

To our customers,

Old Company Name in Catalogs and Other Documents

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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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HD74HC4066

Quad Analog Switches/Quad Multiplexers

REJ03D0651-0200
 (Previous ADE-205-538)
 Rev.2.00
 Mar 30, 2006

Description

This switch has low “on” resistance and low “off” leakage. It is a bidirectional switch, thus any analog input may be used as an output and vice-versa. Also the HD74HC4066 switch contains linearization circuitry which lowers the “on” resistance and increases switch linearity. The HD74HC4066 device allows control of up to 12 V (peak) analog signals with digital control signals of the same range. Each switch has its own control input which disables each switch when low.

Features

- High Speed Operation
- Wide Operating Voltage: $V_{CC} = 2$ to 6 V
- Low Quiescent Supply Current: I_{CC} (static) = $1 \mu\text{A}$ max ($T_a = 25^\circ\text{C}$)
- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74HC4066P	DILP-14 pin	PRDP0014AB-B (DP-14AV)	P	—
HD74HC4066FPEL	SOP-14 pin (JEITA)	PRSP0014DF-B (FP-14DAV)	FP	EL (2,000 pcs/reel)
HD74HC4066RPEL	SOP-14 pin (JEDEC)	PRSP0014DE-A (FP-14DNV)	RP	EL (2,500 pcs/reel)
HD74HC4066TELL	TSSOP-14 pin	PTSP0014JA-B (TTP-14DV)	T	ELL (2,000 pcs/reel)

