↗ **Atmel Motor Driver Solutions**

Atmel's Motor Driver Family

Atmel® has more than 15 years experience with driver ICs for DC motors and supplies devices at a high-volume for typical body electronic applications like mirror control and flap control in HVACs. Although Atmel's driver ICs are equipped with different types of driver stages, they all share the same protection features – short-circuit protection, overtemperature warning and switch off, undervoltage protection, and open load detection – a must for automotive electronics. Atmel's continuously growing driver family provides a selection of different combinations of integrated high-side and low-side output stages so that users can easily tailor solutions to their needs.

The driver portfolio includes ICs for small DC motors controlled directly from the output stages. Motor driver system basis chips, with integrated gate drivers or pre-drivers to control separate NMOS FETs, form a core part of the Atmel's driver portfolio. These devices can be used to control almost any size of NMOSFETs and as such can be used in a broad range of applications.

Atmel's motor driver family targets applications with brushed and brushless DC motors for standard temperature applications as well as in very demanding high-temperature "under-the-hood" applications.

Atmel's Automotive AEC-Q100

Atmel, a globally operating manufacturer of innovative integrated circuits, has more than 25 years of automotive electronics design expertise and is a market leader in various automotive areas.

With a broad scope of automotive-dedicated technologies such as BCDMOS, BCD-on-SOI and non-volatile CMOS, and automotive-qualified

fabs (ISO 9001:2000, ISO TS 16949:2002, ISO 14001:2004), Atmel is able to provide high-end products that meet the strict automotive quality demands and that make vehicles more safe, economical and convenient. Design-ins are supported by our application engineers, demonstration and evaluation kits, reference boards, software, and detailed documentation.

BCD-on-SOI Technology

Atmel's innovative mixed-signal BCD-on-SOI technology (SMART-I.S.®), which is used for many body electronics and powertrain devices, enables maximum integration, extended EMC performance, and high-temperature capability.

SMART-I.S. Features

- Fully Dielectric Isolated Twin Well, 2 Metal Layers, Operating Temperatures up to 200°C
- High-density 5V NMOS and PMOS Transistors
- DMOS Family for 25V, 45V, 65V, and 80V
- Bipolar PNP and NPN Transistors
- Patented DMOS Method for Optimized Trade-off between $V_{breakdown}$ and R_{dson}
- Zener Diodes, Resistors, Capacitors, OTP

SMART-I.S. Benefits

- High-temperature and High-voltage Capability
- Small Size (Gate Density Equivalent to 0.5 μm CMOS)
- Excellent Radiation Hardness
- Reduced R_{dson} Due to SOI
- Lower Parasitics for Simpler Design
- Higher Switching Frequencies for Power Devices

- Reduced Switching Losses
- Improved Latch-up Immunity
- Low Leakage Currents
- Reduced Electromagnetic Susceptibility
- Improved Efficiency, e.g., Power Converters
- New and Easy-to-realize Design Concepts
- Re-useability of IPs
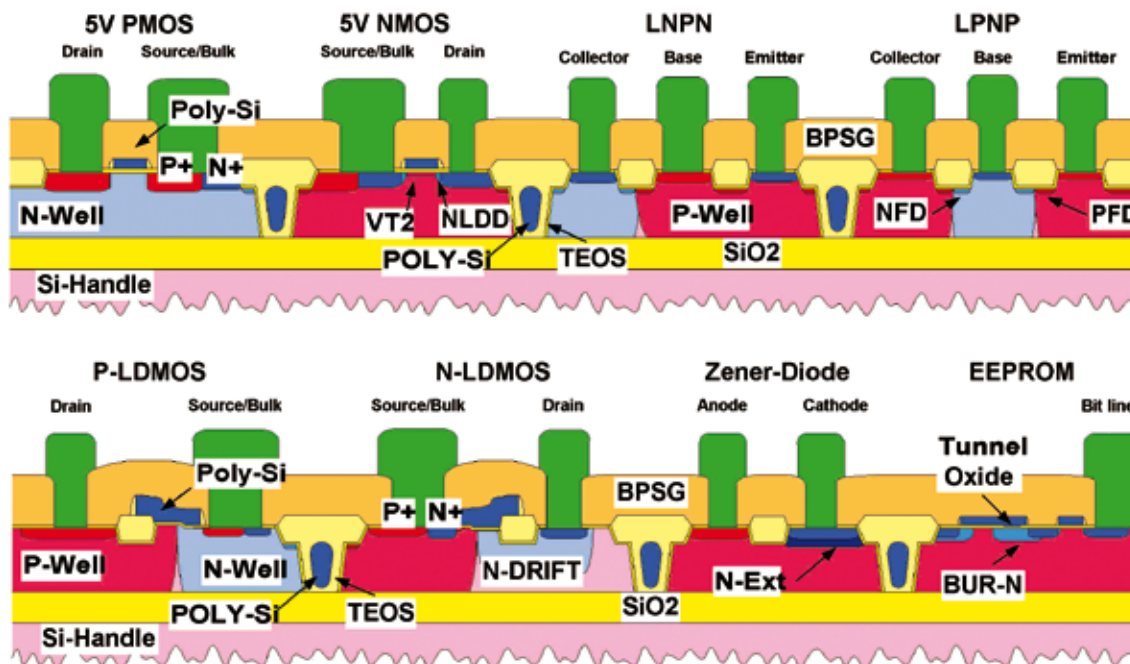
SMART-I.S. Cross Section (Through First Metal Layer)

SOI Technology for Junction Temperatures of 200ºC

Junction temperatures of 200ºC are not attainable with semiconductors made with standard bulk materials. The main reasons for this are that in combination with high-temperatures, the leakage current in semiconductors dramatically increases and also the latch-up performance of the components worsen with rising temperatures. SOI materials offers a range of advantages over bulk materials. Bulk technologies are, in general, dependent on PN-junctions operated in cut-off regions. SOI technology, however, offers the possibility of com-pletely isolating individual components with oxide – both horizontally and vertically.

With SOI technology, no wells are in contact with the substrate and therefore, there is no corresponding leakage current path. The leakage current path to the substrate with conventional bulk technology has an increasing significance with increasing temperatures as thermal leakage current in the PN-junction drastically increases.

