

HD74HC4051

8-Channel Analog Multiplexer Demultiplexer

REJ03D0648-0200
 (Previous ADE-205-535)
 Rev.2.00
 Mar 30, 2006

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: $V_{CC} = 2$ to 6 V
- Low Quiescent Supply Current: I_{CC} (static) = 4 μ A max ($T_a = 25^\circ\text{C}$)
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HC4051P	DILP-16 pin	PRDP0016AE-B (DP-16FV)	P	—
HD74HC4051FPEL	SOP-16 pin (JEITA)	PRSP0016DH-B (FP-16DAV)	FP	EL (2,000 pcs/reel)
HD74HC4051RPEL	SOP-16 pin (JEDEC)	PRSP0016DG-A (FP-16DNV)	RP	EL (2,500 pcs/reel)

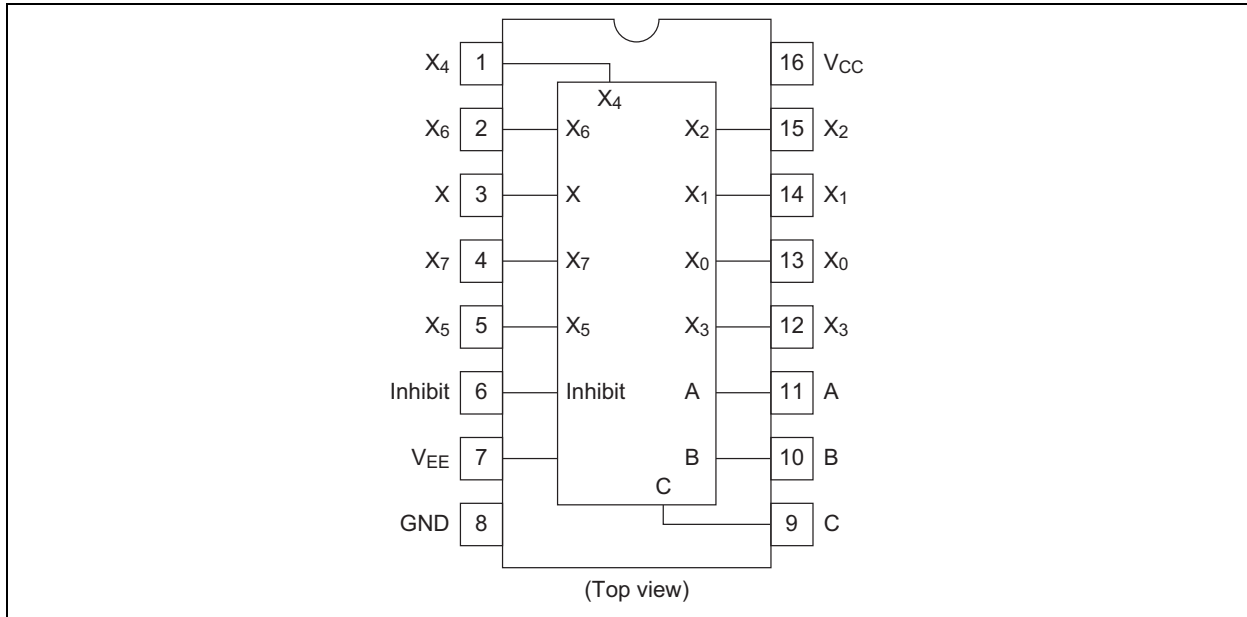
Note: Please consult the sales office for the above package availability.

