BCF80N240M2

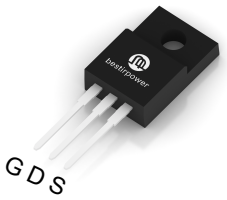
N-Channel Silicon Carbide Power MOSFET

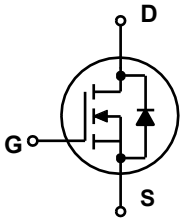
800 V, 10.9 A, 240 mΩ

Features

- Revolutionary semiconductor material Silicon Carbide
- High blocking voltage with low on-resistance
- High-speed switching with very low switching losses
- High-speed and high robust intrinsic body diode

$BV_{DSS, Tc=25℃}$	$I_{D, Tc=25℃}$	$R_{DS(on),typ}$	$Q_{g,typ}$
800 V	10.9 A	240 mΩ	16.7nC





Applications

- LED driver
- PD charger
- PC adapter
- Air-conditioning
- E-bike charger

Absolute Maximum Ratings (T_J = 25℃ 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		0/15	V
I_D	Drain Current	V_{GS} = 15 V, (T_C = 25℃)	10.9	A
		V_{GS} = 15 V,(T_C = 100℃)	7.7	
I_{DM}	Drain Current	Pulsed、	23	A
P_D	Power Dissipation	(T_C = 25℃)	46	W
		Derate Above 25℃	0.31	W/℃
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to 175	℃

Thermal Characteristics

Symbol	Parameter	Value	Unit
R_{thj-C}	MOSFET/Body Diode Junction-Case Thermal Resistance	3.26	℃/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	I_D = 100μA	800	-	-	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS} = 800 V, V_{GS} = 0 V	-	1.02	20	μA
I_{GSS}	Gate-Source Leakage Current	V_{DS} = 0 V, V_{GS} = + 22 V	-	17.9	+250	nA
I_{SGS}	Source-Gate Leakage Current	V_{DS}= 0 V, V_{GS}= - 10 V	-250	-9	-	nA
On Characteristics						
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS} = V_{DS}, I_D = 10 mA, T_J = 25˚C	-	3.13	-	V
$R_{DS(on)}$	Static Drain to Source On Resistance	V_{GS} = 15 V, I_D = 5 A, T_J = 25℃	-	315	-	mΩ
		V_{GS} = 15 V, I_D = 5 A, T_J = 175℃	-	290	-	
		V_{GS} = 18 V, I_D = 5 A, T_J = 25℃	-	246		
		V_{GS} = 18 V, I_D = 5 A, T_J = 175℃	-	237	-	
Dynamic Characteristics						
C_{iss}	Input Capacitance	V_{GS} = 0V, V_{DS} = 650 V, f = 1MHz	-	518	-	pF
C_{oss}	Output Capacitance		-	48.9	-	
C_{rss}	Reverse Capacitance		-	2.23	-	
$Q_{g(tot)}$	Total Gate Charge	V_{DS} = 600 V, I_D = 5 A, V_{GS} = 0V / 15 V	-	16.7	-	nC
Q_{gs}	Gate to Source Charge		-	5.48	-	
Q_{gd}	Gate to Drain “Miller” Charge		-	9.97	-	
R_G	Internal Gate Resistance	f = 1MHz,V_{AC} = 25 mV	-	14.5	-	Ω
Switching Characteristics						
$t_{d(on)}$	Turn-On Delay Time	V_{GS} = 0/15 V, L=600 μH V_{DS} = 600 V, I_D = 5 A, $R_{G(on)}$ = 2.2Ω, $R_{G(off)}$ = 2.2Ω	-	8.8	-	ns
t_r	Turn-On Rise Time		-	14.4	-	
$t_{d(off)}$	Turn-Off Delay Time		-	10.56	-	
t_f	Turn-Off Fall Time		-	27.7	-	
E_{on}	Turn-On Switching Energy		-	95.65	-	μJ
E_{off}	Turn-Off Switching Energy		-	5.5	-	
Source-Drain Diode Characteristics						
V_{SD}	Body Diode Forward Voltage	V_{GS} = 0 V, I_{SD} = 3.5A,T_C = 25˚C	-	2.42	-	V
		V_{GS} = 0 V, I_{SD} =3.5A,T_C = 175˚C	-	2.32	-	V
t_{rr}	Reverse Recovery Time	V_{DS} = 600 V, V_{GS} = 0 V, I_{SD} =5A, di/dt = 1.2 kA/μs	-	8.68	-	ns
Q_{rr}	Reverse Recovery Charge		-	39.6	-	nC
I_{rrm}	Peak Reverse Recovery Current		-	8.17	-	A

