

**描述 / Descriptions**

N 沟道 TO-252 塑封封装场效应管。

N-CHANNEL MOSFET in a TO-252 Plastic Package.

**特征 / Features**

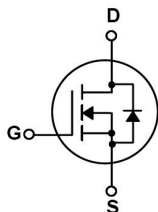
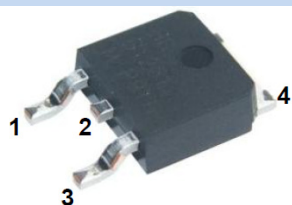
$R_{DS(on)}$  小, 门电荷低,  $C_{rss}$  小, 开关速度快。无卤产品。

Low  $R_{DS(on)}$ , low gate charge, low  $C_{rss}$ , fast switching. Halogen-free Product.

**用途 / Applications**

用于低压电路如: 汽车电路、DC/DC 转换、便携式产品的电源高效转换。

Suited for low voltage applications such as automotive, DC/DC Converters, and high efficiency switching for power management in portable and battery operated products.

**内部等效电路 / Equivalent Circuit****引脚排列 / Pinning**

PIN1 : G

PIN 2 : D

PIN 3 : S

PIN 4 : D

**放大及印章代码 /  $h_{FE}$  Classifications & Marking**

见印章说明。See Marking Instructions.

**极限参数 / Absolute Maximum Ratings(Ta=25°C)**

| 参数<br>Parameter                        |              | 符号<br>Symbol                          | 数值<br>Rating | 单位<br>Unit |
|----------------------------------------|--------------|---------------------------------------|--------------|------------|
| Drain-Source Voltage                   |              | V <sub>DSS</sub>                      | 20           | V          |
| Drain Current                          |              | I <sub>D</sub> (T <sub>c</sub> =25℃)  | 60           | A          |
|                                        |              | I <sub>D</sub> (T <sub>c</sub> =100℃) | 50           | A          |
| Drain Current - Pulsed                 |              | I <sub>DM</sub>                       | 210          | A          |
| Gate-Source Voltage                    |              | V <sub>GS</sub>                       | ±12          | V          |
| Avalanche Current                      |              | I <sub>AS</sub>                       | 18.3         | A          |
| Avalanche energy L=0.5mH               |              | E <sub>AS</sub>                       | 268          | mJ         |
| Power Dissipation                      |              | P <sub>D</sub> (T <sub>c</sub> =25℃)  | 100          | W          |
|                                        |              | P <sub>D</sub> (T <sub>c</sub> =100℃) | 50           | W          |
| Junction and Storage Temperature Range |              | T <sub>j</sub> , T <sub>stg</sub>     | -55~150      | ℃          |
| Maximum Junction-to-Ambient            | Steady-State | R <sup>θ</sup> JA                     | 62           | ℃/W        |
| Maximum Junction-to-Case               | Steady-State | R <sup>θ</sup> JC                     | 1.25         |            |

**电性能参数 / Electrical Characteristics(Ta=25°C)**

| 参数<br>Parameter                   | 符号<br>Symbol  | 测试条件<br>Test Conditions        | 最小值<br>Min | 典型值<br>Typ | 最大值<br>Max | 单位<br>Unit |
|-----------------------------------|---------------|--------------------------------|------------|------------|------------|------------|
| Drain-Source Breakdown Voltage    | $BV_{DSS}$    | $V_{GS}=0V$ $I_D=250\mu A$     | 20         |            |            | V          |
| Zero Gate Voltage Drain Current   | $I_{DSS}$     | $V_{DS}=20V$ $V_{GS}=0V$       |            |            | 1.0        | $\mu A$    |
|                                   |               | $T_J=55^{\circ}C$              |            |            | 5.0        | $\mu A$    |
| Gate-Body Leakage Current Forward | $I_{GSS}$     | $V_{GS}=\pm 12V$ $V_{DS}=0V$   |            |            | $\pm 0.1$  | $\mu A$    |
| Gate Threshold Voltage            | $V_{GS(th)}$  | $V_{DS}=V_{GS}$ $I_D=250\mu A$ | 0.3        | 0.6        | 1.0        | V          |
| Static Drain-Source On-Resistance | $R_{DS(on)1}$ | $V_{GS}=10V$ $I_D=60A$         |            | 5.5        | 7          | m $\Omega$ |
|                                   | $R_{DS(on)2}$ | $V_{GS}=4.5V$ $I_D=30A$        |            | 6          | 7          | m $\Omega$ |
|                                   | $R_{DS(on)3}$ | $V_{GS}=2.5V$ $I_D=15A$        |            | 8          | 10         | m $\Omega$ |
| Diode Forward Voltage             | $V_{SD}$      | $I_S=1A$ $V_{GS}=0V$           |            | 0.9        | 1.35       | V          |

