

BCZ120N32W1

N-Channel Silicon Carbide Power MOSFET

1200 V, 69 A, 32mΩ



Features

- High switching speed with a low gate charge
- Low On-Resistance with High Blocking Voltage
- Low Capacitances with High-Speed switching
- Low reverse recovery (Qrr)
- Halogen Free, and RoHS Compliant

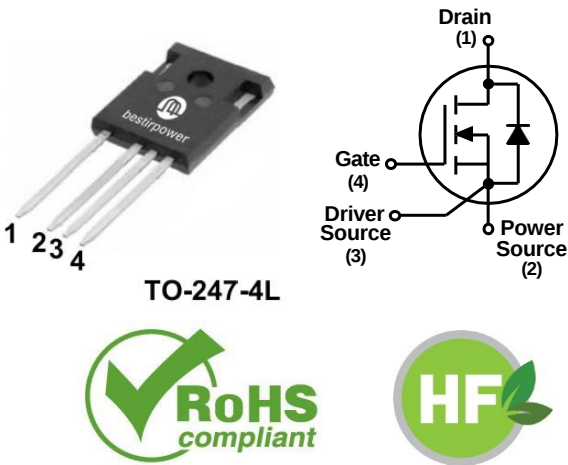
$BV_{DSS}, T_c=25^{\circ}C$	$I_D, T_c=25^{\circ}C$	$R_{DS(on),typ}$	$Q_{g,typ}$
1200 V	69 A	32 mΩ	121nC

Benefits

- Reduce switching losses
- Increased system Switching
- Frequency Increased power density
- Reduction of heat sink requirements

Applications

- Switch mode power supplies
- Renewable energy
- Motor drives
- High voltage DC/DC converters



Absolute Maximum Ratings ($T_c = 25^{\circ}C$ 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		-4 / +20	V
I_D	Drain Current	Continuous ($V_{GS}=18V, T_c = 25^{\circ}C$)	69	A
		Continuous ($V_{GS}=18V, T_c = 100^{\circ}C$)	49	
I_{DM}	Drain Current	Pulse with t_p limited by T_{jmax} at 1 ms	140	A
		Pulse with t_p limited by T_{jmax} at 100 μs	331	
P_D	Power Dissipation		348	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	$^{\circ}C$

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.43	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	40	

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCZ120N32W1	BCZ120N32W1	TO247-4	Tube	30 units

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

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Off Characteristics

BV_{DSS}	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	1200			V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$		1	50	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = 18\text{ V}, V_{DS} = 0\text{ V}$			250	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{DS} = 11.5\text{ mA}$		2.9		V
		$V_{GS} = V_{DS}, I_{DS} = 11.5\text{ mA}, T_J = 175^\circ\text{C}$		2.0		
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 18\text{ V}, I_D = 40\text{ A}$		32	48	mΩ
		$V_{GS} = 20\text{ V}, I_D = 40\text{ A}$		30		
		$V_{GS} = 18\text{ V}, I_D = 40\text{ A}, T_J = 175^\circ\text{C}$		58		
		$V_{GS} = 20\text{ V}, I_D = 40\text{ A}, T_J = 175^\circ\text{C}$		52		
g_{fs}	Transconductance	$V_{GS} = 18\text{ V}, I_D = 40\text{ A}$		26		S
		$V_{GS} = 20\text{ V}, I_D = 40\text{ A}, T_J = 175^\circ\text{C}$		22		

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 1000\text{ V}, V_{GS} = 0\text{ V},$ $f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$		2812		pF
C_{oss}	Output Capacitance			111		
C_{rss}	Reverse Capacitance			7		
$Q_{g(tot)}$	Total Gate Charge	$V_{DD} = 800\text{ V}, V_{GS} = -4/18\text{ V}, I_D = 40\text{ A}$		121		nC
Q_{gs}	Gate to Source Charge			20.9		
Q_{gd}	Gate to Drain "Miller" Charge			23.2		
R_G	Internal Gate Resistance	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$		1		Ω

