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SOLUTIONS MADE TOGETHER

You Bring the Talent. We Bring the Tools.

Solutions pour Véhicules Électriques

Technologies et Modules / Juin 2021

Public Information



Agenda and Speakers

- Marketing Introduction
 - Introduction to Module
 - Automotive Power Modules
 - ASPM
 - VE-Trac™
-
- Application
 - OBC SiC 6.6KW
 - OBC SiC 11KW
 - DC-DC
 - Tractions



Dr. Didier Balocco
Business Marketing - PSG
ON semiconductors
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Diploma :

- Engineering degree from "École Nationale Supérieure d'Électronique et de RadioÉlectricité de Bordeaux", France in 1992
- Ph.D. degree in Power Electronics (PFC) from Bordeaux University in 1997.

Experience :

- Research engineer for dc-dc, ac-dc and dc-ac converters for telecom equipment and solar from 1 W to 150 kW from 1996 to 2014.
- Field Application Engineer (FAE) supporting South of France, Spain and Portugal in Fairchild Semiconductor from 2014 to 2016 and until 2018 with ON Semiconductor.
- EMEA Business Marketing Engineer in ON Semiconductor since 2018.

Introduction

ON Semiconductor™ and Automotive Market Evolution

ON Semiconductor™ and Automotive



On Semiconductor Today

Headquarters: Phoenix, AZ

Employees: 36,000 globally

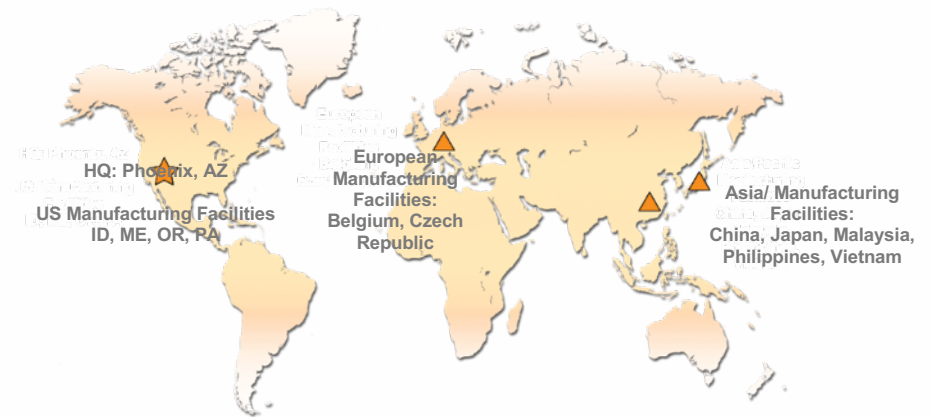
Revenue: ~\$5.9Bn⁽¹⁾

Market Capitalization: ~\$9.6Bn⁽²⁾

Ticker: ON

Founded: Spun-off from Motorola 1999, IPO 2000

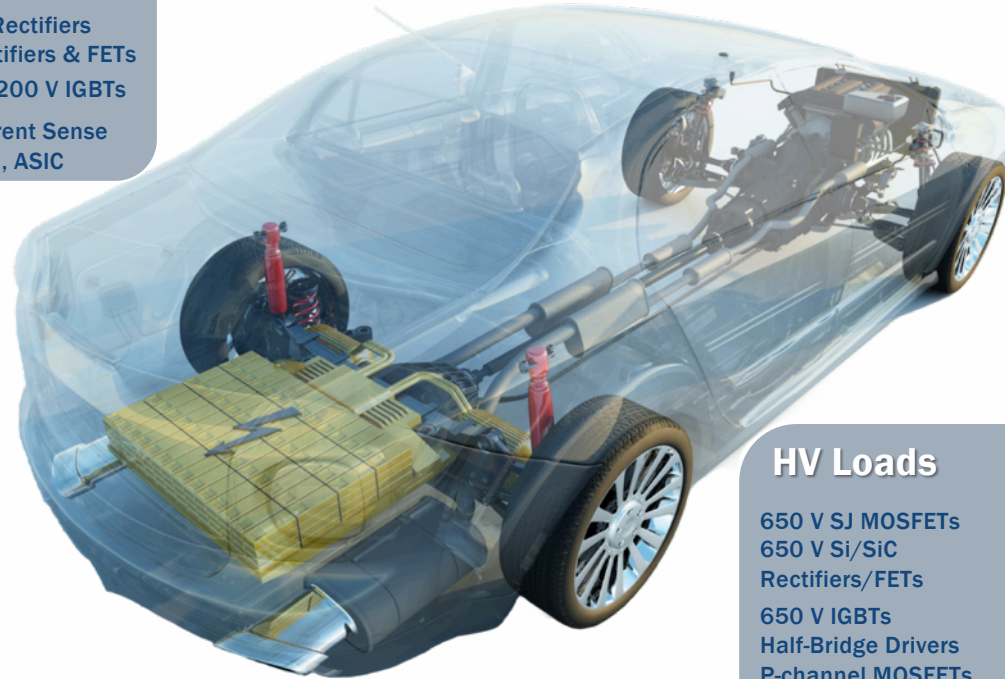
EFK is not added



Automotive Sector (32% of Revenue)	Industrial/Medical/ Aero-Defense Sector (26% of Revenue)	Communications Sector (20% of Revenue)	Consumer Sector (11% of Revenue)	Computing Sector (11% of Revenue)
<ul style="list-style-type: none"> • Vehicle Electrification • Active Safety & Autonomous Driving • Body & Interior Electronics • Connectivity & Power Management • LED Lighting 	<ul style="list-style-type: none"> • IoT Connectivity • Energy Infrastructure • Power Conversion • Motor Control • Sensors • Wide Band Gap 	<ul style="list-style-type: none"> • 5G Infrastructure Power • USB Type-C Solutions • RF Tuning • Wall-to-Battery Power 	<ul style="list-style-type: none"> • Connectivity • Power Conversion • Audio/Video/Imaging • Motor Control 	<ul style="list-style-type: none"> • USB Type-C Solutions • Power Conversion • AC Power Adapter • Server Power
Product Capabilities				
Custom, SoC, Embedded MCU, Connectivity, Sensors, Mixed-Signal, Analog, Logic, Discrete, Optoelectronics Micro-Packages, Power Packages, Power Modules, Chip-Scale, Multi-Die Software, Development Kits, Reference Designs				



A Leader in Vehicle Electrification



On-Board Charger

650 V SJ MOSFETs
650 V Si/SiC Rectifiers/FETs
Automotive HV Modules
Gate drivers
650 V/750 V IGBTs
OP Amps & Current Sense
DC-DC, LDO, IVN, ASICs
SiC Rectifiers & FETs

Main Drive

650 V/1200 V Rectifiers
1200 V SiC Rectifiers & FETs
650 V/750 V/1200 V IGBTs
OP Amps & Current Sense
DC-DC, LDO, IVN, ASIC

Power Steering

40 V, 80 V and 100 V Discrete
MOSFETs and KGD Bare Die
Transfer Molded Modules up
to 180 A

Fans, Pumps & Compressor Motor Control

650 V Automotive Power Modules
1200 V Automotive Power Modules
40 V Controller Embedded
Automotive Power Module

Battery Management

40 V FETs (lowest RDSON)
Cell Balancing ASICs

HV Loads

650 V SJ MOSFETs
650 V Si/SiC
Rectifiers/FETs
650 V IGBTs
Half-Bridge Drivers
P-channel MOSFETs
OP Amps & Current Sense
DC-DC, LDO, IVN, ASICs
Automotive modules

12 V-48 V DC-DC

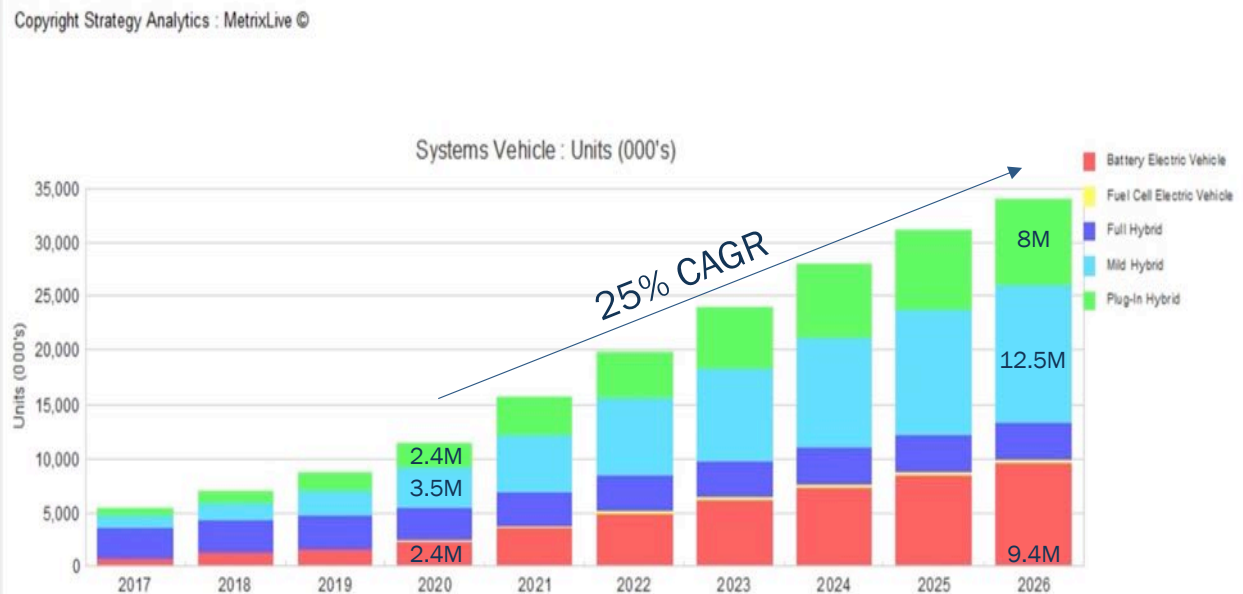
80 V/100 V FETs
Half-Bridge Drivers
40 V FETs
OP Amps & Current Sense
DC-DC, LDO, IVN, ASSPs

