BCZ120N16M1

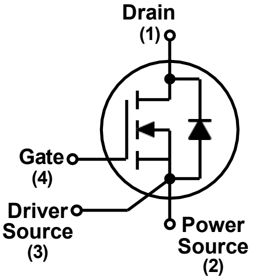
N-Channel Silicon Carbide Power MOSFET

1200 V, 164 A, 16 mΩ

Features

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

$BV_{DSS,\ Tc=25℃}$	$I_{D,\ Tc=25℃}$	$R_{DS(on),typ}$	$Q_{g,typ}$
1200 V	164A	16 mΩ	315.4 nC



Benefits

- System efficiency improvement
- Higher frequency applicability
- Increased power density
- Reduced cooling effort

Applications

- LED Lighting Power Supplies
- High Voltage DC/DC Converters
- Industrial Power Supplies
- HVAC

Absolute Maximum Ratings (T_J = 25℃ unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		1200	V
V_{GS}	Gate to Source Voltage (DC)		-10/ +25	V
V_{GSop}	Recommended Operation Value		-5 / +20	V
I_D	Drain Current	V_{GS} = 20V, (T_C = 25℃)	164	A
		V_{GS} = 20 V, (T_C = 100℃)	116	
I_{DM}	Drain Current	Pulsed (Note1)	328	A
P_D	Power Dissipation	(T_C = 25℃)	760	W
		Derate Above 25℃	5	W/℃
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	℃

※Note 1 : Limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{θJC}$	Thermal Resistance, Junction to Case, Max.	0.2	℃/W
Tsold	Soldering temperature, wave soldering only allowed at leads	260	℃

Electrical Characteristics (T_J = 25℃ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Off Characteristics						
BV_{DSS}	Drain to Source Breakdown Voltage	V_{GS} = 0 V, I_D = 100μA	1200	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1200 V, V_{GS} = 0 V	-	1	100	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS} = +20 V, V_{DS} = 0 V	-	-	250	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 16 mA	2.0	2.8	4.0	V
		V_{GS} = V_{DS}, I_D = 16 mA,T_J = 175℃		1.8		V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 20 V, I_D = 55 A	-	16	25	mΩ
		V_{GS} = 20V, I_D = 55 A, T_J = 175℃	-	28	-	
g_{fs}	Trans conductance	V_{GS} = 20 V, I_D = 55 A	-	22.6	-	S
		V_{DS} = 20 V, I_D = 55 A,T_J = 175℃	-	24	-	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 1000 V, V_{GS} = 0 V, f = 700kHz , V_{AC}=25mV	-	6413	-	pF
C_{oss}	Output Capacitance		-	255	-	
C_{rss}	Reverse Transfer Capacitance		-	9.3	-	
E_{oss}	Stored Energy in Output Capacitance	V_{DS} = 0 V to 1000 V, V_{GS} = 0 V	-	152	-	μJ
Q_{gs}	Gate to Source Charge	V_{DS} = 800 V, I_D = 55A, V_{GS} = -5 V / 20V,	-	70.5	-	nC
Q_{gd}	Gate to Drain “Miller” Charge		-	117.3	-	
$Q_{g(tot)}$	Total Gate Charge			315.4		
R_G	Internal Gate Resistance	f = 1 MHz, V_{AC} = 25 mV	-	1	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DD} = 800 V, I_D = 55 A, V_{GS} = -5V / 20 V, $R_{G(ext)}$=2.2Ω, L= 100μH	-	14	-	ns
t_r	Turn-On Rise Time		-	19	-	
$t_{d(off)}$	Turn-Off Delay Time		-	39	-	
t_f	Turn-Off Fall Time		-	17	-	
E_{on}	Turn-on Switching Energy		-	554	-	μJ
E_{off}	Turn-off Switching Energy		-	223	-	

Electrical Characteristics (T$_C$ = 25℃ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
Source-Drain Diode Characteristics						
I_S	Continuous Diode Forward Current	V_{GS} = -5 V，T_C=25℃	-	159		A
V_{SD}	Diode Forward Voltage	V_{GS} = -5 V, I_{SD} = 27 A	-	3.6	-	V
t_{rr}	Reverse Recovery Time	V_{GS}=-5V,I_{SD}=55A V_R=800V $d_{IF/dt}$ =8620A/μs	-	25.5	-	ns
Q_{rr}	Reverse Recovery Charge		-	2476	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	154.6	-	A

