

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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for new design

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# HD74AC86/HD74ACT86

## Quad 2-Input Exclusive-OR-Gate

REJ03D0278-0200Z  
 (Previous ADE-205-362 (Z))  
 Rev.2.00  
 Jul.16.2004

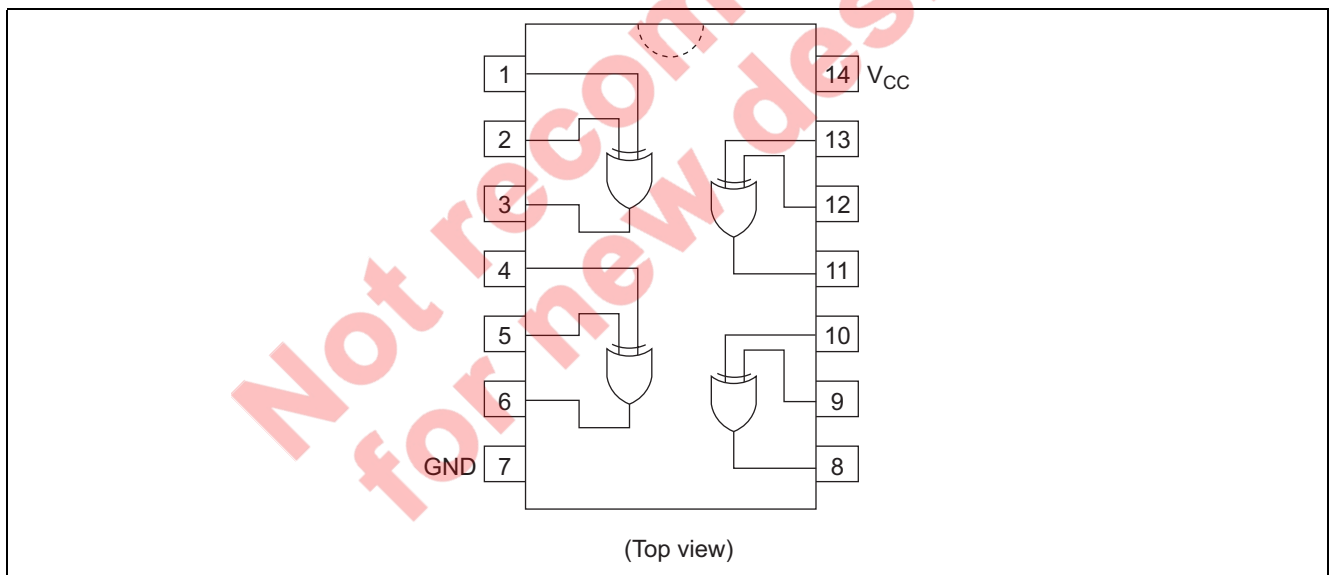
### Features

- Outputs Source/Sink 24 mA
- HD74ACT86 has TTL-Compatible Inputs
- Ordering Information: Ex. HD74AC86

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74AC86FPEL	SOP-14 pin (JEITA)	FP-14DAV	FP	EL (2,000 pcs/reel)
HD74AC86RPEL	SOP-14 pin (JEDEC)	FP-14DNV	RP	EL (2,500 pcs/reel)

Notes: 1. Please consult the sales office for the above package availability.  
 2. The packages with lead-free pins are distinguished from the conventional products by adding V at the end of the package code.

### Pin Arrangement



**Absolute Maximum Ratings**

Item	Symbol	Ratings	Unit	Condition
Supply voltage	$V_{CC}$	-0.5 to 7	V	
DC input diode current	$I_{IK}$	-20	mA	$V_I = -0.5V$
		20	mA	$V_I = V_{CC}+0.5V$
DC input voltage	$V_I$	-0.5 to $V_{CC}+0.5$	V	
DC output diode current	$I_{OK}$	-50	mA	$V_O = -0.5V$
		50	mA	$V_O = V_{CC}+0.5V$
DC output voltage	$V_O$	-0.5 to $V_{CC}+0.5$	V	
DC output source or sink current	$I_O$	$\pm 50$	mA	
DC $V_{CC}$ or ground current per output pin	$I_{CC}, I_{GND}$	$\pm 50$	mA	
Storage temperature	$T_{stg}$	-65 to +150	°C	

**Recommended Operating Conditions: HD74AC86**

Item	Symbol	Ratings	Unit	Condition
Supply voltage	$V_{CC}$	2 to 6	V	
Input and output voltage	$V_I, V_O$	0 to $V_{CC}$	V	
Operating temperature	$T_a$	-40 to +85	°C	
Input rise and fall time (except Schmitt inputs) $V_{IN}$ 30% to 70% $V_{CC}$	tr, tf	8	ns/V	$V_{CC} = 3.0V$
				$V_{CC} = 4.5 V$
				$V_{CC} = 5.5 V$

