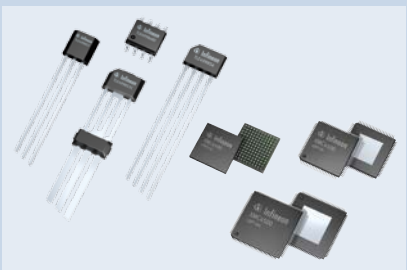
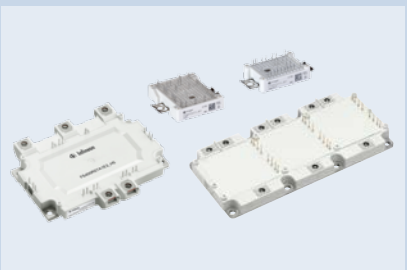
Solutions for construction, commercial and agricultural vehicles

Energy-efficient products for high system reliability





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Solutions for construction, commercial and agricultural vehicles

In a bid to meet rising demand for fuel and operational efficiency, commercial, construction and agricultural vehicle (CAV) manufacturers are increasingly exploring the benefits of electrification. The replacement of hydraulic drives with electric units, controlled by state-of-the-art electronics, offers two key benefits. Manufacturers can comply with upcoming, stricter legislation mandating even lower emission levels and greater energy efficiency. In addition, operators can increase process efficiency and yield rates.

Busses today are powered by combustion engines using fossil fuels like diesel or LPG. Based on the Carnot process, average engine efficiency is well below 40% while average fuel efficiency is even lower still. Similar to the automotive industry, CAVs can also benefit from thefuel economy advantages of hybrid or fully electric drivetrains. Even better still, electric drives can eliminate fuel consumption completely, helping to keep our cities clean and protect our climate by reducing carbon dioxide emissions. In addition, they increase passenger comfort and reduce noise levels. The overall effect is improved quality of life in our cities. The fuel efficiency of electric drives can be increased even further by recovering and storing the energy from braking. Energy recovery is only possible with electric drives, and is possible with all kinds of commercial vehicles like delivery trucks, waste handling machinery, etc.

In logistics, electric forklift trucks already enjoy widespread popularity. Battery powered, all-electric machines can operate for a whole shift without recharging. By eliminating combustion and exhaust emissions, these vehicles can be used indoors without reservations.

Electrification of construction vehicles has the added bonus of reducing or even eliminating the need for hydraulic systems. These are often the root cause of downtime for unscheduled maintenance. Wires and electrical connections are less bulky to install and less sensitive than tubes. And in the event of a failure, no hazardous liquids can leak out, contaminating the site.

In addition, electrical systems are more responsive and precise than hydraulic systems. So operators can control production processes like mining, chaffing, mowing, cutting and harvesting more accurately. This accelerates process times and increases yields.

Electric drivetrains are far less prone than hydraulic systems to wear and tear and thus require less maintenance. These factors combine to increase availability and reliability, contributing to increased productivity.

In the near future, more and more tasks in industry, transport and transit will be powered by electric or at least partially electric (hybrid) drives. Infineon is ready to support designers and developers with the control and power semiconductor components needed to enable the transition to greater fuel economy, productivity and reliability.

Technical Introduction on CAVs

Commercial and Agricultural Vehicles (CAVs) today rely on two main technologies. A central combustion engine provides mechanical power and hydraulic systems are installed to control huge forces at what are usually very low speeds. Both systems can be supported or even replaced by electric drives, controlled by modern power electronics.

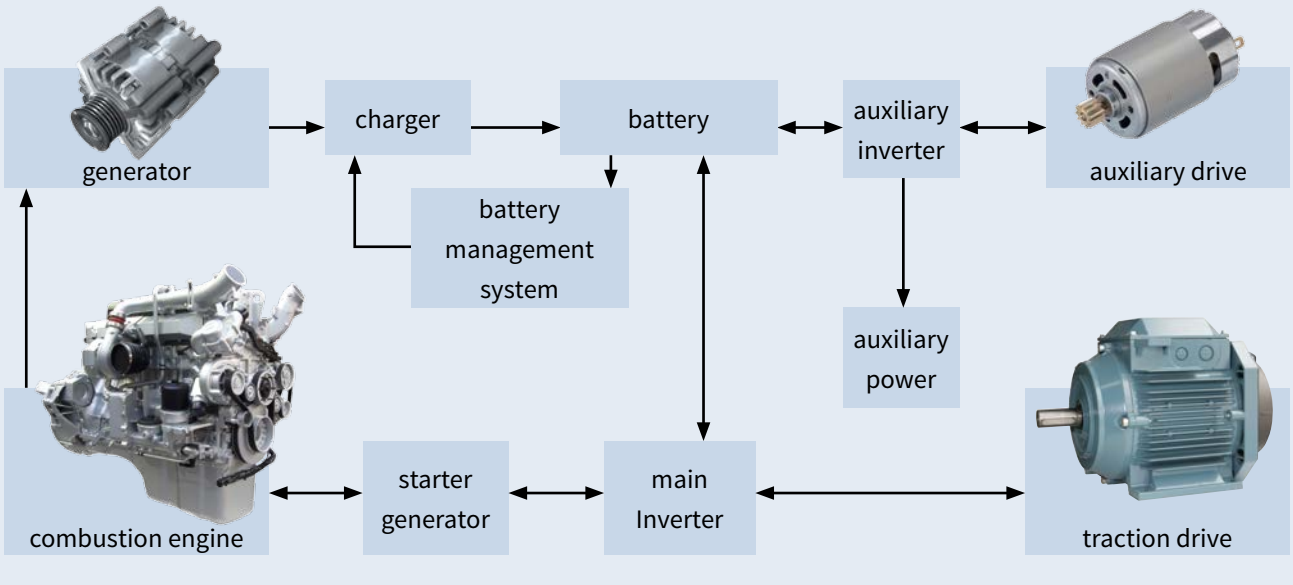
On the engine side, electric machines can be used to either support the combustion drivetain or even replace it (see figure 1). In a hybrid design, the combustion engine still provides parts of the propulsive power but the electric drive provides torque for peak loads. This redcues fuel consumption and allows energy to be recovered during braking events. This energy can later be used to accelerate the vehicle and boost fuel efficiency. In addition, the electric motor can operate as a starter-generator, reducing the complexity of the drivetrain by combining these two parts.

This design concept is similar to the hybrid drive approach established in the automotive industry.

A diesel/electric drivetrain concept is another alternative. Here, the combustion engine is operated for efficiencies while it drives a generator.

This generator provides the electric power needed to operate the vehicle, which is always driven electrically. A battery is used to ensure an independent supply of energy – irrespective of whether power is being generated or not. The battery stores energy recovered during deceleration. Gearbox and clutches are eliminated and, unlike combustion engines, electric machines can provide maximum torque at speed zero. This makes them ideal for heavy-duty applications. Finally, electric drives can eliminate the combustion engine provided an on-board energy storage solution like a battery or fuel cell can provide enough energy to operate the vehicle for a reasonable length of time. In case of an electric forklift truck, this could be a shift of several hours, while a few minutes may be sufficient for a city bus that can recharge at each bus stop. Eliminating the combustion engine also is a major step in improving availability and reliability.

Figure 1: Combined Technologies in CAV

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Changing from something like this

to something like this

massively reduces the number of parts, especially the moving ones, leading to a corresponding reduction in failures and maintenance.

In an all-electric drive train, the tasks of mechanical components like the starter and generator are taken over by power electronic inverters, reducing the complexity of the vehicle's infrastructure even further for added improvements in reliability and availability.

A CAV often needs auxiliary machinery like balers, saws, mowers, rotating brushes or harvesters. Changing the source of mechanical power for these tools from hydraulic to the more reliable electric drive leads to productivity improvements by increasing speed and accuracy of control. Here too, electronic power and control components are a key technology to enable maximum energy conversion efficiency.

To support this demanding market, Infineon offers solutions in various important fields, including

- Power electronic devices to drive machinery from several 100W to the MW-range
- Dedicated Driver ICs to precisely control power devices
- Microcontrollers and DSPs to implement the most demanding control algorithms
- Sensors to accurately monitor movements

1 Communication, monitoring, surveillance, electric air condition, low-power supply devices like USB

2 Electric actuators

3 Starter-generator, diesel-electric power source

4 110V/220V for tools and lights, power supply for auxiliary devices

5 Centralized electric motor or in-wheel machines

IHM

The preferred choice for a powerful, compact and reliable converter design

Main Features:

- Operating temperature -40°C to 150°C (IGBT 4)
- Optimized switching losses combined with soft switching
- Low V_{CEsat} and and $R_{thj\text{-}c}$
- Widest product portfolio available on the market
  - Two housings: IHM A and IHM B
  - Two footprints: 190x140, 130x140
  - Two base-plate materials: AlSiC and Cu
- High creepage and clearance distances
- Superior power cycling (IGBT 4)

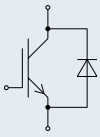
Key Benefits:

- Broadest portfolio available on the market, each type optimized to different customer needs:
  - Product range from 600A to 3600A at 1200V and 1700V
  - Two base-plate materials: AlSiC and Cu
  - Two standardized housings: IHM-A and IHM-B
  - Two standardized footprints: 190x140 and 130x140
  - Four topologies: half-bridge, single-switch, chopper- and diode modules
- UL recognized
- Best in class power density

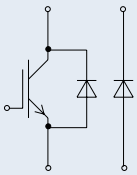
The well-known IHM (IGBT High-Power Modules) is robust and works with supreme reliability in harsh environments and temperatures ranging from -40 to +150°C.