Typical Performance Characteristics

Figure 1: Output Characteristics T_J = -55℃

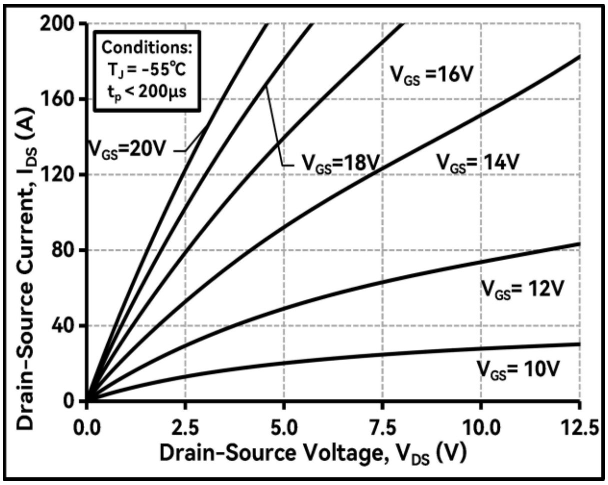


Figure 2: Output Characteristics T_J = 25℃

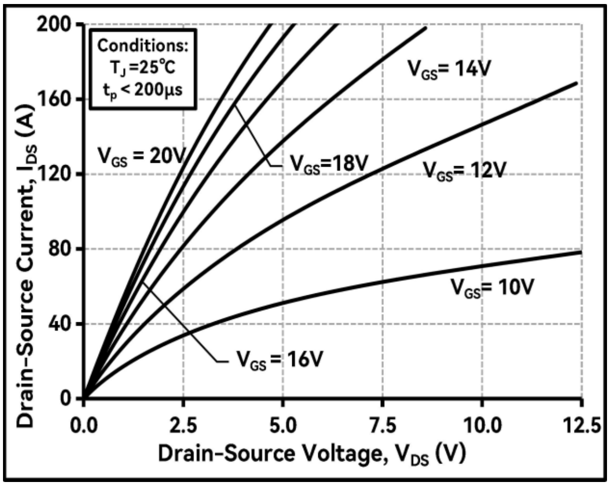


Figure 3: On-Region Characteristics T_J = 175℃

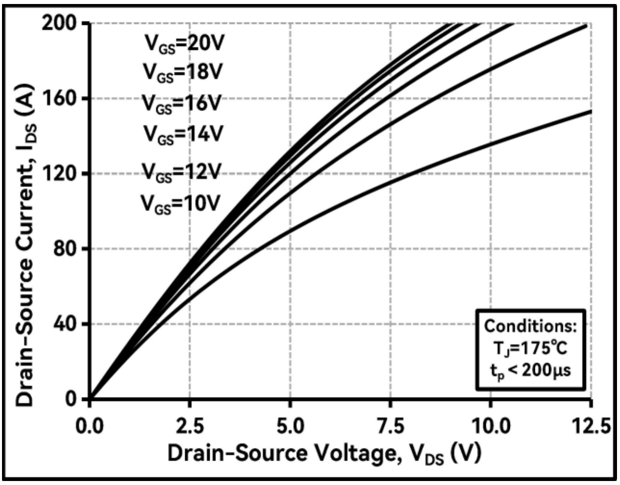


Figure 4: Normalized On-Resistance vs Temperature

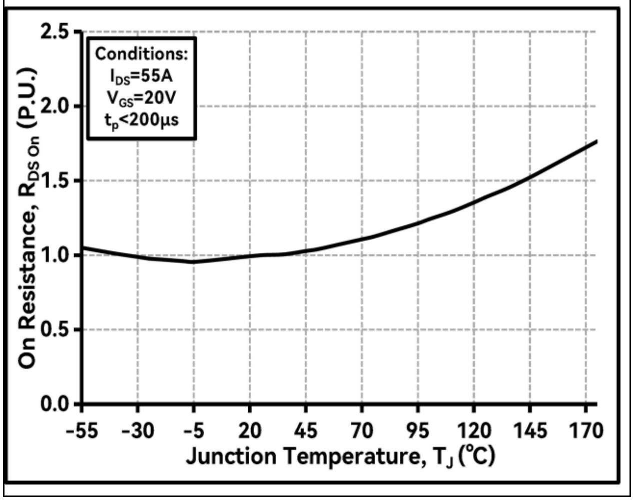


Figure 5: On-Resistance vs Drain Current For Various Temperatures

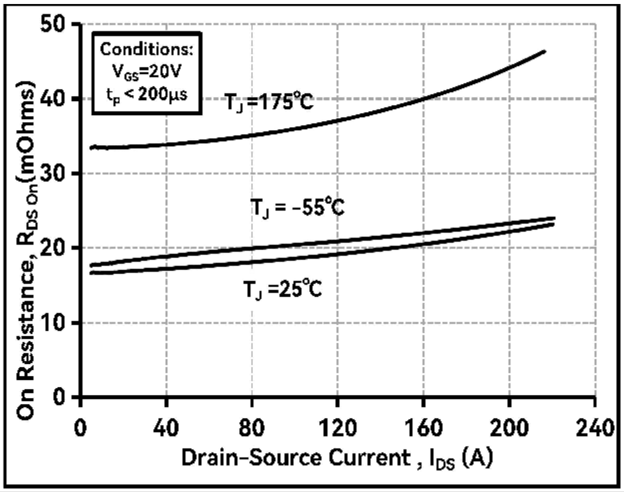
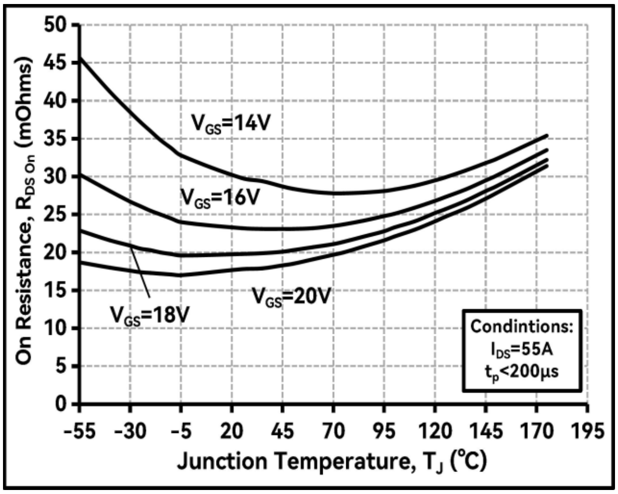


