



## **MB39C811-EVB-03**

# **PMIC for Solar/Vibration Energy Harvesting, Evaluation Board Operation Guide**

Doc. No. 002-08722 Rev. \*B

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# Preface



## **Purpose of this manual and intended readers**

This manual explains how to use the evaluation board. Be sure to read this manual before using the product. For this product, please consult with sales representatives or support representatives.

### **Handling and use**

Handling and use of this product and notes regarding its safe use are described in the manuals.

Follow the instructions in the manuals to use this product.

Keep this manual at hand so that you can refer to it anytime during use of this product.



### **Notice on this document**

All information included in this document is current as of the date it is issued. Such information is subject to change without any prior notice.

Please confirm the latest relevant information with the sales representatives.

### Caution of the products described in this document

The following precautions apply to the product described in this manual.

 <b>WARNING</b>	Indicates a potentially hazardous situation which could result in death or serious injury and/or a fault in the user's system if the product is not used correctly.
<b>Electric shock, Damage</b>	Before performing any operation described in this manual, turn off all the power supplies to the system. Performing such an operation with the power on may cause an electric shock or device fault.
<b>Electric shock, Damage</b>	Once the product has been turned on, do not touch any metal part of it. Doing so may cause an electric shock or device fault.
 <b>CAUTION</b>	Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to lose software resources and other properties such as data, if the device is not used appropriately.
<b>Cuts, Damage</b>	Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.
<b>Cuts</b>	The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.
<b>Damage</b>	Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on. Doing so may cause a malfunction due to overloading or shock.
<b>Damage</b>	Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault.
<b>Damage</b>	Use the product within the ranges given in the specifications. Operation over the specified ranges may cause a fault.
<b>Damage</b>	To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.
<b>Damage</b>	When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault.
<b>Damage</b>	Always turn the power off before connecting or disconnecting any cables from the product. When unplugging a cable, unplug the cable by holding the connector part without pulling on the cable itself. Pulling the cable itself or bending it may expose or disconnect the cable core, resulting in a fault.
<b>Damage</b>	Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

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# 1. Description



The MB39C811-EVB-03 is the tiny evaluation board for the energy harvesting (Power Management) IC, MB39C811. This evaluation board is capable of accepting solar, piezoelectric, or any high impedance AC or DC source.

## 2. Evaluation Board Specification



Table 1. Evaluation Board Specification

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit
Input voltage	VIN	-	2.6	-	23	V
Input slew rate	VIN	VIN ≥ 7V	-	-	0.25	V/ms
Input current	VIN	-	-	-	100	mA
AC pin input voltage	AC1-1,AC1-2, AC2-1,AC2-2	-	-	-	23	V
AC pin input current	AC1-1,AC1-2, AC2-1,AC2-2	-	-	-	50	mA
Output voltage	VOUT	See Table 4. Output Voltage Settings	1.5	-	5	V
Output current	VOUT	Up to 100mA	-	-	100	mA
UVLO release voltage	VOUT	JP3=L, JP2=L, JP1=L (1.5V)	3.8	4.0	4.2	V
		JP3=L, JP2=L, JP1=H (1.8V)				
		JP3=L, JP2=H, JP1=L (2.5V)				
		JP3=L, JP2=H, JP1=H (3.3V)	4.94	5.2	5.46	V
		JP3=H, JP2=L, JP1=L (3.6V)				
		JP3=H, JP2=L, JP1=H (4.1V)	6.84	7.2	7.56	V
		JP3=H, JP2=H, JP1=L (4.5V)				
JP3=H, JP2=H, JP1=H (5.0V)						
Forward bias voltage	AC1-1,AC1-2, AC2-1,AC2-2	IF=10 μA	150	280	450	mV

