MITSUBISHI ELECTRIC

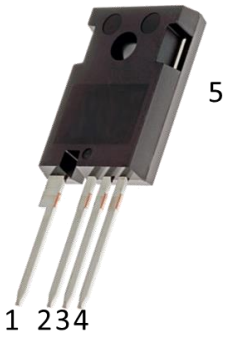
PRELIMINARY

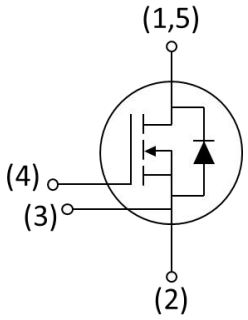
< SiC-MOSFET >

BM080N120KJ

N series 1200V TO-247-4 Automotive Grade

TO-247-4





1 : Drain
2 : Power Source
3 : Driver Source
4 : Gate
5 : Drain

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°C)	36A
$R_{DS(on)}$ (T_j = 25°C)	80mΩ

Packaging Specifications

Part Number	BM080N120KJ
Package	TO-247-4
Marking	BM080N120KJ

Maximum ratings (T_j = 25°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_C = 25°C	36	A
		T_C = 100°C	26	A
Pulsed drain current	$I_{D,pulse}$ *3	Limited by T_{jmax}	80	A
Continuous body diode forward current	I_S *2	T_C = 25°C	36	A
Pulsed body diode forward current	$I_{S,pulse}$ *3	Limited by T_{jmax}	60	A
Power dissipation	P_{TOT} *2	T_C = 25°C	202	W
Operating junction temperature	T_j	-	-55 to 175	°C
Storage temperature	T_{stg}	-	-55 to 150	°C
Soldering temperature	T_{sold}	1.6mm from case for 10s	260	°C
Mounting torque	M	-	0.8	N·m

Thermal characteristics

Item	Symbol	Min.	Typ.	Max.	Unit
Thermal resistance, junction-case	$R_{th(j-c)}$ *3	-	0.59	0.74	°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 = 20A T_j = 25°C T_j = 100°C T_j = 175°C	 - - -	 80 83 105	 120 - -	mΩ
Body diode forward voltage	V_{SD}	V_{GS} = -5V, I_{SD} = 20A, T_j = 25°C	-	4.1	-	V
Gate-source threshold voltage	$V_{GS(th)}$ *4	V_{DS} = 10V, I_D = 2.0mA	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 = 20A	-	9	-	S
Internal gate resistance	$R_{G,int}$	f = 500kHz	-	2	-	Ω
Input capacitance	C_{iss}	V_{DS} = 800V, V_{GS} = 0V, f = 500kHz	-	1330	-	pF
Output capacitance	C_{oss}		-	74	-	
Reverse capacitance	C_{rss}		-	3	-	
C_{oss} Stored Energy	E_{oss}		-	31	-	uJ

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 = 20A, V_{GS} = -5/15V	-	50	-	nC
Gate to Drain charge	Q_{gd}		-	17	-	
Gate to Source charge	Q_{gs}		-	21	-	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 800V, I_D = 20A, V_{GS} = -5/15V, $R_{G,ext}$ = 2.2Ω FWD: same type device as D.U.T. at VGS = -5V Inductive load	-	15	-	ns
Rise time	t_r		-	16	-	
Turn-off delay time	$t_{d(off)}$		-	19	-	
Fall time	t_f		-	10	-	
Turn-on switching loss	E_{on}		-	243	-	uJ
Turn-off switching loss	E_{off}		-	61	-	
Body diode reverse recovery charge	Q_{rr}	V_{DD} = 800V, I_S = 20A, di/dt = 4900A/us, V_{GS} = -5V	-	155	-	nC
Body diode reverse recovery time	t_{rr}		-	10	-	ns
Body diode reverse recovery current	I_{rr}		-	27	-	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

