Robotics

Motor control BOM (Bill-of-Material) proposals

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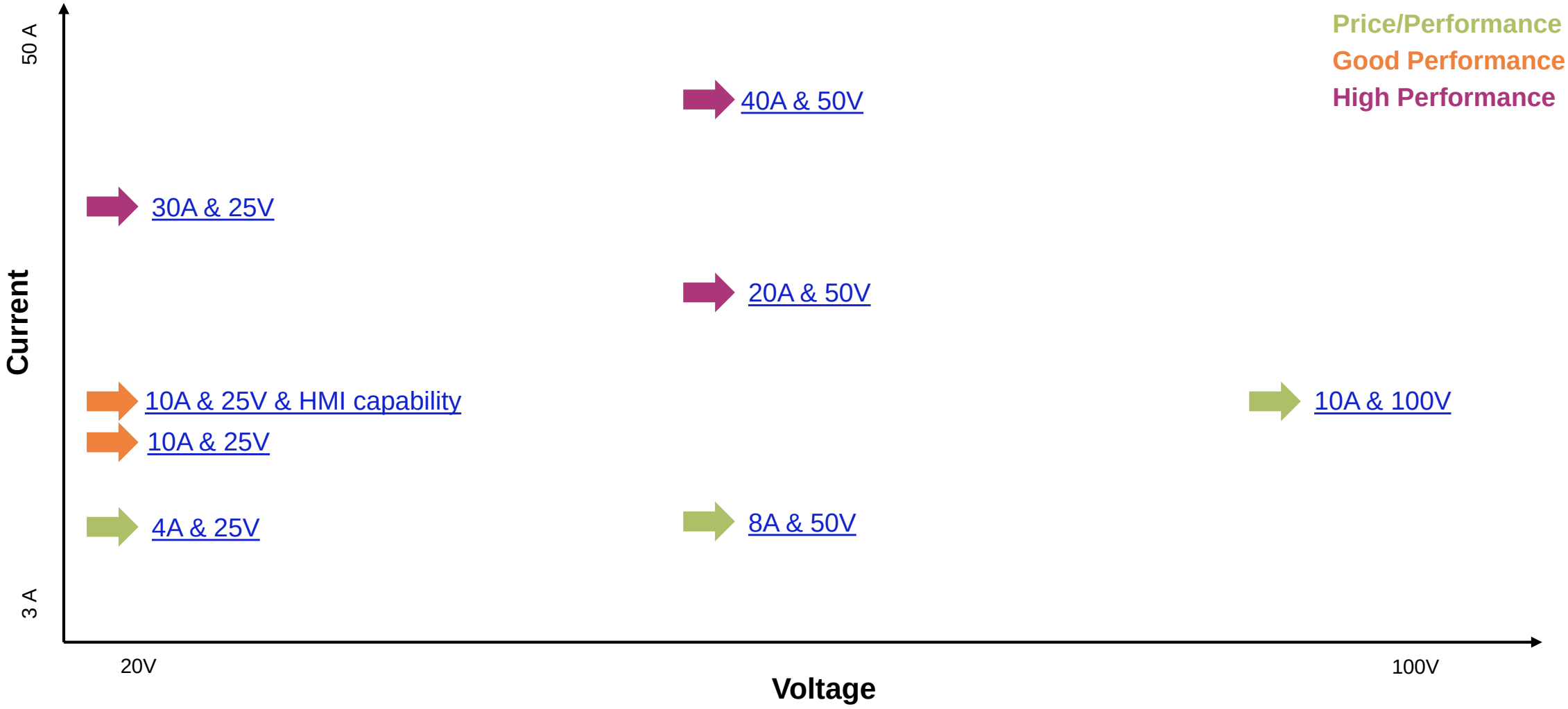
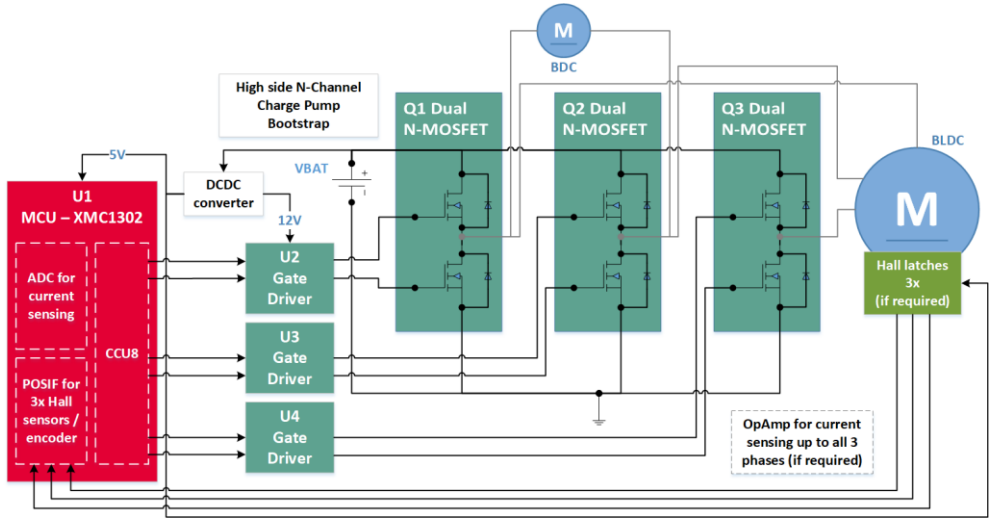
Infineon offers the right BOM solution from price/performance to highest performance motor control needs



