

# BRCS030N04DPQ

Rev.A Oct.-2023

## 描述 / Descriptions

TO-252 塑封封装 N 沟道场效应管。  
N-CHANNEL MOSFET in a TO-252 Plastic Package.

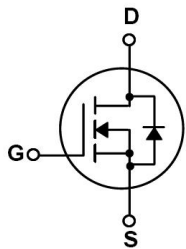
## 特征 / Features

$R_{DS(on)}$ 小, 门电荷低,  $C_{rss}$ 小, 开关速度快, 符合 AEC-Q101 标准高可靠性要求, 无卤产品。  
Low  $R_{DS(on)}$ , low gate charge, low  $C_{rss}$ , fast switching, Qualified to AEC-Q101 Standards for High Reliability, HF Product.

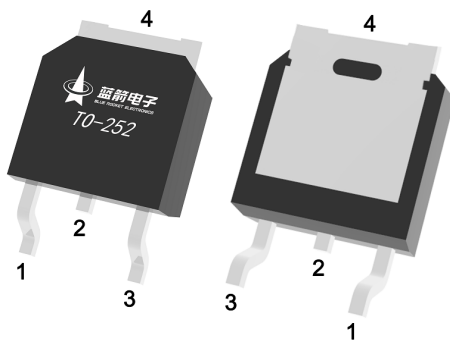
## 用途 / Applications

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, 满足汽车应用的严格要求。  
Suited for low voltage applications such as automotive, DC/DC Converters, and high efficiency switching for power management in portable and battery operated products, Meet the stringent requirements of automotive applications.

## 内部等效电路 / Equivalent Circuit



## 引脚排列 / Pinning



PIN 1 : G

PIN 2 : D

PIN 3 : S

PIN 4 : D

## 印章代码 / 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>                  | 40           | V          |
| Drain Current                           | I <sub>D</sub> (Tc=25°C)          | 150          | A          |
| Drain Current - Pulsed                  | I <sub>DM</sub>                   | 304          | A          |
| Gate-Source Voltage                     | V <sub>GS</sub>                   | ±20          | V          |
| Avalanche Current                       | I <sub>AS</sub>                   | 33           | A          |
| Single Pulsed Avalanche Energy(L=0.5mH) | E <sub>AS</sub>                   | 435          | mJ         |
| Power Dissipation                       | P <sub>D</sub> (Tc=25°C)          | 120          | W          |
| Junction and Storage Temperature Range  | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150   | °C         |
| Thermal Resistance-Junction to Ambient  | t ≤ 10s                           | 20           | °C/W       |
|   | Steady-State                      | 50           |            |
| Thermal Resistance-Junction to Case     | Steady-State                      | 1.04         |            |

**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 <sub>DSS</sub>    | V <sub>GS</sub> =0V I <sub>D</sub> =250μA                       | 40         |            |            | V          |
| Zero Gate Voltage Drain Current    | I <sub>DSS</sub>     | V <sub>DS</sub> =40V V <sub>GS</sub> =0V                        |            |            | 1.0        | μA         |
| Gate-Body Leakage Current Forward  | I <sub>GSS</sub>     | V <sub>GS</sub> =±20V V <sub>DS</sub> =0V                       |            |            | ±100       | nA         |
| Gate Threshold Voltage             | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> I <sub>D</sub> =250μA          | 1.0        | 1.7        | 2.5        | V          |
| Static Drain-Source On-Resistance  | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V I <sub>D</sub> =20A                        |            | 2.5        | 3.0        | mΩ         |
|                                    |                      | V <sub>GS</sub> =4.5V I <sub>D</sub> =10A                       |            | 3.1        | 5.0        |            |
| Drain-Source Diode Forward Voltage | V <sub>SD</sub>      | V <sub>GS</sub> =0V I <sub>S</sub> =1A                          |            |            | 1.4        | V          |
| Gate resistance                    | R <sub>g</sub>       | V <sub>GS</sub> =0V V <sub>DS</sub> =0V, f=1MHz                 |            | 1.16       |            | Ω          |
| Input Capacitance                  | C <sub>iss</sub>     | V <sub>DS</sub> =25V V <sub>GS</sub> =0V f=1.0MHz               |            | 9600       |            | pF         |
| Output Capacitance                 | C <sub>oss</sub>     |   |            | 740        |            |            |
| Reverse Transfer Capacitance       | C <sub>rss</sub>     |   |            | 650        |            |            |
| Total Gate Charge                  | Q <sub>g(10V)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =20A V <sub>DS</sub> =20V, |            | 51         |            | nC         |
| Total Gate Charge                  | Q <sub>g(4.5V)</sub> |   |            | 23         |            |            |
| Gate Source Charge                 | Q <sub>gs</sub>      |   |            | 13.2       |            |            |
| Gate Drain Charge                  | Q <sub>gd</sub>      |   |            | 3.1        |            |            |

