

HC190N070P1E

700V N-Channel SiC MOSFET

产品特点/Product features

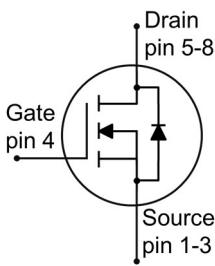
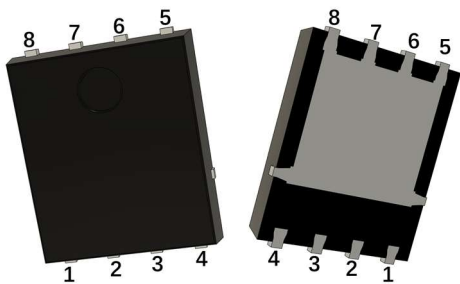
- Low Capacitances with High speed switching
低电容高速开关
- Low specific on-resistance
低导通电阻
- Low reverse recovery (Q_{rr})
低反向恢复电荷 Q_{rr}
- Reduction of heat sink requirements
减少散热器需求
- Halogen Free and RoHS Compliant
无卤素且符合 RoHS 标准

应用领域/Applications

- On-Board Charger
车载充电器
- Direct Current to Direct Current Converters
DC-DC 转换器
- Renewable Energy Applications
可再生能源应用

关键性能参数/Key Performance Parameters

Parameter	Value	Unit
V_{DSS}	700	V
$R_{DS(on),typ}$	190 (@5A)	mΩ
I_{DM}	26	A



Type/型号	Package/封装	Marking/标识	Packaging method/包装方式
HC190N070P1E	PDFN5060	HC190N070E	Tape and Reel/卷带包装

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1. Maximum ratings at $T_j = 25^\circ\text{C}$, unless otherwise specified.

最大额定值 默认 $T_j = 25^\circ\text{C}$ 除非另有说明

Table 1 Maximum ratings/最大额定值

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value 值	Unit 单位
Drain-source voltage 漏极-源极电压	V_{DS}	$T_j \geq 25^\circ\text{C}$	700	V
Drain current ¹ 连续漏极电流	I_D	$T_C = 25^\circ\text{C}, V_{GS} = 18\text{V}$	19	A
		$T_C = 100^\circ\text{C}, V_{GS} = 18\text{V}$	11	
Peak drain current ² 峰值漏极电流	I_{DM}	$T_C = 25^\circ\text{C}$	26	A
Continuous diode current ¹ 连续二极管电流	I_S	$T_C = 25^\circ\text{C}, V_{GS} = -4\text{V}$	17	A
Peak diode current ² 峰值二极管电流	I_{SM}	$T_C = 25^\circ\text{C}, V_{GS} = -4\text{V}$	26	A
Maximum gate source voltage 栅源最大电压	$V_{GS,MAX}$		-10~25	V
Recommend gate source voltage 推荐的栅源电压	$V_{GS,op}$		-4~18	V
Avalanche energy, single pulse 单脉冲雪崩能量	E_{AS}	$I_{AS} = 12\text{A}, V_{DD} = 50\text{V}, L = 1\text{mH}$	110	mJ
Power dissipation 总耗散功率	P_{tot}	$T_C = 25^\circ\text{C}$	54	W
		$T_C = 100^\circ\text{C}$	27	

1. Limited by $T_j(\text{max})$ /受限于最大结温

2. Pulse width t_p limited by $T_j(\text{max})$ /脉宽受限于最大结温



2. Thermal characteristics

热特性

Table 2 Thermal characteristics/热特性

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Storage Temperature 存储温度	T _{stg}		-55		175	°C
Operating junction Temperature 工作结温	T _j		-55		175	°C
Thermal resistance, junction-case 结-壳热阻	R _{th(j-c)}			2.8		K/W
Thermal resistance, junction-ambient 结-环境热阻	R _{th(j-a)}			42		K/W
Soldering temperature, reflow solderin 焊接温度，回流焊	T _{sold}	reflow MSL1			260	°C



