

General Description

GT125N10 use advanced SFGMOS™ 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 motor control applications.

Features

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

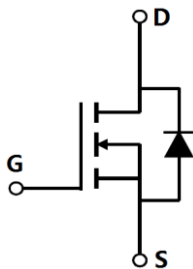
| | | |
|-----------|----------------------------|-------|
| V_{DSS} | $R_{DS(ON)}$ @10V(Typ.) | I_D |
| 100V | 4.1mΩ | 130A |

Applications

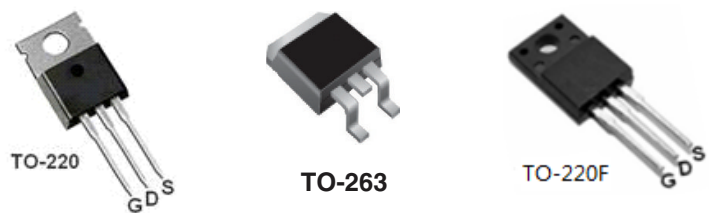
- ◆ Consumer electronic power supply
- ◆ Motor control
- ◆ Synchronous-rectification
- ◆ Isolated DC/DC convertor
- ◆ Invertors

Schematic and Package Information

SCHEMATIC DIAGRAM



PIN ASSIGNMENT TOP VIEW



Ordering Information

| Part Number | Marking | Case | Packaging |
|-------------|----------|---------|-------------|
| GT125N10T | GT125N10 | TO-220 | 50pcs/Tube |
| GT125N10M | GT125N10 | TO-263 | 800pcs/Reel |
| GT125N10F | GT125N10 | TO-220F | 50pcs/Tube |

■ Absolute Maximum Ratings at $T_j=25^\circ\text{C}$ 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⁾ , $T_C=25^\circ\text{C}$ | I_D | 130 | A |
| Pulsed drain current ²⁾ , $T_C=25^\circ\text{C}$ | $I_{D, pulse}$ | 390 | A |
| Power dissipation ³⁾ for TO220, TO263 $T_C=25^\circ\text{C}$ | P_D | 192 | W |
| Power dissipation ³⁾ for TO220F, $T_C=25^\circ\text{C}$ | | 34 | |
| Single pulsed avalanche energy ⁵⁾ | E_{AS} | 400 | mJ |
| Operation and storage temperature | T_{stg}, T_j | -55 to 150 | $^\circ\text{C}$ |

■ Thermal Characteristics

| Parameter | Symbol | Value | | Unit |
|--|-----------------|-------------|--------|---------------------------|
| | | TO263/TO220 | TO220F | |
| Thermal resistance, junction-case | $R_{\theta JC}$ | 0.65 | 3.68 | $^\circ\text{C}/\text{W}$ |
| Thermal resistance, junction-ambient ⁴⁾ | $R_{\theta JA}$ | 62 | 62.5 | $^\circ\text{C}/\text{W}$ |

■ Electrical Characteristics at $T_j=25^\circ\text{C}$ unless otherwise specified

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|----------------------------------|--------------|------|------|------|---------------|---|
| Drain-source breakdown voltage | BV_{DSS} | 100 | | | V | $V_{GS}=0\text{ V}, I_D=250\ \mu\text{A}$ |
| Gate threshold voltage | $V_{GS(th)}$ | 2.0 | | 4.0 | V | $V_{DS}=V_{GS}, I_D=250\ \mu\text{A}$ |
| Drain-source on-state resistance | $R_{DS(ON)}$ | | 4.1 | 4.6 | m Ω | $V_{GS}=10\text{ V}, I_D=60\text{ A}$ |
| Gate-source leakage current | I_{GSS} | | | 100 | nA | $V_{GS}=20\text{ V}$ |
| | | | | -100 | | $V_{GS}=-20\text{ V}$ |
| Drain-source leakage current | I_{DSS} | | | 1 | μA | $V_{DS}=100\text{ V}, V_{GS}=0\text{ V}$ |

■ Dynamic Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|------------------------------|--------------|------|--------|------|------|---|
| Input capacitance | C_{iss} | | 6124.6 | | pF | $V_{GS}=0\text{ V},$ $V_{DS}=50\text{ V},$ $f=1\text{ MHz}$ |
| Output capacitance | C_{oss} | | 792.3 | | pF | |
| Reverse transfer capacitance | C_{rss} | | 15.1 | | pF | |
| Turn-on delay time | $t_{d(on)}$ | | 28.2 | | ns | $V_{GS}=10\text{ V},$ $V_{DS}=50\text{ V},$ $R_G=2.2\ \Omega,$ $I_D=22\text{ A}$ |
| Rise time | t_r | | 7.5 | | ns | |
| Turn-off delay time | $t_{d(off)}$ | | 81.9 | | ns | |
| Fall time | t_f | | 20.1 | | ns | |

