To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

Renesas Electronics website: http://www.renesas.com

April 1st, 2010
Renesas Electronics Corporation

Issued by: Renesas Electronics Corporation (http://www.renesas.com)

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HD74HC4052, HD74HC4053

Dual 4-channel Analog Multiplexers/Demultiplexers
Triple 2-channel Analog Multiplexers/Demultiplexers

REJ03D0649-0200
(Previous ADE-205-536)
Rev.2.00
Mar 30, 2006

Description

HD74HC4052: This device connects together the outputs of 4 switches in two sets, thus achieving a pair of 4 channel multiplexers. The binary code placed on the A, and B select lines determine which switch in each 4 channel section is "on", connecting one of the four inputs in each section to its common output. This enables the implementation of a 4 channel differential multiplexer.

HD74HC4053: This device contains 6 switches whose outputs are connected together in pairs, thus implementing a triple 2 channel multiplexer, or the equivalent of 3 single-pole-double throw configuration. Each of the A, B, or C select lines independently controls one pair of switches, selecting one of the two switches to be "on".

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)
HD74HC4052P HD74HC4053P	DILP-16 pin	PRDP0016AE-B (DP-16FV)	P	—
HD74HC4052FPEL HD74HC4053FPEL	SOP-16 pin (JEITA)	PRSP0016DH-B (FP-16DAV)	FP	EL (2,000 pcs/reel)
HD74HC4052RPEL HD74HC4053RPEL	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.

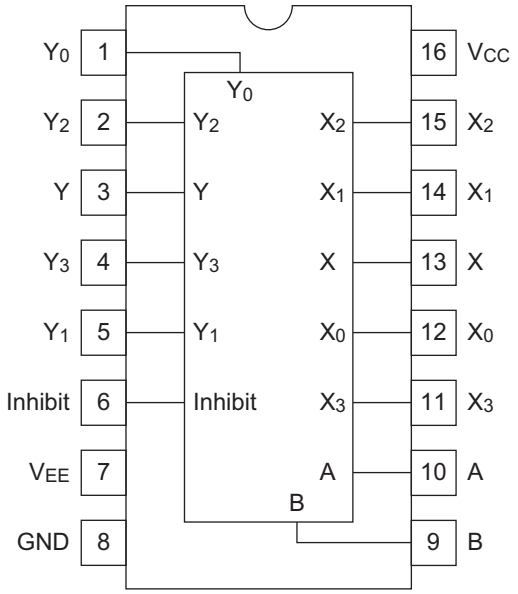
Function Table

Control Inputs				ON Switch				
	Select							
Inhibit	C*[1]	B	A	HD74HC4052		HD74HC4053		
L	L	L	L	Y_0	X_0	Z_0	Y_0	X_0
L	L	L	H	Y_1	X_1	Z_0	Y_0	X_1
L	L	H	L	Y_2	X_2	Z_0	Y_1	X_0
L	L	H	H	Y_3	X_3	Z_0	Y_1	X_1
L	H	L	L	—		Z_1	Y_0	X_0
L	H	L	H	—		Z_1	Y_0	X_1
L	H	H	L	—		Z_1	Y_1	X_0
L	H	H	H	—		Z_1	Y_1	X_1
H	X	X	X	—		—		

Note: 1. Not applicable for HD74HC4052
X = Irrelevant

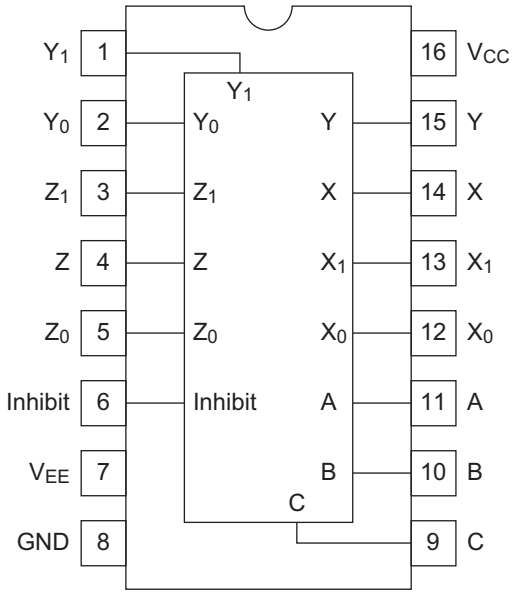
Pin Arrangement

HD74HC4052



(Top view)

