

BCW170N650T1

N-Channel Silicon Carbide Power MOSFET

1700 V, 9 A , 650 mΩ



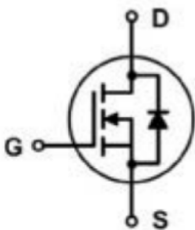
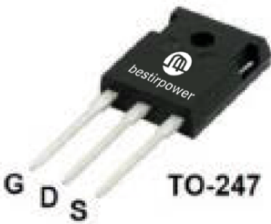
Features

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

$BV_{DSS}, T_c=25^{\circ}C$	$I_D, T_c=25^{\circ}C$	$R_{DS(on),typ}$	$Q_{g,typ}$
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
- Auxiliary power supply



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

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°C)	9	A
		V _{GS} =20V, (T _C = 100°C)	6	
I _{DM}	Drain Current	Pulsed (Note1)	18	A
P _D	Power Dissipation (T _C = 25°C)		85	W
T _J , T _{STG}	Operating and Storage Temperature Range		-55 to 175	°C
T _L	Maximum Lead Temperature for Soldering, 1/8" from Case for 10 Seconds		260	°C

※Note 1 : Limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
R _{θJC}	Thermal Resistance, Junction to Case, Max.	1.74	°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	$V_{GS} = 0\text{ V}, I_D = 100\text{ }\mu\text{A}$	1700	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 1700\text{ V}, V_{GS} = 0\text{ V}$	-	0.9	100	μA
I_{GSS}	Gate-Source Leakage Current	$V_{GS} = +20\text{ V}$	-	2	250	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 0.5\text{ mA}$	1.8	2.8	4.0	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 20\text{ V}, I_D = 2\text{ A}$	-	550	1000	mΩ
		$V_{GS} = 18\text{ V}, I_D = 2\text{ A}$	-	650	-	
		$V_{GS} = 15\text{ V}, I_D = 2\text{ A}$	-	780	-	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 1000\text{ V}$ $f = 1.0\text{ MHz}, V_{AC} = 25\text{ mV}$	-	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	$V_{DS} = 1200\text{ V}, I_D = 2\text{ A}$ $V_{GS} = -5\text{ V} / +20\text{ V}$	-	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	$f = 1.0\text{ MHz}, V_{AC} = 25\text{ mV}$ open drain	-	25.2	-	Ω