Function Table

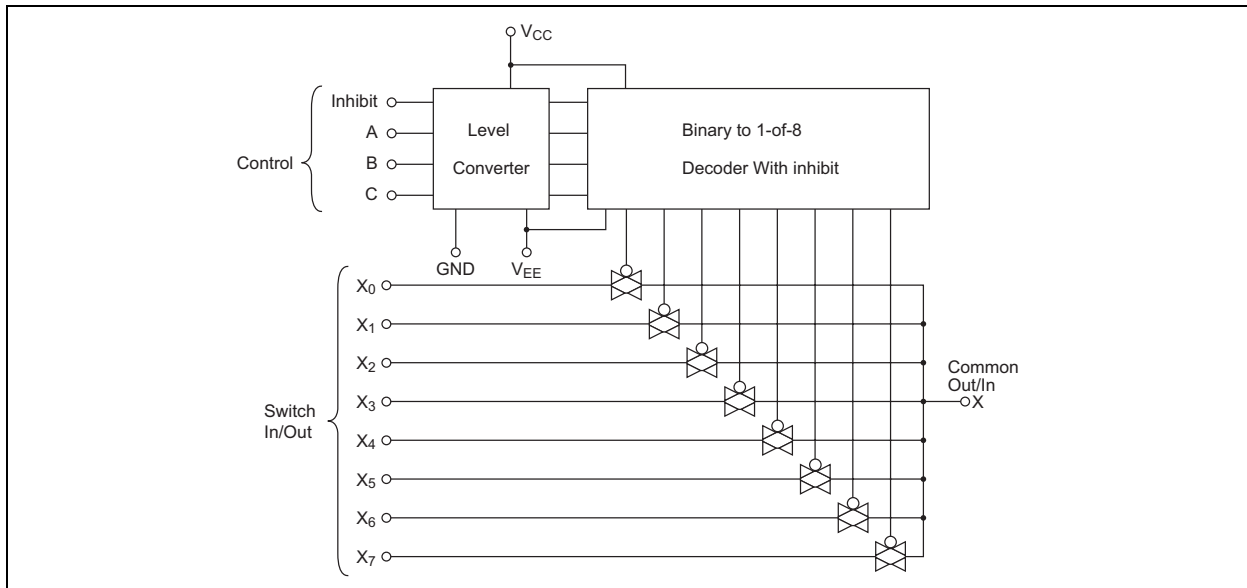
Inhibit	Control Inputs			ON Switch
	C	B	A	
L	L	L	L	X_0
L	L	L	H	X_1
L	L	H	L	X_2
L	L	H	H	X_3
L	H	L	L	X_4
L	H	L	H	X_5
L	H	H	L	X_6
L	H	H	H	X_7
H	X	X	X	—

X: Irrelevant

Pin Arrangement



Block Diagram



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	T_{stg}	-65 to +150	°C	

Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit
Supply voltage	$V_{CC} - V_{EE}$	2	—	6	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	T_{opr}	-40	—	+85	°C
Input rise/fall time	$V_{CC} = 2.0$ V	t_r, t_f	—	1000	ns
	$V_{CC} = 4.5$ V			500	ns
	$V_{CC} = 6.0$ V			400	ns

Electrical Characteristics

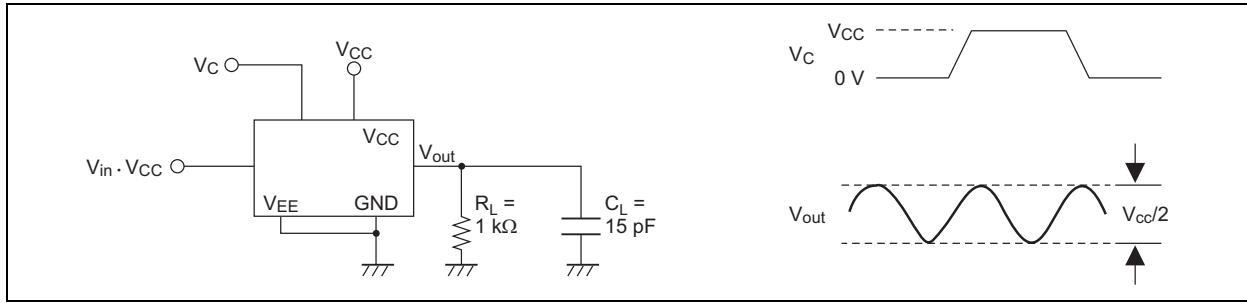
Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to +85°C		Unit	Test Conditions	
			Min	Typ	Max	Min	Max			
Control input voltage	V _{IH}	2.0	1.5	—	—	1.5	—	V		
		4.5	3.15	—	—	3.15	—			
		6.0	4.2	—	—	4.2	—			
	V _{IL}	2.0	—	—	0.5	—	0.5	V		
		4.5	—	—	1.35	—	1.35			
		6.0	—	—	1.8	—	1.8			
ON resistance	R _{ON}	2.0	—	2000	5000	—	6250	Ω	V _{INH} = V _{IL} V _{I/O} = V _{CC} to V _{EE} I _{I/O} ≤ 2 mA	
		4.5	—	120	180	—	225			
		6.0	—	100	170	—	210			
		2.0	—	200	800	—	1000	Ω		
		4.5	—	80	150	—	190			
		6.0	—	70	140	—	175			
ΔON resistance between any two channels	ΔR _{ON}	2.0	—	50	—	—	—	Ω	V _{INH} = V _{IL} V _{I/O} = V _{CC} to V _{EE} I _{I/O} ≤ 2 mA	
		4.5	—	13	40	—	50			
		6.0	—	10	20	—	25			
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 GND
Quiescent supply current	I _{CC}	6.0	—	—	4.0	—	40	μA	V _{in} = V _{CC} or GND	

