FRDM-PWRSTG1EVB evaluation board
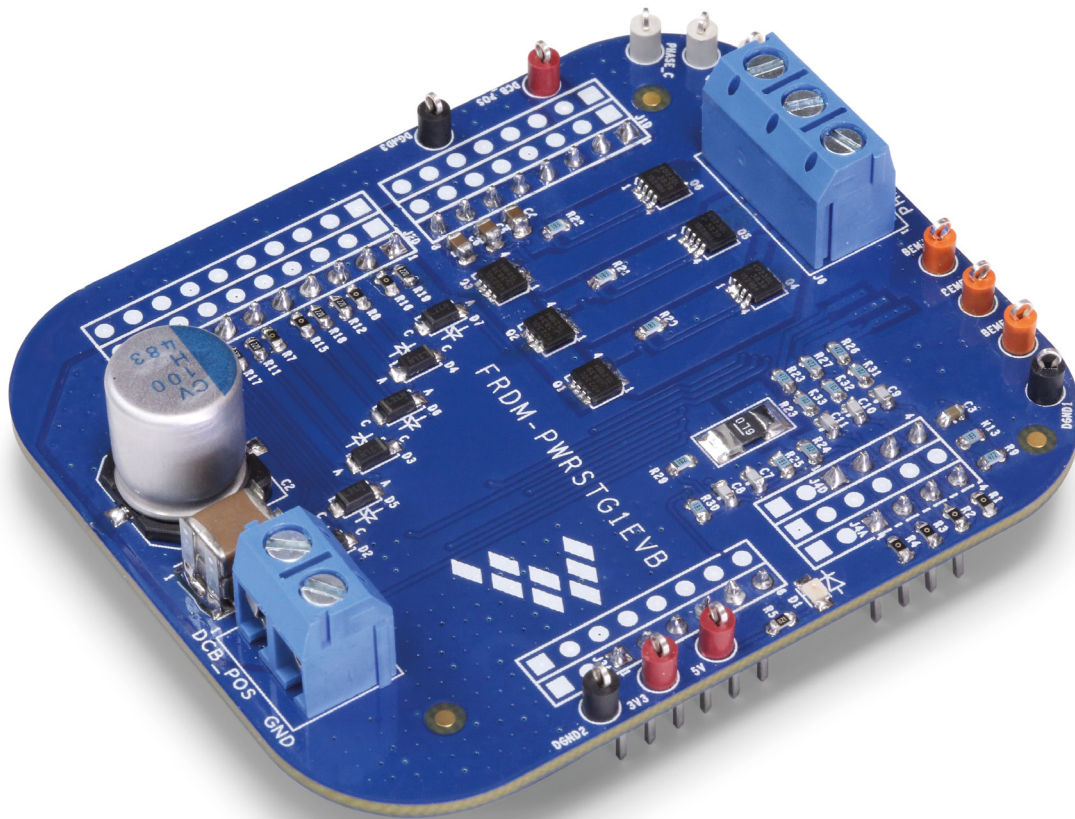

Figure 1. FRDM-PWRSTG1EVB

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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 kit 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. Final device in an application are 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.

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2   Getting started

2.1   Kit contents/packing list

The FRDM-PWRSTG1EVB contents include:

- Assembled and tested evaluation board/module in an anti-static bag
- Warranty card

2.2   Jump start

NXP's analog product development boards help to easily evaluate 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 www.nxp.com/FRDM-PWRSTG
- Look for

↗ Jump Start Your Design

- 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.

2.3   Required equipment and software

To use this kit, you need:

- DC power supply: 5.0 V to 48 V with up to 10 A current handling capability, depending on motor requirements and MOSFET specifications.
- USB standard A (male) to mini or micro (male) cable, depending on which FRDM board is used
- Typical loads (BLDC motor)
- Any compatible FRDM board (see 'Compatible FRDM boards' section)
- A FRDM-GD3000EVB evaluation board to provide the driver and complete the system

2.4   System requirements

The kit requires the following:

- USB-enabled PC with Windows® XP or higher

3   Getting to know the hardware

3.1   Board overview

The FRDM-PWRSTG1EVB evaluation board provides the external MOSFETs needed by the GD3000 three-phase gate driver on the FRDM-GD3000EVB. The EVB is designed for use in conjunction with any compatible FRDM board. It may be used with the FRDM-KL25Z to enable control via the SPIGen GUI.

3.2   Board features

The board allows evaluation of NXP GD3000 and all its functions by providing access to the external MOSFETs required for the system. The board features the following:

- Compatibility with select NXP Freedom development platforms
- Test points to allow signal probing
- External MOSFETs to be used in conjunction with the GD3000
- LEDs to indicate the supply status

