# Alfa-MOS Technology

# AFN9977
## 60V N-Channel Enhancement Mode MOSFET

### General Description

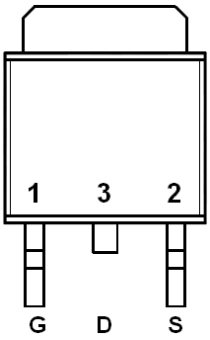
AFN9977, N-Channel enhancement mode MOSFET, uses Advanced Trench Technology to provide excellent $R_{DS(ON)}$, low gate charge.

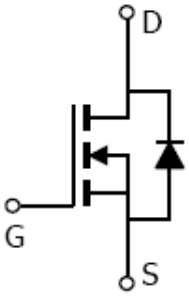
These devices are particularly suited for low voltage power management, and low in-line power loss are needed in commercial industrial surface mount applications.

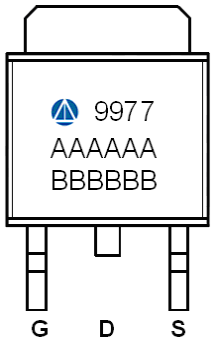
### Features

- 60V/8A, $R_{DS(ON)}$= 118mΩ@$V_{GS}$=10V
- 60V/6A, $R_{DS(ON)}$= 130mΩ@$V_{GS}$=4.5V
- Super high density cell design for extremely low $R_{DS\ (ON)}$
- TO-252-2L package design

### Pin Description ( TO-252-2L )




### Application

- Motor and Load Control
- Power Management in White LED System
- Push Pull Converter
- LCD TV Inverter & AD/DC Inverter Systems.

### Pin Define

| Pin | Symbol | Description |
|---|---|---|
| 1 | G | Gate |
| 2 | S | Source |
| 3 | D | Drain |

### Ordering Information

| Part Ordering No. | Part Marking | Package | Unit | Quantity |
|---|---|---|---|---|
| AFN9977T252RG | 9977 | TO-252-2L | Tape & Reel | 2500 EA |

※ A Lot code
※ B Date code
※ AFN9977T252RG : 13” Tape & Reel ; Pb- Free ; Halogen- Free

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## Absolute Maximum Ratings

($T_A$=25℃ Unless otherwise noted)

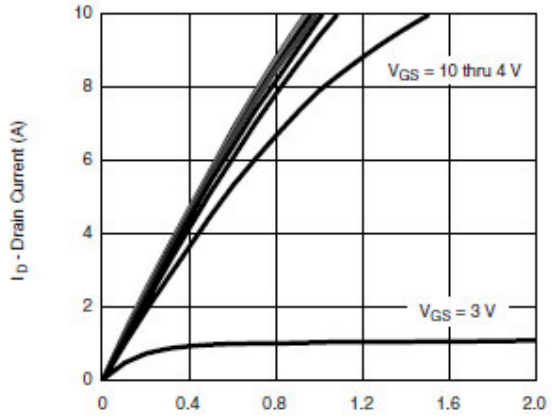
| Parameter | | Symbol | Typical | Unit |
|---|---|---|---|---|
| Drain-Source Voltage | | $V_{DSS}$ | 60 | V |
| Gate –Source Voltage | | $V_{GSS}$ | ±20 | V |
| Continuous Drain Current($T_J$=150℃) | $T_A$=25℃ | $I_D$ | 12 | A |
| | $T_A$=70℃ | | 8 | |
| Pulsed Drain Current | | $I_{DM}$ | 30 | |
| Continuous Source Current(Diode Conduction) | | $I_S$ | 12 | |
| Single Pulse Avalanche Current | | $I_{AS}$ | 15 | |
| Power Dissipation | $T_A$=25℃ | $P_D$ | 40 | W |
| | $T_A$=70℃ | | 15 | |
| Operating Junction Temperature | | $T_J$ | 150 | ℃ |
| Storage Temperature Range | | $T_{STG}$ | -55/150 | ℃ |
| Thermal Resistance-Junction to Ambient | | $R_{\theta JA}$ | 62.5 | ℃/W |

