

# BRFL4N65S

Rev.A Dec.-2023

## 描述 / Descriptions

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

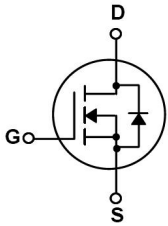
## 特征 / Features

低栅电荷，低反馈电容，开关速度快，具有良好的电磁干扰性能。  
Low gate charge, low crss, fast switching, Have good Electromagnetic Interference performance.

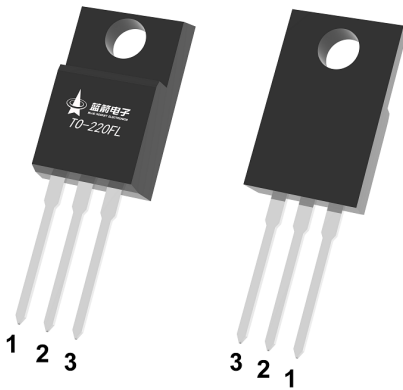
## 用途 / Applications

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



PIN 1 : G

PIN 2 : D

PIN 3 : S

## 印章代码 / Marking

见印章说明。  
See Marking Instructions.

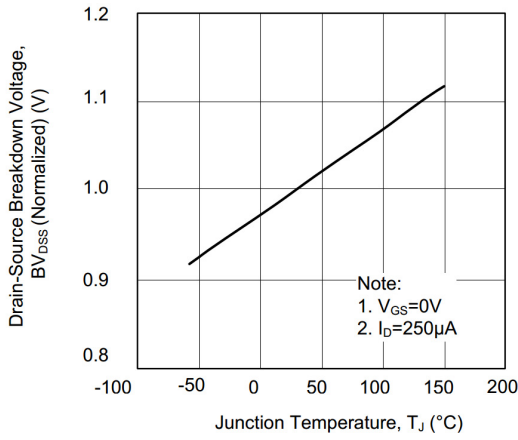
**极限参数 / Absolute Maximum Ratings(Ta=25°C)**

| 参数<br>Parameter                         | 符号<br>Symbol                | 数值<br>Rating | 单位<br>Unit         |
|---|-----------------------------|--------------|--------------------|
| Drain-Source Voltage                    | $V_{DS}$                    | 650          | V                  |
| Drain Current                           | $I_D(T_c=25^\circ\text{C})$ | 4.0          | A                  |
| Drain Current - Pulsed                  | $I_{DM}$                    | 16           | A                  |
| Gate-Source Voltage                     | $V_{GS}$                    | $\pm 30$     | V                  |
| Single Pulsed Avalanche Energy          | $E_{AS}$                    | 160          | mJ                 |
| Avalanche Current                       | $I_{AR}$                    | 6.0          | 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   | $^\circ\text{C}$   |
| Junction to Ambient                     | $R_{\theta JA}$             | 62.5         | $^\circ\text{C/W}$ |
| Junction to Case                        | $R_{\theta JC}$             | 4.2          | $^\circ\text{C/W}$ |

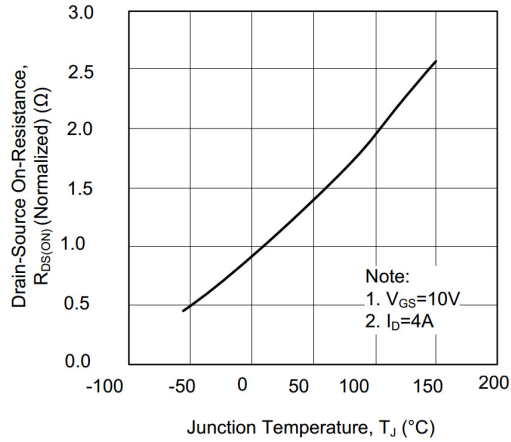
**电性能参数 / Electrical Characteristics(Ta=25°C)**

