Battery Switch for all voltage classes up to 48V

electronica 2018
Basic concept for the demonstrator

- Replace only the be-stable power relay with a "bi-stable" semiconductor power switch board
- Re-use the existing control logic and control ECU unchanged
- Use a small signal be-stable relay to control the semiconductor switch with the existing control ECU
- Easy mechanical integration into the existing battery box should be possible
- No change of the vehicle software necessary
- Overall identical ADR functionality, same behavior, no limitations
Overview

- **8 x IPLU300N04S4-R8**
  - 40 V
  - 0.53 mΩ typ
  - 300 A

- **AUIR 3242S**
  - normally on
  - low quiescent current

- **4 x SMDJ33A**
  - TVS Diode
### PCB technology

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>100.0 mm x 50.0 mm</td>
</tr>
<tr>
<td>Thickness</td>
<td>1.3 mm</td>
</tr>
<tr>
<td>Electrical resistance</td>
<td>60 µΩ</td>
</tr>
<tr>
<td>Thermal resistance (non-isolated version)</td>
<td>0.1 K/W</td>
</tr>
<tr>
<td>Thermal resistance (isolated version)</td>
<td>~ 0.2 K/W</td>
</tr>
<tr>
<td>No. of copper-filled laser vias per MOSFET</td>
<td>300</td>
</tr>
</tbody>
</table>
Connecting the switch

Battery

Copper Bus Bars
Controll connector X1

X1, Pin1: GND

X1, Pin5: Input

Load
Thermal behaviour

500A @ 25°C and 50cm/min airflow

Temperature [°C]

Time [s]

T(PCA)
T(Q8)
# Current rating

<table>
<thead>
<tr>
<th>Current</th>
<th>Power Dissipation</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>300 A</td>
<td>~ 15 W</td>
<td>Continuous</td>
</tr>
<tr>
<td>500 A</td>
<td>~ 40 W</td>
<td>~ 10 min.</td>
</tr>
<tr>
<td>700 A</td>
<td>~ 80 W</td>
<td>~ 5 min.</td>
</tr>
<tr>
<td>1500 A</td>
<td>~ 360 W</td>
<td>~ 15 s</td>
</tr>
<tr>
<td>1800 A</td>
<td>~ 520 W</td>
<td>~ 10 s</td>
</tr>
</tbody>
</table>

Values estimated for board exposed to light air flow of 50 cm / min. and a start temperature of 25 °C
Megatrends of CAV market: Similar to passenger car

Megatrends for commercial vehicles

- **FUEL EFFICIENCY**
  - Enhanced energy recuperation
  - Electrification of side loads and powertrain

- **SAFETY & ADAS**
  - Enhanced emergency braking
  - Enhanced highway pilot
  - V2V – platooning
  - Remote control maneuver

- **CONNECTION**
  - Networked information, Navigation info's
  - Vehicle to infrastructure connectivity

**Powerful energy storage**

**Sensor Fusion**

**System Redundancy**

**Increased data output & secure data- and energy supply**

**Challenges for truck OEMS**

- IT-Security
  - Functional safety

- Energy distribution

- Increasing E/E complexity

- Energy recuperation

- Diagnosis
  - Fail operational

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Example of power architecture: Implementation of megatrends in E/E-architecture of commercial vehicles

Redundant 24 V powernet

Main 24 V powernet

Cabin powernet
Part of your life. Part of tomorrow.