

关键参数		Key Parameters	
V_{DS}		1200	V
$R_{DS(on)}$	Typ.	1.94	mΩ
I_D	Max.	540	A
I_{DM}	Max.	1080	A

典型应用	Typical Applications
● 电动汽车	Automotive Applications
● 混合动力/纯电动车	Hybrid/Electrical Vehicles
● 电机驱动	Motor Drives

特点	Features
● 铜针翅基板	Cu Pin-fin Baseplate
● 低开关损耗	Low Switching Losses
● 低反向恢复损耗	Low Reverse Recovery Loss
● 低感设计	Low Inductive Design
● Si ₃ N ₄ 衬板	Si ₃ N ₄ AMB Substrate

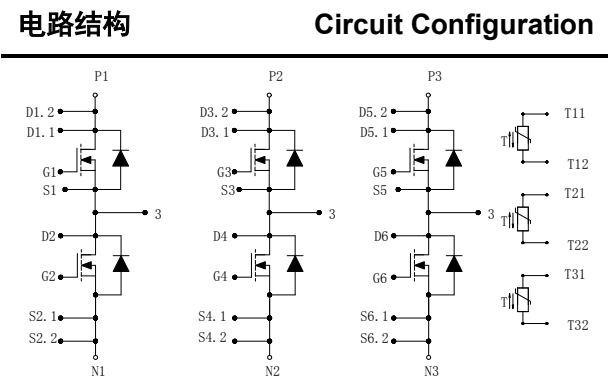


图 1.电路结构

Fig. 1 Circuit configuration

模块外形	Module Appearance
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图 2. 模块外形

Fig. 2 Module appearance

模块标签说明	Module Label Code Instruction	
	数据位置 Data position	数据内容 Content of data
	1--8	模块批次号 Module batch number
	9--12	模块序列号 Module serial number

最大额定值
Absolute Maximum Ratings

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	数值 Value	单位 Unit
V_{DS}	漏源极电压 Drain-source voltage	$V_{GS} = 0V$	1200	V
V_{GSSMAX}	栅源电压 Gate-source voltage		-8/+23	V
V_{GSSOP}	栅源电压 Gate-source voltage		-4/+18	V
I_D	额定漏极电流 Rating drain current	$T_F = 60^\circ C, T_{vj\ max} = 175^\circ C$	540	A
I_{DM}	漏极峰值电流 Peak drain current	$t_P = 1ms$	1080	A
P_{max}	晶体管部分最大损耗 Max. transistor power dissipation	$T_F = 65^\circ C, T_{vj\ max} = 175^\circ C$	1093	W
V_{isol}	绝缘电压(模块) Isolation voltage – per module	短接所有端子，端子与基板间施加电压 (Connected terminals to baseplate), RMS, $f=0\ Hz, t=1\ sec, T_C = 25^\circ C$	4200	V

热和机械数据
Thermal & Mechanical Data

参数 Symbol	说明 Explanation	值 Value	单位 Unit
爬电距离 Creepage distance	端子-散热器 Terminal to heatsink	9	mm
	端子-端子 Terminal to terminal	9	mm
绝缘间隙 Clearance	端子-散热器 Terminal to heatsink	4.5	mm
	端子-端子 Terminal to terminal	4.5	mm
相对漏电起痕指数 CTI (Comparative tracking index)		>200	

热和机械数据

Thermal & Mechanical Data

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$R_{th(J-F)}$ MOSFET	MOSFET 热阻 Thermal resistance -MOSFET	冷却液: 50%乙二醇溶液; $\Delta V/\Delta t=10 \text{ dm}^3/\text{min}$; $T_F = 65^\circ\text{C}$ Cooling Fluid: 50% water / 50% ethylene glycol; $\Delta V/\Delta t=10 \text{ dm}^3/\text{min}$; $T_F=65^\circ\text{C}$		95.5	100.2	K / kW
ΔP	冷却液流阻 Pressure drop in cooling circuit	冷却液: 50%乙二醇溶液; $\Delta V/\Delta t=10 \text{ dm}^3/\text{min}$; $T_F = 65^\circ\text{C}$ Cooling Fluid: 50% water / 50% ethylenglycol; $\Delta V/\Delta t=10 \text{ dm}^3/\text{min}$; $T_F=65^\circ\text{C}$		68		mbar
P	冷却液最大压力 Maximum pressure in cooling circuit				2.5	bar
$T_{vj\text{ op}}$	工作结温 Operating junction temperature		-40		175	$^\circ\text{C}$
T_{stg}	存储温度 Storage temperature range		-40		125	$^\circ\text{C}$
M	安装力矩 Screw torque	安装紧固用 - M4 Mounting - M4	1.8	2.0	2.2	Nm
		PCB 安装用 PCB Mounting	0.55	0.6	0.65	Nm