Proposed BOM DC-Motor drive: PRICE/PERFORMANCE with up to 4A & 25V



Simplified schematics only for illustration purpose

Product type	Device	Part number	Description	Package mm x mm	Quantity	
					BDC	BLDC
N+N dual MOSFET	Q1, Q2, (Q3)	IPG20N06S2L-65	55V OptiMOS® Power-Transistor 65mΩ with continuous I_D 20A at 25°C, V_{GS} 10V & typ. Q_g 9.4nC	SSO8 5x6	2	3
Gate driver	U2, U3	IRS2005S	200V high side & low side gate driver with 0.29A & 0.6A I_O source & sink, propagation delay 160 & 150ns	SOIC8 4x5	2	--
	Integrated U2 to U4	6EDL04N02PR	200V 3-Phase gate driver with OCP, Enable, Fault & integrated BSD with 0.165A & 0.375A I_O source & sink, propagation delay 530ns	TSSOP28 9.7x4.4	--	1
Microcontroller	U1	XMC1302-T038X0032AB	Cortex-M0 32bit 32/64MHz C/P clock 16KB SRAM & 32KB Flash with CCU8 PWM for easy 3-phase inverter implementation & POSIF interface for hall sensors/encoder	TSSOP38 9.7x4.4	1	1
Position sensor	Motor assy.	TLI4961-1M	Bipolar Hall latch with 3 – 32V operating supply voltage	SOT23-3	--	3

Key features and benefits

- Low cost solution
- Available firmware of FOC with Hall sensors or sensorless for BLDC and PMSM motors
- MCU direct interface for either Hall sensors or encoder
- Low gate charge MOSFET enabling higher switching frequency
- Dual N-channel MOSFET and integrated 6-channel gate driver with bootstrap diode (BSD) for BLDC motor reducing the required PCB footprint significantly

Application assumptions

- DC Motor powered up by Lí-ion battery pack of 4S to 6S with typical voltage 14.4 – 21.6V and max. voltage 16.8 – 25.2V
- DC Motor voltage within 12 – 24V
- Average current up to 4A (at 25V)

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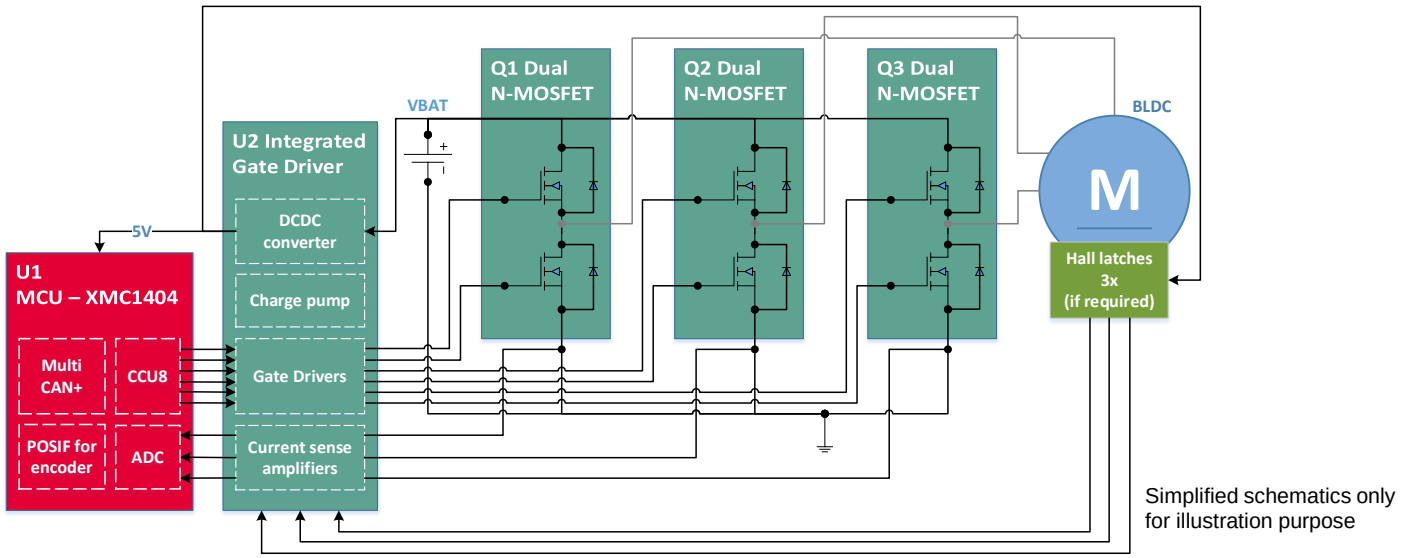
Proposed BOM BLDC-Motor drive: GOOD PERFORMANCE with up to 10A & 25V