Typical Performance Characteristics

Figure 1. Safe operating area (SOA)

Single Pulse, T_{VJ} = 25°C

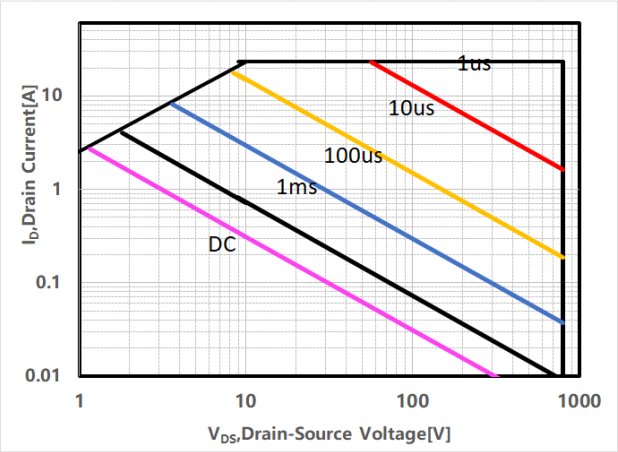


Figure 2. Power dissipation as a function of case temperature limited by bond wire

$P_D = f(T_C)$

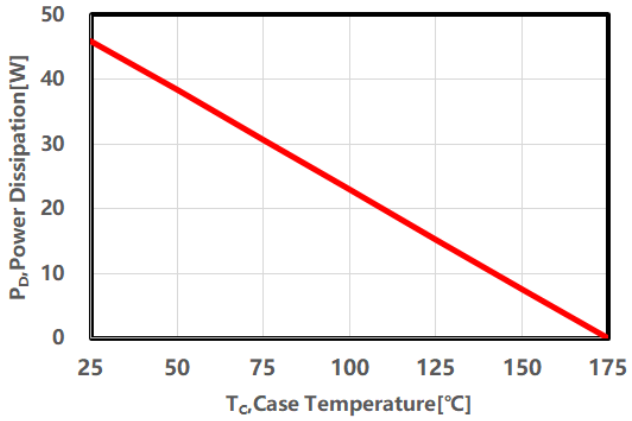


Figure 3. Typical output characteristic, VGS as parameter

$I_{DS} = f(V_{DS})$ T_{VJ} = -55 ℃

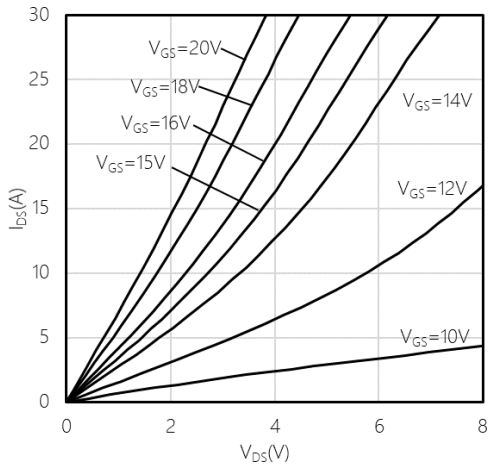


Figure 4. Typical output characteristic, VGS as parameter

$I_{DS} = f(V_{DS})$ T_{VJ} = 25 ℃

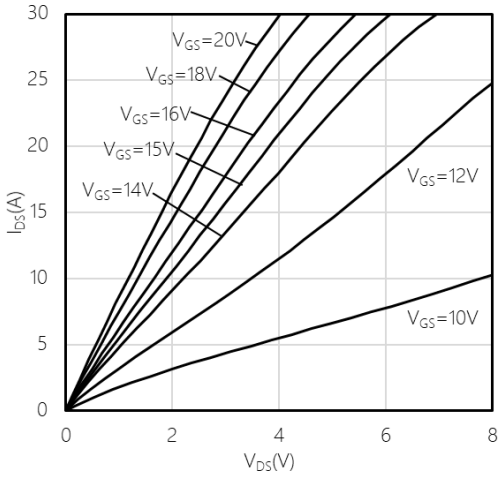


Figure 5. Typical output characteristic, VGS as parameter

$I_{DS} = f(V_{DS})$ T_{VJ} = 175℃

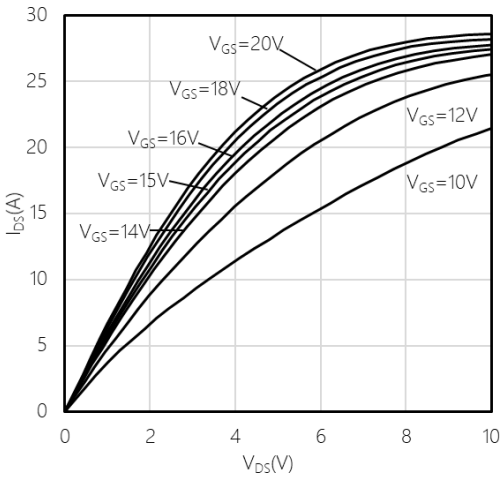
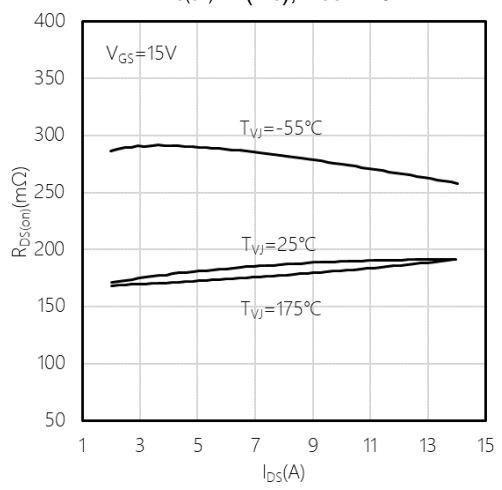


