

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)

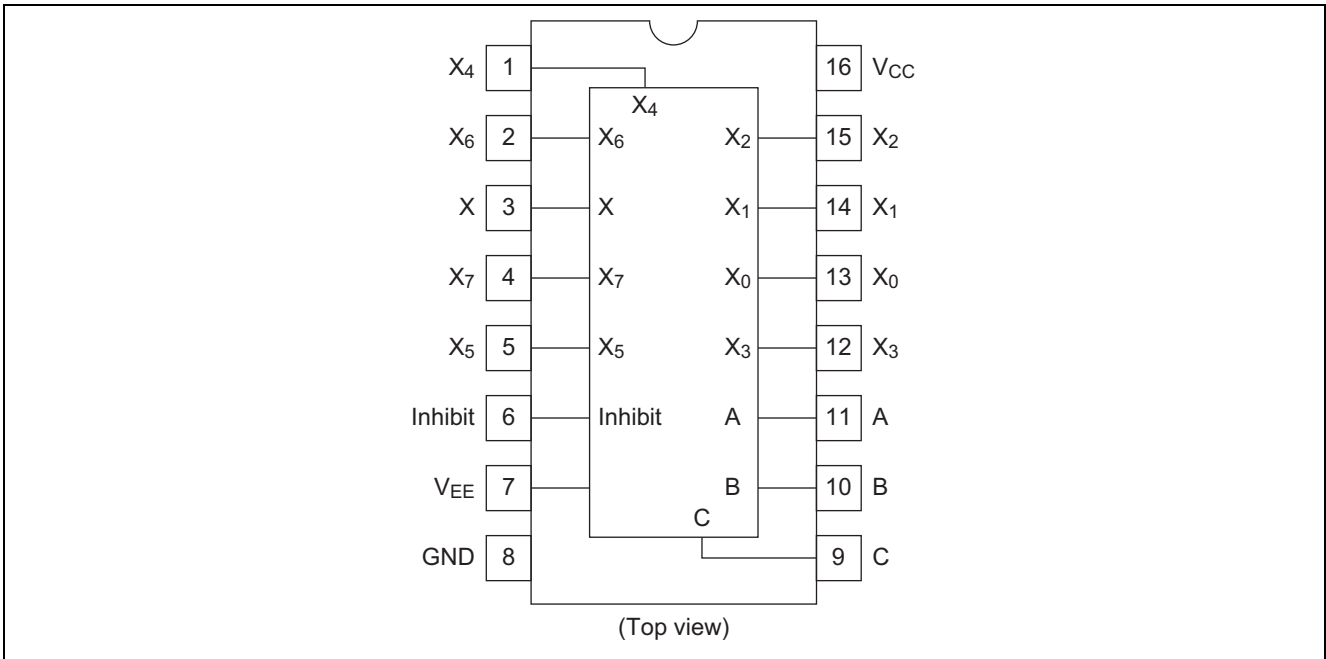
Note: Please consult the sales office for the above package availability.

