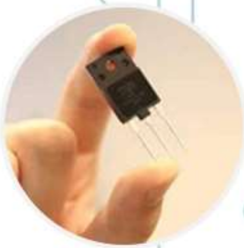

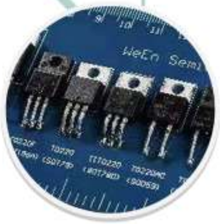

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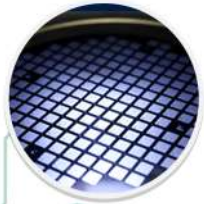

IGBT Introduction

Version 1.0

Sep,2020

IGBT RoadMap

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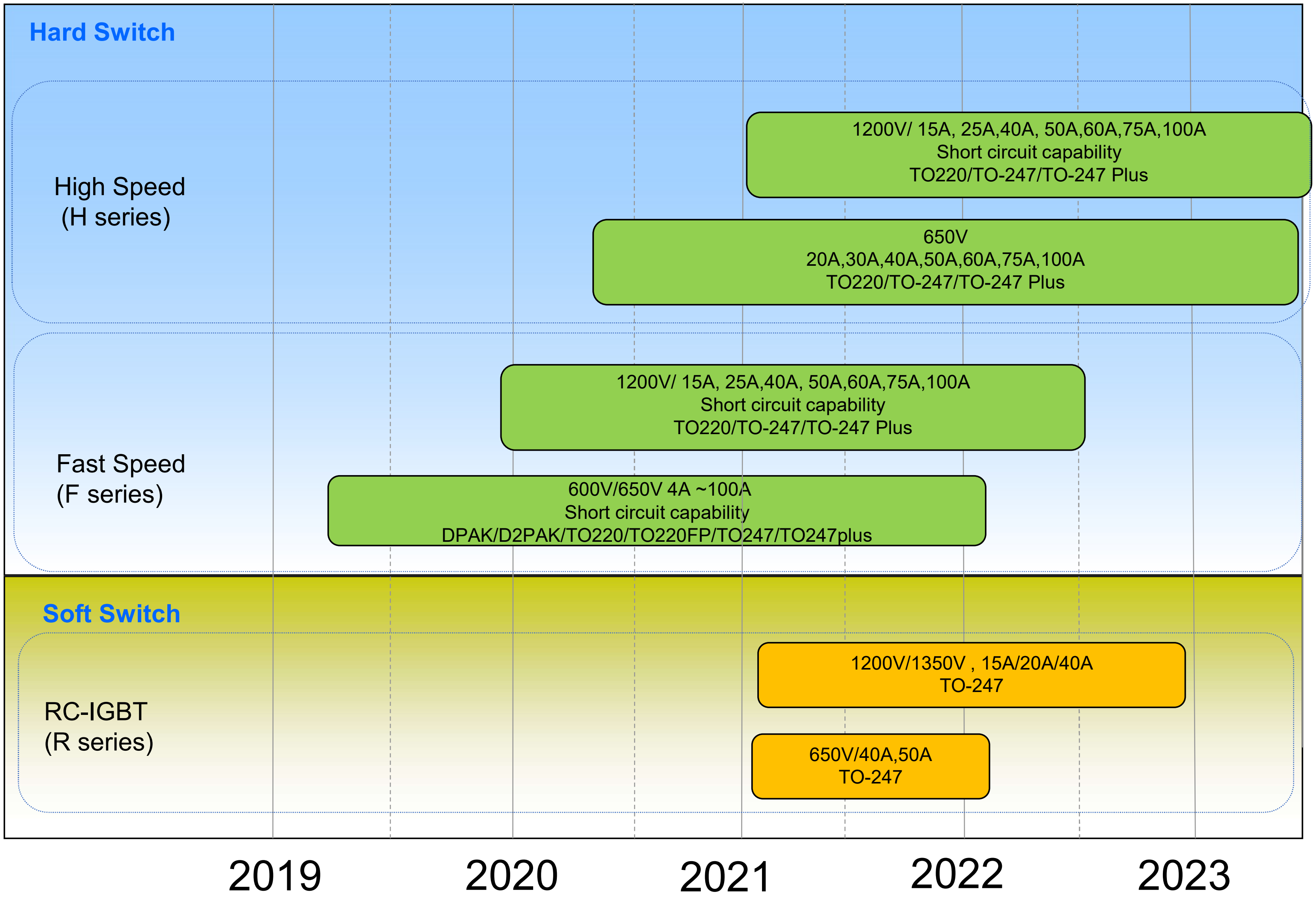
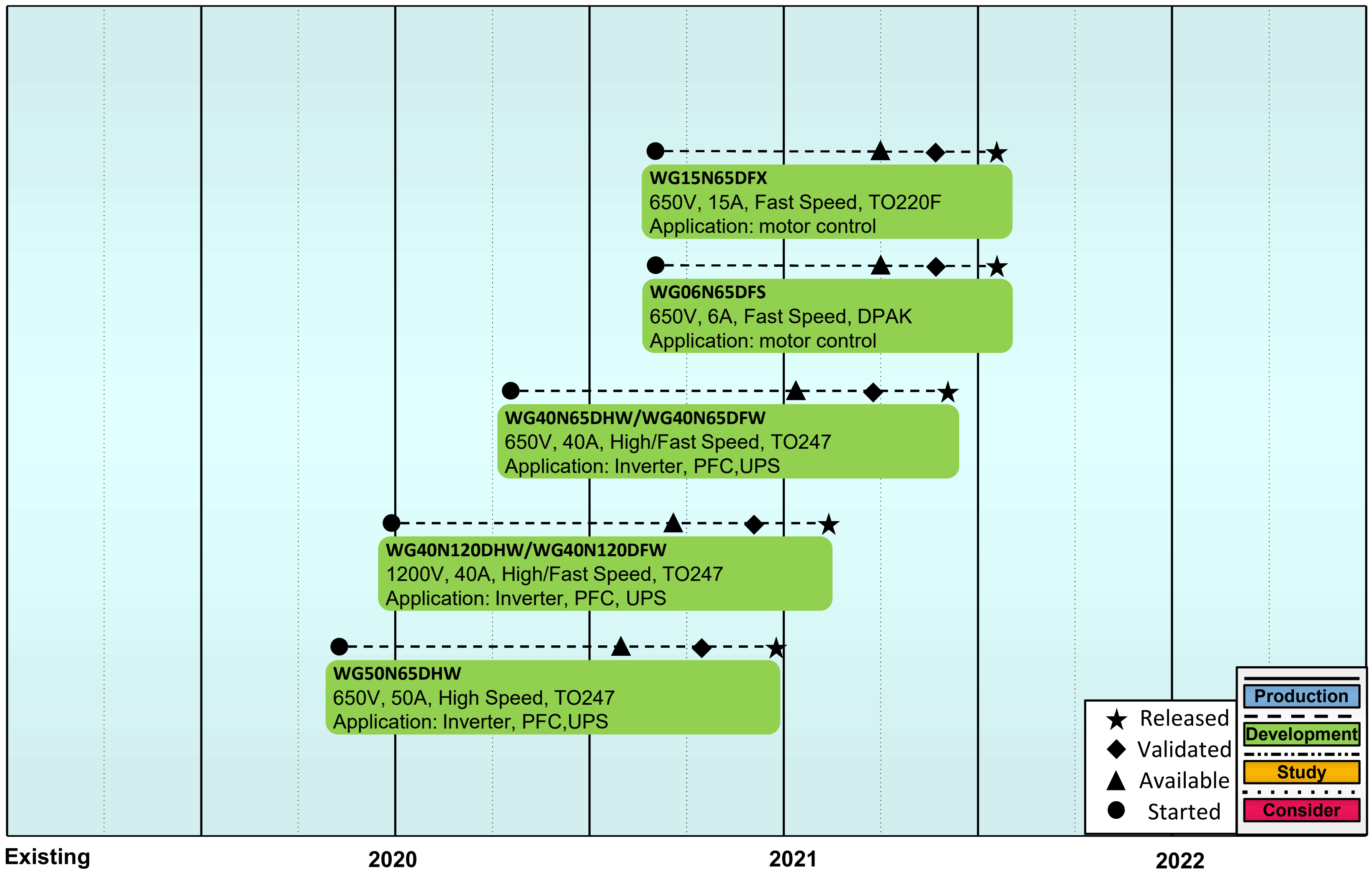
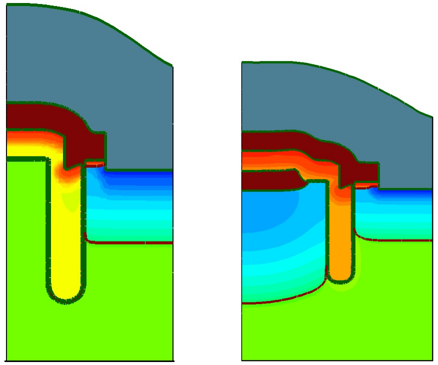


