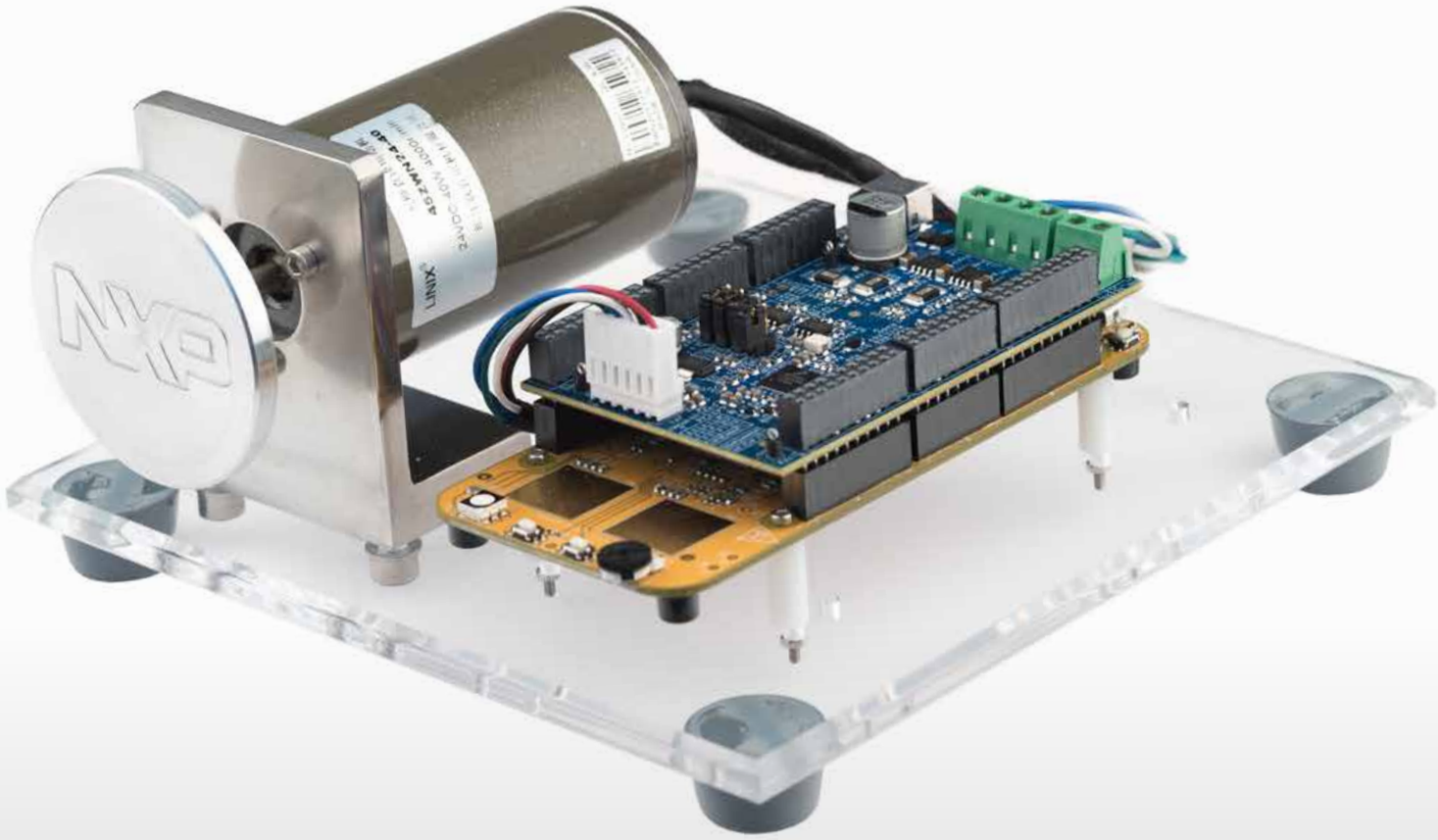


Quick Start Guide

MTRDEVKSBNK144

S32K144 Development Kit for 3-phase BLDC