热敏电阻数据

NTC-Thermistor Data

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
R_{25}	额定电阻值 Rated resistance	$T_C = 25^\circ\text{C}$		5		k Ω
$\Delta R/R$	R_{100} 偏差 Deviation of R_{100}	$T_C = 100^\circ\text{C}$, $R_{100}=493\Omega$	-5		5	%
P_{25}	耗散功率 Power dissipation	$T_C = 25^\circ\text{C}$			20	mW
$B_{25/50}$	B -值 B -value	$R_2 = R_{25} \exp [B_{25/50}(1/T_2 - 1/(298.15 \text{ K}))]$		3375		K
$B_{25/80}$	B -值 B -value	$R_2 = R_{25} \exp [B_{25/80}(1/T_2 - 1/(298.15 \text{ K}))]$		3411		K
$B_{25/100}$	B -值 B -value	$R_2 = R_{25} \exp [B_{25/100}(1/T_2 - 1/(298.15 \text{ K}))]$		3433		K

电特性值
Electrical Characteristics

除非特别声明，否则 $T_C = 25\text{ }^{\circ}\text{C}$
 $T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated

符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
I_{DSS}	零栅压漏极电流 Zero gate voltage drain current	$V_{GS} = 0V, V_{DS} = V_{DSS}$			100	μA
		$V_{GS} = 0V, V_{DS} = V_{DSS}, T_{vj} = 150\text{ }^{\circ}\text{C}$			500	μA
		$V_{GS} = 0V, V_{DS} = V_{DSS}, T_{vj} = 175\text{ }^{\circ}\text{C}$			1000	μA
I_{GSS}	栅极漏电流 Gate leakage current	$V_{GS} = -4/+18V, V_{DS} = 0V$			500	nA
$V_{GS(th)}$	栅极-源极阈值电压 Gate threshold voltage	$I_D = 60mA, V_{GS} = V_{DS}$	2.20	2.80	3.40	V
$R_{DS(on)}^{(*)1}$	漏极-源极通态电阻 Drain-source on-state resistance	$V_{GS} = 18V, I_D = 540A$		1.94		m Ω
		$V_{GS} = 18V, I_D = 540A, T_{vj} = 150\text{ }^{\circ}\text{C}$		2.99		m Ω
		$V_{GS} = 18V, I_D = 540A, T_{vj} = 175\text{ }^{\circ}\text{C}$		3.50		m Ω
g_{fs}	跨导 Forward transconductance	$V_{DS} = 20V, I_D = 540A$		450		S
$V_{SD}^{(*)1}$	二极管正向电压 Diode forward voltage	$I_{SD} = 540A, V_{GS}^{(*)2} = -4V$		5.00		V
		$I_{SD} = 540A, V_{GS} = -4V, T_{vj} = 150\text{ }^{\circ}\text{C}$		4.65		V
		$I_{SD} = 540A, V_{GS} = -4V, T_{vj} = 175\text{ }^{\circ}\text{C}$		4.60		V
I_{SC}	短路电流 Short circuit current	$T_{vj} = 175\text{ }^{\circ}\text{C}, V_{DD} = 800V,$ $V_{GS} \leq 18V, t_p \leq TBD\mu s,$ $V_{DS(max)} = V_{DSS} - L^{(*)3} \times di/dt,$ IEC 60747-8		TBD		A

注意:
Note:

- (*)1 表示该参数的测试点为辅助母排端子((*)1 indicates it is measured at the auxiliary busbar terminal),
- (*)2 图 13 中也提供了 V_{GS} 为 0、18V 条件下的 V_{SD} . ((*)2 V_{SD} with $V_{GS}=0$ 、18V is also provided in figure 13.)
- (*)3 表示 L 是电路杂散电感加上 L_{SDS} ((*)3 indicates L is the circuit stray inductance plus L_{SDS}).

电特性值
Electrical Characteristics

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 $T_C = 25\text{ }^{\circ}\text{C}$ unless otherwise stated

符号 Symbol	参数名称 Parameter	条件 Test Conditions	最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
C_{iss}	输入电容 Input capacitance	$V_{DS} = 600V, V_{GS} = 0V,$ $f = 100kHz$		32		nF
Q_g	栅极电荷 Gate charge	-4/+18V		1.40		μC
C_{rss}	反向传输电容 Reverse transfer capacitance	$V_{DS} = 600V, V_{GS} = 0V, f$ $=100kHz$		0.1		nF
L_{sDS}	模块电感 Module inductance			8		nH
$R_{DD'+SS'}$	模块引线电阻，端子-芯片 Module lead resistance, terminal-chip			0.7		m Ω
R_{Gint}	内部栅极电阻 Internal gate resistor			1.3		Ω

