Automotive Electronics

Product Information
CAN Bus Transceiver – CF151

BOSCH
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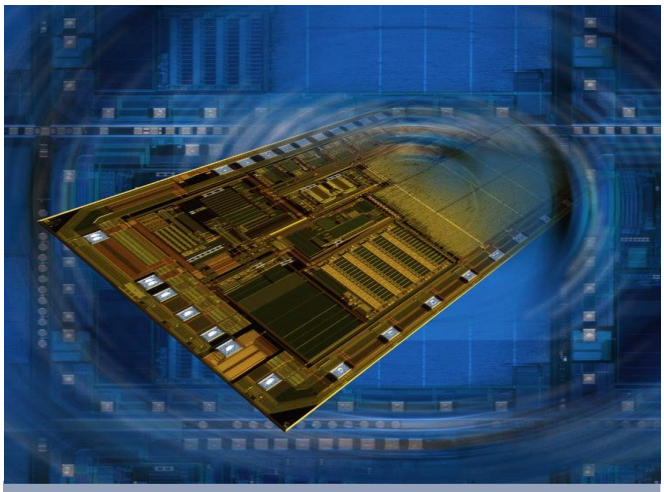


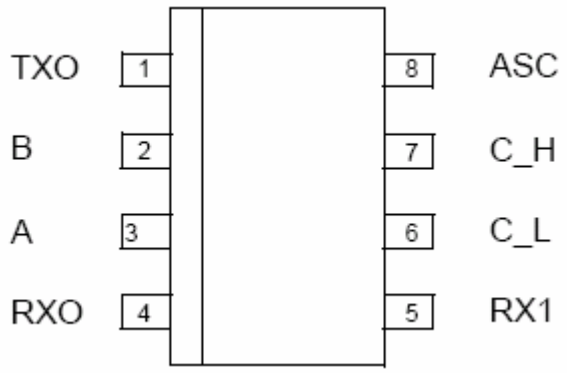
CAN Bus Transceiver

The CF151 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.

Customer benefits:

- Excellent system know-how
- Smart concepts for system safety
- Secured supply
- Long- term availability of manufacturing processes and products
- QS9000 and ISO/TS16949 certified

