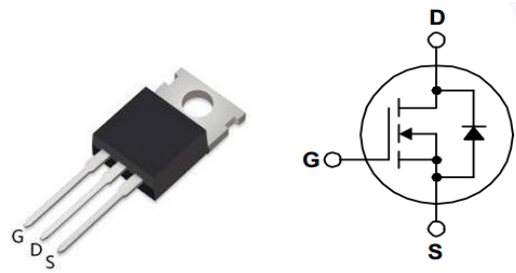


# TH31N20PC

## 200V 31A 69mΩ Silicon N-Channel Planar Power MOSFET

Features of this MOSFET are 150°C operating junction temperature and high repetitive peak current capability. These features combine to make this MOSFET a highly efficient, robust and reliable device for PDP driving applications.



Package view and circuit symbol

### General Features

- $V_{DS}=200V, I_D=31A$
- Low ON Resistance,  $R_{DS(on), typ.}=69m\Omega @ V_{GS}=10V, I_D=15.5A$
- Low reverse transfer capacitance
- Low Qg for fast response
- Short fall & rise times for fast switching
- 100% single pulse avalanche energy Test

### Applications

- Power switching application
- Digital amplifier
- Adapter and charger

### Key Performance Parameters

| Parameter                                                           | Value       | Unit |
|---------------------------------------------------------------------|-------------|------|
| $V_{DSS}, \min @ T_J = 25^\circ C$                                  | <b>200</b>  | V    |
| $T_J, \text{maximum junction temperature}$                          | <b>150</b>  | °C   |
| $I_D @ T_C = 25^\circ C (\text{Silicon Limit})$                     | <b>31</b>   | A    |
| $I_{D,pulse} @ T_C = 25^\circ C, t_p \text{ limited by } T_{Jmax.}$ | <b>124</b>  | A    |
| $R_{DS(on), typ.} @ T_J = 25^\circ C, V_{GS} = 10V$                 | <b>69</b>   | mΩ   |
| $E_{AS}, typ. @ T_J = 25^\circ C$                                   | <b>1040</b> | mJ   |



### Marking Information

| Product Name | Package | Marking   |
|--------------|---------|-----------|
| TH31N20PC    | TO-220C | TH31N20PC |

## Table of contents

|                                           |   |
|-------------------------------------------|---|
| Key Performance Parameters .....          | 1 |
| Marking Information .....                 | 1 |
| Maximum Ratings .....                     | 3 |
| Electrical Characteristics .....          | 4 |
| Diode Characteristics .....               | 4 |
| Typical Performance Characteristics ..... | 5 |
| Test Circuit & Waveform .....             | 7 |
| Package Information .....                 | 8 |
| Notice .....                              | 9 |

**Maximum Ratings** (T<sub>J</sub> = 25°C unless otherwise noted)

| Parameter                                        |                                                          | Symbol                            | Value       | Unit |
|--------------------------------------------------|----------------------------------------------------------|-----------------------------------|-------------|------|
| Drain to Source Voltage                          |                                                          | V <sub>DSS</sub>                  | 200         | V    |
| Gate to Source Voltage                           |                                                          | V <sub>GSS</sub>                  | ±30         | V    |
| Drain Current <sub>(Silicon limit)</sub>         | T <sub>C</sub> =25°C                                     | I <sub>D</sub>                    | 31          | A    |
| Pulsed Drain Current                             | T <sub>C</sub> =25°C<br>tp limited by T <sub>vjmax</sub> | I <sub>DM</sub>                   | 124         | A    |
| Avalanche energy, single pulse                   | L=10mH, R <sub>g</sub> =25Ω                              | E <sub>AS</sub>                   | 1040        | mJ   |
| Power Dissipation                                | T <sub>C</sub> =25°C                                     | P <sub>D</sub>                    | 231         | W    |
| Operating Junction and Storage Temperature Range |                                                          | T <sub>J</sub> , T <sub>stg</sub> | -55 To +150 | °C   |
| Lead Temperature for Soldering Purposes          |                                                          | T <sub>L</sub>                    | 270         |      |

