TPS2292xEVM-661

This user's guide describes the characteristics, operation, and use of the TPS2292xxEVM-661 evaluation module (EVM). This EVM demonstrates the Texas Instruments TPS2292xx load switch with controlled turn on. The device contains a P-channel MOSFET that can operate over an input voltage of 1.4V to 5.5V. The switch is controlled by an on/off input (EN), which is capable of interfacing directly with low-voltage control signals. This user's guide includes setup instructions, schematic diagram, bill of materials, and printed-circuit board layout drawings for the EVM.

1 Introduction

The TPS2292xxEVM-661 evaluation module (EVM) helps designers evaluate the operation and performance of the TPS2292xx load switches. The board features the small 6-pin SOT25-6 package for a small solution size.

Table 1. TPS22928, TPS22929 Vout Rise Time, Enable, and Discharge Options

EVM	Device	Rise Time (µS) Typ.	VIN(V)	Enable	Quick Output Discharge
HPA661-001	TPS22928A	0.5	5	Active High	No
HPA661-002	TPS22928B	100	5	Active High	No
HPA661-003	TPS22928C	1000	5	Active High	No
HPA661-004	TPS22928D	3600	5	Active High	No
HPA661-005	TPS22929A	0.5	5	Active High	Yes
HPA661-006	TPS22929B	100	5	Active High	Yes
HPA661-007	TPS22929C	1000	5	Active High	Yes
HPA661-008	TPS22929D	3600	5	Active High	Yes

1.1 Related Documentation From Texas Instruments

TPS22929, ULTRA-SMALL, LOW r_{ON} LOAD SWITCH data sheet

2 Setup

This section describes the jumpers and connectors on the EVM as well as how to properly connect, set up, and use the TPS2292xxEVM-661.

2.1 J1/J3 – Input Connections

This is the connection for the leads from the input source. Connect the positive connection to the VIN J1 and the negative connection to the GND J3.

2.2 J4/J6 – Output Connections

This is the connection for the output of the TPS2292xxEVM. Connect the positive connection of the load to the VOUT J4 and the negative connection to the GND J6.

2.3 JP3 – EN

This is the enable input for the device. A shorting jumper must be installed on JP3 in either the HI or LO positions, and EN must not be left unconnected. An external enable source can be applied to the EVM by removing the shunt and connecting a signal to the center pin of JP3. Refer to the Datasheet for proper ON and OFF voltage level settings. A switching signal may also be used and connected at this point.

2.4 J2/J5 – V_{IN} Sense and V_{OUT} Sense

These two connectors are used when very accurate measurements of input or output voltage are required, Ron measurements should be made using these sense connections and measuring the voltage drop from VIN to VOUT and then calculating the resistance.

3 Operation

Connect the positive input of the power supply to the VIN J1 and the negative lead of the power supply to GND J3. The input voltage range of the TPS2292xx is 1.4 V to 5.5 V.

Output load can be applied by connecting between J4 VOUT and J6 GND. The TPS2292xx is rated for a maximum continuous current of 2A. Additional output load can be selected using JP6, JP7, and JP8. Shorting across JP6 selects R1 an 560 ohm on board resistor. JP8 selects R3 an 14 ohm on board resistor. JP6 selects R1 which is open for customer selection. R1, 2 and 3 are intended for light loads of the output, observe the 1/8W(R1) and 1/8W(R2 & R3) power rating for these parts. Configure jumper JP3 as required. JP3 must be installed for proper operation. ON is normal operation. While operating in the ON state the rise time of the device is internally controlled to avoid inrush current. In the OFF position, the device is shut down. Devices equipped with the QDO option will connect a Ω on-chip load resistor output quick discharge. Quick Output Discharge (QOD) is noted in Table 1.

4 Test Results

See the *Typical Characteristics* section of the TPS2292xx data sheet.

5 Board Layout, Schematic, and Bill of Materials

This section provides the TPS2292xxEVM-661 board layout, schematic, and bill of materials.

5.1 Board Layout

For best performance, all traces should be as short as possible. To be most effective, the input and output capacitors should be placed close to the device to minimize the effects that parasitic trace inductances may have on normal and short-circuit operation. Using wide traces for V_{IN}, V_{OUT}, and GND helps minimize the parasitic electrical effects along with minimizing the case to ambient thermal impedance Figure 1, Figure 2, and Figure 3 show the board layout for the TPS2292xxEVM-661 PCB.

