

AM26LS31C, AM26LS31M QUADRUPLE DIFFERENTIAL LINE DRIVER

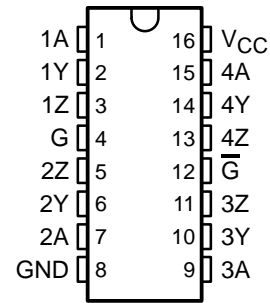
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- Meets or Exceeds the Requirements of ANSI TIA/EIA-422-B and ITU Recommendation V.11
- Operates From a Single 5-V Supply
- TTL Compatible
- Complementary Outputs
- High Output Impedance in Power-Off Conditions
- Complementary Output-Enable Inputs

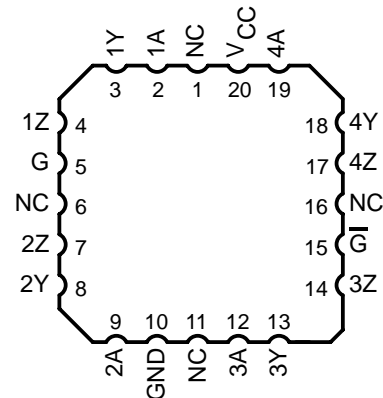
description/ordering information

The AM26LS31 is a quadruple complementary-output line driver designed to meet the requirements of ANSI TIA/EIA-422-B and ITU (formerly CCITT) Recommendation V.11. The 3-state outputs have high-current capability for driving balanced lines such as twisted-pair or parallel-wire transmission lines, and they are in the high-impedance state in the power-off condition. The enable function is common to all four drivers and offers the choice of an active-high or active-low enable (G , \overline{G}) input. Low-power Schottky circuitry reduces power consumption without sacrificing speed.

D, DB, N, NS, OR J PACKAGE
(TOP VIEW)



FK PACKAGE
(TOP VIEW)



ORDERING INFORMATION

T _A	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
0°C to 70°C	PDIP – N	Tube	AM26LS31CN	AM26LS31CN
	SOIC – D	Tube	AM26LS31CD	AM26LS31C
		Tape and reel	AM26LS31CDR	
	SOP – NS	Tape and reel	AM26LS31CNSR	26LS31
–55°C to 125°C	SSOP – DB	Tape and reel	AM26LS31CDBR	SA31C
	CDIP – J	Tube	AM26LS31MJ	AM26LS31MJB
	LCCC – FK	Tube	AM26LS31MFK	AM26LS31MFKB

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at www.ti.com/sc/package.



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS
INSTRUMENTS**

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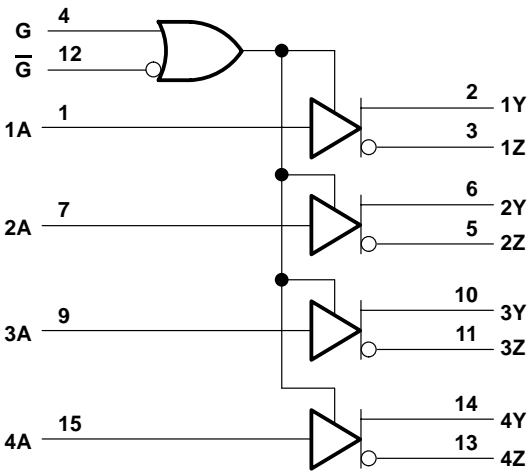
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FUNCTION TABLE
(each driver)

INPUT A	ENABLES		OUTPUTS	
	G	\overline{G}	Y	Z
H	H	X	H	L
L	H	X	L	H
H	X	L	H	L
L	X	L	L	H
X	L	H	Z	Z

H = high level, L = low level, X = irrelevant,
Z = high impedance (off)

