BCZ170N45P1

N-Channel Silicon Carbide Power MOSFET

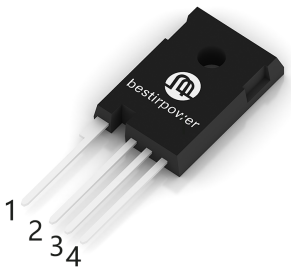
1700 V, 60 A , 45 mΩ

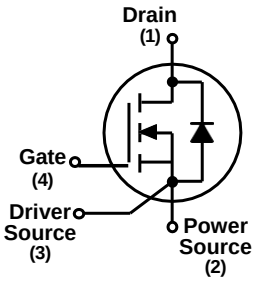
bestirpower

Features

- High switching speed with a low gate charge
- Fast intrinsic diode with low reverse recovery
- Robust Avalanche Capability
- 100% Avalanche Tested
- Pb-free, Halogen Free, and RoHS Compliant

$BV_{DSS, Tc=25℃}$	$I_{D, Tc=25℃}$	$R_{DS(on),typ}$	$Q_{g,typ}$
1700 V	**60 A**	**45 mΩ**	**172.5 nC**





Benefits

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

Applications

- Solar inverter
- EV charging station
- UPS
- Industrial power supply

RoHS compliant

HF

Absolute Maximum Ratings (T_C = 25℃ unless otherwisenoted)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		1700	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} = 20 V, (T_C = 25℃)	60	A
		V_{GS} = 20 V, (T_C = 100℃)	42.7	
I_{DM}	Drain Current	Pulsed (Note1)	120	A
P_D	Power Dissipation	(T_C = 25℃) (T_J = 175℃)	347	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
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.43	℃/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 = 100 uA	1700	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1700 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 = 18 mA	2.0	3.0	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 20 V, I_D = 50 A	-	45	60	mΩ
		V_{GS} = 20 V, I_D = 50 A, T_J = 175℃	-	95	-	
g_{fs}	Transconductance	V_{DS} = 20 V, I_D = 50 A	-	20.4	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{DS} = 1500 V, V_{GS} = 0V, f = 1MHz,V_{AC} = 25mV	-	3446	-	pF
C_{oss}	Output Capacitance		-	112	-	
C_{rss}	Reverse Capacitance		-	3	-	
E_{oss}	Stored Energy in Output Capacitance		-	140	-	μJ
$Q_{g(tot)}$	Total Gate Charge	V_{DS} = 800 V, I_D = 50 A, V_{GS} = -5 V / 18 V, Inductive load	-	172.5	-	nC
Q_{gs}	Gate to Source Charge		-	48	-	
Q_{gd}	Gate to Drain “Miller” Charge		-	65	-	
R_G	Internal Gate Resistance	f = 1 MHz open drain	-	1.24	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 1000 V, I_D = 50 A, V_{GS} = -5 V / 20 V, R_G = 2.2 Ω, L=100μH	-	12	-	ns
t_r	Turn-On Rise Time		-	16	-	
$t_{d(off)}$	Turn-Off Delay Time		-	25	-	
t_f	Turn-Off Fall Time		-	8	-	
E_{on}	Turn-on Switching Energy		-	640.7	-	μJ
E_{off}	Turn-off Switching Energy		-	65.9	-	
E_{tot}	Total Switching Energy		-	715.6	-	
Source-Drain Diode Characteristics						
I_S	Maximum Continuous Diode Forward Current		-	75	-	A
V_{SD}	Diode Forward Voltage	V_{GS} = -5 V, I_{SD} = 25A	-	4.1	-	V
		V_{GS} = -5 V, I_{SD} = 25A,TJ = 175℃	-	3.6	-	
t_{rr}	Reverse Recovery Time	V_R = 800 V, I_{SD} = 25 A, VGS = -5 V,dI_F/dt = 5800 A/μs	-	18.4	-	ns
Q_{rr}	Reverse Recovery Charge		-	1610	-	nC

