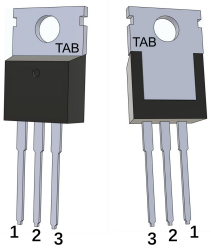
DATA SHEET

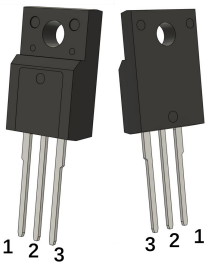
海明微半导体
HIMINGWAY

HC190N070B2E
HC190N070J2E

700V N-Channel SiC MOSFET



HC190N070B2E



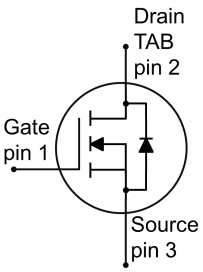
HC190N070J2E

Product features/产品特点

- 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

Applications/应用领域

- 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



Key performance parameters/关键性能参数

Parameter	Value	Unit
V_{DSS}	700	V
$R_{DS(on)}$,typ	190 (@5A)	mΩ
I_{DM}	24	A

Package parameters/封装信息

Type/型号	Package/封装	Marking/标识	Packaging method/包装方式
HC190N070B2E	TO220-3L	HC190N070E	Tube/管装
HC190N070J2E	TO220F-3L		

1. Maximum ratings at T_j= 25°C, unless otherwise specified.

最大额定值默认T_j= 25°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_{DSS}	T_j≥25°C	700	V
Drain current[1] 连续漏极电流	I_D	T_C=25°C,V_{GS}=18V @ HC190N070B2E	20	A
		T_C=100°C,V_{GS}=18V @ HC190N070B2E	11	
		T_C=25°C,V_{GS}=18V @ HC190N070J2E	11	
		T_C=100°C,V_{GS}=18V @ HC190N070J2E	6	
Peak drain current[2] 峰值漏极电流	I_{DM}	T_C=25°C	24	A
Continuous diode current[1] 连续二极管电流	I_S	V_{GS}=-4V @ HC190N070B2E	17	A
		V_{GS}=-4V @ HC190N070J2E	8	
Peak diode current[2] 峰值二极管电流	I_{SM}	V_{GS}=-4V @ HC190N070B2E	26	A
		V_{GS}=-4V @ HC190N070J2E	24	
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}=12A,V_{DD}=50V,L=1mH	110	mJ
Power dissipation 总耗散功率	P_{tot}	T_C=25°C @ HC190N070B2E	83	W
		T_C=100°C @ HC190N070B2E	42	
		T_C=25°C @ HC190N070J2E	40	
		T_C=100°C @ HC190N070J2E	20	
Mounting torque 安装扭矩	M_d	M3 screw M3螺钉	0.6	Nm

1. Limited by T_j(max)/受限于最大结温
2. Pulse width t_p limited by $T_{j(max)}$ /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	$R_{th(j-c)}$	(@ HC190N070B2E)		1.80		K/W
Thermal resistance, junction-ambient 结-环境热阻	$R_{th(j-a)}$	(@ HC190N070B2E)		40		K/W
Thermal resistance, junction-case 结-壳热阻	$R_{th(j-c)}$	(@ HC190N070J2E)		3.78		K/W
Thermal resistance, junction-ambient 结-环境热阻	$R_{th(j-a)}$	(@ HC190N070J2E)		40		K/W
Soldering temperature 焊接温度	T_{sold}				260	°C

3. Electrical characteristics at T_j= 25°C, unless otherwise specified.

电气特性默认T_j= 25°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=100μA,V_{GS}=0V		700			V
Gate threshold voltage 门极开启阀值电压	$V_{GS(th)}$	I_D=2.2mA,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=5A,V_{GS}=15V	T_j=25°C		240		mΩ
			T_j=175°C		249		
		I_D=5A,V_{GS}=18V	T_j=25°C		190	270	
			T_j=175°C		225		
Zero gate voltage drain current 集电极-发射极漏电	I_{DSS}	V_{DS}=700V,V_{GS}=0V			1.0	20	μA
Gate to source Leakage current 门极-源极漏电流	I_{GSS}	V_{DS}=0V,V_{GS}=18V				100	nA
Integrated gate resistor 内部门极电阻	R_G	f=1MHz,V_{AC}=25mV			3.5		Ω

Table 4 Dynamic characteristics/动态特性

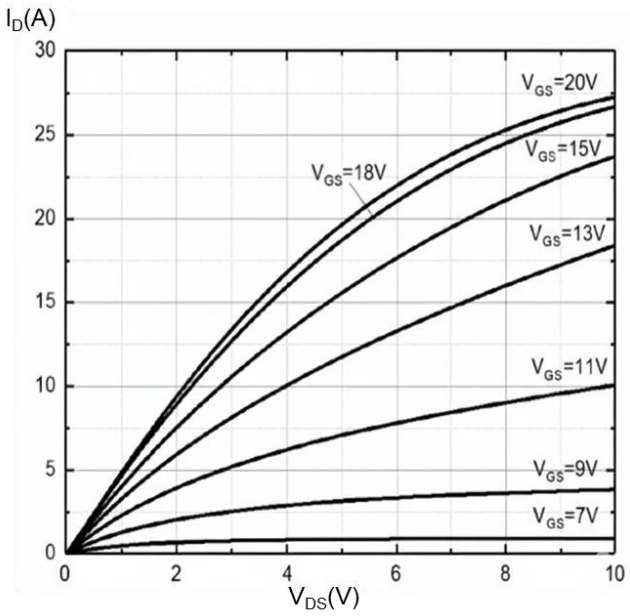
Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Total gate charge 总栅极电荷	$Q_{G(tot)}$	V_{DD}=400V, I_D=5A, V_{GS}=-4/18V		17.6		nC
Gate source charge 栅-源极电荷	Q_{GS}			3.7		
Gate-drain charge 栅-漏极电荷	Q_{GD}			7		
Input capacitance 输入电容	C_{iss}	V_{DS}=600V, V_{GS}=0V, f=1MHz		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, $R_{G(ext)}$=20Ω,		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		
Fall time 下降时间	t_f			11		
Turn-on switching loss 单次开启损耗	E_{on}			31		μJ
Turn-off switching loss 单次关闭损耗	E_{off}			13		

