



## General Description

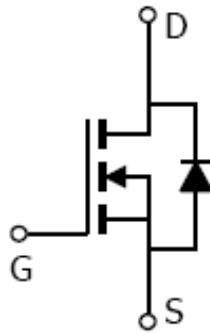
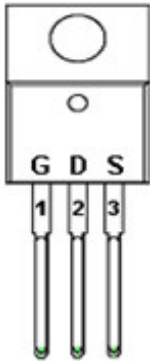
AFN4240S, N-Channel enhancement mode MOSFET, uses Advanced Trench Technology to provide excellent  $R_{DS(ON)}$ , low gate charge.

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

- 40V/30A,  $R_{DS(ON)} = 3.3m\Omega @ V_{GS} = 10V$
- 40V/20A,  $R_{DS(ON)} = 4.3m\Omega @ V_{GS} = 4.5V$
- Super high density cell design for extremely low  $R_{DS(ON)}$
- TO-220-3L package design

## Pin Description ( TO-220-3L )



## Application

- Synchronous Rectifier
- Power Supplies

## Pin Define

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

## Ordering Information

| Part Ordering No. | Part Marking                 | Package   | Unit | Quantity |
|-------------------|------------------------------|-----------|------|----------|
| AFN4240ST220TG    | AFN4240S<br>AAAAAA<br>BBBBBB | TO-220-3L | Tube | 50 EA    |

- ※ A Lot code
- ※ B Date code
- ※ AFN4240ST220TG : Tube ; Pb- Free ; Halogen- Free



## Absolute Maximum Ratings

(T<sub>c</sub>=25°C Unless otherwise noted)

| Parameter                                       | Symbol           | Typical              | Unit |
|---|------------------|----------------------|------|
| Drain-Source Voltage                            | V <sub>DSS</sub> | 60                   | V    |
| Gate –Source Voltage                            | V <sub>GSS</sub> | ±20                  | V    |
| Continuous Drain Current(T <sub>J</sub> =150°C) | I <sub>D</sub>   | T <sub>c</sub> =25°C | 90   |
|   |                  | T <sub>c</sub> =70°C | 80   |
| Pulsed Drain Current                            | I <sub>DM</sub>  | 160                  | A    |
| Continuous Source Current(Diode Conduction)     | I <sub>S</sub>   | 80                   |      |
| Single Pulse Avalanche Current                  | I <sub>AS</sub>  | 40                   |      |
| Power Dissipation                               | P <sub>D</sub>   | T <sub>c</sub> =25°C | 250  |
|   |                  | T <sub>A</sub> =25°C | 3.75 |
| Operating Junction Temperature                  | T <sub>J</sub>   | 150                  | °C   |
| Storage Temperature Range                       | T <sub>STG</sub> | -55/150              | °C   |
| Thermal Resistance-Junction to Ambient          | R <sub>θJA</sub> | 62.5                 | °C/W |

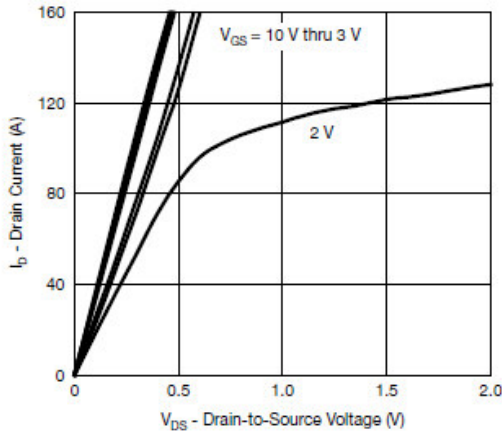
## Electrical Characteristics

(T<sub>A</sub>=25°C Unless otherwise noted)