Product type	Device	Part number	Description	Package mm x mm	Qty.
N+N dual MOSFET	Q1, Q2, Q3	BSC072N04 LD	40V OptiMOS® T2 Power Transistor 7.2mΩ with continuous I_D 20A at 25°C, V_{GS} 10V & typ. Q_g 39nC	SSO8 5x6	3
N-MOSFET	Separated Q1, Q2, Q3	BSC032N04 LS	40V OptiMOS® Power MOSFET 3.2mΩ with continuous I_D 98A at 25°C, V_{GS} 10V & typ. Q_g 25nC	SSO8 5x6	6
Gate driver	Integrated U2 to U4	6EDL7141*	3-Phase smart gate driver with I_O source / sink 1.5A, operating V_S 5.5 – 60V, integrated power supplies, current sense amplifiers, Hall sensor comparators, ADC	VQFN48 7x7	1
Microcontroller	U1	XMC1404-Q064X0200*	Cortex-M0 with MATH, 32bit 48MHz CPU clock 16KB SRAM & 200KB Flash, 12-bit ADC, multiCAN module (2 CAN nodes), 2x CCU8 PWM for easy 3-phase inverter implementation & 2x POSIF interface for hall sensors/encoder, T_A -40 to 105°C	VQFN64 8x8	1
Position sensor	Motor assy.	TLI4961-1M	Bipolar Hall latch with 3 – 32V operating supply voltage	SOT23-3	3

* Near future: integrated to IMD701A of VQFN64 9x9 further reducing the PCB footprint

Key features and benefits

- Cost competitive with high performance solution
- Available firmware of FOC with Hall sensors or sensorless for BLDC and PMSM motors
- MCU direct interface for encoder
- Dual N-channel MOSFET and integrated 6-channel Smart gate driver with integrated power supplies, current sense amplifiers, ADC, and Hall sensor comparators reducing the required PCB footprint significantly

Application assumptions

- DC Motor powered up by Lí-ion battery pack of 4S to 6S with typical voltage 14.4 – 21.6V and max. voltage 16.8 – 25.2V
- DC Motor voltage within 12 – 24V
- Average current up to 10A (at 25V)

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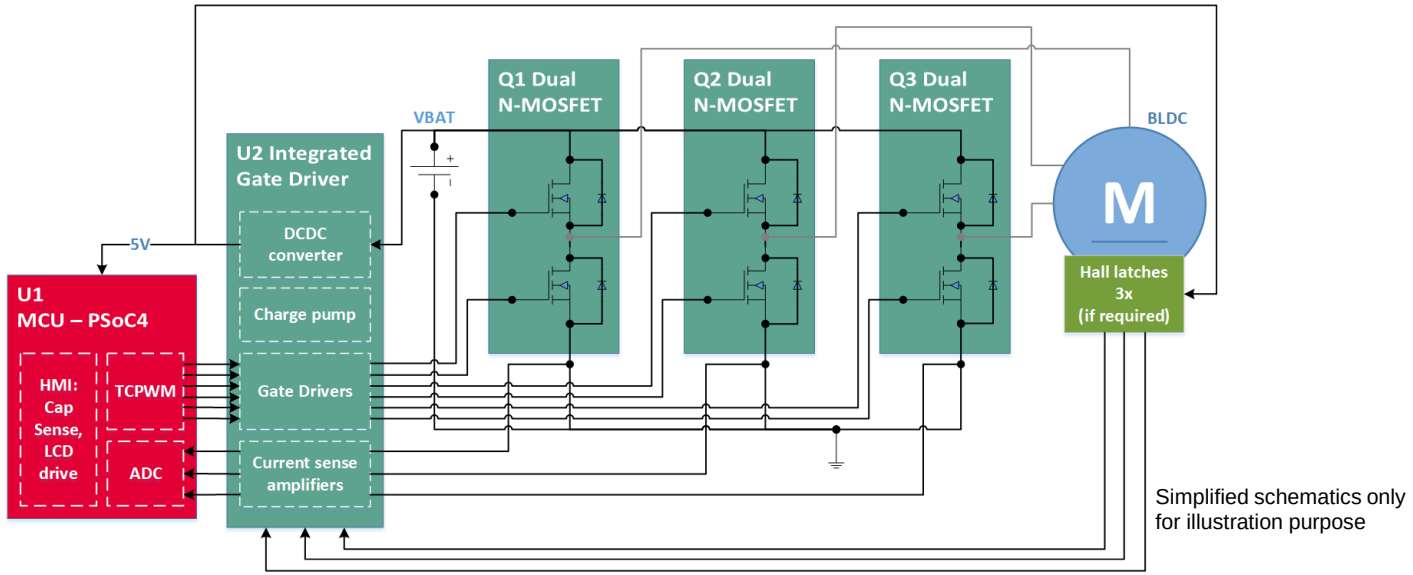
Proposed BOM BLDC-Motor drive: GOOD PERFORMANCE with up to 10A & 25V & HMI capability