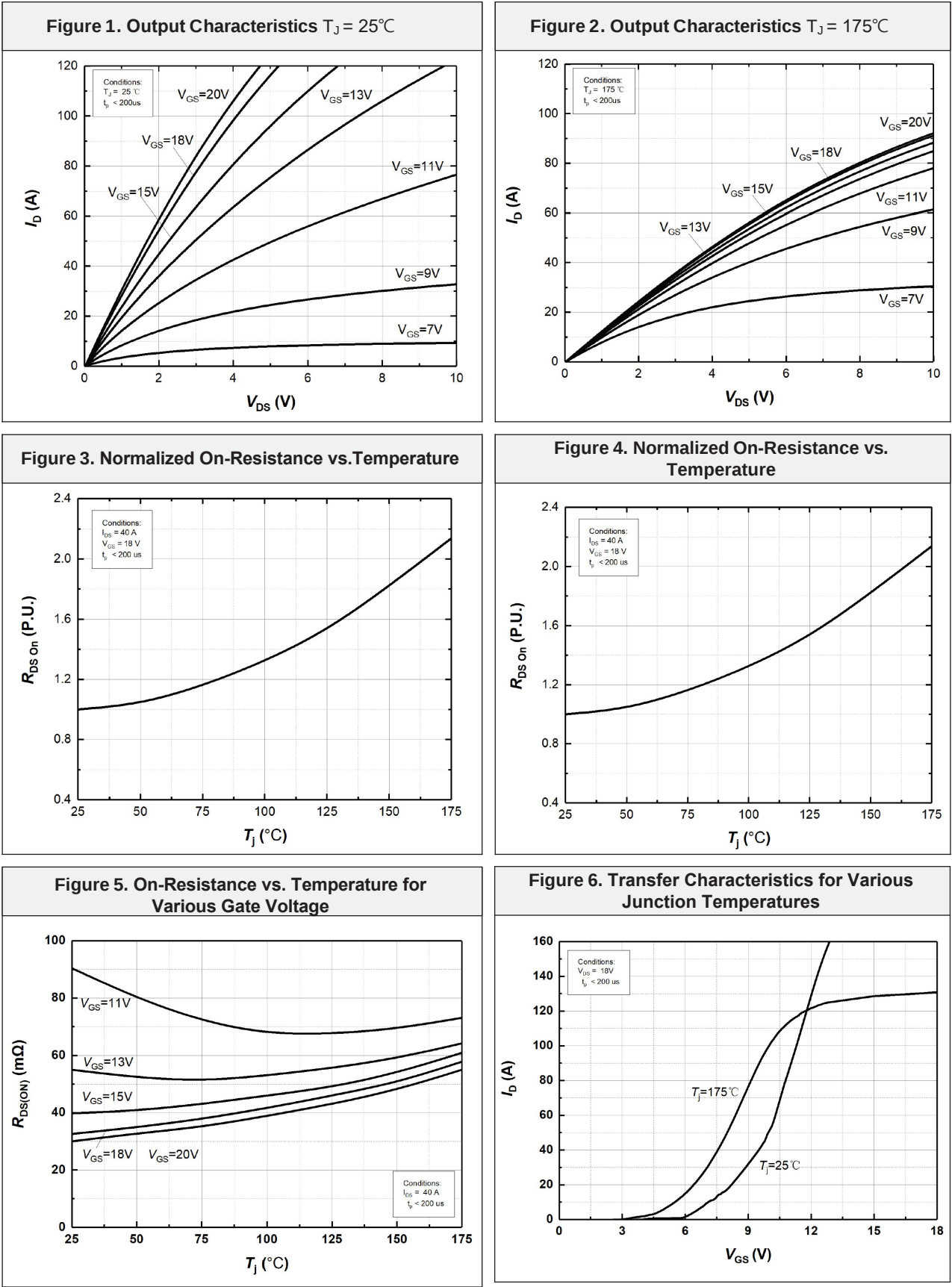
Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 800\text{ V}, V_{GS} = -4/18\text{ V},$ $I_D = 40\text{ A}, R_{G(ext)} = 5\text{ }\Omega,$ $L = 276\text{ }\mu\text{H}$		23		ns
t_r	Turn-On Rise Time			9		
$t_{d(off)}$	Turn-Off Delay Time			27		
t_f	Turn-Off Fall Time			11		
E_{on}	Turn-on Switching Energy			352		μJ
E_{off}	Turn-off Switching Energy			170		

