

BCF65N320Y1

N-Channel Silicon Carbide Power MOSFET

650 V, 11.1 A, 320 mΩ



bestirpower

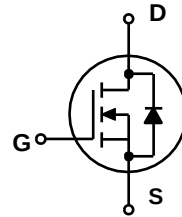
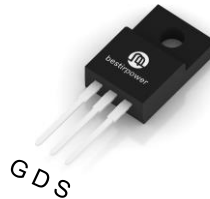
Features

- 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

$BV_{DSS, T_C=25^{\circ}C}$	$I_D, T_C=25^{\circ}C$	$R_{DS(on), typ}$	$Q_{g, typ}$
650 V	11.1A	320 mΩ	8.8nC

Applications

- LED Drive
- PD Charger
- PC Adapter
- Air-conditioning
- E-bike Charger



Absolute Maximum Ratings ($T_J = 25^{\circ}C$ unless otherwise noted)

Symbol	Parameter		Value	Unit
V_{DSS}	Drain to Source Voltage		650	V
V_{GS}	Gate to Source Voltage (DC)		-10 / +22	V
V_{GSop}	Recommended Operation Value		0/15	V
I_D	Drain Current	$V_{GS} = 15 V, (T_C = 25^{\circ}C)$	11.1	A
		$V_{GS} = 15 V, (T_C = 100^{\circ}C)$	7.86	
I_{DM}	Pulsed Drain Current	Pulse Width t_p Limited by T_{Jmax}	22.2	A
P_D	Power Dissipation	($T_C = 25^{\circ}C$)	39.6	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	$^{\circ}C$

Thermal Characteristics

Symbol	Parameter	Value	Unit
R_{thJ-C}	MOSFET/Body Diode Junction-Case Thermal Resistance	3.79	K/W
T_{sld}	Soldering temperature, wave soldering only allowed at leads	260	$^{\circ}C$

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		650	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$	-	0.1	20	μA
I_{GSS}	Gate-Source Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = +22\text{ V}$	-	-	+250	nA
		$V_{DS} = 0\text{ V}, V_{GS} = -10\text{ V}$	-250	-	-	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_D = 100\text{ }\mu\text{A}, T_J = 25^\circ\text{C}$	2.7	3.5	-	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 15\text{ V}, I_D = 5\text{ A}, T_J = 25^\circ\text{C}$	-	300	390	mΩ
		$V_{GS} = 15\text{ V}, I_D = 5\text{ A}, T_J = 175^\circ\text{C}$	-	321	-	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS}=0\text{V}$ $V_{DS}=400\text{V}$ $f=1\text{ MHz}, V_{AC}=25\text{mV}$	-	228	-	pF
C_{oss}	Output Capacitance		-	17	-	
C_{rss}	Reverse Capacitance		-	1.4	-	
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 400\text{ V}, I_D = 5\text{ A},$ $V_{GS} = 0\text{ V} / 15\text{ V}$	-	8.8	-	nC
Q_{gs}	Gate to Source Charge		-	3.3	-	
Q_{gd}	Gate to Drain "Miller" Charge		-	1.2	-	
R_G	Internal Gate Resistance	$f = 1\text{MHz}, V_{AC} = 25\text{ mV}$	-	26	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DD}=400\text{V}$ $V_{GS}=0\text{V}/15\text{V}$ $I_D=5\text{A}$ $R_{G(ext)}=4.3\Omega$ $L=600\mu\text{H}$ $T_J=25^\circ\text{C}$	-	16.5	-	ns
t_r	Turn-On Rise Time		-	11.3	-	
$t_{d(off)}$	Turn-Off Delay Time		-	21.2	-	
t_f	Turn-Off Fall Time		-	12.7	-	
E_{on}	Turn-On Switching Energy		-	47.6	-	μJ
E_{off}	Turn-Off Switching Energy		-	4.0	-	

