

CONNECTING, PROTECTING AND POWERING THE WORLD

Solutions

DRONES

INDUSTRIAL & COMMERCIAL



PAYLOAD



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TRACKING

FEATURING

RF
Power Management
Motor Control
Battery Management
Ultra-Wideband (UWB)
Wi-Fi

qorvo

TABLE OF CONTENTS

DRONE USES AND DESIGN	2
SYSTEM BLOCK DIAGRAM	3
INNOVATIVE SOLUTIONS	4
RF	5
> High-Isolation SPDT Switches	
> Ultra Low Noise Amplifiers	
> High-Linearity Wideband Amplifiers	
> Gain Block Amplifiers	
> Integrated Synthesizers with Mixers	
> BAW Filters	
> Digital Step Attenuators	
WI-FI	8
> QPF4211: 2.4 GHz Wi-Fi 6 Front-End Module	
> QPF4550: 5 GHz Wi-Fi 6 Front-End Module	
> QPQ5200: 2.4 GHz Wi-Fi CH1-11 edgeBoost™ Filter	
ULTRA-WIDEBAND	10
> QM35825: 6.5 & 8.0 GHz Ultra-Wideband SoC	
MOTOR CONTROL	11
> PAC5527: 48V BLDC Motor Controller & Driver with Charge Pump & Configurable AFE	
BATTERY MANAGMENT	12
> PAC25140: Intelligent BMS SoC with Integrated ARM® Cortex®-M4F MCU & Cell Balancing	
> ACT2861: Wide-Input 2-5S Buck-Boost Charger with OTG - 12	
POWER MANAGEMENT	13
> ACT88329: Advanced COT PMIC with 3 Bucks, 2 LDOs & Load Bypass Switches	
> ACT88760: 5V PMIC with 7 High Current Bucks, 6 LDOs & 10 GPIOs	

DRONE USES & DESIGN

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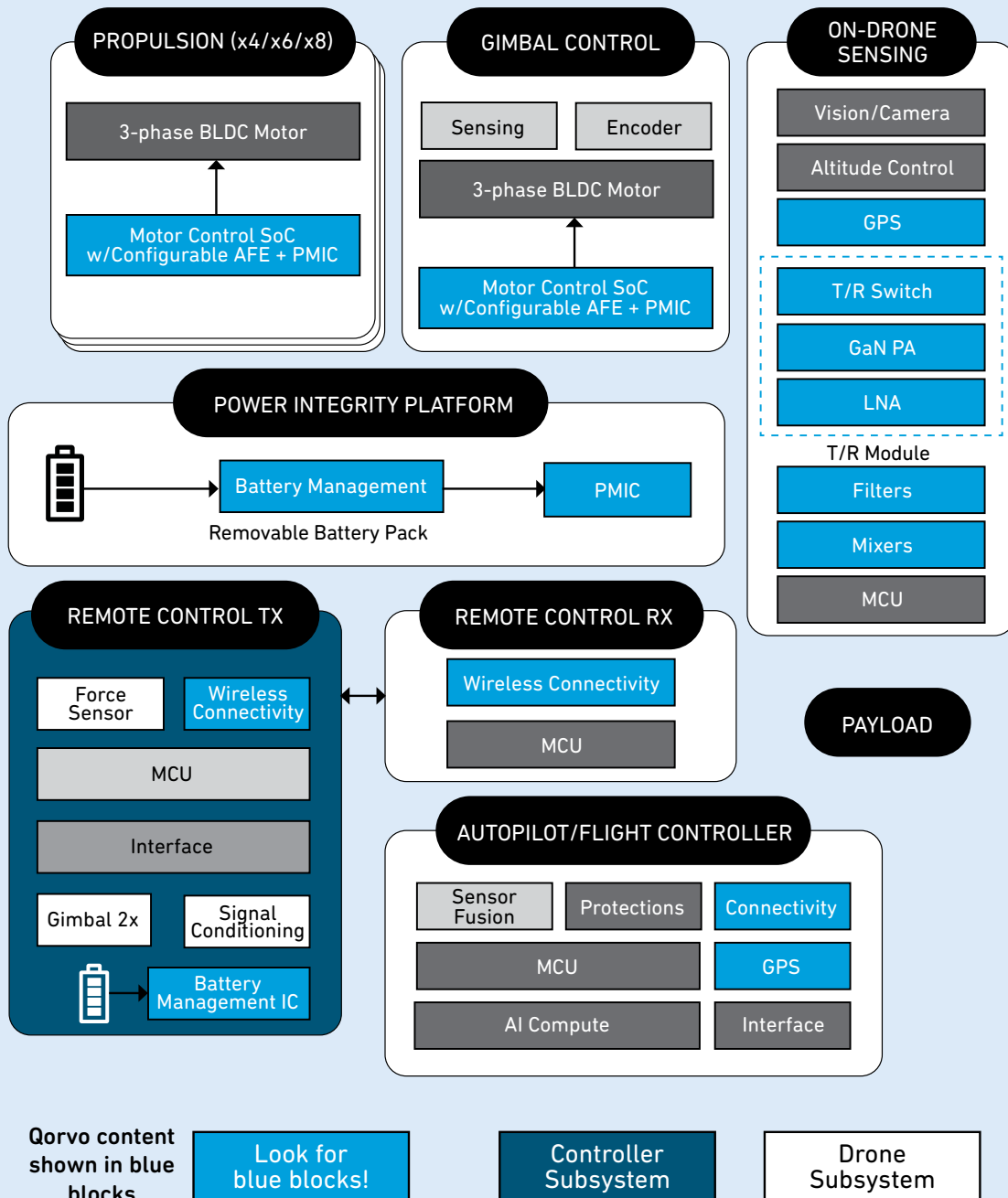
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High Level Design Considerations

