

New intelligent power module, CIPOS™ Mini DCB IPM with 7th generation IGBTs for motor drive applications

Song Bokkeun, Lee Jonguk, Lee Kihyun, Lee Taejin, and Jo David

Infineon Technologies, Korea

Introduction

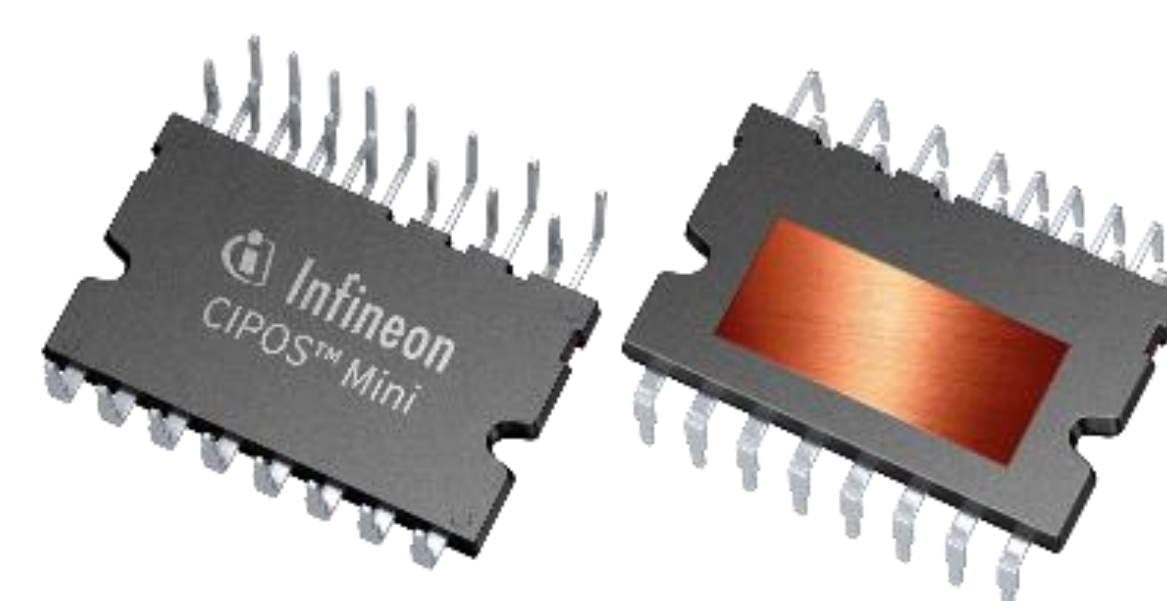
As energy regulations with respect to efficiency and power factor are getting strengthened around the world, the importance of inverter systems is growing. This has led to a rise in the demand for highly efficient heat pumps and home appliances.

Compared to previous generations, the latest 7th generation IGBT has better current density due to its micro-pattern trench technology. Infineon has developed a new inverter module that is optimized to improve electrical performance in power motor drive applications with IGBT7. This new module comes in the same package size and pin map as products in the existing CIPOS™ Mini's series.