■ Gate Charge Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|----------------------|----------------------|------|-------|------|------|---|
| Total gate charge | Q_g | | 101.6 | | nC | $I_D=22\text{ A}$, $V_{DS}=50\text{ V}$, $V_{GS}=10\text{ V}$ |
| Gate-source charge | Q_{gs} | | 20.6 | | nC | |
| Gate-drain charge | Q_{gd} | | 28.7 | | nC | |
| Gate plateau voltage | V_{plateau} | | 4.2 | | V | |

■ Body Diode Characteristics

| Parameter | Symbol | Min. | Typ. | Max. | Unit | Test condition |
|-------------------------------|-----------|------|-------|------|------|---|
| Diode forward current | I_S | | | 130 | A | $V_{GS}<V_{th}$ |
| Pulsed source current | I_{SP} | | | 390 | | |
| Diode forward voltage | V_{SD} | | | 1.3 | V | $I_S=20\text{ A}$, $V_{GS}=0\text{ V}$ |
| Reverse recovery time | t_{rr} | | 82.1 | | ns | $I_S=10\text{ A}$, $di/dt=100\text{ A}/\mu\text{s}$ |
| Reverse recovery charge | Q_{rr} | | 248.4 | | nC | |
| Peak reverse recovery current | I_{rrm} | | 4.9 | | A | |

■ Note

- 1) Calculated continuous current based on maximum allowable junction temperature.
- 2) Repetitive rating; pulse width limited by max. junction temperature.
- 3) P_d 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 $T_a=25\text{ }^\circ\text{C}$.
- 5) $V_{DD}=50\text{ V}$, $R_G=25\text{ }\Omega$, $L=0.5\text{ mH}$, starting $T_j=25\text{ }^\circ\text{C}$.

