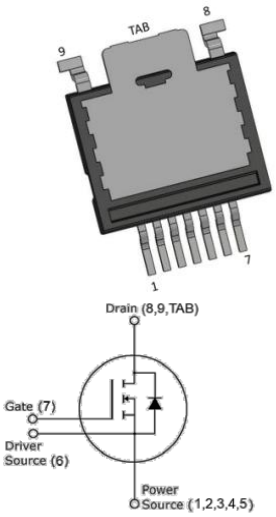
PRELIMINARY DATASHEET 规格书

SCS040XA120M22E

m22 1200V Silicon Carbide Power MOSFET（N Channel Enhancement）
第二代 1200V 碳化硅功率 MOSFET（N 沟道增强型）
Package Type：X2PAK



V_{DS} = 1200 V
I_D(25 °C) = 58 A
$R_{(DS)on}$(25 °C) = 40 mΩ

- 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
- High-Reliability Qualification
  高可靠性认证

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 V, T_{vj} = 25 °C		1200	V
Continuos DC drain current 连续直流漏电流	I_D	V_{GS} = 18 V, T_C = 25 °C		58	A
		V_{GS} = 18 V, T_C = 100 °C		41	A
Peak drain current 漏极和源极峰值电流	I_{DM}	Pulse width t_p limited by T_{jmax}		145	A
Gate-source voltage (DC) 栅源电压（静态）	V_{GSS}		-10	22	V
Gate-source surge voltage 栅源浪涌电压	$V_{GS\ surge}$	$t_p \leq 0.5$ µs, D < 1%	-11	25	V
DC reverse drain current 直流反向漏极电流	I_S	T_c = 25 °C,		58	A
Peak reverse drain current 峰值反向漏极电流	I_{SM}	V_{GS} = -5 V, limited by T_{jmax}		145	A
Total power dissipation 最大功率损耗	P_{tot}	T_C = 25 °C, T_{vj} = 175 °C		288	W
Junction operating temperature 运行结温	$T_{vj(op)}$		-55	175	°C
Storage temperature 存储温度范围	T_{stg}		-55	175	°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 °C, unless otherwise specified / 除非另有规定, T_{vj} = 25 °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} ≤ 0 V, I_D = 100 µA, T_{vj} = 25 °C		1200			V
Drain-source on-state resistance 静态漏极-源极导通电阻	$R_{DS(on)}$	I_D = 22 A, V_{GS} = 18 V	T_{vj} = 25 °C		40	56	mΩ
			T_{vj} = 175 °C		65		mΩ
Drain leakage current 漏源漏电流	I_{DSS}	V_{DS} = 1200 V, V_{GS} = 0 V	T_{vj} = 25 °C		1	100	µA
Gate leakage current 栅极漏电流	I_{GSS}	V_{GS} = 18 V, V_{DS} = 0 V, T_{vj} = 25 °C			1	250	nA
Gate-source threshold voltage 栅极-源极阈值电压	$V_{GS(th)}$	I_D = 7 mA, V_{DS} = V_{GS}	T_{vj} = 25 °C	1.8	3.0	4.2	V
			T_{vj} = 175 °C		2.1		V
Transconductance 跨导	g_{fs}	V_{DS} = 20 V, I_D = 22 A, T_{vj} = 25 °C			16		S
		V_{DS} = 20 V, I_D = 22 A, T_{vj} = 175 °C			17		S
Input capacitance 输入电容	C_{iss}	V_{DS} = 1000 V, V_{GS} = 0 V, f = 100 kHz, V_{AC} = 25 mV T_{vj} = 25 °C			1653		pF
Output capacitance 输出电容	C_{oss}				67		pF
Reverse tansfer capacitance 反向传输电容	C_{rss}				5		pF
C_{oss} stored energy 输出电容损耗	E_{OSS}	(Eoss = ∫Q(V)dV)			39		µJ
Internal gate resistor 栅极内阻	R_{Gint}	f= 1 MHz，V_{AC} = 25 mV, V_{GS} = V_{DS} = 0 V			4.5		Ω
Total gate charge 栅极电荷量	Q_G	I_D = 22 A, V_{DD} = 800 V, V_{GS} = -5 V ... 18 V			75		nC
Gate to source charge 栅极-源极电荷量	Q_{GS}				22		nC
Gate to drain charge 栅极-漏极电荷量	Q_{GD}				22		nC

[3] Characteristic values according to IEC 60747-8
[4] T_{vj} = 25 °C, unless otherwise specified / 除非另有规定, T_{vj} = 25 °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 V, I_D = 22 A, R_G = 2.4 Ω, V_{GS} = -5 / +18 V	T_{vj} = 25 °C		11		ns
			T_{vj} = 175 °C		10		ns
Rise time 上升时间	t_r		T_{vj} = 25 °C		14		ns
			T_{vj} = 175 °C		15		ns
Turn-off delay time 关断延迟	$t_{d(off)}$		T_{vj} = 25 °C		27		ns
			T_{vj} = 175 °C		32		ns
Fall time 下降时间	t_f		T_{vj} = 25 °C		9		ns
			T_{vj} = 175 °C		9		ns
Turn-on switching energy 开通损耗	E_{on}		T_{vj} = 25 °C		202		µJ
			T_{vj} = 175 °C		272		µJ
Turn-off switching energy 关断损耗	E_{off}		T_{vj} = 25 °C		62		µJ
			T_{vj} = 175 °C		64		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 V, I_S = 22 A	T_{vj} = 25 °C		4.3		V
			T_{vj} = 175 °C		3.7		V
MOSFET peak forward recovery current 峰值正向恢复电流	I_{frm}	V_{DS} = 800 V, I_S = 22 A, V_{GS} = -5V dI/dt =3100 A/µs (25 °C), dI/dt =3270 A/µs (175 °C)	T_{vj} = 25 °C		28		A
			T_{vj} = 175 °C		48		A
MOSFET forward recovery charge 正向恢复电荷	Q_f		T_{vj} = 25 °C		0.17		µC
			T_{vj} = 175 °C		0.46		µC
MOSFET forward recovery time 正向恢复时间	t_{fr}		T_{vj} = 25 °C		10		ns
			T_{vj} = 175 °C		15		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	$R_{th(j-c)}$			0.52		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 °C

