# LPN1510C

**Enhancement Mode N-Channel Power MOSFET**

## Description

LPN1510C uses advanced FSMOS™ technology to provide low $R_{DS(on)}$, low gate charge, fast switching and excellent avalanche characteristics. This device is specially designed to get better ruggedness and suitable to use in Synchronous-rectification applications.

| | |
|---|---|
| ◆ $V_{DS,min}$ | 100V |
| ◆ $I_{D,pulse}$ | 160A |
| ◆ $R_{DS(ON),max}$@$V_{GS}$=10V | 14mΩ |
| ◆ $Q_g$ | 34.4nC |

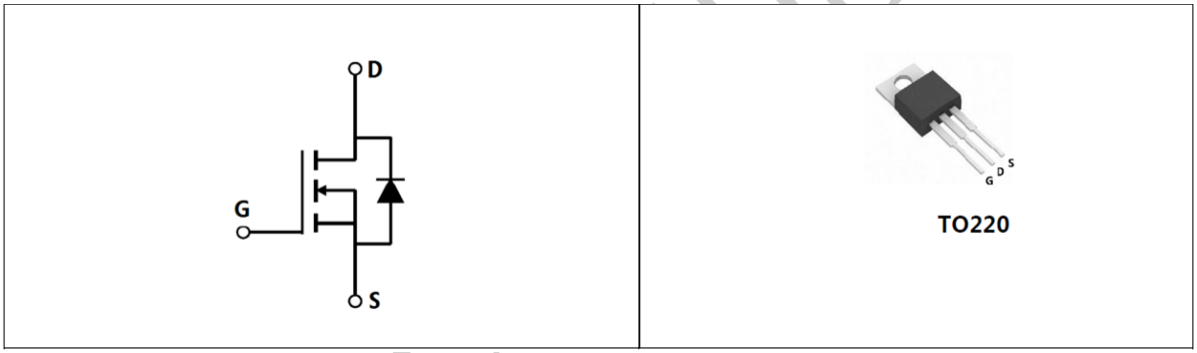
## Features

- Low $R_{DS(on)}$&FOM
- Extremely low switching loss
- Excellent stability and uniformity
- Fast switching and soft recovery

## Applications

- Consumer electronic power supply
- Motor control
- Synchronous-rectification
- Isolated DC/DC convertor
- Invertors

## Schematic and Package Information




Schematic Diagram　　Pin Assignment Top View

## Ordering Information

| Package | Units/Tube | Tubes/Inner Box | Units/Inner Box | Inner Box/Carton Box | Units/Carton Box |
|---|---|---|---|---|---|
| TO220 | 50 | 20 | 1000 | 6 | 6000 |

## Product Information

| Product | Package | Pb Free | RoHS | Halogen Free |
|---|---|---|---|---|
| LPN1510C | TO220 | yes | yes | yes |

# LPN1510C

**Enhancement Mode N-Channel Power MOSFET**

## Absolute Maximum Rating at $T_j$=25℃ unless otherwise noted

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Drain source voltage | $V_{DS}$ | 100 | V |
| Gate source voltage | $V_{GS}$ | ±20 | V |
| Continuous drain current[1)] | $I_D$ | 55 | A |
| Pulsed drain current[2)] | $I_{D,puse}$ | 160 | A |
| Power dissipation[3)] | $P_D$ | 300 | W |
| Single pulsed avalanche energy[5)] | $E_{AS}$ | 100 | mJ |
| Operation and storage temperature | $T_{stg}$, $T_j$ | -55 to 150 | ℃ |

## Thermal Characteristics

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Thermal resistance，junction-case | $R_{\theta JC}$ | 0.38 | ℃/W |
| Thermal resistance，junction-ambient[4)] | $R_{\theta JA}$ | 62.5 | ℃/W |

