



bestirpower

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

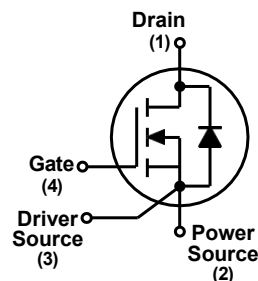
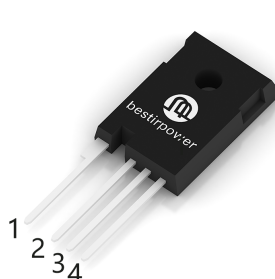
Benefits

- 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

$BV_{DSS}, T_c=25^{\circ}\text{C}$	$I_D, T_c=25^{\circ}\text{C}$	$R_{DS(on),typ}$	$Q_{g,typ}$
1200 V	164A	16 mΩ	315.4 nC



Absolute Maximum Ratings ($T_J = 25^{\circ}\text{C}$ 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		-5 / +20	V
I_D	Drain Current	$V_{GS} = 20\text{V}, (T_C = 25^{\circ}\text{C})$	164	A
		$V_{GS} = 20\text{V}, (T_C = 100^{\circ}\text{C})$	116	
I_{DM}	Drain Current	Pulsed (Note1)	328	A
P_D	Power Dissipation	$(T_C = 25^{\circ}\text{C})$	760	W
		Derate Above 25°C	5	W/ $^{\circ}\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	$^{\circ}\text{C}$

※Note 1 : Limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.2	$^{\circ}\text{C}/\text{W}$
T_{sold}	Soldering temperature, wave soldering only allowed at leads	260	$^{\circ}\text{C}$

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	$V_{GS} = 0\text{ V}, I_D = 100\mu\text{A}$	1200	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1200\text{ V}, V_{GS} = 0\text{ V}$	-	1	100	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = +20\text{ V}, V_{DS} = 0\text{ V}$	-	-	250	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 16\text{ mA}$	2.0	2.8	4.0	V
		$V_{GS} = V_{DS}, I_D = 16\text{ mA}, T_J = 175^\circ\text{C}$		1.8		v
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 20\text{ V}, I_D = 55\text{ A}$	-	16	25	mΩ
		$V_{GS} = 20\text{ V}, I_D = 55\text{ A}, T_J = 175^\circ\text{C}$	-	28	-	
g_{fs}	Trans conductance	$V_{GS} = 20\text{ V}, I_D = 55\text{ A}$	-	22.6	-	S
		$V_{DS} = 20\text{ V}, I_D = 55\text{ A}, T_J = 175^\circ\text{C}$	-	24	-	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 1000\text{ V}, V_{GS} = 0\text{ V}, f = 700\text{ kHz}, V_{AC} = 25\text{ mV}$	-	6413	-	pF
C_{oss}	Output Capacitance		-	255	-	
C_{rss}	Reverse Transfer Capacitance		-	9.3	-	
E_{oss}	Stored Energy in Output Capacitance	$V_{DS} = 0\text{ V to } 1000\text{ V}, V_{GS} = 0\text{ V}$	-	152	-	μJ
Q_{gs}	Gate to Source Charge	$V_{DS} = 800\text{ V}, I_D = 55\text{ A}, V_{GS} = -5\text{ V} / 20\text{ V},$	-	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	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	-	1	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 800\text{ V}, I_D = 55\text{ A}, V_{GS} = -5\text{ V} / 20\text{ V}, R_{G(ext)} = 2.2\Omega, L = 100\mu\text{H}$	-	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 ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
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Source-Drain Diode Characteristics

I_S	Continuous Diode Forward Current	$V_{GS} = -5\text{ V}, T_C = 25^\circ\text{C}$	-	159		A
V_{SD}	Diode Forward Voltage	$V_{GS} = -5\text{ V}, I_{SD} = 27\text{ A}$	-	3.6	-	V
t_{rr}	Reverse Recovery Time	$V_{GS} = -5\text{ V}, I_{SD} = 55\text{ A}, V_R = 800\text{ V}$ $dI_F/dt = 8620\text{ A}/\mu\text{s}$	-	25.5	-	ns
Q_{rr}	Reverse Recovery Charge		-	2476	-	nC
I_{rm}	Peak Reverse Recovery Current		-	154.6	-	A

