

## Evaluating the **ADM3050E** 5.7 kV rms, Signal Isolated, Basic CAN FD Transceiver

### FEATURES

- ADM3050E** 12 Mbps isolated CAN FD transceiver
- 2-layer PCB with low radiated emissions, passes EN 55022 Class B
- On-board LDOs for 6 V to 9 V supply, providing 5 V to the **ADM3050E** V<sub>DD1</sub> pin and V<sub>DD2</sub> pin
- Screw terminal connectors for the following:
  - 6 V to 9 V LDO, 5 V power supply to the V<sub>DD1</sub> pin
  - 1.8 V to 5.0 V direct power supply to V<sub>DD1</sub> pin
  - 6 V to 9 V LDO, 5 V power supply to the V<sub>DD2</sub> pin
  - 5 V direct power supply to V<sub>DD2</sub> pin
  - TXD pin, RXD pin, CANH pin, CANL pin signals
  - Divided PCB return planes for GND<sub>1</sub> and GND<sub>2</sub>
- SMA connectors for TXD pin and RXD pin signals

### EVALUATION KIT CONTENTS

- EVAL-ADM3050EEBZ evaluation board
- ADM3050EBRIZ**
- ADP7104**
- LTC6900**

### DOCUMENTS NEEDED

- ADM3050E** data sheet

### GENERAL DESCRIPTION

The EVAL-ADM3050EEBZ allows the user to evaluate the **ADM3050E** isolated signal and power transceiver for controller area network (CAN) or CAN with flexible data rate (CAN FD) networks. The EVAL-ADM3050EEBZ allows all of the input and output functions to work without the need for external components.

Based on the Analog Devices, Inc., *iCoupler*® technology, the **ADM3050E** integrates logic side on-off keying (OOK) signal isolation channels and an Analog Devices *isoPower*® dc-to-dc converter to provide regulated, isolated power that is well below EN 55022 Class B limits when transmitting on a 2-layer printed circuit board (PCB) with ferrites.

The EVAL-ADM3050EEBZ comes populated with the **ADM3050E**.

Full specifications of the **ADM3050E** can be found in the **ADM3050E** data sheet, available from Analog Devices and must be consulted in conjunction with this user guide when using the EVAL-ADM3050EEBZ.

### PHOTOGRAPH OF EVAL-ADM3050EEBZ

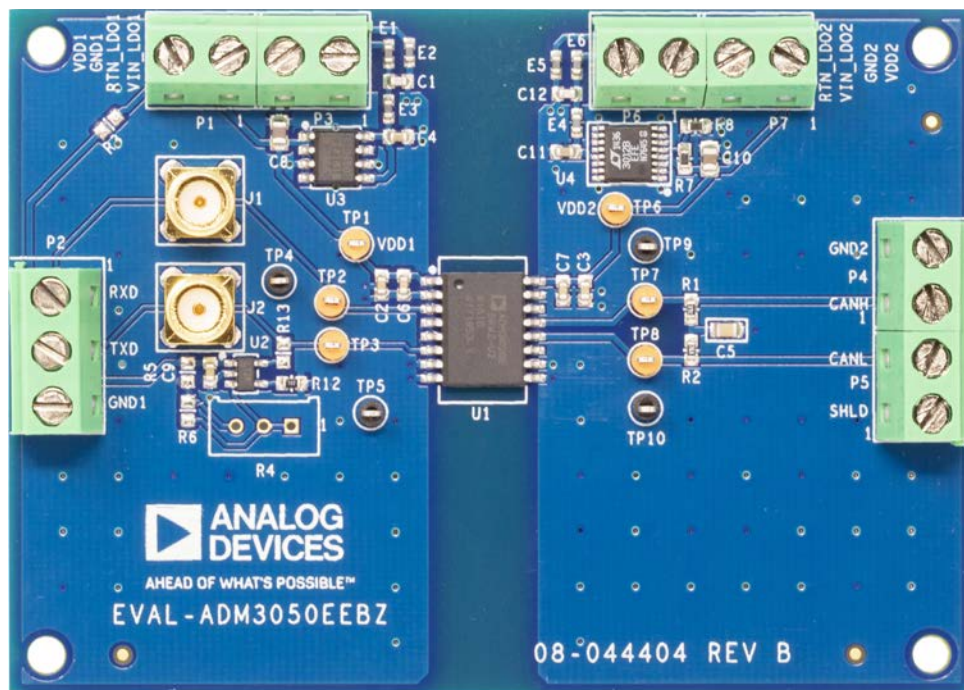


Figure 1.

