



## BSPE60S75HN

### General Description

#### 概述

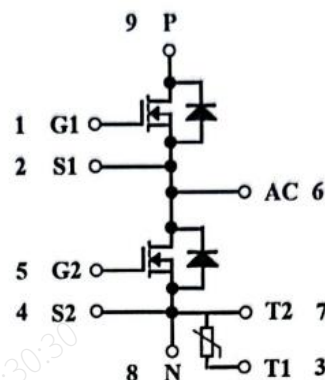
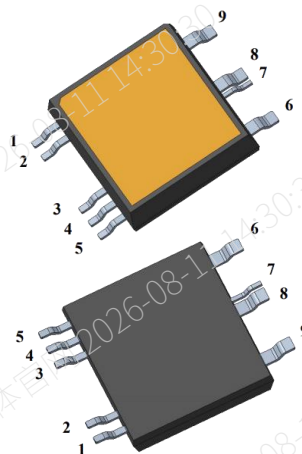
Specifically designed for Automotive applications, this SiC Power Half-bridge module utilizes the latest processing techniques to achieve extremely low on-resistance per unit area.

本产品是一款专为汽车应用设计的碳化硅功率半桥模块产品，采用了先进的工艺技术，产品的单位面积导通电阻低。

### Features

#### 特点

- High Speed Switching with Low Capacitances  
开关速度快，寄生电容小
- High Blocking Voltage with Low  $R_{DS(on)}$   
阻断电压高，开通电阻低
- 100% avalanche tested  
100%通过雪崩测试
- Halogen Free and RoHS Compliant  
无卤元素，符合 RoHS



### Typical Applications

#### 典型应用

- EV Charging  
EV 充电
- DC-AC Inverters  
DC-AC 转换器
- High Voltage DC/DC Converters  
高压 DC/DC 变压器
- Power Factor Correction Modules  
功率因子校正模块

### Ordering Information

#### 订货信息

| Type<br>型号  | $BV_{DSS}[V]$<br>漏极-源极电压 | $R_{DS(on)}[m\Omega]$<br>导通电阻 | $T_{jmax}[^{\circ}C]$<br>最高结温 | Marking<br>标记 | Packing<br>封装外形 |
|-------------|--------------------------|-------------------------------|-------------------------------|---------------|-----------------|
| BSPE60S75HN | 750                      | 60                            | 175                           | 60S75HN       | SOP9            |



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### Maximum Rated Values

#### 最大额定参数

| Parameter<br>参数                                                                          | Symbol<br>符号        | Value<br>数值 | Unit<br>单位       |
|------------------------------------------------------------------------------------------|---------------------|-------------|------------------|
| Drain-Source Voltage, $T_j \geq 25^\circ\text{C}$<br>漏-源电压, $T_j \geq 25^\circ\text{C}$  | $V_{\text{DSS}}$    | 750         | V                |
| Drain Current(continuous)at $T_c=25^\circ\text{C}$<br>常温下漏极电流(持续)                        | $I_{\text{D}}$      | 44          | A                |
| Drain Current(continuous)at $T_c=100^\circ\text{C}$<br>$T_c=100^\circ\text{C}$ 下漏极电流(持续) |                     | 31          |                  |
| Pulsed Drain current, $t_p$ limited by $T_j$ max<br>集电极脉冲电流, 脉宽时间受 $T_j$ max 限制          | $I_{\text{DM}}$     | 90          |                  |
| Gate-Source Voltage<br>栅极-源极电压                                                           | $V_{\text{GSS}}$    | -10/+22     | V                |
| Gate-Source Voltage<br>(Recommended operational values)<br>栅极-源极电压(推荐工作电压)               | $V_{\text{GSS}}$    | -5/+18      | V                |
| Power Dissipation $T_c = 25^\circ\text{C}$ (Fig.10)<br>常温耗散功率                            | $P_{\text{D}}$      | 187         | W                |
| Storage Temperature Range<br>储存温度范围                                                      | $T_{\text{J.Tstg}}$ | -55 to +175 | $^\circ\text{C}$ |
| Solder Temperature<br>焊接温度                                                               | $T_{\text{L}}$      | 260         |                  |
| Operating junction temperature Range<br>工作结温                                             | $T_{\text{J}}$      | -55 to +175 |                  |

