

HC024N120E7R

1200V N-Channel SiC MOSFET

产品特点/Product features

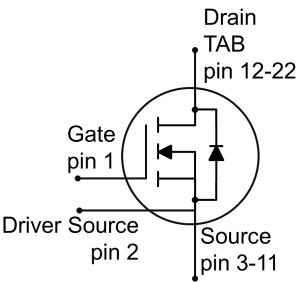
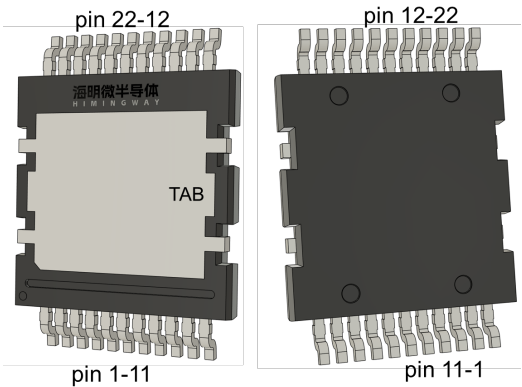
- Kelvin source configuration
开尔文源极配置
- Low specific on-resistance
低导通电阻
- Fast switching speed
快速切换速度
- Controllable dv/dt for optimized EMI
可控的(dv/dt), 用于实现EMI优化设置
- 0V turn-off V_{GS} for simple gate driving
0V关断栅源电压, 简化栅极驱动
- 100% UIS Tested
100% UIS测试
- Easy to parallel
易于并联

应用领域/Applications

- UPS (Uninterruptible Power Supplies)
不间断电源 (UPS)
- Switch Mode Power Supplies (SMPS)
开关模式电源
- 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
$R_{DS(on),typ}$	24	mΩ
I_{DM}	200	A



Type/型号	Package/封装	Marking/标识	Packaging method/包装方式
HC024N120E7R	QDPAK	HC024N120R	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_{DSS}	$T_j \geq 25^\circ\text{C}$	1200	V
Drain current ¹ 连续漏极电流	I_{D}	$T_c = 25^\circ\text{C}, V_{\text{GS}} = 18\text{V}$	104.2	A
		$T_c = 100^\circ\text{C}, V_{\text{GS}} = 18\text{V}$	73.7	
Peak drain current ² 峰值漏极电流	I_{DM}	$T_j \leq 175^\circ\text{C}$	200	A
Continuous diode current ¹ 连续二极管电流	I_{S}	$T_c = 25^\circ\text{C}, V_{\text{GS}} = -4\text{V}$	81.7	A
Peak diode current ² 峰值二极管电流	I_{SM}	$T_c = 25^\circ\text{C}, V_{\text{GS}} = -4\text{V}$	200	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}	$I_{\text{AS}} = 20\text{A}, V_{\text{DD}} = 100\text{V}, L = 1\text{mH}$	200	mJ
Power dissipation ¹ 总耗散功率	P_{tot}	$T_c = 25^\circ\text{C}$	625	W
		$T_c = 100^\circ\text{C}$	313	

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

2. Pulse width t_p limited by $T_{\text{j(max)}}$ /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	$R_{th(j-c)}$			0.24		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	$V_{(BR)DSS}$	$I_D = 100\mu\text{A}, V_{GS} = 0\text{V}$	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	V
			$T_j = 175^\circ\text{C}$		1.9	
Drain-source on-state resistance 漏极-源极导通电阻	$R_{DS(on)}$	$I_D = 40\text{A}, V_{GS(on)} = 15\text{V}$	$T_j = 25^\circ\text{C}$		30	m Ω
		$I_D = 40\text{A}, V_{GS(on)} = 18\text{V}$	$T_j = 25^\circ\text{C}$		24	
			$T_j = 175^\circ\text{C}$		48	
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	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}	$I_D = 40\text{A}, V_{DS} = 20\text{V}$		27		S
Integrated gate resistor 内部门极电阻	R_G	$f = 1\text{MHz}$		0.8		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	$Q_{G(tot)}$	$V_{DD}=800V$, $I_D=40A$, $V_{GS}=-4/18V$		151		nC
Gate source charge 栅-源极电荷	Q_{GS}			63		
Gate-drain charge 栅-漏极电荷	Q_{GD}			21		
Input capacitance 输入电容	C_{iss}	$V_{DS}=1000V$, $V_{GS}=0V$, $f=1MHz$		3305		pF
Output capacitance 输出电容	C_{oss}			139		
Reverse transfer capacitance 反向传输电容	C_{rss}			12		
Coss stored energy 输出电容存储能量	E_{oss}	Calculated based on C_{oss}		69.5		μJ
Turn-On Delay Time 开启延迟时间	$t_{d(on)}$	$V_{DD}=800V$, $I_D=40A$, $V_{GS}=-4/18V$, $R_{G(ext)}=3.6\Omega$, $L=330\mu H$		14		ns
Rise time 上升时间	t_r			27		
Turn-Off Delay Time 关闭延迟时间	$t_{d(off)}$			43		
Turn-Off Fall Time 下降时间	t_f			50		
Turn-on switch loss 单次开启损耗	E_{on}			260		μJ
Turn-off switch loss 单次关闭损耗	E_{off}			156		