3.3   Block diagram

A simplified version of the hardware block diagram is shown in Figure 2. It shows only the major components and features of the evaluation board and the entire system. For specifics, refer to the schematic.
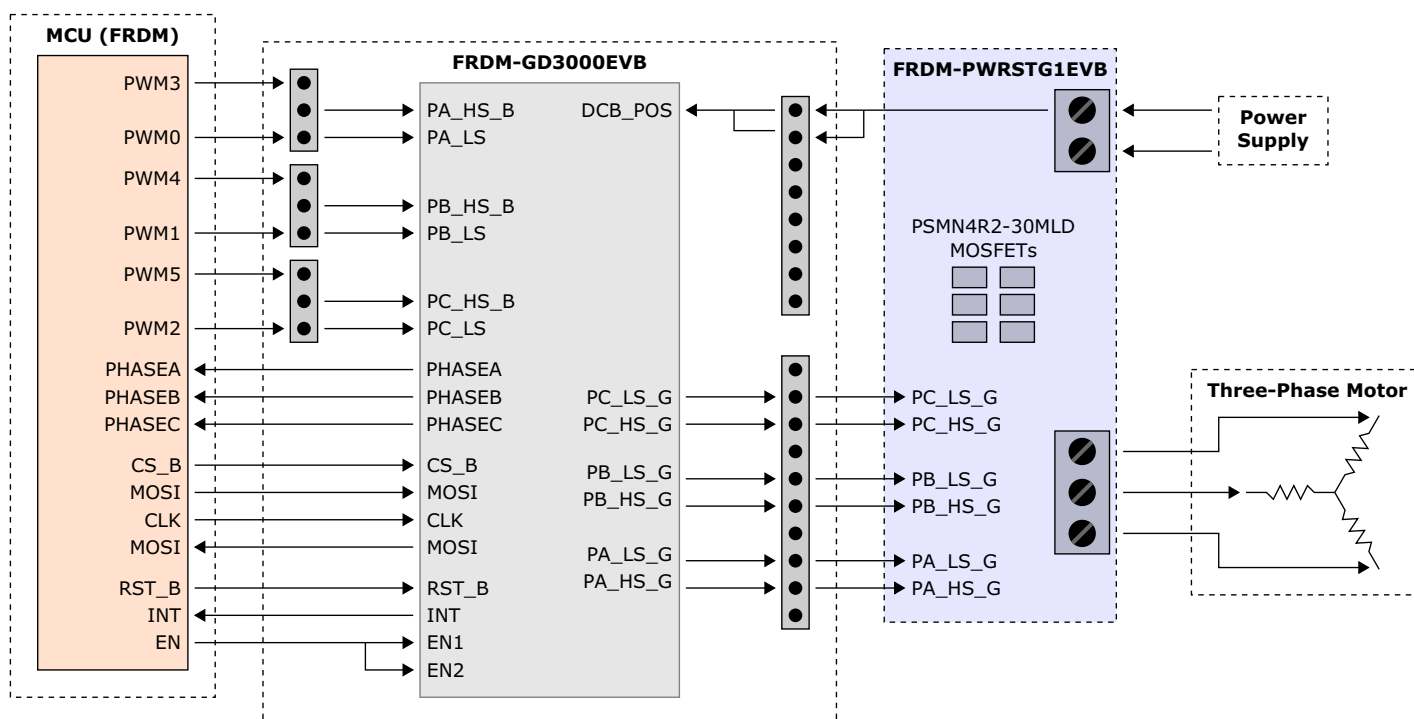

Figure 2. Block diagram

3.4   Board description

Figure 3 describes the main blocks of the evaluation board.
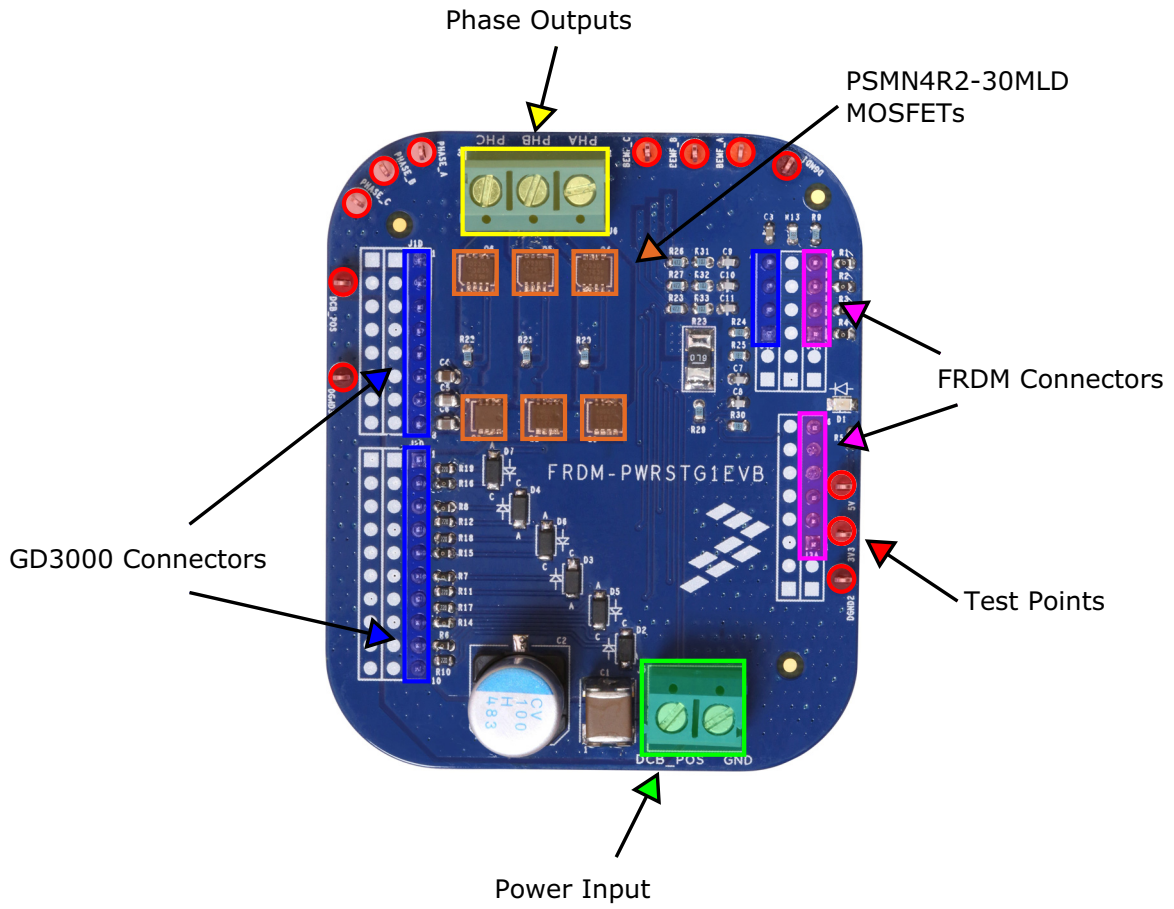
Figure 3. Board description