Typical Performance Characteristics

Figure 1. Output Characteristics T_J = -55℃

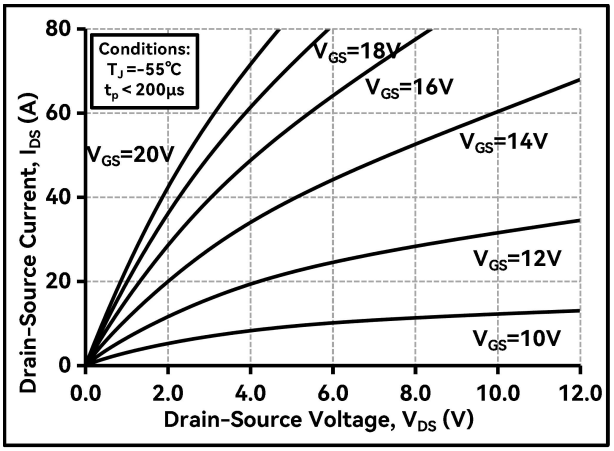


Figure 2. Output Characteristics T_J = 25℃

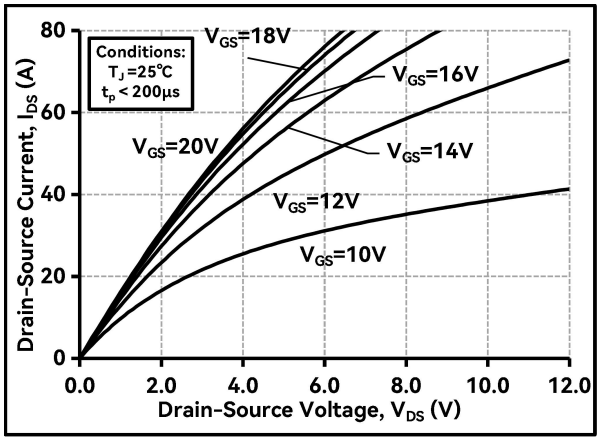


Figure 3.Output Characteristics T_J = 175℃

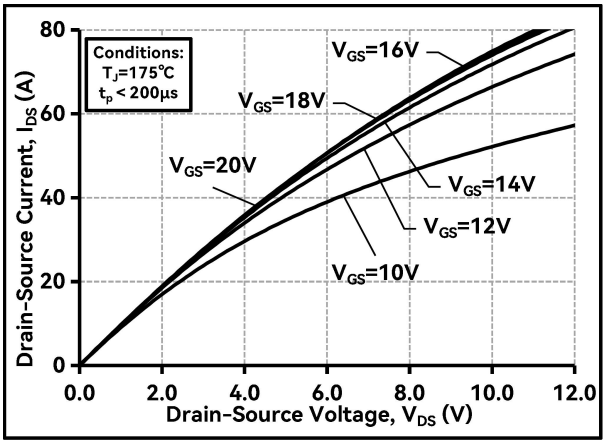


Figure 4. Normalized On-Resistance Characteristics vs. Temperature

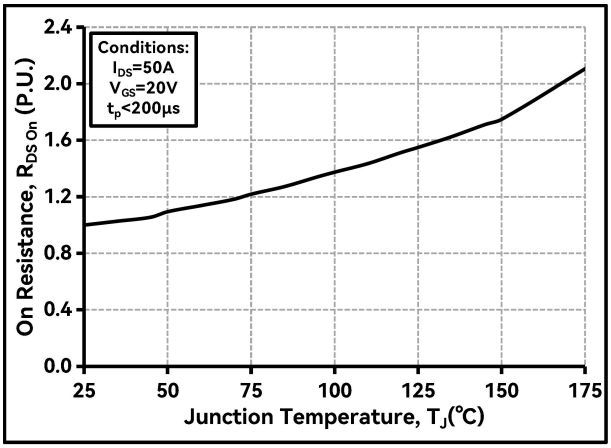


Figure 5. On-Resistance vs Drain Current For Various Temperatures

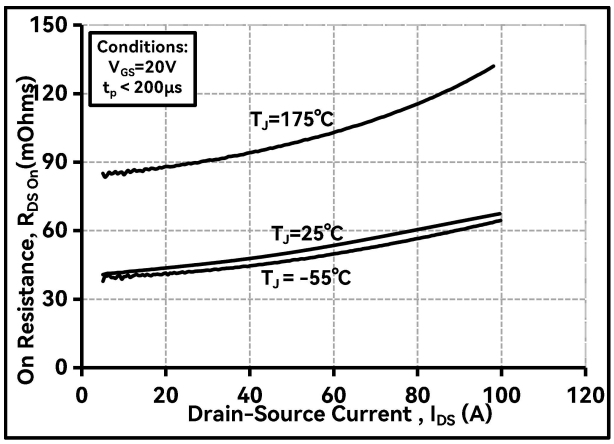
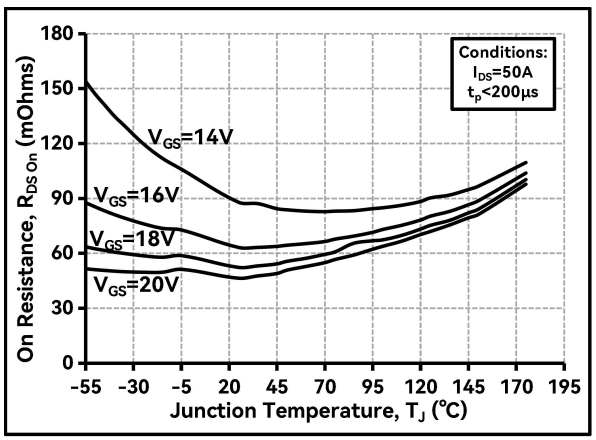


