

BCZ230N20N1

N-Channel Silicon Carbide Power MOSFET

2300 V, 121 A , 20 mΩ

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Easy to Parallel and Simple to Drive

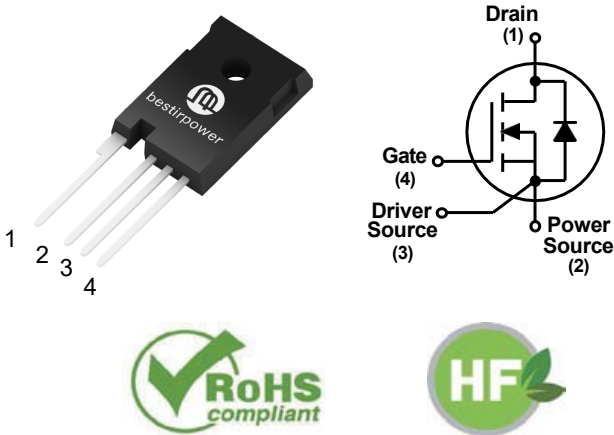
BV_{DSS} , T _C =25°C	I_D , T _C =25°C	R_{DS(on)} ,typ	Q_g ,typ
2300 V	121 A	20 mΩ	280 nC

Benefits

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

Applications

- Solid-state Circuit Breaker
- Industrial Inverters/Converters
- Solar power optimizer
- EV-Charging



Absolute Maximum Ratings (T_J = 25°C unless otherwise noted)

Symbol	Parameter		Value	Unit
V _{DSS}	Drain to Source Voltage		2300	V
V _{GSmax}	Gate to Source Voltage		-10 / +23	V
V _{GSop}	Recommended Operation Value		-5 / +18	V
I _D	Drain Current	T _C = 25°C	121	A
		T _C = 100°C	99	
I _{DM}	Drain Current	Pulsed	300	A
P _D	Power Dissipation (T _C = 25°C)		750	W
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to 175	°C

Thermal Characteristics

Symbol	Parameter	Value	Unit
R _{θJC}	Thermal Resistance, Junction to Case, Max.	0.2	°C/W
T _{sold}	Soldering temperature, wave soldering only allowed at leads	260	°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	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	2300	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 2300\text{ V}, V_{GS} = 0\text{ V}$	-	1	100	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = -10/+23\text{ V}$	-	10	250	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 20\text{ mA}, T_J = 25^\circ\text{C}$	2.0	2.9	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 18\text{ V}, I_D = 80\text{ A}, T_J = 25^\circ\text{C}$	-	20	28	mΩ
		$V_{GS} = 18\text{ V}, I_D = 80\text{ A}, T_J = 175^\circ\text{C}$	-	45	-	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 1200\text{ V}$ $f = 1.0\text{ MHz } V_{AC} = 25\text{ mV}$	-	6300	-	pF
C_{oss}	Output Capacitance		-	140	-	
C_{rss}	Reverse Capacitance		-	15	-	
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 1200\text{ V}, I_D = 80\text{ A}$ $V_{GS} = -5/18\text{ V}$	-	280	-	nC
Q_{gs}	Gate to Source Charge		-	60	-	
Q_{gd}	Gate to Drain "Miller" Charge		-	62	-	
R_G	Internal Gate Resistance	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	-	2.2	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 1200\text{ V}, I_D = 80\text{ A},$ $R_G = 2.5\text{ }\Omega, V_{GS} = -5/18\text{ V}$ $R_L = 20\text{ }\Omega$	-	23	-	ns
t_r	Turn-On Rise Time		-	20	-	
$t_{d(off)}$	Turn-Off Delay Time		-	54	-	
t_f	Turn-Off Fall Time		-	20	-	
E_{on}	Turn-on Switching Energy		-	1.8	-	mJ
E_{off}	Turn-off Switching Energy		-	1.0	-	

Source-Drain Diode Characteristics

I_S	Maximum Continuous Diode Forward Current		-	-	150	A
V_{SD}	Diode Forward Voltage	$V_{GS} = -5\text{ V}, I_{SD} = 40\text{ A}$	-	4.1	-	V
I_{rrm}	Peak Reverse Recovery Current	$I_{SD} = 80\text{ A}, V_R = 1200\text{ V},$	-	11	-	A
t_{rr}	Reverse Recovery Time		-	40	-	ns
Q_{rr}	Reverse Recovery Charge		-	230	-	nC

