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Product Concept for High Current PROFET

Full Exploitation of the chip on chip technology

- The cost performance ratio ($/Siemens) of base chip as a descrete transistor
- Control IC enables the smart functions
- Flexible combination of IC chip and base chip allows the adoption of the newest technology and three products

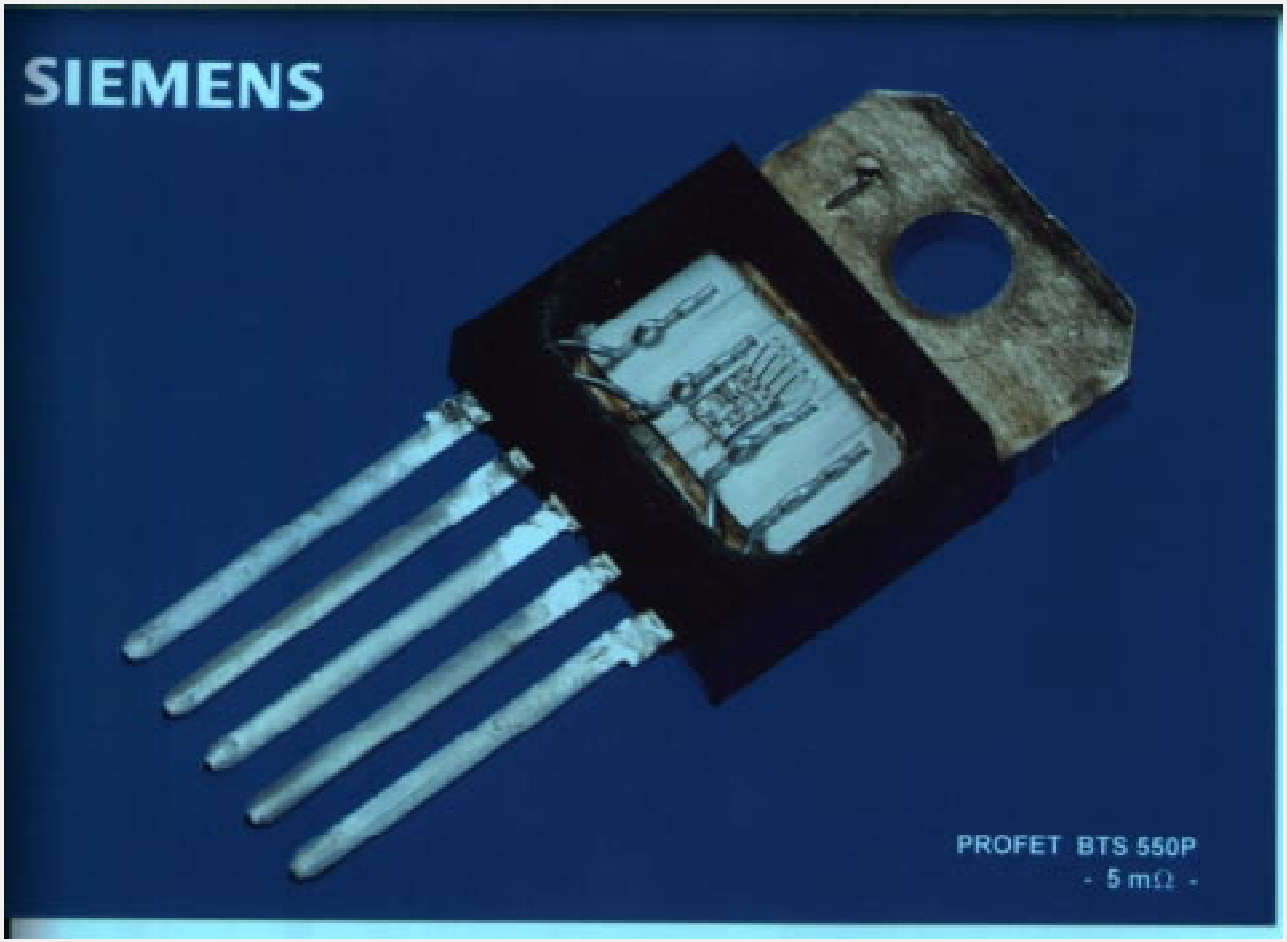
Improvements of assembly technology

- Soldering of maximal die sizes in the TO218 and TO220
- Two (outer) pins for the output and multiple stitching wire bonding