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

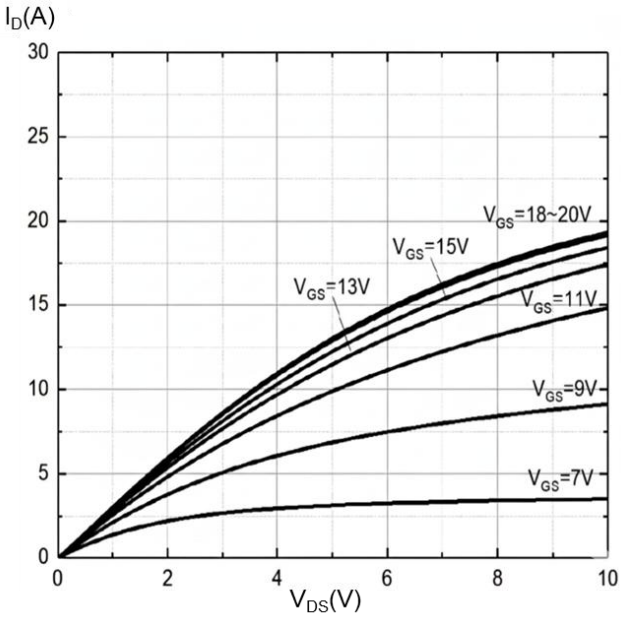
Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Drain-source reverse voltage 体二极管正向压降	V_{SD}	I_S=2.5A,V_{GS}=-4V		4.2		V
MOSFET forward recovery time MOSFET正向恢复时间	t_{fr}	V_{DS}=400V, I_S=5A, di_S/dt=-1000A/μs		28		ns
MOSFET forward recovery charge MOSFET正向恢复电荷	Q_{fr}			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

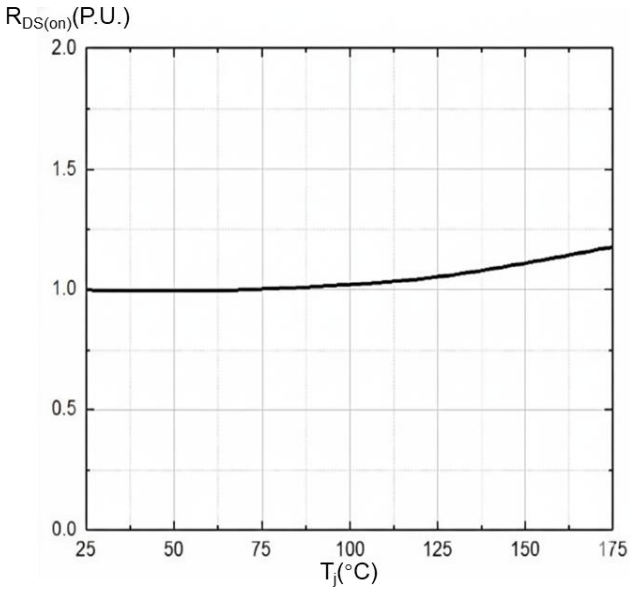
Typ.Output characteristic/典型输出特性
$I_{DS}=f(V_{DS})$; $T_j=25℃$



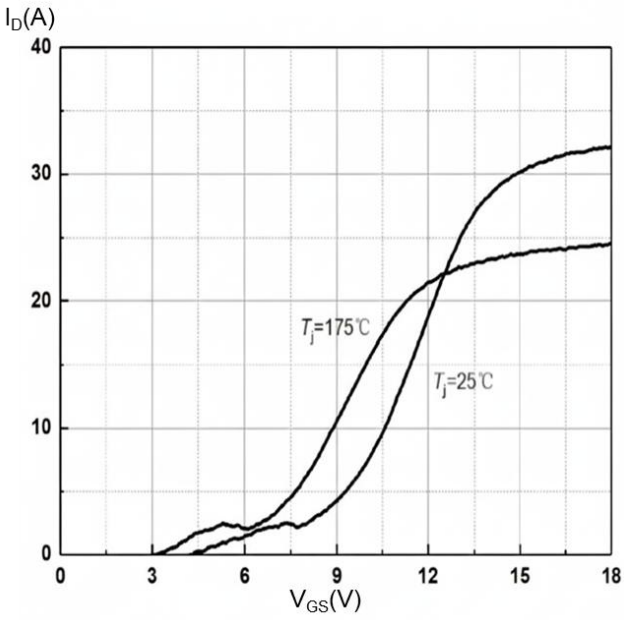
Typ.Output characteristic/典型输出特性
$I_{DS}=f(V_{DS})$; $T_j=175℃$



