

74LCX74

Low Voltage Dual D-Type Positive Edge-Triggered Flip-Flop with 5V Tolerant Inputs

General Description

The LCX74 is a dual D-type flip-flop with Asynchronous Clear and Set inputs and complementary (Q, \bar{Q}) outputs. Information at the input is transferred to the outputs on the positive edge of the clock pulse. After the Clock Pulse input threshold voltage has been passed, the Data input is locked out and information present will not be transferred to the outputs until the next rising edge of the Clock Pulse input.

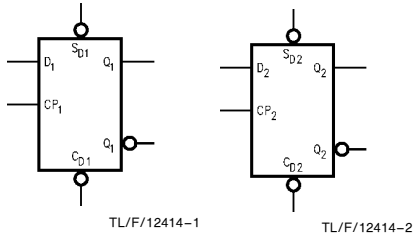
Asynchronous Inputs:

- LOW input to \bar{S}_D (Set) sets Q to HIGH level
- LOW input to \bar{C}_D (Clear) sets Q to LOW level
- Clear and Set are independent of clock
- Simultaneous LOW on \bar{C}_D and \bar{S}_D makes both Q and \bar{Q} HIGH

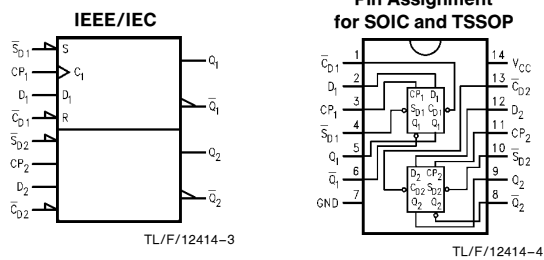
Features

- 5V tolerant inputs
- 7.0 ns t_{PD} max, 10 μ A I_{CCQ} max
- Power down high impedance inputs and outputs
- Supports live insertion/withdrawal
- 2.0V–3.6V V_C supply operation
- ± 24 mA output drive
- Implements patented Quiet Series™ noise/EMI reduction circuitry
- Functionally compatible with 74 series 74
- Latch-up performance exceeds 500 mA
- ESD performance:
 - Human body model > 2000V
 - Machine model > 200V

Logic Symbols



Connection Diagram



Truth Table (Each Half)

Pin Names	Description
D ₁ , D ₂	Data Inputs
CP ₁ , CP ₂	Clock Pulse Inputs
\bar{C}_D1 , \bar{C}_D2	Direct Clear Inputs
\bar{S}_D1 , \bar{S}_D2	Direct Set Inputs
Q ₁ , \bar{Q}_1 , Q ₂ , \bar{Q}_2	Outputs

Inputs				Outputs	
\bar{S}_D	\bar{C}_D	CP	D	Q	\bar{Q}
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	\nearrow	H	H	L
H	H	\searrow	L	L	H
H	H	L	X	Q ₀	\bar{Q}_0

H = HIGH Voltage Level
 L = LOW Voltage Level
 X = Immaterial
 \nearrow = LOW-to-HIGH Clock Transition
 \searrow = HIGH-to-LOW Clock Transition
 Q₀(\bar{Q}_0) = Previous Q(\bar{Q}) before LOW-to-HIGH Transition of Clock

	SOIC JEDEC	SOIC EIAJ	TSSOP
Order Number	74LCX74M 74LCX74MX	74LCX74SJ 74LCX74SJX	74LCX74MTC 74LCX74MTCX
See NS Package Number	M14A	M14D	MTC14

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Absolute Maximum Ratings (Note 1)

Symbol	Parameter	Value	Conditions	Units
V_{CC}	Supply Voltage	-0.5 to +7.0		V
V_I	DC Input Voltage	-0.5 to +7.0		V
V_O	DC Output Voltage	-0.5 to $V_{CC} + 0.5$	Output in High or Low State (Note 2)	V
I_{IK}	DC Input Diode Current	-50	$V_I < \text{GND}$	mA
I_{OK}	DC Output Diode Current	-50 +50	$V_O < \text{GND}$ $V_O > V_{CC}$	mA
I_O	DC Output Source/Sink Current	± 50		mA
I_{CC}	DC Supply Current per Supply Pin	± 100		mA
I_{GND}	DC Ground Current per Ground Pin	± 100		mA
T_{STG}	Storage Temperature	-65 to +150		°C

Note 1: 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.

