

# LTC2875

## ±60V Fault Protected 3.3V or 5V High Speed CAN Transceiver

### DESCRIPTION

Demonstration circuit 2063A is a robust high speed, low power, ISO 11898-2 compliant CAN transceiver featuring the LTC®2875. The demo circuit operates on 3.3V or 5V supplies and features ±60V overvoltage fault protection on the data transmission lines during all modes of operation. The demo circuit contains all the components necessary to demonstrate the features of the LTC2875 in a CAN network, including a terminated SMB jack for TXD data

input, jumper selectable CAN bus termination (supporting either single or split termination configurations), and a jumper selectable variable slew rate control.

**Design files for this circuit board are available at <http://www.linear.com/demo/DC2063A>**

LT, LT, LTC, LTM, Linear Technology and the Linear logo are registered trademarks of Linear Technology Corporation. All other trademarks are the property of their respective owners.

### PERFORMANCE SUMMARY Specifications are at T<sub>A</sub> = 25°C

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
V <sub>CC</sub>	Input Supply Range	3.3V V <sub>CC</sub> Range	3.0	3.3	3.6	V
		5V V <sub>CC</sub> Range	4.5	5.0	5.5	V
f <sub>MAX</sub>	Maximum Data Rate	JP3 in 'MAX' position	4			Mbps
	Interface I/O: CANH, CANL		-60		60	V
	Bus Differential Voltage (CANH-CANL)	JP2 in 'SINGLE' or 'SPLIT' position			10	V

### OPERATING PRINCIPLES

The LTC2875 is enabled by pulling the RS pin low. The slew rate of the transmitter can be controlled by pulling RS low with a resistor ≤ 200kΩ, with the slew rate decreasing with increasing resistor value. The DC2063A provides two jumper positions to enable the LTC2875. With a jumper in the JP3:MAX position, the RS pin is grounded and the LTC2875 operates at its maximum slew rate. With a jumper in the JP3:ADJ position, the transmitter slew rate can be varied from its minimum to maximum using 200kΩ variable resistor RV1. When no jumper is placed on JP3, the RS pin in the LTC2875 is pulled up by an internal 250kΩ resistor, putting the chip in the shut-down state.

The data input signal can be applied to the LTC2875 TXD pin through either the TXD turret or the SMB jack J1. To apply the TXD signal through the SMB jack J1, place a jumper on the JP1:SMB position. The SMB input is terminated to GND by a 50Ω resistor. To apply the TXD signal through the TXD turret, place a jumper on the JP1:TURRET position. The TXD turret input contains a 100Ω series resistor but is not terminated. Jumpers may be applied to both JP1:SMB and JP1:TURRET to enable applying a signal from a pulse generator through the SMB jack J1 and monitoring the signal with a scope probe on the TXD turret.

## OPERATING PRINCIPLES

When TXD is low, the LTC2875 drives the dominant state onto the CANH and CANL bus lines, with CANH pulled high and CANL pulled low. When TXD is high, the LTC2875 is in the recessive state, with both CANH and CANL drivers in the high impedance state, and the differential voltage on the CAN bus lines is returned to near zero by the termination resistors. The TXD pin is pulled high by an internal 500k $\Omega$  resistor when it is left floating.

The CAN bus must be terminated at both ends by resistors matched to the impedance of the bus cable, typically 120 $\Omega$ , while all other nodes on the CAN bus must be unterminated. The DC2063A provides three jumper selectable termination configurations: split termination, single termination, and no termination. The split termination is selected by placing two jumpers on JP2 in the SPLIT (vertical) configuration. This provides 120 $\Omega$  termination consisting of two series 60 $\Omega$  resistors with the LTC2875

SPLIT pin and a 4.7nF decoupling capacitor biasing the termination center point. This configuration lowers the EME of the transmitted signal by reducing common mode voltage fluctuations. The single termination is selected by placing two jumpers on JP2 in the SINGLE (horizontal) configuration. This provides 120 $\Omega$  termination consisting of two series 60 $\Omega$  resistors with no biasing of the center point. No termination may be selected by removing both jumpers from JP2.

The LTC2875 receiver senses the differential voltage on the CAN bus lines and produces a digital output on the RXD pin. When a dominant state is sensed on the bus lines, the RXD output will pull low. When a recessive state is sensed on the bus lines, the RXD output will pull high. When the LTC2875 is in the shutdown state, the RXD pin is pulled high by an internal 500k $\Omega$  resistor. The LTC2875 RXD pin is connected directly to the DC2063A RXD turret.

---

## QUICK START PROCEDURE

Demonstration circuit 2063A is easy to set up and evaluate the performance of the LTC2875.

1. Verify the jumpers are in the following default positions:  
**JP1:SMB ON; JP1:TURRET OFF**  
**JP2: SPLIT**  
**JP3:MAX ON; JP3:ADJ OFF**
2. With power off, connect the input power supply to V<sub>CC</sub> and GND turrets.
3. Turn on the power at the input.

