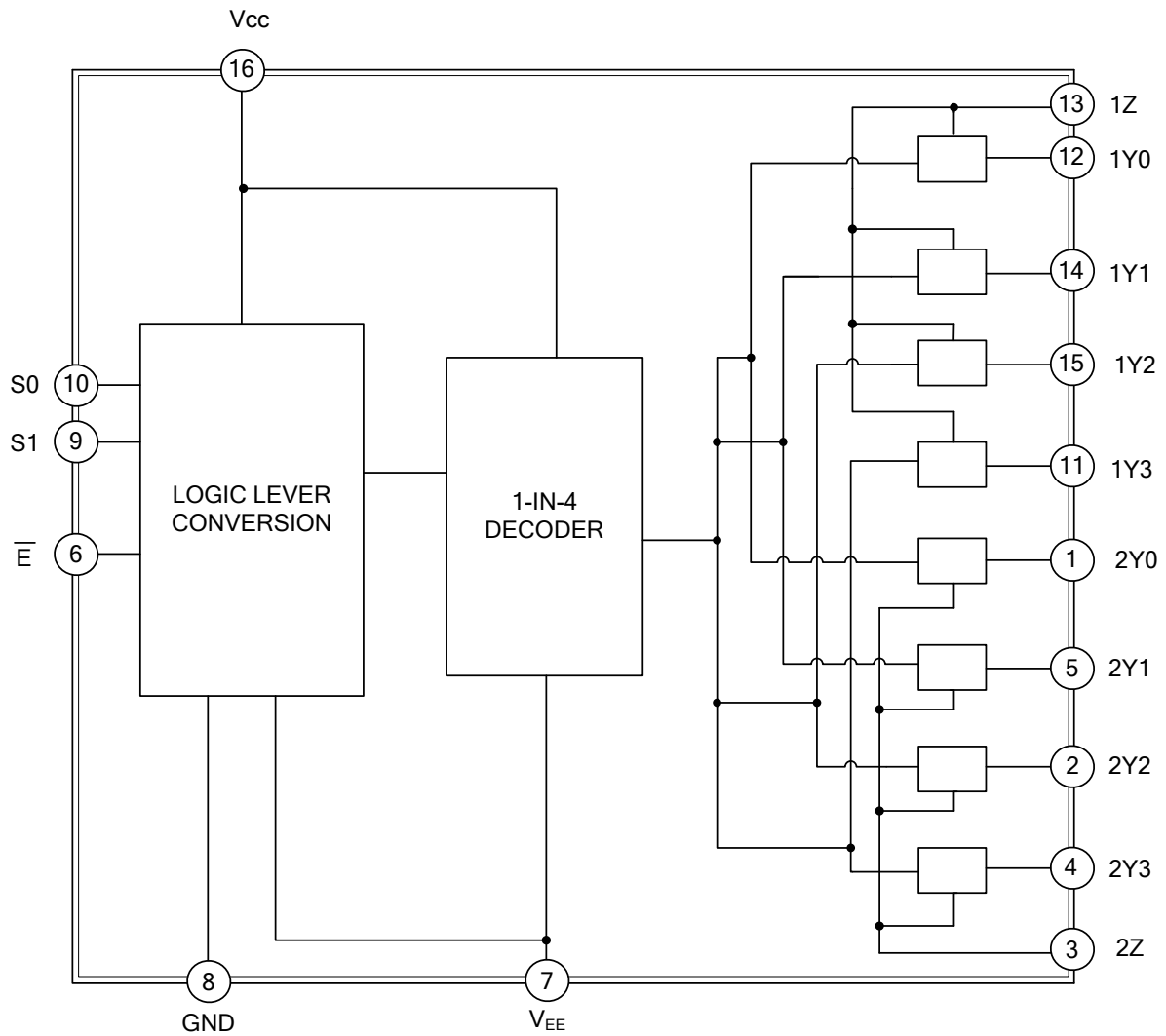


■ FUNCTION TABLE (each gate)