3. Electrical characteristics at $T_j = 25^\circ\text{C}$, unless otherwise specified.

电气特性 默认 $T_j = 25^\circ\text{C}$ 除非另有说明

Table 3 Static characteristics/静态特性

Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Drain-source breakdown voltage 漏源击穿电压	$V_{(BR)DSS}$	$I_D = 100\mu\text{A}, V_{GS} = 0\text{V}$	700			V
Gate threshold voltage 门极开启阈值电压	$V_{GS(th)}$	$I_D = 2.2\text{mA}, V_{DS} = V_{GS}$	2.2	3.0	3.8	V
Drain-source on-state resistance 漏极-源极导通电阻	$R_{DS(on)}$	$I_D = 5\text{A}, V_{GS} = 15\text{V}$	$T_j = 25^\circ\text{C}$		240	m Ω
			$T_j = 175^\circ\text{C}$		249	
		$I_D = 5\text{A}, V_{GS} = 18\text{V}$	$T_j = 25^\circ\text{C}$		190	
			$T_j = 175^\circ\text{C}$		225	
Zero gate voltage drain current 集电极-发射极漏电流	I_{DSS}	$V_{DS} = 700\text{V}, V_{GS} = 0\text{V}$		1.0	20	μA
Gate to source Leakage current 门极-源极漏电流	I_{GSS}	$V_{DS} = 0\text{V}, V_{GS} = 18\text{V}$			100	nA
Integrated gate resistor 内部门极电阻	R_G	$f = 1\text{MHz}$		3.5		Ω

700V N-Channel SiC MOSFET HC190N070P1E



Table 4 Dynamic characteristics/动态特性

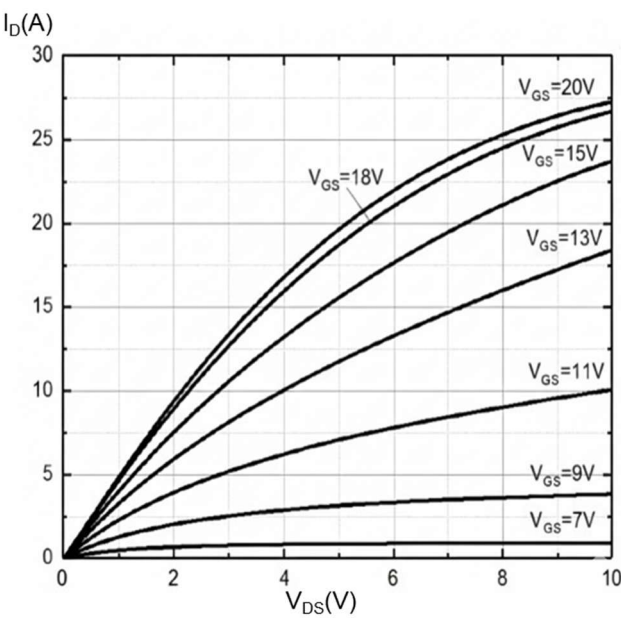
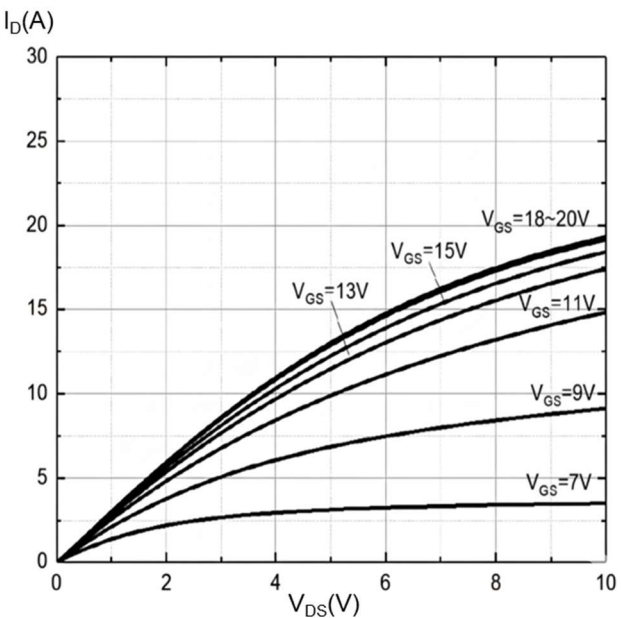
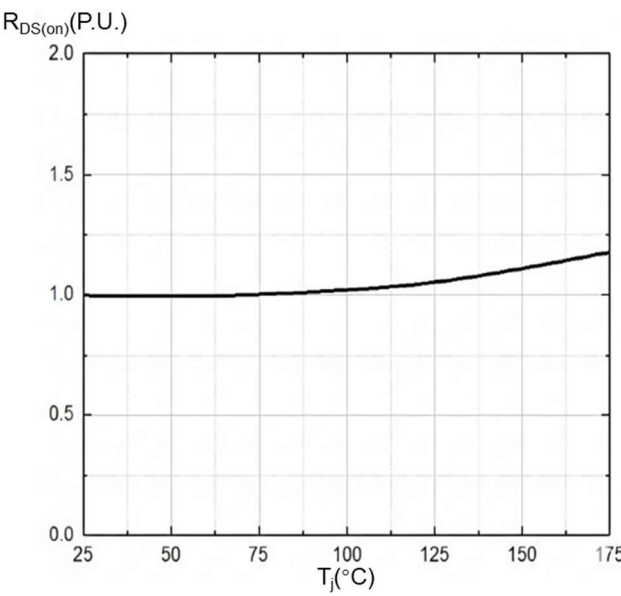
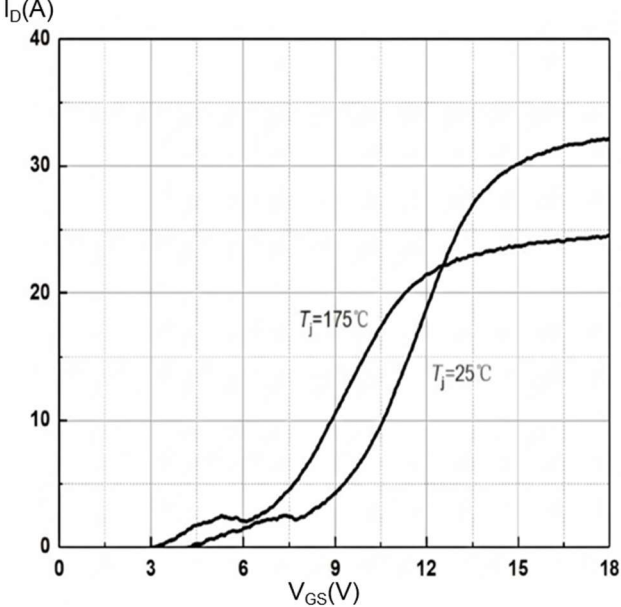
Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Total gate charge 总栅极电荷	$Q_{G(tot)}$	$V_{DD}=400V$, $I_D=5A$, $V_{GS}=-4/18V$		17.6		nC
Gate source charge 栅-源极电荷	Q_{GS}			3.7		
Gate-drain charge 栅-漏极电荷	Q_{GD}			7		
Input capacitance 输入电容	C_{iss}	$V_{DS}=600V$, $V_{GS}=0V$, $f=1MHz$		361		pF
Output capacitance 输出电容	C_{oss}			34		
Reverse transfer capacitance 反向传输电容	C_{rss}			3.5		
Turn-On Delay Time 开启延迟时间	$t_{d(on)}$	$V_{DD}=400V$, $I_D=5A$, $V_{GS}=-4/18V$, $R_{G(ext)}=20\Omega$,		2		ns
Rise time 上升时间	t_r			19		
Turn-Off Delay Time 关闭延迟时间	$t_{d(off)}$			14		
Turn-Off Fall Time 下降时间	t_f			11		
Turn-on switch loss 单次开启损耗	E_{on}			31		μJ
Turn-off switch loss 单次关闭损耗	E_{off}			13		