↗↗↗↗ Up to 50 Times Less Leakage Current with SOI Technology

The sensitivity of the leakage current to temperature is shown below for a high-voltage transistor manufactured with SOI and bulk. SOI offers up to 50-times less leakage current. Leakage current at high-temperatures with bulk technology reaches unacceptable levels. As previously mentioned, in addition to the increasing leakage current, the risk of damage to the circuit due to latch-up also increases significantly with high temperatures. Latch-up is caused by parasitic bipolar transistors that are inherent due to the doping layer structure of the N and P-channel MOS transistors in common substrates (page 5). This parasitic bipolar transistor can form a thyristor as seen in the circuit diagram below.
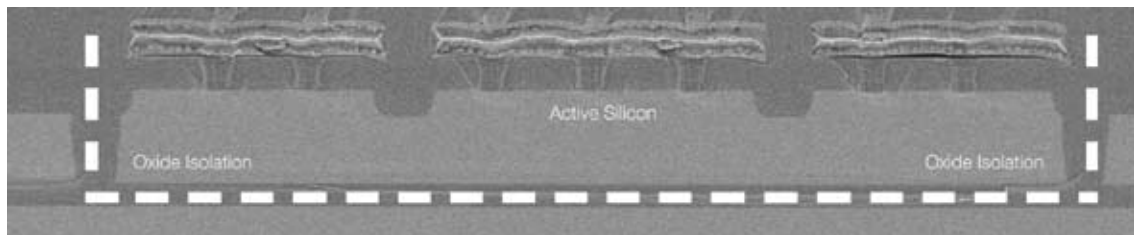
SOI Technology REM Picture (Active Silicon is Isolated Both Horizontally and Vertically)
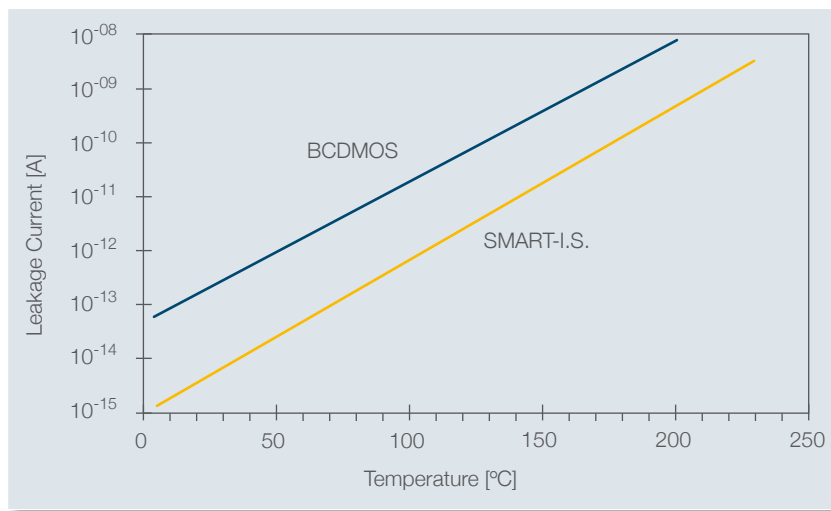
Leakage Current vs. Temperature for 65V High-voltage Transistor Created with Bulk and SOI Materials
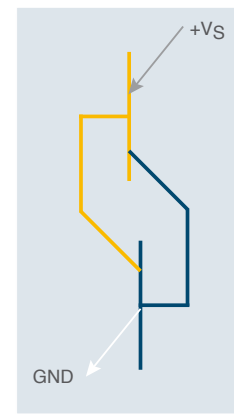
*Parasitic Latch-up Thyristor Circuit Diagram*

↗↗↗↗ Latch-up-free Operation up to 200ºC

The firing of the thyristor causes a short-circuit of the supply voltage to the CMOS-component, which almost always results in damage. The sensitivity of the thyristor rises with increasing temperature because the bipolar transistor's current gain exhibits a positive temperature co-efficient. The use of SOI material as well as the use of vertical oxide-filled trench isolation completely disables the parasitic bipolar transistor and with that the thyristor, thus also enabling reliable operation at high temperatures.

*Parasitic Bipolar Transistor used with Bulk Technology*
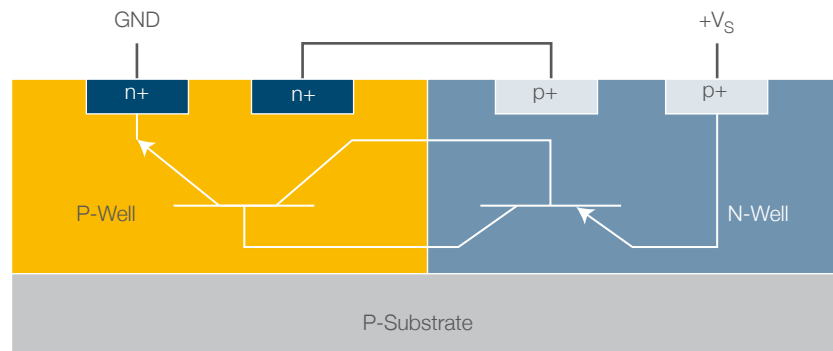
Oxide Isolation with SOI-CMOS Technology
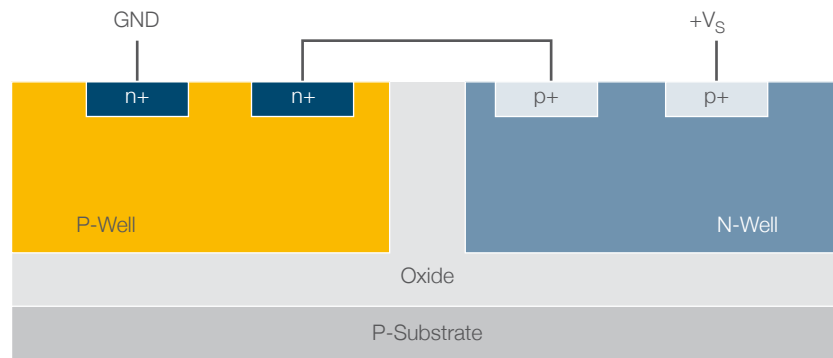
High-temperature Assembly

Packaging is also an important factor for high-temperature ICs. Atmel uses mould compounds and adhesives designed to withstand high temperatures. In integrated circuits the semiconductors are connected to the outside by gold-bumps on the aluminum metallization. When junction temperature increases to values higher than 175°C, an oxide starts to grow between the gold-bump and the aluminum. This is called the Kirkendall effect and leads to an isolation of the device and damage to the module. Atmel avoids this by adding a nickel-gold plating between the gold-bond and the aluminum pad.
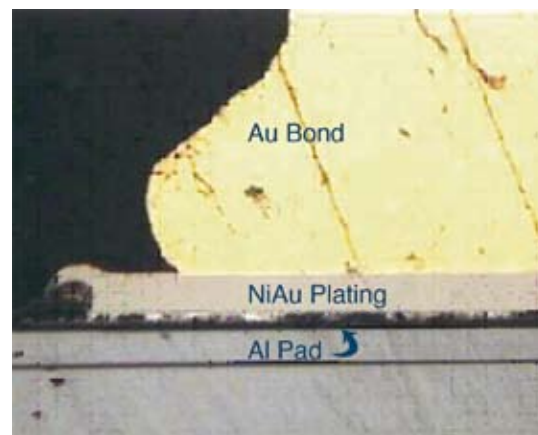
High-temperature ICs Used in Standard Temperature Range

