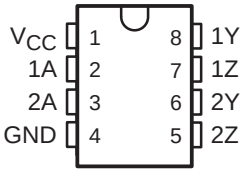
SLLS112C – OCTOBER 1980 – REVISED APRIL 1994

- **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)



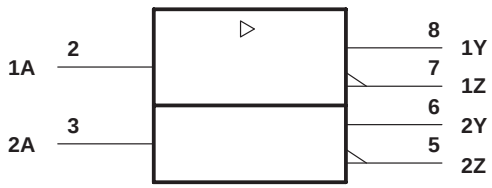
description

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.

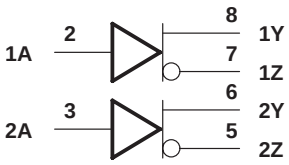
The uA9638C is characterized for operation from 0°C to 70°C.

logic symbol†

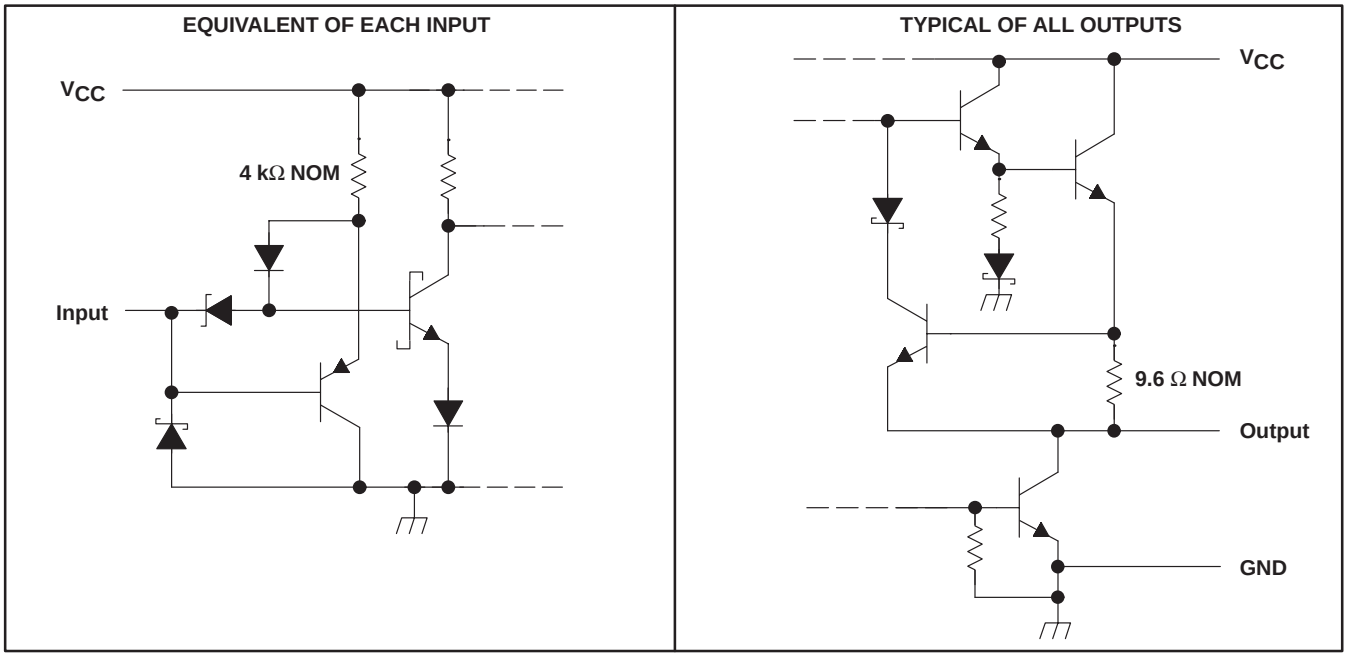


† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

logic diagram



schematics of inputs and 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

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	V_{CC} = 4.75 V to 5.25 V, See Figure 1		R_L = 100 Ω,	2			V
$\Delta\|V_{OD}\|$	Change in magnitude of differential output voltage‡						±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.
‡ $\Delta|V_{OD}|$ and $\Delta|V_{OC}|$ 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

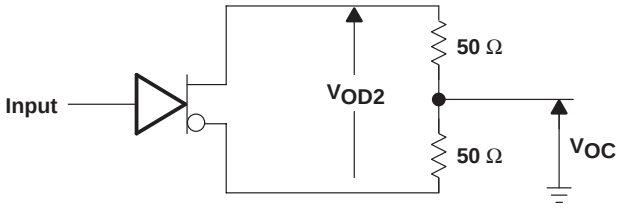
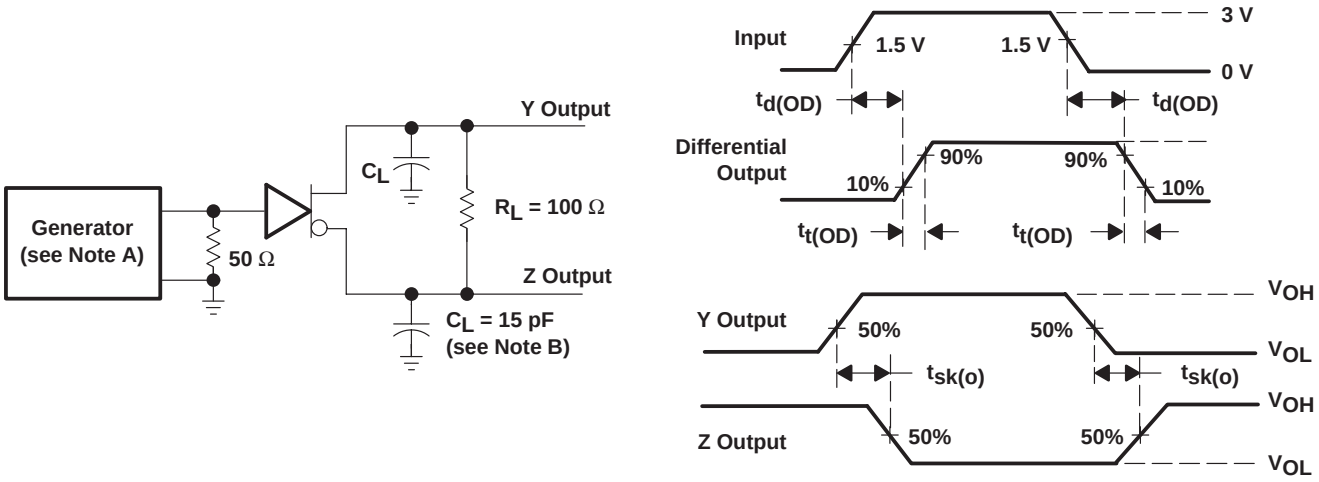


Figure 1. Differential and Common-Mode Output Voltages



TEST CIRCUIT **VOLTAGE WAVEFORMS**

NOTES: A. The input pulse generator has the following characteristics: Z_O = 50 Ω, PRR ≤ 500 kHz, t_W = 100 ns, t_r = ≤ 5 ns.
B. C_L includes probe and jig capacitance.

Figure 2. Test Circuit and Voltage Waveforms

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.