

BCF80N380W1

N-Channel Silicon Carbide Power MOSFET

800 V, 8 A, 380 mΩ



bestirpower

Features

- High Blocking Voltage with Low On-Resistance
- High Speed Switching with Low Capacitances
- Easy to Parallel and Simple to Drive
- Avalanche Ruggedness
- Halogen Free, RoHS Compliant

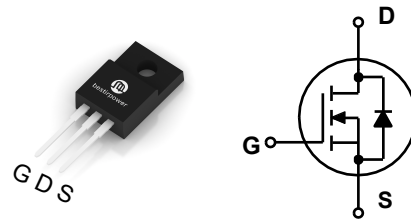
$BV_{DSS, T_C=25^\circ C}$	$I_D, T_C=25^\circ C$	$R_{DS(on), typ}$	$Q_{g, typ}$
800 V	8A	380 mΩ	10.6 nC

Benefits

- Higher System Efficiency
- Reduced Cooling Requirements
- Increased Power Density
- Increased System Switching Frequency

Applications

- Solar Inverters
- Switch Mode Power Supplies
- High Voltage DC/DC Converters
- Battery Chargers
- Motor Drives
- Pulsed Power applications



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

Symbol	Parameter	Value	Unit	
V_{DSS}	Drain to Source Voltage	800	V	
V_{GS}	Gate to Source Voltage (DC)	-10 / +22	V	
V_{GSop}	Recommended Operation Value	-5 / +18	V	
I_D	Drain Current	$V_{GS} = 18 V, (T_C = 25^\circ C)$	8	A
		$V_{GS} = 18 V, (T_C = 100^\circ C)$	5.7	
I_{DM}	Drain Current	Pulsed (Note1)	17	A
P_D	Power Dissipation	$(T_C = 25^\circ C)$	34.1	W
		Derate Above 25°C	0.23	W/°C
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to 175	°C	

※Note 1 : Limited by maximum junction temperature.

Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	4.4	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction to Ambient, Max.	48	
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	$V_{GS} = 0\text{ V}, I_D = 100\ \mu\text{A}$	800	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 650\text{ V}, V_{GS} = 0\text{ V}$	-	2	10	μA
I_{GSS}	Gate-Source Leakage Current	$V_{DS} = 0\text{ V}, V_{GS} = +22\text{ V}$	-	-	+200	nA
		$V_{DS} = 0\text{ V}, V_{GS} = -10\text{ V}$	-200	-	-	nA

On Characteristics

$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS} = V_{DS}, I_{DS} = 1\text{ mA}, T_J = 25^\circ\text{C}$	2.2	3.4	4.2	V
$R_{DS(on)}$	Static Drain to Source On Resistance	$V_{GS} = 18\text{ V}, I_D = 5\text{ A}$	-	380	450	mΩ
		$V_{GS} = 18\text{ V}, I_D = 5\text{ A}, T_J = 175^\circ\text{C}$	-	520	-	

Dynamic Characteristics

C_{iss}	Input Capacitance	$V_{DS} = 400\text{ V}, V_{GS} = 0\text{ V}, f = 1\text{ MHz}$	-	208	-	pF
C_{oss}	Output Capacitance		-	18	-	
C_{rss}	Reverse Capacitance		-	1.8	-	
$Q_{g(tot)}$	Total Gate Charge	$V_{DS} = 400\text{ V}, I_D = 5\text{ A}, V_{GS} = -5\text{ V} / 18\text{ V}$	-	10.6	-	nC
Q_{gs}	Gate to Source Charge		-	5.1	-	
Q_{gd}	Gate to Drain "Miller" Charge		-	2.2	-	
R_G	Internal Gate Resistance	$f = 1\text{ MHz}$	-	59	-	Ω

