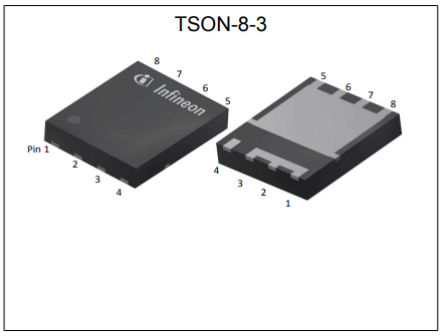
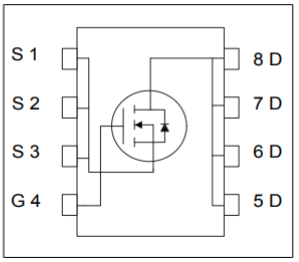
英飞凌MOSFET功率晶体管

英飞凌BSC220N20NSFD OptiMOS™3 200 V 175°C功率晶体管



特性

- N沟道，正常电平
- 额定温度为 175°C
- 出色的栅极电荷 x $R_{DS(on)}$乘积 (FOM)
- 极低的导通电阻$R_{DS(on)}$
- 无铅镀层；符合RoHS标准
- 符合 IEC61249-2-21 标准的无卤素
- 非常适合高频开关和同步整流



产品验证

符合JEDEC47/20/22相关测试的工业应用要求

表 1　　主要性能参数

Parameter	Value	Unit
V_{DS}	200	V
$R_{DS(on),max}$	22	mΩ
I_D	52	A

Type / Ordering Code	Package	Marking	Related Links
BSC220N20NSFD	TSON-8-3	220N20F	-

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1 最大额定值

除非另有规定， T_A = 25 °C

表 2 最大额定值

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Continuous drain current	I_D	- -	- -	52 41	A	T_C=25 °C T_C=100 °C
Pulsed drain current[1]	$I_{D,pulse}$	-	-	208	A	T_C=25 °C
Avalanche energy, single pulse	E_{AS}	-	-	214	mJ	I_D=38 A, R_{GS}=25 Ω
Reverse diode peak dv/dt	dv/dt	-	-	60	kV/µs	I_D=52 A, V_{DS}=100 V, di/dt=1500 A/µs, $T_{j,max}$=175 °C
Gate source voltage	V_{GS}	-20	-	20	V	-
Power dissipation	P_{tot}	-	-	214	W	T_C=25 °C
Operating and storage temperature	T_j, T_{stg}	-55	-	175	°C	IEC climatic category; DIN IEC 68-1: 55/175/56

2 热特性

T_j=25 °C, 除非另有规定

表3 热特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Thermal resistance, junction - case	R_{thJC}	-	0.4	0.7	K/W	-
Thermal resistance, junction - ambient, minimal footprint	R_{thJA}	-	-	75	K/W	-
Thermal resistance, junction - ambient, 6 cm² cooling area[2]	R_{thJA}	-	-	50	K/W	-

[1] 参见图3

[2] 器件安装在 40 mm x 40 mm x 1.5 mm环氧树脂印刷电路板 FR4 上，漏极连接用铜面积为 6 cm² （一层，70 µm厚）。印刷电路板垂直放置在静止空气中。

3 电气特性

除非另有规定， T_j = 25 °C

表4 静态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Drain-source breakdown voltage	$V_{(BR)DSS}$	200	-	-	V	V_{GS}=0 V, I_D=1 mA
Gate threshold voltage	$V_{GS(th)}$	2	3	4	V	V_{DS}=V_{GS}, I_D=137 µA
Zero gate voltage drain current	I_{DSS}	- -	0.1 10	1 100	µA	V_{DS}=160 V, V_{GS}=0 V, T_j=25 °C V_{DS}=160 V, V_{GS}=0 V, T_j=125 °C
Gate-source leakage current	I_{GSS}	-	1	100	nA	V_{GS}=20 V, V_{DS}=0 V
Drain-source on-state resistance	$R_{DS(on)}$	-	17.7	22	mΩ	V_{GS}=10 V, I_D=52 A
Gate resistance[1)]	R_G	-	3.7	5.5	Ω	-
Transconductance	g_{fs}	44	88	-	S	$\|V_{DS}\|>2\|I_D\|R_{DS(on)max}$, I_D=52 A

表 5 动态特性

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Input capacitance[1)]	C_{iss}	-	2770	3680	pF	V_{GS}=0 V, V_{DS}=100 V, f=1 MHz
Output capacitance[1)]	C_{oss}	-	210	279	pF	V_{GS}=0 V, V_{DS}=100 V, f=1 MHz
Reverse transfer capacitance[1)]	C_{rss}	-	5.7	10	pF	V_{GS}=0 V, V_{DS}=100 V, f=1 MHz
Turn-on delay time	$t_{d(on)}$	-	7	-	ns	V_{DD}=100 V, V_{GS}=10 V, I_D=17 A, $R_{G,ext}$=1.6 Ω
Rise time	t_r	-	7	-	ns	V_{DD}=100 V, V_{GS}=10 V, I_D=17 A, $R_{G,ext}$=1.6 Ω
Turn-off delay time	$t_{d(off)}$	-	28	-	ns	V_{DD}=100 V, V_{GS}=10 V, I_D=17 A, $R_{G,ext}$=1.6 Ω
Fall time	t_f	-	10	-	ns	V_{DD}=100 V, V_{GS}=10 V, I_D=17 A, $R_{G,ext}$=1.6 Ω

