APPLICATION NOTE
AN003_MPT11210IL Evaluation Board User Guide

The MPT11210IL are fully integrated step down DCDC converters with control, gate drive, compensation, MOSFET switches, and high performance magnetics. They come in an advanced 11mm x 11mm x 4.59mm 76-pin open frame package, and require only a small number of external components to make complete converter solutions. This user guide should be used together with the latest MPT11210IL datasheets for detailed Output Voltage, Switching Frequency, and Compensation settings.

The following are the features of this evaluation board.

- Populated with one MPT11210IL.
- Pads are available for a wide range of input and output capacitor configurations.
- Output voltage programming is accomplished via a simple resistor divider. Jumpers are provided for 5 pre-configured output settings. These settings are as follows: 0.6V, 1.2V, 1.8V, 3.3V, 5.0V. For output voltage settings other than the pre-configured options, please refer to the "*Setting Output Voltages*" section in this user guide.
- Switching Frequency programming is accomplished via a simple pulldown resistor. Jumpers are provided for 3 pre-configured frequency settings. These settings are as follows: 550kHZ, 750kHZ, 900kHZ, where 550kHZ is the default setting with no jumper installed. For switching frequency settings other than the pre-configured options, please refer to the "*Setting Switching Frequencies*" section in this user guide.
- An internal ramp generator can be adjusted for system stability via a simple pulldown resistor. Jumpers are provided for 5 pre-configured compensation settings. Please refer to the "*Setting VRAMP*" section in this user guide.
- Easy jumper setting for Enable and Disable Functions.
- Numerous test points are provided as well as clip leads for input and output connections.
- The board comes with input decoupling.

Figure 1 shows a photograph of the evaluation board. Please refer to this while configuring the board for evaluation.

