

# BRFL65R160C

Rev.E Nov.-2017

## 描述 / Descriptions

TO-220FL 塑封封装 N 沟道 650V 超结工艺功率场效应管。

N-CHANNEL 650V Super-Junction Power MOSFET in a TO-220FL Plastic Package.

## 特征 / Features

低  $R_{DS(on)} \times Q_g$  , 100%雪崩测试, 符合 ROHS 标准。

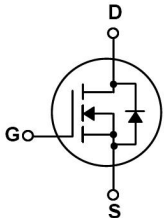
Very low  $R_{DS(on)} \times Q_g$ , 100% avalanche tested, RoHS compliant.

## 用途 / Applications

用于开关电源, 不间断电源, 功率因素校正。

For switch mode power supply, uninterruptible power supply, power factor correction.

## 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                    | $V_{DSS}$                   | 650          | V                         |
| Drain Current                           | $I_D(T_C=25^\circ\text{C})$ | 20           | A                         |
| Drain Current - Pulsed(note1)           | $I_{DM}$                    | 60           | A                         |
| Gate-Source Voltage                     | $V_{GSS}$                   | $\pm 30$     | V                         |
| Single Pulsed Avalanche Energy(note2)   | $E_{AS}$                    | 240          | mJ                        |
| Repetitive Avalanche Energy(note1)      | $E_{AR}$                    | 1.0          | mJ                        |
| Avalanche Current(note1)                | $I_{AR}$                    | 7.0          | A                         |
| Power Dissipation                       | $P_D(T_C=25^\circ\text{C})$ | 34           | W                         |
| Operating and Storage Temperature Range | $T_J, T_{STG}$              | -55 to 150   | $^\circ\text{C}$          |
| Junction-to-Case                        | $R_{\theta JC}$             | 3.67         | $^\circ\text{C}/\text{W}$ |
| Junction-to-Ambient                     | $R_{\theta JA}$             | 80           | $^\circ\text{C}/\text{W}$ |

**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           | $BV_{DSS}$   | $V_{GS}=0V$ $I_D=250\mu\text{A}$                    | 650                                       |            |            | V             |
| Zero Gate Voltage Drain Current          | $I_{DSS}$    | $V_{DS}=650V$ $V_{GS}=0V$<br>$T_J=25^\circ\text{C}$ |   |            | 1.0        | $\mu\text{A}$ |
|  |              | $V_{DS}=650V$ $T_J=150^\circ\text{C}$               |   |            | 100        | $\mu\text{A}$ |
| Gate-Body Leakage Current, Forward       | $I_{GSS}$    | $V_{GS}=\pm 30V$                                    |   |            | $\pm 100$  | nA            |
| Gate Threshold Voltage                   | $V_{GS(th)}$ | $V_{DS}=V_{GS}$ $I_D=250\mu\text{A}$                | 2.5                                       |            | 4.0        | V             |
| Static Drain-Source On-Resistance(note3) | $R_{DS(on)}$ | $V_{GS}=10V$ $I_D=10A$                              |   | 0.14       | 0.16       | $\Omega$      |
| Forward Transconductance(note3)          | $g_{FS}$     | $V_{DS}=10V$ $I_D=20A$                              |   | 18.8       |            | S             |
| Drain-Source Diode Forward Voltage       | $V_{SD}$     | $V_{GS}=0V$ $I_{SD}=20A$<br>$T_J=25^\circ\text{C}$  |   | 0.95       | 1.2        | V             |
| Input Capacitance                        | $C_{iss}$    | $V_{DS}=50V$ $V_{GS}=0V$<br>$f=1.0\text{MHz}$       |   | 1605       |            | pF            |
| Output Capacitance                       | $C_{oss}$    |   |   | 225        |            | pF            |
| Reverse Transfer Capacitance             | $C_{rss}$    |   |   | 14         |            | pF            |
| Turn-On Delay Time                       | $t_{d(on)}$  |   | $V_{DD}=400V$ $I_D=20A$<br>$R_G=25\Omega$ |            | 13         |               |
| Turn-On Rise Time                        | $t_r$        |   |   | 13         |            | ns            |
| Turn-Off Delay Time                      | $t_{d(off)}$ |   |   | 96         |            | ns            |
| Turn-Off Fall Time                       | $t_f$        |   |   | 8          |            | ns            |