**Thermal Characteristics**

| Parameter                               | Symbol            | Max Value | Unit |
|-----------------------------------------|-------------------|-----------|------|
| Thermal Resistance, Junction-to-Case    | R <sub>thJC</sub> | 0.54      | °C/W |
| Thermal Resistance, Junction-to-Ambient | R <sub>thJA</sub> | 62        |      |

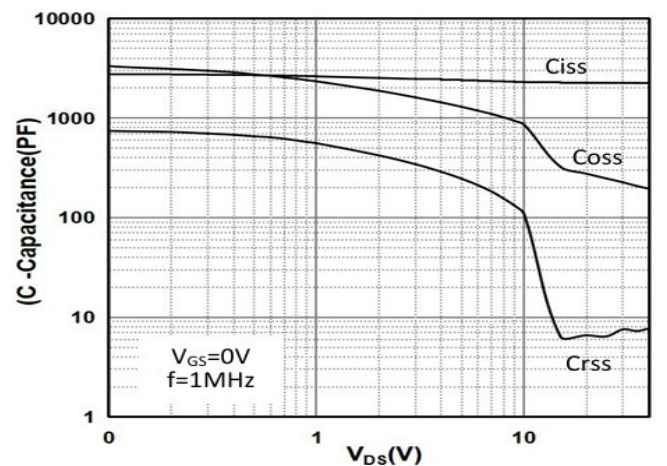
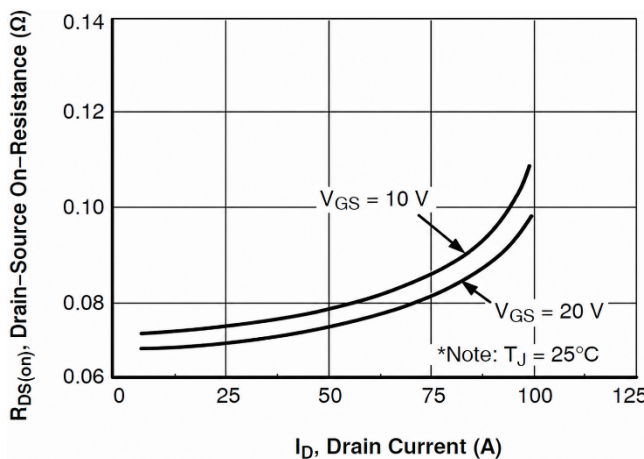
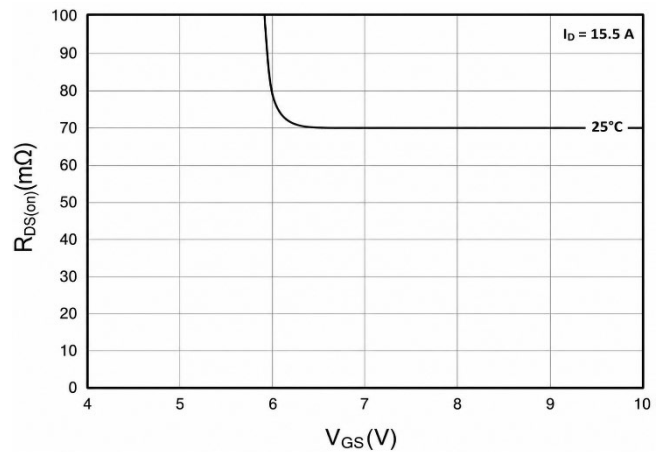
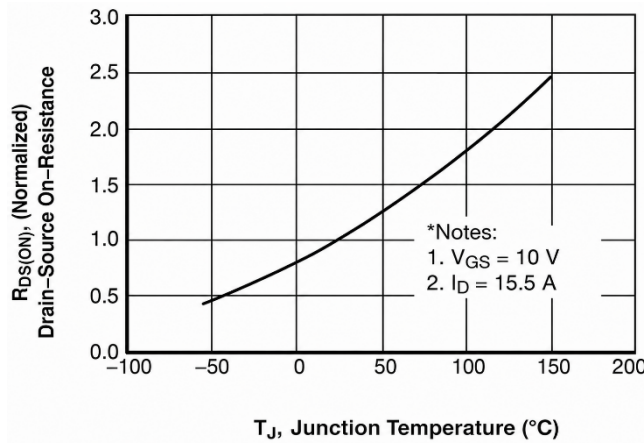
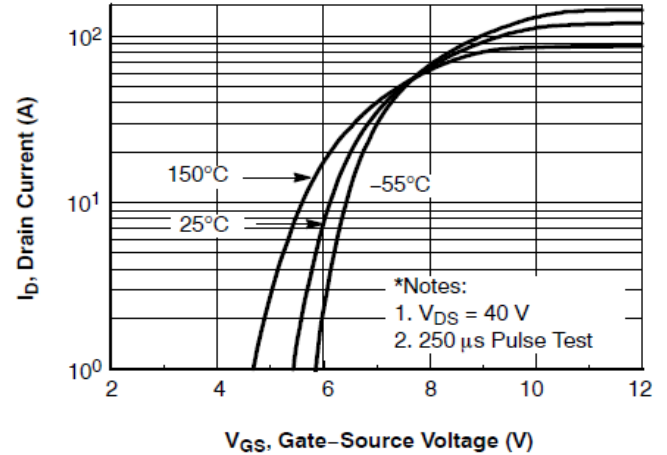
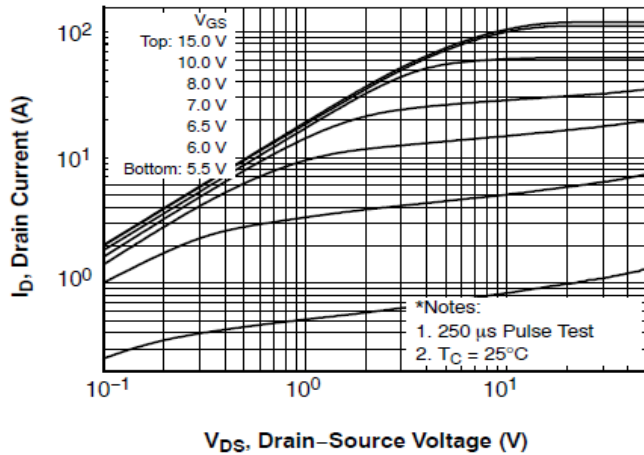
**Electrical Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

