Product presentation
CoolSET™ PWM Fixed Frequency Gen5 Pro

December 2025

Table of contents

Table of contents

CoolSET™ PWM Fixed Frequency Gen5 Pro

PWM controller for 1-ph and 3-ph power supply

Renewables

PWM controller for power conversion systems for 1ph and 3ph AC supply.

Capable of handling >1000V_{DC} input from PV arrays
Comprehensive advanced protection features

EV Charging

Suitable PWM controller for 3ph power supply
Fully address the central control unit and main power conversion unit

Capable of handling >1200V_{DC} input voltage and supports 800V architecture
Advanced safety features

Industrial Drives and Industrial SMPS

Suitable PWM controller for 1ph and 3ph power supply. Achieving a balance between optimized cost and advanced functionality

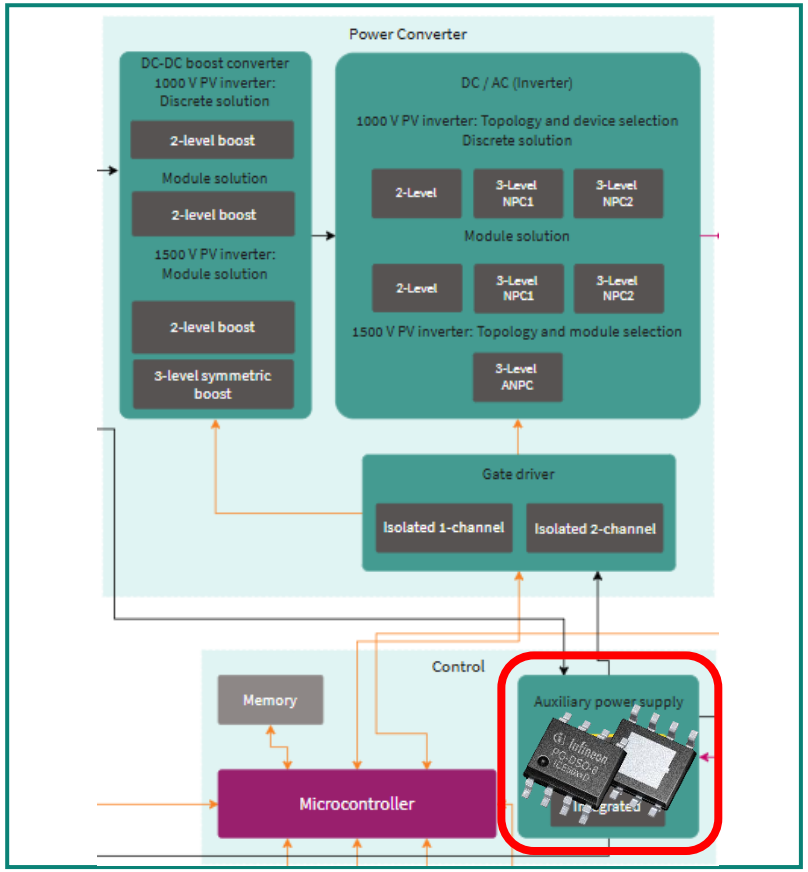
Adapting to variable load conditions while maintaining system stability

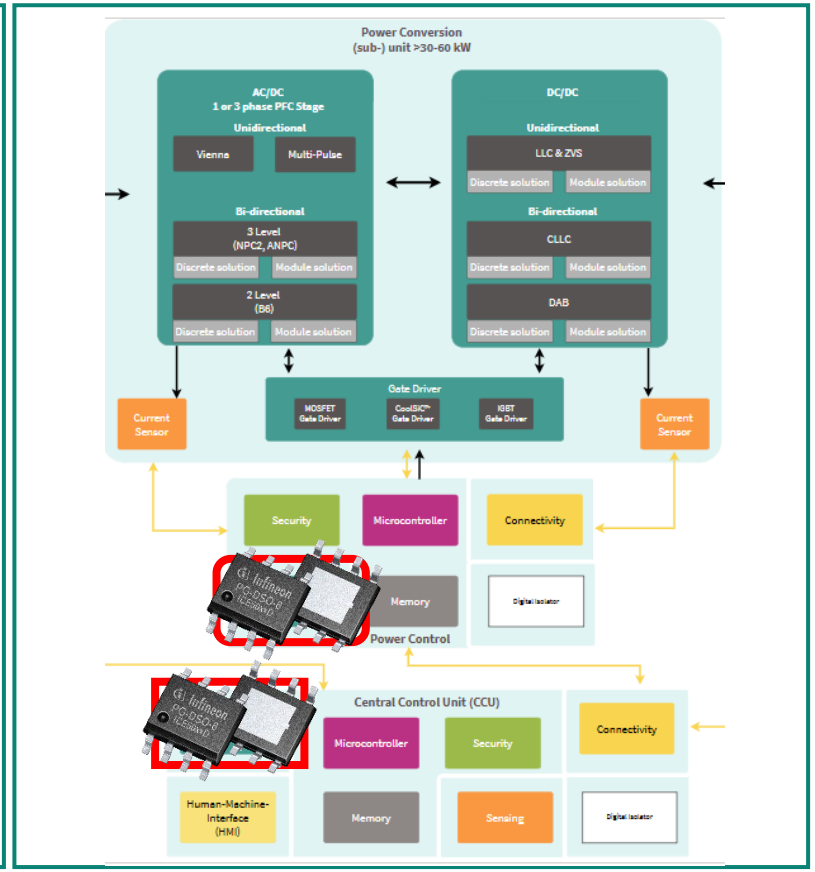
» Integrated gate driver for CoolSiC™ / CoolMOS ™ in auxiliary power supply design for 3ph / 1ph system

