



# Line Drivers/Receivers

## DM7831/DM8831, DM7832/DM8832 TRI-STATE™ line driver

### general description

Through simple logic control, the DM7831/DM8831, DM7832/DM8832 can be used as either a quad single-ended line driver or a dual differential line driver. They are specifically designed for party line (bus-organized) systems. The DM7832/DM8832 does not have the  $V_{CC}$  clamp diodes found on the DM7831/DM8831.

The DM7831 & DM7832 are specified for operation over the  $-55^{\circ}\text{C}$  to  $+125^{\circ}\text{C}$  military temperature range. The DM8831 & DM8832 are specified for operation over the  $0^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  temperature range.

### features

- Series 54/74 compatible
- 17 ns propagation delay
- Very low output impedance—high drive capability
- 40 mA sink and source currents
- Gating control to allow either single-ended or differential operation

- High impedance output state which allows many outputs to be connected to a common bus line.

### mode of operation

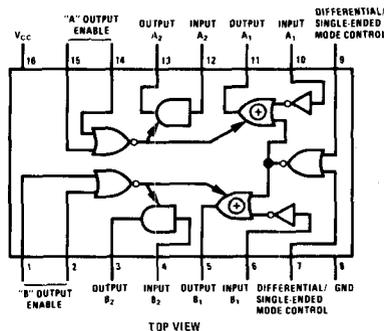
To operate as a quad single-ended line driver apply logical "0"s to the Output Disable pins (to keep the outputs in the normal low impedance mode) and apply logical "0"s to both Differential/Single-ended Mode Control inputs. All four channels will then operate independently and no signal inversion will occur between inputs and outputs.

To operate as a dual differential line driver apply logical "0"s to the Output Disable pins and apply at least one logical "1" to the Differential/Single-ended Mode Control inputs. The inputs to the A channels should be connected together and the inputs to the B channels should be connected to- In this mode the signals applied to the resulting inputs will pass non-inverted on the  $A_2$  and  $B_2$  outputs and inverted on the  $A_1$  and  $B_1$  outputs.

When operating in a bus-organized system with outputs tied directly to outputs of other

(continued)

### connection and logic diagram



Order Number DM7831J, DM8831J,  
DM7832J or DM8832J  
See Package 17  
Order Number DM8831N or DM8832N  
See Package 23  
Order Number DM7831W, DM8831W,  
DM7832W or DM8832W  
See Package 28

### truth table (Shown for A Channels Only)

"A" OUTPUT DISABLE		DIFFERENTIAL/ SINGLE-ENDED MODE CONTROL		INPUT $A_1$	OUTPUT $A_1$	INPUT $A_2$	OUTPUT $A_2$
0	0	0	0	Logical "1" or Logical "0"	Same as Input $A_1$	Logical "1" or Logical "0"	Same as Input $A_2$
0	0	X	1	Logical "1" or Logical "0"	Opposite of Input $A_1$	Logical "1" or Logical "0"	Same as Input $A_2$
1	X	X	X	X	High impedance state	X	High impedance state

X = Don't Care

## absolute maximum ratings

Supply Voltage	7V
Input Voltage	5.5V
Output Voltage	5.5V
Storage Temperature Range	-65°C to +150°C
Operating Temperature Range	DM7831, DM7832 -55°C to +125°C
	DM8831, DM8832 0°C to +70°C
Lead Temperature (Soldering, 10 sec.)	300°C
Time that 2 bus-connected devices may be in opposite low impedance states simultaneously	10 ms