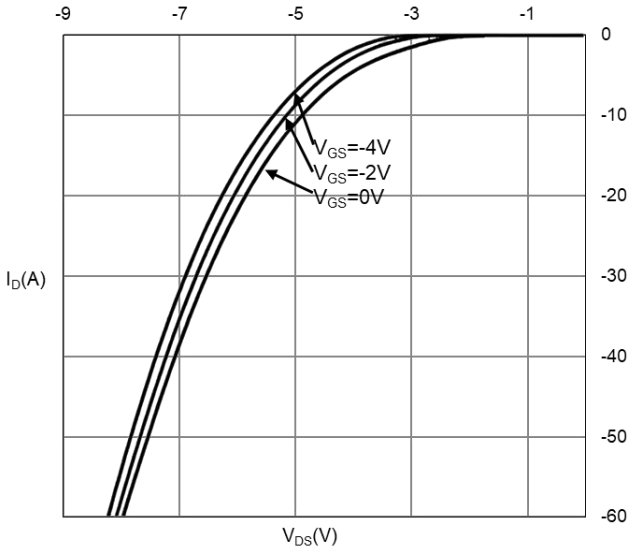
Typ.Drain-source on-state resistance/典型漏源导通电阻
$R_{DS(on)}=f(T_j)$; $I_{DS}=5A$, $V_{GS}=18V$



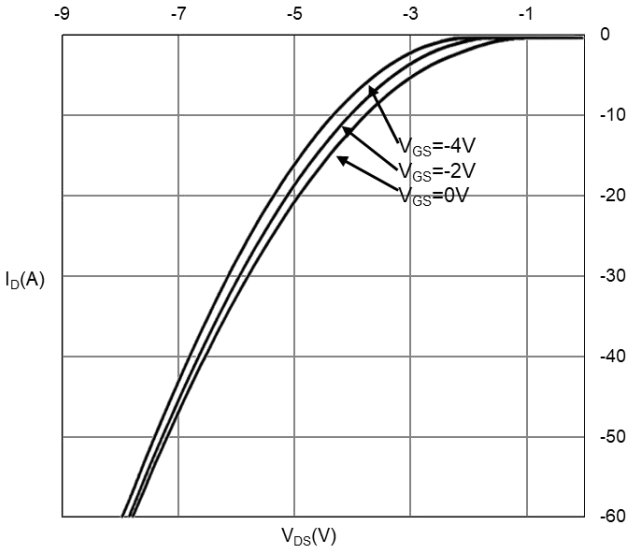
Typ.Transfer characteristics/典型传输特性
$I_{DS}=f(V_{GS})$; $V_{GS}=18V$,$T_j=25℃$



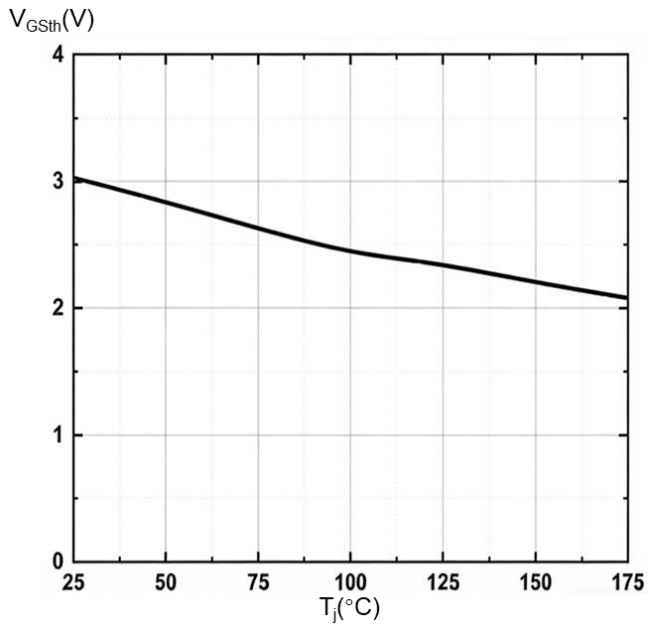
Typ.Reverse drain current characteristics/典型二极管特性
$I_D=f(V_{DS})$; $T_j=25℃$



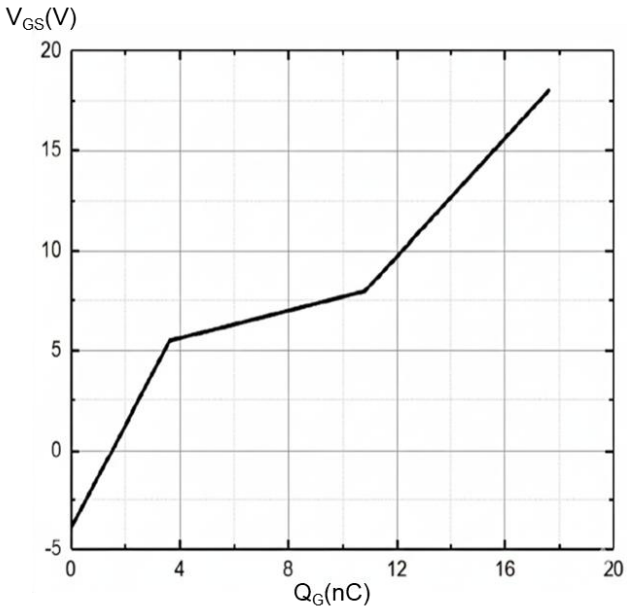
Typ.Reverse drain current characteristics/典型二极管特性
$I_D=f(V_{DS})$; $T_j=175℃$