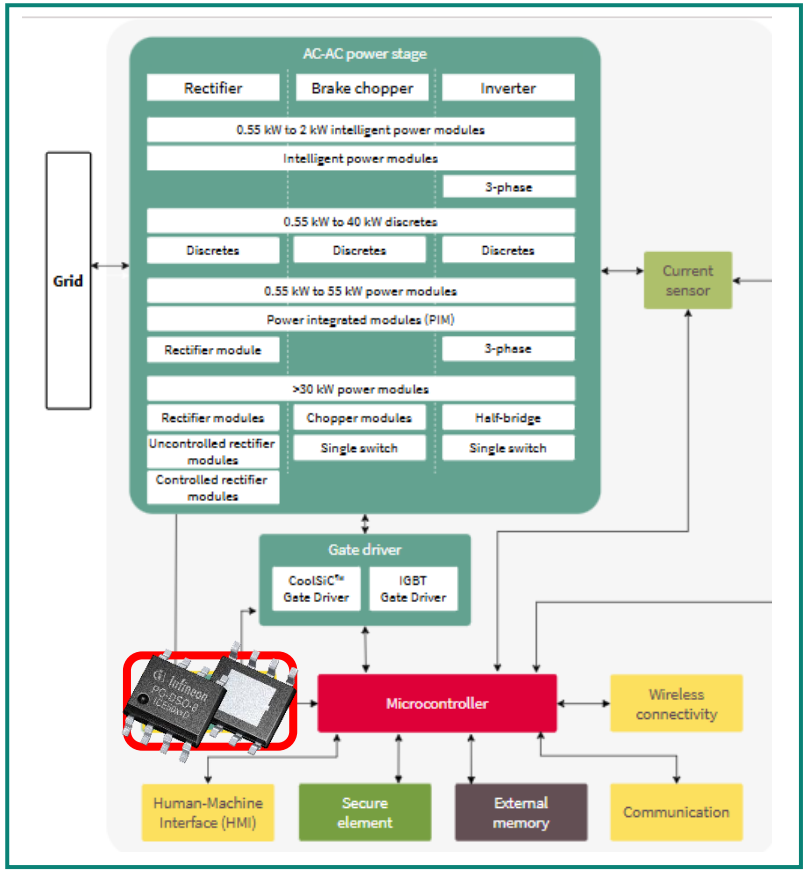
CoolSET™ PWM Fixed Frequency Gen5 Pro

Target appliations

Renewables	EV Charging	Industrial Drives and Industrial SMPS
3-ph String Inverter Block Diagram	Fast DC EV Charger Block Diagram	LV Drives Block Diagram







CoolSET™ PWM Fixed Frequency Gen5 Pro delivers up to 100+ W in 3-ph PSU

Table of contents

How CoolSET™ PWM Fixed Frequency Gen5 Pro addresses the challenges for 1-ph and 3-ph power supply?

Key requirements

- Need SiC MOSFET for high DC input voltage
- Good enough protections

- Require primary side regulation / non-isolated regulation

Industrial drive

- Require secondary side regulation / isolated regulation
- Multiple outputs in both primary side and secondary side

Solar

- Multiple outputs in both primary side and secondary side
- Require primary side regulation / non-isolated regulation

Fast charger

- Output in secondary side
- Require secondary side regulation / isolated regulation

UPS

Typical challenges

- Difficult to find a controller that can drive both Si and SiC MOSFET by configuration
- Limited controller selection that can provide configurable gate clamp voltage for different SiC MOSFET.
- Limited controller selection that can support good enough protections
- Limited controller selection that can give high performance features with limited components count

Infineon solution features and benefits

- Selectable gate voltage of 15V and 18V to drive SiC MOSFET.
- Integrated error amplifier and make both isolation and non-isolation control feasible.
- Integrated comprehensive protections such as LOVP, VCC OVP, VCC UVP, OLP, OTP, etc.
- Integrated high performance features such as ABM, frequency reduction, slope compensation, frequency jittering, etc. to simplify the circuit and reduce BOM count.

CoolSET™ PWM Fixed Frequency Gen5 Pro

Freedom to design system with 3-ph input and for aux power up to 100W

CoolSET™ PWM FF

Key differentiating value proposition of the product family

NEW

PWM FF Gen5 Pro

ICE501LD	ICE502LD
ICE501MD	ICE502MD

Key differentiating features of the product family:

- Drive up to 1700V CoolSiC™
- Available in 65 kHz and 100 kHz
- Supports both isolated and non-isolated flyback topology
- Comprehensive protection features
- Cascode configuration
- Selectable gate voltage: 10V, 15V, 18V

PWM FF Gen5

ICE5ASAG	ICE5GSAG

Key differentiating features of the product family:

- Drive up to 1200V external Si MOSFET
- Available in 100 kHz and 125 kHz
- Supports both isolated and non-isolated flyback topology
- Comprehensive protection features
- Cascode configuration

PWM FF Gen3

ICE3AS03LJG	ICE3BS03LJG

Key differentiating features of the product family:

- Drive up to 800V external Si MOSFET
- Available in 65 kHz and 100 kHz
- 500V Start-up cell

CoolSET™ PWM Fixed Frequency Gen5 Pro

ICE50xxD controllers for driving external CoolSiC™ / CoolMOS™

Part number	Marking	Output power [85V_{AC} ~ 440V_{AC}]	Output power [200V_{DC} ~ 1000V_{DC}]	Frequency switching scheme	Package
ICE501LD	501L	70 W	79 W	65 kHz	DSO-8
ICE501MD	501M			100 kHz	
ICE502LD	502L	105 W	114 W	65 kHz	
ICE502MD	502M			100 kHz	

Main Features

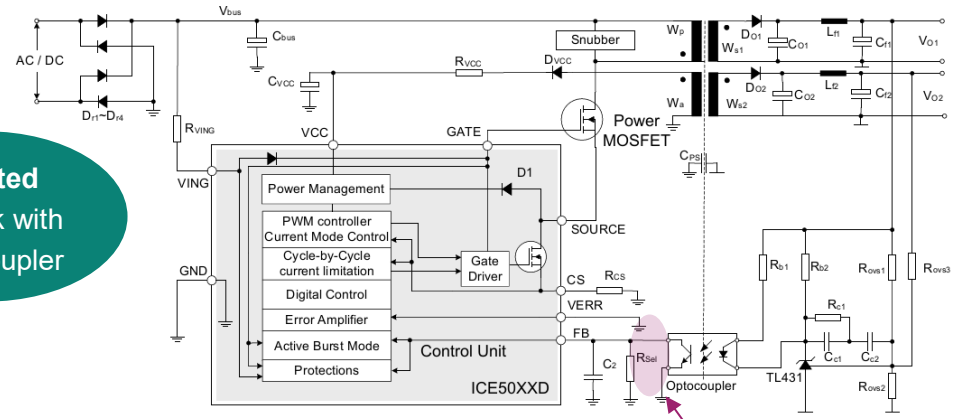
- **Selectable gate voltage** 10 V, 15 V, 18 V for **driving external power MOSFET**
- **Comprehensive protections**, including **input line voltage protection**
- **Fast startup by VCC charging** via **external CoolSiC™ / CoolMOS™**
- Integrated **soft-start** to **minimize component stress** during startup
- Integrated error amplifier to **support direct sense** for **non-isolated design**
- **Enhanced active burst mode** for **low standby power**
- **Frequency reduction** for **improved average efficiency**
- **Frequency jitter** for **low EMI**
- **CCM slope compensation**