Note 2: I_O Absolute Maximum Rating must be observed.

Recommended Operating Conditions

Symbol	Parameter	Min	Max	Units	
V_{CC}	Supply Voltage	Operating Data Retention	2.0 1.5	3.6 3.6	V
V_I	Input Voltage	0	5.5	V	
V_O	Output Voltage	HIGH or LOW State	0	V_{CC}	V
I_{OH}/I_{OL}	Output Current	$V_{CC} = 3.0V - 3.6V$ $V_{CC} = 2.7V$		± 24 ± 12	mA
T_A	Free-Air Operating Temperature	-40	85	°C	
$\Delta t/\Delta V$	Input Edge Rate, $V_{IN} = 0.8V - 2.0V$, $V_{CC} = 3.0V$	0	10	ns/V	

DC Electrical Characteristics

Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = -40^\circ\text{C to } +85^\circ\text{C}$		Units
				Min	Max	
V_{IH}	HIGH Level Input Voltage		2.7-3.6	2.0		V
V_{IL}	LOW Level Input Voltage		2.7-3.6		0.8	V
V_{OH}	HIGH Level Output Voltage	$I_{OH} = -100 \mu\text{A}$	2.7-3.6	$V_{CC} - 0.2$		V
		$I_{OH} = -12 \text{ mA}$	2.7	2.2		V
		$I_{OH} = -18 \text{ mA}$	3.0	2.4		V
		$I_{OH} = -24 \text{ mA}$	3.0	2.2		V
V_{OL}	LOW Level Output Voltage	$I_{OL} = 100 \mu\text{A}$	2.7-3.6		0.2	V
		$I_{OL} = 12 \text{ mA}$	2.7		0.4	V
		$I_{OL} = 16 \text{ mA}$	3.0		0.4	V
		$I_{OL} = 24 \text{ mA}$	3.0		0.55	V
I_I	Input Leakage Current	$0 \leq V_I \leq 5.5V$	2.7-3.6		± 5.0	μA
I_{OFF}	Power-Off Leakage Current	V_I or $V_O = 5.5V$	0		10	μA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or GND	2.7-3.6		10	μA
		$3.6V \leq V_I, V_O \leq 5.5V$	2.7-3.6		± 10	μA
ΔI_{CC}	Increase in I_{CC} per Input	$V_{IH} = V_{CC} - 0.6V$	2.7-3.6		500	μA

AC Electrical Characteristics

Symbol	Parameter	$T_A = -40^{\circ}\text{C to } +85^{\circ}\text{C}$				Units
		$V_{CC} = 3.3\text{V} \pm 0.3\text{V}$		$V_{CC} = 2.7\text{V}$		
		Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	150		150		MHz
t_{PHL} t_{PLH}	Propagation Delay CP_n to Q_n or \bar{Q}_n	1.5	7.0	1.5	8.0	ns
t_{PHL} t_{PLH}	Propagation Delay \bar{C}_{Dn} or \bar{S}_{Dn} to Q_n or \bar{Q}_n	1.5	7.0	1.5	8.0	ns
t_S	Setup Time	2.5		2.5		ns
t_H	Hold Time	1.5		1.5		ns
t_W	Pulse Width CP	3.3		3.3		ns
t_W	Pulse Width and \bar{C}_D, \bar{S}_D	3.3		3.6		ns
t_{rem}	Removal Time	2.5		3.0		ns
t_{OSHL} t_{OSLH}	Output to Output Skew (Note 3)		1.0			ns

Note 3: Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH to LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}).