## electrical characteristics (Note 1)

PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
Logical "1" Input Voltage	DM7831,DM7832 $V_{CC} = 4.5V$ DM8831,DM8832 $V_{CC} = 4.75V$	2.0			V
Logical "0" Input Voltage	DM7831,DM7832 $V_{CC} = 4.5V$ DM8831,DM8832 $V_{CC} = 4.75V$			0.8	V
Logical "1" Output Voltage	DM7831,DM7832 $V_{CC} = 4.5V$ $I_O = -40\text{ mA}$ $I_O = -2\text{ mA}$	1.8	2.3		V
	DM8831,DM8832 $V_{CC} = 4.75V$ $I_O = -40\text{ mA}$ $I_O = -5.2\text{ mA}$	2.4	2.7		V
Logical "0" Output Voltage	DM7831,DM7832 $V_{CC} = 4.5V$ $I_O = 40\text{ mA}$ $I_O = 32\text{ mA}$	1.8	2.5	0.29	V
	DM8831,DM8832 $V_{CC} = 4.75V$ $I_O = 40\text{ mA}$ $I_O = 32\text{ mA}$	2.4	2.9	0.50	V
Logical "1" Input Current	DM7831,DM7832 $V_{CC} = 5.5V$ DM8831,DM8832 $V_{CC} = 5.25V$			1	mA
				40	$\mu\text{A}$
Logical "0" Input Current	DM7831,DM7832 $V_{CC} = 5.5V$ DM8831,DM8832 $V_{CC} = 5.25V$			-1.0	mA
				-1.6	mA
Output Disable Current	DM7831,DM7832 $V_{CC} = 5.5V$ DM8831,DM8832 $V_{CC} = 5.25V$			40	$\mu\text{A}$
Output Short Circuit Current	DM7831,DM7832 $V_{CC} = 5.5V$ DM8831,DM8832 $V_{CC} = 5.25V$	-40	-100	-120	mA
		(Note 2)		(Note 2)	
Supply Current	DM7831,DM7832 $V_{CC} = 5.5V$ DM8831,DM8832 $V_{CC} = 5.25V$		65	90	mA
Input Diode Clamp Voltage	DM7831,DM8831 $V_{CC} = 5.0V, T_A = 25^\circ\text{C}$ DM7832,DM8832 $I_{IN} = -12\text{ mA}$			-1.5	V
Output Diode Clamp Voltage	DM7831,DM8831 $I_{OUT} = -12\text{ mA}, V_{CC} = 5.0V, T_A = 25^\circ\text{C}$			-1.5	V
	DM7832,DM8832 $I_{OUT} = +12\text{ mA}, V_{CC} = 5.0V, T_A = 25^\circ\text{C}$			$V_{CC} + 1.5$	V
Propagation Delay to a Logical "0" from Inputs A <sub>1</sub> , A <sub>2</sub> , B <sub>1</sub> , B <sub>2</sub> Differential Single-ended Mode Control to Outputs, $t_{p00}$	$V_{CC} = 5.0V, T_A = 25^\circ\text{C}$		13	25	ns
Propagation Delay to a Logical "1" from Inputs A <sub>1</sub> , A <sub>2</sub> , B <sub>1</sub> , B <sub>2</sub> Differential Single-ended Mode Control to Outputs, $t_{p01}$	$V_{CC} = 5.0V, T_A = 25^\circ\text{C}$		13	25	ns
Delay from Disable Inputs to High Impedance State (from Logical "1" Level), $t_{1H}$	$V_{CC} = 5.0V, T_A = 25^\circ\text{C}$		6	12	ns
Delay from Disable Inputs to High Impedance State (from Logical "0" Level), $t_{0H}$	$V_{CC} = 5.0V, T_A = 25^\circ\text{C}$		14	22	ns
Propagation Delay from Disable Inputs to Logical "1" Level (from High Impedance State), $t_{H1}$	$V_{CC} = 5.0V, T_A = 25^\circ\text{C}$		14	22	ns
Propagation Delay from Disable Inputs to Logical "0" Level (from High Impedance State), $t_{H0}$	$V_{CC} = 5.0V, T_A = 25^\circ\text{C}$		18	27	ns

**Note 1:** Unless otherwise specified min/max limits apply across the -55°C to +125°C temperature range for the DM7831, DM7832 and across the 0°C to 70°C temperature range for the DM8831, DM8832. All typicals are given for  $V_{CC} = 5.0V$  and  $T_A = 25^\circ\text{C}$ .

**Note 2:** Applies for  $T_A = 125^\circ\text{C}$  only. Only one output should be shorted at a time.

### mode of operation (cont.)

DM7831/DM8831's, DM7832/DM8832's (Figure 1), all devices except one must be placed in the "high impedance" state. This is accomplished by ensuring that a logical "1" is applied to at least one of the Output Disable pins of each device which is to be in the "high impedance" state. A NOR gate was purposely chosen for this function since it is possible with only two DM5442/DM7442, BCD-to-decimal decoders, to decode as many as 100 DM7831/DM8831's, DM7832/DM8832's (Figure 2).

The unique device whose Disable inputs receive two logical "0" levels assumes the normal low

impedance output state, providing good capacitive drive capability and waveform integrity especially during the transition from the logical "0" to logical "1" state. The other outputs—in the high impedance state—take only a small amount of leakage current from the low impedance outputs. Since the logical "1" output current from the selected device is 100 times that of a conventional Series 54/74 device (40 mA vs. 400  $\mu$ A), the output is easily able to supply that leakage current for several hundred other DM7831/DM8831's, DM7832/DM8832's and still have available drive for the bus line (Figure 3).