Typical Performance Characteristics

Figure 1: Output Characteristics $T_J = -55^\circ\text{C}$

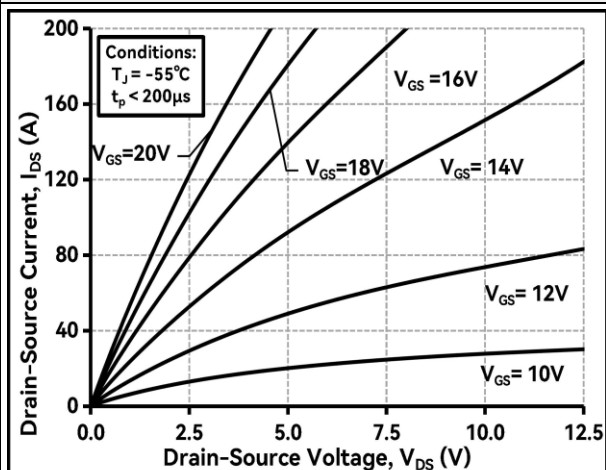


Figure 2: Output Characteristics $T_J = 25^\circ\text{C}$

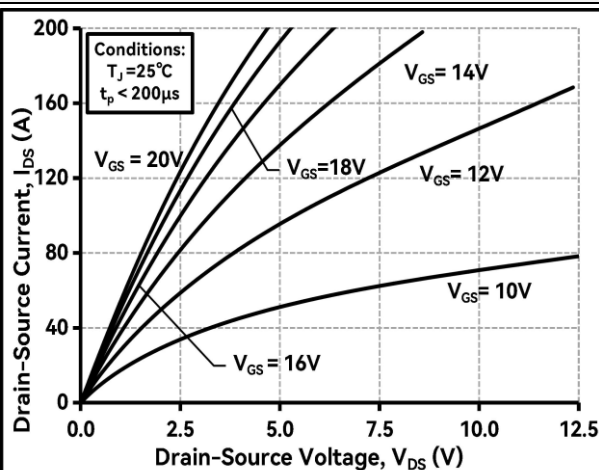


Figure 3: On-Region Characteristics $T_J = 175^\circ\text{C}$

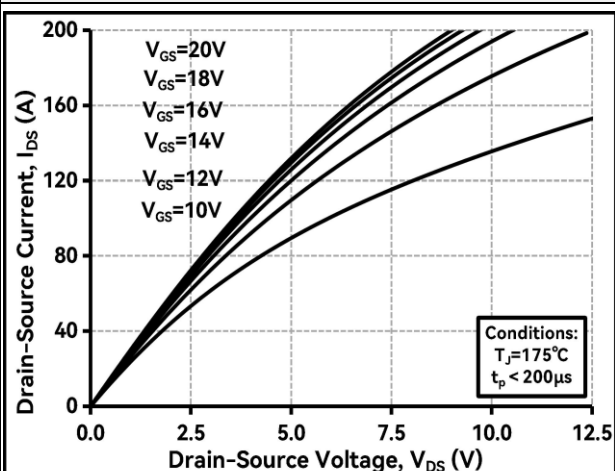


Figure 4: Normalized On-Resistance vs Temperature

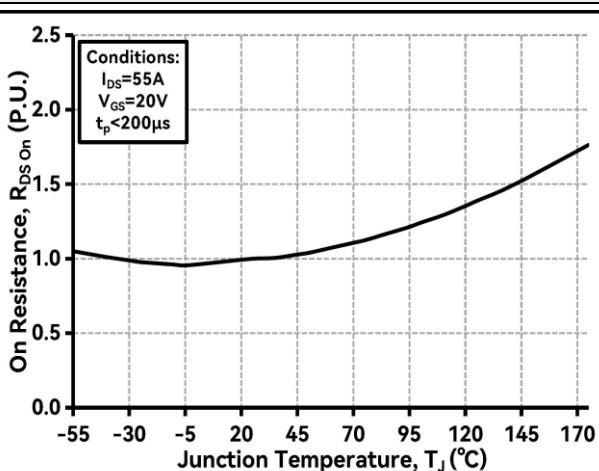


Figure 5: On-Resistance vs Drain Current For Various Temperatures

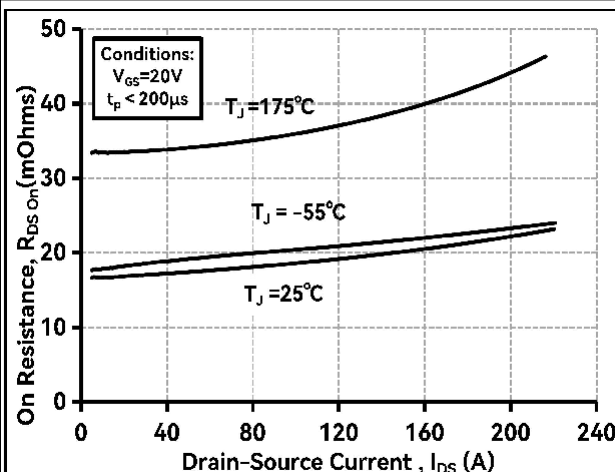
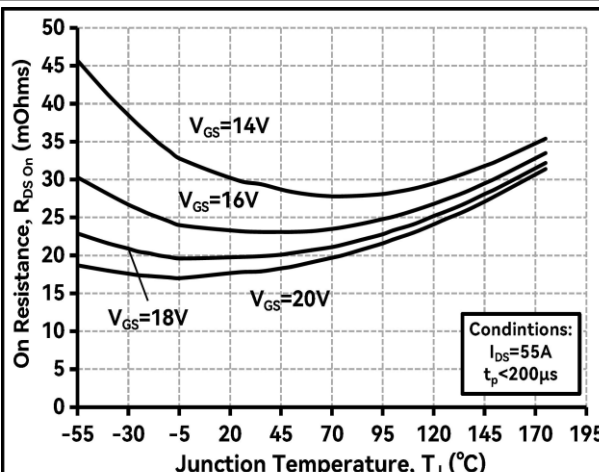