Switching Characteristics

$t_{d(on)}$	Turn-On Delay Time	$V_{DS} = 400\text{ V}, I_D = 5\text{ A}, V_{GS} = -5\text{ V} / 18\text{ V}, R_G = 10\ \Omega,$	-	5	-	ns
t_r	Turn-On Rise Time		-	17	-	
$t_{d(off)}$	Turn-Off Delay Time		-	8	-	
t_f	Turn-Off Fall Time		-	10	-	
E_{on}	Turn-On Switching Energy	$V_{DD} = 400\text{ V}, I_D = 5\text{ A}, V_{GS} = -5/18\text{ V}, R_G = 10\ \Omega$	-	25	-	μJ
E_{off}	Turn-Off Switching Energy		-	10	-	

Source-Drain Diode Characteristics

I_{SD}	Continuous Diode Forward Current	$T_C = 25^\circ\text{C}$	-	9	-	A
		$T_C = 100^\circ\text{C}$	-	6	-	
V_{SD}	Diode Forward Voltage	$V_{GS} = -5\text{ V}, I_{SD} = 2.5\text{ A}$	-	4.0	-	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 5\text{ A}, di/dt = 1000\text{ A}/\mu\text{s}, V_{DD} = 400\text{ V}, V_{GS} = -5\text{ V}$	-	23	-	ns
Q_{rr}	Reverse Recovery Charge		-	32	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	2.4	-	A