Low leaking current and continuously upgraded thermal and electrical performance make IHM the preferred choice for a powerful, compact and reliable converter design.

The recently introduced IHM-B enhances the portfolio with its lower switching losses and higher power cycling capability. Additionally, its reduced stray inductance and optimized terminal connections make the module easy to control and safe to use.

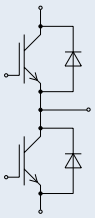


Single Switches (FZ)



Chopper Modules (FD)

Dual Diode (DD)



Half Bridge (FF)

www.infineon.com/ihm-b

Product Type	Green	Configuration	Voltage	Current	Housing
DD1200S17H4_B2	RoHS	Dual Diode	1700V	1200A	IHM B 130mm
DD800S17H4_B2	RoHS	Dual Diode	1700V	800A	IHM B 130mm
FD1200R17HP4-K_B2	RoHS	Chopper	1700V	1200A	IHM B 130mm
FD1600/1200R17HP4_B2	RoHS	Chopper	1700V	1600A/1200A	IHM B 190mm
FF1200R17KP4_B2		Half Bridge	1700V	1200A	IHM 130mm
FF800R17KP4_B2		Half Bridge	1700V	800A	IHM 130mm
FZ1200R12HP4		Single Switch	1200V	1200A	IHM B 130mm
FZ1600R12HP4		Single Switch	1200V	1600A	IHM B 130mm
FZ2400R12HP4		Single Switch	1200V	2400A	IHM B 130mm
FZ3600R12HP4		Single Switch	1200V	3600A	IHM B 190mm
FZ1200R17HP4		Single Switch	1700V	1200A	IHM B 130mm
FZ1600R17HP4		Single Switch	1700V	1600A	IHM B 130mm
FZ2400R17HP4		Single Switch	1700V	2400A	IHM B 130mm
FZ2400R17HP4_B9		Single Switch	1700V	2400A	IHM B 190mm
FZ3600R17HP4		Single Switch	1700V	3600A	IHM B 190mm
FZ1600R17HP4_B2	RoHS	Single Switch	1700V	1600A	IHM B 130mm
FZ1600R17HP4_B21	RoHS	Single Switch	1700V	1600A	IHM B 130mm
FZ2400R17HP4_B2	RoHS	Single Switch	1700V	2400A	IHM B 130mm
FZ2400R17HP4_B28	RoHS	Single Switch	1700V	2400A	IHM B 190mm
FZ2400R17HP4_B29	RoHS	Single Switch	1700V	2400A	IHM B 190mm
FZ3600R17HP4_B2	RoHS	Single Switch	1700V	3600A	IHM B 190mm

IHV

The IHV modules offers excellent power density and efficiency and a long lifetime within a broad portfolio from 3.3kV up to 6.5kV.

Main Features:

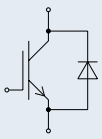
- Operating Temperature
  - IHV B -40°C to 150°C (IGBT 3)
  - IHV A -50°C to 125°C (IGBT 3)
- Optimized switching losses combined with soft switching
- Low V_{CEsat} and $R_{thj\text{-}c}$
- Comprehensive product portfolio: efficient purchasing (cross buying, package bundling), less effort for supplier qualification
  - Two footprints: 190x140, 130x140

Key Benefits:

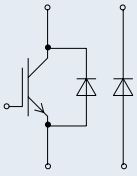
- Robustness, high reliability and long lifetime: lowest fit rate and service cost
- Long-term DC stability: high cosmic radiation robustness
- Compatible package for all voltage classes (3.3kV, 4.5kV, 6.5kV)
- Global application engineering team

IHV modules offer high quality and reliability with a long lifetime – key product features for CAV applications. A broad product portfolio in standardized packages, low leaking current and continuously improved thermal properties are appreciated by customers in different applications with harsh environmental conditions.

The IHV product portfolio covers different high power inverter sizes with single switch, chopper and diode modules in the voltage ranges of 3300V, 4500V and 6500V and current ratings from 400A up to 1500A in two package versions (IHV A and IHV B) depending on clearance and creepage requirements.



Single Switches (FZ)



Chopper Modules (FD/DF)

Dual Diode (DD)

www.infineon.com/highpower

Product Type	Green	Configuration	Voltage	Current	Housing
FZ1500R33HL3	RoHS	Single Switch	3300V	1500A	IHV B 190mm
FZ1500R33HE3	RoHS	Single Switch	3300V	1500A	IHV B 190mm
FZ1200R33HE3	RoHS	Single Switch	3300V	1200A	IHV B 190mm
FZ1000R33HL3	RoHS	Single Switch	3300V	1000A	IHV B 130mm
FZ1000R33HE3	RoHS	Single Switch	3300V	1000A	IHV B 130mm
DD500S33HE3	RoHS	Dual Diode	3300V	500A	IHV B 130mm
DD1000S33HE3	RoHS	Dual Diode	3300V	1000A	IHV B 130mm
FD1000R33HE3-K	RoHS	Chopper	3300V	1000A	IHV B 190mm
FZ1200R45KL3_B5		Single Switch	4500V	1200A	IHV 190mm
FZ800R45KL3_B5		Single Switch	4500V	800A	IHV 130mm
FD800R45KL3_B5		Chopper	4500V	800A	IHV 190mm
DD400S45KL3_B5		Dual Diode	4500V	400A	IHV 130mm
DD800S45KL3_B5		Dual Diode	4500V	800A	IHV 130mm
DD1200S45KL3_B5		Dual Diode	4500V	1200A	IHV 130mm

PrimePACK™

CAV Modules for Engine and Transmission Mount Controllers

Main Features:

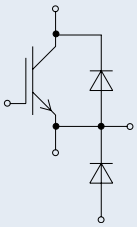
- Operating temperature -40°C to 150°C (IGBT 4)
- Optimized switching losses combined with soft switching
- High current density with max 1400A
- High robustness against mechanical stress and shock
- Widest product portfolio available on the market

Key Benefits:

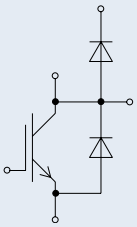
- Extended operating temperature $T_{vj,op}$
- up to 150°C
- Best in class load cycle capability
- Low VCEsat
- Low switching losses
- NTC sensor included
- Optimized for paralleling

The PrimePACK™ CAV offers high power and thermal cycling capability, mechanical robustness and high clearance and creepage distances to withstand the harsh environmental conditions in CAV applications.

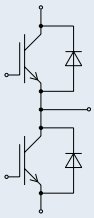
These modules are suitable for peak acceleration of up to 15g in all directions to offer extremely high vibration robustness and can also withstand shock vibrations of up to 50g acceleration.



Chopper (FD)



Chopper (DF)

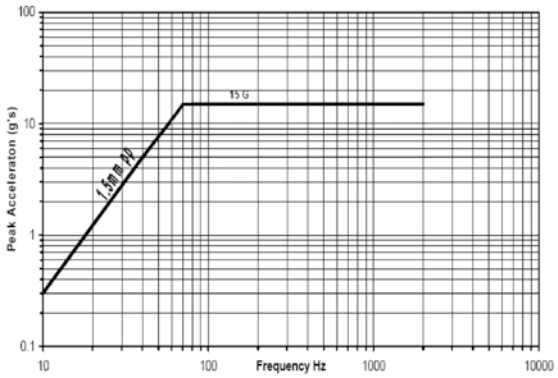


Half Bridge (FF)

www.infineon.com/highpower

Product Type	Green	Configuration	Voltage	Current	Housing
FF600R12IE4V	RoHS	Half Bridge	1200V	600A	PrimePACK™ 2
FF600R12IP4V	RoHS	Half Bridge	1200V	600A	PrimePACK™ 2
FF650R17IE4V	RoHS	Half Bridge	1700V	650A	PrimePACK™ 2
FF900R12IE4V	RoHS	Half Bridge	1200V	900A	PrimePACK™ 2
FF900R12IP4V	RoHS	Half Bridge	1200V	900A	PrimePACK™ 2
FF900R12IP4DV	RoHS	Half Bridge	1200V	900A	PrimePACK™ 2
DF600R12IP4DV	RoHS	Chopper	1200V	600A	PrimePACK™ 2
DF900R12IP4DV	RoHS	Chopper	1200V	900A	PrimePACK™ 2
FD900R12IP4DV	RoHS	Chopper	1200V	900A	PrimePACK™ 2

Sine sweep vibration



Medium Power

For your reliable inverter designs, we offer the complete portfolio from 225 A upto 600 A

Main Features:

- Compact modules with height of only 17mm
- Easy and reliable assembly: PressFIT control pins and screw power terminals for completely solderless connections
- Highest power densities for compact inverter designs
- Optional: EconoDUAL™ 3 with automotive qualification

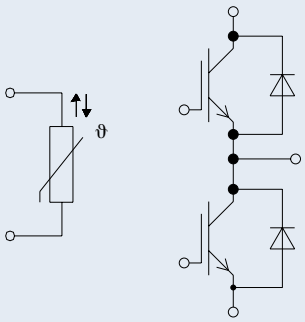
Key Benefits:

- Compact inverter designs
- Highest reliability and robustness
- Solution with full Infineon automotive qualification available

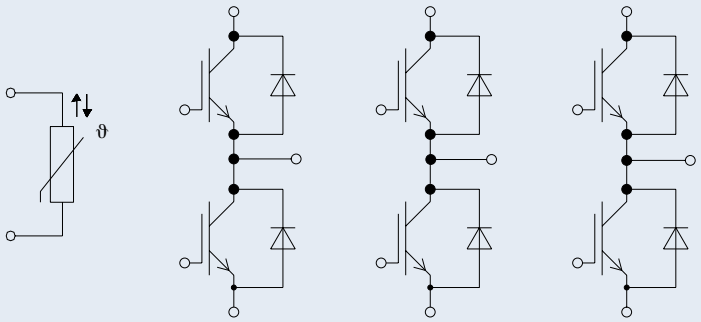
The packages EconoDUAL™ 3 and EconoPACK™ + enable a compact and reliable inverter design due to the module height of 17mm and the possibility to press the driver board on top by using the fast and extremely reliable PressFIT technology.

The portfolio covers different topologies like half and full bridges. The current ratings are from 225A up to 600A at different voltage ratings of 650V/1200V/ 1700V.

As an additional option, Infineon introduces the EconoDUAL™ 3 with Infineon automotive qualification. The EconoDUAL™ 3 is equipped with automotive qualified IGBTs and diodes and features enhanced internal joining technologies. The EconoDUAL™ 3 therefore meets the highest reliability and robustness requirements.



Half Bridge



Full Bridge

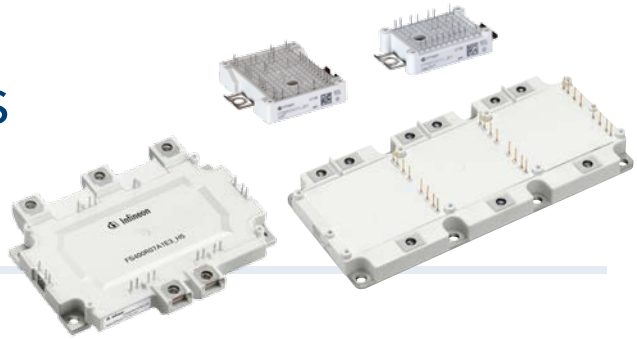
www.infineon.com/highpower

Product Type	Green	Configuration	Voltage	Current	Housing
FS225R12OE4	RoHS	Sixpack	1200V	225A	EconoPACK™ + D
FS225R17OE4	RoHS	Sixpack	1700V	225A	EconoPACK™ + D
FS300R12OE4	RoHS	Sixpack	1200V	300A	EconoPACK™ + D
FS300R17OE4	RoHS	Sixpack	1700V	300A	EconoPACK™ + D
FS450R12OE4	RoHS	Sixpack	1200V	450A	EconoPACK™ + D
FS450R17OE4	RoHS	Sixpack	1700V	450A	EconoPACK™ + D
FS500R17OE4D	RoHS	Sixpack	1700V	500A	EconoPACK™ + D
FF225R12ME4_B11	RoHS	Half Bridge	1200V	225A	EconoDUAL™ 3
FF225R17ME4_B11	RoHS	Half Bridge	1700V	225A	EconoDUAL™ 3
FF300R12ME4_B11	RoHS	Half Bridge	1200V	300A	EconoDUAL™ 3
FF300R17ME4_B11	RoHS	Half Bridge	1700V	300A	EconoDUAL™ 3
FF400R12ME4A_B11	RoHS	Half Bridge	1200V	400A	EconoDUAL™ 3
FF450R12ME4_B11	RoHS	Half Bridge	1200V	450A	EconoDUAL™ 3
FF450R17ME4_B11	RoHS	Half Bridge	1700V	450A	EconoDUAL™ 3
FF600R12ME4_B11	RoHS	Half Bridge	1200V	600A	EconoDUAL™ 3
FF600R17ME4_B11	RoHS	Half Bridge	1700V	600A	EconoDUAL™ 3
FF600R12ME4A_B11	RoHS	Half Bridge	1200V	600A	EconoDUAL™ 3

...A Automotive qualified
...B11 PressFIT

Automotive Power Modules

for Hybrid- and Electric Vehicle Applications



Main Features:
- Flexible platform for several topologies
- Complete 3-phase six pack
- Current rating up to 800A
- Extended temperature range (T_{jop} =150° C, T_{jmax} = 175° C)
- Fully automotive qualified
- Pin-Fin baseplate for direct cooling

Key Benefits:
- Cost efficient system approach
- High reliability
- Enables compact design
- High efficiency due to low power losses
- NTC temperature sensor

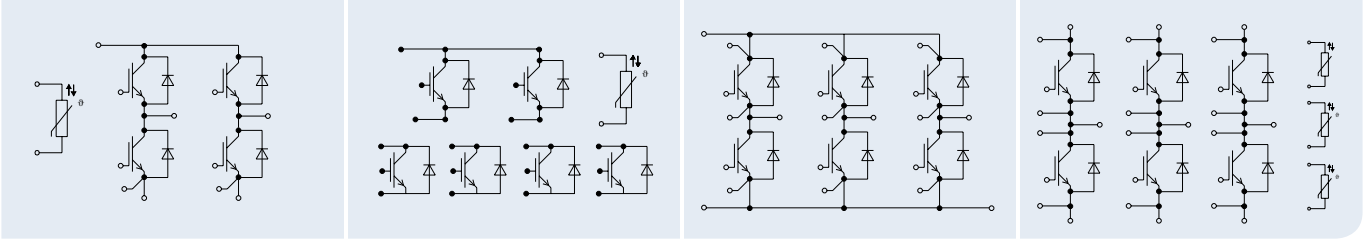
Applications:
- Motor and/ or generator inverter for hybrid- and electric vehicle applications
- Air conditioning compressor
- Oil pump
- PTC heater
- DC/DC converter
- Onboard charger

Infineon's HybridPACK™ 1 and 2 are automotive-qualified power modules designed for hybrid and electric vehicle applications for a power range up to 100kW continuous power. The modules are designed for a 150°C junction operating temperature. They accommodate a 3-phase six-pack configuration of Trench-Field-Stop IGBT3 and matching emitter controlled diodes. Maximum chip ratings are 800A/650V. The HybridPACK™ power modules are basedon Infineon's leading IGBT Trench-Field-Stop technology, which offers ultra-low conduction and switching losses together with a low inductance module design. HybridPACK™ 1 Pin-Fin package is a HybridPACK™ 1 with a Pin-Fin baseplate replacing the flat baseplate. This direct cooling concept increases the power density of the package significantly.

Infineon's Easy 1B and Easy 2B automotive power modules provide a platform for different hybrid and electric vehicle applications for a power range up to about 10kW. The most common applications are auxiliary drives, DC/DC converters (HV/LV), PTC heaters and onboard chargers. The Easy automotive power module series is based on the well-established industrial Easy Module version. Higher-performance materials are used to achieve the required robustness for automotive applications. The unique module identification with both data matrix chip on the ceramic substrate and data matrix code on the module housing allows seamless traceability over the entire supply chain.

AEC Qualified

RoHS



www.infineon.com/hev

HybridPACK™ 1 – power module for hybrid- and electric vehicle applications for a power range up to 20kW

Product Type	Configuration	Voltage	Current	Housing	Application
FS400R07A1E3	Sixpack	650V	400A	HybridPACK™ 1	Inverter
FS400R07A1E3_S6	Sixpack	705V	400A	HybridPACK™ 1	Inverter
FS200R07A1E3	Sixpack	650V	200A	HybridPACK™ 1	Inverter
FS200R12A1T4	Sixpack	1200V	200A	HybridPACK™ 1	Charger
FS215R04A1E3D	Sixpack	400V	215A	HybridPACK™ 1	Inverter

HybridPACK™ 1 Pin-Fin – power module for hybrid- and electric vehicle applications for a power range from 20kW to 50kW

Product Type	Configuration	Voltage	Current	Housing	Application
FS400R07A1E3_H5	Sixpack	650V	400A	HybridPACK™ 1 Pin-Fin	Inverter
FS200R12A1E3_H5	Sixpack	1200V	200A	HybridPACK™ 1 Pin-Fin	Inverter

HybridPACK™ 2 – power module for hybrid- and electric vehicle applications for a power range up to 100kW