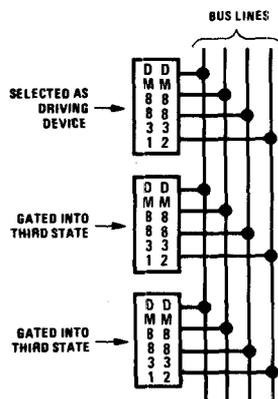


Figure 1

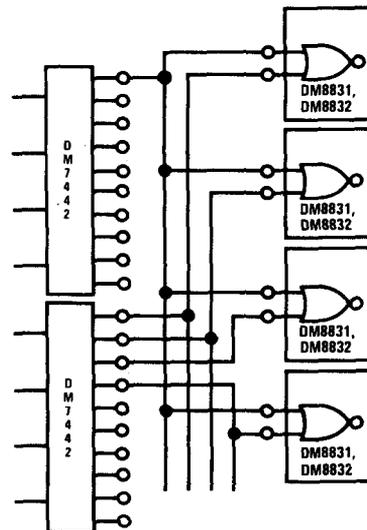


Figure 2

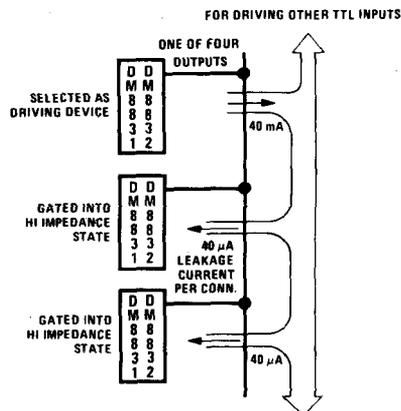
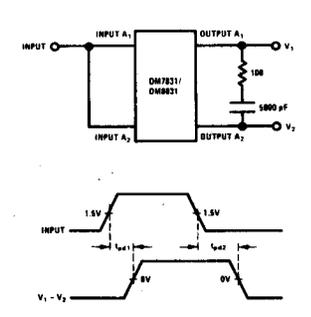
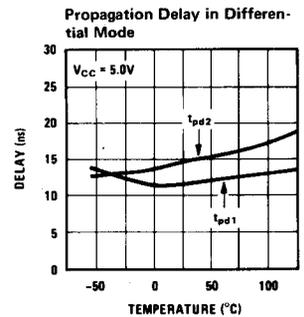
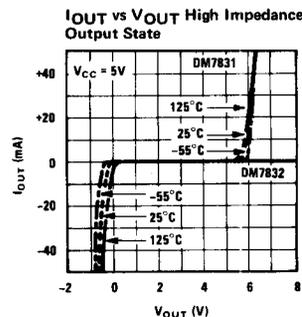
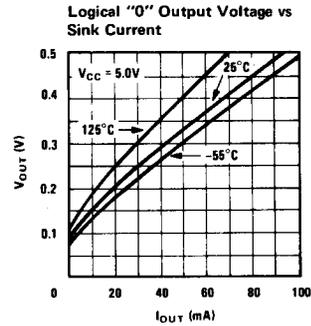
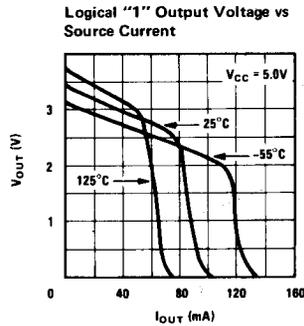
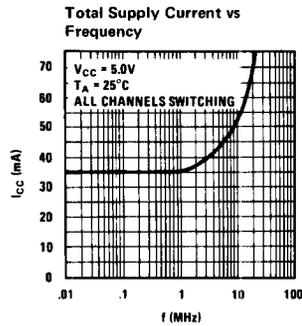
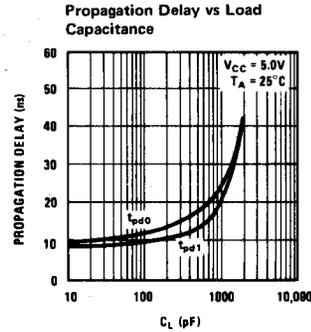
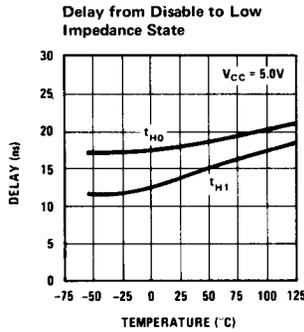
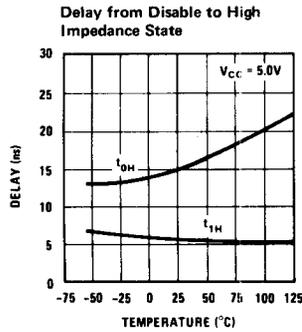
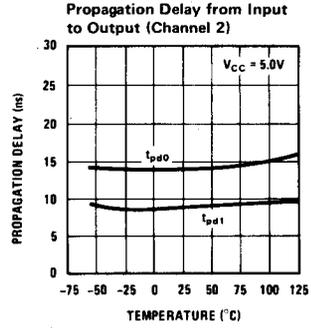
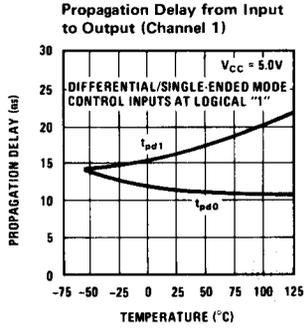
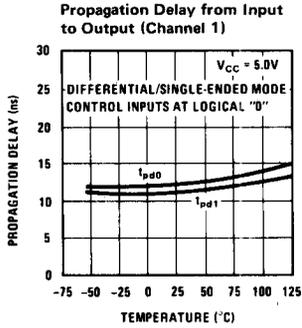
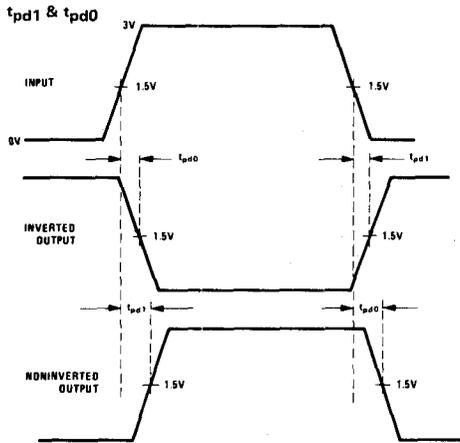