Source-Drain Diode Characteristics

V_{SD}	Body Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 2.5\text{ A}, T_C = 25^\circ\text{C}$	-	3.5	-	V
		$V_{GS} = 0\text{ V}, I_{SD} = 2.5\text{ A}, T_C = 175^\circ\text{C}$	-	3.0	-	V
t_{rr}	Reverse Recovery Time	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, I_{SD} = 5\text{ A}, di/dt = 1.1\text{ kA}/\mu\text{s}$	-	10.9	-	ns
Q_{rr}	Reverse Recovery Charge		-	28	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	3.9	-	A

Typical Performance Characteristics

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

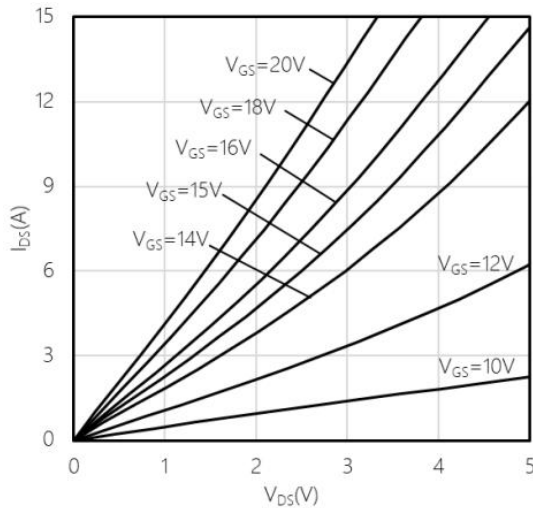


Figure 2: Output Characteristics ($T_J = 25^\circ\text{C}$)

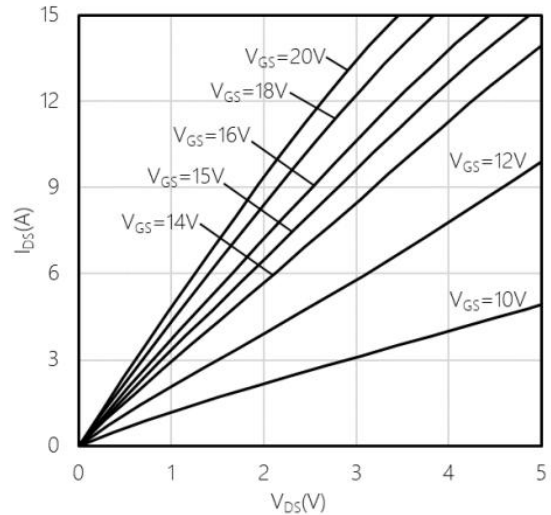


Figure 3: Output Characteristics ($T_J = 175^\circ\text{C}$)

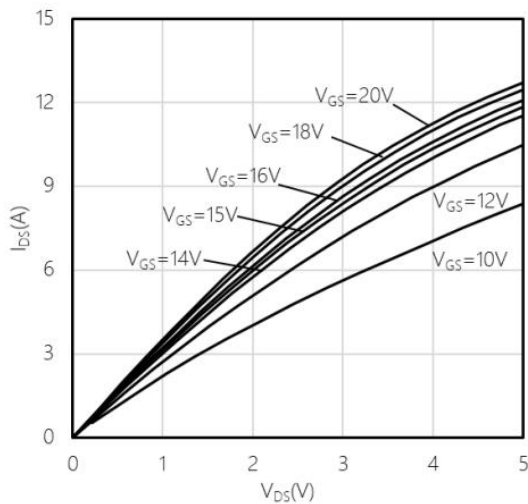


Figure 4: Typical on-state Resistance as a Function of Drain Current ($V_{GS} = 15\text{V}$)