表6 栅极电荷特性[2)]

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Gate to source charge	Q_{gs}	-	13.1	-	nC	V_{DD}=100 V, I_D=52 A, V_{GS}=0 to 10 V
Gate to drain charge[1)]	Q_{gd}	-	4.4	7	nC	V_{DD}=100 V, I_D=52 A, V_{GS}=0 to 10 V
Switching charge	Q_{sw}	-	9.2	-	nC	V_{DD}=100 V, I_D=52 A, V_{GS}=0 to 10 V
Gate charge total[1)]	Q_g	-	34	43	nC	V_{DD}=100 V, I_D=52 A, V_{GS}=0 to 10 V
Gate plateau voltage	$V_{plateau}$	-	4.7	-	V	V_{DD}=100 V, I_D=52 A, V_{GS}=0 to 10 V
Output charge[1)]	Q_{oss}	-	84	111	nC	V_{DD}=100 V, V_{GS}=0 V

[1)]由设计标定，不受制于生产测试。
[2)] 参数定义请参见“栅极电荷波形”

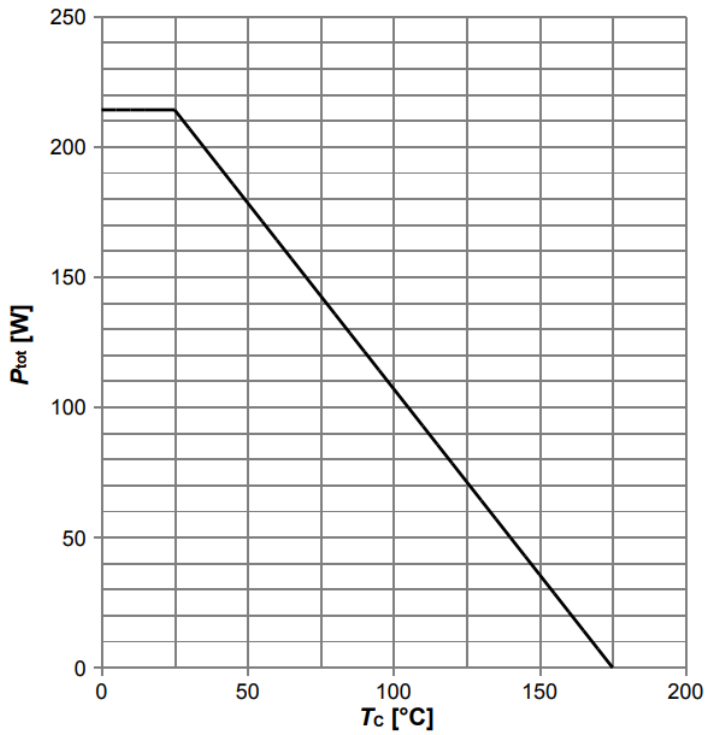
表 7 反向二极管

Parameter	Symbol	Values			Unit	Note / Test Condition
		Min.	Typ.	Max.		
Diode continous forward current	I_S	-	-	52	A	T_C=25 °C
Diode pulse current[1)]	$I_{S,pulse}$	-	-	208	A	T_C=25 °C
Diode hard commutation current[2)]	$I_{S,hard}$	-	-	52	A	T_C=25 °C, di_F/dt=1500 A/µs
Diode forward voltage	V_{SD}	-	1.0	1.2	V	V_{GS}=0 V, I_F=52 A, T_j=25 °C
Reverse recovery time[3)]	t_{rr}	-	89	-	ns	V_R=100 V, I_F=12.5 A, di_F/dt=100 A/µs
Reverse recovery charge[3)]	Q_{rr}	-	195	-	nC	V_R=100 V, I_F=12.5 A, di_F/dt=100 A/µs

[1)] 二极管脉冲电流由热和/或封装限制定义
[2)] di/dt=1500 A/µs 时允许通过二极管的最大硬换向电流
[3)] 由设计定义。未经过生产测试。

