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 µA max (Ta = 25°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)

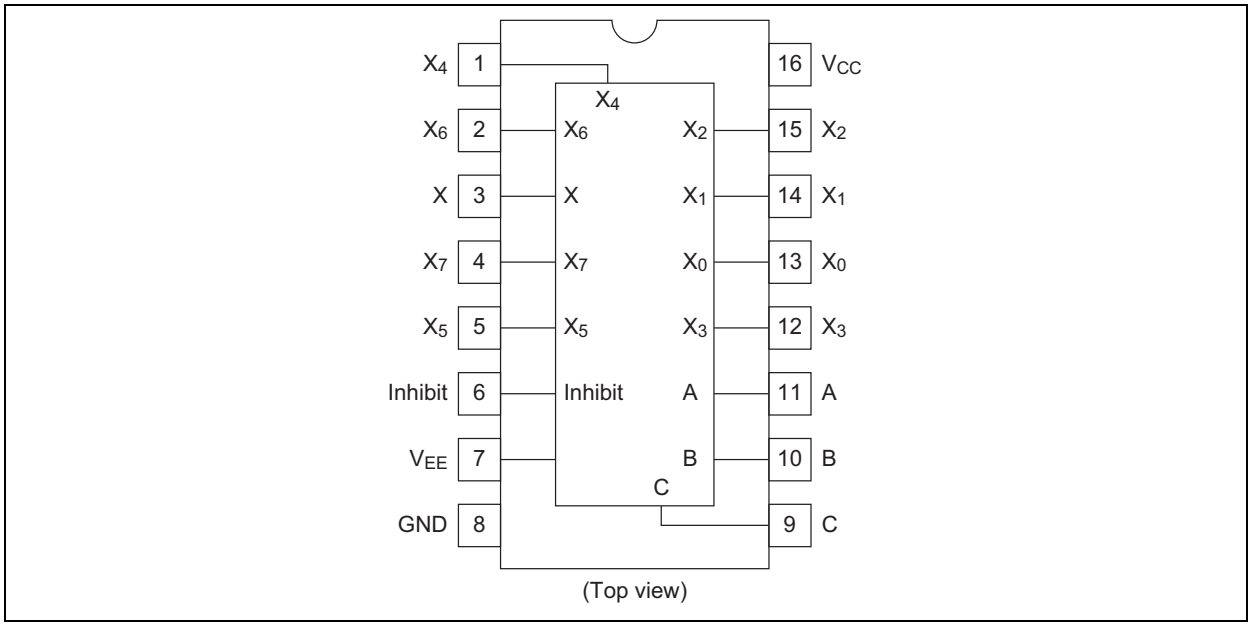
Note: Please consult the sales office for the above package availability.

Function Table

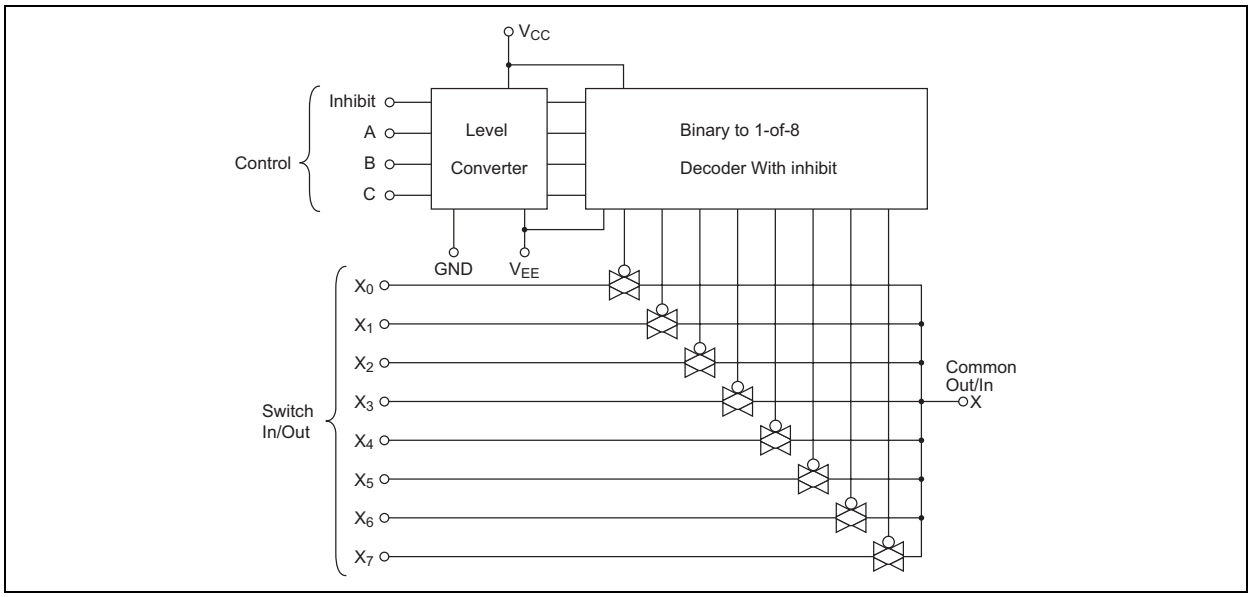
Control Inputs				ON Switch
Inhibit	C	B	A	
L	L	L	L	X_0
L	L	L	H	X_1
L	L	H	L	X_2
L	L	H	H	X_3
L	H	L	L	X_4
L	H	L	H	X_5
L	H	H	L	X_6
L	H	H	H	X_7
H	X	X	X	—