■ Electrical Characteristics Diagrams

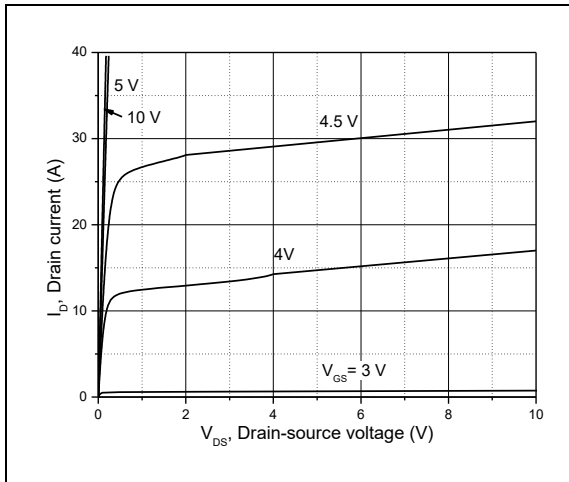


Figure 1, Typ. output characteristics

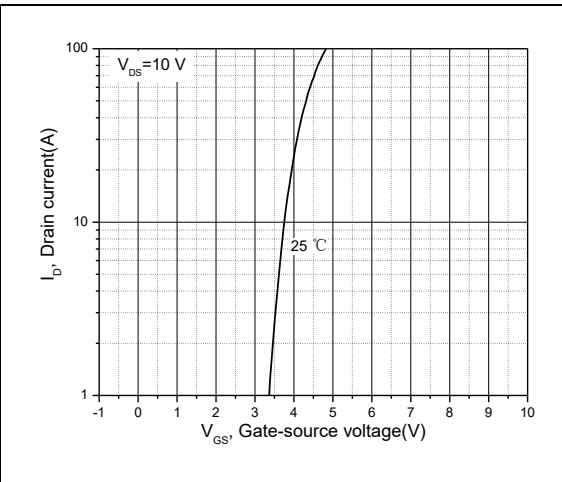


Figure 2, Typ. transfer characteristics

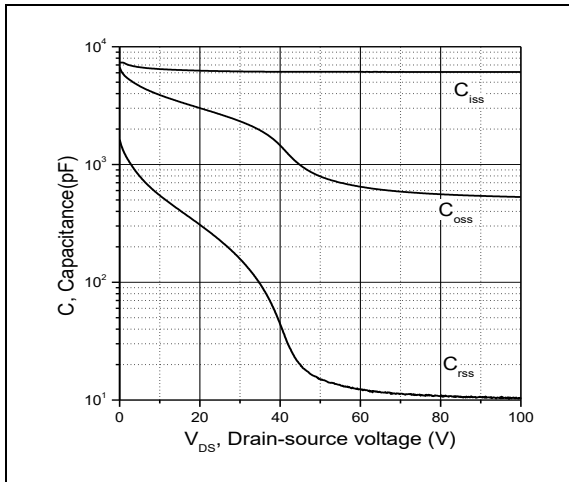


Figure 3, Typ. capacitances

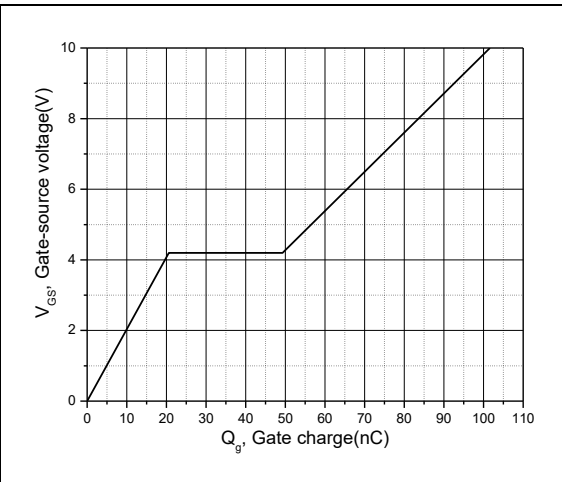


