

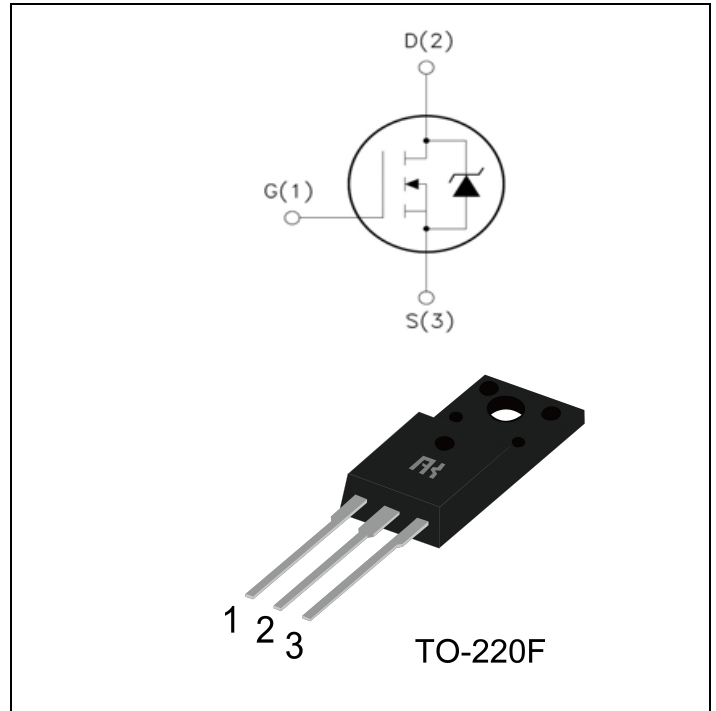
650V,15A N-CHANNEL POWER MOSFET

GENERAL DESCRIPTION

The AKF15N65P is a high voltage power MOSFET and is designed to have better characteristics, such as fast switching time, low gate charge, low on-state resistance and have a high rugged avalanche characteristics . It can be used in a wide variety applications.

Features:

- ◆ Low Intrinsic Capacitances.
- ◆ Excellent Switching Characteristics.
- ◆ Extended Safe Operating Area.
- ◆ Unrivalled Gate Charge :Qg= 48.5nC (Typ.).
- ◆ V_{DSS}=650V,I_D=15A
- ◆ R_{DS(on)} : 0.52 Ω (Max) @V_G=10V
- ◆ 100% Avalanche Tested



Absolute Maximum Ratings (Ta=25°C unless otherwise noted)

| Symbol | Parameter | Value | Unit |
|------------------|---|-----------------------|------|
| V _{DSS} | Drain-Source Voltage | 650 | V |
| I _D | Drain Current | T _C =25°C | 15 |
| | | T _C =100°C | 9.5 |
| V _{GSS} | Gate - Source voltage | ±30 | V |
| E _{AS} | Single Pulse Avalanche Energy (note1) | 920 | mJ |
| I _{AR} | Avalanche Current (note2) | 15 | A |
| P _D | Power Dissipation (T _C =25°C) | 60 | W |
| T _j | Junction Temperature(Max) | 150 | °C |
| T _{stg} | Storage Temperature | -55~+150 | |
| TL | Maximum lead temperature for soldering purpose,1/8" from case for 5 seconds | 300 | |

Thermal Characteristics

| Symbol | Parameter | Typ. | Max. | Unit |
|------------------|--|------|------|------|
| R _{θJC} | Thermal Resistance,Junction to Case | - | 2.08 | °C/W |
| R _{θJA} | Thermal Resistance,Junction to Ambient | - | 62.5 | |

Electrical Characteristics (Ta=25°C unless otherwise noted)