**DC Characteristics: HD74AC86**

Item	Sym- bol	Vcc (V)	$T_a = 25^\circ C$			$T_a = -40 \text{ to } +85^\circ C$		Unit	Condition		
			min.	typ.	max.	min.	max.				
Input Voltage	$V_{IH}$	3.0	2.1	1.5	—	2.1	—	V	$V_{OUT} = 0.1 V \text{ or } V_{CC} - 0.1 V$		
		4.5	3.15	2.25	—	3.15	—				
		5.5	3.85	2.75	—	3.85	—				
	$V_{IL}$	3.0	—	1.50	0.9	—	0.9		$V_{OUT} = 0.1 V \text{ or } V_{CC} - 0.1 V$		
		4.5	—	2.25	1.35	—	1.35				
		5.5	—	2.75	1.65	—	1.65				
Output voltage	$V_{OH}$	3.0	2.9	2.99	—	2.9	—	V	$V_{IN} = V_{IL} \text{ or } V_{IH}$ $I_{OUT} = -50 \mu A$		
		4.5	4.4	4.49	—	4.4	—				
		5.5	5.4	5.49	—	5.4	—				
		3.0	2.58	—	—	2.48	—			$V_{IN} = V_{IL} \text{ or } V_{IH}$	$I_{OH} = -12 \text{ mA}$
		4.5	3.94	—	—	3.80	—				$I_{OH} = -24 \text{ mA}$
		5.5	4.94	—	—	4.80	—				$I_{OH} = -24 \text{ mA}$
	$V_{OL}$	3.0	—	0.002	0.1	—	0.1	V	$V_{IN} = V_{IL} \text{ or } V_{IH}$ $I_{OUT} = 50 \mu A$		
		4.5	—	0.001	0.1	—	0.1				
		5.5	—	0.001	0.1	—	0.1				
		3.0	—	—	0.32	—	0.37			$V_{IN} = V_{IL} \text{ or } V_{IH}$	$I_{OL} = 12 \text{ mA}$
		4.5	—	—	0.32	—	0.37				$I_{OL} = 24 \text{ mA}$
		5.5	—	—	0.32	—	0.37				$I_{OL} = 24 \text{ mA}$
Input leakage current	$I_{IN}$	5.5	—	—	$\pm 0.1$	—	$\pm 1.0$	$\mu A$	$V_{IN} = V_{CC} \text{ or } GND$		
Dynamic output current*	$I_{OLD}$	5.5	—	—	—	86	—	mA	$V_{OLD} = 1.1 V$		
	$I_{OHD}$	5.5	—	—	—	-75	—	mA	$V_{OHD} = 3.85 V$		
Quiescent supply current	$I_{CC}$	5.5	—	—	4.0	—	40	$\mu A$	$V_{IN} = V_{CC} \text{ or } ground$		

\*Maximum test duration 2.0 ms, one output loaded at a time.

**Recommended Operating Conditions: HD74ACT86**

Item	Symbol	Ratings	Unit	Condition
Supply voltage	$V_{CC}$	2 to 6	V	
Input and output voltage	$V_I, V_O$	0 to $V_{CC}$	V	
Operating temperature	$T_a$	-40 to +85	°C	
Input rise and fall time (except Schmitt inputs) $V_{IN}$ 0.8 to 2.0 V	$t_r, t_f$	8	ns/V	$V_{CC} = 4.5V$ $V_{CC} = 5.5V$

**DC Characteristics: HD74ACT86**

Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ C$			$T_a = -40$ to $+85^\circ C$		Unit	Condition				
			min.	typ.	max.	min.	max.						
Input voltage	$V_{IH}$	4.5	2.0	1.5	—	2.0	—	V	$V_{OUT} = 0.1 V$ or $V_{CC}-0.1 V$				
		5.5	2.0	1.5	—	2.0	—						
	$V_{IL}$	4.5	—	1.5	0.8	—	0.8	V	$V_{OUT} = 0.1 V$ or $V_{CC}-0.1 V$				
		5.5	—	1.5	0.8	—	0.8						
Output voltage	$V_{OH}$	4.5	4.4	4.49	—	4.4	—	V	$V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OUT} = -50 \mu A$				
		5.5	5.4	5.49	—	5.4	—						
		4.5	3.94	—	—	3.80	—			$V_{IN} = V_{IL}$	$I_{OH} = -24 mA$		
		5.5	4.94	—	—	4.80	—				$I_{OH} = -24 mA$		
	$V_{OL}$	4.5	—	0.001	0.1	—	0.1	V	$V_{IN} = V_{IL}$ or $V_{IH}$ $I_{OUT} = 50 \mu A$				
		5.5	—	0.001	0.1	—	0.1						
		4.5	—	—	0.32	—	0.37			$V_{IN} = V_{IL}$	$I_{OL} = 24 mA$		
		5.5	—	—	0.32	—	0.37				$I_{OL} = 24 mA$		
		Input current	$I_{IN}$	5.5	—	—	$\pm 0.1$			—	$\pm 1.0$	$\mu A$	$V_{IN} = V_{CC}$ or GND
		$I_{CC}$ /input current	$I_{CCT}$	5.5	—	0.6	—			—	1.5	mA	$V_{IN} = V_{CC}-2.1 V$
Dynamic output current*	$I_{OLD}$	5.5	—	—	—	86	—	mA	$V_{OLD} = 1.1 V$				
	$I_{OHD}$	5.5	—	—	—	-75	—	mA	$V_{OHD} = 3.85 V$				
Quiescent supply current	$I_{CC}$	5.5	—	—	4.0	—	40	$\mu A$	$V_{IN} = V_{CC}$ or ground				

\*Maximum test duration 2.0 ms, one output loaded at a time.

