

## Silicon N-Channel Planar Power MOSFET

### Description

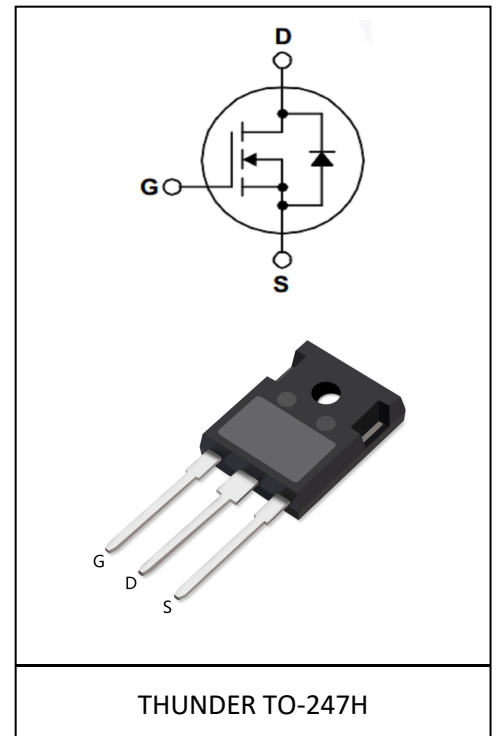
The IRFP250M utilizes the latest processing techniques to achieve low on-resistance per silicon area. Additional features of this MOSFET are 150°C operating junction temperature and high repetitive peak current capability. These features combine to make this MOSFET a highly efficient, robust and reliable device for PDP driving applications. It can be used in a wide variety of applications.

### General Features

- $V_{DS}=200V, I_D=30A$
- Low ON Resistance,  $R_{DS(ON)}=60m\Omega @ V_{GS}=10V, I_D=15A$
- Low reverse transfer capacitance
- Low Qg for fast response
- Short fall & rise times for fast switching
- 100% single pulse avalanche energy Test

### Application

- Power switching application
- Digital amplifier
- Adapter and charger



### Product Summary

|              |              |
|--------------|--------------|
| $V_{DS}$     | 200V         |
| $R_{DS(on)}$ | 60m $\Omega$ |
| $I_D$        | 30A          |

### Absolute Maximum Ratings

| Parameter   | Symbol         | Value      | Unit       |
|---|----------------|------------|------------|
| Drain-source voltage  | $V_{DS}$       | 200        | V          |
| Continuous drain current<br>$T_C = 25^\circ C$ (Silicon limit)            | $I_D$          | 30         | A          |
| Pulsed drain current ( $T_C = 25^\circ C$ , $t_p$ limited by $T_{jmax}$ ) | $I_{DM}$       | 120        | A          |
| Avalanche energy, single pulse ( $L=10mH$ , $R_g=25\Omega$ )              | $E_{AS}$       | 516        | mJ         |
| Gate-Source voltage   | $V_{GS}$       | $\pm 30$   | V          |
| Power dissipation ( $T_C = 25^\circ C$ )                                  | $P_D$          | 178        | W          |
| Operating junction and storage temperature                                | $T_j, T_{stg}$ | -55...+150 | $^\circ C$ |

### Thermal Resistance

| Parameter  | Symbol     | Max  | Unit |
|--|------------|------|------|
| Thermal resistance, junction – case.                   | $R_{thJC}$ | 0.7  | °C/W |
| Thermal resistance, junction – ambient(min. footprint) | $R_{thJA}$ | 62.5 |      |

### Electrical Characteristic (at $T_j = 25\text{ }^\circ\text{C}$ , unless otherwise specified)

| Parameter | Symbol | Value |      |      | Unit | Test Condition |
|-----------|--------|-------|------|------|------|----------------|
|           |        | min.  | typ. | max. |      |                |

