

HC016N120R4R

1200V N-Channel SiC MOSFET

产品特点/Product features

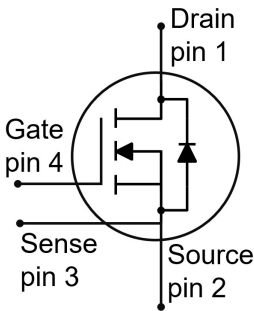
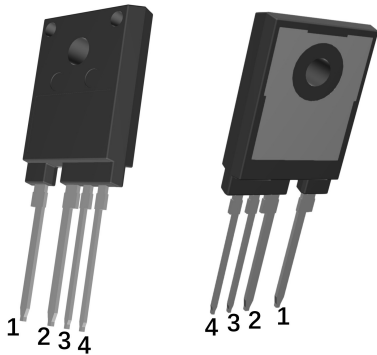
- Kelvin source configuration
开尔文源极配置
- Low specific on-resistance
低导通电阻
- Optimized dynamic performance
优化的动态性能
- Robust gate design
可靠的栅极设计
- 0V turn-off V_{GS} for simple gate driving
0V关断栅源电压，简化栅极驱动
- 100% UIS Tested
100% UIS测试
- Easy to parallel
易于并联

应用领域/Applications

- UPS & Energy storage system
不间断电源（UPS）和储能系统
- PC/server/telecom power supplies
计算机/服务器/通信电源
- Solar string inverter and solar optimizer
太阳能电池组逆变器、太阳能优化器
- EV Charger
电动汽车充电桩
- Motor Drives
电机驱动

关键性能参数/Key Performance Parameters

Parameter	Value	Unit
V_{DSS}	1200	V
$R_{DS(on),typ}$	16	mΩ
I_{DM}	300	A



Type/型号	Package/封装	Marking/标识	Packaging method/包装方式
HC016N120R4R	TO247-4L(HC)	HC016N120R	Tube/管装

1200V N-Channel SiC MOSFET

HC016N120R4R



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_{DSS}	$T_j \geq 25^\circ\text{C}$	1200	V
Drain current ¹ 连续漏极电流	I_{D}	$T_c = 25^\circ\text{C}, V_{\text{GS}} = 18\text{V}$	158.6	A
		$T_c = 100^\circ\text{C}, V_{\text{GS}} = 18\text{V}$	112.2	
Peak drain current ² 峰值漏极电流	I_{DM}	$T_j \leq 175^\circ\text{C}$	300	A
Continuous diode current ¹ 连续二极管电流	I_{S}	$T_c = 25^\circ\text{C}, V_{\text{GS}} = -4\text{V}$	111.6	A
Peak diode current ² 峰值二极管电流	I_{SM}	$T_c = 25^\circ\text{C}, V_{\text{GS}} = -4\text{V}$	300	A
Maximum gate source voltage 栅源最大电压	$V_{\text{GS,MAX}}$		-12~24	V
Recommend gate source voltage 推荐的栅源电压	$V_{\text{GS,op}}$		-4~18	V
Avalanche energy, single pulse 单脉冲雪崩能量	E_{AS}	$I_{\text{AS}} = 30\text{A}, V_{\text{DD}} = 100\text{V}, L = 1\text{mH}$	450	mJ
Power dissipation ¹ 总耗散功率	P_{tot}	$T_c = 25^\circ\text{C}$	833	W
		$T_c = 100^\circ\text{C}$	417	
Mounting torque 安装扭矩	M_{d}	M3 and M3.5 screw M3或者M3.5螺钉	0.6	Nm

