



Converters

Isolation

Around the Core

Texas Instruments
Analog Solutions

HPA

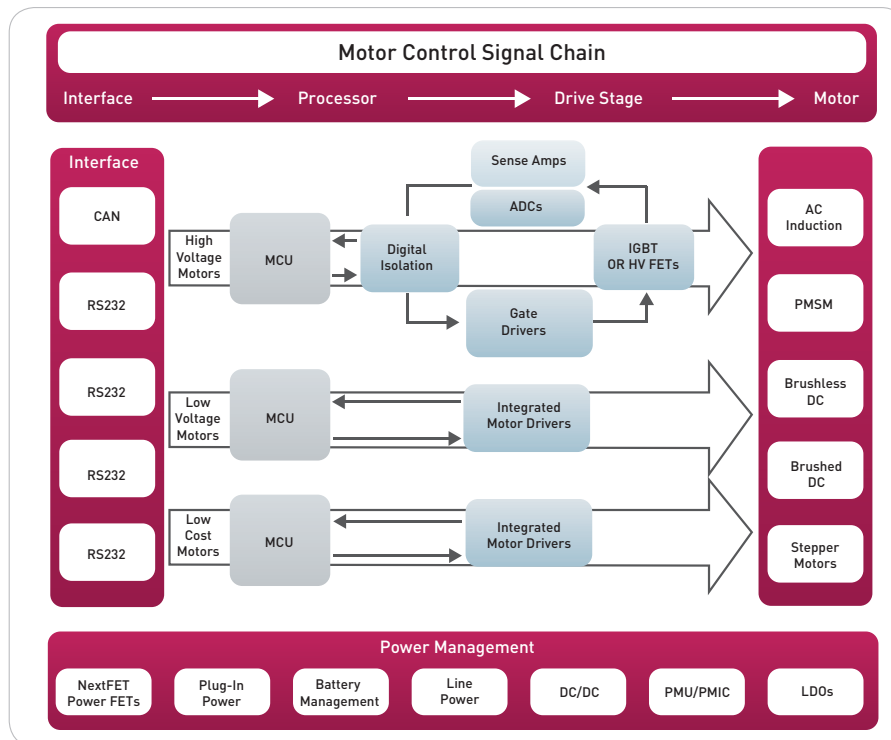
Motor
Drives

Interfaces



Motor Control/Drives Solutions	4
Industrial Communication	6
Human Machine Interfaces (HMI)	8
Programmable Logic Controller (PLC)	10
Smart Metering Solutions	12
Industrial Automation Solutions for Sensors	14
Motor Driver Evaluation Platform	15

With the increasing demand for energy efficiency, safety, reliable connectivity and precise control, industrial drives for factory automation are becoming more and more sophisticated systems requiring cutting-edge technologies. TI provides a broad range of analog products, digital controllers and software to precisely control the position, velocity and torque of mechanical drives. A robust process technology and a long product life policy enable TI to meet stringent customer requirements for reliability and continuity of supply.



Motor Control/Drives Portfolio at a glance

Power Stage

Description	Key Benefits	Device
5 kV _{RMS} isolated gate driver for IGBTs and MOSFETs of up to IC = 150 A and V _{CE} = 1200 V	<ul style="list-style-type: none"> Support for high current/high voltage operation Improved safety and system performance Proven reliability of SiO₂ dielectric, stable over time, temperature & moisture 	IS055xx
3-phase gate driver with dual shunt amplifiers and buck converter	<ul style="list-style-type: none"> Eliminates external current shunt monitors Eliminates external power supply for MCU and system accessories Enhanced protection features and integrated charge-pump for 100% duty cycle 	DRV8301
Stepper motor driver with on-chip 1/32 microstepping indexer	<ul style="list-style-type: none"> Two integrated H-bridges (each up to 2.5 A) Easy-to-use STEP/DIR interface Enhanced protection features 	DRV8825
Dual brushed DC/single stepper PWM motor driver with ultra low RDS _(ON) MOSFETs	<ul style="list-style-type: none"> Up to 14 A continuous current (24 A peak) High efficiency of up to 97% Enhanced protection features 	DRV8412/32

Industrial Communication Interfaces

Description	Key Benefits	Device
Single-port Ethernet PHY for 10 BaseT and 100 Base TX signaling	<ul style="list-style-type: none"> Predictable and precise for time-critical apps Finds cable faults/length within ± 1 m TLK100/TLK110 adds support for RMII interface 	TLK100
ARM9™ microprocessor	<ul style="list-style-type: none"> Highly integrated System on Chip Certified Profibus solution in conjunction with the ISO1176(T) 	AM1810 or OMAPL138
Isolated Profibus transceiver with integrated transformer driver	<ul style="list-style-type: none"> Meets Profibus driver strength and timing requirements High speed isolation allows longer buses Proven reliability of SiO₂ insulation, stable over time, temperature & moisture 	ISO1176T

