



N 沟道增强型场效应晶体管

N-Channel Power MOSFET

FHA59N30WC

主要参数 MAIN CHARACTERISTICS

|                       |        |
|-----------------------|--------|
| ID(Tc=25℃)            | 59A    |
| VDSS                  | 300 V  |
| Rdson-typ ( @Vgs=10V) | 43.5mΩ |
| Qg-typ                | 130 nC |

用途 APPLICATIONS

|           |                              |
|-----------|------------------------------|
| 逆变器       | Inverter                     |
| AC-DC开关电源 | AC-DC Power Supply           |
| 音响功放      | Audio power amplifier        |
| UPS       | Uninterruptible Power Supply |

产品特性 FEATURES

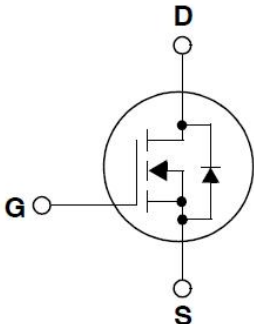
|                   |                          |
|-------------------|--------------------------|
| 低内阻               | Low On-Resistance        |
| 低栅极电荷             | Low gate charge          |
| 低 Crss (典型值 53pF) | Low Crss (typical 53pF ) |
| 开关速度快             | Fast switching           |
| 100%经过雪崩测试        | 100% avalanche tested    |
| 100%经过热阻测试        | 100% DVDS tested         |
| 100%经过 Rg 测试      | 100% Rg tested           |
| 符合 RoHS 标准        | RoHS compliant           |
| 飞虹特色平面工艺技术        | FH-Plane technology      |

封装形式 Package



TO-247  
FHA series

示意图 Schematic diagram



绝对最大额定值 ABSOLUTE RATINGS (Tc25℃)

| 项目<br>Parameter                                                                       | 符号<br>Symbol      | 数值<br>Value   | 单位<br>Unit |
|---------------------------------------------------------------------------------------|-------------------|---------------|------------|
|                                                                                       |                   | FHA59N30WC    |            |
| 最高漏极—源极直流电压<br>Drain-Source Voltage                                                   | VDS               | 300           | V          |
| 连续漏极电流*<br>Drain Current -continuous *                                                | ID (Tc=25℃)       | 59            | A          |
|                                                                                       | ID (Tc=100℃)      | 37.4          | A          |
| 最大脉冲漏极电流（注 1）<br>Drain Current – pulse（note 1）                                        | IDM               | 236           | A          |
| 最高栅源电压<br>Gate-Source Voltage                                                         | VGS               | ±30           | V          |
| 单脉冲雪崩能量（注 2）<br>Single Pulsed Avalanche Energy（note 2）                                | EAS               | 3328          | mJ         |
| 单脉冲雪崩能量测试值（注 3）<br>Single Pulsed Avalanche Energy Tested Value（note 3）                | EAS(Tested)       | 819           | mJ         |
| 耗散功率<br>Power Dissipation                                                             | Pd (TC=25℃)       | 500           | W          |
|                                                                                       | -Derate above 25℃ | 4             | W/℃        |
| 最高结温及存储温度<br>Operating and Storage Temperature Range                                  | TJ, TSTG          | 150, -55~+150 | ℃          |
| 引线最高焊接温度<br>Maximum Lead Temperature for Soldering Purposes (1.6mm from case for 10s) | TL                | 300           | ℃          |

\*漏极电流由最高结温限制

\*Drain current limited by maximum junction temperature

电特性 ELECTRICAL CHARACTERISTICS

| 项目<br>Parameter                                                              | 符号<br>Symbol                         | 测试条件<br>Tests conditions                                                                                 | 最小<br>Min | 典型<br>Typ | 最大<br>Max | 单位<br>Units |
|------------------------------------------------------------------------------|--------------------------------------|----------------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-------------|
| 关态特性 <b>Off –Characteristics</b>                                             |                                      |                                                                                                          |           |           |           |             |
| 漏－源击穿电压 Drain-Source Voltage                                                 | BV <sub>DSS</sub>                    | I <sub>D</sub> =250μA, V <sub>GS</sub> =0V                                                               | 300       | 340       | -         | V           |
| 击穿电压温度特性 Breakdown Voltage Temperature Coefficient                           | ΔBV <sub>DSS</sub> /Δ T <sub>J</sub> | I <sub>D</sub> =250μA, referenced to 25℃                                                                 | -         | 0.37      | -         | V/℃         |
| 零栅压下漏极漏电流<br>Zero Gate Voltage Drain Current                                 | I <sub>DSS</sub>                     | V <sub>DS</sub> =300V, V <sub>GS</sub> =0V, T <sub>J</sub> =25℃                                          | -         | -         | 1         | μA          |
|                                                                              |                                      | V <sub>DS</sub> =300V, T <sub>J</sub> =150℃                                                              | -         | -         | 250       | μA          |
| 栅极体漏电流<br>Gate-body leakage current                                          | I <sub>GSS</sub> (F/R)               | V <sub>DS</sub> =0V, V <sub>GS</sub> =±30V                                                               | -         | -         | ±100      | nA          |
| 通态特性 <b>On-Characteristics</b>                                               |                                      |                                                                                                          |           |           |           |             |
| 阈值电压<br>Gate Threshold Voltage                                               | V <sub>GS(th)</sub>                  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> =250μA                                                | 3.0       | 3.82      | 4.5       | V           |
| 静态导通电阻<br>Static Drain-Source On-Resistance                                  | R <sub>DS(ON)</sub>                  | V <sub>GS</sub> =10V , I <sub>D</sub> =29.5A                                                             | -         | 43.5      | 55        | mΩ          |
| 动态特性 <b>Dynamic Characteristics</b>                                          |                                      |                                                                                                          |           |           |           |             |
| 栅电阻<br>Gate Resistance                                                       | R <sub>g</sub>                       | f=1.0MHz, V <sub>DS</sub> OPEN                                                                           | -         | 1.1       | -         | Ω           |
| 输入电容<br>Input capacitance                                                    | C <sub>iss</sub>                     | V <sub>DS</sub> =25V,<br>V <sub>GS</sub> =0V,<br>f=1.0MHz                                                | -         | 6445      | -         | pF          |
| 输出电容<br>Output capacitance                                                   | C <sub>oss</sub>                     |                                                                                                          | -         | 740       | -         |             |
| 反向传输电容<br>Reverse transfer capacitance                                       | C <sub>rss</sub>                     |                                                                                                          | -         | 53        | -         |             |
| 开关特性 <b>Switching Characteristics</b>                                        |                                      |                                                                                                          |           |           |           |             |
| 延迟时间<br>Turn-On delay time                                                   | t <sub>d(on)</sub>                   | V <sub>DS</sub> =250V,<br>I <sub>D</sub> =59A,<br>R <sub>G</sub> =5Ω<br>V <sub>GS</sub> =10V<br>(note 4) | -         | 178       | -         | ns          |
| 上升时间<br>Turn-On rise time                                                    | t <sub>r</sub>                       |                                                                                                          | -         | 129       | -         | ns          |
| 延迟时间<br>Turn-Off delay time                                                  | t <sub>d(off)</sub>                  |                                                                                                          | -         | 135       | -         | ns          |
| 下降时间<br>Turn-Off Fall time                                                   | t <sub>f</sub>                       |                                                                                                          | -         | 20        | -         | ns          |
| 栅极电荷总量<br>Total Gate Charge                                                  | Q <sub>g</sub>                       | V <sub>DS</sub> =250V ,<br>I <sub>D</sub> =59A ,<br>V <sub>GS</sub> =10V<br>(note 4)                     | -         | 130       | -         | nC          |
| 栅－源电荷<br>Gate-Source charge                                                  | Q <sub>gs</sub>                      |                                                                                                          | -         | 38        | -         | nC          |
| 栅－漏电荷<br>Gate-Drain charge                                                   | Q <sub>gd</sub>                      |                                                                                                          | -         | 47        | -         | nC          |
| 漏－源二极管特性及最大额定值 <b>Drain-Source Diode Characteristics and Maximum Ratings</b> |                                      |                                                                                                          |           |           |           |             |
| 正向最大连续电流<br>Maximum Continuous Drain -Source Diode Forward Current           | I <sub>S</sub>                       |                                                                                                          | -         | -         | 59        | A           |
| 正向最大脉冲电流<br>Maximum Pulsed Drain-Source Diode Forward Current                | I <sub>SM</sub>                      |                                                                                                          | -         | -         | 236       | A           |
| 正向压降<br>Drain-Source Diode Forward Voltage                                   | V <sub>SD</sub>                      | V <sub>GS</sub> =0V, I <sub>S</sub> =59A                                                                 | -         | 0.89      | 1.3       | V           |
| 反向恢复时间<br>Reverse recovery time                                              | t <sub>rr</sub>                      | V <sub>GS</sub> =0V, I <sub>S</sub> =59A ,dI <sub>F</sub> /dt=100A/μs<br>(note 4)                        | -         | 320       | -         | ns          |
| 反向恢复电荷<br>Reverse recovery charge                                            | Q <sub>rr</sub>                      |                                                                                                          | -         | 3.05      | -         | μC          |