## Electrical Characteristics at $T_j$=25℃ unless otherwise specified

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Drain-source breakdown voltage | $BV_{DSS}$ | 100 | | | V | $V_{GS}$=0V，$I_D$=250uA |
| Gate threshold voltage | $V_{GS(th)}$ | 1.5 | | 2.5 | V | $V_{DS}$= $V_{GS}$，$I_D$=250uA |
| Drain-source on-state resistance | $R_{DS(ON)}$ | | 11.0 | 14.0 | mΩ | $V_{GS}$=10V，$I_D$=12A |
| Drain-source on-state resistance | $R_{DS(ON)}$ | | 15.0 | 18.0 | mΩ | $V_{GS}$=4.5V，$I_D$=9A |
| Gate-source leakage current | $I_{GSS}$ | | | 100 | nA | $V_{GS}$=20V |
| | | | | -100 | | $V_{GS}$=-20V |
| Drain-source leakage current | $I_{DSS}$ | | | 1 | uA | $V_{DS}$=100V，$V_{GS}$=0V |

## Dynamic Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Input capacitance | $C_{iss}$ | | 2145.8 | | pF | $V_{GS}$=0V，$V_{DS}$=50V，f=100kHz |
| Output capacitance | $C_{oss}$ | | 305.7 | | pF | |
| Reverse transfer capacitance | $C_{rss}$ | | 9.6 | | pF | |
| Turn-on delay time | $T_{d(on)}$ | | 19.5 | | nS | $V_{GS}$=10V，$V_{DS}$=50V，$R_G$=2Ω，$I_D$=10A |
| Rise time | $t_r$ | | 6.2 | | nS | |
| Turn-off delay time | $T_{d(off)}$ | | 43.8 | | nS | |
| Fall time | $t_f$ | | 9.3 | | nS | |

## Gate Charge Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Total gate charge | $Q_g$ | | 34.4 | | nC | $I_D$=10A，$V_{DS}$=50V，$V_{GS}$=10V |
| Gate-source charge | $Q_{gs}$ | | 5.3 | | nC | |
| Gate-drain charge | $Q_{gd}$ | | 8.0 | | nC | |
| Gate plateau voltage | $V_{plateau}$ | | 3.0 | | V | |

## Body Diode Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|---|---|---|---|---|---|---|
| Diode forward current | $I_S$ | | | 55 | A | $V_{GS}$<Vth |
| Pulsed source current | $I_{SP}$ | | | 160 | A | |
| Diode forward voltage | $V_{SD}$ | | | 1.3 | V | $I_S$=12A，$V_{GS}$=0V |
| Reverse recovery time | $t_{rr}$ | | 59.3 | | nS | $I_S$=12A，di/dt=100A/uS |
| Reverse recovery charge | $Q_{rr}$ | | 108.7 | | nC | |
| Peak reverse recovery current | $I_{rrm}$ | | 3.0 | | A | |

## Note

1） Calculated continuous current based on maximum allowable junction temperature.

2） Repetitive rating；pulse width limited by max. junction temperature.

3） Pd is based on max. junction temperature，using junction-case thermal resistance.

4） The value of $R_{\theta JA}$ is measured with the device mounted on 1 in 2 FR-4 board with 2oz. Copper，in a still air environment with $T_a$=25℃.

