Quick Start Guide

TWR-KV10Z32

Development Kit for
Kinetis KV1x Family

freescale

Get to Know the TWR-KV10Z32

UART Select Jumper

Motor Control Auxiliary Connector

Thermistor RT3

User's button SW2

KV1x Power Select Jumper

+1.8 V LDO

+3.3 V LDO

KV1x Debug OpenSDA/JTAG Select Jumper

JTAG Connector

Power/OpenSDA mini-USB port

Thermistor RT2

Thermistor RT4

User's Button SW1

Motor Control Auxiliary Connector

Reset Button

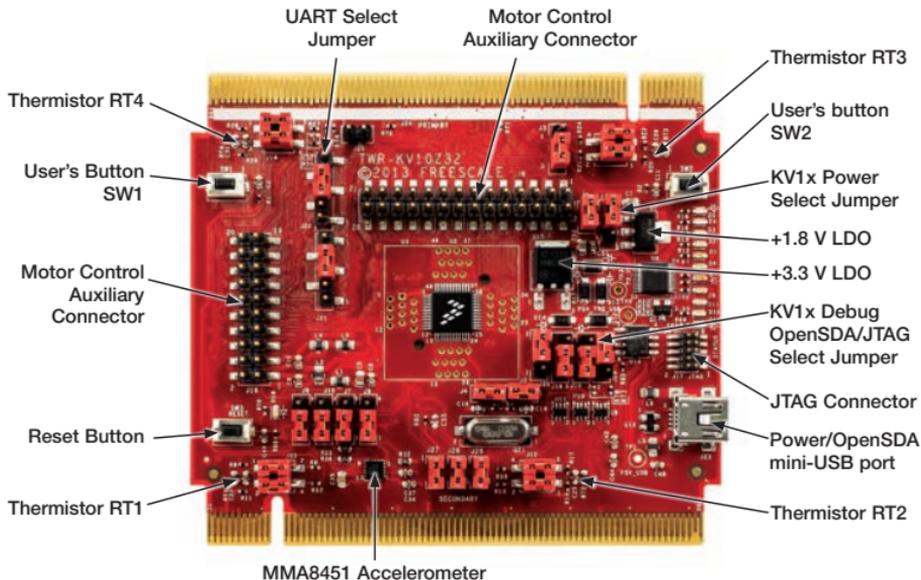Thermistor RT1

MMA8451 Accelerometer

Figure 1: Front side of TWR-KV10Z32

TWR-KV10Z32
Freescale Tower System

The TWR-KV10Z32 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.

TWR-KV10Z32 Features

The TWR-KV10Z32 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.

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

Tower System Module
- 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 CodeWarrior Development Studio for Microcontrollers V10.5
- Freescale Processor Expert with MQX™ RTOS
- Freescale FreeMASTER for real-time debug monitoring and data visualization

[1] Refer to the OpenSDA User Guide available at **freescale.com**

Step-by-Step Installation Instructions
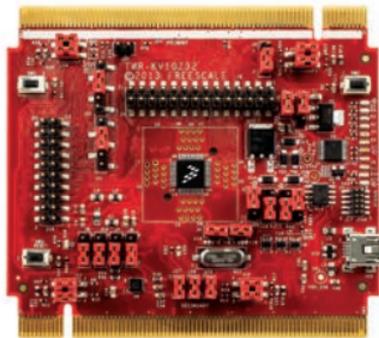
1 Download Software and Tools

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

2 Install the Software and Tools

- Download and install the IDE toolchain IAR Embedded Workbench® for ARM® v6.70.2 or later, 30-day free evaluation license, at **iar.com/Freescale**.

- Download and install the PEMicro Windows® USB Drivers at **pemicro.com/OpenSDA**.

- Download and install the free debug monitoring and data visualization tool Freescale FreeMASTER, v1.3.16 or later, at freescale.com/FreeMASTER.

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 Tilt the Board

TWR-KV10Z32 comes preloaded with the OpenSDA MSD application and the accelerometer demo. Plug in the USB cable and angle the board left or right to switch the LED on.

5 Program a Precompiled Example Using the OpenSDA MSD Application

1) Launch the Bootloader Mode

Press and hold the reset (SW3) 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 MSD Flash Programmer Application

Copy to the BOOTLOADER drive the MSD-TWR-KV10Z32_Pemicro.SDA file from the OpenSDA Applications folder of the Quick Start Package, then unplug and replug the USB cable. Windows 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 repeat the previous step. It is not necessary to disconnect the USB cable.
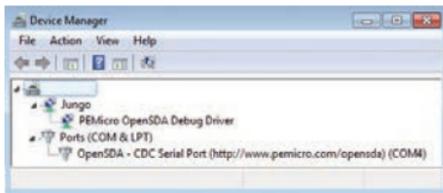

4) Go Further

The OpenSDA application is stored in Flash and will automatically restart at each board connection. To load a different application (e.g., P&E Multilink, CMSIS-DAP or SEGGER J-Link), start over again at Step 1 and select the corresponding SDA file in the OpenSDA Applications folder.

6 Debug Your First IAR Project

1) Change jumper 8 to position 2-3

2) Load the OpenSDA P&E Debug Application

Follow the steps from the previous exercise and now select the DEBUG-APP_Pemicro.SDA file. Windows will detect two new peripherals: a PEMicro OpenSDA Debug Driver and an OpenSDA CDC Serial Port and install the PEMicro Windows drivers.

3) Launch IAR EWARM v6.70.2 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: To warranty your project compatibility with the hardware tool, select the Options: 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 V6.70.2 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.

7 Spin the TWR-MC-LV3PH BLDC Motor and Monitor It with the FreeMASTER Tool

1) Load the OpenSDA P&E Debug Application

Copy the DEBUG-APP_Pemicro.SDA file in the Bootloader drive and unplug the USB for detection.
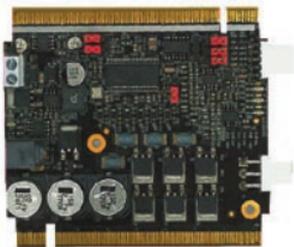
2) Connect TWR-KV10Z32 and TWR-MC-LV3PH with the Jumper Setup shown in the tables below.

Note: Refer to the TWR-KV10Z32 User Guide at 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		

3) Compile the BLDC Sensorless Demo with IAR EWARM v6.70.2

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.

4) Run IAR EWARM V6.70.2 Debug Mode

Download and Debug the project BLDC_Sensorless.

Start the debug session by selecting the GO option.

5) Monitor the Project with Freescale FreeMASTER v1.3.16 or later

Launch Freescale FreeMASTER v1.3.16 or later 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.

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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.

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 Edition Mode.

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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