PIN configuration



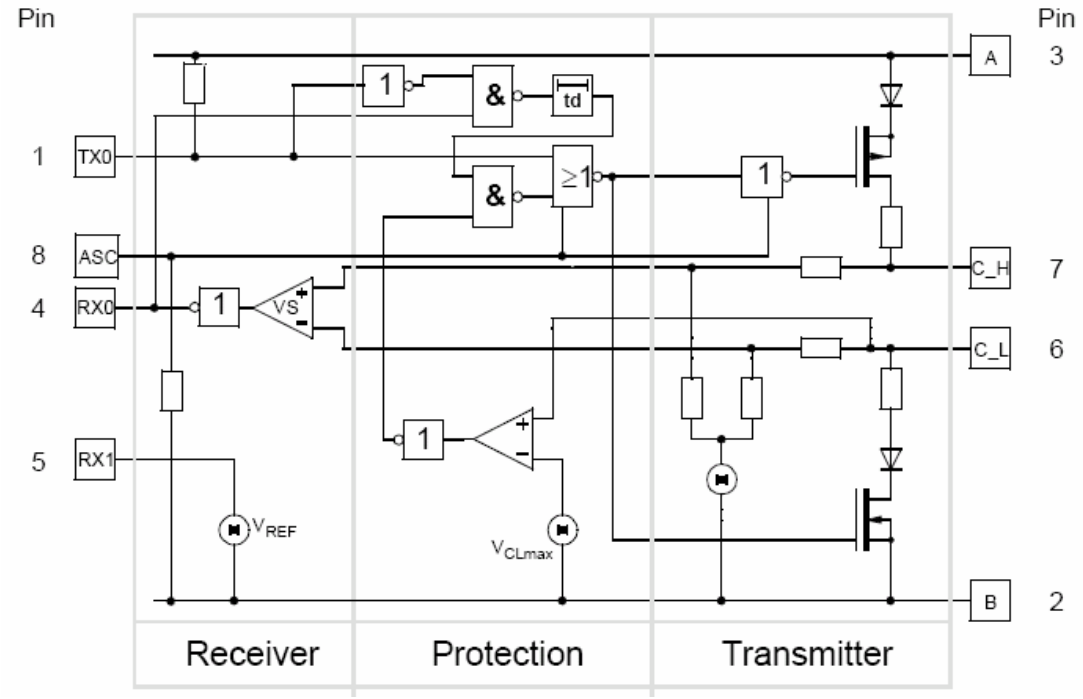
Features

- CF151 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 (≤500kBaud / ≤125kBaud)
- Receiver
  - Differential input with high interference suppression
  - Common mode input voltage range (V_{COM}) from 5V to 12V
- Package: SOIC 8

Pin description

Pin	Name	Description
1	TXO	Transmitter input
2	B	Ground
3	A	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

Block diagram



Maximum ratings

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

Rating	Condition	Symbol	Min.	Max.	Unit
Supply voltage (A)		V_A	-0.3	7	V
Bus voltage (C_H,C_L)	0V < V_A< 5.5V	V_{C_H}, V_{C_L}	-5	36	V
Off state leakage current at C_H, C_L	0V < V_A < 5.5V; -5V < V_{C_H} < 36V; -5V < V_{C_L}< 36V	I_{C_H}, I_{C_L}	-1	4	mA
DC voltage at TXO, ASC	0V < V_A< 5.5V	V_X	V_B-0.3V	V_A+0.3V	
Output current at RXO	0V < V_A< 5.5V	I_{RXO}	-0,3	1	mA
Storage temperature		T_{ST}	-40	150	°C
Operating temperature		T_{OP}	-40	125	°C
Junction temperature		T_J	-40	150	°C

Characteristics

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

General conditions:
-40°C < T_{OP} < 125°C ; 4.5V < V_A < 5.5V

Comment:
Dominant: V_{TXO} = V_B ; Recessive: V_{TXO} = V_A

Rating	Conditions	Symbol	Min.	Typ.	Max.	Unit
Supply voltage		V_A	4.5	5	5.5	V
Supply current	Dominant	I_A	0	12	80	mA
Supply current	Recessive	I_A	0	12	20	mA

Transmitter section

R_A: 60Ω between C_H and C_L

Rating	Conditions	Symbol	Min.	Typ.	Max.	Unit
TXO Input capacitance	$V_B < V_{TXO} < V_A$	C_{TXO}		25		pF
TXO High level input voltage		V_{TXO}	$0.7V_A$		V_A	
TXO Low level input voltage		V_{TXO}	0		$0.3V_A$	
TXO High level input current	$V_{TXO}= V_A$	I_{TXO}	-2	0	2	µA
TXO Low level input current	$V_{TXO}= V_B$	I_{TXO}	-275		-30	µA
ASC Input capacitance	$V_B < V_{ASC} < V_A$	C_{ASC}		25		pF
ASC Input voltage for high speed		V_{ASC}	0		$0.1V_A$	
ASC Input voltage for low speed		V_{ASC}	$0.9V_A$		VA	
ASC Input current	$V_{ASC}= V_A$	I_{ASC}	30		275	µA
	$V_{ASC}= V_B$	I_{ASC}	-2	0	2	µA
Bus voltage recessive	Recessive	V_{C_H} V_{C_L}	$0.4V_A$	$0.5V_A$	$0.6V_A$	
Leakage current recessive	-2V < V_{C_L} < 7V -2V < V_{C_H} < 7V	I_{C_H} I_{C_L}	-0.7		0.7	µA
Leakage current recessive	1V < V_{C_L} < 4V 1V < V_{C_H} < 4V	I_{C_H} I_{C_L}	-0.3		0.3	µA
Input resistance	Recessive	$R_{IN(C\_H,C\_L)}$		18.5		kΩ
Differential input resistance	Recessive	$R_{Diff(C\_H,C\_L)}$		37		kΩ
Differential output voltage	Dominant, R_A	$V_{Diff}= V_{C\_H}-V_{C\_L}$	1.5		3	V
Differential output voltage	Recessive	$V_{Diff}= V_{C\_H}-V_{C\_L}$	-500	0	50	mV
Short circuit detection time C_H to C_L C_H to B	short circuit resistance < 1Ω	t_d	1	5	10	µs
Supply current in case of short circuit, C_H to C_L, C_H to B (time = t_d)		I_A		150		mA
Overvoltage protection threshold on C_L		V_{C_Lmax}	7	8	10	V