Table 5 Reverse diode characteristics/体二极管反向特性

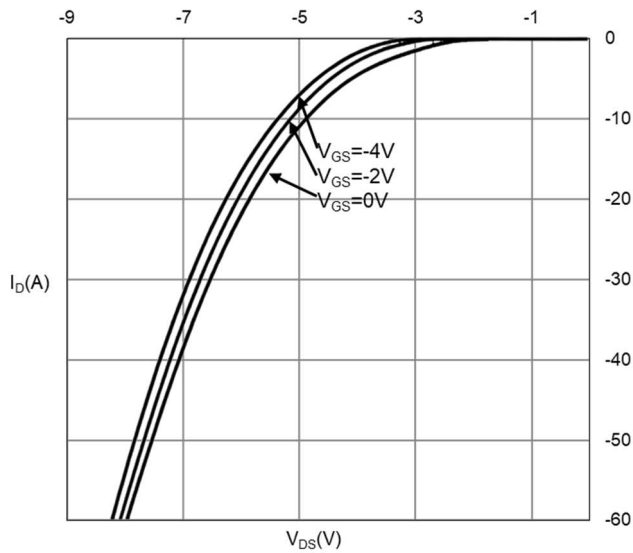
Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Drain-source reverse voltage 体二极管正向压降	V_{SD}	$I_S=2.5A, V_{GS}=-4V$		4.2		V
MOSFET forward recovery time MOSFET正向恢复时间	t_{fr}	$V_{DS}=400V$, $I_S=5A$, $-di/dt=1000A/\mu s$		28		ns
MOSFET forward recovery charge MOSFET正向恢复电荷	Q_{fr}			38		nC
MOSFET peak forward recovery current MOSFET正向恢复峰值电流	I_{frm}			3.5		A



