HD74LV4066A

Quad. Analog Switches / Quad. Multiplexers

REJ03D0340–0400Z
(Previous ADE-205-285B (Z))
Rev.4.00
Jul. 21, 2004

Description

The HD74LV4066A handles both analog and digital signals, and enables signals of either type with amplitudes of up to 5.5 V (peak) to be transmitted in either direction (at V_{CC} = 0 V to 5.5 V).

Each switch section has its own enable input control (C). A high-level voltage applied to C turns on the associated switch section.

Applications include signal gating, chopping, modulation or demodulation (modem), and signal multiplexing for analog-to-digital and digital-to-analog conversion systems.

Features

- V_{CC} = 2.0 V to 5.5 V operation
- All control inputs V_{IH} (Max.) = 5.5 V (@V_{CC} = 0 V to 5.5 V)
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LV4066AFPEL	SOP–14 pin (JEITA)	FP–14DAV	FP	EL (2,000 pcs/reel)
HD74LV4066ARPEL	SOP–14 pin (JEDEC)	FP–14DNV	RP	EL (2,500 pcs/reel)
HD74LV4066ATELL	TSSOP–14 pin	TTP–14DV	T	ELL (2,000 pcs/reel)

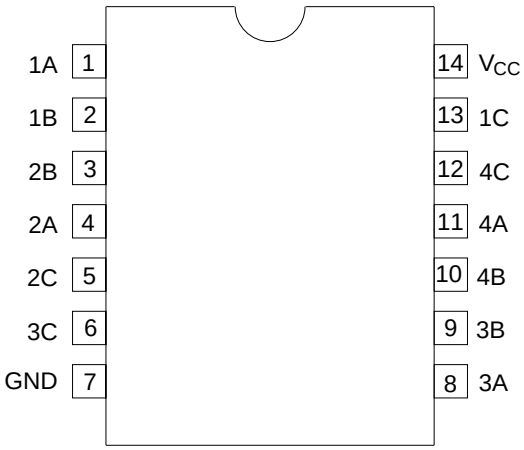
Note: Please consult the sales office for the above package availability.

Function Table

Control	Switch
L	OFF
H	ON

Note: H: High level
L: Low level

Pin Arrangement



(Top view)

Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Conditions
Supply voltage range	V_{CC}	–0.5 to 7.0	V	
Input voltage range*[1]	V_I	–0.5 to 7.0	V	
Output voltage range*[1, 2]	V_O	–0.5 to V_{CC} + 0.5	V	Output: H or L
Input clamp current	I_{IK}	–20	mA	V_I < 0
Output clamp current	I_{OK}	±50	mA	V_O < 0 or V_O > V_{CC}
Continuous output current	I_O	±25	mA	V_O = 0 to V_{CC}
Continuous current through V_{CC} or GND	I_{CC} or I_{GND}	±50	mA	
Maximum power dissipation at Ta = 25°C (in still air)*[3]	P_T	785	mW	SOP
		500		TSSOP
Storage temperature	Tstg	–65 to 150	°C	

Notes: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore, no two of which may be realized at the same time.

