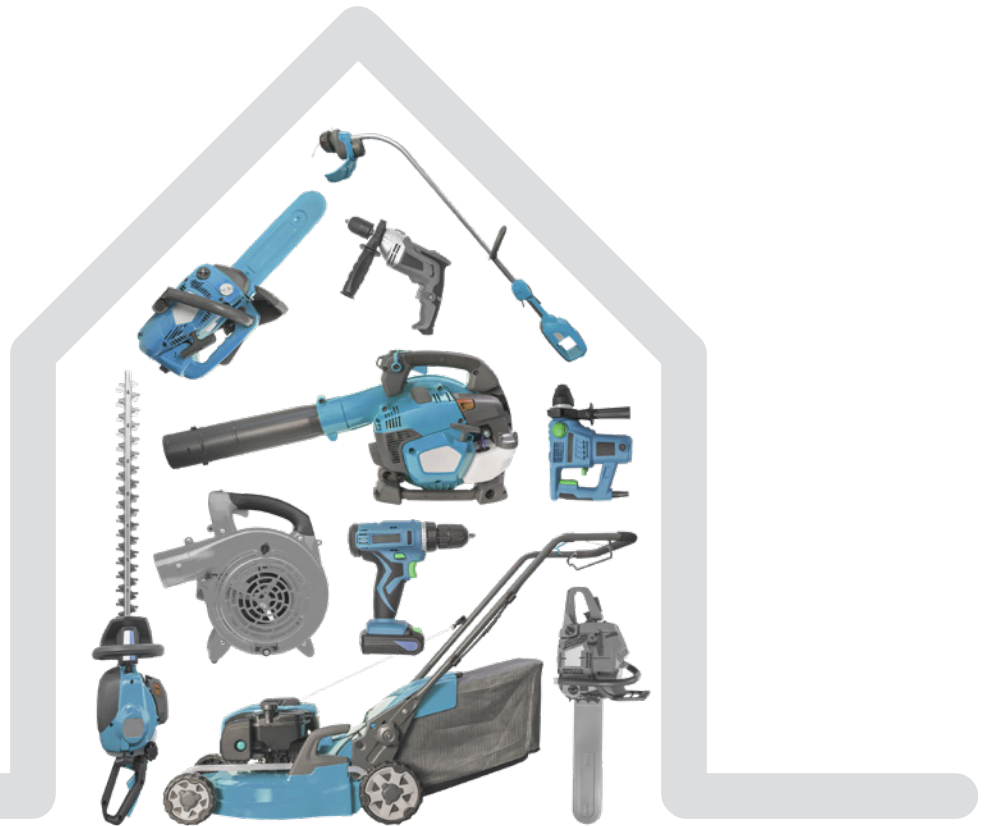


# Optimized Power Application Controllers<sup>®</sup> (PAC<sup>™</sup>) for Power and Garden Tools

Single system-on-chip performs multiple motor control and drive functions



**Qorvo**  
all around you

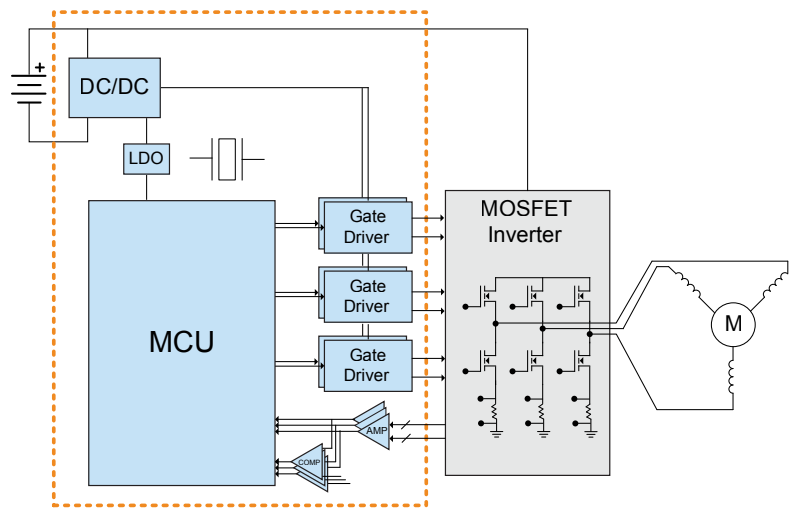
# Maximize Efficiency and Minimize Weight in Low-to High-Voltage Tools

Garden and power tools are a mainstay in nearly every home, and consumers are increasingly demanding that these items deliver more and longer-lasting power in ever smaller, lighter footprints.

