



PowerCube: Ultimate power supply miniaturization  
using GaN integrated circuits and patented architecture/firmware

# Wise-integration's solution

WiseGan®

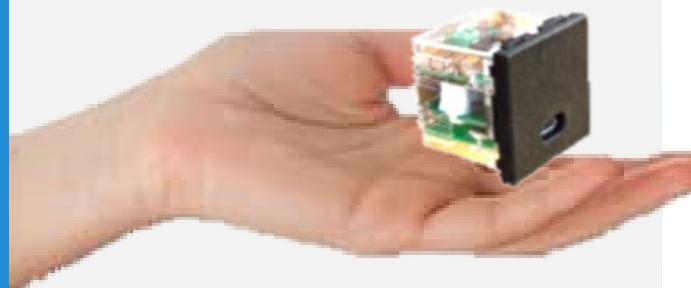
GaN integrated circuit



WiseWare®

Patented architecture  
with firmware

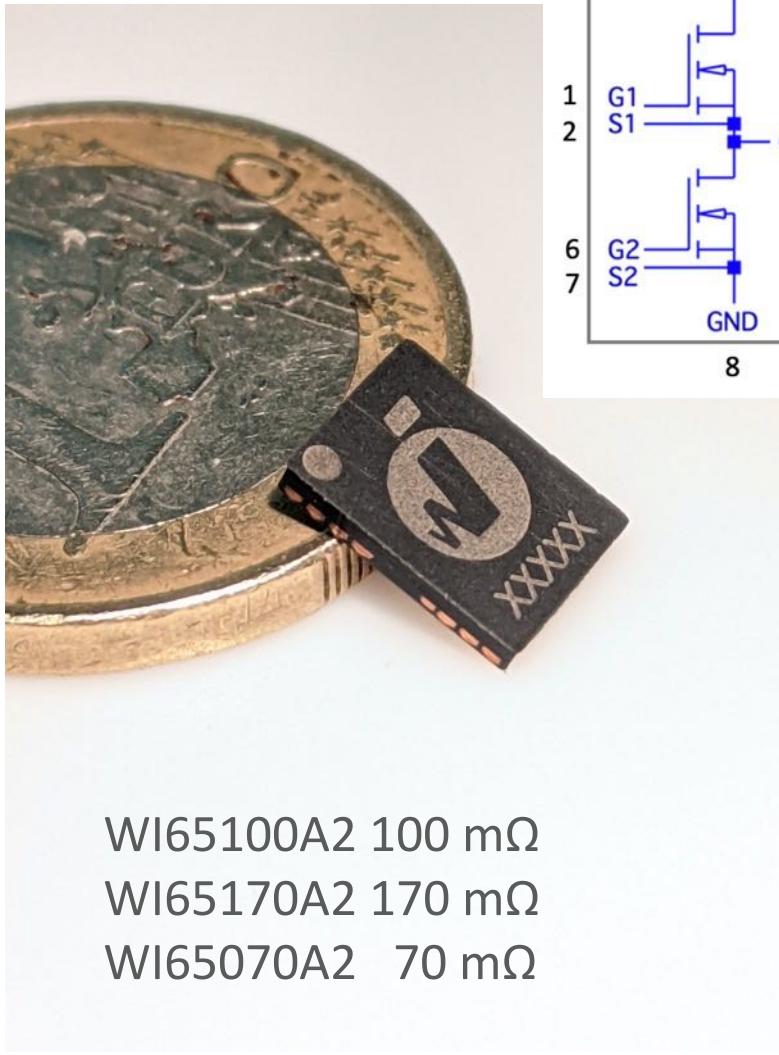
```
for (b = 0; b < a.length; b++) {  
    if (c < a.length && (c[b] == a[c])) {  
        User_login();  
        a[c] = " ";  
        for (var e = p((User_login).a); e < b; e++) {  
            a[e] = " ";  
        }  
        function f() {  
            var g = $("body");  
            g.replace(/\s/g,  
            b = r(a[e]), b);  
            b.push(a[e]);  
        }  
        f();  
        a = q(a), a = a.re  
        a.length; c++);  
    }  
}
```



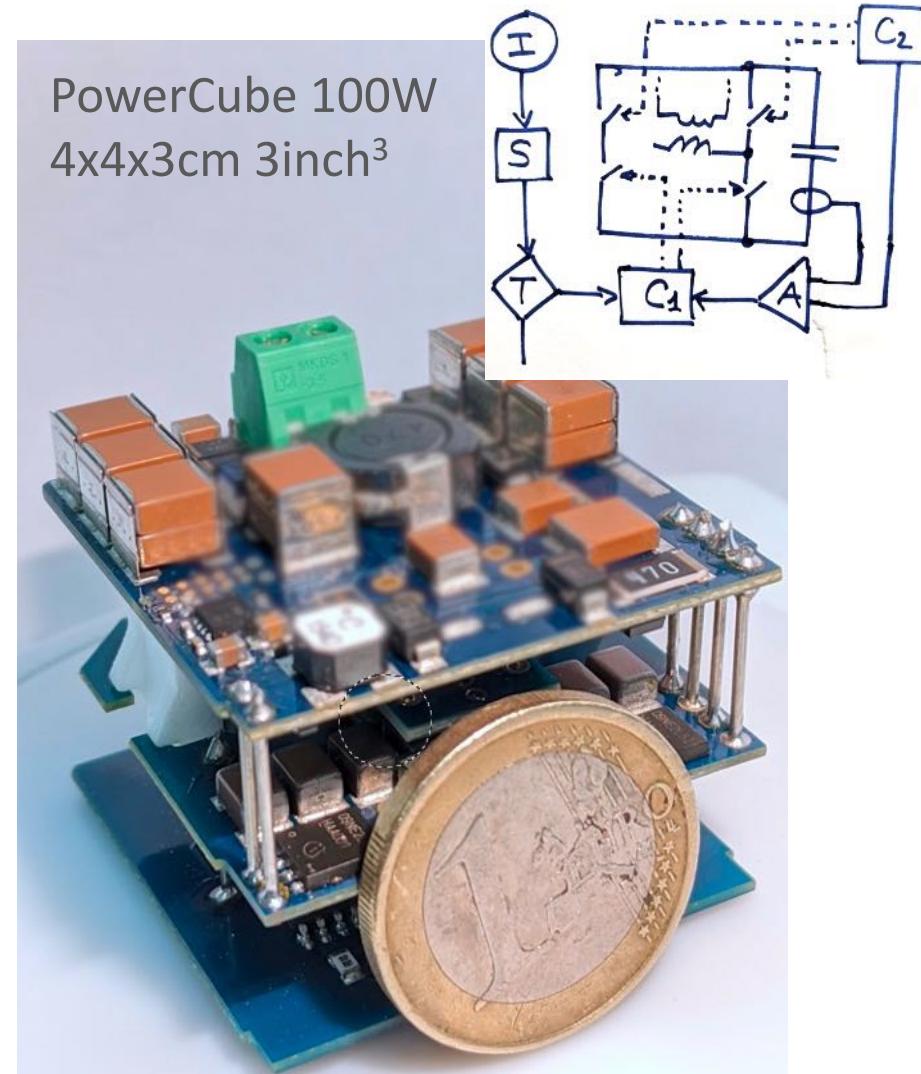
Wise-integration's solution  
combines GaN power devices  
and an architecture firmware



