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 µA max (Ta = 25°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.

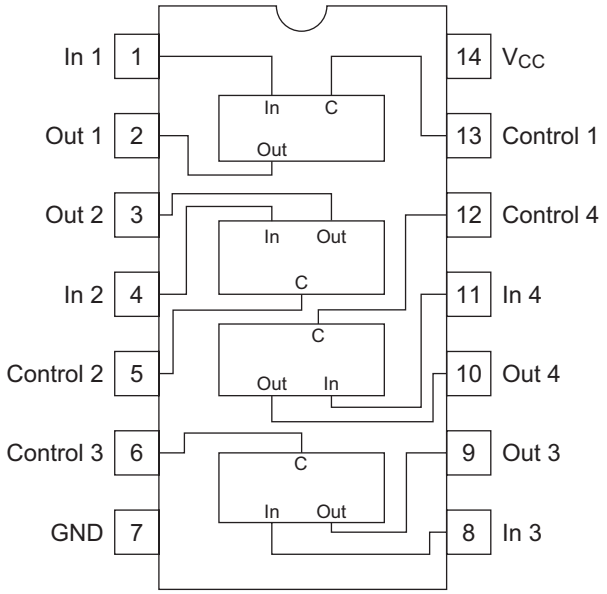
Function Table

Control	Switch
L	OFF
H	ON

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

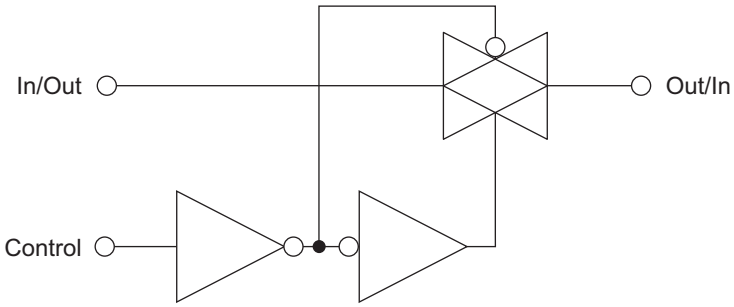
$GND \leq Vout \leq V_{CC}$

Pin Arrangement



(Top view)

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	mA
	(GND)	I_{GND}	–50	mA
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		Tstg	–65 to +150	°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		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

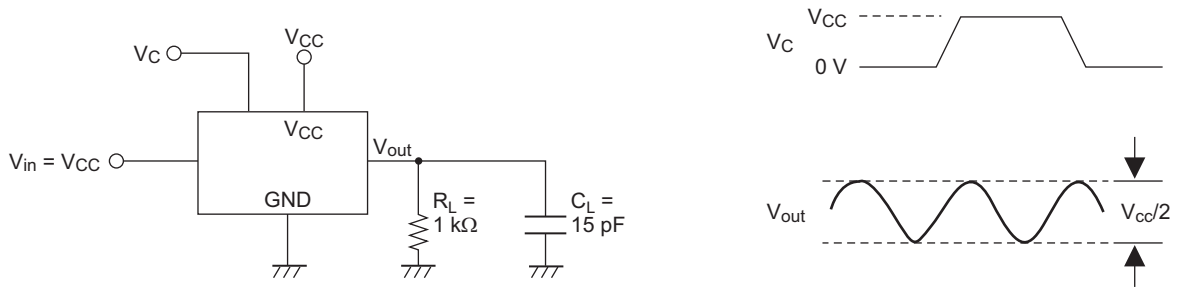
Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to+85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Control input voltage	V_{IH}	2.0	1.5	—	—	1.5	—	V	
		4.5	3.15	—	—	3.15	—		
		6.0	4.2	—	—	4.2	—		
	V_{IL}	2.0	—	—	0.5	—	0.5	V	
		4.5	—	—	1.35	—	1.35		
		6.0	—	—	1.8	—	1.8		
“ON” resistance	R_{ON}	2.0	—	2000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