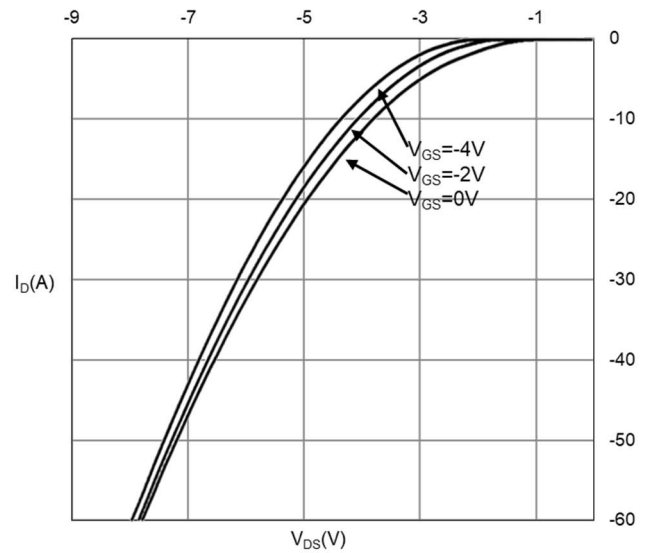
4. Electrical characteristics diagrams
电气特性图表

Typ.Output characteristic/典型输出特性 $I_D=f(V_{DS}); T_J=25^{\circ}\text{C}$ 	Typ.Output characteristic/典型输出特性 $I_D=f(V_{DS}); T_J=175^{\circ}\text{C}$ 
Typ.Drain-source on-state resistance/典型漏源导通电阻 $R_{DS(on)}=f(T_J); I_D=5\text{A}, V_{GS}=18\text{V}$ 	Typ.Transfer characteristics/典型传输特性 $I_D=f(V_{GS}); V_{GS}=18\text{V}, T_J=25^{\circ}\text{C}$ 

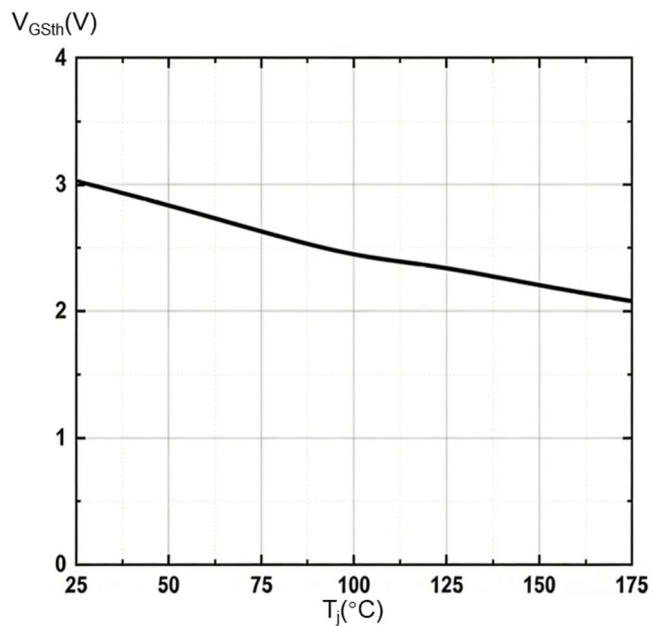
Typ.Reverse drain current characteristics/典型二极管特性
 $I_D=f(V_{DS}); T_J=25^{\circ}\text{C}$



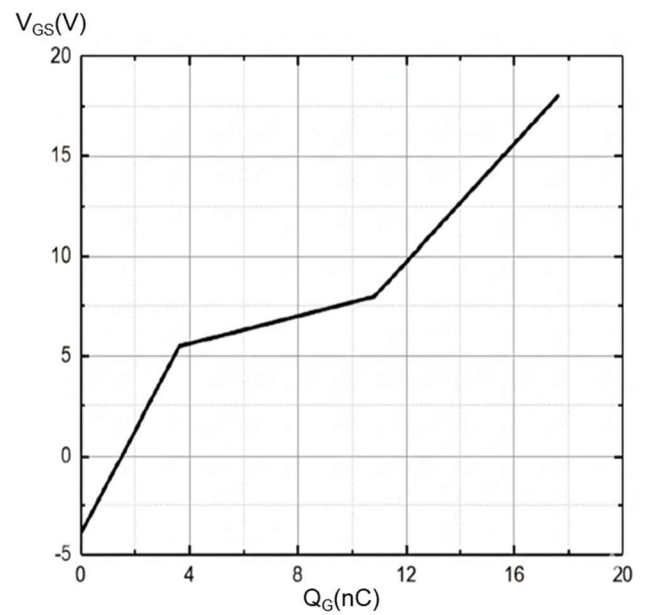
Typ.Reverse drain current characteristics/典型二极管特性
 $I_D=f(V_{DS}); T_J=175^{\circ}\text{C}$