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	$R_{\text{th(j-c)}}$			0.18		K/W
Thermal resistance, junction-ambient 结-环境热阻	$R_{\text{th(j-a)}}$			40		K/W
Soldering temperature 焊接温度	T_{sold}				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	$V_{(BR)DSS}$	$I_D = 100\mu\text{A}, V_{GS} = 0\text{V}$		1200			V
Gate threshold voltage 门极开启阈值电压	$V_{GS(th)}$	$I_D = 20\text{mA}, V_{DS} = V_{GS}$	$T_j = 25^\circ\text{C}$	1.9	2.6	3.5	V
			$T_j = 175^\circ\text{C}$		1.9		
Drain-source on-state resistance 漏极-源极导通电阻	$R_{DS(on)}$	$I_D = 50\text{A}, V_{GS(on)} = 15\text{V}$	$T_j = 25^\circ\text{C}$		20		m Ω
		$I_D = 50\text{A}, V_{GS(on)} = 18\text{V}$	$T_j = 25^\circ\text{C}$		16	29	
			$T_j = 175^\circ\text{C}$		28		
Zero gate voltage drain current 集电极-发射极漏电	I_{DSS}	$V_{DS} = 1200\text{V}, V_{GS} = 0\text{V}$	$T_j = 25^\circ\text{C}$		0.2	50	μA
			$T_j = 175^\circ\text{C}$		2		
Gate to source Leakage current 门极-源极漏电流	I_{GSS}	$V_{DS} = 0\text{V}, V_{GS} = 24\text{V}, T_j = 25^\circ\text{C}$				100	nA
		$V_{DS} = 0\text{V}, V_{GS} = -12\text{V}, T_j = 25^\circ\text{C}$				100	
Forward transconductance 正向跨导	g_{fs}	$I_D = 50\text{A}, V_{DS} = 20\text{V}$			32		S
Integrated gate resistor 内部门极电阻	R_G	$f = 1\text{MHz}$			0.6		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	$Q_{G(tot)}$	$V_{DD}=800V$, $I_D=50A$, $V_{GS}=-4/18V$		215		nC
Gate source charge 栅-源极电荷	Q_{GS}			83		
Gate-drain charge 栅-漏极电荷	Q_{GD}			32		
Input capacitance 输入电容	C_{iss}	$V_{DS}=1000V$, $V_{GS}=0V$, $f=1MHz$		4701		pF
Output capacitance 输出电容	C_{oss}			199		
Reverse transfer capacitance 反向传输电容	C_{rss}			20		
Coss stored energy 输出电容存储能量	E_{oss}	Calculated based on C_{oss}		99.5		μJ
Turn-On Delay Time 开启延迟时间	$t_{d(on)}$	$V_{DD}=800V$, $I_D=50A$, $V_{GS}=-4/18V$, $R_{G(ext)}=2.4\Omega$, $L=100\mu H$		17		ns
Rise time 上升时间	t_r			26		
Turn-Off Delay Time 关闭延迟时间	$t_{d(off)}$			45		
Turn-Off Fall Time 下降时间	t_f			16		
Turn-on switch loss 单次开启损耗	E_{on}			781		μJ
Turn-off switch loss 单次关闭损耗	E_{off}			380		

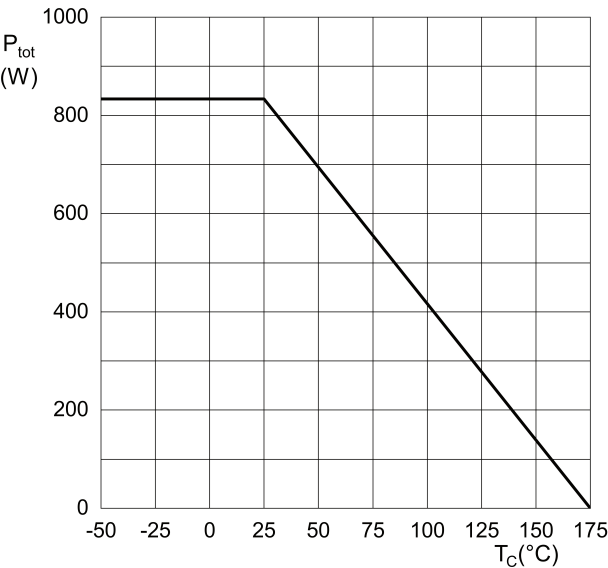
Table 5 Reverse diode characteristics/体二极管反向特性

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}	$I_S=25A, V_{GS}=0V, T_j=25^\circ C$		2.9		V
		$I_S=25A, V_{GS}=-4V, T_j=25^\circ C$		4.7		
		$I_S=25A, V_{GS}=-4V, T_j=175^\circ C$		4.1		
MOSFET forward recovery time MOSFET正向恢复时间	t_{fr}	$V_{DS}=400V$, $I_S=50A$, $-di/dt=500A/\mu s$		54		ns
MOSFET forward recovery charge MOSFET正向恢复电荷	Q_{fr}			276		nC
MOSFET peak forward recovery current MOSFET正向恢复峰值电流	I_{frm}			9		A