Receiver section

Rating	Conditions	Symbol	Min.	Typ.	Max.	Unit
RXO High level output voltage	V_{Diff}< 0,5V I_{RXO} = -0.3mA -2V < VC_H< 7V -2V < VC_L< 7V	V_{RXO}	$0.9V_A$		V_A	V
RXO Low level output voltage	V_{Diff} > 0.9V I_{RXO} = 1mA -2V < V_{C_H}< 7V -2V < V_{C_L}< 7V	V_{RXO}			0.5	V
Input signal threshold	-2V < V_{C_H} < 7V -2V < V_{C_L} < 7V	$V_S= V_{C\_H}-V_{C\_L}$	500	700	900	mV
Differential input hysteresis		V_{HYS}		100		mV

Receiver section

Rating	Conditions	Symbol	Min.	Typ.	Max.	Unit
Reference voltage	I_{RX1}=0	V_{RX1}	$0.45V_A$	$0.5V_A$	$0.55V_A$	V
Output resistance		R_{RX1}	2		20	kΩ

Dynamic characteristics

General conditions:
C_A: 47pF between C_H and C_L, V_A= 5V, t_R < 5ns
C_{RXO}: 20pF between RXO and B, R_A: 60Ω between C_H and C_L

Rating	Conditions	Symbol	Min.	Typ.	Max.	Unit
Signal delay TXO to C_H,C_L		t_{OT}			50	ns
Differential output slew rate (Transmitter)	V_{ASC}= V_B	SR	20		50	V/µs
	V_{ASC}= V_A	SR	5		20	V/µs
Signal delay C_H,C_L to R_{XO}	V_{ASC}= V_B	t_{OR}			150	ns
Signal delay TXO to RXO	V_{ASC}= V_B	t_{OTR}			300	ns

Functional description

The CF151 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. 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_A. If $V_{C\_L} > V_{C\_Lmax}$ the transmitter output stages would be disabled immediately.

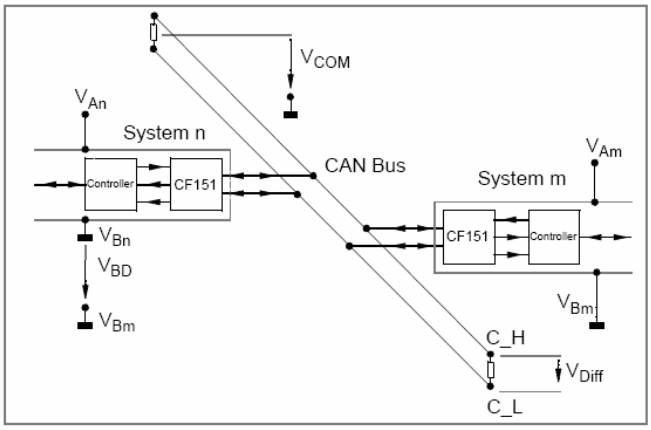
Pin ASC makes it possible to select two different modes of operation: High speed (≤500kBaud) and low speed (≤125kBaud).

The ASC pin is tied to VB for normal operation at ≤500kBaud. For slower speed operation at ≤125kBaud the rise and fall slope of the bus output can be decreased to reduce EMI by connecting the ASC pin to V_A.