Applications

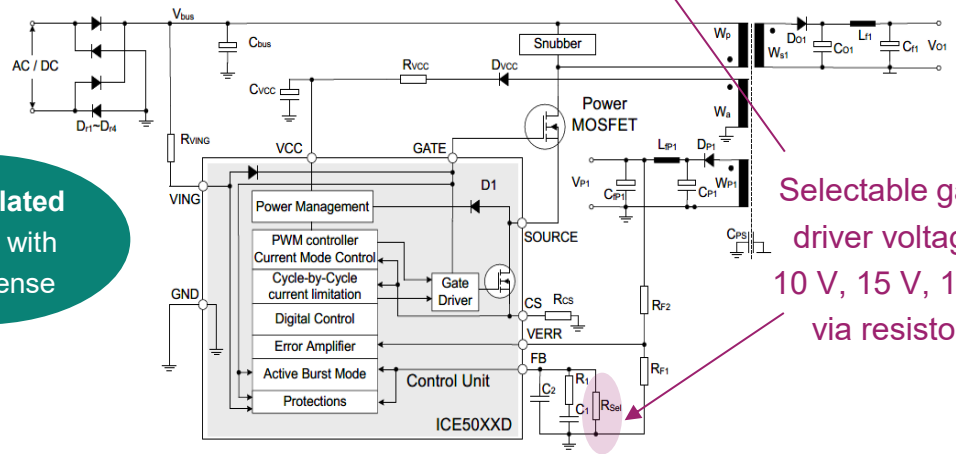
- Auxiliary power supply for **Industrial, solar, energy storage, EV charger, UPS and consumer** applications

Block Diagram + System / Application Architecture

Isolated
Flyback with opto-coupler



Non-isolated
Flyback with direct sense



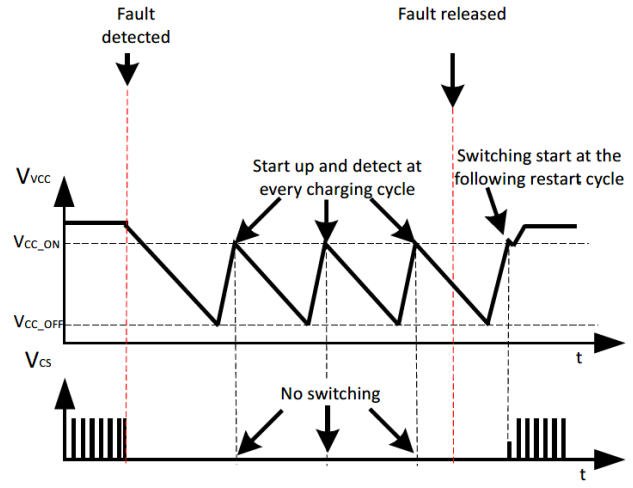
Selectable gate driver voltage 10 V, 15 V, 18 V via resistor

CoolSET™ PWM Fixed Frequency Gen5 Pro

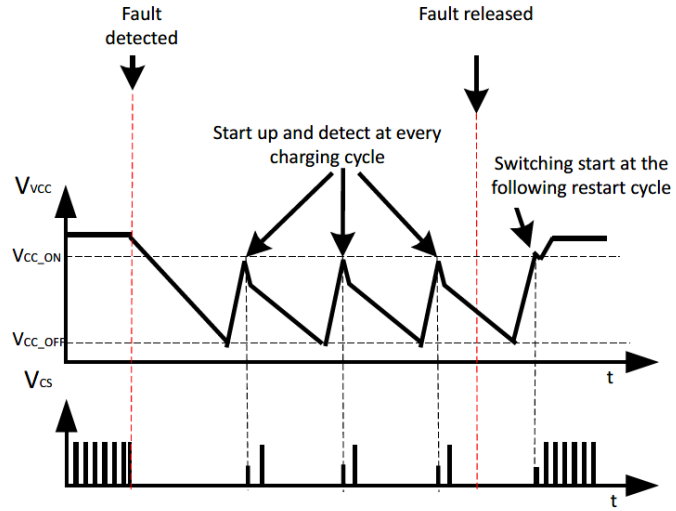
Comprehensive protections

Protections		
1	Line overvoltage	Non-switch auto restart
2	Vcc overvoltage	Extended cycle skip auto restart
3	Vcc undervoltage	Auto restart
4	Overload or open loop	Extended cycle skip auto restart
5	Over temperature	Non-switch auto -restart
6	Vcc short to GND	No start-up

