

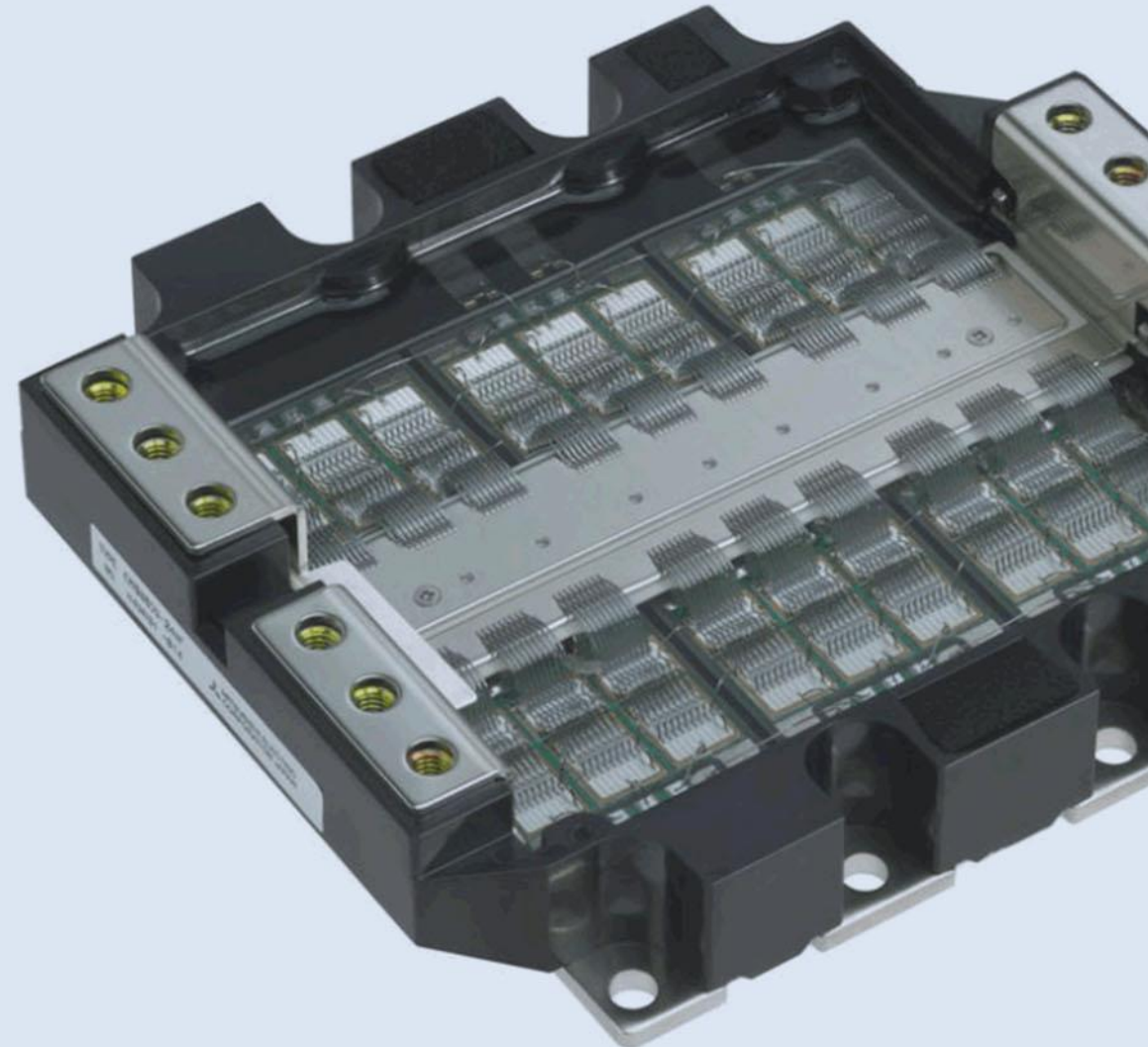
Attracting Tomorrow



NTC chip thermistors L860

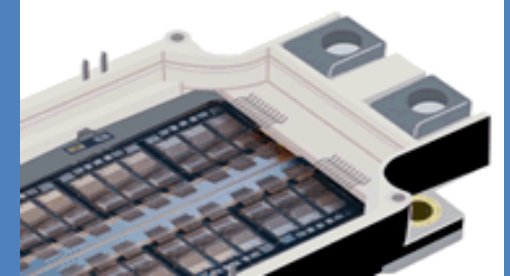
Temperature control in
power modules

TDK Sensors AG & Co. KG
Temperature & Pressure Sensors Business Group
Berlin, Germany
February 2022

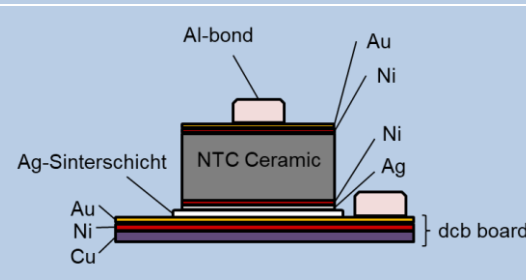


Introduction

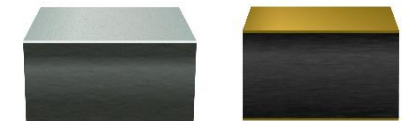
Inverter-controlled applications in the industrial and automotive segment use **power semiconductors** which typically are very sensitive to overheating. Precise temperature monitoring close to the power semiconductors is essential.



