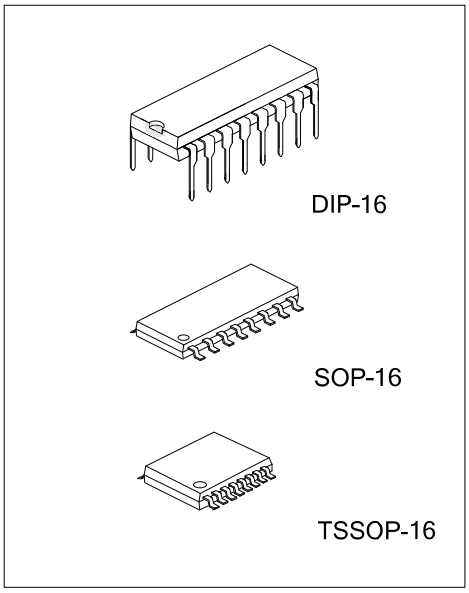
U74HC4052

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

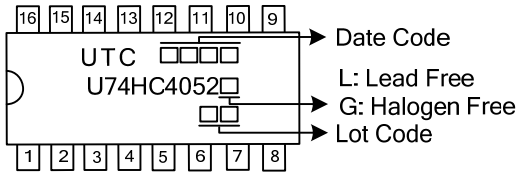
Ordering Number		Package	Packing
Lead Free	Halogen Free		
U74HC4052L-D16-T	U74HC4052G-D16-T	DIP-16	Tube
-	U74HC4052G-S16-R	SOP-16	Tape Reel
-	U74HC4052G-P16-R	TSSOP-16	Tape Reel

U74HC4052L-D16-T
(1)Packing Type
(2)Package Type
(3)Green Package

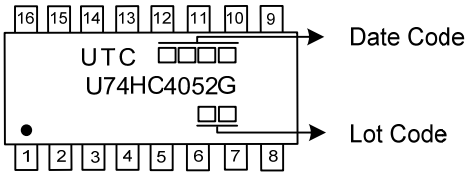
(1) T: Tube, R: Tape Reel
(2) D16: DIP-16, S16: SOP-16, P16: TSSOP-16
(3) L: Lead Free, G: Halogen Free and Lead Free

