FAIRCHILD SEMICONDUCTOR™

September 1986
Revised February 2000

DM74ALS174 • DM74ALS175
Hex/Quad D-Type Flip-Flops with Clear

General Description

These positive-edge-triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic. Both have an asynchronous clear input, and the quad (DM74ALS175) version features complementary outputs from each flip-flop.

Information at the D inputs meeting the setup time requirements is transferred to the Q outputs on the positive-going edge of the clock pulse. Clock triggering occurs at a particular voltage level and is not directly related to the transition time of the positive-going pulse. When the clock input is at either the HIGH or LOW level, the D input signal has no effect at the output.

Features

- Advanced oxide-isolated ion-implanted Schottky TTL process
- Pin and functional compatible with LS family counterpart
- Typical clock frequency maximum is 80 MHz
- Switching performance guaranteed over full temperature and V_{CC} supply range

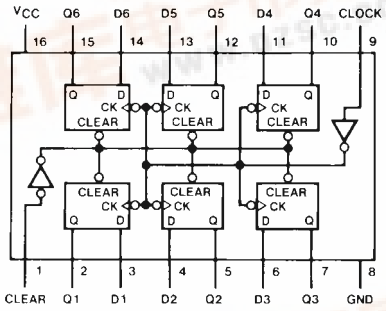
Ordering Code:

Ordering Code	Package Number	Package Description
DM74ALS174M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
DM74ALS174SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74ALS174N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
DM74ALS175M	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
DM74ALS175SJ	M16D	16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
DM74ALS175N	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

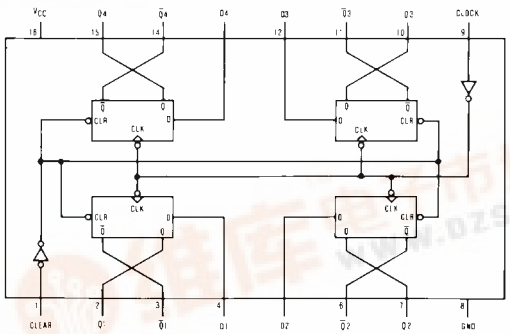
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Connection Diagrams

DM74ALS174



DM74ALS175



Function Table

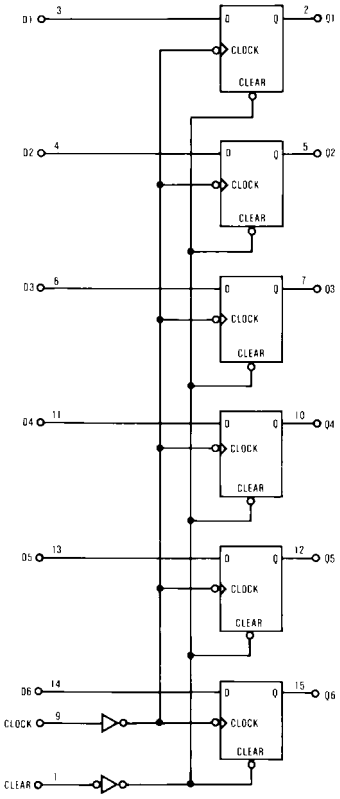
Inputs			Outputs	
Clear	**Clock**	**D**	**Q**	**$\overline{Q}$ (Note 1)**
L	X	X	L	H
H	↑	H	H	L
H	↑	L	L	H
H	L	X	Q_0	$\overline{Q}_0$

H = HIGH Level (steady state)
L = LOW Level (steady state)
X = Don't Care
↑ = Transition from LOW-to-HIGH Level
Q_0 = the level of Q before the indicated steady-state input conditions were established

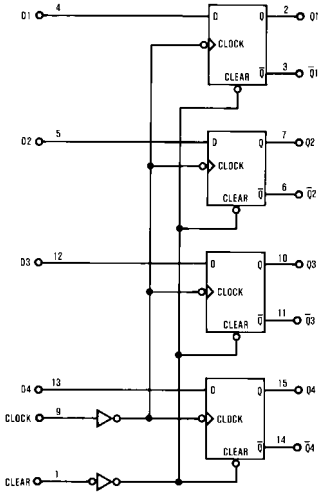
Note 1: applies to DM74ALS175 only

Logic Diagrams

DM74ALS174



DM74ALS175



Absolute Maximum Ratings(Note 2)

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Typical θ_{JA}	
N Package	77.9°C/W
M Package	107.3°C/W

Note 2: 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 tables 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		Min	Nom	Max	Units
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				8	mA
t_W	Pulse Width	Clock HIGH or LOW	10			ns
		$\overline{\text{Clear}}$ LOW	10			
t_{SETUP}	Setup Time (Note 3)	Data Input	10↑			ns
		$\overline{\text{Clear}}$ Inactive State	6↑			
t_{HOLD}	Data Hold Time (Note 3)		0↑			ns
f_{CLOCK}	Clock Frequency		0		50	MHz
T_A	Free Air Operating Temperature		0		70	°C

Note 3: The symbol ↑ indicates that the rising edge of the clock is used as reference.