Source-Drain Diode Characteristics

I_S	Diode Forward Current	$V_{GS} = -4\text{ V}$		72		A
V_{SD}	Diode Forward Voltage	$V_{GS} = -4\text{ V}, I_{SD} = 20\text{ A}$		3.9		V
		$V_{GS} = -4\text{ V}, I_{SD} = 20\text{ A}, T_J = 175^\circ\text{C}$		3.3		
t_{rr}	Reverse Recovery Time	$V_R = 800\text{ V}, V_{GS} = -4\text{ V}, I_{SD} = 40\text{ A},$ $dif/dt = 3800\text{ A}/\mu\text{s}$		31		ns
Q_{rr}	Reverse Recovery Charge			281		nC
I_{rrm}	Peak Reverse Recovery Current			18		A

Typical Performance Characteristics



Typical Performance Characteristics

Figure 7. Body Diode Characteristics at $T_J = 25^\circ\text{C}$

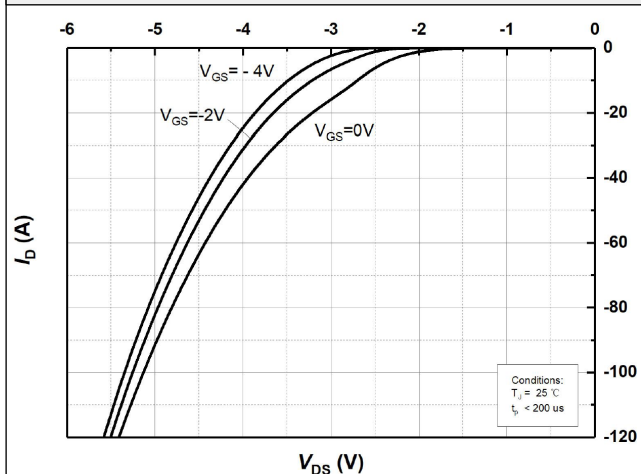


Figure 8. Body Diode Characteristics at $T_J = 175^\circ\text{C}$

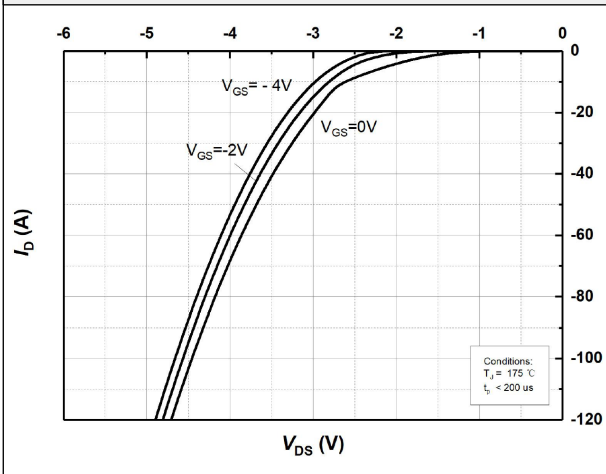


Figure 9. Threshold Voltage vs. Temperature

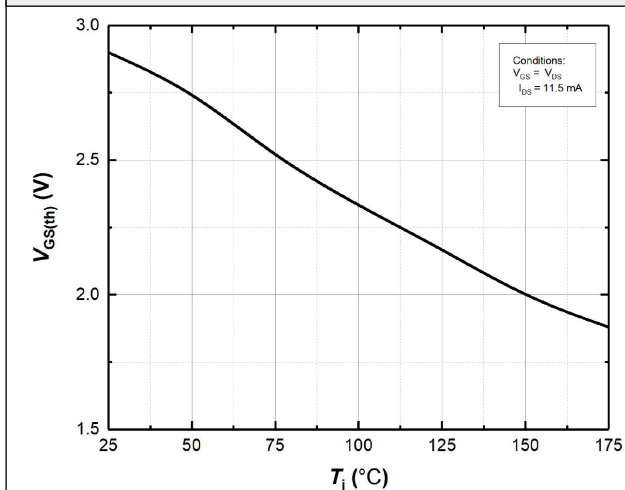


Figure 10. Gate Charge Characteristics

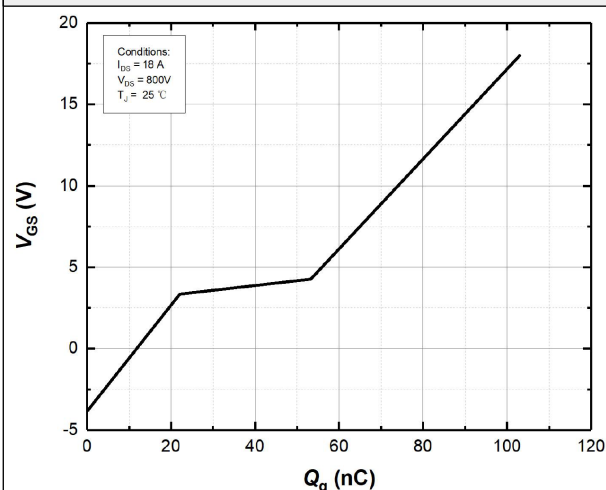


Figure 11. 3rd Quadrant Characteristic at $T_J = 25^\circ\text{C}$

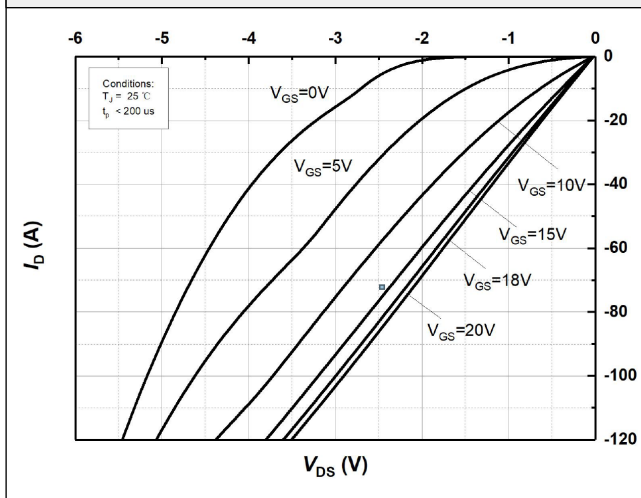
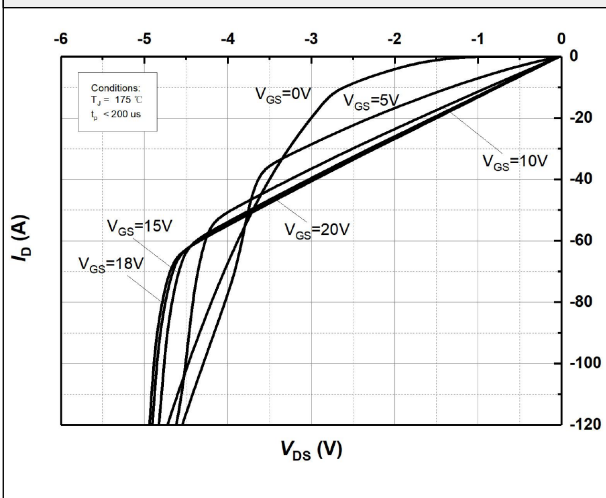