Figure 6: On-Resistance vs Temperature For Various Gate Voltage



Typical Performance Characteristics

Figure 7: Transfer Characteristic for Various Junction Temperatures

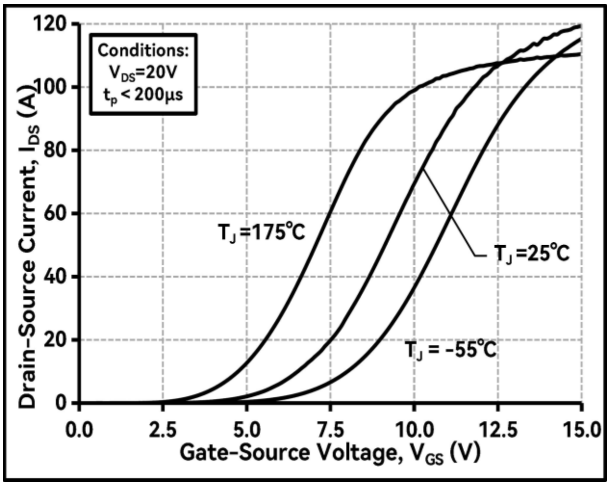


Figure 8: Body Diode Characteristic at -55℃

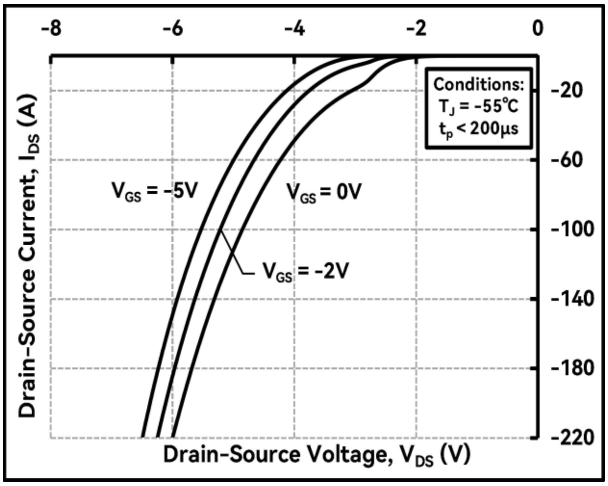


Figure 9: Body Diode Characteristic at 25℃

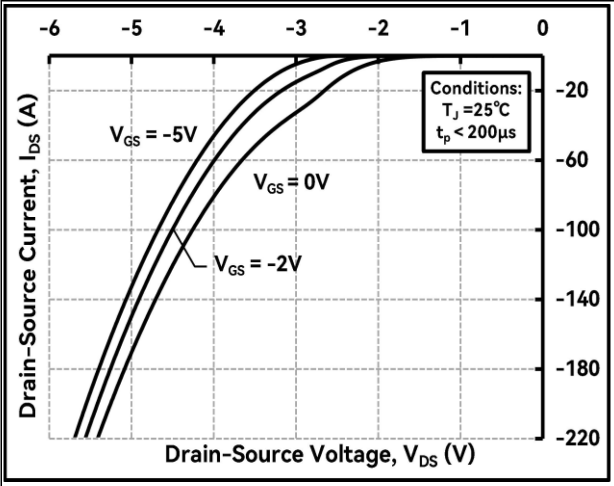


Figure 10: Body Diode Characteristic at 175℃

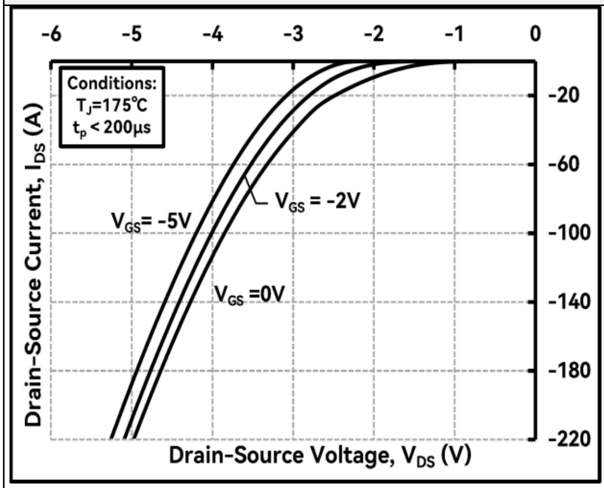


Figure 11: Threshold Voltage vs Temperature

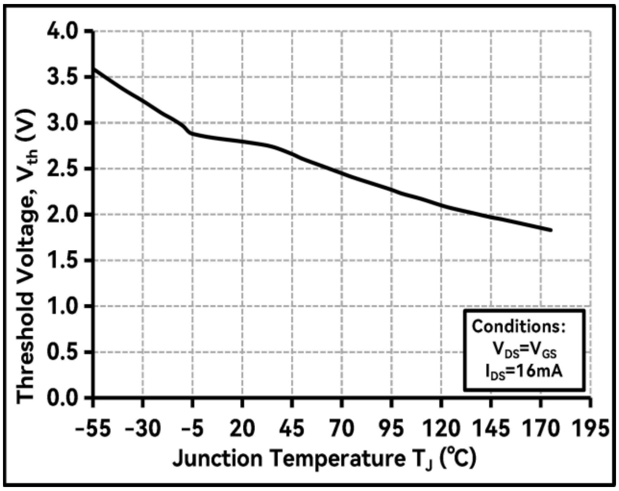
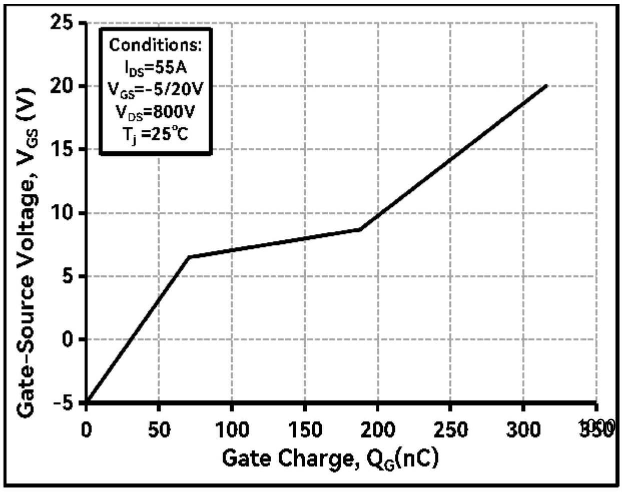


