- **Meets or Exceeds ANSI Standard EIA/TIA-422-B**
- **Operates From a Single 5-V Power Supply**
- **Drives Loads as Low as 50 Ω up to 15 Mbps**
- **TTL- and CMOS-Input Compatibility**
- **Output Short-Circuit Protection**
- **Interchangeable With National Semiconductor™ DS9638**

D OR P PACKAGE
(TOP VIEW)

|				
V_{CC}	1		8	1Y
1A	2		7	1Z
2A	3		6	2Y
GND	4		5	2Z
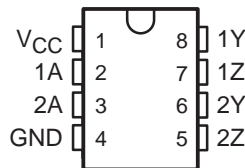
description

The uA9638C is a dual high-speed differential line driver designed to meet ANSI Standard EIA/TIA-422-B. The inputs are TTL and CMOS compatible and have input clamp diodes. Schottky-diode-clamped transistors are used to minimize propagation delay time. This device operates from a single 5-V power supply and is supplied in an 8-pin package.

The uA9638 provides the current needed to drive low-impedance loads at high speeds. Typically used with twisted-pair cabling and differential receiver(s), base-band data transmission can be accomplished up to and exceeding 15 Mbps in properly designed systems. The uA9637A dual line receiver is commonly used as the receiver. For even faster switching speeds in the same pin configuration, see the SN75ALS191.

The uA9638C is characterized for operation from 0°C to 70°C.

logic symbol†
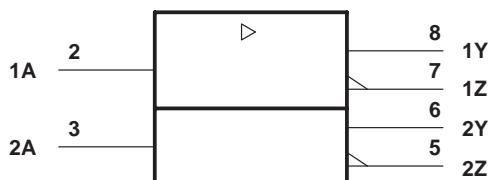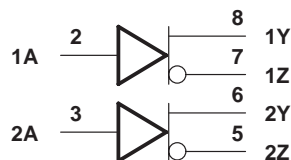
† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram

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uA9638C
DUAL HIGH-SPEED DIFFERENTIAL LINE DRIVER

schematics of inputs and outputs

EQUIVALENT OF EACH INPUT	TYPICAL OF ALL OUTPUTS
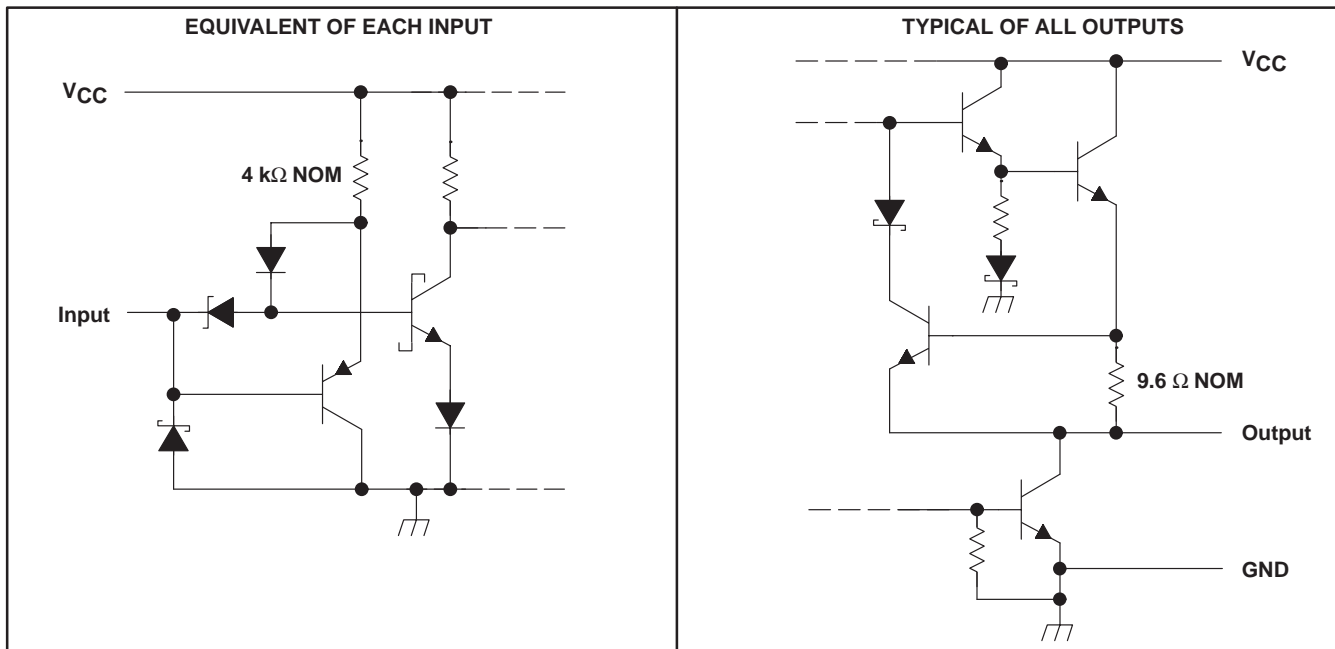
absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

