DS9638QML RS-422 Dual High Speed Differential Line Driver

Check for Samples: DS9638QML

FEATURES

- **Single 5V Supply**
- **Schottky Technology**
- **TTL and CMOS Compatible Inputs**
- **Output Short Circuit Protection**
- **Input Clamp Diodes**
- **Complementary Outputs**
- **Minimum Output Skew (<1.0 ns Typical)**
- **50 mA Output Drive Capability for 50Ω Transmission Lines**
- **Meets EIA RS-422 Specifications**
- **Propagation Delay of Less than 10 ns**
- **"Glitchless" Differential Output**
- **Delay Time Stable with V_{CC} and Temperature Variations (<2.0 ns typical) (Figure 4)**
- **Extended Temperature Range**

DESCRIPTION

The DS9638 is a Schottky, TTL compatible, dual differential line driver designed specifically to meet the EIA Standard RS-422 specifications. It is designed to provide unipolar differential drive to twisted pair or parallel wire transmission lines. The inputs are TTL compatible. The outputs are similar to totem pole TTL outputs, with active pull-up and pull-down. The device features a short circuit protected active pull-up with low output impedance and is specified to drive 50Ω transmission lines at high speed. The mini-CDIP provides high package density.

Connection Diagram

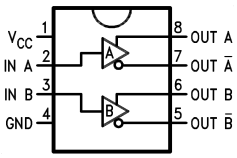

Figure 1. 8-Lead CDIP, Top View

These devices have limited built-in ESD protection. The leads should be shorted together or the device placed in conductive foam during storage or handling to prevent electrostatic damage to the MOS gates.

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Absolute Maximum Ratings(1)

Storage Temperature Range	Ceramic DIP	−65°C to +175°C
Lead Temperature	Ceramic DIP (Soldering, 60 sec.)	300°C
Maximum Power Dissipation at 25°C(2)	Cavity Package	1300 mW
V_{CC} Lead Potential to Ground		−5V to 7V
Input Voltage		−0.5V to +7V

(1) "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be ensured. They are not meant to imply that the devices should be operated at these limits. The tables of "Electrical Characteristics provide conditions for actual device operation.
(2) Derate cavity package 8.7 mW/°C above 25°C.

Recommended Operating Conditions

DS9638J/883	Min	Max	Units
Supply Voltage (V_{CC})	4.5	5.5	V
Output Current HIGH (I_{OH})		−50	mA
Output Current LOW (I_{OL})		50	mA
Operating Temperature (T_A)	−55	125	°C

Quality Conformance Inspection

MIL-STD-883, Method 5005 - Group A

Subgroup	Description	Temp (°C)
1	Static tests at	+25°C
2	Static tests at	+125°C
3	Static tests at	-55°C
4	Dynamic tests at	+25°C
5	Dynamic tests at	+125°C
6	Dynamic tests at	-55°C
7	Functional tests at	+25°C
8A	Functional tests at	+125°C
8B	Functional tests at	-55°C
9	Switching tests at	+25°C
10	Switching tests at	+125°C
11	Switching tests at	-55°C
12	Setting time at	+25°C
13	Setting time at	+125°C
14	Setting time at	-55°C

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DS9638J/883 Electrical Characteristics DC Parameters

Over recommended operating temperature and supply voltage ranges, unless otherwise specified

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-Groups
V_{OL}	Output Voltage Low	V_{CC} = 4.5V, F_{IOL} = 30mA for temp, F_{IOL} = 35mA for room	See (1)		0.5	V	1, 2, 3
VFCD	Input Clamped Voltage	V_{CC} = 4.5V, FIFCD = -18mA		-1.2		V	1, 2, 3
V_{OHQVT}	V_T, $\overline{V}_T$ Terminated Output Voltage	V_{CC} = 5.5V, R_O = 100 Ω		2		V	1, 2, 3
V_{OH}	Logical "1" Output Voltage	V_{CC} = 4.5V, F_{IOH} = -10mA		2.5		V	1
				2.0			2, 3
V_{OHQ}	Logical "1" Output Voltage	V_{CC} = 4.5V, F_{IOHQ} = -40mA		2.0		V	1
				1.0			2, 3
V_{OHQBAL}	V_T- $\overline{V}_T$ Output Balance	V_{CC} = 5.5V, R_O = 100 Ω		-0.4	0.4	V	1, 2, 3
I_{IL}	Logical "0" Input Current	V_{CC} = 5.5V, F_{VIIL}= 0.5V		-200		µA	1, 2, 3
I_{IH}	Logical "1" Input Current	V_{CC} = 5.5V, F_{VIIH} = 2.7V			25	µA	1, 2, 3
I_{IHQH}	Logical "1" Input Current	V_{CC} = 5.5V, FV_{IIHQH} = 5.5V			50	µA	1, 2, 3
I_{OS}	Output Short Circuit Current	V_{CC} = 5.5V, FV_{IOS} = 0V		-150	-50	mA	1
				-150	-40		2, 3
I_{CC}	Supply Current	V_{CC} = 5.5V, FV_{CCH} = 5.5V			65	mA	1
					75	mA	2, 3
I_{OHC}	I_O (off) Output Leakage	V_{CC} = 5.5V, FV_{OH} = 5.5V			200	µA	1
V_{OS}, $\overline{V}_{OS}$	Output Offset Voltage		See (2)		3	V	1, 2, 3
V_{OS}- $\overline{V}_{OS}$	Output Offset Balance		See (3)		.4	V	1, 2, 3
V_{IH}	Input High Voltage		See (4)	2		V	1, 2, 3
V_{IL}	Input Low Voltage		See (4)		0.5	V	1, 2, 3
V_{HB}	I_X Output Leakage	V_{CC} = 0.0V, FIOHBQI = 150 µA		5.55		V	1
I_{CEX}	Output Leakage Current	V_{CC} = 0.0V, FVCEX = 5.5V			150	µA	2, 3
I_{CEXQI}	Output Leakage Current	V_{CC} = 0.0V, FVICEXQ2 = -0.25V		-150		µA	2, 3