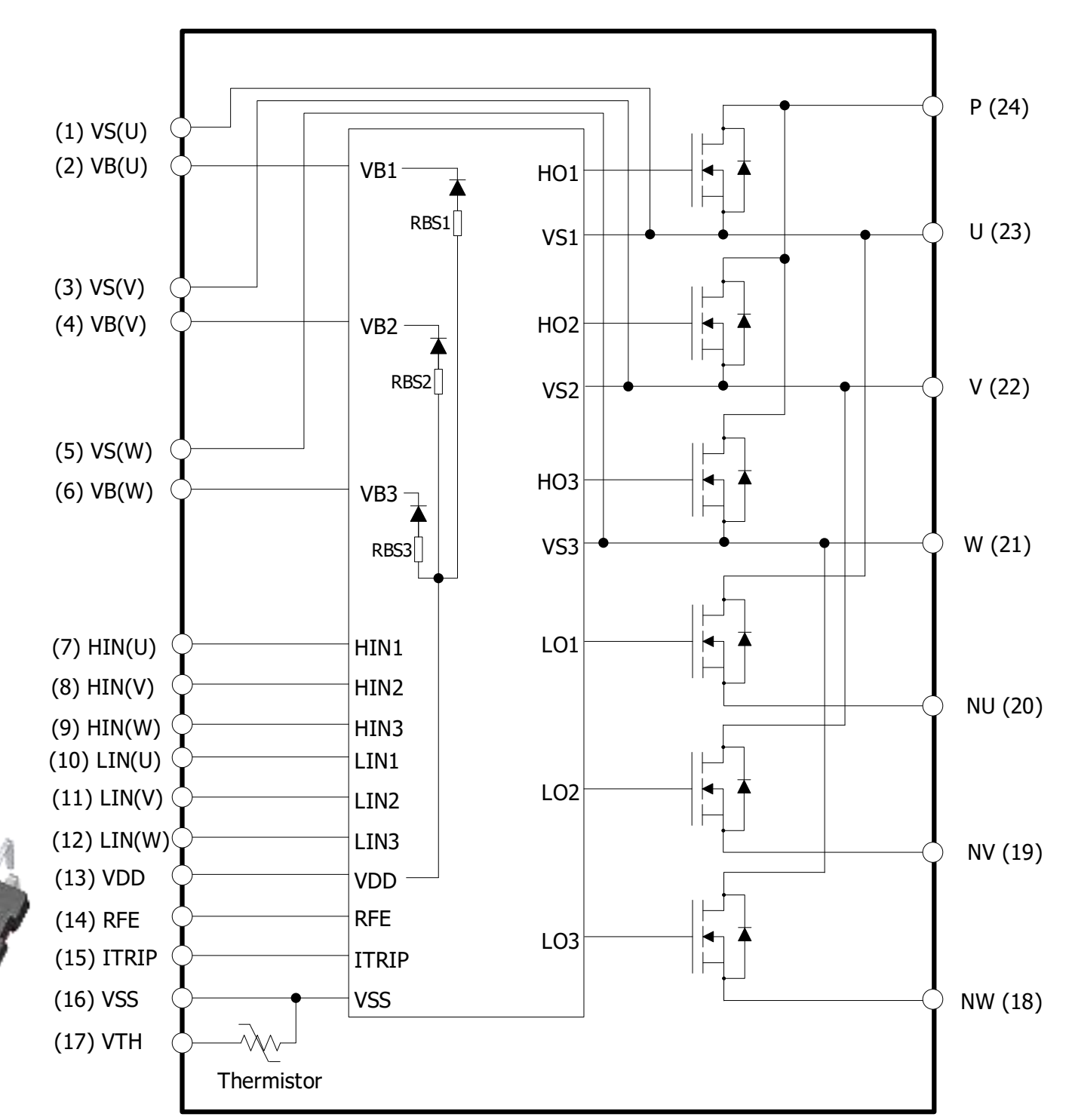
- The new CIPOS™ Mini IM06B50GC1 offers an optimized package with low power consumption and improved reliability
- The CIPOS™ Mini IM06B50GC1 is composed of six TRENCHSTOP™ 7th generation IGBTs in a three-phase inverter structure together with one gate driver IC and a built-in NTC thermistor for temperature monitoring
- An open emitter pin configuration is adopted for the low side

Key features of IM06B50GC1

- TRENCHSTOP™ IGBT 7 offers significantly lower losses and a low rise in the case temperature
 - Lower $V_{CE(sat)}$
 - 650 V maximum blocking voltage
- Enhanced humidity ruggedness for outdoor applications and a new gate driver IC in SOI technology
- A 600 V SOI single-gate driver IC
 - Overcurrent shut down
 - Undervoltage lockout
 - Cross-conduction prevention
 - All the six switches turn off during protection
 - Integrated bootstrap functionality
- Allowable negative VS potential up to -11 V for signal transmission at VBS = 15 V
- Built-in NTC thermistor for monitoring temperature
- Low-side source pins accessible for all phase current monitoring
- Package information
 - Without dummy pin
 - Size: 36 mm x 21 mm x 3.1 mm
 - Fully isolated dual-in-line molded package

