BCZ65N30P1

N-Channel Silicon Carbide Power MOSFET

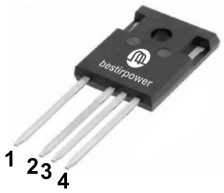
650 V, 42 A, 30 mΩ

bestirpower

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

$BV_{DSS, Tc=25℃}$	$I_{D, Tc=25℃}$	$R_{DS(on),typ}$	$Q_{g,typ}$
650 V	88.4 A	30 mΩ	89.7 nC



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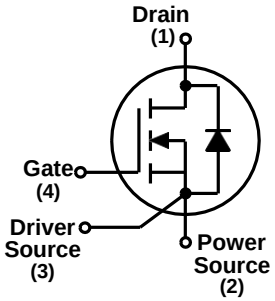


Applications

- 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		650	V
V_{GS}	Gate to Source Voltage (DC)		-8/ +22	V
V_{GSop}	Recommended Operation Value		-3 / +18	V
I_D	Drain Current	V_{GS} = 18 V, (T_C = 25℃)	88.4	A
		V_{GS} = 18 V, (T_C = 100℃)	62.5	
I_{DM}	Drain Current	Pulsed (Note1)	176.8	A
P_D	Power Dissipation	(T_C = 25℃)	261	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	℃

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.58	℃/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 µA	650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 650 V, V_{GS} = 0 V	-	1	100	µA
		V_{DS} = 650 V, V_{GS} = 0 V, T_J = 175℃	-	10	-	
I_{GSS}	Gate-Source Leakage Current	V_{GS} = 18 V, V_{DS} = 0 V	-	-	200	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 10 mA	2	2.9	4	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 18 V, I_D = 40 A	-	30	45	mΩ
		V_{GS} = 18 V, I_D = 40 A, T_J = 175℃	-	34	-	
g_{fs}	Transconductance	V_{DS} = 20 V, I_D = 40 A	-	23	-	S
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{GS}=0V,V_{DS}=400V, f=100KHz,V_{AC}=25mV	-	2200	-	pF
C_{oss}	Output Capacitance		-	143.4	-	
C_{rss}	Reverse Capacitance		-	6.4	-	
E_{oss}	Stored Energy in Output Capacitance		-	15.4	-	µJ
E_{ON}	Turn-On Switching Energy	V_{DS}=400V,V_{GS}=-3/18V, I_D=40A,R_G(ext)=5Ω,L=100µH	-	162.0	-	pF
E_{OFF}	Turn-Off Switching Energy		-	236	-	
$Q_{g(tot)}$	Total Gate Charge	V_{DS} = 400 V, I_D = 40 A, V_{GS} = -3 V / 18 V, Inductive load	-	89.7	-	nC
Q_{gs}	Gate to Source Charge		-	23.1	-	
Q_{gd}	Gate to Drain “Miller” Charge		-	40.3	-	
R_G	Internal Gate Resistance	f = 1MHz, V_{AC}=25mV	-	2.7	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 400 V, I_D =40 A, V_{GS} = -3 V / 18 V, R_G = 5 Ω, L=100µH	-	12.2	-	ns
t_r	Turn-On Rise Time		-	17.6	-	
$t_{d(off)}$	Turn-Off Delay Time		-	33.3	-	
t_f	Turn-Off Fall Time		-	12.8	-	
E_{on}	Turn-on Switching Energy		-	149.3	-	µJ
E_{off}	Turn-off Switching Energy		-	113.2	-	
Source-Drain Diode Characteristics						
I_S	Maximum Continuous Diode Forward Current		-	59	-	A
V_{SD}	Diode Forward Voltage	V_{GS} =0V, I_{SD} = 20 A	-	4.2	-	V
t_{rr}	Reverse Recovery Time	V_{DD} = 400 V, I_{SD} = 40 A, dI_F/dt = 4730 A/µs,	-	16.9	-	ns
Q_{rr}	Reverse Recovery Charge		-	705.3	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	67.7	-	A

Typical Performance Characteristics

Figure 1: Output Characteristics(TJ =-55℃)