Figure 6.On-Resistance vs Temperature For Various Gate Voltage



Typical Performance Characteristics

Figure 7. Transfer Characteristic for Various Junction Temperatures

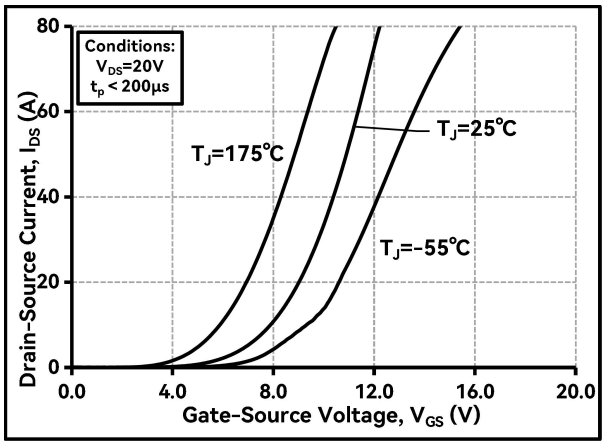


Figure 8. Body Diode Characteristic T_J = -55℃

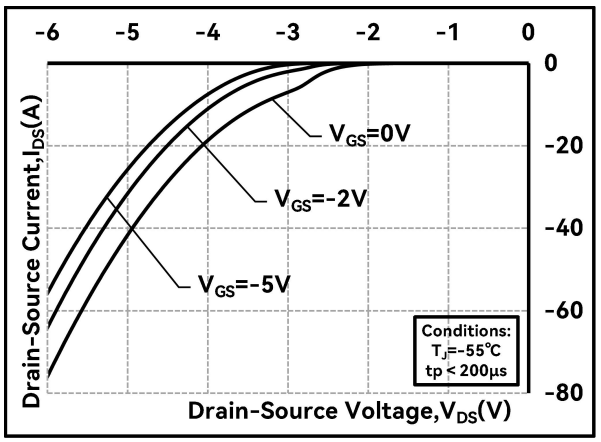


