N-CHANNEL ENHANCEMENT MODE VERTICAL DMOS FET

ISSUE 3 - APRIL 1998

FEATURES
* 60 Volt $V_{DS}$
* $R_{DS(on)}=1\Omega$
* Repetitive avalanche rating
* No transient protection required
* Characterised for 5V logic drive

APPLICATIONS
* Automotive relay drivers
* Stepper motor driver

ABSOLUTE MAXIMUM RATINGS.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>VALUE</th>
<th>UNIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Voltage</td>
<td>$V_{DS}$</td>
<td>60</td>
<td>V</td>
</tr>
<tr>
<td>Continuous Drain Current at $T_{amb}=25^\circ C$</td>
<td>$I_D$</td>
<td>600</td>
<td>mA</td>
</tr>
<tr>
<td>Pulsed Drain Current</td>
<td>$I_{DM}$</td>
<td>8</td>
<td>A</td>
</tr>
<tr>
<td>Gate-Source Voltage</td>
<td>$V_{GS}$</td>
<td>±20</td>
<td>V</td>
</tr>
<tr>
<td>Power Dissipation at $T_{amb}=25^\circ C$</td>
<td>$P_{tot}$</td>
<td>700</td>
<td>mW</td>
</tr>
<tr>
<td>Continuous Body Diode Current at $T_{amb}=25^\circ C$</td>
<td>$I_{SD}$</td>
<td>600</td>
<td>mA</td>
</tr>
<tr>
<td>Avalanche Current – Repetitive</td>
<td>$I_{AR}$</td>
<td>600</td>
<td>mA</td>
</tr>
<tr>
<td>Avalanche Energy – Repetitive</td>
<td>$E_{AR}$</td>
<td>15</td>
<td>mJ</td>
</tr>
<tr>
<td>Operating and Storage Temperature Range</td>
<td>$T_J$ ; $T_{stg}$</td>
<td>-55 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SYMBOL</th>
<th>MIN.</th>
<th>MAX.</th>
<th>UNIT</th>
<th>CONDITIONS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain-Source Breakdown Voltage</td>
<td>$BVDSS$</td>
<td>60</td>
<td>V</td>
<td></td>
<td>$I_D=1mA, V_{GS}=0V$</td>
</tr>
<tr>
<td>Gate-Source Threshold Voltage</td>
<td>$V_{GSS(th)}$</td>
<td>1.3</td>
<td>3</td>
<td>V</td>
<td>$I_D=1mA, V_{DS}=V_{GS}$</td>
</tr>
<tr>
<td>Gate-Body Leakage</td>
<td>$I_{GSS}$</td>
<td>100</td>
<td>nA</td>
<td></td>
<td>$V_{GS}=\pm20V, V_{DS}=0V$</td>
</tr>
<tr>
<td>Zero Gate Voltage Drain Current</td>
<td>$I_{DSS}$</td>
<td>10</td>
<td>100</td>
<td>μA</td>
<td>$V_{DS}=60V, V_{GS}=0$</td>
</tr>
<tr>
<td>On-State Drain Current</td>
<td>$I_{D(on)}$</td>
<td>3</td>
<td>A</td>
<td></td>
<td>$V_{DS}=25V, V_{GS}=10V$</td>
</tr>
<tr>
<td>Static Drain-Source On-State Resistance (1)</td>
<td>$R_{DS(on)}$</td>
<td>1.5</td>
<td>μΩ</td>
<td>μΩ</td>
<td>$V_{GS}=10V, I_D=1.5A$</td>
</tr>
<tr>
<td>Forward Transconductance (1)(2)</td>
<td>$g_{fs}$</td>
<td>300</td>
<td>mS</td>
<td></td>
<td>$V_{DS}=25V, I_D=1.5A$</td>
</tr>
<tr>
<td>Input Capacitance (2)</td>
<td>$C_{iss}$</td>
<td>100</td>
<td>pF</td>
<td></td>
<td>$V_{DS}=25V, V_{GS}=0V, f=1MHz$</td>
</tr>
<tr>
<td>Common Source Output Capacitance (2)</td>
<td>$C_{oss}$</td>
<td>60</td>
<td>pF</td>
<td></td>
<td>$V_{DS}=25V, V_{GS}=0V, f=1MHz$</td>
</tr>
<tr>
<td>Reverse Transfer Capacitance (2)</td>
<td>$C_{rss}$</td>
<td>20</td>
<td>pF</td>
<td></td>
<td>$V_{DS}=25V, I_D=1.5A$</td>
</tr>
<tr>
<td>Turn-On Delay Time (2)(3)</td>
<td>$t_{d(on)}$</td>
<td>8</td>
<td>ns</td>
<td></td>
<td>$V_{DD}=25V, I_D=1.5A, V_{GEN}=10V$</td>
</tr>
<tr>
<td>Rise Time (2)(3)</td>
<td>$t_r$</td>
<td>12</td>
<td>ns</td>
<td></td>
<td>$V_{DD}=25V, I_D=1.5A, V_{GEN}=10V$</td>
</tr>
<tr>
<td>Turn-Off Delay Time (2)(3)</td>
<td>$t_{d(off)}$</td>
<td>12</td>
<td>ns</td>
<td></td>
<td>$V_{DD}=25V, I_D=1.5A, V_{GEN}=10V$</td>
</tr>
<tr>
<td>Fall Time (2)(3)</td>
<td>$t_f$</td>
<td>15</td>
<td>ns</td>
<td></td>
<td>$V_{DD}=25V, I_D=1.5A, V_{GEN}=10V$</td>
</tr>
</tbody>
</table>

(1) Measured under pulsed conditions. Width=300μs. Duty cycle ≤2%
(2) Sample test.
(3) Switching times measured with 50Ω source impedance and <5ns rise time on a pulse generator
TYPICAL CHARACTERISTICS

Output Characteristics

Saturation Characteristics

Voltage Saturation Characteristics

Transfer Characteristics

On-resistance v drain current

Normalised $R_{DS(on)}$ and $V_{GS(th)}$ v Temperature
**ZVN4206AV**

**TYPICAL CHARACTERISTICS**

- **Transconductance v drain current**
  - $g_{m}$ vs. drain current (Amps)
  - $V_{DS} = 10V$
  - $V_{GS} = 20V$
  - $I_{D} = 1.5A$

- **Transconductance v gate-source voltage**
  - $g_{m}$ vs. gate-source voltage (Volts)
  - $V_{DS} = 10V$
  - $V_{GS} = 20V$
  - $I_{D} = 1.5A$

- **Capacitance v drain-source voltage**
  - $C_{ss}, C_{os}, C_{rs}$ vs. drain-source voltage (Volts)
  - $V_{DS} = 10V$
  - $V_{GS} = 20V$

- **Gate charge v gate-source voltage**
  - $Q_{CHARGE}$ vs. gate-source voltage (Volts)
  - $V_{DS} = 10V$
  - $V_{GS} = 20V$

- **Maximum repetitive avalanche energy v Junction Temperature**
  - $E_{AR}$ vs. $T_{J}$ (°C)
  - $L = 72mH, V_{CC} = 12V$

- **Maximum repetitive avalanche current v Junction Temperature**
  - $I_{AR}$ vs. $T_{J}$ (°C)
  - $L = 72mH, V_{CC} = 12V$