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

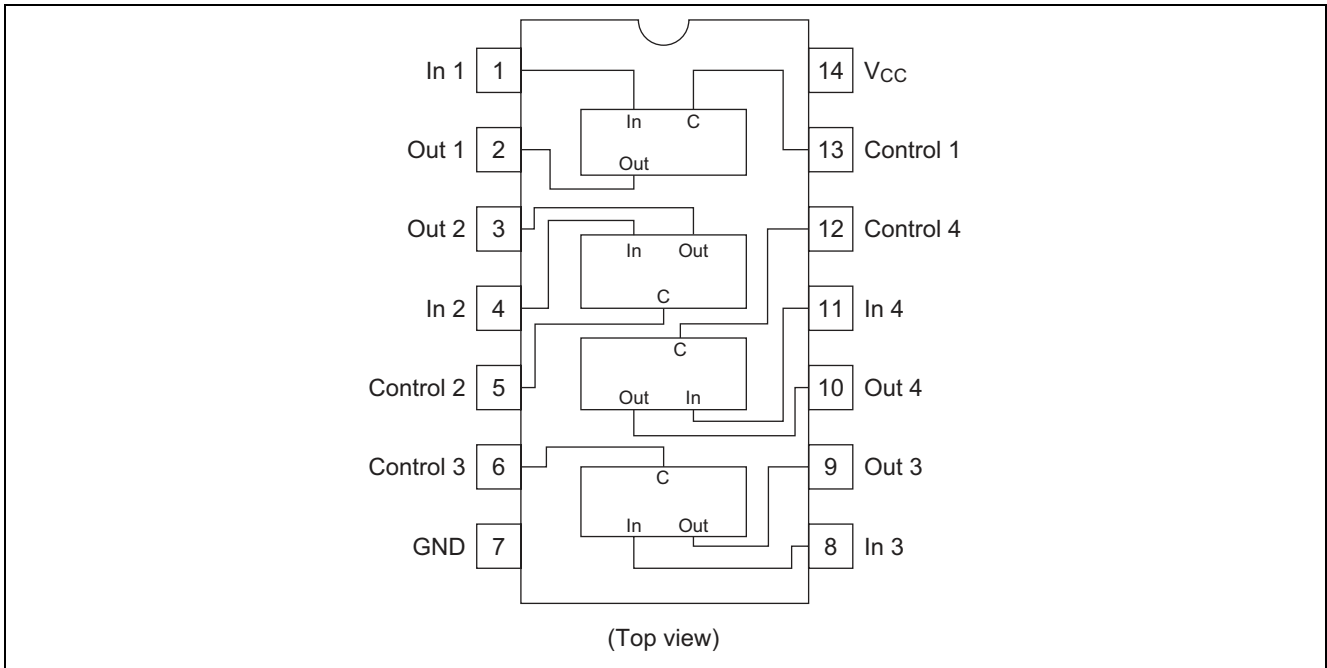
Function Table

Control	Switch
L	OFF
H	ON

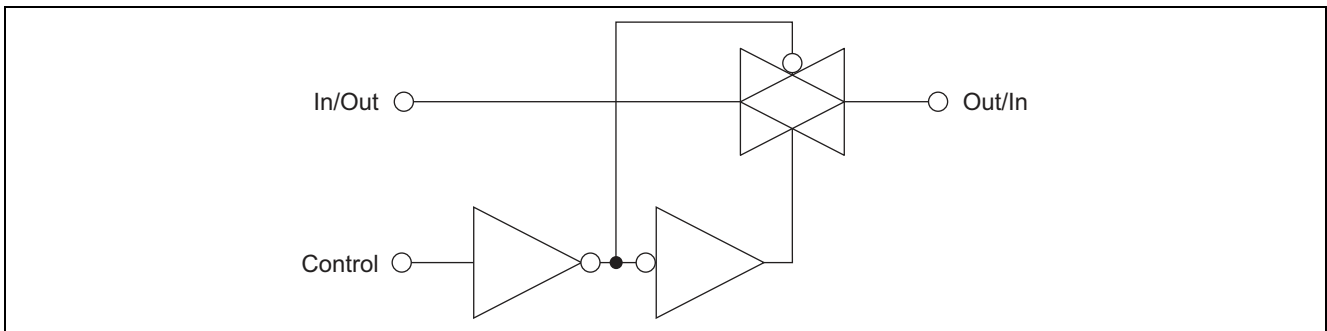
$GND \leq V_{in} \leq V_{CC}$

$GND \leq V_{out} \leq V_{CC}$

Pin Arrangement



Logic Diagram



Absolute Maximum Ratings

Item	Symbol	Rating	Unit
Supply voltage	V_{CC}	-0.5 to +7.0	V
Control input voltage	V_C	-0.5 to $V_{CC} + 0.5$	V
Switch I/O voltage	$V_{IN/OUT}$	-0.5 to $V_{CC} + 0.5$	V
Supply current	(V_{CC})	I_{CC}	+50
	(GND)	I_{GND}	-50
Switch I/O current (per pin)	$I_{IN/OUT}$	± 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	$^{\circ}C$

Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit	
Supply voltage	V_{CC}	2	—	6	V	
Control input voltage	V_C	0	—	V_{CC}	V	
Switch I/O voltage	$V_{IN/OUT}$	0	—	V_{CC}	V	
Operating temperature	T_{opr}	-40	—	+85	°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

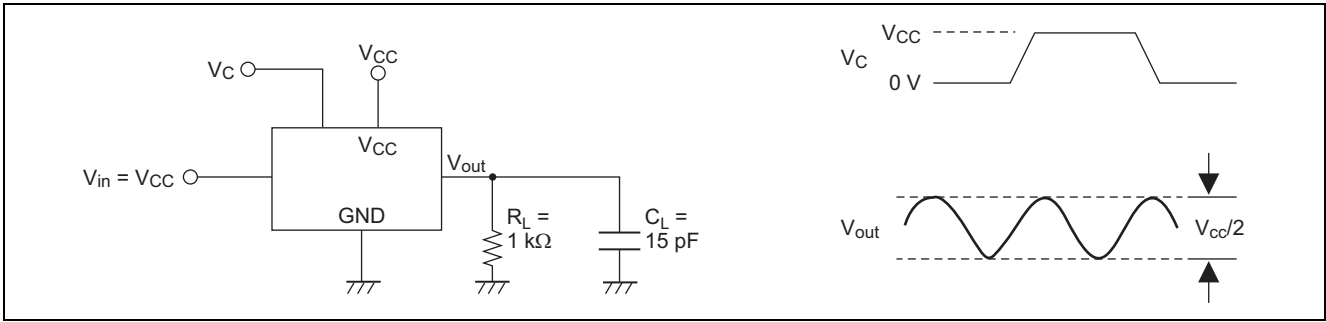
Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40\text{ to }+85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Control input voltage	V_{IH}	2.0	1.5	—	—	1.5	—	V	
		4.5	3.15	—	—	3.15	—		
		6.0	4.2	—	—	4.2	—		
	V_{IL}	2.0	—	—	0.5	—	0.5	V	
		4.5	—	—	1.35	—	1.35		
		6.0	—	—	1.8	—	1.8		
“ON” resistance	R_{ON}	2.0	—	2000	5000	—	6250	Ω	$V_C = V_{IH}$ $V_{in} = 0\text{ to }V_{CC}$ $I_{in/out} = 1\text{ mA}$
		4.5	—	100	200	—	250		
		6.0	—	60	170	—	210		
Δ ON resistance between any two channels	ΔR_{ON}	2.0	—	50	—	—	—	Ω	$V_C = V_{IH}$, $I_{in/out} = 1\text{ mA}$ between any two channels
		4.5	—	3	—	—	—		
		6.0	—	2	—	—	—		
OFF channel leakage current (switch off)	$I_{S(OFF)}$	6.0	—	—	± 0.1	—	± 1.0	$\infty\text{ A}$	$V_C = V_{IL}$ $V_{IN} = V_{CC}$, $V_{out} = \text{GND}$ or, $V_{in} = \text{GND}$, $V_{out} = V_{CC}$
OFF channel leakage current (switch on)	$I_{S(ON)}$	6.0	—	—	± 0.1	—	± 1.0	$\infty\text{ A}$	$V_C = V_{IH}$ $V_{in} = V_{CC}$ or GND
Control input current	I_{in}	6.0	—	—	± 0.1	—	± 1.0	$\infty\text{ A}$	$V_{in} = V_{CC}$ or GND
Quiescent supply current	I_{CC}	6.0	—	—	1.0	—	10.0	$\infty\text{ A}$	$V_{in} = V_{CC}$ or GND

