Automotive Electronics

Semiconductors and sensors
Product overview 2008/2009

BOSCH
Invented for life

Throughout the world, the automotive industry **relies on our products**

Bosch Automotive Electronics division (AE) 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 sensors. We design, manufacture and sell sensors, ASICs, ASSPs and power semiconductors, based on experience in automotive electronics components of more than 40 years.

We support vehicle manufacturers and their suppliers with new solutions in order to fulfil the stringent requirements imposed on automobiles today and in the future.

True to our motto “Invented for life”, we develop innovations that meet the growing demands on safety, environmental compatibility, economy, and comfort.

Bosch Automotive Electronics is located in Reutlingen, Germany. With our sales and application forces, located in Europe, North America, and Asia we offer worldwide customer support.

We have direct access to state-of-the-art technologies and best production techniques. Based on our long term commitment to technology and manufacturing, we can offer reliable and long term deliveries to the automotive industry.

We have been certified in accordance with ISO/TS 16949 and ISO14001 and are committed to meet highest quality standards.

In addition to the Bosch Group itself, our customer base includes many well-known companies in the OEM sector.

We offer component solutions and Intellectual Property Modules in the following areas:

- Airbag
- Engine Management
- Transmission Control
- Vehicle Dynamics
- Driver Information
- Drive Train
- Communication

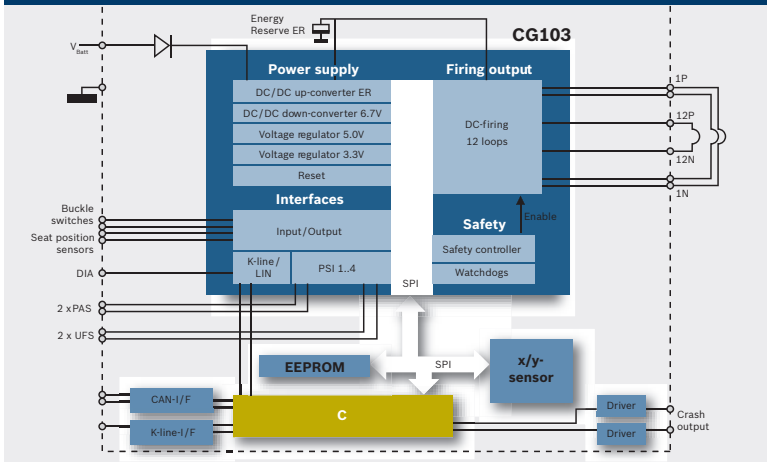
Contents

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_{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	14	33 or 24.4 (programmable)	n/a	2	SPI (3.3 V), K-Line/LIN	4 x high energy	• 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	-40	150	LQFP100
Single-chip integrated airbag system	CG102	3.3 + 5	14	33 or 24.4 (programmable)	2 x PSI5	4	SPI (3.3 V), K-Line/LIN	8 x high energy	• 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	-40	150	LQFP100
Single-chip integrated airbag system	CG103	3.3 + 5	14	33 or 24.4 (programmable)	4 x PSI5	6	SPI (3.3 V), K-Line/LIN	12 x high energy	• 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	-40	150	LQFP100

CG103



PSI = Peripheral Sensor Interface Bus
SPI = Synchronous Serial Peripheral Interface
C_{VER} = 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 as well as 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 2 x 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	CG681	14	1 x SPI 2 x K-Line 2 x PAS3	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