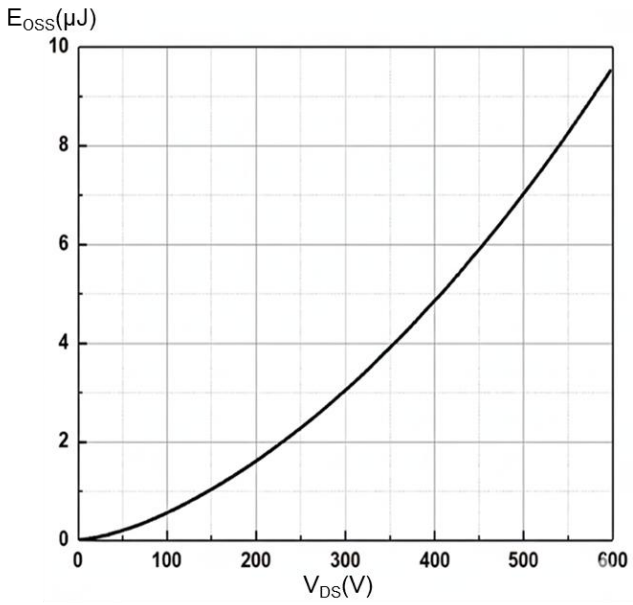
Typ.Gate threshold voltage/典型门级阈值电压结温特性
$V_{GSth}=f(T_j)$;I_D=2.2mA,$V_{DS}=V_{GS}$



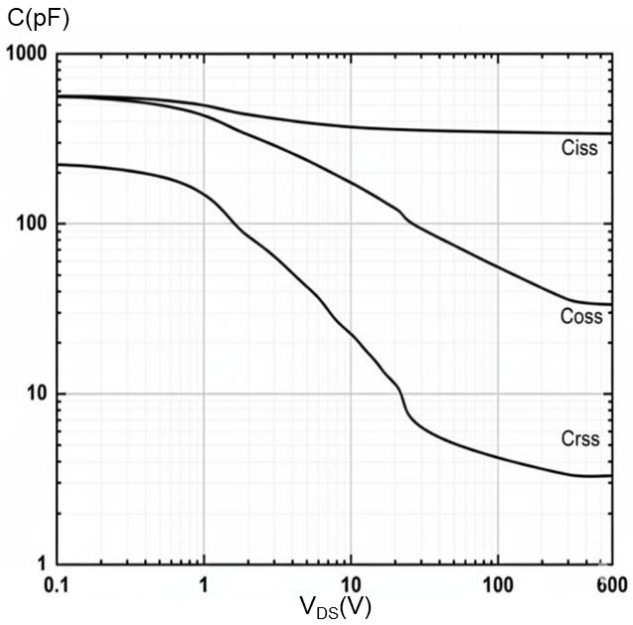
Typ.Gate charge/典型门级电荷
$V_{GS}=f(Q_G)$; I_{DS}=5A,V_{DS}=400V,T_j=25℃



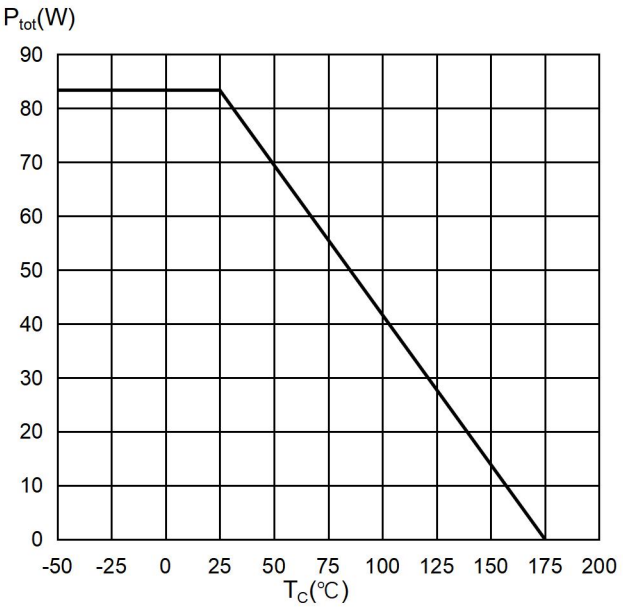
Typ.Coss stored energy/典型Coss存储能量
$E_{OSS}=f(V_{DS})$; $T_j=25℃$



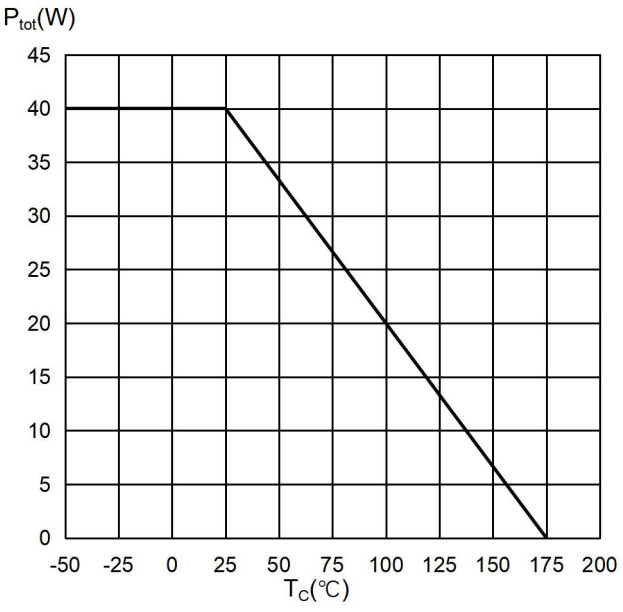
Typ.Capacitances/典型电容特性
$C=f(V_{DS})$; $V_{AC}=25mV,f=1MHz,T_j=25℃$