Figure 6: On-Resistance vs Temperature For Various Gate Voltage



Typical Performance Characteristics

Figure 7: Transfer Characteristic for Various Junction Temperatures

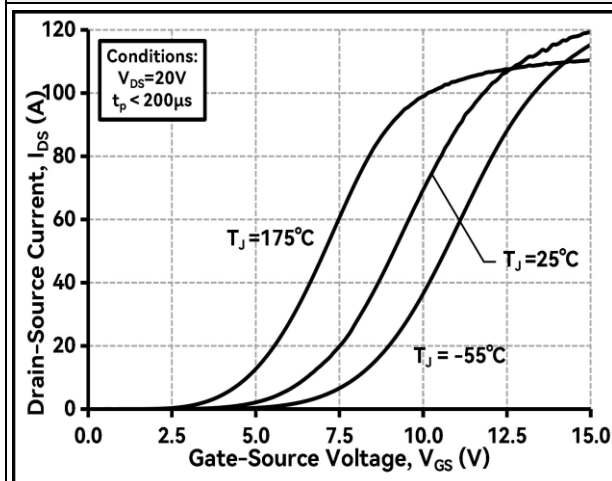


Figure 8: Body Diode Characteristic at -55°C

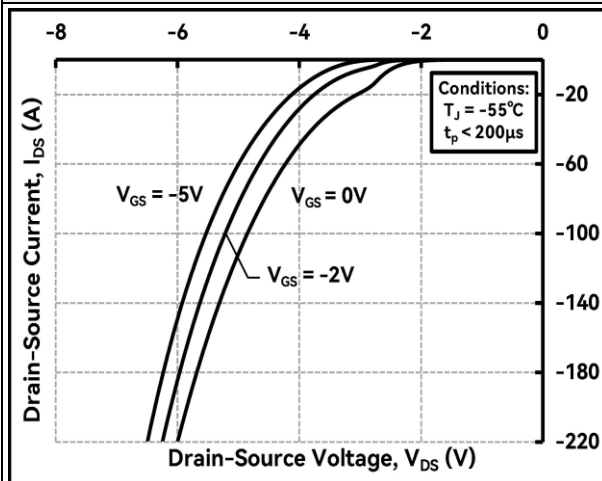


Figure 9: Body Diode Characteristic at 25°C

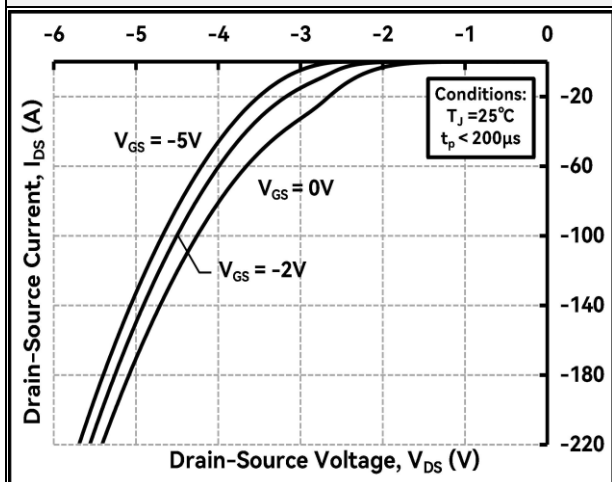


Figure 10: Body Diode Characteristic at 175°C

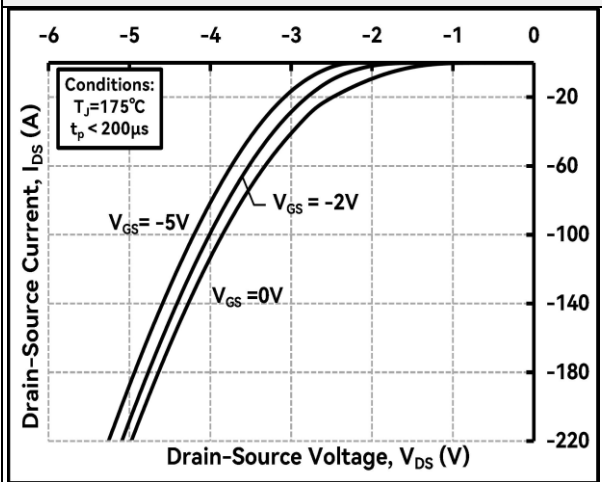


Figure 11: Threshold Voltage vs Temperature

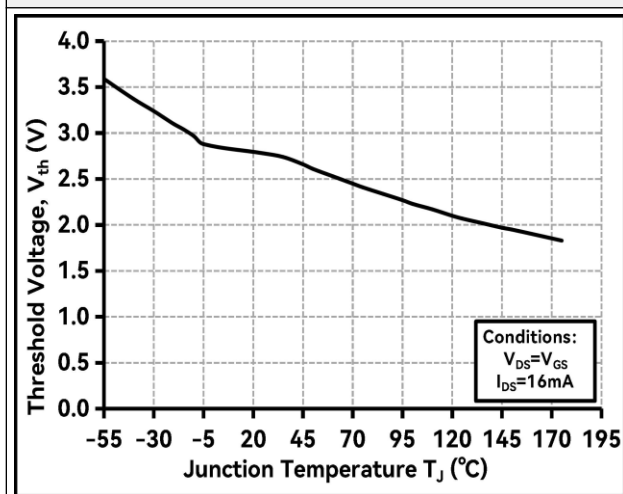
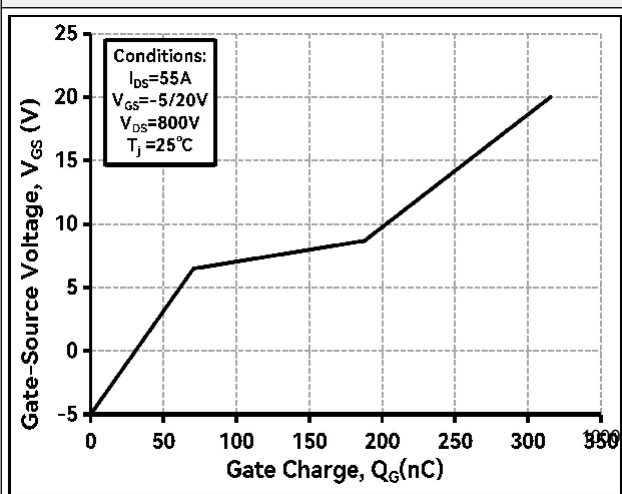


