Automotive Electronics

Semiconductors and sensors
Product overview 2011

Spring 2011 edition

BOSCH
Invented for life

Components for **vehicle electronics**

Bosch Automotive Electronics (AE) – headquartered in Reutlingen, Germany – is the largest manufacturer of micromechanical products and one of the largest automotive semiconductor manufacturers in Europe. We are the undisputed market leader for automotive MEMS (Micro-Electro-Mechanical Systems) sensors. We design, manufacture and sell sensors, ASICs, ASSPs and power semiconductors, based on experience in automotive electronics components of more than 40 years. With sales and application forces located in Europe, North America, Japan, China, and South Korea, we offer worldwide customer support. In addition to the Bosch Group itself, our customer base includes many well-known ECU makers in the Automotive sector.

The division Automotive Electronics is the competence center for electronics within Bosch. For more than 40 years, we have designed and manufactured a wide range of automotive specific semiconductors and sensors.

Combustion engines of today and tomorrow are expected to be clean, economical, and have high-performance. Also, modern vehicle electronics should protect the driver and passengers in the best way possible.

Our devices address the two major aspects in automobile electronics:
- Safety

and
- Clean and economical driving.

Our products for passenger safety include components for airbag systems, Vehicle Dynamics Control VDC, active suspension, Electric Power Steering EPS, in-vehicle communication, and IP modules.

Our product range for clean and economical driving includes system components for engine management, transmission control, alternator electronics, and IP modules. The newest products in our portfolio are power modules for electric drives. Over the next few years, this new product area will be continuously expanded.

Your advantage as our customer:

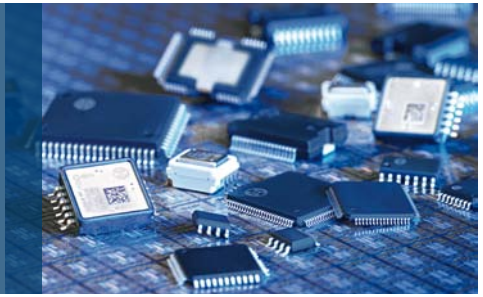
- Semiconductors, sensors, and IP modules, developed and thoroughly tested by Bosch, one of the driving forces within the automotive world.
- Innovative products
- Robustness and reliability
- Best quality
- Long availability

This brochure lists all the devices that we currently sell.

For your convenience, all new products are marked accordingly.

More product details can be found on our websites:
www.bosch-semiconductors.com
www.bosch-sensors.com.

Content



safe

clean & economical

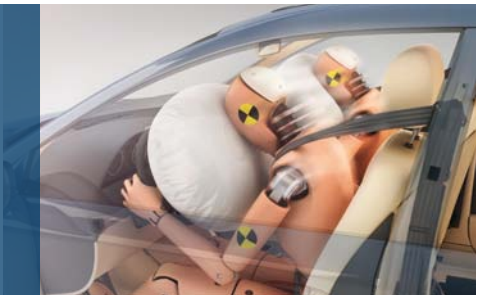
Airbag systems:
Single-chip airbag system ICs

Compact airbag ECUs are now possible by using fully integrated airbag system ICs. The only other active components required are a microcontroller and an on-board acceleration sensor.

Application	Product	V_{DD} typ. [V]	V_{VAS} typ. [V]	V_{VZP} typ. [V]	V_{VER} typ. [V]	Peripheral sensor interfaces	Analog interfaces	Interfaces	Firing loops	Features	T_j min. [°C]	T_j max. [°C]	Package
Single-chip integrated airbag system	CG101	3.3 + 5	6.7	14	24.4 or 33 (programmable)	n/a	2 x AIN 2 x AIO	SPI, 16 bit (3.3V), K-Line/LIN	4 x 1.2A or 1.75A	• Sophisticated safety concept: safety controller; 3 watchdogs • Integrated monitoring of voltages and overtemperature • Support of sensor test, C_{ER} diagnosis, polarity protection test and squib diagnosis • 7bit firing current counter	-40	150	LQFP100
Single-chip integrated airbag system	CG102	3.3 + 5	6.7	14	24.4 or 33 (programmable)	2 x PSI5a	4 x AIN 2 x AIO	SPI, 16 bit (3.3V), K-Line/LIN	8 x 1.2A or 1.75A	• Sophisticated safety concept: safety controller; 3 watchdogs • Integrated monitoring of voltages and overtemperature • Support of sensor test, C_{ER} diagnosis, polarity protection test and squib diagnosis • 7bit firing current counter	-40	150	LQFP100
Single-chip integrated airbag system	CG103	3.3 + 5	6.7	14	24.4 or 33 (programmable)	4 x PSI5a	6 x AIN 2 x AIO	SPI, 16 bit (3.3V), K-Line/LIN	12 x 1.2A or 1.75A	• Sophisticated safety concept: safety controller; 3 watchdogs • Integrated monitoring of voltages and overtemperature • Support of sensor test, C_{ER} diagnosis, polarity protection test and squib diagnosis • 7bit firing current counter	-40	150	LQFP100
Single-chip integrated airbag system	CG108	3.3 + 5	6.7	14	24.4 or 33 (programmable)	2 x PSI5a	4 x AIN 2 x AIO	SPI, 16 bit (3.3V), K-Line/LIN	6 x 1.5A or 2.0A	• Sophisticated safety concept: safety controller; 3 watchdogs • Integrated monitoring of voltages and overtemperature • Support of sensor test, C_{ER} diagnosis, polarity protection test and squib diagnosis • 2 independent 7bit firing current counters per channel • PWM controlled GPIO • Special firing modes	-40	150	LQFP100
Single-chip integrated airbag system	CG109	3.3 + 5	6.7	14	24.4 or 33 (programmable)	4 x PSI5a	6 x AIN 2 x AIO	SPI, 16 bit (3.3V), K-Line/LIN	10 x 1.5A or 2.0A	• Sophisticated safety concept: safety controller; 3 watchdogs • Integrated monitoring of voltages and overtemperature • Support of sensor test, C_{ER} diagnosis, polarity protection test and squib diagnosis • 2 independent 7bit firing current counters per channel • PWM controlled GPIO • Special firing modes	-40	150	LQFP100
New Single-chip integrated airbag system	CG147	enhanced 3.3 + 5	6.7	14	24.4 or 33 (programmable)	4 x PSI5 (V1.2)	6 x AIN 2 x AIO	SPI, 16 bit (3.3V), K-Line/LIN	12 x 1.5A or 2.0A	• Sophisticated safety concept: safety controller; 3 watchdogs • Integrated monitoring of voltages and overtemperature • Support of sensor test, C_{ER} diagnosis, polarity protection test and squib diagnosis • 2 independent 7bit firing current counters per channel • PWM controlled GPIO • Special firing modes • Enhanced safety concept 16..64 bit data words possible	-40	150	TQFP100ePad
Companion Chip for integrated airbag system ICs	CG143	enhanced 3.3 + 5	6.7	14	24.4 or 33 (programmable)	6 x PSI5a	6 x AIN 2 x AIO	SPI, 16 bit (3.3V), K-Line/LIN	12 x 1.2A or 1.75A	• Sophisticated safety concept: ECLK-watchdog • Integrated monitoring of voltages and overtemperature • C_{ER} diagnosis, polarity protection test and squib diagnosis • 7bit firing current counter • PWM controlled GPIO	-40	150	LQFP100

PSI = Peripheral Sensor Interface Bus
SPI = Synchronous Serial Peripheral Interface
C_{ER} = Energy reserve capacitor
V_{VZP} = Supply voltage
V_{DD} = System supply

Airbag systems:
System supply ICs, safety controllers



Airbag system supply ICs combine power supply with various input and output control functions and sensor interfaces.