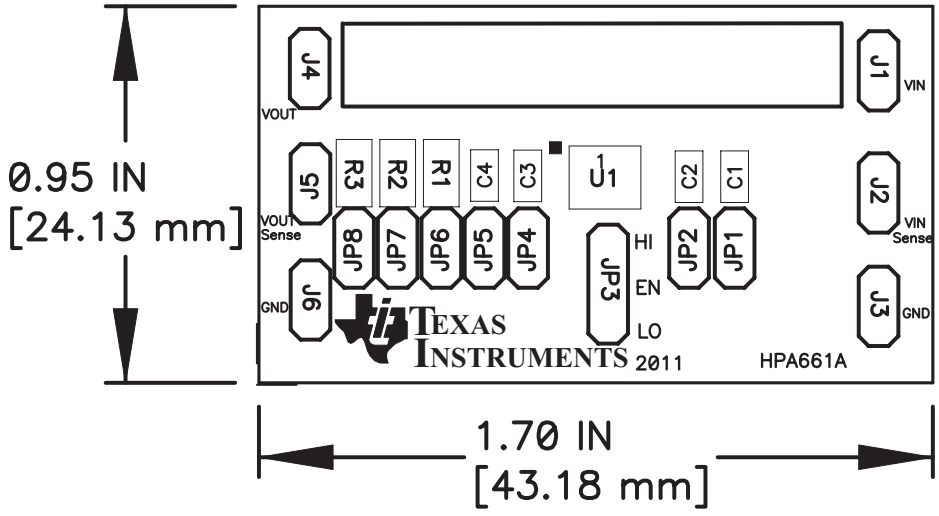

Figure 1. Top Assembly Layer

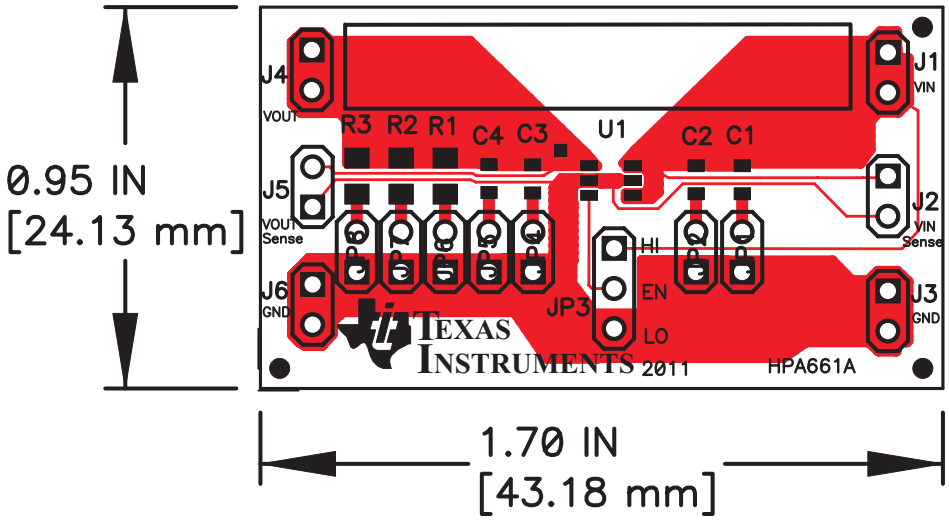

Figure 2. Top Layer

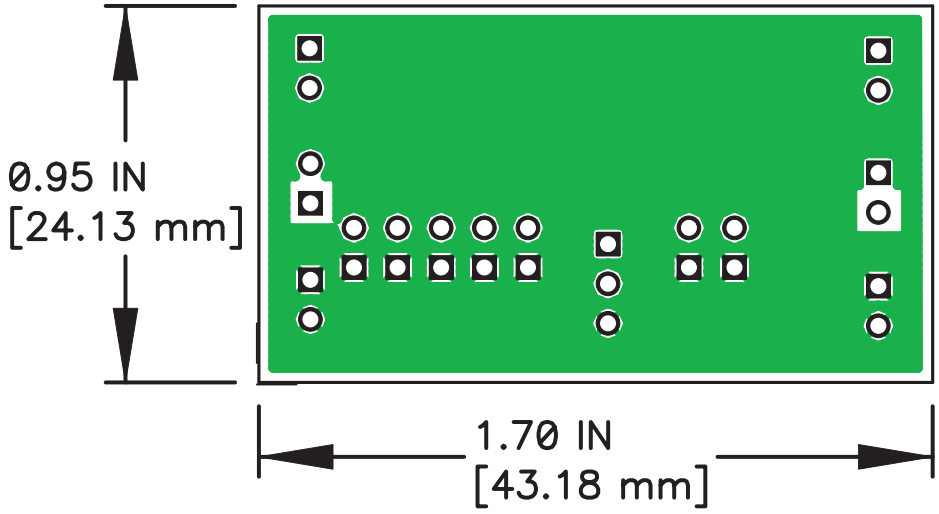

Figure 3. Bottom Layer

5.2 Schematic and Bill of Materials

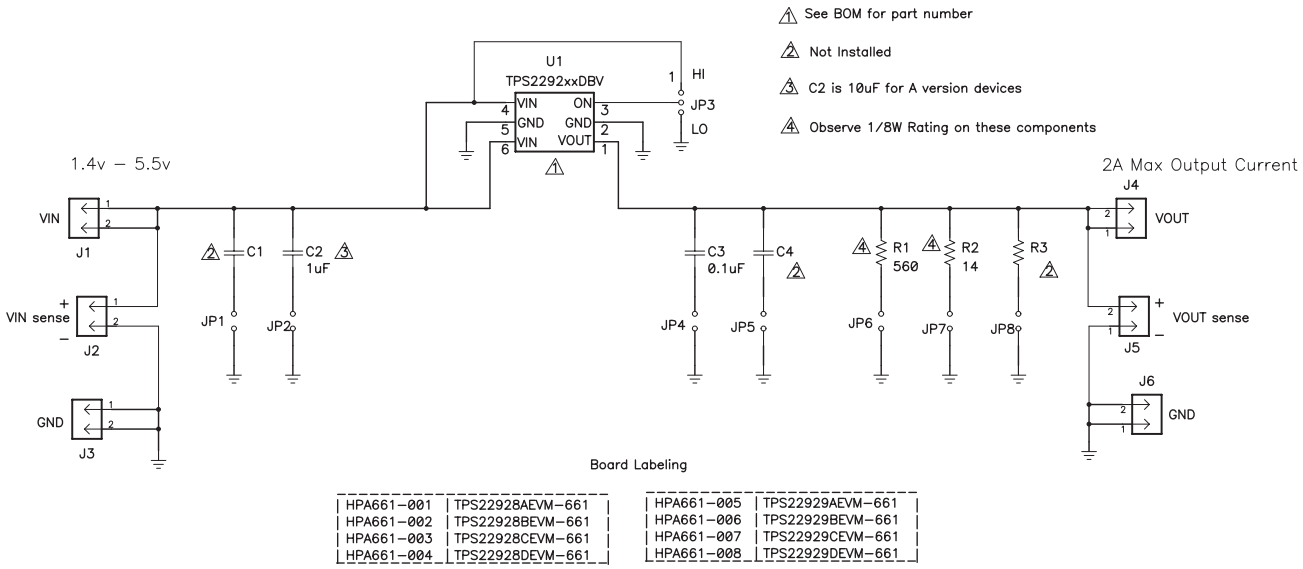

Figure 4. TPS2292xxEVM-661 Schematic

5.3 Bill of Materials

Table 2. Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR
1	–		PCB, 0.9 In x 1.7 In x 0.062 In		HPA661	Any
1	C3	0.1 µF	Capacitor, Ceramic, 16-V, X7R, 10%	603	Std	Std
1	C2	1 µF or 10µF for A type	Capacitor, Ceramic, 25-V, X5R, 10%	603	Std	Std
0	C1, C4	OPEN	Capacitor, Ceramic	603	Std	Std
1	R1	560 Ω	Resistor, 5% 1/8W	805	Std	Std
1	R2	14 Ω	Resistor, 1% 1/8W	805	Std	Std
0	R3	OPEN	Resistor, 5% 1/8W	805	Std	Std
13	J1–J6, JP1–2, JP4–8	PEC02SAAN	Header,2pin, 100mil spacing	0.100 inch x 2	PEC02SAAN	Sullins
1	JP3	PEC03SAAN	Header,3pin, 100mil spacing IC,	0.100 inch x 3	PEC03SAAN	Sullins
1	U1	TPS2292xxDBV	Single Chip, Low Input Voltage Current-Limited Load Switch with Shut Off Auto-Restart	SOT25-6	TPS2292xxDBV	TI
3	N/A	N/A	Shunt, 100-mil, Black	0.100	929950-00	3M

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 components.

Table 3.