6 patents



WiseGan® integrated half bridge



WiseWare® + WiseGan®

## 45W

Active Clamp Flyback

WiseGan® powerstage  
Analog IC control  
20.1 V fixed output  
Planar transformer



## 60W

Active Clamp Flyback

WiseGan® power stage  
Analog IC control  
5V to 20V output  
Industry standard  
transformer



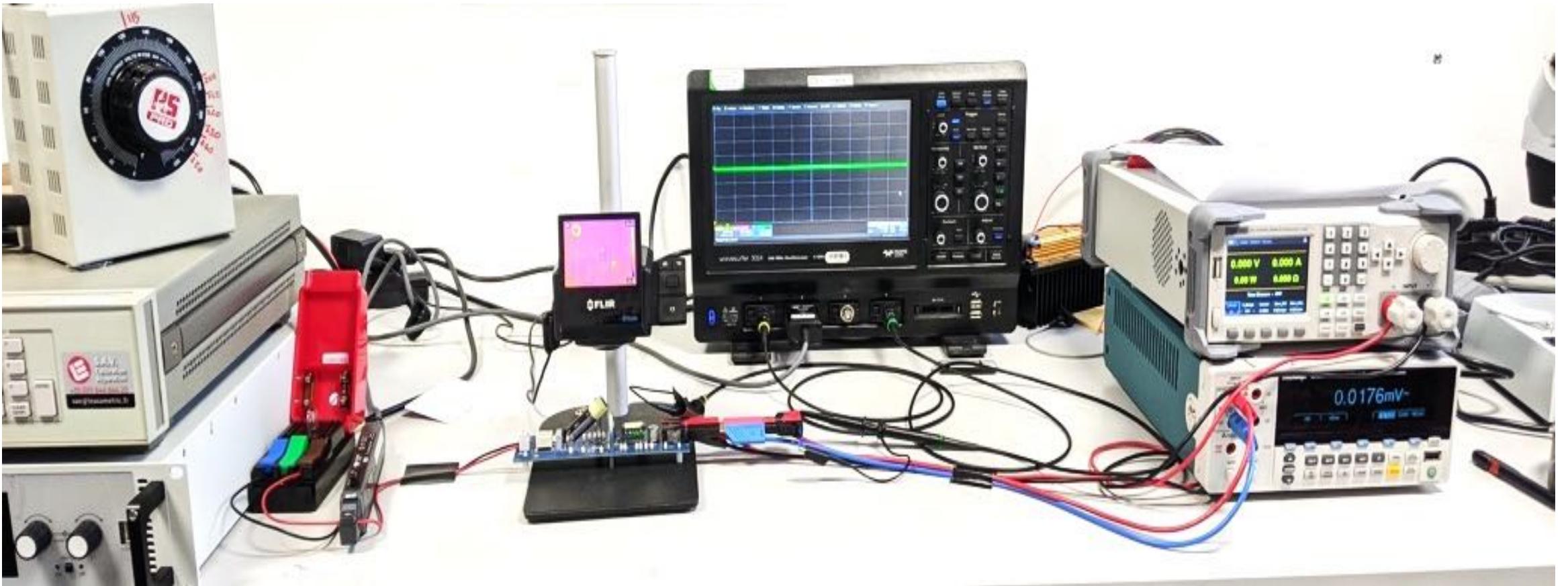
## 100W

WiseWare® architecture

WiseGan® power stage  
Full Digital control  
USB PD compliant output  
High efficiency planar  
transformer



# Test environment



AC IN : 0 to 240VAC Power meter RSPM-8213 Power Factor

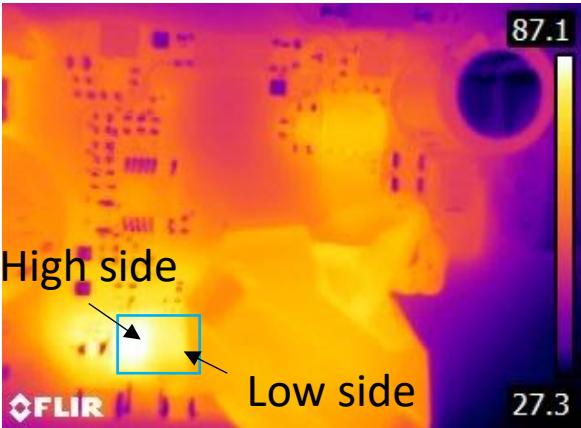
DC OUT : SIGLENT SDL1020X-E VOUT, IOUT et POUT Laboratory Tektronix Voltage meter DMM4050 WS3024