Typical Performance Characteristics

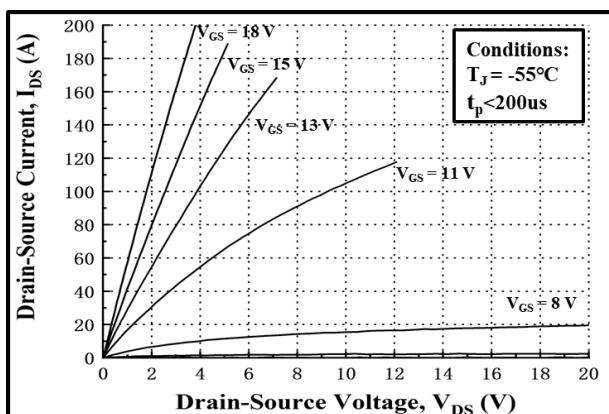
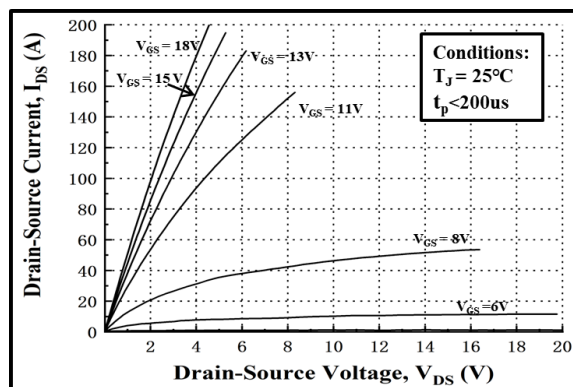
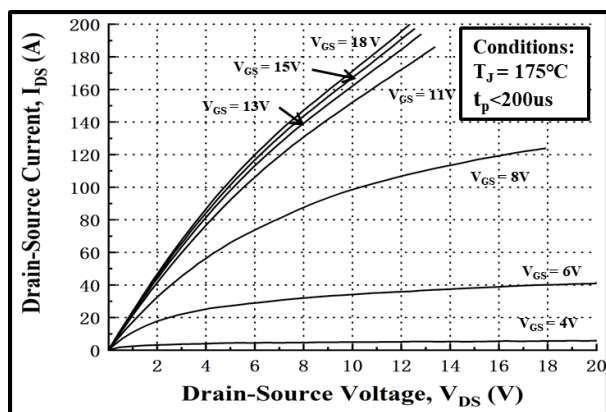
Figure 1. Output Characteristics $T_J = -55^\circ\text{C}$ Figure 2. Output Characteristics $T_J = 25^\circ\text{C}$ Figure 3. Output Characteristics $T_J = 175^\circ\text{C}$ 