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

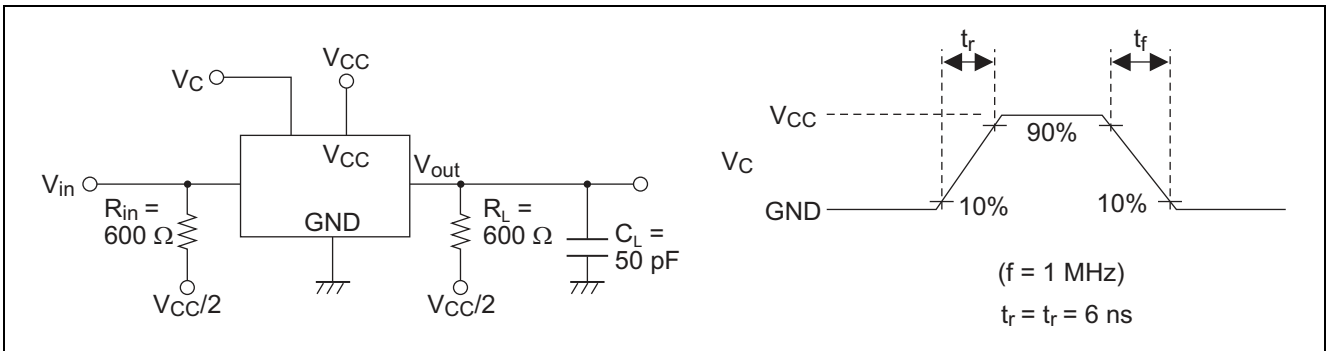
Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			$T_a = -40 \text{ to } +85^\circ\text{C}$		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Propagation delay time	t_{PLH}	2.0	—	25	60	—	75	ns	$R_L = 10 \text{ k}\Omega$ Switch input to switch output
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
	t_{PHL}	2.0	—	25	60	—	75	ns	
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
Propagation delay time	t_{PLH}	2.0	—	—	50	—	65	ns	$R_L = 10 \text{ k}\Omega$
	t_{PHT}	4.5	—	4	10	—	13		
	6.0	—	—	9	—	11			
Output enable time	t_{ZH}	2.0	—	—	115	—	145	ns	$R_L = 1 \text{ k}\Omega$
		4.5	—	10	23	—	29		
		6.0	—	—	20	—	25		
Output disable time	t_{LZ}	2.0	—	—	115	—	145	ns	$R_L = 1 \text{ k}\Omega$
	t_{HZ}	4.5	—	14	23	—	29		
	6.0	—	—	20	—	25			
Sine wave distortion		4.5	—	0.05	—	—	—	%	$R_L = 10 \text{ k}\Omega$, $C_L = 50 \text{ pF}$, $f_{IN} = 1 \text{ kHz}$
Band width (-3 dB)		4.5	—	30	—	—	—	MHz	$R_L = 600 \Omega$, $C_L = 50 \text{ pF}$, $20 \log_{10} V_{out}/V_{in} = -3\text{dB}$
Feed through attenuation		4.5	—	-50	—	—	—	dB	$R_L = 600 \Omega$, $C_L = 50 \text{ pF}$, $f_{IN} = 1 \text{ MHz}$
Cross talk between control input to signal I/O		2.0	—	25	—	—	—	mA	$R_L = 600 \Omega$, $C_L = 50 \text{ pF}$, $f_{IN} = 1 \text{ MHz}$
		4.5	—	60	—	—	—		
		6.0	—	75	—	—	—		
Cross talk between any two switches		4.5	—	-50	—	—	—	dB	$R_L = 600 \Omega$, $C_L = 50 \text{ pF}$, $f_{IN} = 1 \text{ MHz}$
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	—	—	—		
Control input capacitance	C_{in}		—	5	10	—	10	pF	
Switch I/O capacitance	$C_{in/out}$		—	6	—	—	—	pF	
Feed through capacitance	$C_{in/out}$		—	0.5	—	—	—	pF	
Power dissipation capacitance	C_{PD}		—	13	—	—	—	pF	