Product type	Device	Part number	Description	Package mm x mm	Qty.
N+N dual MOSFET	Q1, Q2, Q3	BSC072N04LD	40V OptiMOS® T2 Power Transistor 7.2mΩ with continuous I_D 20A at 25°C, V_{GS} 10V & typ. Q_g 39nC	SSO8 5x6	3
N-MOSFET	Separated Q1, Q2, Q3	BSC032N04LS	40V OptiMOS® Power MOSFET 3.2mΩ with continuous I_D 98A at 25°C, V_{GS} 10V & typ. Q_g 25nC	SSO8 5x6	6
Gate driver	Integrated U2 to U4	6EDL7141	3-Phase smart gate driver with I_O source / sink 1.5A, operating supply voltage 5.5 – 60V, integrated power supplies, current sense amplifiers, Hall sensor comparators, ADC	VQFN48 7x7	1
Microcontroller	U1	CY8C4146AZI-S423T	Cortex-M0+ 32bit 48MHz CPU clock 8KB SRAM & 64KB Flash with 5 TCPWM blocks & Comparator-based triggering of Kill signals for motor drive, 2 opamps, CapSense, LCD drive capability on GPIOs	TQFP48 9x9	1
Position sensor	Motor assy.	TLI4961-1M	Bipolar Hall latch with 3 – 32V operating supply voltage	SOT23-3	3

Key features and benefits

- Cost competitive with high performance solution
- Available firmware of FOC with Hall sensors or sensorless for BLDC motors
- Dual N-channel MOSFET and integrated 6-channel Smart gate driver with integrated power supplies, current sense amplifiers, ADC, and Hall sensor comparators reducing the required PCB footprint significantly
- MCU HMI capability i.e. capacitive touch sensing & LCD drive

Application assumptions

- DC Motor powered up by Lí-ion battery pack of 4S to 6S with typical voltage 14.4 – 21.6V and max. voltage 16.8 – 25.2V
- DC Motor voltage within 12 – 24V
- Average current up to 10A (at 25V)

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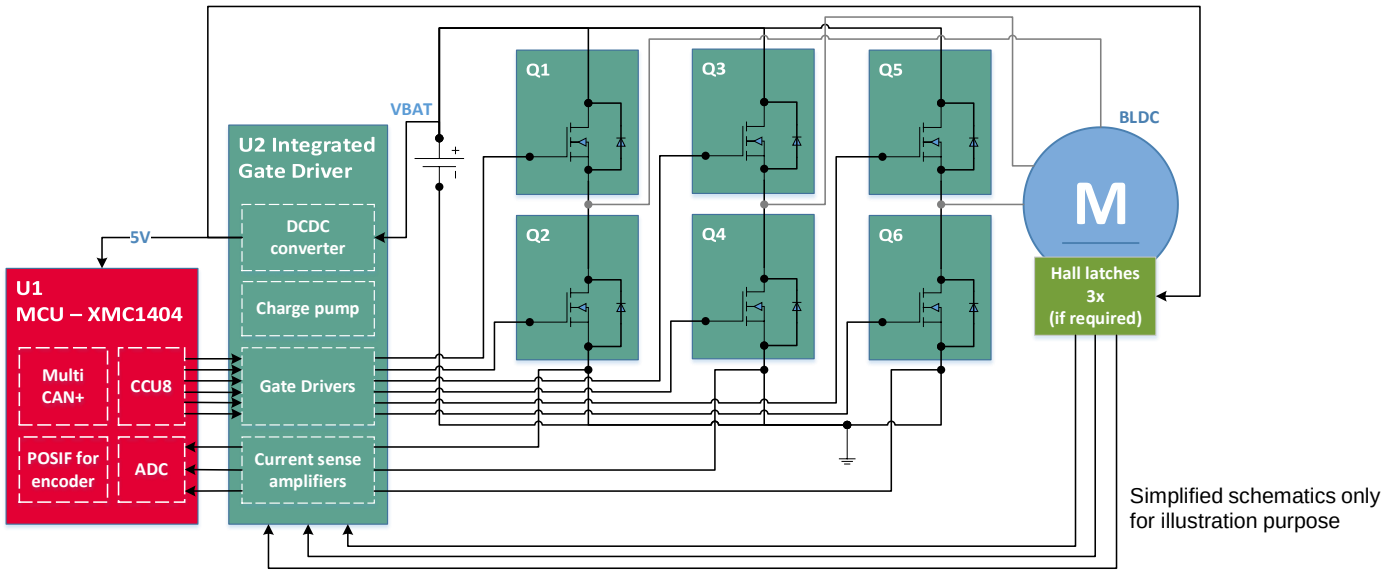
Proposed BOM BLDC-Motor drive: HIGH PERFORMANCE with up to 30A & 25V



