TPS62746EVM-706 Evaluation Module

This user's guide describes the characteristics, operation, and use of TI's TPS62746 evaluation module (EVM). This EVM is designed to help the user easily evaluate and test the operation and functionality of the TPS62746. The EVM converts a 2.0-V to 5.5-V input voltage to a regulated output voltage that is set either 1.2 V or 1.8 V at up to 300 mA. The TPS62746 also includes an input voltage switch and has an ultra-low quiescent current of 360 nA. This user's guide includes setup instructions for the hardware, a printed-circuit board (PCB) layout for the EVM, a schematic diagram, and the bill of materials (BOM).

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1 Introduction

The TPS62746 is a 300-mA, synchronous, step-down converter in a tiny 1.6 x 0.9-mm, 8-ball DSBGA package. The output voltage is fixed inside the device by the connection of the VSEL pin.

1.1 Background

The TPS62746EVM-706 uses the TPS62746 device. The EVM operates with full-rated performance with an input voltage between 2.15 V and 5.5 V.

2 Evaluation Module Setup

This section describes how to properly use the TPS62746EVM-706.

2.1 Input/Output Connector Descriptions

J1, Pin 1&2 – VIN	Positive input connection from the input supply for the EVM.
J1, Pin 3&4 – S+/S-	Input voltage sense connections. Measure the input voltage at this point.
J1, Pin 5&6 – GND	Return connection from the input supply for the EVM.
J2, Pin 1&2 – VOUT	Output voltage connection.
J2, Pin 3&4 – S+/S-	Output voltage sense connections. Measure the output voltage at this point.
J2, Pin 5&6 – GND	Output return connection.
J3 – SW & GND	Measurement connection for the Switch Node, including Ground connection
J4 - VOUT Sense	Output Voltage SMA Measurement connection.
J5, Pin 1&2 - VSW	Load switch output connection.
J5, Pin 3&4 - S+/S-	Load switch output voltage sense connections. Measure the load switch output voltage at this point.
J5, Pin 5&6 - GND	Load switch output return connection.
JP1 - SW_CTRL	CTRL pin input jumper. Place the supplied jumper across LOAD_ON and CTRL to activate (close) the internal load switch. Place the jumper across LOAD_OFF and CTRL to de-activate (open) the internal load switch.
JP2 - VSEL	Output Voltage Selection Pin. Chose VSEL = LOW for 1.2 VOUT or VSEL = HIGH for 1.8 VOUT
JP3 - VHIGH	High Level Selection Jumper. The high level can be selected as VIN or VOUT
JP4 - EN	EN pin input jumper. Place the supplied jumper across ON and EN to turn on the IC. Place the jumper across OFF and EN to turn off the IC.

2.2 Setup

To operate the EVM, set jumpers JP1 through JP4 to the desired positions per Section 2.1. Connect the input supply to J1 and J3 and connect the load to J4 and J6.

3 Common Efficiency Measurement Errors with Ultra-Low Iq Devices

Efficiency is a common measurement for a power supply. With an ultra-low quiescent current device, such as the TPS62746, measurement errors can have a large impact on the measured efficiency, especially at very low load currents (< 100 µA).

3.1 Efficiency Measurement Setup

To accurately measure the efficiency of the TPS62746EVM-706, use the setup described in SLVA236 Figure 6. The 'Additional Input Capacitor' referred to in that application note is not needed as C5 is already included on the TPS62746EVM-706. Any additional input capacitance is not recommended as it incurs increased leakage on the input which lowers the measured efficiency.

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When measuring efficiency through the setup in SLVA236, special care must be taken to remove the current consumed by the measurement instruments from the efficiency calculations. Such measurement instruments typically include the input voltage and output voltage multimeters as well as the input power supply's remote sense lines (if it has this capability). The current into these points affects the measured efficiency at very light loads. Two possible methods to overcome this are: measuring the current into these points (measure the current into the multimeters and/or remote sense lines) and then subtracting this current from the efficiency calculation or simply removing these instruments from the test setup. At very light load currents, it is typically best to remove the remote sense lines of the input power supply and then measure the current into the input and output voltage multimeters to get the most accurate efficiency measurement.