Application	Product	V_{bat} typ. [V]	Interfaces	Supply voltages	Analog interfaces	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
System supply IC for airbag systems	CG680	14	1 x SPI, 8 bit (5V) 2 x COM (K-Line) 2 x PAS2	Energy reserve: 25/45 V System: 4.8 V	• 6 AI-interfaces for interior sensing • 2 x test current sources for one external seat occupancy detector	• 2 x warning lamp drivers	• Over/under voltage reset • Window watchdog • Extensive diagnosis functionality • Support of C_{ER} diagnosis	-40	150	PLCC44
System supply IC for airbag systems	CG683	14	1 x SPI, 8 bit/16 bit (5V) 2 x COM (K-Line) 2 x PAS3	Energy reserve: 25/45 V System: 4.8 V	• 5 AI-interfaces for interior sensing • 2 x test current sources for one external seat occupancy detector	• 2 x warning lamp drivers	• Over/under voltage reset • Window watchdog • Extensive diagnosis functionality • Support of C_{ER} diagnosis • EMC optimized supply	-40	150	PLCC44

Safety controllers are cost attractive alternatives to secondary airbag CPUs.

Application	Product	V_{DD} typ. [V]	V_{PAS} typ. [V]	V_{VZP} typ. [V]	V_{VER} typ. [V]	Peripheral sensor interfaces	Analog interfaces	Disable outputs	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
Airbag safety controller and PAS interface	CG975	3.3 + 4.9	8.7	14	33	3 x PAS3/PAS4	8 x AIO	2 x general disable, up to 5 special disable	SPI, 16bit	• Integrated safety controller • 3 watchdogs • Integrated voltage monitoring • Support of sensor test	-40	150	LQFP44

PAS = Peripheral Airbag Sensor Interface
C_{ER} = Energy reserve capacitor
SPI = Synchronous Serial Peripheral Interface
V_{DD} = System supply
V_{VZP} = Supply voltage
V_{VER} = Energy reserve voltage

Airbag systems:
Firing loop drivers

All CG98x carry a superior safety concept: The IC is bared in case of no supply voltage.
Integrated cross coupling ensures secure firing. Dedicated groups of firing loops can be disabled.

Application	Product	V_{DD} typ. [V]	V_{VER} typ. [V]	Interfaces	Firing loops	Features	Diagnostics	T_j min. [°C]	T_j max. [°C]	Package
Firing Loop IC	CG685	4.8	25	SPI, 8 bit (5V)	4 x 1.75A	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring	-40	150	SOIC24w
Firing Loop IC	CG687	4.8	25	SPI, 8 bit (5V)	2 x 1.75A	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring	-40	150	SOIC24w
Firing Loop IC	CG983	3.3 + 4.9	25 or 33	SPI, 16 bit (3.3 V or 4.9 V)	4 x 1.75A	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing current counter	-40	150	LQFP44
Firing Loop IC	CG984	3.3 + 4.9	25 or 33	SPI, 16 bit (3.3 V or 4.9 V)	4 x 2.0A dual firing mode	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing current counter	-40	150	LQFP44
Firing Loop IC	CG985	3.3 + 4.9	25 or 33	SPI, 16 bit (3.3 V or 4.9 V)	4 x 1.2A or 1.75A (programmable)	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing current counter	-40	150	LQFP44
Firing Loop IC	CG987	3.3 + 4.9	25 or 33	SPI, 16 bit (3.3 V or 4.9 V)	8 x 2.0A	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing current counter	-40	150	LQFP44
Firing Loop IC	CG988	3.3 + 4.9	25 or 33	SPI, 16 bit (3.3 V or 4.9 V)	8 x 2.0A dual firing mode	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing current counter	-40	150	LQFP44
Firing Loop IC	CG989	3.3 + 4.9	25 or 33	SPI, 16 bit (3.3 V or 4.9 V)	8 x 1.2A or 1.75A (programmable)	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing current counter	-40	150	LQFP44

V_{DD} = System supply V_{VER} = Energy reserve voltage SPI = Synchronous Serial Peripheral Interface

Airbag systems: Sensor interfaces

Sensor interfaces connect peripheral sensors to the ECU. They combine sensor supply and digital communication. Suitable acceleration and pressure sensors with digital PAS interface are described on pages 8 and 9.

Application	Product	V_{DD} typ. [V]	V_{VZP} typ. [V]	V_{VER} typ. [V]	V_{PASOx} typ. [V]	Peripheral sensor interfaces	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
Dual peripheral sensor interface	CG570	4.8	14	33	8.7	2 x PAS3	SPI, 8 bit/ 16 bit (5 V)	• Integrated voltage monitoring • Support of sensor test	-40	150	SOIC16w
Triple peripheral sensor interface	CG974	3.3 + 4.9	14	33	8.7	3 x PAS3/PAS4	SPI, 16 bit (3.3 or 4.9 V)	• Integrated voltage monitoring • Support of sensor test • Support of SID coding	-40	150	SOIC24w

Matrix ICs for seat mats with resistive elements provide information about the passenger weight and help the system to decide for appropriate action.

Application	Product	V_{DD} typ. [V]	Inputs	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
OC-sensor IC for FSR seat matrix	CG642	5	23 x low current 2 x high current	SPI K-Line	• SPI controlled multiplexer • Analog out for voltage and current measurement result • Window watchdog • Overvoltage protection	-40	150	PLCC44

V_{DD} = System supply
V_{VZP} = Protected supply voltage
V_{VER} = Energy reserve voltage
V_{PASOx} = Sensor supply voltage
PAS = Peripheral Airbag Sensor Interface
SPI = Synchronous Serial Peripheral Interface

Airbag systems:
Peripheral sensor devices

In cases of head-on or side collisions, fractions of a second are decisive for deploying the airbags at the correct instant. Our peripheral sensors are fitted in the side and front areas of the vehicle and supply valuable data within the shortest possible time to the central airbag control unit for a decision to deploy. Suitable sensor interface ASICs with PAS interface are described on page 7.

Application	Product	Range	Output	Sensitivity Δp/p [LSB/%]	Tolerance [%]	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
Peripheral pressure sensor	PPS2	Absolute pressure measurement range: p_abs 50 kPa...126.5 kPa Relative pressure p_rel measurement range with ref. to p_abs: -5 %...+15 %	PSI5, 10 bit Resolution abs. pressure p_abs: 12 bit (mapped into 10 bit words) Resolution of relative pressure: 10 bit	20.48	p_abs: 3.5 kPa (4.58 % of FS) p_rel: 7 % (for p_abs ≥ 70 kPa), 10 % (for p_abs < 70 kPa)	6.4	-40	85	Customer specific

Application	Product	Range [g]	Output	Sensitivity [LSB/g]	Tolerance [%]	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
Peripheral acceleration sensor	PAS4	50 / 100	PAS4, 8 bit	1 / 2	≤ 9	5-11	-40	85	Customer specific
Peripheral acceleration sensor	UFS2	200	PAS4, 8 bit	0.5	≤ 15	5-11	-40	120	Customer specific

LSB = Least significant bit
PPS = Peripheral Pressure Sensor
PAS = Peripheral Airbag Sensor Interface

Airbag systems:
Acceleration sensors

In case of an accident, MEMS acceleration sensors securely detect crash situations.
They are available in various sensitivity ranges and with either analog or digital output.
Suitable sensor interface ASICs with PAS interface are described on page 7 and PSI5 receivers on page 15.