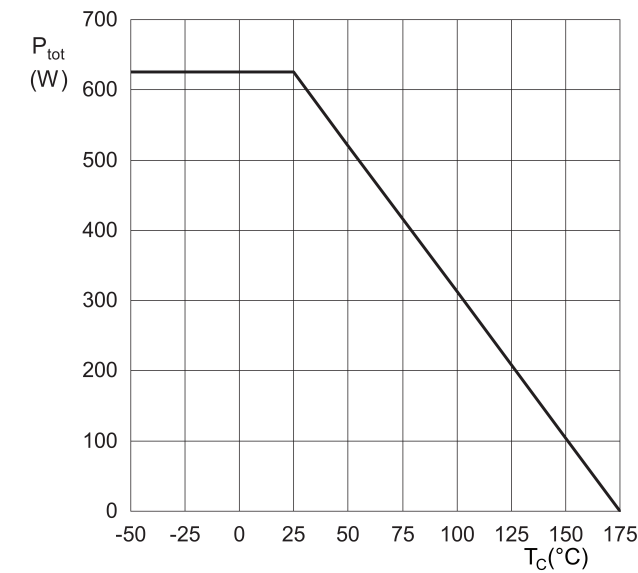
Table 5 Reverse diode characteristics/体二极管反向特性

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}	$I_S=20A, V_{GS}=0V, T_j=25^\circ C$		3.1		V
		$I_S=20A, V_{GS}=-4V, T_j=25^\circ C$		4.9		
		$I_S=20A, V_{GS}=-4V, T_j=175^\circ C$		4.3		
MOSFET forward recovery time MOSFET正向恢复时间	t_{fr}	$V_{DS}=400V$, $I_S=40A$, $-di/dt=500A/\mu s$		33.4		ns
MOSFET forward recovery charge MOSFET正向恢复电荷	Q_{fr}			129		nC
MOSFET peak forward recovery current MOSFET正向恢复峰值电流	I_{frm}			6.9		A

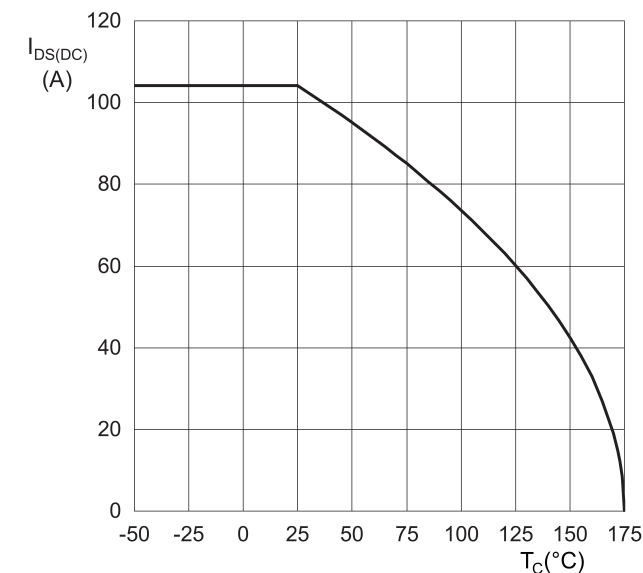


4. Electrical characteristics diagrams
电气特性图表

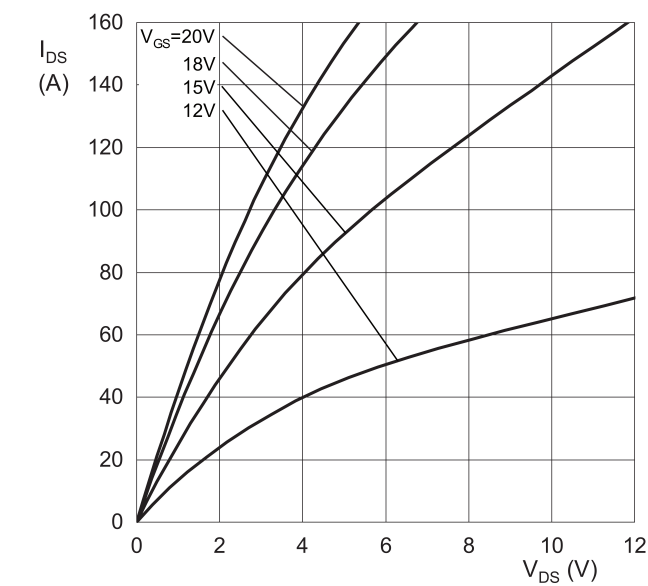
Power dissipation/耗散功率
 $P_{tot}=f(T_c)$