## Electrical Characteristics

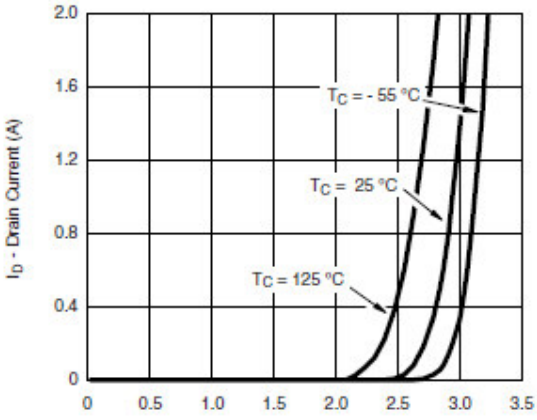
($T_A$=25℃ Unless otherwise noted)

| Parameter | Symbol | Conditions | Min. | Typ | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static** | | | | | | |
| Drain-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$=0V,$I_D$=250uA | 60 | | | V |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250uA | 0.7 | | 2.5 | |
| Gate Leakage Current | $I_{GSS}$ | $V_{DS}$=0V,$V_{GS}$=±20V | | | ±100 | nA |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=60V,$V_{GS}$=0V | | | 1 | uA |
| | | $V_{DS}$=60V,$V_{GS}$=0V $T_J$=85℃ | | | 5 | |
| On-State Drain Current | $I_{D(on)}$ | $V_{DS}$≧5V,$V_{GS}$=4.5V | 30 | | | A |
| Drain-Source On-Resistance | $R_{DS(on)}$ | $V_{GS}$=10V,$I_D$=8A | | | 118 | mΩ |
| | | $V_{GS}$=4.5V,$I_D$=6A | | | 130 | |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=15V,$I_D$=5.3A | | 12 | | S |
| Diode Forward Voltage | $V_{SD}$ | $I_S$=2.0A,$V_{GS}$=0V | | 0.8 | 1.2 | V |
| **Dynamic** | | | | | | |
| Total Gate Charge | $Q_g$ | $V_{DS}$=48V,$V_{GS}$=4.5V $I_D$≡5A | | 6 | 12 | nC |
| Gate-Source Charge | $Q_{gs}$ | | | 2.0 | | |
| Gate-Drain Charge | $Q_{gd}$ | | | 3.0 | | |
| Input Capacitance | $C_{iss}$ | $V_{DS}$=25V,$V_{GS}$=0V f=1MHz | | 480 | | pF |
| Output Capacitance | $C_{oss}$ | | | 50 | | |
| Reverse Transfer Capacitance | $C_{rss}$ | | | 35 | | |
| Turn-On Time | $t_{d(on)}$ | $V_{DD}$=30V,$R_L$=6.0Ω $I_D$≡5.0A,$V_{GEN}$=10V $R_G$=3.3V | | 6 | 12 | ns |
| | $t_r$ | | | 6 | 12 | |
| Turn-Off Time | $t_{d(off)}$ | | | 12 | 20 | |
| | $t_f$ | | | 4 | 10 | |

