

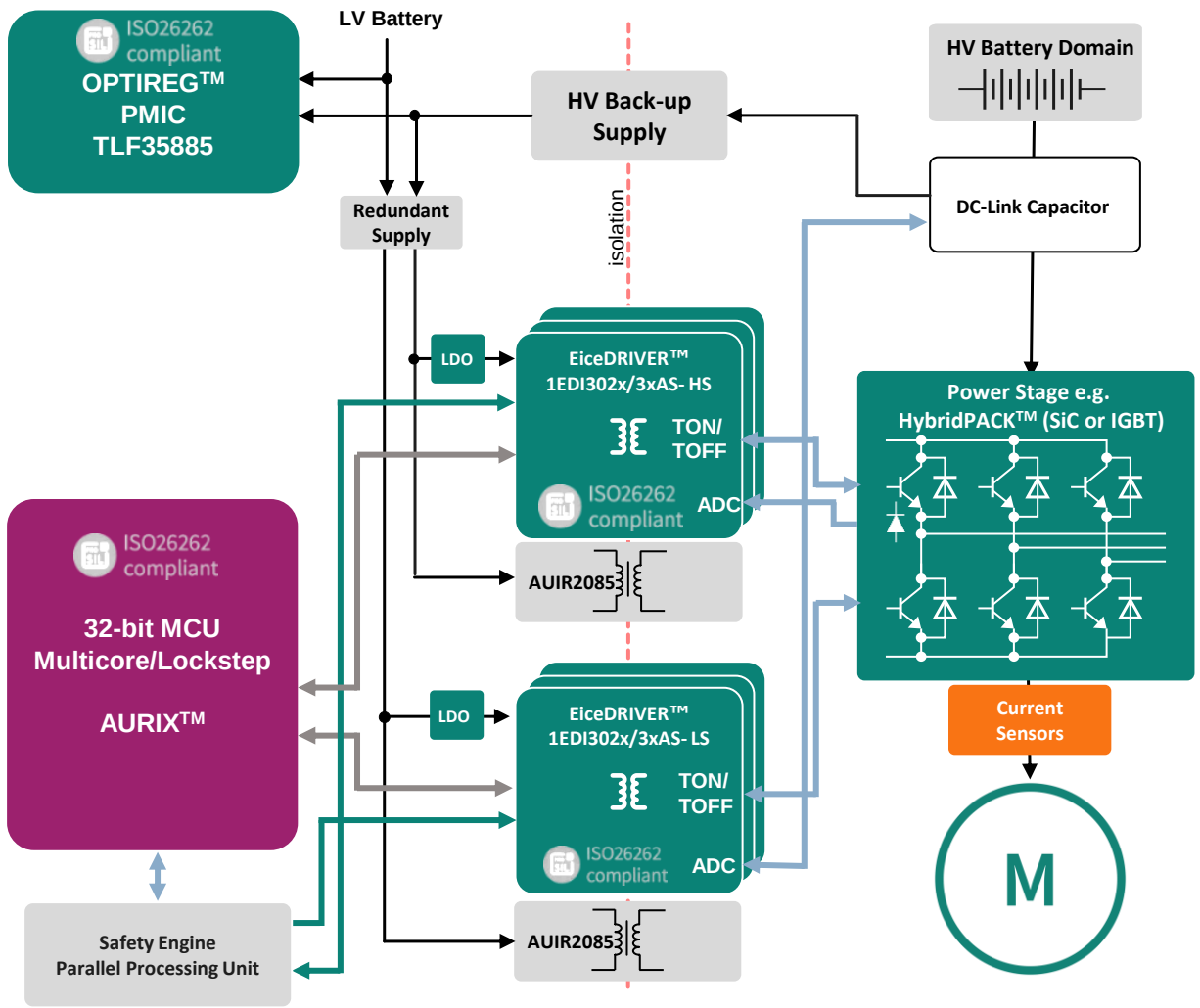
EiceDRIVER™ 1EDI302x/3x (x=5,6,8) Most compact ISO 26262-compliant isolated gate driver ICs (IGBT & SiC) currently available in the market

