

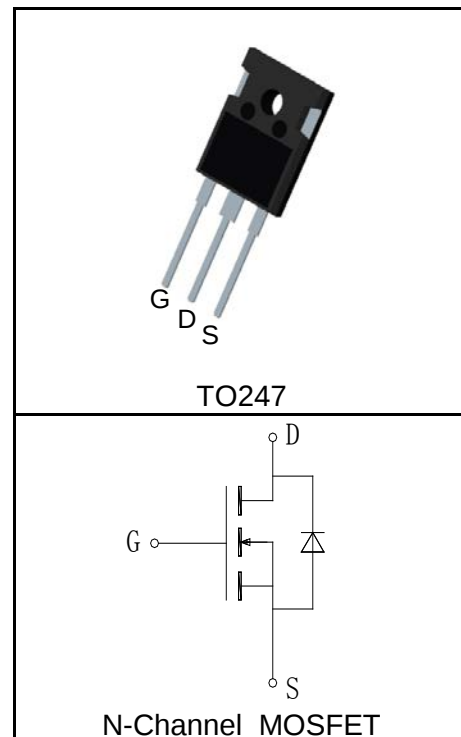
### Features

- 55V/200A,  
 $R_{DS(ON)} = 3.3m\Omega(Typ.)@V_{GS}=10V$
- Ultra Low On-Resistance
- Fast Switching and Fully Avalanche Rated
- 100% avalanche tested
- 175°C Operating Temperature
- Lead Free and Green Devices Available (RoHS Compliant)

### Applications

- High Efficiency Synchronous Rectification in SMPS
- High Speed Power Switching
- Power Supply

### Pin Description



### Absolute Maximum Ratings

| Symbol                                                       | Parameter                                      |                       | Rating     | Unit |
|--------------------------------------------------------------|------------------------------------------------|-----------------------|------------|------|
| Common Ratings (T <sub>C</sub> =25°C Unless Otherwise Noted) |                                                |                       |            |      |
| V <sub>DSS</sub>                                             | Drain-Source Voltage                           |                       | 55         | V    |
| V <sub>GSS</sub>                                             | Gate-Source Voltage                            |                       | ±25        |      |
| T <sub>J</sub>                                               | Maximum Junction Temperature                   |                       | 175        | °C   |
| T <sub>STG</sub>                                             | Storage Temperature Range                      |                       | -55 to 175 | °C   |
| I <sub>S</sub>                                               | Diode Continuous Forward Current               | T <sub>C</sub> =25°C  | 200        | A    |
| Mounted on Large Heat Sink                                   |                                                |                       |            |      |
| I <sub>DP</sub> <sup>①</sup>                                 | 300μs Pulse Drain Current Tested               | T <sub>C</sub> =25°C  | 800        | A    |
| I <sub>D</sub> <sup>②</sup>                                  | Continuous Drain Current(V <sub>GS</sub> =10V) | T <sub>C</sub> =25°C  | 200        | A    |
|                                                              |                                                | T <sub>C</sub> =100°C | 142        |      |
| P <sub>D</sub>                                               | Maximum Power Dissipation                      | T <sub>C</sub> =25°C  | 326        | W    |
|                                                              |                                                | T <sub>C</sub> =100°C | 163        |      |
| R <sub>θJC</sub>                                             | Thermal Resistance-Junction to Case            |                       | 0.46       | °C/W |
| R <sub>θJA</sub>                                             | Thermal Resistance-Junction to Ambient         |                       | 50         | °C/W |
| Drain-Source Avalanche Ratings                               |                                                |                       |            |      |
| E <sub>AS</sub> <sup>③</sup>                                 | Avalanche Energy, Single Pulsed                |                       | 625        | mJ   |

