TPS650240EVM-331

This User's Guide describes the characteristics, operation, and use of the TPS650240EVM-331 evaluation module (EVM). This EVM is designed to help the user evaluate the TPS650240 and the TPS79901 in a configuration for powering the iMX31 Processor. This User's Guide includes setup instructions for the hardware, a schematic diagram, a bill of materials (BOM), and PCB layout drawings for the evaluation module.

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1 Introduction

The Texas Instruments TPS650240EVM-331 uses the TPS650240 Power Management IC and the TPS79901 LDO in a configuration designed to meet the requirements for powering an iMX31 application. The default settings of the EVM meet the voltage settings and the power sequencing requirements for the iMX31 processor

1.1 Requirements

In order for this EVM to operate properly, the following components must be connected and properly configured.

1.1.1 Printed Circuit Board Assembly

The TPS650240EVM-331 PCB contains the TPS650240 IC and its required external components along with the TPS79901. This board contains several jumpers and connectors that allow the user to customize the board for specific operating conditions.

1.2 Power Sequencing

The TPS650240EVM-331 has been designed to allow DCDC3 of the TPS650240 device to power up as soon as the input voltage has been applied. Once DCDC3 powers up, the TPS650240 DCDC1 output is enabled at the same time that LDO1 and LDO2 are enabled. Upon DCDC1 powering up, the TPS650240 DCDC2 output is enabled along with the TPS79901 device.

1.3 Related Documentation From Texas Instruments

TPS650240 data sheet (SLVS774)

2 Setup

This chapter describes the jumpers and connectors on the EVM as well as how to properly connect, setup, and use the TPS650240EVM-331

2.1 Input / Output Connector Descriptions

2.1.1 J1 –VIN and GND

Input voltage from external power supply, recommended max 5.5V. Input current is dependent on load but will typically be below 2A.

2.1.2 J2–VINLDO and GND

Input voltage from external power supply, recommended max 5.5V. Input current is dependent on load but will typically be below 2A. The EVM has this connected to VIN via R7.

2.1.3 J3–DEFDCDC1

Sets default voltage for DCDC1, 2.8V or 3.3V.

2.1.4 J4–DEFDCDC2

Sets default voltage for DCDC2, 1.8V or 2.5V.

2.1.5 J5–DEFDCDC3

Sets default voltage for DCDC3, 1.0V or 1.3V.

2.1.6 J6–Vout Ext LDO and GND

The output from the TPS79901 LDO with a max output current of 0.2mA and a 1.4V voltage setting.

2.1.7 J7–EN_LDO

Enable for both the LDO1 and LDO2 regulators.

2.1.8 J8–EN_DCDC3

Enable for the DCDC3 converter.

2.1.9 J9–EN_ DCDC2

Enable for the DCDC2 converter.

2.1.10 J10–EN_DCDC1

Enable for the DCDC1 converter.

2.1.11 J11–PWM/PFM MODE

PWM or PFM Mode jumper, default setting is PWM.

2.1.12 J12–VDCDC1 and GND

The output from the DCDC1 switching regulator with a max output current of 1.0A and a default voltage setting of 2.7V.

2.1.13 J13–VDCDC2 and GND

The output from the DCDC2 switching regulator with a max output current of 0.8A and a default voltage setting of 1.8V.

2.1.14 J14–VDCDC3 and GND

The output from the DCDC3 switching regulator with a max output current of 0.8A and a default voltage setting of 1.3V.

2.1.15 J15–VLDO1 and GND

The output from the low drop out regulator, VLDO1, which has a max output current of 200mA and a default voltage setting of 1.8V.

2.1.16 J16–VLDO2 and GND

The output from the low drop out regulator, VLDO2, which has a max output current of 200mA and a default voltage setting of 1.8V.

2.1.17 J17–VDD_ALIVE and GND

The output from the VDD_ALIVE low drop out regulator with a max output current of 30mA and a default voltage setting of 1.2V.

2.1.18 J18–$\overline{\text{PWRFAIL}}$

The $\overline{\text{PWRFAIL}}$ output will assert low when the PWRFAIL comparator indicates a low Vin

2.1.19 J19–EN_VDD_ALIVE

Enable for the VDD_ALIVE low dropout regulator.

2.2 Setup

The EVM comes from the factory with the following default settings on the jumpers.