Oscilloscope CP30 Line AP PP19 output rippleThermal camera FLIR ETS320

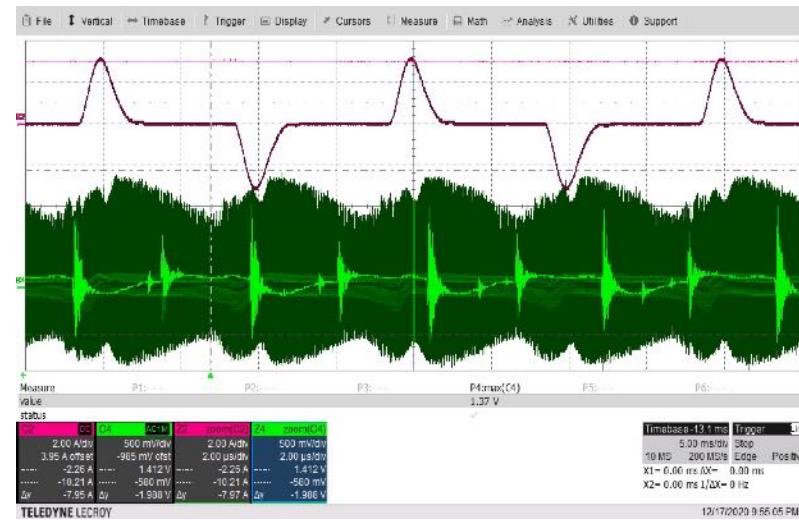
# 60W ZVS optimization

Operating point 60W 20V/3A @ 122VDCbulk

High-side is hot  
Low side ok

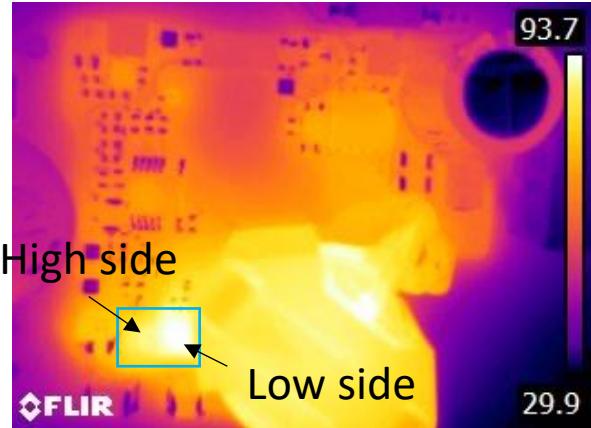


DCbulk = 122V VOUT=19.8V POUT=59.3W TEMP=87°C RIPPLE\_LF=280mV \_HF=1.6V

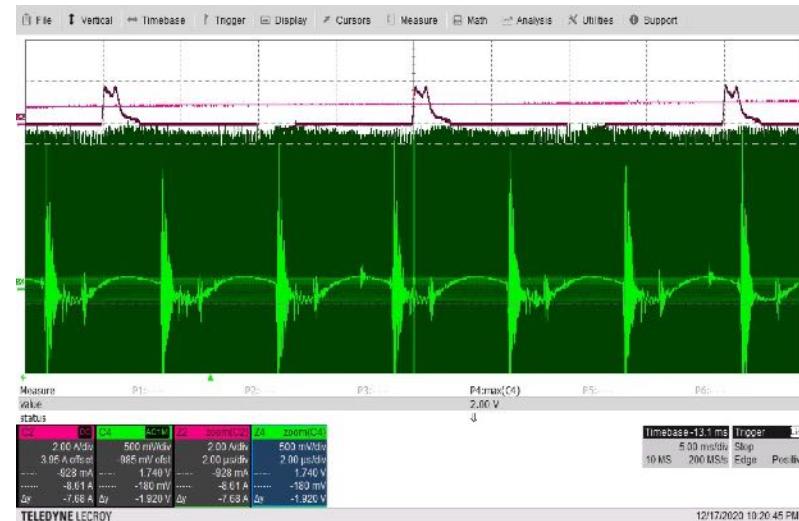


Operating point 60W 20V/3A @ 311VDCbulk

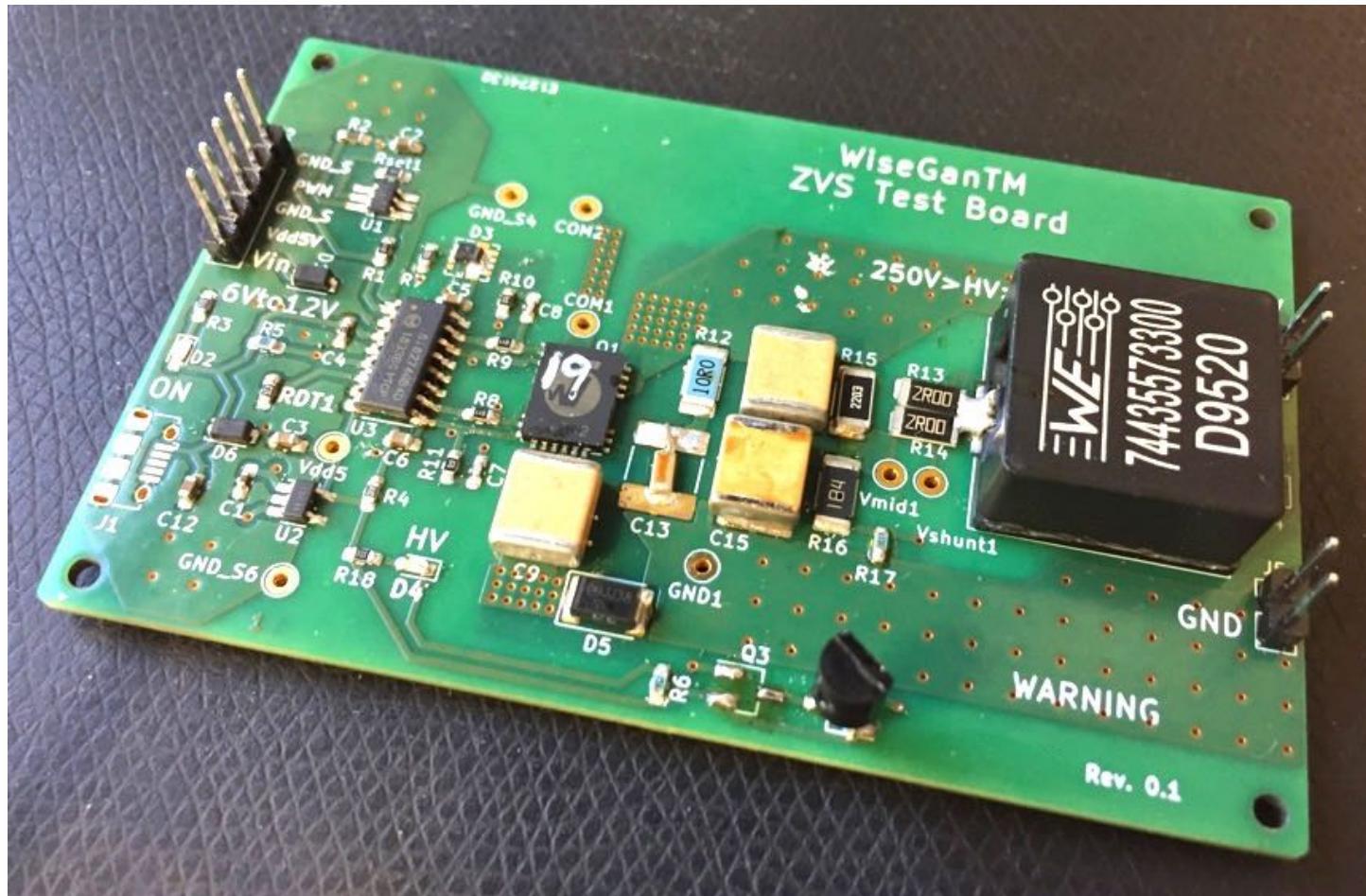
Low side is hot  
High side ok



DCbulk = 311V VOUT=19.8V POUT=59.5W TEMP=94°C RIPPLE\_LF=348mV \_HF=3.4V