电特性值

Electrical Characteristics

符号 Symbol	参数名称 Parameter	测试条件 Test Conditions		最小值 Min.	典型值 Typ.	最大值 Max.	单位 Unit
$t_{d(off)}$	关断延迟时间 Turn-off delay time	I_D =540A, V_{DS} = 850V, V_{GS} = -4/+18V, $R_{G(OFF)}$ = 4.6Ω, L_S = 30nH, dv/dt =9150V/μs (T_{vj} = 175 °C).	T_{vj} = 25 °C		382		ns
			T_{vj} = 150 °C		470		
			T_{vj} = 175 °C		482		
t_f	下降时间 Fall time		T_{vj} = 25 °C		64		ns
			T_{vj} = 150 °C		70		
			T_{vj} = 175 °C		70		
E_{OFF}	关断损耗 Turn-off energy loss		T_{vj} = 25 °C		27		mJ
			T_{vj} = 150 °C		30		
			T_{vj} = 175 °C		31		
$t_{d(on)}$	开通延迟时间 Turn-on delay time	T_{vj} = 25 °C		93		ns	
		T_{vj} = 150 °C		73			
		T_{vj} = 175 °C		70			
t_r	上升时间 Rise time	T_{vj} = 25 °C		96		ns	
		T_{vj} = 150 °C		78			
		T_{vj} = 175 °C		77			
E_{ON}	开通损耗 Turn-on energy loss	T_{vj} = 25 °C		51		mJ	
		T_{vj} = 150 °C		46			
		T_{vj} = 175 °C		47			
Q_{rr}	二极管反向恢复电荷 Diode reverse recovery charge	T_{vj} = 25 °C		2		μC	
		T_{vj} = 150 °C		6			
		T_{vj} = 175 °C		7			
I_{rr}	二极管反向恢复电流 Diode reverse recovery current	T_{vj} = 25 °C		90		A	
		T_{vj} = 150 °C		174			
		T_{vj} = 175 °C		191			
E_{rec}	二极管反向恢复损耗 Diode reverse recovery energy	T_{vj} = 25 °C		0.01		mJ	
		T_{vj} = 150 °C		0.05			
		T_{vj} = 175 °C		0.18			

