

HIGH SPEED CAN BUS TRANSCEIVER

- L9616 MEETS ISO/DIS 11898 UP TO 1MEGABAUD
- TRANSMITTER
 - GENERATION OF DIFFERENTIAL OUTPUT SIGNALS
 - SHORT CIRCUIT PROTECTED FROM -5V TO 36V, DETECTION & SHUTDOWN
 - SLOPE CONTROL TO REDUCE RFI AND EMI
 - TWO STATES ADJUSTABLE SLOPE CONTROL (≤1MEGABAUD/≤250KBAUD)
- RECEIVER
 - DIFFERENZIAL INPUT WITH HIGH INTERFERENCE SUPPRESSION
 - COMMON MODE INPUT VOLTAGE RANGE (V_{COM}) FROM -2V TO V_{S} +3V
- ESD PROTECTION LEVEL UP TO 4kV
- PACKAGE: SO-8

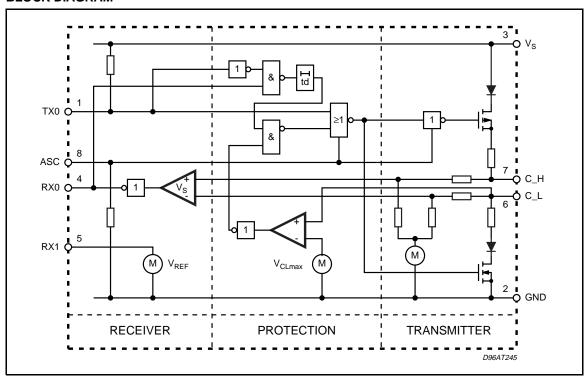


conditioning and processing in connection with a CAN controller. Data rates of up to 1MEGABAUD are supported using either shielded or non-shielded pair of lines.

DESCRIPTION

The L9616 is a bidirectional transceiver for signal

BLOCK DIAGRAM



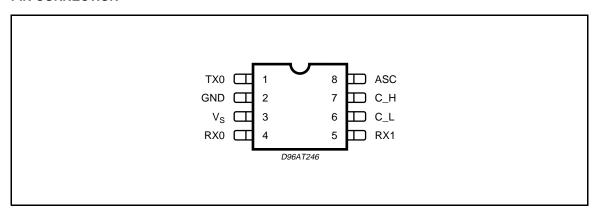
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ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
Vs	Supply Voltage	-0.3 to 7	V
V _{C_H} , V _{C_L}	Bus Voltage at C_H, C_L (VS 0 to 5.5V)	-5 to 36	V
I _{C_H} , I _{C_L}	Off State Leakage Current at C_H, C_L (VS =0 to 5.5V, V_{C_H} = -5 to 36V, V_{C_L} = -5 to 36)	-3 to 5	mA
V_{DC}	DC Voltage at TXO, ASC (VS 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	ပ္
T _{op}	Operating Temperature Range	-40 to 125	°C