Figure 9. Body Diode Characteristic T_J = 25℃

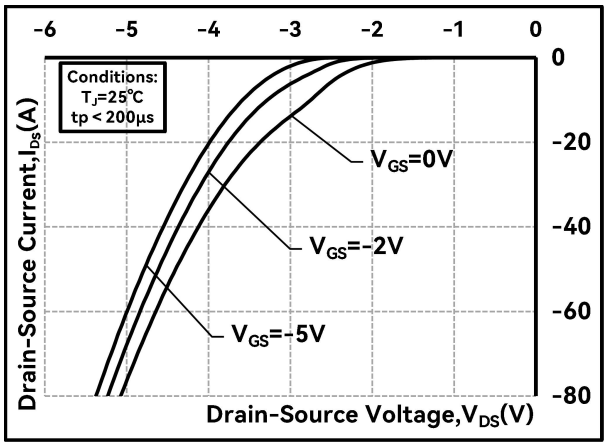


Figure 10. Body Diode Characteristic T_J = 175℃

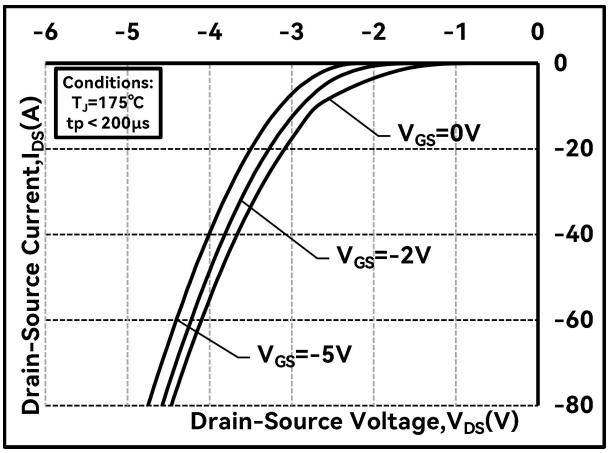


Figure 11. Threshold Voltage vs Temperature

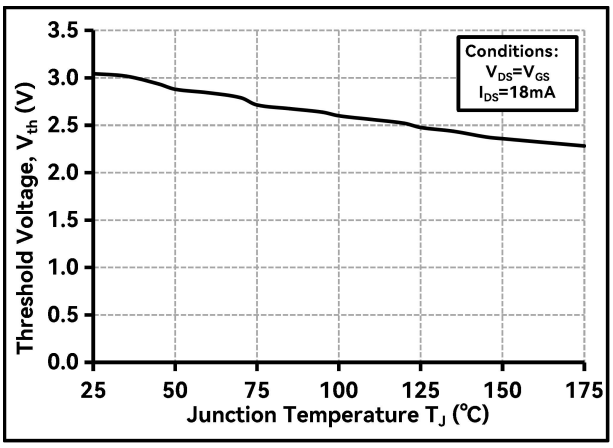
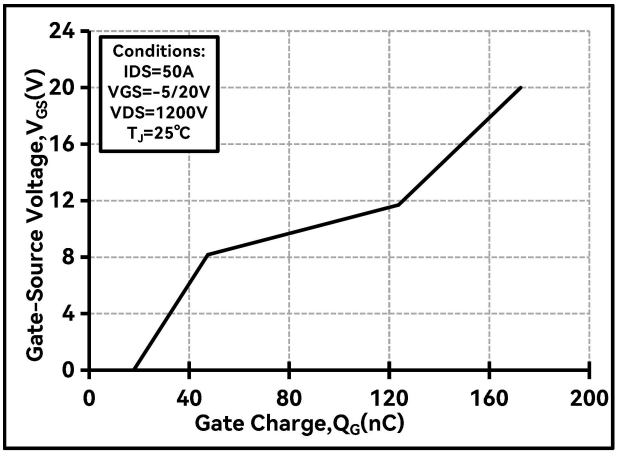


