TPS65300EVM

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PowerPAD is a trademark of Texas Instruments.

1 Introduction

The Texas Instruments TPS65300EVM evaluation module (EVM) helps designers evaluate the operation and performance of the TPS65300 Switch Mode Power Supply – Multiple-output voltage regulator.

The EVM contains one DC / DC converter (see Table 1).

Table 1. Device and Package Configurations

Converter	IC	Package
U1	TPS65300QPWPRQ1	PWP-24

2 Setup

This section describes the jumpers and connectors on the EVM and how to properly connect, set up and use the TPS65300EVM.

2.1 Input/Output Connector Description

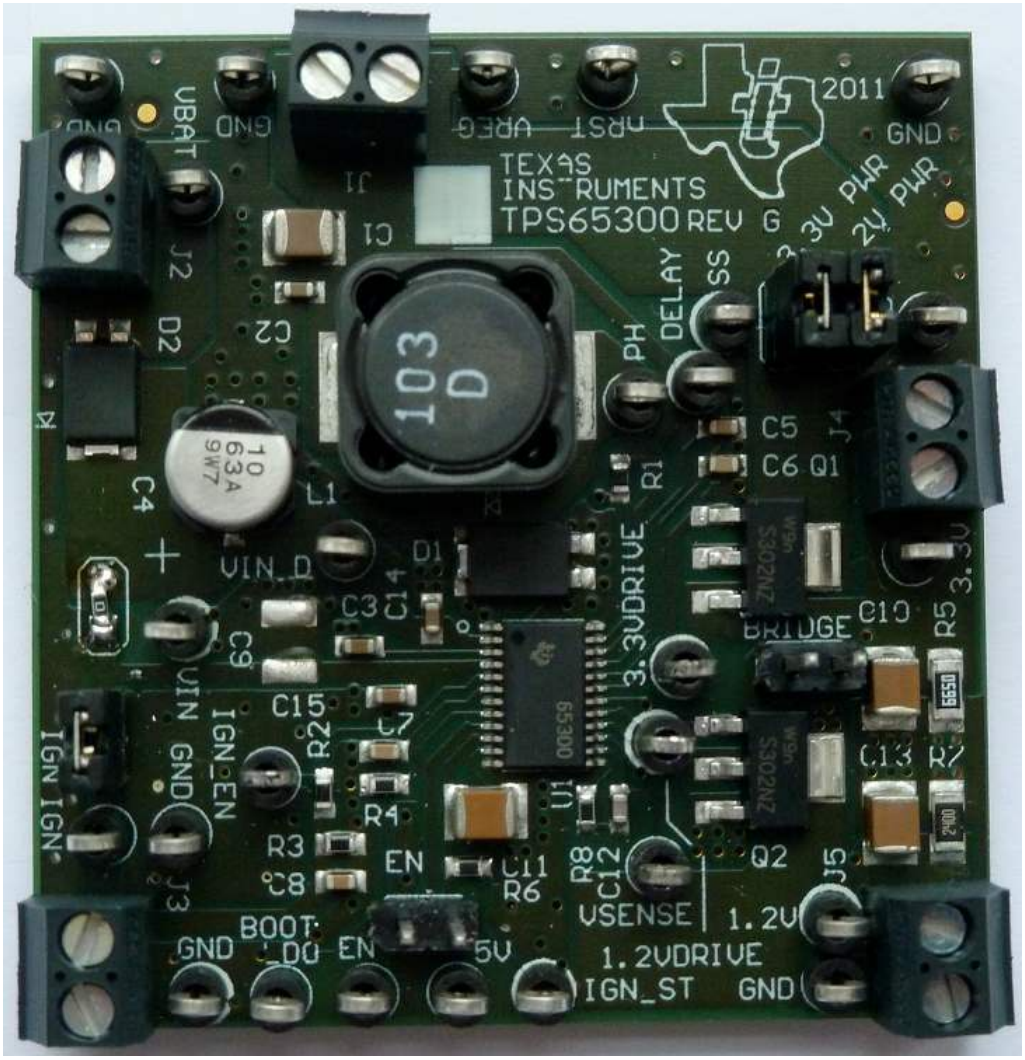

Figure 1. EVM Board

Terminal blocks:

J1 – Input is the output terminal for the TPS65300 switch-mode converter. The terminal block provides a power (VREG) and ground (GND) connection.