Product Under development



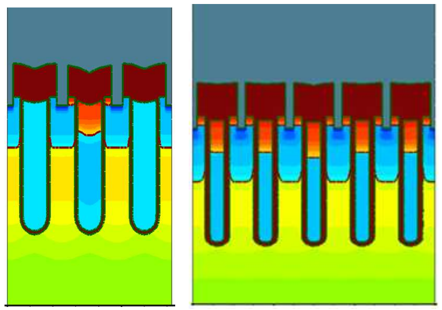
WeEn IGBT Technology



WeEn G1 IGBT Platform

- ✓ Trench Gate Field Stop
- ✓ Thin wafer
- ✓ Low Vcesat & Switching loss
- ✓ High RBSOA and short current capability

Existing platform



WeEn G2 IGBT Platform

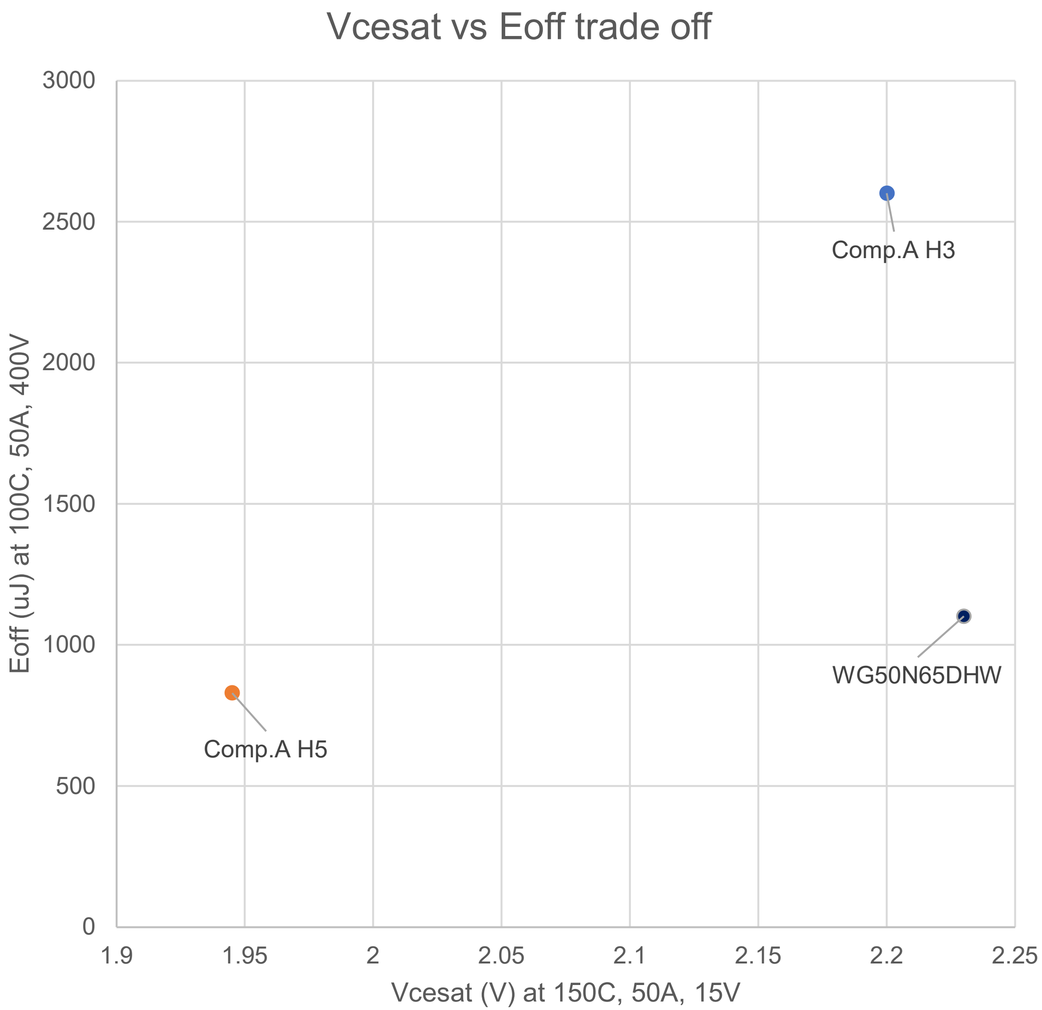
- ✓ Fine Pitch
- ✓ High current density
- ✓ Superior Vcesat & switching loss
- ✓ Improved EMI performance at high frequency

