BCBF170N650T1

N-Channel Silicon Carbide Power MOSFET

1700 V, 8 A , 650 mΩ

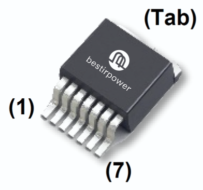
Features

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

$BV_{DSS, Tc=25℃}$	$I_{D, Tc=25℃}$	$R_{DS(on),typ}$	$Q_{g,typ}$
1700 V	**8A**	**650 mΩ**	**13.2 nC**

Benefits

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



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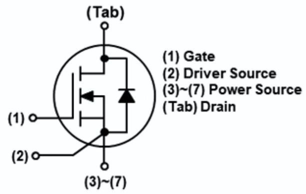


Applications

- DC/DC converters
- Solar Inverters
- Battery Chargers
- Motor Drives
- Auxiliary power supply

Absolute Maximum Ratings (T_J = 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}=15V，(T_C = 25℃)	8	A
		V_{GS}=15V，(T_C = 100℃)	5.7	
		V_{GS}=20V，(T_C = 25℃)	8.6	
I_{DM}	Drain Current	Pulsed (Note1)	17	A
P_D	Power Dissipation	(T_C = 25℃)	78	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	℃

※Note 1 : Limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{θJC}$	Thermal Resistance, Junction to Case, Max.	1.92	℃/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	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_{DS} = 15 V, I_D = 2A	-	750	-	

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 / +20V	-	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 open drain	-	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		-	-	8	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℃