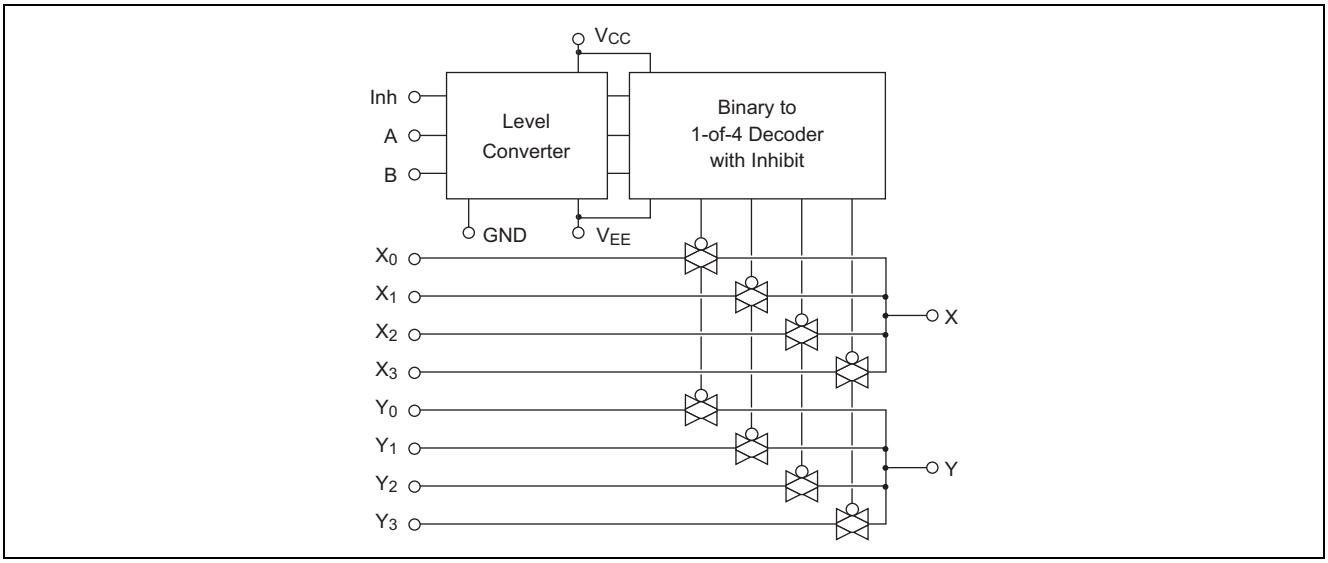
HD74HC4053



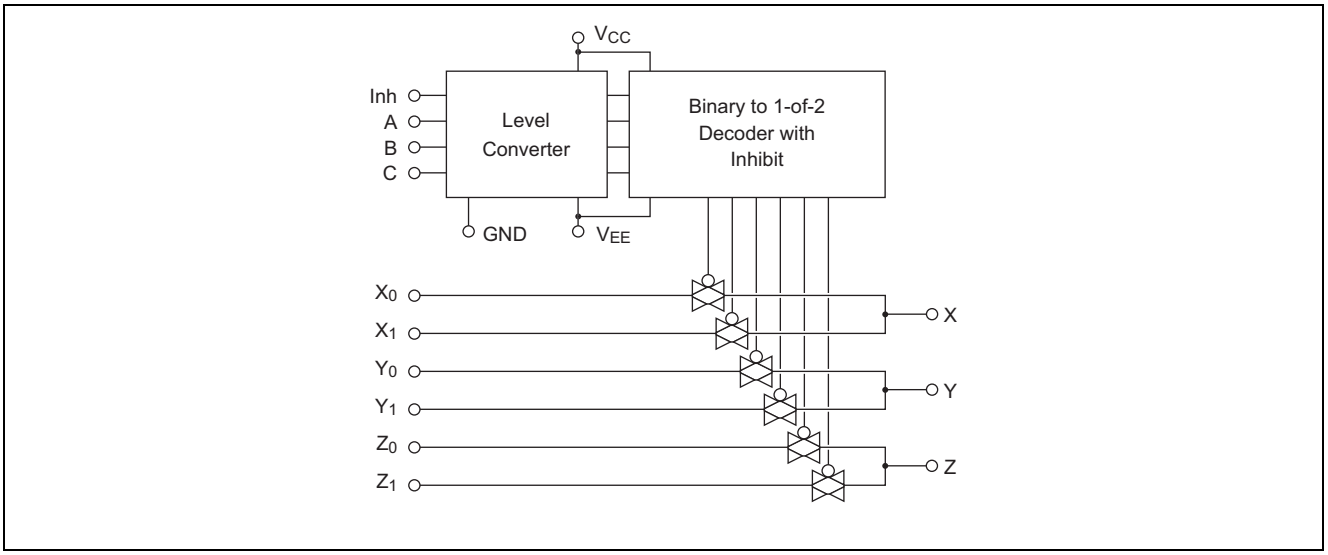
(Top view)