Jumper	Shunt Location
J4	Between V-LO and DEFDCDC2
J5	Between V-HI and DEFDCDC3
J8	Between EN_DCDC3 and ON
J11	Between PWM and MODE
J19	Between ON and EN_VDD_ALIVE

3 Board Layout

This chapter provides the TPS650240EVM-331 board layout and illustrations.

3.1 Layout

Board layout is critical for all switch mode power supplies. The following figure shows the board layout for the TPS650240EVM-331 PWB. The nodes with high switching frequencies and currents are short and are isolated from the noise sensitive feedback circuitry. Careful attention has been given to the routing of high frequency current loops. Refer to the datasheet for specific layout guidelines.

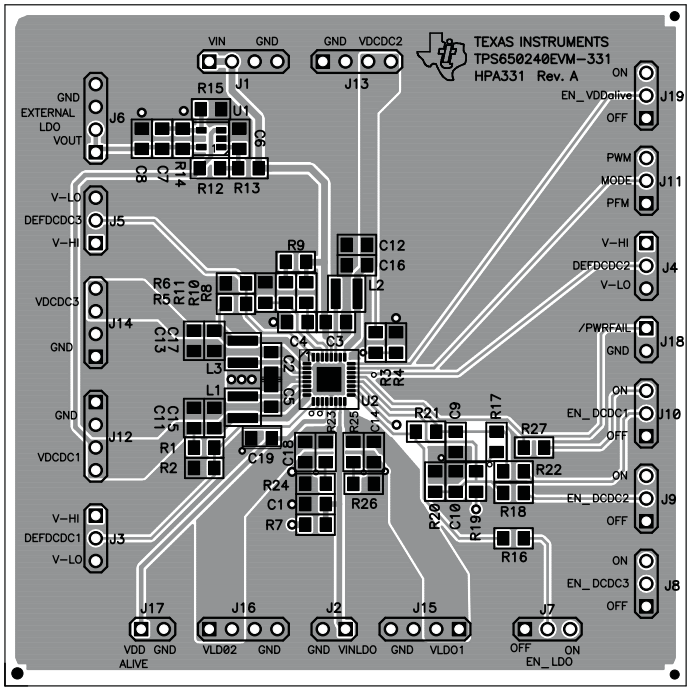


Figure 1. Assembly Layer

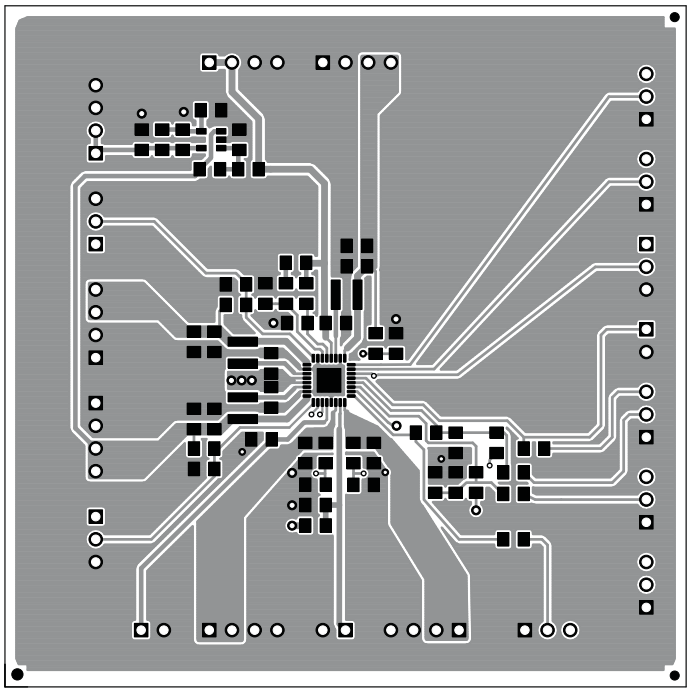


Figure 2. Top Layer Routing

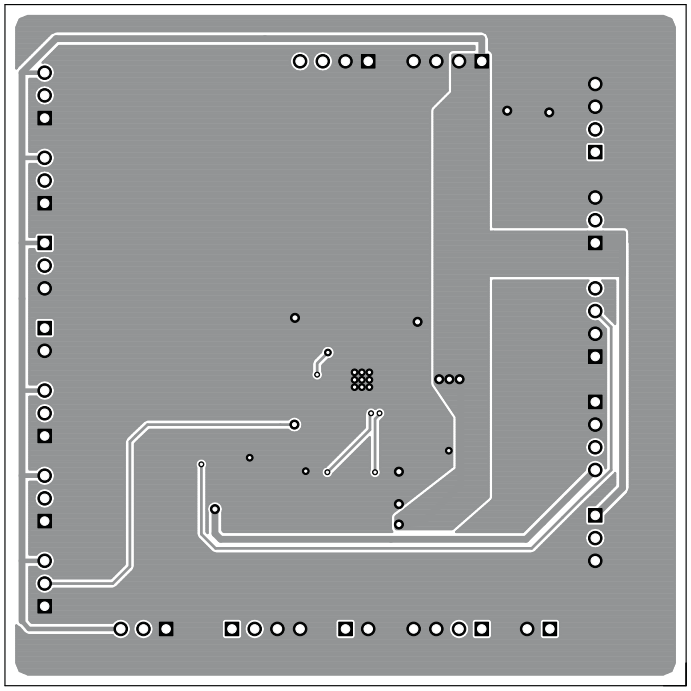
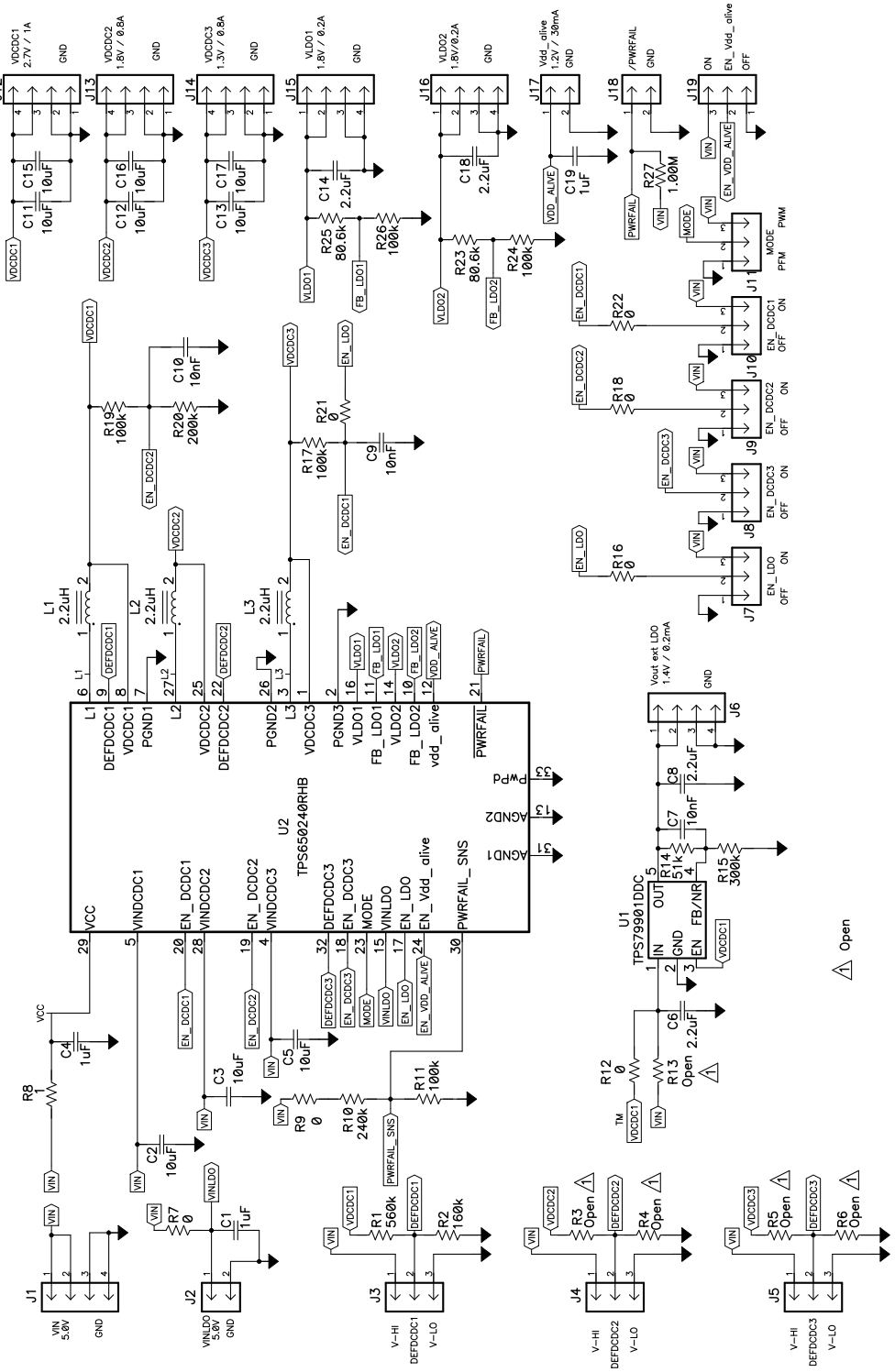


