

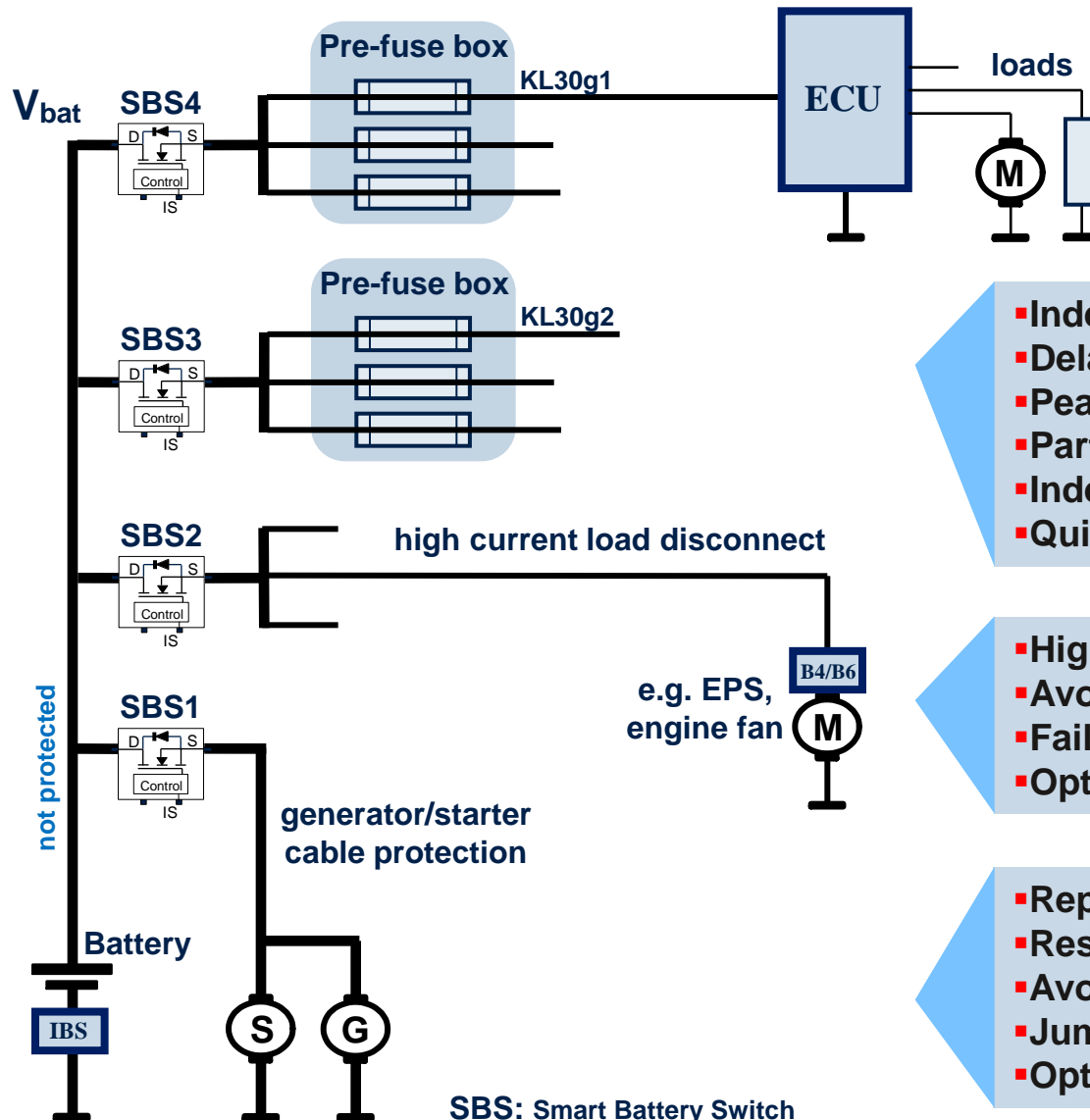
Smart Battery Switch Demonstrator (SBS)