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	4.9 3.3	8.7	14	33	3 x PAS3/PAS4	8 x AIO	7 x DIS_n	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	4 x high energy	• 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	2 x high energy	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring	-40	150	SOIC24w
Firing Loop IC	CG983	4.9 + 3.3	25 or 33	SPI	4 x high energy	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing counter	-40	150	LQFP44
Firing Loop IC	CG984	4.9 + 3.3	25 or 33	SPI	4 x high energy, dual firing mode	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing counter	-40	150	LQFP44
Firing Loop IC	CG985	4.9 + 3.3	25 or 33	SPI	4 x low energy, switchable firing current level	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing counter	-40	150	LQFP44
Firing Loop IC	CG987	4.9 + 3.3	25 or 33	SPI	8 x high energy	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing counter	-40	150	LQFP44
Firing Loop IC	CG988	4.9 + 3.3	25 or 33	SPI	8 x high energy, dual firing mode	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing counter	-40	150	LQFP44
Firing Loop IC	CG989	4.9 + 3.3	25 or 33	SPI	8 x low energy, switchable firing current level	• Power stage test • Firing loop monitoring • Firing enable pin	• Short circuit • Leakage • Integrated voltage monitoring • 4 bit firing 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	• Integrated voltage monitoring • Support of sensor test	-40	150	SOIC16w
Triple peripheral sensor interface	CG974	4.9 + 3.3	14	33	8.7	3 x PAS3/PAS4	SPI	• 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:
Airbag sensor modules

Pressure sensors have proven to be reliable detectors for side impacts. Packed in a robust plastic housing, these MEMS sensor modules are intended to be mounted in the side doors. Suitable sensor interfaces with PAS interface are described on page 7.

Application	Product	Range [bar]	Sensitivity [Δp/p]	Supply/ output	T_{min} [°C]	T_{max} [°C]	Housing
Peripheral pressure sensor	PPS1	0.5...1.35	20.4 LSB/%	PAS4	-40	85	Customer specific module

Application	Product	Range [g]	Sensitivity [LSB/g]	Supply output	T_{min} [°C]	T_{max} [°C]	Housing
Peripheral acceleration sensor	PAS4/UFS2	60...240	0.5...2	PAS4	-40	85 (UFS: 120)	Customer specific module

PPS1

LSB = Least significant bit
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 interfaces with PAS interface are described on page 7

Single axis acceleration sensors

Application	Product	V_{DD} typ. [V]	Range [g]	Output	A/D converter resolution	Tolerance [%]	T_{min} [°C]	T_{max} [°C]	Package
Single axis	SMB05x	5	±35/±50	Analog		5	-40	105	PLCC28
Single axis	SMB25x	5	±35/±50/±140	Analog		4	-40	105	SOIC16w
Single axis	SMB120	5	±50	PAS3	8bit	5	-40	85	PLCC28
Single axis	SMB124	5	±100	PAS3	8bit	5	-40	85	PLCC28
Single axis	SMB172	5	±200	PAS3	8bit	10	-40	120	PLCC28
Single axis	SMB180	5	±50/±100	PAS4	8bit	5	-40	85	SOIC16w
Single axis	SMB190	5	±200	PAS4	8bit	10	-40	120	SOIC16w
Single axis	SMB48x	5	±120	PSI5	10bit	6	-40	125	SOIC14n
Single axis	SMB49x	5	±480	PSI5	10bit	8	-40	125	SOIC14n

Dual axis acceleration sensors

Application	Product	V_{DD} typ. [V]	Range [g]	Output	A/D converter resolution	Tolerance [%]	T_{min} [°C]	T_{max} [°C]	Package
Dual axis	SMB06x	5	±35/±50	Analog		5	-40	105	PLCC28
Dual axis	SMB26x	5	±35g/±50	Analog		4	-40	105	SOIC16w
Dual axis	SMB200	3.3/4.8	±4.8	SPI	10bit	9	-40	105	SOIC16w
Dual axis	SMB46x	5	±48g	SPI	10bit	5	-40	105	SOIC14n

PAS = Peripheral Airbag Sensor Interface

Airbag systems: Angular rate sensors

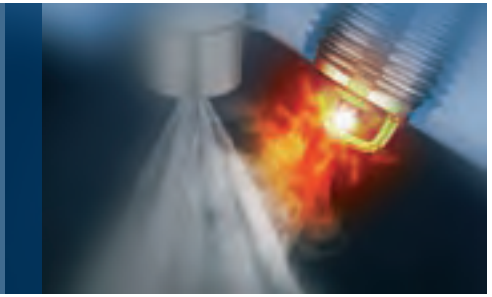
In case of an accident, a rollover situation can be securely detected with these MEMS angular rate sensors. The sensors are available with either analog or digital output.
Angular rate sensors for rollover detection.

