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HD74AC107/HD74ACT107

Dual JK Flip-Flop (with Separate Clear and Clock)

REJ03D0243–0200Z (Previous ADE-205-363 (Z)) Rev.2.00 Jul.16.2004

Description

The HD74AC107/HD74ACT107 dual JK master/slave flip-flops have a separate clock for each flip-flop. Inputs to the master section are controlled by the clock pulse. The clock pulse also regulates the state of the coupling transistors which connect the master and slave sections. The sequence of operation is as follows: 1) isolate slave from master; 2) enter information from J and K inputs to master; 3) disable J and K inputs; 4) transfer information from master to slave.

Features

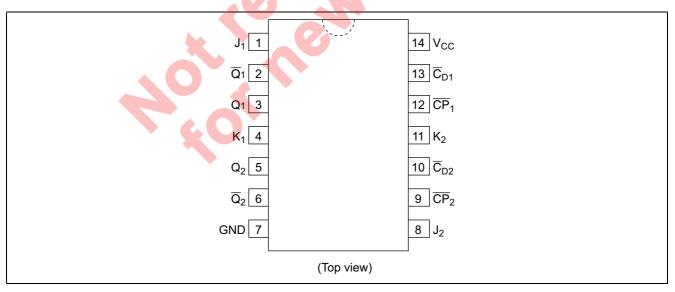
- Outputs Source/Sink 24 mA
- HD74ACT107 has TTL-Compatible Inputs
- Ordering Information: Ex. HD74AC107

Part Name	Package Type	Package Code	Packa	age Abbreviation	Taping Abbreviation (Quantity)
HD74AC107FPEL	SOP-14 pin (JEITA)	FP-14DAV	FP		EL (2,000 pcs/reel)
HD74AC107RPEL	SOP-14 pin (JEDEC)	FP-14DNV	RP		EL (2,500 pcs/reel)

Notes: 1. Please consult the sales office for the above package availability.

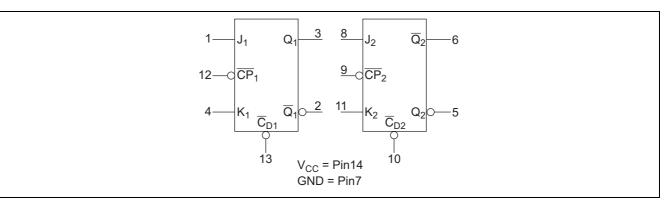
2. The packages with lead-free pins are distinguished from the conventional products by adding V at the end of the package code.

Pin Arrangement





Logic Symbol



Pin Names

J ₁ , J ₂ , K ₁ , K ₂	Data Inputs
$\overline{CP}_1, \overline{CP}_2$	Clock Pulse Inputs (Active Falling Edge)
$\overline{\mathrm{C}}_{\mathrm{D1}},\overline{\mathrm{C}}_{\mathrm{D2}}$	Direct Clear Inputs (Active Low)
$\mathbf{Q}_1, \mathbf{Q}_2, \overline{\mathbf{Q}}_1, \overline{\mathbf{Q}}_2$	Outputs

Truth Table

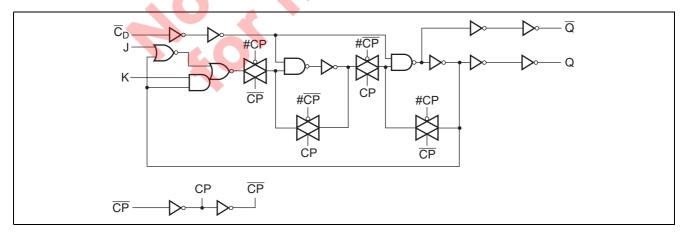
Inputs					Outputs	
@ t _n					@ t _{n + 1}	
J		К			Q	
L	L		Qn	6		
L	Н					
Н	L		Н			
Н	Н		Qn			
H : High Voltage L	evel					

rign voltage Level н L : Low Voltage Level

Bit time before clock pulse. :