Expansion of high current testing competance

- Development of high power source of 1000A, new contact unit and load board

Structure of High Current PROFET



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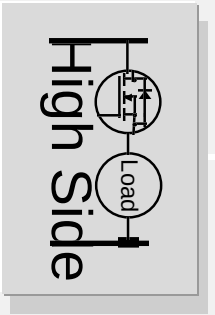
High Current PROFET Family



Type	$V_{DS(AZ)}$ [V]	$R_{on(max)}$ [mOhm]	Current Sense Ratio	$I_{L-SC(typ)}$ [A]	Package
BTS 555 P	50	**3.5**	25 000	400	TO-218/5
BTS 550 P	50	**5.0**	20 000	280	TO-218/5
BTS 650 P	50	**8.0**	15 000	170	TO-220/7

Availability: End of´96

- ☑ Current controlled PROFET
- ☑ Simplifies current monitoring by a sense current proportional to the load current

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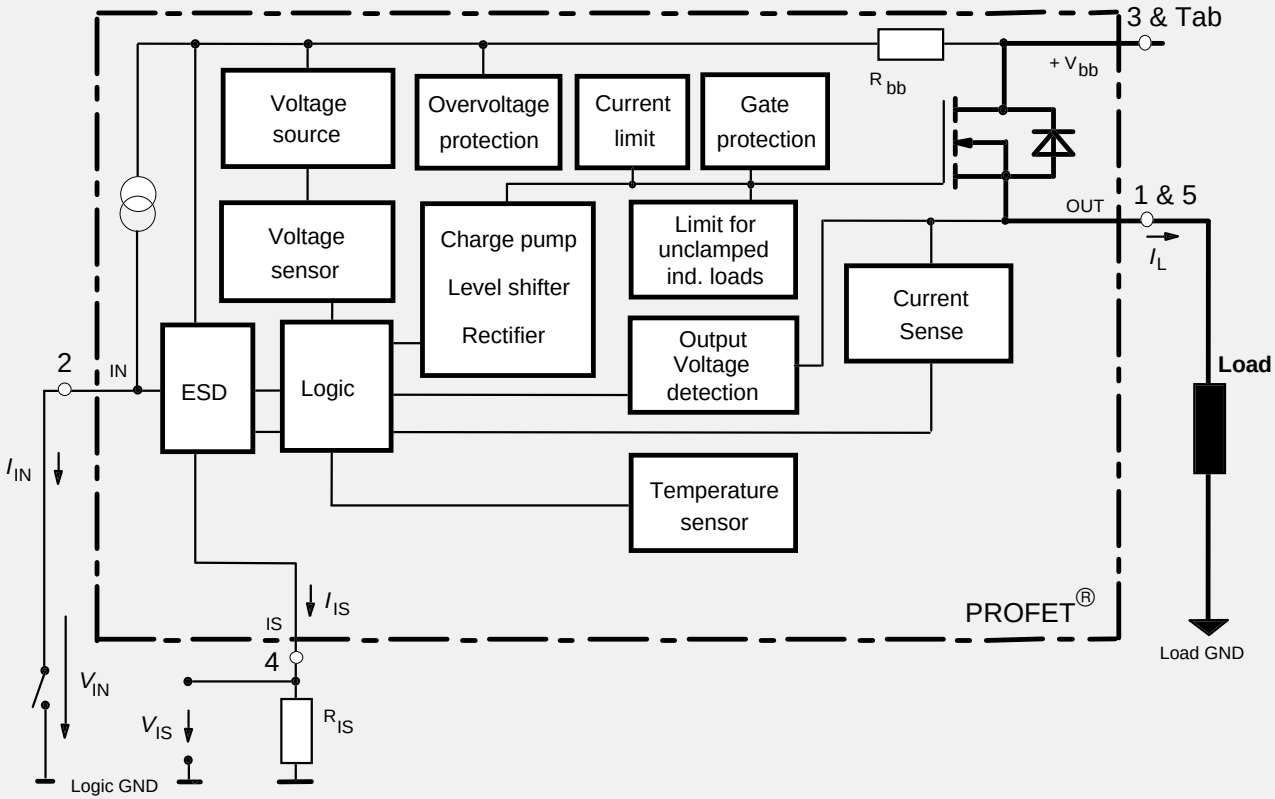
Main Features and Functional Diagram of High Current PROFET