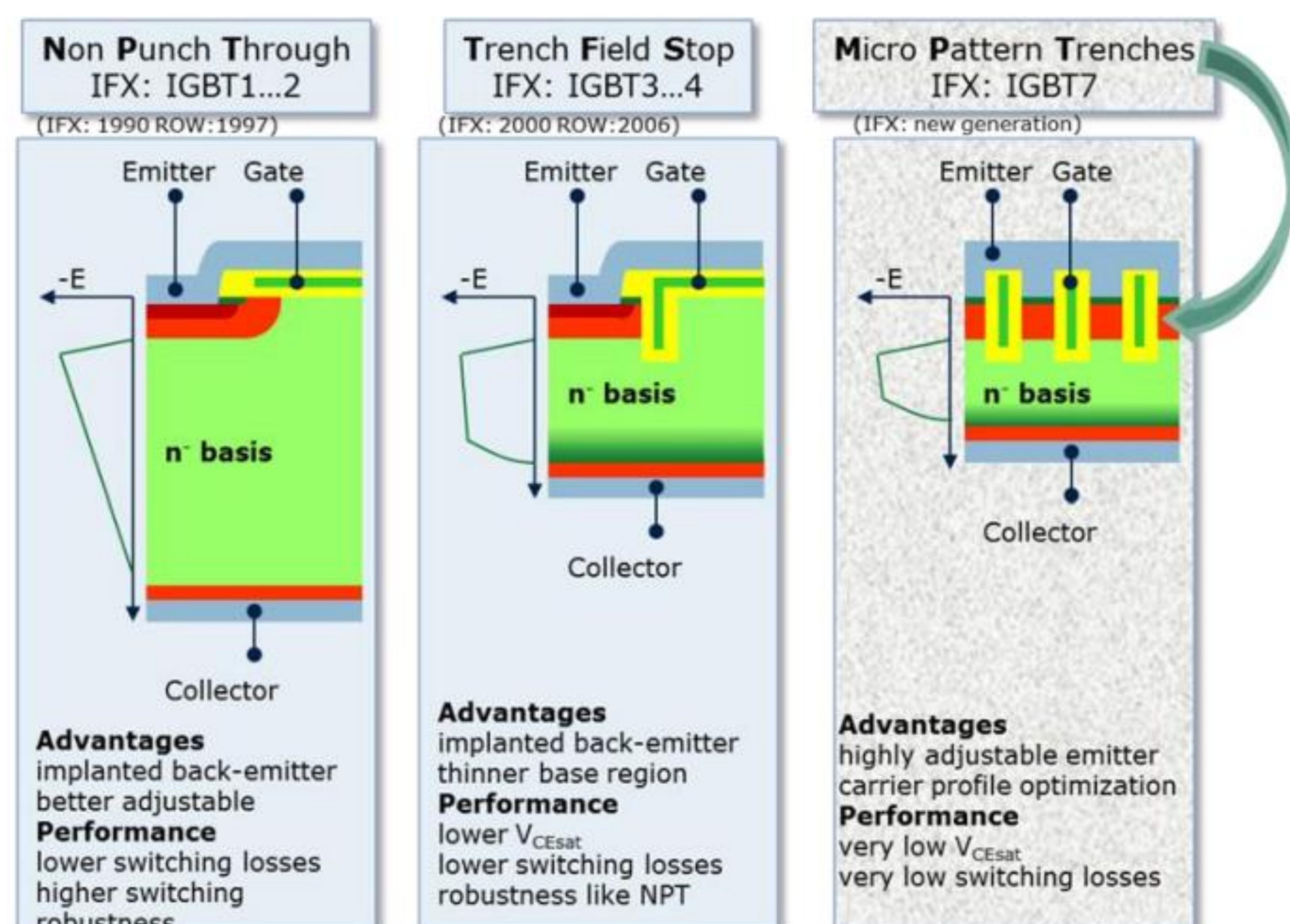


Package outline



Internal circuit configuration

Infineon's chip technologies



Package

Properties/ceramic	Al ₂ O ₃	ALN	H-ALN
Product	DCB/AMB	DCB/AMD	DCB/AMB
Thermal conductivity (W/mK)	24	170	150
CTE (ppm)	6.8	4.5	4.5
Bending strength (N/mm ²)	550	450	580