Automotive Market Trends

Global New Energy Vehicle Production Forecast

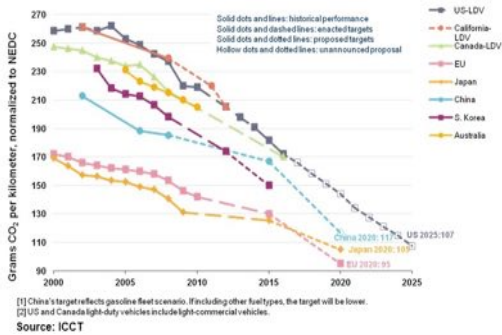
- **Topologies – 48V to HV**
 - Different xEV topologies and architecture will be adopted
- **Technology**
 - Efficiency, Performances and cost are major drivers
- **Supply Chain**
 - Stable, scalable supply chain is key

Hybrid & Electric Vehicle Production (2017-2026, Thousand of units)

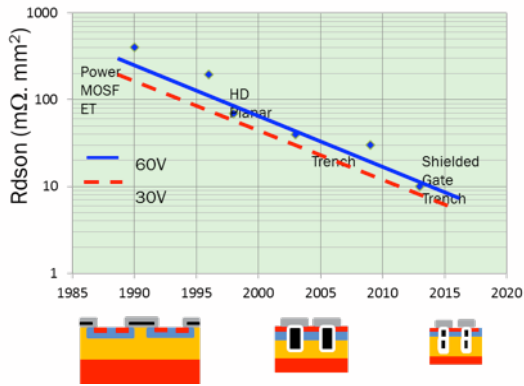


Electrification Enablers and Challenges

Regulations



Power Semiconductors



Battery – Cost, Recycling



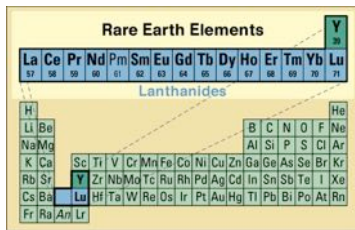
SOURCE: 2017 Chevy Bolt

Charging – Ratio of 1:1.x



SOURCE: Greenbiz.com

Resources – Energy, Magnets



SOURCE: USGS.GOV

Goals and Benefits of Electrification



Instantaneous Torque, Noise Reduction



\$\$ - Cost of ownership Reduction



CO₂ – Significant Emissions Reduction

Challenges

Enablers

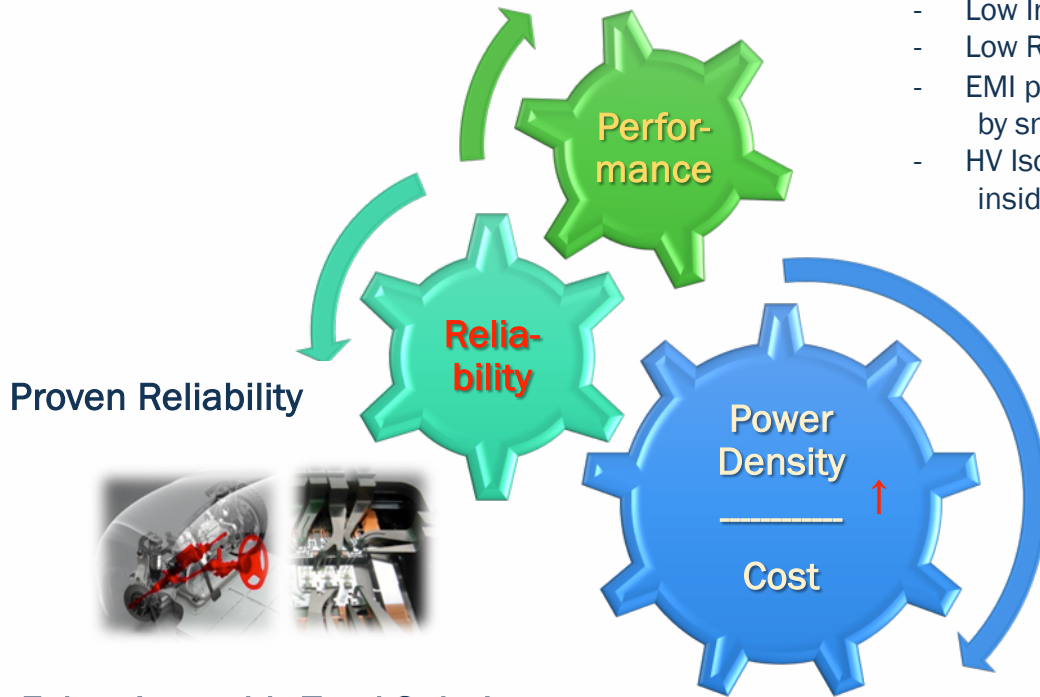
Public Information



Introduction to Modules

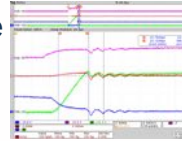
Why using Power Modules ?

Benefits of APM

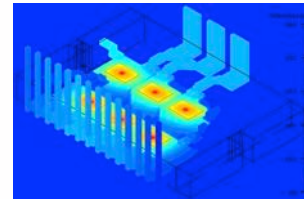


Electrical Performance

- High Current Capability
- Low Inductance
- Low Resistance
- EMI performance by snubber
- HV Isolation inside

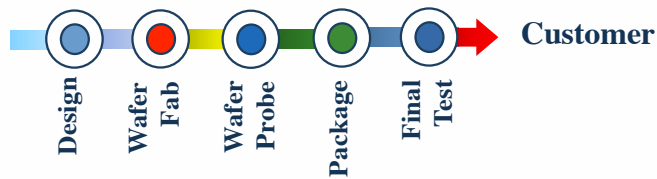


Low Thermal Resistance
Junction to Heat sink

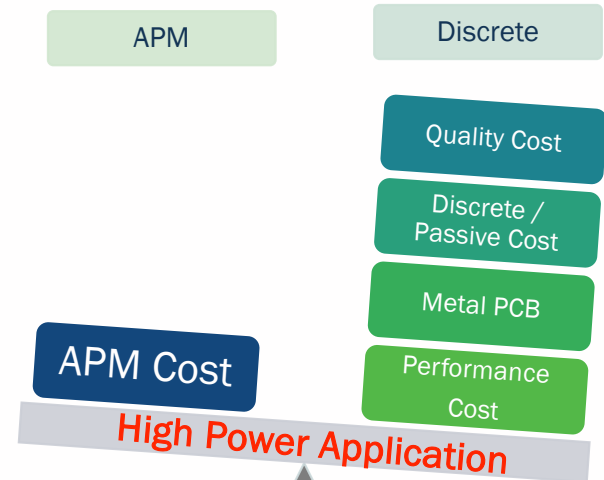


Smaller foot print

Fab + Assembly Total Solution



System Cost (for High Power Application)

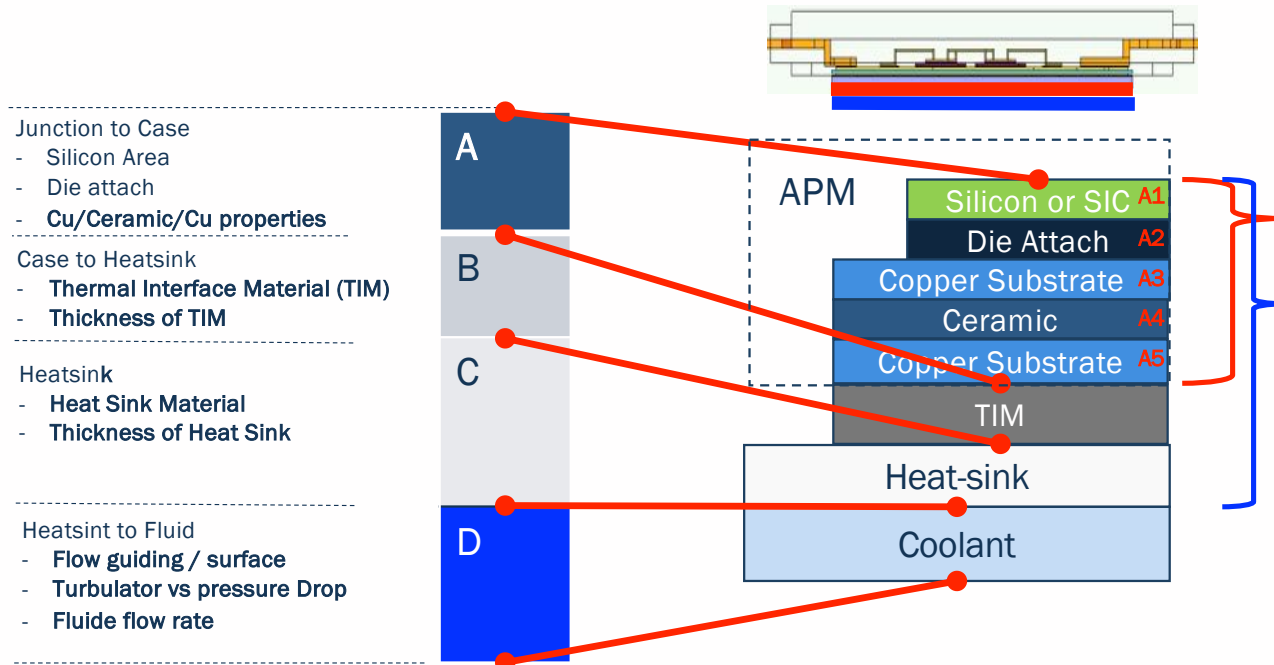


Higher Power \uparrow \rightarrow APM Benefit \uparrow



Benefit: Thermal

ON APM design enabling better thermal performance of total Rth junction to Heat sink