Product type	Device	Part number	Description	Package mm x mm	Qty.
N-MOSFET	Q1 to Q6	ISC019N04NM5	40V OptiMOS® 5 Power MOSFET 1.9mΩ with continuous I_D 170A at 25°C, V_{GS} 10V & typ. Q_g 42nC	SSO8 5x6	6
Gate driver	Integrated U2 to U4	6EDL7141*	3-Phase smart gate driver with I_O source / sink 1.5A, operating V_S 5.5 – 60V, integrated power supplies, current sense amplifiers, Hall sensor comparators, ADC	VQFN48 7x7	1
Microcontroller	U1	XMC1404-Q064X0200*	Cortex-M0 with MATH, 32bit 48MHz CPU clock 16KB SRAM & 200KB Flash, 12-bit ADC, multiCAN module (2 CAN nodes), 2x CCU8 PWM for easy 3-phase inverter implementation & 2x POSIF interface for hall sensors/encoder, T_A -40 to 105°C	VQFN64 8x8	1
Position sensor	Motor assy.	TLI4961-1M	Bipolar Hall latch with 3 – 32V operating supply voltage	SOT23-3	3

* Option: Integration to IMD701A (MCU + Gate driver) in VQFN64 9x9 package is further reducing the PCB footprint

Key features and benefits

- High performance solution
- Available firmware of FOC with Hall sensors or sensorless for BLDC and PMSM motors
- MCU direct interface for encoder
- Integrated 6-channel Smart gate driver with integrated power supplies, current sense amplifiers, ADC, and Hall sensor comparators, in addition to high power density MOSFET reducing the required PCB footprint quite significantly

Application assumptions

- DC Motor powered up by Lí-ion battery pack of 4S to 6S with typical voltage 14.4 – 21.6V and max. voltage 16.8 – 25.2V
- DC Motor voltage within 12 – 24V
- Average current up to 30A (at 25V)

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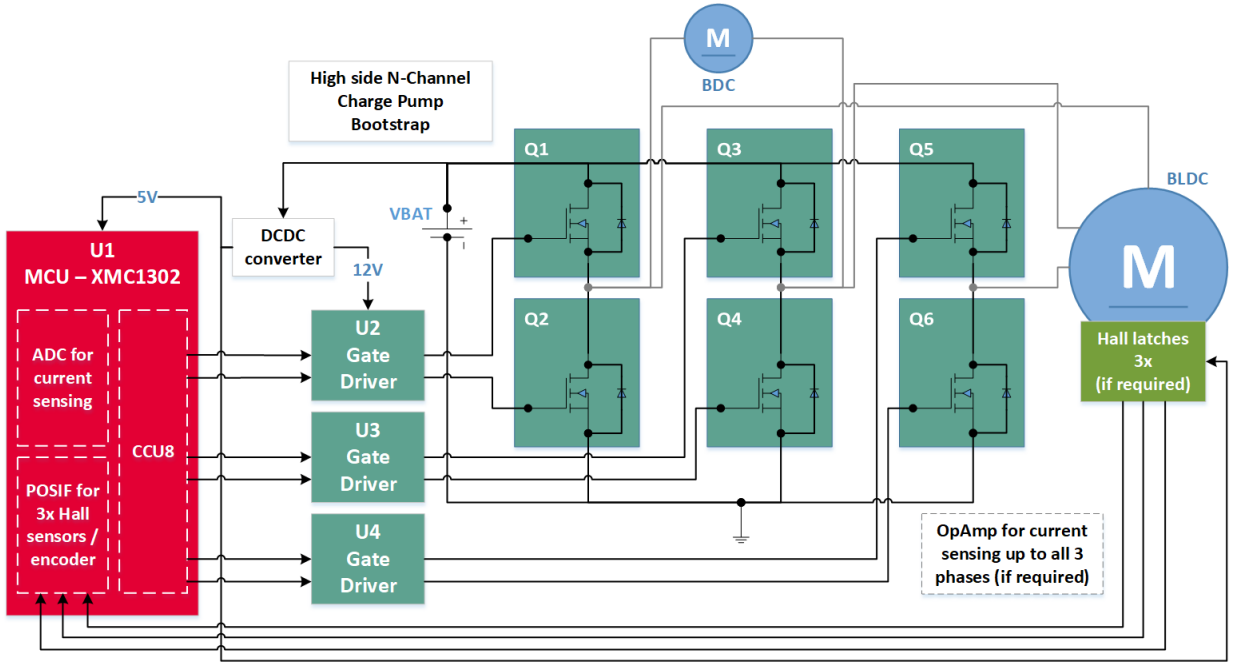
Proposed BOM DC-Motor drive: PRICE/PERFORMANCE with up to 8A & 50V