Function Table

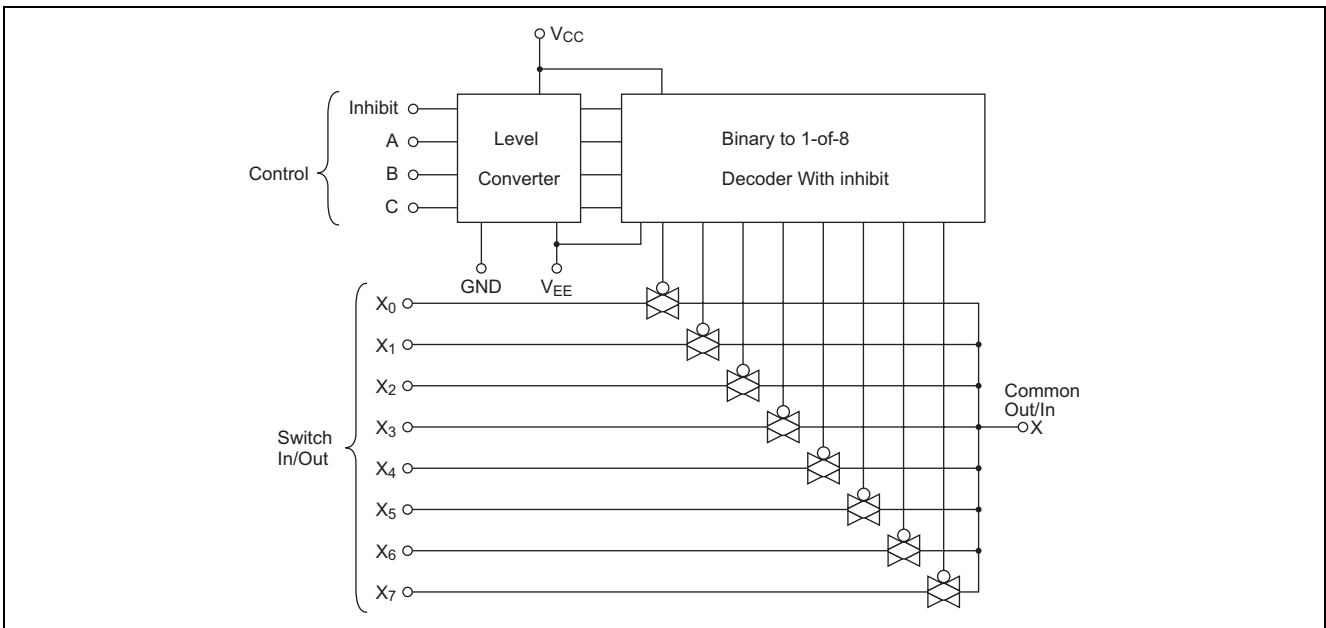
Control Inputs				ON Switch
Inhibit	C	B	A	
L	L	L	L	X_0
L	L	L	H	X_1
L	L	H	L	X_2
L	L	H	H	X_3
L	H	L	L	X_4
L	H	L	H	X_5
L	H	H	L	X_6
L	H	H	H	X_7
H	X	X	X	—

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	$^{\circ}\text{C}$

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	$^{\circ}\text{C}$
Input rise/fall time	$V_{CC} = 2.0\text{ V}$	t_r, t_f	0	—	1000	ns
	$V_{CC} = 4.5\text{ V}$		0	—	500	ns
	$V_{CC} = 6.0\text{ V}$		0	—	400	ns

Electrical Characteristics

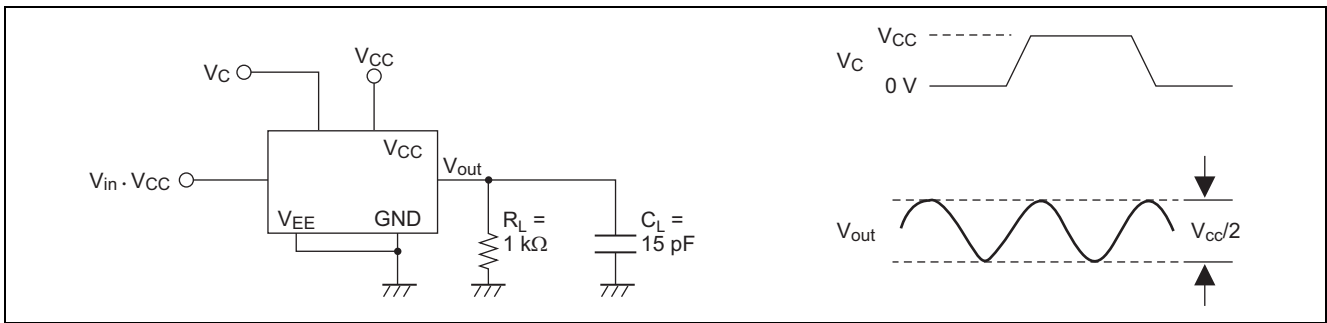
Item	Symbol	V _{CC} (V)	Ta = 25°C			Ta = -40 to+85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Control input voltage	V _{IH}	2.0	1.5	—	—	1.5	—	V	
		4.5	3.15	—	—	3.15	—		
		6.0	4.2	—	—	4.2	—		
	V _{IL}	2.0	—	—	0.5	—	0.5	V	
		4.5	—	—	1.35	—	1.35		
		6.0	—	—	1.8	—	1.8		
ON resistance	R _{ON}	2.0	—	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 ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$, $V_{EE} = \text{GND}$)