Test Circuit

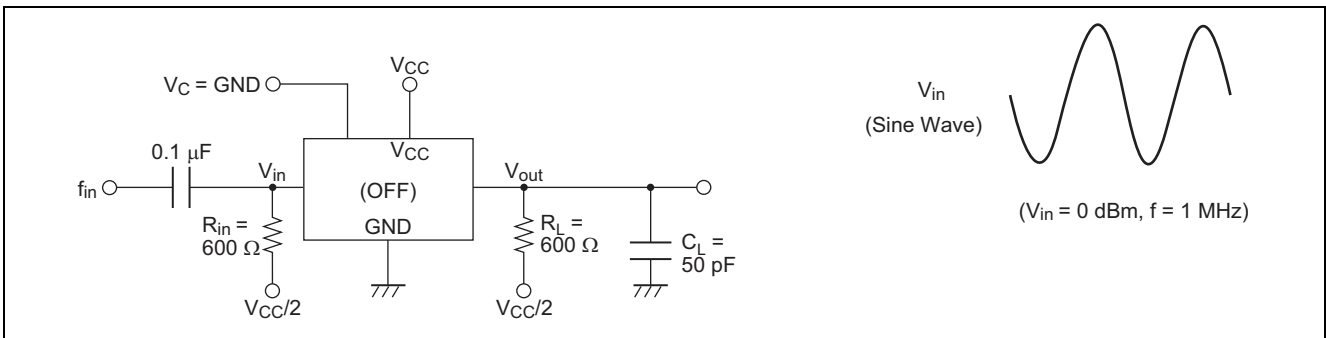
Maximum Control Frequency



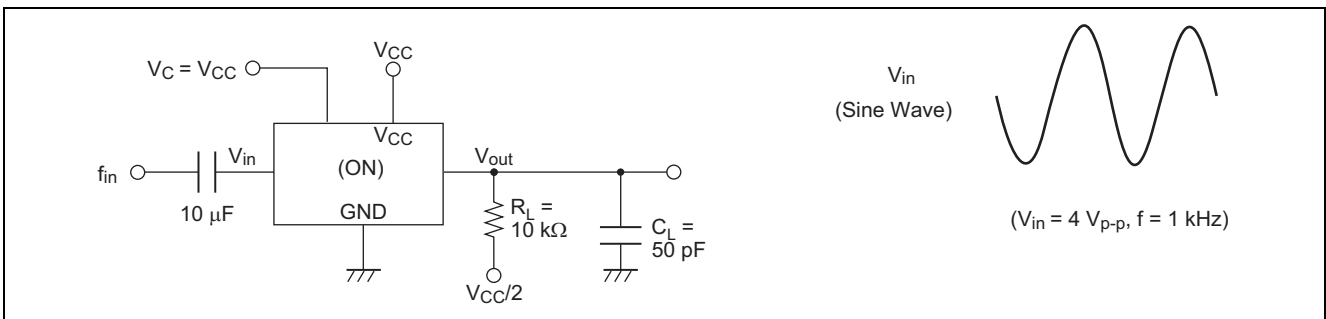
Cross talk (Control Input to Switch Output)