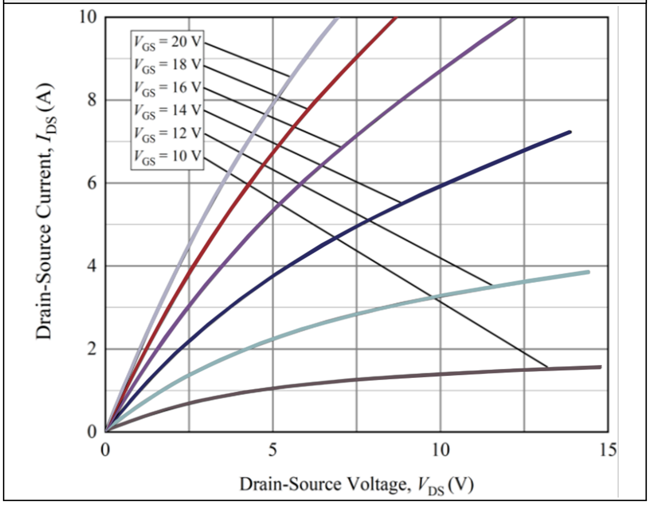


Figure 2. Typical Output Characteristics T_J = 25℃

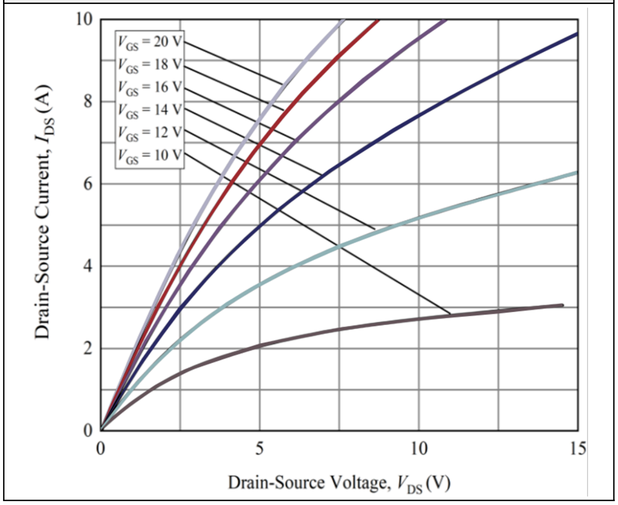


Figure 3. Typical Output Characteristics T_J = 175℃

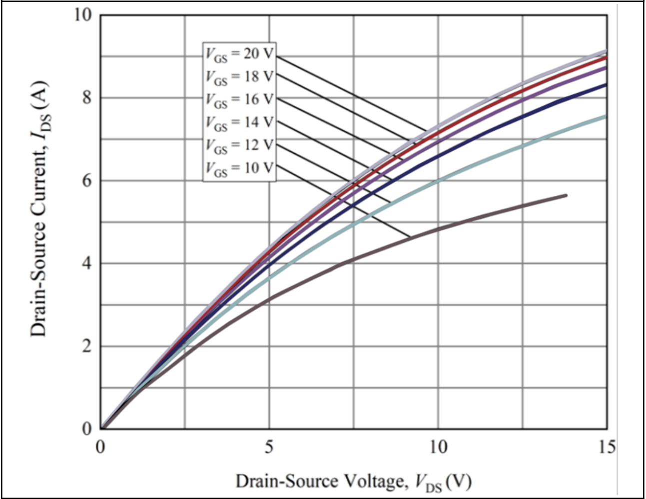


Figure 4. Typical Transfer Characteristics for Various Temperatures

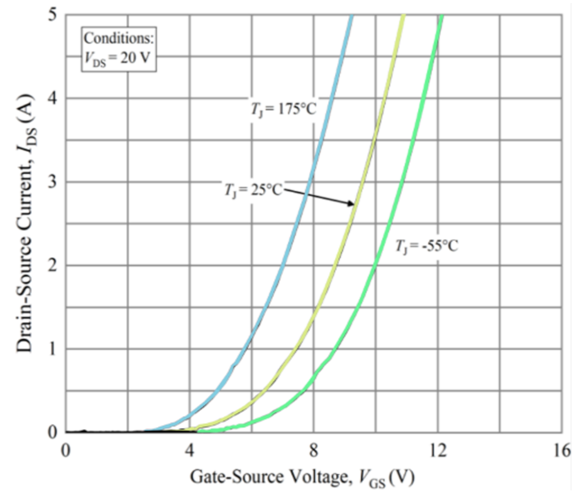


Figure 5. Normalized On-Resistance vs. Temperature

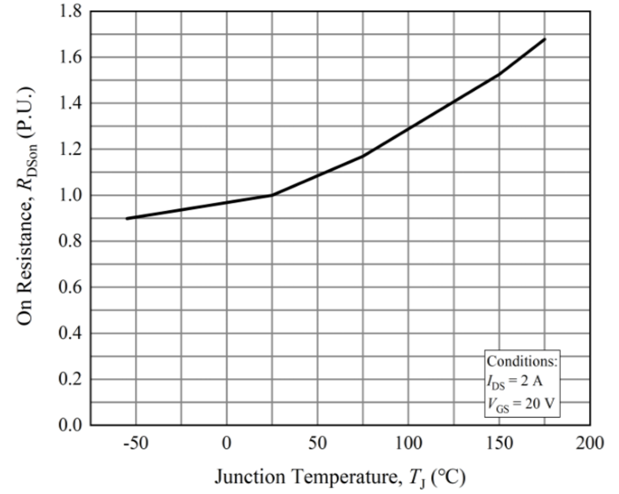
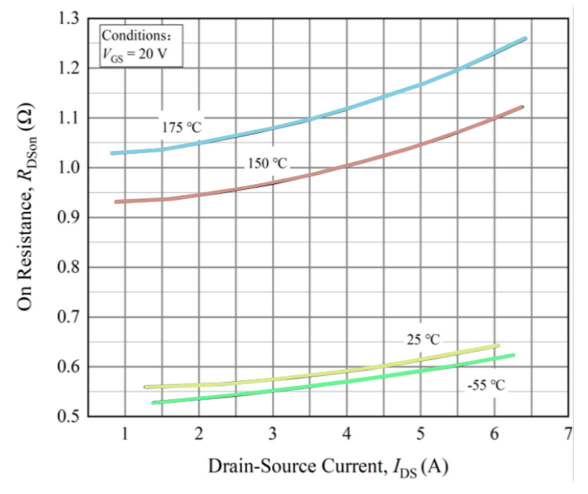