Figure 12: Gate Charge Characteristics



Typical Performance Characteristics

Figure 13: 3rd Quadrant Characteristic at -55℃

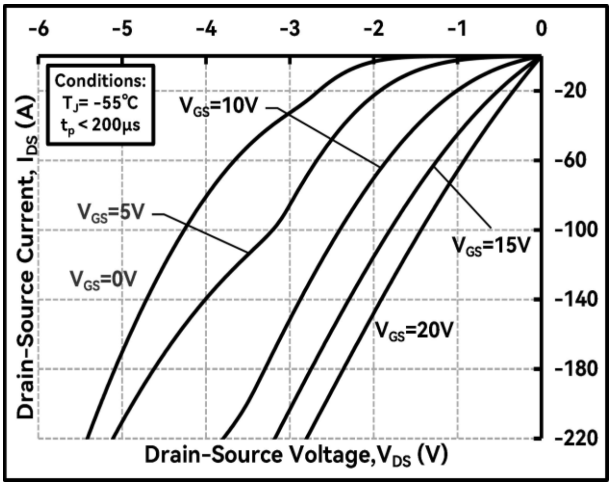


Figure 14: 3rd Quadrant Characteristic at 25℃

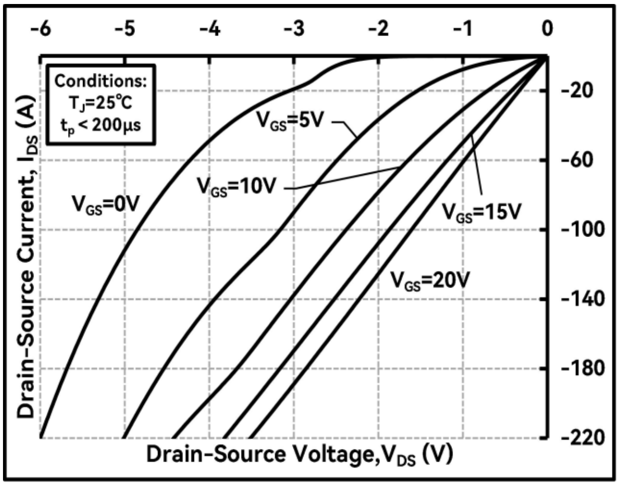


Figure 15: 3rd Quadrant Characteristic at 175℃

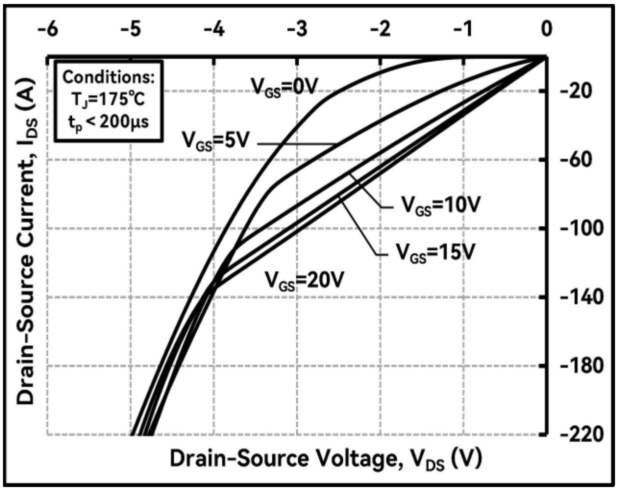


Figure 16: Output Capacitor Stored Energy

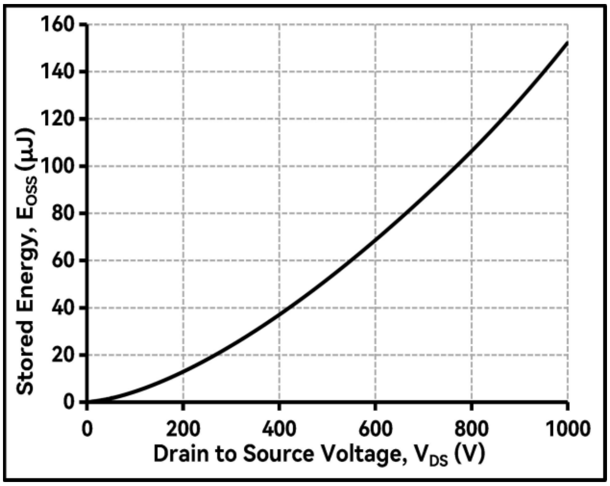


Figure 17: Capacitance vs Drain-Source Voltage (0-200 V)

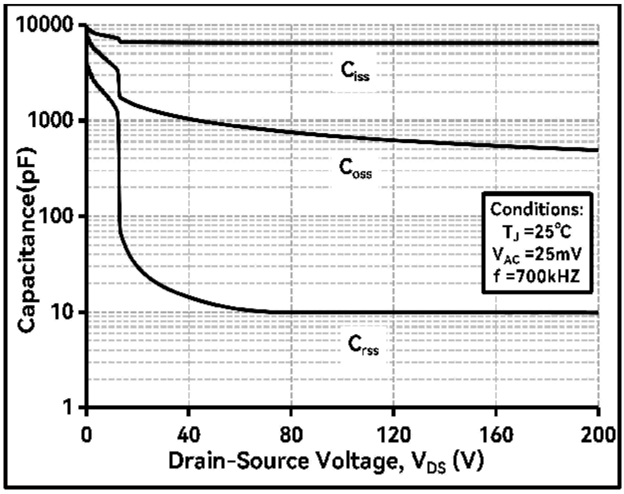
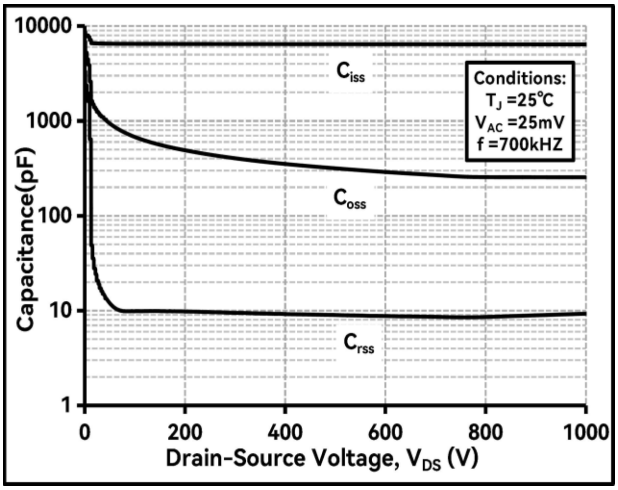


Figure 18: Capacitance vs Drain-Source Voltage (0-1000 V)



Typical Performance Characteristics

Figure 19: Continuous Drain Current Derating vs Case Temperature

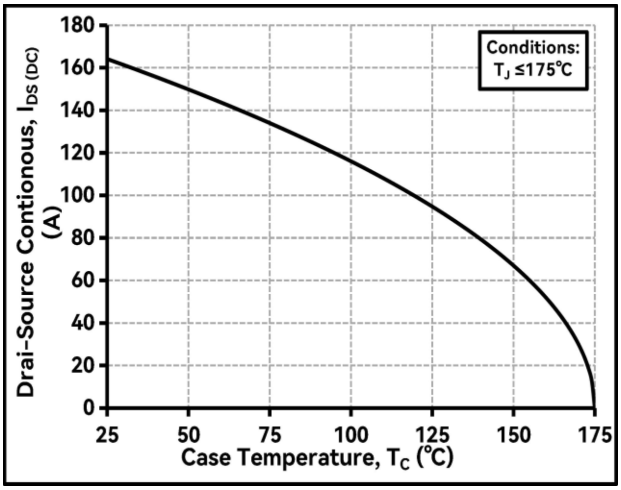


Figure 20: Maximum Power Dissipation Derating vs Case Temperature

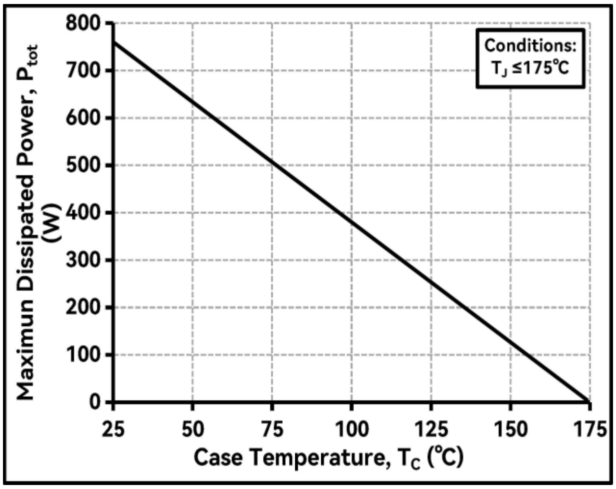


Figure 21: Transient Thermal Impedance (Junction - Case)