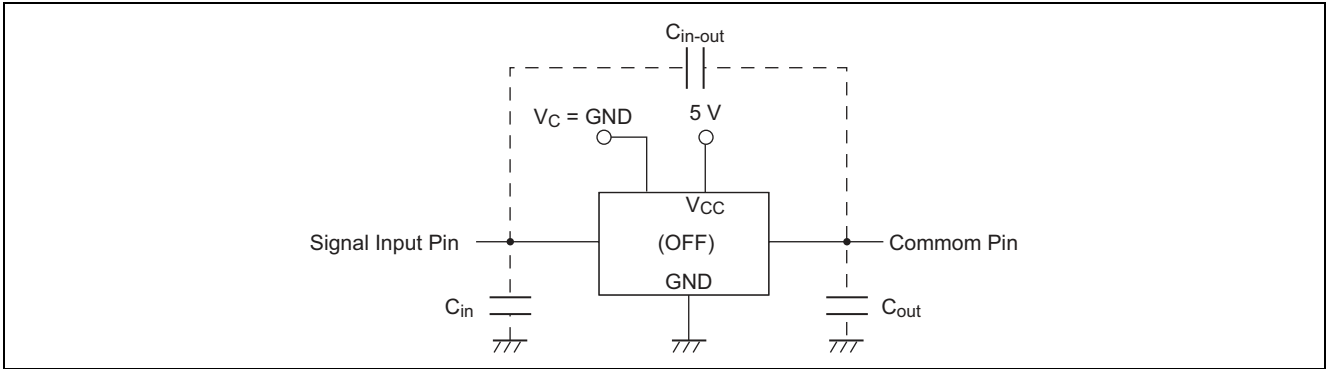
Feed through Attenuation



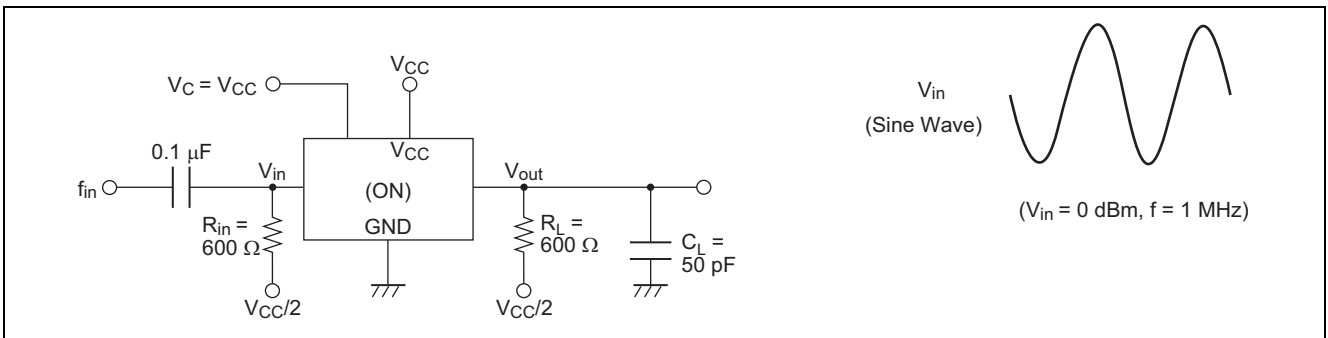
Sine Wave Distortion



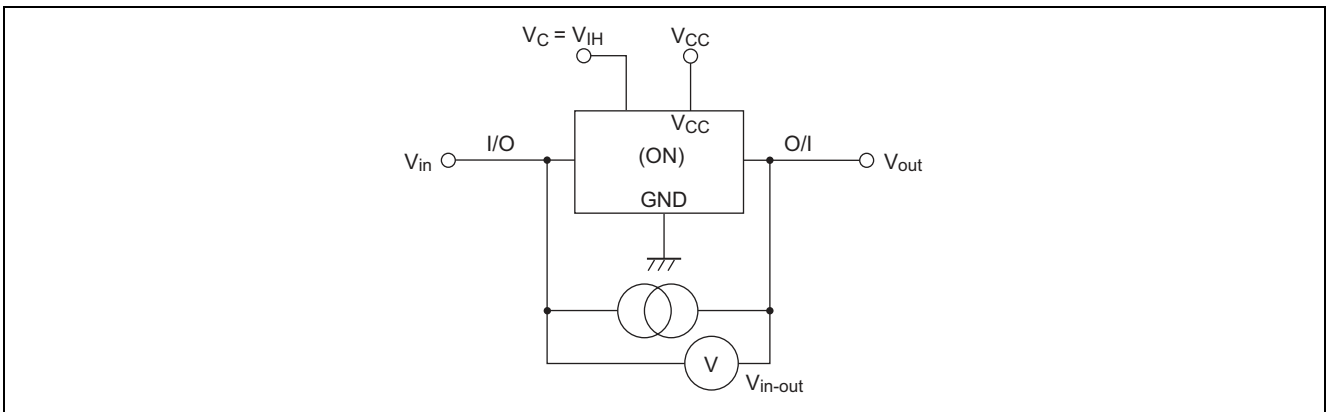
C_{in}, C_{out}, C_{in-out} (Input, Output, and Feed through Capacitance)



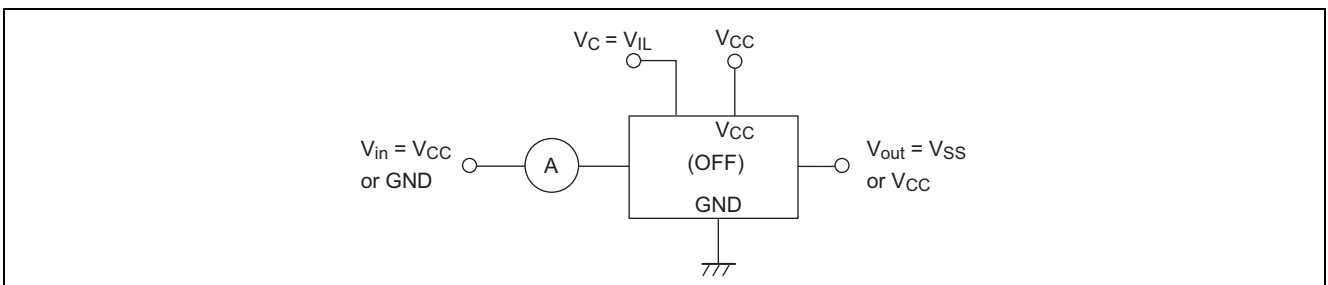
Switch Frequency Response Band Width (-3dB)



