EV-VND7020AJ

VND7020AJ evaluation board

GAPG1704141052CFT

Features

Max transient supply voltage	V_{CC}	40 V
Operating voltage range	V_{CC}	4 to 28 V
Typ on-state resistance (per Ch)	R_{ON}	22 mΩ
Current limitation (typ)	I_{LIMH}	63 A
Standby current (max)	I_{STBY}	0.5 µA

- Simple single IC application board dedicated for VND7020AJ
- Provides electrical connectivity and thermal heat-sinking for easy prototyping
- General device features
  - Double channel smart high-side driver with MultiSense analog feedback
  - Very low standby current
  - Compatible with 3 V and 5 V CMOS outputs
- Diagnostic functions
  - Multiplexed analog feedback of: load current with high precision proportional current mirror, V_{CC} supply voltage and T_{CHIP} device temperature
  - Overload and short to ground (power limitation) indication
  - Thermal shutdown indication

- Off-state open-load detection
- Output short to V_{CC} detection
- Sense enable/disable
- Protections
  - Undervoltage shutdown
  - Overvoltage clamp
  - Load current limitation
  - Self-limiting of fast thermal transients
  - Configurable latch-off on overtemperature or power limitation with dedicated fault reset pin
  - Loss of ground and loss of V_{CC}
  - Reverse battery with external components
  - Electrostatic discharge protection

Applications

Typical applications are all types of automotive resistive, inductive and capacitive loads.

Table 1. Device summary

Order code	Reference
EV-VND7020AJ	VND7020AJ evaluation board

www.st.com

1 Description

The board provides you an easy way to connect ST VIPower® M0-7 technology into your existing system.

The EV-VND7020AJ evaluation board comes pre-assembled with a VND7020AJ high-side driver.

On board minimum set of electrical components (as for device datasheet recommendation) enables the user to directly connect the load, the power supply and the microcontroller without any additional effort in external component design and connection.

The VND7020AJ is a double channel high-side driver manufactured using ST proprietary VIPower M0-7 technology and housed in PowerSSO-16 package. It is designed to drive 12 V automotive grounded loads through a 3 V and 5 V CMOS-compatible interface, providing protection and diagnostics.

The device integrates advanced protective functions such as load current limitation, overload active management by power limitation and overtemperature shutdown with configurable latch-off.

A FaultRST pin unlatches the output in case of fault or disables the latch-off functionality.

A dedicated multifunction multiplexed analog output pin delivers sophisticated diagnostic functions including high precision proportional load current sense, supply voltage feedback and chip temperature sense, in addition to the detection of overload and short circuit to ground, short to V_{CC} and OFF-state open-load.

A sense enable pin allows OFF-state diagnosis to be disabled during the module low-power mode as well as external sense resistor sharing among similar devices.

Figure 1. EV-VND7020AJ schematic

2   Board connections

Figure 2 shows the placement of the connectors to be used for supplying the evaluation board, connecting the load and controlling the functionality and diagnostic of the device.

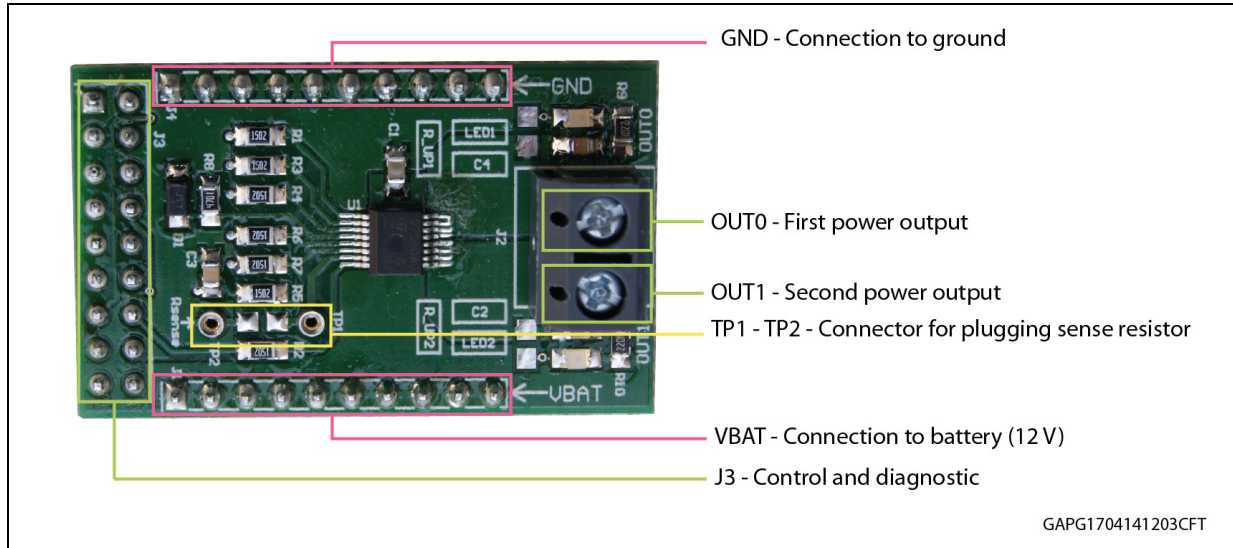**Figure 2. Evaluation board connectors**

GND - Connection to ground

OUT0 - First power output

OUT1 - Second power output

TP1 - TP2 - Connector for plugging sense resistor

VBAT - Connection to battery (12 V)