Next Generation

650V/50A

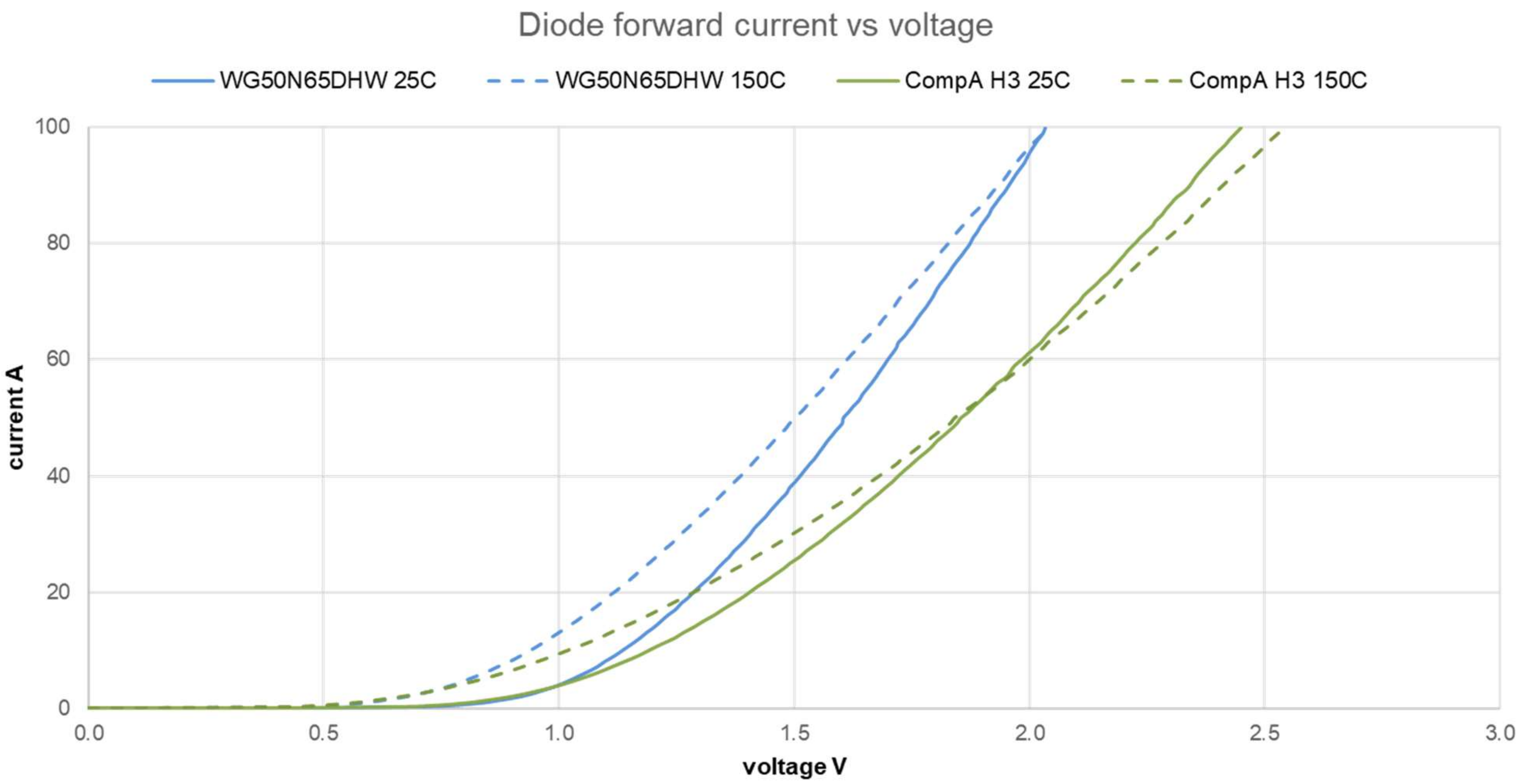
WG50N65DHW

IGBT Vcesat / Eoff comparison



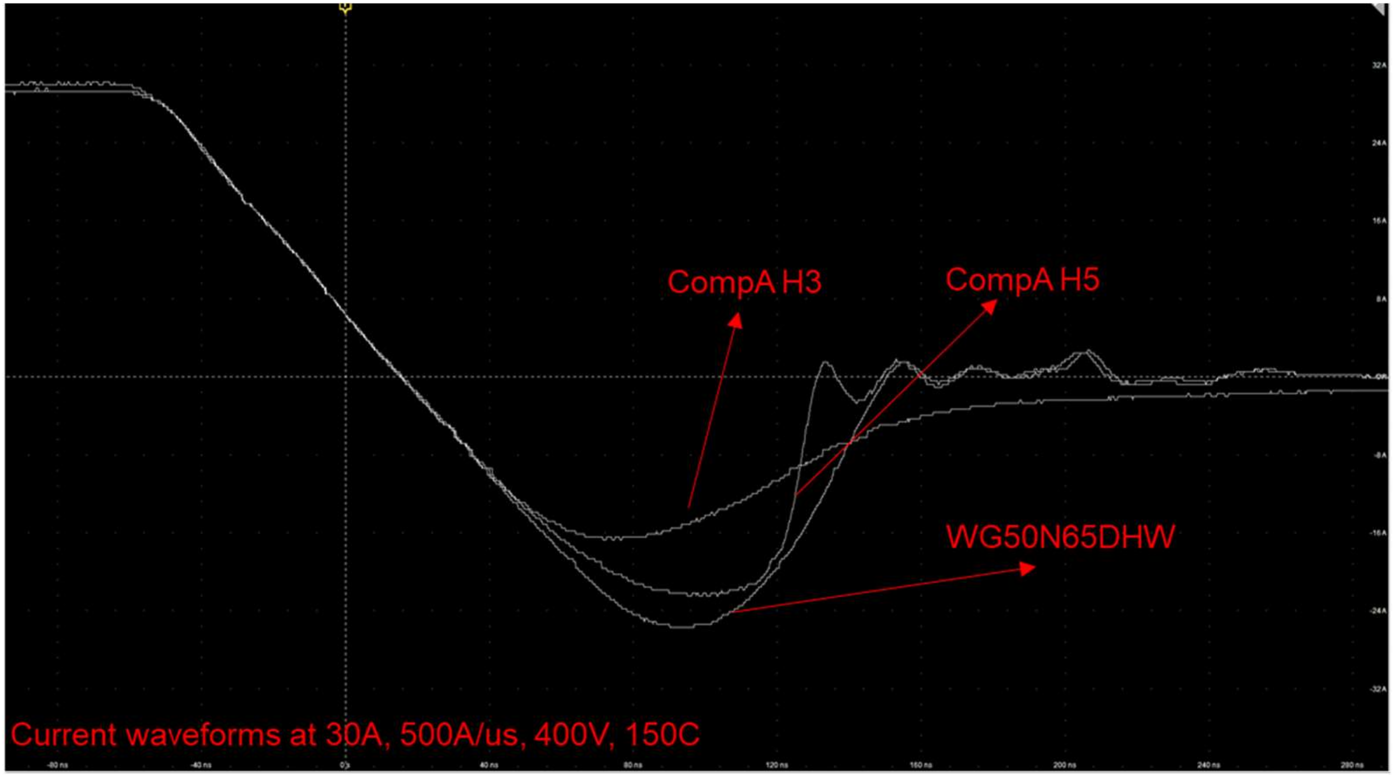
- WG50N65DHW's performance is in between with competitor's Gen 3 & Gen 5
- Switching performance wise, WG50N65DHW is more close to Gen5 and better than Gen3, which is suitable for high frequency application

