ISI IDEAL SEMICONDUCTOR INC.

"Your Best Defense Against Obsolescence"

112A

54HCTLS
74HCTLS

OBJECTIVE SPECIFICATIONS

Dual J-K Negative-Edge-Triggered Flip-Flops with Preset and Clear

Features

- *Function, pin-out, speed and drive compatability with 54/74LS logic family*
- *Low power consumption characteristic of CMOS*
- *High-Drive-Current outputs: I_{OL} = 8 mA @ V_{OL} = 0.5V*
- *Inputs and outputs interface directly with TTL, NMOS and CMOS devices*
- *Wide operating voltage range: 4.5V to 5.5V*
- *Characterized for operation over industial and military temperature ranges:*

  74HCTLS: -40°C to +85°C
  54HCTLS: -55°C to +125°C

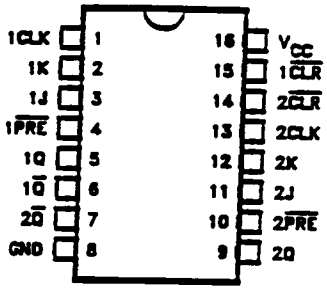
Description

These devices contain two negative-edge-triggered J-K flip-flops with independent J, K, preset, clear inputs and clocks and complementary outputs. The J-K inputs at each flip-flop are enabled when the clock goes high. The input data are transferred to the outputs on the negative-going edge of the clock pulse, provided the setup requirements have been met.

Fabrication using ISI proprietary ICE-MOS process, these devices provide speeds and drive capability equivalent to their LSTTL counterparts and yet maintain CMOS power levels. The input and output voltage levels allow direct interface with TTL, NMOS and CMOS devices without any external components.

All inputs and outputs are protected from damage due to static discharge by internal diode clamps to V_{CC} and ground.

Pin Configuration



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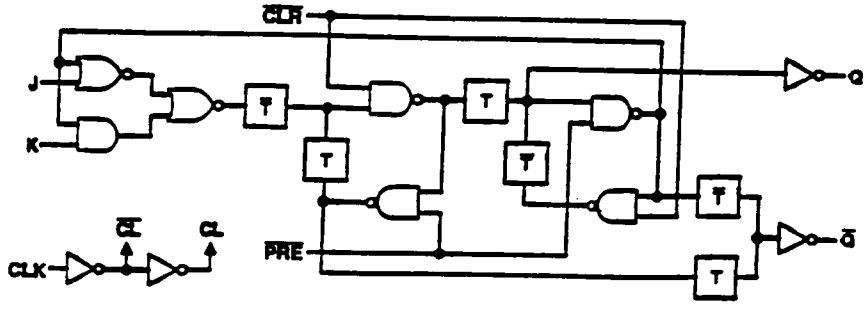
Function Table

Inputs					Outputs	
PRE	CLR	CLK	J	K	Q	Q̄
L	H	X	X	X	H	L
H	L	X	X	X	L	H
L	L	X	X	X	H*	H*
H	H	↓	L	L	Q_0	$\bar{Q}_0$
H	H	↓	H	L	H	L
H	H	↓	L	H	L	H
H	H	↓	H	H	TOGGLE	
H	H	H	X	X	Q_0	$\bar{Q}_0$

*Both outputs will remain high as long as PRE and CLR are low, but the output states are unpredictable if PRE and CLR go high simultaneously.

Logic Diagrams



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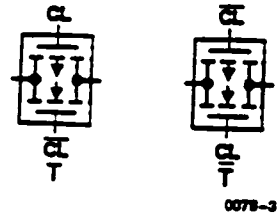

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Absolute Maximum Ratings*

Supply Voltage Range, V_{CC} .....-0.5V to 7V
DC Input Diode Current, I_{IK}
(V_I <-0.5V or V_I> V_{CC} + 0.5V)..... ±20 mA
DC Output Diode Current, I_{OK}
(V_O<-0.5V or V_O>V_{CC} + 0.5V)..... ±20 mA
Continuous Output Current Per Pin, I_O
(-0.5V< V_O< V_{CC} + 0.5V)..... ±35 mA
Continuous Current Through
V_{CC} or GND pins..... ±125 mA
Storage Temperature Range, T_{STG} .....-65°C to +150°C
Power Dissipation Per Package, P_D• .....500 mW

*Absolute Maximum Ratings are those values beyond which permanent damage to the device may occur. These are stress ratings only and functional operation of the device at or beyond them is not implied. Long exposure to these conditions may affect device reliability.