 \mathbf{t}_{n} Bit time after clock pulse. : t_{n + 1}

Logic Diagram



Absolute Maximum Ratings

ltem	Symbol	Ratings	Unit	Condition
Supply voltage	V _{cc}	–0.5 to 7	V	
DC input diode current	I _{IK}	-20	mA	$V_1 = -0.5V$
		20	mA	$V_1 = Vcc+0.5V$
DC input voltage	V	-0.5 to Vcc+0.5	V	
DC output diode current	Ι _{οκ}	-50	mA	$V_0 = -0.5V$
		50	mA	$V_0 = Vcc+0.5V$
DC output voltage	Vo	-0.5 to Vcc+0.5	V	
DC output source or sink current	I _o	±50	mA	
DC V_{cc} or ground current per output pin	I _{CC} , I _{GND}	±50	mA	
Storage temperature	Tstg	-65 to +150	°C	

Recommended Operating Conditions: HD74AC107

ltem	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	Та	-40 to +85	°C	
Input rise and fall time	tr, tf	8	ns/V	$V_{\rm CC} = 3.0 V$
(except Schmitt inputs)				V _{cc} = 4.5 V
V_{IN} 30% to 70% V_{CC}				V _{cc} = 5.5 V
DC Characteristics: HD74AC1	07	0 6		

DC Characteristics: HD74AC107

Item	Sym-	Vcc	-	Га = 25°	C	Ta=	-40 to	Unit	Condition	
nom	bol	(V)		.			5°C	•	Containen	
			min.	typ.	max.	min.	max.			
Input Voltage	V _{IH}	3.0	2.1	1.5	—	2.1	—	V	$V_{OUT} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V}$	
		4.5	3.15	2.25	-	<mark>3</mark> .15	_			
		5.5	3.85	2.75		3.85	_			
	V _{IL}	3.0		1.50	0.9	—	0.9		$V_{OUT} = 0.1 \text{ V or } V_{CC} - 0.1 \text{ V}$	
		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	$V_{IN} = V_{IL} \text{ or } V_{IH}$	
		4.5	4.4	4.49	—	4.4	—		I _{OUT} = -50 μA	
		5.5	5.4	5.49	—	5.4	—			
		3.0	2.58		—	2.48	—		$V_{IN} = V_{IL} \text{ or } V_{IH}$ $I_{OH} = -12 \text{ m}$	Α
		4.5	3.94		—	3.80	—		I _{он} = -24 m	Α
		5.5	4.94		—	4.80	—		I _{он} = -24 m	Α
	V _{OL}	3.0	—	0.002	0.1	—	0.1		$V_{IN} = V_{IL} \text{ or } V_{IH}$	
		4.5	—	0.001	0.1	—	0.1		I _{OUT} = 50 μA	
		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 mA	
		5.5	—	—	0.32	—	0.37		I _{OL} = 24 mA	
Input leakage current	I _{IN}	5.5	_	—	±0.1	—	±1.0	μA	$V_{IN} = V_{CC}$ or GND	
Dynamic output	I _{OLD}	5.5	—	—	—	86	—	mA	V _{OLD} = 1.1 V	
current*	I _{OHD}	5.5	—	—	—	-75	—	mA	V _{OHD} = 3.85 V	
Quiescent supply current	I _{CC}	5.5	—	—	4.0	—	40	μA	$V_{IN} = V_{CC}$ or ground	

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



Recommended Operating Conditions: HD74ACT107

ltem	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	Та	-40 to +85	°C	
Input rise and fall time (except Schmitt inputs) V _{IN} 0.8 to 2.0 V	tr, tf	8	ns/V	$V_{CC} = 4.5V$ $V_{CC} = 5.5V$