Figure 6. On-Resistance vs. Drain Current for Various Temperatures



Typical Performance Characteristics

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

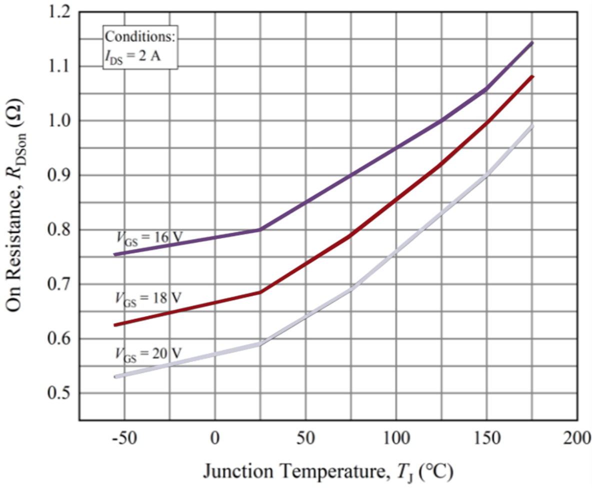


Figure 8. Typical Body Diode Characteristics
T_J = -55℃

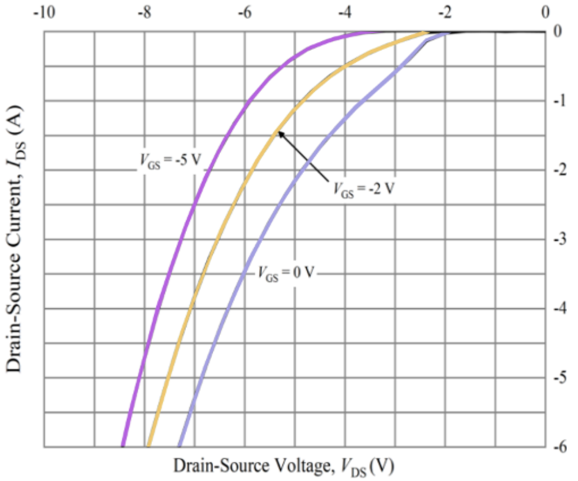


Figure 9. Typical Body Diode Characteristics
T_J = 25℃

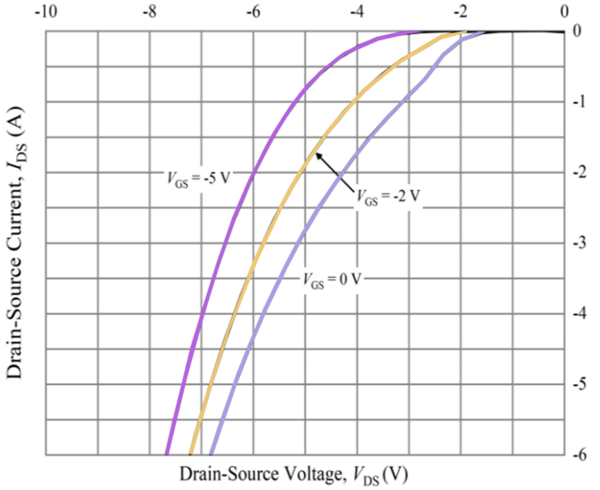


Figure 10. Typical Body Diode Characteristics
T_J = 175℃

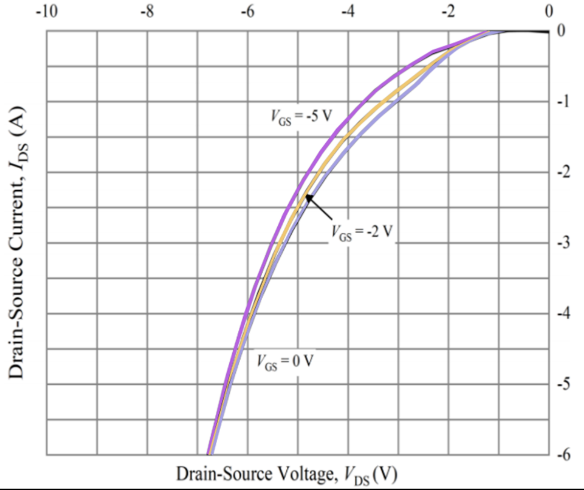


Figure 11. Typical Threshold Voltage vs. Temperature

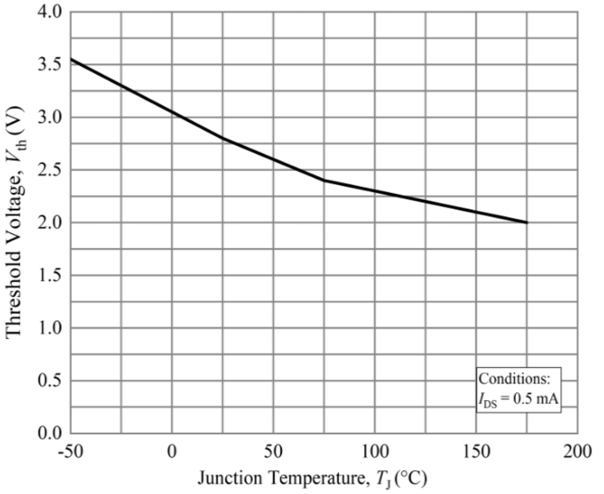
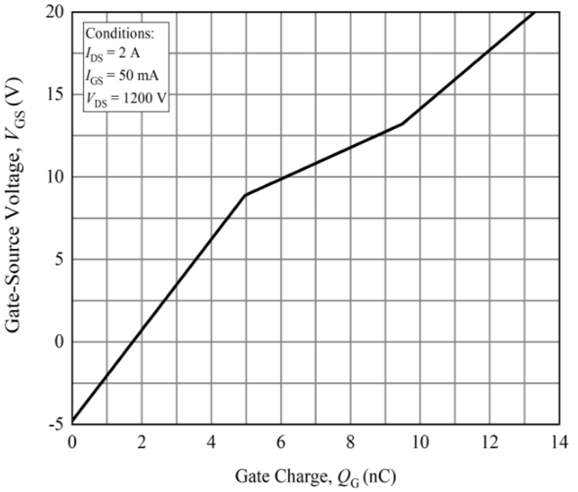