| Symbol | Parameter | Test Condition | Min. | Typ. | Max. | Unit |
|---|---|--|------|------|------|------|
| Off Characteristics | | | | | | |
| BV _{DSS} | Drain-Source Breakdown Voltage | I _D =250μA, V _{GS} =0 | 650 | - | - | V |
| ΔBVDSS/ΔT _J | Breakdown Voltage Temperature Coefficient | I _D =250μA, Reference to 25°C | - | 0.71 | - | V/°C |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =650V, V _{GS} =0V | - | - | 10 | μA |
| | | V _{DS} =480V, T _C =125°C | | | 100 | |
| I _{GSSF} | Gate-body leakage Current, Forward | V _{GS} =+30V, V _{DS} =0V | - | - | 100 | nA |
| I _{GSSR} | Gate-body leakage Current, Reverse | V _{GS} =-30V, V _{DS} =0V | - | - | -100 | |
| On Characteristics | | | | | | |
| V _{GS(TH)} | Gate Threshold Voltage | I _D =250μA, V _{DS} =V _{GS} | 2 | - | 4 | V |
| R _{DS(ON)} | Static Drain-Source On-Resistance | I _D =7.5A, V _{GS} =10V | - | 0.45 | 0.52 | Ω |
| Dynamic Characteristics | | | | | | |
| C _{iss} | Input Capacitance | V _{DS} =25V, V _{GS} =0, f=1.0MHz | - | 2450 | - | pF |
| C _{oss} | Output Capacitance | | - | 295 | - | |
| C _{rss} | Reverse Transfer Capacitance | | - | 23.6 | - | |
| Switching Characteristics | | | | | | |
| T _{d(on)} | Turn-On Delay Time | V _{DD} =325V, I _D =15A R _G =21.7Ω (Note 3,4) | - | 65 | 140 | ns |
| T _r | Turn-On Rise Time | | - | 125 | 260 | |
| T _{d(off)} | Turn-Off Delay Time | | - | 105 | 220 | |
| T _f | Turn-Off Rise Time | | - | 65 | 140 | |
| Q _g | Total Gate Charge | V _{DS} =480V, V _{GS} =10V, I _D =15A (Note 3,4) | - | 48.5 | 63 | nC |
| Q _{gs} | Gate-Source Charge | | - | 14 | - | |
| Q _{gd} | Gate-Drain Charge | | - | 21 | - | |
| Drain-Source Diode Characteristics and Maximum Ratings | | | | | | |
| I _S | Max. Diode Forward Current | - | - | - | 15 | A |
| I _{SM} | Max. Pulsed Forward Current | - | - | - | 60 | |
| V _{SD} | Diode Forward Voltage | I _D =15A | - | - | 1.4 | V |
| T _{rr} | Reverse Recovery Time | I _S =15A, V _{GS} =0V diF/dt=100A/μs | 496 | - | - | nS |
| Q _{rr} | Reverse Recovery Charge | (Note3) | 5.69 | - | - | μC |

Notes : 1, L=8.15mH, I_{AS}=15A, V_{DD}=50V, R_G=25Ω, Starting T_J =25°C

2, Repetitive Rating : Pulse width limited by maximum junction temperature

3, Pulse Test : Pulse Width ≤ 300μs, Duty Cycle ≤ 2%

4, Essentially Independent of Operating Temperature

Typical Characteristics

Figure 1. On-Region Characteristics

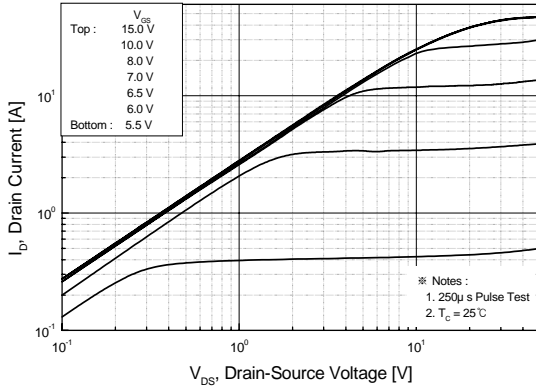


Figure 2. Transfer Characteristics

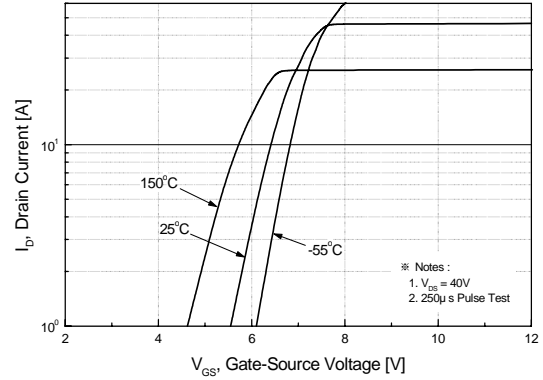


Figure 3. On-Resistance Variation vs. Drain Current and Gate Voltage

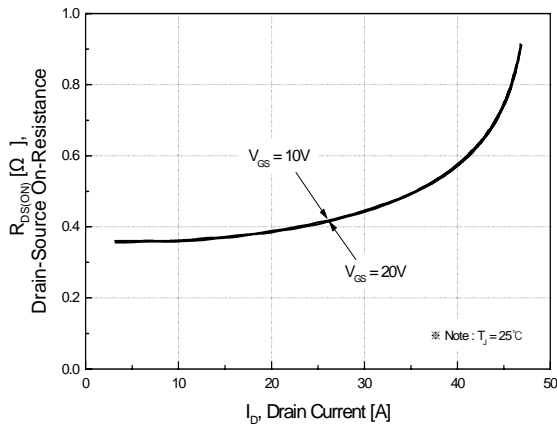


Figure 4. Body Diode Forward Voltage Variation vs. Source Current and Temperature

