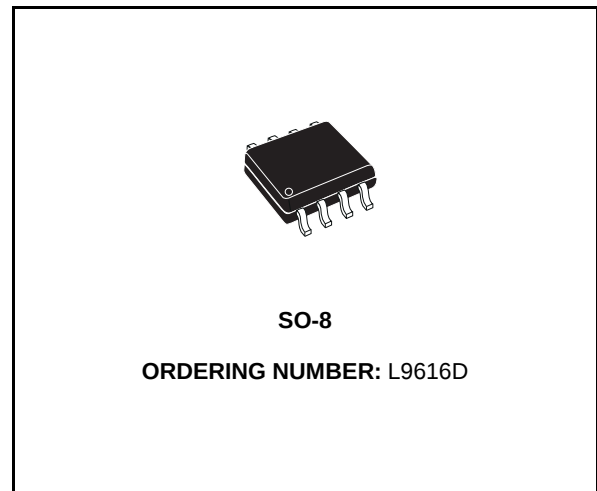


HIGH SPEED CAN BUS TRANSCEIVER

- 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 ($\leq 1\text{MEGABAUD}/\leq 250\text{KBAUD}$)
- RECEIVER
 - DIFFERENTIAL INPUT WITH HIGH INTERFERENCE SUPPRESSION
 - COMMON MODE INPUT VOLTAGE RANGE (V_{COM}) FROM -2V TO $V_{\text{S}}+3\text{V}$
- ESD PROTECTION LEVEL UP TO 4kV
- PACKAGE: SO-8

