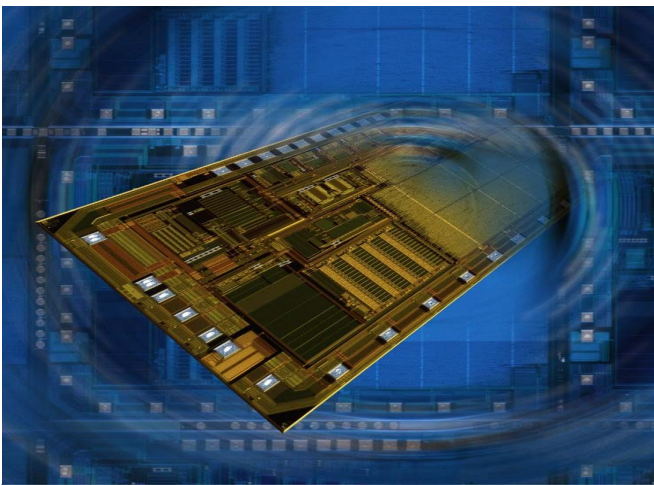


## Product Information CAN Bus Transceiver – CF160



CAN Bus Transceiver

### Customer benefits:

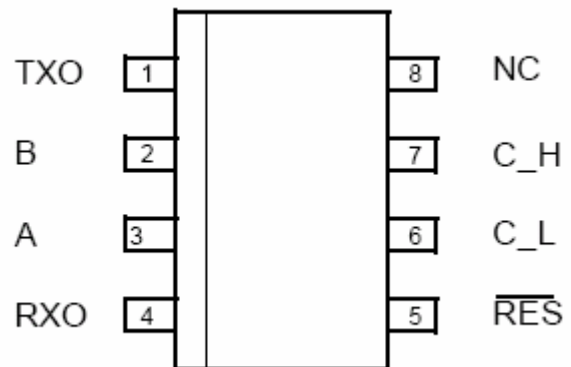
- ▶ Excellent system know-how
- ▶ Smart concepts for system safety
- ▶ Secured supply
- ▶ Long- term availability of manufacturing processes and products
- ▶ QS9000 and ISO/TS16949 certified

### Features

- ▶ The CF160 is based on ISO/DIS 11898
- ▶ Transmitter
  - Generation of differential output signals
  - Overtemperature-shutdown
  - Slope control to reduce RFI and EMI
  - RES-Input to switch off transmitter in case of error
- ▶ Receiver
  - Differential input with high interference suppression
  - Common mode input voltage range (VCOM) from 5 V to 12 V
- ▶ Package: SOIC 8

The CF160 is a bidirectional transceiver for signal conditioning and processing in connection with a CAN controller. Data rates of up to 1 MBaud are supported using either shielded or non-shielded pair of lines.

