KTFRDM17511EVBUG

FRDM-17511EVB evaluation board

Rev. 1.0 — 3 April 2017 User guide

1 FRDM-17511EVB evaluation board

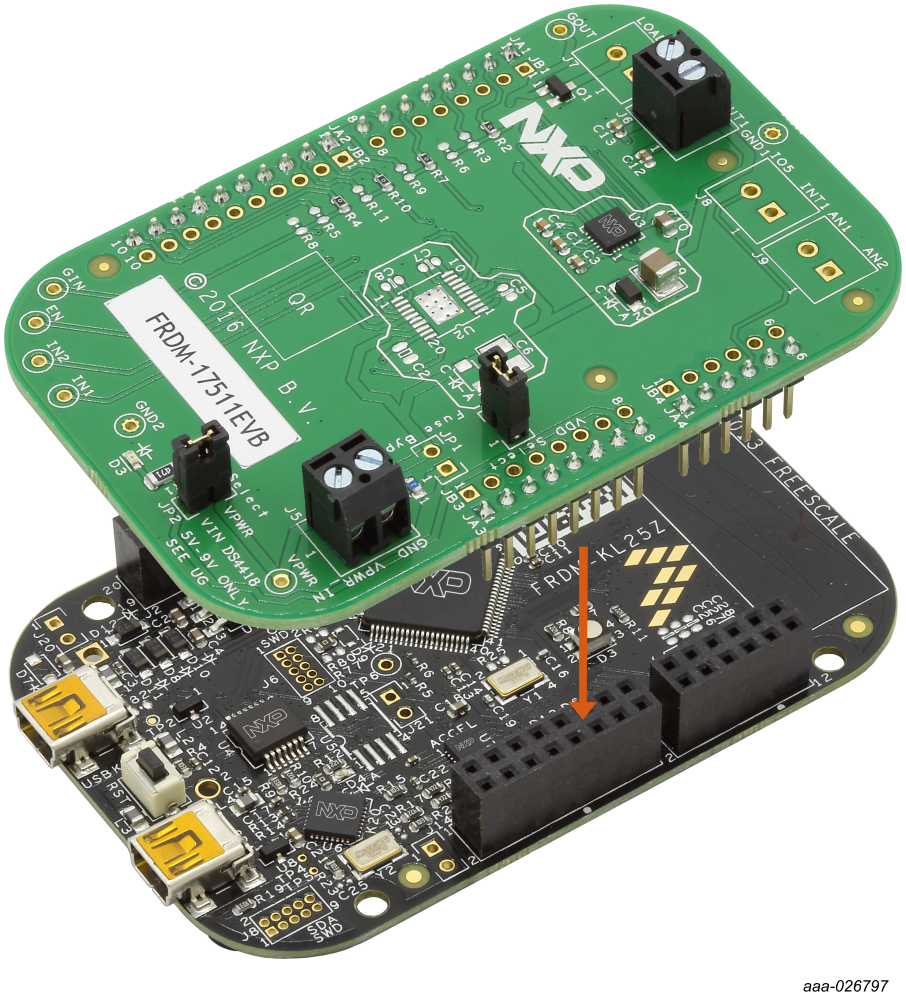


Figure 1. FRDM-17511EVB with FRDM-KL25Z Freedom Development Platform

2 Important notice

NXP provides the enclosed product(s) under the following conditions:

This evaluation kit is intended for use of ENGINEERING DEVELOPMENT OR EVALUATION PURPOSES ONLY. It is provided as a sample IC pre-soldered to a printed circuit board to make it easier to access inputs, outputs, and supply terminals. This evaluation board may be used with any development system or other source of I/O signals by simply connecting it to the host MCU or computer board via off-the-shelf cables. This evaluation board is not a Reference Design and is not intended to represent a final design recommendation for any particular application. Final device in an application will be heavily dependent on proper printed circuit board layout and heat sinking design as well as attention to supply filtering, transient suppression, and I/O signal quality.

The goods provided may not be complete in terms of required design, marketing, and or manufacturing related protective considerations, including product safety measures typically found in the end product incorporating the goods. Due to the open construction of the product, it is the user's responsibility to take any and all appropriate precautions with regard to electrostatic discharge. In order to minimize risks associated with the customers applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards. For any safety concerns, contact NXP sales and technical support services.

Should this evaluation kit not meet the specifications indicated in the kit, it may be returned within 30 days from the date of delivery and will be replaced by a new kit.

NXP reserves the right to make changes without further notice to any products herein. NXP makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does NXP assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. “Typical” parameters can and do vary in different applications and actual performance may vary over time. All operating parameters, including “Typical”, must be validated for each customer application by customer’s technical experts.

NXP does not convey any license under its patent rights nor the rights of others. NXP products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the NXP product could create a situation where personal injury or death may occur.

Should the Buyer purchase or use NXP products for any such unintended or unauthorized application, the Buyer shall indemnify and hold NXP and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges NXP was negligent regarding the design or manufacture of the part.

NXP and the NXP logo are trademarks of NXP B.V. All other product or service names are the property of their respective owners. © NXP B.V. 2017.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

3 Getting started

3.1 Kit contents and packing list

The FRDM-17511EVB contents include:

- Assembled and tested evaluation board/module in antistatic bag.
- Four Arduino™ R3 female/male connectors
  - Two 2 x 8
  - One 2 x 6
  - One 2 x 10
- Warranty card

3.2 Jump start

The analog product development boards from NXP help the evaluation of NXP products. These tools support analog mixed signal and power solutions, including monolithic ICs using proven high-volume SMARTMOS mixed signal technology, and system-in-package devices utilizing power, SMARTMOS and MCU dies. NXP products enable longer battery life, smaller form factor, component count reduction, ease of design, lower system cost and improved performance in powering state-of-the-art systems.

- Go to the tool summary page: www.nxp.com/FRDM-17511EVB
- Locate your kit
- Review your tool summary page
- Look for

- Download documents, software and other information

Once the files are downloaded, review the user guide in the bundle. The user guide includes setup instructions, BOM and schematics. Jump start bundles are available on each tool summary page with the most relevant and current information. The information includes everything needed for design.

3.3 Required equipment

To use this kit, you need:

- DC Power supply (2.0 V to 15 V, 0.1 A to 3.8 A, depending on brushed DC motor requirements)
- Compatible Freedom development platform accessory board (See Table 1)
- USB Mini-B or Micro-B (depending on the Freedom board being used) to Standard A cable
- Typical loads (brushed DC motor or power resistors)
- 3/16" blade screwdriver

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

3.4 System requirements

To use this kit, you need:

- USB-enabled PC with Windows® XP or higher

4 Getting to know the hardware

4.1 Board overview

The FRDM-17511EVB evaluation board features the MPC17511 H-bridge IC. This IC features the ability to drive brushed DC motors in both directions. The MPC17511 incorporates internal control logic, a charge pump, gate drive, and high current, low $R_{DS(on)}$ MOSFET output circuitry. An auxiliary gate drive for an external MOSFET circuit is also available.

4.2 Board features

The FRDM-17511EVB evaluation board is able to easily evaluate and test the main component, the MPC17511EJ. The main features of the board are as follows:

- Compatible with most Freedom Development Platform Accessory Boards. See Table 1.
- Built-in fuse for both part and load protection
- Screw terminals to provide easy connection of power and loads
- Test points to allow probing of signals
- Built in voltage regulator to supply logic-level circuitry
- LED to indicate status of the onboard voltage regulator

4.3 Device features

This evaluation board features the following NXP product:

Table 1. Device features

Evaluation board	Device	Device features
FRDM- MPC17511EVB	MPC17511	The NXP MPC17511 is a monolithic H-bridge IC that is ideal for portable electronic applications to control various DC micromotors such as single-lens reflex cameras and optical disc drives. • 2.0 V to 6.8 V H-bridge motor driver with enable and tristate bridge control via a parallel MCU interface • The IC has low ON-resistance of 0.55 Ohm (max.) and the drivers can be PWMed at 200 kHz control frequency • Drives various types of micromotors with low loss via parallel drive; each section has efficient drivers designed for PWM control frequency up to 200 kHz for high-speed drive and independent input/output circuitry • Contains an integrated charge pump and level shifter for gate drive voltages, with an integrated shoot-through current protection circuit and under voltage circuit detector to avoid malfunction • Can control four output modes: Forward, Reverse, Brake, tristate (Open)

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

4.4 Board description

This document refers to FRDM-17511EVB. The following sections describe the additional hardware used to support the H-bridge driver.