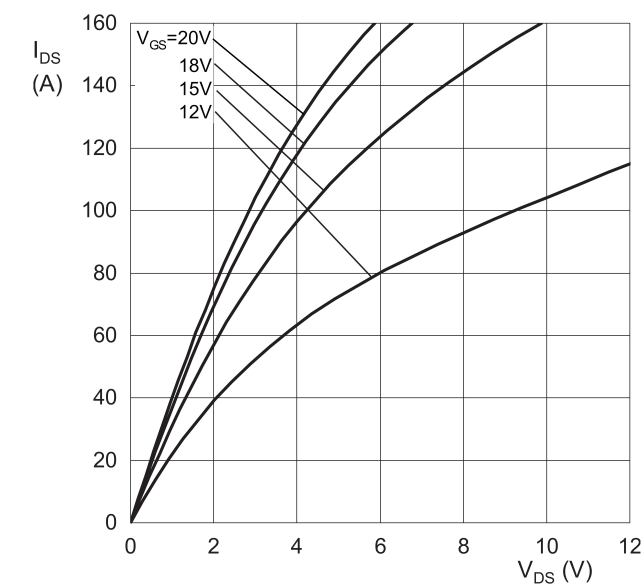
Continuous Drain Current/连续漏电流与壳温
 $I_{DS}=f(T_c); V_{GS} \geq 18V$