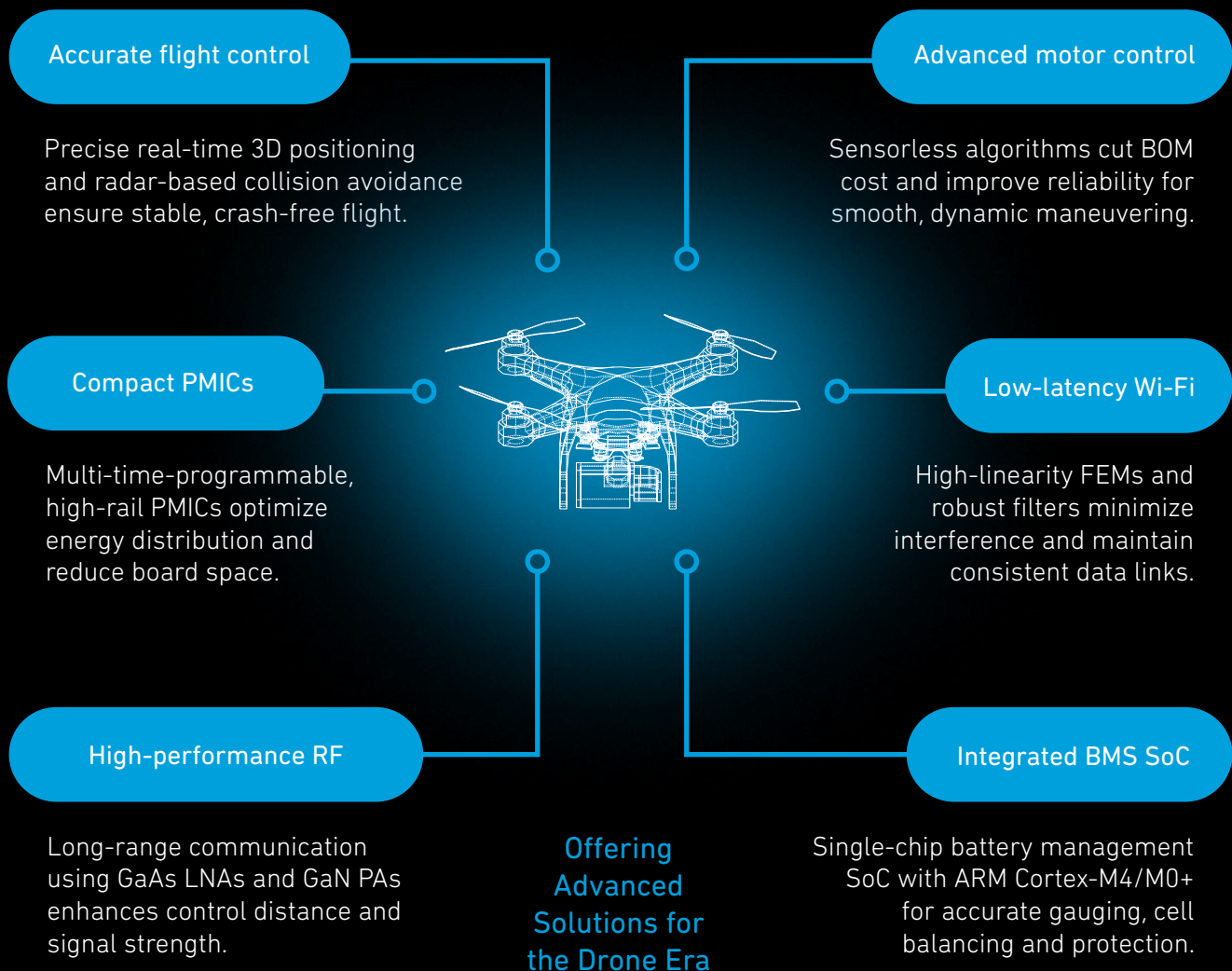
- ✓ **Safety:** Redundancy • E-stop • Fault isolation
- ✓ **Energy:** BMS • Efficiency budget • Thermal control
- ✓ **Motion:** Torque control • Flight hold • Payload stabilization
- ✓ **Power:** Multi-rails • Transient immunity • Protection/sequencing
- ✓ **Connectivity:** RF link • Wi-Fi telemetry • UWB locating
- ✓ **Ops/Analytics:** Health telemetry • Predictive alerts • Mission logs