AUTOMOTIVE MOTOR CONTROL DEVELOPMENT SOLUTIONS

S32K144 DEVELOPMENT KIT FOR 3-PHASE BLDC

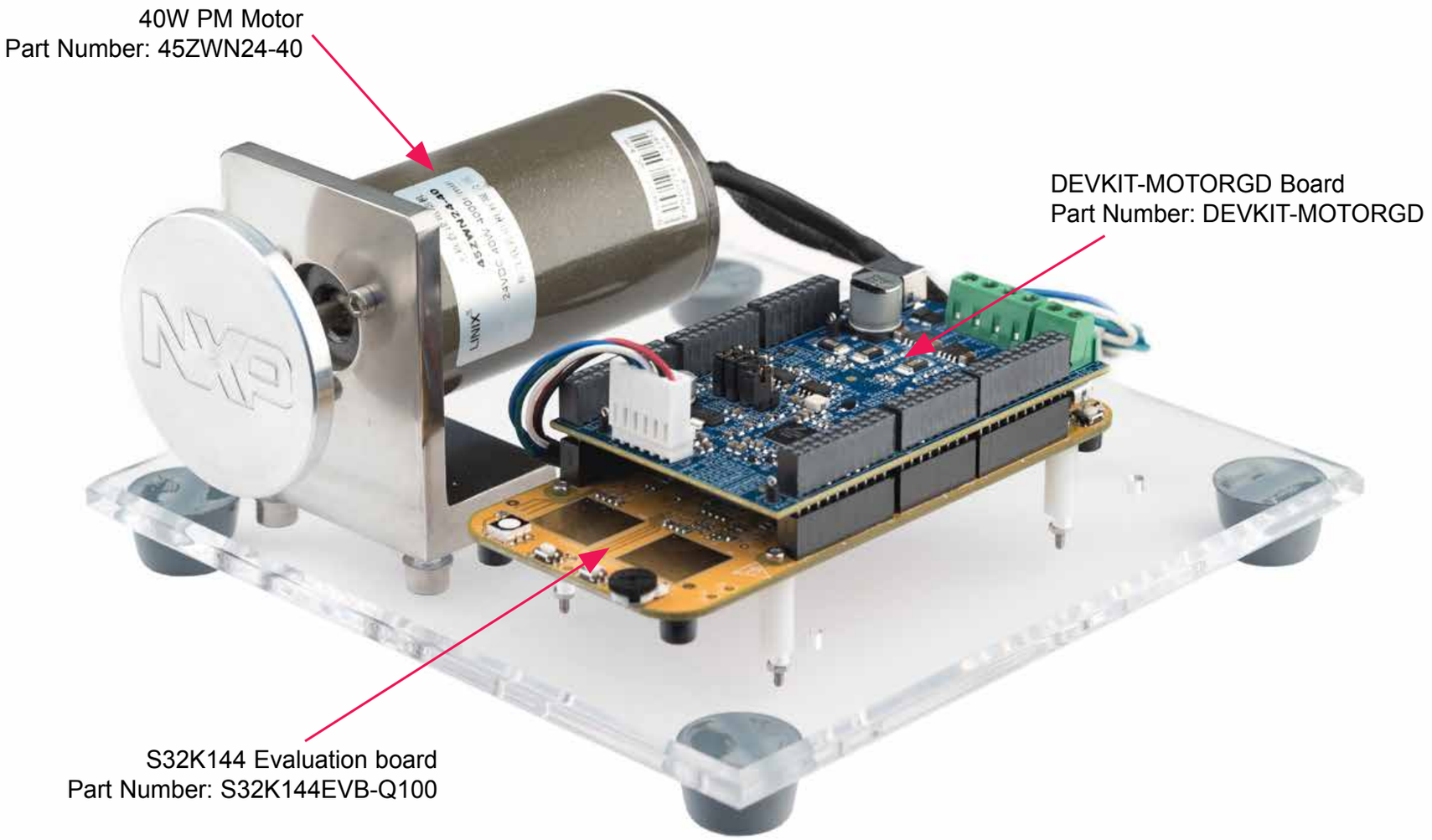