WG50N65DHW, Diode forward current vs voltage



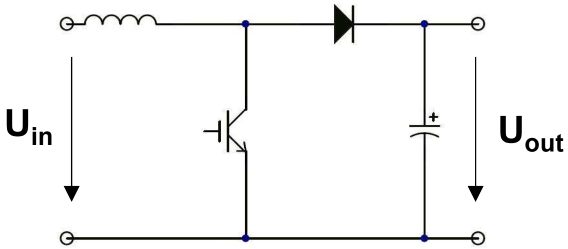
- ❑ Diodes Voltage Drop (V_F), WG50N65DHW is slightly better

WG50N65DHW,
Diodes reverse recovery comparison

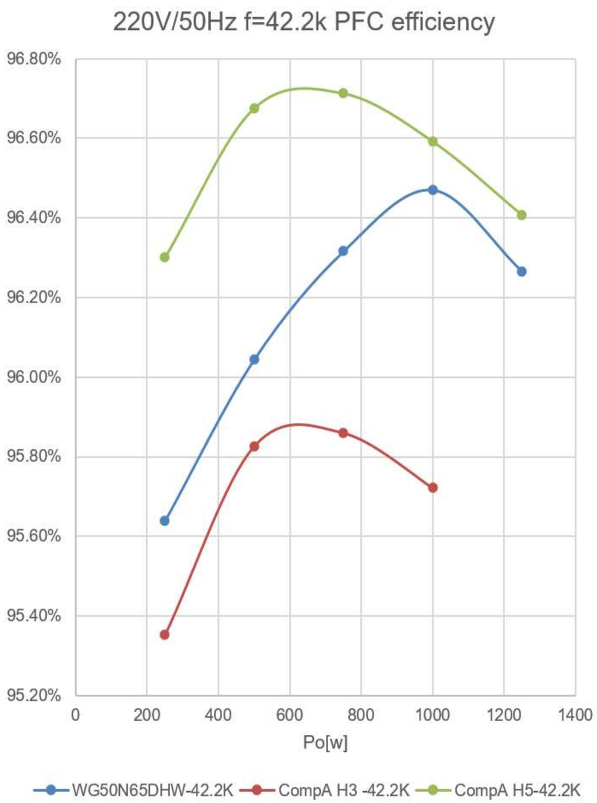


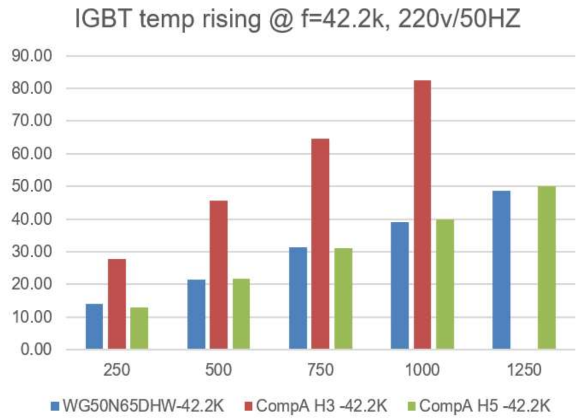
- WG50N65DHW is matched with a diode of optimized VF/Trr trade-off to balance power loss and oscillation induced by diode reverse recovery.

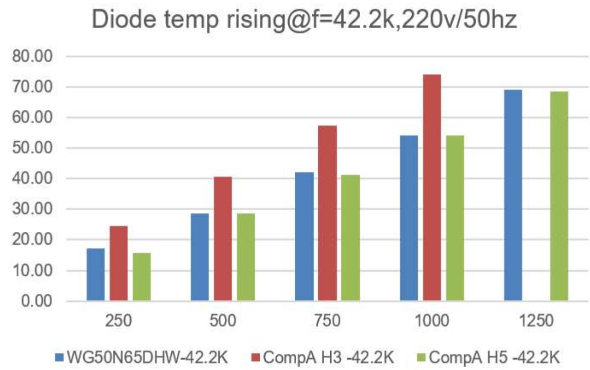
Efficiency comparison PFC Boost application



220V/50Hz PFC efficiency @f=42.2k,Vo=403V

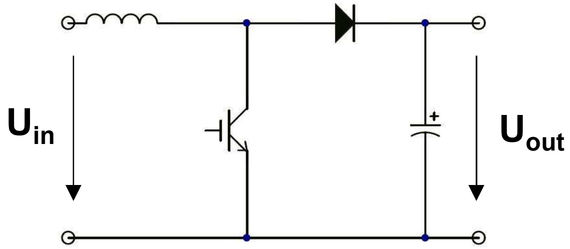




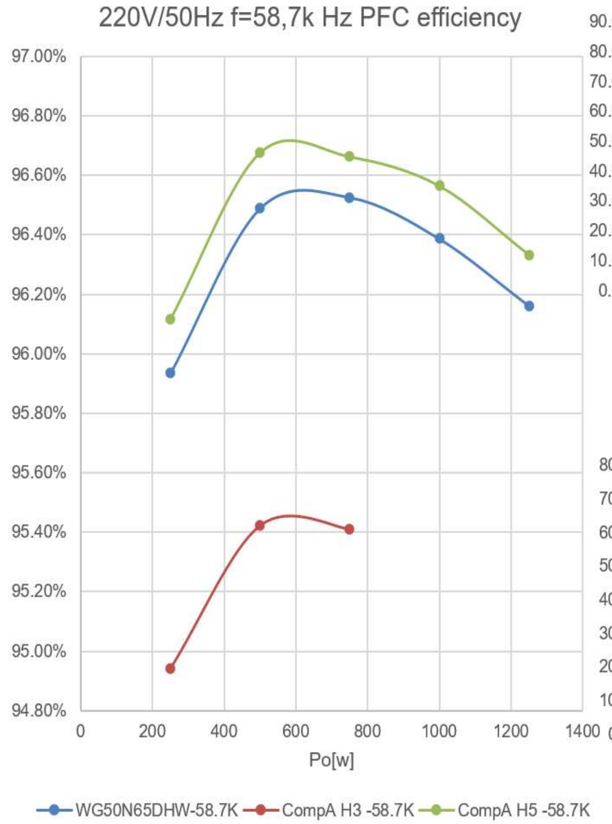


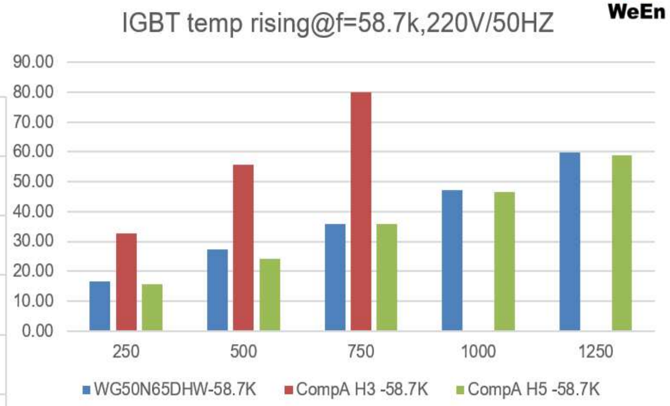
- ❑ WG50N65DHW performance is in between of competitor G3 & G5 @f_{sw} 40KHz
- ❑ At higher power condition (>1KW), efficiency is close to G5.