**Caution:** These values must not be exceeded under any conditions.

注意：任何条件下都不能超出上述值。

### Thermal Resistance

#### 热阻

| Parameter<br>参数                                               | Symbol<br>符号          | Value<br>值 | Unit<br>单位         |
|---------------------------------------------------------------|-----------------------|------------|--------------------|
| Thermal Resistance, Junction to Case, Max.<br>结-管壳热阻 (Fig.11) | $R_{\theta\text{JC}}$ | 0.80       | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Ambient, Max.<br>结-环境热阻       | $R_{\theta\text{JA}}$ | 40         |                    |



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### Electrical Characteristic at $T_j = 25^\circ\text{C}$ (unless otherwise specified)

$T_j=25^\circ\text{C}$ 时电学特性（除非特别声明）

| Parameter<br>参数                                       | Symbol<br>符号        | Conditions<br>条件                                                                  | Value<br>值  |             |             | Unit<br>单位 |
|-------------------------------------------------------|---------------------|-----------------------------------------------------------------------------------|-------------|-------------|-------------|------------|
|                                                       |                     |                                                                                   | Min.<br>最小值 | Typ.<br>典型值 | Max.<br>最大值 |            |
| Static Characteristic<br>静态特性                         |                     |                                                                                   |             |             |             |            |
| Drain to Source Breakdown Voltage<br>漏极-源极电压击穿电压      | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V, I <sub>D</sub> =100uA,<br>T <sub>j</sub> =25°C               | 750         | -           | -           | V          |
| Zero Gate Voltage Drain Current<br>栅源短路的漏极电流          | I <sub>DSS</sub>    | V <sub>DS</sub> =750V, V <sub>GS</sub> =0V,<br>T <sub>j</sub> =25°C               | -           | -           | 100         | uA         |
| Gate to Body Leakage Current<br>栅极-源极漏泄电流             | I <sub>GSS</sub>    | V <sub>GS</sub> =22V, V <sub>DS</sub> =0V,<br>T <sub>j</sub> =25°C                | -           | -           | 100         | nA         |
| Gate to Body Leakage Current<br>栅极-源极漏泄电流             | I <sub>SGS</sub>    | V <sub>GS</sub> =-10V, V <sub>DS</sub> =0V,<br>T <sub>j</sub> =25°C               | -           | -           | 100         | nA         |
| Static Drain-source On Resistance(Fig.4)<br>漏极-源极通态电阻 | R <sub>DS(on)</sub> | V <sub>GS</sub> =18V, I <sub>D</sub> =20A,<br>T <sub>j</sub> =25°C                | -           | 50          | 70          | mΩ         |
|                                                       |                     | V <sub>GS</sub> =18V, I <sub>D</sub> =20A,<br>T <sub>j</sub> =175°C               | -           | 68          | -           |            |
| Gate Threshold Voltage(Fig.6)<br>栅极-源极阈值电压            | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =5mA,<br>T <sub>j</sub> =25°C  | 2.2         | 3.2         | 4.2         | V          |
|                                                       |                     | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =5mA,<br>T <sub>j</sub> =175°C |             | 2.3         |             |            |
| Gate Resistance<br>栅极电阻                               | R <sub>G</sub>      | f=1MHz, V <sub>AC</sub> =25mV                                                     | -           | 4.4         | -           | Ω          |

### Dynamic Characteristic

#### 动态特性

|                                        |              |                                                              |   |      |   |    |
|----------------------------------------|--------------|--------------------------------------------------------------|---|------|---|----|
| Input Capacitance(Fig.8)<br>输入电容       | $C_{iss}$    | $V_{DS}=400V,$<br>$f=1MHz,$<br>$V_{GS}=0V,$<br>$V_{AC}=25mV$ | - | 1940 | - | pF |
| Output Capacitance<br>输出电容             | $C_{oss}$    |                                                              | - | 144  | - |    |
| Reverse Transfer Capacitance<br>反向传输电容 | $C_{rss}$    |                                                              | - | 23   | - |    |
| Total Gate Charge(Fig.9)<br>栅极总电荷      | $Q_{g(tot)}$ | $V_{DS}=400V,$<br>$I_D=20A,$<br>$V_{GS}=-5/18V,$             | - | 75   | - | nC |
| Gate-source Charge<br>栅-源电荷            | $Q_{gs}$     |                                                              | - | 21   | - |    |
| Gate-drain Charge<br>栅-漏电荷             | $Q_{gd}$     |                                                              | - | 14   | - |    |



