

BCF65N260Y1

N-Channel Silicon Carbide Power MOSFET

650 V, 14.4 A, 260 mΩ



bestirpower

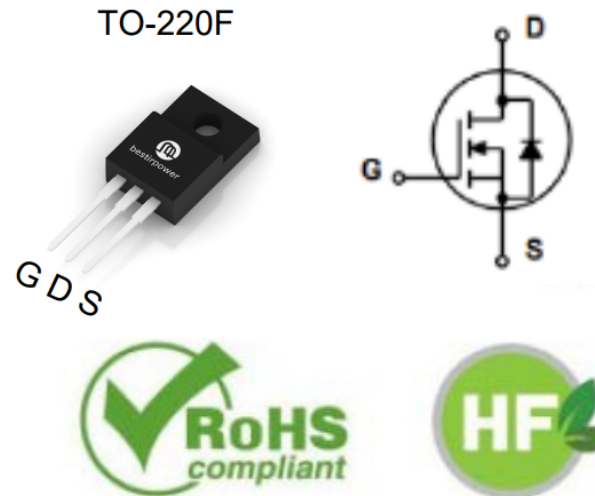
Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitance
- Fast Intrinsic Diode With Low Reverse Recovery
- Low Switching Losses

BV_{DSS}	$I_D, T_C=25^\circ\text{C}$	$R_{DS(on),typ}$	$Q_{g,typ}$
650 V	14.4 A	260 mΩ	12.5 nC

Applications

- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Uninterruptable Power Supplies
- EV Battery Chargers
- Solar/Wind Inverters



Absolute Maximum Ratings ($T_J = 25^\circ\text{C}$ 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	$T_C = 25^\circ\text{C}$	14.4
		$T_C = 100^\circ\text{C}$	10.2
I_{DM}	Drain Current	Pulsed	28.8
P_D	Power Dissipation	($T_C = 25^\circ\text{C}$)	46
E_{AS}	Single Pulse Avalanche Energy	$V_{DD}=50\text{V}, V_{GS}=15\text{V}, L=0.5\text{mH}, I_{AS}=10\text{A}$	25
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to 175	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	3.26	$^\circ\text{C}/\text{W}$
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	$V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$	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
I_{GSS}	Source-Gate Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = -10\text{ V}$	-250	-	-	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{DS} = 10\text{ mA}, T_J = 25^\circ\text{C}$	3.2	4.1	5	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 15\text{ V}, I_D = 5\text{ A}$	-	260	300	mΩ
		$V_{GS} = 15\text{ V}, I_D = 5\text{ A}, T_J = 175^\circ\text{C}$	-	222	-	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{GS} = 0\text{ V}, V_{DS} = 650\text{ V}, f = 1\text{ MHz}$	-	294	-	pF
C_{oss}	Output Capacitance		-	25	-	
C_{rss}	Reverse Capacitance		-	4	-	
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 400\text{ V}, I_D = 5\text{ A}, V_{GS} = 0\text{ V} / 15\text{ V}$	-	12.5	-	nC
Q_{gs}	Gate to Source Charge		-	4.3	-	
Q_{gd}	Gate to Drain "Miller" Charge		-	1.6	-	
R_G	Internal Gate Resistance	$f = 1\text{ MHz}, V_{AC} = 25\text{ mV}$	-	25.5	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{GS} = 0/15\text{ V}, L = 600\ \mu\text{H}$ $V_{DS} = 400\text{ V}, I_D = 5\text{ A},$ $R_{G(on)} = 2.2\ \Omega, R_{G(off)} = 2.2\ \Omega$	-	6.6	-	ns
t_r	Turn-On Rise Time		-	18.3	-	
$t_{d(off)}$	Turn-Off Delay Time		-	17.7	-	
t_f	Turn-Off Fall Time		-	32.1	-	μJ
E_{on}	Turn-On Switching Energy		-	43.2	-	
E_{off}	Turn-Off Switching Energy		-	5.5	-	