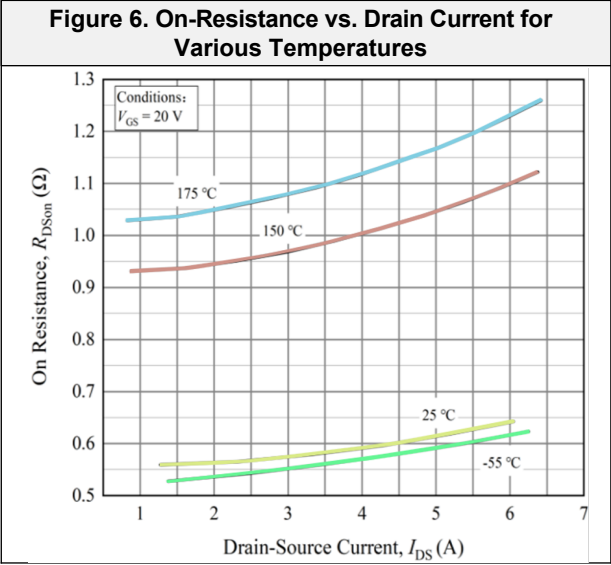
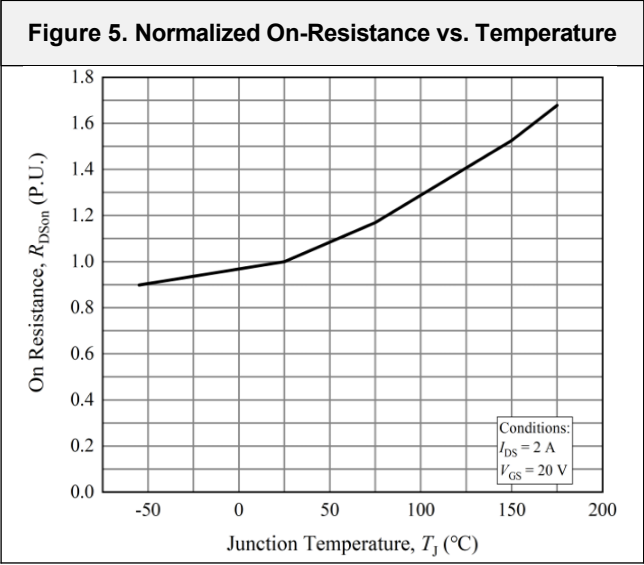
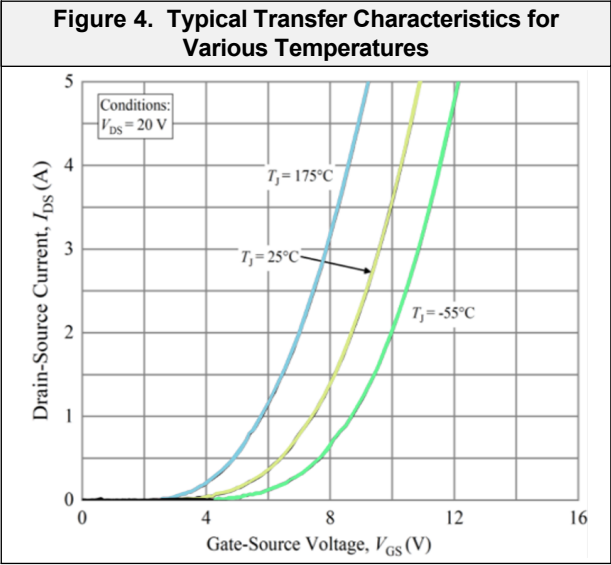
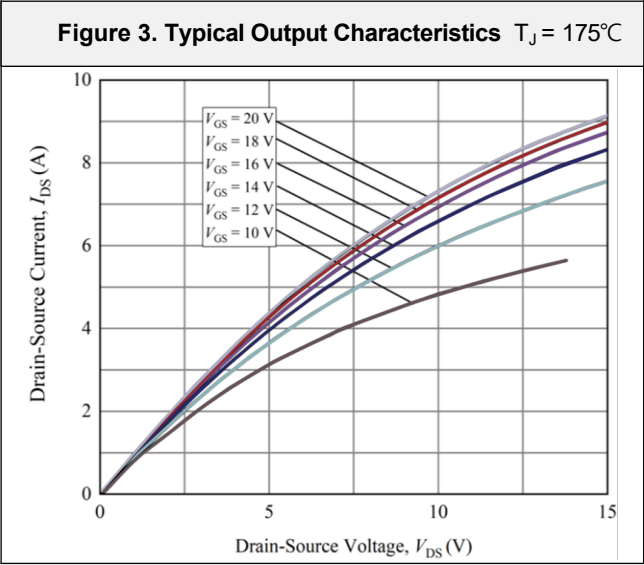
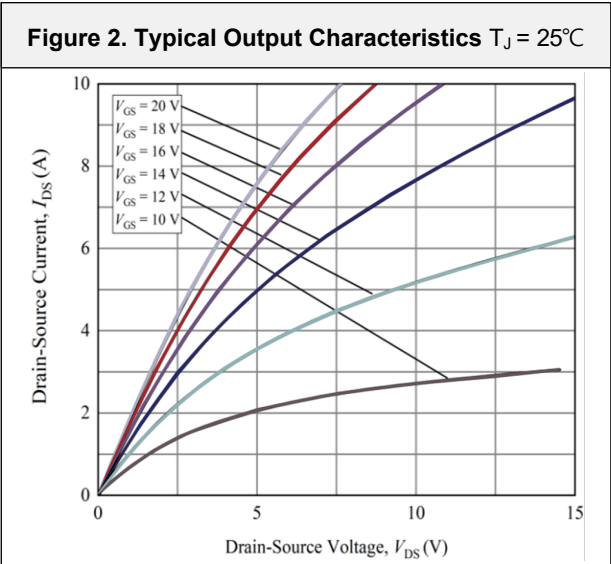
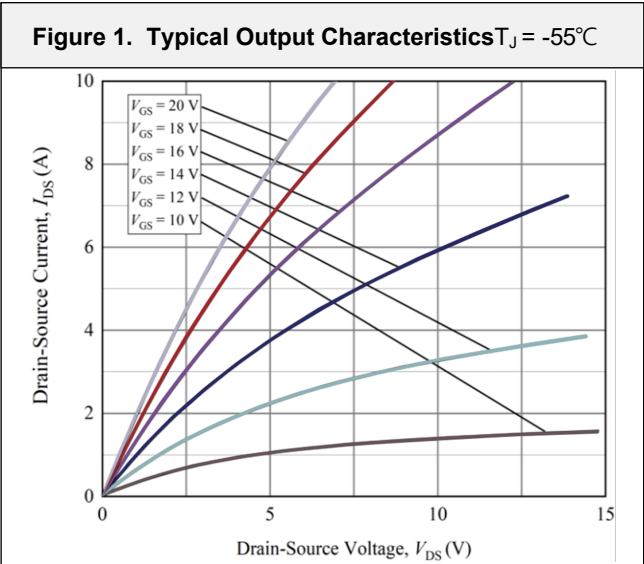
Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 1000\text{ V}$ $I_D = 2\text{ A}$ $V_{GS} = -5\text{ V} / +20\text{ V}$ $R_{G(ext)} = 2.5\text{ }\Omega$ $L = 70\text{ mH}$	-	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	-	

