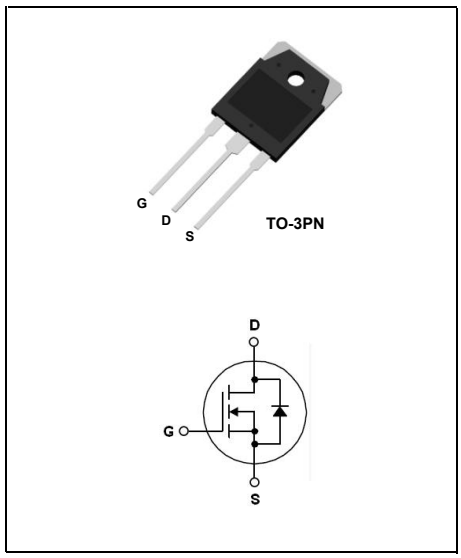
# 900V 13A N-Channel Enhancement Mode Power MOSFET

## Description

The AKT13N90NB is an high blocking voltage N-Channel power MOSFET which using proprietary planar stripe and DMOS technology. This device provide excellent performance for high voltage power supplies or pulse circuits.




## Features

- Typical on-Resistance: $R_{DS\ (on)}$=0.52Ω
- High Blocking Voltage
- 100% Avalanche Test
- Good Stability and Uniformity with High $E_{AS}$

## Applications

- High Voltage Power Supplies
- Capacitor Discharge Applications
- Pulse Circuits

## Absolute Maximum Ratings @$T_C$=25 ℃ unless otherwise noted

| Symbol | Parameter | | Ratings | Unit |
|---|---|---|---|---|
| $V_{DSS}$ | Drain to Source Voltage | | 900 | V |
| $V_{GSS}$ | Gate to Source Voltage | | ±30 | V |
| $I_D$ | Drain Current | $T_C$=25℃ | 13 | A |
| | | $T_C$=100℃ | 6.3 | A |
| $I_{DM}$ | Pulsed Drain Current (Note1) | | 52 | A |
| $P_D$ | Maximum Power Dissipation | $T_C$=25℃ | 300 | W |
| | Derate above 25℃ | | 2.38 | W/℃ |
| $E_{AS}$ | Single Pulsed Avalanche Energy (Note 2) | | 1100 | mJ |
| $T_J$ | Operating Junction Temperature Range | | -50~+150 | ℃ |
| $T_{STG}$ | Storage Temperature Range | | -50~+150 | ℃ |

## Thermal Characteristics

| Symbol | Parameter | Ratings | Unit |
|---|---|---|---|
| $R_{th\ (J-C)}$ | Thermal Resistance, Junction to case | 0.41 | ℃/W |
| $R_{th\ (J-A)}$ | Thermal Resistance, Junction to Ambient | 40 | ℃/W |

## Electrical Characteristics @$T_C$=25 ℃ unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $BV_{DSS}$ | Drain to Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250uA | 900 | - | - | V |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$, $I_D$=250uA | 3.0 | 3.6 | 5.0 | V |
| $R_{DS(on)}$ | Static Drain-Source On-Resistance | $V_{GS}$=10V, $I_D$=6.5A | - | 0.52 | 1.2 | Ω |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=$V_{DSS}$, $V_{GS}$=0V | - | - | 10 | uA |
| $I_{GSS}$ | Gate to Source Leakage Current | $V_{GS}$=$V_{GSS}$, $V_{DS}$=0V | - | - | ±100 | nA |

## D-S Diode Characteristics and Maximum Rating @$T_C$=25 ℃ unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Maximum Drain to Source Diode Forward Current | | - | - | 11.0 | A |
| $V_{SD}$ | Drain-Source Diode Forward Voltage | $V_{GS}$=0V, $I_S$=13A | - | 0.85 | 1.4 | V |
| $t_{rr}$ | Reverse Recovery Time | $V_{GS}$=0V, $I_S$=13A, di/dt=-100A/us | - | 1000 | - | ns |
| $Q_{rr}$ | Reverse Recovery Charge | | - | 20 | - | uC |

## Switching Characteristics @$T_C$=25 ℃ unless otherwise noted

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $t_{d(on)}$ | Turn-on Delay Time | $I_D$=13A , $V_{DD}$=450V, $R_G$=25Ω (Note 3) | - | 65 | 140 | ns |
| $t_r$ | Rising Time | | - | 140 | 280 | ns |
| $t_{d(off)}$ | Turn-off Delay Time | | - | 140 | 260 | ns |
| $t_f$ | Falling Time | | - | 90 | 190 | ns |
| $C_{iss}$ | Input Capacitance | $V_{GS}$=0V, $V_{DS}$=25V, f=1.0MHz | - | 2750 | 3300 | pF |
| $C_{oss}$ | Output Capacitance | | - | 240 | 310 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | - | 26 | 32 | pF |
| $Q_g$ | Total Gate Charge | $I_D$=13A, $V_{DD}$=720V $V_{GS}$=10V (Note 3) | - | 68 | 90 | nC |
| $Q_{gs}$ | Gate to Source Charge | | - | 14 | - | nC |
| $Q_{gc}$ | Gate to Drain Charge | | - | 26 | - | nC |