Source-Drain Diode Characteristics

I_S	Continuous Diode Forward Current	$T_C = 25^\circ\text{C}$	-	12	-	A
		$T_C = 100^\circ\text{C}$	-	7	-	
V_{SD}	Diode Forward Voltage	$V_{GS} = 0\text{ V}, I_{SD} = 2.5\text{ A}$	-	3.3	-	V
t_{rr}	Reverse Recovery Time	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, I_{SD} = 5\text{ A},$ $di/dt = 1600\text{ A}/\mu\text{s}$	-	9.9	-	ns
Q_{rr}	Reverse Recovery Charge		-	32.6	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	5.8	-	A

Typical Performance Characteristics

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

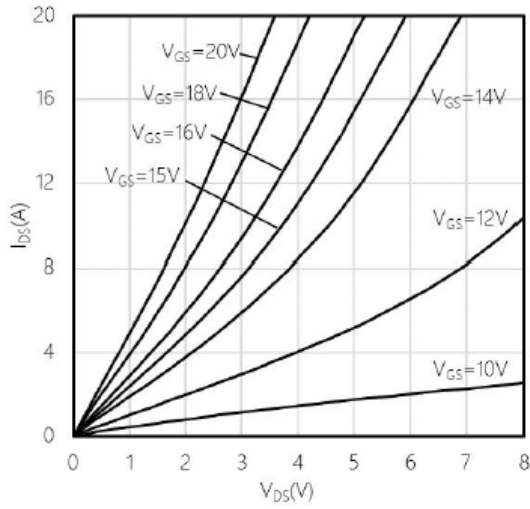


Figure 2: Output Characteristics ($T_J = 25^\circ\text{C}$)

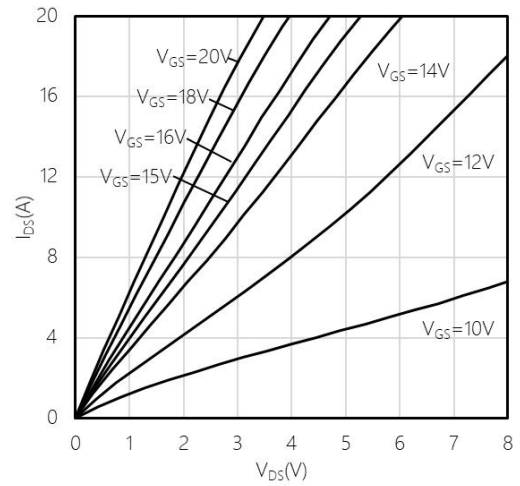


Figure 3: Output Characteristics ($T_J = 175^\circ\text{C}$)

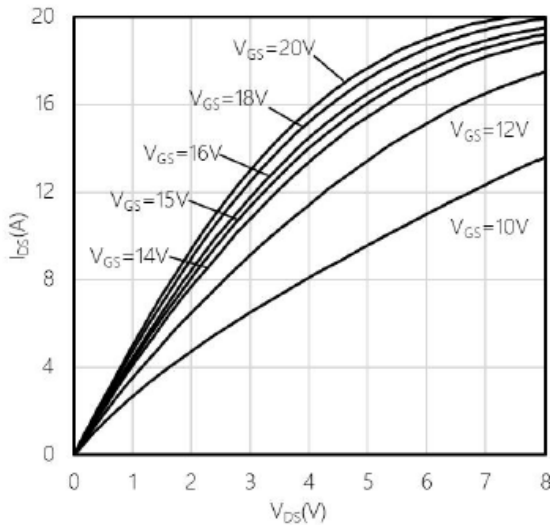


Figure 4: Typical on-state Resistance as a Function of Drain Current ($V_{GS} = 15\text{V}$)

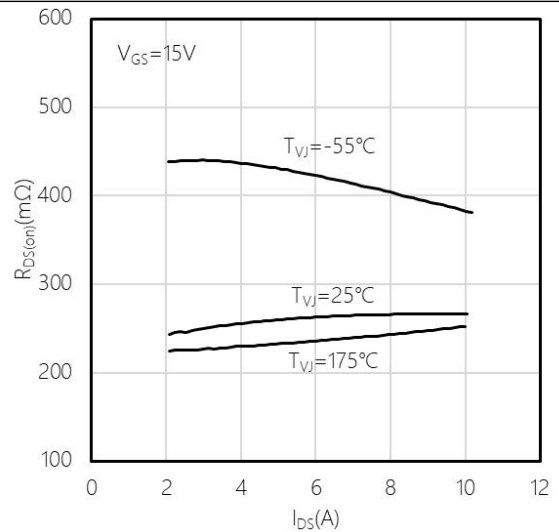


Figure 5 : Typical on-state Resistance as a Function of Temperature ($I_{DS} = 5\text{A}$)