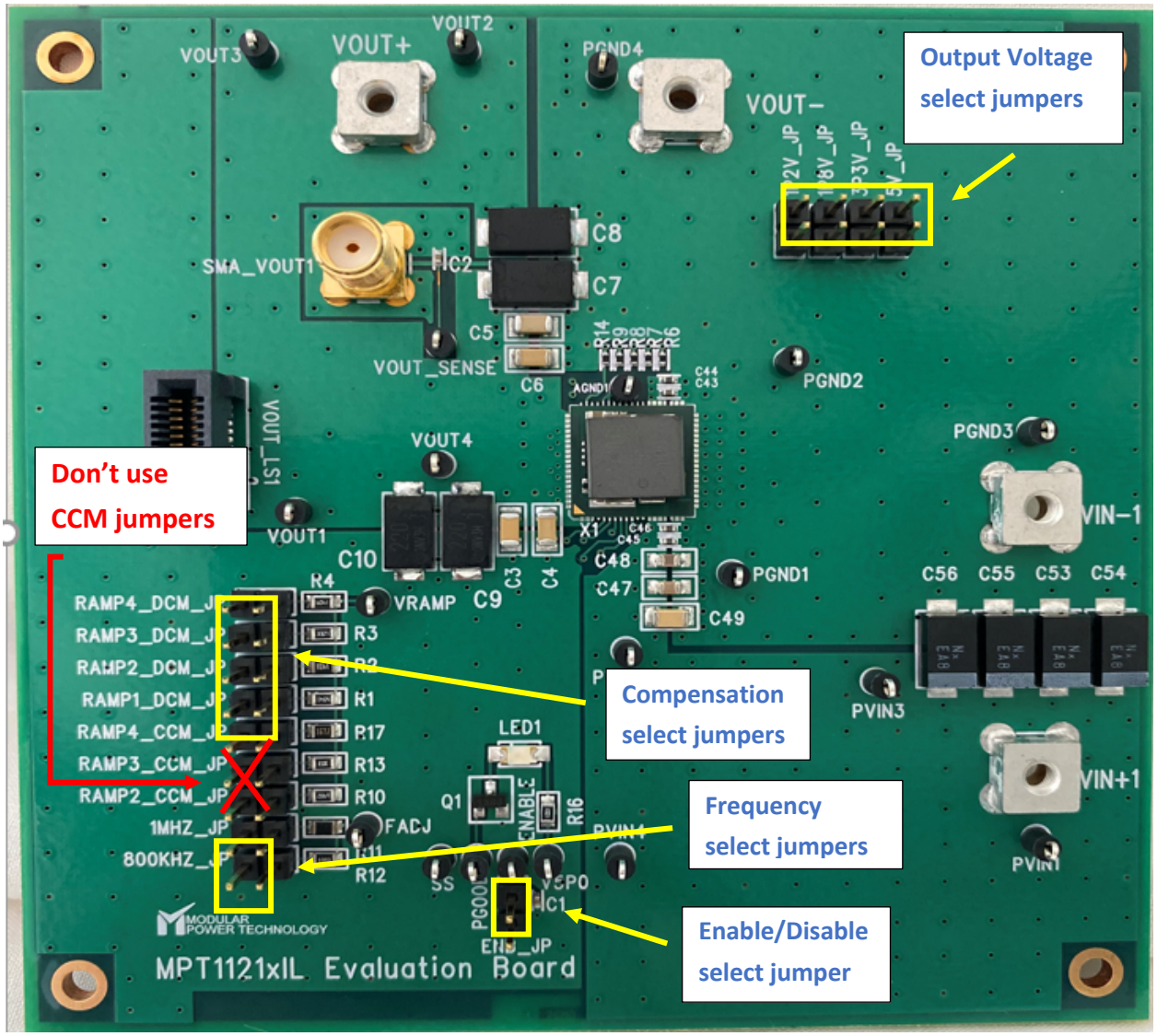

Figure 1: MPT11210IL Evaluation Board

SETTING OUTPUT VOLTAGES

There are 5 pre-configured output voltage options to choose from by placing the appropriate jumper. Those output voltages are: 0.6V, 1.2V, 1.8V, 3.3V, and 5V where 0.6V option is the default Vout with no jumper installed. To choose output voltage settings other than those pre-configured on this evaluation board, **REMOVE** R9, R8, and R7, and **REPLACE** R6 per the formulas below and set the jumper 5V_JP accordingly.

$$R6 = \frac{R14\ x\ Vref}{Vout - Vref}$$

Since R14 = 20kΩ and V_{REF} = 0.6V, the equation becomes:

$$R6 = \frac{12}{Vout - 0.6}\ k\Omega$$

SETTING SWITCHING FREQUENCY

There are 3 pre-configured switching frequency options to choose from by placing the appropriate jumper. Those switching frequencies are: 550kHZ, 750KHZ, and 900kHZ where 550KHZ is the default switching frequency with no jumper installed. The figure below shows the recommended switching frequency for various output voltage settings.

