
HD74HC4051

8-Channel Analog Multiplexer Demultiplexer

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Description

This device connects together the outputs of 8 switches, thus achieving an 8 Channel Multiplexer. The binary code placed on the A, B, and C select lines determine which one of the eight switches in “on”, and connects one of the eight inputs to the common output.

Features

- High Speed Operation
- Wide Operating Voltage
- Low Quiescent Supply Current

Function Table

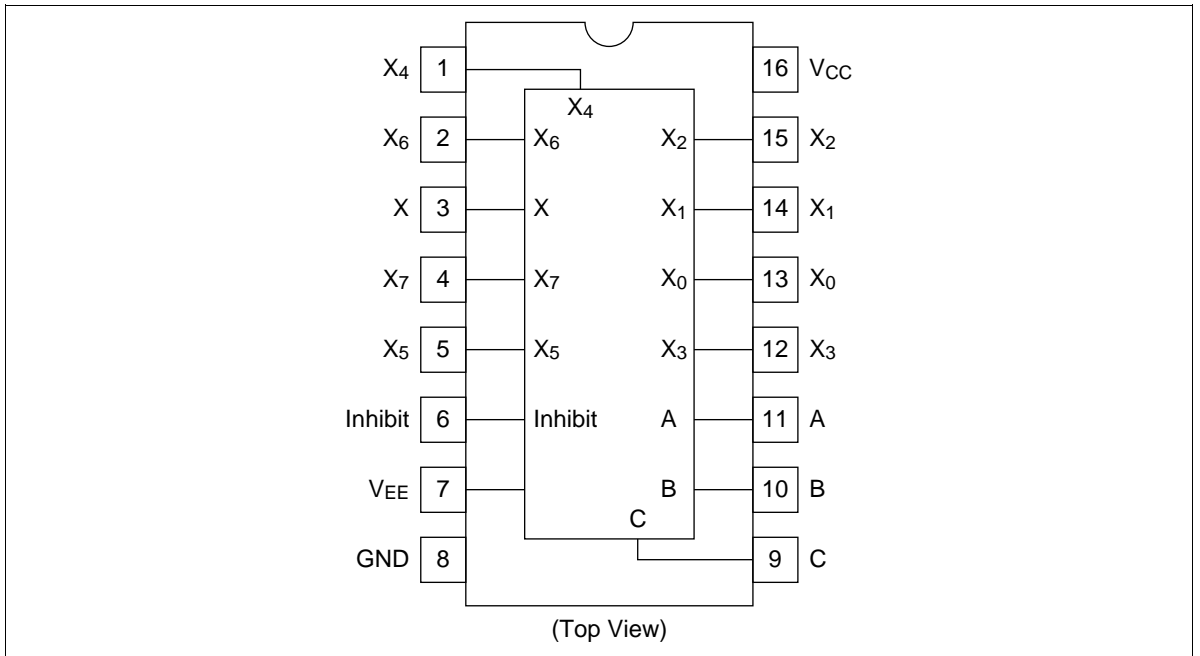
Control Inputs

Inhibit	C	B	A	ON Switch
L	L	L	L	X ₀
L	L	L	H	X ₁
L	L	H	L	X ₂
L	L	H	H	X ₃
L	H	L	L	X ₄
L	H	L	H	X ₅
L	H	H	L	X ₆
L	H	H	H	X ₇
H	X	X	X	—