热特性 THERMAL CHARACTERISTIC

| 项目<br>Parameter                                    | 符号<br>Symbol | Max  | 单位<br>Unit |
|----------------------------------------------------|--------------|------|------------|
| 结到管壳的热阻<br>Thermal Resistance, Junction to Case    | Rth(j-c)     | 0.25 | ℃/W        |
| 结到环境的热阻<br>Thermal Resistance, Junction to Ambient | Rth(j-A)     | 40   | ℃/W        |

- 注释：
- 1：脉冲宽度由最高结温限制
  - 2：L=1.6mH, VDD=100V, ID=32A,RG=25 Ω,起始结温 TJ=25℃
  - 3：该值由故障样本确定，在生产中 100%测试了该值。
  - 4：脉冲测试：脉冲宽度 ≤300μs,占空比≤2%

- Notes:
- 1：Pulse width limited by maximum junction temperature
  - 2：L=1.6mH, VDD=100V, ID=32A,RG=25 Ω,Starting TJ=25℃
  - 3：This value determined from sample failure population, 100% tested to this value in production.
  - 4：Pulse Test: Pulse Width ≤300μs,Duty Cycle≤2%

典型特性曲线 Typical Performance Characteristics

Figure 1. Safe Operating Area

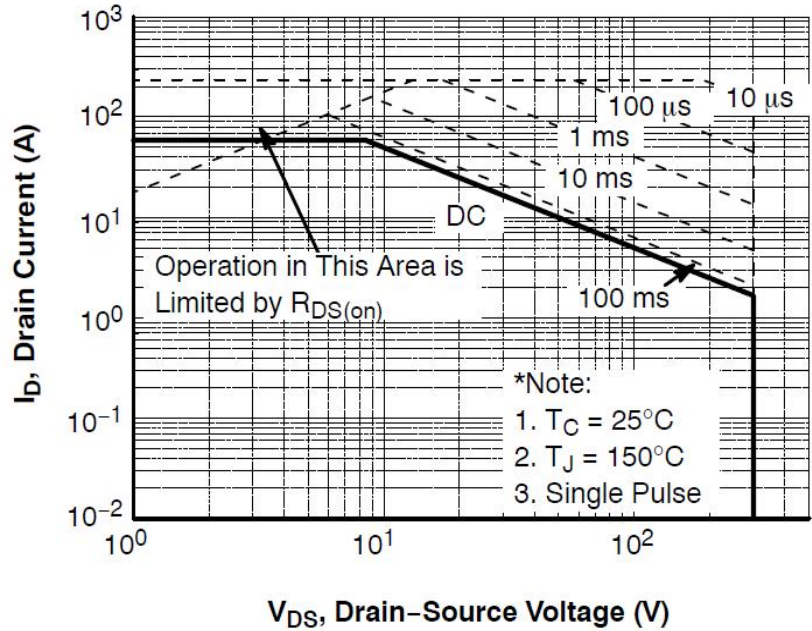


Figure 2. Maximum power Dissipation vs Case Temperature

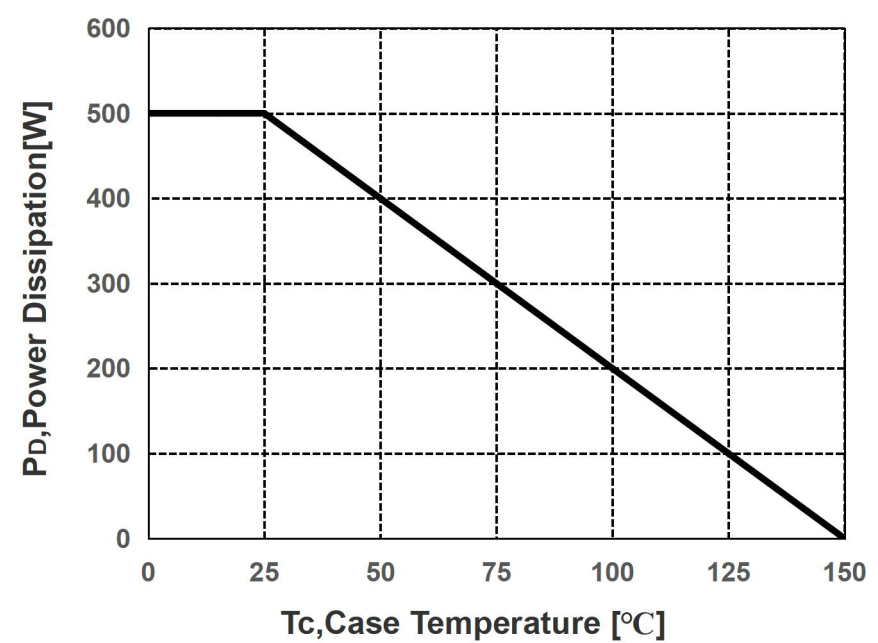