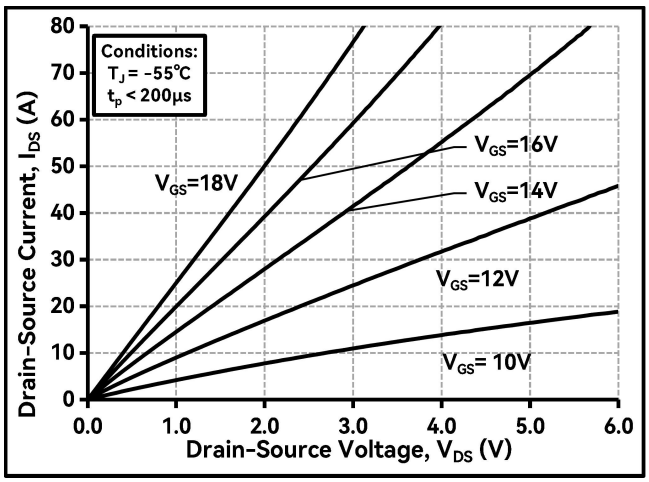


Figure 2: Output Characteristics(TJ = 25℃)

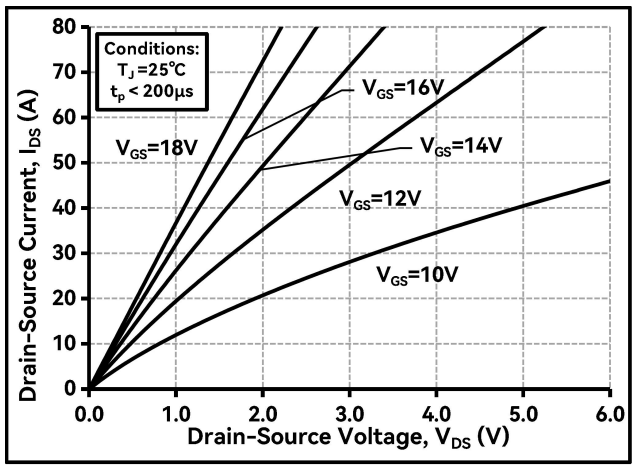


Figure 3: Output Characteristics(TJ = 175℃)

