

## 描述 / Descriptions

TO-220F 塑封封装 N 沟道 MOS 场效应管。N-CHANNEL MOSFET in a TO-220F Plastic Package.

## 特征 / Features

低栅电荷,低反馈电容,开关速度快。

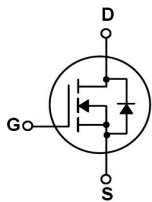
Low gate charge, low crss, fast switching.

## 用途 / Applications

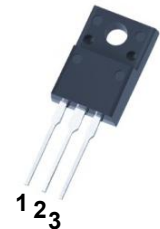
用于高功率 DC/DC 转换和功率开关。

These devices are well suited for high efficiency switching DC/DC converters and switch mode power supplies.

## 内部等效电路 / Equivalent Circuit



## 引脚排列 / Pinning



PIN1 : G

PIN 2 : D

PIN 3 : S

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

见印章说明。See Marking Instructions.

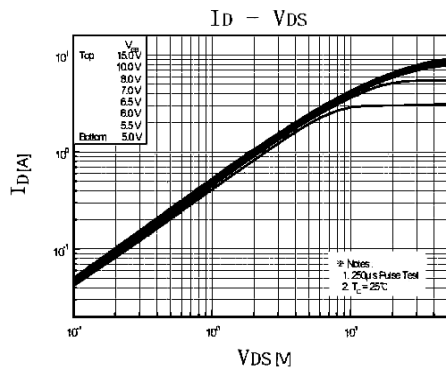
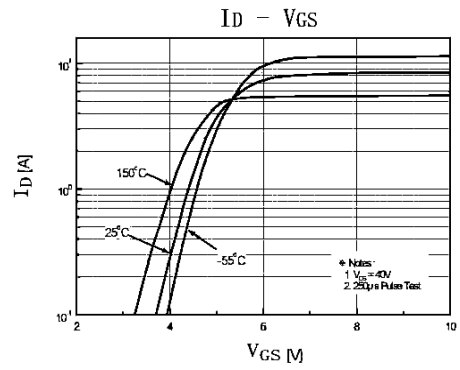
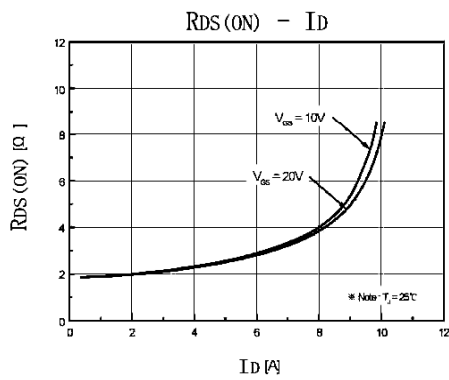
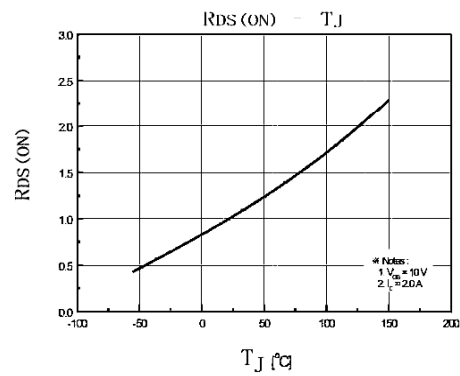
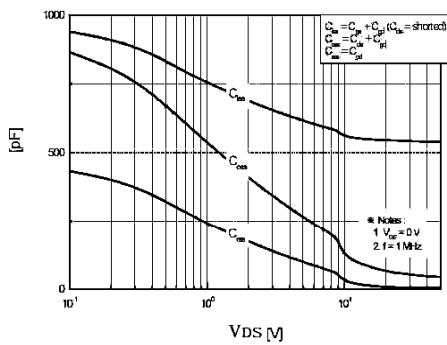
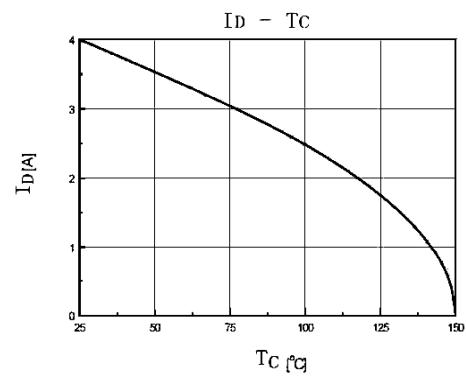
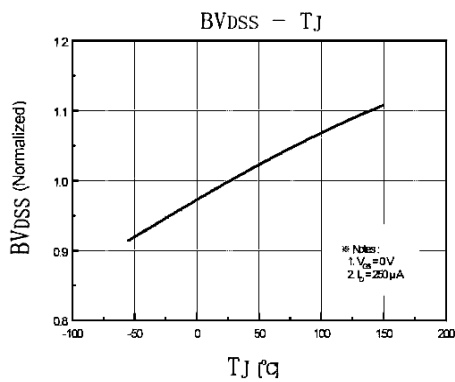
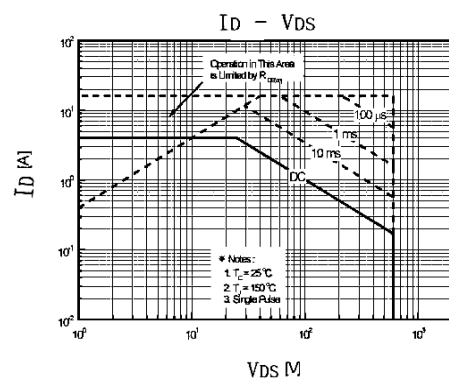
**极限参数 / Absolute Maximum Ratings(Ta=25°C)**