Figure 4. Normalized On-Resistance vs. Temperature

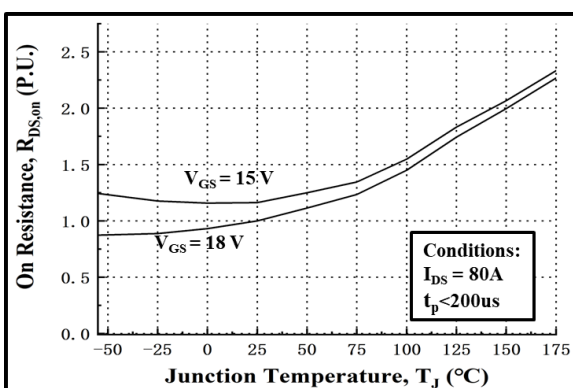


Figure 5. On-Resistance vs. Drain Current For Various Temperatures

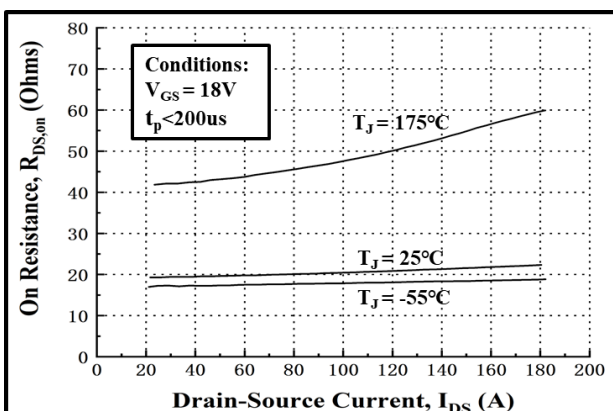
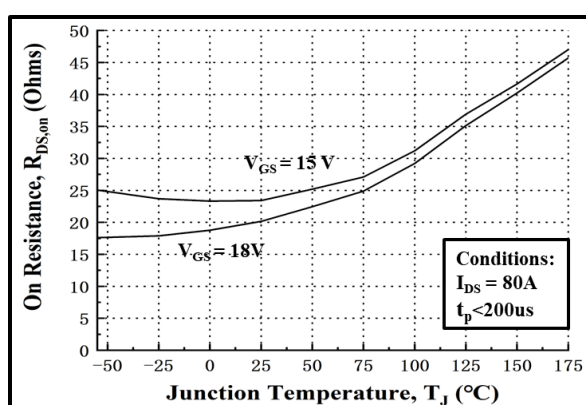