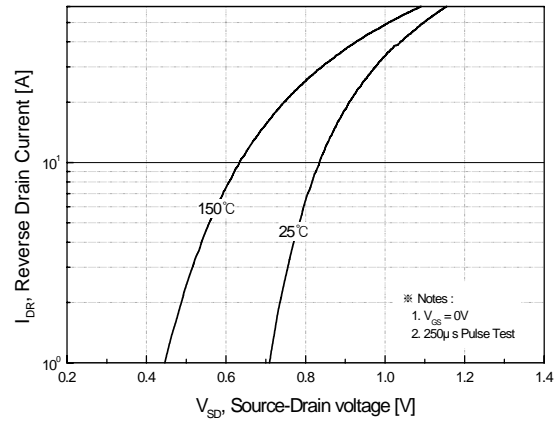


Figure 5. Capacitance Characteristics

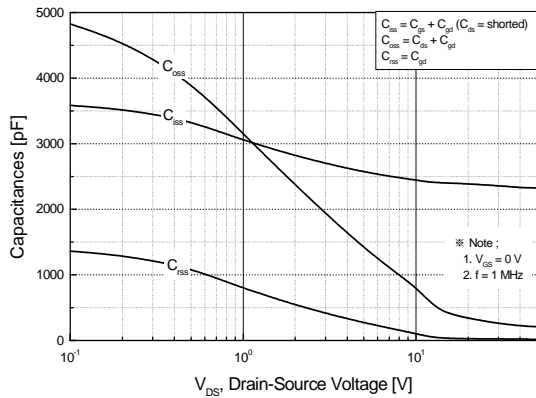
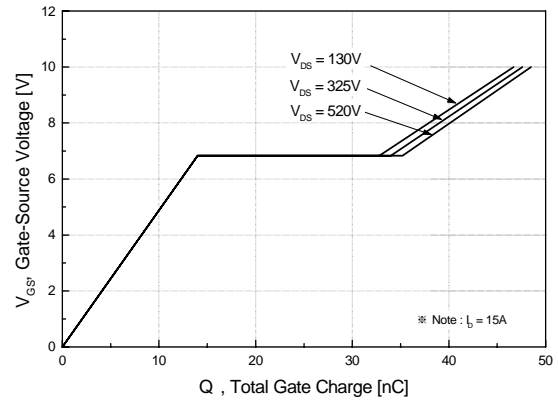


Figure 6. Gate Charge Characteristics



Typical Characteristics (Continued)