| 参数<br>Parameter                         | 符号<br>Symbol            | 数值<br>Rating | 单位<br>Unit    |
|-----------------------------------------|-------------------------|--------------|---------------|
| Drain-Source Voltage                    | $V_{DSS}$               | 600          | V             |
| Drain Current                           | $I_D(T_c=25^{\circ}C)$  | 4.0          | A             |
| Drain Current                           | $I_D(T_c=100^{\circ}C)$ | 2.5          | A             |
| Drain Current - Pulsed                  | $I_{DM}$                | 16           | A             |
| Gate-Source Voltage                     | $V_{GSS}$               | $\pm 30$     | V             |
| Single Pulsed Avalanche Energy          | $E_{AS}$                | 240          | mJ            |
| Repetitive Avalanche Energy             | $E_{AR}$                | 10           | mJ            |
| Avalanche Current                       | $I_{AR}$                | 4.0          | A             |
| Power Dissipation                       | $P_D(T_c=25^{\circ}C)$  | 33           | W             |
| Operating and Storage Temperature Range | $T_J, T_{STG}$          | -55 to 150   | $^{\circ}C$   |
| Thermal Resistance, Junction-to-Case    | $R_{\theta JC}$         | 3.6          | $^{\circ}C/W$ |
| Thermal Resistance, Junction-to-Ambient | $R_{\theta JA}$         | 65           | $^{\circ}C/W$ |

**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            | $BV_{DSS}$                     | $V_{GS}=0V \quad I_D=250\mu A$                | 600        |            |            | V              |
| Breakdown Voltage Temperature coefficient | $\Delta BV_{DSS} / \Delta T_J$ | $I_D=250\mu A$                                |            | 0.6        |            | V/ $^{\circ}C$ |
| Zero Gate Voltage Drain Current           | $I_{DSS}$                      | $V_{DS}=600V \quad V_{GS}=0V$                 |            |            | 10         | $\mu A$        |
|                                           |                                | $V_{DS}=480V \quad T_C=125^{\circ}C$          |            |            | 100        | $\mu A$        |
| Gate-Body Leakage Current Forward         | $I_{GSS}$                      | $V_{GS}=\pm 30V \quad V_{DS}=0V$              |            |            | $\pm 0.1$  | $\mu A$        |
| Gate Threshold Voltage                    | $V_{GS(th)}$                   | $V_{DS}=V_{GS} \quad I_D=250\mu A$            | 2.0        |            | 4.0        | V              |
| Static Drain-Source On-Resistance         | $R_{DS(on)}$                   | $V_{GS}=10V \quad I_D=2.0A$                   |            | 2.0        | 2.5        | $\Omega$       |
| Forward Transconductance                  | $g_{FS}$                       | $V_{DS}=40V \quad I_D=2.0A$                   |            | 4.7        |            | S              |
| Drain-Source Diode Forward Voltage        | $V_{SD}$                       | $V_{GS}=0V \quad I_S=4.0A$                    |            |            | 1.4        | V              |
| Input Capacitance                         | $C_{iss}$                      | $V_{DS}=25V \quad V_{GS}=0V \quad f=1.0MHz$   |            | 545        | 710        | pF             |
| Output Capacitance                        | $C_{oss}$                      |                                               |            | 60         | 80         |                |
| Reverse Transfer Capacitance              | $C_{rss}$                      |                                               |            | 8          | 11         |                |
| Turn-On Delay Time                        | $t_{d(on)}$                    | $V_{DD}=300V \quad I_D=4.0A \quad V_{GS}=10V$ |            | 10         | 30         | ns             |
| Turn-On Rise Time                         | $t_r$                          |                                               |            | 35         | 80         |                |
| Turn-Off Delay Time                       | $t_{d(off)}$                   |                                               |            | 45         | 100        |                |
| Turn-Off Fall Time                        | $t_f$                          |                                               |            | 40         | 90         |                |