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		Tstg	–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		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

Electrical Characteristics

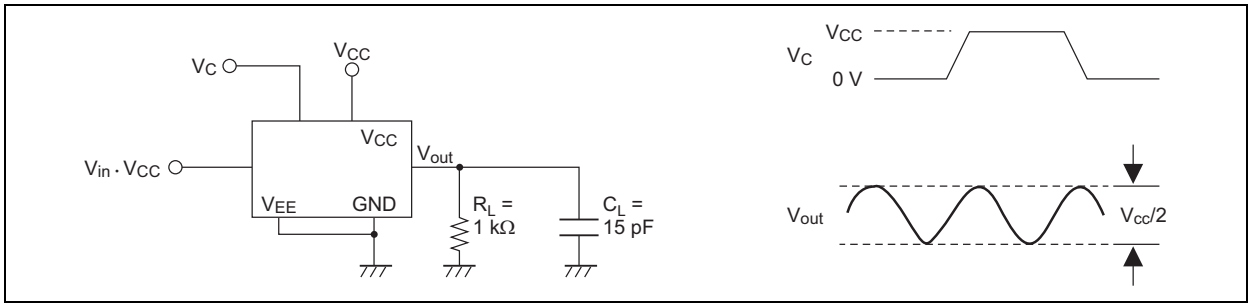
Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to+85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Control input voltage	V_{IH}	2.0	1.5	—	—	1.5	—	V	
		4.5	3.15	—	—	3.15	—		
		6.0	4.2	—	—	4.2	—		
	V_{IL}	2.0	—	—	0.5	—	0.5	V	
		4.5	—	—	1.35	—	1.35		
		6.0	—	—	1.8	—	1.8		
ON resistance	R_{ON}	2.0	—	2000	5000	—	6250	Ω	$V_{INH} = V_{IL}$ $V_{I/O} = V_{CC}$ to V_{EE} $I_{I/O} \leq 2$ mA
		4.5	—	120	180	—	225		
		6.0	—	100	170	—	210		
		2.0	—	200	800	—	1000	Ω	$V_{INH} = V_{IL}$ $V_{I/O} = V_{CC}$ or V_{EE} $V_{I/O} \leq 2$ mA
		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} $I_{I/O} \leq 2$ 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	Iin	6.0	—	—	±0.1	—	±1.0	μA	Vin = V_{CC} or GND
Quiescent supply current	I_{CC}	6.0	—	—	4.0	—	40	μA	Vin = V_{CC} or GND