**Electrical Characteristics** ( $T_C=25^{\circ}\text{C}$  Unless Otherwise Noted)

| Symbol                                   | Parameter                        | Test Condition                                                                            | RU55200Q              |      |      | Unit |
|------------------------------------------|----------------------------------|-------------------------------------------------------------------------------------------|-----------------------|------|------|------|
|                                          |                                  |                                                                                           | Min.                  | Typ. | Max. |      |
| Static Characteristics                   |                                  |                                                                                           |                       |      |      |      |
| BV <sub>DSS</sub>                        | Drain-Source Breakdown Voltage   | V <sub>GS</sub> =0V, I <sub>DS</sub> =250μA                                               | 55                    | 65   |      | V    |
| I <sub>DSS</sub>                         | Zero Gate Voltage Drain Current  | V <sub>DS</sub> =55V, V <sub>GS</sub> =0V                                                 |                       |      | 1    | μA   |
|                                          |                                  |                                                                                           | T <sub>J</sub> =125°C |      | 30   |      |
| V <sub>GS(th)</sub>                      | Gate Threshold Voltage           | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>DS</sub> =250μA                                 | 2                     | 3    | 4    | V    |
| I <sub>GSS</sub>                         | Gate Leakage Current             | V <sub>GS</sub> =±25V, V <sub>DS</sub> =0V                                                |                       |      | ±100 | nA   |
| R <sub>DS(ON)</sub> <sup>④</sup>         | Drain-Source On-state Resistance | V <sub>GS</sub> =10V, I <sub>DS</sub> =40A                                                |                       | 3.3  | 4    | mΩ   |
| Diode Characteristics                    |                                  |                                                                                           |                       |      |      |      |
| V <sub>SD</sub> <sup>④</sup>             | Diode Forward Voltage            | I <sub>SD</sub> =40A, V <sub>GS</sub> =0V                                                 |                       |      | 1.2  | V    |
| t <sub>rr</sub>                          | Reverse Recovery Time            | I <sub>SD</sub> =40A, dI <sub>SD</sub> /dt=100A/μs                                        |                       | 70   |      | ns   |
| Q <sub>rr</sub>                          | Reverse Recovery Charge          |                                                                                           |                       | 135  |      | nC   |
| Dynamic Characteristics <sup>⑤</sup>     |                                  |                                                                                           |                       |      |      |      |
| R <sub>G</sub>                           | Gate Resistance                  | V <sub>GS</sub> =0V,V <sub>DS</sub> =0V,F=1MHz                                            |                       | 2    |      | Ω    |
| C <sub>iss</sub>                         | Input Capacitance                | V <sub>GS</sub> =0V,<br>V <sub>DS</sub> =28V,<br>Frequency=1.0MHz                         |                       | 6700 |      | pF   |
| C <sub>oss</sub>                         | Output Capacitance               |                                                                                           |                       | 1100 |      |      |
| C <sub>rss</sub>                         | Reverse Transfer Capacitance     |                                                                                           |                       | 480  |      |      |
| t <sub>d(ON)</sub>                       | Turn-on Delay Time               | V <sub>DD</sub> =28V, I <sub>DS</sub> =40A,<br>V <sub>GEN</sub> =10V,R <sub>G</sub> =4.5Ω |                       | 40   |      | ns   |
| t <sub>r</sub>                           | Turn-on Rise Time                |                                                                                           |                       | 23   |      |      |
| t <sub>d(OFF)</sub>                      | Turn-off Delay Time              |                                                                                           |                       | 120  |      |      |
| t <sub>f</sub>                           | Turn-off Fall Time               |                                                                                           |                       | 70   |      |      |
| Gate Charge Characteristics <sup>⑤</sup> |                                  |                                                                                           |                       |      |      |      |
| Q <sub>g</sub>                           | Total Gate Charge                | V <sub>DS</sub> =44V, V <sub>GS</sub> =10V,<br>I <sub>DS</sub> =40A                       |                       | 160  |      | nC   |
| Q <sub>gs</sub>                          | Gate-Source Charge               |                                                                                           |                       | 50   |      |      |
| Q <sub>gd</sub>                          | Gate-Drain Charge                |                                                                                           |                       | 47   |      |      |