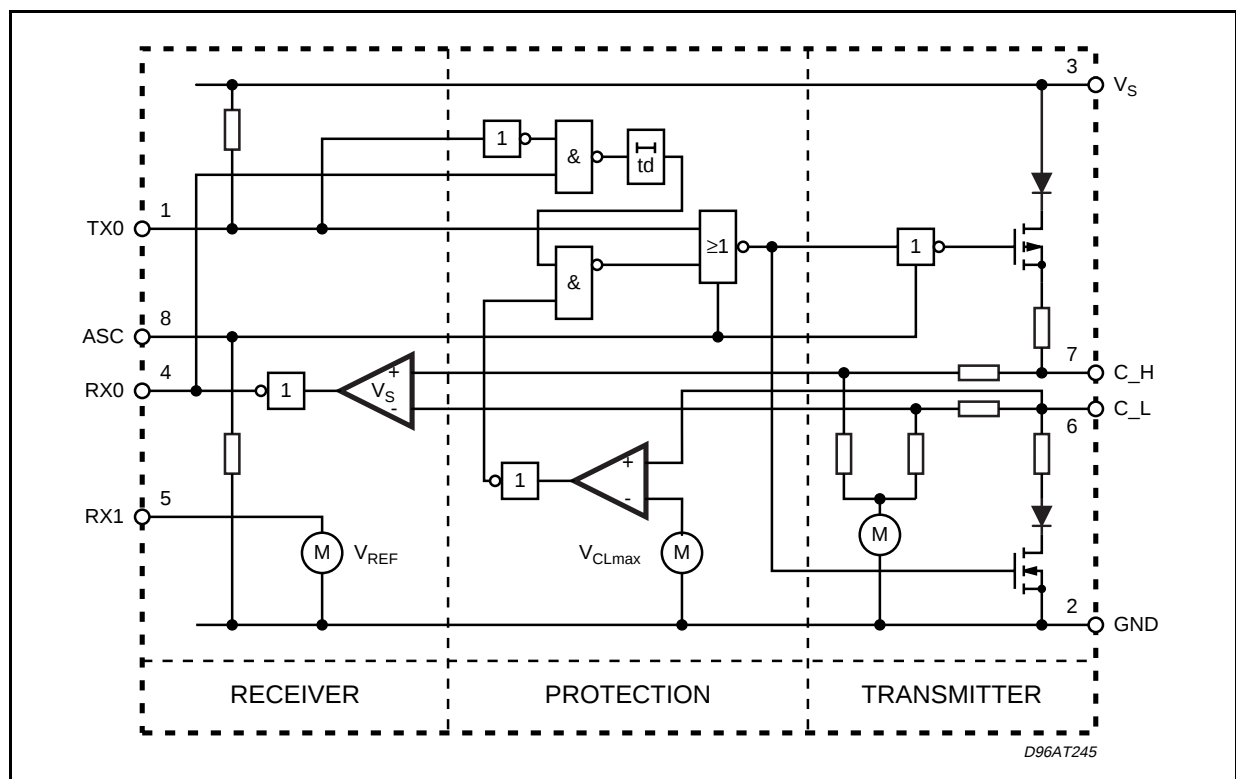


DESCRIPTION

The L9616 is a bidirectional transceiver for signal

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.

BLOCK DIAGRAM

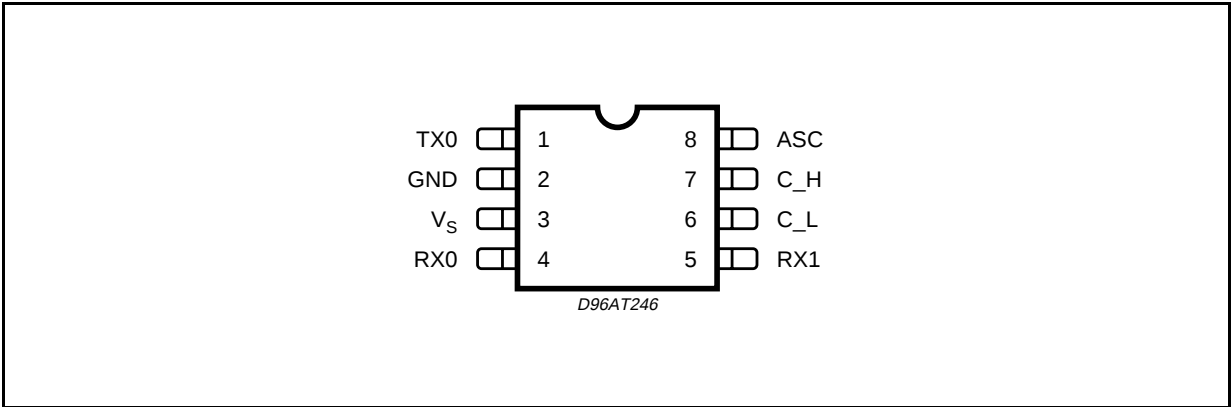


ABSOLUTE MAXIMUM RATINGS

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 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	V_S	Supply Voltage
4	R XO	Receive Output
5	R X1	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 ; 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
TRANSMITTER SECTION (R _A = 60Ω between 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
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	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	KΩ
R _{DIFF} (C _H , C _L)	Differential Input Resistance	Recessive	10		100	KΩ
V _{Diff} = V _{C_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	R _{CS} < 1Ω	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_L} max	Overvoltage Protection Threshold on C _L		7	8	10	V
RECEIVE SECTION						
V _{RXO}	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 V _S		V _S	V
	RXO Low Level Output Voltage	V _{Diff} > 0.9V; I _{RXO} = 1mA; V _{C_H} = -2 to 7V; 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	KΩ

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

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/μs
		V _{ASC} = V _S	5		20	V/μs
t _{OR}	Signal Delay C_H, C_L to R _{XO}	V _{ASC} = 0V			150	ns
t _{OTR}	Signal Delay T _{xo} 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. 10μs 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