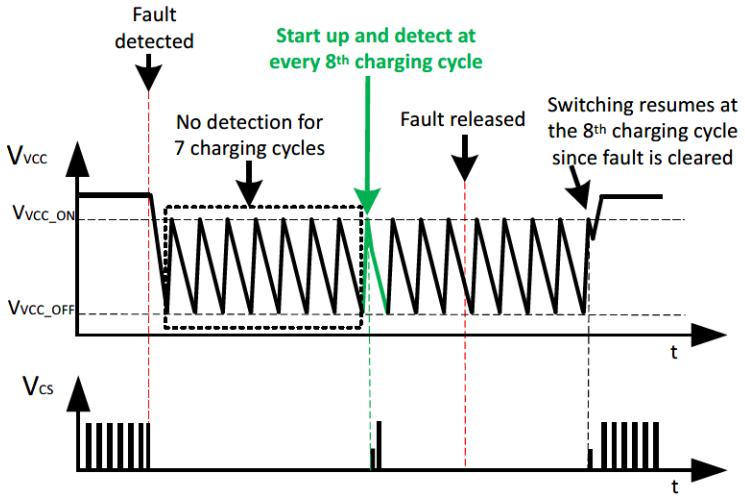
Non-switch auto restart



Auto restart



Extended cycle skip auto restart



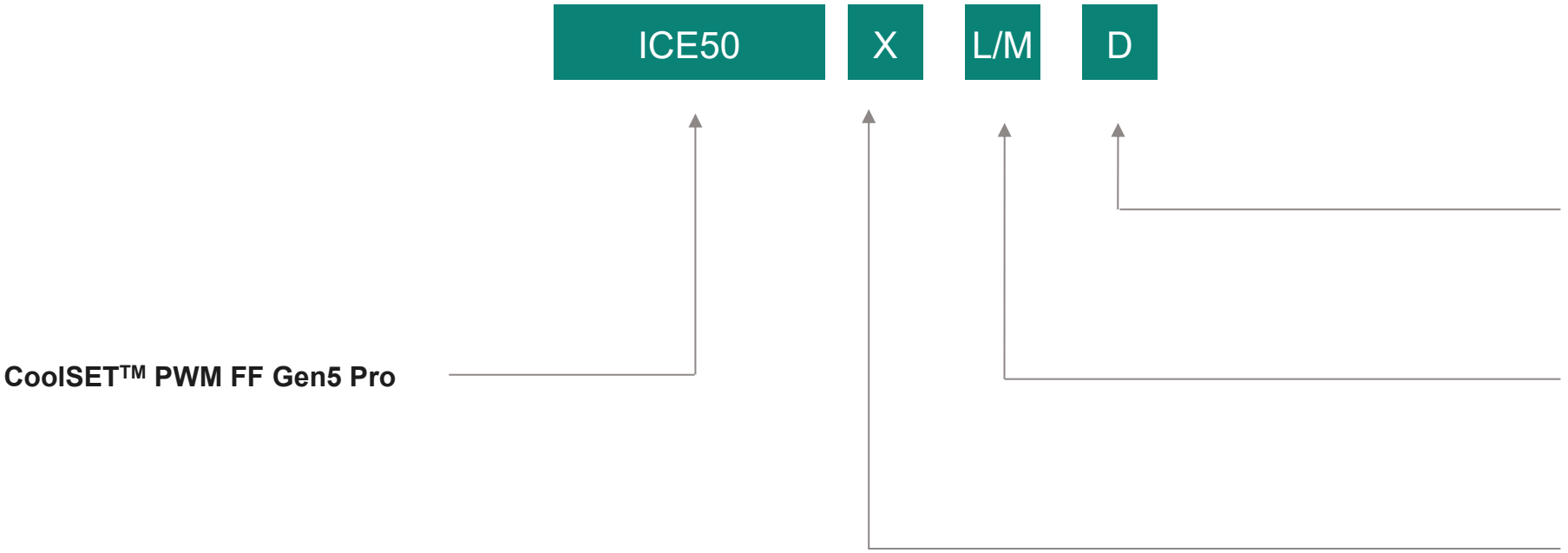
CoolSET™ PWM Fixed Frequency Gen5 Pro: flyback controller for driving external CoolSiC™ / Si-MOSFET auxiliary power application

Value Proposition	Customer benefits	Product features
Ease of use	– **Integrated gate driver for driving external CoolSiC™ / CoolMOS™**	– **Selectable gate clamp voltage 10 V, 15 V, 18 V via resistor setting for driving different external Power MOSFET**
	– **Support Non-isolated flyback with direct sense**	– **Integrated error amplifier to support direct sense**
Reliability	– **Protection against system anomalies**	– **Comprehensive protection** against: ▪ Input line over-voltage ▪ Vcc over- and under-voltage ▪ Over-load / short circuit ▪ Over-temperature
System cost	– **Ease of design with low BOM**	– **Integrated VCC startup and essential features**, e.g. soft-start, leading edge blanking, fixed frequency setting
	– **High performance**	– **Enhanced burst mode** operation for low standby power – **Frequency reduction at partial load** to increase average efficiency – **CCM slope compensation** – **Frequency jittering** for EMI signature reduction

Note: based on datasheet's parameters

CoolSET™ PWM Fixed Frequency Gen5 Pro

Product naming nomenclature



Type	Switching Frequency	Maximum output power	
	fsw	85Vac ~ 440Vac	200Vdc ~ 1000Vdc
ICE501LD	65 kHz	70 W	79W
ICE501MD	100 kHz	70 W	79W
ICE502LD	65 kHz	105 W	114W
ICE502MD	100 kHz	105 W	114W

CoolSET™ PWM Fixed Frequency Gen5 Pro

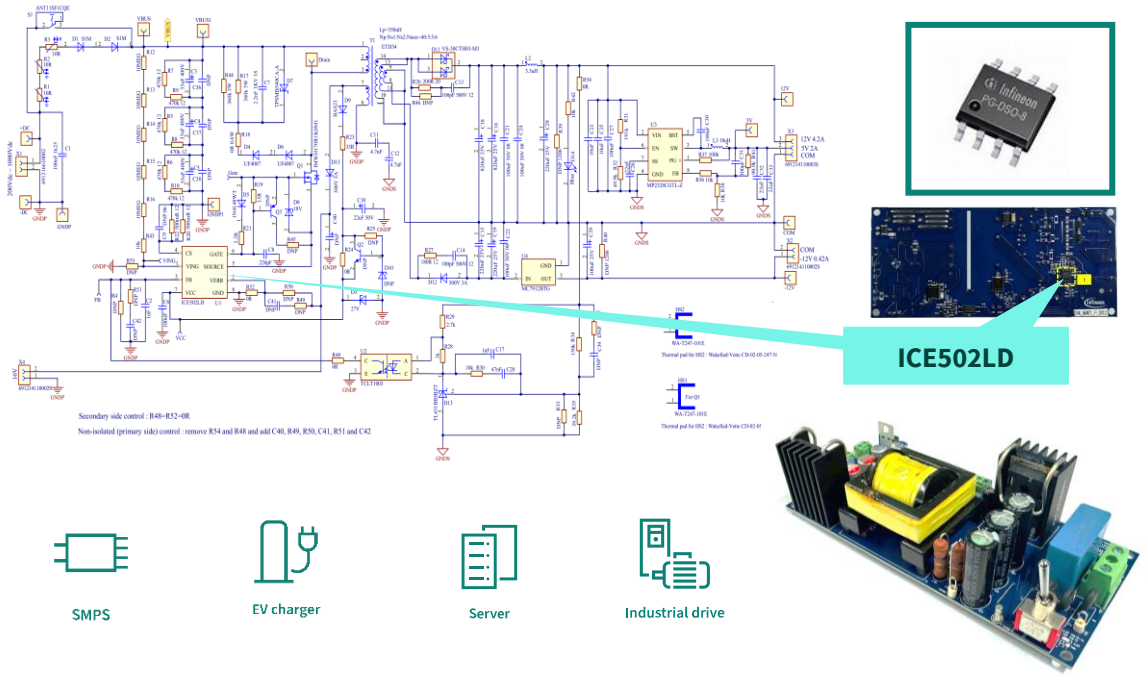
Reference boards featuring ICE502MD and ICE502LD