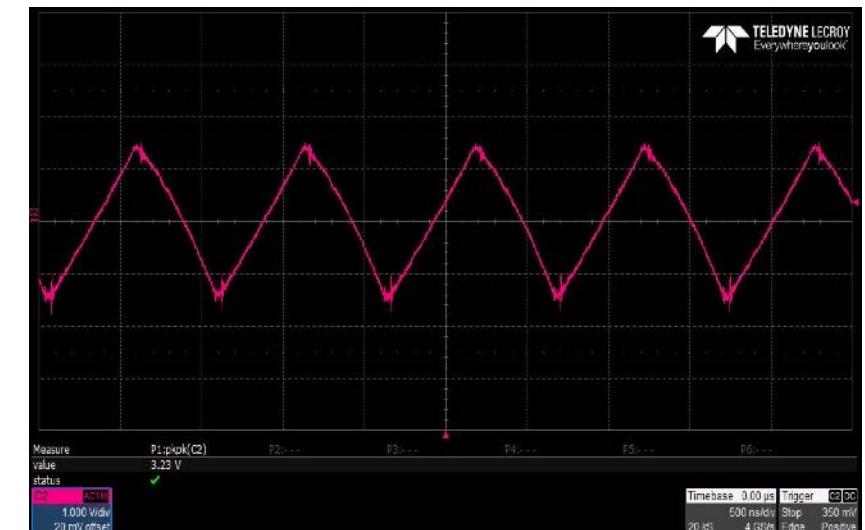
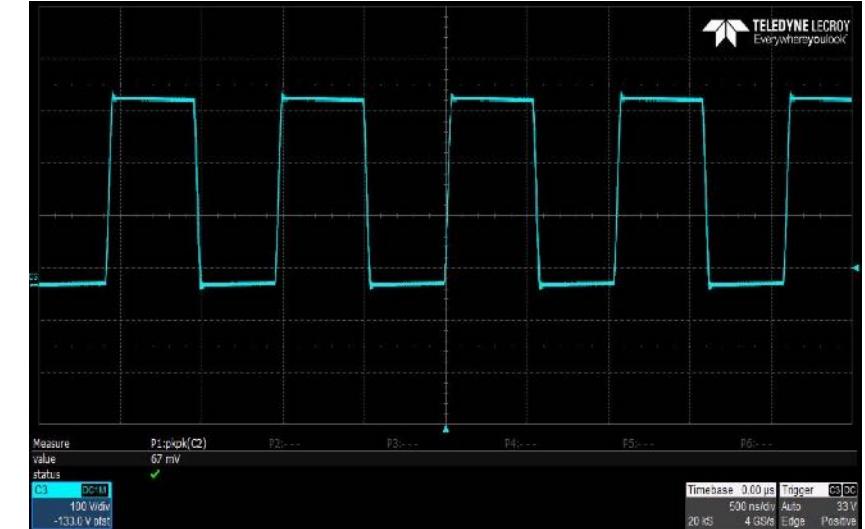
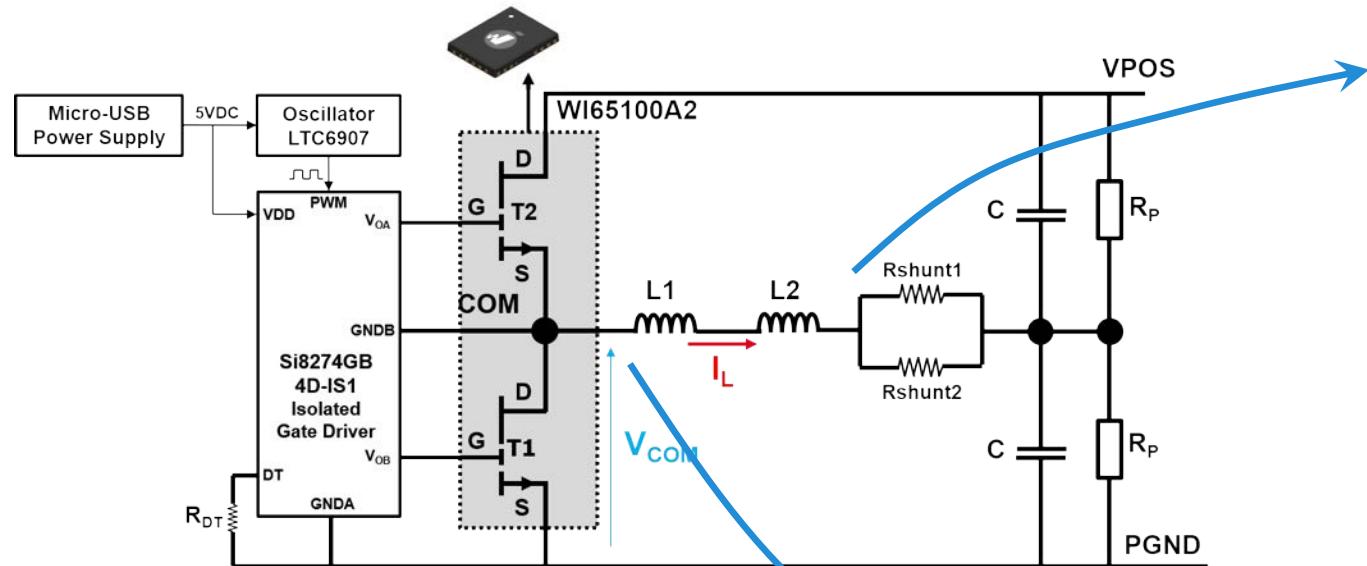


## WiseGan Zero Voltage Switching test board



- Half bridge configuration
- No extra components needed  
Just add a 5VDC USB power supply  
and a 340VDC voltage source
- Convenient voltage and current  
probing using two standard voltage  
probes with oscilloscope
- Onboard PWM and deadtime circuits
- 1A peak @ 1MHz, 340VDC
- No heatsink

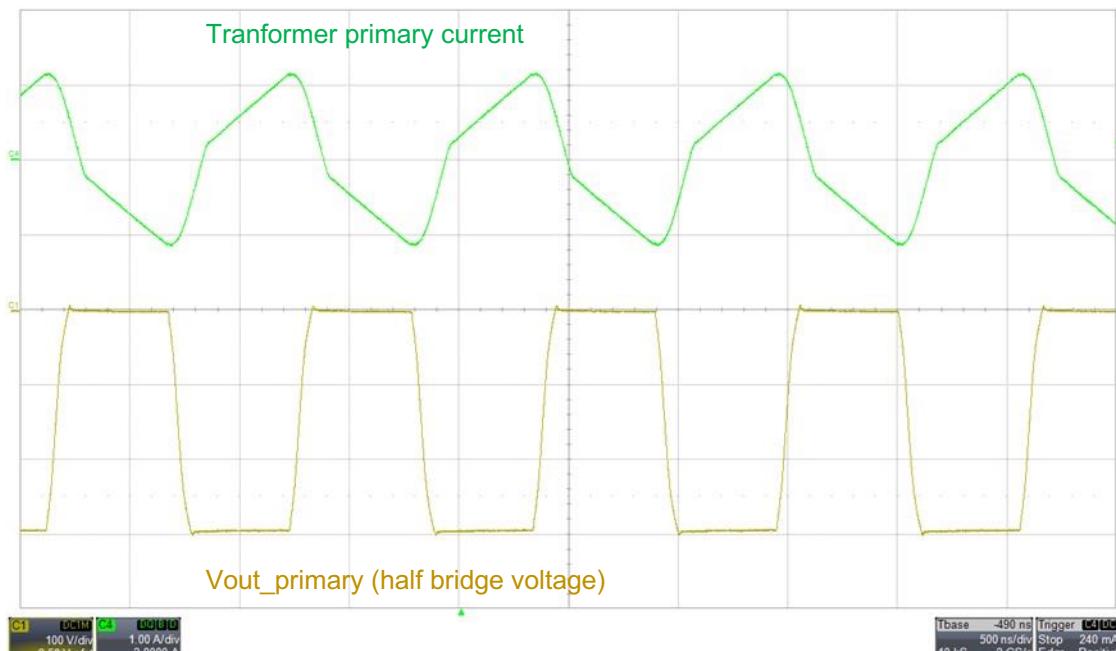
## Two voltage probes show voltage and current



