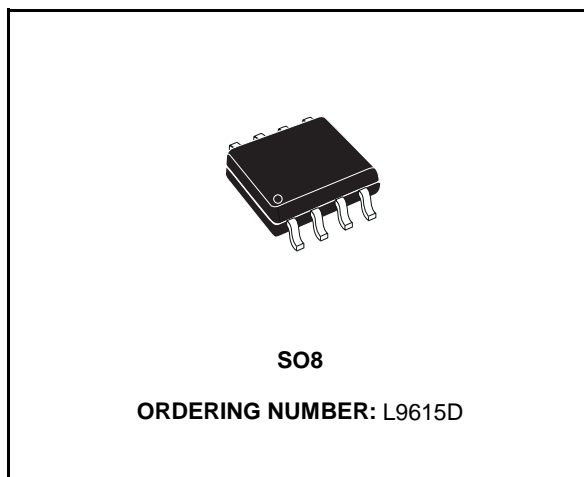


**CAN BUS TRANSCEIVER**

- L9615 MEETS ISO/DIS 11898 UP TO 500KBAUD
- 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 ( $\leq 500\text{KBAUD}/\leq 125\text{KBAUD}$ )
- RECEIVER
  - DIFFERENTIAL INPUT WITH HIGH INTERFERENCE SUPPRESSION
  - COMMON MODE INPUT VOLTAGE RANGE ( $V_{\text{COM}}$ ) FROM -2V TO  $V_{\text{S}}+3\text{V}$
- PACKAGE: SO 8

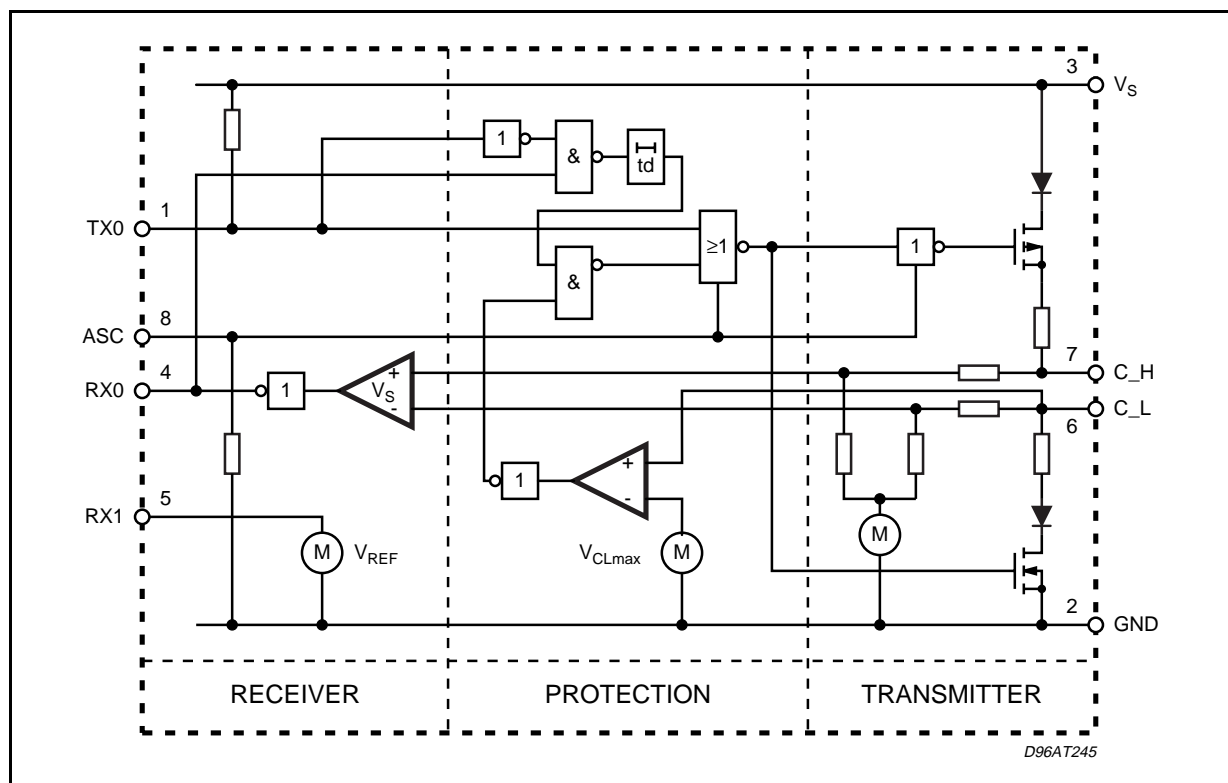


**DESCRIPTION**

The L9615 is a bidirectional transceiver for signal

conditioning and processing in connection with a CAN controller. Data rates of up to 500KBAUD are supported using either shielded or non-shielded pair of lines.