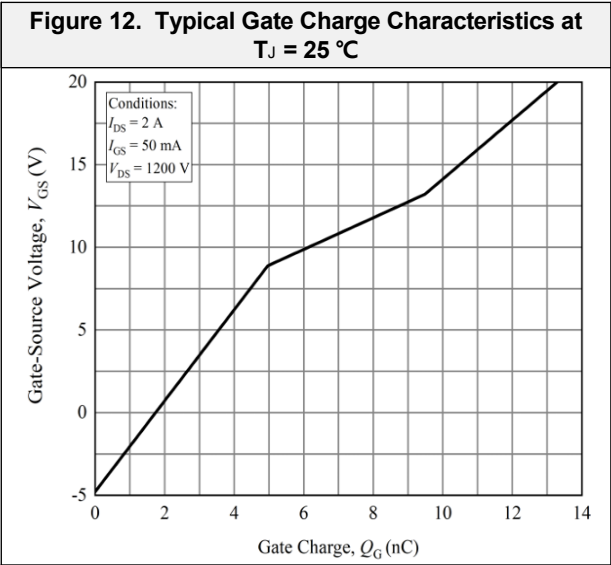
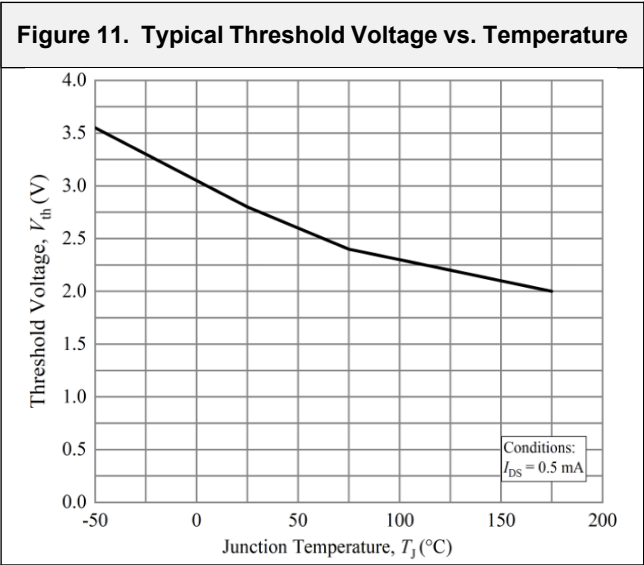
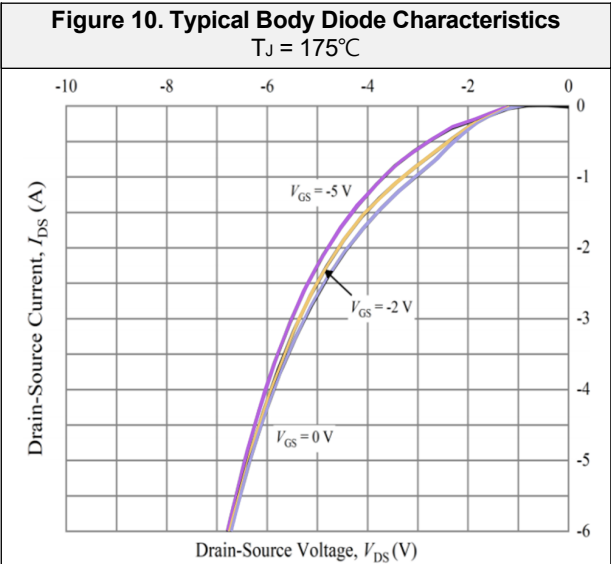
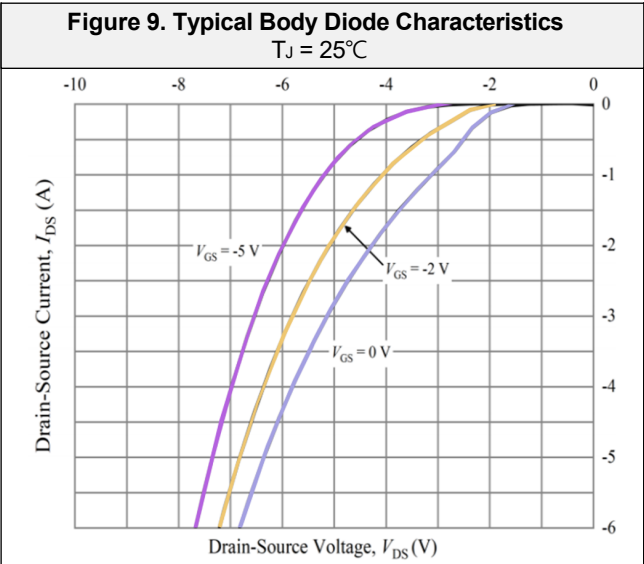
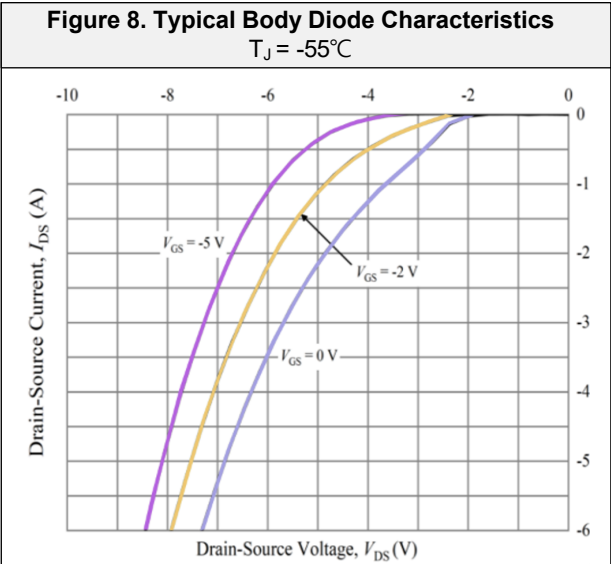
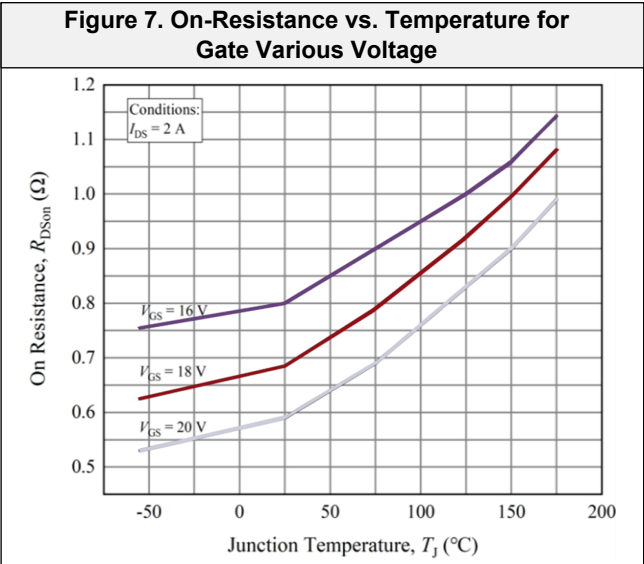
Source-Drain Diode Characteristics