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

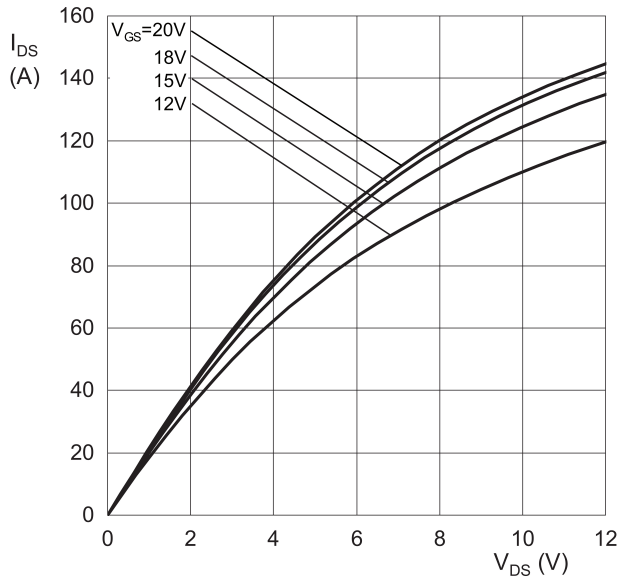


Typ Output Characteristic/典型输出特性
 $I_{DS}=f(V_{DS}); T_c=25^{\circ}C$

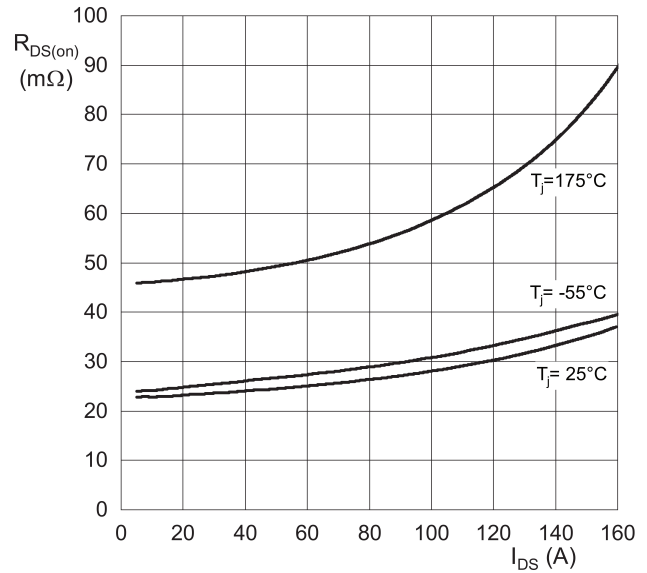




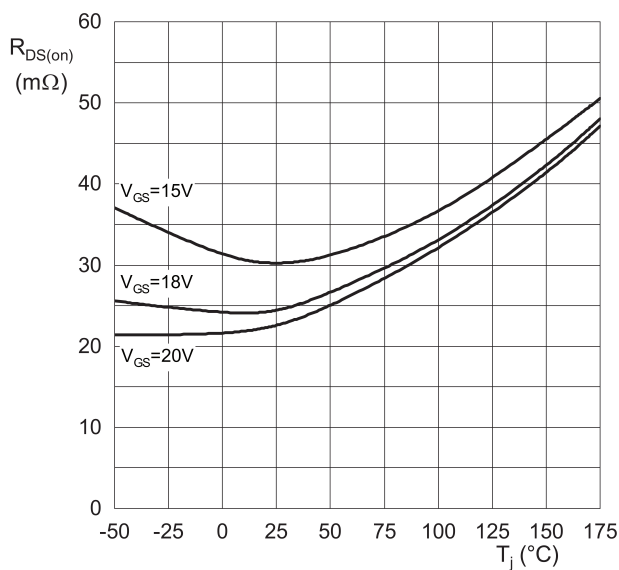
Typ output characteristic/典型输出特性
 $I_{DS}=f(V_{DS}); T_C=175^{\circ}\text{C}$



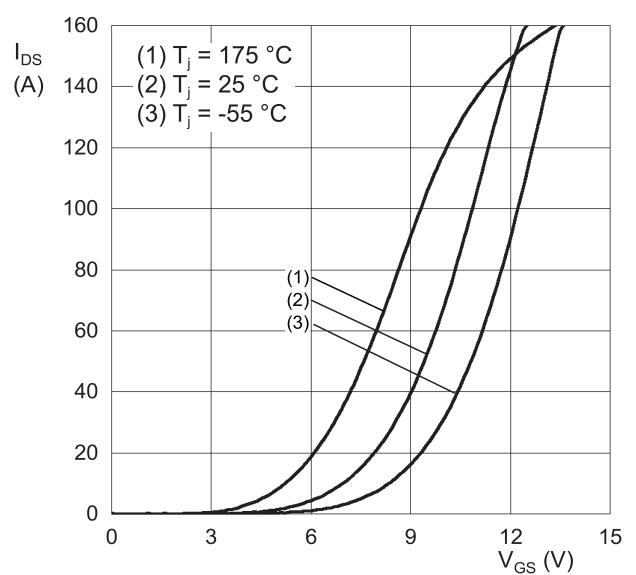
Typ.drain-source on-state resistance/典型漏源导通电阻
 $R_{DS(on)}=f(I_{DS}); V_{GS}=18\text{V}$



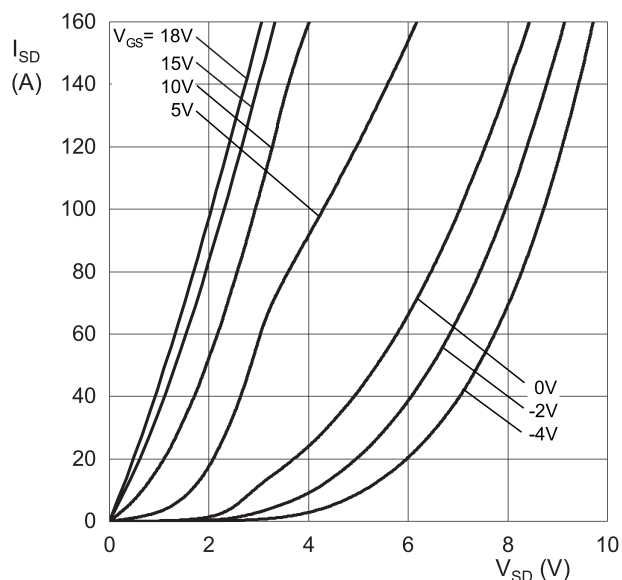
Drain-source on-state resistance/漏源导通电阻
 $R_{DS(on)}=f(T_J); I_{DS}=40\text{A}$



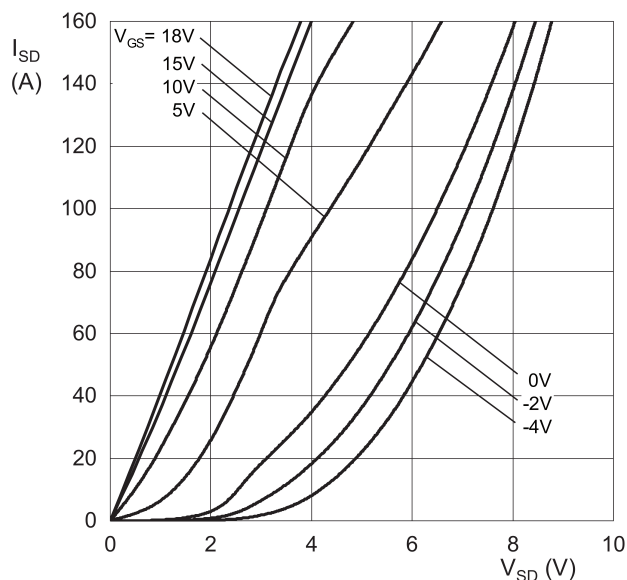
Typ Transfer characteristics/传输特性
 $I_{DS}=f(V_{GS}); V_{DS}=20\text{V}$