Application	Product	V_{DD} typ. [V]	Range [°/s]	Output	Sensitivity	Tolerance [%]	Features	T_{min} [°C]	T_{max} [°C]	Package
Rollover	SMG060	Analog: 5 Digital: 5 or 3.3	±240	SPI	2 LSB/°/s	±7	Digital low pass filter	-40	105	PLCC44
Rollover	SMG061	Analog: 5 Digital: 5 or 3.3	±240	Analog	7 mV/°/s	±7	Digital low pass filter	-40	105	PLCC44

SMG060

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

Engine management:
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 x HSPS • 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 1 x SPI	• 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 1 x SPI	• 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 1 x SPI	• System: 5V, 3.3.V, 2.6V, 1.5V • Sensors: 3x3.3/5V progammable	• Ignition • Wakeup	• Main relay control: 1 x LSPS	• 2 pre-regulator modes (switched, linear) • Advanced 3-level watchdog	-40	150	PSO36
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
Pre-regulator for 24 V boardnet Main relay substitute	CY141	24...42	1 x SPI	• 5.5...14 V		• 5 x gate control for ext. main relay switches • 1 x main relay	• Adjustable switching regulator • Short circuit monitoring	-40	150	PSO36

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

Engine management:
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
8-fold power stage control for Common Rail diesel injectors	CY220	14 5	n/a	TTL/CMOS logic	2 x booster driver 2 x HSPS 2 x booster driver	• 1- or 2-bank operation • Current level monitoring • Booster voltage monitoring • Short-circuit and load-loss detection • Driver deactivation at power-on and in failure mode	-40	140	MQFP64

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

Engine management:
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/70 V		-40	150	MultiWatt15
4-fold Low-side Power Switch	CJ420	14		Serial diagnostics interface	TTL/CMOS logic	4 x 2.2 A/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/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	6 x 2.2 A/70 V 2 x 2.2 A/45 V 2 x 2.7 A/45 V 4 x 0.6 A/40 V	• Open-circuit detection • Overtemperature detection	-40	150	HIQUAD64
18-fold Low-side Power Switch	CJ945	14	5	SPI, µsec bus	TTL/CMOS logic	6 x 2.2 A/70 V 6 x 2.2 A/45 V 2 x 3 A/45 V 4 x 1.1 A/45 V	• Open-circuit detection • Overtemperature detection	-40	150	HIQUAD64

SPI = Synchronous Serial Peripheral Interface

Engine management:
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

Engine management:
Ignition stage drivers, integrated ignition stages

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

Low cost, fully integrated ignition stages.

Application	Product	Inputs	CE Voltage clamp [V]	V_{CEsat}	Features	T_j min. [°C]	T_j max. [°C]	Package
Integrated ignition power switch	BIP172	CMOS	360	<2 V @ 7 A		-40	150	TO220 / D2PAK
Integrated ignition power switch	BIP306	CMOS	375	<2 V @ 7 A	• Current flag @ 2 A • Voltage flag @ 105 V • Overtemperature protection @ 195 °C (thermal shutdown)	-40	150	PSO10
Integrated ignition power switch	BIP350	CMOS	375	<2 V @ 7 A		-40	150	TO220 / D2PAK
Integrated ignition power switch	BIP355	CMOS	375	<2 V @ 9 A		-40	150	TO220
Integrated ignition power switch	BIP372	CMOS	375	<2 V @ 7 A	• Overtemperature protection @ 195 °C (thermal shutdown)	-40	150	D2PAK
Integrated ignition power switch	BIP373	CMOS	375	<2 V @ 7 A	• Overtemperature protection @ 195 °C (thermal shutdown)	-40	150	TO220
Integrated ignition power switch	BIP390	CMOS	375	<2 V @ 7 A	• Current flag @ 2 A	-40	150	TO218/5

Engine management:
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	1	Analog	• Lambda measurement	-40	150	SOIC16w
Bosch Lambda probe (LSU)	CJ120	14	5	1	SPI	• Lambda measurement • Probe temperature measurement • Diagnostics • For new applications please use CJ125	-40	150	SOIC24w
Bosch Lambda probe (LSU)	CJ125	14	5	1	SPI	• Lambda measurement • Probe temperature measurement • Programmable reference pump current • Diagnostics • Recommmended for new applications	-40	150	SOIC24w LQFP32

Intelligent H-bridge for precise flap control.