Figure 4, Typ. gate charge

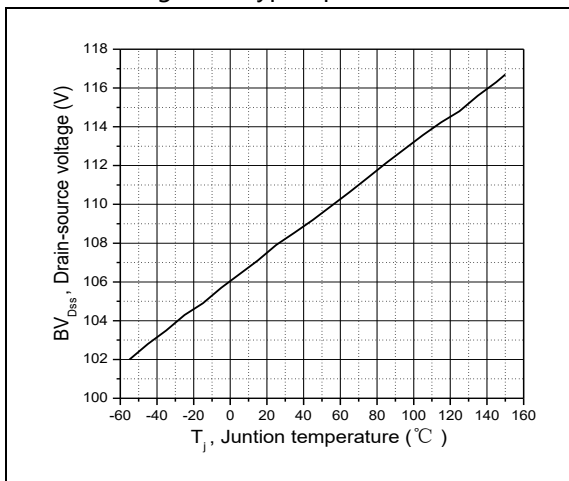


Figure 5, Drain-source breakdown voltage

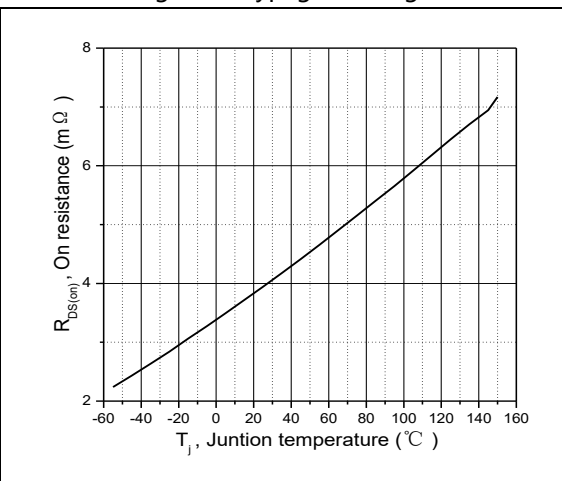


Figure 6, Drain-source on-state resistance

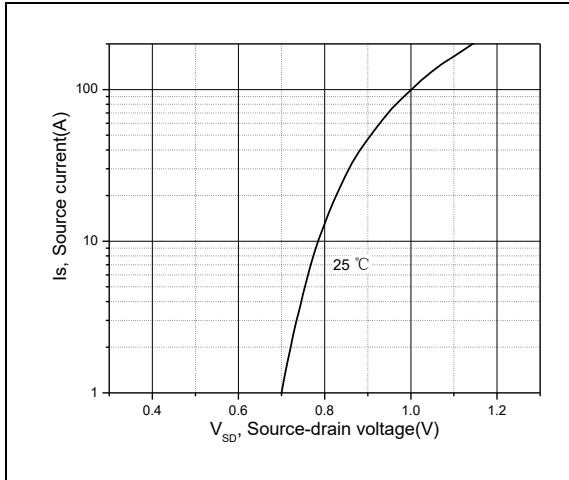


Figure 7, Forward characteristic of body diode

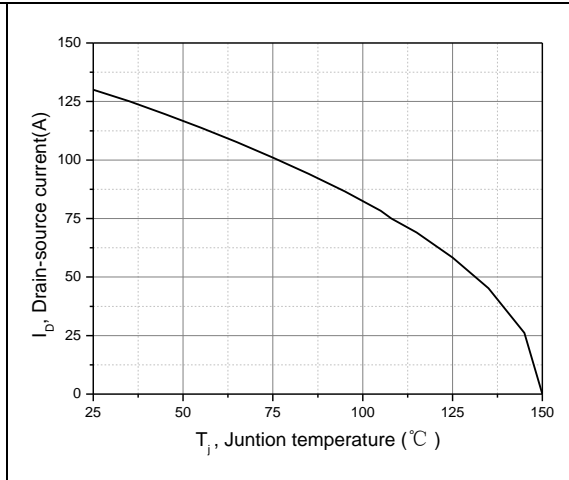