I_S	Maximum Continuous Diode Forward Current		-	-	4	A
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_S = 1\text{ A}$	-	4.0	-	V
I_{rm}	Peak Reverse Recovery Current	$V_{DS} = 1200\text{ V}, I_S = 2\text{ A},$ $V_{GS} = -5\text{ V}, \text{dif/dt} = 1200\text{ A}/\mu\text{s}$	-	3	-	A
t_{rr}	Reverse Recovery Time		-	33	-	ns
Q_{rr}	Reverse Recovery Charge		-	32	-	nC

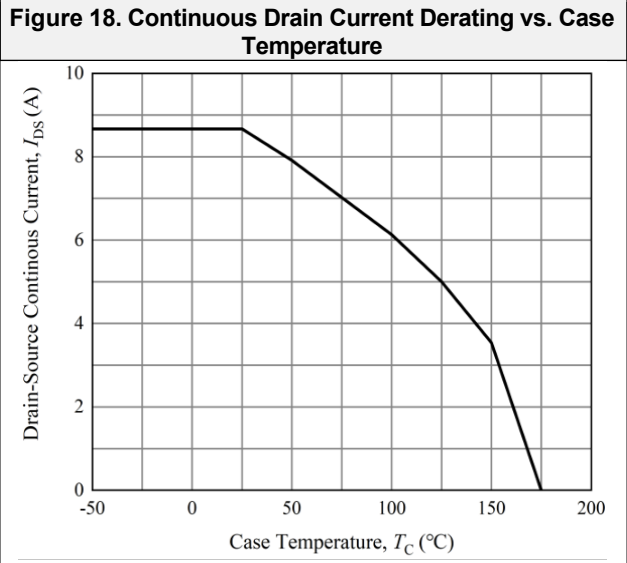
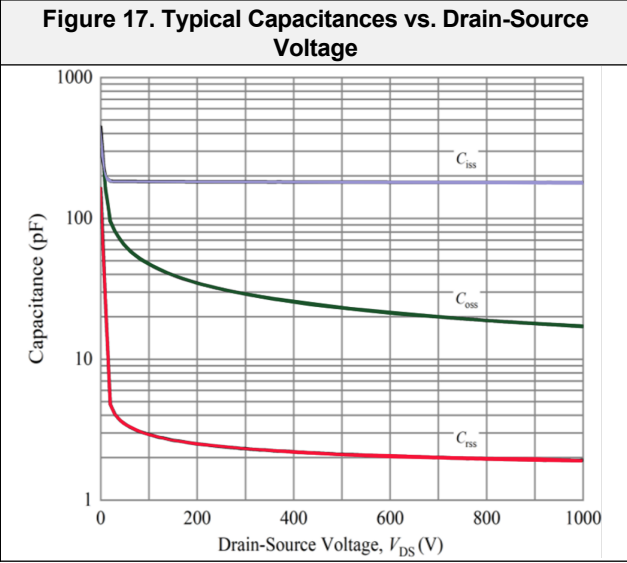
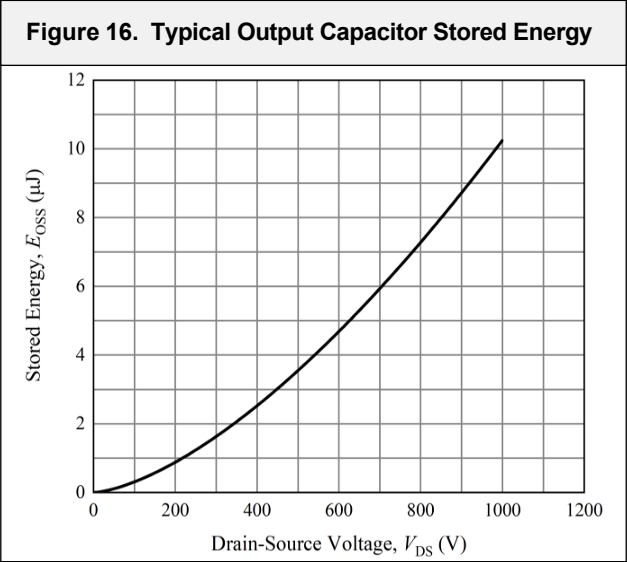
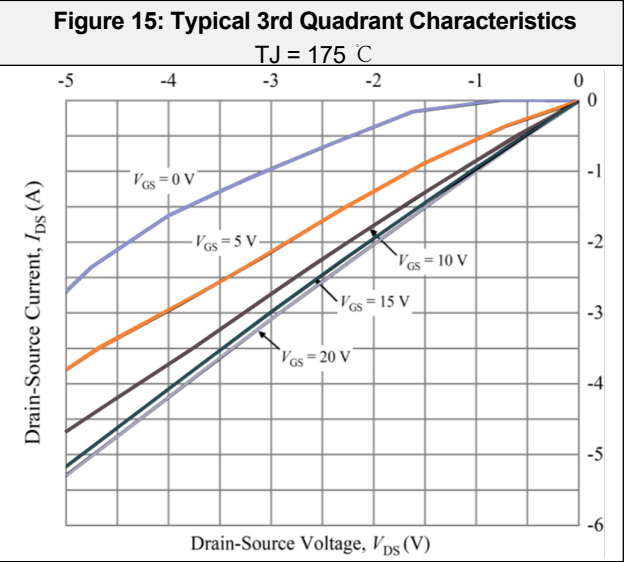
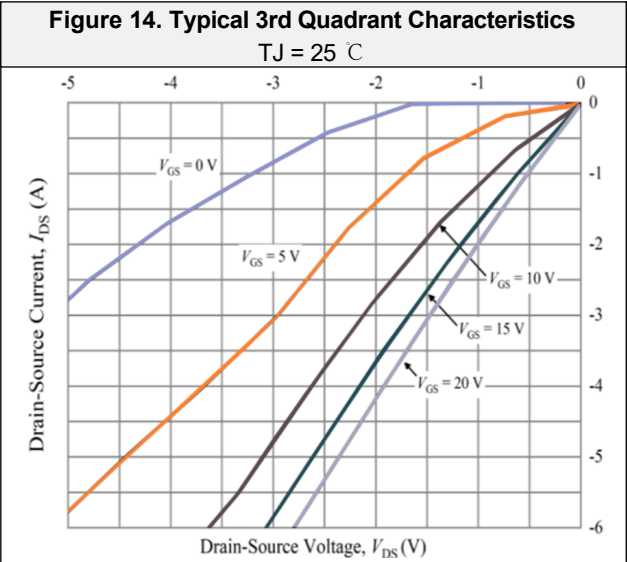
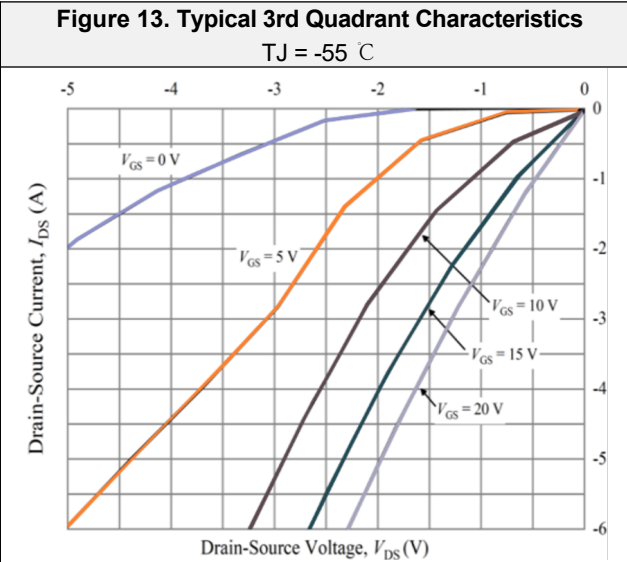
Typical Performance Characteristics