The use of high-temperature products in a standard temperature range offers a number of advantages. This can be seen for driver IC with a thermal resistance of $R_{thja} = 40k/W$ and a maximum unit temperature of $TA = 125°C$. At the standard temperature $(TJ_{max} = 150°C)$, the maximum power dissipation is as follows: $P_{max} = (150°C - 125°C)/40K/W = 0.6W$.
Using a high-temperature IC $(TJ_{max} = 200°C)$ results in a maximum power-dissipation of:
$P_{max} = (200°C - 125°C)/40K/W = 1.8W$
High-temperature products can offer up to 3-times higher power dissipation due to the 3-times higher temperature difference between the junction and the surrounding area. With this type of circuit customers can either drive larger loads or use simpler, less expensive heat-sinks or driver ICs.

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Triple Half-bridge Drivers for High-Temperature Applications

ATA6827, ATA6832

Atmel's driver ICs are also available for high-temperature applications. In mechatronic solutions, for example, turbo charger or exhaust gas recirculation systems, many flaps have to be controlled by DC motor drivers located very close to the hot engine. Due to the advantages of Atmel's own SOI technology SMART-I.S., these driver ICs can withstand ambient temperatures of up to 150°C/302°F.

The ATA6827 is a fully protected triple half-bridge driver IC that controls up to 3 different loads by a microcontroller in automotive and industrial applications. Each of the 3 high-side and 3 low-side drivers is capable of driving currents up to 1.0A. The drivers are internally connected to form 3 half-bridges and can be controlled separately via a standard serial data interface.

The ATA6832's power stages are also combined to form 3 half-bridges. Due to the enhanced PWM signal of up to 25 kHz, the ATA6832 generates smooth control of a DC motor without any noise.

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Features

- Supply Voltage up to 40V
- Various Diagnostic Functions
- Integrated Communication Interface
- Enhanced PWM Frequency of up to 25 kHz (ATA6832)
- No Shoot-through Current
- QFN18 (ATA6827/32) Power Package with Heat Slug

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Benefits

- Automotive-qualified
- Ambient Temperatures up to 150°C/302°F
- Junction Temperatures up to 200°C/392°F
- Outputs Short-circuit Protected
- Selective Overtemperature Protection for Each Integrated Switch and Overtemperature Pre-warning
- Undervoltage Protection
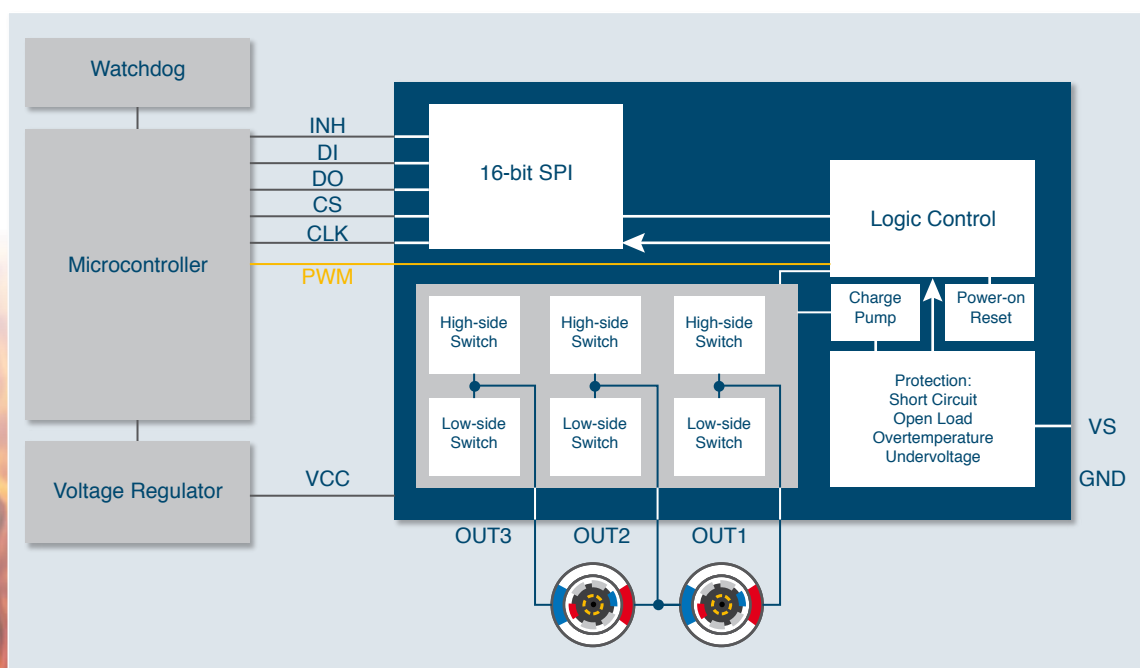
H-Bridge Gate Driver for High-Temperature Applications

ATA6824

The ATA6824 is designed for DC motor control application in automotive high temperature environment like in mechatronic assemblies in the vicinity of the hot engine, e.g. turbo charger. With a maximum junction temperature of 200°C, ATA6824 is suitable for applications with an ambient temperature up to 150°C.

If higher output currents are required, the MOSFET driver IC ATA6824 is recommended. This device also includes a 5V/3V voltage regulator for micro-controller supply, a window watchdog, and a serial interface. The integrated motor control unit avoids peak currents within the H-bridge.
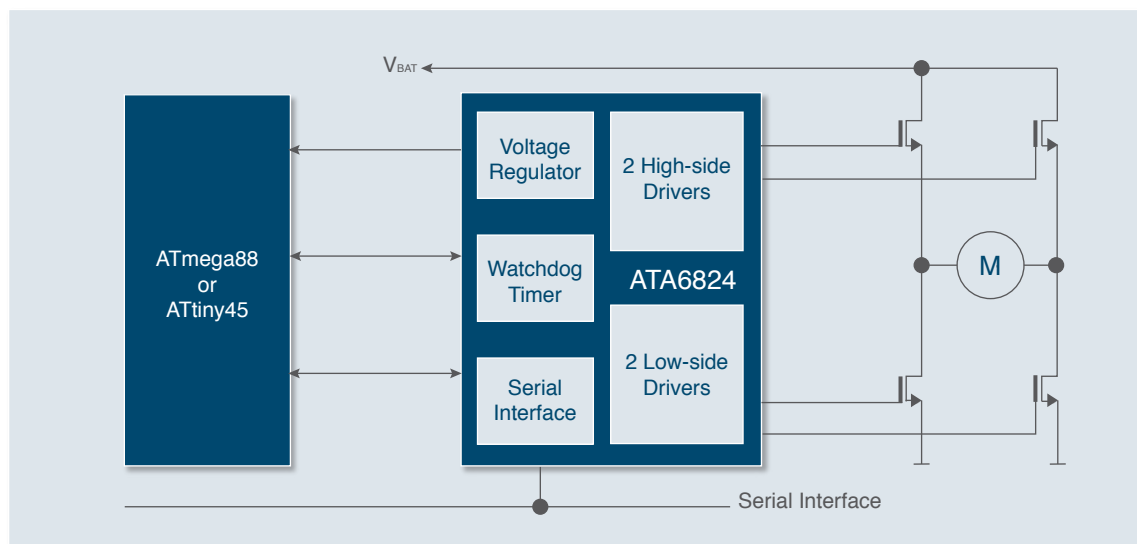
Features

