

TPS7B68xx-Q1 Evaluation Module

This user's guide describes the characteristics, operation, and use of the TPS7B68xx-Q1 evaluation module (EVM). Throughout this document, TPS7B68xx-Q1 refers to both the TPS7B6850-Q1 and TPS7B6833-Q1 devices. A complete schematic diagram, printed-circuit board layouts, and bill of materials are also included.

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1 Introduction

TI's TPS7B68xx-Q1 evaluation module (EVM) helps designers evaluate the operation and performance of the TPS7B6833-Q1 and TPS7B6850-Q1, 500-mA watchdog LDO. For more information on the TPS7B68xx-Q1 devices, see the data sheet ([SLVSD43](#)).

The EVM contains one linear regulator (see [Table 1](#)).

Table 1. Device and Package Configurations

Regulator	IC	Package
U1	TPS7B6850QPWPRQ1 or TPS7B6833QPWPRQ1	28-pin HTSSOP

2 Connector Descriptions, Setup, and Operation

This section describes the jumpers and connectors on the EVM as well and how to properly connect, set up, and use the TPS7B68xx-Q1 EVM.

2.1 Input and Output (I/O) Connector Descriptions

J1/VIN connector – This connector directly connects the regulator IN pin to the input power supply. Left open, this connector could protect the regulator from input reverse polarity connection.

J2/PGADJ connector – This connector sets the regulator PG (power good) threshold. Connect pin 3 and pin 4 to set the threshold to default. Connect pin 1 and pin 2 to set the threshold to 4 V (for TPS7B6850-Q1).

J3/EN/FSEL/WTS connector – This connector sets the regulator EN, FSEL and WTS status.

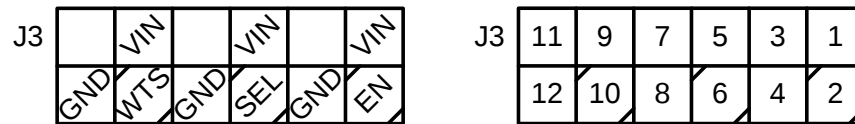


Figure 1. Connector J3

- **EN:** Connect pin 1 and pin 2 to enable the regulator. Connect pin 2 and pin 4 to disable the regulator.
- **FSEL:** Connect pin 5 and pin 6 to set FSEL to HIGH. Connect pin 6 and pin 8 to set FSEL to LOW.
- **WTS:** Connect pin 9 and pin 10 to select standard watchdog. Connect pin 10 and pin 12 to select window watchdog.

J4/WD_EN connector – This connector sets the watchdog function working status. Connect pin 1 and pin 2 to disable the watchdog function. Connect pin 2 and pin 3 to enable the watchdog function.

J5/PG connector – This connector connects the regulator PG pin to the OUT pin through a 10-kΩ resistor. Leave this connector open if the PG function is not used.

J6/WDO connector – This connector connects the watchdog WDO pin to the OUT pin through a 10-kΩ resistor. Leave this connector open if the watchdog function is not used.

J7/ROSC connector – This connector sets the duration of the watchdog monitor. Connect the corresponding pins to select the required watchdog period.

J8/DELAY connector – This connector sets the regulator power good delay time. Connect the corresponding pins to select the required delay time.

J9/WRS connector – This connector sets the open window and closed window ratio (window watchdog only). Connect pin 1 and pin 2 to set the open/closed window ratio to 8:1. Connect pin 2 and pin 3 to set the open/closed window ratio to 1:1.

J10/WDO-PG connector – This connector directly connects watchdog WDO pin to regulator RST pin.

J11/ GND connector – This connector directly connects the regulator GND pin to the ground of the input power supply. Connecting an ammeter to pin 1 and pin 2 allows the measurement of the regulator ground current.

TP1/VIN – This test point provides an input power supply to power the EVM.

TP2/OUT – This test point provides the output of the regulator to allow a load to be attached to the EVM.

TP3/VIN – This test point allows measurement of the input voltage at the regulator IN pin.

TP4/OUT – This test point allows measurement of the output voltage at the regulator OUT pin.

TP5/EN - This test point allows measurement of the enable voltage at the regulator EN pin.

TP6/PGADJ – This test point allows measurement of the voltage at the regulator PGADJ pin.

TP7/WD_EN – This test point allows measurement of the watchdog enable voltage at the WD_EN pin.

