

# STEVAL-IFP006V1

Quad high side smart power solid state relay evaluation board using the VNI4140K

Data Brief

### **Features**

- Shorted load protections
- Junction over-temperature protection
- Case over-temperature protection for thermal independence of the channels
- Thermal case shut-down non-simultaneous restart for the various channels
- Protection against loss of ground
- Current limitation
- Undervoltage shut-down
- Open drain diagnostic outputs
- 3.3 V CMOS/TTL compatible inputs
- Fast demagnetization of inductive loads
- Conforms to IEC 61131-2

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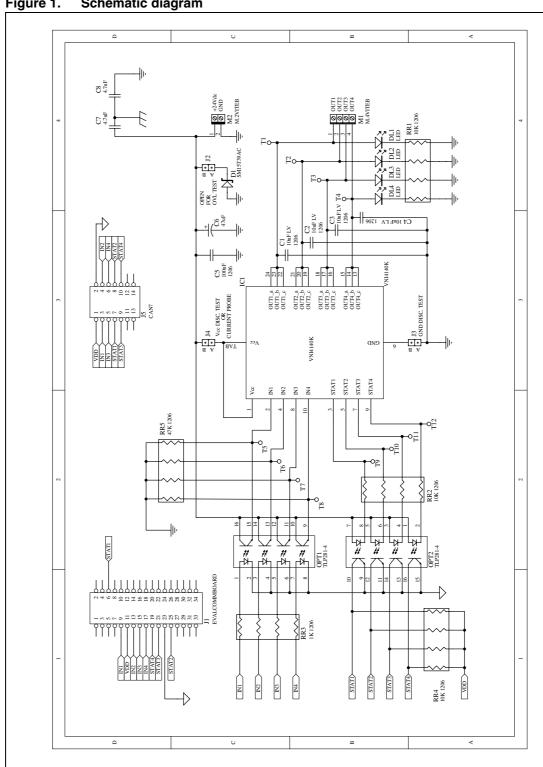
# **Description**

The purpose of this design is to demonstrate the features of the VNI4140K quad high side smart power solid state relay. The application offers robustness and complies with EMC industrial standards. It implements short-circuit/overload protection and thermal management as well, achieving best-in-class MTBF values. The reference design is suitable for use in programmable logic controllers (PLCs) as well as to drive generic loads which require up to 0.7 A of nominal current (the typical current limitation is 0.7 - 1.7 A). Thanks to the very low  $R_{DS(on)}$  (only 80 m $\Omega$  typ. @ 25 °C per channel) the device allows very low power consumption during operation and for this reason making it an ideal solution for IP65 / IP67 requirements. The device is compliant with IEC 61131-2 (Programmable Controllers International Standard).

STEVAL-IFP006V1 **Board schematic** 

### **Board schematic** 1

Figure 1. Schematic diagram



STEVAL-IFP006V1 Connectors

## 2 Connectors

This evaluation board uses two input header connectors, one screw drives the four-channels output connector and one screw drives the two-channel supply connector.

Both input connectors, J5 and J1, provide the same bidirectional evaluation board signalization guaranteeing the maximum compatibility with existing ST tools, such as the ST7540 FSK powerline transceiver evaluation board (see AN2451) and similar.

Figure 2. J1 connector pinout

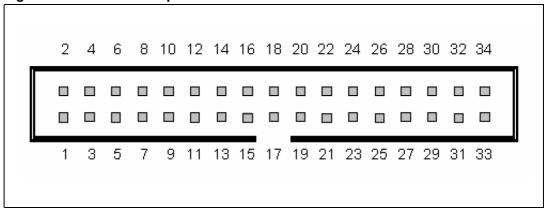
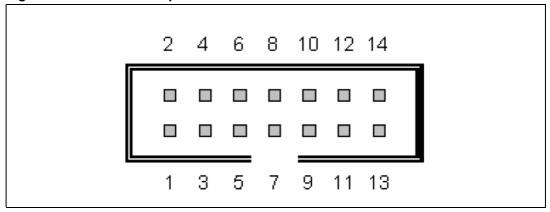