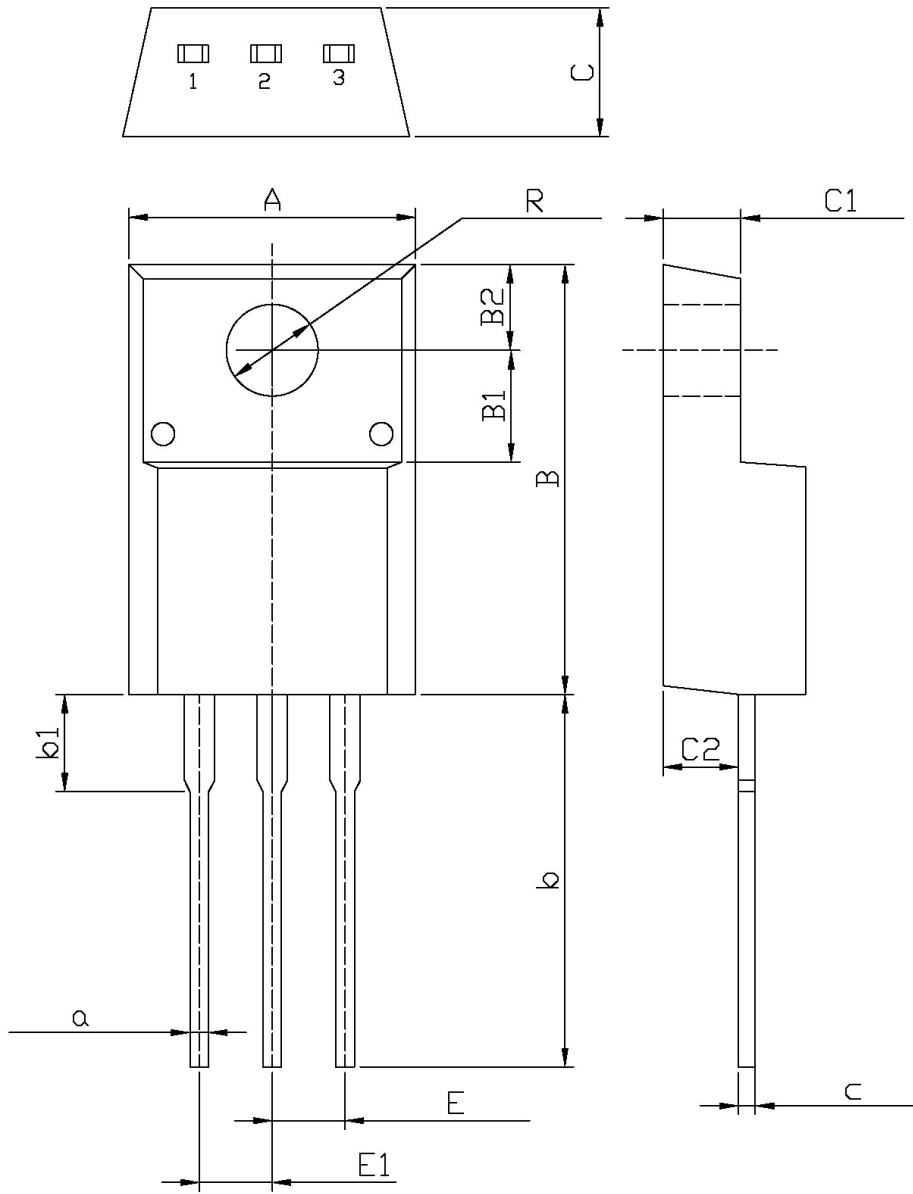
**电参数曲线图 / Electrical Characteristic Curve**