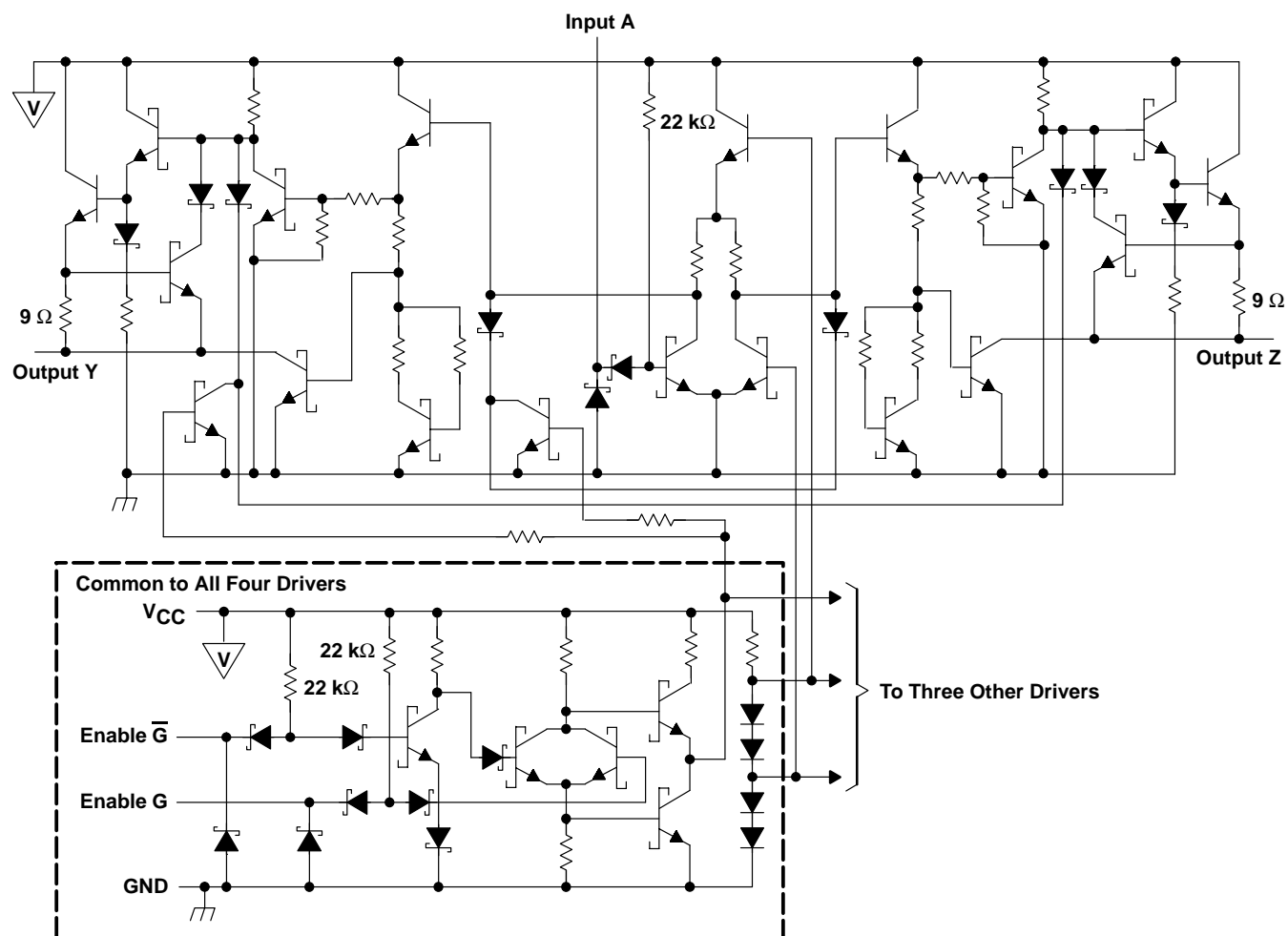
logic diagram (positive logic)



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schematic (each driver)



All resistor values are nominal.

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absolute maximum ratings over operating free-air temperature range (unless otherwise noted)[†]

Supply voltage, V_{CC} (see Note 1)	7 V
Input voltage, V_I	7 V
Output off-state voltage	5.5 V
Package thermal impedance, θ_{JA} (see Note 2): D package	73°C/W
DB package	82°C/W
N package	67°C/W
NS package	64°C/W
Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds	260°C
Lead temperature 1,6 mm (1/16 inch) from case for 60 seconds: J package	300°C
Storage temperature range, T_{stg}	–65°C to 150°C

[†] Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. All voltage values, except differential output voltage V_{OD} , are with respect to network GND.
2. The package thermal impedance is calculated in accordance with JESD 51-7.