| Parameter                         | Symbol       | Test Condition                                                          | Value |      |           | Unit       |
|-----------------------------------|--------------|-------------------------------------------------------------------------|-------|------|-----------|------------|
|                                   |              |                                                                         | min.  | typ. | max.      |            |
| Drain-to-Source Breakdown Voltage | $B_{V_{DS}}$ | $V_{GS}=0V, I_D=250\mu A$                                               | 200   | -    | -         | V          |
| Zero Gate Voltage Drain Current   | $I_{DSS}$    | $V_{GS}=0V$<br>$V_{DS}=V_{DSS}$<br>$T_J=25^\circ\text{C}$               | -     | -    | 1         | $\mu A$    |
|                                   |              | $V_{GS}=0V$<br>$V_{DS}=80\%V_{DSS}$<br>$T_J=125^\circ\text{C}$          | -     | -    | 10        |            |
| Gate-to-Source leakage Current    | $I_{GSS}$    | $V_{GS}=\pm 30V, V_{DS}=0V$                                             | -     | -    | $\pm 100$ | nA         |
| Gate Threshold Voltage            | $V_{GS(th)}$ | $V_{GS}=V_{DS}$ ,<br>$I_D=250\mu A$<br>$T_J=25^\circ\text{C}$           | 2.0   | -    | 4.0       | V          |
| Drain-Source on-state resistance  | $R_{DS(on)}$ | $V_{GS}=10V$ ,<br>$I_D=15.5A$<br>$T_J=25^\circ\text{C}$                 | -     | 69   | 83        | m $\Omega$ |
| Gate resistance                   | $R_g$        | $V_{GS}=0V, V_{DS}=0V, f=1\text{MHz}$                                   | -     | 1.2  | -         | $\Omega$   |
| Transconductance                  | $g_{fs}$     | $V_{DS}=40V, I_D=15.5A$                                                 | -     | 28   | -         | S          |
| Input Capacitance                 | $C_{iss}$    | $V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V},$<br>$f = 1\text{ MHz}$      | -     | 2230 | -         | pF         |
| Output Capacitance                | $C_{oss}$    |                                                                         | -     | 240  | -         |            |
| Reverse Transfer Capacitance      | $C_{rss}$    |                                                                         | -     | 7    | -         |            |
| Total Gate Charge                 | $Q_g$        | $V_{DS} = 160\text{ V}, V_{GS} = 0/10\text{ V},$<br>$I_D = 31\text{ A}$ | -     | 30   | -         | nC         |
| Gate- Source charge               | $Q_{gs}$     |                                                                         | -     | 10   | -         |            |
| Gate-Drain charge                 | $Q_{gd}$     |                                                                         | -     | 12   | -         |            |
| Turn-On Delay Time                | $t_{d(on)}$  | $V_{DS} = 100\text{ V}$                                                 | -     | 50   | -         | ns         |
| Turn-Off Delay Time               | $t_{d(off)}$ | $V_{GS} = 10\text{ V}$                                                  | -     | 160  | -         |            |
| Rise time                         | $t_r$        | $I_D = 31\text{ A}$<br>$R_G = 25\Omega$                                 | -     | 510  | -         |            |
| Fall time                         | $t_f$        | $T_J = 25^\circ\text{C}$                                                | -     | 365  | -         |            |