Infineon Technologies
Automotive Smart Power | Motor Control Solutions

Application example:
Infineon ASIL D traction inverter chipset

Main component	Infineon product offering
– Power supply	– OPTIREG™ PMIC TLF35585
– Microcontroller	– AURIX™ TC3xx microcontrollers
– Gate driver	– EiceDRIVER™ 1EDI302xAS, 1EDI303xAS isolated gate driver ICs for EV
– Power stage	– HybridPACK™ Drive/DSC Automotive IGBT & CoolSiC™ MOSFET modules

For more info and product recommendations visit our webpage:
Traction inverter



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Target Applications

EiceDRIVER™ 1EDI302x/3x (x=5,6,8) isolated gate driver ICs for EV, pin-compatible product family for SiC and IGBT technologies up to 1200 V



Traction inverter



Auxiliary inverter



EESM Exciter

Motivation

- Support highest system reliability and efficient application designs at the same time:
  - Functional safety, system designs up to ASIL D
  - High feature integration and small package to save PCB space and system cost
  - Pre-configured settings reduce design efforts, pin-compatible product variants

Product description

- Galvanically isolated (reinforced), ISO 26262-compliant gate driver ICs
- Compact package design (DSO-20, 10.3 x 6.4 mm) and high feature integration including extensive diagnostic and monitoring
- Fits perfect to Infineon's latest SiC and IGBT technologies

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EiceDRIVER™ 1EDI302xAS/1EDI303xAS tailored for traction inverters
Leanest ISO 26262-compliant gate driver ICs on the market

Key Features

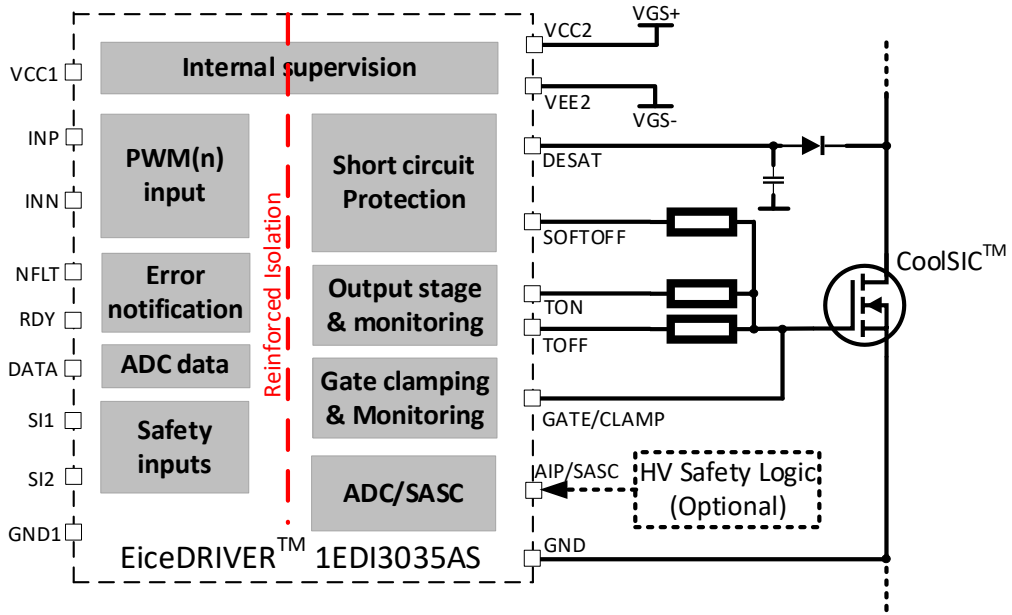
- 1ch gate driver with **reinforced insulation (VDE 0884-17)**
- Pin-compatible devices optimized either for SIC or IGBT
- Strong 20 A drive stage & active miller clamping
- Accurate 12-Bit DS-ADC for temperature or DC-Link measurements

  ISO 26262 ASIL B (D) compliant diagnostics & monitoring:
- DESAT or OCP incl. built-in self-test
- SOFTOFF pin to save the power device (detection & reaction 1 µs)
- Supply monitoring (VCC1/VCC2/VEE2)
- Gate and output stage monitoring
- Primary & secondary side active short circuit introduction



PG-DSO-20

Application Diagram Example for SiC



Key Benefits

- **No SPI needed,** pin compatible SiC & IGBT variants saving SW resources and reduce T2M
- Includes all monitoring needed for ASIL D inverters
- **Fastest DESAT fitting latest SiC optimized for lowest Rdson**
- Compact package (10.3 x 6.4 mm) saving board space