September 2014

Smart Battery Switch Demonstrator

Power Distribution System Innovation



- Independent power networks
- Delay / timing functionality
- Peak current management
- Partial powernet activation
- Independent failure management
- Quiescent current management

- High current load disconnect
- Avoid corrosion / electro-migration
- Failure / safety disconnect
- Optional high-current electronic fuse

- Replacement of pyro-electric switch
- Resettable high current cable shutdown
- Avoid corrosion / electro-migration
- Jumpstart reverse battery blocking
- Optional smart starter control function

SBS: Smart Battery Switch

Smart Battery Switch Demonstrator Technical Realization

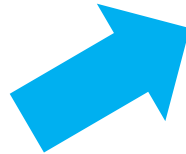
Electronic replacement of the
Pyro-electric SBK

- Same current handling
- Similar size
- Switch at any time

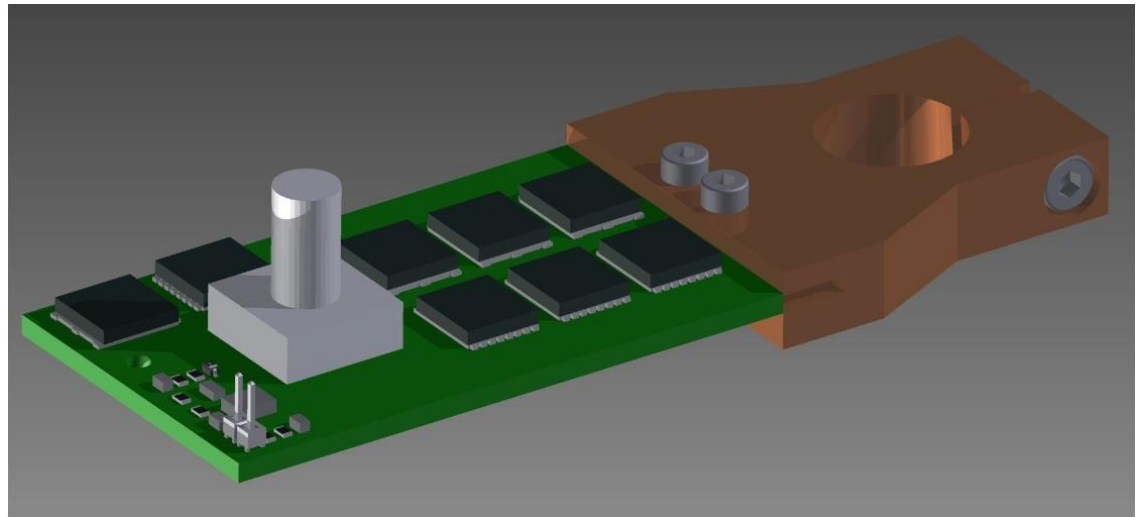
Pyro-electric
Battery Disconnect (SBK)



Picture from Auto Kabel



Electronic Smart Battery Switch (SBS)

