

**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**

$V_{DS}=200V$  ;  $I_D=9A$

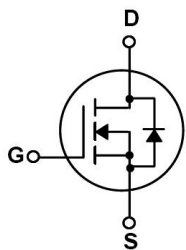
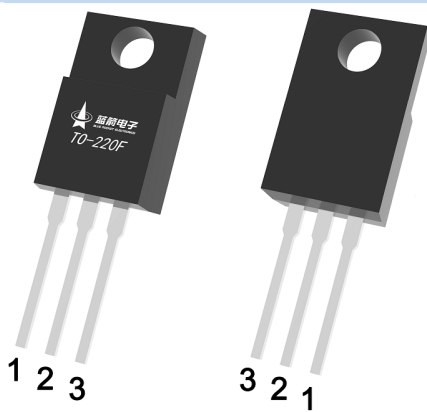
$R_{DS(on)}@10V \leq 0.4\Omega$  (Type.0.35 $\Omega$ )

无卤产品。HF Product.

**用途 / Applications**

网络、负载开关、LED 应用。

Networking, Load Switch, LED applications.

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

PIN1 : G

PIN 2 : D

PIN 3 : S

**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                    | $V_{DS}$                    | 200          | V                  |
| Drain Current                           | $I_D(T_c=25^\circ\text{C})$ | 9            | A                  |
| Drain Current - Pulsed                  | $I_{DM}$                    | 36           | A                  |
| Gate-Source Voltage                     | $V_{GS}$                    | $\pm 20$     | V                  |
| Single Pulsed Avalanche Energy(L=10mH)  | $E_{AS}$                    | 166          | mJ                 |
| Avalanche Current(L=10mH)               | $I_{AS}$                    | 5            | A                  |
| Power Dissipation                       | $P_D(T_c=25^\circ\text{C})$ | 30           | W                  |
| Operating and Storage Temperature Range | $T_J, T_{STG}$              | -55 to 150   | $^\circ\text{C}$   |
| Maximum Junction-to-Ambient             | $R_{\theta JA}$             | 100          | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case                | $R_{\theta JC}$             | 4.17         |                    |

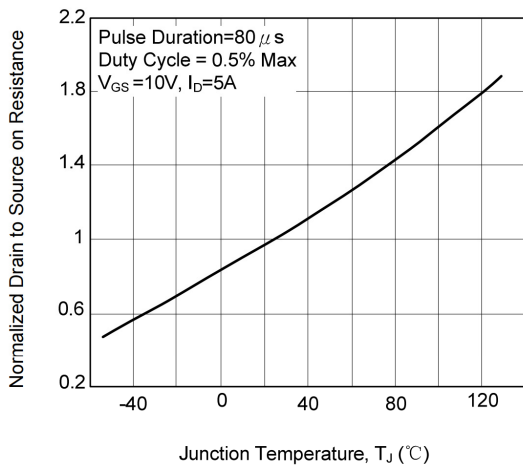
**电性能参数 / Electrical Characteristics(Ta=25°C)**

| 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    | $BV_{DS}$    | $V_{GS}=0V$ $I_D=250\mu A$                            | 200        |            |            | V          |
| Zero Gate Voltage Drain Current   | $I_{DSS}$    | $V_{DS}=200V$ $V_{GS}=0V$                             |            |            | 1          | $\mu A$    |
| Gate-Body Leakage Current Forward | $I_{GSS}$    | $V_{GS}=\pm 20V$ $V_{DS}=0V$                          |            |            | $\pm 100$  | nA         |
| Gate Threshold Voltage            | $V_{GS(th)}$ | $V_{DS}=V_{GS}$ $I_D=250\mu A$                        | 2          | 3          | 4          | V          |
| Total gate charge                 | $R_{DS(on)}$ | $V_{GS}=10V$ $I_D=4.5A$                               |            | 0.35       | 0.4        | $\Omega$   |
| Gate resistance                   | $R_g$        | $V_{GS}=0V$ $f=1MHz$ $V_{DS}=0V$                      |            | 1.7        |            | $\Omega$   |
| Input Capacitance                 | $C_{iss}$    | $V_{DS}=25V$ $V_{GS}=0V$ $f=1MHz$                     |            | 630        |            | pF         |
| Output Capacitance                | $C_{oss}$    |                                                       |            | 270        |            |            |
| Reverse Transfer Capacitance      | $C_{rss}$    |                                                       |            | 50         |            |            |
| Total Gate Charge                 | $Q_g$        | $V_{GS}=10V$ , $I_G=1.5mA$ , $V_{DS}=160V$ , $I_D=9A$ |            | 21         | 30         | nC         |
| Gate Source Charge                | $Q_{gs}$     |                                                       |            | 11.2       | 20         |            |
| Gate Drain Charge                 | $Q_{gd}$     |                                                       |            | 9.5        | 15         |            |