Table 1. Board description

Name	Description
PSMN4R2-30MLD	N-channel 30 V, 4.2 mΩ logic level MOSFET
Jumpers	Jumpers for configuring the board for various modes of operation
Power and ground inputs	Power supply terminals to connect the battery/power supplies with the board
Test points	Test points to probe various signals
Output terminal	Output connector to connect a load to the FRDM-PWRSTG1EVB output
GD3000 connectors	Connectors to attach to a FRDM-GD3000EVB board

3.5 LED display

The following LEDs are provided as visual output devices for the evaluation board:
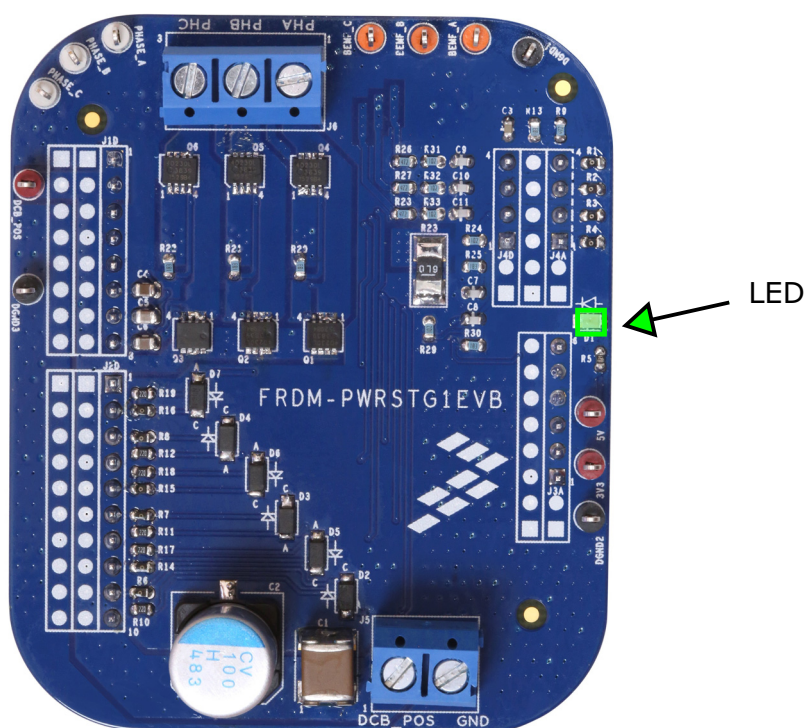
Figure 4. LED display

Table 2. LED display

Name	Description
D1	GREEN LED indicates when 5.0 V from the FRDM board is present (LED will light up only if the FRDM MCU board is being powered by a USB cable).

3.6 Input signal definition

The board has the following input signals used to drive the MOSFETs.

Table 3. Input signals

Input name	Description
AMP_OUT	Output of the current-sensing amplifier (from MCU, then from the FRDM-GD3000EVB)
PC_LS_G	Gate drive for output phase C low-side (from FRDM-GD3000EVB)
PC_HS_G	Gate drive for output phase C high-side (from FRDM-GD3000EVB)
PB_LS_G	Gate drive for output phase B low-side (from FRDM-GD3000EVB)
PB_HS_G	Gate drive for output phase B high-side (from FRDM-GD3000EVB)
PA_LS_G	Gate drive for output phase A low-side (from FRDM-GD3000EVB)
PA_HS_G	Gate drive for output phase A high-side (from FRDM-GD3000EVB)

3.7 Output signal definition

The board has the following output signals which are used to communicate with an MCU board and the FRDM-GD3000EVB.

Table 4. Output signals

Output name	Description
OC_TH	Threshold of the overcurrent detector (to FRDM-GD3000EVB)
AMP_P	Non-inverting input of the current-sensing amplifier (to FRDM-GD3000EVB)
AMP_N	Inverting input of the current-sensing amplifier (to FRDM-GD3000EVB)
PA_HS_S	Source connection for phase A high-side FET (to FRDM-GD3000EVB)
PB_HS_S	Source connection for phase B high-side FET (to FRDM-GD3000EVB)
PC_HS_S	Source connection for phase C high-side FET (to FRDM-GD3000EVB)
PA_BOOT	Bootstrap capacitor for phase A (to FRDM-GD3000EVB)
PB_BOOT	Bootstrap capacitor for phase B (to FRDM-GD3000EVB)
PC_BOOT	Bootstrap capacitor for phase C (to FRDM-GD3000EVB)
PA_LS_S	Source connection for phase A low-side FET (to FRDM-GD3000EVB)
PB_LS_S	Source connection for phase B low-side FET (to FRDM-GD3000EVB)
PC_LS_S	Source connection for phase C low-side FET (to FRDM-GD3000EVB)

