

HC190N070A5E

700V N-Channel SiC MOSFET

产品特点/Product features

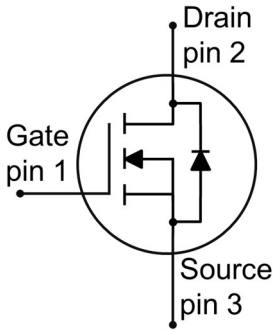
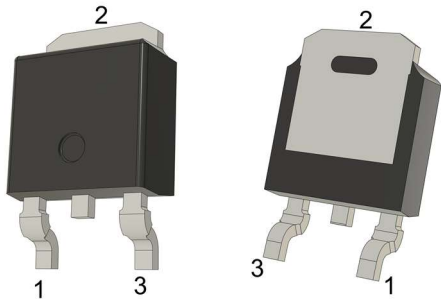
- Low Capacitances with High speed switching
低电容高速开关
- Low specific on-resistance
低导通电阻
- Low reverse recovery (Q_{rr})
低反向恢复电荷 Q_{rr}
- Reduction of heat sink requirements
减少散热器需求
- Halogen Free and RoHS Compliant
无卤素且符合 RoHS 标准

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
HC190N070A5E	TO252-2L	HC190N070E	Tape and Reel/卷带包装

700V N-Channel SiC MOSFET

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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}	$T_C = 25^\circ\text{C}$	79	W
		$T_C = 100^\circ\text{C}$	39	

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)}			1.9		K/W
Thermal resistance, junction-ambient 结-环境热阻	R _{th(j-a)}			40		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	270	
			$T_j = 175^\circ\text{C}$		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

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Table 4 Dynamic characteristics/动态特性