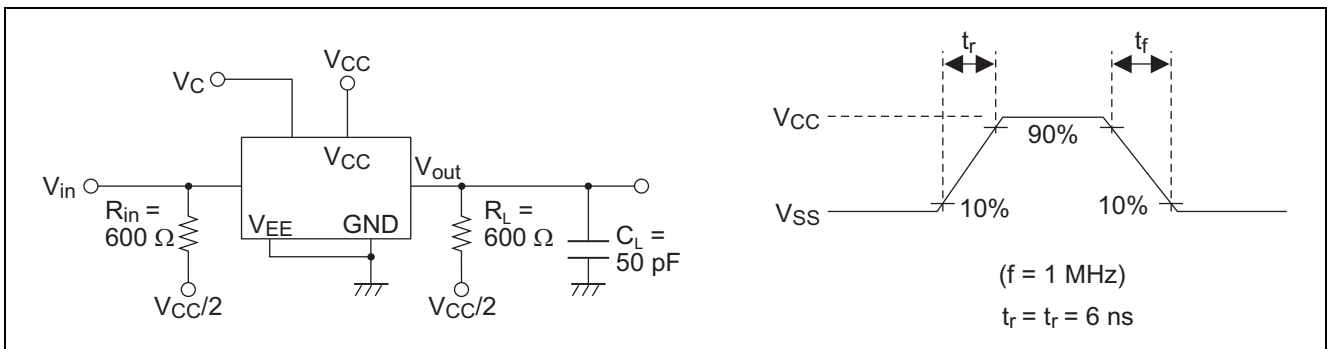
Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } +85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Propagation delay time	t_{PLH}	2.0	—	25	60	—	75	ns	$R_L = 10 \text{ k}\Omega$ Switch input to switch output
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
	t_{PHL}	2.0	—	25	60	—	75		
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
Propagation delay time	t_{PLH}	2.0	—	50	153	—	191	ns	$R_L = 10 \text{ k}\Omega$ 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	$R_L = 1 \text{ k}\Omega$
		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	$R_L = 1 \text{ k}\Omega$
		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	—	—	—	%	$f_{in} = 1 \text{ kHz}$, $V_{in} = 4 \text{ V}_{P-P}$ $R_L = 10 \text{ k}\Omega$, $C_L = 50 \text{ pF}$
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	—	—	—		