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### Switching Characteristic at $T_j=25^{\circ}\text{C}$ (Inductive Load)

$T_j=25^{\circ}\text{C}$ 时开关特性（电感负载）

| Parameter<br>参数                    | Symbol<br>符号        | Conditions<br>条件                                                                                                                            | Value<br>值  |             |             | Unit<br>单位 |
|------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------|-------------|------------|
|                                    |                     |                                                                                                                                             | Min.<br>最小值 | Typ.<br>典型值 | Max.<br>最大值 |            |
| MOSFET Characteristic<br>MOSFET 特性 |                     |                                                                                                                                             |             |             |             |            |
| Turn-on delay time<br>开通延迟时间       | t <sub>d(on)</sub>  | V <sub>DS</sub> =400V,<br>V <sub>GS</sub> =-5/18V,<br>I <sub>D</sub> =20A,<br>R <sub>G(ext)</sub> =5Ω,<br>L=200μH,<br>T <sub>J</sub> =25°C; | -           | 39          | -           | ns         |
| Rise time<br>上升时间                  | t <sub>r</sub>      |                                                                                                                                             | -           | 44          | -           |            |
| Turn-off delay time<br>关断延迟时间      | t <sub>d(off)</sub> |                                                                                                                                             | -           | 104         | -           |            |
| Fall time<br>下降时间                  | t <sub>f</sub>      |                                                                                                                                             | -           | 46          | -           |            |
| Turn-on Switching Energy<br>开通损耗   | E <sub>on</sub>     |                                                                                                                                             | -           | 290         | -           | μJ         |
| Turn-off Switching Energy<br>关断损耗  | E <sub>off</sub>    |                                                                                                                                             | -           | 240         | -           |            |

### SOURCE-DRAIN DIODE CHARACTERISTICS

源极-漏极二极管特性

|                                                                       |           |                                                                                                                                                 |   |     |   |    |
|-----------------------------------------------------------------------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------|---|-----|---|----|
| Source to Drain Diode Forward Voltage <sup>(Fig.7)</sup><br>源极-漏极正向电压 | $V_{SD}$  | $V_{GS}=-5\text{V},$<br>$I_{SD}=10\text{A},$<br>$T_j=25^{\circ}\text{C};$                                                                       | - | 3.4 | - | V  |
|                                                                       |           | $V_{GS}=-5\text{V},$<br>$I_{SD}=10\text{A},$<br>$T_j=175^{\circ}\text{C};$                                                                      | - | 2.8 | - |    |
| Continuous Diode Forward Current<br>正向电流                              | $I_S$     | $T_C=25^{\circ}\text{C};$                                                                                                                       | - | 30  | - | A  |
| Reverse recovery time<br>反向恢复时间                                       | $t_{rr}$  | $T_j=25^{\circ}\text{C},$<br>$V_{GS}=-5\text{V}/18\text{V},$<br>$V_R=400\text{V},$<br>$I_{SD}=20\text{A},$<br>$diF/dt=1000\text{A}/\mu\text{s}$ | - | 20  | - | ns |
| Recovered charge<br>恢复电荷                                              | $Q_{rr}$  |                                                                                                                                                 | - | 65  | - | nC |
| Peak reverse recovery current<br>反向峰值电流                               | $I_{rrm}$ |                                                                                                                                                 | - | 8   | - | A  |