Qorvo® is meeting those challenges with the industry's most efficient family of Power Application Controller (PAC) products for brushless DC (BLDC) motor control and drive. This system-on-chip (SoC) platform integrates a programmable MCU, power management, gate drive and signal conditioning in a single, small QFN package.

Combining these features has created the most integrated and compact solution available to designers of BLDC motors. It is the only device on the market for 160 V integrated MCU, gate drivers and power supply, making it ideal for low-voltage power tools and high-voltage garden tools with complex control, monitoring and diagnostic requirements. The Qorvo PAC portfolio also has the lowest standby current available, which means consumers can immediately use their tools even after months of storage.

Qorvo's SoC approach enables smaller tools, reduces bill of material and lowers design costs.



This diagram illustrates the compact efficiency of a single IC.

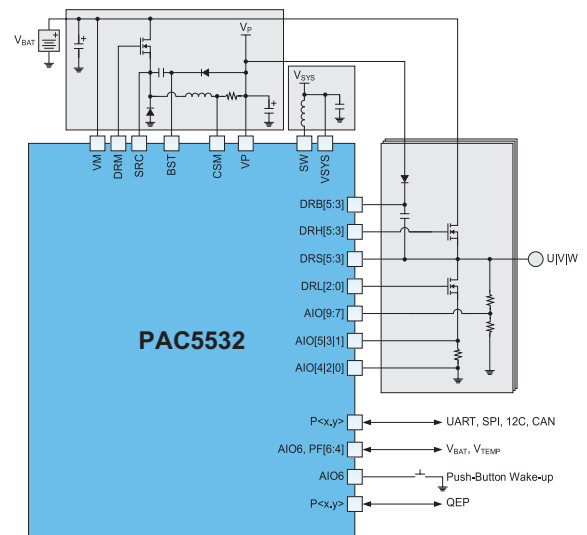
## The PAC5xxx Family

The PAC5xxx portfolio offers the most flexible microcontroller-based motor controllers and drivers on the market, suitable for power tools, garden tools, home appliances, industrial automation, drones and remote-control vehicles and other applications.

As part of Qorvo's complete range of battery- and AC-powered motor control and drive solutions, the PAC5xxx platform also enables IoT connected devices when coupled with Qorvo's low-power, wireless **Bluetooth®** Low Energy solutions.

### Key features include:

- High integration that enables small size, low cost and high-performance drive
- Integrated 50 MHz Arm® Cortex®-M0 or 150 MHz Arm® Cortex®-M4F MCUs
- Integrated, configurable power management up to 160 V supply input; support for buck and charge pump topologies
- Integrated high-side and low-side gate drivers, with up to 2A gate drive capability
- Ultra-low standby power consumption of 8 µA in hibernation mode
- Flexible and configurable power and temperature monitoring to build a more reliable motor drive control system
- Integrated 3 differential and 4 single-ended programmable-gain amplifiers (PGAs) for voltage and current sensing
- Dedicated phase comparators for sensor-less BLDC zero-crossing detection, to simplify external circuit and algorithm design



This system block diagram illustrates the very high degree of integration in the Qorvo PAC5532, which supports low- and mid-voltage applications.

