

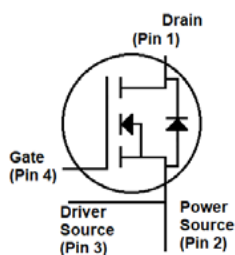
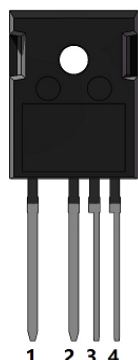
PRELIMINARY DATASHEET 规格书

SCS014HG120M24F

m24 1200V Silicon Carbide Power MOSFET (N Channel Enhancement)

第三代 1200V 碳化硅功率 MOSFET (N 沟道增强型)

Package Type: TO-247-4LB



$$V_{DS} = 1200 \text{ V}$$

$$I_D(25^\circ\text{C}) = 141 \text{ A}$$

$$R_{(DS)on}(25^\circ\text{C}) = 14 \text{ m}\Omega$$

- High blocking voltage with low on-resistance
兼具高击穿电压和低导通电阻
- Very low switching losses
低开关损耗

Maximum ratings 最大额定值^{1 2}

PARAMETER 参数	SYMBOL 符号	TEST CONDITIONS 测试条件	MIN 最小值	MAX 最大值	UNIT 单位
Drain-source voltage 漏源电压	V_{DSmax}	$V_{GS} = 0 \text{ V}, T_{vj} = 25^\circ\text{C}$		1200	V
Continuos DC drain current 连续直流漏电流	I_D	$V_{GS} = 18 \text{ V}, T_c = 25^\circ\text{C}$		141	A
		$V_{GS} = 18 \text{ V}, T_c = 100^\circ\text{C}$		100	A
Peak drain current 漏极和源极峰值电流	I_{DM}	Pulse width t_p limited by T_{jmax}		352	A
Gate-source voltage (DC) 栅源电压 (静态)	V_{GSS}		-8	22	V
Gate-source surge voltage 栅源浪涌电压	$V_{GS \text{ surge}}$	$t_p \leq 0.5 \mu\text{s}, D < 1\%$	-10	25	V
DC reverse drain current 直流反向漏极电流	I_S	$T_c = 25^\circ\text{C},$		141	A
Peak reverse drain current 峰值反向漏极电流	I_{SM}	$V_{GS} = -5 \text{ V}, \text{ limited by } T_{jmax}$		352	A
Total power dissipation 最大功率损耗	P_{tot}	$T_c = 25^\circ\text{C}, T_{vj} = 175^\circ\text{C}$		600	W
Junction operating temperature 运行结温	$T_{vj(op)}$		-55	175	$^\circ\text{C}$
Storage temperature 存储温度范围	T_{stg}		-55	175	$^\circ\text{C}$



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¹ Maximum rated values indicate limits beyond which damage to the device may occur per IEC 60747

¹ 根据标准 IEC 60747 要求，最大额定值表示超过该限值可能会对器件造成损坏

² $T_{vj} = 25^\circ\text{C}$, unless otherwise specified / 除非另有规定, $T_{vj} = 25^\circ\text{C}$

**MOSFET^{3 4}****Recommended values 推荐值**

PARAMETER 参数	SYMBOL 符号	TEST CONDITIONS 测试条件	VALUE 值	UNIT 单位
Gate-source turn-on voltage 栅源导通电压	$V_{GS(on)}$		18	V
Gate-source turn-off voltage 栅源关断电压	$V_{GS(off)}$		-5	V

Characteristic values 特征值

PARAMETER 参数	SYMBOL 符号	TEST CONDITIONS 测试条件	MIN 最小	TYP 典型	MAX 最大	UNIT 单位
Drain-source breakdown voltage 漏极-源极击穿电压	$V_{(BR)DSS}$	$V_{GS} \leq 0 \text{ V}$, $I_D = 100 \mu\text{A}$, $T_{vj} = 25 \text{ }^\circ\text{C}$	1200			V
Drain-source on-state resistance 静态漏极-源极导通电阻	$R_{DS(on)}$	$I_D = 100 \text{ A}$, $V_{GS} = 18 \text{ V}$		14	18	$m\Omega$
				23		$m\Omega$
Drain leakage current 漏源漏电流	I_{DSS}	$V_{DS} = 1200 \text{ V}$, $V_{GS} = 0 \text{ V}$		1	50	μA
Gate leakage current 栅极漏电流	I_{GSS}	$V_{GS} = 18 \text{ V}$, $V_{DS} = 0 \text{ V}$, $T_{vj} = 25 \text{ }^\circ\text{C}$		1	250	nA
Gate-source threshold voltage 栅极-源极阈值电压	$V_{GS(th)}$	$I_D = 20 \text{ mA}$, $V_{DS} = V_{GS}$	1.8	3.0	4.2	V
				2.2		V
Transconductance 跨导	g_{fs}	$V_{DS} = 20 \text{ V}$, $I_D = 100 \text{ A}$, $T_{vj} = 25 \text{ }^\circ\text{C}$		56		S
		$V_{DS} = 20 \text{ V}$, $I_D = 100 \text{ A}$, $T_{vj} = 175 \text{ }^\circ\text{C}$		52		S
Input capacitance 输入电容	C_{iss}	$V_{DS} = 1000 \text{ V}$, $V_{GS} = 0 \text{ V}$, $f = 100 \text{ kHz}$, $V_{AC} = 25 \text{ mV}$		4883		nF
Output capacitance 输出电容	C_{oss}	$T_{vj} = 25 \text{ }^\circ\text{C}$		211		pF
Reverse transfer capacitance 反向传输电容	C_{rss}			11		pF
C_{oss} stored energy 输出电容损耗	E_{oss}			120		μJ
Internal gate resistor 栅极内阻	R_{Gint}	$f = 1 \text{ MHz}$, $V_{AC} = 25 \text{ mV}$, $V_{GS} = V_{DS} = 0 \text{ V}$		2.6		Ω
Total gate charge 栅极电荷量	Q_G	$I_D = 100 \text{ A}$, $V_{DD} = 800 \text{ V}$, $V_{GS} = -5 \text{ V} \dots 18 \text{ V}$		210		nC
Gate to source charge 栅极-源极电荷量	Q_{GS}			75		nC
Gate to drain charge 栅极-漏极电荷量	Q_{GD}			51		nC

³ Characteristic values according to IEC 60747-8⁴ $T_{vj} = 25 \text{ }^\circ\text{C}$, unless otherwise specified / 除非另有规定, $T_{vj} = 25 \text{ }^\circ\text{C}$