DISSIPATION RATING TABLE

PACKAGE	$T_A \leq 25^\circ\text{C}$ POWER RATING	DERATING FACTOR ABOVE $T_A = 25^\circ\text{C}$ [‡]	$T_A = 70^\circ\text{C}$ POWER RATING	$T_A = 125^\circ\text{C}$ POWER RATING
FK	1375 mW	11.0 mW/°C	880 mW	275 mW
J	1375 mW	11.0 mW/°C	880 mW	275 mW

[‡] This is the inverse of the traditional junction-to-ambient thermal resistance ($R\theta_{JA}$). Thermal resistances are not production tested and the values given are for informational purposes only.

recommended operating conditions

		MIN	NOM	MAX	UNIT
V_{CC} Supply voltage	AM26LS31C	4.75	5	5.25	V
	AM26LS31M	4.5	5	5.5	
V_{IH} High-level input voltage		2			V
V_{IL} Low-level input voltage				0.8	V
I_{OH} High-level output current				–20	mA
I_{OL} Low-level output current				20	mA
T_A Operating free-air temperature	AM26LS31C	0		70	°C
	AM26LS31M	–55		125	



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electrical characteristics over operating free-air temperature range (unless otherwise noted)[†]

PARAMETER	TEST CONDITIONS	MIN	TYP [‡]	MAX	UNIT
V _{IK} Input clamp voltage	V _{CC} = MIN, I _I = -18 mA			-1.5	V
V _{OH} High-level output voltage	V _{CC} = MIN, I _{OH} = -20 mA		T _A = -55°C	2.4	V
			All other temperatures	2.5	
V _{OL} Low-level output voltage	V _{CC} = MIN, I _{OL} = 20 mA			0.5	V
I _{OZ} Off-state (high-impedance-state) output current	V _{CC} = MIN		V _O = 0.5 V	-20	μA
			V _O = 2.5 V	20	
I _I Input current at maximum input voltage	V _{CC} = MAX, V _I = 7 V			0.1	mA
I _{IH} High-level input current	V _{CC} = MAX, V _I = 2.7 V			20	μA
I _{IL} Low-level input current	V _{CC} = MAX, V _I = 0.4 V			-0.36	mA
I _{OS} Short-circuit output current [§]	V _{CC} = MAX	-30		-150	mA
I _{CC} Supply current	V _{CC} = MAX, All outputs disabled		32	80	mA

[†] For C suffix devices, V_{CC} MIN = 4.75 V and V_{CC} MAX = 5.25 V. For M suffix devices, V_{CC} MIN = 4.5 V and V_{CC} MAX = 5.5 V.

[‡] All typical values are at V_{CC} = 5 V and T_A = 25°C.

[§] Not more than one output should be shorted at a time, and duration of the short circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C (see Figure 1)