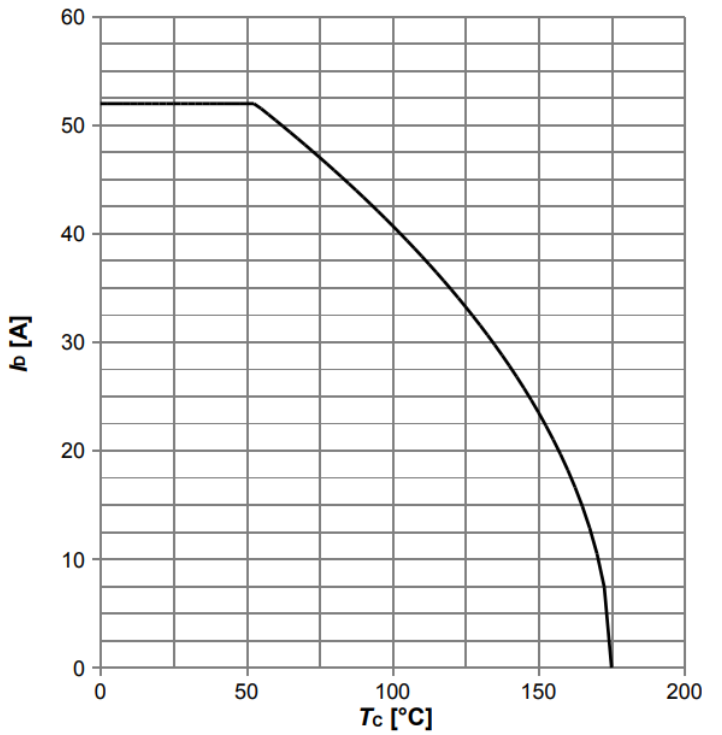
4 电气特性图

Diagram 1: Power dissipation



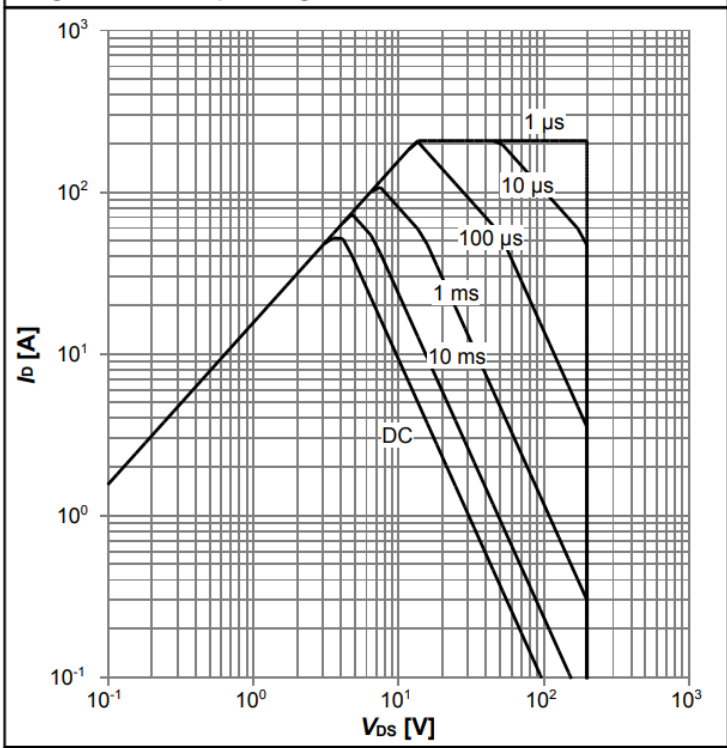
P_{tot}=f(T_C)