note	Cheaper price	High thermal Low strength	High thermal Good strength

- The new CIPOS™ Mini IM06B50GC1 used the H-ALN.

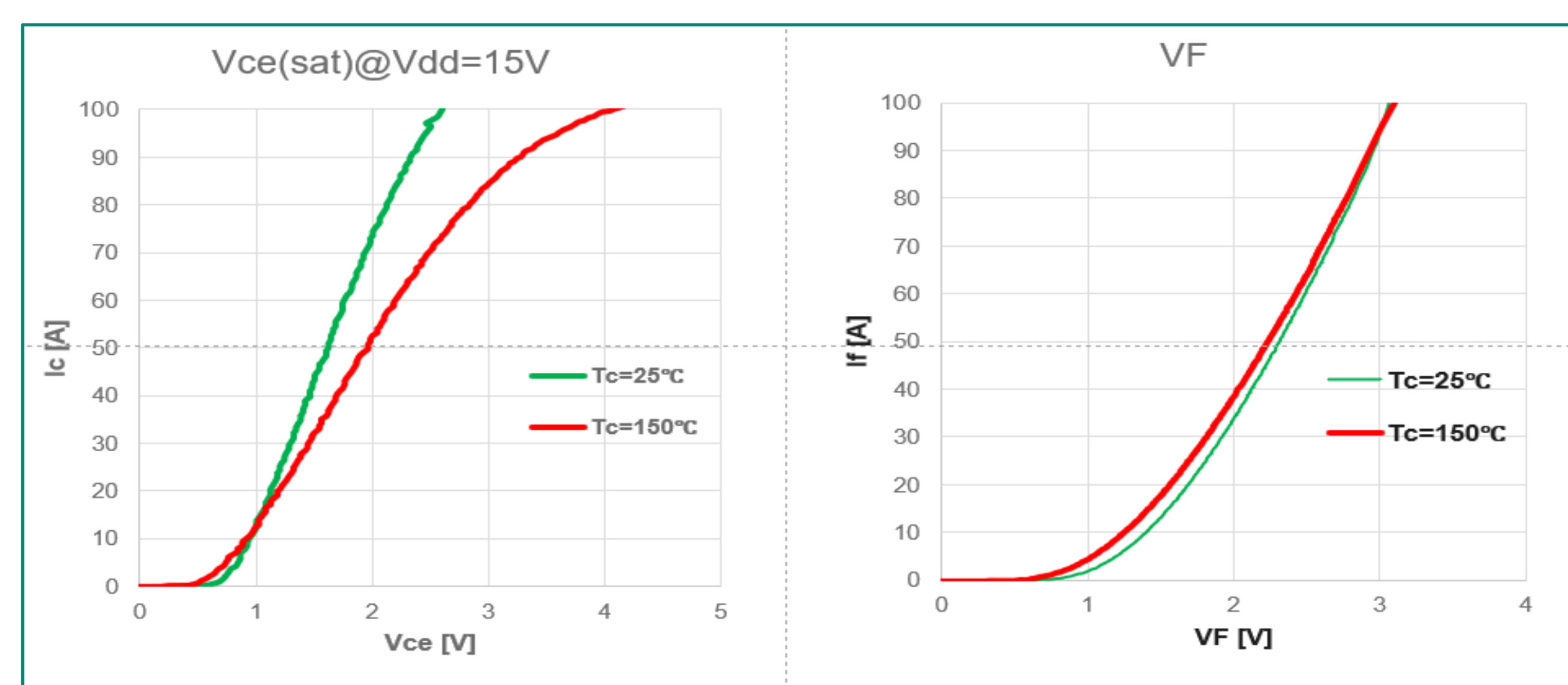
New intelligent power module, CIPOS™ Mini DCB IPM with 7th generation IGBTs for motor drive applications