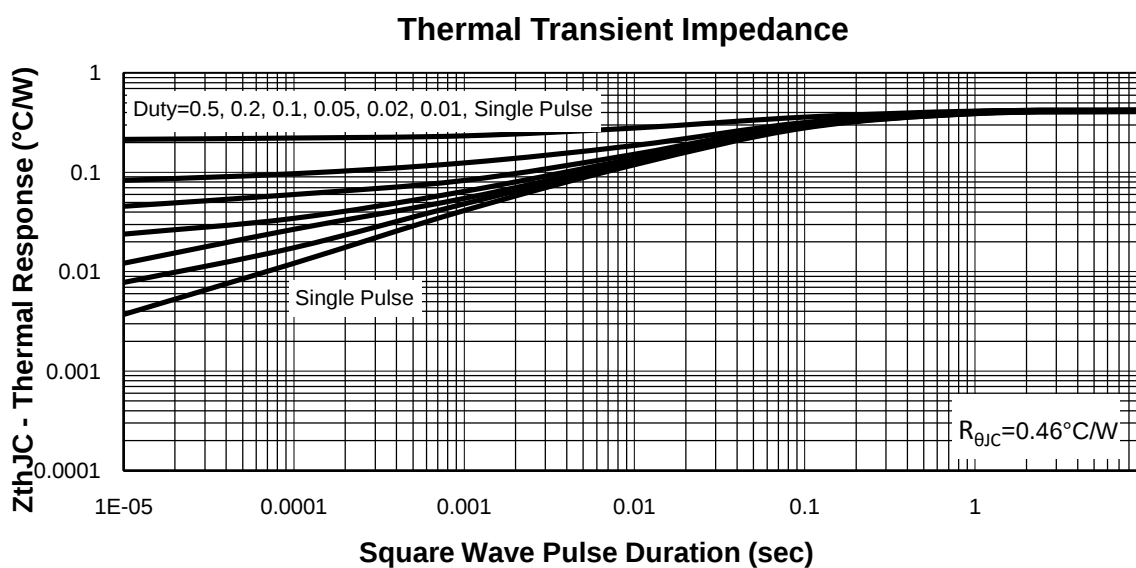
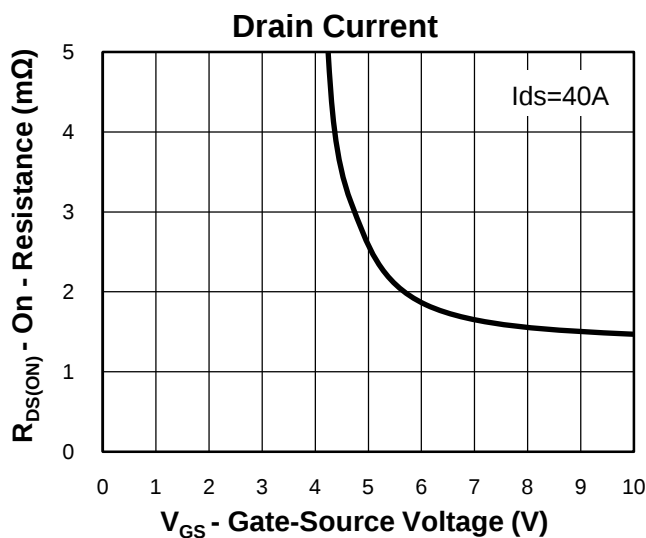
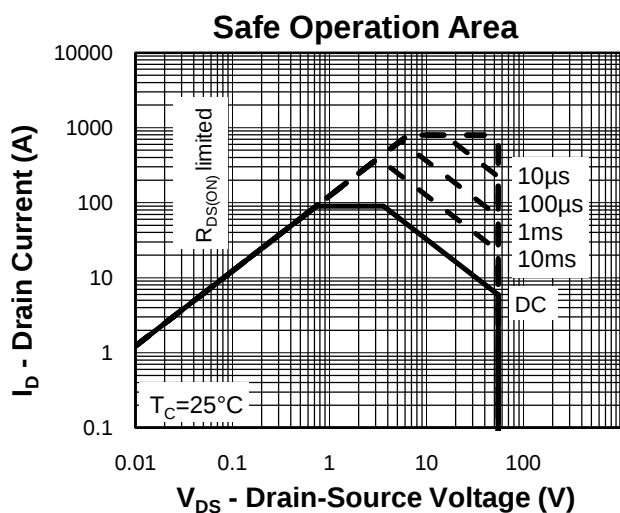
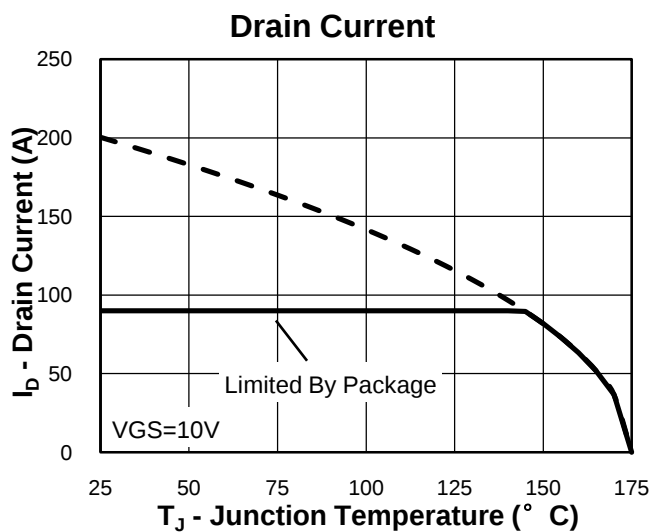
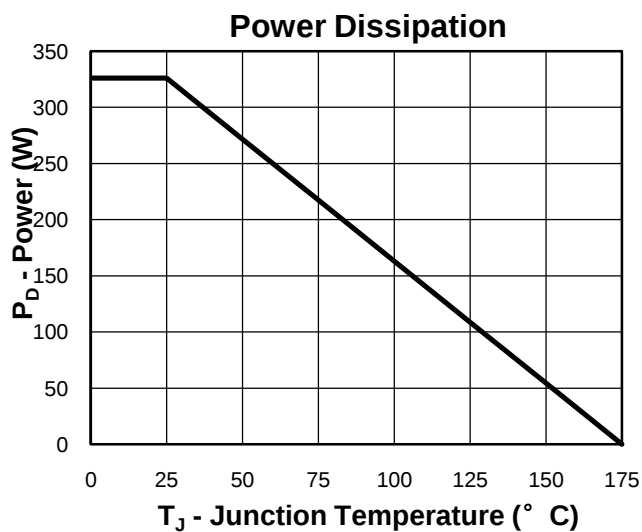
**Notes:**