- Supply Voltage up to 40V
- Various Diagnostic Functions
- Integrated Motion Logic
- Integrated Voltage Regulator
- Integrated Window Watchdog

Benefits

- QFN32/TQFP32
- Ideal for High Temperature Applications
- Junction Temperature up to 200°C/392°F
- High Integration Level Reduces Assembly Cost
- Robust Package with Low Thermal Resistance

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Hex Half-Bridge Drivers for High-Temperature Applications

ATA6837, ATA6839

The automotive-qualified hex half-bridge drivers ATA6837/39 have been specifically designed for high-temperature applications. They are particularly suited to driving DC motors. Mechatronic solutions, as found in turbo charger or exhaust gas recirculation systems, incorporate flaps that must be controlled by DC motor driver ICs. These applications, due to the close proximity to the engine or the hot actuator, need to function in environments where an ambient temperature of up to 150°C is usual. The ATA6837/39 is specialized for use in such environments. The six high-side and six low-side drivers are able to drive currents up to 650 mA (ATA6837) or 1A (ATA6839) respectively. The drivers are internally connected to form 6 half-bridges, each of which can be controlled separately via a serial data interface.
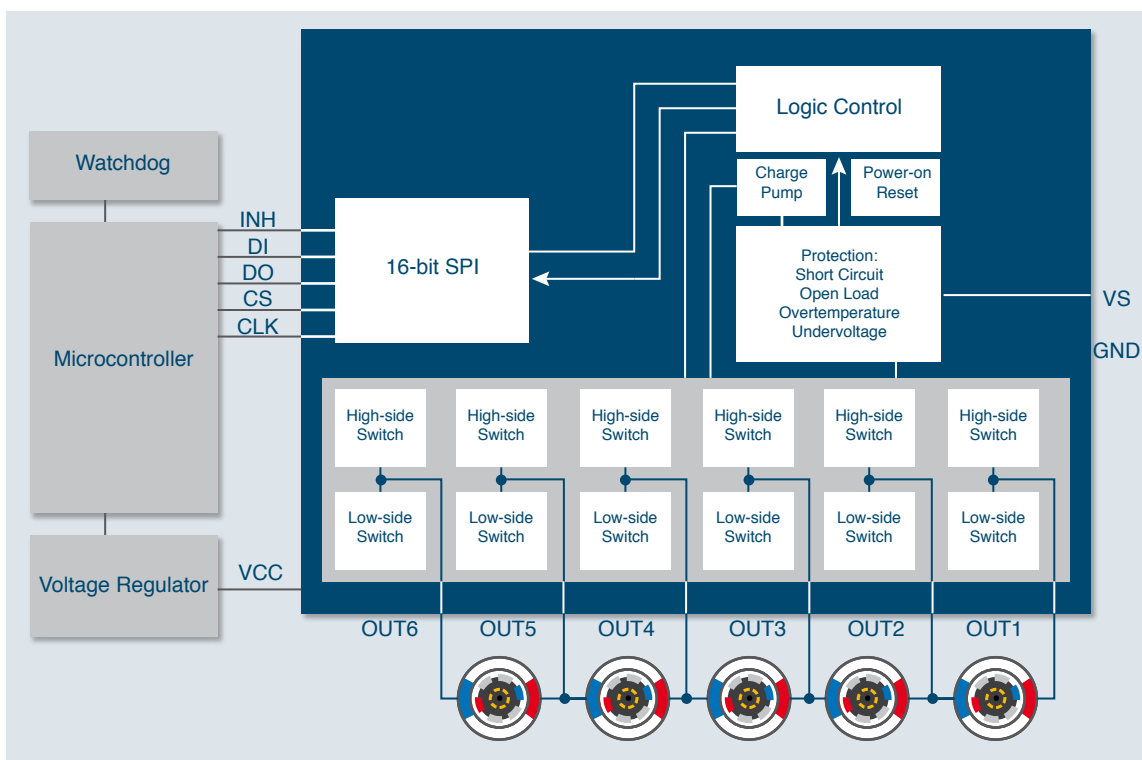
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Features

- Six Integrated Half Bridges
- Supply Voltage up to 40V
- Various Diagnostic Functions
- Integrated Communication Interface
- No Shoot-through Current
- QFN24

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Benefits

- Automotive Qualified
- Junction Temperature up to 200°C/392°F
- Ideal for Several DC Motors Controlled Sequentially
- Robust Package with Low Thermal Resistance

