



钜地半导体
Tudi Semiconductor

Product Specification

TUDI-L9616

Automotive high speed CAN bus transceiver

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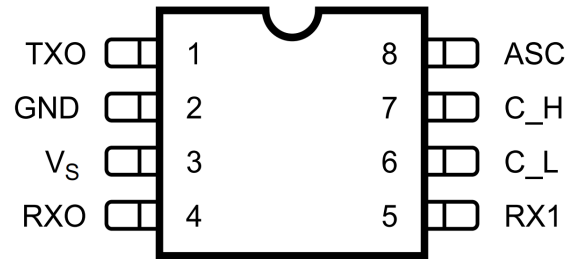
**semiconductor device
manufacturer**

- Design
- research and development
- production
- and sales



Features

- AEC-Q100 qualified
- ISO/DIS 11898 up to 1 Mbaud
- Transmitter:
 - Generation of differential output signals
 - Short circuit protected from -5 V to 36 V, detection and shutdown
 - Slope control to reduce RFI and EMI
 - Two states adjustable slope control (Mbaud / $\leq 1 \leq 250$ Kbaud)
- Receiver:
 - Differential input with high interference suppression
 - Common mode input voltage range (VCOM) from -2 V to V_S+3 V
- ESD protection level up to 4 kV
- Package: SO-8



SOP8

Description

The L9616 is a bidirectional transceiver for signal conditioning and processing in connection with a CAN controller. Data rates of up to 1 Mbaud are supported using either shielded or non-shielded pair of lines.



Pins description

Pin#	Name	Function
1	TXO	Transmitter input
2	GND	Ground
3	Vs	Supply voltage
4	RXO	Receive output
5	RX1	Reference voltage
6	C_L	Low side bus output
7	C_H	High side bus output
8	ASC	Adjustable slope control