Figure 6. Typical on-state resistance as a function of drain current

$R_{DS(on)} = f(I_{DS})$, V_{GS} = 15V



Typical Performance Characteristics

Figure 7. Typical on-state resistance as a function of temperature

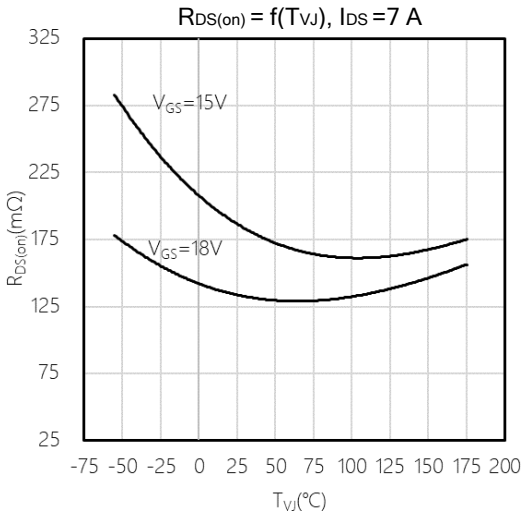


Figure 8. Typical on-state resistance as a function of VGS

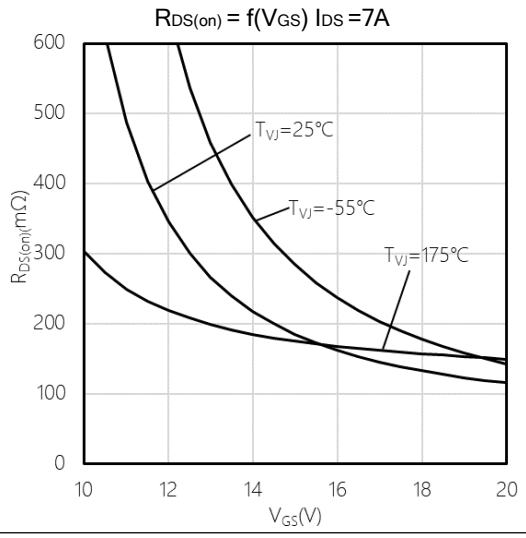