Product Type	Configuration	Voltage	Current	Housing	Application
FS800R07A2E3	Sixpack	650V	800A	HybridPACK™ 2	Inverter
FS600R07A2E3	Sixpack	650V	600A	HybridPACK™ 2	Inverter
FS400R12A2T4	Sixpack	1200V	400A	HybridPACK™ 2	Inverter
FS800R07A2E3_B31	Sixpack	680V	800A	HybridPACK™ 2 Enhanced	Inverter
FS600R07A2E3_B31	Sixpack	680V	600A	HybridPACK™ 2 Enhanced	Inverter

www.infineon.com/hybridpack

Automotive Easy modules – power modules for auxiliaries and charger up to 10kW

Product Type	Configuration	Voltage	Current	Housing	Application
FS75R07W2E3_B11A	Sixpack	650V	75A	Automotive Easy 2B	Inverter
FS50R07W1E3_B11A	Sixpack	650V	50A	Automotive Easy 1B	Inverter
FS30R07W1E3_B11A	Sixpack	650V	30A	Automotive Easy 1B	Inverter
F4-50R07W1H3_B11A	Fourpack	650V	50A	Automotive Easy 1B	DC/DC Converter
F4-75R07W1H3_B11A	Fourpack	650V	75A	Automotive Easy 1B	DC/DC Converter
FZ30R07W1E3_B31A	Single Switch	650V	30A	Automotive Easy 1B	PTC Heater

www.infineon.com/autoeasy

Evaluation Kits

Kit Name	SP Number	Description
Hybrid Kit 1 Pin-Fin	SP000889400	Evaluation kit for applications with HybridPACK™ 1 Pin-Fin FS400R07A1E3_H5
Hybrid Kit 1+	SP000806996	Evaluation kit for applications with HybridPACK™ 1 FS400R07A1E3
Hybrid Kit 2	SP000635950	Evaluation kit for applications with HybridPACK™ 2 FS800R07A2E3
Easy Kit Aux Drives	SP001020068	Evaluation kit for applications with Easy 1B FS50R07W1E3_B11A
Easy Kit DC/DC	SP001007734	Evaluation kit for applications with Easy 1B F4-50R07W1H3_B11A

www.infineon.com/evaluation-boards

Suitable for our Power Products:

Automotive Gate Driver ICs: EiceDRIVER™ – Single-channel IGBT driver IC providing galvanic isolation and bidirectional signal transmission with high ambient temperature capability

Product Type	Topology	Voltage	Current	Housing
1ED020I12FTA	Single	1200V	2A	PG-DSO-20
2ED020I12FA	Dual	1200V	2A	PG-DSO-36
1ED020I12FA2	Single	1200V	2A	PG-DSO-20

Discrete IGBT for Motor Drives

Optimized Product Portfolio for Excellent Performance & High Reliability

Main Features:
- Optimized parameters for up to 20% lower switching losses
- Wide operating range from DC up to 70 kHz
- Max junction temperature 175°C
- Short circuit capability of 5µs
- Very tight parameter distribution
- Best in class current versus package size performance
- Smooth switching performance leading to low EMI levels

Key Benefits:
- Excellent cost/performance for hard switching applications
- Outstanding temperature stability
- Very good EMI behavior
- Small size of components allows up to 60% space saving on the PCB
- Higher reliability due to monolithically integrated IGBT & diode due to less thermal cycling during switching

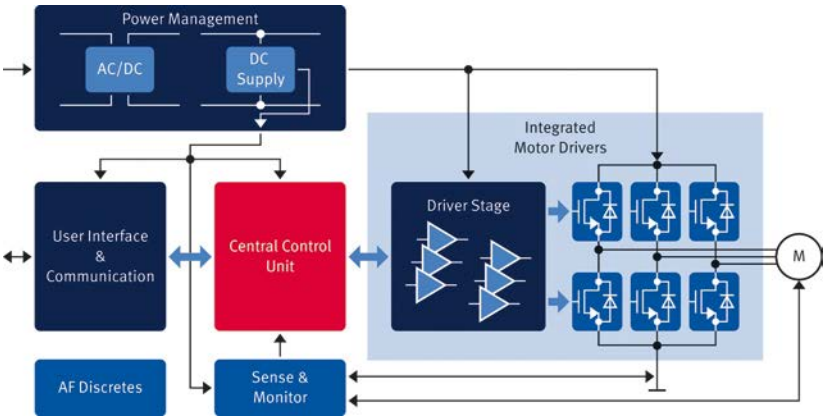
Key Applications:
Motor drive product portfolio, 50W - 5kW
- 1200V – industrial drives, public air-con, fans
- 600V – public air-con, room air-con, industrial drives, fans, pumps, doors, treadmills, washing machines, vacuum cleaners, other MHA

RC drive IGBT technology provides outstanding performance for permanent magnet synchronous and brushless DC motor drives.

The world-famous TRENCHSTOP™ technology reduces saturation voltages to intrinsically very low levels, well below the values offered by competing standard NPT IGBTs.

The HighSpeed 3 family provides the best compromise between switching and conduction losses at switching frequencies of 20 - 70kHz.

Requirements of variable frequency drives:
- Control ability: speed and torque control
- Jolt free in start and stop
- Avoiding repetitive start/stop in pumps/compressors/valves
- Reducing consumption
- Increasing efficiency
- Energy saving



www.infineon.com/discretes

[A]	TO-247	TO-220 FullPAK	TO-220	D²PAK	I²PAK	DPAK
4			IKP04N60T		IKI04N60T	IKD04N60R IKD04N60RF
6		IKA06N60T	IKP06N60T	IKB06N60T		IKD06N60R IKD06N60RF
8	IKW08T120					
10		IKA10N60T	IKP10N60T	IKB10N60T		IKD10N60R IKD10N60RF
15	IKW15N120T2 IKW15T120 IKW15N120H3	IKP15N60T	IKA15N60T	IKB15N60T		IKD15N60R IKD15N60RF
20	IKW20N60T IKW20N60H3		IKP20N60T IKP20N60H3	IKB20N60T IKB20N60H3		
25	IKW25N120T2 IKW25N120H3					
30	IKW30N60T IKW30N60H3					
40	IKW40N120T2 IKW40T120 IKW40N60H3 IKW40N120H3					
50	IKW50N60T IKW50N60H3					
60	IKW60N60H3					
75	IKW75N60T IKW75N60H3					

600V TRENCHSTOP™ 600V HS3 family 1200V HS3 family

600V RC drives 1200V TRENCHSTOP™

Switching Frequency Range

IGBT family	Switching frequency in application, kHz
RC drives	Direct current -> 5kHz
RC drives Fast	5 kHz -> 30 kHz
TRENCHSTOP™	20 kHz -> 50 kHz
HighSpeed 3	20 kHz -> 70kHz

Microcontrollers

The perfect microcontroller family for your 24V – 60V applications

XMC4000
Application Segments
Industrial
- Position Detection
- Sense & Control
- Light Networks
- Motor Control
- IO Devices
- HMI

XMC1000
Application Segments
Industrial
- Smart Sensors
- Motor Control
- Touch Control
- LED Lighting
- LED Displays

Automotive AURIX™
Powertrain
- Gasoline Injection
- Diesel Direct Injection
- Transmission Systems
- (H)EV Control
- Battery Management System

Automotive AURIX™
Safety
- Chassis Domain Control
- Electric Power Steering (EPS)
- Active Suspension Control System
- Advanced Airbag System
- Braking Systems
- Hydraulic Management System
- Pneumatic Management System

Automotive AURIX™
Body
- Body Domain Controller
- Gateway
- Advanced Body Applications

Automotive AURIX™
Driver Assist
- Camera Systems
- RADAR (24/76/77GHz) System

We offer a broad portfolio of 8-bit to 32-bit microcontrollers suitable for any kind of sub-application in the transportation field.

Highest quality microcontroller portfolio to realize your business ideas
- Leading real-time performance
- Outstanding peripherals
- Complete portfolio
- Superior quality
- Ease-of-use and expert support