- ① Pulse width limited by safe operating area.
- ② Calculated continuous current based on maximum allowable junction temperature. The package limitation current is 90A.
- ③ Limited by  $T_{Jmax}$ ,  $I_{AS}=50A$ ,  $V_{DD}=48V$ ,  $R_G=50\Omega$ , Starting  $T_J=25^{\circ}\text{C}$ .
- ④ Pulse test; Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
- ⑤ Guaranteed by design, not subject to production testing.

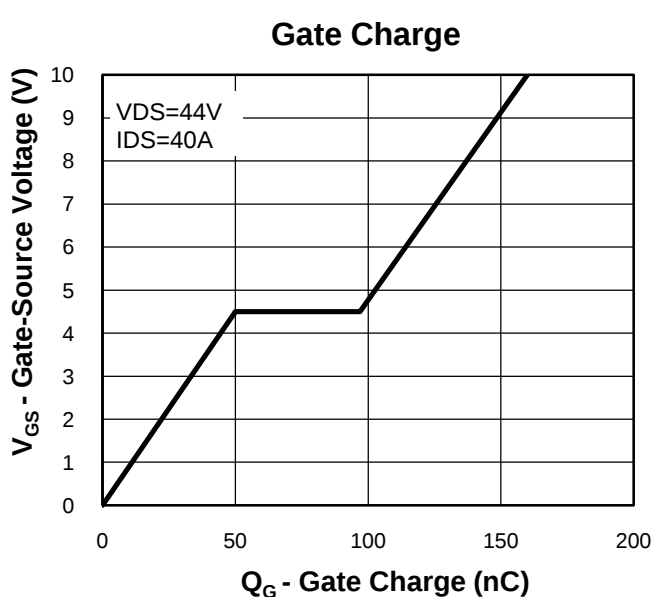
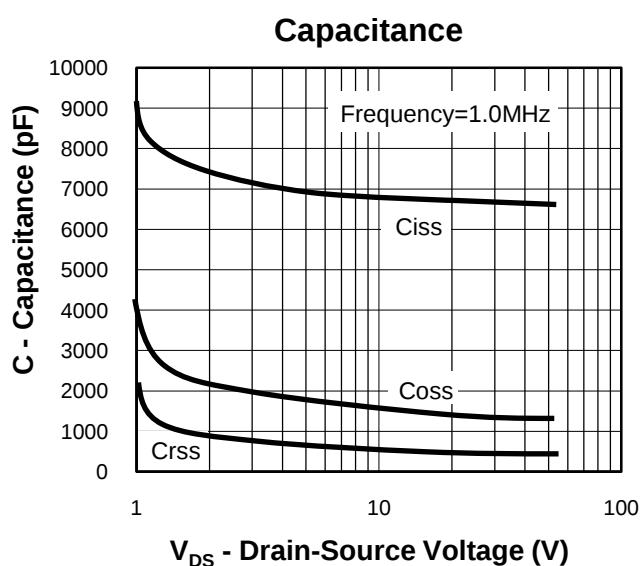
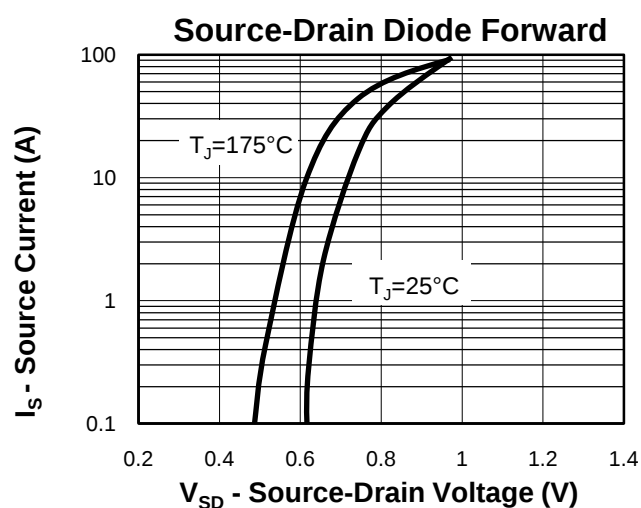
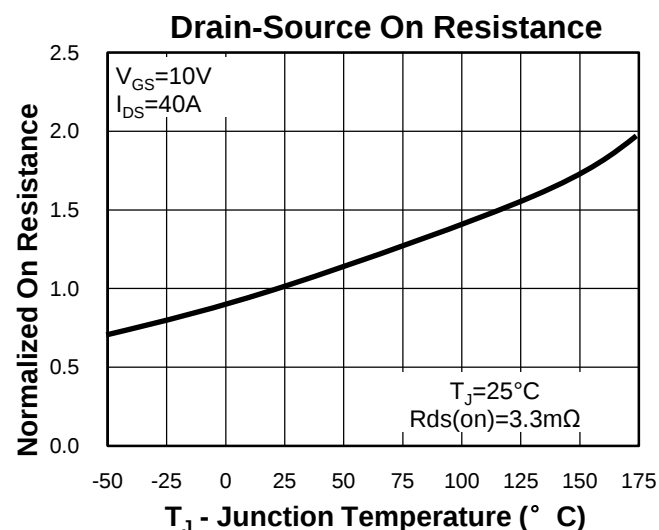
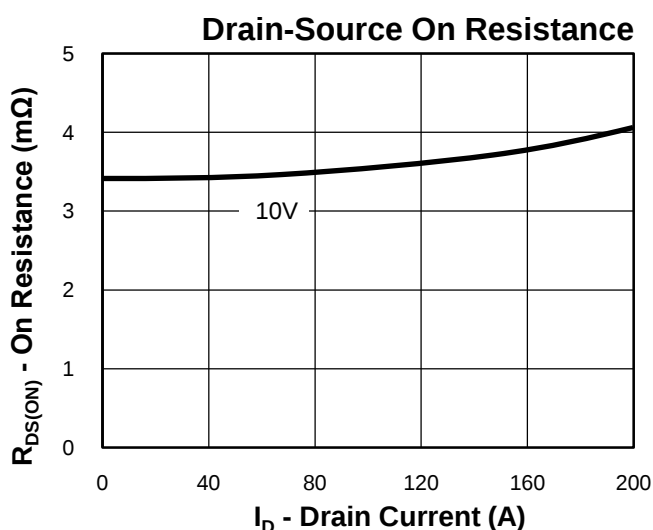
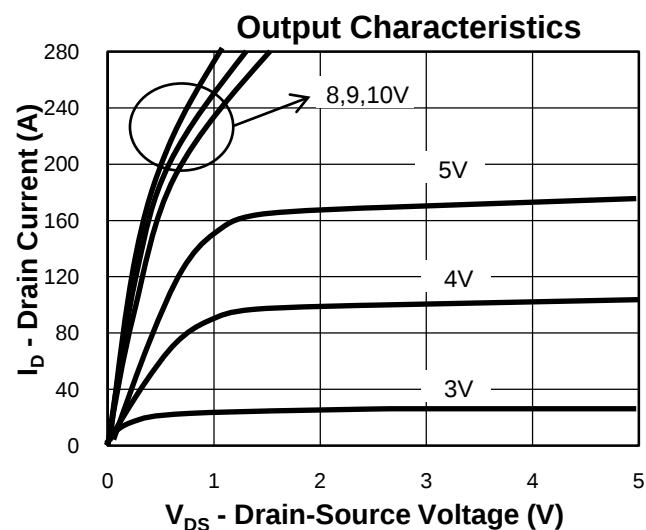
**Ordering and Marking Information**