**BLOCK DIAGRAM**

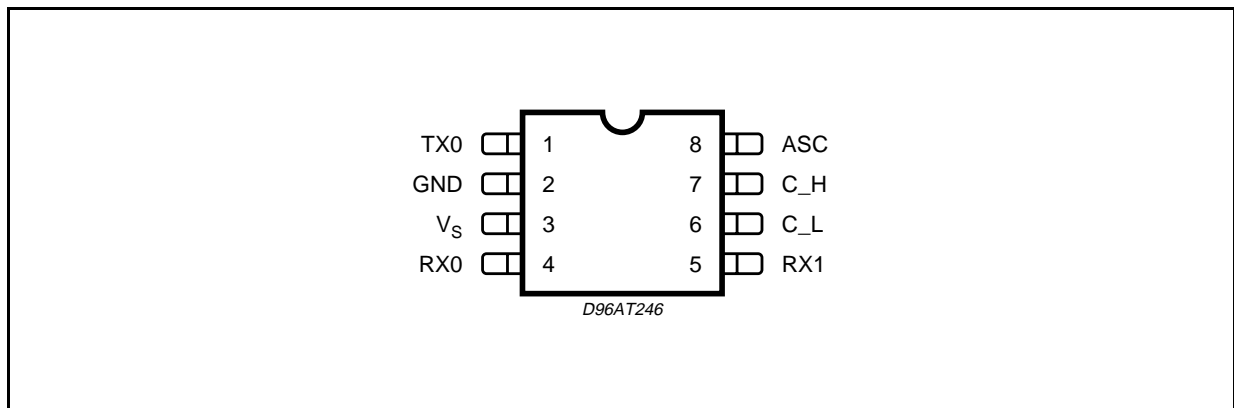


**ABSOLUTE MAXIMUM RATINGS**

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 (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 (VS 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 110	°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	$V_S$	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  $110^{\circ}\text{C}$ ;  $V_S = 4.5$  to  $5.5\text{V}$ ; Dominant:  $V_{TXO} = \text{GND}$ ; 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
<b>TRANSMITTER SECTION</b> ( $R_A = 60\Omega$ between $C_H$ and $C_L$ )						
$C_{TXO}$	TXO Input Capacitance	$0\text{V} < V_{TXO} < V_S$		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	$\mu\text{A}$
	TXO Low Level Input Current	$V_{TXO} = \text{GND}$	-275	0	-25	$\mu\text{A}$
$C_{ASC}$	ASC Input Capacitance	$0\text{V} < V_{ASC} < V_S$		25		pF
$V_{ASC}$	ASC Input Voltage for High Speed		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	$\mu\text{A}$
		$V_{ASC} = 0\text{V}$	-2	0	2	$\mu\text{A}$
$V_{C_H}, V_{C_L}$	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 $7\text{V}$	-0.7		0.7	mA
		$V_{C_L} = V_{C_H} = 1$ to $4\text{V}$	-0.3		0.3	mA
$R_{IN}(C_H, C_L)$	Input Resistance	Recessive	5		50	$\text{K}\Omega$
$R_{Dif}(C_H, C_L)$	Differential Input Resistance	Recessive	10		100	$\text{K}\Omega$
$V_{Dif} = V_{C_H} - V_{C_L}$	Differential Output Voltage	Dominant, $R_A$	1.5		3	V
$V_{Dif} = V_{C_H} - V_{C_L}$	Differential Output Voltage	Recessive	-500	0	50	mV
$t_d$	Short Circuit Detection Time $C_H$ to $C_L$ ; $C_H$ to B	$R_{CS} < 1\Omega$	1	5	10	$\mu\text{s}$
$I_A$	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
<b>RECEIVE SECTION</b>						
$V_{RXO}$	RXO High Level Output Voltage	$V_{Dif} < 0.5\text{V}$ ; $I_{RXO} = 0.3\text{mA}$ ; $V_{C_H} = -2$ to $7\text{V}$ ; $V_{C_L} = -2$ to $7\text{V}$ ;	$0.9 V_S$		$V_S$	V
	RXO Low Level Output Voltage	$V_{Dif} > 0.9\text{V}$ ; $I_{RXO} = 1\text{mA}$ ; $V_{C_H} = -2$ to $7\text{V}$ ; $V_{C_L} = -2$ to $7\text{V}$ ;			0.5	V
$V_S = V_{C_H} - V_{C_L}$	Input Signal Threshold	$V_{C_H} = -2$ to $7\text{V}$ ; $V_{C_L} = -2$ to $7\text{V}$ ;	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
<b>REFERENCE OUTPUT</b>						
$V_{RX1}$	Reference Voltage	$I_{RX1} = 0$	$0.45 V_S$	$0.5 V_S$	$0.55 V_S$	V
$R_{RX1}$	Output Resistance		2		9	$\text{K}\Omega$

