ANALOG DEVICES

EVAL-ADM3050EEBZ User Guide
UG-1436

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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_{DD1} pin and V_{DD2} pin
- Screw terminal connectors for the following:
  - 6 V to 9 V LDO, 5 V power supply to the V_{DD1} pin
  - 1.8 V to 5.0 V direct power supply to V_{DD1} pin
  - 6 V to 9 V LDO, 5 V power supply to the V_{DD2} pin
  - 5 V direct power supply to V_{DD2} pin
  - TXD pin, RXD pin, CANH pin, CANL pin signals
  - Divided PCB return planes for GND_1 and GND_2
- 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., *i*Coupler® technology, the ADM3050E integrates logic side on-off keying (OOK) signal isolation channels and an Analog Devices *iso*Power® 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

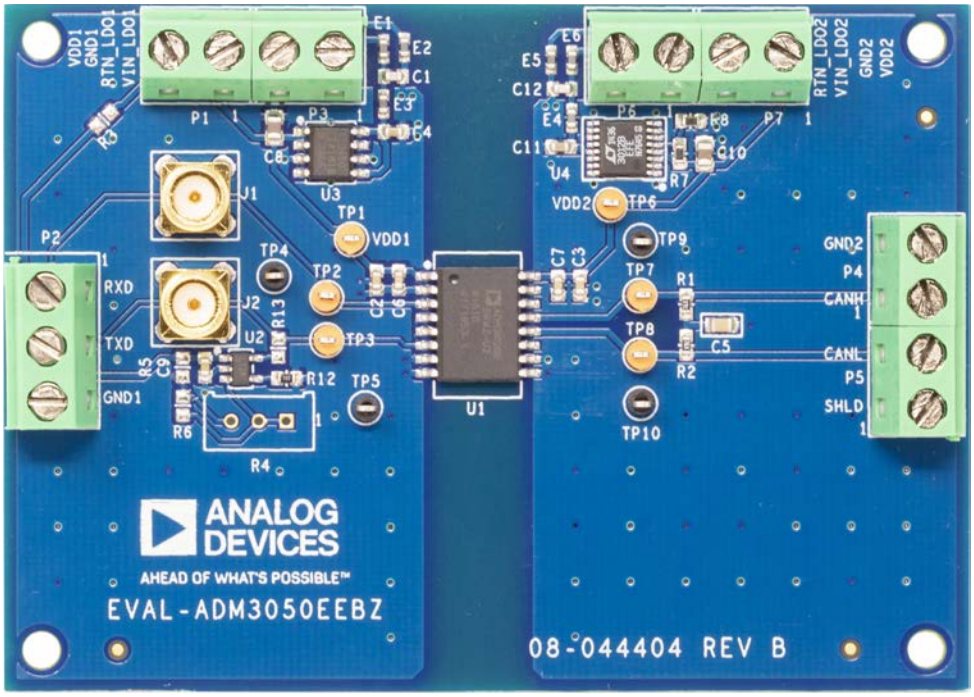

Figure 1.

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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 µF capacitor as close as possible to VDD1 and GND1 and another 0.1 µF capacitor as close as possible to VDD2 and GND2 as shown in the layout example for the EVAL-ADM3050EEBZ (see Figure 2).

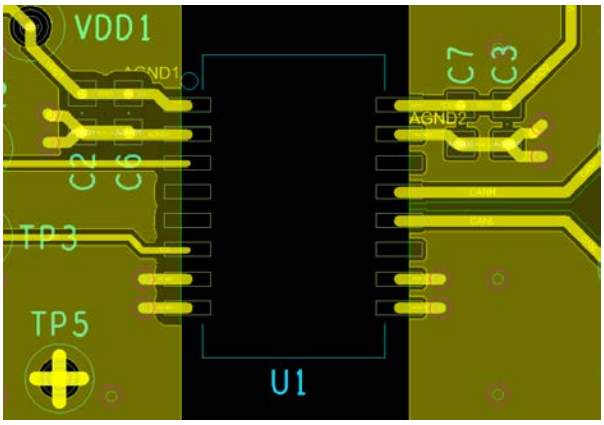

Figure 2. Layout Example for the EVAL-ADM3050EEBZ

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.