Figure 6. On-Resistance vs. Temperature For Various Gate Voltage



Typical Performance Characteristics

Figure 7. Transfer Characteristic for Various Junction Temperatures

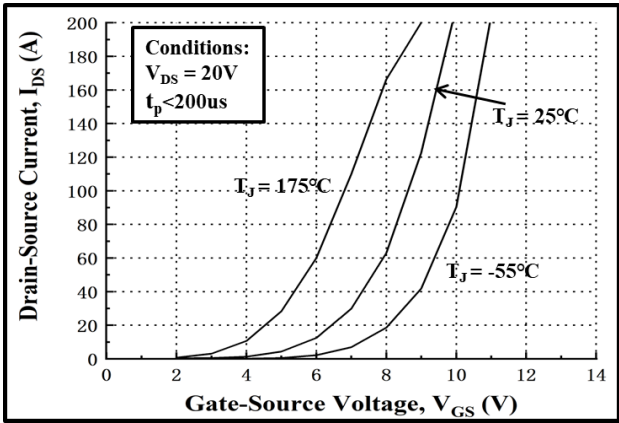


Figure 8. Body Diode Characteristic at -55°C

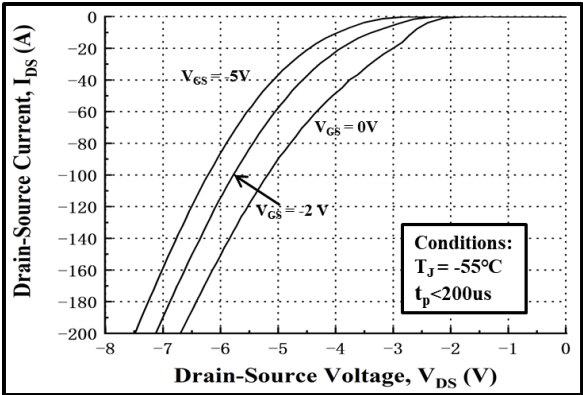


Figure 9. Body Diode Characteristic at 25°C

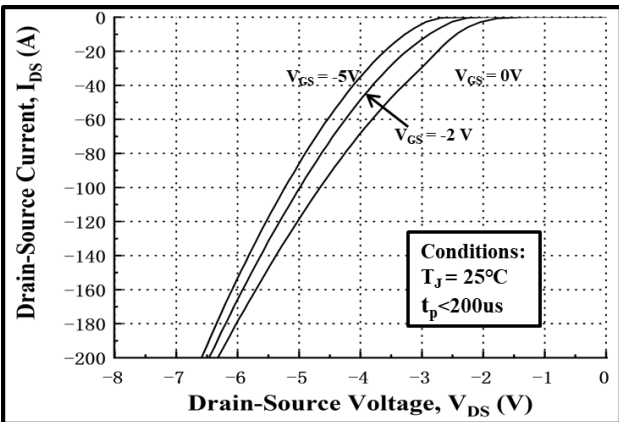


Figure 10. Body Diode Characteristic at 175°C

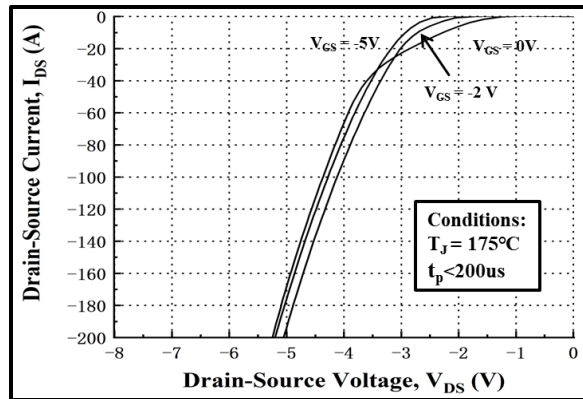


Figure 11. Threshold Voltage vs. Temperature

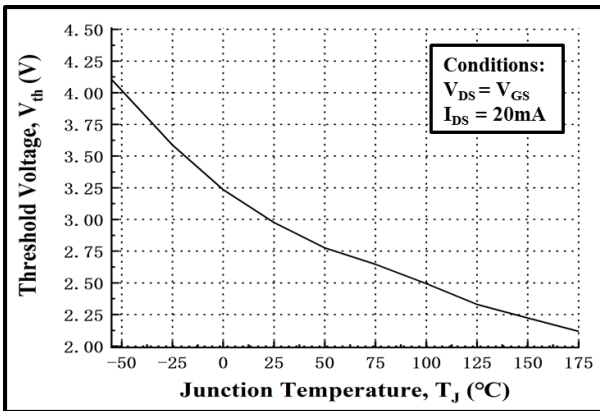
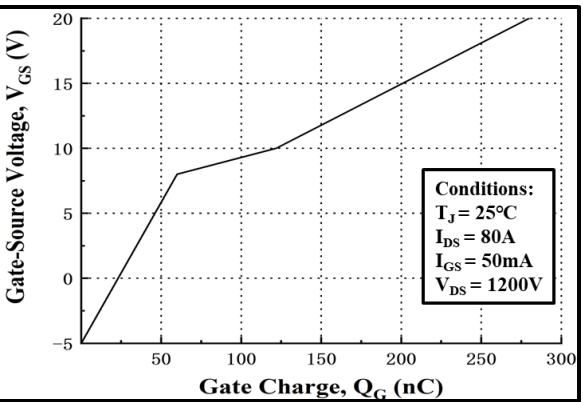