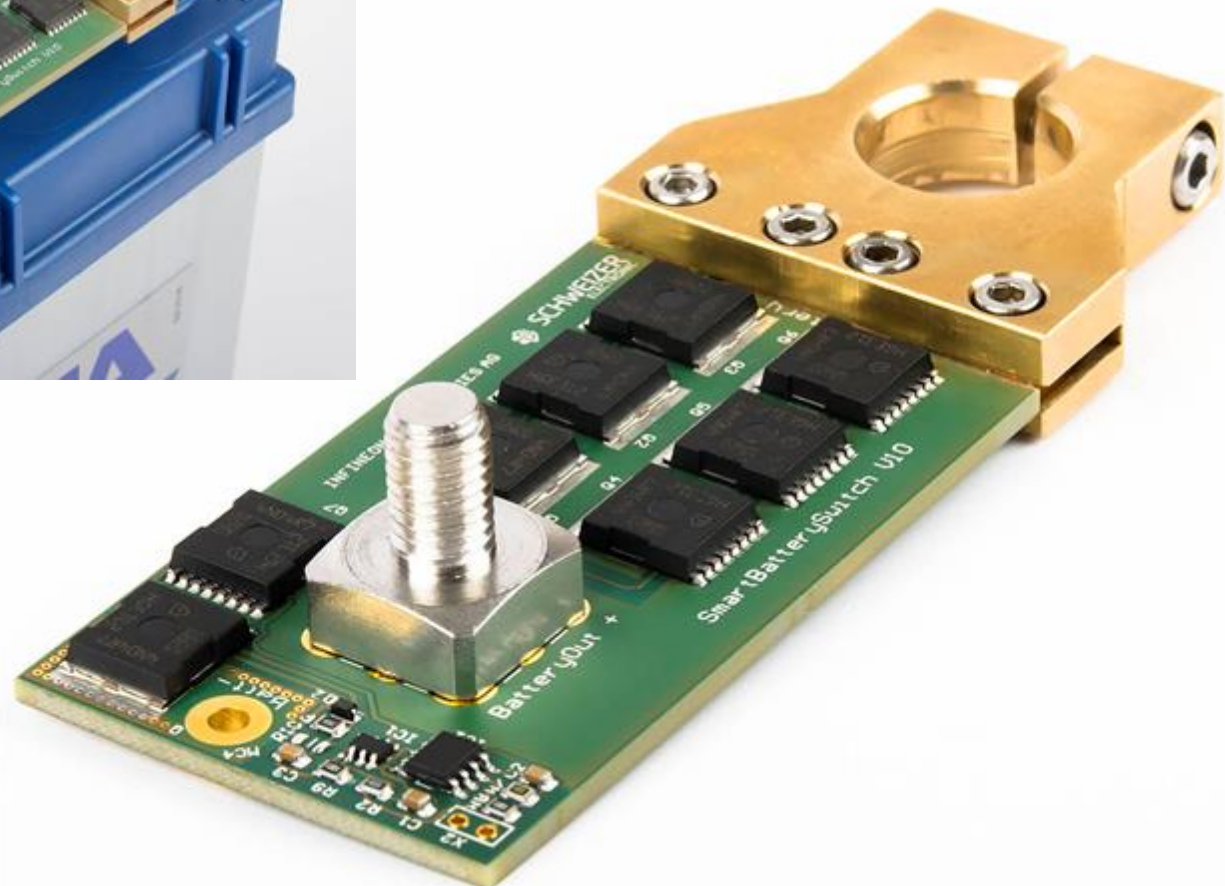


A joint high current system demonstrator project of
Infineon Technologies and Schweizer Electronic

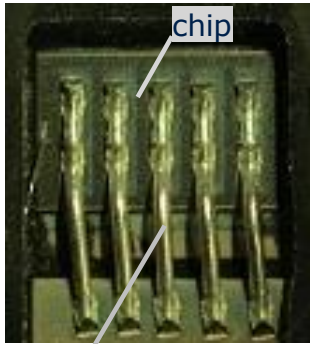
Smart Battery Switch Demonstrator Technical Realization



A joint high current system demonstrator project of
Infineon Technologies and Schweizer Electronic