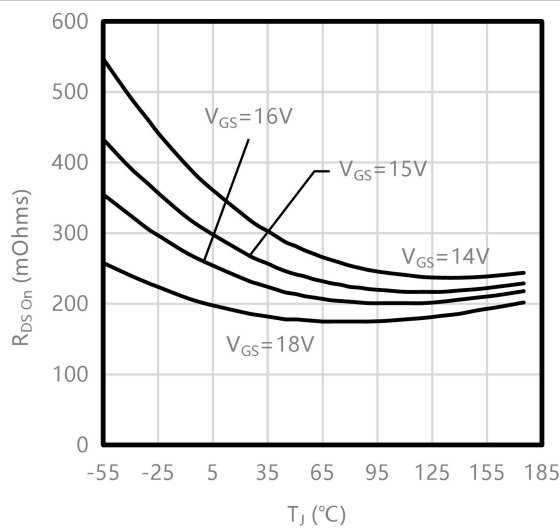
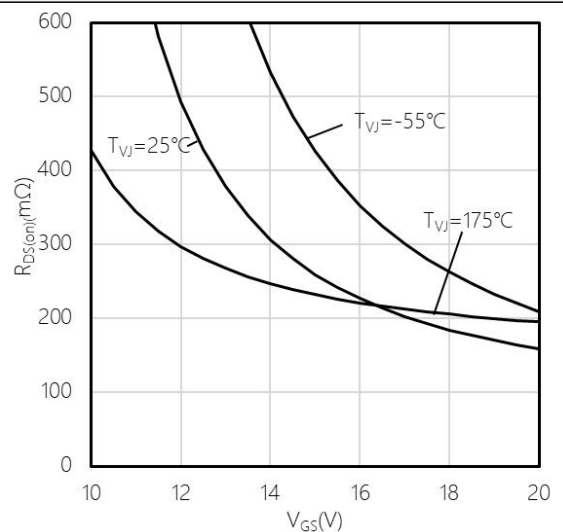


Figure 6: Typical on-state Resistance as a Function of V_{GS} ($I_{DS} = 5\text{A}$)



Typical Performance Characteristics

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

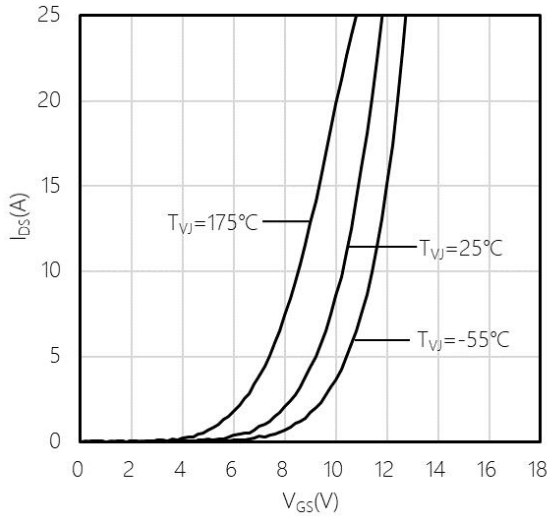


Figure 8: Typical Gate-Source Threshold Voltage as a Function of T_J ($I_{DS}= 10\text{mA}$)

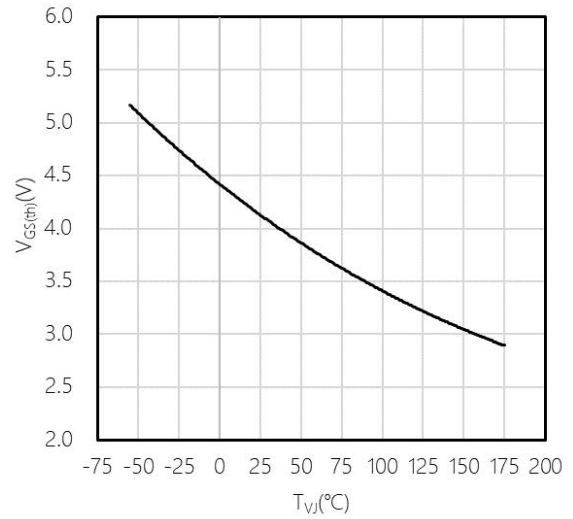


Figure 9: Typical Reverse Drain Current as Function of V_{DS} , V_{GS} as Parameter ($T_J = -55^{\circ}\text{C}$)