Figure 3. Maximum Continuous Drain Current vs Case Temperature

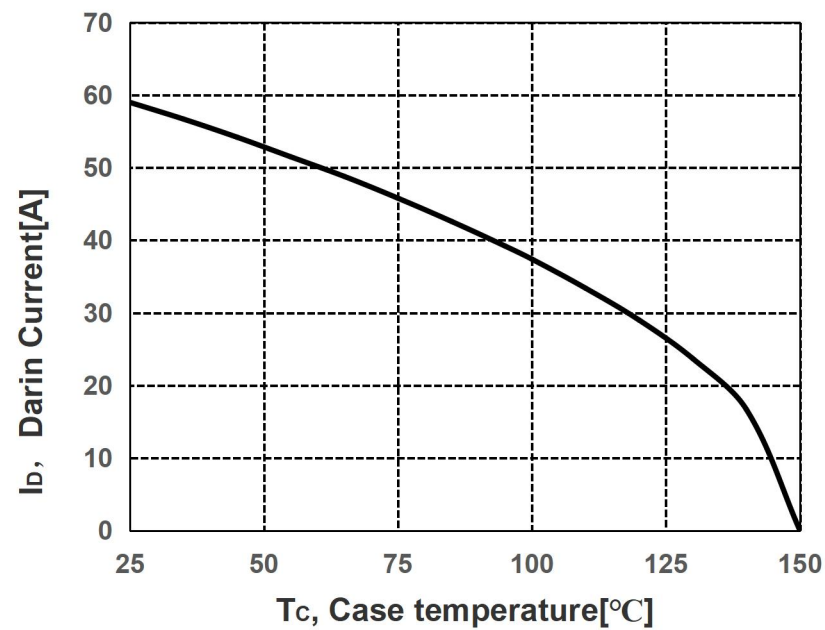


Figure 4. Typical Output Characteristics

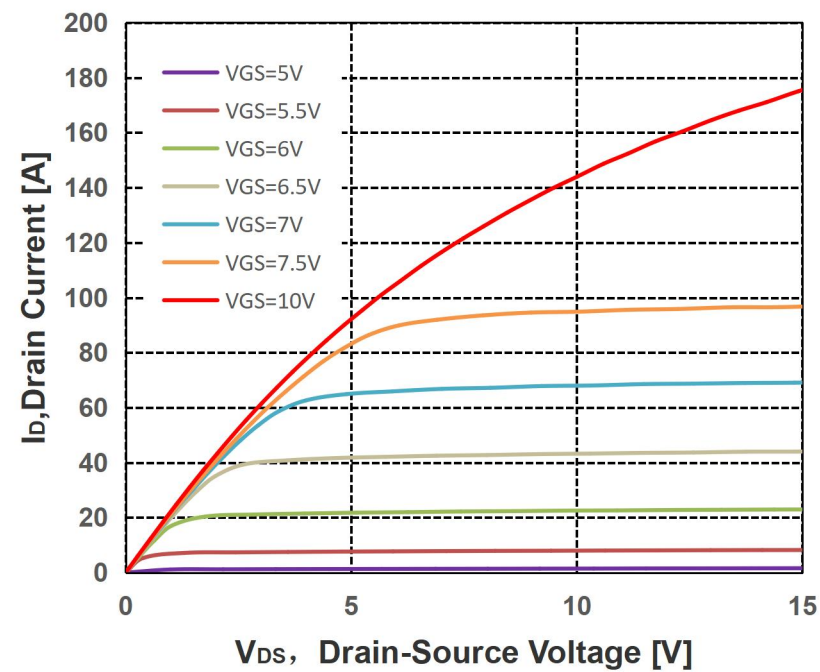


Figure 5. Typical Transfer Characteristics

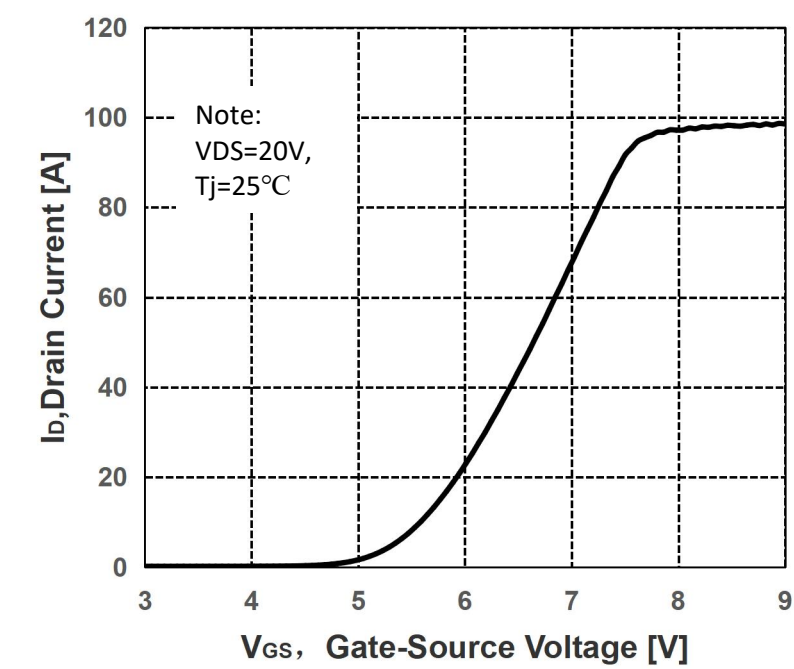


Figure 6. Source-Drain Diode Forward Characteristics

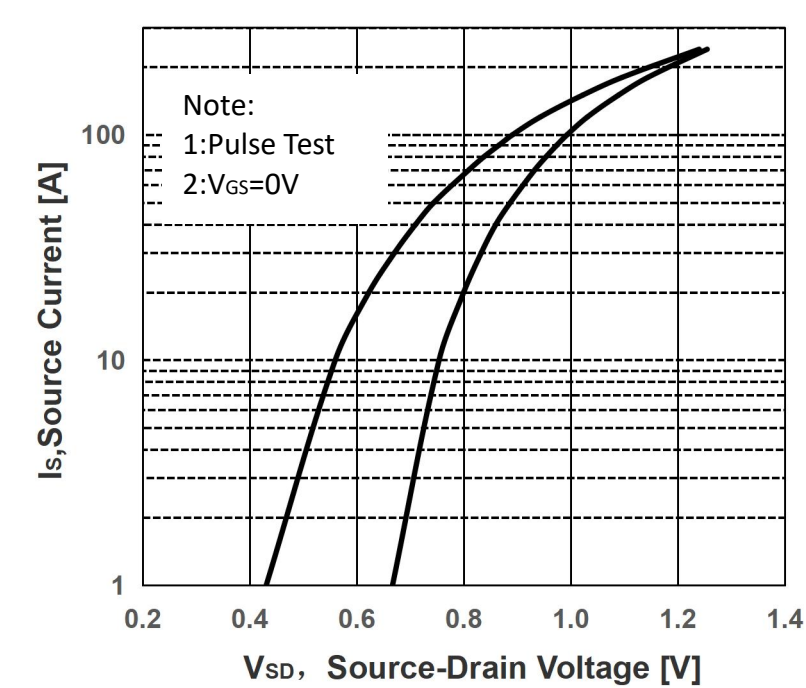


Figure 7. Drain-Source On-Resistance vs Drain Current

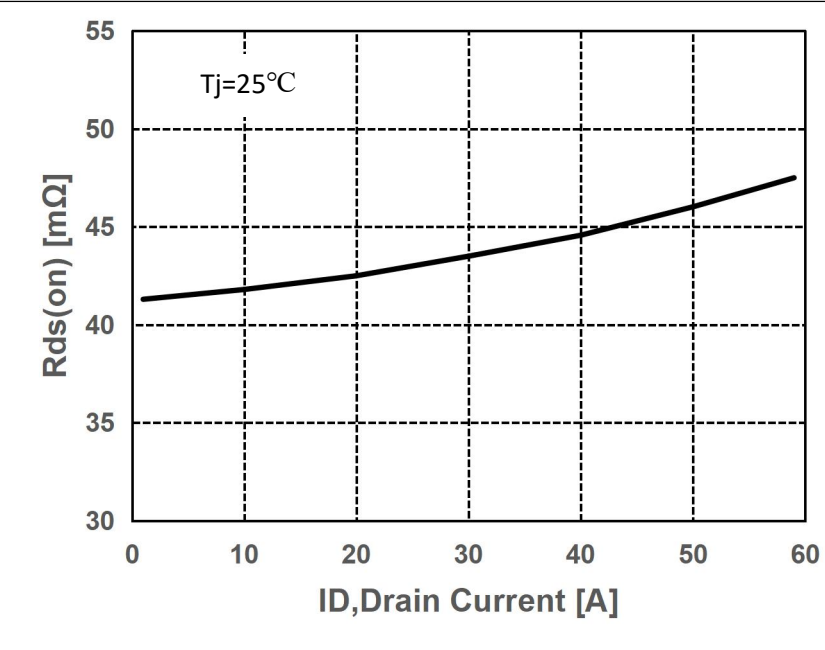


Figure 8. Normalized On-Resistance vs Junction Temperature

