# EVQ6541A-QK-00A

## 40V, 8A, Three-Phase BLDC Motor Driver with High-Side and Low-Side Logic Inputs Evaluation Board

## DESCRIPTION

The EVQ6541A-QK-00A is an evaluation board designed to demonstrate the capabilities of the MPQ6541A, a three-phase brushless DC (BLDC) motor driver. It operates from a wide 4.75V to 40V input voltage range.

The MPQ6541A has three integrated half-bridges consisting of six N-channel power MOSFETs. The rotor position information is provided by the Hall sensors assembled in the motor. The driver control signals are generated via an external controller, such a microcontroller unit (MCU) or field-programmable gate array (FPGA).

The MPQ6541A is available in a QFN-26 (6mmx6mm) package.

## ELECTRICAL SPECIFICATIONS

| Parameter | Symbol | Value | Units |
|---|---|---|---|
| Input voltage | $V_{IN}$ | 4.75 to 40 | V |
| Maximum output current | $I_{OUT_MAX}$ | 8 | A |
| Reference voltage | $V_{REF}$ | 3.3 or 5 | V |
| Logic input voltage | $V_{3P3}$ | 3.3 or 5 | V |

## FEATURES

- Wide 4.75V to 40V Operating Input Range
- Integrated Bidirectional Current-Sense Amplifiers
- Supports 100% Duty Cycle Operation
- High-Side (HS) and Low-Side (LS) Logic Inputs
- Over-Current Protection (OCP) and Over-Temperature Protection (OTP)
- Fault Indication

## APPLICATIONS

- Three-Phase Brushless DC (BLDC) Motors
- Permanent Magnet Synchronous Motors (PMSMs)
- Power Drills
- Impact Drivers

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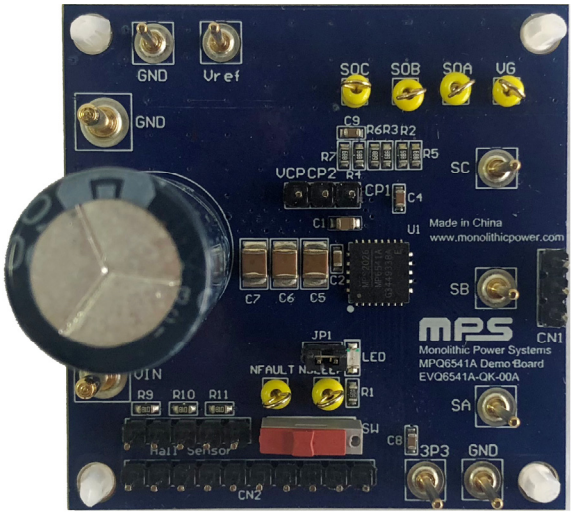
## EVQ6541A-QK-00A EVALUATION BOARD




**LxW (5.08cmx5.08cm)**

| Board Number | MPS IC Number |
|---|---|
| EVQ6541A-QK-00A | MPQ6541AGQKTE |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## QUICK START GUIDE

1. Preset the power supply between 4.75V and 40V, then turn off the power supply.
2. Connect the power supply terminals to:
   a. Positive (+): VIN
   b. Negative (-): GND
3. Switch SW1 to position 1 (left) to turn the motor driver on.
4. Apply a 3.3V or 5V constant voltage to the 3P3 pin.
5. To set the current-sense output reference voltage ($V_{REF}$), apply a 3.3V or 5V constant voltage to the VREF pin.
6. Connect the motor driver's Hall signals to the Hall sensor connector.
7. Connect the driver control signals (generated by the external controller) to the CN2 connector.
8. After making the connections, turn on the power supply.


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# EVALUATION BOARD SCHEMATIC

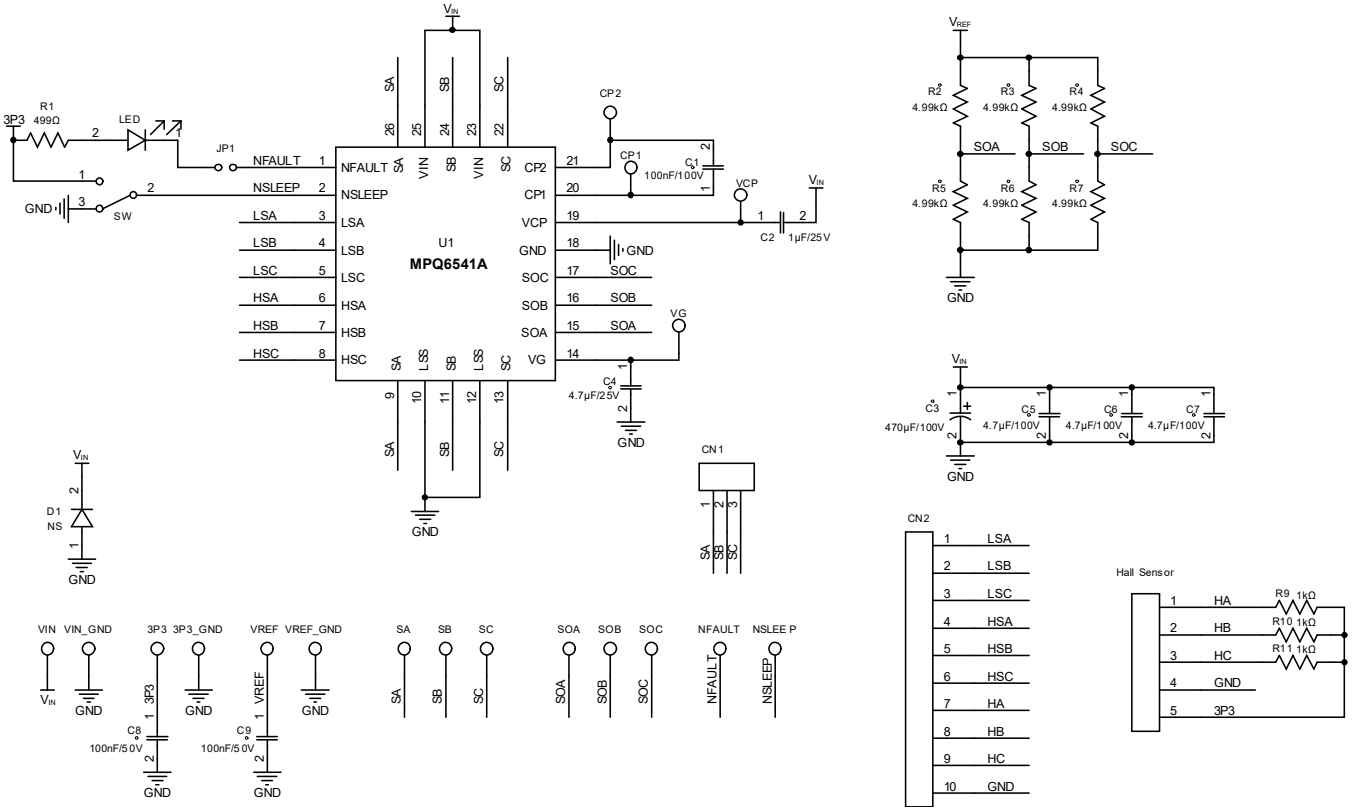


**Figure 1: Evaluation Board Schematic**


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# EVQ6541A-QK-00A BILL OF MATERIALS