## 电性能参数 / Electrical Characteristics(Ta=25°C)

| 参数<br>Parameter                    | 符号<br>Symbol | 测试条件<br>Test Conditions                                           | 最小值<br>Min | 典型值<br>Typ | 最大值<br>Max | 单位<br>Unit |
|------------------------------------|--------------|-------------------------------------------------------------------|------------|------------|------------|------------|
| Input Capacitance                  | $C_{iss}$    | $V_{DS}=25V$ $V_{GS}=0V$<br>$f=1.0MHz$                            |            | 2380       |            | pF         |
| Output Capacitance                 | $C_{oss}$    |                                                                   |            | 65         |            |            |
| Reverse Transfer Capacitance       | $C_{rss}$    |                                                                   |            | 165        |            |            |
| Gate resistance                    | $R_g$        | $V_{GS}=0V$ $V_{DS}=0V$<br>$f=1MHz$                               |            | 1.28       |            | $\Omega$   |
| Total Gate Charge                  | $Q_g(4.5V)$  | $V_{GS}=10V$ $V_{DS}=10V$<br>$I_D=20A$                            | 28         | 36         | 43         | nC         |
| Gate Source Charge                 | $Q_{gs}$     |                                                                   |            | 9          |            |            |
| Gate Drain Charge                  | $Q_{gd}$     |                                                                   |            | 12         |            |            |
| Turn-On Delay Time                 | $t_{d(on)}$  | $V_{GS}=10V$ $V_{DS}=10V$<br>$R_L=0.5\Omega$<br>$R_{GEN}=3\Omega$ |            | 7          |            | ns         |
| Turn-On Rise Time                  | $t_r$        |                                                                   |            | 8          |            |            |
| Turn-Off Delay Time                | $t_{d(off)}$ |                                                                   |            | 70         |            |            |
| Turn-Off Fall Time                 | $t_f$        |                                                                   |            | 18         |            |            |
| Body Diode Reverse Recovery Time   | $t_{rr}$     | $I_F=20A$<br>$dI/dt=500A/ms$                                      | 13         | 17         | 20         | ns         |
| Body Diode Reverse Recovery Charge | $Q_{rr}$     | $I_F=20A$<br>$dI/dt=500A/ms$                                      | 29         | 36         | 43         | nC         |