Figure 9. Typical transfer characteristic

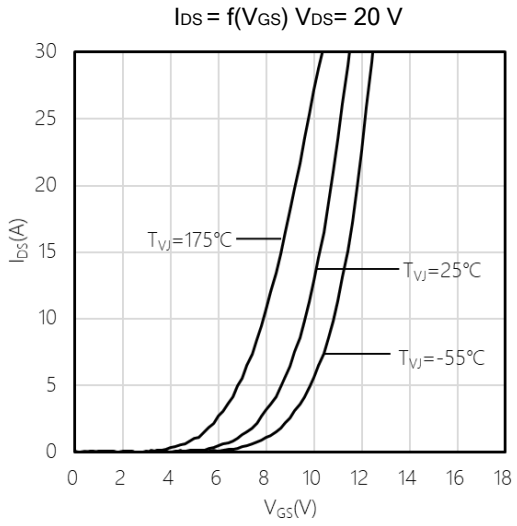


Figure 10. Typical gate-source threshold voltage as a function of junction temperature

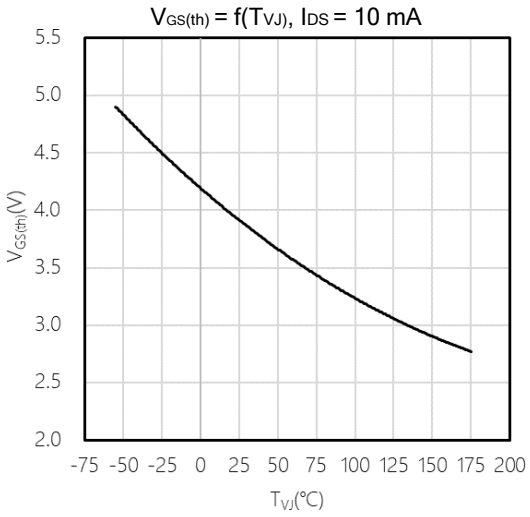


Figure 11. Typical reverse drain current as function of reverse drain voltage, VGS as parameter

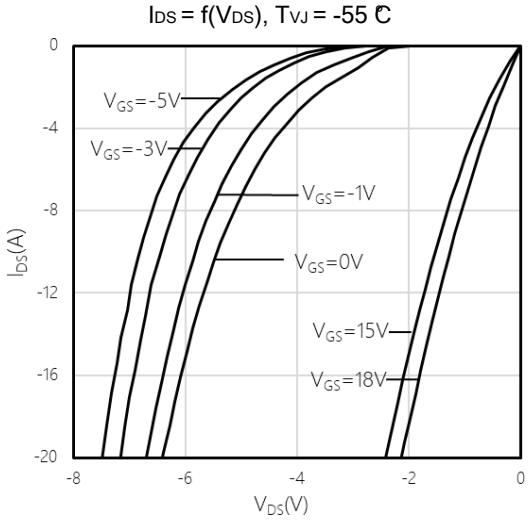
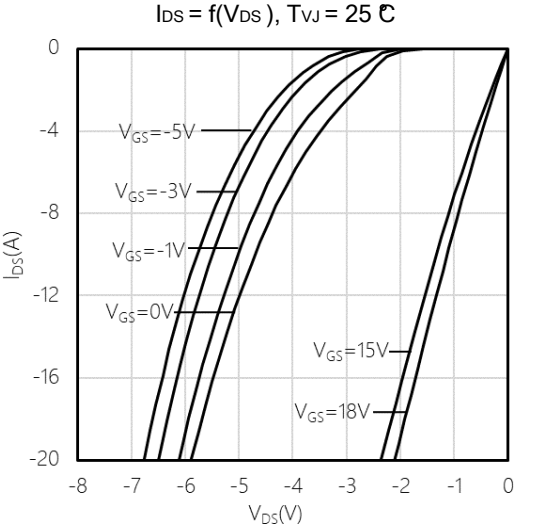