DC Characteristics: HD74ACT107

Item	Sym- bol	V _{cc} (V)	1	a = 25°0	C	+85°C		Unit	Condition
			min.	typ.	max.	min.	max.		
Input voltage	V _{IH}	4.5	2.0	1.5	—	2.0	—	V	$V_{OUT} = 0.1 \text{ V or Vcc0.1 V}$
		5.5	2.0	1.5	—	2.0	—		
	V _{IL}	4.5	—	1.5	0.8	—	0.8		$V_{OUT} = 0.1 \text{ V or Vcc-}0.1 \text{ V}$
		5.5	—	1.5	0.8	—	0.8		
Output voltage	V _{OH}	4.5	4.4	4.49	—	4.4		V	$V_{IN} = V_{IL} \text{ or } V_{IH}$
		5.5	5.4	5.49	—	5.4			Ι _{ουτ} = -50 μΑ
		4.5	3.94	—	—	3.80			$V_{IN} = V_{IL}$ $I_{OH} = -24 \text{ mA}$
		5.5	4.94	—	—	4.80			I _{он} = –24 mA
	V _{OL}	4.5	—	0.001	0.1	ł	0.1		$V_{IN} = V_{IL} \text{ or } V_{IH}$
		5.5	—	0.001	0.1		0.1		I _{OUT} = 50 μA
		4.5	—	—	0.32		0.37		$V_{IN} = V_{IL}$ $I_{OL} = 24 \text{ mA}$
		5.5	—	—	0.32	-	0.37		I _{OL} = 24 mA
Input current	I _{IN}	5.5	—		±0.1		±1.0	μΑ	$V_{IN} = V_{CC}$ or GND
I _{cc} /input current	I _{CCT}	5.5	—	0.6	-		1.5	mA	$V_{IN} = V_{CC} - 2.1 V$
Dynamic output	I _{OLD}	5.5	- 6	X	-	86	—	mA	V _{OLD} = 1.1 V
current*	I _{OHD}	5.5		-	1	-75	—	mA	V _{OHD} = 3.85 V
Quiescent supply current	I _{cc}	5.5		-	4.0	—	40	μA	$V_{IN} = V_{CC}$ or ground

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

AC Characteristics: HD74AC107

	• •	9	Ta = +25°C C _∟ = 50 pF				C to +85°C 50 pF	
Item	Symbol	V _{cc} (V)* ¹	Min	Тур	Max	Min	Max	Unit
Maximum clock	f _{max}	3.3	125	—	—	100	—	MHz
frequency		5.0	150	—	—	125	—	
Propagation delay	t _{PLH}	3.3	1.0	9.5	13.0	1.0	14.0	ns
\overline{C}_{P} to Q or \overline{Q}		5.0	1.0	7.5	10.0	1.0	11.0	
Propagation delay	t _{PHL}	3.3	1.0	10.0	13.5	1.0	14.5	ns
\overline{C}_{P} to Q or \overline{Q}		5.0	1.0	8.0	10.5	1.0	11.5	
Propagation delay	t _{PLH}	3.3	1.0	9.5	13.0	1.0	14.0	ns
\overline{C}_{D} to \overline{Q}		5.0	1.0	7.5	10.0	1.0	11.0	
Propagation delay	t _{PHL}	3.3	1.0	9.5	13.0	1.0	14.0	ns
\overline{C}_{D} to \overline{Q}		5.0	1.0	7.5	10.0	1.0	11.0	

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



Operating Requirements: HD74AC107

			Ta = +25°C C _L = 50 pF		Ta = -40°C to +85°C C _L = 50 pF	
ltem	Symbol	V _{cc} (V)* ¹	Тур	Guarantee	d Minimum	Unit
Setup time	t _{su}	3.3	3.0	5.5	6.0	ns
J or k to \overline{C}_{P}		5.0	2.0	4.0	4.5	
Hold time	t _h	3.3	-1.5	0.0	0.0	
\overline{C}_{P} to J or k		5.0	-0.5	0.0	0.0	
Pulse width	t _w	3.3	2.0	5.5	7.0	
\overline{C}_{P} or \overline{C}_{D}		5.0	2.0	4.5	5.0	
Recovery time	t _{rec}	3.3	1.5	3.0	3.0	
\overline{C}_{D} to \overline{C}_{P}		5.0	1.0	3.0	3.0	