Block Diagram

HD74HC4052



HD74HC4053



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 (V_{EE} = GND)

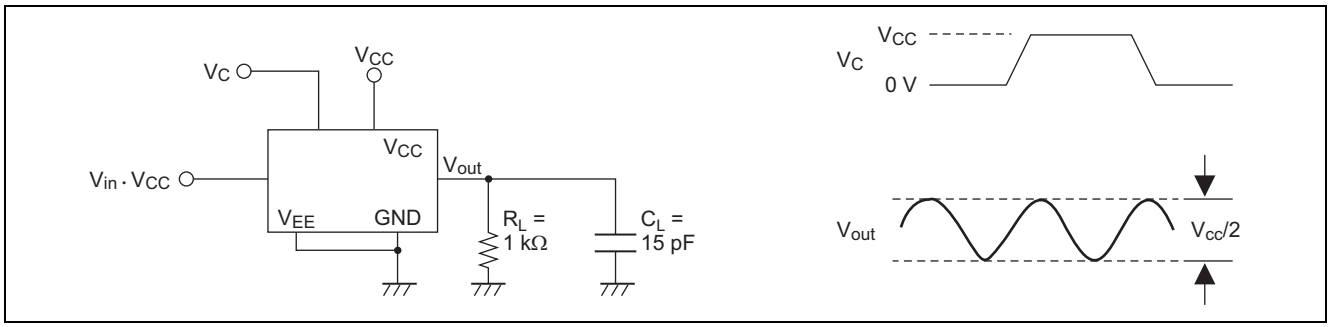
Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to+85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Control input voltage	V_{IH}	2.0	1.5	—	—	1.5	—	V	
		4.5	3.15	—	—	3.15	—		
		6.0	4.2	—	—	4.2	—		
	V_{IL}	2.0	—	—	0.5	—	0.5	V	
		4.5	—	—	1.35	—	1.35		
		6.0	—	—	1.8	—	1.8		
ON resistance	R_{ON}	2.0	—	2000	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)

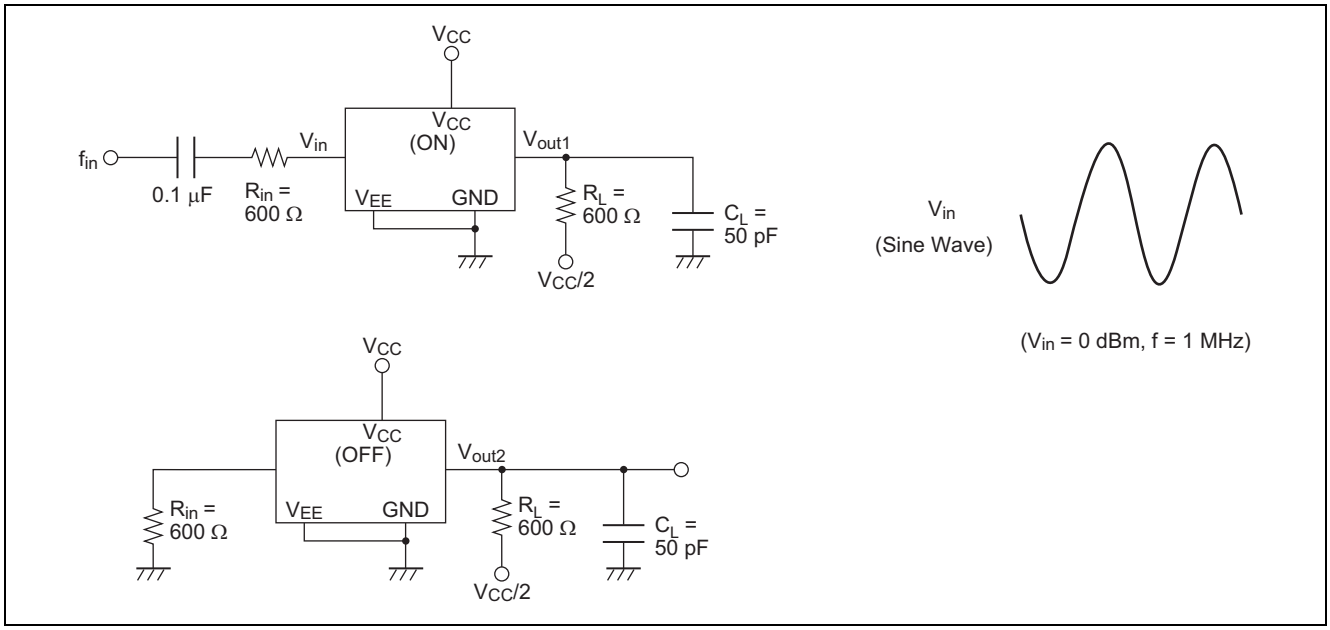
Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Propagation delay time	t_{PLH}	2.0	—	25	60	—	75	ns	R_L = 10 kΩ Switch input to switch output
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
	t_{PHL}	2.0	—	25	60	—	75	ns	
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
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	—	12	—	—	—	pF	HD74HC4052
		5.0	—	6	—	—	—		HD74HC4053
Feed through capacitance	Cin–out	5.0	—	0.6	—	—	—	pF	HD74HC4052
		5.0	—	0.5	—	—	—		HD74HC4053
Power dissipation capacitance	C_{PD}	5.0	—	32.0	—	—	—	pF	HD74HC4052
		5.0	—	17.0	—	—	—		HD74HC4053
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 control input and switch I/O		2.0	—	25	—	—	—	mV	R_L = 600 Ω, C_L = 15 pF, f_{in} = 1 MHz
		4.5	—	50	—	—	—		
		6.0	—	75	—	—	—		
Cross talk between any two switches		4.5	—	–50	—	—	—	dB	R_L = 600 Ω, C_L = 50 pF, f_{in} = 1 MHz
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