Test Circuit

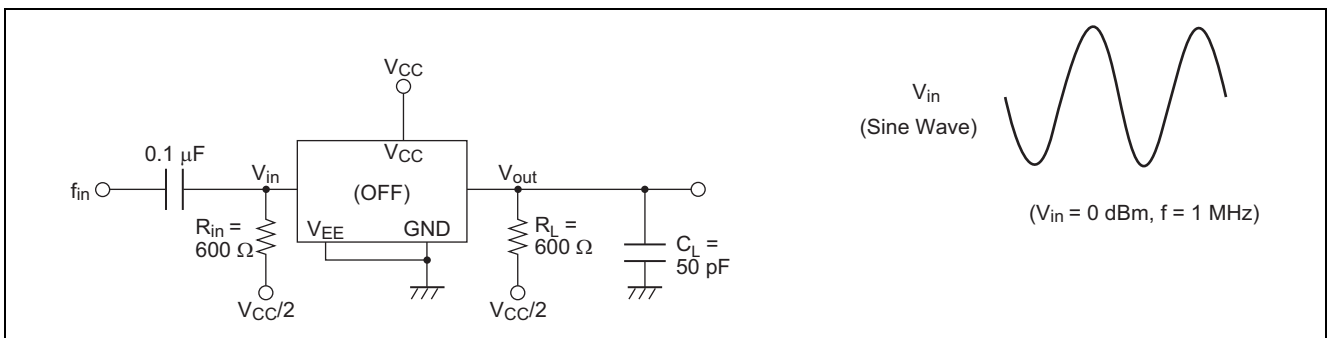
Maximum Control Frequency



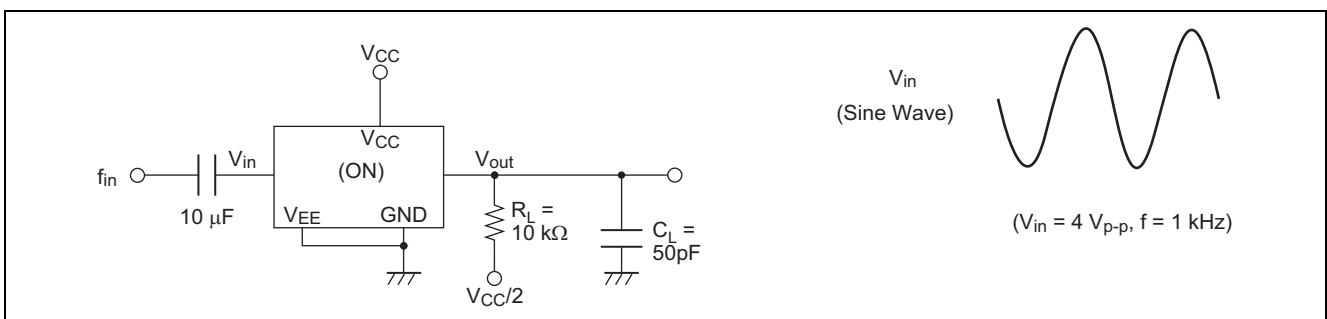
Cross talk (Control Input to Switch Output)