■ MARKING

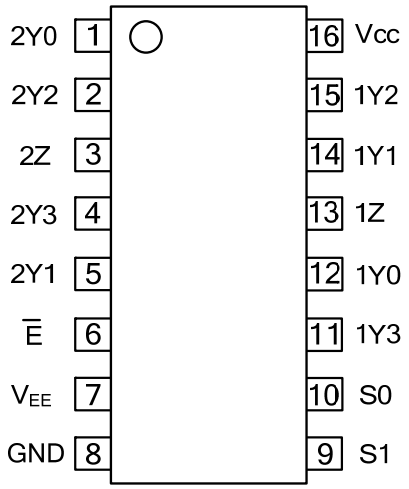
DIP-16



SOP-16 / TSSOP-16



■ PIN CONFIGURATION

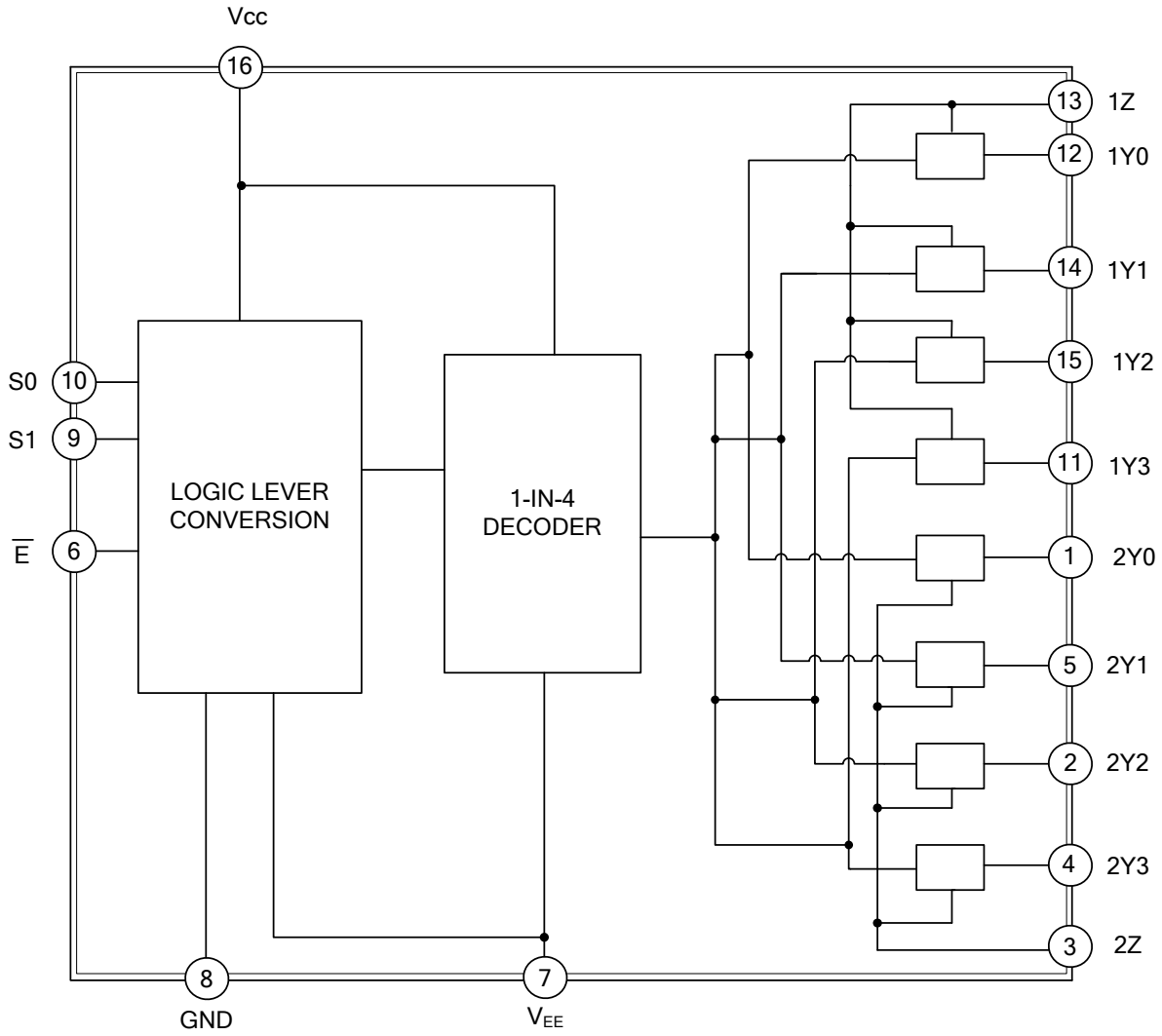


■ FUNCTION TABLE (each gate)

INPUT($\overline{E}$)	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

■ FUCTIONAL 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°C	DIP-16		12	mW/K
	SOP-16		8	mW/K
Derate above T_A>60°C	TSSOP-16		5.5	mW/K
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

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}=2.0V		6.0	1000	ns
		V_{CC}=4.5V		6.0	500	ns
		V_{CC}=6.0V		6.0	400	ns
		V_{CC}=10.0V		6.0	250	ns
Operating Temperature	T_A		-40		+85	°C

■ STATIC CHARACTERISTICS (T_A=25°C)

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

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

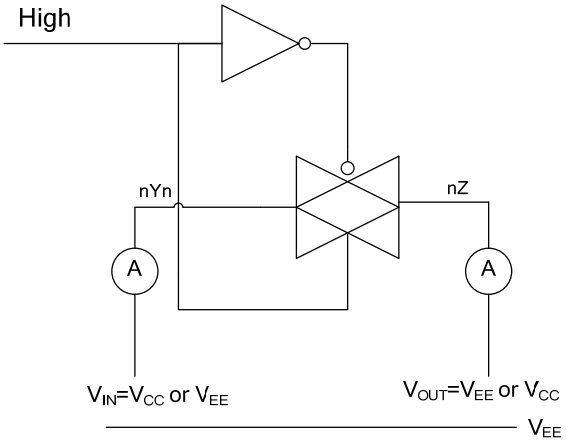
PARAMETER		SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
ON-Resistance	PEAK	$R_{ON(PEAK)}$	V_{CC}=2V,V_{EE}=0V, I_S=100uA, V_{IS}=V_{CC} to V_{EE}, V_{IN}=V_{IH} or V_{IL},				Ω
			V_{CC}=4.5V,V_{EE}=0V, I_S=1mA, V_{IS}=V_{CC} to V_{EE}, V_{IN}=V_{IH} or V_{IL},		100	225	Ω
			V_{CC}=6V,V_{EE}=0V, I_S=1mA, 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)