(1) 35mA is more stringent than 30mA.
(2) Specified by design.
(3) Specified by Vt- $\overline{V}_T$ test.
(4) Specified by V_{OH} & V_{OL} tests.

DS9638J/883 Electrical Characteristics AC Parameters

Over recommended operating temperature and supply voltage ranges, unless otherwise specified

Symbol	Parameter	Conditions	Notes	Min	Max	Units	Sub-Groups
t_{PLH}	Propagation Delay to High Level	V_{CC} = 5V, R_O = 100 Ω, C_L = 15_{PF}			20	nS	9
t_{PHL}	Propagation Delay to Low Level	V_{CC} = 5V, R_O = 100 Ω, C_L = 15_{PF}			20	nS	9
t_F	Fall Time	V_{CC} = 5V, 90% - 10%			20	nS	9
t_R	Rise Time	V_{CC} = 5V, 10% - 90%			20	nS	9

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Equivalent Circuit

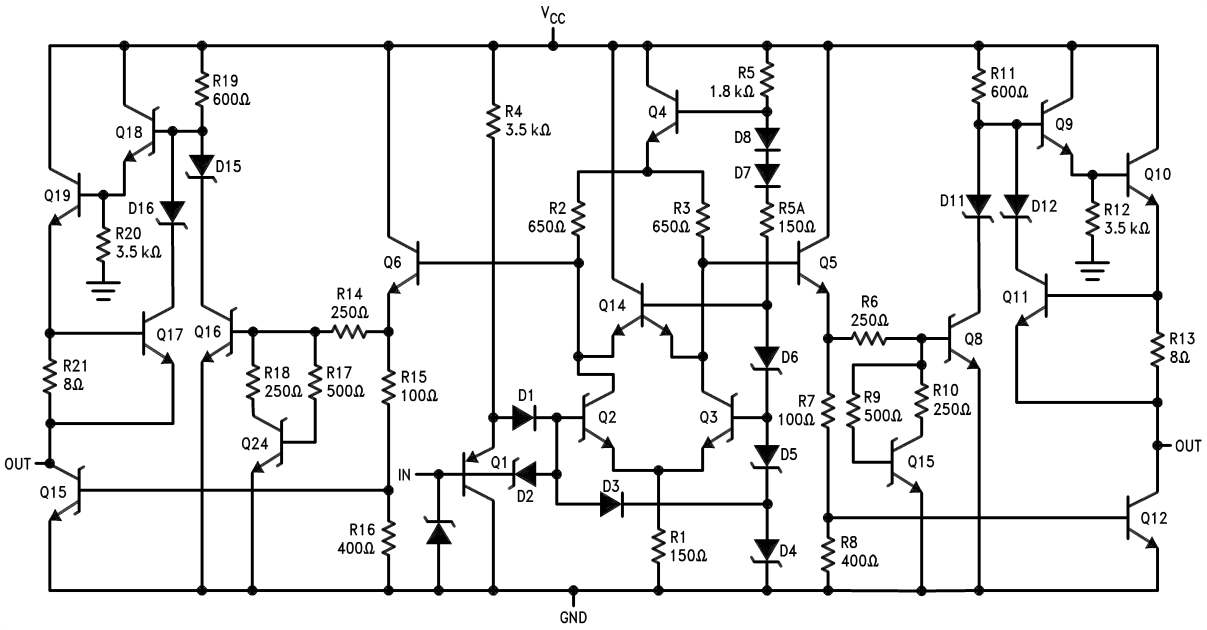


Figure 2.