www.infineon.com/microcontroller

Performance / Features / Memory

32-bit TriCore™

- **AUDO NG** TC17x6
- **AUDO F** TC17x7 TC1736
- **AUDO MAX** TC179x TC178x TC172x

16-bit C166

- **C16x**
- **XC16x**
- **XE16x**
- **XC2000**

8-bit 8051 Compliant

- **C5xx**
- **XC800**
- **XC800 HOT**

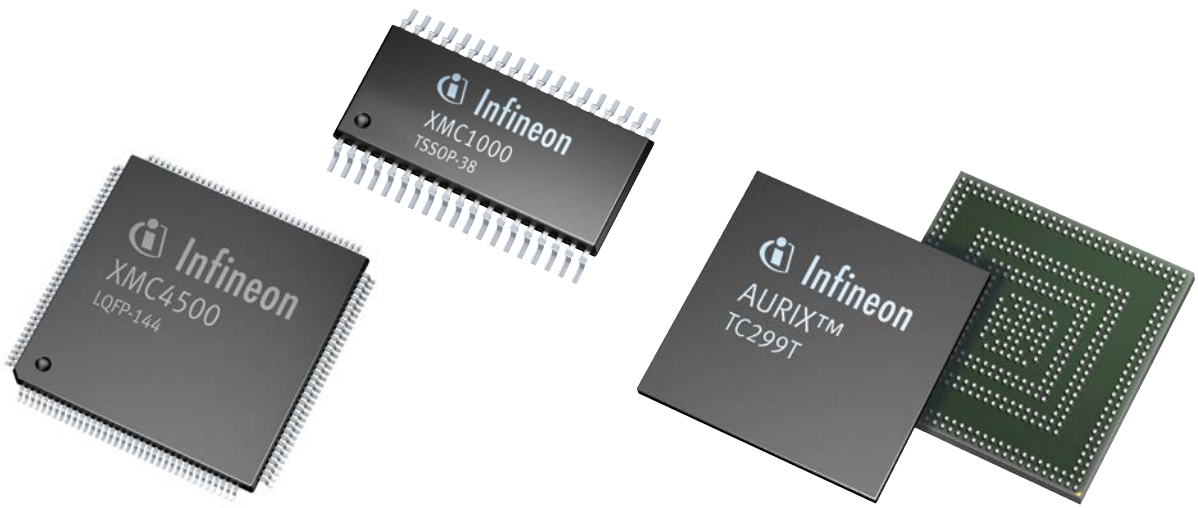
Industrial 32-bit ARM® Cortex™-M

- **XMC4000** ARM® Cortex™-M4
- **XMC1000** ARM® Cortex™-M0

Automotive 32-bit TriCore™

- **AURIX™**
  - TC29 - Series
  - TC27 - Series
  - TC26 - Series
  - TC24 - Series
  - TC23 - Series
  - TC22 - Series
  - TC21 - Series

Automotive Industrial



Industrial MCU Portfolio powered by 32-bit ARM® Cortex™-M Processor

More than 100 devices scaling from 16 to 144pins, 8kB to 1MB Flash, 16kB to 160kB RAM with up to 120MHz

Main Features:

- XMC1000 – 32-bit performance with 8-bit ease-of-use and price
- Scalable portfolio powered by ARM® Cortex™-M0 or ARM® Cortex™-M4 with built in DSP, FPU and MPU
- Comprehensive analog-mixed signal
- Precision timing/control
- Rich communication feature
- Free and revolutionary DAVE™ IDE with predefined and tested application-oriented SW components, called DAVE™ Apps

Key Benefits:

- Scalability & ease-of-use – common peripherals combined with ARM® Cortex™-M processor
- System, architecture and peripherals are optimized for embedded real-time performance and deterministic behavior
- Control & accuracy – leading-edge mixed signal and digital peripherals running at up to twice the core speed
- Excellent ecosystem: DAVE™ IDE, team up with 3rd party tools and software

www.infineon.com/xmc

XMC MCUs – one platform, countless solutions

XMC 32-bit MCU families offer a wide and scalable portfolio with outstanding real-time performance combined with excellent digital and analog mixed-signal peripherals.

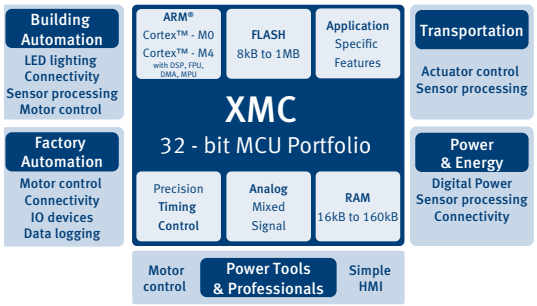
The XMC1000 family starts from 8kB Flash with 16kB RAM, offering 32MHz ARM® Cortex™-M0 performance plus a rich peripheral set in a TSSOP-16 package.

The XMC4000 family starts from 64kB Flash, 20kB RAM and 80MHz ARM® Cortex™-M4 with built in DSP, FPU, DMA and MPU plus a rich peripheral set in a VQFN-48 package.

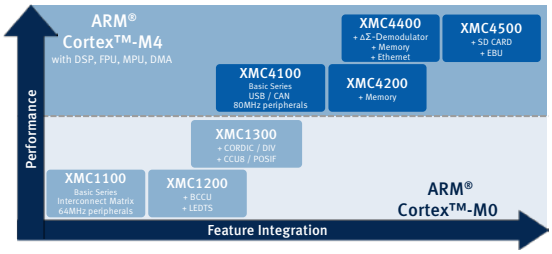
Target Applications – Industrial Market:

- Digital Power and Power Conversion
- Motor Control
- LED Lighting and Control
- Smart Sensors and Position Detection
- HMI and Touch Control
- Networking and Communication
- Programmable Logic Devices
- General Purpose Devices

XMC MCU Target Markets



XMC Portfolio



XMC1000 Family – 32-bit Performance for 8-bit Price

XMC1000 family powered by ARM® Cortex-M0

Main Features:

- ARM® Cortex™-M0
- Up to 32MHz core
- 64MHz MATH co-processor (CORDIC)
- Up to 200KB Flash
- 16kB RAM
- Up to 34 GPIOs
- Analog mixed signal
- Precise timer/PWM
- Rich communication feature
- Application-specific peripherals (BCCU, LEDTS)
- Operating voltage 1.8 to 5.5 V
- Operating temperature: up to 105°C $T_{Ambient}$

Target Application:

- Motor drive and control (e.g. stepper, BLDC)
- Digital power conversion (UPS, SMPS, inverter)
- LED lighting & displays
- Touch control
- Smart sensors
- General purpose devices

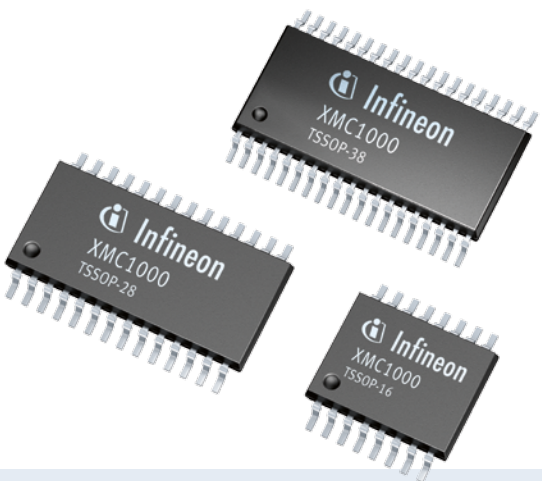
The XMC1000 product family integrates the ARM® Cortex™-M0 processor into a leading-edge manufacturing process to overcome the limitations of today's 8-bit designs. The XMC1000 is a full member of the XMC portfolio which was introduced in early 2012, and uses common peripherals such as timer/ PWMs, analog-to-digital converters or peripherals for serial communication, as is the case with XMC4000 products.

XMC1000 offers up to 200kB Flash memory starting from 8kB combined with 16kB RAM. Three product series (XMC1100, XMC1200, XMC1300) cover different markets while offering application-specific features such as a BCCU (Brightness and Color Control Unit) for PDM LED control (Pulse Density Modulation), CORDIC (64MHz vector co-processor), CCU (Capture Compare Unit with up to 64MHz), MATH co-processor (CORDIC, 64MHz vector co-processing).

- XMC1100 series – easy entry into XMC world starting from €0.25 at higher volume
- XMC1200 series – peripherals for LED lighting and HMI
- XMC1300 series – addresses the needs of real-time control applications in the fields of motor control or digital power conversion

Package:

- TSSOP-16
- TSSOP-28
- TSSOP-38
- VQFN-24
- VQFN-40



www.infineon.com/xmc1000

XMC4000 Family – 32-bit Real-time Performance for your Application

XMC4000 family powered by ARM® Cortex-M4 with MPU, DMA, DSP and FPU

Main Features:

- Up to 120MHz CPU
- Up to 12ch DMA, 8ch MPU
- Up to 1 MB Flash with ECC and 22ns access time
- Up to 160kB RAM with 4kB Cache
- ADC with up to 4Mega Samples
- Precision Timer/PWM (up to 120MHz)
- Rich communication features
- Up to 91 GPIOs
- Application specific peripherals (DSD, HRPWM, DAC, EBU)
- Operating Temperature up to 125°C

Target Application:

- Motor Drives and Control (Stepper, BLDC, PMSM)
- Digital Power Conversion (UPS, SMPS, Inverter)
- Position Detection
- Programmable Logic Control (PLC)
- IO Devices
- Human Machine Interface (HMI)
- Communication & Networking

The XMC4000 family marks a cornerstone in microcontroller design. Infineon combines its leading-edge peripheral set with an industry-standard ARM® Cortex™-M4 processor. The advanced and configurable peripherals are designed to offload the CPU and support process parallelization – needed for PMSM motor control, for example. XMC4000 family members can operate at up to 125°C and provide advanced built-in safety as well as integrity and security features. XMC4000 offers 64kB, up to 1MB Flash memory and 20kB to 160kB RAM. Four product series offer application-specific features such as a Delta-Sigma Demodulator (DSD), high resolution PWM (HRPWM, 150ps), Capture Compare Unit (CCU, up to 120MHz), Ethernet, CAN, USB, SD card interface and external bus unit / interface.