Figure 12. Gate Charge Characteristics



Typical Performance Characteristics

Figure 13. 3rd Quadrant Characteristic T_J= -55℃

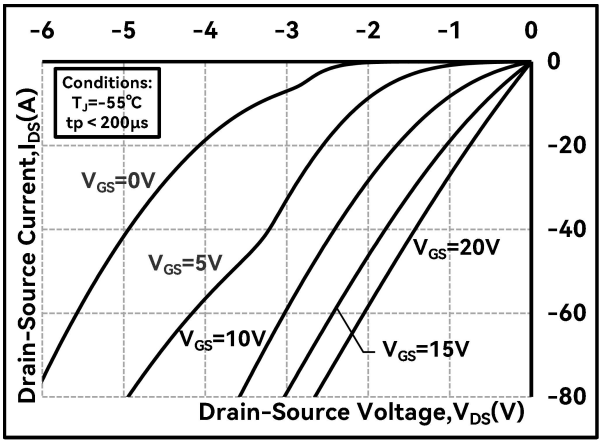


Figure 14. 3rd Quadrant Characteristic T_J= 25℃

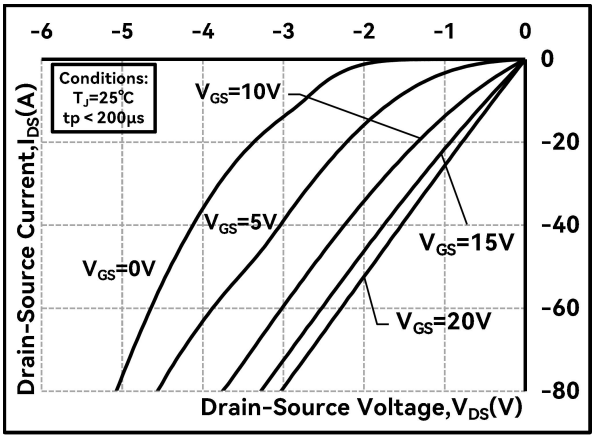


Figure 15. 3rd Quadrant Characteristic T_J= 175℃

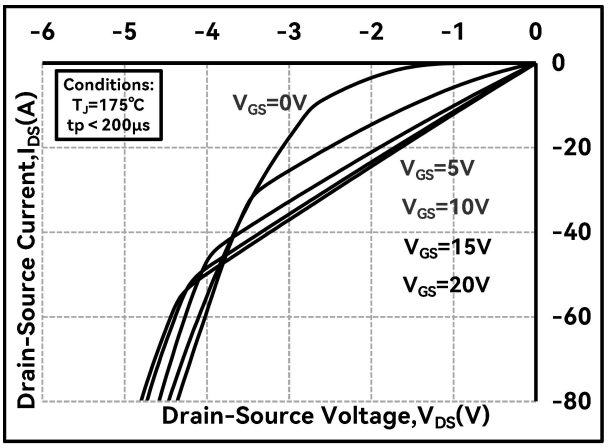


Figure 16. Output Capacitor Stored Energy

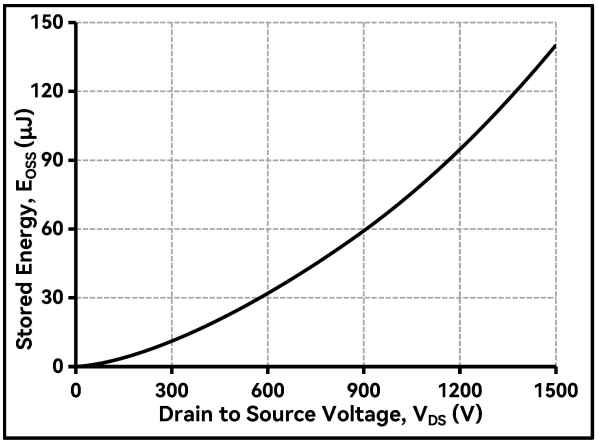


Figure 17. Capacitance vs Drain-Source Voltage (0-200 V)

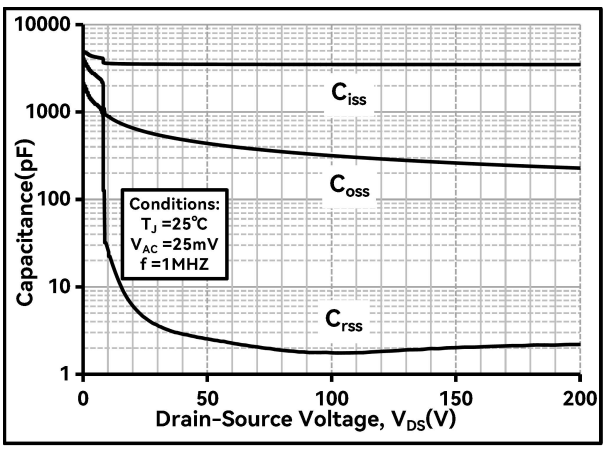
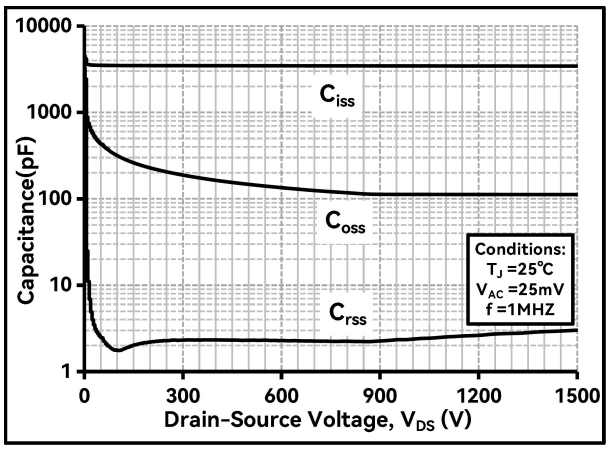