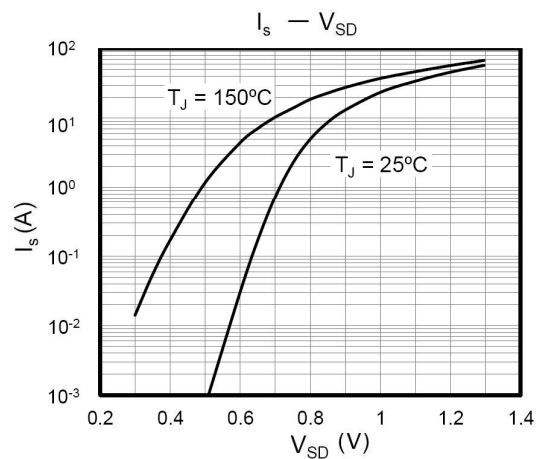
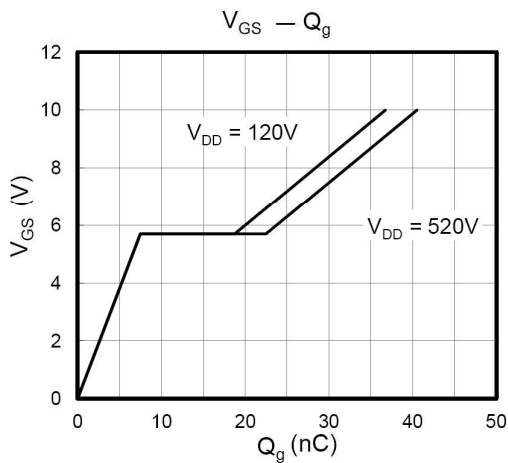
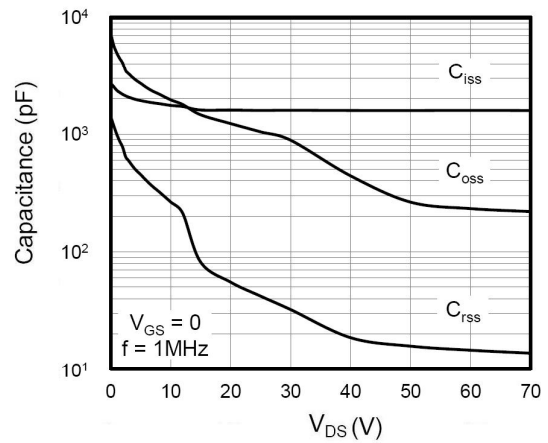
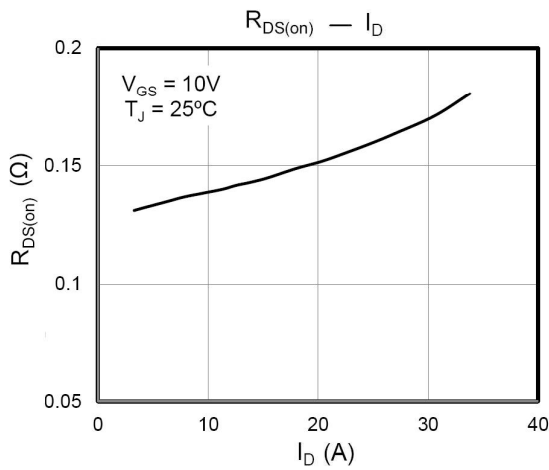
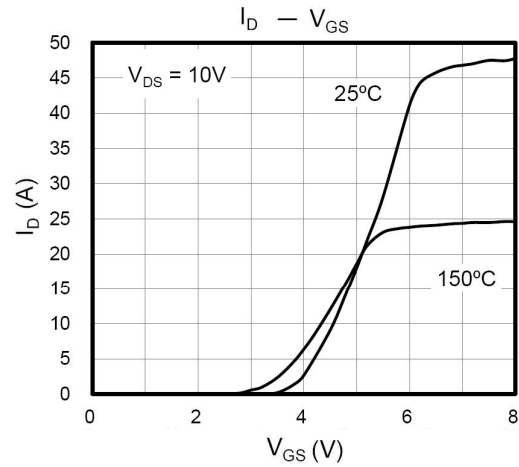
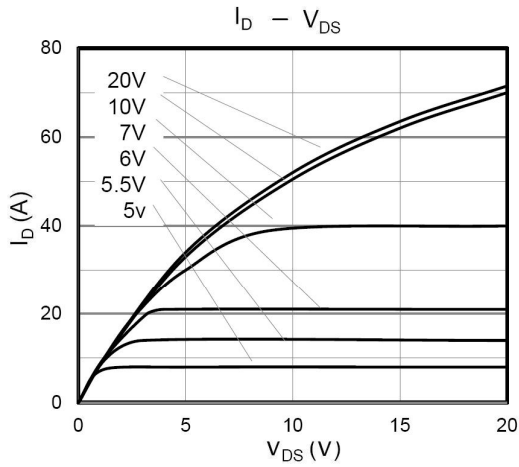
## 电性能参数 / Electrical Characteristics(Ta=25°C)