Junction to Case

- Silicon Area
- Die attach
- **Cu/Ceramic/Cu properties**

Case to Heatsink

- **Thermal Interface Material (TIM)**
- **Thickness of TIM**

Heatsink

- **Heat Sink Material**
- **Thickness of Heat Sink**

Heatsink to Fluid

- **Flow guiding / surface**
- **Turbulator vs pressure Drop**
- **Fluid flow rate**

A : Options of vertical structure selection and Internal Design defines Rth Per Power rating of application

B : By the usage of APM, enable thin layer of B for minimum Rth of of A+B

C/D : Customer's design per system requirements

	APM – ON	Discrete
Rthjc – junction to case = A (A1~A5)		>
Rthjs – junction to heat sink = A+B+C		<

Rthjs Simulation result (Per 44mm² die)

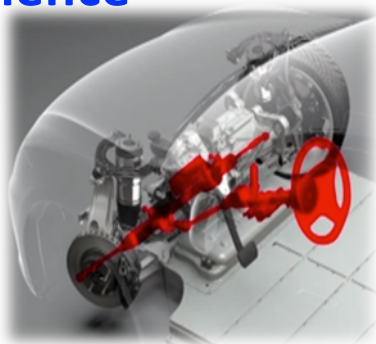
	Low Rth Substrate		AL2O3 Substrate	
	Rth, °C/W	%	Rth, °C/W	%
A1	0.0202	4.6%	0.0232	3.3%
A2	0.0185	4.2%	0.0185	2.6%
A3	0.0202	4.6%	0.0190	2.7%
A4 – Ceramic	0.0621	14.1%	0.3465	48.7%
A5	0.0113	2.6%	0.0105	1.5%
B TIM	0.0619	14.0%	0.0581	8.2%
C Heat Sink	0.2468	56.0%	0.2363	33.2%
TOTAL	0.4410	---	0.7120	---



Benefit: Proven Reliability

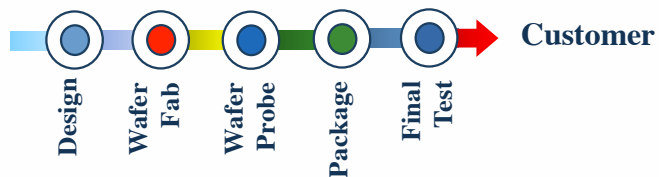
Field proven experience

11 years life in the field



APM released in 2008 for Electrical Power Steering and has been leader in MOSFET Module for LV Auto

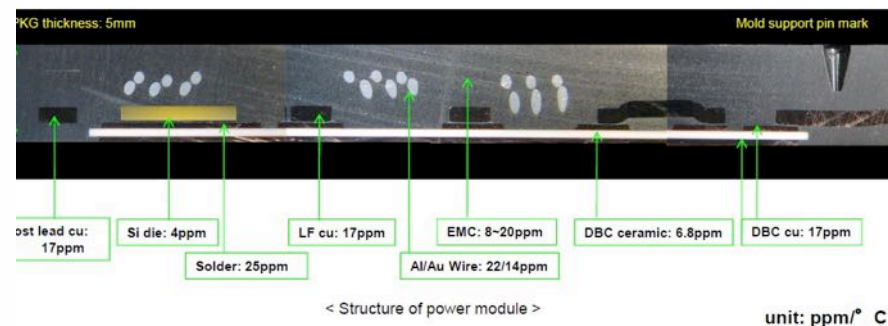
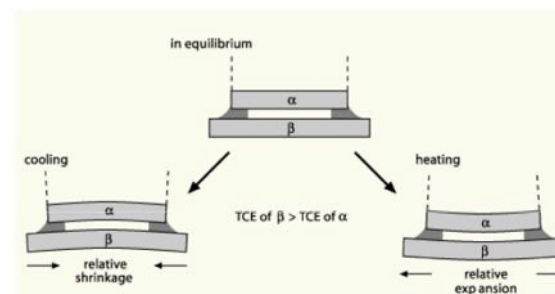
Fab+ Assmeby Total Solution



Minimized CTE mismatch in Transfer

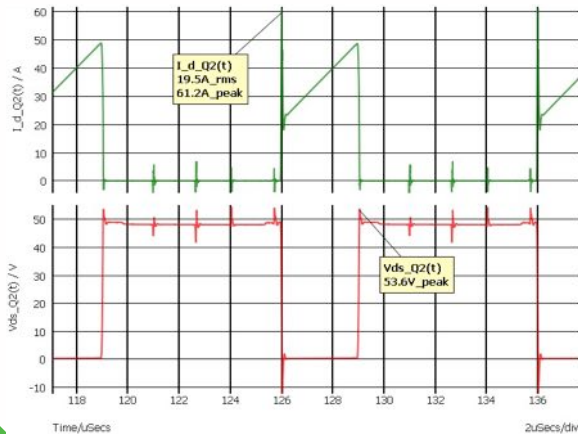
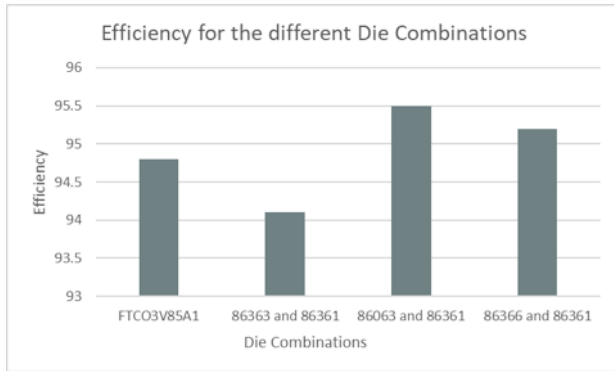
Mold DBC technology enables long term thermal cycling

* CTE(Coefficient of thermal Expansion) mismatch?



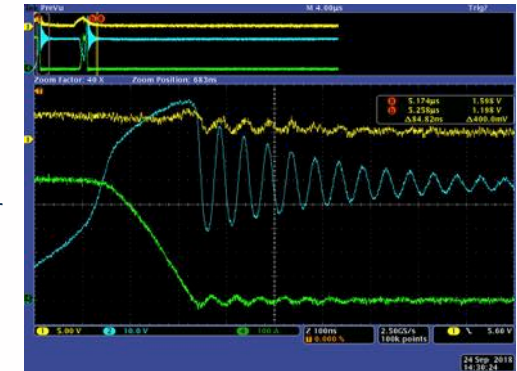
Benefit: Electrical Performance

Development for best fit for customer requirement in Electrical performance, supported by customized application support.

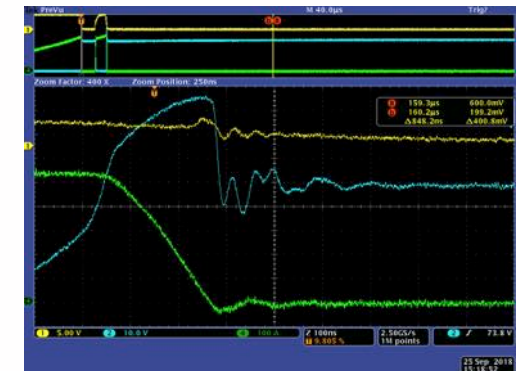


Device		Current [Arms/unit]	P _{sw} [W/unit]	P _{con} [W/unit]	P _{total/unit} [W/unit]	P _{total} [W]
Output Load Inductor (6 x 3.6µH)		36.5Arms	3W			18W
MOSFET	Phase leg 1- High	No	11.2	1	12.2	24.4
		RC	11.3	0.9	12.2	24.4
	Phase leg 1- Low	No	5.8	1	6.8	13.6
		RC	5.3	1.4	6.7	13.4
	Phase leg 2- High	No	10	0.8	10.9	21.8
		RC	10.1	0.8	10.9	21.8
	Phase leg 2- Low	No	5.8	0.9	6.7	13.4
		RC	5.1	1.2	6.3	12.6
	Phase leg 3- High	No	10.9	1	11.9	23.8
		RC	10.9	0.9	11.8	23.6
	Phase leg 3- Low	No	5.7	1.1	6.8	13.6
		RC	5.4	1.5	6.9	13.8
RC Snubber		1.1W _{on} + 1.3W _{off} = 2.4W				14.4
Control and misc.		4				8
Total Converter Loss and Efficiency 86366 + 86361		No Snubber	Total Converter Power Dissipation = 136.6W and Converter Efficiency, $E = \frac{2902W}{(2902W + 136.6W)} \times 100\% \approx 95.5\%$			
		RC Snubber	Total Converter Power Dissipation = 151W and Converter Efficiency, $E = \frac{2960W}{(2960W + 151W)} \times 100\% \approx 95.2\%$			