Figure 12: Gate Charge Characteristics



Typical Performance Characteristics

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

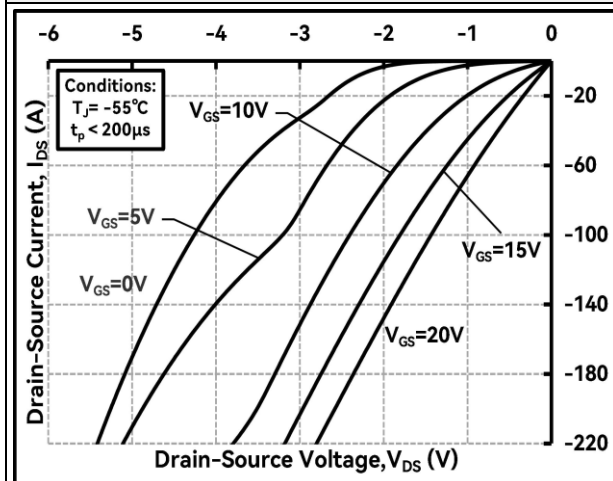


Figure 14: 3rd Quadrant Characteristic at 25°C

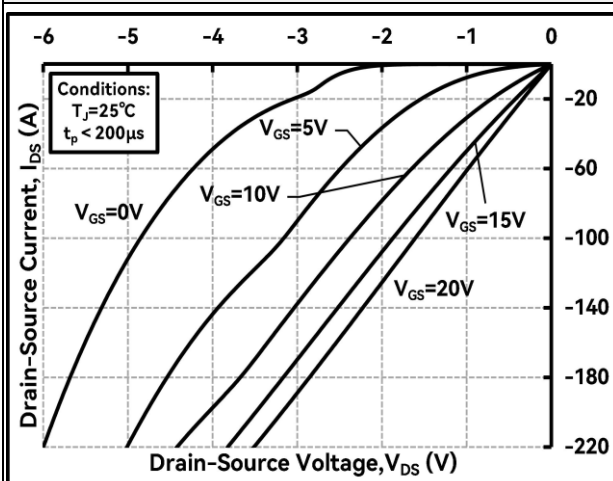


Figure 15: 3rd Quadrant Characteristic at 175°C

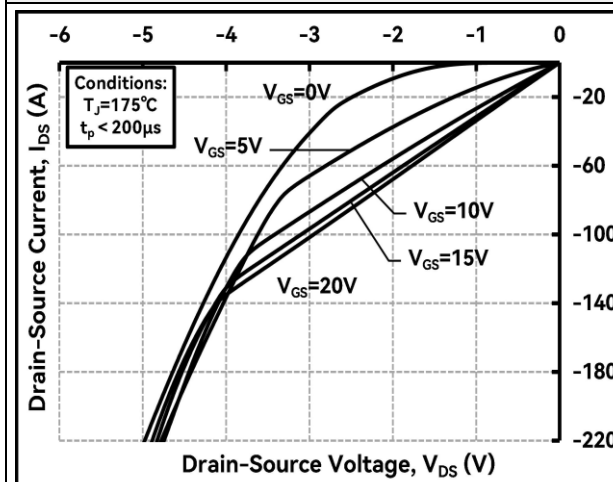


Figure 16: Output Capacitor Stored Energy

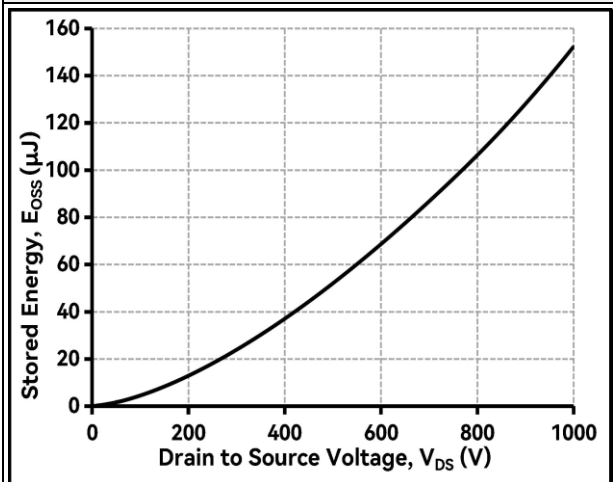


Figure 17: Capacitance vs Drain-Source Voltage (0-200 V)