5） $V_{DD}$=50V，$R_G$=25Ω，L=0.3mH，starting $T_j$=25℃

## Electrical Characteristics Diagrams

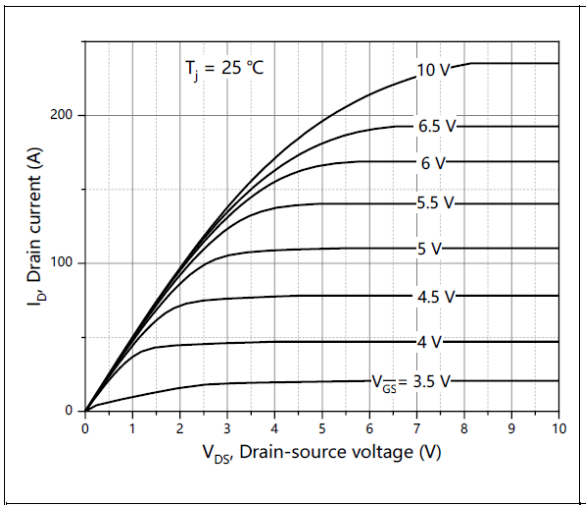



Figure 1， Typ. Output characteristics

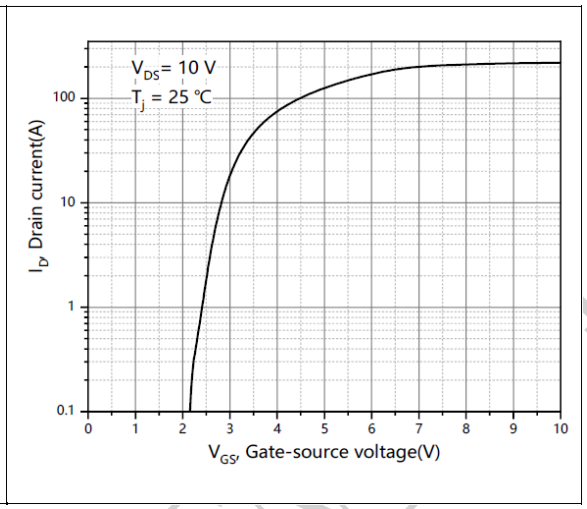



Figure 2， Typ. Transfer characteristics

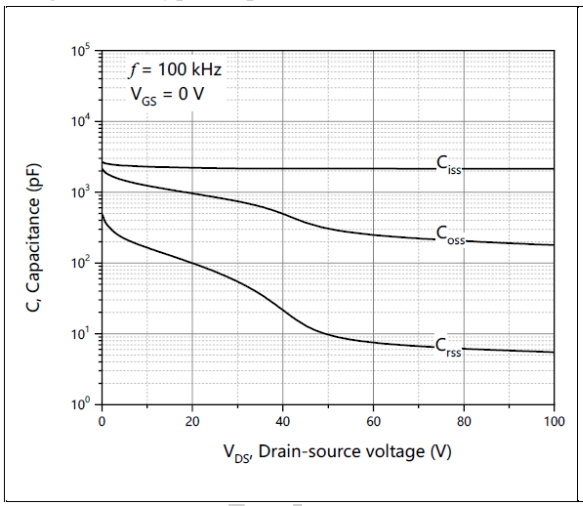



Figure 3， Typ. capacitances

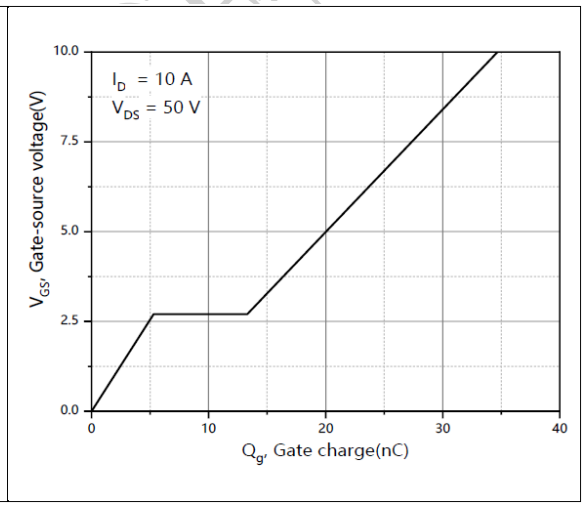