Figure 12. Typical reverse drain current as function of reverse drain voltage, VGS as parameter



Typical Performance Characteristics

Figure 13.Typical reverse drain current as function of reverse drain voltage, VGS as parameter

$I_{DS} = f(V_{DS})$, $T_{VJ} = 175$ ℃

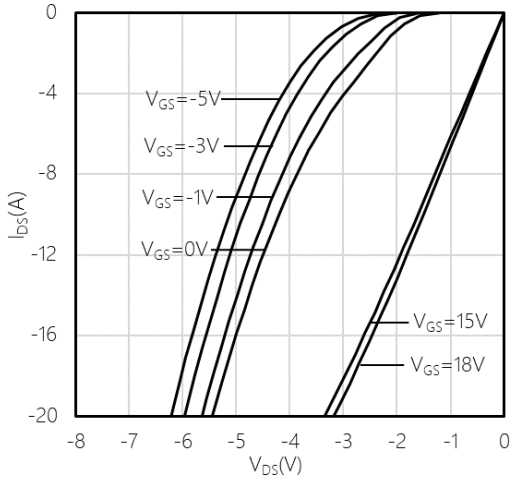


Figure 14. Typical reverse drain voltage as function of junction temperature

$V_{SD} = f(T_{VJ})$, $I_{SD} = 3.5A$

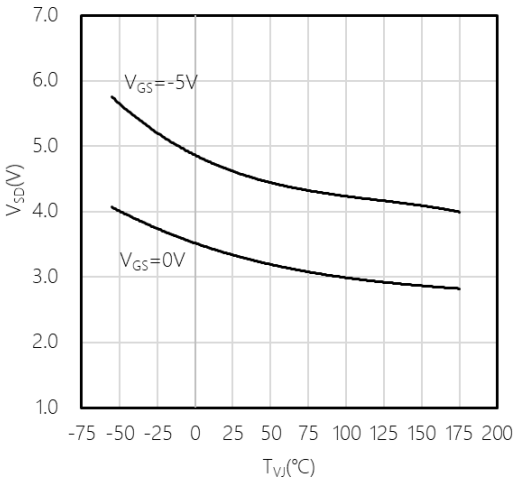


Figure 15. Typical switching energy as a function of junction temperature

$E = f(T_{VJ})$