Board name (CoolSET™ SiP p/n)	Pout	Feature set	V_{in} range	Vout_1	Vout_2	Vout_3	η at 1000 VDC full load	
EVAL_100W1_FF_502MD (ICE502MD)	100 W	3-phase and ultra-wide DC input	200 ~ 1000 VDC	24 V / 4.2 A	-	-	>85%	
EVAL_65WT1_FF_502LD (ICE502LD)	65 W	3-phase and ultra-wide DC input	200 ~ 1000 VDC	12 V / 4.2 A	5 V / 2 A	-12 V / 0.42 A	>82%	

65W Auxiliary SMPS for Industrial Drives using ICE502LD

Board for 3-phase and ultra-wide DC input

EVAL_65WT1_FF_502LD



Technical & Order details

Parameter	Value
Input voltage range	200 V_{DC} ~ 1000 V_{DC}
Output voltage range 1	12 V_{DC} (isolated)
Output current nom 1	4.2 A (isolated)
Output voltage range 2	5 V (isolated)
Output current nom 2	2 A (isolated)
Output voltage range 3	-12 V (isolated)
Output current nom 3	0.42 A (isolated)
Input frequency	50 / 60 Hz
Output power max	65 W
PWM Gate Voltage	15V
Efficiency average	>80 % @ 1000 V_{DC}, full load

Learn more	
Sales name	EVAL_65WT1_FF_502LD
SP number	SP006184396
Orderable part number	EVAL65WT1FF502LDTOBO1
Infineon components	ICE502LD, IMWH170R1K0M1
Focus application	Industrial Drives, EV Charger, Solar, UPS, Commercial ESS, Industrial SMPS

Features & Benefits

- Integrated gate driver for CoolSiC™ / CoolMOS™ with selectable gate clamp voltage via resistor setting
- Comprehensive protection against system anomalies
- Ease of design with integrated VCC startup and essential features e.g. soft-start, leading edge blanking, fixed frequency setting
- Integrated error amplifier for non-isolated flyback with direct sense
- High performance, e.g. Enhanced burst mode, Frequency reduction at partial load, CCM slope compensation, frequency jittering

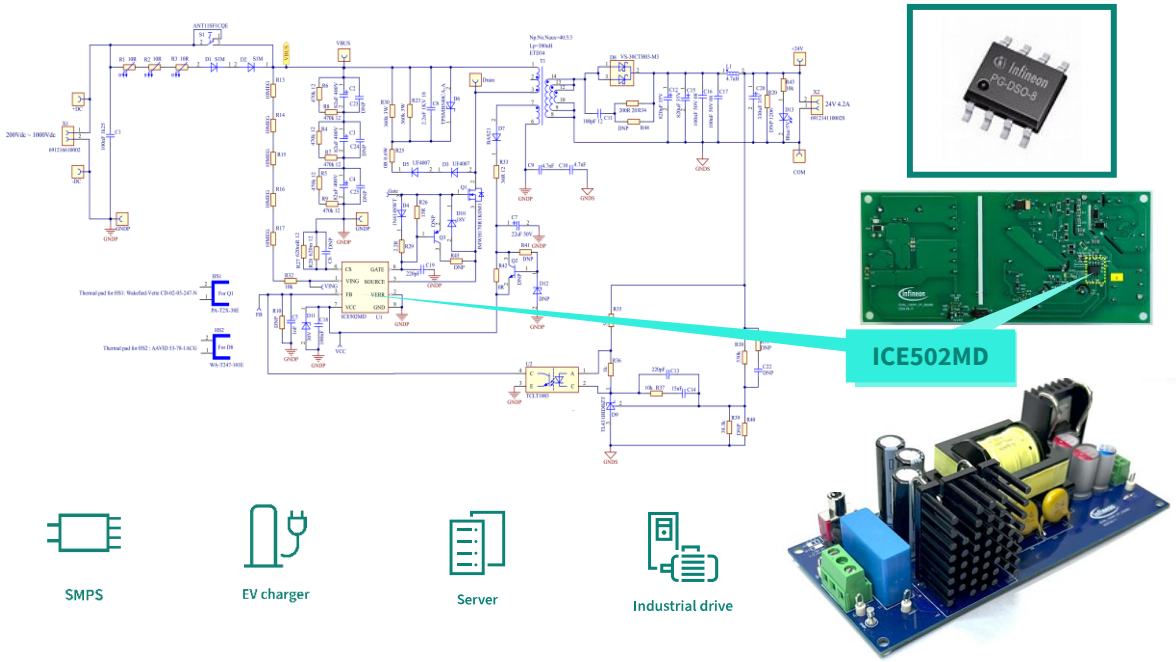
Purpose of the solution

- The purpose of the solution is to demonstrate the solution for high input voltage DC link 65W auxiliary power supply designs using Infineon's controller ICE502LD and 1700 V CoolSiC™ MOSFET in TO-247 package (IMWF170R1K0M1) in a single switch flyback topology. The document can support designers targeting three-phase converters that includes solar inverter, energy storage, EV-charger, UPS and motor drives.

