

BCQ65N15M1

N-Channel Silicon Carbide Power MOSFET

650 V, 190 A, 15 mΩ



bestirpower

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

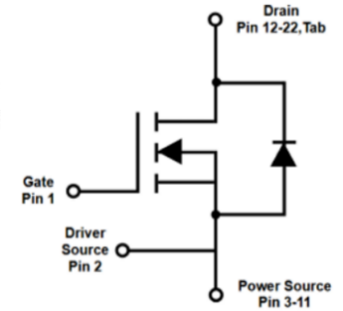
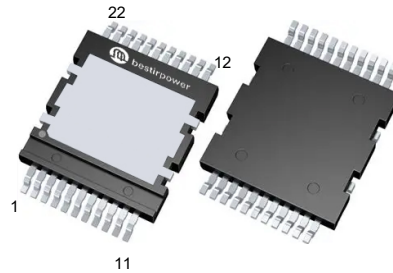
BV_{DSS}	$I_D, T_C=25^{\circ}C$	$R_{DS(on),typ}$	$Q_{g,typ}$
650 V	190A	15 mΩ	146 nC

Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications



Absolute Maximum Ratings ($T_J = 25^{\circ}C$ unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		650	V
V_{GS}	Gate to Source Voltage (DC)		-10 / +22	V
V_{GSop}	Recommended Operation Value		-5 / +18	V
I_D	Drain Current (1)	$T_C = 25^{\circ}C$	190	A
		$T_C = 110^{\circ}C$	125	
I_{DM}	Drain Current	Pulsed	500	A
P_D	Power Dissipation	($T_C = 25^{\circ}C$)	728	W
		Derate Above $25^{\circ}C$	4.85	W/ $^{\circ}C$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	$^{\circ}C$

[1] I_D is limited by package.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.21	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	
T_{sold}	Soldering temperature, wave soldering only allowed at leads	260	$^{\circ}C$

Electrical Characteristics ($T_J = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 1\text{ mA}$	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$	-	1	100	μA
I_{GSS+}	Gate-Source Leakage Current	$V_{GS} = +22\text{ V}, V_{DS} = 0\text{ V}$	-	-	+100	nA
I_{GSS-}		$V_{GS} = -10\text{ V}, V_{DS} = 0\text{ V}$	-	-	-100	

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 20.3\text{ mA}$	2.0	2.8	4.5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 18\text{ V}, I_D = 60\text{ A}$	-	15	21	mΩ
		$V_{GS} = 18\text{ V}, I_D = 60\text{ A}, T_J = 175^\circ\text{C}$	-	20		

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 250\text{ kHz}$	-	3525	-	pF
C_{oss}	Output Capacitance		-	297	-	
C_{rss}	Reverse Capacitance		-	16	-	
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 400\text{ V}, I_D = 60\text{ A},$ $V_{GS} = -5\text{ V} / 18\text{ V},$ Inductive load	-	146	-	nC
Q_{gs}	Gate to Source Charge		-	45	-	
Q_{gd}	Gate to Drain "Miller" Charge		-	36	-	
R_G	Internal Gate Resistance	$f = 1\text{ MHz}$	-	2.2	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 400\text{ V}, I_D = 60\text{ A},$ $V_{GS} = -5\text{ V} / 18\text{ V},$ $R_G = 5.6\text{ }\Omega$	-	28.8	-	ns
t_r	Turn-On Rise Time		-	25.7	-	
$t_{d(off)}$	Turn-Off Delay Time		-	60.1	-	
t_f	Turn-Off Fall Time		-	10.5	-	
E_{on}	Turn-on Switching Energy		-	146	-	uJ
E_{off}	Turn-off Switching Energy		-	279	-	

Source-Drain Diode Characteristics

I_{SD}	Continuous Diode Forward Current ⁽¹⁾		-	-	190	A
V_{SD}	Diode Forward Voltage	$V_{GS} = -5\text{ V}, I_{SD} = 60\text{ A}$	-	4.4	-	V
t_{rr}	Reverse Recovery Time	$V_{DD} = 400\text{ V}, I_{SD} = 60\text{ A},$ $di_F/dt = 1000\text{ A}/\mu\text{s}$	-	29.5	-	ns
Q_{rr}	Reverse Recovery Charge		-	303	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	17.4	-	A

[1] ISD is limited by bonding wires.

