

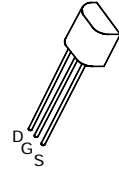
# N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

## ZVN1409A

ISSUE 2 – MARCH 94

### FEATURES

- \* 90 Volt  $V_{DS}$
- \* Low input capacitance
- \* Fast switching



E-Line  
TO92 Compatible

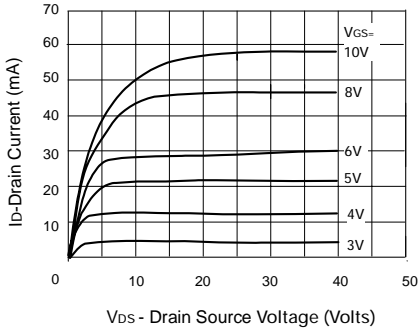
### ABSOLUTE MAXIMUM RATINGS.

| PARAMETER                                       | SYMBOL         | VALUE       | UNIT             |
|---|----------------|-------------|------------------|
| Drain-Source Voltage                            | $V_{DS}$       | 90          | V                |
| Continuous Drain Current                        | $I_D$          | 10          | mA               |
| Pulsed Drain Current                            | $I_{DM}$       | 40          | mA               |
| Gate Source Voltage                             | $V_{GS}$       | $\pm 20$    | V                |
| Power Dissipation at $T_{amb}=25^\circ\text{C}$ | $P_{tot}$      | 625         | mW               |
| Operating and Storage Temperature Range         | $T_j; T_{stg}$ | -55 to +150 | $^\circ\text{C}$ |

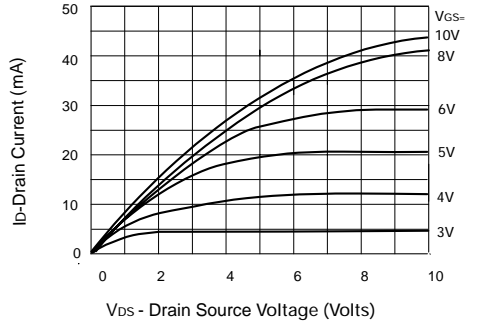
### ELECTRICAL CHARACTERISTICS (at $T_{amb} = 25^\circ\text{C}$ unless otherwise stated).

| PARAMETER                                   | SYMBOL       | MIN. | MAX.         | UNIT                           | CONDITIONS.  |
|---|--------------|------|--------------|--------------------------------|--|
| Drain-Source Breakdown Voltage              | $BV_{DSS}$   | 90   |              | V                              | $I_D=0.1\text{mA}, V_{GS}=0\text{V}$   |
| Gate-Source Breakdown Voltage               | $V_{GS(th)}$ | 0.8  | 2.4          | V                              | $I_D=0.1\text{mA}, V_{DS}=V_{GS}$  |
| Gate Body Leakage                           | $I_{GSS}$    |      | 100          | nA                             | $V_{GS}=\pm 20\text{V}, V_{DS}=0\text{V}$  |
| Zero Gate Voltage Drain Current             | $I_{DSS}$    |      | 1<br>100 (2) | $\mu\text{A}$<br>$\mu\text{A}$ | $V_{DS}=90\text{V}, V_{GS}=0\text{V}$<br>$V_{DS}=72\text{V}, V_{GS}=0\text{V},$<br>$T=125^\circ\text{C}$ |
| On State Drain Current (1)                  | $I_{D(on)}$  | 10   |              | mA                             | $V_{DS}=25\text{V}, V_{GS}=10\text{V}$   |
| Static Drain Source On State Resistance (1) | $R_{DS(on)}$ |      | 250          | $\Omega$                       | $V_{GS}=10\text{V}, I_D=5\text{mA}$  |
| Forward Transconductance (1)(2)             | $g_{fs}$     | 2    |              | mS                             | $V_{DS}=25\text{V}, I_D=10\text{mA}$   |
| Input Capacitance (2)                       | $C_{iss}$    |      | 6.5          | pF                             | $V_{DS}=25\text{V}, V_{GS}=0\text{V}$<br>$f=1\text{MHz}$   |
| Common Source Output Capacitance (2)        | $C_{oss}$    |      | 3            | pF                             |  |
| Reverse Transfer Capacitance (2)            | $C_{rss}$    |      | 0.65         | pF                             |  |
| Turn-On Delay Time (2)(3)(4)                | $t_{d(on)}$  |      | 0.3          | ns                             | $V_{DD}\approx 25\text{V}, I_D=5\text{mA}$   |
| Rise Time (2)(3)(4)                         | $t_r$        |      | 0.5          | ns                             |  |
| Turn-Off Delay Time (2)(3)(4)               | $t_{d(off)}$ |      | 0.35         | ns                             |  |
| Fall Time (2)(3)(4)                         | $t_f$        |      | 0.5          | ns                             |  |