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**REVISION HISTORY**

10/2018—Revision 0: Initial Version

## EVALUATION BOARD HARDWARE USING THE EVALUATION BOARD

Figure 1 shows the EVAL-ADM3050EEBZ. The  $V_{DD1}$  and  $V_{DD2}$  supply pins of the ADM3050E device must be supplied with input power. The  $V_{DD1}$  pin and the  $V_{DD2}$  pin can be powered directly or through the fixed output 5 V on-board low dropout (LDO) regulators. The VDD1 side LDO input supply requires a power supply voltage of 6 V to 9 V and connects to Pin 1 of Screw Terminal P3 (marked VIN\_LDO1 on the silkscreen) and Pin 2 of Screw Terminal P3 (marked RTN\_LDO1 on the silkscreen). The VDD2 side LDO input supply also requires a power supply voltage of 6 V to 9 V but connects to Pin 1 of Screw Terminal P6 (marked VIN\_LDO2 on the silkscreen) and Pin 2 of Screw Terminal P6 (marked RTN\_LDO2 on the silkscreen).

Using the LDO, the complete board can be powered by a 9 V battery (when testing for electromagnetic compatibility (EMC), for example). The ADP7104 LDO and LT3012 LDO both feature reverse current protection and can be left unpowered but connected to the EVAL-ADM3050EEBZ evaluation board when supplying power directly to the ADM3050E  $V_{DD1}$  and  $V_{DD2}$  pins. Additionally, the LT3012 is protected against reverse voltages to the input power pin. This LT3012 feature can be used in conjunction with the ADM3050E device bus fault tolerance to protect against miswire damage in applications where the supply power and CAN bus pins are manually wired.

### PCB LAYOUT RECOMENDATIONS

Place a 0.1  $\mu$ F capacitor as close as possible to VDD1 and GND1 and another 0.1  $\mu$ F capacitor as close as possible to VDD2 and GND2 as shown in the layout example for the EVAL-ADM3050EEBZ (see Figure 2).

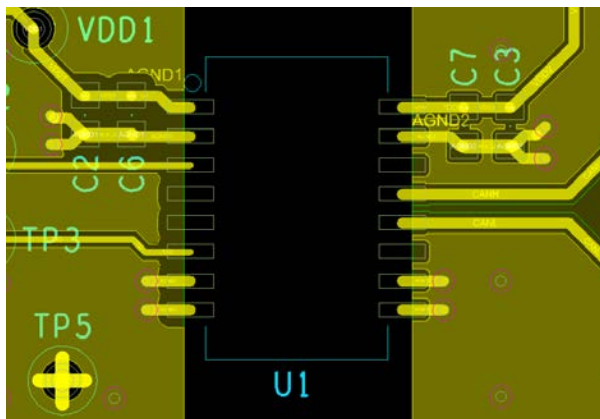


Figure 2. Layout Example for the EVAL-ADM3050EEBZ

### EN 55022 RADIATED EMISSIONS TEST RESULTS

The EVAL-ADM3050EEBZ passes the EN 55022 Class B standard.

The EVAL-ADM3050EEBZ is configured and tested with a 5 V power supplied to the  $V_{DD1}$  pin from the ADP7104 regulator output and the  $V_{DD2}$  pin from the LT3012 regulator output. The on-board LTC6900 generates the clock signal input to the TXD pin and is set to a given frequency with the on-board potentiometer. Battery packs with short leads are used for emissions testing to supply the ADP7104 regulator and the LT3012 regulator inputs.

Figure 3 shows the measurements carried out according to the EN 55032 Class B standard in a semianechoic chamber at 10 m from 30 MHz to 1 GHz. Figure 3 shows the results of the peak horizontal scan (the worst case). These results demonstrate that the ADM3050E has a greater than 6.0 dB margin below EN 55032 Class B limits on a 2-layer PCB.