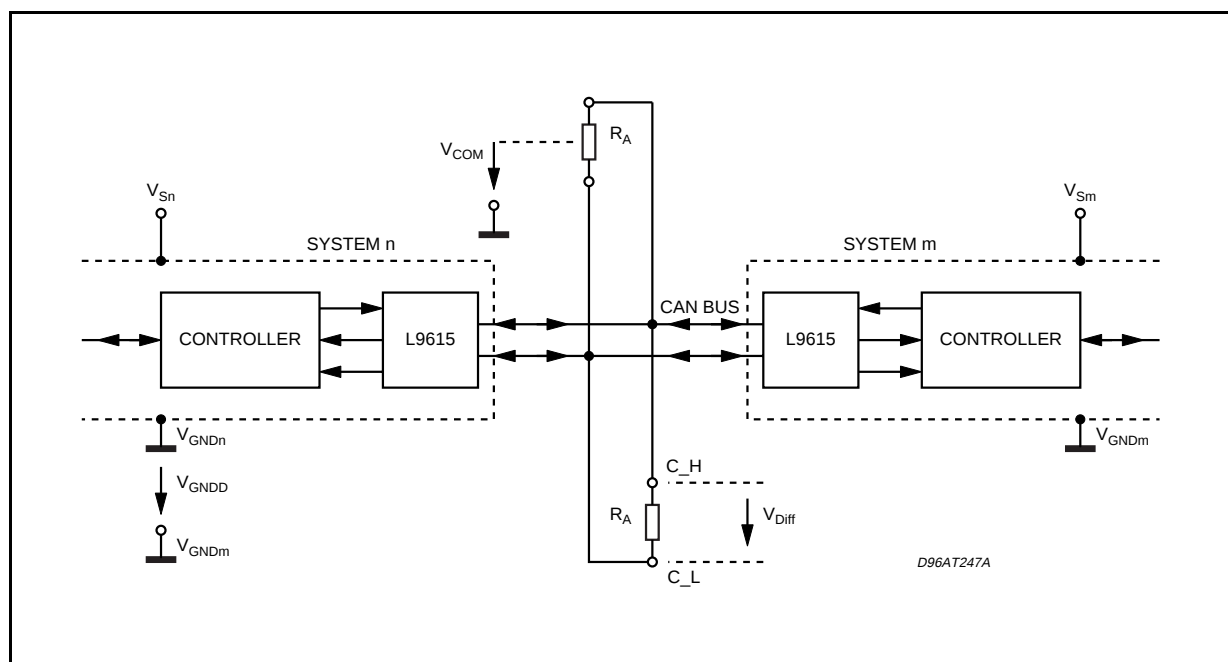
modes of operation: High speed ($\leq 1\text{MEGABaud}$) and low speed ($\leq 250\text{kBaud}$).

The ASC pin is tied to GND for normal operation at $\leq 1\text{MEGABaud}$. 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 .