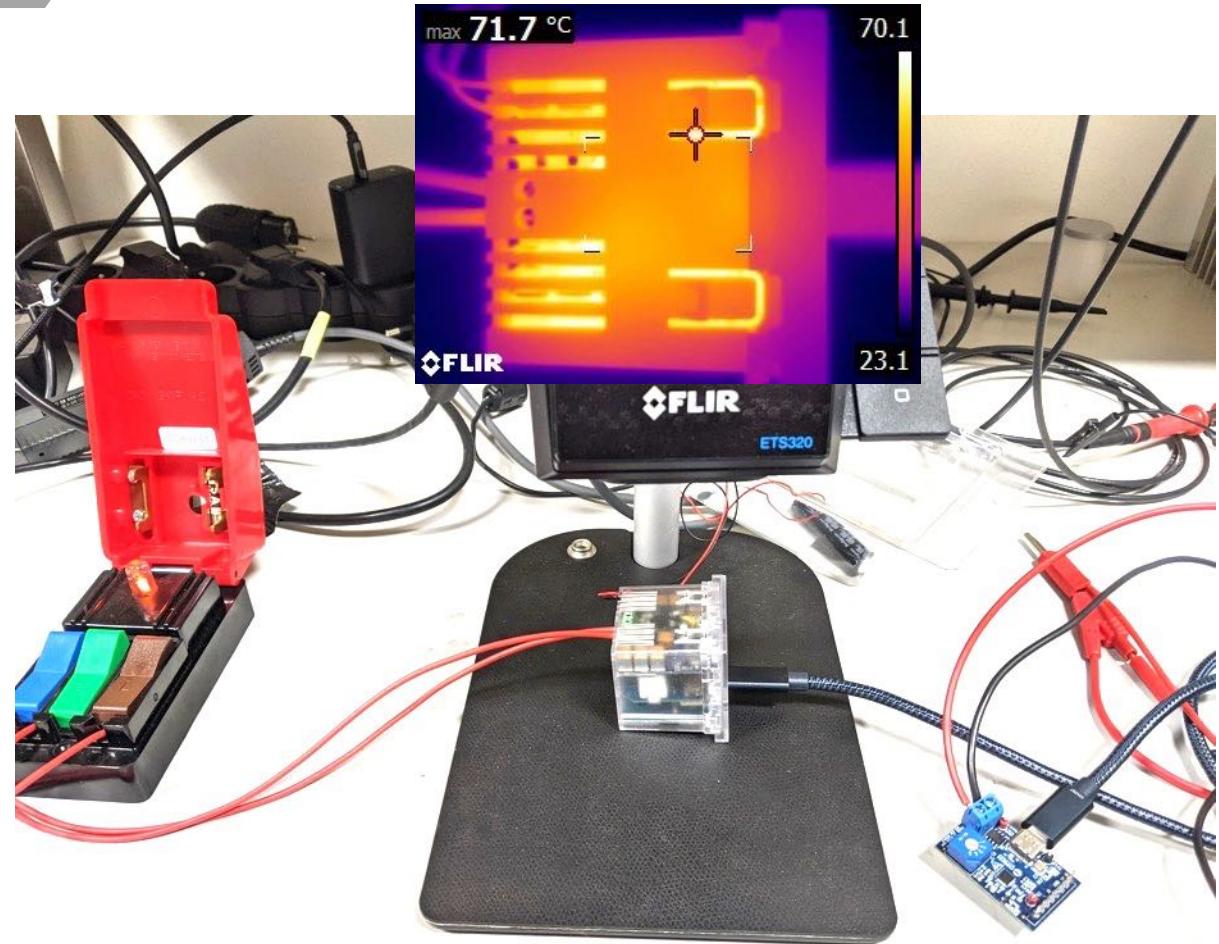
- Clean voltage waveforms from ZVS operation
- Current waveform measured on shunt resistor

# Test result: 100W WISEWARE USB PD

- Reference design validated with GaN devices
- Efficiency 95% reached at 90W
- Test evaluation done on the full power range [0 to 100W]
- ZVS and ZCS is maintained on the full power range



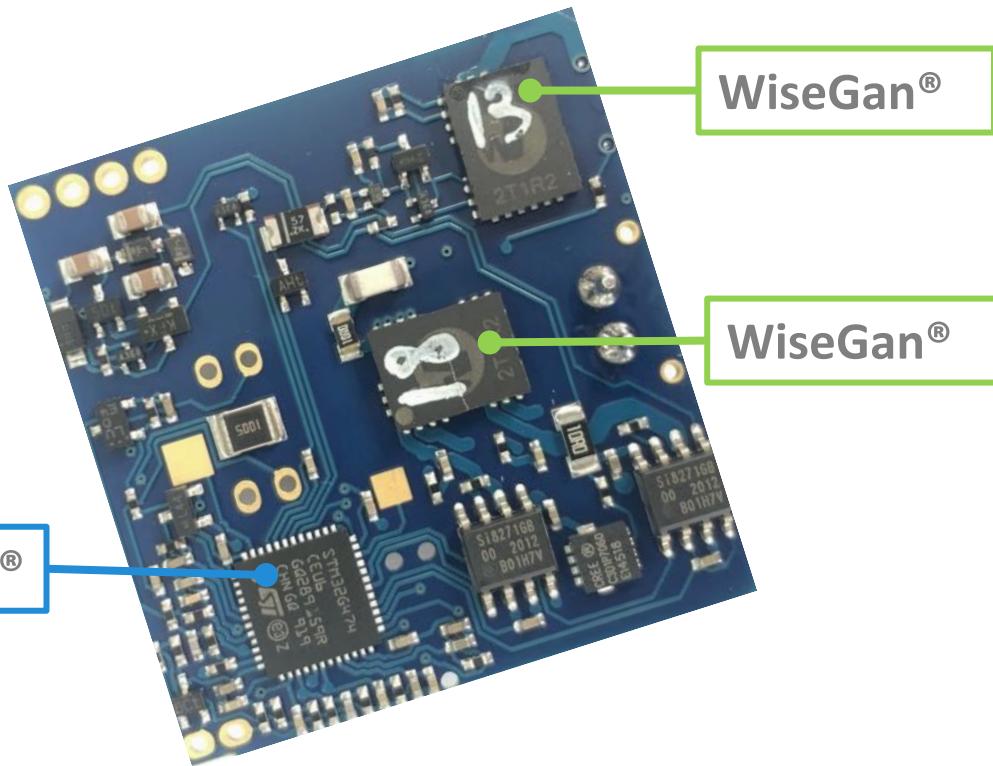
ZVS Switching



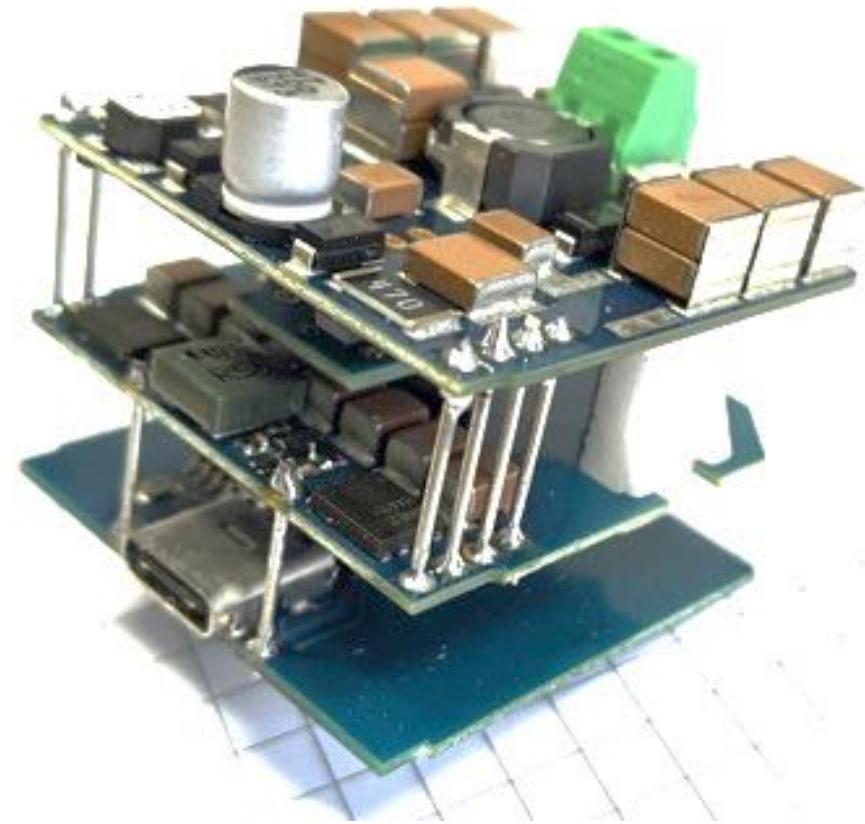
Testing WiseWare embedded in a PowerCube