V_{DS} = 400 V, R_G(ext) = 2.2 Ω, V_{GS} = 0/15 V, I_{DS} = 7A

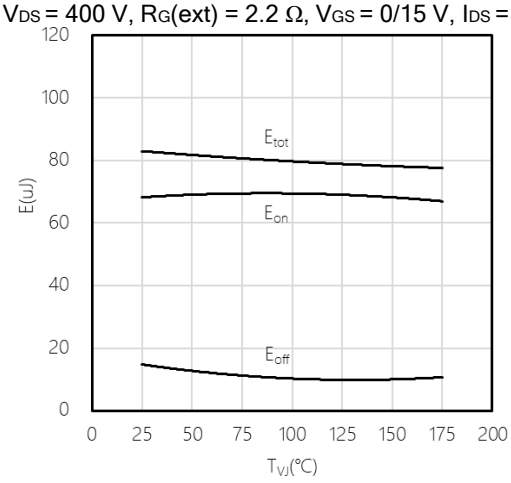


Figure 16. Typical switching energy losses as a function of gate resistance

$E = f(R_{G(EXT)})$ V_{GS} = 0/15 V, I_{DS} = 7A, T_{VJ} = 25 °C, V_{DS} = 400 V

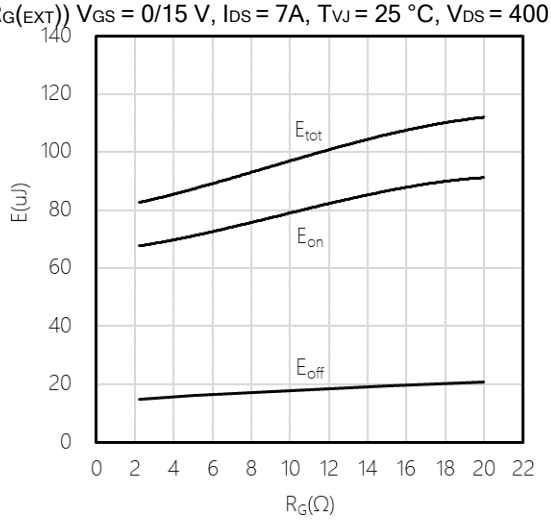


Figure 17. Typical switching energy losses as a function of gate resistance

$E = f(_{RG(EXT)})$

V_{GS} = 0/15 V, I_{DS} =7 A, T_{VJ} = 175 °C, V_{DS} = 400 V

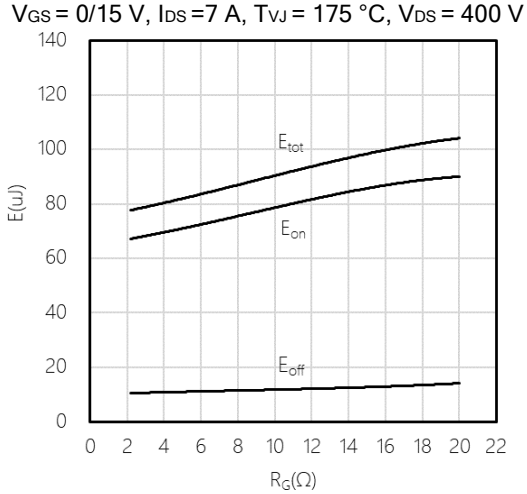
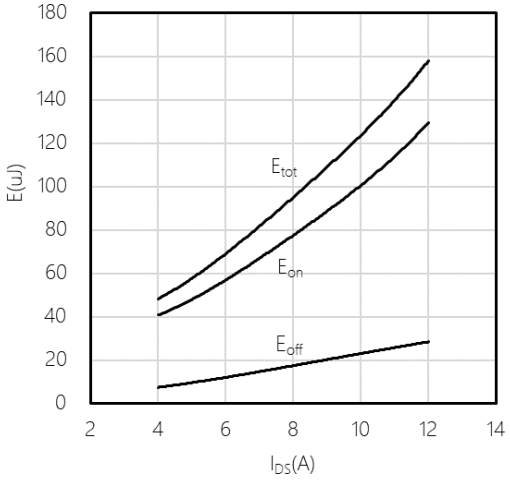