Target Applications

- **xEV traction inverter**
- **Auxiliary inverter**
- Fuel-cell compressor
- High availability DC/DC
- **EESM exciter**

ISO 26262 compliant

Status: In production

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3rd generation EiceDRIVER™ isolated gate driver ICs for EV
Product family overview

	1EDI3025AS	1EDI3026AS	1EDI3028AS	1EDI3035AS	1EDI3038AS
Isolation & CMTI	Reinforced Isolation (VDE 0884-17) VIORM = 1767 V; VIOTM=8000 V; CMTI >150 V/ns				
Interface	Fast pins & PWM data stream				
Drive strength	±20 A	±20 A	±15 A	±20 A	±15 A
Active miller clamp	Yes, internal				
Power technology	IGBT			SiC & HybridPACK™ Drive G2 Fusion	
STP[1] & deadtime	Yes, typ. 800 ns deadtime			Yes, typ. 140 ns deadtime	
SC cetection	DESAT (9 V & BIST)	OCP (1 V & BIST)	DESAT (9 V & BIST)	DESAT (6 V & BIST)	
ADC	Yes, 12-Bit DS-ADC & 200 uA source		Yes, 12-Bit DS-ADC, no current source	Yes, 12-Bit DS-ADC & 200 uA source	No ADC
ISO 26262-compliant	Yes, ASIL B (D)				
Additional safety features	Gate & output stage monitoring Supply monitoring (VCC1/VCC2/VEE2) Internal primary to secondary supervision Internal supply rail monitoring				
Safe state pin (ASC)	Yes, on primary & secondary side				
Package	DSO-20 (10.3 mm x 6.4 mm)				

[1]STP = Shoot Through Protection

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EiceDRIVER™ 1EDI302x/3x (x=5,6,8)
Key features and benefits

Key features	Key benefits	Value
Pre-configured for SiC or IGBT	– No SPI needed, communication via pins and PWM data stream	Easy to design products
Strong output stage (up to 20 A) and miller clamping	– Driving large modules and parallel discrete devices	
Separated TON/TOFF pins	– Saving the external diode and hence system cost	Reduced system costs
Fast DESAT detection (<1us) & separate SOFTOFF pin	– Fitting latest SiC made for lowest RDSON with compromise SC robustness	High system reliability
Lean and compact ISO 26262-compliant (ASIL B) driver	– For cost optimized ASIL D inverter with leading performance-to-cost ratio	
Power technology	– Fits Infineon's latest SiC GEN2 and IGBT EDT3 technology	Highest efficiency and power density

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Recognized strengths of EiceDRIVER™ preconfigured gate drivers vs. SPI configurable gate drivers

Preconfigured (non-SPI) gate driver like 1EDI302xAS & 1EDI303xAS

- Minimize software development effort
- Higher cost effectiveness
- Out of the box optimizatized for SiC and IGBT technology
- Tiny package



SPI configurable gate driver like 1EDI3050AS

- Configurability ease platform scaling
- Further optimization possible to maximize inverter performance