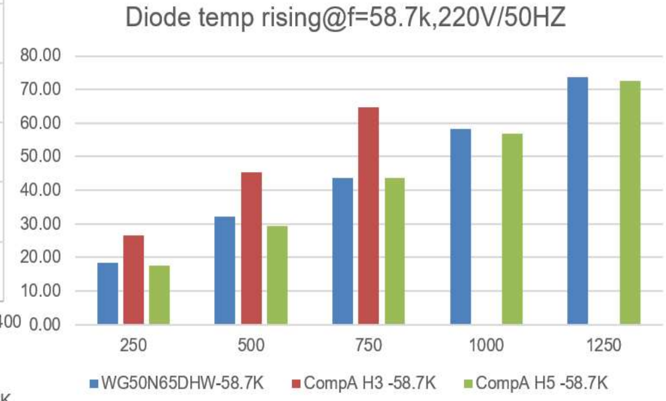
Efficiency comparison
PFC Boost application



220V/50Hz PFC efficiency @f=58.7k,Vo=403V





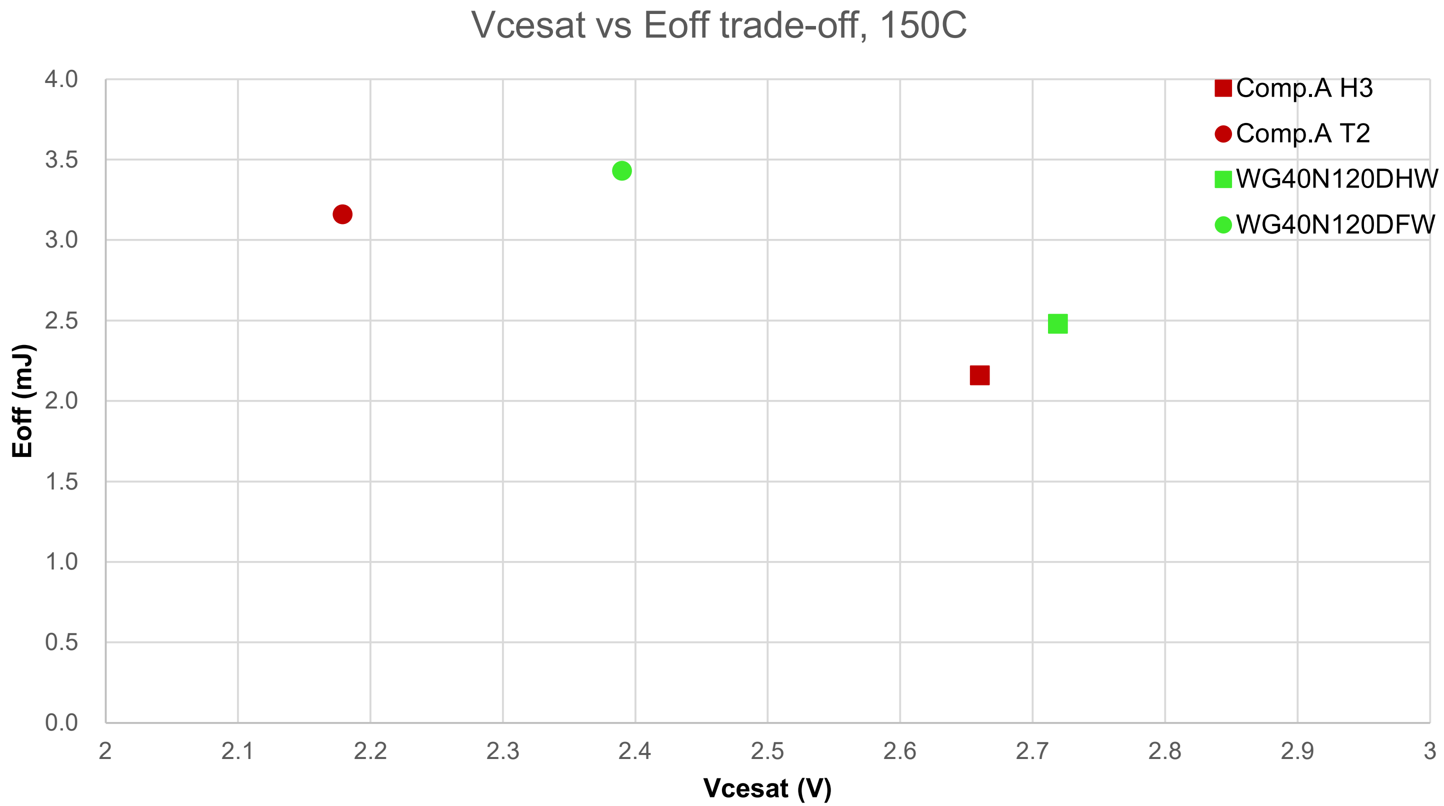


- ❑ WG50N65DHW performance is close to competitor G5 @f_{sw} 60KHz , better than G3.