DC Test Circuit

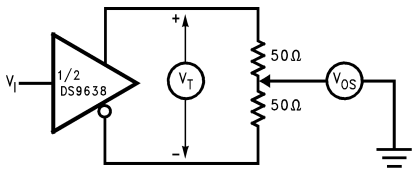
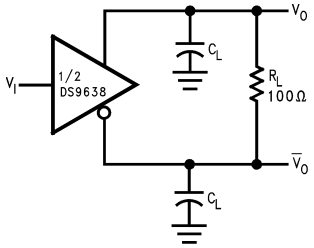


Figure 3. Terminated Output Voltage and Output Balance



The pulse generator has the following characteristics:
C_L includes probe and jig capacitance.
PRR = 500 kHz, t_W = 100 ns,
$t_r \le 5.0$ ns, $Z_O = 50\Omega$.

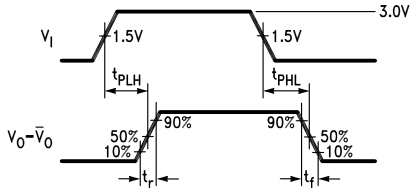


Figure 4. AC Test Circuit and Voltage Waveform

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Typical Delay Characteristics

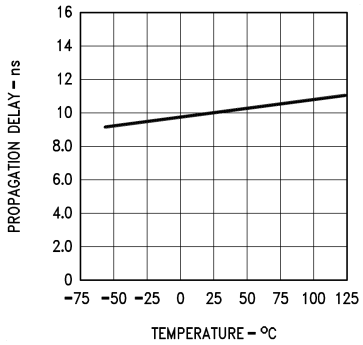

Figure 5.

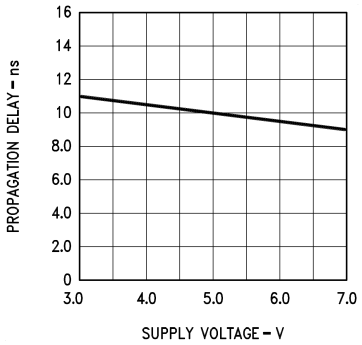

Figure 6.

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REVISION HISTORY

Date Released	Revision	Section	Originator	Changes
05/27/08	A	New Release, Corporate Format, Change to DC Electrical Section	Bill Petcher	1 MDS data sheet converted into one Corp. data sheet format. Change made to V_{OH}, V_{OHQ} and I_{OS}. MNDS9638-X, Rev. 0AL data sheet will be Archived.

Changes from Original (April 2013) to Revision A **Page**

- Changed layout of National Data Sheet to TI format 5

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PACKAGING INFORMATION

Orderable part number	Status (1)	Material type (2)	Package | Pins	Package qty | Carrier	RoHS (3)	Lead finish/ Ball material (4)	MSL rating/ Peak reflow (5)	Op temp (°C)	Part marking (6)
5962-8754601PA	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	SNPB	Level-1-NA-UNLIM	-55 to 125	DS9638J/883 5962-87546 01PA Q ACO 01PA Q >T
DS9638J/883	Active	Production	CDIP (NAB) | 8	40 | TUBE	No	SNPB	Level-1-NA-UNLIM	-55 to 125	DS9638J/883 5962-87546 01PA Q ACO 01PA Q >T

(1) **Status:** For more details on status, see our product life cycle.

(2) **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

(3) **RoHS values:** Yes, No, RoHS Exempt. See the TI RoHS Statement for additional information and value definition.