Figure 12. 3rd Quadrant Characteristic at $T_J = 175^\circ\text{C}$



Typical Performance Characteristics

Figure 13. Capacitances vs. Drain-Source Voltage

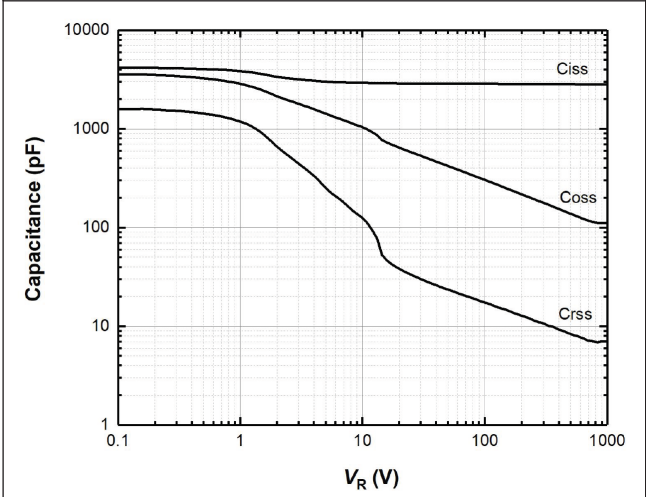


Figure 14. Continuous Drain Current Derating vs. Case Temperature

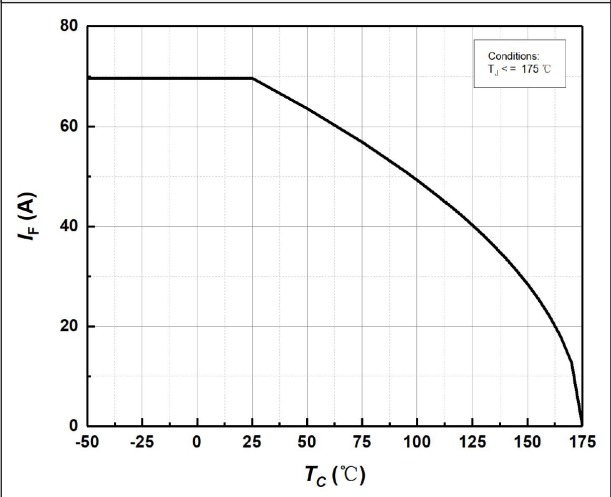


Figure 15. Transient Thermal Impedance

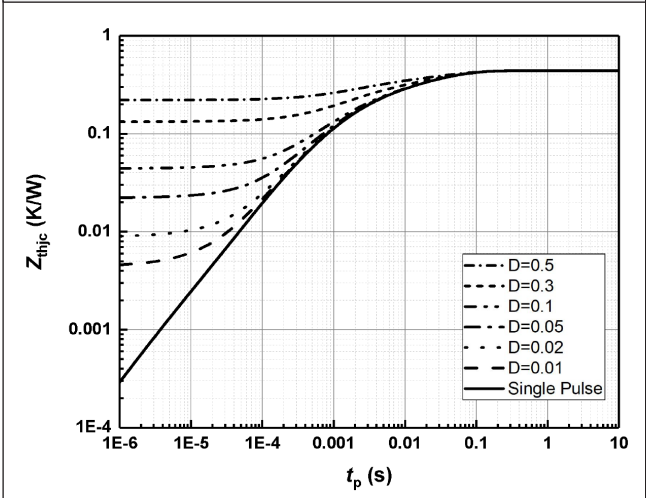


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