Dynamic Switching Characteristics

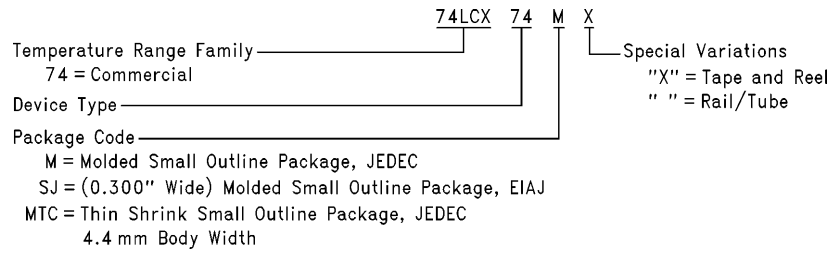
Symbol	Parameter	Conditions	V_{CC} (V)	$T_A = 25^{\circ}\text{C}$	Unit
				Typical	
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	$C_L = 50\text{ pF}, V_{\text{IH}} = 3.3\text{V}, V_{\text{IL}} = 0\text{V}$	3.3	0.8	V
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	$C_L = 50\text{ pF}, V_{\text{IH}} = 3.3\text{V}, V_{\text{IL}} = 0\text{V}$	3.3	-0.8	V

Capacitance

Symbol	Parameter	Conditions	Typical	Units
C_{IN}	Input Capacitance	$V_{CC} = \text{Open}, V_I = 0\text{V or } V_{CC}$	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V or } V_{CC}$	8	pF
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V or } V_{CC}, F = 10\text{ MHz}$	25	pF

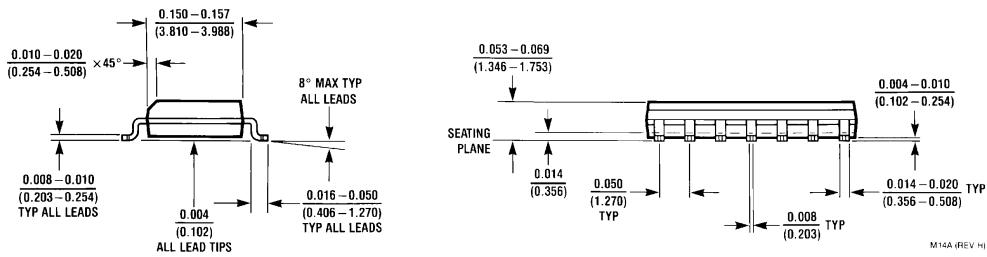
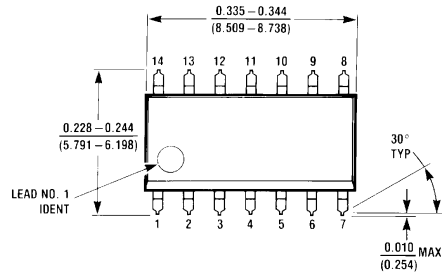
74LCX74 Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:

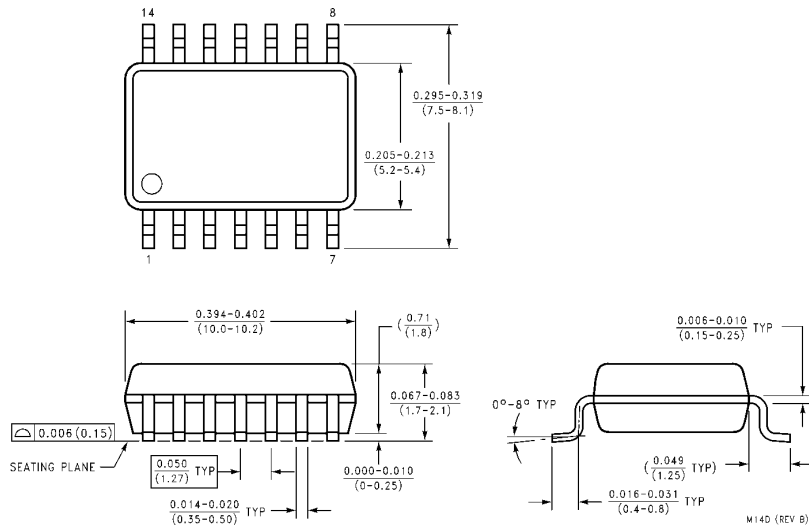


TL/F/12414-5

Physical Dimensions inches (millimeters) unless otherwise noted



16-Lead (0.0150" Wide) Molded Small Outline Package JEDEC
Order Number 74LCX74M or 74LCX74MX
NS Package Number M14A



14-Lead Small Outline Package EIAJ (SJ)
Order Number 74LCX74SJ or 74LCX74SJX
NS Package Number M14D