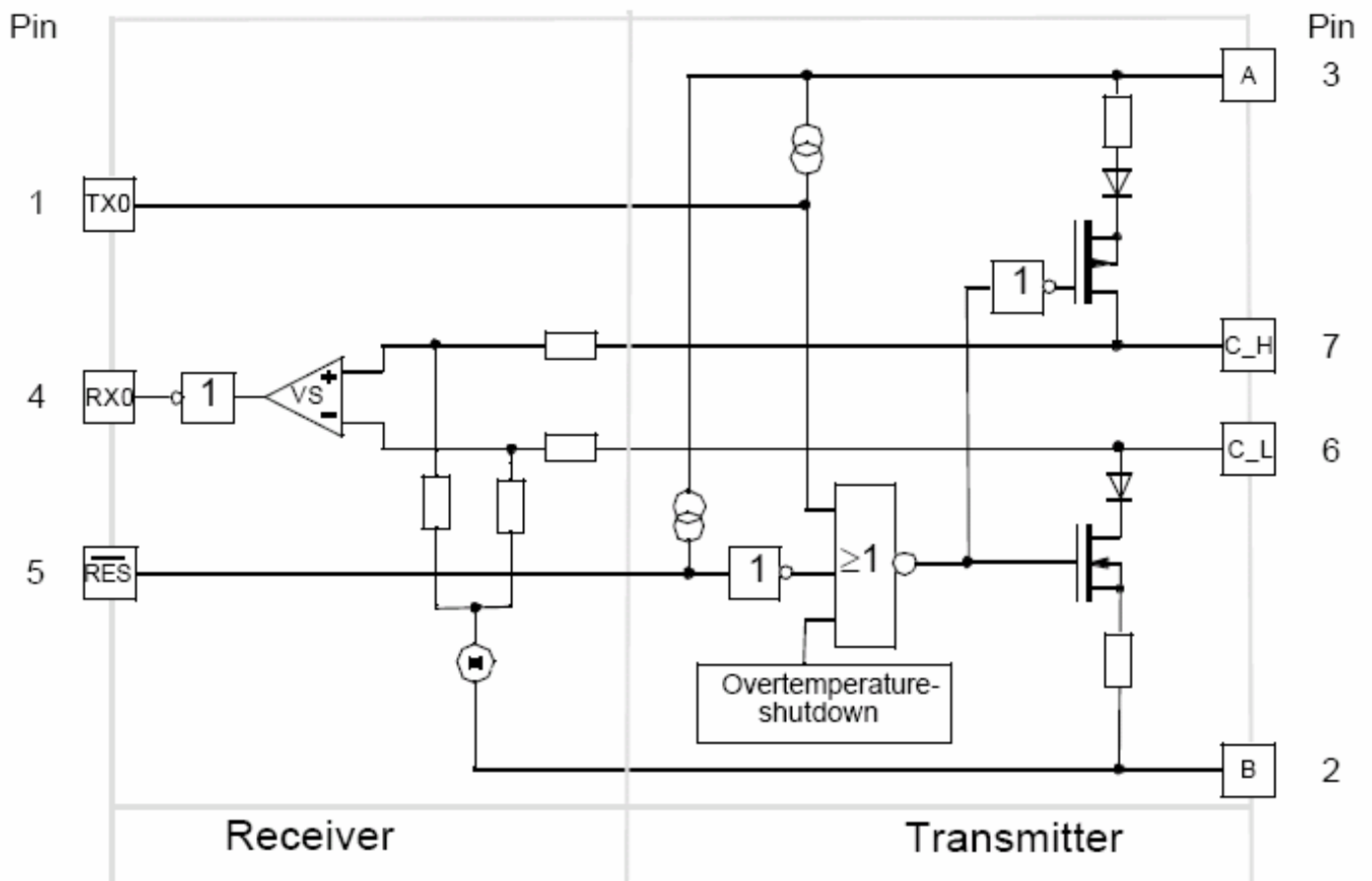
### PIN configuration



### Pin description

Pin	Name	Description
1	TXO	Transmitter input
2	B	Ground
3	A	Supply voltage
4	RXO	Receive output
5	RES	Reset input (active low)
6	C_L	Low side bus output
7	C_H	High side bus output
8	NC	Not connected

## 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 <sub>A</sub>	-0.3	5.5	V
Bus voltage (C_H,C_L)		V <sub>C_H</sub> , V <sub>C_L</sub>	-5	36	V
DC voltage at TXO, RES		V <sub>TXO</sub> , V <sub>RES</sub>	V <sub>B</sub> -0.3V	V <sub>A</sub> +0.3V	
Output current at RXO		I <sub>RXO</sub>	-0,3	1	mA
Storage temperature		T <sub>ST</sub>	-40	150	°C
Operating temperature		T <sub>OP</sub>	-40	125	°C
Junction temperature (normal mode)		T <sub>J</sub>	-40	150	°C
Junction temperature (short circuit mode)	For less than a total of 5h over the entire lifetime	T <sub>J</sub>		190	°C

## Characteristics

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

General conditions:

$40^{\circ}\text{C} < T_{\text{OP}} < 125^{\circ}\text{C}$  ;  $4.5\text{ V} < V_{\text{A}} < 5.5\text{ V}$

Comment:

Dominant:  $V_{\text{TXO}} = V_{\text{B}}$  ; Recessive:  $V_{\text{TXO}} = V_{\text{A}}$

Rating	Conditions	Symbol	Min.	Typ.	Max.	Unit
Supply voltage		$V_{\text{A}}$	4.5	5	5.5	V
Supply current	Dominant $R_{\text{A}}$	$I_{\text{A}}$		50	80	mA
Supply current	Recessive	$I_{\text{A}}$		6	17	mA

## Transmitter section

$R_{\text{A}}$ :  $60\ \Omega$  between  $C_{\text{H}}$  and  $C_{\text{L}}$ ;  $V_{\text{Diff}} = V_{\text{C}_{\text{H}} - V_{\text{C}_{\text{L}}}$