Typ.Gate threshold voltage/典型门级阈值电压结温特性
 $V_{GSth}=f(T_J); I_D=2.2\text{mA}, V_{DS}=V_{GS}$



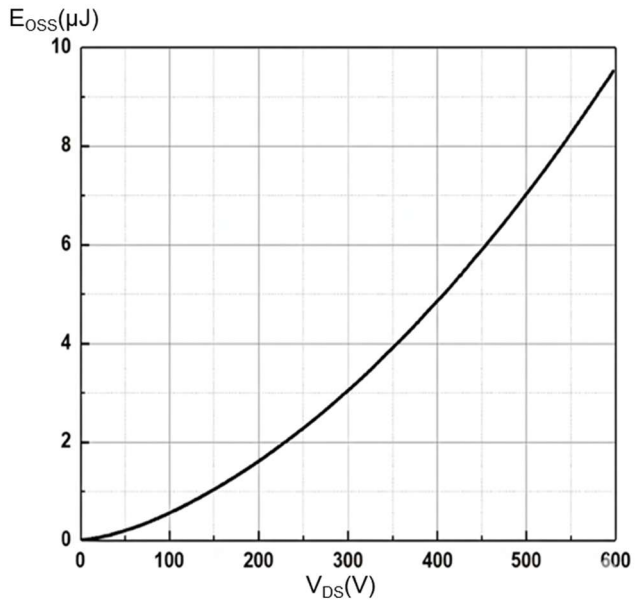
Typ.Gate charge/典型门级电荷
 $V_{GS}=f(Q_G); I_{DS}=5\text{A}, V_{DS}=400\text{V}, T_J=25^{\circ}\text{C}$