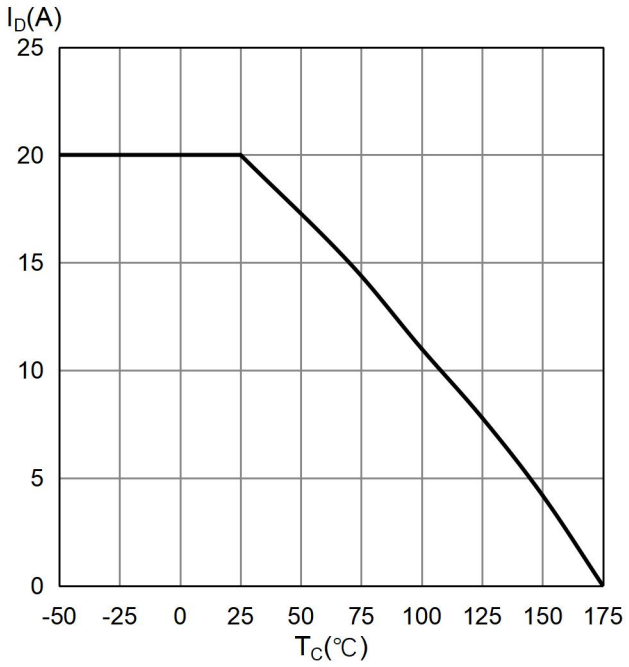
Power dissipation/耗散功率
$P_{tot}=f(T_C)$; $T_j≤175℃$, (@ HC190N070B2E)



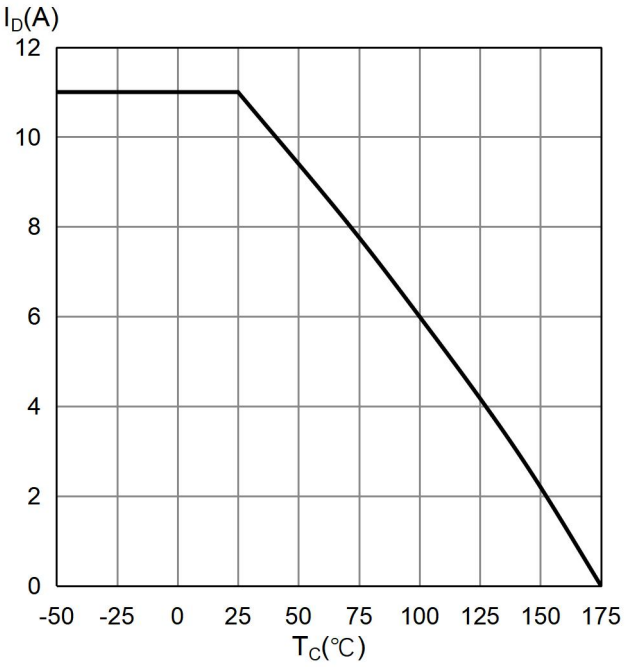
Power dissipation/耗散功率
$P_{tot}=f(T_C)$; $T_j≤175℃$, (@ HC190N070J2E)



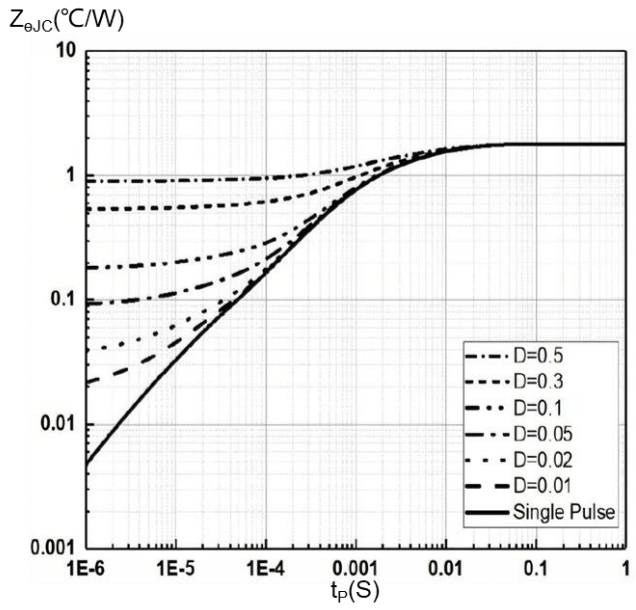
Continuous Drain Current/连续漏电与壳温
I_D=f(T_C); T_j≤175℃,(@ HC190N070B2E)



