BCW170N650T1

N-Channel Silicon Carbide Power MOSFET

1700 V, 9 A , 650 mΩ

bestirpower

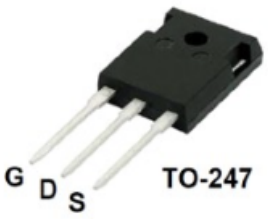
Features

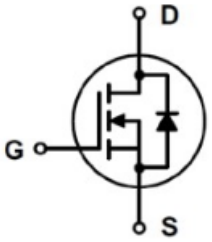
- High blocking voltage
- Low on-resistance with high junction temperature
- High-speed switching with low capacitances
- High-speed switching with low reverse recovery (Qrr)

$BV_{DSS,\ Tc=25℃}$	$I_{D,\ Tc=25℃}$	$R_{DS(on),typ}$	$Q_{g,typ}$
1700 V	**9A**	**650 mΩ**	**13.2 nC**

Benefits

- Higher System Efficiency
- Reduce cooling requirements
- Increased power density
- Enabling higher frequency
- Minimize gate ringing





Applications

- Switch Mode Power Supplies
- DC/DC converters
- Solar Inverters
- Battery Chargers
- Motor Drives

RoHS compliant

HF

Absolute Maximum Ratings (T_C = 25℃ unless otherwisenoted)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		1700	V
V_{GSmax}	Gate to Source Voltage (AC f>1Hz)		-10 / +25	V
V_{GSop}	Recommended Operation Value		-5 / +20	V
I_D	Drain Current	V_{GS}=20V, (T_C = 25℃)	9	A
I_{DM}	Drain Current	Pulsed (Note1)	18	A
P_D	Power Dissipation	(T_C = 25℃)	85	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	℃
T_L	Maximum Lead Temperature for Soldering, 1/8" from Case for 10 Seconds		260	℃

※Note 1 : Limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	1.74	℃/W

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCW170N650T1	BCW170N650T1	TO247-3	Tube	30 units

Electrical Characteristics (T_C = 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	1700			V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 1700 V, V_{GS} = 0 V		0.9	100	μA
I_{GSS}	Gate-Source Leakage Current	V_{GS} = +20 V		2	250	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 0.5 mA	1.8	2.8	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 20 V, I_D = 2 A		550	1000	mΩ
		V_{GS} = 18 V, I_D = 2 A		650		
		V_{GS} = 15 V, I_D = 2 A		780		
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 1000 V *f* = 1.0 MHz ,V_{AC} = 25 mV		183		pF
C_{oss}	Output Capacitance			17.1		
C_{rss}	Reverse Capacitance			2.1		
E_{oss}	Stored Energy in Output Capacitance			10.1		μJ
$Q_{g(tot)}$	Total Gate Charge	V_{DS} = 1200 V, I_D = 2 A V_{GS} = -5 V / +20 V		13.2		nC
Q_{gs}	Gate to Source Charge			5.0		
Q_{gd}	Gate to Drain “Miller” Charge			4.5		
R_G	Internal Gate Resistance	*f* = 1.0 MHz, V_{AC} = 25 mV		25.2		Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{DS} = 1000 V I_D = 2 A V_{GS} = -5 V / +20V $R_{G\ (ext)}$ = 2.5 Ω L = 70 mH		5		ns
t_r	Turn-On Rise Time			17		
$t_{d(off)}$	Turn-Off Delay Time			13		
t_f	Turn-Off Fall Time			55.6		
E_{on}	Turn-on Switching Energy			170		μJ
E_{off}	Turn-off Switching Energy			68		
Source-Drain Diode Characteristics						
I_S	Maximum Continuous Diode Forward Current				4	A
V_{SD}	Diode Forward Voltage	V_{GS} = 0 V, I_S = 1 A		4.0		V
I_{rrm}	Peak Reverse Recovery Current	V_{DS} = 1200 V, I_S = 2 A, V_{GS}=-5V, dif/dt = 1200 A/μs		3		A
t_{rr}	Reverse Recovery Time			33		ns
Q_{rr}	Reverse Recovery Charge			32		nC