Figure 8, Drain current

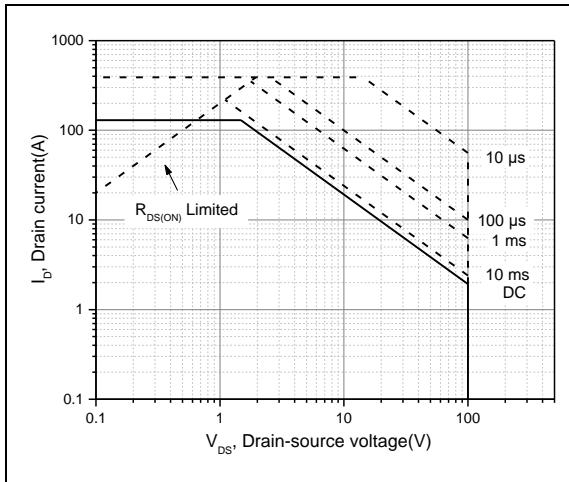


Figure 9, Safe operation area for TO220/TO263
 $T_C=25\text{ }^\circ\text{C}$

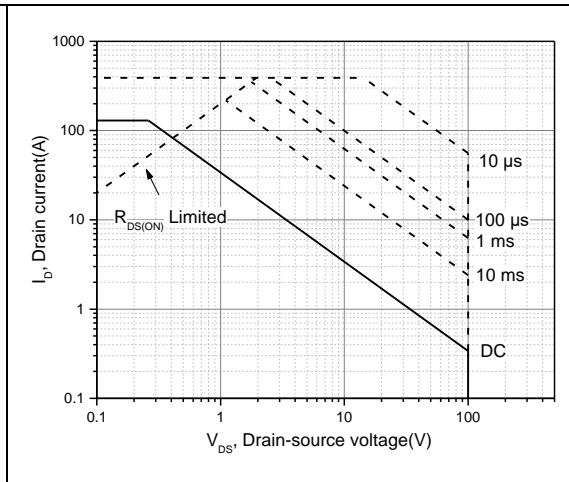


Figure 10, Safe operation area for TO220F
 $T_C=25\text{ }^\circ\text{C}$

■ Test circuits and waveforms

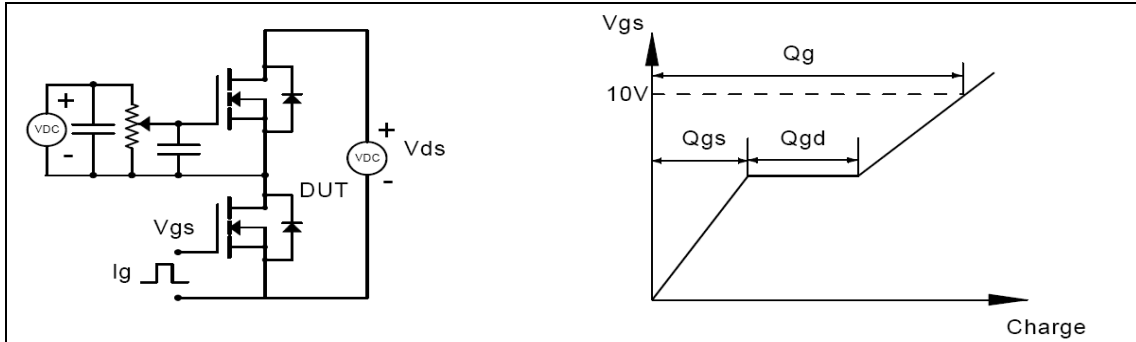


