

# eGaN® FETs and ICs for Brushless DC (BLDC) Motors



	BLDC Application	Application Description	Benefits
eMobility		<p>The rapid emergence of e-scooters and e-bikes has created a surge in demand for compact, lightweight motor drives.</p> <p>The high frequency capability of GaN allows for the design of much smaller motor drives and this miniaturization enables better esthetic, lighter weight, and lower cost solutions for eMobility. Also, the higher efficiency provided by GaN is critical for longer battery life to achieve increased range between charges.</p>	<p>eGaN FETs from EPC offer significantly higher performance switching than silicon-based MOSFETs in brushless DC motor designs.</p> <p>eGaN FET attributes:</p> <ul style="list-style-type: none"> <li>- no parasitic p-n diode</li> <li>- zero <math>Q_{RR}</math></li> <li>- lower <math>Q_{OSS}</math></li> </ul>
Robotics and Drones	<p><b>Industrial Robot</b></p>	<p>Autonomous robots, lean production line collaborative robots and industrial drones use brushless DC motors where the input voltage is between 24 V and 150 V, typically 48 V and the emerging 96 V.</p> <p>GaN-based designs are smaller, lighter weight, have higher efficiency, and lower EMI.</p>	<p>eGaN FET attributes reduce the current noise generation in brushless DC motors and provide a 5x reduction in switching current noise.</p> <p>Lower noise equals higher current measurement accuracy.</p>
Automotive	<p><b>Automotive Motors</b></p>	<p>Automobiles today contain over 50 small motors and the number of brushless DC motors (BLDC) being used is increasing rapidly. This is because BLDC motors save energy, have longer life, reduce noise, and are more compact.</p>	<p>Torque ripple caused by commutation in BLDC motors is unacceptable in applications such as electric power steering (EPS). Higher inverter switching frequencies with GaN minimize losses and torque ripple in BLDC motors used for EPS.</p>
Healthcare Surgical Robotics		<p>Robotic surgery requires great precision and in high-torque BLDC using rotor position sensing for intricate robot motion control eGaN FETs significantly outperform MOSFETs.</p> <p>In high-torque BLDC motors using rotor position sensing for intricate robot motion control, eGaN FETs outperform MOSFETs significantly.</p>	<p>GaN's small size, thermal efficiency, high frequency switching and low switching losses contribute to high-resolution and precise control in medical equipment such as surgical robotics.</p>