Figure 12. Typical Gate Charge Characteristics at T_J = 25 ℃



Typical Performance Characteristics

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

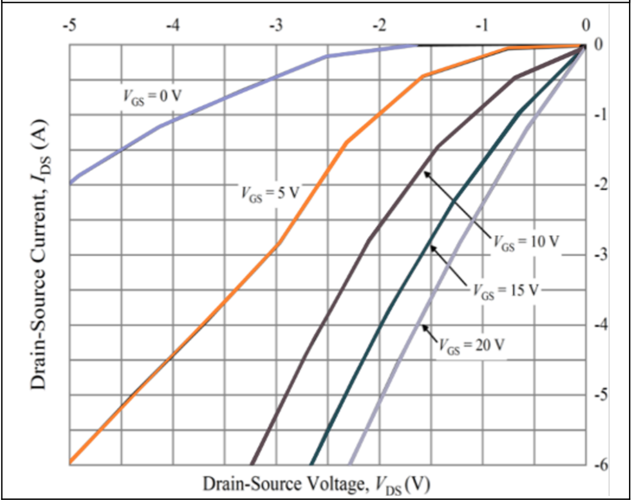


Figure 14. Typical 3rd Quadrant Characteristics
TJ = 25 ℃

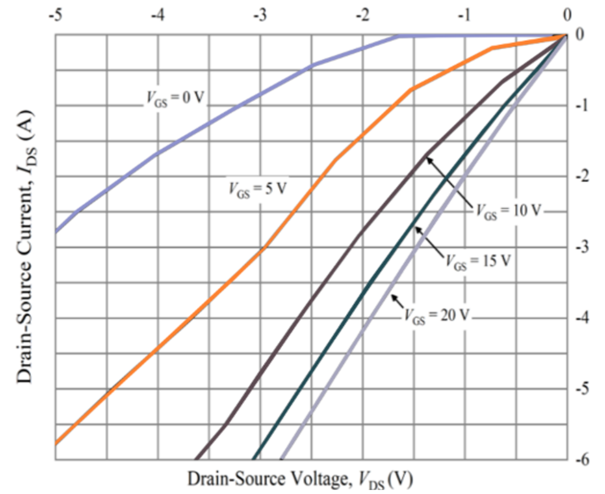