| Device   | Marking  | Package | Packaging | Quantity | Reel Size | Tape width |
|----------|----------|---------|-----------|----------|-----------|------------|
| RU55200Q | RU55200Q | TO247   | Tube      | 30       | -         | -          |

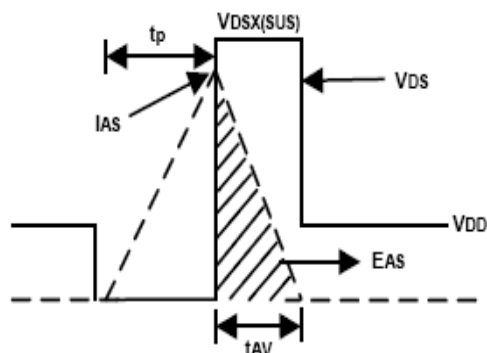
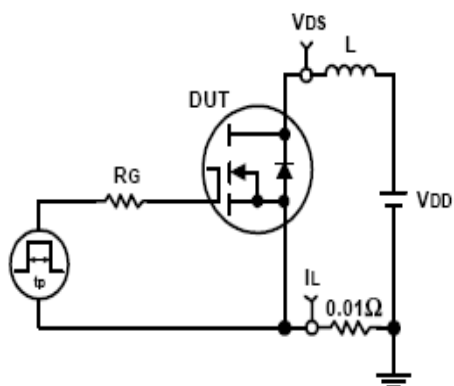
## Typical Characteristics



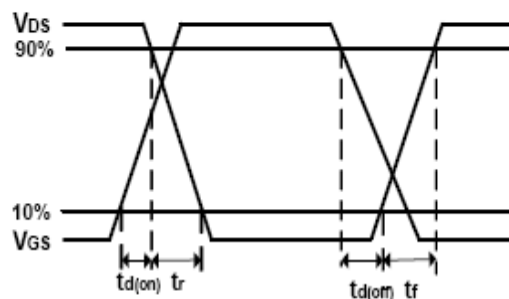
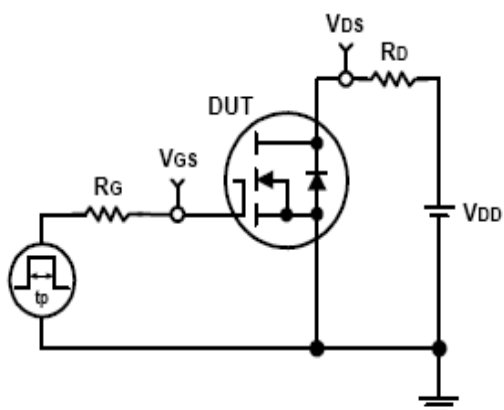
## Typical Characteristics