Figure 12. Gate Charge Characteristics



Typical Performance Characteristics

Figure 13. 3rd Quadrant Characteristic at -55°C

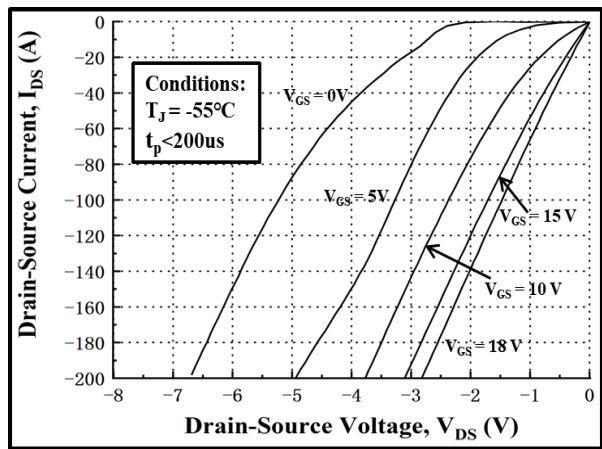


Figure 14. 3rd Quadrant Characteristic at 25°C

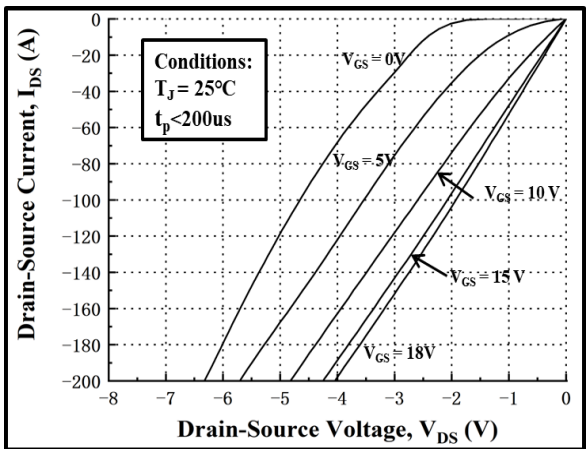


Figure 15. 3rd Quadrant Characteristic at 175°C

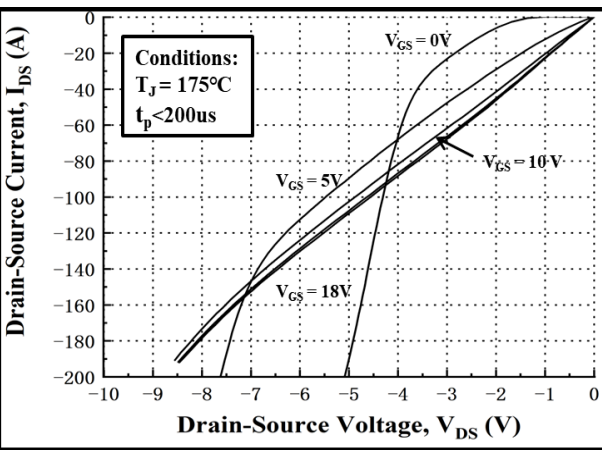


Figure 16. Output Capacitor Stored Energy

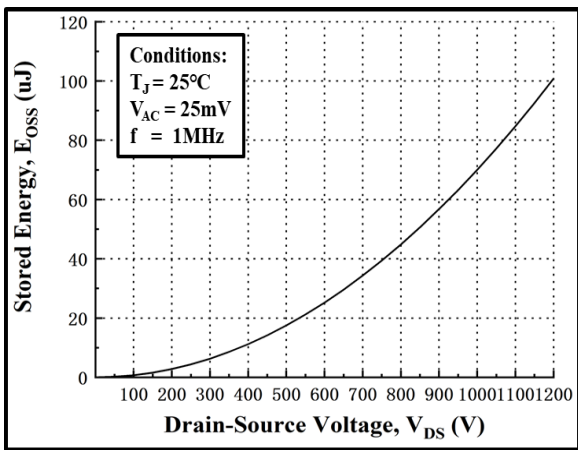


Figure 17. Capacitances vs. Drain-Source Voltage (0 - 400V)

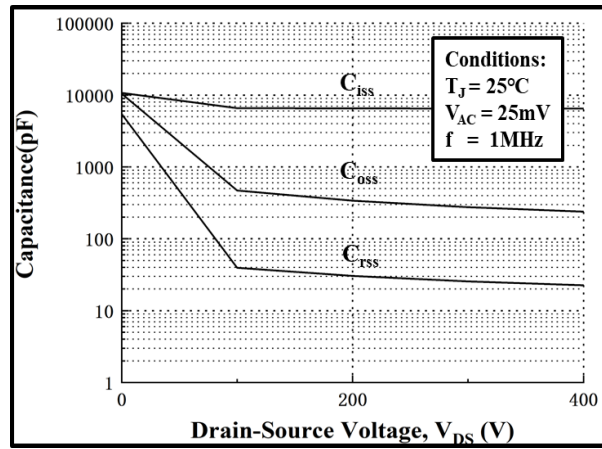
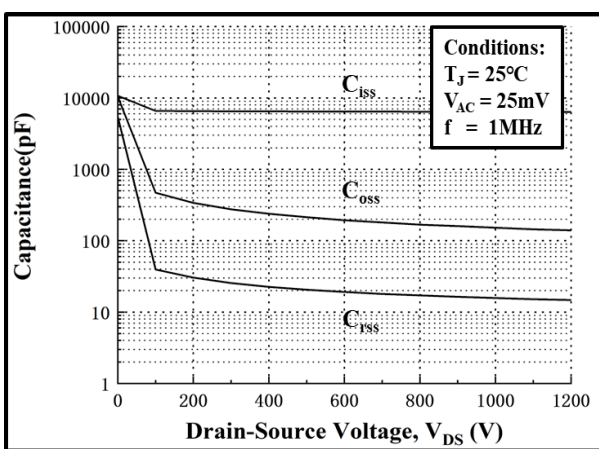


