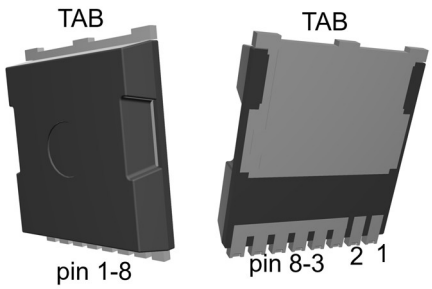
# DATA SHEET

海明微半导体
HIMINGWAY

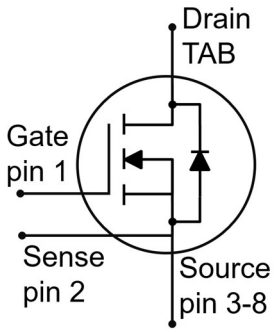
# HC034N065C7R

**650V 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
- Battery formation instrument
  电池化成设备
- PV MPPT and inverters
  光伏最大功率点追踪与逆变器
- 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 |
|---|---|---|
| $V_{DSS}$ | 650 | V |
| $R_{DS(on)}$,typ | 34 | mΩ |
| $I_{DM}$ | 163 | A |

| Type/型号 | Package/封装 | Marking/标识 | Packaging method/包装方式 |
|---|---|---|---|
| HC034N065C7R | TOLL | HC034N065R | Tape and Reel/卷带包装 |

# 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<br>参数 | Symbol<br>符号 | Test conditions<br>测试条件 | Value<br>值 | Unit<br>单位 |
|---|---|---|---|---|
| Drain-source voltage<br>漏极-源极电压 | $V_{DSS}$ | $T_j$≥25°C | 650 | V |
| Drain current[1]<br>连续漏极电流 | $I_D$ | $T_C$=25°C,$V_{GS}$=18V | 81 | A |
| | | $T_C$=100°C,$V_{GS}$=18V | 58 | |
| Peak drain current[2]<br>峰值漏极电流 | $I_{DM}$ | $T_C$≤175°C | 163 | A |
| Continuous diode current[1]<br>连续二极管电流 | $I_S$ | $T_C$=25°C,$V_{GS}$=-4V | 59 | A |
| Peak diode current[2]<br>峰值二极管电流 | $I_{SM}$ | $T_C$=25°C,$V_{GS}$=-4V | 163 | A |
| Maximum gate source voltage<br>栅源最大电压 | $V_{GS.MAX}$ | | -10~22 | V |
| Recommend gate source voltage<br>推荐的栅源电压 | $V_{GS.op}$ | | -4~18 | V |
| Avalanche energy, single pulse<br>单脉冲雪崩能量 | $E_{AS}$ | $I_{AS}$=17.2A,$V_{DD}$=100V,L=1mH | 147 | mJ |
| Power dissipation[1]<br>总耗散功率 | $P_{tot}$ | $T_C$=25°C | 306 | W |
| | | $T_C$=100°C | 153 | |

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<br>参数 | Symbol<br>符号 | Test conditions<br>测试条件 | Value/值 | | | Unit<br>单位 |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Storage Temperature<br>存储温度 | $T_{stg}$ | | -55 | | 175 | °C |
| Operating junction Temperature<br>工作结温 | $T_j$ | | -55 | | 175 | °C |
| Thermal resistance, junction-case<br>结-壳热阻 | $R_{th(j-c)}$ | | | 0.49 | | K/W |
| Thermal resistance, junction-ambient<br>结-环境热阻 | $R_{th(j-a)}$ | | | 40 | | K/W |
| Soldering temperature, reflow solderin<br>焊接温度，回流焊 | $T_{sold}$ | reflow MSL1 | | | 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 | | 650 | | | V |
| Gate threshold voltage 门极开启阀值电压 | $V_{GS(th)}$ | $I_D$=6mA,$V_{DS}$=$V_{GS}$ | $T_j$=25°C | 1.9 | 2.6 | 3.5 | V |
| | | | $T_j$=175°C | | 1.9 | | |
| Drain-source on-state resistance 漏极-源极导通电阻 | $R_{DS(on)}$ | $I_D$=25A,$V_{GS(on)}$=15V | $T_j$=25°C | | 43 | | mΩ |
| | | $I_D$=25A,$V_{GS(on)}$=18V | $T_j$=25°C | | 34 | 45 | |
| | | | $T_j$=175°C | | 41 | | |
| Zero gate voltage drain current 集电极-发射极漏电 | $I_{DSS}$ | $V_{DS}$=650V,$V_{GS}$=0V | $T_j$=25°C | | 0.1 | 50 | μA |
| | | | $T_j$=175°C | | 5 | | |
| Gate to source Leakage current 门极-源极漏电流 | $I_{GSS}$ | $V_{DS}$=0V,$V_{GS}$=22V,$T_j$=25°C | | | | 100 | nA |
| | | $V_{DS}$=0V,$V_{GS}$=-10V,$T_j$=25°C | | | | 100 | |
| Forward transconductance 正向跨导 | $g_{fs}$ | $I_D$=25A,$V_{DS}$=20V | | | 18 | | S |
| Integrated gate resistor 内部门极电阻 | $R_G$ | f=1MHz | | | 1.15 | | Ω |