Single axis acceleration sensors

Type	Product	Range [g]	Output	Sensitivity	Tolerance [%]	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
Single axis, x	SMB253	±50	Analog	38.5 mV/g	5	5	-40	95	SOIC16w
Single axis, x	SMB256	±100	Analog	19.25 mV/g	5	5	-40	95	SOIC16w
Single axis, x	SMB257	±140	Analog	13.75 mV/g	5	5	-40	95	SOIC16w
Single axis, x	SMB180	±100	PAS4, 8 bit	1 LSB/g	9	5-11	-40	85	SOIC16w
Single axis, x	SMB190	±200	PAS4, 8 bit	0.5 LSB/g	15	5-11	-40	120	SOIC16w
Single axis, x	SMB455	±25/35/50/70	SPI, 10 bit	18.2/13/9.1/6.5 LSB/g	5	3.3	-40	105	SOIC14n
Single axis, y	SMB482	±120/240	PSI5, 10 bit	4/2 LSB/g	7	5-11	-40	125	SOIC14n
Single axis, x	SMB483	±120/240	PSI5, 10 bit	4/2 LSB/g	7	5-11	-40	125	SOIC14n
Single axis, y	SMB492	±480	PSI5, 10 bit	1 LSB/g	7	5-11	-40	125	SOIC14n
Single axis, x	SMB493	±480	PSI5, 10 bit	1 LSB/g	7	5-11	-40	125	SOIC14n

Dual axis acceleration sensors

Type	Product	Range [g]	Output	Sensitivity	Tolerance [%]	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
Dual axis, x/y	SMB262	±35	Analog	55 mV/g	5	5	-40	95	SOIC16w
Dual axis, x/y	SMB263	±50	Analog	38.5 mV/g	5	5	-40	95	SOIC16w
Dual axis, x/y	SMB266	±100/50	Analog	19.25/38.5 mV/g	5	5	-40	95	SOIC16w
Dual axis, x/z	SMB200	±4.8	SPI, 10 bit	100 LSB/g	9	3.3 or 5	-40	105	SOIC16w
Dual axis, x/y	SMB460	±96	SPI, 10 bit	5 LSB/g	5	3.3	-40	105	SOIC16w
Dual axis, x/y	SMB461	±50	SPI, 10 bit	9.1 LSB/g	5	3.3	-40	105	SOIC14n
Dual axis, x/y	SMB465	±25/35/50/70	SPI, 10 bit	18.2/13/9.1/6.5 LSB/g	5	3.3	-40	105	SOIC14n
New Dual axis, x/y	SMA560	±35/48/70/96	SPI, 10 bit	5/6.75/10/13.5 LSB/g	5	3.3 or 5	-40	105	SOIC8

PAS = Peripheral Airbag Sensor Interface

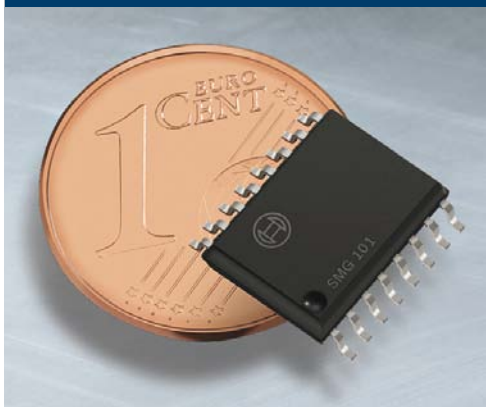
Airbag systems:
Angular rate sensors

In case of an accident, a rollover situation can be securely detected with these MEMS angular rate sensors. The sensors are available with either analog or digital output.

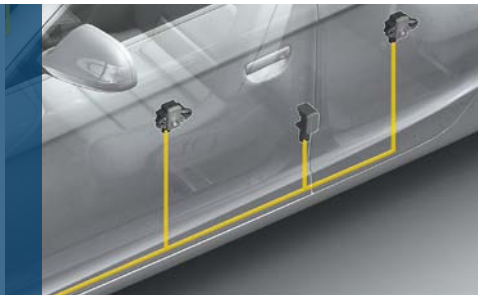
Type	Product	Range [°/s]	Output	Sensitivity	Tolerance [%]	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
Angular rate sensor Ω_x	SMG060	±240	SPI (Bosch)	2 LSB/°/s	±7	Analog: 5 Digital: 5 or 3.3	-40	105	PLCC44
Angular rate sensor Ω_x	SMG061	±240	Analog	7 mV/°/s	±7	Analog: 5 Digital: 5 or 3.3	-40	105	PLCC44
New Angular rate sensor Ω_x	SMG101	±240	SPI (open)	2 LSB/°/s	±7	5	-40	105	SOIC16w
New Angular rate sensor Ω_x	SMG102	±240	SPI (Bosch)	2 LSB/°/s	±7	3.3	-40	105	SOIC16w

SPI = Synchronous Serial Peripheral Interface
Other configurations are possible on customer demand.

SMG101



Airbag systems:
Pressure sensors



High accuracy and fast crash information. Pressure sensors detect the pressure change in a side door of an automotive vehicle due to the deformation of the door during an impact.

Application	Product	Range	Output	Sensitivity Δp/p [LSB/%]	Tolerance	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
Pressure sensor for occupant protection	SMD187	Absolute pressure measurement range: p_abs 50 kPa...126.5 kPa Relative pressure p_rel measurement range with ref. to p_abs: -5 %...+15 %	PSI5, 10 bit Resolution abs. pressure p_abs: 12 bit (mapped into 10 bit words) Resolution of relative pressure: 10 bit	20.48	p_abs: 3.5 kPa (4.58 % of FS) p_rel: 5 % (for p_abs ≥ 70 kPa), 6 % (for p_abs < 70 kPa)	6.9	-40	125	Mold-Premold (MPM) SOIC16

SMD187

Vehicle Dynamics Control VDC:
Sensors for VDC and active suspension

Modern ESP®/ESC systems require precise and fast information on a car's movements.
Our high precision MEMS sensors come with digital SPI interface for onboard application.

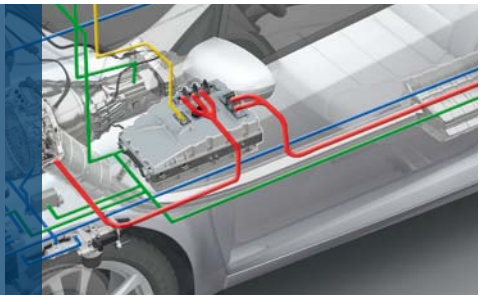
Type	Product	Range	Output	Sensitivity	Tolerance [%]	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
Angular rate sensors for VDC									
Angular rate sensor Ω_z	SMG074	±187 °/s	SPI, 16 bit	±175 LSB/°/s	±2.5	3.3 or 5	-40	120	PM16
Angular rate sensor Ω_z	SMG075	±244 °/s	SPI, 16 bit	±134 LSB/°/s	±2.5	3.3 or 5	-40	120	PM16
Acceleration sensors for VDC									
Dual axis accelerometer, x/y	SMB225	4.9 g	SPI, 16 bit	6667 LSB/g	±3	3.3 or 5	-40	120	PM12
Dual axis accelerometer, y/z	SMB227	3.3 g	SPI, 16 bit	10000 LSB/g	±5	5	-40	135	PM12
Combined inertial sensors for VDC									
New Angular rate sensor (Ω_z) and dual axis accelerometer (x/y)	SMI540	±160 °/s ±2 g	SPI	175 LSB/°/s 6667 LSB/g	±3 ±2	3.3 or 5	-40	105	SOIC16w

Low-g acceleration sensors for active suspension. Active suspension systems help to shorten stopping distances, reduce the risk of rollover accidents and contribute to a more comfortable drive thanks to less chassis movements and a reduced noise in the interior of the vehicle.

Type	Product	Range [g]	Output	Sensitivity [LSB/g]	Tolerance [%]	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
Acceleration sensors for active suspension									
New Single axis, y	SMB431	1.6	PSI5	300	±5	5-11	-40	125	SOIC14n

SPI = Synchronous Serial Peripheral Interface
VDC = Vehicle Dynamics Control

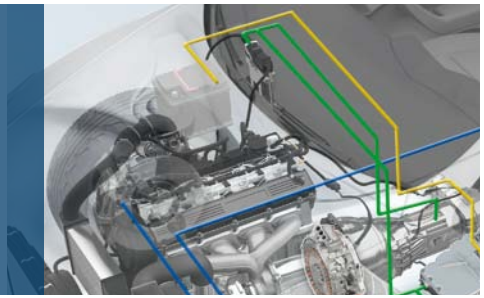
In-vehicle communication:
CAN transceivers



From the beginning, Bosch has been the driving force for CAN bus applications in automotive and industrial environment. A wide range of transceivers with individual features covers all applications. All devices feature a short circuit protection for the CAN bus lines.