1. The input and output voltage ratings may be exceeded even if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

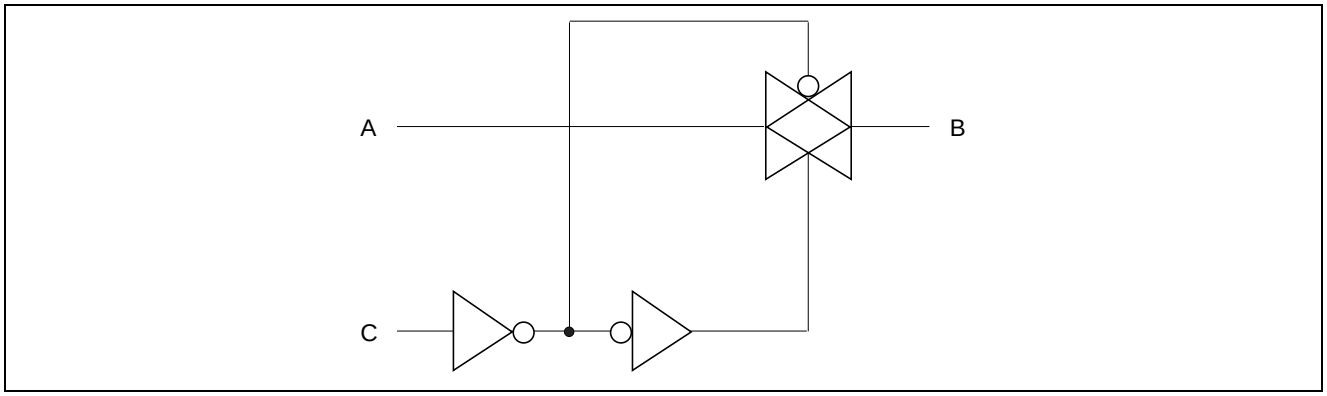
Recommended Operating Conditions

Item	Symbol	Min	Max	Unit	Conditions
Supply voltage range	V_{CC}	2.0*[1]	5.5	V	
Input voltage range	V_I	0	5.5	V	
Output voltage range	$V_{I/O}$	0	V_{CC}	V	
Input transition rise or fall rate	$\Delta t/\Delta v$	0	200	ns/V	V_{CC} = 2.3 to 2.7 V
		0	100		V_{CC} = 3.0 to 3.6 V
		0	20		V_{CC} = 4.5 to 5.5 V
Operating free-air temperature	Ta	–40	85	°C	

Notes: Unused or floating control inputs must be held high or low.

1. With the supply voltage at or around 2 V, the analog switch on-state resistance loses linearity significantly. It is recommended that only digital signals be transmitted at these low supply voltages.

Logic Diagram



DC Electrical Characteristics

Item	Symbol	V_{CC} (V)	Ta = 25°C			Ta = –40 to 85°C		Unit	Test Conditions
			Min	Typ	Max	Min	Max		
Input voltage	V_{IH}	2.0	—	—	—	1.5	—	V	Control input only
		2.3 to 2.7	—	—	—	$V_{CC} \times 0.7$	—		
		3.0 to 3.6	—	—	—	$V_{CC} \times 0.7$	—		
		4.5 to 5.5	—	—	—	$V_{CC} \times 0.7$	—		
	V_{IL}	2.0	—	—	—	—	0.5		
		2.3 to 2.7	—	—	—	—	$V_{CC} \times 0.3$		
		3.0 to 3.6	—	—	—	—	$V_{CC} \times 0.3$		
		4.5 to 5.5	—	—	—	—	$V_{CC} \times 0.3$		
On-state switch resistance	R_{ON}	2.3	—	60	180	—	225	Ω	V_{IN} = V_{CC} or GND
		3.0	—	50	150	—	190		V_C = V_{IH}
		4.5	—	40	75	—	100		I_T = 1 mA
Peak on resistance	$R_{ON\ (P)}$	2.3	—	250	500	—	600	Ω	V_{IN} = V_{CC} to GND
		3.0	—	100	180	—	225		V_C = V_{IH}
		4.5	—	50	100	—	125		I_T = 1 mA
Difference of on-state resistance between switches	ΔR_{ON}	2.3	—	20	30	—	40	Ω	V_{IN} = V_{CC} to GND
		3.0	—	10	20	—	30		V_C = V_{IH}
		4.5	—	7	15	—	20		I_T = 1 mA
Off-state switch leakage current	Is (OFF)	5.5	—	—	±0.1	—	±1.0	μA	V_{IN} = V_{CC}, V_{OUT} = GND or V_{IN} = GND, V_O = V_{CC}, V_C = V_{IL}
On-state switch leakage current	Is (ON)	5.5	—	—	±0.1	—	±1.0	μA	V_{IN} = V_{CC} or GND V_C = V_{IH}
Input current	I_{IN}	0 to 5.5	—	—	±0.1	—	±1.0	μA	V_{IN} = 5.5 V or GND
Quiescent supply current	I_{CC}	5.5	—	—	—	—	20	μA	V_{IN} = V_{CC} or GND