INPUT(\bar{E})	INPUT(S1)	INPUT(S0)	CHANNEL BETWEEN
L	L	L	nY0 and nZ
L	L	H	nY1 and nZ
L	H	L	nY2 and nZ
L	H	H	nY3 and nZ
H	X	X	none

Note: H=High voltage level; L=Low voltage level; X=don't care

■ FUNCTIONAL DIAGRAM



■ ABSOLUTE MAXIMUM RATINGS

PARAMETER	SYMBOL	RATINGS	UNIT	
Supply Voltage	V_{CC}	-0.5~11	V	
V_{CC} or GND Current	I_{CC}	± 50	mA	
V_{EE} Current	I_{EE}	± 20	mA	
Input Clamp Current	I_{IK}	± 20	mA	
Switch Diode Current	I_{SK}	± 20	mA	
Switch Current	I_S	± 25	mA	
Power Dissipation	P_D	500	mW	
Derate above $T_a > 70^\circ\text{C}$		DIP-16	12	mW/K
		SOP-16	8	mW/K
Derate above $T_a > 60^\circ\text{C}$		TSSOP-16	5.5	mW/K
Storage Temperature	T_{STG}	-65 ~ +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

PARAMETER	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT
Supply Voltage	V_{CC}	V_{CC} -GND	2.0	5.0	10.0	V
		V_{CC} - V_{EE}	2.0	5.0	10.0	V
Input Voltage	V_{IN}		GND		V_{CC}	V
Switch voltage	V_S		V_{EE}		V_{CC}	V
Input Transition Rise or Fall Rate	t_R, t_F	$V_{CC}=2.0\text{V}$		6.0	1000	ns
		$V_{CC}=4.5\text{V}$		6.0	500	ns
		$V_{CC}=6.0\text{V}$		6.0	400	ns
		$V_{CC}=10.0\text{V}$		6.0	250	ns
Operating Temperature	T_A		-40		+85	$^\circ\text{C}$

■ STATIC CHARACTERISTICS ($T_a=25^\circ\text{C}$)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
High-Level Input Voltage	V_{IH}	$V_{CC}=2.0\text{V}$	1.5	1.2		V	
		$V_{CC}=4.5\text{V}$	3.15	2.4		V	
		$V_{CC}=6.0\text{V}$	4.2	3.2		V	
		$V_{CC}=9.0\text{V}$	6.3	4.7		V	
Low-Level Input Voltage	V_{IL}	$V_{CC}=2.0\text{V}$		0.8	0.5	V	
		$V_{CC}=4.5\text{V}$		2.1	1.35	V	
		$V_{CC}=6.0\text{V}$		2.8	1.8	V	
		$V_{CC}=9.0\text{V}$		4.3	2.7	V	
Analog switch OFF-state current	$I_{S(OFF)}$	$V_{CC}=10\text{V}, V_{EE}=0\text{V}, V_{IN}=V_{IH}$ or V_{IL} $ V_S =V_{CC}-V_{EE}$	per channel			± 1	μA
			all channels			± 2	μA
Analog switch ON-state current	$I_{S(ON)}$	$V_{CC}=10\text{V}, V_{EE}=0\text{V}, V_{IN}=V_{IH}$ or V_{IL} $ V_S =V_{CC}-V_{EE}$				± 2.0	μA
Input Leakage Current	$I_{I(LEAK)}$	$V_{CC}=6\text{V}, V_{EE}=0\text{V}, V_{IN}=V_{CC}$ or GND				± 1.0	μA
		$V_{CC}=10\text{V}, V_{EE}=0\text{V}, V_{IN}=V_{CC}$ or GND				± 2.0	μA
Quiescent Supply Current	I_Q	$V_{IN}=V_{CC}$ or GND $V_{IS}=V_{EE}$ or V_{CC} $V_{OS}=V_{CC}$ or V_{EE}	$V_{CC}=6\text{V}, V_{EE}=0\text{V}$			80	μA
			$V_{CC}=10\text{V}, V_{EE}=0\text{V}$			160	μA