DRONE & CONTROLLER BLOCK DIAGRAM



BRIDGING GAPS WITH INNOVATIVE SOLUTIONS

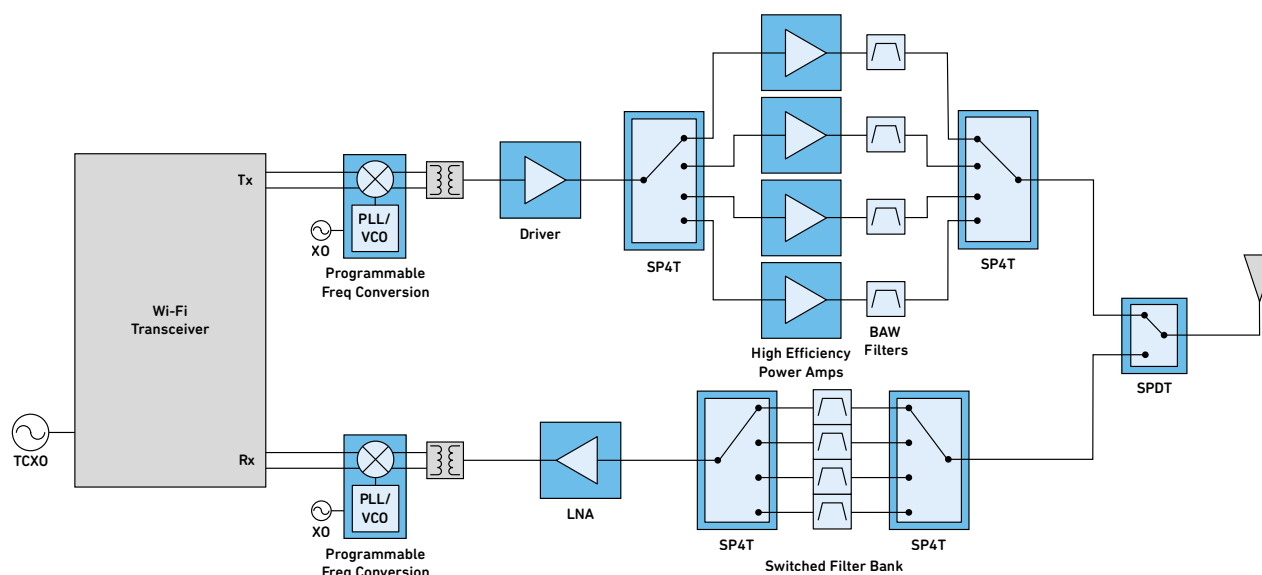
For Current Challenges



RF

Drone SDR Applications

Industrial and commercial drones increasingly rely on software defined radio (SDR) architectures to support multiple links, regional standards and evolving bandwidth needs from a single airframe. These SDR platforms depend on a wideband RF front end that preserves signal integrity while meeting tight size, weight and power (SWaP) budgets. Qorvo's wideband amplifiers, switches and low-noise amplifiers are engineered for multi-band drone radios, enabling robust command-and-control, high-throughput payload links and advanced sensing on a single RF platform.