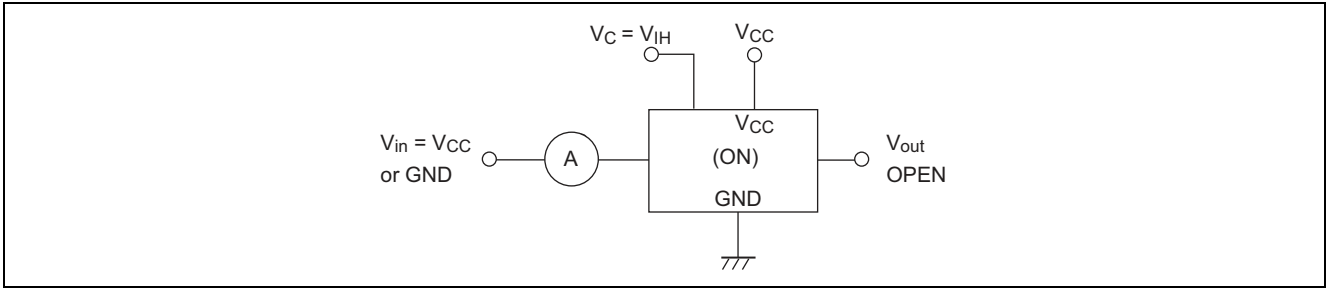
R_{ON}: ON Resistance



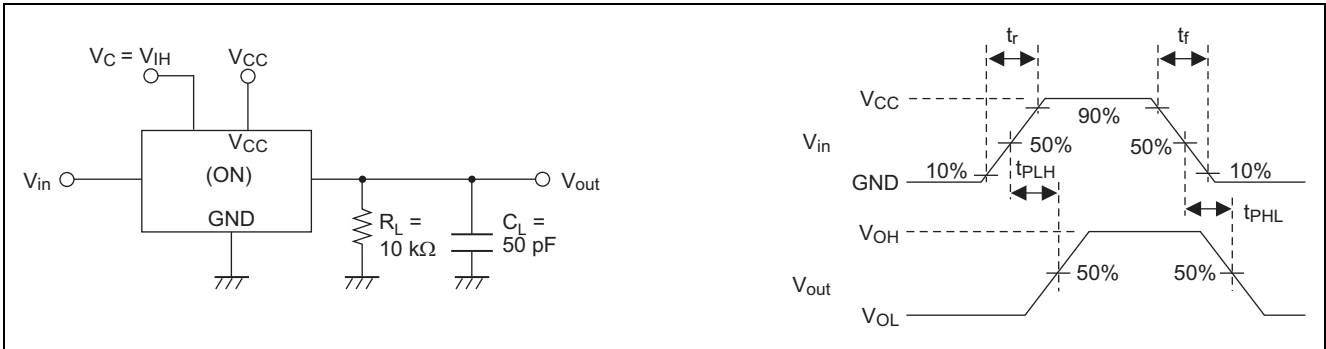
I_s (OFF): OFF Channel Leakage Current (Switch OFF)



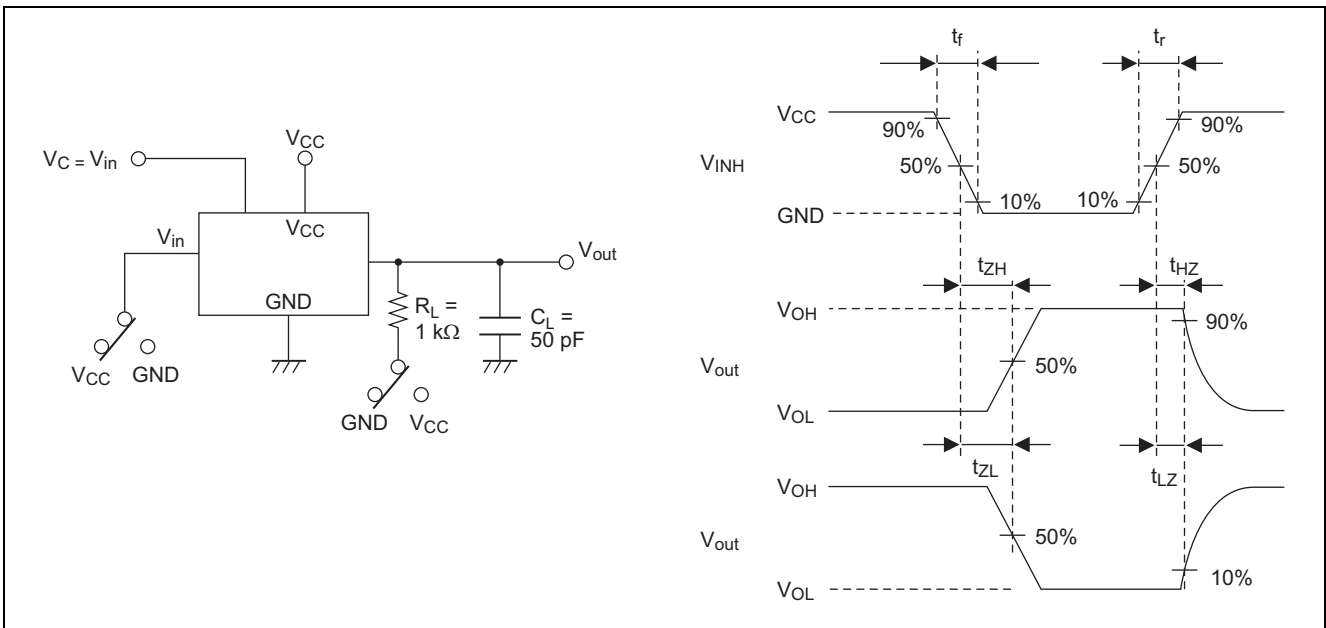
I_S (ON): OFF Channel Leakage Current (Switch ON)