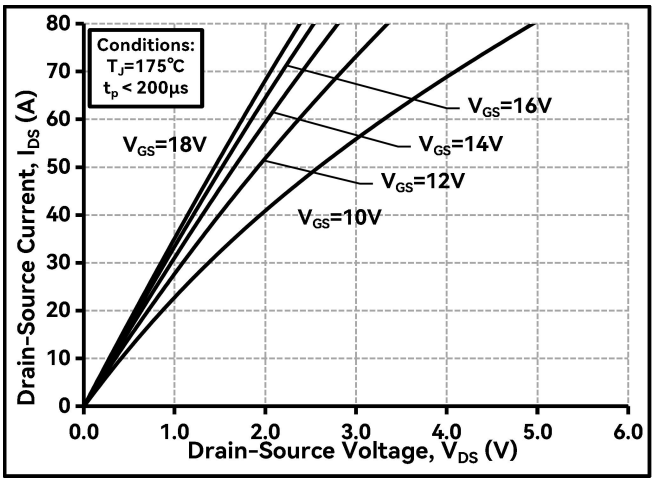


Figure 4: Transfer Characteristic for Various Junction Temperatures

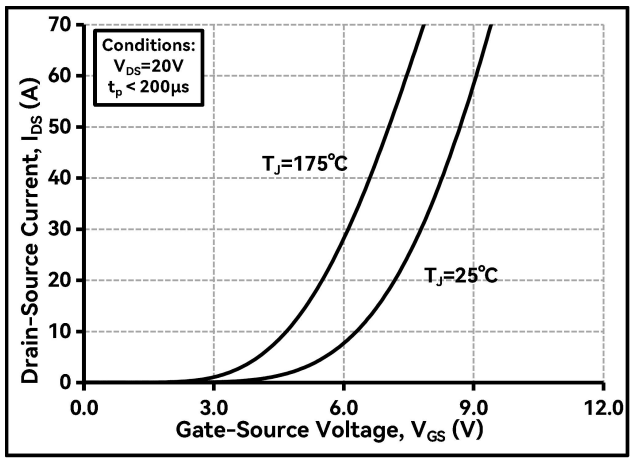


Figure 5: Normalized On-Resistance vs Temperature

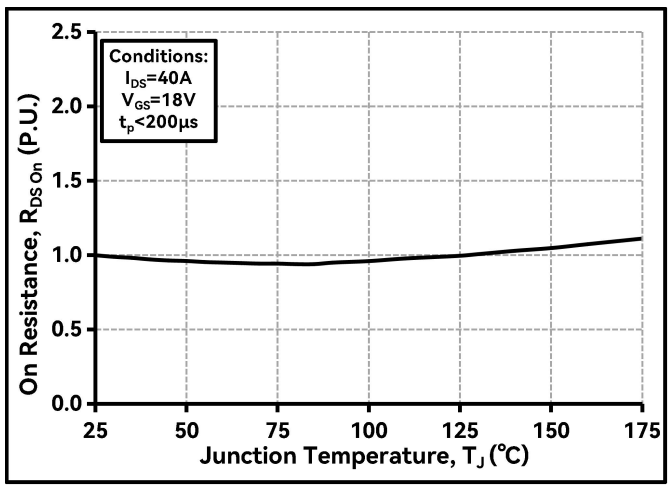
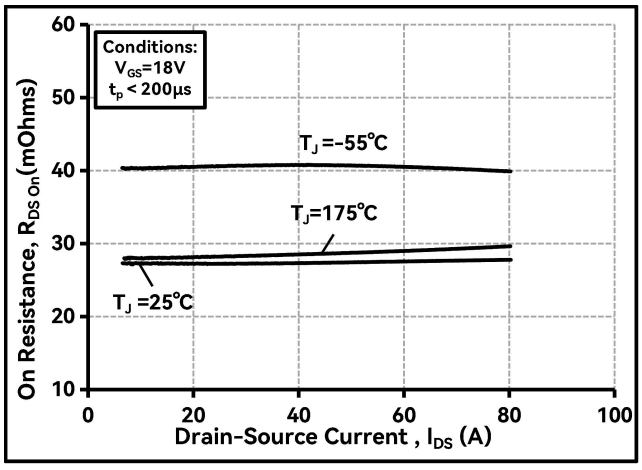