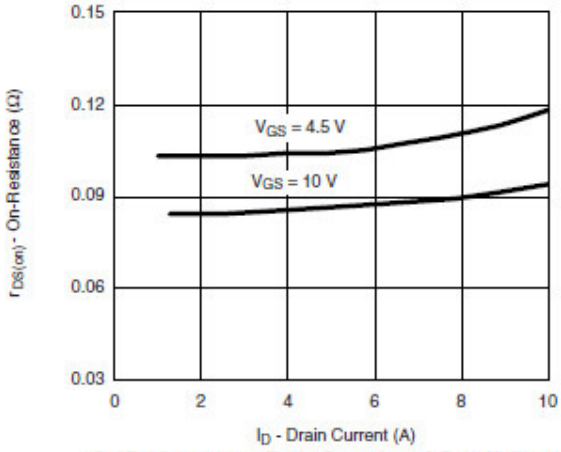
## Typical Characteristics



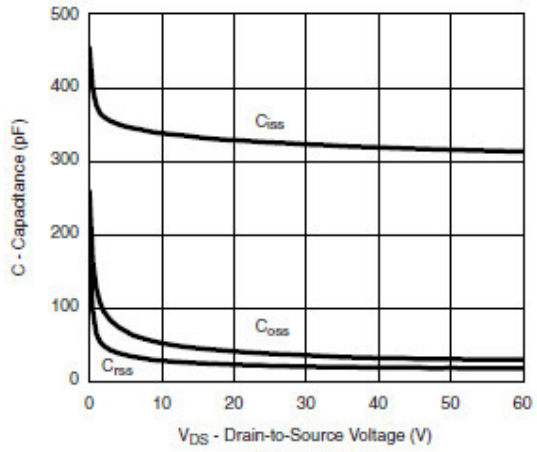

**Output Characteristics**



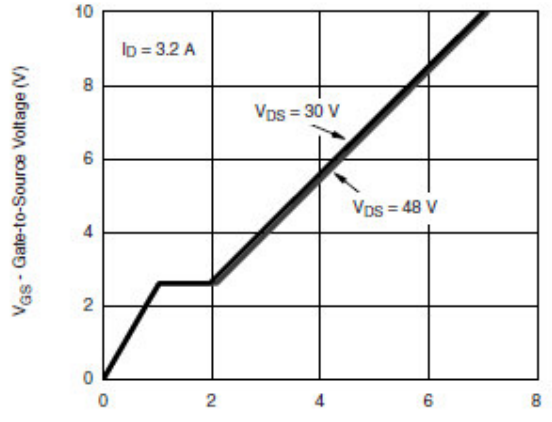

**Transfer Characteristics**



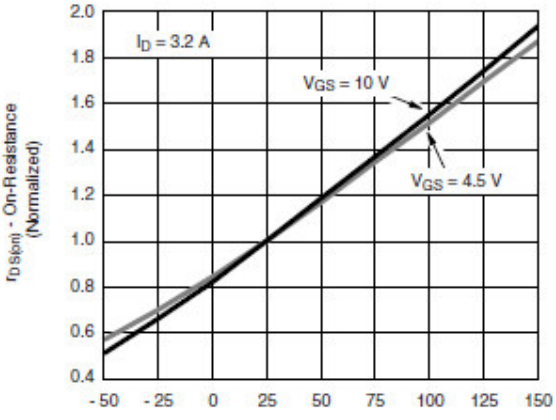

**On-Resistance vs. Drain Current and Gate Voltage**




**Capacitance**

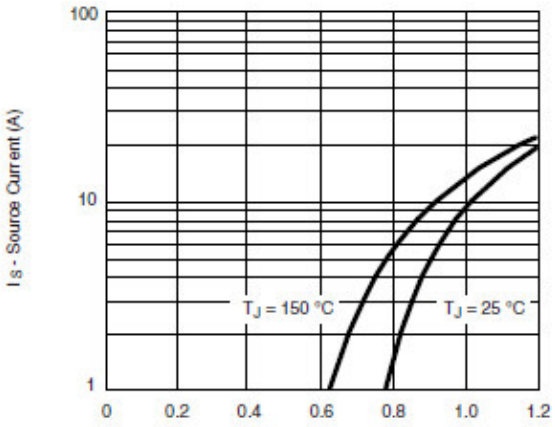



**Gate Charge**

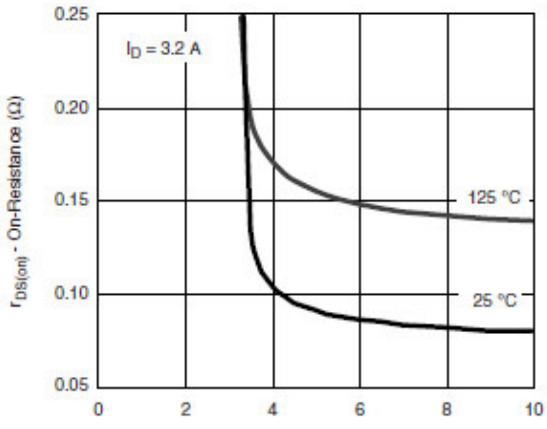



**On-Resistance vs. Junction Temperature**

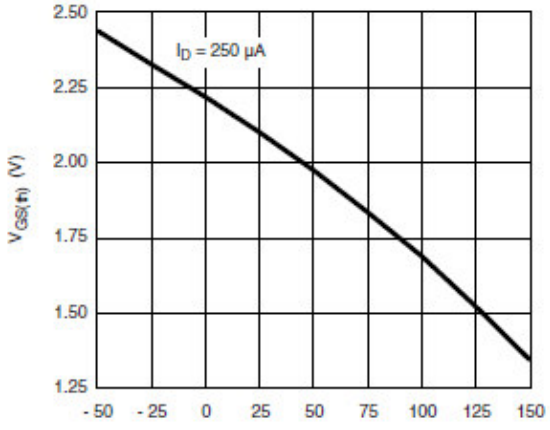
