National Semiconductor

March 1996

DM64ALS273/DM74ALS273
Octal D-Type Edge-Triggered Flip-Flop with Clear

General Description

These monolithic, positive-edge-triggered flip-flops utilize TTL circuitry to implement D-type flip-flop logic with a direct clear input.

Information at the D inputs meeting the setup 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.

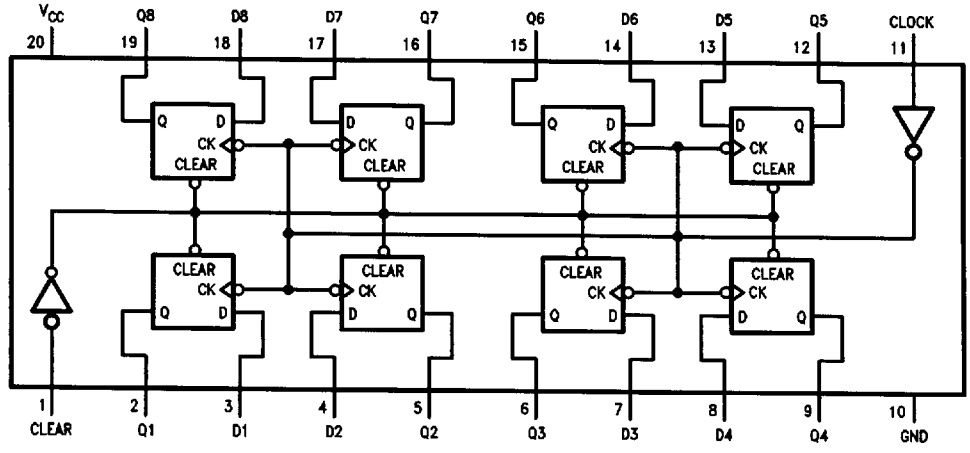
The DM64ALS273 version features the same performance as the standard version DM74ALS273 with a guarantee over an extended temperature range (−40°C to +85°C)

Features

- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and V_{CC} range
- Buffer-type outputs and improved AC offer significant advantage over 'LS273.
- Advanced oxide-isolated, ion-implanted Schottky TTL process
- Functionally and pin-for-pin compatible with 'LS273.
- DM64ALS273 guarantee over extended temperature −40°C to +85°C

Connection Diagram

Dual-In-Line Package



TL/F/6216–1

Order Number DM64ALS273N, DM64ALS273WM, DM74ALS273WM, DM74ALS273N, DM74ALS273SJ or DM74ALS273MSA
See NS Package Number M20B, M20D, MSA20 or N20A

Absolute Maximum Ratings

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM64ALS	−40°C to +85°C
DM74ALS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Typical θ_{JA}	
N Package	60.0°C/W
M Package	79.0°C/W

Note: This product meets application requirements of 500 temperature cycles from −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		DM64ALS273			DM74ALS273			Units
			Min	Nom	Max	Min	Nom	Max	
V_{CC}	Supply Voltage		4.5	5	5.5	4.5	5	5.5	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				−2.6			−2.6	mA
I_{OL}	Low Level Output Current				24			24	mA
f_{CLK}	Clock Frequency		0		35	0		35	MHz
$t_{W(CLK)}$	Width of Clock Pulse	High	14			14			ns
		Low	14			14			ns
t_W	Width of Clear Pulse	Low	10			10			ns
t_{SU}	Data Setup Time		10↑			10↑			ns
		Clear Inactive	15↑			15↑			
t_H	Data Hold Time		0↑			0↑			ns
T_A	Free Air Operating Temperature		−40		85	0		70	°C

The (↑) arrow indicates the positive edge of the Clock is used for 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_I = −18 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = 4.5V	I_{OH} = −2.6 mA	2.4	3.3		V
		V_{CC} = 4.5V to 5.5V	I_{OH} = −400 μA	V_{CC} − 2			V
V_{OL}	Low Level Output Voltage	V_{CC} = 4.5V	I_{OL} = 12 mA		0.25	0.4	V
			I_{OL} = 24 mA		0.35	0.5	V
I_I	Input Current @ Max. Input Voltage	V_{CC} = 5.5V, V_{IH} = 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_{IL} = 0.4V				−0.2	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 Outputs Open	Outputs High		11	20	mA
			Outputs Low		19	29	mA

Switching Characteristics over recommended operating free air temperature range (Note 1).