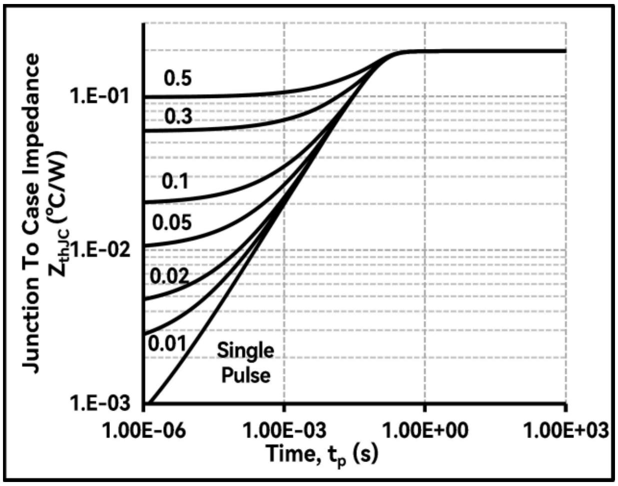


Figure 22: Safe Operating Area

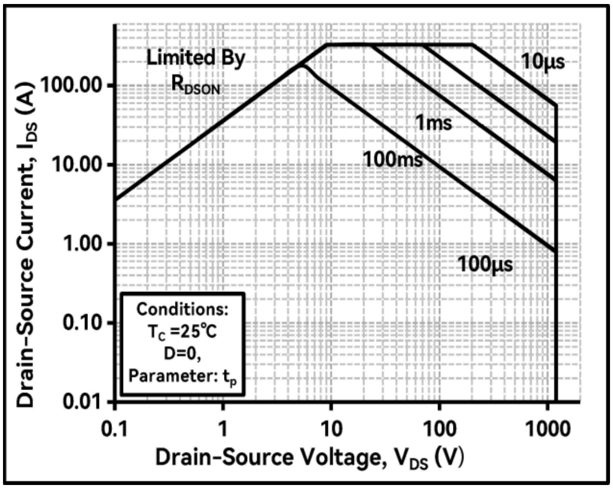


Figure 23: Clamped Inductive Switching Energy vs Drain Current

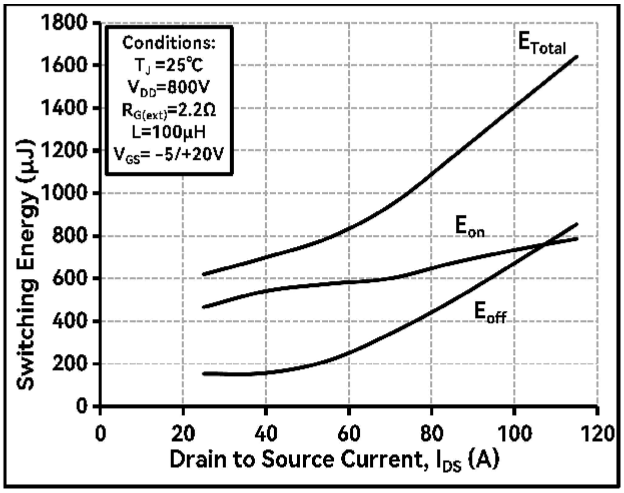
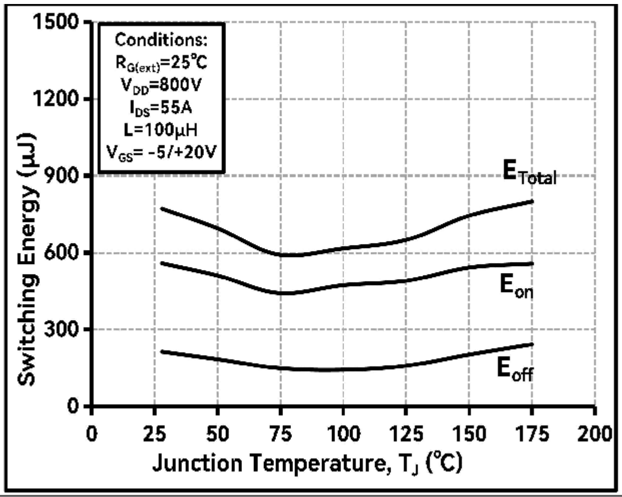


