



TWR-KV46F150M Quick Start Guide for Power Conversion

Development Kit for
Kinetis KV4x Family

Tower System
Development Board
Platform



Get to know the TWR-KV46F150M



Figure 1: Front side of TWR-KV46F150M

TWR-KV46F150M Tower System Module Freescale Tower System

The TWR-KV46F150M module is part of the Freescale Tower System, a modular development platform that enables rapid prototyping and tool reuse through reconfigurable hardware. Take your design to the next level and begin constructing your Tower System platform today.

Introduction to TWR-KV46F150M Tower System Module

The TWR-KV46F150M Tower System Module is a standalone development kit that can be used in conjunction with the Tower System development platform and the TWR-SMPS-LVFB for software and hardware development for low-voltage full-bridge DC-DC switch mode power supply (SMPS) and various control algorithms.

This Quick Start Guide will teach you to:

- Easily configure your system for working on the project
- Setup the hardware (TWR-KV46F150M and TWR-SMPS-LVFB)
- Generate stable 5V output from a variable supply of 20-30V using full-bridge topology using eFlexPWM while monitoring and controlling the SMPS parameters with the FreeMASTER tool.

Note: TWR-KV46F150 Tower System Module is also compatible with TWR-MC-LV3PH Development Kit for motor control. Please refer to (TWR-MC-LV3PH link) the more information on TWR-MC-LV3PH.

TWR-KV46F150M Tower System Module Features

- MKV46F256VLL15 MCU (ARM® Cortex®-M4 168 MHz, 256 KB flash, dual 12-bit ADCs up to 4.1MSPS, 3x FlexTimers and 1x eFlexPWM with 260ps resolution, up to 30x PWM channels, 100 LQFP)
- OpenSDA¹ debug circuit with Mini USB connector and virtual serial port
- Nine LEDs with connected buffers to PWM channels for dimming
- Two pushbuttons for user input or interrupts
- Four thermistors
- FlexCAN interface
- Motor control and auxiliary signal connectors

Tools Required

- IAR Embedded Workbench V7.30.4 or higher
- Freescale FreeMASTER for real-time debug monitoring and data visualization

⁽¹⁾ Refer to the OpenSDA User Guide available at [freescale.com](http://www.freescale.com)

Software Installation Instructions

1 Download Software and Tools

Download installation software and documentation under **“Jump Start Your Design”** at freescale.com/TWR-KV46F150M.



2 Install the Software and Tools

- Install the IDE toolchain IAR Embedded Workbench® for ARM® v7.30.4 or later, 30-day free evaluation license, at iar.com/Freescale.
- Install the PEMicro Windows® USB Drivers at pemicro.com/OpenSDA.

- Install the free debug monitoring and data visualization tool Freescale FreeMASTER v1.4, or later, at freescale.com/FreeMASTER.





TWR-KV46F150M Tower System Module Initial Configuration

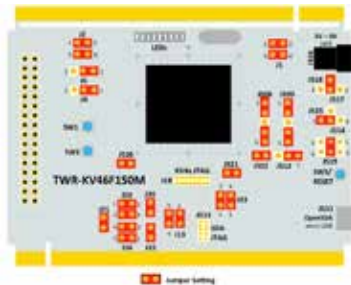
3 Default Jumper Settings

See the default jumper settings in the table below. Refer to the TWR-KV46F150M User Guide at freescale.com/TWR-KV46F150M for detailed jumper descriptions.

Option	Setting	Option	Setting
J1	1-2, 3-4	J23	1-2, 3-4
J2	1-2, 3-4	J505	1-2, 4-5
J4	1-2	J506	1-2, 4-5
J5	1-2	J512	1-2
J13	1-2, 3-4	J517-518	J518 J517-2
J15	ON	J514-515	J514-1 J514-2
J16	1-2, 3-4	J519	3-4
J19	1-2, 3-4	J520	ON
J20	ON		
J21	ON		

4 Verification of Jumper Setting

TWR-KV46F150M comes preloaded with the P&E OpenSDA Applications (MSD flash programmer and debug) and the LED demo. Plug in the USB cable and watch LEDs powering ON/OFF alternately.