| 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    |
|-------------------------------|--------------|--|------------|------------|------------|---------------|
| Continuous Body Diode Current | $I_S$        | $T_C=25^\circ\text{C}$   |            |            | 20.6       | A             |
| Pulsed Diode Forward Current  | $I_{SM}$     |  |            |            | 70         | A             |
| Total Gate Charge             | $Q_g$        | $V_{DD}=520\text{V}$ $I_D=20\text{A}$<br>$V_{GS}=10\text{V}$     |            | 41         |            | nC            |
| Gate-Source Charge            | $Q_{gs}$     |  |            | 7.5        |            | nC            |
| Gate-Drain Charge             | $Q_{gd}$     |  |            | 15         |            | nC            |
| Reverse Recovery Time         | $t_{rr}$     | $V_R=520\text{V}$ $I_F=I_S$<br>$di_F/dt=100\text{A}/\mu\text{s}$ |            | 460        |            | ns            |
| Reverse Recovery Charge       | $Q_{rr}$     |  |            | 8.2        |            | $\mu\text{C}$ |
| Peak Reverse Recovery Current | $I_{rrm}$    |  |            | 35         |            | A             |

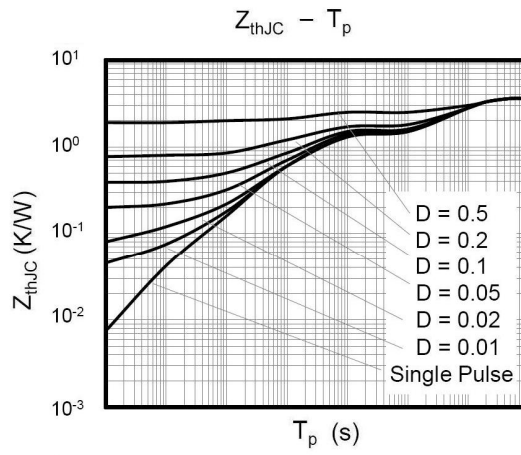
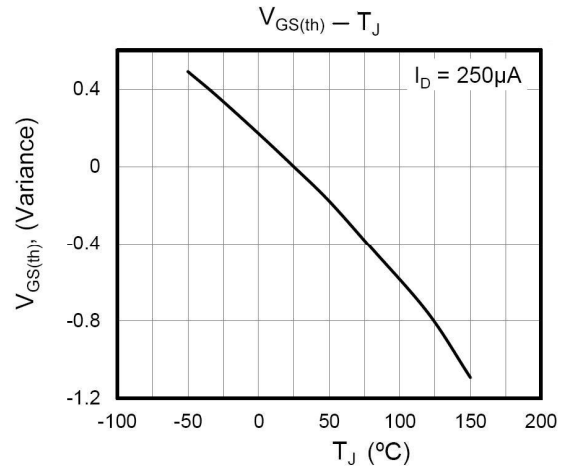
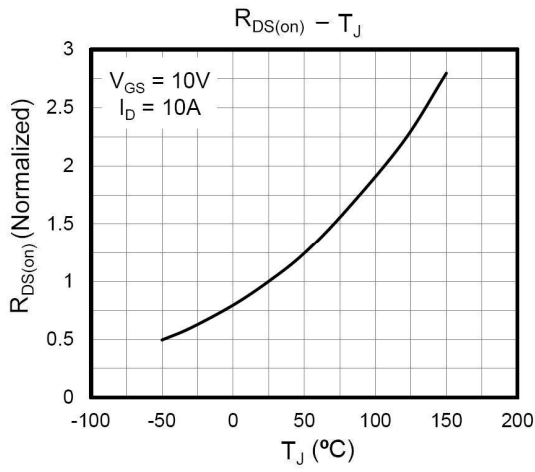
**Notes**