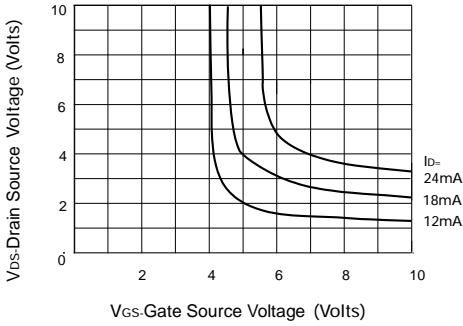
## TYPICAL CHARACTERISTICS



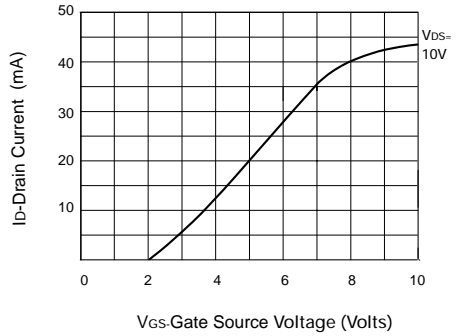
**Output Characteristics**



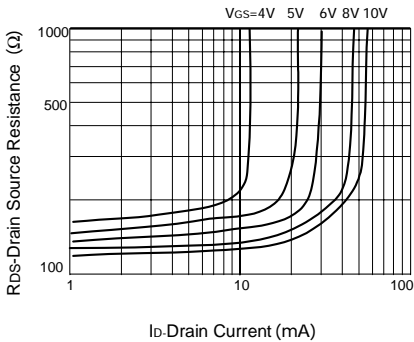
**Saturation Characteristics**



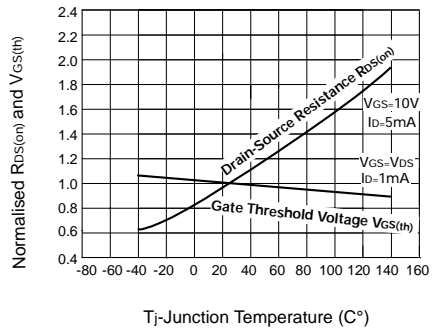
**Voltage Saturation Characteristics**



**Transfer Characteristics**



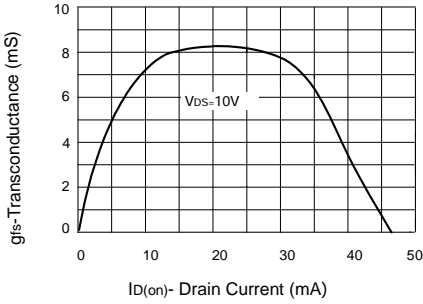
**On-resistance v drain current**



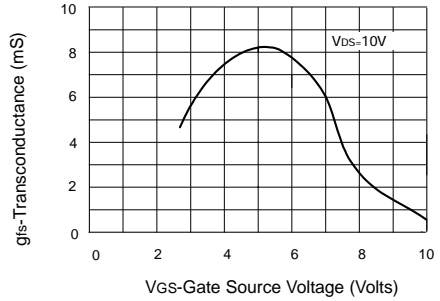
**Normalised  $R_{DS(on)}$  and  $V_{GS(th)}$  vs Temperature**

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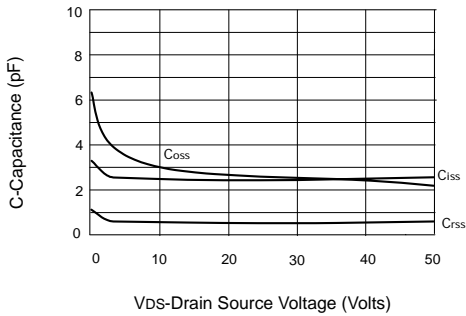
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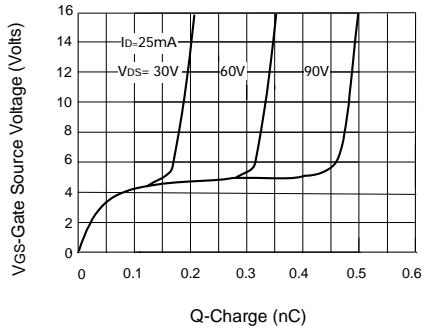
**Transconductance v drain current**



**Transconductance v gate-source voltage**



**Capacitance v drain-source voltage**



**Gate charge v gate-source voltage**