Time to market + system simplicity



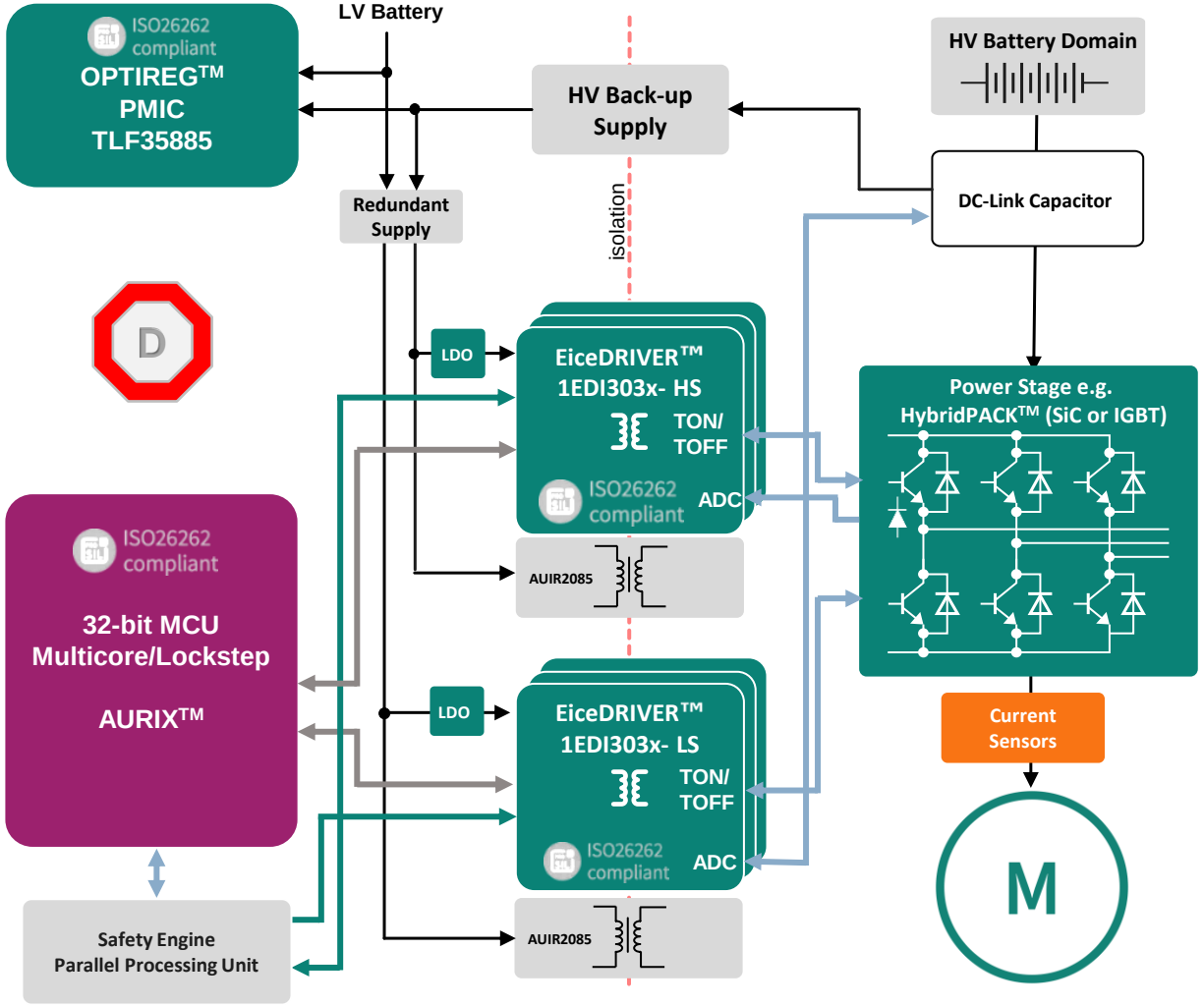


Flexibility + maximum performance

Pre-configured drivers are appealing especially to everybody with a high pressure to deliver solutions fast. Pre-configured drivers also address car architectures with two-axle inverters, where the second inverter is of a lower power and complexity class. Additionally, A/B class BEV cars can benefit from the cost effectiveness.

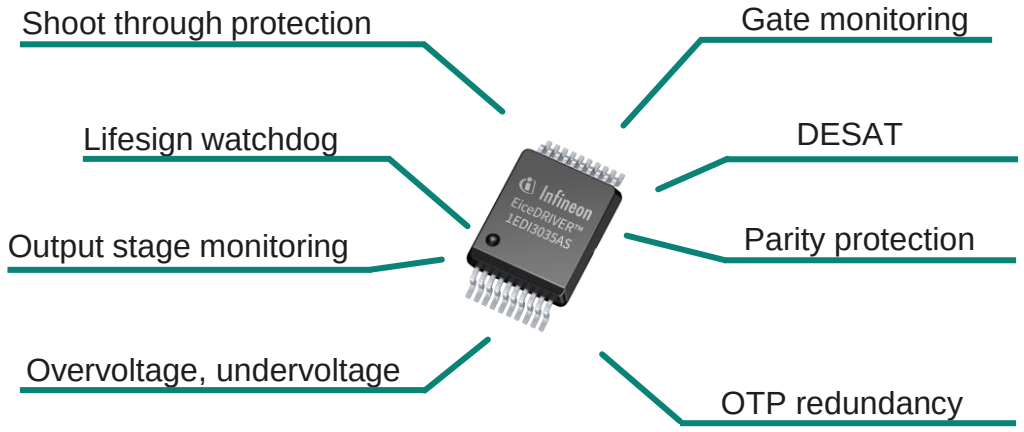
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Primary side safety interface reduces safety logic complexity