**Diode Characteristics** ( $T_J = 25^\circ\text{C}$  unless otherwise specified)

| Parameter                        | Symbol   | Test Condition                                             | Value |      |      | Unit          |
|----------------------------------|----------|------------------------------------------------------------|-------|------|------|---------------|
|                                  |          |                                                            | min.  | typ. | max. |               |
| Diode Continuous Forward Current | $I_S$    | $T_C=25^\circ\text{C}$                                     | -     | -    | 31   | A             |
| Pulsed Diode Forward Current     | $I_{SM}$ |                                                            | -     | -    | 124  |               |
| Diode Forward Voltage            | $V_{SD}$ | $I_S = 31A$<br>$T_J = 25^\circ\text{C}$                    | -     | -    | 1.5  | V             |
| Reverse Recovery Time            | $t_{rr}$ | $V_R = 100\text{ V}, I_S = 31\text{ A},$                   | -     | 210  | -    | ns            |
| Reverse Recovery Charge          | $Q_{rr}$ | $di/dt = 100\text{ A}/\mu\text{s}, T_J = 25^\circ\text{C}$ | -     | 1.2  | -    | $\mu\text{C}$ |

## Typical Performance Characteristics



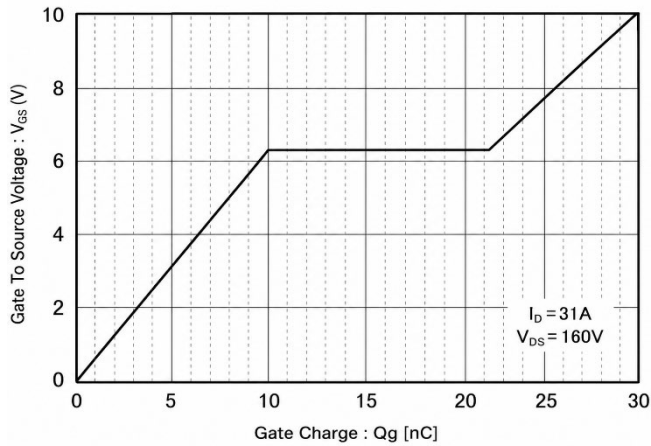