Application	Product	V_{DD} typ. [V]	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
CAN transceiver (ISO 11898)	CF150	5	5 V µC interface	• High Speed • For new applications please use CF151	-40	150	SOIC8n
CAN transceiver (ISO 11898)	CF151	5	5 V µC interface	• High/low speed • Slew rate control	-40	150	SOIC8n
CAN transceiver (ISO 11898)	CF160	5	5 V µC interface	• Supports up to 1 MBaud • Optimized slew rate	-40	150	SOIC8n
CAN transceiver (ISO 11898)	CF163	5	3.3 V µC interface	• Supports up to 1 MBaud • Optimized slew rate	-40	150	SOIC8n
CAN transceiver (ISO 11898)	CF173	5	3.3 V µC interface	• Supports up to 1 MBaud • Optimized slew rate • Standby mode • Wake-up detection • Suitable also for truck application	-40	150	SOIC8n
CAN transceiver (ISO 11898)	CF175	5	5 V µC interface	• Supports up to 1 MBaud • Optimized slew rate • Standby mode • Wake-up detection • Suitable also for truck application	-40	150	SOIC8n

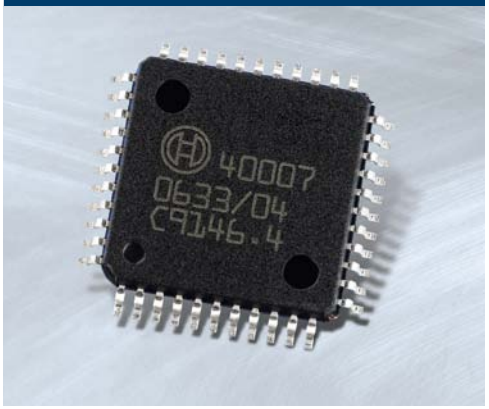
In-vehicle communication:
CAN controllers



Our CAN controllers support the CAN Protocol version 2.0 A,B.
The CC770 CAN Controller is available in two packages.

Application	Product	V_{DD} typ. [V]	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
CAN controller	CC750	5	1 x SPI	• Programmable global mask • 15 message objects of 8-byte data length • Programmable bit rate	-40	150	SOIC16w
CAN controller	CC770	5	1 x SPI 4 x parallel bus 2 x 8bit IO	• Programmable global mask • 15 message objects of 8-byte data length • Programmable bit rate • Flexible CPU interface • Programmable clock output	-40	150	LQFP44 PLCC44

CC770



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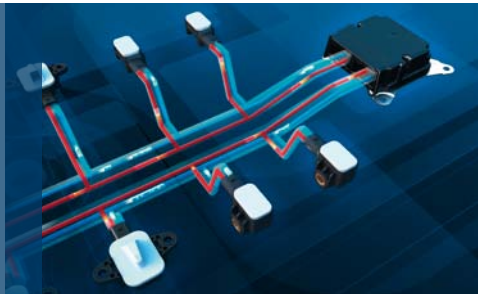
In-vehicle communication:
PSI5 receivers



The Peripheral Sensor Interface 5 (PSI5) is an open standard based on existing sensor interfaces for peripheral airbag sensors, already proven in millions of airbag systems. PSI5 also suitable for many other automotive sensor applications.

Application	Product	Inputs	V_{ER} typ. [V]	Peripheral Sensor interfaces	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
New									
2 channel PSI5 receiver	CF190	V_{DD} typ.: 3.3 V or 5 V V_{AS} : 6.35...11 V V_{ER} typ.: (V_{AS}+2 V)...35 V V_{SYNC} typ.: (V_{AS}+4.5 V)...35 V	24.4 or 33 (programmable)	2 x PSI5 (V1.3)	SPI (3.3V or 5V)	• max. 8 sensors • bidirectional communication • Bosch AB, EM and Open SPI protocol • Integrated monitoring of voltages and overtemperature • Integrated diagnosis	-40	150	LQFP32, QFN36 (on request)

CF190

IP modules
for networking applications

Whether you are dealing with FlexRay, CAN, TTCAN, LIN or timer platforms – our IP modules solve your communication problems.

E-Ray:
FlexRay Communication Controller IP
The E-Ray IP module can be integrated as stand-alone device, as part of an ASIC, or as a micro controller peripheral. It is described in VHDL on RTL level, prepared for synthesis. The E-Ray IP module performs communication according to the FlexRay protocol specification v2.1. Up to 128 message buffers with a payload of up to 254 data bytes can be configured for communication on a FlexRay network. The E-Ray IP module comes with an 8/16/32 bit generic CPU Interface connectable to a wide range of customer-specific Host CPUs.

CAN Protocol License
The CAN Protocol is developed by Robert Bosch GmbH and is protected by patents. Additionally to the CAN IP modules offered by Bosch, a CAN Protocol License is required. The CAN Protocol License is also required for self-developed CAN modules, or for CAN modules purchased from other vendors.

VHDL Reference CAN
The VHDL Reference CAN model is intended for semiconductor designers/ manufacturers who want to build their own implementation of a CAN device using VHDL as hardware description language. It is provided in addition to the existing C Reference CAN model.

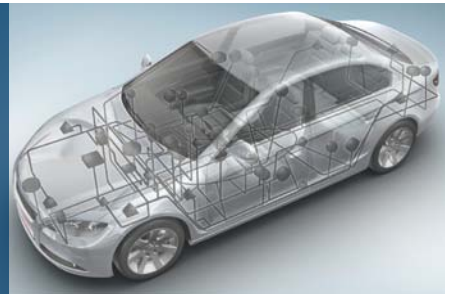
C_CAN
The C_CAN is a CAN IP module that can be realized as a stand-alone device, as part of an ASIC, or as a FPGA. The C_CAN performs communication according to ISO 11898-1 (identical to Bosch CAN specification 2.0 parts A and B). For connection to the physical layer additional transceiver hardware is required.

For communication on a CAN network, individual Message Objects are configured. The Message Objects and Identifier Masks are stored in the Message RAM. All functions concerning the handling of messages are implemented in the Message Handler. Those functions are the acceptance filtering, the transfer of messages between the CAN_Core and the Message RAM, and the handling of transmission requests as well as the generation of the module interrupt. The register set of the C_CAN can be accessed directly by an external CPU via the module interface. These registers are used to control/configure the CAN_Core and the Message Handler and to access the Message RAM. The ASIC version is delivered with the AMBA APB bus interface from ARM. For Altera FPGAs the Altera Avalon bus interface is provided, for Lattice FPGAs the Wishbone interface. They can easily be replaced by a user-defined module interface.

D_CAN
The D_CAN is a CAN IP module that can be realized as a standalone device, as part of an ASIC, or as a FPGA. The D_CAN performs communication according to ISO 11898-1 (identical to Bosch CAN specification 2.0 parts A and B). For connection to the physical layer additional transceiver hardware is required.

The dual clock design provides highest performance in CPU access and highest accuracy for the CAN bus sampling. The D_CAN can be implemented with 16, 32, 64, or 128 Message Objects. The Message Objects and Identifier Masks are stored in the Message RAM. All functions concerning the handling of messages, like acceptance filtering, transfer of messages between CAN_Core and Message RAM, handling of transmission requests as well as generation of module interrupt are implemented in the Message Handler. The register set of the D_CAN can be accessed directly by an external CPU via the module interface. These registers are used to control/configure the CAN_Core and the Message Handler and to access the Message RAM. The ASIC version is delivered with the Altera Avalon bus interface. For Altera FPGAs the Altera Avalon bus interface is provided, for Lattice FPGAs the Wishbone interface. They can easily be replaced by a user-defined module interface.

