



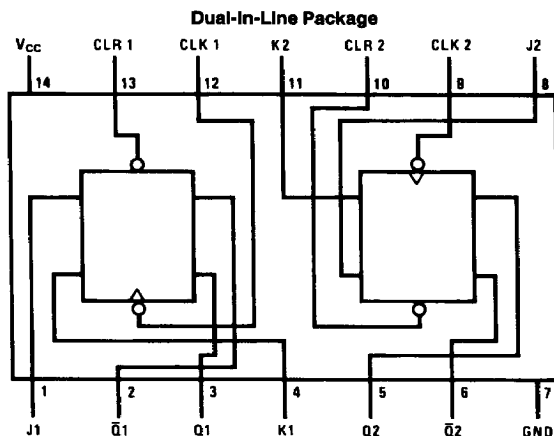
DM54107 Dual Master-Slave J-K Flip-Flops with Clear and Complementary Outputs

General Description

This device contains two independent positive pulse triggered J-K flip-flops with complementary outputs. The J and K data is processed by the flip-flops after a complete clock pulse. While the clock is low the slave is isolated from the master. On the positive transition of the clock, the data from the J and K inputs is transferred to the master. While the clock is high the J and K inputs are disabled. On the nega-

tive transition of the clock, the data from the master is transferred to the slave. The logic states of the J and K inputs must not be allowed to change while the clock is high. Data is transferred to the outputs on the falling edge of the clock pulse. A low logic level on the clear input will reset the output regardless of the logic states of the other inputs.

Connection Diagram



TL/F/6536-1

Function Table

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

H = High Logic Level

X = Either Low or High Logic Level

L = Low Logic Level

= Positive pulse data. The J and K inputs must be held constant while the clock is high. Data is transferred to the outputs on the falling edge of the clock 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 complete positive clock pulse.

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	
DM54	–55°C to +125°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

Symbol	Parameter		DM54107			Units
			Min	Nom	Max	
V _{CC}	Supply Voltage		4.5	5	5.5	V
V _{IH}	High Level Input Voltage		2			V
V _{IL}	Low Level Input Voltage				0.8	V
I _{OH}	High Level Output Current				–0.4	mA
I _{OL}	Low Level Output Current				16	mA
f _{CLK}	Clock Frequency (Note 5)		0	20	15	MHz
t _w	Pulse Width (Note 5)	Clock High	20			ns
		Clock Low	47			
		Clear Low	25			
t _{SU}	Input Setup Time (Notes 1 & 5)		0 ↑			ns
t _H	Input Hold Time (Notes 1 & 5)		0 ↓			ns
T _A	Free Air Operating Temperature		–55		125	°C

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

Symbol	Parameter	Conditions	Min	Typ (Note 2)	Max	Units
V _I	Input Clamp Voltage	V _{CC} = Min, I _I = –12 mA			–1.5	V
V _{OH}	High Level Output Voltage	V _{CC} = Min, I _{OH} = Max V _{IL} = Max, V _{IH} = Min	2.4	3.4		V
V _{OL}	Low Level Output Voltage	V _{CC} = Min, I _{OL} = Max V _{IH} = Min, V _{IL} = Max		0.2	0.4	V
I _I	Input Current @ Max Input Voltage	V _{CC} = Max, V _I = 5.5V			1	mA
I _{IH}	High Level Input Current	V _{CC} = Max V _I = 2.4V	J, K		40	μA
			Clock		80	
			Clear		80	
I _{IL}	Low Level Input Current	V _{CC} = Max V _I = 0.4V	J, K		–1.6	mA
			Clock		–3.2	
			Clear		–3.2	
I _{OS}	Short Circuit Output Current	V _{CC} = Max (Note 3)	–20		–55	mA
I _{CC}	Supply Current	V _{CC} = Max, (Note 4)		18	34	mA

Note 1: The symbols (↑, ↓) indicate the edge of the clock pulse is used for reference: (↑) for rising edge, (↓) for falling edge.

Note 2: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 3: Not more than one output should be shorted at a time.

Note 4: 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.

Note 5: T_A = 25°C and V_{CC} = 5V.

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

Symbol	Parameter	From (Input) To (Output)	$R_L = 400\Omega$ $C_L = 15\text{ pF}$		Units
			Min	Max	
f_{MAX}	Maximum Clock Frequency		15		MHz
t_{PHL}	Propagation Delay Time High to Low Level Output	Clear to Q		40	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Clear to $\bar{Q}$		25	ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Clock to Q or $\bar{Q}$		40	ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Clock to Q or $\bar{Q}$		25	ns