Figure 4， Typ. gate charge

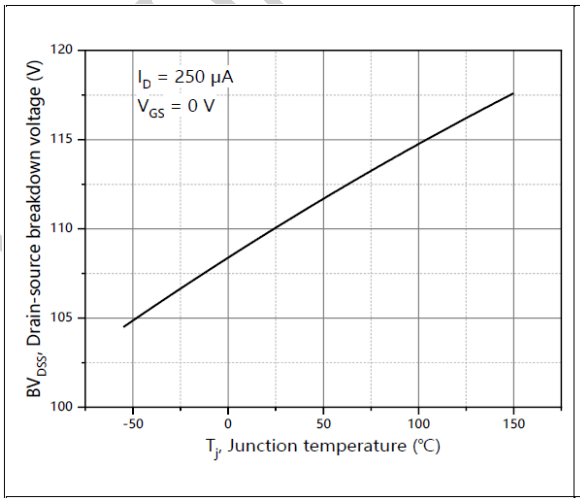



Figure 5， Drain-source breakdown voltage

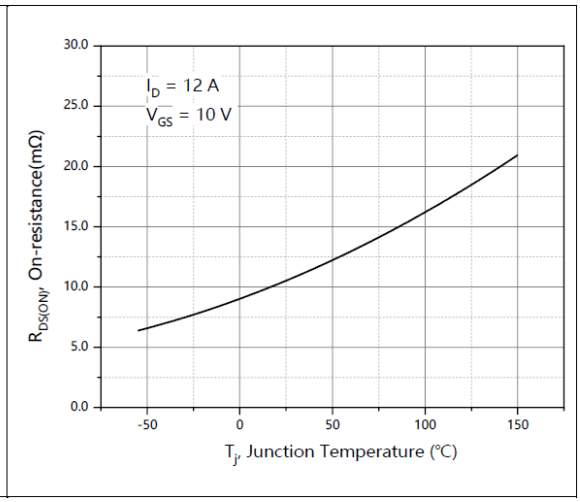



Figure 6， Drain-source on-state resistance

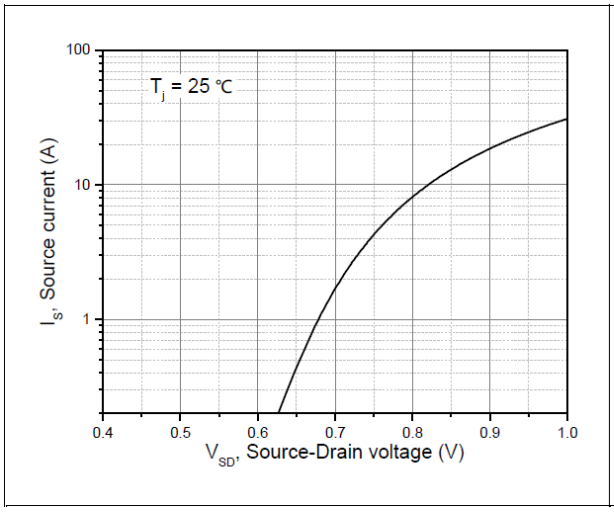



Figure 7， Forward characteristics of body diode

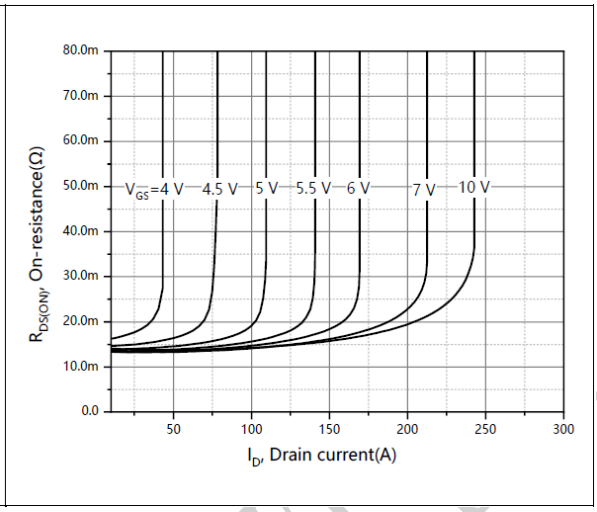



Figure 8， Drain-source on-state resistance