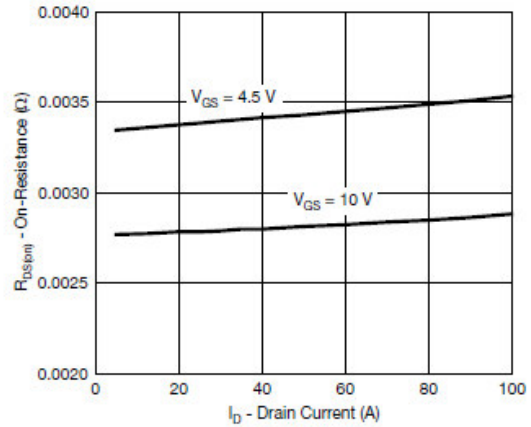
| Parameter                       | Symbol               | Conditions   | Min. | Typ  | Max. | Unit |
|---------------------------------|----------------------|--|------|------|------|------|
| <b>Static</b>                   |                      |  |      |      |      |      |
| Drain-Source Breakdown Voltage  | V <sub>(BR)DSS</sub> | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA   | 40   |      |      | V    |
| Gate Threshold Voltage          | V <sub>GS(th)</sub>  | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA   | 1.0  |      | 2.0  |      |
| Gate Leakage Current            | I <sub>GSS</sub>     | V <sub>DS</sub> =0V, V <sub>GS</sub> =±20V   |      |      | ±100 | nA   |
| Zero Gate Voltage Drain Current | I <sub>DSS</sub>     | V <sub>DS</sub> =32V, V <sub>GS</sub> =0V  |      |      | 1    | uA   |
|                                 |                      | V <sub>DS</sub> =32V, V <sub>GS</sub> =0V<br>T <sub>J</sub> =85°C  |      |      | 10   |      |
| On-State Drain Current          | I <sub>D(on)</sub>   | V <sub>DS</sub> ≥ 10V, V <sub>GS</sub> =10V  | 50   |      |      | A    |
| Drain-Source On-Resistance      | R <sub>DS(on)</sub>  | V <sub>GS</sub> =10V, I <sub>D</sub> =30A  |      | 2.45 | 3.3  | mΩ   |
|                                 |                      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =20A   |      | 3.18 | 4.3  |      |
| Forward Transconductance        | g <sub>FS</sub>      | V <sub>DS</sub> =15V, I <sub>D</sub> =15A  |      | 75   |      | S    |
| Diode Forward Voltage           | V <sub>SD</sub>      | I <sub>S</sub> =10A, V <sub>GS</sub> =0V   |      | 0.85 | 1.3  | V    |
| <b>Dynamic</b>                  |                      |  |      |      |      |      |
| Total Gate Charge               | Q <sub>g</sub>       | V <sub>DS</sub> =20V, V <sub>GS</sub> =10V<br>I <sub>D</sub> = 20A   |      | 60   | 100  | nC   |
| Gate-Source Charge              | Q <sub>gs</sub>      |  |      | 12   |      |      |
| Gate-Drain Charge               | Q <sub>gd</sub>      |  |      | 10   |      |      |
| Input Capacitance               | C <sub>iss</sub>     | V <sub>DS</sub> =20V, V <sub>GS</sub> =0V<br>f=1MHz  |      | 4500 |      | pF   |
| Output Capacitance              | C <sub>oss</sub>     |  |      | 520  |      |      |
| Reverse Transfer Capacitance    | C <sub>rss</sub>     |  |      | 180  |      |      |
| Turn-On Time                    | t <sub>d(on)</sub>   | V <sub>DD</sub> =20V, R <sub>L</sub> =2Ω<br>I <sub>D</sub> ≅10A, V <sub>GEN</sub> =10V<br>R <sub>G</sub> =1Ω |      | 10   | 20   | ns   |
|                                 | t <sub>r</sub>       |  |      | 8    | 18   |      |
| Turn-Off Time                   | t <sub>d(off)</sub>  |  |      | 40   | 75   |      |
|                                 | t <sub>f</sub>       |  |      | 8    | 18   |      |