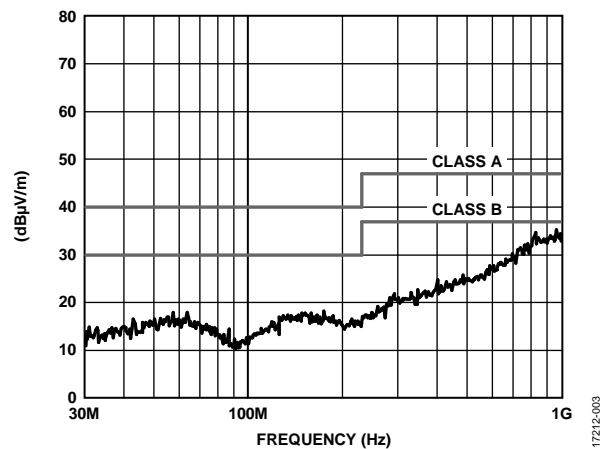


Figure 3. Horizontal Scan from 30 MHz to 1 GHz with 12 Mbps Signal to TXD with 60  $\Omega$  Termination

EVALUATION BOARD SCHEMATIC AND ARTWORK

17212-004

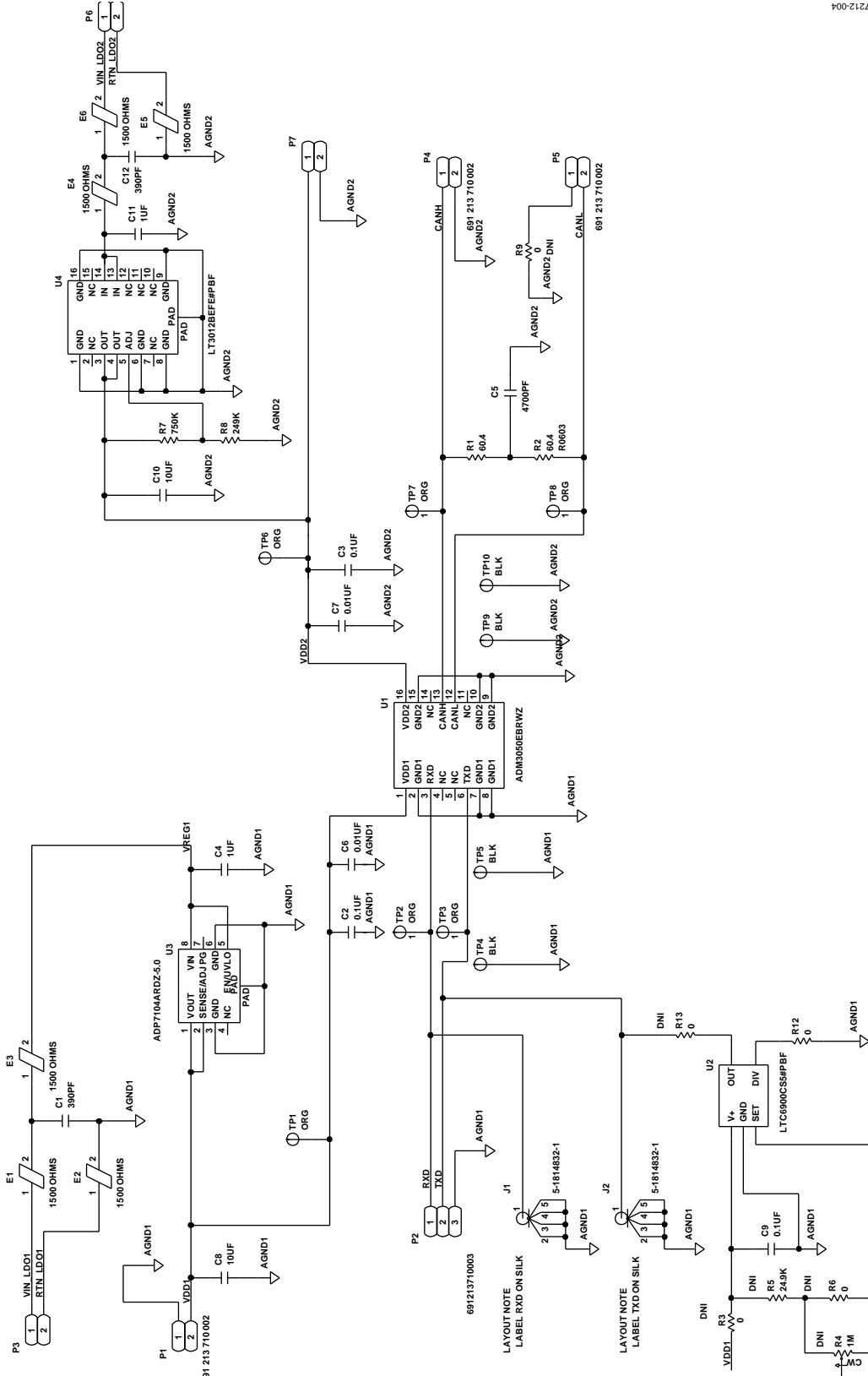
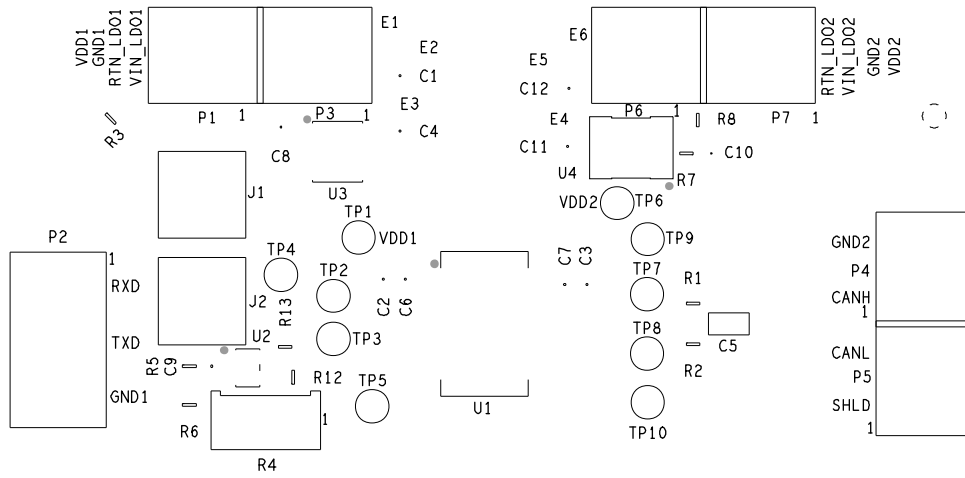