Main Features

- High side switch
- Extremly low on-resistance
- Capability of handling very high load currents
- Forward and inverse operation with the extremly low on-resistance
- Conduction of power MOSFET in reverse battery
- Analog current sense
- Current control input



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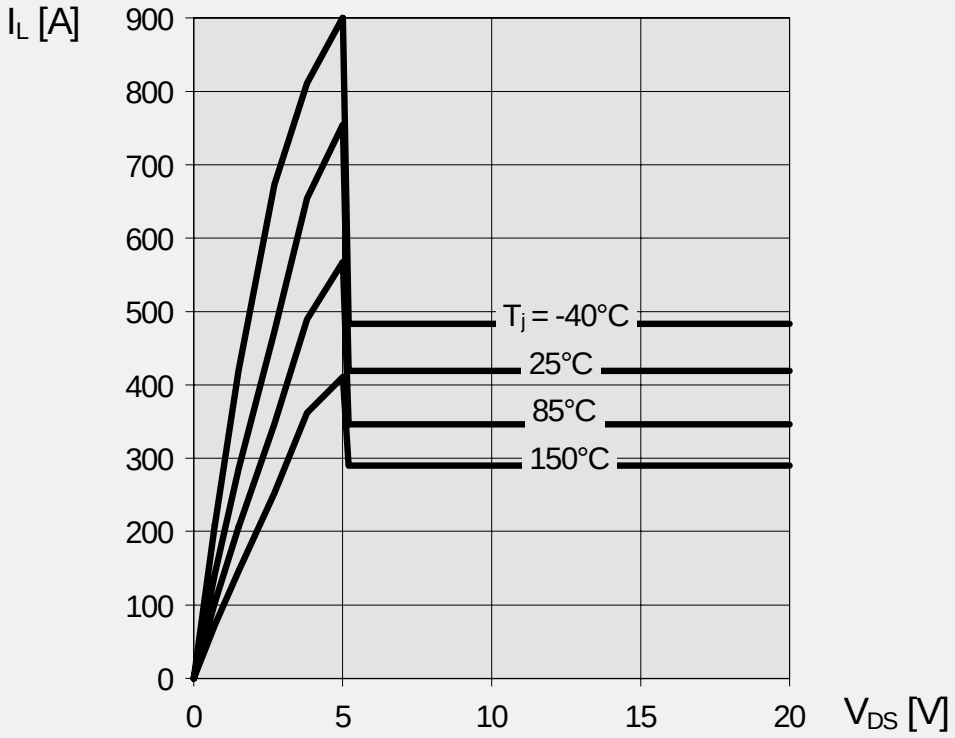
Current Limition for High Current Applications



Current Limit Characteristics

- **No current limitation at Vds < 5 V -> Very high load current allowed**
- **Output current limited at Vds > 5 V**
- **Current decreases with temperature**