RF Switches

High-isolation SOI switching protects the receiver and enables clean antenna/band routing. Low insertion loss and absorptive design preserve link budget and enhance RF stability.

Part Number	Freq (GHz)	Switch Type	IL (dB)	Isolation (dB)	P _{IN} Max (dBm)	V _{CC} (V)	Package (mm)
QPC6044	0.005-6	SP4T	0.98	34	35	3-5	4x4
QPC1022	0.005-6	SPDT	0.25	46	37	3-5	1.1x1.5
RFSW6024	0.005-6	SPDT	0.7	70	35	3-5	4x4
QPC6324	0.005-6	SPDT	0.9	62	37	5	4x4

Low-Noise Amplifiers

Ultra-low noise and high linearity improve sensitivity and maintain reliable links in RF-dense environments. Wide 0.1-6 GHz coverage supports multi-band SDR designs for global drone fleets.

Part Number	Freq (GHz)	NF (dB)	Gain (dB)	OP1dB (dBm)	OIP3 (dBm)	Vd (V)	Package (mm)
QPL9547	0.01-6.0	0.3	19.5	23	38	5	2x2
TQL9092	0.6-4.2	0.55	21	20	38	5	2x2
TQL9093	0.6-4.2	0.54	20	21.7	41.5	5	2x2
QPL9504	0.6-6.0	0.75	21.5	19	35	5	2x2
QPL9057	0.7-4.5	0.5	20	19	35	5	2x2
QPL9058	1.0-5.0	0.6	18	21	35	5	2x2

High-Efficiency Amplifiers

High-efficiency amplifiers preserve HD video, telemetry and command links across key drone bands. Compact, efficient designs reduce SWaP burden and scale easily across drone platforms.

Part Number	Freq (GHz)	Gain (dB)	P3dB (dBm)	Voltage (V)	Current (mA)	Package (mm)
QPA9510	0.1-1.0	34	+36	3.6-5	208	3x3
QPA9903	1.81-1.88	32	+36	5	92	5x5
QPA9901	2.1-2.2	36.5	+35.6	5	93	5x5
QPA9940	2.3-2.4	34.5	+36	5	100	5x5

Gain Block Amplifiers

Wideband 50Ω gain blocks strengthen low-noise receive and transmit chains for longer-range C2, video, relay and inspection payload links in compact RF front ends.

Part Number	Frequency (GHz)	Gain (dB)	OP1dB (dBm)	OIP3 (dBm)	NF (dB)	Vd (V)	Package (mm)
QPA9126	1-6	16	20	35	1.4	5	2x2
QPA9127	1-6	20	19.5	35	1.4	5	2x2
TQP3M9019	0.02-4	22	22	39.5	1.3	5	3x3
TQP3M9018	0.02-4	20.5	21	37	1.3	5	3x3
TQL9062	0.5-6	16	21.3	40.3	1.5	5	2x2

Integrated Synthesizers with Mixers

Programmable frequency conversion enables agile SDR command/control, telemetry, payload backhaul and spectrum-sensing links for drones operating across congested or region-specific bands.

Part Number	Mixer RF/IF (MHz)	Mixer LO (MHz)	PN @ 10k (dBc/Hz)	PN @ 1M (dBc/Hz)	Vdd (V)	Idd (mA)	Package (mm)
RFFC2072A	30-2700	85-2700	-102	-130	3	132	5x5
RFFC5071A	30-6000	85-4200	-102	-130	3	132	5x5
RFSW6024	30-2500	300-2400	-90	-130	3	75	5x5

BAW Filters

BAW filters improve coexistence and out-of-band rejection for private LTE/5G, mesh and auxiliary radios operating near machinery, towers and neighboring wireless systems.

Part Number	Frequency (GHz)	Band(s)	Type	IL (dB)	Package (mm)
QPQ1298	2515-2675	B41	Sub-Band Filter	2.5 typ	2x1.6
QPQ3501	3300-3600	B52+B42	Bandpass Filter	3.0 max	2x1.6
QPQ3500	3400-3600	B42	Bandpass Filter	3.2 max	2x1.6
QPQ3509	3700-3980	C-band	Bandpass Filter	3.5 max	2x1.6
QPQ4900	4800-4960	n79	Bandpass Filter	2.2 typ	2x1.6
QPQ3550	3550-3700	B48/CBRS	Bandpass Filter	2.7 max	2x1.6

Digital Step Attenuators

Programmable attenuation supports AGC, calibration, power leveling and dynamic-range control as link distance and interference conditions change.