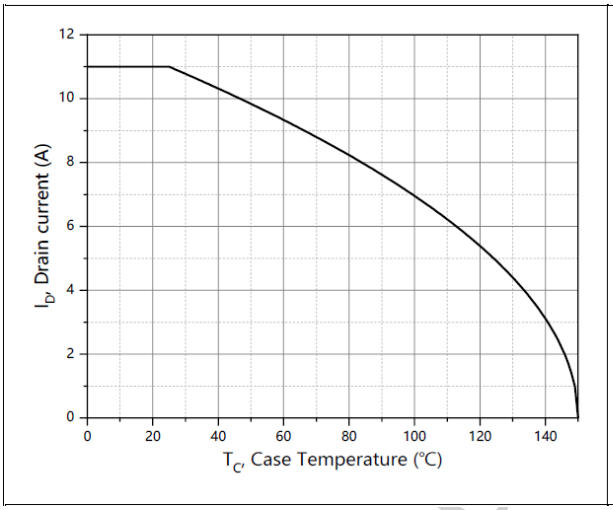



Figure 9， Drain current

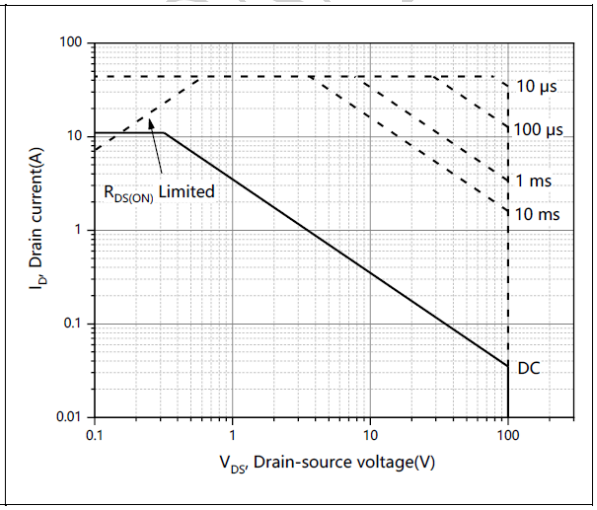



Figure 10， Safe operation area $T_C$=25℃

## Test circuits and waveforms

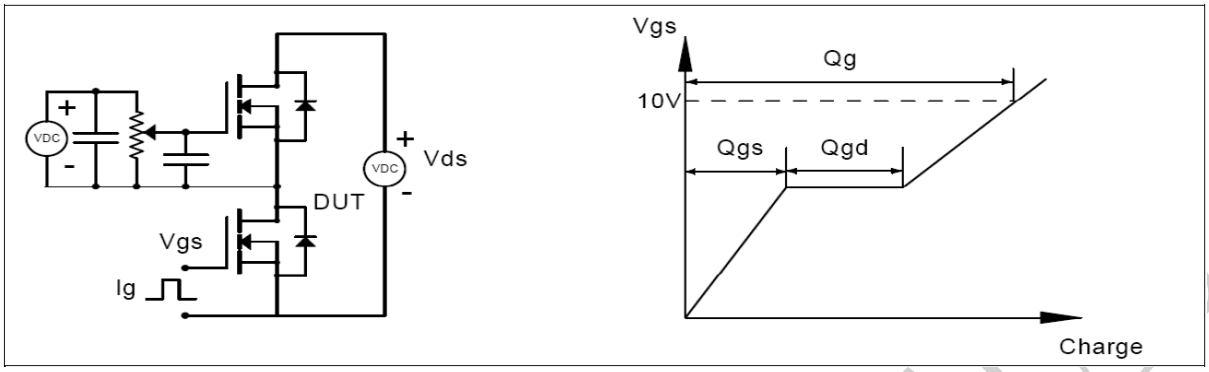



Figure 1，Gate charge test circuit &waveform

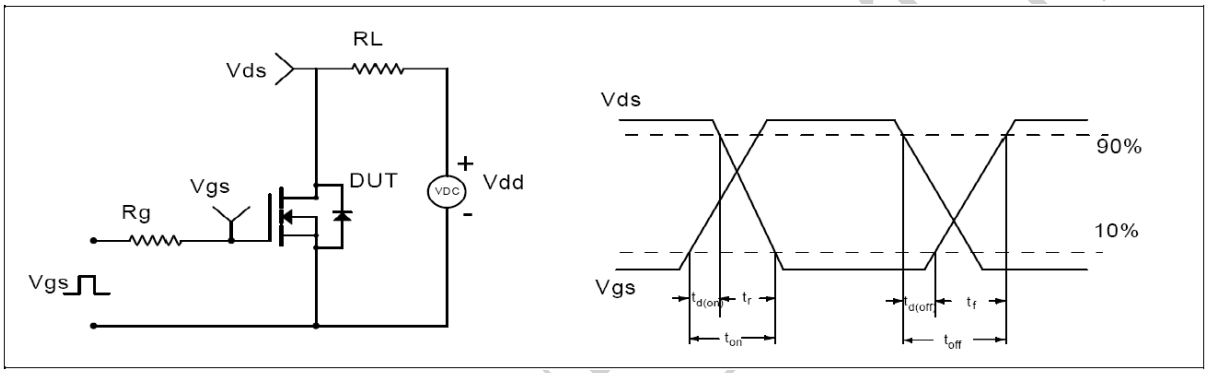



Figure 2，Switching time test circuit & waveforms

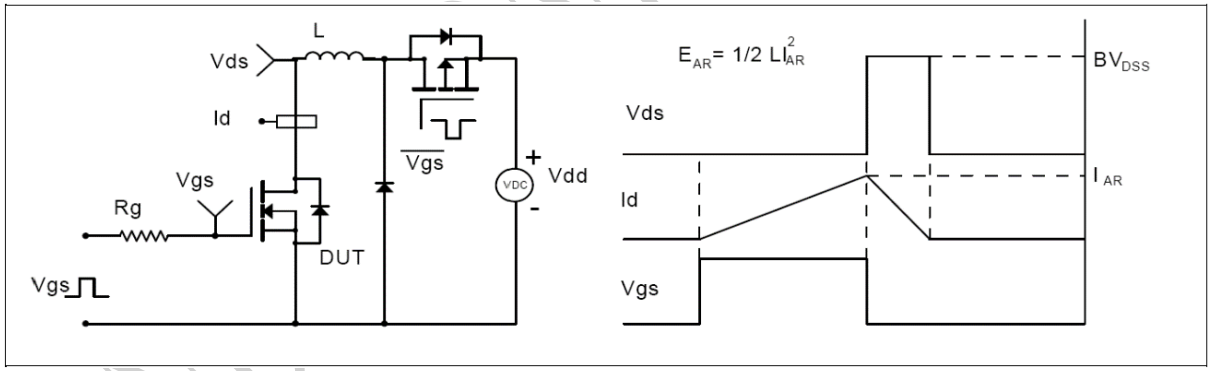