- XMC4100 series – entry level into XMC4000 world, starting from VQFN-48,
- 80MHz, 64kB Flash, 20kB RAM offering CAN, USB and 12-bit DAC
- XMC4200 series – more memory and also HRPWM (up to 150ps) for efficient power conversion
- XMC4400 series – up to 100pins, 120MHz, 512kB Flash, 80kB RAM with
- 4kB cache and delta-sigma-(ΔΣ)-modulator in addition
- XMC4500 series – high end, up to 144pins, 120MHz, 1MB Flash, 160kB RAM with 4kB cache and more communication features

Package:

- VQFN-48
- LFBGA-144
- LQFP-64
- LQFP-100
- LQFP-144

www.infineon.com/xmc4000

Ecosystem and Third Party Landscape

Well established ARM® Ecsoystem teaming up with Infineon's DAVE™

Main Features:

- Free DAVE™ Eclipse-based IDE using GNU Compiler
- Open to third party tools
- Free IEC 60730 Class B-compliant software library approved by VDE
- MISRA and CMSIS compliance
- DAVE™ APPs – predefined and intuitive software / application components which developer can use and customize for their applications

Third Parties and Partners:

- ARM/KEIL
- Altium
- Atollic
- CMX Systems
- emtas
- Expresslogic
- FreeRTOS
- Hcc embedded
- HI LO Systems
- HITEX
- IAR System
- iSystem
- Lauterbach
- Micrium
- Port
- PLS Development Tools
- Rowley
- SEGGER
- SevenStax
- Thesycon
- XELTEK
- and more

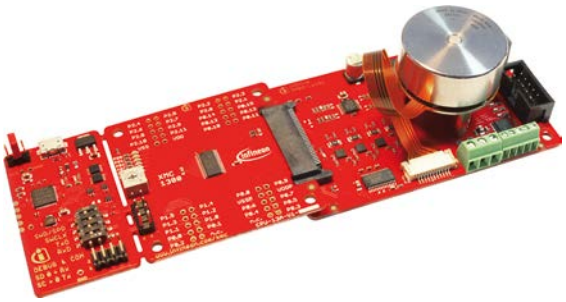
www.infineon.com/xmc-dev

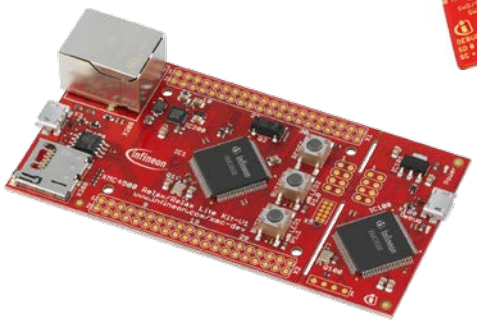
The XMC1000 and XMC4000 families form the basis of today's XMC portfolio with more than 100 devices fully supported by the free DAVE™ Integrated Development Environment (IDE) and the wide ARM Ecosystem.

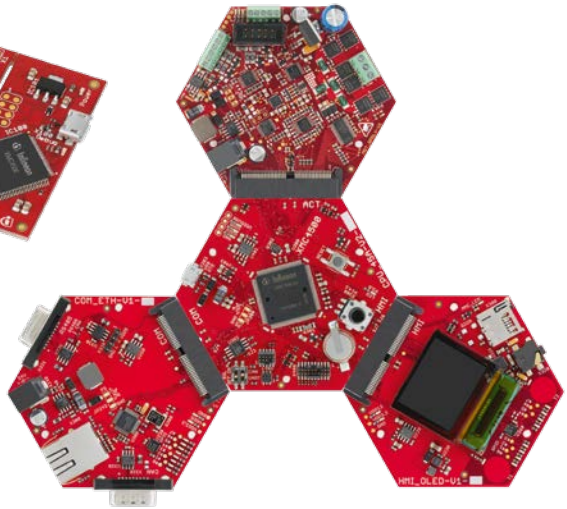
The DAVE™ IDE and DAVE™ Apps are available free of charge including example codes and documentation to simplify and speed up the development process for ease-of-use and shorter time-to-market.

Links:

- www.infineon.com/XMC
- www.infineon.com/XMC1000
- www.infineon.com/XMC4000
- www.infineon.com/DAVE
- www.infineon.com/IEC60730







AURIX™ Family

Combining safety and performance: Infineon introduces the automotive multicore 32-bit microcontroller family AURIX™ to meet the safety and performance requirements of upcoming vehicle generations

Main Features:

- Scalable MCU family from single- to multi-core, offering best in class performance
- Scalability over Flash, RAM and peripherals, offering the best cost-performance ratio
- Latest connectivity: CAN, CAN FD, LIN, SPI, FlexRay, Ethernet
- Dedicated RADAR and vision peripherals
- High temperature variants for HOT applications

Key Benefits:

- Proven safety concept to support ISO 26262
- Innovative supply concept for best-in-class power consumption
- Enables pretended networking and ECU degradation
- High integration for significant cost savings
- High integration for reduced complexity

AURIX™ is Infineon's brand new family of microcontrollers designed for the needs of construction and agricultural vehicles.

Innovation has been focused on system partitioning in order to further integrate system functionality for reduced complexity and area, providing our customers with highly optimized solutions.

All devices have been designed in accordance with the ISO 26262 safety standard to achieve a safety level up to ASIL D/SIL 3.

www.infineon.com/aurix

	TQFP-80	TQFP-100	LQFP-144 TQFP-144	LQFP-176	LFBGA-292	LBGA-416	LFBGA-516
9x Series up to 8MB Triple-Core					TC297	TC298	TC299
7x Series up to 4MB Triple-Core				TC275	TC277		
6x Series up to 2.5MB Dual-Core			TC264	TC265	TC267		
4x Series up to 2MB Single-Core			TC244				
3x Series up to 2MB Lockstep-Core		TC233	TC234		TC237		
2x Series up to 1MB Lockstep-Core	TC222	TC223	TC224				
1x Series up to 512KB Lockstep-Core	TC212	TC213	TC214				

Upgrade/Downgrade with pin-compatible packages

Highly accurate and robust Magnetic Speed Sensors

Two-wire speed sensor family for outstanding accuracy, reliability and robustness

Main Features:

- Detection of rotation direction
- Excellent vibration suppression
- Option to use innovative iBB package solution

Key Benefits:

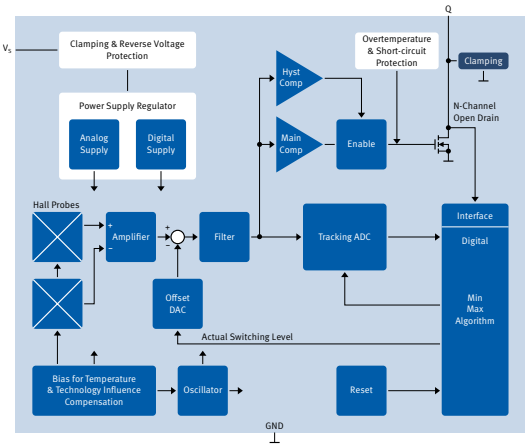
Greater robustness against vibrations

- Highly accurate speed measurements from 1 Hz to 12 kHz over large operating air gaps
- Broad operating temperature range
- High EMC robustness
- Reverse polarity protection

AEC Qualified

Highly accurate and robust speed sensors

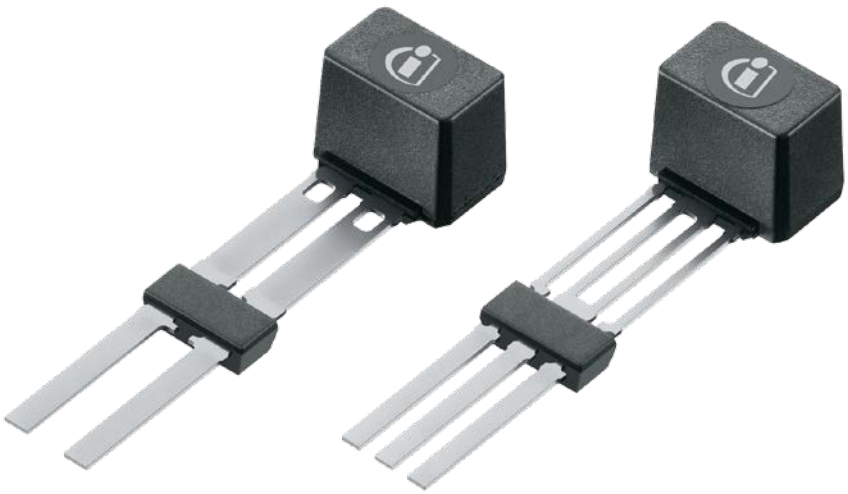
Our differential Hall sensor families TLE4957C(B) and TLE4951/54C(B) are the ideal choice for designers who need a robust speed sensor with high accuracy, good air gap performance and vibration robustness. All devices in these families provide precise switching algorithms, dynamic self-calibration and excellent jitter and sensitivity levels, thus ensuring accurate speed measurements for both fine and coarse target wheels in the harshest of environments. All of our sensors are designed to measure speed over a broad frequency range and come with sophisticated protective functionality. The TLE4957 family is a three-wire sensor with a voltage interface and is available with adaptive hidden or adaptive visible hysteresis. The TLE4951/54 family is a two-wire sensor with a current interface. In addition, TLE4954 provides direction information in four different protocol options. All sensors in the TLE4957, TLE4951 and TLE4954 families are available in our innovative iBB package and are ideal for industrial and automotive speed sensing applications.