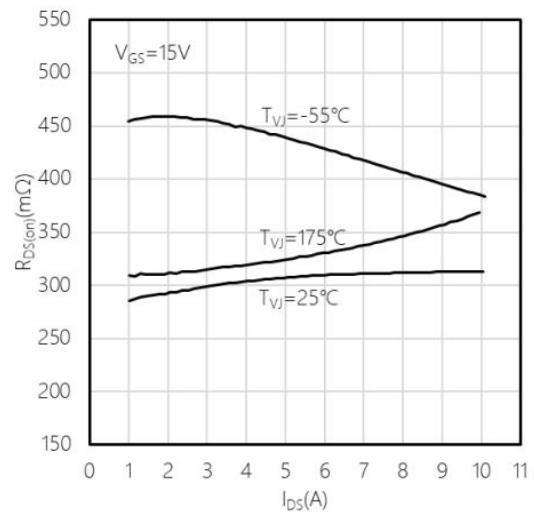


Figure 5: Typical on-state Resistance as a Function of Temperature ($I_{DS} = 5\text{A}$)

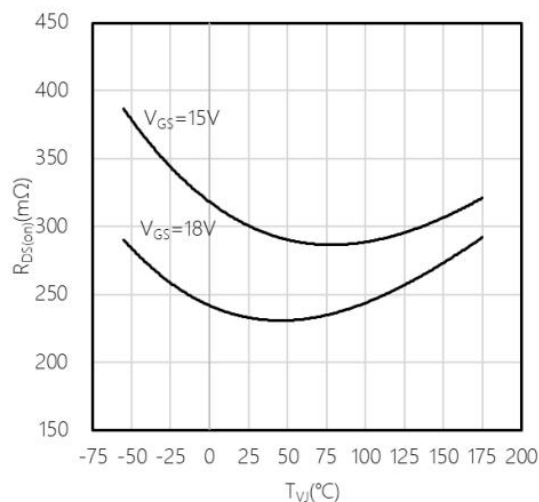
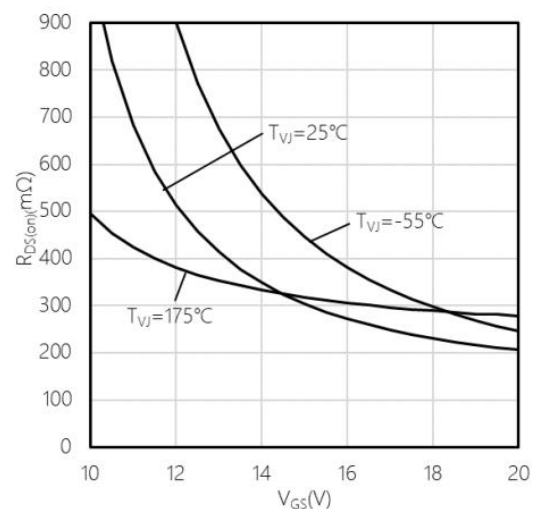


Figure 6: Typical on-state Resistance as a Function of V_GS ($I_{DS} = 5\text{A}$)



Typical Performance Characteristics

Figure 7: Typical transfer characteristic ($V_{DS} = 20\text{ V}$)

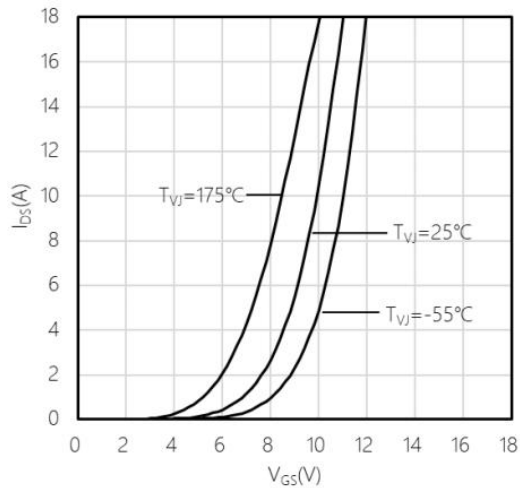


Figure 8: Typical Gate-Source Threshold Voltage as a Function of T_J ($I_{DS} = 3.5\text{ mA}$)