Figure 7. Breakdown Voltage Variation vs. Temperature

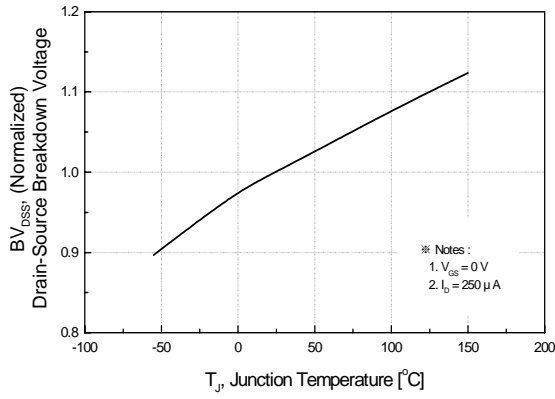


Figure 8. On-Resistance Variation vs. Temperature

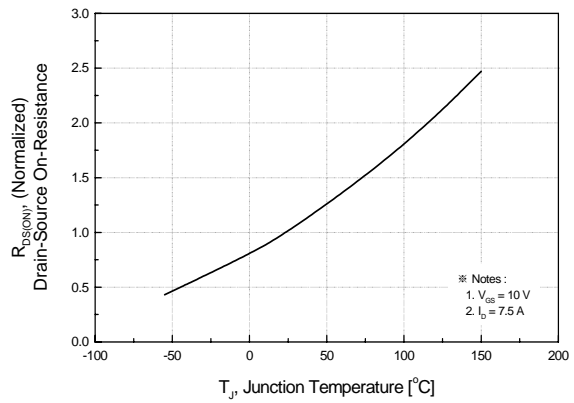


Figure 9-2. Safe Operating Area

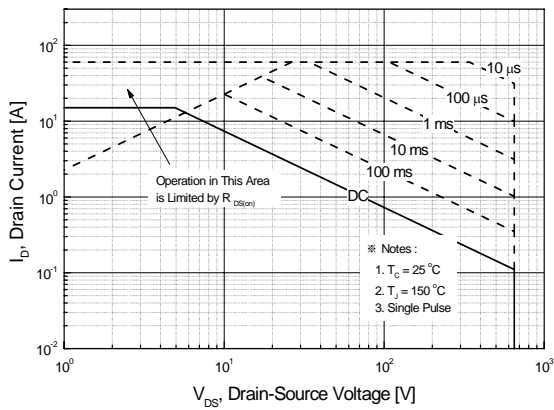
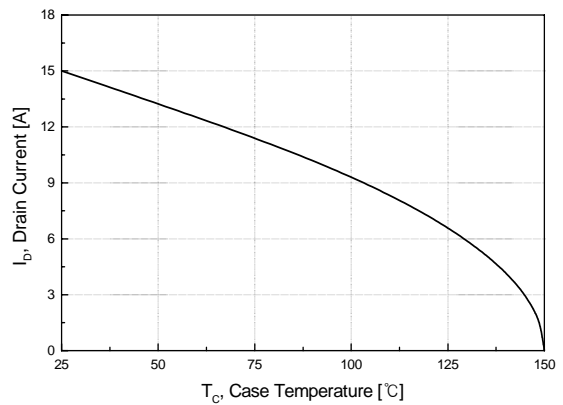
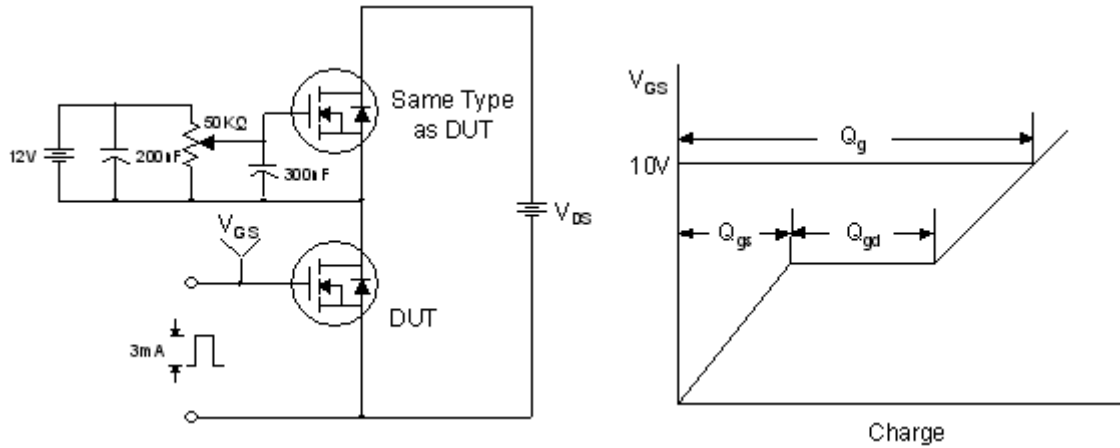


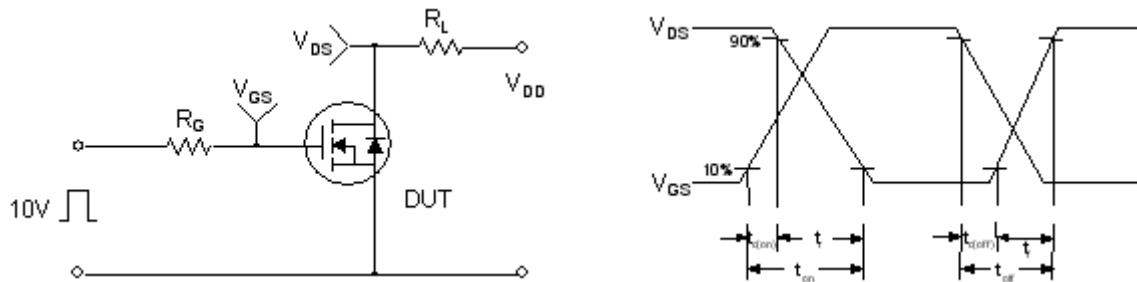
Figure 10. Maximum Drain Current vs. Case Temperature