IP modules
for networking applications



M_CAN

The M_CAN is a CAN IP module that can be realized as a stand-alone device, as part of an ASIC, or as a FPGA. The M_CAN performs communication according to ISO 11898-1 (identical to Bosch CAN specification 2.0 parts A and B). For connection to the physical layer additional transceiver hardware is required.

The message storage is intended to be a single- or dual-ported Message RAM outside of the module. It is connected to the M_CAN via the Generic Master Interface. Depending on the chosen integration, multiple M_CAN controllers can share the same Message RAM. The Host CPU is connected via the 32-bit Generic Slave Interface.

For reception two receive FIFOs for storage of up 64 messages each can be setup. Acceptance filtering is implemented by a combination of up to 128 filter elements whereas each one can be configured as a range, as a bit mask, or as a dedicated ID filter. For transmission 32 Tx Buffers are available. They can be configured as dedicated Tx Buffers, as part of a Tx FIFO, or as part of a Tx Queue. A Tx Event FIFO stores time stamp and identifier of transmitted messages.

For Altera FPGAs the Altera Avalon bus interface is provided, for Lattice FPGAs the Wishbone interface. They can easily be replaced by a user-defined module interface.

C_TTCAN / M_TTCAN

The C_TTCAN and M_TTCAN IP modules are Time Triggered CAN IP modules derived from the C_CAN and M_CAN IP modules. The TTCAN IP modules perform communication according to ISO 11898-1 (identical to Bosch CAN specification 2.0 parts A and B) and according to ISO 11898-4 (Time Triggered Communication on CAN). They are intended for low-cost time triggered applications with bit rates up to 1Mbit/s. Both TTCAN IP modules are also available for Altera and Lattice FPGA.

LIN Communication Controller Module (C_LIN)

The C_LIN IP module is targeting low cost LIN slave designs. The C_LIN module is an autonomous LIN 1.3 or 2.1 protocol controller with embedded message handling for integration in a system on chip. It is described in VHDL on RTL level, prepared for synthesis.

Outputs from the receive message buffers can be used to directly control application blocks. Vice versa, inputs from the application layer can be directly connected as inputs to the transmit message buffers. Easy configuration methods enable the adaption of the module to specific applications for optimized designs.

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Engine management systems:
System basis ICs, power supply ICs

System basis ICs and power supplies provide the CPU with power, communication channels and necessary input and output functions.

Application	Product	V_{DD} typ. [V]	Interfaces	Supply voltages	Inputs	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
System basis IC	CJ910	14	1 x ISO	• System: 5 V • Standby: 5 V, 5 V (operation) • Sensors: 2 x 5 V	• Ignition • RPM-sensor (typ. glitch filter delay time: 28 µs) • Sustaining control reset	• Switched battery: 1 • Main relay control: 1 x LSPS • Signal drivers: 4 x LSPS • Ignition reset • Flash EPROM enable	• Overvoltage shutdown	-40	150	PSO36
System basis IC	CJ911	14	1 x ISO	• System: 5 V • Standby: 5 V 5 V (operation) • Sensors: 2 x 5 V	• Ignition • RPM-sensor (typ. glitch filter delay time: 12.5 µs) • Sustaining control reset	• Switched battery: 1 x HSPS • Main relay control: 1 x LSPS • Signal drivers: 4 x LSPS • Ignition reset	• Overvoltage shutdown	-40	150	PSO36
System basis IC	CY310	14	1 x CAN 2 x ISO SPI, 16 bit (5V)	• System: 5 V, 3.3 V • Standby: 3.3 V • Sensors: 3 x 5 V	• RPM sensor	• 4 x LSS • 1 x HSS		-40	150	HIQUAD64
System basis IC	CY317	14	1 x CAN 2 x ISO SPI, 16 bit (5V)	• System: 5 V, 3.3 V, 2.6 V • Standby: 3.3 V • Sensors: 3 x 5 V	• Ignition • Wakeup • RPM sensor	• Switched battery: 1 x HSPS • Main relay control: 1 x LSPS • Signal drivers: 4 x LSPS	• Reverse polarity protection • Digital watchdog	-40	150	HIQUAD64
System basis IC	CY320	14	1 x CAN 1 x ISO SPI, 16 bit (5V)	• System: 5V, 3.3V, 2.6V, 1.5V • Sensors: 3 x 3.3/5V progammable	• Ignition • Wakeup	• Main relay control: 1 x LSPS	• 2 pre-regulator modes (switched, linear) • Advanced 3-level watchdog • µC-reset & system reset • Stop counter functions	-40	150	PSO36
New System basis IC	CY325	14	SPI, 16 bit (3.3V)	• System: 5V, 3.3V, 2.6V, 1.5V (optional 1.2V) • Standby: 1V • Sensors: 2 x 5V	• Ignition • Wake • Wake via CAN	• Main relay control: 1 x LSPS	• 3 pre-regulator modes (buck, boost, linear) • Advanced 3-level watchdog for Infineon TriCore and Freescale SNAKE µC • µC-reset & system reset • Stop counter functions • Low quiescent current for permanent supplied systems	-40	150	TQFP64ePad or bare die
µC supply and CAN transceiver	CA500	14	1 x CAN	• µC: 5 V • Analog: 5 V	• 3 x line	• 3 x LSPS (line) • 1 x µC reset		-40	150	PS020
µC supply and CAN transceiver	CA510	14	1 x CAN	• µC: 5V, 200mA • I/O: 5V	• Watchdog	• Watchdog reset	* current limitation * undervoltage reset * overtemperature protection	-40	150	MLF 5x5 or QFN28
Pre-regulator for 24 V boardnet Main relay substitute	CY141	24...42	SPI, 16 bit (5V)	• 5.5...14 V		• 5 x gate control for ext. main relay switches • 1 x main relay	• Adjustable step-up/step-down regulator • Short circuit monitoring	-40	150	PSO36

SPI = Synchronous Serial Peripheral Interface HSPS = High side power switch LSPS = Low side power switch

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Engine management systems: Injection valve drivers

Injection valve drivers are the key to efficient fuel and diesel consumption.

Application	Product	V_{bat} typ. V_{DD} typ. [V]	Interfaces	Inputs	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
4-fold integrated power stage for GDI injectors	CJ840	14 5	SPI	TTL/CMOS logic	2 x HSPS (battery) 2 x HSPS (booster) 4 x LSPS (injectors)	• 1- or 2-bank operation, parallel and/or double injection mode • DC/DC boost converter • Selective valve disable • Current level control • Diagnosis via SPI • Programmable parameters	-40	150	HIQUAD64
4-fold integrated power stage for GDI injectors	CJ841	14 5	SPI	TTL/CMOS logic	2 x HSPS (battery) 2 x HSPS (booster) 4 x LSPS (injectors)	• 1- or 2-bank operation, parallel and/or double injection mode • DC/DC boost converter • Selective valve disable • Current level control • Diagnosis via SPI • Programmable parameters • Higher current capability than CJ840	-40	150	HIQUAD64

SPI = Synchronous Serial Peripheral Interface
HSPS = High side power switch
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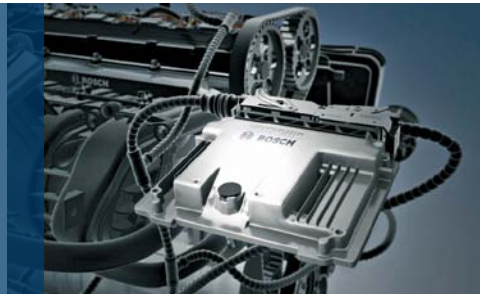
Engine management systems:
Low-side power switches



Low-side power switches with integrated short circuit detection for better system safety.