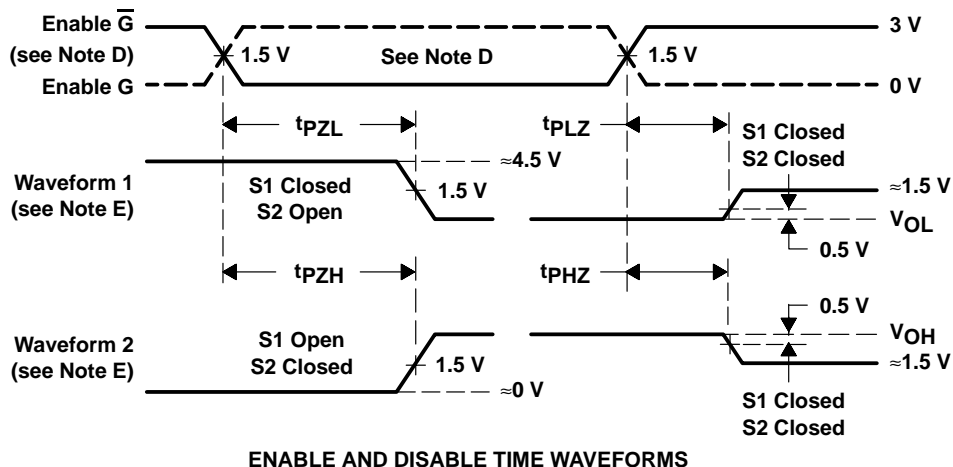
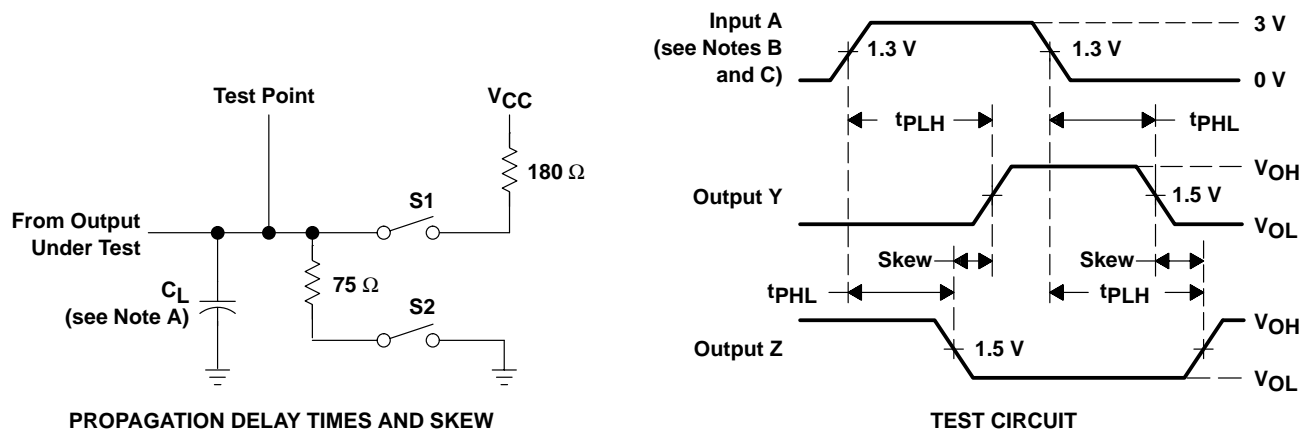
PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
t _{PLH} Propagation delay time, low-to-high-level output	C _L = 30 pF, S1 and S2 open		14	20	ns
t _{PHL} Propagation delay time, high-to-low-level output			14	20	
t _{PZH} Output enable time to high level	C _L = 30 pF			25	ns
t _{PZL} Output enable time to low level				37	
t _{PHZ} Output disable time from high level	C _L = 10 pF, S1 and S2 closed		21	30	ns
t _{PLZ} Output disable time from low level			23	35	
Output-to-output skew	C _L = 30 pF, S1 and S2 open		1	6	ns



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PARAMETER MEASUREMENT INFORMATION



- NOTES:
- A. C_L includes probe and jig capacitance.
 - B. All input pulses are supplied by generators having the following characteristics: $PRR \leq 1$ MHz, $Z_O \approx 50 \Omega$, $t_r \leq 15$ ns, $t_f \leq 6$ ns.
 - C. When measuring propagation delay times and skew, switches S1 and S2 are open.
 - D. Each enable is tested separately.
 - E. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.