100W Auxiliary SMPS for Industrial Drives using ICE502MD

Board for 3-phase and ultra-wide DC input

EVAL_100W1_FF_502MD



Technical & Order details

Parameter	Value
Input voltage range	200 V_{DC} ~ 1000 V_{DC}
Output voltage range	24 V (isolated)
Output current nom	4.2 A (isolated)
Input frequency	50 / 60 Hz
Output power max	100 W
PWM Gate Voltage	15V
Efficiency average	>85% @ 1000 V_{DC}, full load
Topology	FF Flyback

Learn more	
Sales name	EVAL_100W1_FF_502MD
SP number	SP006168102
Orderable part number	EVAL100W1FF502MDTOBO1
Infineon components	ICE502MD, IMWH170R1K0M1
Focus application	Industrial Drives, EV Charger, Solar, UPS, Commercial ESS, Industrial SMPS

Features & Benefits

- Integrated gate driver for CoolSiC™ / CoolMOS™ with selectable gate clamp voltage via resistor setting
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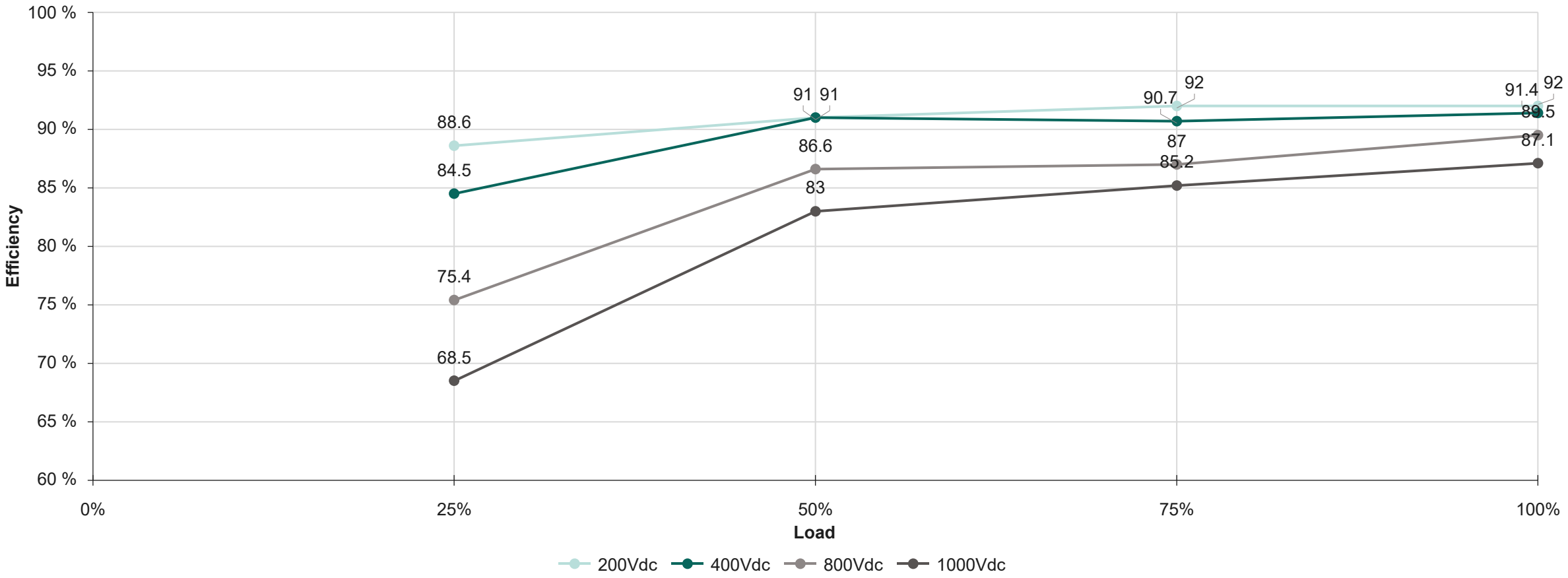
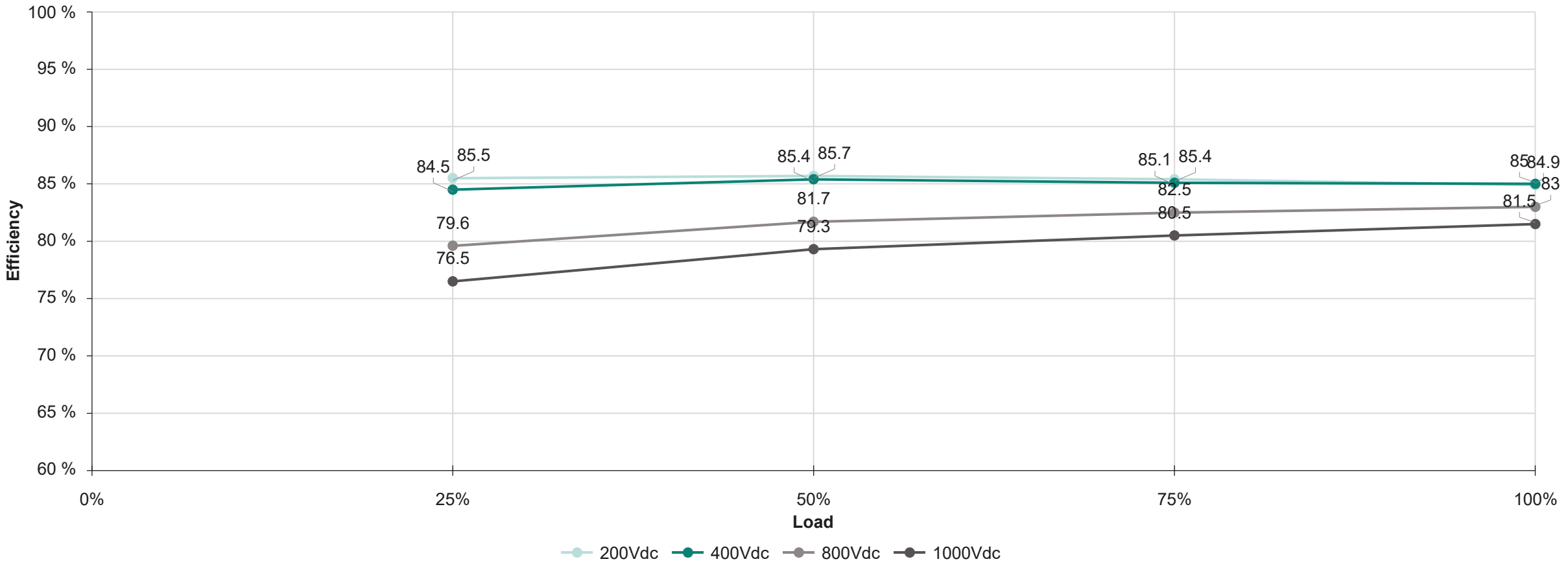
Efficiency curve
EVAL_100W1_FF_502MD