## 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 |
|---------------------|--------------|--|------------|------------|------------|------------|
| Turn-On Delay Time  | $t_{d(on)}$  | $V_{GS}=10V$ $V_{DS}=20V$<br>$R_L=1\ \Omega$ $R_{GEN}=3\ \Omega$ |            | 11         |            | ns         |
| Turn-On Rise Time   | $t_r$        |  |            | 11         |            |            |
| Turn-Off Delay Time | $t_{d(off)}$ |  |            | 40         |            |            |
| Turn-Off Fall Time  | $t_f$        |  |            | 10         |            |            |

## 电参数曲线图 / Electrical Characteristic Curve

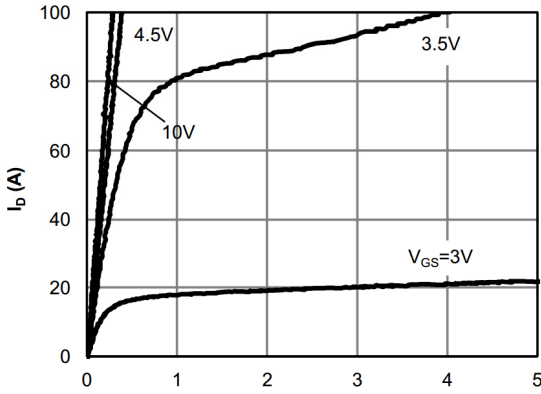


Figure 1: On-Region Characteristics

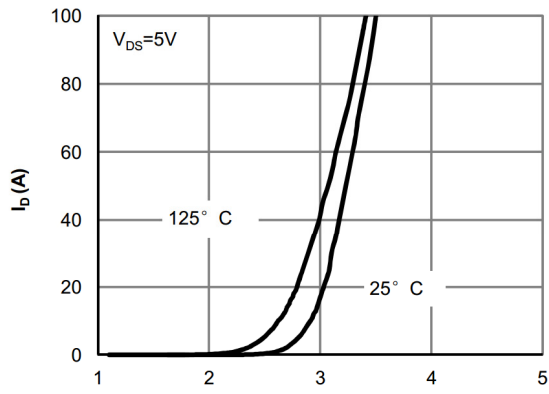


Figure 2: Transfer Characteristics

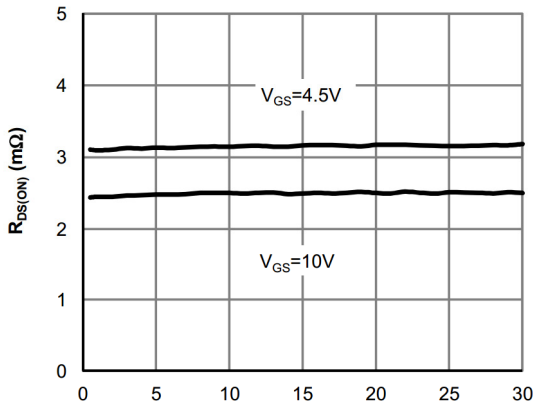


Figure 3: On-Resistance vs. Drain Current and Gate Voltage

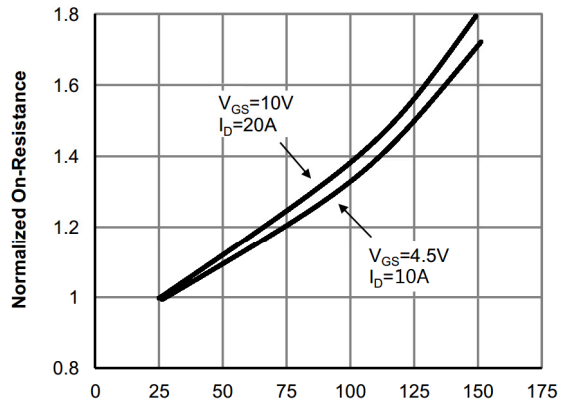


Figure 4: On-Resistance vs. Junction Temperature

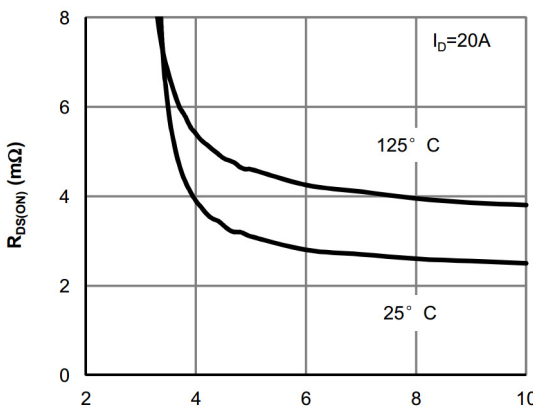


Figure 5: On-Resistance vs. Gate-Source Voltage