Typical Performance Characteristics



Typical Performance Characteristics



Typical Performance Characteristics

Figure 19: Power Dissipation Derating Curve

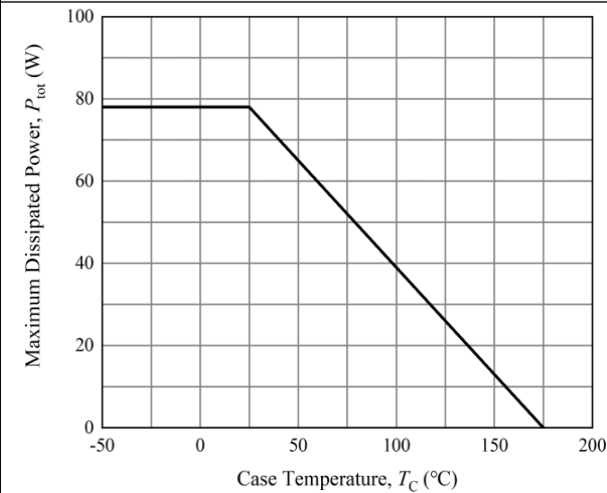


Figure 20: Typical Transient Thermal Impedance (Junction – Case) with Duty Cycle

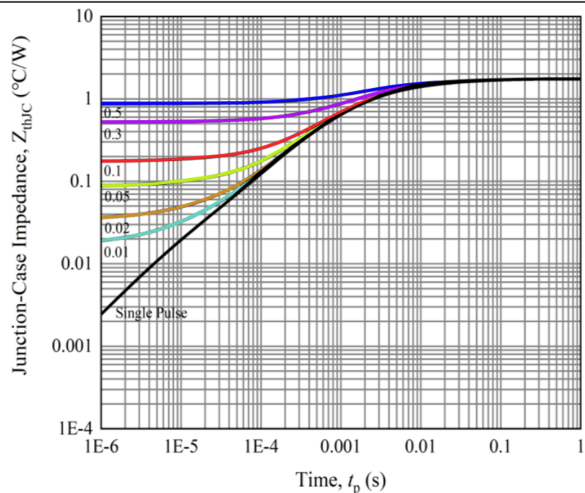


Figure 21: Safe Operate Area

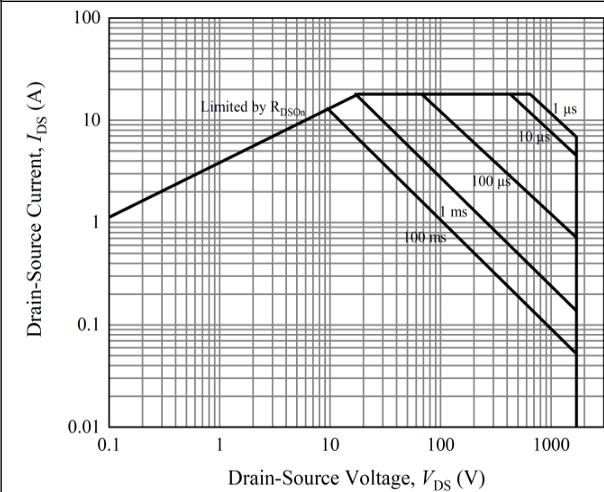


Figure 22: Clamped Inductive Switching Energy vs. Drain Current (V_DD = 1000 V)

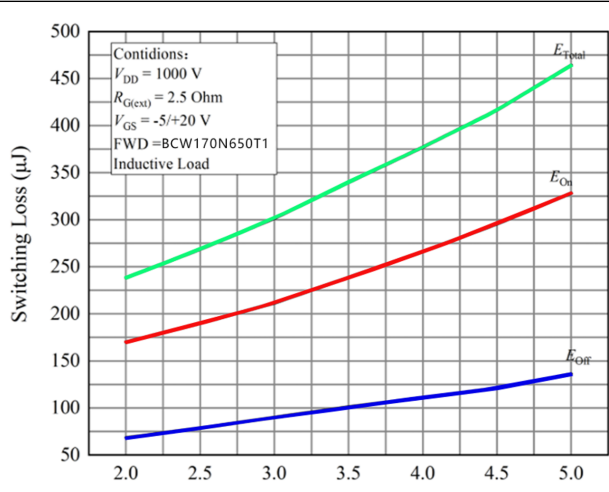


Figure 23: Clamped Inductive Switching Energy vs. R_G(ext)