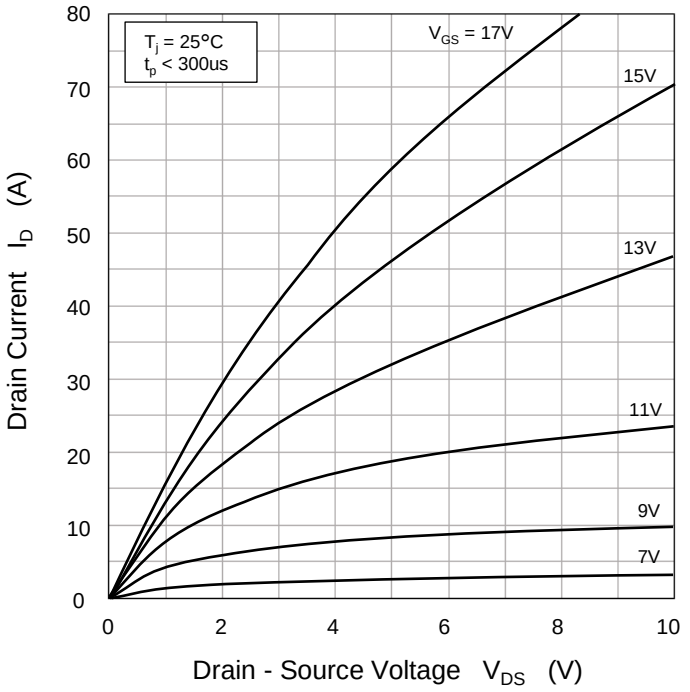


Figure 1 Typical Output Characteristics (T_j = 25°C)

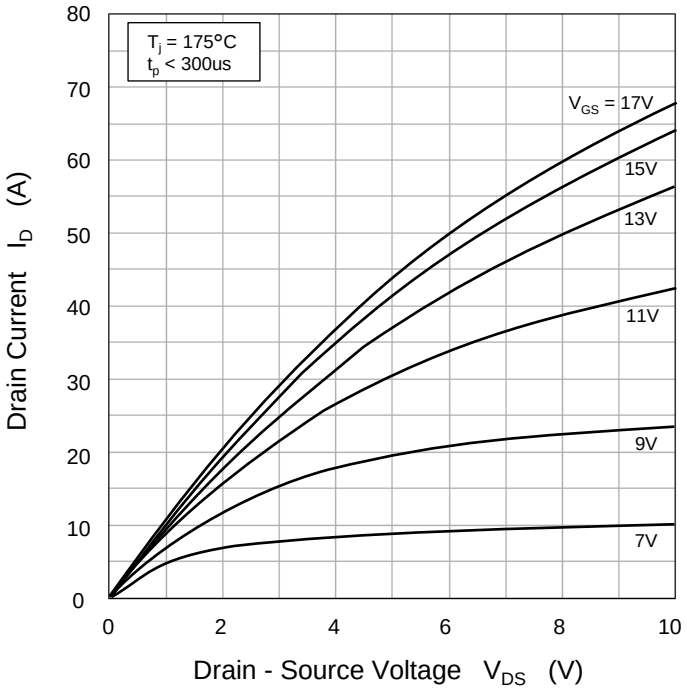


Figure 1 Typical Output Characteristics (T_j = 175°C)