3.8 Test point definitions

The following test points, shown in Figure 5, provide access to various signals to and from the board.
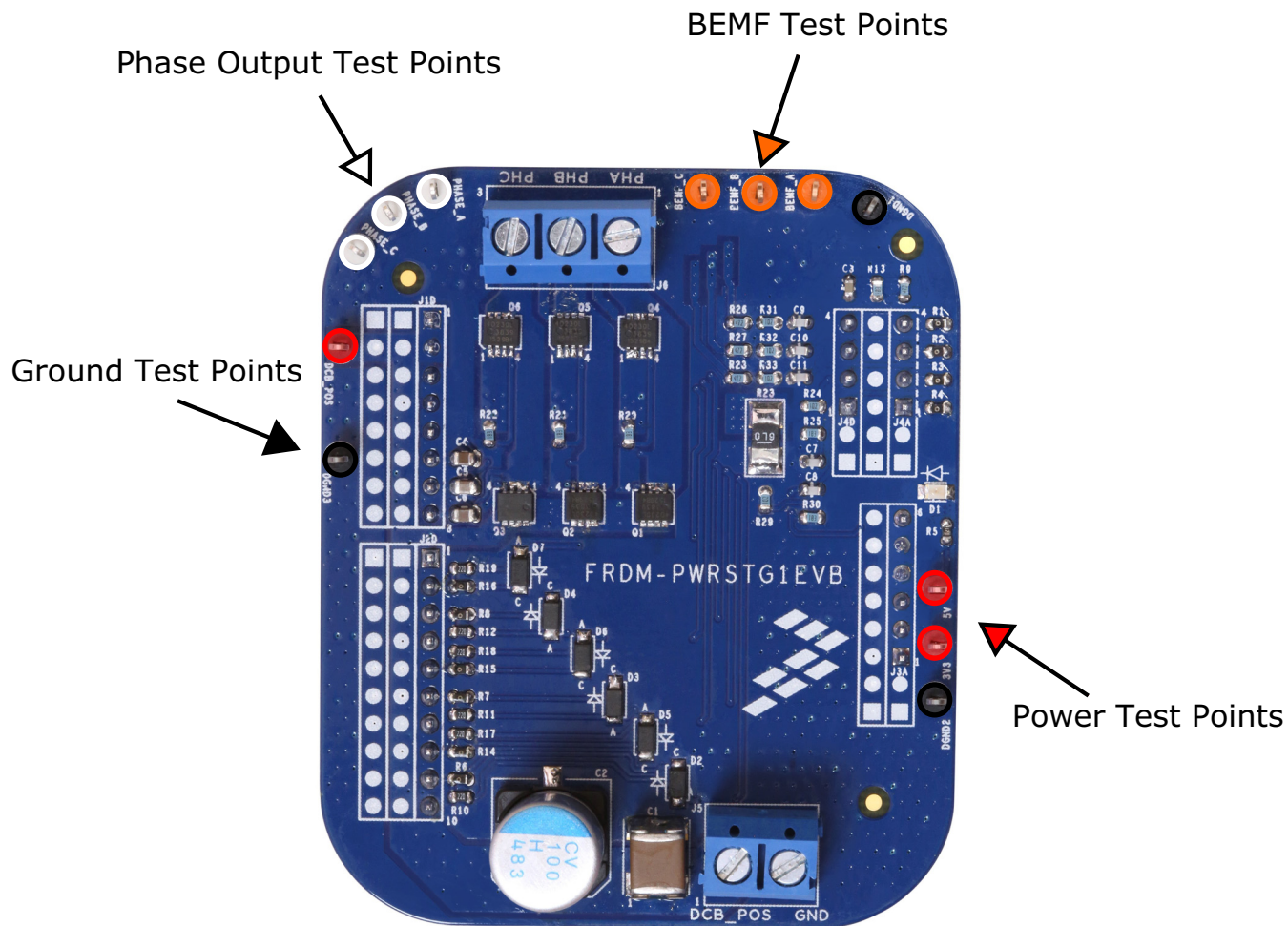
Figure 5. Test points

Table 5. Test point definitions

Test point name	Signal name	Description
5V	5V	5.0 V coming from the FRDM board
3V3	3V3	3.3 V coming from the FRDM board
DCB_POS	DCB_POS	Power supply input for gate drives
DGND1	GND	Ground
DGND2	GND	Ground
DGND3	GND	Ground
PA_BEMF	BEMF_A	BEMF for phase A

Table 5. Test point definitions (continued)

PB_BEMF	BEMF_B	BEMF for phase B
PC_BEMF	BEMF_C	BEMF for phase C
PHASE_A	PA_HS_S	Source connection for phase A high-side FET (PHASE A output)
PHASE_B	PB_HS_S	Source connection for phase B high-side FET (PHASE B output)
PHASE_C	PC_HS_S	Source connection for phase C high-side FET (PHASE C output)

3.9   Screw terminal connections

The FRDM-PWRSTG1EVB board features screw terminal connections to allow easy access to output signals and supply rails for both the FRDM-PWRSTG1EVB and FRDM-GD3000EVB. Figure 6 shows the board locations and names of the screw terminals.
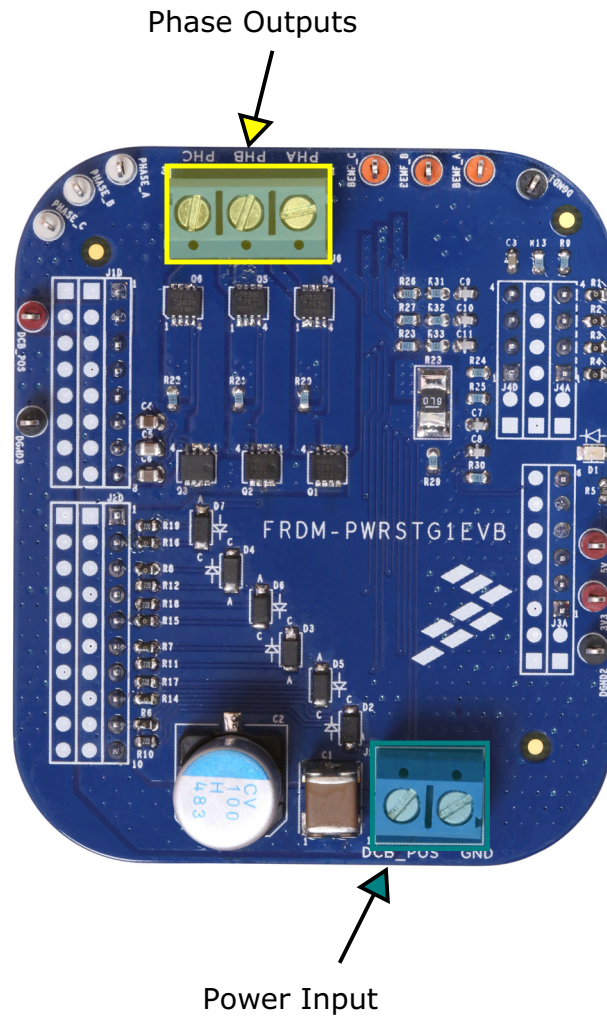
Figure 6. Screw terminals