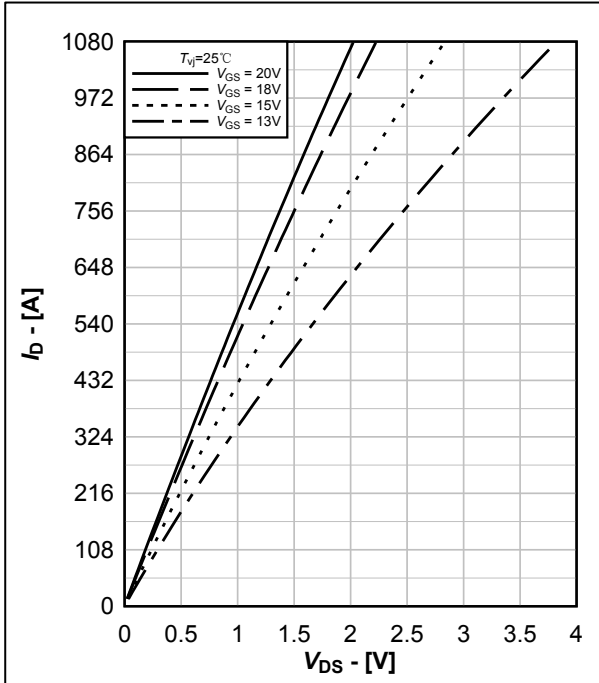


图 3. MOSFET 输出特性典型曲线, $I_D = f(V_{DS})$

Fig.3 Typical MOSFET output characteristics, $I_D = f(V_{DS})$

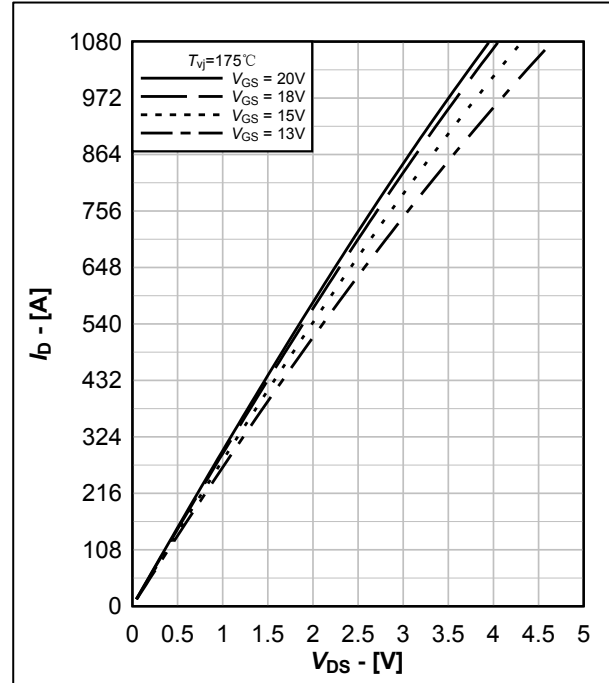


图 4. MOSFET 输出特性典型曲线, $I_D = f(V_{DS})$

Fig.4 Typical MOSFET output characteristics, $I_D = f(V_{DS})$

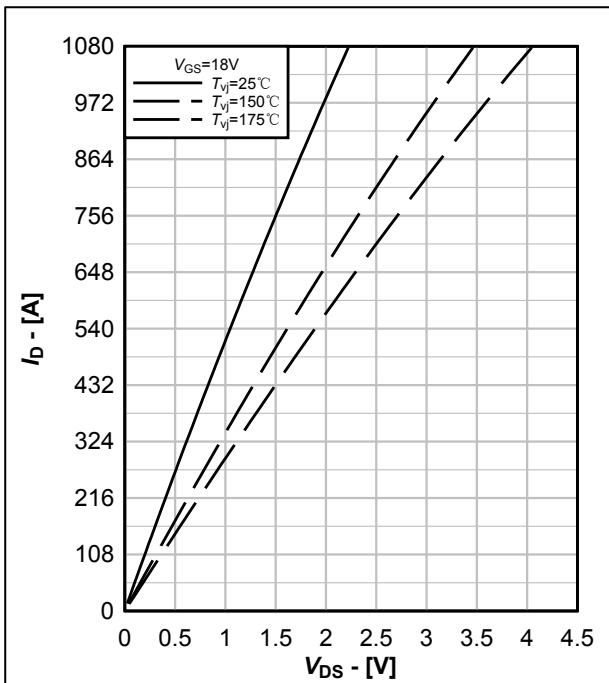


图 5. MOSFET 输出特性典型曲线, $I_D = f(V_{DS})$

Fig.5 Typical MOSFET output characteristics, $I_D = f(V_{DS})$

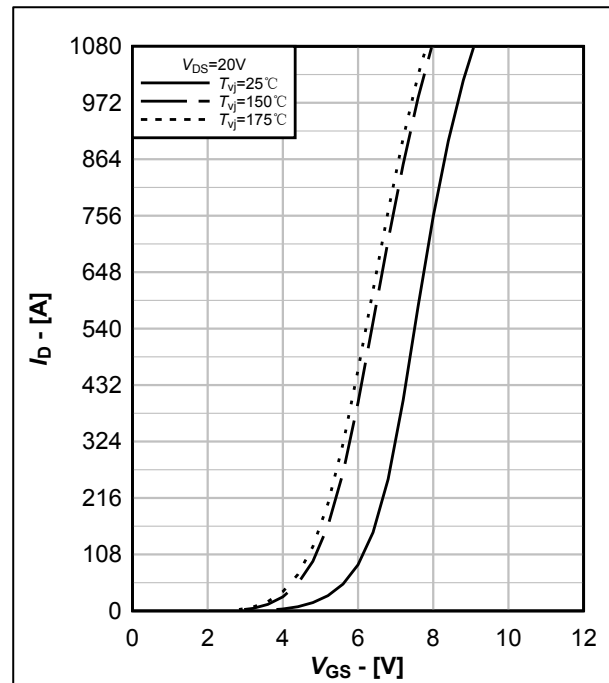


图 6. MOSFET 传输特性典型曲线, $I_D = f(V_{GS})$

Fig.6 Typical MOSFET transfer characteristics, $I_D = f(V_{GS})$