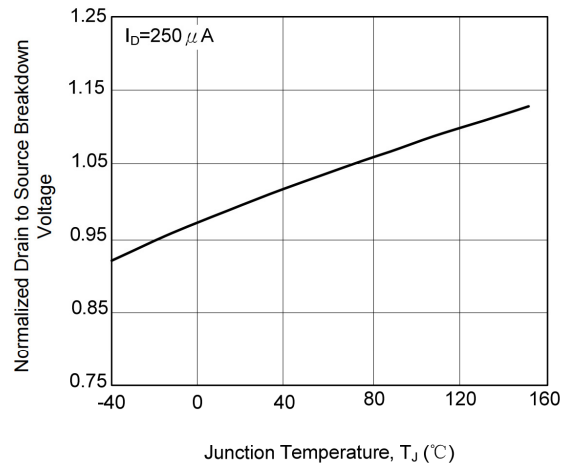
## 电性能参数 / Electrical Characteristics(Ta=25°C)

| 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                                    | $t_{d(on)}$  | $V_{GS}=10V$ $V_{DS}=90V$<br>$R_L=9.6\ \Omega$ $R_{GEN}=9.1\ \Omega$ |            | 15         | 32         | ns         |
| Turn-On Rise Time                                     | $t_r$        |                                                                      |            | 33         | 53         |            |
| Turn-Off Delay Time                                   | $t_{d(off)}$ |                                                                      |            | 40         | 55         |            |
| Turn-Off Fall Time                                    | $t_f$        |                                                                      |            | 30         | 45         |            |
| Maximum Continuous Drain-Source Diode Forward Current | $I_S$        |                                                                      |            |            | 9          | A          |
| Maximum Pulsed Drain-Source Diode Forward Current     | $I_{SM}$     |                                                                      |            |            | 36         | A          |
| Drain-Source Diode Forward Voltage                    | $V_{SD}$     | $V_{GS} = 0\ V,$ $I_S = 9.0A$                                        |            |            | 1.2        | V          |
| Reverse Recovery Time                                 | $t_{rr}$     | $V_{GS} = 0V,$ $I_S = 9.0A,$<br>$di_F/dt = 100\ A/\mu s$             |            | 455        |            | nS         |
| Reverse Recovery Charge                               | $Q_{rr}$     |                                                                      |            | 3.5        |            | nC         |

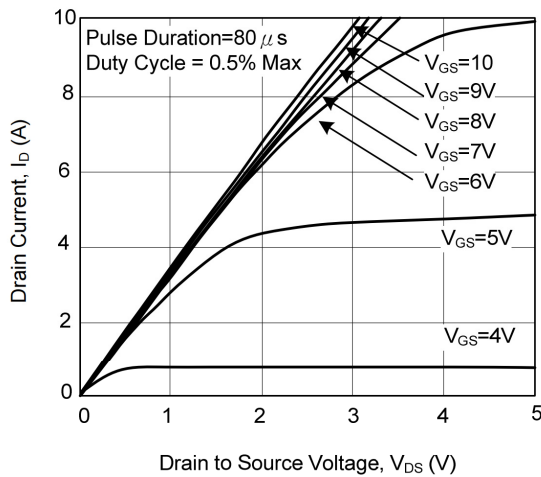
## 电参数曲线图 / Electrical Characteristic Curve



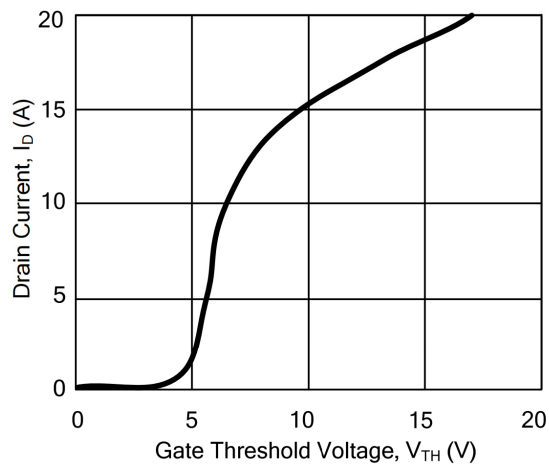
1. Normalized Drain to Source on Resistance vs. Junction Temperature



