

DM74AS533 Octal D-Type Transparent Latch with TRI-STATE® Outputs

General Description

These 8-bit registers feature 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 these registers 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. They are particularly attractive for implementing buffer registers, I/O ports, bidirectional bus drivers, and working registers.

The eight inverting latches of the AS533 are transparent D-type latches, meaning that while the enable (G) is high the \bar{Q} outputs will follow the complement of the data (D) inputs. When the enable is taken low the output will be latched at the complement of the level of the data that was set up.

A buffered output control input can be used to place the eight outputs in either a normal logic state (high or low logic

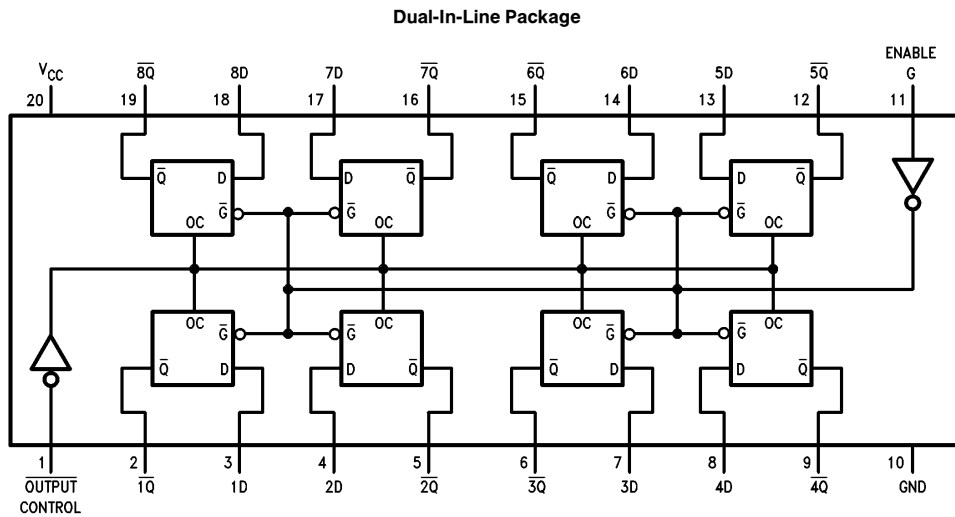
levels) or a high-impedance state. In the high-impedance state the outputs neither load nor drive the bus lines significantly.

The output control does not affect the internal operation of the latches. 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

Connection Diagram



Order Number DM74AS533WM or DM74AS533N
See NS Package Number M20B or N20A

TL/F/6311-1

TRI-STATE® is a registered trademark of National Semiconductor Corporation.

Absolute Maximum Ratings

Supply Voltage	7V
Input Voltage	7V
Voltage Applied to Disabled Output	5.5V
Operating Free Air Temperature Range	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Typical θ_{JA}	
N Package	52.5°C/W
M Package	70.5°C/W

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	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			−15	mA
I_{OL}	Low Level Output Current			48	mA
t_W	Width of Enable Pulse, High or Low	2			ns
t_{SU}	Data Setup Time	2 \uparrow			ns
t_H	Data Hold Time	3 \uparrow			ns
T_A	Free Air Operating Temperature	0		70	°C

The (\uparrow) 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 $V_{CC} = 5V$, $T_A = 25^\circ C$.

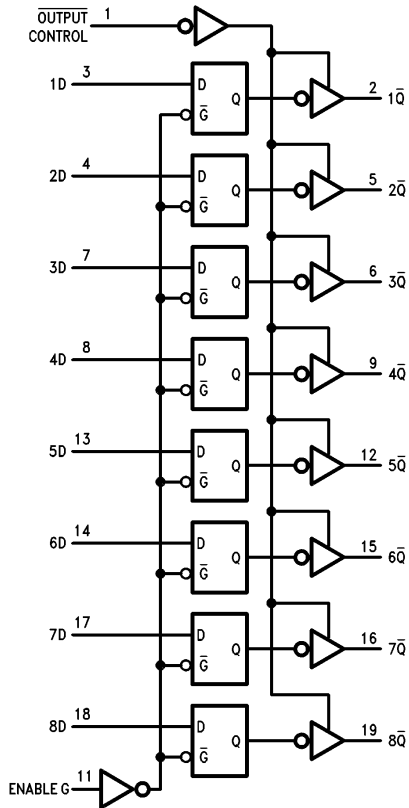
Symbol	Parameter	Conditions	Min	Typ	Max	Units
V_{IK}	Input Clamp Voltage	$V_{CC} = 4.5V$, $I_I = -18\text{ mA}$			−1.2	V
V_{OH}	High Level Output Voltage	$V_{CC} = 4.5V$, $I_{OH} = \text{Max}$	2.4	3.2		V
		$I_{OH} = -2\text{ mA}$, $V_{CC} = 4.5V$ to $5.5V$	$V_{CC} - 2$			
V_{OL}	Low Level Output Voltage	$V_{CC} = 4.5V$, $I_{OL} = \text{Max}$		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	$V_{CC} = 5.5V$, $V_{IL} = 0.4V$			−0.5	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	$V_{CC} = 5.5V$, $V_O = 2.7V$			50	μA
I_{OZL}	Off-State Output Current, Low Level Voltage Applied	$V_{CC} = 5.5V$, $V_O = 0.4V$			−50	μA
I_{CC}	Supply Current	$V_{CC} = 5.5V$ Outputs Open	Outputs High	62	100	mA
			Outputs Low	64	100	
			Outputs Disabled	71	110	