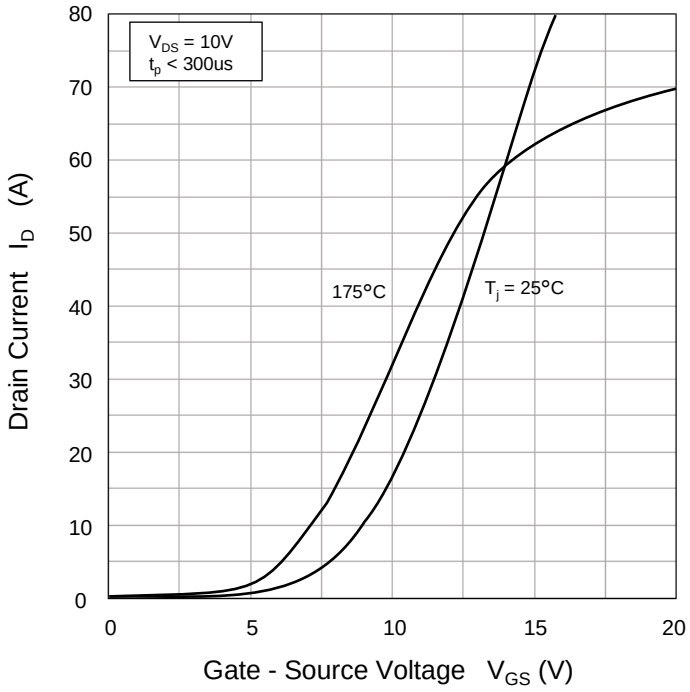


Figure 3 Typical Transfer Characteristics

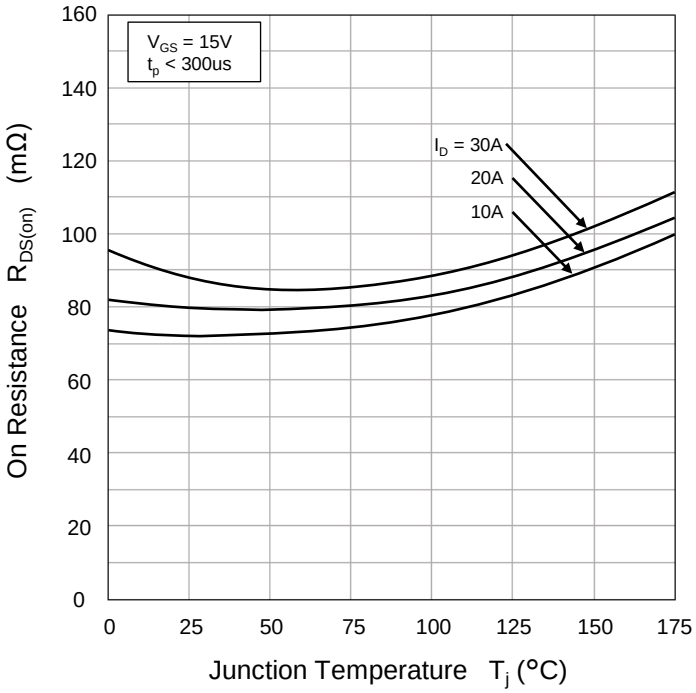


Figure 4 Typical On resistance vs. Junction Temperature

Electrical Characteristic Curves

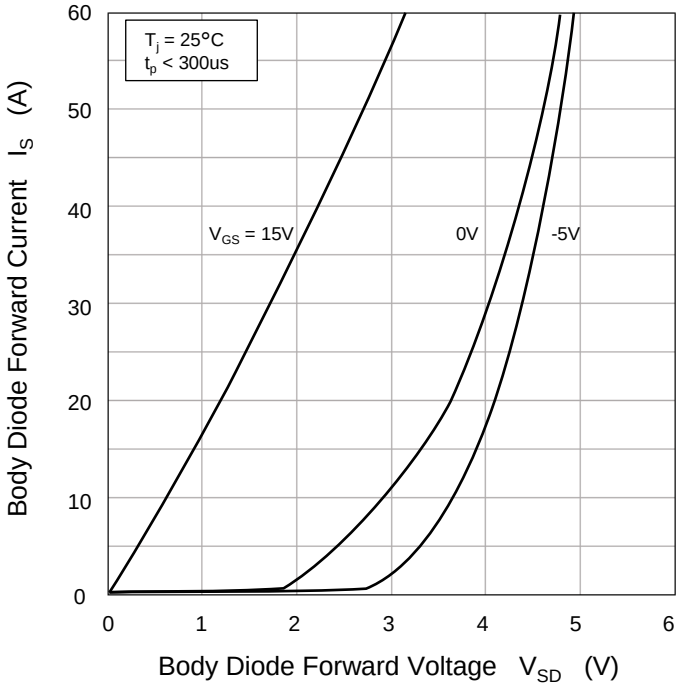


Figure 5 Typical Body Diode Forward current vs. Source-Drain Voltage (T_j = 25°C)

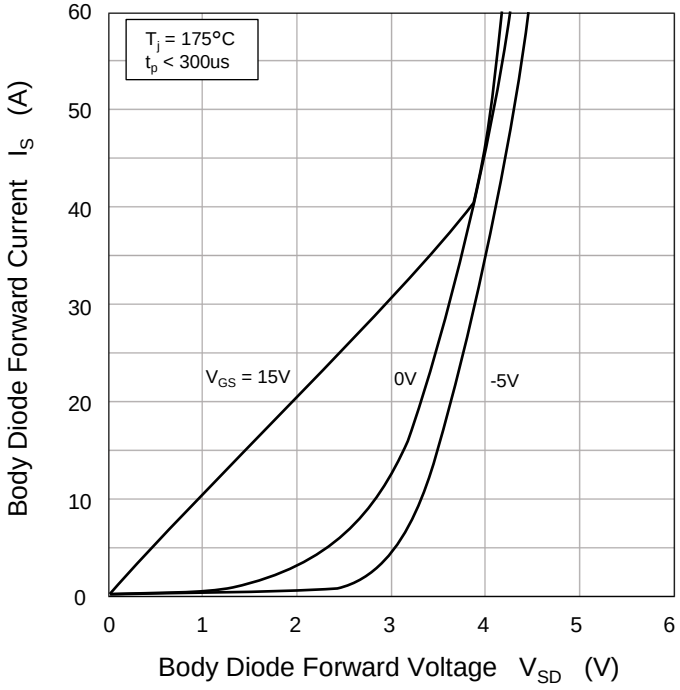


Figure 6 Typical Body Diode Forward current vs. Source-Drain Voltage (T_j = 175°C)