Figure 6: On-Resistance vs Drain Current For Various Temperatures



Typical Performance Characteristics

Figure 7: On-Resistance vs Temperature For Various Gate Voltage

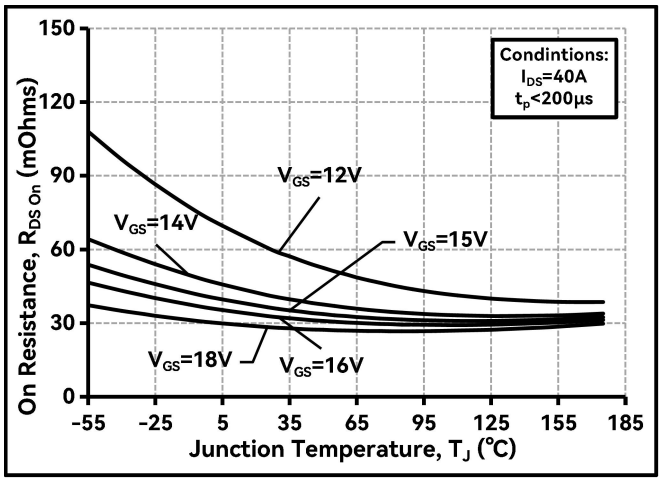


Figure 8: Body Diode Characteristic at -55℃

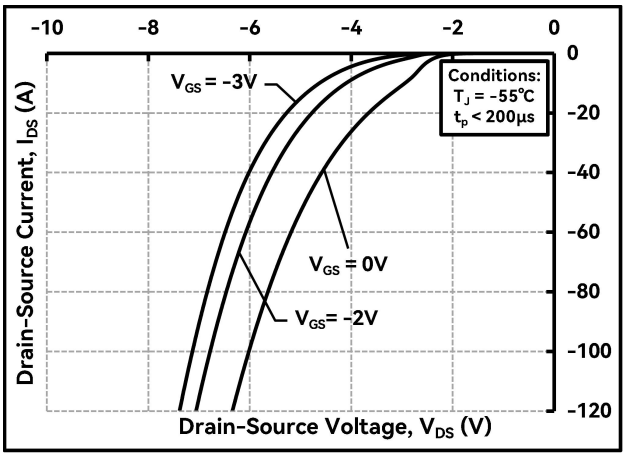


Figure 9: Body Diode Characteristic at 25℃

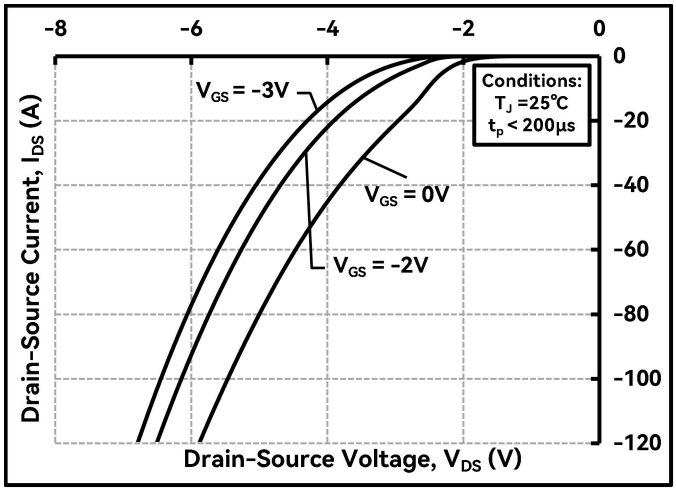


Figure 10: Body Diode Characteristic at 175℃

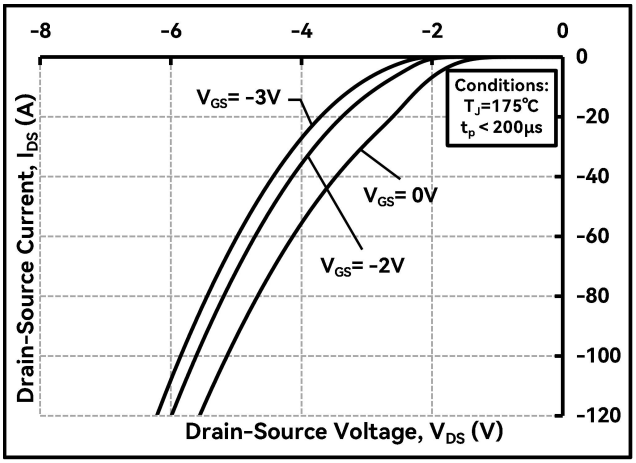


Figure 11: Threshold Voltage vs Temperature

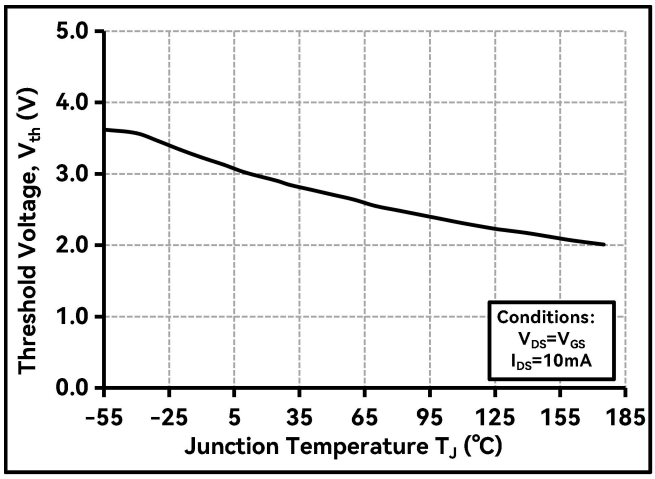
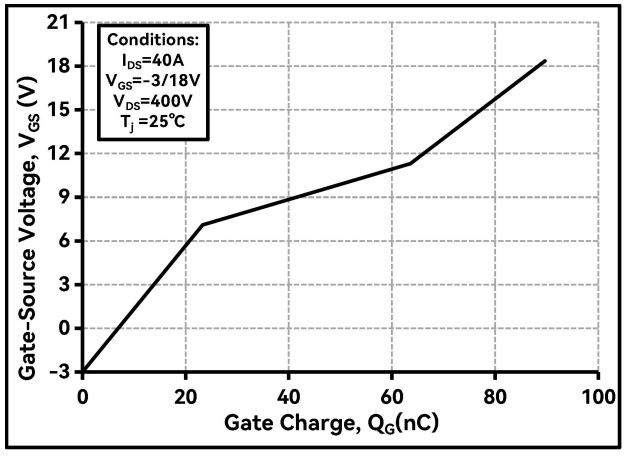