Control MPU/ MPU with integrated FieldBus

Description	Key Benefits	Device
C2000™ 32-bit real-time MCUs	<ul style="list-style-type: none"> Best in class capability for sensorless and field oriented control (FOC) Motor control library, documentation and system examples Up to 12.5 Mbps, 12-bit ADCs and dedicated motor control timers 	TMS320F283xx/ TMS320F280xx Delfino™/Piccolo™
Sitara™ 32-bit Cortex-A8 & ARM9™ MPUs	<ul style="list-style-type: none"> Extensive set of integrated and flexible industrial control and connectivity interfaces Available in industrial temperature ranges 	AM35x/AM37x/ AM17x/AM18x Sitara™

Current Sensing

Description	Key Benefits	Device
Single channel isolated $\Delta\Delta$ modulator and a quad digital filter with resolver excitation	<ul style="list-style-type: none"> Simple system design for combined A-to-D conversion and isolation Cost savings on active filters and analog comparators Excellent magnetic immunity 	AMC1203/4 with AMC1210
High accuracy current shunt monitor (for in-line current sensing)	<ul style="list-style-type: none"> High CMRR allows precise bi-directional in-line current sensing Saves system power by allowing for smaller shunt resistors 	INA282

Position Sensing

Description	Key Benefits	Device
Dual 16/14/12 bit 1MSPS, 4x2/2x2 simultaneous SAR ADC	<ul style="list-style-type: none"> 2-bit counter for safety applications FIFO allows storage of up to 4 results per channel 	ADS8363/7263/7223

I/O (24 V, 12 mA)

Description	Key Benefits	Device
Input: Highly integrated digital input serializer (eight channels from 0 to 34 V to SPI interface)	<ul style="list-style-type: none"> Simplified PCB design High-density signal conditioning in a single, compact device 	SN65HVS882
Output: 8-bit shift register design to drive low-side switched resistive loads	<ul style="list-style-type: none"> Low RDS_(on) Eight power DMOS transistor outputs of 100 mA DC 	TPIC2810

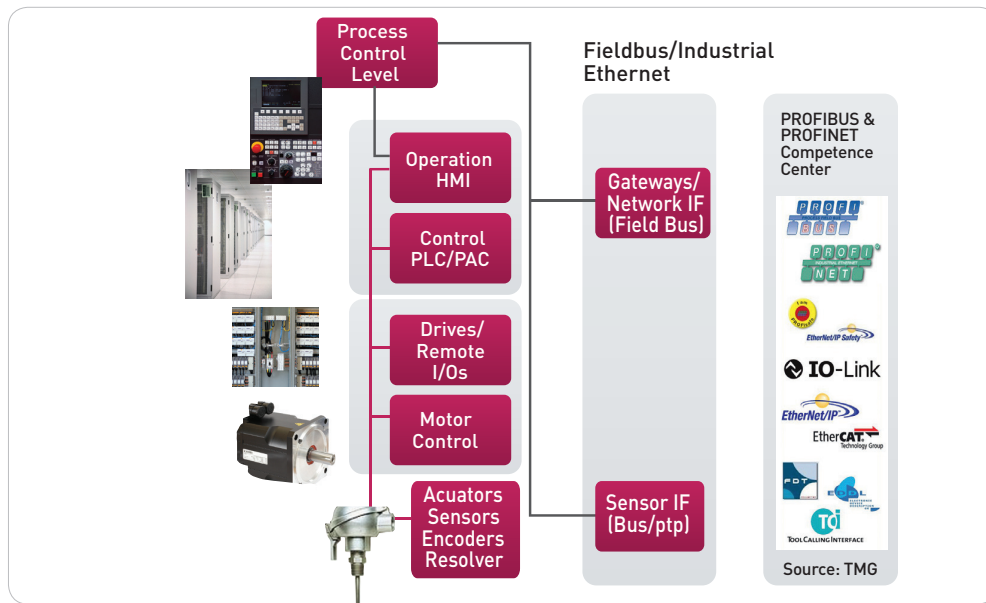
Isolation

Description	Key Benefits	Device
Low-Power 2.5 kV _{RMS} to 5 kV _{RMS} dual digital isolators (up to 50 Mbps)	<ul style="list-style-type: none"> Fail-safe LOW key spec for safe operation of MOSFET & IGBT gate drivers Proven reliability of SiO₂ insulation, stable over time, temperature & moisture 	ISO7420FE, ISO7520/21

Harsh Environment

- Standard off the shelf parts offering 55 °C to 210 °C operation
- Special packaging
- Long product life cycles

In today's industrial automation market new technology brings many opportunities for industrial system developers to successfully address ever-evolving challenges. With applications ranging from programmable logic controllers and industrial computers to human machine interface, industrial peripherals and factory communication, automation systems require cutting-edge technologies to meet stringent customer requirements for high reliability and harsh environment in mission-critical environments.