Symbol	Parameter	Conditions	From	To	DM64ALS273		DM74ALS273		Units
					Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	V_{CC} = 4.5V to 5.5V R_L = 500Ω C_L = 50 pF			35		35		MHz
t_{PHL}	Propagation Delay Time High to Low Level Output		Clear	Any Q	4	18	4	18	ns
t_{PLH}	Propagation Delay Time Low to High Level Output		Clock	Any Q	2	12	2	12	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		Clock	Any Q	3	15	3	15	ns

Note 1: See Section 5 for test waveforms and output load.

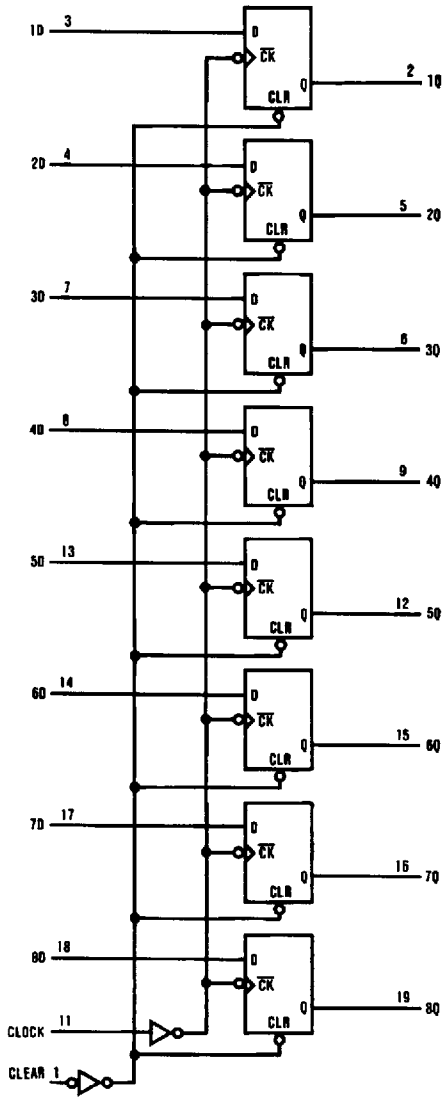
Function Table (Each Flip-Flop)

Inputs			Output
Clear	Clock	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q_0

L = Low State, H = High State, X = Don't Care

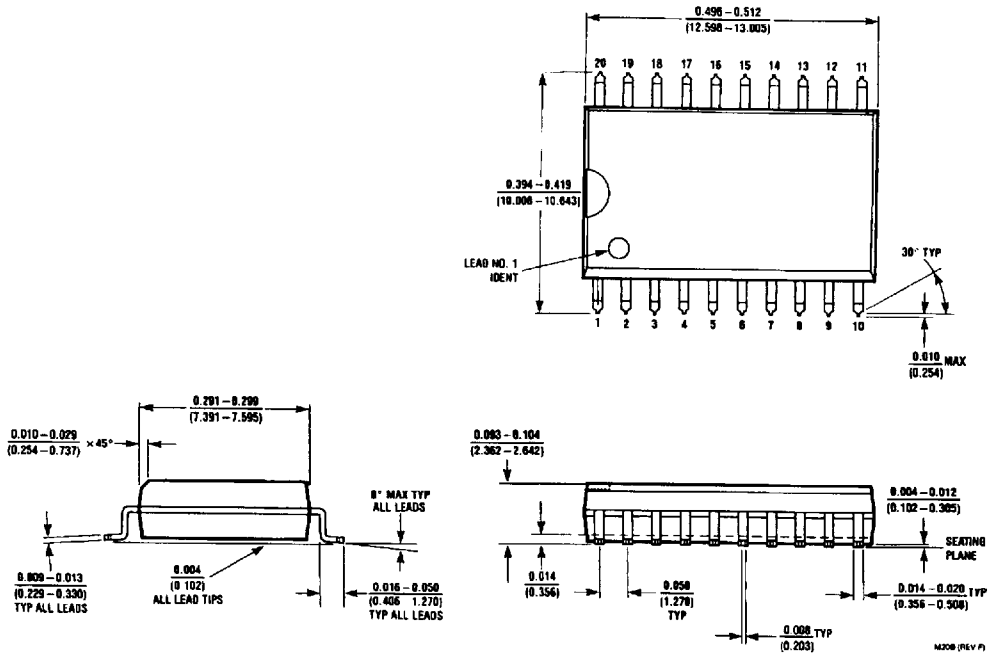
↑ = Positive Edge Transition, Q_0 = Previous Condition of Q