1200V/40A

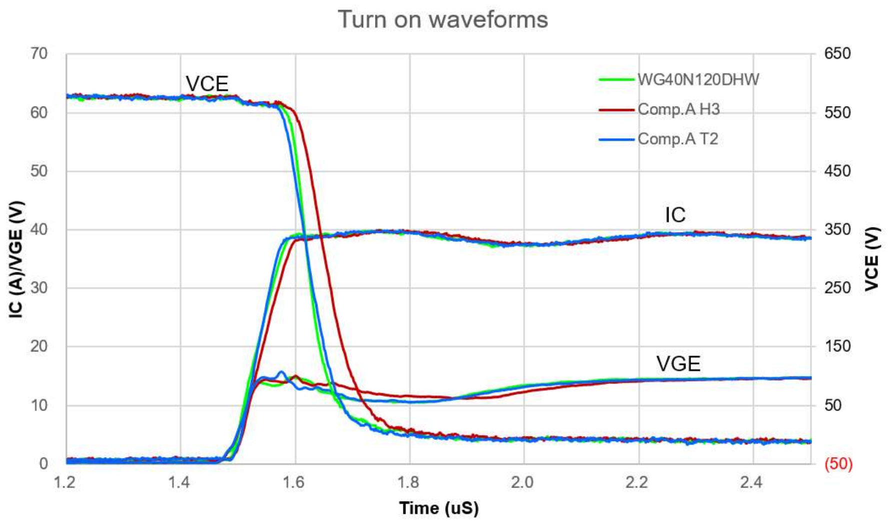
WG40N120DFW
WG40N120DHW

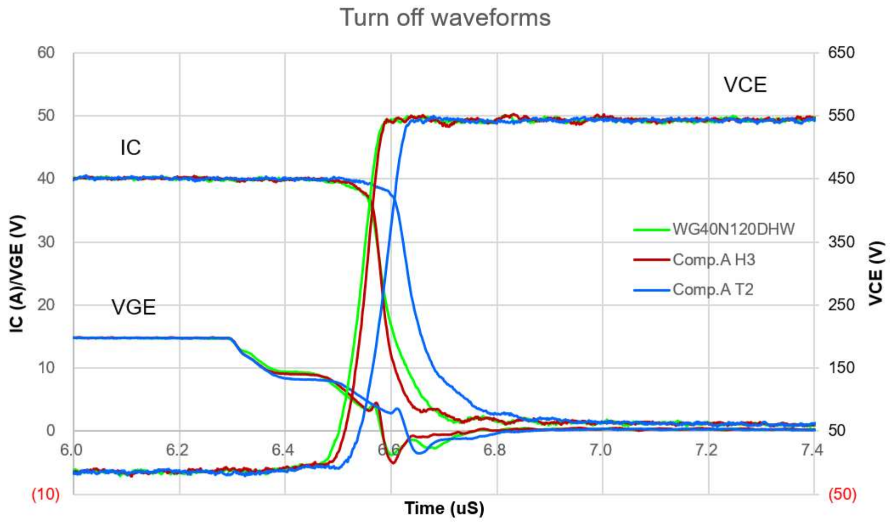
IGBT Trade-off



- Test condition: VCE=600V, IC=40A, VGE=15V,RG=12Ω
- WG40N120DHW/WG40N120DFW shows similar Vcesat-Eoff trade-off level as competitors H3 and T2.

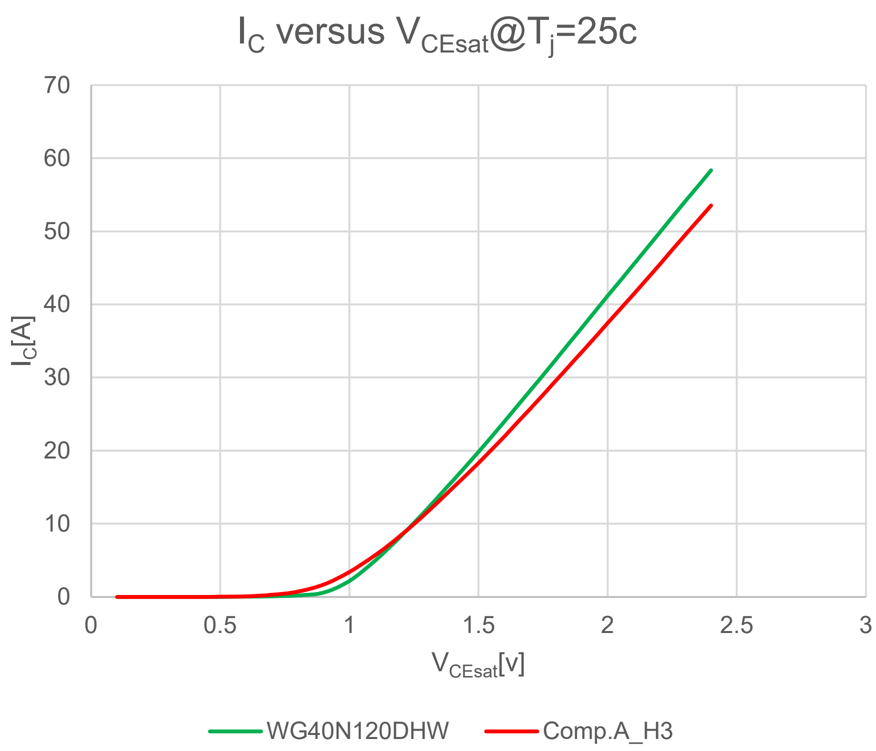
IGBT Switching waveforms

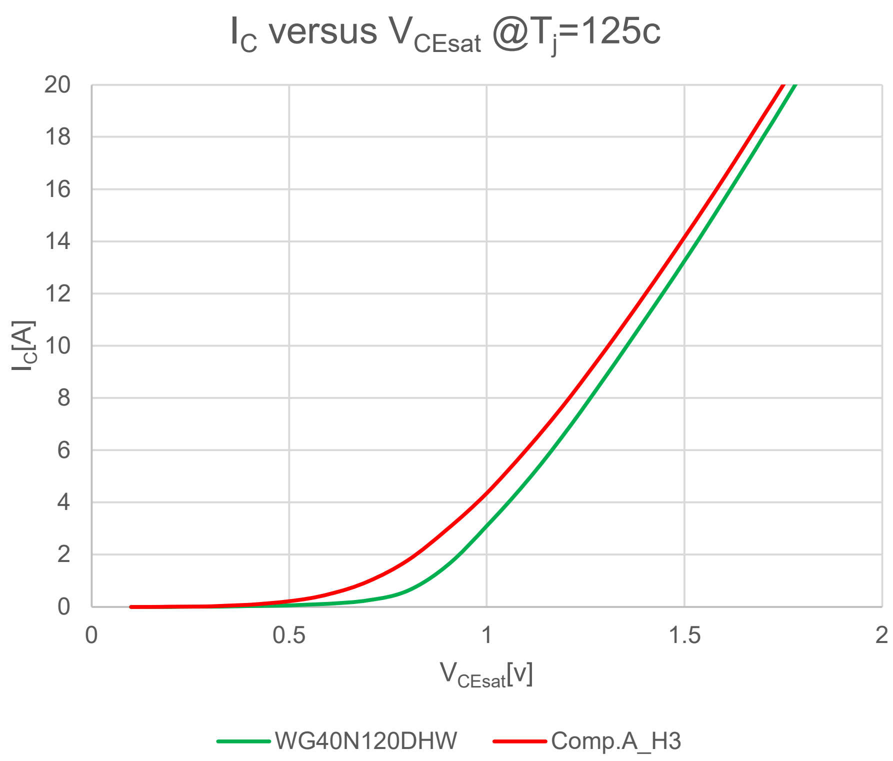




- Test condition: VCE=600V, IC=40A, VGE=15V, RG=12Ω , 25C
- Switching on behavior is very similar to competitors
- Switching off behavior is very similar to competitors with slightly slower current falling.