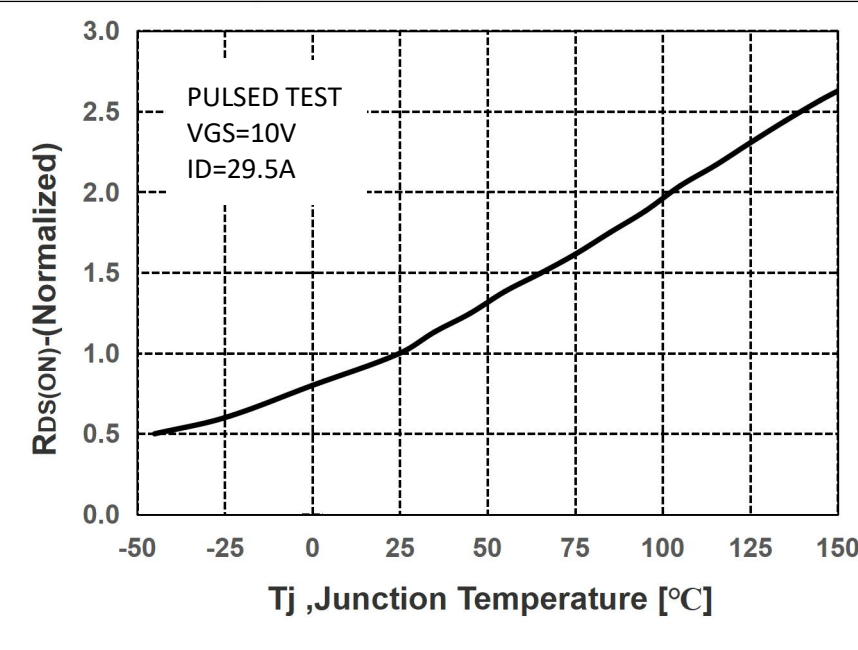


Figure 9. Normalized Threshold Voltage vs Junction Temperature

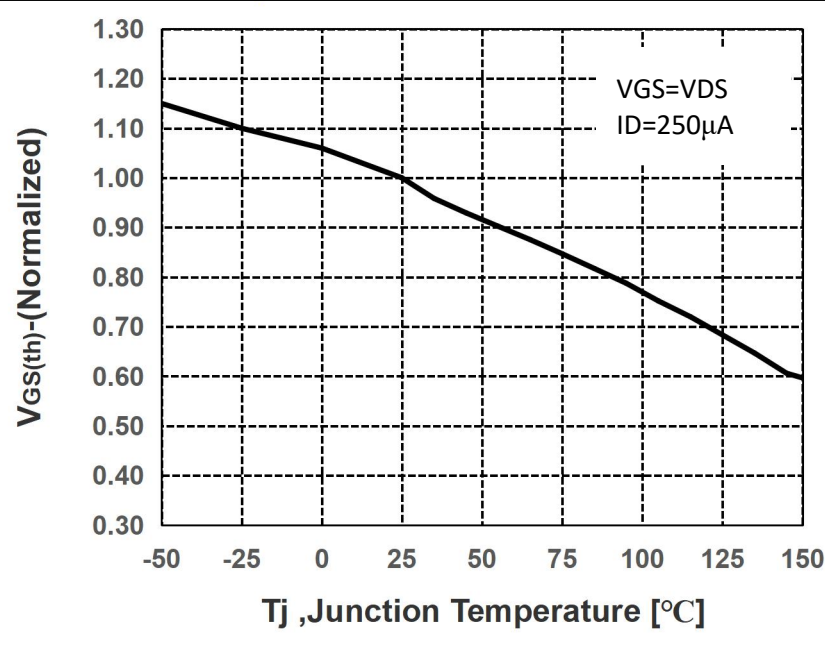


Figure 10. Normalized Breakdown Voltage vs Junction Temperature

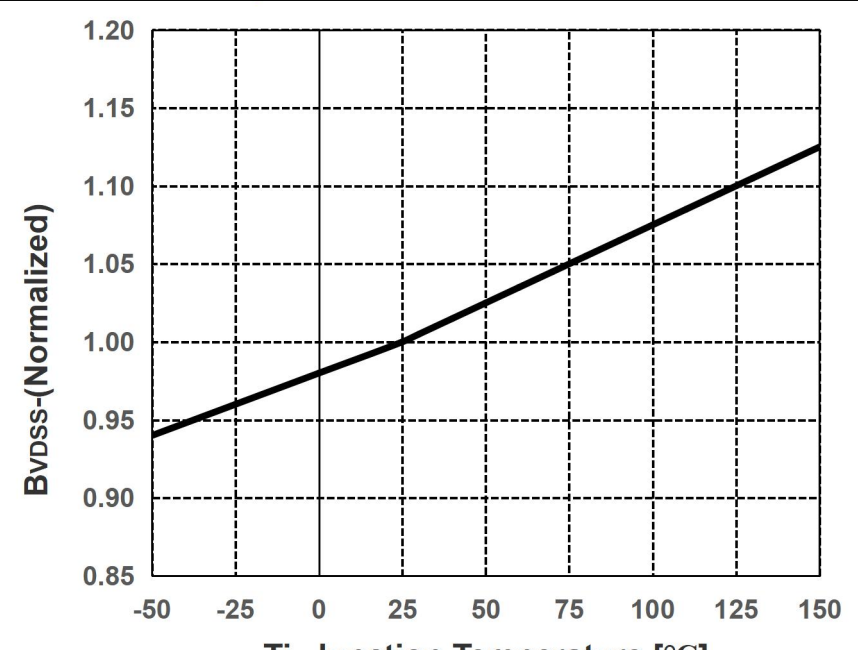


Figure 11. Capacitance Characteristics

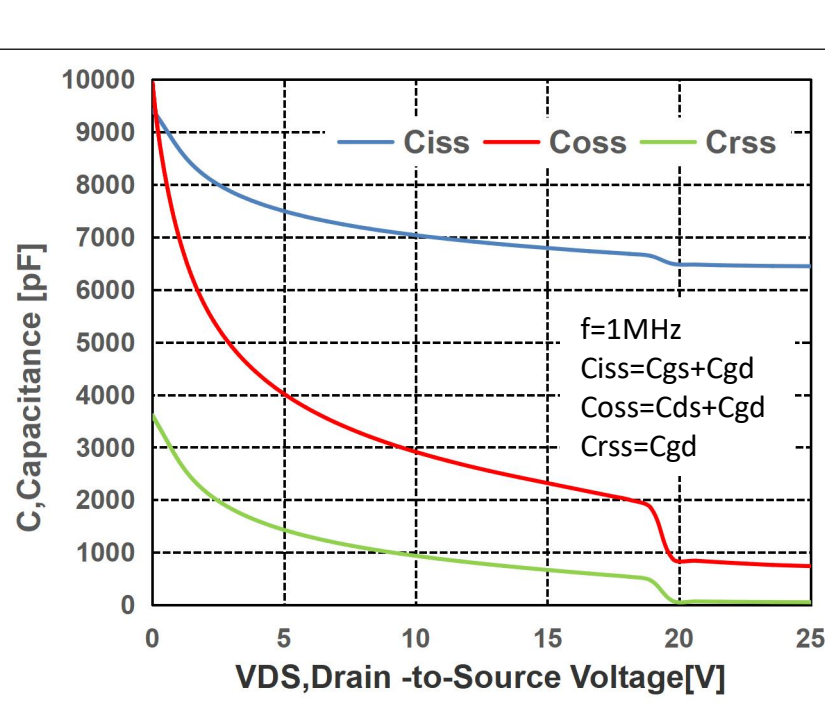


Figure 12. Typical Gate Charge vs Gage-Source Voltage

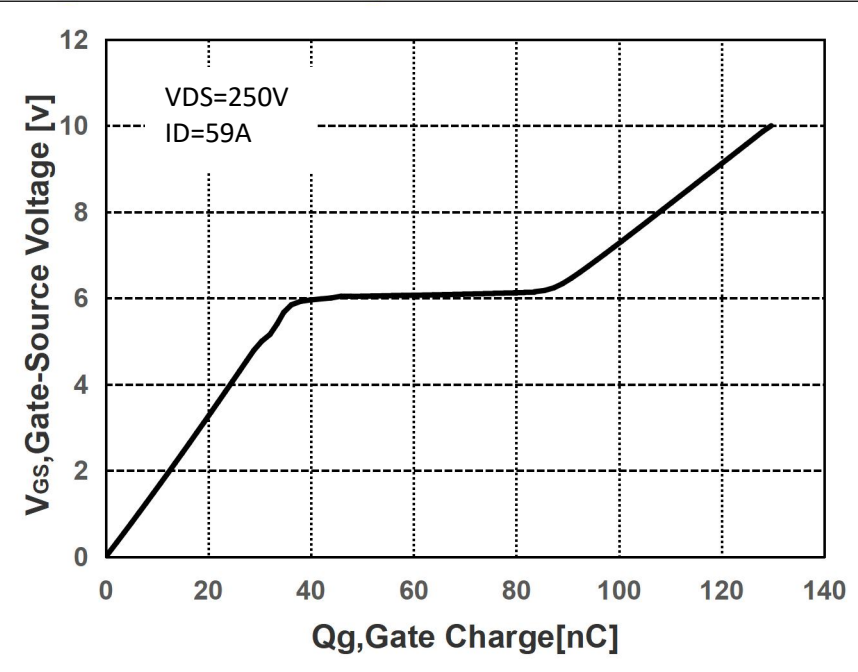
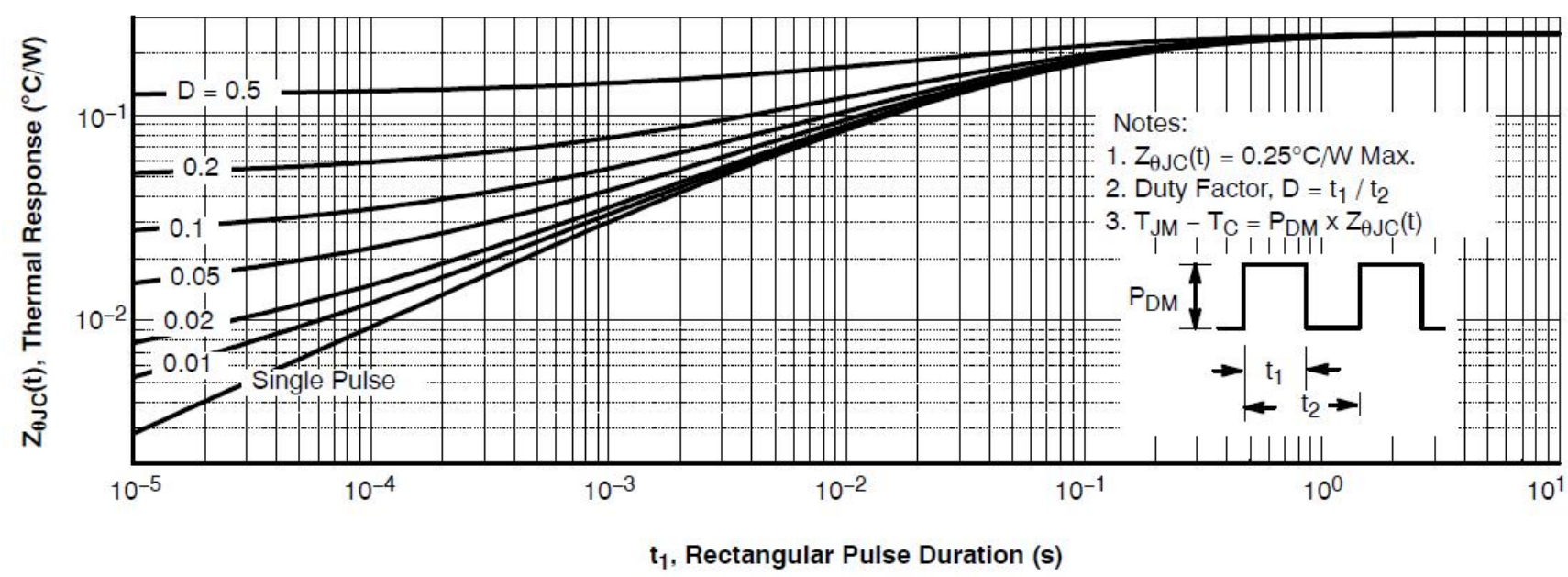