Application	Product	V_{bat} typ. [V]	V_{DD} typ. [V]	Interfaces	Inputs	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
4-fold Low-side Power Switch	CJ406	14		Serial diagnostics interface	TTL/CMOS logic	4 x 2.2 A/ 500mΩ/70 V		-40	150	MultiWatt15
4-fold Low-side Power Switch	CJ420	14		Serial diagnostics interface	TTL/CMOS logic	4 x 2.2 A/ 500mΩ/70 V	• Overtemperature detection	-40	150	PSO20
4-fold Low-side Power Switch	CJ450		5	Serial diagnostics interface	TTL/CMOS logic	4 x 0.6 A/ 1 Ω/46 V	• Open-circuit detection • Overtemperature detection	-40	150	PLCC28
14-fold Low-side Power Switch	CJ920	14	5	Serial diagnostics interface	TTL/CMOS logic	4 x 0.6 A/1 Ω/40 V 2 x 2.2 A/500mΩ/45 V 6 x 2.2 A/500mΩ/70 V 2 x 2.7 A/500mΩ/45 V	• Open-circuit detection • Overtemperature detection	-40	150	HIQUAD64
18-fold Low-side Power Switch	CJ945	14	5	SPI, µsec bus	TTL/CMOS logic	4 x 1.1 A/780mΩ/45 V 6 x 2.2 A/380mΩ/45 V 6 x 2.2 A/400mΩ/70 V 2 x 3 A/280mΩ/45 V	• Open-circuit detection • Overtemperature detection	-40	150	HIQUAD64
New 18-fold Low-side Power Switch	CJ950		14	SPI (3.3V or 5V), µsec bus 4 parallel ports in case SPI is used	TTL/CMOS logic, withstands 36V permanently	4 x 0.6 A/920mΩ/55 V 10 x 2.2 A/270mΩ/55 V 2 x 3 A/260mΩ/55 V 2 x 8 A/150mΩ/55 V	• Diagnosis: OL, SCG, SCB and OT • OUT1, 3 with current monitoring • 5V monitoring • 2nd independent shut down path • 2 x lambda probe heater	-40	150	PSO36

SPI = Synchronous Serial Peripheral Interface

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Engine management systems:
Multi-Purpose MOSFET drivers

Application	Product	V_{DD} typ [V]	Interfaces	Inputs	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
Configurable HS-/LS-Driver, H-Bridge or Half bridge	CY146	5	SPI, 16 bit (3.3 or 5 V)	UBAT, VDD: 5V CLK	6 x HS-/LS-switch	3 x Half-bridge or individually configurable for HS / LS application	-40	150	LQFP44

CY146

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Engine management systems:
A/D converters, sensor interfaces

A/D converter with integrated multiplexer to select from up to eight analog inputs.

Application	Product	V_{DD} typ. [V]	Inputs	ADC resolution	Conversion range	Conversion time	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
A/D converter	CY100	5	8 channels multiplexed	10bit	5 V	120 µs	ISO SPI (3 V)	• 2 x digital out • Open drain	-40	150	LQFP32

Interfaces for engine sensors.

Application	Product	V_{DD} typ. [V]	Inputs	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
Single-channel rotation speed signal evaluation	CY30	5	1 x RPM sensor	Analog	• Differential inputs • Selectable thresholds • Open drain output	-40	150	SOIC8n
Knock sensor evaluation	CC195	5	2 x symmetric or 4 x asymmetric, switchable	Analog	• Knock sensor evaluation • Programmable gain and band pass filter • Band pass filter in SC-filter technology	-40	150	PLCC28
Knock sensor evaluation	CC196	5	2 x symmetric or 4 x asymmetric, switchable	SPI	• Knock sensor evaluation • Programmable gain and BP filter • Digital band pass filter (FIR)	-40	150	SOIC16w
Knock sensor evaluation and multichannel A/D converter	CC650	5	2 x symmetric or 4 x asymmetric	Digital I/O ports	• Knock sensor evaluation • 16-channel A/D converter (8 bit) • Reset module • Post-run module	-40	150	MQFP80

SPI = Synchronous Serial Peripheral Interface

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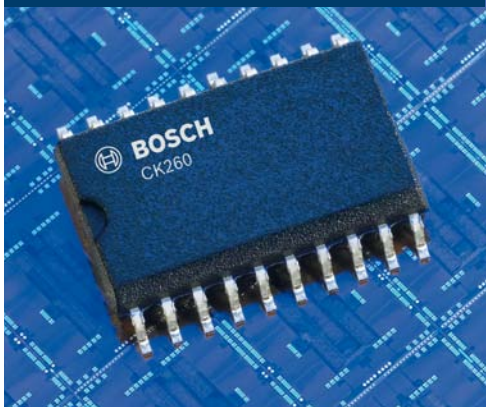
Engine management systems:
Ignition stage drivers

Drivers for external ignition stages with integrated monitoring function for ignition harness and coil.

Application	Product	V_{DD} typ. [V]	Channels	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
6-channel inverting driver for external ignition stages	CK110	5	6	n/a	• Short-circuit protection • Diagnosis	-40	150	SOIC20w
6-channel inverting driver for external ignition stages	CK200	5	6	SPI	• Short-circuit protection • Diagnosis • Wire and ignition coil diagnosis	-40	150	Bare die
4-channel inverting driver for external ignition stages	CK240	5	4	SPI	• Short-circuit protection • Diagnosis • Wire and ignition coil diagnosis	-40	150	Bare die or SOIC16w
6-channel inverting driver for external ignition stages	CK260	5	6	SPI	• Short-circuit protection • Diagnosis • Wire and ignition coil diagnosis	-40	150	SOIC20w

CK260



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Engine management systems:
Lambda probe interfaces, H-bridges

These Lambda probe interfaces provide all that is needed to drive Nernst cells: Pump current sense amplifier, reference voltage, virtual ground voltage source and diagnosis features.

Application	Product	V_{bat} typ. [V]	V_{DD} typ. [V]	Inputs	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
Bosch Lambda probe (LSU)	CJ110	14	5	Lambda probe signals	Analog	• Lambda measurement	-40	150	SOIC16w
Bosch Lambda probe (LSU)	CJ120	14	5	Lambda probe signals	SPI	• Lambda measurement • Probe temperature measurement • Diagnostics • For new applications please use CJ125	-40	150	SOIC24w
Bosch Lambda probe (LSU)	CJ125	14	5	Lambda probe signals	SPI	• Lambda measurement • Probe temperature measurement • Programmable reference pump current • Diagnostics • Recommmended for new applications	-40	150	SOIC24w, LQFP32
New Lambda probe control for Bosch & NTK lambda probes	CJ135	14	3 / 5	Lambda probe signals	SPI	• Lambda measurement • Probe temperature evaluation • SPI programmable controls • Diagnostic features • Support LSU 4.9, ADV and NTK ZFAS-U2	-40	150	TQFP32ePad, QFN36 (on demand)

Intelligent H-bridge for precise flap control.

Application	Product	V_{bat} typ. [V]	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
Intelligent full H-bridge	CJ220	14	TTL/CMOS logic	• R_{DSon} = 150 mΩ, I_{max}= 6.6 A, f_{max}=30 kHz • Integrated free-wheeling diodes output current limitation • Undervoltage lockout overtemperature protection • Short-circuit shutdown • Diagnosis function	-40	150	PSO20

SPI = Synchronous Serial Peripheral Interface

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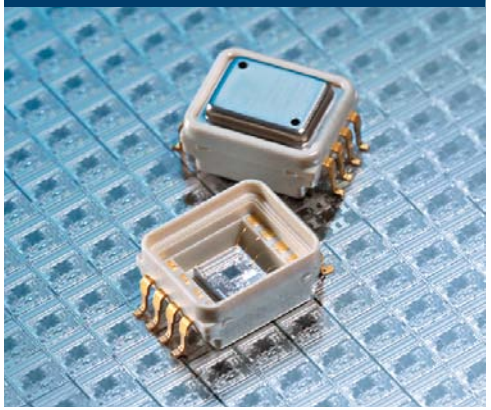
Engine management systems:
Barometric pressure sensors

Barometric pressure sensors for precise engine control.