TP8/WDO – This test point allows measurement of the watchdog output signal at the WDO pin.

TP9/WD – This test point allows measurement of the watchdog service signal at the WD pin.

TP10/PG – This test point allows measurement of the power good voltage at the regulator PG pin.

TP11/WTS – This test point allows measurement of the signal at the WTS pin.

TP12/FSEL – This test point allows measurement of the signal at the FSEL pin.

TP13/ROSC – This test point allows measurement of the voltage at the ROSC pin.

TP14/WRS – This test point allows measurement of the signal at the WRS pin.

TP15/DELAY – This test point allows measurement of the voltage at the regulator DELAY pin.

TP16/TP17/TP18/TP19/TP20/TP21/GND – GND is the ground return for the regulator. The EVM provides TP16 and TP17, two GND test points to power up the EVM, to connect the load. The EVM also provides TP18 to TP21, four GND test points as the ground reference for the signal or voltage test point.

2.2 Bench Setup

The input voltage range for the watchdog LDO TPS7B68xx-Q1 is 4 V to 40 V. The EVM can support up to a 500-mA load current. Using the following steps to setup the test bench for the EVM:

1. Set the power supply for input (V_{IN}) to 12 V and set the current limit to 1 A.
2. Set the EVM board:
 - (a) Regulator only. Connect EN to VIN (J3), and connect $\overline{WD_EN}$ to OUT (J4).
 - (b) Watchdog enabled. Connect EN to VIN (J3), and connect $\overline{WD_EN}$ to GND (J4).
3. Connect the power supply positive lead to the VIN (TP1) and the negative lead to GND (TP16).
4. Apply the load between OUT (TP2) and GND (TP17).

2.3 Operation

The TPS7B68xx-Q1 powers up after the V_{IN} voltage exceeds the UVLO rising threshold.

3 Board Layout

The printed-circuit board (PCB) offers footprints for the TPS7B68xx-Q1 device as shown in [Figure 2](#), [Figure 3](#), and [Figure 4](#).

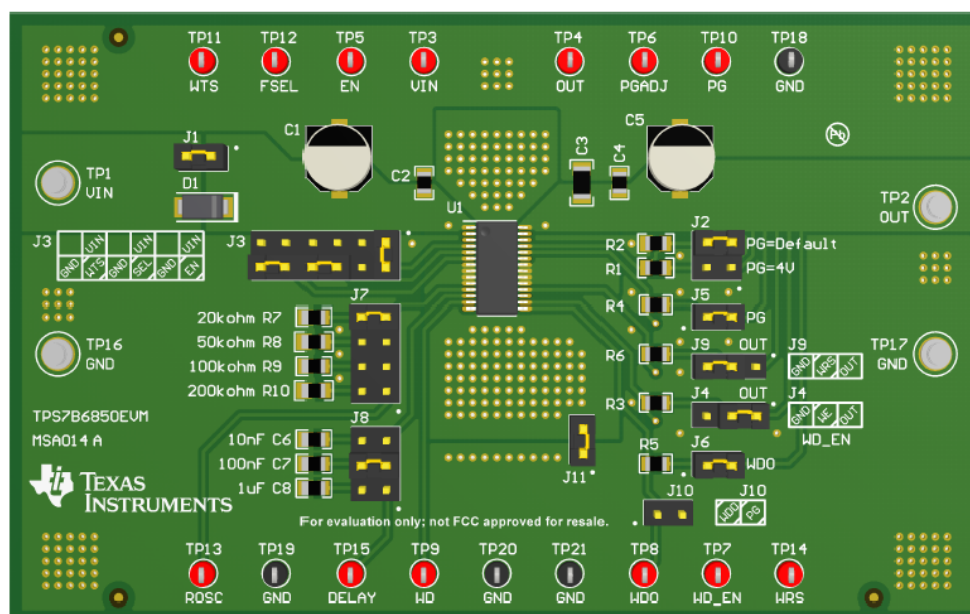


Figure 2. TPS7B6850EVM Component Placement (Assembly Top View)