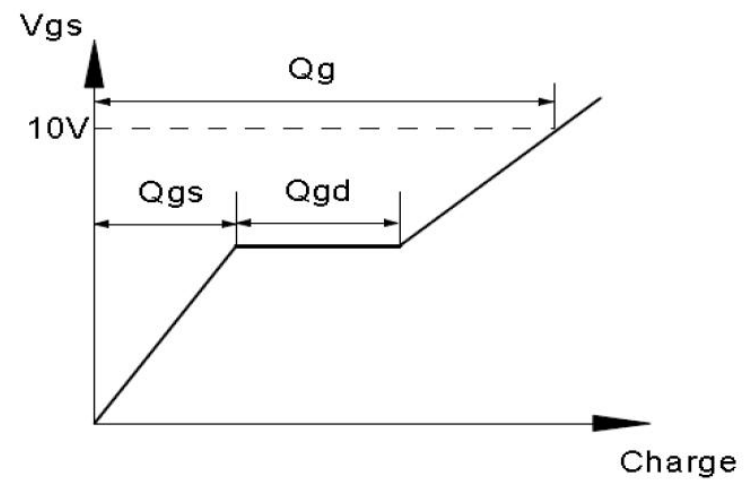
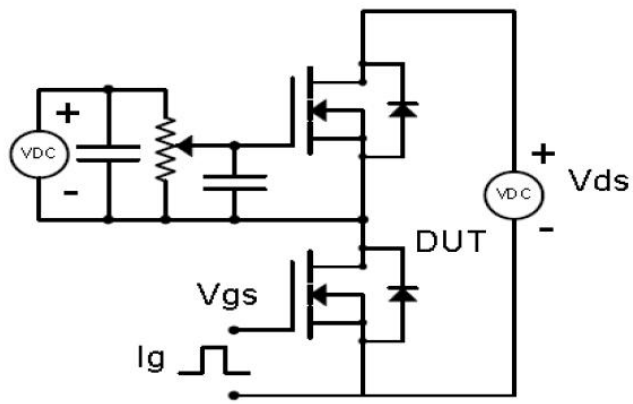


Figure 13. Transient Thermal Impedance

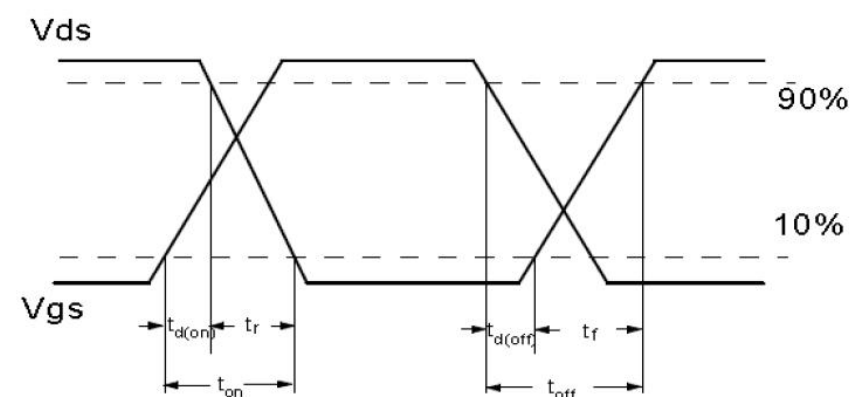
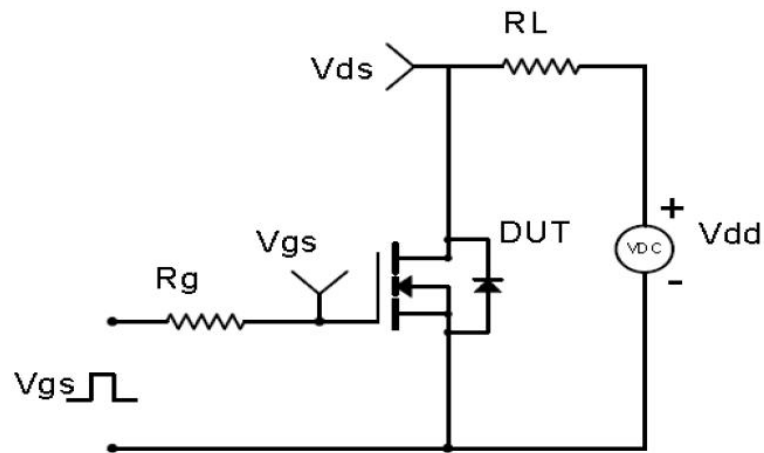