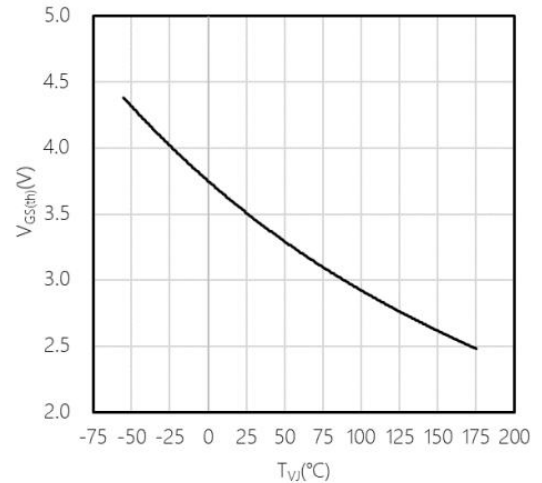


Figure 9: Typical Reverse Drain Current as Function of V_{DS} , V_{GS} as Parameter ($T_J = 55^\circ\text{C}$)

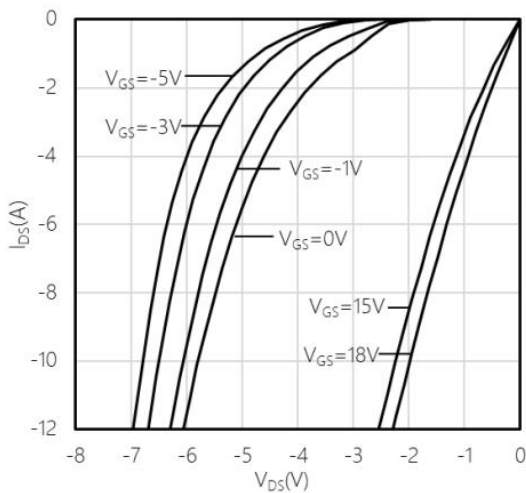


Figure 10: Typical Reverse Drain Current as Function of V_{DS} , V_{GS} as Parameter ($T_J = 25^\circ\text{C}$)

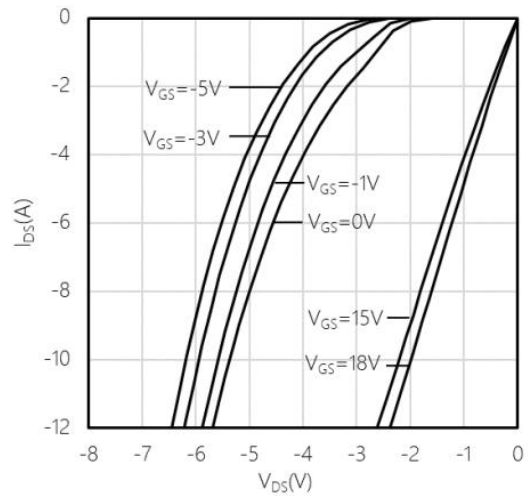


Figure 11: Typical Reverse Drain Current as Function of V_{DS} , V_{GS} as Parameter ($T_J = 175^\circ\text{C}$)

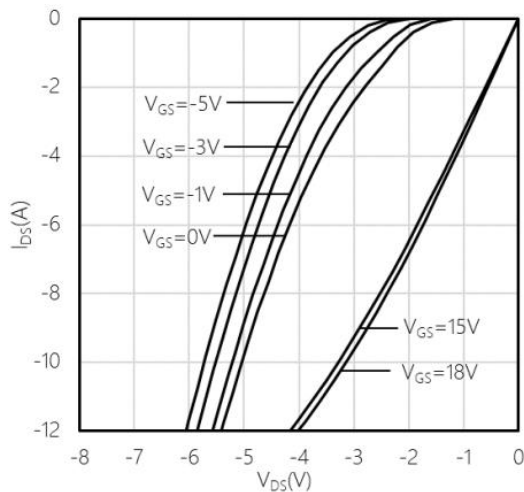
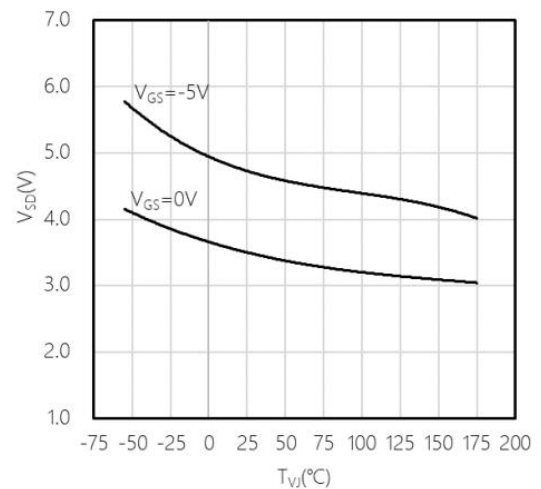