BLDC Motor Driver and LIN System Basis Chip

ATA6833, ATA6834

The outstanding features of brushless DC motors are used more and more in automotive applications. The ATA6833/34 is designed to control a 3-phase BLDC motor via six external NMOS transistors in conjunction with a separate microcontroller. Convenience electronics as well as safety critical high-temperature applications in the powertrain can benefit from its high functionality, which comprises voltage regulator, watchdog, LIN transceiver, and pre-driver stages. The ATA6833 works up to 150°C junction temperature, which is sufficient for ambient temperatures up to 125°C, whereas ATA6834 is specially equipped to work up to 200°C junction temperature, which qualifies this IC for high-temperature under-the-hood applications with 150°C ambient temperature.
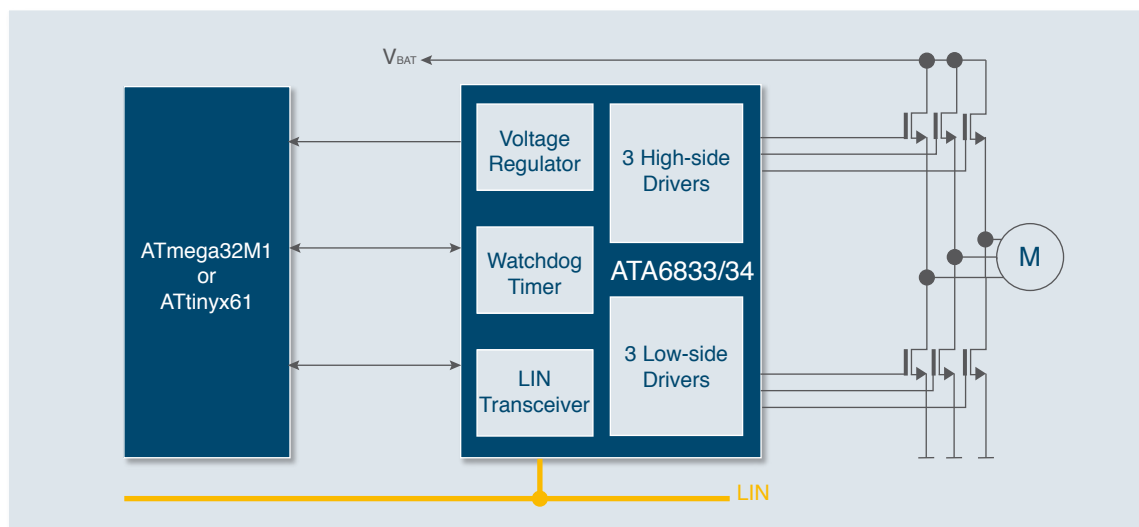
Features

- 3 Push-pull Stages Control 6 Externally Powered NMOS Transisitors
- PWM Frequency up to 50 kHz
- Various Diagnostic and Protection Functions Including Thermal Prewarning
- Integrated Window Watchdog
- Integrated LIN 2.1-compliant LIN Transceiver
- Shoot-through Protection by Adjustable Cross-conduction Timer
- Small and Robust QFN48 7 mm x 7 mm Package
- Very Low Current Consumption in Sleep Mode

Benefits

- Low Additional Component Requirement for Complete BLDC Motor Control Systems
- Reuse of Atmel's Renowned LIN Transceiver
- Suitable for Safety-critical Applications due to an Internal Watchdog
- Predriver Stages Designed to Control a Variety of External NMOS Transistors up to 100A Current Capability
- BLDC Motor Drives without Hall Sensors can be Used as Signal Conditioning Carried out by the Microcontroller
- Fully Populated and Programmable Design Boards Available

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H-Bridge Gate Driver with LIN Transceiver

ATA6823

The ATA6823, combining system basis func-tionality with the capability of predriver stages, is designed to control a DC motor in an external H-bridge. Together with a microcontroller, the ATA6823 forms a small system, which can work in the low speed in-vehicle-networking thanks to the LIN transceiver. With a PWM input and direction input from the microcontroller, ATA6823 indepen-dently handles the control of the external NMOS transistor.

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Features

- Speed and Direction Control of a DC Motor via 4 Externally-powered NMOS Transisitors
- Diagnostic and Protection Functions Including Thermal Prewarning
- Integrated Window Watchdog
- Integrated Pin-programmable 5V/3.3V Regulator
- Integrated LIN Transceiver LIN 2.1 Compliant
- Very Low Current Consumption in Sleep Mode
- Shoot-through Protection with an Adjustable Cross-conduction Timer
- Small, Robust QFN32 7 mm x 7 mm Package

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Benefits

- Complete DC Motor Control System with only a Few Components
- Atmel's LIN Transceiver as Integrated Design Block
- Integrated Watchdog Enables Use in Safety-critical Applications
- Predriver Stages Designed to Control Broad Range of External NMOS Transistors up to 100A and More Current Capability
- Fully Populated and Programmed Design Boards Available for Easy Application Design
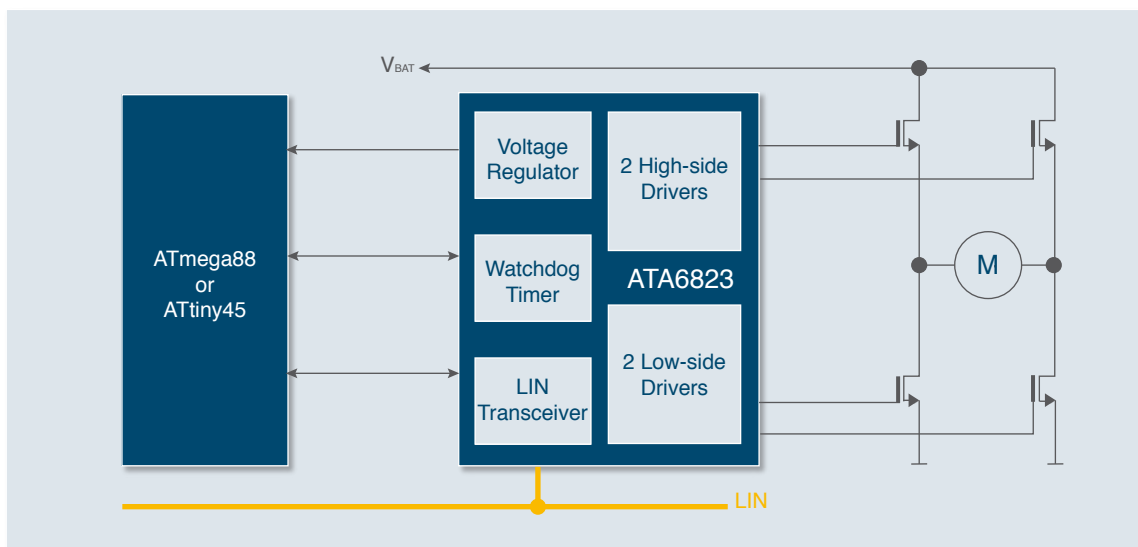
Hex Half-Bridge Drivers