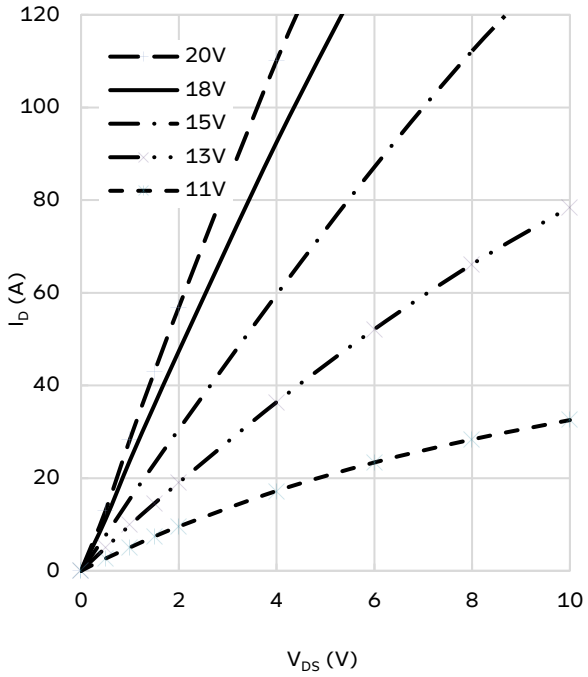


Figure 2: Output characteristics (typical)
图 2. MOSFET 输出特性（典型值）
$I_D = f(V_{DS})$
T_{vj} = 25 °C

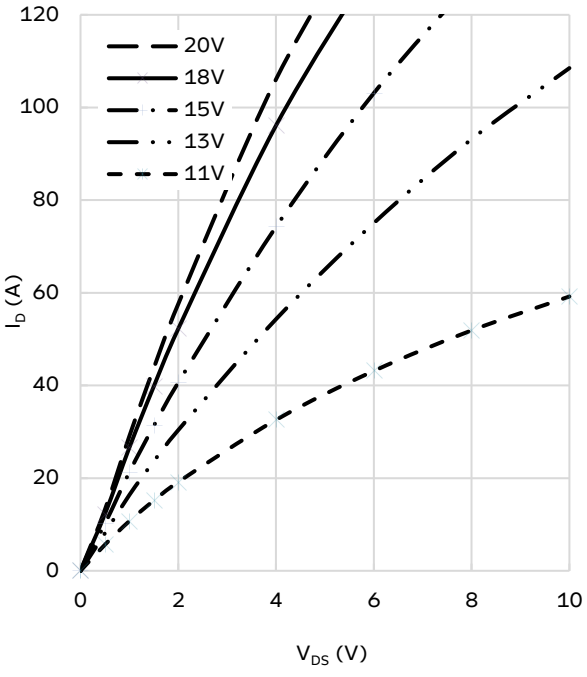


Figure 3: Output characteristics (typical)
图 3. MOSFET 输出特性（典型值）
$I_D = f(V_{DS})$
T_{vj} = 175 °C

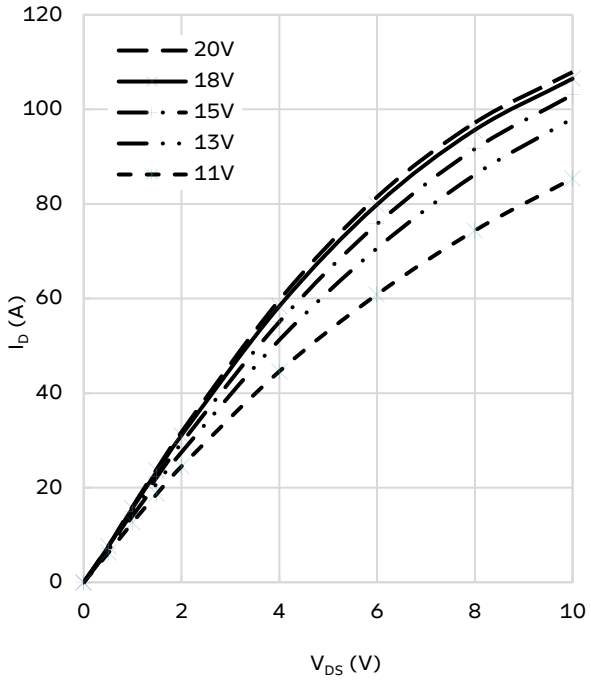


Figure 4: Drain-source on-state resistance vs. temperature
图 4. 导通电阻 vs 结温
$R_{DS(on)} = f(T_{vj})$
I_D = 22 A

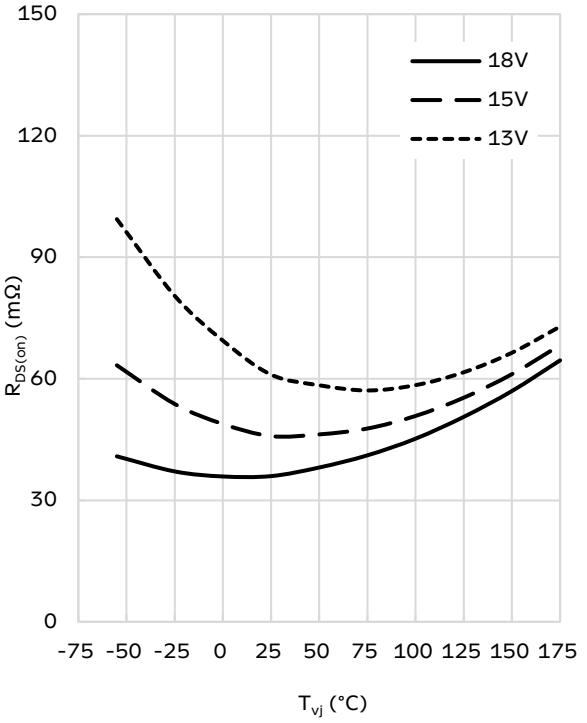


Figure 5: Drain-source on-state resistance vs. drain current
图 5. 导通电阻 vs 漏极电流
$R_{DS(on)} = f(I_D)$
V_{GS} = 18 V