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

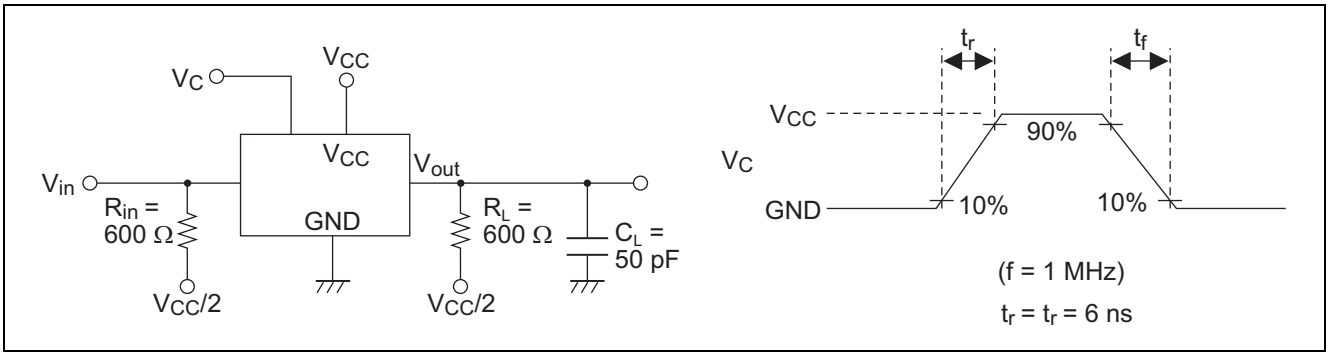
Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to +85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Propagation delay time	t_{PLH}	2.0	—	25	60	—	75	ns	R_L = 10 kΩ Switch input to switch output
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13		
	t_{PHL}	2.0	—	25	60	—	75	ns	
		4.5	—	6	12	—	15		
		6.0	—	5	10	—	13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