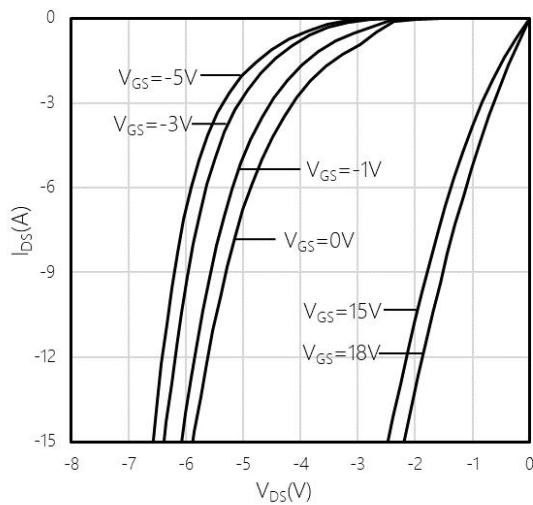


Figure 10: Typical Reverse Drain Current as Function of V_{DS} , V_{GS} as Parameter ($T_J = 25^{\circ}\text{C}$)

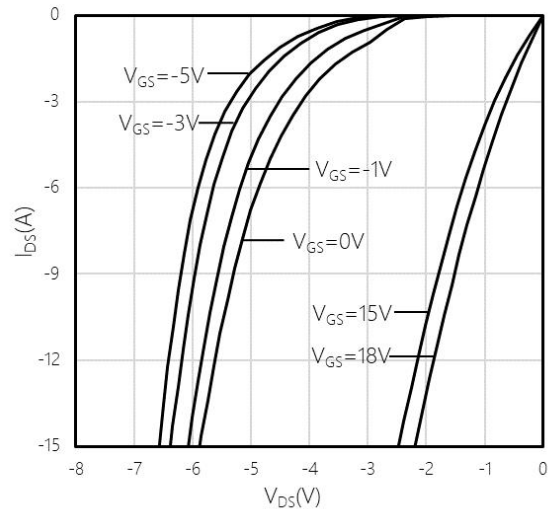


Figure 11: Typical Reverse Drain Current as Function of V_{DS} , V_{GS} as Parameter ($T_J = 175^{\circ}\text{C}$)

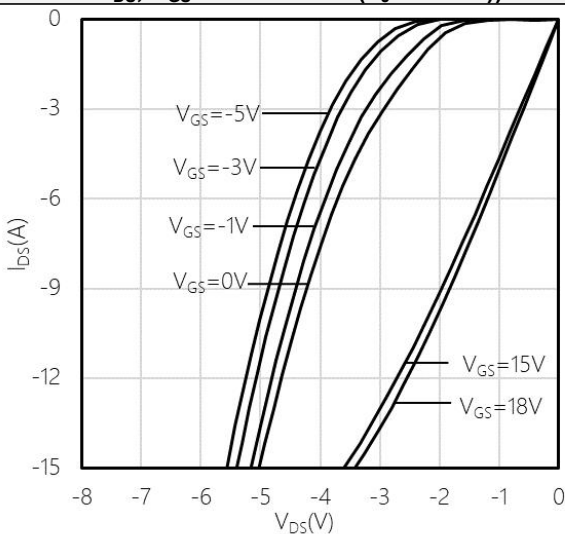
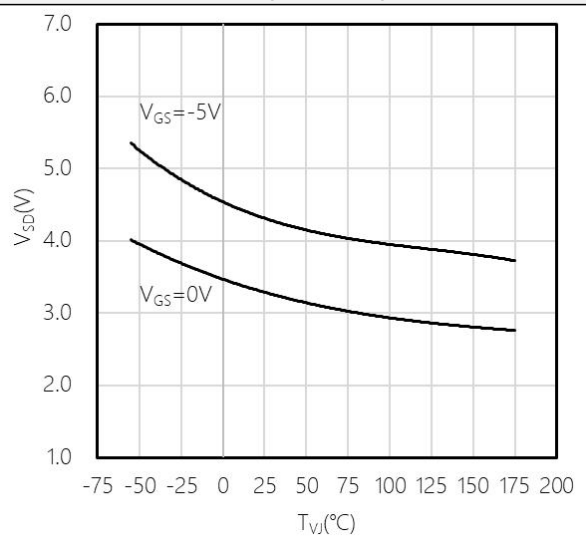