Rating	Conditions	Symbol	Min.	Typ.	Max.	Unit
TXO Input capacitance	$V_{\text{B}} < V_{\text{TXO}} < V_{\text{A}}$	$C_{\text{TXO}}$		5		pF
TXO High level input voltage		$V_{\text{TXO}}$	$0.7V_{\text{A}}$		$V_{\text{A}}$	
TXO Low level input voltage		$V_{\text{TXO}}$	0		$0.3V_{\text{A}}$	
TXO input current source	$0 < V_{\text{TXO}} < 0.7 V_{\text{A}}$	$-I_{\text{TXO}}$	20	50	170	$\mu\text{A}$
RES High level input current		$V_{\text{RES}}$	$0.7V_{\text{A}}$		$V_{\text{A}}$	
RES Low level input current		$V_{\text{RES}}$	0		$0.25 V_{\text{A}}$	
RES input current source	$V_{\text{B}} < V_{\text{RES}} < 0.7V_{\text{A}}$	$-I_{\text{RES}}$	20	60	170	$\mu\text{A}$
Bus voltage recessive	Recessive	$V_{\text{C}_{\text{H}}}, V_{\text{C}_{\text{L}}}$	$0.4V_{\text{A}}$	$0.5V_{\text{A}}$	$0.6V_{\text{A}}$	
Leakage current recessive	$0 < V_{\text{C}_{\text{L}}} < 5V$ $0 < V_{\text{C}_{\text{H}}} < 5V$	$I_{\text{C}_{\text{H}}}, I_{\text{C}_{\text{L}}}$	-0.3		0.3	mA
Input resistance	Recessive	$R_{\text{IN}(C_{\text{H}}, C_{\text{L}})}$		20		k $\Omega$
Differential input resistance	Recessive	$R_{\text{Diff}(C_{\text{H}}, C_{\text{L}})}$		40		k $\Omega$
Differential output voltage dominant	Dominant, $R_{\text{A}}$ $4.75V < V_{\text{A}} < 5.5V$	$V_{\text{Diff}} = V_{\text{C}_{\text{H}} - V_{\text{C}_{\text{L}}}$	1.5		3	V
Differential output voltage recessive	Recessive	$V_{\text{Diff}} = V_{\text{C}_{\text{H}} - V_{\text{C}_{\text{L}}}$	-500	0	50	mV
Supply current in case of short circuit		$I_{\text{A}}$		140		mA
Thermal resistance		$R_{\text{thj-ambient}}$		200		K/W
Overtemperature- shutdown		$T_{\text{j}}$		180	190	$^{\circ}\text{C}$

## Receiver section

$R_{\text{A}}$ :  $60\ \Omega$  between  $C_{\text{H}}$  and  $C_{\text{L}}$ ;  $V_{\text{Diff}} = V_{\text{C}_{\text{H}} - V_{\text{C}_{\text{L}}}$

Rating	Conditions	Symbol	Min.	Typ.	Max.	Unit
RXO High level output voltage	$V_{\text{Diff}} < 0.4V$ $I_{\text{RXO}} = -0.3\text{mA}$ $-2V < V_{\text{C}_{\text{H}}} < 7V$ $-2V < V_{\text{C}_{\text{L}}} < 7V$	$V_{\text{RXO}}$	$0.9V_{\text{A}}$		$V_{\text{A}}$	V
RXO Low level output voltage	$V_{\text{Diff}} > 1V$ $I_{\text{RXO}} = 1\text{mA}$ $-2V < V_{\text{C}_{\text{H}}} < 7V$ $-2V < V_{\text{C}_{\text{L}}} < 7V$	$V_{\text{RXO}}$			0.5	V
Input signal threshold	$-2V < V_{\text{C}_{\text{H}}} < 7V$ $-2V < V_{\text{C}_{\text{L}}} < 7V$	$V_{\text{S}} = V_{\text{C}_{\text{H}} - V_{\text{C}_{\text{L}}}$	$0.1V_{\text{A}}$		$0.18V_{\text{A}}$	
Differential input hysteresis	$V_{\text{HYS}} = V_{\text{Diff,high}} - V_{\text{Diff,low}}$	$V_{\text{HYS}}$		200		mV

## 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  $\Omega$  between C\_H and C\_L

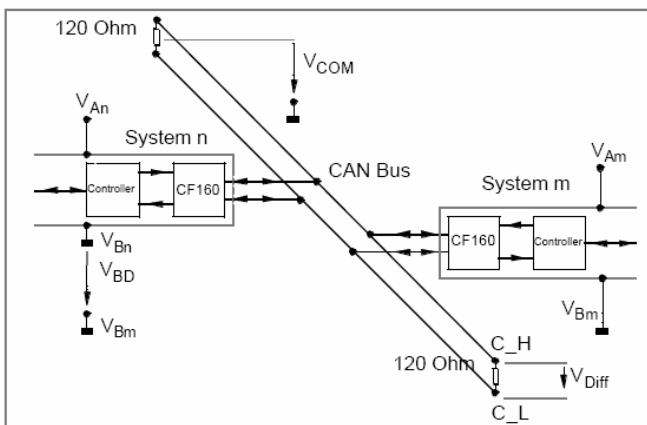
Rating	Conditions	Symbol	Min.	Typ.	Max.	Unit
Signal delay TXO to C_H,C_L		$t_{OT}$		50		ns
Differential output slew rate		SR		40		V/ $\mu$ s
Signal delay C_H,C_L to RXO		$t_{OR}$			150	ns
Signal delay TXO to RXO		$t_{OTR}$		150	280	ns

