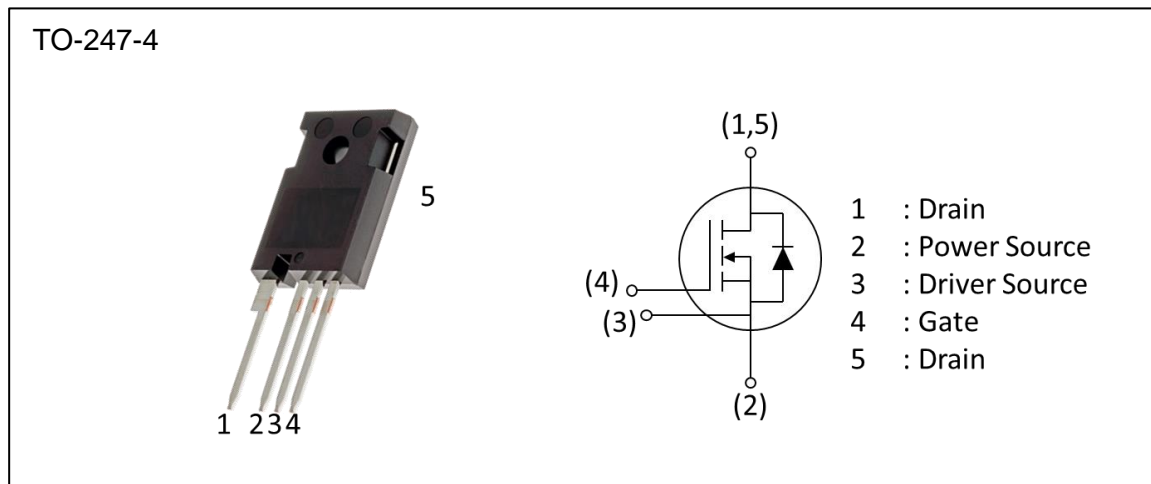


< SiC-MOSFET >

BM022N120KJ

N series 1200V TO-247-4 Automotive Grade



Features

- ✓ Low switching losses
- ✓ High tolerance for capacitive turn-on
- ✓ Fast reverse recovery of body diode
- ✓ Pb-free lead plating (RoHS compliant)

Applications

- ✓ On Board Charger
- ✓ DC/DC Converter

Key Performance

V_{DSS}	1200V
$I_D (T_C = 25^\circ\text{C})$	107A
$R_{DS(on)} (T_j = 25^\circ\text{C})$	22m Ω

Packaging Specifications

Part Number	BM022N120KJ
Package	TO-247-4
Marking	BM022N120KJ

Maximum ratings ($T_j = 25^\circ\text{C}$, unless otherwise noted)

Item	Symbol	Condition	Rating	Unit
Drain-source voltage	V_{DSS}	-	1200	V
Gate-source voltage	V_{GSS}^{*1}	-	-10/+22	V
Continuous drain current	I_{D}^{*2}	$T_{\text{C}} = 25^\circ\text{C}$	107	A
		$T_{\text{C}} = 100^\circ\text{C}$	77	A
Pulsed drain current	$I_{\text{D,pulse}}^{*3}$	Limited by T_{jmax}	284	A
Continuous body diode forward current	I_{S}^{*2}	$T_{\text{C}} = 25^\circ\text{C}$	89	A
Pulsed body diode forward current	$I_{\text{S,pulse}}^{*3}$	Limited by T_{jmax}	213	A
Power dissipation	P_{TOT}^{*2}	$T_{\text{C}} = 25^\circ\text{C}$	468	W
Operating junction temperature	T_{j}	-	-55 to 175	$^\circ\text{C}$
Storage temperature	T_{stg}	-	-55 to 150	$^\circ\text{C}$
Soldering temperature	T_{sold}	1.6mm from case for 10s	260	$^\circ\text{C}$
Mounting torque	M	-	0.8	N·m

Thermal characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction-case	$R_{\text{th(j-c)}}^{*3}$	-	0.25	0.32	$^\circ\text{C/W}$

Static characteristics (T_j = 25 °C, unless otherwise noted.)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Drain-source breakdown voltage	V _{(BR)DSS}	V _{GS} = 0V, I _D = 10uA	1200	-	-	V
Drain-source on-state resistance	R _{DS(on)}	V _{GS} = 15V, I _D = 71A	-	22	33	mΩ
		T _j = 25°C	-	23	-	
		T _j = 100°C	-	29	-	
Body diode forward voltage	V _{SD}	V _{GS} = -5V, I _{SD} = 71A, T _j = 25°C	-	4.1	-	V
Gate-source threshold voltage	V _{GS(th)} *4	V _{DS} = 10V, I _D = 7.1mA	1.7	2.3	2.9	V
Drain-source leakage current	I _{DSS}	V _{DS} = 1200V, V _{GS} = 0V	-	0.01	10	uA
Gate – Source leakage current	I _{GSS}	V _{GS} = 22V, V _{DS} = 0V	-	-	100	nA
		V _{GS} = -10V, V _{DS} = 0V	-	-	100	
Transconductance	g _{fs}	V _{DS} = 10V, I _D = 71A	-	30	-	S
Internal gate resistance	R _{G,int}	f = 500kHz	-	1	-	Ω
Input capacitance	C _{iss}	V _{DS} = 800V, V _{GS} = 0V, f = 500kHz	-	4680	-	pF
Output capacitance	C _{oss}		-	235	-	
Reverse capacitance	C _{rss}		-	8	-	
C _{oss} Stored Energy	E _{oss}		-	100	-	

BM022N120KJ

PRELIMINARY

N series 1200V TO-247-4 Automotive Grade

Dynamic characteristics (T_j = 25 °C, unless otherwise noted.)