Figure 4. EVAL-ADM3050EEBZ Schematic



AHEAD OF WHAT'S POSSIBLE™

EVAL-ADM3050EEBZ

08-044404 REV B

17212-005

Figure 5. EVAL-ADM3050EEBZ Primary Silkscreen

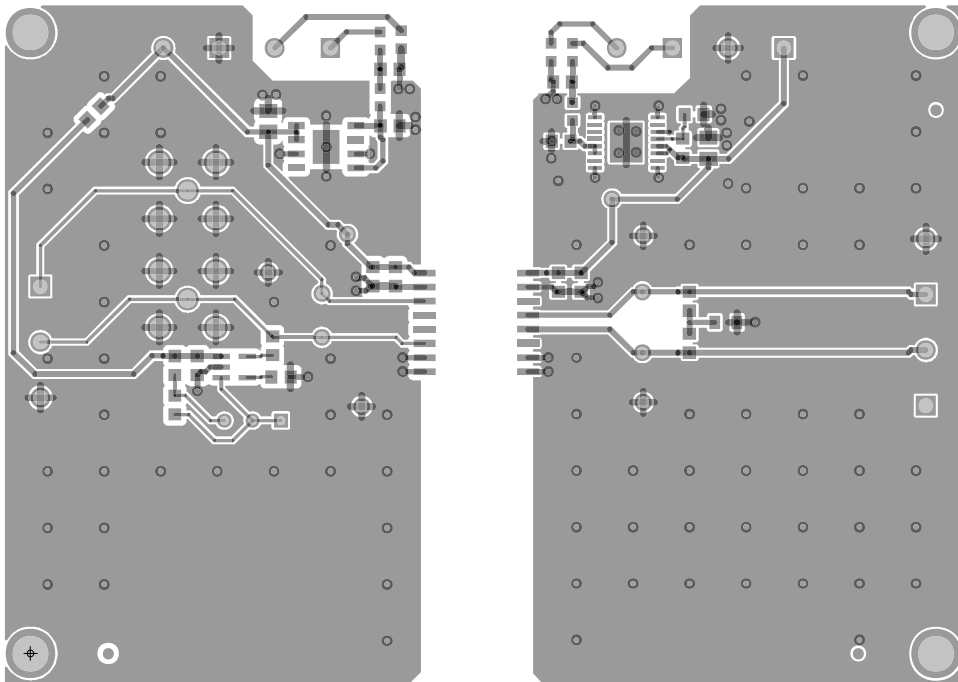


Figure 6. EVAL-ADM3050EEBZ Top Layer

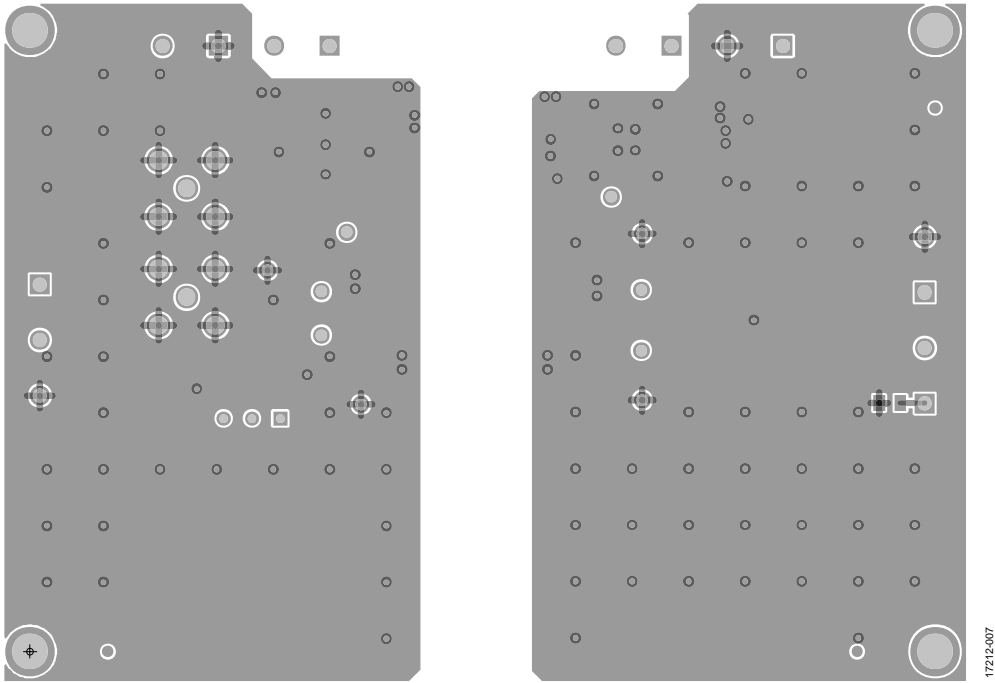


Figure 7. EVAL-ADM3050EEBZ Bottom Layer

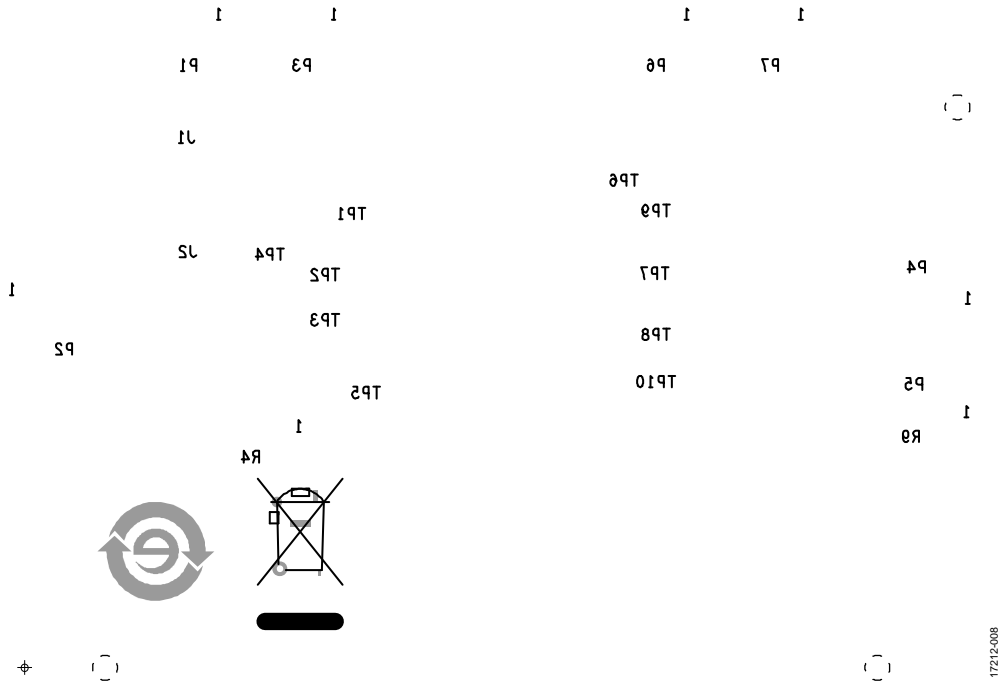


Figure 8. EVAL-ADM3050EEBZ Bottom Silkscreen

## ORDERING INFORMATION

### BILL OF MATERIALS

Table 1.

Component	Description	Supplier	Part No.
U1	5.7 kV rms, signal isolated, basic CAN FD transceiver	Analog Devices	<a href="#">ADM3050EBRWZ</a>
U2	Low power, resistor set oscillator, 1 kHz to 20 MHz	Analog Devices	<a href="#">LTC6900CS5#PBF</a>
U3	Low noise, CMOS, LDO, 5.0 V <sub>OUT</sub>	Analog Devices	<a href="#">ADP7104ARDZ-5.0-R7</a>
U4	Low dropout, micropower linear regulator	Analog Devices	<a href="#">LT3012BEFE#PBF</a>
C1, C12	Capacitors, 390 pF, X7R, 0603	AVX	0603YC391KAT2A
C8, C10	Capacitors, 10 μF, X7R, 0805	Würth Electronik	885012207026
C4, C11	Capacitors, 1 μF, X7R, 0603	Würth Electronik	885012206076
C2, C3, C9	Capacitors, 0.1 μF, X7R, 0603	Würth Electronik	885012206046
C5	Capacitor, 4700 pF, X7R, 0805	Würth Electronik	885012207090
C6, C7	Capacitors, 0.01 μF, X7R, 0603	Würth Electronik	885012206014
E1, E2, E3, E4, E5, E6	Ferrite beads, 1500 Ω, 0603	Murata	BLM18HE152SN1D
J1, J2	Connector, subminiature, Version A (SMA)	TE Connectivity	5-1814832-1