Figure 12: Typical Reverse Drain Voltage as Function of T_J ($I_{SD}= 2.5\text{A}$)



Typical Performance Characteristics

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

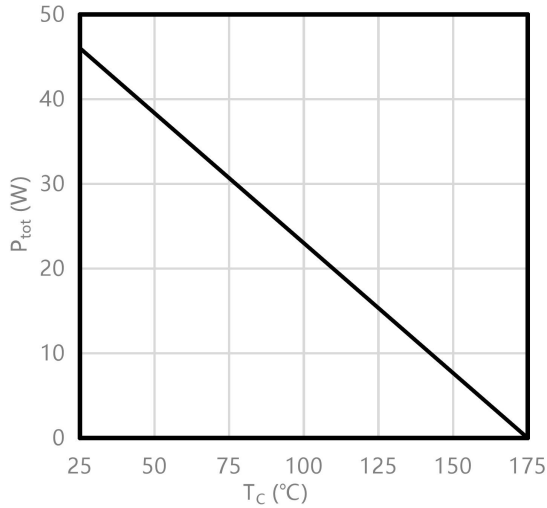


Figure 14: Typical gate charge ($I_{DS}= 5A, V_{DS}= 400V$)

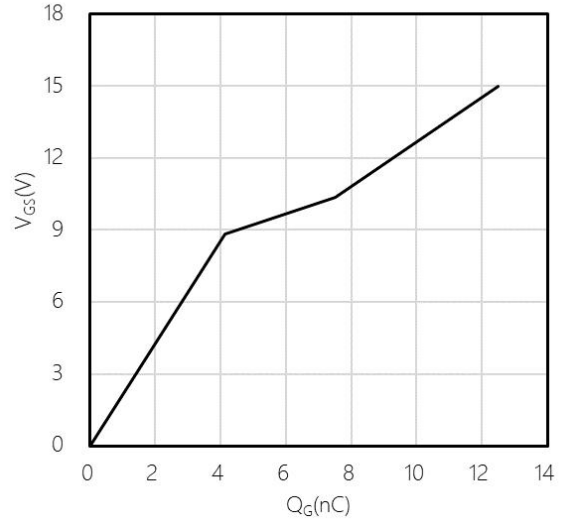


Figure 15: Switching Energy as a Function of T_J ($V_{DS}=400V, R_{G(ext)}=2.2\Omega, V_{GS}=0/15V, I_{DS}=5A$)

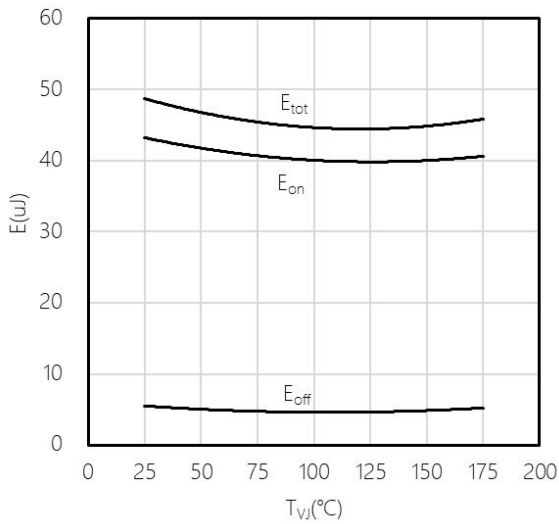


Figure 16: Switching Energy as a Function of R_G ($V_{DS}=400V, T_J=25^\circ C, V_{GS}=0/15V, I_{DS}=5A$)