■ STATIC CHARACTERISTICS(Cont.) (T_a=25°C)

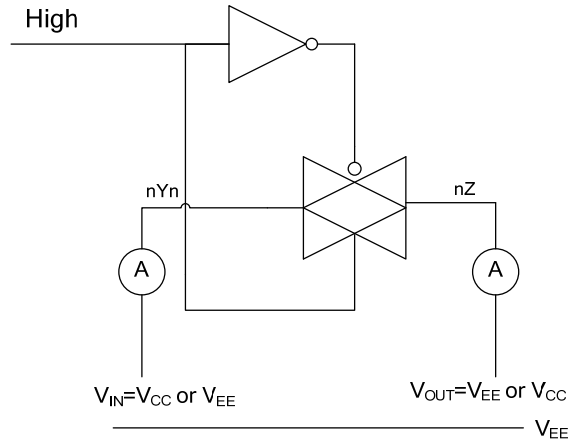
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT	
ON-Resistance	PEAK	R _{ON(PEAK)}	V _{CC} =2V, V _{EE} =0V, I _S =100uA, V _{IS} =V _{CC} to V _{EE} , V _{IN} =V _{IH} or V _{IL} ,			Ω	
			V _{CC} =4.5V, V _{EE} =0V, I _S =1mA, V _{IS} =V _{CC} to V _{EE} , V _{IN} =V _{IH} or V _{IL} ,		100	225	Ω
			V _{CC} =6V, V _{EE} =0V, I _S =1mA, V _{IS} =V _{CC} to V _{EE} , V _{IN} =V _{IH} or V _{IL}		90	200	Ω
			V _{CC} =4.5V, V _{EE} =-4.5V, I _S =1mA, V _{IS} =V _{CC} to V _{EE} , V _{IN} =V _{IH} or V _{IL}		70	165	Ω
	RAIL	R _{ON(RAIL)}	V _{CC} =2V, V _{EE} =0V, I _S =100uA, V _{IS} =V _{EE} , V _{IN} =V _{IH} or V _{IL} ,		150		Ω
			V _{CC} =4.5V, V _{EE} =0V, I _S =1mA, V _{IS} =V _{EE} , V _{IN} =V _{IH} or V _{IL} ,		80	175	Ω
			V _{CC} =6V, V _{EE} =0V, I _S =1mA, V _{IS} =V _{EE} , V _{IN} =V _{IH} or V _{IL}		70	150	Ω
			V _{CC} =4.5V, V _{EE} =-4.5V, I _S =1mA, V _{IS} =V _{EE} , V _{IN} =V _{IH} or V _{IL}		60	130	Ω
			V _{CC} =2V, V _{EE} =0V, I _S =100uA, V _{IS} =V _{CC} , V _{IN} =V _{IH} or V _{IL} ,		150		Ω
			V _{CC} =4.5V, V _{EE} =0V, I _S =1mA, V _{IS} =V _{CC} , V _{IN} =V _{IH} or V _{IL} ,		90	200	Ω
			V _{CC} =6V, V _{EE} =0V, I _S =1mA, V _{IS} =V _{CC} , V _{IN} =V _{IH} or V _{IL}		80	175	Ω
			V _{CC} =4.5V, V _{EE} =-4.5V, I _S =1mA, V _{IS} =V _{CC} , V _{IN} =V _{IH} or V _{IL}		65	150	Ω
Maximum On-Resistance Difference Between Any Two Channels	ΔR _{ON}	V _{CC} =2V, V _{EE} =0V, V _{IS} =V _{CC} to V _{EE} , V _{IN} =V _{IH} or V _{IL} ,				Ω	
		V _{CC} =4.5V, V _{EE} =0V, V _{IS} =V _{CC} to V _{EE} , V _{IN} =V _{IH} or V _{IL} ,		9		Ω	
		V _{CC} =6V, V _{EE} =0V, V _{IS} =V _{CC} to V _{EE} , V _{IN} =V _{IH} or V _{IL}		8		Ω	
		V _{CC} =4.5V, V _{EE} =-4.5V, V _{IS} =V _{CC} to V _{EE} , V _{IN} =V _{IH} or V _{IL}		6		Ω	