TWR-KV46F150M Jumper Map

TWR-KV46F150M SMPS Demo

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 TWR-KV46F150M and TWR-SMPS-LVFB Set Up

1) The OpenSDA P&E Debug Application

The OpenSDA P&E application comes preloaded in to the TWR-KV46F150M.

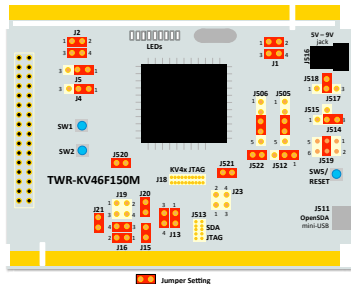
2) Connect the boards and the load

Connect TWR-KV46F150M with the jumper setup shown in the table below. Refer to TWR-SMPS-LVFB quick start guide (freescale.com/TWR-SMPS-LVFB) for hardware setup details of TWR-SMPS-LVFB and integration with the Tower System. Do not touch the load resistor when the DC power supply is connected. The temperature at the load resistor is very high.

Plug the 24 V power supply included in the TWR-SMPS-LVFB kit into the barrel connector (J1) of the TWR-SMPS-LVFB. Then, connect the USB cable to TWR-KV46F150M and the computer.

TWR-KV46F150M: Jumper Settings

Option	Setting	Option	Setting
J1	1-2, 3-4	J23	Open
J2	1-2, 3-4	J505	3-4
J4	1-2	J506	3-4
J5	1-2	J512	1-2
J13	1-2, 3-4	J517-518	J518 J517-2
J15	ON	J514-515	J514-2 J514-3
J16	1-2, 3-4	J519	3-4
J19	Open	J520	ON
J20	ON		
J21	ON		



6 Working with IAR EWARM

1) Compile the SMPS low-voltage full-bridge demo with IAR EWARM

Open the IAR project file **KV46F256_LV_SMPS_FB** following the path LV_SMPS_TWR\Software\KV46_LV_SMPS_FB\build\iar\KV46F256_LV_SMPS_FB in the Quick Start Package.

Clean the project before selecting the action Rebuild All.

Note: The compilation may return warning messages without consequence.

2) Run IAR EWARM Debug Mode

From the toolbar, click on Download and Debug.

Start the debug session by selecting the GO option.

7 Monitor the Project with FreeMASTER

1) Launch Freescale FreeMASTER from the Windows Start menu.

Note: At first start-up, you may have an error message regarding the COM connection.

Open the FreeMASTER project file **LV_SMPS_KV46.pmp** following the path KV46_LV_SMPS_FB\src\projects\KV46F256_LV_SMPS_FB\freemaster in Quick Start Package. The application interface LV SMPS application using KV46F256 will appear in FreeMASTER. The voltage and current consumption, control loop coefficients and application fault status can be monitored and controlled using FreeMASTER project.



2) Connecting to FreeMASTER

In the Project Options, set the COM port affected to the OpenSDA -CDC Serial Port (info available in Device Manager) and set the baud rate/speed to 9600 bps (check the option Do Not Open Port at Startup to avoid error messages at FreeMASTER startup).

From the toolbar, select the action File->Start the communication.

There are two operating modes displayed in the FreeMaster project.

- The Demo mode in which the load changes continuously.
- The Application mode in which the load remains constant and changes when either the 'LOAD SW' in the FreeMASTER window button is pressed or SW2 on the TWR-KV46F150M is pressed.

Current and Output Voltage waveforms can be observed on the recorder as the image shows below.



3) Working with the application

At the start of the project, Demo mode is a default mode. Pressing the mode switch in the FreeMASTER window toggles the application between demo mode and application mode.

It is recommended to keep the values of control parameters within +/-10% of the default as represented in FreeMASTER project otherwise it may result in application instability or damage.



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Download installation software and documentation under
“**Jump Start Your Design**” at freescale.com/TWR-KV46F150M.

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-KV46F150M,
freescale.com/Kinetis or freescale.com/Tower

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