Simplified schematics only for illustration purpose

Product type	Device	Part number	Description	Package mm x mm	Quantity	
					BDC	BLDC
N-MOSFET	Q1 – Q4, (Q5, Q6)	IRFR540ZPbF	100V HEXFET® Power MOSFET 28.5mΩ with continuous I_D 35A at 25°C, V_{GS} 10V & typ. Q_g 39nC	DPAK	4	6
Gate driver	U2, U3, (U4)	2ED2181S06F	650V high side & low side gate driver with integrated BSD & I_O source / sink 2.5A, propagation delay 200ns	DSO8 4x5	2	3
Microcontroller	U1	XMC1302-T038X0032AB	Cortex-M0 32bit 32/64MHz C/P clock 16KB SRAM & 32KB Flash with CCU8 PWM for easy 3-phase inverter implementation & POSIF interface for hall sensors/encoder	TSSOP38 9.7x4.4	1	1
Position sensor	Motor assy.	TLI4961-1M	Bipolar Hall latch with 3 – 32V operating supply voltage	SOT23-3	--	3

Key features and benefits

- Low cost solution
- Available firmware of FOC with Hall sensors or sensorless for BLDC and PMSM motors
- MCU direct interface for either Hall sensors or encoder
- Dual-channel gate driver with integrated bootstrap diode (BSD) with high output current source and sink enabling high switching frequency

Application assumptions

- DC Motor powered up by Lí-ion battery pack of 7S to 12S with typical voltage 25.2 – 43.2V and max. voltage 29.4 – 50.4V
- DC Motor voltage within 24 – 48V
- Average current up to 8A (at 50V)

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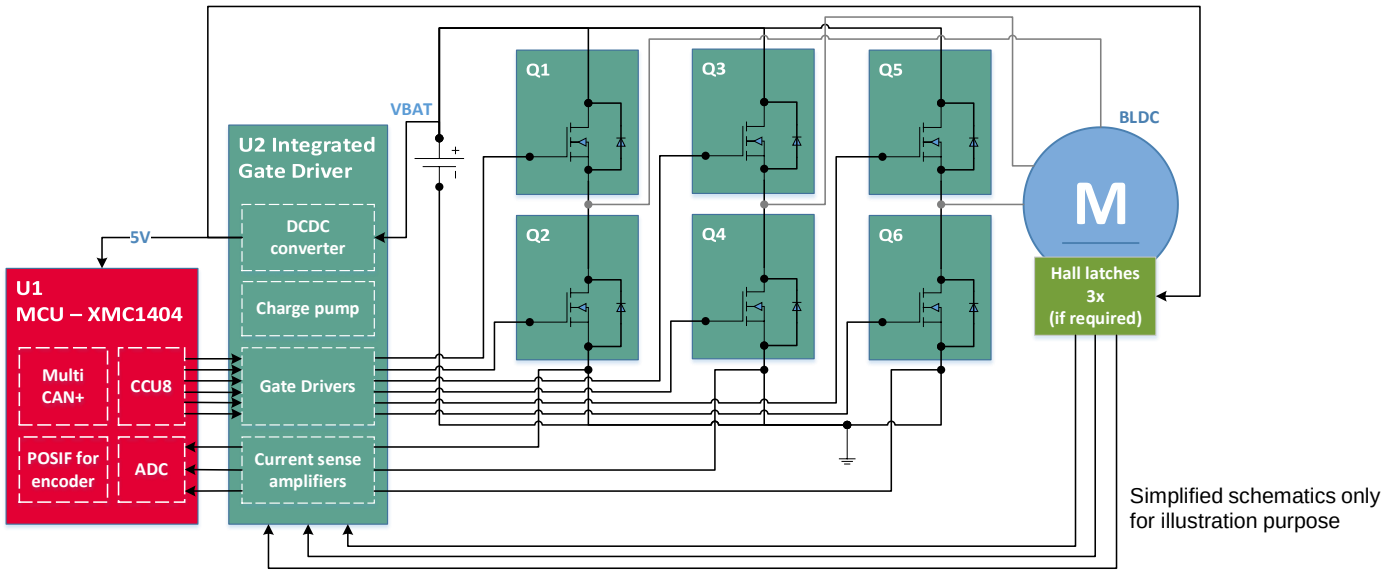
Proposed BOM BLDC-Motor drive: HIGH PERFORMANCE with up to 20A & 50V



Product type	Device	Part number	Description	Package mm x mm	Qty.
N-MOSFET	Q1 to Q6	IQE065N10NM5	100V OptiMOS® 5 Power MOSFET 6.5mΩ with continuous I_D 85A at 25°C, V_{GS} 10V & typ. Q_g 34nC	TSON8 3.3x3.3	6
Gate driver	Integrated U2 to U4	6EDL7141*	3-Phase smart gate driver with I_O source / sink 1.5A, operating V_S 5.5 – 60V, integrated power supplies, current sense amplifiers, Hall sensor comparators, ADC	VQFN48 7x7	1
Microcontroller	U1	XMC1404-Q064X0200*	Cortex-M0 with MATH, 32bit 48MHz CPU clock 16KB SRAM & 200KB Flash, 12-bit ADC, multiCAN module (2 CAN nodes), 2x CCU8 PWM for easy 3-phase inverter implementation & 2x POSIF interface for hall sensors/encoder, T_A -40 to 105°C	VQFN64 8x8	1
Position sensor	Motor assy.	TLI4961-1M	Bipolar Hall latch with 3 – 32V operating supply voltage	SOT23-3	3