**Table 4 Dynamic characteristics/动态特性**

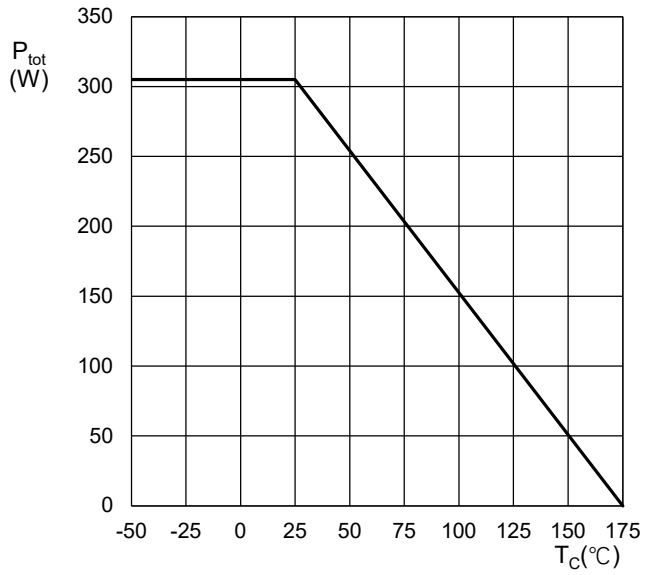
| Parameter<br>参数 | Symbol<br>符号 | Test conditions<br>测试条件 | Value/值 | | | Unit<br>单位 |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Total gate charge<br>总栅极电荷 | $Q_{G(tot)}$ | $V_{DD}$=400V,<br>$I_D$=25A,<br>$V_{GS}$=-4/18V | | 73 | | nC |
| Gate source charge<br>栅-源极电荷 | $Q_{GS}$ | | | 30 | | |
| Gate-drain charge<br>栅-漏极电荷 | $Q_{GD}$ | | | 8.6 | | |
| Input capacitance<br>输入电容 | $C_{iss}$ | $V_{DS}$=400V,<br>$V_{GS}$=0V,<br>f=1MHz | | 1745 | | pF |
| Output capacitance<br>输出电容 | $C_{oss}$ | | | 149 | | |
| Reverse transfer capacitance<br>反向传输电容 | $C_{rss}$ | | | 11 | | |
| Coss stored energy<br>输出电容存储能量 | $E_{oss}$ | Calculated based on $C_{oss}$ | | 11.9 | | μJ |
| Turn-On Delay Time<br>开启延迟时间 | $t_{d(on)}$ | $V_{DD}$=400V,<br>$I_D$=12.5A,<br>$V_{GS}$=-4/18V,<br>$R_{G(ext)}$=5.1Ω,<br>L=100μH | | 9 | | ns |
| Rise time<br>上升时间 | $t_r$ | | | 11 | | |
| Turn-Off Delay Time<br>关闭延迟时间 | $t_{d(off)}$ | | | 29 | | |
| Turn-Off Fall Time<br>下降时间 | $t_f$ | | | 13 | | |
| Turn-on switch loss<br>单次开启损耗 | $E_{on}$ | | | 74 | | μJ |
| Turn-off switch loss<br>单次关闭损耗 | $E_{off}$ | | | 12 | | |

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

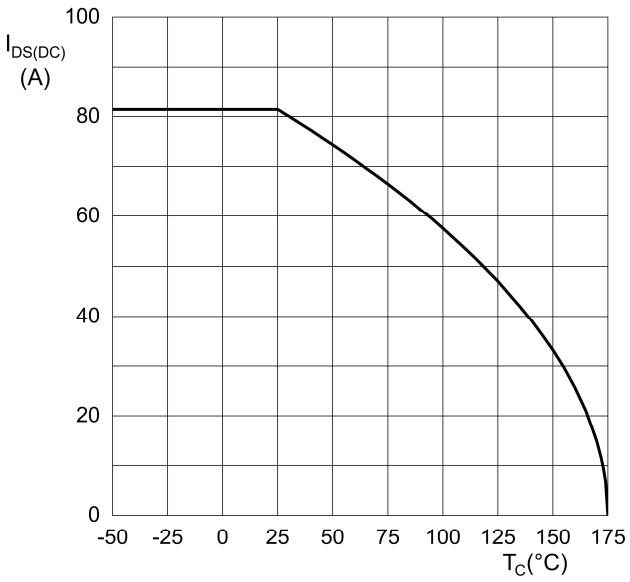
| Parameter<br>参数 | Symbol<br>符号 | Test conditions<br>测试条件 | Value/值 | | | Unit<br>单位 |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Drain-source reverse voltage<br>体二极管正向压降 | $V_{SD}$ | $I_S$=25A,$V_{GS}$=0V,$T_j$=25°C | | 3.7 | | V |
| | | $I_S$=25A,$V_{GS}$=-4V,$T_j$=25°C | | 4.2 | | |
| | | $I_S$=25A,$V_{GS}$=-4V,$T_j$=175°C | | 3.7 | | |
| MOSFET forward recovery time<br>MOSFET正向恢复时间 | $t_{fr}$ | $V_{DS}$=400V,<br>$I_S$=25A,<br>-di$_S$/dt=500A/μs | | 27.7 | | ns |
| MOSFET forward recovery charge<br>MOSFET正向恢复电荷 | $Q_{fr}$ | | | 77.4 | | nC |
| MOSFET peak forward recovery current<br>MOSFET正向恢复峰值电流 | $I_{frm}$ | | | 5.6 | | A |