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

Symbol	Parameter	Conditions	From	To	Min	Max	Units
t_{PLH}	Propagation Delay Time Low to High Level Output	$V_{CC} = 4.5V$ to $5.5V$ $R_L = 500\Omega$ $C_L = 50 pF$	Data	Any \bar{Q}	4	7.5	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		Data	Any \bar{Q}	4	7	ns
t_{PLH}	Propagation Delay Time Low to High Level Output		Enable	Any \bar{Q}	5	9	ns
t_{PHL}	Propagation Delay Time High to Low Level Output		Enable	Any \bar{Q}	4.5	8	ns
t_{PZH}	Output Enable Time to High Level Output		Output Control	Any \bar{Q}	2	6.5	ns
t_{PZL}	Output Enable Time to Low Level Output		Output Control	Any \bar{Q}	4.5	9.5	ns
t_{PHZ}	Output Disable Time from High Level Output		Output Control	Any \bar{Q}	3	6.5	ns
t_{PLZ}	Output Disable Time from Low Level Output		Output Control	Any \bar{Q}	3	7	ns

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

Logic Diagram



TL/F/6311-2

Function Table

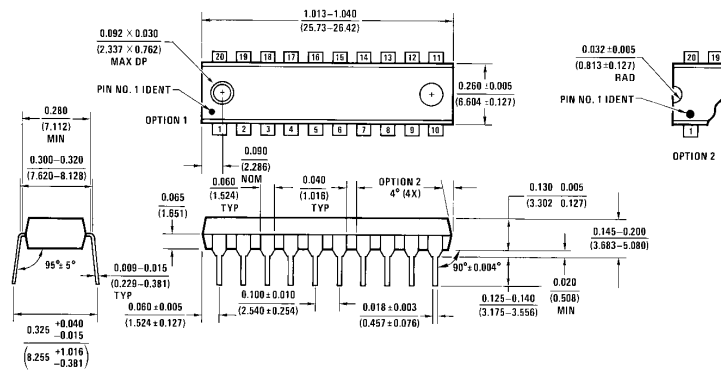
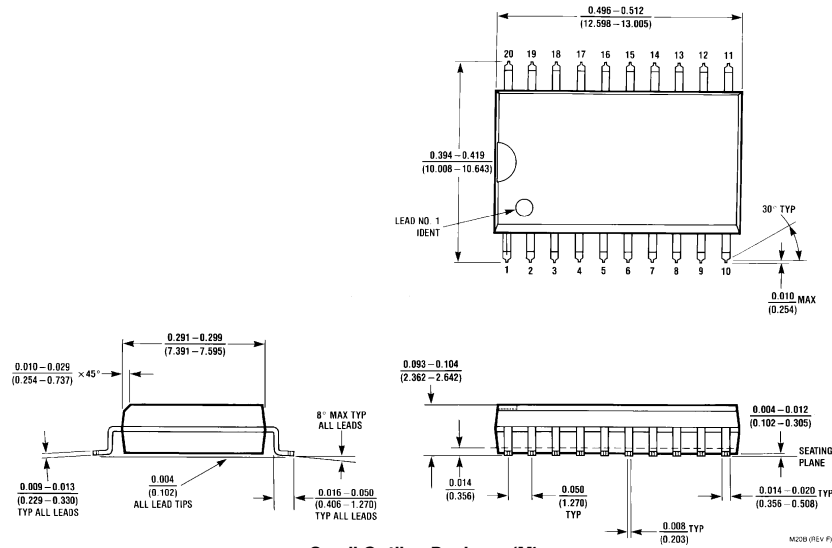
Output Control	Enable G	D	Output Q
L	H	H	L
L	H	L	H
L	L	X	\bar{Q}_0
H	X	X	Z

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

Z = High Impedance State

\bar{Q}_0 = Previous Condition of \bar{Q}

Physical Dimensions inches (millimeters)



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: (800) 272-9959
Fax: (800) 737-7018

National Semiconductor Europe
Fax: (+49) 0-180-530 85 86
Email: cnjwge@tevm2.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.
19th 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: 81-043-299-2309
Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.