Figure 15: Typical 3rd Quadrant Characteristics
TJ = 175 ℃

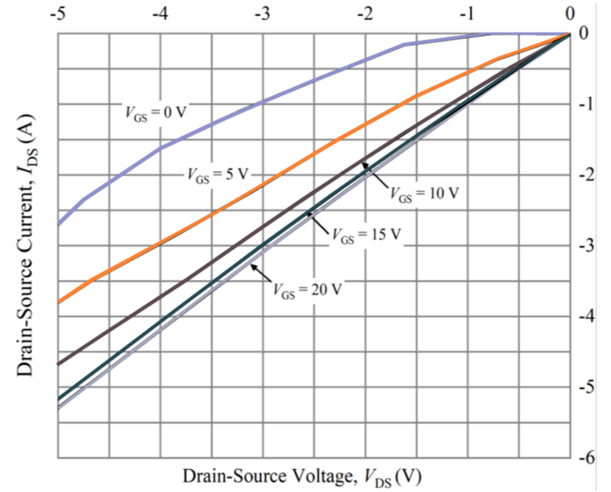


Figure 16. Typical Output Capacitor Stored Energy

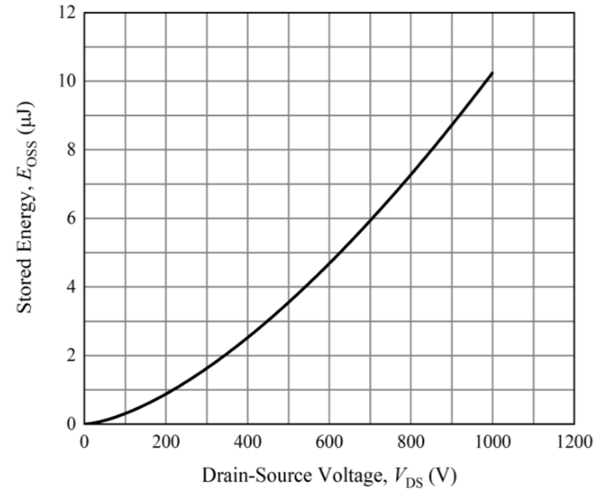


Figure 17. Typical Capacitances vs. Drain-Source Voltage

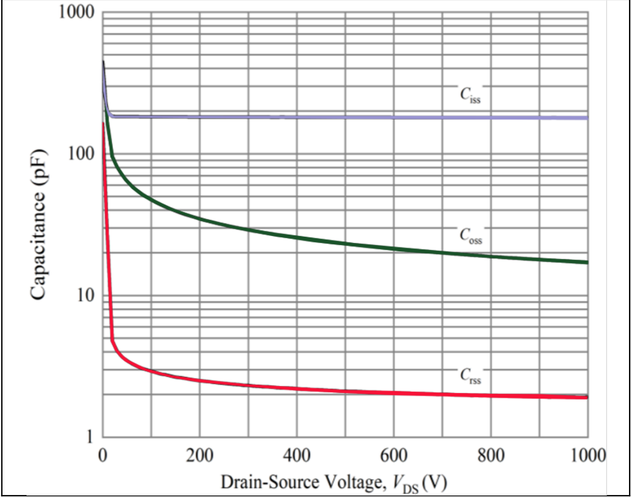
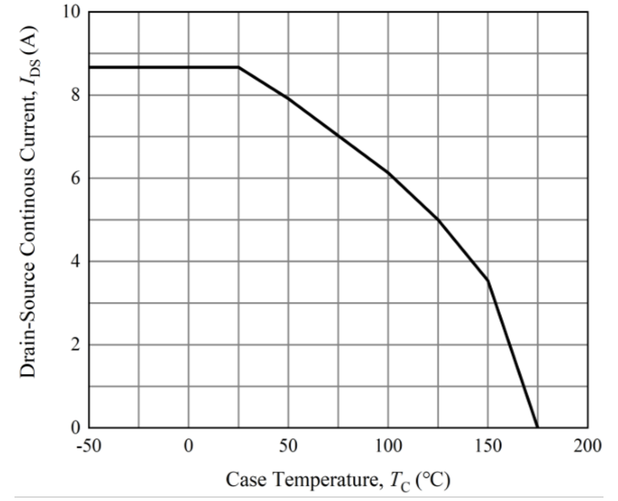