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

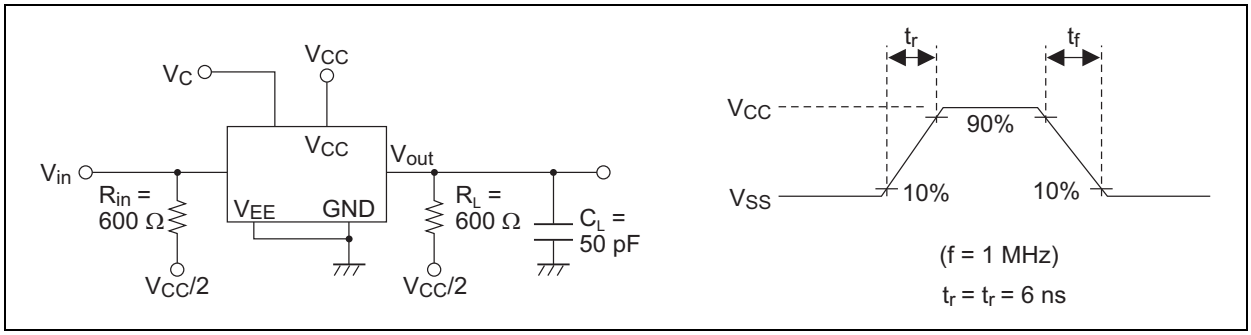
Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Propagation delay time	t_{PLH}	2.0	—	25	60	—	75	ns	R_L = 10 kΩ Switch input to switch output
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
	t_{PHL}	2.0	—	25	60	—	75	ns	
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
Propagation delay time	t_{PLH}	2.0	—	50	153	—	191	ns	R_L = 10 kΩ Control input to switch output
		4.5	—	16	30	—	38		
		6.0	—	14	26	—	33		
	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 kΩ
		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 kΩ
		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	Cin	—	—	5	10	—	10	pF	
Switch input capacitance	Cin	5.0	—	5	—	—	—	pF	
Output capacitance (Common pin)	Cout	5.0	—	22	—	—	—	pF	
Feed through capacitance	Cin–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, Vin = 4 V_{P-P} R_L = 10 kΩ, 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 kΩ, C_L = 15 pF Vout = 1/2 (V_{CC})
		4.5	—	30	—	—	—		
		6.0	—	30	—	—	—		

Test Circuit

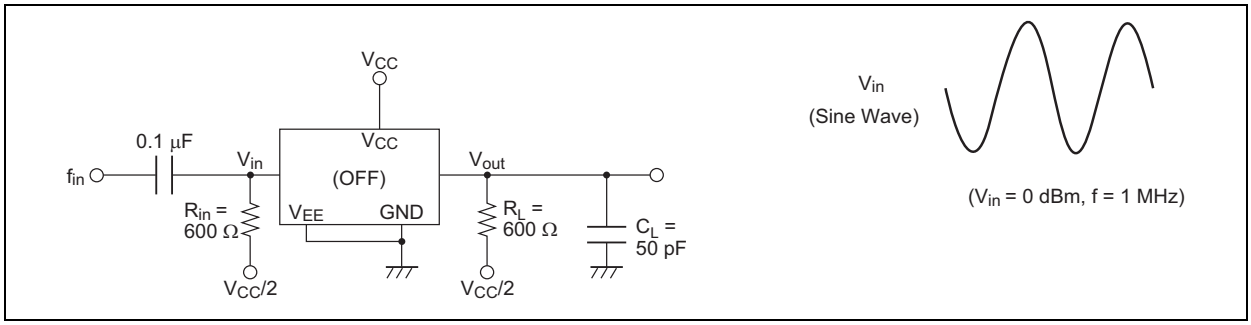
Maximum Control Frequency



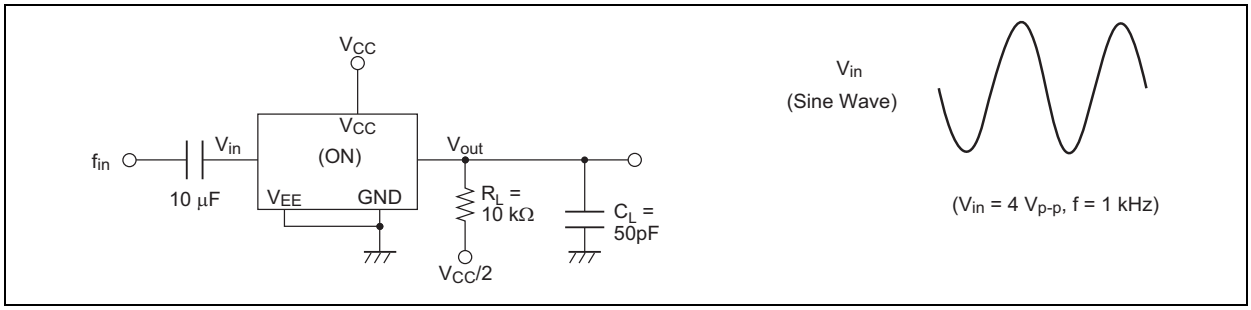
Cross talk (Control Input to Switch Output)