3.9.1   Input and output connectors

The board has one input connector providing access to the following signals:

Table 6. Input connector

Pin	Schematic label	Signal name
1	J5	DCB_POS
2		GND

The board has one output connector providing access to the following signals:

Table 7. Output connector

Pin	Schematic label	Signal name
1	J6	PA_HS_S
2		PB_HS_S
3		PC_HS_S

3.10 Compatible FRDM boards

The following FRDM boards are guaranteed to be compatible with this evaluation board. If using a FRDM board not listed, check the pin assignments to make sure the FRDM board is compatible with this evaluation board.

Table 8. Compatible Freedom development boards

FRDM board name	Functionality
FRDM-K22F	Partial
FRDM-K64F	Partial
FRDM-K20D50M	Partial
FRDM-KE02Z	Partial
FRDM-KE02Z40M	Partial
FRDM-KE04Z	<none>
FRDM-KE06Z	Partial
FRDM-KL02Z	Partial
FRDM-KL03Z	Partial
FRDM-KL05Z	Partial
FRDM-KL25Z	Partial
FRDM-KL26Z	Partial
FRDM-KL27Z	Partial
FRDM-KL43Z	Partial
FRDM-KL46Z	Partial
FRDM-KV10Z	Full [1]
FRDM-KV31F	Full

Notes:
1. On the FRDM-KV10Z, the 0 Ohm resistor going to pin 40 on the MCU (R62) must be removed to allow access to the EN signal.

3.11 Pin assignments

Table 9 provides information about the connectors and pin assignments of the FRDM-KL25Z, FRDM-KV10Z, and FRDM-KV31F to the FRDM-PWRSTG1EVB and FRDM-GD3000EVB. The FRDM-KL25Z is generally used as a Freedom SPI dongle (FSD), but can also be used as a regular microcontroller, although with limited functionality. The FRDM-KV10Z and FRDM-KV31F can be used as regular MCU boards and provide full functionality. Grey cells indicate pins that are not connected. On the FRDM-KV10Z, the 0 Ohm resistor going to pin 40 on the MCU (R62) must be removed to allow access to the EN signal.

Table 9. Arduino connector pin assignments ('A' suffix)

FRDM-GD3000EVB			FRDM-PWRSTG1EVB			FRDM-KL25Z			FRDM-KV10Z			FRDM-KV31F		
Header	Pin	Name	Header	Pin	Name	Header	Pin	Port	Header	Pin	Port	Header	Pin	Port
J1A	1	INT	J1A	1	N/A	J1	2	PTA1	J1	2	PTD0	J1	2	PTE1
J1A	2	OC_OUT	J1A	2	N/A	J1	4	PTA2	J1	4	PTD1	J1	4	PTE0
J1A	3	<NC>	J1A	3	N/A	J1	6	PTD4	J1	6	-	J1	6	PTD5
J1A	4	TOTEM_PA	J1A	4	N/A	J1	8	PTA12	J1	8	PTE24	J1	8	PTE6
J1A	5	TOTEM_PB	J1A	5	N/A	J1	10	PTA4	J1	10	PTB0	J1	10	PTC13
J1A	6	TOTEM_PC	J1A	6	N/A	J1	12	PTA5	J1	12	PTE25	J1	12	PTA12
J1A	7	<NC>	J1A	7	N/A	J1	14	PTC8	J1	14	PTE29	J1	14	PTC3
J1A	8	EN	J1A	8	N/A	J1	16	PTC9	J1	16	PTC7	J1	16	PTC6
J2A	1	<reserved>	J2A	1	N/A	J2	2	PTA13	J2	2	PTD2	J2	2	PTA0
J2A	2	RST_B	J2A	2	N/A	J2	4	PTD5	J2	4	PTA4	J2	4	PTA1
J2A	3	CS	J2A	3	N/A	J2	6	PTD0	J2	6	PTD6	J2	6	PTC19
J2A	4	MOSI	J2A	4	N/A	J2	8	PTD2	J2	8	PTC6	J2	8	PTC18
J2A	5	MISO	J2A	5	N/A	J2	10	PTD3	J2	10	PTD3	J2	10	PTC17
J2A	6	CLK	J2A	6	N/A	J2	12	PTD1	J2	12	PTC5	J2	12	PTC16
J2A	7	GND	J2A	7	N/A	J2	14	GND	J2	14	GND	J2	14	GND
J2A	8	AREF	J2A	8	N/A	J2	16	VREFH	J2	16	AREF	J2	16	VREF
J2A	9	<reserved>	J2A	9	N/A	J2	18	PTE0	J2	18	PTB3	J2	18	PTC1
J2A	10	<reserved>	J2A	10	N/A	J2	20	PTE1	J2	20	PTB2	J2	20	PTC0
J3A	8	VIN	J3A	8	<NC>	J3	16	P5-9V_VIN	J3	16	P5-9V_VIN	J3	16	P5-9V_VIN
J3A	7	GND	J3A	7	GND	J3	14	GND	J3	14	GND	J3	14	GND
J3A	6	GND	J3A	6	GND	J3	12	GND	J3	12	GND	J3	12	GND
J3A	5	5V	J3A	5	5V	J3	10	P5V_USB	J3	10	P5V_USB	J3	10	P5V_USB
J3A	4	3V3	J3A	4	3V3	J3	8	P3V3	J3	8	P3V3	J3	8	P3V3
J3A	3	<NC>	J3A	3	<NC>	J3	6	RESET/PTA20	J3	6	RST_TGTMCU_B	J3	6	RST_TGTMCU_B
J3A	2	IOREF	J3A	2	<NC>	J3	4	P3V3	J3	4	P3V3	J3	4	P3V3
J4A	6	<reserved>	J4A	4	AN5	J4	12	PTC1	J4	12	PTB2	J4	12	PTC10
J4A	5	<reserved>	J4A	3	AN4	J4	10	PTC2	J4	10	PTB3	J4	10	PTC11
J4A	4	<reserved>	J4A	2	AN3	J4	8	PTB3	J4	8	PTE21	J4	8	PTC0
J4A	3	<reserved>	J4A	1	AN2	J4	6	PTB2	J4	6	PTE20	J4	6	PTB11
J4A	2	<reserved>	J4A	-	N/A	J4	4	PTB1	J4	4	PTE16	J4	4	PTC9
J4A	1	<reserved>	J4A	-	N/A	J4	2	PTB0	J4	2	PTC0	J4	2	PTC8