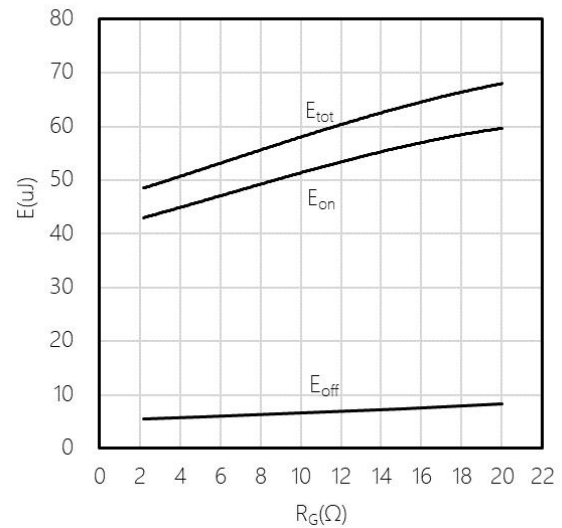


Figure 17: Switching Energy as a Function of R_G ($V_{DS}=400V, T_J=175^\circ C, V_{GS}=0/15V, I_{DS}=5A$)

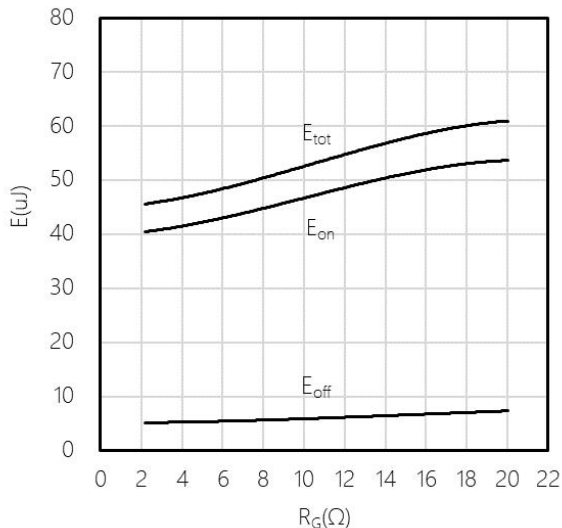
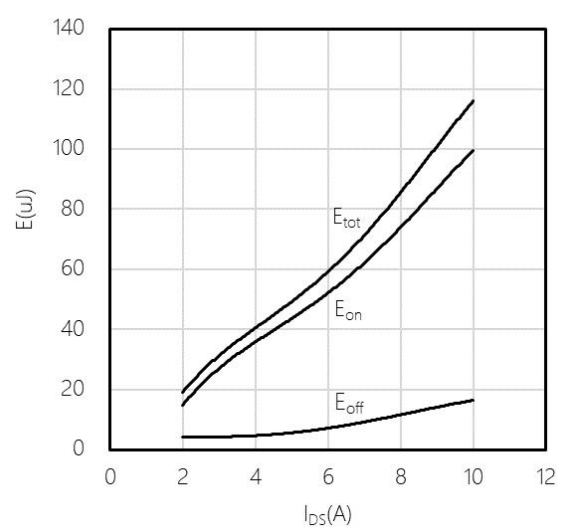


Figure 18: Switching Energy as a Function of I_{DS} ($V_{DS}=400V, R_{G(ext)}=2.2\Omega, V_{GS}=0/15V, T_J=25^\circ C$)



Typical Performance Characteristics

Figure 19: Switching Energy as a Function of I_{DS}
 ($V_{DS}=400V, R_{G(ext)}=2.2\Omega, V_{GS}=0/15V, T_J=175^\circ C$)

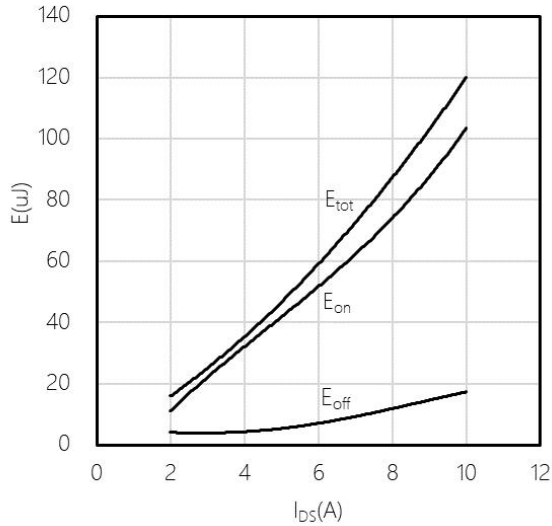


Figure 20: Switching Energy as a Function of V_{DS}
 ($I_{DS}=5A, R_{G(ext)}=2.2\Omega, V_{GS}=0/15V, T_J=25^\circ C$)

