



TWR-SMPS-LVFB Quick Start Guide

Low-Voltage, Full-Bridge
Power Conversion Module

Tower System
Development Board
for Switch Mode
Power Supply



Get to know the TWR-SMPS-LVFB



Figure 1: Front side of TWR-SMPS-LVFB

TWR-SMPS-LVFB Tower System Module Freescale Tower System

The TWR-SMPS-LVFB module is part of the Freescale Tower System, a modular development platform that enables rapid prototyping and tool re-use through reconfigurable hardware. Take your design to the next level and begin constructing your Tower System platform today.

Introduction to TWR-SMPS-LVFB Tower System Module

The TWR-SMPS-LVFB Tower System Module is a development kit that can be used in conjunction with the Tower System development platform, providing ready-made software and hardware development for a low-voltage, full-bridge DC-DC switch mode power supply and using various control algorithms.

TWR-SMPS-LVFB Tower System Module Features

- Power topology full-bridge DC-DC converter with synchronous rectification
- Input and output voltage sensing with under and over voltage protection
- Transformer primary current sensing with over load and short circuit protection
- Primary current sensing for average and peak current control implementation
- Full-bridge MOSFET driver to driver primary full bridge MOSFETs
- Half-bridge MOSFET driver for synchronous MOSFET driving
- Dynamic/transient load circuit to test digital control loop performance on transient load
- Power supply input voltage input of 20-30V DC, output voltage 5V and load up to 8A
- Input power supply reverse polarity protection circuitry

This kit includes:

- TWR-SMPS-LVFB (Peripheral Module)
- Load Circuit for System Simulation
- Power supply

Required Modules with TWR-SMPS-LVFB

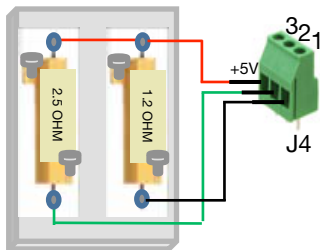
- Tower System Elevator Module, TWR-ELEV
- Tower System compatible controller module (for example, the TWR-KV46F150M)

Step-by-Step Hardware Installation Instructions

1 Attach Load Resistor Setup

Attach the load resistor setup to output connector J4 (output load connector) on the TWR-SMPS-LVFB:

- Connect **RED** wire at pin 3 of J4
- Connect **GREEN** wire at pin 2 of J4
- Connect **BLACK** wire at pin 1 of J4



Load resistor set-up

CAUTION

Hot! Do not touch the load resistor when it is powered on.

2 Assemble Your Tower System

- Locate the Elevator modules identifiable by the four card edge connectors on each.
- The controller module will be connected to slot 4 and the TWR-SMPS-LVFB will be connected to slot 1 of the elevator card. The slot number is labeled on the elevator cards. Identify these now.
- Each Elevator modules has one primary and secondary card. The primary is denoted by white card edge connectors and the secondary is denoted by black card edge connector.
- Identify now the primary and secondary card edges for TWR-SMPS-LVFB and compatible controller module. Plug the “Primary” card edge of each module into “Primary” Elevator and the “Secondary” Elevator module onto the “Secondary” card edges.
- Please refer to Freescale Tower system Factsheet (TWRFS) for more information.

Step-by-Step Hardware Installation Instructions

3 Connect DC Power Supply

Connect the DC power supply provided in the kit to connector J1. If using an external power supply then the input voltage range on J5 should be 20 to 30V DC and the current should be limited to less than 3A. Do not touch the load resistor when the DC power supply is connected. The temperature at the load resistor is very high.

4 Turn ON DC Power Supply

Turn ON the DC power supply. When power is applied, the D12 power-on LED will illuminate. The TWR-SMPS-LVFB board powers the Tower System with 5V and 3.3V on-board power supplies.

5 Running A Demo

Please refer to freescale.com/TWR-SMPS-LVFB to understand what MCU controller cards are supported, and to download a Quick Start Guide to learn more about running the low-voltage SMPS demo.

TWR-SMPS-LVFB Tower System Module Demo

The TWR-SMPS-LVFB Tower System demonstration implements average current mode control of full bridge converter and is implemented on the TWR-KV46F150M controller card. Other cards are also supported. Refer to [freescale.com/TWR-SMPS-LVFB](https://www.freescale.com/TWR-SMPS-LVFB) for the full list of supported controller cards. For more details, refer to the TWR-KV46F150M Quick Start Guide for TWR-SMPS-LVFB on [freescale.com/TWR-KV46F150M](https://www.freescale.com/TWR-KV46F150M).

TWR-SMPS-LVFB Demo Software Features

- Constant 5V output with load changes from zero Amps to 8Amps
- Constant 5V output with input voltage from 20V to 30V
- Average current mode control with voltage feed forward
- Output overshoot and undershoot <5% of output voltage with load changes from 25% to 75% of load
- Demo and application mode of demo code
- Dynamic load control
- Over voltage, under voltage and over current fault protection
- FreeMASTER integration for output voltage and current waveform observation, demo software running status information
- User interface control loop co-efficient parameters

WARNING

Changing of control loop to be out of range may cause output to be unstable and may destroy the board. Be aware:

- Do not change voltage loop control coefficients K_p , K_i and K_{pi} more than +/-10% of the set default value.





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Download installation software and documentation under
“**Jump Start Your Design**” at freescale.com/TWR-SMPS-LVFB.

Support

Visit freescale.com/support for a list of phone numbers within your region.

Warranty

Visit freescale.com/warranty for complete warranty information.

For more information, visit freescale.com/TWR-SMPS-LVFB, freescale.com/Kinetis or freescale.com/Tower

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