Notes:

a: Repetitive Rating : Pulse width limited by maximum junction temperature

b: Essentially independent of operating temperature

注:

a: 重复范围：脉冲宽度受限于最大结温

b: 本质上与工作温度无关



## BSPE60S75HN

### Electrical characteristics diagram 特性曲线

Figure 1. Output Characteristics  $T_J = -55^\circ\text{C}$

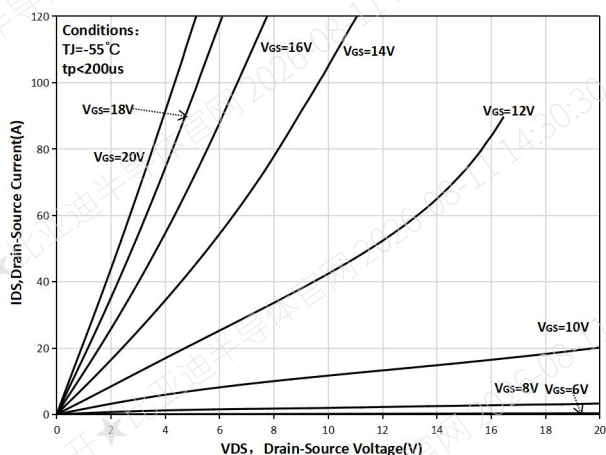


Figure 2. Output Characteristics  $T_J = 25^\circ\text{C}$

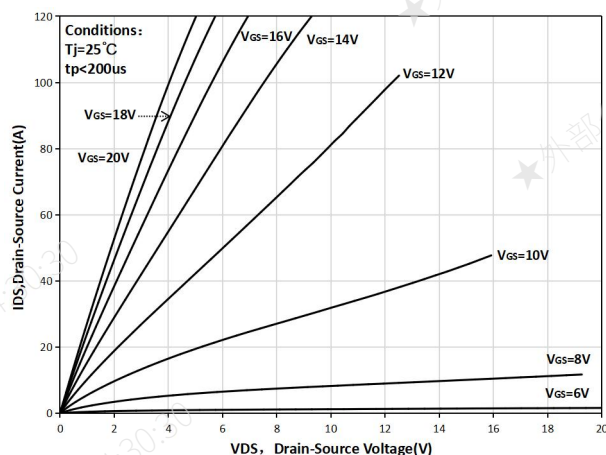