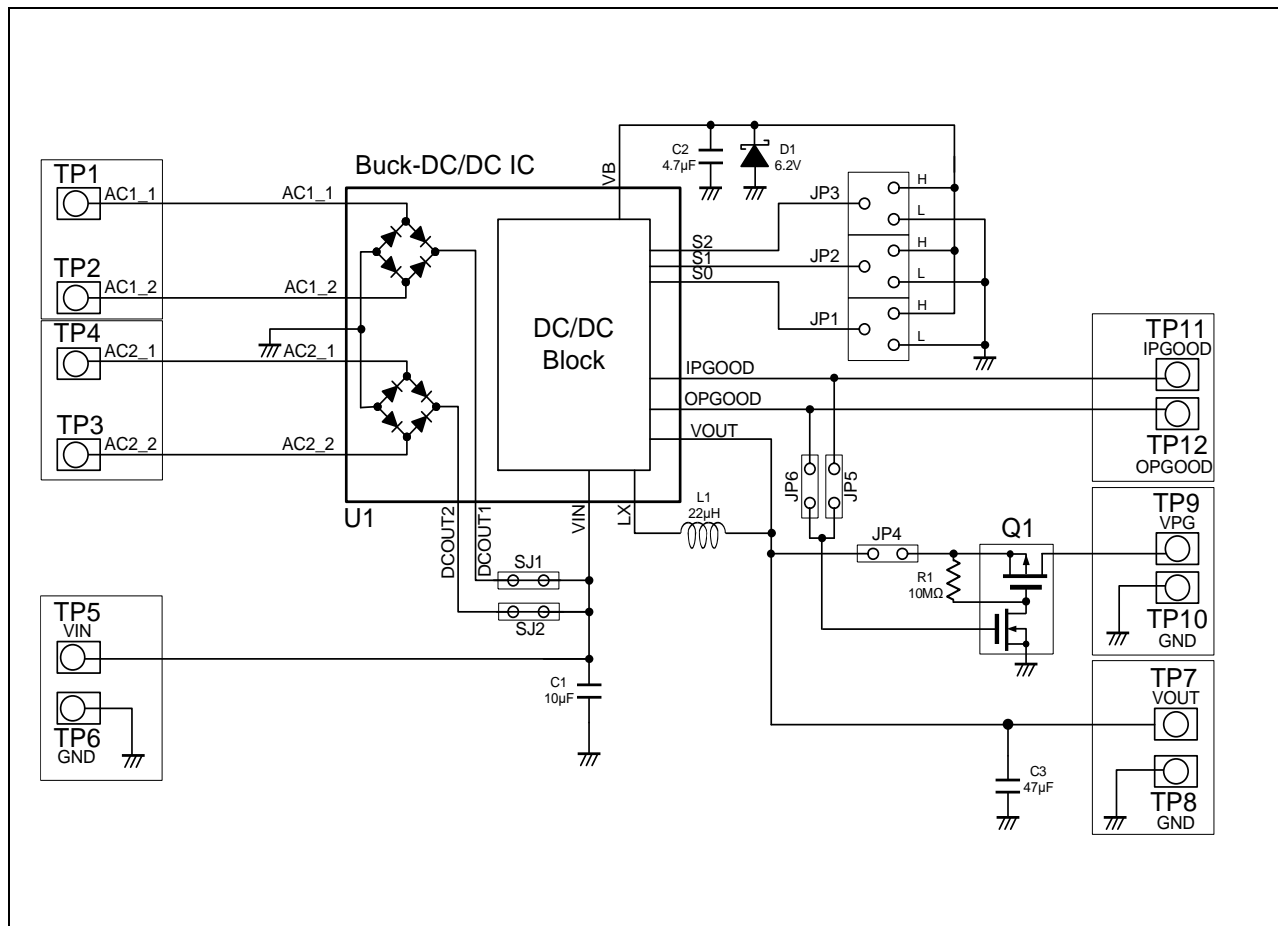
Please see the [MB39C811 datasheet](#) (DS405-00013) for more information.