# L9615

**DINAMIC 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
SR	Differential Output Slew Rate (Transmitter)	$V_{ASC} = 0\text{V}$	20		50	$\text{V}/\mu\text{s}$
		$V_{ASC} = V_S$	5		20	$\text{V}/\mu\text{s}$
$t_{OR}$	Signal Delay $C_H$ , $C_L$ to $R_XO$	$V_{ASC} = 0\text{V}$			150	ns
$t_{OTR}$	Signal Delay Txo to Rxo	$V_{ASC} = 0\text{V}$			300	ns

## FUNCTIONAL DESCRIPTION

The L9615 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.  $10\mu\text{s}$  to prevent destruction of the IC and high consumption of supply current  $I_S$ . If  $V_{C_L} > V_{C_{Lmax}}$  the transmitter output stages would be disabled immediately.

Pin ASC makes it possible to select two different

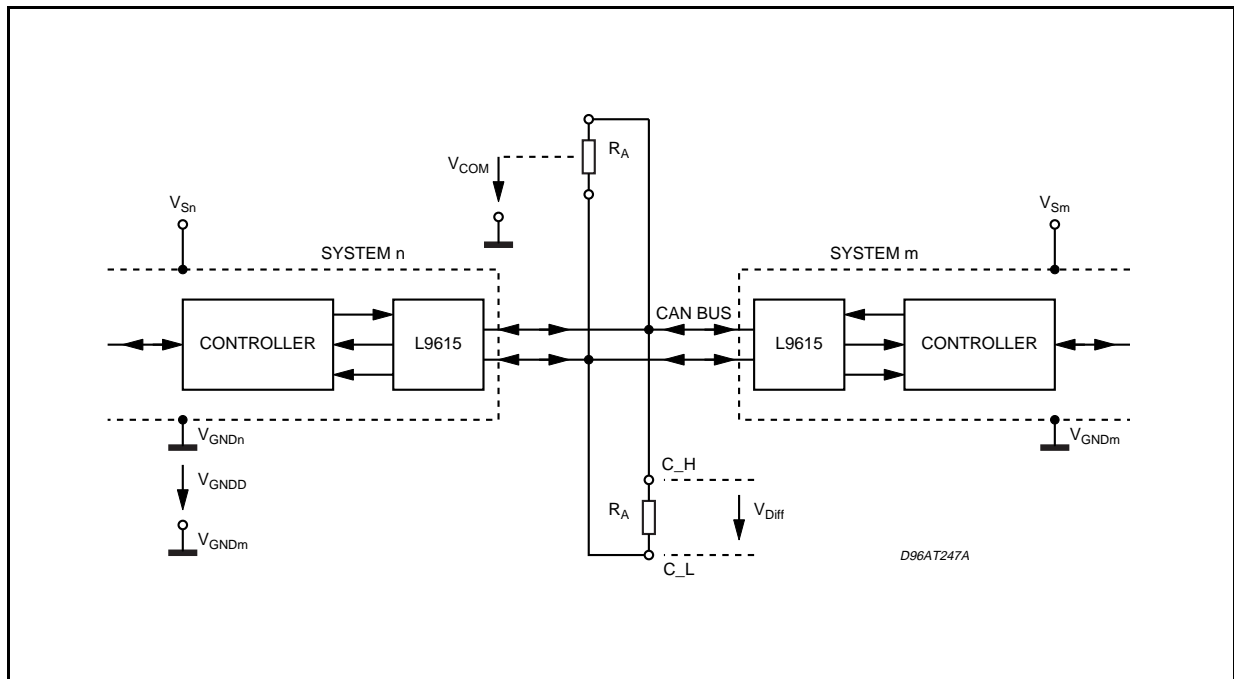
modes of operation: High speed ( $\leq 500\text{kBaud}$ ) and low speed ( $\leq 125\text{kBaud}$ ).