## Typical Characteristics



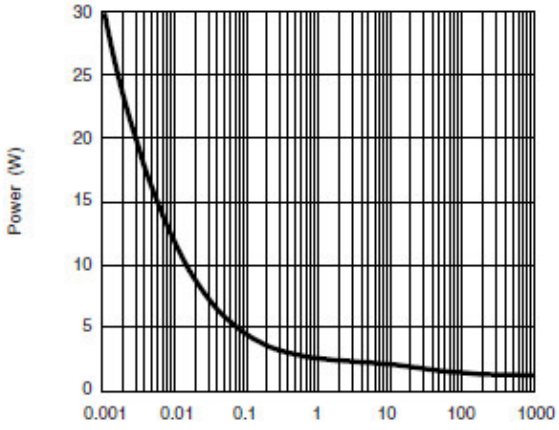

**Source-Drain Diode Forward Voltage**



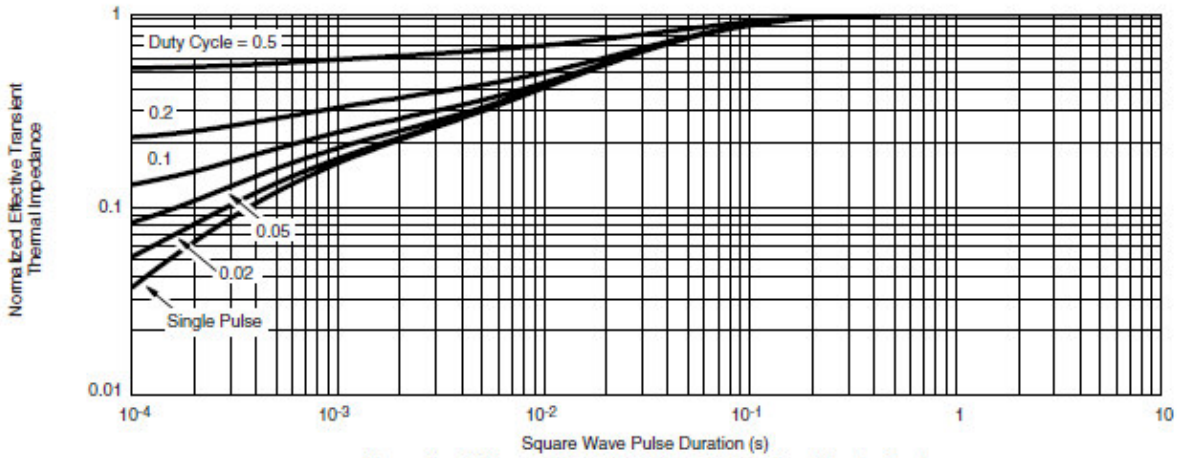

**On-Resistance vs. Gate-to-Source Voltage**




**Threshold Voltage**



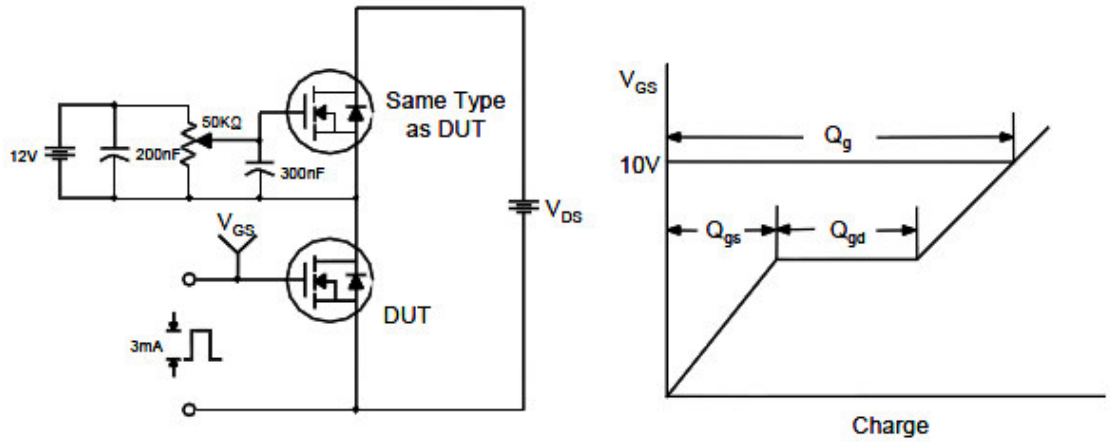

**Single Pulse Power (Junction-to-Ambient)**



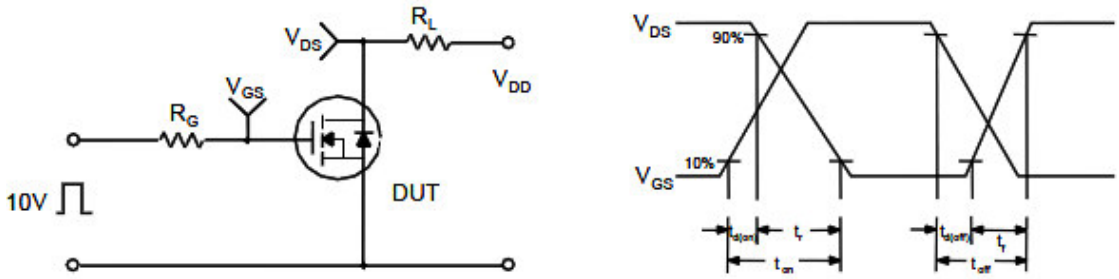

**Normalized Thermal Transient Impedance, Junction-to-Foot**

## Typical Characteristics

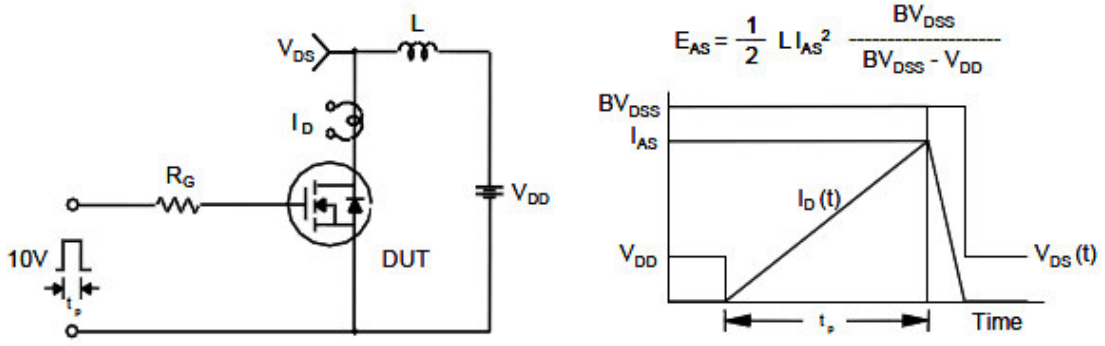