Typical Performance Characteristics

Figure 1. On-Region Characteristics $T_J = -40^\circ\text{C}$

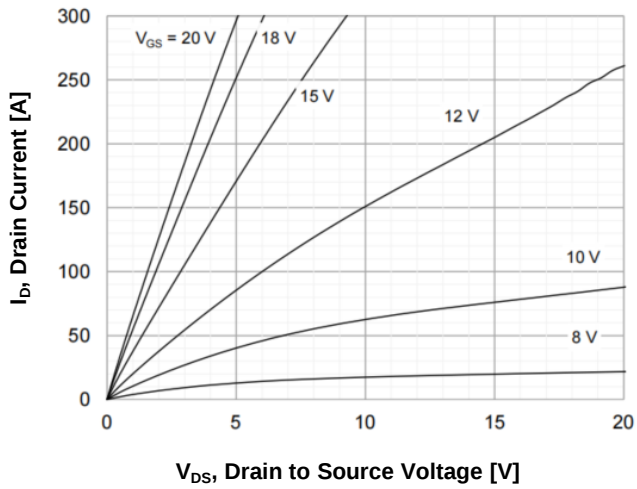


Figure 2. On-Region Characteristics $T_J = 25^\circ\text{C}$

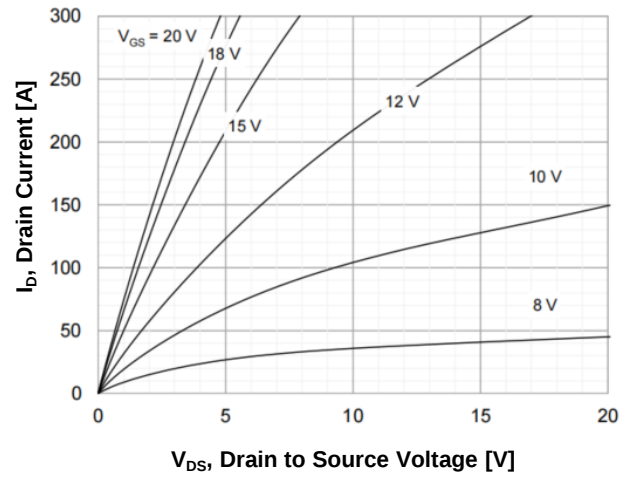


Figure 3. On-Region Characteristics $T_J = 125^\circ\text{C}$

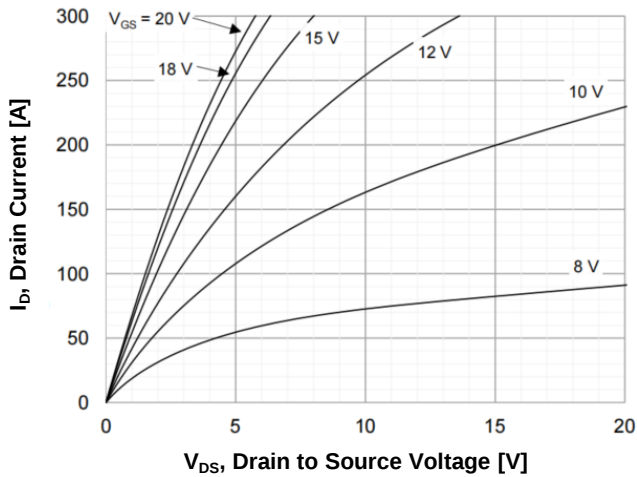


Figure 4. On-Region Characteristics $T_J = 175^\circ\text{C}$

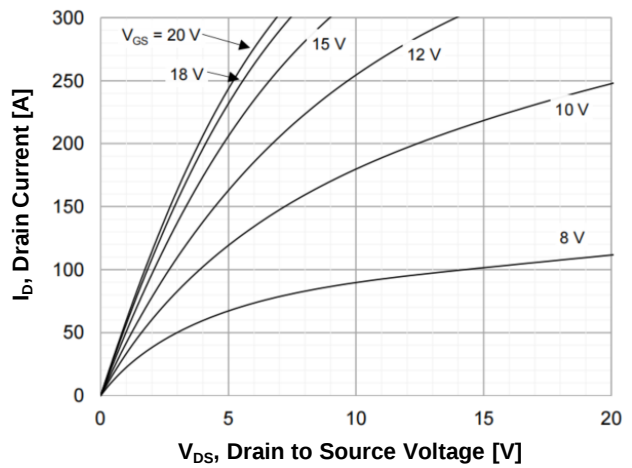


Figure 5. On-Resistance Characteristics vs. Temperature

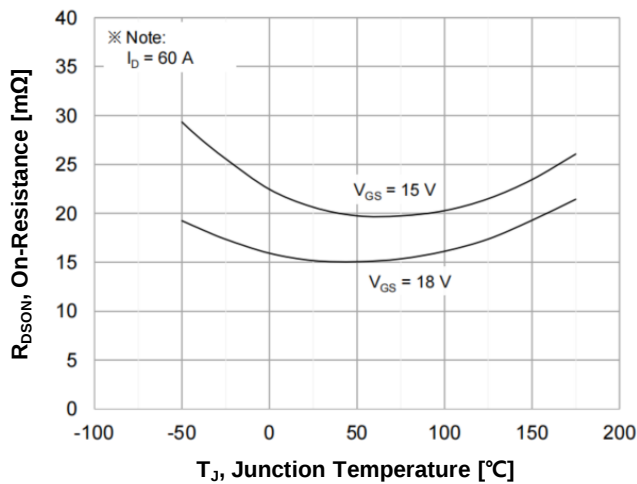