Application	Product	V_{DD} 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

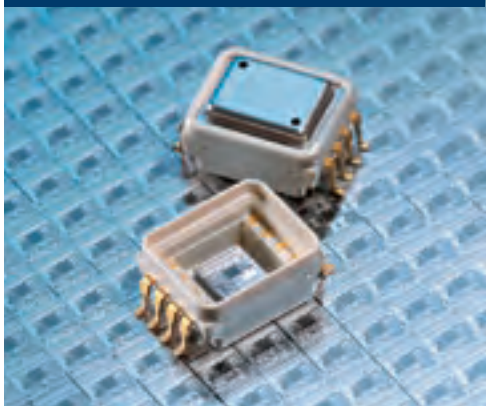
SPI = Synchronous Serial Peripheral Interface

Engine management:
Barometric pressure sensors

Barometric pressure sensors for precise engine control.

Application	Product	V_{DD} typ [V]	Range [kPa]	Output	Features	T_{min} [°C]	T_{max} [°C]	Package
Barometric	SMD288	5	40...115	Analog	• Various transfer functions • One-chip calibration • ESD protection (2 kV HBM) • Short-circuit protected	-40	125	PM8

SMD288



Transmission control: Current regulators

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 I_L	• Power Switch, shunt and free wheeling diode integrated current regulation range: 0...1,023 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 (3.3 or 5V) SPI	2 x I_L	• Power Switch, shunt and free wheeling diode integrated current regulation range: 0...1,200 mA • Accuracy <1% • Overcurrent protection • Overtemperature protection • SPI controlled regulation loop characteristics	-40	150	Bare die, TQFP44_e-pad

SPI = Synchronous Serial Peripheral Interface

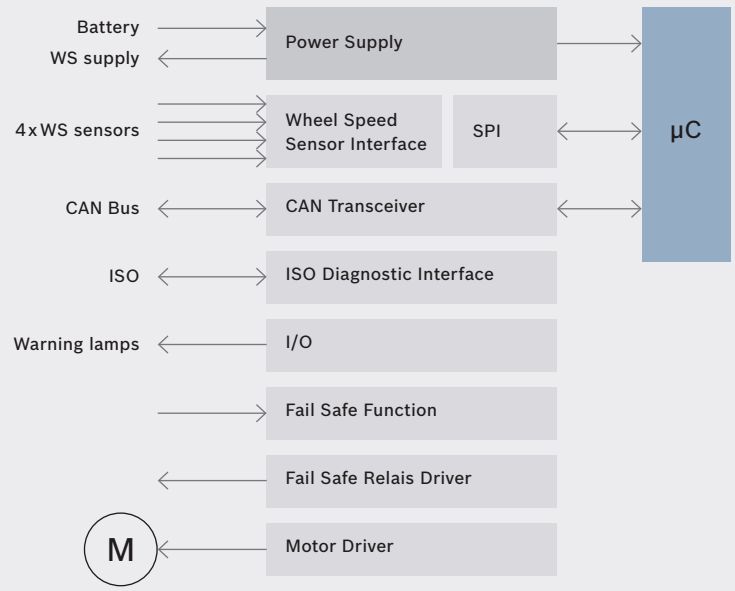
Vehicle dynamics systems:
System basis ICs

Compact power supply for ABS/ESP® systems with wheel speed sensor interface.

Application	Product	V_{DD} typ. [V]	Interfaces	Supply voltages	Inputs	Outputs	Features	T_j min. [°C]	T_j max. [°C]	Package
System basis IC	CS241	14	1 x ISO 1 x CAN 1 x SPI	System: 5 V, 3.3 V, 1.87 V Sensors: 5 V	• 4 x wheel speed sensor	• 4 x open collector • Power on reset • 3 x open collector for warning lamps	• ISO diagnostic interface • Watchdog	-40	150	HIQUAD64

SPI = Synchronous Serial Peripheral Interface

CS241



Vehicle dynamics systems:
ESP® sensors

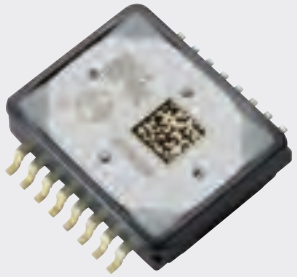
Modern ESP®/ESC systems require precise and fast information on a car's movements.
Our high precision MEMS sensors come with digital SPI interface for onboard application.