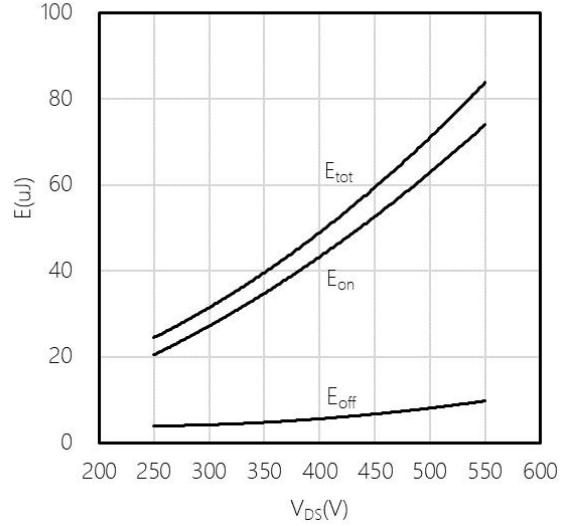


Figure 21: Switching Energy as a Function of V_{DS}
 ($I_{DS}=5A, R_{G(ext)}=2.2\Omega, V_{GS}=0/15V, T_J=175^\circ C$)

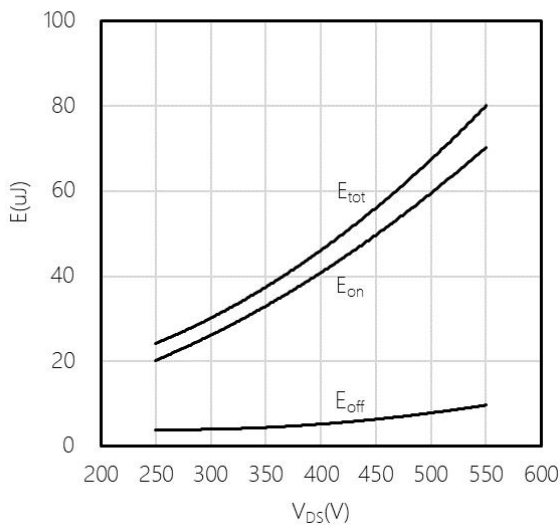


Figure 22: Typical Capacitance as a Function of V_{DS}
 ($V_{GS}=0V, f=1MHz$)

