

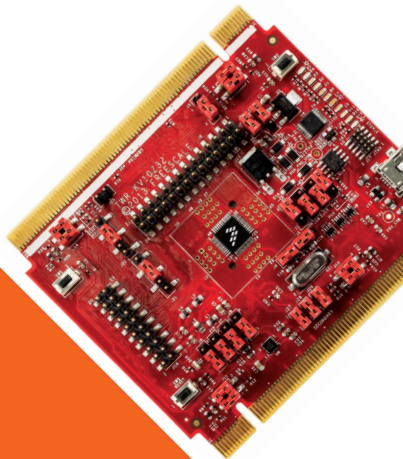


TWR-KV10Z32

Quick Start Guide

Development Kit for
Kinetis KV1x Family

Tower System
Development Board
Platform



Get to Know the TWR-KV10Z32

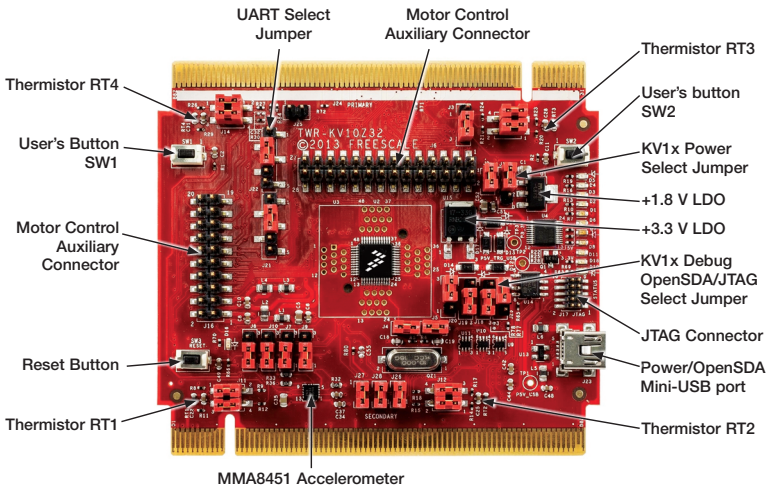


Figure 1: Front side of TWR-KV10Z32

TWR-KV10Z32 Tower System Module Freescale Tower System

The TWR-KV10Z32 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-KV10Z32

Tower System Module

The TWR-KV10Z32 Tower System Module is a standalone development kit that can be used in conjunction with the Tower System development platform and the TWR-MC-LV3PH motor control module. To watch a video on how to configure the board, go to **freescale.com/TWR-KV10Z32**.

This Quick Start Guide will teach you to:

- Easily program precompiled examples for the KV1x MCU
- Run an IAR Embedded Workbench project featuring an ADC/FIR filter application
- Spin the 3-phase BLDC motor of the TWR-MC-LV3PH module while monitoring the motor with the FreeMASTER tool

TWR-KV10Z32 Tower System Module Features

- MKV10Z32VLF7 MCU (ARM® Cortex®-M0+ 75 MHz, 32 KB flash, 2x12-bit ADCs, 3x FlexTimer, 48 LQFP)
- OpenSDA(1) debug circuit with Micro USB connector and virtual serial port
- MMA8451Q 3-axis digital accelerometer
- Eight LEDs with connected buffers to PWM channels for dimming
- Two pushbuttons for user input or interrupts
- Four thermistors
- Two motor control auxiliary connectors

Tools Required

- IAR Embedded Workbench V6.7.0.2 or higher
- Freescale FreeMASTER for real-time debug monitoring and data visualization

⁽¹⁾ Refer to the OpenSDA User Guide available at **freescale.com**

Software Installation Instructions

1

Download Software and Tools

Download installation software and documentation under **“Jump Start Your Design”** at freescale.com/TWR-KV10Z32.

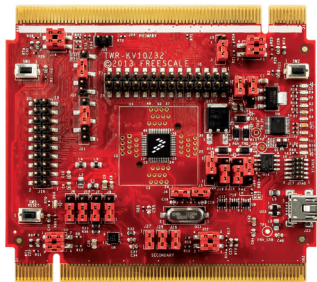


2

Install the Software and Tools

- Install the IDE toolchain IAR Embedded Workbench® for ARM® v6.70.2 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 v1.3.16, or later, at freescale.com/FreeMASTER.