Fig 7. Gate Charge Characteristics

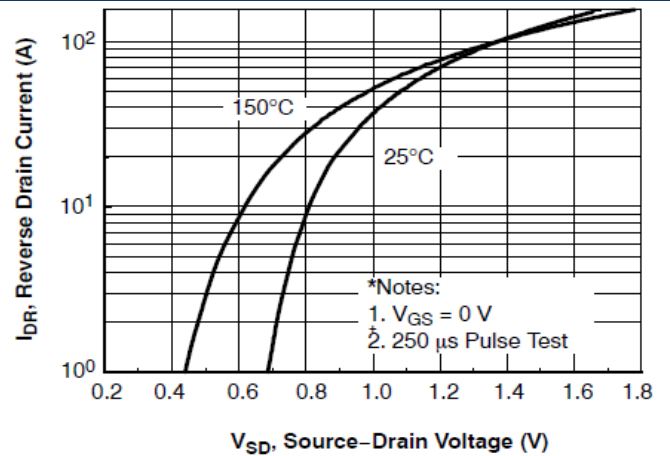


Fig 8. Body-diode Forward Characteristics

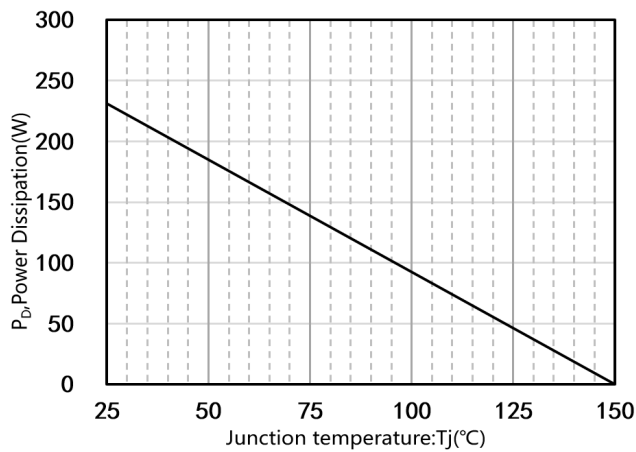


Fig 9. Power Dissipation

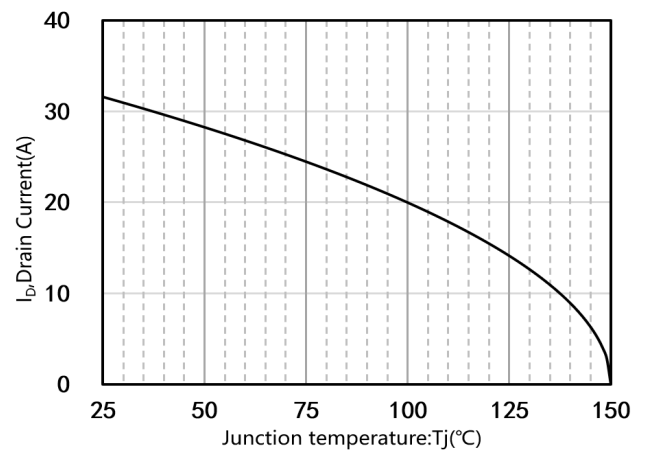


Fig 10. Drain Current Derating

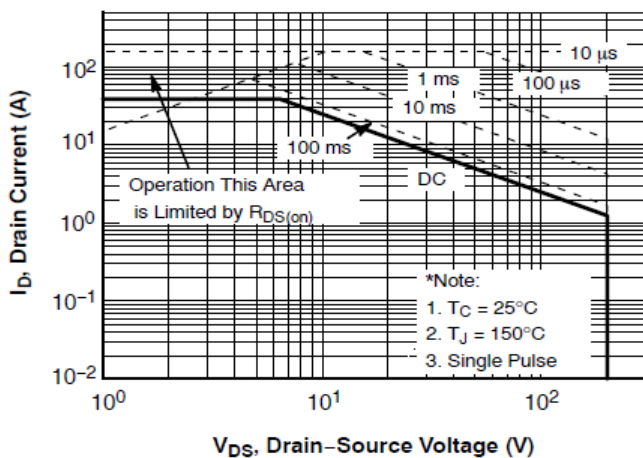


Fig 11. Safe Operating Area

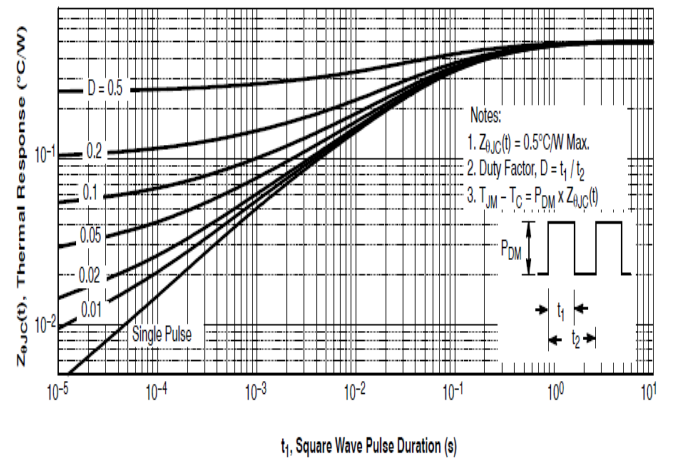
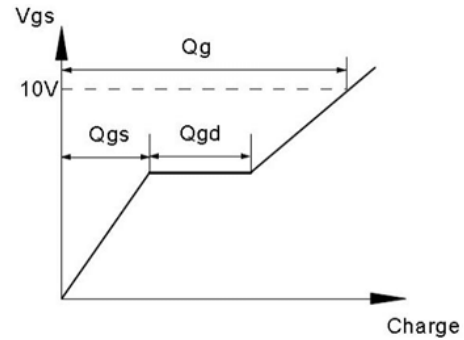
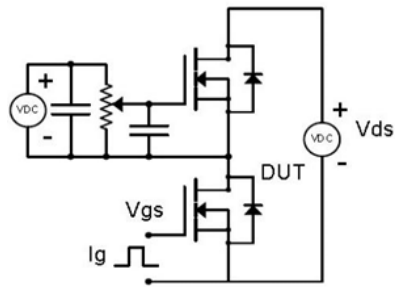
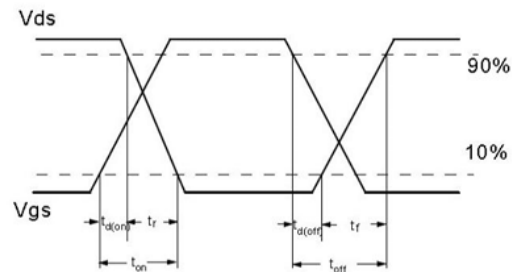
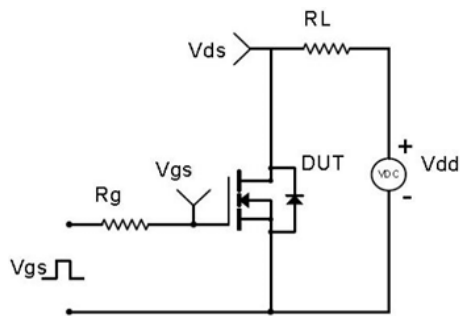


Fig 12. Transient Thermal Response Curve

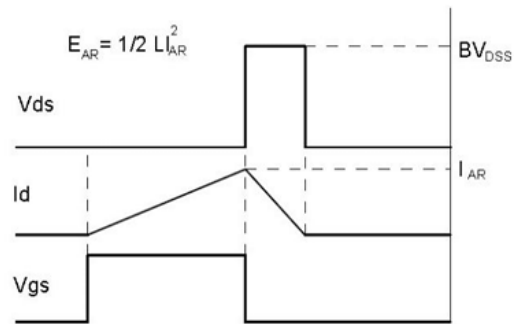
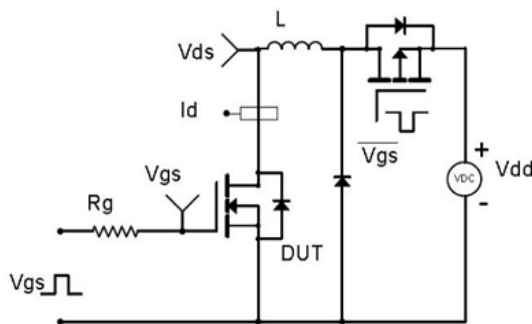
## Test Circuit & Waveform