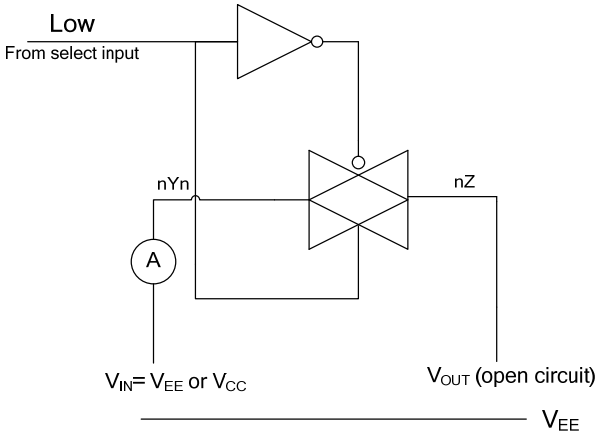
PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Propagation Delay From V_{IS} to V_{OS}	t_{PHL}/t_{PLH}	V_{CC}=2V, V_{EE}=0V, R_L=∞		14	75	ns
		V_{CC}=4.5V, V_{EE}=0V, R_L=∞		5	15	ns
		V_{CC}=6V, V_{EE}=0V, R_L=∞		4	13	ns
		V_{CC}=4.5V, V_{EE}=-4.5V, R_L=∞		4	10	ns
Turn-ON Time $\overline{E}$ Sn to V_{OS}	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 $\overline{E}$ Sn to V_{OS}	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

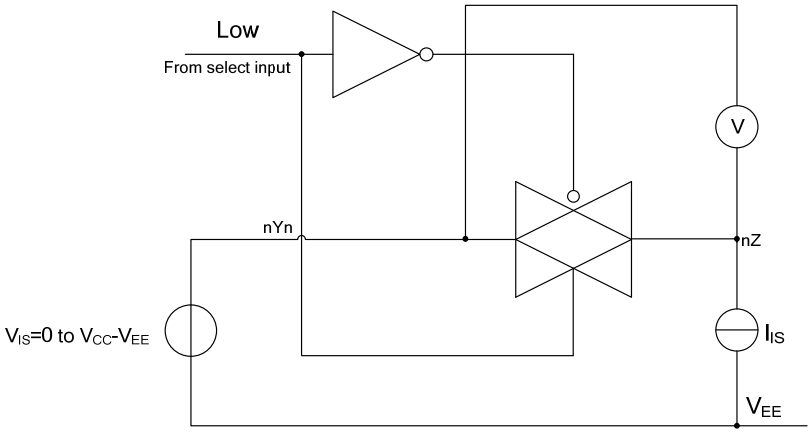
Test circuit for measuring OFF-state current



