Dual High Speed CAN Transceiver

General Description

Controller area network (CAN) is a serial communication protocol, which supports distributed real-time control and multiplexing with high safety level. Typical applications of CAN-based networks can be found in automotive and industrial environments.

The AMIS-42700 Dual-CAN transceiver is the interface between up to two physical bus lines and the protocol controller and will be used for serial data interchange between different electronic units at more than one bus line. It can be used for both 12 V and 24 V systems.

The circuit consists of following blocks:

- Two differential line transmitters
- Two differential line receivers
- Interface to the CAN protocol handler
- Interface to expand the number of CAN busses
- Logic block including repeater function and the feedback suppression
- Thermal shutdown circuit (TSD)
- · Short to battery treatment circuit

Due to the wide common-mode voltage range of the receiver inputs, the AMIS-42700 is able to reach outstanding levels of electromagnetic susceptibility (EMS). Similarly, extremely low electromagnetic emission (EME) is achieved by the excellent matching of the output signals.

Key Features

- Fully compatible with the ISO 11898-2 standard
- Certified "Authentication on CAN Transceiver Conformance (d1.1)"
- High speed (up to 1 Mbit/s in function of the bus topology)
- Ideally suited for 12 V and 24 V industrial and automotive applications
- Low EME common-mode-choke is no longer required
- Differential receiver with wide common–mode range (±35 V) for high EMS
- No disturbance of the bus lines with an un-powered node
- Dominant time-out function
- Thermal protection
- Bus pins protected against transients in an automotive environment
- Short circuit proof to supply voltage and ground



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NC 1	20 NC
2	19
3	18
Tx0 4	17
GND 5	16
GND 6	15 GND
Rx0 7	14 CANL1
Vref1 8	CANH1
Rint 9	VCC
EN1 10	

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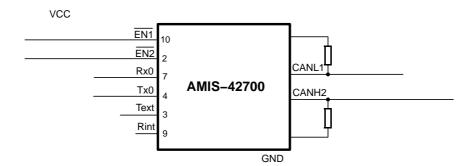
ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 12 of this data sheet.

Table 1. Technical Characteristics

Symbol	Parameter	Conditions	Min.	Max.	Unit
V_{CANHx}	DC voltage at pin CANH1/2	$0 < V_{CC} < 5.25 \text{ V}$; no time limit	-45	+45	V
V_{CANLx}	DC voltage at pin CANL1/2	0 < V _{CC} < 5.25 V; no time limit	-45	+45	V
V _{o(dif)(bus_dom)}	Differential bus output voltage in dominant state	$42.5 \Omega < R_{LT} < 60 \Omega$	1.5	3	V
CM-range	Input common-mode range for comparator	Guaranteed differential receiver threshold and leakage current	-	-	

VBAT



Functional Description Overall Functional Description

AMIS–42700 is specially designed to provide the link between the protocol IC (CAN controller) and two physical bus lines. Data interchange between those two bus lines is realized via the logic unit inside the chip. To provide an independent switch–off of the transceiver units for both bus systems by a third device (e.g. the μ C), enable–inputs for the corresponding driving and receiving sections are provided. As long as both lines are enabled, they appear as one logical bus to all nodes connected to either of them.

The bus lines can have two logical states, dominant or recessive. A bus is in the recessive state when the driving sections of all transceivers connected to the bus are passive. The differential voltage between the two wires is approximately zero. If at least one driver is active, the bus changes into the dominant state. This state is represented by a differential voltage greater than a minimum threshold and therefore by a current flow through the terminating resistors of the bus line. The recessive state is overwritten by the dominant state.

Table 3. Function of the Logic Unit (bold letters describe input signals)

EN1B	EN2B	TX0	TEXT	Bus 1 State	Bus 2 State	RX0	RINT
0	1	1	1	recessive	dominant (Note 3)	1	1
1	0	0	0	recessive	dominant	0	0
1	0	0	1	recessive	dominant	0	0
1	0	1	0	recessive	dominant	0	1
1	0	1	1	recessive	recessive	1	1
1	0	1	1	dominant (Note 3)	recessive	1	1
1	0	1	1	recessive	dominant (Note 3)	0	0
1	1	0	0	recessive	recessive	0	0
1	1	0	1	recessive	recessive	0	0
1	1	1	0	recessive	recessive	0	1
1	1	1	1	recessive	recessive	1	1
1	1	1	1	dominant (Note 3)	recessive	1	1
1	1	1	1	recessive	dominant (Note 3)	1	1

^{3.} Dominant detected by the corresponding receiver.