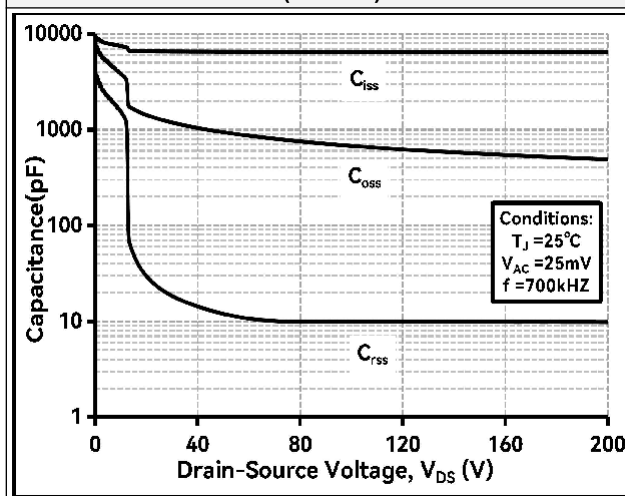
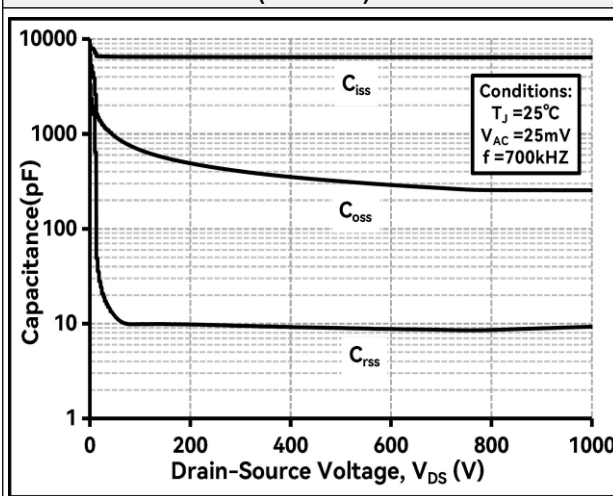


Figure 18: Capacitance vs Drain-Source Voltage (0-1000 V)



Typical Performance Characteristics

Figure 19: Continuous Drain Current Derating vs Case Temperature

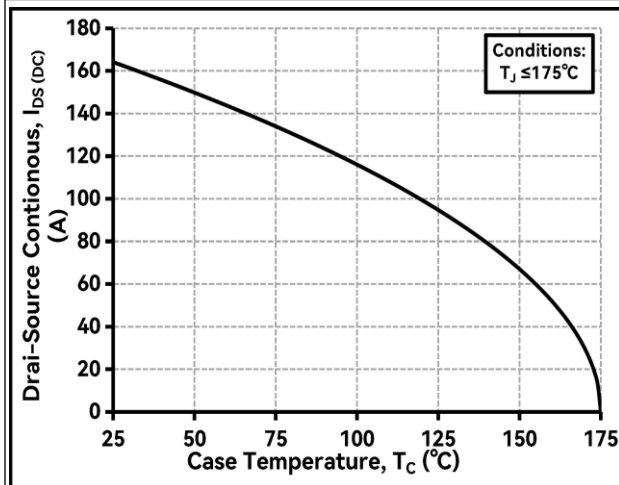


Figure 20: Maximum Power Dissipation Derating vs Case Temperature

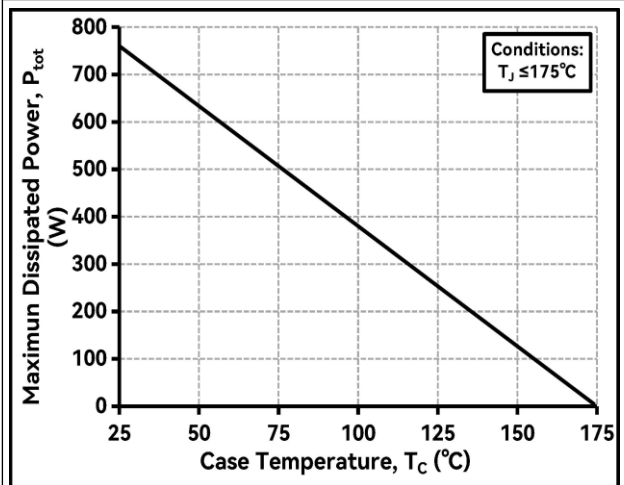


Figure 21: Transient Thermal Impedance (Junction - Case)