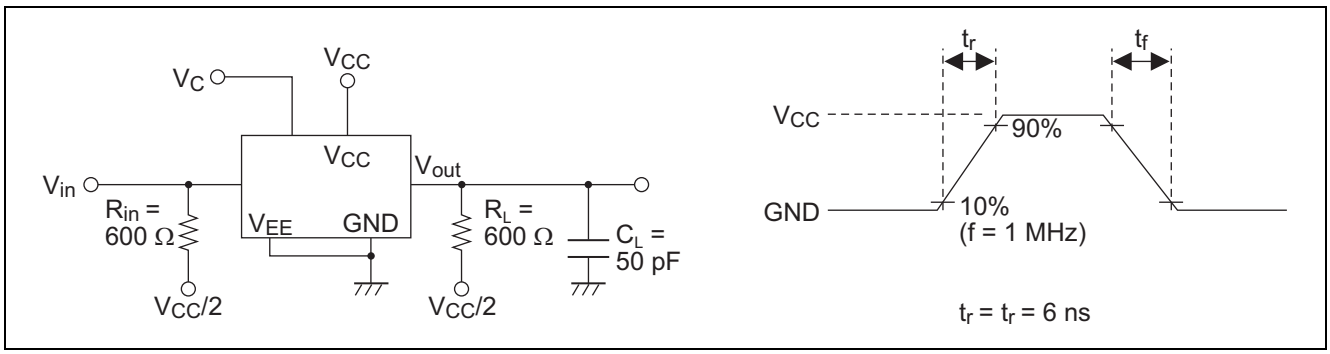
Maximum Control Frequency



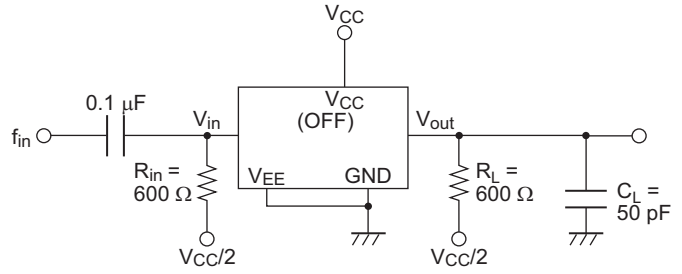
Cross talk (Between Any Two Switches)

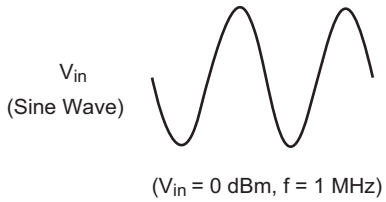


Cross talk (Control Input to Switch Output)