Diagram 2: Drain current



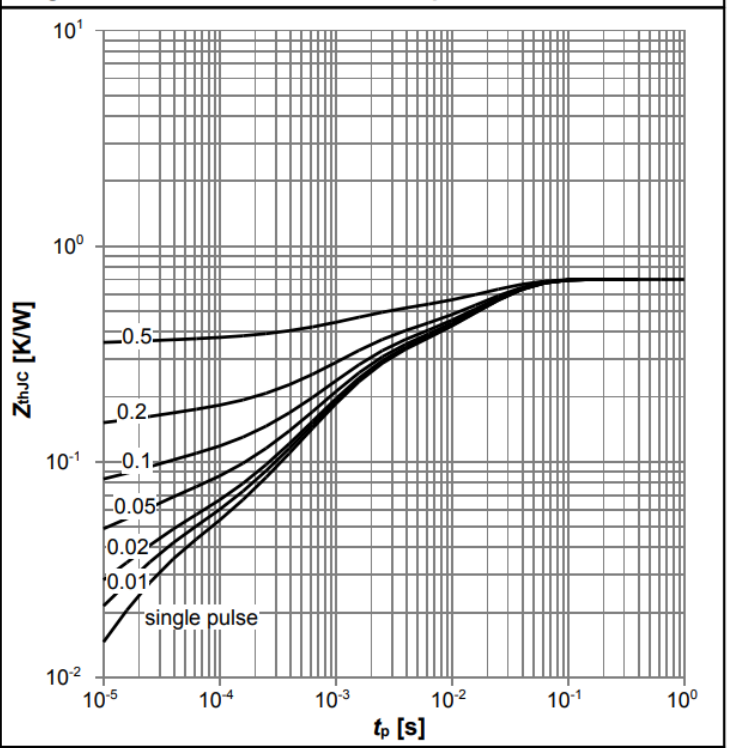
I_D=f(T_C); V_{GS}>=10 V

Diagram 3: Safe operating area



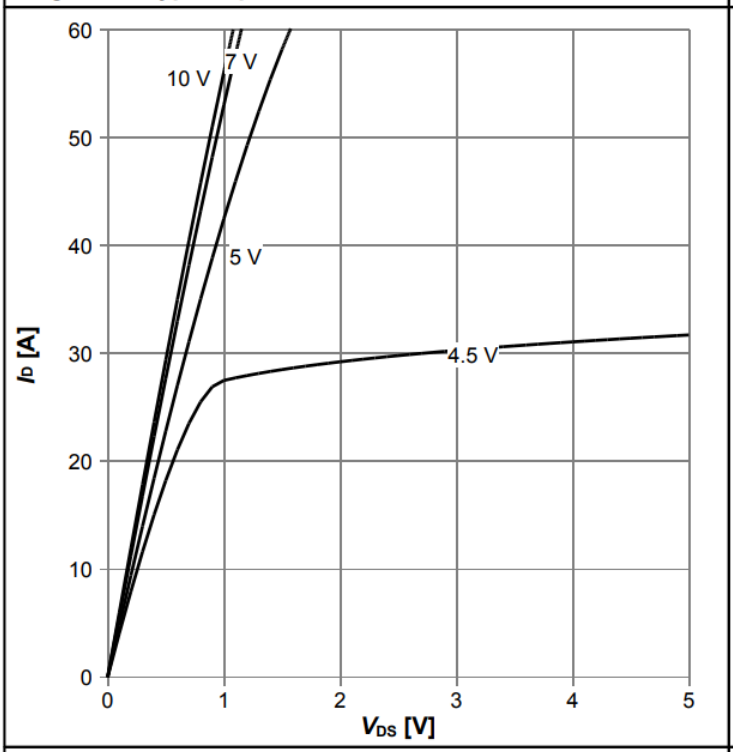
I_D=f(V_{DS}); T_C=25 °C; D=0; parameter: t_p

Diagram 4: Max. transient thermal impedance



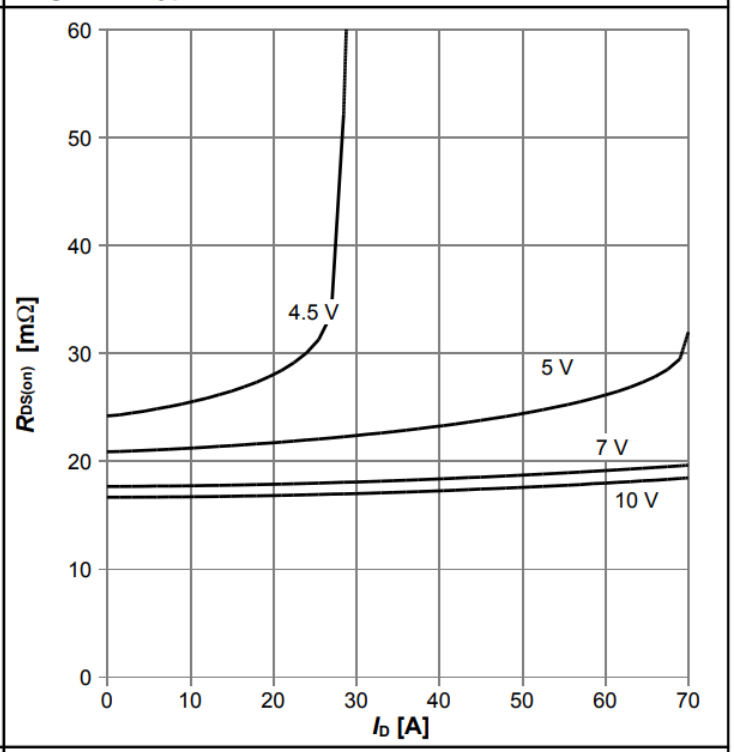
Z_{thJC}=f(t_p); parameter: D=t_p/T

Diagram 5: Typ. output characteristics



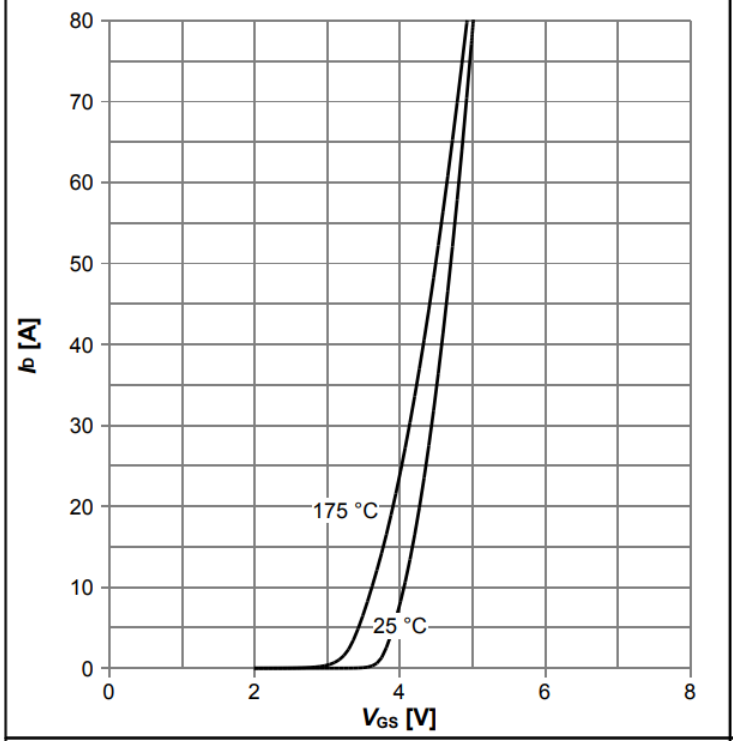
I_D=f(V_{DS}); T_j=25 °C; parameter: V_{GS}