Figure 12: Typical Reverse Drain Voltage as Function of T_J ($I_{SD} = 2.5\text{ A}$)



Typical Performance Characteristics

Figure 13: Power Dissipation as a Function of Case Temperature Limited by Bond Wire

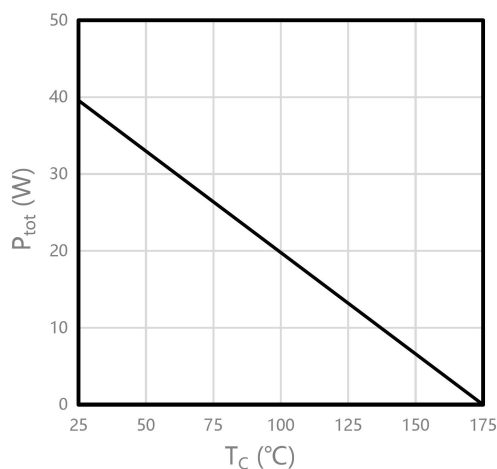


Figure 14: Continuous Drain Current Derating vs Case Temperature

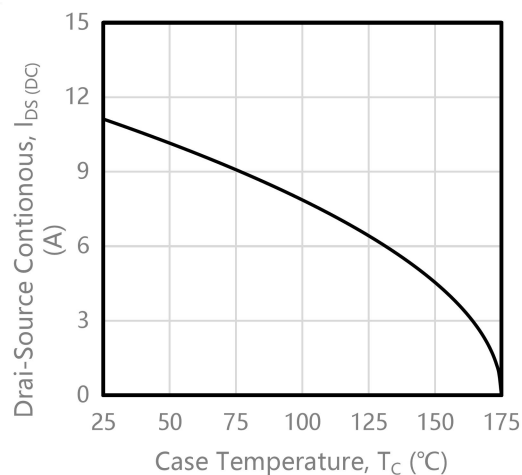


Figure 15: Typical gate charge ($I_{DS}=5A, V_{DS}=400V$)

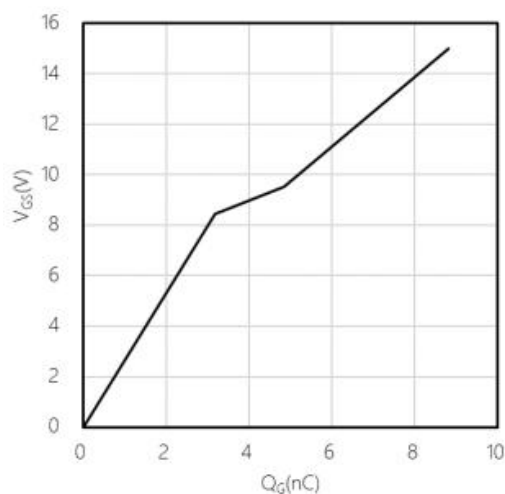


Figure 16: Switching Energy as a Function of T_J ($V_{DS}=400V, R_{G(ext)}=4.3\Omega, V_{GS}=0/15V, I_{DS}=5A$)