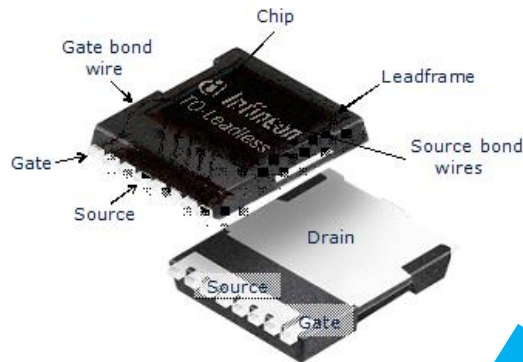


Smart Battery Switch Demonstrator TO-Leadless MOSFET & PCB Inlay Technology



chip

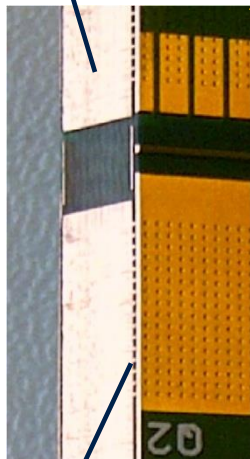
bond wires



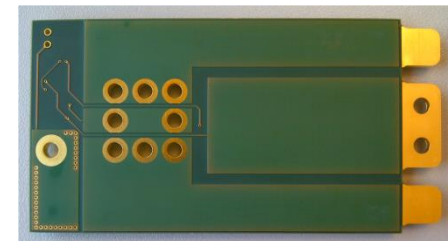
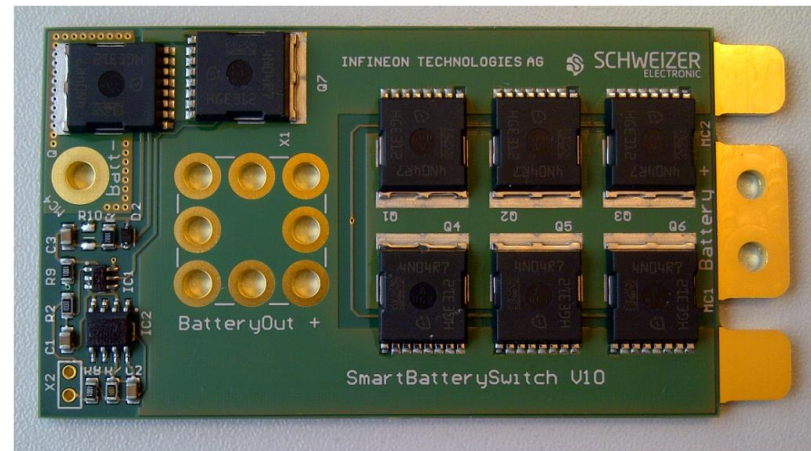
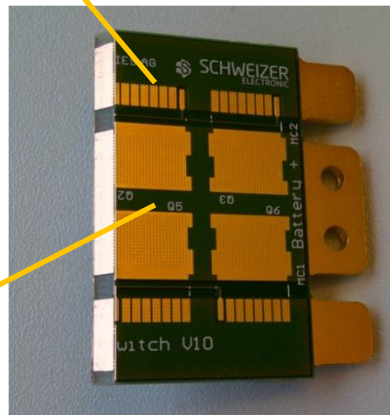
High current system approach, combining

- High current MOSFET technology
- High current PCB Inlay technology

2mm Cu-Inlay



thermal-vias



planar backside for optional cooling

Smart Battery Switch Demonstrator

Main Features



■ Description

Electronic high current battery disconnect, built up with the new ultra lowohmic TO-Leadless MOSFETs in combination with an innovative Inlay PCB technology

■ Key features

- ❑ **400A** static current
- ❑ **1800A** starter current (thermal limited)
- ❑ **4500A** short circuit shutdown
- ❑ **7200A** peak current (40µs at 125°C)

- ❑ **0.082mΩ** typ MOSFET resistor (25°C)
- ❑ **0.112mΩ** typ Terminal-Terminal resistor
- ❑ 4.7K/W thermal resistor
- ❑ 36K temperature rise at 250A DC

■ Main Applications

- ❑ Replacement of pyro-electric battery disconnect switches (SBK)
- ❑ Resettable failure current shutdown (electro-migration, corrosion)
- ❑ Safety switch for high current loads (EPS, engine fan, chassis control, ...)
- ❑ Quiescent current optimization (parking, transport, seasonal use, ...)
- ❑ Partial power networks (electric vehicle charging, living/working in the car, ...)