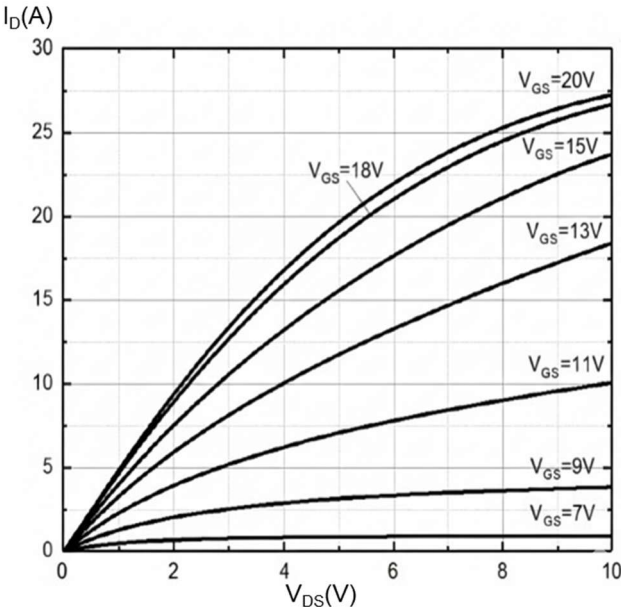
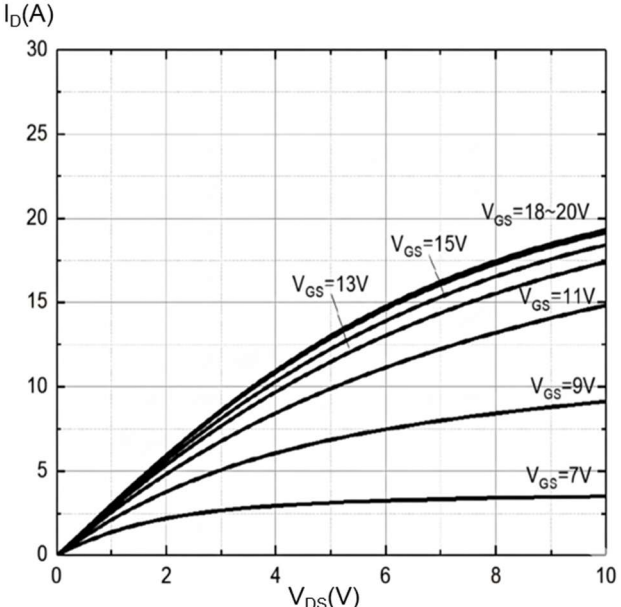
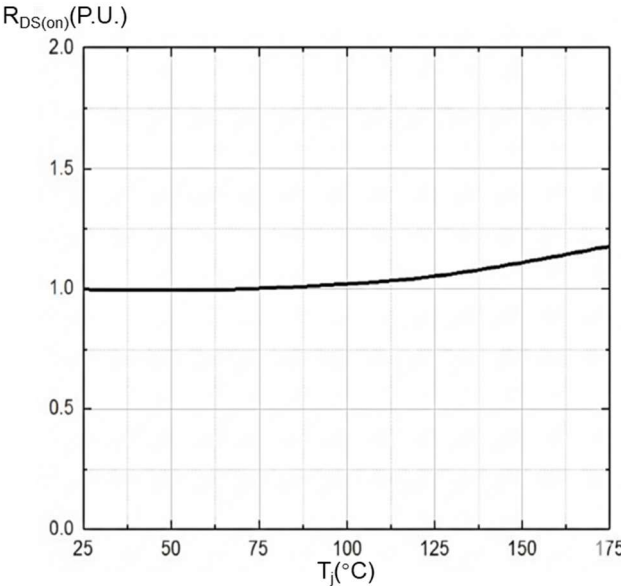
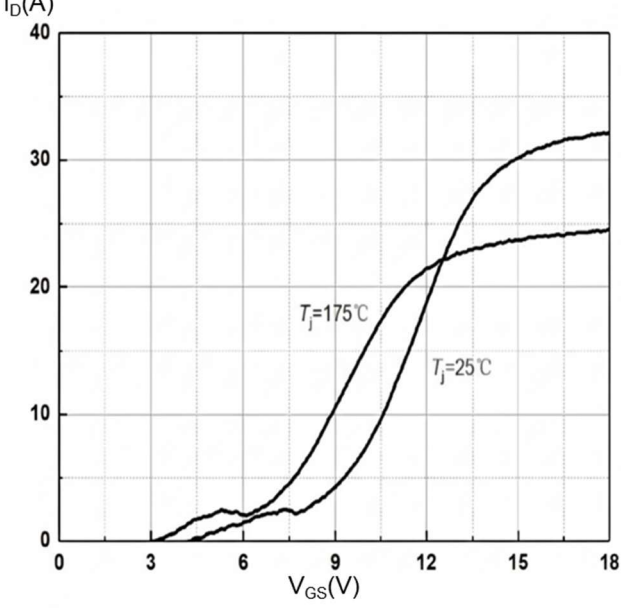
Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Total gate charge 总栅极电荷	$Q_{G(tot)}$	$V_{DD}=400V$, $I_D=5A$, $V_{GS}=-4/18V$		17.6		nC
Gate source charge 栅-源极电荷	Q_{GS}			3.7		
Gate-drain charge 栅-漏极电荷	Q_{GD}			7		
Input capacitance 输入电容	C_{iss}	$V_{DS}=600V$, $V_{GS}=0V$, $f=1MHz$		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

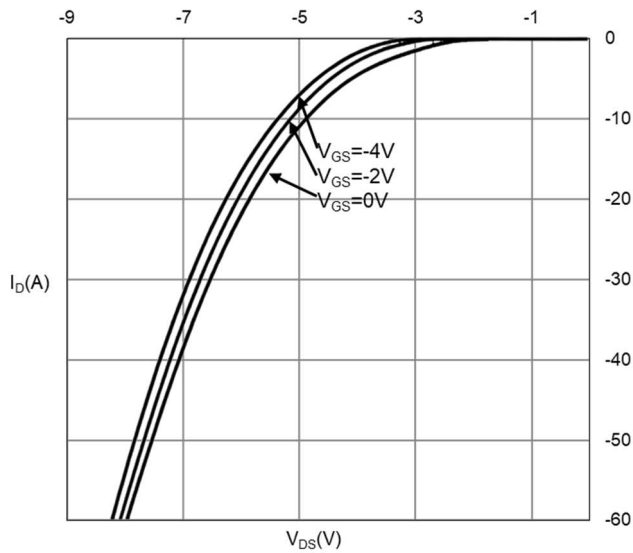
Parameter 参数	Symbol 符号	Test conditions 测试条件	Value/值			Unit 单位
			Min.	Typ.	Max.	
Drain-source reverse voltage 体二极管正向压降	V_{SD}	$I_S=2.5A, V_{GS}=-4V$		4.2		V
MOSFET forward recovery time MOSFET正向恢复时间	t_{fr}	$V_{DS}=400V$, $I_S=5A$, $-di/dt=1000A/\mu s$		28		ns
MOSFET forward recovery charge MOSFET正向恢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