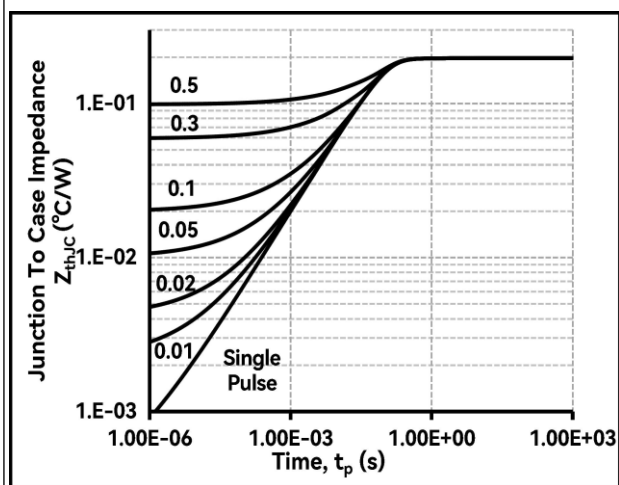


Figure 22: Safe Operating Area

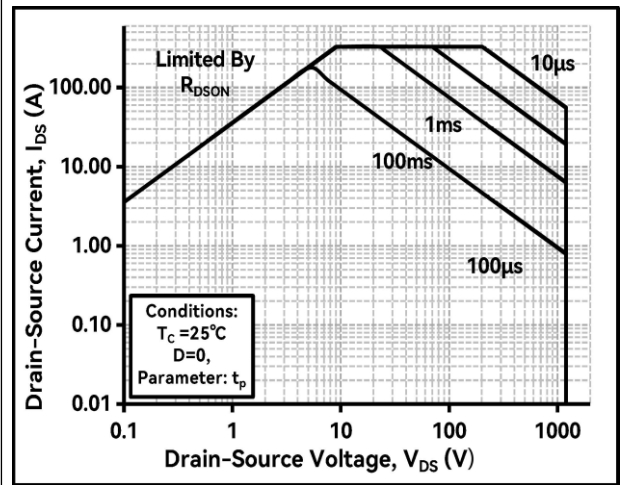


Figure 23: Clamped Inductive Switching Energy vs Drain Current

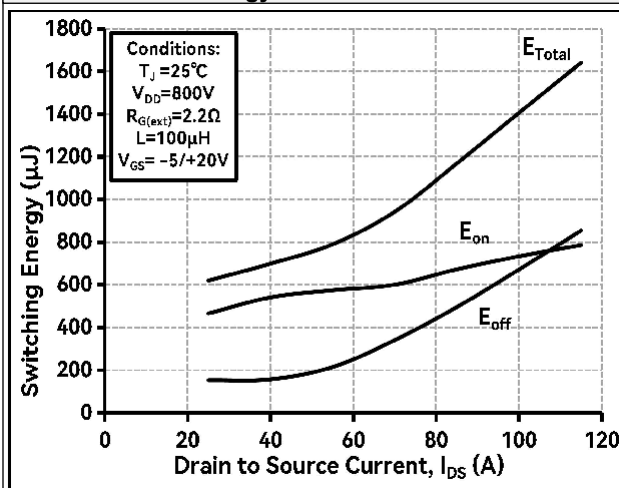
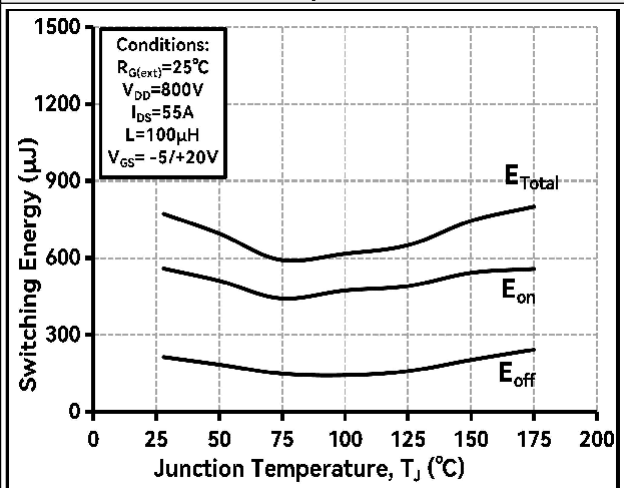