www.infineon.com/magnetic-sensors

	Icon/ Description	TLE4921	TLE4924	TLE4926	TLE4927	TLE4928	TLE4941 plusC	TLE4942	TLE4951[3]	TLE4953	TLE4954[3]	TLE4957	TLE5025	TLE5027
Automotive	Wheel speed						Yes	Yes						
	Camshaft		Yes		Yes								Yes	
	Crankshaft	Yes	Yes	Yes	Yes	Yes						Yes	Yes	Yes
	Transmission	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industrial		Yes	Yes		Yes				Yes		Yes	Yes		
Sensor technology		Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	Diff. Hall	iGMR	iGMR
Improved air gap/jitter performance													Yes	Yes
Direction information available								Yes	Yes	Yes	Yes			Yes
vibration suppression algorithm Incl.									Yes	Yes	Yes	Yes		
Type of hysteresis[1]		V	V	H	H	H	H	H	V	V	V	V/H	H	H
		F	A/F	F	A	F	F	F	A	A	A	A	A	A
Interface[2]	# of pins	4	3	3	3	3	2	2	2	2	2	3	3	3
	Interface	V	V	V	V	V	C	C	C	C	C	V	V	V
	Protocol	S	S	S	S	S	S	P	P	P	P	S	S	P
Package without integrated capacitor		Yes				Yes				Yes				
Package with integrated capacitor			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
iBB-Package			Yes		Yes		Yes		Yes		Yes	Yes		

[1] H = Hidden; V = Visible; F = Fixed; A = Adaptive; P = Programmable | [2] C = Current; V = Voltage interface; S = Single pulse; P = PWM protocol; A = AK protocol | [3] Coming soon



Angle Sensors

iGMR and iAMR Sensors

Main Features:

- Integrated GMR (iGMR) technology
- Full 0° to 360° angle measurement
- Pre-calibrated sensors
- High angle resolution
- Fast update rates
- Multiple interfaces available
  - SPI-compatible synchronous serial communication (SSC). Bidirectional up to 8Mbit/s
  - Pulse Width Modulation (PWM)
  - Hall Switch Mode (HSM) for motor commutation
  - Incremental interface (IIF)
  - Analog differential or single-ended
- Integrated angle calculation with CORDIC algorithm
- Temperature compensation and auto-calibration algorithm
- Diagnoses function for sensor elements and circuitry with PRO-SIL™ support
- Automotive-qualified: -40 ... 150°C (junction temperature)
- ESD > 2kV (HBM)
- Green package with lead-free (Pb-free) plating

Key Benefits:

TLE5012B Rotor Position Sensing

- Up to 15-bit resolution
- Absolute position 0°-360°
- Fast update rates
- Short signal delay times
- Multiple selectable interfaces

AEC Qualified iGMR iAMR

www.infineon.com/angle-sensors

iGMR Sensors

Infineon's iGMR sensors are the ideal choices for applications with a wide angle range, such as BLDC motor or steering sensors. The sensors are pre-calibrated and ready to use. A different level of signal-processing integration allows the optimization of system partitioning.

iAMR Sensors

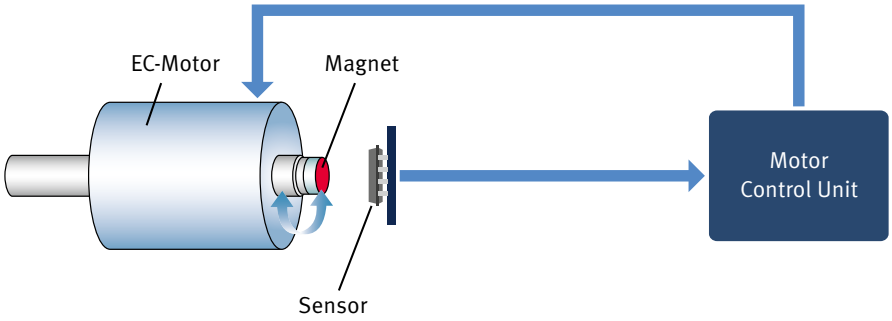
Infineon's iAMR sensors are particularly well suited for applications with a small angle range, such as wipers, pedals and flaps. Their excellent accuracy can also be beneficial to some BLDC applications where 180° information is sufficient.

Applications

- Steering angle
- Brushless DC motor commutation (e.g. Electric Power Steering (EPS))
- Rotary switch
- General angular sensing
- Incremental or absolute magnetic encoder
- Contactless angle measurement
- Wiper positioning
- Rotational position measurement

Product Type	Sin/Cos Output	Angle Output	Second Interface	Accuracy
TLE5009	Analog			2.3°
TLE5011	SPC (SPI)			1.6°
TLE5012B	SPC (SPI)	SPC (SPI)	PWM/IIF/SPC/HCM	1.0°

TLE5012B acting as rotor position sensor



Linear Hall sensors

High-precision linear Hall sensors for current sensing

Main Features:

TLE4998x family

- Fully digital signal processing up to 20 bit on-chip
- Active on-chip Hall probe stress compensation

TLE4997

- Low ratio-metric error, low integral & excellent differential nonlinearity

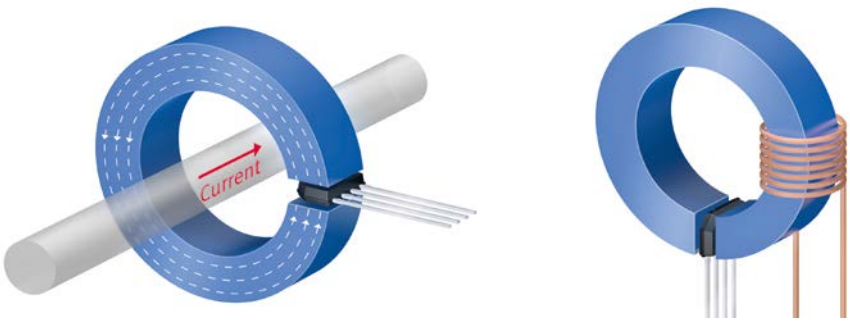
Key Benefits:

Best-in-class accuracy with low drift of output signal over temperature and lifetime (including stress compensation in TLE4998)

- Programmable transfer function (gain, offset), clamping, bandwidth and temperature characteristics
- Broad range of interfaces (analog, PWM, SENT and SPC) and especially thin packages (SMD and leaded) available
- High reliability of sensors due to proven automotive zero-defect program

AEC Qualified

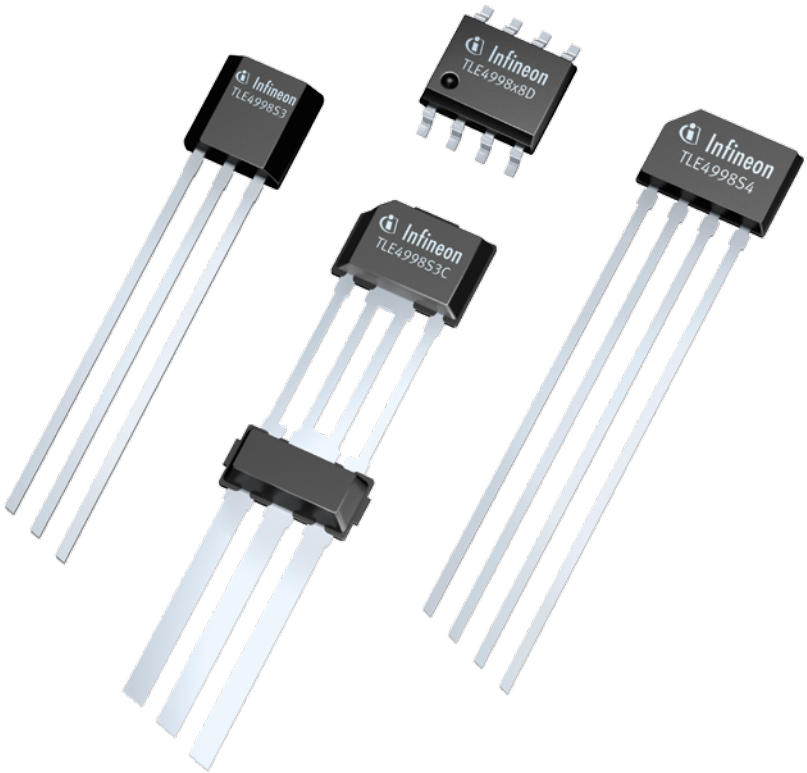
Our TLE4997/98 family of linear Hall ICs is tailored to the needs of highly accurate angular and linear position detection and current measurement applications. Each product measures the vertical component of a magnetic field and outputs a signal that is directly proportional to the magnetic field. Thanks to digital signal processing based on a 20-bit DSP architecture plus digital temperature compensation, these sensors deliver outstanding temperature stability compared with similar compensation methods. The TLE4998x products also come with a stress compensation feature to extend stability over lifetime and significantly reduce performance degradation. The TLE4997/98 family offers a broad range of packages (including leaded and SMD options) and interface variants, giving engineers a large degree of design flexibility.