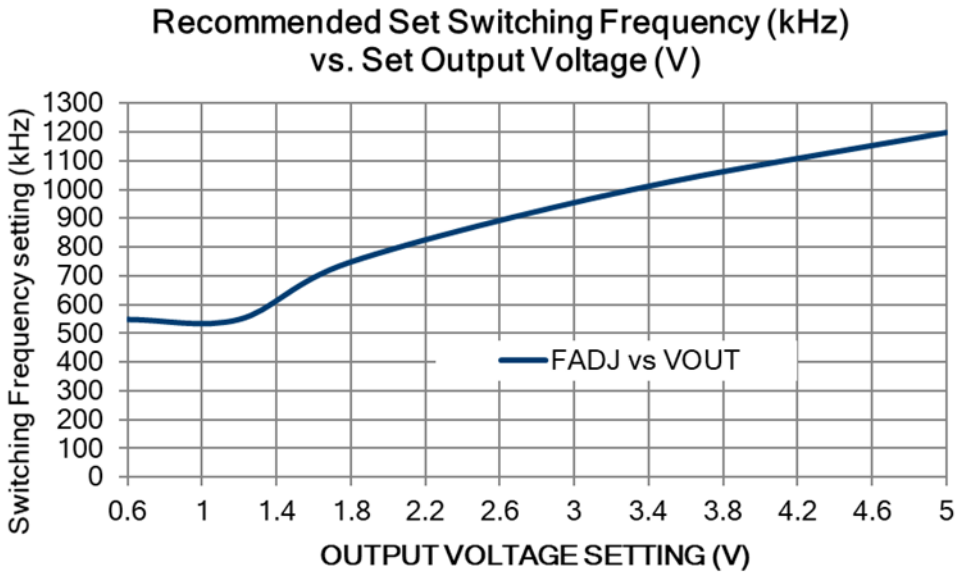

Figure 2: Recommendation chart for Fsw and associated Output Voltage setting

To choose switching frequency settings other than those pre-configured on this evaluation board, **REMOVE** R12, and **REPLACE** R11 per the table below and set the jumper 1MHZ_JP accordingly.

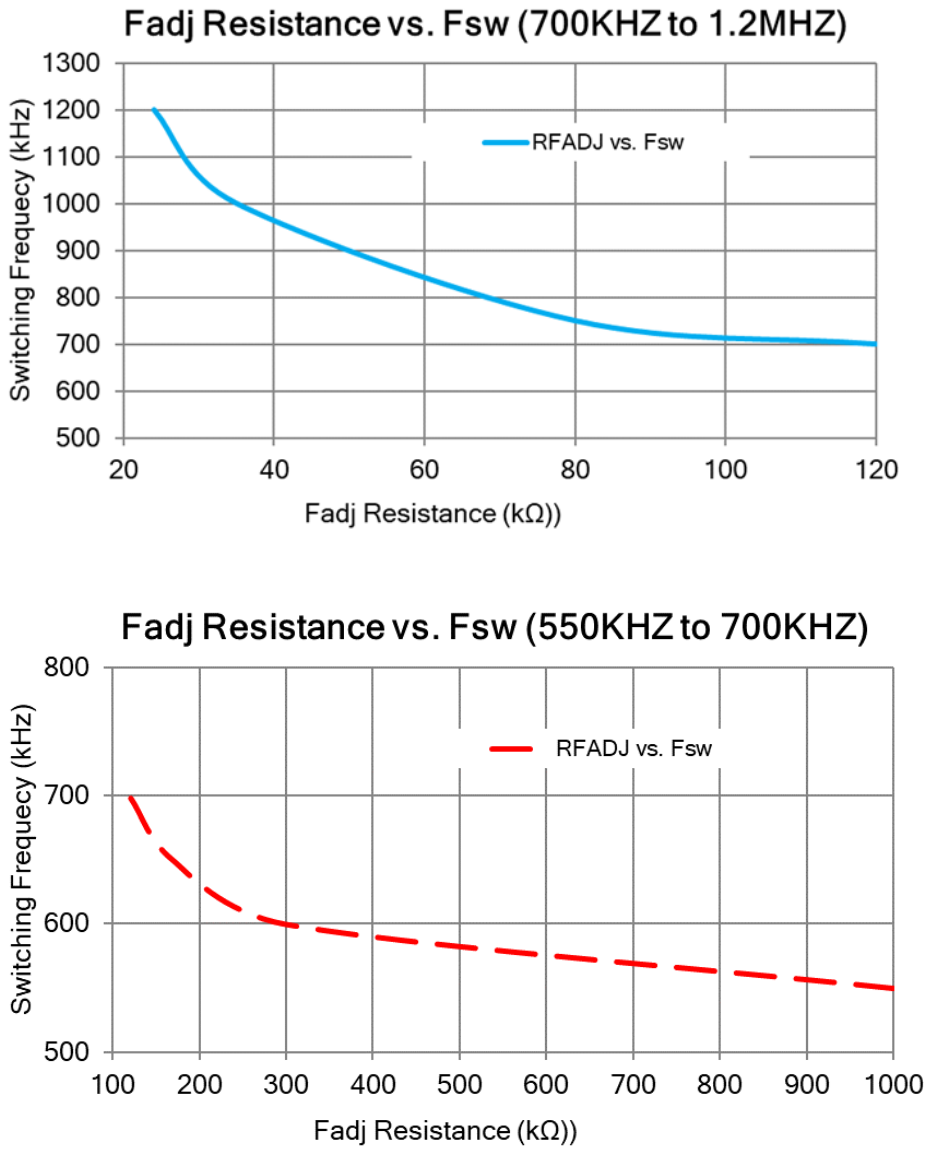

Figure 3: FADJ Resistance (R11) setting and associated switching frequencies

SETTING VRAMP/COMPENSATION

The internal ramp generator can be adjusted for system stability. There are 5 pre-configured compensation settings to choose from by placing the appropriate jumper. Typically, the default setting with NO jumper installed results in stable operation of the converter. Please see table below for compensation settings:

Vramp Voltage (VRAMP)	Vramp Amplitude	VRAMP Jumper
VRAMP < 1/16*VDD	Vramp1	RAMP1_DCM_JP
1/16*VDD < VRAMP < 3/16*VDD	Vramp2	RAMP2_DCM_JP
3/16*VDD < VRAMP < 5/16*VDD	Vramp3	RAMP3_DCM_JP
5/16*VDD < VRAMP < 7/16*VDD	Vramp4	RAMP4_DCM_JP
VRAMP >15/16*VDD	Vramp1	OPEN
Vramp level is: Vramp1 < Vramp2 < Vramp3 < Vramp4		

Figure 4: VRAMP jumper settings to set internal ramp generator voltage level

BOARD POWER UP PROCEDURE

STEP 1: Initially disable the MPT11210IL by placing a jumper on the “ENB_JP” 2 pin header.

STEP 2: Select the desired VOUT voltage setting by placing a jumper on the correct output voltage select header pins.

Below shows the VOUT jumper options:

- VOUT = 5V, connect jumper on 5V_JP
- VOUT = 3.3V, connect jumper on 3P3V_JP
- VOUT = 1.8V, connect jumper on 1P8V_JP
- VOUT = 1.2V, connect jumper on 1P2V_JP
- VOUT = 0.6V, no jumper installed

STEP 3: Select the desired switching frequency setting by placing a jumper on the correct frequency select header pins. Please refer to recommendation chart for Fsw vs Vout to set the recommended switching frequency.

Below shows the switching frequency jumper options:

- Fsw = 900KHZ, connect jumper on 1MHZ_JP
- Fsw = 750KHZ, connect jumper on 800KHZ_JP
- Fsw = 550KHZ, no jumper installed

STEP 4: Select the desired compensation setting by placing a jumper on the correct Vramp select header pins. Stable operation is typical when there is no jumper installed. Please refer to the Vramp jumper setting chart to adjust the Vramp voltage levels.

CAUTION: the VOUT, Fsw, and VRAMP jumper settings should only be changed when the device is disabled. Failure to follow this guideline may result in damage to the part.

STEP 5: Connect the Power Supply to the input power connectors, VIN (+) and VIN (-). **DO NOT** turn the power supply on yet.

CAUTION: Be mindful of the polarity. Reversing polarity will result in damage to the part.

STEP 6: Connect an electronic load, or load board to the output connectors VOUT (+) and VOUT (-).

STEP 7: Power up the board by removing the ENABLE jumper from the ENB_JP jumper header pins. **The MPT11210IL is now powered up and should have a regulated output voltage at this point.**

TEST MEASUREMENT RECOMMENDATIONS

To guarantee measurement accuracy, the following precautions should be observed:

- Make all input and output voltage measurements at the board using the test points provided. This will eliminate voltage drop across the line and load cables that can produce false readings.

- Measure input and output current with series ammeters or accurate shunt resistors. This is especially important when measuring efficiency.

- Use a balanced impedance probe tip across C_{OUT} to measure V_{OUT} Ripple to avoid noise coupling into the probe ground lead. The recommended probe configuration is shown in Figure 2.

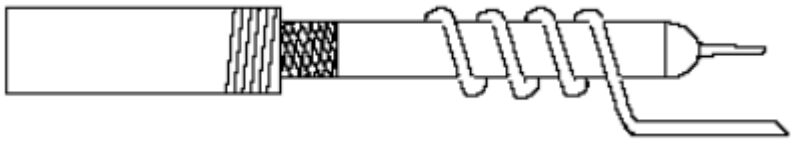

Figure 2. Recommended probe configuration.