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

Switching Characteristics

V_{CC} = 2.5 ± 0.2 V

Item	Symbol	Ta = 25°C Min	Typ	Max	Ta = –40 to 85°C Min	Max	Unit	Test Conditions		FROM (Input)	TO (Output)
Propagation delay time	t_{PLH}	—	2.0	10.0	—	16.0	ns	C_L = 15 pF		A or B	B or A
	t_{PHL}	—	5.0	12.0	—	18.0		C_L = 50 pF			
Enable time	t_{ZH}	—	6.0	15.0	—	20.0	ns	R_L = 1 kΩ	C_L = 15 pF	C	A or B
	t_{ZL}	—	8.0	25.0	—	32.0			C_L = 50 pF		
Disable time	t_{HZ}	—	7.0	15.0	—	23.0	ns	R_L = 1 kΩ	C_L = 15 pF	C	A or B
	t_{LZ}	—	11.0	25.0	—	32.0			C_L = 50 pF		

V_{CC} = 3.3 ± 0.3 V

Item	Symbol	Ta = 25°C Min	Typ	Max	Ta = –40 to 85°C Min	Max	Unit	Test Conditions		FROM (Input)	TO (Output)
Propagation delay time	t_{PLH}	—	1.5	6.0	—	10.0	ns	C_L = 15 pF		A or B	B or A
	t_{PHL}	—	4.0	9.0	—	12.0		C_L = 50 pF			
Enable time	t_{ZH}	—	4.0	11.0	—	15.0	ns	R_L = 1 kΩ	C_L = 15 pF	C	A or B
	t_{ZL}	—	6.0	18.0	—	22.0			C_L = 50 pF		
Disable time	t_{HZ}	—	5.0	11.0	—	15.0	ns	R_L = 1 kΩ	C_L = 15 pF	C	A or B
	t_{LZ}	—	8.0	18.0	—	22.0			C_L = 50 pF		

V_{CC} = 5.0 ± 0.5 V

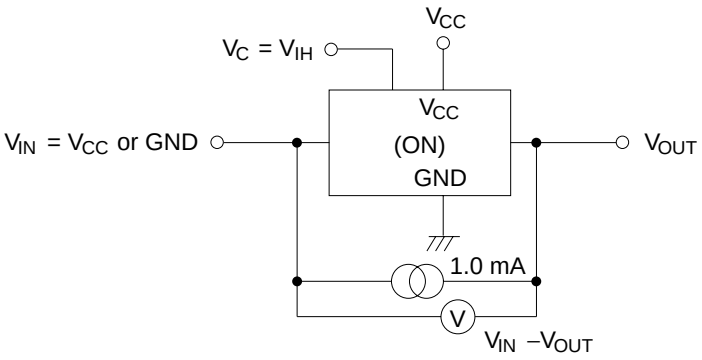
Item	Symbol	Ta = 25°C Min	Typ	Max	Ta = –40 to 85°C Min	Max	Unit	Test Conditions		FROM (Input)	TO (Output)
Propagation delay time	t_{PLH}	—	1.0	4.0	—	7.0	ns	C_L = 15 pF		A or B	B or A
	t_{PHL}	—	3.0	6.0	—	8.0		C_L = 50 pF			
Enable time	t_{ZH}	—	3.0	7.0	—	10.0	ns	R_L = 1 kΩ	C_L = 15 pF	C	A or B
	t_{ZL}	—	5.0	12.0	—	16.0			C_L = 50 pF		
Disable time	t_{HZ}	—	4.0	7.0	—	10.0	ns	R_L = 1 kΩ	C_L = 15 pF	C	A or B
	t_{LZ}	—	6.0	12.0	—	16.0			C_L = 50 pF		

Switching Characteristics (Cont.)