## 电参数曲线图 / Electrical Characteristic Curve

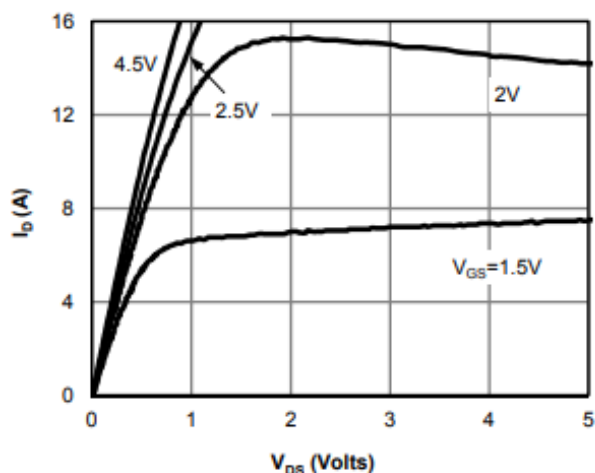


Figure 1: On-Region Characteristics

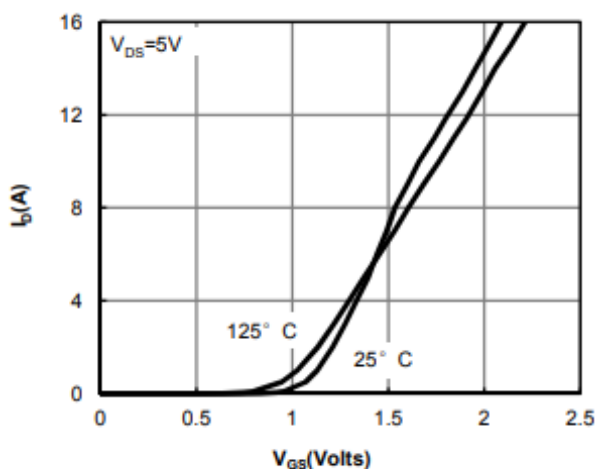


Figure 2: Transfer Characteristics

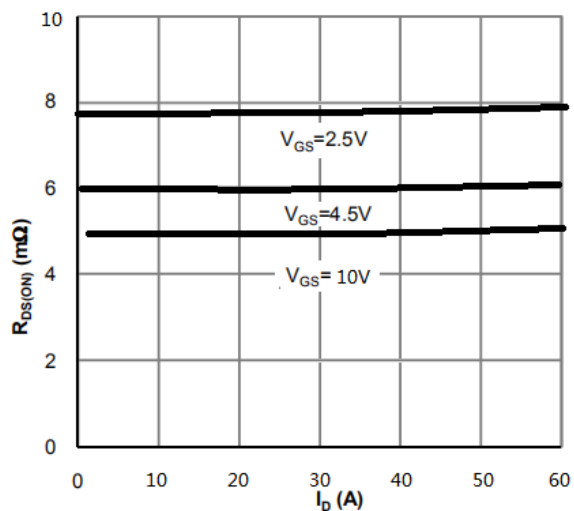


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

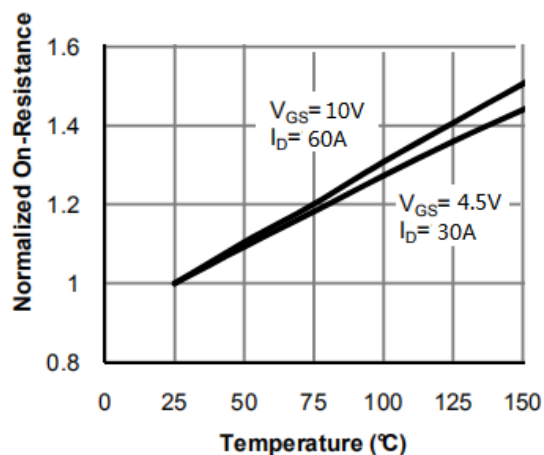