J2 – Output is the power input terminal for the device. The terminal block provides a power (VBAT) and ground connection to allow the user to attach the EVM to a cable harness.

J3 – Sync is the input terminal to enable the TPS65300 at initial startup. The terminal block provides a power (IGN) and ground (GND) connection. If this terminal is not used, install the IGN-Jumper to power-up the device (see the respective description). If IGN is shut down again, the device will power down, unless the EN-Jumper is installed.

J5 – Output is the output terminal for the TPS65300 linear regulator controller with 1.2V output. The terminal block provides a power (1.2V) and ground (GND) connection. Please observe the Power-ratings of the external bipolar-transistor: If powered from VREG, it allows approximately 120mA at room temperature, approximately 50mA at 125°C ambient. Note, if the dropout is reduced by powering it from the 3.3V-rail (installing BRIDGE jumper instead of 1.2V_PWR jumper), will allow higher currents on this rail, but consider the extra power drawn from the 3.3V rail and its transistor

Jumpers:

IGN – required to power-up the device at startup: if IGN is low (IGN-terminal not supplied AND IGN-jumper not installed) the part will not power-up (indifferent of EN-setting). Either supply IGN-terminal with a High-level or install the IGN-jumper to power up the device:

Low, part disabled at startup, (unless supplied via IGN-terminal)

High, part enabled at startup, do not install if connected at IGN-terminal

Figure 2. IGN Jumper Settings

EN – Keeps the outputs of the devices active after ignition is turned off (IGN = low). However, a high level on IGN is required for initial start-up. Before this, the EN-jumper has no effect. Note, as opposed to IGN, the EN-pin is a logic-level-input, maximum input voltage should not exceed 5.25V.

Low, part disabled after ignition of (IGN = low)

High, part remains enabled after ignition off (IGN = low)

Figure 3. EN Jumper Settings

3.3V_PWR – Supplies the Collector of the external bipolar transistor of the 3.3V rail. Installing connects it to VREG (5.3V-output of the Buck-regulator). If uninstalled, the transistor in not powered (Note: at light loads, the base-current may be sufficient to supply the output, but adding a load causes V_{OUT} to drop).

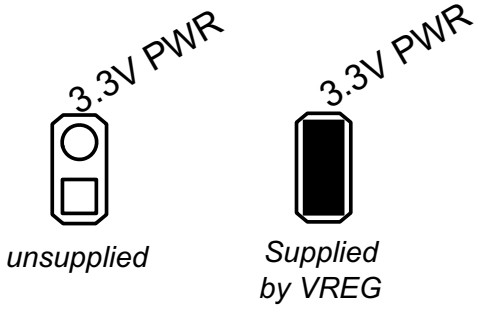

Figure 4. 3.3V PWR Jumper Settings

1.2V_PWR - Supplies the Collector of the external bipolar transistor of the 1.2V rail. Installing connects it to VREG (5.3V-output of the Buck-regulator). If uninstalled, the transistor in not powered (Note: at light loads, the base-current may be sufficient to supply the output, but adding a load causes V_{OUT} to drop). An alternative to supply the 1.2V rail is to install the jumper on BRIDGE (see Figure 6), but make sure to never have both jumpers (1.2V_PWR and BRIDGE) installed at the same time.

