Quick Start Guide

S12ZVML-MINIKIT

3-phase BLDC and PMSM Development Kit with NXP S12ZVVML128 MCU
Quick Start Guide

3-PHASE BLDC/PMSM DEVELOPMENT KIT WITH NXP S12ZVML128 MCU

40W PM Motor
Part Number: 45ZWN24-40

S12ZVML-MINIBRD
GET TO KNOW THE S12ZVML-MINIBRD

Figure 1: Front side of S12ZVML-MINIBRD
GET TO KNOW THE S12ZVML-MINIBRD

Figure 1: Back side of S12ZVML-MINIBRD
S12ZVML-MINIBRD FEATURES

Hardware

- **S12ZVML-MINIBRD**—MC9S12ZVML128 with LIN connectivity support, BDM and OSBDM downloading and debugging
- **Low Cost PM Motor**—3-phase PM motor, 24VDC, 4000RPM, 40W, 45Z WN24-40
- **Boost circuitry**—allow driving Vgs = 10 V MOSFETs from +3.5 V power supply
- **Mini Board size**—MC9S12ZVML128 related part size of 5cmx5cm, OSBDM related part size of 5cmx4cm
- Reverse battery protection
- Load current monitoring
- On-board charge pumps
- USB cable

Software

- **Automotive Motor Control Algorithm**
  - Sensorless control of the BLDC motor based on Six-step commutation control technique allowing torque/speed control with low CPU load
  - High-performance sensorless field-oriented control of the PMSM motor with DC-link current sensor and 3-phase current reconstruction, field weakening and other advanced algorithms
- **Automotive Math and Motor Control Library Set**—control algorithm built on blocks of precompiled SW library
- **FreeMASTER and MCAT**—Application tuning and variable tracking
**STEP-BY-STEP INSTRUCTIONS**

1. **Download Software**
   Download installation software and documentation under “Getting started” at [nxp.com/AutoMCDevKits](http://nxp.com/AutoMCDevKits).

2. **Install CodeWarrior Development Studio IDE**

3. **Install FreeMASTER**
   Download and install FreeMASTER runtime debugging tool available at [nxp.com/FreeMASTER](http://nxp.com/FreeMASTER).

4. **Download BLDC Motor Control Software Package**
   Visit [nxp.com/S12ZVML-MINIBRD](http://nxp.com/S12ZVML-MINIBRD). Navigate the “Getting Started” section and download the latest version of documentation and software package.

5. **Connect the Motor**
   Connect the LINIX 45ZWN24-40 3-phase PM motor to the motor phase terminals on S12ZVML-MINIBRD board pins JP1, JP2, JP3.

6. **Connect the Power Supply**
   Connect the power supply cable with J1 LIN connector. Keep the DC supply voltage within the range of -25 V to +25 V, nominal +12 V.
STEP-BY-STEP INSTRUCTIONS CONTINUED

7 Connect the USB Cable
Connect S12ZVML-MINIBRD to the PC using the USB cable. Allow the PC to automatically configure the USB drivers if needed.

8 Re-program the MCU using CodeWarrior IDE
Import the installed application software project in the CodeWarrior Development Studio IDE:

- Start CodeWarrior Development Studio application
- Click File – Import
- Select General – Existing Projects into Workspace
- Navigate to the installed application directory:
  - for BLDC application: MC_DevKits\S12ZVMLMINIBRD\sw\S12ZVMLMINIBRD_BLDC_SW_CW11 and click OK
  - for PMSM application: MC_DevKits\S12ZVMLMINIBRD\sw\S12ZVMLMINIBRD_PMSM_SW_CW11 and click OK
- Click Finish
- Click Run – Debug
FreeMASTER Setup

• Start the FreeMASTER application
  – For BLDC application: Open FreeMASTER project MC_DevKits\S12ZVMLMINIBRD\sw\S12ZVMLMINIBRD_BLDC_SW_CW11\FreeMASTER_control\S12ZVMLMINIBRD_BLDC_SW_CW11.pmp by clicking File – Open Project
  
  – For PMSM application: Open FreeMASTER project MC_DevKits\S12ZVMLMINIBRD\sw\S12ZVMLMINIBRD_PMSM_SW_CW11\FreeMASTER_control\S12ZVMLMINIBRD_PMSM_SW_CW11.pmp by clicking File – Open Project

• Click the red STOP button in the FreeMASTER toolbar or press CTRL+K to enable the communication.

• Successful communication is signalized in the status bar at very bottom as BLDC: “RS232 UART Communication;COMn;speed = 9600”. PMSM: “RS232 UART Communication;COMn;speed = 19200”.
APPLICATION CONTROL

1. Click Motor 1 in the Motor Control Application Tuning tool (MCAT) tool tab menu to display the motor control page.

2. In case of pending faults, click the fault button Clear FAULT on the FreeMASTER MCAT Control Page.

3. Start the application by pressing ON/OFF button on the FreeMASTER MCAT Control Page.

4. Set required speed by changing the Speed Required variable value manually in the variable watch window, by clicking speed gauge. For BLDC application, the speed range is between 250rpm to 4000rpm. For PMSM application the speed range is between -4000rpm to 4000rpm. Do not exceed 2000rpm for more than 5 minutes.

5. To stop the application, click the ON/OFF button on the FreeMASTER MCAT Control page.

S12ZVML-MINIBRD JUMPER OPTIONS

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<th>JUMPER</th>
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<th>SETTING</th>
<th>DESCRIPTION</th>
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<td>Motor run/stop</td>
<td>1-2</td>
<td>Motor run</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-3</td>
<td>Motor stop</td>
</tr>
<tr>
<td>J5</td>
<td>Motor run/stop</td>
<td>short</td>
<td>LED_GREEN Enabled</td>
</tr>
<tr>
<td>J6</td>
<td>PS2/RxD1</td>
<td>1-2</td>
<td>USB OSBDM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-3</td>
<td>MCU RxD1 connect to J7 SCI port which allows to connect board external device using the MCU SCI module</td>
</tr>
<tr>
<td>J8</td>
<td>PS3/TxD1</td>
<td>1-2</td>
<td>USB OSBDM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2-3</td>
<td>MCU TxD1 connect to J7 SCI port which allows to connect board external device using the MCU SCI module</td>
</tr>
<tr>
<td>J11</td>
<td>Bootloader enable</td>
<td>Open</td>
<td>Bootloader disabled</td>
</tr>
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SUPPORT
Visit www.nxp.com/support for a list of phone numbers within your region.

WARRANTY
Visit www.nxp.com/warranty for complete warranty information.

Get Started
Download installation software and documentation under "Getting Started" at www.nxp.com/SZVML-MINIBRD.