Gate Charge Test Circuit & Waveform



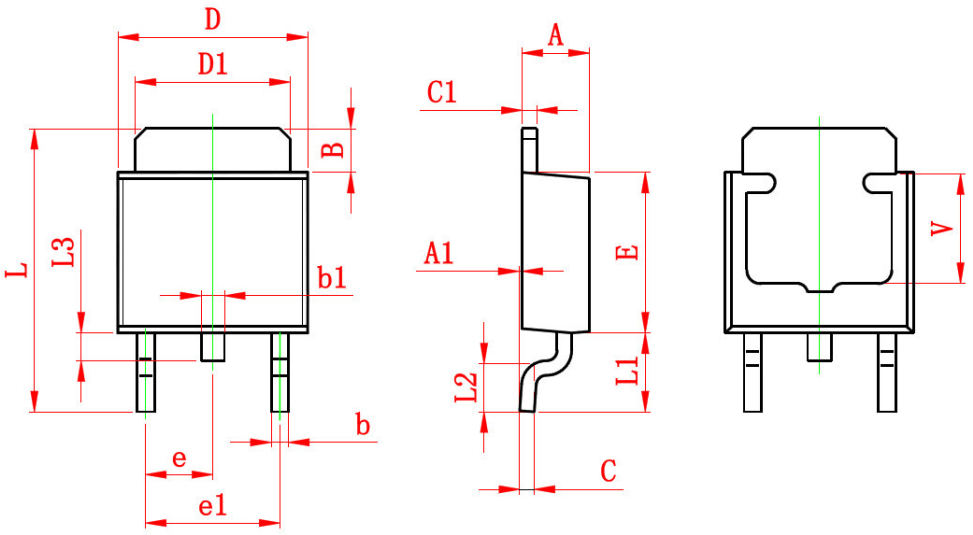

Resistive Switching Test Circuit & Waveforms




Unclamped Inductive Switching Test Circuit & Waveforms



## Package Information ( TO-252-2L )




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 0.000 | 0.127 | 0.000 | 0.005 |
| B | 1.350 | 1.650 | 0.053 | 0.065 |
| b | 0.500 | 0.700 | 0.020 | 0.028 |
| b1 | 0.700 | 0.900 | 0.028 | 0.035 |
| c | 0.430 | 0.580 | 0.017 | 0.023 |
| c1 | 0.430 | 0.580 | 0.017 | 0.023 |
| D | 6.350 | 6.650 | 0.250 | 0.262 |
| D1 | 5.200 | 5.400 | 0.205 | 0.213 |
| E | 5.400 | 5.700 | 0.213 | 0.224 |
| e | 2.300 TYP. | | 0.091 TYP. | |
| e1 | 4.500 | 4.700 | 0.177 | 0.185 |
| L | 9.500 | 9.900 | 0.374 | 0.390 |
| L1 | 2.550 | 2.900 | 0.100 | 0.114 |
| L2 | 1.400 | 1.780 | 0.055 | 0.070 |
| L3 | 0.600 | 0.900 | 0.024 | 0.035 |
| V | 3.800 REF. | | 0.150 REF. | |

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