Figure 24: Clamped Inductive Switching Energy vs Temperature



Typical Performance

Figure 25: Clamped Inductive Switching Energy vs $R_{G(ext)}$

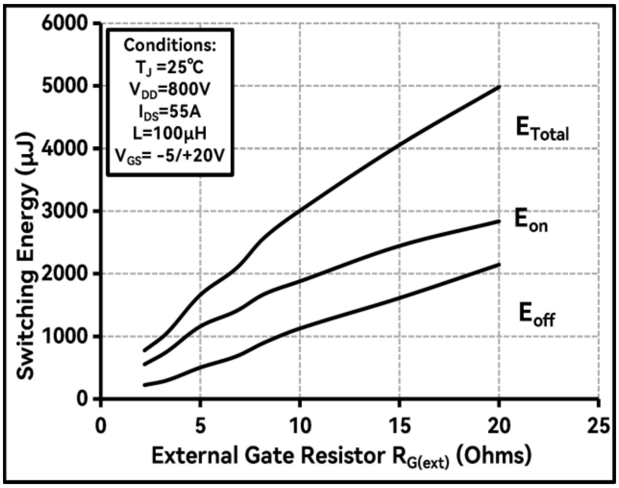
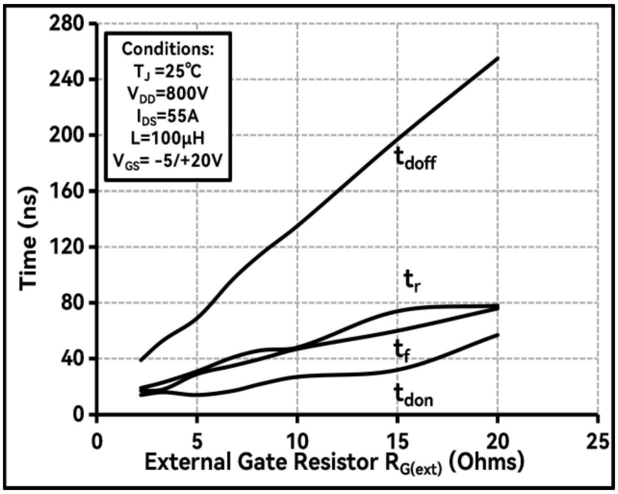