Test Circuit

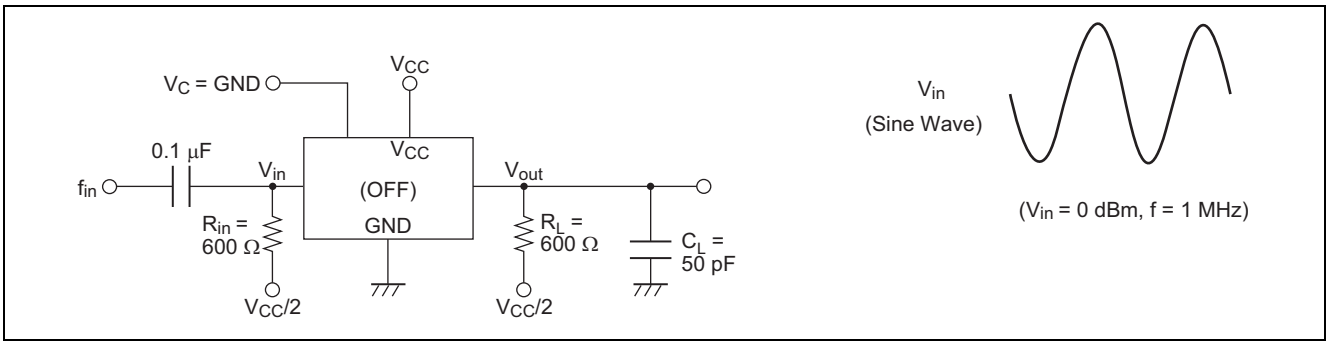
Maximum Control Frequency



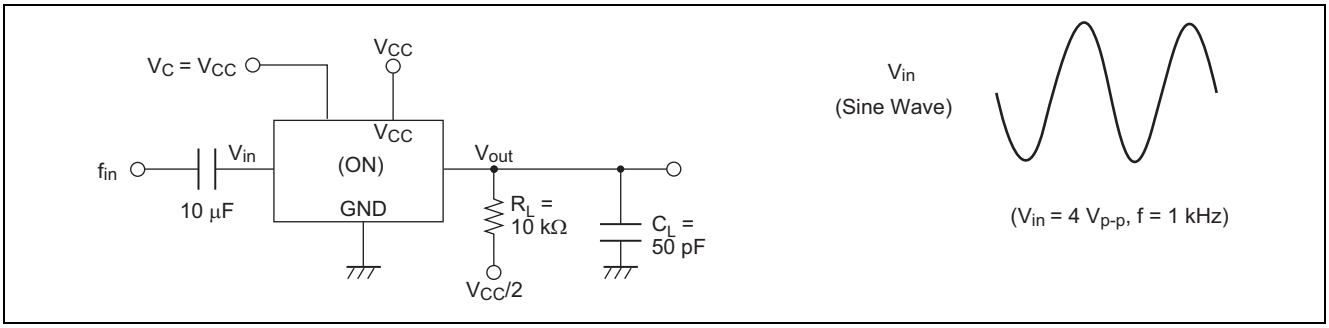
Cross talk (Control Input to Switch Output)