Diagram 6: Typ. drain-source on resistance



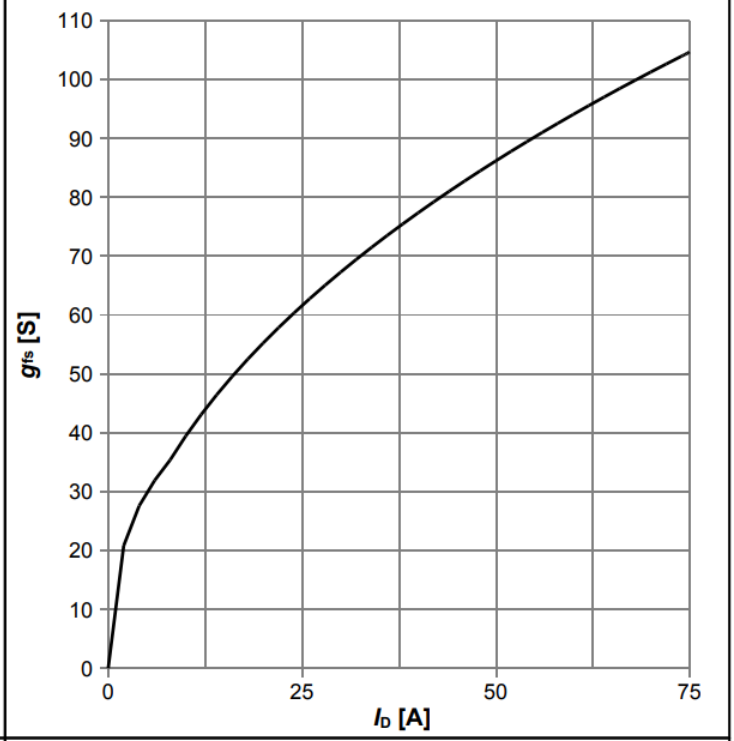
$R_{DS(on)}$=f(I_D); T_j=25 °C; parameter: V_{GS}

Diagram 7: Typ. transfer characteristics



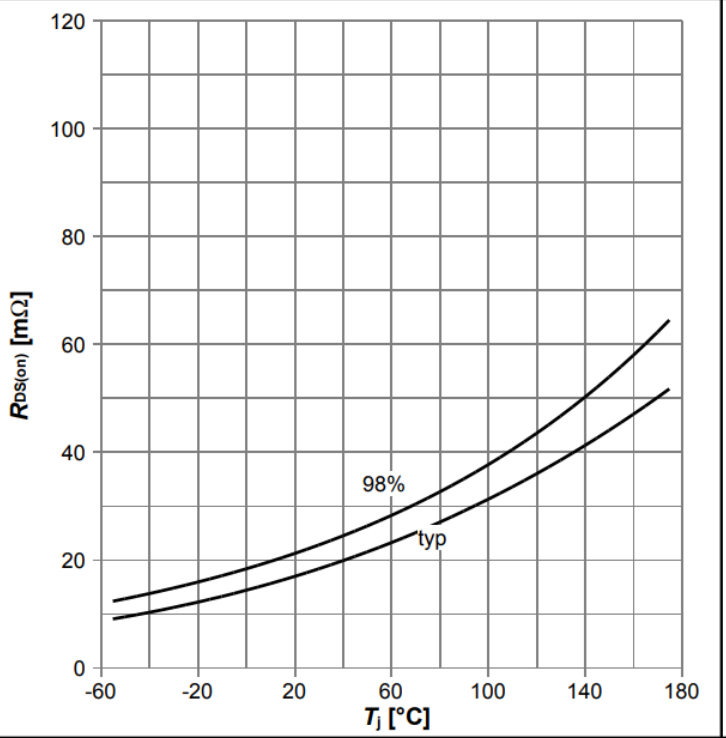
I_D=f(V_{GS}); |V_{DS}|>2|I_D|$R_{DS(on)max}$; parameter: T_j