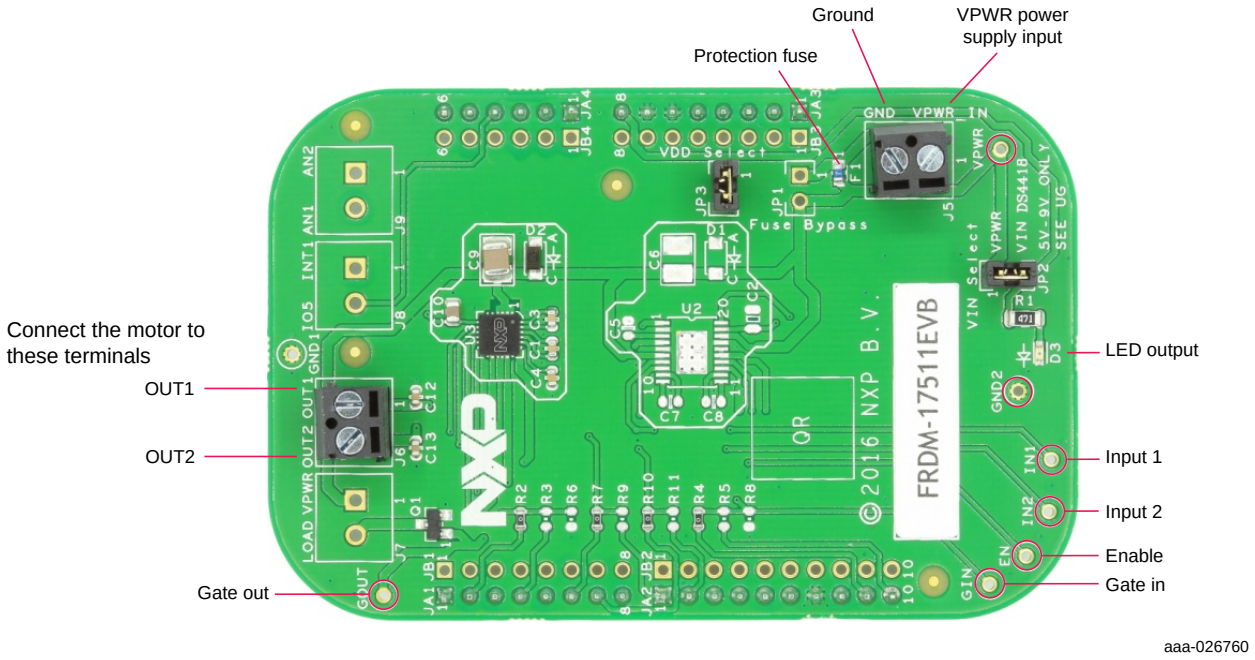


Figure 2. Board description

4.5 LED indicator

An LED is provided as a visual output device for the evaluation board:

Table 2. LED Display

LED ID	Description
D3	Indicates when power is supplied to the board via J5

4.6 Test point definitions

The following test-points provide access to signals on the FRDM-17511EVB.

Table 3. Test point definitions

TP #	Signal name	Description
TP1	VPWR	Power input after fuse
TP2	EN	Enable signal
TP3	GOUT	General purpose output
TP4	GIN	Input for general purpose output
TP5	GND1	Ground
TP6	IN1	Input signal for OUT1

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

TP #	Signal name	Description
TP7	GND2	Ground
TP8	IN2	Input signal for OUT1

4.7 Input signal definitions

The MPC17511EP IC has four input signals that are used to control certain outputs or functions inside the circuit. See Table 4.

Table 4. Input signal definitions

Name on board	Name on device	Description
GIN	GIN_B	This signal is the input that controls the Auxiliary Output
IN1	IN1	This signal controls Output 1
IN2	IN2	This signal controls Output 2
EN	EN	This signal enables Output 1 and Output 2

4.8 Output signal definitions

The MPC17511 IC has three output signals that are used to drive a DC brushed motor and an auxiliary output designed to drive a high-side MOSFET. See Table 5.

Table 5. Output signal definitions

Name	Description
OUT1	Driver output 1
OUT2	Driver output 2
LOAD	Drain of internal Q1

4.9 Screw terminal connections

The FRDM-17511EVB board features screw terminal connections to allow easy access to device signals and supply rails.

Table 6. Screw terminals

Name	Pin	Signal name	Signal description
J5	1	VPWR_IN	Power input
	2	GND	Ground
J6	1	OUT1	Driver output 1
	2	OUT2	Driver output 2
J7	1	VPWR	Power output
	2	LOAD	Drain of internal Q1
J8	1	AUX_INT1	Auxiliary MCU signal (interrupt) Not populated

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

Name	Pin	Signal name	Signal description
	2	AUX_IO5	Auxiliary MCU signal (gpio) Not populated
J9	1	AUX_AN2	Auxiliary MCU signal (analog) Not poplulated
	2	AUX_AN1	Auxiliary MCU signal (analog) Not populated

4.10 Jumpers

The board features jumper connections as shown in Table 7.

Table 7. Jumpers

Name	Description
JP1	Fuse bypass
JP2	VPWR to VIN pin on Driver IC
JP3	VDD select (must be jumped to supply VDD to Driver IC logic)

5 FRDM-KL25Z Freedom Development Platform

The NXP Freedom development platform is a set of software and hardware tools for evaluation and development. It is ideal for rapid prototyping of microcontroller-based applications. The NXP Freedom KL25Z hardware, FRDM-KL25Z, is a simple, yet sophisticated design featuring a Kinetis L Series microcontroller, the industry's first microcontroller built on the ARM® Cortex™-M0+ core.

5.1 Connecting a FRDM-KL25Z to the board

The FRDM-17511EVB kit can be used with many of the Freedom platform evaluation boards featuring Kinetis processors. The FRDM-KL25Z evaluation board has been chosen specifically to work with the FRDM-17511EVB kit because of its low cost and features. The FRDM-KL25Z board makes use of the USB, built in LEDs, and I/O ports available with the Kinetis KL2x family of microcontrollers from NXP. The main functions provided by the FRDM-KL25Z are to allow control of a DC brushed motor using a PC computer over USB, and to drive the necessary inputs on the FRDM-17511EVB evaluation kit to operate the motor.

The FRDM-17511EVB is connected to the FRDM-KL25Z using four dual-row headers. The connections are shown in Table 8.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

Table 8. FRDM-17511EVB to FRDM-KL25Z connections

FRDM LV DC			FRDM-KL25Z		
Header	**Pin**	**Name**	**Header**	**Pin**	**Name**
JA1	1	AUX_INT1	J1	2	PTA1
JA1	2	IO1	J1	4	PTA2
JA1	3		J1	6	PTD4
JA1	4	IO2	J1	8	PTA12
JA1	5		J1	10	PTA4
JA1	6	PWM1	J1	12	PTA5
JA1	7	PWM2	J1	14	PTC8
JA1	8		J1	16	PTC9
JA2	1	PWM3	J2	2	PTA13
JA2	2	PWM4	J2	4	PTD5
JA2	3		J2	6	PTD0
JA2	4		J2	8	PTD2
JA2	5		J2	10	PTD3
JA2	6		J2	12	PTD1
JA2	7	GND	J2	14	GND
JA2	8		J2	16	VREFH
JA2	9	IO3	J2	18	PTE0
JA2	10	IO4	J2	20	PTE1
JA3	8	VIN	J3	16	P5-9V_VIN
JA3	7	GND	J3	14	GND
JA3	6	GND	J3	12	GND
JA3	5		J3	10	P5V_USB
JA3	4	3V3	J3	8	P3V3
JA3	3		J3	6	RESET/PTA20
JA3	2		J3	4	P3V3
JA3	1		J3	2	SDA_PTD5
JA4	6		J4	12	PTC1
JA4	5		J4	10	PTC2
JA4	4	AUX_IO5	J4	8	PTB3
JA4	3		J4	6	PTB2
JA4	2	AUX_AN2	J4	4	PTB1
JA4	1	AUX_AN1	J4	2	PTB0

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

6 Installing the software and setting up the hardware

6.1 Installing the Motor Control GUI on your computer

The latest version of the Motor Control GUI is designed to run on any Windows 8, Windows 7, Vista or XP-based operating system. To install the software, go to

www.nxp.com/products/automotive-products/:FRDM-17510EJ-EVB?&tab=Design_Tools_Tab

Select LVMC-DC motor-setup.exe

Run the installed program from the desktop. The Installation Wizard guides you through the rest of the process. Close the Motor Control GUI, click the Start button, and then point to All Programs. Point to Motor Control GUI, and then click the NXP icon. The Motor Control Graphic User Interface (GUI) appears. The GUI is shown in Figure 3. The hex address numbers at the top are loaded with the vendor ID for NXP (0x15A2), and the part ID (0x138). The left side panel displays these numbers only if the PC is communicating with the FRDM-KL25Z via the USB interface.