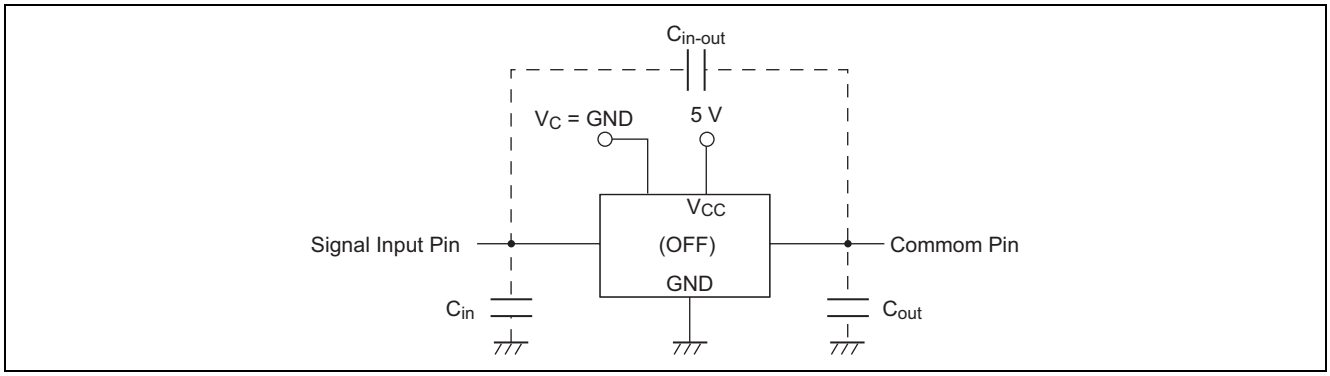
Feed through Attenuation



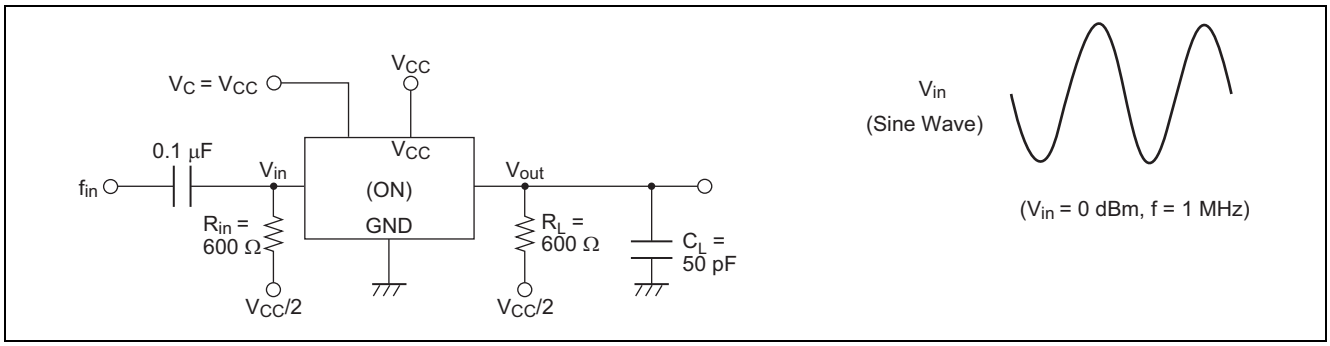
Sine Wave Distortion



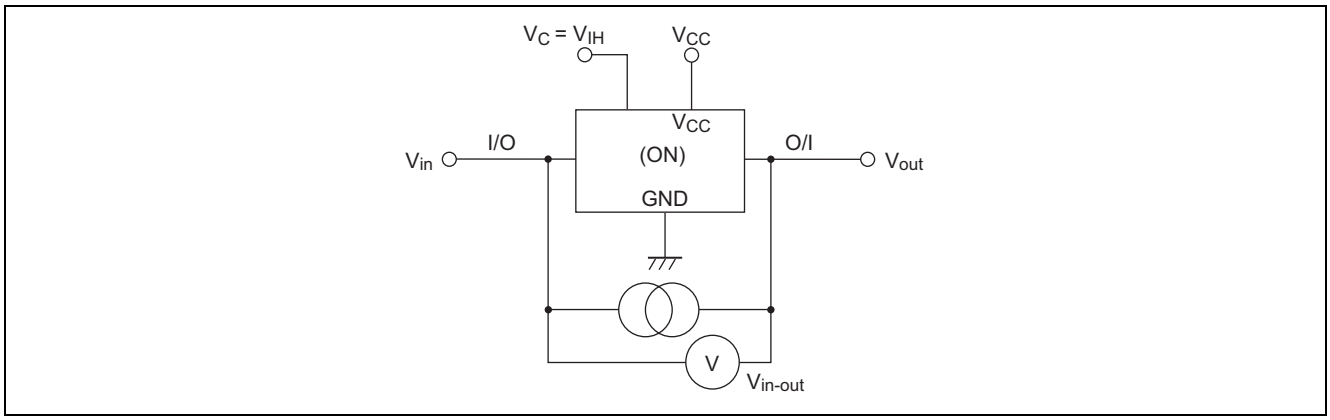
Cin, Cout, Cin–out (Input, Output, and Feed through Capacitance)



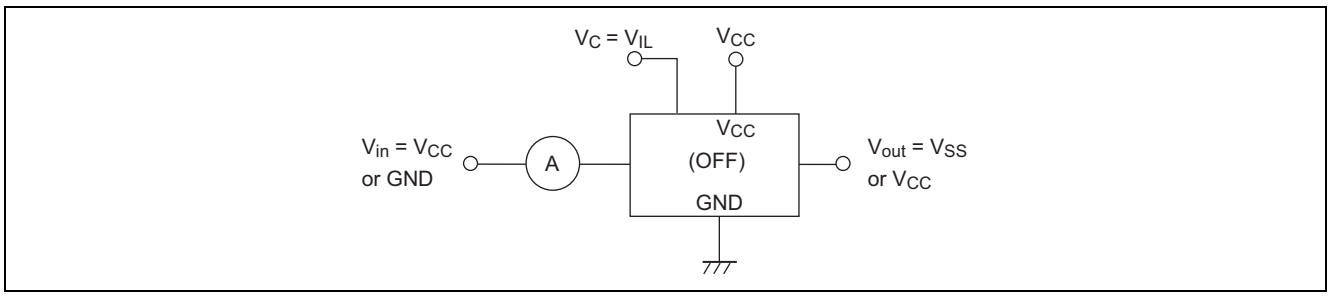
Switch Frequency Response Band Width (-3dB)