**Note:**

1. Repetitive rating: pulse-width limited by maximum junction temperature
2. $V_{DD}$=100V, L=10mH, $V_{clamp}$=1100V, $V_G$=10V, $I_D$=18.5A
3. Essentially independent of operating temperature typical characteristics

## Typical Performance Characteristics

Fig. 1. Typical on-Region Characteristics

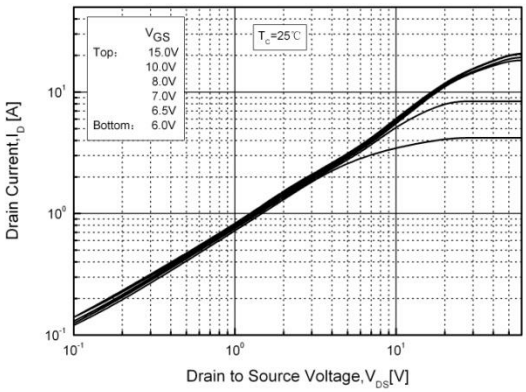



Fig. 2. Typical Transfer Characteristics

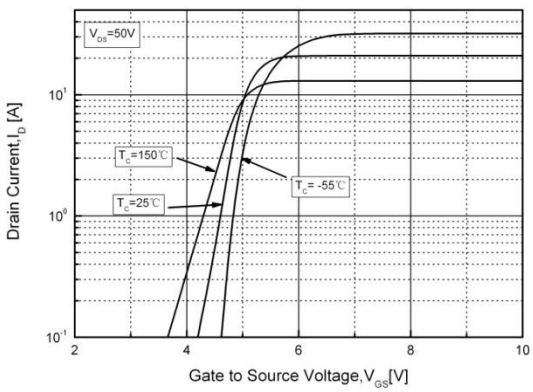



Fig. 3. Static on-Resistance vs. $I_D$

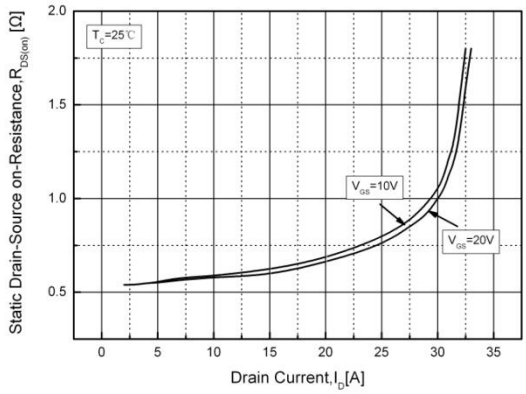



Fig. 4. Body Diode Forward Voltage vs. $I_{DR}$

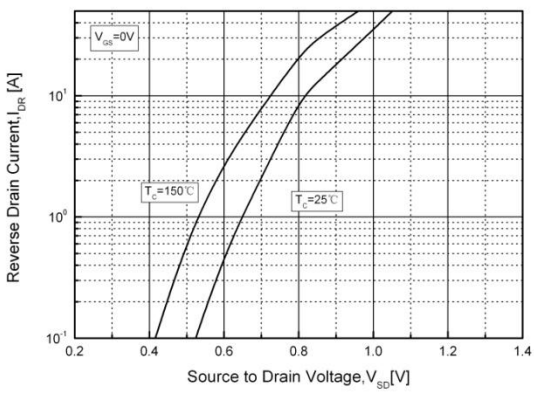



Fig. 5. Capacitance Characteristics

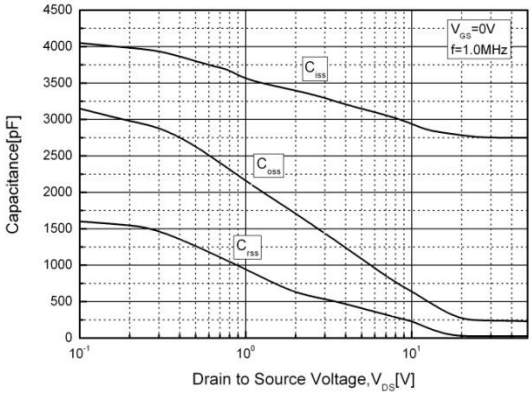
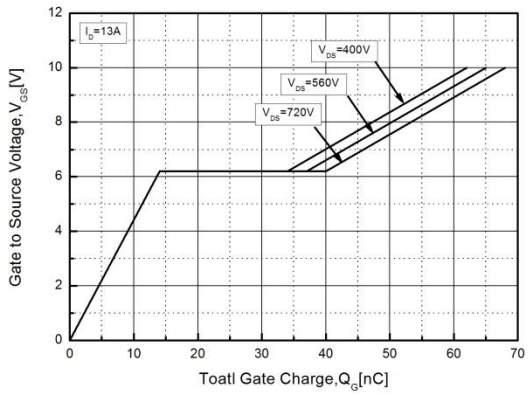