System safety concept example

- Back-up supply for 12 V low voltage side ensure microcontroller availability in case of power loss
- In case of microcontroller failure the safety engine can choose between high-side and low-side Active Short Circuit (ASC)



Various integrated safety mechanisms ensure a high diagnostic coverage

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1EDI3035/8AS: SiC optimized product variants getting the best performance out of SiC components

Switching SiC MOSFET is different from IGBT:

- Low short circuit capability
- Smaller gate charge & faster switching

1EDI3035/38AS optimized for SiC MOSFET:

Parameter	Configuration
DESAT threshold	6 V threshold voltage (IGBT variants 9 V)
SC reaction time	Super fast short circuit detection & reaction timing < 1 µs (same for IGBT)
VCC2 OVLO	22 V threshold, to protect 23 V gate oxide abs. max. (IGBT variants 19 V)
VCC2 UVLO	12 V threshold to prevent un-save switch ON (same for IGBT variants)
VEE2 UVLO	-7.2 V threshold protecting the gate oxide abs. max. (IGBT variants -10.3 V)
CMTI	Increased CMTI robustness to 150 kV/us compared to Infineon's 2nd generation (same for IGBT variants)
Dead time	140 ns int. dead time for shoot through protection (IGBT variants 800 ns)

Get the **best performance** out of Infineon SiC components:



EiceDRIVER™ 1EDI3035/38AS isolated gate driver ICs for EV made for all **Infineon CoolSiC™ G1 & G2 products**