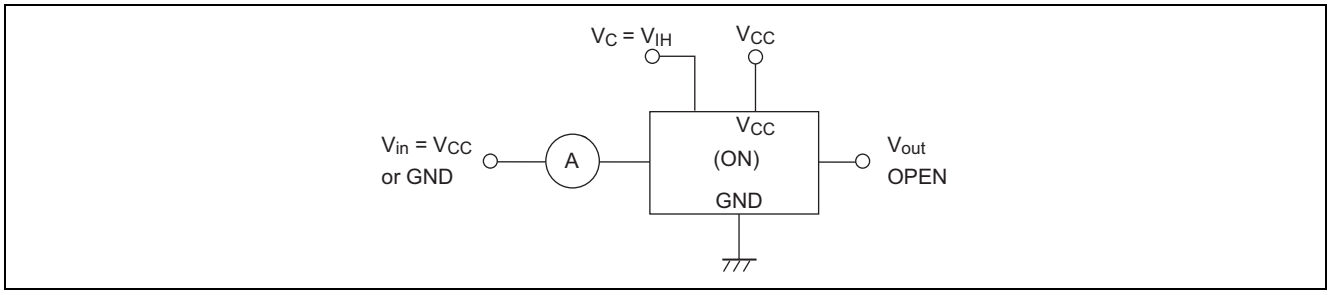
R_{ON}: ON Resistance



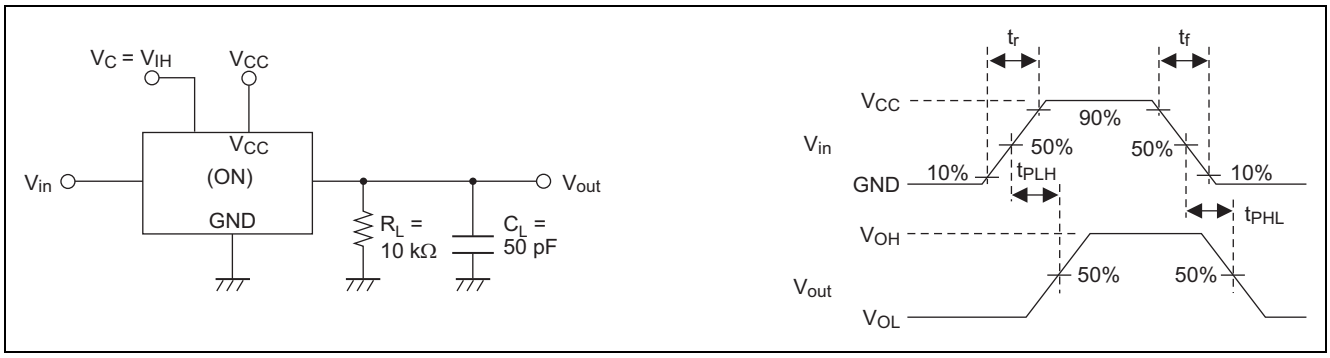
I_S (OFF): OFF Channel Leakage Current (Switch OFF)