Integrating the snubber inside provide Enhanced EMI performance



No Snubber



With Snubber Inside Module



IPMs / ASPM - No. 1 supplier units w/ broadest portfolio in market 50W - 7.5kW

Automotive IPM (ASPM)	Industrial IPM	Consumer IPM
<p>APM27-V2</p> <ul style="list-style-type: none"> [650V 30-50A IGBT, INV, DBC] <p>ASPM27-V3 (fast switching)</p> <ul style="list-style-type: none"> [650V 30-60A IGBT, INV, DBC] <p>ASPM34</p> <ul style="list-style-type: none"> [1200V 25-50A IGBT, INV, DBC] <p>ASPM16 (Exciter topology)</p> <ul style="list-style-type: none"> [650V 75A IGBT, F/Bridge, DBC] 	<p>SPM31/SPM49</p> <ul style="list-style-type: none"> [650V 20~50A IGBT, INV, DBC] [1200V,35~50A,INV,DBC] <p>SPM3V/SPM34</p> <ul style="list-style-type: none"> [600V 15~50A IGBT] [1200V 25A~50A IGBT, INV, DBC] <p>SIPK</p> <ul style="list-style-type: none"> [600V 10A IGBT, INV+PFC, IMST] 	<p>SPM45</p> <ul style="list-style-type: none"> [600V 15-30A IGBT, INV, FP+LF & IMST] <p>DIPS/6 (Compact IPM)</p> <ul style="list-style-type: none"> [600V 5~15A IGBT, INV, IMST & DBC] <p>SPM8</p> <ul style="list-style-type: none"> [600V 3-15A IGBT & SJ, INV, FP+LF] <p>SPM5</p> <ul style="list-style-type: none"> [250/500/600V SJ & Planar, INV, FP+LF] <p>SPM7</p> <ul style="list-style-type: none"> [250/500V MOSFET, PQFN, INV]
Flagship Products		
<ul style="list-style-type: none"> ASPM27: NFVA3xx65L32 /L42 ASPM34: NFVA2XX12NP2T 	<ul style="list-style-type: none"> SPM31: NFAMxx12L5B, NFAMxx65L4B SPM49: NFALxx12L5B SPM3V: FNB3xx60T, FSBBxxCH120D(F) 	<ul style="list-style-type: none"> SPM45: NFAxx60L42, FNA4xx60(T2), FNB4xx60T2, FND4xx60T2 DIPS/6: NFAQxx60R43T/L36T, STK5C4U332J-E
Key Specifications		
<ul style="list-style-type: none"> Automotive ver. w/ better reliability (AQG324, AEC-Q) Ultra low Rth w/ DBC substrate (Al2O3, AlN) Wider Iso distance (ex.no side dummy pin) 	<ul style="list-style-type: none"> 1200V & 650V w/ new field stop SCR IGBT Wider power density (3A~75A) Real NTC, BSD & market proven HVIC integration 	
Strategy		
<ul style="list-style-type: none"> Cost competitiveness & Stable wafer supply w/ EFK transfer Better price competition w/ RC IGBT 	<ul style="list-style-type: none"> Wider product portfolio w/ pin comparable Better reliability w/ Automotive Qual. criteria satisfaction for Indus new OPNs 	

Module Portfolio

ASPM and VE-Trac™

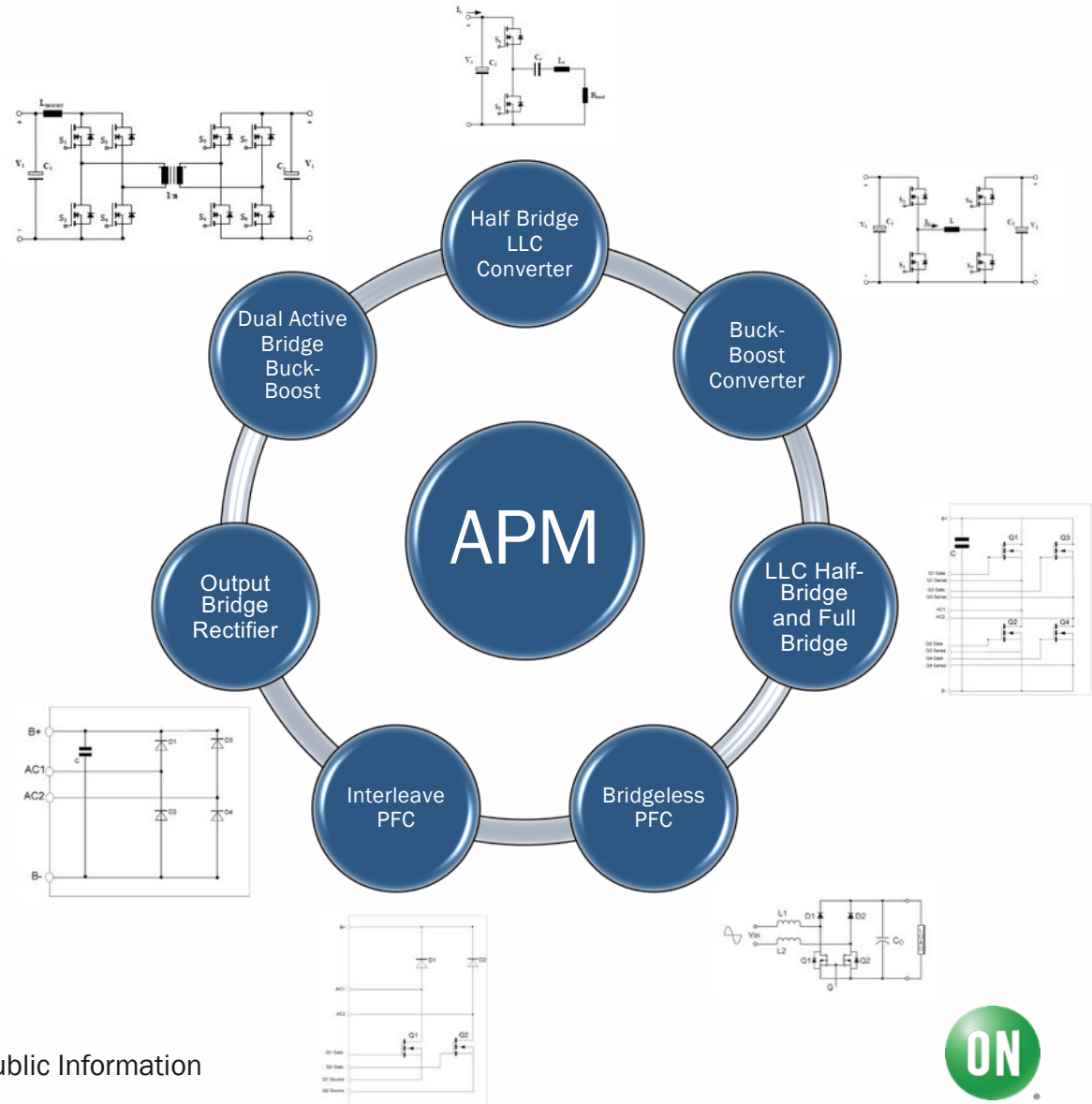
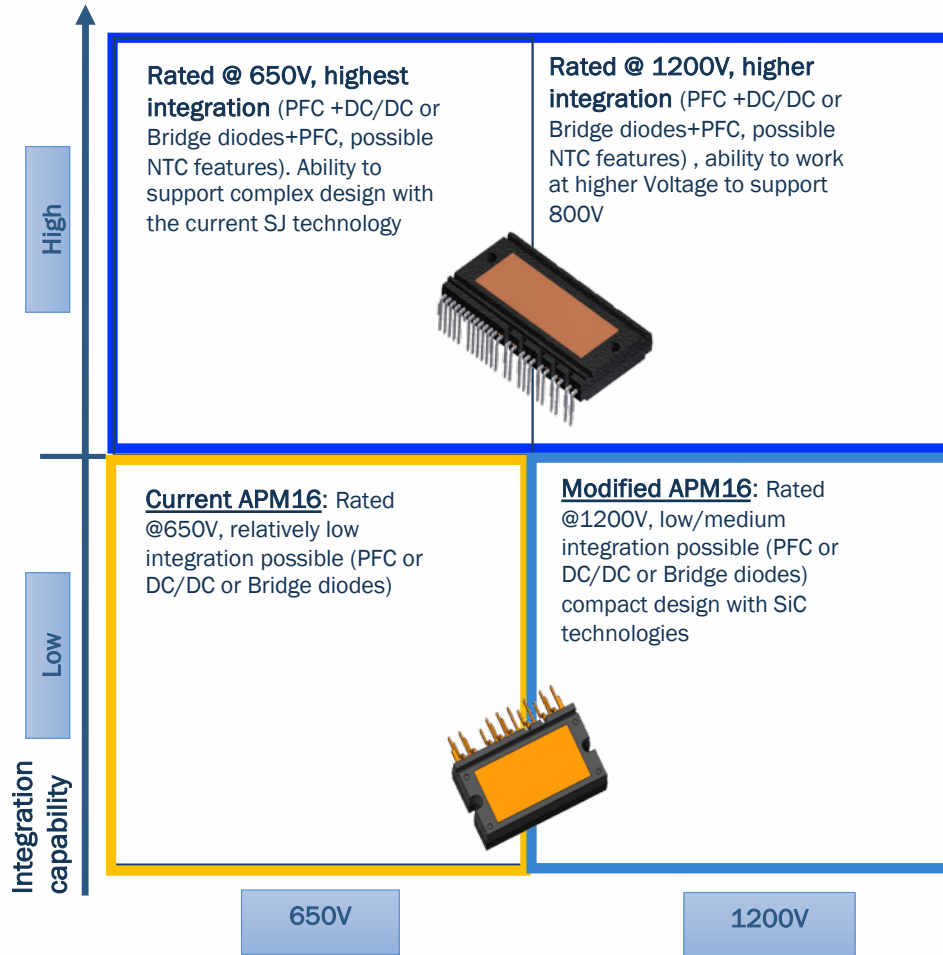