# A Range of Solutions for a Variety of Home Tool/Appliance Applications

The table below details the specifications of the Qorvo low- and mid-voltage PAC portfolio of ICs:

## Battery Powered BLDC: Tools, DC Fans, RC, ESC

### 12 V-48 V battery-powered applications

Part Number	Package (mm)	MCU	IO	Power Management	Gate Drivers	Signal Conditioning	Applications
PAC5222	6x6 48L	50 MHz Arm® Cortex®-M0 32 kB FLASH, 8 kB SRAM 10b 1 MSPS ADC UART/SPI, I2C	3 @ 3.3 V 13 @ 3.3 V/5 V 10 @ 5 V	44 V Buck/SEPIC DC/DC Core, IO, Analog LDOs	3 HS: 56 V/1.5A 3 LS: 20 V/1.5A	3 Diff PGA 4 Single PGA	12 V-18 V Power Tools
PAC5223 PAC5225*	6x6 48L	50 MHz Arm® Cortex®-M0 32 kB FLASH, 8 kB SRAM 10b 1 MSPS ADC UART/SPI, I2C	2 @ 3.3 V 12 @ 3.3 V/5 V 10 @ 5 V	70 V Buck/SEPIC DC/DC Core, IO, Analog LDOs	3 HS: 70 V/1A 3 LS: 20 V/1A	3 Diff PGA 4 Single PGA	12 V-48 V DC Fans
PAC5523	6x6 48L	150 MHz Arm® Cortex®-M4F 128 kB FLASH, 32 kB SRAM 12b 1 MSPS ADC 2xUSART, CAN, 12C, QEP	15 @ 3.3 V 10 @ 5 V	70 V Buck/SEPIC DC/DC Core, IO, Analog LDOs	3 HS: 70 V/1A 3 LS: 20 V/1A	3 Diff PGA 4 Single PGA	High-Performance Power Tools
PAC5527	6x6 48L	150 MHz Arm® Cortex®-M4F 128 kB FLASH, 32 kB SRAM 12b 1 MSPS ADC 3xUSART, CAN, 12C, QEP	16 @ 3.3 V 10 @ 5 V	48 V Buck/SEPIC DC/DC Core, IO, Analog LDOs	3 HS: Programmable 3LS: Programmable	3 Diff PGA 4 Single PGA	10 V-24 V Power Tools

\* UL/IEC60730 Class B Safety Optimized

## Garden Tools, EV, Industrial Robotics


### 40 V-80 V battery-powered applications

Part Number	Package (mm)	MCU	IO	Power Management	Gate Drivers	Signal Conditioning	Applications
PAC5232	8x8 51L	50 MHz Arm® Cortex®-M0 32 kB FLASH, 8 kB SRAM 10b 1 MSPS ADC UART/SPI, I2C	2 @ 3.3 V 14 @ 3.3 V/5 V 10 @ 5 V	160 V Buck DC/DC Core, IO, Analog LDOs	3 HS: 180 V/2A 3 LS: 20 V/2A	3 Diff PGA 4 Single PGA	40 V-80 V Garden Tools, EV, Scooters, E-skateboard
PAC5532	8x8 51L	150 MHz Arm® Cortex®-M4F 128 kB FLASH, 32 kB SRAM 12b 1 MSPS ADC 3xUSART, CAN, 12C, QEP	16 @ 3.3 V 10 @ 5 V	160 V Buck DC/DC Core, IO, Analog LDOs	3 HS: 180 V/2A 3 LS: 20 V/2A	3 Diff PGA 4 Single PGA	40 V-80 V Garden Tools, EV, Scooters, E-skateboard

## Lower Costs and Faster Time-to-Market

The PAC5xxx family's efficient and highly configurable system architecture helps designers work faster and lowers the cost of creating AC motor control and drive solutions for a new generation of white goods and other AC-powered equipment.


The Qorvo PAC eco-system also enables faster time-to-market, by more than 50%, by providing customers with hardware, software, evaluation tools, and third-party design partners and production tools. IEC and UL Class B pre-certified firmware speeds system-level certification.