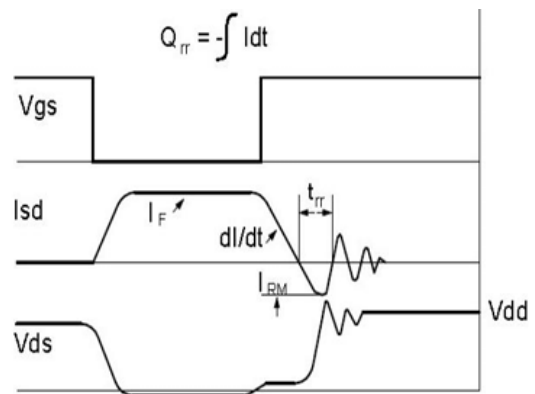
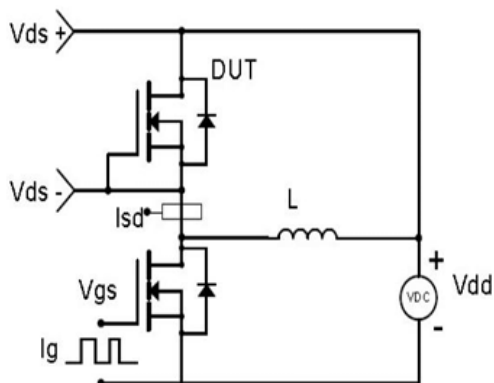
### Gate Charge Test Circuit & Waveform



### Resistive Switching Test Circuit & Waveforms



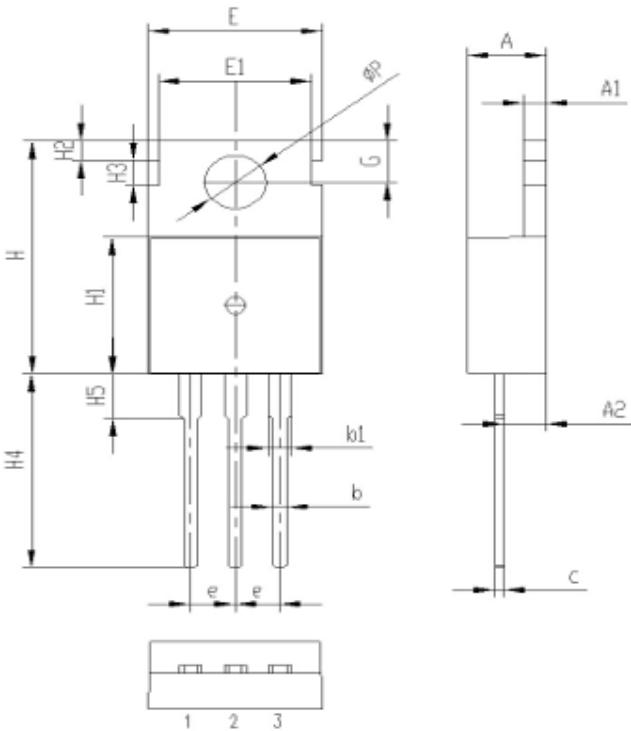
### Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



### Diode Recovery Test Circuit & Waveforms

Package Information

基本尺寸



| Symbol   | 单位 mm |      |      |
|----------|-------|------|------|
|          | Min   | Nom  | Max  |
| A        | 4.30  | 4.5  | 4.70 |
| A1       | 1.20  | 1.30 | 1.40 |
| A2       | 2.20  | 2.4  | 2.60 |
| b        | 0.60  | 0.8  | 1.00 |
| b1       | 1.20  | 1.30 | 1.40 |
| c        | 0.40  | 0.5  | 0.60 |
| e        | 2.44  | 2.54 | 2.64 |
| E        | 9.80  | 10.0 | 10.2 |
| E1       | 8.50  | 8.70 | 8.90 |
| H        | 15.5  | 15.7 | 15.9 |
| H1       | 9.00  | 9.2  | 9.40 |
| H2       | 1.10  | 1.34 | 1.50 |
| H3       | 1.50  | 1.7  | 1.90 |
| H4       | 12.9  | 13.3 | 13.7 |
| H5       | 2.80  | 3.0  | 3.20 |
| G        | 2.60  | 2.8  | 3.00 |
| $\Phi P$ | 3.40  | 3.6  | 3.80 |



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## Notice

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