ASPM

The Solution for Automotive Applications

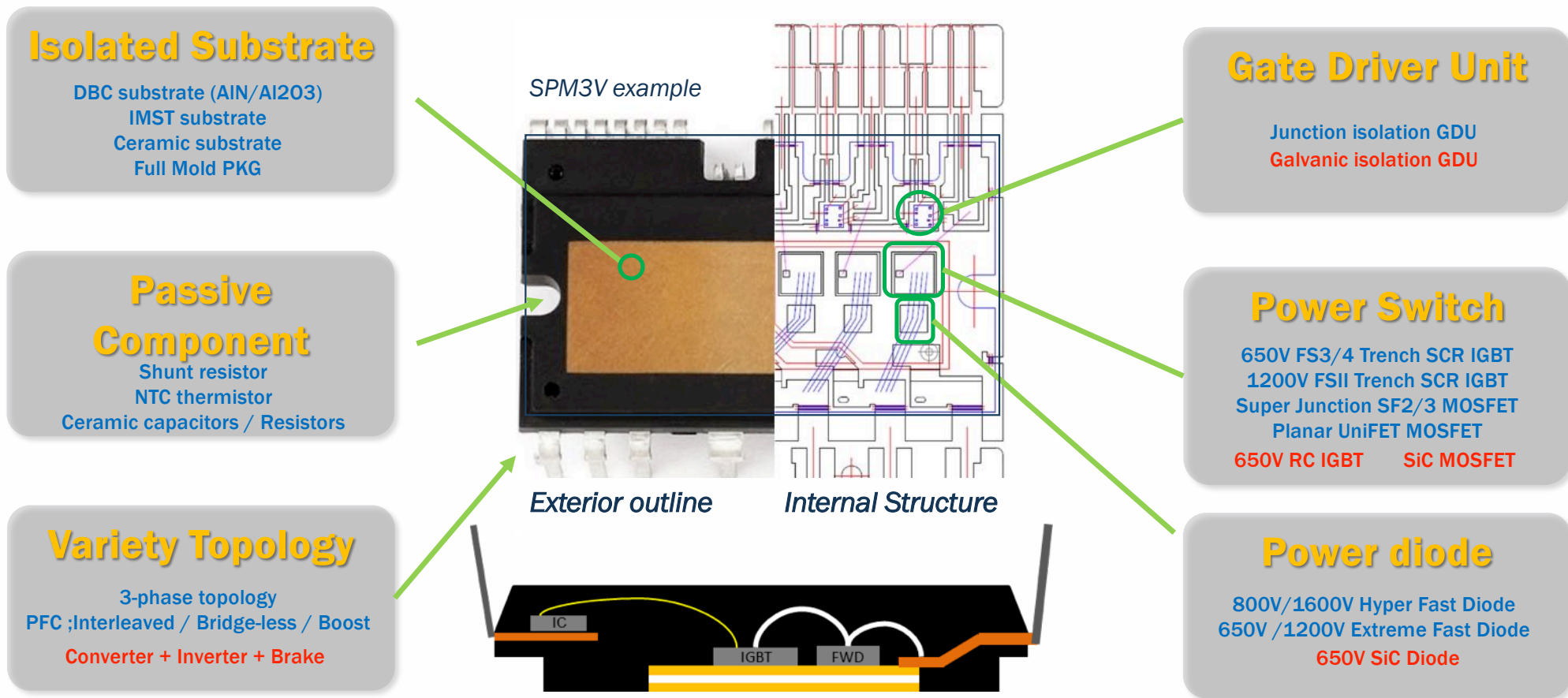


OBC APM Module Platform



Automotive SPM - All-in-One

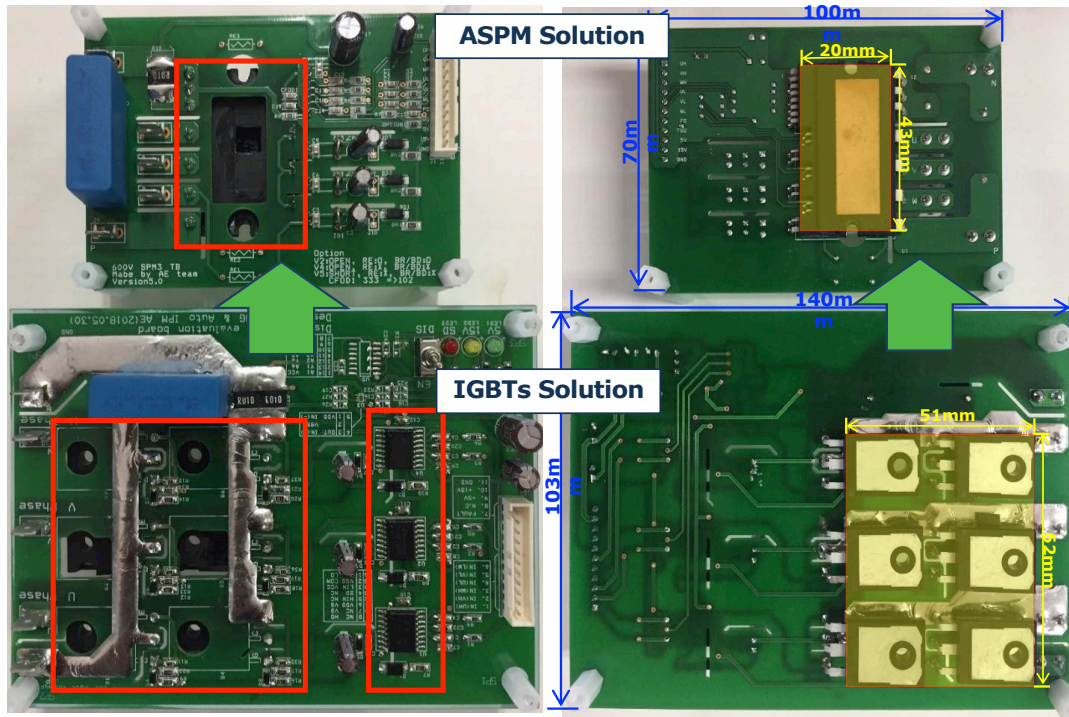
- ON Semiconductor have All in-house technology including product design & assembly etc



ASPM vs. Discrete IGBTs solution

< Top side >

< Bottom side >



< Advantages of ASPM >

- Minimizing internal wiring to reduce stray L
- No need consider power pin distance
 - ✓ Achieved super-compact foot print
- Superior Isolation
 - ✓ 2.5KV @60HZ, Sinusoidal, 1min
- The super easy assembly process
 - ✓ IPM Solution : Only 2 screws
 - ✓ Discrete IGBTs Solution : 6 IGBTs + 3 Driver ICs + Gate resistors + 6 Screws

[PCB and H/S size comparison]

	ASPM Solution	Discrete Solution
PCB Size[mm]	100*70	140*103
*H/S Size[mm]	20*43	51*62

*H/S Size : Contacted area

Auxiliary ASPM Target Application

Targeting for all of HV auxiliary motor w/ ASPM in xEV market

Exciter

For Traction motor
(Exclusive)

** Freedom from rare earth material
(*Neodymium, terbium etc)



Active Suspension w/ e-comp



HV Supercharger w/ e-comp.



HV Cooling Fans

for Radiators, Battery, Engine



HV AC-Comp.

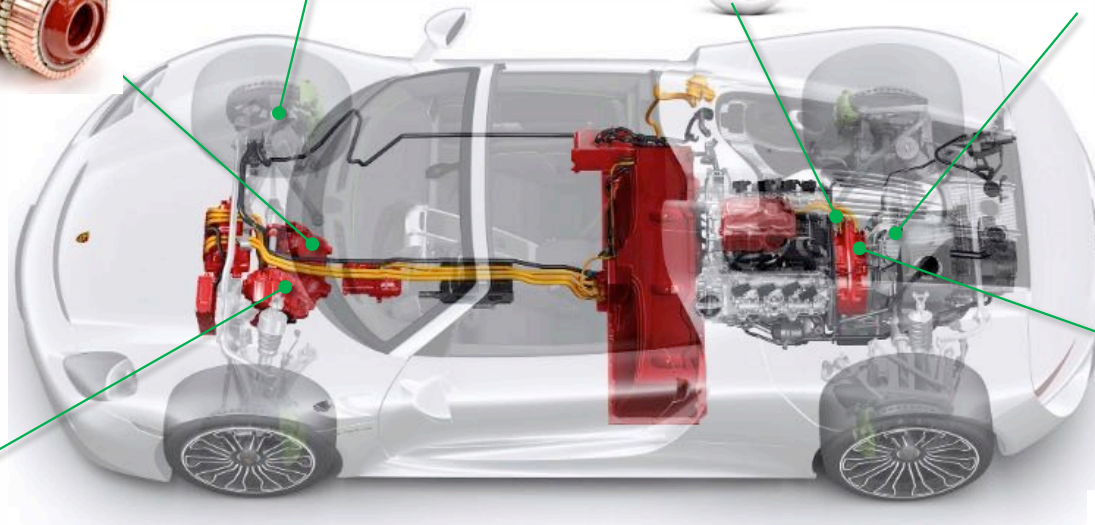
(E compressor)



- HV EOP (Electric Oil Pumps)
- HV EFP (Electric Fuel Pumps)
- HV EWP (Electric Water Pumps)



EPS Oil pump for e Bus



650V ASPM® 27 V2

Features

- All-in-one solution ; 6-IGBT & FWD, HVIC in one PKG
- For 400V battery system
- Supports AEC-Q100/101, AQC324
- Transfer-molded module with DBC substrate for better TMCL & PRCL than Gel-filled

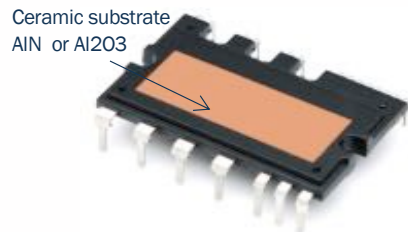
Benefits

- Smaller footprint than discrete solution
- Electrically isolated substrate for easy assembly
- Superior thermal performance
- Excellent EMI performance

Specifications

Product	Silicon	Io/A	BV [V]	Gate driver	Rth(j-c)	Substrate	Sample /MP
NFVA35065L32	FS3 IGBT	50A	650V	Integrated	0.35°C/W	DBC(AIN)	MP
NFVA34065L32		40A	650V	Integrated	1.19°C/W	DBC(AI203)	MP
NFVA33065L32		30A	650V	Integrated	1.4°C/W	DBC(AI203)	MP