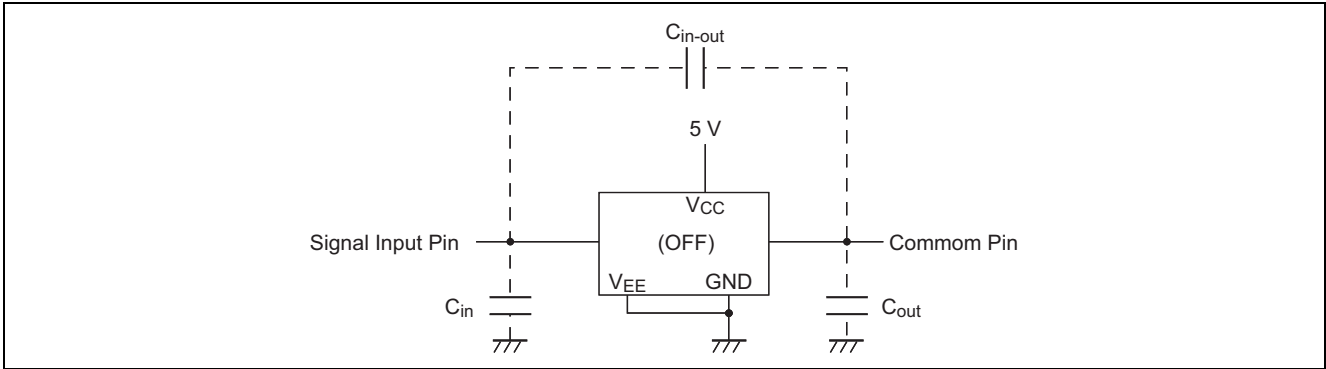
Feed through Attenuation



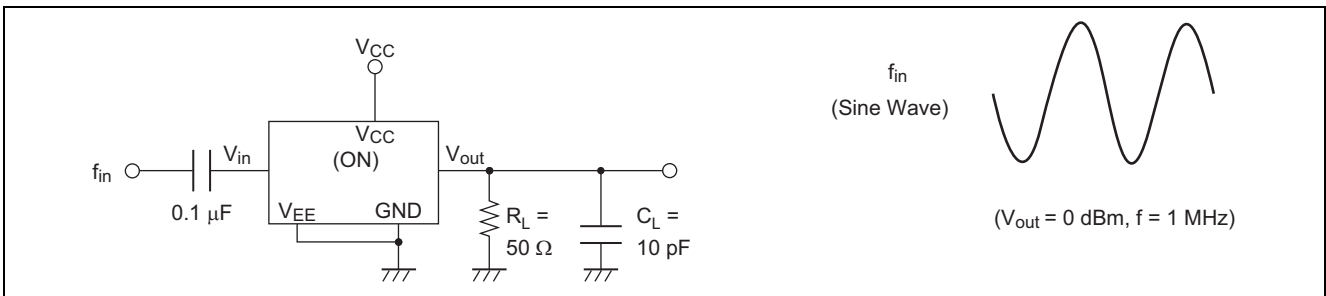
Sine Wave Distortion



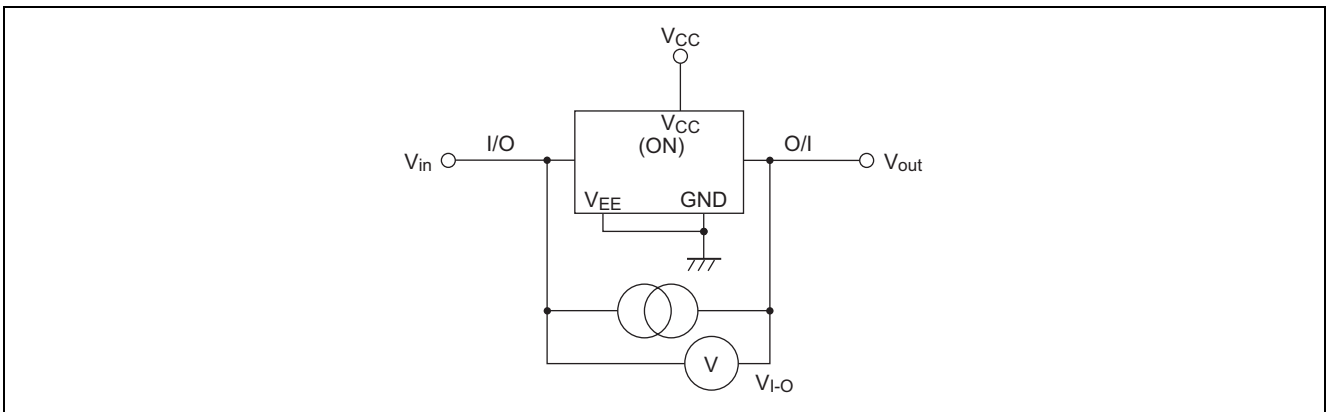
C_{in}, C_{out}, C_{in-out} (Input, Output, and Feed through Capacitance)