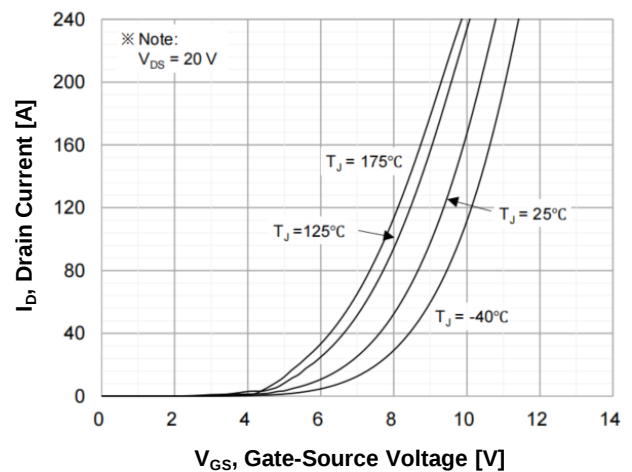


Figure 6. Transfer Characteristics



Typical Performance Characteristics

Figure 7. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = -40^\circ\text{C}$

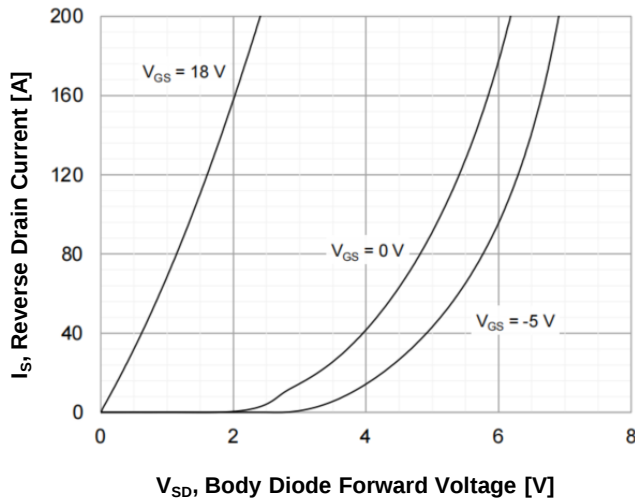


Figure 8. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = 25^\circ\text{C}$

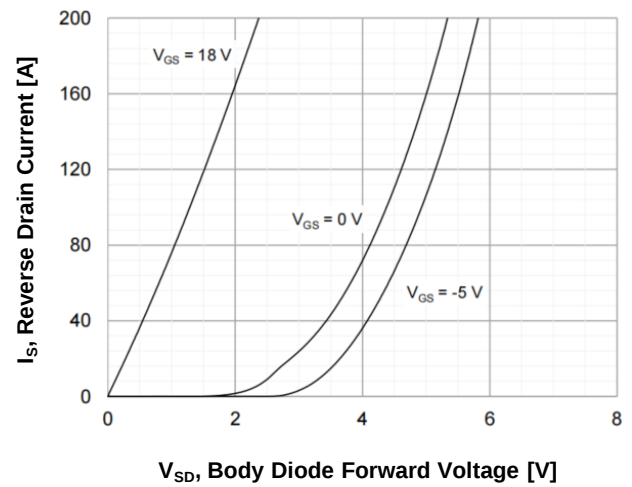


Figure 9. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = 125^\circ\text{C}$

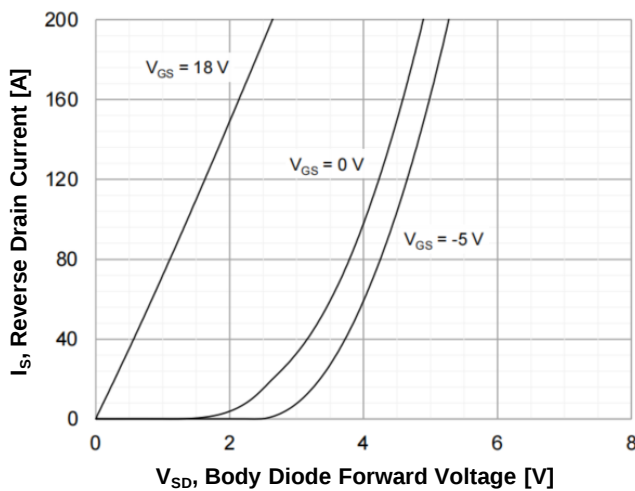


Figure 10. Diode Forward Voltage Characteristics vs. Source-Drain Current $T_J = 175^\circ\text{C}$

