User's Guide

REF35EVM User's Guide

ABSTRACT

The REF35EVM is an ultra low-power precision voltage reference evaluation module that demonstrates the REF35 integrated circuit from Texas Instruments (TI).

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Trademarks

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1 Overview

The REF35EVM is a voltage reference evaluation module that demonstrates the REF35 integrated circuit from Texas Instruments (TI).

The REF35 is an ultra-low power voltage reference with maximum 10 ppm/C temperature drift. The REF35 is used primarily as a voltage reference for low power data converters.

The REF35 can be operated from \( V_{REF} + V_{DO} \) to 6 V. The REF35 uses only 1.4 μA of current in active mode. This device comes with an enable pin that allows the device to be set in shutdown mode. Under the shutdown condition, the REF35 only consumes 0.1 μA of current. The REF35 is optimal for a wide range of applications such as flow transmitters, blood glucose monitors, servo drive control modules, power quality analyzers, fault indicators, oscilloscopes and process analytics.

The REF35EVM features a user selectable wide VIN input which uses a TPS7B8150 linear regulator, allowing the user to widen the input range to 40 V if so desired. The VIN header can be connected to an external power supply to provide power. All of the REF35 input and output pins are accessible for external connection via test headers.

1.1 REF35EVM Features

- Includes: REF35125QDBVR
- Footprints for resistors and capacitors
- Multiple outputs for voltage measurements

<table>
<thead>
<tr>
<th>KEY PARAMETERS</th>
<th>PARAMETER</th>
<th>PARAMETER LIMITS</th>
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</thead>
<tbody>
<tr>
<td>Supply Voltage (VREF)</td>
<td>IN_VREF</td>
<td>0 V – 6 V</td>
</tr>
<tr>
<td>Supply Voltage (VLDO)</td>
<td>IN_LDO</td>
<td>0 V to 40 V</td>
</tr>
<tr>
<td>Enable Pin</td>
<td>EN</td>
<td>0 V to IN_VREF</td>
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<tr>
<td>Fixed Output Voltage</td>
<td>VREF</td>
<td>1.25 V (REF35125QDBVR)</td>
</tr>
<tr>
<td>Output Current:</td>
<td>IOUT</td>
<td>-5 mA to 10 mA</td>
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**CAUTION**

Applying voltages above the limitations given in this table may cause permanent damage to your hardware.
1.2 REF35EVM Schematic

The schematic for the REF35EVM is illustrated in Figure 1-1.
1.3 REF35EVM Bill of Materials

