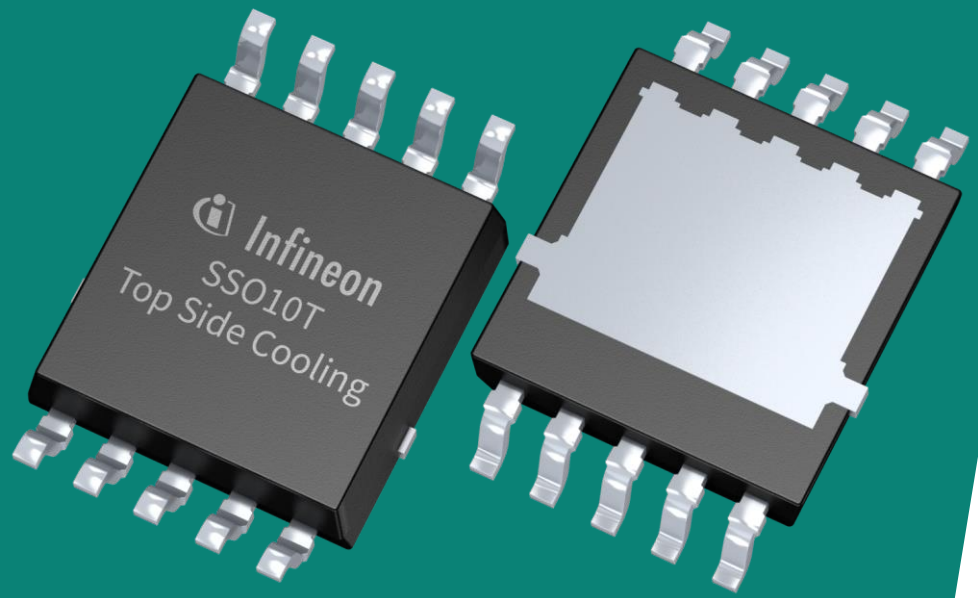
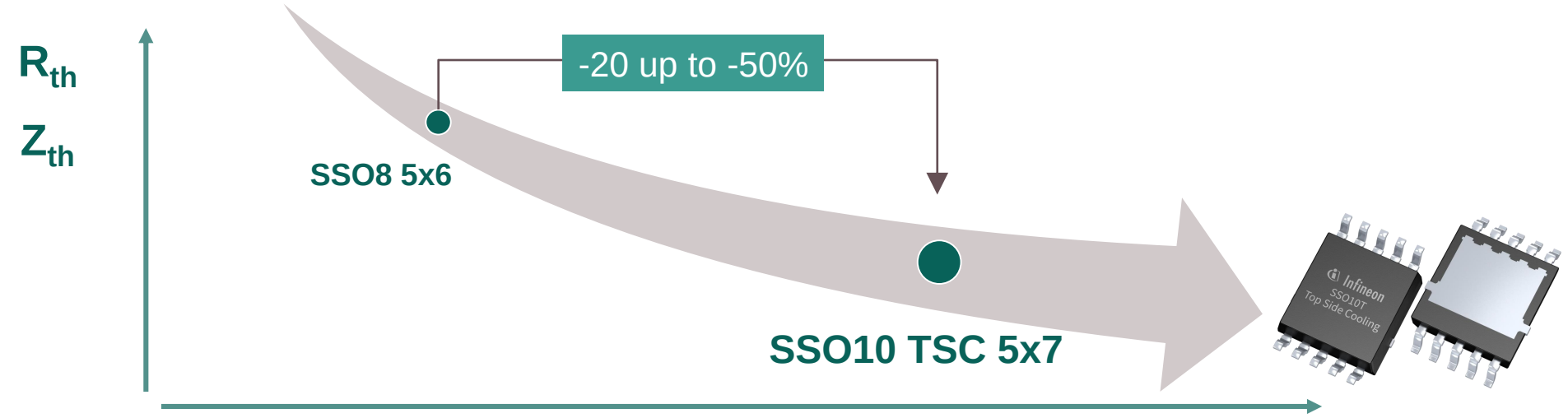
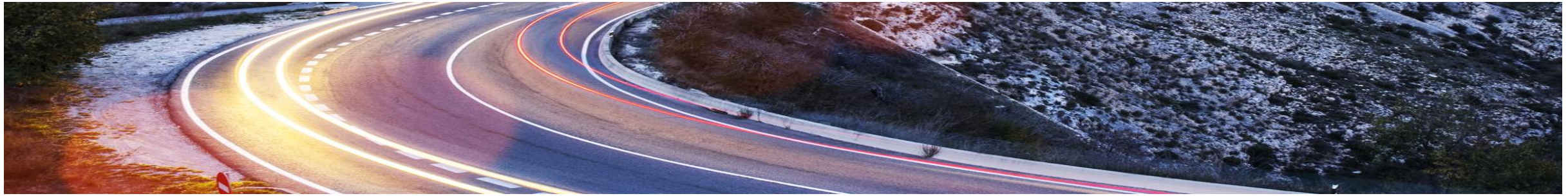


Infineon Automotive MOSFET Top Side Cooling (TSC) 40V SSO10T 5x7

September 2023

SSO10 TSC - Top Side Cooling
Best Cooling Performance and Compact Design = Low System Cost



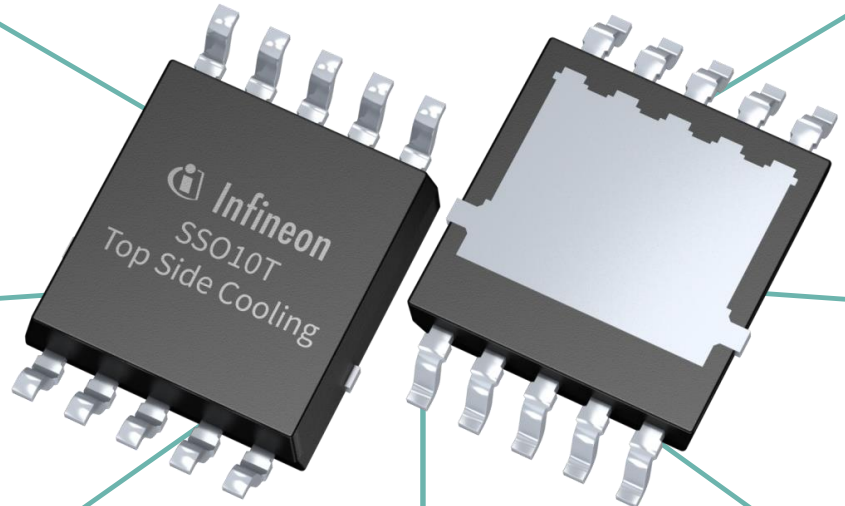


SSO10 TSC - Top Side Cooling
Best Cooling Performance and Compact Design = Low System Cost