Fig. 6. Gate Charge Characteristics



## Typical Performance Characteristics

Fig. 7. Breakdown Voltage vs. Temperature

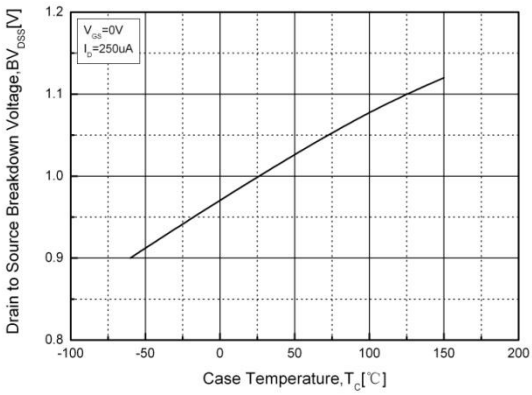



Fig. 8. Static on-Resistance vs. Temperature

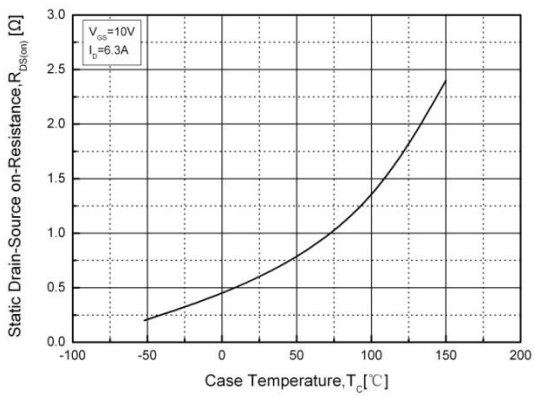



Fig. 9. Maximum Safe Operating Area

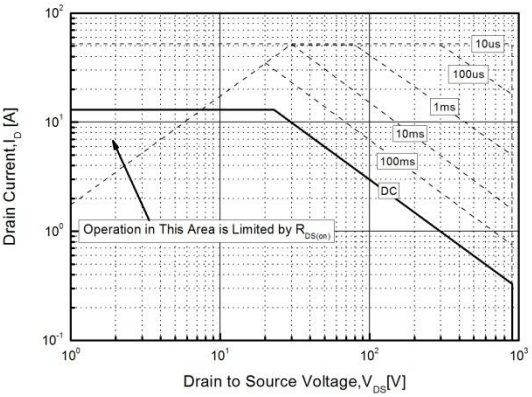



Fig. 10. Maximum Drain Current vs. Temperature

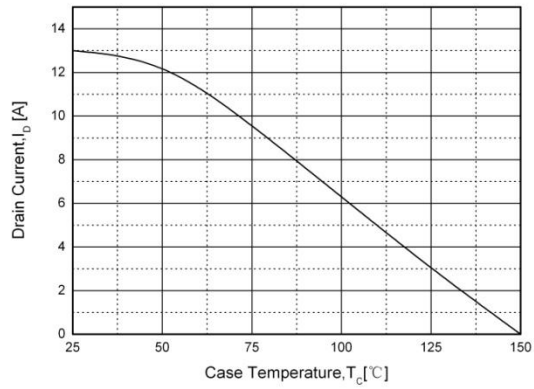
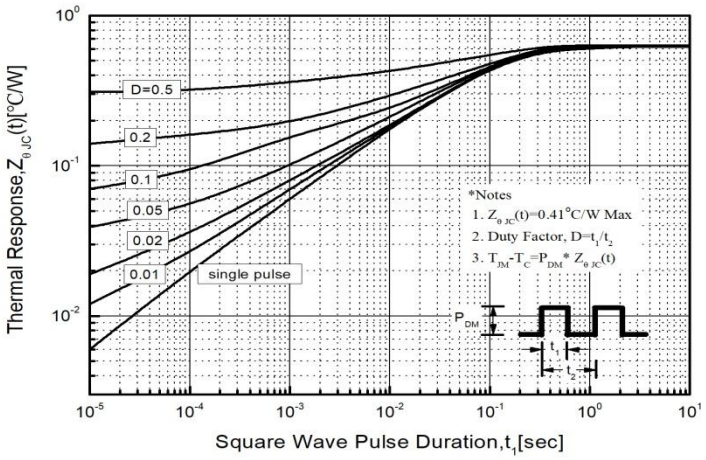



Fig. 11. Transient Thermal Response Curve



## Package Dimensions

**TO-3PN**

(Dimensions in Millimeters)