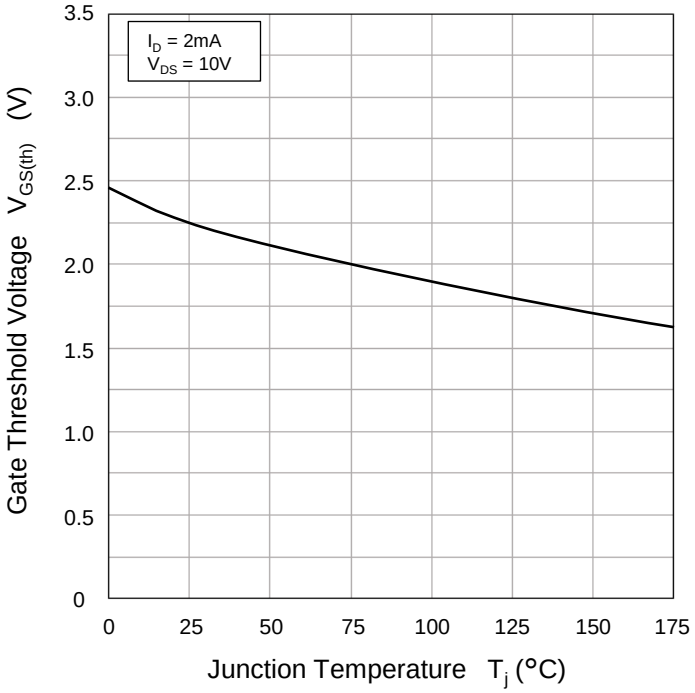


Figure 7 Typical Gate Threshold Voltage vs. Junction Temperature

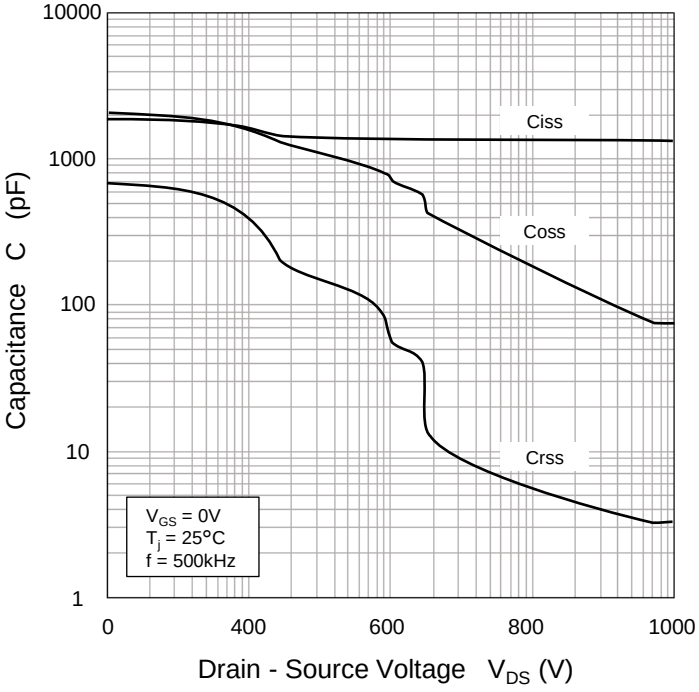


Figure 8 Typical Capacitance vs. Drain-Source Voltage

Electrical Characteristic Curves

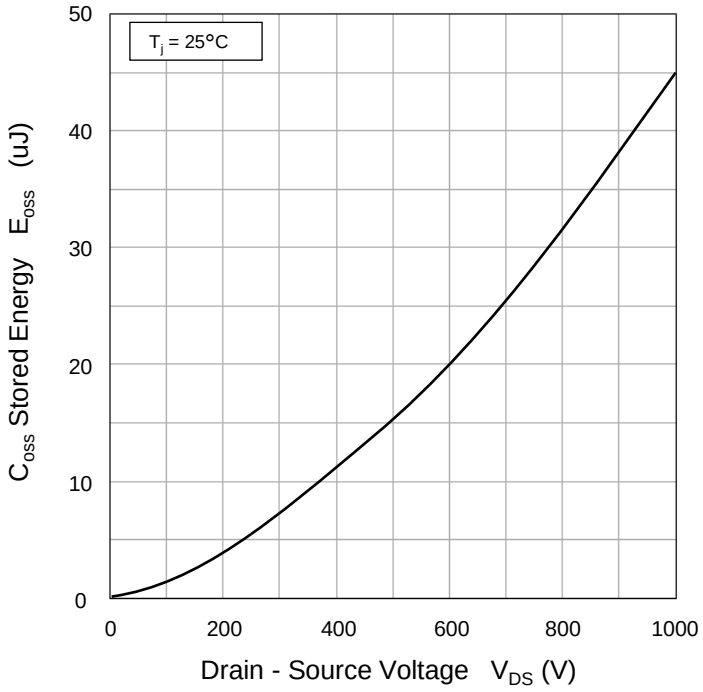