### Static Characteristic

|                                  |              |     |      |           |            |   |
|----------------------------------|--------------|-----|------|-----------|------------|---|
| Drain-source breakdown voltage   | $BV_{DSS}$   | 200 | -    | -         | V          | $V_{GS}=0V, I_D=250\mu A$                                   |
| Gate threshold voltage           | $V_{GS(th)}$ | 2.0 | -    | 4.0       | V          | $V_{DS}=V_{GS}, I_D=250\mu A$                               |
| Zero gate voltage drain current  | $I_{DSS}$    | -   | -    | 1         | $\mu A$    | $V_{DS}=200V, V_{GS}=0V$<br>$T_j=25\text{ }^\circ\text{C}$  |
|                                  |              | -   | -    | 10        | $\mu A$    | $V_{DS}=160V, V_{GS}=0V$<br>$T_j=125\text{ }^\circ\text{C}$ |
| Gate-source leakage current      | $I_{GSS}$    | -   | -    | $\pm 100$ | nA         | $V_{GS}=\pm 30V, V_{DS}=0V$                                 |
| Drain-source on-state resistance | $R_{DS(on)}$ | -   | 60   | 75        | m $\Omega$ | $V_{GS}=10V, I_D=15A$                                       |
| Transconductance                 | $g_{fs}$     | -   | 28.5 | -         | S          | $V_{DS}=40V, I_D=15A$                                       |

### Dynamic Characteristic

|                              |              |   |      |   |          |   |
|------------------------------|--------------|---|------|---|----------|---|
| Input Capacitance            | $C_{iss}$    | - | 3050 | - | pF       | $V_{GS}=0V, V_{DS}=25V,$<br>$f=1MHz$      |
| Output Capacitance           | $C_{oss}$    | - | 300  | - |          |   |
| Reverse Transfer Capacitance | $C_{rss}$    | - | 2.4  | - |          |   |
| Gate Total Charge            | $Q_g$        | - | 40   | - | nC       | $V_{GS}=10V, V_{DS}=160V,$<br>$I_D=30A$   |
| Gate-Source charge           | $Q_{gs}$     | - | 12   | - |          |   |
| Gate-Drain charge            | $Q_{gd}$     | - | 18.5 | - |          |   |
| Turn-on delay time           | $t_{d(on)}$  | - | 35   | - | ns       | $V_{DD}=100V, I_D=30A,$<br>$R_G=25\Omega$ |
| Rise time                    | $t_r$        | - | 165  | - |          |   |
| Turn-off delay time          | $t_{d(off)}$ | - | 155  | - |          |   |
| Fall time                    | $t_f$        | - | 155  | - |          |   |
| Gate resistance              | $R_G$        | - | 0.9  | - | $\Omega$ | $V_{GS}=0V, V_{DS}=0V,$<br>$f=1MHz$       |

### Body Diode Characteristic

| Parameter                             | Symbol   | Value |      |      | Unit    | Test Condition                                |
|---------------------------------------|----------|-------|------|------|---------|---|
|                                       |          | min.  | typ. | max. |         |   |
| Body Diode Forward Voltage            | $V_{SD}$ | -     | -    | 1.4  | V       | $V_{GS}=0V, I_{DS}=30A$                       |
| Body Diode Continuous Forward Current | $I_S$    | -     | -    | 30   | A       | $T_C=25^\circ C$                              |
| Body Diode Reverse Recovery Time      | $t_{rr}$ | -     | 150  | -    | ns      | $T_C=25^\circ C, I_S=30A,$<br>$di/dt=100A/us$ |
| Body Diode Reverse Recovery Charge    | $Q_{rr}$ | -     | 1.2  | -    | $\mu C$ |   |