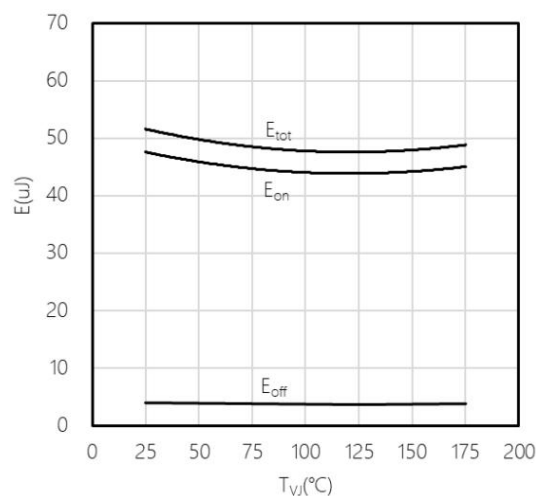


Figure 17: Switching Energy as a Function of R_G ($V_{DS}=400V, T_J=25^\circ C, V_{GS}=0/15V, I_{DS}=5A$)

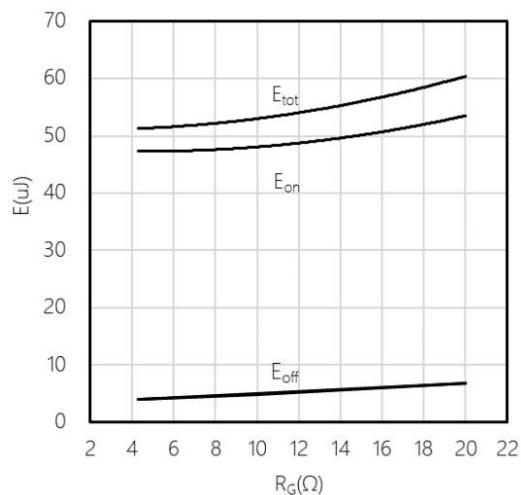
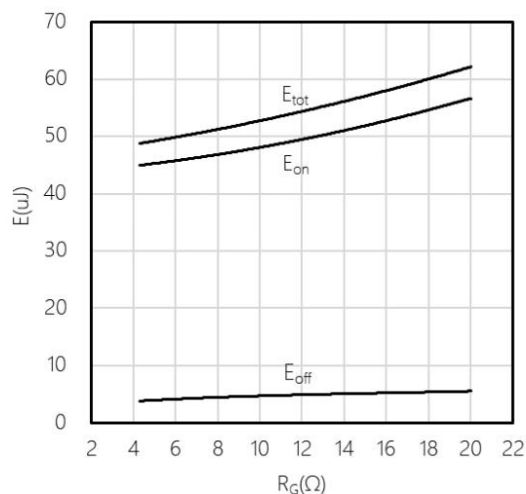