* Option: Integration to IMD701A (MCU + Gate driver) in VQFN64 9x9 package is further reducing the PCB footprint

Key features and benefits

- High performance solution
- Available firmware of FOC with Hall sensors or sensorless for BLDC and PMSM motors
- MCU direct interface for either Hall sensors or encoder
- Integrated 6-channel Smart gate driver with integrated power supplies, current sense amplifiers, ADC, and Hall sensor comparators, in addition to high power density MOSFET reducing the required PCB footprint quite significantly

Application assumptions

- DC Motor powered up by Lí-ion battery pack of 7S to 12S with typical voltage 25.2 – 43.2V and max. voltage 29.4 – 50.4V
- DC Motor voltage within 24 – 48V
- Average current up to 20A (at 50V)

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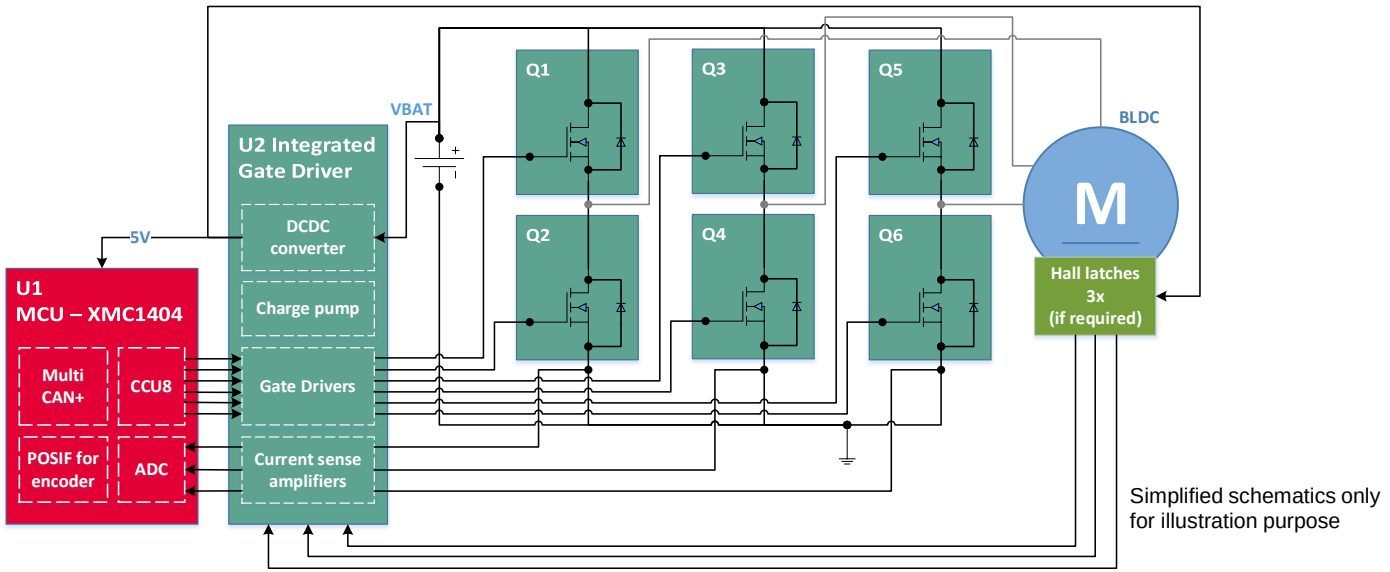
Proposed BOM BLDC-Motor drive: HIGH PERFORMANCE with up to 40A & 50V



Product type	Device	Part number	Description	Package mm x mm	Qty.
N-MOSFET	Q1 to Q6	ISC027N10NM6	100V OptiMOS® 6 Power MOSFET 2.7mΩ with continuous I_D 192A at 25°C, V_{GS} 10V & typ. Q_g 58nC	SSO8 5x6	6
Gate driver	Integrated U2 to U4	6EDL7141*	3-Phase smart gate driver with I_O source / sink 1.5A, operating V_S 5.5 – 60V, integrated power supplies, current sense amplifiers, Hall sensor comparators, ADC	VQFN48 7x7	1
Microcontroller	U1	XMC1404-Q064X0200*	Cortex-M0 with MATH, 32bit 48MHz CPU clock 16KB SRAM & 200KB Flash, 12-bit ADC, multiCAN module (2 CAN nodes), 2x CCU8 PWM for easy 3-phase inverter implementation & 2x POSIF interface for hall sensors/encoder, T_A -40 to 105°C	VQFN64 8x8	1
Position sensor	Motor assy.	TLI4961-1M	Bipolar Hall latch with 3 – 32V operating supply voltage	SOT23-3	3