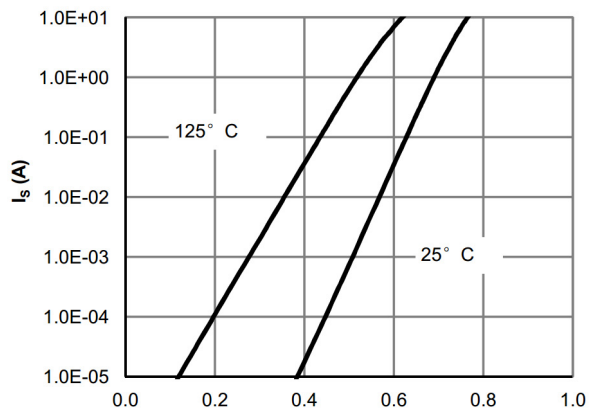


Figure 6: Body-Diode Characteristics

## 电参数曲线图 / Electrical Characteristic Curve

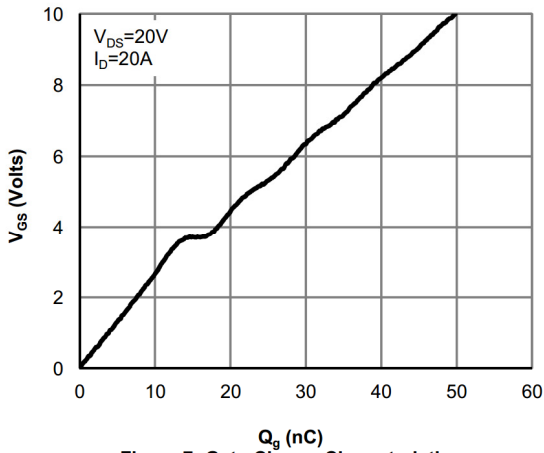


Figure 7: Gate-Charge Characteristics

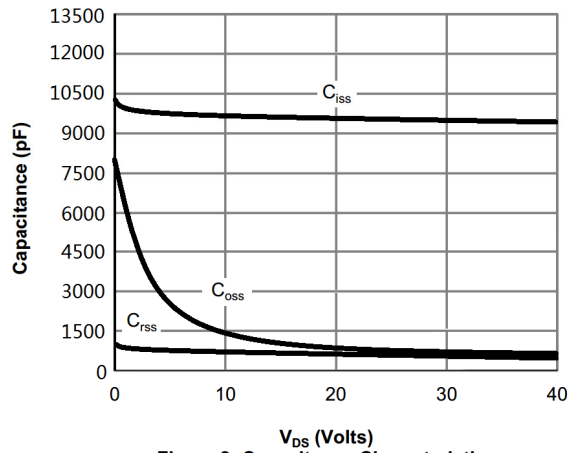


Figure 8: Capacitance Characteristics

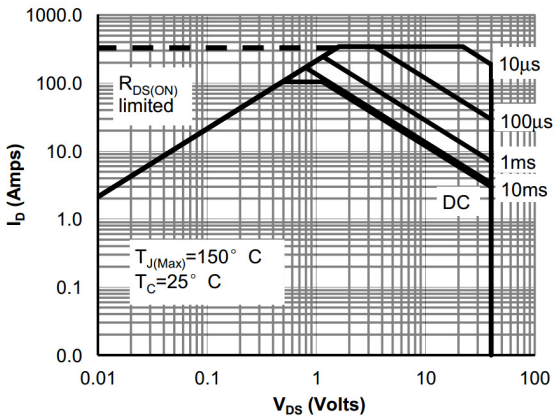


Figure 9: Maximum Forward Biased Safe Operating Area  
V<sub>GS</sub> > or equal to 4.5V

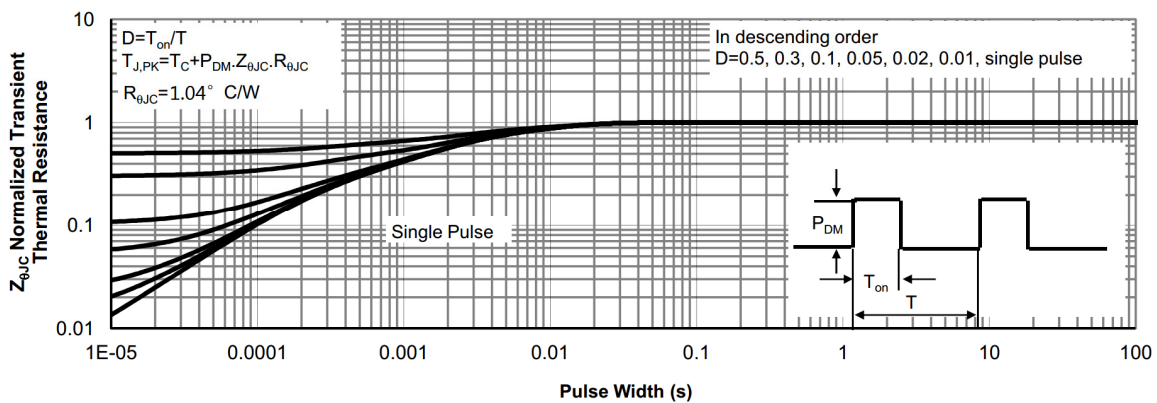
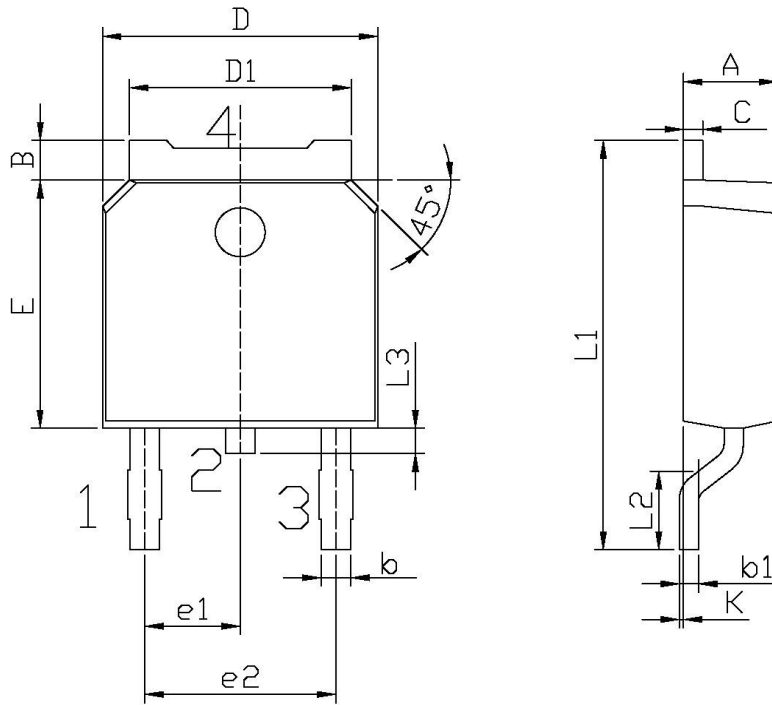