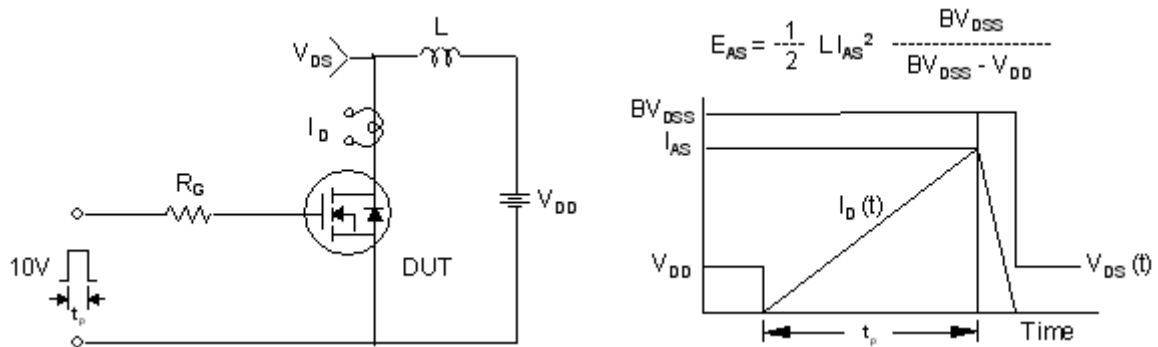
Gate Charge Test Circuit & Waveform



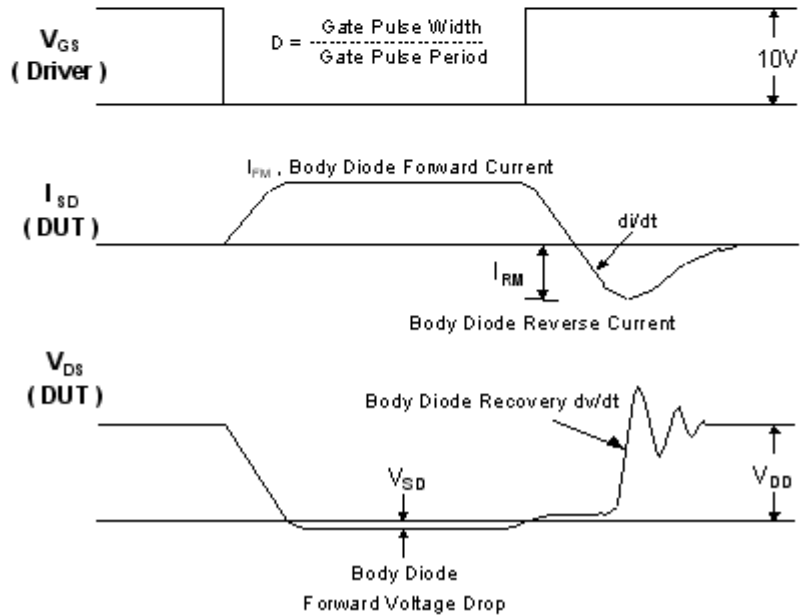
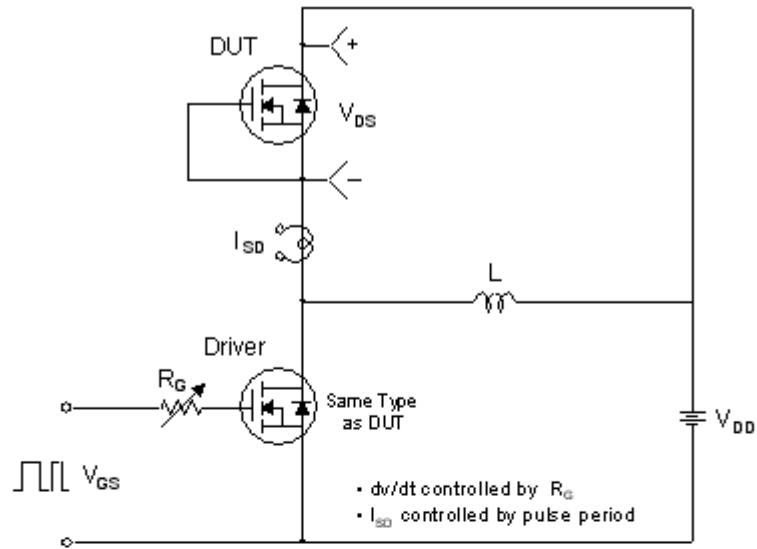
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching Test Circuit & Waveforms