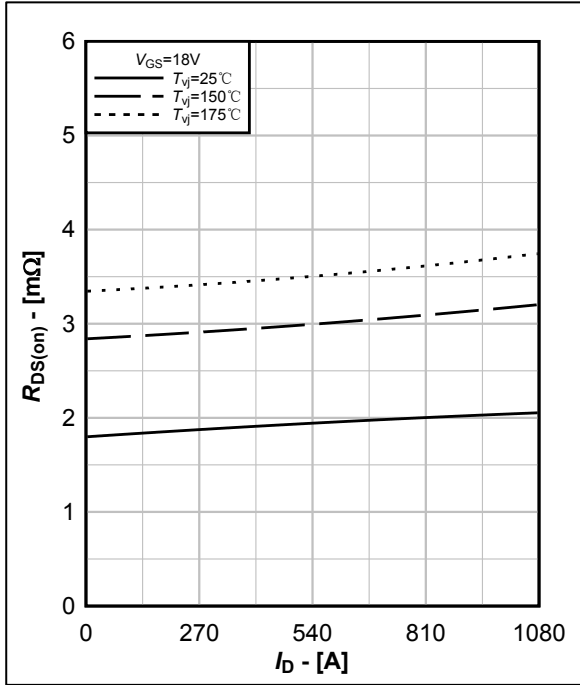

图 7. 导通电阻典型曲线, $R_{DS(on)} = f(I_D)$

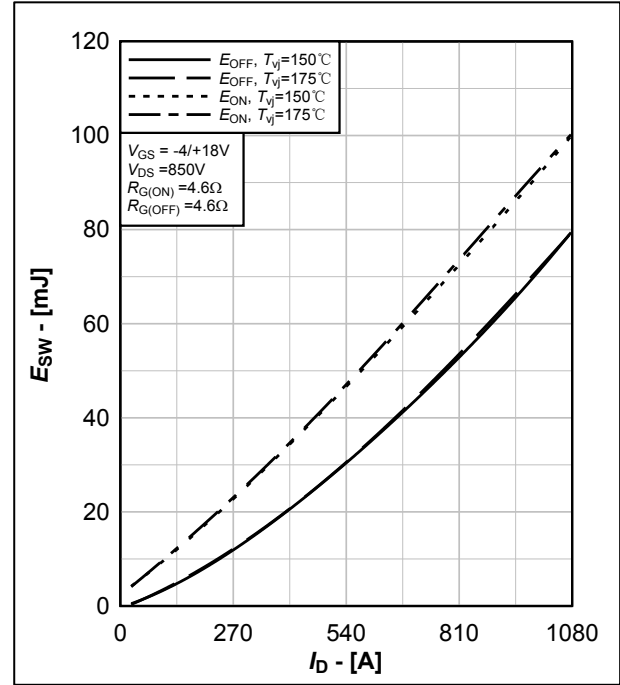
Fig.7 Typical On-Resistance characteristics, $R_{DS(on)} = f(I_D)$

图 8. MOSFET 开关损耗典型曲线, $E_{on} = f(I_C)$, $E_{off} = f(I_C)$

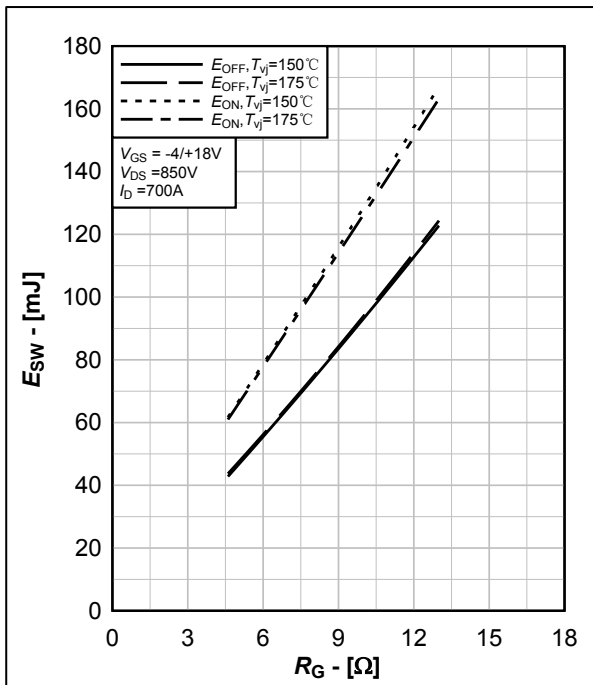
Fig.8 Typical MOSFET switching energy, $E_{on} = f(I_C)$, $E_{off} = f(I_C)$

图 9. MOSFET 开关损耗典型曲线, $E_{on} = f(R_G)$, $E_{off} = f(R_G)$

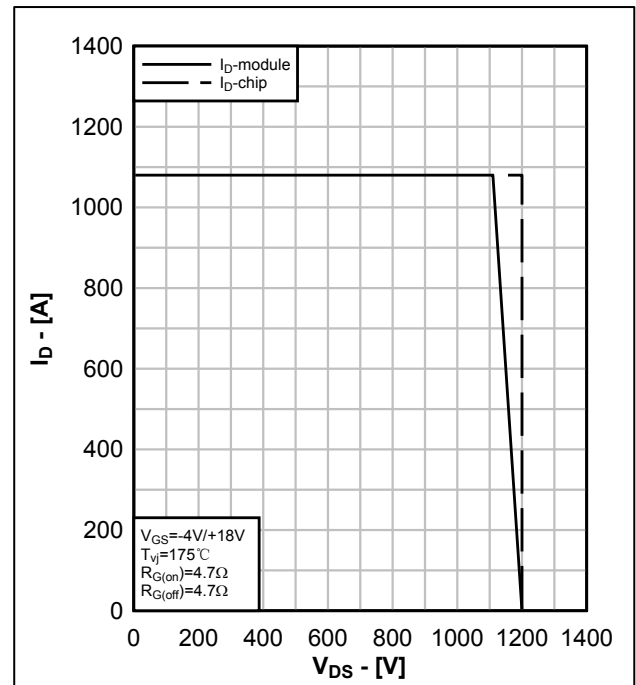
Fig.9 Typical MOSFET switching energy, $E_{on} = f(R_G)$, $E_{off} = f(R_G)$

