

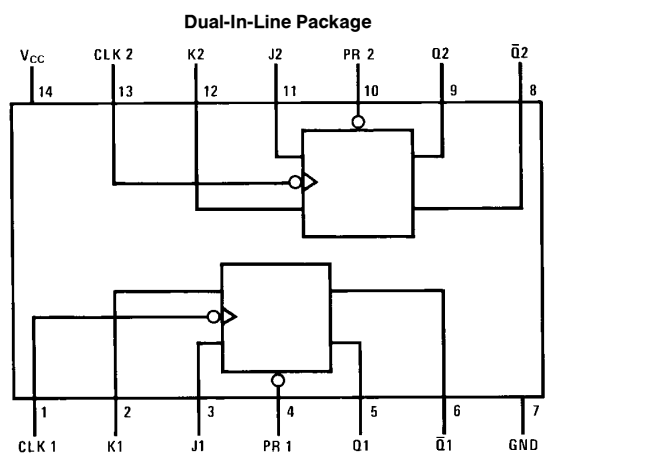
DM54S113/DM74S113 Dual Negative-Edge-Triggered Master-Slave J-K Flip-Flops with Preset and Complementary Outputs

General Description

This device contains two independent negative-edge-triggered J-K flip-flops with complementary outputs. The J and K data is processed by the flip-flops on the falling edge of the clock pulse. The clock triggering occurs at a voltage level and is not directly related to the transition time of the

negative going edge of the clock pulse. Data on the J and K inputs may be changed while the clock is high or low without affecting the outputs as long as setup and hold times are not violated. A low logic level on the preset input will set the outputs regardless of the logic levels of the other inputs.

Connection Diagram



Order Number DM54S113J or DM74S113N
See NS Package Number J14A or N14A

Function Table

Inputs				Outputs	
PR	CLK	J	K	Q	\bar{Q}
L	X	X	X	H	L
H	↓	L	L	Q_0	\bar{Q}_0
H	↓	H	L	H	L
H	↓	L	H	L	H
H	↓	H	H	Toggle	Toggle
H	H	X	X	Q_0	\bar{Q}_0

H = High Logic Level

X = Either Low or High Logic Level

L = Low Logic Level

↓ = Negative going edge of pulse.

Q_0 = The output logic level of Q before the indicated input conditions were established.

Toggle = Each output changes to the complement of its previous level on each falling edge of the clock pulse.

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Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Supply Voltage	7V
Input Voltage	5.5V
Operating Free Air Temperature Range	
DM54S	−55°C to +125°C
DM74S	0°C to +70°C
Storage Temperature Range	−65°C to +150°C

Note: The “Absolute Maximum Ratings” are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the “Electrical Characteristics” table are not guaranteed at the absolute maximum ratings. The “Recommended Operating Conditions” table will define the conditions for actual device operation.

Recommended Operating Conditions (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter		DM54S113			DM74S113			Units
			Min	Nom	Max	Min	Nom	Max	
V _{CC}	Supply Voltage		4.5	5	5.5	4.75	5	5.25	V
V _{IH}	High Level Input Voltage		2			2			V
V _{IL}	Low Level Input Voltage				0.8			0.8	V
I _{OH}	High Level Output Current				−1			−1	mA
I _{OL}	Low Level Output Current				20			20	mA
f _{CLK}	Clock Frequency (Note 2)		0	125	80	0	125	80	MHz
f _{CLK}	Clock Frequency (Note 3)		0	80	60	0	80	60	MHz
t _W	Pulse Width (Note 2)	Clock High	6			6			ns
		Clock Low	6.5			6.5			
		Preset Low	8			8			
t _W	Pulse Width (Note 3)	Clock High	8			8			ns
		Clock Low	8			8			
		Preset Low	10			10			
t _{SU}	Setup Time (Notes 1 & 4)		7 ↓			7 ↓			ns
t _H	Input Hold Time (Notes 1 & 4)		0 ↓			0 ↓			ns
T _A	Free Air Operating Temperature		−55		125	0		70	°C

Note 1: The symbol (↓) indicates the falling edge at the clock pulse is used for reference.

Note 2: C_L = 15 pF, R_L = 280Ω, T_A = 25°C and V_{CC} = 5V.

Note 3: C_L = 50 pF, R_L = 280Ω, T_A = 25°C and V_{CC} = 5V.

Note 4: T_A = 25°C and V_{CC} = 5V.