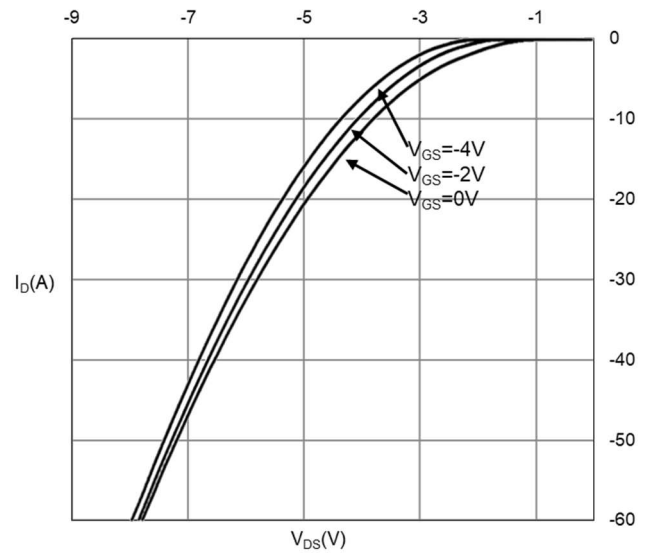
4. Electrical characteristics diagrams
电气特性图表

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 $I_D=f(V_{GS}); V_{GS}=18\text{V}, T_J=25^{\circ}\text{C}$ 

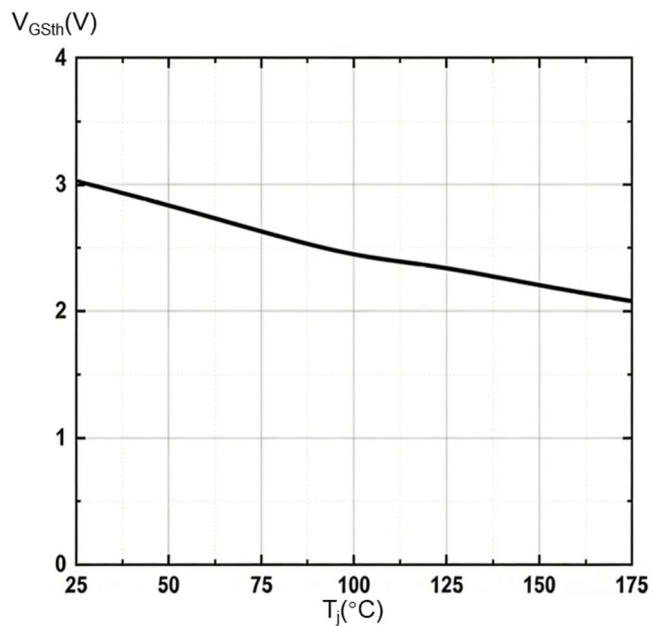
Typ.Reverse drain current characteristics/典型二极管特性
 $I_D=f(V_{DS}); T_J=25^{\circ}\text{C}$



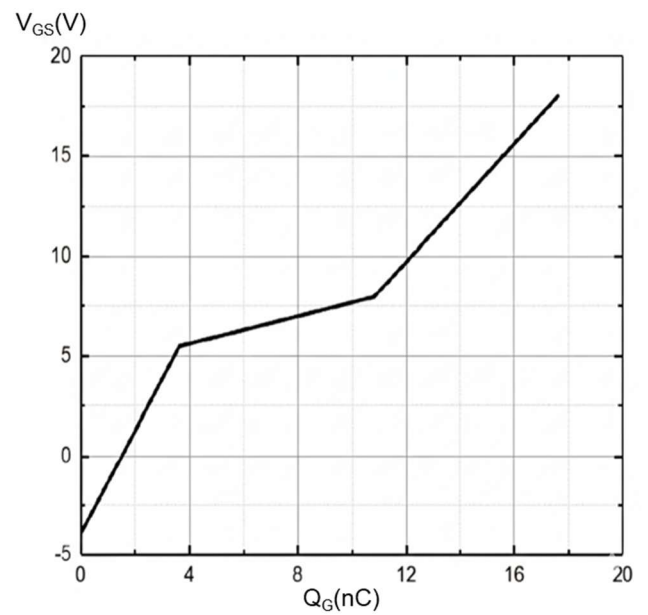
Typ.Reverse drain current characteristics/典型二极管特性
 $I_D=f(V_{DS}); T_J=175^{\circ}\text{C}$