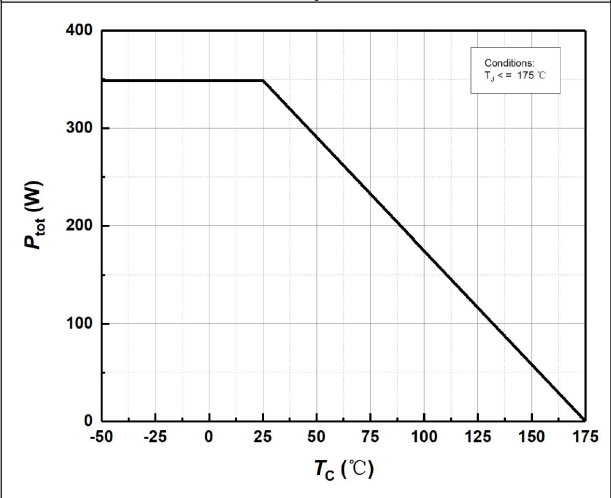


Figure 17. Output Capacitor Stored Energy

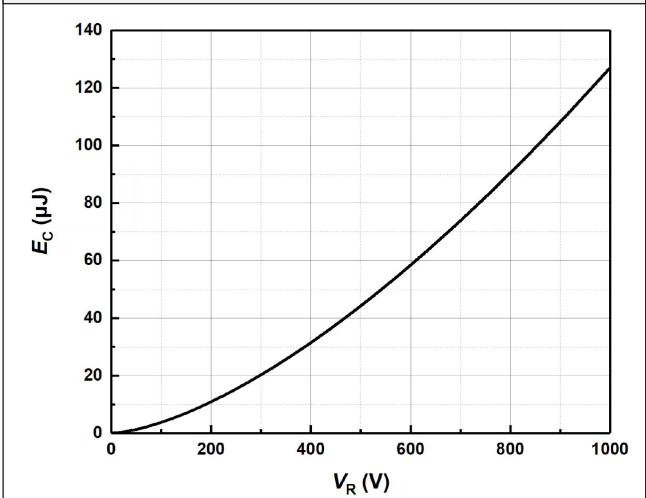
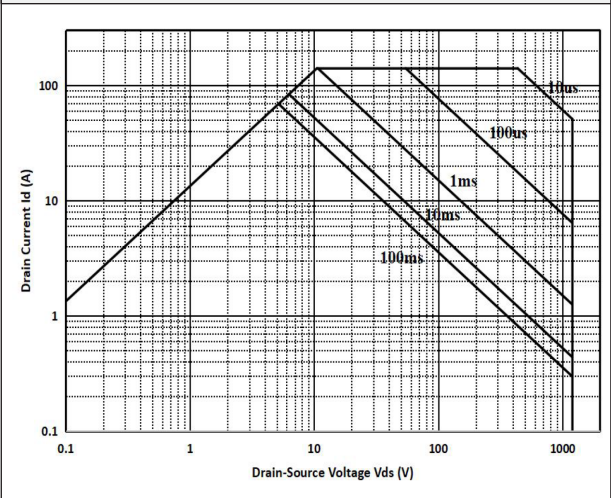


Figure 18. Safe Operating Area



Typical Performance Characteristics

Figure 19. Clamped Inductive Switching Energy vs. Drain Current($V_{DD} = 600V$)

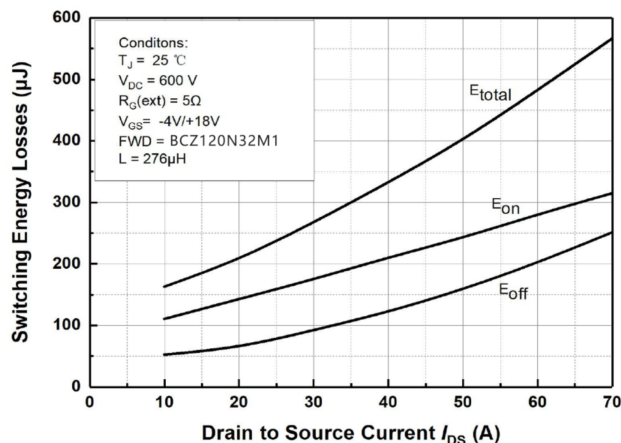


Figure 20. Clamped Inductive Switching Energy vs. Drain Current($V_{DD} = 800V$)