Figure 1. Test Circuit and Voltage Waveforms

TYPICAL CHARACTERISTICS

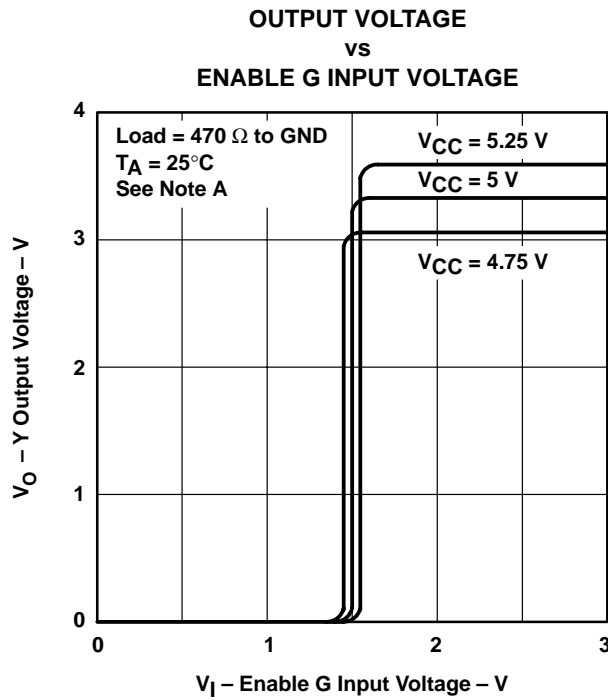


Figure 2

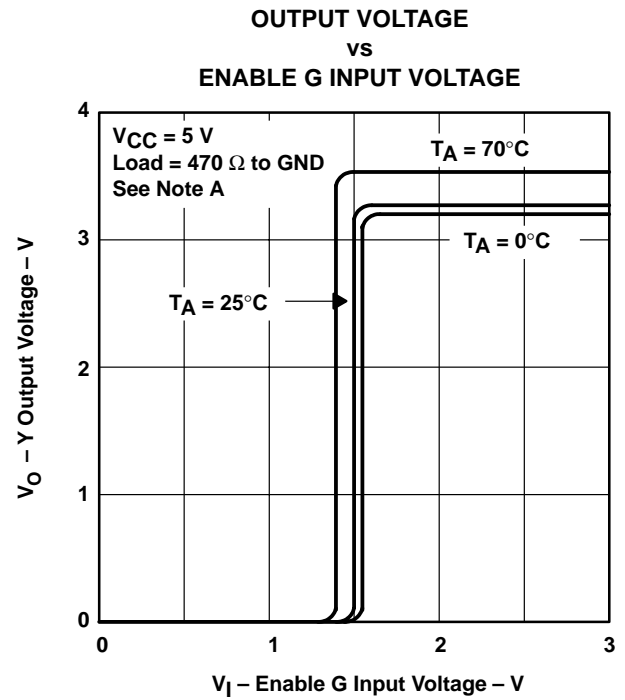


Figure 3

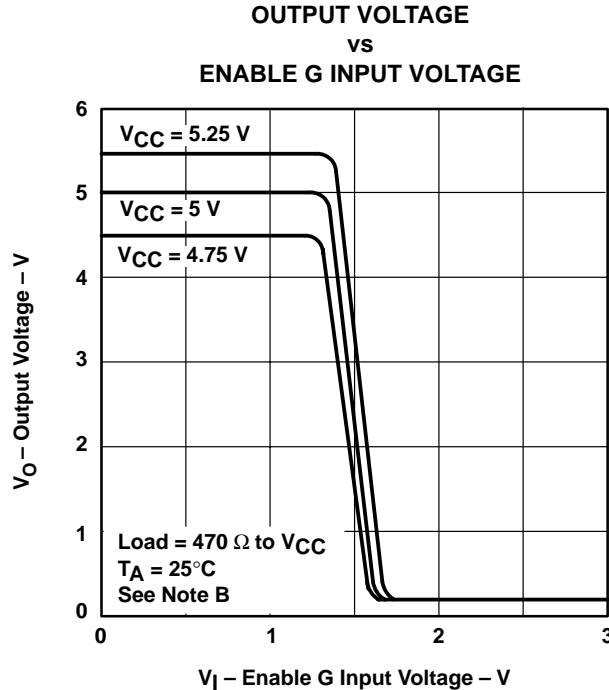


Figure 4

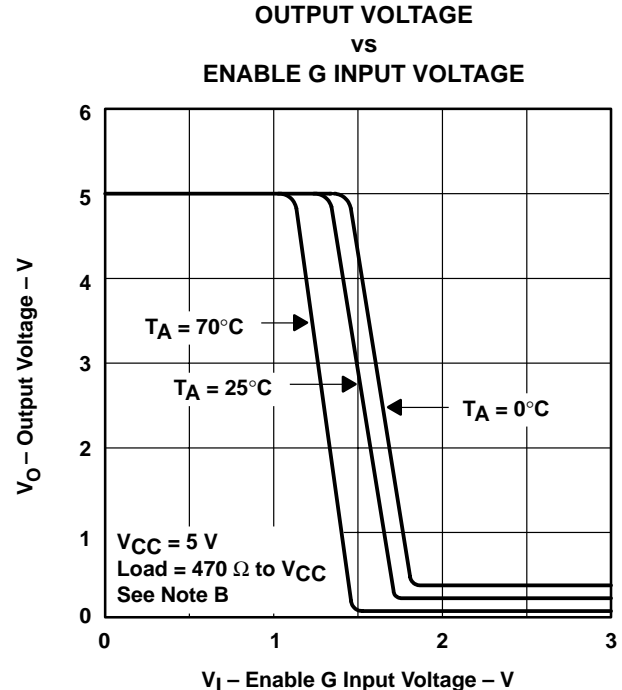


Figure 5

NOTES: A. The A input is connected to V_{CC} during testing of the Y outputs and to ground during testing of the Z outputs.
B. The A input is connected to ground during testing of the Y outputs and to V_{CC} during testing of the Z outputs.