Package : 44 mm × 26.8 mm × 5.5 mm



End products

- **Automotive Applications**
 - Electric Air-conditioner Compressor
 - HV Automotive Fan
 - HV super/turbocharger w/ e Comp
 - HV Oil/Water Pump

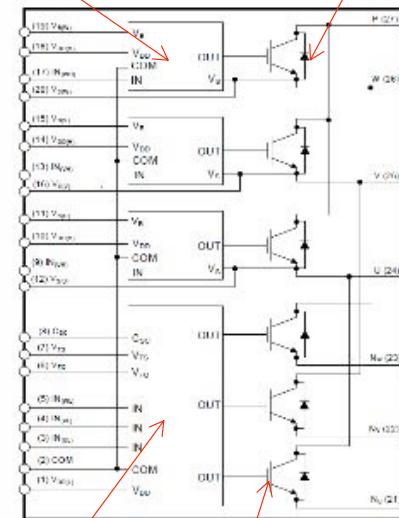
Block Diagram

HVIC

- 2A source / 4A sink
- Fpwm up to 20KHz
- Protection :UVLO

Diode

- Soft recovery for easy drive and low EMI



LVIC

- 2A source/4A sink
- f_{pwm} up to 20KHz
- Protection :UVLO, OCP, TSU, Fault out
- Thermal Sensing 0°C~150°C via V_{ts}

IGBT

- low conduction and switching losses
- optimized switching dV/dt for motor control
- Short circuit rated



1200V ASPM® 34

Features

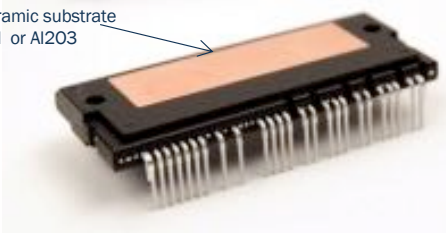
- All-in-one solution ; 6-IGBT & FWD, HVIC in one PKG
- For 800V battery system
- Supports AEC-Q100/101, AQG324
- Transfer-molded module with DBC substrate for better TMCL & PRCL than Gel-filled

Specifications

Product	Silicon	Io/A	BV [V]	Io/A	Substrate	Sample /MP
NFVA22512NP2T	NPT Trench	Io/A	BV [V]	25A	DBC(AIN)	MP
NFVA23512NP2T		25A	1200V	35A	DBC(AI2O3)	MP
NFVA25012NP2T		35A	1200V	50A	DBC(AI2O3)	MP

Package : 80 mm × 33 mm × 8 mm

Ceramic substrate
AIN or AI2O3



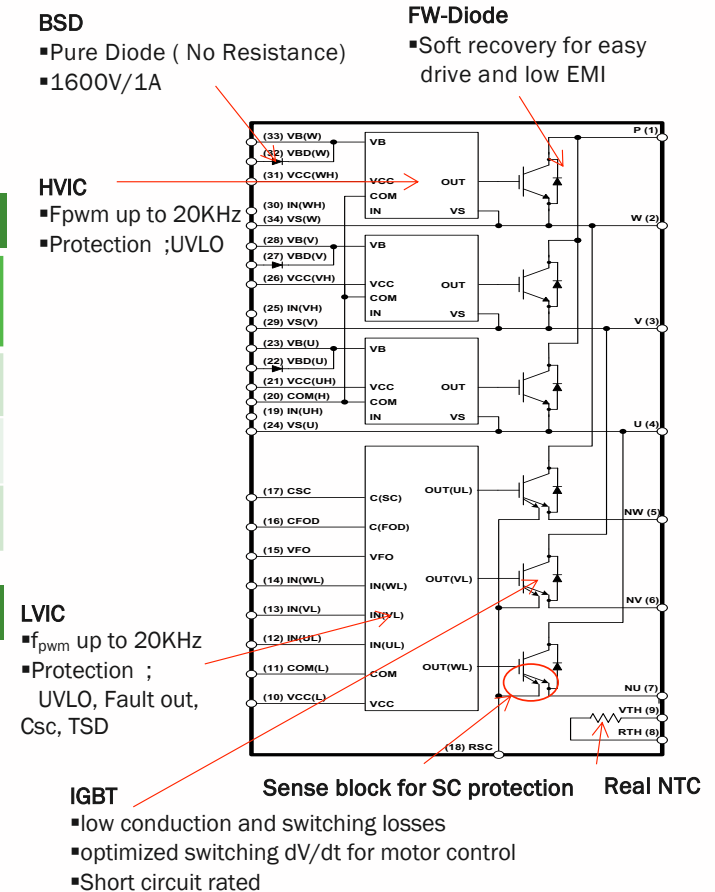
Benefits

- All parts pin-compatible
- Wide product coverage ;10~50A/1200V
- For design convenience, remove side dummy
- Embedded real NTC(47KΩ) & sense IGBT for protection

End products

- **Automotive Applications**
 - Electric Air-conditioner Compressor
 - Automotive Fan
 - Oil/Water Pump

Block Diagram



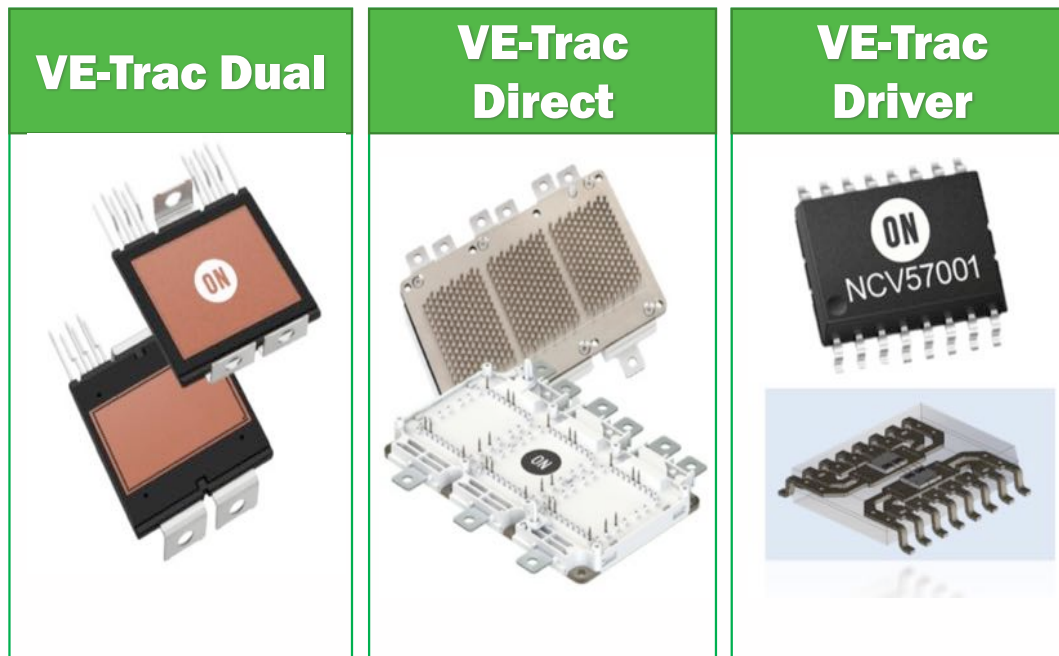
VE-Trac™

Dedicated Solutions for Traction Inverters



VE-Trac™ (Vehicle Electrification for Traction) Product Family

- Versatile & innovative solutions to power vehicle electrification into the future
- Uncompromised cost, quality & performance

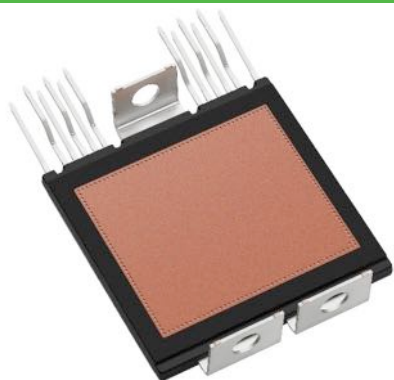


Addressing all present and future key Requirements

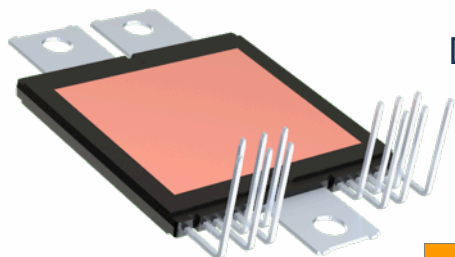
- Multi power class segmentation/Coverage by IGBT and SiC
 - 80KW-250KW
- Packaging differentiation & reliability
 - Strat inductance
 - Sintering on more interfaces
 - Reliability lifetime
- 400V & 800V DC Bus
 - 750V & 1200V switeches
- IGBT and SiC solutions in same packages
 - Power class scalability for next gen
- Platform approach
- Cost reduction
- Manufacturing scale/supply Gardienne

DSC Module Overview

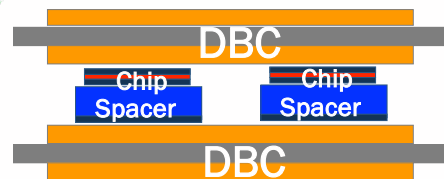
Flip Chip Dual Side Cooling



DSC Package



DSB Package



- Offers **lowest cost per kW**
- Half-bridge configurations: **scalable, modular, and compact**
- Completely wire-bond free module for **better reliability and longer lifetime**
- **Smart features** on Silicon: current and temperature sense for **high speed feedback**
- Class Leading Ultra low stray **inductance of 6.5nH**
- Top and bottom side cooling offers better thermal performance
 - **40% reduction** in RthJ-F compared to standard modules
- Simplified Gate Driver: optional negative bias and boost stage
- Visit: www.onsemi.com/ve-trac for more information