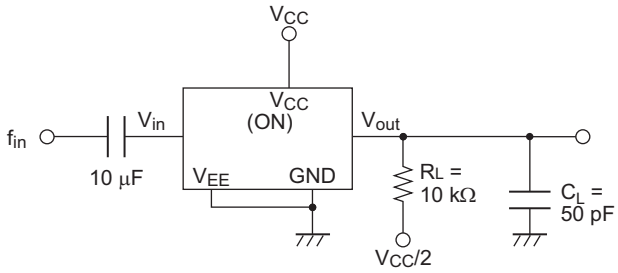
Feed through Attenuation

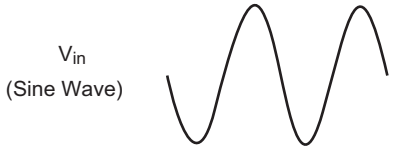




(Vin = 0 dBm, f = 1 MHz)

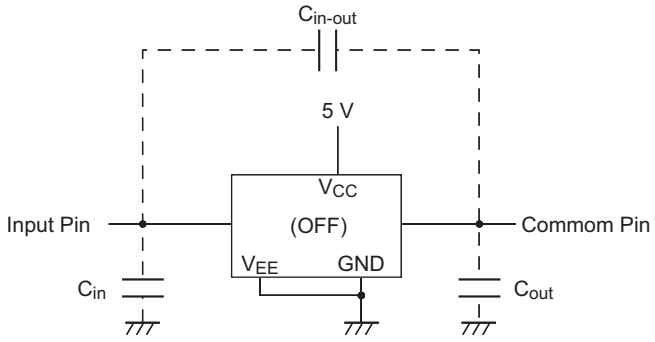
Sine Wave Distortion



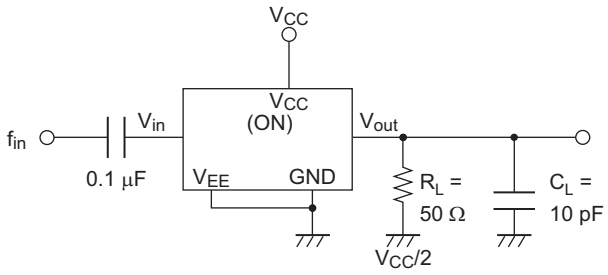


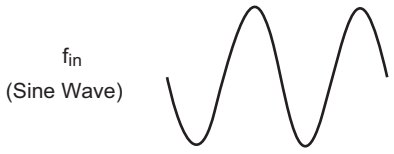
(Vin = 4 Vp-p, f = 1 kHz)