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TYPICAL CHARACTERISTICS

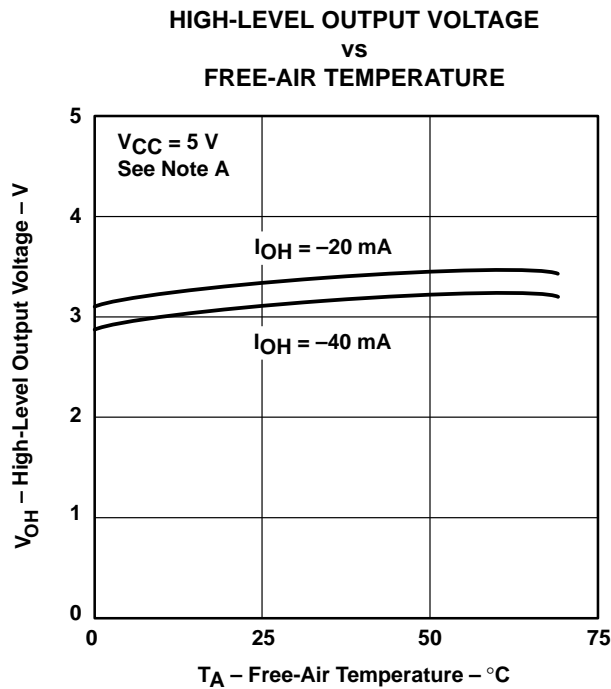


Figure 6

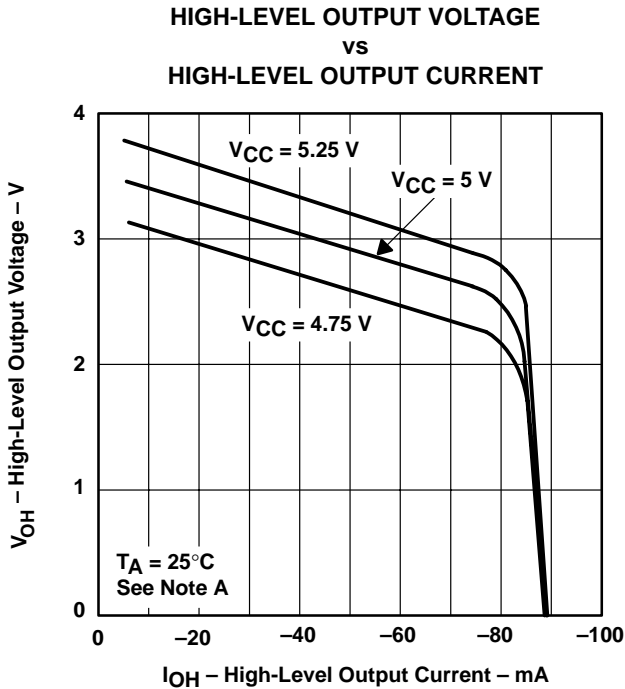


Figure 7