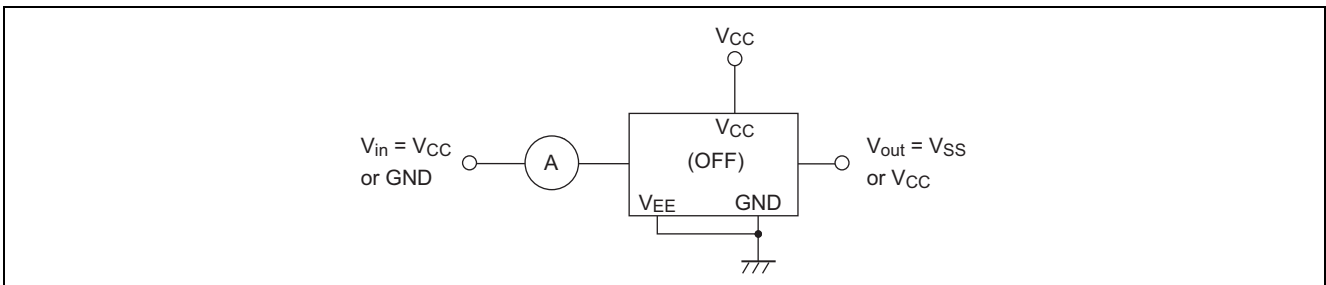
Frequency Response Channel ON



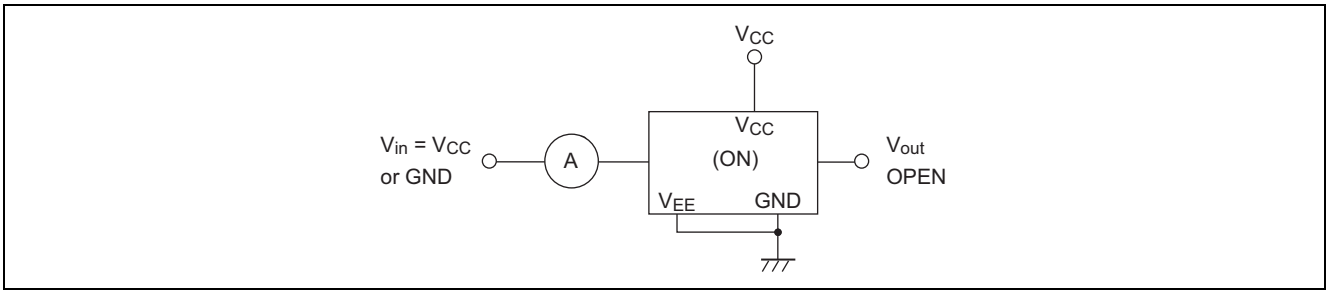
R_{ON}: ON Resistance



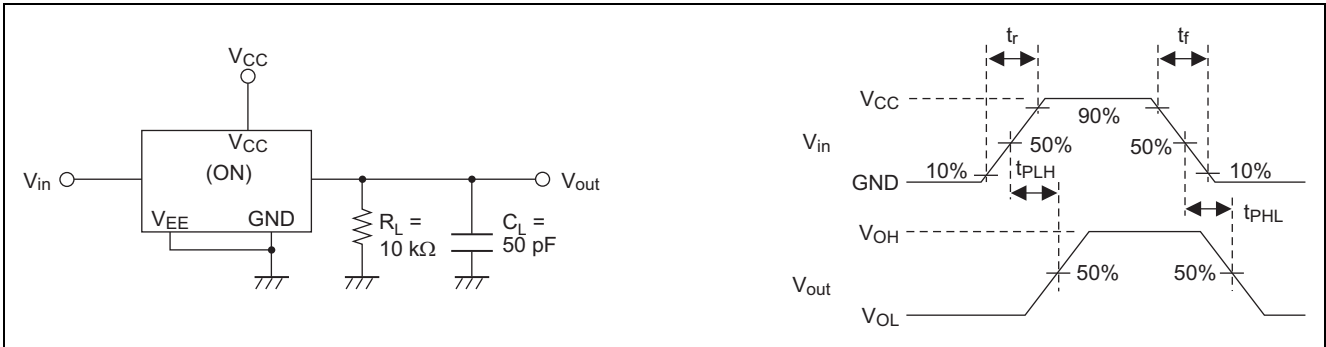
I_s (OFF): OFF Channel Leakage Current (Switch OFF)



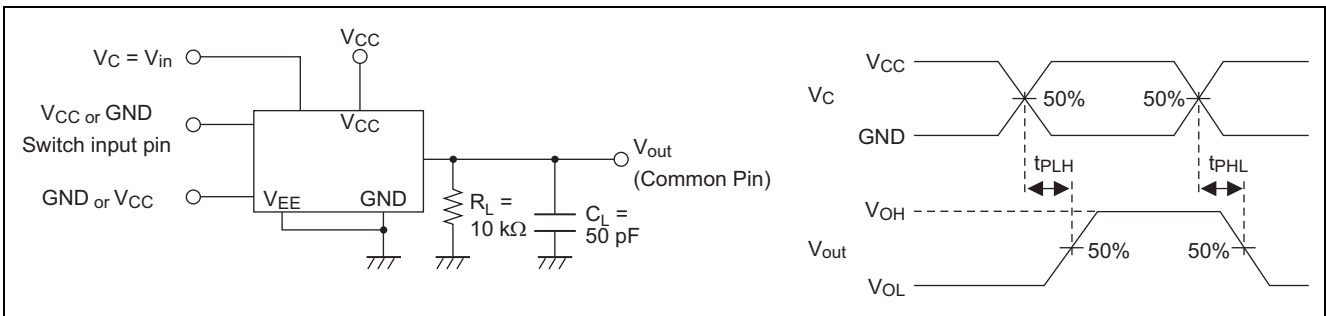
I_s (ON): OFF Channel Leakage Current (Switch ON)