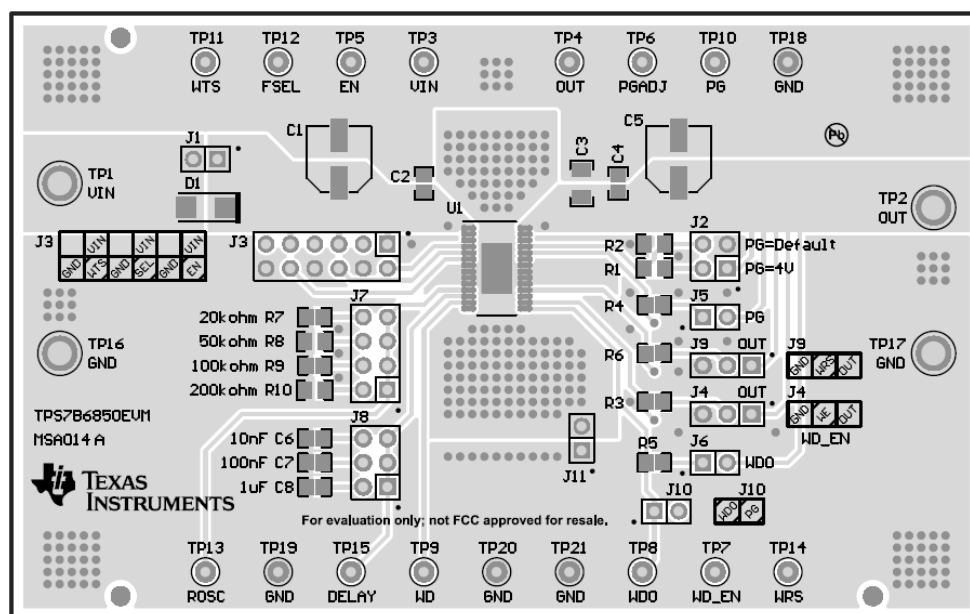


Figure 3. TPS7B6850EVM Top Layer Routing

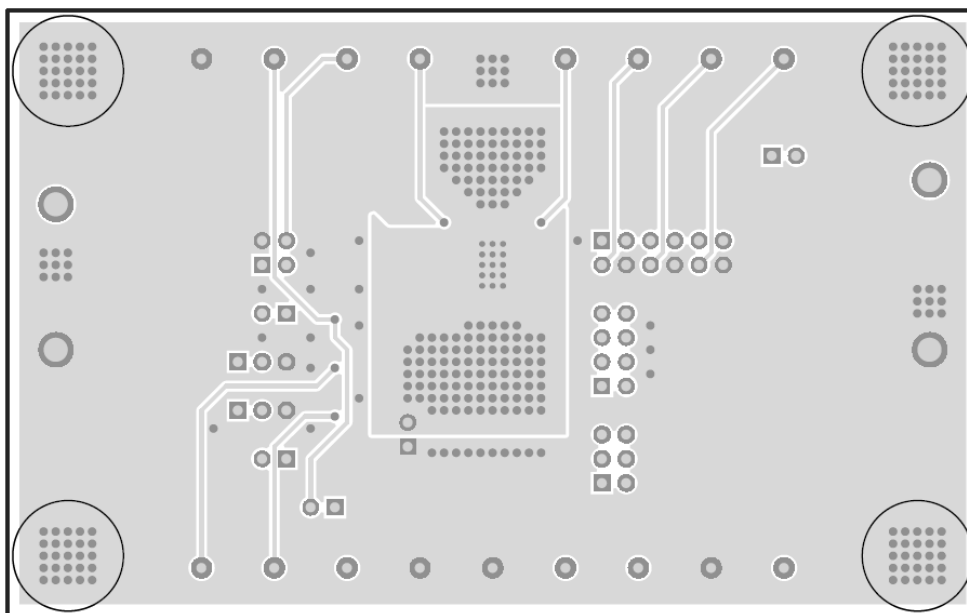
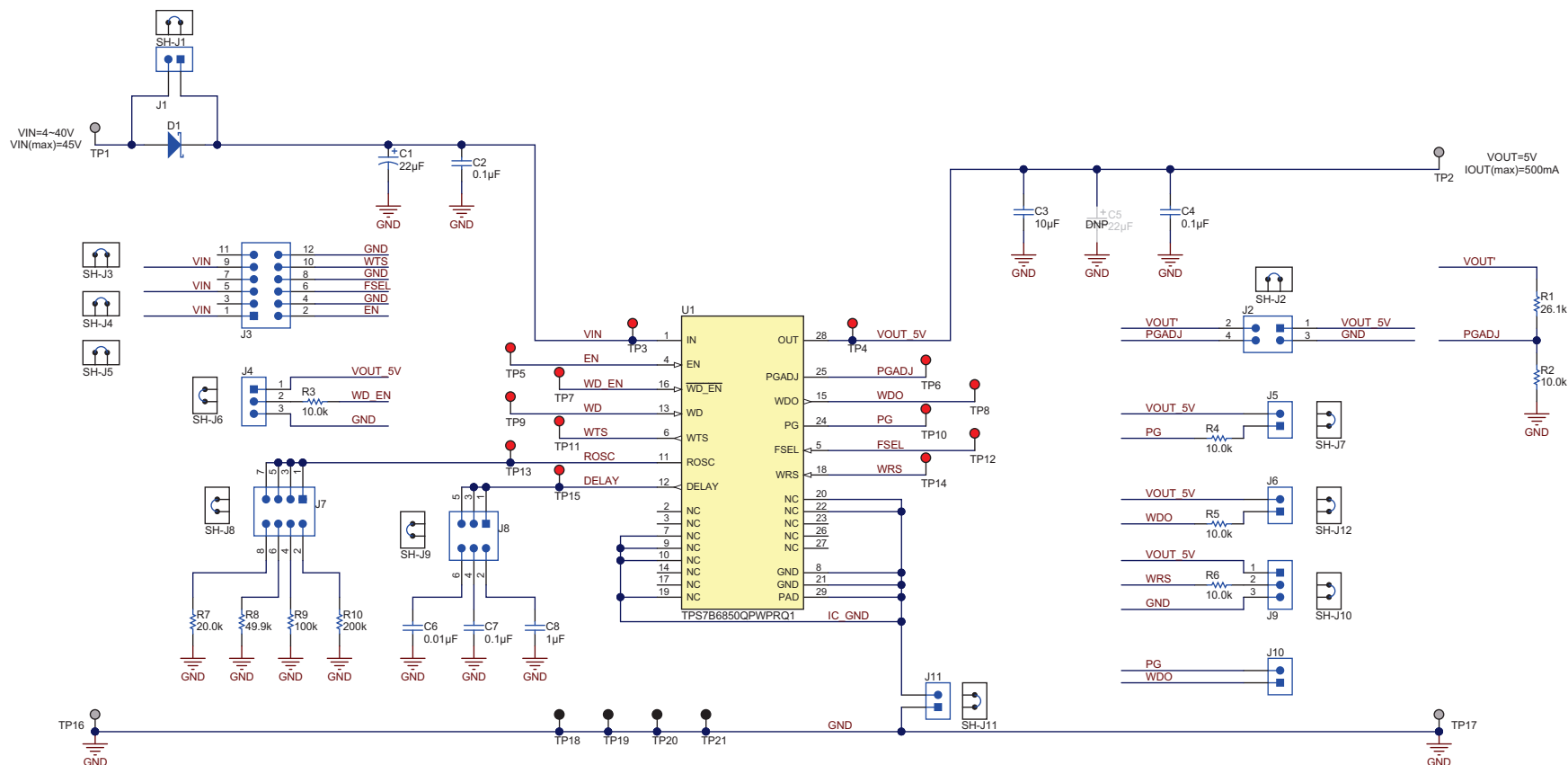


Figure 4. TPS7B6850EVM Bottom Layer Routing

4 Schematic and Bill of Materials

4.1 Schematic

Figure 5 illustrates the TPS7B6850EVM schematic.



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Figure 5. TPS7B6850EVM Schematic

4.2 Bill of Materials

Table 2 lists the TPS7B6850EVM bill of materials.