Typical Performance Characteristics

Figure 1. Typical Output Characteristics, $T_J = 25^\circ\text{C}$

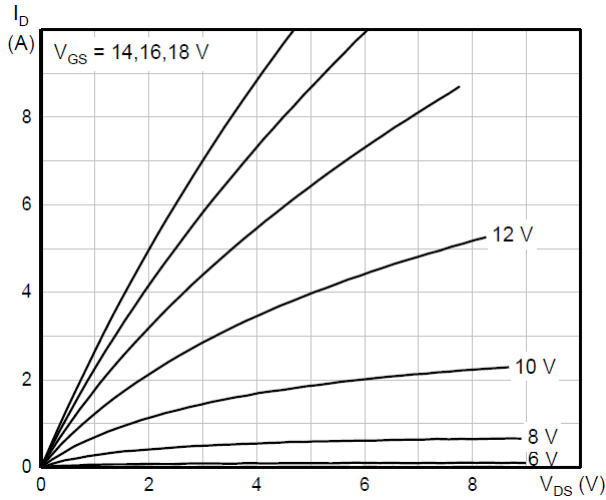


Figure 2. Typical Output Characteristics, $T_J = 175^\circ\text{C}$

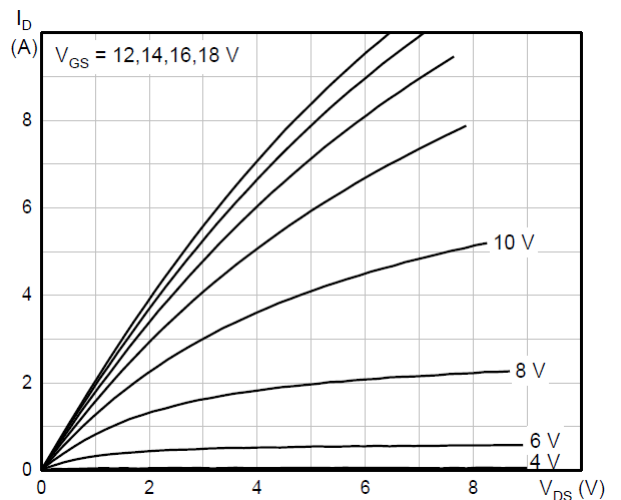


Figure 3. Typical Transfer Characteristics