Figure 12: Gate Charge Characteristics



Typical Performance Characteristics

Figure 13: 3rd Quadrant Characteristic at -55℃

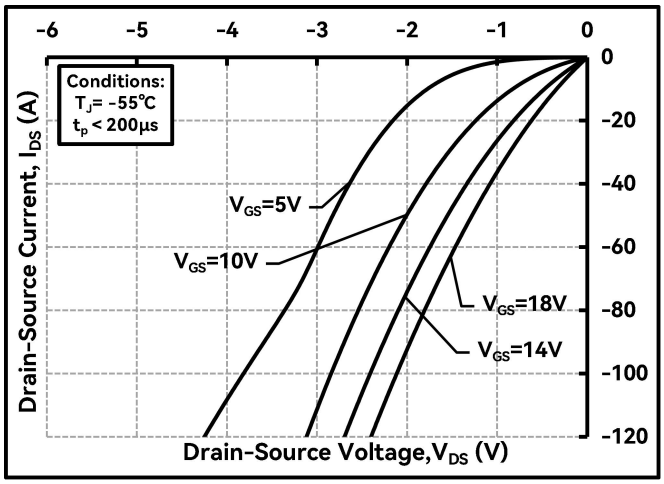


Figure 14: 3rd Quadrant Characteristic at 25℃

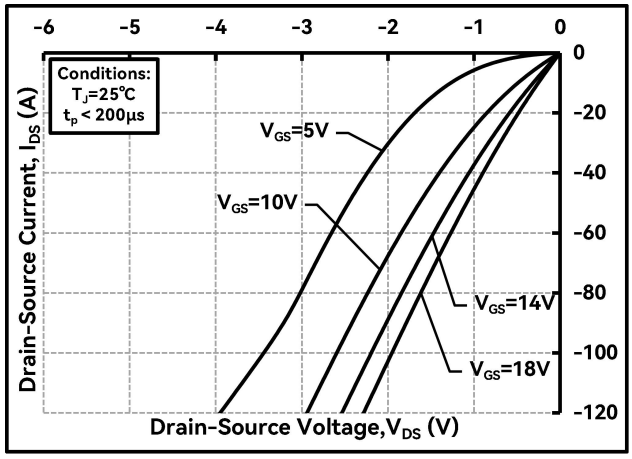


Figure 15: 3rd Quadrant Characteristic at 175℃

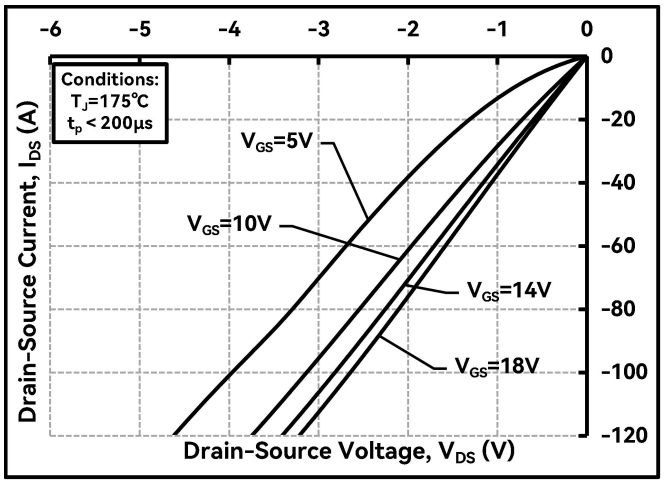


Figure 16: Capacitance vs Drain-Source Voltage (0-200 V)

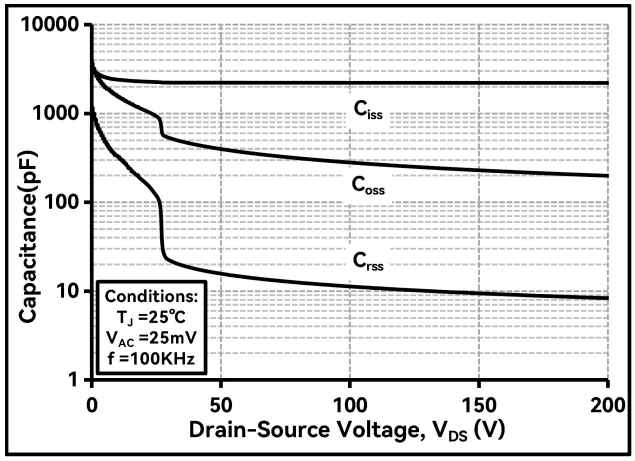


Figure 17: Capacitance vs Drain-Source Voltage (0-600 V)