■ DYNAMIC CHARACTERISTICS (T_a=25°C, GND=0V; t_R=t_F=6ns; C_L=50pF)

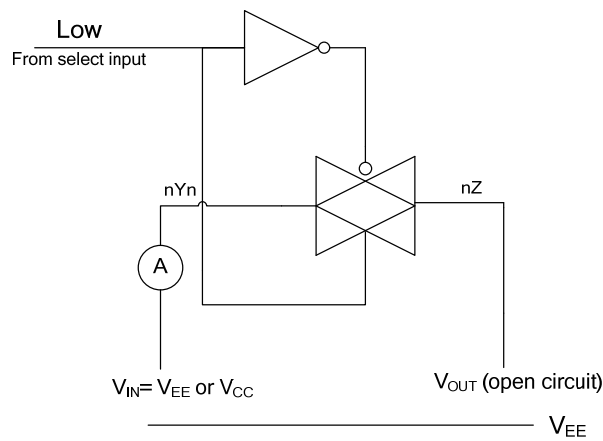
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay From V _{IS} to V _O	t _{PHL} /t _{PLH}	V _{CC} =2V, V _{EE} =0V, R _L =∞		14	75	ns
		V _{CC} =4.5V, V _{EE} =0V, R _L =∞		5	15	ns
		V _{CC} =6V, V _{EE} =0V, R _L =∞		4	13	ns
		V _{CC} =4.5V, V _{EE} =-4.5V, R _L =∞		4	10	ns
Turn-ON Time \bar{E} Sn to V _O	t _{PZH} /t _{PZL}	V _{CC} =2V, V _{EE} =0V, R _L =∞		105	405	ns
		V _{CC} =4.5V, V _{EE} =0V, R _L =∞		38	81	ns
		V _{CC} =6V, V _{EE} =0V, R _L =∞		30	69	ns
		V _{CC} =4.5V, V _{EE} =-4.5V, R _L =∞		26	58	ns
Turn-OFF Time \bar{E} Sn to V _O	t _{PHZ} /t _{PLZ}	V _{CC} =2V, V _{EE} =0V, R _L =1k		74	315	ns
		V _{CC} =4.5V, V _{EE} =0V, R _L =1k		27	63	ns
		V _{CC} =6V, V _{EE} =0V, R _L =1k		22	54	ns
		V _{CC} =4.5V, V _{EE} =-4.5V, R _L =1k		22	48	ns

■ TEST CIRCUIT AND WAVEFORMS

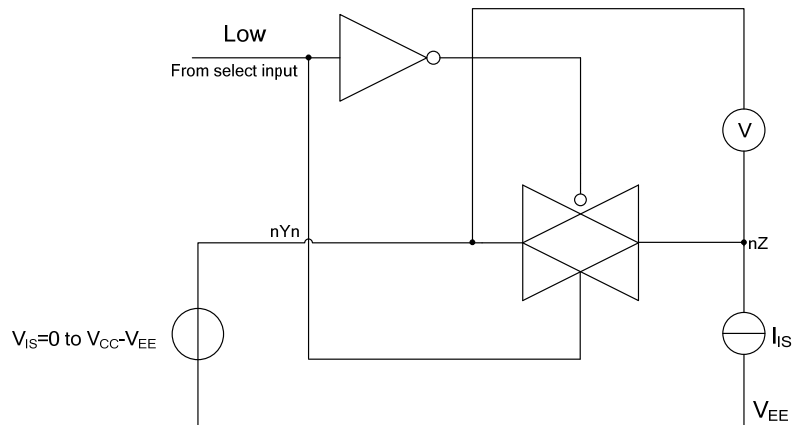
Test circuit for measuring OFF-state current