Application	Product	Range [kPa]	Output	Sensitivity	Tolerance	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
Barometric pressure sensor	SMD288	40...115	Analog	45 mV/kPa (@ V_{DD} = 5 V)	1.5 kPa (0 °C...85 °C) / 2.25 kPa	5	-40	125	PM8

SMD288



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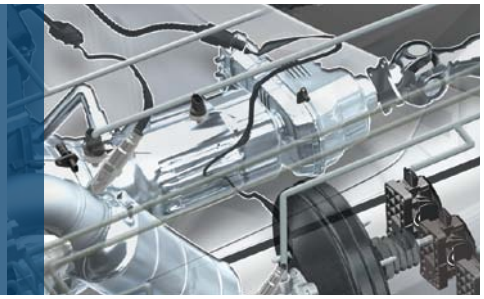
Transmission control systems:
System basis ICs, system watchdog ICs



Application	Product	V_{DD} typ. [V]	Interfaces	Supply Voltages	Inputs	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
System basis IC	CG124	14	ISO/LIN SPI (5V)	3.3V 5V 9V	3 x speed sensor Wake Up	Startup Reset Shutdown for µC	Permanent Supply reset control HS switch for starter enable For Renesas SH7 16-channel multiplexer for diagnosis:OL, SCG and SCB	-40	150	TQFP64ePad or bare die

Application	Product	V_{DD} typ. [V]	Interfaces	Inputs	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
System watchdog IC	CG130	14	SPI (3.3 or 5 V)	V_{ASIC}	High Side driver Sequencing Control	• Voltage monitoring with µC core voltage monitoring • Question / Answer watchdog • Periphery clock monitoring • Periphery reset circuit	-40	150	LQFP32 or bare die

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Transmission control systems:
Current regulators, shunt evaluation

Integrated current regulators for precise control of oil pressure valves in hydraulic systems.
Programmable hardware loop for low CPU load.

Application	Product	V_{bat} typ. [V]	V_{DD} typ. [V]	Interfaces	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
Single-channel current regulator for inductive loads for low-side or high-side application	CG202	14		PWM	PWM signal for ext. power switch	• For use with external power switch, shunt and free wheeling diode current regulation range with ext. 1 Ω shunt: 0...1,200 mA • Accuracy with 1 Ω shunt: ±7 mA • Adjustable PWM frequency • Opt. external sync	-40	150	SOIC16w
Dual-channel fully integrated current regulator for inductive loads for low-side application	CG207	14	5	1 x SPI (5V) PWM	2 x regulated load current	• Power Switch, shunt and free wheeling diode integrated current regulation range: 0...1023 mA • Accuracy <2.5% • Overcurrent protection • Overtemperature protection • PWM controlled regulation loop characteristics	-40	150	Bare die, PSO36
Dual-channel fully integrated current regulator for inductive loads for low-side application	CG208	14	5	1 x SPI (3.3V or 5V) SPI	2 x regulated load current	• Power Switch, shunt and free wheeling diode integrated current regulation range: 0...1200 mA • Accuracy <1 % • Dither function • Overcurrent protection • Overtemperature protection • SPI controlled regulation loop characteristics	-40	150	Bare die, TQFP44ePad

Application	Product	V_{DD} typ. [V]	V_{bat} typ. [V]	Interfaces	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
Quad-channel shunt evaluation	CG211	3.3 or 5	14	4 x shunt voltage evaluation	4 x bit stream 2 x Diagnosis	* temperature measurement * low-side, high-side or bridge application * integrated diagnosis (overcurrent, overtemperature, system clock, supply voltages)	-40	150	LQFP32

SPI = Synchronous Serial Peripheral Interface

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Transmission control systems:
Pressure sensors

Medium pressure sensors for applications such as regulation of the hydraulic pressure at the transmission (DCT) clutch, optimized drive belt adjustment in CVT systems (sliding point) and the regulation of the hydraulic reservoir pressure.

Application	Product	Range [bar]	P_Burst [bar]	Output	Sensitivity [mV/bar]	Tolerance [% V_{CC}]	V_{DD} typ. [V]	$T_{min.}$ [°C]	$T_{max.}$ [°C]	Package
New Medium pressure sensor for transmission control	SMP132	0.5...22	80	analog	186	1.5...2.5	5	-40	150	Hermetic metal package
New Medium pressure sensor for transmission control	SMP137	0.5...70	140	analog	58	1.5...2.5	5	-40	150	Hermetic metal package

SMP132

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Electric Power Steering EPS:
Torque sensor for electric power steering

The Torque Sensor Steering TSS was developed for vehicles with Electric Power Steering EPS.
The sensor measures the steering force applied by the driver and thus enables sensitive control of the electric steering support.

Application	Product	Range [°]	Output	Resolution [°]	Accuracy [°]	V_{DD} typ. [V]	T_{min} [°C]	T_{max} [°C]	Package
New Torque sensor for EPS	TSS	±4	PAS4/PSI5 or PWM (other interfaces on request)	0.002	0.3	5	-40	125	Customer specific

TSS

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Electric drives control:
Multi-chip power packages

Extremely compact high power mold modules, optimized for use in (H)EV and E-Bike inverters where high currents have to be handled, space is limited, heat dissipation is critical and high reliability is a must.

Application	Product	$V_{DS\ max}$ [V]	$I_{D\ max}$ [A]	$R_{DS\ on}$ [mΩ]	$R_{th\ (j\text{-}c)}$ per MOSFET switch [W/K]	Features	T_j min [°C]	T_j max [°C]	Package
New MOSFET B6 bridge for E-Bike inverters	MB0608A	60	130	4	0.4	• MOSFET module in B6 bridge configuration with integrated free-wheeling diodes • optimized for E-Bike application • Normal level MOSFETs • optimized R_{th}, Z_{th} • Pb free, Halogen-free	-40	150	Mold module with THRS contacts, 40 mm (L) x 15 mm (W) x 3 mm (H)

Application	Product	$V_{CE\ max}$ [V]	$I_{c\ max}$ [A]	$U_{GE\ sat}$ [V]	$R_{th\ (j\text{-}c)}$ per IGBT switch [W/K]	Features	T_j min [°C]	T_j max [°C]	Package
New IGBT half bridge for (H)EV inverters	MH6560B	650	600	1.65 (@$I_{CE\ mod}$ = 600 A, V_{GE} = 15 V, 25 °C, 600 A)	0.07	• IGBT module in half bridge configuration with integrated free-wheeling diodes • optimized for (H)EV application • integrated T-Sense (NTC) • optimized R_{th}, Z_{th} • exposed pad for thermal contact • Pb-free, Halogen-free • Availability on demand	-40	150	Mold module with customer specific contacts, 63 mm (L) x 57 mm (W) x 6.6 mm (H)

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Alternator electronics:
Press fit diodes

Press fit diodes for automotive alternators, designed for long life at high ambient temperatures.

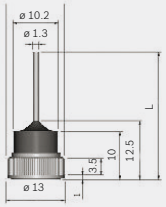
Type	I_{FAV} Forward Current [A]	Diode Package	I_{FSM} T=150°C Surge Current Limit value [A]	I_R T=25°C, 16/28V* Reverse Current Upper limit [µA]	V_F 100A Forward voltage at 25°C [V]	R_{th} Thermal Resistance [K/W]	T_{max} Max. barrier layer temp. [°C]	I_{ZM} Max. Zener Peak Current [A]	V_Z 5 mA, Zener Operating Voltage (1) [V]	Polarity C+/A- (2)
ZH2 (14V)	35	ED7	300	50	1.14	0.8	215	65	19-23	C/A
ZH6 (14V)	50	ED9	380	50	1.08	0.6	215	100	19-23	C/A
ZH2850 (28V)	50	ED10	380	50*	1.10	0.6	215	54	34-40	C/A