For Industrial Communication at a glance

Interface Solutions

Description	Device	Key Benefits
Isolated 5 V CAN transceiver	ISO1050	<ul style="list-style-type: none"> • Reduced components and board space • Life span > 25 years @ 125 °C • Allows longer cable length
Industrial Ethernet PHY	TLK100	<ul style="list-style-type: none"> • Predictable and precise timing (for industrial "real time" Ethernet) • Reliable operation over long cables (up to 200 m)
Isolated RS-485 (PROFIBUS) transceiver (ISO1176 T with integrated transformer driver)		<ul style="list-style-type: none"> • Reduced components and board space • Life span > 25 years @ 125 °C
Dual bidirectional bus buffer	ISO1176/1176T	<ul style="list-style-type: none"> • I²C bus operation over 20 m of wire • I²C bus signals for interface with optoelectrical isolators
3 V to 5.5 V two-channel RS-232 1-Mbit/s line driver/receiver	TRSF3232E	<ul style="list-style-type: none"> • No external ESD protection needed • Small external capacitors needed (4 × 0.1 µF)
Differential line receiver with ± 15 kV IEC ESD	AM26LV32E	<ul style="list-style-type: none"> • Highest ESD protection for RS422 bus pins • Pin-to-pin compatible with AM26C32, AM26LS32

Embedded Processing Solutions

Description	Device	Key Benefits
OMAP™ application Processor with PRU (Programmable Realtime Unit)	OMAP137	<ul style="list-style-type: none"> • Design flexibility by programmability • Shortest cycle times • Supports fieldbus and industrial ETN
Stellaris® ARM® Cortex™-M3-based MCUs	LM3S9x	<ul style="list-style-type: none"> • Only ARM MCU with 10/100 MAC/PHY • Reduced BOM and board space • Freely available communication stacks • Cost reduction by analog integration
MSP430™ 16-bit Ultra-Low-Power Microcontroller, 256 KB Flash, 16 KB RAM, LCD, USB	MSP430F663x	<ul style="list-style-type: none"> • Optimized system power budget • Advanced algorithms (Flash, RAM, CPU) • Reduced external BOM (LCD, USB, RTC, etc.)
C6-Integra DSP + ARM® Processor	OMAPL138	<ul style="list-style-type: none"> • 10/100 Mb/s Ethernet MAC (EMAC) • Enhanced Direct-Memory-Access Controller • Serial ATA (SATA) Controller • DDR2/Mobile DDR Memory Controller • Programmable Real-Time Unit Subsystem
ARM® microprocessor for PROFIBUS	AM1810	<ul style="list-style-type: none"> • Programmable Real-Time Unit Subsystem (with profibus) • Enhanced Direct-Memory-Access Controller • USB 2.0 OTG Port With Integrated PHY • 10/100 Mb/s Ethernet MAC (EMAC)