# 4. Electrical characteristics diagrams
## 电气特性图表

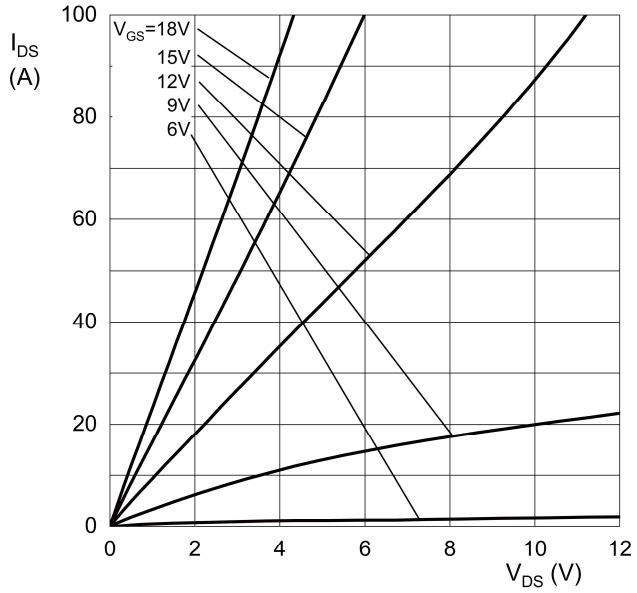
**Power dissipation/耗散功率**
**$P_{tot}=f(T_C)$;**