Type	I_{FAV} Forward Current [A]	Diode Package	I_{FSM} T=150°C Surge Current Limit value [A]	I_R T=25°C, 16V Reverse Current Upper limit [µA]	V_F 100/200A* Forward voltage at 25°C [V]	R_{th} Thermal Resistance [K/W]	T_{max} Max. barrier layer temp. [°C]	I_{ZM} Max. Zener Peak Current [A]	V_Z 5 mA, Zener Operating Voltage (2) [V]	Polarity C+/A- (3)
ZR1435 (14V)	35	ED10	275	100	1.15	0.8	225	60	19-25	C/A
ZR1450 (14V)	50	ED10	380	100	1.10	0.6	225	80	19-25	C/A
ZR1465 (14V)	65	ED10	500	100	1.07	0.5	225	100	19-25	C/A
ZR1480 (14V)	80	ED10	600	100	1.17*	0.45	225	125	19-25	C/A

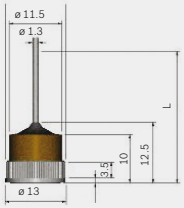
(1) Classified in 1V steps
(2) Classified in 1.5V steps
(3) C/+ Positive diodes have the cathode at the heat sink; A/- Negative diodes have the anode at the heat sink

Housing dimensions

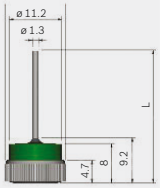
ED7



ED9



ED10



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Alternator electronics: Voltage regulators

Alternator regulators keep the alternator output voltage on the desired level. The interface allows for various control and monitoring functions.

Application	Product	V_{DD} typ. [V]	Interfaces	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
Voltage regulator for 14V alternators	CR665	14	LIN1.3; LIN2.1	excitation current	• LIN control function acc. to VDA specification • Programmable	-40	175	TO220-5, bare die

CR665

clean & economical

IP modules
for timer applications

Generic Timer Module (GTM)

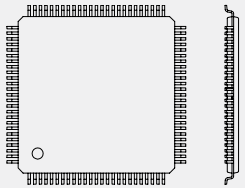
The GTM IP module forms a generic timer platform for complex applications in the automotive industry like power train, power steering, chassis and transmission control. To serve these different application domains, the GTM provides a wide range of timer functions like:

- Counters (free running and resettable)
- Multi-action capture/compare
- PWM input
- Complex PWM output function
- Duty-cycle measurement
- Global time bases
- Complex angle clock mechanism for power train applications
- Input signal filtering
- Internal RISC-like programmable cores for data processing and complex output sequence generation

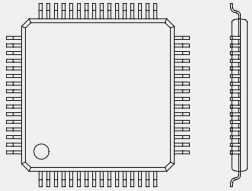
The GTM IP is designed to offer flexible solutions for different application domains and for different application classes within one specific application domain. The IP is designed to run with minimal CPU interaction and to unload the CPU from handling interrupt service requests as much as possible.

Generic interfaces and the hierarchical system architecture make the GTM an ideal solution as IP core for various microcontroller architectures.

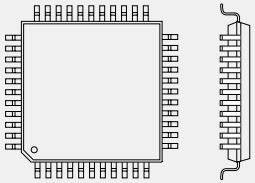
TQFP100_ePad (14 x 14 mm)



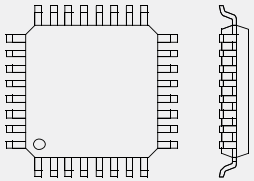
TQFP64_ePad (10 x 10 mm)



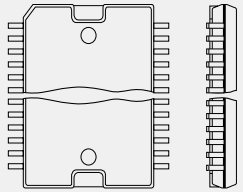
TQFP_44ePad (10 x 10 mm)



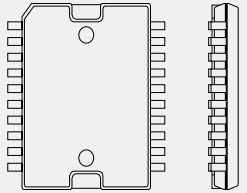
TQFP_32ePad (7 x 7 mm)



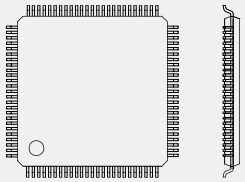
PSO36 (11.1 x 16 mm)



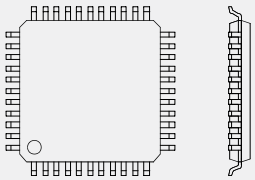
PSO20 (11.1 x 16 mm)



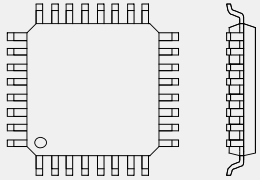
LQFP100 (14 x 14 mm)



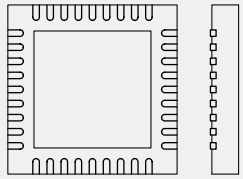
LQFP44 (10 x 10 mm)



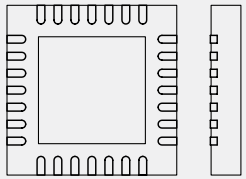
LQFP32 (7 x 7 mm)



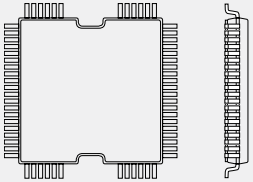
QFN36 (6 x 6 mm)



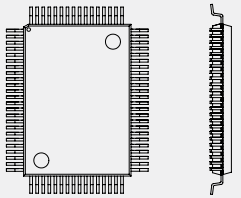
QFN28 (5 x 5 mm)



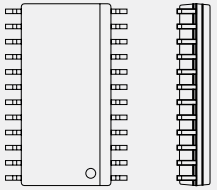
HIQUAD64 (14 x 14 mm)



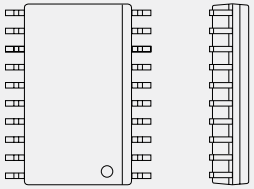
MQFP80 (14 x 20 mm)



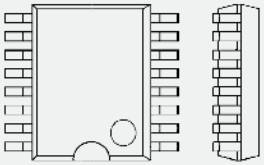
SOIC24w (7.5 x 15.4 mm)



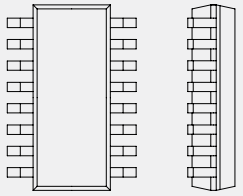
SOIC20w (7.5 x 12.8 mm)



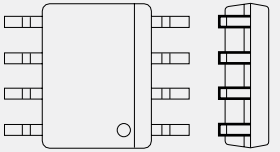
SOIC16w (7.5 x 10.3 mm)



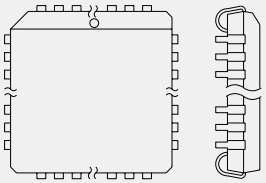
SOIC14n (3.9 x 8.6 mm)



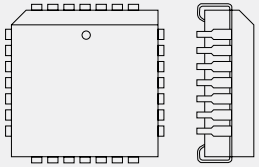
SOIC8n (3.9 x 4.9 mm)



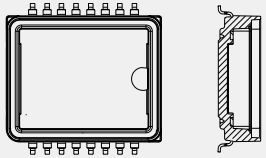
PLCC44 (16.6 x 16.6 mm)



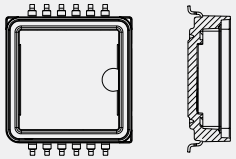
PLCC28 (11.5 x 11.5 mm)



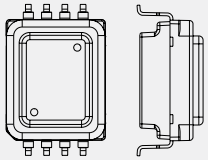
PM16 (11 x 13.5 mm)



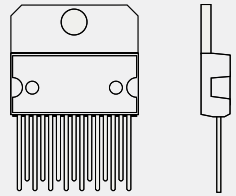
PM12 (11 x 11 mm)



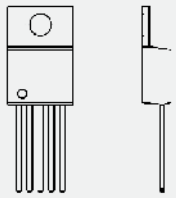
PM8 (6.9 x 8.4 mm)



Multiwatt15 (In-Line)



TO220-5



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125 Years Bosch 1886–2011

In 2011, the Bosch Group is celebrating a double anniversary: the 125th anniversary of the company's establishment, and the company founder's 150th birthday. This is cause for more than mere retrospection – it prompts us to show how the company's past fuels its future. The history of the company has had its ups and downs, but at the same time has always been vibrant. We see this history as one that drives us forward to new – and above all beneficial – achievements.