Efficiency vs Load for different line at Ta =25C (4.2A 24V full load)

CoolSET™ PWM FF Gen5 Pro optimized operation enables higher efficiency

Efficiency curve
EVAL_65WT1_FF_502LD



Efficiency vs Load for different line at Ta =25C (for multi-output)

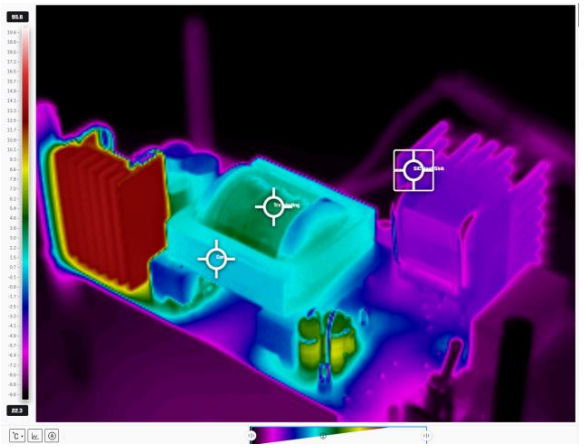
* Switch is kept on to bypass NTC and diode drops.

CoolSET™ PWM FF Gen5 Pro optimized operation enables higher efficiency

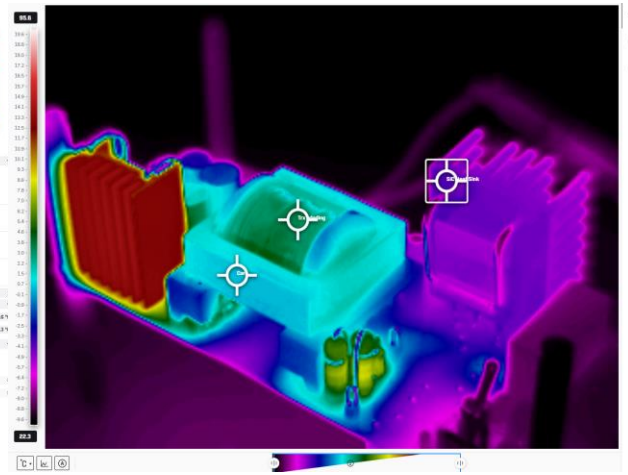
100 W reference board thermal performance

EVAL_100W1_FF_502MD Thermal Scan @ 25ºC T_{amb} for $200V_{DC}$/$1000V_{DC}$

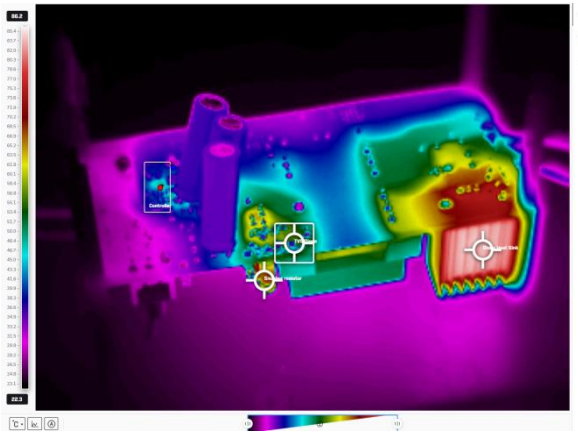
200Vdc,100W Load Top



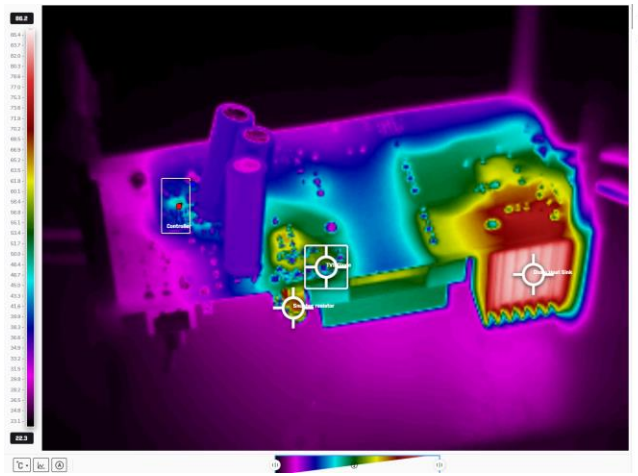
1000Vdc,100W Load Top



200Vdc,100W Load Bottom



1000Vdc,100W Load Bottom

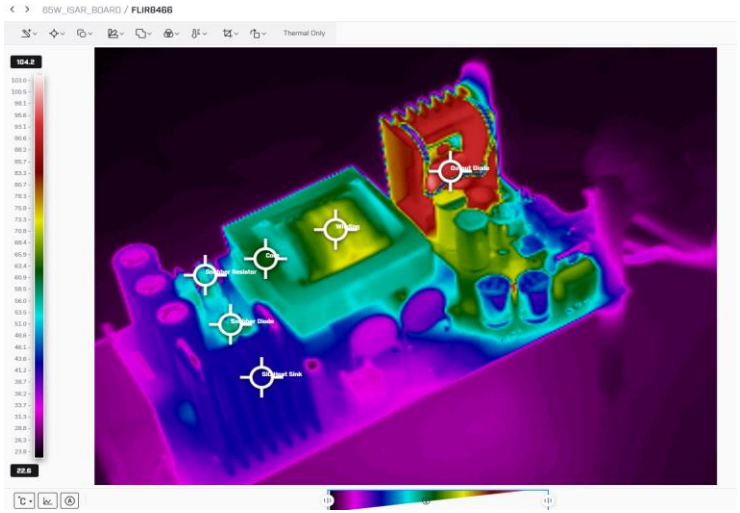


		100W 100kHz TO247SiC	
Sno	**Components**	**200V/100W**	**1000V/100W**
1	**IMWH170R1K0M1 CoolSiC™**	40.2 ºC	83.2 ºC
2	**CoolSiC™ heatsink**	40.8 ºC	78.2 ºC
3	**Trf Core**	52.2 ºC	69 ºC
4	**Trf winding**	59.6 ºC	74.1 ºC
5	**Output diode**	86.3 ºC	94.3 ºC
6	**Diode heatsink**	83.9 ºC	84.7 ºC
7	**ICE502MD** (PWM IC)	52 ºC	63.8 ºC
8	**RCD diode**	66.1 ºC	79.3 ºC
9	**TVS diode**	52.3 ºC	66.5 ºC
10	**Snubber resistor**	70.5 ºC	79.4 ºC