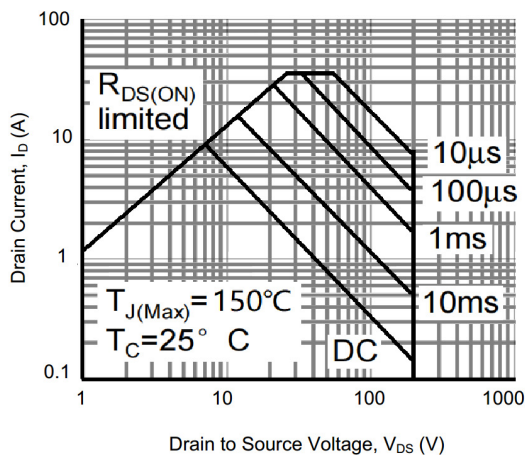
2. Normalized Drain to Source Breakdown Voltage vs. Junction Temperature



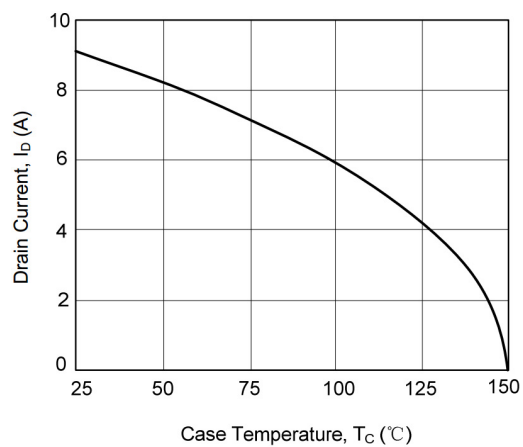
3. Saturation Characteristics



4. Drain Current vs. Gate Threshold Voltage



5. Forward Bias Safe Operating Area

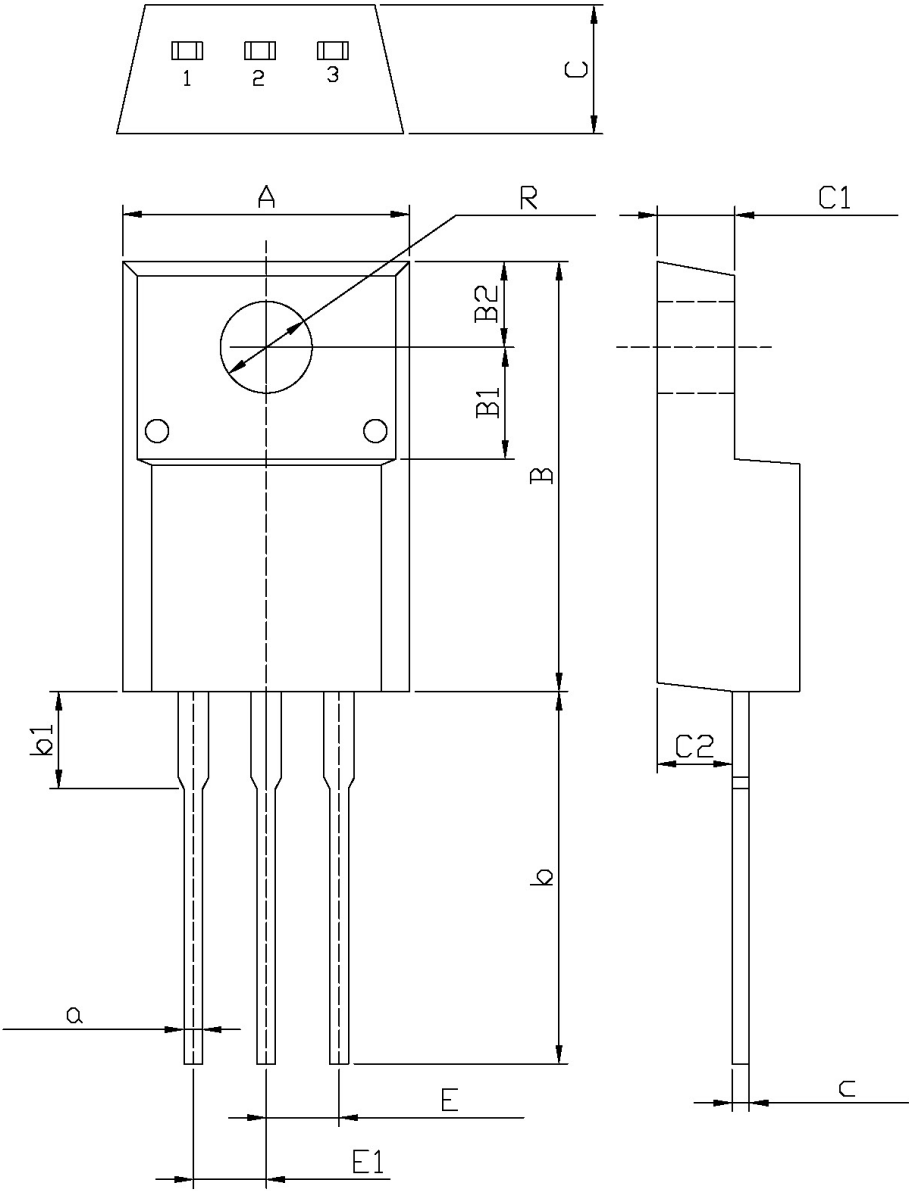