## Avalanche Test Circuit and Waveforms

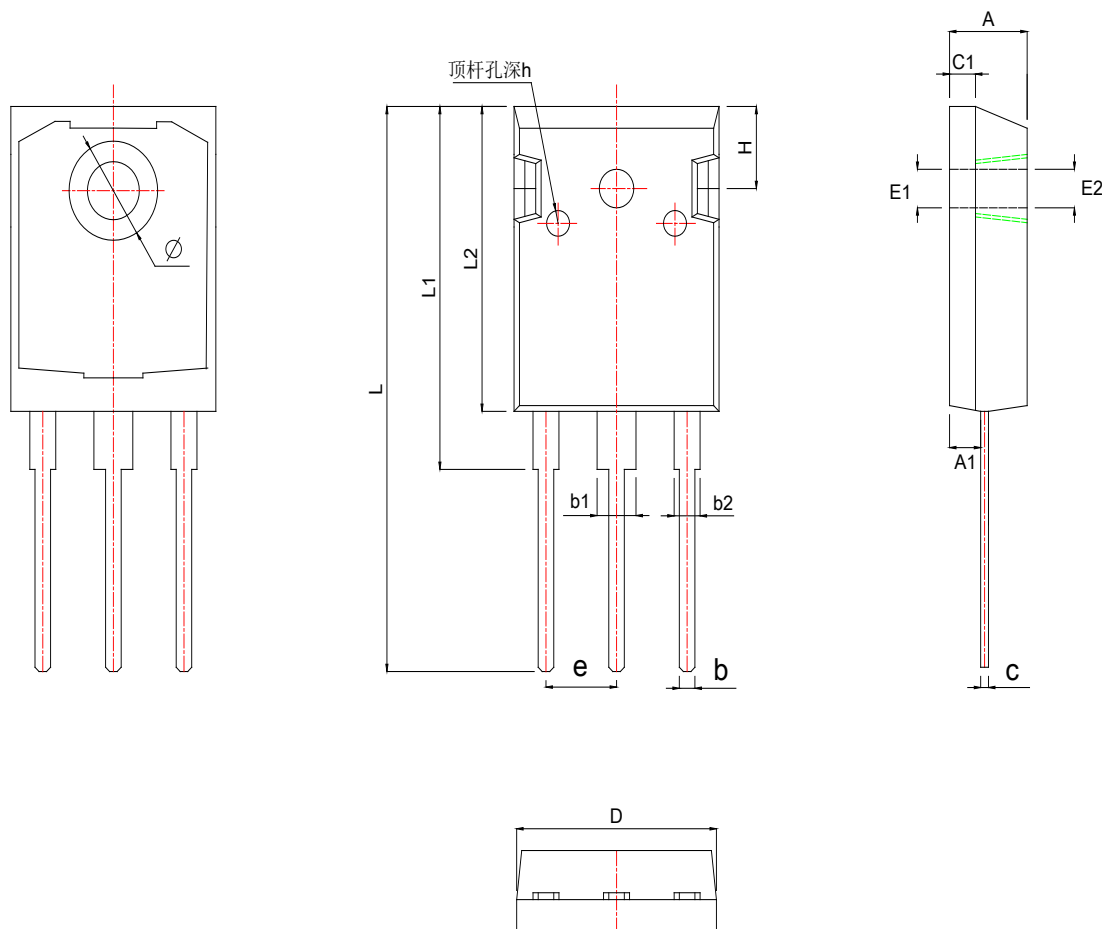


## Switching Time Test Circuit and Waveforms



**Package Information**

**TO247**



| SYMBOL | MM       |        |        | INCH     |       |       |
|--------|----------|--------|--------|----------|-------|-------|
|        | MIN      | NOM    | MAX    | MIN      | NOM   | MAX   |
| A      | 4.850    | 5.000  | 5.150  | 0.191    | 0.197 | 0.203 |
| A1     | 2.200    | 2.400  | 2.600  | 0.087    | 0.094 | 0.102 |
| b      | 1.000    | 1.200  | 1.400  | 0.039    | 0.047 | 0.055 |
| b1     | 2.800    | 3.000  | 3.200  | 0.110    | 0.118 | 0.126 |
| b2     | 1.800    | 2.000  | 2.200  | 0.071    | 0.079 | 0.087 |
| c      | 0.500    | 0.600  | 0.700  | 0.020    | 0.024 | 0.028 |
| c1     | 1.900    | 2.000  | 2.100  | 0.075    | 0.079 | 0.083 |
| D      | 15.450   | 15.600 | 15.750 | 0.608    | 0.614 | 0.620 |
| E1     | 3.500REF |        |        | 0.138REF |       |       |
| E2     | 3.600REF |        |        | 0.142REF |       |       |
| L      | 40.900   | 41.100 | 41.300 | 1.610    | 1.618 | 1.626 |
| L1     | 24.800   | 24.950 | 25.100 | 0.976    | 0.982 | 0.988 |
| L2     | 20.300   | 20.450 | 20.600 | 0.799    | 0.805 | 0.811 |
| $\Phi$ | 7.10     | 7.20   | 7.30   | 0.280    | 0.283 | 0.287 |
| e      | 5.450TYP |        |        | 0.215TYP |       |       |
| H      | 5.980REF |        |        | 0.235REF |       |       |
| h      | 0.000    | 0.150  | 0.300  | 0.000    | 0.006 | 0.012 |

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