Figure 18. Capacitance vs Drain-Source Voltage (0-1500 V)



Typical Performance Characteristics

Figure 19. Continuous Drain Current Derating vs Case Temperature

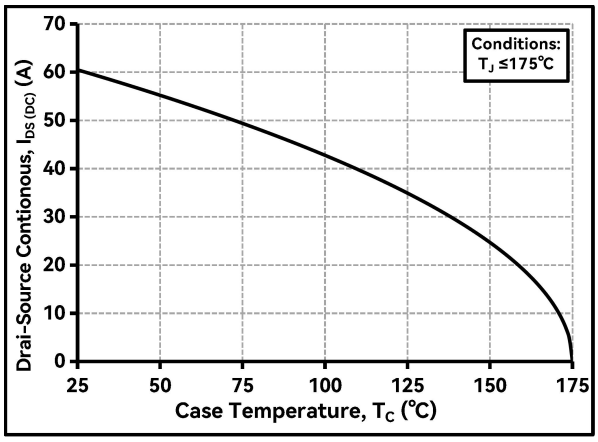


Figure 20. Maximum Power Dissipation Derating vs Case Temperature

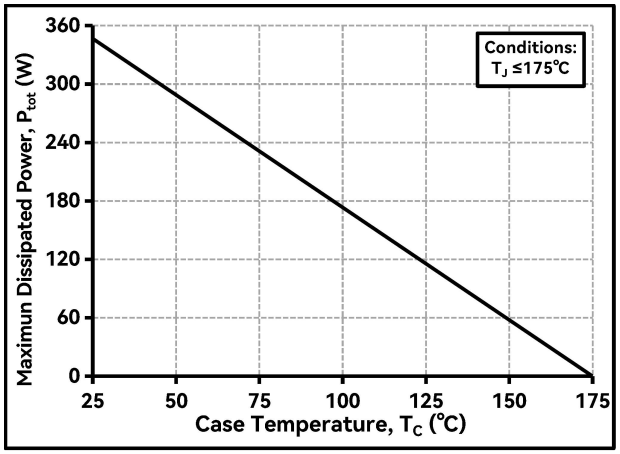


Figure 21. Transient Thermal Impedance (Junction - Case)