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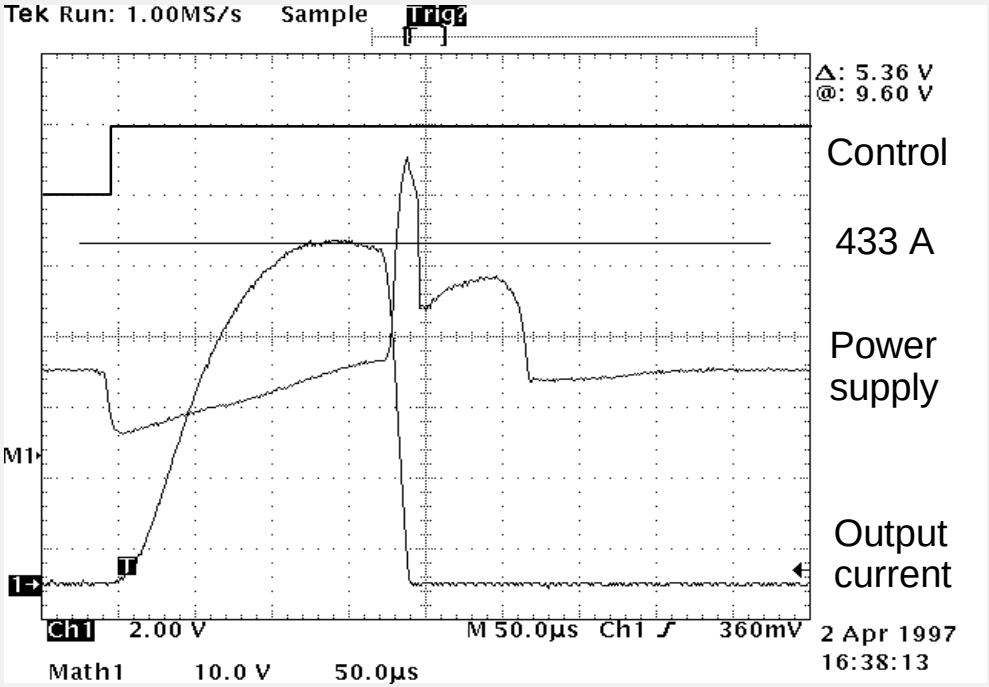
Short Circuit Shutdown Function



Turn-on transient at short circuit

Overtemperature Protection

Two Sensors for Overtemperature detection

- **One temperature sensor on the IC-chip; T = 175 C; slow**
- **One temperature sensor on the base chip; T = 200 C; fast**