**Characteristic values (continued) 特征值（续）**

PARAMETER 参数	SYMBOL 符号	TEST CONDITIONS 测试条件	MIN 最小	TYP 典型	MAX 最大	UNIT 单位
Turn-on delay time 开通延迟	$t_{d(on)}$	$V_{CC} = 800\text{ V}$, $I_D = 100\text{ A}$, $R_G = 8.2\ \Omega$, $V_{GS} = -5 / +18\text{ V}$	$T_{vj} = 25\text{ °C}$	43		ns
			$T_{vj} = 175\text{ °C}$	33		ns
Rise time 上升时间	t_r		$T_{vj} = 25\text{ °C}$	52		ns
			$T_{vj} = 175\text{ °C}$	51		ns
Turn-off delay time 关断延迟	$t_{d(off)}$		$T_{vj} = 25\text{ °C}$	82		ns
			$T_{vj} = 175\text{ °C}$	104		ns
Fall time 下降时间	t_f		$T_{vj} = 25\text{ °C}$	16		ns
			$T_{vj} = 175\text{ °C}$	16		ns
Turn-on switching energy 开通损耗	E_{on}		$T_{vj} = 25\text{ °C}$	2497		μJ
			$T_{vj} = 175\text{ °C}$	2954		μJ
Turn-off switching energy 关断损耗	E_{off}		$T_{vj} = 25\text{ °C}$	724		μJ
			$T_{vj} = 175\text{ °C}$	758		μJ

Body Diode (MOSFET)⁵

PARAMETER 参数	SYMBOL 符号	CONDITIONS 工作条件	MIN 最小值	TYP 典型	MAX 最大值	UNIT 单位
Drain-source reverse voltage 漏源反向电压	V_{SD}	$V_{GS} = -5\text{ V}$, $I_S = 100\text{ A}$	$T_{vj} = 25\text{ °C}$	4.8		V
			$T_{vj} = 175\text{ °C}$	4.0		V
MOSFET peak forward recovery current 峰值正向恢复电流	I_{frm}	$V_{DS} = 800\text{ V}$, $I_S = 100\text{ A}$, $V_{GS} = -5\text{ V}$ $dI/dt = 2970\text{ A}/\mu\text{s}$ (25 °C), $dI/dt = 3040\text{ A}/\mu\text{s}$ (175 °C)	$T_{vj} = 25\text{ °C}$	48		A
			$T_{vj} = 175\text{ °C}$	83		A
MOSFET forward recovery charge 正向恢复电荷	Q_f		$T_{vj} = 25\text{ °C}$	0.45		μC
			$T_{vj} = 175\text{ °C}$	1.57		μC
MOSFET forward recovery time 正向恢复时间	t_{fr}		$T_{vj} = 25\text{ °C}$	18		ns
			$T_{vj} = 175\text{ °C}$	31		ns

Package properties 封装特性

PARAMETER 参数	SYMBOL 符号	TEST CONDITIONS 测试条件	MIN 最小值	TYP 典型值	MAX 最大值	UNIT 单位
Thermal resistance from junction to case 结到壳热阻	$R_{th(j-c)}$			0.25		K/W

⁵ Characteristic values according to IEC 60747-8

Characteristics 特性曲线

Figure 1: Output characteristics (typical)

图 1. MOSFET 输出特性 (典型值)

$$I_D = f(V_{DS})$$

$T_{vj} = -55\text{ }^{\circ}\text{C}$

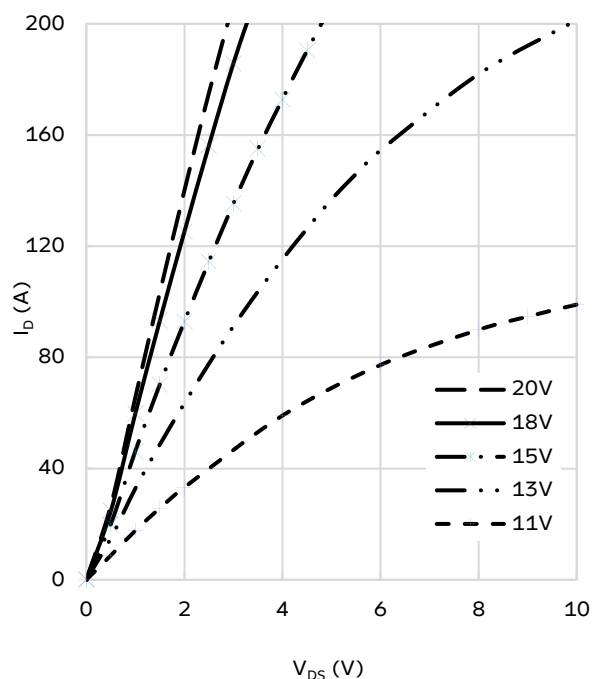


Figure 2: Output characteristics (typical)

图 2. MOSFET 输出特性 (典型值)

$$I_D = f(V_{DS})$$

$T_{vj} = 25\text{ }^{\circ}\text{C}$

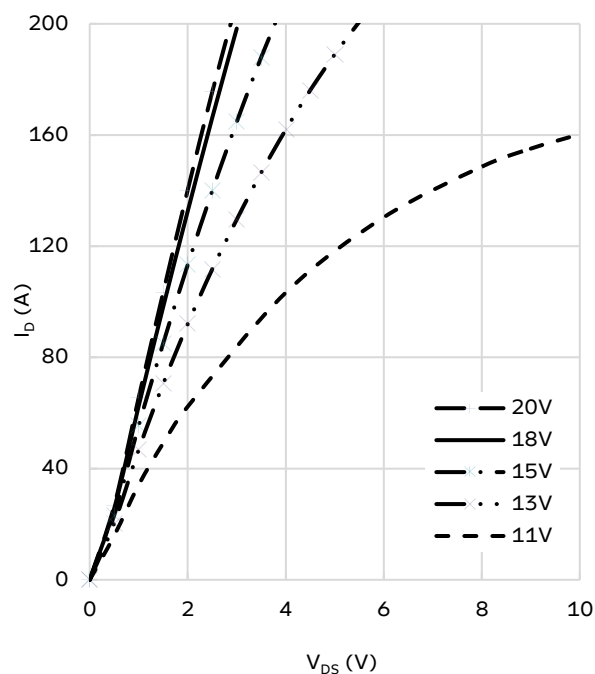


Figure 3: Output characteristics (typical)