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



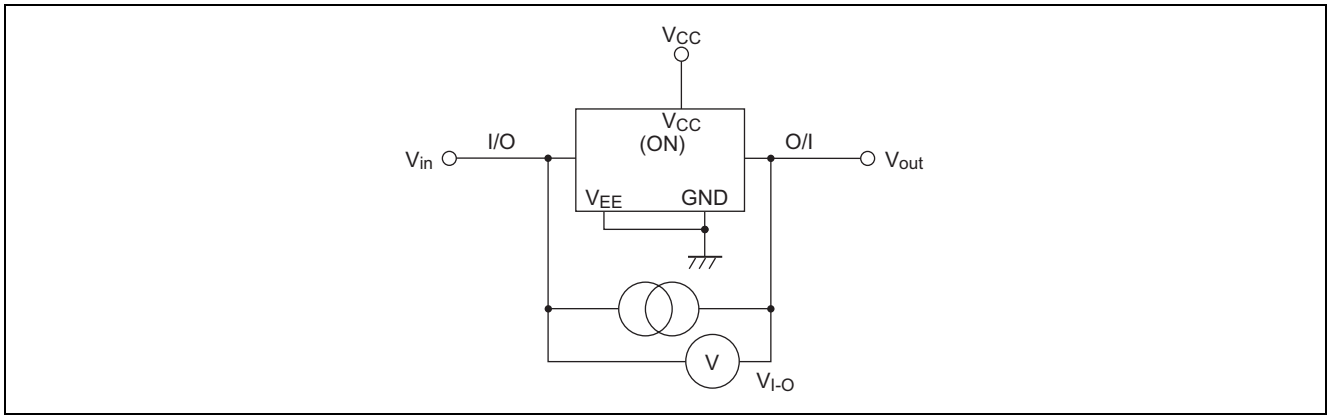
Frequency Response Channel ON



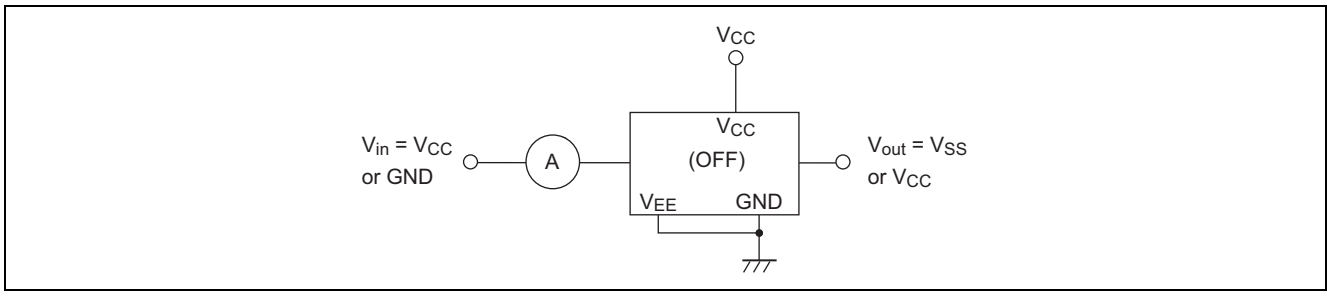


(Vout = 0 dBm, f = 1 MHz)

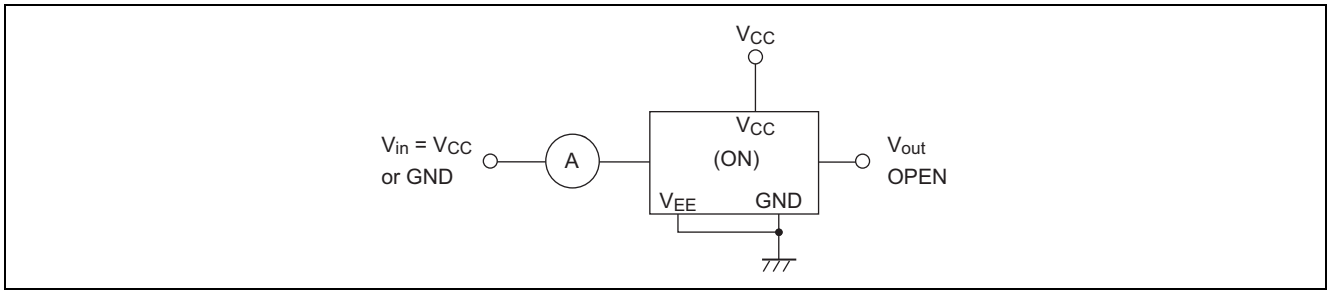
R_{ON}: ON Resistance



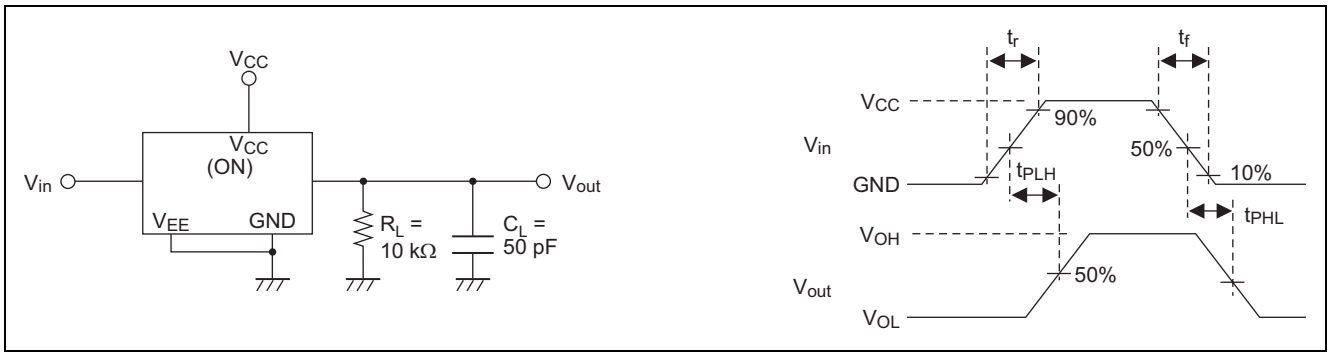
I_S (OFF): OFF Channel Leakage Current (Switch OFF)