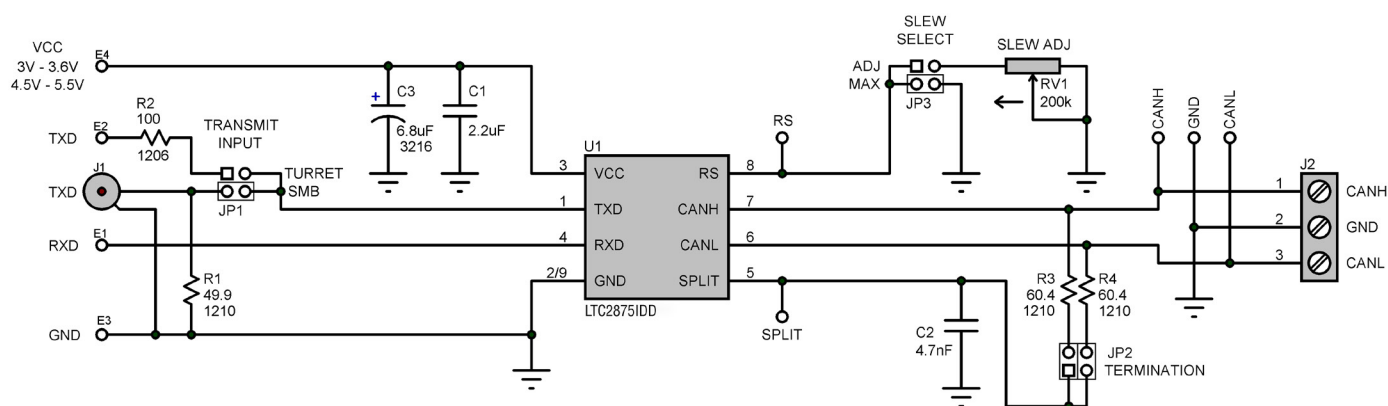
**NOTE:** Make sure the input voltage does not exceed 6V.

4. Connect a function generator to SMB jack J1 and set to square wave with a low of 0V, high = V<sub>CC</sub>. Set frequency to 100kHz (200kbps). Enable output of function generator.
5. Connect oscilloscope to pin RXD and observe 100kHz waveform. This demonstration shows that data applied to TXD is transmitted to the CAN bus, looped back through the receiver, and outputted on RXD.

## PARTS LIST

ITEM	QTY	REFERENCE	PART DESCRIPTION	MANUFACTURER/PART NUMBER
<b>Required Circuit Components</b>				
1	1	U1	IC, CAN Transceiver	LINEAR LTC2875IDD
<b>Hardware/Components (For Demo Board Only)</b>				
2	1	C1	Capacitor, 2.2 $\mu$ F, 10%, 0603, 10V, X7R	Murata/GRM188R71A225KE15D
3	1	C2	Capacitor, 4700pF 20% 0603, 100V, X7R	AVX/06031C472MAT2A
4	1	C3	Capacitor, Tantalum, 6.8 $\mu$ F, 10%, 3216, 16V	AVX/TAJA685K016RNJ
5	2	E1, E2	Turret	Mill Max/2308-2-00-80-00-00-07-0
6	2	E3, E4	Turret	Mill Max/2501-2-00-80-00-00-07-0
7	1	J1	Connector, SMB Male Jack, Straight, 50 $\Omega$	Amphenol/142138
8	1	J2	Terminal Block, 3 Position, Side Entry 3.5mm	TE Connectivity/284391-3
9	3	JP1-3	Header, 2 x 2 0.1"	Samtec/TSW-102-07-G-D
10	1	R1	Resistor, 49.9 $\Omega$ , 1%, 1210	Panasonic/ERJ-14NF49R9U
11	1	R2	Resistor, 100 $\Omega$ , 5%, 1206	AAC/CR10-101JM
12	2	R3, R4	Resistor 60.4 $\Omega$ , 1%, 1210	Vishay/CRCW121060R4FKEA
13	1	RV1	Trimmer, 200k $\Omega$ , 1-Turn	Panasonic/EVM-3VVSX50B25
14	4		Standoff, Snap-on	Keystone/8833

## SCHEMATIC DIAGRAM



# DEMO MANUAL DC2063A

---

## DEMONSTRATION BOARD IMPORTANT NOTICE

Linear Technology Corporation (LTC) provides the enclosed product(s) under the following **AS IS** conditions:

This demonstration board (DEMO BOARD) kit being sold or provided by Linear Technology is intended for use for **ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY** and is not provided by LTC for commercial use. As such, the DEMO BOARD herein may not be complete in terms of required design-, marketing-, and/or manufacturing-related protective considerations, including but not limited to product safety measures typically found in finished commercial goods. As a prototype, this product does not fall within the scope of the European Union directive on electromagnetic compatibility and therefore may or may not meet the technical requirements of the directive, or other regulations.

If this evaluation kit does not meet the specifications recited in the DEMO BOARD manual the kit may be returned within 30 days from the date of delivery for a full refund. **THE FOREGOING WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY THE SELLER TO BUYER AND IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED, IMPLIED, OR STATUTORY, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. EXCEPT TO THE EXTENT OF THIS INDEMNITY, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.**

The user assumes all responsibility and liability for proper and safe handling of the goods. Further, the user releases LTC from all claims arising from the handling or use of the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. Also be aware that the products herein may not be regulatory compliant or agency certified (FCC, UL, CE, etc.).

No License is granted under any patent right or other intellectual property whatsoever. **LTC assumes no liability for applications assistance, customer product design, software performance, or infringement of patents or any other intellectual property rights of any kind.**

LTC currently services a variety of customers for products around the world, and therefore this transaction **is not exclusive**.

**Please read the DEMO BOARD manual prior to handling the product.** Persons handling this product must have electronics training and observe good laboratory practice standards. **Common sense is encouraged.**

This notice contains important safety information about temperatures and voltages. For further safety concerns, please contact a LTC application engineer.

Mailing Address:

Linear Technology  
1630 McCarthy Blvd.  
Milpitas, CA 95035

Copyright © 2004, Linear Technology Corporation