6. Maximum Continuous Drain Current vs. Case Temperature

外形尺寸图 / Package Dimensions

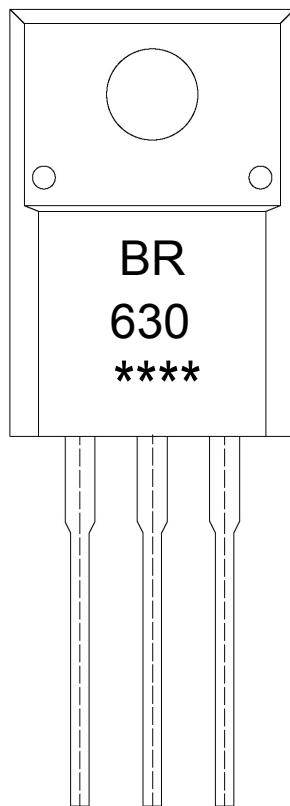
T□-220F

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

630： 为型号代码

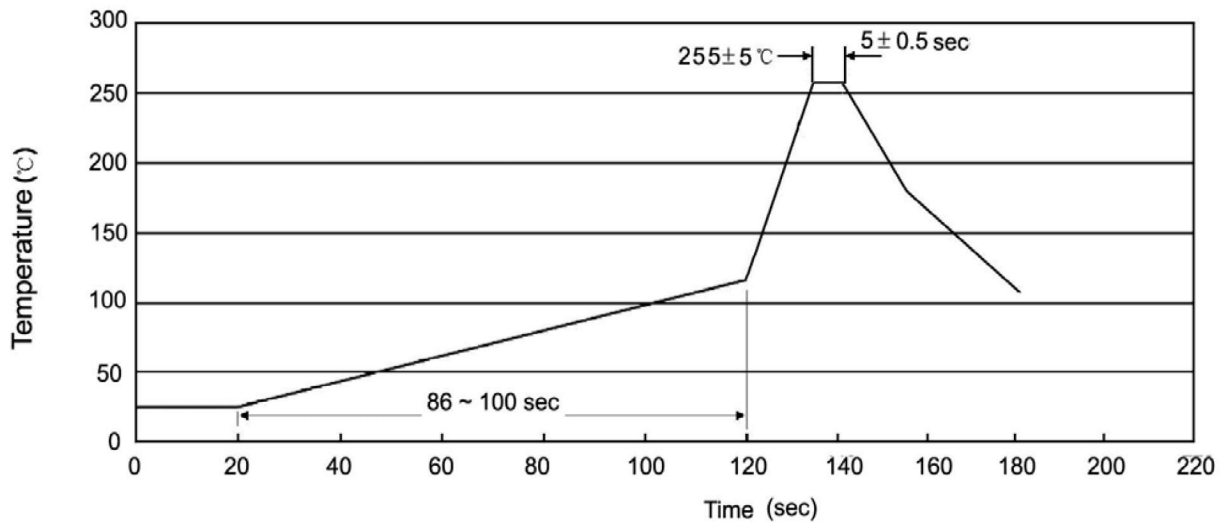
\*\*\*\*： 为生产批号代码，随生产批号变化

Note:

BR: Company Code

630: 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**