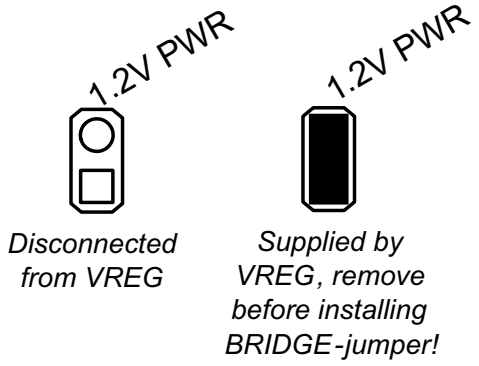

Figure 5. 1.2V PWR Jumper Settings

JP6 – Bridge - Supplies the Collector of the external bipolar transistor of the 1.2V rail. Installing connects it to the 3.3V LDO-output. If connected, consider the extra current drawn from the 3.3V rail, which must be supported by the power-dissipation of the 3.3V-transistor! Make sure to never have both jumpers (1.2V_PWR and BRIDGE) installed at the same time.

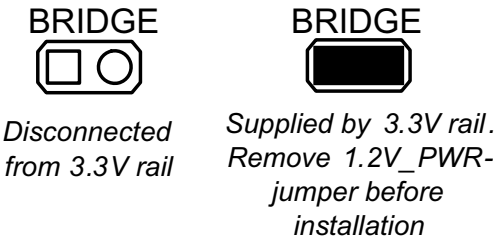

Figure 6. Bridge Jumper Settings

Test Points:

• VBAT	Power Input
• VIN_D, VIN	Power Input after the reverse battery protection diode.
• IGN	Ignition, monitors if IGN-input is high, powering up the device.
• IGN_EN	Ignition enable (IGN after series resistor).
• BOOT_LDO	Voltage at internal regulator, which supplies the power to charge the flying boot capacitor.
• VREG	Regulated output of switch-mode converter, supplying 5.3V.
• DELAY	Input for reset delay.
• SS	Input for soft start time.
• EN	Enable pin, if high, the device remains active after IGN is transitioning to low.
• GND	(x7) Ground
• PH	Switch node, source of internal switching FET.
• nRST	Reset output for Switcher, asserted high after VREG, 3.3V and 1.2V regulator outputs are regulating and delay timer has expired.
• 3.3V	3.3V - Linear regulator output
• 3.3VDRIVE	Base drive for external 3.3V-regulator bipolar transistor.
• 1.2V	1.2V - Linear regulator output.
• 1.2VDRIVE	Base drive for external 1.2V-regulator bipolar transistor.
• VSENSE	Inverting node of error amplifier for voltage mode control of VREG.
• IGN_ST	Ignition input indicator. Asserted high while ignition input is high.
• 5V	Output of the 5V linear regulator. Since no screw-terminal is provided for this output, use the test-point to attach a load.

2.2 Setup

The input voltage range for the converter is 5.6 volts to 40 volts.

2.3 Operation

For proper operation of the TPS65300EVM, the jumpers should be properly configured. Set jumpers to this configuration:

EN	Open (device will power down if IGN is transitioning low.
3.3V_PWR	Installed (supply 3.3V rail from VREG).
1.2V_PWR	Installed (supply 1.2V rail from VREG, remove before installing BRIDGE-jumper!).
BRIDGE	Open (install to supply 1.2V rail from 3.3V-rail, remove 1.2V_PWR jumper before installing BRIDGE!).
IGN	Installed (device powers up if VIN is applied).

In this configuration, the regulators will turn on when power is applied and will power down if Vin is falling. To prohibit initial startup, remove IGN-jumper. While IGN is high, EN has no functionality. If IGN transitions low after the device has powered up, a high level on EN (jumper installed) will keep the regulators active, a low (EN open) will power down the regulators if IGN goes low.

The supply for the 1.2V rail is sourced from VREG in the above configuration. BRIDGE allows to power the external transistor of this rail from the 3.3V output, make sure to remove the jumper on 1.2V_PWR before installing BRIDGE-jumper. This reduces the drop-out-voltage on the external transistor and such helps to reduce power dissipation on this transistor; however, consider the extra power drawn from the 3.3V rail, causing extra dissipation on the 3.3V-rail transistor.

The switching frequency is defined by the resistor on RT (R4), here 40.2kΩ, setting f_{SW} to approximately 2.4MHz.