Figure 10: Normalized Maximum Transient Thermal Impedance

**外形尺寸图 / Package Dimensions**

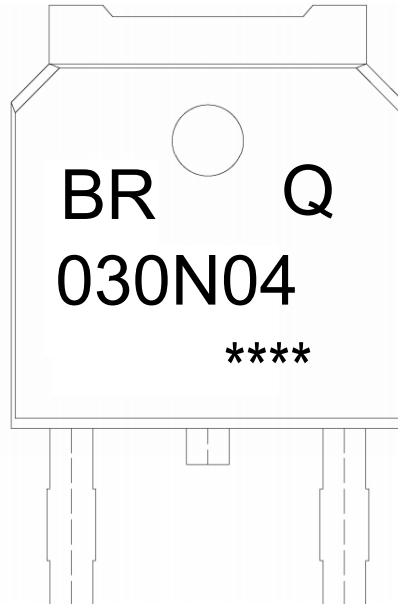


单位: mm

| 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      | 0.70                      | 0.90 | e2     | 4.43                      | 4.73  |
| b1     | 0.45                      | 0.55 | L1     | 9.85                      | 10.35 |
| C      | 0.45                      | 0.55 | L2     | 1.70                      | 2.00  |
| 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

Q： 为汽车无卤产品标识

030N04： 为型号代码

\*\*\*\*： 为生产批号代码，随生产批号变化

Note:

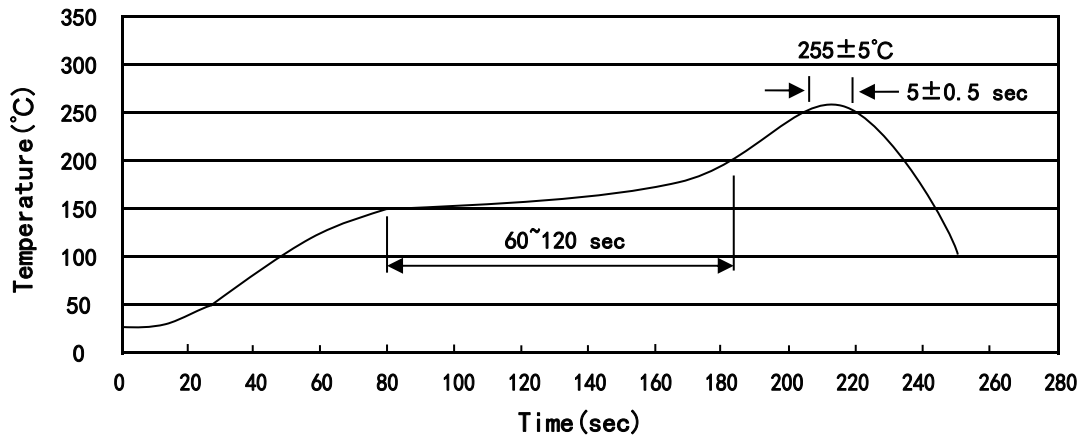
BR: Company Code

Q: Automobile halogen-free product Code

030N04: 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 150~200°C，时间 60~120sec;
- 2、峰值温度 255±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:150~200°C, Time:60~120sec.
- 2.Peak Temp.:255±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                  | 6                            | 30,000                 | 13" ×16                                 | 360×360×50  | 380×335×366 |

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**