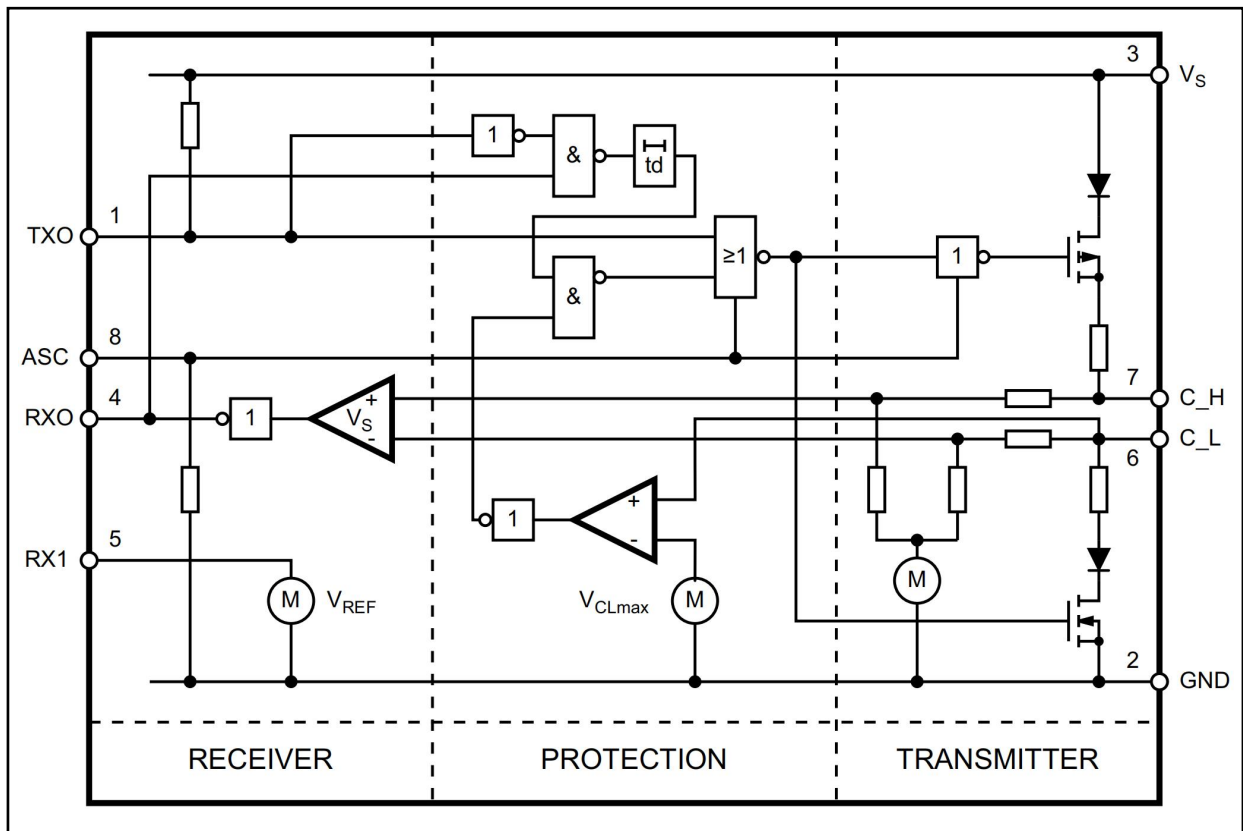


Figure 1. Block diagram



Electrical specifications

Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_S	Supply voltage	-0.3 to 7	V
V_{C_H}, V_{C_L}	Bus voltage at C_H, C_L ($V_S=0$ to 5.5V)	-5 to 36	V
I_{C_H}, I_{C_L}	Off state leakage current at C_H, C_L ($V_S=0$ to 5.5V, $V_{C_H}=-5$ to 36V, $V_{C_L}=-5$ to 36V)	-3 to 5	mA
V_{DC}	DC voltage at TXO, ASC ($V_S=0$ to 5.5V)	GND-0.3 to $V_S+0.3$	V
I_{RXO}	Output current at RXO ($V_S=0$ to 5.5V)	-0.3 to 1	mA
T_{stg}, T_J	Storage and junction temperature range	-40 to 150	°C
T_{op}	Operating temperature range	-40 to 125	°C

Note: All voltages, except bus voltage, are defined with respect to pin 2. Positive currents flow into the IC.

Electrical characteristics

$T_{OP} = -40$ to 125 °C; $V_S = 4.5$ to 5.5 V; Dominant: $V_{TXO} = GND$; Recessive: $V_{TXO} = V_S$; All voltages, except bus voltage, are defined with respect to pin 2. Positive currents flow into the IC unless otherwise specified.

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V _S	Supply voltage		4.5	5	5.5	V
I _S	Supply current	Dominant	-	-	80	mA
		Recessive	-	-	20	mA
Transmitter Section(R _A =60 Ωbetween C _H and C _L)						
C _{TXO}	TXO input capacitance	0V<V _{TXO} <V _S	-	25	-	pF
V _{TXO}	TXO high level input voltage	-	0.7 V _S	-	V _S	-
	TXO low level input voltage	-	0	-	0.3 V _S	-
I _{TXO}	TXO high level input current	V _{TXO} =V _S	-2	0	2	μA
	TXO low level input current	V _{TXO} =GND	-275	0	-25	μA
C _{ASC}	ASC input capacitance	0V<V _{ASC} <V _S	-	25	-	pF



Electrical characteristics (continued)