Item	Symbol	V_{CC} (V)	Ta = 25°C Min	Typ	Max	Unit	Test Conditions	FROM (Input)	TO (Output)
Control input capacitance	C_{IC}	—	—	3.5	—	pF			
Switch terminal capacitance	$C_{I/O}$	—	—	6.0	—	pF			
Feedthrough capacitance	C_T	—	—	0.5	—	pF			
Power dissipation capacitance	C_{PD}	—	—	4.0	—	pF			
Frequency response (Switch ON)		2.3	—	30.0	—	MHz	C_L = 50 pF, R_L = 600 Ω Adjust f_{in} voltage to obtain 0 dBm at output when f_{in} is 1 MHz (sine wave). Increase f_{in} frequency until the dB-meter reads –3dBm. 20 log (V_O/V_I) = –3 dBm	A or B	B or A
		3.0	—	35.0	—				
		4.5	—	50.0	—				
Crosstalk (Between any switches)		2.3	—	–45.0	—	dB	C_L = 50 pF, R_L = 600 Ω Adjust f_{in} voltage to obtain 0 dBm at input when f_{in} is 1 MHz (sine wave).	A or B	B or A
		3.0	—	–45.0	—				
		4.5	—	–45.0	—				
Crosstalk (Control input to signal output)		2.3	—	15.0	—	mV	C_L = 50 pF, R_L = 600 Ω Adjust R_L value to obtain 0 A at $I_{IN/OUT}$ when f_{in} is 1 MHz (square wave).	C	A or B
		3.0	—	20.0	—				
		4.5	—	50.0	—				
Feedthrough attenuation (Switch OFF)		2.3	—	–40.0	—	dB	C_L = 50 pF, R_L = 600 Ω Adjust f_{in} voltage to obtain 0 dBm at input when f_{in} is 1 MHz (sine wave).	A or B	B or A
		3.0	—	–40.0	—				
		4.5	—	–40.0	—				
Sine-wave distortion		2.3	—	0.1	—	%	C_L = 50 pF, R_L = 10 kΩ f_{IN} = 1 kHz (sine wave) V_I = 2 V_{P-P}, V_{CC} = 2.3 V V_I = 2.5 V_{P-P}, V_{CC} = 3.0 V V_I = 4 V_{P-P}, V_{CC} = 4.5 V	A or B	B or A
		3.0	—	0.1	—				
		4.5	—	0.1	—				

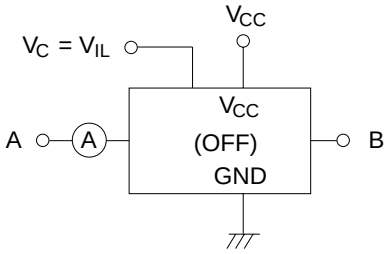
Test Circuits

R_{ON}: On-state switch resistance



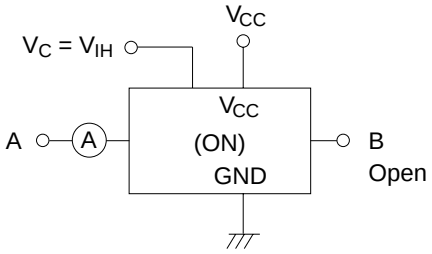
$$R_{ON} = \frac{V_{IN} - V_{OUT}}{10^{-3}} (\Omega)$$

Is (OFF): Off-state switch leakage current, Is (ON): On-state switch leakage current