Typical Performance Characteristics

Figure 1. Typical Output Characteristics T_J = -55℃

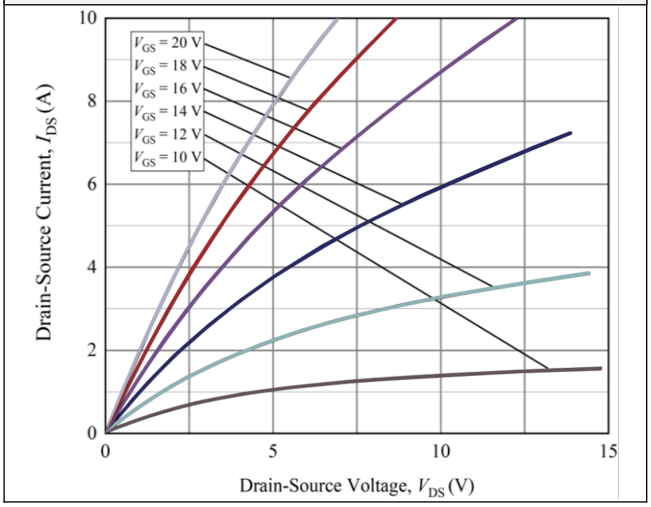


Figure 2. Typical Output Characteristics T_J = 25℃

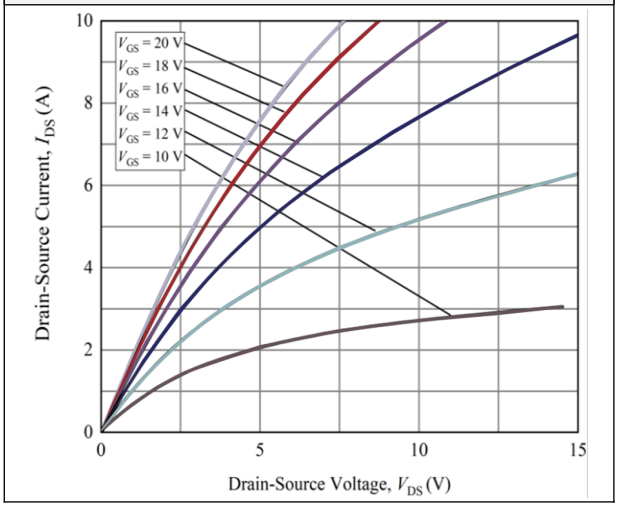


Figure 3. Typical Output Characteristics T_J = 175℃

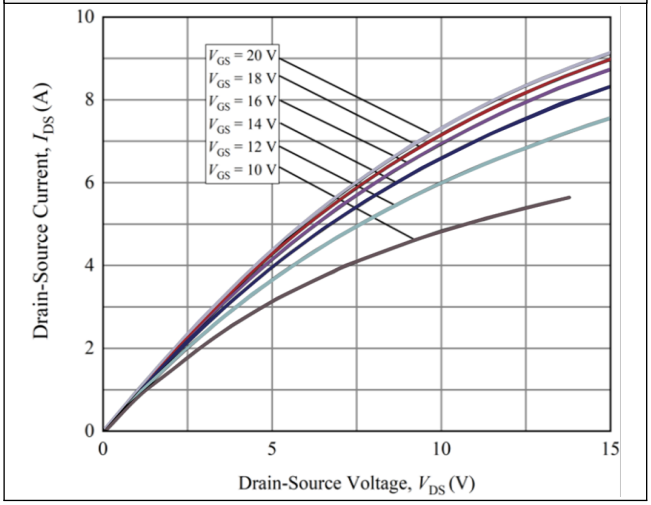


Figure 4. Typical Transfer Characteristics for Various Temperatures

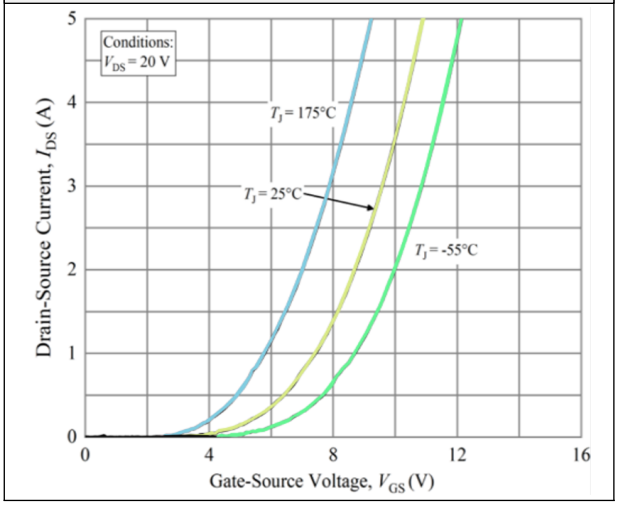


Figure 5. Normalized On-Resistance vs. Temperature

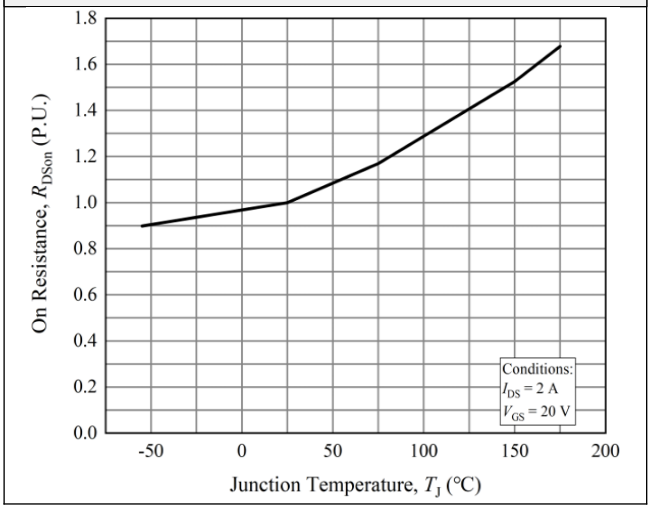
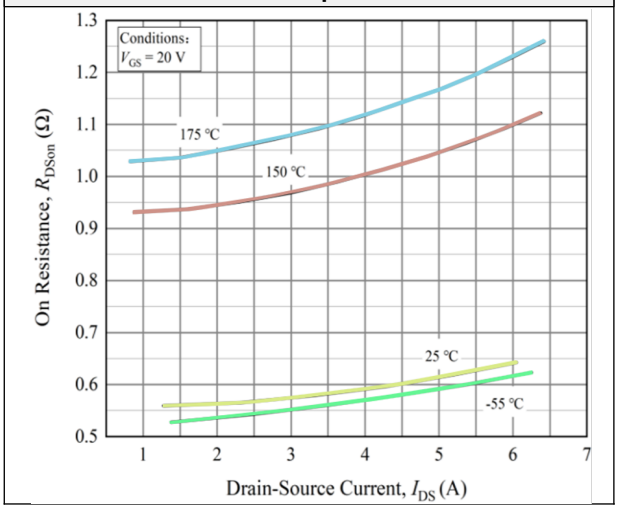