Figure 18. Capacitances vs. Drain-Source Voltage (0 - 1200V)



Typical Performance Characteristics

Figure 19. Continuous Drain Current Derating vs. Case Temperature

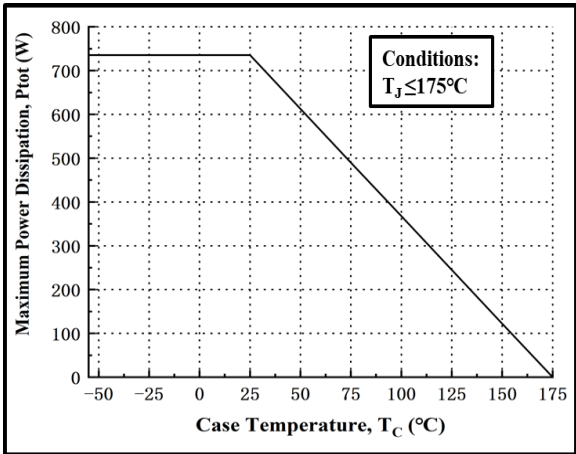


Figure 20. Maximum Power Dissipation Derating vs. Case Temperature

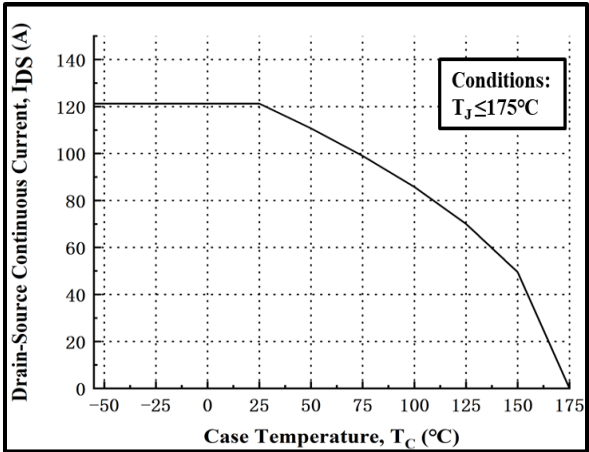


Figure 21. Transient Thermal Impedance (Junction - Case)