图 3. MOSFET 输出特性 (典型值)

$$I_D = f(V_{DS})$$

$T_{vj} = 175\text{ }^{\circ}\text{C}$

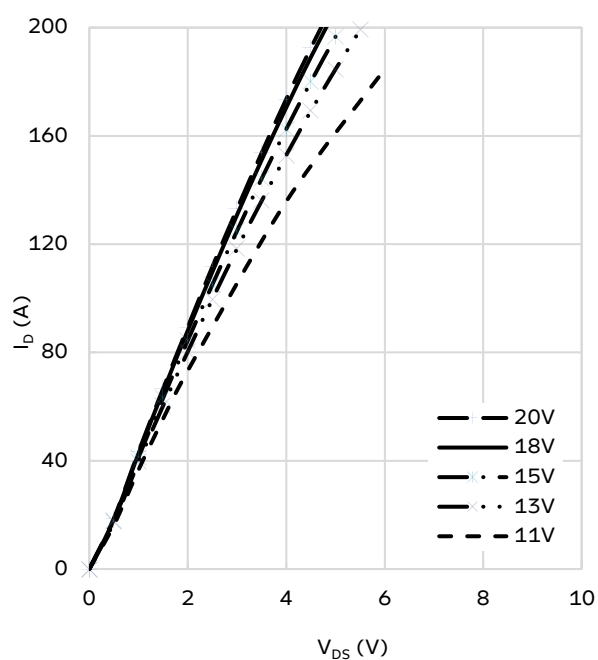


Figure 4: Drain-source on-state resistance vs. temperature

图 4. 导通电阻 vs 结温

$$R_{DS(on)} = f(T_{vj})$$

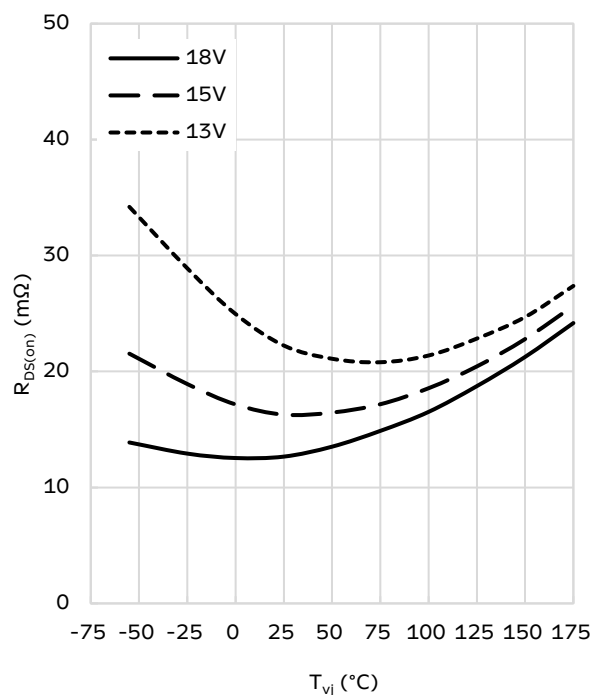


Figure 5: Drain-source on-state resistance vs. drain current
图 5. 导通电阻 vs 漏极电流

$R_{DS(on)} = f(I_D)$

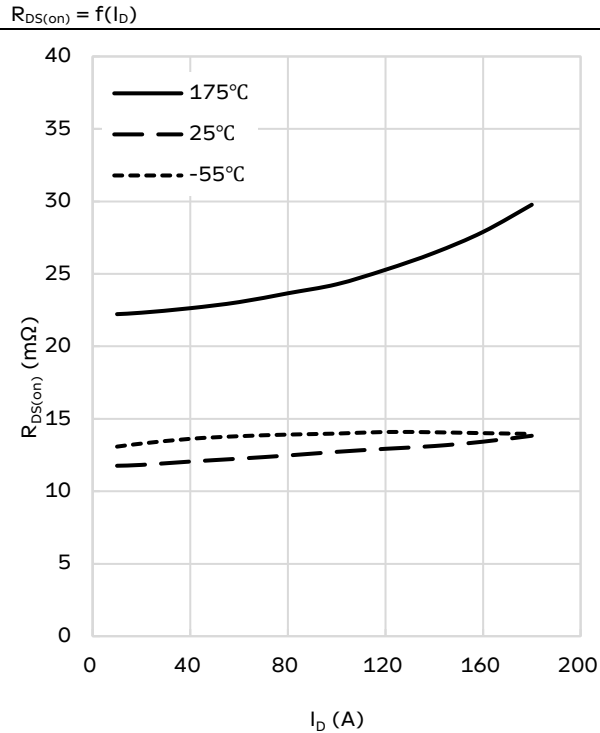


Figure 6: Transfer characteristic (typical)

图 6. 传输特性

$I_D = f(V_{GS})$

$V_{DS} = 20 \text{ V}$

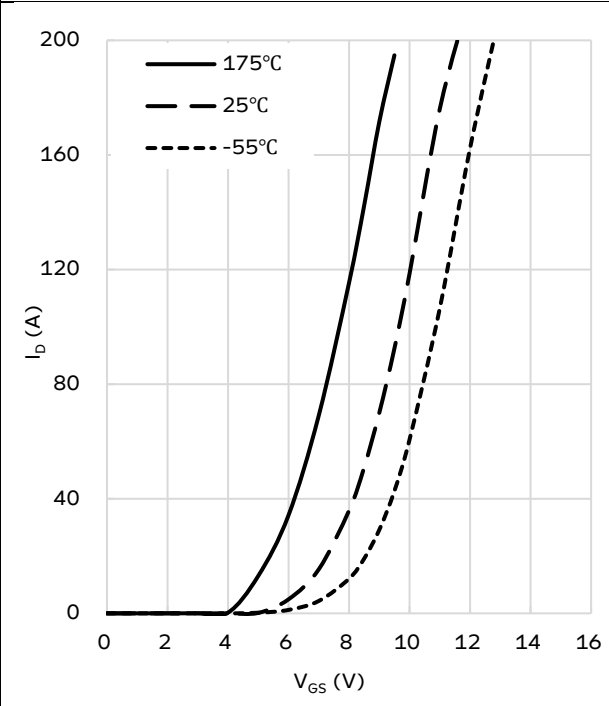


Figure 7: Gate-source threshold voltage vs. temperature

图 7. 开启电压 vs 温度特性

$V_{GS} = f(T_{vj})$

$I_D = 20 \text{ mA}, V_{GS} = V_{DS}$

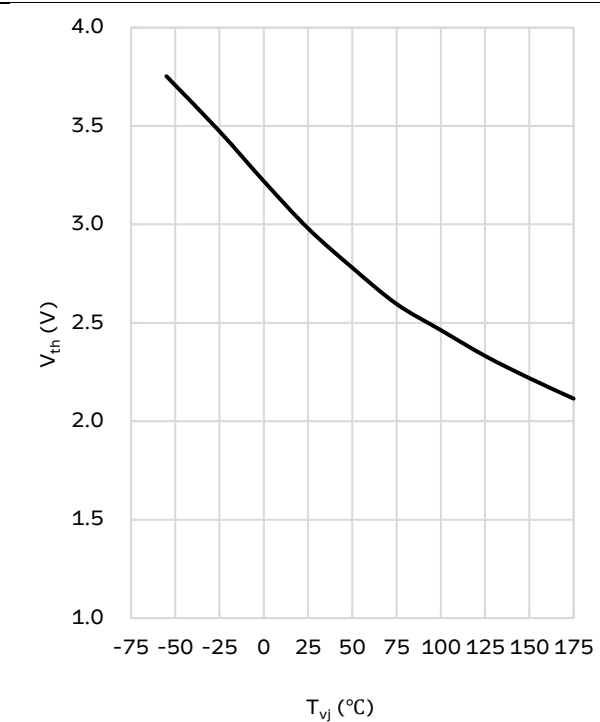


Figure 8: Body diode characteristic (typical)