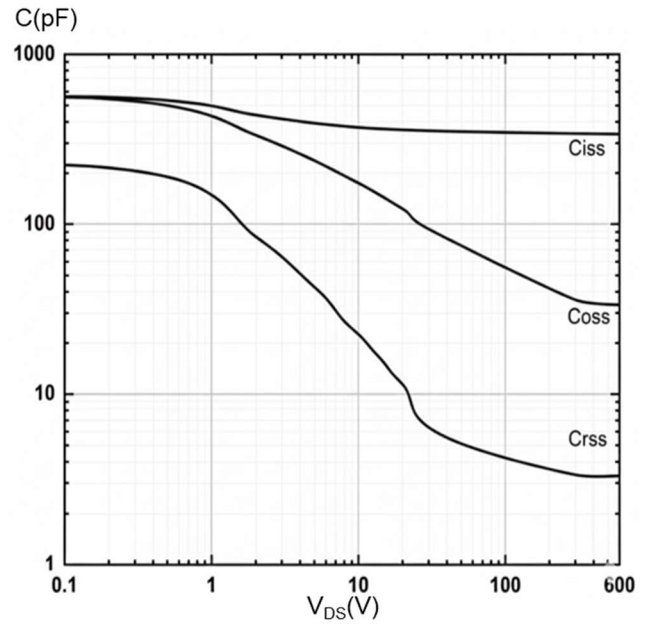
700V N-Channel SiC MOSFET HC190N070P1E



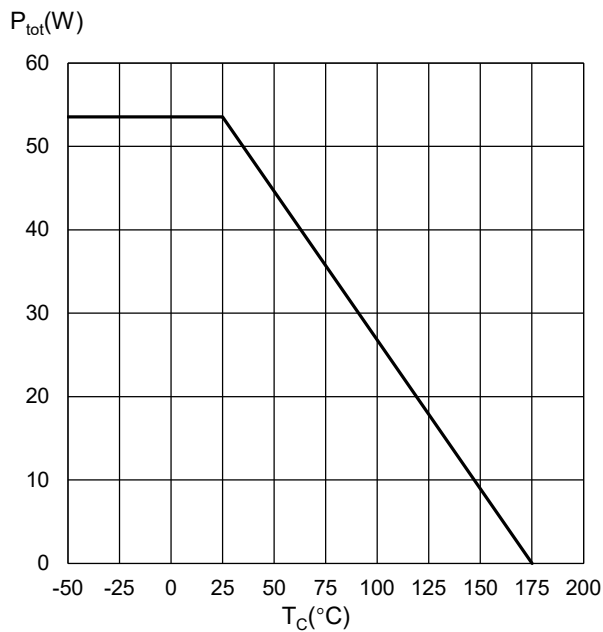
Typ.Coss stored energy/典型Coss存储能量
 $E_{oss}=f(V_{DS});$



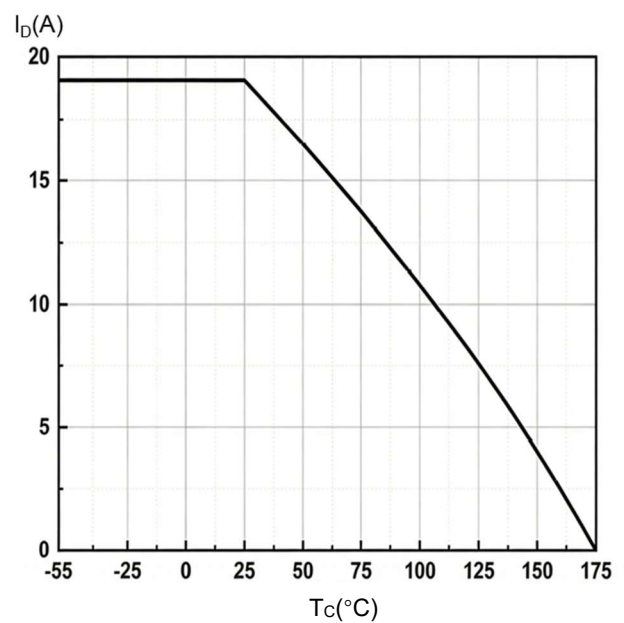
Typ.Capacitances/典型电容特性
 $C=f(V_{DS}); V_{AC}=25mV, f=1MHz, T_J=25^{\circ}C$