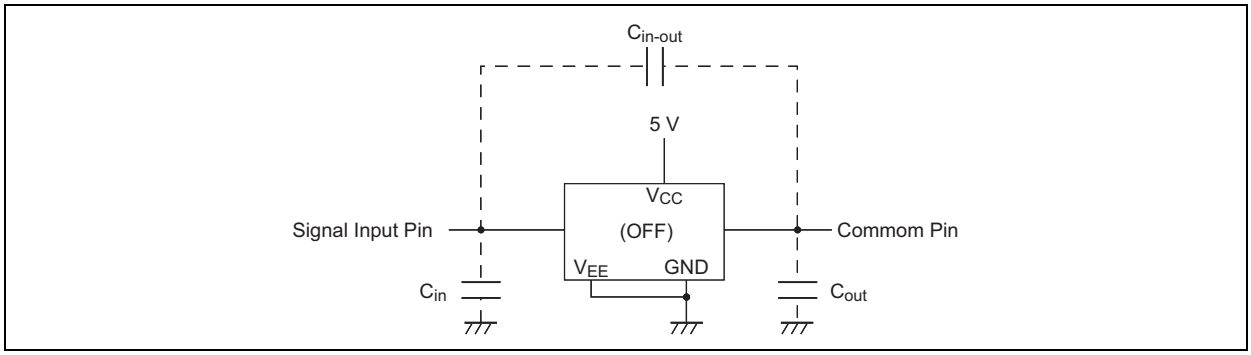
Feed through Attenuation



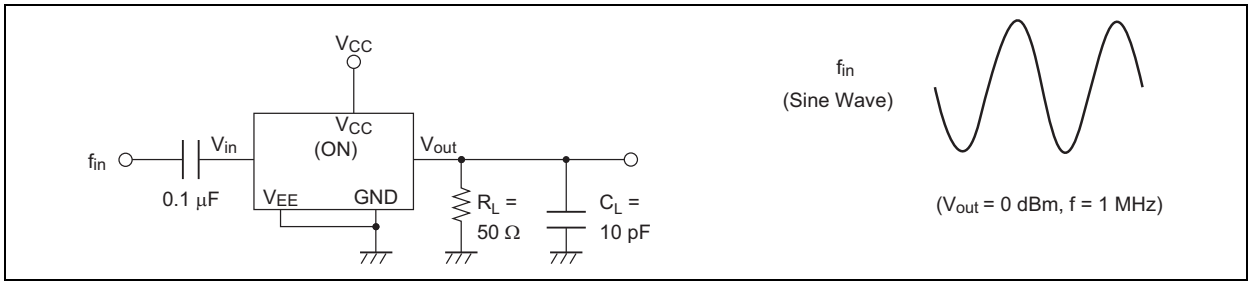
Sine Wave Distortion



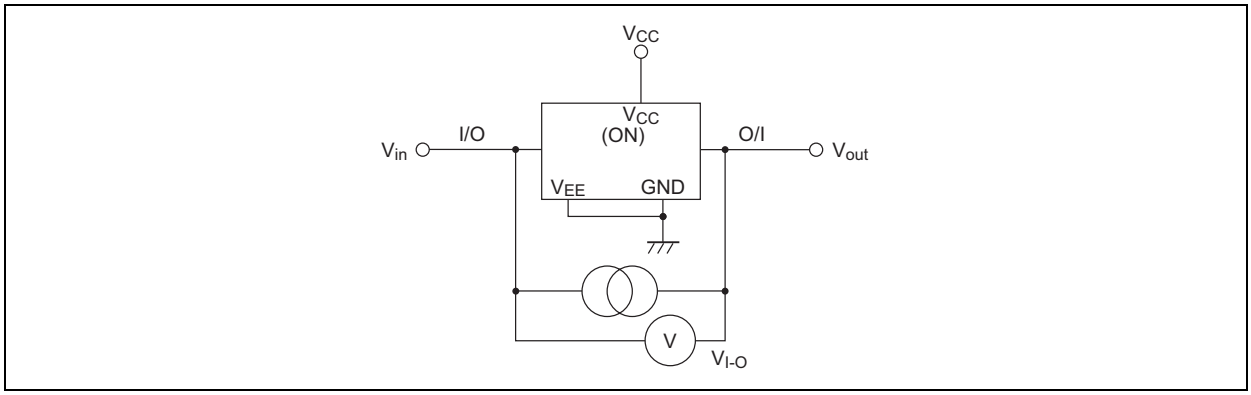
Cin, Cout, Cin–out (Input, Output, and Feed through Capacitance)