Table 10. MCU connector pin assignments ('B' suffix)

FRDM-GD3000EVB			FRDM-PWRSTG1EVB			FRDM-KL25Z			FRDM-KV10Z			FRDM-KV31F		
Header	Pin	Name	Header	Pin	Name	Header	Pin	Port	Header	Pin	Port	Header	Pin	Port
J1B	1	N/A	J1B	1	N/A	J1	1	PTC7	J1	1	PTE24	J1	1	PTC12
J1B	2	N/A	J1B	2	N/A	J1	3	PTC0	J1	3	PTD7	J1	3	PTA13
J1B	3	N/A	J1B	3	N/A	J1	5	PTC3	J1	5	PTE25	J1	5	PTC15
J1B	4	N/A	J1B	4	N/A	J1	7	PTC4	J1	7	PTD0	J1	7	PTC16
J1B	5	N/A	J1B	5	N/A	J1	9	PTC5	J1	9	PTD1	J1	9	PTC17
J1B	6	N/A	J1B	6	N/A	J1	11	PTC6	J1	11	PTB0	J1	11	PTE2
J1B	7	N/A	J1B	7	N/A	J1	13	PTC10	J1	13	PTE29	J1	13	PTE3
J2B	1	N/A	J2B	1	N/A	J2	1	PTC12	J2	1	PTE18	J2	1	<NC>
J2B	2	N/A	J2B	2	N/A	J2	3	PTC13	J2	3	PTB1	J2	3	<NC>
J2B	3	N/A	J2B	3	N/A	J2	5	PTC16	J2	5	PTE19	J2	5	<NC>
J2B	4	N/A	J2B	4	N/A	J2	7	PTC17	J2	7	PTE17	J2	7	<NC>
J2B	5	N/A	J2B	5	N/A	J2	9	PTA16	J2	9	PTE30	J2	9	<NC>
J2B	6	N/A	J2B	6	N/A	J2	11	PTA17	J2	11	PTB3	J2	11	<NC>
J2B	7	N/A	J2B	7	N/A	J2	13	PTE31	J2	13	PTC6	J2	13	<NC>
J2B	8	N/A	J2B	8	N/A	J2	15	<NC>	J2	15	PTB0	J2	15	<NC>
J2B	9	N/A	J2B	9	N/A	J2	17	PTC6	J2	17	PTE29	J2	17	<NC>
J2B	10	N/A	J2B	10	N/A	J2	19	PTD7	J2	19	PTC7	J2	19	<NC>
J3B	8	PWM2	J3B	8	N/A	J3	15	PTE5	J3	15	PTC1	J3	15	PTC1
J3B	7	PWM1	J3B	7	N/A	J3	13	PTE4	J3	13	PTC2	J3	13	PTC2
J3B	6	PWM0	J3B	6	N/A	J3	11	PTE3	J3	11	PTC3	J3	11	PTC5
J3B	5	PWM3	J3B	5	N/A	J3	9	PTE2	J3	9	PTC4	J3	9	PTC4
J3B	4	PWM4	J3B	4	N/A	J3	7	PTB11	J3	7	PTD4	J3	7	PTD4
J3B	3	PWM5	J3B	3	N/A	J3	5	PTB10	J3	5	PTD5	J3	5	PTD5
J3B	2	N/A	J3B	2	N/A	J3	3	PTB9	J3	3	PTA1	J3	3	PTB18
J3B	1	N/A	J3B	1	N/A	J3	1	PTB8	J3	1	PTA2	J3	1	PTB19
J4B	6	N/A	J4B	6	N/A	J4	11	PTE30	J4	11	PTE30	J4	11	DAC0_OUT
J4B	5	N/A	J4B	5	N/A	J4	9	PTE29	J4	9	PTC5	J4	9	PTB21
J4B	4	N/A	J4B	4	N/A	J4	7	PTE23	J4	7	PTB2	J4	7	ADC1_DM0
J4B	3	N/A	J4B	3	N/A	J4	5	PTE22	J4	5	PTB3	J4	5	ADC0_DM0
J4B	2	N/A	J4B	2	N/A	J4	3	PTE21	J4	3	PTE21	J4	3	ADC0_DM1
J4B	1	N/A	J4B	1	N/A	J4	1	PTE20	J4	1	PTE20	J4	1	ADC0_DP1