## Prototype 100W AC-DC charger

Prototype 3 x smaller than competition products

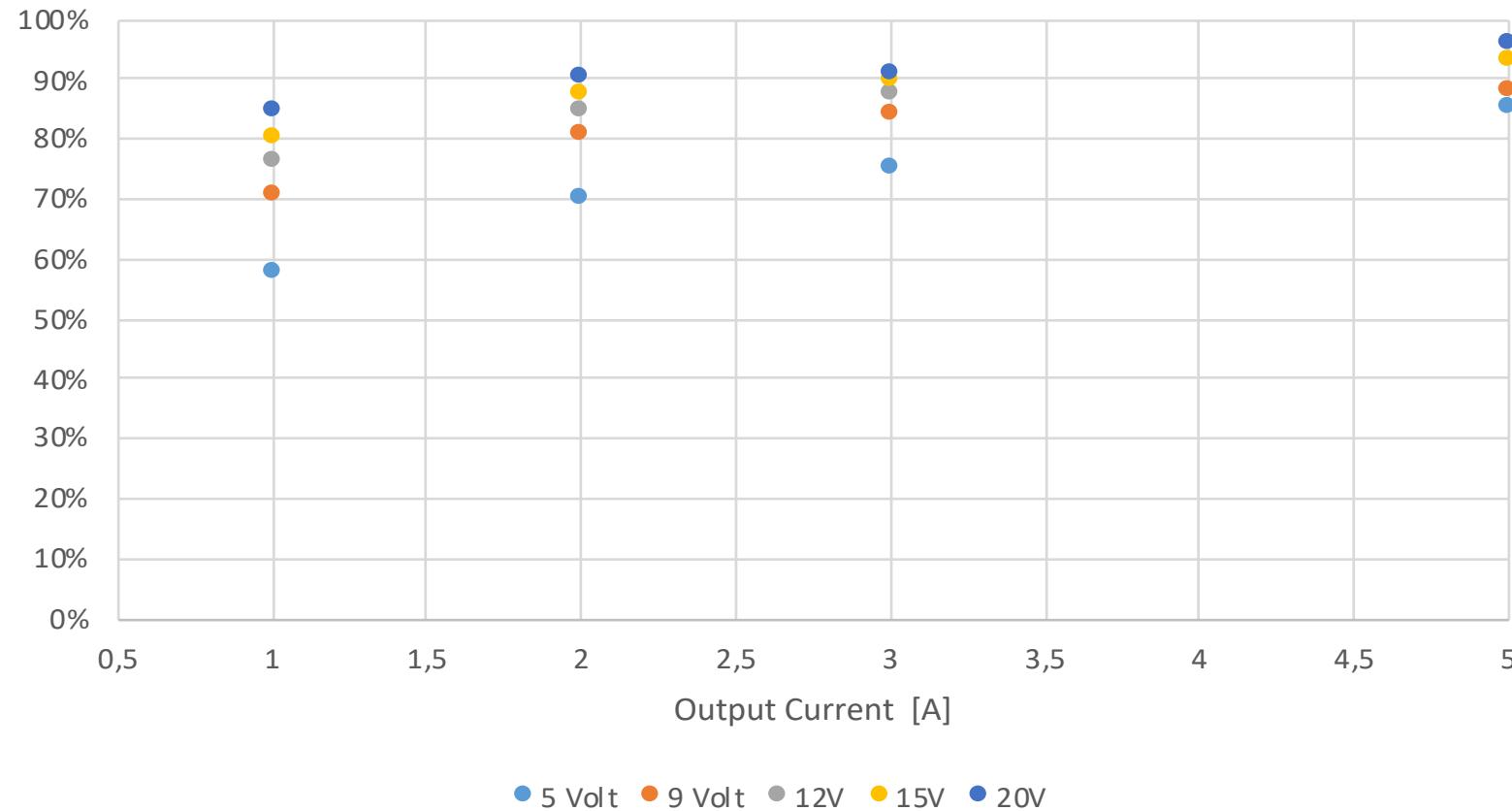


*Power board, active components side*



*Ultra-miniature 100W USB PD charger 4x4x3cm*

WiseWare® system architecture reaches 96% efficiency at 100W (5A, 20V) simulation results