图 10. MOSFET 反偏安全工作区, $I_D = f(V_{DS})$

Fig.10 Reverse bias safe operating area of MOSFET, $I_D = f(V_{DS})$

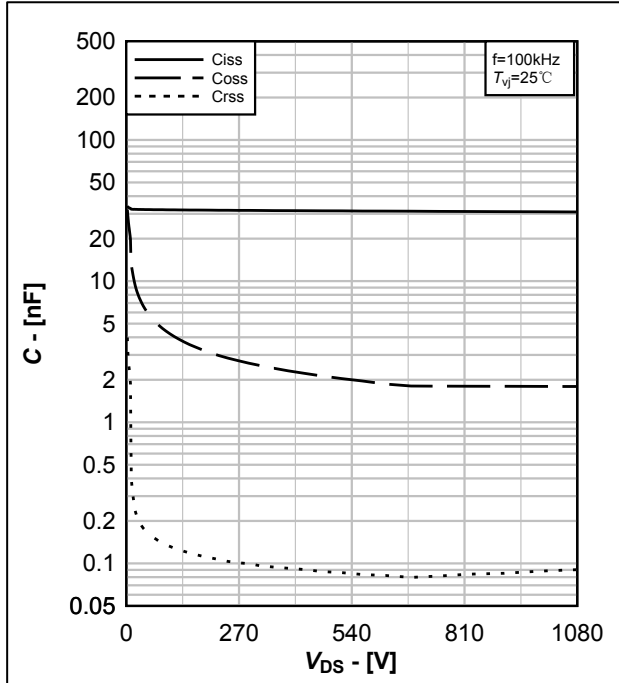

图 11. 电容特性典型曲线, $C = f(V_{DS})$

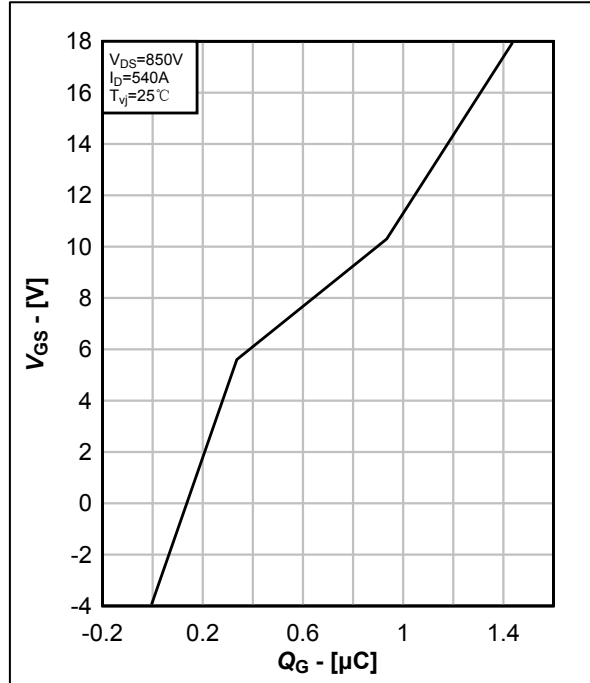
Fig.11 Typical capacity characteristic, $C = f(V_{DS})$

图 12. 栅极电荷特性典型曲线, $V_{GS} = f(Q_G)$

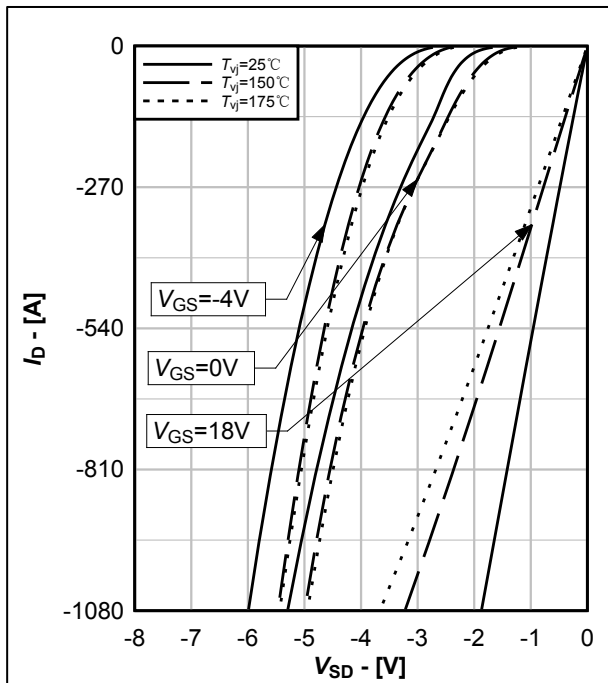
Fig.12 Typical gate charge characteristic, $V_{GS} = f(Q_G)$

图 13. 体二极管及第三象限输出特性典型曲线, $I_D = f(V_{DS})$

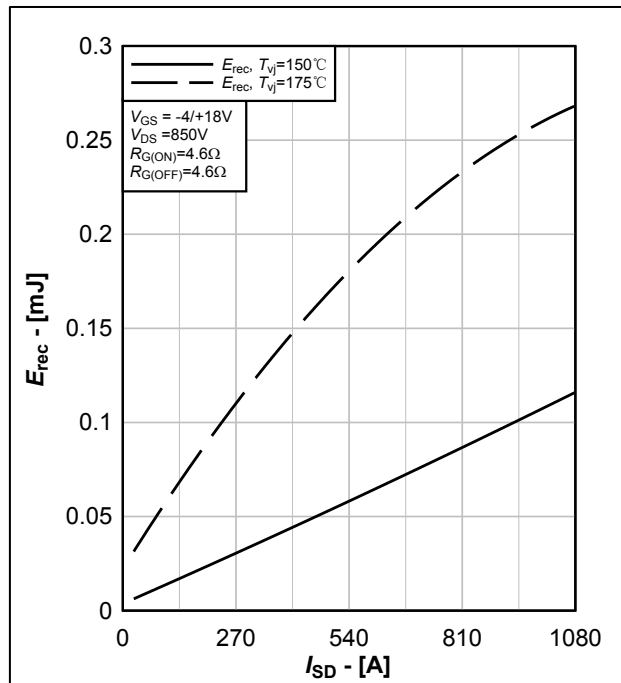
Fig.13 Typical body diode output and 3rd quadrant characteristic,
 $I_D = f(V_{DS})$