Table 11. Gate drive connector pin assignments ('D' suffix)

FRDM-GD3000EVB			FRDM-PWRSTG1EVB			FRDM-KL25Z			FRDM-KV10Z			FRDM-KV31F		
Header	Pin	Name	Header	Pin	Name	Header	Pin	Port	Header	Pin	Port	Header	Pin	Port
J1D	1	DCB_POS	J1D	1	DCB_POS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J1D	2	DCB_POS	J1D	2	DCB_POS	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J1D	3	PA_HS_S	J1D	3	PA_HS_S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J1D	4	PB_HS_S	J1D	4	PB_HS_S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J1D	5	PC_HS_S	J1D	5	PC_HS_S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J1D	6	PA_BOOT	J1D	6	PA_BOOT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J1D	7	PB_BOOT	J1D	7	PB_BOOT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J1D	8	PC_BOOT	J1D	8	PC_BOOT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	1	PC_LS_S	J2D	1	PC_LS_S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	2	PC_LS_G	J2D	2	PC_LS_G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	3	PC_HS_G	J2D	3	PC_HS_G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	4	PB_LS_S	J2D	4	PB_LS_S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	5	PB_LS_G	J2D	5	PB_LS_G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	6	PB_HS_G	J2D	6	PB_HS_G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	7	PA_LS_S	J2D	7	PA_LS_S	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	8	PA_LS_G	J2D	8	PA_LS_G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	9	PA_HS_G	J2D	9	PA_HS_G	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J2D	10	<NC>	J2D	10	<NC>	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J3D	8	N/A	J3D	8	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J3D	7	N/A	J3D	7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J3D	6	N/A	J3D	6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J3D	5	N/A	J3D	5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J3D	4	N/A	J3D	4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J3D	3	N/A	J3D	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J3D	2	N/A	J3D	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J3D	1	N/A	J3D	1	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J4D	6	OC_TH	J4D	4	OC_TH	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J4D	5	AMP_P	J4D	3	AMP_P	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J4D	4	AMP_N	J4D	2	AMP_N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J4D	3	AMP_OUT	J4D	1	AMP_OUT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J4D	2	<reserved>	J4D	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
J4D	1	<reserved>	J4D	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

4 Installing the software and setting up the hardware

4.1 General hardware setup

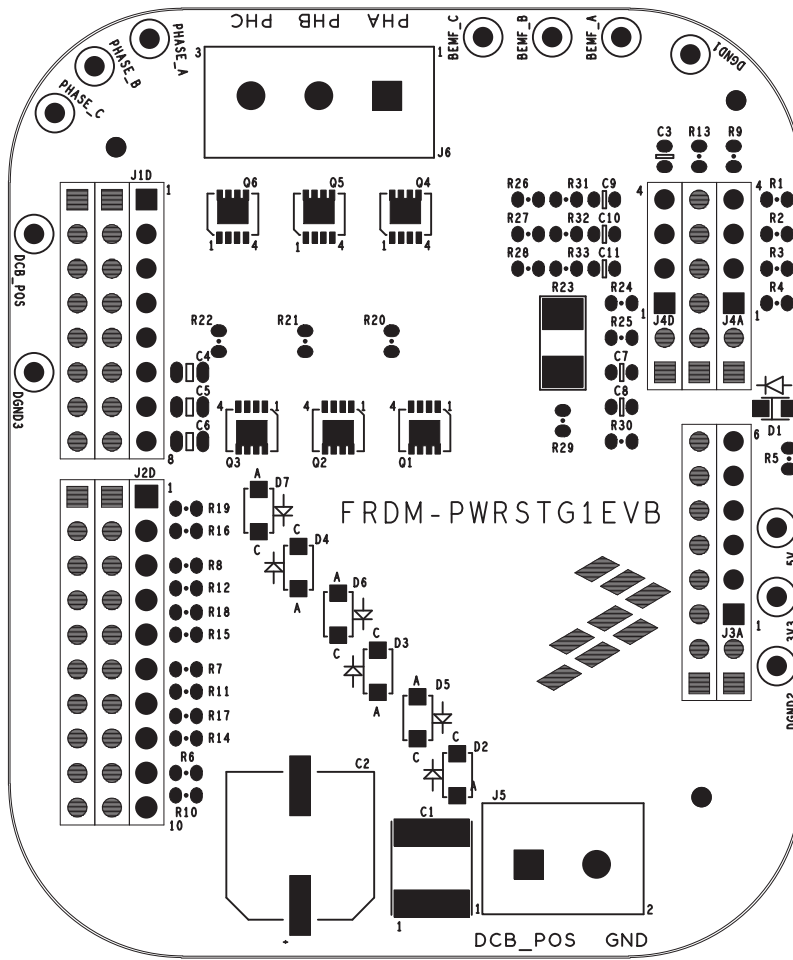For information about the hardware setup, see the user guide for the FRDM-GD3000EVB.