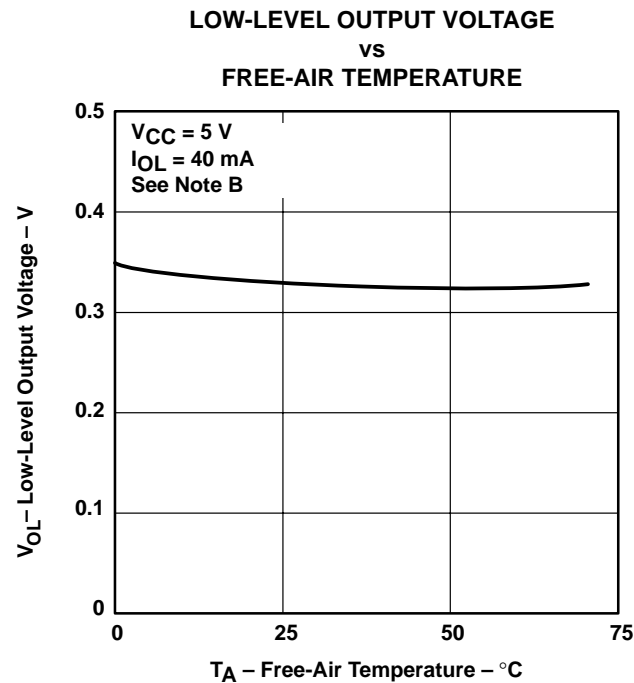


Figure 8

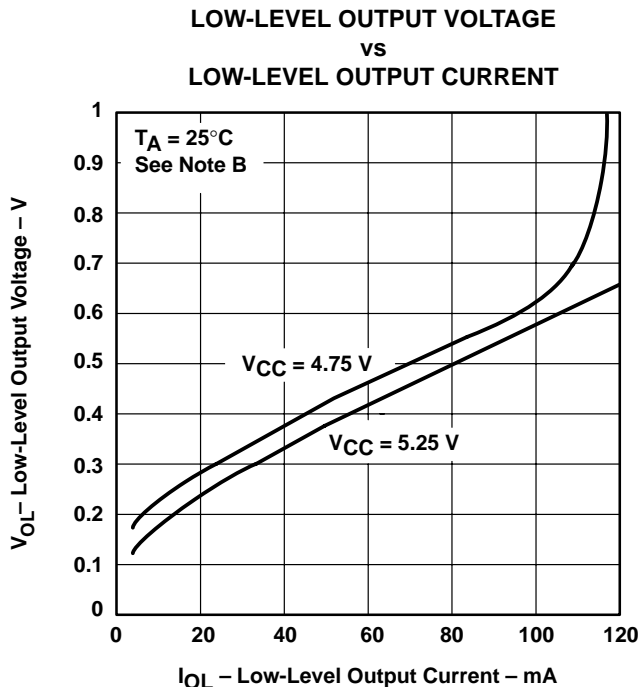
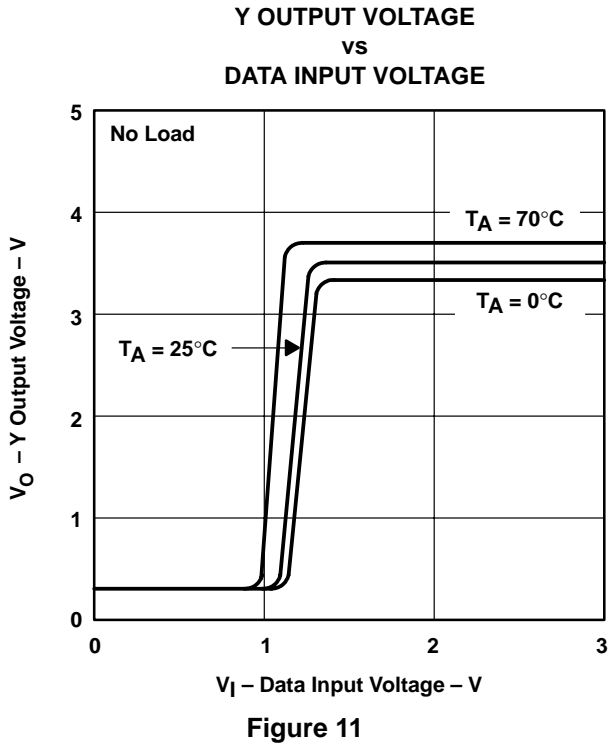
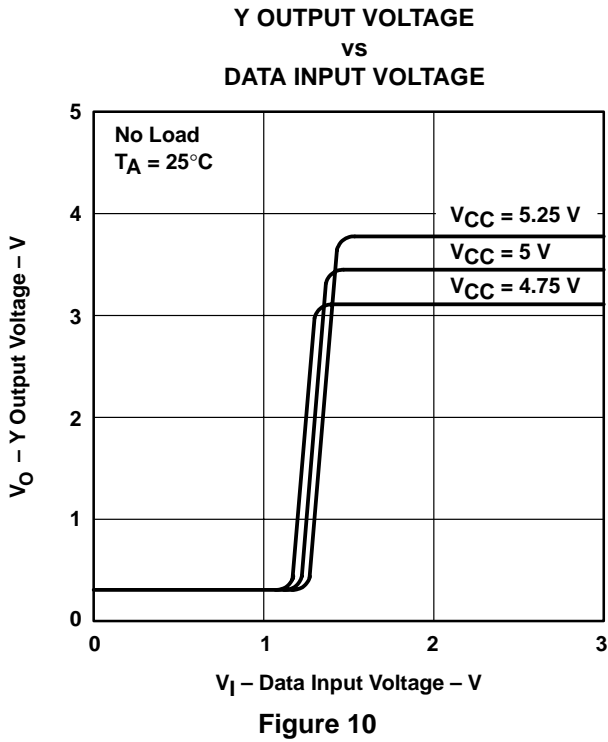