Board size: 23mmx14mm

# 3. Block Diagram



Figure 1. Block Diagram





# 4. Pin Descriptions



## 4.1 Input/Output Pin Descriptions

Table 2. Input/Output Pin Descriptions

Pin Number	Pin Symbol	I/O	Function Description
TP1	AC1-1	I	Bridge rectifier 1, AC input 1
TP2	AC1-2	I	Bridge rectifier 1, AC input 2
TP4	AC2-1	I	Bridge rectifier 2, AC input 1
TP3	AC2-2	I	Bridge rectifier 2, AC input 2
TP5	VIN	I	DC power input It supplies power through the bridge rectifier from DCOUT1/2 to the VIN pin.
TP6	GND	-	GND pin
TP7	VOUT	O	VOUT pin
TP8	GND	-	GND pin
TP9	VPG	O	Power Gating VOUT pin
TP10	GND	-	GND pin
TP11	IPGOOD	O	Input power good monitor pin
TP12	OPGOOD	O	Output power good monitor pin

## 4.2 Jumper Descriptions

Table 3. Jumper, Switch Descriptions

Jumper, Switch	Function Description	Initial Setting
SJ1	Connection jumper between the DC output pin (DCOUT1) of bridge rectifier 1 and DC input pin (VIN) of DC/DC converter	Pattern short
SJ2	Connection jumper between the DC output pin (DCOUT2) of bridge rectifier 2 and DC input pin (VIN) of DC/DC converter to "open/short"	Pattern short
JP1	High/Low selecting switch for S0. See Table 4	H
JP2	High/Low selecting switch for S1. See Table 4.	H
JP3	High/Low selecting switch for S2. See Table 4.	L
JP4	Short between VOUT and Power Gating Circuit	Short
JP5	Short between IPGOOD and Nch-Gate of Power Gating Circuit	Short
JP6	Short between OPGOOD and Nch-Gate of Power Gating Circuit	Open

\*: Open/Short by soldering

Table 4. Output Voltage Settings

S2 Pin (JP3)	S1 Pin (JP2)	S0 Pin (JP1)	Preset Output Voltage
L	L	L	1.5
L	L	H	1.8
L	H	L	2.5
L	H	H	3.3 (Initial setting)
H	L	L	3.6
H	L	H	4.1
H	L	L	4.5
H	H	H	5.0

# 5. Outside Drawing of Evaluation Board



Figure 2. Outside Drawing (Top)