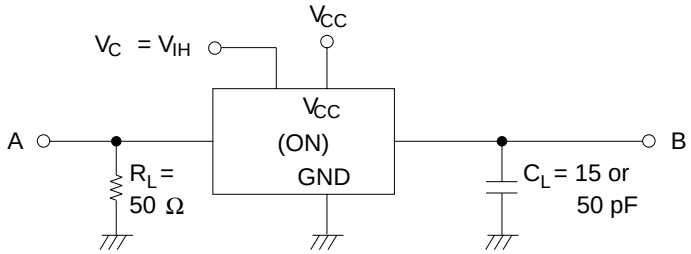
CONDITION 1: V_A = 0, V_B = V_{CC}

CONDITION 2: V_A = V_{CC} , V_B = 0

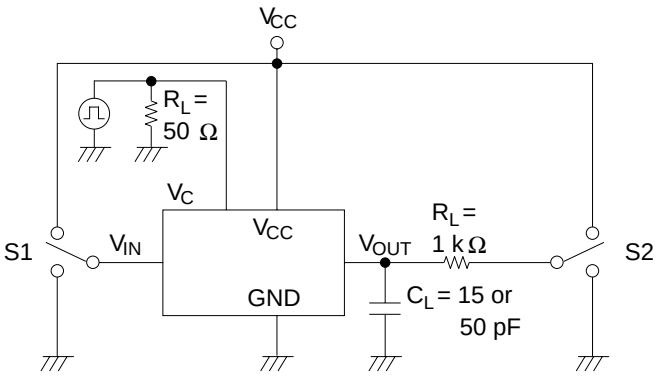


V_A = V_{CC} or GND

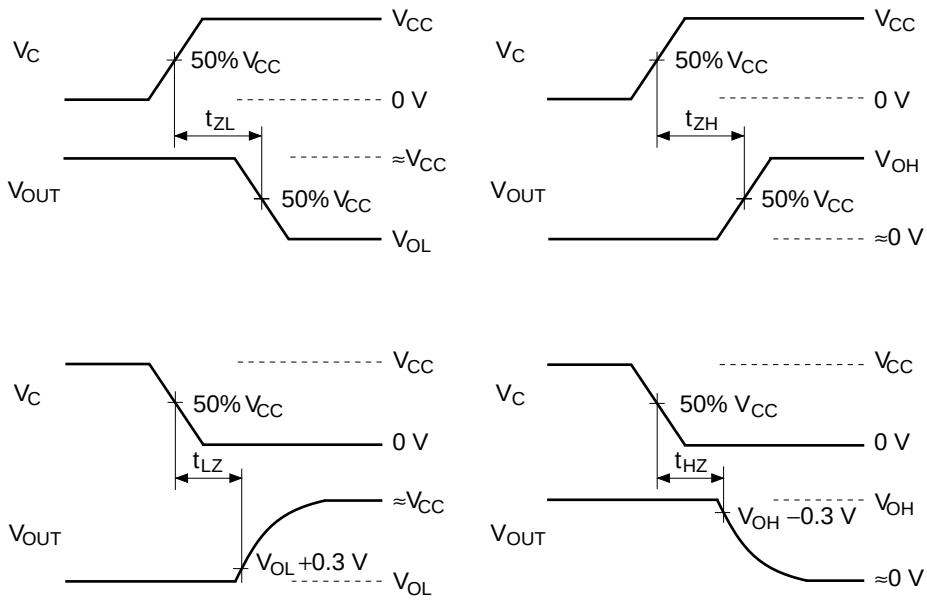
t_{PLH}, t_{PHL}: Propagation delay time (from switch input to switch output)



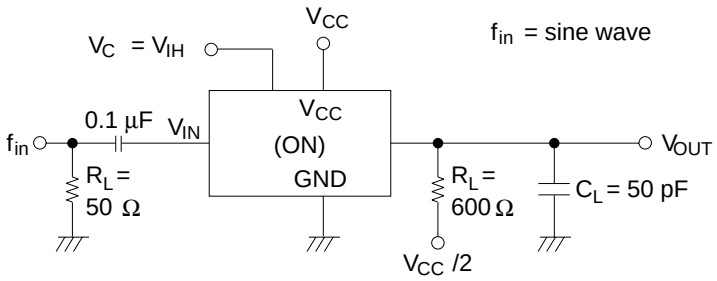
Switching time



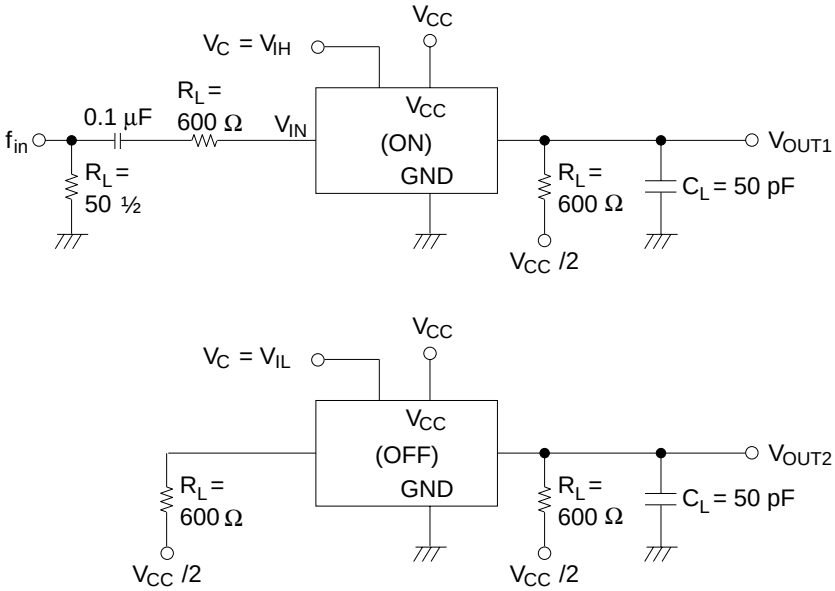
TEST	S1	S2
t_{LZ} /t_{ZL}	GND	Vcc
t_{HZ}/t_{ZH}	Vcc	GND