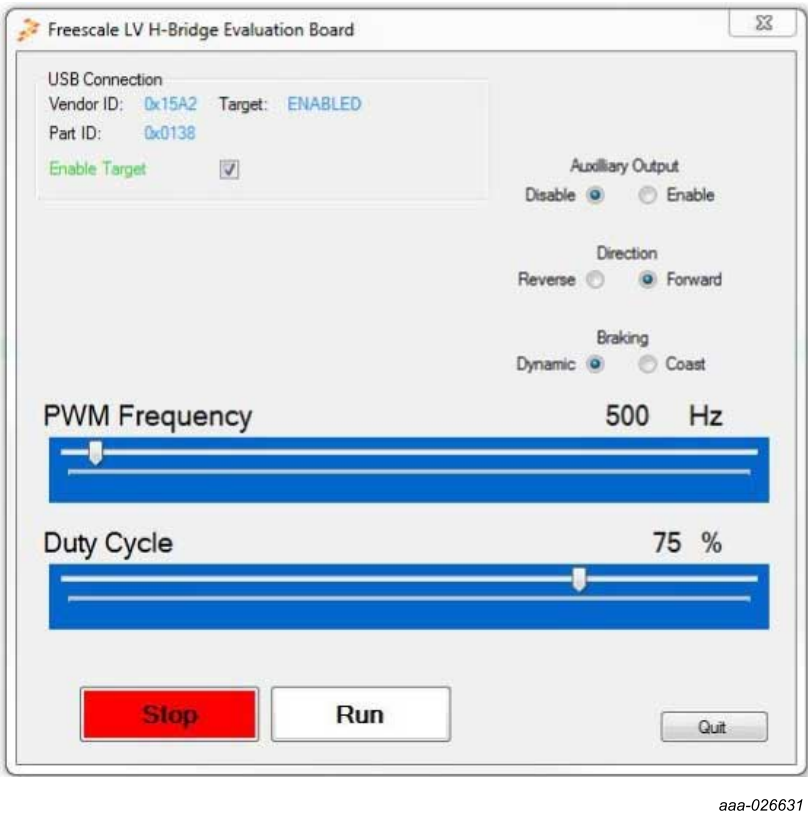


Figure 3. Motor control GUI

6.2 Configuring the hardware

The figure below shows the configuration diagram for FRDM-17511EVB.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

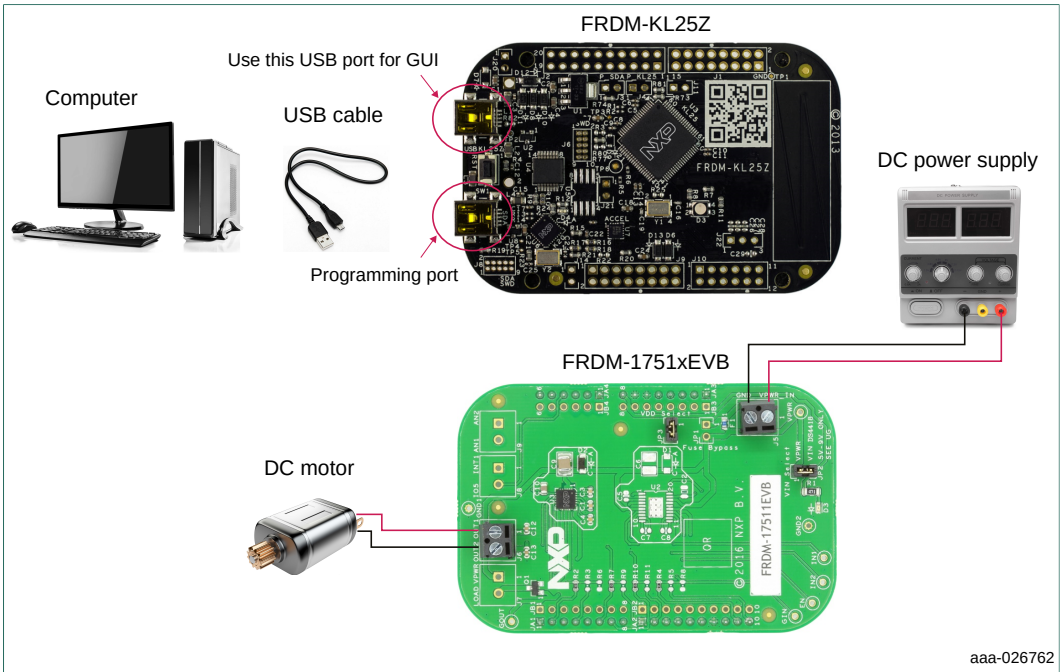


Figure 4. FRDM-17511EVB Plus FRDM-KL25Z Board Setup

6.3 Step-by-step instructions for setting up the hardware

The following operating parameters must be followed when using the FRDM-17511EVB, or damage could occur.

- The maximum motor supply voltage (VM) cannot exceed 156.8 V, and must be at least 5.0 V
- The nominal operating current of the DC motor cannot exceed 1.2 A (3.0 A peak)
- If the auxiliary output is used, do not exceed 12 V for the motor supply voltage (VM)

In order to perform the demonstration example, first set up the evaluation board hardware and software as follows:

1. Set up the FRDM-KL25Z to accept code from the mbed online compiler. The instructions are at mbed.org
   ***Note**: Switch to the other USB port (programming port) on the FRDM-KL25Z. Switch back after the project is loaded.*
2. Go to the NXP/LVHB DC Motor Drive page on mbed.org (https://developer.mbed.org/teams/NXP/code/LVHB-DC-Motor-Drive-v2/). Save the compiled code on your local drive, and then drag and drop it onto the mbed drive (which is the FRDM-KL25Z). Move the USB connector back to the other USB port on the FRDM-KL25Z.
   ***Note:** You might be asked to create a user before you can download the code.*
3. Connect the FRDM-17511EVB to the FRDM-KL25Z. Solder female connectors to the FRDM-KL25Z, and then connect them to the male pins on the FRDM-17511EVB).
4. Ready the computer, install the DC Brushed Motor Driver GUI software. See Section 6.1 "Installing the Motor Control GUI on your computer" of this user guide for instructions.
5. Attach a DC power supply (without turning on the power) to the VM and GND terminals.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

6. Attach a brushed DC motor load to the OUT 1 and OUT 2 output terminals. As an option, you can attach an auxiliary output to Q1D (and GND).
7. Launch the DC Brushed Motor Driver GUI Software.
8. Make sure that the GUI sees the FRDM-KL25Z. This connection can be determined by seeing the hex Vendor ID (0x15A2), and Part ID (0x138) under USB connection in the upper left-hand corner of the GUI. If you do not see values, disconnect and reconnect the USB cable to the FRDM-KL25Z.
9. Turn on the DC power supply.
10. Select Enable Target on the GUI. The demo is now ready to run.
11. Click the Run button to run the motor. Notice that many options of the GUI are disabled while the motor is running. To make changes, click the Stop button on the GUI, make the desired changes, and then click Run on the GUI to continue.

When finished:

1. Click the Enable Target button on the GUI
2. Click the Quit button
3. Turn off the DC power supply
4. Remove the USB cable

7 Installing the Processor Expert software

7.1 Installing CodeWarrior on your computer

This procedure explains how to obtain and install the latest version of CodeWarrior (version 10.6 in this guide).

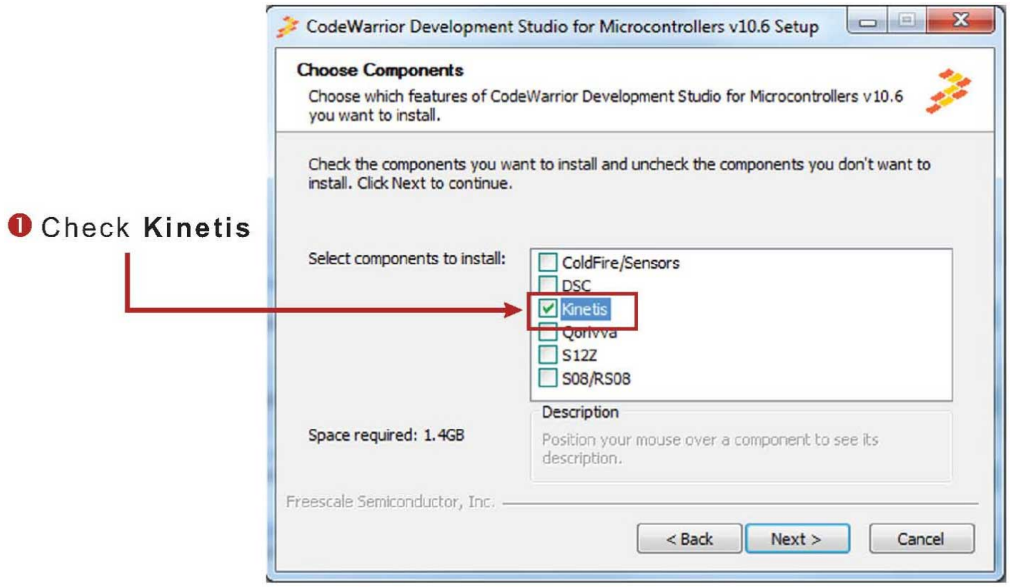
Note: *The sample software in this kit requires CodeWarrior 10.6 or newer. The component and some examples in the component package are intended for Kinetis Design Studio 3.0.0. If you have CodeWarrior 10.6 and Kinetis Design Studio 3.0.0 already installed on your system, skip this section.*

1. Obtain the latest CodeWarrior installer file from the NXP CodeWarrior website: www.nxp.com/products/:CW-MCU10?tab=Design_Tools_Tab
2. Run the executable file and follow the instructions.