Song Bokkeun, Lee Jonguk, Lee Kihyun, Lee Taejin, and Jo David

Infineon Technologies, Korea

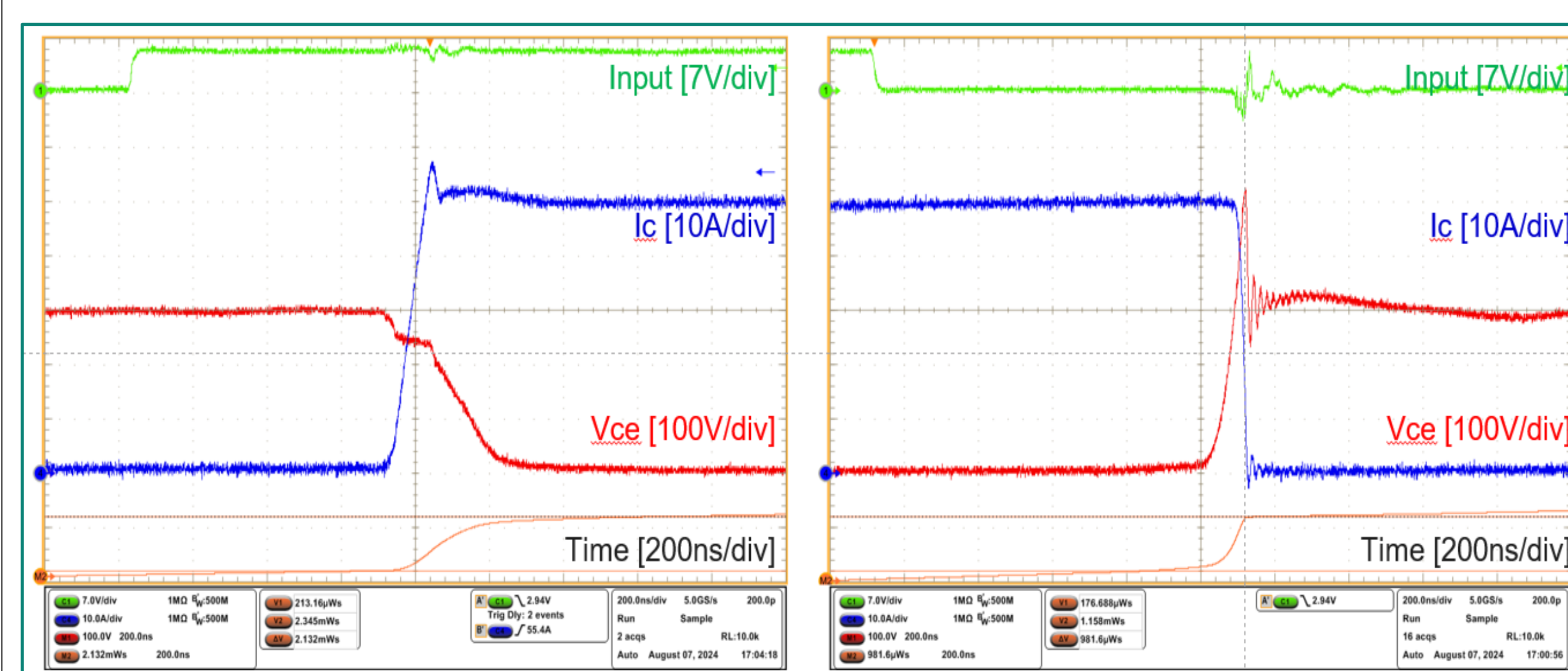
Static characteristics

$V_{DD} = 15\text{ V}$, $T_c = 25^\circ\text{C}$, 150°C