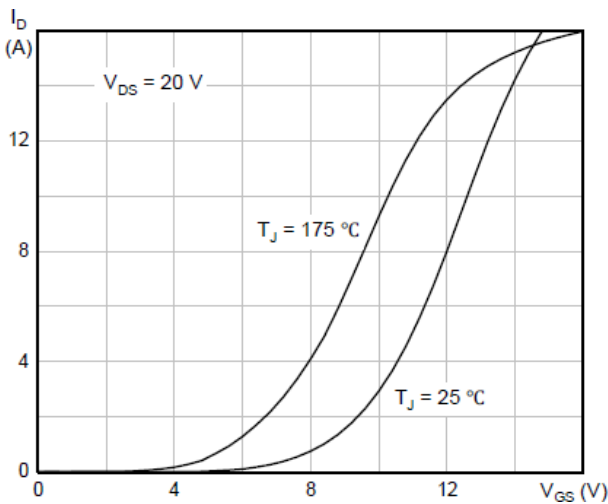


Figure 4. Typical Gate Charge Characteristics

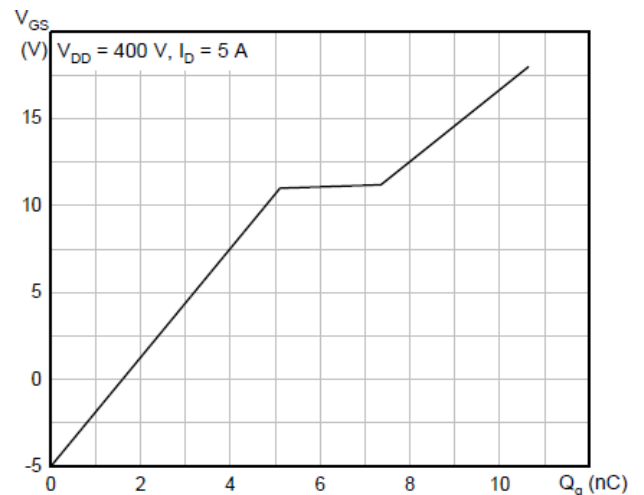


Figure 5. Typical Capacitance Characteristics

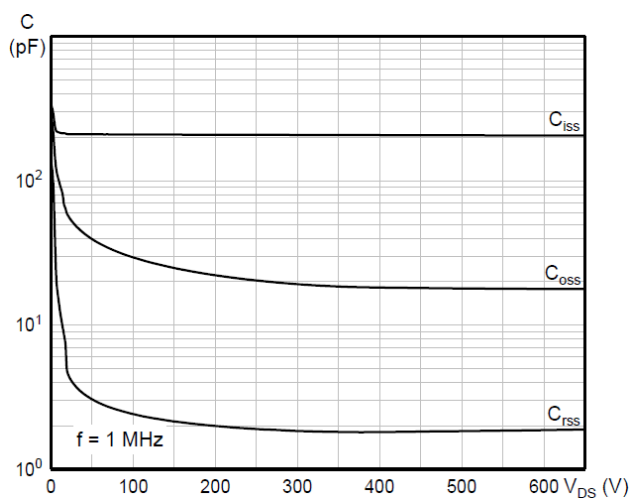
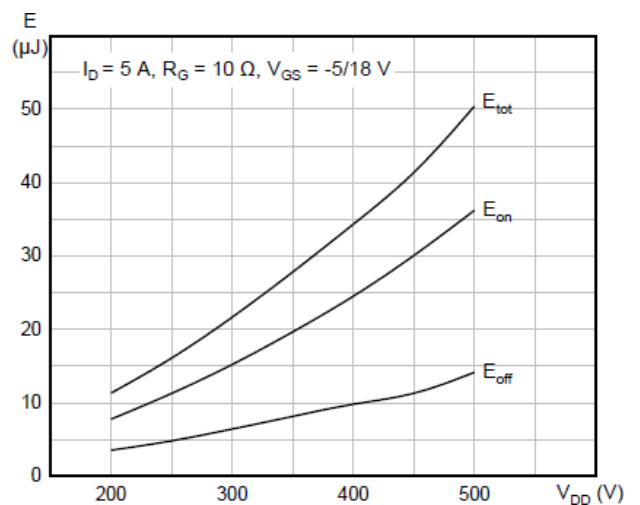