In the Choose Components window, select the Kinetis component and click Next to complete the installation.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.



aaa-026669

7.2 Downloading the LVHBridge component and example projects

The examples used in this section are based on a preconfigured CodeWarrior project. Download the LVHBRIDGE-PEx-EMC.zip file first, which contains the project and its associated components:

1. Go to the NXP website www.nxp.com/lvhbridge-pexpert
2. Click the Downloads tab.
3. To download the LVHBRIDGE-PEx-EMC.zip file, click the Download button.
4. Register to become a member on NXP, then continue.
5. Unzip the downloaded file and check that the folder contains the files listed in Table 9

Table 9. Folders and files in the LVHBRIDGE-PEx-EMC.zip file

Folder or file name	Description
CodeWarrior_Examples	Example project folder for CodeWarrior
LVH_KL25Z_brush_MC34933	Example project for DC brush motor control using FRDM-34933EP-EVB H-bridge board and FRDM-KL25Z MCU board
LVH_KL25Z_brush_MPC17511	Example project for DC brush motor control using FRDM-17511EVB H-bridge board and FRDM-KL25Z MCU board
LVH_KL25Z_stepper	Example project intended to control stepper motor using FRDM-34933EP-EVB H-bridge board and FRDM-KL25Z MCU board
LVH_KL25Z_stepper_ramp	Example project intended to control stepper motor using FRDM-34933EP-EVB H-bridge board and FRDM-KL25Z MCU board. Acceleration ramp is enabled
Component	ProcessorExpert component folder
KDS_Examples	Example project folder for Kinetis Design Studio 3.0.0 or newer.
LVH_K20D50M_brush_MC34933	Example project for DC brush motor control using FRDM-34933EP-EVB H-bridge board and FRDM-K20D50M MCU board

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

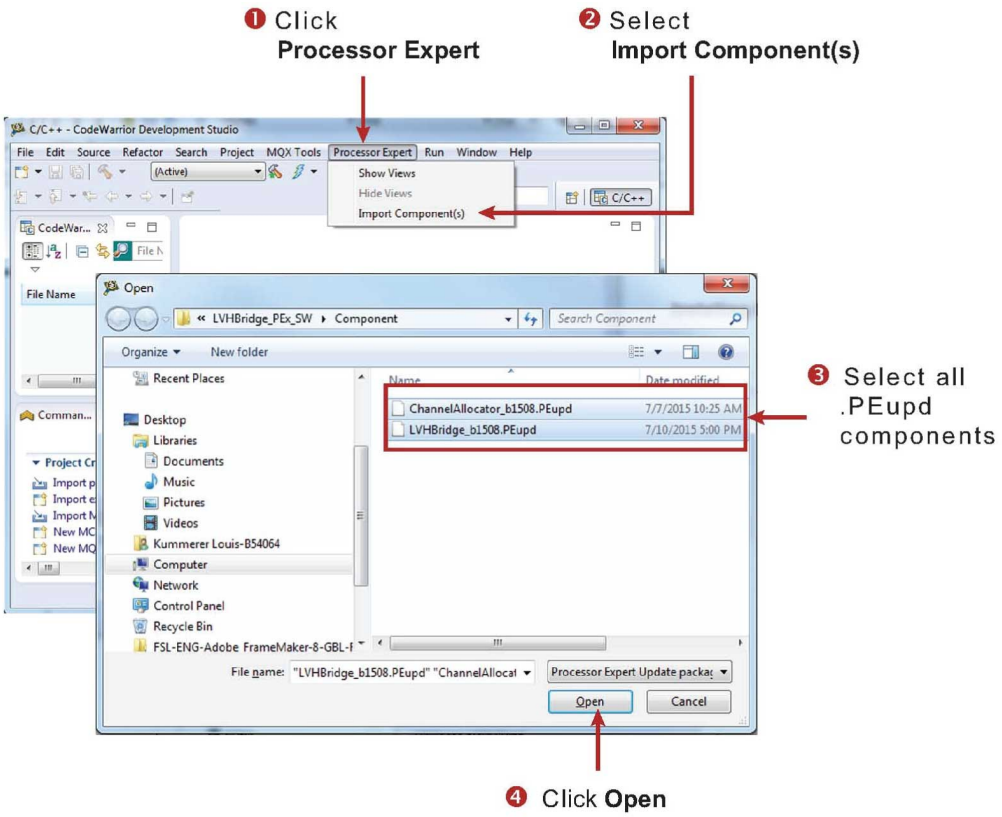
Folder or file name	Description
LVH_K20D50M_brush_MPC17511	Example project for DC brush motor control using FRDM-17511EVB H-bridge board and FRDM- K20D50M MCU board
LVH_K20D50M_stepper_bitIO	Example project intended to control stepper motor using FRDM-34933EP-EVB H-bridge board and FRDM- K20D50M MCU board
LVH_K20D50M_stepper_ramp_bitIO	Example project intended to control stepper motor using FRDM-34933EP-EVB H-bridge board and FRDM- K20D50M MCU board. Acceleration ramp is enabled
LVH_KL25Z_brush_MC34933	Example project for DC brush motor control using FRDM-34933EP-EVB H-bridge board and FRDM-KL25Z MCU board
LVH_KL25Z_brush_MPC17511	Example project for DC brush motor control using FRDM-17511EVB H-bridge board and FRDM-KL25Z MCU board
LVH_KL25Z_brush_FreeMASTER	Example project intended to control DC brush motor using FreeMASTER tool. Latest FreeMASTER installation package: www.nxp.com/freemaster
LVH_KL25Z_step_FreeMASTER	Example project intended to control stepper motor using FreeMASTER tool
LVH_KL25Z_stepper	Example project intended to control stepper motor using FRDM-34933EP-EVB H-bridge board and FRDM-KL25Z MCU board
LVH_KL25Z_stepper_ramp	Example project intended to control stepper motor using MC34933 H-bridge freedom board and FRDM-KL25Z MCU board. Acceleration ramp is enabled
LVH_KL26Z_stepper	Example project intended to control stepper motor using FRDM-34933EP-EVB H-bridge board and FRDM-KL26Z MCU board
LVH_KL26Z_stepper_iar	Example project intended to control stepper motor using FRDM-34933EP-EVB H-bridge board and FRDM-KL26Z MCU board. IAR compiler is used instead of GNU C compiler

7.2.1 Import the LVHBridge component into Processor Expert Library

1. Launch CodeWarrior by double-clicking the CodeWarrior icon on your desktop. If the icon is not on your desktop, you can find the executable file in C:\Program Files \NXP Codewarrior. When the CodeWarrior IDE opens, go to the menu bar and click Processor Expert, and then click on Import Component(s).
2. In the pop-up window, locate the component file (.PEupd) in the example project folder LVHBridge_PEx_SW\Component. Select LVHBridge_b1508.PEupd and ChannelAllocator_b1508.PEupd files then click Open.

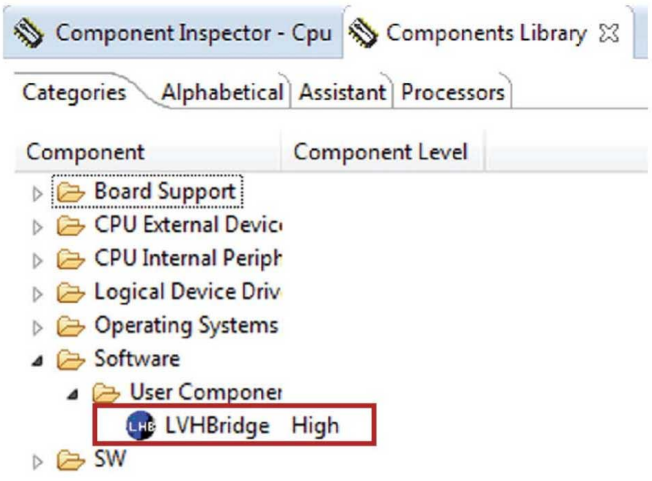
All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.



aaa-026670

3. If the import is successful, the LVHBridge component appears under the Components Library tab in Software\User Component. The component ChannelAllocator is not visible, because it is not designed to be user-accessible.



aaa-026671

The LVHBridge component is ready to use.

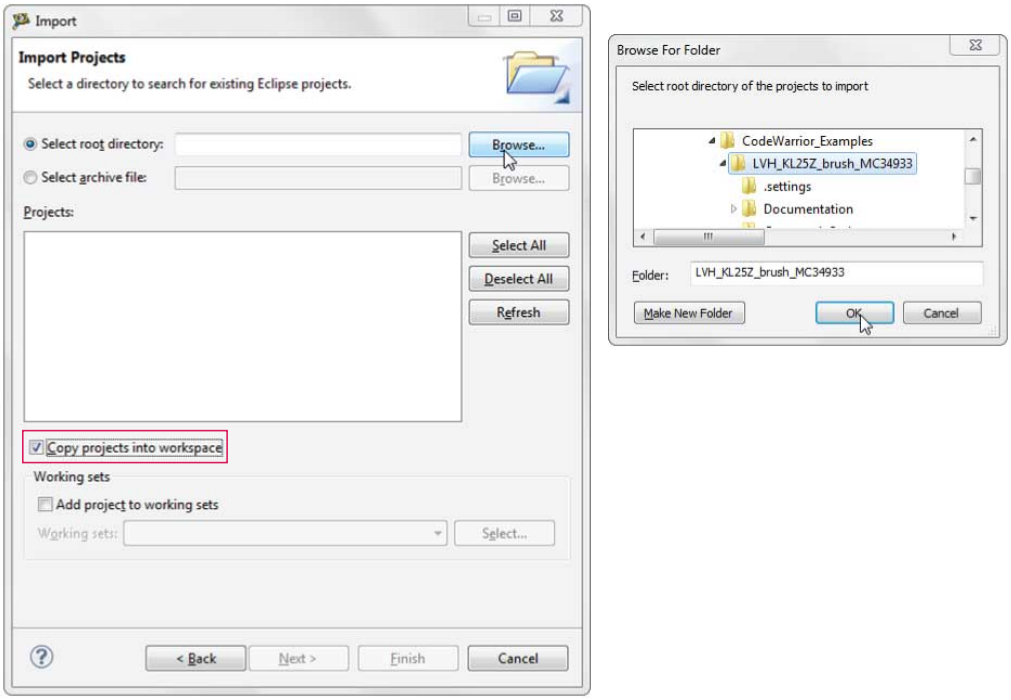
All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

7.2.2 Import an example project into CodeWarrior

The following steps show how to import an example from the downloaded zip file into CodeWarrior.