•Power Dissipation temperature derating:
Plastic Package (N): -12mW/°C from 65°C to 85°C
Ceramic Package (J): -12mW/°C from 100°C to 125°C

Recommended Operating Conditions

Supply Voltage, V_{CC} .....4.5V to 5.5V
DC Input & Output Voltages*, V_{IN}, V_{OUT} .....0V to V_{CC}

Operating Temperature

Range 74HCTLS: -40°C to +85°C
54HCTLS: -55°C to +125°C

Input Rise & Fall Times, t_r , t_f .....Max 500 ns

*Unused inputs must always to tied to an appropriate logic voltage level (either V_{CC} or GND)

DC Electrical Characteristics (V_{CC} = 5V ±10% Unless Otherwise Specified)

Sym	Parameter	Test Conditions	T_A = 25°C	74HCTLS T_A = -40°C to +85°C	54HCTLS T_A = -55°C to +125°C	Unit
			Typ	Guaranteed Limits		
V_{IH}	Minimum High-Level Input Voltage			2.0	2.0	2.0	V
V_{IL}	Maximum Low-Level Input Voltage			0.8	0.8	0.8	V
V_{OH}	Minimum High-Level Output Voltage	V_{IN} = V_{IH} or V_{IL} I_O = -20 µA I_O = -4 mA	V_{CC} 4.2	V_{CC} - 0.1 3.98	V_{CC} - 0.1 3.84	V_{CC} - 0.1 3.7	V
V_{OL}	Maximum Low-Level Output Voltage	V_{IN}= V_{IH} or V_{IL} I_O = 20 µA I_O = 4 mA I_O = 8 mA	0	0.1 0.26 0.39	0.1 0.33 0.5	0.1 0.4	V
I_{IN}	Maximum Input Current	V_{IN} = V_{CC} or GND		±0.1	±1.0	±1.0	µA
I_{CC}	Maximum Quiescent Supply Current	V_{IN} = V_{CC} or GND I_{OUT} = 0 µA		4.0	40.0	80.0	µA

AC Electrical Characteristics (Input t_r, $t_f \leq 6$ ns), HCTLS112A

Sym	Parameter		Conditions •	T_A = 25°C VCC - 5.0V	74HCTLS T_A = -40°C to +85°C V_{CC} = 5.0V ±10%	54HCTLS T_A = -55°C to +125°C V_{CC} = 5.0V ±10%	Unit
				Typ	Guaranteed Limits		
f_{max}	Maximum Clock Frequency		C_L = 50 pF	40	30	25	21	MHz
t_{PLH}	Maximum Propagation Delay, CLK to Q or $\overline{Q}$			15	20	25	30	ns
t_{PHL}				15	20	25	30	
t_{PLH}	Maximum Propagation Delay, $\overline{PRE}$ or $\overline{CLR}$ to Q or $\overline{Q}$			15	20	25	30	ns
t_{PHL}				15	20	25	30	
t_{su}	Minimum Setup Time before CLK ↓	J or K		10	13	17	20	ns
		$\overline{PRE}$ or $\overline{CLR}$ In-Active		10	13	17	20	
t_h	Minimum Hold Time, J or K after CLK ↓			0	0	0	0	ns
t_w	Minimum Pulse Width	CLK High or Low		10	13	17	20	ns
		$\overline{PRE}$ or $\overline{CLR}$ Low		10	13	17	20	
C_{IN}	Maximum Input Capacitance			5				pF
C_{PD}	Power Dissipation Capacitance*			40				pF

*C_{PD} determines the no-load dynamic power consumption: $P_D = C_{PD}\ V_{CC}^2\ f + I_{CC}\ V_{CC}$
•For AC switching test circuits and timing waveforms see section 2.