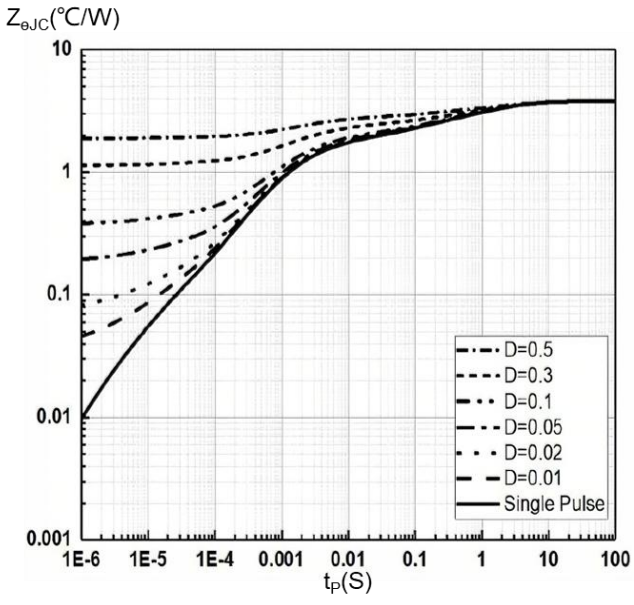
Continuous Drain Current/连续漏电与壳温
I_D=f(T_C); T_j≤175℃, (@ HC190N070J2E)



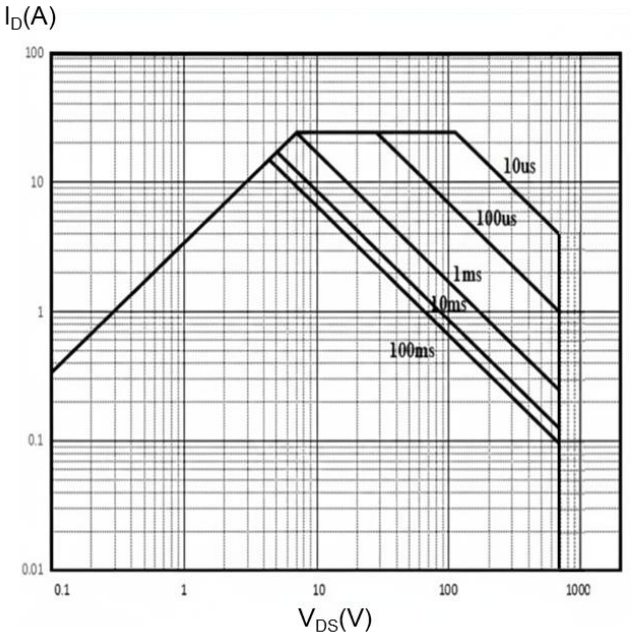
Transient thermal impedance/热阻特性
$Z_{\theta JC}$=f(t_P); ($R_{th(j-c),typ}$ @ HC190N070B2E)



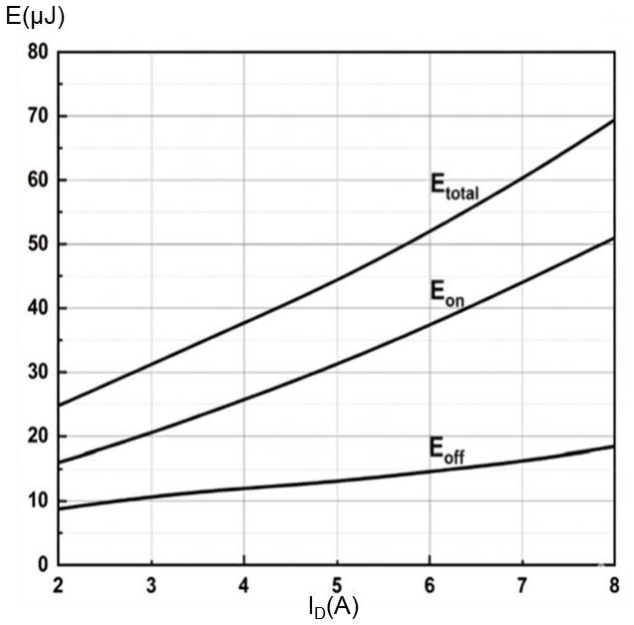
Transient thermal impedance/热阻特性
$Z_{\theta JC}$=f(t_P); ($R_{th(j-c),typ}$ @ HC190N070J2E)



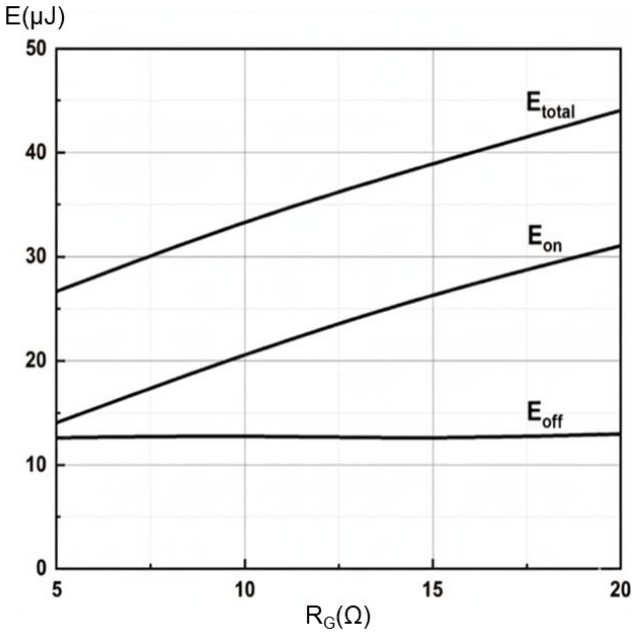
Safe Operating Area/安全工作区
I_D=f(V_{DS});