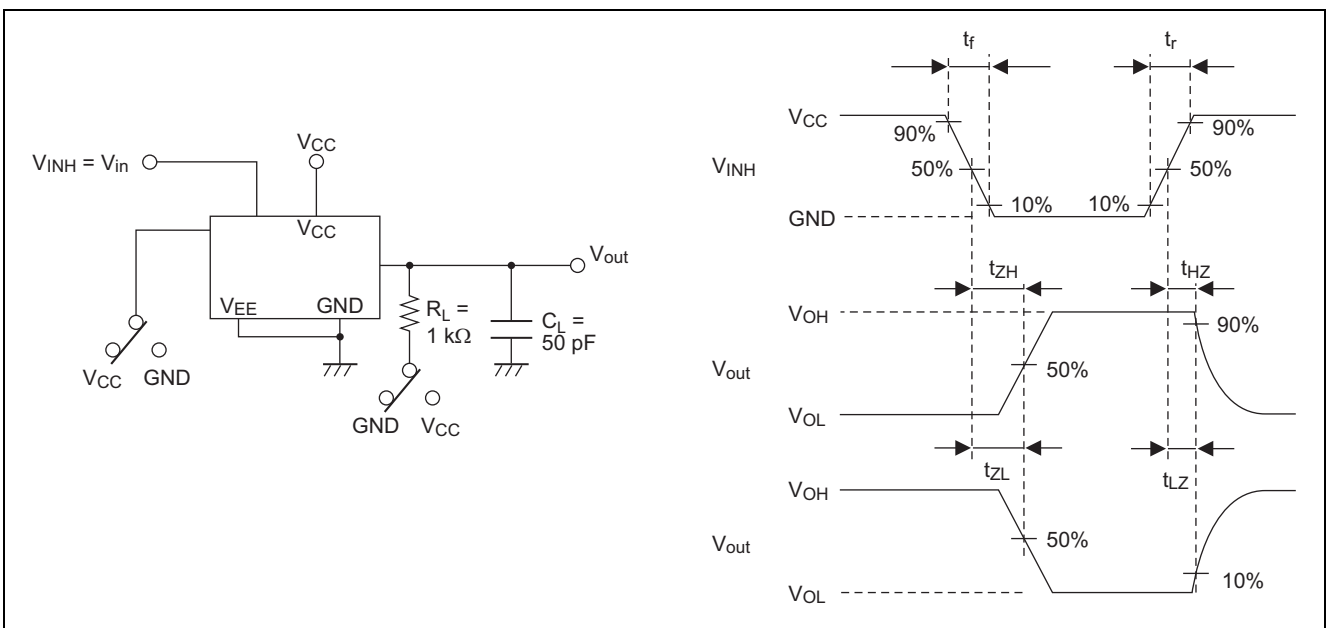
t_{PLH} , t_{PHL} : Propagation Delay Time (Switch Input to Switch Output)



