

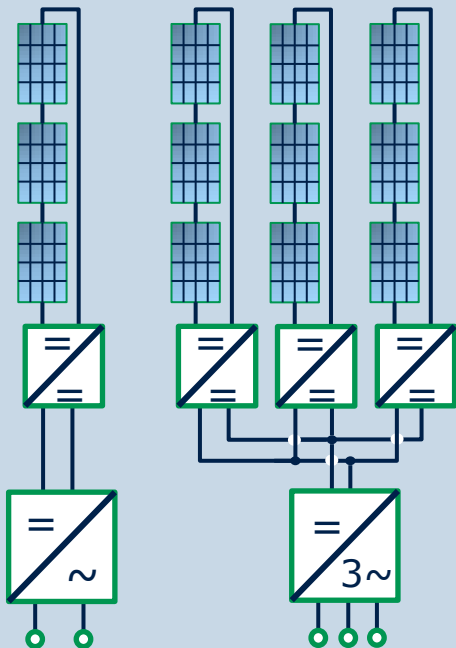
# Applications Solar (String Inverters)

PCIM 2014, Nuremberg



# String and Multi-String Inverter Solutions

## Single or Three phase AC connection



## Power Semiconductors and Drivers

- Discretes
  - CoolMOS™
  - CoolSiC™ SiC JFET
  - thinQ!™ SiC Diode
  - TRENCHSTOP™ 5
- Modules
  - Easy1B/2B
  - SiC JFET Easy1B
- Driver
  - 1ED Compact Driver
  - Single channel EiceDRIVER™
  - Dual channel EiceDRIVER™

## Auxiliary power supply and Controller

- SMPS controller CoolSET™
- Microcontroller
  - XE166 Family
  - XMC4000 ARM™ Family
  - TriCore™ Family



# Technologies: 650V TRENCHSTOP™ 5 IGBT

## Features

- Compared to HS3
  - >60% lower switching losses
  - 10% lower conduction losses
  - Factor 2.5 lower QG
- 650V Blocking Voltage
- For high frequency
  - Ease of use **H5**
  - Performance optimized **F5**
- For low frequency
  - Best in class **L5**  $V_{cesat}$

## Benefits

- Best-in-Class efficiency, resulting in
  - lower junction and case temperature
  - Leading to higher device reliability
  - High power density
- Reduced system cost

## Applicable for

- Inverter
- DC/DC converter

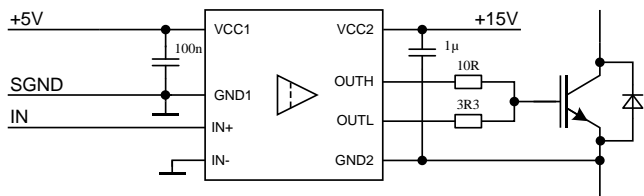


# 1ED Compact Family

## 1ED Separate Outputs

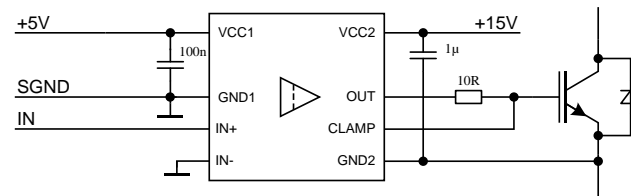
- Coreless transformer isolated driver
- Target output current ON & OFF  
0,5A; 2A; 4A; 6A @ 15V
- Supply voltage up to 35V (uni- & bipolar)
- UVLO for IGBT or MOS