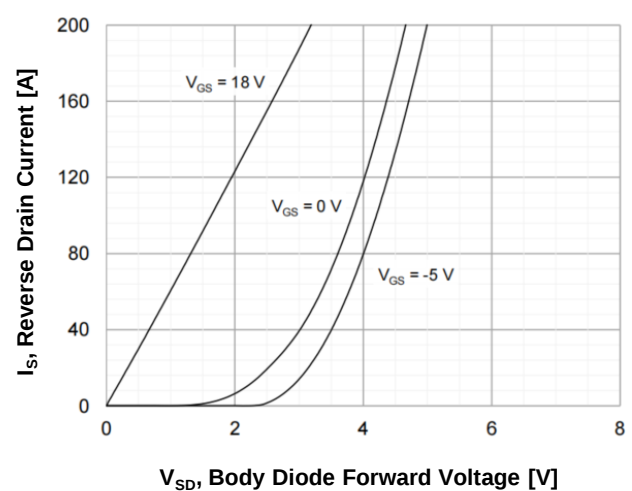


Figure 11. Threshold Voltage vs. Temperature

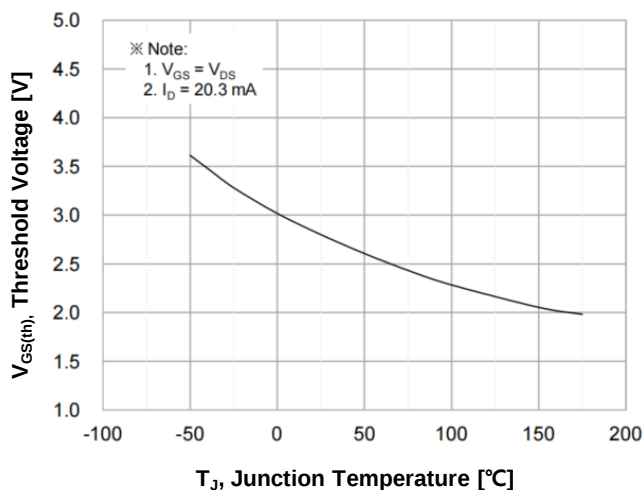
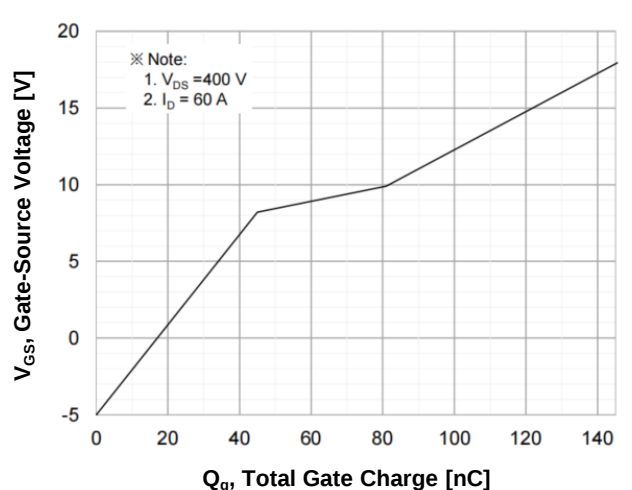