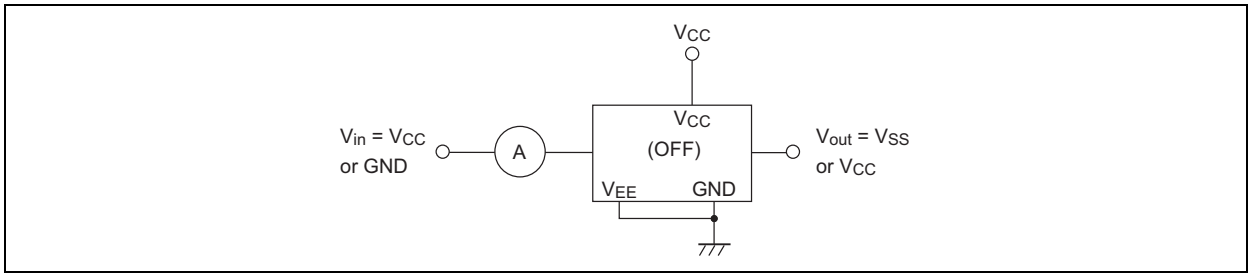
Frequency Response Channel ON



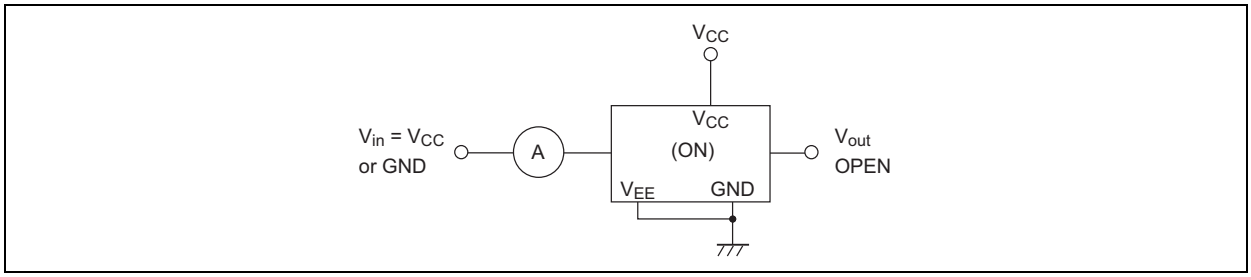
R_{ON}: ON Resistance



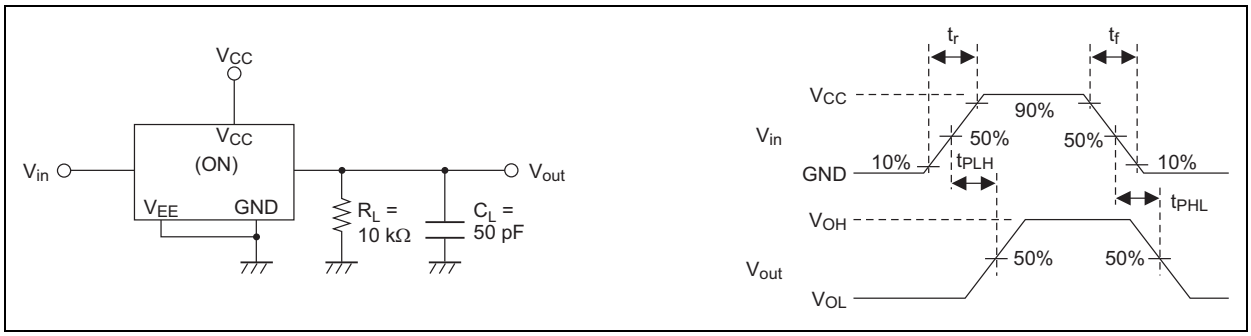
I_S (OFF): OFF Channel Leakage Current (Switch OFF)