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

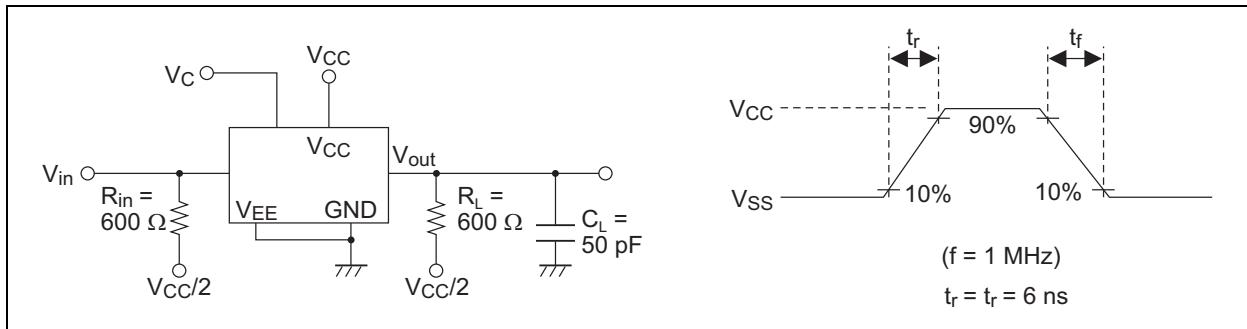
Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $+85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Propagation delay time	t_{PLH}	2.0	—	25	60	—	75	ns	$R_L = 10$ k Ω Switch input to switch output
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
	t_{PHL}	2.0	—	25	60	—	75		
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
Propagation delay time	t_{PLH}	2.0	—	50	153	—	191	ns	$R_L = 10$ k Ω Control input to switch output
		4.5	—	16	30	—	38		
		6.0	—	14	26	—	33		
	t_{PHL}	2.0	—	50	153	—	191		
		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		
		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		
		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	
Sine wave distortion		4.5	—	0.1	—	—	—	%	$f_{in} = 1$ kHz, $V_{in} = 4$ V _{p-p} $R_L = 10$ k Ω , $C_L = 50$ pF
Frequency response channel "ON" (Sine wave input)		4.5	—	95	—	—	—	MHz	$f_{in} = 1$ MHz, $20 \log_{10} V_{OS}/V_{IS} = -3$ dB $R_L = 50$ Ω , $C_L = 10$ pF
Feed through attenuation		4.5	—	-50	—	—	—	dB	$R_L = 600$ Ω , $C_L = 50$ pF, $f_{in} = 1$ MHz
Cross talk between any two switches		2.0	—	25	—	—	—	mV	$R_L = 600$ Ω , $C_L = 15$ pF, $f_{in} = 1$ MHz
		4.5	—	60	—	—	—		
		6.0	—	75	—	—	—		
Maximum control frequency		2.0	—	20	—	—	—	MHz	$R_L = 1$ k Ω , $C_L = 15$ pF $V_{out} = 1/2 (V_{CC})$
		4.5	—	30	—	—	—		
		6.0	—	30	—	—	—		