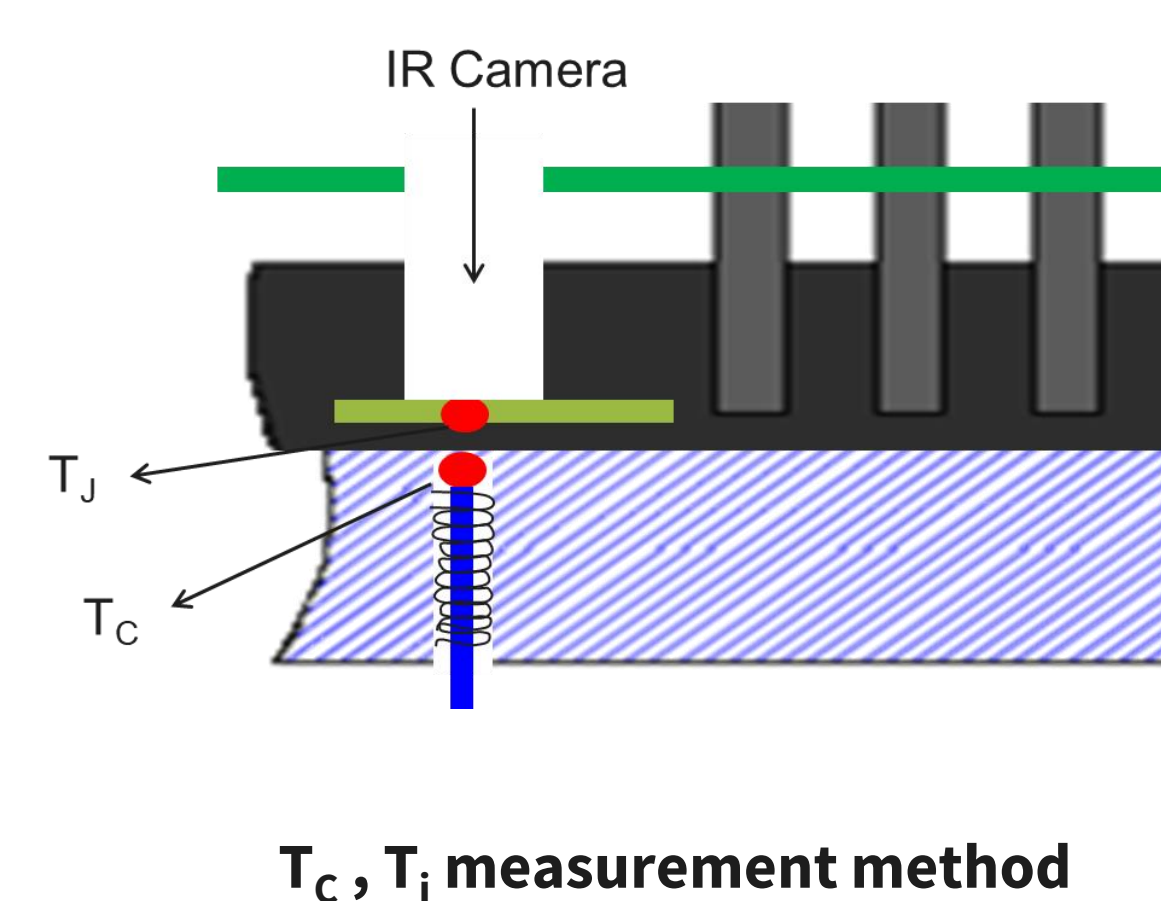
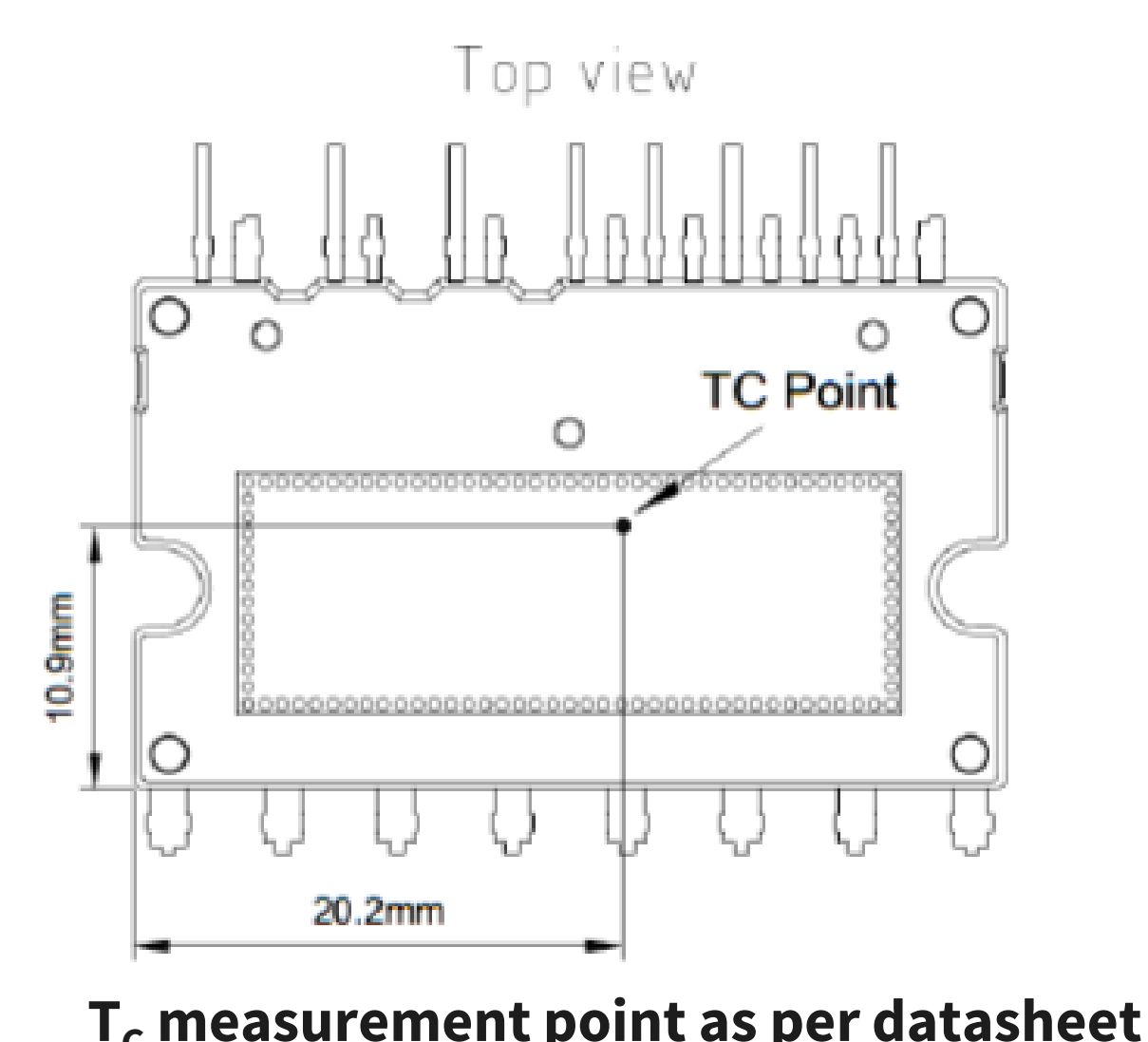
Dynamic characteristics at 50 A