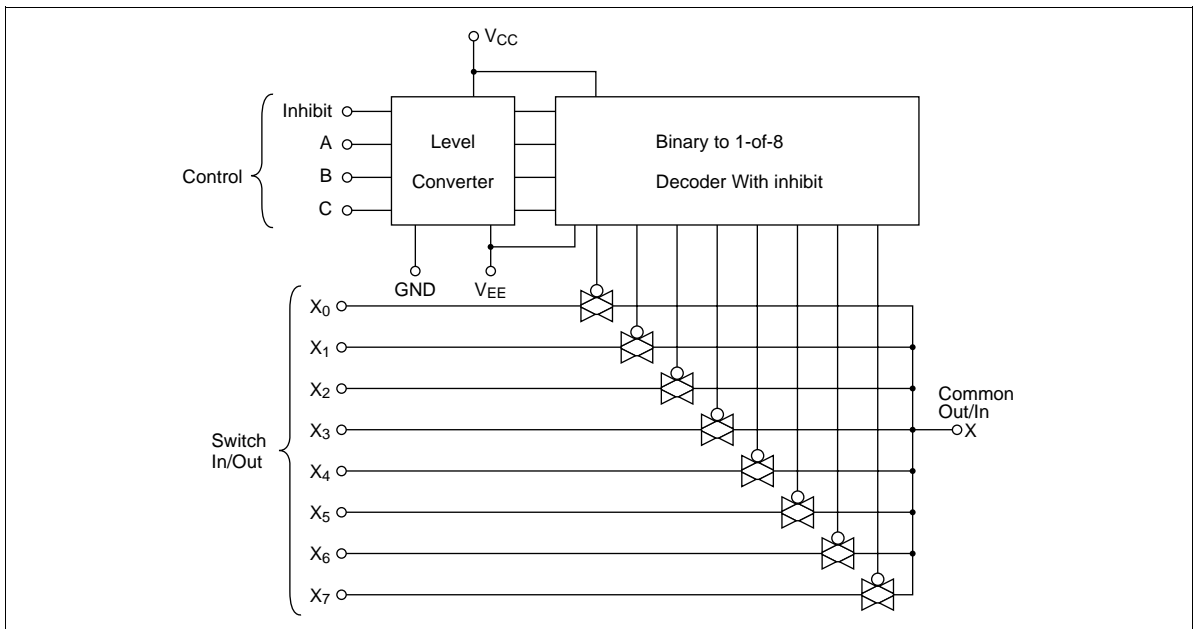
X : Don't Care

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Pin Arrangement



Block Diagram



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Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply voltage	V_{CC}	-0.5 to +7.0	V
	$V_{CC} - V_{EE}$	-0.5 to +7.0	V
Control input voltage	V_{IN}	GND - 0.5 to $V_{CC} + 0.5$	V
Switch I/O voltage	$V_{I/O}$	$V_{EE} - 0.5$ to $V_{CC} + 0.5$	V
Supply current	(V_{CC}) I_{CC}	+50	mA
	(GND) I_{GND}	-50	mA
Switch I/O current (per pin)	$I_{I/O}$	± 25	mA
Control input diode current	I_{IK}	± 20	mA
Switch I/O diode current	I_{IOK}	± 20	mA
Power dissipation	P_T	500	mW
Storage temperature range	Tstg	-65 to +150	°C

Recommended Operating Range

Item	Symbol	Min	Typ	Max	Unit
Supply voltage	$V_{CC} - V_{EE}$	2	—	6	V
	$V_{GND} - V_{EE}$	-4	—	0	V
Control input voltage	V_{IN}	0	—	V_{CC}	V
Switch I/O voltage	$V_{I/O}$	V_{EE}	—	V_{CC}	V
Operating temperature	Topr	-40	—	+85	°C
Input rise/fall time	$V_{CC} = 2.0$ V	t_r, t_f	0	1000	ns
	$V_{CC} = 4.5$ V		0	500	ns
	$V_{CC} = 6.0$ V		0	400	ns

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DC Characteristics ($V_{SS} = V_{EE} = \text{GND}$)

Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $+85^\circ\text{C}$		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Control input voltage	V_{IH}	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V_{IL}	2.0	—	—	0.5	—	0.5			V
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
ON resistance	R_{ON}	2.0	—	2000	5000	—	6250	Ω	$V_{INH} = V_{IL}$	
		4.5	—	120	180	—	225		$V_{IO} = V_{CC}$ to V_{EE}	
		6.0	—	100	170	—	210		$I_{IO} \leq 2 \text{ mA}$	
		R_{ON}	2.0	—	200	800	—	1000	Ω	$V_{INH} = V_{IL}$
			4.5	—	80	150	—	190		$V_{IO} = V_{CC}$ to V_{EE}
			6.0	—	70	140	—	175		$V_{IO} \leq 2 \text{ mA}$
Δ ON resistance between any two channels	ΔR_{ON}	2.0	—	50	—	—	—	Ω	$V_{INH} = V_{IL}$	
		4.5	—	13	40	—	50		$V_{IO} = V_{CC}$ to V_{EE}	
		6.0	—	10	20	—	25		$I_{IO} \leq 2 \text{ mA}$	
OFF channel leakage current (switch off)	$I_{S(OFF)}$	6.0	—	—	± 0.1	—	± 1.0	μA	$V_{INH} = V_{IL}$	
OFF channel leakage current (switch on)	$I_{S(ON)}$	6.0	—	—	± 0.1	—	± 1.0	μA	$V_{INH} = V_{IL}$	
Control input current	I_{in}	6.0	—	—	± 0.1	—	± 1.0	μA	$V_{in} = V_{CC}$ or V_{SS}	
Quiescent supply current	I_{CC}	6.0	—	—	4.0	—	40	μA	$V_{in} = V_{CC}$ or V_{SS}	

AC Characteristics ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns, $V_{SS} = V_{EE} = \text{GND}$)

Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $+85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Propagation delay time	t_{PLH}	2.0	—	25	60	—	75	ns	$R_L = 10$ k Ω
		4.5	—	6	12	—	15		Switch input to
		6.0	—	5	10	—	13		switch output
	t_{PHL}	2.0	—	25	60	—	75	ns	
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
Propagation delay time	t_{PLH}	2.0	—	50	153	—	191	ns	$R_L = 10$ k Ω
		4.5	—	16	30	—	38		Control input to
		6.0	—	14	26	—	33		switch output
	t_{PHL}	2.0	—	50	153	—	191	ns	
		4.5	—	16	30	—	38		
		6.0	—	14	26	—	33		
Output enable time	t_{ZH}	2.0	—	50	153	—	191	ns	$R_L = 1$ k Ω
		4.5	—	14	30	—	38		
		6.0	—	12	26	—	33		
	t_{ZL}	2.0	—	50	153	—	191	ns	
		4.5	—	14	30	—	38		
		6.0	—	12	26	—	33		
Output disable time	t_{HZ}	2.0	—	40	153	—	191	ns	$R_L = 1$ k Ω
		4.5	—	17	30	—	38		
		6.0	—	14	26	—	33		
	t_{LZ}	2.0	—	40	153	—	191	ns	
		4.5	—	17	30	—	38		
		6.0	—	14	26	—	33		
Control input capacitance	C_{in}	—	—	5	10	—	10	pF	
Switch input capacitance	C_{in}	5.0	—	5	—	—	—	pF	
Output capacitance (Common pin)	C_{out}	5.0	—	22	—	—	—	pF	
Feed through capacitance	C_{in-out}	5.0	—	0.7	—	—	—	pF	
Power dissipation capacitance	C_{PD}	5.0	—	22.0	—	—	—	pF	