Part Number	Frequency (GHz)	Range (dB)	Step (dB)	Ctrl	IIP3 (dBm)	Vd (V)	Package (mm)
QPC3223	0.05-6	18	6	Parallel	>55	3-5	3x3
QPC6614	0.005-6	31.5	0.5	Serial	55	5	4.2x4.2
QPC6713	0.05-6	31.75	0.25	Serial	55	3-5	3x3

WI-FI

Front-End Module



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QPF4211 and QPF4550 deliver robust 2.4/5 GHz Wi-Fi 6 video and command links across industrial and commercial drones by integrating a linear PA, low-noise LNA and T/R switch in one compact front-end module. The high-linearity PA and sensitive LNA maintain margin for both high-rate transfers and long-reach control profiles. A compact, single-supply design simplifies layout and reuse across SKUs.

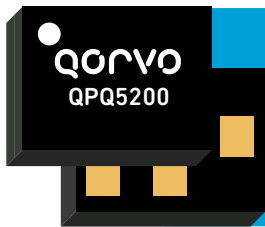
	QPF4211	QPF4550
Frequency Band	2.4 GHz	5 GHz
Voltage Supply	5V	5V
Tx Gain (typ)	33 dB	33 dB
Rx NF	1.8 dB	2.1 dB
O/P @ 11n MCS7	+23.5 dB	+22 dB
O/P @ 11n MCS0	+25.5 dB	+24 dB
DC Power @ P _{OUT}	< 1.7W PdC @ 26 dBm	< 1.0W PdC @ 26 dBm
Control/Detect Pins	VDET, Tx/Rx enables, LNA_EN	PDET, PA_EN, Tx/Rx enables, LNA_EN
Package	2.5x2.5 mm	2.5x2.5 mm



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Wi-Fi

Bandedge Filter



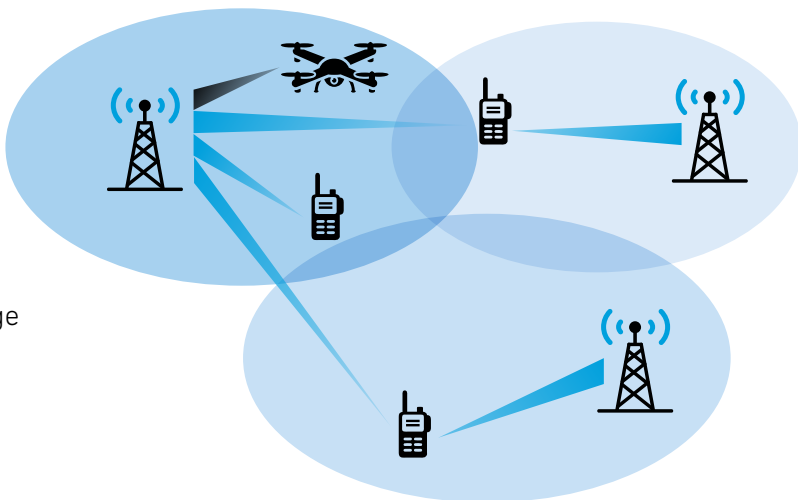
Wi-Fi 2.4 GHz CH1-CH11 edgeBoost Filter

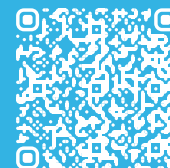
QPQ5200 improves 2.4 GHz Wi-Fi link reliability on drones by tightly filtering at the band edges, limiting nearby interferers before they reach the front-end module. Low in-band loss preserves range and video/telemetry throughput. High power tolerance and a tiny laminate package make it easy to place near the RF chain in both consumer and industrial airframes.