ATA6836, ATA6838

The automotive-qualified hex half-bridge drivers ATA6836/38 have been specifically designed to drive several DC motors in H-bridge configuration for reverse operation controlled by a microcontroller. The six high-side and six low-side drivers are able to drive currents up to 650 mA (ATA6836) or 1A (ATA6838) respectively. The drivers are internally connected to form 6 half-bridges, each of which can be controlled separately via a standard serial data interface. With 5 DC motors connected to the six half bridges of ATA6836/38, these ICs are ideal to be used in smart flap control of automotive HVACs. In this application the DC motors can be activated sequentially without negative effect on the performance of the HVAC. If independent operation of DC motors is requested, the six half-bridges can be used as three H-bridges.
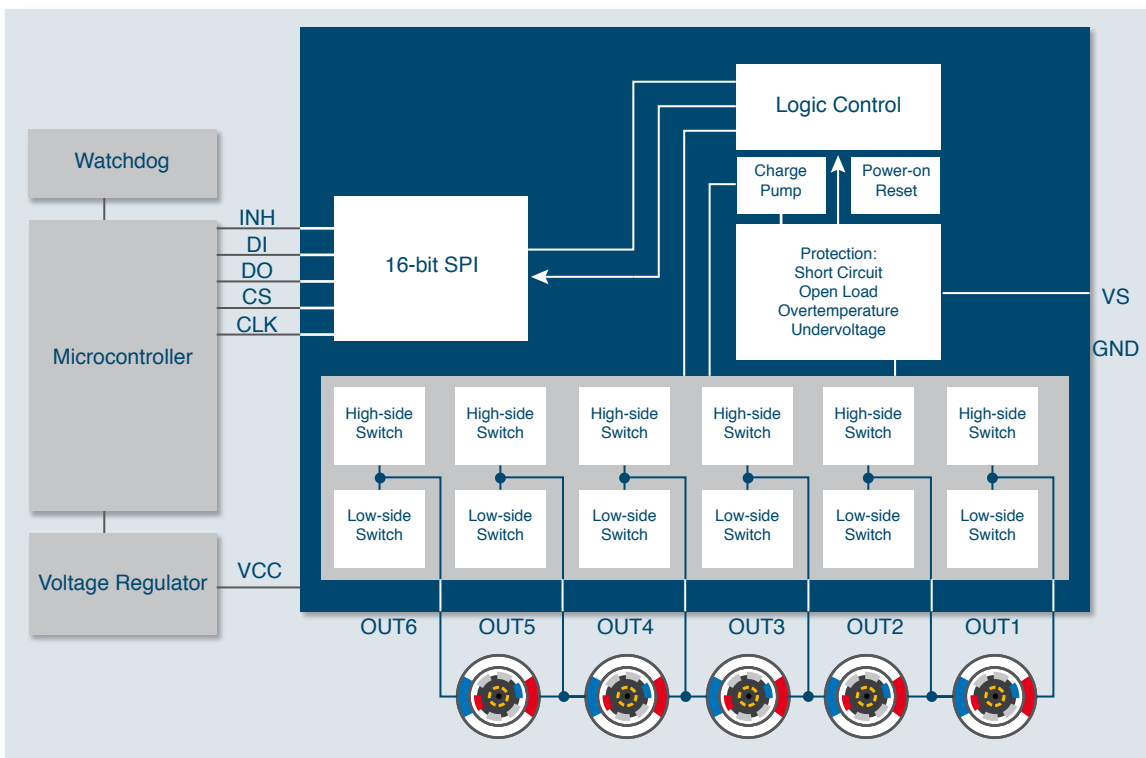
Features

- Six Integrated Half Bridges
- Supply Voltage up to 40V
- Various Diagnostic
- Integrated Communication Interface
- No Shoot-through Current
- SO28 and QFN24 (ATA6836)
- QFN 24 (ATA6838)

Benefits

- Automotive Qualified
- Simple Connection of up to 5 DC Motors
- Robust Package with Low Thermal Resistance
- ATA6836 Can Replace T6816

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Triple Half-Bridge Drivers

ATA6826, ATA6828, ATA6831, T6818

The ATA6826/ATA6828/ATA6831, and T6818 are fully protected driver interfaces designed in smart power BCDMOS technology. They are used to control up to 3 different loads by a microcontroller in automotive applications. The 3 high-side and 3 low-side drivers are connected internally to form 3 half-bridges. The communication with the microcontroller is carried out via a 16-bit SPI. The IC design especially supports the application of H-bridges to drive DC motors. The ATA6826 and ATA6831 can drive at least 1A output current, whereas the T6818 and ATA6828 handle currents of up to 1.5A. If the power dissipation exceeds the limits of the standard SO14 package, a special package variant (ATA6828) with heat slug for optimized heat transfer can be used. The ATA6831 can be PWM-controlled from a standard serial interface. The ATA6831 has an enhanced PWM frequency of up to 25 kHz, which eliminates noise.

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Features

- Supply Voltage up to 40V
- 3 Half-bridge Outputs
- Output Currents up to 1A/1.5A
- Various Diagnostic Functions Such as Shorted Output, Open Load, Overtemperature, and Power-supply Fail Detection
- SPI up to 2-MHz Clock Frequency
- SO14 Power Package with Heat Slug
- Automotive Qualified

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Benefits

- Outputs Short-circuit Protected
- ATA6831: Noiseless Speed Setting by Non-Audible PWM Frequency
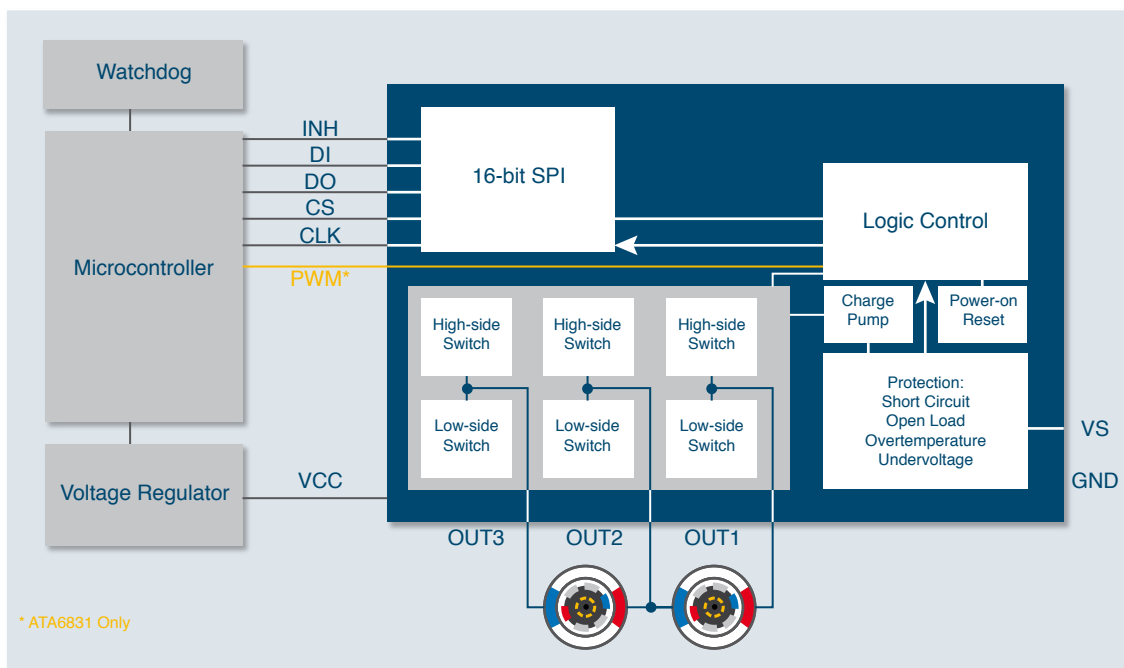
AVR® Automotive Microcontrollers

The automotive market for electronics is grow-
ing rapidly as the demand for comfort, safety and
reduced fuel consumption increases. All of these
new functions require local intelligence and control,
which can be optimized by the use of small, power-
ful microcontrollers.