Temperature sensors should be placed as close as possible to the heat source and should be able to be connected with industry standard processes: sintering (soldering) and Al-heavy wire bonding.

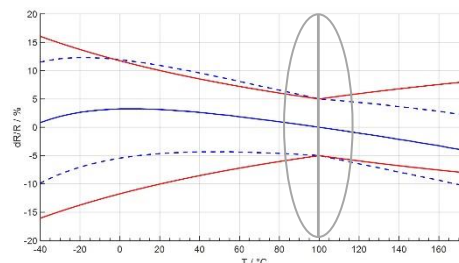


- Ni/Au thin-film electrode for Al-heavy wire bonding
- Ni/Ag thin-film electrode for Ag-pressure sintering and soldering



NTC thermistor chips with thin-film electrode

The L860 *R/T* curve has been adjusted to fulfill the industrial standard **R100**: **493 Ω**



Comparison of industry standard MELF curve (red) to L860 *R/T* curve (blue) → No need to change driver

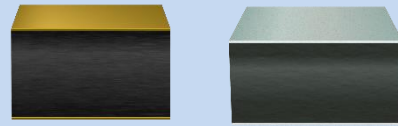
Dimensions	
Chip length (square)	1.6 ±0.15 mm
Chip thickness	0.5 ±0.10 mm
Electrical values	
T_{Rated}	100 °C
R_{Rated}	493 Ω ±5%
B (25 °C/100 °C)	3480 K ±1%

L860 NTC chip sensors

Intelligent Power Modules (IPM)



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L860 NTC chip sensor

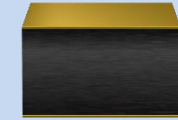
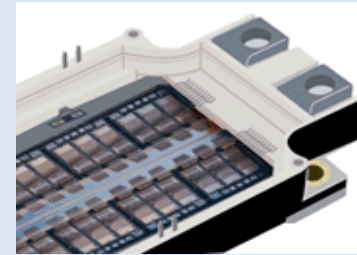
Customer benefits of using L860 NTC chip sensors

- **Saving space:** The L860 NTC chip can be offered with 0.15 mm² total space demand; no soldering pads needed
- **Established processes:** Wire bonding process can be used for the interconnection; gluing and soldering process can be used to attach the NTC

Proposed type for IPM

- B57860S104J200
- R25: 100 kΩ
- Dimensions (l x w x t) 0.39 x 0.39 x 0.2 mm

Power Integrated Modules (PIM)



L860 NTC chip sensor

Customer benefits of using L860 NTC chip sensors

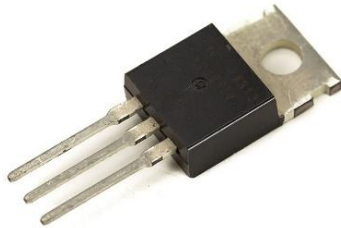
- **Lead-free:** Future ready as fully RoHS II compliant
- **Temperature:** With operating temperature up to +175 °C ready to be used for SiC module designs
- **Attachment:** L860 sensors are designed to be attached with silver sintering process; optional soldering and gluing
- **Interconnection:** The special metalization allows Al-wire bonding

Proposed type for MELF replacement in PIM

- B57860L522J500
- R25: 5.2 kΩ, R100: 493 Ω (could replace **MELF** R/T characteristic)
- Dimensions (l x w x t) 1.6 x 1.6 x 0.5 mm

M703 Screw-on sensors · NTC sensor systems

Discrete semiconductors



M703 screw-on sensor

Customer benefits of using M703 screw-on sensors

- **Temperature range:** -20 up to +125 °C
- **Insulation voltage:** $V_{ins} > 1000 \frac{V_{ac}}{s}$
- **Easy mounting:** Fast and simple screw-on installation
- **Response time:** Good thermal coupling through metal tag
- **Certification:** UL approved versions available

Proposed type for discrete semiconductors

- B57703M103G40
- R25: 10 kΩ
- Resistance tolerance at R_R : ±2%
- Cable length: 45 mm ± 3 mm

Customer-specific sensor design (e.g. cable length, RT curve, temperature range, ring tongue design, connectors, etc.)



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