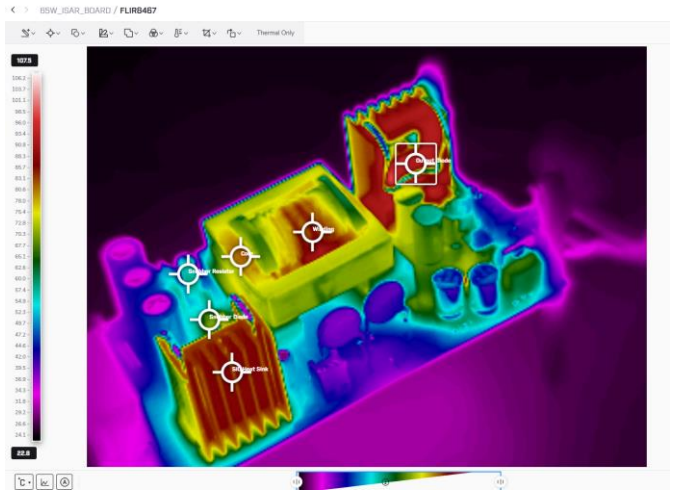
65 W reference board thermal performance

EVAL_65WT1_FF_502LD Thermal Scan @ 25ºC T_{amb} for $200V_{DC}$/$1000V_{DC}$

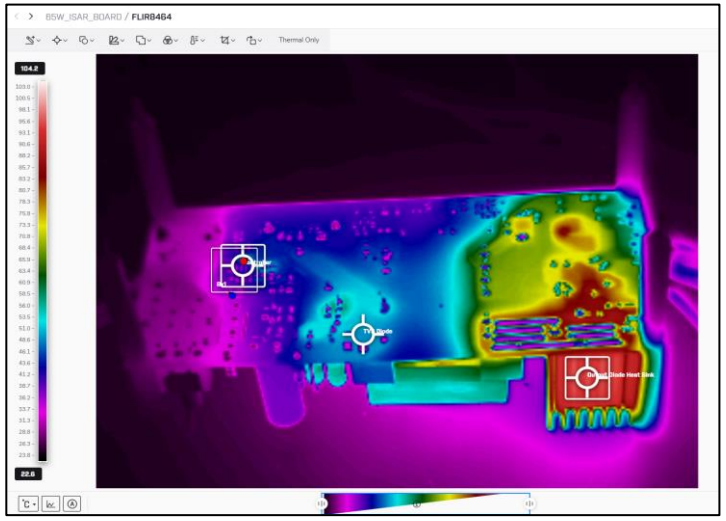
200Vdc 65W Load TOP



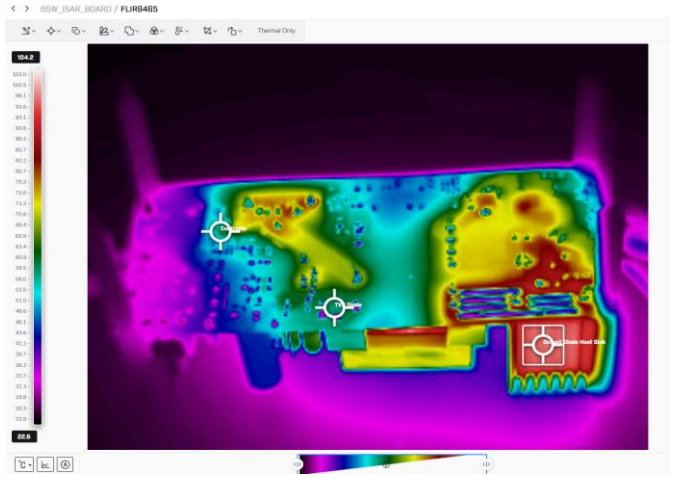
1000Vdc 65W Load TOP



200Vdc 65W Load Bottom



1000Vdc 65W Load Bottom



		65W 65kHz TO247SiC	
Sno	**Components**	**200V/65W**	**1000V/65W**
1	**IMWH170R1K0M1 CoolSiC™**	45 ºC	83.4 ºC
2	**CoolSiC™ heatsink**	47 ºC	87 ºC
3	**Trf Core**	68.4 ºC	86.2 ºC
4	**Trf winding**	74.2 ºC	90.4 ºC
5	**Output diode**	93.8 ºC	95 ºC
6	**Diode heatsink**	96.9 ºC	97.9 ºC
7	**ICE502LD** (PWM IC)	53.1 ºC	65.7 ºC
8	**RCD diode**	62.6 ºC	62.9 ºC
9	**TVS diode**	54.2 ºC	63.4 ºC
10	**Snubber resistor**	58.4 ºC	62.9 ºC

Table of contents

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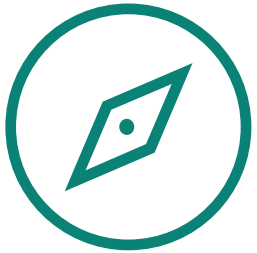

Product and application information

- CoolSET™ PWM
- CoolSET™ PWM fixed frequency

Reference designs & boards

- EVAL_65WT1_FF_502LD
- EVAL_100W1_FF_502MD

Technical documents

- Datasheet
- Application note: 65 W auxiliary power supply using CoolSET™ ICE502LD
- Application note: 100 W auxiliary power supply using CoolSET™ ICE502MD

Trainings

- Webinars, online trainings


Infineon