### Typical Performance Characteristics

Fig 1: On-Region Characteristics

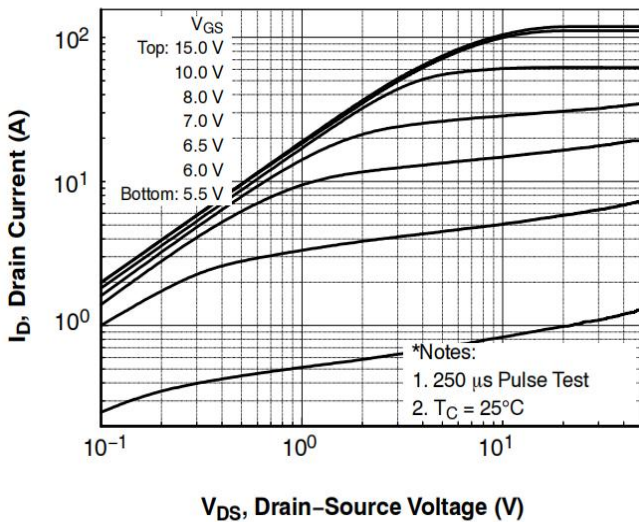


Fig 2: Transfer Characteristics

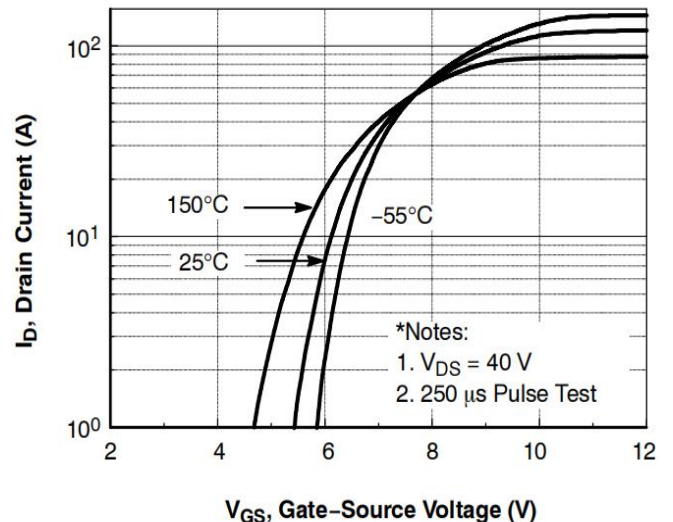


Fig 3: On-Resistance Variation vs. Drain Current and Gate Voltage