■ Customer Benefits

- ❑ Very compact design, ready to use
- ❑ Lowest terminal-terminal resistor due to newest technologies (MOSFET and PCB)
- ❑ Minimum passive cooling via terminal/cable
- ❑ Low cost approach

Smart Battery Switch Demonstrator Measurement Results

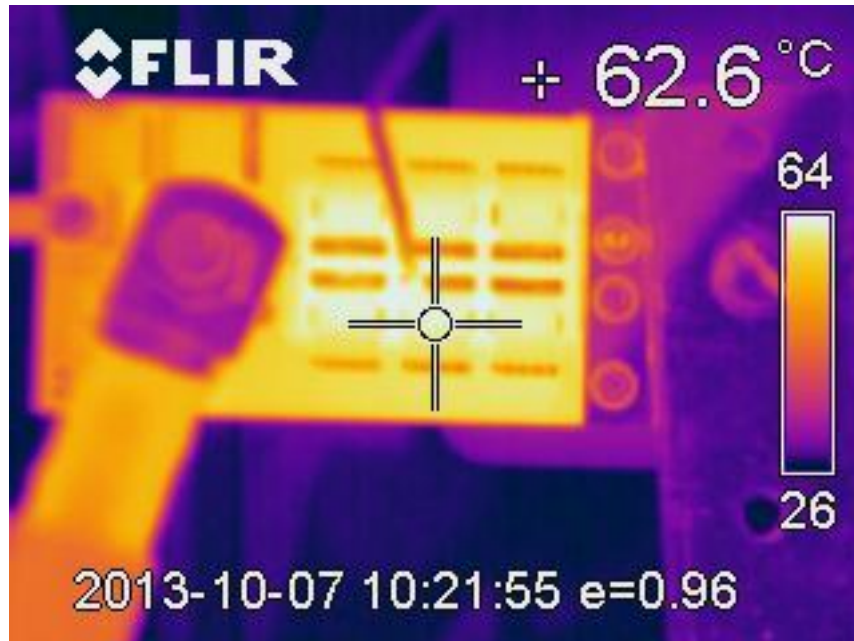
■ Description

Measurement results at the Smart Battery Switch, sitting directly on the battery terminal, 50mm² cable at the output, free air convection, ambient temperature is 26°C and the measurements are done after a thermal settling time of ~30min.

	MOSFETs				Terminal-to-Terminal		
Current [A]	Voltage drop [mV]	Resistor [μOhm]	Power loss [W]	delta_T static junction-ambient [K]	Voltage drop [mV]	Resistor [μOhm]	Power loss [W]
50	4.1	82	0.2	3.7	5.6	112	0.3
100	8.2	82	0.8	7.4	11.2	112	1.2
250	22.9	92	5.7	36	31.1	124	7.8
400	43.4	108	17.4	80	57.7	144	23.1