**VDE**




**IEC**



**UL**

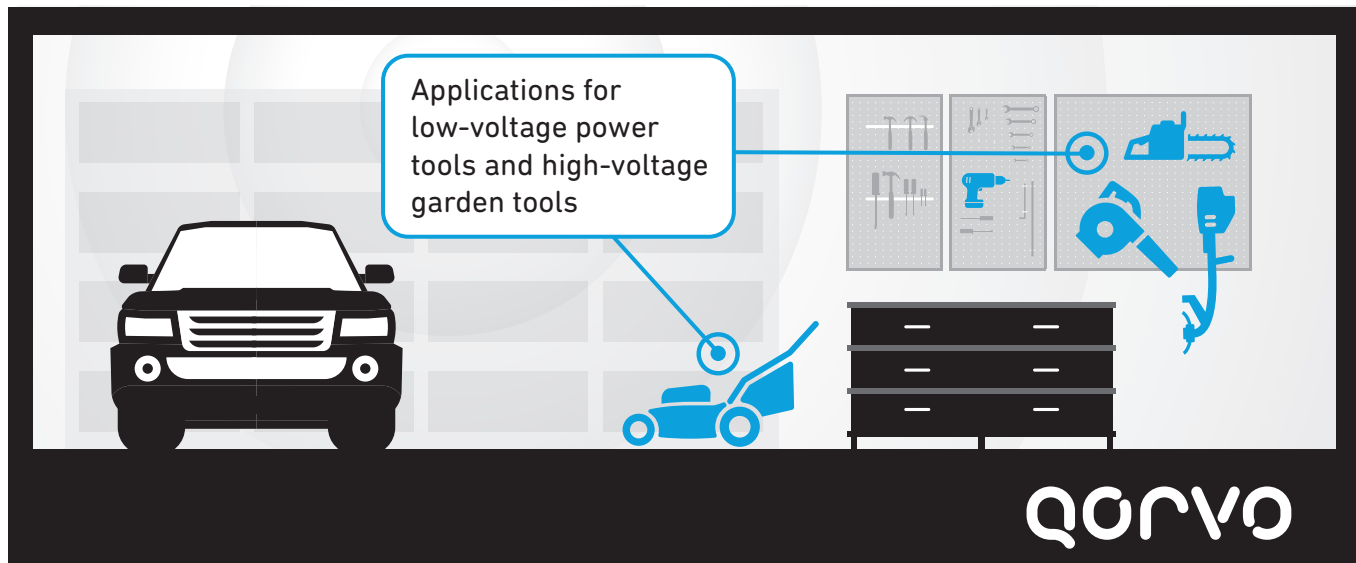
VDE Certification		Certificate of Compliance	
EN 60335-1 DIN EN 60335-1 (VDE 0700-1):2012-10 DIN EN 60335-1 Ber.1 (VDE 0700-1 Ber.1):2014-04	EN 60335-1:2012 EN 60335-1:2012/AC:2014 EN 60335-1:2012/A11:2014 Annex R	Certificate Number Report Reference Issue Date	20180907-E502048 E502048-20180907 2018-SEPTEMBER-07
Anhang R		This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.	
EN 60730-1 DIN EN 60730-1 (VDE 0631-1):2012-10 Anhang H	EN 60730-1:2011 Annex H	Integrated, Protective Control (Self-Test Software Library - Safety Control); PAC52XX ActiveSafe Class B Library	
IEC 60335-1 IEC 60335-1(ed.5);am1 Anhang R	Annex R	Standard(s) for Safety: UL 60730-1 AUTOMATIC ELECTRICAL CONTROLS - PART 1: GENERAL REQUIREMENTS. UL 60335-1 SAFETY OF HOUSEHOLD AND SIMILAR APPLIANCES, PART 1: GENERAL REQUIREMENTS. CSA E60730-1 AUTOMATIC ELECTRICAL CONTROLS - PART 1: GENERAL REQUIREMENTS. CSA C22.2 NO. 60335-1:16 HOUSEHOLD AND SIMILAR ELECTRICAL APPLIANCES - SAFETY - PART 1: GENERAL REQUIREMENTS.	
IEC 60730-1 IEC 60730-1(ed.5) Anhang H	Annex H	Functional safety package based on standard peripheral libraries to achieve IEC 60730 class B certification with the PAC52xx	



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## Designed With a Purpose

Qorvo's innovative power management solutions deliver a highly efficient, flexible platform for high performance, high reliability and high integration in motor control. Our scalable core platforms are used for charging, powering and embedded digital control systems for end applications in the industrial, commercial and consumer equipment markets.



For more information about our integrated motor control and drivers, visit:  
[www.qorvo.com/products/power-management/intelligent-motor-controllers](http://www.qorvo.com/products/power-management/intelligent-motor-controllers)