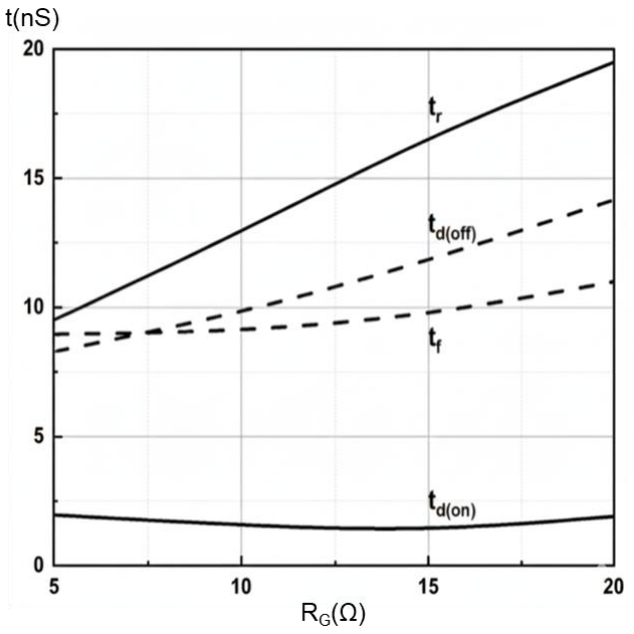
Typ.Switching Losses vs current /动态损耗-电流特性
E=f(I_D); V_{GS}=-4/18V,R_G=20Ω,V_{DD}=400V,T_j=25℃



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℃

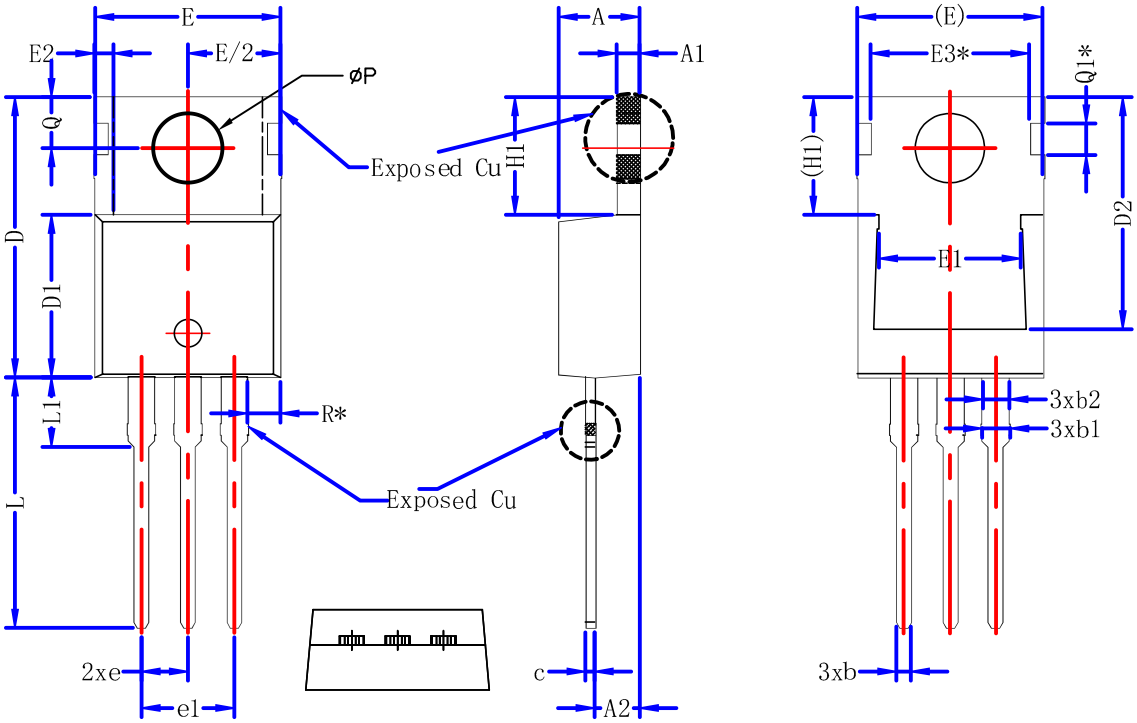


Typ.Switching times vs resistance/开关时间-门级电阻特性
t=f(R_G); V_{GS}=-4/18V,V_{DD}=400V,I_D=5A,T_j=25℃