Receivers

Two bus receiving sections sense the states of the bus lines. Each receiver section consists of an input filter and a fast and accurate comparator. The aim of the input filter is to improve the immunity against high-frequency disturbances and also to convert the voltage at the bus lines CANHx and CANLx, which can vary from -12 V to +12 V,

Short Circuits

As specified in the maximum ratings, short circuits of the bus wires CANHx and CANLx to the positive supply voltage V bat or to ground must not destroy the transceiver. A short circuit between CANHx and CANLx must not destroy the IC as well.

The dedicated comparator (L2VBAT) on CANL pin detects the short to battery and after debounce time-out switches off the affected driver only. The receiver of the affected driver has to operate normally.

Faulty Supply

In case of a faulty supply (missing connection of the electronic unit or the transceiver to ground, missing connection of the electronic unit to Vbat or missing connection of the transceiver to Vcc), the power supply module of the electronic unit will operate such that the transceiver is not supplied, i.e. the voltage Vcc is below the POR level. In this condition the bus connections of the transceiver must be in the POR state.

If the ground line of the electronic unit is interrupted, V bat may be applied to the Vcc pin (measured relative to the original ground potential, to which the other units on the bus are connected).

Reverse Electronic Unit (ECU) Supply

If the connections for ground and supply voltage of an electronic unit (ECU) (max. 50 V) which provides Vcc for the transceiver are exchanged, this transceiver has a ground potential which may be up to 50 V higher than that of the other transceivers. In this case no transceiver must be destroyed even if several of them are connected via the bus system.

Any exchange among the six connections CANH1, CANH2, CANL1, CANL2, ground, and supply voltage of the electronic unit at the connector of the unit must never lead to the destruction of any transceiver of the bus system.

Electrical Characteristics

Definitions

All voltages are referenced to GND. Positive currents flow into the IC. Sinking current means that the current is flowing into the pin. Sourcing current means that the current is flowing out of the pin.

Absolute Maximum Ratings

Stresses above those listed in Table 4 may cause permanent device failure. Exposure to absolute maximum ratings for extended periods may affect device reliability.

Table 4. Absolute Maximum Ratings

Symbol	Parameter	Conditions	Min.	Max.	Unit
V _{CC}	Supply voltage		-0.3	+7	V
V_{CANHx}	DC voltage at pin CANH1/2	0 < V _{CC} < 5.25 V; no time limit	-45	+45	V
V _{CANLx}	DC voltage at pin CANL1/2	0 < V _{CC} < 5.25 V; no time limit	-45	+45	V
V _{dialO}	DC voltage at digital IO pins (EN1B, EN2B,	•	-	<u>-</u>	•

Table 5. Thermal Characteristics

Symbol Parameter		Conditions	Value	Unit
R _{th(vj-a)}	Thermal resistance from junction to ambient in SO20 package	In free air	85	K/W
R _{th(vj-s})	Thermal resistance from junction to substrate of bare die	In free air	45	K/W

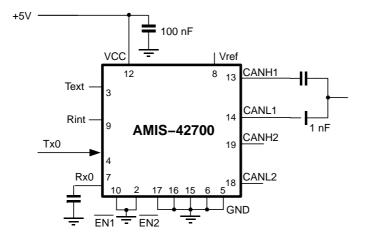
Table 6. DC and Timing Characteristics ($V_{CC} = 4.75$ to 5.25 V; $T_{junc} = -40$ to +150°C; $R_{LT} = 60$ W unless specified otherwise.)