Application	Product	V_{DD} typ. [V]	Range [°/s]	Output	Sensitivity [LSB/°/s]	Tolerance [%]	Features	T_{min} [°C]	T_{max} [°C]	Package
Angular rate sensor	SMG074	3.3 5	±187	SPI, 16 bit	±175	±4	• Digital signal processing • Low noise • Internal test function	-40	120	PM16
Angular rate sensor	SMG075	3.3 5	±244	SPI, 16 bit	±134	±4	• Digital signal processing • Low noise • Internal test functions	-40	120	PM16

Application	Product	V_{DD} typ. [V]	Range [g]	Output	A/D converter resolution	Tolerance [%]	Features	T_{min} [°C]	T_{max} [°C]	Package
Dual axis linear accelerometer	SMB225	3.3 5	4.9/35	SPI	16/8bit	±2.5	• Digital signal processing • Internal test functions	-40	120	PM12

SPI = Synchronous Serial Peripheral Interface

SMG074

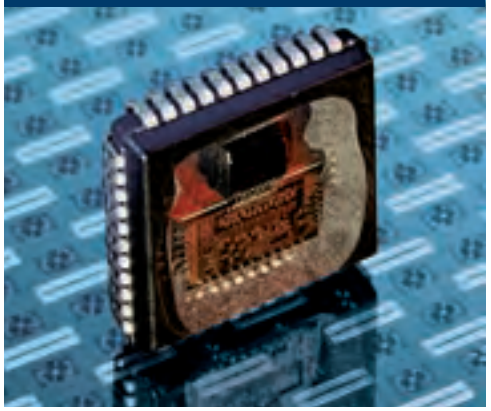


Driver information systems:
Angular rate sensors for navigation systems

Now also navigation systems can benefit from MEMS technology.
Our angular rate sensors provide accurate information about any turn.

Application	Product	V_{DD} typ. [V]	Range [°/s]	Output	Sensitivity [mV/°/s]	Tolerance [%]	Features	T_{min} [°C]	T_{max} [°C]	Package
Angular rate sensor	SMG045	5	±75	Analog	24	±8	Self test	-40	85	PLCC44

SMG045



Drive train:
Press fit diodes

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

Type	I_{FAV} Forward Current [A]	Diode Housing	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_j 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
ZH8 (28V)	50	ED9	380	50*	1.10	0.6	215	54	34-40	C/A
ZH2850 (28V)	50	ED10	380	50*	1.10	0.6	215	54	34-40	C/A

Zener diodes – second generation.

Type	I_{FAV} Forward Current [A]	Diode Housing	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_j max. Max. barrier layer temp. [°C]	I_{ZM} Max. Zener Peak Current [A]	V_Z 5mA, 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

Housing dimensions

(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

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	-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	-40	150	SOIC8n

Communication: CAN controllers

Our CAN controllers support the CAN Protocol version 2.0 A,B.
The CC770 CAN Controller is available in two packages.
For many applications, the CC770 can be used as a suitable replacement for Intel's AN82527.