## Functional description

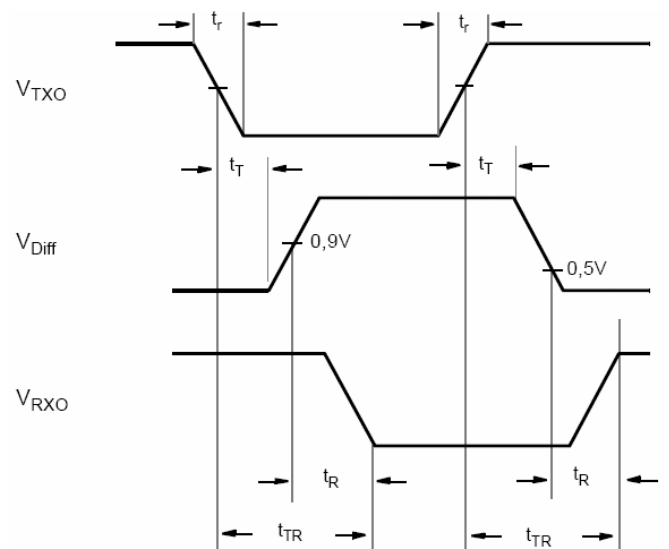
The CF160 is used as an interface between a CAN controller and the physical bus. The device provides transmitting capability to the CAN controller.

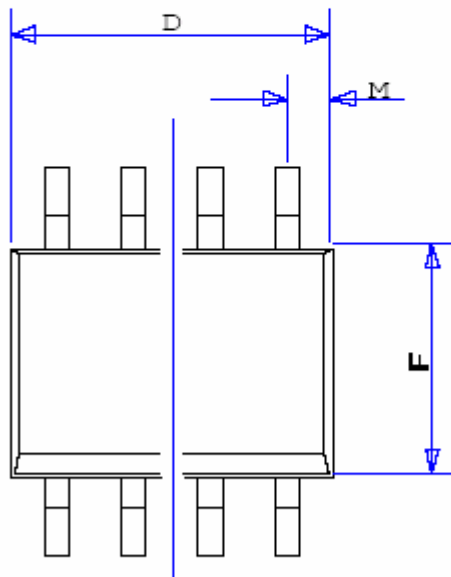
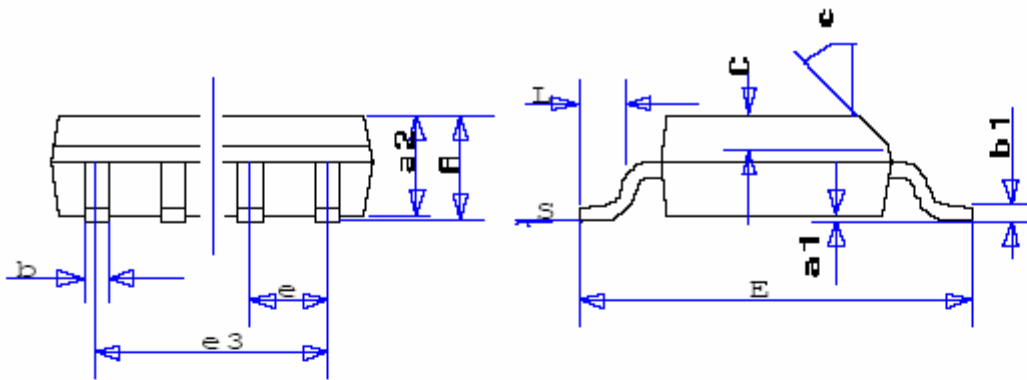
TXO	RES	C_H	C_L	Bus State	RXO
L	H or Floating	H	L	Dominant	L
H or Floating	H or Floating	Floating VA/2	Floating VA/2	Recessive	H
L	L	Floating VA/2	Floating VA/2	Recessive	H
H or Floating	L	Floating VA/2	Floating VA/2	Recessive	H

## Application note



## Timing diagram





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		
F		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			
	Typ	Min	Max
N		4.8	5.0

Variations e3/ mm			
	Typ	Min	Max
N	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](mailto:bosch.semiconductors@de.bosch.com)

Internet: [www.bosch-semiconductors.de](http://www.bosch-semiconductors.de)

© 02/2006 All rights reserved by Robert Bosch GmbH including the right to file industrial property rights  
 Robert Bosch GmbH retains the sole powers of distribution, such as reproduction, copying and distribution.  
 For any use of products outside the released application, specified environments or installation conditions no warranty shall apply and  
 Bosch shall not be liable for such products or any damage caused by such products.