3.2 Pullup and Pulldown Resistors

In addition to the input capacitor and remote sense lines noted in Section 3.1, any pullup or pulldown resistors can draw significant current and affect the measured efficiency. For example, if the VSEL pin were pulled up to the input voltage with a 1-MΩ resistor and the pin were tied low through JP2, this would draw an extra 3.6 µA from the input source at a 3.6-V input voltage. This would greatly affect the efficiency at very light loads. For this reason, no pullup or pulldown resistors have been used on the TPS62746EVM-706. The final application circuit should ensure that all digital inputs to the TPS62746 are terminated either high or low and not left floating, per the device data sheet.

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4 Board Layout

This section provides the TPS62746EVM-706 board layout and illustrations.

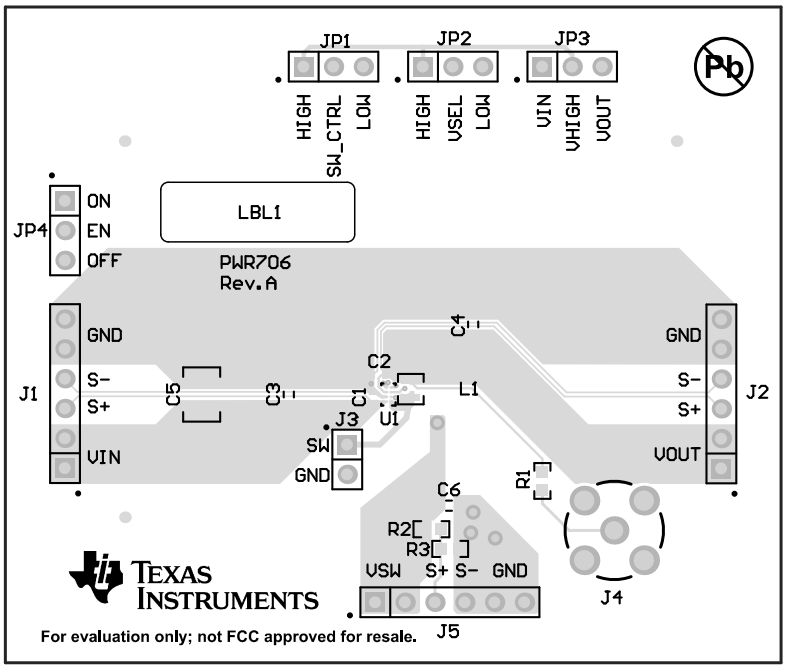


Figure 1. Assembly Layer

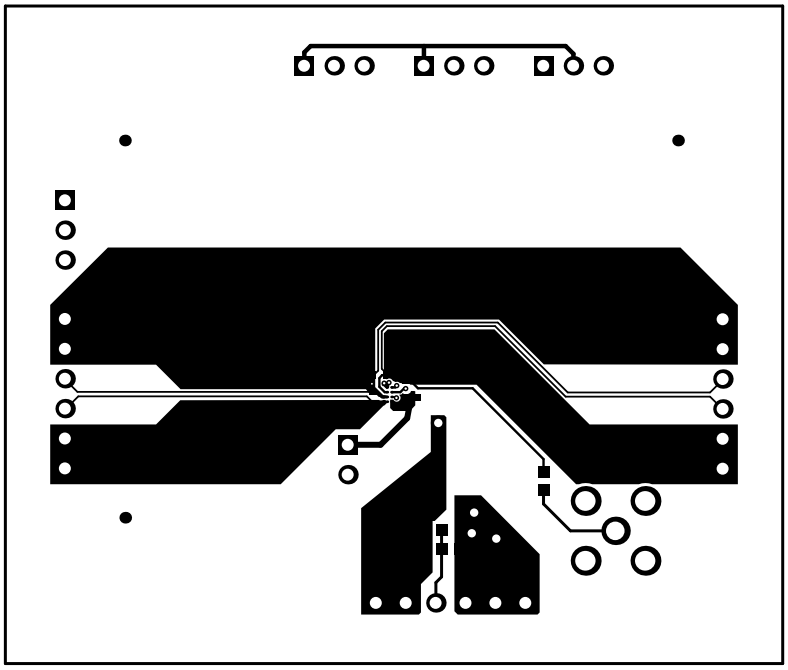


Figure 2. Top Layer

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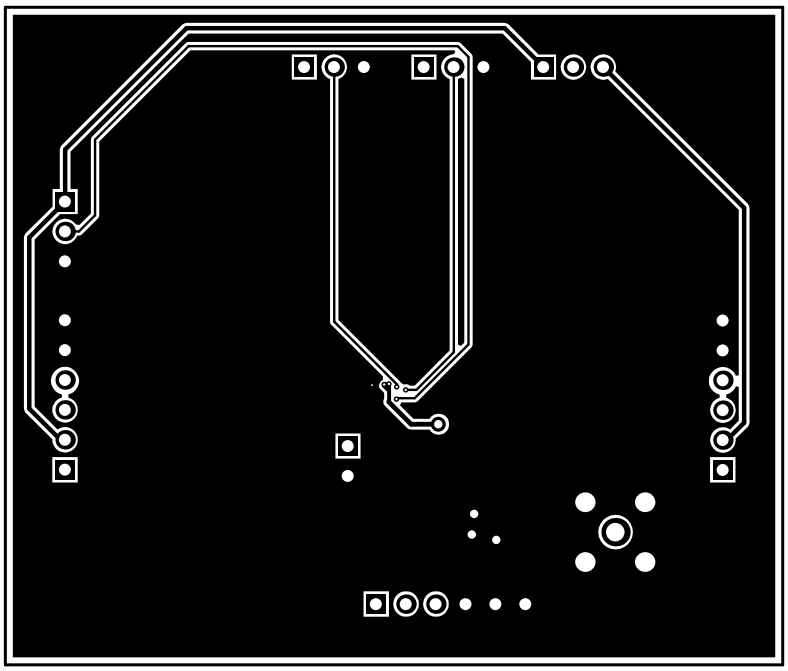


Figure 3. Bottom Layer

5 TPS62746EVM-706 Configuration

TPS62746 features an integrated VIN switch VINSW. This switch connects/disconnects the pin VINSW with the input of the TPS62746 VIN.

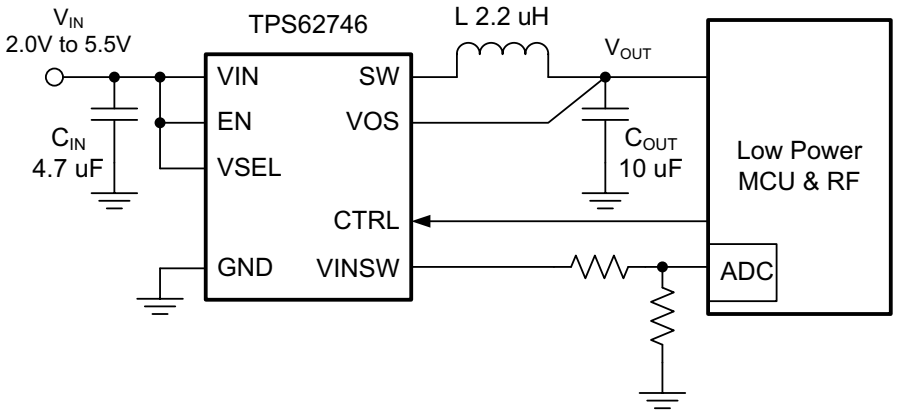


Figure 4. TPS62746 Typical Application Circuit

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5.1 Schematic

Figure 5 shows the TPS62746EVM-706 schematic.