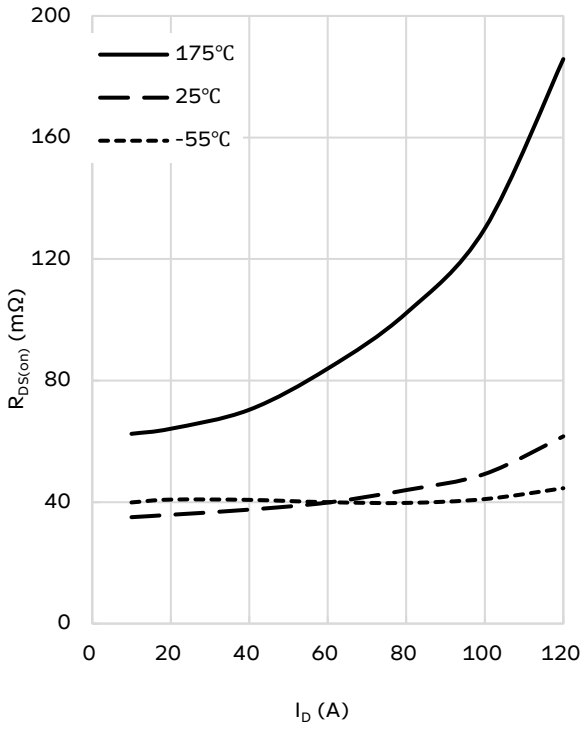


Figure 6: Transfer characteristic (typical)
图 6. 传输特性
$I_D = f(V_{GS})$
V_{DS} = 20 V

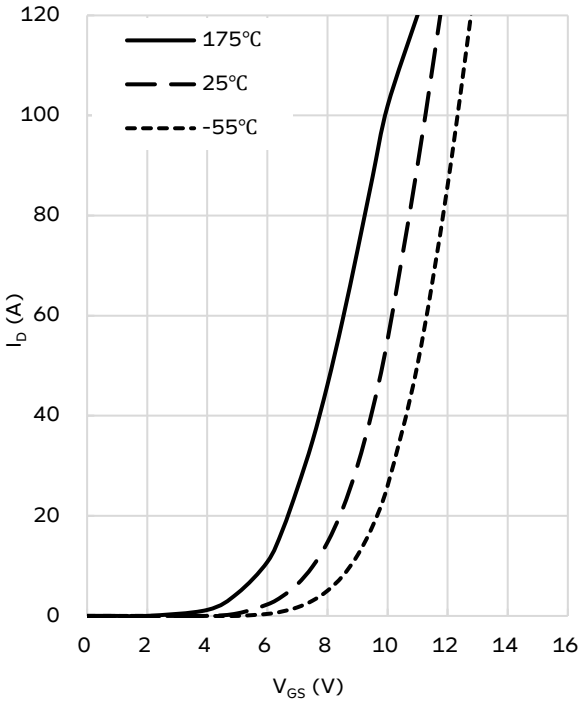


Figure 7: Gate-source threshold voltage vs. temperature
图 7. 开启电压 vs 温度特性
$V_{GS} = f(T_{vj})$
I_D = 7 mA, $V_{GS} = V_{DS}$

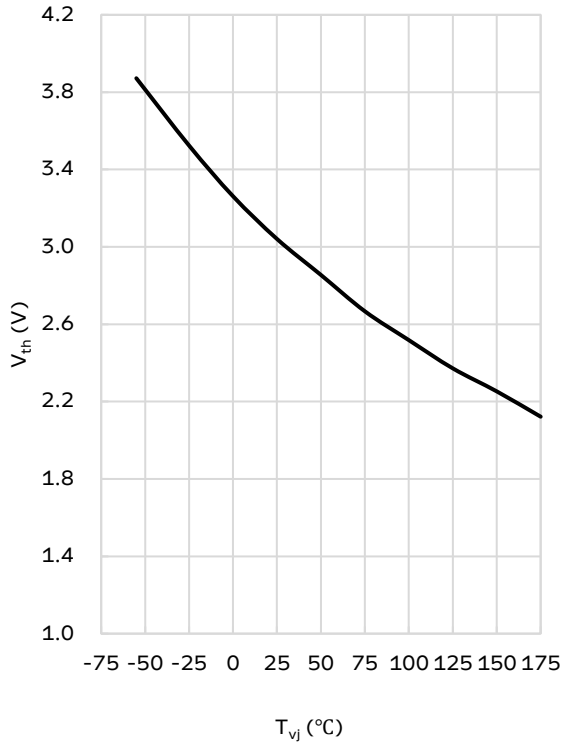


Figure 8: Body diode characteristic (typical)
图 8. 体二极管特性（典型值）
$I_S = f(V_{SD})$
T_{vj} = -55 °C

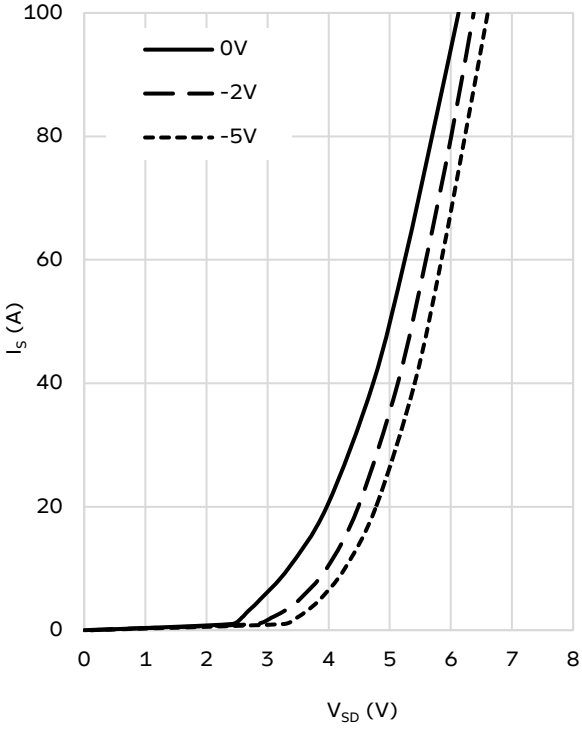


Figure 9: Body diode characteristic (typical)
图 9. 体二极管特性（典型值）
$I_S = f(V_{SD})$
T_{vj} = 25 °C