Regulator Configuration (out current s given for above configuration, i.e. 1.2V rail powered from VREG):

Regulator	Output Voltage	Maximum Output Current
Switcher	5.3 V	1.2 A
3.3V regulator	3.3 V	0.3A (at room temperature, less at high temperature)
1.2V regulator	1.2 V	0.1A (at room temperature, less at high temperature)
5V regulator	5 V	0.2A

3 Board Layout

Figure 7, Figure 8 and Figure 9 show the board layout for the TPS65300EVM PWB. The EVM offers jumpers to enable the device in various ways and to select supply rails for 3.3V and 1.2V linear regulators. Figure 10 shows the schematic.

The TPS65300 converter offers high efficiency, but does dissipate power. The PowerPAD™ package offers an exposed thermal pad to enhance thermal performance. This must be soldered to the copper landing on the PCB for optimal performance. The PCB provides a GND-plane on the bottom side to dissipate heat from the device, transferred via the PowerPad™ and thermal vias underneath the device. The external transistors have a smaller area on the top side connected to their collector to allow heat dissipation.

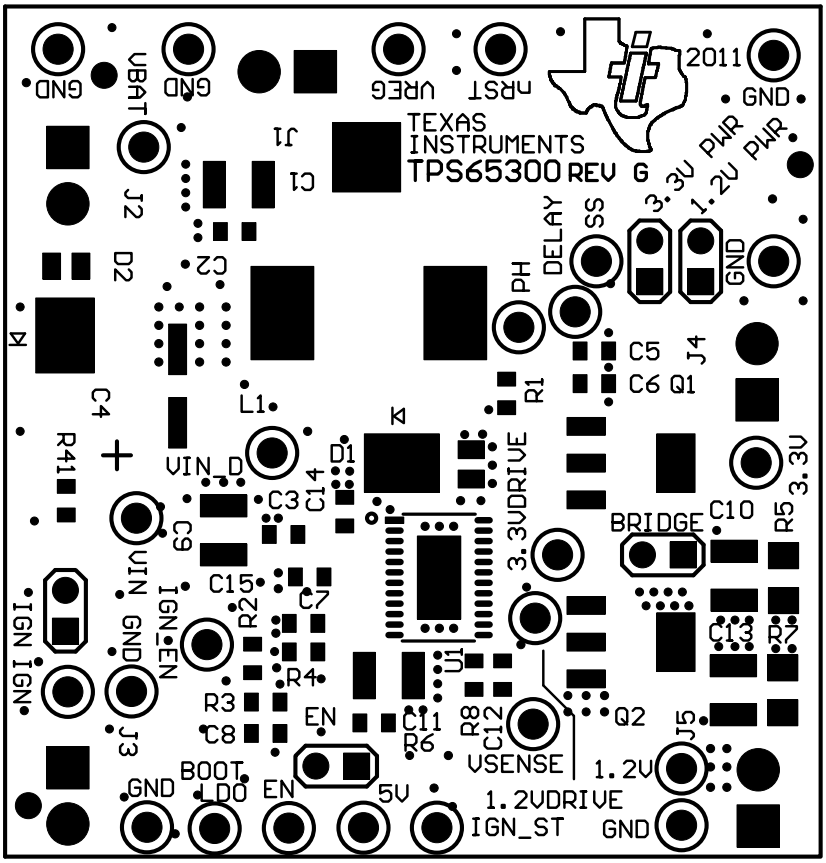

Figure 7. Top Assembly Layer

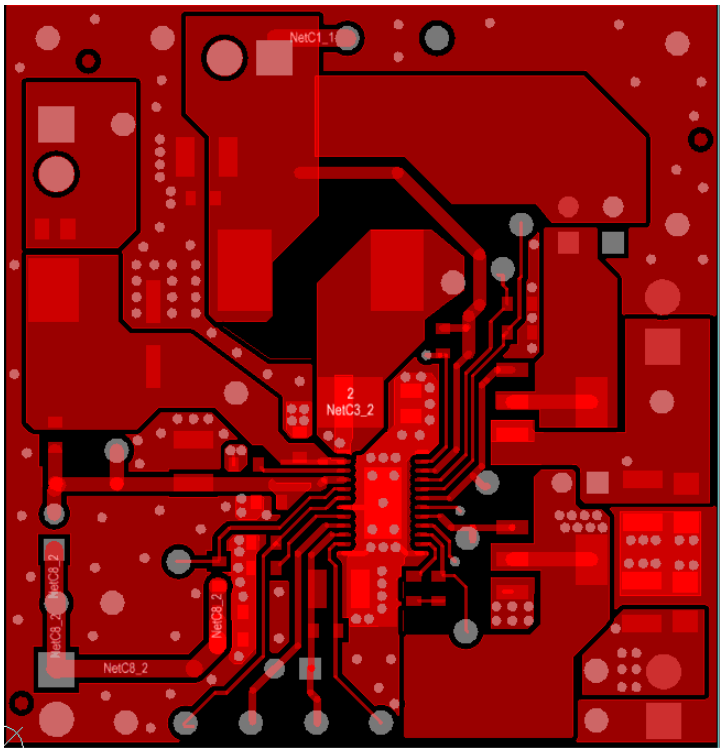

Figure 8. Top Layer Routing

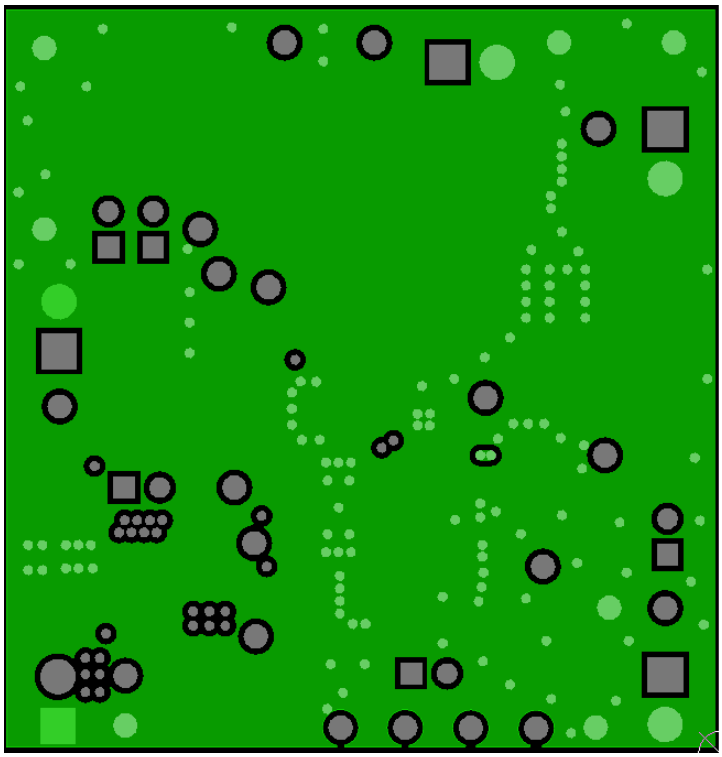