图 8. 体二极管特性 (典型值)

$I_S = f(V_{SD})$

$T_{vj} = -55 \text{ °C}$

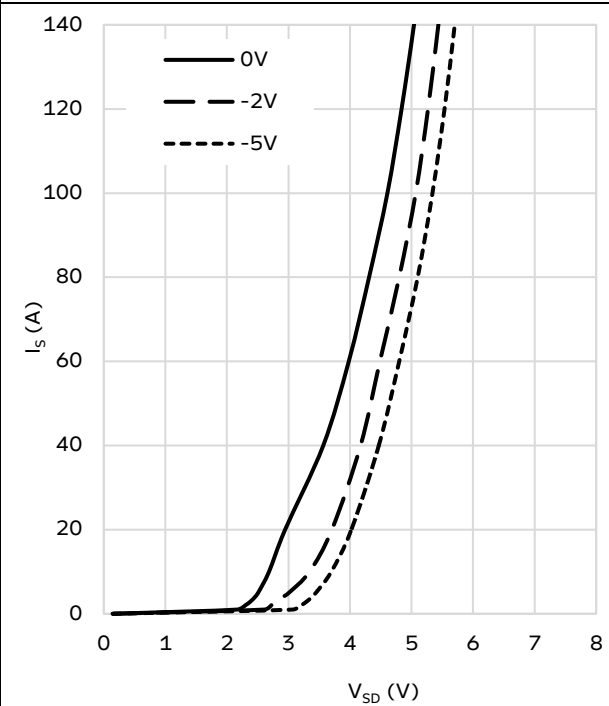


Figure 9: Body diode characteristic (typical)

图 9. 体二极管特性 (典型值)

$$I_S = f(V_{SD})$$

$T_{vj} = 25\text{ °C}$

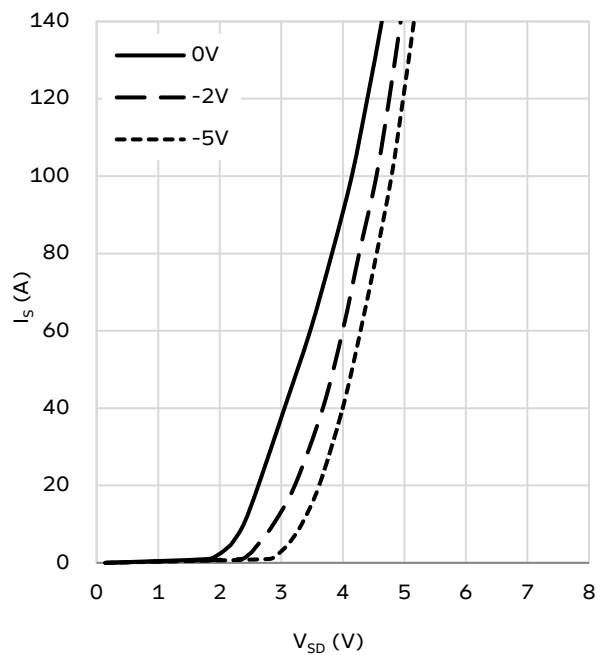


Figure 10: Body diode characteristic (typical)

图 10. 体二极管特性 (典型值)

$$I_S = f(V_{SD})$$

$T_{vj} = 175\text{ °C}$

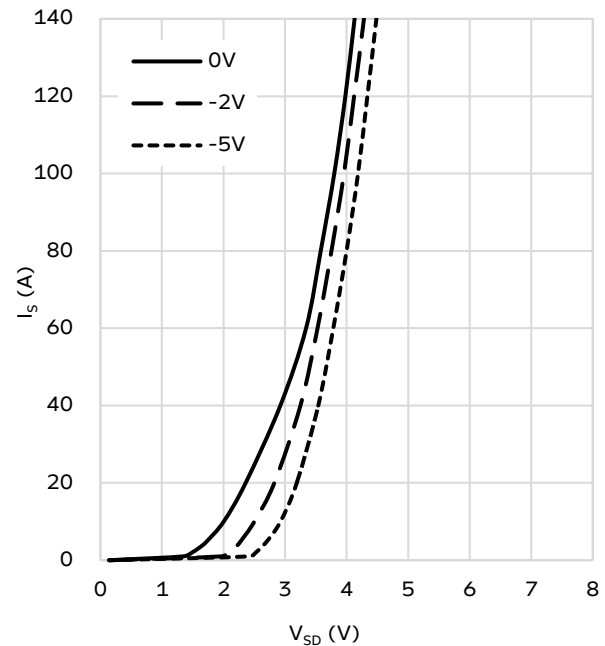


Figure 11: 3rd quadrant characteristics (typical)

图 11. 三象限特性 (典型值)

$$I_b = f(V_{DS})$$

$T_{vj} = -55\text{ °C}$

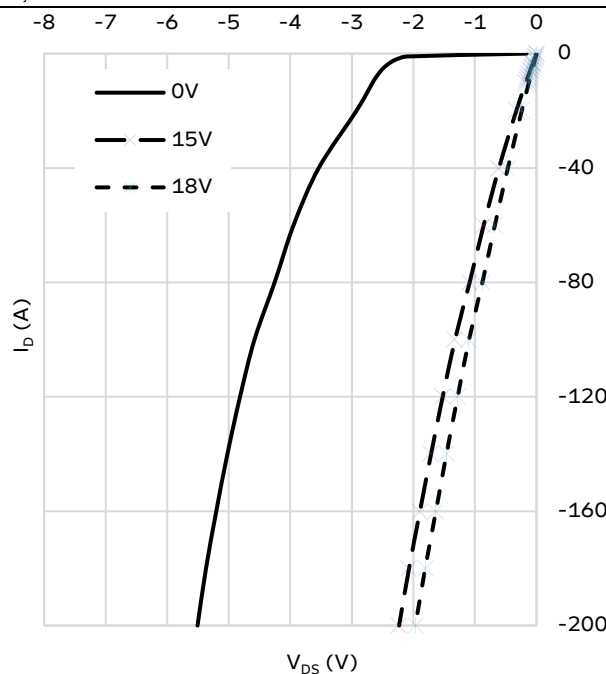


Figure 12: 3rd quadrant characteristics (typical)