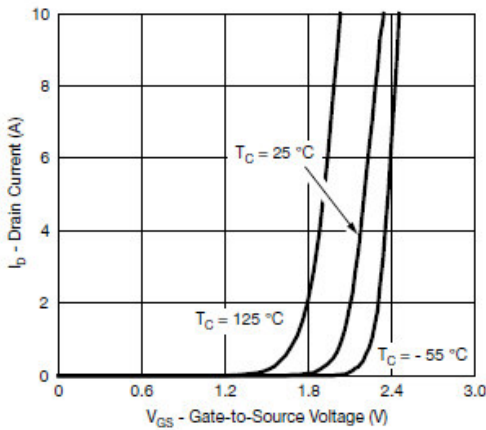
**Typical Characteristics**



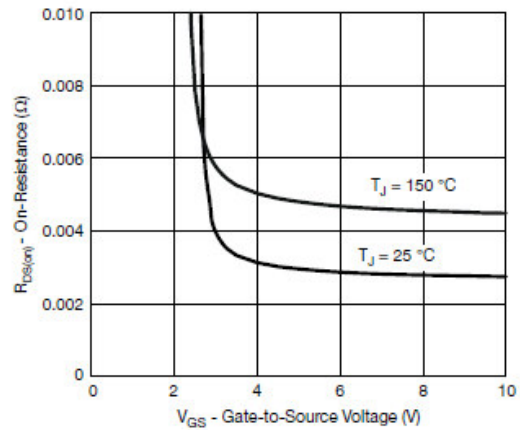
**Output Characteristics**



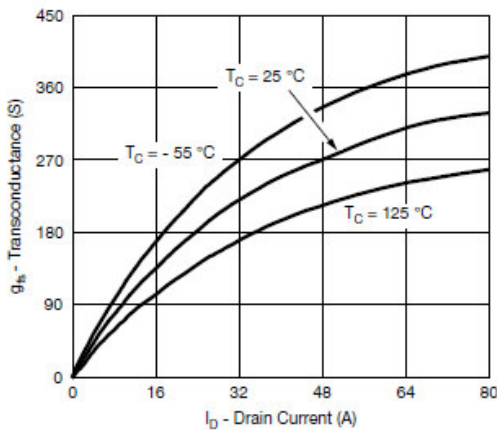
**On-Resistance vs. Drain Current**



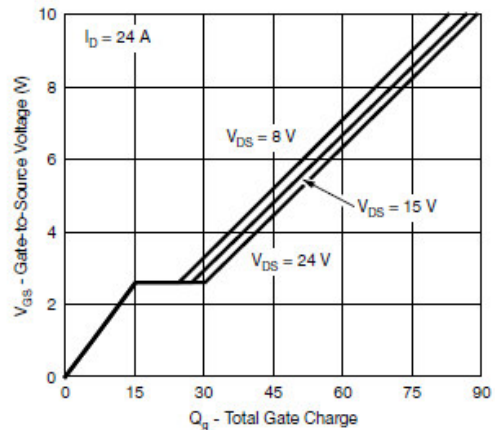
**Transfer Characteristics**



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



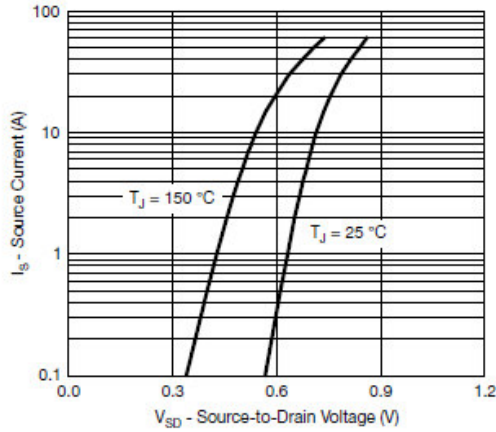
**Transconductance**



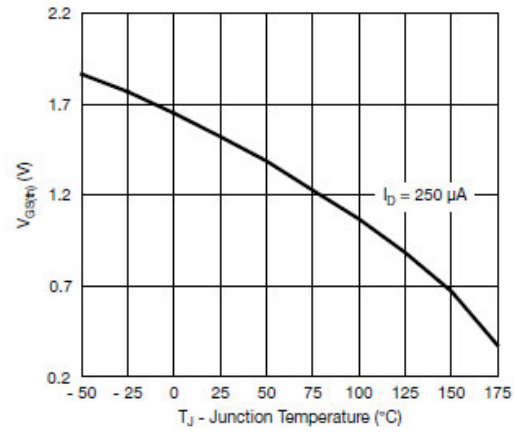
**Gate Charge**



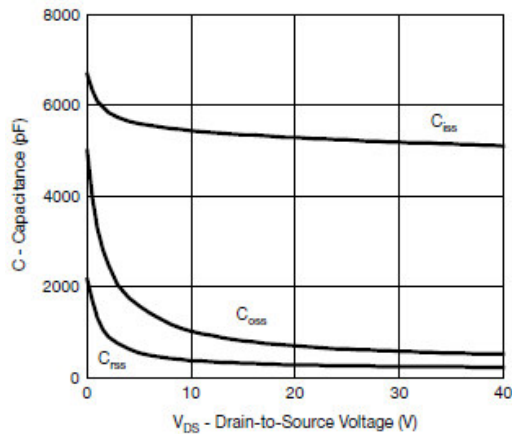
## Typical Characteristics



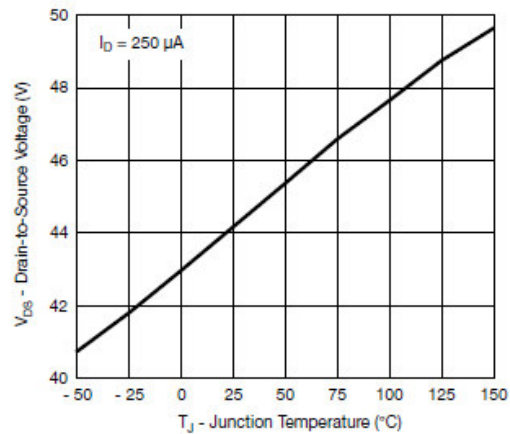
Source-Drain Diode Forward Voltage



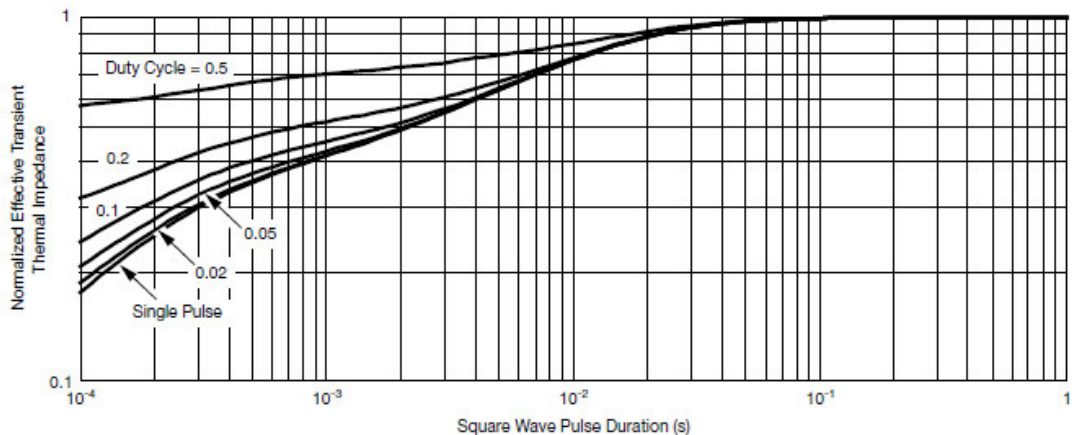
Threshold Voltage



Capacitance



Drain Source Breakdown vs. Junction Temperature



Normalized Thermal Transient Impedance, Junction-to-Case