Flux concentrator (blue) surrounding the conductor. A Hall sensor is inserted in the air gap (left). The flux can be further boosted by using multiple windings on the principal conductor (right).

www.infineon.com/linear-hall

Product program	Memory	Number of pins	Magnetic sensitivity	Offset	Supply voltage (extended range)	ATV	Industrial	Package
TLE4997	EEPROM	3	±12.5 to ±300 mV/mT	< ±400 µT	5V ±10 % (7 V)	•	•	PG-SSO-3-10 PG-TDSO-8
TLE4998P	EEPROM	3	±0.2 to ±6 %/mT	< ±400 µT	5V ±10 % (16 V)	•	•	PG-SSO-3-10 PG-SSO-4-1 PG-SSO-3-9 (2 capacitors) PG-TDSO-8
TLE4998S	EEPROM	3	±8.2 to ±245 LSB/mT	< ±400 µT	5V ±10 % (16 V)	•	•	PG-SSO-3-10 PG-SSO-4-1 PG-SSO-3-9 (2 capacitors) PG-TDSO-8
TLE4998C	EEPROM	3	±8.2 to ±245 LSB/mT	< ±400 µT	5V ±10 % (16 V)	•	•	PG-SSO-3-10 PG-SSO-4-1 PG-SSO-3-9 (2 capacitors) PG-TDSO-8



Integrated Pressure Sensor ICs

High Performance Pressure Sensors (MAP+TurboMAP/BAP/Digital BAP)

Main Features:

KP25x SPI Digital Barometric Air Pressure Sensor IC Family SPI – digital interface

- Absolute air pressure measurement
- Excellent accuracy of 1.0kPa over a large temperature range
- Output signal fully compensated across pressure and temperature ranges
- Pressure range from 40 to 165kPa
- Temperature range -40 ... 125°C
- Self-diagnosis routines & diagnosis codes
- Reverse polarity protection
- Diagnosis checks during operation

Key Benefits:

- Fully calibrated Green SMD housing for standard re-flow soldering

AEC Qualified

Our integrated pressure sensor family uses unique multiple surface micro-machined capacitive sensor cell arrays that support powerful self-diagnosis features, such as the mechanical and electrical verification of sensor functionality. Monolithic integration onto a single chip enables state-of-the-art production using a standard automotive-qualified BiCMOS process. Sophisticated sensor cell design combined with fully digital signal conditioning and processing based on high-volume production flows ensures superior quality over the entire lifecycle.

Our digital interface portfolio ranges from PSI5 for safety products (such as side crash detection and pedestrian protection systems) to SPI for automotive powertrain and body applications (such as Barometric Air Pressure (BAP), fuel vapor and seat comfort systems) all the way up to I^2C and SENT with SPC functionality for upcoming engine management products (such as MAP, Turbo MAP (with NTC) and secondary air valves).

Key Applications

- BAP
- Seat comfort systems
- Fuel vapor
- Idle stop

www.infineon.com/pressure

Product Type	Pressure Range [kPa]	Max. Accuracy [kPa]	Max. Operating Temperature [°C]
KP23x	40–115	1.0	125
KP236N6165	60–165	1.0	125
KP21x	10–115	1.0	140
KP22x	10–400	2.5	140
KP253	60–165	1.0	125
KP254	40–115	1.5	125
KP256	60–165	1.0	125

KP21x/KP22x
Analog Manifold Air Pressure Sensor IC Family (MAP + Turbo MAP)

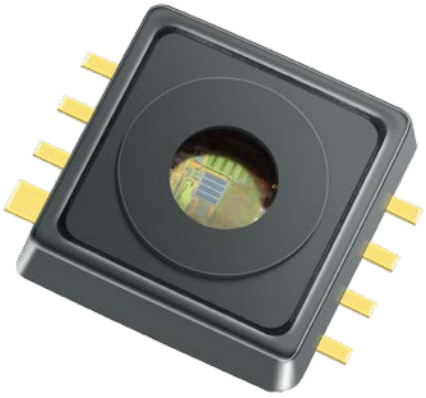
Main Features

- Manifold air pressure measurement – MAP and Turbo MAP
- Excellent accuracy of up to 1.0kPa over a large temperature range
- Ratiometric analog voltage output proportional to the applied pressure
- Output signal fully compensated across pressure and temperature ranges
- Pressure range from 10 to 400kPa
- Temperature range from -40 ... 140°C
- Output clamping (optional)
- Complete product family available with multiple transfer function
- Reverse polarity protection

KP23x
Analog Barometric Air Pressure (BAP) Sensor IC Family

Main Features

- Absolute air pressure measurement
- Excellent accuracy of 1.0kPa over a large temperature range
- Ratiometric analog voltage output proportional to the applied pressure
- Output signal fully compensated across pressure and temperature ranges
- Pressure range from 40 to 115kPa
- Temperature range from -40 ... 125°C
- Serial service interface
- Open Bond Detection for supply and GND (OBD)
- Self-diagnosis routines
- Inverse polarity protection



IPOSIM

Infineon POwer SIMulation

The Infineon POwer SIMulation (IPOSIM) program is designed to help customers select the right Infineon bipolar products for their rectifier (B2, B6, M3.2 and M6) or AC switch (W1C and W3C) applications. It also helps engineers select suitable IGBT modules for inverter (single- & three-phase in 2-level as well as 3-level) or DC converter (buck and boost) applications.

IPOSIM calculates switching and conduction losses for active components in power semiconductor modules by taking into account static and dynamic module parameters as well as thermal ratings. Cooling conditions are custom-specified, but default values are also available. Junction temperatures as a result of applied loads for specific inverter operation points are calculated. IPOSIM also runs calculations for complete load cycles. Results are shown in tables and plotted as charts. Both can be saved for later review or printed as PDF files. For optimum accuracy and convenience, different control algorithms can be applied.

IPOSIM is quick and easy to use, enabling each engineer to select the best Infineon product for their application, also working out the applicable semiconductor power losses to establish the expected service life.

Visit the website and run a sample calculation yourself.

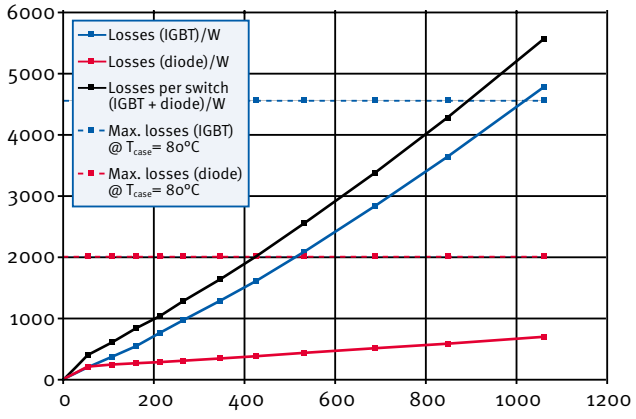
web.transim.com/Infineon-IPOSIM

IPOSIM calculation results

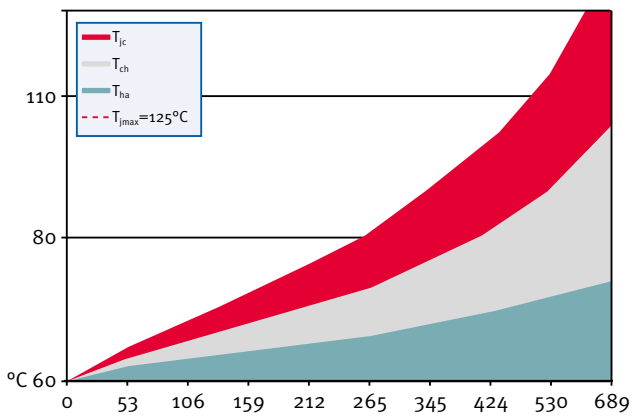
Selected module IHV 6.5 kV 140x190	FZ750R65KE3
Input	
DC link voltage Vdc	3600 V
Frequency f_0	50 Hz
Switching frequency f_s	400 Hz
Modulation factor m	1
Cos φ	1
Operation point current Irms	600 A
Thermal input	
Max. junction temperature T_j	125°C
Max. ambient temperature T_a	60°C
Rth heat sink per arm	0,006 K/W

Losses at 600 A	IGBT	Diodes
Static losses	859 W	74 W
Dynamic losses	1541 W	405 W
Total losses	2400 W	478 W
Temperatures at 600 A	**IGBT**	**ripple Δ T_j [K]**
T_{jmax}	122.3° C	
T_{jmin}	116.7° C	5,5 K
T_c	98.6° C	
T_{hs}	77.4° C	

IGBT power simulation



Average losses for sinusoidal output current at 400 Hz switching frequency



Temperature distribution across IGBT junction-to-case, case-to-heat sink and heat sink-to-ambient for Ta = 60° C and a given heat sink

Ask Infineon. Get connected with the answers.

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