

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

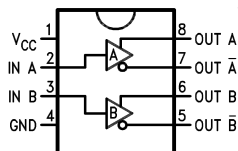


Figure 1. 8-Lead CDIP, Top View



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.



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

All trademarks are the property of their respective owners.

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

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
V_FCD	Input Clamped Voltage	$V_{CC} = 4.5V$, $F_{IFCD} = -18mA$		-1.2		V	1, 2, 3
V_{OHQVT}	V_T , \bar{V}_T Terminated Output Voltage	$V_{CC} = 5.5V$, $R_O = 100 \Omega$		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 , \bar{V}_T Output Balance	$V_{CC} = 5.5V$, $R_O = 100 \Omega$		-0.4	0.4	V	1, 2, 3
I_{IL}	Logical "0" Input Current	$V_{CC} = 5.5V$, $F_{VII} = 0.5V$		-200		μA	1, 2, 3
I_{IH}	Logical "1" Input Current	$V_{CC} = 5.5V$, $F_{VIH} = 2.7V$			25	μA	1, 2, 3
I_{IHQH}	Logical "1" Input Current	$V_{CC} = 5.5V$, $F_{VIIHQH} = 5.5V$			50	μA	1, 2, 3
I_{OS}	Output Short Circuit Current	$V_{CC} = 5.5V$, $F_{V_{IOS}} = 0V$		-150	-50	mA	1
				-150	-40		2, 3
I_{CC}	Supply Current	$V_{CC} = 5.5V$, $F_{V_{CCH}} = 5.5V$			65	mA	1
					75		2, 3
I_{OHC}	I_O (off) Output Leakage	$V_{CC} = 5.5V$, $F_{V_{OH}} = 5.5V$			200	μA	1
V_{OS} , \bar{V}_{OS}	Output Offset Voltage		See (2)		3	V	1, 2, 3
V_{OS} , \bar{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	$V_{CC} = 0.0V$, $F_{IOHBQI} = 150 \mu A$		5.55		V	1
I_{CEX}	Output Leakage Current	$V_{CC} = 0.0V$, $F_{V_{CEX}} = 5.5V$			150	μA	2, 3
I_{CEXQI}	Output Leakage Current	$V_{CC} = 0.0V$, $F_{VICEXQ2} = -0.25V$		-150		μA	2, 3

(1) 35mA is more stringent than 30mA.

(2) Specified by design.

 (3) Specified by V_T - \bar{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	$V_{CC} = 5V$, $R_O = 100 \Omega$, $C_L = 15pF$			20	nS	9
t_{PHL}	Propagation Delay to Low Level	$V_{CC} = 5V$, $R_O = 100 \Omega$, $C_L = 15pF$			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

Equivalent Circuit

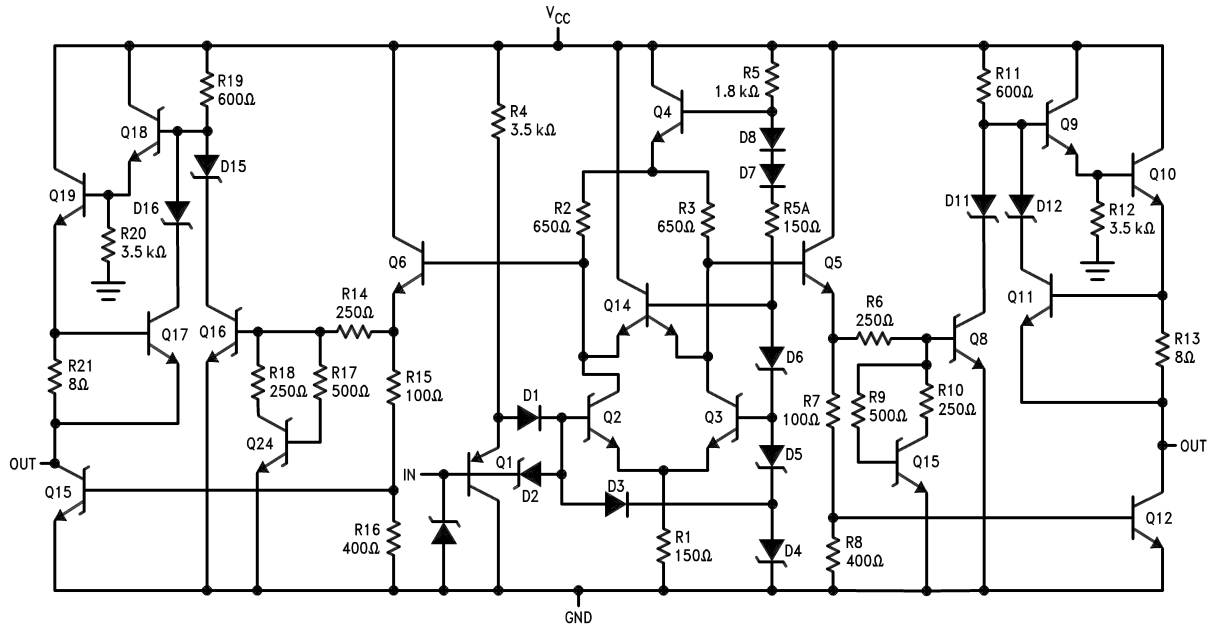


Figure 2.