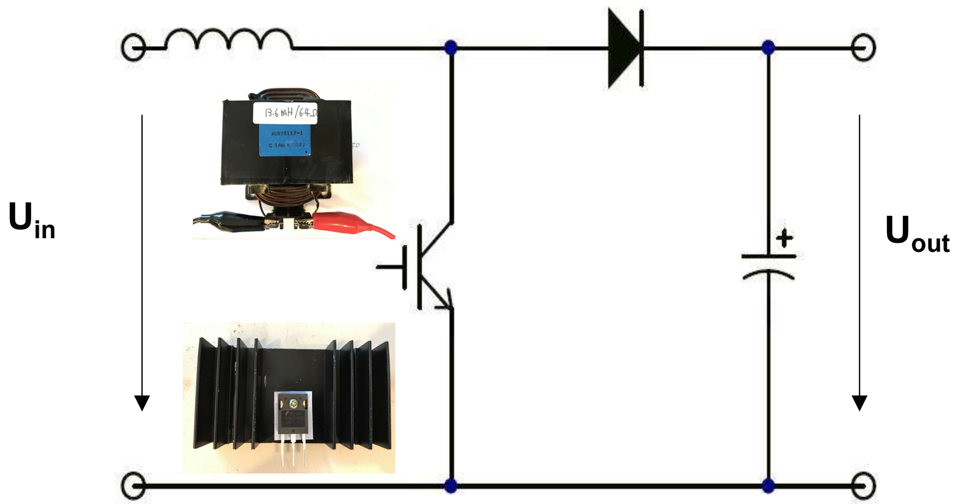
I_C versus V_{CEsat}





- ❑ WG40N120DHW I_C_V_{CEsat} performance are very close to competitors'