## 1ED Compact

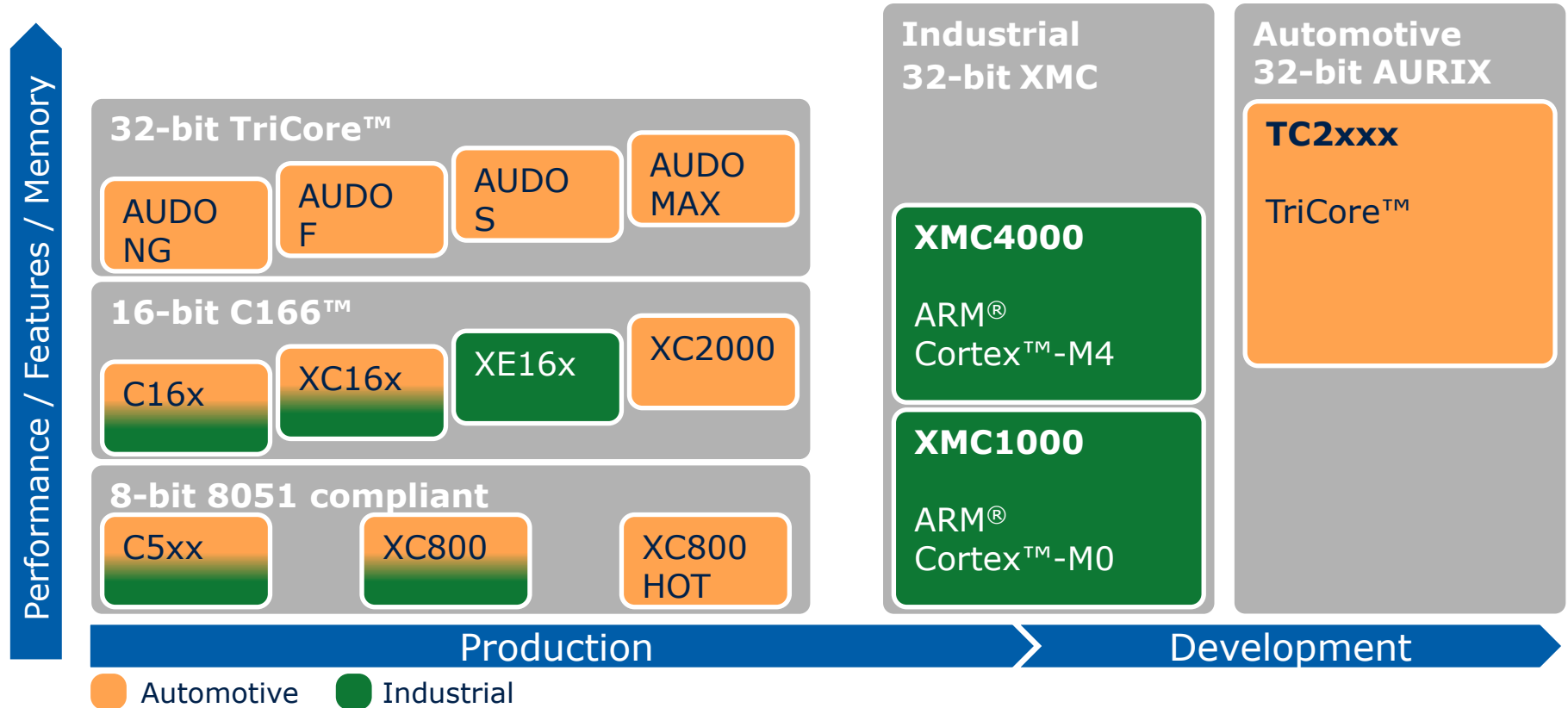


## 1ED with Clamping


- Coreless transformer isolated driver
- Target output current for OUT & CLAMP  
1A; 2A; 3A @ 15V
- Integrated CLAMP output
- Supply voltage 20V (uni)
- UVLO for IGBT



# Infineon Microcontrollers enable customers to differentiate



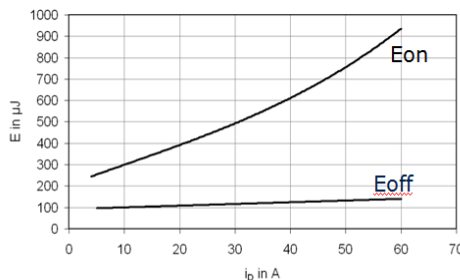
# Solar Modules and Semiconductors Solution Overview

	Micro Inverters	String Inverters	Central Inverters
Products	TRENCHSTOP™ 5 CoolMOS™ OptiMOS™ 	Easy1B/2B TRENCHSTOP™ 5 SiC JFET Easy1B 	PrimePACK™ EconoPACK™ 4 EconoDUAL™ 3 
Power	100W → 500W	1kW → 50kW	100kW → 1MW
Frequency	16kHz → >48kHz	16kHz → 48kHz	1kHz → 15kHz
			

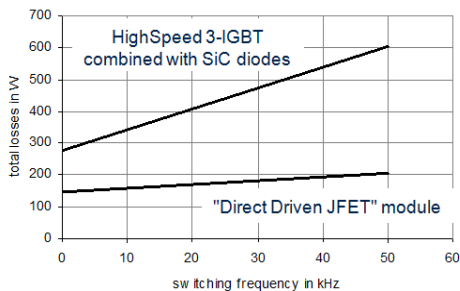
# Half-Bridge SiCJFET Photo-Voltaic Module

## Half Bridge Module SiC JFET

- With SiC JFET, heatsink and magnetics can be decreased.
- Dedicated driver IC completes the solution
- Performs as **DC/DC** converter with/out synchronous rectification
- Performs as **DC/AC** 2-Level Inverter