Figure 12. Gate Charge Characteristics



Typical Performance Characteristics

Figure 13. Stored Energy in Output Capacitance

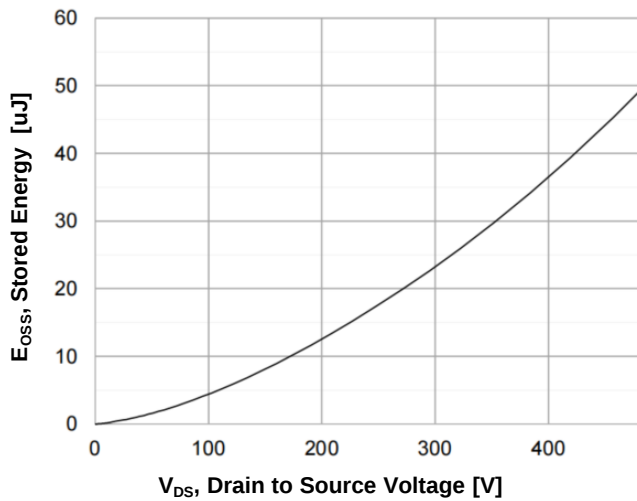


Figure 14. Capacitance Characteristics

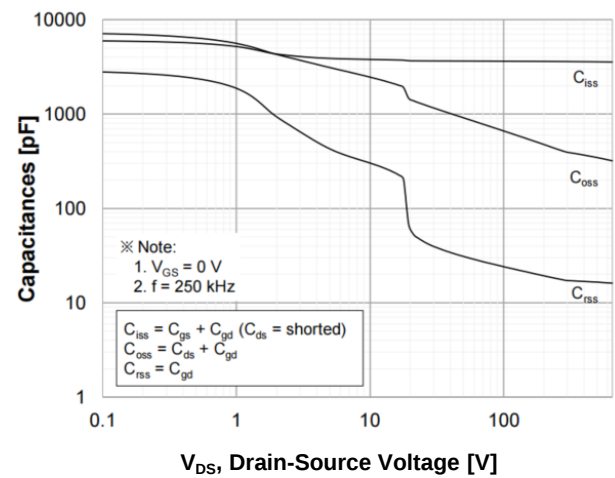


Figure 15. Continuous Drain Current Derating vs. Case Temperature

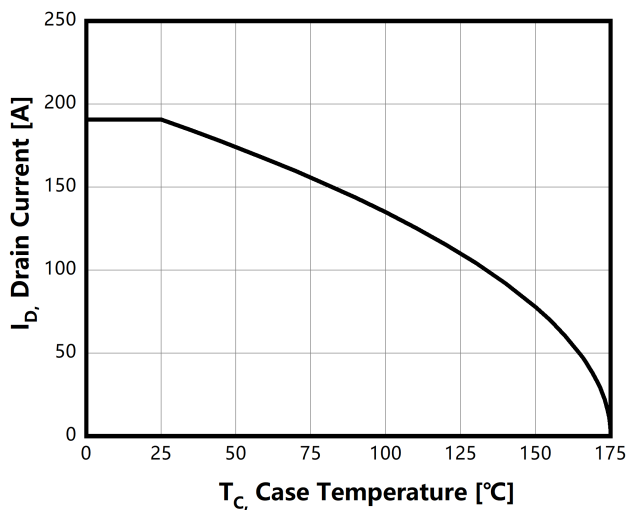


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

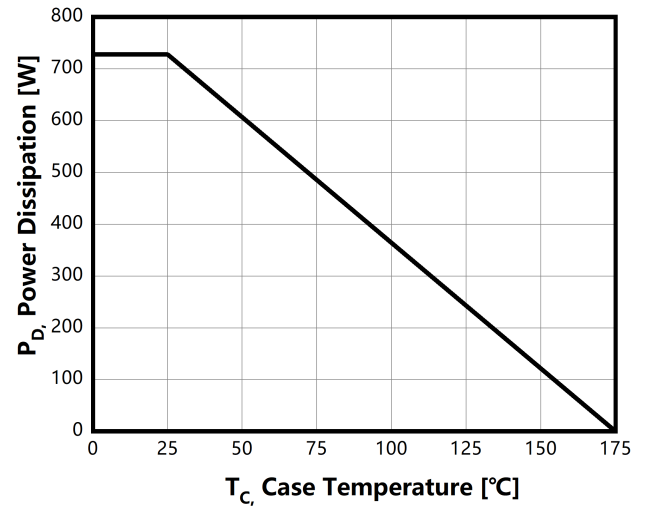


Figure 17. Typ. Switching Losses vs. Drain Current

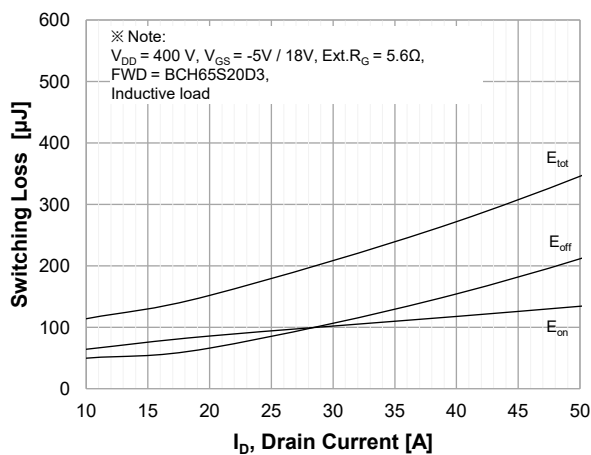
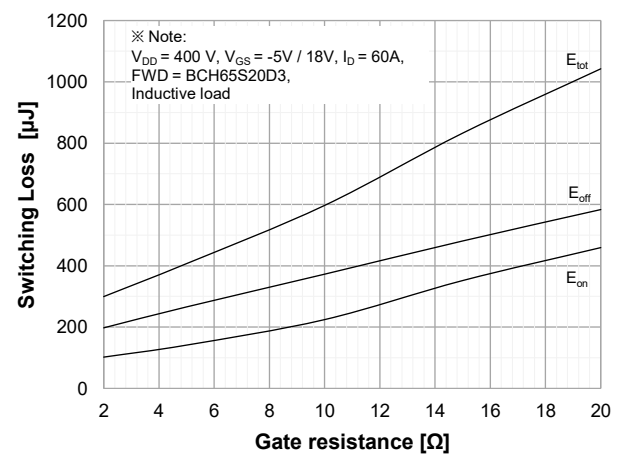