The ASC pin is tied to GND for normal operation at  $\leq 500\text{kBaud}$ . For slower speed operation at  $\leq 125\text{kBaud}$  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

## TYPICAL APPLICATION



**TIMING DIAGRAM**



**EMC PERFORMANCE (RECEIVER)**

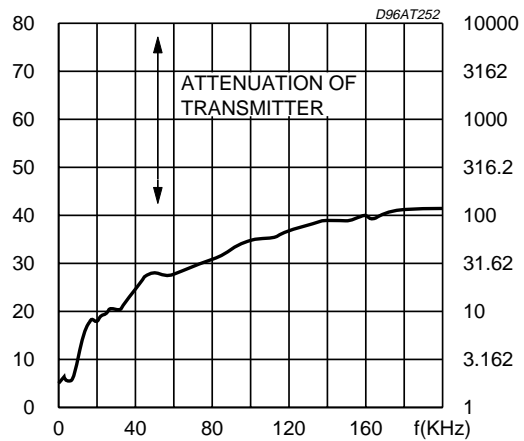
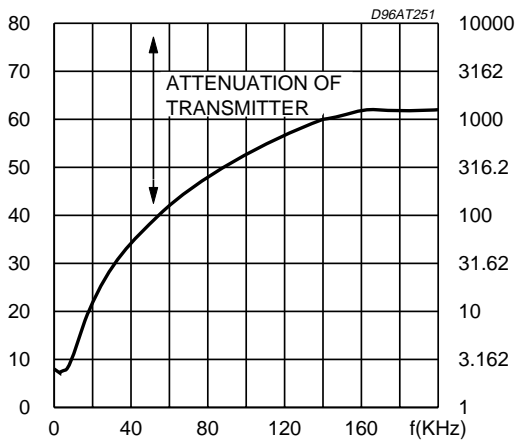


EMC PERFORMANCE (TRANSMITTER)