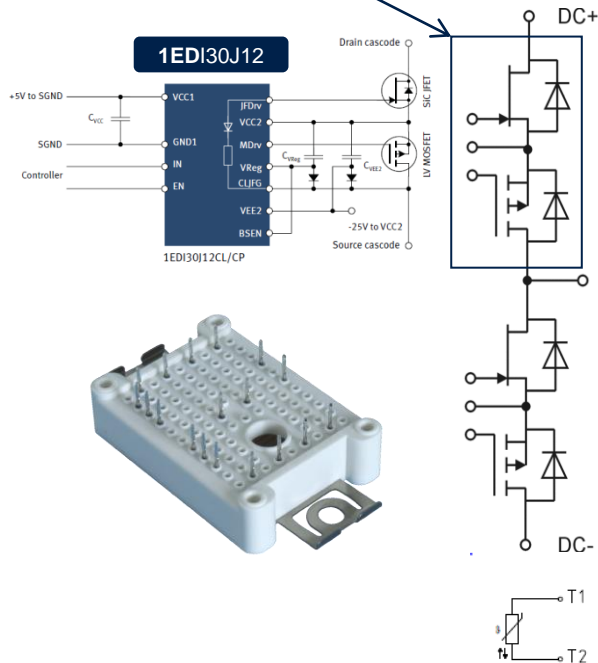


Dynamic losses of the half bridge JFET module at  $T_J=125^\circ C$  and  $R_{G,ext}=0$



Calculated Semiconductor Losses of the Inverter Stage of a 22kVA 2-Level Converter ( $V_{DC}=600V$ ,  $\cos\phi=0.9$ ,  $m=1$ ,  $T_J=125^\circ C$ )

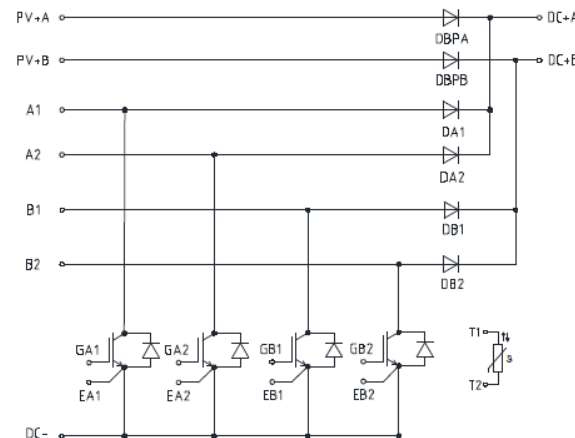
SICJFET + PMOS + Driver perform as a purely **Normally\_OFF\_Device**



# Three-Phase Photo-Voltaic Inverter Modules

## Booster Modules 10 kVA ... 20 kVA

- Booster modules for three-phase solar inverters
- Excellent efficiency and performance
- Suitable for up to 4 strings
- Bypass diodes integrated
- Options with SiC booster diodes available
- Fast and solder-less assembly is possible using proven PressFIT technology





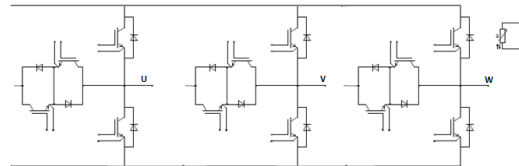
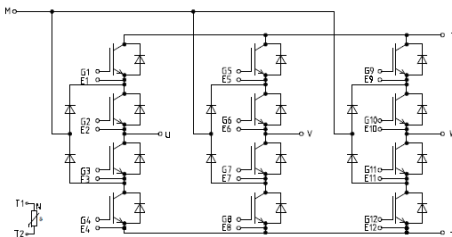
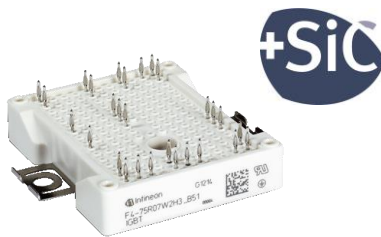
# Three-Phase Photo-Voltaic Inverter Modules

## Three Phase 3-Level Module up to 9 kVA

## NPC1 up to 9kVA

## NPC2 up to 9kVA

- **NPC1 and NPC2**  
Topology
- Fully integrated module 3Phases solar inverters
- Excellent efficiency and performance
- Full reactive power capability
- PressFIT technology

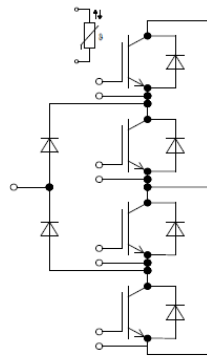
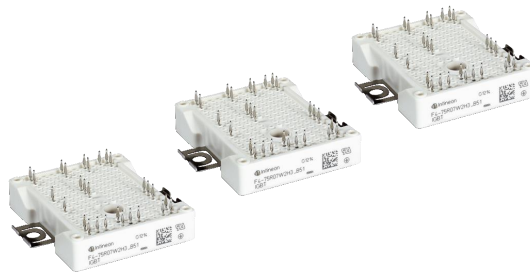