--> enlarged safe operation area

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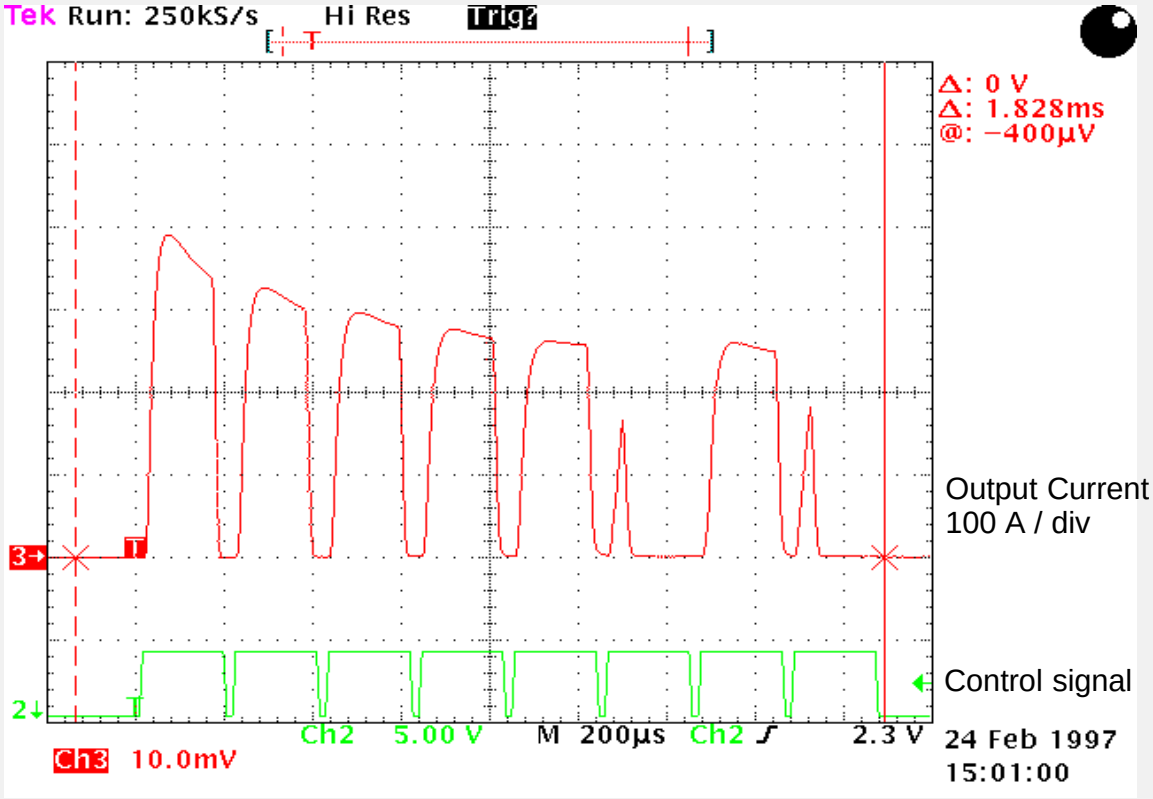
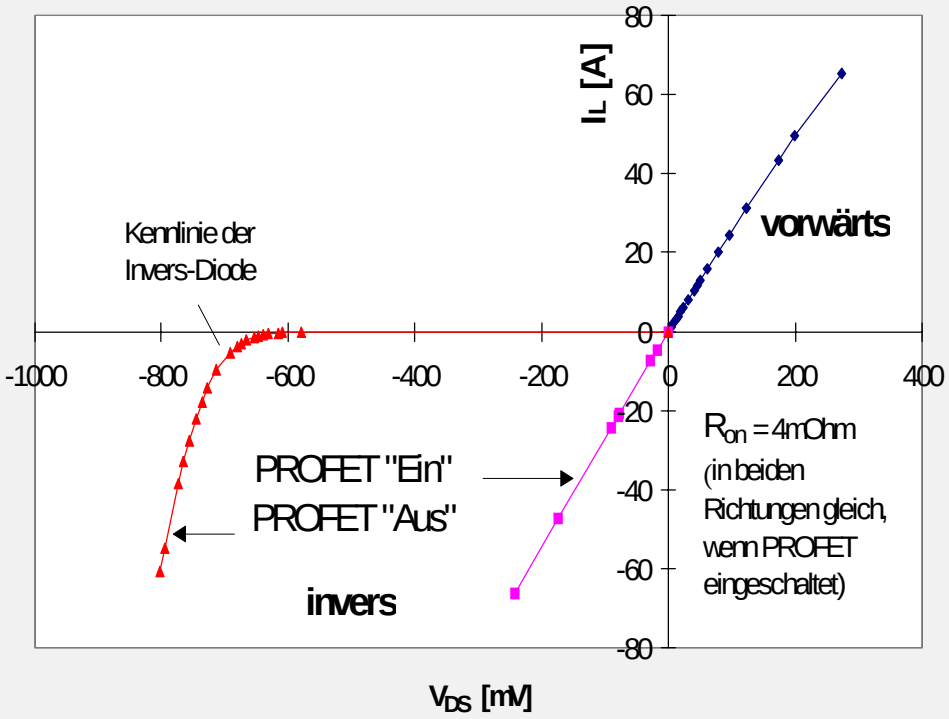
Combined Protecton of Current Limitaion, Short Circuit and Overtempearture Shut Down Functions