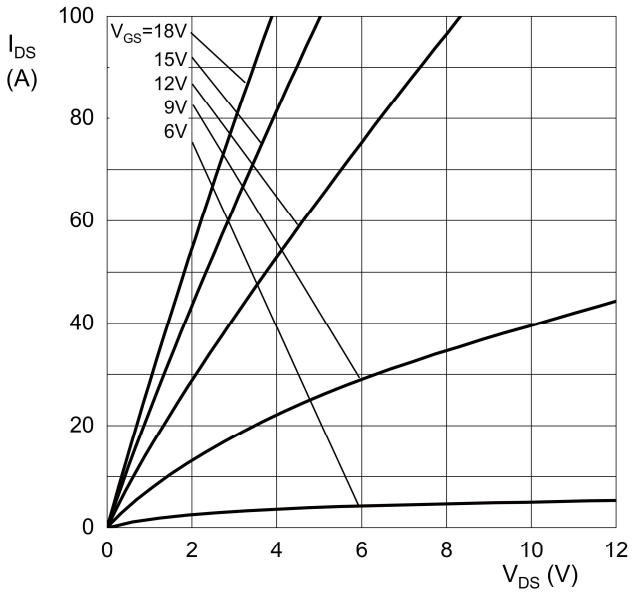

**Continuous drain current/连续漏电与壳温**
**$I_{DS}=f(T_C)$; $V_{GS}\geq 18V$**



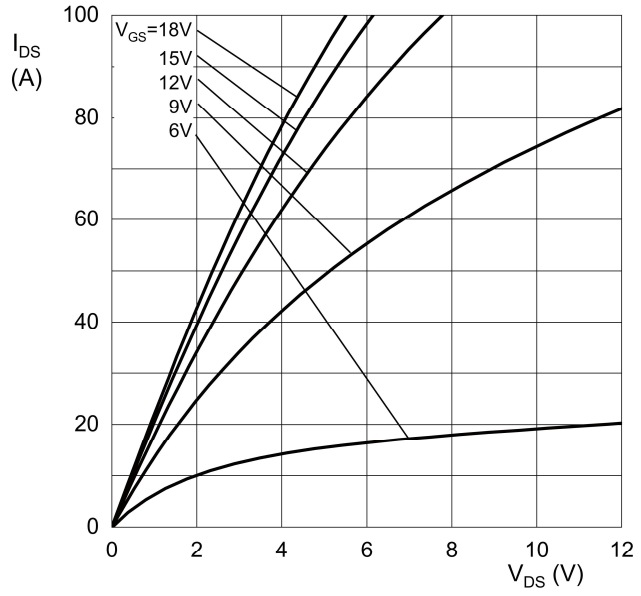

**Typ.Output characteristic/典型输出特性**
**$I_{DS}=f(V_{DS})$; $T_C$=-55℃**



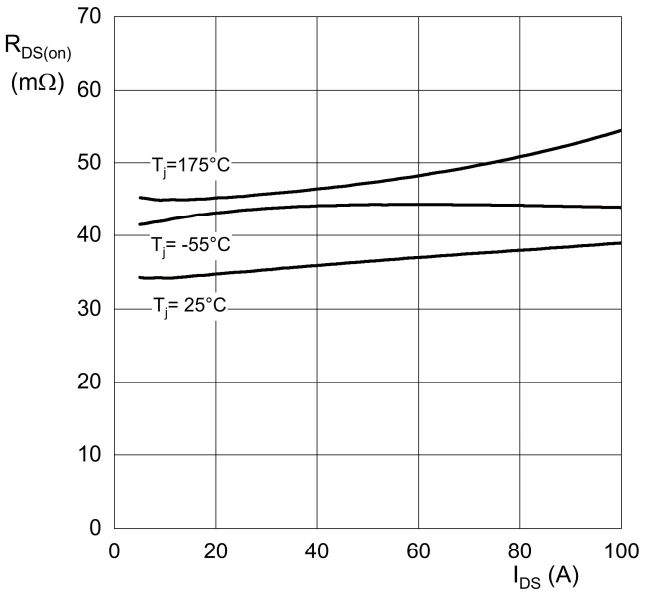

**Typ.Output characteristic/典型输出特性**
**$I_{DS}=f(V_{DS})$; $T_C$=25℃**



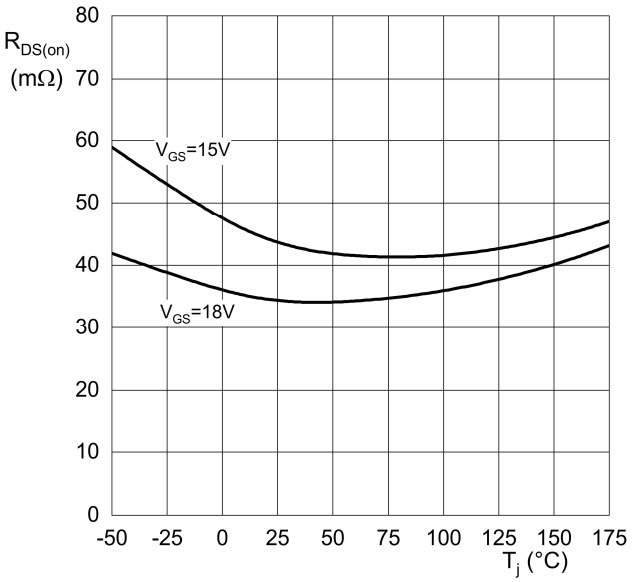
**Typ.Output characteristic/典型输出特性**
**$I_{DS}$=f($V_{DS}$); $T_C$=175℃**