Taking advantage of its unsurpassed experience in
embedded Flash memory microcontrollers, with a
large number of AVR devices, Atmel brings innova-
tive solutions, whether for sensor or actuator con-
trol or more-sophisticated networking applications.
These microcontrollers are fully-engineered to fulfill
OEMs' quality requirements towards zero defects.

AVR Architecture Benefits

The AVR 8-bit architecture has reached a high level
of acceptance in many market segments for its:

■ Highest System Integration with a Large Num-
  ber of Analog and Digital Peripherals

■ Highest 8-bit CPU Performance Executing Pow-
  erful Instructions in a Single Clock Cycle

■ Highest Code Density with High-level C-lan-
  guage Optimization

■ Self-programming Memory

■ Product Compatibility for both Code and Fea-
  tures

■ Complete and Low-cost Tool Set Including
  Open-source C-compiler

■ Brown-out Detection and Flash Corruption Se-
  curity

Multiplexing & Standard Microcontrollers

tinyAVR®

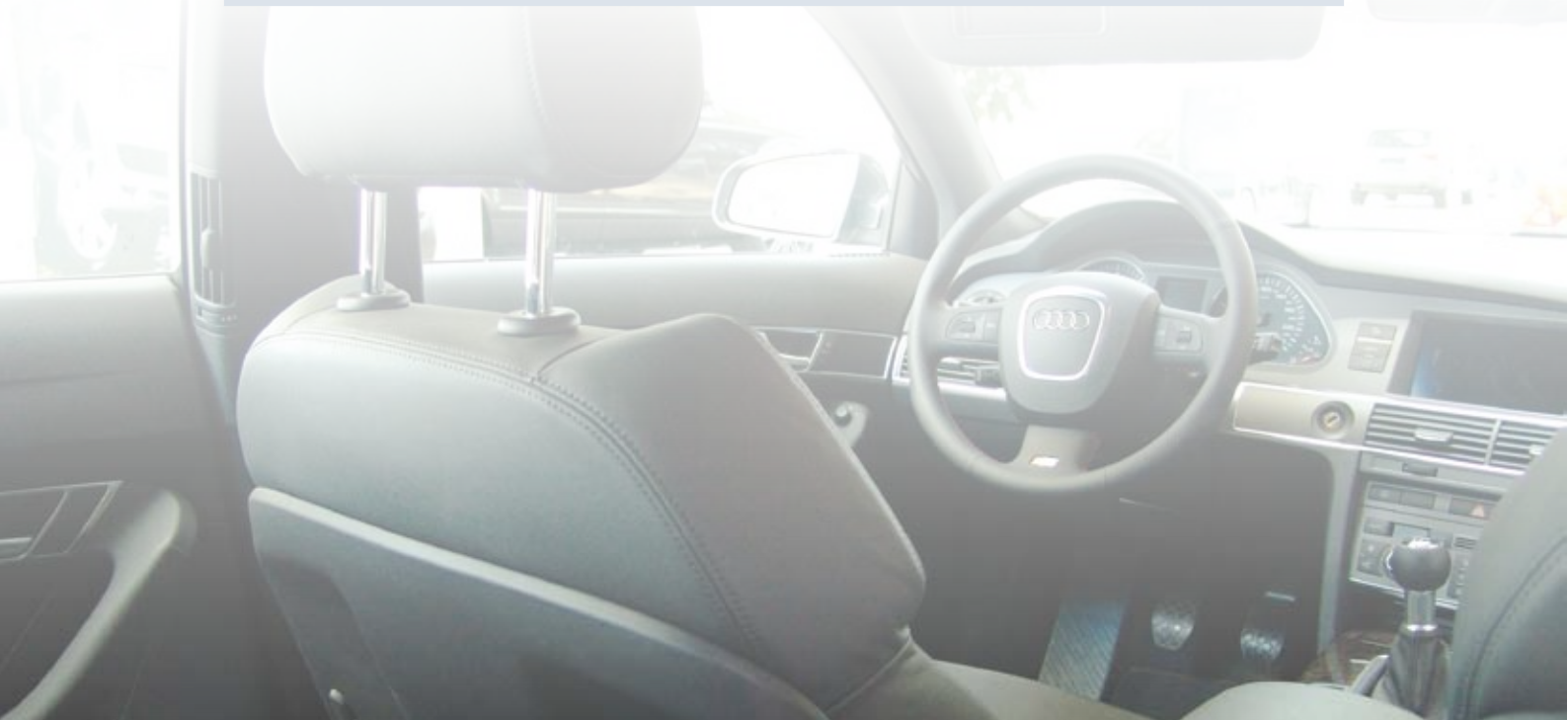| Part Number	Description	Package
ATtiny25	AVR Microcontroller with 2-Kbyte Flash MCU, 128-byte RAM, 128-byte EEPROM, 10-bit ADC, up to 16 MIPS, Internal Calibrated Oscillator	SOIC8
ATtiny45	AVR Microcontroller with 4-Kbyte Flash MCU, 256-byte RAM, 256-byte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable USI, Internal Calibrated Oscillator	SOIC8
ATtiny85	AVR Microcontroller with 8-Kbyte Flash MCU, 512-byte RAM, 512-byte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable USI, Internal Calibrated Oscillator	SOIC8
ATtiny24	AVR Microcontroller with 2-Kbyte Flash MCU, 128-byte RAM, 128-byte EEPROM, 10-bit ADC, up to 16 MIPS, Internal Calibrated Oscillator	SOIC14, QFN28
ATtiny44	AVR Microcontroller with 4-Kbyte Flash MCU, 256-byte RAM, 256-byte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable USI, Internal Calibrated Oscillator	SOIC14, QFN28
ATtiny84	AVR Microcontroller with 8-Kbyte Flash MCU, 512-byte RAM, 512-byte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable USI, Internal Calibrated Oscillator	SOIC14, QFN28
ATtiny167	AVR Microcontroller with 16-Kbyte Flash MCU, 512-byte RAM, 512-byte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable USI, Internal Calibrated Oscillator	TSSOP20 SOIC20 VQFN32