Supply voltage range, V_{CC} (see Note 1) .... −0.5 V to 7 V

Input voltage range, V_I .... −0.5 V to 7 V

Continuous total power dissipation .... See Dissipation Rating Table

Operating free-air temperature range, T_A .... 0°C to 70°C

Storage temperature range, T_{stg} .... −65°C to 150°C

Lead temperature 1,6 mm (1/16 inch) from 10 seconds .... 260°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.

NOTE 1: Voltage values except differential output voltages are with respect to network GND.

DISSIPATION RATING TABLE

PACKAGE	T_A = 25°C POWER RATING	DERATING FACTOR ABOVE T_A = 25°C	T_A = 70°C POWER RATING
D	725 mW	5.8 mW/°C	464 mW
P	1000 mW	8.0 mW/°C	640 mW

recommended operating conditions

	MIN	NOM	MAX	UNIT
Supply voltage, V_{CC}	4.75	5	5.25	V
High-level input voltage, V_{IH}	2			V
Low-level input voltage, V_{IL}			0.8	V
High-level output current, I_{OH}			−50	mA
Low-level output current, I_{OL}			50	mA
Operating free-air temperature, T_A	0		70	°C

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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} = 4.75 V,	I_I = − 18 mA			−1	−1.2	V
V_{OH}	High-level output voltage	V_{CC} = 4.75 V, V_{IH} = 2 V, V_{IL} = 0.8 V		I_{OH} = − 10 mA	2.5	3.5		V
				I_{OH} = − 40 mA	2			
V_{OL}	Low-level output voltage	V_{CC} = 4.75 V, V_{IH} = 2 V, I_{OL} = 40 mA		V_{IL} = 0.8 V,			0.5	V
$|V_{OD1}|$	Magnitude of differential output voltage	V_{CC} = 5.25 V,	I_O = 0				$2V_{OD2}$	V
$|V_{OD2}|$	Magnitude of differential output voltage				2			V
$\Delta|V_{OD}|$	Change in magnitude of differential output voltage‡	V_{CC} = 4.75 V to 5.25 V, R_L = 100 Ω, See Figure 1					±0.4	V
V_{OC}	Common-mode output voltage§						3	V
$\Delta|V_{OC}|$	Change in magnitude of common-mode output voltage‡						±0.4	V
I_O	Output current with power off	V_{CC} = 0	V_O = 6 V			0.1	100	μA
			V_O = − 0.25 V			−0.1	−100	
			V_O = − 0.25 V to 6 V				±100	
I_I	Input current	V_{CC} = 5.25 V,	V_I = 5.5 V				50	μA
I_{IH}	High-level input current	V_{CC} = 5.25 V,	V_I = 2.7 V				25	μA
I_{IL}	Low-level input current	V_{CC} = 5.25 V,	V_I = 0.5 V				−200	μA
I_{OS}	Short-circuit output current¶	V_{CC} = 5.25 V,	V_O = 0		−50		−150	mA
I_{CC}	Supply current (both drivers)	V_{CC} = 5.25 V, No load,	All inputs at 0 V			45	65	mA

† All typical values are at V_{CC} = 5 V and T_A = 25°C.
‡ Δ| V_{OD} | and Δ| V_{OC} | are the changes in magnitude of V_{OD} and V_{OC}, respectively, that occur when the input is changed from a high level to a low level or vice versa.
§ In Standard EIA-422-A, V_{OC}, which is the average of the two output voltages with respect to ground, is called output offset voltage, V_{OS}.
¶ Only one output at a time should be shorted, and duration of the short circuit should not exceed one second.

switching characteristics, V_{CC} = 5 V, T_A = 25°C

	PARAMETER	TEST CONDITIONS	MIN	TYP	MAX	UNIT
$t_{d(OD)}$	Differential output delay time	C_L = 15 pF, R_L = 100 Ω, See Figure 2		10	20	ns
$t_{t(OD)}$	Differential output transition time			10	20	ns
$t_{sk(o)}$	Output skew	See Figure 2		1		ns