- 1.Repetitive Rating: Pulse width limited by maximum junction temperature
2. $I_{AS}=7.0\text{A}$ ,  $V_{DD}=50\text{V}$ ,  $R_G=25\Omega$ , Starting  $T_J=25^\circ\text{C}$
- 3.Pulse Test: Pulse width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 1\%$

电参数曲线图 / Electrical Characteristic Curve

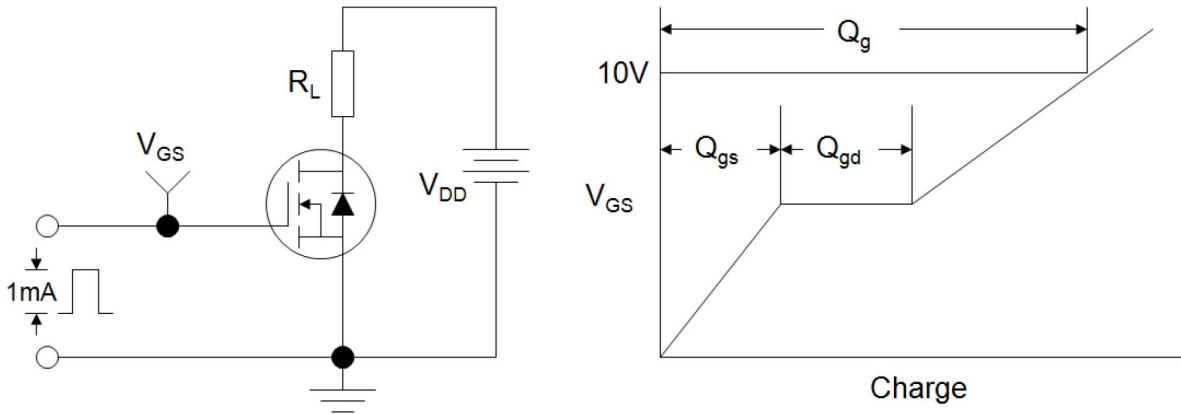