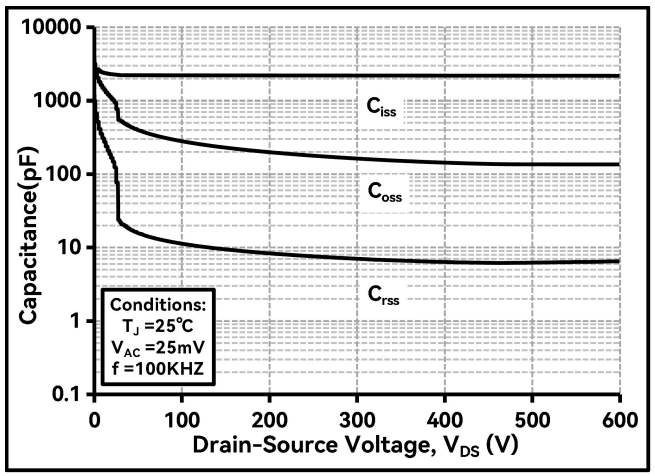
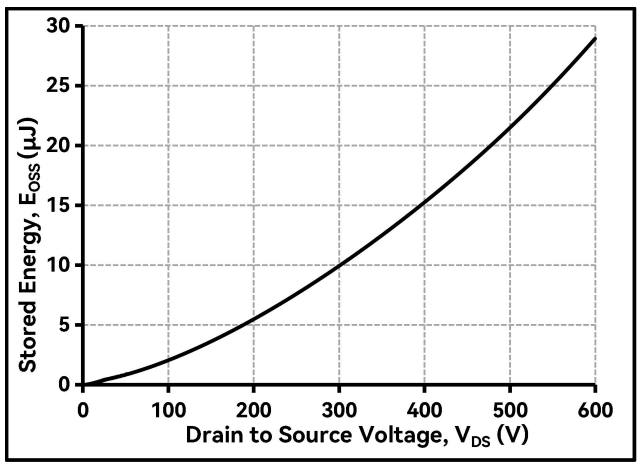


Figure 18: Output Capacitor Stored Energy



Typical Performance Characteristics

Figure19: Maximum Power Dissipation Derating vs Case Temperature

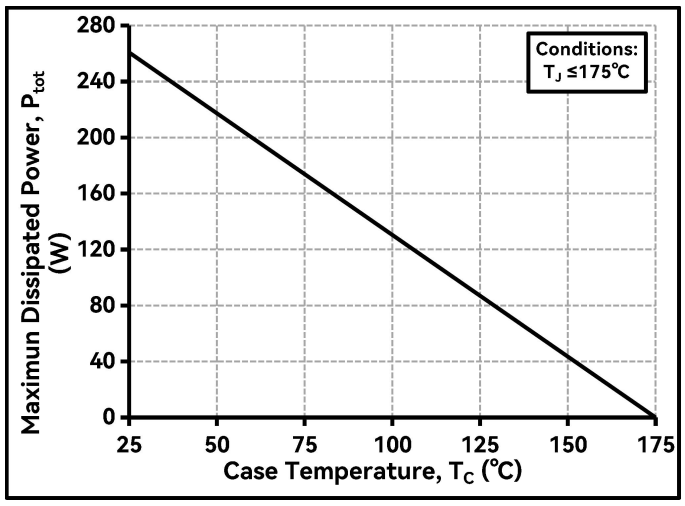


Figure 20: Continuous Drain Current Derating vs Case Temperature

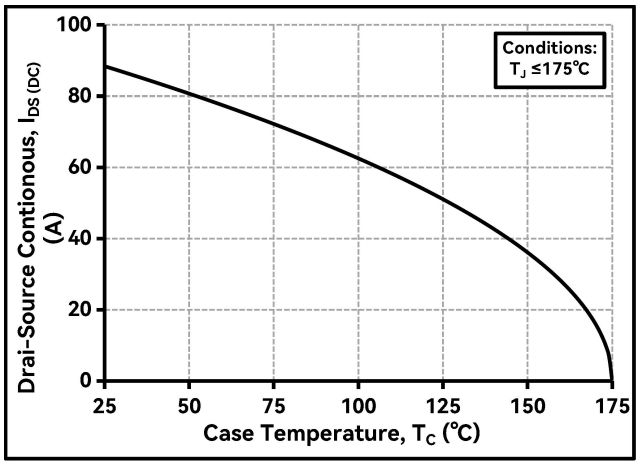


Figure 21: Transient Thermal Impedance (Junction - Case)