(4) **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

(5) **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

(6) **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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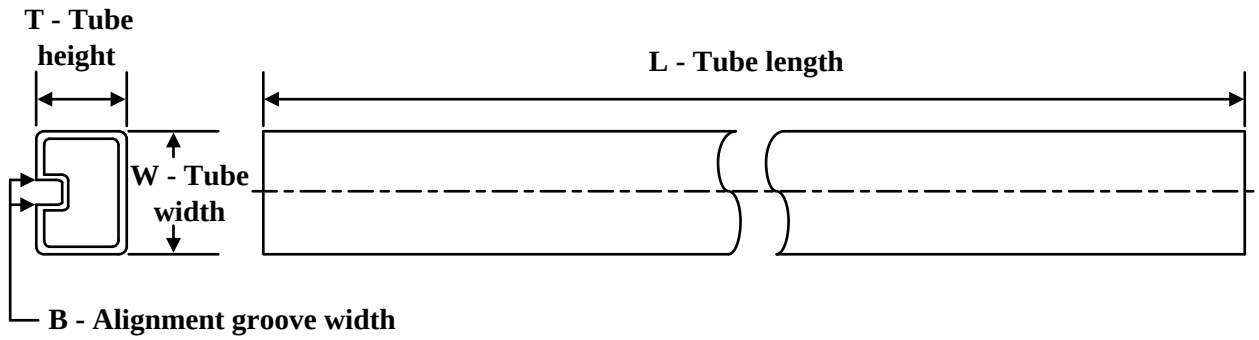
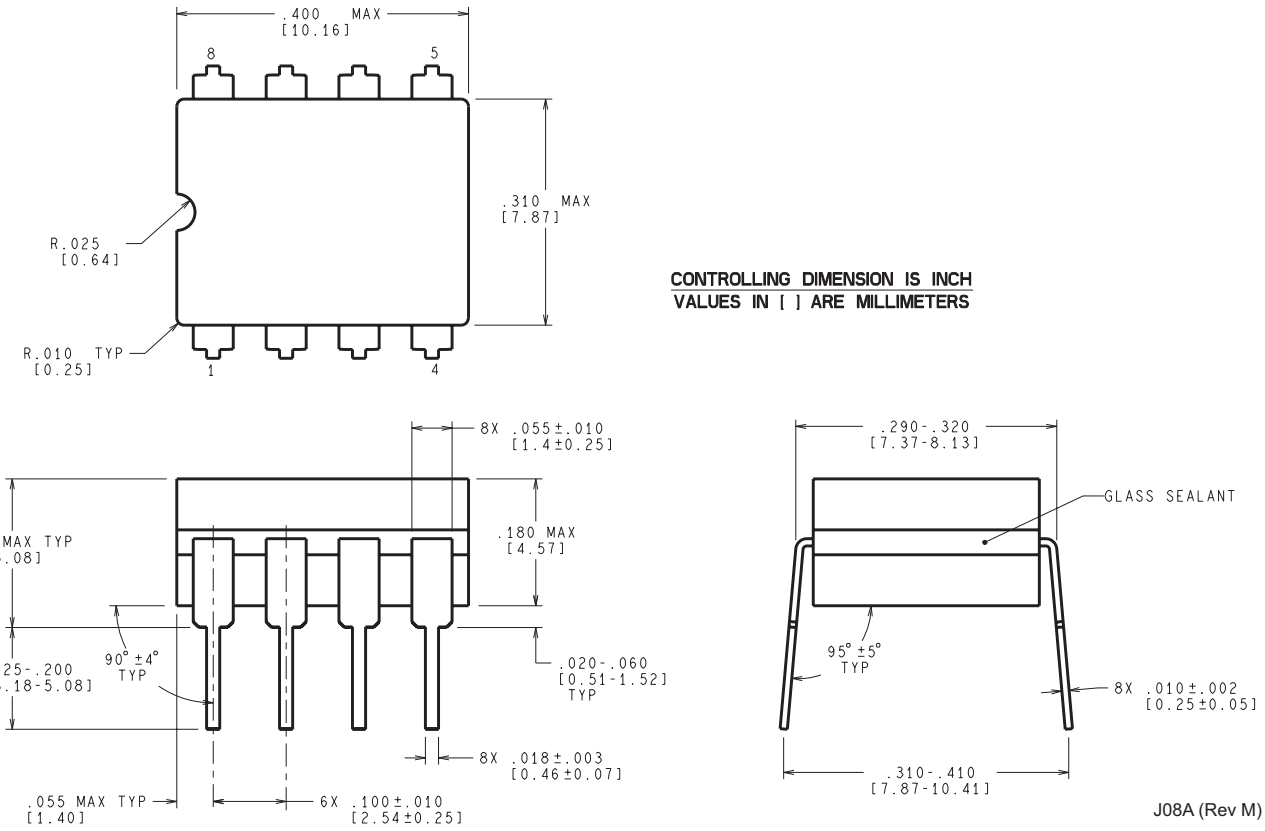
TUBE



*All dimensions are nominal

Device	Package Name	Package Type	Pins	SPQ	L (mm)	W (mm)	T (µm)	B (mm)
5962-8754601PA	NAB	CDIP	8	40	506.98	15.24	13440	NA
DS9638J/883	NAB	CDIP	8	40	506.98	15.24	13440	NA

NAB0008A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8
5
.310 MAX
[7.87]
R.025
[0.64]
R.010 TYP
[0.25]
1
4
CONTROLLING DIMENSION IS INCH
VALUES IN [ ] ARE MILLIMETERS
8X .055±.010
[1.4±0.25]
.200 MAX TYP
[5.08]
.180 MAX
[4.57]
8X .125-.200
[3.18-5.08]
90° ±4°
TYP
.020-.060
[0.51-1.52]
TYP
8X .018±.003
[0.46±0.07]
.055 MAX TYP
[1.40]
6X .100±.010
[2.54±0.25]
.290-.320
[7.37-8.13]
GLASS SEALANT
95° ±5°
TYP
8X .010±.002
[0.25±0.05]
.310-.410
[7.87-10.41]
J08A (Rev M)

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