| 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     | $BV_{DSS}$   | $V_{GS}=0V$ $I_D=250\mu A$                              | 650        | 680        |            | V          |
| Zero Gate Voltage Drain Current    | $I_{DSS}$    | $V_{DS}=650V$ $V_{GS}=0V$                               |            |            | 1          | $\mu A$    |
| Gate-Body Leakage Current Forward  | $I_{GSS}$    | $V_{GS}=\pm 30V$ $V_{DS}=0V$                            |            |            | $\pm 100$  | nA         |
| Gate Threshold Voltage             | $V_{GS(th)}$ | $V_{DS}=V_{GS}$ $I_D=250\mu A$                          | 2.0        | 3.3        | 4.0        | V          |
| Static Drain-Source On-Resistance  | $R_{DS(on)}$ | $V_{GS}=10V$ $I_D=2.0A$                                 |            | 2.2        | 2.7        | $\Omega$   |
| Input Capacitance                  | $C_{iss}$    | $V_{DS}=25V$ $V_{GS}=0V$<br>$f=1.0MHz$                  |            | 570        |            | pF         |
| Output Capacitance                 | $C_{oss}$    |   |            | 44         |            |            |
| Reverse Transfer Capacitance       | $C_{rss}$    |   |            | 3          |            |            |
| Total Gate Charge                  | $Q_G$        | $V_{DS}=520V,$ $I_D=4.0A,$<br>$V_{GS}=10V$              |            | 102        |            | nC         |
| Gate-Source Charge                 | $Q_{GS}$     |   |            | 18         |            |            |
| Gate-Drain Charge                  | $Q_{GD}$     |   |            | 22         |            |            |
| Turn-On Delay Time                 | $t_{d(on)}$  | $V_{DD}=325V$ $I_D=4.0A$<br>$R_G=25\Omega$ $V_{GS}=10V$ |            | 48         |            | ns         |
| Turn-On Rise Time                  | $t_r$        |   |            | 102        |            |            |
| Turn-Off Delay Time                | $t_{d(off)}$ |   |            | 205        |            |            |
| Turn-Off Fall Time                 | $t_f$        |   |            | 134        |            |            |
| Drain-Source Diode Forward Voltage | $V_{SD}$     | $V_{GS}=0V,$ $I_S=4.0A$                                 |            |            | 1.4        | V          |

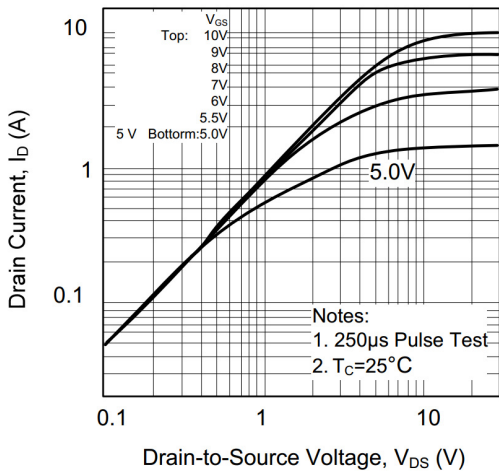
**电参数曲线图 / Electrical Characteristic Curve**



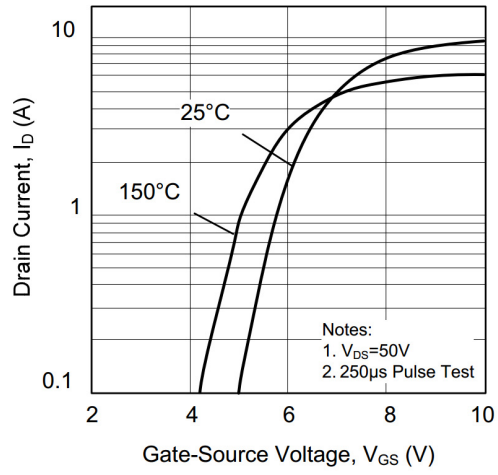
1. Breakdown Voltage Variation vs. Temperature