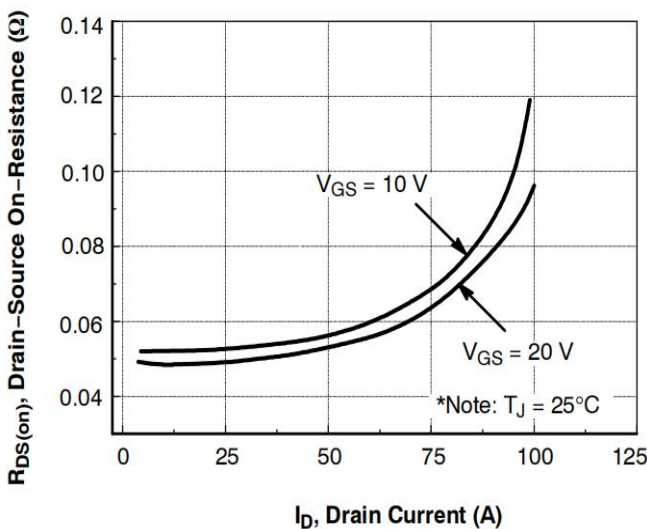


Fig 4: On-Resistance Variation vs. Temperature

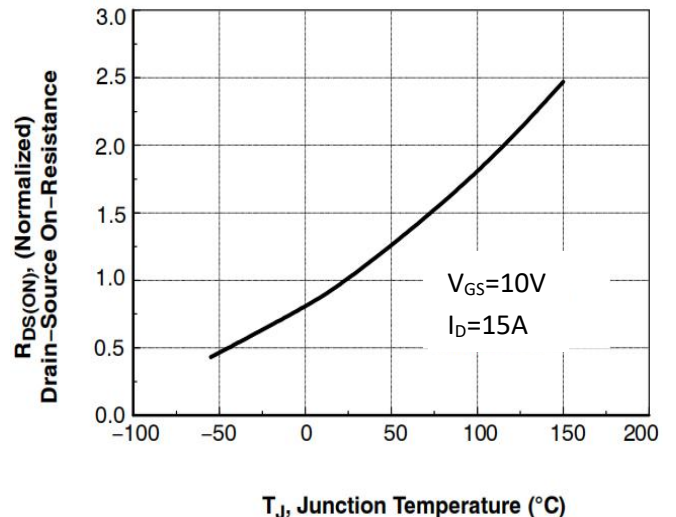


Fig 5: Gate Charge Characteristics

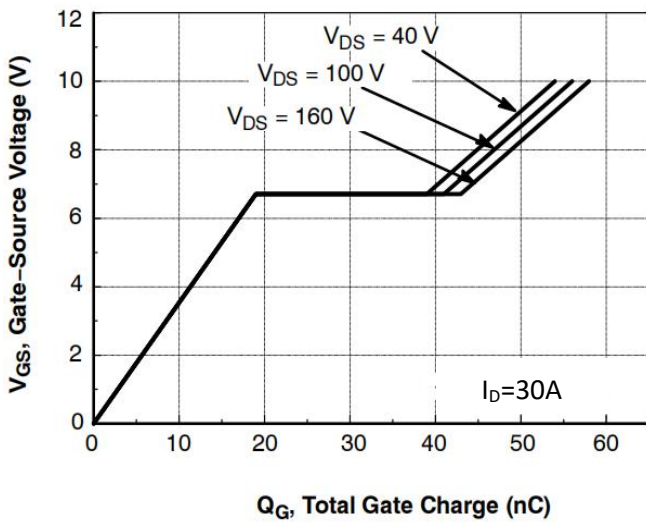