Figure 18. Typ. Switching Losses vs. Gate Resistance



Typical Performance Characteristics

Figure 19. Typ. Switching Losses vs. Drain Current

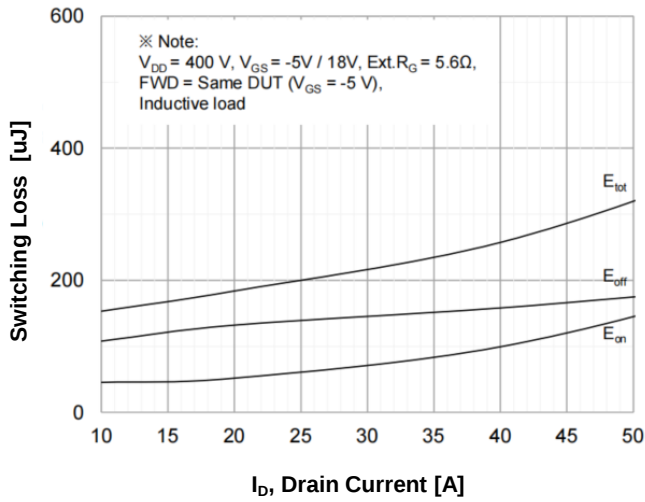


Figure 20. Typ. Switching Losses vs. Gate Resistance

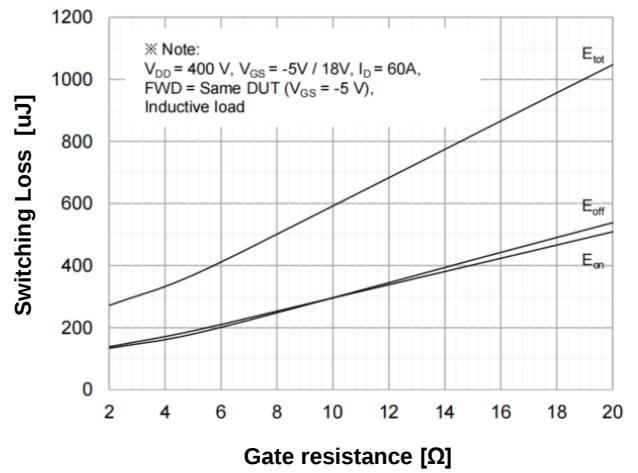


Figure 21. Maximum Safe Operating Area

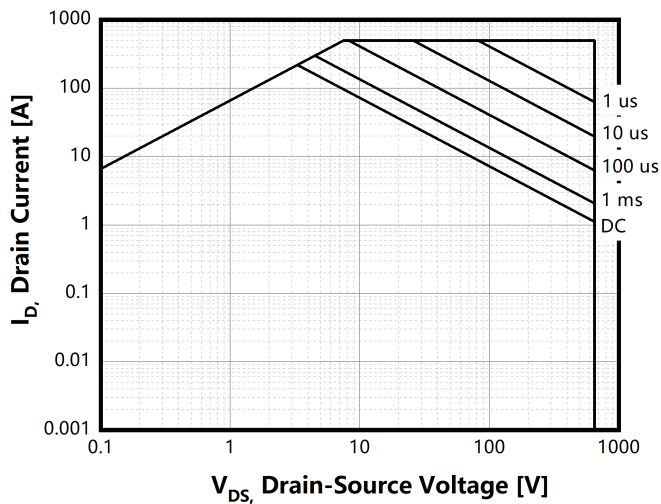
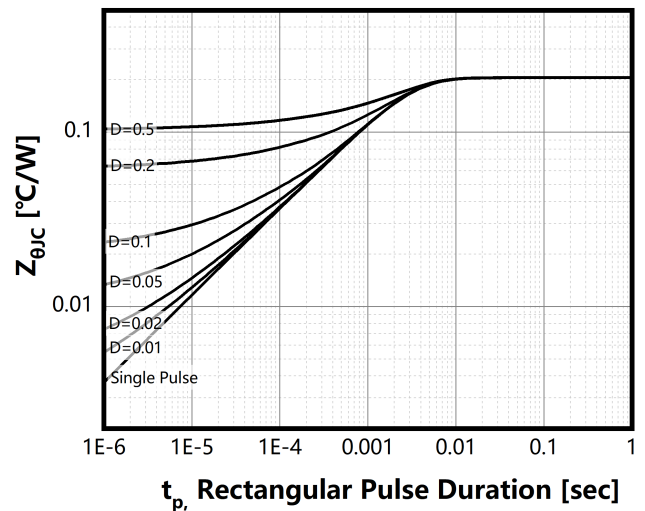