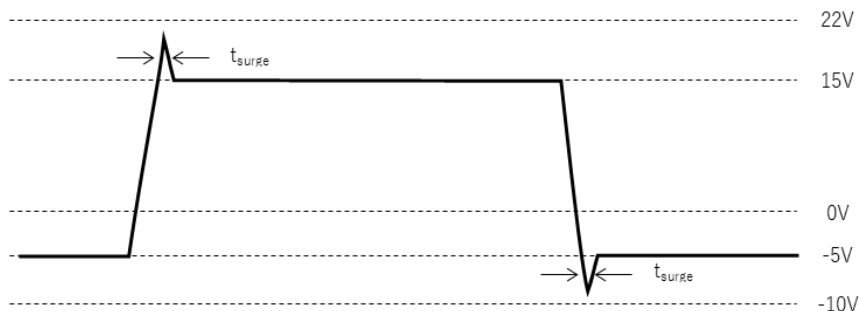
Item	Symbol	Condition	Min.	Typ.	Max.	Unit
Total gate charge	Q _g	V _{DD} = 800V, I _D = 71A, V _{GS} = -5/15V	-	163	-	nC
Gate to Drain charge	Q _{gd}		-	57	-	
Gate to Source charge	Q _{gs}		-	67	-	
Turn-on delay time	t _{d(on)}	V _{DD} = 800V, I _D = 71A, V _{GS} = -5/15V, R _{G,ext} = 2.2Ω FWD: same type device as D.U.T. at VGS = -5V Inductive load	-	21	-	ns
Rise time	t _r		-	29	-	
Turn-off delay time	t _{d(off)}		-	36	-	
Fall time	t _f		-	9	-	
Turn-on switching loss	E _{on}		-	1093	-	uJ
Turn-off switching loss	E _{off}		-	283	-	
Body diode reverse recovery charge	Q _{rr}	V _{DD} = 800V, I _S = 71A, di/dt = 7300A/us, V _{GS} = -5V	-	575	-	nC
Body diode reverse recovery time	t _{rr}		-	15	-	ns
Body diode reverse recovery current	I _{rr}		-	61	-	A

*1 Recommended turn-off gate voltage V_{GS_off} is -5~0V.

Recommended turn-on gate voltage V_{GS_on} is 15V.

Use with t_{surge} < 300ns. Do not use with V_{GS_on} < 13V.

V_{GS} Waveform Example



*2 Limited by T_{jmax} and R_{th(j-c)max}

*3 Designed value (not tested).

*4 Tested after applying VGS = 20V for 200ms.

Electrical Characteristic Curves

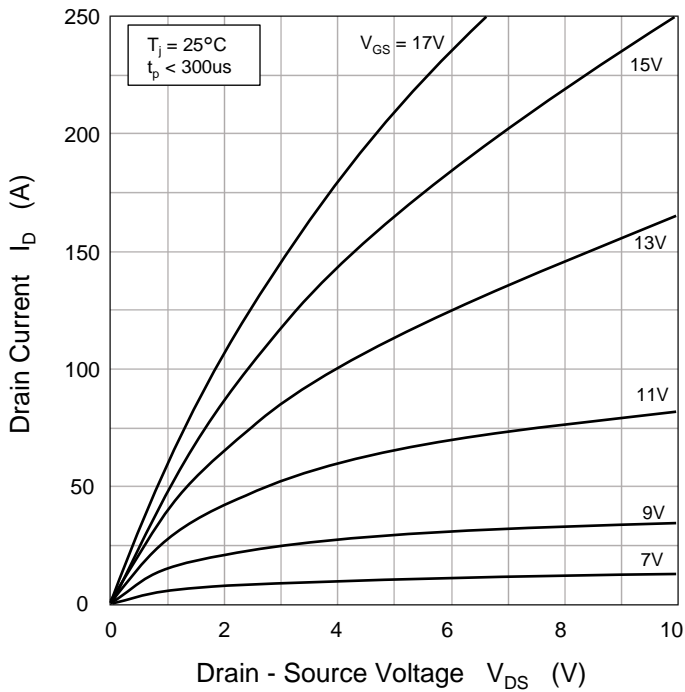


Figure 1 Typical Output Characteristics
($T_j = 25^\circ\text{C}$)