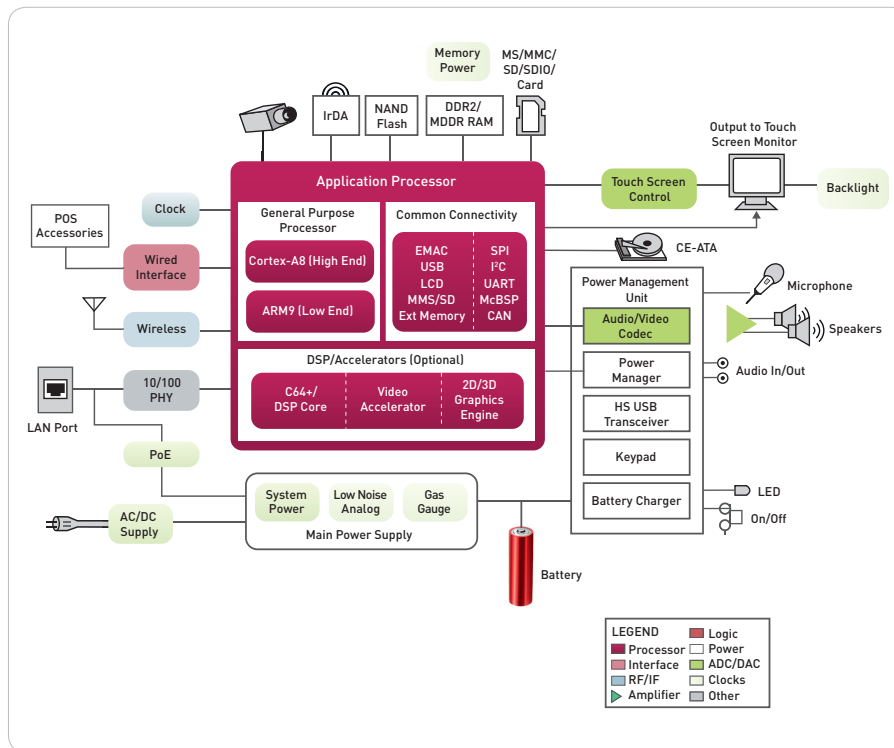
Power Solutions

Description	Device	Key Benefits
1.5 kV isolated flyback (PMP4190)	TPS61175	<ul style="list-style-type: none"> • Design flexibility: 1/2 W, 1/4 W up to 1 W • Isolation support of 1.5 kV • Simple 3.3 V to 5 V converter design
Power Management Unit	TPS65070	<ul style="list-style-type: none"> • High integration level with all power rails to power the Sitara™ processor • Portable applications benefit from the integrated charger solution
17 V step-down converter	TPS62110	<ul style="list-style-type: none"> • Very efficient solution to power Stellaris® processor
Power Management Unit for OMAP™	TPS65023	<ul style="list-style-type: none"> • High integration level with all power rails to power the OMAP processor • Ideal as well for portable applications

Harsh Environment

- Standard off the shelf parts offering 55 °C to 210 °C operation
- Special packaging
- Long product life cycles

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For Human Machine Interfaces at a glance

High Performance Analog Solutions

Description	Device	Key Benefits
Nano-power touch screen controller with SPI	TSC2008/2020/2046	<ul style="list-style-type: none"> Low cost, low power
Very low power Stereo Audio Coded	TLV320AIC3254	<ul style="list-style-type: none"> Very low power miniDSP Power Tune™ Technology SPI I²C
Industrial Ethernet PHY	TLK100 / TLK110	<ul style="list-style-type: none"> Reliable operation over log cables (up to 200 m) Predictable and precise timing for industrial real time Ethernet

Embedded Processing Solutions

Description	Device	Key Benefits
Sitara™ ARM® Cortex™-A8, up to 600 MHz	AM35x	<ul style="list-style-type: none"> • Flexibility for scalable display resolutions (VGA, SVGA, XGA, 720 p) • Enables high-level operating systems
Sitara™ Cortex™-A8 up to 1 GHz	AM37x	<ul style="list-style-type: none"> • Immersive 3D graphics accelerations (20 M polygons/sec.) • Low power • Device scalability
Sitara™ Cortex™-A8 up to 1.5 GHz	AM389x	<ul style="list-style-type: none"> • High performance • High bandwidth connectivity • Advanced displays and 3D graphics acceleration