Improvement of Zth, Rth and System Cooling by -20% up to -50%

Direct Cooling Path to heat sink No heat transfer into PCB

System Area Reduction Compact Design by PCB backside mounting



Best Cooling Performance

Higher Power Density in combination with IFX OptiMOS™ 40V

Higher Application Current than standard SSO8 5x6

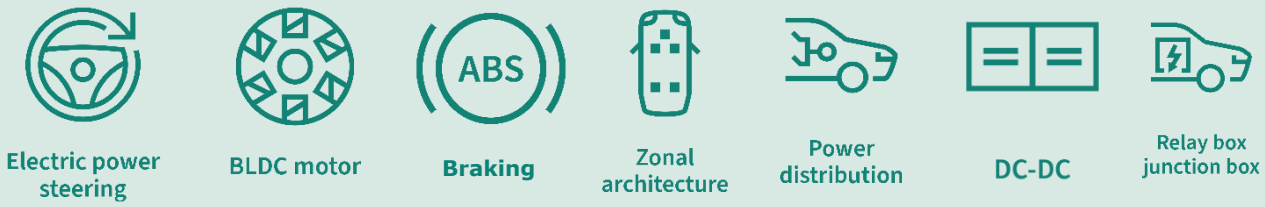
Reduction of System Costs & Design Efforts

SSO10 TSC - Top Side Cooling
Product Portfolio OptiMOS™6 – 40V

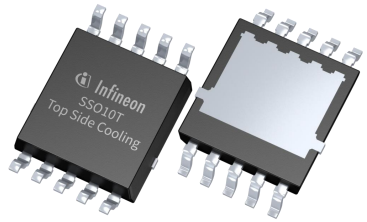
Group	Product	max $R_{DS(on)}$ [mΩ]	I_D (DC current) [A]	I_D (chip limitation) [A]	Q_G typ. [nC]	$V_{GS(th)}$ [LL/NL]
1	IAUCN04S6N007T	0.75	120	390	100	NL
1	IAUCN04S6N009T	0.90	120	330	85	NL
1	IAUCN04S6N013T	1.32	120	230	52	NL
1	IAUCN04S6N017T	1.73	120	200	37	NL

- **TSC features best cooling performance** by heat transfer directly to ECU housing
- **TSC improves Zth & Rth and system cooling by 20% up to 50%**
- **TSC enables direct cooling path to heat sink** -> no heat transfer into PCB thus lower PCB temp. for logic & sense
- **TSC reduces system area & supports compact PCB design** by double sided PCB mounting
- **TSC offers higher power density in combination with IFX OptiMOS™ 40V**
- **TSC provides higher application currents** and therefore can replaces larger packages
- **TSC facilitates reduction of system cooling effort & reduces system costs and design efforts**
- **Infineon TSC packages are JEDEC listed** to enable 2nd source offering for all customers

Application examples:



Single SSO10 TSC



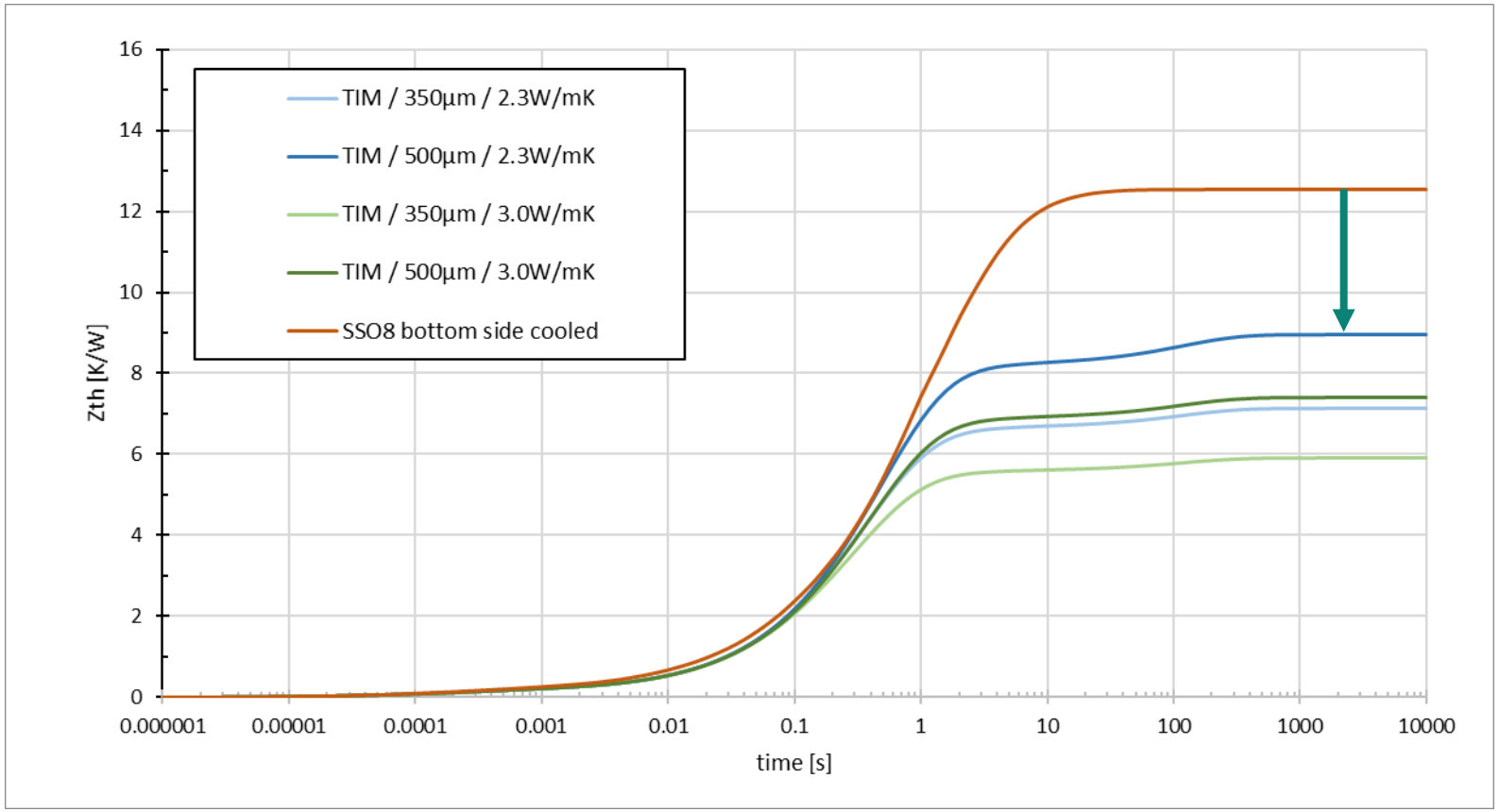
L x W x H

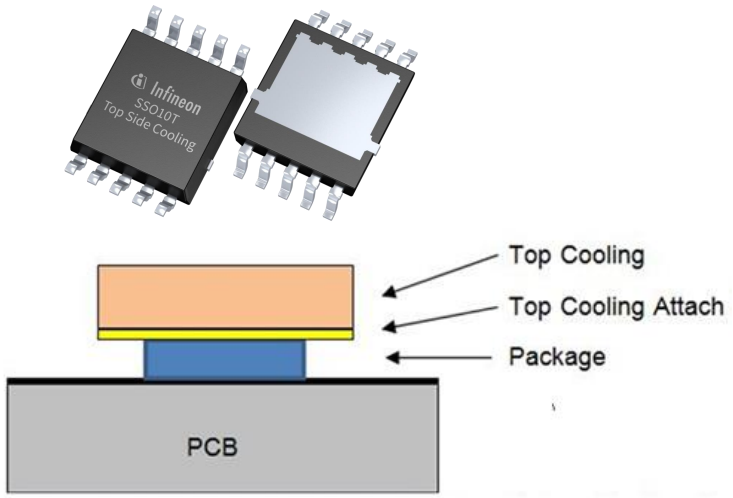
7.68 x 5.15 x 1.3 mm³

Cu-Clip soldered

Project Schedule	Group 1
QS	available
SOP	Q3 2023

SSO10 TSC - Top Side Cooling
Thermal simulation with different TIM material and thickness