Figure 6. Typical Switching Energy vs. Supply Voltage



Typical Performance Characteristics

Figure 7. Typical Switching Energy vs. Drain Current

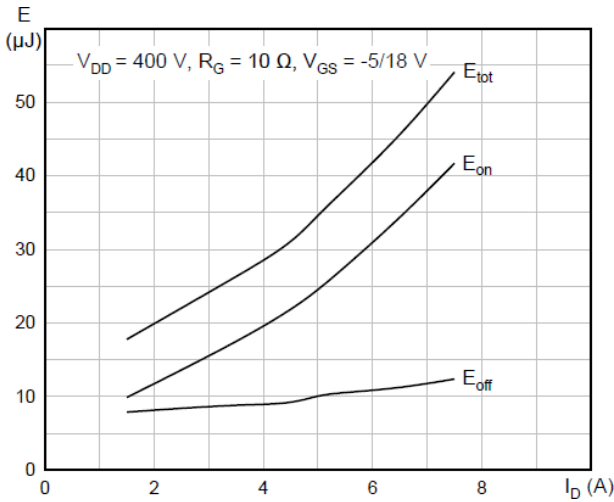


Figure 8. Typical Switching Energy vs. Gate Resistance

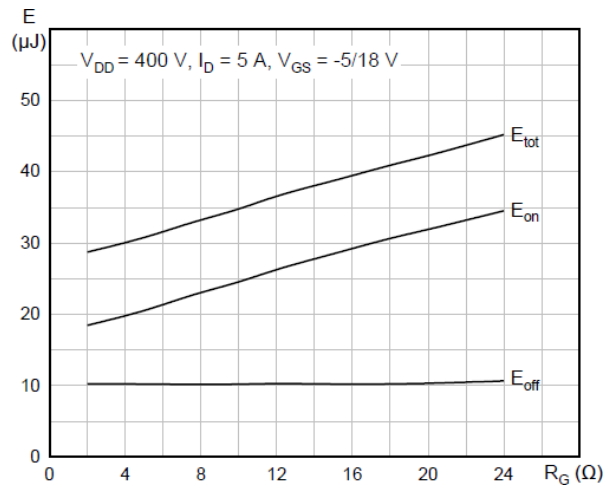


Figure 9. Typical Switching Energy vs. Temperature

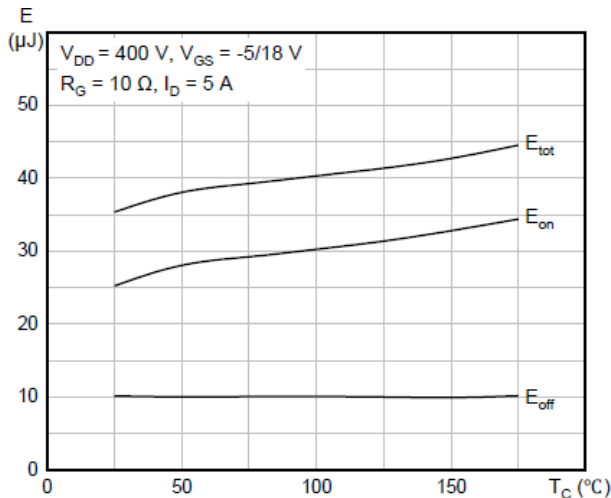


Figure 10. Breakdown Voltage vs. Temperature

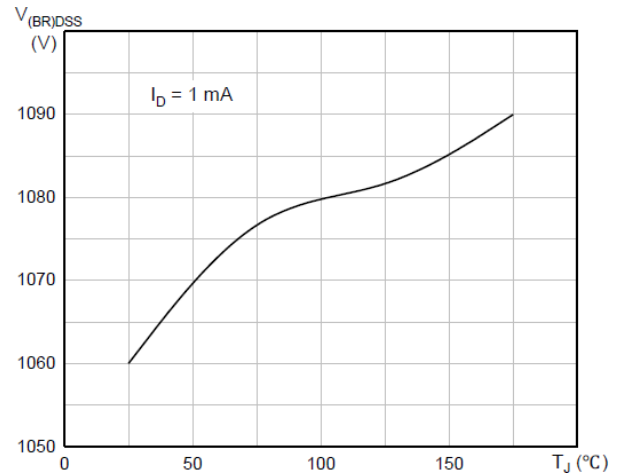


Figure 11. Gate Threshold vs. Temperature

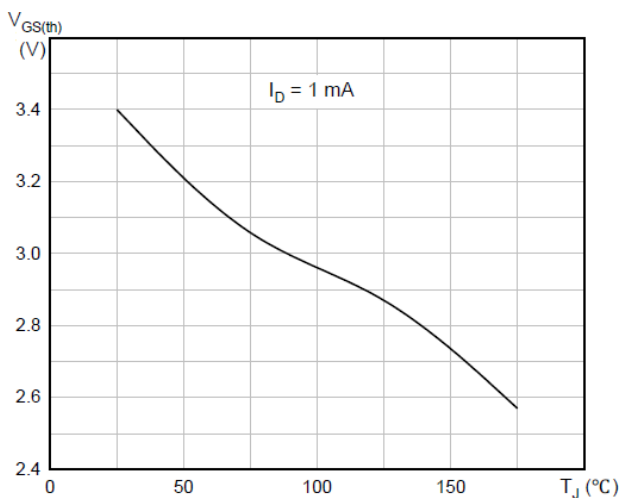
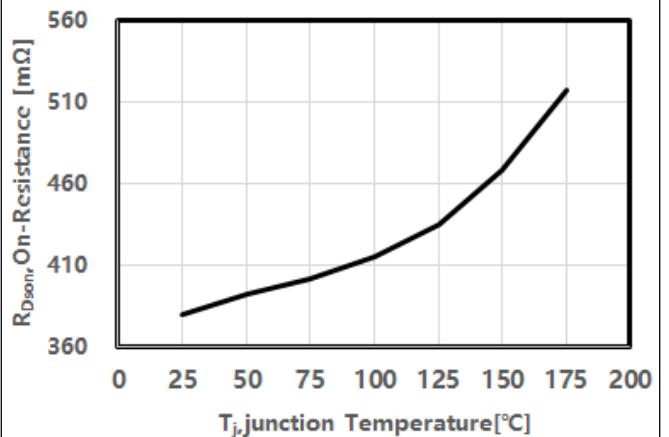