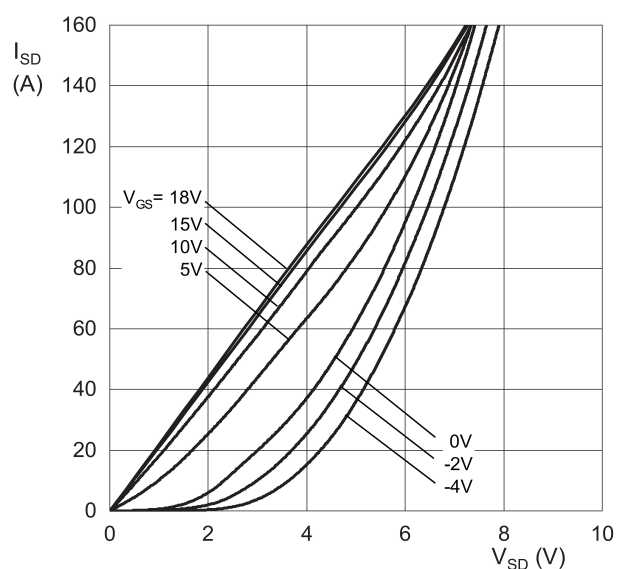
Typ.reverse drain current characteristics/典型二极管特性
 $I_{SD}=f(V_{SD})$; $T_C=-55^{\circ}\text{C}$



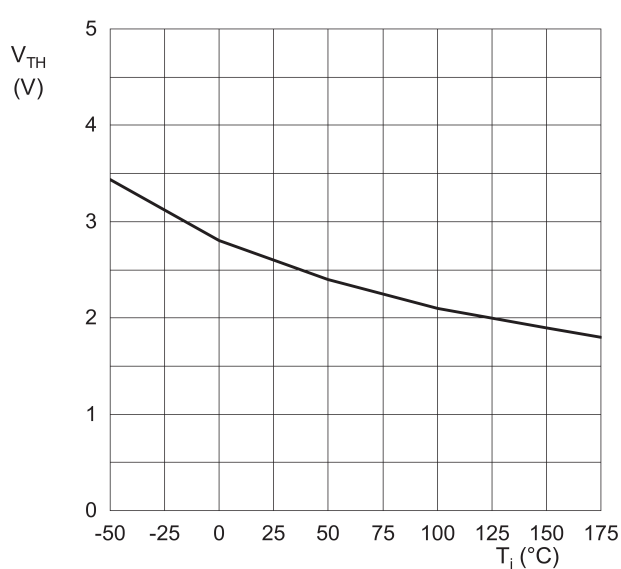
Typ.reverse drain current characteristics/典型二极管特性
 $I_{SD}=f(V_{SD})$; $T_C=25^{\circ}\text{C}$



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



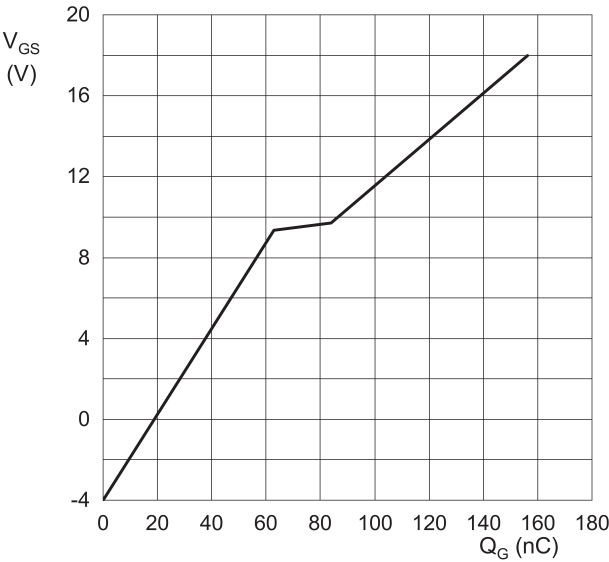
Typ.Gate threshold voltage/门级阈值电压结温特性
 $V_{Gsth}=f(T_j)$; $I_D=12\text{mA}$, $V_{DS}=V_{GS}$