图 12. 三象限特性 (典型值)

$$I_b = f(V_{DS})$$

$T_{vj} = 25\text{ °C}$

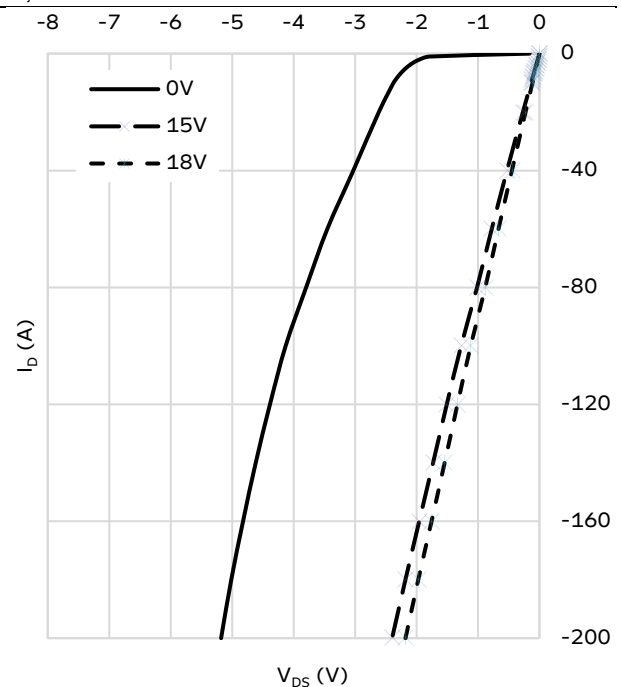


Figure 13: 3rd quadrant characteristics (typical)

图 13. 三象限特性 (典型值)

$$I_D = f(V_{DS})$$

$T_{vj} = 175\text{ }^{\circ}\text{C}$

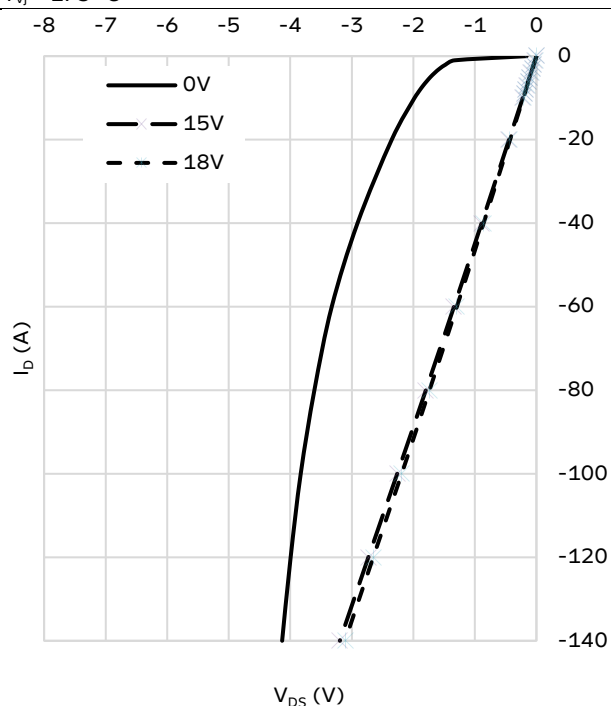


Figure 14: Total gate charge characteristics (typical)

图 14. 栅电荷特性 (典型值)

$$V_{GS} = f(Q_G)$$

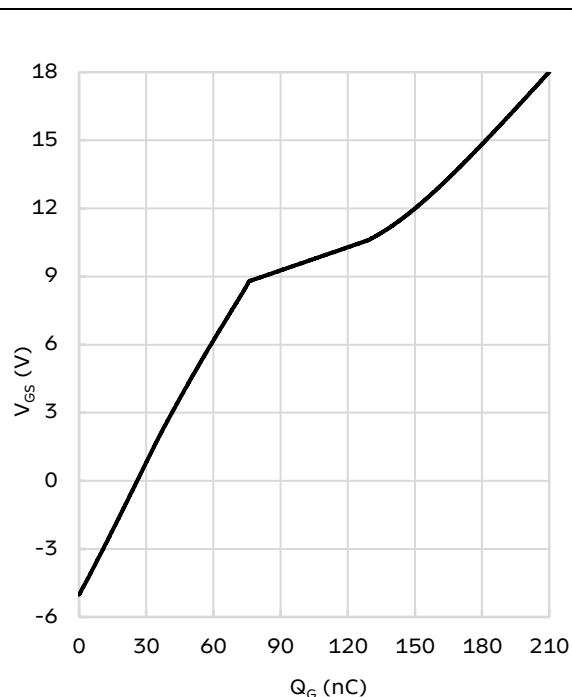


Figure 15: Capacitance vs. drain-source voltage (typical)

图 15. 电容 vs 漏源电压 (典型值)