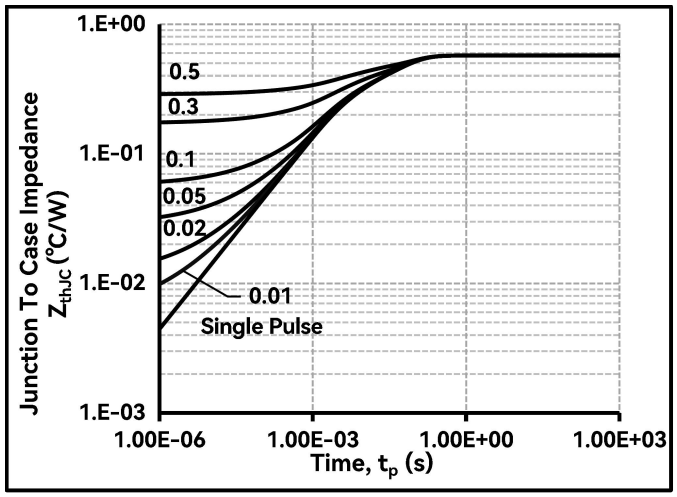


Figure 22: Safe Operating Area

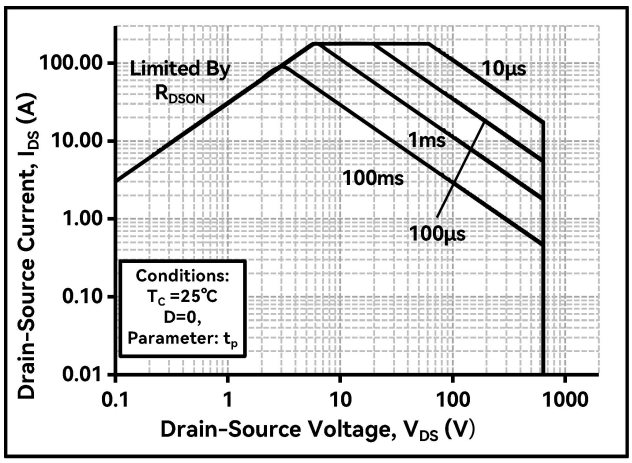


Figure 23: Clamped Inductive Switching Energy vs Drain Current

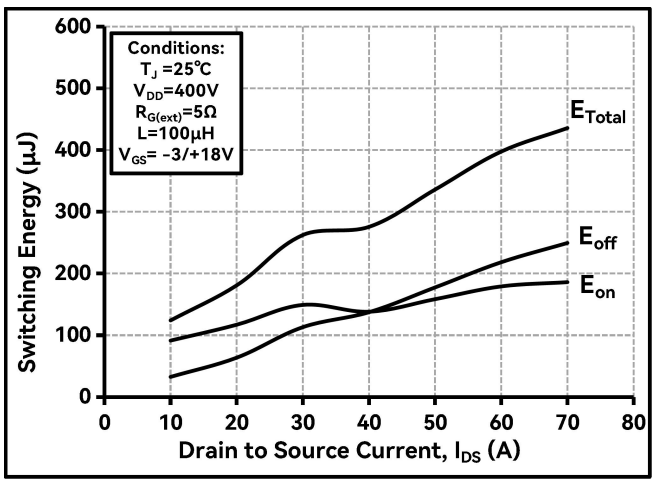
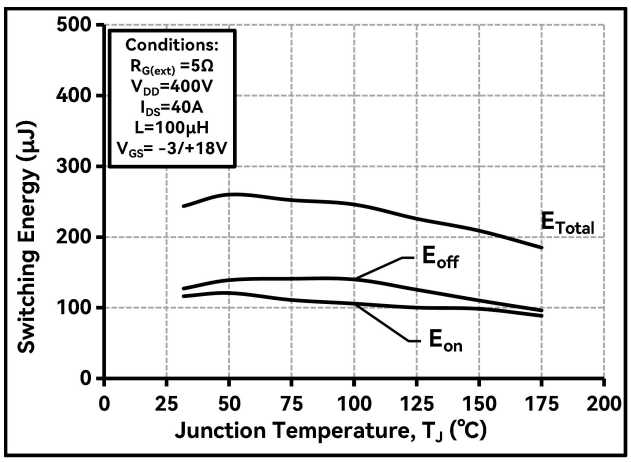