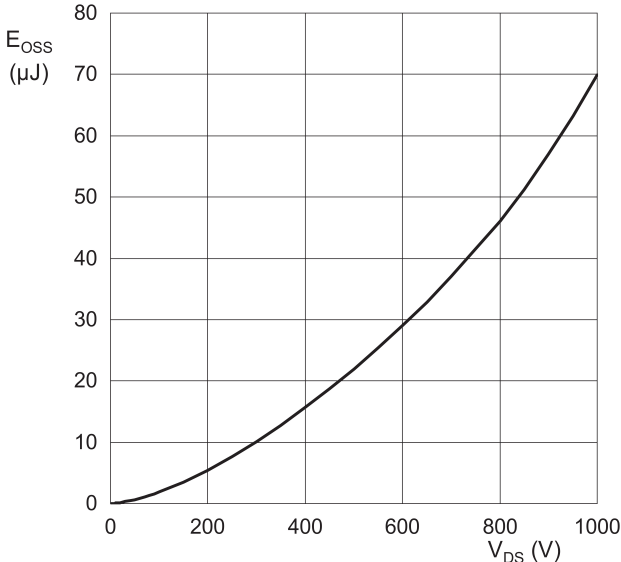
1200V N-Channel SiC MOSFET
HC024N120E7R



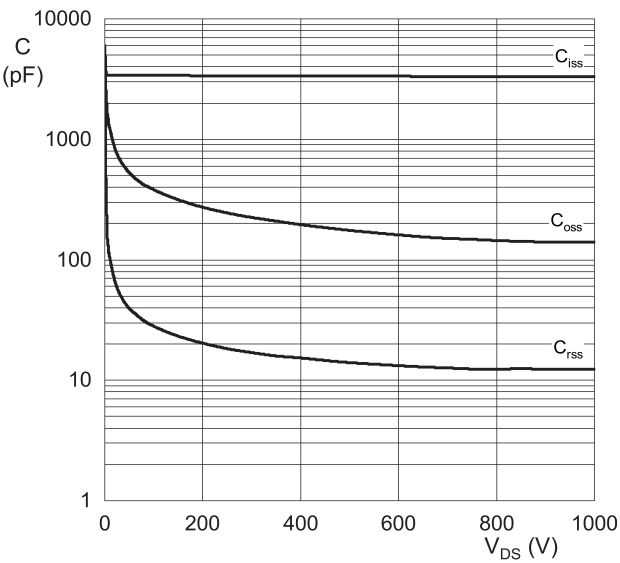
Typ.gate charge/典型门级电荷
 $V_{GS}=f(Q_G)$; $I_{DS}=40A, I_{GS}=0.1mA, V_{DS}=800V$



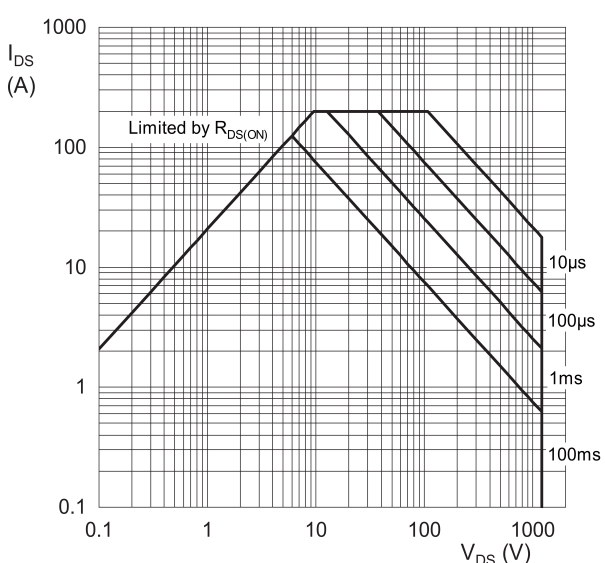
Typ.Coss stored energy/典型Coss存储能量
 $E_{OSS}=f(V_{DS})$