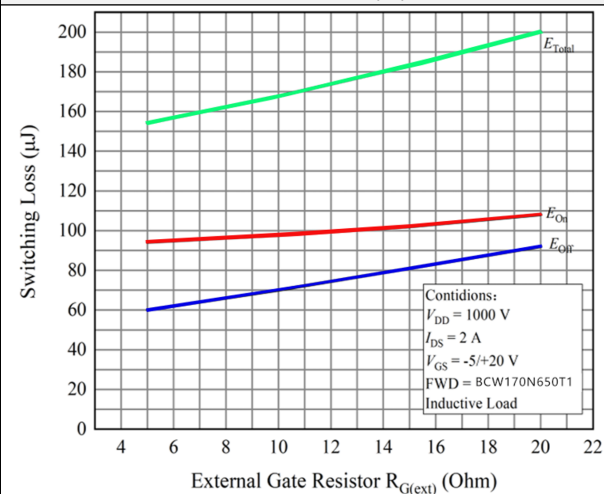
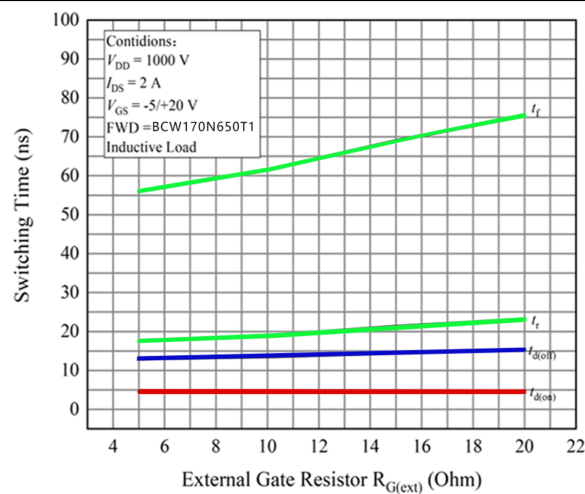
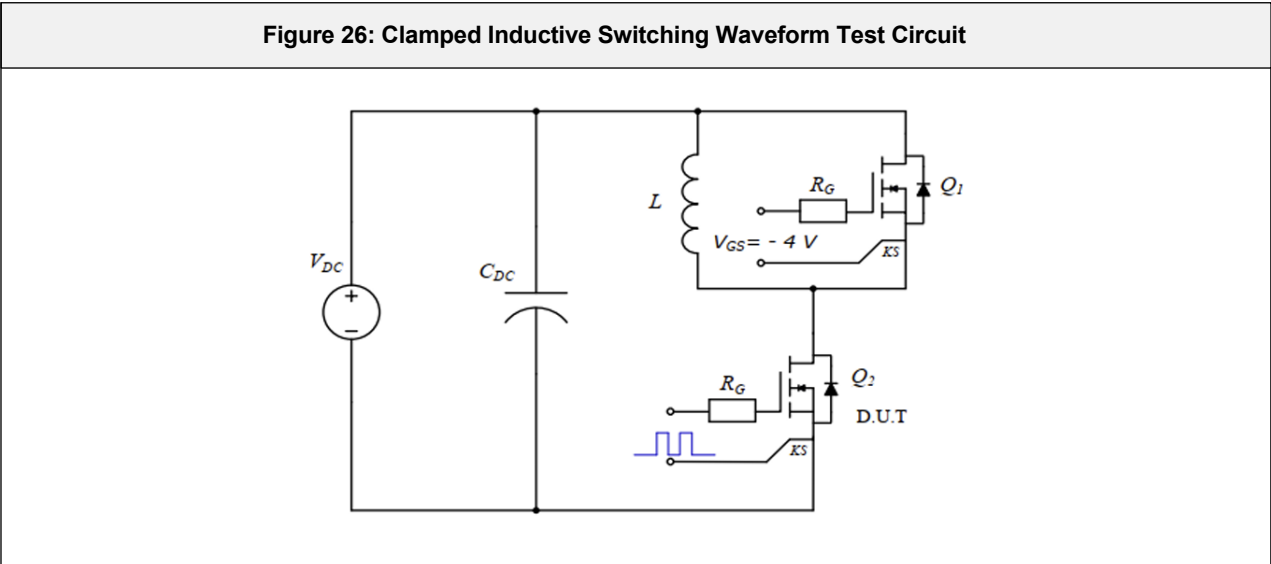
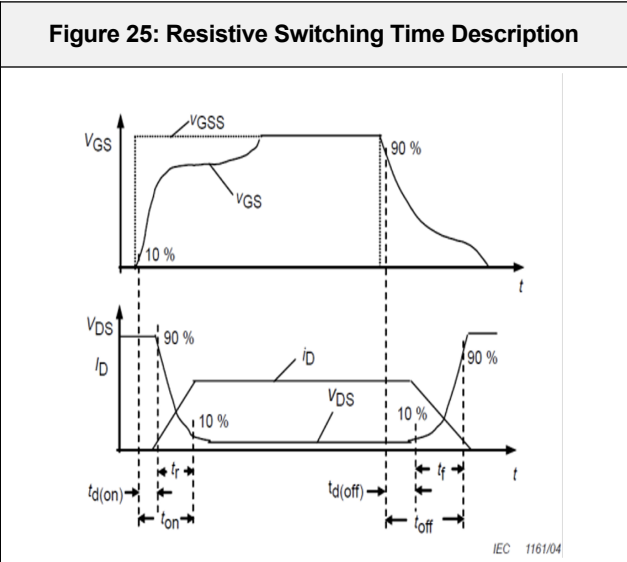