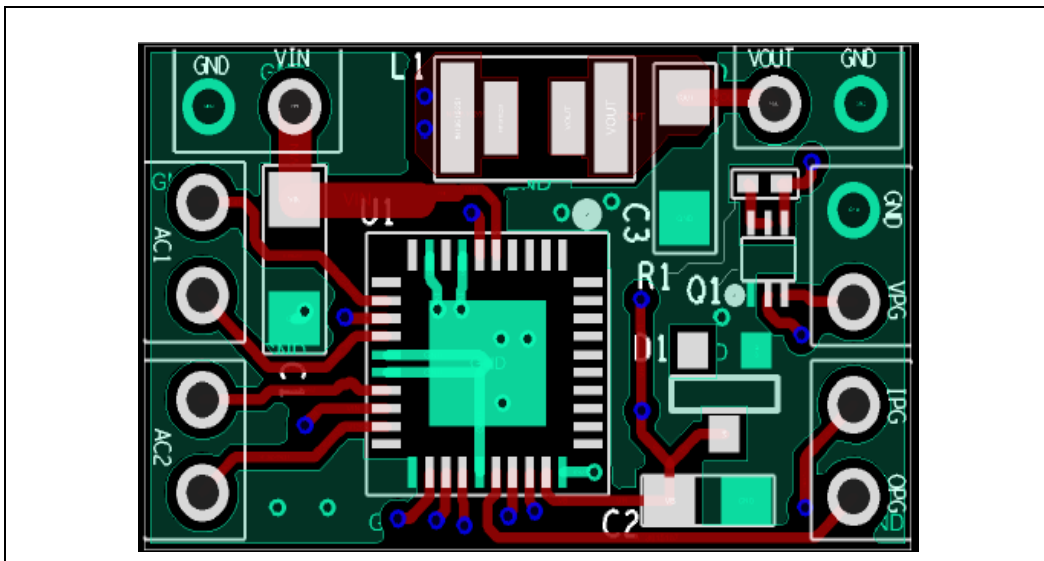
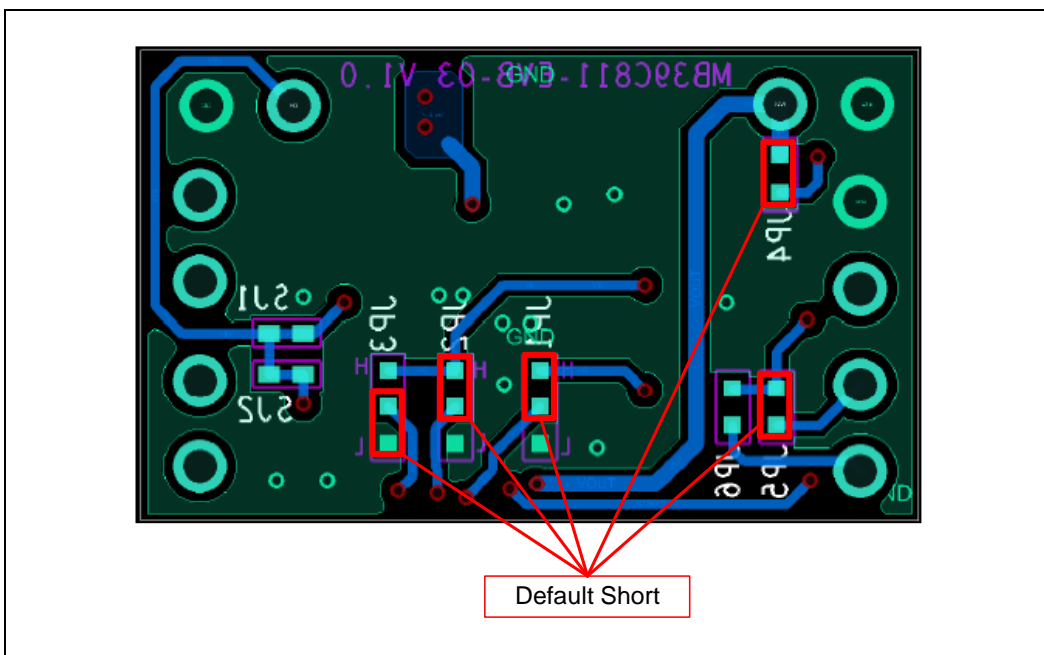


Figure 3. Outside Drawing (Bottom)