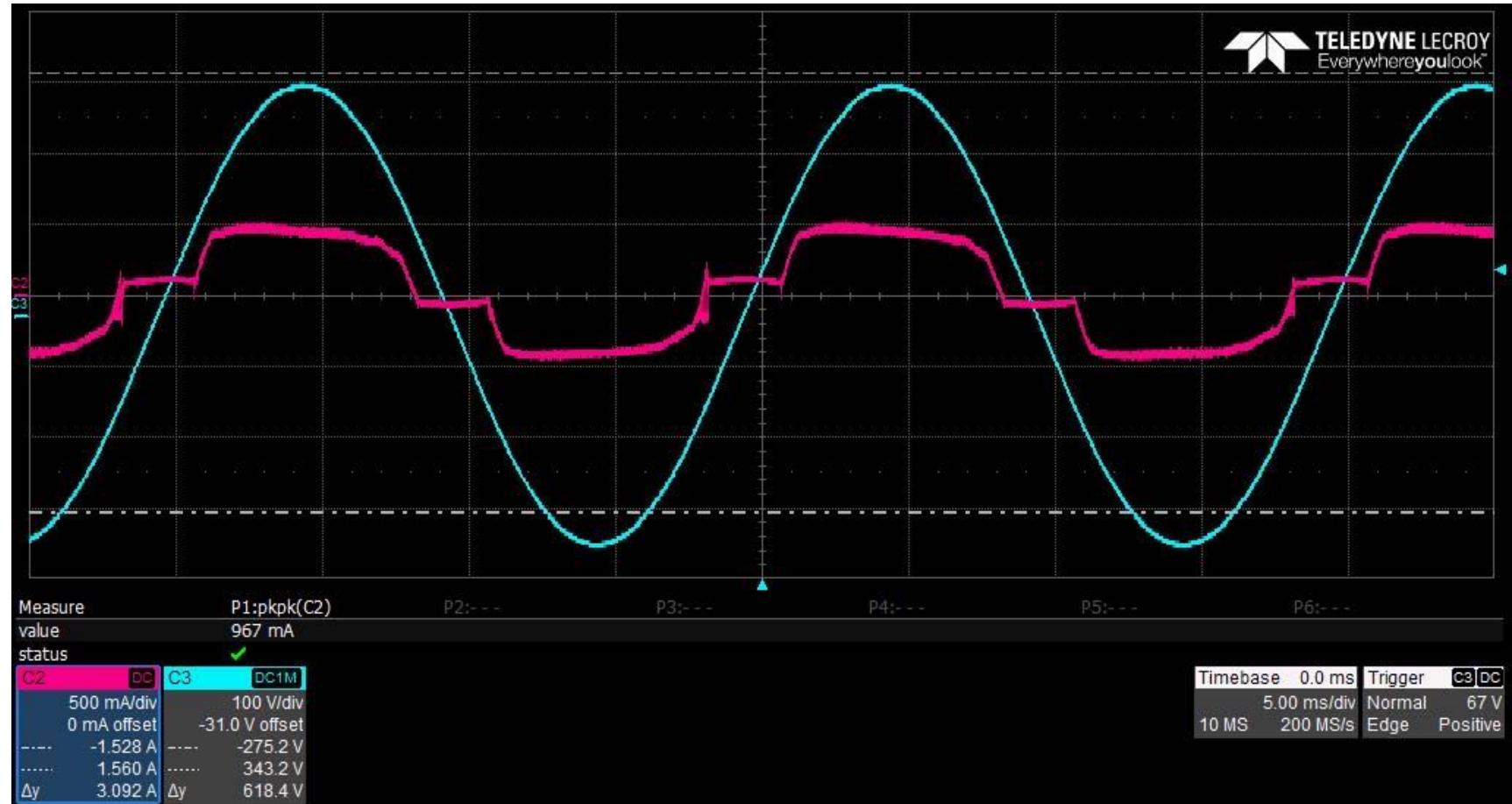


# Input current waveform

AC voltage from AC source

AC input current controlled by  
WiseWare

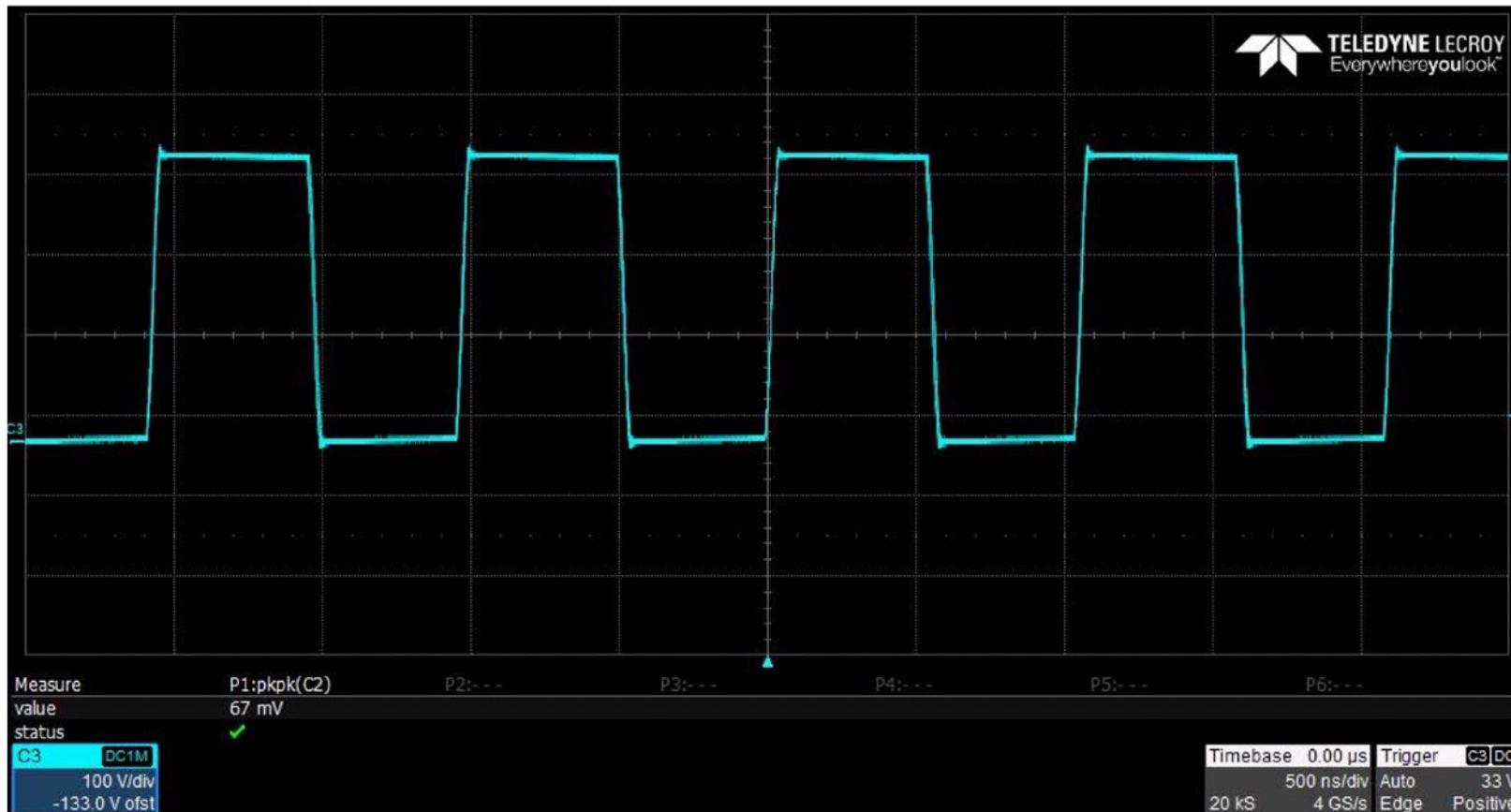
67W output (20V)