Test circuit for measuring ON-state current

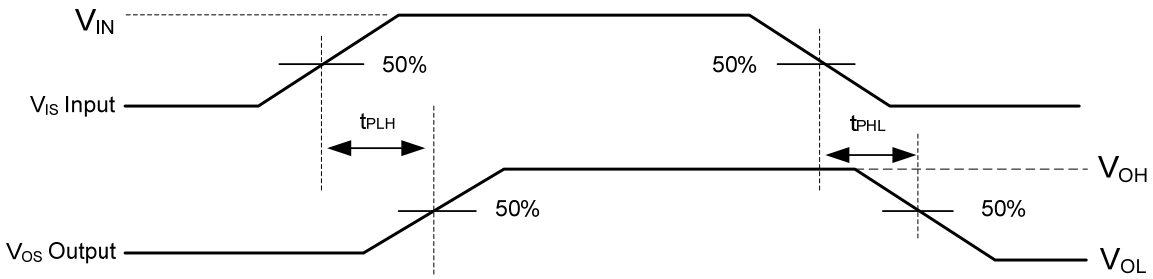


Test circuit for measuring RON

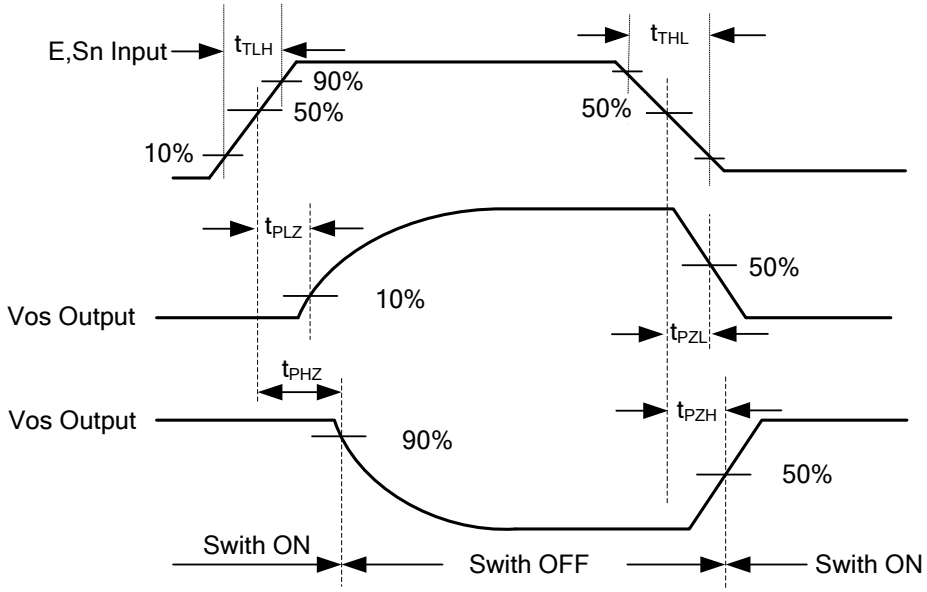


■ TEST CIRCUIT AND WAVEFORMS(Cont.)

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



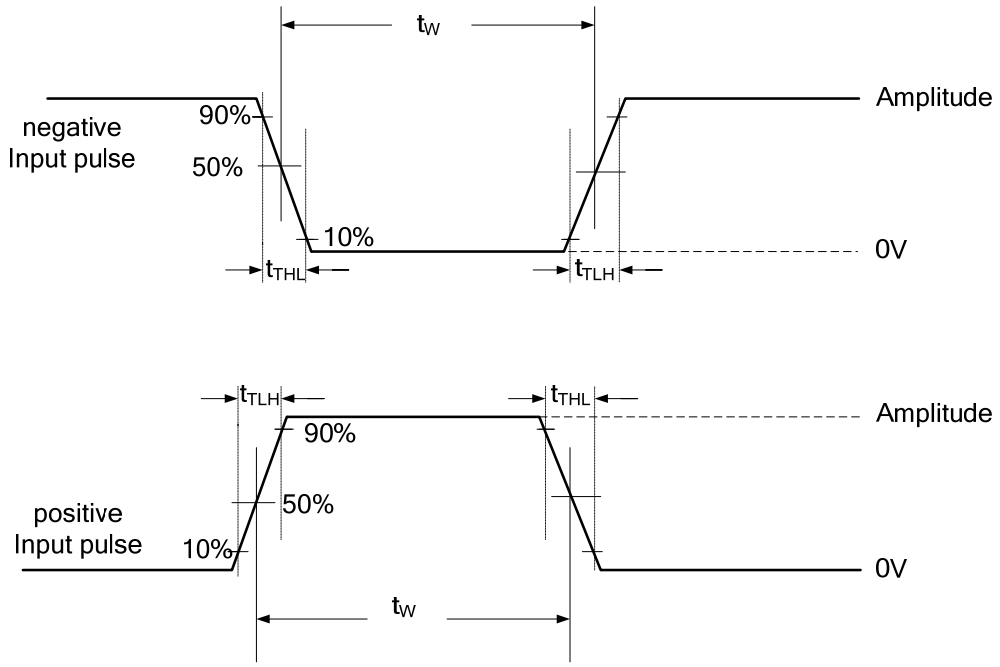
Waveforms showing the turn-on and turn-off times.



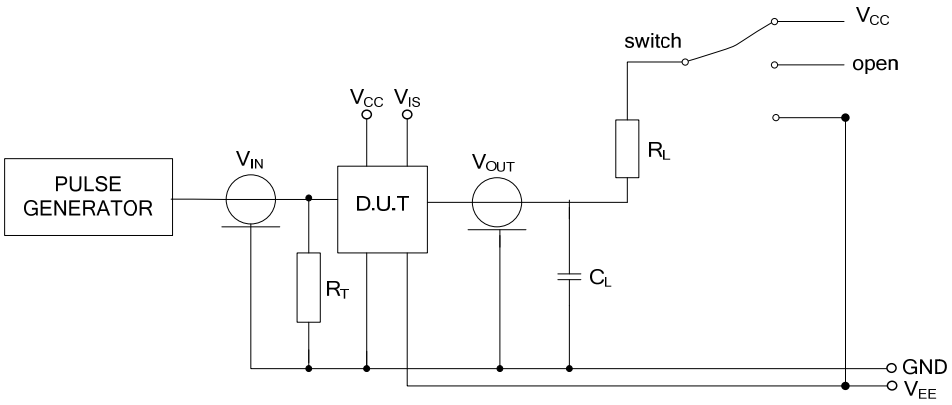
Note: V_{IN}=GND to V_{CC}

■ 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.