Recommended Devices for Brushless DC (BLDC) Motors

Part Number	Configuration	V <sub>DS</sub> (V)	Max R <sub>DS(on)</sub> (mΩ) @ 5 V <sub>GS</sub>	Q <sub>G</sub> typ (nC)	Q <sub>GS</sub> typ (nC)	Q <sub>GD</sub> typ (nC)	Q <sub>DSS</sub> typ (nC)	Q <sub>RR</sub> (nC)	C <sub>ISS</sub> (pF)	C <sub>OSS</sub> (pF)	C <sub>RSS</sub> (pF)	I <sub>D</sub> (A)	Pulsed I <sub>D</sub> (A)	Max T <sub>J</sub> (°C)	Package (mm)	Development Board
EPC2040	Single	15	30	0.745	0.23	0.14	0.42	0	86	67	20	3.4	28	150	BGA 0.85 x 1.2	n/a
EPC2023	Single	30	1.45	19	5.7	3.2	30	0	2150	1530	100	90	590	150	LGA 6.05 x 2.3	EPC9031
EPC2014C	Single	40	16	2	0.7	0.3	4	0	220	150	6.5	10	60	150	LGA 1.7 x 1.1	EPC9005C
EPC2015C	Single	40	4	8.7	2.7	1.2	19	0	980	710	18	53	235	150	LGA 4.1 x 1.6	EPC9001C
EPC2030	Single	40	2.4	17	5.8	3.4	32	0	1960	1120	62	48	490	150	BGA 4.6 x 2.6	EPC9060
EPC2069	Single	40	2.25	12.5	3.9	2.4	32	0	1351	1044	32	80	422	150	LGA 3.25 x 3.25	EPC90139
EPC2067	Single	40	1.55	17.1	5.3	2	37	0	2178	1071	24	69	409	150	LGA 2.85 x 3.25	EPC90138
EPC2024	Single	40	1.5	18	5.1	2.4	45	0	1920	1620	29	90	560	150	LGA 6.05 x 2.3	EPC9032
EPC2066	Single	40	1.1	25	8.9	3.2	59	0	3539	1670	30	90	639	150	LGA 6.05 x 2.3	EPC90149
EPC2035	Single	60	45	0.88	0.25	0.16	2.6	0	95	60	2	1.7	24	150	BGA 0.9 x 0.9	EPC9049
EPC102	Half Bridge	60	4.9	8	2.5	1.5	26,31	0	850	500,610	11	30	220	150	BGA 6.05 x 2.3	EPC9038
EPC2031	Single	60	2.6	16	5	3.2	48	0	1640	980	35	48	450	150	BGA 4.6 x 2.6	EPC9061
EPC2020	Single	60	2.2	16	3.9	2.3	50	0	1780	1020	24	90	470	150	LGA 6.05 x 2.3	EPC9033
EPC2039	Single	80	25	1.91	0.76	0.42	7.64	0	210	115	2	6.8	50	150	BGA 1.35 x 1.35	EPC9057
EPC103	Half Bridge	80	5.5	6.5	2.2	1.1	30,34	0	730	445,525	7	30	195	150	BGA 6.05 x 2.3	EPC9039
EPC2065	Single	80	3.6	9.4	2.6	1.7	33	0	1097	534	8.9	60	215	150	LGA 3.5 x 2	EPC90137
EPC2021	Single	80	2.2	15	4.1	3	72	0	1610	1100	15	90	390	150	LGA 6.05 x 2.3	EPC9034
EPC2038	Single with Gate Diode	100	3300	0.044	0.02	0.004	0.134	0	7	1.6	0.02	0.5	0.5	150	BGA 0.9 x 0.9	EPC9507
EPC2037	Single	100	550	0.115	0.032	0.025	0.6	0	14	6.5	0.1	1.7	2.4	150	BGA 0.9 x 0.9	EPC9087
EPC2036	Single	100	73	0.7	0.17	0.14	3.9	0	75	50	0.7	1.7	18	150	BGA 0.9 x 0.9	EPC9050
EPC106	Half Bridge	100	70	0.73	0.24	0.140	3.96, 4.68	0	79	52,61	0.5	1.7	18	150	BGA 1.35 x 1.35	EPC9055
EPC2007C	Single	100	30	1.6	0.6	0.3	8.3	0	170	110	1.9	6	40	150	LGA 1.7 x 1.1	EPC9006C
EPC2051	Single	100	25	1.8	0.6	0.3	7.3	0	224	86	1	1.7	37	150	BGA 1.3 x 0.85	EPC9091
EPC2016C	Single	100	16	3.4	1.1	0.55	16	0	360	210	3.2	18	75	150	LGA 2.1 x 1.6	EPC9010C
EPC2052	Single	100	13.5	3.5	1.5	0.5	13	0	441	195	3.2	8.2	74	150	BGA 1.5 x 1.5	EPC9092
EPC2045	Single	100	7	6	1.9	0.8	25	0	767	295	3	16	130	150	BGA 2.5 x 1.5	EPC9078
EPC2001C	Single	100	7	7.5	2.4	1.2	31	0	770	430	10	36	150	150	LGA 4.1 x 1.6	EPC9002C
EPC104	Half Bridge	100	6.8	6.8	2.3	1.4	35,41	0	730	430,500	5	30	180	150	BGA 6.05 x 2.3	EPC9040
EPC2032	Single	100	4	12	3	2	66	0	1270	800	12	48	340	150	BGA 4.6 x 2.6	EPC9062
EPC2053	Single	100	3.8	11.4	4.1	1.5	45	0	1453	642	10.4	48	246	150	BGA 3.5 x 2	EPC9093
EPC2218	Single	100	3.2	10.5	3.2	1.5	46	0	1189	562	4.3	60	231	150	LGA 3.5 x 1.95	EPC90123
EPC2022	Single	100	3.2	13.2	3.4	2.4	71	0	1400	840	7	90	390	150	LGA 6.05 x 2.3	EPC9035
EPC2071	Single	100	2.2	18	6	1.8	71	0	2664	878	5.4	64	350	150	LGA 4.45 x 2.3	EPC90146
EPC2302	Single	100	1.8	23	8	2.3	85	0	3200	1000	7	101	408	150	QFN 3 x 5	EPC90142
EPC2033	Single	150	7	12	3.8	3.2	90	0	1160	480	6	48	260	150	BGA 4.6 x 2.6	EPC9047
EPC2012C	Single	200	100	1	0.3	0.2	10	0	100	64	0.4	5	22	150	LGA 1.7 x 0.9	EPC9004C
EPC2054	Single	200	43	2.9	0.9	0.30	15	0	358	89	0.3	3.0	32	150	BGA 1.3 x 1.3	EPC9094
EPC2010C	Single	200	25	3.7	1.3	0.7	40	0	380	240	1.8	22	90	150	LGA 3.6 x 1.6	EPC9003C
EPC2034C	Single	200	8	11.4	3.8	2.1	95	0	1166	630	2.8	48	213	150	BGA 4.6 x 2.6	EPC9048C

ePower™ Stage

Part Number	Configuration	Function	VPwr	I <sub>OUT</sub>	I <sub>OUT</sub> Peak	V <sub>DD</sub>	Input Logic	F (Max)	UVLO	Package (mm)	Development Board
EPC2152	Half-Bridge ePower™ Stage	ePower™ Stage	80	12.5	90	12	3.3 V	3 MHz	7.5	LGA 3.65 x 2.59	EPC90120
EPC23101	HS FET + Driver + Level Shift	ePower™ Stage	100	65	240	6	5.5 V	3 MHz	0.5 – 4	QFN 3.5 x 5	EPC90142
EPC23102	HS FET + Driver + Level Shift	ePower™ Stage	100	35		6	5.5 V	3 MHz	0.5 – 4	QFN 3.5 x 5	EPC90147

Table data subject to change. Please visit: [www.epc-co.com/epc/Products/eGaNfetsandICs.aspx](http://www.epc-co.com/epc/Products/eGaNfetsandICs.aspx)

For more information, visit the Motor Drive page on our website:



For More Information

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