Test circuit for measuring ON-state current

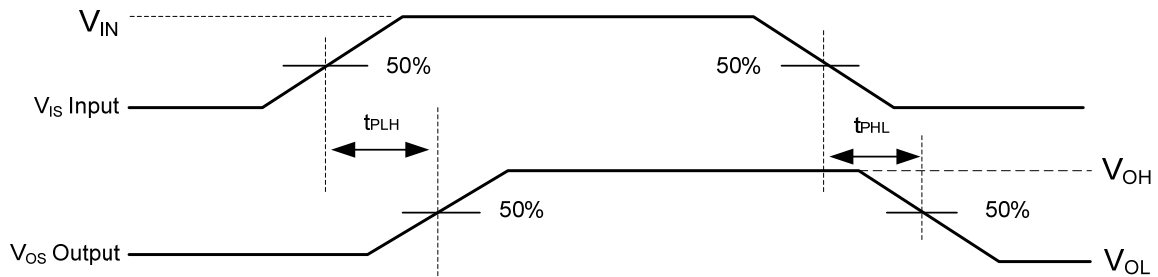


Test circuit for measuring RON

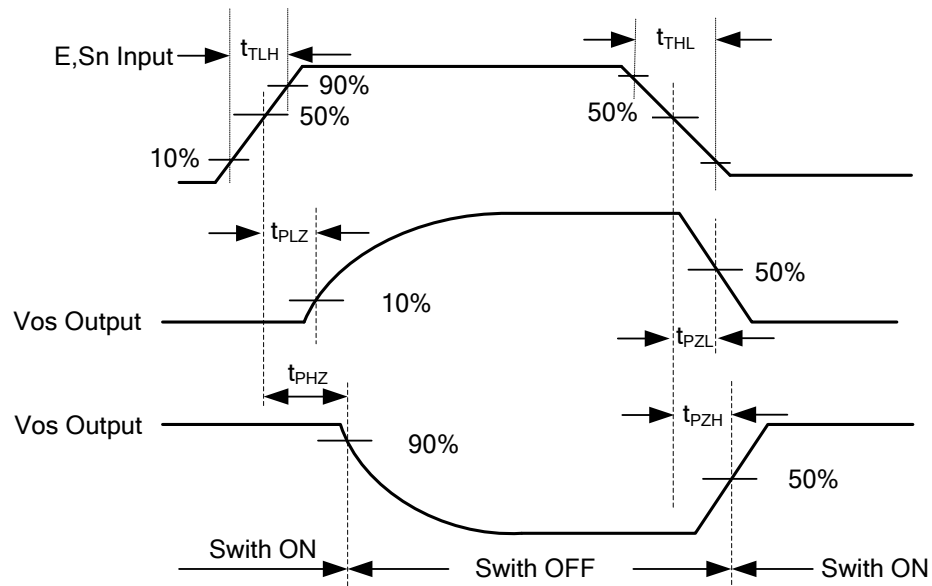


■ TEST CIRCUIT AND WAVEFORMS(Cont.)