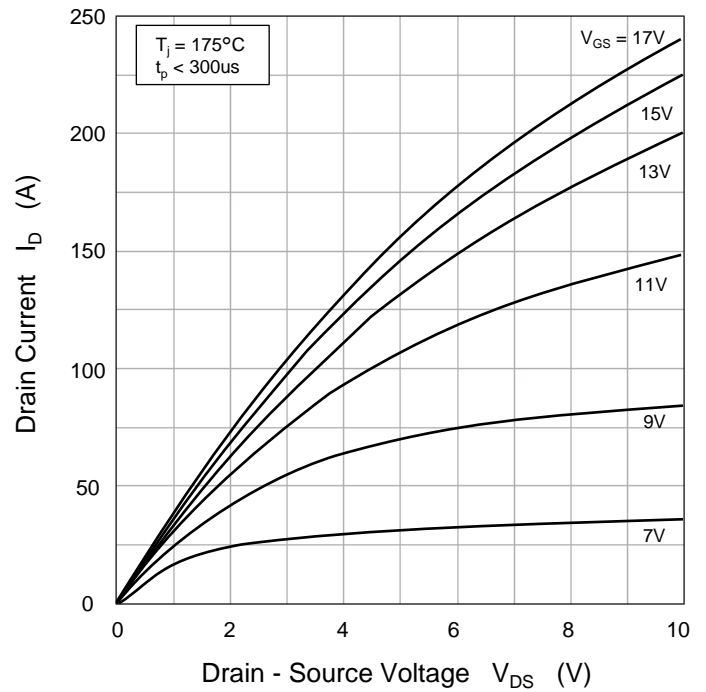


Figure 1 Typical Output Characteristics
($T_j = 175^\circ\text{C}$)