J3 - Control and diagnostic

GAPG1704141203CFT

Table 2. J5 connector: pin functions

Connector	Pin number	Pin name	Pin function
J5	1…4	N/A	Not connected
J5	5	IN_PullUP	Connection to optional external pull-up resistor for open load detection in off-state.
J5	6	+5V	5V Power Supply
J5	7	FaultRST	Active low compatible with 3 V and 5 V CMOS outputs pin; it unlatches the output in case of fault; If kept low, sets the outputs in auto-restart.
J5	8	MultiSense	Multiplexed analog sense output pin; it delivers a current proportional to the selected diagnostic: load current, supply voltage or chip temperature.
J5	9	S_EN	Active high compatible with 3 V and 5 V CMOS outputs pin; it enables the MultiSense diagnostic pin.
J5	10	SEL0	Active high compatible with 3 V and 5 V CMOS outputs pin; together with SEL1, it addresses the MultiSense multiplexer.
J5	11	SEL1	Active high compatible with 3 V and 5 V CMOS outputs pin; together with SEL0, it addresses the MultiSense multiplexer.
J5	12	N/A	Not connected
J5	13	IN0	Voltage controlled input pin with hysteresis, compatible with 3 V and 5 V CMOS outputs. It controls OUT0 switch state.

Table 2. J5 connector: pin functions (continued)

Connector	Pin number	Pin name	Pin function
J5	14	IN1	Voltage controlled input pin with hysteresis, compatible with 3 V and 5 V CMOS outputs. It controls OUT1 switch state.
J5	15…18	N/A	Not connected

In case the user wishes to utilize the Current Sense / MultiSense function of the device, it is necessary to plug a sense resistor in R_{SENSE}.

The package includes a through-hole resistor, to be mounted on TP1-TP2 (see figure b).

Different R_{SENSE} values can be adopted based on user preference.

Another option is soldering an SMD resistor on the dedicated PCB pad, as shown in

Figure 3. No sense resistor

GAPG0904141657CFT

Figure 4. Mounting through-hole sense resistor
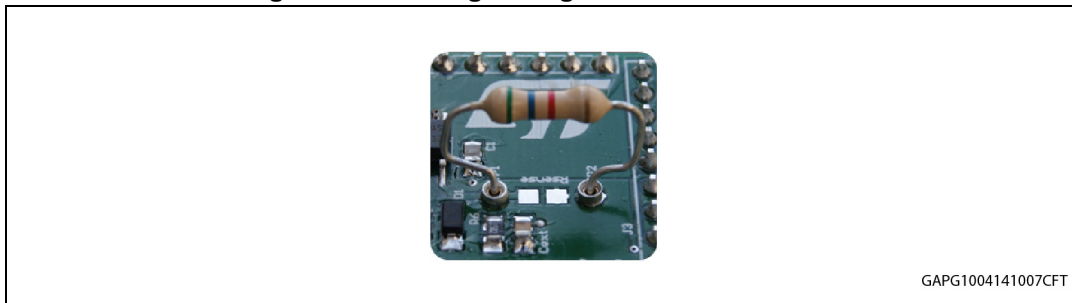
GAPG1004141007CFT

Figure 5. Pads for soldering SMD resistor
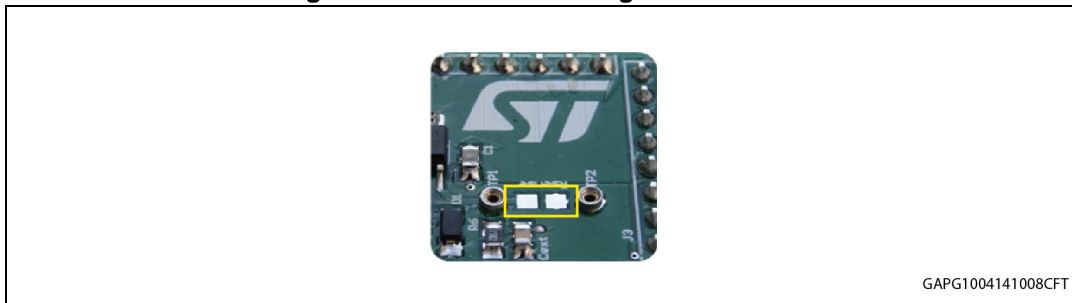
GAPG1004141008CFT

3   Thermal data

Table 3. VND7020AJ thermal data

Symbol	Parameter	Max	Unit
Rthj-amb	Thermal resistance junction-ambient (MAX)	39	°C/W

Table 4. PCB specifications

Parameter	Value
Board dimensions	25 mm x 41.5 mm
Number of Cu layer	2
Layer Cu thickness	35 μm
Board finish thickness	1.6 mm +/- 10%
Board Material	FR4
Thermal vias separation	1.1 mm
Thermal vias diameter	0.5 mm

4   Revision history

Table 5. Document revision history

Date	Revision	Changes
13-Jan-2014	1	Initial release.
15-Jan-2014	2	Updated *Figure 2: Evaluation board connectors*
15-May-2014	3	Updated *Applications* and Description. Updated Description, *Chapter 2: Board connections* and *Chapter 3: Thermal data*
24-Jul-2014	4	Updated *Figure 1: EV-VND7020AJ schematic*
01-Sep-2015	5	Changed EV-VND7020AJ-E in EV-VND7020AJ. Updated *Features* and *Section 1: Description*.

IMPORTANT NOTICE – PLEASE READ CAREFULLY