Figure 9 Typical C_{oss} Stored Energy

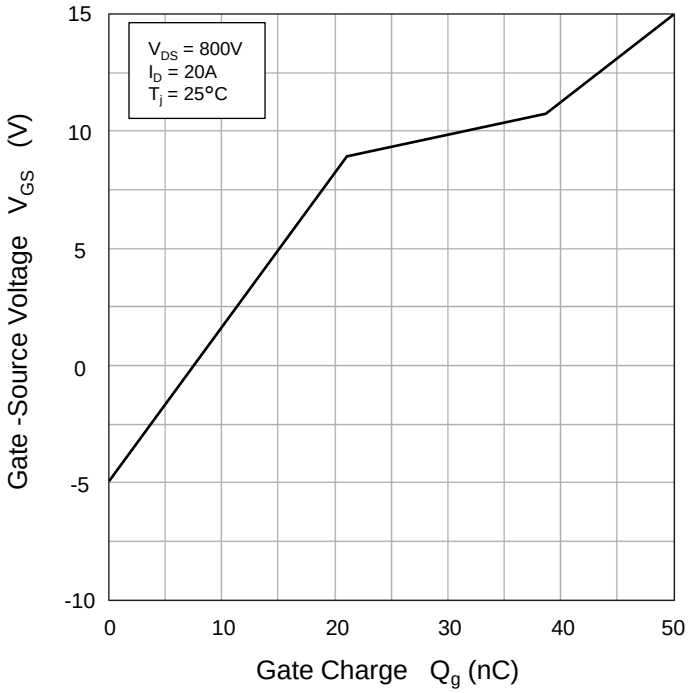


Figure 10 Typical Gate charge Characteristics

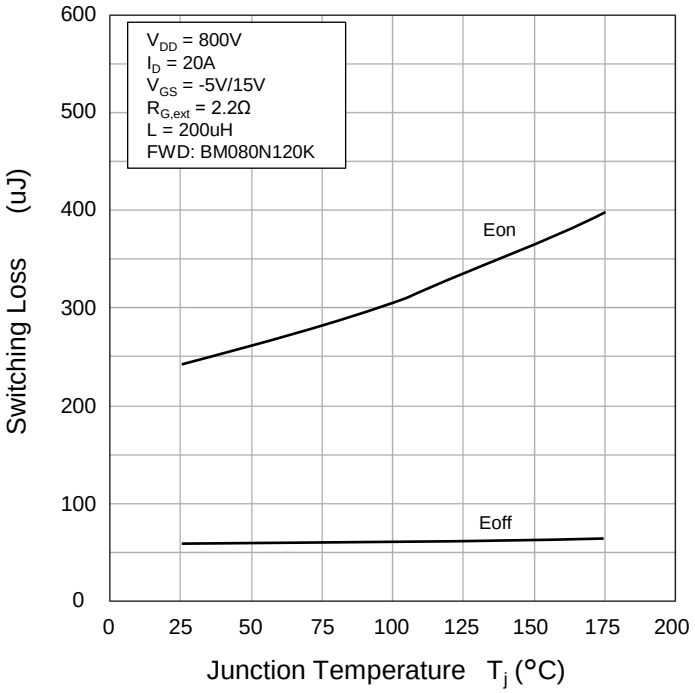


Figure 11 Typical Switching Loss vs. Junction Temperature

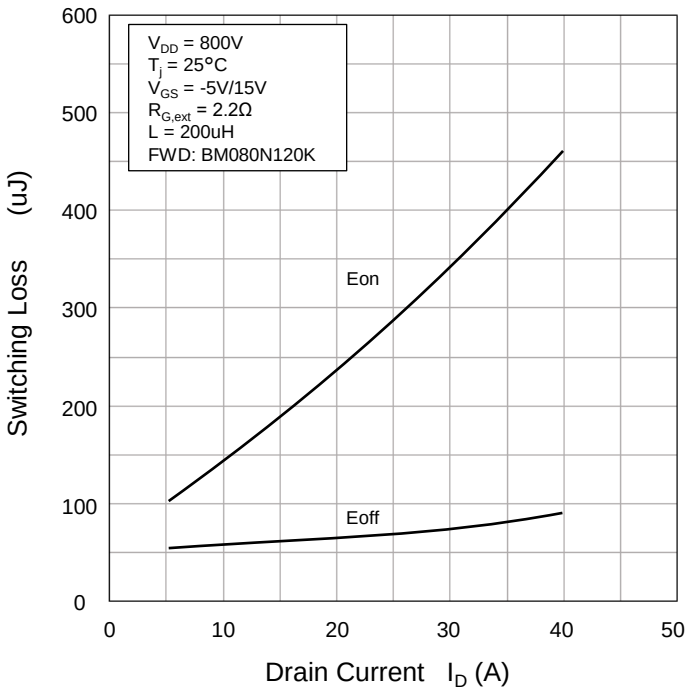