Assembly Number	Text
HPA661-001	TPS22928AEVM-661
HPA661-002	TPS22928BEVM-661
HPA661-003	TPS22928CEVM-661
HPA661-004	TPS22928DEVM-661
HPA661-005	TPS22929AEVM-661
HPA661-006	TPS22929BEVM-661
HPA661-007	TPS22929CEVM-661
HPA661-008	TPS22929DEVM-661

5.4 VOUT Rise Time Example TPS22929D

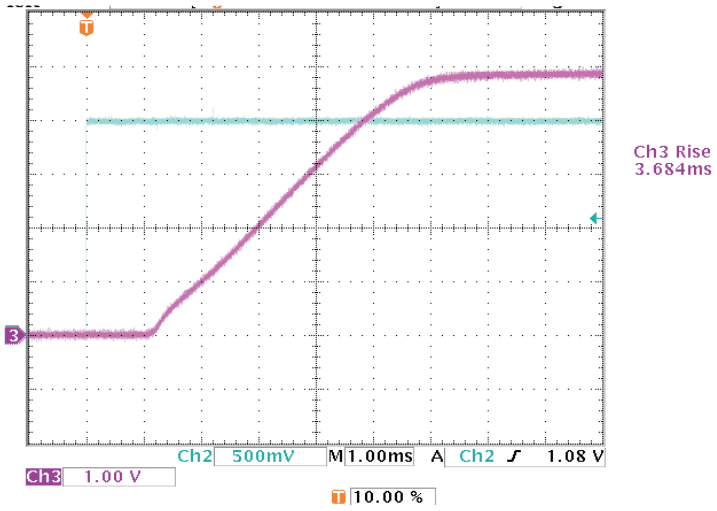

Figure 5. TPS229129D Trise Example

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EVM Warnings and Restrictions

It is important to operate this EVM within the input voltage range of 1.4 V to 5.5 V and the output voltage range of unspecified.

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 50°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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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

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- 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.

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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.

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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.

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