Test Circuit

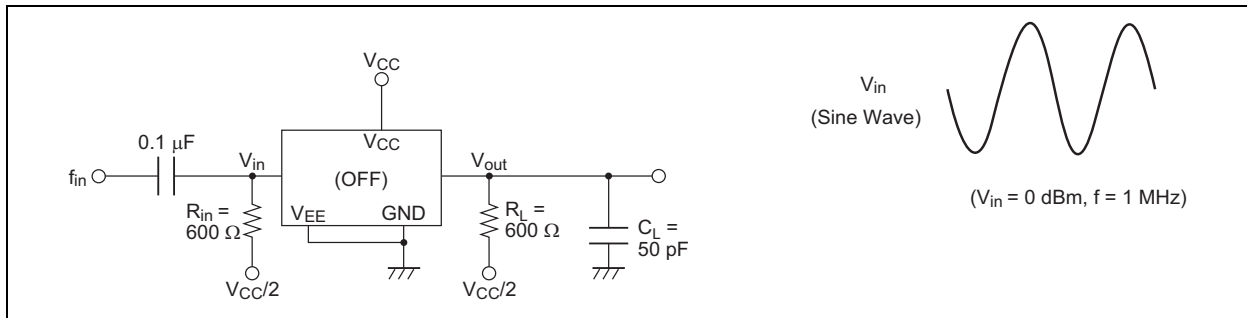
Maximum Control Frequency



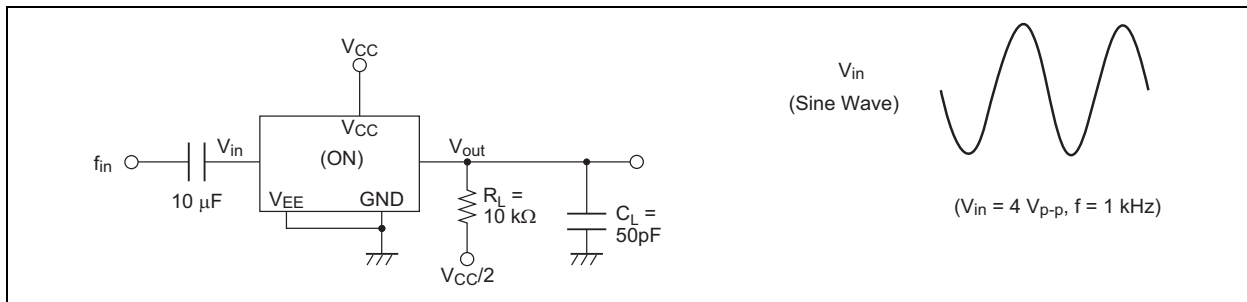
Cross talk (Control Input to Switch Output)