## Test Circuit & Waveform

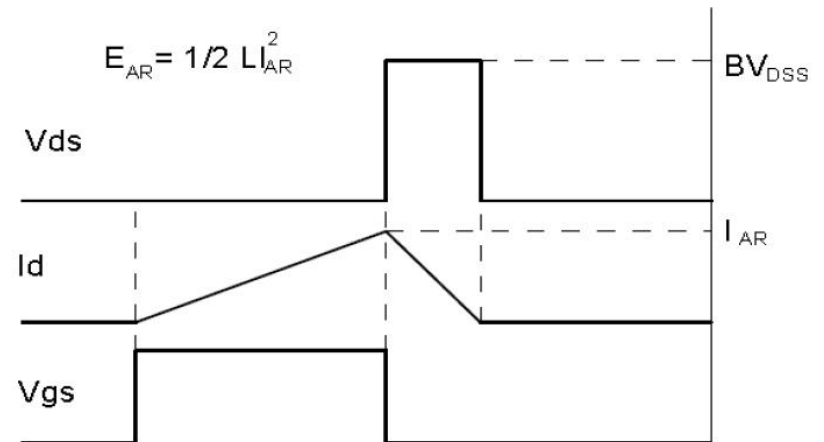
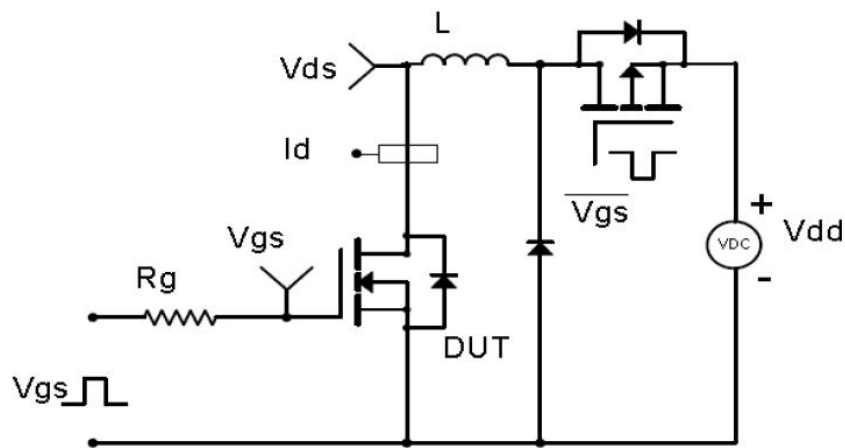
Gate Charge Test Circuit & Waveform



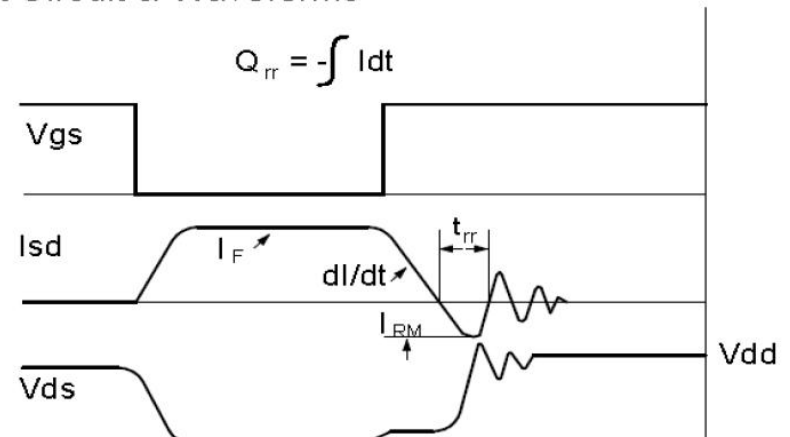
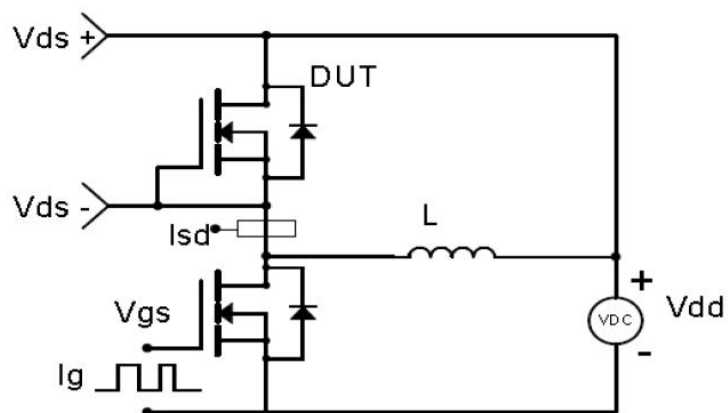
Resistive Switching Test Circuit & Waveforms



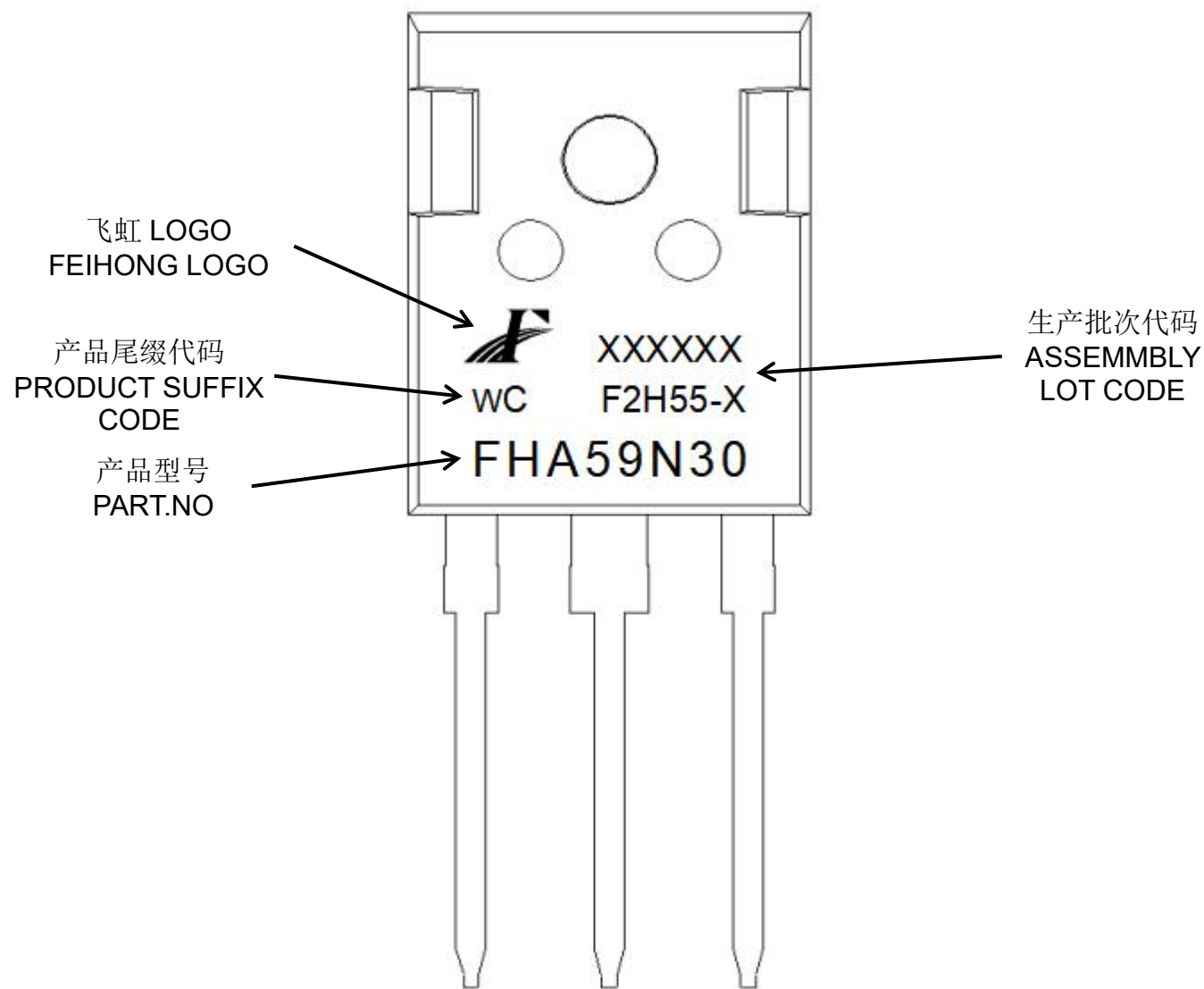
Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms



印记 Marking:

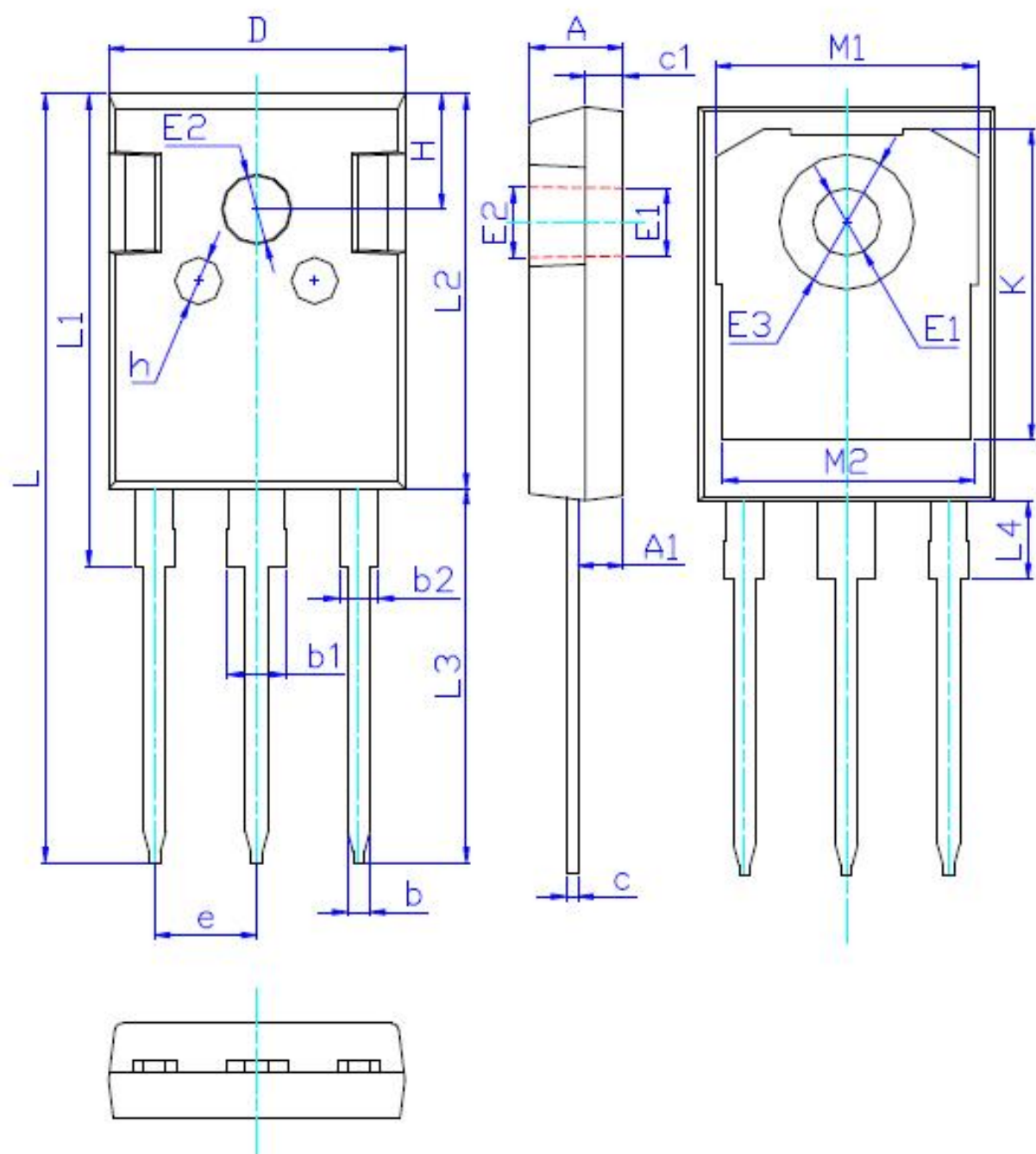




外形尺寸:

Package Dimension:

TO-247



| 标注        | 尺寸(mm)            |
|-----------|-------------------|
| A         | 5.00±0.20         |
| A1        | 2.41±0.15         |
| b         | 1.2±0.10          |
| b1        | 3.10±0.10         |
| b2        | 2.10±0.10         |
| c         | 0.60±0.10         |
| c1        | 2.00±0.15         |
| D         | 15.80±0.20        |
| E1        | 3.60±0.15         |
| E2        | 3.70±0.15         |
| E3        | 7.19±0.15         |
| L         | 40.92±0.25        |
| L1        | 24.95±0.15        |
| L2        | 21.00±0.20        |
| L3        | 19.92±0.20        |
| <b>L4</b> | <b>4.10±0.15</b>  |
| e         | 5.44±0.15         |
| H         | 6.15±0.15         |
| h         | 2.50±0.15         |
| <b>K</b>  | <b>16.45±0.20</b> |
| <b>M1</b> | <b>14.00±0.20</b> |
| <b>M2</b> | <b>13.30±0.20</b> |