Figure 6. On-Resistance vs. Drain Current for Various Temperatures



Typical Performance Characteristics

Figure 7. On-Resistance vs. Temperature for Gate Various Voltage

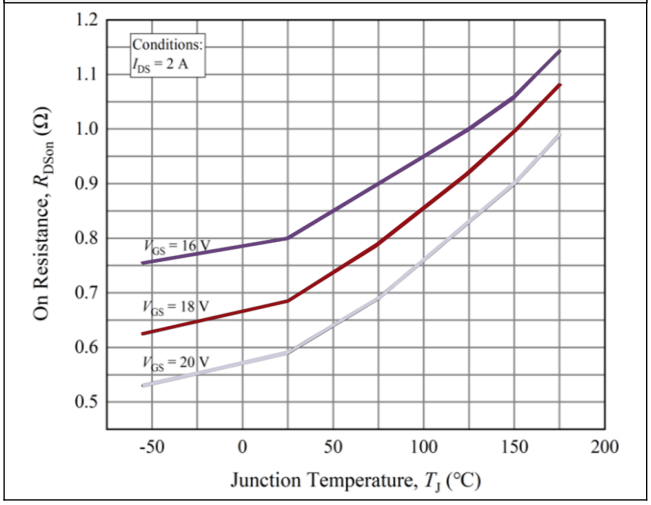


Figure 8. Typical Body Diode Characteristics
T_J = -55℃

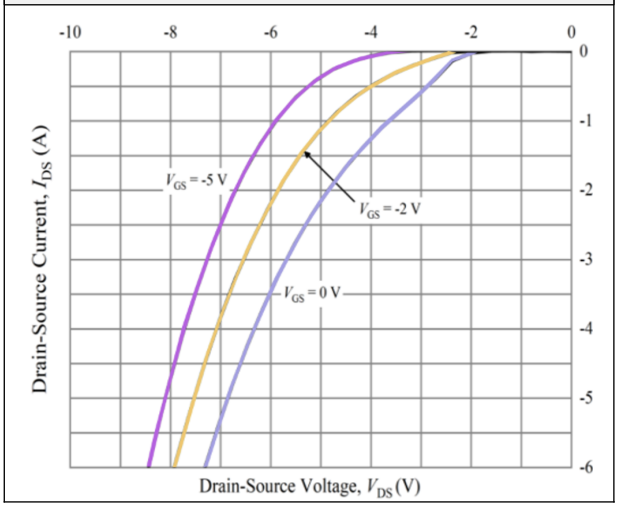