Figure 3. J5 connector pinout



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Connectors STEVAL-IFP006V1

Table 1. Connector J1 and J5 pinout mapping

| J1 pin number | J5 pin number | Signal | Туре                   |
|---------------|---------------|--------|------------------------|
| 11            | 1             | Vdd    | 5/3.3 V supply voltage |
| 23            | 2             | GND    | Signal ground          |
| 9             | 3             | IN1    | Input channel 1        |
| 13            | 4             | IN2    | Input channel 2        |
| 15            | 5             | IN3    | Input channel 3        |
| 17            | 6             | IN4    | Input channel 4        |
| 6             | 7             | STAT1  | Status channel 1       |
| 25            | 8             | STAT2  | Status channel 2       |
| 21            | 9             | STAT3  | Status channel 3       |
| 19            | 10            | STAT4  | Status channel 4       |

STEVAL-IFP006V1 Bill of materials

# 3 Bill of materials

Table 2. Evaluation board bill of material

| Designator | Part         | Description                   |  |
|------------|--------------|-------------------------------|--|
| RR1        | 10 kΩx 4     | SMD resistor pack 1206 format |  |
| RR2        | 10 kΩx 4     | SMD resistor pack 1206 format |  |
| RR3        | 1 kΩx 4      | SMD resistor pack 1206 format |  |
| RR4        | 10 kΩx 4     | SMD resistor pack 1206 format |  |
| RR5        | 47 kΩx 4     | SMD resistor pack 1206 format |  |
| C1         | 10 nF LV     | SMD capacitor 1206 format     |  |
| C2         | 10 nF LV     | SMD capacitor 1206 format     |  |
| C3         | 10 nF LV     | SMD capacitor 1206 format     |  |
| C4         | 10 nF LV     | SMD capacitor 1206 format     |  |
| C5         | 100 nF       | SMD capacitor 1206 format     |  |
| C6         | 47 μF 50 V   | SMD electrolitic capacitor    |  |
| C7         | 4.7 nF       | SMD capacitor 1206 format     |  |
| C8         | 4.7 nF       | SMD capacitor 1206 format     |  |
| D1         | SM15T39AC    | Transil diode                 |  |
| DL1        | LED          | SMD LED diode 0805 format     |  |
| DL2        | LED          | SMD LED diode 0805 format     |  |
| DL3        | LED          | SMD LED diode 0805 format     |  |
| DL4        | LED          | SMD LED diode 0805 format     |  |
| OPT1       | PC3Q66Q      | 4 channel opto isolator       |  |
| OPT2       | PC3Q66Q      | 4 channel opto isolator       |  |
| IC1        | VNI4140K     | ST IC industrial 4 ch hsd     |  |
| J1         | Hader 34 pin | Compatible evalcommboard      |  |
| J2         | Jumper       | Over voltage test             |  |
| J3         | Jumper       | Ground disconnection test     |  |
| J4         | Jumper       | Vcc disconnection test        |  |
| J5         | HADER 14 pin | Compatible ST7CANIC DB        |  |
| M1         | 4 screw plug | HSD output connector          |  |
| M2         | 2 screw plug | Power supply conector         |  |
| T1         | Test point   | HSD output channel 1 voltage  |  |
| T2         | Test point   | HSD output channel 2 voltage  |  |
| Т3         | Test point   | HSD output channel 3 voltage  |  |
| T4         | Test point   | HSD output channel 4 voltage  |  |

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Bill of materials STEVAL-IFP006V1

Table 2. Evaluation board bill of material (continued)

| T5  | Test point | HSD input channel 1 signal |
|-----|------------|----------------------------|
| Т6  | Test point | HSD input channel 2 signal |
| T7  | Test point | HSD input channel 3 signal |
| Т8  | Test point | HSD input channel 4 signal |
| Т9  | Test point | HSD channel 1 status       |
| T10 | Test point | HSD channel 2 status       |
| T11 | Test point | HSD channel 3 status       |
| T12 | Test point | HSD channel 4 status       |

STEVAL-IFP006V1 Revision history

# 4 Revision history

Table 3. Document revision history

| Date        | Revision | Changes         |
|-------------|----------|-----------------|
| 13-Dec-2007 | 1        | Initial release |

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