

## Description

The VSM95N08 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. This device is suitable for use in PWM, load switching and general purpose applications.

## Application

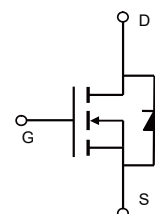
- Power switching application
- Hard switched and High frequency circuits
- Uninterruptible power supply

## General Features

- $V_{DS} = 82V, I_D = 95A$   
 $R_{DS(ON)} < 7.0 m\Omega @ V_{GS} = 10V$  (Typ: 6mΩ)
- High density cell design for ultra low  $R_{DS(on)}$
- Fully characterized avalanche voltage and current
- Special designed for convertors and power controls
- 150 °C operating temperature
- Pb-free lead plating



DFN5x6



Schematic

## Package Marking and Ordering Information

| Device Marking | Device       | Device Package | Reel Size | Tape width | Quantity |
|----------------|--------------|----------------|-----------|------------|----------|
| VSM95N08       | VSM95N08-D56 | DFN5x6         | -         | -          | -        |

## Absolute Maximum Ratings ( $T_A = 25^\circ C$ unless otherwise noted)

| Parameter                                         | Symbol             | Limit      | Unit          |
|---------------------------------------------------|--------------------|------------|---------------|
| Drain-Source Voltage                              | $V_{DS}$           | 82         | V             |
| Gate-Source Voltage                               | $V_{GS}$           | $\pm 20$   | V             |
| Drain Current-Continuous                          | $I_D$              | 95         | A             |
| Drain Current-Continuous( $T_C = 100^\circ C$ )   | $I_D(100^\circ C)$ | 67         | A             |
| Pulsed Drain Current                              | $I_{DM}$           | 320        | A             |
| Maximum Power Dissipation                         | $P_D$              | 140        | W             |
| Derating factor                                   |                    | 1.12       | W/ $^\circ C$ |
| Single pulse avalanche energy <sup>(Note 5)</sup> | $E_{AS}$           | 480        | mJ            |
| Operating Junction and Storage Temperature Range  | $T_J, T_{STG}$     | -55 To 150 | $^\circ C$    |

## Thermal Characteristic

|                                                          |                 |      |              |
|----------------------------------------------------------|-----------------|------|--------------|
| Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup> | $R_{\theta JC}$ | 0.89 | $^\circ C/W$ |
|----------------------------------------------------------|-----------------|------|--------------|

**Electrical Characteristics ( $T_A=25^{\circ}\text{C}$  unless otherwise noted)**

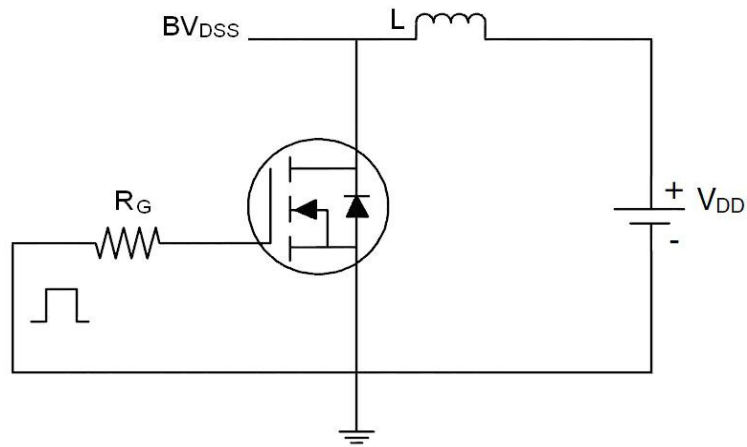
| Parameter                          | Symbol       | Condition                                                 | Min | Typ   | Max       | Unit       |
|------------------------------------|--------------|-----------------------------------------------------------|-----|-------|-----------|------------|
| Off Characteristics                |              |                                                           |     |       |           |            |
| Drain-Source Breakdown Voltage     | $BV_{DSS}$   | $V_{GS}=0V, I_D=250\mu A$                                 | 82  | -     | -         | V          |
| Zero Gate Voltage Drain Current    | $I_{DSS}$    | $V_{DS}=82V, V_{GS}=0V$                                   | -   | -     | 1         | $\mu A$    |
| Gate-Body Leakage Current          | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                               | -   | -     | $\pm 100$ | nA         |
| On Characteristics (Note 3)        |              |                                                           |     |       |           |            |
| Gate Threshold Voltage             | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                             | 2   | 2.9   | 4         | V          |
| Drain-Source On-State Resistance   | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=20A$                                     | -   | 6     | 7.0       | m $\Omega$ |
| Forward Transconductance           | $g_{FS}$     | $V_{DS}=5V, I_D=20A$                                      | -   | 50    | -         | S          |
| Dynamic Characteristics (Note4)    |              |                                                           |     |       |           |            |
| Input Capacitance                  | $C_{iss}$    | $V_{DS}=40V, V_{GS}=0V,$<br>$F=1.0MHz$                    | -   | 5633  | -         | PF         |
| Output Capacitance                 | $C_{oss}$    |                                                           | -   | 268   | -         | PF         |
| Reverse Transfer Capacitance       | $C_{rss}$    |                                                           | -   | 226   | -         | PF         |
| Switching Characteristics (Note 4) |              |                                                           |     |       |           |            |
| Turn-on Delay Time                 | $t_{d(on)}$  | $V_{DD}=40V, R_L=15\Omega$<br>$R_G=2.5\Omega, V_{GS}=10V$ | -   | 18    | -         | nS         |
| Turn-on Rise Time                  | $t_r$        |                                                           | -   | 12    | -         | nS         |
| Turn-Off Delay Time                | $t_{d(off)}$ |                                                           | -   | 56    | -         | nS         |
| Turn-Off Fall Time                 | $t_f$        |                                                           | -   | 15    | -         | nS         |
| Total Gate Charge                  | $Q_g$        | $V_{DS}=40V, I_D=50A,$<br>$V_{GS}=10V$                    | -   | 109.3 | -         | nC         |
| Gate-Source Charge                 | $Q_{gs}$     |                                                           | -   | 35.1  | -         | nC         |
| Gate-Drain Charge                  | $Q_{gd}$     |                                                           | -   | 25.8  | -         | nC         |
| Drain-Source Diode Characteristics |              |                                                           |     |       |           |            |
| Diode Forward Voltage (Note 3)     | $V_{SD}$     | $V_{GS}=0V, I_S=95A$                                      | -   | -     | 1.2       | V          |
| Diode Forward Current (Note 2)     | $I_S$        |                                                           | -   | -     | 95        | A          |
| Reverse Recovery Time              | $t_{rr}$     | $T_j=25^{\circ}C, I_F=95A$<br>$di/dt=100A/\mu s$ (Note3)  | -   |       | 37        | nS         |
| Reverse Recovery Charge            | $Q_{rr}$     |                                                           | -   |       | 58        | nC         |