Figure 18. Typical switching energy losses as a function of I_{DS}

$E = f(I_{DS})$, V_{GS} = 0/15 V, $R_{G(ext)}$ = 2.2 Ω, T_{VJ} = 25 °C, V_{DS} = 400 V



Typical Performance Characteristics

Figure 19.Typical switching energy losses as a function of I_{DS}

E = f(I_{DS})
V_{GS} = 0/15 V, R_G(ext) = 2.2 Ω, T_{VJ} = 175 °C, V_{DS} = 400 V

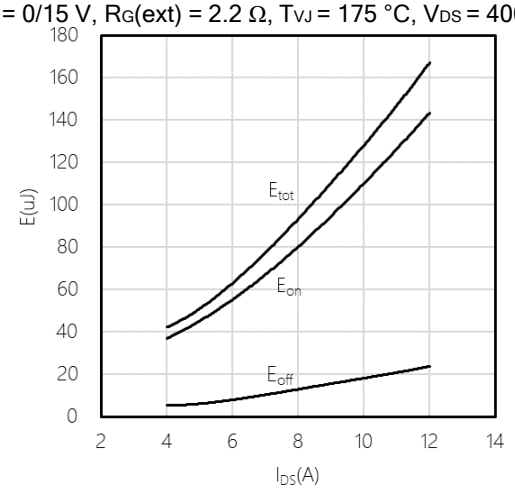


Figure 20. Typical switching energy losses as a function of V_{DS}

E = f(V_{DS})
V_{GS} = 0/15 V, $R_{G(ext)}$ = 2.2 Ω, T_{VJ} = 25 °C, I_{DS} = 7 A

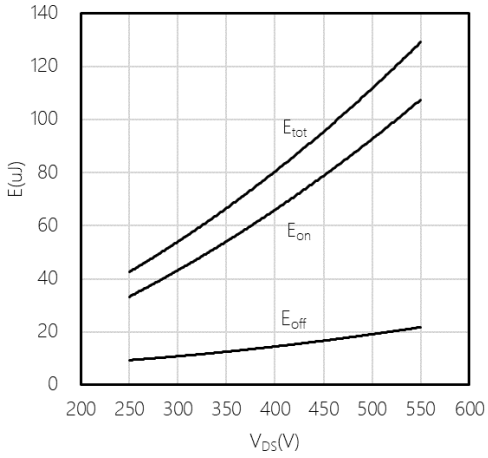


Figure 21. Typical switching energy losses as a function of V_{DS}

E = f(V_{DS})
V_{GS} = 0/15 V, RG(ext) = 2.2 Ω, TVJ = 175 °C, I_{DS} = 7A