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

PIN CONNECTION



THERMAL DATA

Symbol	Parameter	Value	Unit

PIN FUNCTIONS

N.	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				

ELECTRICAL CHARACTERISTICS (T_{OP} = -40 to 125°C; V_S = 4.5 to 5.5V; Dominat: VTXO = GND; Recessive: VTXO = Vs; 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.	Тур.	Max.	Unit
Vs	Supply Voltage		4.5	5	5.5	V
Is	Supply Current	Dominant			80	mΑ
		Recessive			20	mA
TRANSMIT	TER SECTION (RA = 60Ω bet	ween C_H and C_L)				
Стхо	TXO Input Capacitance	0V < VTXO < Vs		25		pF
VTXO	TXO High Level Input Voltage		0.7 V _S		Vs	
	TXO Low Level Input Voltage		0		0.3 V _S	
Ітхо	TXO High Level Input Current	VTXO = Vs	-2	0	2	μΑ
	TXO Low Level Input Current	VTXO = GND	-275	0	-25	μΑ
Casc	ASC Input Capacitance	0V < VASC < VS		25		pF
Vasc	ASC Input Voltage for High Speed		0		0.1 Vs	
	ASC Input Voltage for Low Speed		0.9 V _S		VS	
lasc	ASC Input Current	VASC = VS	25		275	μΑ
		Vasc = 0V	-2	0	2	μΑ
Vc_H, Vc_L	Bus Voltage Recessive	Recessive	0.4 V _S	0.5 Vs	0.6 Vs	
Ic_н, Ic_L	Leakage Current Recessive	VC_L = Vc_H = -2 to 7V	-0.7		0.7	mΑ
		Vc_L = Vc_H = 1 to 4V	-0.3		0.3	mΑ
RIN(C_H, C_L)	Input Resistence Recessive		5		50	ΚΩ
RDiff(C_H, C_L)	Differential Input Resistence	Recessive	10		100	ΚΩ
VDiff = VC_H - V C_L)	Differential Output Voltage	Dominant, R _A	1.5		3	V
V _{Diff} = V _{C_H} - V _{C_L)}	Differential Output Voltage	Recessive	-500	0	50	mV
t _d	Short Circuit Detection Time C_H to C_L; C_H to B	$Rcs < 1\Omega$	1	5	10	μs
IA	Supply Current in Case of Short Circuit, C_H to C_L, C_H to B (time = t_d)			150		mA
VC_Lmax	Overvoltage Protection Threshold on C_L		7	8	10	V
RECEIVE S	SECTION					
Vrxo	RXO High Level Output Voltage	V _{Diff} < 0.5V; I _{RXO} = 0.3mA; V _{C_H} = -2 to 7V; V _{C_L} = -2 to 7V;	0.9 Vs		Vs	V
	RXO Low Level Output Voltage	VDiff > 0.9V; IRXO = 1mA; VC_H = -2 to 7V; VC_L = -2 to 7V;			0.5	V
Vs = Vc_H -Vc_L	Input Signal Threshold	Vc_H = -2 to 7V; Vc_L = -2 to 7V;	500	700	900	mV
VCOM = (VC_H +VC_L)/2	Input Common Mode Voltage Range		-2		7	V
VHYS	Differential Input Hysteresis			150		mV
REFERENC	CE OUTPUT					
V _{RX1}	Reference Voltage	$I_{RX1} = 0$	0.45 V _S	0.5 Vs	0.55 Vs	V
R _{RX1}	Output Resistance		2		9	ΚΩ

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DINAMIC CHARACTERISTICS (C_A = 47pF between C_L and C_L ; V_S = 5V; t_R < 5ns; C_{RXO} = 20pF between RXO and B; R_A = 60 Ω between C_H and C_L)

Symbol	Parameter	Test Condition	Min.	Тур.	Max.	Unit
tот	Signal Delay TXO to C_H, C_L				50	ns
SR	Differential Output Slew Rate	VASC = 0V	20		50	V/μs
	(Transmitter)	VASC = VS	5		20	V/µs
tor	Signal Delay C_H, C_L to Rxo	VASC = 0V			150	ns
totr	Signal Delay Txo to Rxo	VASC = 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 conditionand the transmitter output stages are disabled with a delay of max. 10µs to prevent destruction of the IC and high consumption of supply current Is. If Vc_L >Vc_Lmax the transmitter output stages would be disabled immediately.

Pin ASC makes it possible to select two different

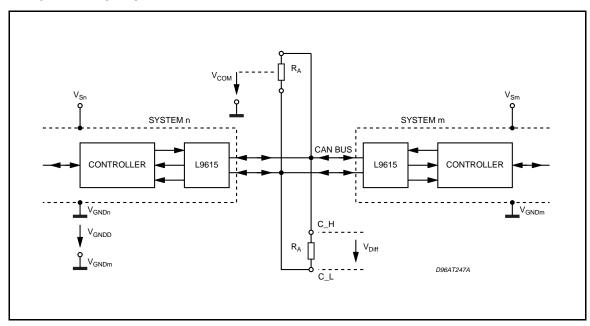
modes of operation: High speed (≤1MEGABaud) and low speed (≤250kBaud).

The ASC pin is tied to GND for normal operation at ≤1MEGABaud. For slower speed operation at ≤250kBaud the rise and fall slope of the bus output can be decreased to reduce EMI by connecting the ASC pin to Vs.

FUNCTIONAL TABLE

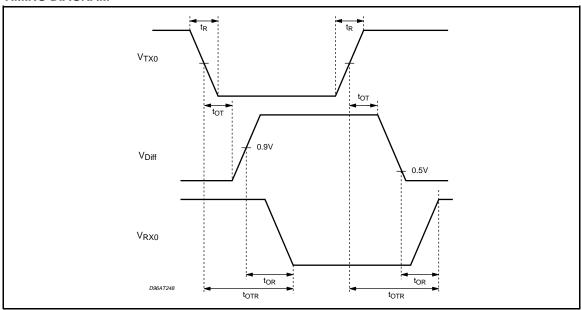
TXO	C_H	C_L	Bus State	RXO
L	Н	Ш	Dominant	Ш
H or Floating	Floating Vs/2	Floating Vs/2	Recessive	Η