Figure 3

typical performance characteristics

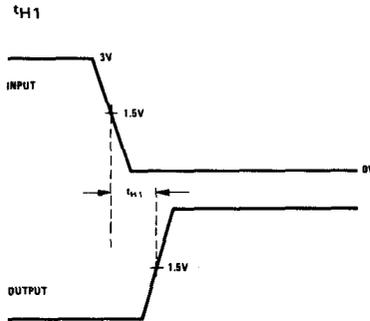
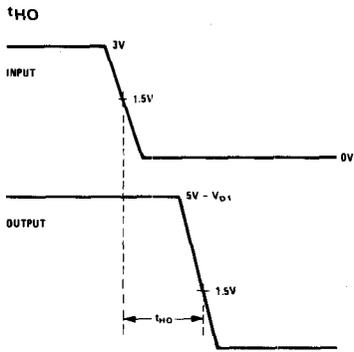
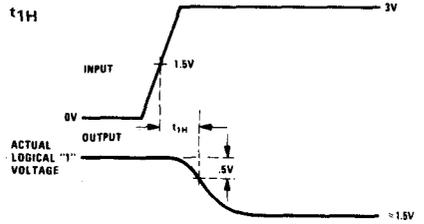
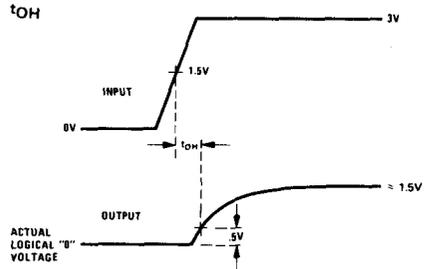


### switching time waveforms

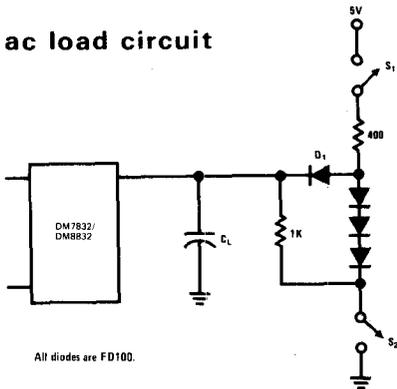


Input characteristic:

Amplitude = 3.0V  
 Frequency = 1.0 MHz, 50% duty cycle  
 $t_r = t_f \leq 10$  ns (10% to 90%)



### ac load circuit



All diodes are FD100.

	Switch S <sub>1</sub>	Switch S <sub>2</sub>	C <sub>L</sub>
t <sub>pd1</sub>	closed	closed	50 pF
t <sub>pd0</sub>	closed	closed	50 pF
t <sub>OH</sub>	closed	closed	* 5 pF
t <sub>1H</sub>	closed	closed	* 5 pF
t <sub>HO</sub>	closed	open	50 pF
t <sub>H1</sub>	open	closed	50 pF

\*Jig capacitance.