Diagram 8: Typ. forward transconductance



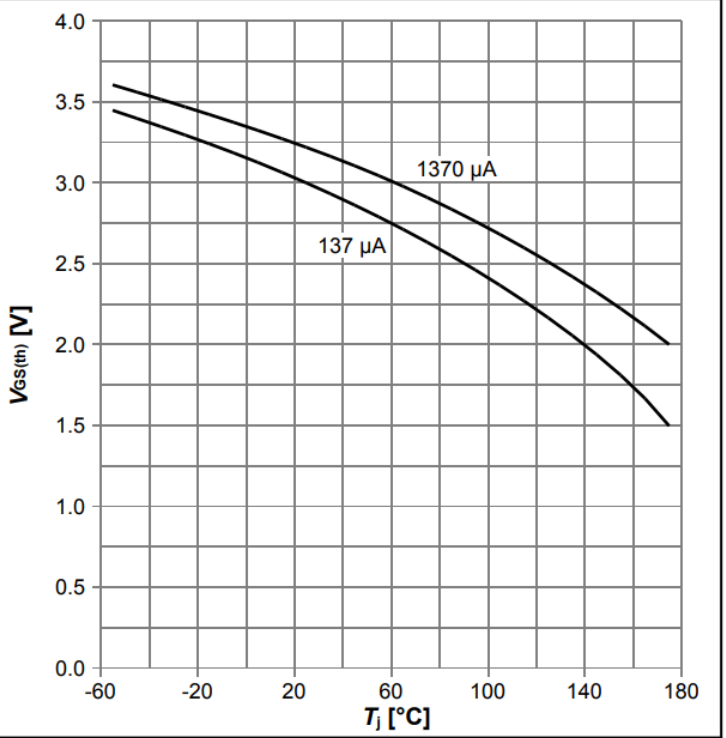
g_{fs}=f(I_D); T_j=25 °C

Diagram 9: Drain-source on-state resistance



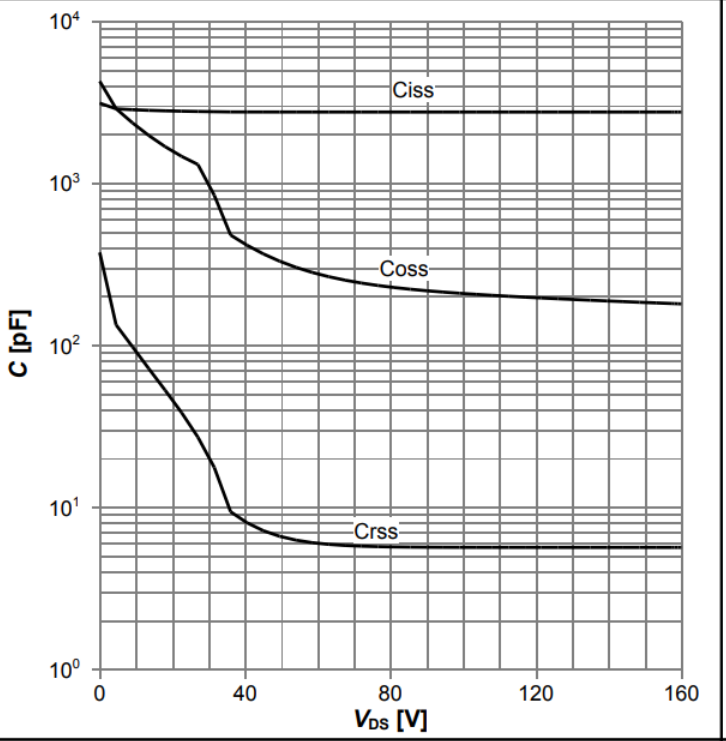
$R_{DS(on)}$=f(T_j); I_D=55 A; V_{GS}=10 V

Diagram 10: Typ. gate threshold voltage



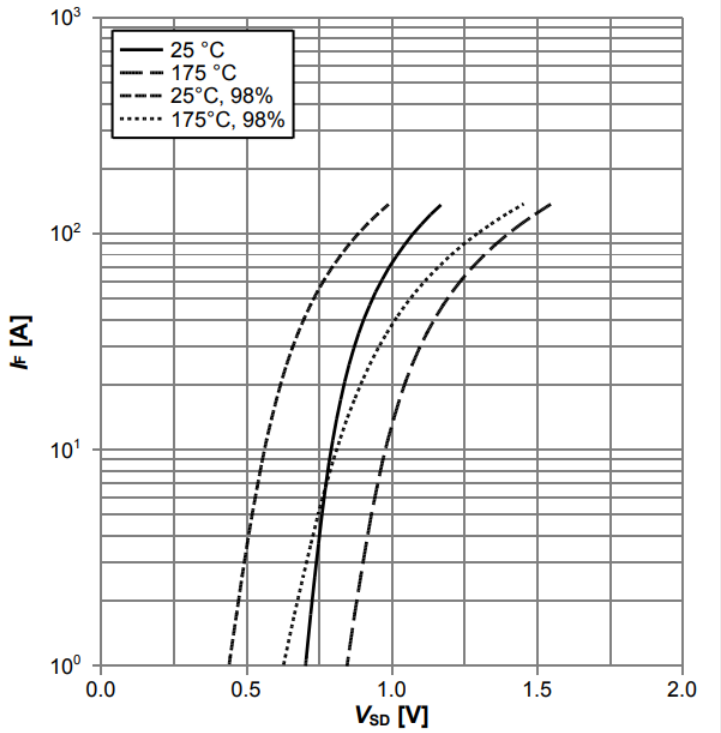
$V_{GS(th)}$=f(T_j); V_{GS}=V_{DS}; parameter: I_D