Figure 3. Output Characteristics  $T_J = 175^\circ\text{C}$

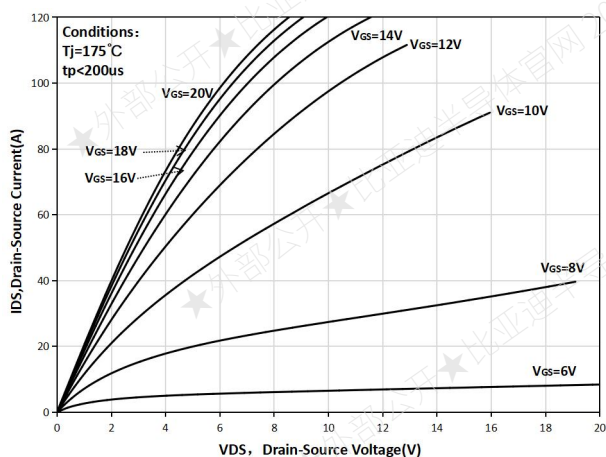


Figure 4. On-Resistance For Various Gate Voltage

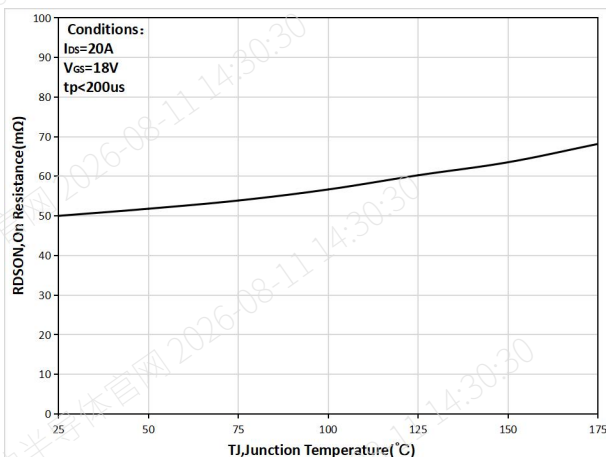


Figure 5. Transfer Characteristic  
for Various Junction Temperatures

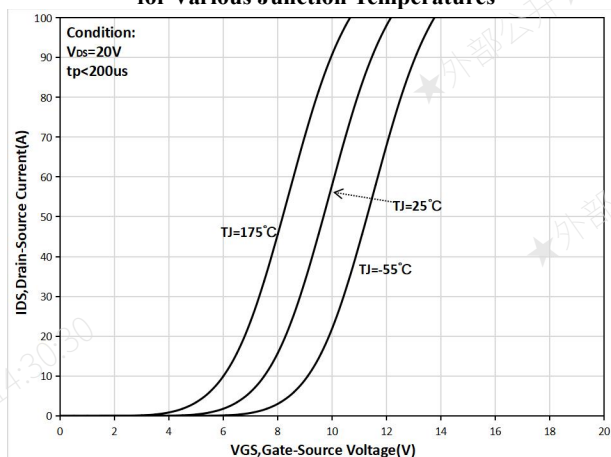
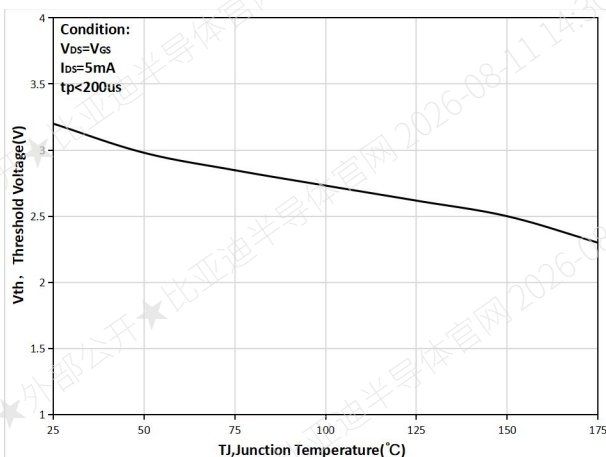


Figure 6. Threshold Voltage vs. Temperature





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Figure 7. Body Diode Characteristics at -55°C