Figure 9. Bottom Layer Routing

4 Schematic and Bill of Materials

4.1 Schematic

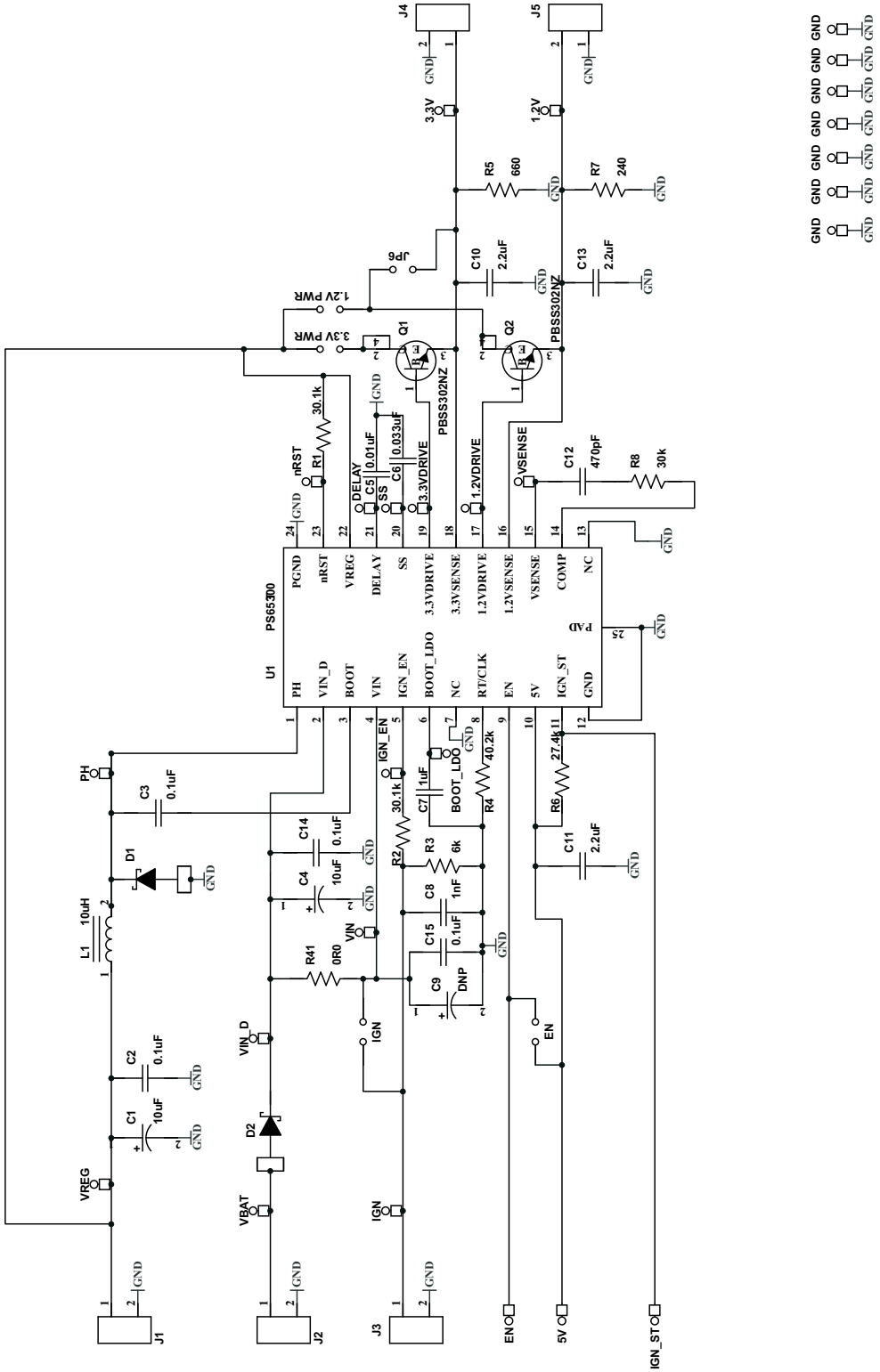

Figure 10. TPS653000EVM Schematic

4.2 Bill of Materials

Table 2. TPS65300EVM Bill of Materials

COUNT	REF DES	DESCRIPTION	SIZE	MFR	PART NUMBER
1	C1	Capacitor, ceramic, 10uF, 16V	1206	Panasonic	EEV-FK1H221P
2	C2, C3	Capacitor, ceramic, 0.1uF, 50V, 10%	603	muRata	GCM188R71H104KA57
1	C4	Capacitor, ceramic, 10uF, 63V	Size D	Panasonic	ECE-V1JA100P
1	C5	Capacitor, ceramic, 0.01uF, 50V, 10%	603	muRata	GRM188R71H103KA01D
1	C6	Capacitor, ceramic, 0.033uF, 25V, 10%	603	muRata	GRM188R71E333KA01D
1	C7	Capacitor, ceramic, 1uF, 16V, 10%	603	muRata	GRM188R61E105KA12D
1	C8	Capacitor, ceramic, 1000pF, 50V, 10%	603	muRata	GRM188R71H102KA01D
1	C9	do not populate			
3	C10, C11, C13	Capacitor, ceramic, 2.2uF, 50V, 10%	1210	muRata	GCM31CR71H225KA55L
1	C12	Capacitor, ceramic, 470pF, 50V, 10%	603	muRata	GRM188R71H471KA01D
2	D1, D2	Diode, Schottky, 3A, 100V	PowerDI	Diodes	PDS360-13
5	J1, J2, J3, J4, J5	Terminal block, 2-pin, 6A, 3.5mm	0.25 x 0.27	OST	ED1514
1	L1	Inductor, SMT, 10-uH	12.3mm x 12.3mm	Coilcraft	MSS1278T-103
26	1.2V, 3.3V, 1.2VDRIVE, 3.3VDRIVE, 5V, BOOT_LDO, DELAY, EN, GND(7), IGN, IGN_EN, IGN_ST, nRST, PH, SS, VBAT, VIN, VIN_D, VREG, VSENSE	Test point, 52-mil	0.052	Kobiconn	151-103-RC