- $T_{ambient}$ = 85°C
- P_{Loss} = 5W

SSO10 TSC 5x7 offers more than 20% up to 50% higher power capability than standard SSO8 5x6

SSO10 TSC - Top Side Cooling
Best Cooling Performance + Compact Design = Perfect System Cost

Key features

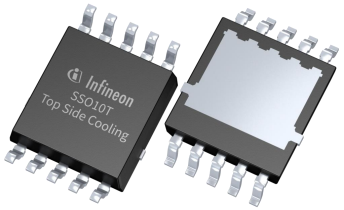
- Direct cooling path to ECU housing
- Improves Zth by -20% up to -50%
- Improves Rth by -20% up to -50%
- Enables double sided PCB design
- Provides higher application currents
- SSO10T TSC is JEDEC listed for open market and 2nd source compatibility

Key benefits

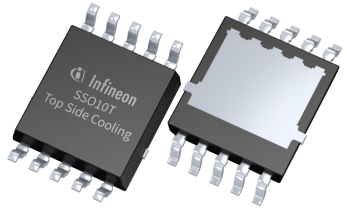
- Best Cooling Performance
- Not heat transfer into PCB
- Very compact PCB design
- Reduces system area
- Reduces cooling efforts & costs (no more vias)
- Reduces system costs & design efforts
- High power density & efficiency

Key applications

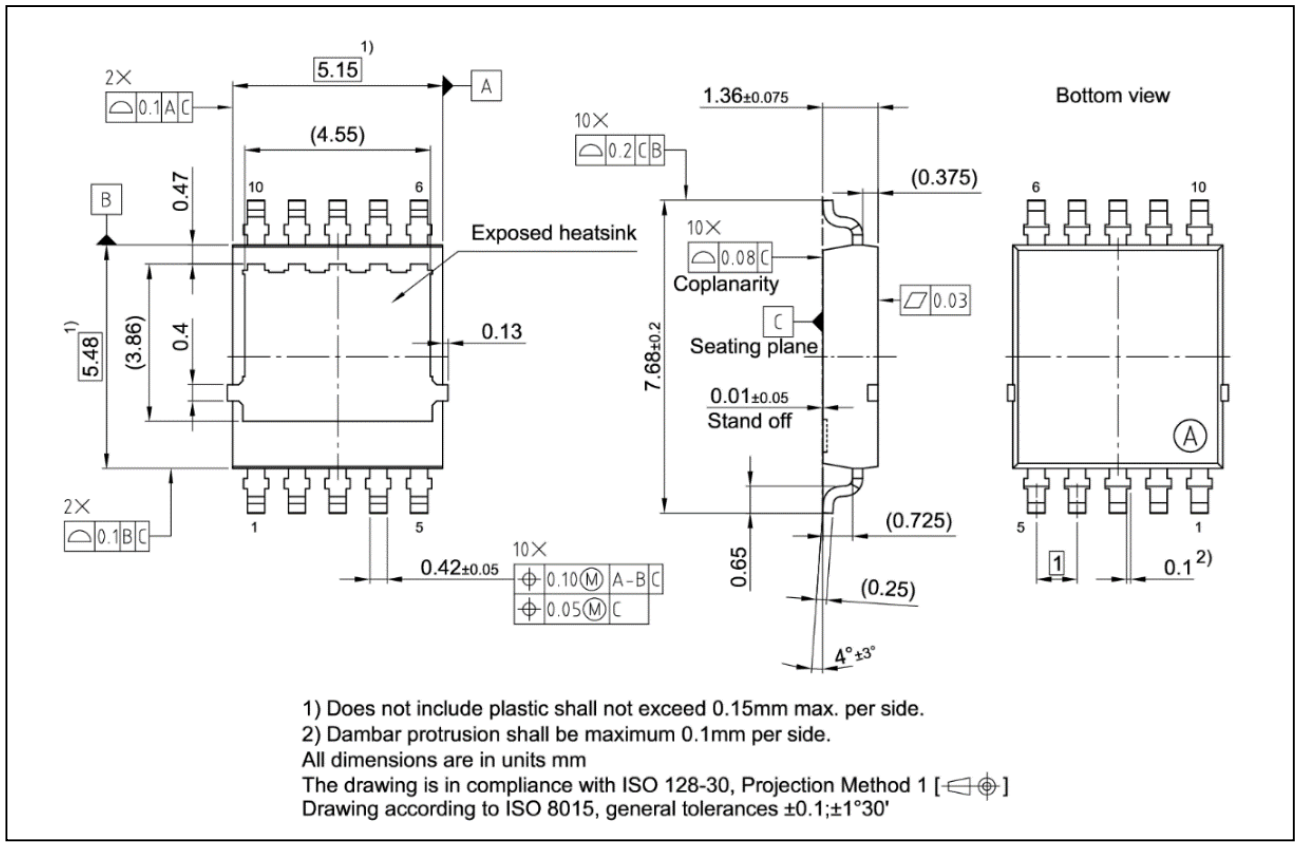
- Electric power steering
- Power disconnect switches
- Zone control units
- E-fuse box
- DC/DC
- ABS Braking, e-Booster
- all automotive applications
- BLDC drives in a wide variety