**电参数曲线图 / Electrical Characteristic Curve**

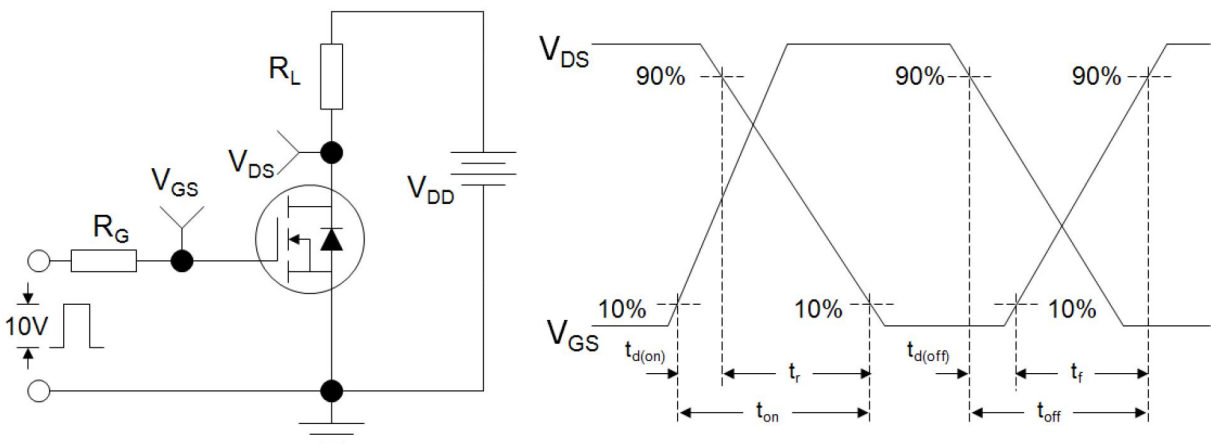


**测试电路与波形图 / Test Circuit and Waveform Curve**

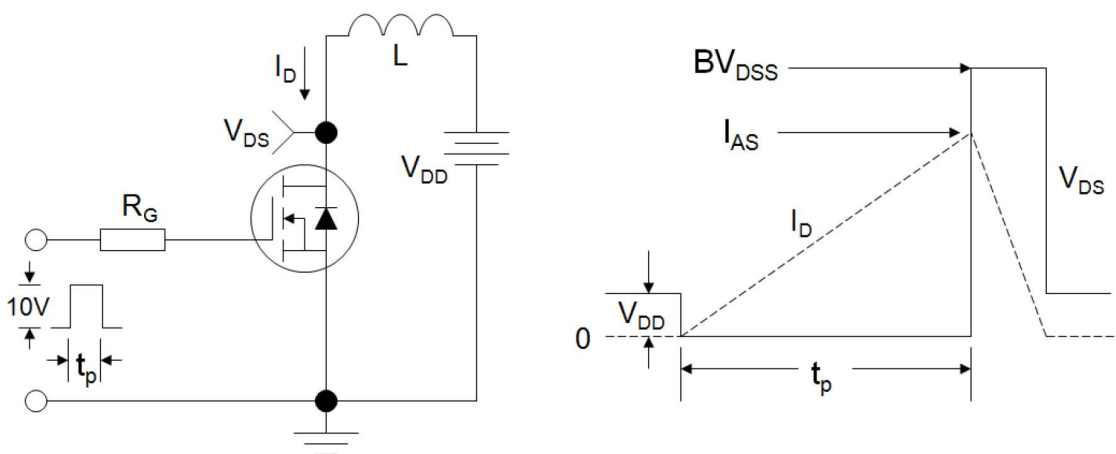
**Gate Charge Test Circuit and Waveform**



**Resistive Switching Test Circuit and Waveform**



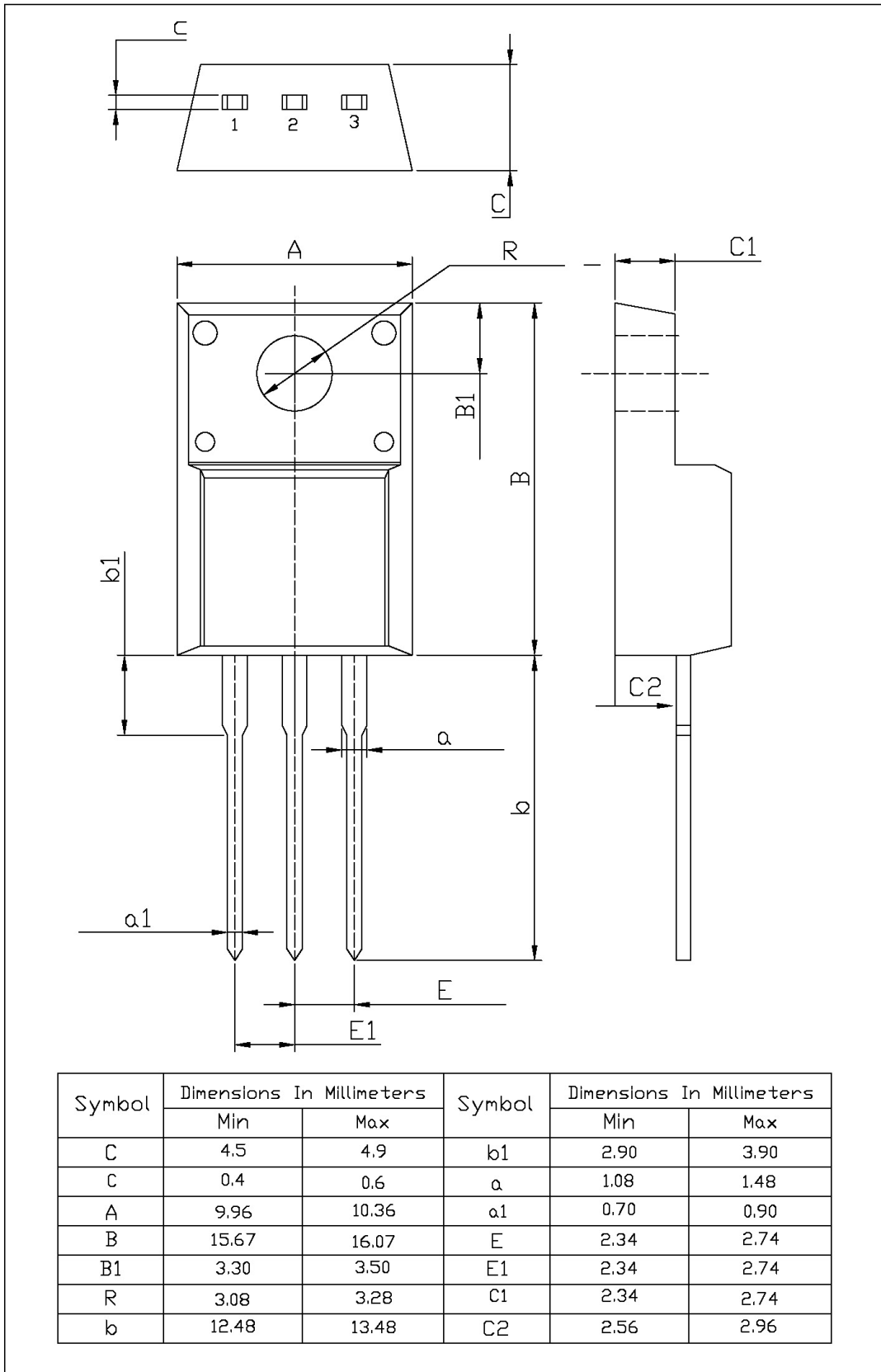
**Unclamped Inductive Switching Test Circuit and Waveform**