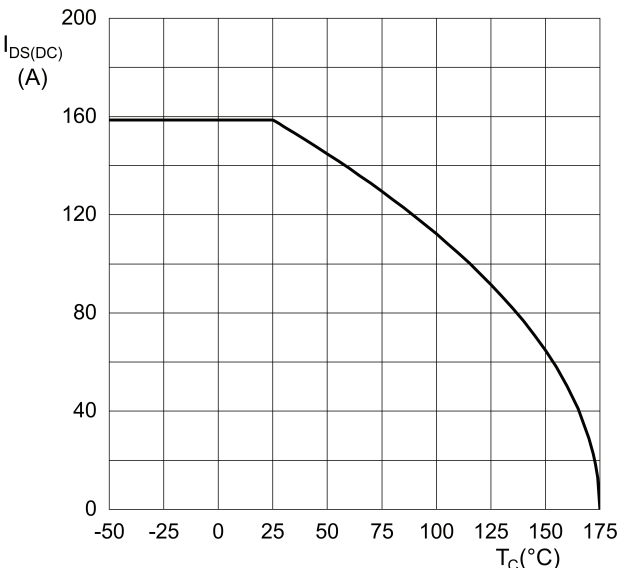


4. Electrical characteristics diagrams
电气特性图表

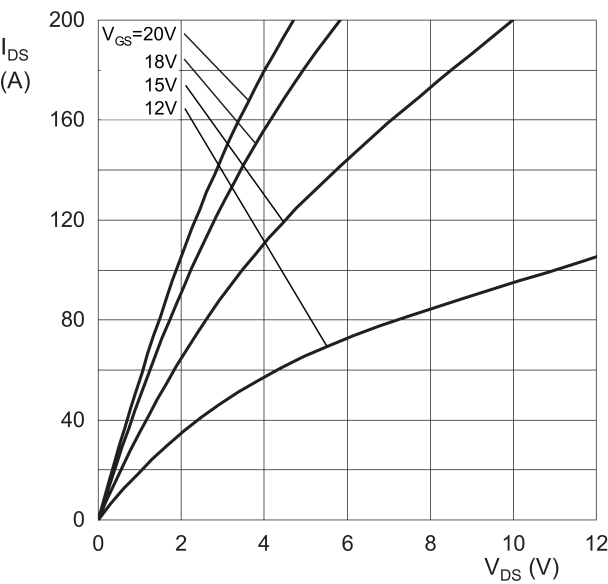
Power dissipation/耗散功率
 $P_{tot}=f(T_c)$



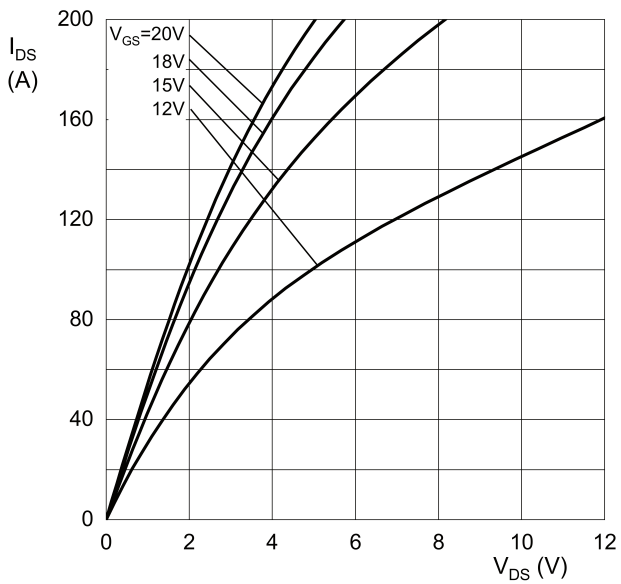
Continuous Drain Current/连续漏电流与壳温
 $I_{DS}=f(T_c); V_{GS} \geq 18V$