Figure 1: S32K144 Development Kit for 3-phase BLDC

GET TO KNOW THE S32K144EVB

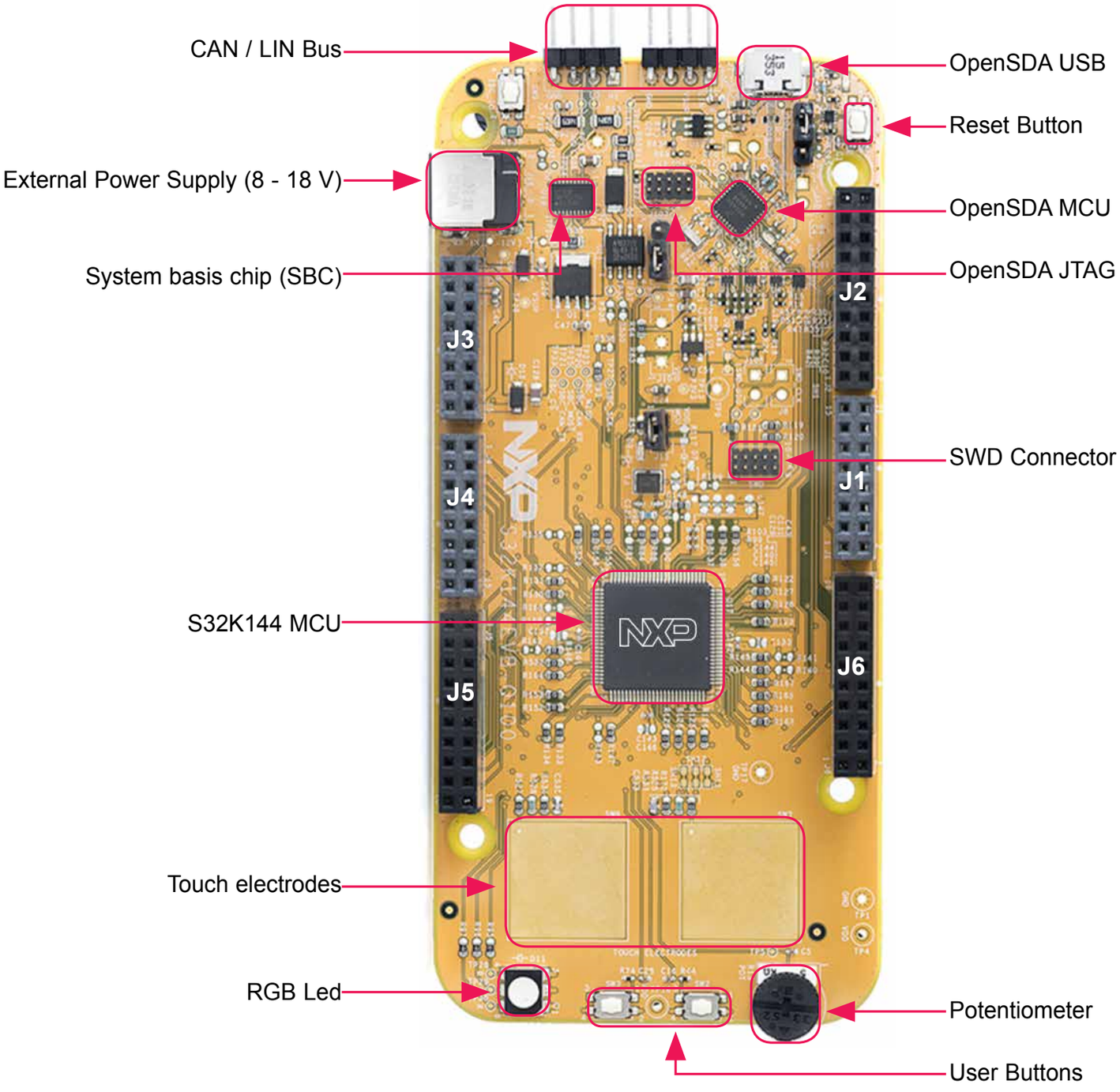