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



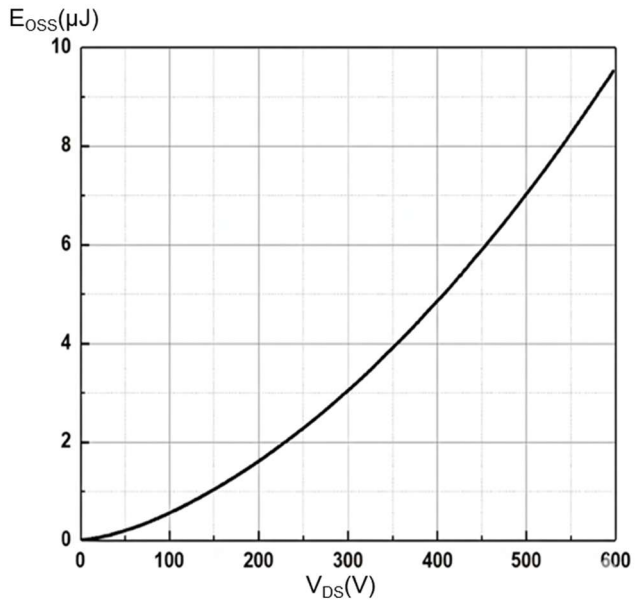
Typ.Gate charge/典型门级电荷
 $V_{GS}=f(Q_G); I_{DS}=5\text{A}, V_{DS}=400\text{V}, T_J=25^{\circ}\text{C}$



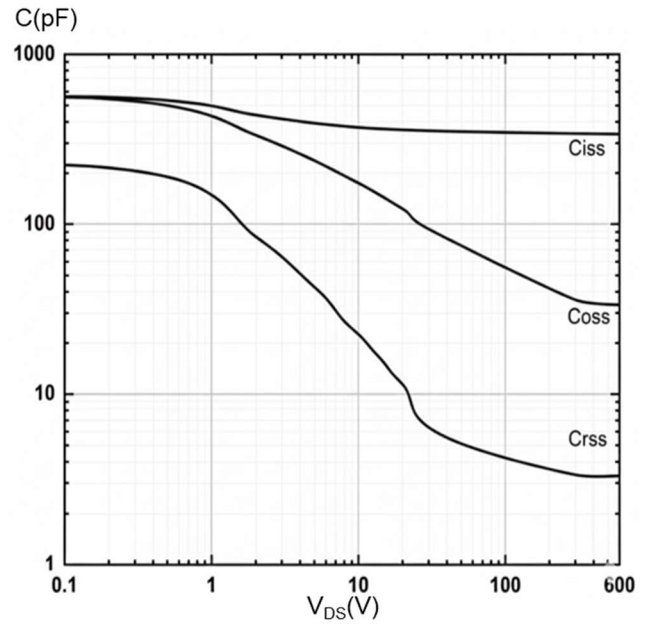
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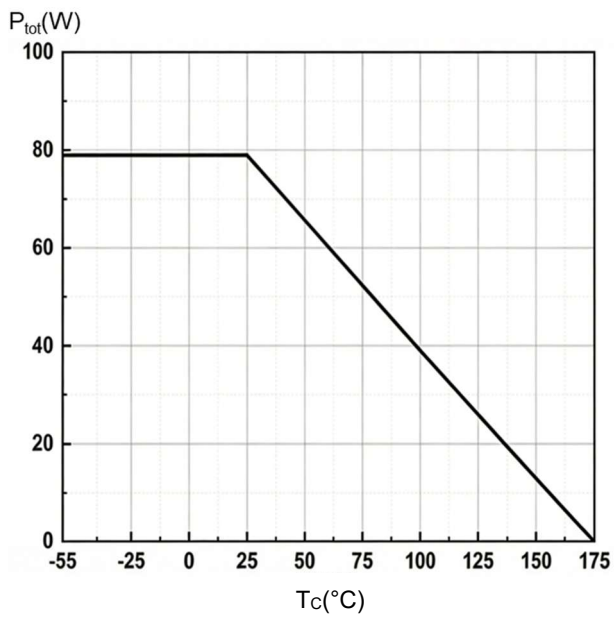
Typ.Coss stored energy/典型Coss存储能量
 $E_{oss}=f(V_{DS}); T_J=25^{\circ}\text{C}$