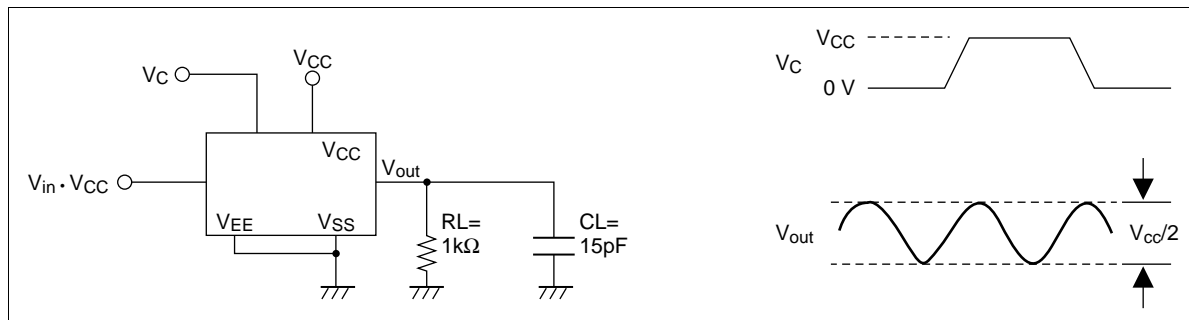
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AC Characteristics ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$, $V_{SS} = V_{EE} = \text{GND}$) (cont)

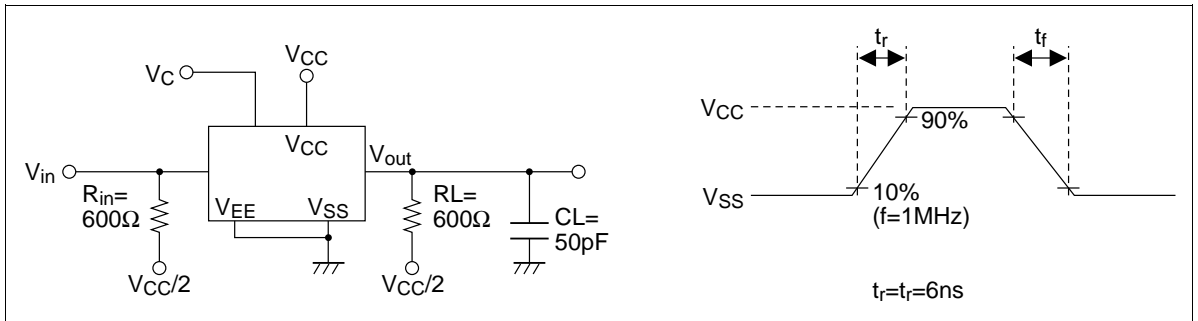
Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } +85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Sine wave distortion		4.5	—	0.1	—	—	—	%	$f_{in} = 1 \text{ kHz}$, $V_{in} = 4 V_{P-P}$ $R_L = 10 \text{ k}\Omega$, $C_L = 50 \text{ pF}$
Frequency response channel "ON" (Sine wave input)		4.5	—	95	—	—	—	MHz	$f_{in} = 1 \text{ MHz}$, $20 \log_{10} V_{OS}/V_{IS} = -3 \text{ dB}$ $R_L = 50 \Omega$, $C_L = 10 \text{ pF}$
Feed through attenuation		4.5	—	-50	—	—	—	dB	$R_L = 600 \Omega$, $C_L = 50 \text{ pF}$, $f_{in} = 1 \text{ MHz}$
Cross talk between any two switches		2.0	—	25	—	—	—	mV	$R_L = 600 \Omega$, $C_L = 15 \text{ pF}$, $f_{in} = 1 \text{ MHz}$
		4.5	—	60	—	—	—		
		6.0	—	75	—	—	—		
Maximum control frequency		2.0	—	20	—	—	—	MHz	$R_L = 1 \text{ k}\Omega$, $C_L = 15 \text{ pF}$ $V_{out} = 1/2 (V_{CC})$
		4.5	—	30	—	—	—		
		6.0	—	30	—	—	—		