Typ Output Characteristic/典型输出特性
 $I_{DS}=f(V_{DS}); T_c=-55^{\circ}C$

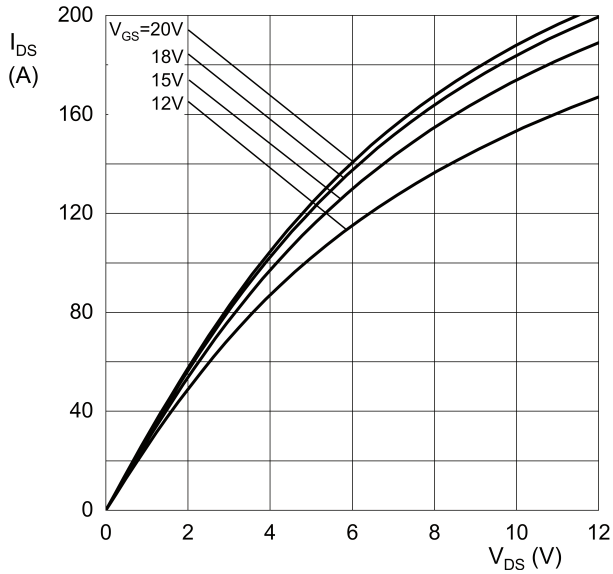


Typ Output Characteristic/典型输出特性
 $I_{DS}=f(V_{DS}); T_c=25^{\circ}C$

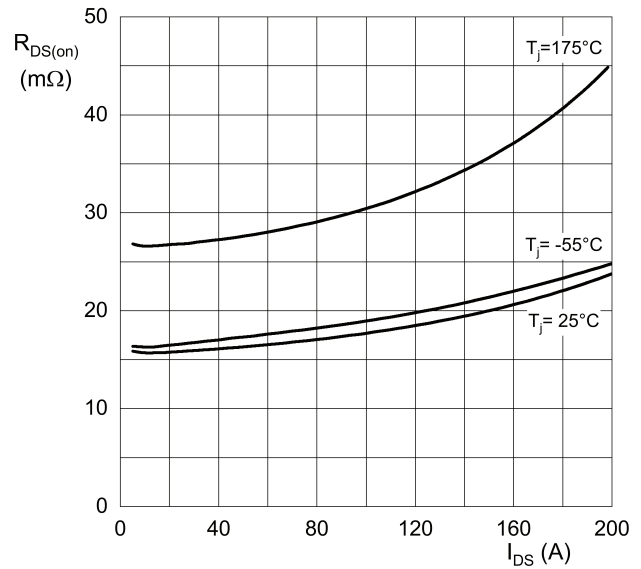




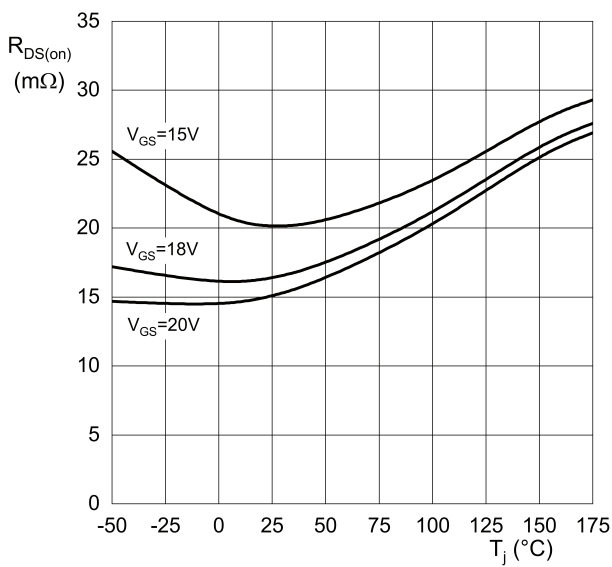
Typ output characteristic/典型输出特性
 $I_{DS}=f(V_{DS}); T_C=175^{\circ}\text{C}$



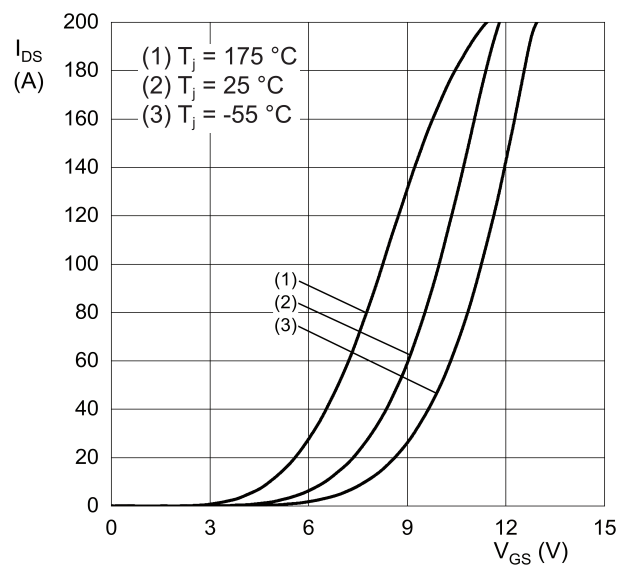
Typ. drain-source on-state resistance/典型漏源导通电阻
 $R_{DS(on)}=f(I_{DS}); V_{GS}=18\text{V}$