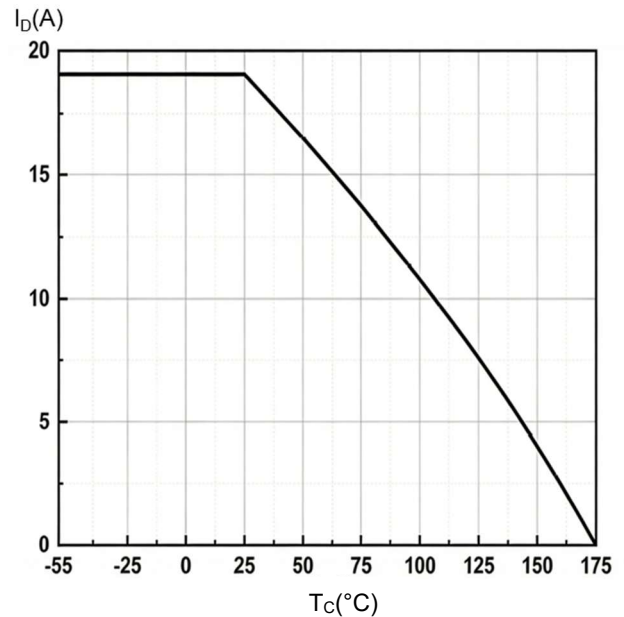
Typ.Capacitances/典型电容特性
 $C=f(V_{DS}); V_{AC}=25\text{mV}, f=1\text{MHz}, T_J=25^{\circ}\text{C}$