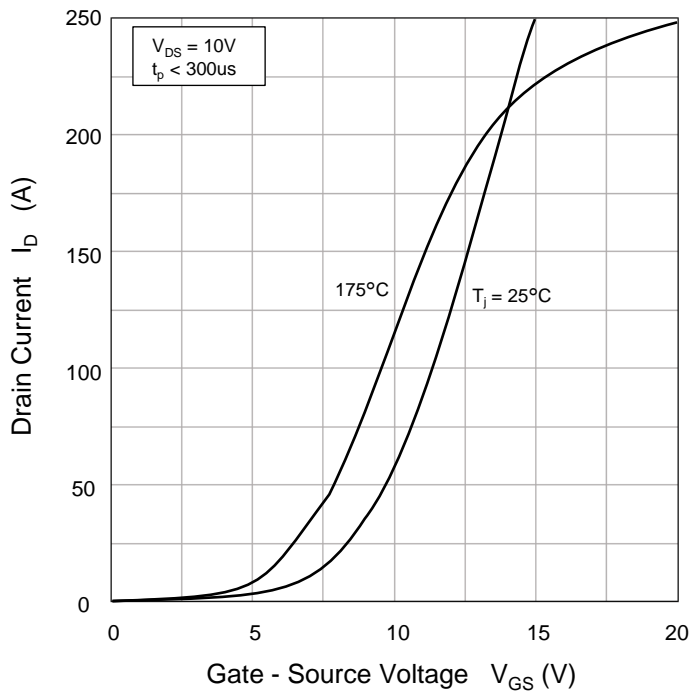


Figure 3 Typical Transfer Characteristics

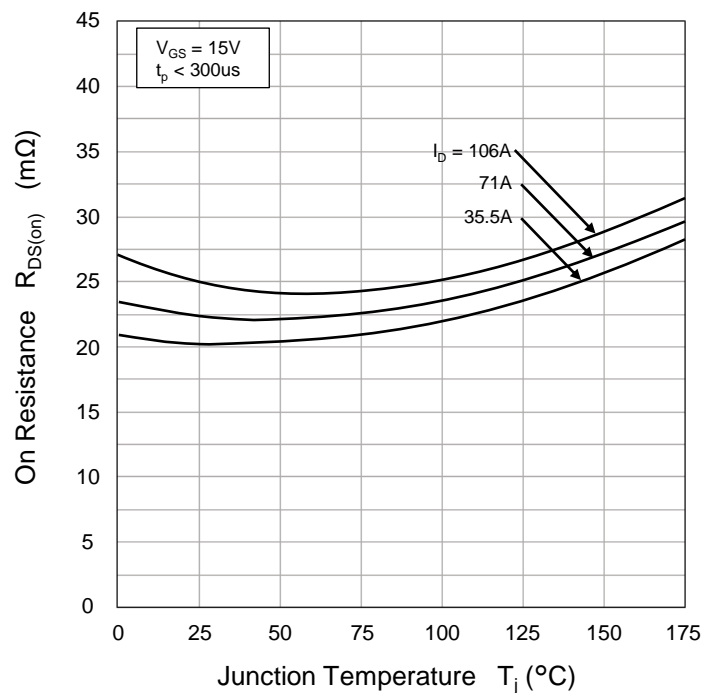


Figure 4 Typical On resistance vs.
Junction Temperature

Electrical Characteristic Curves

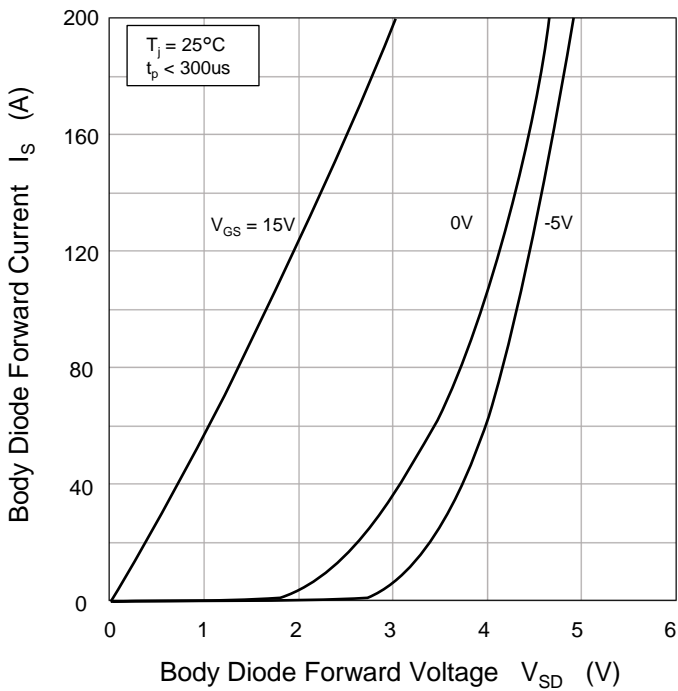


Figure 5 Typical Body Diode Forward current vs. Source-Drain Voltage ($T_j = 25^\circ\text{C}$)

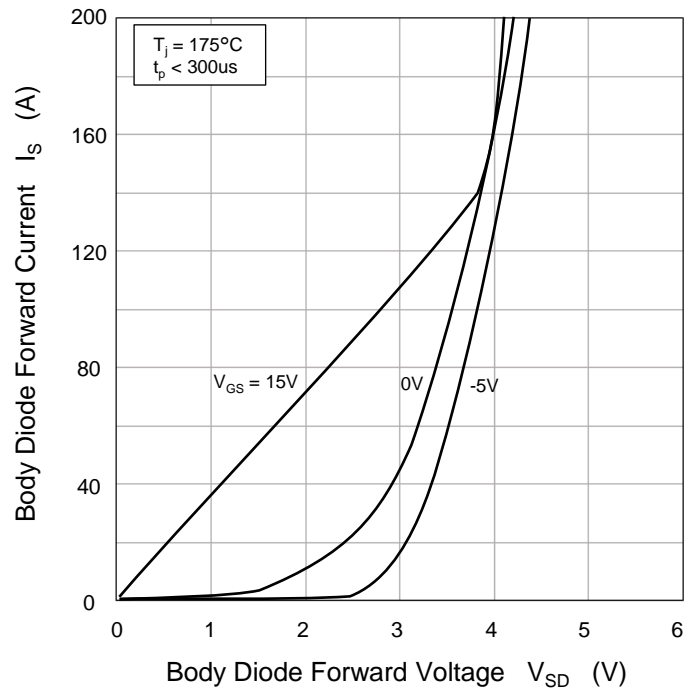


Figure 6 Typical Body Diode Forward current vs. Source-Drain Voltage ($T_j = 175^\circ\text{C}$)