Drain-source on-state resistance/漏源导通电阻
 $R_{DS(on)}=f(T_j); I_{DS}=50\text{A}$

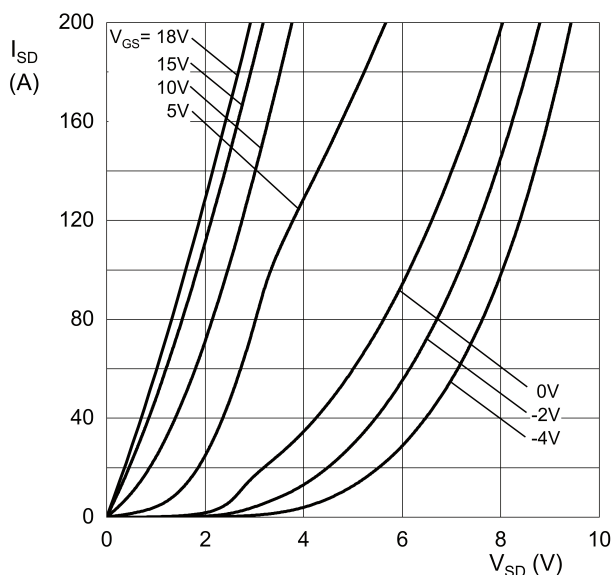


Typ Transfer characteristics/传输特性
 $I_{DS}=f(V_{GS}); V_{DS}=20\text{V}$

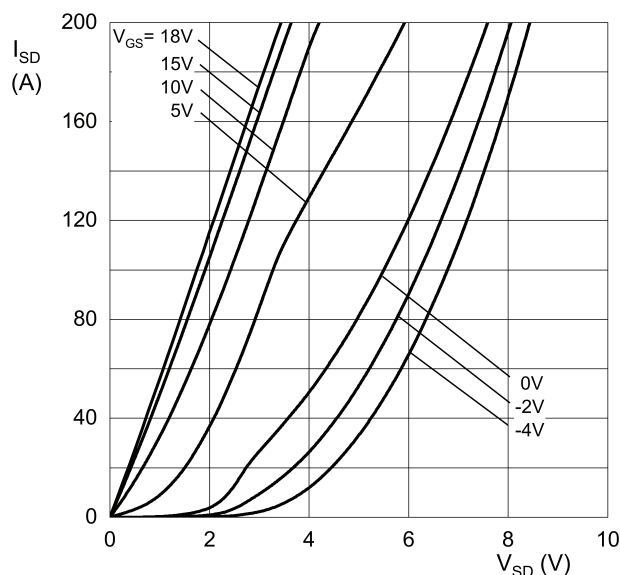




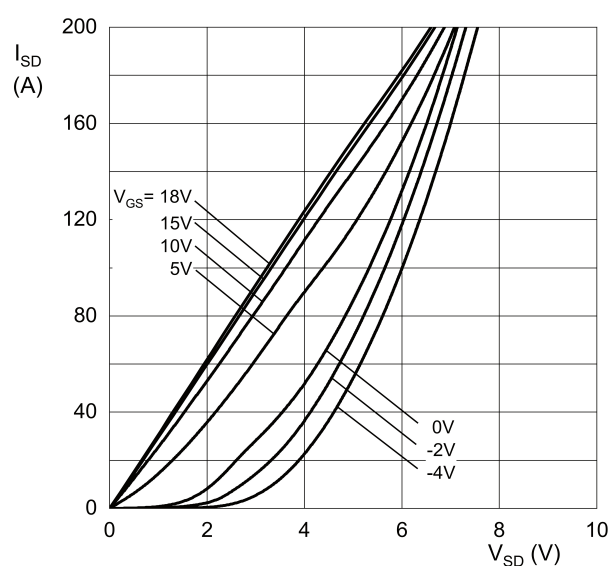
Typ.reverse drain current characteristics/典型二极管特性
 $I_{SD}=f(V_{SD})$; $T_C=-55^{\circ}\text{C}$



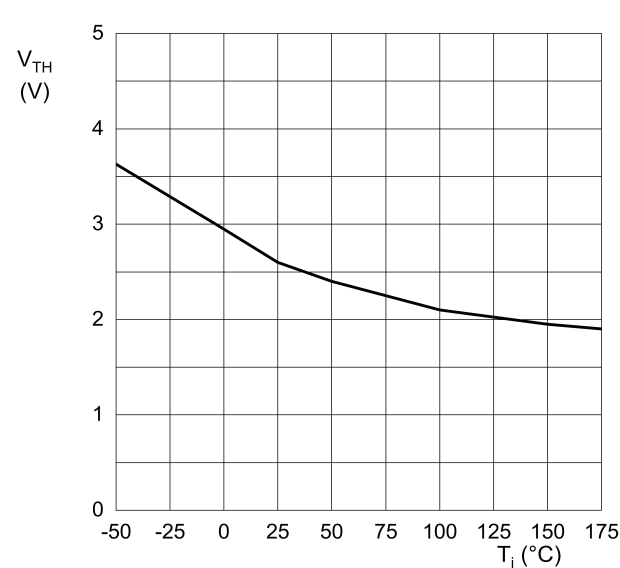
Typ.reverse drain current characteristics/典型二极管特性
 $I_{SD}=f(V_{SD})$; $T_C=25^{\circ}\text{C}$



Typ.reverse drain current characteristics/典型二极管特性
 $I_{SD}=f(V_{SD})$; $T_C=175^{\circ}\text{C}$



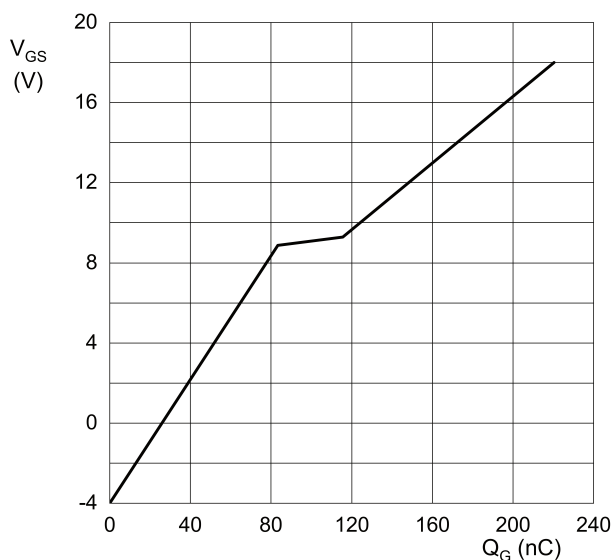
Typ.Gate threshold voltage/门级阈值电压结温特性
 $V_{GSth}=f(T_j)$; $I_D=12\text{mA}$, $V_{DS}=V_{GS}$