$$C = f(V_{DS})$$

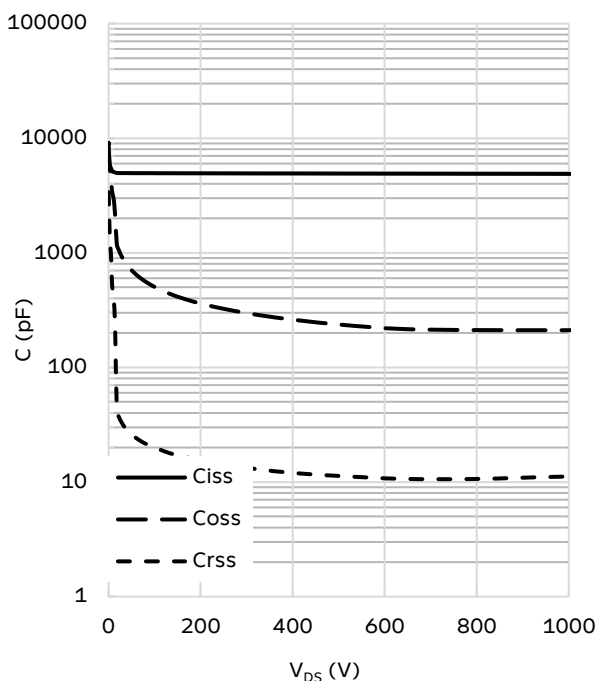


Figure 16: Output capacitor stored energy

图 16. 输出电容储存能量

$$E_{OSS} = f(V_{DS})$$

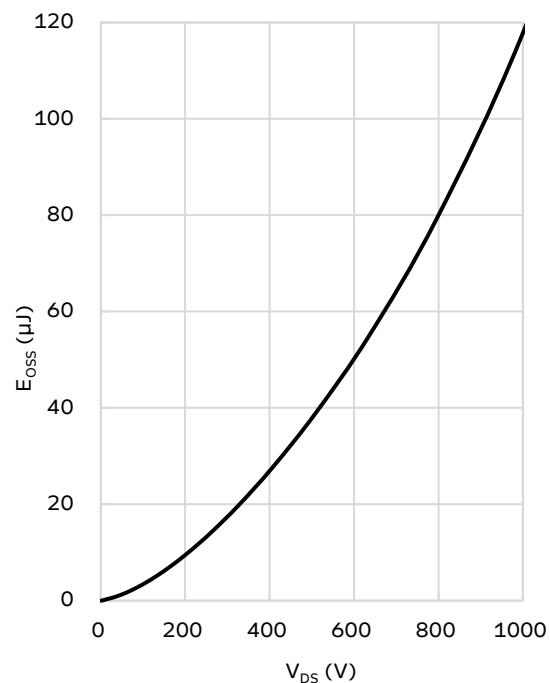




Figure 17: Continuous drain current derating vs. temperature

图 17. 漏极电流 vs 壳温

$$I_D = f(T_C)$$

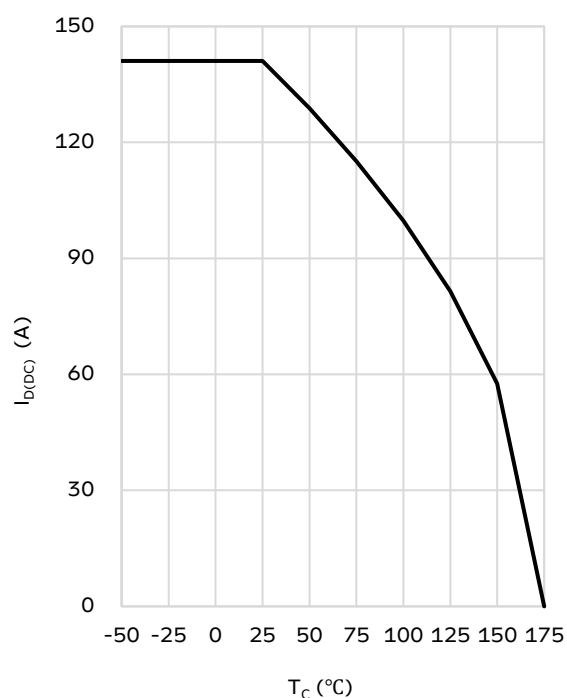


Figure 18: Maximum power dissipation derating vs. temperature

图 18. 耗散功率 vs 壳温

$$P_D = f(T_C)$$

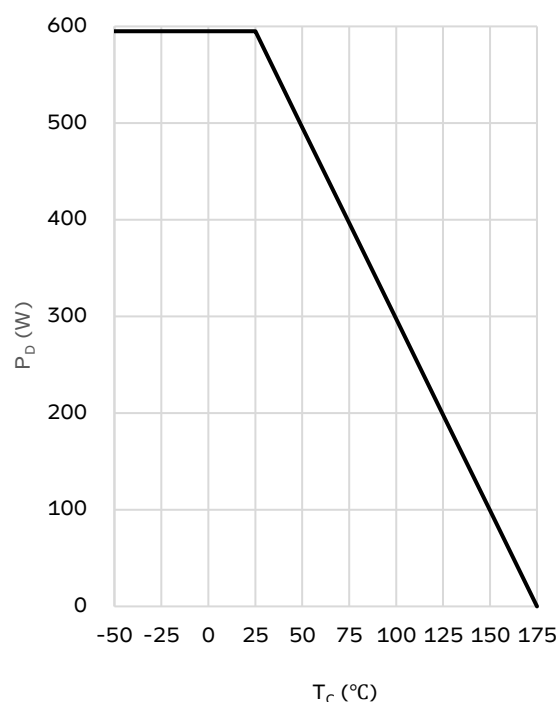


Figure 19: Switching energy vs. Drain current

图 19. 钳位电感开关能量 vs 漏极电流

$$E = f(I_{DS})$$

$V_{DS} = 800$ V, $V_{GS} = -5/18$ V, $T_{vj} = 175$ °C

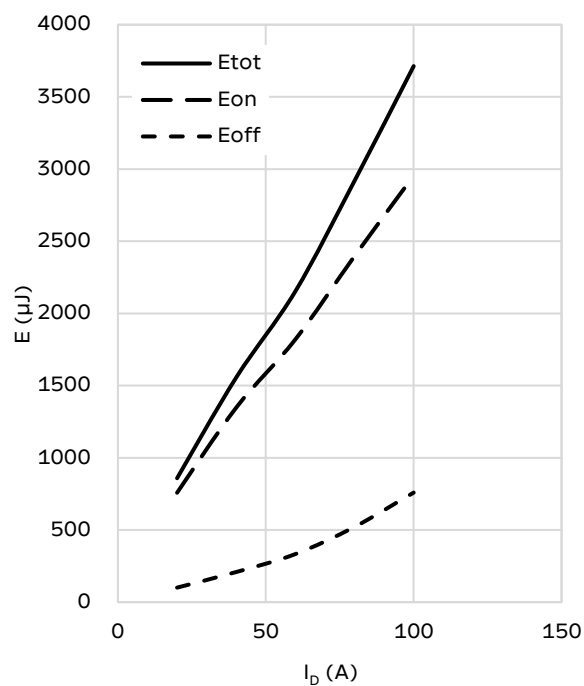


Figure 20: Switching energy vs. temperature

图 20. 钳位电感开关能量 vs 结温

$$E = f(T_{vj})$$

$V_{DS} = 800$ V, $V_{GS} = -5/18$ V, $I_D = 100$ A

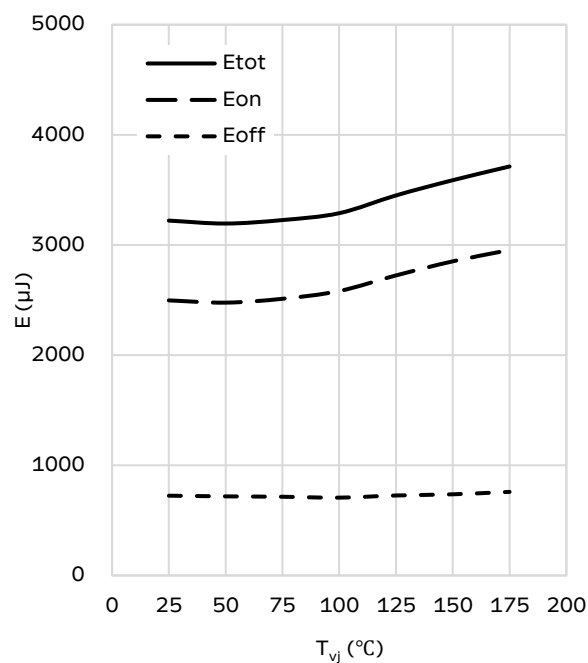


Figure 21: Switching energy vs. $R_{G(ext)}$

图 21. 钳位电感开关能量 vs $R_{G(ext)}$

$$E = f(R_{G(ext)})$$

$V_{DS} = 800 \text{ V}$, $V_{GS} = -5/18 \text{ V}$, $I_D = 100 \text{ A}$, $T_{vj} = 25^\circ \text{C}$