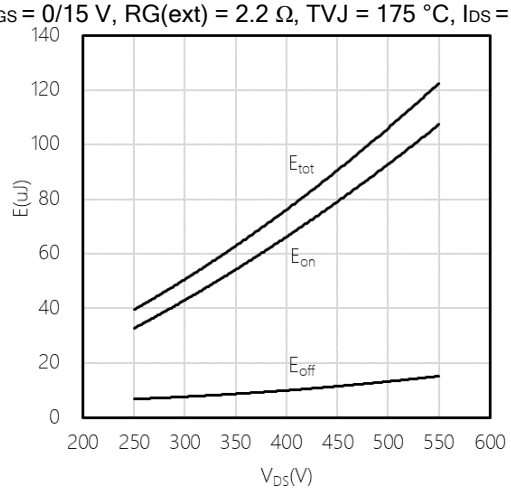


Figure 22. Typical gate charge

V_{GS} =f(Q_G), I_{DS} = 7A, V_{DS} = 400V turn-on pulse

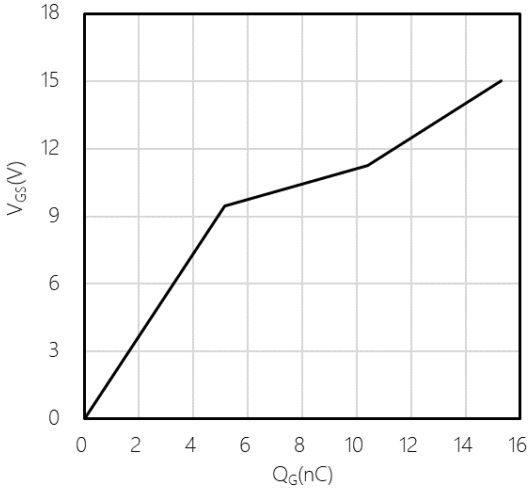


Figure 23. Typical capacitance as a function of drain-source voltage

C = f(V_{DS}), V_{GS} = 0V, f = 1MHz

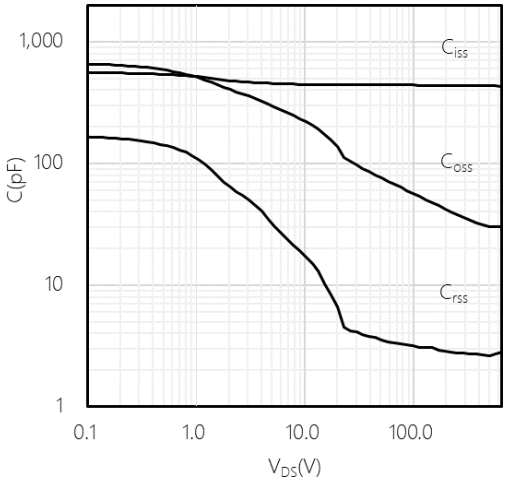
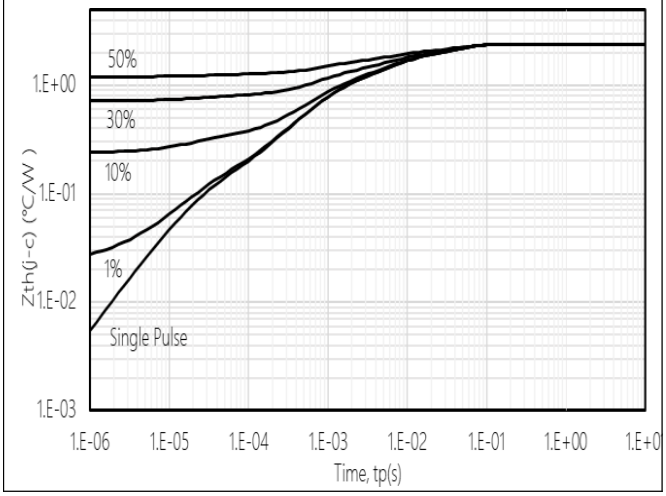


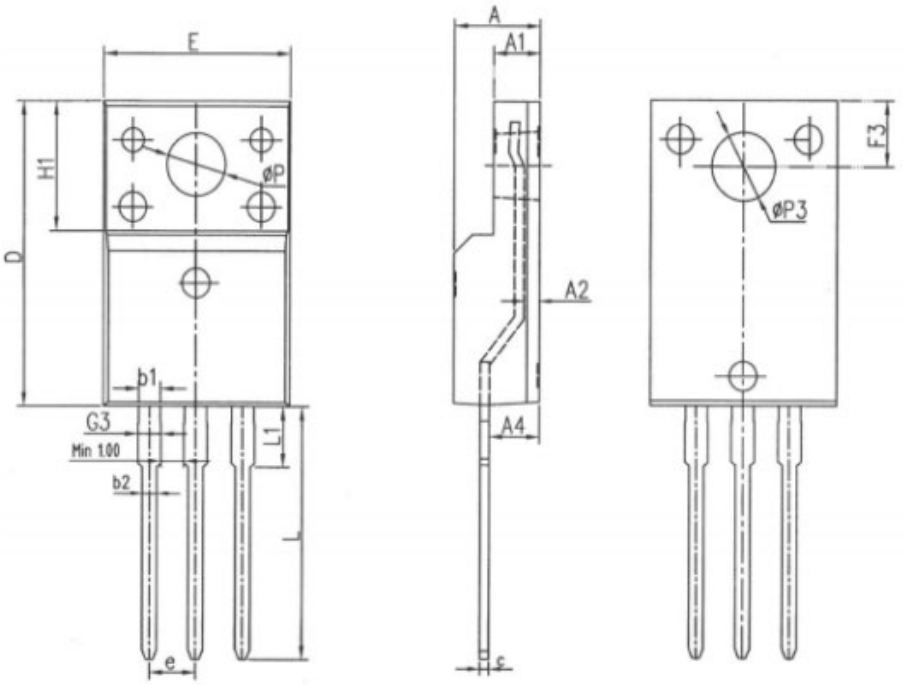
Figure 24. Transient thermal resistance (MOSFET)

(Zth(j-c,max) = f(tp), Parameter D = tp/T



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
BCF80N240M2	BCF80N240M2	TO220F	Tape & Reel	50 units

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