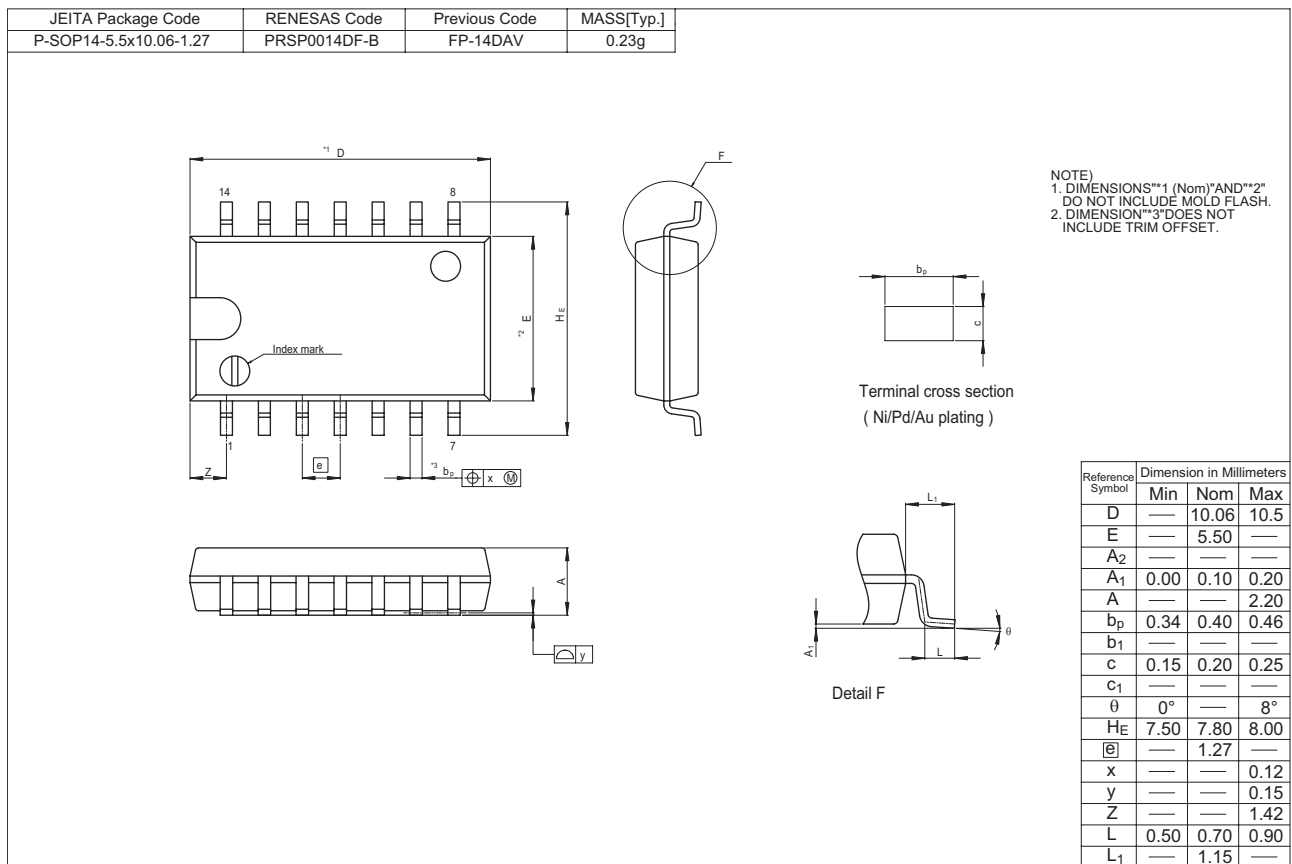
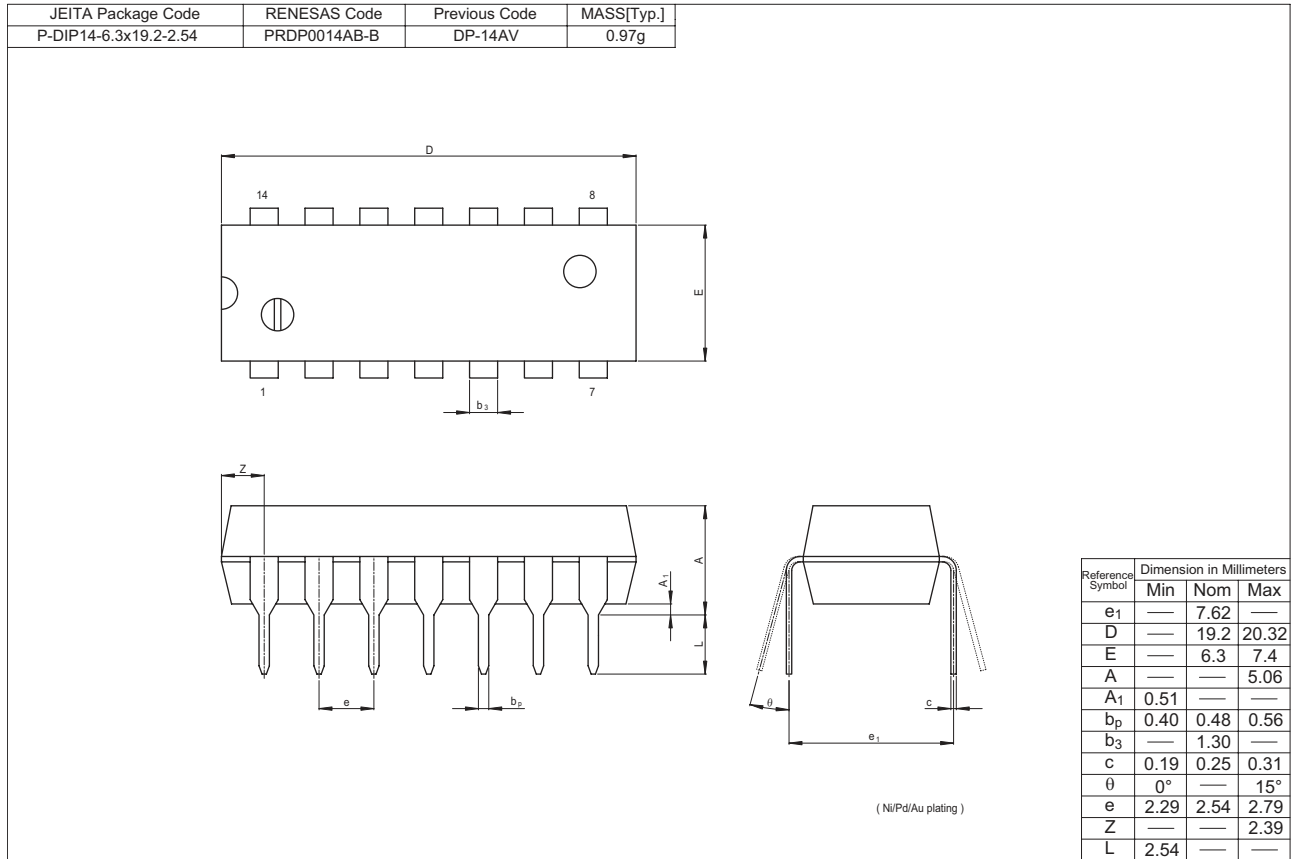
t_{PLH} , t_{PHL} : Propagation Delay Time (Switch Input to Switch Output)



