National Semiconductor

March 1996

DM74ALS874B Dual 4-Bit D-Type Edge-Triggered Flip-Flop with TRI-STATE® Outputs

General Description

This dual 4-bit register features totem-pole TRI-STATE outputs designed specifically for driving highly-capacitive or relatively low-impedance loads. The high-impedance state and increased high-logic-level drive provide this register with the capability of being connected directly to and driving the bus lines in a bus-organized system without need for interface or pull-up components. It is particularly attractive for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight flip-flops of the 'ALS874B are edge-triggered D-type flip-flops. On the positive transition of the clock, the Q outputs will be set to the logic states that were set up at the D inputs.

A buffered output control input can be used to place the eight outputs in either a normal logic state (high or low logic levels) or a high-impedance state. In the high-impedance state the outputs neither load nor drive the bus lines significantly.

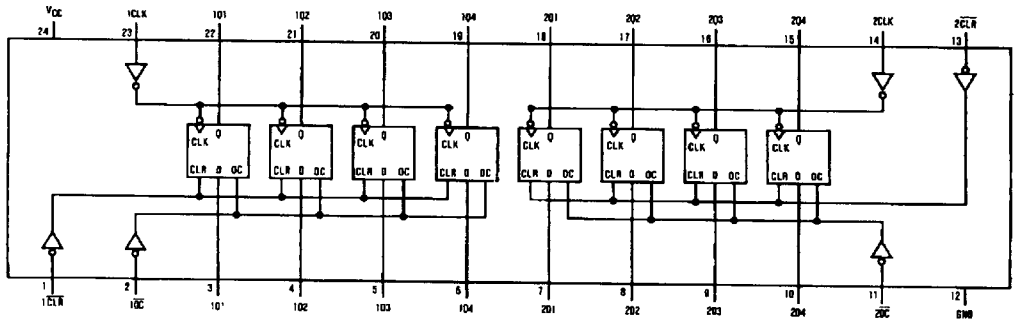
The output control does not affect the internal operation of the flip-flops. That is, the old data can be retained or new data can be entered even while the outputs are off.

Features

- Switching specifications at 50 pF
- Switching specifications guaranteed over full temperature and V_{CC} range
- Advanced oxide-isolated, ion-implanted Schottky TTL process
- TRI-STATE buffer-type outputs drive bus lines directly
- Space saving 300 mil wide package
- Asynchronous clear

Connection Diagram

Dual-In-Line Package



TL/F/6244–1

Order Number DM74ALS874BWM or DM74ALS874BNT
See NS Package Number M24B or N24C

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Absolute Maximum Ratings

Supply Voltage	7V
Input Voltage	7V
Voltage Applied to Disabled Output	5.5V
Operating Free Air Temperature Range	
DM74ALS	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Typical θ_{JA}	
N Package	51.0°C/W
M Package	86.5°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		DM74ALS874B			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				−2.6	mA
I_{OL}	Low Level Output Current				24	mA
f_{CLK}	Clock Frequency		0		30	MHz
t_{WCLK}	Width of Clock Pulse	High	16.5			ns
		Low	16.5			ns
t_{WCLR}	Width of Clear Pulse	Low	10			ns
t_{SU}	Data Setup Time		15 ↑			ns
t_H	Data Hold Time		0 ↑			ns
t_{SU}	Clear Inactive		12			ns
T_A	Free Air Operating Temperature		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				−1.2	V
V_{OH}	High Level Output Voltage	V_{CC} = 4.5V V_{IL} = V_{IL} Max	I_{OH} = Max	2.4	3.2		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 V_{IH} = 2V	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_{OZH}	Off-State Output Current High Level Voltage Applied	V_{CC} = 5.5V, V_{IH} = 2V V_O = 2.7V				20	μA
I_{OZL}	Off-State Output Current Low Level Voltage Applied	V_{CC} = 5.5V, V_{IH} = 2V V_O = 0.4V				−20	μA
I_{CC}	Supply Current	V_{CC} = 5.5V Outputs Open	Outputs High		14	21	mA
			Outputs Low		19	30	mA
			Outputs Disabled		20	32	mA

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

Symbol	Parameter	Conditions	From	To	DM74ALS874B		Units
					Min	Max	
f_{MAX}	Maximum Clock Frequency	V_{CC} = 4.5V to 5.5V R_L = 500,Ω, C_L = 50 pF			30	MHz	
t_{PLH}	Propagation Delay Time Low to High Level Output		Clock	Any Q	4	14	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		Clock	Any Q	4	14	ns
t_{PZH}	Output Enable Time to High Level Output		Output Control	Any Q	4	18	ns
t_{PZL}	Output Enable Time to Low Level Output		Output Control	Any Q	4	18	ns
t_{PHZ}	Output Disable Time from High Level Output		Output Control	Any Q	2	10	ns
t_{PLZ}	Output Disable Time from Low Level Output		Output Control	Any Q	3	12	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		Clear	Any Q	5	17	ns

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

Function Table

Inputs				Output
$\overline{CLR}$	D	CLK	$\overline{OC}$	Q
X	X	X	H	Z
L	X	X	L	L
H	H	↑	L	H
H	L	↑	L	L
H	X	L	L	Q_0