1. On the CodeWarrior menu bar, click File, and then click Import.... In the pop-up window, click the arrow next to General, and then click Existing Projects into Workspace.
2. Click Next.
3. Click Browse..., and then locate the example in LVHBridge_PEx_SW \CodeWarrior_Examples. The image below shows LVH_KL25Z_brush_MC34933 as the imported project.



aaa-026672

4. Click Finish.

The project is now in the CodeWarrior workspace where you can build and run it.

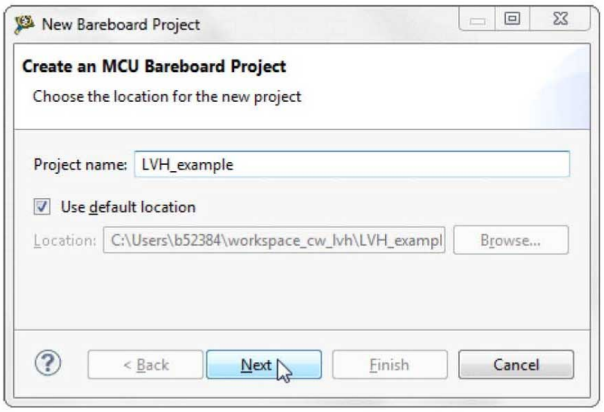
7.3 Create a new project with Processor Expert and LVHBridge component

If you choose not to use the example project, the following instructions describe how to create and set up a new project that uses the LVHBridge component. If you do not have the LVHBridge component in the Processor Expert Library, follow steps in Section 6.3 "Step-by-step instructions for setting up the hardware".

1. Create and name an MCU Bareboard project.

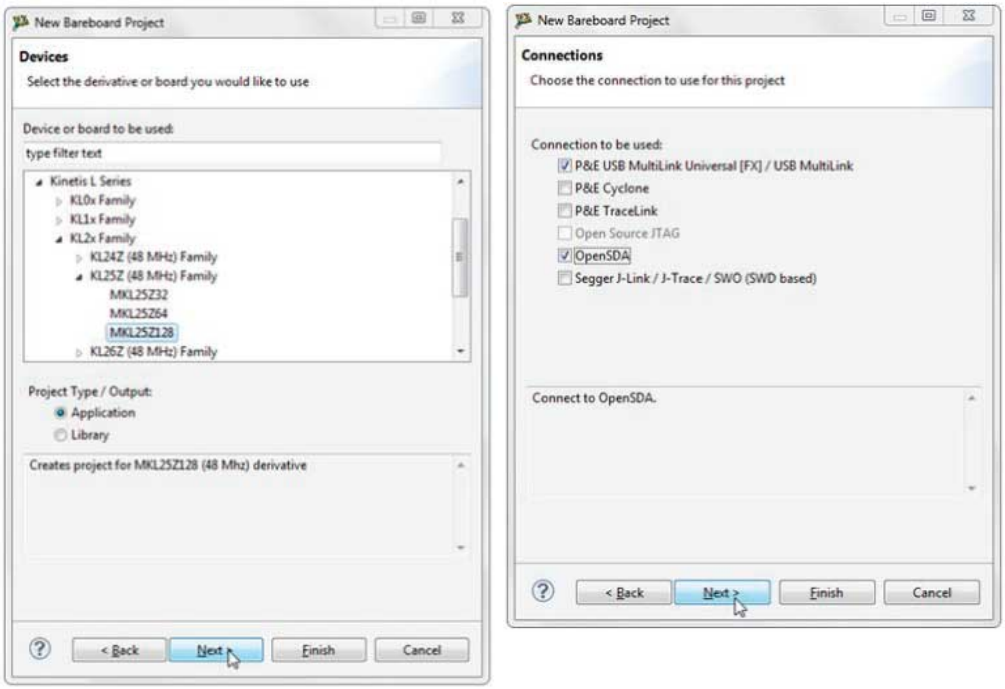
All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.



aaa-026673

2. Choose the MCU class to be used in the freedom MCU board, MKL25Z128 in this example. Then, select the connections to be used.

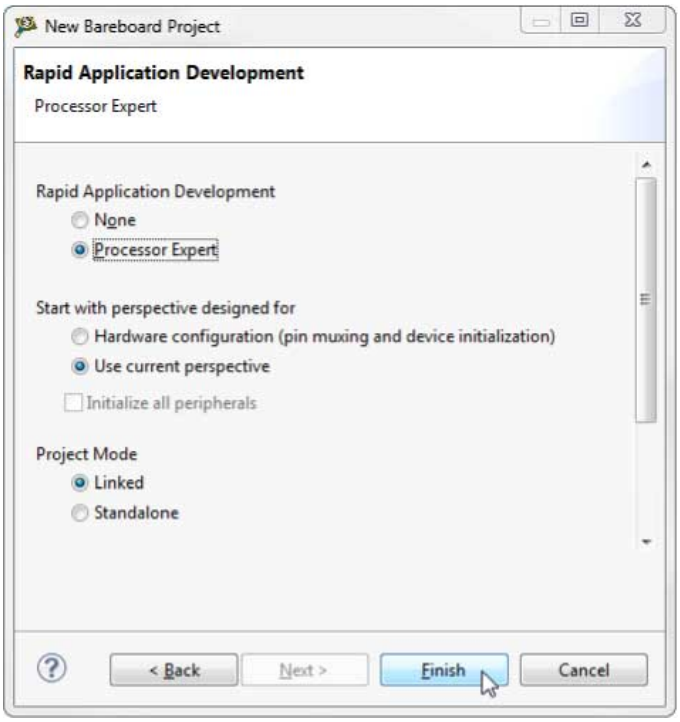


aaa-026674

3. Select the Processor Expert option, and then click Finish.

All information provided in this document is subject to legal disclaimers.

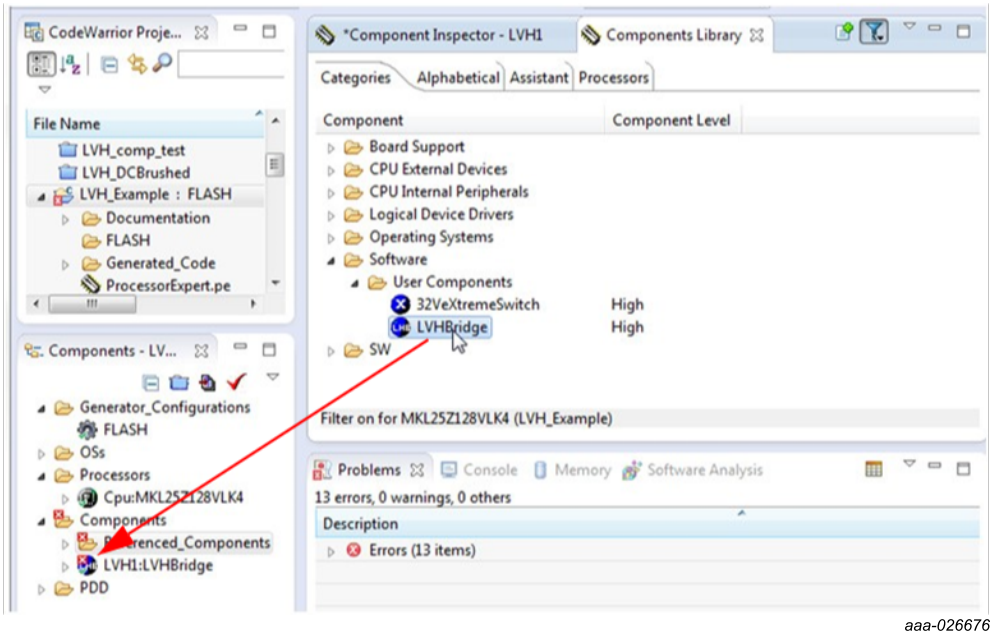
© NXP B.V. 2017. All rights reserved.