Figure 26: Switching Times vs $R_{G(ext)}$



Typical Performance Characteristics

Figure 27. Inductive Load Switching Test Circuit and Waveforms

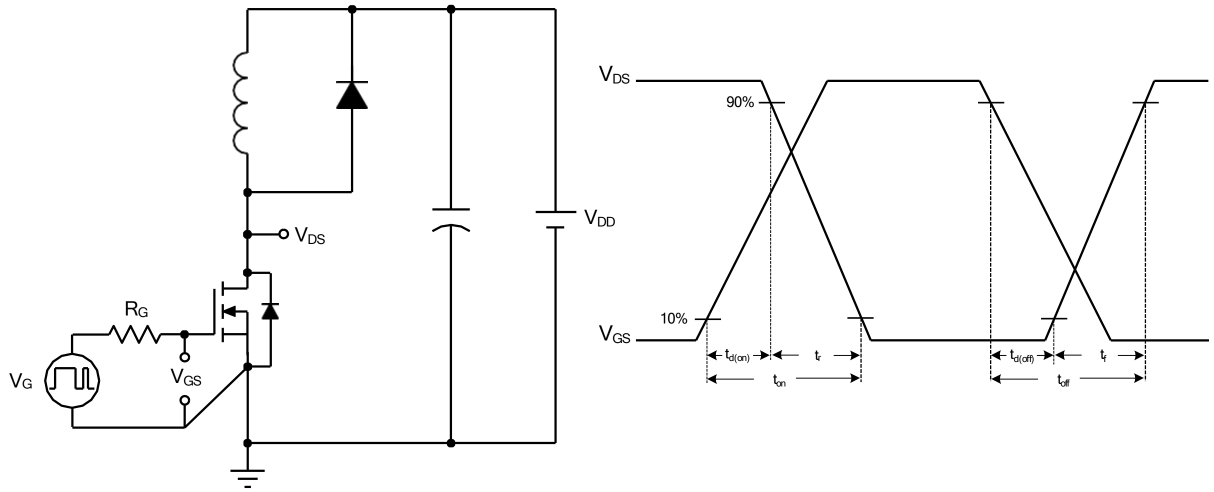
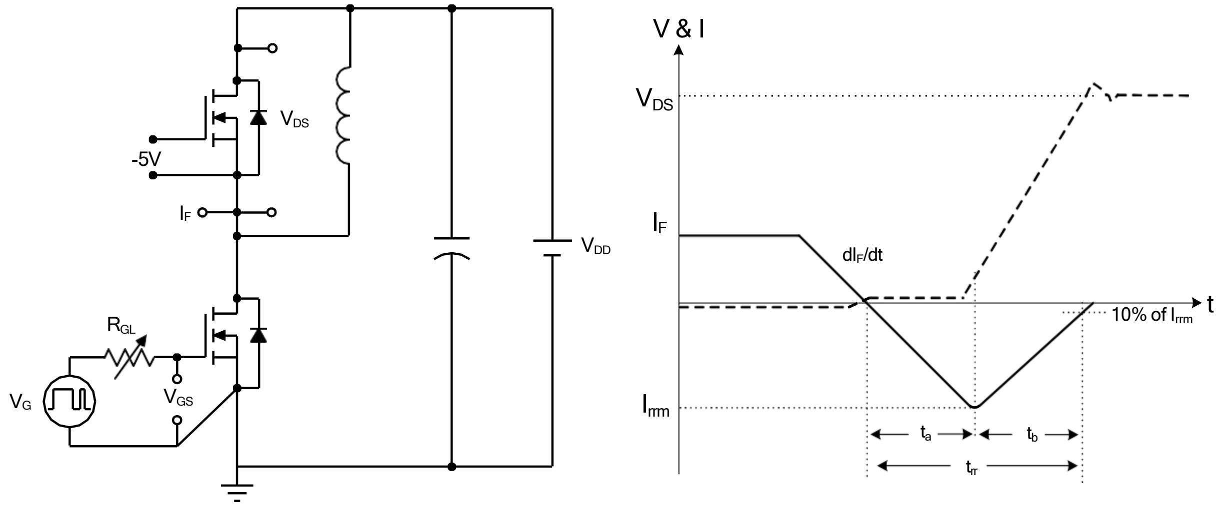
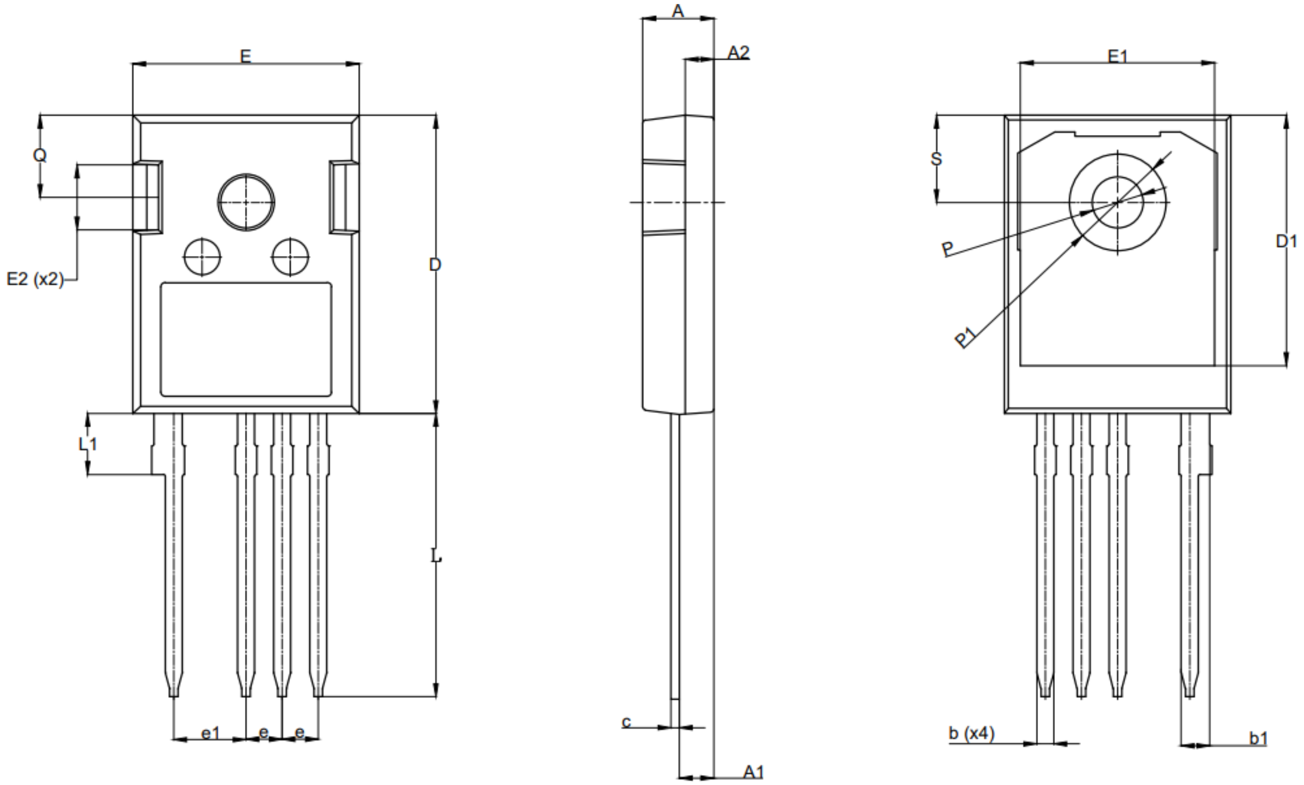


Figure 28. Peak Diode Recovery dv/dt Test Circuit and Waveforms



Package Outlines

TO247-4L



SYMBOL	Common		
	DIMENSIONS MILLIMETER		
	MIN.	NOM.	MAX.
A	4.80	5.00	5.20
A1	2.29	2.42	2.54
A2	1.90	2.00	2.10
b	1.10	1.20	1.30
b1	1.86	2.01	2.15
c	0.50	0.60	0.70
D	20.90	21.00	21.10
D1	17.43	17.63	17.83
E	15.75	15.94	16.13
E1	13.46	13.66	13.86
E2	4.32	4.58	4.83
e	2.54 BSC.		
e1	5.08 BSC.		
L	19.80	19.95	20.10
L1	-	-	4.30
P	3.56	3.61	3.66
P1	6.75	6.80	6.85
Q	5.38	5.79	6.20
S	6.15 BSC.		

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCZ120N16M1	BCZ120N16M1	TO247-4L	Tube	30 units

Disclaimer

Bestirpower reserve the right to make changes, corrections, enhancements, modifications, and improvements to Bestirpower products and/or to this document at any time without notice.

The information given in this document shall in no event be regarded as a guarantee of conditions or characteristics. Bestirpower does not assume any liability for infringement of patents, copyrights, or other intellectual property rights of third parties by or arising from the use of Products or technical information described in this document.

This document is the property of Bestirpower Co,. LTD., and not allowed to copy or transformed to other format if not under the authority approval.