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

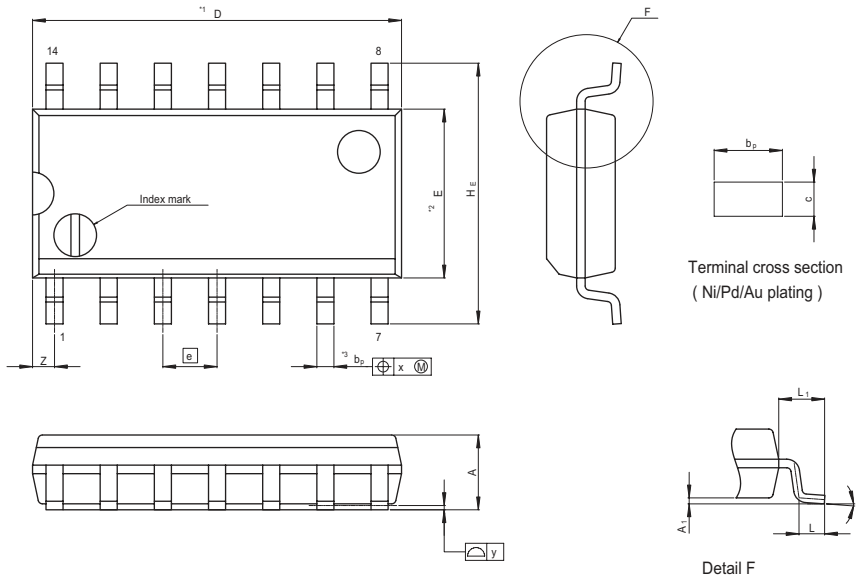


Package Dimensions



HD74HC4066

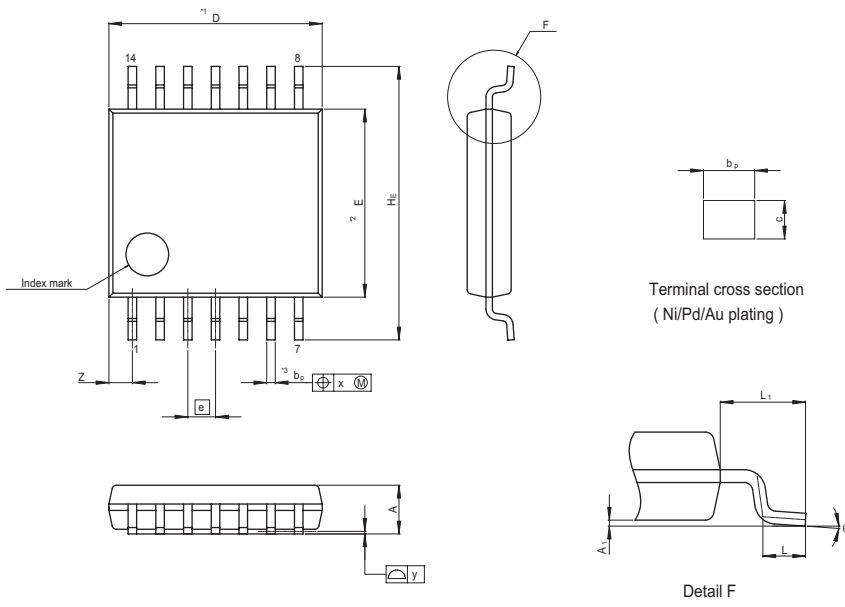
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP14-3.95x8.65-1.27	PRSP0014DE-A	FP-14DNV	0.13g



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	—	8.65	9.05
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	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-TSSOP14-4.4x5-0.65	PTSP0014JA-B	TTP-14DV	0.05g



NOTE)
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 2. DIMENSION**3*DOES NOT
 INCLUDE TRIM OFFSET.

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	5.00	5.30
E	—	4.40	—
A ₂	—	—	—
A ₁	0.03	0.07	0.10
A	—	—	1.10
b _p	0.15	0.20	0.25
b ₁	—	—	—
c	0.10	0.15	0.20
c ₁	—	—	—
θ	0°	—	8°
HE	6.20	6.40	6.60
ⓐ	—	0.65	—
x	—	—	0.13
y	—	—	0.10
Z	—	—	0.83
L	0.4	0.5	0.6
L ₁	—	1.0	—

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