Figure 9. Typical Body Diode Characteristics
T_J = 25℃

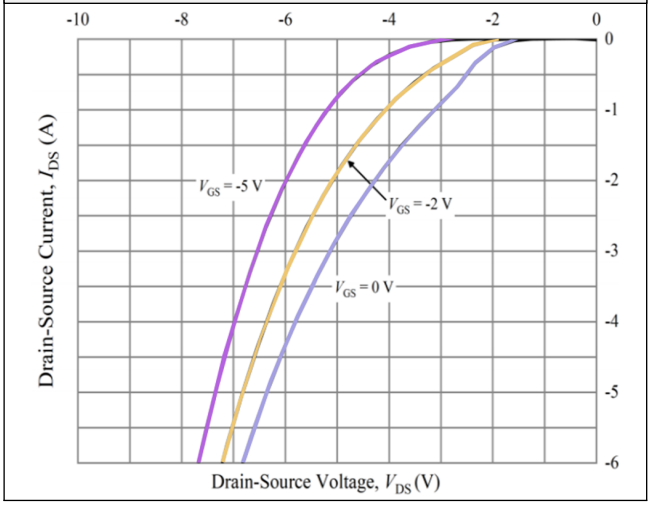


Figure 10. Typical Body Diode Characteristics
T_J = 175℃

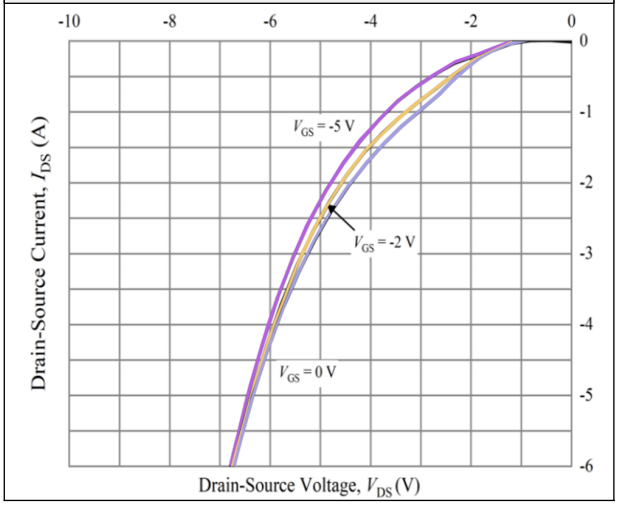


Figure 11. Typical Threshold Voltage vs. Temperature

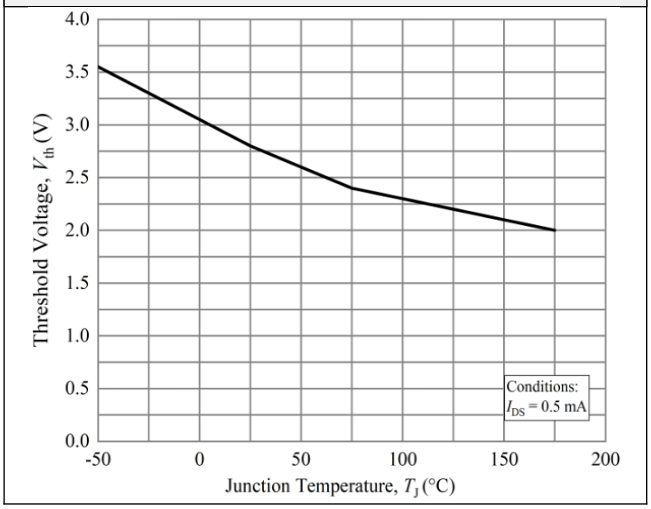
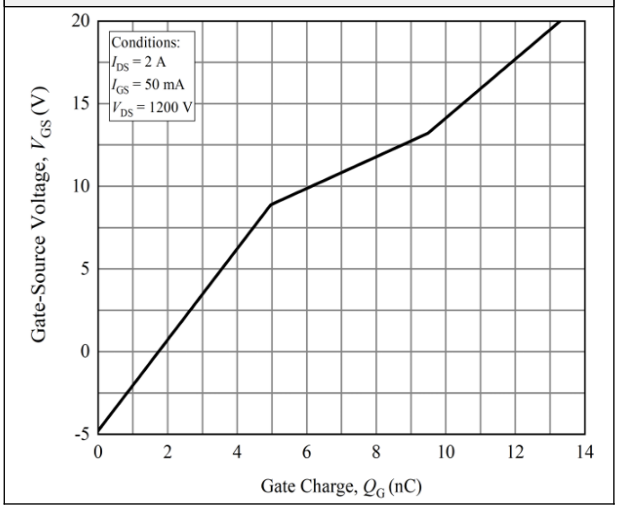