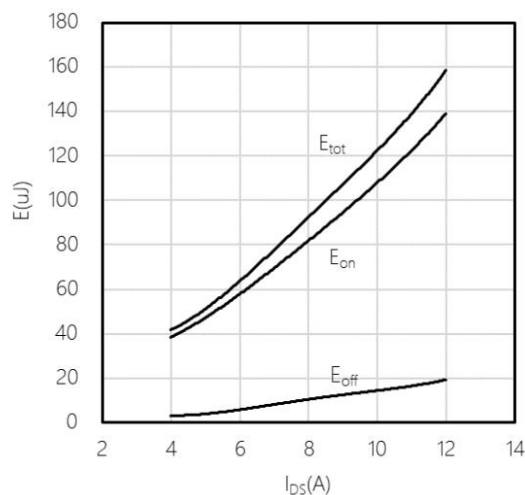
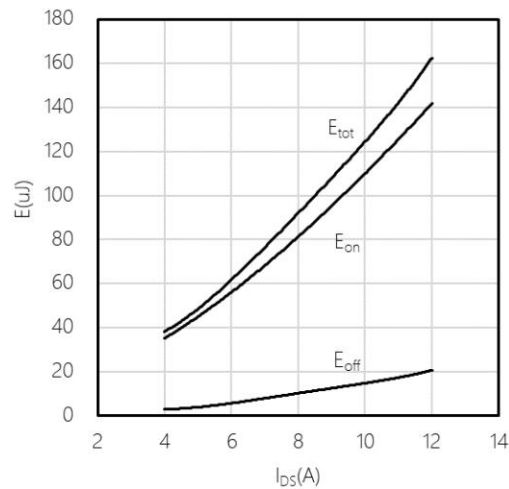
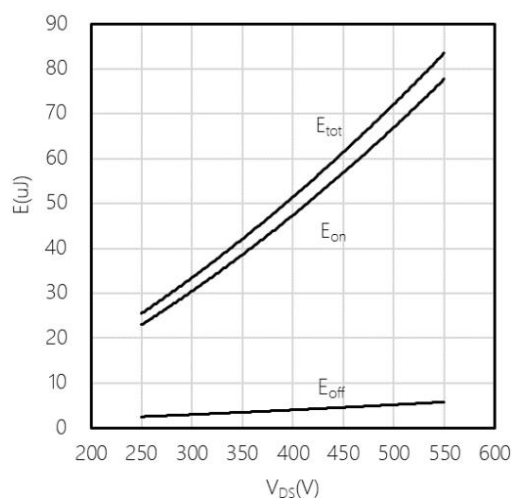
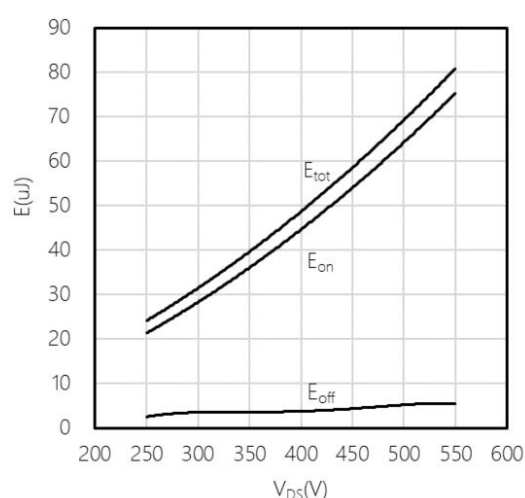
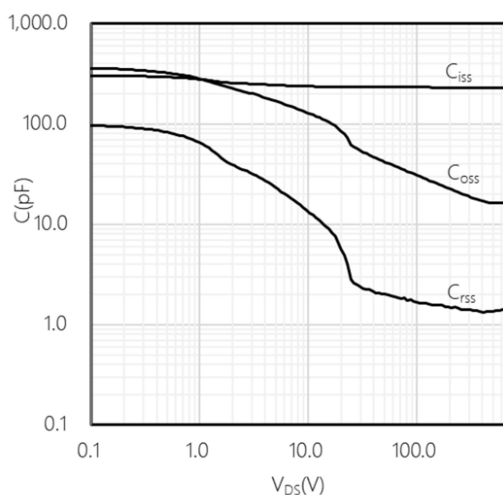
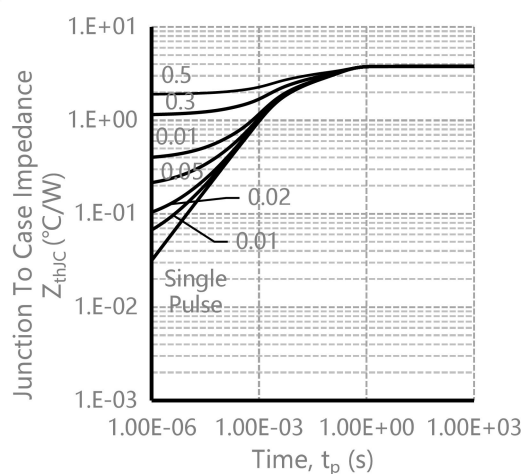


