BOSCH

Microelectronics
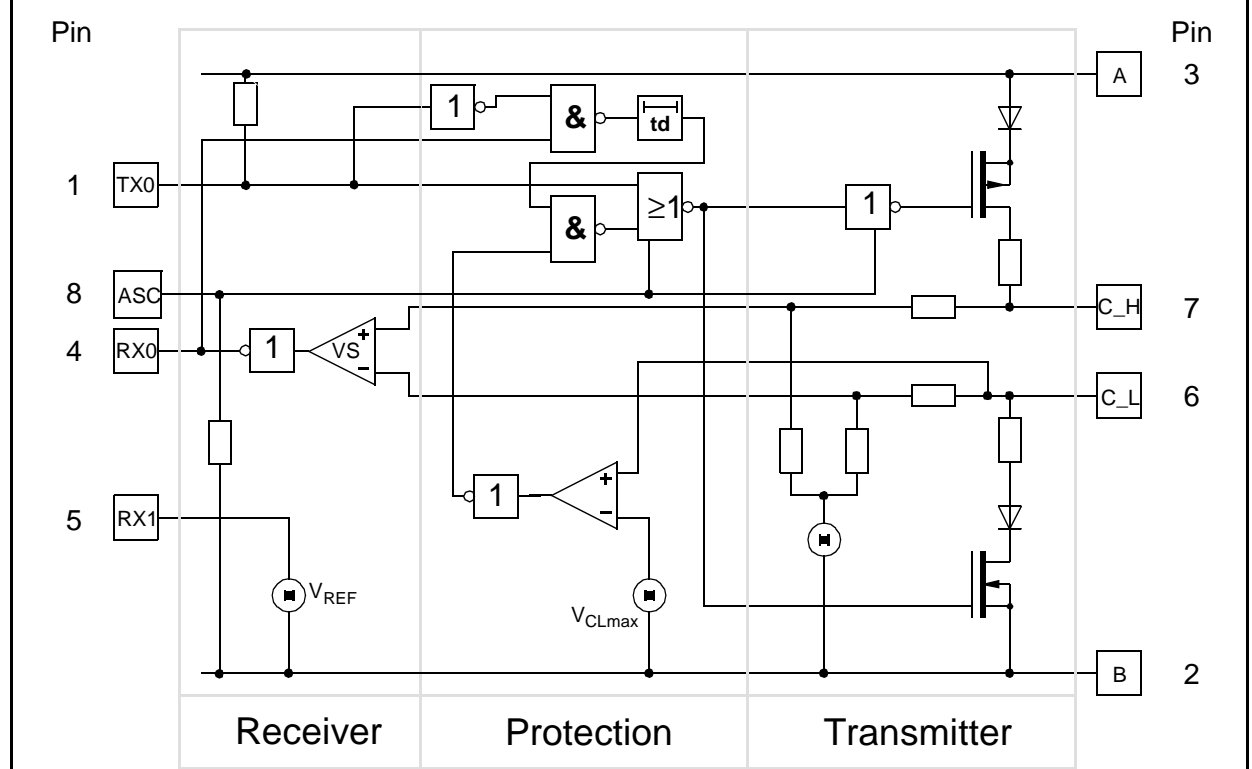
Technical Data

CF151

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 500 kBaud are supported using either shielded or non-shielded pair of lines.
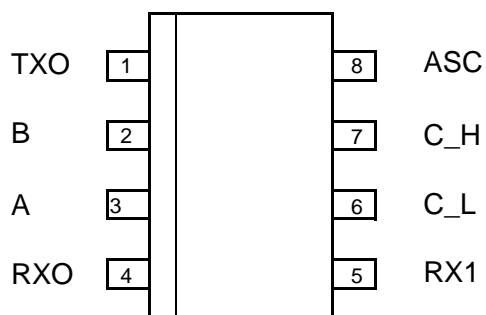
FEATURES

- CF151 meets ISO/DIS 11898 up to 500 kBaud
- Transmitter
    - Generation of differential output signals
    - Short circuit protected from -5 V to +36 V, detection & shutdown
    - Slope control to reduce RFI and EMI
    - Two states adjustable slope control ($\leq$500 kBaud / $\leq$125 kBaud)
- Receiver
    - Differential input with high interference suppression
    - Common mode input voltage range (V_{COM}) from -5 V to 12 V
- Package: SOIC 8