TYPICAL APPLICATION

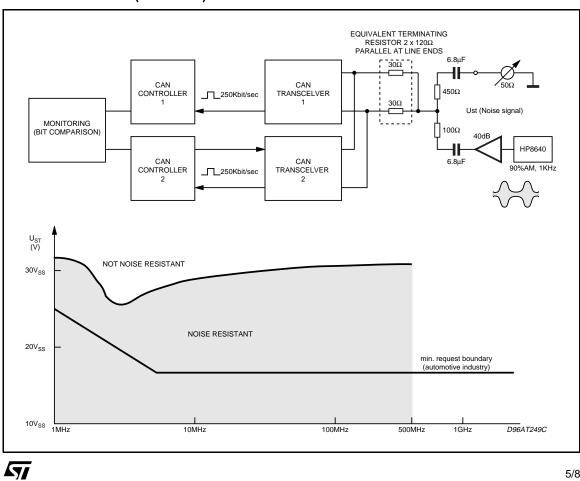


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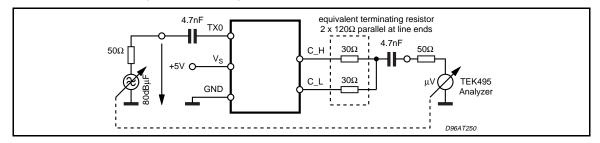
TIMING DIAGRAM



EMC PERFORMANCE (RECEIVER)

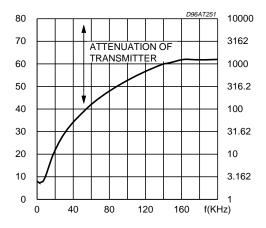


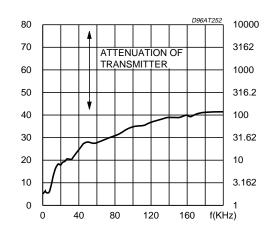
EMC PERFORMANCE (TRANSMITTER)



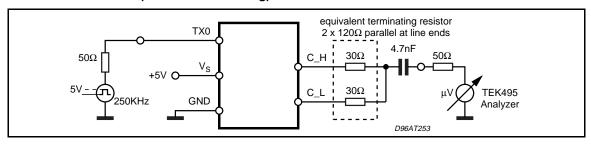
Transceiver Without Emc Reducing Measures

Transceiver With Emc Reducing Measures



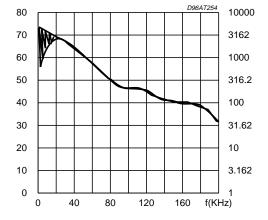


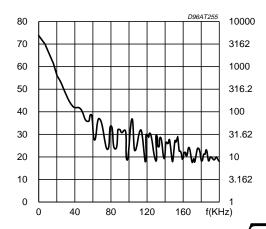
EMC PERFORMANCE (Transceiver Sending)



Transceiver Without Emc Reducing Measures

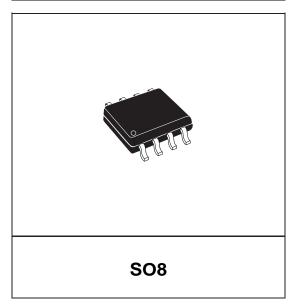
Transceiver With Emc Reducing Measures



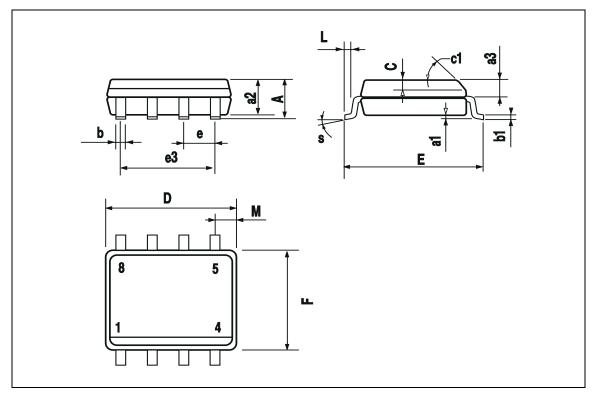


DIM.	mm			inch		
Dilvi.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
Α			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
аЗ	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
С	0.25		0.5	0.010		0.020
c1			45° ((typ.)		
D (1)	4.8		5.0	0.189		0.197
Е	5.8		6.2	0.228		0.244
е		1.27			0.050	
еЗ		3.81			0.150	
F (1)	3.8		4.0	0.15		0.157
L	0.4		1.27	0.016		0.050
М			0.6			0.024
S	8° (max.)					

OUTLINE AND
MECHANICAL DATA



⁽¹⁾ D and F do not include mold flash or protrusions. Mold flash or potrusions shall not exceed 0.15mm (.006inch).



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