图 14. 体二极管反向恢复损耗典型曲线, $E_{rec} = f(I_F)$

Fig.14 Typical body diode switching loss E_{rec} , $E_{rec} = f(I_F)$

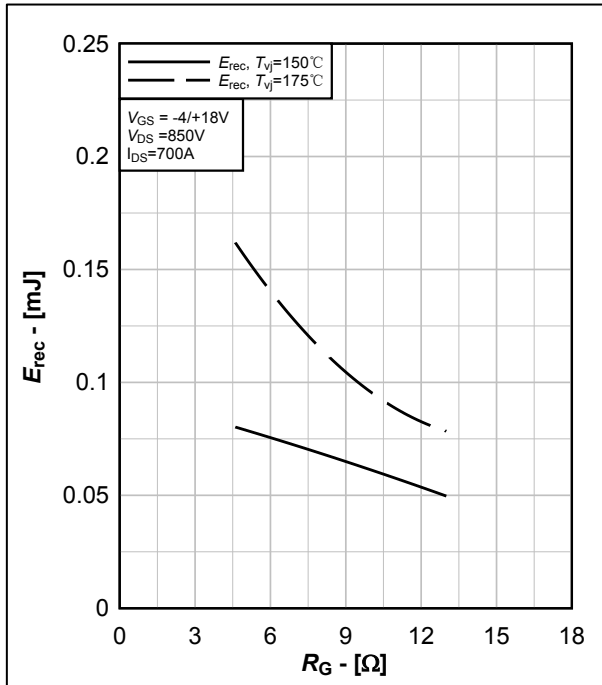


图 15. 体二极管反向恢复损耗典型曲线, $E_{rec}=f(R_G)$

Fig.15 Typical body diode switching loss E_{rec} , $E_{rec}=f(R_G)$

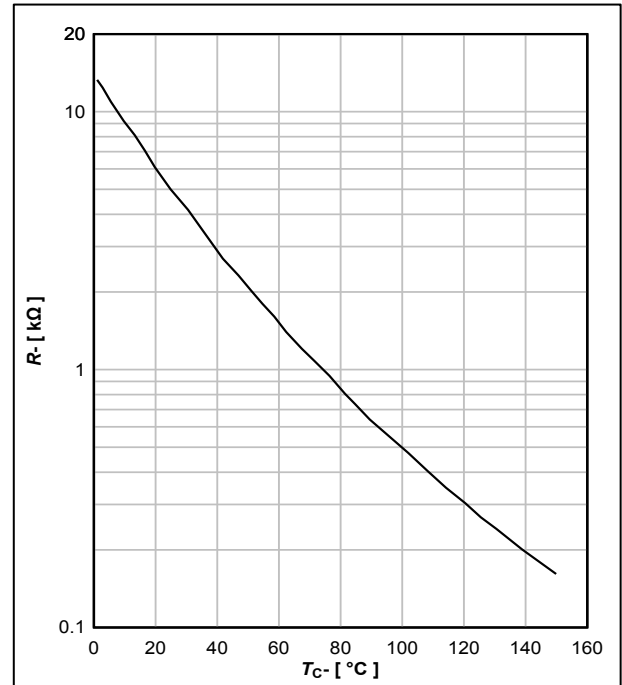


图 16. 热敏电阻典型特性曲线, $R= f(T_C)$

Fig.16 Typical NTC thermistor characteristic, $R= f(T_C)$

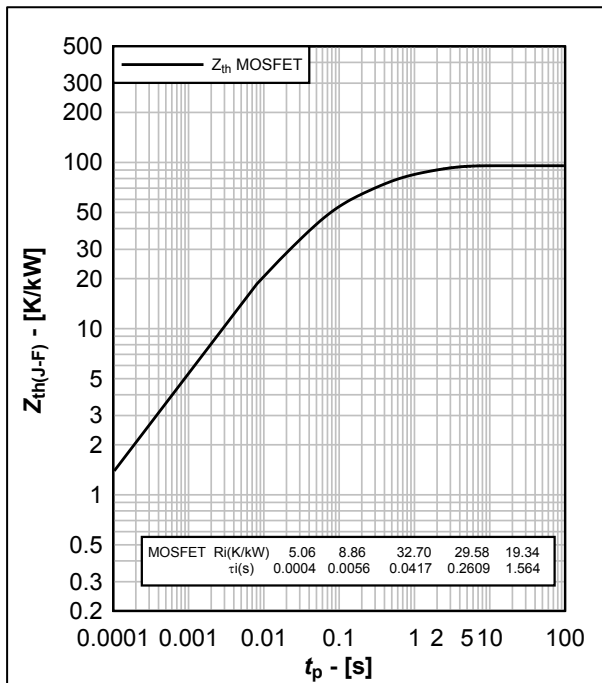