Figure 22. Transient Thermal Response Curve



Typical Performance Characteristics

Figure 23. Inductive Load Switching Test Circuit and Waveforms

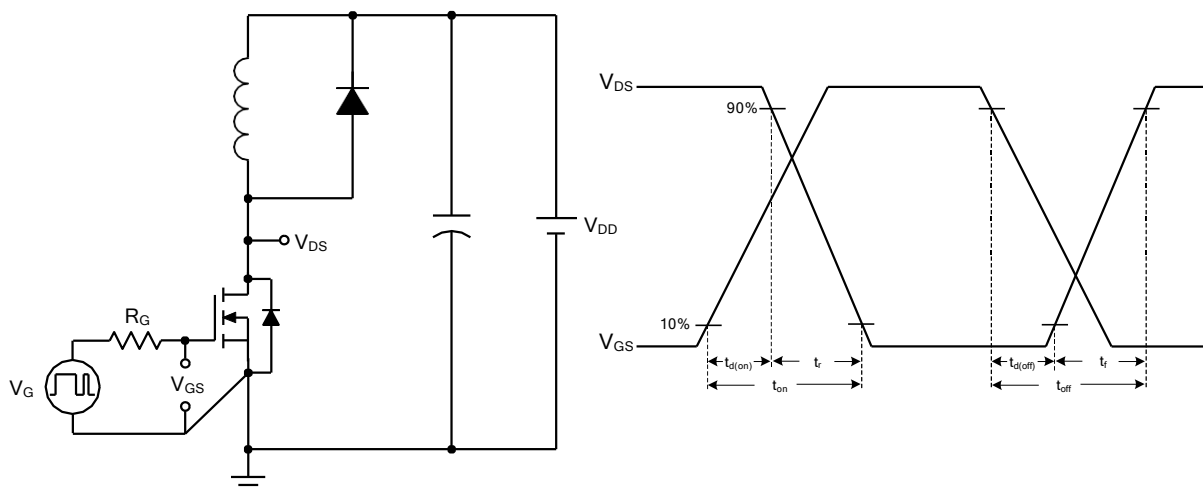
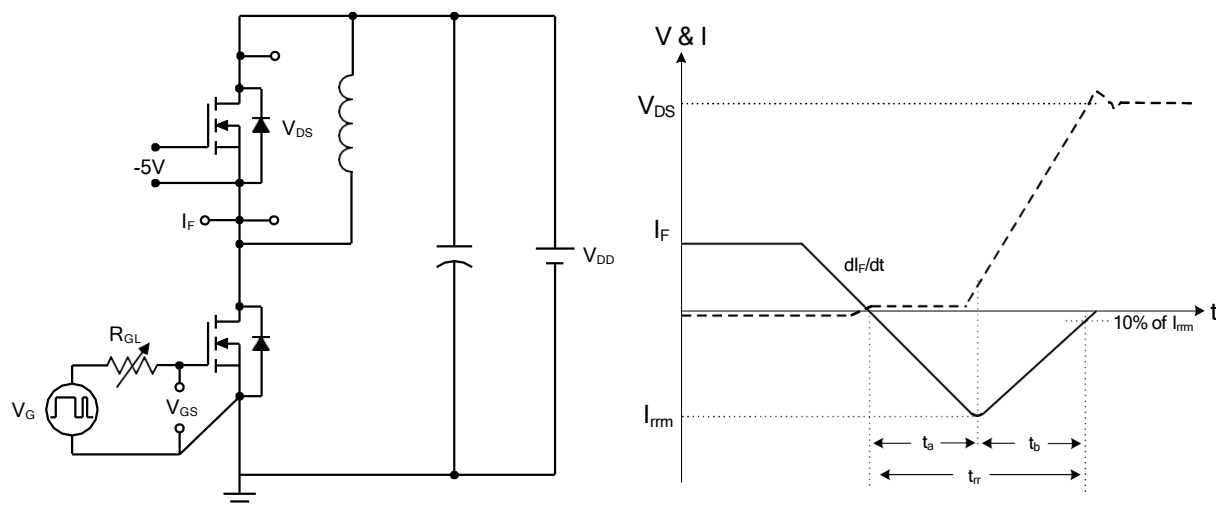
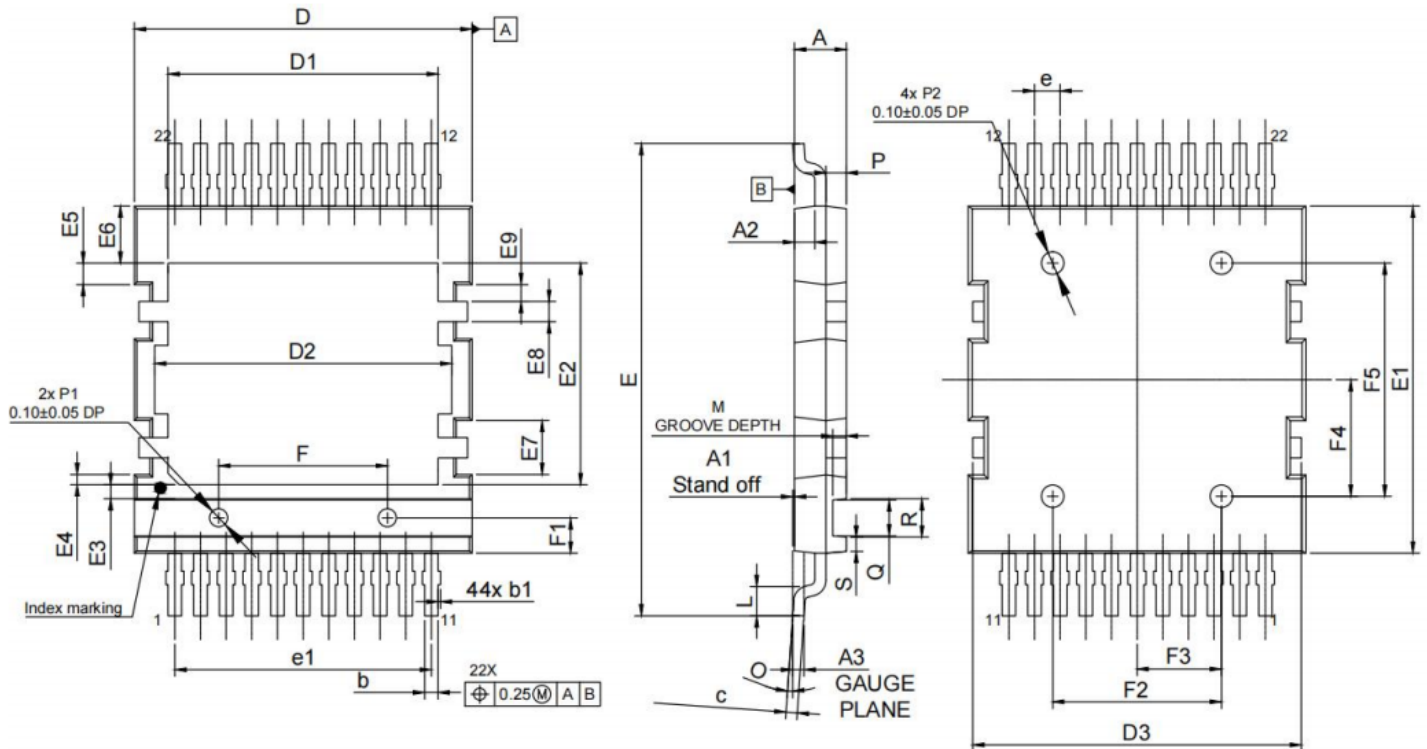


Figure 24. Peak Diode Recovery dv/dt Test Circuit and Waveforms



Package Outlines

QDPAK



SYMBOL	MIN	MAX	SYMBOL	MIN	MAX
A	2.25	2.35	E9	0.75	
A1	0.00	0.15	e	1.14	
A2	0.90		e1	11.4	
A3	0.50		F	7.40	7.60
b	0.50	0.70	F1	1.47	1.67
b1	-	0.15	F2	7.40	7.60
c	0.46	0.58	F3	3.65	3.85
D	14.90	15.10	F4	5.07	5.27
D1	12.00		F5	10.24	10.44
D2	13.20		L	1.30	
D3	14.50	14.70	M	0.60	
E	20.81	21.11	N	22	
E1	15.30	15.50	O	0°	8°
E2	9.83		P	0.90	
E3	0.625		P1	0.70	0.90
E4	0.45		P2	0.90	1.10
E5	0.95		Q	1.60	
E6	2.53		R	1.70	
E7	2.40		S	0.631	
E8	0.90				

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCQ65N15W1	BCQ65N15W1	QDPAK	Tape & Reel	750 units

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