AC Characteristics Test Circuit

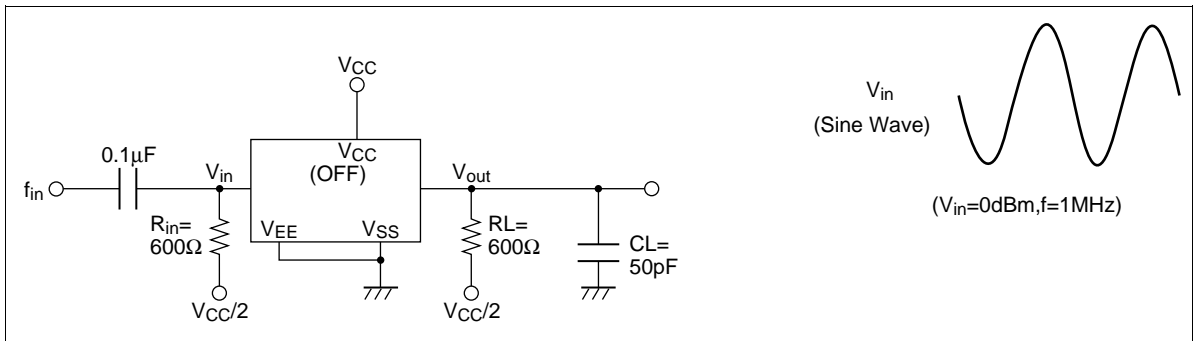
Maximum Control Frequency



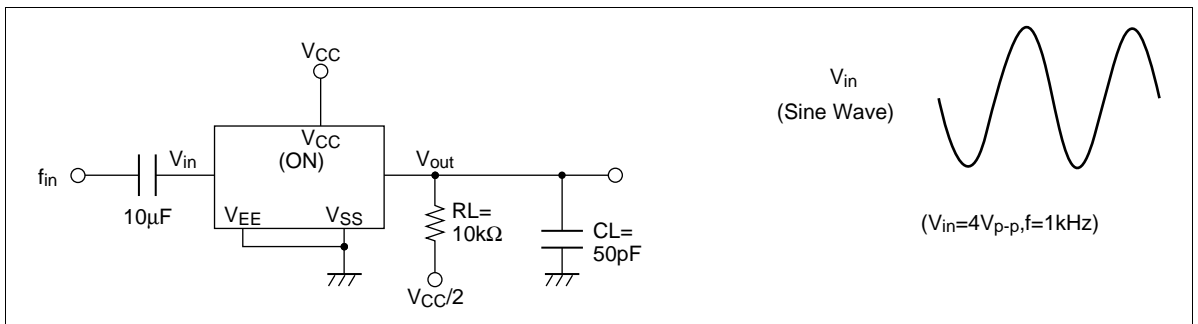
Cross talk (Control Input to Switch Output)