Power dissipation/耗散功率
 $P_{tot}=f(T_C); T_J \leq 175^{\circ}\text{C}$

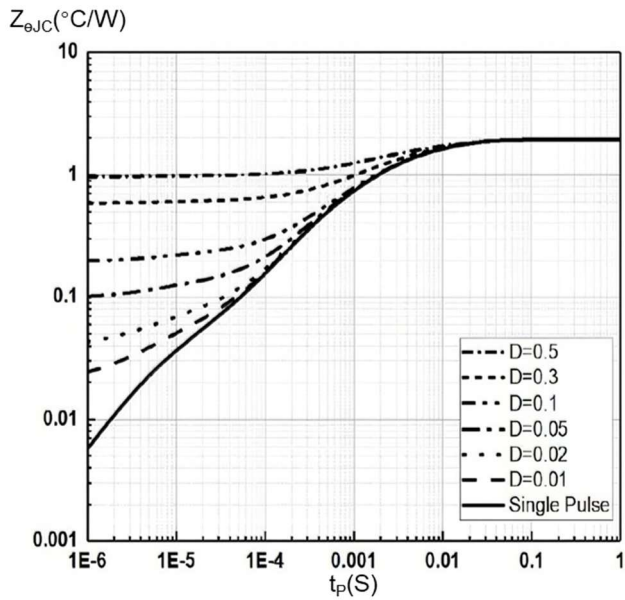


Continuous Drain Current/连续漏电流与壳温
 $I_D=f(T_C); T_J \leq 175^{\circ}\text{C}$

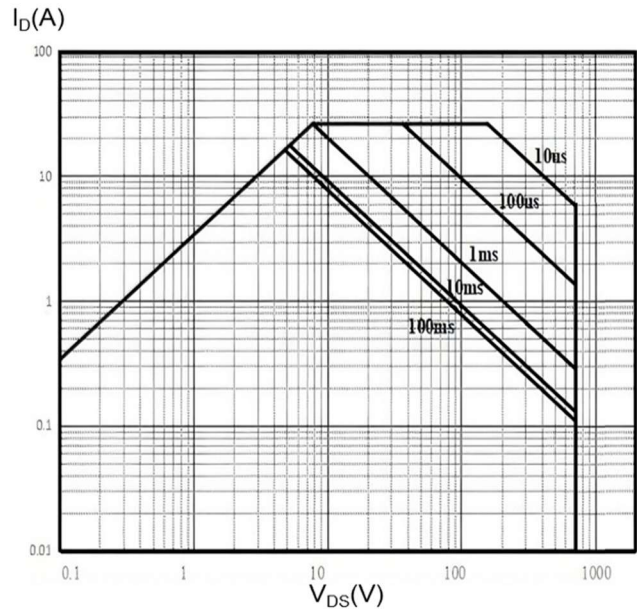




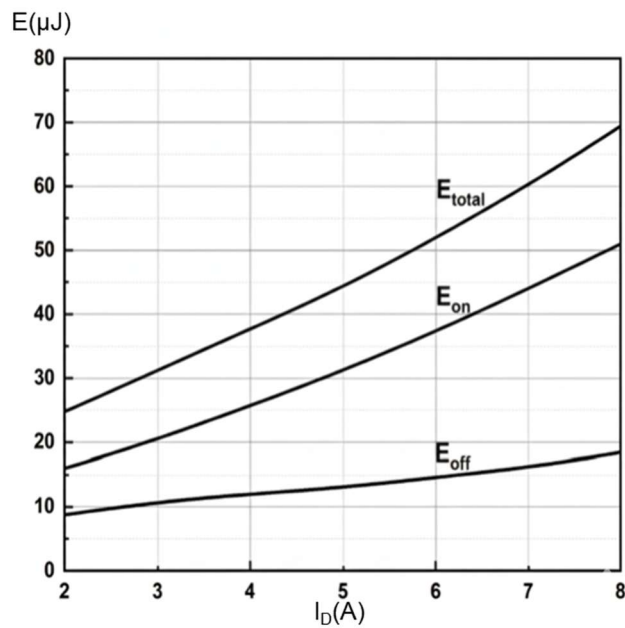
Transient thermal impedance/热阻特性
 $Z_{\theta JC}=f(t_p)$; ($R_{th(j-c),typ}$)



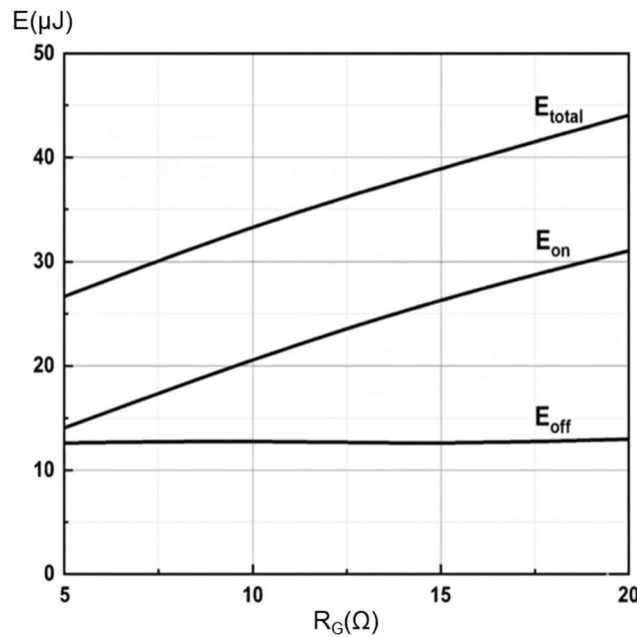
Safe operating area/安全工作区
 $I_D=f(V_{DS})$



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



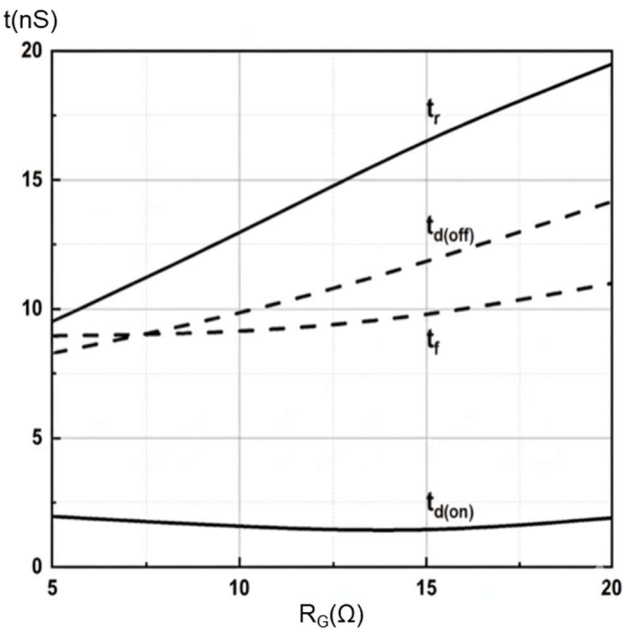
Typ.Switching losses vs resistance/动态损耗-门级电阻特性
 $E=f(R_G)$; $V_{GS}=-4/18V, V_{DD}=400V, I_D=5A, T_j=25^\circ C$