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

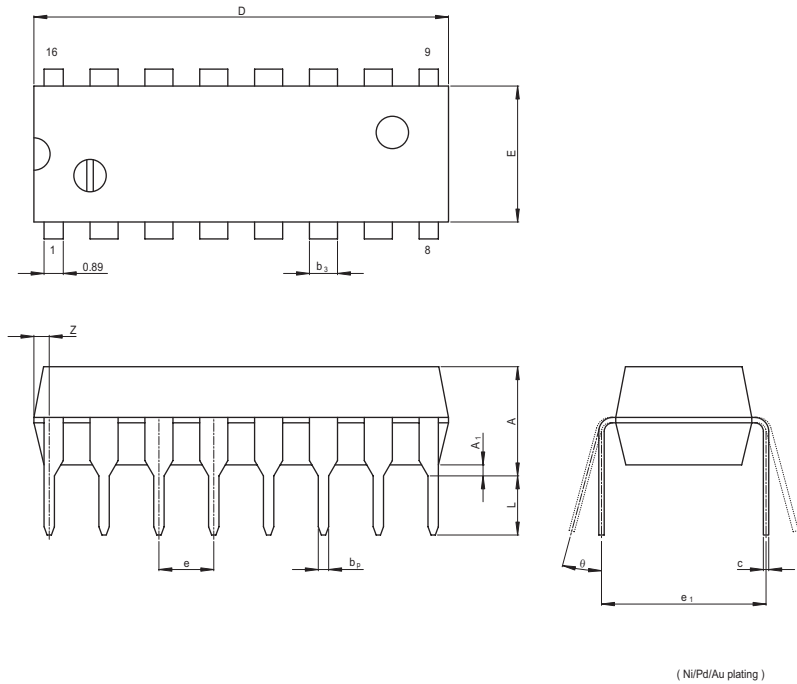


t_{ZH} , t_{ZL}/t_{HZ} , t_{LZ} : Output Enable and Disable Time



Package Dimensions

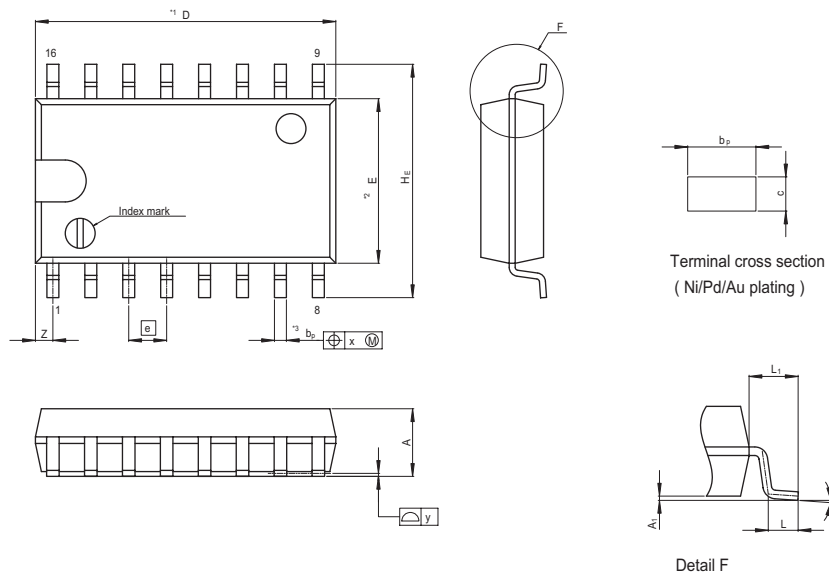
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP16-6.3x19.2-2.54	PRDP0016AE-B	DP-16FV	1.05g



Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e ₁	—	7.62	—
D	—	19.2	20.32
E	—	6.3	7.4
A	—	—	5.06
A ₁	0.51	—	—
b _p	0.40	0.48	0.56
b ₃	—	1.30	—
c	0.19	0.25	0.31
θ	0°	—	15°
e	2.29	2.54	2.79
Z	—	—	1.12
L	2.54	—	—

(Ni/Pd/Au plating)

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-5.5x10.06-1.27	PRSP0016DH-B	FP-16DAV	0.24g



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

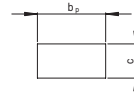
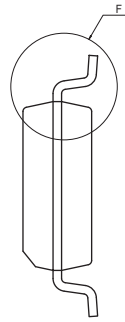
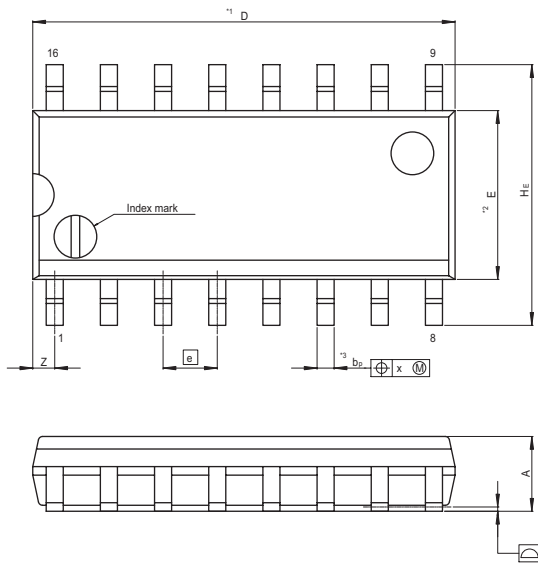
Terminal cross section
 (Ni/Pd/Au plating)

Detail F

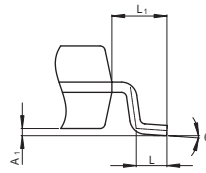
Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	10.06	10.5
E	—	5.50	—
A ₂	—	—	—
A ₁	0.00	0.10	0.20
A	—	—	2.20
b _p	0.34	0.40	0.46
b ₁	—	—	—
c	0.15	0.20	0.25
c ₁	—	—	—
θ	0°	—	8°
HE	7.50	7.80	8.00
Ⓜ	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	0.80
L	0.50	0.70	0.90
L ₁	—	1.15	—

HD74HC4051

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



Terminal cross section
(Ni/Pd/Au plating)



Detail F

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 _p	0.34	0.40	0.46
b ₁	—	—	—
c	0.15	0.20	0.25
c ₁	—	—	—
θ	0°	—	8°
HE	5.80	6.10	6.20
Ⓜ	—	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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