Figure 12. On-Resistance vs. Temperature



Typical Performance Characteristics

Figure 13. Body Diode Characteristics, $T_J = 25^\circ\text{C}$

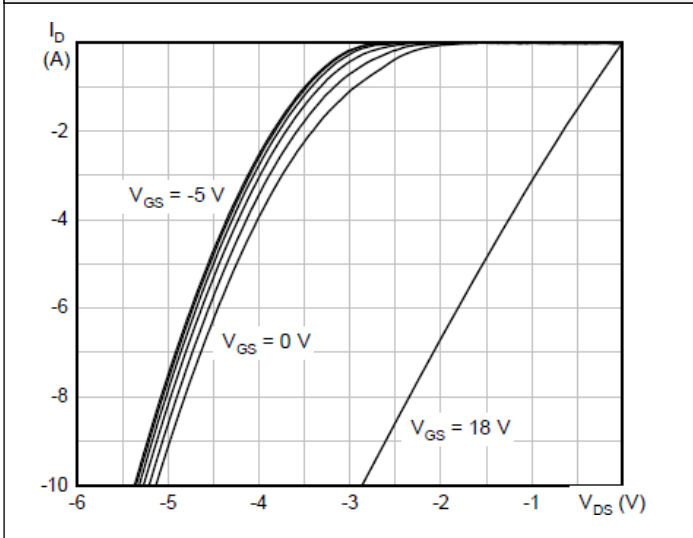


Figure 14. Body Diode Characteristics, $T_J = 175^\circ\text{C}$

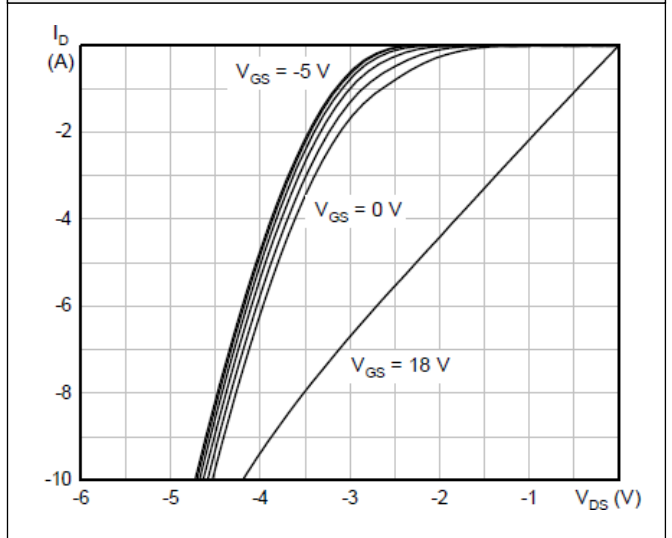


Figure 15. Continuous Drain Current Derating vs. Case Temperature

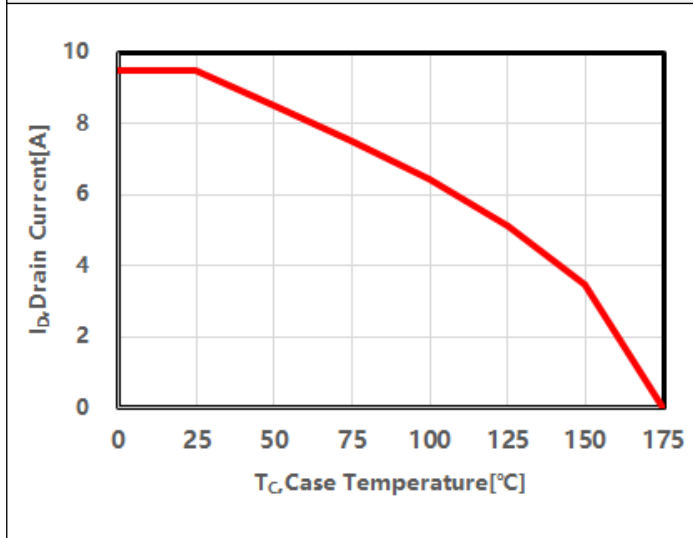


Figure 16. Maximum Power Dissipation Derating vs. Case Temperature