BLOCK DIAGRAM

PINNING

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

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:

$-40°C < T_{OP} < 125°C$
$4.5\ V < V_A < 5.5\ V$

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: 60 Ω 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}	$0.9V_A$		V_A	
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	mA
Leakage current recessive	$1V < V_{C\_L} < 4V$ $1V < V_{C\_H} < 4V$	I_{C_H} I_{C_L}	-0.3		0.3	mA
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	$V_{Diff} < 0,5V$ $I_{RXO}=-0.3mA$ $-2V < V_{C\_H} < 7V$ $-2V < V_{C\_L} < 7V$	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

REFERENCE OUTPUT

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: 47 pF between C_H and C_L, V_A=5V, t_R<5ns
C_{RXO}: 20 pF between RXO and B, R_A: 60 Ω 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. 10 µs 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.
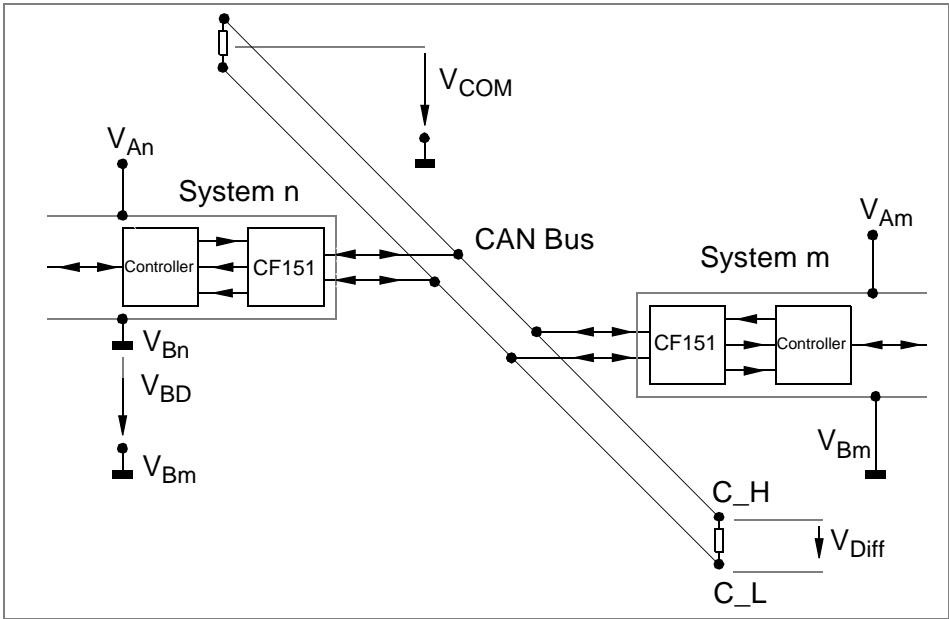
Pin ASC makes it possible to select two different modes of operation: High speed ($\leq$500kBaud) and low speed ($\leq$125kBaud).