Figure 9

NOTES: A. The A input is connected to V_{CC} during testing of the Y outputs and to ground during testing of the Z outputs.
B. The A input is connected to ground during testing of the Y outputs and to V_{CC} during testing of the Z inputs.

TYPICAL CHARACTERISTICS



PACKAGING INFORMATION

Orderable Device	Status ⁽¹⁾	Package Type	Package Drawing	Pins	Package Qty	Eco Plan ⁽²⁾	Lead/Ball Finish	MSL Peak Temp ⁽³⁾
AM26LS31CD	ACTIVE	SOIC	D	16	40	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
AM26LS31CDBR	ACTIVE	SSOP	DB	16	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
AM26LS31CDR	ACTIVE	SOIC	D	16	2500	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM
AM26LS31CN	ACTIVE	PDIP	N	16	25	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
AM26LS31CNSR	ACTIVE	SO	NS	16	2000	Pb-Free (RoHS)	CU NIPDAU	Level-2-260C-1 YEAR/ Level-1-235C-UNLIM

⁽¹⁾ The marketing status values are defined as follows:

ACTIVE: Product device recommended for new designs.

LIFEBUY: TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

NRND: Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

PREVIEW: Device has been announced but is not in production. Samples may or may not be available.

OBSOLETE: TI has discontinued the production of the device.

⁽²⁾ Eco Plan - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

None: Not yet available Lead (Pb-Free).

Pb-Free (RoHS): TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

Green (RoHS & no Sb/Br): TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

⁽³⁾ MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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N (R-PDIP-T**)

16 PINS SHOWN

PLASTIC DUAL-IN-LINE PACKAGE



PINS ** DIM	14	16	18	20
A MAX	0.775 (19,69)	0.775 (19,69)	0.920 (23,37)	1.060 (26,92)
A MIN	0.745 (18,92)	0.745 (18,92)	0.850 (21,59)	0.940 (23,88)
MS-001 VARIATION	AA	BB	AC	AD



4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
 - B. This drawing is subject to change without notice.
 -  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
 -  The 20 pin end lead shoulder width is a vendor option, either half or full width.

D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



4040047-4/F 07/2004

NOTES:

- All linear dimensions are in inches (millimeters).
- This drawing is subject to change without notice.
- Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
- Falls within JEDEC MS-012 variation AC.

MECHANICAL DATA

NS (R-PDSO-G**)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



DIM \ PINS **	14	16	20	24
A MAX	10,50	10,50	12,90	15,30
A MIN	9,90	9,90	12,30	14,70

4040062/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
 - B. This drawing is subject to change without notice.
 - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

DB (R-PDSO-G**)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.
 B. This drawing is subject to change without notice.
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.
 D. Falls within JEDEC MO-150

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