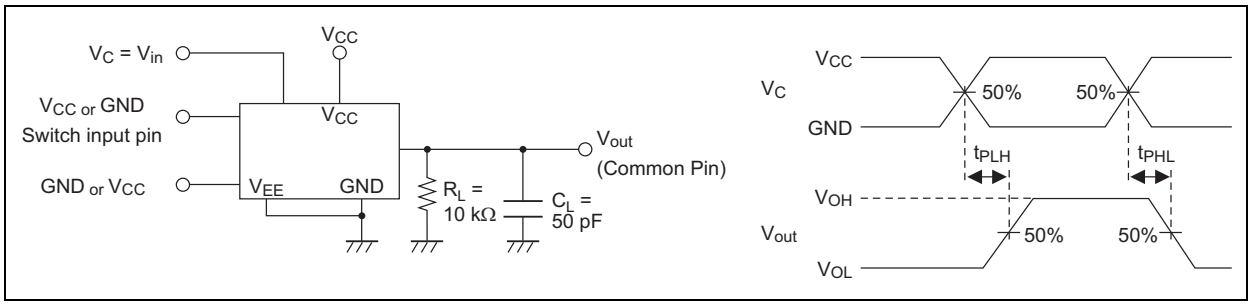
I_S (ON): OFF Channel Leakage Current (Switch ON)



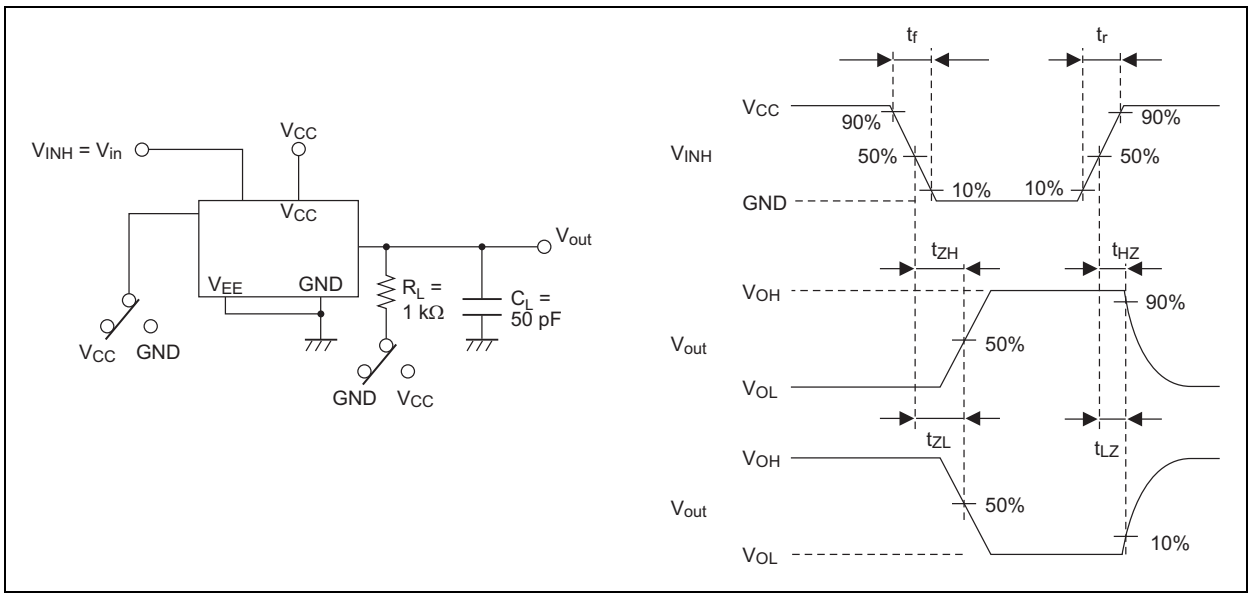
t_{PLH}, t_{PHL}: Propagation Delay Time (Switch Input to Switch Output)