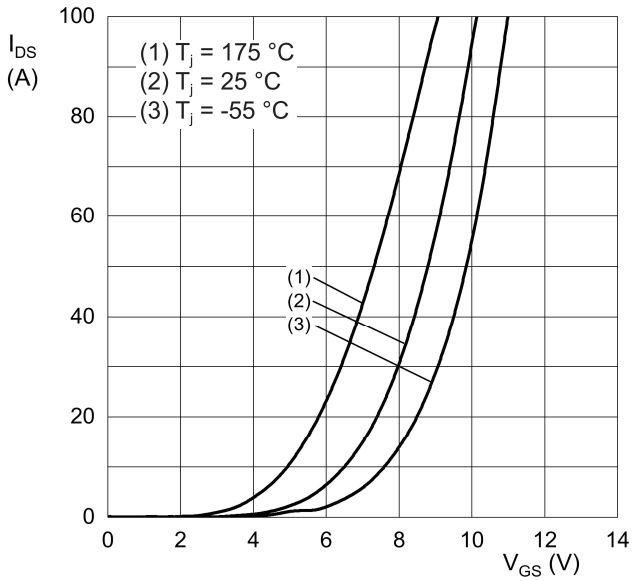

**Typ.Drain-source on-state resistance/典型漏源导通电阻**
**$R_{DS(on)}$=f($I_{DS}$); $V_{GS}$=18V**



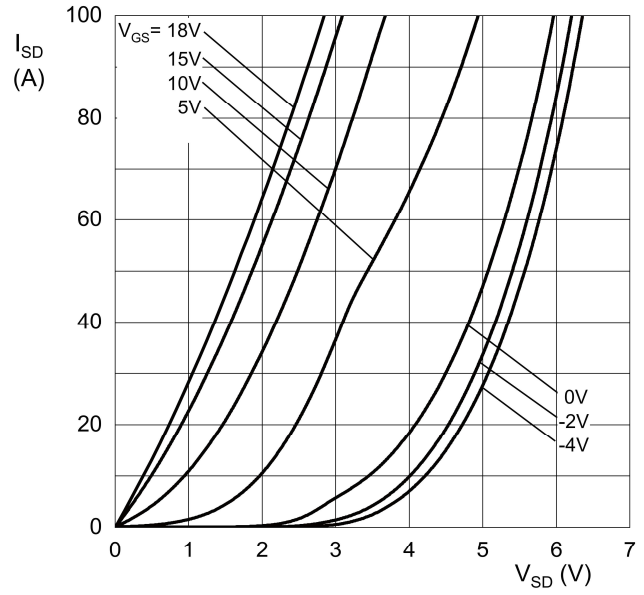

**Typ.Drain-source on-state resistance/漏源导通电阻**
**$R_{DS(on)}$=f($T_j$); $I_{DS}$=25A**



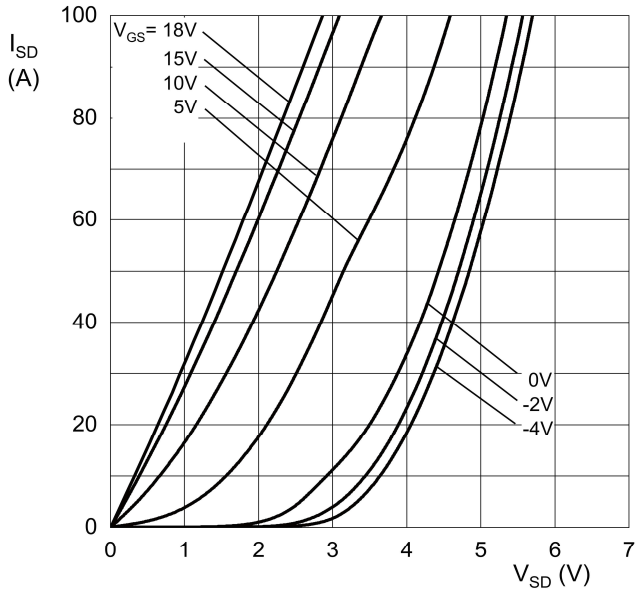

**Typ.Transfer characteristics/传输特性**
**$I_{DS}$=f($V_{GS}$); $V_{DS}$=20V**



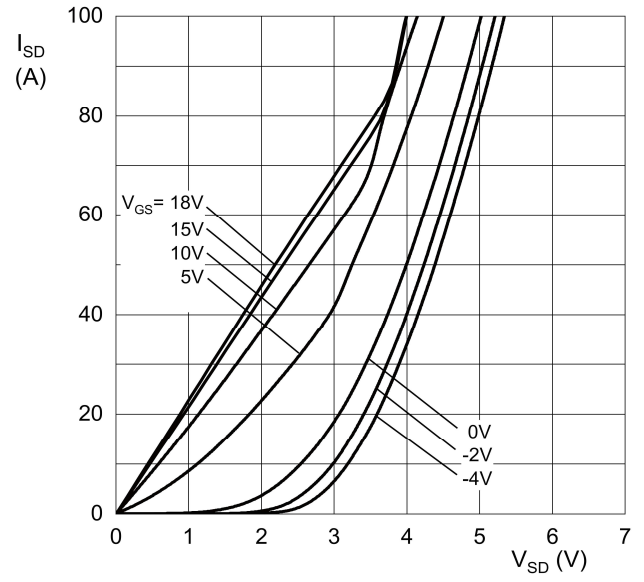
**Typ.Reverse drain current characteristics/典型二极管特性**
**$I_{SD}=f(V_{SD})$; $T_C$=-55℃**