Feed through Attenuation

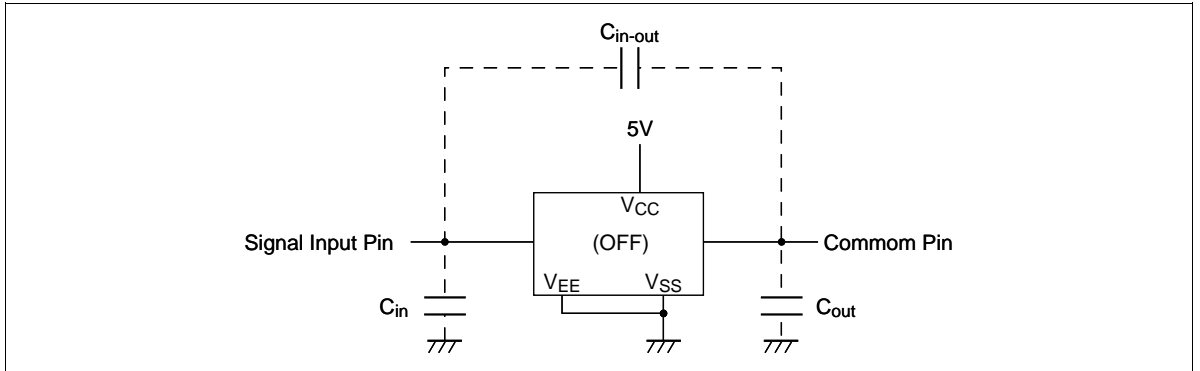


Sine Wave Distortion

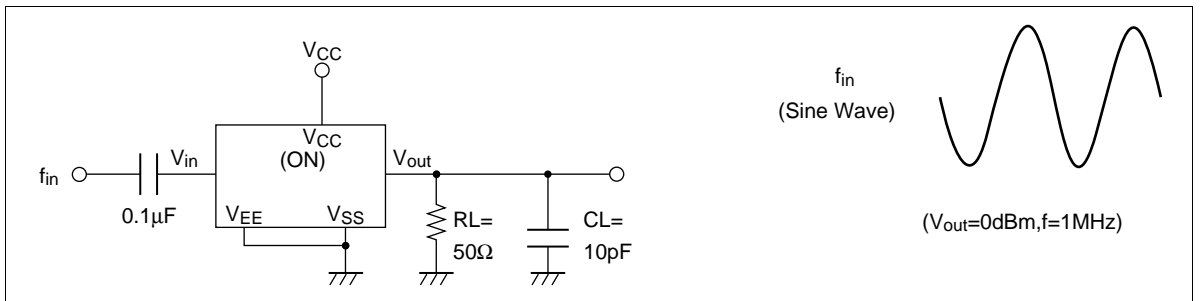


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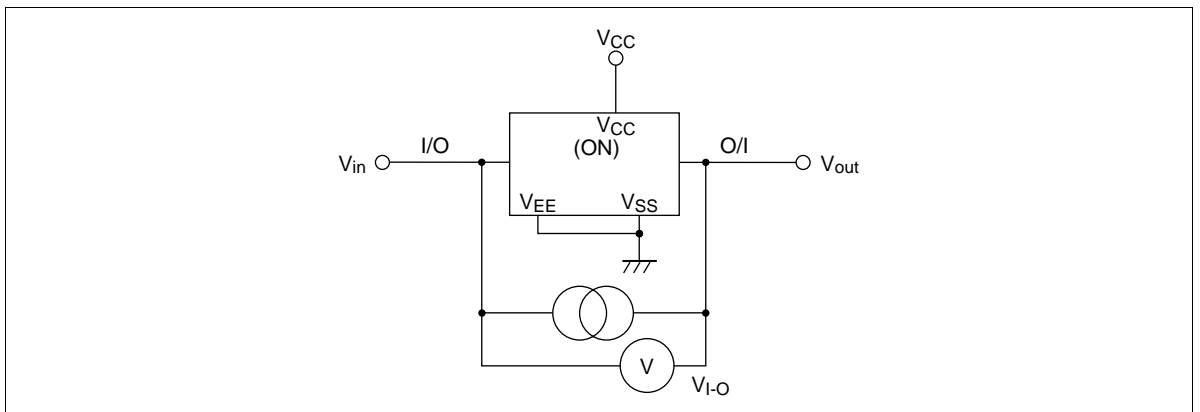
C_{in}, C_{out}, C_{in-out} (Input, Output, and Feed through Capacitance)