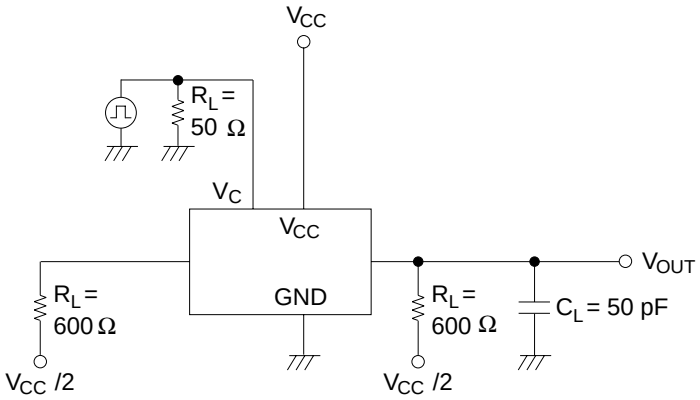
Frequency response (Switch ON)



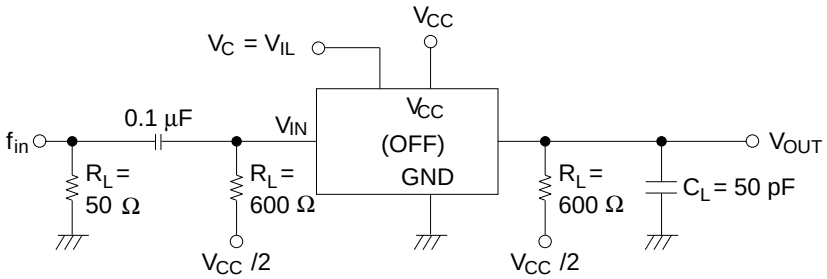
Crosstalk (Between any switches)



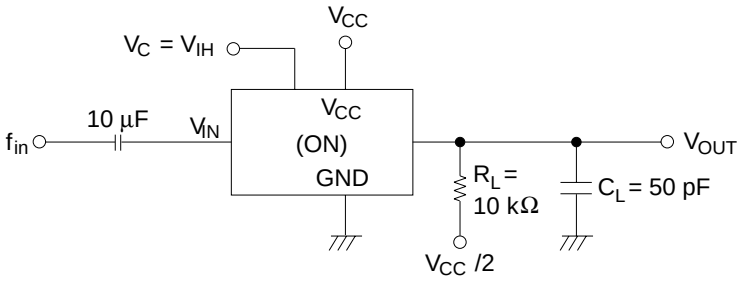
Crosstalk (Control input to signal output)



Feedthrough attenuation (Switch OFF)