Electrical Characteristics

over recommended operating free air temperature range. All typical values are measured at V_{CC} = 5V, T_A = 25°C.

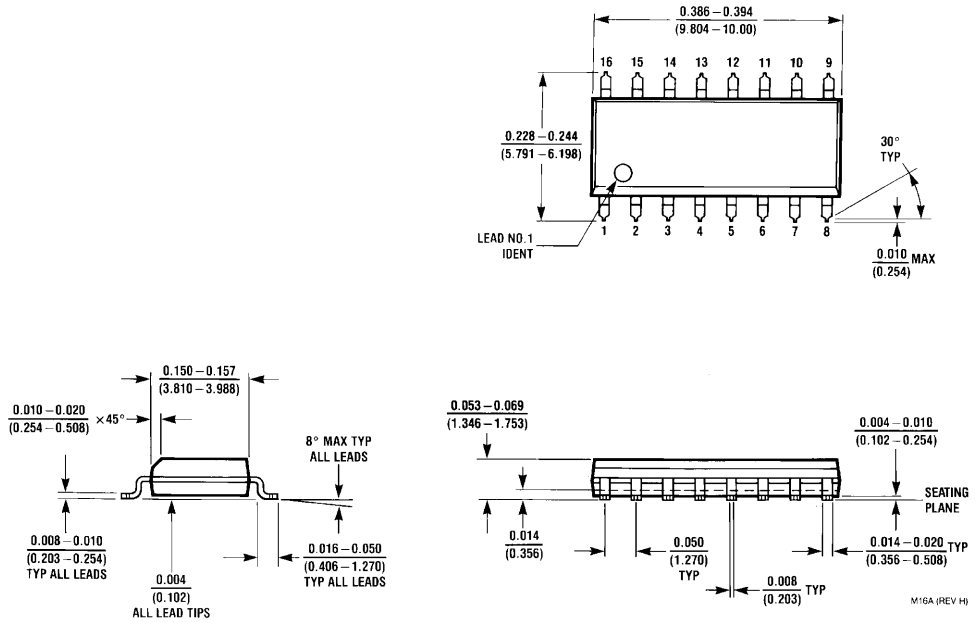
Symbol	Parameter	Conditions		Min	Typ	Max	Units
V_{IK}	Input Clamp Voltage	V_{CC} = 4.5V, I_{IN} = −18 mA				−1.5	V
V_{OH}	HIGH Level Output Voltage	I_{OH} = −400 µA V_{CC} = 4.5V to 5.5V		V_{CC} − 2	V_{CC} − 1.6		V
V_{OL}	LOW Level Output Voltage	V_{CC} = 4.5V	I_{OL} = 8 mA		0.35	0.5	V
I_I	Input Current at Max Input Voltage	V_{CC} = 5.5V, V_{IN} = 7V				0.1	mA
I_{IH}	HIGH Level Input Current	V_{CC} = 5.5V, V_{IH} = 2.7V				20	µA
I_{IL}	LOW Level Input Current	V_{CC} = 5.5V, V_{IN} = 0.4V				−0.1	mA
I_O	Output Drive Current	V_{CC} = 5.5V, V_O = 2.25V		−30		−112	mA
I_{CC}	Supply Current	V_{CC} = 5.5V Clock = 4.5V Clear = GND D Input = GND	DM74ALS174		11	19	mA
			DM74ALS175		8	14	