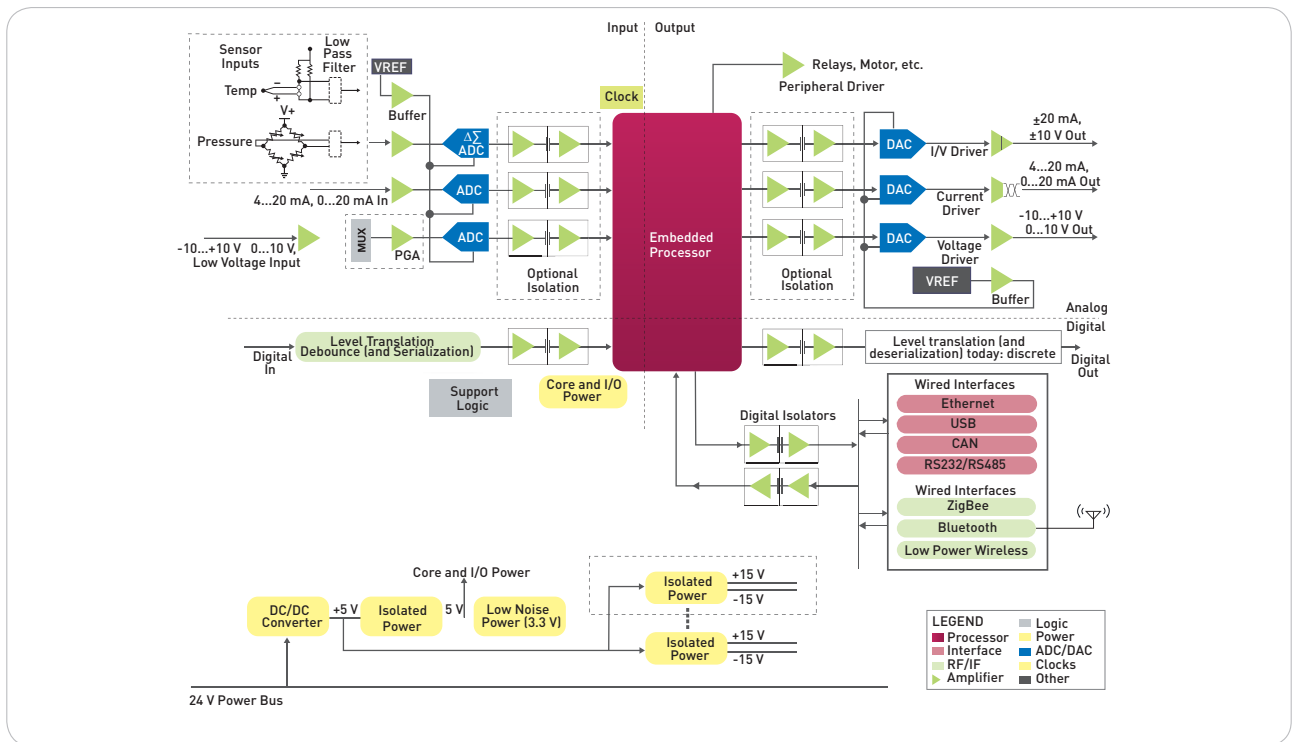
Power Solutions

Description	Device	Key Benefits
1 Channel 42 V, 500 mA linear LED driver	TL4242	<ul style="list-style-type: none"> • Adjustable current up to 500 mA
Integrated Power Management IC	TPS65950	<ul style="list-style-type: none"> • 3 DC/DC's • 11 LDO's • Audio Codec • USB HS Transceiver
IEEE 802.3-2005 PoE Interface	TPS23753	<ul style="list-style-type: none"> • Robust 100 V • DC/DC converter for isolated designs • 15 KV ESD

Harsh Environment

Description	Key Benefits
Extended temperature operation	<ul style="list-style-type: none"> • Support for high temperature applications from -55 °C to 210°C
Complete product portfolio	<ul style="list-style-type: none"> • Complete signal chain solutions with product offerings across the entire TI product line
Multiple package options	<ul style="list-style-type: none"> • Ceramic – surface mount and through hole for 200 °C + requirement • Known good die – smallest footprint for multichip modules and hybrids • Plastic – 175 °C package options
Extended product life cycle support	<ul style="list-style-type: none"> • Device availability for long life programs 10 + years
Up-front device feasibility evaluation	<p>Complete initial pre-release coverage for:</p> <ul style="list-style-type: none"> • Temperature performance • Silicon reliability • Package reliability • Roadmap to known good die

In today's industrial automation market new technology brings many opportunities for industrial system developers to successfully address ever-evolving challenges. With applications ranging from programmable logic controllers and industrial computers to human machine interface, industrial peripherals and factory communication, automation systems require cutting-edge technologies to meet stringent customer requirements for high reliability and harsh environment in mission-critical environments.



For Programmable Logic Controller (PLC)

High Performance Analog Solutions

Description	Device	Key Benefits
Zero Drift, HV prog gain amplifier + low-noise, 14 kSPS, 24-bit Analog-to-Digital converter	ADS1259 + PGA280 (analog input)	<ul style="list-style-type: none"> Input signals from ±5 V down to mV Allows input signal diagnostics
Eight channel, nominal 24 V digital-input serializer	SN65HVS880 (digital input)	<ul style="list-style-type: none"> Highest input density Reduced components and board space Lowest system power 75% less typ
Octal low power 16-bit ±15 V output serial input Digital-to-Analog converter	DAC8718 (analog output)	<ul style="list-style-type: none"> No need for external voltage gain circuitry
Dual channel, 1/1, 200 Mbps digital isolator	ISO7421	<ul style="list-style-type: none"> Life span > 25 years High immunity for noisy environments Flexibility with power supplies

Embedded Processing Solutions

Description	Device	Key Benefits
Sitara™ ARM® Cortex™-A8 with MMU and FPU, up to 720 MHz	AM37x	<ul style="list-style-type: none"> • Large PLC, 2D/3D graphics • Enables full spectrum HMI • Maximum flexibility and graphics scalability
C2000™ 32-bit real-time MCUs up to 300 MHz, up to 512 kB Flash	Delfino™ floatingpoint, series	<ul style="list-style-type: none"> • IEC61131-3 programming with CoDeSys • Integrated realtime control peripherals
Stellaris® ARM® Cortex™-M3-based MCUs up to 100 MHz, up to 256 kB Flash	LM3Sx	<ul style="list-style-type: none"> • Fully integrated 10/100 Ethernet MAC and PHY • Hardware assisted IEEE 1588 precision time protocol • Integrated Bosch CAN controllers • Integrated USB on-the-go/host/device
MSP430™ 16-bit ultra-low-power microcontroller, 120 KB Flash, 4 KB RAM, ADC12, 16-bit timer A+B, USCI	MSP430F2419	<ul style="list-style-type: none"> • Simple PLC implementation • Versatile connectivity options • Optimized system power budget • Temperature monitoring on-board

Power Solutions

Description	Device	Key Benefits
±12 V or ±15 V cost optimized converter design (PR909)	TPS54160	<ul style="list-style-type: none"> • Solution for ±12 V or ±15 V • Cost effective solution • Various power levels can be addressed • Easy design through support of SpreadSheet
Wide Vin 3.5 V to 60 V buck converter	TPS54060/160/040/140/260	<ul style="list-style-type: none"> • Small form factor • Universal 12 V/24 V support • Easy design through SwitcherPro simulator
Cost optimized 200 mA linear reg.	TLV700xx	<ul style="list-style-type: none"> • Saves board space • Energy efficient with only 31 uA • Saves an RC filter through high PSRR of 68 dB at 1 kHz