Figure 1, Gate charge test circuit & waveform

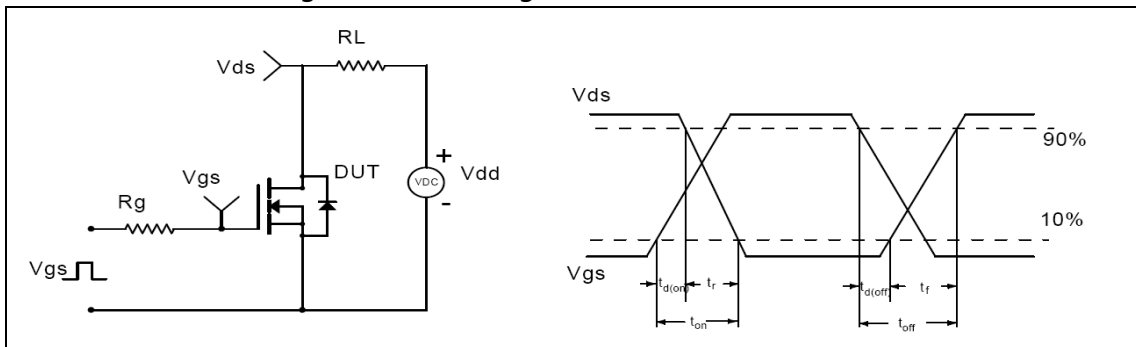


Figure 2, Switching time test circuit & waveforms

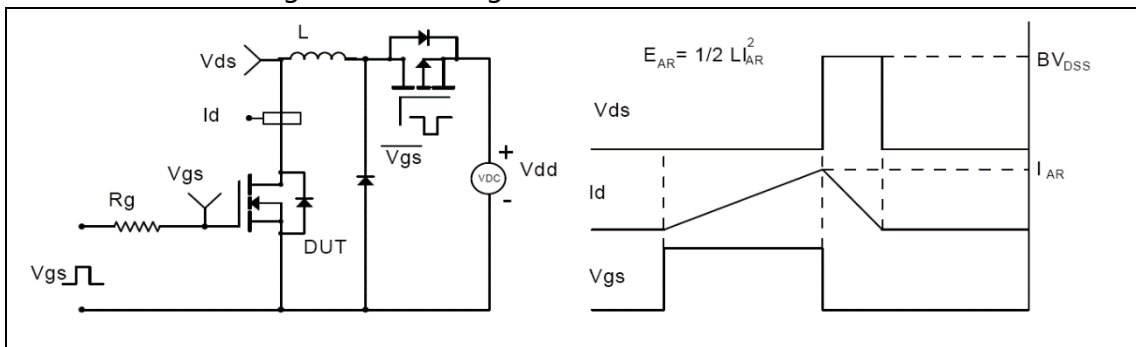


Figure 3, Unclamped inductive switching (UIS) test circuit & waveforms

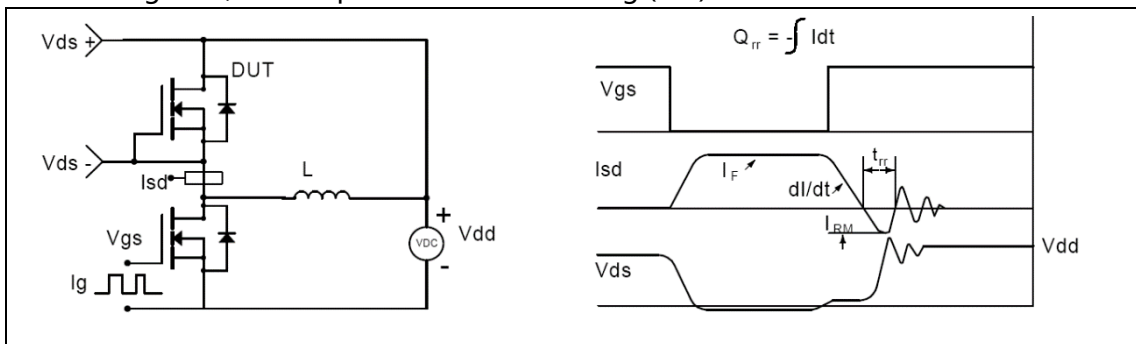
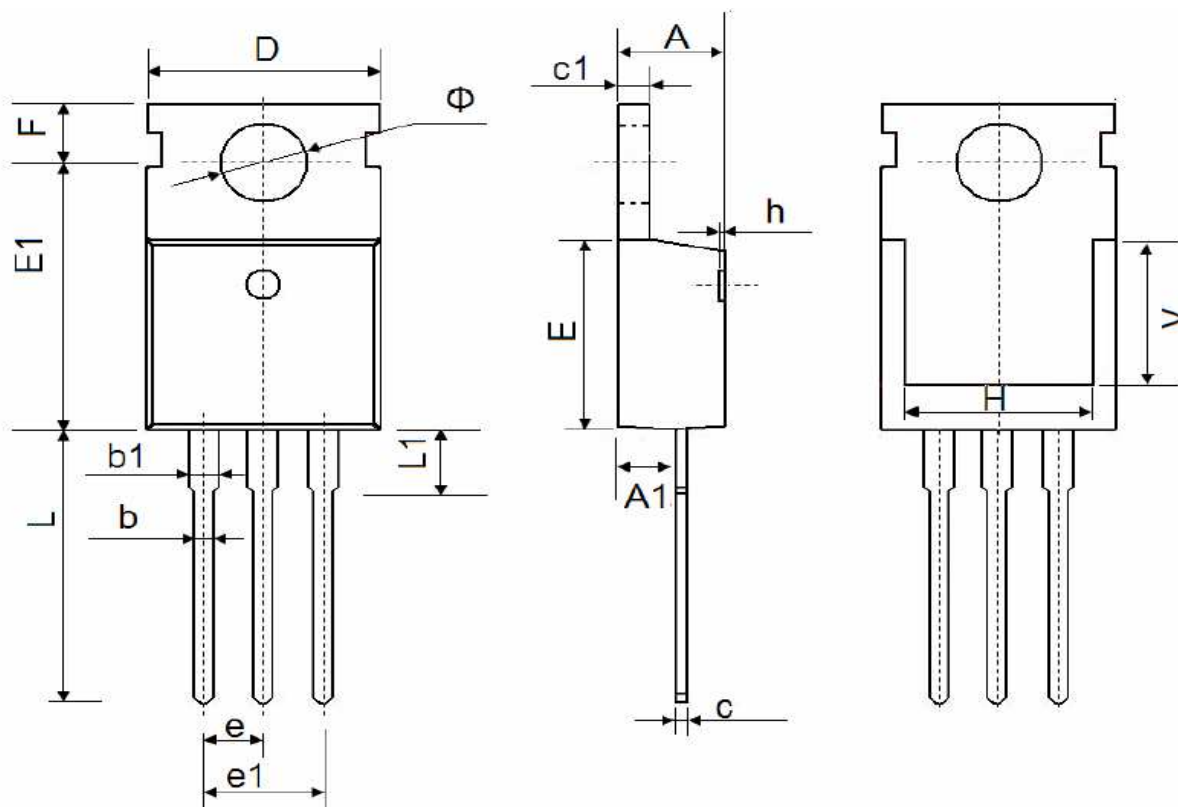