Figure 12. Typical Gate Charge Characteristics at T_J = 25 ℃



Typical Performance Characteristics

Figure 13. Typical 3rd Quadrant Characteristics
TJ = -55 ℃

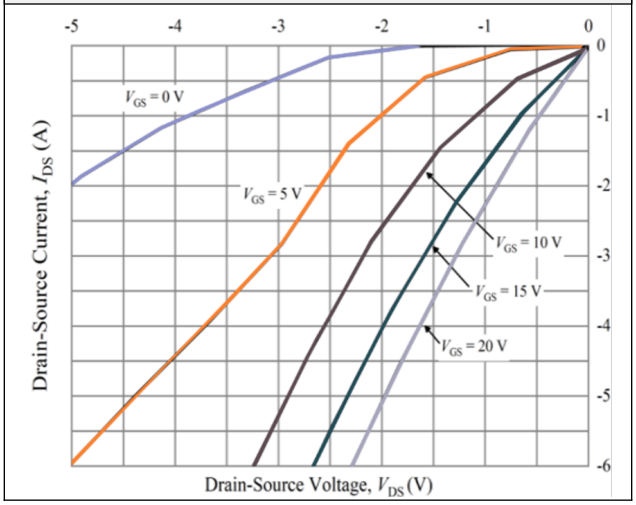


Figure 14. Typical 3rd Quadrant Characteristics
TJ = 25 ℃

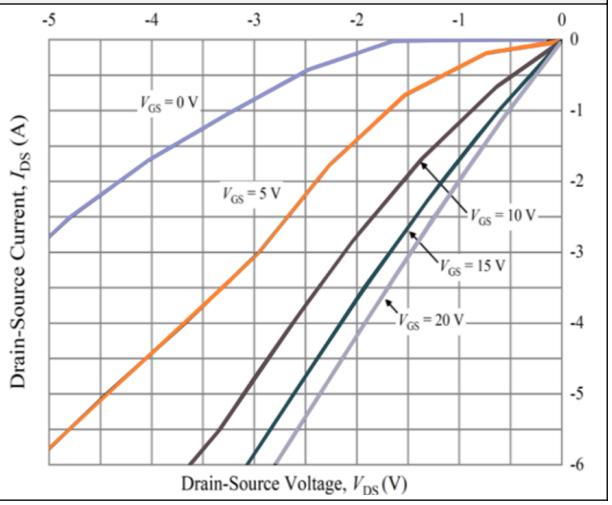


Figure 15: Typical 3rd Quadrant Characteristics
TJ = 175 ℃

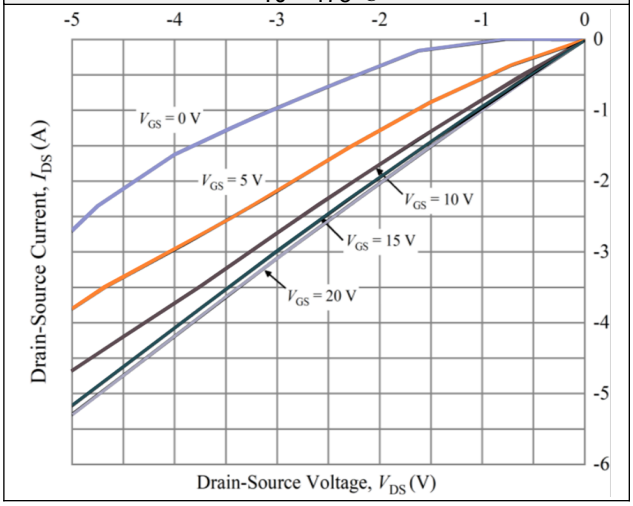


Figure 16. Typical Output Capacitor Stored Energy

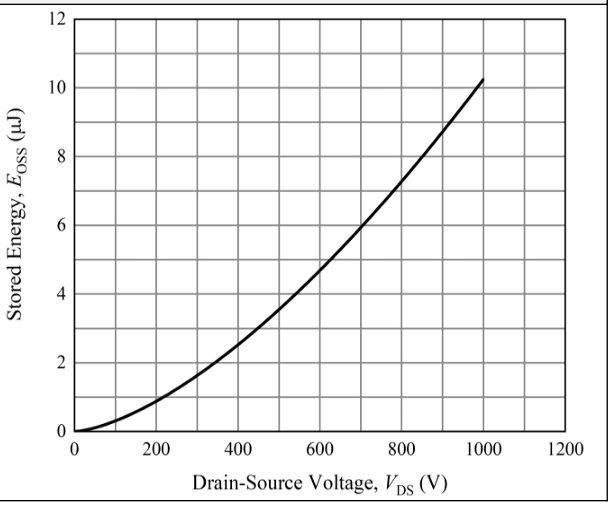


Figure 17. Typical Capacitances vs. Drain-Source Voltage