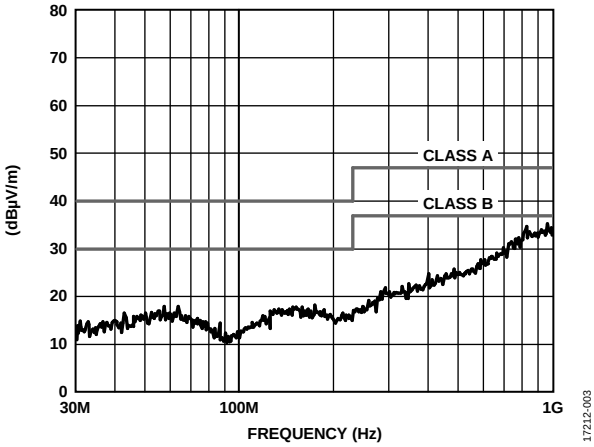

Figure 3. Horizontal Scan from 30 MHz to 1 GHz with 12 Mbps Signal to TXD with 60 Ω Termination

EVALUATION BOARD SCHEMATIC AND ARTWORK

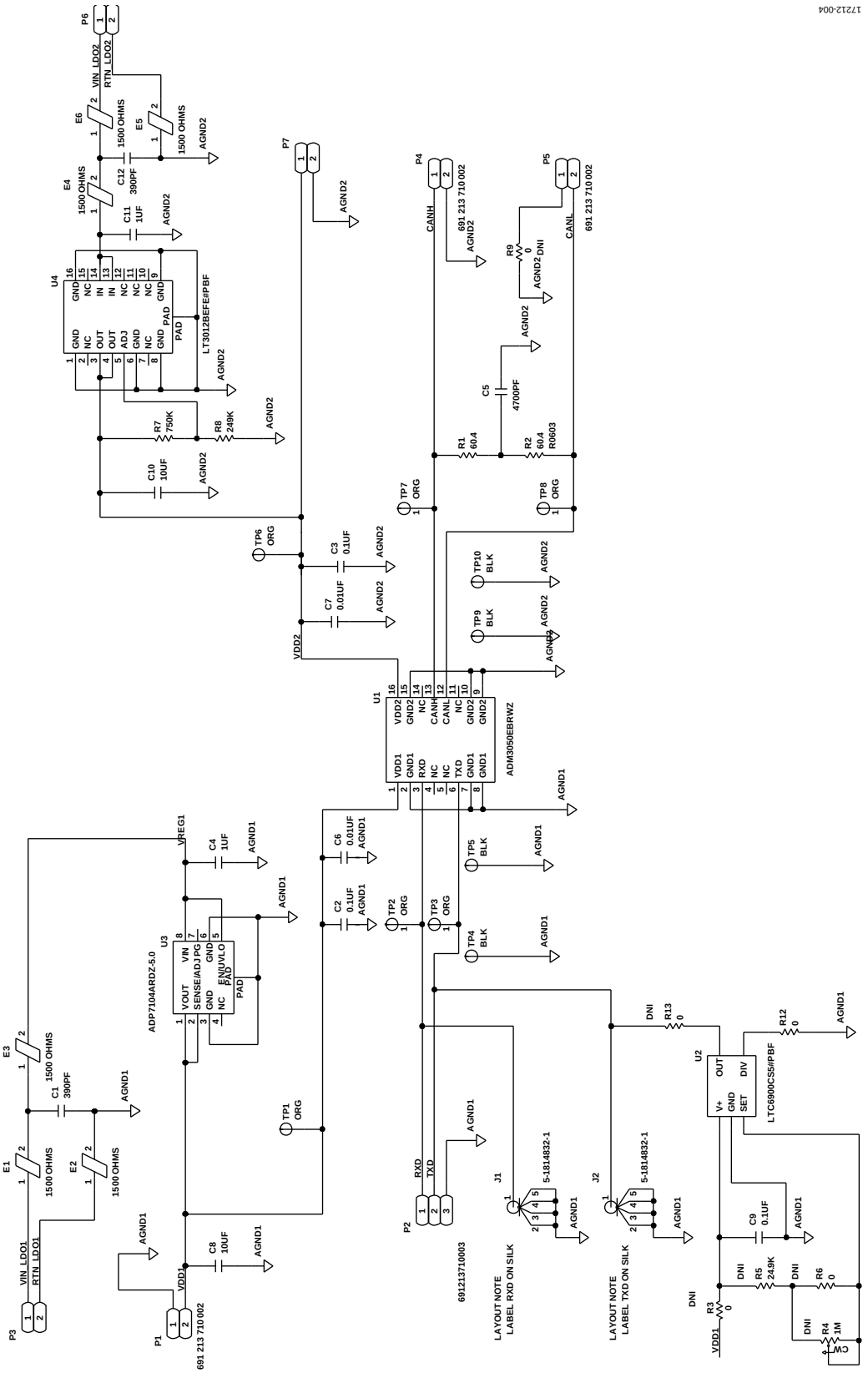

Figure 4. EVAL-ADM3050EEBZ Schematic

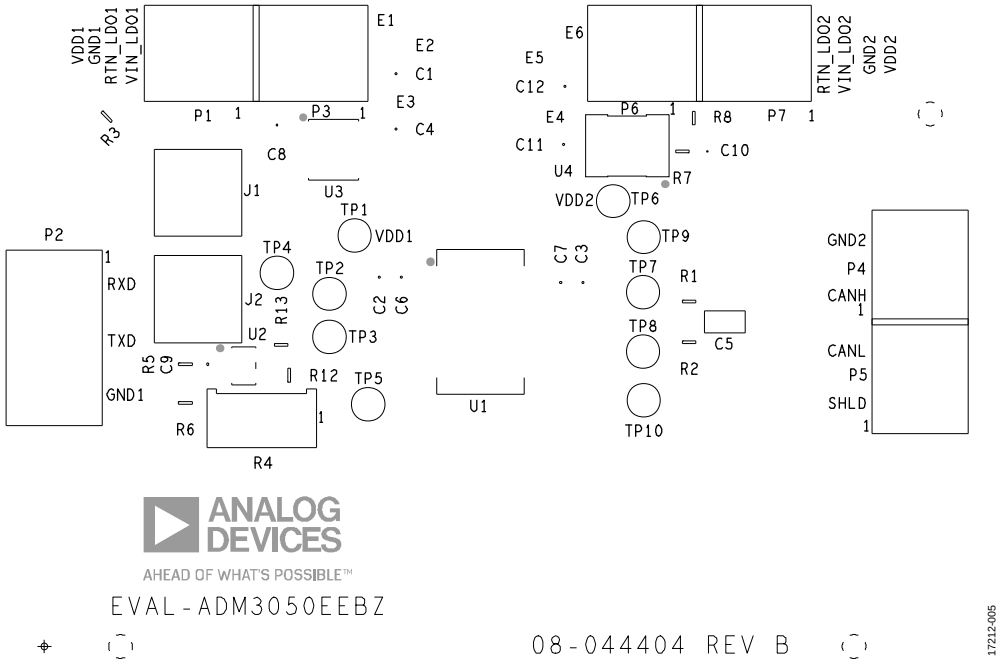

Figure 5. EVAL-ADM3050EEBZ Primary Silkscreen

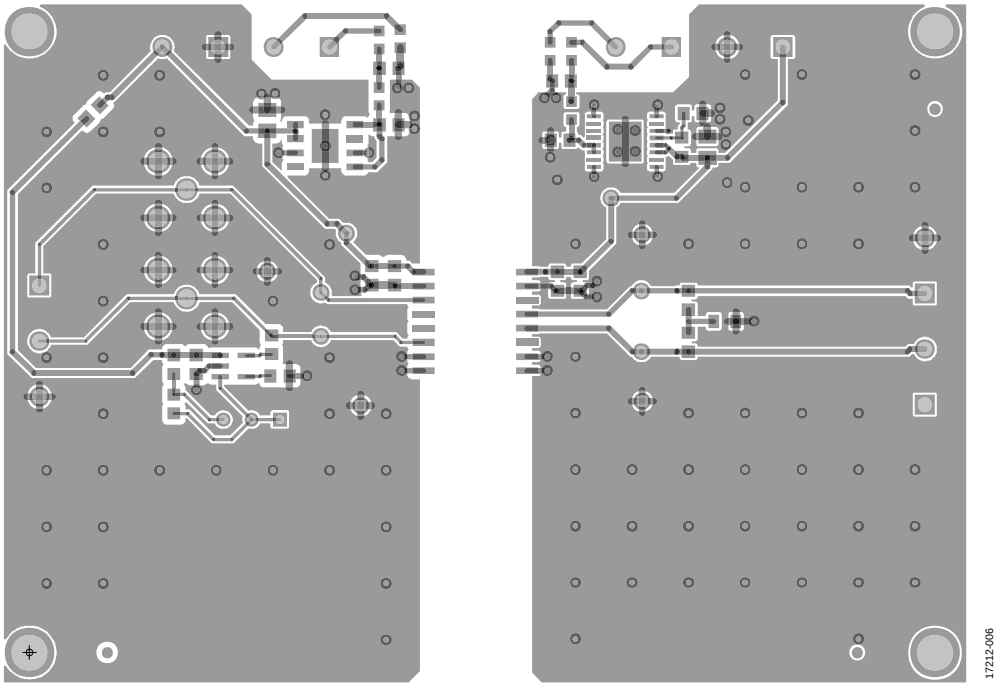

Figure 6. EVAL-ADM3050EEBZ Top Layer