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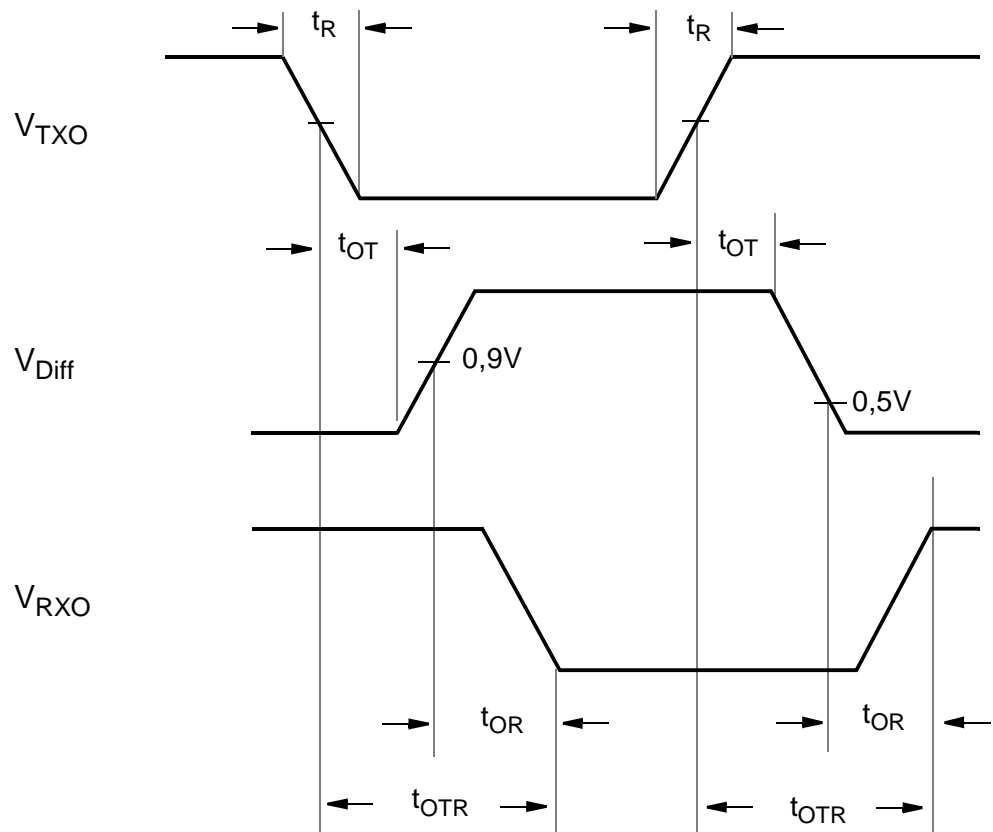
FUNCTIONAL TABLE

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

V_{TXO}

t_R t_R

t_{OT} t_{OT}

V_{Diff}

0,9V

0,5V

V_{RXO}

t_{OR} t_{OR}

t_{OTR} t_{OTR}

Package: SOIC 8 - Narrow


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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
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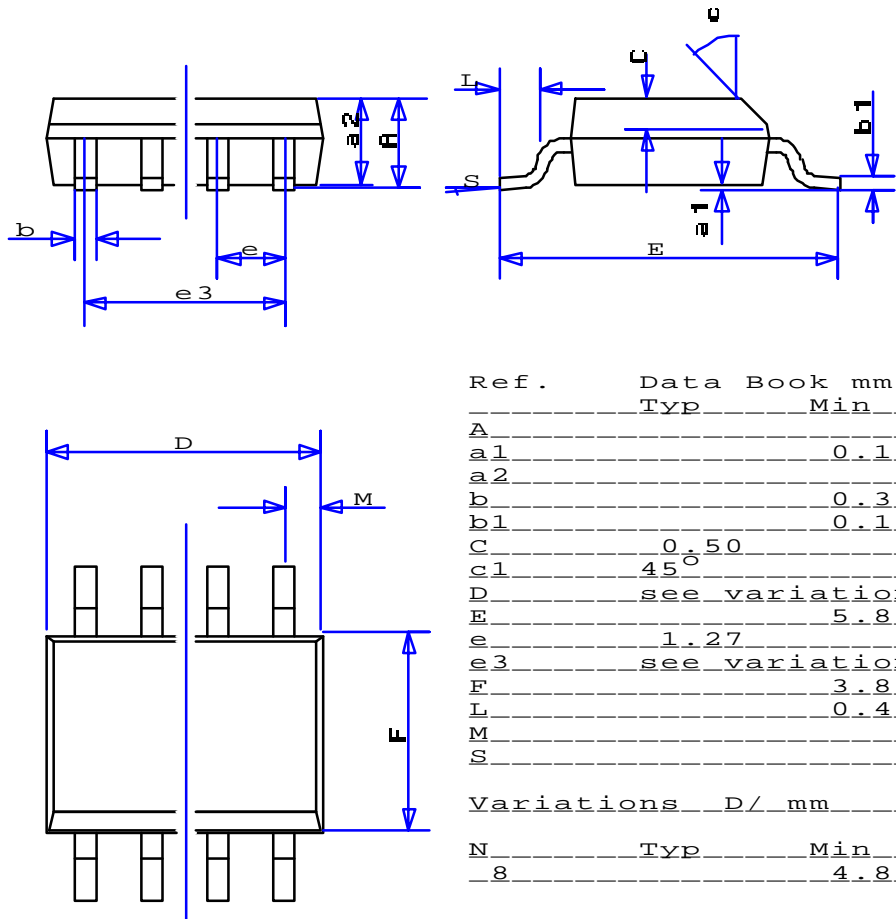
For further information: