

### Features

| Parameter                | Symbol     | Value     | Unit          |
|--------------------------|------------|-----------|---------------|
| Max supply voltage       | $V_{CC}$   | 41        | V             |
| Operating voltage range  | $V_{CC}$   | 4.5 to 28 | V             |
| Max On-State resistance  | $R_{ON}$   | 50        | m $\Omega$    |
| Current limitation (typ) | $I_{LIMH}$ | 27        | A             |
| Off-state supply current | $I_S$      | 2         | $\mu A^{(1)}$ |

1. Typical value with all loads connected.

- Simple single IC application board dedicated for VNQ5E050AK-E
- Provides thermal heat-sinking for ease of use in prototyping
- Provides electrical connectivity for easy prototyping

### Description

EV-VNQ5E050AK provides you an easy way to connect ST's surface mounted VIPower® drivers into your existing prototype circuitry. This evaluation board comes pre-assembled with VNQ5E050AK-E high-side driver.

The VNQ5E050AK-E is a quad channel high-side driver manufactured using ST proprietary VIPower M0-5 technology and housed in PowerSSO-24 package. The VNQ5E050AK-E is designed to drive 12 V automotive grounded loads, providing protection, diagnostics and easy 3 V and 5 V CMOS-compatible interface with any microcontroller.

The device integrates advanced protective functions such as load current limitation, inrush and overload active management by power limitation, overtemperature shut-off with auto-restart and overvoltage active clamp. A dedicated analog current sense pin is associated with every

output channel provides enhanced diagnostic functions including fast detection of overload and short-circuit to ground through power limitation indication, overtemperature indication, short-circuit to  $V_{CC}$  diagnosis and ON-state and OFF-state open-load detection.

The current sensing and diagnostic feedback of the whole device can be disabled by pulling the CS\_DIS pin high to share the external sense resistor with similar devices.

Figure 1. VNQ5E050AK evaluation board



Table 1. Device summary

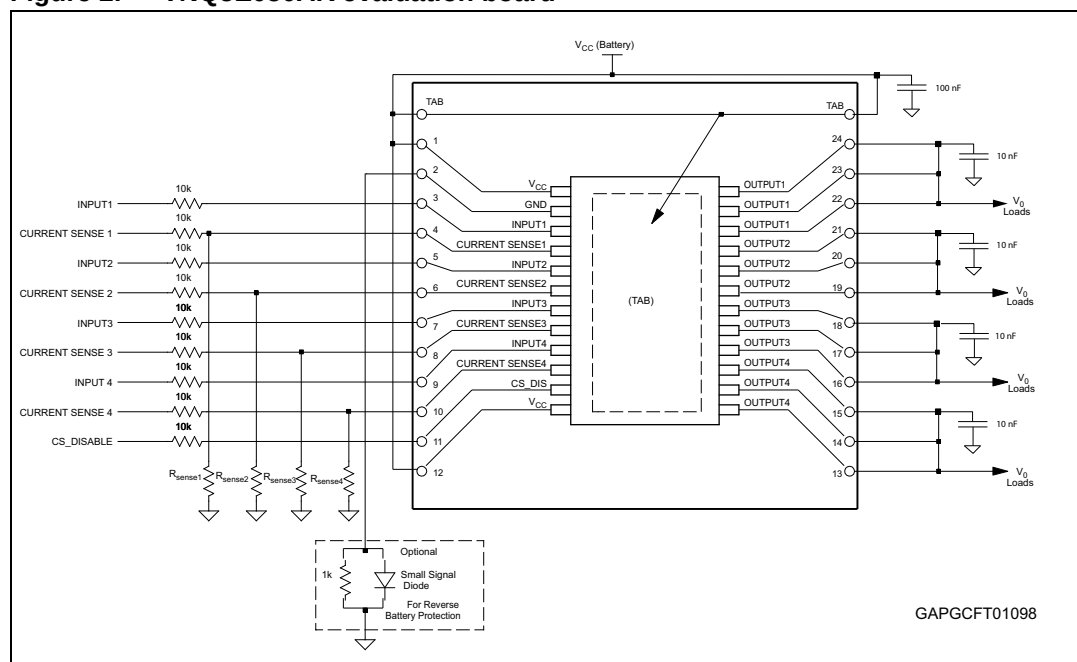
| Order code    | Reference                   |
|---------------|-----------------------------|
| EV-VNQ5E050AK | VNQ5E050AK evaluation board |

# 1 Design recommendations

This evaluation board provides mounting solution and some heat sinking capability for prototype development, but there are still external components that are required to make these devices work in any application. For further information on how the evaluation board has to be used you can refer to the AN4212 (see [Appendix A: Reference documents](#)).

[Figure 2](#) illustrates the necessary components for any application.

**Figure 2. VNQ5E050AK evaluation board**



ST has produced a user manual for safe designs using ST's VIPower devices. This is UM1556 (see [Appendix A: Reference documents](#)). UM1556 is a VIPower Hardware design guide that provides all necessary information to successfully design your circuit using our VIPower drivers.

All designs have different needs and requirements. Whatever design you decide to use, it will still need to be verified in order to meet your application specifications. ST implies no guarantee or warranty (see [Appendix A: Reference documents](#)).