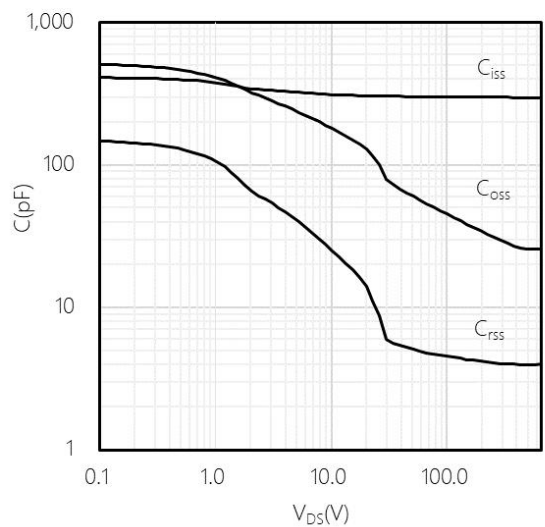


Figure 23: Safe Operating Area

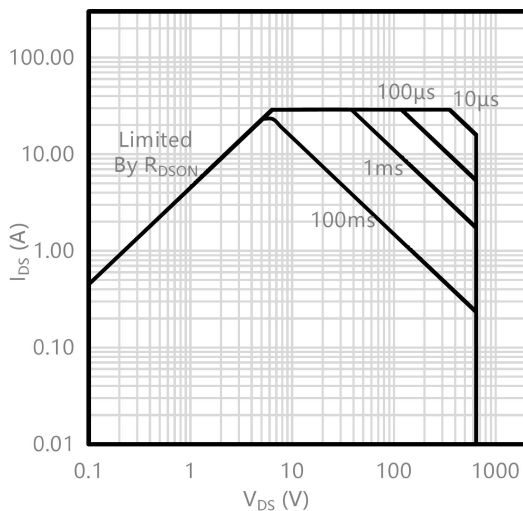
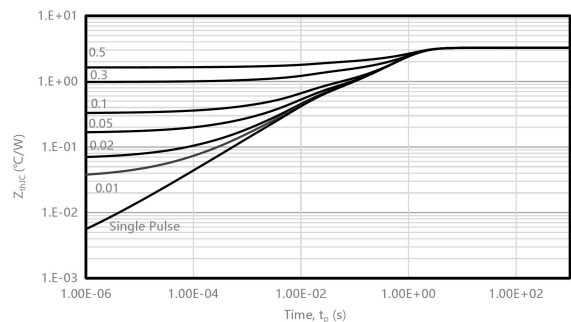
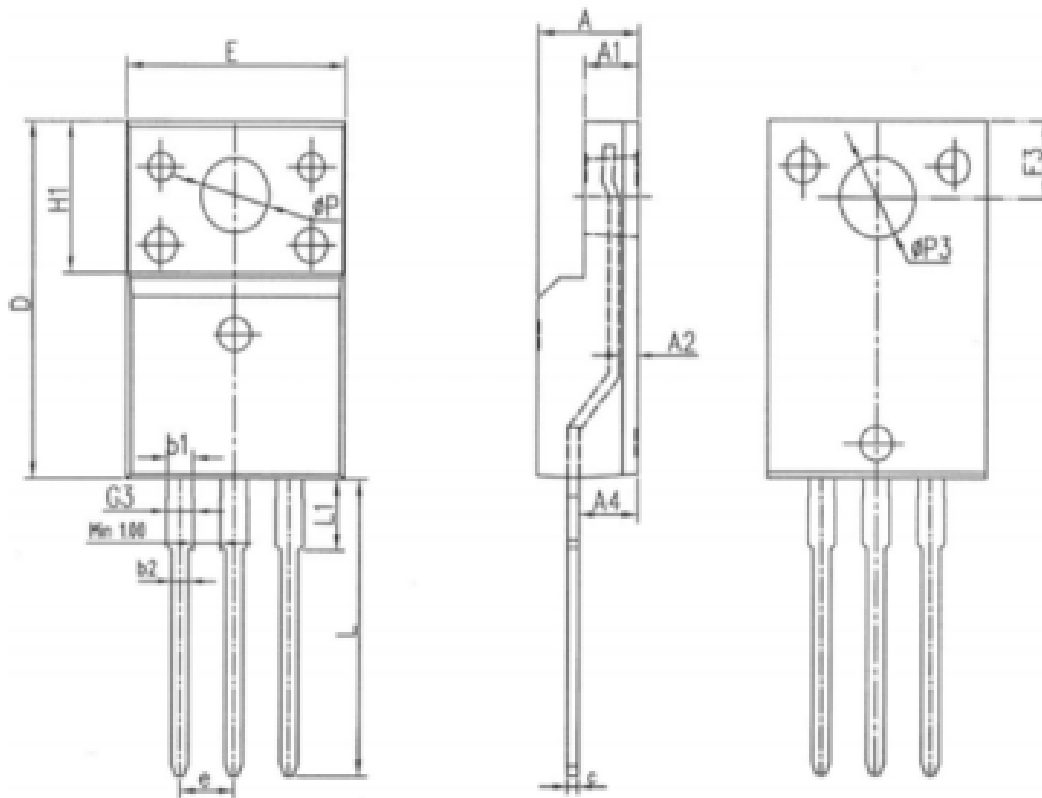


Figure 24: Transient Thermal Resistance
 (Parameter $D = t_p/T$)



Package Outlines

TO-220F



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
BCF65N260Y1	BCF65N260Y1	TO220F	Tube	50 units

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