Figure 2: S32K144 Evaluation Board

GET TO KNOW DEVKIT-MOTORGD

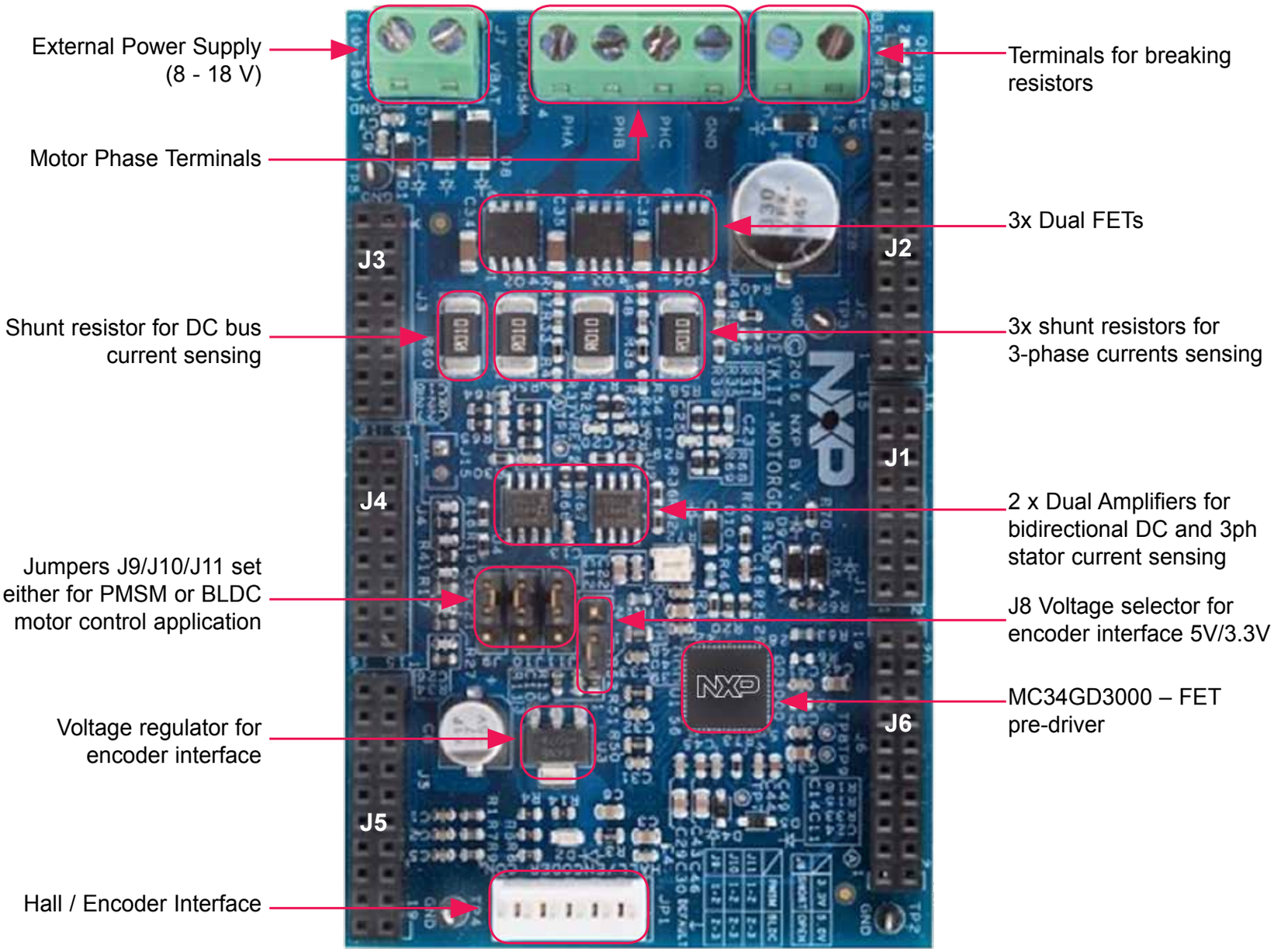
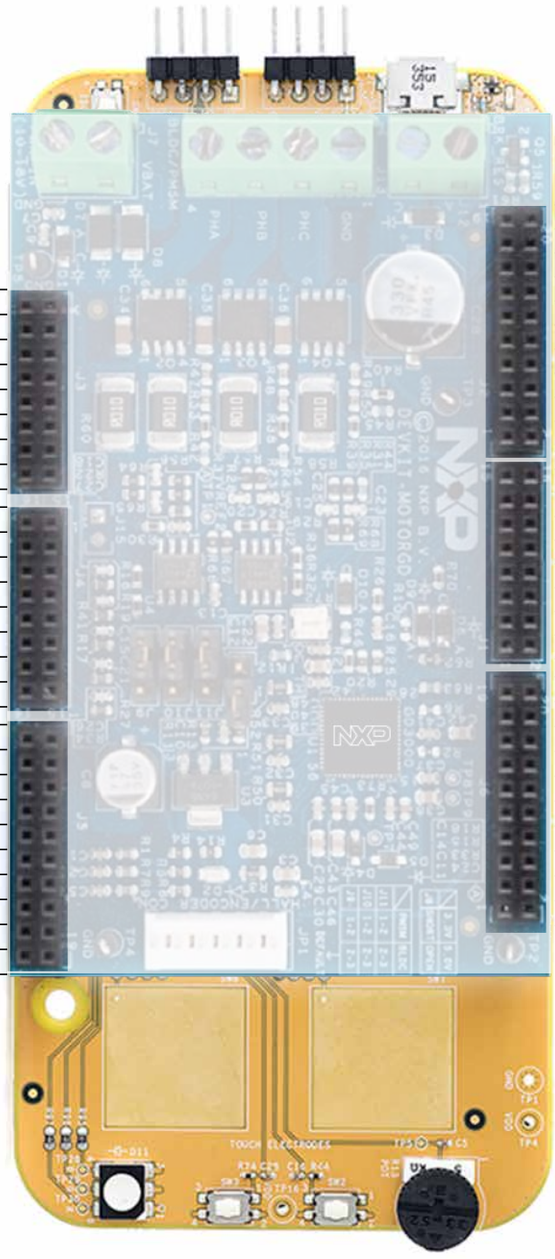