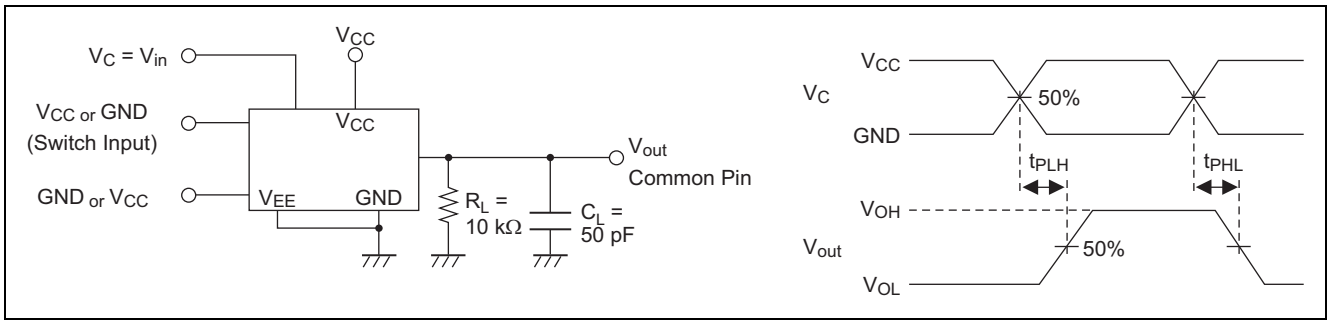
I_S (ON): OFF Channel Leakage Current (Switch ON)



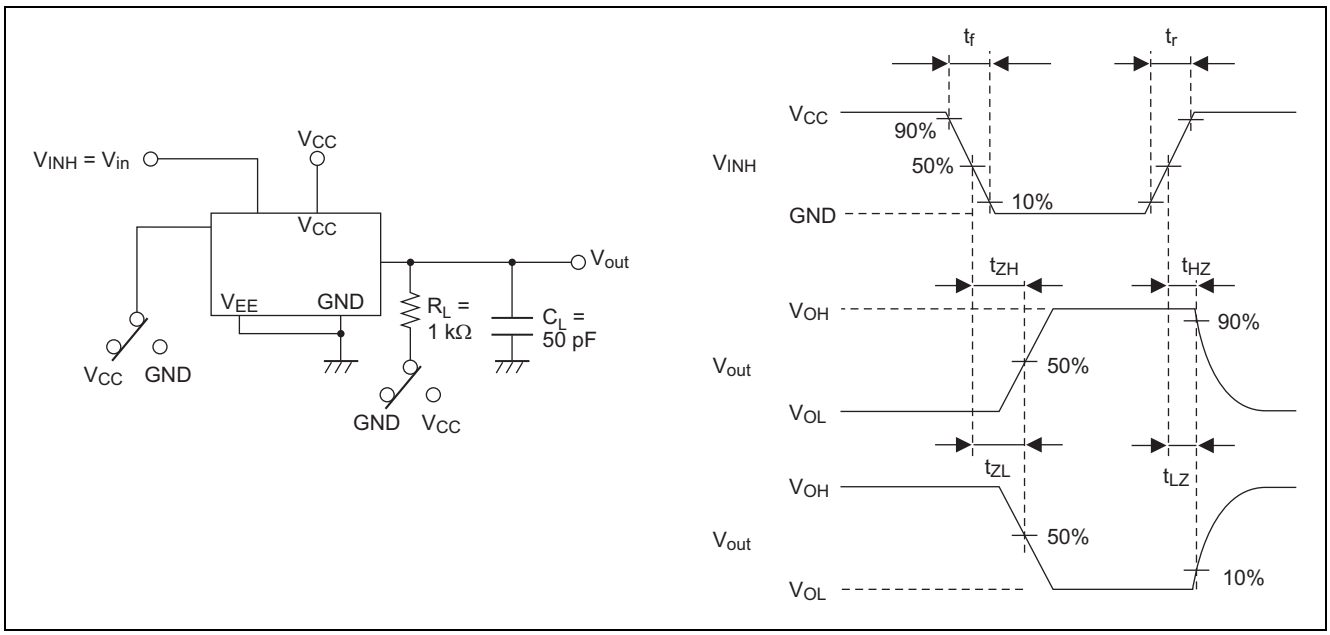
t_{PLH}, t_{PHL}: Propagation Delay Time (Switch Input to Switch Output)