aaa-026675

7.3.1 Add LVHBridge component into the project

1. Find LVHBridge in the Components Library and add it into your project.

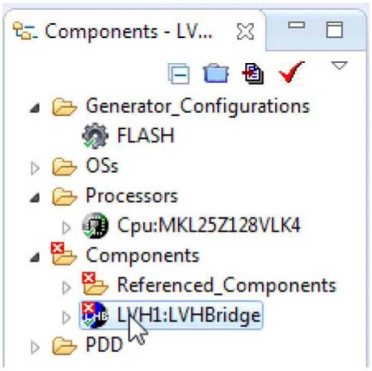


aaa-026676

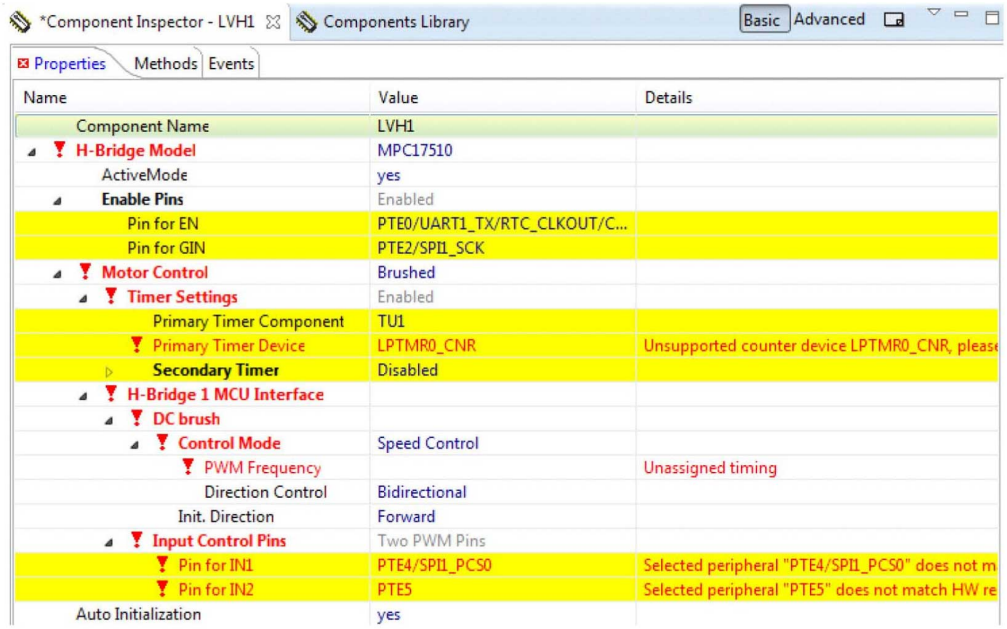
2. Double-click LVHBridge component in the Components window to show the configuration in the Component Inspector view.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.



aaa-026677



aaa-026678

7.3.2 General settings of LVHBridge component

Component settings in the Component Inspector view have a tree structure. H-bridge Model is on top of the tree.

ActiveMode defines the H-bridge device operational mode (normal or power-conserving sleep mode), which is controlled by the enabling pin. Selection of the enabling pin is in the EnablePins group. For more information, see the data sheet for your H-bridge model. The mode can be changed later using the C code method SetMode.

The Motor Control group involves timer settings, H-bridge device and motor control settings. The Timer Settings group contains the Primary Timer Component property (the name of a linked TimerUnit_LDD component) and the name of the hardware timer being used (defined in the Primary Timer Device property). Secondary Timer encompasses the properties of an additional timer.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

The Secondary Timer Component property must use a different TimerUnit_LDD component than the PrimaryTimer Component property. The purpose of the primary and secondary timers is to allow the input control pins of an H-bridge device to be connected to different timers (this applies for some freedom H-bridge boards and freedom MCUs). But these timers must be synchronized to control a stepper motor. The primary timer is the source for the global time base and the secondary timer is synchronized with the primary timer. To find out which timer provides the global time base (GTB) and set the Primary Timer Device property, see the data sheet for your MCU. An example of a timer selection using the FRDM-KL25Z MCU is shown in Figure 5.If you are using a single timer, set the SecondaryTimer Component to Disabled.

Figure 5. Selection of a FRDM-KL25Z MCU primary and a secondary timer device

H-bridge1 MCU Interface and H-bridge 2 MCU Interface allow you to set H-bridge control function. The H-bridge 2 MCU Interface is shown only for dual H-bridge models (for example MC34933). The DC Brush group is described in Section 7.3.3 "Setting up a project to control a DC brushed motor". The Input Control Pins allow you to select the H-bridge input control pins that utilize timer or GPIO pin channels.

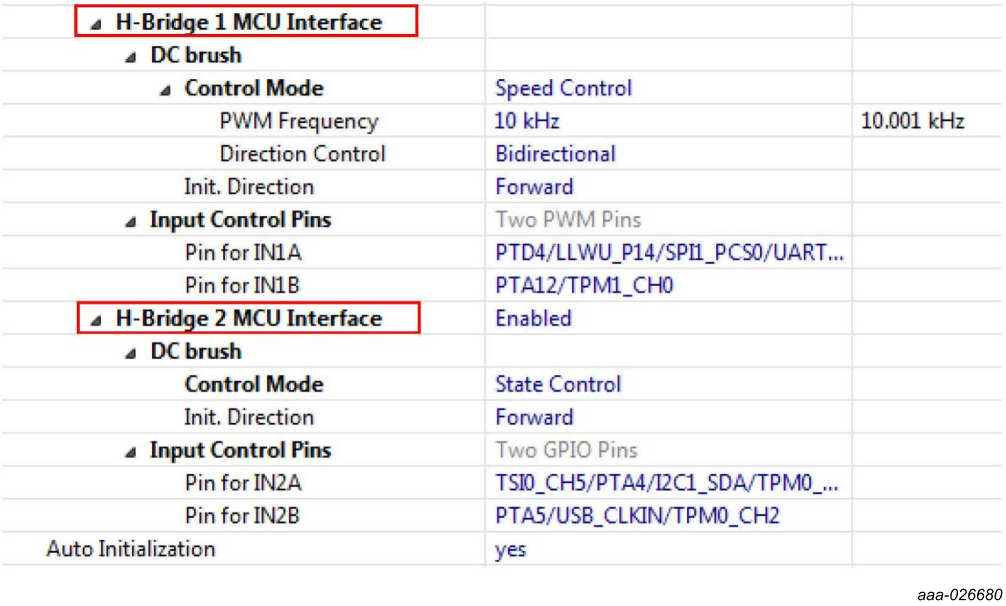


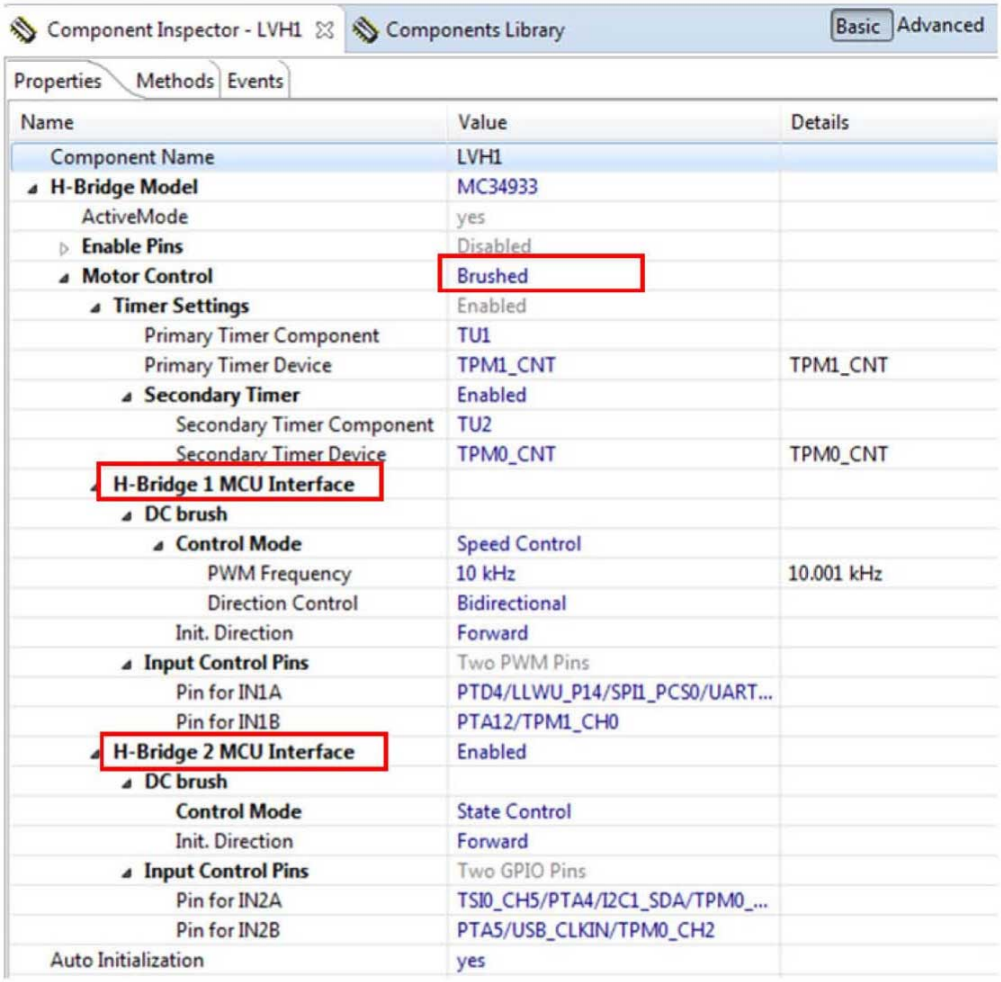
Figure 6. LVHBridge component — general settings

7.3.3 Setting up a project to control a DC brushed motor

1. Select the H-bridge model you want to configure and set the Motor Control property to Brushed.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.



aaa-026681

2. Set the Control Mode property. There are two ways to control the DC brushed motor:
   a. Speed Control - motor speed is controlled by your settings. The TimerUnit_LDD component is used to generate the PWMsignal. The PWM Frequency property is visible in this mode only. If you set the Speed Control mode on both interfaces (i.e. Interface 1 and Interface 2), the PWM Frequency property on Interface 2 is set automatically to the same value as Interface 1 (because Interface 2 uses the same timer.)
   b. StateControl - motor is controlled by GPIO pins (BitIO_LDDcomponents). This configuration means you can switch the motor on or off without speed adjustments. The advantage of this mode is that you do not need timer channels. If you set StateControl on both interfaces or you have only a single H-bridge model (one interface) with StateControl, the TimerUnit_LDD component is not required anymore by the LVHBridge component and you can remove it from the project.
3. Set the PWM Frequency.
4. Set the Direction Control property. The Direction Control property determines what direction the motor is allowed to move in.