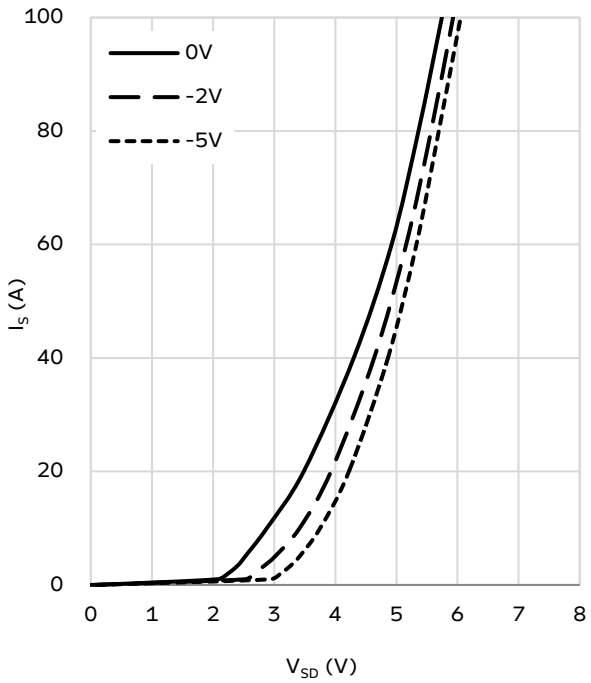


Figure 10: Body diode characteristic (typical)
图 10. 体二极管特性（典型值）
$I_S = f(V_{SD})$
T_{vj} = 175 °C

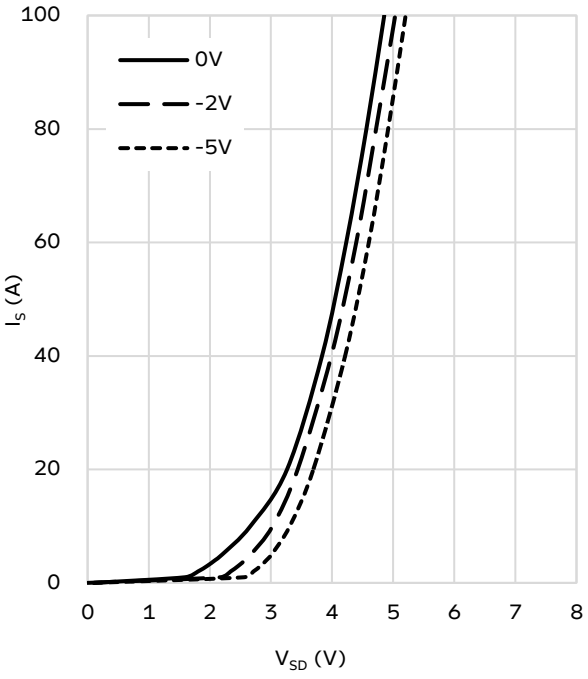


Figure 11: 3rd quadrant characteristics (typical)
图 11. 三象限特性（典型值）
$I_D = f(V_{DS})$
T_{vj} = -55 °C

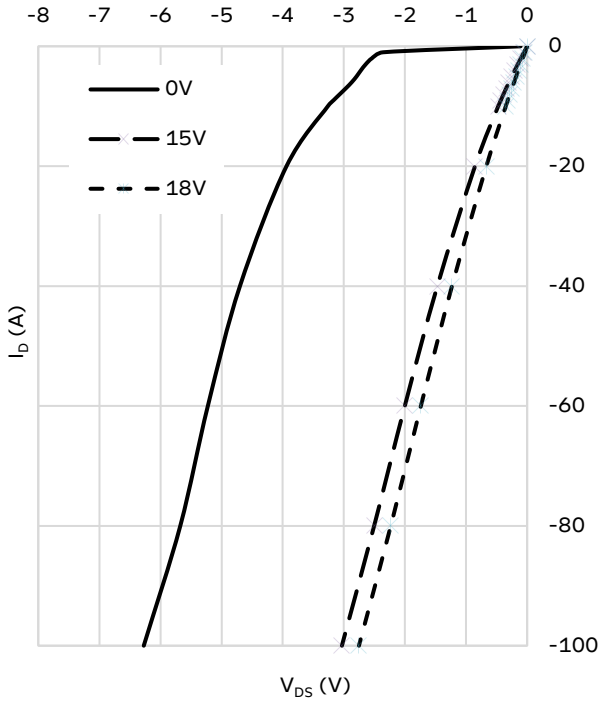


Figure 12: 3rd quadrant characteristics (typical)
图 12. 三象限特性（典型值）
$I_D = f(V_{DS})$
T_{vj} = 25 °C

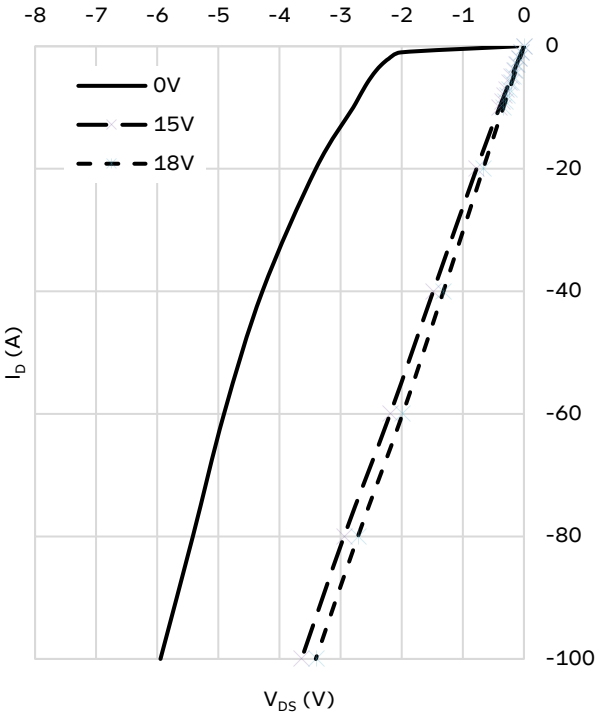


Figure 13: 3rd quadrant characteristics (typical)
图 13. 三象限特性（典型值）
$I_D = f(V_{DS})$
$T_{vj} = 175$ °C