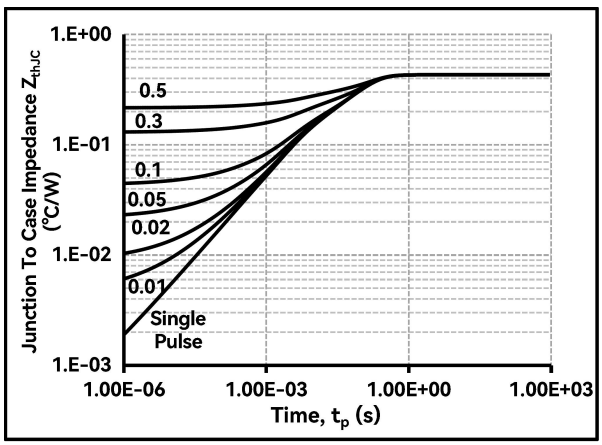


Figure 22. Safe Operating Area

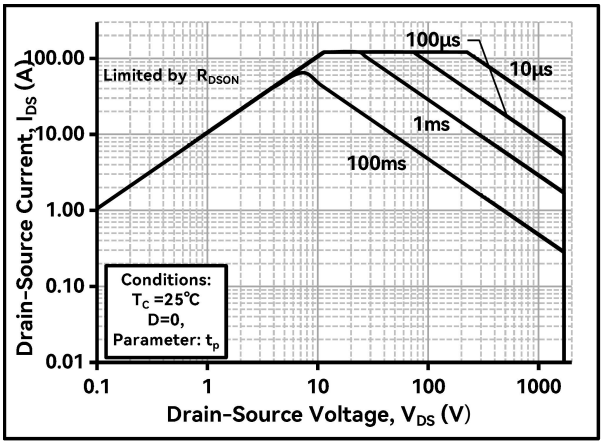


Figure 23. Clamped Inductive Switching Energy vs Drain Current

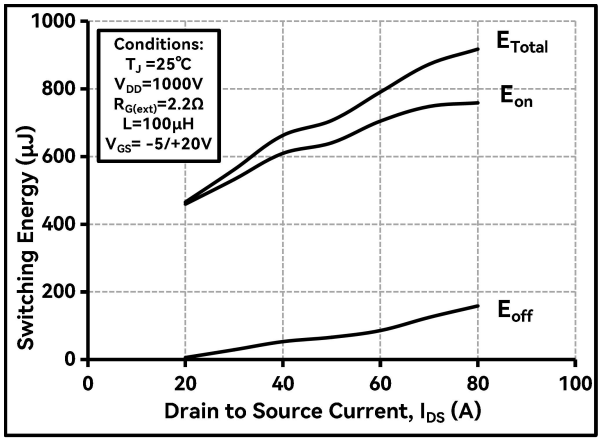
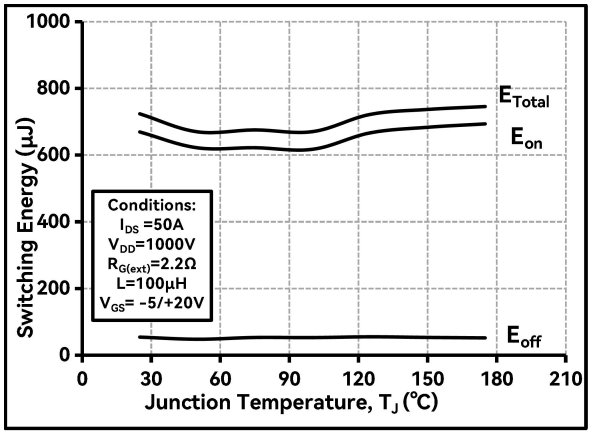


Figure 24. Clamped Inductive Switching Energy vs Temperature



Typical Performance Characteristics

Figure 25. Clamped Inductive Switching Energy vs RG(ext)