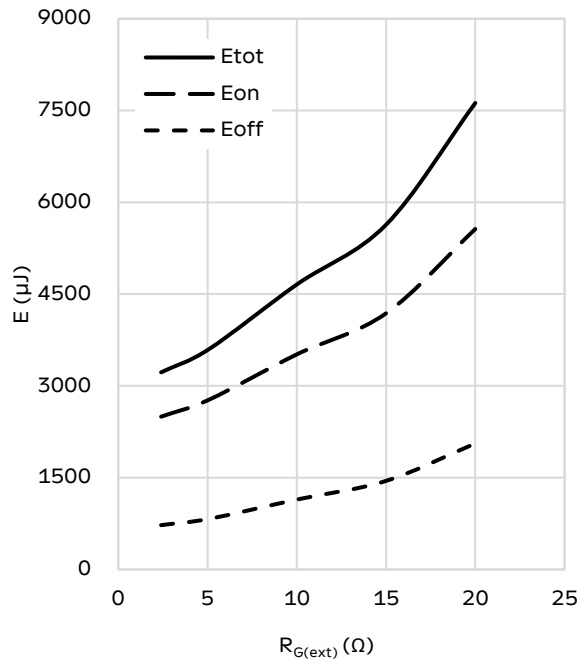


Figure 22: Reverse recovery charge vs. di_r/dt

图 22. 反向恢复电荷 vs di_r/dt

$$Q_r = f(di_r/dt)$$

$V_{DS} = 800 \text{ V}$, $V_{GS} = -5/18 \text{ V}$, $I_D = 100 \text{ A}$

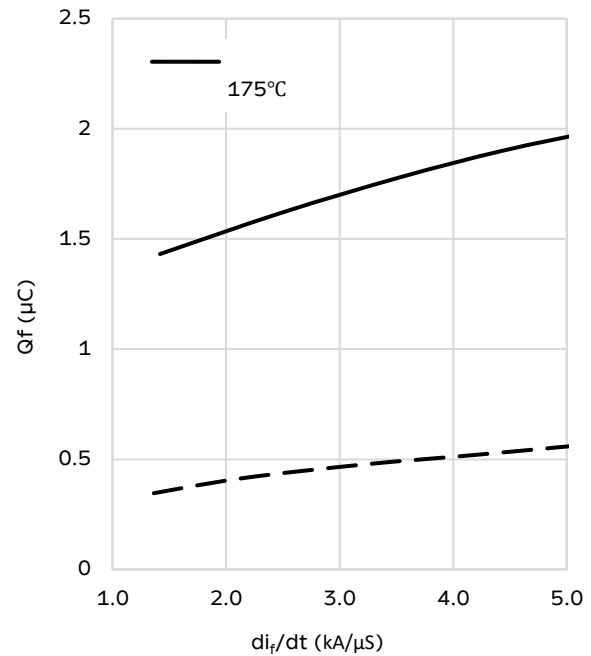


Figure 23: Reverse recovery current vs. di_r/dt

图 23. 反向恢复电流 vs di_r/dt

$$I_{frm} = f(di_r/dt)$$

$V_{DS} = 800 \text{ V}$, $V_{GS} = -5/18 \text{ V}$, $I_D = 100 \text{ A}$

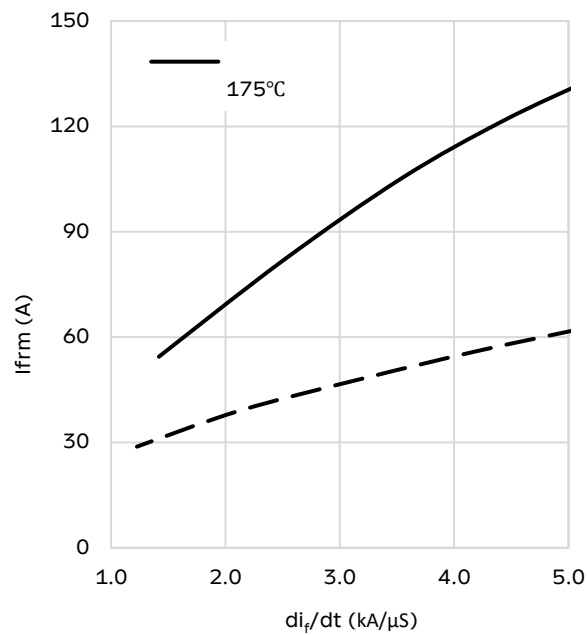


Figure 24: Safe Operating Area

图 24. 安全工作区

$$I_{DS} = f(V_{DS})$$

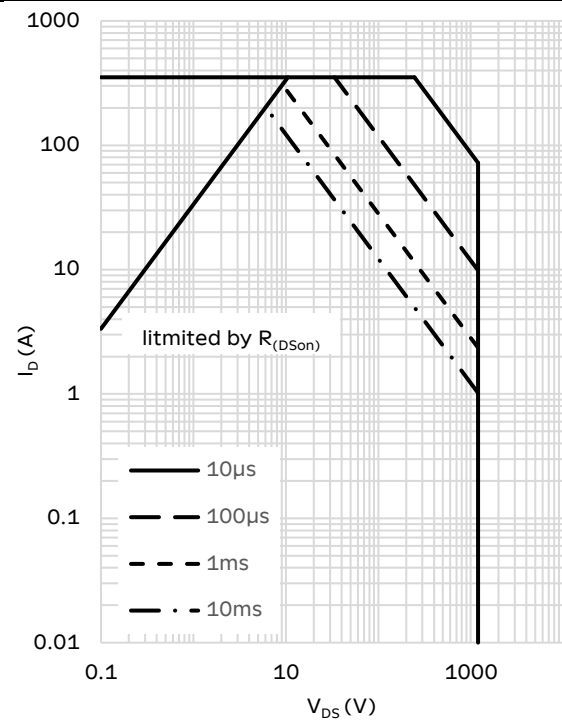
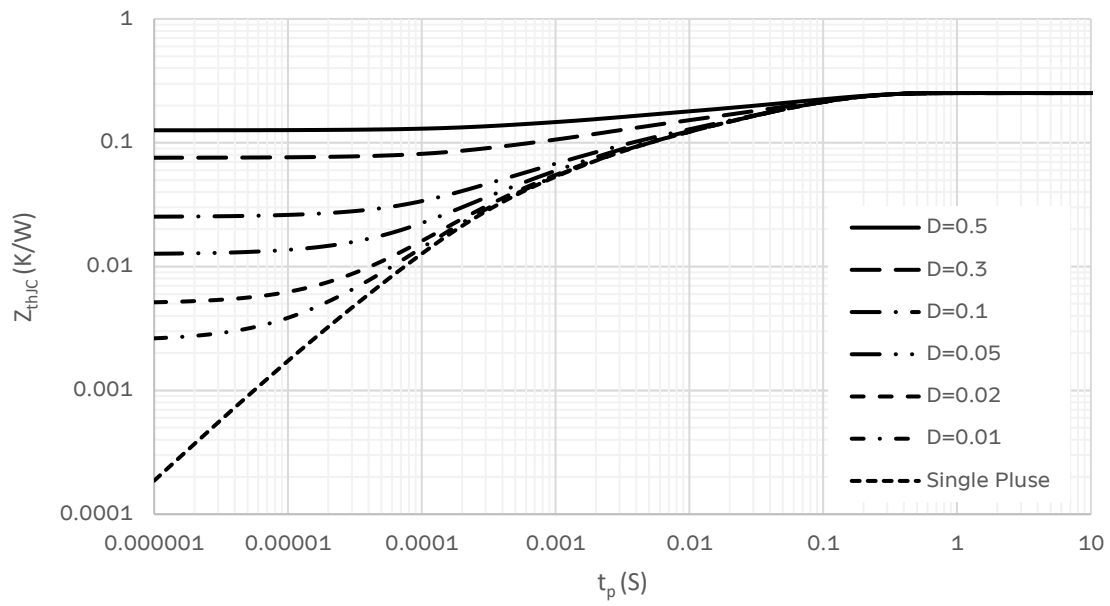