Figure 12 Typical Switching Loss vs. Drain Current (T_j = 25°C)

Electrical Characteristic Curves

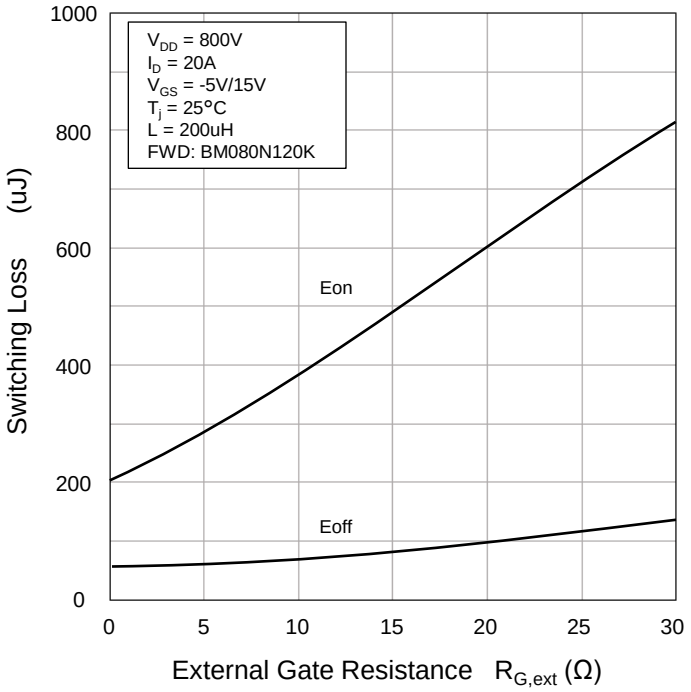


Figure 13 Typical Switching Loss vs. $R_{G,ext}$ (T_j = 25°C)

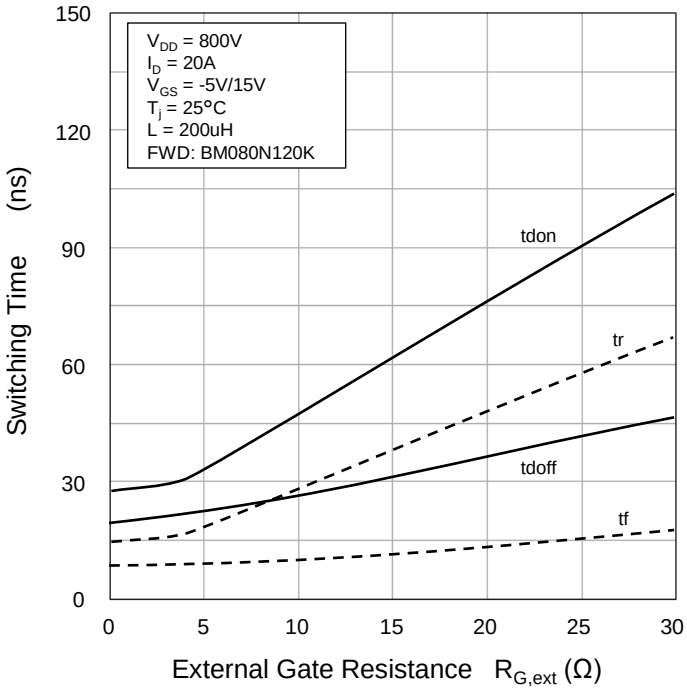


Figure 14 Typical Switching Times vs. $R_{G,ext}$ (T_j = 25°C)