Figure 3: DEVKIT-MOTORGD Board

HEADER/PINOUT

S32K144EVB controls DEVKIT-MOTORGD through inner pins of the I/O headers. Inner pins of the I/O headers are Arduino compatible

DKT-MOTORGD	S32K144EVB	PIN
VDC (10-18V)	VIN (5-12V)	J3-01
MCU_VCC (5V)	IOREF (5V)	J3-03
NC	RESET	J3-05
NC	3V3	J3-07
NC	5V	J3-09
GND	GND	J3-11
GND	GND	J3-13
VDC (10-18V)	VIN (10-18V)	J3-15
DCBI	ADC1_SE6	J4-01
DCBV	ADC1_SE7	J4-03
PHA_I	ADC0_SE4	J4-05
PHB_I	ADC1_SE15	J4-07
PHC_I	ADC0_SE2	J4-09
NC	PTC0	J4-11
NC	PTE2	J4-13
NC	PTE6	J4-15
HALL_A/ENC_A	FTM2_CH1	J5-01
HALL_B/ENC_B	FTM2_CH0	J5-03
HALL_C/INDEX	FTM1_CH1	J5-05
NC	PTA0	J5-07
NC	PTA7	J5-09
NC	PTB13	J5-11
NC	PTC1	J5-13
NC	PTC2	J5-15
NC	NC	J5-17
NC	NC	J5-19



PIN	S32K144EVB	DKT-MOTORGD
J2-19	PTE10	GD_INT
J2-17	PTE11	OC_OUT
J2-15	AREF	NC
J2-13	GND	GND
J2-11	LPSPI0_SCK	SPI_SCLK
J2-09	LPSPI0_SIN	SPI_MISO
J2-07	LPSPI0_SOUT	SPI_MOSI
J2-05	PTB5	SPI_CS_B
J2-03	PTD14	BRAKE_PWM
J2-01	PTD13	NC
J1-15	FTM3_CH5	PWMC_LS
J1-13	FTM3_CH4	PWMC_HS
J1-11	FTM3_CH3	PWMB_LS
J1-09	FTM3_CH2	PWMB_HS
J1-07	FTM3_CH1	PWMA_LS
J1-05	FTM3_CH0	PWMA_HS
J1-03	PTA3	GD_RST
J1-01	PTA2	GD_EN
J6-19	PTD0	NC
J6-17	PTD2	NC
J6-15	PTD9	NC
J6-13	PTD8	NC
J6-11	PTC8	NC
J6-09	PTC9	NC
J6-07	PTD17	NC
J6-05	PTE12	NC
J6-03	PTA8	NC
J6-01	PTA9	NC

Figure 4: S32K144EVB + DEVKIT-MOTORGD pin assignment

MTRDEVKSPNK144 FEATURES

Hardware

- **S32K144EVB**—S32K144 Evaluation board with LIN & CAN connectivity support, OpenSDA programming/ debugging
- **DEVKIT-MOTORGD**—up to 12V/5A 3-phase power stage board based on SMARTMOS GD3000 pre-driver with condition monitoring and fault detection
- **Low Cost PM Motor**—3-phase PM motor equipped with HALL sensor, 24 VDC, 4000 RPM, 40 W, 45ZWN24-40
- **USB cable**
- **12 VDC power supply**

Software

- **Automotive Motor Control Algorithm** —Sensorless / Hall control of the BLDC motor based on Six-step commutation technique ensuring low CPU load
- **Evaluation version of the Automotive Math and Motor Control Library Set** —control algorithm built on blocks of precompiled SW library
- **FreeMASTER and MCAT** Application tuning and variables tracking
- **Design Studio & SDK**—Example software created in the S32 Design Studio for ARM built on S32 SDK software
- **SDK - Processor Expert**—MCU peripherals initialization generated by Processor Expert (PEx)

STEP-BY-STEP INSTALATION INSTRUCTIONS

1 Download Software

Download installation software and documentation at **nxp.com/AutoMCDevKits**.