| Qty | Ref | Value | Description | Package | Manufacturer | Manufacturer PN |
|---|---|---|---|---|---|---|
| 1 | R1 | 499Ω | Film resistor, 1% | 0603 | Yageo | RC0603FR-07499RL |
| 6 | R2, R3, R4, R5, R6, R7 | 4.99kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-074K99L |
| 3 | R9, R10, R11 | 1kΩ | Film resistor, 1% | 0603 | Yageo | RC0603FR-071KL |
| 1 | C1 | 100nF | Ceramic capacitor, 100V, X7R | 0805 | Murata | GRM21BR72A104KAC4L |
| 1 | C2 | 1μF | Ceramic capacitor, 25V, X7R | 0603 | Murata | GRM188R71E105KA12D |
| 1 | C3 | 470μF | Electrolytic capacitor, 100V | DIP | Jianghai | CD263-100V470 |
| 1 | C4 | 4.7μF | Ceramic capacitor, 25V, X6S | 0603 | Murata | GRM188C81E475KE11D |
| 3 | C5, C6, C7 | 4.7μF | Ceramic capacitor, 100V, X8L | 1210 | Murata | GCM32DL8EL475KE07L |
| 2 | C8, C9 | 100nF | Ceramic capacitor, 50V, X7R | 0603 | Murata | GCJ188R71H104KA12D |
| 1 | LED | 2.6V | Red LED | 0805 | Baihong | BL-HUE35A-AV-TRB |
| 1 | SW | $12V_{DC}$ | SPDT button | DIP | Wurth | 450301014042 |
| 1 | U1 | MPQ6541A | Three-phase BLDC motor driver | QFN-26 (6mmx 6mm) | MPS | MPQ6541AGQKTE |
| 1 | D1 | NS | | | | |
| 1 | CN1 | 2.54mm | 3-bit connector | DIP | Any | |
| 1 | CN2 | 2.54mm | 10-bit connector | DIP | Any | |
| 1 | Hall sensor | 2.54mm | 5-bit connector | DIP | Any | |
| 1 | CP1, CP2, VCP | 2.54mm | 3-bit connector | DIP | Any | |
| 1 | JP1 | 2mm | 2-bit connector | DIP | Any | |
| 1 | JP1 | 2mm | 2-bit short jumper | DIP | Any | |
| 6 | NFAULT, NSLEEP, SOA, SOB, SOC, VG | 1mm | Yellow test point | DIP | Any | |
| 2 | VIN, VIN_GND | 2mm | Connector, 2mm needle | DIP | Any | |
| 7 | 3P3, 3P3_GND, SA, SB, SC, VREF, VREF_GND | 1mm | Connector, 1mm needle | DIP | Any | |