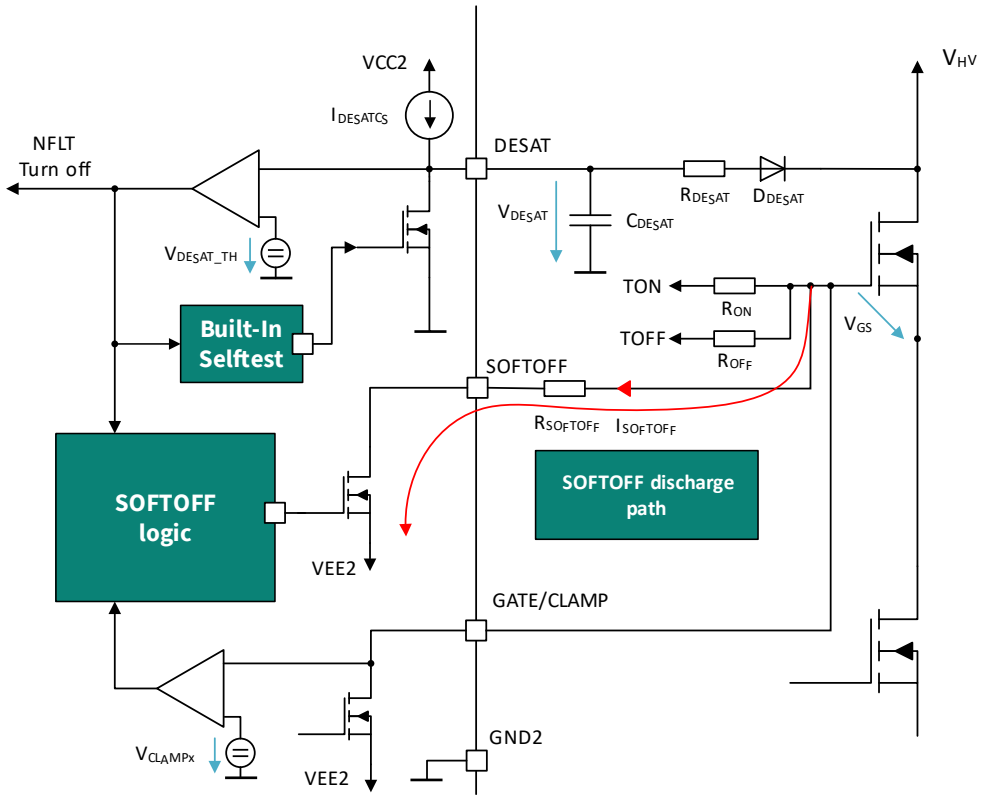


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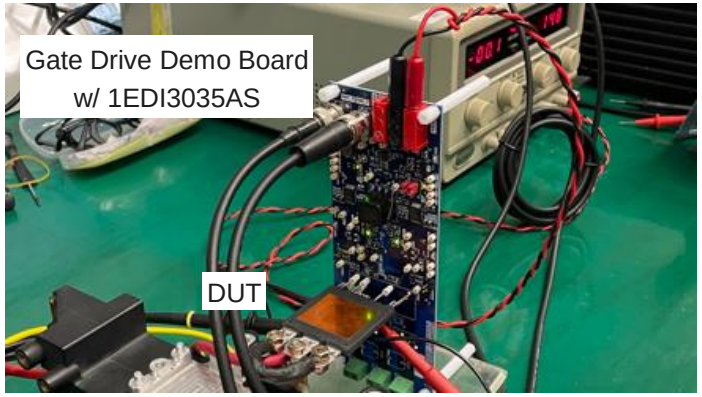
EiceDRIVER™ 1EDI303xAS
Fast DESAT and SOFTOFF principle made for latest SiC!

Key functions **of fast short circuit detection & reaction**

- Fast reacting DESAT comparator
- SOFTOFF characteristics configurable with an external resistor
- Automatic built-in self test on power-up of the device

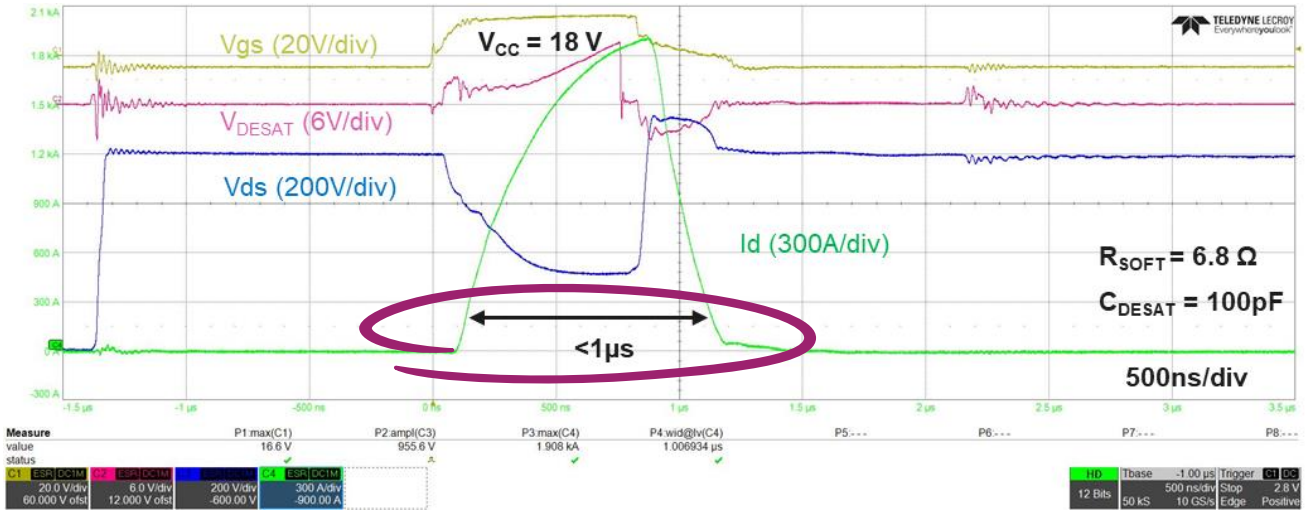


Short circuit measurement with **HybridPACK™ DSC SiC**





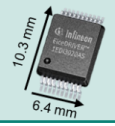
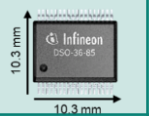
CoolSiC™



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EiceDRIVER™ 1EDI302xAS made for latest IGBT
maximizing the performance-to-cost ratio of your traction inverter