Figure 24: Clamped Inductive Switching Energy vs Temperature



Typical Performance Characteristics

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

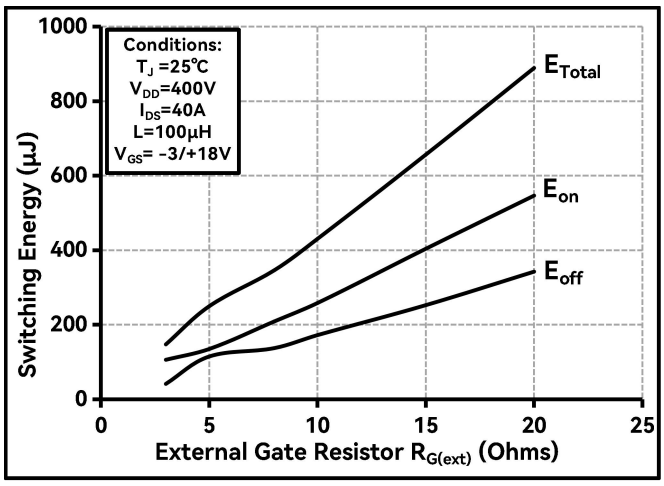
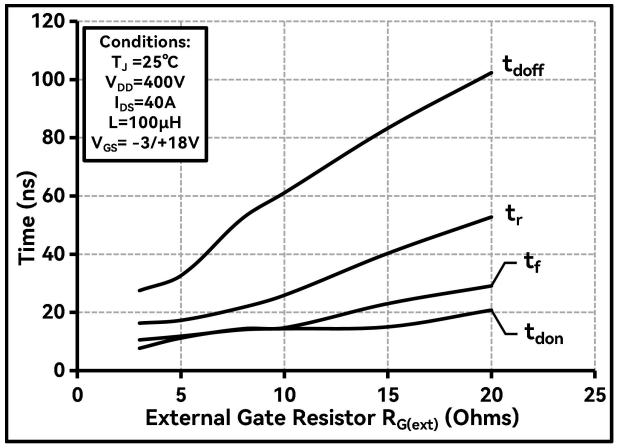
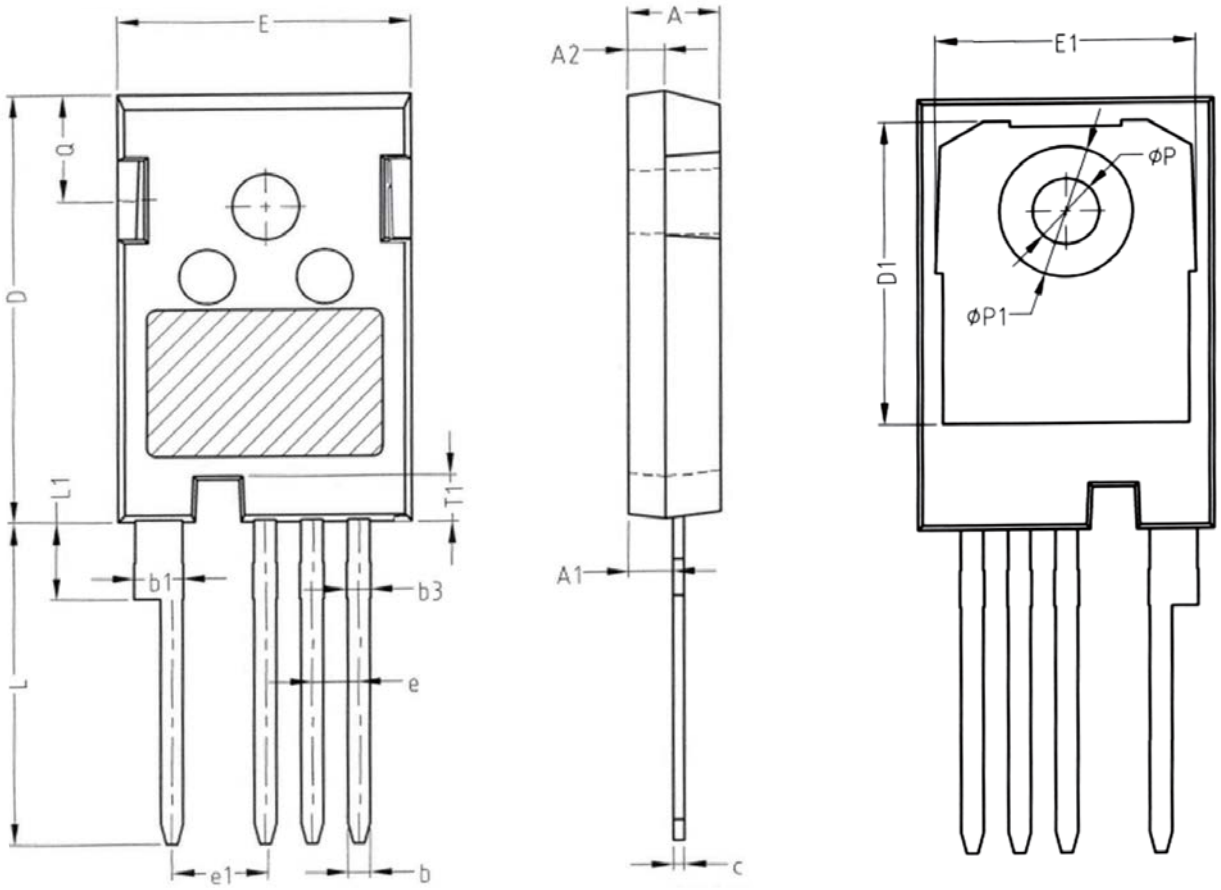


Figure 26: Switching Times vs RG(ext)



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
BCZ65N30P1	BCZ65N30P1	TO-247-4L	Tube	30 units

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