Product Features

- Low in-band loss:
 - 1.1 dB @ 2420 MHz
 - 0.9 dB @ 2472 MHz
- High out-of-band attenuation:
 - 30 dB @ 2370-2390 MHz
 - 25 dB @ 2484-2500 MHz
 - +30 dBm average power handling
 - -20 to +95°C operating range
 - 1.1x0.9 mm 5-pad laminate package

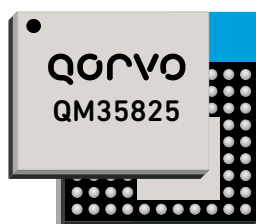
Drone signal detection under multi-node interference conditions





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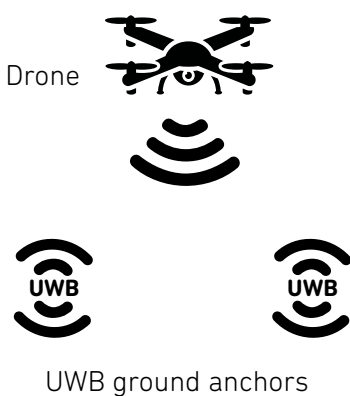
ULTRA WIDEBAND SoC



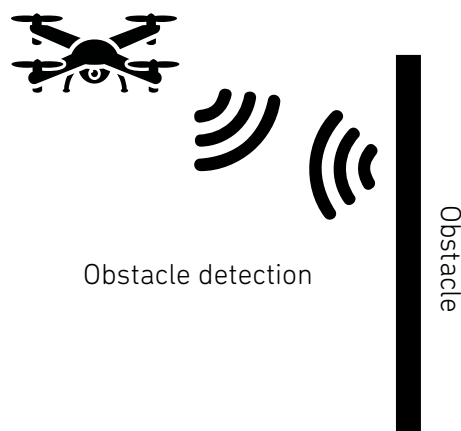
UWB Low, 6.5 & 8.0 GHz SoC compliant with
IEEE 802.15.4z™-2024

QM35825 delivers fine-ranging localization for industrial drones by combining a UWB radio, secure ranging and on-chip processing in a single SoC. Precise time-of-flight and angle-of-arrival processing preserve positioning margin for both fast, low-altitude navigation and long-reach asset tracking in RF-dense sites. An integrated MCU, security features and flexible RF I/O streamline hookups to flight controllers and RTLS backends, accelerating development from prototype to fleet deployment.

3D-positioning



UWB Radar Sensing



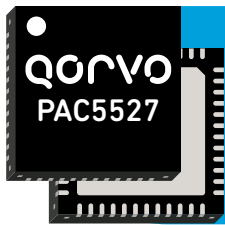
±5 cm ranging • ±2° AoA • Channels 5&9 • 802.15.4-2024/-z HRP/BPRF/HPRF • Up to ~104 dB link budget • -98 dBm (1% PER, BPRF-3) • Secure ToF/STS • On-chip AoA/radar compute



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MOTOR CONTROL

Controller & Driver



48V BLDC Motor Controller and Driver with Charge Pump and Configurable AFE

PAC5527 consolidates the motor-control MCU, power management and gate drivers into a single SoC; delivering efficient, reliable BLDC propulsion and actuation for commercial and industrial drones. Integrated current/voltage sensing and fast control peripherals preserve thrust authority through rapid load changes, while built-in communications support networked ESCs and real-time diagnostics. The one-chip architecture trims BOM and weight, simplifies EMI and wiring, and scales cleanly from propulsion to gimbals and auxiliary drives.

Electronic Speed Control

- 150 MHz ARM Cortex-M4F
- 6-48V supply input
- 128 kB FLASH, 32 kB SRAM
- 12-bit, 2.5 MSPS SAR ADC
- 16x GPIOs (3.3V)
- 3 programmable HS and LS gate drivers
- 3x differential, 4x single-ended PGAs
- 6x6mm, 48-pin QFN



BATTERY MANAGEMENT

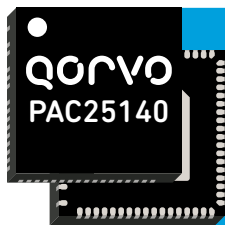
SoC



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Up to 20s Intelligent Battery Management
SoC with ARM Cortex MCU and
Integrated Power Management



2-5 Cell, 30V, 5A Buck-Boost Charger with Integrated
MOSFETs and OTG

Industrial and commercial drones require predictable propulsion and payload power, accurate state-of-charge reporting and fast, controlled responses to faults. PAC25140 consolidates pack monitoring, balancing and protection for up to 20-cell packs with fast measurement/control loops and standard digital interfaces to reduce harness complexity across airframes. ACT2861 allows compact 2-5S charging from a wide input range for field chargers and docking stations, with OTG and I²C telemetry for smart bidirectional power designs.