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megaAVR®

Part Number	Description	Package
ATmega48	AVR Microcontroller with 4-Kbyte Flash MCU, 512-byte RAM, 256-byte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable UART, Internal Calibrated Oscillator	TQFP32, QFN32
ATmega88	AVR Microcontroller with 8-Kbyte Flash MCU, 1-Kbyte RAM, 512-byte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable UART, Internal Calibrated Oscillator	TQFP32, QFN32
ATmega168	AVR Microcontroller with 16-Kbyte Flash MCU, 1-Kbyte RAM, 512-byte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable USI, Internal Calibrated Oscillator	TQFP32, QFN32
ATmega164P	AVR Microcontroller with 16-Kbyte Flash MCU, 1-Kbyte RAM, 512-byte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable USI, Internal Calibrated Oscillator	TQFP44, QFN44
ATmega324P	AVR Microcontroller with 32-Kbyte Flash MCU, 2-Kbyte RAM, 1-Kbyte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable USI, Internal Calibrated Oscillator	TQFP44, QFN44
ATmega644P	AVR Microcontroller with 64-Kbyte Flash MCU, 4-Kbyte RAM, 2-Kbyte EEPROM, 10-bit ADC, up to 16 MIPS, LIN-capable USI, Internal Calibrated Oscillator	TQFP44, QFN44

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Application-Specific Microcontrollers

Part Number	Description	Package
AT90CAN32	AVR Microcontroller with 32-Kbyte Flash MCU, 15 Message Objects CAN Controller, 2-Kbyte RAM, 1-Kbyte EEPROM, 10-bit ADC, TWI, up to 16 MIPS, LIN-capable UART	TQFP64, QFN64
AT90CAN64	AVR Microcontroller with 64-Kbyte Flash MCU, 15 Message Objects CAN Controller, 4-Kbyte RAM, 2-Kbyte EEPROM, 10-bit ADC, TWI, up to 16 MIPS, LIN-capable UART	TQFP64, QFN64
AT90CAN128	AVR Microcontroller with 128-Kbyte Flash MCU, 15 Message Objects CAN Controller, 4-Kbyte RAM, 4-Kbyte EEPROM, 10-bit ADC, 2-Wire Interface (TWI), up to 16 MIPS, LIN-capable UART	TQFP64, QFN64
ATmega32M1	AVR Microcontroller with 32-Kbyte Flash MCU, 2-Kbyte RAM, 1-Kbyte EEPROM, 6 Message Objects CAN Controller, LIN Controller, 10-bit ADC, 10-bit DAC, PSC high performance waveform controller, 64 MHz PLL for fast PWM, up to 16 MIPS	TQFP32, QFN32
ATmega32C1	AVR Microcontroller with 32-Kbyte Flash MCU, 2-Kbyte RAM, 1-Kbyte EEPROM, 6 Message Objects CAN Controller, LIN Controller, 10-bit ADC, 10-bit DAC, 64 MHz PLL for fast PWM, up to 16 MIPS	TQFP32, QFN32

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Overview – High-Temperature Driver ICs

Part Number	Description	Package
ATA6824	H-bridge DC Motor Driver. System Basis Chip. Integrated 3.3V/5V /100 mA Power Supply, Serial Interface, Watchdog, 2 High-side and 2 Low-side Gate Drivers	QFN32 TQFP32
ATA6827	Triple Half-bridge Driver with 3 High-side and 3 Low-side Drivers, 1000 mA Current Limitation	QFN18
ATA6832	Triple Half-bridge Driver with 3 High-side and 3 Low-side Drivers, 1000 mA Current Limitation and PWM > 20 kHz	QFN18
ATA6834	BLDC Motor System Basis Chip with 3 Half-bridge Gate Drivers, LIN Interface, Window Watchdog, and Voltage Regulator, $T_{junction}$ up to 200°C	QFN48
ATA6837	Hex Half-bridge Driver with Serial Input Control, 650 mA Current Limitation	QFN24
ATA6839	Hex Half-bridge Driver with Serial Input Control, 1000 mA Current Limitation	QFN24

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Overview – Standard Driver ICs

Part Number	Description	Package
T6801	Single-channel Driver; 25 mA Output with Thermal Monitoring, Thermal Shutdown, Short-circuit Protection	SO8
U6803B	Triple Driver; 3 x 25 mA Output with Thermal Monitoring, Common Thermal Shutdown, Short-circuit Protection	SO8
U6805B	Hex Driver; 6 x 25 mA Output with Thermal Monitoring, Common Thermal Shutdown, Short-circuit Protection	SO14
U6815BM	Dual Hex Driver with Serial Input Control, 6 High-side and 6 Low-side Drivers, 600 mA Current Limitation	SO28
T6816	40V Dual Hex Driver with Serial Input Control, 6 High-side and 6 Low-side Drivers, 600 mA Current Limitation	SO28
T6817	Dual Triple Driver with Serial Input Control, 3 High-side and 3 Low-side Drivers, 600 mA Current Limitation	SSO20
T6818	Triple Half-bridge Driver with Serial Input Control, 3 High-side and 3 Low-side Drivers, 1500 mA Current Limitation	SO14
T6819	Dual Triple Driver with Serial Input Control and PWM Input, 3 High-side and 3 Low-side Drivers, 1500 mA Current Limitation	SO16
U6820BM	Dual Quad Driver with Serial Input Control, 4 High-side Output Stages, 4 Low-side Output Stages, 50 mA Capability, Current Limitation	SO16
ATA6823	LIN System Basis Chip with H-bridge DC Motor Driver. Integrated 3.3V/5V/100 mA Power Supply, LIN Transceiver, Watchdog, 2 High-side and 2 Low-side Gate Drivers	QFN32
ATA6826	Triple Half-bridge Driver with Serial Input Control, 3 High-side and 3 Low-side Drivers, 1000 mA Current Limitation	SO14
ATA6828	Triple Half-bridge Driver with Serial Input Control, 3 High-side and 3 Low-side Drivers, 1500 mA Current Limitation	SO14 Heat Slug
ATA6829	Dual Triple Driver with Serial Input Control and PWM Input, 3 High-side and 3 Low-side Drivers, 1500 mA Current Limitation	SO16 Heat Slug
ATA6831	Triple Half-bridge Driver with Serial Input Control and 25-kHz PWM Input, 3 High-side and 3 Low-side Drivers, 1000 mA Current Limitation	QFN18
ATA6833	BLDC Motor System Basis Chip with 3 Half-bridge Gate Drivers, LIN Interface, Window Watchdog and Voltage Regulator	QFN48
ATA6836	Hex Half-bridge Driver with Serial Input Control, 6 High-side and 6 Low-side Drivers, 650 mA Current Limitation	SO28, QFN24
ATA6838	Hex Half-bridge Driver with Serial Input Control, 6 High-side and 6 Low-side Drivers, 1.5A Current Limitation	QFN24

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