Waveforms showing the Input (V_{IS}) to Output (V_{OS}) propagation delays



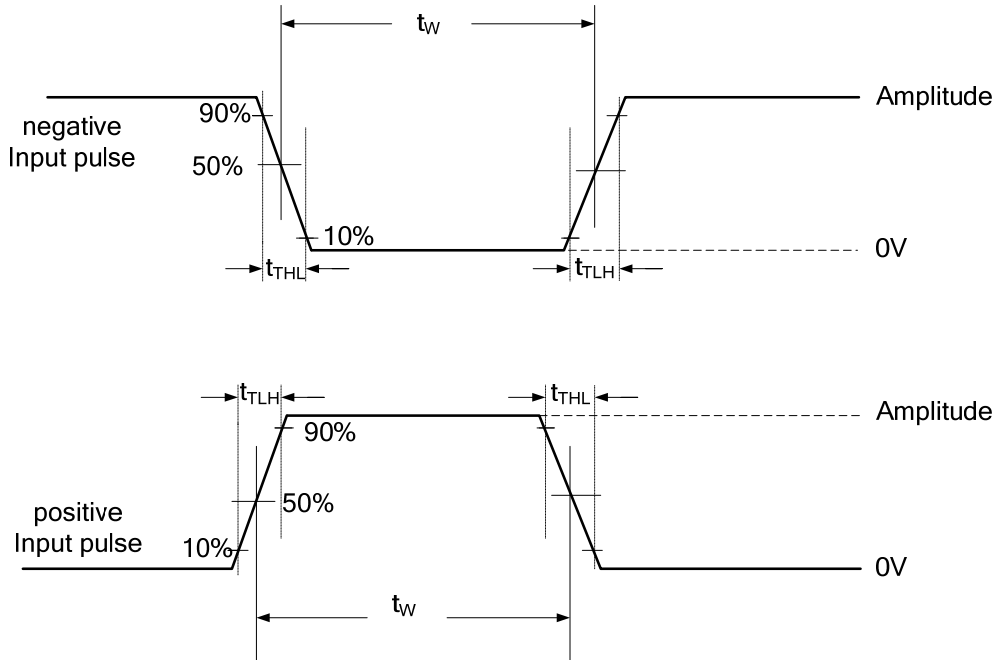
Waveforms showing the turn-on and turn-off times.



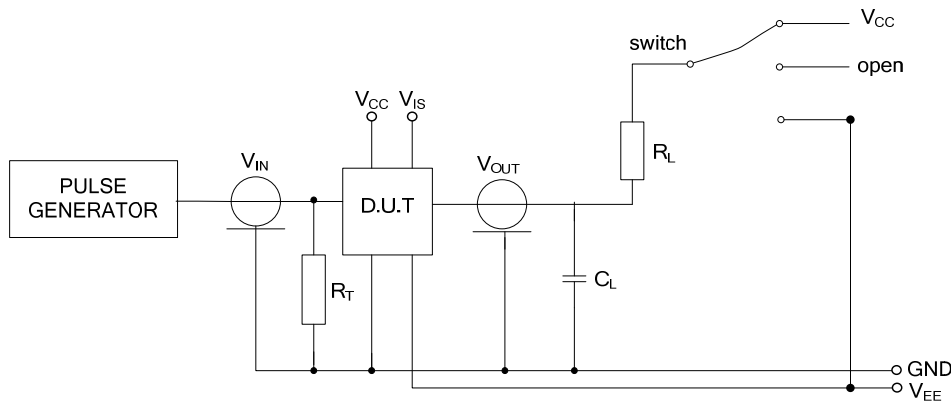
Note: V_{IN} =GND to V_{CC}

■ TEST CIRCUIT AND WAVEFORMS(Cont.)

input pulse definitions



Test circuit for measuring AC performance.



TEST	SWITCH	V_{is}
t_{PZH}	V_{EE}	V_{CC}
t_{PZL}	V_{CC}	V_{EE}
t_{PHZ}	V_{EE}	V_{CC}
t_{PLZ}	V_{CC}	V_{EE}
other	open	pulse

NOTE: Definitions for test circuit:

R_L = load resistance

C_L = load capacitance including jig and probe capacitance.

R_T = termination resistance should be equal to the output impedance Z_O of the pulse generator.

$t_{THL}=t_{TLH}=6$ ns; when measuring f_{MAX} , there is no constraint to t_{THL} and t_{TLH} with 50% duty factor.

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