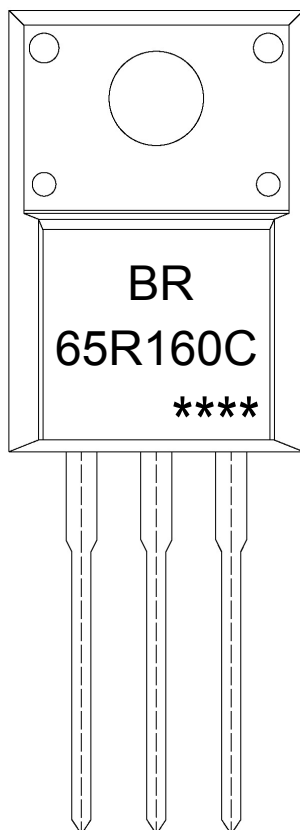
外形尺寸图 / Package Dimensions

TO-220FL

单位: mm



## 印章说明 / Marking Instructions



说明：

BR： 为公司代码

65R160C： 为型号代码

\*\*\*\*： 为生产批号代码，随生产批号变化。

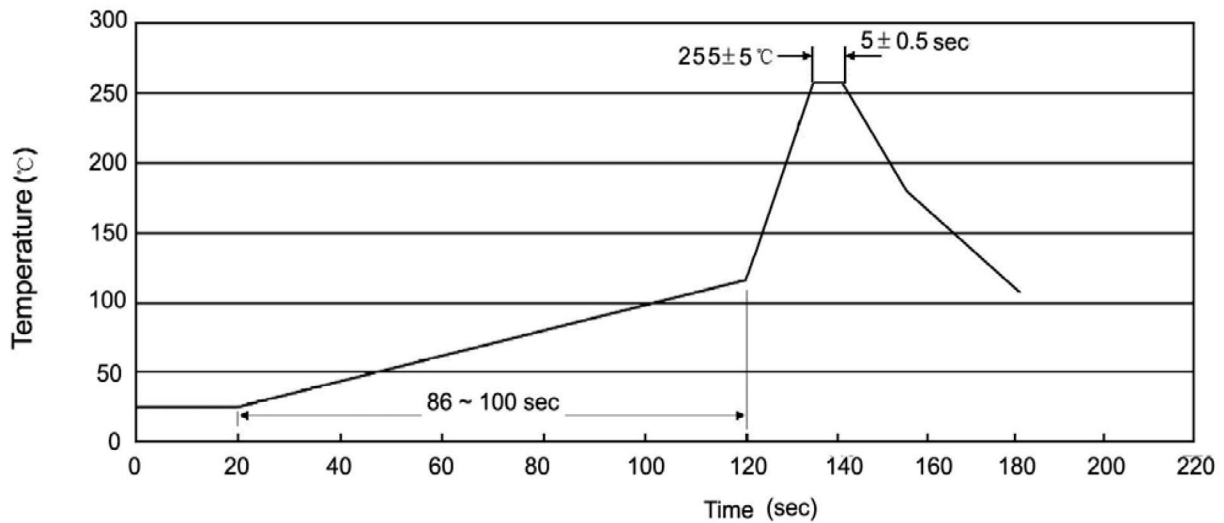
Note:

BR: Company Code

65R160C: 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.**

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**