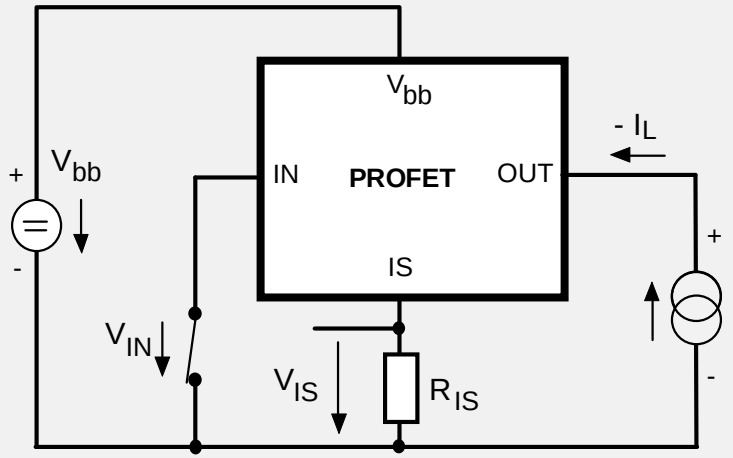


Short circuit response of BTS550P in on-state

Output current of BTS550P at repetitive short circuit of 40 V

Forward and Inverse Operation



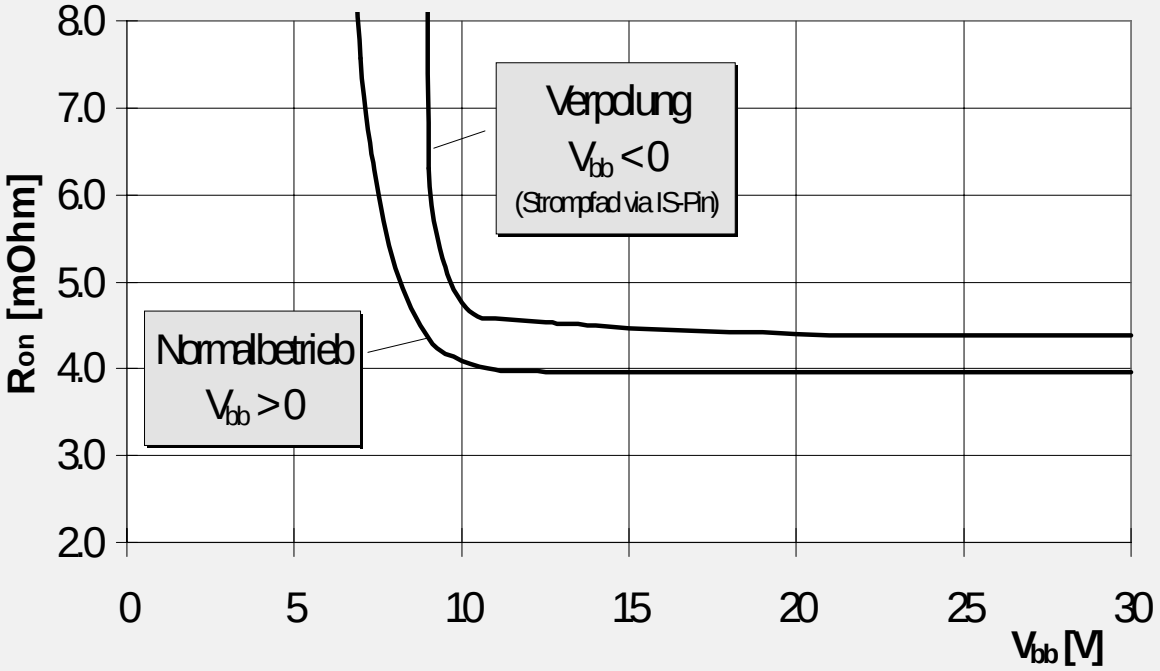


Inverse Operation

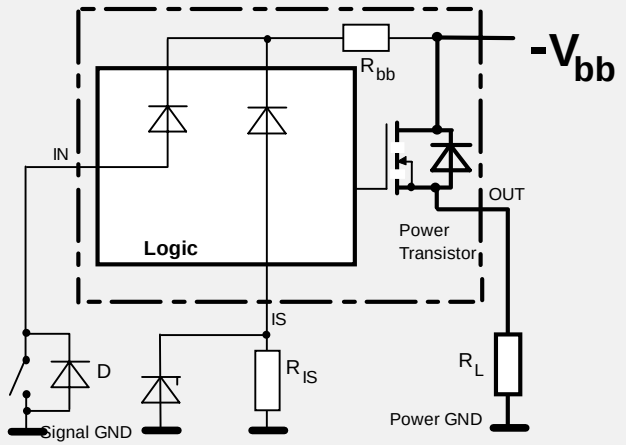
- **The same on-resistance as in forward operation**