Electrical Characteristics over recommended operating free air temperature (unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	$V_{CC} = \text{Min}, I_I = -18 \text{ mA}$			-1.2	V
V_{OH}	High Level Output Voltage	$V_{CC} = \text{Min}, I_{OH} = \text{Max}$ $V_{IL} = \text{Max}, V_{IH} = \text{Min}$	DM54 2.5 DM74 2.7	3.4 3.4		V
V_{OL}	Low Level Output Voltage	$V_{CC} = \text{Min}, I_{OL} = \text{Max}$ $V_{IH} = \text{Min}, V_{IL} = \text{Max}$			0.5	V
I_I	Input Current @ Max Input Voltage	$V_{CC} = \text{Max}, V_I = 5.5 \text{ V}$			1	mA
I_{IH}	High Level Input Current	$V_{CC} = \text{Max}$ $V_I = 2.7 \text{ V}$	J, K Preset Clock		50 100 100	μA
I_{IL}	Low Level Input Current	$V_{CC} = \text{Max}$ $V_I = 0.5 \text{ V}$	J, K Preset Clock		-1.6 -7 -4	mA
I_{OS}	Short Circuit Output Current	$V_{CC} = \text{Max}$ (Note 2)	DM54 DM74	-40 -40	-100 -100	mA
I_{CC}	Supply Current	$V_{CC} = \text{Max}, \text{(Note 3)}$		30	50	mA

Note 1: All typicals are at $V_{CC} = 5 \text{ V}$, $T_A = 25^\circ\text{C}$.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

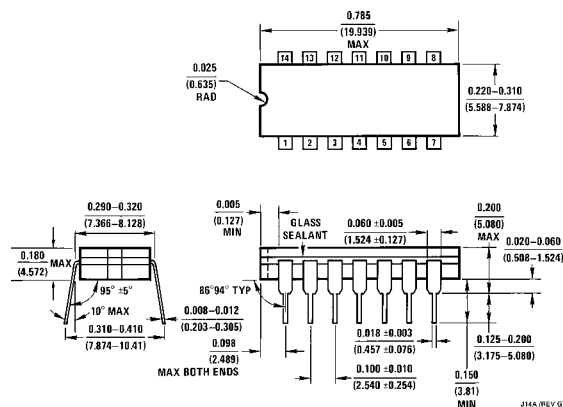
Note 3: With all outputs open, I_{CC} is measured with the Q and \bar{Q} outputs high in turn. At the time of measurement, the clock input is grounded.

Switching Characteristics at $V_{CC} = 5 \text{ V}$ and $T_A = 25^\circ\text{C}$ (See Section 1 for Test Waveforms and Output Load)

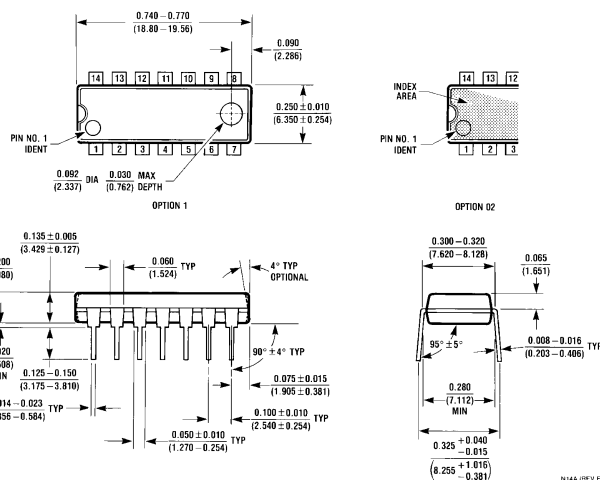
Symbol	Parameter	From (Input) To (Output)	R _L = 280Ω				Units
			C _L = 15 pF		C _L = 50 pF		
			Min	Max	Min	Max	
f _{MAX}	Maximum Clock Frequency		80		60		MHz
t _{PLH}	Propagation Delay Time Low to High Level Output	Preset to Q		7		9	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Preset to \overline{Q}		7		12	ns
t _{PLH}	Propagation Delay Time Low to High Level Output	Clock to Q or \overline{Q}		7		9	ns
t _{PHL}	Propagation Delay Time High to Low Level Output	Clock to Q or \overline{Q}		7		12	ns

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Physical Dimensions inches (millimeters)



14-Lead Ceramic Dual-In-Line Package (J)
Order Number DM54S113J
NS Package Number J14A



14-Lead Molded Dual-In-Line Package (N)
Order Number DM74S113N
NS Package Number N14A

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National Semiconductor Corporation
 1111 West Bardin Road
 Arlington, TX 76017
 Tel: 1(800) 272-9959
 Fax: 1(800) 737-7018

National Semiconductor Europe
 Fax: (+49) 0-180-530 85 86
 Email: onjwge@tevm2.nsc.com
 Deutsch Tel: (+49) 0-180-530 85 85
 English Tel: (+49) 0-180-532 78 32
 Français Tel: (+49) 0-180-532 93 58
 Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
 19th Floor, Straight Block,
 Ocean Centre, 5 Canton Rd.
 Tsimshatsui, Kowloon
 Hong Kong
 Tel: (852) 2737-1600
 Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
 Tel: 81-043-299-2309
 Fax: 81-043-299-2408

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