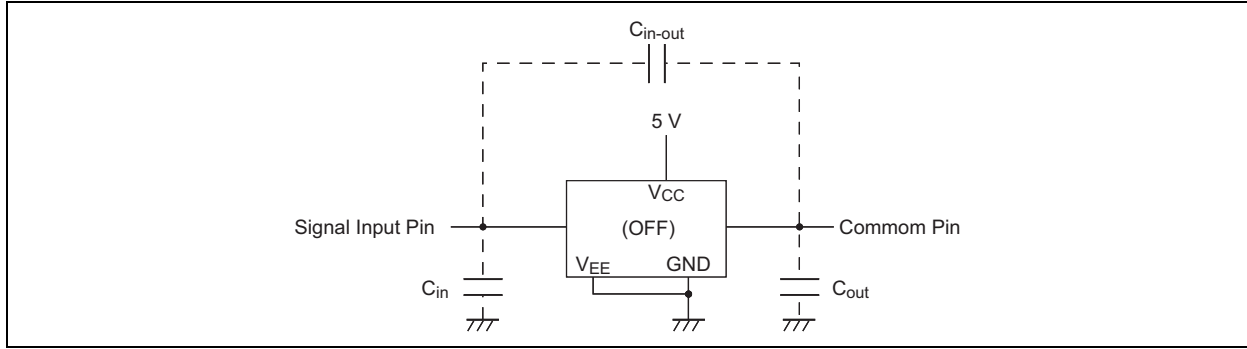
Feed through Attenuation



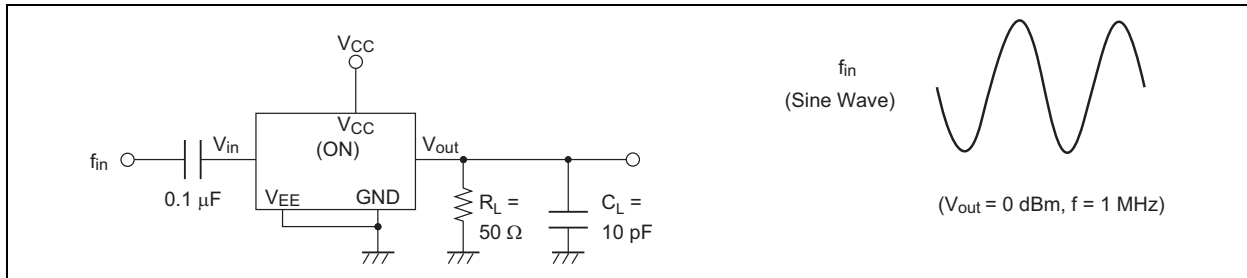
Sine Wave Distortion



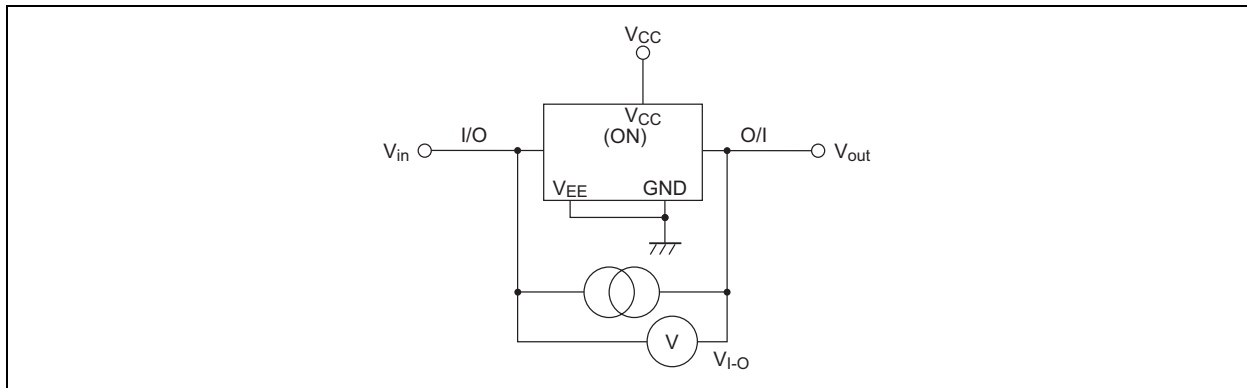
C_{in}, C_{out}, C_{in-out} (Input, Output, and Feed through Capacitance)