Typ. capacitances/典型电容特性
 $C=f(V_{DS})$; $V_{GS}=0V$

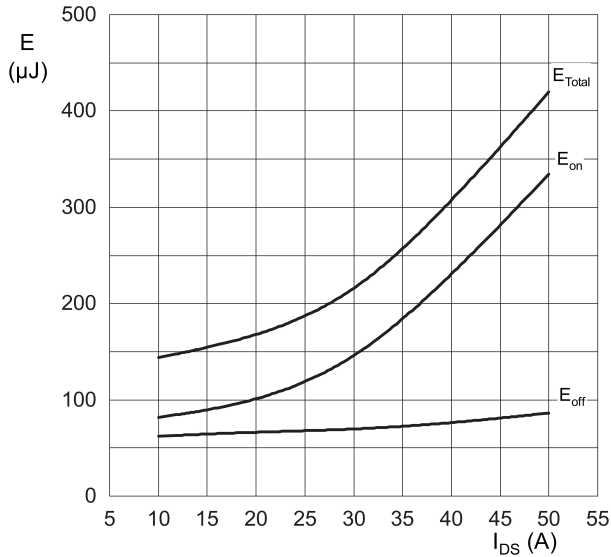


Forward bias safe operating area/安全工作区
 $I_D=f(V_{DS})$; $T_C=25^\circ C, D=0$

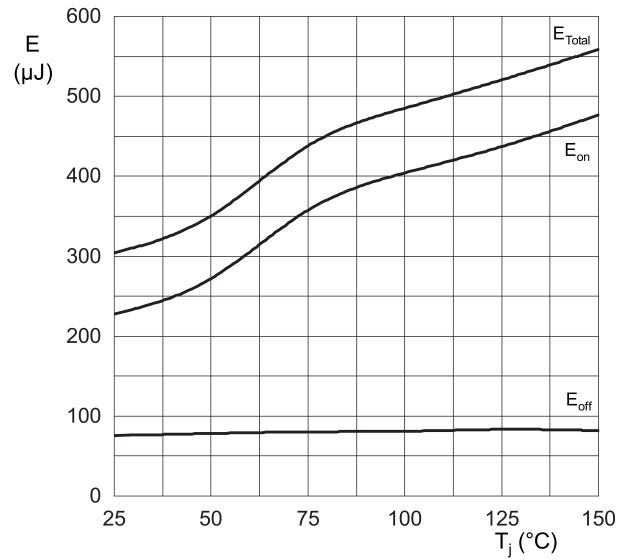




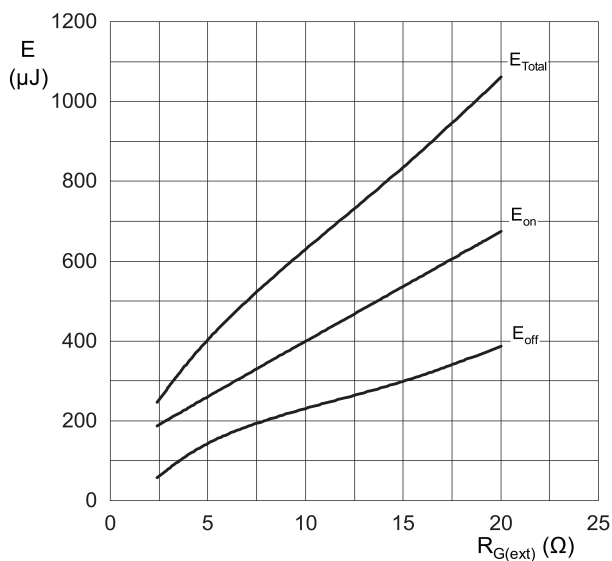
Typ. Switching Losses vs current /动态损耗-电流特性
 $E=f(I_D)$; $V_{GS}=-4/18V$, $R_G=3.6\Omega$, $V_{DD}=800V$, $T_J=25^\circ C$



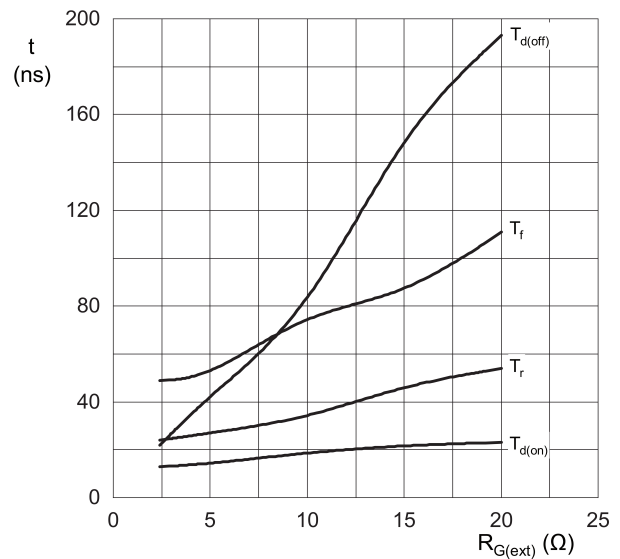
Typ. Switching losses vs temperature/动态损耗-结温特性
 $E=f(T_J)$; $V_{GS}=-4/18V$, $R_G=3.6\Omega$, $V_{DD}=800V$, $I_D=40A$



Typ. Switching losses vs resistance/动态损耗-门级电阻特性
 $E=f(R_G)$; $V_{GS}=-4/18V$, $V_{DD}=800V$, $I_D=40A$, $T_J=25^\circ C$