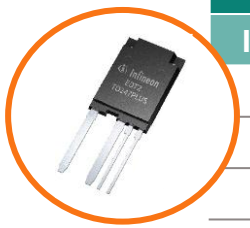
Gate driver overview for IGBT

Gate Driver	1EDI302xAS (x=5,8)	1EDI3050AS
Isolation	Reinforced 6.8 kV, CMTI >150 V/ns	
Interface	Fast pins & PWM data stream	Fast pins & SPI
Power technology	Optimized for IGBT (EDT2 & 3)	SPI to optimize for SiC or IGBT
Flyback contr.	No	Yes (±2%)
Drive stage	Split output ±20 A	Split output ±20 A
Active MC	Yes, internal	Yes, int. & ext.
ISO-26262	Yes, ASIL B (D)	Yes, ASIL B (D)
ISO-26262 safety features	DESAT Gate & output stage monitoring Supply monitoring Internal pri. to sec. supervision	
ASC input	Yes, on primary & secondary side	
ADC	Yes, 12-Bit ADC	Yes, 12-Bit ADC 2 ext. channels
Package	DSO-20 	DSO-36 

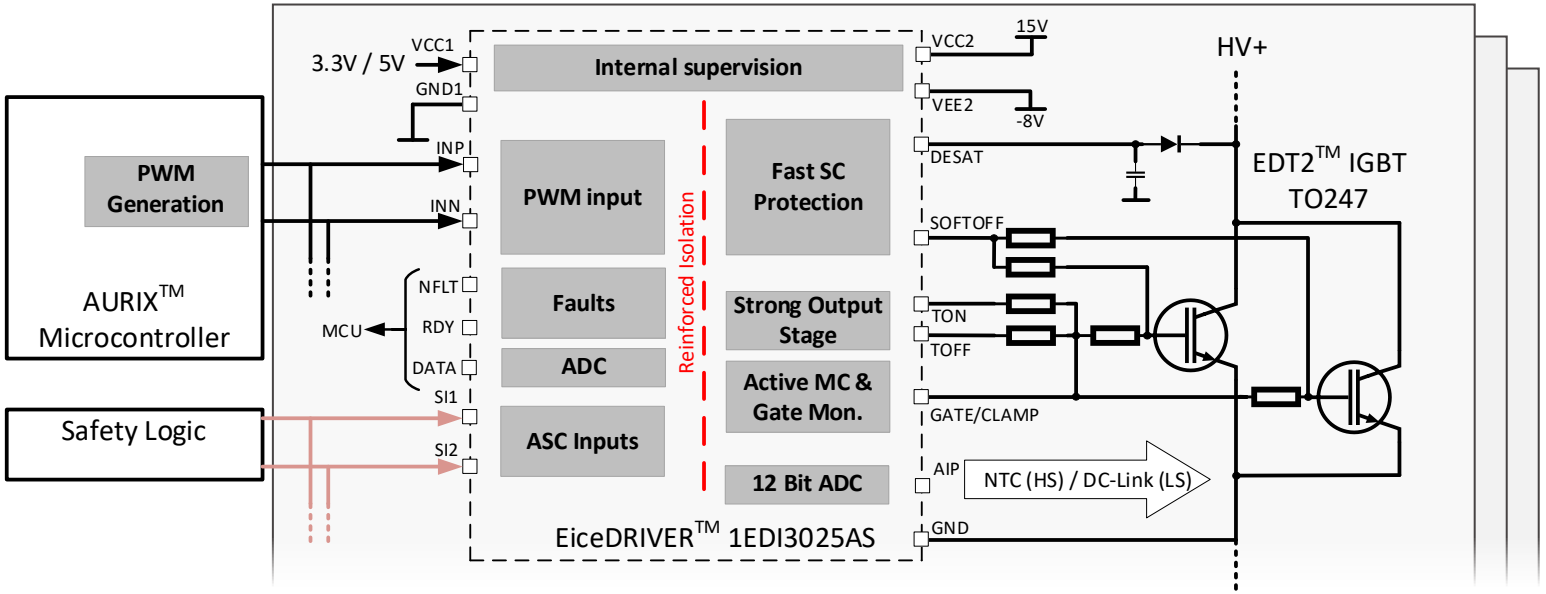
Example: 1EDI3025AS with EDT2 IGBT TO247PLUS targeting A/B class EVs



1EDI3025AS



TO247PLUS 4pin reflow		
$I_{C(nom)\ 100C°}$ [A]	Part name	Power @350V
200A	AIKYX200N75CP2	≤45 kW
160A	AIKYX160N75CP2	≤35 kW
120A	AIKYX120N75CP2	≤25 kW



Lean performance-to-cost optimized gate driver with fast DESAT fitting well to EDT2 TO247PLUS for cost optimized IGBT traction inverters

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EiceDRIVER™ 1EDI302x/3x (x=5,6,8)
Overview collaterals, software and design tools