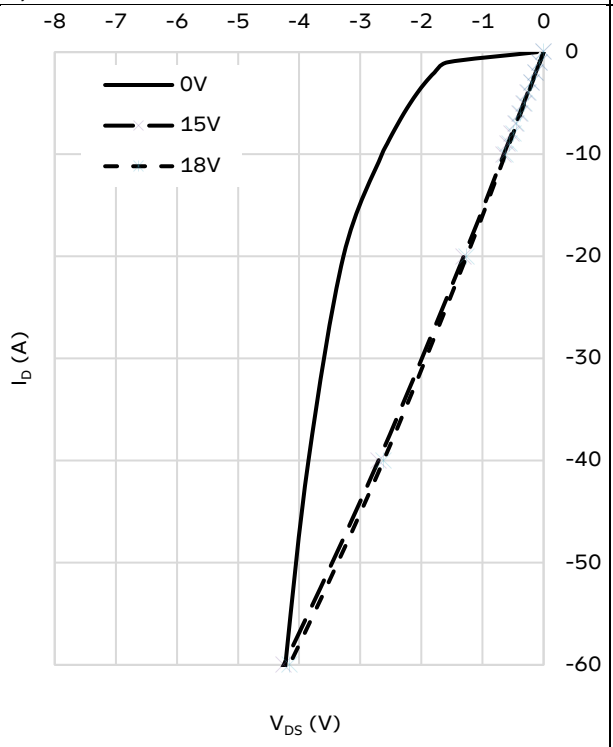


Figure 14: Total gate charge characteristics (typical)
图 14. 栅电荷特性（典型值）
$V_{GS} = f(Q_G)$

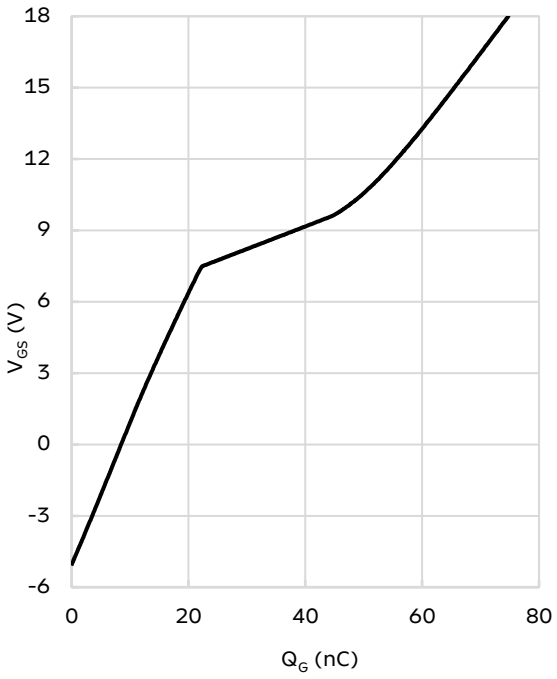


Figure 15: Capacitance vs. drain-source voltage (typical)
图 15. 电容 vs 漏源电压（典型值）
$C = f(V_{DS})$

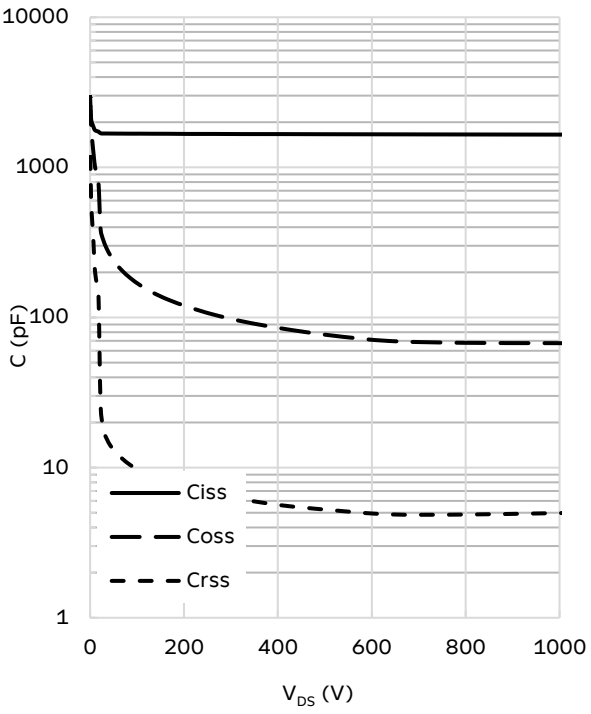


Figure 16: Output capacitance stored energy
图 16. 输出电容储存能量
$E_{OSS} = f(V_{DS})$

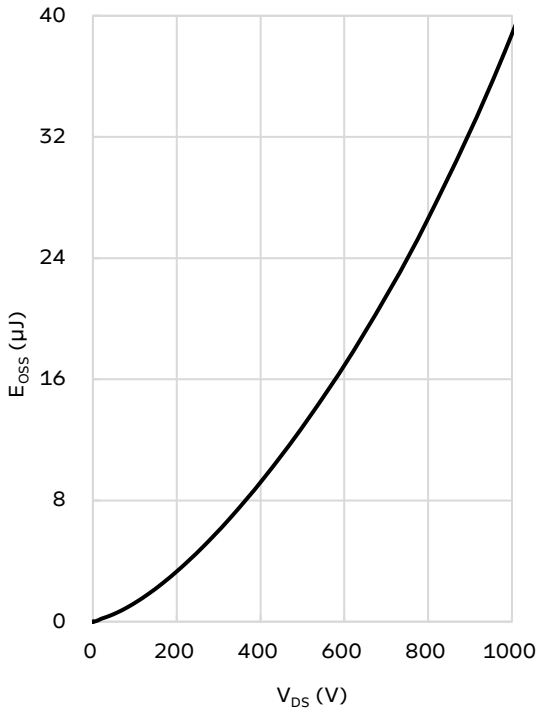


Figure 17: Continuous drain current derating vs. temperature
图 17. 漏极电流 vs 壳温
$I_D = f(T_C)$