DC Test Circuit

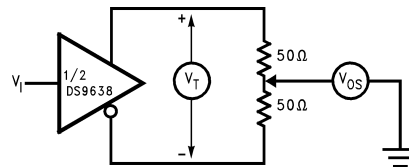
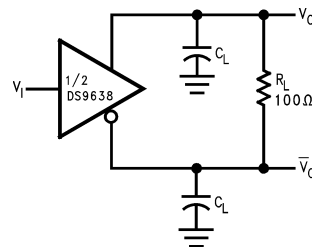


Figure 3. Terminated Output Voltage and Output Balance



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

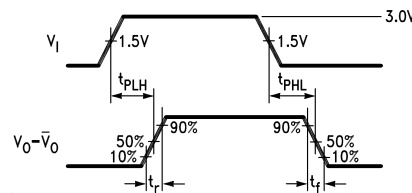


Figure 4. AC Test Circuit and Voltage Waveform

Typical Delay Characteristics

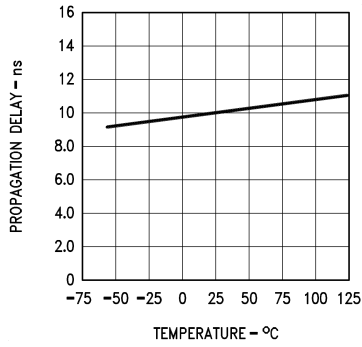


Figure 5.

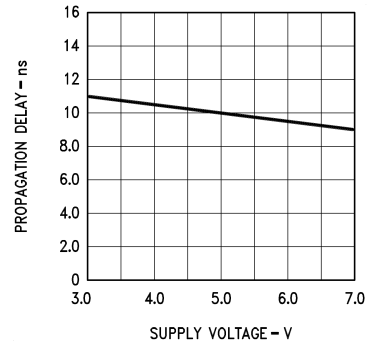


Figure 6.

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**

PACKAGING INFORMATION

Orderable Device	Status (1)	Package Type	Package Drawing	Pins	Package Qty	Eco Plan (2)	Lead finish/ Ball material (6)	MSL Peak Temp (3)	Op Temp (°C)	Device Marking (4/5)	Samples
5962-8754601PA	ACTIVE	CDIP	NAB	8	40	Non-RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS9638J/883 5962-87546 01PA Q ACO 01PA Q >T	
DS9638J/883	ACTIVE	CDIP	NAB	8	40	Non-RoHS & Green	Call TI	Level-1-NA-UNLIM	-55 to 125	DS9638J/883 5962-87546 01PA Q ACO 01PA Q >T	

(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.

OBSELETE: TI has discontinued the production of the device.

(2) **RoHS:** TI defines "RoHS" to mean semiconductor products that are compliant with the current EU RoHS requirements for all 10 RoHS substances, including the requirement that RoHS substance do not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, "RoHS" products are suitable for use in specified lead-free processes. TI may reference these types of products as "Pb-Free".

RoHS Exempt: TI defines "RoHS Exempt" to mean products that contain lead but are compliant with EU RoHS pursuant to a specific EU RoHS exemption.

Green: TI defines "Green" to mean the content of Chlorine (Cl) and Bromine (Br) based flame retardants meet JS709B low halogen requirements of <=1000ppm threshold. Antimony trioxide based flame retardants must also meet the <=1000ppm threshold requirement.

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

(6) Lead finish/Ball material - Orderable Devices 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.

Important Information and Disclaimer:The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and

continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

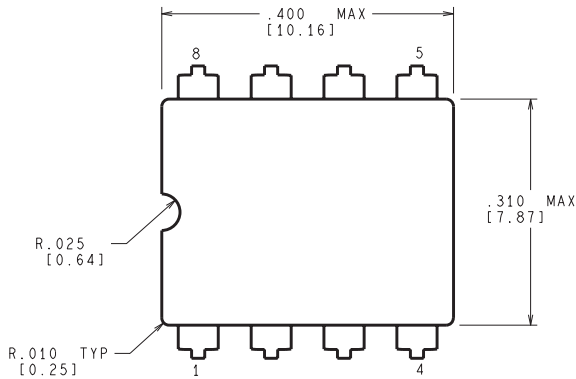
In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

TUBE

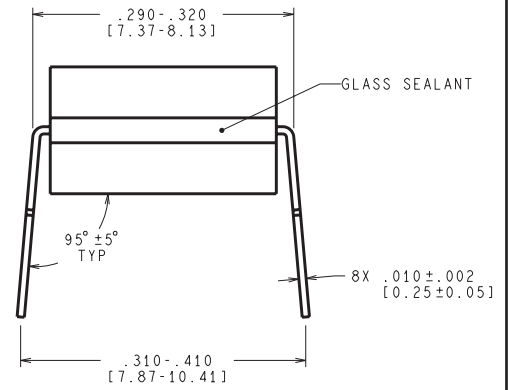

*All dimensions are nominal

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



CONTROLLING DIMENSION IS INCH
VALUES IN [] ARE MILLIMETERS



J08A (Rev M)

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATA SHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, regulatory or other requirements.

These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to [TI's Terms of Sale](#) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

TI objects to and rejects any additional or different terms you may have proposed.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2022, Texas Instruments Incorporated