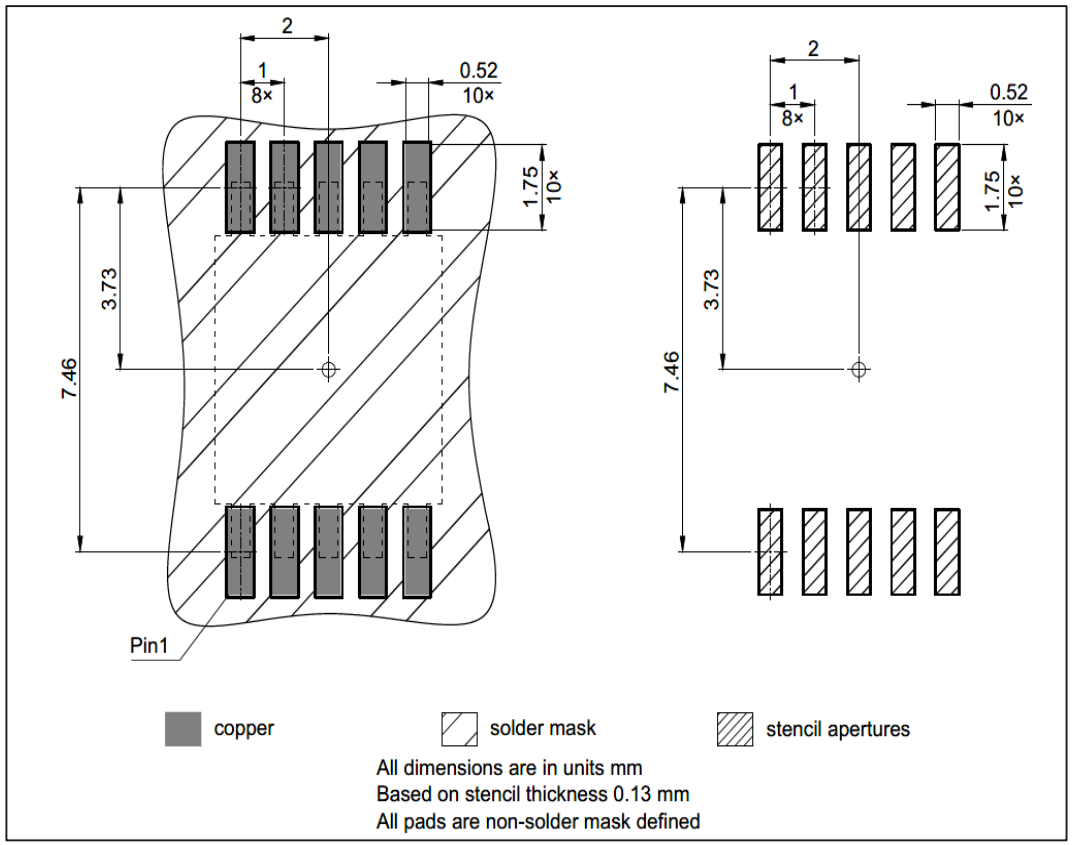


https://www.infineon.com/cms/en/product/promopages/SSO10T/

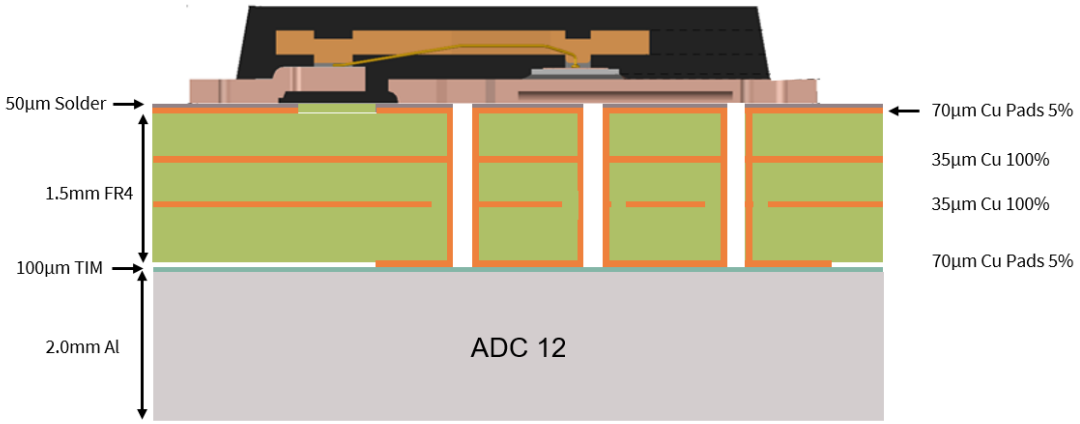


SSO10 TSC - Top Side Cooling
Package Dimensions

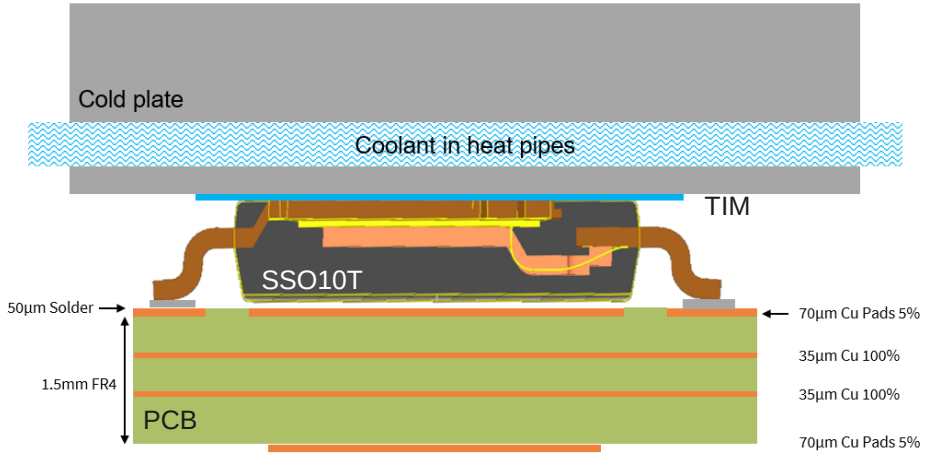




SSO10 TSC - Top Side Cooling
Bottom Side vs Top Side Design

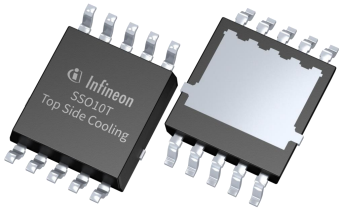


- Thermal vias necessary for cooling
- PCB temperature close to temperature of Tj



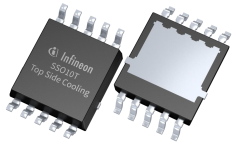
- No thermal vias needed
- Enables double sided mounting & compact PCB design
- PCB temperature lower than Tj

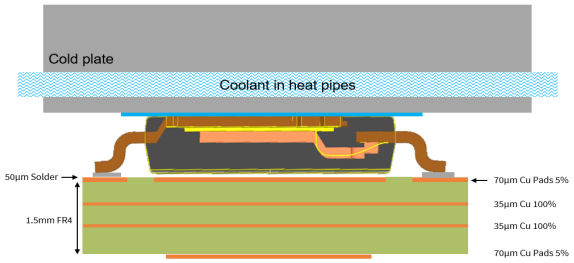
https://www.infineon.com/cms/en/product/promopages/SSO10T/

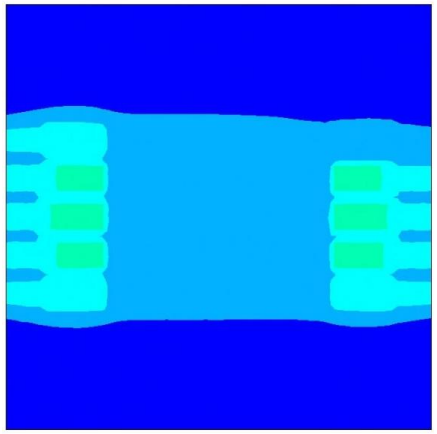


SSO10 TSC - Top Side Cooling
>50% less PCB heating (IAUCN04S6N009T vs IAUC120N04S6N009)