Symbol	Parameter	Test condition	Min.	Typ.	Max.	Unit
V_{ASC}	ASC input voltage for highspeed	-	0	-	0.1 V_S	-
	ASC input voltage for low speed	-	0.9 V_S	-	V_S	-
I_{ASC}	ASC input current	$V_{ASC}=V_S$	25	-	275	μA
		$V_{ASC}=0V$	-2	0	2	μA
V_{C_H}, V_{C_L}	Bus voltage recessive	Recessive	0.4 V_S	0.5 V_S	0.6 V_S	-
I_{C_H}, I_{C_L}	Leakage current recessive	$V_{C_L}=V_{C_H}=-2$ to 7V	-0.7	-	0.7	mA
		$V_{C_L}=V_{C_H}=1$ to 4V	-0.3	-	0.3	mA
$R_{IN(C_H,C_L)}$	Input resistance	Recessive	5	-	50	k
$R_{Dif(C_H,C_L)}$	Differential input resistance	Recessive	10	-	100	k Ω
$V_{Dif}=V_{C_H}-V_{C_L}$	Differential output voltage	Dominant, R_A	1.5	-	3	V
		Recessive	-500	0	50	mV
t_d	Short circuit detection time C_H to C_L ; C_H to B	$R_{CS}<1\Omega$	1	5	10	μs
I_A	Supply current in case of short circuit, C_H to C_L , C_H to B (time = t_d)			150	-	mA
V_{C_Lmax}	Overvoltage protection threshold on C_L	-	7	8	10	V
Receive section						
V_{RXO}	RXO high level output voltage	$V_{Dif}<0.5V$; $I_{RXO}=0.3$ mA; $V_{C_H}=-2$ to 7 V; $V_{C_L}=-2$ to 7V;	0.9 V_S	-	V_S	V
	RXO low level output voltage	$V_{Dif}>0.9V$; $I_{RXO}=1$ mA; $V_{C_H}=-2$ to 7 V; $V_{C_L}=-2$ to 7V;	-	-	0.5	V
$V_S=V_{C_H}-V_{C_L}$	Input signal threshold	$V_{C_H}=-2$ to 7V; $V_{C_L}=-2$ to 7V	500	700	900	mV
$V_{COM}=(V_{C_H}+V_{C_L})/2$	Input common mode voltage range	-	-2	-	7	V
V_{HYS}	Differential input hysteresis	-	-	150	-	mV
REFERENCE OUTPUT						
V_{RX1}	Reference voltage	$I_{RX1}=0$	0.45 V_S	0.5 V_S	0.55 V_S	V
R_{RX1}	Output resistance	-	2	-	9	k Ω

Dynamic characteristics

$C_A = 47 \text{ pF}$ between C_H and C_L ; $V_S = 5 \text{ V}$; $t_R < 5 \text{ ns}$; $C_{RXO} = 20 \text{ pF}$ between R_{XO} and B ; $R_A = 60 \Omega$ between C_H and C_L .

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
t_{OT}	Signal Delay TXO to C_H, C_L	-		-	50	ns
S_R	Differential Output Slew Rate (Transmitter)	$V_{ASC}=0V$	20	-	50	V/ μ s
		$V_{ASC}=V_S$	5	-	20	V/ μ s
t_{OR}	Signal Delay C_H, C_L to R_{XO}	$V_{ASC}=0V$	-	-	150	ns
t_{OTR}	Signal Delay TXO to R_{XO}	$V_{ASC}=0V$		-	300	ns

Functional description

The L9616 is used as an interface between a CAN controller and the physical bus. The device provides transmitting capability to the CAN controller.

The transmitter outputs C_H and C_L are protected against short circuits and electrical transients which may occur in an automotive environment.

In case of short circuit (C_H to C_L , C_H to B) the protection circuit recognizes this fault condition and the transmitter output stages are disabled with a delay of max. 10 ms to prevent destruction of the IC and high consumption of supply current I_S . If $V_{C_L} > V_{C_L \text{ max}}$ the transmitter output stages would be disabled immediately.

Pin ASC makes it possible to select two different modes of operation: high speed ($\leq 1 \text{ Mbaud}$) and low speed ($\leq 250 \text{ kbaud}$).

The ASC pin is tied to GND for normal operation at $\leq 1 \text{ Mbaud}$. For slower speed operation at $\leq 250 \text{ kbaud}$ the rise and fall slope of the bus output can be decreased to reduce EMI by connecting the ASC pin to V_S .

Functional table

TXO	C_H	C_L	Bus state	R XO
L	H	L	Dominant	L
H or Floating	Floating $V_S/2$	Floating $V_S/2$	Recessive	H