Figure 24: Clamped Inductive Switching Energy vs Temperature



Typical Performance

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

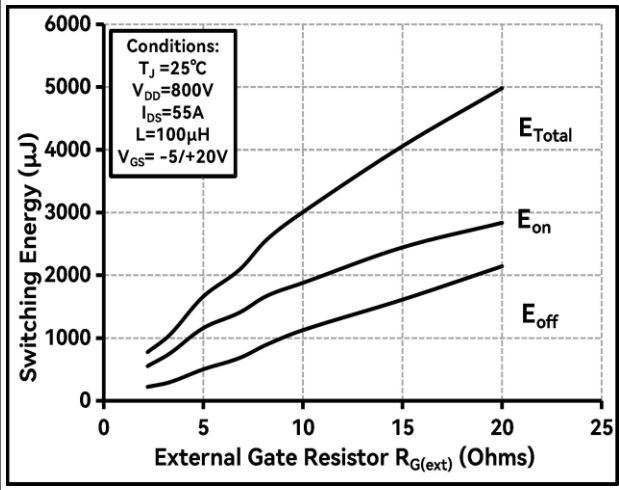
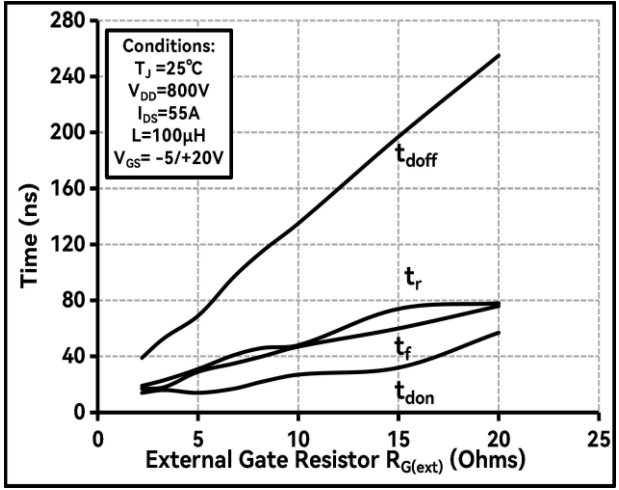