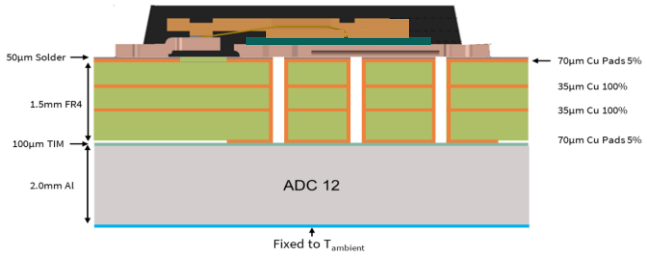
IAUCN04S6N009T

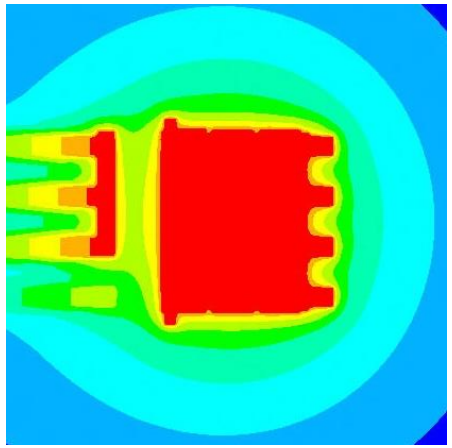




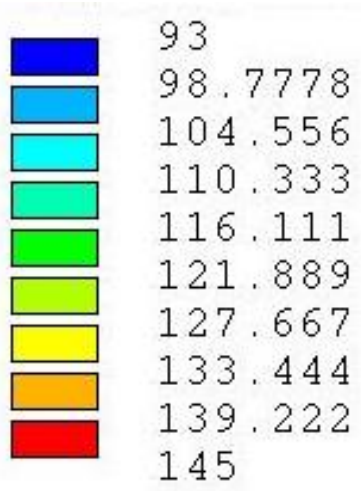


IAUC120N04S6N009

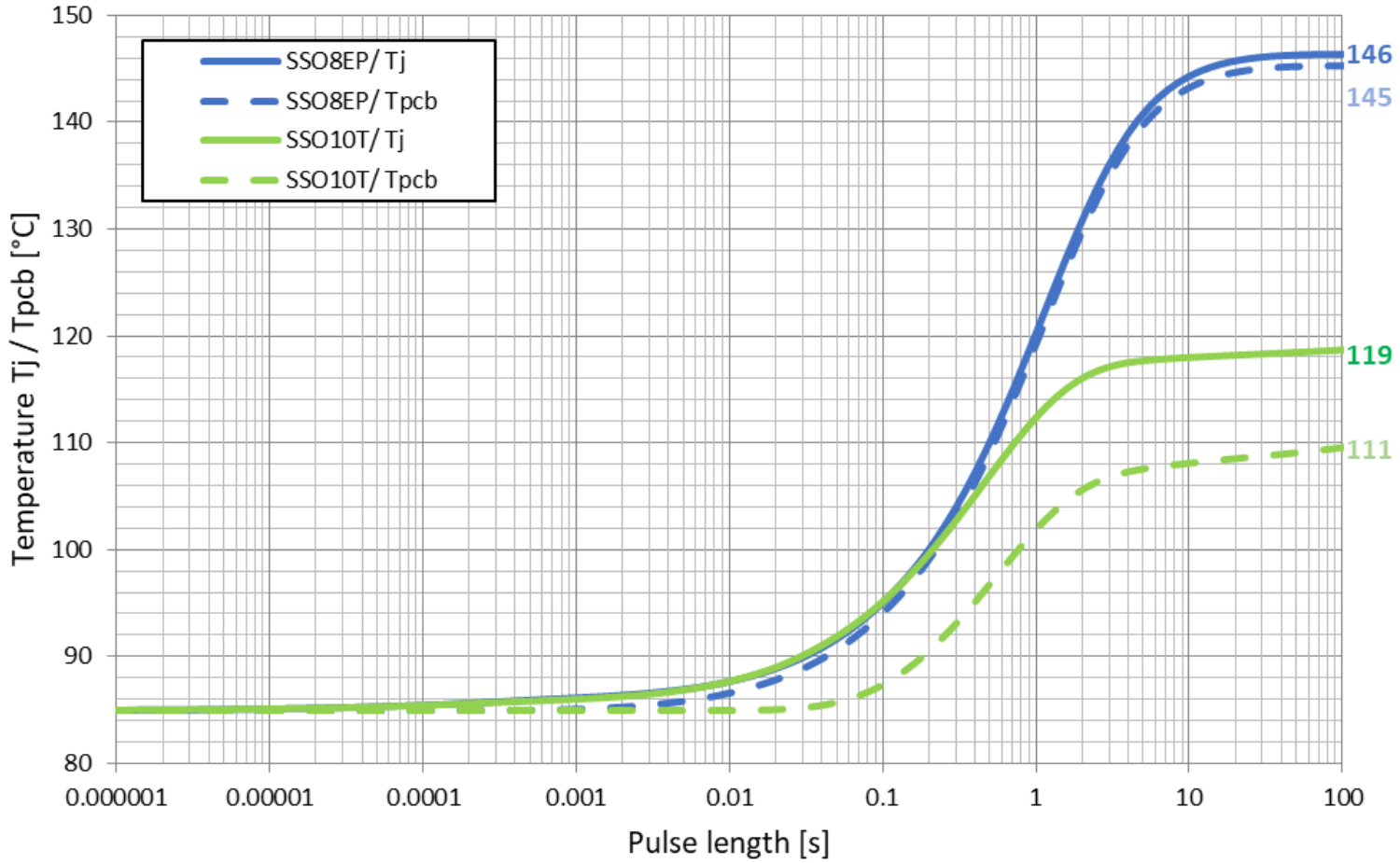




- IAUCN04S6N009T with 111°C PCB temperature has 57% less heating into PCB which allows lower Tg for the PCB (dT is only 26K)
- IAUC120N04S6N009 has same power dissipation as the IAUCN04S6N009T, but much higher PCB temperature of 145°C (dT is 60K)