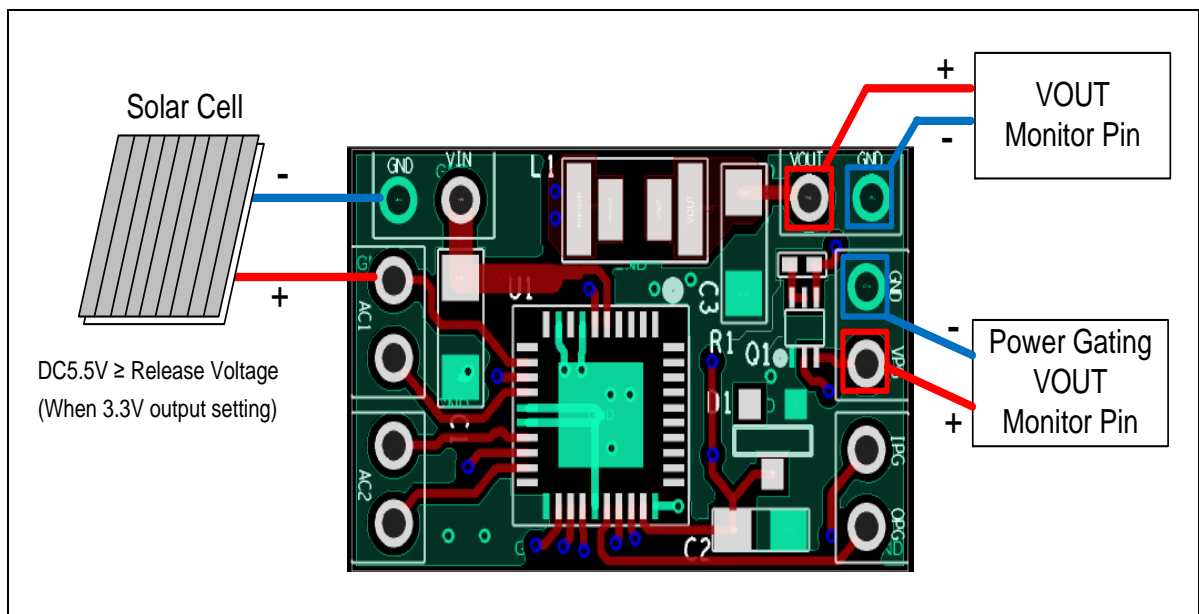
## 6. Setup and Verification



### 6.1 Solar (or Light) Energy Harvesting

1. To output 3.3V voltage to VOUT pin, input a DC 5.5V or more voltage into TP1 (AC1-1). Recommend solar cell of 8cells or more, if connect solar cell. The number of plus for UVLO release voltage (5.2Vtyp@3.3V setting) and the forward bias voltage of diode (0.28Vtyp) are required to start up (see the Table 1).
2. 3.3V is output to TP7 (VOUT) and TP9 (VPG).
3. To change the output voltage, change the jumper settings (see the Table 4) using soldering.

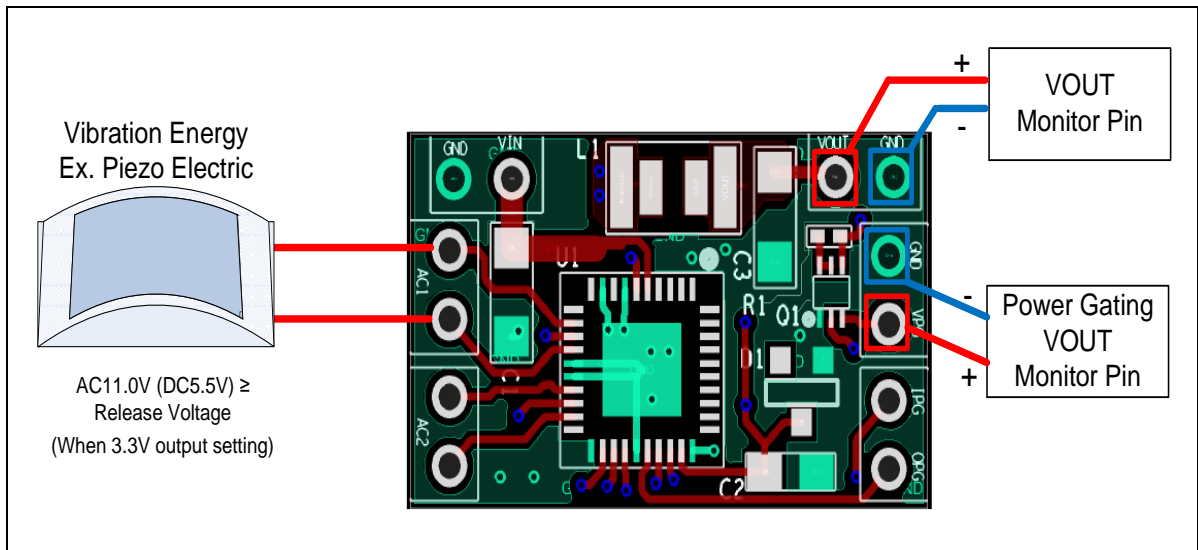
Figure 4. Solar (or Light) Energy Harvesting



## 6.2 Vibration Energy Harvesting

1. To output 3.3V voltage to VOUT pin, input AC 11V (DC5.5V) or more voltage into TP1 and TP2 (AC1-1 and AC1-2). The number of plus for UVLO release voltage (5.2Vtyp@3.3V setting) and the forward bias voltage of diode (0.28Vtyp) are required to start up (see the Table 1).
2. 3.3V is output to TP7 (VOUT) and TP9 (VPG).
3. To change the output voltage, change the jumper settings (see the Table 4) using soldering.