Figure 18. Continuous Drain Current Derating vs. Case Temperature



Typical Performance Characteristics

Figure 19: Power Dissipation Derating Curve

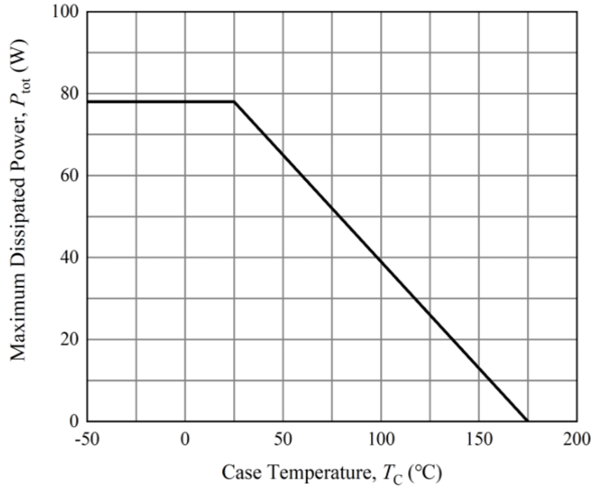


Figure 20: Typical Transient Thermal Impedance (Junction – Case) with Duty Cycle

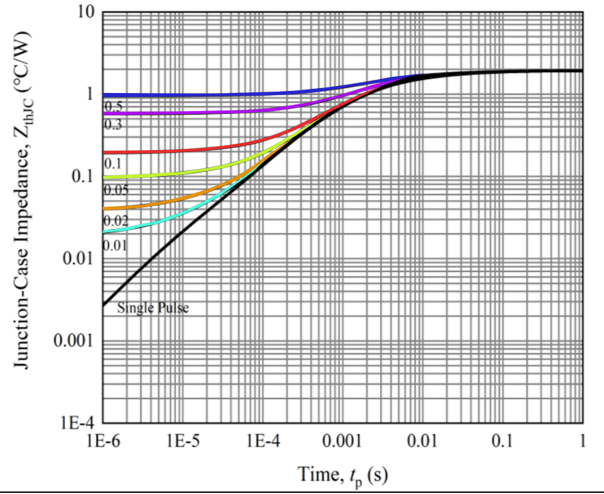


Figure 21: Safe Operate Area

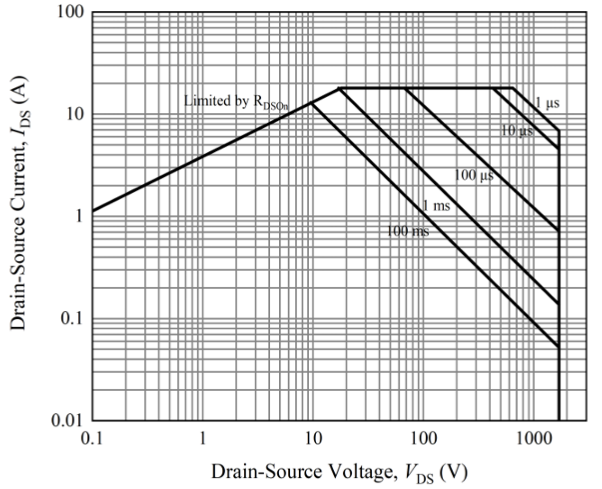


Figure 22: Clamped Inductive Switching Energy vs. Drain Current(V_{DD} = 1000 V)