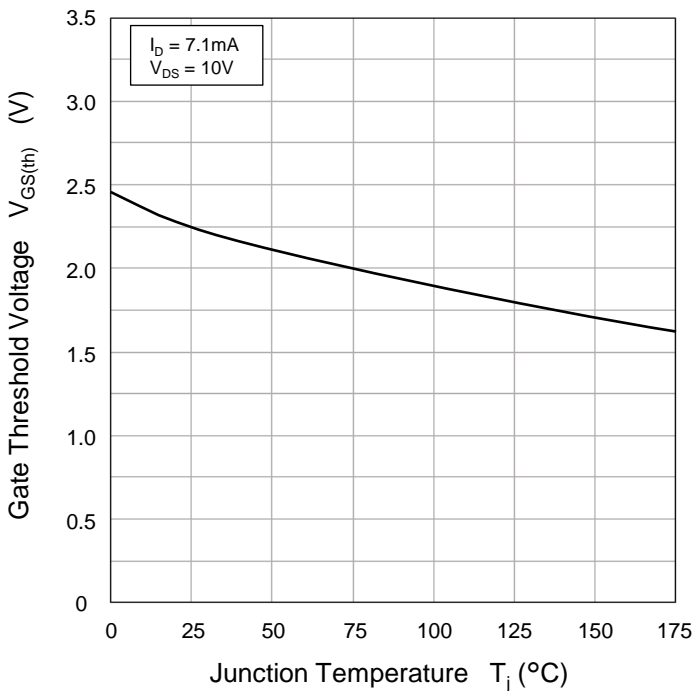


Figure 7 Typical Gate Threshold Voltage vs. Junction Temperature

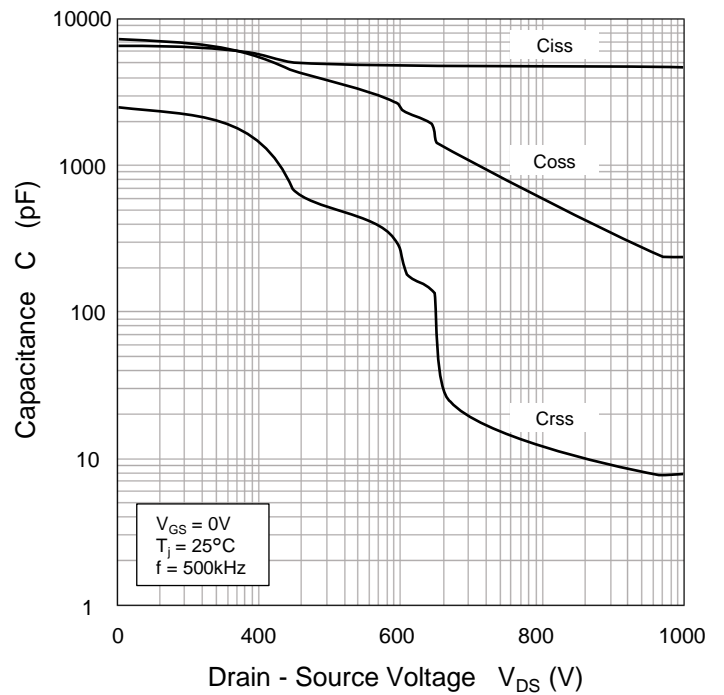


Figure 8 Typical Capacitance vs. Drain-Source Voltage

Electrical Characteristic Curves

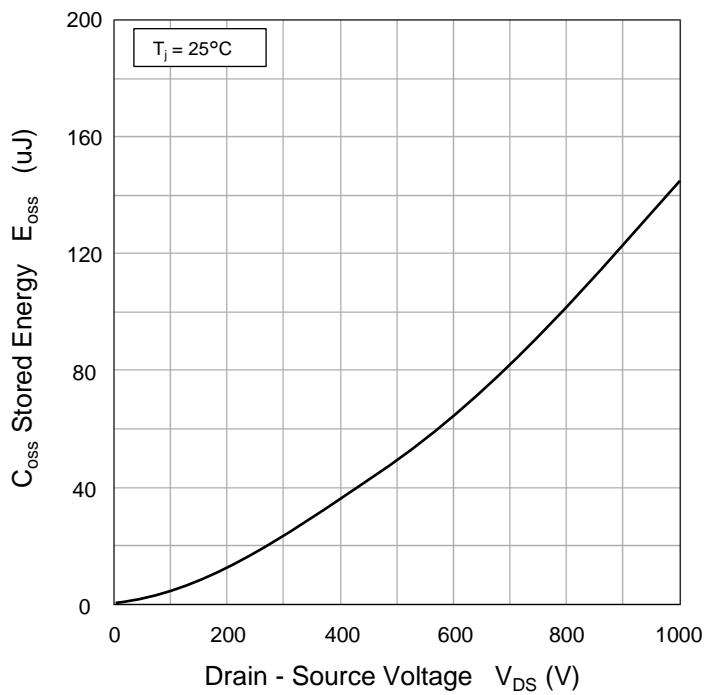


Figure 9 Typical C_{oss} Stored Energy

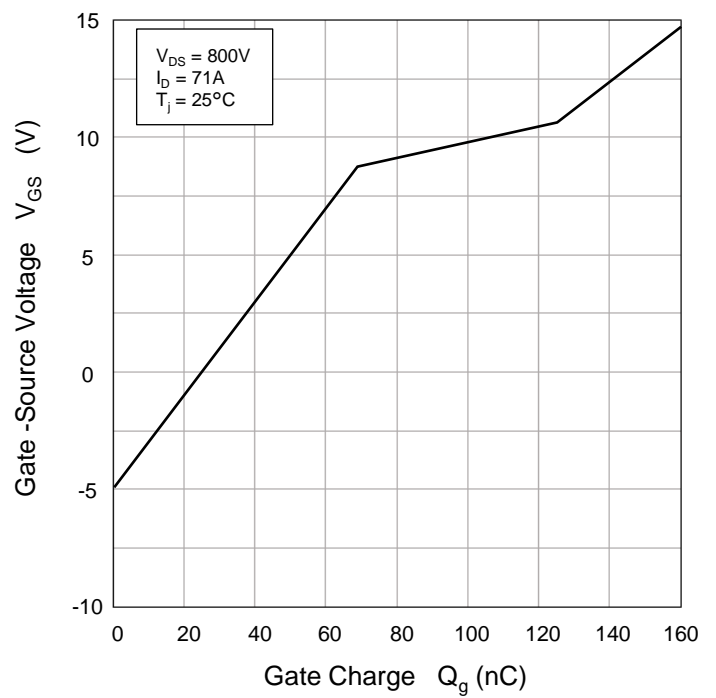


Figure 10 Typical Gate charge Characteristics

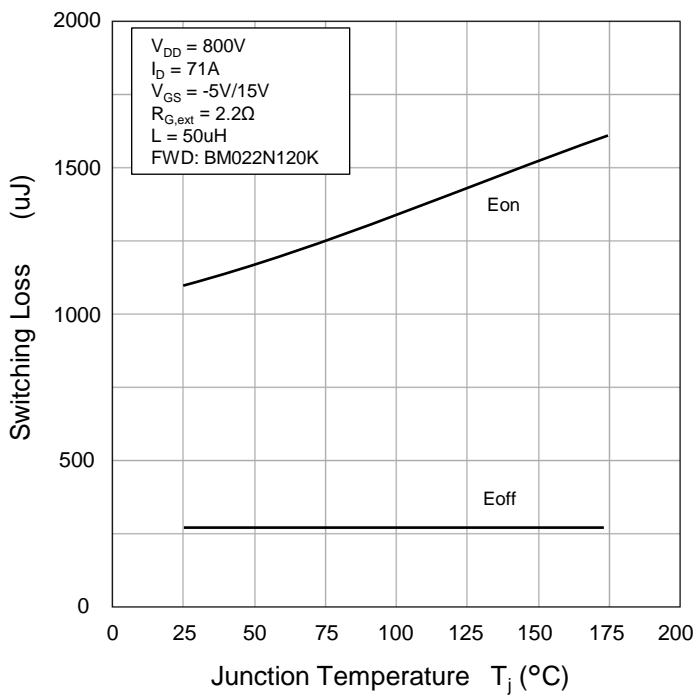