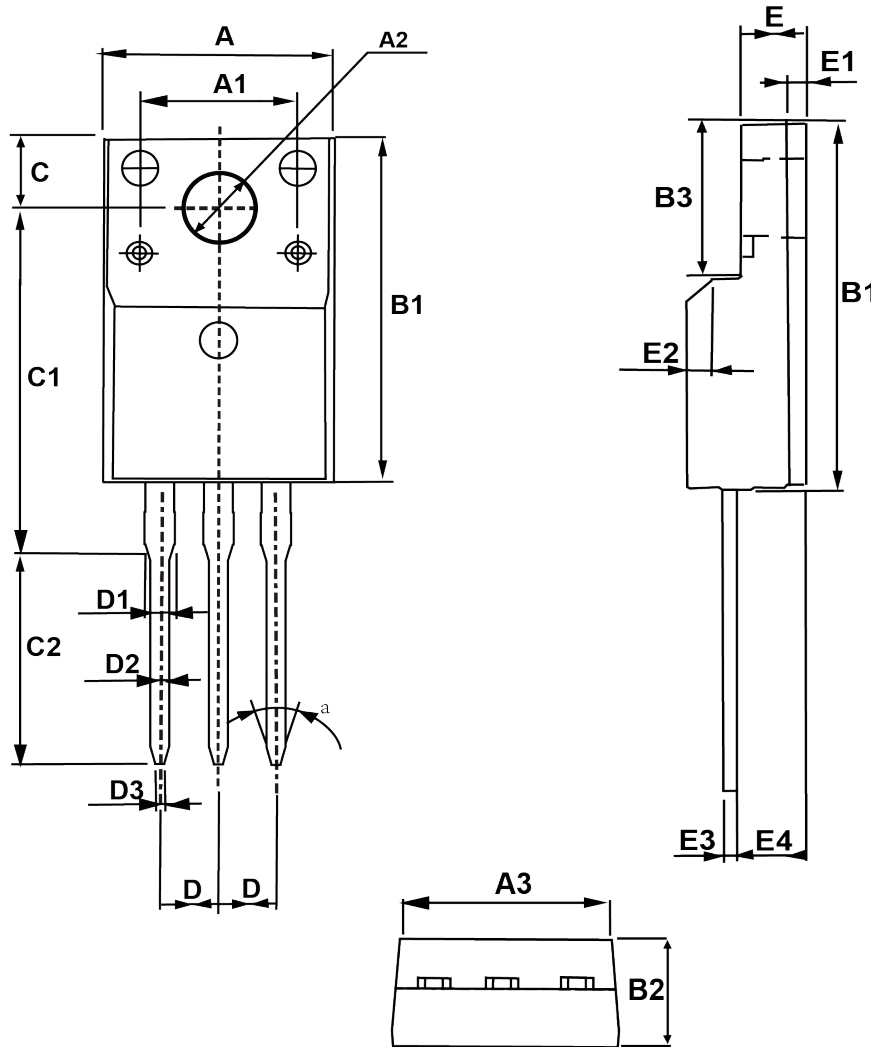


Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension of TO-220F

Unit: mm



| Symbol | Min | Max | Symbol | Min | Max |
|--------|-------|-------|-----------|---------|------|
| A | 9.96 | 10.36 | D | 2.54 | |
| A1 | 7.00 | | D1 | 1.15 | 1.35 |
| A2 | 3.08 | 3.28 | D2 | 0.70 | 0.90 |
| A3 | 9.25 | 9.65 | D3 | 0.28 | 0.48 |
| B1 | 15.70 | 16.10 | E | 2.34 | 2.74 |
| B2 | 4.50 | 4.90 | E1 | 0.70 | |
| B3 | 6.20 | 6.80 | E2 | 1.0×45° | |
| C | 3.20 | 3.40 | E3 | 0.36 | 0.65 |
| C1 | 15.20 | 16.00 | E4 | 2.55 | 2.95 |
| C2 | 9.75 | 10.15 | a (angle) | 30° | |