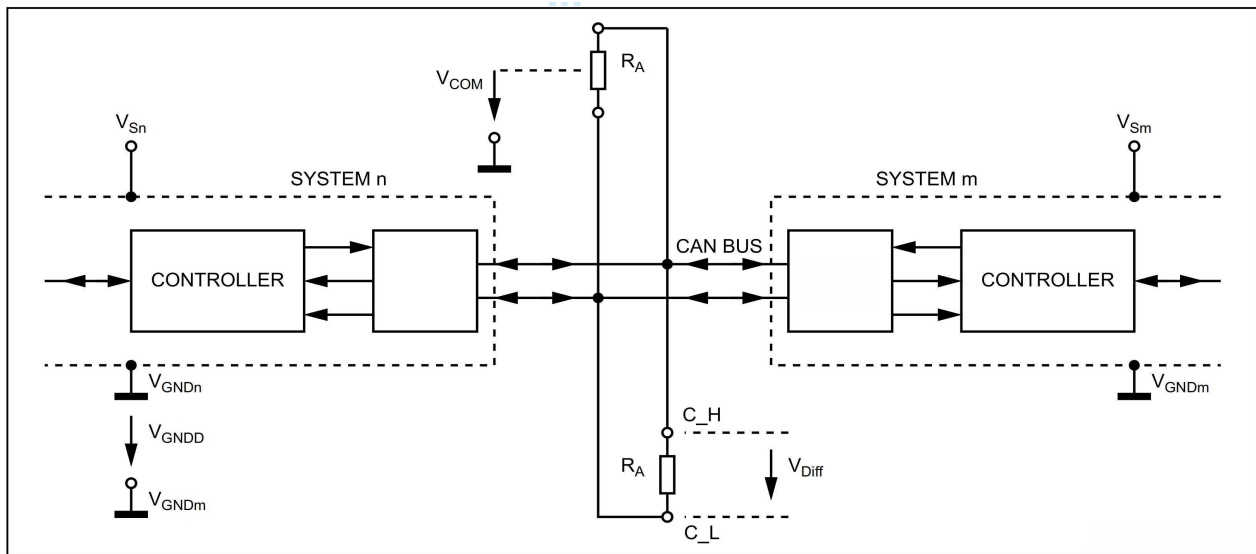


Figure 2. Typical application

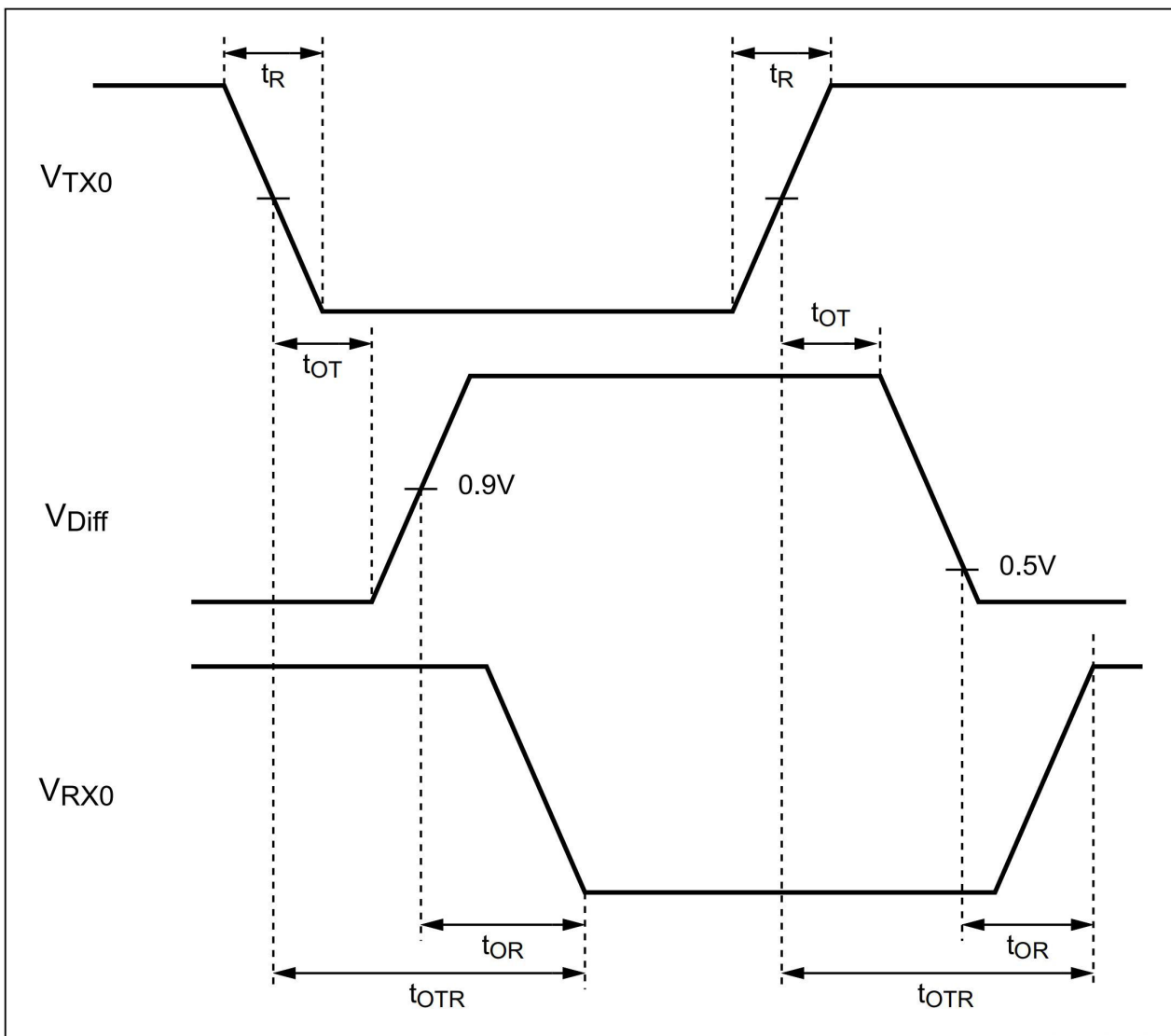


Figure 3. Timing diagram



Order information

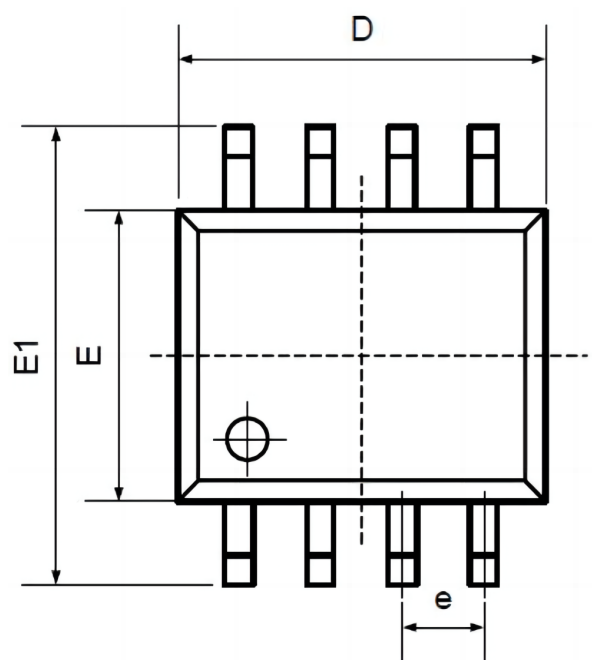
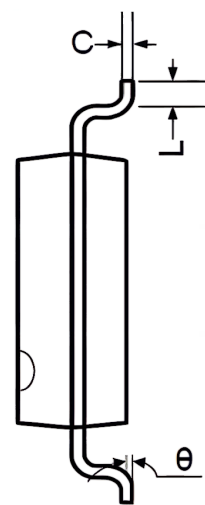
Order Number	Package	Package Quantity	Marking On The park	Temperature
L9616-TR-TUDI	SOP8	Tape,Reel,4000	L9616	-40°C to 110°C
			L9616D	

Revision history

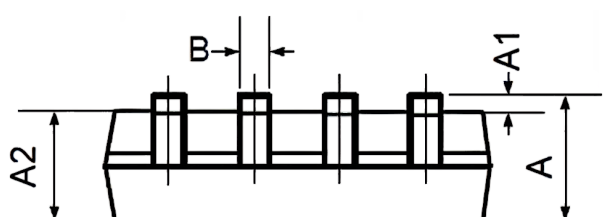
	Date	Revision	Page
V1.0	2020/7	New	1-12
V1.1	2025-3	Update model and PDF template	1-10



Package SOP8



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
B	0.330	0.510	0.013	0.020
C	0.190	0.250	0.007	0.010
D	4.780	5.000	0.188	0.197
E	3.800	4.000	0.150	0.157
E1	5.800	6.300	0.228	0.248
e	1.270TYP		0.050TYP	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°





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