Diagram 11: Typ. capacitances



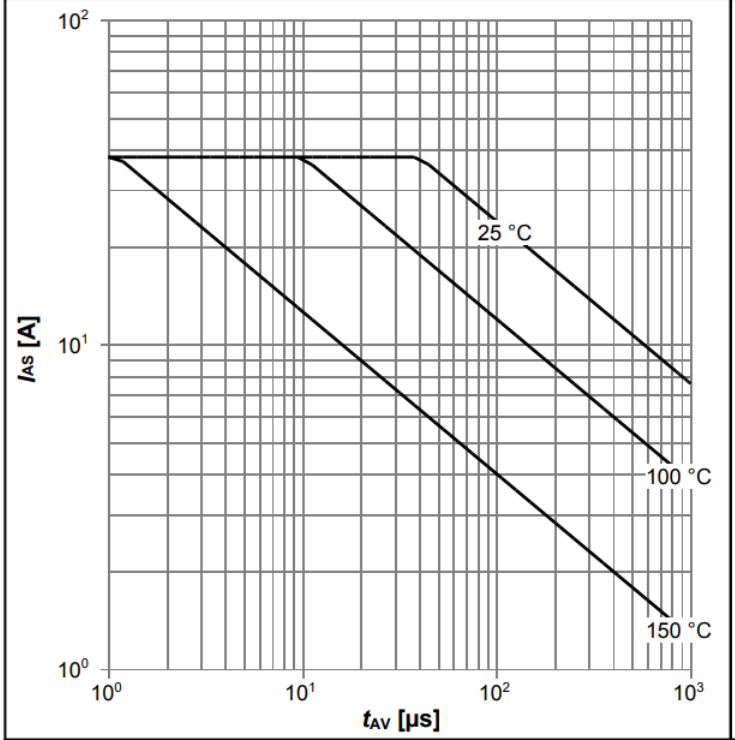
C=f(V_{DS}); V_{GS}=0 V; f=1 MHz

Diagram 12: Forward characteristics of reverse diode



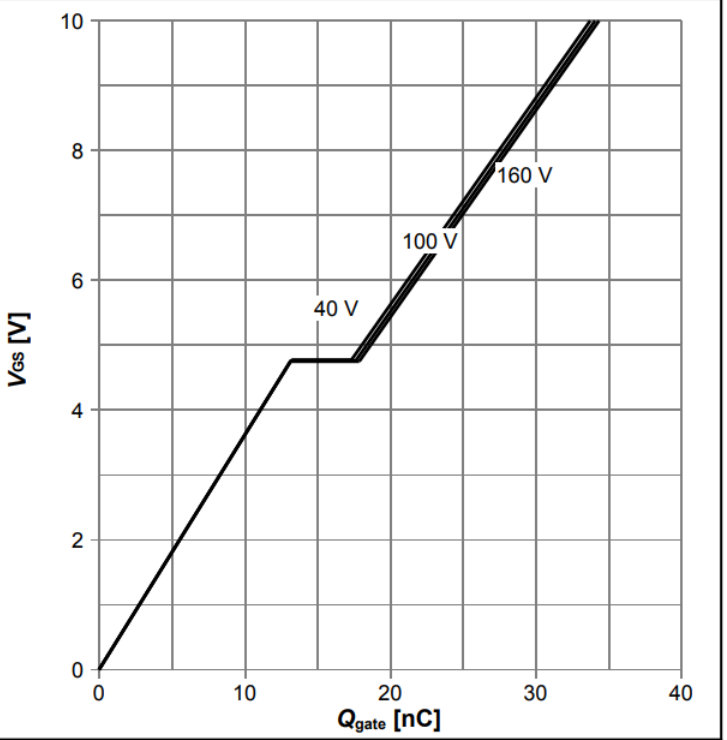
I_F=f(V_{SD}); parameter: T_j

Diagram 13: Avalanche characteristics



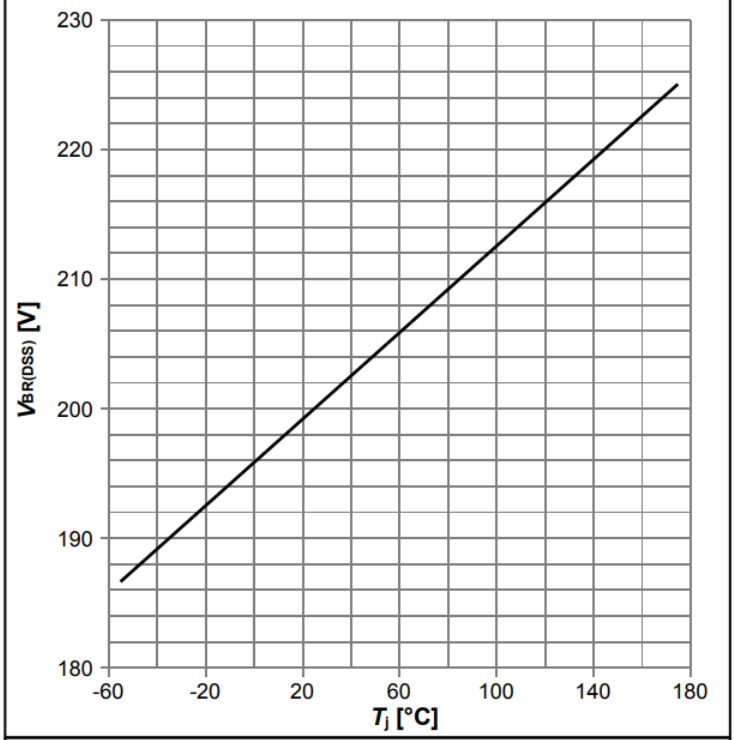
I_{AS}=f(t_{AV}); R_{GS}=25 Ω; parameter: $T_{j(start)}$