Logic Diagram

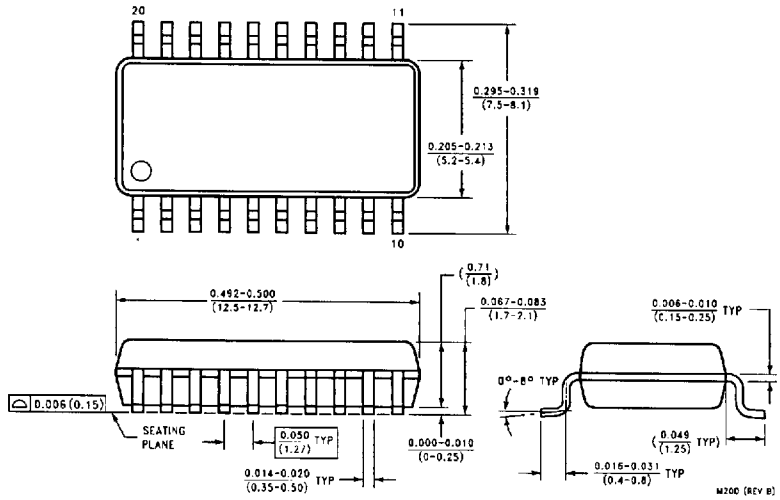


TL/F/6216–2

Physical Dimensions inches (millimeters)

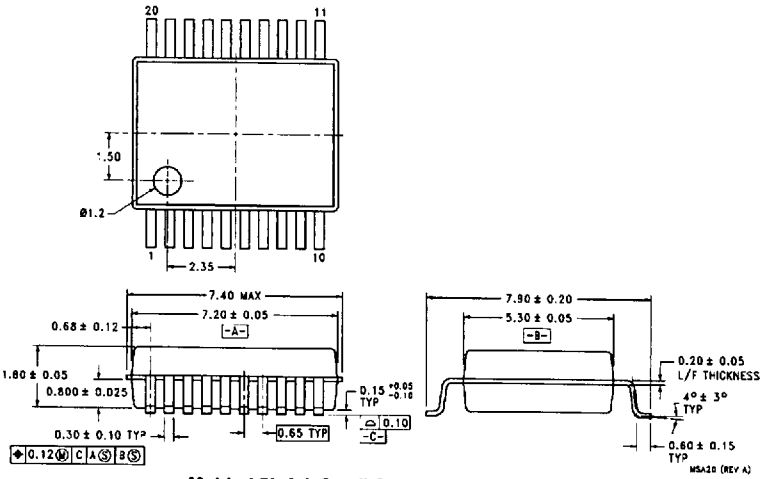


S.O. Package (M)
Order Number DM74ALS273WM, DM64ALS273WM
NS Package Number M20B

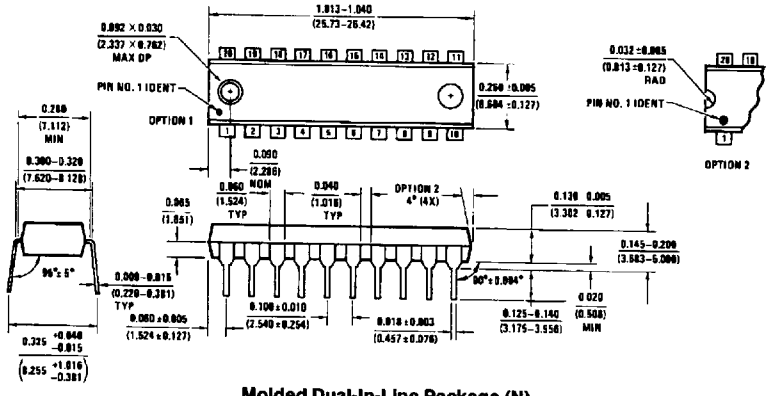


Small Outline Package (SJ)
Order Number DM74ALS273SJ
NS Package Number M20D

Physical Dimensions inches (millimeters) (Continued)



Molded Shrink Small Outline Package (MSA)
Order Number DM74ALS273MSA
NS Package Number MSA20



Molded Dual-In-Line Package (N)
Order Number DM74ALS273N, DM64ALS273N
NS Package Number N20A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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

http://www.national.com

National Semiconductor Europe
Fax: +49 (0) 180-530 85 86
Email: europe.support@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.
13th 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: 81-043-299-2308
Fax: 81-043-299-2408