5. Package outline
封装外形

Figure 1. Outline TO220-3L, dimensions in mm/TO220-3L外形尺寸（毫米）
@HC190N070B2E



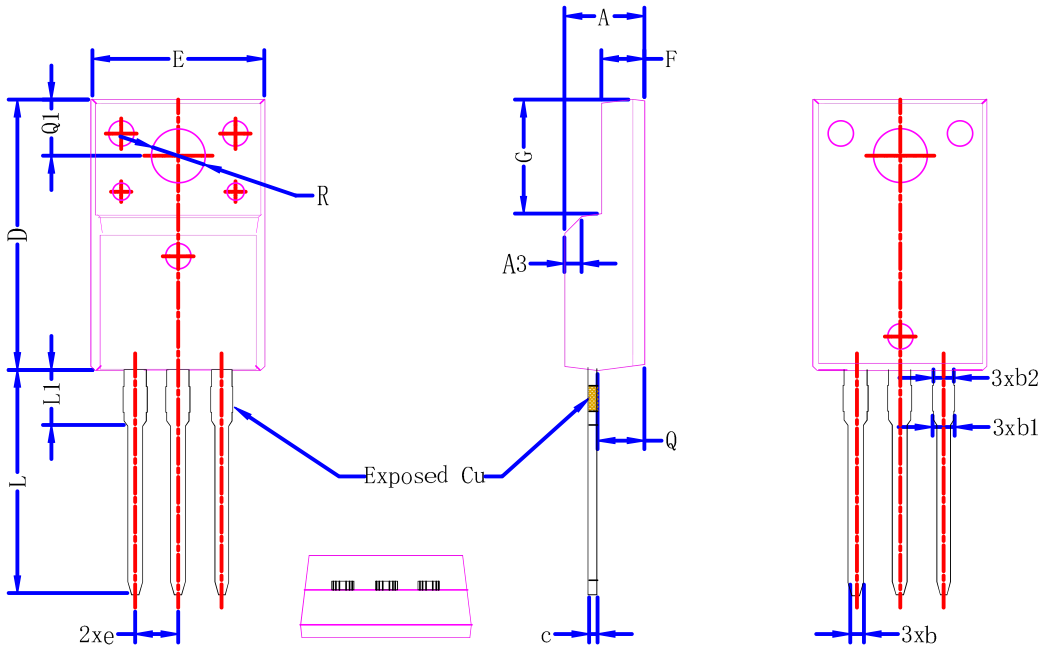
SYMBOL	DIMENSIONS			SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.		MIN.	NOM.	MAX.
A	4.24	4.44	4.64	E3*	8.70REF.		
A1	1.15	1.27	1.40	e	2.54BSC		
A2	2.30	2.48	2.70	e1	5.08BSC		
b	0.70	0.80	0.90	H1	6.30	6.45	6.60
b1	1.20	1.55	1.75	L	13.47	13.72	13.97
b2	1.20	1.45	1.70	L1	3.60	3.80	4.00
C	0.40	0.50	0.60	⌀P	3.75	3.84	3.93
D	14.70	15.37	16.00	Q	2.60	2.80	3.00
D1	8.82	8.92	9.02	Q1*	1.73REF.		
D2	12.43	12.73	12.83	R*	1.82REF.		
E	9.96	10.16	10.36				
E1	6.86	7.77	8.89				
E2	-	-	0.76				

Note:
1. Package Reference: JEDEC TO220, Variation AB
2. Slot Required, Notch May Be Rounded
3. Dimension D & E Do Not Include Mold Flash. Mold Flash Shall Not Exceed 0.127mm Pre Side. These Dimensions Are Measured At The Outermost Extreme Of The Plastic Body.
4. Thermal Pad Contour Optional Within Dimensions E,H1,D2&E1.
5. Dimension E2 & H1 Define A Zone Where Stamping And Singulation Irregularities Are Allowed.
6. "*"is reference.

注:
1. 封装参考：JEDEC TO220，变体AB。
2. 槽口是必需的，缺口（或凹槽）可以倒圆（或圆角化）。
3. 尺寸 D 和 E 不包含溢边（模具飞边）。溢边每侧不得超过0.127mm。这些尺寸测量于塑料本体的最外极限。
4. 散热焊盘的轮廓在尺寸 E、H1、D2 和 E1 定义的范围内可选。
5. 尺寸 E2 和 H1 定义了一个允许冲压和单体切割不规则的区域。
6. "*"表示参考尺寸

Figure 2. Outline TO220F-3L, dimensions in mm/TO220F-3L外形尺寸（毫米）

@HC190N070J2E



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	4.60	4.70	4.80
b	0.70	0.80	0.91
b1	1.20	1.30	1.47
b2	1.10	1.20	1.30
c	0.45	0.50	0.63
D	15.80	15.87	15.97
E	10.00	10.10	10.30
e		2.54 BSC	
F	2.44	2.54	2.65
G	6.50	6.70	6.90
L	12.90	13.10	13.30
L1	3.13	3.23	3.33
P	3.75	3.84	3.93
Q	2.65	2.75	2.85
Q1	3.20	3.30	3.40
R	3.08	3.18	3.28

Note:
- Package reference: JEDEC T0220FP;
- Slot required, notch may be rounded;
- Dimension D&E don't include mode flash, Mold flash not exceed 0.152mm pre side. These dimensions are measured at the outermost extreme of the plastic body;

注:
- 包装参考号：JEDEC T0220FP;
- 需要开槽，槽口可以倒圆;
- 尺寸D&E不包括模飞边，模飞边预边不超过0.152mm。这些尺寸是在塑料体的最外端测量的;

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
2025-09-26	Rev. G 1.0	Target Datasheet（目标规格书）

7. Matters needing attention

Appendix 1. Important Technical Guidance, Application Policy, and Copyright Notice/重要技术指南、应用规范与版权声明

[Data and Design Guidance]

The information provided herein, including typical values and application examples, serves as technical guidance only and should not be construed as a formal guarantee of product characteristics. This documentation is intended for qualified engineering personnel, who bear the ultimate responsibility for evaluating the product's suitability for their specific application and compliance with all industry standards.

【数据与设计指引】

本文件中提供的所有信息，包括任何典型值和应用示例，仅作为技术指引，不应被视为对产品特性的正式保证。本资料专供具备资质的工程技术人员使用，客户的技术部门应对产品在特定应用中的适用性和对所有行业标准的符合性负最终评估责任。

[Copyright and Revision Management]

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[Application Safety and Intellectual Property]

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