--> low power loss

Conduction at Reverse Battery



Ron in normal operation and reverse battery in dependance of the battery voltage



Behavior at Reverse Battery

- **Connection of IN and/or IS pin to ground necessary**
- **For Voltage higher than 8 V conduction with power Mosfet**
- **On-resistance 15% higher than in normal operation**

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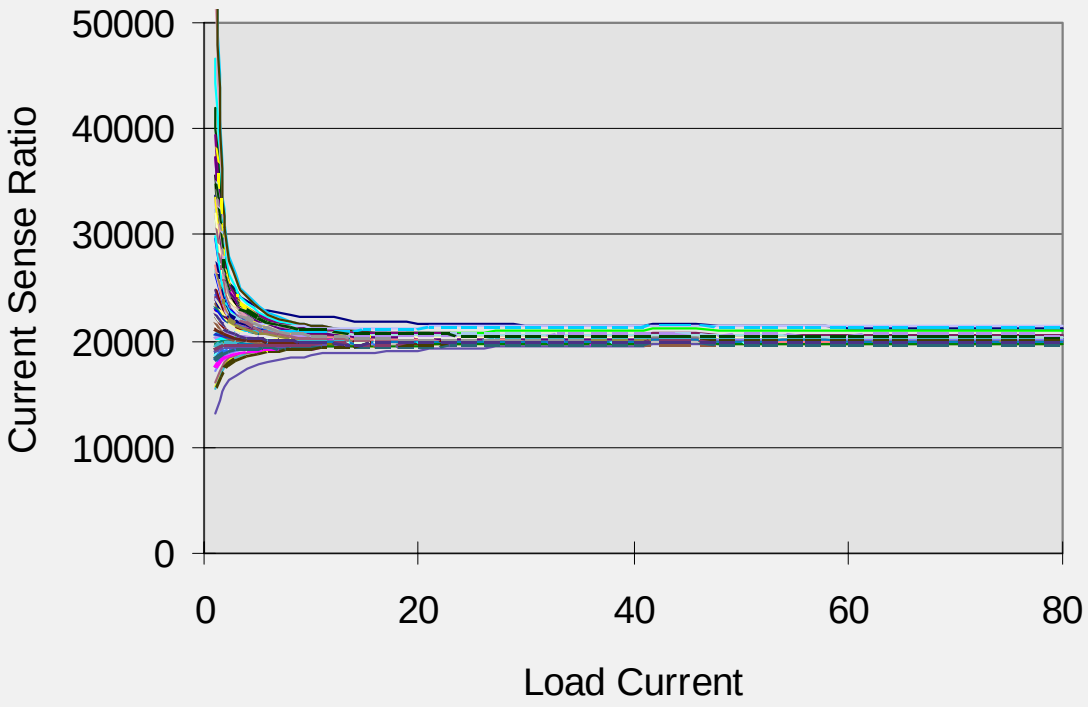
Current Sense Function of BTS550P



Current Sense Function

- **Current sense ratio constant in the lifetime and over a wide load current range: 25 - 120 A; Tolerance < 15%**
- **lowst sensed current : 5 A; Tolerance < 50%**
- **Temperature coefficient: -6% / 100K**

Current Control Input

Current Control Input Characteristics

- On/Off, if the input pin is connected / disconnected to ground
- A leakage current of 100 µA for input is allowed
  -> unintended turn-on is prevent
- Quiesent current to Output typically 10 µA
- High EMC-ruggedness -> suitable for mounting on the load
- High ESD-ruggedness (8 kV)