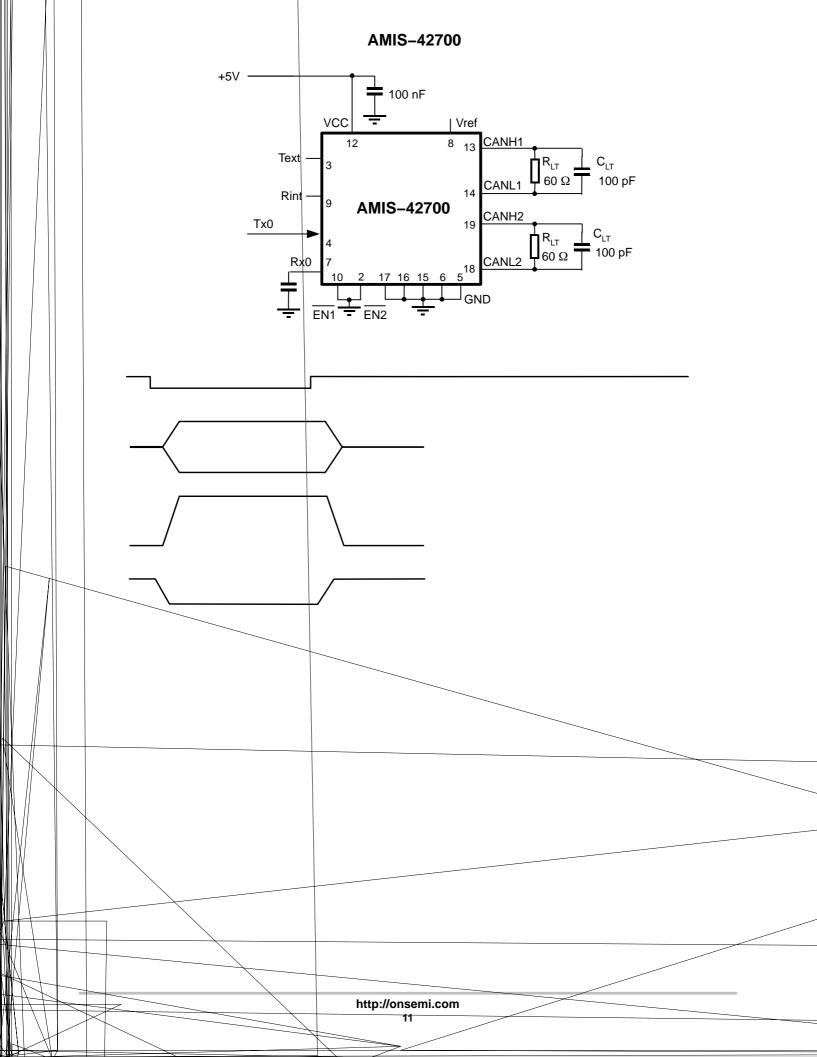
Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
SUPPLY (pin	V _{CC})					
Icc	Supply current, no loads on digital outputs, both busses enabled	Dominant transmitted Recessive transmitted		45	137.5 19.5	•

Table 6. DC and Timing Characteristics ($V_{CC} = 4.75$ to 5.25 V; $T_{junc} = -40$ to +150°C; $R_{LT} = 60$ W unless specified otherwise.)

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Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
BUS LINES (p	oins CANH1/2 and CANL1/2)					
V _{i(dif)(th)}	Differential receiver threshold voltage	-5 V < V _{CANLx} < +12 V; -5 V < V _{CANHx} < +12 V; see Figure 6	0.5	0.7	0.9	V
Vihcm(dif) (th)	Differential receiver threshold voltage for high common-mode	-35 V < V _{CANLx} < +35 V; -35 V < V _{CANHx} < +35 V; see Figure 6	0.3	0.7	1.05	V
V _{i(dif)} (hys)	Differential receiver input voltage hysteresis	-35V < V _{CANL} < +35 V; -35 V < V _{CANH} < +35 V; see Figure 6			•	

Measurement Set-ups and DefinitionsSchematics are given for single CAN transceiver.





Soldering

Introduction to Soldering Surface Mount Packages

This text gives a very brief insight to a complex technology. A more in–depth account of soldering ICs can be found in the ON Semiconductor "Data Handbook IC26; Integrated Circuit Packages" (document order number 9398 652 90011). There is no soldering method that is ideal for all surface mount IC packages. Wave soldering is not always suitable for surface mount ICs, or for printed–circuit boards with high population densities. In these situations reflow soldering is often used.