Figure 4: On-Resistance vs. Junction Temperature

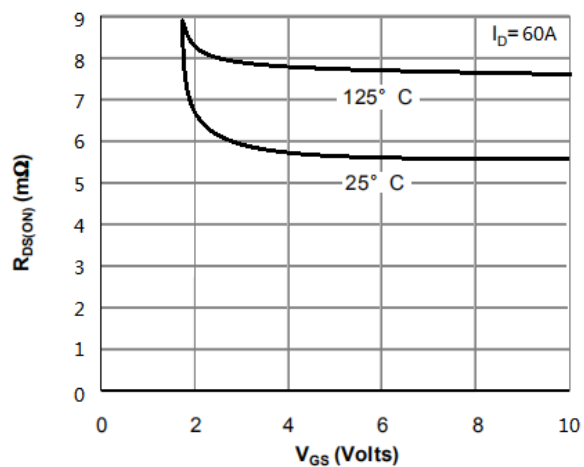


Figure 5: On-Resistance vs. Gate-Source Voltage

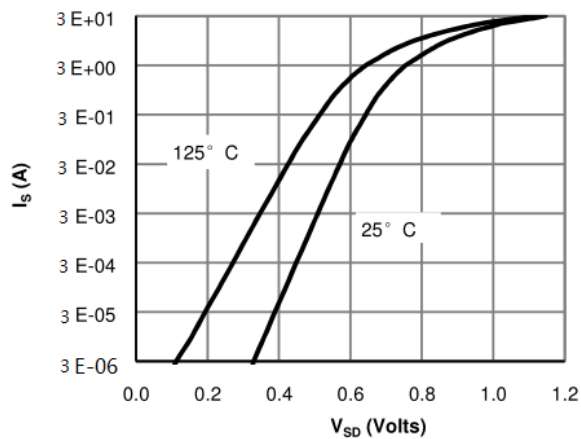
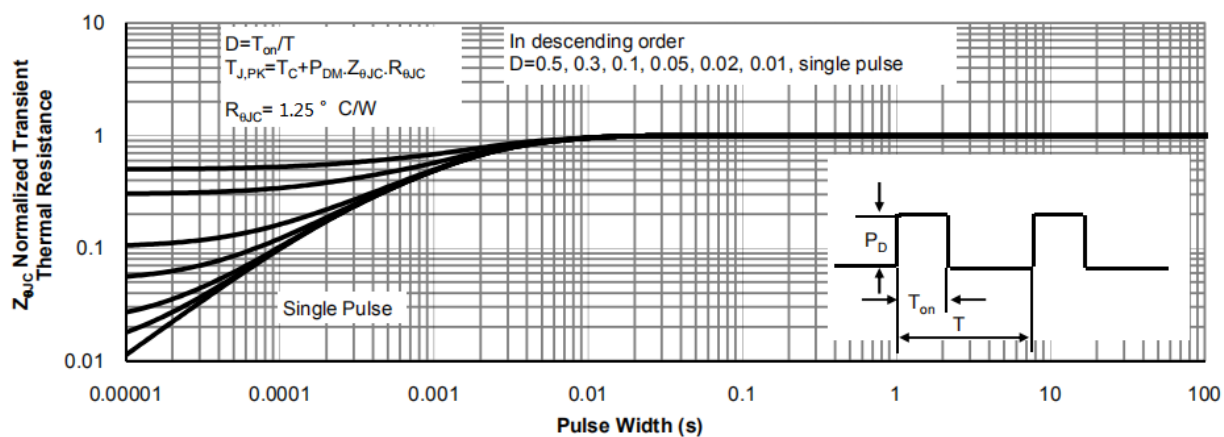
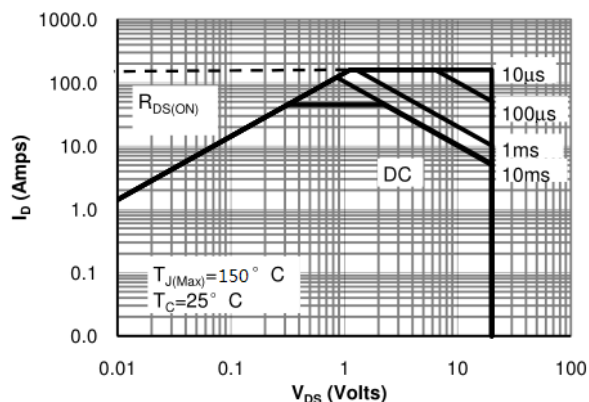
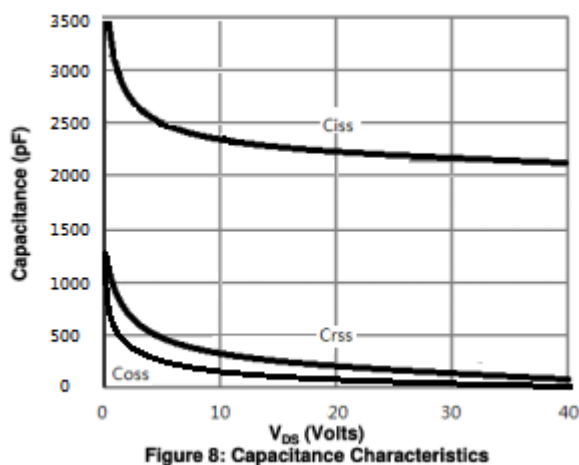
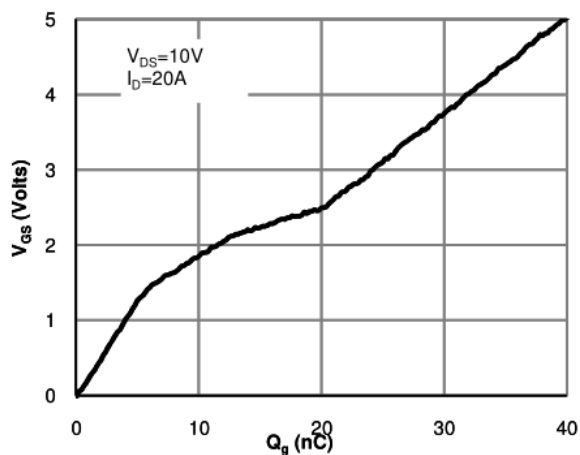
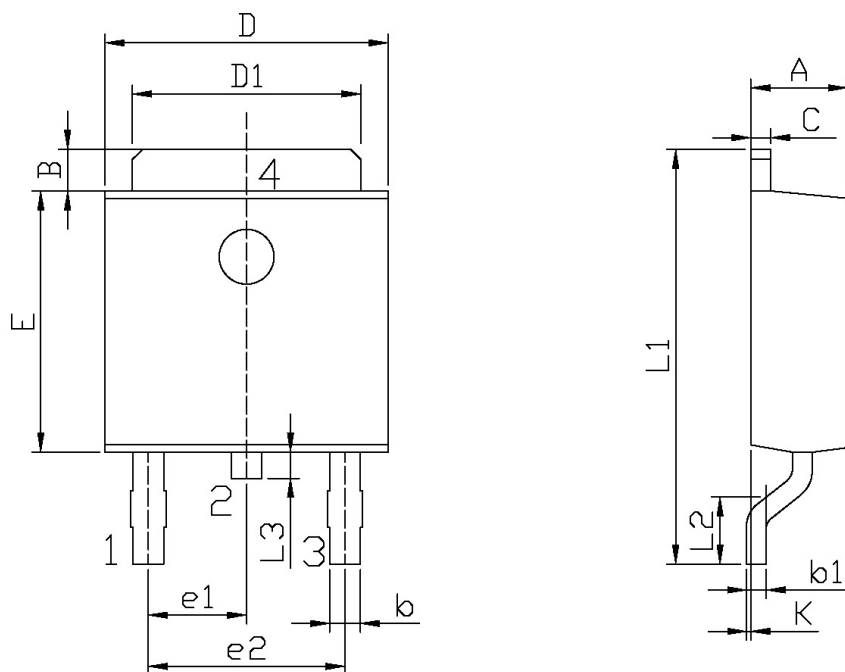