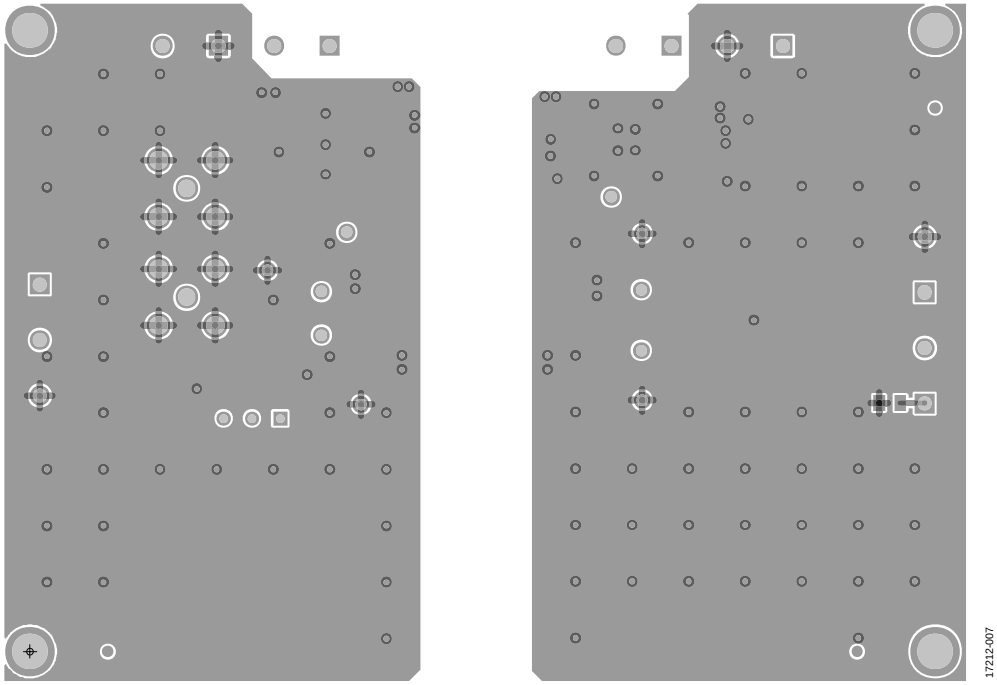

Figure 7. EVAL-ADM3050EEBZ Bottom Layer

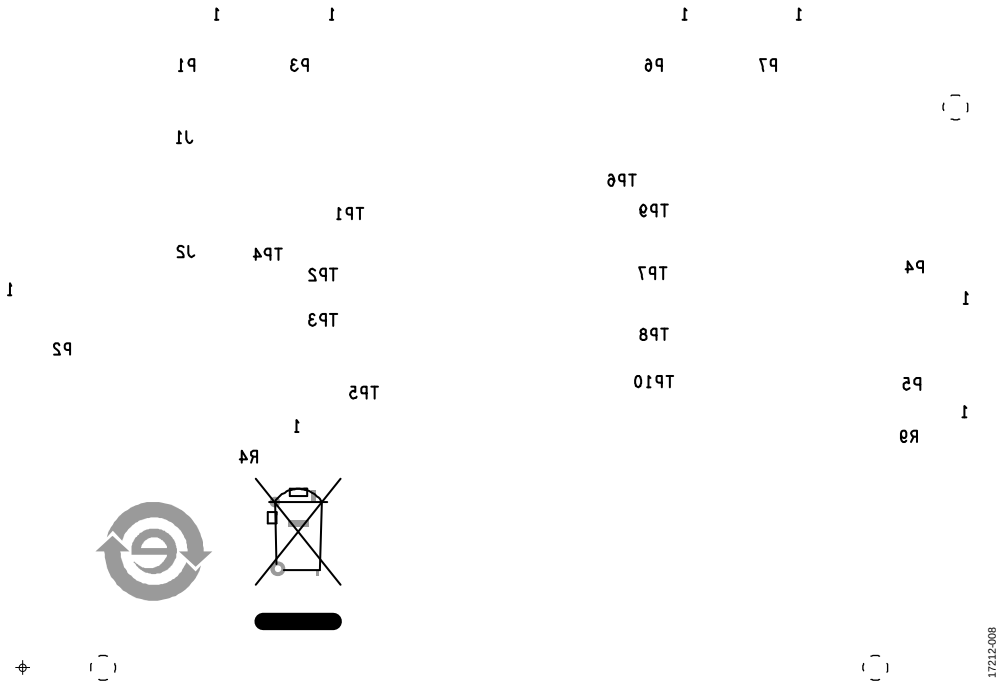

Figure 8. EVAL-ADM3050EEBZ Bottom Silkscreen

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	ADM3050EBRWZ
U2	Low power, resistor set oscillator, 1 kHz to 20 MHz	Analog Devices	LTC6900CS5#PBF
U3	Low noise, CMOS, LDO, 5.0 V_{OUT}	Analog Devices	ADP7104ARDZ-5.0-R7
U4	Low dropout, micropower linear regulator	Analog Devices	LT3012BEFE#PBF
C1, C12	Capacitors, 390 pF, X7R, 0603	AVX	0603YC391KAT2A
C8, C10	Capacitors, 10 µF, X7R, 0805	Wurth Electonik	885012207026
C4, C11	Capacitors, 1 µF, X7R, 0603	Wurth Electonik	885012206076
C2, C3, C9	Capacitors, 0.1 µF, X7R, 0603	Wurth Electonik	885012206046
C5	Capacitor, 4700 pF, X7R, 0805	Wurth Electonik	885012207090
C6, C7	Capacitors, 0.01 µF, X7R, 0603	Wurth Electonik	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	Wurth Electonik	691 213 710 002
P2	Connector, 3-position screw terminal block	Wurth Electonik	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
ADM3050E	5.7 kV rms, signal isolated, basic CAN FD transceiver
AN-1123	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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