Re-flow Soldering

Re–flow soldering requires solder paste (a suspension of fine solder particles, flux and binding agent) to be applied to the printed–circuit board by screen printing, stenciling or pressure–syringe dispensing before package placement. Several methods exist for re–flowing; for example, infrared/convection heating in a conveyor type oven. Throughput times (preheating, soldering and cooling) vary between 100 and 200 seconds depending on heating method. Typical re–flow peak temperatures range from 215°C to 260°C.

Wave Soldering

Conventional single wave soldering is not recommended for surface mount devices (SMDs) or printed-circuit boards with a high component density, as solder bridging and non-wetting can present major problems. To overcome these problems the double-wave soldering method was specifically developed.

If wave soldering is used the following conditions must be observed for optimal results:

- Use a double-wave soldering method comprising a turbulent wave with high upward pressure followed by a smooth laminar wave.
- For packages with leads on two sides and a pitch (e):
 - Larger than or equal to 1.27 mm, the footprint longitudinal axis is preferred to be parallel to the transport direction of the print-circuit board;
 - Smaller than 1.27 mm, the footprint longitudinal axis must be parallel to the transport direction of the printed-circuit board. The footprint must incorporate solder thieves at the downstream end.
- For packages with leads on four sides, the footprint must be placed at a 45° angle to the transport direction of the printed-circuit board. The footprint must incorporate solder thieves downstream and at the side corners.

During placement and before soldering, the package must be fixed with a droplet of adhesive. The adhesive can be applied by screen printing, pin transfer or syringe dispensing. The package can be soldered after the adhesive is cured. Typical dwell time is four seconds at 250°C. A mildly-activated flux will eliminate the need for removal of corrosive residues in most applications.

Manual Soldering

Fix the component by first soldering two diagonally-opposite end leads. Use a low voltage (24 V or less) soldering iron applied to the flat part of the lead. Contact time must be limited to 10 seconds at up to 300°C.

When using a dedicated tool, all other leads can be soldered in one operation within two to five seconds between 270°C and 320°C.

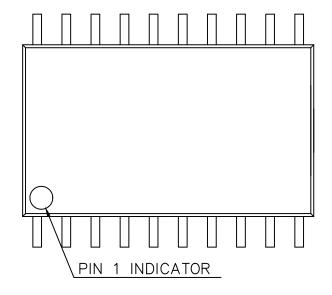
Table 7. Soldering Process

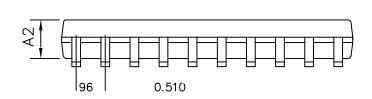
	Soldering Met	Soldering Method			
Package	Wave	Re-flow (Note 9)			
BGA, SQFP	Not suitable	Suitable			
HLQFP, HSQFP, HSOP, HTSSOP, SMS	Not suitable (Note 10)	Suitable			
PLCC (Note 11), SO, SOJ	Suitable	Suitable			
LQFP, QFP, TQFP	Not recommended (Notes 11 and 12)	Suitable			
SSOP, TSSOP, VSO	Not recommended (Note 13)	Suitable			

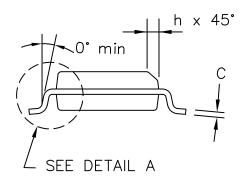
All SMD packages are moisture sensitive. Depending upon the moisture content, the maximum temperature (with respect to time) and body Q.06.t 2.moi90709 refBTin 575.5oards

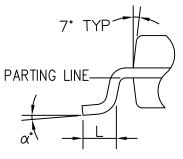
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DETAIL A

DIMENSIONS IN INCHE						
SYMBOL		NOM	MAX.			
Α	0.093		0.104			
A1			0.012			
A2	0.088	0.094	0.100			
В						
С	00					
D			,			
Е	0.292	0.296	0.299			
е	.050 BSC.					
Н		ა.402	0.419			
h	0.010	0.015	0.019			
L	0.016	0.033				
	0,	5°	8°			