Standard Linear and Logic Solutions

Description	Device	Key Benefits
Dual OpAmp with internal reference	TL103WA	<ul style="list-style-type: none"> • No need for calibration of ext. components
8-channel relay driver with integrated 5V LDO and zero-volt detection	TPL9201	<ul style="list-style-type: none"> • 8 low side driver with protection for inductive loads • Companion chip for MCU • Accepts unregulated voltage of 7 V to 18 V_{IN}.
Tandem 64-tap logarithmic digital potentiometre	TPL8002-25	<ul style="list-style-type: none"> • Control feedback and gain on two amps • Supports 8 MHz analog bandwidth • Wide bipolar supply range

Harsh Environment

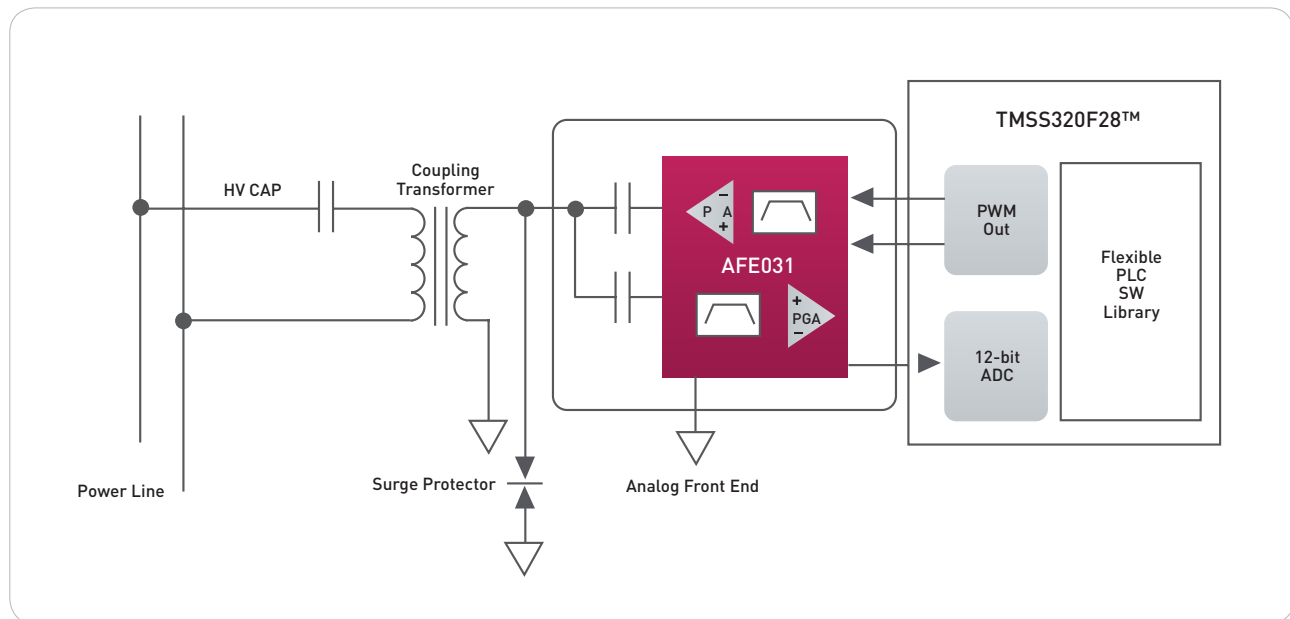
- Standard off the shelf parts offering 55 °C to 210 °C operation
- Special packaging
- Long product life cycles

AFE031: Power Line Communications

A Power Line Communications front end provides the interface between the communications processor and the line coupling circuit. It consists of transmit, receive and control sections. It takes digital signals, filters them, and drives the low impedance line. It receives signals from the line, filters them, amplifies them and provides them back into the processor.