Smart Battery Switch Demonstrator Thermal Inspection

250A 10min

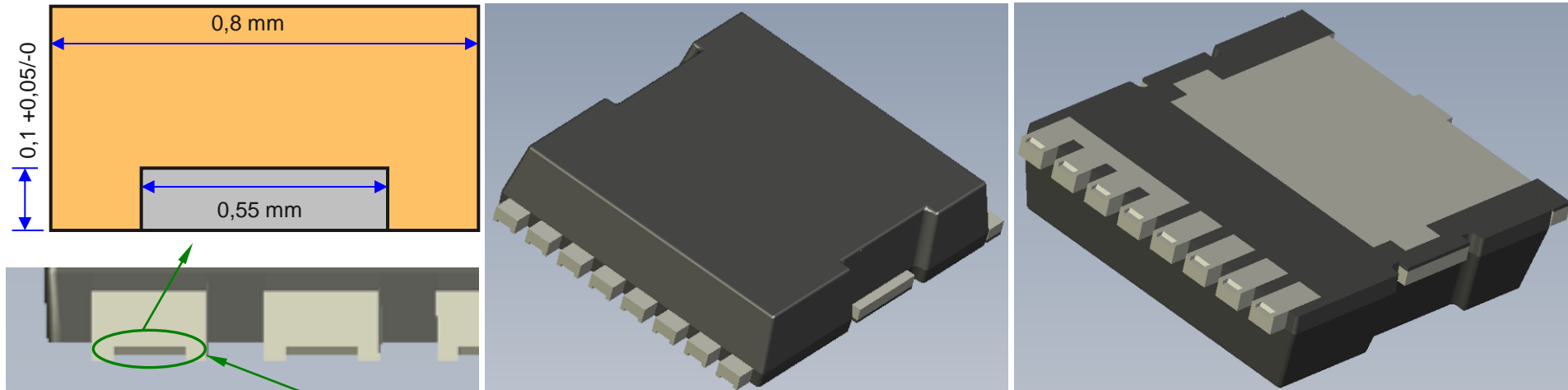


400A 2.5min

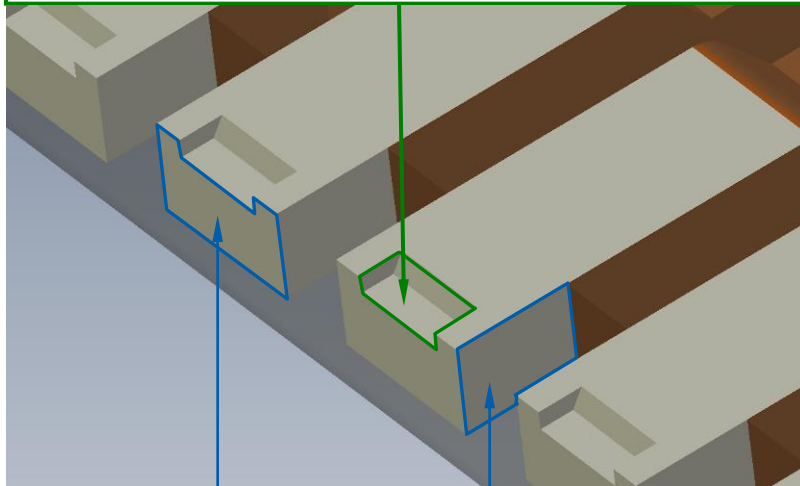


TO-Leadless Package H_PSOF

Package Topology and Solder Joint Control



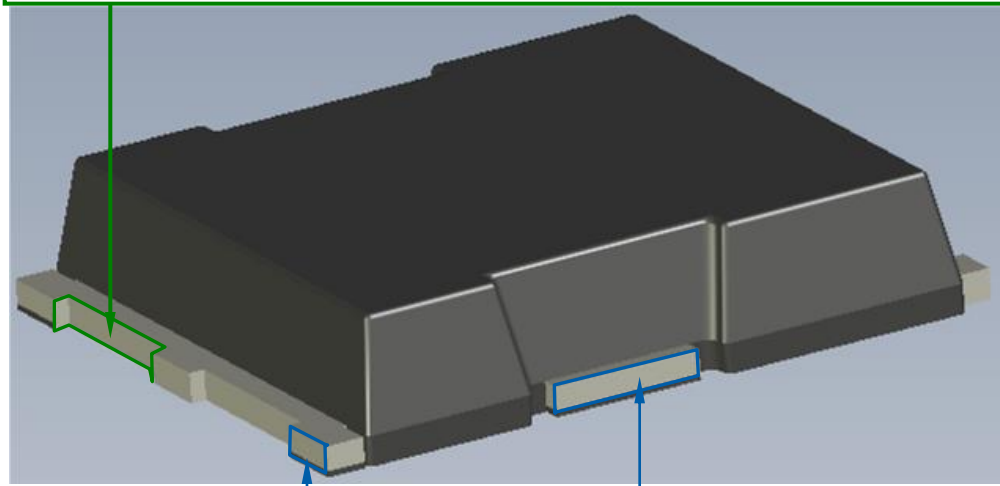
Trapezoid groove = guaranteed wetting



Exposed Cu =
no guaranteed wetting

Sn plated but no guaranteed wetting due
to mold flashes

Sn plated = guaranteed wetting



Exposed Cu =
no guaranteed wetting

Sn plated but no guaranteed wetting due
to mold flashes

TOLL - Infineon's latest PowerMOS Package

40V TOLL Product Portfolio



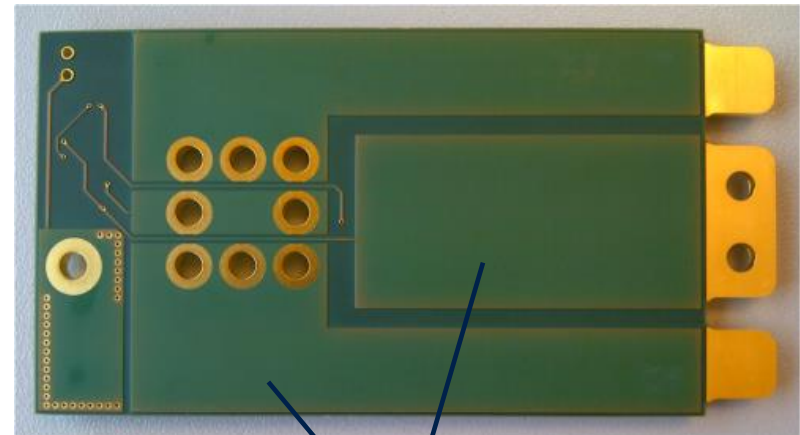