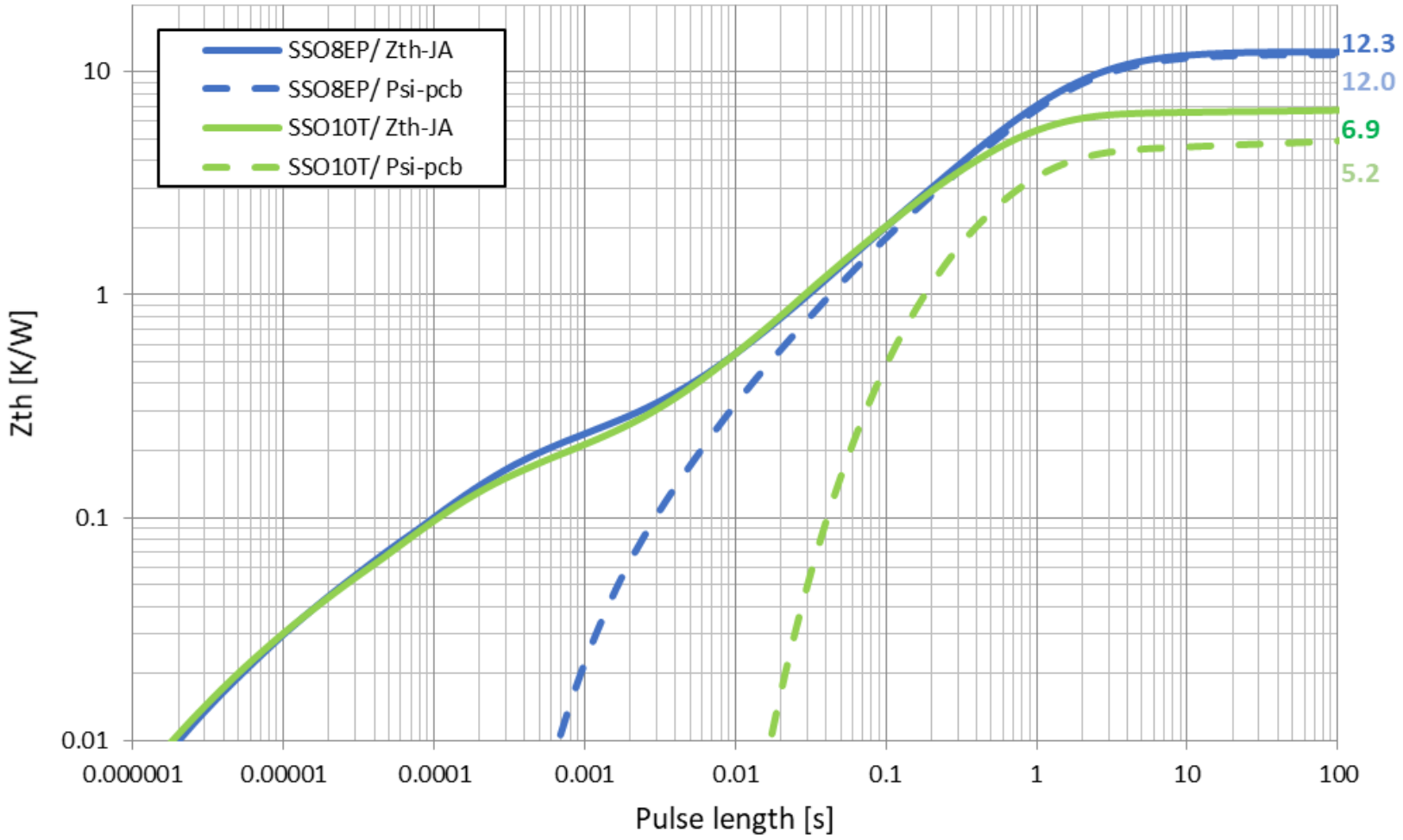


SSO10 TSC - Top Side Cooling
Lower PCB temperature - for long pulses but also shorter pulses



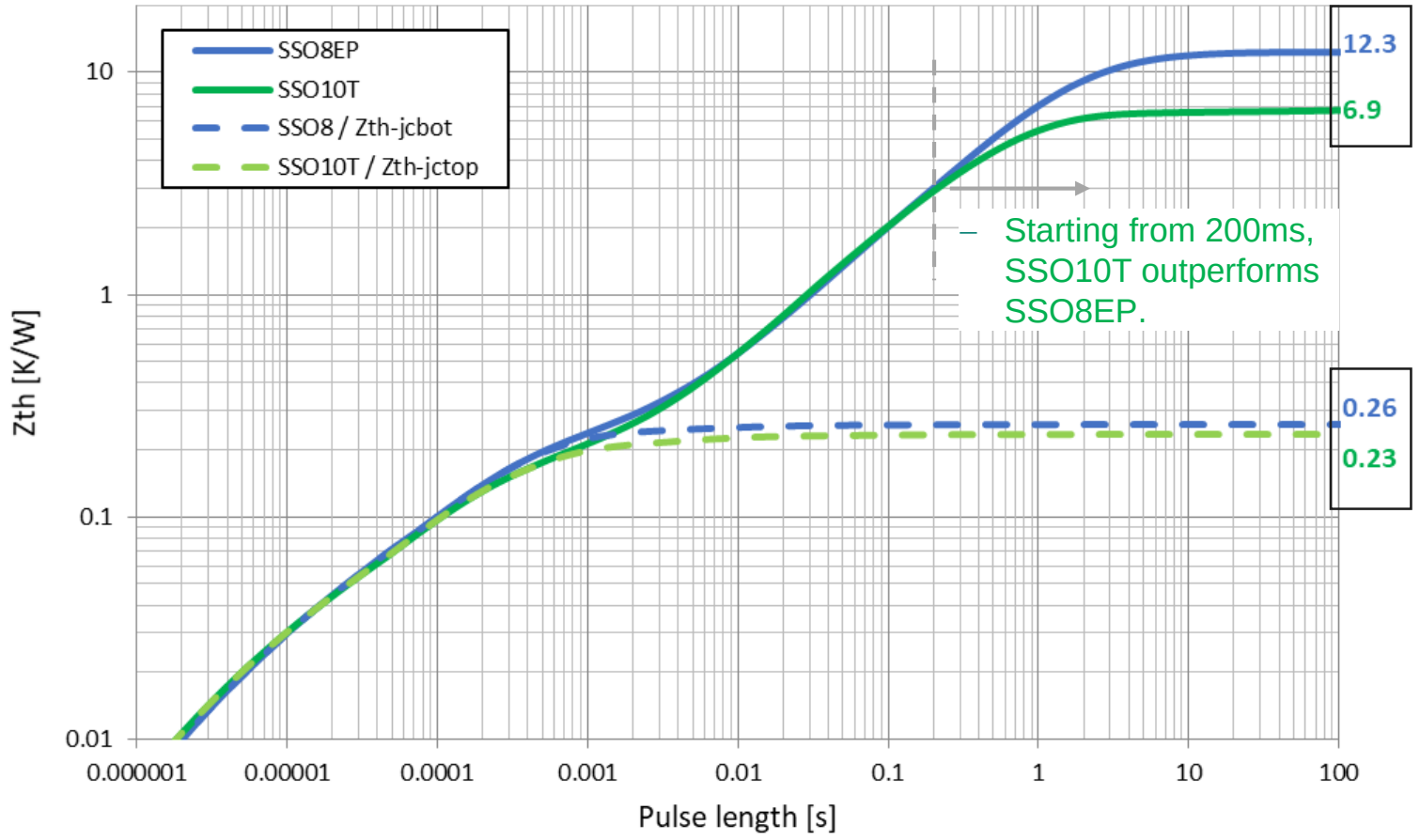
- 50% less heating at 1s and at 100ms is achievable with SSO10T package
- Much lower junction temperature inside SSO10T supports higher power dissipation

SSO10 TSC - Top Side Cooling
Correlating $Z_{th\text{-}JA}$ and ψ_{PCB} values are key drivers for lower PCB temp.



