T-52-09-00

National Semiconductor

DM74AS230/DM74AS231 TRI-STATE® Bus Driver/Receiver

General Description

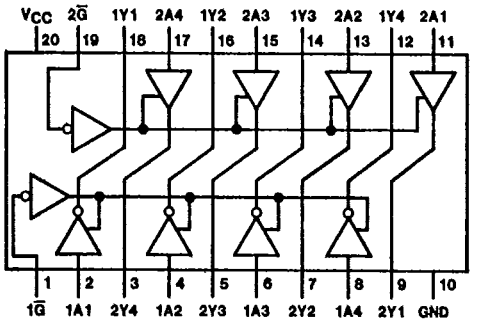
This family of Advanced Schottky TRI-STATE Bus circuits are designed to provide either bidirectional or unidirectional buffer interface in Memory, Microprocessor, and Communication Systems. The output characteristics of the circuits have low impedance sufficient to drive terminated transmission lines down to 133 ohms. The input characteristics of the circuits likewise have a high impedance so it will not significantly load the transmission line. The package contains eight TRI-STATE buffers organized with four buffers having a common TRI-STATE enable gate. The AS230 is organized as 4 bit buffers inverting and 4 bit buffers non inverting. The AS231 is organized as two 4 bit wide inverting buffers with separate complementary output control buffers.

Features

- Advanced oxide-isolated, ion-implanted Schottky TTL process
- Improved switching performance over low power Schottky counterpart
- Functional and pin compatible with low power Schottky counterpart
- Switching response specified into 500Ω and 50 pF
- Low level drive current 74AS = 48 mA
- Specified to interface with CMOS at $V_{OH} = V_{CC} - 2V$

Connection Diagrams

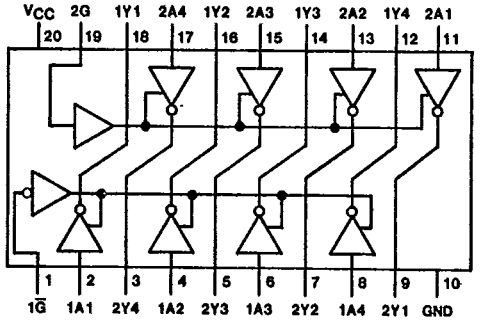
Dual-In-Line Package



TL/F/6297–1

Order Number DM74AS230N
See NS Package Number N20A*

Dual-In-Line Package



TL/F/6297–2

Order Number DM74AS231N
See NS Package Number N20A*

Function Tables

'AS230

Inputs		Outputs	
$\overline{G}$	A	1Y	2Y
L	L	H	L
L	H	L	H
H	X	Z	Z

'AS231

Inputs		Output
1$\overline{G}$	1A	1Y
L	L	H
L	H	L
H	X	Z

'AS231

Inputs		Output
2G	2A	2Y
H	L	H
H	H	L
L	X	Z

H = High Logic Level
L = Low Logic Level
X = Either Low or High Logic Level
Z = High Impedance (off)

*Contact your local NSC representative about surface mount (M) package availability.

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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	0°C to +70°C
Storage Temperature Range	−65°C to +150°C
Typical θ_{JA} N Package	57.0°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	DM74AS 230, 231			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			−15	mA
I_{OL}	Low Level Output Current			64	mA
T_A	Free Air Operating Temperature	0		70	°C

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				−1.2	V
V_{OH}	High Level Output Voltage	I_{OH} = Max, V_{CC} = 4.5V		2.4			V
		I_{OH} = −2 mA, V_{CC} = 4.5V to 5.5V		V_{CC} − 2			V
V_{OL}	Low Level Output Voltage	V_{CC} = 4.5V, I_{OL} = Max			0.35	0.55	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_{IN} = 2.7V				20	μA
I_{IL}	Low Level Input Current	V_{CC} = 5.5V, V_{IN} = 0.4V	Others			−0.5	mA
			AS230 2A Inputs			−1	
I_{OZH}	High Level TRI-STATE Output Current	V_{CC} = 5.5V, V_O = 2.7V				50	μA
I_{OZL}	Low Level TRI-STATE Output Current	V_{CC} = 5.5V, V_O = 0.4V				−50	μA
I_O	Output Drive Current	V_{CC} = 5.5V, V_{OUT} = 2.25V		−50		−150	mA
I_{CC}	74AS230 Supply Current	V_{CC} = 5.5V	Outputs High		16	25	mA
			Outputs Low		55	87	
			TRI-STATE		29	46	
I_{CC}	74AS231 Supply Current	V_{CC} = 5.5V	Outputs High		12	18	mA
			Outputs Low		52	82	
			TRI-STATE		25	39	

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

Symbol	Parameter	From (Input)	To (Output)	Conditions	DM74AS230		Units
					Min	Max	
t_{PLH}	Propagation Delay Time Low-to-High Level Output	1A	1Y	V_{CC} = 4.5V to 5.5V R_L = 500Ω C_L = 50 pF	2.5	6.5	ns
t_{PHL}	Propagation Delay Time High-to-Low Level Output				2	5.7	
t_{PLH}	Propagation Delay Time Low-to-High Level Output	2A	2Y		2.5	6.2	ns
t_{PHL}	Propagation Delay Time High-to-Low Level Output				2	6.2	
t_{PZH}	Output Enable to High Level	$1\overline{G}$	1Y		2	6.4	ns
t_{PZL}	Output Enable to Low Level				2	8.5	
t_{PHZ}	Output Disable from High Level				2	5	
t_{PLZ}	Output Disable from Low Level				2	9.5	
t_{PZH}	Output Enable to High Level	$2\overline{G}$	2Y		2	9	ns
t_{PZL}	Output Enable to Low Level				2	7.5	
t_{PHZ}	Output Disable from High Level				2	6	
t_{PLZ}	Output Disable from Low Level				2	9	

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

Symbol	Parameter	From (Input)	To (Output)	Conditions	DM74AS231		Units
					Min	Max	
t_{PLH}	Propagation Delay Time Low-to-High Level Output	A	Y	V_{CC} = 4.5V to 5.5V R_L = 500Ω C_L = 50 pF	2	6.5	ns
t_{PHL}	Propagation Delay Time High-to-Low Level Output				2	5.7	
t_{PZH}	Output Enable to High Level	$\overline{G}$	Y		2	6.4	ns
t_{PZL}	Output Enable to Low Level				2	8.5	
t_{PHZ}	Output Disable from High Level				2	5	
t_{PLZ}	Output Disable from Low Level				2	9.5	
t_{PZH}	Output Enable to High Level	G	Y		3	6	ns
t_{PZL}	Output Enable to Low Level				3	9	
t_{PHZ}	Output Disable from High Level				3	6	
t_{PLZ}	Output Disable from Low Level				3	7	

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