Setting the property to Forward restricts the movement of the motor to the forward direction only. Setting the property to Reverse restricts movement to the reverse direction

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

only. A Bidirectional setting allows the motor to move in either direction. The Bidirectional mode requires two timer channels. Forward or Reverse requires only one timer channel and one GPIO port. This setting is available only when Speed Control mode is set in the Control Mode property.

7.3.4 Generating application code

After configuration, generate the source code by clicking on the icon in the upper right corner of the Components screen.

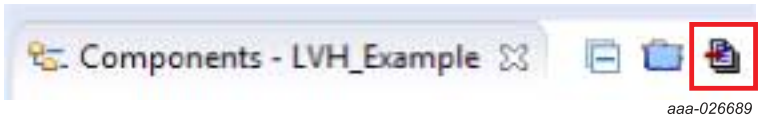


Figure 7. Generating the source code

The driver code for the H-bridge device is generated into the Generated_Code folder in the project view. The component only generates application driver code. It does not generate application code.

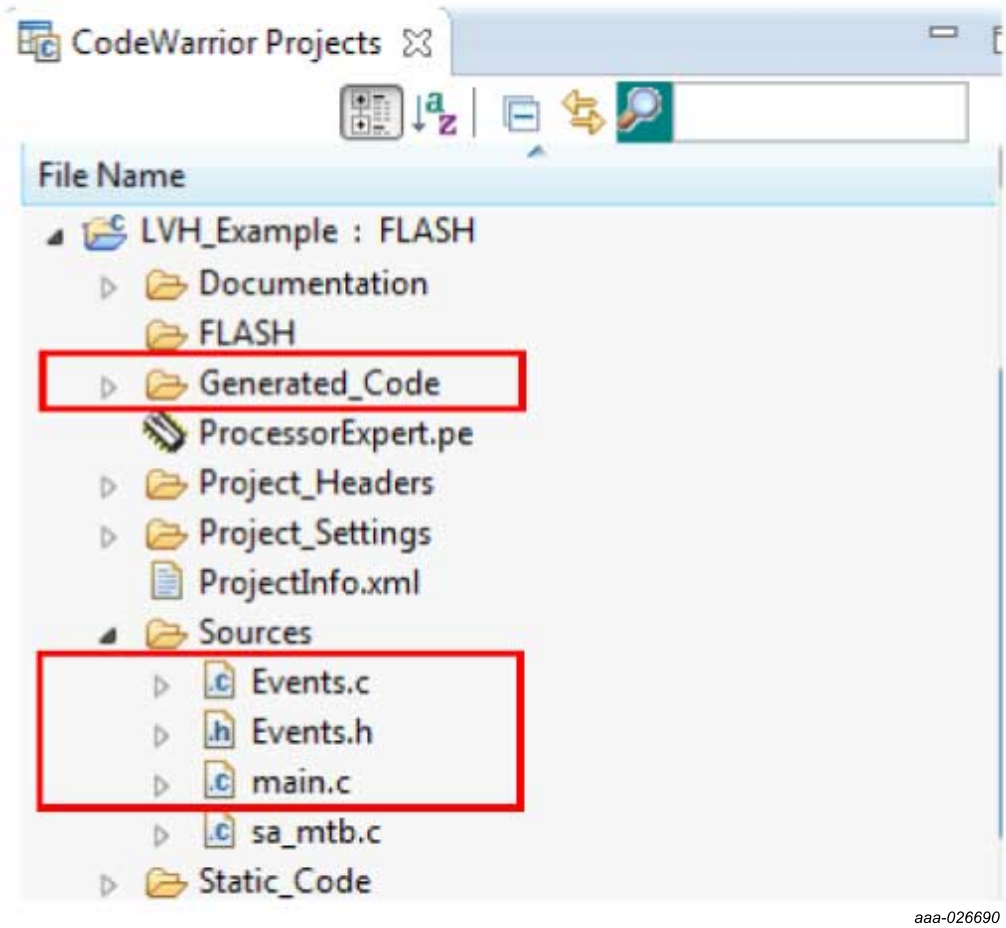


Figure 8. Generated files

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

7.3.5 Using the interface

Application code can be written and tested in the project. For example, you can open the LVHBridge component method list, drag and drop RotateProportional to main.c, add any necessary parameters, then compile the program. See Figure 9.

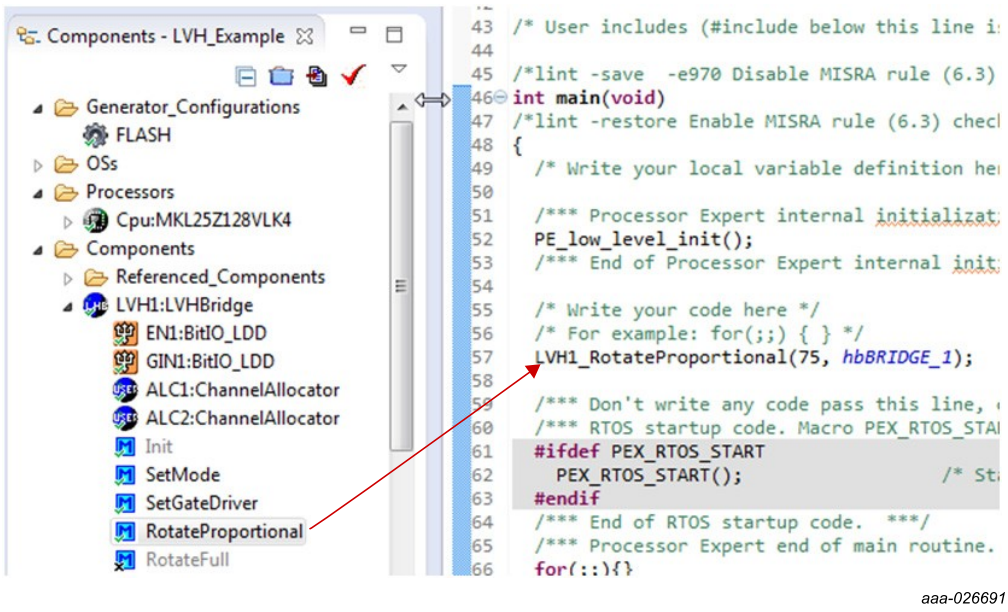


Figure 9. Using the interface

To compile, download and debug onboard, click compile, then click the debug icon in the toolbar. CodeWarrior downloads and launches the program onboard. See Figure 10.

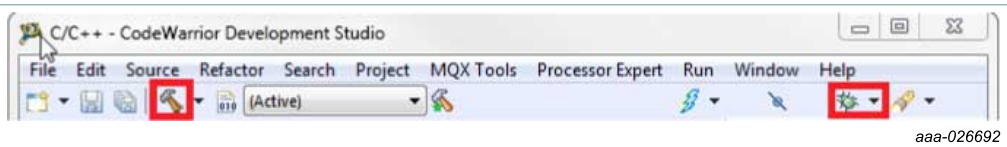


Figure 10. Compile and download the application

A description of each LVHBridge method appears in the pop-up window. See Figure 11.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

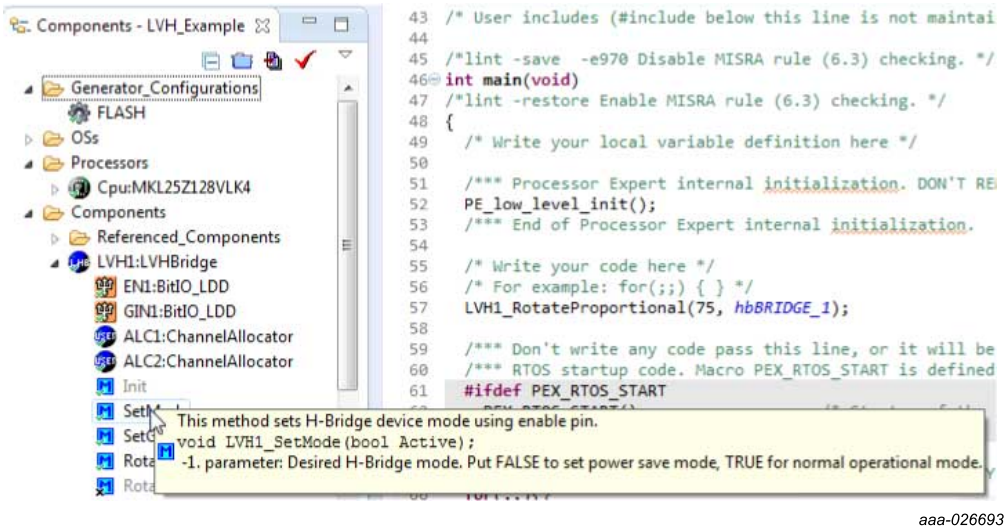


Figure 11. LVHBridge method information

7.4 Frequently asked questions

Q: How do I set up the LVHBridge component when two or more components with conflicting values are configured to control brushed motors? See Figure 12.