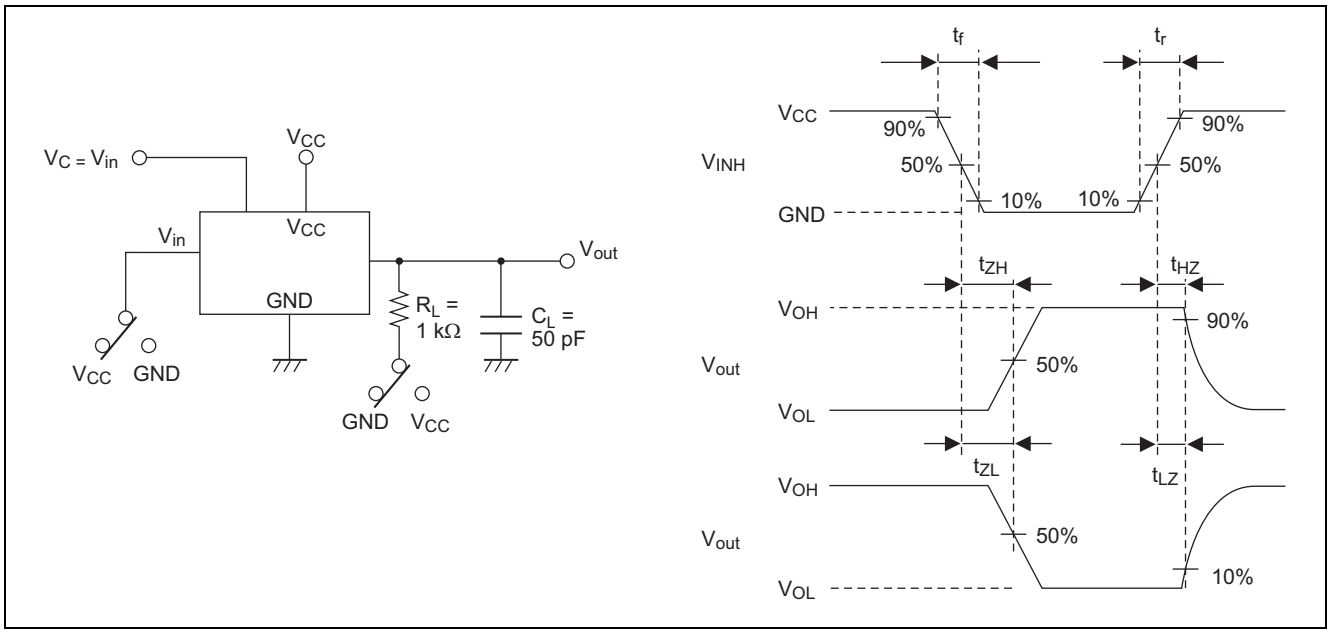
I_S (ON): OFF Channel Leakage Current (Switch ON)



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

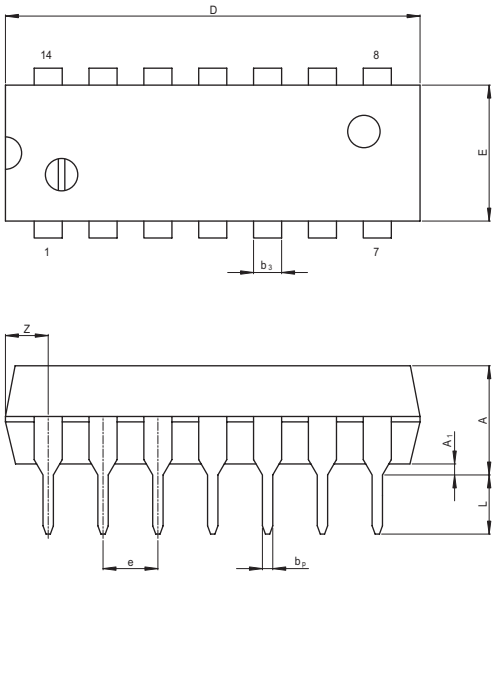


t_{ZH}, t_{ZL}/t_{HZ}, t_{LZ}: Output Enable and Disable Time



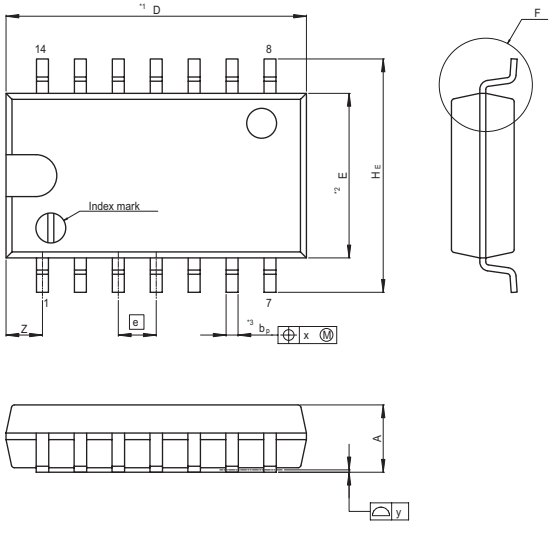
Package Dimensions

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP14-6.3x19.2-2.54	PRDP0014AB-B	DP-14AV	0.97g