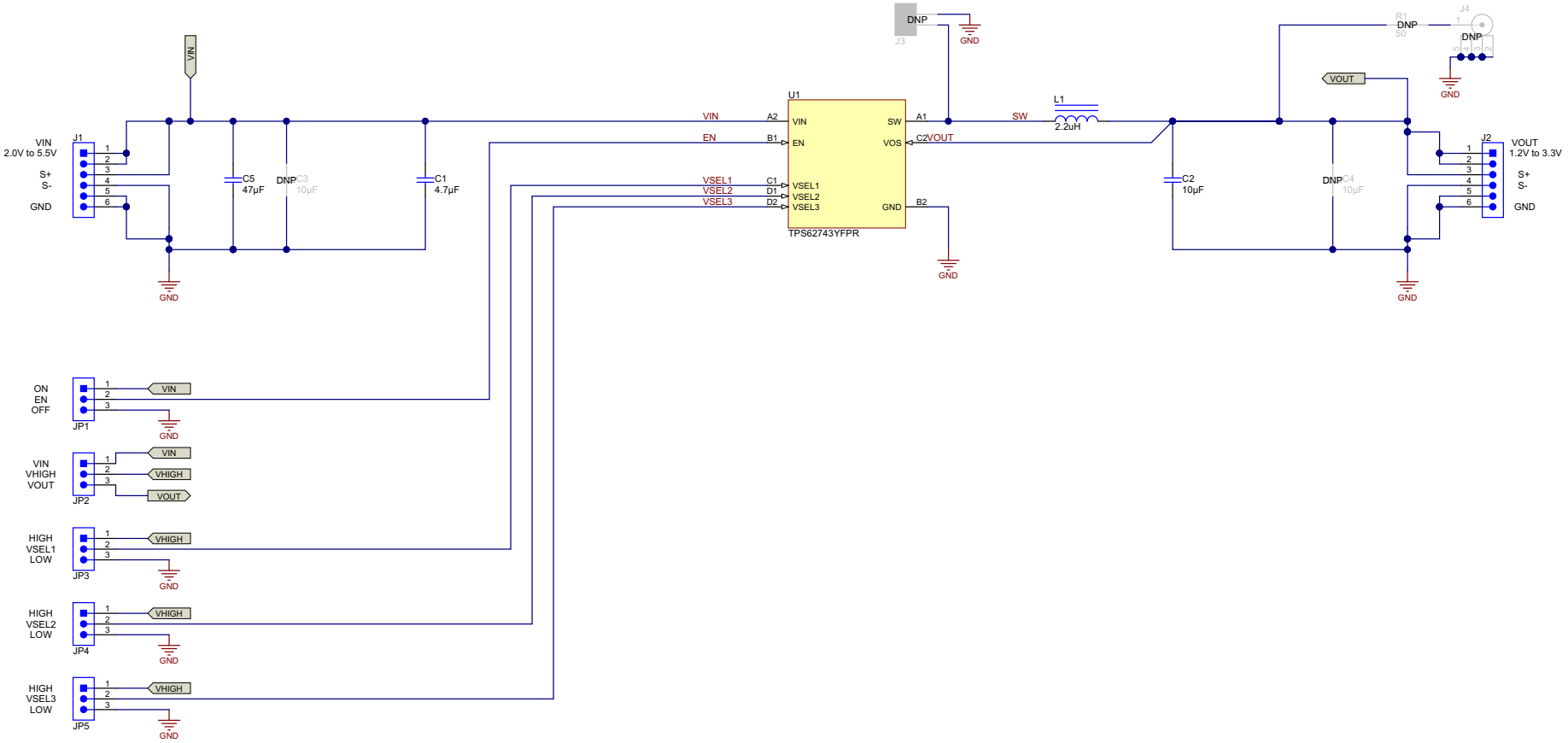


Figure 5. TPS62746EVM-706 Schematic

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5.2 Bill of Materials

Table 1 lists the TPS62746EVM-706 BOM.

Table 1. TPS62746EVM-706 Bill of Materials

Count	RefDes	Value	Description	Size	Part Number	MFR
1	C1	4.7µF	Capacitor, Ceramic, X5R, 16V, 20%	0402	GRM155R61C475ME15	Murata
1	C2	10uF	Capacitor, Ceramic, X5R, 6.3V, 20%	0402	GRM155R60J106ME11	Murata
1	C5	47µF	Capacitor, Ceramic, X5R, 16V, 20%	1210	GRM32ER61C476ME15L	Murata
1	L1	2.2µH	Inductor, SMT, 1.2A, 204-mΩ	2016	1285AS-H-2R2M	Toko
1	U1	TPS62746	IC, 360 nA I_Q Step Down Converter with VIN Switch	1.6mm x 0.9mm	TPS62746YFP	TI

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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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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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