Application	Product	V_{DD} typ. [V]	Interfaces	Features	T_j min. [°C]	T_j max. [°C]	Package
				• Programmable global mask			
				• 15 message objects of 8-byte data length			
				• Programmable bit rate			
			1 x SPI serial	• Flexible CPU interface			
			4 x parallel bus	• Programmable clock output			LQFP44
CAN controller	CC770	5	2 x 8bit IO	• Suitable replacement for Intel® AN82527	-40	150	PLCC44
				• Programmable global mask			
				• 15 message objects of 8-byte data length			
CAN controller	CC750	5	1 x SPI serial	• Programmable bit rate	-40	150	SOIC16w

IP modules
for networking and timer applications

Whether you are dealing with FlexRay, CAN, TTCAN, LIN, timer platforms, media interfaces, or even gateway solutions – 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 to128 message buffers with a maximum of up to 254 data bytes payload 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. Bosch is licensing the CAN protocol as follows:

- CAN Protocol License for IC-manufacturers and
- CAN Protocol License for FPGA programming

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. The test bench supplied with the VHDL Reference CAN model assures the conformity of the CAN Protocol Controller part of a user-defined implementation with CAN Protocol version 2.0 part A and B.

CAN Core
The CAN Core is a CAN IP module that can be integrated as part of an ASIC. It is described in VHDL on RTL level, prepared for synthesis. The CAN Core consists of a shift register and the CAN protocol state machine. Message handling and storage have to be implemented separately.

C_CAN
The C_CAN is a CAN IP module that can be integrated as stand-alone device or as part of an ASIC. It is described in VHDL on RTL level, prepared for synthesis. The C_CAN consists of the CAN Core, a message memory for 32 messages, and a message handler. The C_CAN can be connected to a wide range of 8/16 bit CPUs.

D_CAN
The D_CAN is a high-performance CAN IP module that can be integrated as stand-alone device or as part of an ASIC. It is described in VHDL on RTL level, prepared for synthesis. The D_CAN consists of the CAN Core, a message memory configurable in the range from 16 to 128 messages and a message handler. The D_CAN can be connected to a wide range of 8/16/32 bit CPUs.

The Dual Clock approach (separate clock domains for CAN protocol and for message handling) ensures highest design flexibility. The D_CAN IP module supports debug and power down modes.

D_CAN for FPGA
The D_CAN communication controller is also available as encrypted netlist for ALTERA FPGA.

IP modules
for networking and timer applications

TTCAN IP Module
The TTCAN IP module is a Time Triggered CAN IP module that can be integrated as stand-alone device or as part of an ASIC. It is described in VHDL on RTL level, prepared for synthesis. The TTCAN IP module performs 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). It is intended for low-cost time-triggered applications with bit rates up to 1Mbit/s.

TTCAN for FPGA
The TTCAN communication controller is also available as encrypted netlist for ALTERA 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, 2.0 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.

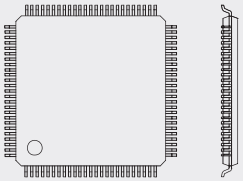
Generic Timer Module (GTM)
The GTM IP module forms a generic timer platform for complex applications in the automotive industry like power train, power steering, chassis and transmission control. To serve these different application domains, the GTM provides a wide range of timer functions like:

- Counters (free running and resettable)
- Multi-action capture/compare
- PWM input
- Complex PWM output function
- Duty-cycle measurement
- Global time bases
- Digital phase locked loop (dPLL)
- Input signal filtering
- Build-in DMA support (configurable)

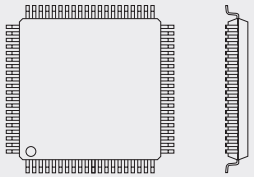
The GTM IP is designed to offer flexible solutions for different application domains and for different application classes within one specific application domain.

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

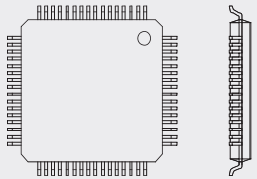
LQFP100 (14 x 14 mm)



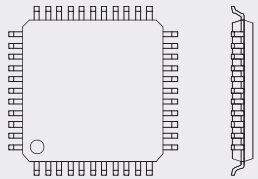
LQFP80 (14 x 14 mm)



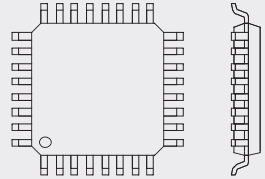
LQFP64 (10 x 10 mm)



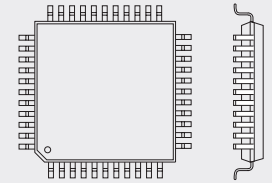
LQFP44 (10 x 10 mm)