5	1.2VPWR, 3.3VPWR, EN, IGN, BRIDGE (J6)	Header, 2-pin, 100-mil spacing, (36-pin strip)	0.100 x 2	Sullins	PEC02SAAN
5	1.2VPWR, 3.3VPWR, EN, IGN, BRIDGE (J6)	Connector jumper, shorting, 100-mil spacing	0.1	Sullins	SPC02SYAN
2	Q1, Q2	TRANS NPN 20V 5.8A	SOT-223	NXP	PBSS302NZ
3	R1, R2, R8	Resistor, chip, 30.1-kΩ, 1/10W, 1%	603	Panasonic	ERJ-3EKF3012V
1	R3	Resistor, chip, 6.04-kΩ, 1/10W, 1%	603	Panasonic	ERJ-3EKF6041V
1	R4	Resistor, chip, 40.2-kΩ, 1/10W, 1%	603	Panasonic	ERJ-3EKF4022V
1	R5	Resistor, chip, 665-Ω, 1/10W, 1%	603	Panasonic	ERJ-8ENF6650V
1	R6	Resistor, chip, 27.4-kΩ, 1/10W, 1%	603	Panasonic	ERJ-3EKF2742V
1	R7	Resistor, chip, 240-Ω, 1/10W, 1%	603	Panasonic	ERJ-8GEYJ241V
1	R41	Resistor, chip, 0R0Ω, 1/10W, 1%	603	Panasonic	ERJ-3GEY0R00V
1	U1	IC, TPS65300-Q1PWPR		TI	TPS65300QPWP
	-	PCB, 3-inch x 3-inch x 0.062		Any	TPS65300, REV G

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As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this is strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

REGULATORY COMPLIANCE INFORMATION (continued)

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

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This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

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2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. 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 as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

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Should this evaluation board/kit not meet the specifications indicated in the User's Guide, the board/kit may be returned within 30 days from the date of delivery for a full refund. THE FOREGOING LIMITED WARRANTY IS THE EXCLUSIVE WARRANTY MADE BY 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 THE INDEMNITY SET FORTH ABOVE, NEITHER PARTY SHALL BE LIABLE TO THE OTHER FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES.

Please read the User's Guide and, specifically, the Warnings and Restrictions notice in the User's Guide prior to handling the product. This notice contains important safety information about temperatures and voltages. For additional information on TI's environmental and/or safety programs, please visit www.ti.com/esh or contact TI.

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REGULATORY COMPLIANCE INFORMATION

As noted in the EVM User's Guide and/or EVM itself, this EVM and/or accompanying hardware may or may not be subject to the Federal Communications Commission (FCC) and Industry Canada (IC) rules.