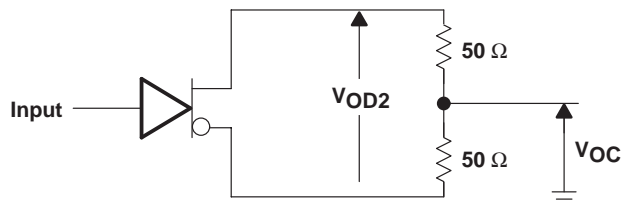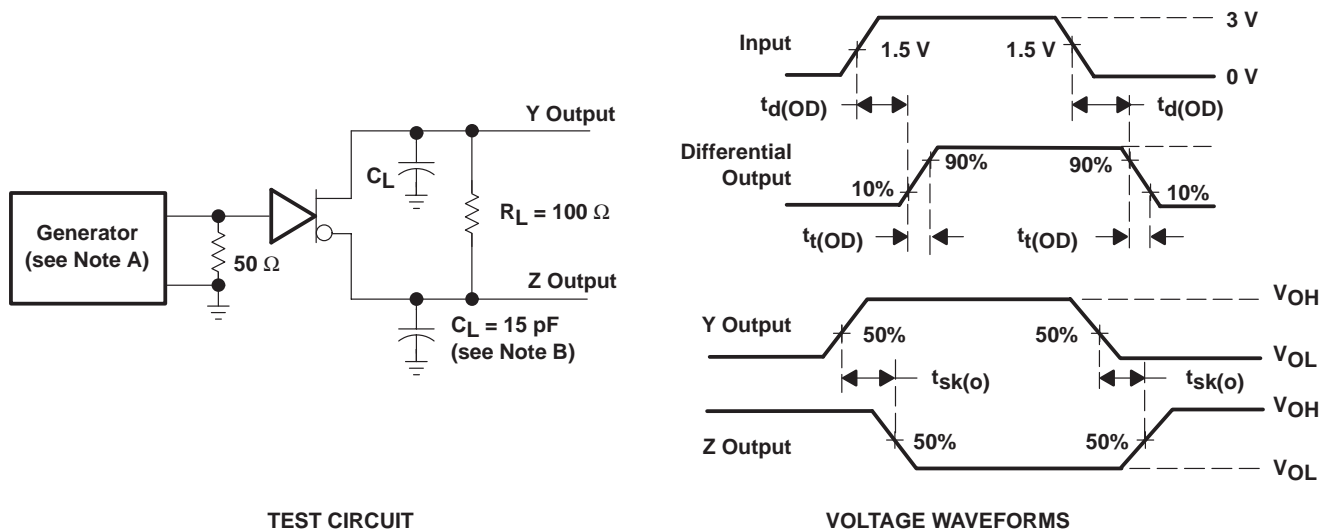## PARAMETER MEASUREMENT INFORMATION

Figure 1. Differential and Common-Mode Output Voltages

TEST CIRCUIT

VOLTAGE WAVEFORMS

NOTES: A. The input pulse generator has the following characteristics: $Z_O = 50\ \Omega$, PRR $\leq$ 500 kHz, t_w = 100 ns, $t_r = \leq$ 5 ns.
B. C_L includes probe and jig capacitance.

Figure 2. Test Circuit and Voltage Waveforms

PACKAGING INFORMATION

Orderable Device	Status [1]	Package Type	Package Drawing	Pins	Package Qty	Eco Plan [2]	Lead/Ball Finish	MSL Peak Temp [3]
UA9638CD	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
UA9638CDE4	ACTIVE	SOIC	D	8	75	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
UA9638CDR	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
UA9638CDRG4	ACTIVE	SOIC	D	8	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
UA9638CP	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC
UA9638CPE4	ACTIVE	PDIP	P	8	50	Pb-Free (RoHS)	CU NIPDAU	Level-NC-NC-NC

[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 - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check http://www.ti.com/productcontent for the latest availability information and additional product content details.
TBD: The Pb-Free/Green conversion plan has not been defined.
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 (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

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MECHANICAL DATA

MPDI001A – JANUARY 1995 – REVISED JUNE 1999

P (R-PDIP-T8)   **PLASTIC DUAL-IN-LINE**

0.400 (10,60)
0.355 (9,02)

8   5

0.260 (6,60)
0.240 (6,10)

1   4

0.070 (1,78) MAX

0.020 (0,51) MIN

0.200 (5,08) MAX

0.125 (3,18) MIN

Seating Plane

0.100 (2,54)

0.021 (0,53)
0.015 (0,38)

⊕ 0.010 (0,25) Ⓜ

0.325 (8,26)
0.300 (7,62)

0.015 (0,38)