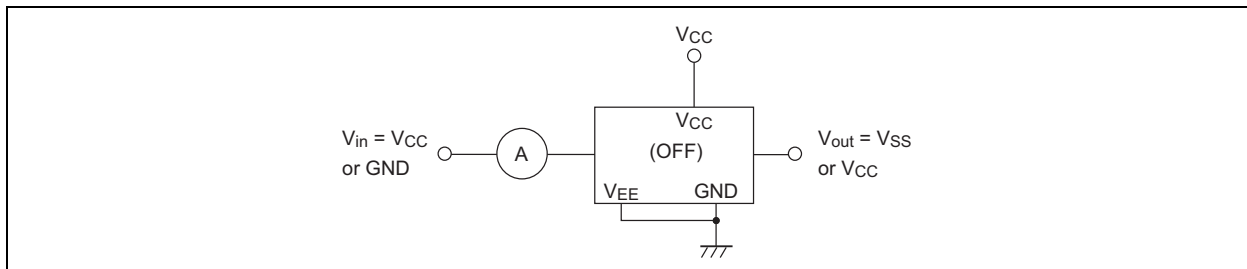
Frequency Response Channel ON



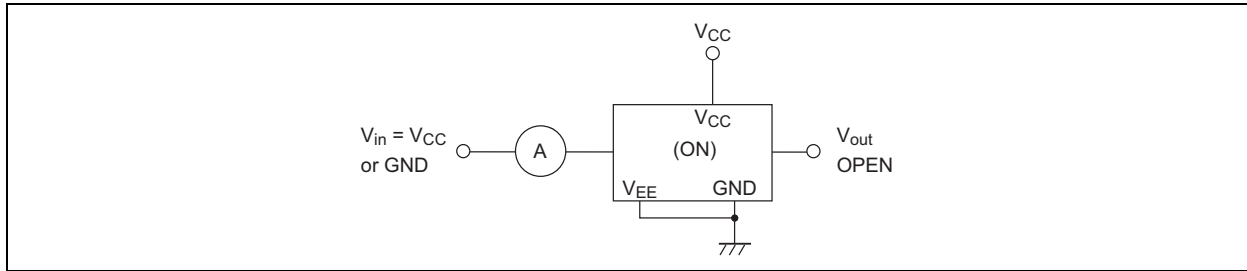
R_{ON}: ON Resistance



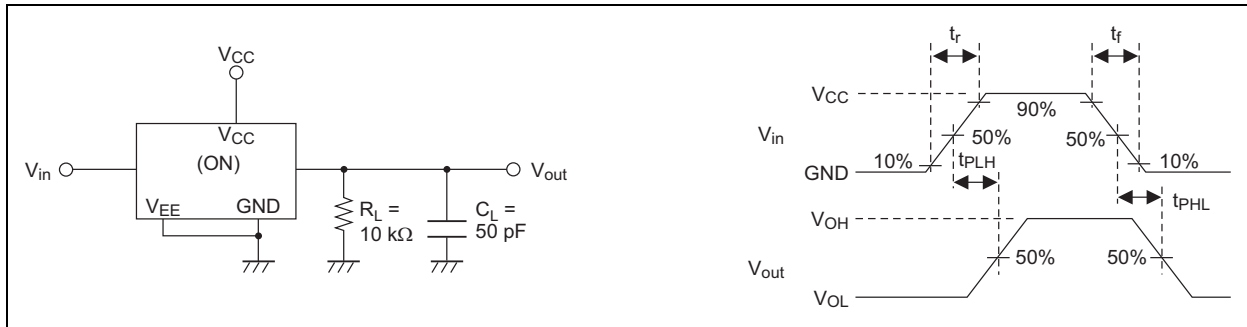
I_s (OFF): OFF Channel Leakage Current (Switch OFF)



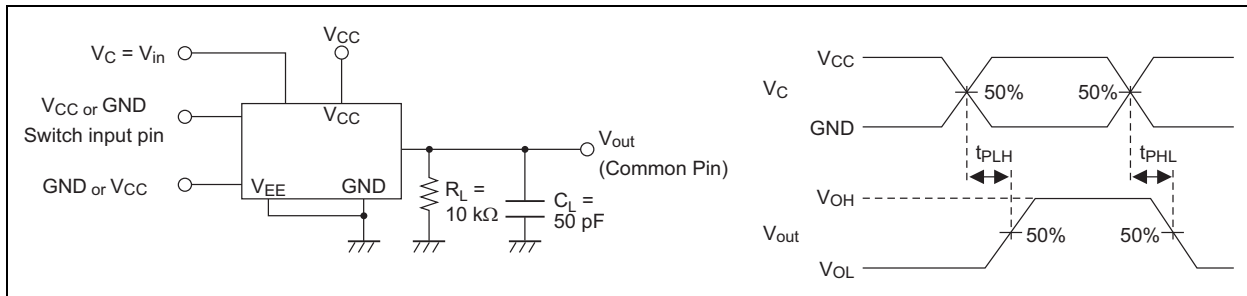
I_S (ON): OFF Channel Leakage Current (Switch ON)



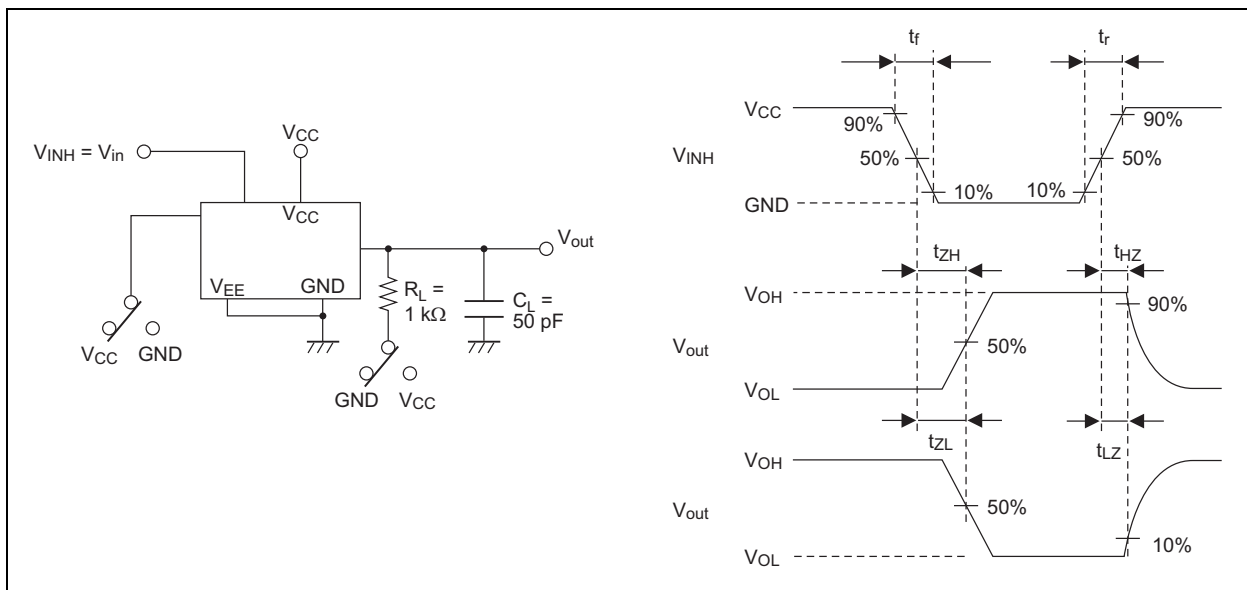
t_{PLH} , t_{PHL} : Propagation Delay Time (Switch Input to Switch Output)