5   Schematic

Figure 7. Schematic

6   Silkscreen

Figure 8. Silkscreen

7   Bill of materials

Table 12. Bill of materials[2]

Item	Qty	Schematic label	Value	Description	Part number	Assy opt
Capacitors						
1	1	C1	22 µF	CAP CER 22 µF 63 V 20% X7R SMD	KRM55WR71J226MH01K	
2	1	C2	100 µF	CAP ALEL ESR 0.027 Ω 100 µF 50 V 20% -- SMD	PCV1H101MCL2GS	
3	1	C3	0.1 µF	CAP CER 0.1 µF 50 V 10% X7R 0603	06035C104KAT2A	
4	3	C4, C5, C6	1 µF	CAP CER 1 µF 50 V 10% X7R AEC-Q200 0805	GCM21BR71H105KA03	
5	5	C7, C8, C9,C10, C11	390 pF	CAP CER 390 pF 50 V 5% C0G 0603	GRM1885C1H391JA01	
Diodes						
6	1	D1		LED GREEN SGL 2.2 V 20 MA 0805	HSMG-C170	
7	6	D2, D3, D4, D5, D6, D7		DIODE SCH PWR RECT 1 A 20 V SMT	MBR120LSFT3G	
Resistors						
8	10	R1, R2, R3, R4, R6,R7, R8, R14, R15,R16	0 Ω	RES MF ZERO Ω 1/10 W -- 0603	CR0603J/000ELF	
9	1	R5	820 Ω	RES MF 820 Ω 1/10 W 5% 0603	CR0603-JW-821ELF	
10	4	R9, R26, R27, R28	4.7 KΩ	RES MF 4.70 KΩ 1/10 W 1% 0603	RK73H1JTTD4701F	
11	6	R10, R11, R12, R17, R18, R19	22 Ω	RES MF 22 Ω 1/10 W 5% 0603	RK73B1JTTD220J	
12	6	R13, R20, R21, R22, R25,R30	18 KΩ	RES MF 18.0 KΩ 1/10 W 1% AEC-Q200 0603	RK73H1JTTD1802F	
13	1	R23	0.006 Ω	RES MF 0.006 Ω 1/2 W 1% AEC-Q200 2010	WSL20106L000FEA	
14	5	R24, R29, R31, R32, R33	1 KΩ	RES MF 1.00 KΩ 1/10 W 1% 0603	RK73H1JTTD1001F	
Switches, connectors, jumpers, and test points						
15	1	J5		CON 1X2 TB TH 5 MM SP 406H SN 138L	OSTTC020162	
16	1	J6		CON 1X3 TB TH 5 MM SP 402H SN 138L	OSTTC030162	
17	1	J1D		HDR 1X8 TH 100 MIL SP 343H SN 100L	TSW-108-07-T-S	
18	1	J2D		HDR 1X10 TH 100 MIL SP 343H SN 100L	TSW-110-07-T-S	
19	1	J3A		HDR 1X6 TH 100 MIL SP 330H SN 100L	TSW-106-07-T-S	
20	2	J4D, J4A		HDR 1X4 TH 100 MIL SP 338H SN 100L	TSW-104-07-T-S	
21	3	BEMF_C, BEMF_B, BEMF_A		TEST POINT ORANGE 40 MIL DRILL 180 MIL TH	5003	
22	3	5V, 3V3, DCB_POS		TEST POINT RED 40 MIL DRILL 180 MIL TH 109L	5000	
23	3	DGND1, DGND2, DGND3		TEST POINT BLACK 40 MIL DRILL 180 MIL TH 109L	5001	
24	3	PHASE_C, PHASE_B, PHASE_A		TEST POINT WHITE 40 MIL DRILL 180 MIL TH 109L	5002	

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Table 12. Bill of materials[2]

Item	Qty	Schematic label	Value	Description	Part number	Assy opt
Transistors						
25	6	Q1, Q2, Q3, Q4, Q5, Q6		TRAN NMOS PWR 30V 70A LFPAK33 - NXP SEMICONDUCTORS	PSMN4R2-30MLD	(3)

Notes:

2. NXP does not assume liability, endorse, or warrant components from external manufacturers that are referenced in circuit drawings or tables. While NXP offers component recommendations in this configuration, it is the customer's responsibility to validate their application.
3. **Critical components.** For critical components, it is vital to use the manufacturer listed.

8 Accessory item bill of materials

Table 13. Bill of materials [4]

Item	Qty.	Part number	Description
1	1	FRDM-Kxxxx MCU Board	Any compatible FRDM board
2	1	FRDM-GD3000EVB	The GD3000 board having the three phase pre driver

Notes:

4. NXP does not assume liability, endorse, or warrant components from external manufacturers that are referenced in circuit drawings or tables. While NXP offers component recommendations in this configuration, it is the customer's responsibility to validate their application.

9   References

Following are URLs to obtain information on related NXP products and application solutions:

NXP.com support pages	Description	URL
FRDM-PWRSTG	Tool Summary Page	www.nxp.com/FRDM-PWRSTG
FRDM-KL25Z	Tool Summary Page	www.nxp.com/FRDM-KL25Z
FRDM-KV10Z	Tool Summary Page	www.nxp.com/FRDM-KV10Z
FRDM-KV31F	Tool Summary Page	www.nxp.com/FRDM-KV31F

9.1   Support

Visit www.nxp.com/support for a list of phone numbers within your region.

9.2   Warranty

Visit www.nxp.com/warranty to submit a request for tool warranty.

10   Revision history

Revision	Date	Description of Changes
1.0	10/2015	• Initial release
2.0	11/2015	• Updated description in Table 2 • Updated Figure 7
	11/2015	• Fixed typo in Table 9 and Table 10
3.0	6/2016	• Updated Figure 2 and Figure 3 • Added On the FRDM-KV10Z, the 0 Ohm resistor going to pin 40 on the MCU (R62) must be removed to allow access to the EN signal. for note [1] and to Pin assignments on page 12. • Updated to NXP form and style.

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