Fig 6: Capacitance Characteristics

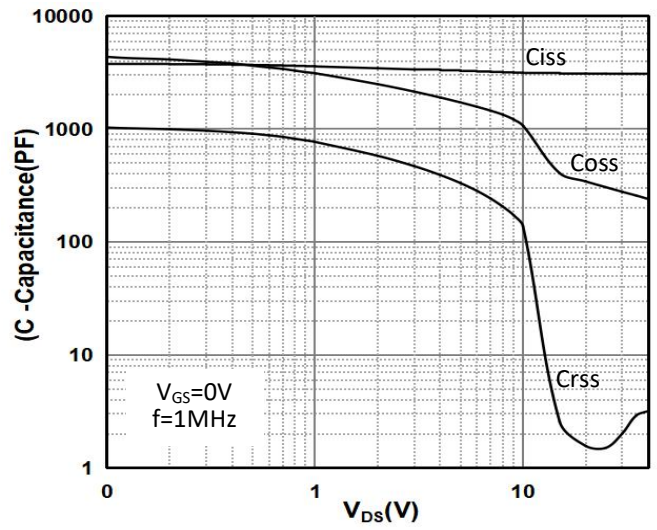


Fig 7: Power Dissipation

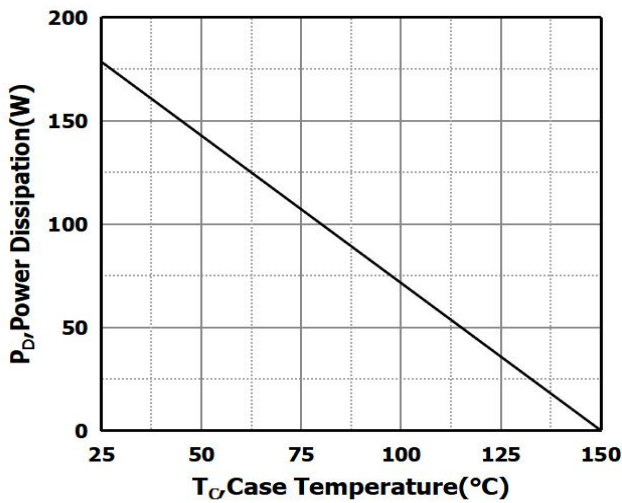


Fig 8: Drain Current Derating

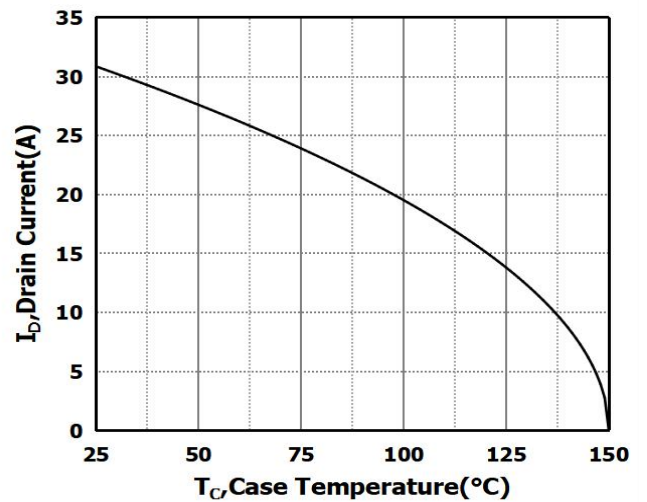