# Three-Phase Photo-Voltaic Inverter Modules

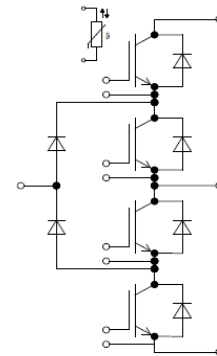
## Three Phase 3-Level Module up to 25-40kVA

- **NPC1** Topology
- Phase leg module for three phase solar inverters
- Excellent efficiency and performance
- Full reactive power capability
- PressFIT technology

## Easy2B up to 25kVA



## Easy2B up to 40kVA

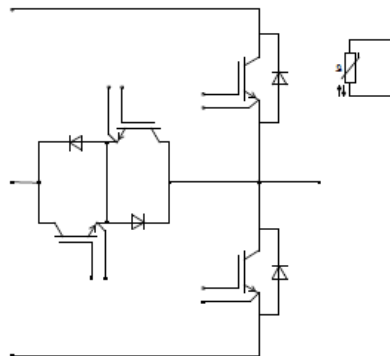


# Three-Phase Photo-Voltaic Inverter Modules

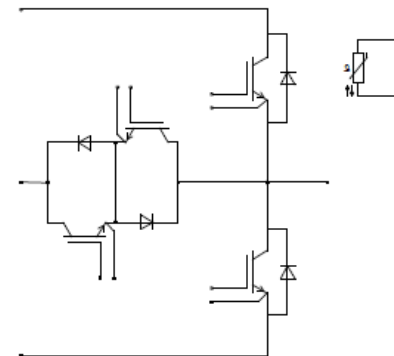
## Three Phase 3-Level Module up to 20-50kVA

- **NPC2** Topology
- Phase leg module for three phase solar inverters
- Excellent efficiency and performance
- Full reactive power capability
- PressFIT technology

## Easy1B up to 20kVA



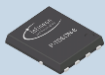
## Easy2B up to 50kVA



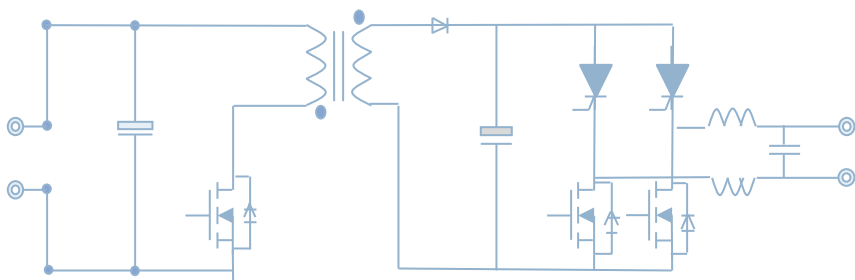
# Micro Inverters

## Current Source uInverter

- **OptiMOS™**
- Lowest  $R_{DS(on)} \times A$
- Lowest FOM [ $R_{DS(on)} \times Q_g$ ]
- FOM[ $Q_g$ ] 55% lower than current gen.
- 60V-250V in all packages

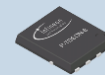


- **CoolMOS™ 800V C3**
- High breakdown voltage
- $R_{DS(on)}$  290mOhm
- High commutation ruggedness
- D2PAK

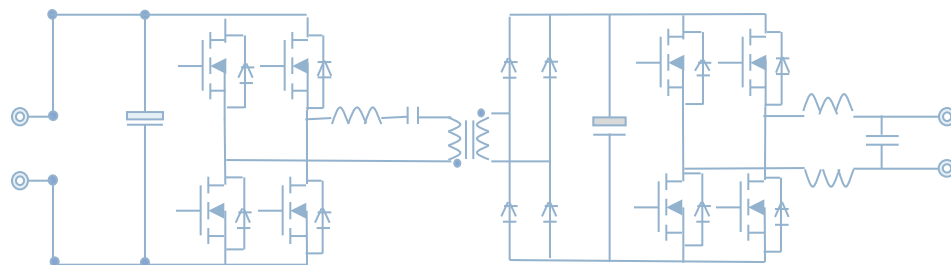


## Voltage Source uInverter

- **OptiMOS™**
- Lowest  $R_{DS(on)} \times A$
- Lowest FOM [ $R_{DS(on)} \times Q_g$ ]
- FOM[ $Q_g$ ] 55% lower than current gen.
- 60V-250V in all packages



- **CoolMOS™ 650V CFD**
- Fastest body diode
- $R_{DS(on)}$  150-660mOhm
- High commutation ruggedness
- DPAK / D2PAK





# ENERGY EFFICIENCY MOBILITY SECURITY

Innovative semiconductor solutions for energy efficiency, mobility and security.