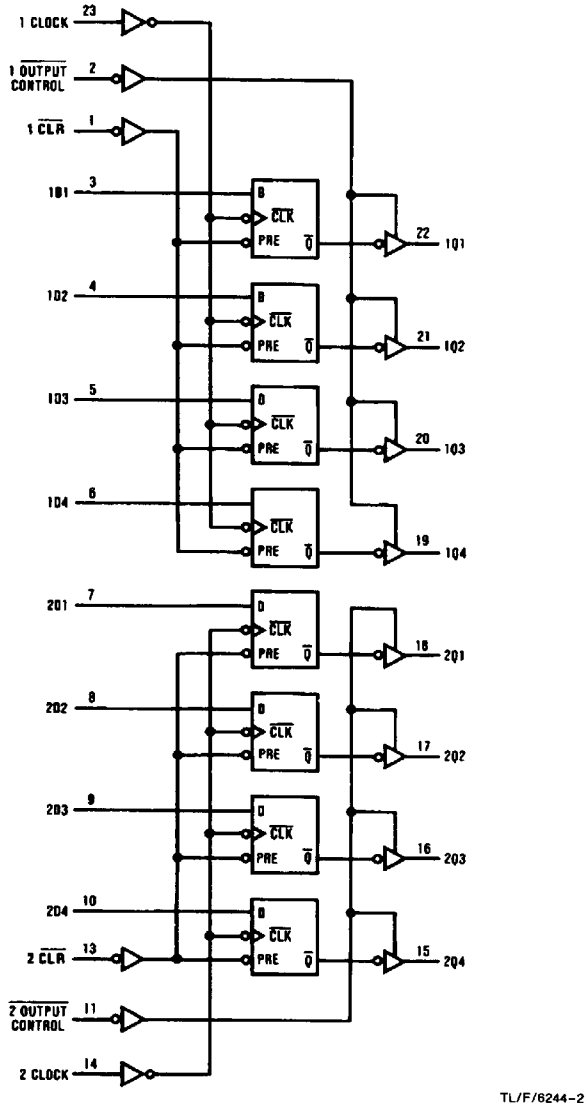
L = Low State, H = High State, X = Don't Care

↑ = Positive Edge Transition

Z = High Impedance State

Q_0 = Previous Condition of Q

Logic Diagram



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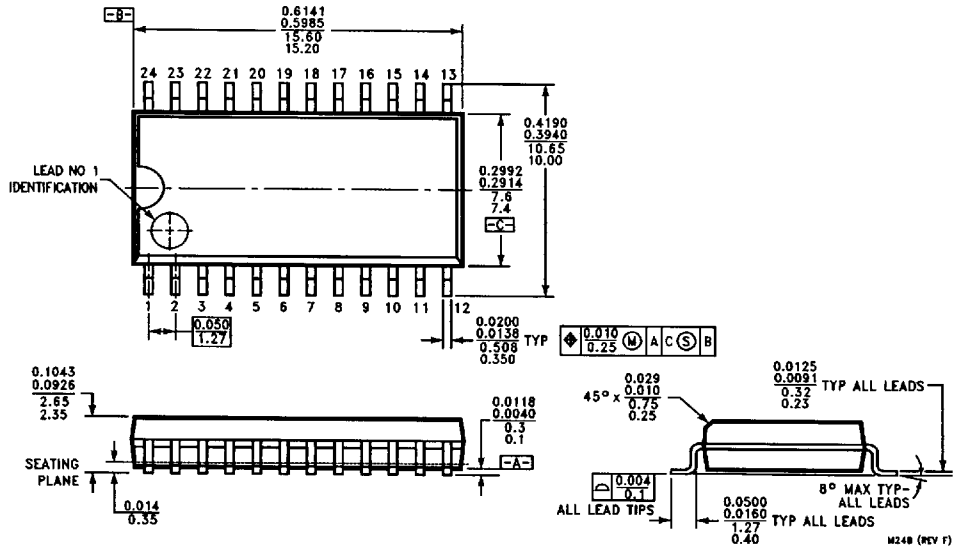
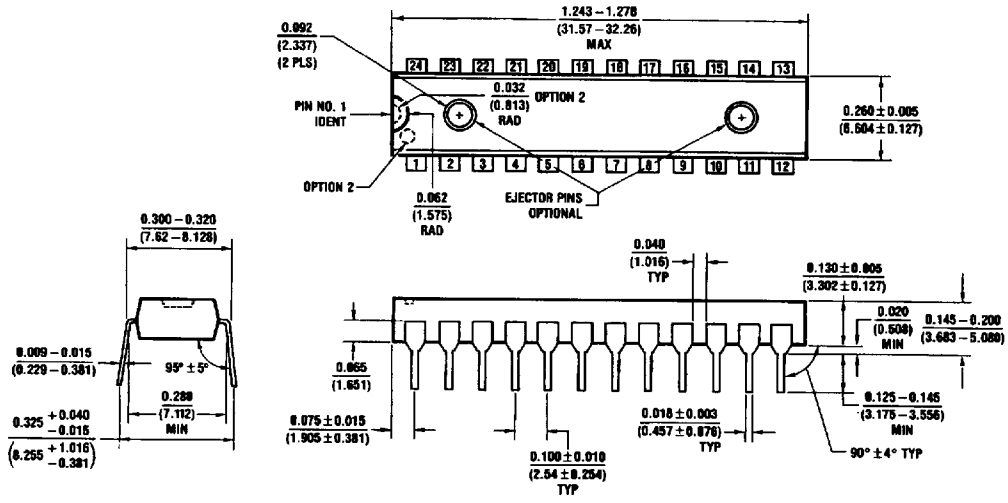
Physical Dimensions inches (millimeters)



S.O. Package (M)
Order Number DM74ALS874BWM
NS Package Number M24B

Physical Dimensions inches (millimeters) (Continued)



Skinny Dual-In-Line Package (N)
Order Number DM74ALS874BNT
NS Package Number N24C

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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