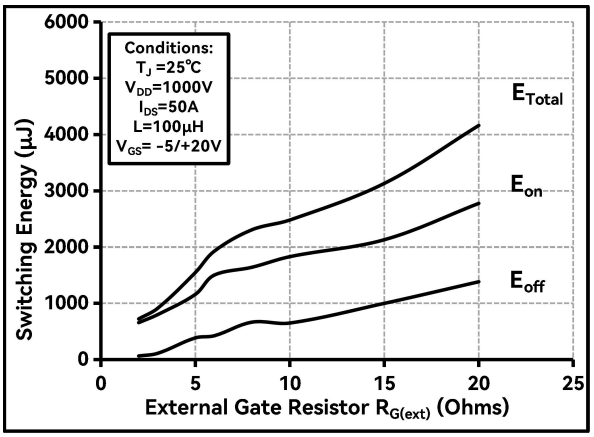
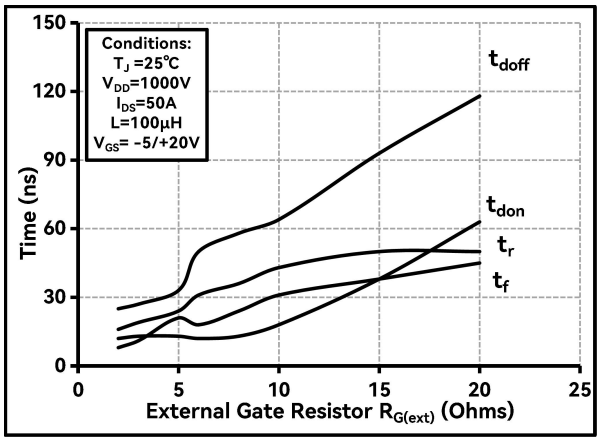
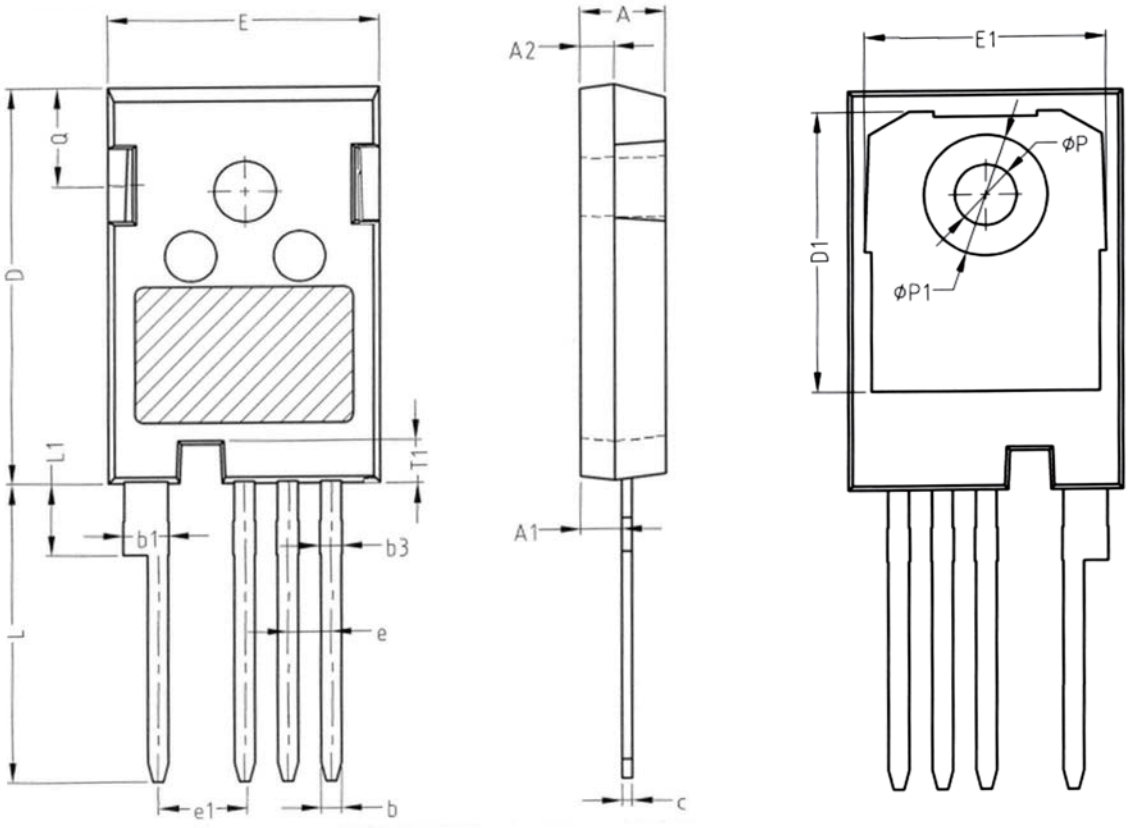


Figure 26. Switching Times vs RG(ext)



Package Outlines

TO247-4



SYMBOL	NM		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.61
A2	1.80	2.00	2.20
b	1.06	1.21	1.36
b1	2.33	2.63	2.93
b3	1.07	1.30	1.60
c	0.51	0.61	0.75
D	23.30	23.45	23.60
D1	16.25	16.55	16.85
E	15.74	15.94	16.14
E1	13.72	14.02	14.32
T1	2.35	2.50	2.65
e	2.54 BSC		
e1	5.08 BSC		
Q	5.49	5.79	6.09
L	17.27	17.57	17.87
L1	3.99	4.19	4.39
Φp	3.40	3.60	3.80
Φp1	7.19 REF		

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCZ170N45P1	BCZ170N45P1	TO247-4L	Tube	30 units

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