Technical documents	Status
Datasheet	online
General application note	online
Safety documentation*	on request
VDE Reinforced Isolation	online

Design and simulation tools	Status
Simetrix, PSPICE model	available
EMC reports	online

Boards	Status
1EDI302YAS EVALBOARD (1EDI3025/26)	online
1EDI3028 EVAL BOARD	online
1EDI303YAS EVALBOARD (1EDI3035)	online
1EDI3038 EVAL BOARD	online
Inverter evaluation kits based on HybridPACK™ Drive G2 IGBT / CoolSiC™ G2 and EiceDRIVER™ 1EDI3025/35A	online

Available Half Bridge EVALBOARDs

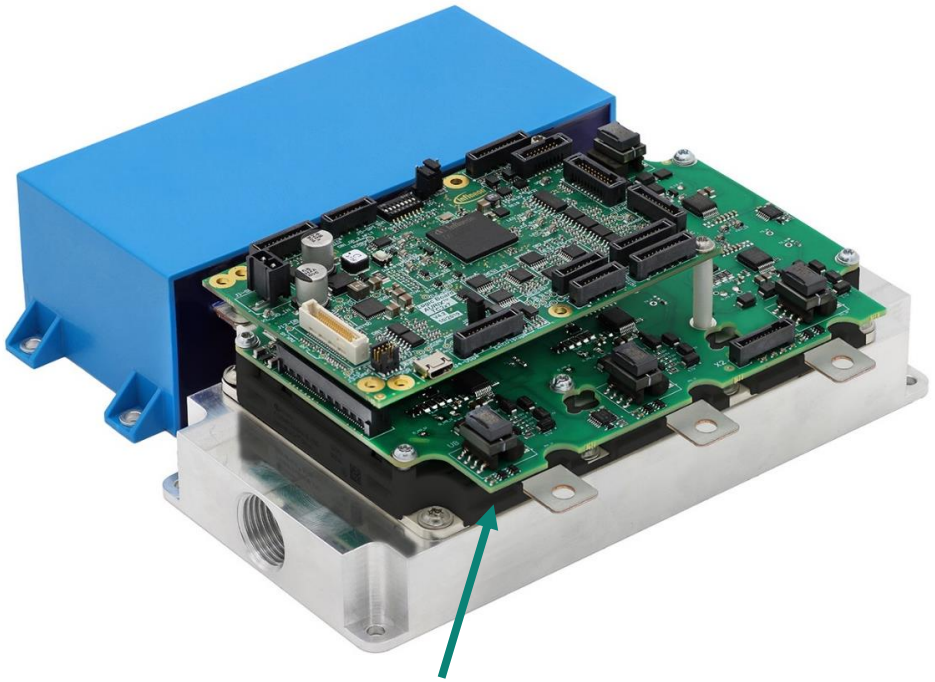


www.infineon.com/eicedriver-xeV

* Please consider NDA restrictions for EiceDRIVER™ collaterals, software and design tools and contact your regional Infineon sales partner in order to get access to restricted information.

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Inverter Evaluation Kit
based on HybridPACK™ Drive G2 & EiceDRIVER™ 1EDI3025/35AS



Documentation available online; gate driver board Altium files available on request.

Available

Power module	Gate Driver	Eval Kit Order code Sales name	Homepage Eval Kit	Gate Driver Board only* Order code
IGBT 750V/1150A FS1150R08A8P3	**1EDI3025AS**	SP005739456 EV INV HPD2 SI FS1150 08	Product page	SP006038350
IGBT 1200V/520A FS520R12A8P1	**1EDI3025AS**	SP005739466 EV INV HPD2 SI FS520 12	Product page	SP006038348
SiC 750V/1 mOhm FS01MR08A8MA2	**1EDI3035AS**	SP005739468 EV INV HPD2 SIC FS01 08	Product page	SP006056143 (Common gate driver board for 750V & 1200V)
SiC 1200V/2 mOhm FS02MR12A8MA2	**1EDI3035AS**	SP005739445 EV INV HPD2 SIC FS02 12	Product page	

*Please contact your regional Infineon sales representative for ordering

The inverter evaluation kits comes with two boards: power board & logic board.
- Power board includes 1) power module 2) cooler 3) DC-link capacitor 4) gate driver
- Logic board includes AURIX 2G TC3x7, pre-installed software, USB stick

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