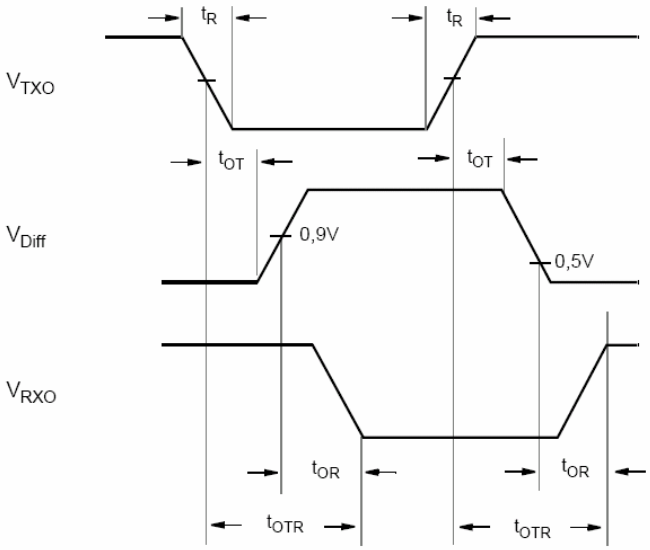
Functional table

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

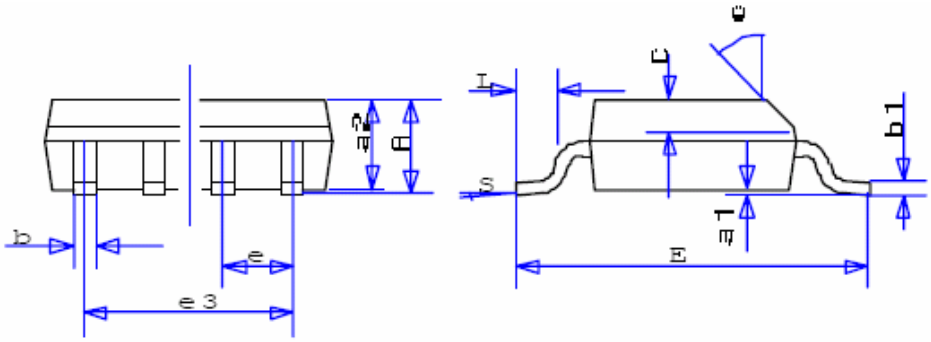
Application note

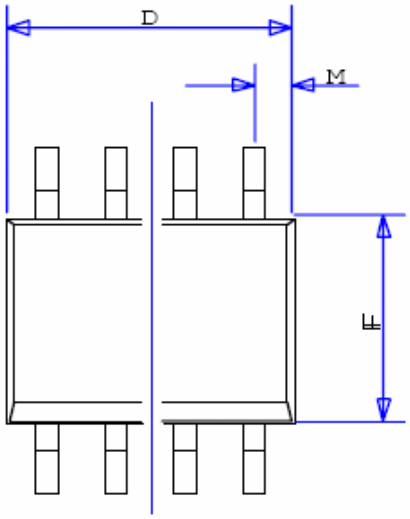


Timing diagram



Package: SOIC 8 - Narrow





Ref.	Data Book mm		
	Typ	Min	Max
A			1.75
a1		0.10	0.25
a2			1.65
b		0.35	0.48
b1		0.19	0.25
C	0.50		
c1	45°		
D	see variations		
E		5.8	6.2
e	1.27		
e3	see variations		
F		3.8	4.0
L		0.4	1.27
M			0.6
S			8°

Variations D/ mm

N	Typ	Min	Max
8		4.8	5.0

Variations e3/mm

N	Typ	Min	Max
8	3.81		

Contact

Robert Bosch GmbH
Sales Semiconductors
Postbox 13 42
72703 Reutlingen
Germany
Tel.: +49 7121 35-2979
Fax: +49 7121 35-2170

Robert Bosch Corporation
Component Sales
38000 Hills Tech Drive
Farmington Hills, MI 48331
USA
Tel.: +1 248 876-7441
Fax: +1 248 848-2818

Robert Bosch K.K.
Component Sales
9-1, Ushikubo 3-chome
Tsuzuki-ku, Yokohama 224
Japan
Tel.: +81 45 9 12-83 01
Fax: +81 45 9 12-95 73

E-Mail: bosch.semiconductors@de.bosch.com
Internet: www.bosch-semiconductors.de