TWR-KV10Z32 Tower System Module Initial Configuration

3

Default Jumper Settings

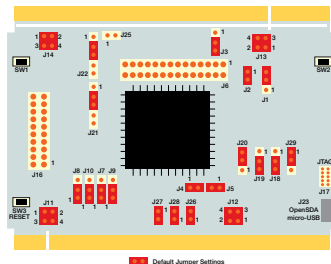
See the default jumper settings in the table below. Refer to the TWR-KV10Z32 User Guide at freescale.com/TWR-KV10Z32 for detailed jumper descriptions.

| Option | Setting | Option | Setting |
|--------|----------|--------|----------|
| J1 | 2-3 | J14 | 1-2, 3-4 |
| J2 | ON | J18 | 2-3 |
| J3 | 2-3 | J19 | 2-3 |
| J4 | ON | J20 | 2-3 |
| J5 | ON | J21 | 2-3 |
| J7 | 1-2 | J22 | 2-3 |
| J8 | 1-2 | J25 | OPEN |
| J9 | 1-2 | J26 | ON |
| J10 | 1-2 | J27 | ON |
| J11 | 1-2, 3-4 | J28 | ON |
| J12 | 1-2, 3-4 | J29 | 1-2 |
| J13 | 1-2, 3-4 | | |

4

Verification of Jumper Setting

TWR-KV10Z32 comes preloaded with the P&E OpenSDA Applications (MSD flash programmer and debug) and the accelerometer demo. Plug in the USB cable in TWR-KV10Z32 and computer, tilt TWR-KV10Z32 left or right to make corresponding LEDs blink.



TWR-KV10Z32 Jump Map

Note: Please refer to detailed Jumper Map on page 11

TWR-KV10Z32 Tower System Module Demo

5 Program a Precompiled Example Using the OpenSDA MSD Application

1) Launch the Bootloader Mode

Press and hold the reset (SW5) button while plugging in the USB cable; then release it. Windows will detect a new BOOTLOADER drive and automatically install requested drivers.

2) Load the OpenSDA P&E Applications

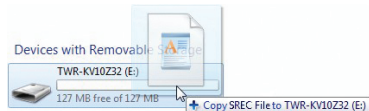
Copy and paste MSD-TWR-KV10Z32_Pemicro.SDA file from OpenSDA Applications folder in quick start package to the BOOTLOADER drive in my computer/disk drive. Unplug and plug back the USB cable. Computer will detect a new TWR-KV10Z32 drive and automatically install the required drivers.

Note: TWR-KV10Z32 drive contains backup drivers for the OpenSDA-CDC Serial Port.



3) Program a Precompiled Example for the KV1x

In the TWR-KV10Z32 drive, copy any SREC file from the Precompiled Examples folder of the Quick Start Package. Demo will start automatically when the download is complete. To program a new demo, just copy any other SREC file. It is not necessary to disconnect the USB cable.



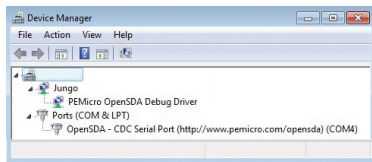
6 Debug Your First IAR Project

1) Change jumper 8 to position 2-3

2) Load the OpenSDA P&E Debug Application

Copy and paste DEBUG-APP_Pemicro.SDA file from OpenSDA Applications folder in quick start package to the TWR-KV10Z32 drive in my computer/disk drive.

Unplug and plug back the USB cable. In Device manager in control panel, Windows will detect two new peripherals: a PEMicro OpenSDA Debug Driver in Jungo and OpenSDA CDC Serial Port in ports.



3) Launch IAR EWARM and Build the Thermistor Project

Open the IAR project file Thermistor_lab.eww following the path Project Labs\build\iar\kv10\Thermistor_lab in the Quick Start Package.

Note: For making sure that the project is compatible with hardware tool, please select the following configuration: Freescale MKV10Z32xxx7 as Target Device, KV10_32KB_Pflash.icf as Linker configuration file, PE micro as Debug Driver, FlashKV1x32K.board as Flashloader configuration file and OpenSDA-USB as PE Micro Hardware Interface Type.

Clean the project before selecting the action Rebuild All.

Note: The compilation may return warning messages without consequence.

4) Run IAR EWARM Debug Mode

Download and Debug the thermistor project.

Note: If a Connection Manager window appears, check that your board is configured with the OpenSDA P&E Debug Application, then connect to the Interface OpenSDA Embedded Tower Debug-USB Port.

Start the debug session by selecting the GO option from the toolbar. LEDs D1 to D6 will blink. Touch thermistor RT1, RT2, RT3 or RT4 located in the corners of the board to heat. An affected pair of LEDs will blink faster. From the toolbar, suspend the demo using Break option, select Stop to return to the Edition Mode.