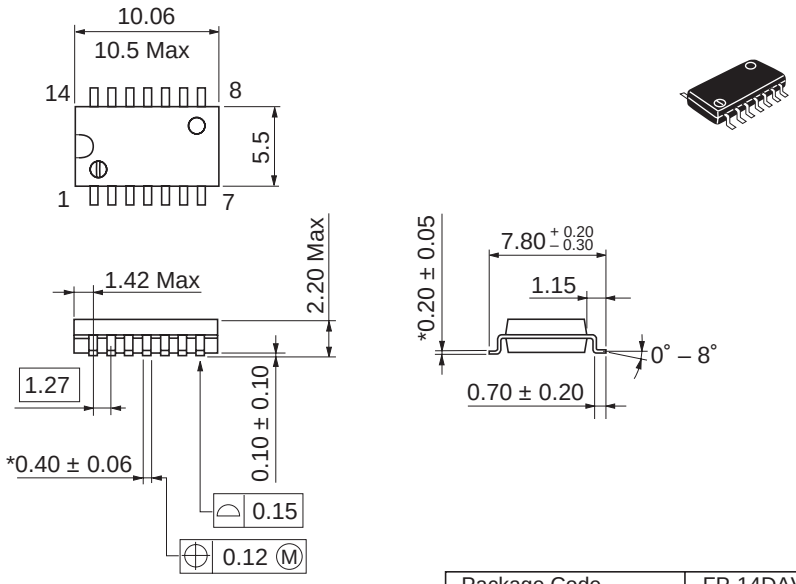
Sine-wave distortion



Package Dimensions

As of January, 2003

Unit: mm

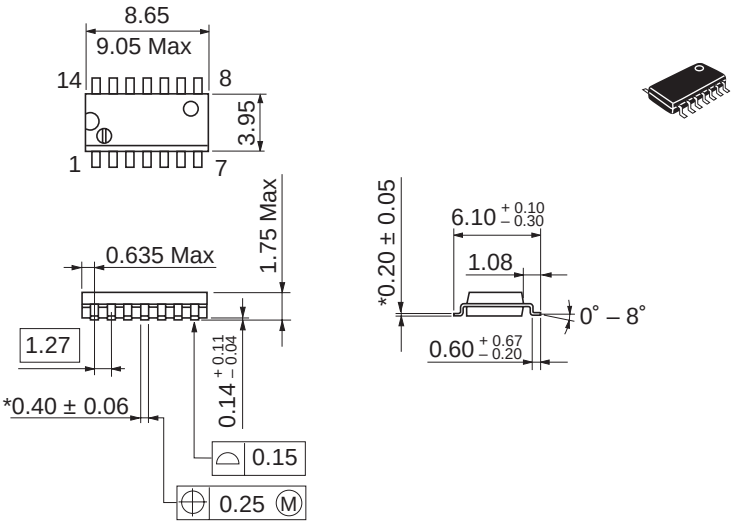


*Ni/Pd/Au plating

Package Code	FP-14DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.23 g

As of January, 2003

Unit: mm

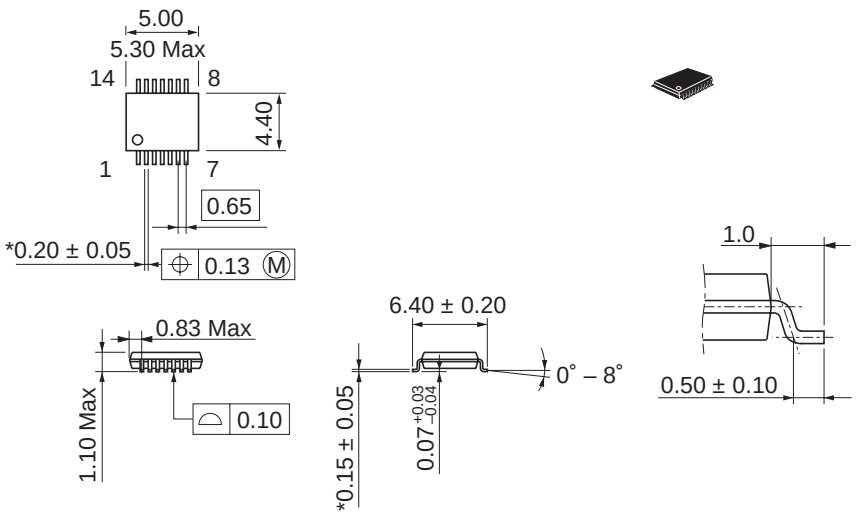


*Ni/Pd/Au plating

Package Code	FP-14DNV
JEDEC	Conforms
JEITA	Conforms
Mass (reference value)	0.13 g

As of January, 2003

Unit: mm



*Ni/Pd/Au plating

Package Code	TTP-14DV
JEDEC	—
JEITA	—
Mass (reference value)	0.05 g

Renesas Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

RENESAS SALES OFFICES

http://www.renesas.com

Renesas Technology America, Inc.
450 Holger Way, San Jose, CA 95134-1368, U.S.A
Tel: <1> (408) 382-7500 Fax: <1> (408) 382-7501

Renesas Technology Europe Limited.
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, United Kingdom
Tel: <44> (1628) 585 100, Fax: <44> (1628) 585 900

Renesas Technology Europe GmbH
Dornacher Str. 3, D-85622 Feldkirchen, Germany
Tel: <49> (89) 380 70 0, Fax: <49> (89) 929 30 11

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7/F., North Tower, World Finance Centre, Harbour City, Canton Road, Hong Kong
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Renesas Technology Taiwan Co., Ltd.
FL 10, #99, Fu-Hsing N. Rd., Taipei, Taiwan
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Renesas Technology (Shanghai) Co., Ltd.
26/F., Ruijin Building, No.205 Maoming Road (S), Shanghai 200020, China
Tel: <86> (21) 6472-1001, Fax: <86> (21) 6415-2952

Renesas Technology Singapore Pte. Ltd.
1, Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632
Tel: <65> 6213-0200, Fax: <65> 6278-8001

Colophon .1.0