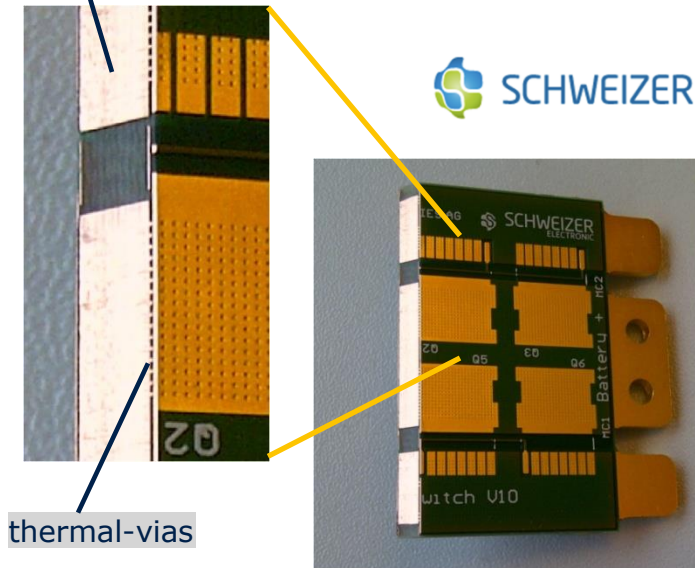
Product Name	max R_{DSon} [mOhm]	I_D [A]	LL/NL	R_{thJC} [K/W]	Status
IPLU300N04S4-R8	0.77	300	NL	0.35	Released
IPLU300N04S4-1R1	1.1	300	NL	0.8	QS-available
IPLU250N04S4-1R7	1.7	250	NL	0.5	QS-available

Smart Battery Switch Demonstrator PCB Copper Inlay Technology

High Current PCB Copper Inlay Technology

- Multilayer PCB combined with thick Cu Inlays
- Highest current capability and low resistance
- Excellent thermal resistance and heat spreading
- High mechanical stability
- Automotive qualified

2mm Cu-Inlay





ENERGY EFFICIENCY MOBILITY SECURITY

Innovative semiconductor solutions for energy efficiency, mobility and security.