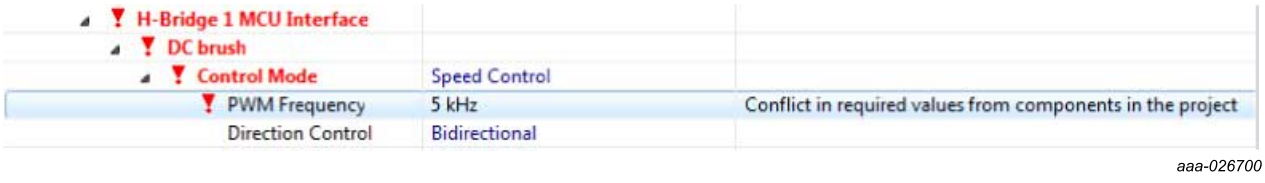


Figure 12. Conflict in the required values for components in the project

A: You can use more LVHBridge components in same project. These components can share a timer device in brushed motor control mode. However, PWM Frequency and Timer Device properties must conform in all of the components.

Q: I sometimes get the following unexpected error while generating Processor Expert code: "Generator: FAILURE: Unexpected status of script: Drivers\\Kinetis\imerUnit_LDD.drv, contact Freescale support". What causes this?

A: Occasionally, when you enable the LVHBridge component in your project, the TimerUnit_LDD component channels have not been allocated. Changing certain LVHBridge properties forces allocation of the channels. If you are configuring a stepper motor (Motor Control property set to Stepper), try changing the Output Control property to GPIO and then back to PWM. If you are configuring a brushed motor (Motor Control property set to Brushed), change the Control Mode property to State Control and then back to Speed Control on interface 1 or interface 2.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

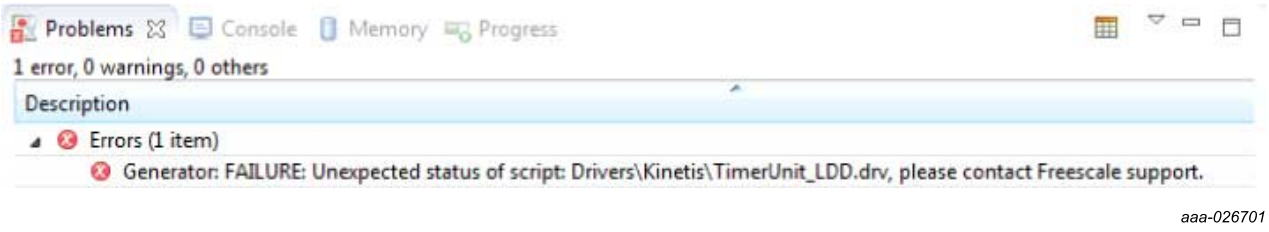


Figure 13. Unexpected error related to the LVHBridge TimerUnit_LDD component

Q: I have set up several CPU clock configurations (via the Clock configurations property of the CPU component.) Sometimes during runtime, when I switch between these configurations (using the CPU SetClockConfiguration method), the speed of the stepper motor appears to be inaccurate. Why does this inaccuracy occur?

A: Switching to a different configuration results in the use of a different input frequency by a timer device. LVHBridge might not pick up the new value and continues to use the previous value in its calculations.

Q: What does the error message "The component has no method to enable its event (OnCounterRestart)" raised in an LVHBridge TimerUnit_LDD component mean?

A: This message appears only when you add an LVHBridge component to a project and set the Motor Control property to Stepper. The error disappears if you change any property of the LVHBridge component.

8 Schematics, board layout and bill of materials

Board schematics, board layout and bill of materials are available in the download tab of the Tool summary page for the associated board. See Section 9 "References" for link to the relevant tool summary page.

9 References

Following are URLs where you can obtain information on related NXP products and application solutions:

Table 10. References

NXP.com support pages	Description	URL
FRDM-17511EVB	Tool summary page	www.nxp.com/products/FRDM-17511EVB
FRDM-KL25Z	Tool summary page	www.nxp.com/products/:FRDM-KL25Z
CodeWarrior	Tool summary page	www.nxp.com/products/:CW_HOME
Processor Expert Code Model	Code walkthrough video	www.nxp.com/video/:PROEXPCODMODCW_VID
LVHBRIDGE-PEXPERT	Tool summary page	www.nxp.com/lvhbridge-pexpert
MPC17511	Product summary page	www.nxp.com/MPC17511
mbed	Home page	mbed.org

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

10 Contact information

Visit www.nxp.com/support for a list of phone numbers within your region.
Visit www.nxp.com/warranty to submit a request for tool warranty.

11 Revision history

Document ID	Release date	User guide status	Change notice	Supercedes
KTFRDM17511EVBUG v1.0	20170403	Initial release	—	—

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

12 Legal information

12.1 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

12.2 Disclaimers

Information in this document is provided solely to enable system and software implementers to use NXP products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits based on the information in this document. NXP reserves the right to make changes without further notice to any products herein.

NXP makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does NXP assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. “Typical” parameters that may be provided in NXP data sheets and/ or specifications can and do vary in different applications, and actual performance may vary over time. All operating parameters, including “typicals,” must be validated for each customer application by customer's technical experts. NXP does not convey any license under its patent rights nor the rights of others. NXP sells products pursuant to standard terms and conditions of sale, which can be found at the following address: nxp.com/salestermsandconditions.

12.3 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

NXP — is a trademark of NXP B.V.

the NXP logo — is a trademark of NXP B.V.

Freescale — is a trademark of NXP B.V.

the Freescale logo — is a trademark of NXP B.V.

SMARTMOS — is a trademark of NXP B.V.

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

Tables

Tab. 1. Device features 4
Tab. 2. LED Display 5
Tab. 3. Test point definitions 5
Tab. 4. Input signal definitions 6
Tab. 5. Output signal definitions 6
Tab. 6. Screw terminals 6
Tab. 7. Jumpers 7
Tab. 8. FRDM-17511EVB to FRDM-KL25Z connections 8
Tab. 9. Folders and files in the LVHBRIDGE-PEx-EMC.zip file 12
Tab. 10. References 24

Figures

Fig. 1. FRDM-17511EVB with FRDM-KL25Z Freedom Development Platform 1
Fig. 2. Board description 5
Fig. 3. Motor control GUI 9
Fig. 4. FRDM-17511EVB Plus FRDM-KL25Z Board Setup 10
Fig. 5. Selection of a FRDM-KL25Z MCU primary and a secondary timer device 19
Fig. 6. LVHBridge component — general settings 19
Fig. 7. Generating the source code 21
Fig. 8. Generated files 21
Fig. 9. Using the interface 22
Fig. 10. Compile and download the application 22
Fig. 11. LVHBridge method information 23
Fig. 12. Conflict in the required values for components in the project 23
Fig. 13. Unexpected error related to the LVHBridge TimerUnit_LDD component 24

All information provided in this document is subject to legal disclaimers.

© NXP B.V. 2017. All rights reserved.

Contents

1 FRDM-17511EVB evaluation board 1
2 Important notice 2
3 Getting started 3
3.1 Kit contents and packing list 3
3.2 Jump start 3
3.3 Required equipment 3
3.4 System requirements 4
4 Getting to know the hardware 4
4.1 Board overview 4
4.2 Board features 4
4.3 Device features 4
4.4 Board description 5
4.5 LED indicator 5
4.6 Test point definitions 5
4.7 Input signal definitions 6
4.8 Output signal definitions 6
4.9 Screw terminal connections 6
4.10 Jumpers 7
5 FRDM-KL25Z Freedom Development Platform 7
5.1 Connecting a FRDM-KL25Z to the board 7
6 Installing the software and setting up the hardware 9
6.1 Installing the Motor Control GUI on your computer 9
6.2 Configuring the hardware 9
6.3 Step-by-step instructions for setting up the hardware 10
7 Installing the Processor Expert software 11
7.1 Installing CodeWarrior on your computer 11
7.2 Downloading the LVHBridge component and example projects 12
7.2.1 Import the LVHBridge component into Processor Expert Library 13
7.2.2 Import an example project into CodeWarrior 15
7.3 Create a new project with Processor Expert and LVHBridge component 15
7.3.1 Add LVHBridge component into the project 17
7.3.2 General settings of LVHBridge component 18
7.3.3 Setting up a project to control a DC brushed motor 19
7.3.4 Generating application code 21
7.3.5 Using the interface 22
7.4 Frequently asked questions 23
8 Schematics, board layout and bill of materials 24
9 References 24
10 Contact information 25
11 Revision history 25
12 Legal information 26

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP B.V. 2017. All rights reserved.

For more information, please visit: http://www.nxp.com
For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 3 April 2017

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А