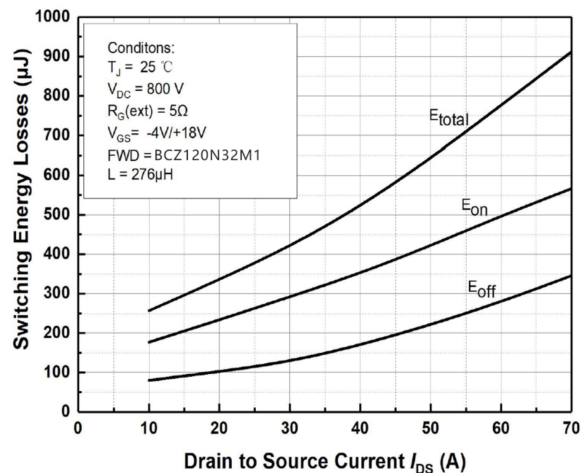


Figure 21. Clamped Inductive Switching Energy vs. $R_{G(ext)}$

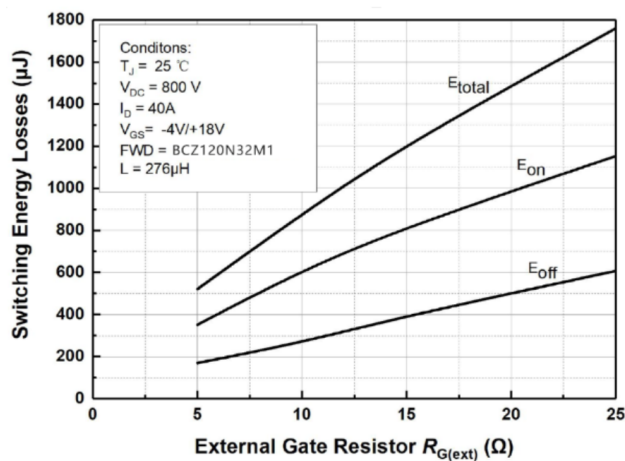
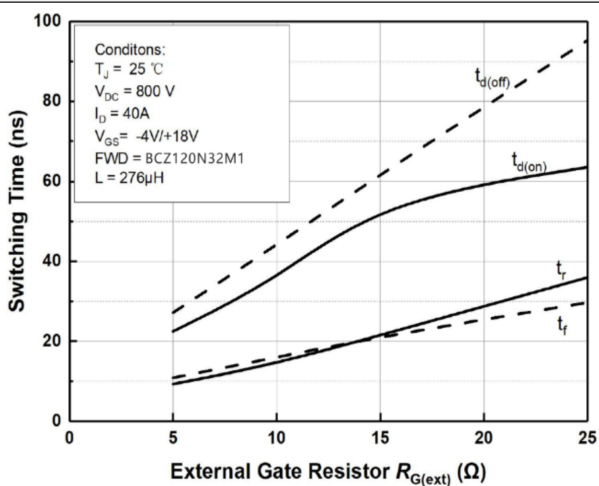
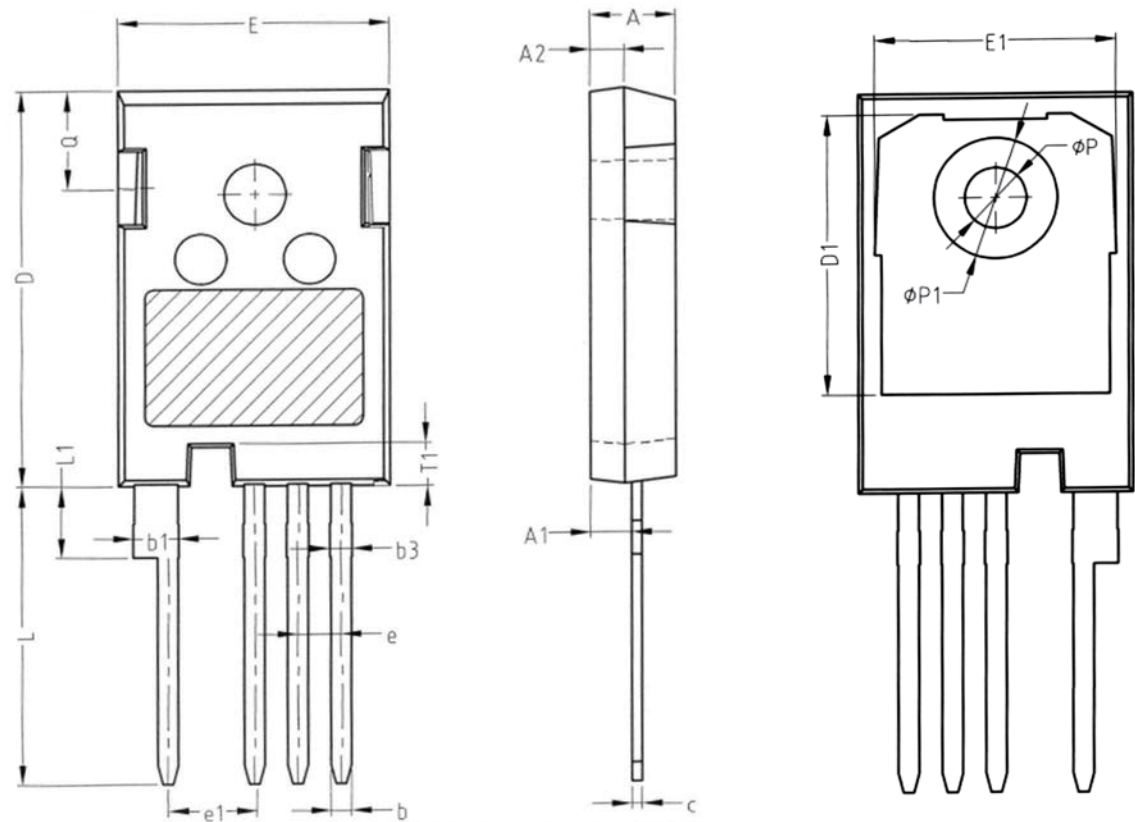


Figure 22. On-Resistance vs. Temperature For



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

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