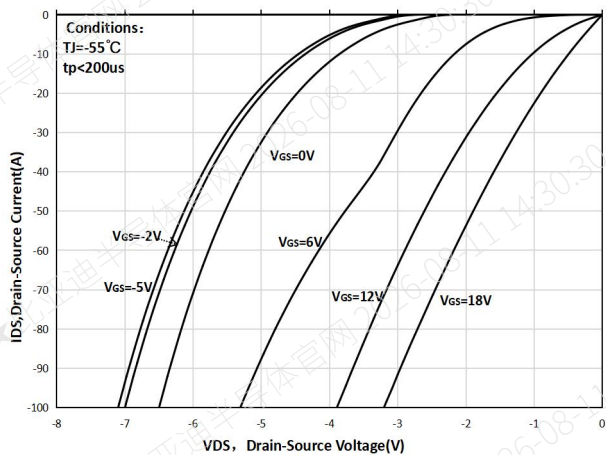


Figure 8. Body Diode Characteristics at 25°C

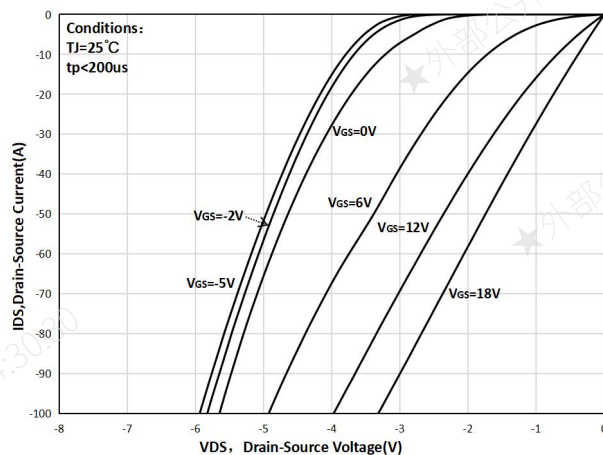


Figure 9. Body Diode Characteristics at 175°C

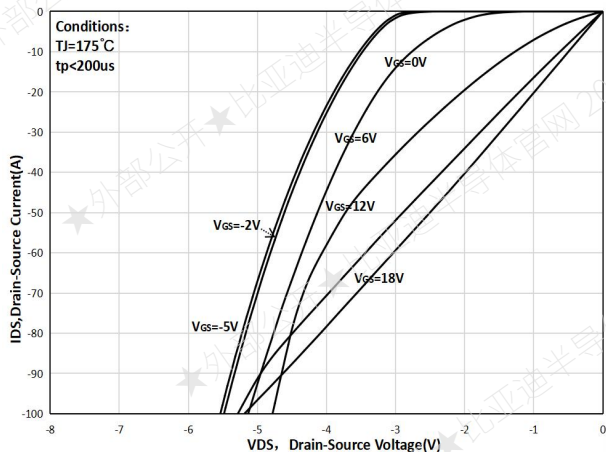


Figure 10. Capacitances vs. Drain-Source Voltage

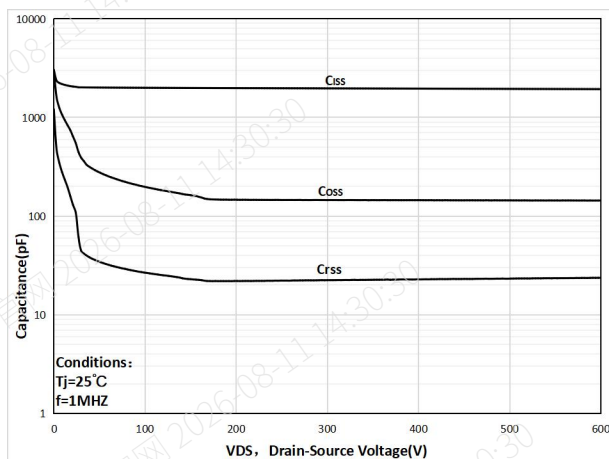


Figure 11. Gate Charge Characteristics

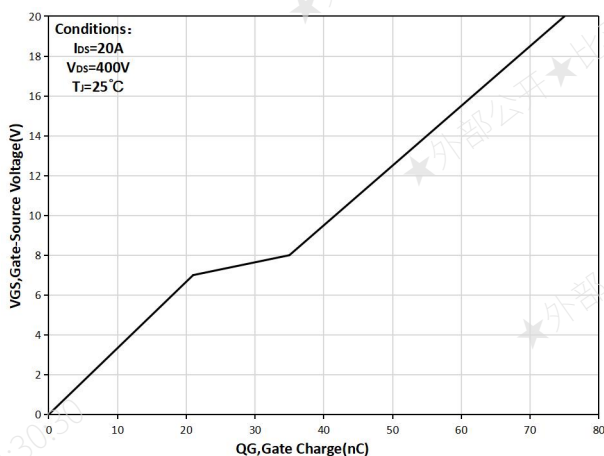
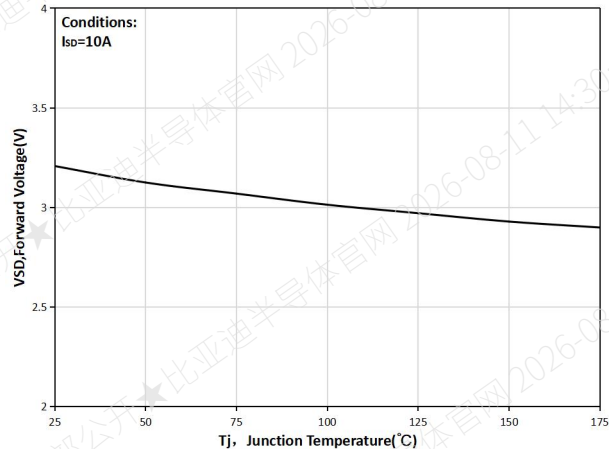


Figure 12. Forward Voltage vs. Junction Temperature





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Figure 13. Body Diode Characteristics for Various Junction Temperatures