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

Voltage Range 5.0 is 5.0 V ± 0.5 V

AC Characteristics: HD74ACT107

			Ta = +25°C			Ta = -40°0	C to +85°C			
			C	C _∟ = 50 p	F	C _L = 5	50 pF			
Item	Symbol	V _{cc} (V)* ¹	Min	Тур	Max	Min	Max	Unit		
Maximum clock frequency	f _{max}	5.0	100	-		80	3	MHz		
Propagation delay \overline{C}_{P} to Q or \overline{Q}	t _{PLH}	5.0	1.0	9.5	12.5	1.0	13.5	ns		
Propagation delay \overline{C}_{P} to Q or \overline{Q}	t _{PHL}	5.0	1.0	10.5	13.0	1.0	14.0			
Propagation delay \overline{C}_{D} to \overline{Q}	t _{PLH}	5.0	1.0	8.5	11.0	1.0	12.0			
Propagation delay \overline{C}_{D} to Q	t _{PHL}	5.0	1.0	8.5	11.0	1.0	12.0			

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

Operating Requirements: HD74ACT107

	20		Ta = +25°C C _L = 50 pF		Ta = -40°C to +85°C C _L = 50 pF	
Item	Symbol	V _{cc} (V)* ¹	Тур	Guarantee	d Minimum	Unit
Setup time J or k to \overline{C}_{P}	t _{su}	5.0	2.5	7.0	8.0	ns
Hold time \overline{C}_{P} to J or k	t _h	5.0	0.0	1.5	1.5	
Pulse width \overline{C}_{P} or \overline{C}_{D}	t _w	5.0	4.5	7.0	8.0	
Recovery time \overline{C}_{D} to \overline{C}_{P}	t _{rec}	5.0	_	3.0	3.0	

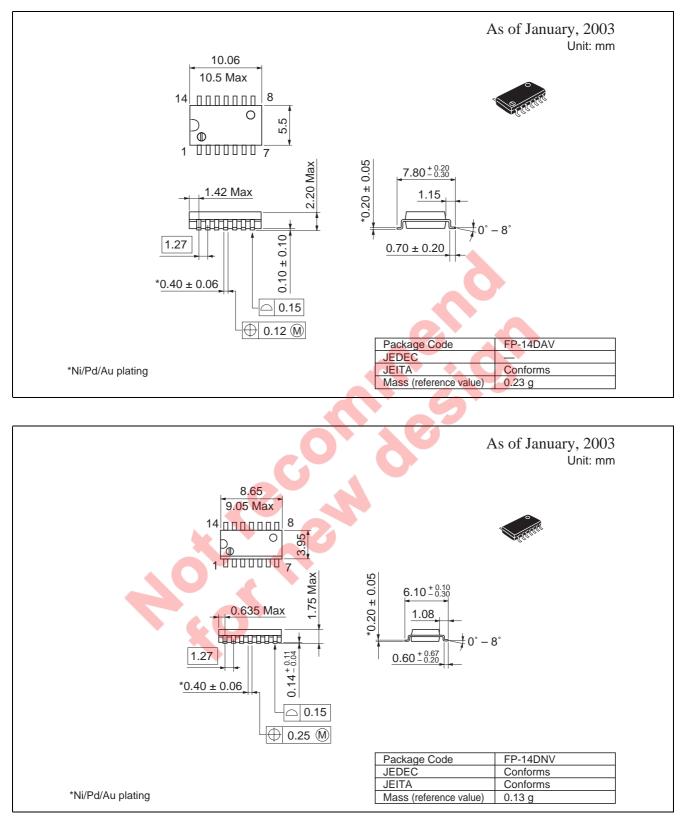
Note: 1. Voltage Range 5.0 is 5.0 V \pm 0.5 V

Capacitance

Item	Symbol	Тур	Unit	Condition
Input capacitance	C _{IN}	4.5	pF	$V_{\rm CC} = 5.5 \text{ V}$
Power dissipation capacitance	C _{PD}	35.0	pF	$V_{CC} = 5.0 V$



Package Dimensions





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