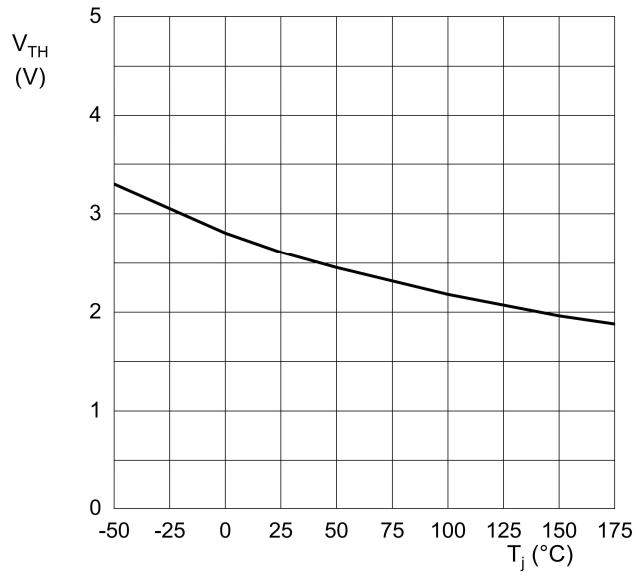

**Typ.Reverse drain current characteristics/典型二极管特性**
**$I_{SD}=f(V_{SD})$; $T_C$=25℃**



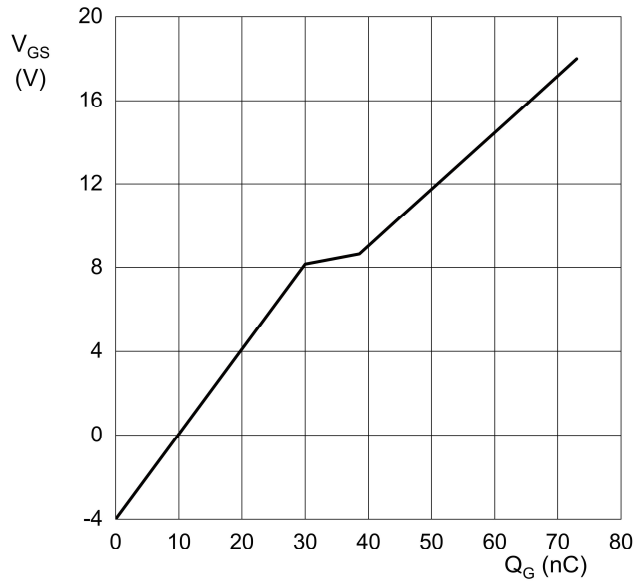

**Typ.Reverse drain current characteristics/典型二极管特性**
**$I_{SD}=f(V_{SD})$; $T_C$=175℃**



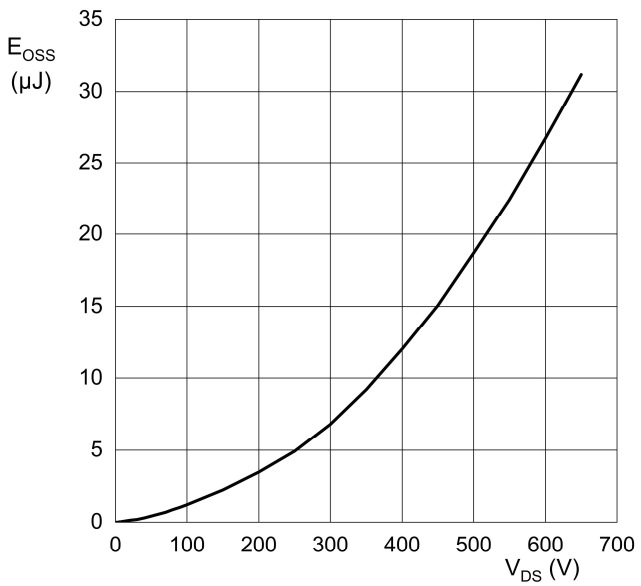

**Typ.Gate threshold voltage/门级阈值电压结温特性**
**$V_{GSth}=f(T_j)$; $I_D$=6mA,$V_{DS}=V_{GS}$**



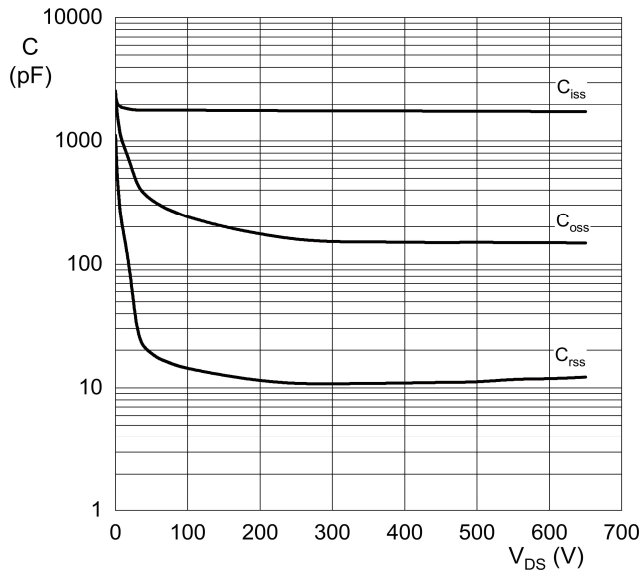
**Typ.Gate charge/典型门级电荷**
**$V_{GS}$=f($Q_G$); $I_{DS}$=25A,$I_{GS}$=0.1mA,$V_{DS}$=400V**