Fig 9: Body Diode Forward Voltage Variation vs. Source Current and Temperature

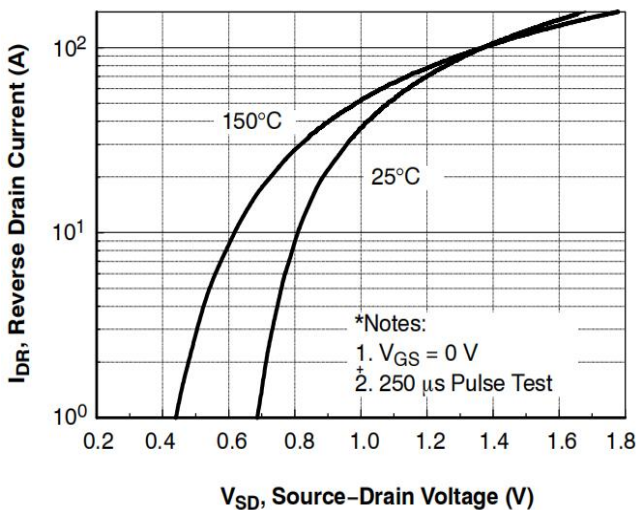


Fig 10: Safe Operating Area

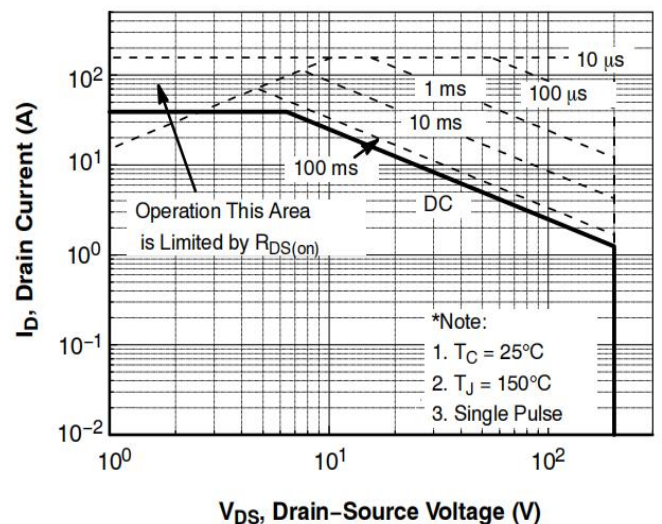
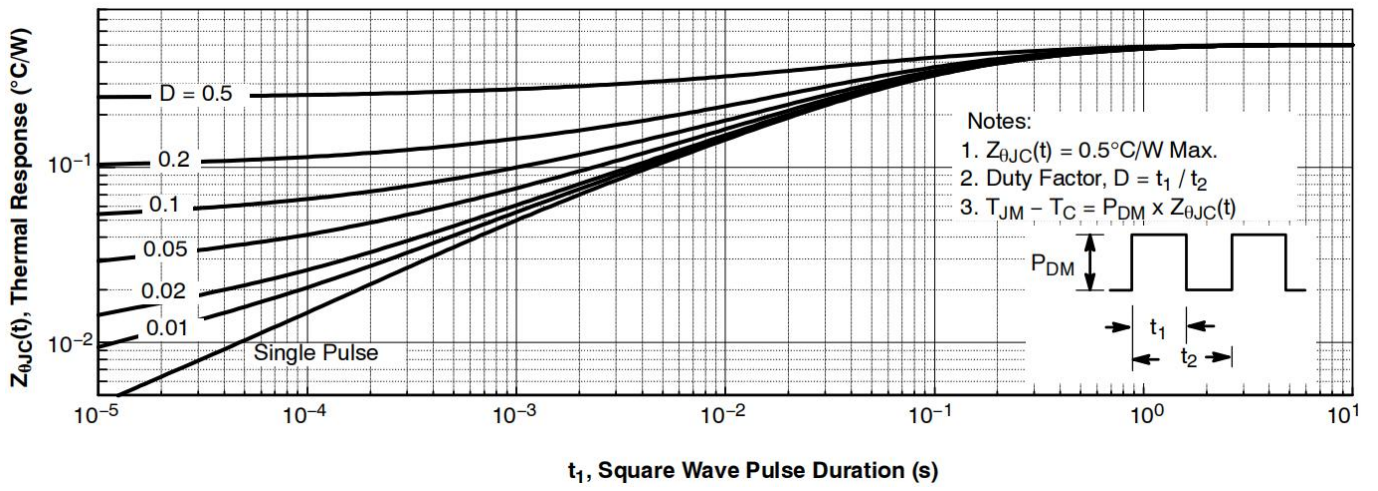
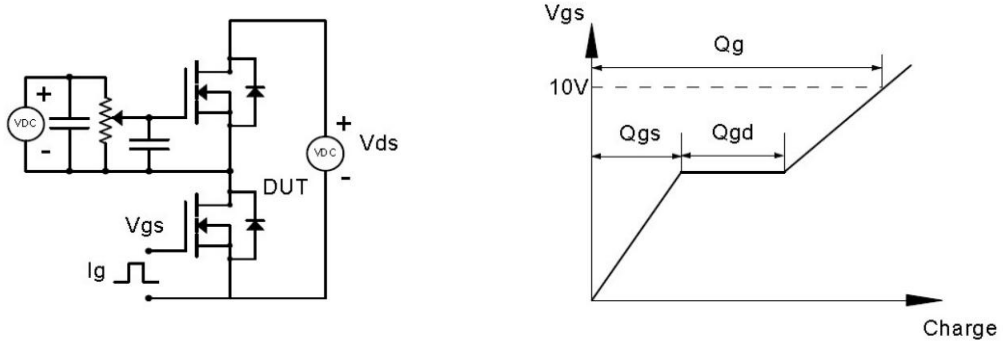