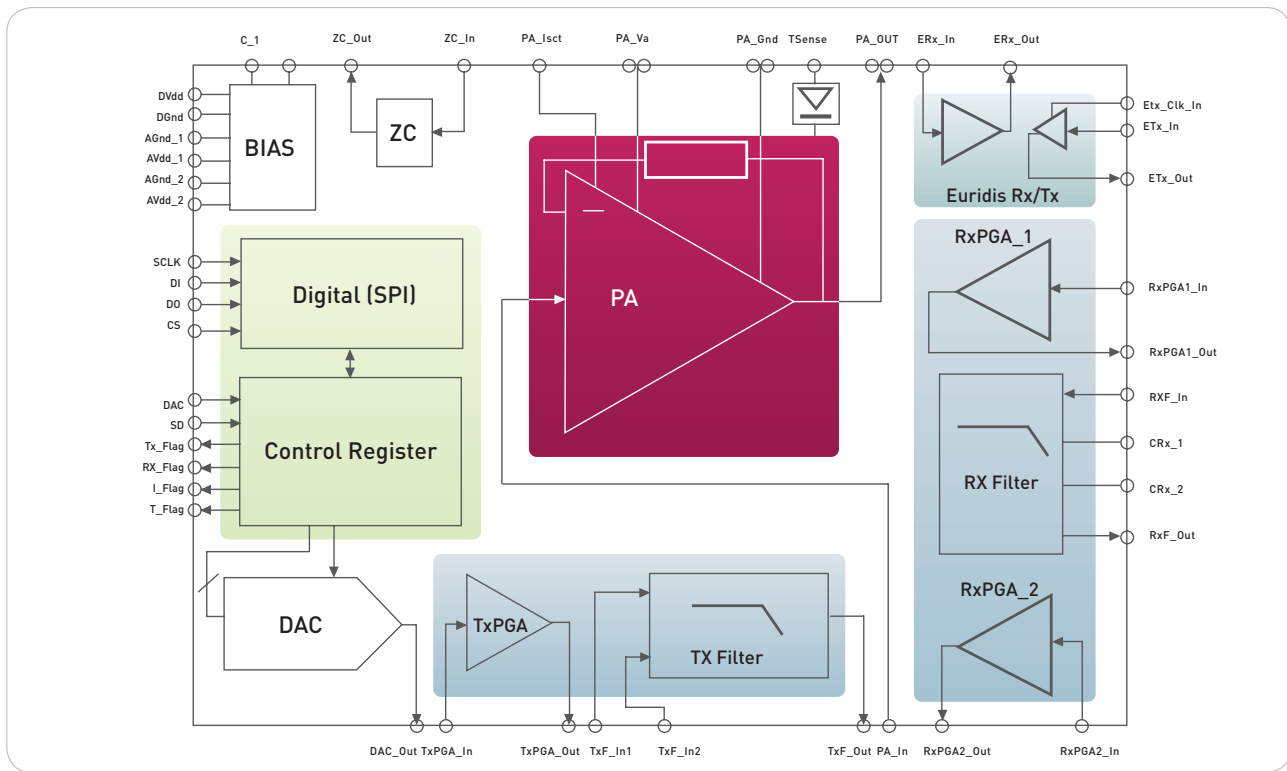
AFE031 Analog Front End for Power Line Communications

Fully Integrated Power Line Communications Analog Front End



Key Features

- Dual chip solution: C2000™ + AFE031
- Flexible, easy to use, low cost
- Reduces BOM of PLC modem by 80%
- System cost reduction of 90% compared to discrete solutions



AFE031 – Highlights

Key Features

- Replace 100 discrete parts with AFE031
- Integrated power line driver
- Fully integrated Tx and Rx
- Low power consumption 15 mW (receive mode)
- Large output swing 13 V_{pp} @ 1.5 A on 15 V supply
- 2 integrated zero crossing detectors
- Fully programmable
- Supports CENELEC Bands A, B, C, D
- Supports FSK, S-FSK and OFDM
- SPI can enable/disable each functional block
- Single hardware for multiple modulation and standards adaptability

Related Products

Gas and Water Meters to operate the Shut-Off Valve	
DRV8830/32	Single Full Bridge DC Motor Driver
DRV8833	Dual Brushed DC or Single Stepper Motor Driver

Analog to Digital Converter for Metering Applications	
ADS1274/78	Simultaneous sampling Quad and Octal 24-bit Delta-Sigma ADCs
ADS1174 /78	Simultaneous sampling Quad and Octal 16-bit Delta-Sigma ADCs

For Sensors at a Glance

Description	Device	Key Benefits
24-bit Analog-to-Digital Converter for temperature sensors	ADS1248	<ul style="list-style-type: none"> • Most flexible front end • Designed for temp sensors
24-bit Analog-to-Digital Converter for bridge sensors (e.g. pressure sensors)	ADS1231	<ul style="list-style-type: none"> • Eliminates temp drift error • Onboard oscillator reduces additional component cost • Shuts down power dissipation through bridge when ADC is not in use
24-bit, 105 ksp/s Analog-to-Digital Converter for industrial applications	ADS1271	<ul style="list-style-type: none"> • Unique combination of excellent DC accuracy and AC performance • Three operating modes for optimization of speed, resolution and power
16-bit ADC with integrated MUX, PGA, comparator, oscillator, temperature sensor and reference	ADS1115/ADS1118	<ul style="list-style-type: none"> • Smaller and more flexible than other 16-bit solutions • Improved data rate for faster applications onboard comparator for level detection or warnings • Family options for scalable integration
Sensor signal conditioner, programmable calibration, digital serial output	TPIC83000	<ul style="list-style-type: none"> • Reduces development time • Saves board space • Flexible solution for resistive-bridge sensors
Zero Drift, RRIO, PGA w/ 2 ch. Mux	PGA112	<ul style="list-style-type: none"> • Allows for optimum A/D range matching for a wide variety of input signal amplitudes • Allows easy system calibration for gain and offset • Ideal for power sensitive applications • Perfect for mixed voltage systems • DC accuracy for high precision applications