Device Part Number	Current Rating	Voltage Rating	Package
NVG800A75L4DSC	800A	750V	VE-Trac™ Dual
NVG400A120L2DSC	400A	1200V	VE-Trac™ Dual

VE-Trac™ EV PIMs Power Module Portfolio

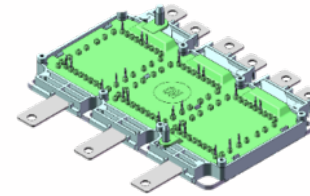
Key advantages of Direct Module

- Drop in solution for 2nd source or new designs
- B6 bridge
- Highly integrated for easy assembly
- Ultra-Low Stray Inductance 8nH
- Latest FS4 750V Silicon Technology
- Multiple power terminal configurations
- Robust press fit design

Key advantages of DSC Module

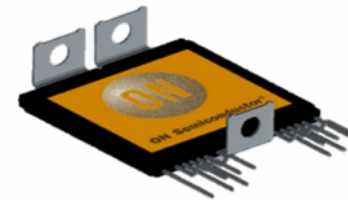
- Offers lowest cost per kW
- Half-bridge configurations: scalable, modular, and compact
- Completely wire-bond free module for better reliability and longer lifetime
- Smart features on Silicon: current and temperature sense for high speed feedback
- Class Leading Ultra low stray inductance of 6.5nH
- Top and bottom side cooling offers better thermal performance
 - 40% reduction in RthJ-F compared to standard modules
- Simplified Gate Driver: optional negative bias and boost stage

Single Side Direct Cooling



Part Number	Rating	RTM	Configuration
NVH820S75L4SPA	750V, 820A	Released	Direct
NVH820S75L4SPB	750V, 820A	Released	Direct
NVH820S75L4SPC	750V, 820A	Released	Direct
NVH820S75L4SPD	750V, 820A	Released	Direct
NVH950S75L4SPB	750V, 950A	Released	Direct
NVH950S75L4SPC	750V, 950A	Released	Direct
NVH660S75L4SPFB	750V, 660A	Released	Direct
NVH660S75L4SPFC	750V, 660A	Released	Direct
NVH640S75L4SPB	750V, 640A	Released	Direct
NVH640S75L4SPC	750V, 640A	Released	Direct
NVH680S75L4SPB	750V, 680A	Released	Direct
NVH680S75L4SPC	750V, 680A	Released	Direct
NVH820S75L6SPB	750V, 820A	Q4'21	Direct Eco+
NVH820S75L6SPC	750V, 820A	Q4'21	Direct Eco+
NVH820S75L6SSB	750V, 820A	Q4'21	Direct Eco+ Solder Pin
NVH820S75L6SSC	750V, 820A	Q4'21	Direct Eco+ Solder Pin

Dual Side Cooling



Part Number	Rating	RTM	Configuration
NVG800A75L4DSC	750V, 800A	Released	Dual Gen I
NVG800A75L4DSB	750V, 800A	Released	Dual Gen I
NVG450A120L5DSC	1200V, 450A	Q2'21	Dual Gen I
NVG600A75L4DSE2	750V, 600A	Q2'21	Dual Gen II
NVG500A75L4DSF2	750V, 500A	Q2'21	Dual Gen II
NVG800A75L4DSC2	750V, 800A	Q4'21	Dual Gen II
NVG800A75L4DSB2	750V, 800A	Q3'21	Dual Gen II
NVG600A75L4DSC2	750V, 600A	Q4'21	Dual Gen II
NVG500A75L4DSC2	750V, 500A	Q4'21	Dual Gen II
NVG600A75L4DSB2	750V, 600A	Q3'21	Dual Gen II
NVG500A75L4DSB2	750V, 500A	Q3'21	Dual Gen II

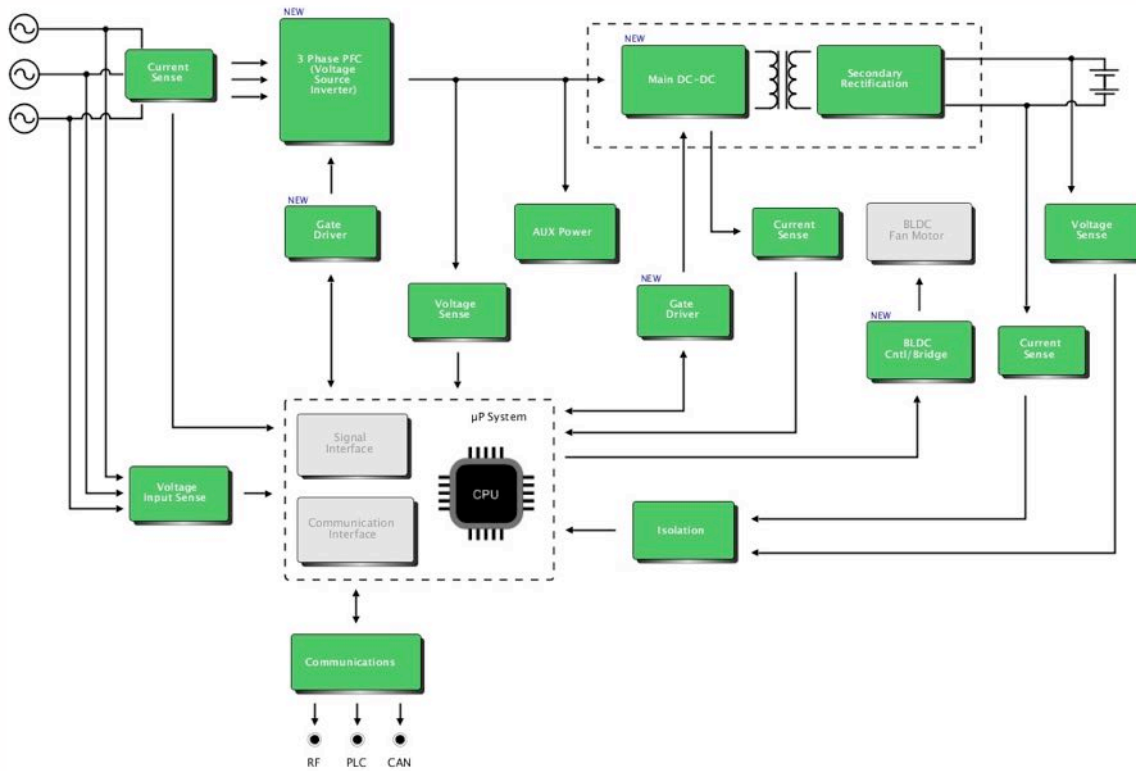


Applications Support

On Board Charger (OBC) and Traction Inverters



On Board Charger



Key solutions

Modules

- APM module family specifically for OBC
- 50 years mfg experience in power modules
- 18 OEM served (LV / Aux modules)
- >80 vehicle models (LV / AUX modules)

HV Power Switch and Driver

- First 300A Auto Grade AEC Q101 D IGBT in the mkt
- SiC and SJ technologies and products
- High efficiency, high reliability low cost, Non/Iso high voltage gate drivers
- Diodes portfolio of AEC-Q101 Qualified and PPAP Capable

Power Management and control

- Wide range of DC/DC controller and converters for both primary and secondary regulation
- Bi-directional high/low side current sensing with a high degree of precision current sensing along wide input common mode range
- Battery connected LDOs, Trackers, Charge Pumps and special functions

Communication


- EEPROM supplier for over 30yrs with a wide coverage : 1 kb to 1 Mbit with Focus on High Density
- Patented EEPROM Process Technology and Cell Structure
- WW First AECQ Grade 0 EEPROM
- Comprehensive portfolio on CAN, LIN, Flex ray and SBC, qualified by major OEM and protection

Benefit: Compact System Size

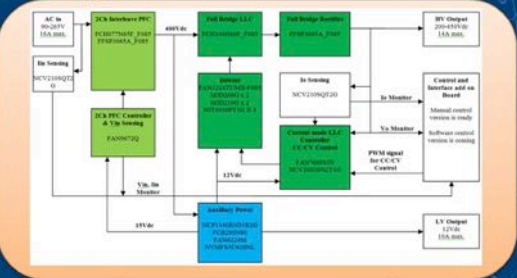
EV / HEV On-Board Charger **ON**

OBC Power Device Solutions

- Wide output voltage range coverage, 200-450V
- High efficiency system, >95% at 400V output
- Compatible for both air-cooling and liquid cooling
- Two channel interleave PFC for high efficiency and power density.
- Full bridge LLC to boost efficiency.
- CAN interface to control constant current/voltage settings(option)




Block Diagram



Performance

- Up to 95.6% total efficiency at 220Vac.
- >0.99 Power Factor.