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

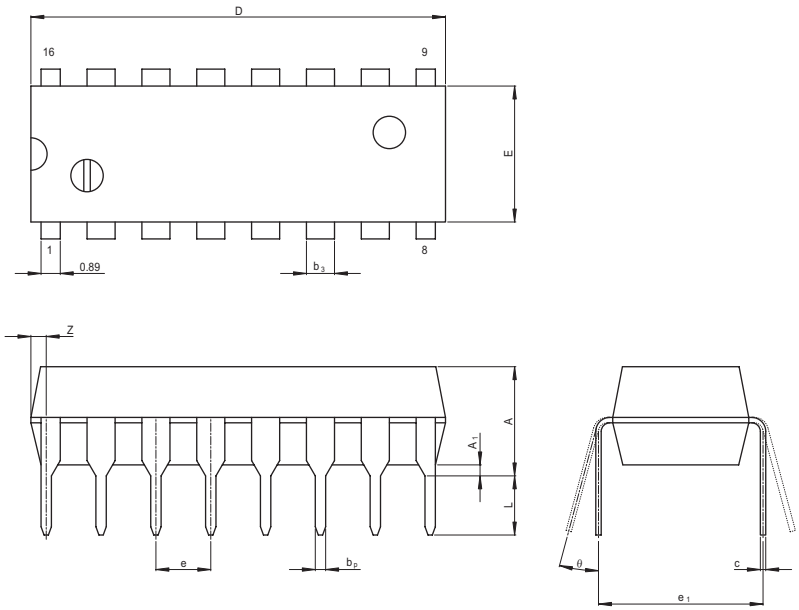


t_{ZH}, t_{ZL}/t_{HZ}, t_{LZ}: Output Enable and Disable Time



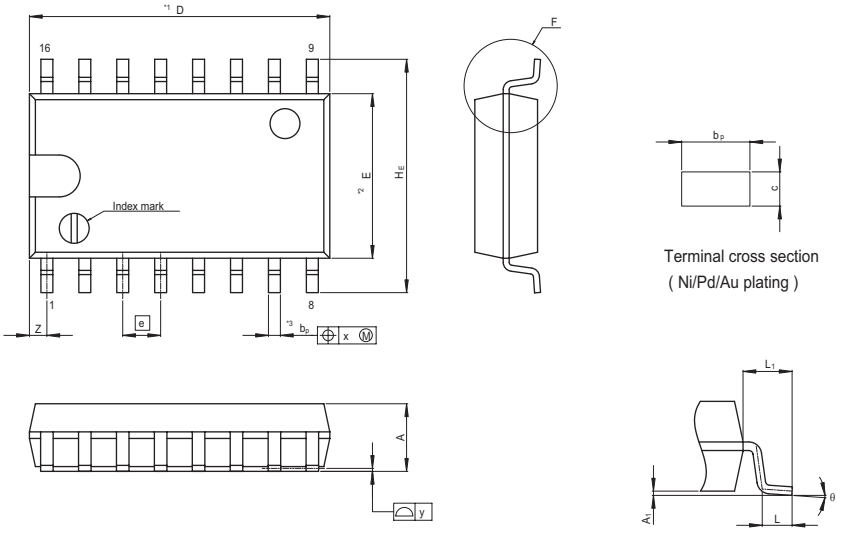
Package Dimensions

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	—	—

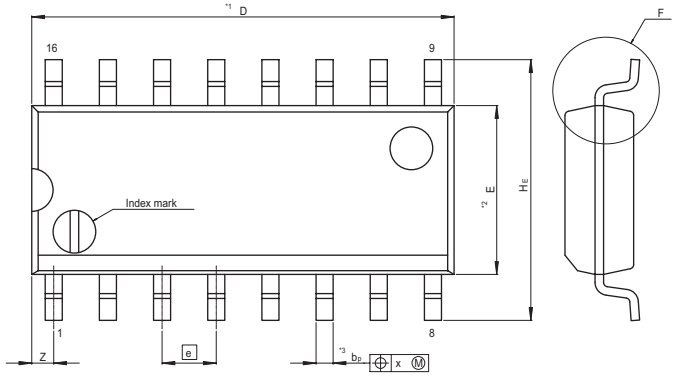
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-5.5x10.06-1.27	PRSP0016DH-B	FP-16DAV	0.24g

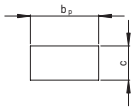


NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2" DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.

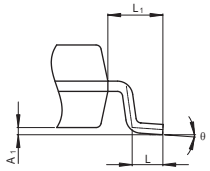
Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	10.06	10.5
E	—	5.50	—
A_2	—	—	—
A_1	0.00	0.10	0.20
A	—	—	2.20
b_p	0.34	0.40	0.46
b_1	—	—	—
c	0.15	0.20	0.25
c_1	—	—	—
θ	0°	—	8°
H_E	7.50	7.80	8.00
e	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	0.80
L	0.50	0.70	0.90
L_1	—	1.15	—

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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Colophon .6.0