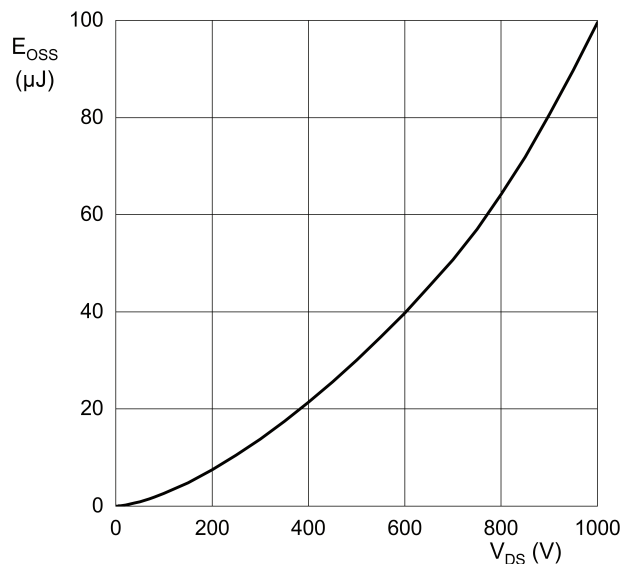
Typ.gate charge/典型门级电荷

$V_{GS}=f(Q_G)$; $I_{DS}=50A$, $I_{GS}=0.1mA$, $V_{DS}=800V$



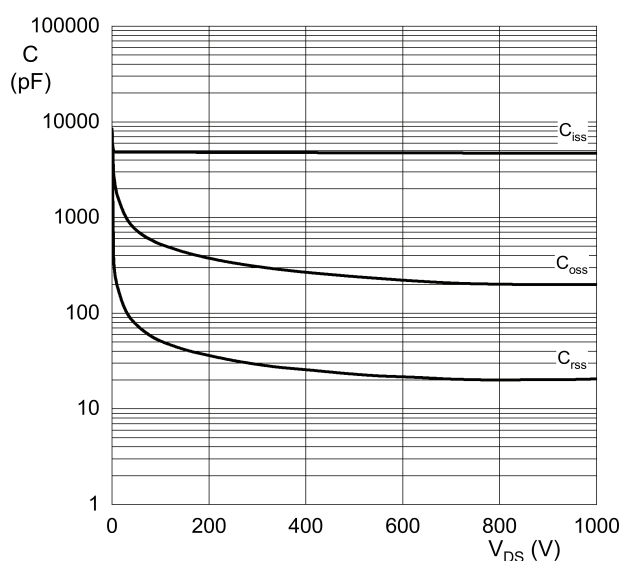
Typ.Coss stored energy/典型Coss存储能量

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



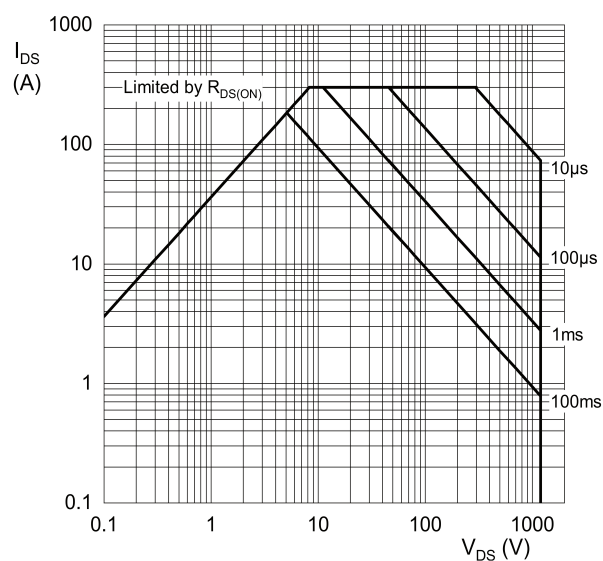
Typ. capacitances/典型电容特性

$C=f(V_{DS})$; $V_{GS}=0V$



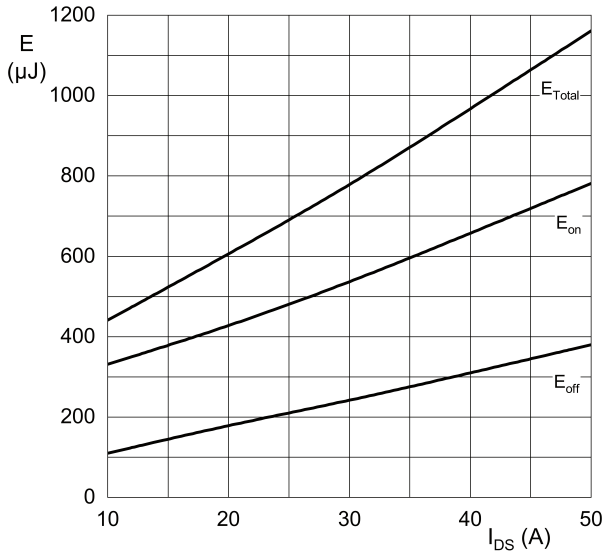
Forward bias safe operating area/安全工作区

$I_D=f(V_{DS})$; $T_C=25^{\circ}C$, $D=0$