Figure 6: Body-Diode Characteristics

## 电参数曲线图 / Electrical Characteristic Curve



## 外形尺寸图 / Package Dimensions

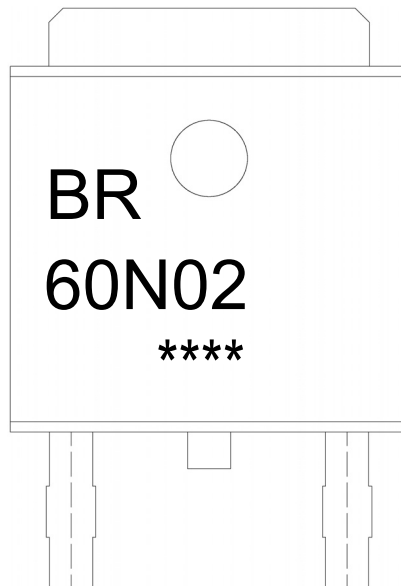


单位: mm

| Symbol | Dimensions In Millimeters |      | Symbol | Dimensions In Millimeters |      |
|--------|---------------------------|------|--------|---------------------------|------|
|        | Min                       | Max  |        | Min                       | Max  |
| A      | 2.20                      | 2.40 | E      | 5.95                      | 6.25 |
| B      | 0.95                      | 1.25 | e1     | 2.24                      | 2.34 |
| b      | 0.50                      | 0.70 | e2     | 4.43                      | 4.73 |
| b1     | 0.45                      | 0.55 | L1     | 9.45                      | 9.95 |
| C      | 0.45                      | 0.55 | L2     | 1.25                      | 1.75 |
| D      | 6.45                      | 6.75 | L3     | 0.60                      | 0.90 |
| D1     | 5.10                      | 5.50 | K      | 0.00                      | 0.10 |