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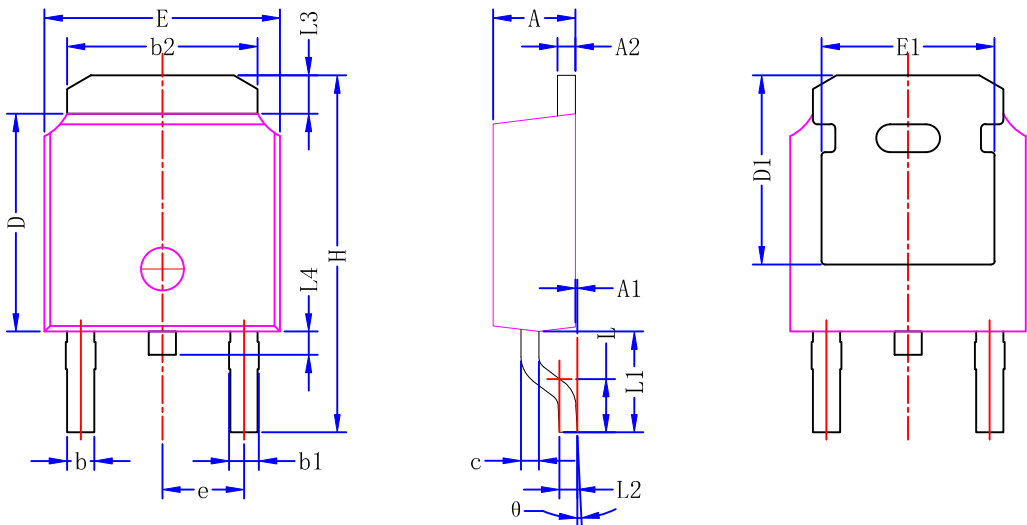
Typ.Switching times vs resistance/开关时间-门级电阻特性
 $t=f(R_G)$; $V_{GS}=-4/18V$, $V_{DD}=400V$, $I_D=5A$, $T_j=25^{\circ}C$





5. Package outline
封装外形

Figure 1. Outline TO252-2L, dimensions in mm/TO252-2L外形尺寸（毫米）



SYMBOL	DIMENSIONS		
	MIN.	NOM.	MAX.
A	2.20	2.30	2.40
A1	0.00	0.127	0.13
A2	0.46	0.50	0.58
b	0.64	0.76	0.88
b1	0.77	0.84	1.14
b2	5.21	5.34	5.46
c	0.46	0.50	0.60
D	6.00	6.10	6.22
D1	5.21	---	---
E	6.40	6.60	6.73
E1	4.40	---	---
e	2.286 BSC		
H	9.40	10.00	10.40
L	1.40	1.52	1.77
L1	2.743 REF.		
L2	0.508 REF.		
L3	0.89	---	1.27
L4	0.64	---	1.01
Q	0°	---	10°

NOTES:

- Package body sizes exclude mold flash, Protrusion or gate burrs. Mold flash, Protrusion or gate burrs shall not exceed 0.10mm per side.
- Package body sizes determined at the outermost extremes of the plastic body, Exclusive of mold flash, gate burrs and interlead flash, but including any mismatch between the top bottom of the plastic body.
- The package top may be smaller than the package bottom.
- Dimension b' does not include dambar protrusion. Allowable dambar protrusion shall be 0.10mm total in excess of b dimension at maximum material condition. The dambar can't be located on the lower radius of the foot.

注:

- 封装本体尺寸不包括模具飞边、突出物或浇口残余。模具飞边、突出物或浇口残余在每侧不得超过 0.10 mm。
- 封装本体尺寸是在塑胶本体的最外极限确定的，不包括模具飞边、浇口残余和引脚间的飞边，但包括塑胶本体顶部和底部之间可能存在的任何不匹配或错位。
- 封装的顶部尺寸可能小于底部尺寸。
- 尺寸 b' (引脚宽度) 不包括防焊条突出物。在最大材料条件下，允许的防焊条突出总量在 b 尺寸基础上不得超过 0.10 mm。防焊条不能位于引脚脚部的下部圆角上。



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

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

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