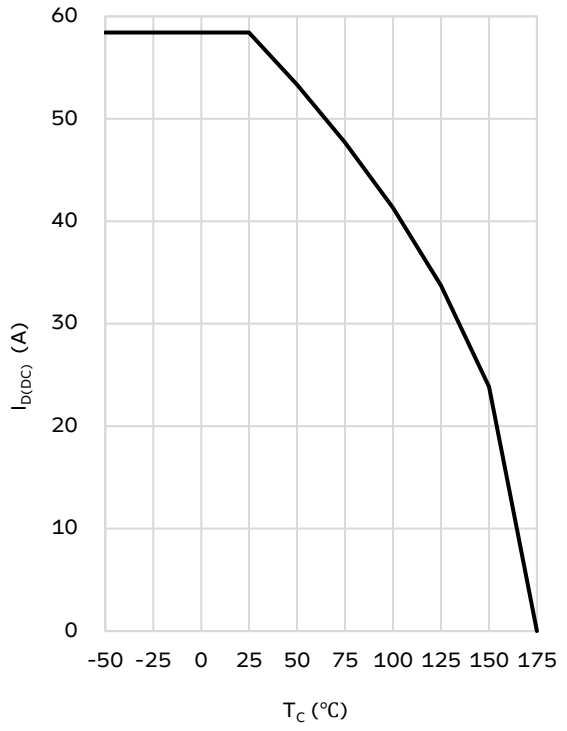


Figure 18: Maximum power dissipation derating vs. temperature
图 18. 耗散功率 vs 壳温
$P_D = f(T_C)$

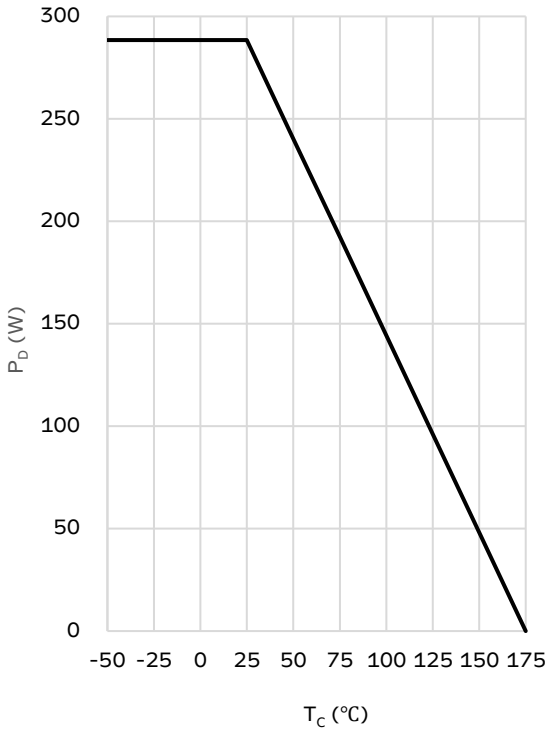


Figure 19: Switching energy vs. Drain current
图 19. 钳位电感开关能量 vs 漏极电流
$E = f(I_D)$
V_{DS} = 800 V, V_{GS} = -5/18 V, T_{vj} = 175 °C

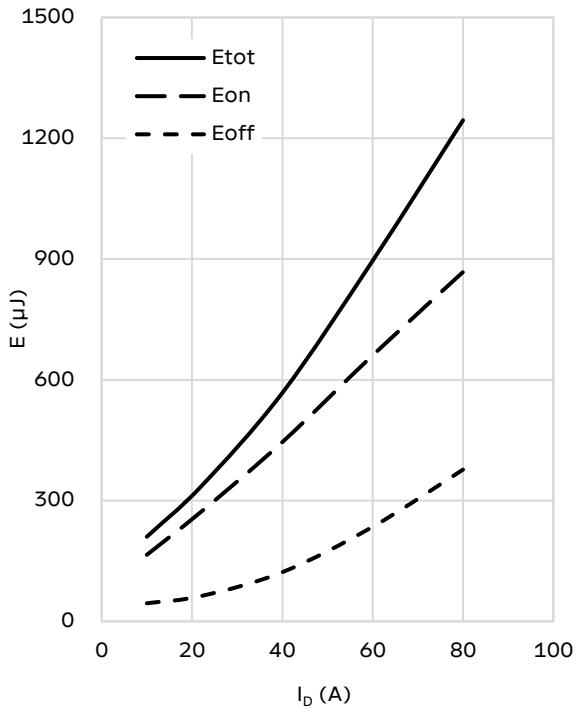


Figure 20: Switching energy vs. temperature
图 20. 钳位电感开关能量 vs 结温
$E = f(T_{vj})$
V_{DS} = 800 V, V_{GS} = -5/18 V, I_D = 22 A

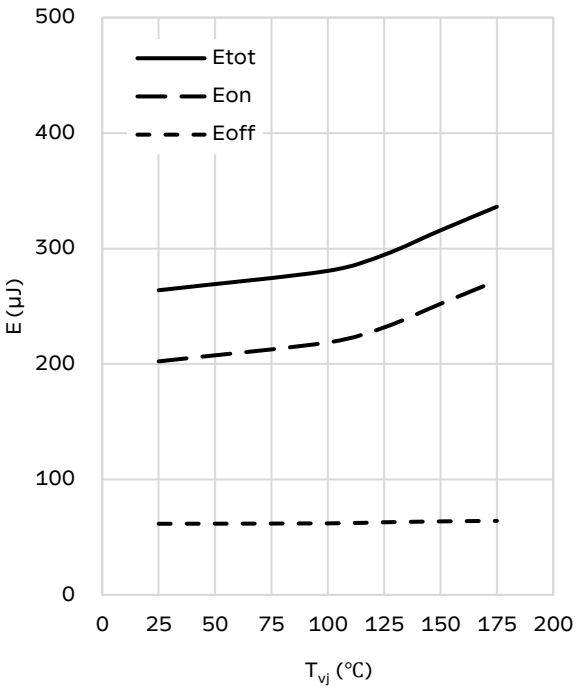


Figure 21: Switching energy vs. $R_{G(ext)}$
图 21. 钳位电感开关能量 vs $R_{G(ext)}$
$E = f(R_{G(ext)})$
V_{DS} = 800 V, V_{GS} = -5/18 V, I_D = 22 A, T_{vj} = 25 °C