TO-252

**印章说明 / Marking Instructions**



说明：

BR： 为公司代码

60N02： 为型号代码

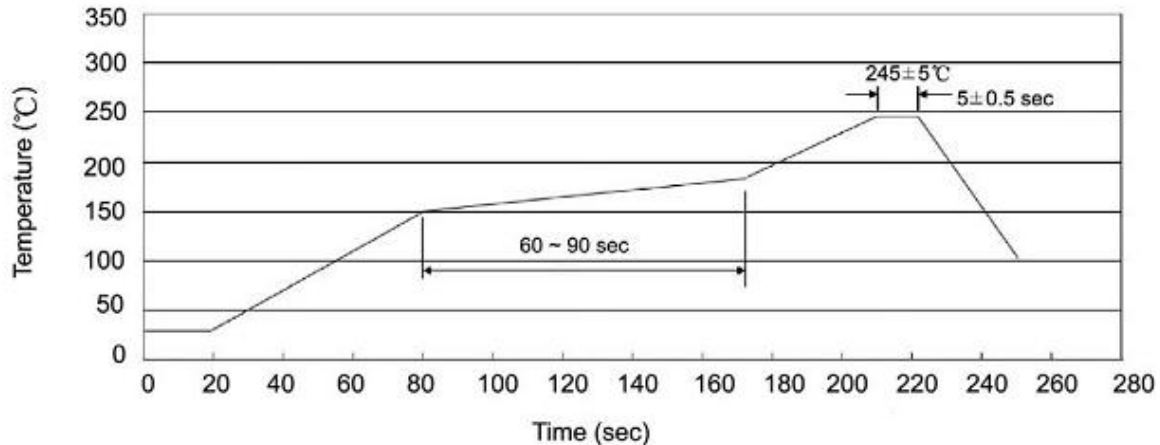
\*\*\*\*： 为生产批号代码，随生产批号变化。

Note:

BR: Company Code

60N02: Product Type Code.

\*\*\*\*: Lot No. Code, code change with Lot No.

**回流焊温度曲线图(无铅) / Temperature Profile for IR Reflow Soldering(Pb-Free)**


说明：

- 1、预热温度 150 ~ 180°C，时间 60 ~ 90sec;
- 2、峰值温度 245±5°C，时间持续为 5±0.5sec;
- 3、焊接制程冷却速度为 2 ~ 10°C/sec.

Note:

- 1.Preheating:150~180°C, Time:60~90sec.
- 2.Peak Temp.:245±5°C, Duration:5±0.5sec.
3. Cooling Speed: 2~10°C/sec.

**耐焊接热试验条件 / Resistance to Soldering Heat Test Conditions**

温度：260±5°C

时间：10±1 sec.

Temp.:260±5°C

Time:10±1 sec

**包装规格 / Packaging SPEC.**

卷盘包装 / REEL

| Package Type<br>封装形式 | Units 包装数量         |                         |                        |                              |                        | Dimension 包装尺寸 (unit: mm <sup>3</sup> ) |             |             |
|----------------------|--------------------|-------------------------|------------------------|------------------------------|------------------------|-----------------------------------------|-------------|-------------|
|                      | Units/Reel<br>只/卷盘 | Reels/Inner Box<br>卷盘/盒 | Units/Inner Box<br>只/盒 | Inner Boxes/Outer Box<br>盒/箱 | Units/Outer Box<br>只/箱 | Reel                                    | Inner Box 盒 | Outer Box 箱 |
| TO-252               | 2,500              | 2                       | 5,000                  | 5                            | 25,000                 | 13" ×16                                 | 360×360×50  | 385×257×392 |

套管包装 / TUBE

| Package Type<br>封装形式 | Units 包装数量         |                         |                        |                              |                        | Dimension 包装尺寸 (unit: mm <sup>3</sup> ) |             |             |
|----------------------|--------------------|-------------------------|------------------------|------------------------------|------------------------|-----------------------------------------|-------------|-------------|
|                      | Units/Tube<br>只/套管 | Tubes/Inner Box<br>套管/盒 | Units/Inner Box<br>只/盒 | Inner Boxes/Outer Box<br>盒/箱 | Units/Outer Box<br>只/箱 | Tube 套管                                 | Inner Box 盒 | Outer Box 箱 |
| TO-251/252           | 75                 | 48                      | 3,600                  | 5                            | 18,000                 | 526×20.5×5.25                           | 555×164×50  | 575×290×180 |

**使用说明 / Notices**