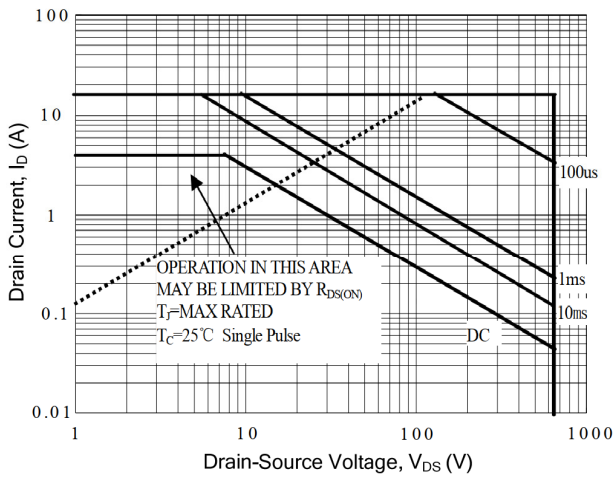
2. On-Resistance Junction Temperature



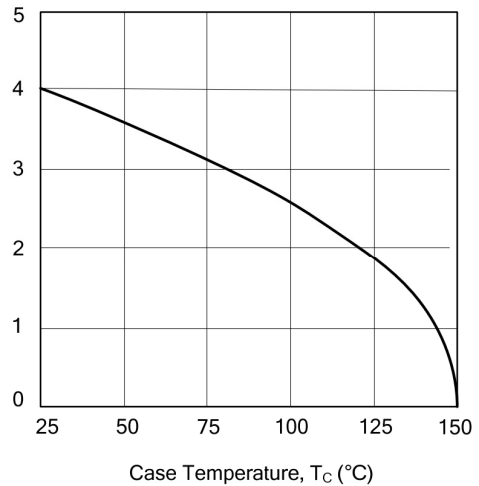
3. On-State Characteristics



4. Transfer Characteristics



5. Safe Operating Area

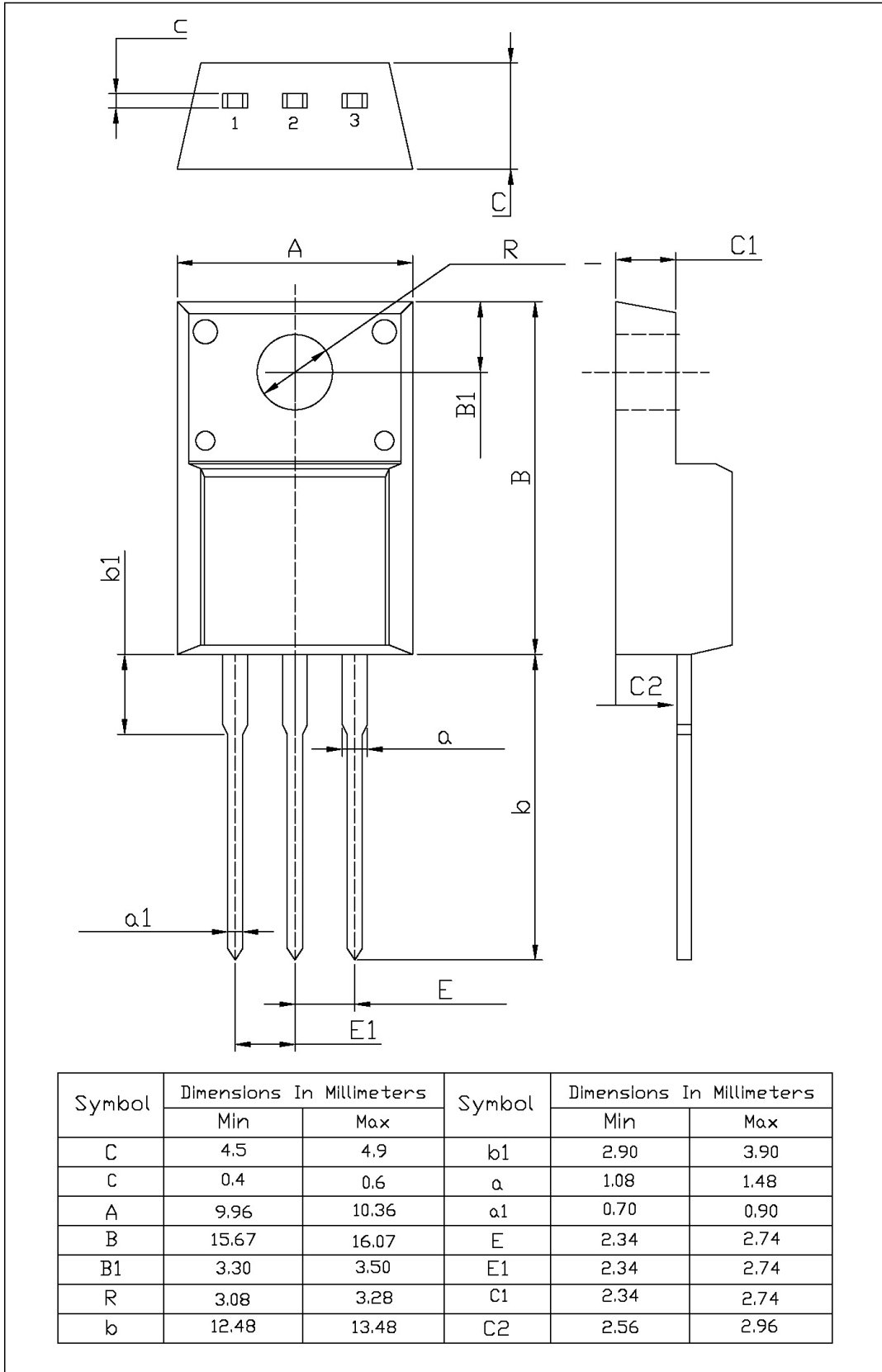


6. Maximum Drain Current vs. Case Temperature

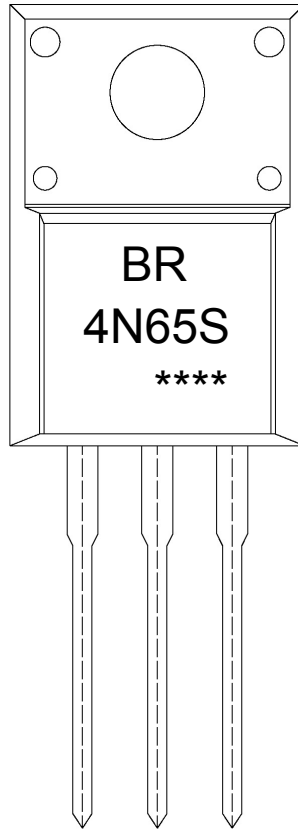
外形尺寸图 / Package Dimensions

TO-220FL

单位: mm



**印章说明 / Marking Instructions**



说明：

BR： 为公司代码

4N65S： 为型号代码