Embedded Processing Solutions

Description	Device	Key Benefits
MSP430™ 16-bit ultra-low-power microcontroller, 10-bit ADC, high-resolution PWMs, 5 V tolerant I/Os	TXS03121	<ul style="list-style-type: none"> • Reduced BOM by analog integration • Optimized system power budget • Industrial feature set
MSP430™ 16-bit ultra-low-power microcontroller, 32 KB Flash, 2 KB RAM, comparator	MSP430F2370	<ul style="list-style-type: none"> • Optimized footprint for smallest PCBs (3.2 x 3.2 mm² footprint) • Optimized system power budget
C2000™ 32-bit real-time MCUs up to 60 MHz + CLA, up to 128 kB Flash	TMS320F2803x Piccolo™ Series	<ul style="list-style-type: none"> • Control law accelerator (CLA) for high efficiency control loops • 4.6 Msps 12-bit ADC, analog comparators, • 150 ps high resolution ePWMs • Support for CAN and LIN

Standard Linear and Logic Solutions

Description	Device	Key Benefits
Comparator with output voltage-level translation	TXS03121	<ul style="list-style-type: none"> • Voltage translation and output FET as a switch
± 6 V, + 12 V low RON SPDT analog switch	TS12A12511	<ul style="list-style-type: none"> • Max. current consumption is <1 μA • Break-before-make switching • Preventing momentary shorting
Low-voltage adjustable precision shunt regulator	TLV431B	<ul style="list-style-type: none"> • Output voltage can be set to any value between V_{REF} (1.24 V) and 6 V with two external resistors

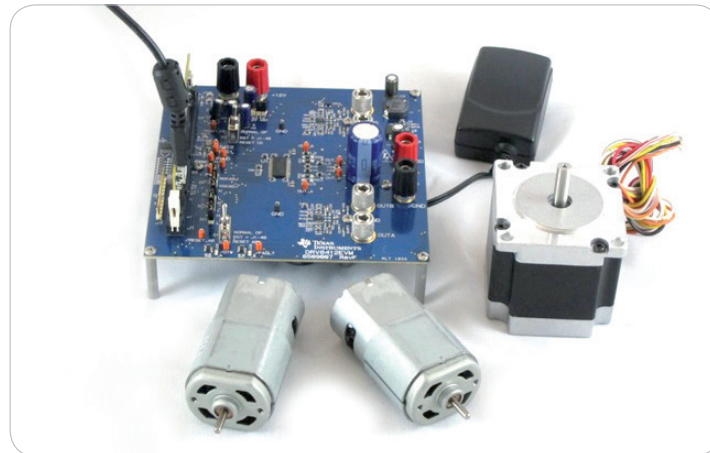
New Motor Driver Evaluation Platform spins

Includes all the hardware and software needed to spin

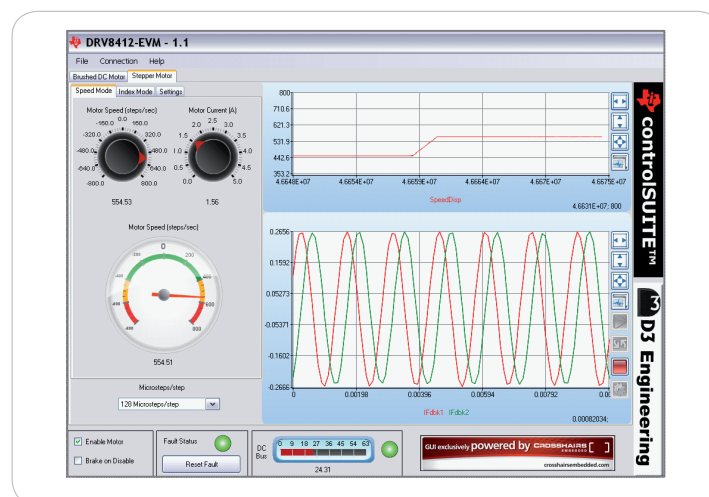
- DRV8412 motor driver
- C2000™ Piccolo™ MCU control CARD module;
more TI MCU options coming in 2011
- Quickstart GUI
- Full development source code
- Code Composer Studio™ integrated development environment
- Motors: 2 brushed DC, 1 stepper, power supply

For applications such as textile manufacturing tools, industrial or consumer robotics and much more!

DRV8412-C2-Kit



Easy-to-Use GUI Interface



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