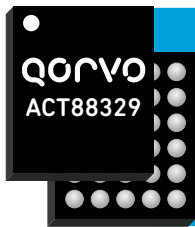
Device	Function	Key Specs	Performance
PAC25140	Pack monitoring, balancing, protection	Up to 20S, UART/SPI, SMBus/I ² C	SOC accuracy, fast fault response, reduced harness
ACT2861	Charging + power path (field/dock)	2-5S, 30V, 5A, 4-29V input, I ² C, OTG	Wide input flexibility, compact design, bidirectional power



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POWER MANAGEMENT

PMIC



Tiny, Programmable, Fully-Configurable, Supporting
PMIC for QM35825

ACT88329 delivers stable, low-noise power for QM35825 UWB systems, validated as a reference PMIC for bursty ranging workloads. Fast constant-on-time regulation and low rail impedance hold voltage through Tx/Rx bursts, cutting transmit current versus discrete power trees and improving receiver margin and packet reliability. Integrated bucks/LDOs with programmable sequencing, I²C monitoring, GPIOs and fault interrupts reduce BOM and speed bring-up across tags, anchors and gateways.

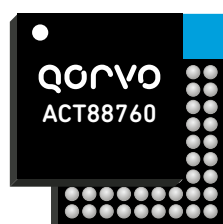
Part Solution	Max I Battery Rx (mA)	Max I Battery Tx (mA)	Sensitivity (dBm)	PER (%)
ACT88329	117	150	-96.5	0.9
Discrete	177	204	-96.6	1.0

The table above compares the current draw from the battery of the two systems using different power solutions. The ACT88329 provides a 26% reduction in transmit battery current which translates to a significant improvement in battery life. Also, note the ACT88329's improved sensitivity packet error rate (PER).



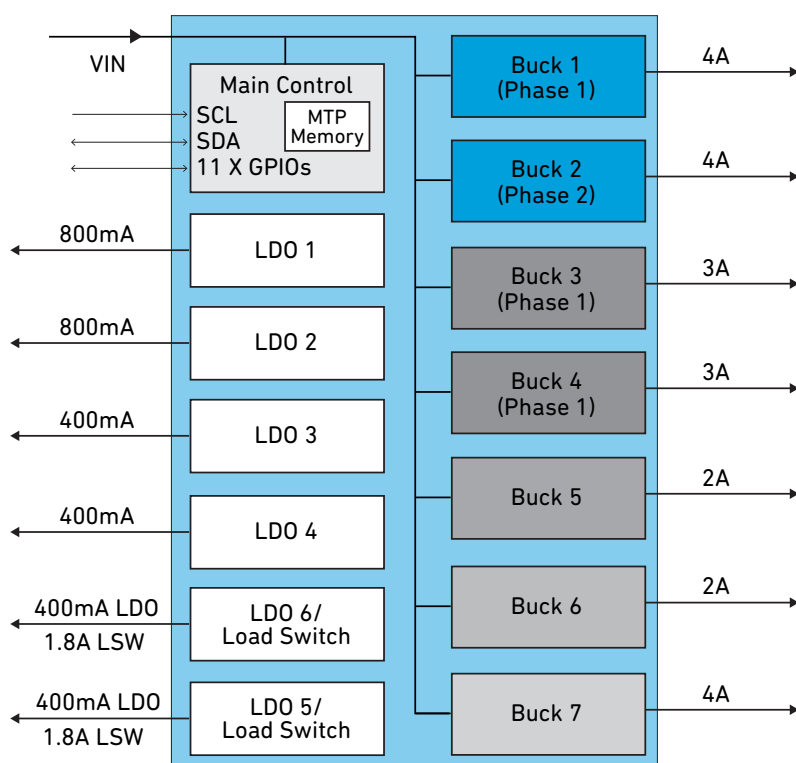
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POWER MANAGEMENT PMIC



13 Voltage Rail PMIC With Dual-Phase Bucks,
High PSSR LDOs/LSW

ACT88760 centralizes multi-rail power for flight controllers, vision compute, radios and sensors; keeping domains stable through fast load steps and brownouts. Reliable sequencing and low standby draw support longer missions and predictable restarts. Configurable power blocks with I²C/GPIO control and fault telemetry cut BOM/weight and speed bring-up across airframes.



- 13-rail, highly configurable PMIC
- Up to 25A aggregate output
- Programmable sequencing and timing
- I²C control + 11 GPIOs
- Low standby power
- Power-good, fault and thermal protections
- Integrated monitoring and telemetry



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