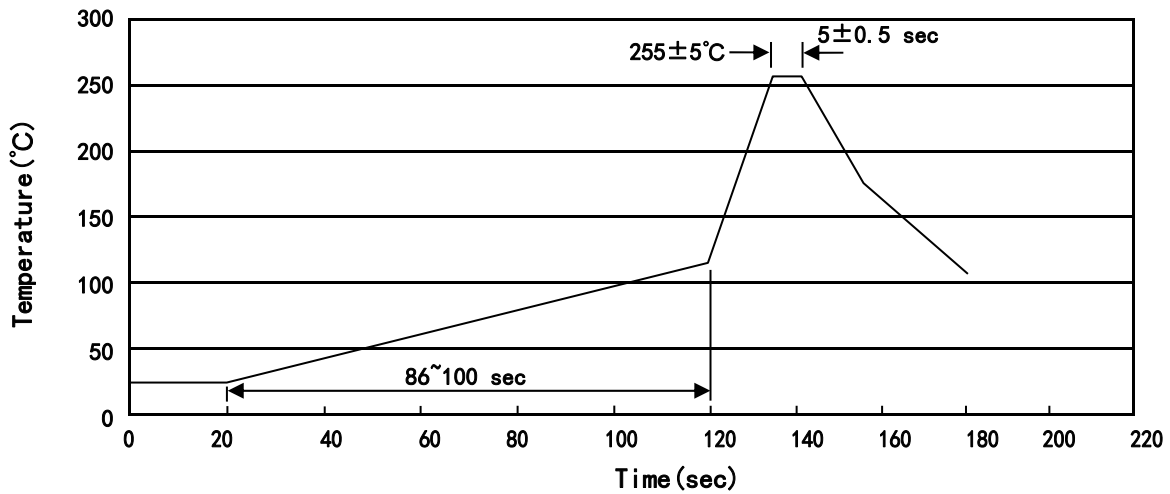
\*\*\*\*： 为生产批号代码，随生产批号变化

Note:

BR: Company Code

4N65S: Product Type Code

\*\*\*\*: 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.**

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-220FL             | 50                 | 20                      | 1,000                  | 5                            | 5,000                  | 532×33×7.0                              | 555×164×50  | 575×290×180 |

**使用说明 / Notices**