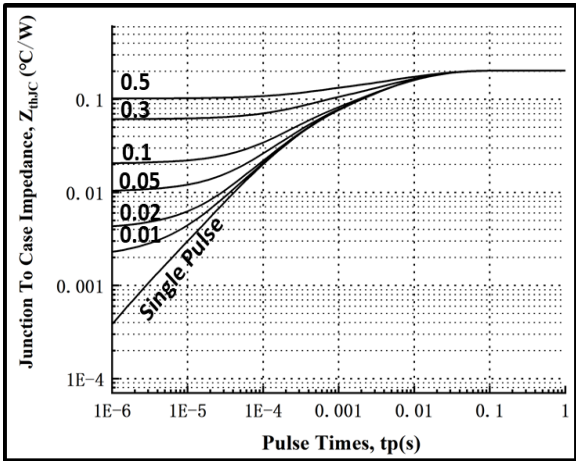


Figure22. Safe Operating Area

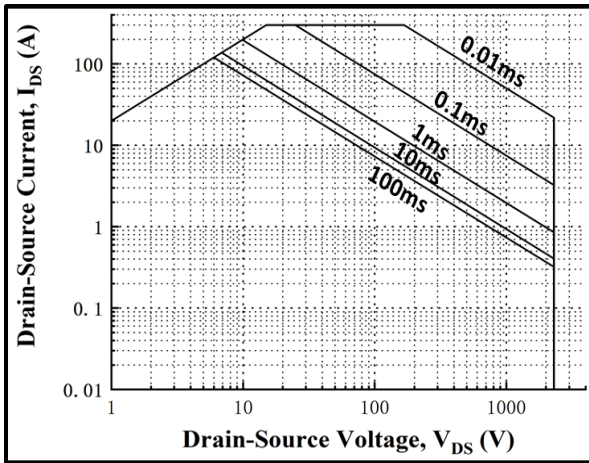
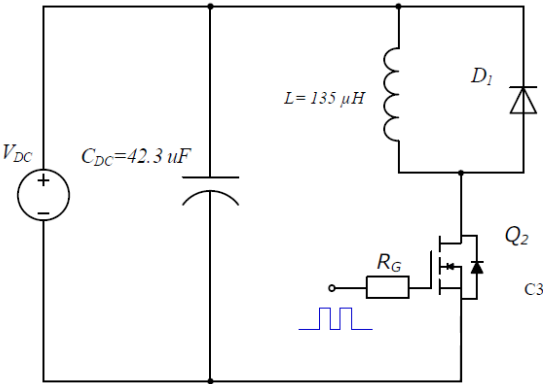
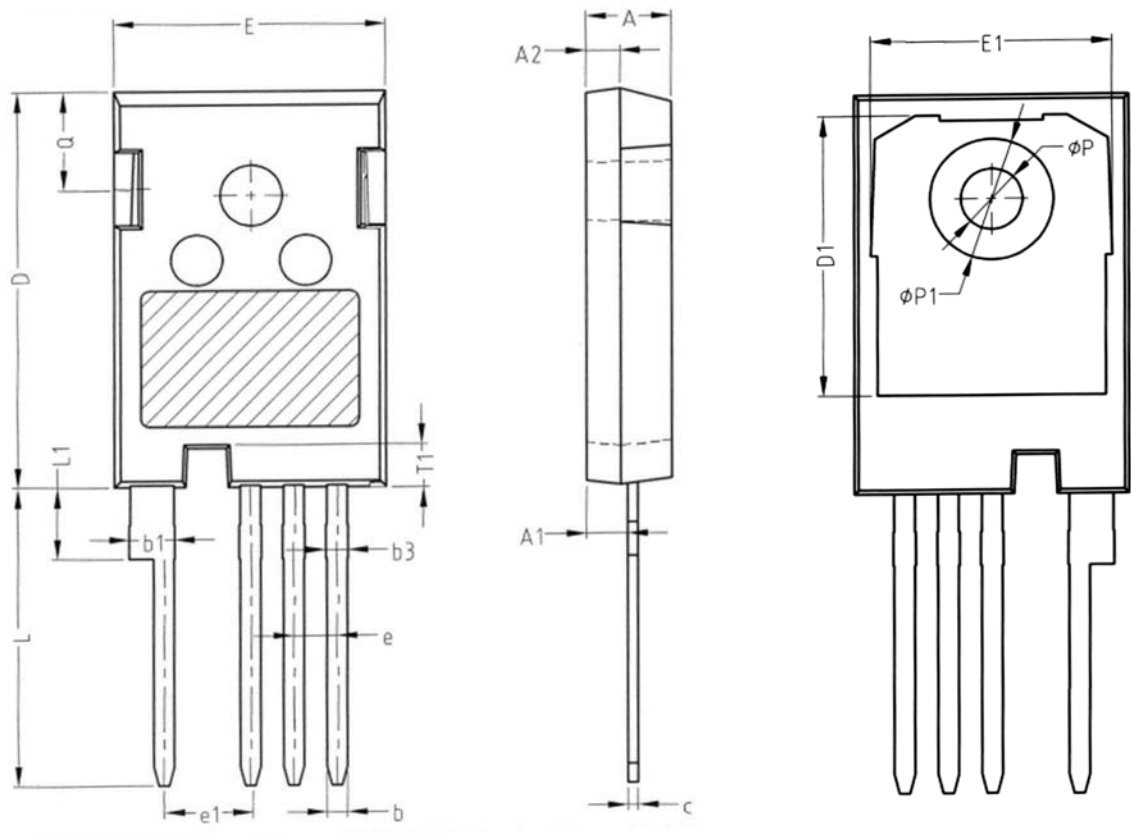


Figure 23. Clamped Inductive Switching Waveform Test Circuit



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
BCZ230N20N1	BCZ230N20N1	TO247-4	Tube	30 units

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