外形尺寸图 / Package Dimensions

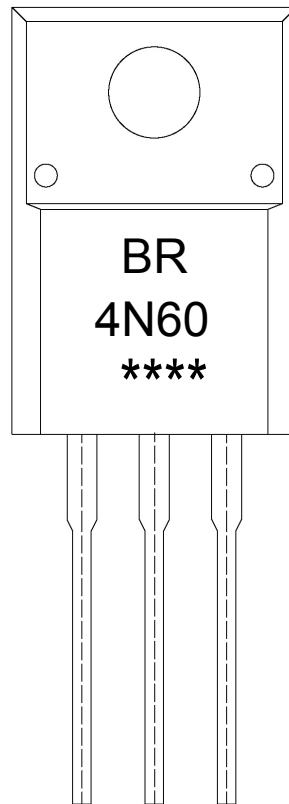
T0-220F

单位: mm



| Symbol | Dimensions In Millimeters |      | Symbol | Dimensions In Millimeters |      |
|--------|---------------------------|------|--------|---------------------------|------|
|        | Min                       | Max  |        | Min                       | Max  |
| C      | 4.3                       | 4.7  | b1     | 2.9                       | 3.9  |
| A      | 9.7                       | 10.3 | a      | 0.55                      | 0.75 |
| B      | 14.7                      | 15.3 | E      | 2.29                      | 2.79 |
| B1     | 3.8                       | 4.0  | E1     | 2.29                      | 2.79 |
| B2     | 2.9                       | 3.1  | C1     | 2.5                       | 2.9  |
| R      | 3.0                       | 3.4  | C2     | 2.5                       | 2.7  |
| b      | 12.5                      | 13.5 | c      | 0.5                       | 0.7  |

**印章说明 / Marking Instructions**



说明：

BR： 为公司代码

4N60： 为型号代码

\*\*\*\*： 为生产批号代码，随生产批号变化。

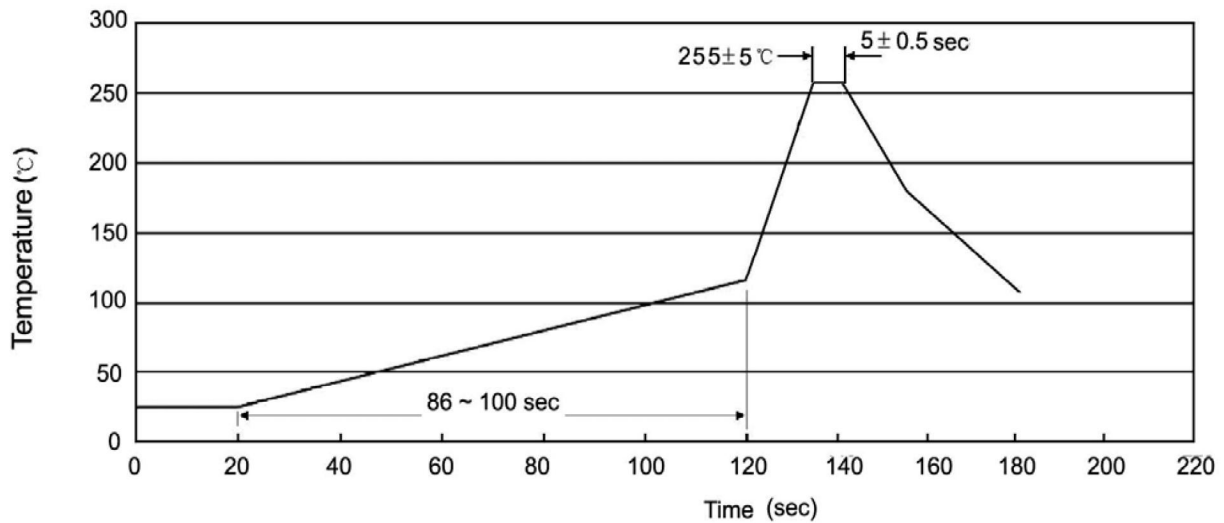
Note:

BR: Company Code

4N60: Product Type.

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

**波峰焊温度曲线图(无铅) / Temperature Profile for Dip Soldering(Pb-Free)**



说明：

- 1、预热温度 25 ~ 150°C，时间 60 ~ 90sec;
- 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:25~150°C, Time:60~90sec.
- 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：270±5°C

时间：10±1 sec.

Temp.:270±5°C

Time:10±1 sec

**包装规格 / Packaging SPEC.**

散件包装 / BULK

| Package Type<br>封装形式 | Units 包装数量       |                       |                        |                              |                        | Dimension 包装尺寸 (unit: mm <sup>3</sup> ) |             |             |
|----------------------|------------------|-----------------------|------------------------|------------------------------|------------------------|-----------------------------------------|-------------|-------------|
|                      | Units/Bag<br>只/袋 | Bags/Inner Box<br>袋/盒 | Units/Inner Box<br>只/盒 | Inner Boxes/Outer Box<br>盒/箱 | Units/Outer Box<br>只/箱 | Bag 袋                                   | Inner Box 盒 | Outer Box 箱 |
| TO-220/F             | 200              | 10                    | 2,000                  | 5                            | 10,000                 | 135×190                                 | 237×172×102 | 560×245×195 |

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-220/F             | 50                 | 20                      | 1,000                  | 5                            | 5,000                  | 532×31.4×5.5                            | 555×164×50  | 575×290×180 |

**使用说明 / Notices**