Gage Plane

0.010 (0,25) NOM

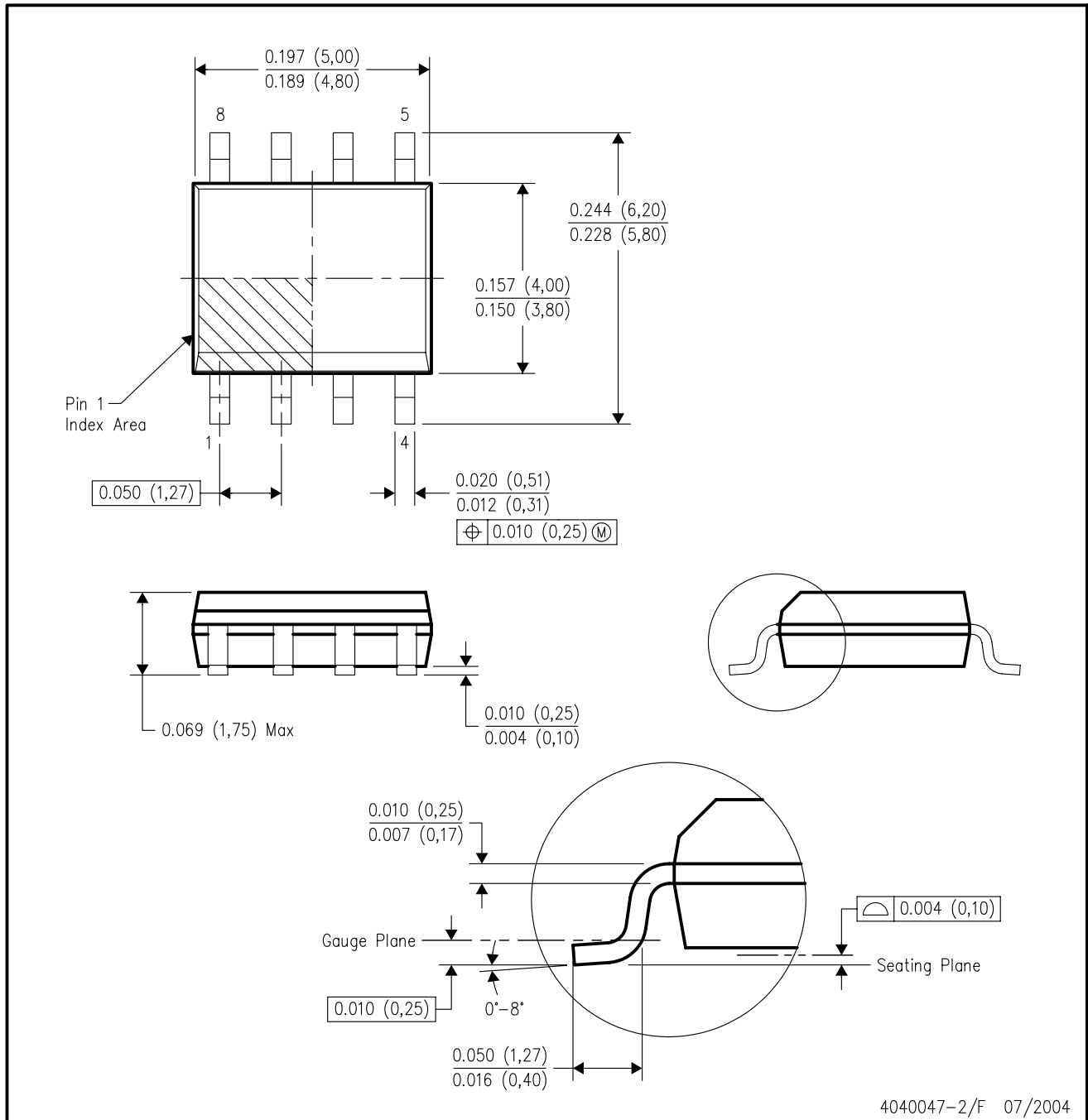0.430 (10,92)
MAX

4040082/D 05/98

NOTES: A.   All linear dimensions are in inches (millimeters).
         B.   This drawing is subject to change without notice.
         C.   Falls within JEDEC MS-001

For the latest package information, go to http://www.ti.com/sc/docs/package/pkg_info.htm

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D (R−PDSO−G8)   PLASTIC SMALL−OUTLINE PACKAGE

0.197 (5,00)
0.189 (4,80)

8   5

0.244 (6,20)
0.228 (5,80)

0.157 (4,00)
0.150 (3,80)

Pin 1
Index Area

1   4

0.050 (1,27)

0.020 (0,51)
0.012 (0,31)

⊕ 0.010 (0,25) Ⓜ

0.069 (1,75) Max

0.010 (0,25)
0.004 (0,10)

0.010 (0,25)
0.007 (0,17)

0.004 (0,10)

Gauge Plane

Seating Plane

0.010 (0,25)

0°−8°

0.050 (1,27)
0.016 (0,40)

4040047−2/F 07/2004

NOTES: A. All linear dimensions are in inches (millimeters).
        B. This drawing is subject to change without notice.
        C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
        D. Falls within JEDEC MS−012 variation AA.

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