Figure 3，Unclamped inductive switching (UIS) test circuit & waveforms

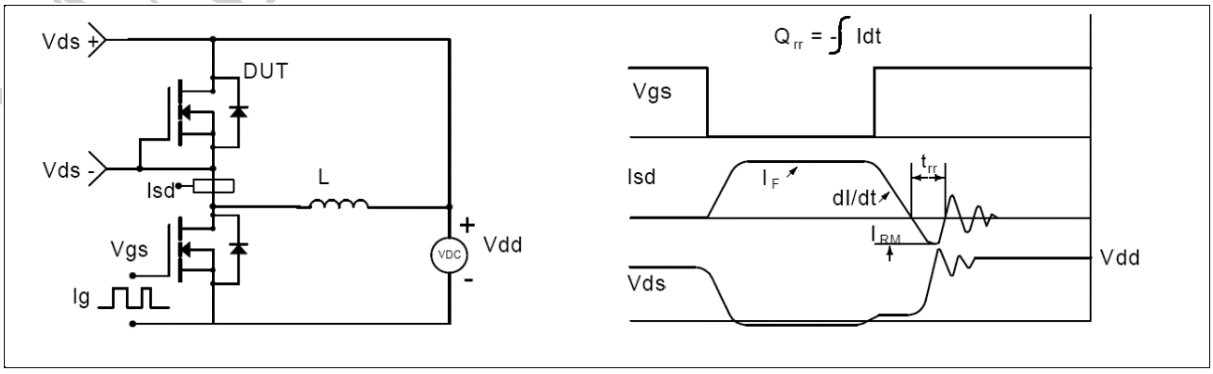
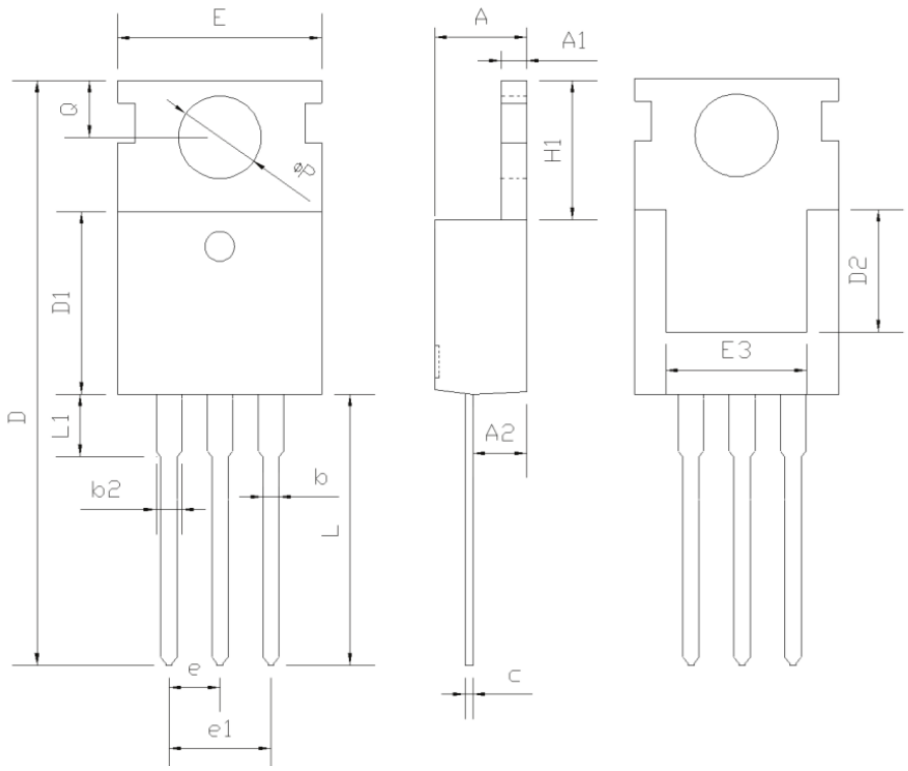



Figure 4，Diode reverse recovery test circuit & waveforms

## Package Information




| Symbol | Min | Nom | Max |
|---|---|---|---|
| A | 4.37 | 4.57 | 4.77 |
| A1 | 1.25 | 1.30 | 1.45 |
| A2 | 2.20 | 2.40 | 2.60 |
| b | 0.70 | 0.80 | 0.95 |
| b2 | 1.17 | 1.27 | 1.47 |
| c | 0.40 | 0.50 | 0.65 |
| D | 15.10 | 15.60 | 16.10 |
| D1 | 8.80 | 9.10 | 9.40 |
| D2 | 5.50 | - | - |
| E | 9.70 | 10.00 | 10.30 |
| E3 | 7.00 | - | - |
| e | 2.54 BSC | | |
| e1 | 5.08 BSC | | |
| H1 | 6.25 | 6.50 | 6.85 |
| L | 12.75 | 13.50 | 13.80 |
| L1 | - | 3.10 | 3.40 |
| ΦP | 3.40 | 3.60 | 3.80 |
| Q | 2.60 | 2.80 | 3.00 |