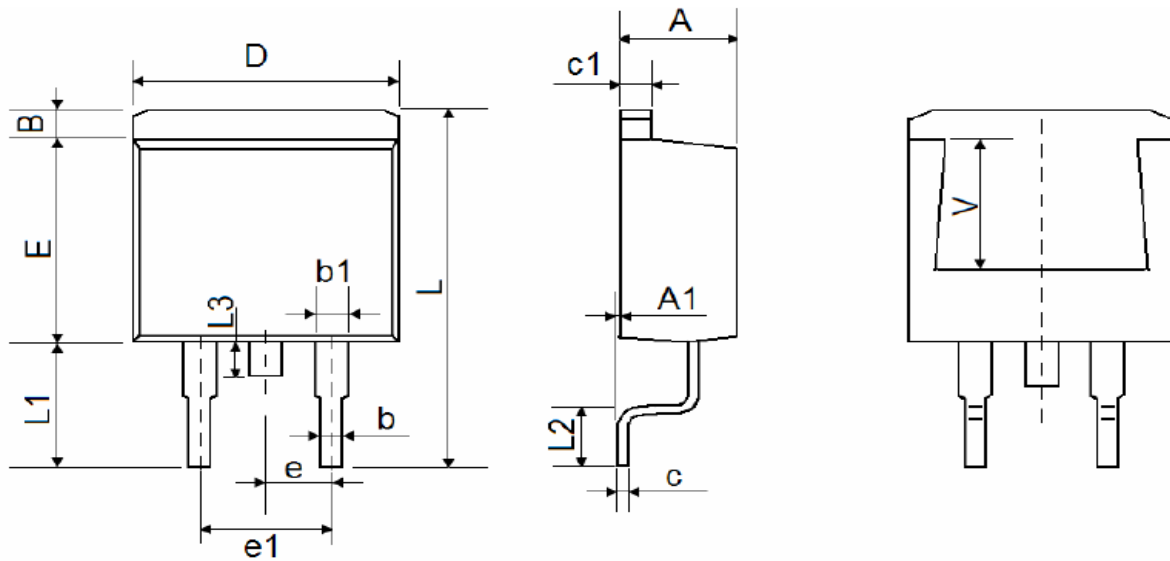
Figure 4, Diode reverse recovery test circuit & waveforms

Package information TO-220



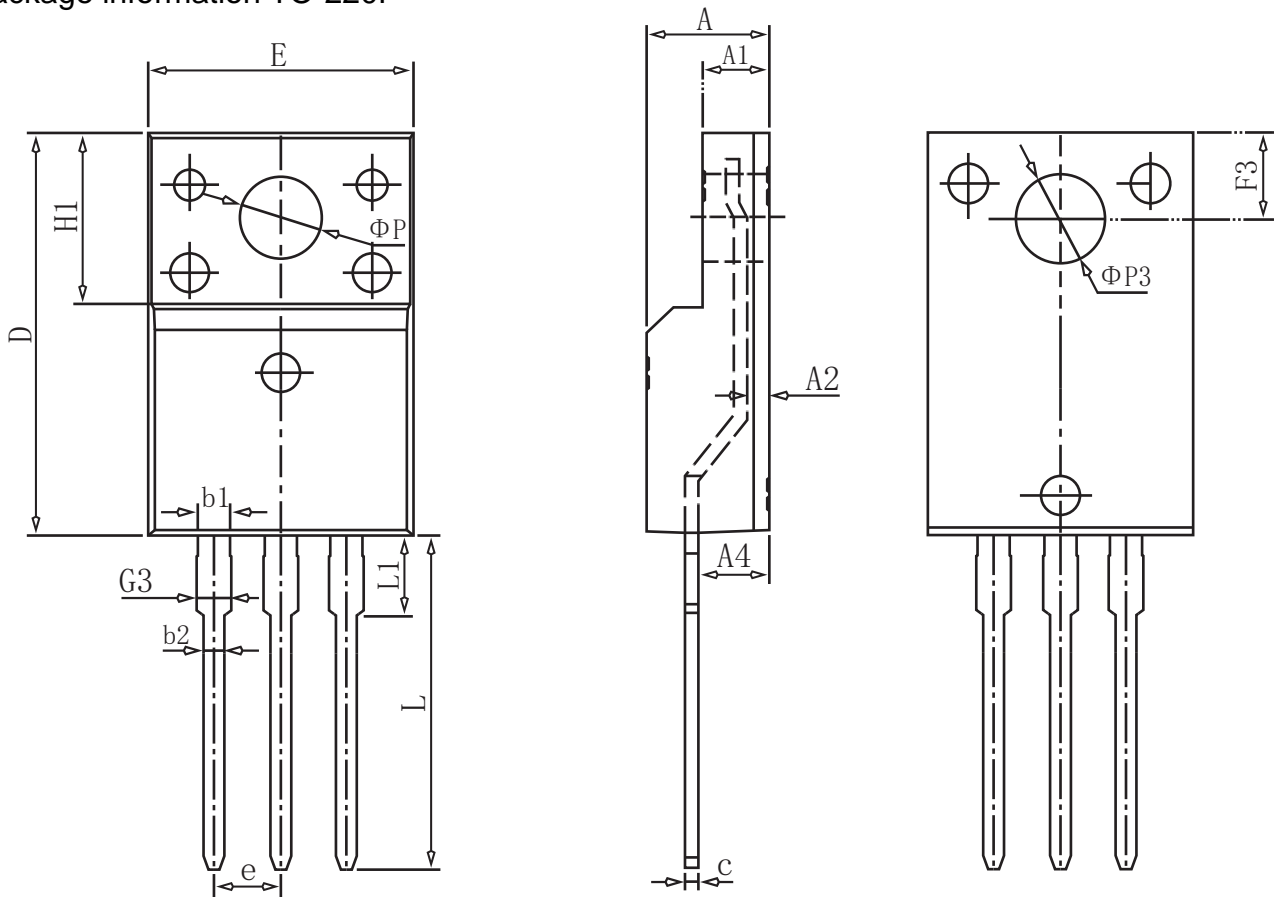
| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.4 | 4.6 | 0.173 | 0.181 |
| A1 | 2.25 | 2.55 | 0.089 | 0.1 |
| b | 0.71 | 0.91 | 0.028 | 0.036 |
| b1 | 1.17 | 1.37 | 0.046 | 0.054 |
| c | 0.33 | 0.65 | 0.013 | 0.026 |
| c1 | 1.2 | 1.4 | 0.047 | 0.055 |
| D | 9.91 | 10.25 | 0.39 | 0.404 |
| E | 8.95 | 9.75 | 0.352 | 0.384 |
| E1 | 12.65 | 12.95 | 0.498 | 0.51 |
| e | 2.540 Typ. | | 0.100 Typ. | |
| e1 | 4.98 | 5.18 | 0.196 | 0.204 |
| F | 2.65 | 2.95 | 0.104 | 0.116 |
| H | 7.9 | 8.1 | 0.311 | 0.319 |
| h | 0 | 0.3 | 0 | 0.012 |
| L | 12.9 | 13.4 | 0.508 | 0.528 |
| L1 | 2.85 | 3.25 | 0.112 | 0.128 |
| V | 7.500 Ref. | | 0.295 Ref. | |
| Φ | 3.4 | 3.8 | 0.134 | 0.15 |