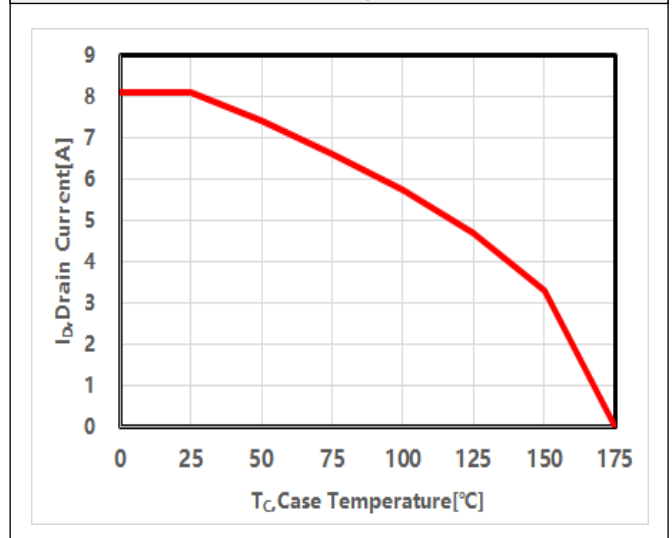


Figure 17. Maximum Safe Operating Area

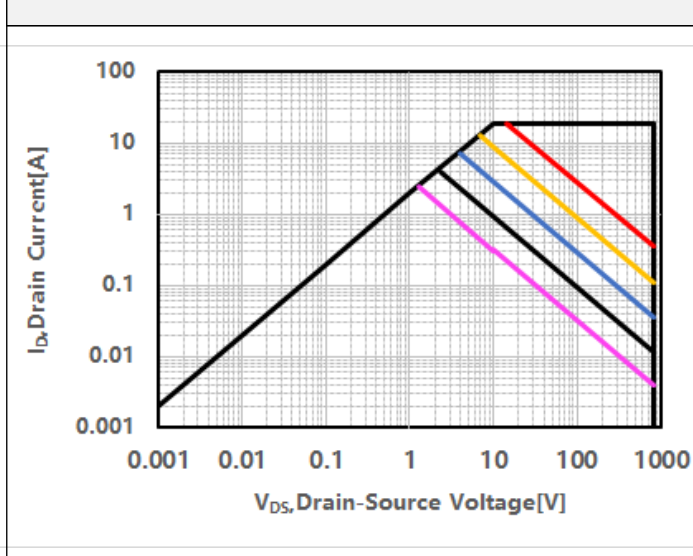
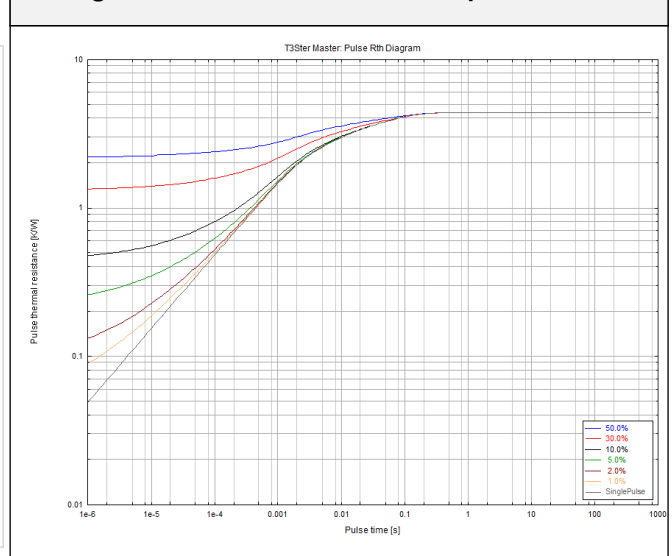
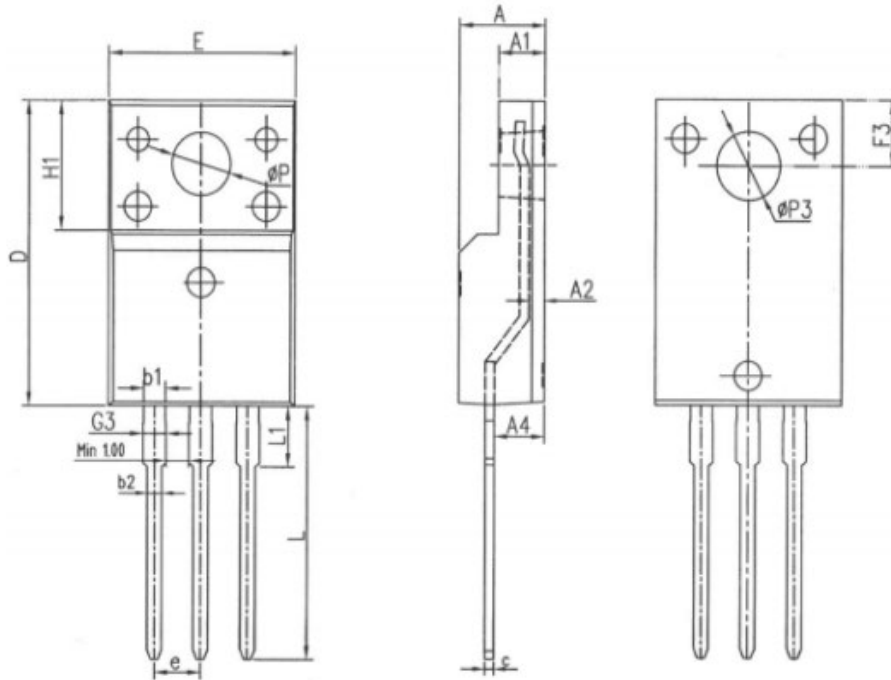


Figure 18. Transient Thermal Response Curve



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

Package Marking and Ordering Information

Part Number	Top Marking	Package	Packing Method	Quantity
BCF80N380W1	BCF80N380W1	TO220F	Tape & Reel	50 units

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