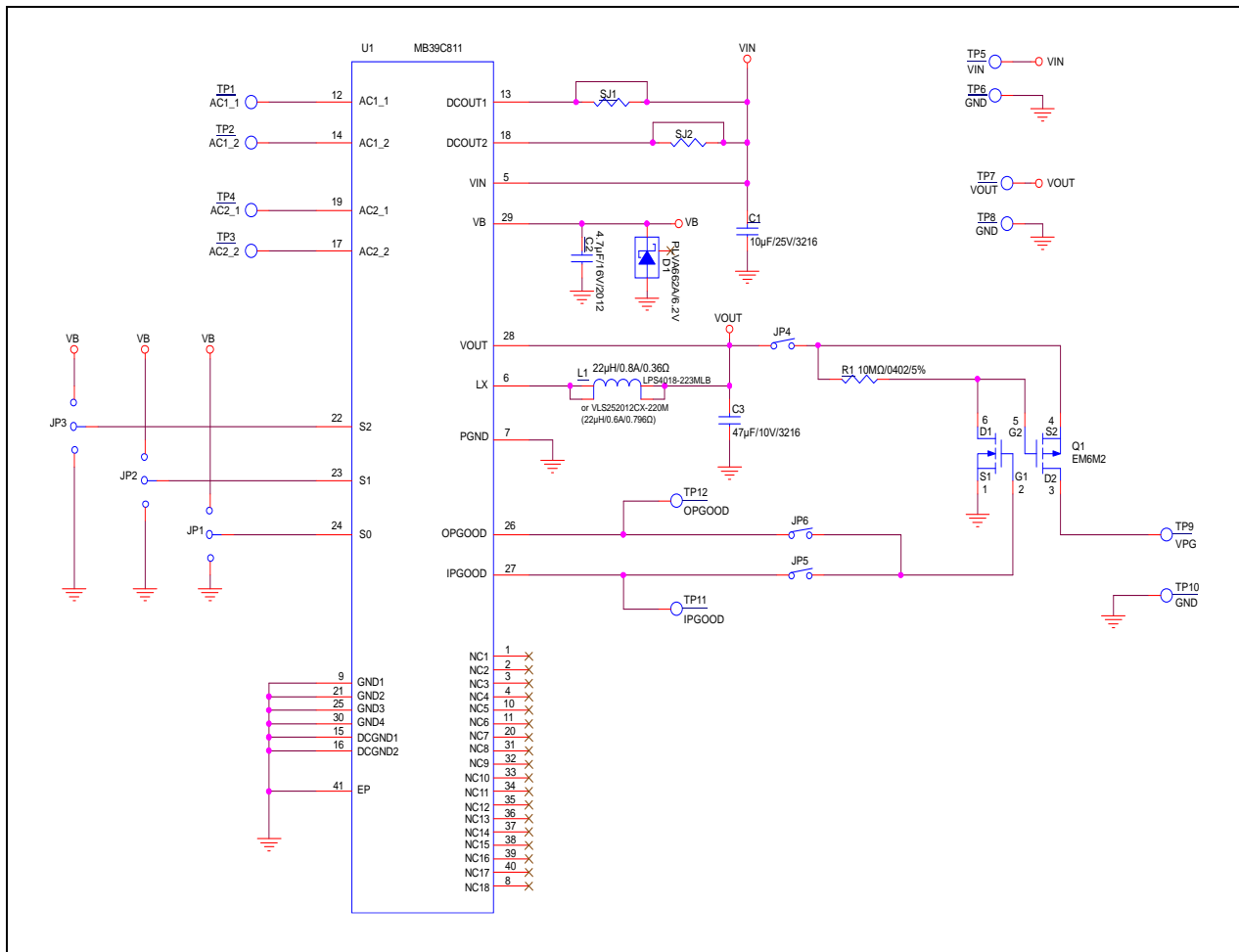
Figure 5. Vibration Energy Harvesting



# 7. Circuit Schematic



Figure 6. Circuit Schematic



## 8. Component List



Table 5. Component List

No.	Qty.	Reference	Parts Number	Description	Manufacturer
1	1	C1	C3216X5R1E106MT	10 $\mu$ F/25V	TDK
2	1	C2	C2012JB1C475K	4.7 $\mu$ F/16V	TDK
3	1	C3	C3216X5R1A476M160AB	47 $\mu$ F/10V	TDK
4	1	L1	LPS4018-223MLB VLS252012CX-220M	22 $\mu$ H/4018 22 $\mu$ H/2520	Coilcraft TDK
5	1	M1	MB39C811	Energy Harvesting PMIC	Cypress
6	1	Q1	EM6M2	Nch+Pch MOSFET	ROHM
7	1	R1	TRR01MZPJ106	10 M $\Omega$ 5% 0402 SMD	ROHM
8	1	D1	PLVA662A	Voltage regulator diode	NXP

These components are compliant with RoHS, but please ask each vender for details if necessary.