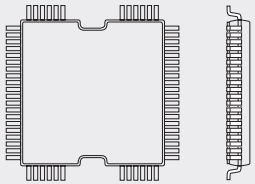
LQFP32 (7 x 7 mm)



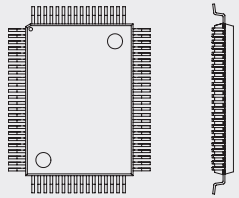
TQFP44 (10 x 10 mm)



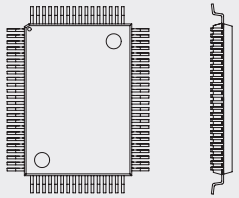
HiQUAD-64 (14 x 14 mm)



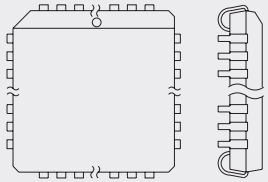
MQFP80 (14 x 20 mm)



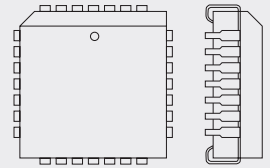
MQFP64 (14 x 20 mm)



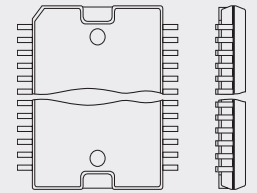
PLCC44 (16.6 x 16.6 mm)



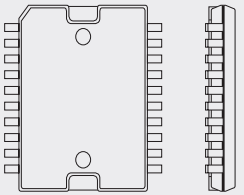
PLCC28 (11.5 x 11.5 mm)



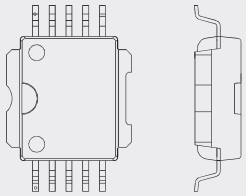
PSO36 (11.1 x 16 mm)



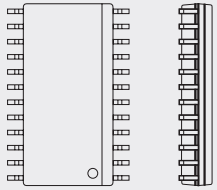
PSO20 (11.1 x 16 mm)



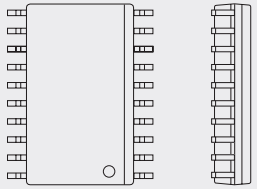
PSO10 (9.4 x 9.5 mm)



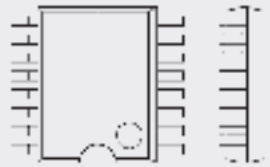
SOIC24w (7.5 x 15.4 mm)



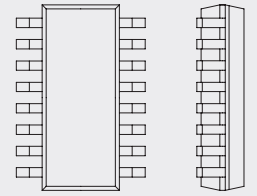
SOIC20w (7.5 x 12.8 mm)



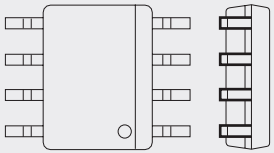
SOIC16w (7.5 x 10.3 mm)



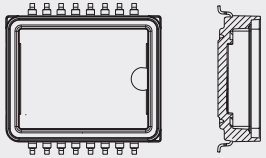
SOIC14n (3.9 x 8.6 mm)



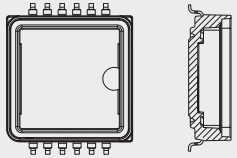
SOIC8n (3.9 x 4.9 mm)



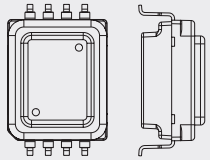
PM16 (11 x 13.5 mm)



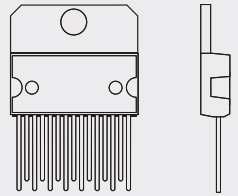
PM12 (11 x 11 mm)



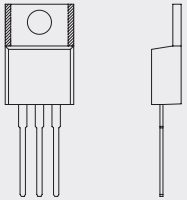
PM8 (6.9 x 8.4 mm)



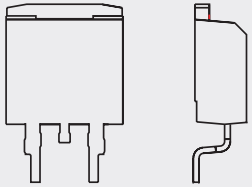
Multiwatt15 (In-Line)



TO-220K



D²PAK



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