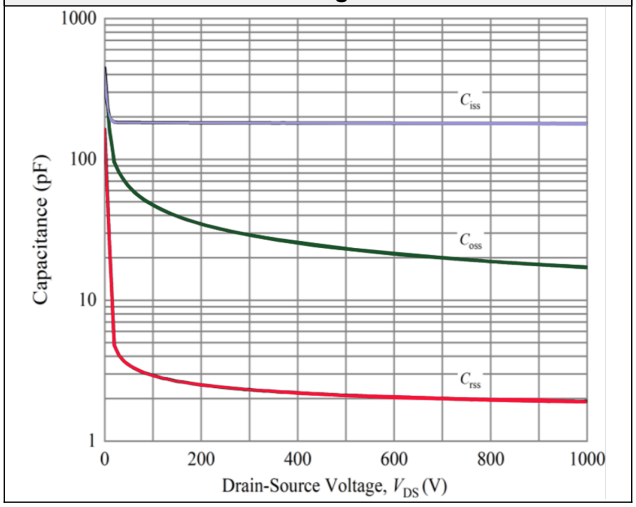
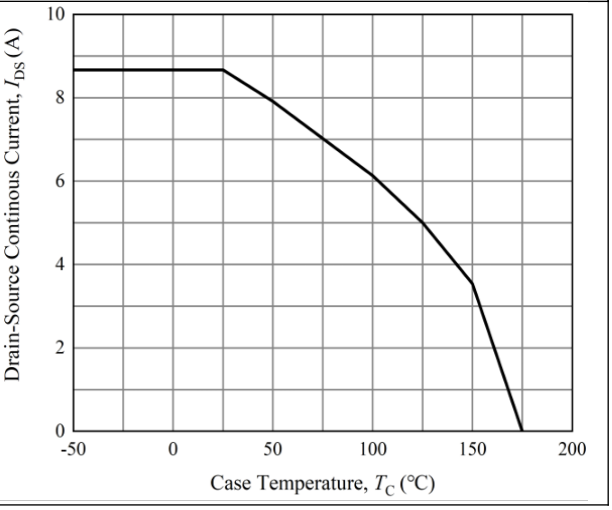


Figure 18. Continuous Drain Current Derating vs. Case Temperature



Typical Performance Characteristics

Figure 19: Power Dissipation Derating Curve

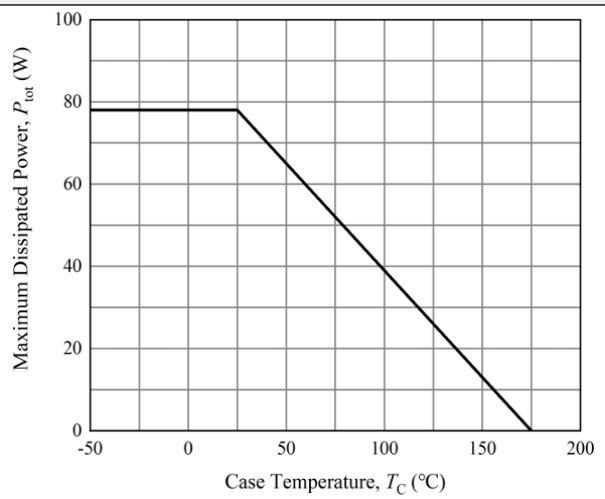


Figure 20: Typical Transient Thermal Impedance (Junction – Case) with Duty Cycle

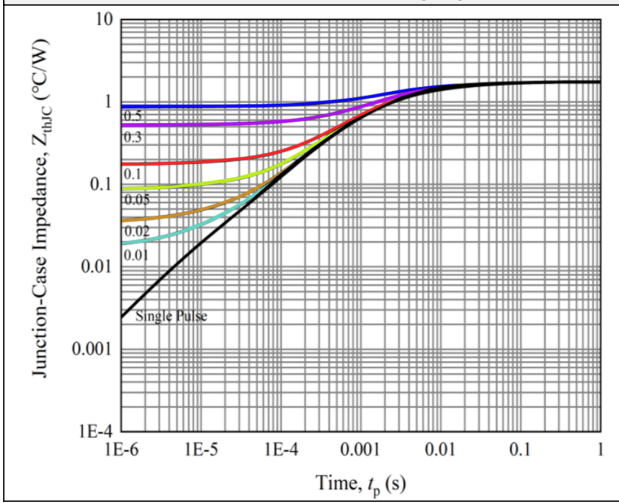


Figure 21: Safe Operate Area

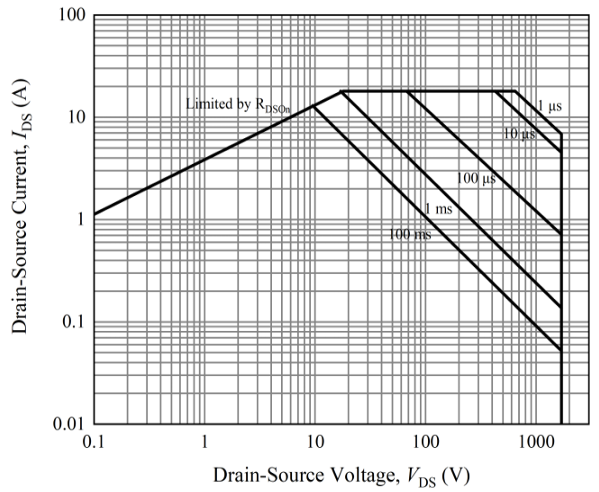


Figure 22: Clamped Inductive Switching Energy vs. Drain Current(V_{DD} = 1000 V)