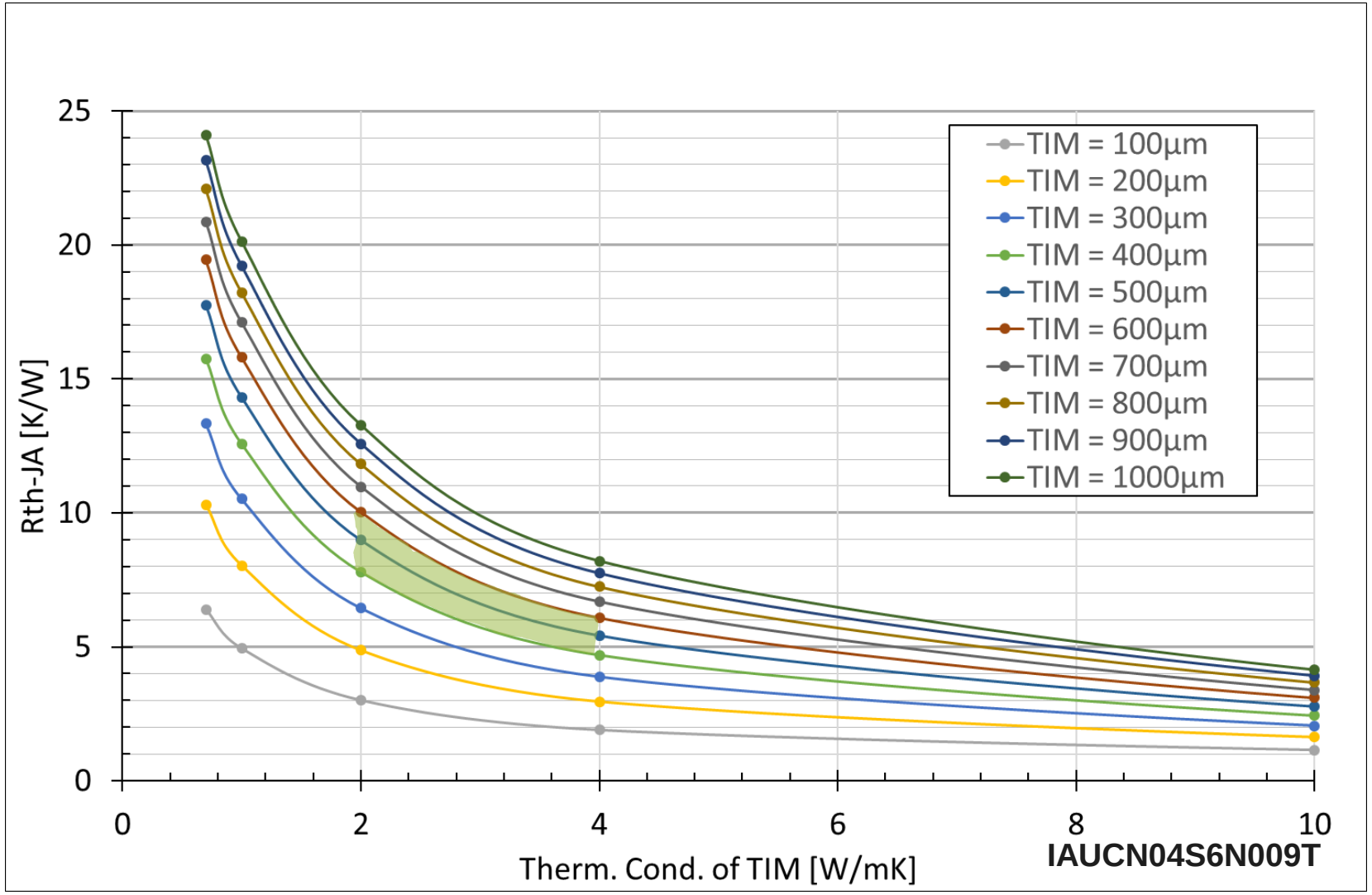
- ψ_{PCB} thermal characterization parameter is calculated by: (TPCB-Tambient)/Power

SSO10 TSC - Top Side Cooling
Zth-JC and Zth-JA comparison



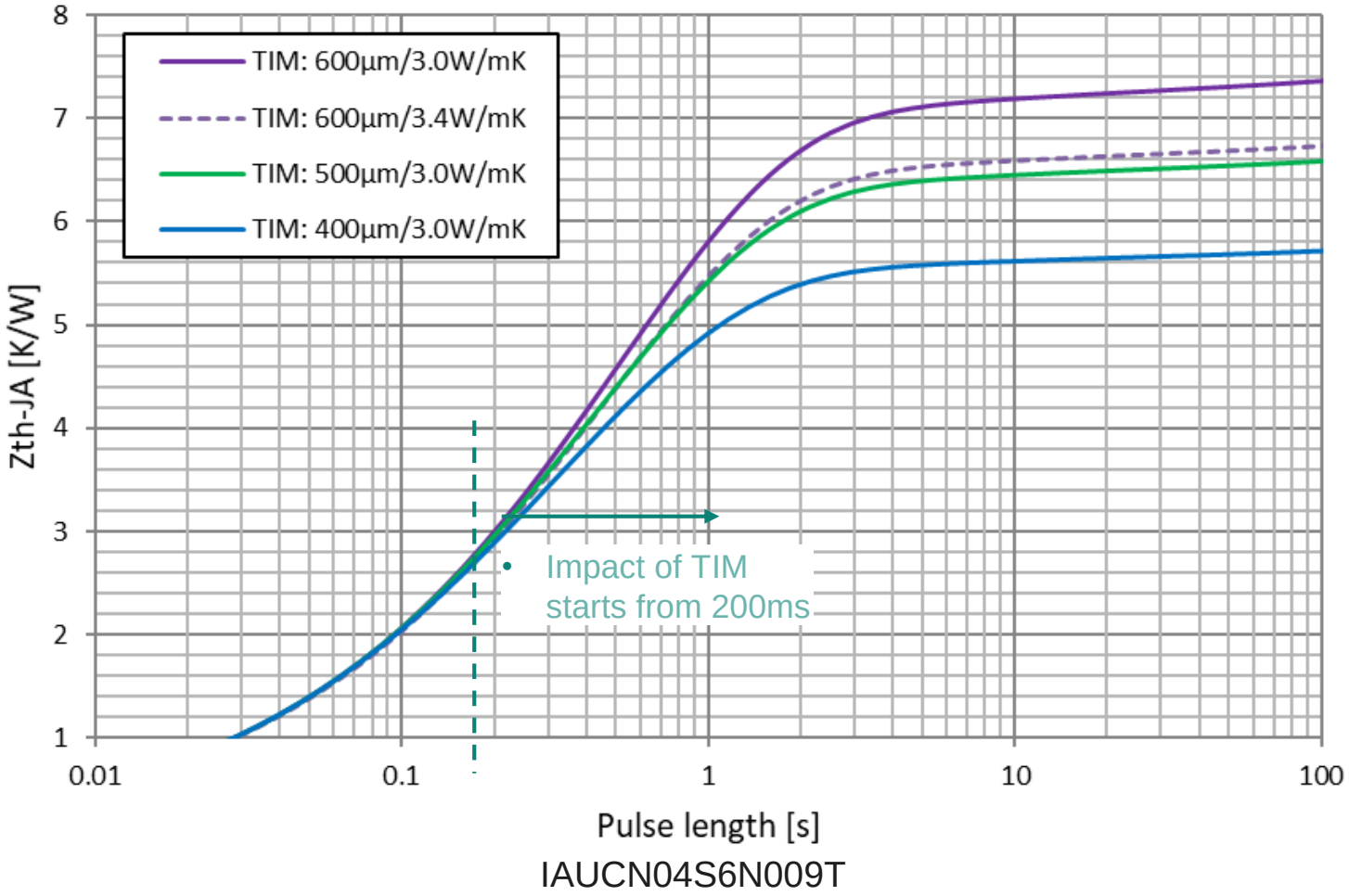
- Much lower Zth-JA enabling the lower junction and board temperature
- Not too much difference at $Z_{th\text{-}JC}$