P1, P3, P4, P5, P6, P7	Connectors, 2-position screw terminal block	Würth Electronik	691 213 710 002
P2	Connector, 3-position screw terminal block	Würth Electronik	691213710003
R1, R2	Resistors, 60.4 Ω, 1/10 W, 0603	Panasonic	ERJ-3EKF60R4V
R12	Resistor, 0 Ω, 1/10 W, 0603	Panasonic	ERJ-3GEY0R00V
R7	Resistor, 750 kΩ, 1/10 W, 0603	Panasonic	ERJ-3EKF7503V
R8	Resistor, 249 kΩ, 1/10 W, 0603	Panasonic	ERJ-3EKF2493V
TP1, TP2, TP3, TP6, TP7, TP8	Orange test points	Keystone	5003
TP4, TP5, TP9, TP10	Black test points	Vero	20-2137
R3, R6, R13	Resistors, 0 Ω, 1/10 W, 0603 (do not installed, DNI)	Panasonic	ERJ-3GEY0R00V
R4	Potentiometer, 1 MΩ (DNI)	Bourns	3296W-1-105LF
R5	Resistor, 24.9 kΩ, 1/10 W, 0603 (DNI)	Panasonic	ERA-3AEB2492V
R9	Resistor, 0 Ω, 1/10 W, 0805 (DNI)	Panasonic	ERJ-6GEY0R00V

### RELATED LINKS

Resource	Description
<a href="#">ADM3050E</a>	5.7 kV rms, signal isolated, basic CAN FD transceiver
<a href="#">AN-1123</a>	Controller area network (CAN) implementation guide

## NOTES

**ESD Caution**

**ESD (electrostatic discharge) sensitive device.** Charged devices and circuit boards can discharge without detection. Although this product features patented or proprietary protection circuitry, damage may occur on devices subjected to high energy ESD. Therefore, proper ESD precautions should be taken to avoid performance degradation or loss of functionality.

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