For EVMs **not** subject to the above rules, this evaluation board/kit/module is intended for use for ENGINEERING DEVELOPMENT, DEMONSTRATION OR EVALUATION PURPOSES ONLY and is not considered by TI to be a finished end product fit for general consumer use. It generates, uses, and can radiate radio frequency energy and has not been tested for compliance with the limits of computing devices pursuant to part 15 of FCC or ICES-003 rules, which are designed to provide reasonable protection against radio frequency interference. Operation of the equipment may cause interference with radio communications, in which case the user at his own expense will be required to take whatever measures may be required to correct this interference.

General Statement for EVMs including a radio

User Power/Frequency Use Obligations: This radio is intended for development/professional use only in legally allocated frequency and power limits. Any use of radio frequencies and/or power availability of this EVM and its development application(s) must comply with local laws governing radio spectrum allocation and power limits for this evaluation module. It is the user's sole responsibility to only operate this radio in legally acceptable frequency space and within legally mandated power limitations. Any exceptions to this are strictly prohibited and unauthorized by Texas Instruments unless user has obtained appropriate experimental/development licenses from local regulatory authorities, which is responsibility of user including its acceptable authorization.

For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant

Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

FCC Interference Statement for Class B EVM devices

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

For EVMs annotated as IC – INDUSTRY CANADA Compliant

This Class A or B digital apparatus complies with Canadian ICES-003.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Concerning EVMs including radio transmitters

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concerning EVMs including detachable antennas

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Cet appareil numérique de la classe A ou B est conforme à la norme NMB-003 du Canada.

Les changements ou les modifications pas expressément approuvés par la partie responsable de la conformité ont pu vider l'autorité de l'utilisateur pour actionner l'équipement.

Concernant les EVMs avec appareils radio

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

【Important Notice for Users of this Product in Japan】

This development kit is NOT certified as Confirming to Technical Regulations of Radio Law of Japan

If you use this product in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product:

1. Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry's Rule for Enforcement of Radio Law of Japan,
2. Use this product only after you obtained the license of Test Radio Station as provided in Radio Law of Japan with respect to this product, or
3. Use of this product only after you obtained the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to this product. Also, please do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

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http://www.tij.co.jp

EVALUATION BOARD/KIT/MODULE (EVM)
WARNINGS, RESTRICTIONS AND DISCLAIMERS

For Feasibility Evaluation Only, in Laboratory/Development Environments. Unless otherwise indicated, this EVM is not a finished electrical equipment and not intended for consumer use. It is intended solely for use for preliminary feasibility evaluation in laboratory/development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical mechanical components, systems and subsystems. It should not be used as all or part of a finished end product.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.
4. You will take care of proper disposal and recycling of the EVM's electronic components and packing materials.

Certain Instructions. It is important to operate this EVM within TI's recommended specifications and environmental considerations per the user guidelines. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. 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 as long as the input and output are maintained at a normal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be identified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch. As with all electronic evaluation tools, only qualified personnel knowledgeable in electronic measurement and diagnostics normally found in development environments should use these EVMs.

Agreement to Defend, Indemnify and Hold Harmless. You agree to defend, indemnify and hold TI, its licensors and their representatives harmless from and against any and all claims, damages, losses, expenses, costs and liabilities (collectively, "Claims") arising out of or in connection with any use of the EVM that is not in accordance with the terms of the agreement. This obligation shall apply whether Claims arise under law of tort or contract or any other legal theory, and even if the EVM fails to perform as described or expected.

Safety-Critical or Life-Critical Applications. If you intend to evaluate the components for possible use in safety critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, such as devices which are classified as FDA Class III or similar classification, then you must specifically notify TI of such intent and enter into a separate Assurance and Indemnity Agreement.

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Only those TI components which TI has specifically designated as military grade or “enhanced plastic” are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components which have ***not*** been so designated is solely at the Buyer's risk, and that Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components which meet ISO/TS16949 requirements, mainly for automotive use. Components which have not been so designated are neither designed nor intended for automotive use; and TI will not be responsible for any failure of such components to meet such requirements.

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