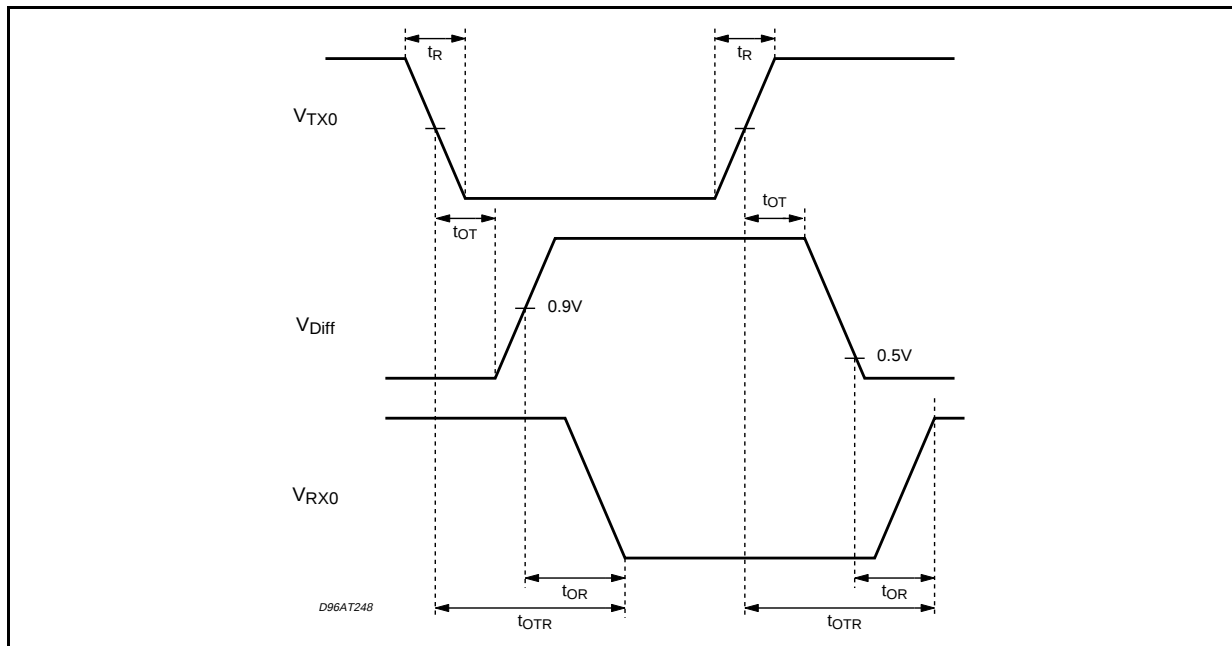
FUNCTIONAL TABLE

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

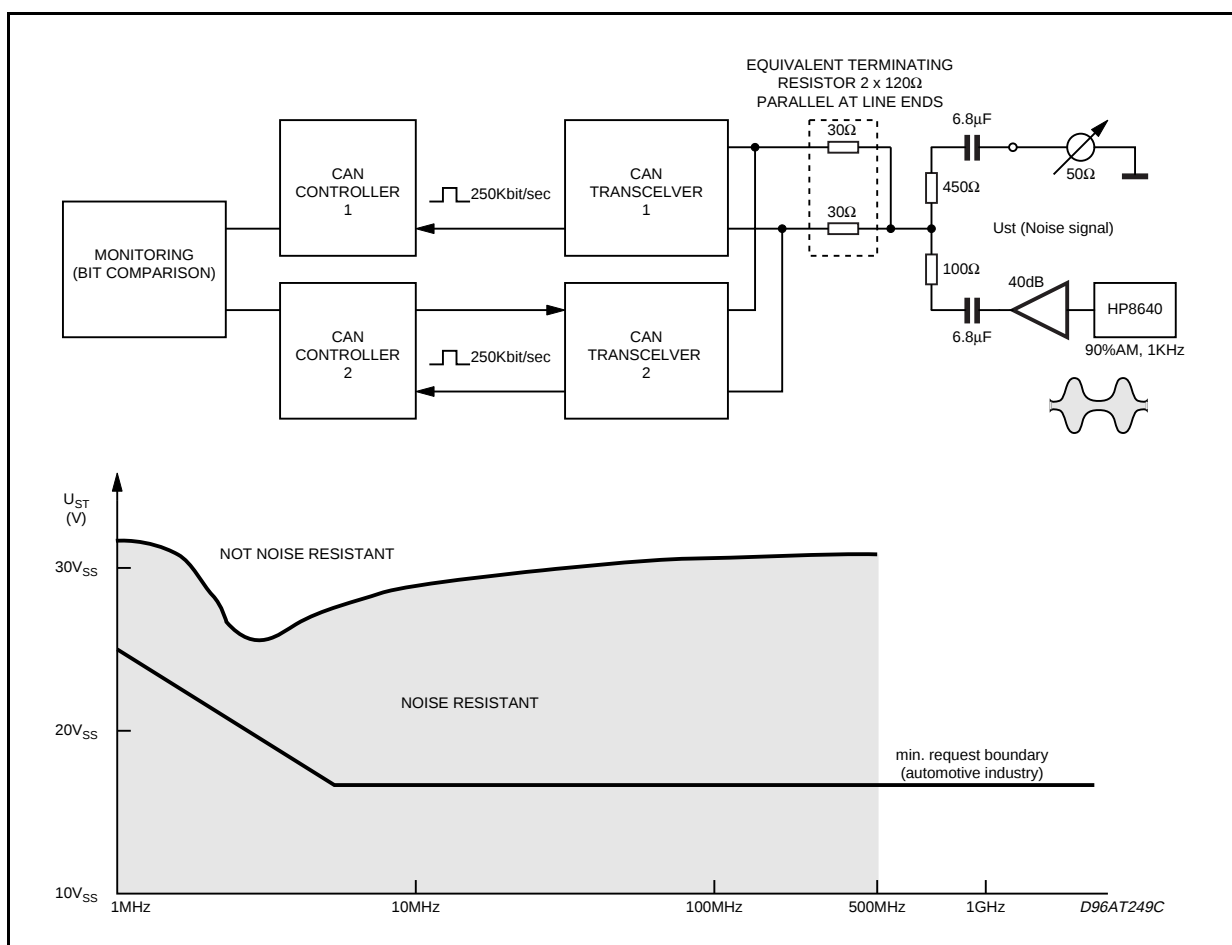
TYPICAL APPLICATION

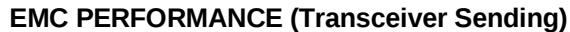


TIMING DIAGRAM



EMC PERFORMANCE (RECEIVER)

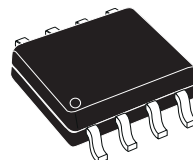




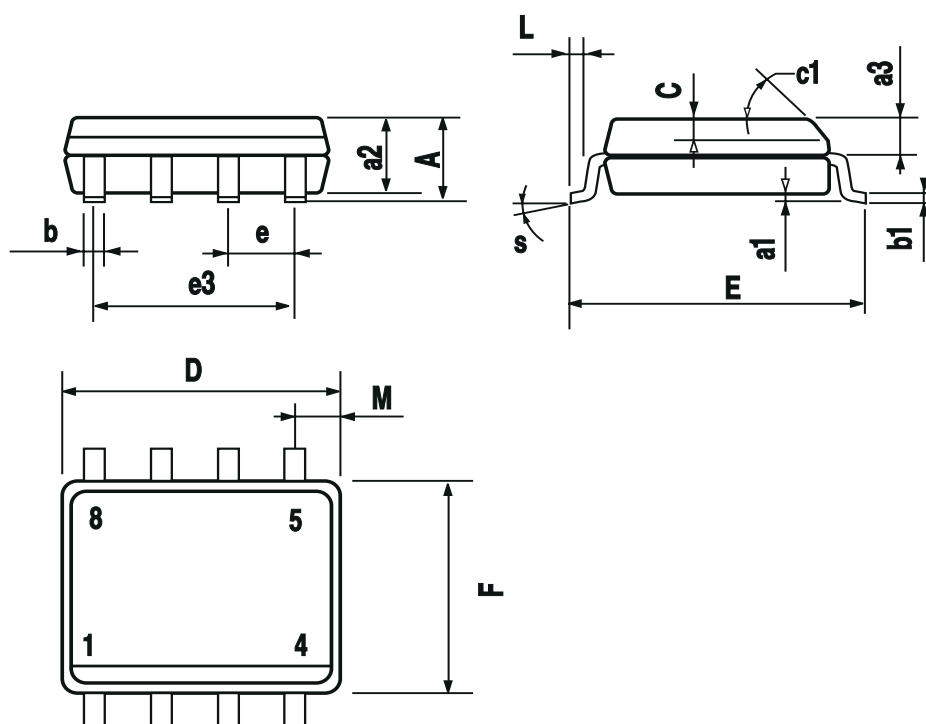
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.069
a1	0.1		0.25	0.004		0.010
a2			1.65			0.065
a3	0.65		0.85	0.026		0.033
b	0.35		0.48	0.014		0.019
b1	0.19		0.25	0.007		0.010
C	0.25		0.5	0.010		0.020
c1	45° (typ.)					
D (1)	4.8		5.0	0.189		0.197
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		3.81			0.150	
F (1)	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.)					

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

OUTLINE AND MECHANICAL DATA



SO8



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