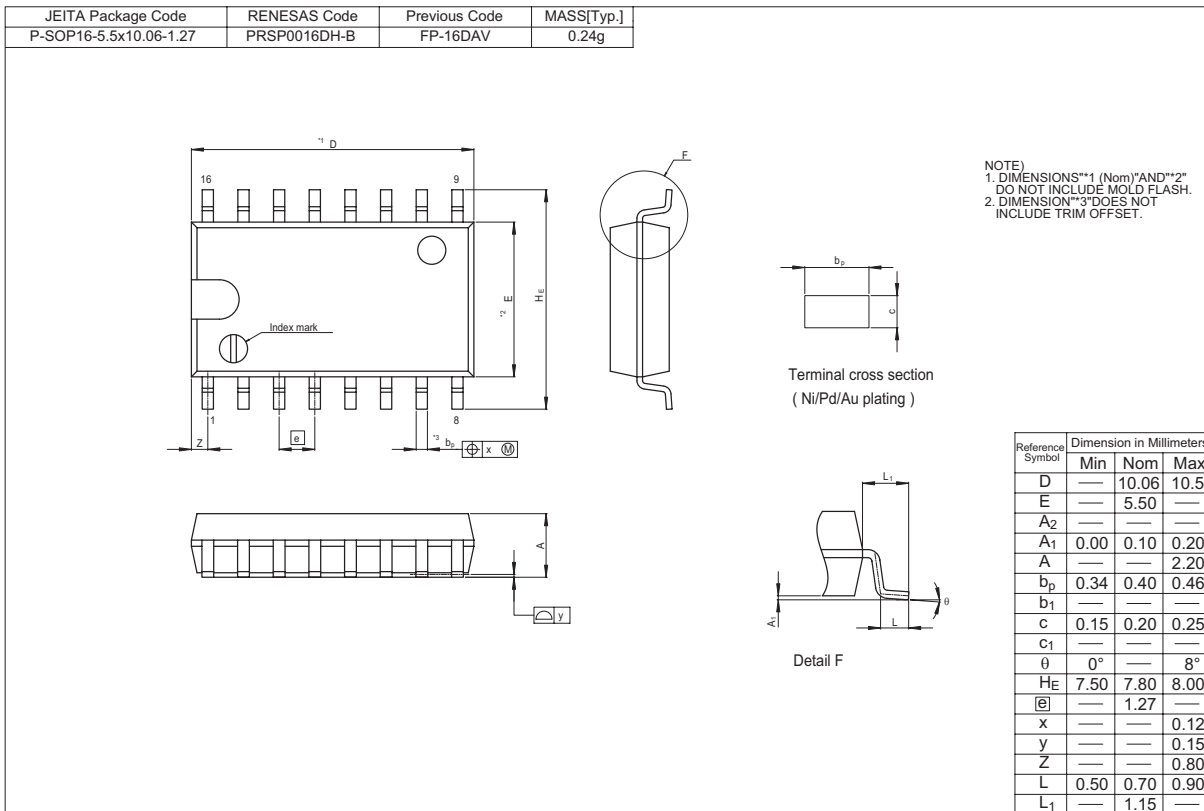
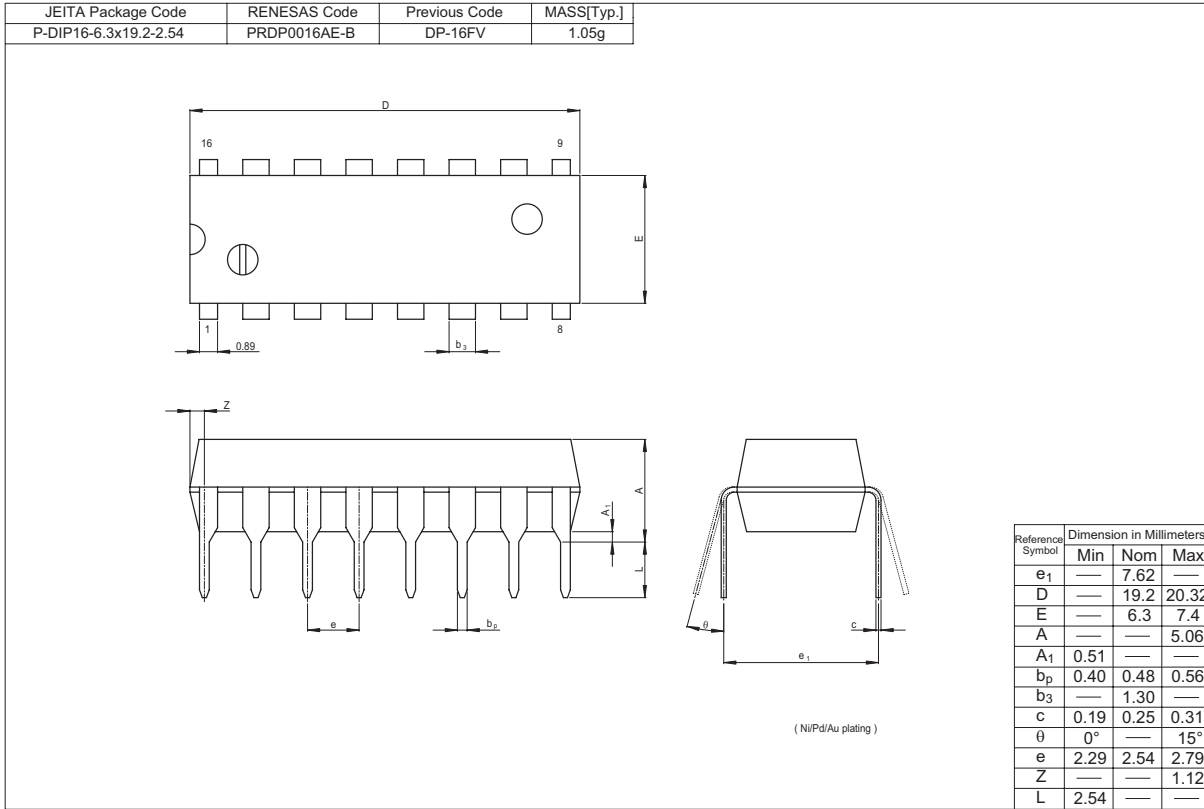
t_{PLH} , t_{PHL} : Propagation Delay Time (Control Input to Switch Output)