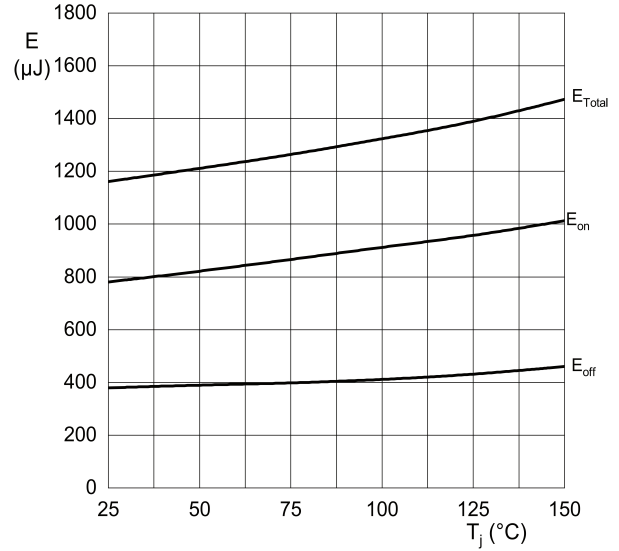




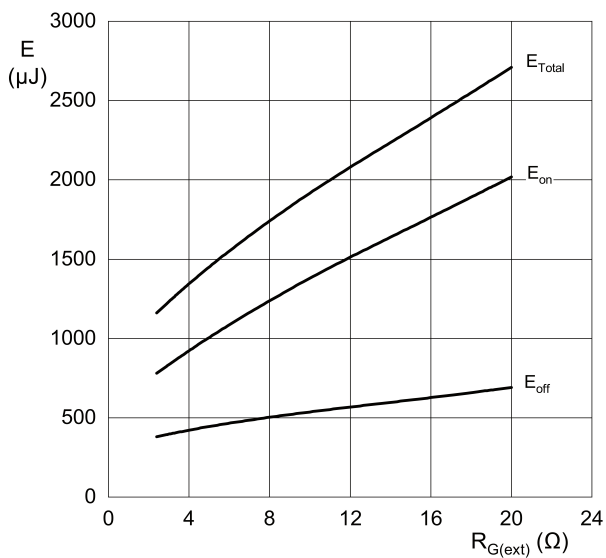
Typ. Switching Losses vs current /动态损耗-电流特性
 $E=f(I_D)$; $V_{GS}=-4/18V$, $R_G=2.4\Omega$, $V_{DD}=800V$, $T_J=25^\circ C$



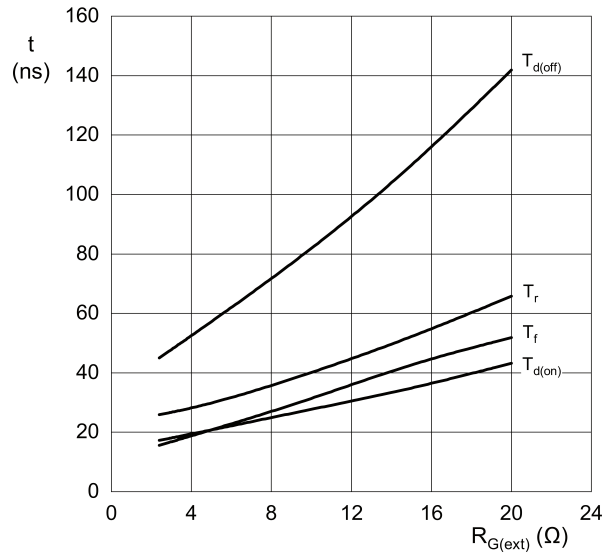
Typ. Switching losses vs temperature/动态损耗-结温特性
 $E=f(T_J)$; $V_{GS}=-4/18V$, $R_G=2.4\Omega$, $V_{DD}=800V$, $I_D=50A$



Typ. Switching losses vs resistance/动态损耗-门级电阻特性
 $E=f(R_G)$; $V_{GS}=-4/18V$, $V_{DD}=800V$, $I_D=50A$, $T_J=25^\circ C$