**Typical Characteristics**

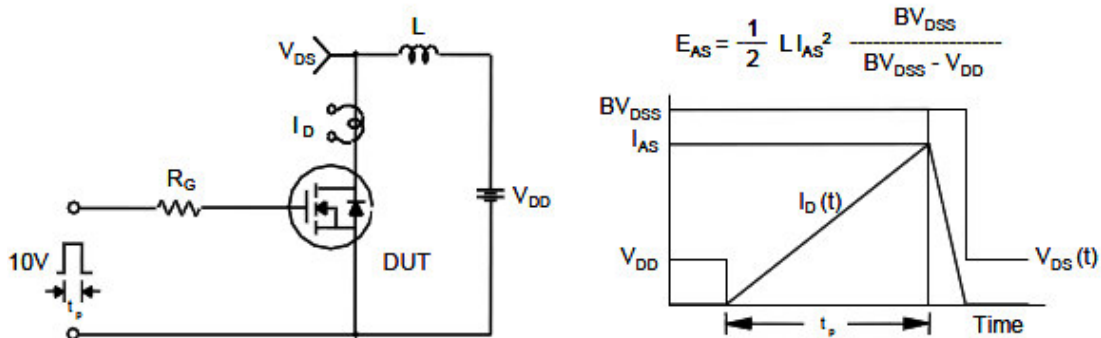
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms

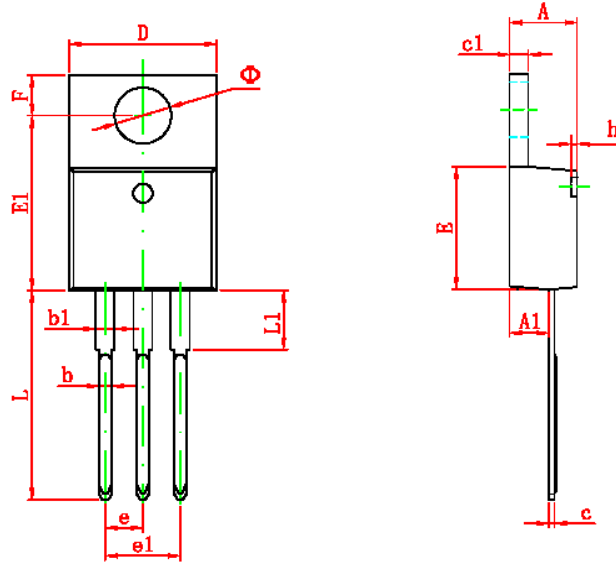


Unclamped Inductive Switching Test Circuit & Waveforms





**Package Information ( TO-220-3L )**



| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min                       | Max    | Min                  | Max   |
| A      | 4.470                     | 4.670  | 0.176                | 0.184 |
| A1     | 2.520                     | 2.820  | 0.099                | 0.111 |
| b      | 0.710                     | 0.910  | 0.028                | 0.036 |
| b1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| c      | 0.310                     | 0.530  | 0.012                | 0.021 |
| c1     | 1.170                     | 1.370  | 0.046                | 0.054 |
| D      | 10.010                    | 10.310 | 0.394                | 0.406 |
| E      | 8.500                     | 8.900  | 0.335                | 0.350 |
| E1     | 12.060                    | 12.460 | 0.475                | 0.491 |
| e      | 2.540 TYP                 |        | 0.100 TYP            |       |
| e1     | 4.980                     | 5.180  | 0.196                | 0.204 |
| F      | 2.590                     | 2.890  | 0.102                | 0.114 |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| L      | 13.400                    | 13.800 | 0.528                | 0.543 |
| L1     | 3.560                     | 3.960  | 0.140                | 0.156 |
| • •    | 3.735                     | 3.935  | 0.147                | 0.155 |

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