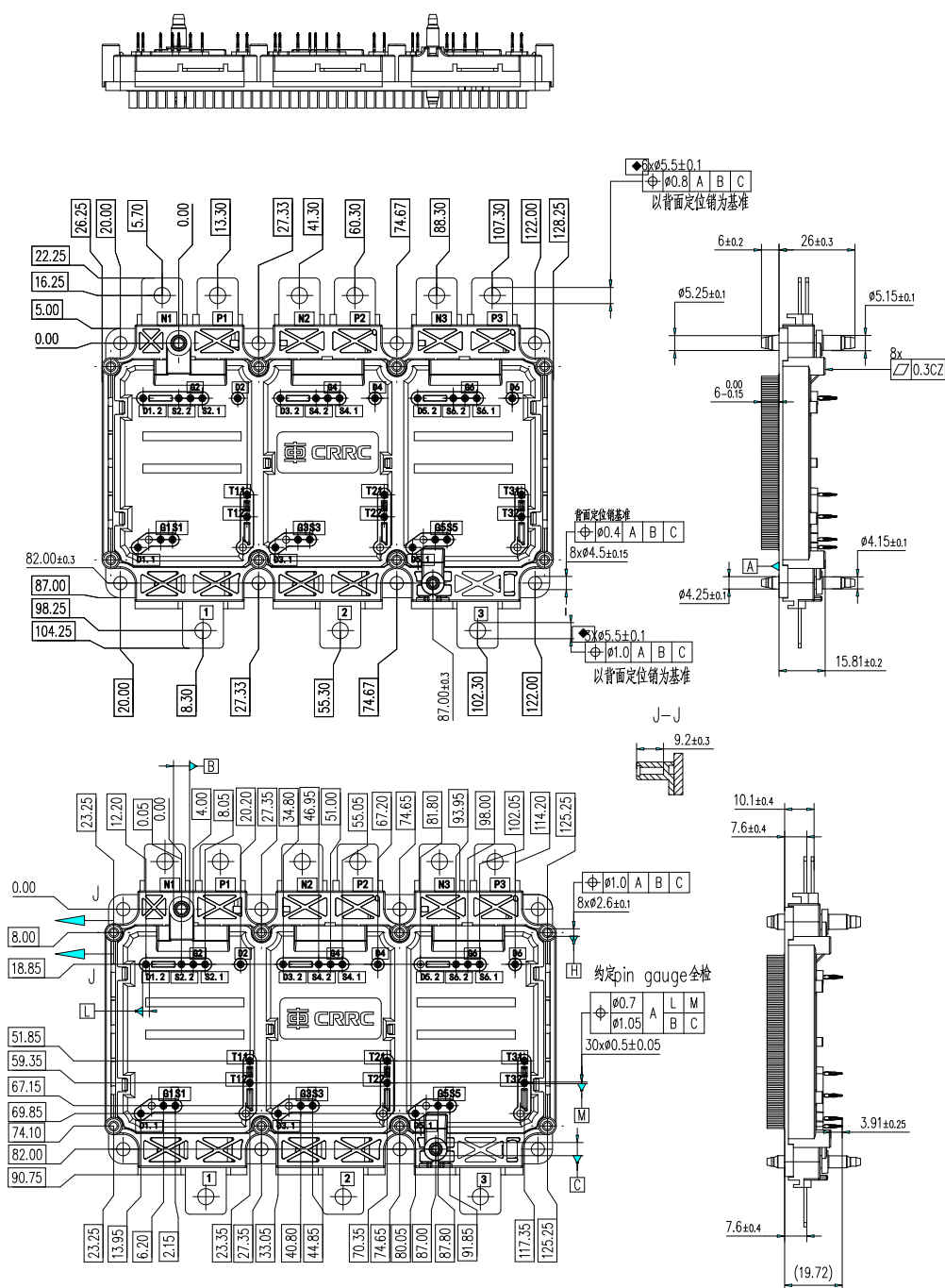


图 17. 瞬态热阻抗曲线, $Z_{th(J-C)} = f(t_p)$

Fig.17 Transient thermal impedance, $Z_{th(J-C)} = f(t_p)$



重量 Weight: TBDg

模块外观类型 Module outline code: S3

图 18. 模块外观尺寸

Fig. 18 Module outlines

Caution: This device is sensitive to electrostatic discharge. Users should follow ESD handling procedures.

注意: 该器件对静电敏感, 用户须采取 ESD 防护措施。

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