Package information TO-263



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 4.47 | 4.67 | 0.176 | 0.184 |
| A1 | 0 | 0.15 | 0 | 0.006 |
| B | 1.17 | 1.37 | 0.046 | 0.054 |
| b | 0.71 | 0.91 | 0.028 | 0.036 |
| b1 | 1.17 | 1.37 | 0.046 | 0.054 |
| c | 0.31 | 0.53 | 0.012 | 0.021 |
| c1 | 1.17 | 1.37 | 0.046 | 0.054 |
| D | 10.01 | 10.31 | 0.394 | 0.406 |
| E | 8.5 | 8.9 | 0.335 | 0.35 |
| e | 2.540 Typ. | | 0.100 Typ. | |
| e1 | 4.98 | 5.18 | 0.196 | 0.204 |
| L | 15.05 | 15.45 | 0.593 | 0.608 |
| L1 | 5.08 | 5.48 | 0.2 | 0.216 |
| L2 | 2.34 | 2.74 | 0.092 | 0.108 |
| L3 | 1.3 | 1.7 | 0.051 | 0.067 |
| V | 5.600 Ref. | | 0.220 Ref. | |

Package information TO-220F



COMMON DIMENSIONS

| SYMBOL | mm | | |
|--------|----------|-------|-------|
| | MIN | NOM | MAX |
| E | 10.00 | 10.20 | 10.40 |
| A | 4.50 | 4.70 | 4.90 |
| A1 | 2.34 | 2.54 | 2.74 |
| A2 | 0.65 | 0.85 | 1.30 |
| A4 | 2.55 | 2.75 | 2.95 |
| c | 0.40 | 0.50 | 0.65 |
| D | 15.57 | 15.87 | 16.17 |
| H1 | 6.70REF | | |
| e | 2.54BSC | | |
| Φ P | 3.183REF | | |
| L | 12.68 | 12.98 | 13.28 |
| L1 | 3.25 | 3.45 | 3.65 |
| Φ P3 | 3.45REF | | |
| F3 | 3.10 | 3.30 | 3.50 |
| G3 | 1.10 | 1.30 | 1.50 |
| b1 | 1.05 | 1.20 | 1.35 |
| b2 | 0.70 | 0.80 | 0.92 |