Figure 11 Typical Switching Loss vs. Junction Temperature

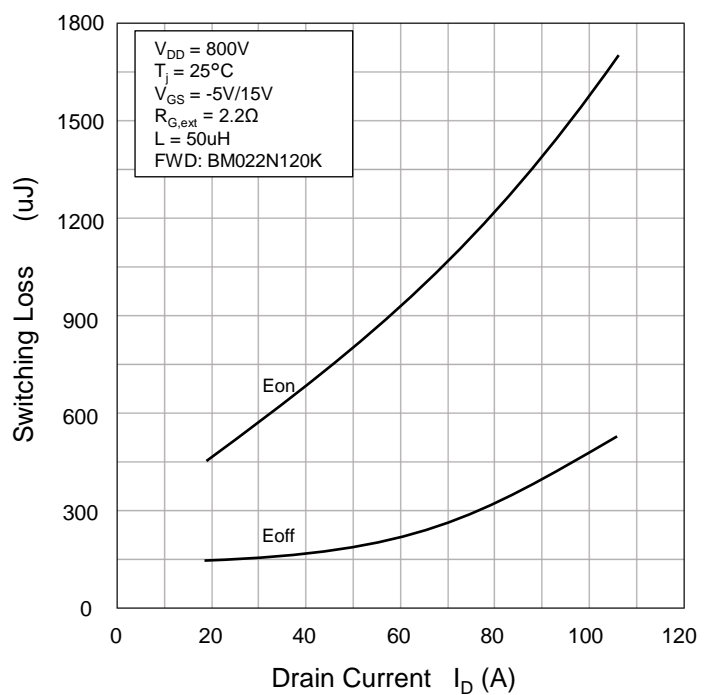


Figure 12 Typical Switching Loss vs. Drain Current ($T_j = 25^\circ\text{C}$)

Electrical Characteristic Curves

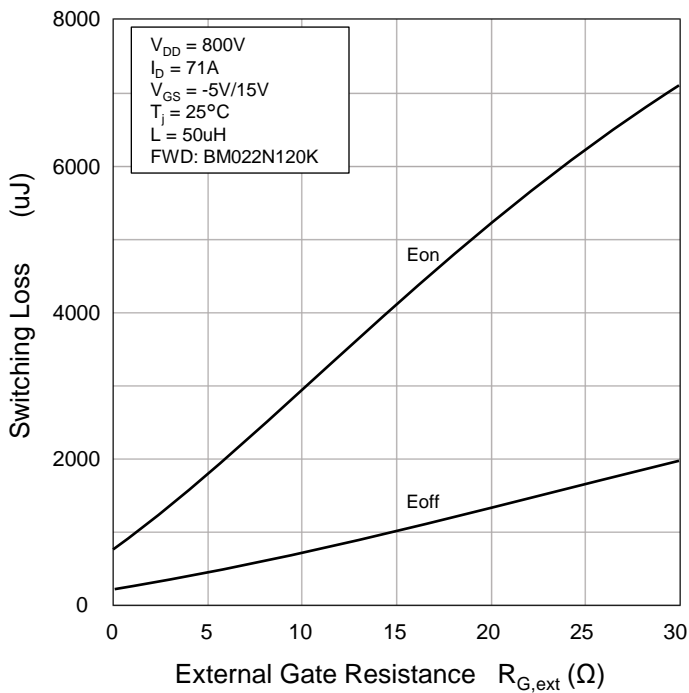


Figure 13 Typical Switching Loss vs. $R_{G,ext}$
($T_j = 25^\circ\text{C}$)

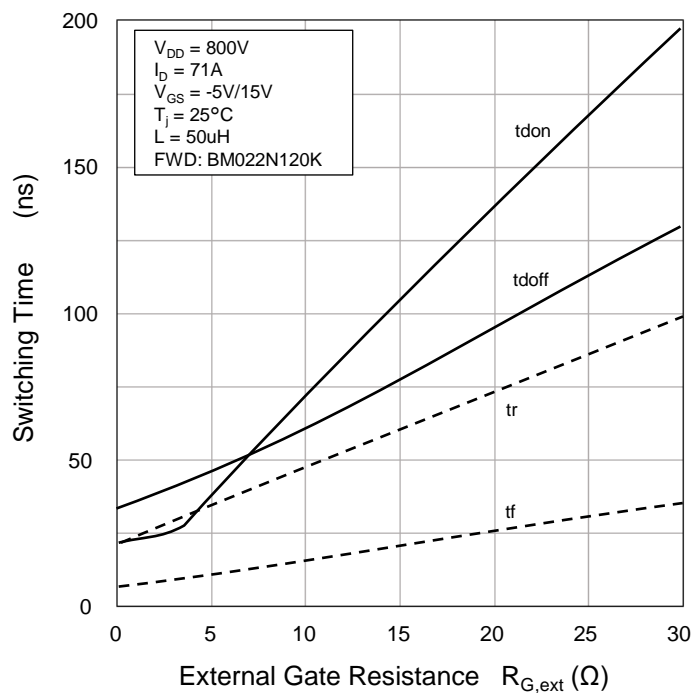


Figure 14 Typical Switching Times vs. $R_{G,ext}$
($T_j = 25^\circ\text{C}$)