Diagram 14: Typ. gate charge



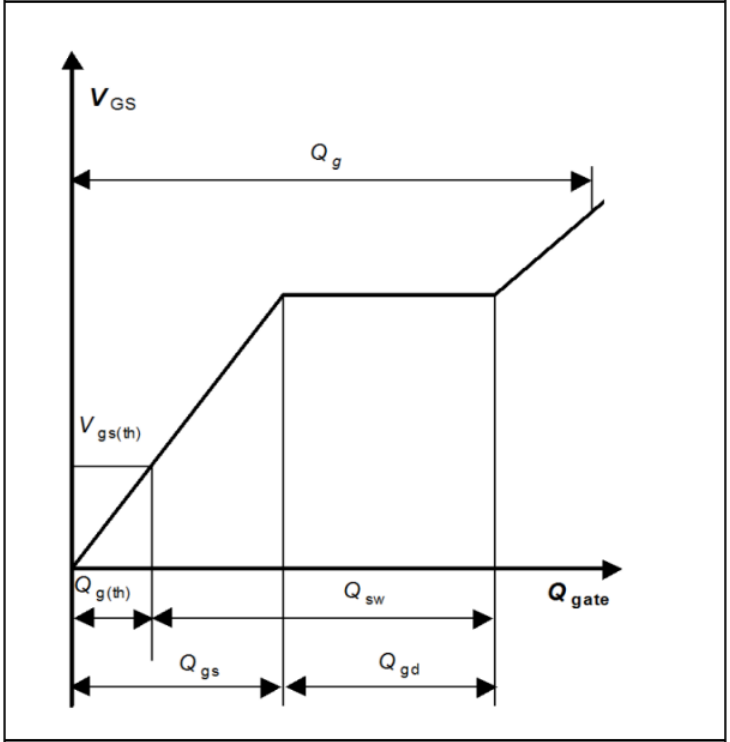
V_{GS}=f(Q_{gate}); I_D=55 A pulsed; parameter: V_{DD}

Diagram 15: Drain-source breakdown voltage

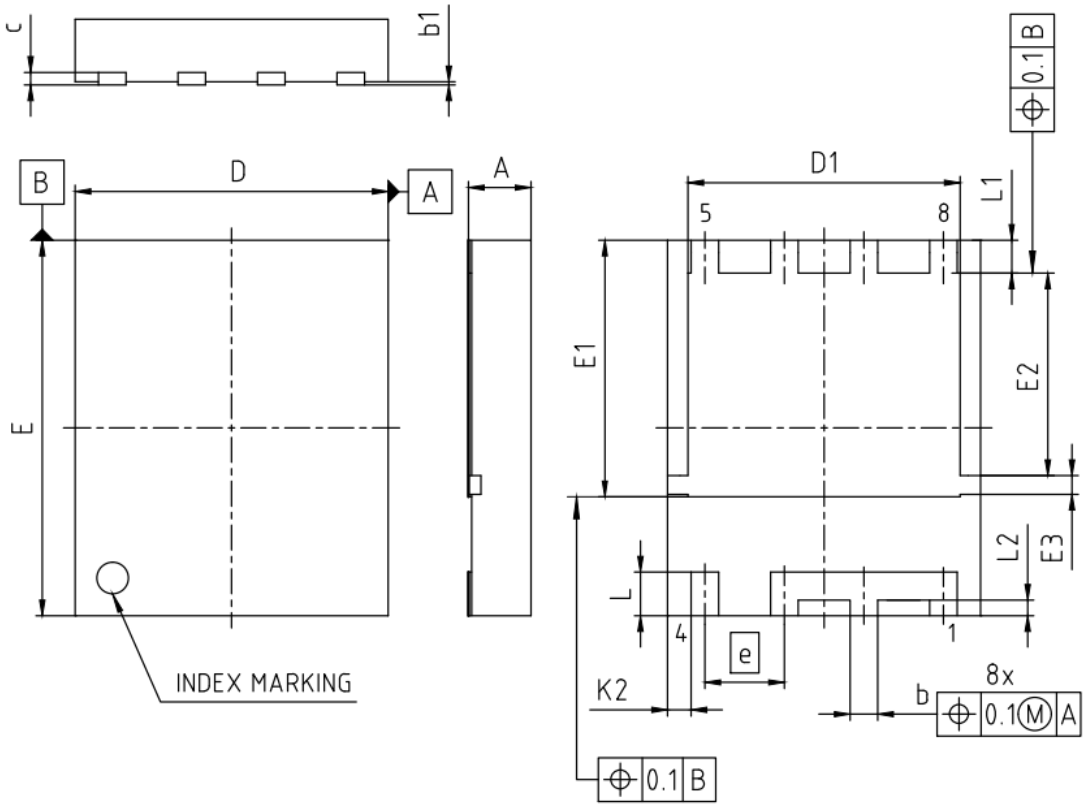


$V_{BR(DSS)}$=f(T_j); I_D=1 mA

Diagram Gate charge waveforms



5 封装外形



DIMENSION	MILLIMETERS	
	MIN.	MAX.
A	-	1.10
b	0.34	0.54
b1	-	0.05
c	0.20	
D	4.90	5.10
D1	4.25	4.45
E	5.90	6.10
E1	4.00	4.20
E2	3.14	3.34
E3	0.20	0.40
e	1.27	
K2	(0.37)	
L	0.60	0.80
L1	0.43	0.63
L2	(0.25)	

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图 1 PG-TSON-8-3 外形图，尺寸单位为毫米/英寸

修订记录

BSC220N20NSFD

Revision: 2018-03-14, Rev. 2.0

历史修订版本

Revision	Date	Subjects (major changes since last revision)
2.0	2018-03-14	Release of final version

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