**AC Characteristics: HD74AC86**

Item	Symbol	$V_{CC}$ (V)*1	$T_a = +25^\circ C$ $C_L = 50 pF$			$T_a = -40^\circ C$ to $+85^\circ C$ $C_L = 50 pF$		Unit
			Min	Typ	Max	Min	Max	
Propagation delay	$t_{PLH}$	3.3	1.0	9.5	12.5	1.0	14.0	ns
		5.0	1.0	7.5	10.0	1.0	11.0	
Propagation delay	$t_{PHL}$	3.3	1.0	8.5	11.5	1.0	13.0	ns
		5.0	1.0	6.5	9.0	1.0	10.0	

Note: 1. Voltage Range 3.3 is 3.3 V  $\pm$  0.3 V  
Voltage Range 5.0 is 5.0 V  $\pm$  0.5 V

## AC Characteristics: HD74ACT86

Item	Symbol	V <sub>CC</sub> (V)*1	Ta = +25°C C <sub>L</sub> = 50 pF			Ta = -40°C to +85°C C <sub>L</sub> = 50 pF		Unit
			Min	Typ	Max	Min	Max	
Propagation delay	t <sub>PLH</sub>	5.0	1.0	8.5	11.0	1.0	12.0	ns
Propagation delay	t <sub>PHL</sub>	5.0	1.0	7.0	10.0	1.0	11.0	ns

Note: 1. Voltage Range 3.3 is 3.3 V ± 0.3 V  
Voltage Range 5.0 is 5.0 V ± 0.5 V

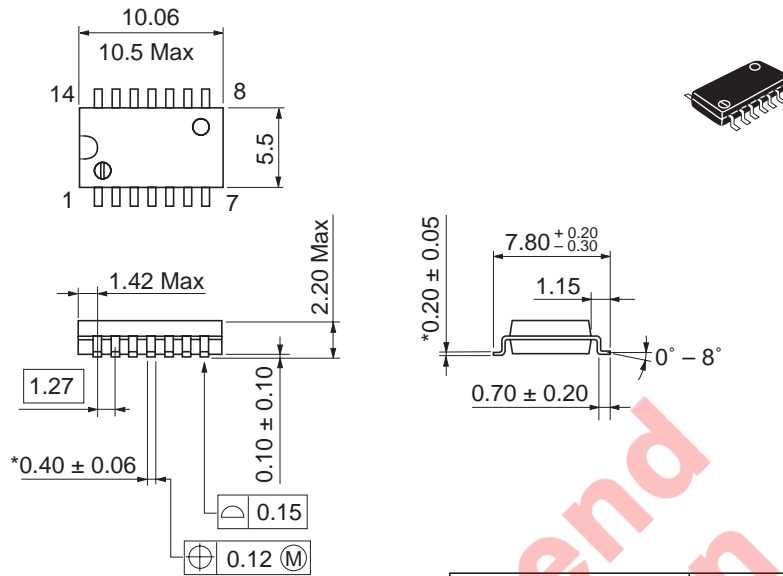
## Capacitance

Item	Symbol	Typ	Unit	Condition
Input capacitance	C <sub>IN</sub>	4.5	pF	V <sub>CC</sub> = 5.5 V
Power dissipation capacitance	C <sub>PD</sub>	45.0	pF	V <sub>CC</sub> = 5.0 V

Not recommend  
for new design

Package Dimensions

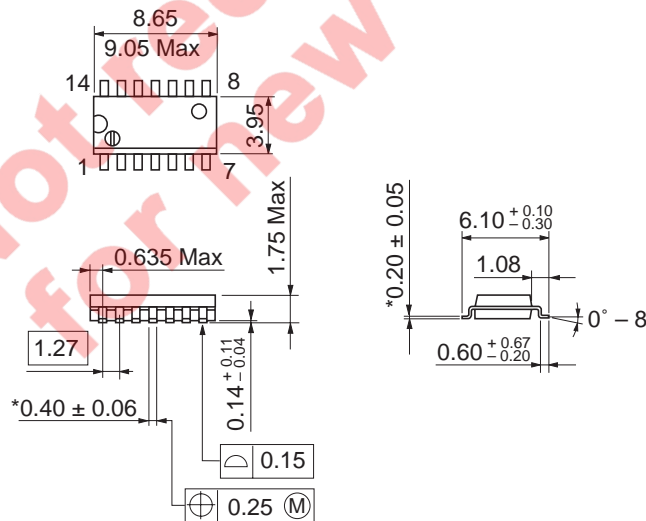
As of January, 2003  
Unit: mm



\*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

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