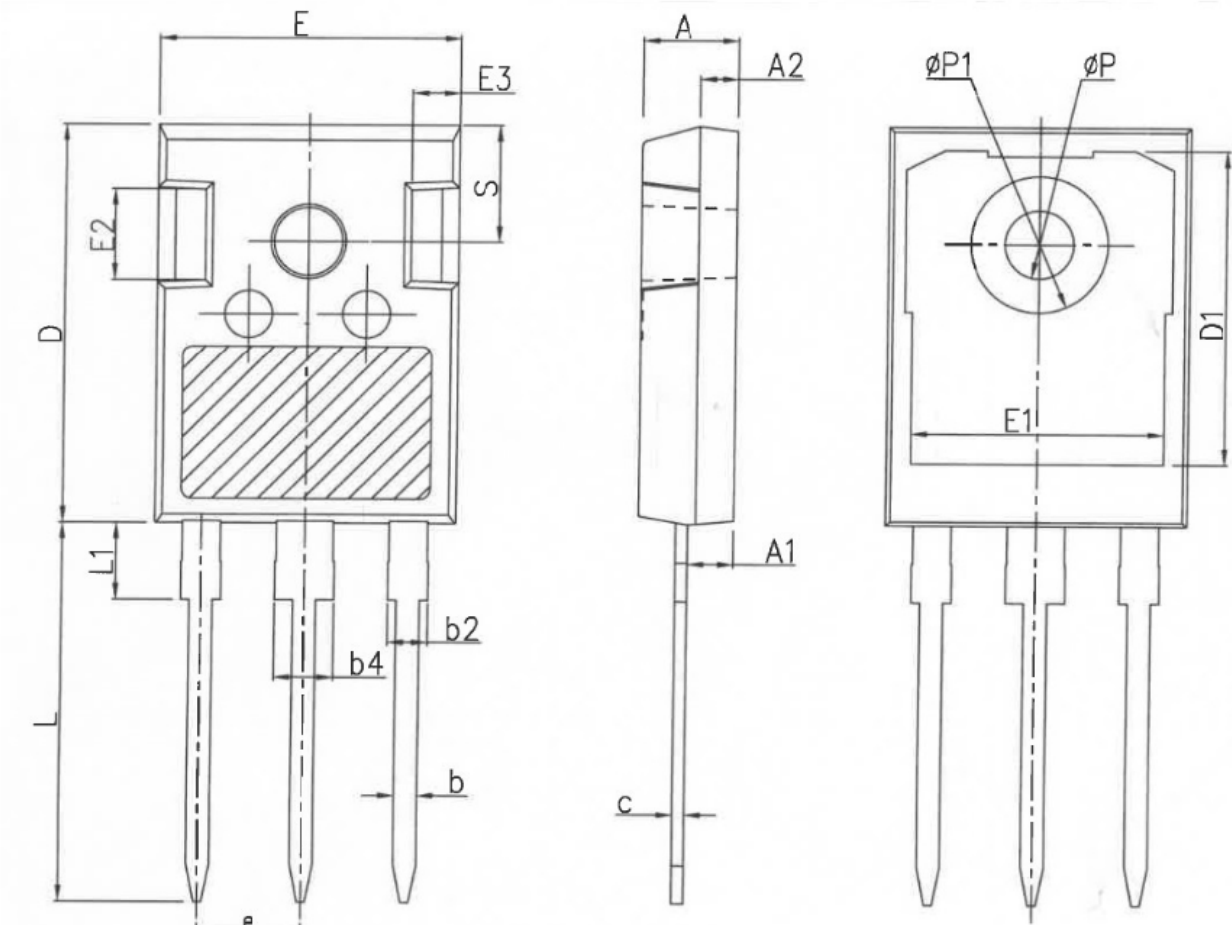
Figure 24: Switching Times vs. R_G(ext)



Typical Performance Characteristics



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

Package Marking and Ordering Information

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

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