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	—	—	2.39
L	2.54	—	—

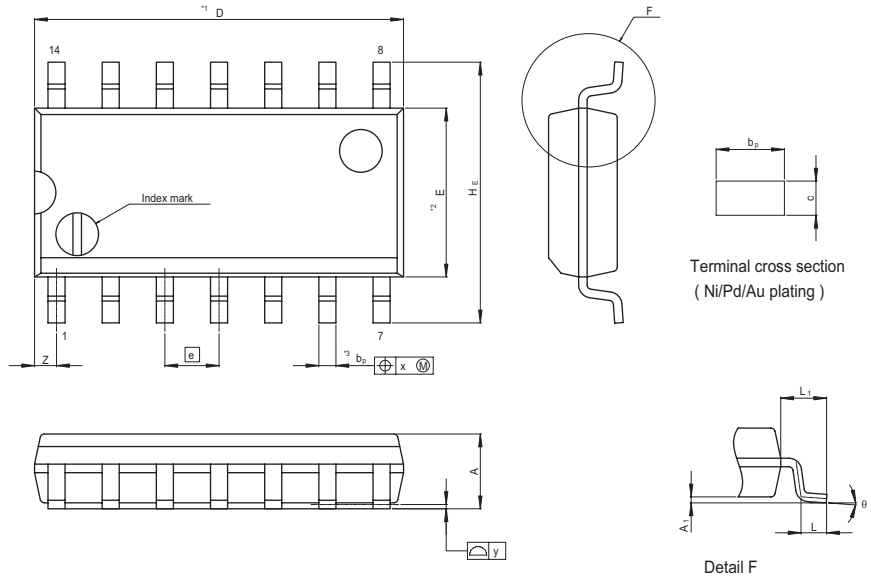
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP14-5.5x10.06-1.27	PRSP0014DF-B	FP-14DAV	0.23g



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	—	—	1.42
L	0.50	0.70	0.90
L_1	—	1.15	—

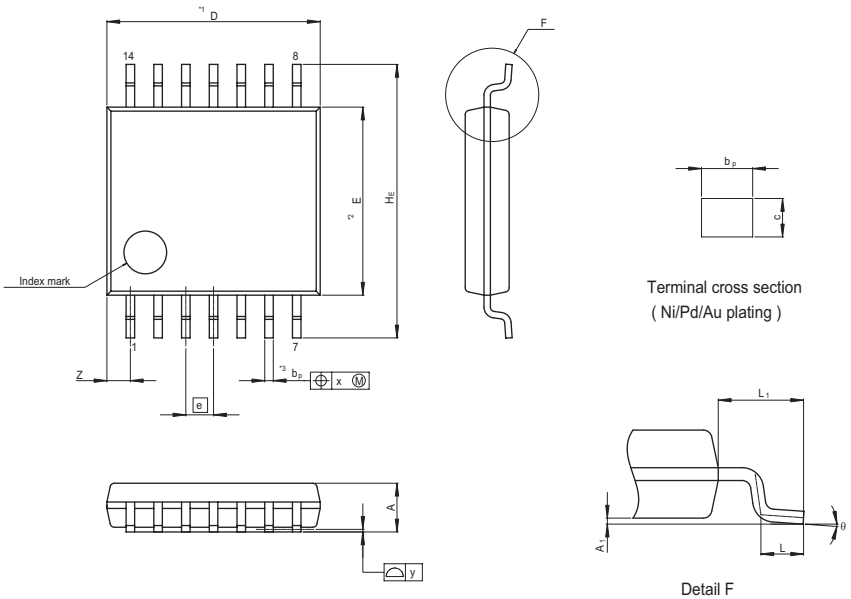
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP14-3.95x8.65-1.27	PRSP0014DE-A	FP-14DNV	0.13g



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°
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	—

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



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	—	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°
H_E	6.20	6.40	6.60
e	—	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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