Figure 25: Transient thermal impedance (Junction - Case)

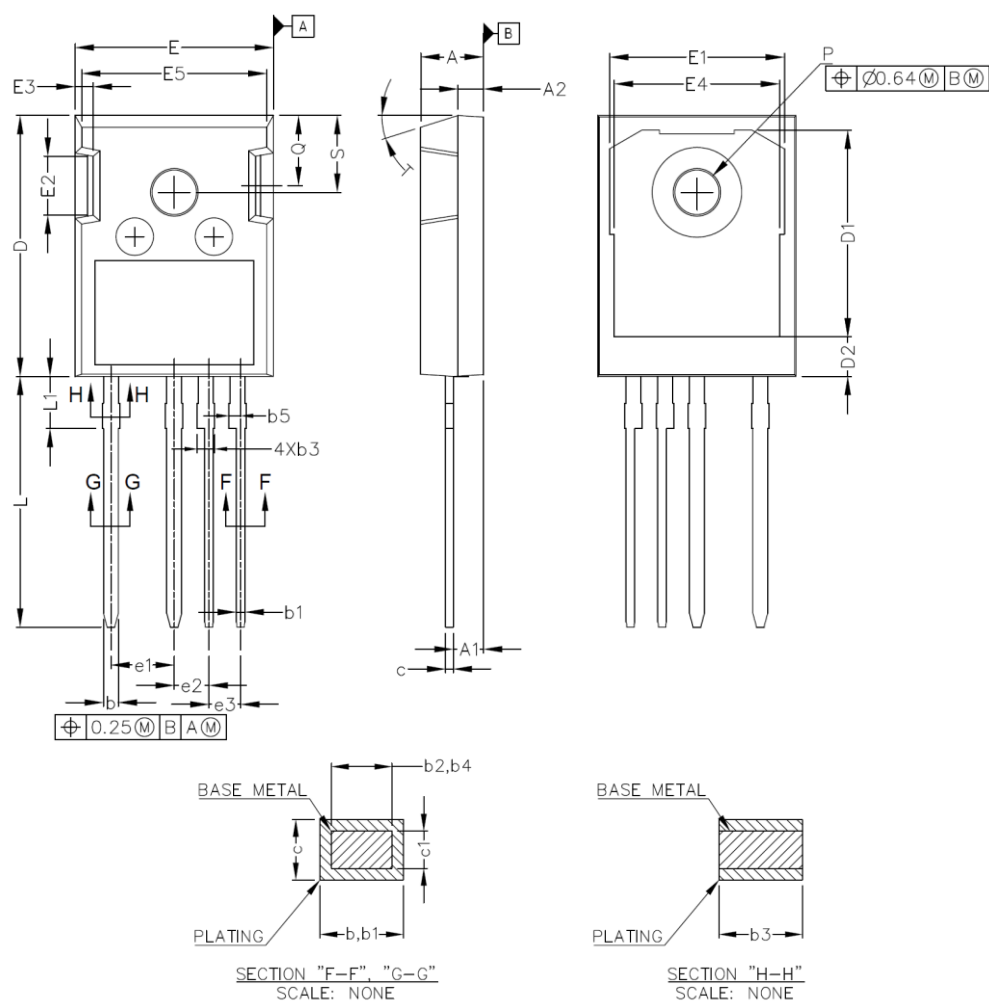
图 25. 瞬态热阻

$$Z_{th(jc)} = f(t_p)$$



Outline drawing 外形图

Marking SCSM24F014HG120



Sym- bol	Dimensions In Millimeters	
	Min.	Max.
A	4.83	5.21
A1	2.29	2.54
A2	1.91	2.16
b	1.10	1.30
b1	0.65	0.79
b2	1.10	1.25
b3	1.34	1.44
b4	0.65	0.74
b5	0.74	1.14
c	0.55	0.68

Sym- bol	Dimensions In Millimeters	
	Min.	Max.
c1	0.55	0.65
D	20.80	21.10
D1	16.25	17.65
D2	2.95	3.35
E	15.75	16.13
E1	13.10	14.15
E2	4.32	5.10
E3	1.00	1.90
E4	12.38	13.43
E5	14.65	15.05

Sym- bol	Dimensions In Millimeters	
	Min.	Max.
e1	5.08 BSC	
e2	2.79 BSC	
e3	2.54 BSC	
L	19.72	20.32
L1	3.97	4.37
ΦP	3.51	3.65
Q	5.49	6.00
S	6.04	6.30
T	17.5° REF	

This is an electrostatic sensitive device. 本产品对静电特别敏感。

This product has been designed and qualified for Industrial Level. 本产品的设计符合工业级标准。

Note: All dimensions are in mm



Ordering Information 订购信息

OPTION 选项		ARTICLE NUMBER 商品编号
Qualification grade 资质等级	Industrial (F)	SCS014HG120M24F
Packaging Method 包装方式	Tube (_P20)	SCS014HG120M24F _P20

Revision History 修订历史

Release 发布	Version 版本	Description 描述
2026-08-10	v1.0	Preliminary Datasheet 初始规格书