2 Install S32 Design Studio IDE for ARM

Download and install S32 Design Studio IDE for ARM version 2018.R1 available at **nxp.com/S32DS-Arm**.

3 Install FreeMASTER

Download and install FreeMASTER run-time debugging tool available at **nxp.com/FreeMASTER**.

4 Connect the Motor

Ensure default S32K144EVB and DEVKIT-MOTORGD jumper options (see pages 10 and 11)

5 Connect the Power Supply

Connect the 12 V power supply to the power supply terminals on DEVKIT-MOTORGD board.

Keep the DC supply voltage within the range of 8 to 18 V. The DC power supply voltage affects the maximum motor speed

6 Connect the USB Cable

Connect S32K144EVB to the PC using the USB cable. Allow the PC to automatically configure the USB drivers if needed.

7 Select MCU programming

Select one of the next two steps (8 or 9) for MCU programming.

STEP-BY-STEP INSTRUCTIONS CONTINUED

8 Re-program the MCU using MSD Flash Programmer

Copy & paste or drag & drop the Motorola S-record MTRDEVKSBNK144_S32DS.srec file to the S32K144 EVB disk drive. The SW is directly programmed into the flash memory of the S32K144 MCU and executed automatically.

9 Re-program the MCU using S32 Design Studio

Import the installed application software project in the S32 Design Studio for Arm:

- Start S32 Design Studio application
- Click **File – Import**
- Select General – **Existing Projects into Workspace**
- Navigate to the installed application directory: **MC_DevKits\MTRDEVKSBNK144\sw\MTRDEVKSBNK144_S32DS** and click **OK**
- Click **Finish**
- Click Run – **Debug**

10 FreeMASTER Setup

- Start the FreeMASTER application
- Open FreeMASTER project **MC_DevKits\MTRDEVKSBNK144\sw\MTRDEVKSBNK144_S32DS\FreeMASTER_control\ S32K_BLDC_Sensorless.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 “RS232 UART Communication;COMn; speed = 115200”.

APPLICATION CONTROL

1 Click **App Control tab** in the Motor Control Application Tuning tool (MCAT) tool menu to display the application control page. When the power supply is connected to the DEVKIT-MOTOGD board, application is in **READY** state indicating green LED on S32K144EVB board. RGB LED also indicates:

- **READY, INIT** states lighting green LED,
- **CALIB, ALIGN** states flashing green LED,
- **RUN** state lighting blue LED
- **FAULT** state lighting red LED

2 In case of pending faults, click the fault button **Clear FAULT** on the FreeMASTER MCAT Control Page, or alternatively press and hold **SW2** and **SW3** buttons on S32K144EVB board simultaneously.

3 Start the application by pressing **ON/OFF** button on the FreeMASTER MCAT Control Page or by pressing switch **SW2/SW3** on S32K144EVB to initiate clockwise/ counter clockwise rotor spinning direction.

4 Set required speed by changing the **Speed Required** variable value manually in the variable watch window, by clicking **speed gauge**, or by pressing the switch **SW2/SW3**

5 To stop the application, click the **ON/OFF** button on the FreeMASTER MCAT Control Page or press and hold **SW2** and **SW3** buttons on S32K144EVB board simultaneously.

S32K144EVB JUMPER OPTIONS

JUMPER	OPTION	SETTING	DESCRIPTION
J104	Reset Signal	1-2	Reset signal to OpenSDA, use to enter into OpendSDA Bootloader mode
		2-3	Reset signal direct to the MCU, use to reset S32K144 (default)
J107	Board powering	1-2	S32K144 powered by 12V power source (default)
		2-3	S32K144 powered by USB micro connector
J109/J108	CAN	OPEN	CAN termination resistor is disconnected
		SHORT	CAN terminator resistor is connected (default)

DEVKIT-MOTORGD JUMPER OPTIONS

JUMPER	OPTION	SETTING	DESCRIPTION
J8	HALL/ Encoder interface	Short	Voltage level for HALL/Encoder interface is 3.3V
		Open	Voltage level for HALL/Encoder interface is 5.0V (default)
J9/J10/J11	Motor type	1-2	Bidirectional 3-phase current sensing for PMSM FOC (sinusoidal) motor control
		2-3	3-phase back-EMF voltage sensing for BLDC Six-step (trapezoidal) sensorless motor control (default)

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 at **nxp.com/AutoMCDevKits**.

www.nxp.com

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