Power dissipation/耗散功率
 $P_{tot}=f(T_c); @R_{th(j-c).typ}$

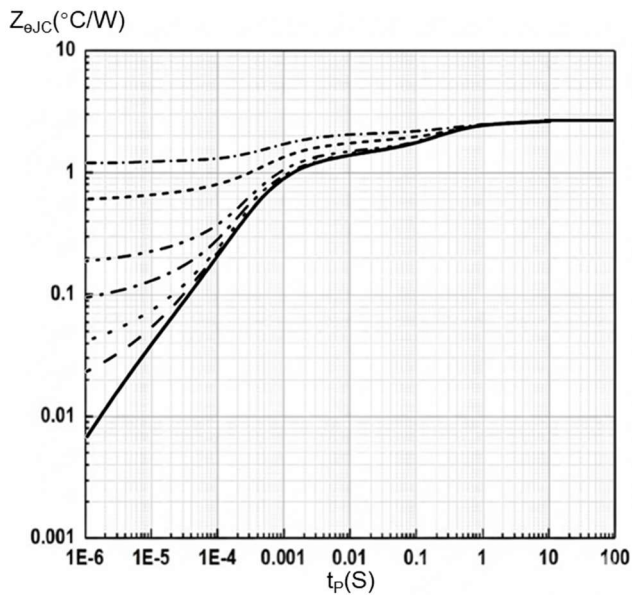


Continuous Drain Current/连续漏电流与壳温
 $I_D=f(T_c); T_J \leq 175^{\circ}C$

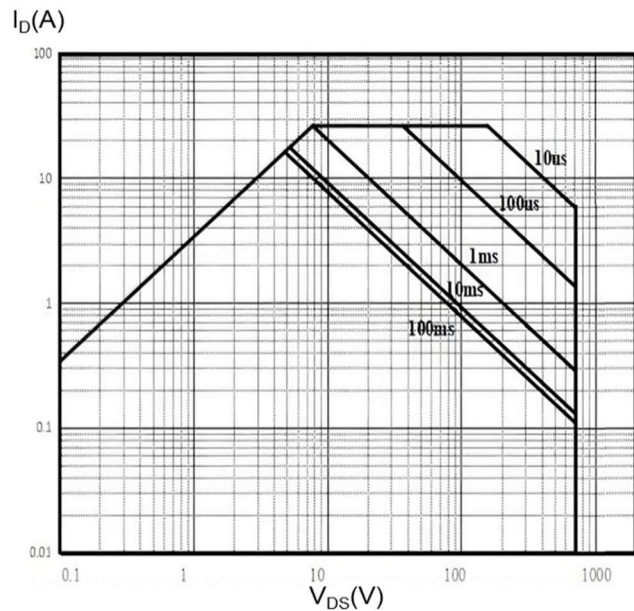




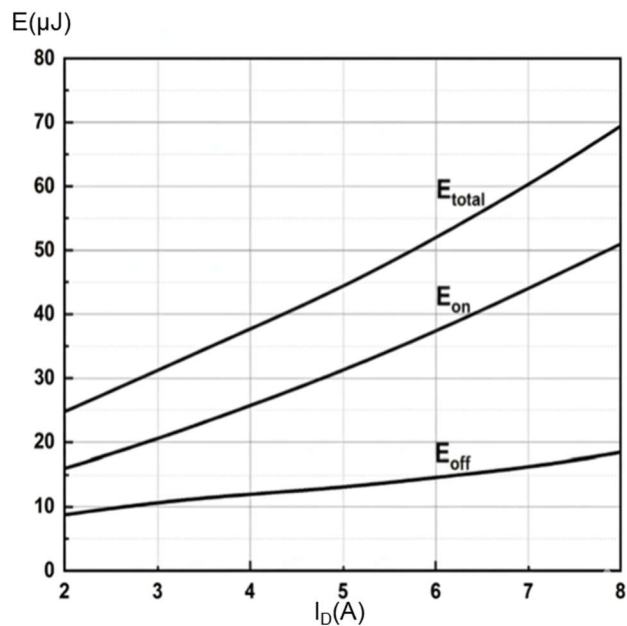
Transient thermal impedance/热阻特性
 $Z_{\theta JC}=f(t_p)$; ($R_{th(j-c),typ}$)



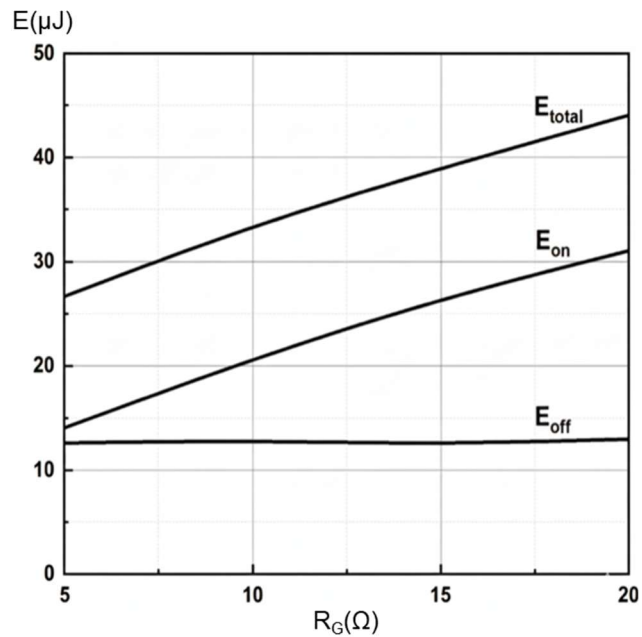
Safe operating area/安全工作区
 $I_D=f(V_{DS})$;



Typ.Switching losses vs current /动态损耗-电流特性
 $E=f(I_D)$; $V_{GS}=-4/18V$, $R_G=20\Omega$, $V_{DD}=400V$, $T_j=25^\circ C$



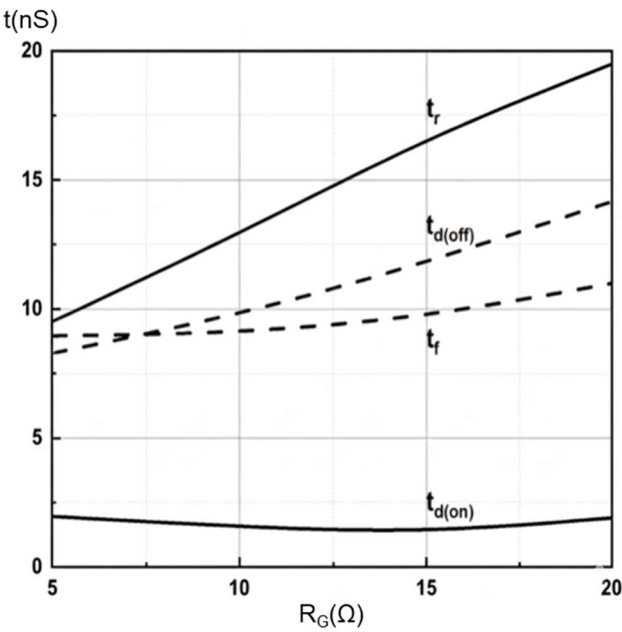
Typ.Switching losses vs resistance/动态损耗-门级电阻特性
 $E=f(R_G)$; $V_{GS}=-4/18V$, $V_{DD}=400V$, $I_D=5A$, $T_j=25^\circ C$