SSO10 TSC - Thermal Performance
TIM impact at steady state



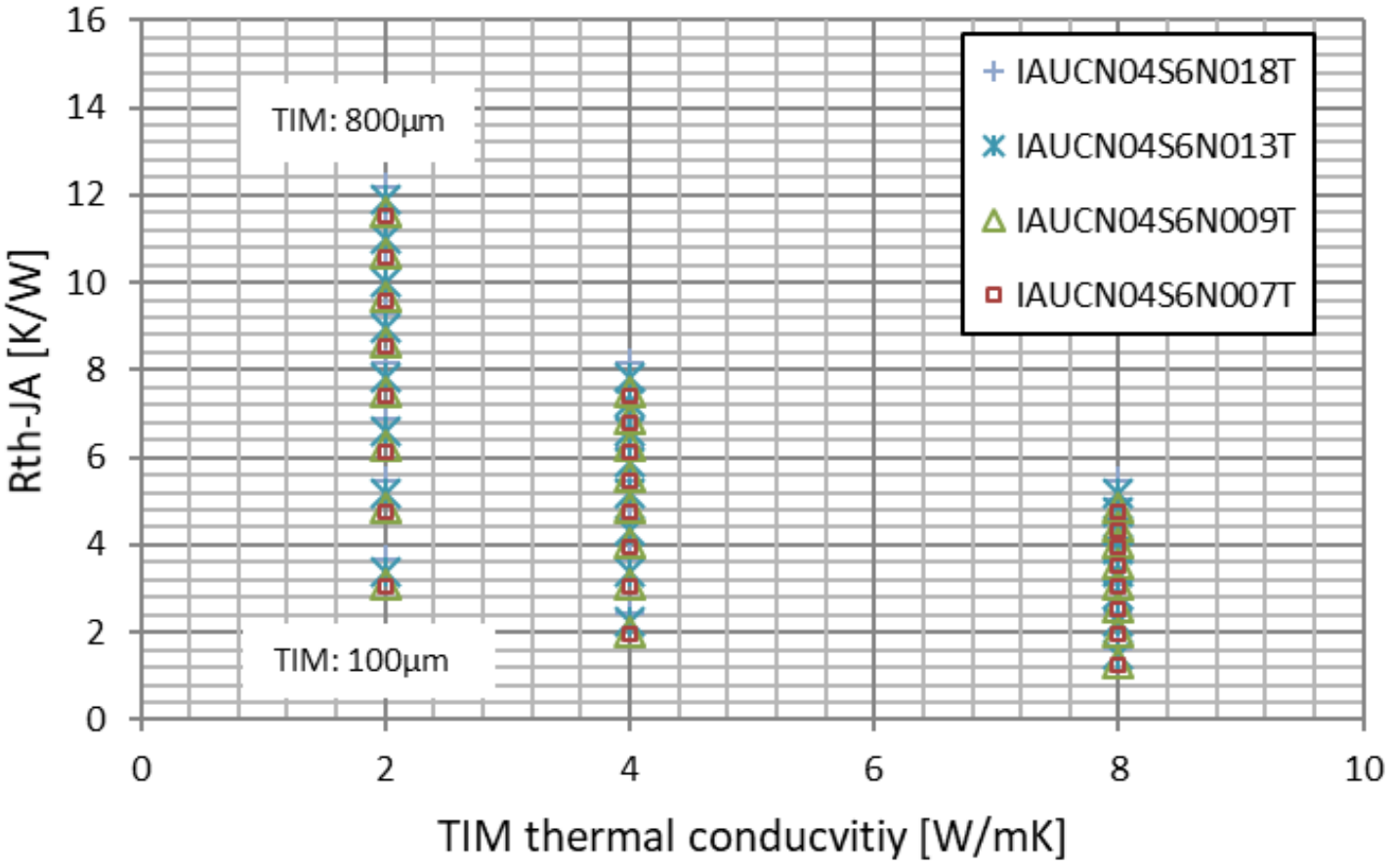
- SSO10T has a wide range of Rth-JA (junction to ambient thermal resistance), depending to TIM therm. cond. and thickness
- When TIM therm. cond. is low, Rth-JA is sensitive to TIM thickness, thus the control of TIM thickness shall be strict
- Rth-JA for SSO10T varies btw 5-10K/W, assuming TIM is 400-600µm thick and 2-4W/mK therm. cond., as observed in many application conditions. The green box in the chart highlights those conditions

SSO10 TSC - Thermal Performance at Transient State
TIM thickness has no impact on short pulses (<200ms)



- The impact of TIM at transient state starts from 200ms onwards, as indicating as a arrow on the chart.
- Application pulses which are shorter than 200ms won't see the difference of TIM.
- Short pulses must be enabled by the correct choice of product

SSO10 TSC Product Portfolio
Overall excellent thermal performance



Product	max $R_{DS(on)}$ [mΩ]	I_D (DC current) [A]
IAUCN04S6N007T	0.75	120
IAUCN04S6N009T	0.90	120
IAUCN04S6N013T	1.32	120
IAUCN04S6N017T	1.73	120

- Any higher Ron product has slightly higher Rth values
- But the impact of TIM is much more dominant for TSC
- Thus the SSO10 TSC product portfolio has similar thermal performance.

SSO10 TSC - Top Side Cooling
Best Cooling Performance + Compact Design = Perfect System Cost

Key features

- Direct cooling path to ECU housing
- Improves Zth by -20% up to -50%
- Improves Rth by -20% up to -50%
- Enables double sided PCB design
- Provides higher application currents
- SSO10T TSC is JEDEC listed for open market and 2nd source compatibility

Key benefits

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- Not heat transfer into PCB
- Very compact PCB design
- Reduces system area
- Reduces cooling efforts & costs (no more vias)
- Reduces system costs & design efforts
- High power density & efficiency

Key applications

- Electric power steering
- Power disconnect switches
- Zone control units
- E-fuse box
- DC/DC
- ABS Braking, e-Booster
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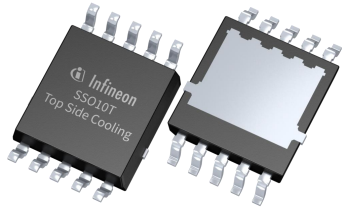
- BLDC drives in a wide variety

https://www.infineon.com/cms/en/product/promopages/SSO10T/

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