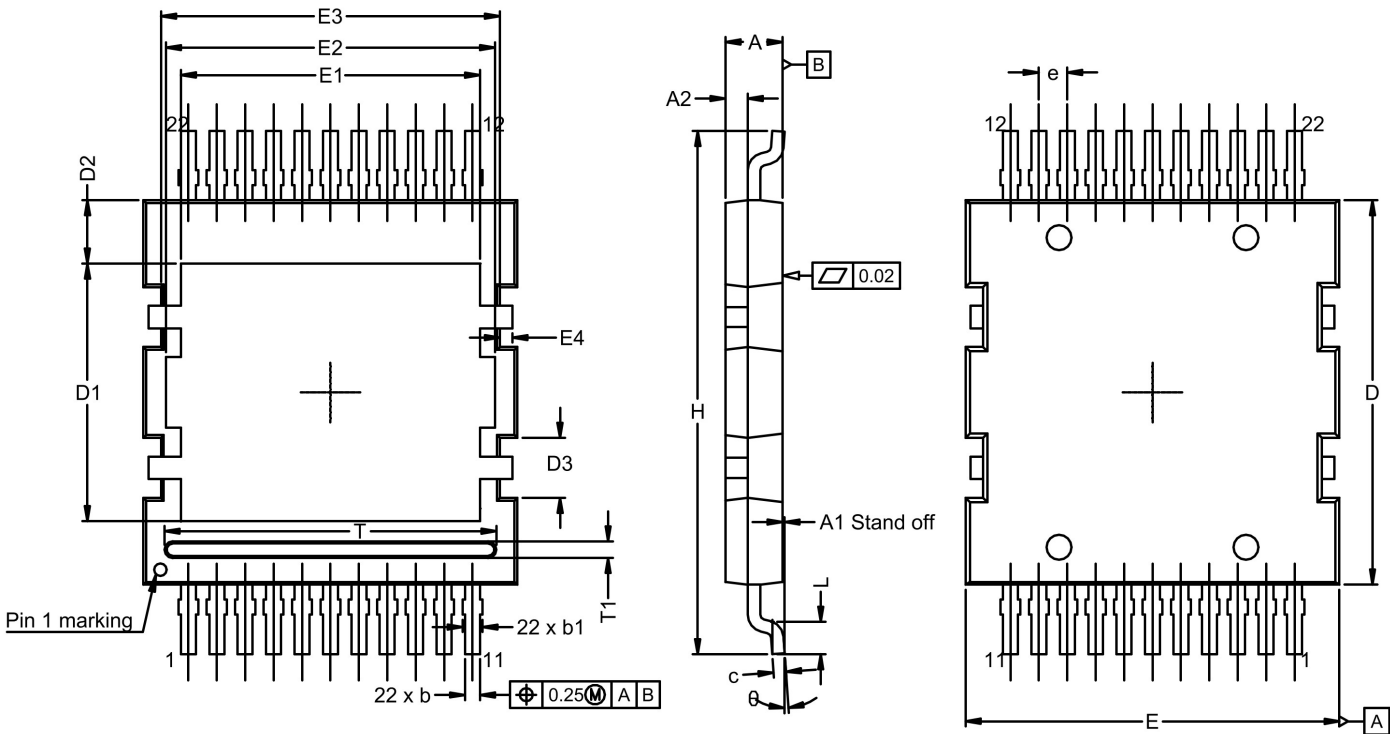
Typ. Switching times vs resistance/开关时间-门级电阻特性
 $t=f(R_G)$; $V_{GS}=-4/18V$, $V_{DD}=800V$, $I_D=40A$, $T_J=25^\circ C$





5. Package outline
封装外形

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



DIM SYMBOL	MIN.	NOM.	MAX.
A	2.200	2.300	2.350
A1	0.000	---	0.150
A2	0.800	0.900	1.000
b	0.500	0.600	0.700
b1	0.500	---	0.900
c	0.460	0.500	0.580
e	1.140 BSC		
D	15.300	15.400	15.500
D1	10.23	10.320	10.43
D2	2.540 REF.		
D3	2.400 REF.		
E	14.900	15.000	15.100
E1	11.910	12.010	12.110
E2	13.200 REF.		
E3	13.600 REF.		
E4	0.500 REF.		
H	20.810	20.960	21.110
L	1.200	1.300	1.400
θ	0°	---	8°
T	13.210	13.310	13.410
T1	0.500	0.670	0.700

NOTES/注:
ALL METAL SUFACES ARE TIN PLATED,EXCEPT AREA OF CUT.
除切割区域外，所有金属表面均为镀锡。



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]

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