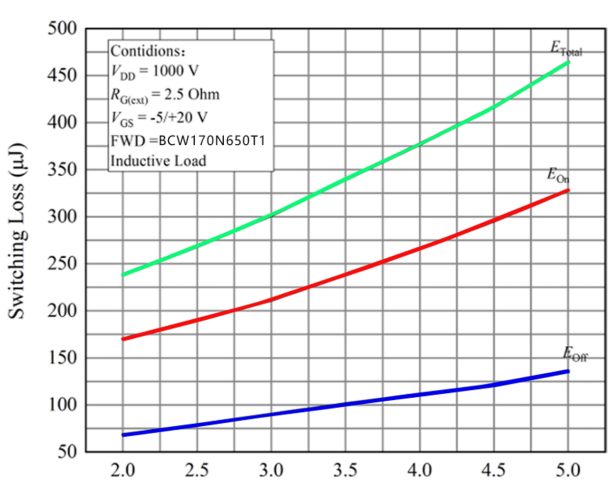


Figure 23: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

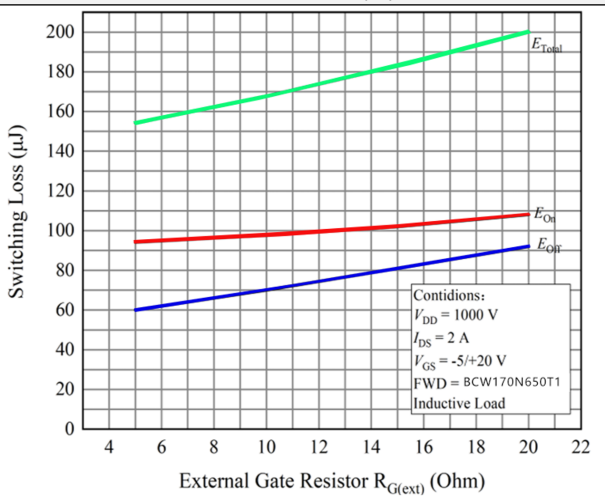
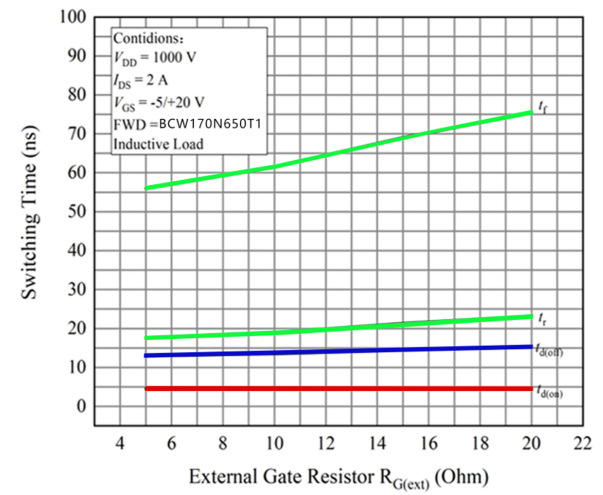