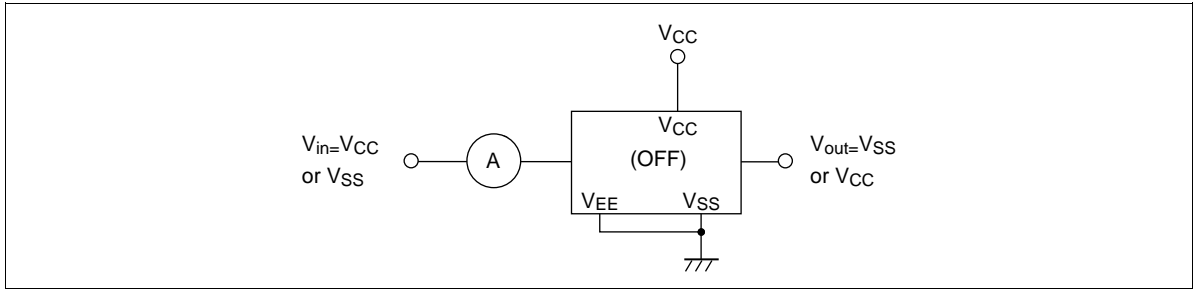
Frequency Response Channel ON



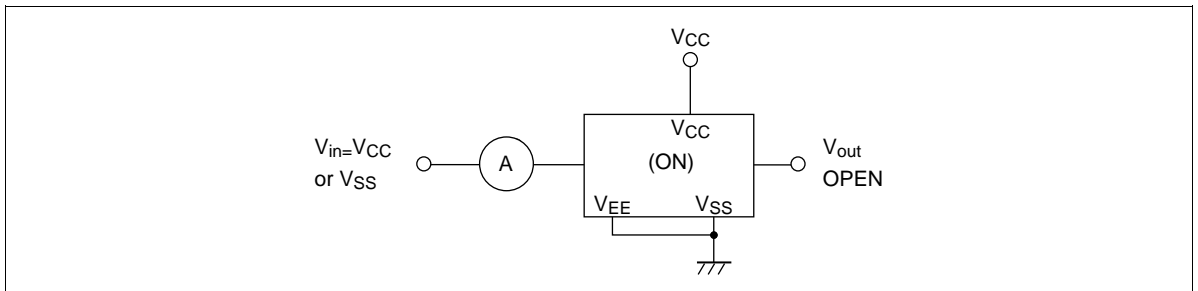
R_{ON}: ON Resistance



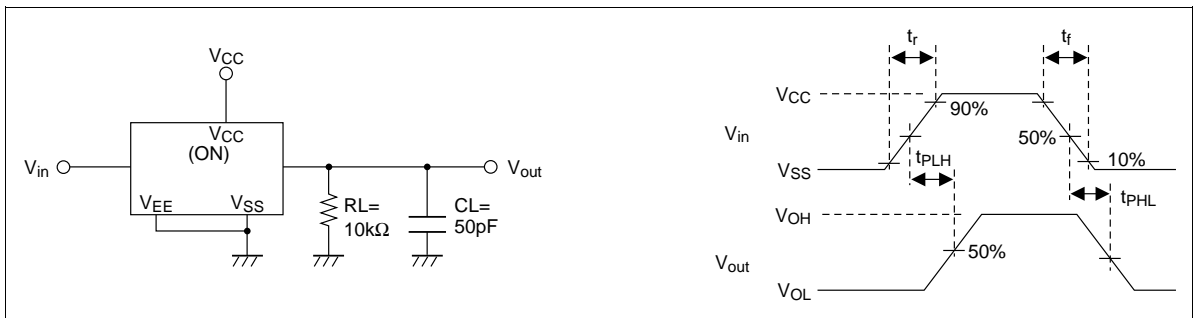
I_s (OFF): OFF Channel Leakage Current (Switch OFF)



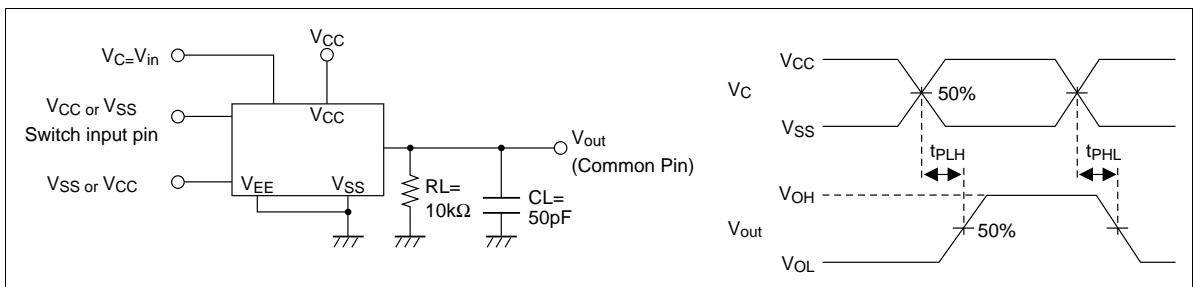
I_s (ON): OFF Channel Leakage Current (Switch ON)



t_{PLH} , t_{PHL} : Propagation Delay Time (Switch Input to Switch Output)