Switching Characteristics

over recommended operating free air temperature range

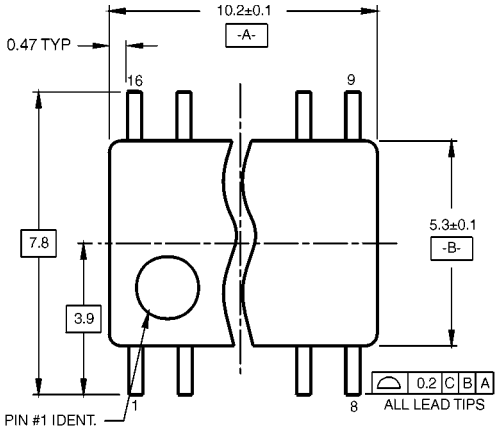
Symbol	Parameter	Conditions	Min	Max	Units
f_{MAX}	Maximum Clock Frequency	R_L = 500Ω	50		MHz
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output From Clear (175 Only)	C_L = 50 pF V_{CC} = 4.5V to 5.5V	5	18	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output From Clear		8	23	ns
t_{PLH}	Propagation Delay Time LOW-to-HIGH Level Output From Clock		3	15	ns
t_{PHL}	Propagation Delay Time HIGH-to-LOW Level Output From Clock		5	17	ns

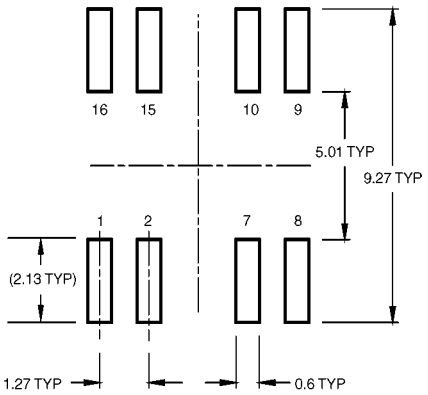
Physical Dimensions inches (millimeters) unless otherwise noted



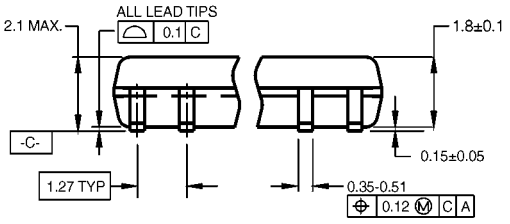
16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150 Narrow
Package Number M16A

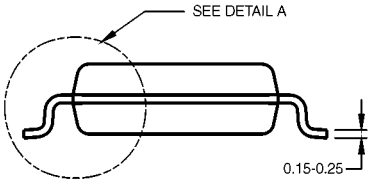
Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



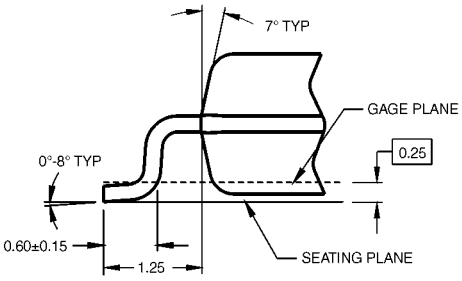


LAND PATTERN RECOMMENDATION





DIMENSIONS ARE IN MILLIMETERS



DETAIL A

NOTES:

A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.

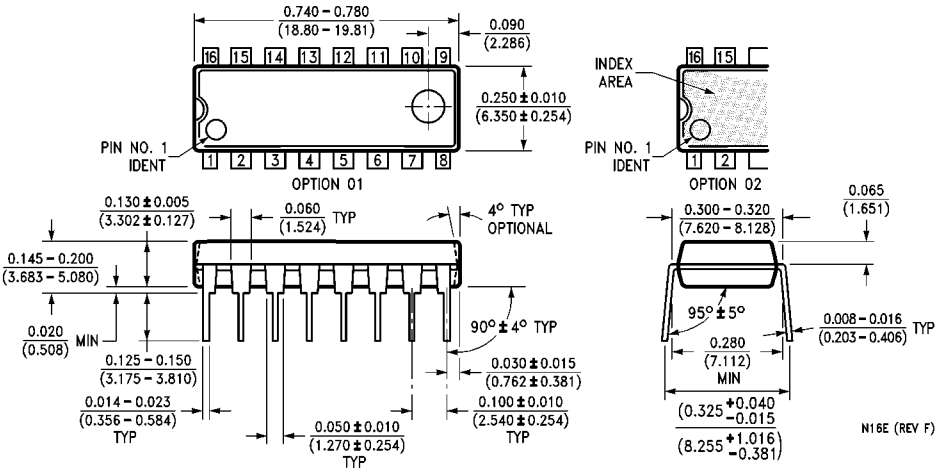
B. DIMENSIONS ARE IN MILLIMETERS.

C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M16DRevB1

16-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M16D

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N16E