Running BLDC Motor

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TWR-KV10Z32 and TWR-MC-LV3PH Set Up

1) Load the OpenSDA P&E Debug Application

Copy and paste DEBUG-APP_Pemicro.SDA file from OpenSDA Applications folder in quick start package to the TWR-KV10Z32 drive in my computer/disk drive. Unplug and plug back the USB cable.

2) Connect TWR-KV10Z32 and TWR-MC-LV3PH with the jumper setup shown in the table below following the black and white markings on the Tower System elevators. Connect the motor to the three-prong connectors (J5) of the motor module.

First, plug the 24V power supply included in the TWR-MC-LV3PH kit into the barrel connector (J1) of the motor module. Then, connect the USB cable to TWR-KV10Z32 and the computer.

Note: Refer to the TWR-KV10Z32 User Guide (TWRKV10Z32UG) at [freescale.com/TWR-KV10Z32](https://www.freescale.com/TWR-KV10Z32) for detailed jumper description

TWR-KV10Z32: Jumper Settings

| Option | Setting | Option | Setting |
|--------|------------|--------|------------|
| J1 | 2-3 | J14 | Open, Open |
| J2 | ON | J18 | 2-3 |
| J3 | 2-3 | J19 | 2-3 |
| J4 | ON | J20 | 2-3 |
| J5 | ON | J21 | 3-4 |
| J7 | 1-2 | J22 | 3-4 |
| J8 | 2-3 | J25 | OPEN |
| J9 | 1-2 | J26 | ON |
| J10 | 1-2 | J27 | ON |
| J11 | Open, Open | J28 | ON |
| J12 | Open, Open | J29 | 1-2 |
| J13 | Open, Open | | |

TWR-MC-LV3PH: Jumper Settings

| Option | Setting | Option | Setting |
|--------|---------|--------|---------|
| J2 | 1-2 | J12 | 2-3 |
| J3 | 1-2 | J13 | 2-3 |
| J10 | 2-3 | J14 | OPEN |
| J11 | 2-3 | | |

8

Working with IAR EWARM

1) Compile the BLDC Sensorless Demo with IAR EWARM

Open the IAR project file BLDC_Sensorless.eww following the path ProjectLabs\ build\iar\kv10\BLDC_Sensorless 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

Download and Debug the project BLDC_Sensorless.

Start the debug session by selecting the GO option.

9

Monitor the Project with FreeMASTER

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 BLDC_Sensorless.pmp following the path Project Labs\Freemaster\BLDC_Sensorless in the Quick Start Package. The BLDC Sensorless Application interface will appear in FreeMASTER to monitor and control the speed, the voltage and the current consumption of the motor.



Or simply select in FreeMASTER speedometer the requested speed and the motor will spin automatically.

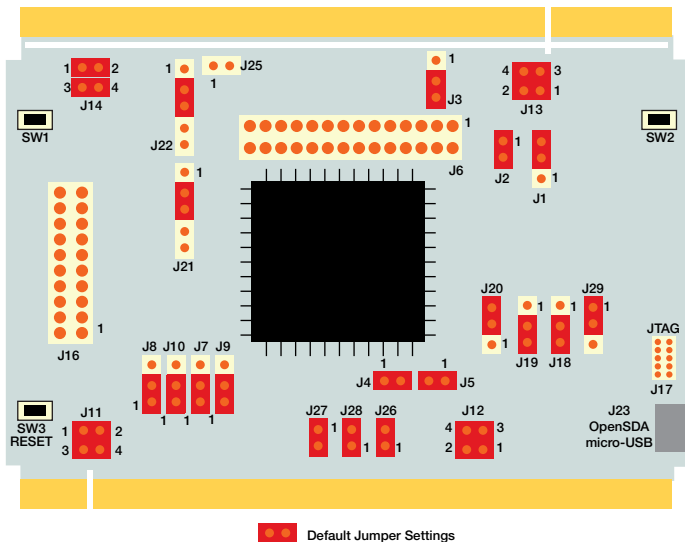
In IAR EWARM, from the toolbar, suspend the demo using the Break option, or select Stop to return to the Edit Mode.

In the Project Options, set the COM port affected as 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 Start the Communication.

Press button SW1 of the TWR-KV10Z32 board to spin the motor clockwise. Continue to push button SW1 to increase the speed of the motor. Press button SW2 to decrease the speed and stop the motor before spinning it counterclockwise.

TWR-KV10Z32 Jumper Map





Get Started

Download installation software and documentation under
“**Jump Start Your Design**” at freescale.com/TWR-KV10Z32.

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-KV10Z32,
freescale.com/Kinetis or freescale.com/Tower

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