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## PCB LAYOUT

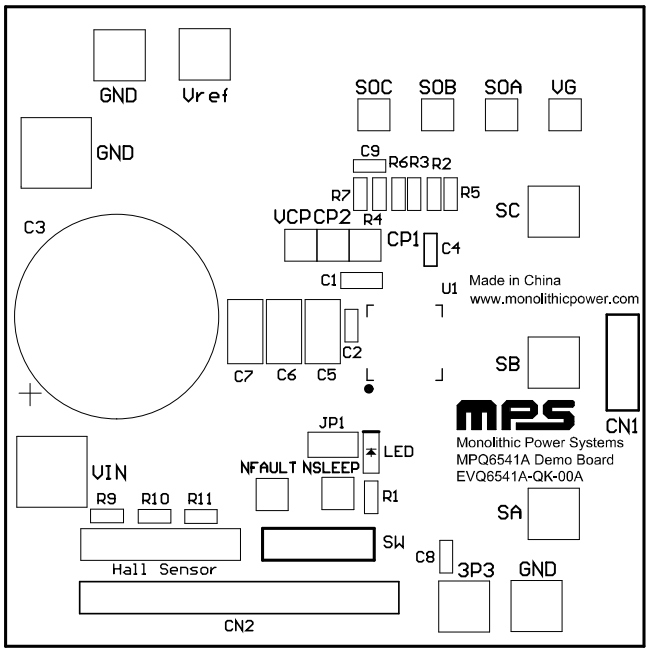


Figure 2: Top Silk

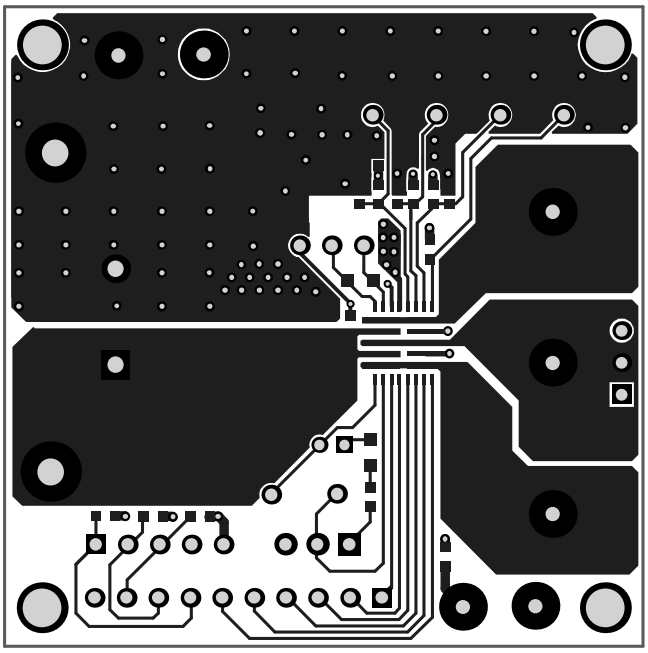

Figure 3: Top Layer

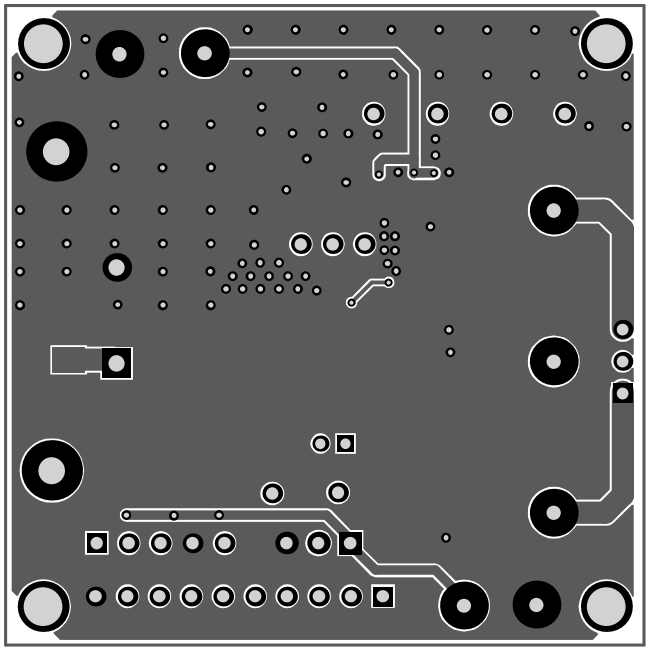

Figure 4: Bottom Layer

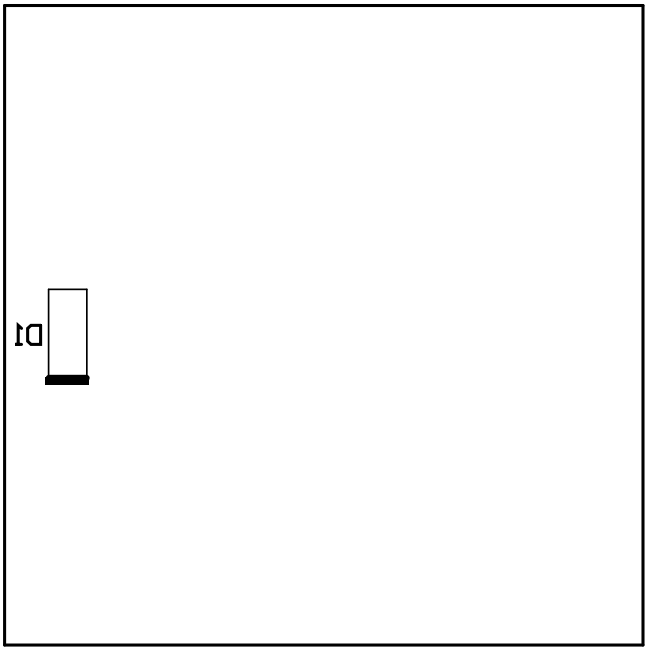


Figure 5: Bottom Silk


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## REVISION HISTORY

| Revision # | Revision Date | Description | Pages Updated |
|---|---|---|---|
| 1.0 | 5/10/2021 | Initial Release | - |

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