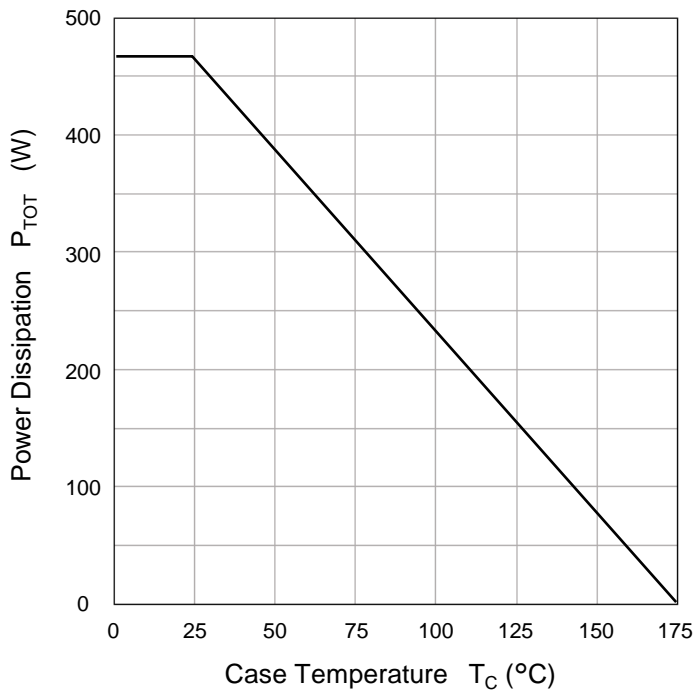


Figure 15 Maximum Power Dissipation Derating vs.
Case Temperature

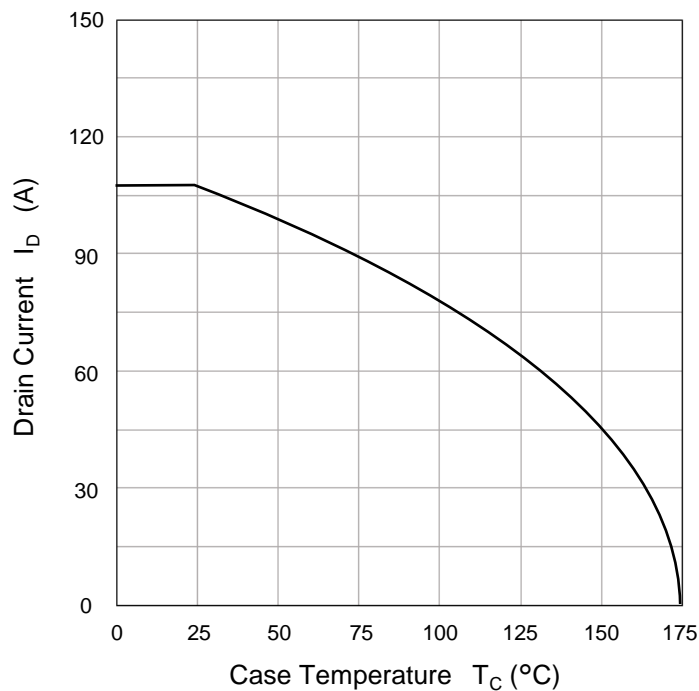


Figure 16 Maximum Continuous Drain Current vs.
Case Temperature

Electrical Characteristic Curves

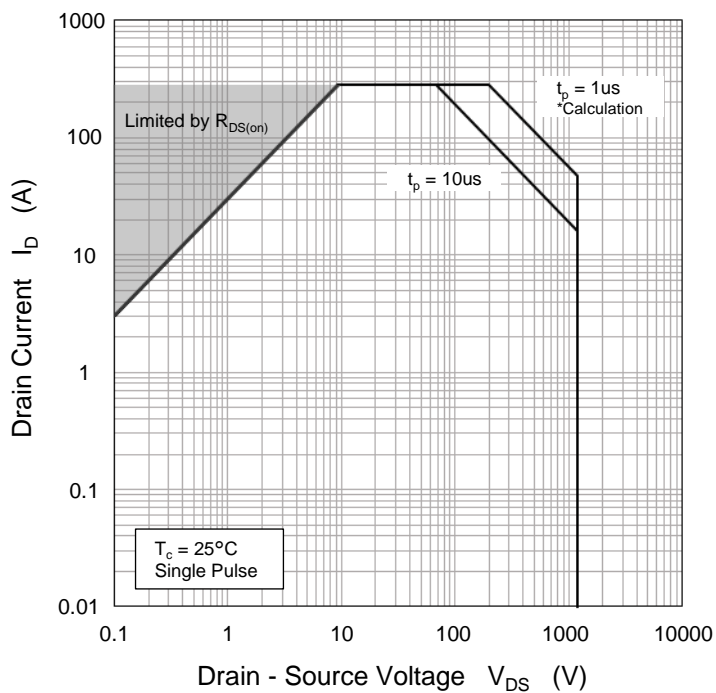


Figure 17 Maximum Safe Operating Area

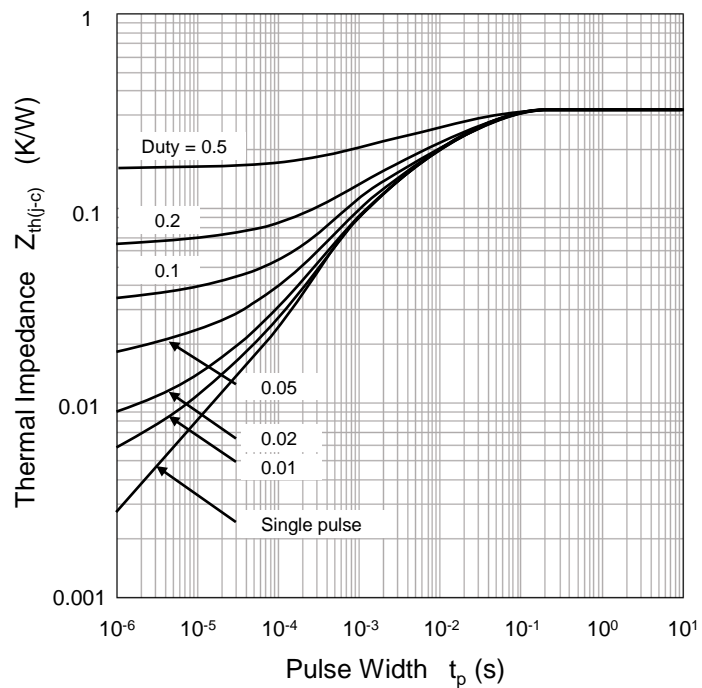
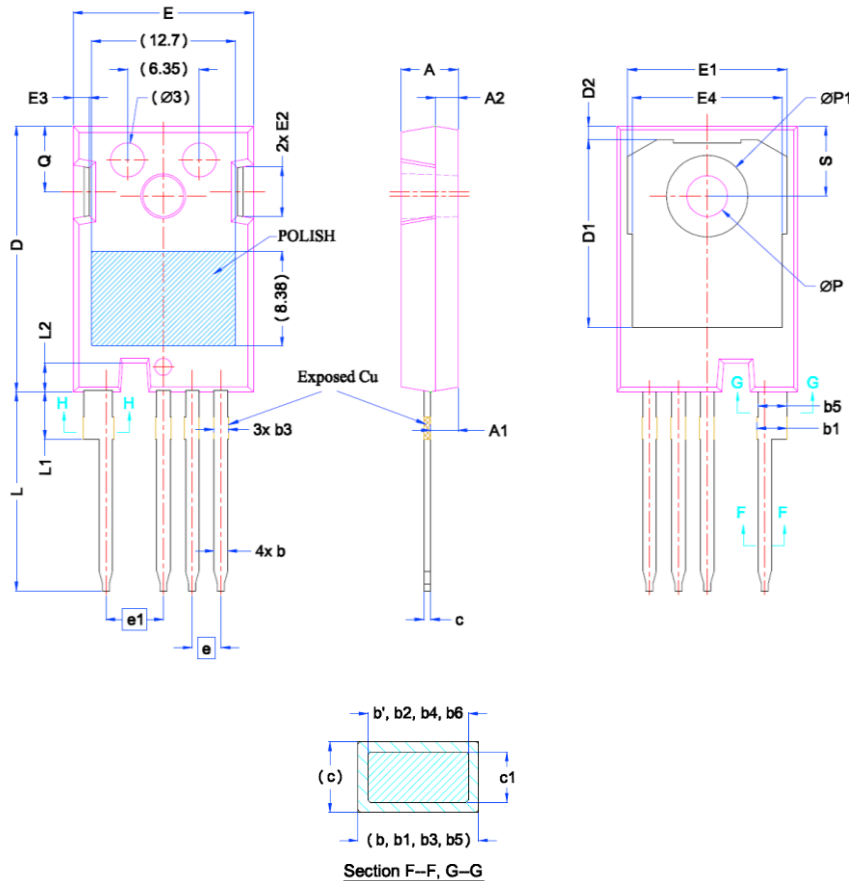


Figure 18 Maximum Transient Thermal Impedance vs. Pulse Width

Package Dimensions

TO-247-4 (unit : mm)



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.83	5.02	5.21
A1	2.29	2.41	2.54
A2	1.91	2.00	2.16
b'	1.07	1.20	1.28
b	1.07	1.20	1.30
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.80
b4	1.07	1.30	1.50
b5	2.39	2.53	2.69
b6	2.39	2.53	2.64
c	0.55	0.60	0.68
c1	0.55	0.60	0.65
D	23.30	23.45	23.60
D1	16.25	16.55	17.65
D2	0.95	1.19	1.25
E	16.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.98	4.40	5.10
E3	1.00	1.45	1.90
E4	12.38	13.26	13.43
e	2.54 BSC		
e1	5.08 BSC		
L	17.31	17.57	17.82
L1	3.97	4.19	4.37
L2	2.35	2.50	2.65
ØP	3.51	3.61	3.65
ØP1	7.19 REF.		
Q	5.49	5.79	6.00
S	6.04	6.17	6.30

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