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

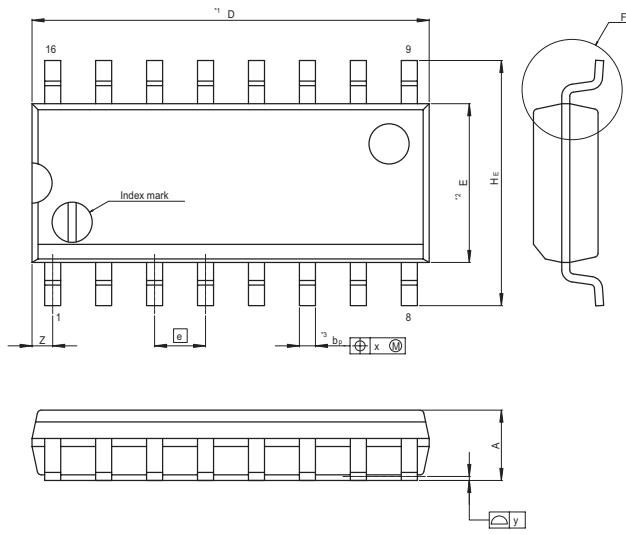


Package Dimensions



HD74HC4051

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-3.95x9.9-1.27	PRSP0016DG-A	FP-16DNV	0.15g



NOTE)
 1. DIMENSIONS "1" (Nom)"AND"2"
 DO NOT INCLUDE MOLD FLASH.
 2. DIMENSION "3" DOES NOT
 INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	9.90	10.30
E	—	3.95	—
A ₂	—	—	—
A ₁	0.10	0.14	0.25
A	—	—	1.75
b _D	0.34	0.40	0.46
b ₁	—	—	—
c	0.15	0.20	0.25
c ₁	—	—	—
θ	0°	—	8°
H _E	5.80	6.10	6.20
ϕ	—	1.27	—
x	—	—	0.25
y	—	—	0.15
Z	—	—	0.635
L	0.40	0.60	1.27
L ₁	—	1.08	—

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Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

Renesas Technology Malaysia Sdn. Bhd

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