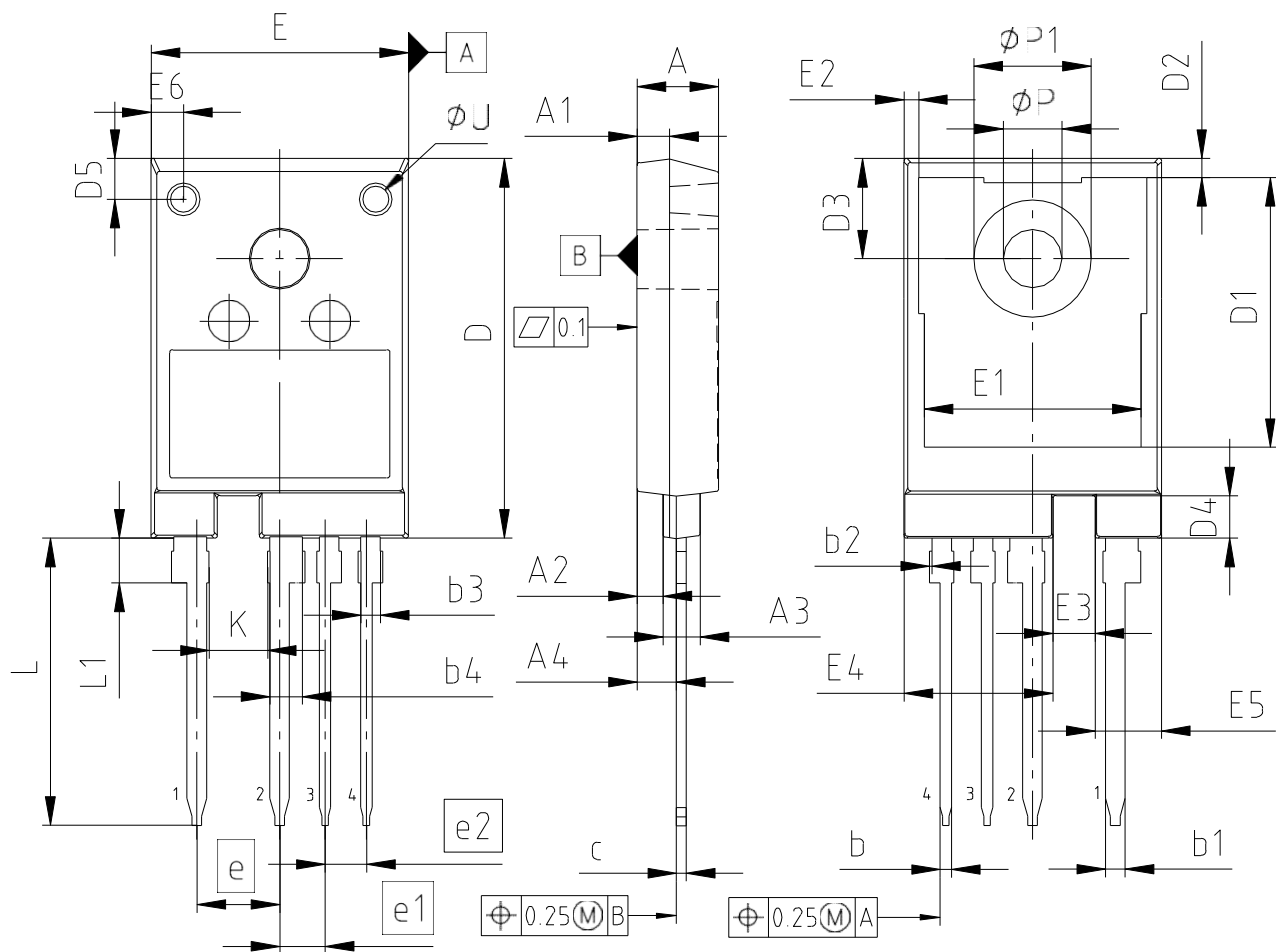
Typ. Switching times vs resistance/开关时间-门级电阻特性
 $t=f(R_G)$; $V_{GS}=-4/18V$, $V_{DD}=800V$, $I_D=50A$, $T_J=25^\circ C$





5. Package outline
封装外形

Figure 1. Outline TO247-4L(HC), dimensions in mm/TO247-4L(HC)外形尺寸 (毫米)



DIMENSIONS	MILLIMETERS		DIMENSIONS	MILLIMETERS	
	MIN.	MAX.		MIN.	MAX.
A	4.90	5.10	E	15.60	16.00
A1	1.90	2.10	E1	13.10	13.50
A2	1.50	1.70	E2	0.60	1.20
A3	2.16	2.36	E3	2.48	2.68
A4	2.31	2.51	E4	9.05	9.25
b	0.60	0.80	E5	3.97	4.17
b1	1.10	1.30	E6	1.80	2.20
b2	---	0.15	e	5.08	
b3	1.10	1.30	e1	2.79	
b4	1.90	2.10	e2	2.54	
c	0.50	0.70	K	3.50	---
D	23.10	23.50	L	17.50	17.80
D1	16.25	16.85	L1	2.61	2.91
D2	0.97	1.37	N	4	
D3	6.00	6.30	ØP1	7.00	7.40
D4	2.50	2.70	ØP	3.50	3.70
D5	2.30	2.70	ØU	1.40	1.80

NOTES:
ALL DIMENSIONS DO NOT INCLUDE MOLD FLASH OR PROTRUSIONS.
注：不计模具飞边或凸起



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
2025-09-15	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.

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