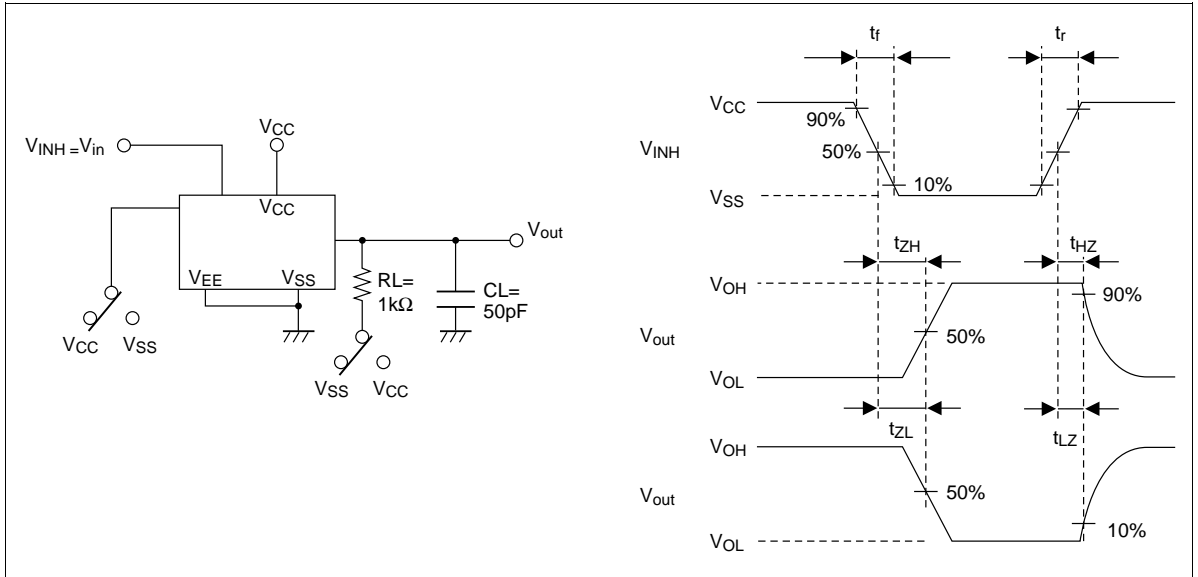


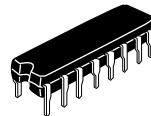
t_{PLH} , t_{PHL} : Propagation Delay Time (Control Input to Switch Output)



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t_{ZH} , t_{ZL}/t_{HZ} , t_{LZ} : Output Enable and Disable Time



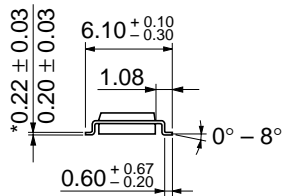
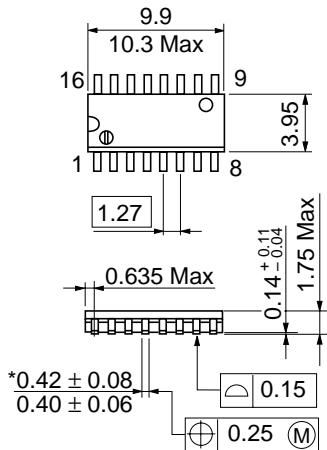


Hitachi Code	DP-16
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	1.07 g



*Dimension including the plating thickness
 Base material dimension

Hitachi Code	FP-16DA
JEDEC	—
EIAJ	Conforms
Weight (reference value)	0.24 g



*Dimension including the plating thickness
Base material dimension

Hitachi Code	FP-16DN
JEDEC	Conforms
EIAJ	Conforms
Weight (reference value)	0.15 g

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