$V_{DC} = 300\text{ V}$, $V_{DD} = 15\text{ V}$, $T_J = 150^\circ\text{C}$



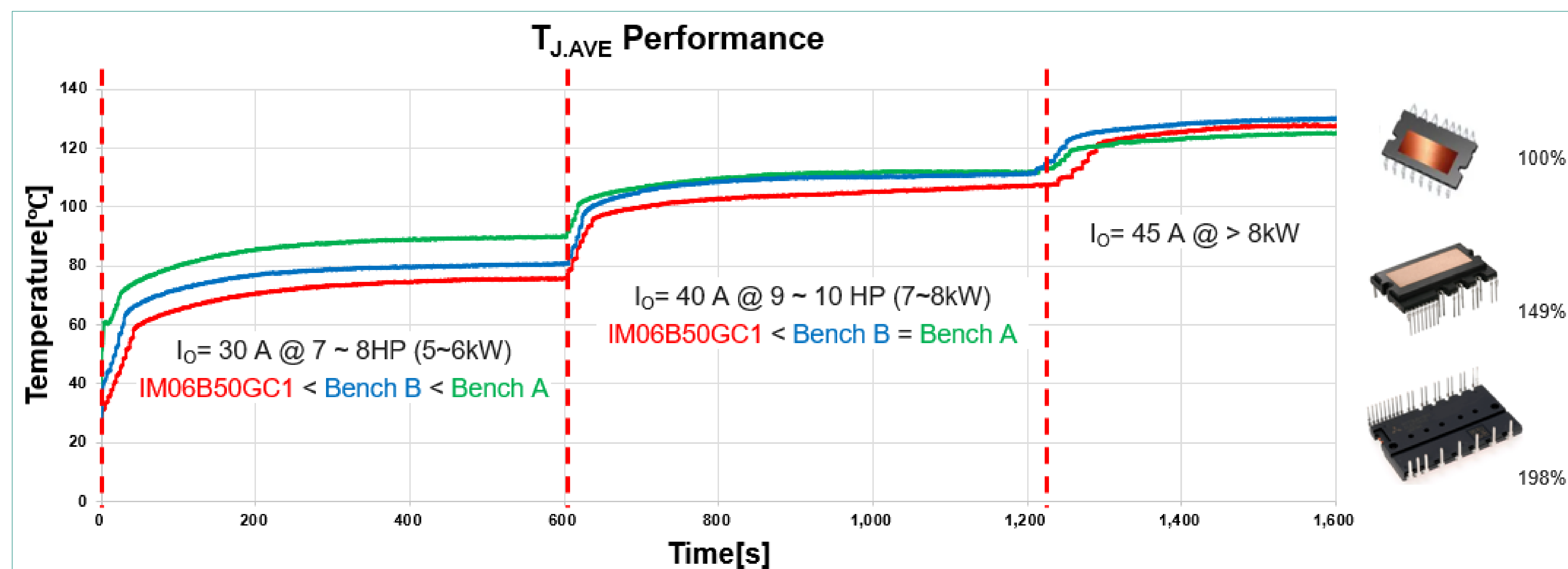
Thermal performance

Measurement information



Test conditions and results

- $V_{DC} = 380\text{ V}$, $V_{DD} = 15\text{ V}$, $F_{SW} = 5\text{ kHz}$, $F_O = 60\text{ Hz}$, $MI = 0.6$, $PF = 0.80$, SVPWM, $T_{dead} = 2\text{ }\mu\text{sec}$, 3-phase R-L load
- Case 1: 5 kW to 6 kW heat pump; Case 2: 7 kW to 8 kW heat pump; Case 3: 8 kW and above with forced cooling



Conclusion

- The CIPOS™ IM06B50GC1 is designed to offer optimized performance in compressor and industrial drives thanks to the improved power loss from IGBT 7 and better functionalities of the new C5SOI, compared to the existing Mini solutions
- These products can provide better supply flexibility to customers
- These products can potentially replace the existing Mini DCB solutions considering the improved thermal performance of their package