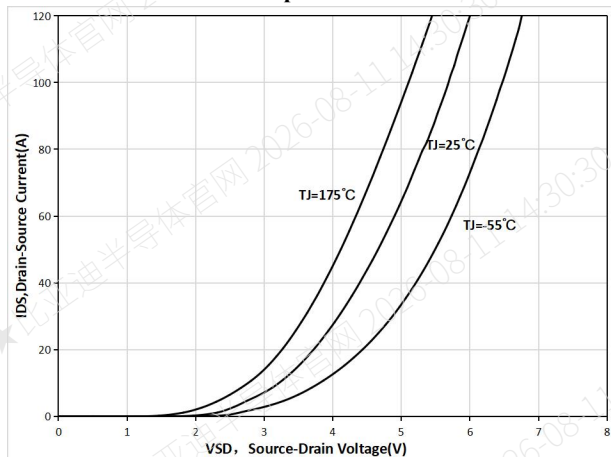


Figure 14. Clamped Inductive Switching Energy Vs. Temperature

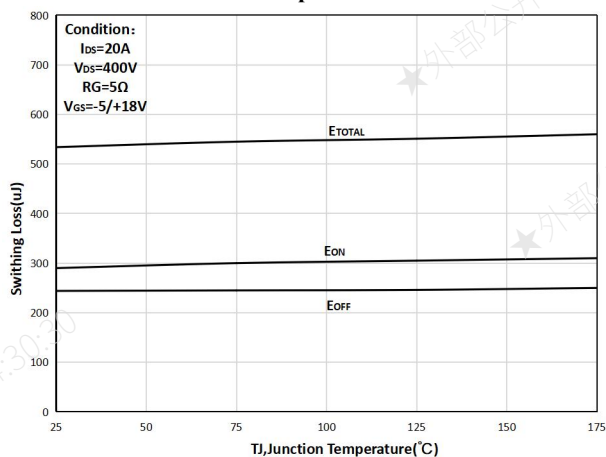


Figure 15. Switching Times vs. Junction Temperature

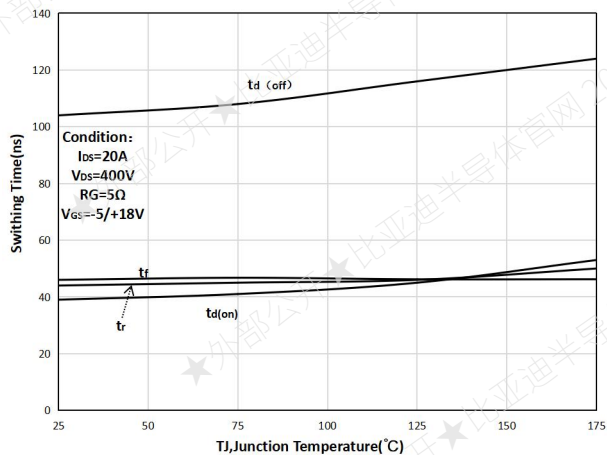


Figure 16. On-Resistance vs. Drain Current

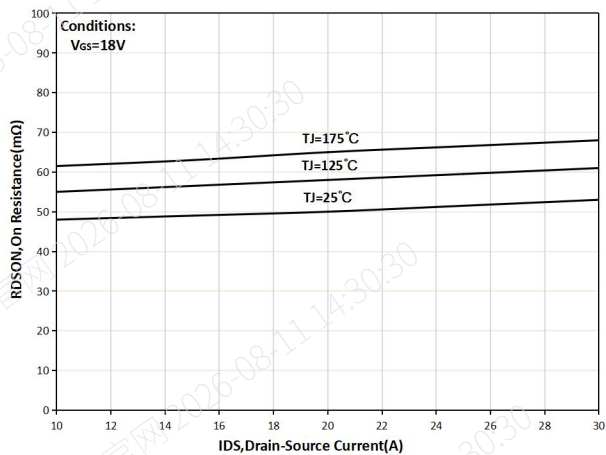


Figure 17. Continuous Drain Current Derating vs. Case Temperature

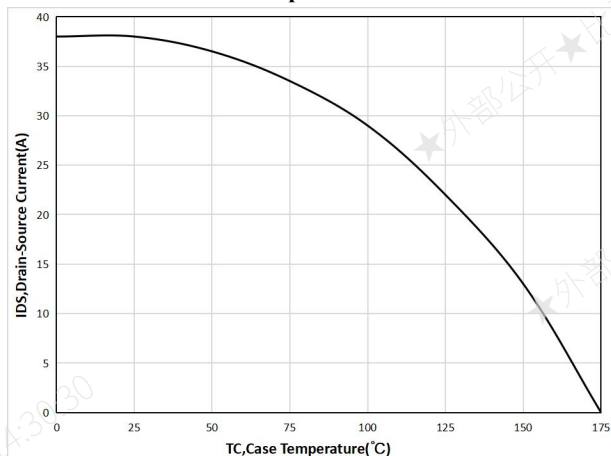
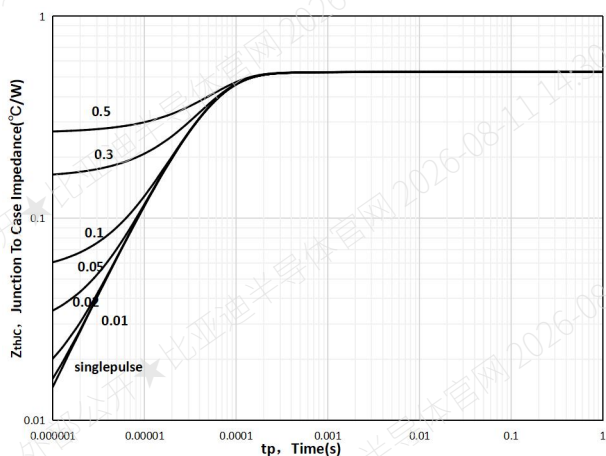
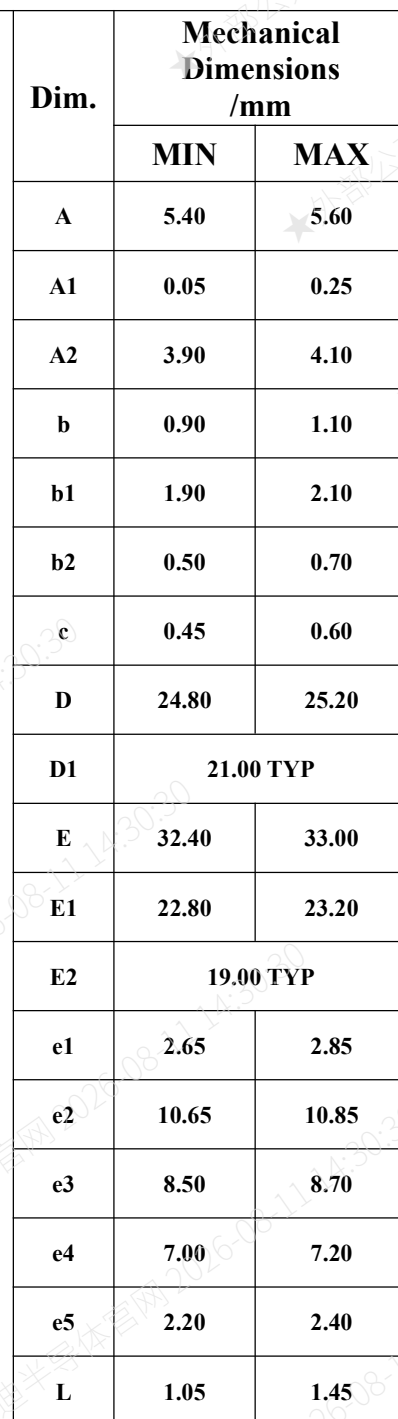


Figure 18 Transient Thermal Impedance



## SOP 封装外形尺寸





## ***BSPE60S75HN***

### **DISCLAIMER 免责声明**

- **Warranty Period:** Unless otherwise agreed in the COOPERATION AGREEMENT or other WRITTEN DOCUMENTS, the Warranty Period for products specified in this specification shall be one year from the date of purchase if the products are properly preserved.

Special instructions: Storage Temperature:  $20\pm 5^{\circ}\text{C}$ ; Relative Humidity: 30%-60%; The product should be stored in a place away from direct light and vibration.

质保期: 除双方在合作协议或其他书面文件中另行约定外, 产品妥当保存的情况下自购买之日起, 本规格书所述产品质保期为一年。

特殊说明: 储存温度:  $20\pm 5^{\circ}\text{C}$ ; 相对湿度: 30%-60%; 产品应放置于避光地方, 避免震动。

- Our Company is committed to enhancing product quality and stability. This specification serves solely to delineate technical product details.

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