700V N-Channel SiC MOSFET
HC190N070P1E



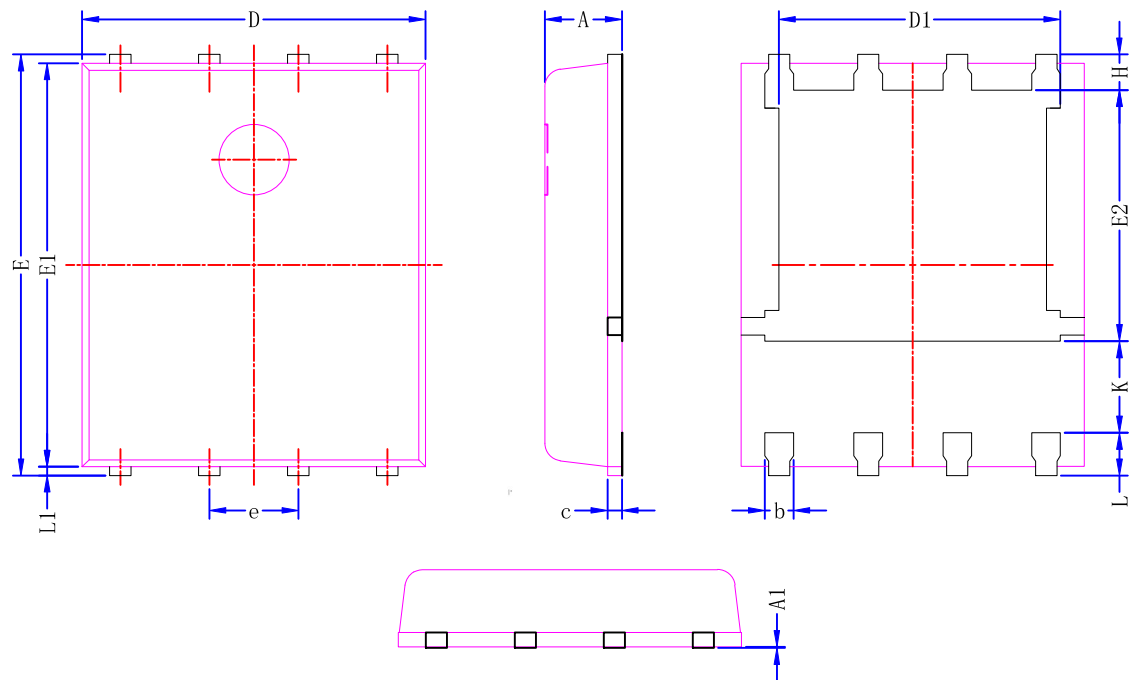
Typ.Switching times vs resistance/开关时间-门级电阻特性
 $t=f(R_G)$; $V_{GS}=-4/18V$, $V_{DD}=400V$, $I_D=5A$, $T_j=25^{\circ}C$





5. Package outline
封装外形

Figure 1. Outline PDFN5060, dimensions in mm/PDFN5060 外形尺寸 (毫米)



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	0.90	1.00	1.10
A1	0.00	---	0.05
b	0.33	0.41	0.51
c	0.20	0.25	0.30
D	4.80	4.90	5.00
D1	3.61	3.81	3.96
E	5.90	6.00	6.10
E1	5.70	5.75	5.80
E2	3.38	3.58	3.78
e	1.27 BSC		
H	0.41	0.51	0.61
K	1.10	---	---
L	0.51	0.61	0.71
L1	0.06	0.13	0.20

- NOTES:
- Package body sizes exclude mold flash
- 注:
- 封装本体尺寸不包括模具飞边



6. Revision history

Table 6 Date and version number/日期与版本号

Date日期	Revision版本	Changes更改内容
2025-12-05	Rev.G1.0	Target Datasheet （目标规格书）

7. Matters needing attention

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