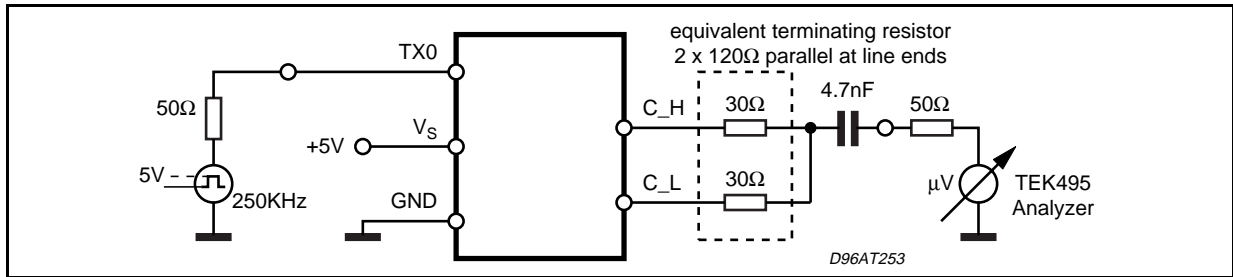


Transceiver Without Emc Reducing Measures

Transceiver With Emc Reducing Measures

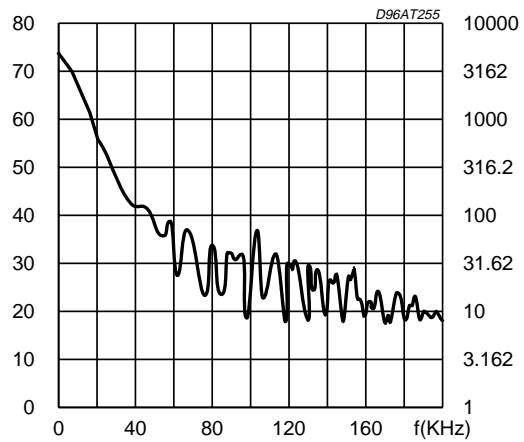
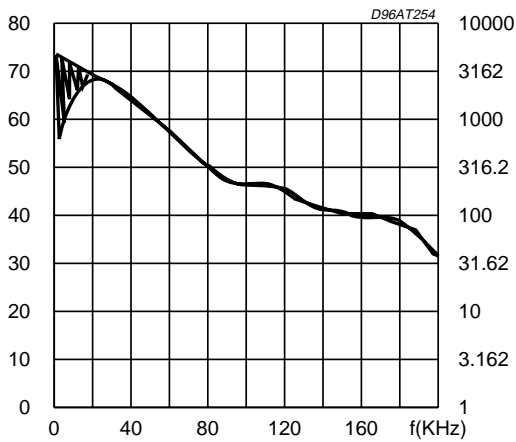


EMC PERFORMANCE (Transceiver Sending)



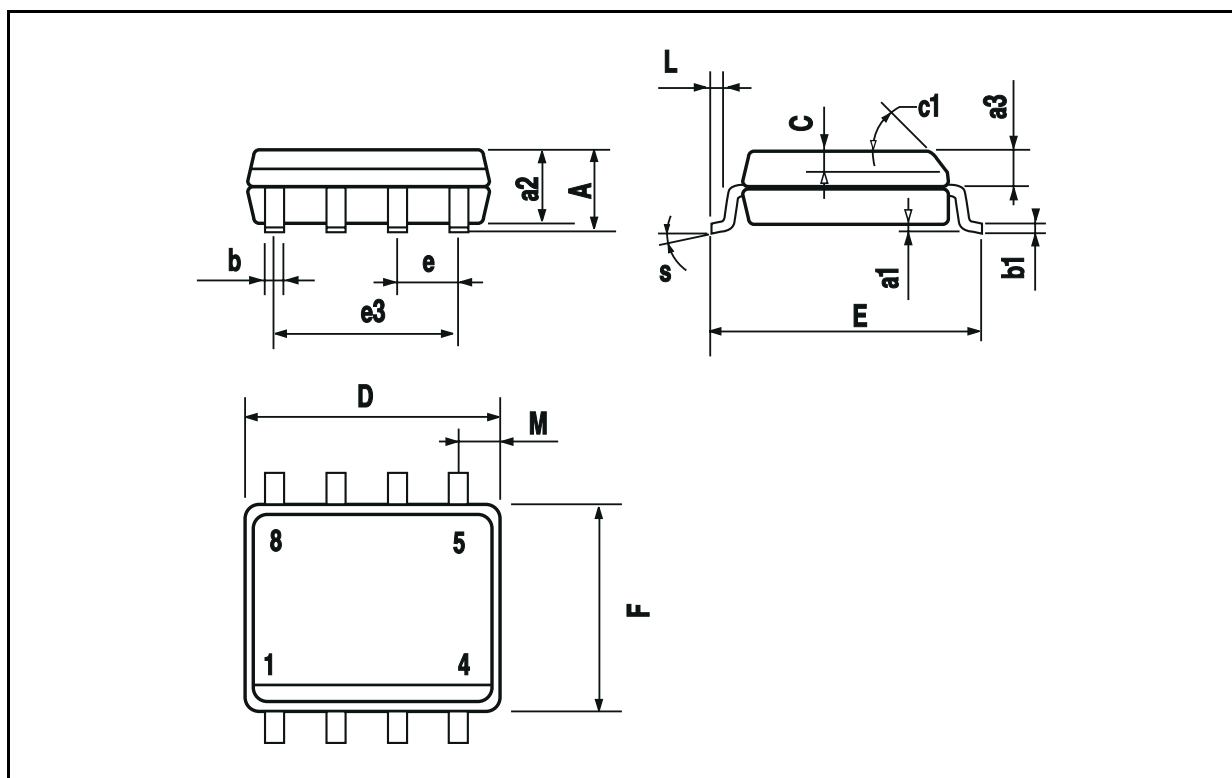
Transceiver Without Emc Reducing Measures

Transceiver With Emc Reducing Measures



## SO8 PACKAGE MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	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
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F	3.8		4.0	0.15		0.157
L	0.4		1.27	0.016		0.050
M			0.6			0.024
S	8° (max.)					



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