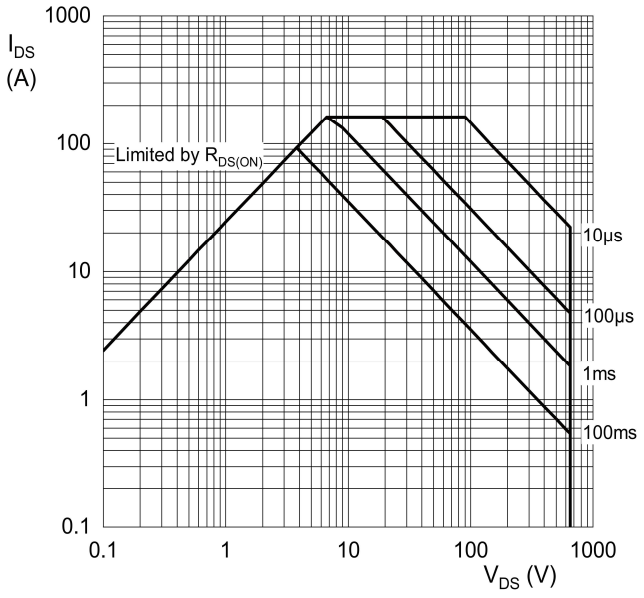

**Typ.Coss stored energy/典型Coss存储能量**
**$E_{OSS}$=f($V_{DS}$);**



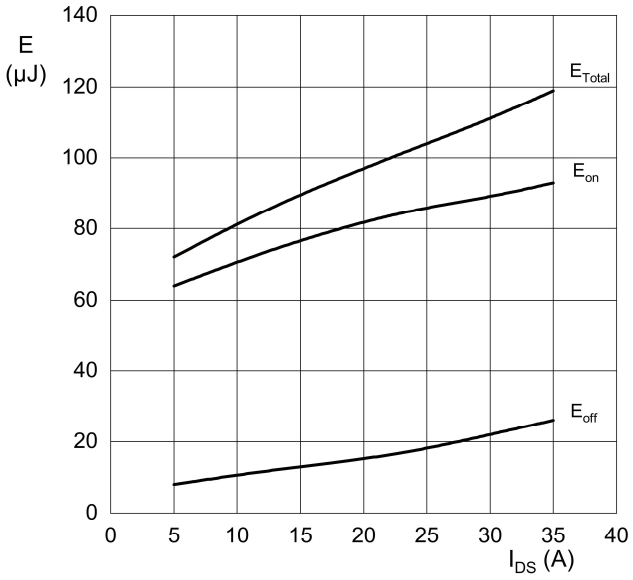

**Typ. Capacitances/典型电容特性**
**C=f($V_{DS}$); $V_{GS}$=0V**



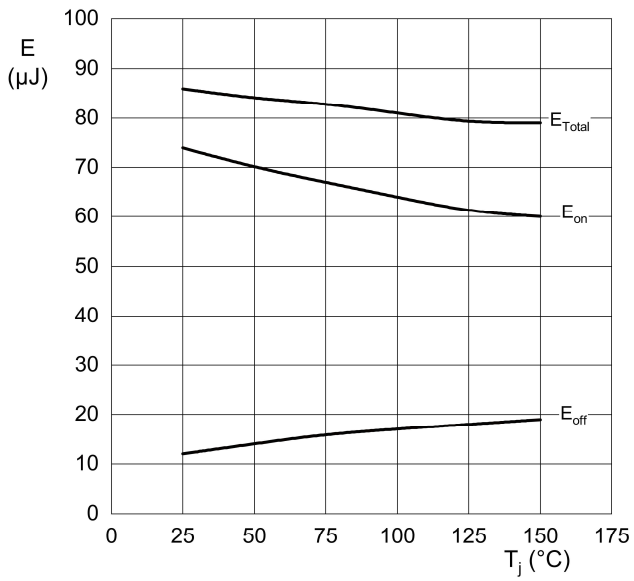

**Forward bias safe operating area/安全工作区**
**$I_D$=f($V_{DS}$);$T_C$=25℃,D=0**



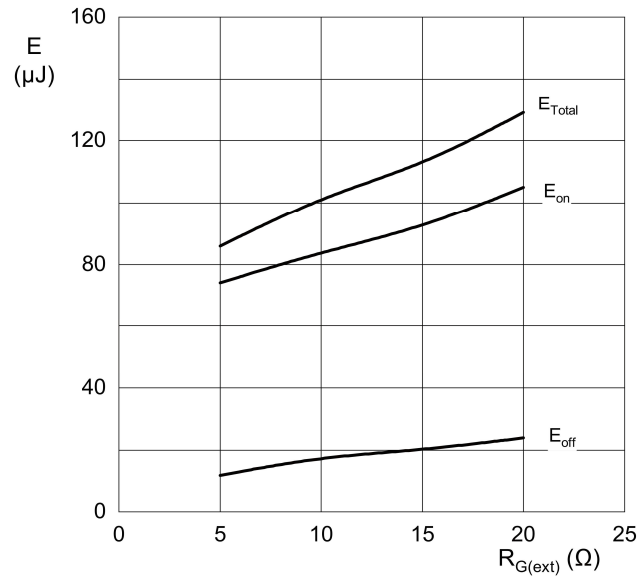
**Typ.Switching losses vs current /动态损耗-电流特性**
**$E=f(I_D)$; $V_{GS}$=-4/18V,$R_G$=5.1Ω,$V_{DD}$=400V,$T_j$=25℃**