Figure 24: Switching Times vs. $R_{G(ext)}$



Typical Performance Characteristics

Figure 25: Resistive Switching Time Description

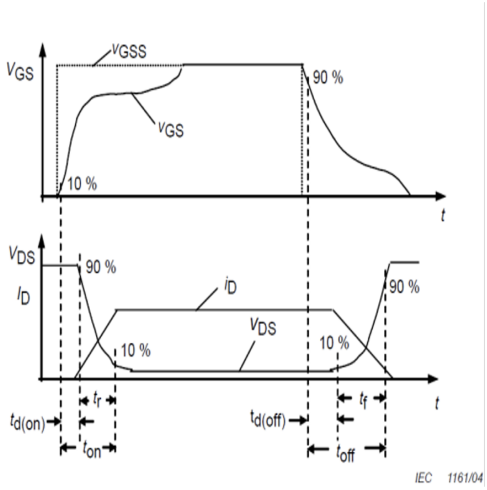
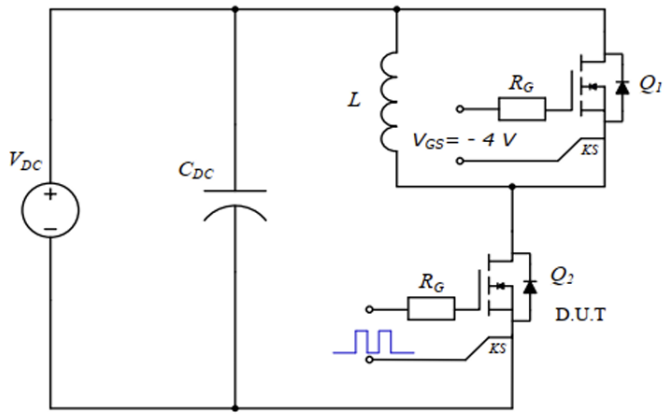
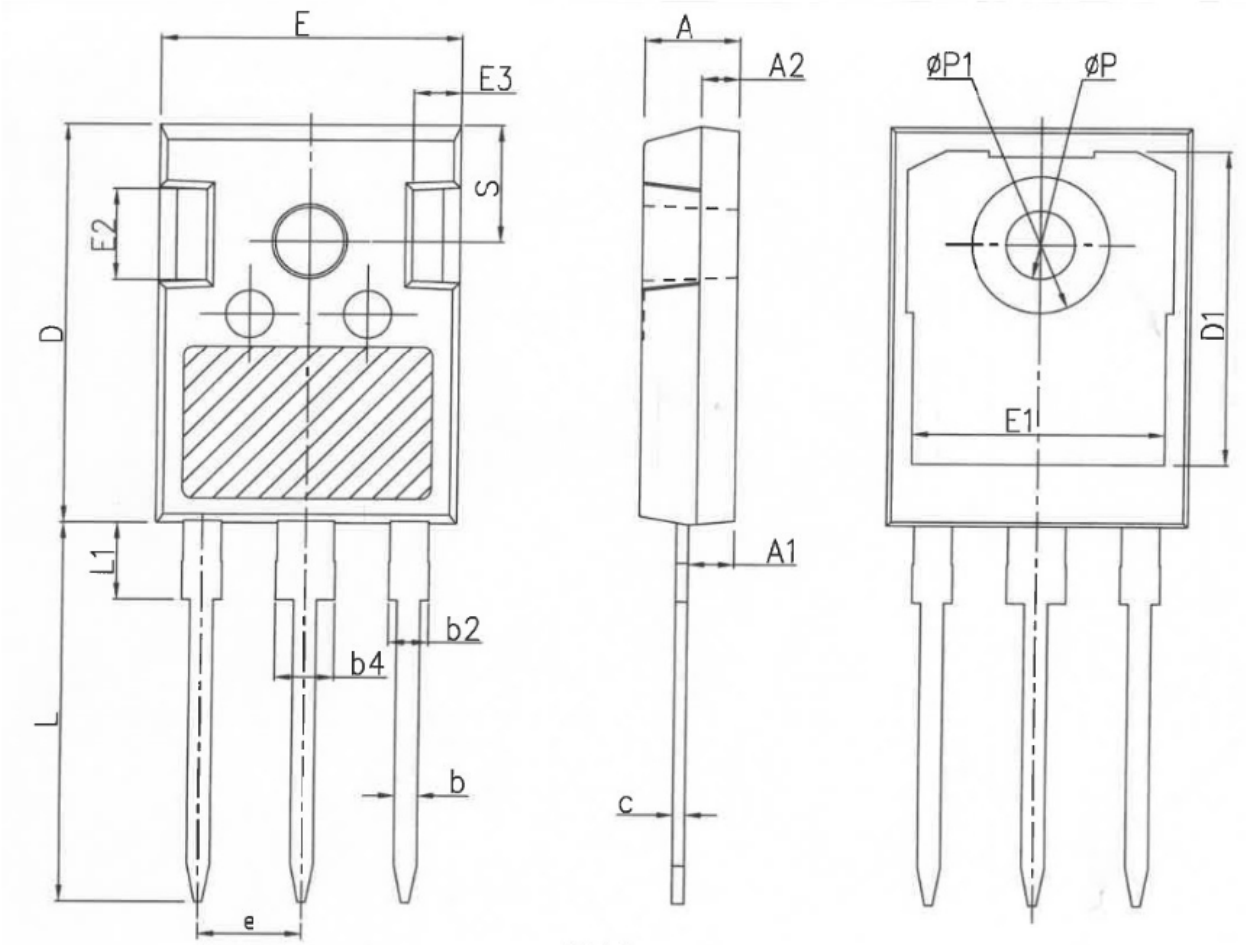


Figure 26: Clamped Inductive Switching Waveform Test Circuit



Package Outlines

TO247-3



COMMON DIMENSIONS

SYMBOL	mm		
	MIN	NOM	MAX
A	4.80	5.00	5.20
A1	2.21	2.41	2.59
A2	1.85	2.00	2.15
b	1.11	1.21	1.36
b2	1.91	2.01	2.21
b4	2.91	3.01	3.21
c	0.51	0.61	0.75
D	20.70	21.00	21.30
D1	16.25	16.55	16.85
E	15.50	15.80	16.10
E1	13.00	13.30	13.60
E2	4.80	5.00	5.20
E3	2.30	2.50	2.70
e	5.44BSC		
L	19.62	19.92	20.22
L1	–	–	4.30
ΦP	3.40	3.60	3.80
ΦP1	–	–	7.30
S	6.15BSC		

* Dimensions in millimeters

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