Table 2. Bill of Materials

Designator	Qty	Value	Description	Package Reference	Part Number	Manufacturer	Alternate Part Number	Alternate Manufacturer
PCB1	1		Printed Circuit Board		MSA014	Any	-	-
C1	1	22uF	CAP, AL, 22 μ F, 50 V, +/- 20%, 0.88 ohm, SMD	SMT Radial D	EEE-FK1H220P	Panasonic		
C2, C4	2	0.1uF	CAP, CERM, 0.1 μ F, 50 V, +/- 10%, X7R, 0805	0805	GRM21BR71H104KA01L	Murata		
C3	1	10uF	CAP, CERM, 10 μ F, 25 V, +/- 10%, X7R, 1206	1206	GRM31CR71E106KA12L	Murata		
C6	1	0.01uF	CAP, CERM, 0.01 μ F, 50 V, +/- 10%, X7R, 0805	0805	GRM216R71H103KA01D	Murata		
C7	1	0.1uF	CAP, CERM, 0.1 μ F, 16 V, +/- 10%, X7R, 0805	0805	GRM219R71C104KA01D	Murata		
C8	1	1uF	CAP, CERM, 1 μ F, 16 V, +/- 10%, X7R, 0805	0805	GRM21BR71C105KA01L	Murata		
D1	1	60V	Diode, Schottky, 60 V, 2 A, SMA	SMA	B260A-13-F	Diodes Inc.		
H1, H2, H3, H4	4		Bumpon, Hemisphere, 0.44 X 0.20, Clear	Transparent Bumpon	SJ-5303 (CLEAR)	3M		
J1, J5, J6, J10, J11	5		Header, 100mil, 2x1, Gold, TH	2x1 Header	TSW-102-07-G-S	Samtec		
J2	1		Header, 100mil, 2x2, Gold, TH	2x2 Header	TSW-102-07-G-D	Samtec		
J3	1		Header, 100mil, 6x2, Gold, TH	6x2 Header	TSW-106-07-G-D	Samtec		
J4, J9	2		Header, 100mil, 3x1, Gold, TH	3x1 Header	TSW-103-07-G-S	Samtec		
J7	1		Header, 100mil, 4x2, Gold, TH	4x2 Header	TSW-104-07-G-D	Samtec		
J8	1		Header, 100mil, 3x2, Gold, TH	3x2 Header	TSW-103-07-G-D	Samtec		
R1	1	26.1k	RES, 26.1 k, 0.1%, 0.125 W, 0805	0805	RT0805BRD0726K1L	Yageo America		
R2	1	10.0k	RES, 10.0 k, 0.1%, 0.125 W, 0805	0805	RT0805BRD0710KL	Yageo America		
R3, R4, R5, R6	4	10.0k	RES, 10.0 k, 1%, 0.125 W, 0805	0805	CRCW080510K0FKEA	Vishay-Dale		
R7	1	20.0k	RES, 20.0 k, 1%, 0.125 W, 0805	0805	CRCW080520K0FKEA	Vishay-Dale		
R8	1	49.9k	RES, 49.9 k, 1%, 0.125 W, 0805	0805	CRCW080549K9FKEA	Vishay-Dale		
R9	1	100k	RES, 100 k, 1%, 0.125 W, 0805	0805	CRCW0805100KFKEA	Vishay-Dale		
R10	1	200k	RES, 200 k, 1%, 0.125 W, 0805	0805	CRCW0805200KFKEA	Vishay-Dale		
SH-J1, SH-J2, SH-J3, SH-J4, SH-J5, SH-J6, SH-J7, SH-J8, SH-J9, SH-J10, SH-J11, SH-J12	12	1x2	Shunt, 100mil, Gold plated, Black	Shunt	969102-0000-DA	3M	SNT-100-BK-G	Samtec
TP1, TP2, TP16, TP17	4	Double	Terminal, Turret, TH, Double	Keystone1502-2	1502-2	Keystone		
TP3, TP4, TP5, TP6, TP7, TP8, TP9, TP10, TP11, TP12, TP13, TP14, TP15	13	Red	Test Point, Miniature, Red, TH	Red Miniature Testpoint	5000	Keystone		
TP18, TP19, TP20, TP21	4	Black	Test Point, Miniature, Black, TH	Black Miniature Testpoint	5001	Keystone		
U1	1		500mA 40V High Voltage Ultra Low Quiescent Current Watchdog LDO, PWP0028C	PWP0028C	TPS7B6850QPWPRQ1	Texas Instruments		Texas Instruments
C5	0	22uF	CAP, AL, 22 μ F, 25 V, +/- 20%, 1 ohm, SMD	SMT Radial D	EEE-FC1E220P	Panasonic		
FID1, FID2, FID3	0		Fiducial mark. There is nothing to buy or mount.	Fiducial	N/A	N/A		
Note:			Unless otherwise noted in the Alternate PartNumber and/or Alternate Manufacturer columns, all parts may be substituted with equivalents.					

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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.

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NOTE: 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.

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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.

3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210

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2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs, or
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.

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