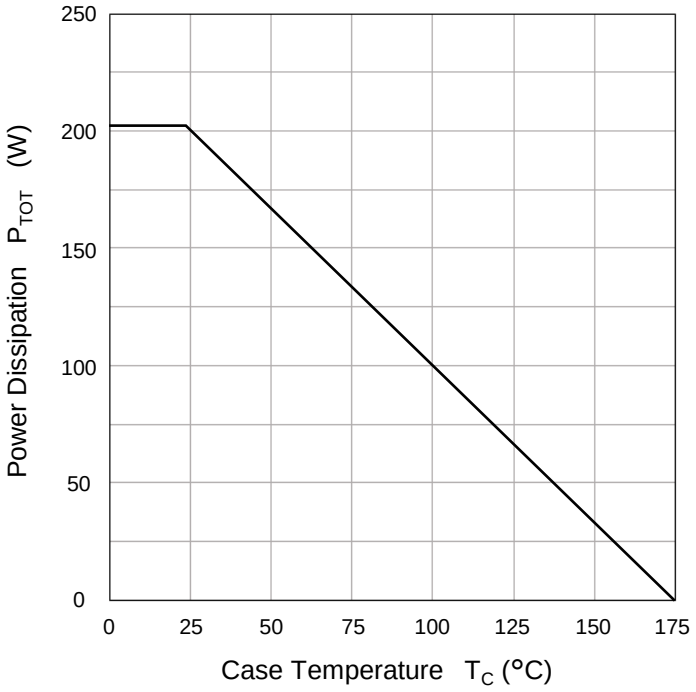


Figure 15 Maximum Power Dissipation Derating vs. Case Temperature

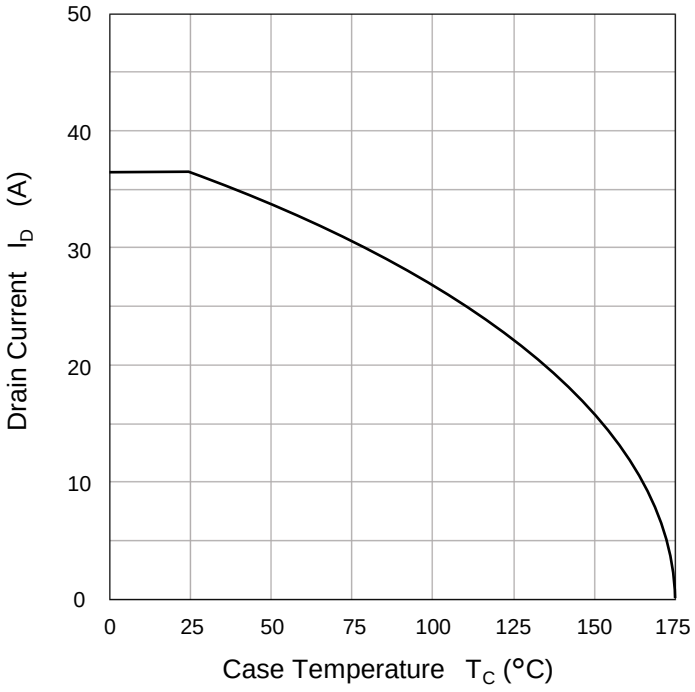


Figure 16 Maximum Continuous Drain Current vs. Case Temperature

Electrical Characteristic Curves

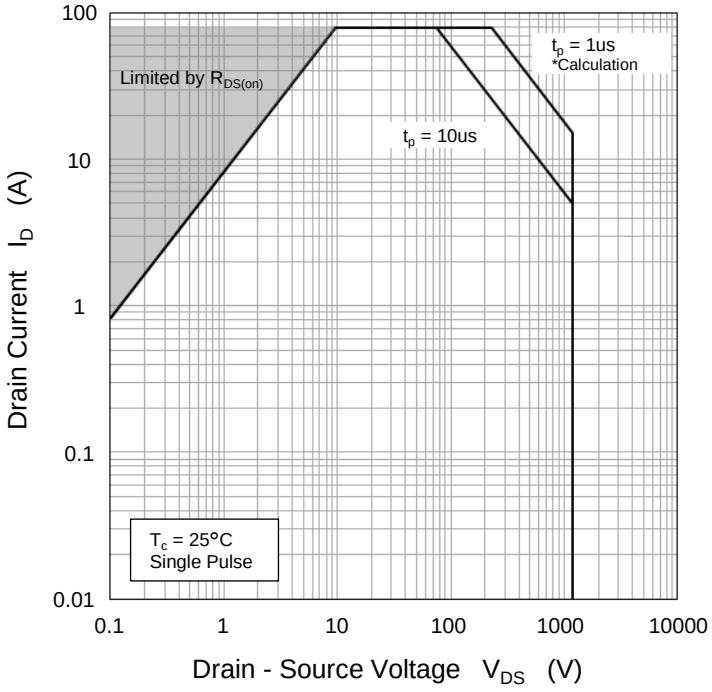


Figure 17 Maximum Safe Operating Area

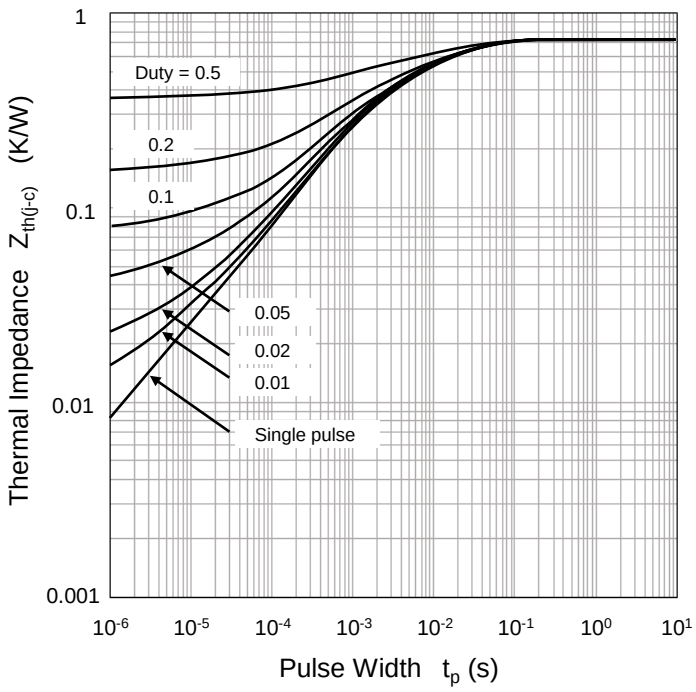
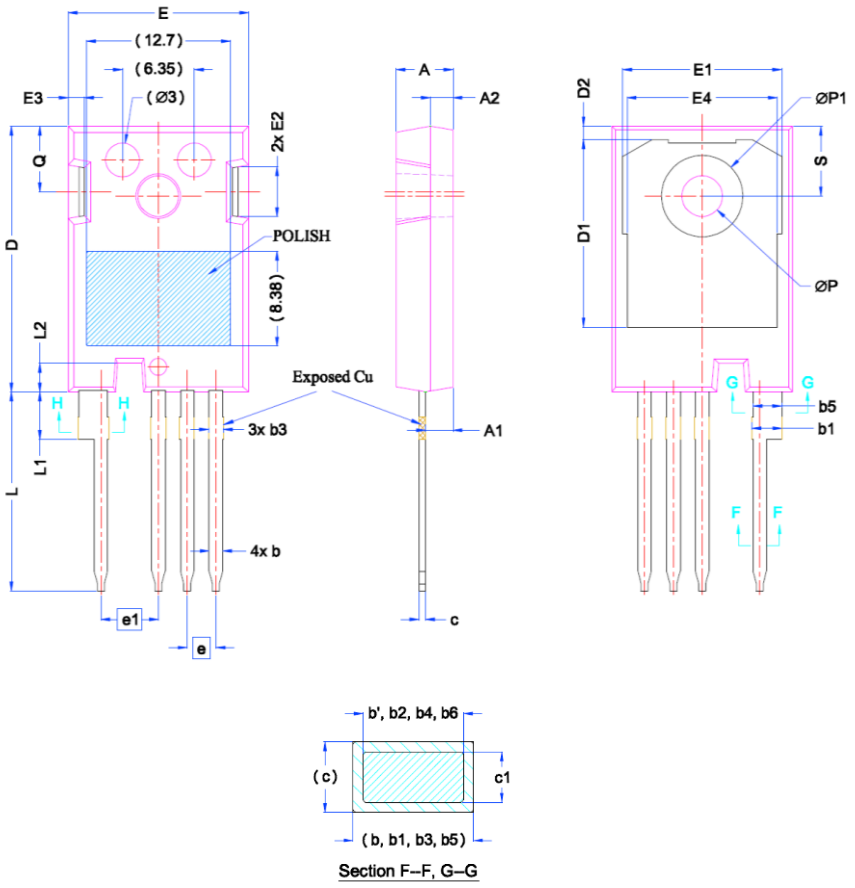


Figure 18 Maximum Transient Thermal Impedance vs. Pulse Width

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	1.33
b1	2.39	2.67	2.94
b2	2.39	2.67	2.84
b3	1.07	1.30	1.60
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	15.75	15.94	16.13
E1	13.10	14.02	14.15
E2	3.68	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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