# 9. Silk and Layout



Figure 7. Silk and Layout

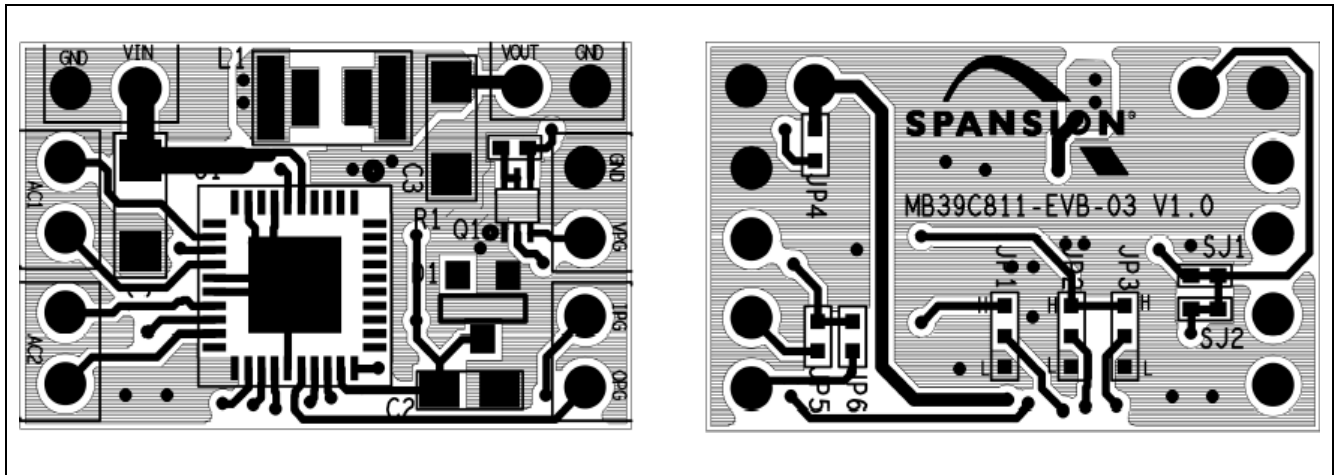


Figure 8. Layout

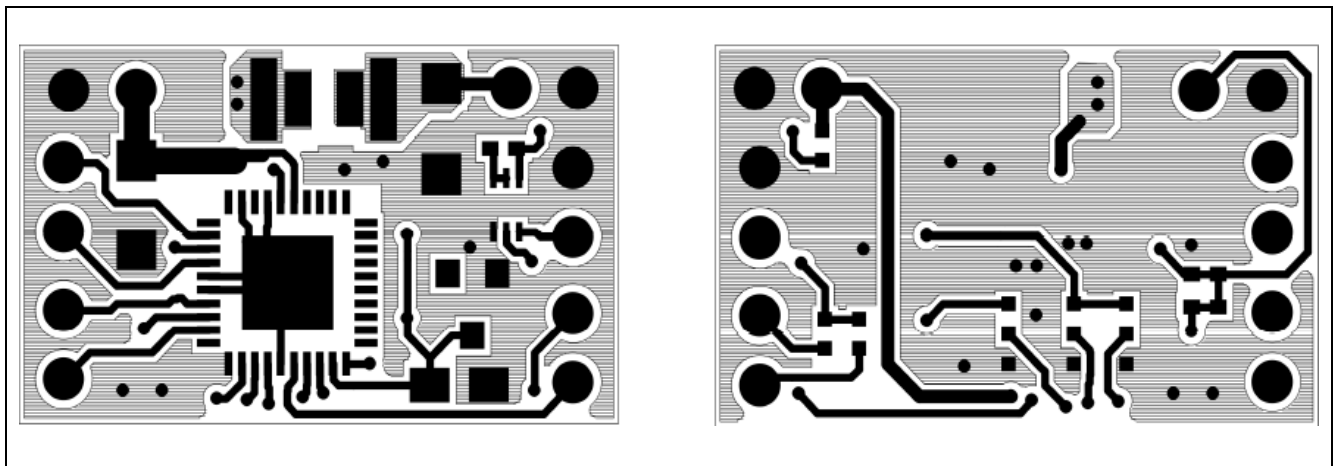
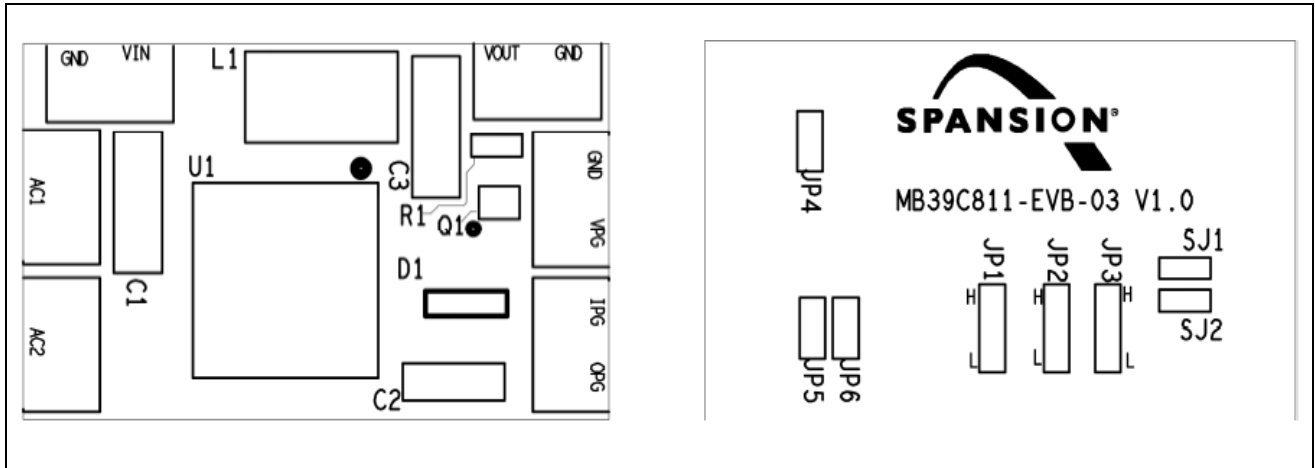




Figure 9. Silk



# 10. Ordering Information



Table 6. Ordering Information

Part Number	EVB Revision	Note
MB39C811-EVB-03	Rev. 1.0	---

# 11. Major Changes



Spansion Publication Number: MB39C811-EVB-03\_SS901-00034-1v0-E

Page	Section	Change Results
Revision 1.0		
-	-	Initial release

**Note: Please see Document Revision History for more Details**

# 12. Revision History



## Document Revision History

<b>Document Title: MB39C811-EVB-03, PMIC for Solar/Vibration Energy Harvesting, Evaluation Board Operation Guide</b>			
<b>Document Number:002-08722</b>			
Revision	Issue Date	Origin of Change	Description of Change
**	01/09/2015	EIFU	Initial Release
*A	05/04/2016	EIFU	Updated to Cypress template.
*B	12/11/2017	EIFU	Updated Document Title to read as "MB39C811-EVB-03, PMIC for Solar/Vibration Energy Harvesting, Evaluation Board Operation Guide". Updated to new template. Completing Sunset Review.

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