Figure 3. Bottom Layer Routing

4 Schematic and Bill of Materials

This chapter provides the TPS650240EVM-331 schematic and bill of materials.

4.1 Schematic



4.2 Bill of Materials

Table 1. TPS650240EVM-331 Bill of Materials

Count	Ref Des	Value	Description	Size	Part Number	MFR
3	C1, C4, C19	1 µF	Capacitor, Ceramic, 10V, X5R, 10%	0805	Std	Std
9	C2, C3, C5, C11–C13, C15–C17	10 µF	Capacitor, Ceramic, 10V, X5R, 10%	0805	Std	Std
4	C6, C8, C14, C18	2.2 µF	Capacitor, Ceramic, 10V, X5R, 10%	0805	Std	Std
3	C7, C9, C10	10 nF	Capacitor, Ceramic, 10V, X5R, 10%	0805	Std	Std
7	J1, J6, J12–J16	PTC36SAAN	Header, 4-pin, 100mil spacing, (36-pin strip)	0.100 × 4	PTC36SAAN	Sullins
3	J2, J17, J18	PTC36SAAN	Header, 2-pin, 100mil spacing, (36-pin strip)	0.100 × 2	PTC36SAAN	Sullins
9	J3–J5, J7 - J11, J19	PTC36SAAN	Header, 3-pin, 100mil spacing, (36-pin strip)	0.100 × 3	PTC36SAAN	Sullins
3	L1, L2, L3	2.2 µH	Inductor, SMT, 2.0A, 110mΩ	0.118 × 0.118 inch	LPS3015-222ML	Coilcraft
1	R1	560k	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
1	R10	240k	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
5	R11, R17, R19, R24, R26	100k	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
1	R14	51k	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
1	R15	300k	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
1	R2	160k	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
1	R20	200k	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
2	R23, R25	80.6k	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
1	R27	1.00M	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
0	R3 - R6, R13	Open	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
7	R7, R9, R12, R16, R18, R21, R22	0	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
1	R8	1	Resistor, Chip, 1/10-W, 1%	0805	Std	Std
1	U1	TPS79901DDC	IC, Ultra-low Noise, High PSRR 200 mA, LDO Regulators	SOT23-5	TPS79901DDC	TI
1	U2	TPS650240RHB	IC, 3 DC-DC Converters	QFN-32[RTV]	TPS650240RHB	TI
9	—		Shunt, 100-mil, Black	0.100	929950-00	3M
4	—		Bumper foot - clear	0.44" × 0.20"	SJ-5303	3M
1	—		PCB, 3.0" × 3.0" √ 0.062"		HPA331	Any

Notes: 1. These assemblies are ESD sensitive, ESD precautions shall be observed
2. These assemblies must be clean and free from flux and all contaminants. Use of no clean flux is not acceptable
3. These assemblies must comply with workmanship standards IPC-A-610 Class 2
4. Ref designators marked with an asterisk ('**') cannot be substituted. All other components can be substituted with equivalent MFG's components.
5. Add self-adhesive bumper feet to each corner of PCB after final assembly and wash

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EVM WARNINGS AND RESTRICTIONS

It is important to operate this EVM within the input voltage range of 5.5 V max. at 2 A (typ), and the default output voltage of 2.7 V at 1.0 A.

Exceeding the specified input range may cause unexpected operation and/or irreversible damage to the EVM. If there are questions concerning the input range, please contact a TI field representative prior to connecting the input power.

Applying loads outside of the specified output range may result in unintended operation and/or possible permanent damage to the EVM. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative.

During normal operation, some circuit components may have case temperatures greater than 60° C. The EVM is designed to operate properly with certain components above 60° C as long as the input and output ranges are maintained. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors. These types of devices can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during operation, please be aware that these devices may be very warm to the touch.

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