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<tr>
<th>DESIGNATOR</th>
<th>QTY</th>
<th>VALUE</th>
<th>DESCRIPTION</th>
<th>PACKAGE</th>
<th>PART NUMBER</th>
<th>MANUFACTURER</th>
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<td>Printed Circuit Board</td>
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<td>LP053</td>
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<td>C1, C3</td>
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<td>10uF</td>
<td>CAP, CERM, 10 uF, 16 V, +/-10%, X7R, 1206</td>
<td>1206</td>
<td>GRM31CR71C106KAC7L</td>
<td>Murata Electronics</td>
</tr>
<tr>
<td>C2, C4, C5, C7</td>
<td>4</td>
<td>0.1uF</td>
<td>CAP, CERM, 0.1 uF, 100V, +/-10%, X7R, 0805</td>
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<td>C0805C104K1RACTU</td>
<td>KEMET</td>
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<td>C0805C105K4RACTU</td>
<td>KEMET</td>
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<tr>
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<td>GRT31CR61H106KE01L</td>
<td>Murata Electronics</td>
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<td>J1</td>
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<td>SMA JACK 50 OHM EDGE MNT, SMT</td>
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<td>142-0711-821</td>
<td>Cinch Connectivity Solutions Johnson</td>
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<td>PEC02SAAN</td>
<td>Sullins Connector Solutions</td>
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<tr>
<td>P4, P5, P6, P7</td>
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<td>100mil</td>
<td>Header, 100mil, 3x1, Tin, TH</td>
<td>TH</td>
<td>PEC03SAAN</td>
<td>Sullins Connector Solutions</td>
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<td>RES, 499, 1%, 0.125 W, AEC-Q200 Grade 0, 0805</td>
<td>0805</td>
<td>CRCW0805499RFKEA</td>
<td>Vishay Dale</td>
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<td>1</td>
<td>1k</td>
<td>RES, 1.00 k, 1%, 0.125W, AEC-Q200 Grade 0, 0805</td>
<td>0805</td>
<td>CRCW08051K00FKEA</td>
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</tr>
<tr>
<td>R3, R4</td>
<td>2</td>
<td>0</td>
<td>RES, 0, 5%, 0.333 W, AEC-Q200 Grade 0, 0805</td>
<td>0805</td>
<td>CRCW08050000Z0EAHP</td>
<td>Vishay Dale</td>
</tr>
<tr>
<td>R5</td>
<td>1</td>
<td>10M</td>
<td>RES, 10.0 M, 1%, 0.125 W, 0805</td>
<td>0805</td>
<td>CRCW080510M0FKEA</td>
<td>Vishay Dale</td>
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<td>Keystone Technologies</td>
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<td>Keystone Technologies</td>
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<td>SOT23-6</td>
<td>REF35125QDBVR</td>
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<td>U2</td>
<td>1</td>
<td></td>
<td>150-mA High-Voltage Ultra-low-IQ Low-Dropout Regulator, DRV0006A (WSON-6)</td>
<td>WSON-6</td>
<td>TPS7B8150QDVRQ1</td>
<td>Texas Instruments</td>
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1.4 REF35EVM Board

The PCB layout for the REF35EVM is illustrated in Figure 1-2 and Figure 1-3.

Figure 1-2. REF35EVM Board Top

Figure 1-3. REF35EVM Board Bottom
2 Quick Setup Guide

This section describes the setup to quickly check the functionality of the REF35EVM.

2.1 Electrostatic Discharge Warning

Many of the components on the REF35EVM are susceptible to damage by electrostatic discharge (ESD). Customers are advised to observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

CAUTION

Failure to observe ESD handling procedures may result in damage to EVM components.

2.2 Power Supply Setup and Functional Test

Normal operation:

If directly connecting the REF35 to the lab supply, a 5-V power supply capable of 50 mA of current is required (to handle load transients). The "Power Select" jumpers should be set to "Lab". The REF35 consumes 1.4 μA of current during normal operation and has a maximum 10 mA of output current for maintaining regulated voltage. During start-up, the REF35 might consume I_SC momentarily to charge the output capacitors.

Connect the positive power supply lead to the "VIN_REF" pin on the "REF Power" header pin on the left side of the board. Connect the negative power supply lead to the "GND" pin on the "REF Power" header pin.

If powering the REF35 through the on-EVM LDO, a 5-V (up to the LDO max voltage, 40 V) power supply capable of 50 mA of current is required. The "Power Select" jumpers should be set to "LDO".

Connect the positive power supply lead to the "VIN_REF" pin on the "REF Power" header pin on the left side of the board. Connect the negative power supply lead to the "GND" pin on the "REF Power" header pin.

This EVM features selectable loads, where the load can be pulled to GND or VCC.

Connect a voltmeter to the VREF pin on the right side of the board. Connect the negative voltmeter terminal to "GND". An SMA cable can also be used to measure the same output.

The output voltage of the REF35125QDBVR will be 1.25V.

Shutdown mode: Move the jumper pin from EN to SHDN to place the part in shutdown mode. The REF35 will be in active mode if the jumper pin is either in EN or not present.
3 Layout

Figure 3-1 and Figure 3-2 show the top and bottom layers, and Figure 3-3 shows the top solder mask of the EVM.
Figure 3-2. Bottom Layer
Figure 3-3. Top Solder Mask
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