* Option: Integration to IMD701A (MCU + Gate driver) in VQFN64 9x9 package is further reducing the PCB footprint

Key features and benefits

- High performance solution
- Available firmware of FOC with Hall sensors or sensorless for BLDC and PMSM motors
- MCU direct interface for either Hall sensors or encoder
- Integrated 6-channel Smart gate driver with integrated power supplies, current sense amplifiers, ADC, and Hall sensor comparators, in addition to high power density MOSFET reducing the required PCB footprint quite significantly

Application assumptions

- DC Motor powered up by Lí-ion battery pack of 7S to 12S with typical voltage 25.2 – 43.2V and max. voltage 29.4 – 50.4V
- DC Motor voltage within 24 – 48V
- Average current up to 40A (at 50V)

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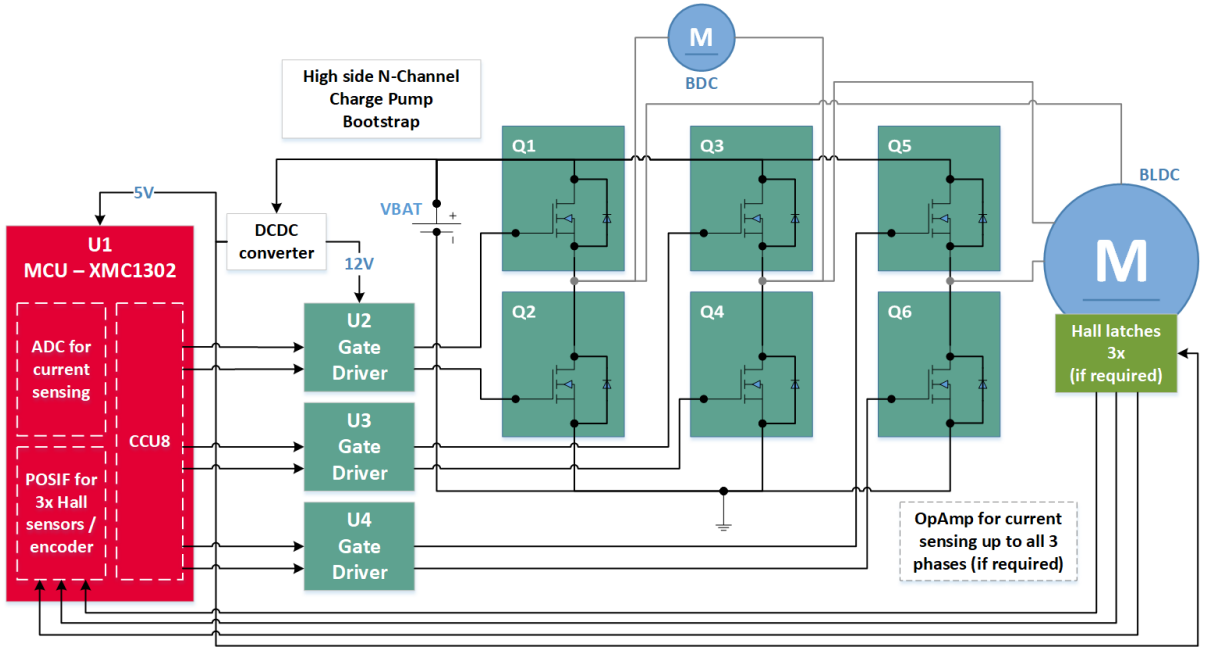
Proposed BOM DC-Motor drive: PRICE/PERFORMANCE with up to 10A & 100V



Simplified schematics only for illustration purpose

Key features and benefits

- Low cost solution
- Available firmware of FOC with Hall sensors or sensorless for BLDC and PMSM motors
- MCU direct interface for either Hall sensors or encoder
- Dual-channel gate driver with high output current source and sink enabling high switching frequency

Product type	Device	Part number	Description	Package mm x mm	Quantity	
					BDC	BLDC
N-MOSFET	Q1 – Q4, (Q5, Q6)	IRFS4227PbF	200V HEXFET® Power MOSFET 26mΩ with continuous I_D 62A at 25°C, V_{GS} 10V & max. Q_g 70nC	D2PAK	4	6
Gate driver	U2, U3, (U4)	IRS21867S	600V high side & low side gate driver with I_O source / sink 4A, propagation delay 170ns	SOIC8 4x5	2	3
Microcontroller	U1	XMC1302-T038X0032AB	Cortex-M0 32bit 32/64MHz C/P clock 16KB SRAM & 32KB Flash with CCU8 PWM for easy 3-phase inverter implementation & POSIF interface for hall sensors/encoder	TSSOP38	1	1
Position sensor	Motor assy.	TLI4961-1M	Bipolar Hall latch with 3 – 32V operating supply voltage	SOT23-3	--	3

Application assumptions

- DC Motor powered up by Lí-ion battery pack of 13S to 24S with typical voltage 46.8 – 86.4V and max. voltage 54.6 – 100.8V
- DC Motor voltage within 48 – 96V
- Average current up to 10A (at 100V)

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