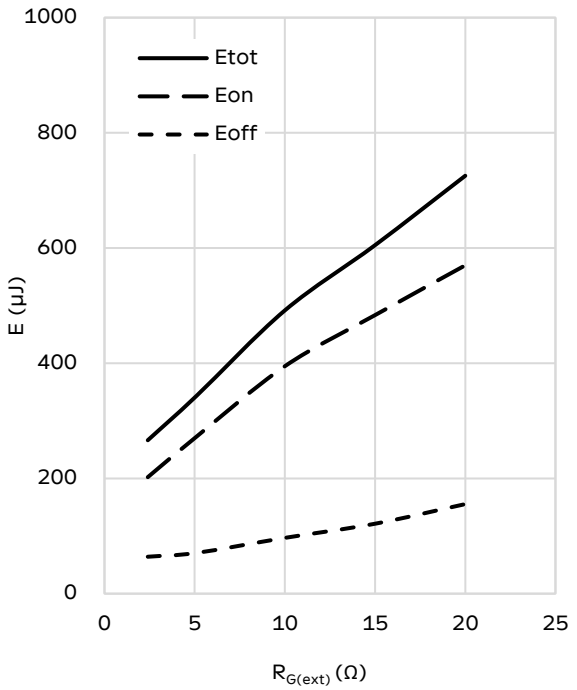


Figure 22: Reverse recovery charge vs. di_f/dt
图 22. 反向恢复电荷 vs di_f/dt
$Q_f = f(di_f/dt)$
V_{DS} = 800 V, V_{GS} = -5/18 V, I_D = 22 A

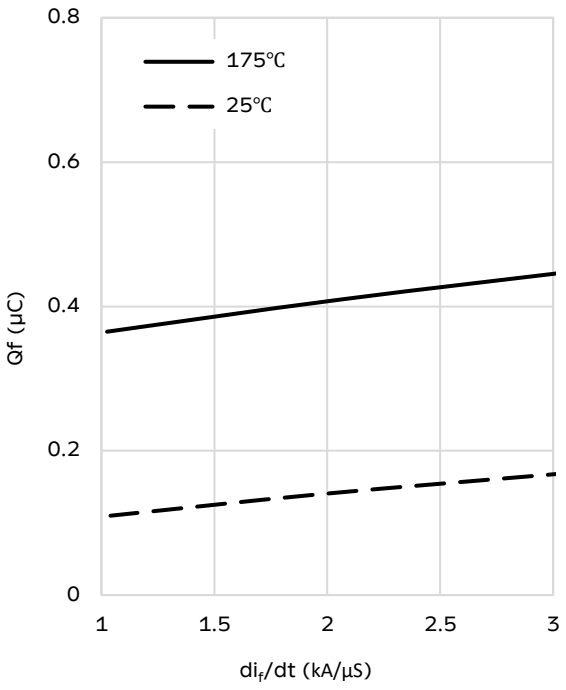


Figure 23: Reverse recovery current vs. di_f/dt
图 23. 反向恢复电流 vs di_f/dt
$I_{frm} = f(di_f/dt)$
V_{DS} = 800 V, V_{GS} = -5/18 V, I_D = 22 A