## Evaluation Results

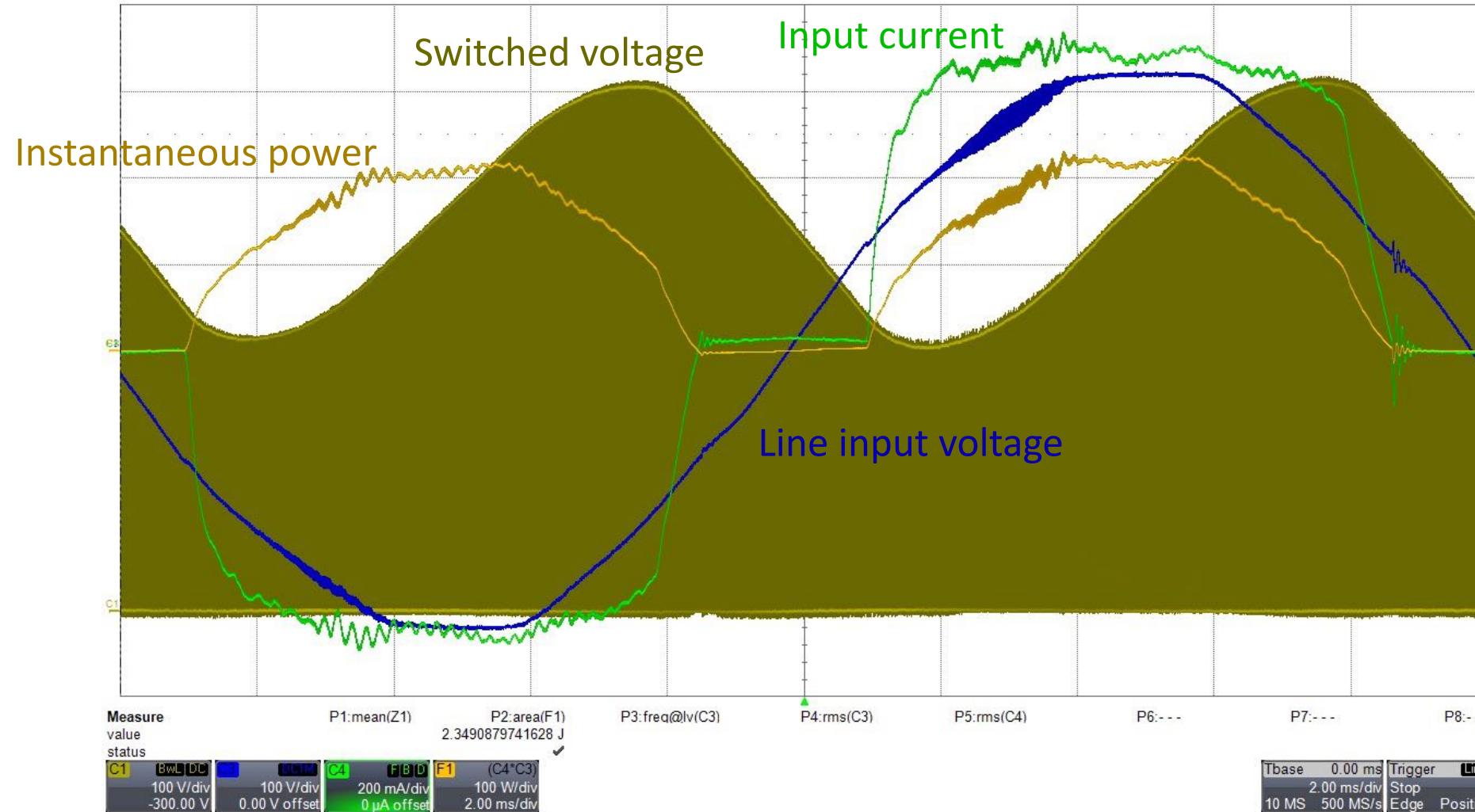
The evaluation results are shown in Figures 8 to 10.

**Figure 8.  $V_{COM}$  waveform at 1 MHz, with VPOS=350V**



# Waveform at 100W

Input current waveform of the Power cube observed at full power 100W (5A, 20V)



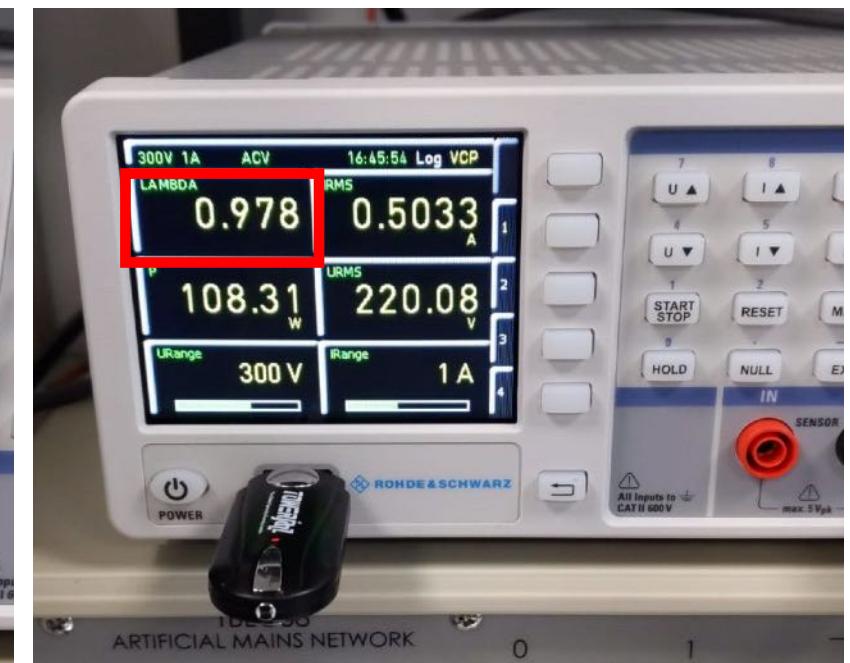
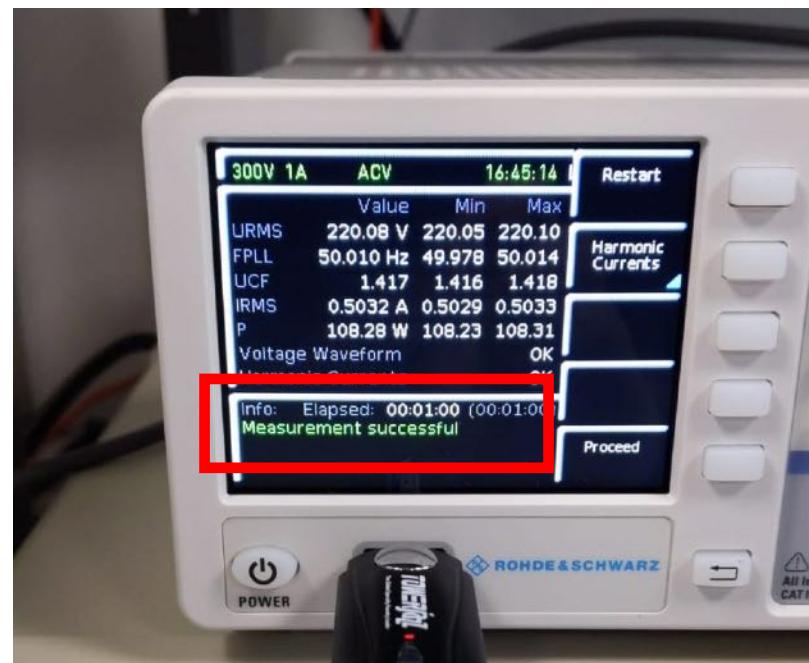
# IEC61000-3-2 standard succeeded

108W AC input  
100W DC output

WiseWare operating

Power factor : 0.97

IEC61000-3-2 standard succeeded



# The company



Wise-Integration is a French Tech company which develops GaN Integrated Circuits (IC) and new system architecture with software to make more compact, more efficient and more reliable power supplies.



Incorporated by 4 co-founders from CEA LETI spin-off combining 25 years of experience in semiconductor industry (Engineering, Marketing, R&D and Management).



Locations :

- Grenoble: Business and R&D
- Aix-en-Provence: Head office & Operational center (Product design & industrialization)
- Taïwan : Asian sales office



WiseWare® proprietary digital control is well suited to customers applications

WiseGaN® 650V GaN IC portfolio extends from  $500\text{m}\Omega$  down to  $35\text{m}\Omega$

Package roadmap aims at high power with reduced temperature rise



Wise-integration



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