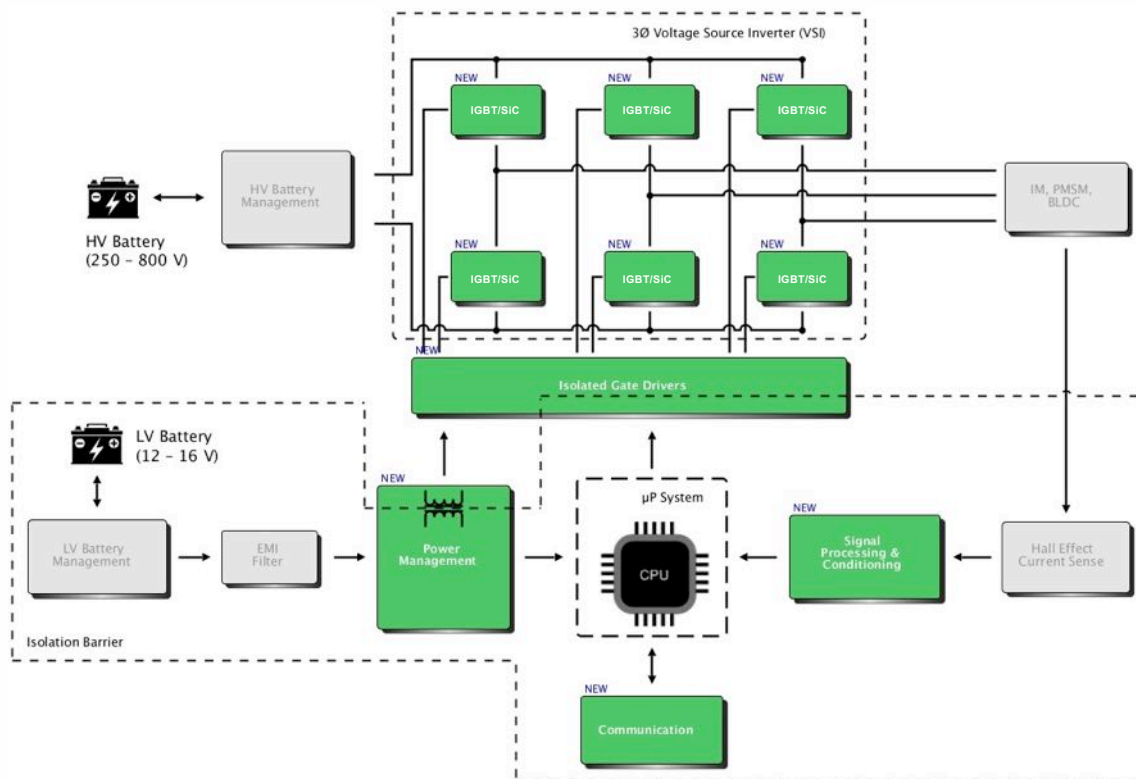



Discrete design
256 × 180 X 60
mm =2.7 l

APM16 design
212×150
×47mm=1.5 l



Traction Inverter



Key solutions

Traction Modules

- IGBT VE-Trac family with AQG-324 released products
- 2 released platform: VE-Trac-Direct and VE-Trac-Dual
- 50 years mfg experience in power modules (Sanyo/FCS)

HV Power Switch and Driver

- First 300A Auto Grade AEC-Q101 D IGBT in the mkt
- SiC Power technology and products
- High efficiency, high reliability low cost, Non/Iso high voltage gate drivers
- Diodes portfolio of AEC-Q101 Qualified and PPAP Capable
- 650V-1200V SiC AEC-Q101 Qualified and PPAP Capable solutions specifically engineered for automotive application

Power Management and control

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VE-Trac™ Dual Inverter Kit

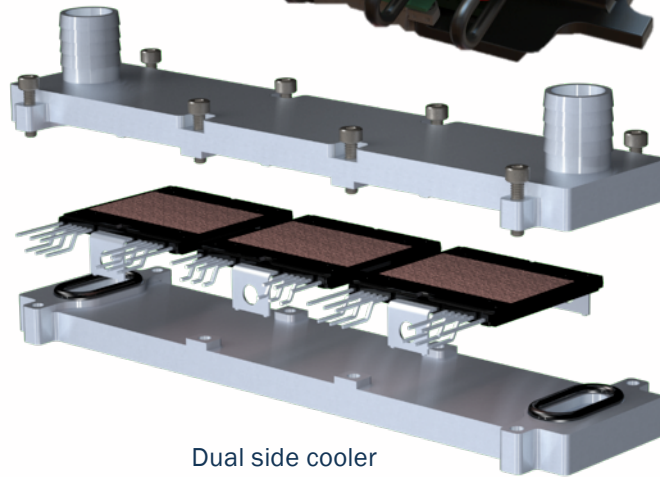
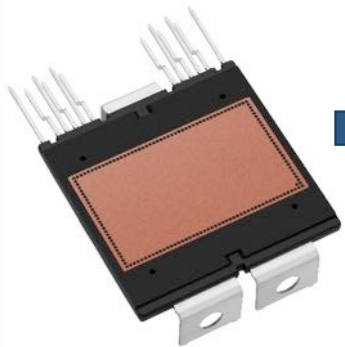
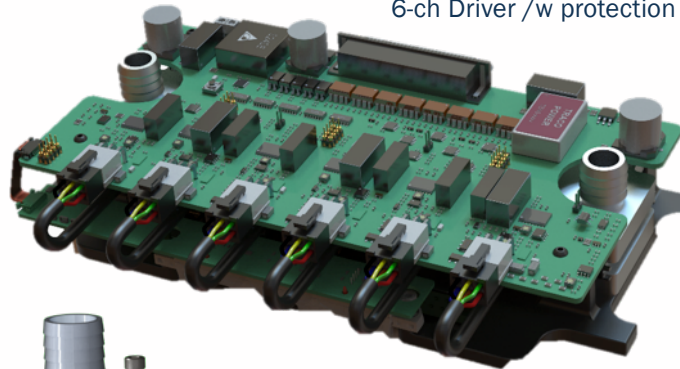
440VDC, 560Arms, up to 160kW 3-ph Inverter

Compact size: 110 x 240 x 120 mm

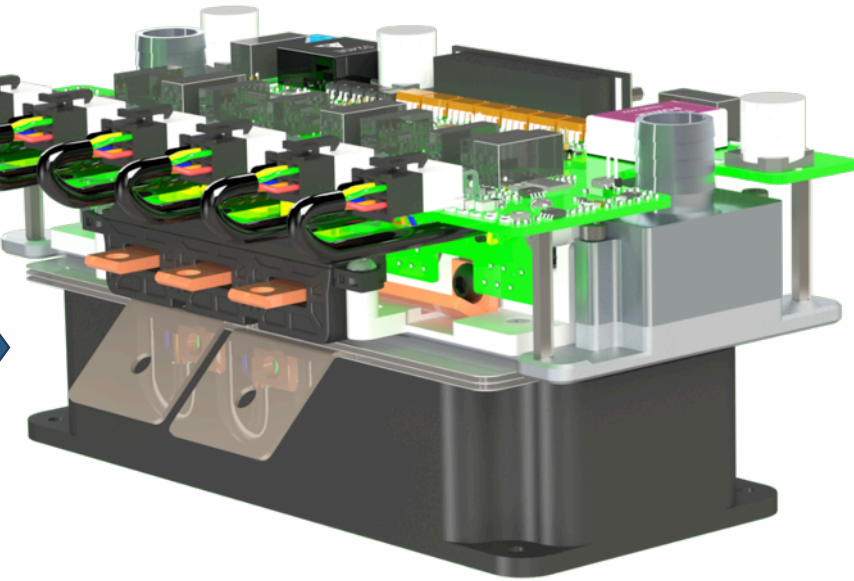
2-ch Isolated Driver



6-ch Driver /w protection



Design kit makes it easy to test performance



▲ Complete Inverter Kit

VE-Trac Dual HB Module

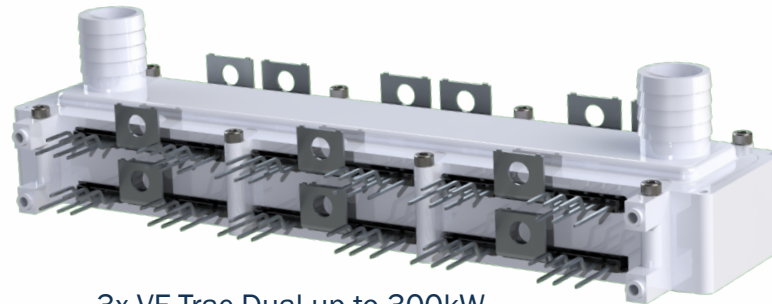
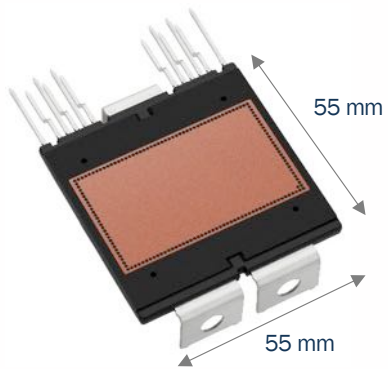
Dual side cooler

Public Information

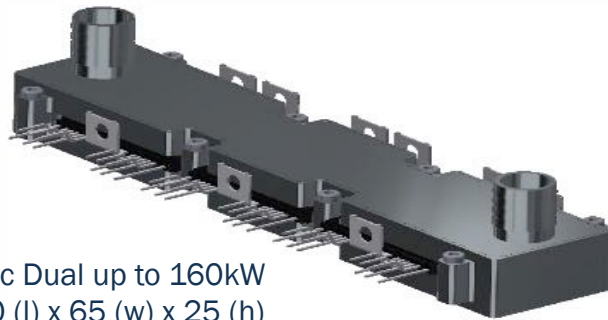


One Power Module – Many power levels

200% Increase in Output Power
/w only a 50% increase in volume



3x VE-Trac Dual up to 300kW
Size: 230 (l) x 65 (w) x 39 (h)



3x VE-Trac Dual up to 160kW
Size: 230 (l) x 65 (w) x 25 (h)

SCALABILITY



Conclusion



Key TakeAways

- **ON Semiconductor is #2 supplier of std & power products in the market (32% revenue in Automotive)**
- **BOM Coverage of all the functions inside the car of the future. Application specific solutions will facilitate positioning and speed up the time to market**
- **Long expertise in Power Module manufacturing with High Reliability and Lifetime**
- **Wide range of Power Modules (Molded or Gel-Fill) for Electrical Vehicle dedicated for Traction or OBC applications**
- **With ASPM covering wider range of HV Auxiliary applications xEV market**



Thank You for your Attention

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