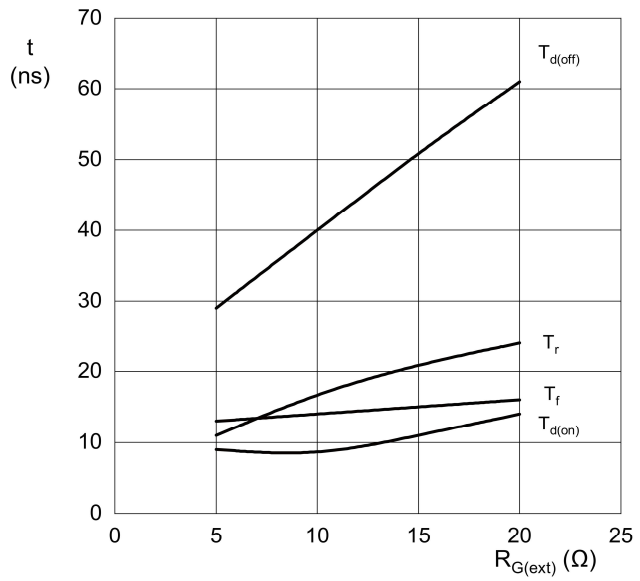

**Typ.Switching losses vs temperature/动态损耗-结温特性**
**$E=f(T_j)$;$V_{GS}$=-4/18V,$R_G$=5.1Ω,$V_{DD}$=400V,$I_D$=12.5A**




**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,$I_D$=12.5A,$T_j$=25℃**



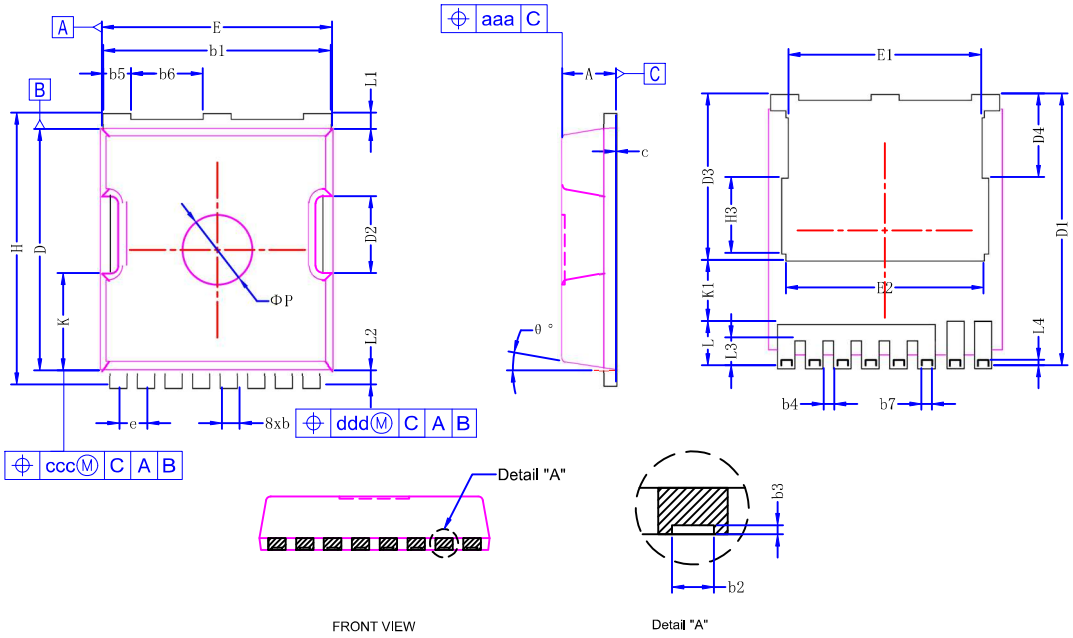

**Typ.Switching times vs resistance/开关时间-门级电阻特性**
**t=f($R_G$); $V_{GS}$=-4/18V,$V_{DD}$=400V,$I_D$=12.5A,$T_j$=25℃**



# 5. Package outline

## 封装外形

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




| SYMBOL | COMMON MILLIMETER | | | SYMBOL | COMMON MILLIMETER | | |
|---|---|---|---|---|---|---|---|
| | MIN. | NOMINAL | MAX. | | MIN. | NOMINAL | MAX. |
| A | 2.2 | 2.3 | 2.4 | E | 9.8 | 9.9 | 10 |
| b | 0.7 | 0.8 | 0.9 | E1 | 8.2 | 8.3 | 8.4 |
| b1 | 9.7 | 9.8 | 9.9 | E2 | 8.35 | 8.5 | 8.65 |
| b2 | 0.36 | 0.45 | 0.55 | H | 11.5 | 11.68 | 11.85 |
| b3 | 0.05 | 0.1 | 0.35 | H3 | 3.16 | 3.26 | 3.36 |
| b4 | 0.3 | 0.4 | 0.5 | K | 4.08 | 4.18 | 4.28 |
| b5 | 1.1 | 1.2 | 1.3 | K1 | 2.45 | --- | --- |
| b6 | 3 | 3.1 | 3.2 | L | 1.6 | 1.9 | 2 |
| b7 | 0.39 | 0.45 | 0.51 | L1 | 0.5 | 0.7 | 0.9 |
| c | 0.4 | 0.5 | 0.6 | L2 | 0.5 | 0.6 | 0.7 |
| D | 10.28 | 10.38 | 10.55 | L3 | 1 | 1.2 | 1.3 |
| D1 | 10.98 | 11.08 | 11.18 | L4 | 0.13 | 0.23 | 0.33 |
| D2 | 3.2 | 3.3 | 3.4 | L5 | 0.13 | 0.23 | 0.33 |
| D3 | 7 | 7.15 | 7.3 | P | 2.85 | 3 | 3.15 |
| D4 | 3.44 | 3.59 | 3.74 | θ | 10°REF | | |
| e | 1.1 | 1.2 | 1.3 | aaa | 0.2 | | |
| | | | | ccc | 0.2 | | |
| | | | | ddd | 0.25 | | |

NOTES:/注

- Refer to JEDEC MO-299/请参阅 JEDEC MO-299
- All dimension are in millimeters, angles in degrees/所有尺寸均以毫米为单位，角度以度为单位
- Dimension D, D2, E, K not include mold flash, protrusions or gate burrs/尺寸 D、D2、E、K 不包括模具飞边、突起或浇口毛刺。
- Mold flash, protrusions or gate burrs shall not exceed 0.25mm per end/模具飞边、突起或浇口毛刺每端不得超过 0.25mm。

# 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.

**【数据与设计指引】**

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**[Copyright and Revision Management]**

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**[Application Safety and Intellectual Property]**

Our product supply does not confer any license or right under any third-party intellectual property. Customers are fully responsible for the patent clearance and functional safety of their end application. Furthermore, this product is not intended for use in life-critical or high-risk systems (such as Class III medical devices or aerospace control) unless explicitly approved by us through a dedicated high-reliability agreement.

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