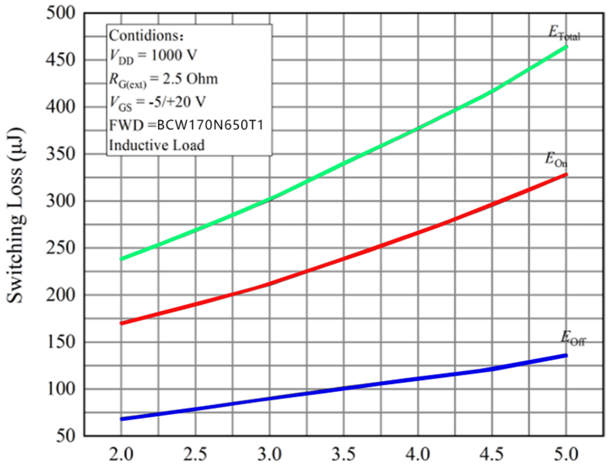


Figure 23: Clamped Inductive Switching Energy vs. $R_{G(ext)}$

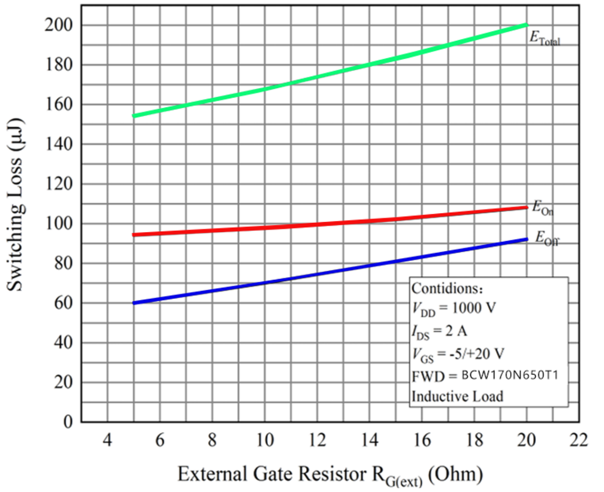
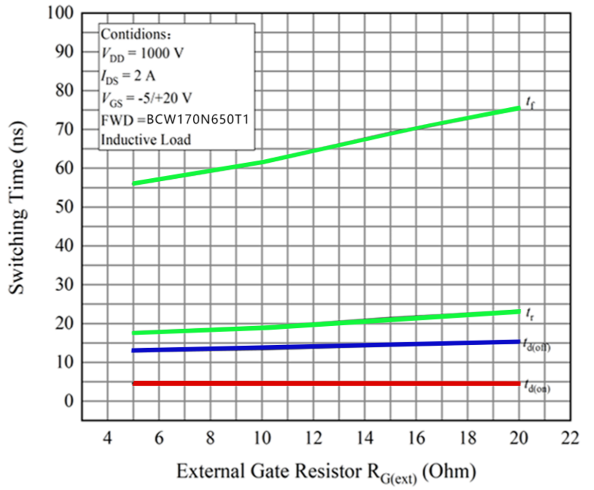