Figure 26: Switching Times vs $R_{G(ext)}$



Typical Performance Characteristics

Figure 27. Inductive Load Switching Test Circuit and Waveforms

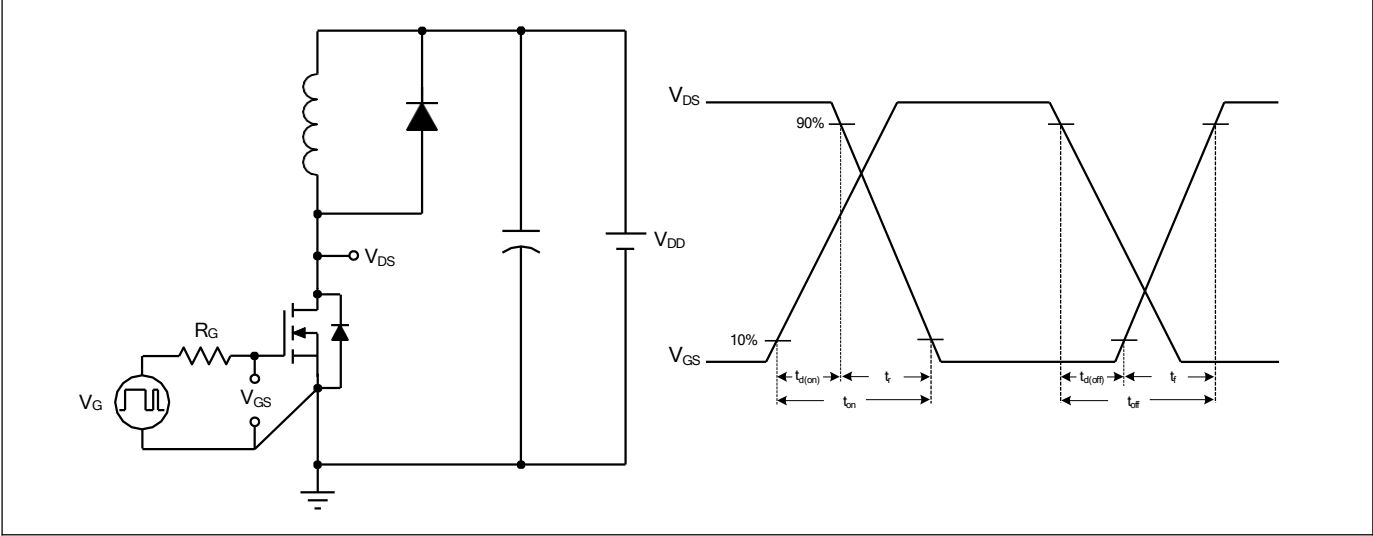
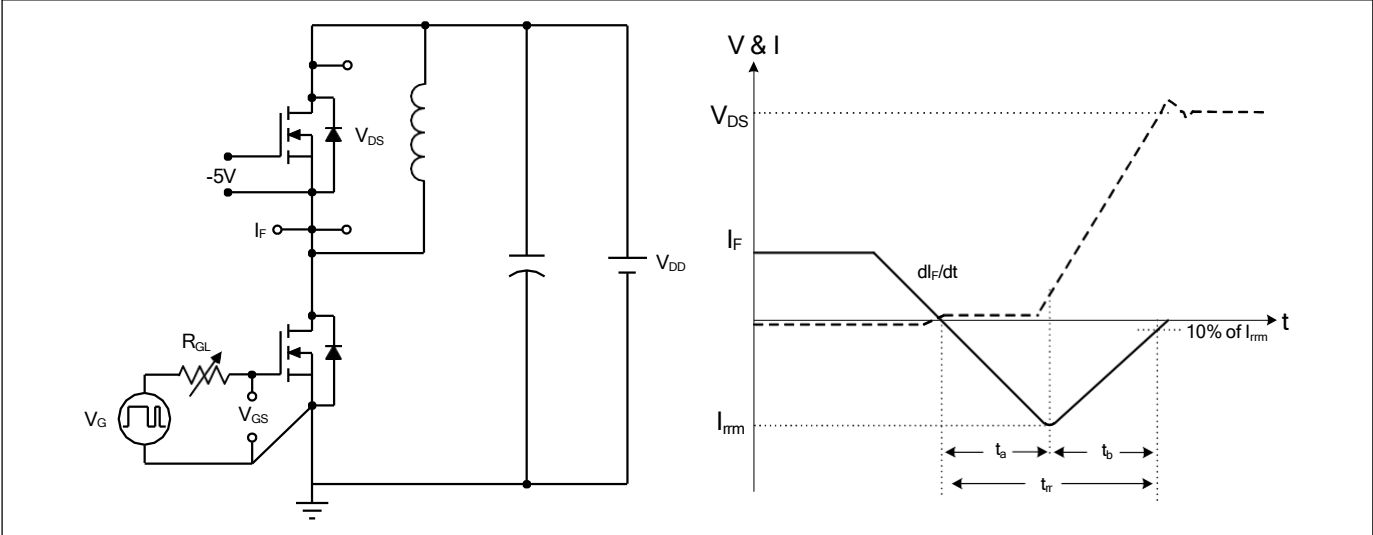
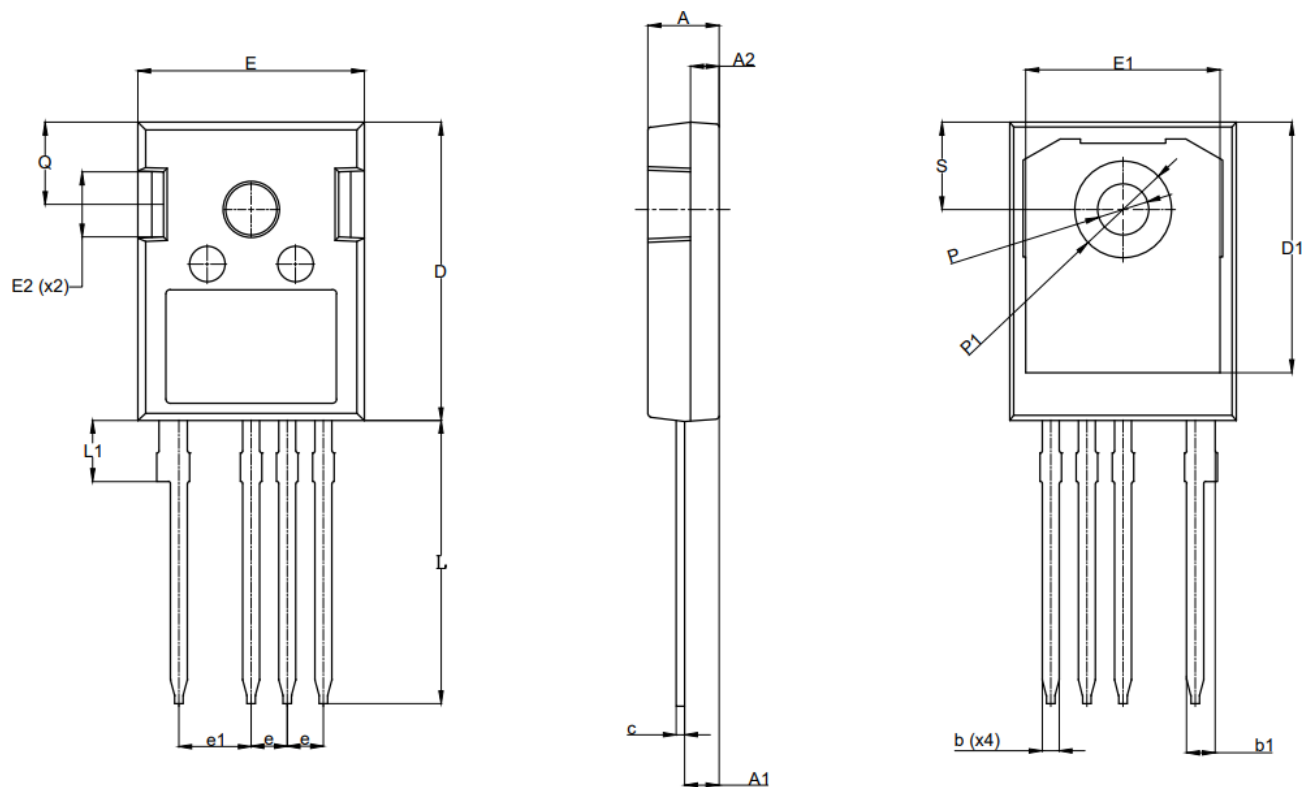


Figure 28. Peak Diode Recovery dv/dt Test Circuit and Waveforms



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

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