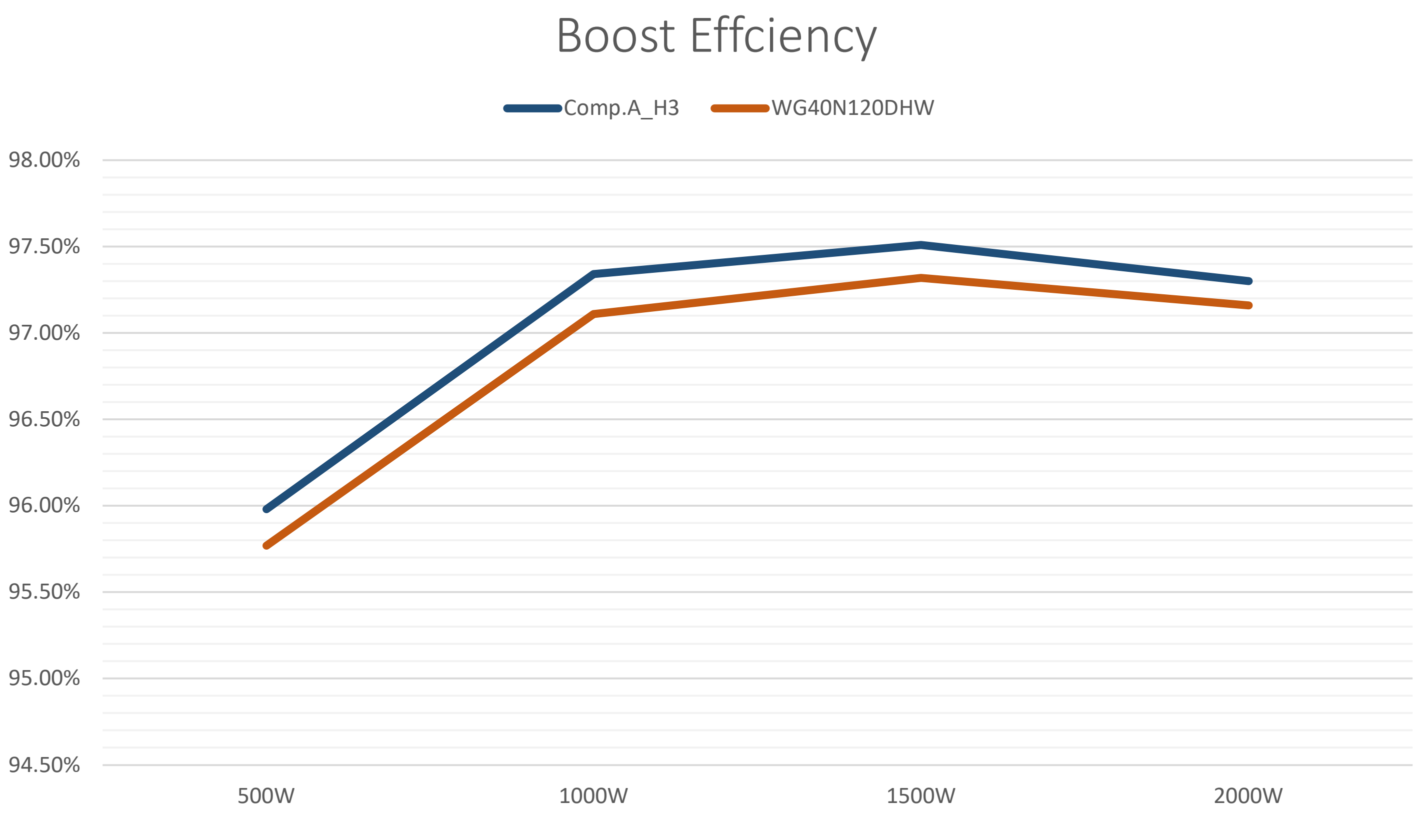
Boost Converter test condition



Temp measure

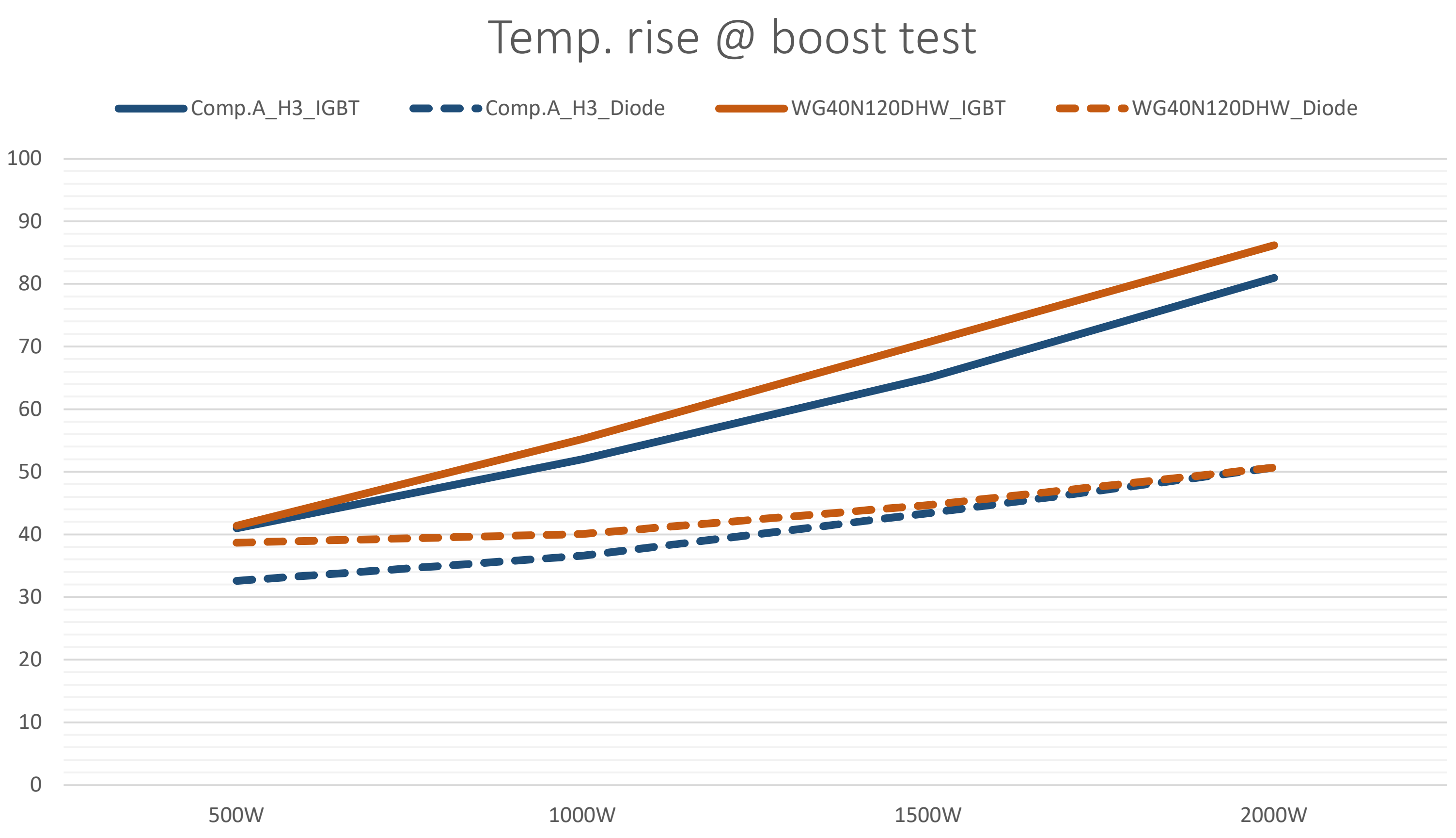
1. In the following, we will use boost circuit to test the IGBT.
2. Test conditions:
   - Diode: 1200V/15A SiC Diode FFSH15120A.
   - Boost inductor: 13.6mH/6.4ohm Steel core, fsw=18KHz.
   - IGBT gate driver: IR44272, gate resistance 20ohm.
   - In PV inverter the duty D is in the range of 0.3-0.5 due to panel output voltage.
   - Test condition 2: D=0.5, Rg=20ohm, Vo=500V. DC Fan=6V. Worst case.

Boost efficiency waveform



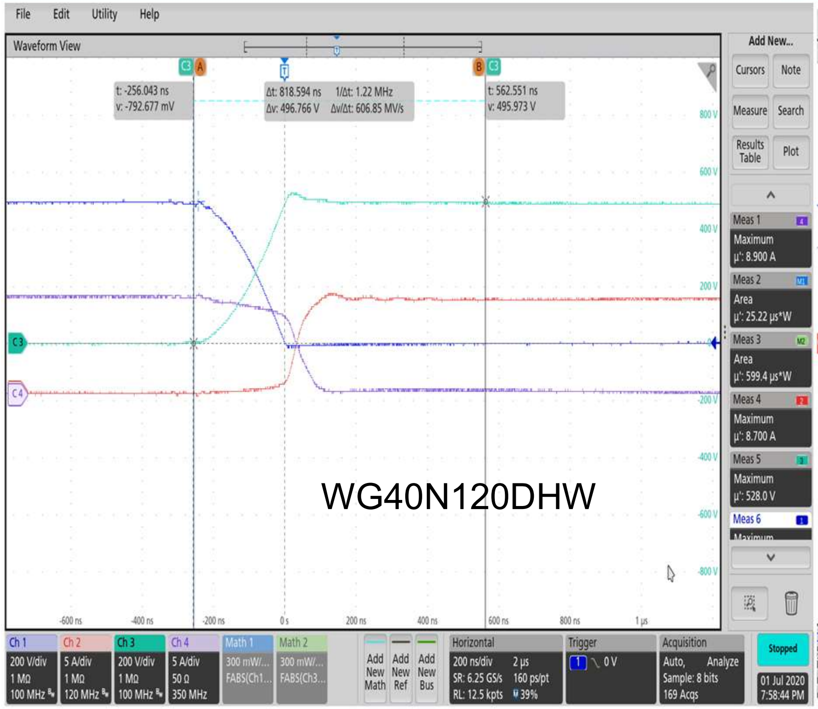
- ❑ WG40N120DHW efficiency is close to competitor H3

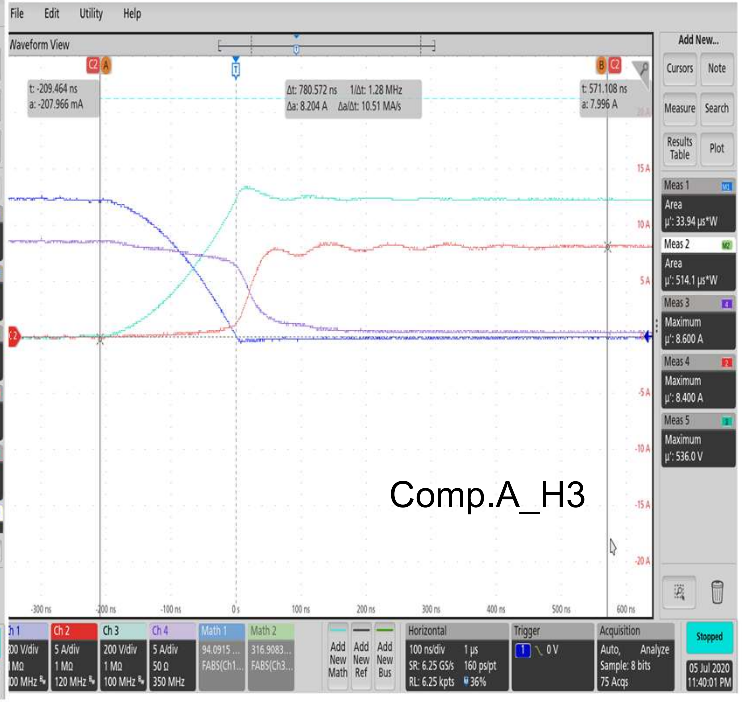
Component temp rising during Boost test



- ❑ Temperature raise wise
  - ✓ WG40N120DHW_IGBT slightly worse than competitor H3
  - ✓ WG40N120DHW_Diode shows equal performance

Boost Converter Electrical Stress @ 2000W condition





CH1: Diode voltage
CH2: Diode current
CH3: IGBT voltage
CH4: IGBT current

Power	WG40N120DHW		Comp.A_H3	
	Turn on Ipeak(IGBT)	Turn off Vpeak(IGBT)	Turn on Ipeak(IGBT)	Turn off Vpeak(IGBT)
2000	14.10	529.60	12.90	536.90

- ❑ WG40N120DHW gives similar I_{peak} & V_{peak} performance during switch on & switch off, which means the EMI performance is similar

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