Fig 11: Transient Thermal Response Curve

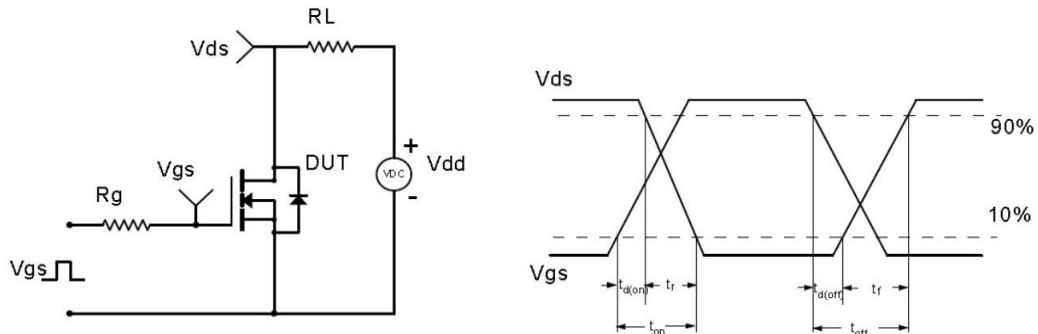


## Test Circuit & Waveform

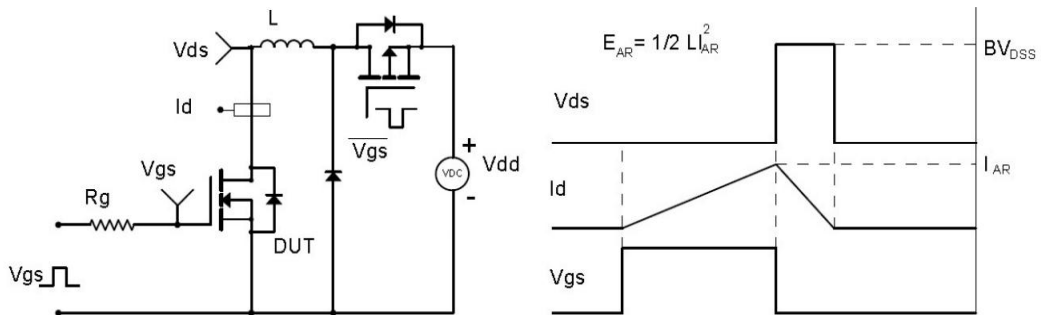
Gate Charge Test Circuit & Waveform



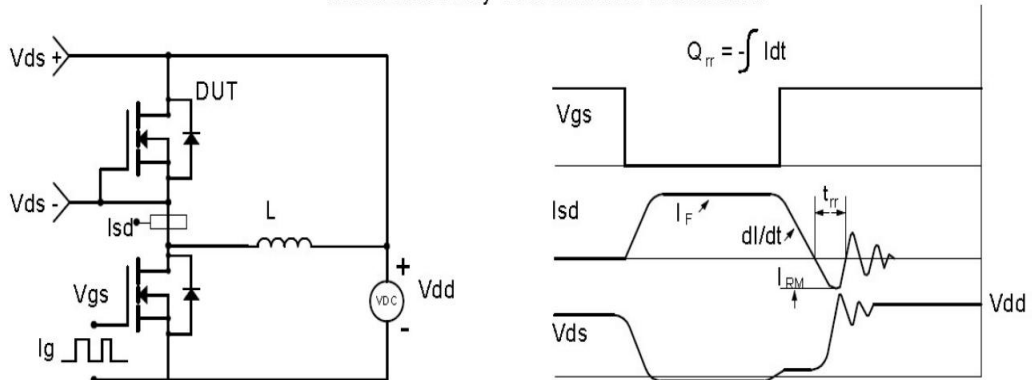
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms

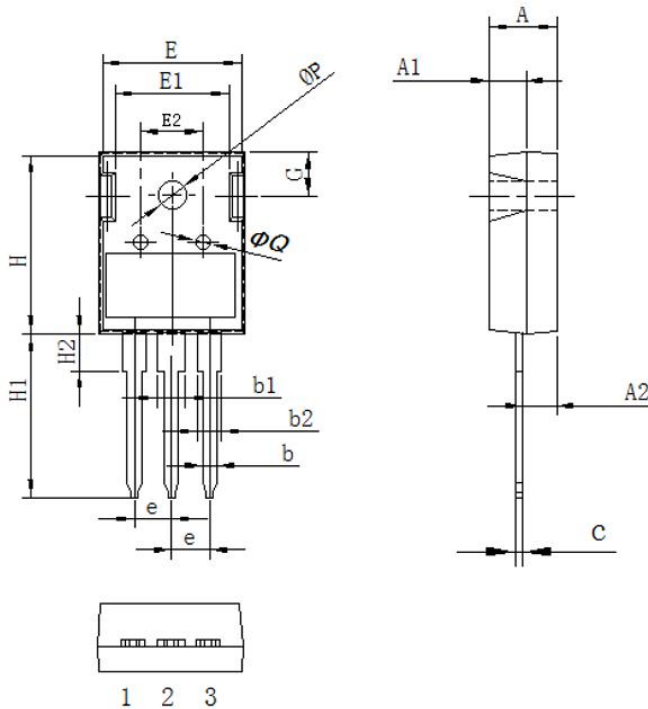


## Package Information

## Package Information

### TO-247H PACKAGE

#### 基本尺寸



| Symbol | 单位 mm |       |      |
|--------|-------|-------|------|
|        | Min   | Nom   | Max  |
| A      | 4.80  | 5.00  | 5.20 |
| A1     | 2.80  | 3.00  | 3.20 |
| A2     | 2.20  | 2.40  | 2.60 |
| b      | 1.05  | 1.20  | 1.35 |
| b1     | 2.80  | 3.00  | 3.20 |
| b2     | 1.80  | 2.00  | 2.20 |
| c      | 0.50  | 0.60  | 0.70 |
| e      | 5.35  | 5.45  | 5.75 |
| E      | 15.6  | 15.80 | 16.0 |
| E1     | 12.3  | 12.50 | 12.7 |
| E2     | 6.00  | 6.20  | 6.40 |
| H      | 20.5  | 21.0  | 21.5 |
| H1     | 19.0  | 20.0  | 21.0 |
| H2     | 3.00  | 4.00  | 5.00 |
| G      | 5.70  | 5.90  | 6.10 |
| ΦP     | 3.30  | 3.50  | 3.50 |
| ΦQ     | 2.30  | 2.50  | 2.70 |

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