## 2 Thermal data

**Table 2. VNQ5E050AK-E thermal data**

| Symbol        | Parameter                                 | Max. value | Unit |
|---------------|-------------------------------------------|------------|------|
| $R_{thj-amb}$ | Thermal resistance junction-ambient (MAX) | 29.5       | °C/W |

**Table 3. PCB specifications**

| Parameter               | Value       | Unit |
|-------------------------|-------------|------|
| Board dimensions        | 38 x 43     | mm   |
| Number of Cu layer      | 2           | —    |
| Layer Cu thickness      | 70          | μm   |
| Board finish thickness  | 1.6 +/- 10% | mm   |
| Board Material          | FR4         | —    |
| Thermal vias separation | 1.2         | mm   |
| Thermal vias diameter   | 0.3 /- 0.08 | mm   |

### 3 Board connector reference

Figure 3. Board layout

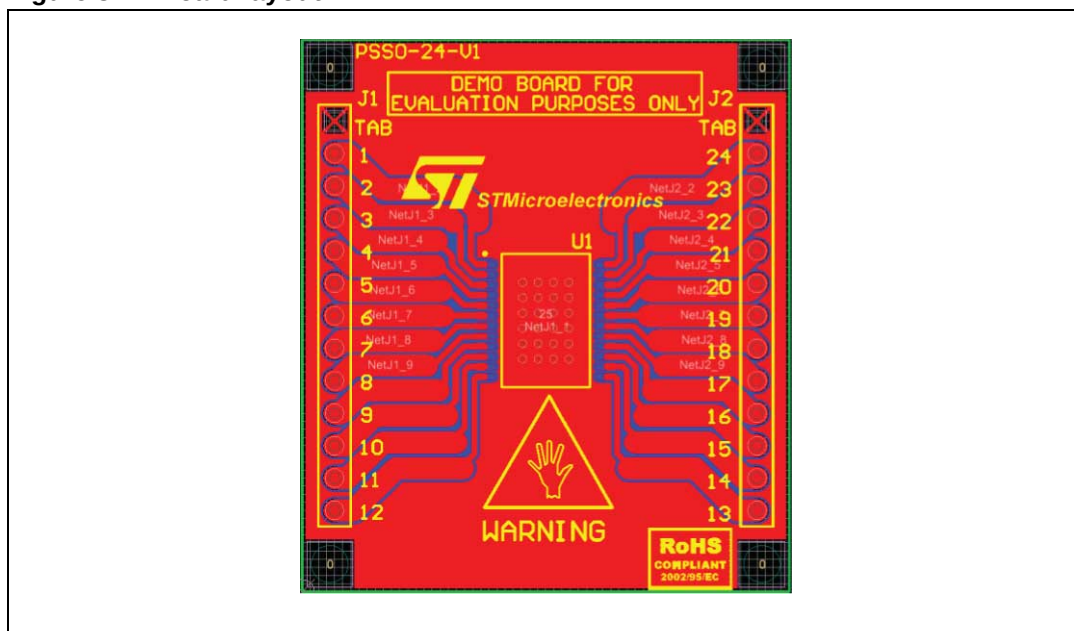


Table 4. Board connector specification

| Connector | Board lead number | Device pin function <sup>(1)</sup> |
|-----------|-------------------|------------------------------------|
| J1        | TAB               | V <sub>CC</sub>                    |
| J1        | 1                 | V <sub>CC</sub>                    |
| J1        | 2                 | GND                                |
| J1        | 3                 | INPUT1                             |
| J1        | 4                 | CURRENT SENSE1                     |
| J1        | 5                 | INPUT2                             |
| J1        | 6                 | CURRENT SENSE2                     |
| J1        | 7                 | INPUT3                             |
| J1        | 8                 | CURRENT SENSE3                     |
| J1        | 9                 | INPUT4                             |
| J1        | 10                | CURRENT SENSE4                     |
| J1        | 11                | CS_DIS                             |
| J1        | 12                | V <sub>CC</sub>                    |
| J2        | TAB               | V <sub>CC</sub>                    |
| J2        | 13                | OUTPUT4                            |
| J2        | 14                | OUTPUT4                            |
| J2        | 15                | OUTPUT4                            |

**Table 4. Board connector specification (continued)**

| Connector | Board lead number | Device pin function <sup>(1)</sup> |
|-----------|-------------------|------------------------------------|
| J2        | 16                | OUTPUT3                            |
| J2        | 17                | OUTPUT3                            |
| J2        | 18                | OUTPUT3                            |
| J2        | 19                | OUTPUT2                            |
| J2        | 20                | OUTPUT2                            |
| J2        | 21                | OUTPUT2                            |
| J2        | 22                | OUTPUT1                            |
| J2        | 23                | OUTPUT1                            |
| J2        | 24                | OUTPUT1                            |

1. For further clarification on pin functions please refer to the related datasheet (see [Appendix A: Reference documents](#)).

## 4 Package information

### 4.1 ECOPACK<sup>®</sup> packages

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com).

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## Appendix A      Reference documents

1. Quad channel high-side driver with analog current sense for automotive applications (VNQ5E050AK-E, DocID 13519)
2. VIPower M0-5 and M0-5Enhanced high-side drivers (UM1556, DocID 023520)
3. PowerSSO-24 devices evaluation board (AN4212, DocID 023983)
4. Evaluation Product Licence Agreement on [www.st.com](http://www.st.com)

## Revision history

**Table 5. Document revision history**

| Date        | Revision | Changes             |
|-------------|----------|---------------------|
| 29-Nov-2012 | 1        | Initial release.    |
| 17-Sep-2013 | 2        | Updated disclaimer. |

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