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

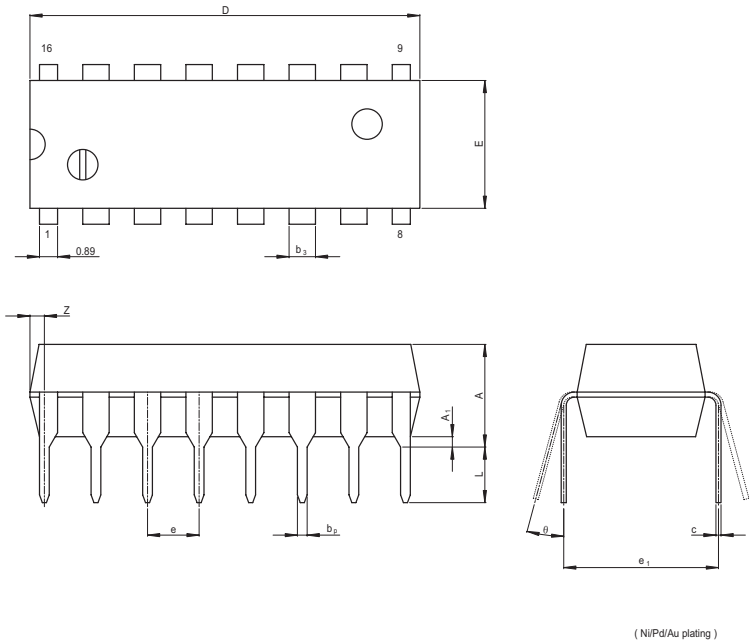


t_{ZH}, t_{ZL}/t_{HZ}, t_{LZ}: Output Enable and Disable Time



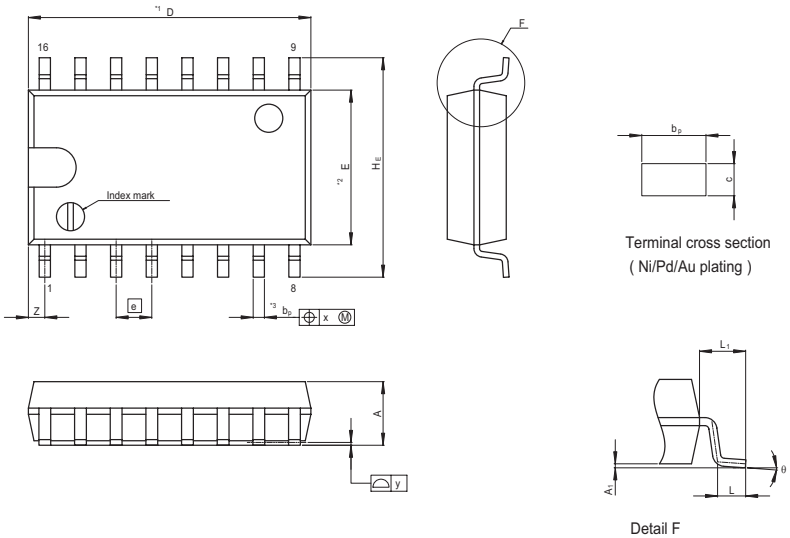
Package Dimensions

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	—	—

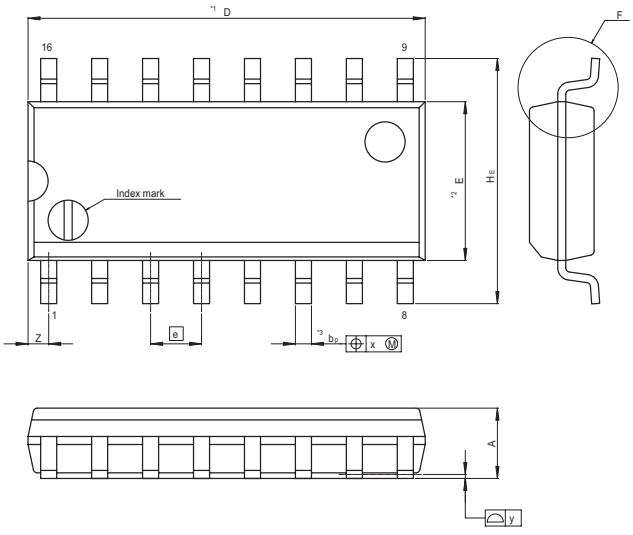
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-5.5x10.06-1.27	PRSP0016DH-B	FP-16DAV	0.24g

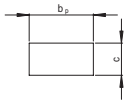


NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

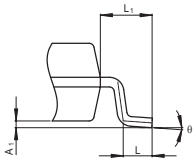
Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	10.06	10.5
E	—	5.50	—
A_2	—	—	—
A_1	0.00	0.10	0.20
A	—	—	2.20
b_p	0.34	0.40	0.46
b_1	—	—	—
c	0.15	0.20	0.25
c_1	—	—	—
θ	0°	—	8°
H_E	7.50	7.80	8.00
e	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	0.80
L	0.50	0.70	0.90
L_1	—	1.15	—

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°
H_E	5.80	6.10	6.20
e	—	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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http://www.renesas.com

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