Figure 18: Switching Energy as a Function of R_G ($V_{DS}=400V, T_J=175^\circ C, V_{GS}=0/15V, I_{DS}=5A$)

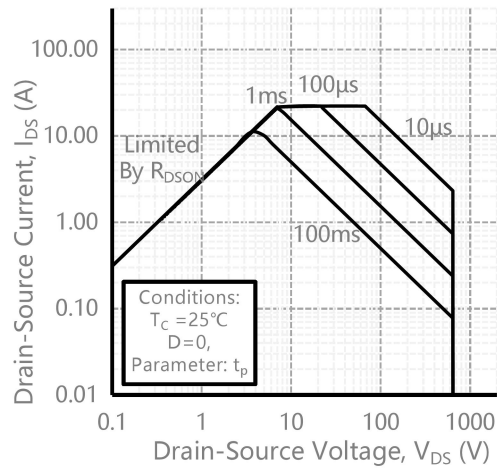


Typical Performance Characteristics

Figure 19: Switching Energy as a Function of I_{DS}
 ($V_{DS}=400V, R_{G(ext)}=4.3\Omega, V_{GS}=0/15V, T_J=25^\circ C$)

Figure 20: Switching Energy as a Function of I_{DS}
 ($V_{DS}=400V, R_{G(ext)}=4.3\Omega, V_{GS}=0/15V, T_J=175^\circ C$)

Figure 21: Switching Energy as a Function of V_{DS}
 ($I_{DS}=5A, R_{G(ext)}=4.3\Omega, V_{GS}=0/15V, T_J=25^\circ C$)

Figure 22: Switching Energy as a Function of V_{DS}
 ($I_{DS}=5A, R_{G(ext)}=4.3\Omega, V_{GS}=0/15V, T_J=175^\circ C$)

Figure 23: Typical Capacitance as a Function of V_{DS}
 ($V_{GS}=0V, f=1MHz$)

Figure 24: Transient Thermal Impedance
 (Junction - Case)


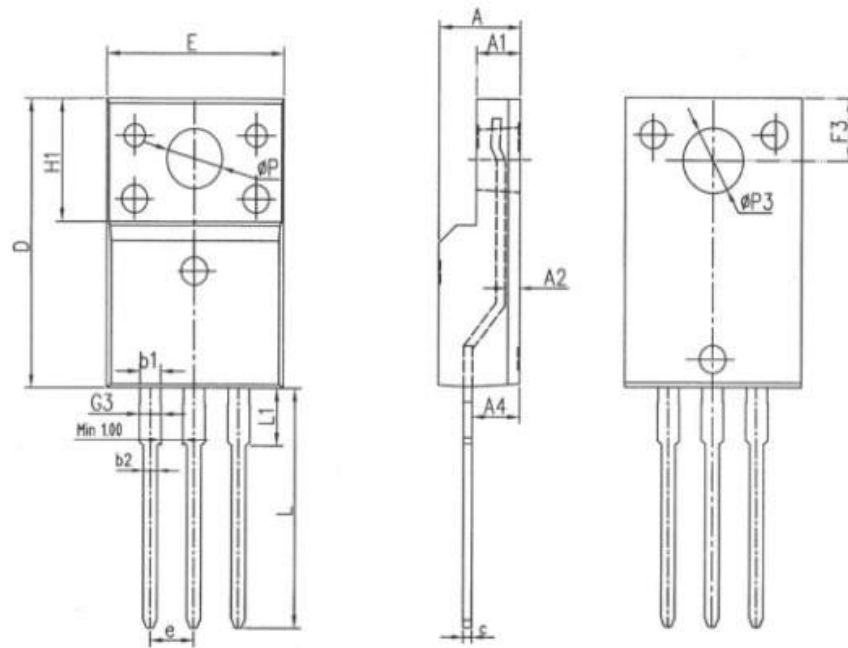
Typical Performance Characteristics

Figure 25: Safe Operating Area



Package Outlines

TO-220F



COMMON DIMENSIONS

SYMBOL	MM		
	MIN	NOM	MAX
E	10.00	10.20	10.40
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	0.65	0.85	1.30
A4	2.55	2.75	2.95
c	0.40	0.50	0.65
D	15.57	15.87	16.17
H1	6.70REF		
e	2.54BSC		
ΦP	3.183REF		
L	12.68	12.98	13.28
L1	3.25	3.45	3.65
ΦP3	3.45REF		
F3	3.10	3.30	3.50
G3	1.10	1.30	1.50
b1	1.05	1.20	1.35
b2	0.70	0.80	0.92

* Dimensions in millimeters

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCF65N320Y1	BCF65N320Y1	TO-220F	Tube	50 units

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