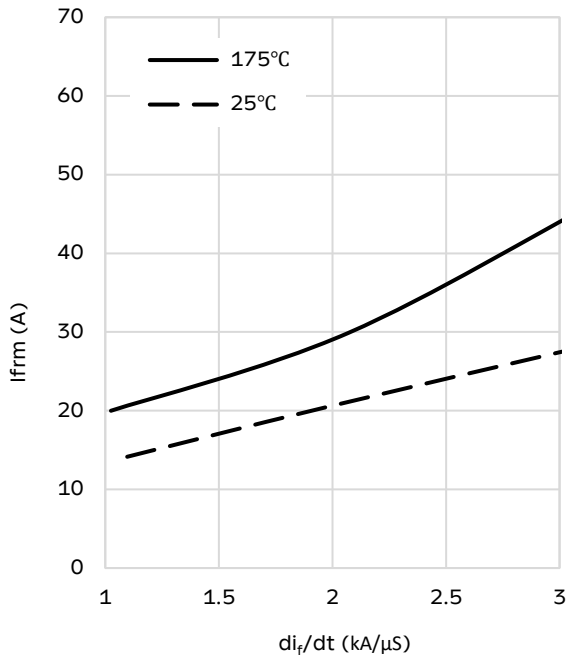


Figure 24: Safe Operating Area
图 24. 安全工作区
$I_D = f(V_{DS})$

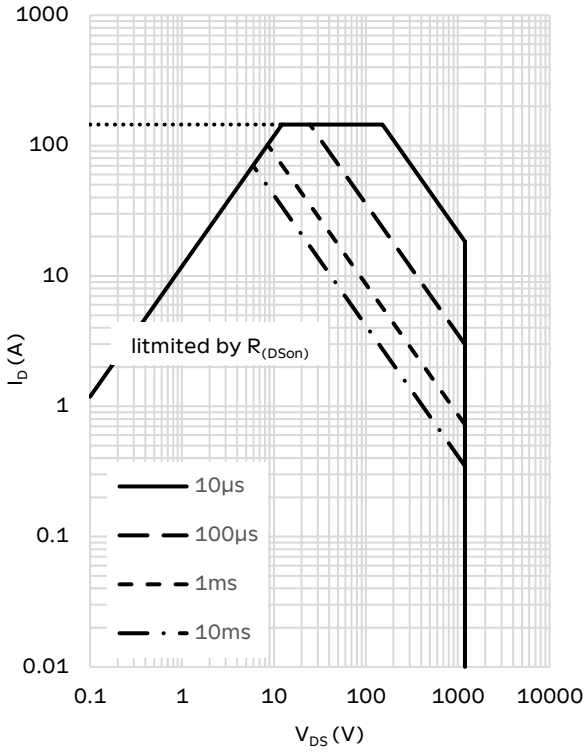
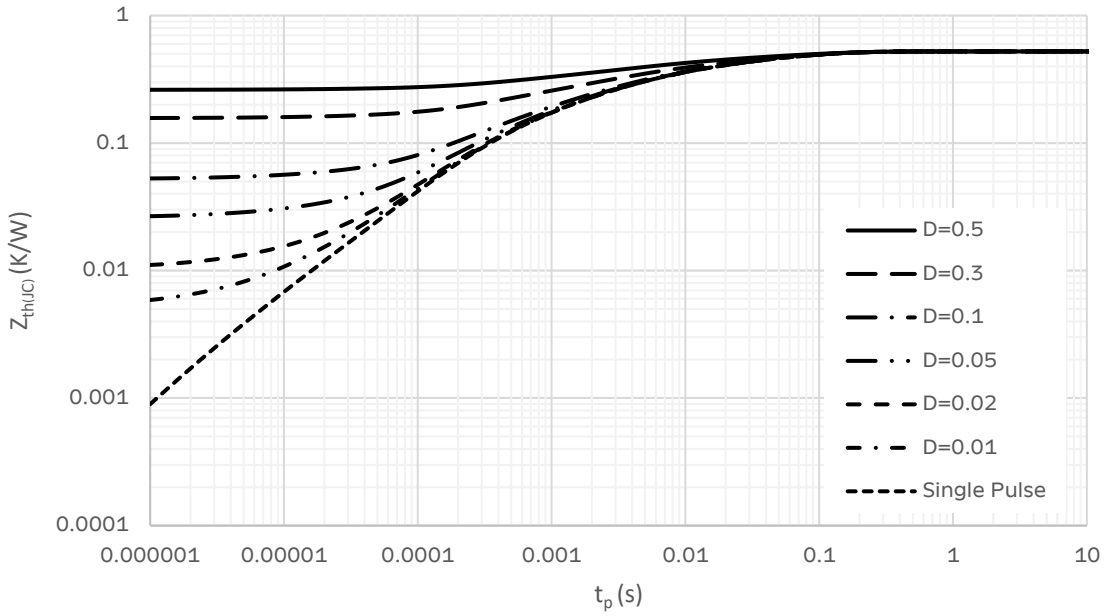
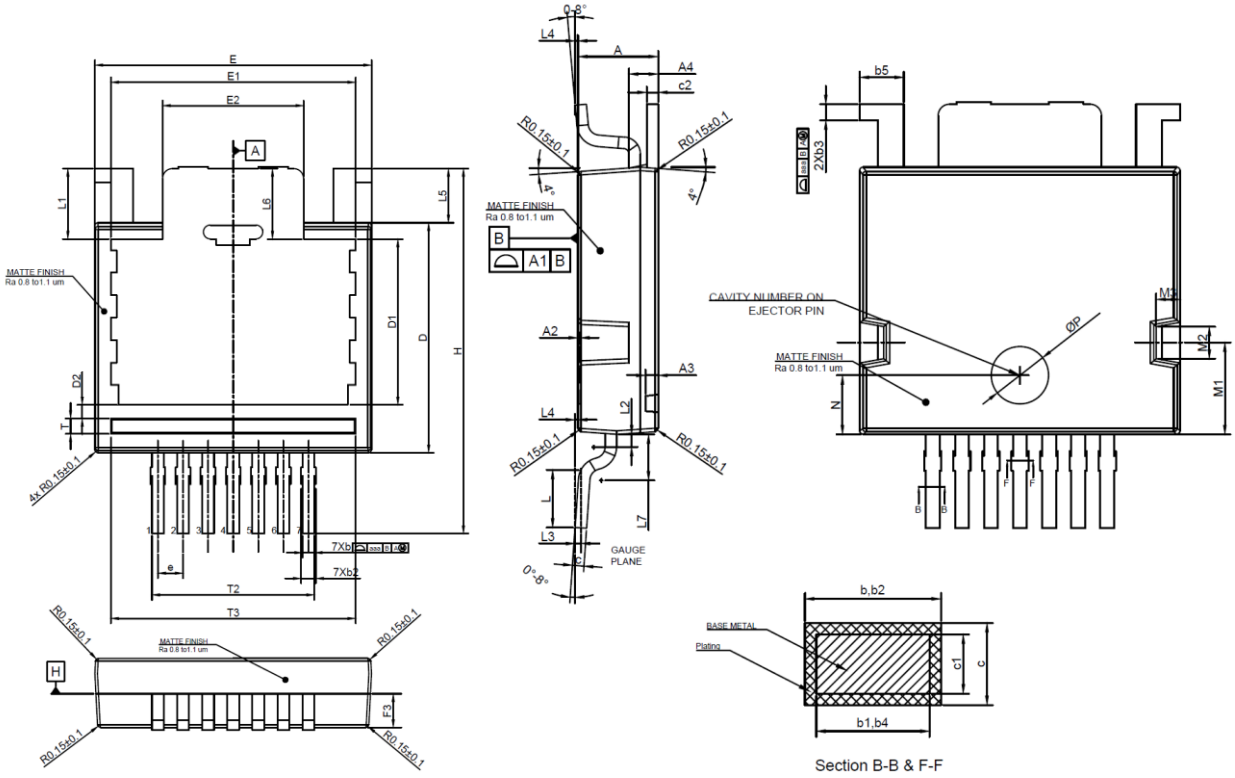


Figure 25: Transient thermal impedance (Junction - Case)
图 25. 瞬态热阻
$Z_{th(jc)} = f(t_p)$



Outline drawing 外形图

Marking SCSM22E040XA120



Sym-bol	Dimensions In Millimeters	
	Min.	Max.
A	3.40	3.60
A1	0.05	
A2	0.05	0.15
A3	0.45	0.65
A4	1.27 REF	
b	0.50	0.70
b1	0.50	0.65
b2	0.50	1.00
b3	0.60	0.80
b4	0.50	0.95
b5	1.83	2.03
c	0.40	0.60
c1	0.40	0.55

Sym-bol	Dimensions In Millimeters	
	Min.	Max.
c2	0.40	0.60
D	11.50	11.80
D1	8.30	8.50
D2	0.70 REF	
E	13.90	14.10
E1	12.30	12.50
E2	7.04	7.24
F3	1.60	1.80
T	0.58	0.98
T2	8.12	8.32
T3	12.30	12.50
e	1.27 BSC	
H	18.00	19.00

Sym-bol	Dimensions In Millimeters	
	Min.	Max.
L	2.40	2.60
L1	3.47	3.67
L2	0.45	0.65
L3	0.26 BSC	
L4	0.08	0.18
L5	2.65	2.85
L6	3.47	3.67
L7	2.01 REF	
M1	4.00 REF	
M2	1.31	1.51
M3	0.95	1.15
N	2.57 REF	
ΦP	2.50 REF	
aaa	----	0.10

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	High-Reliability Industrial (E)	SCS040XA120M22**E**
Packaging Method 包装方式	Tape & reel (_P10)	SCS040XA120M22**E _P10**

Revision History 修订历史

Release 发布	Version 版本	Description 描述
2026-08-25	v1.0	Preliminary Datasheet 初始规格书