Figure 24: Switching Times vs. $R_{G(ext)}$



Typical Performance Characteristics

Figure 25: Resistive Switching Time Description

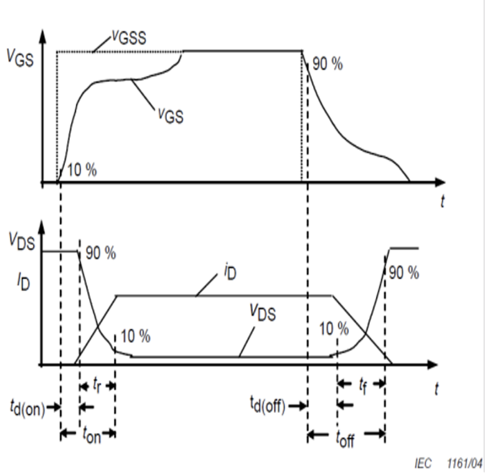
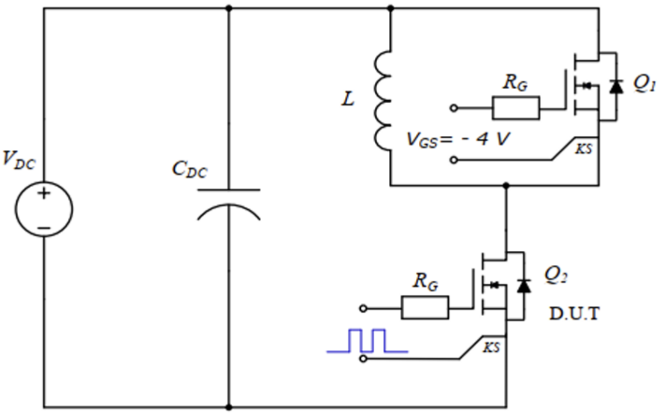
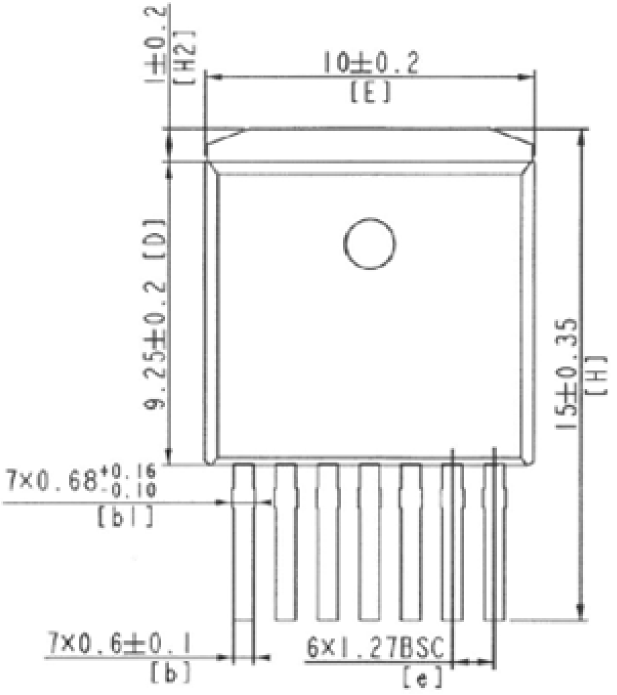


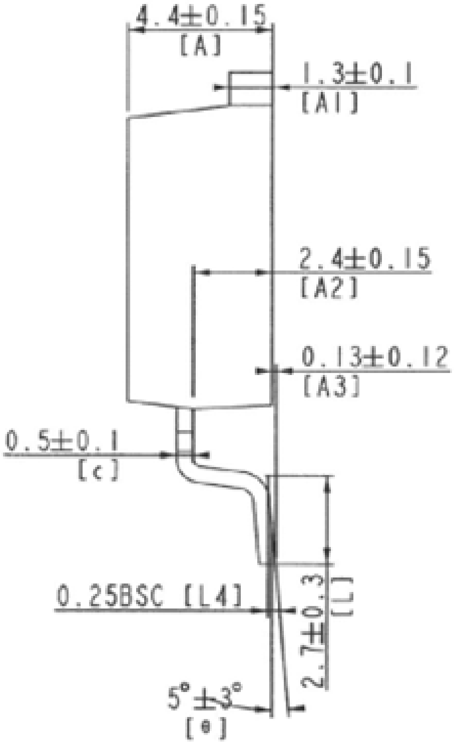
Figure 26: Clamped Inductive Switching Waveform Test Circuit

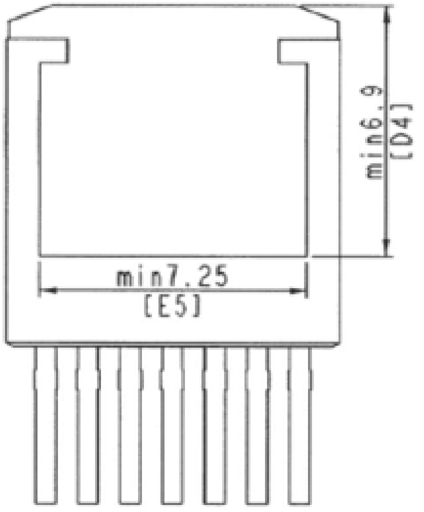


Package Outlines

TO263-7







* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCBF170N650T1	BCBF170N650T1	TO263-7	Tape & Reel	800 units

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