**Notes:**

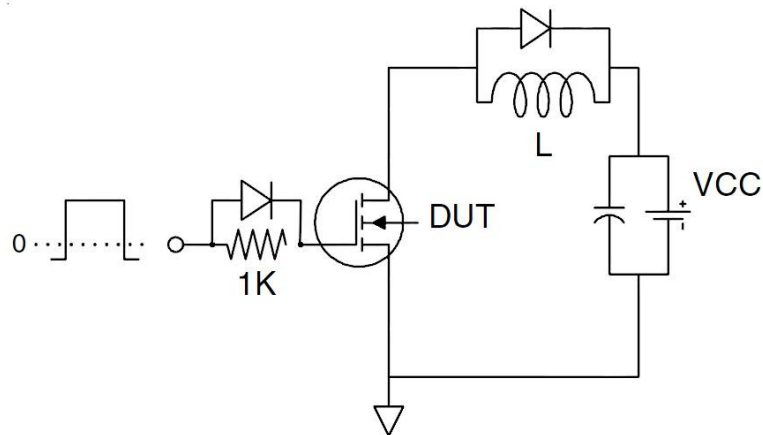
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production
5. EAS condition:  $T_J=25^{\circ}\text{C}, V_{DD}=40V, V_G=10V, L=0.5mH, R_G=25\Omega$

## Test Circuit

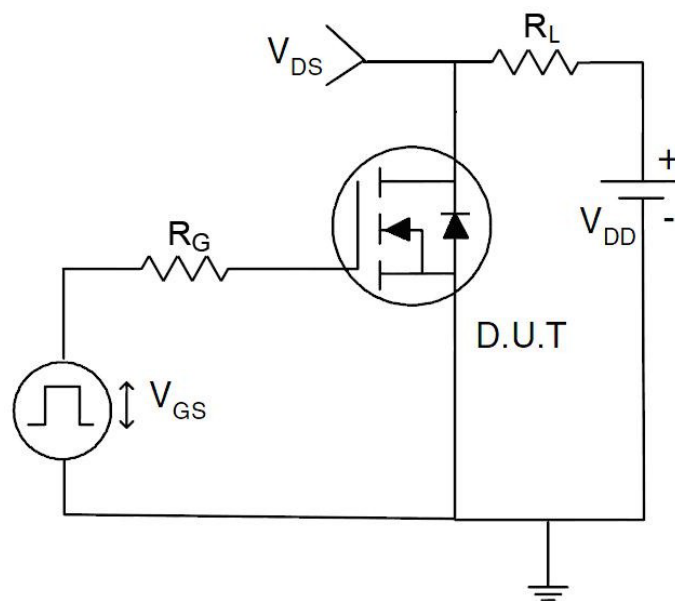
### 1) $E_{AS}$ Test Circuits



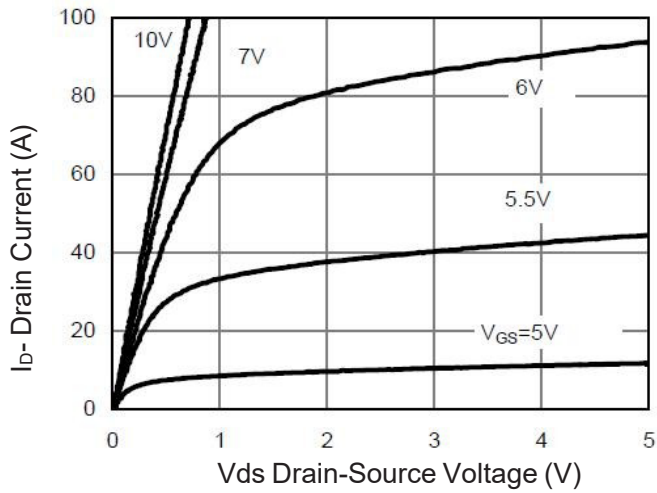
### 2) Gate Charge Test Circuit



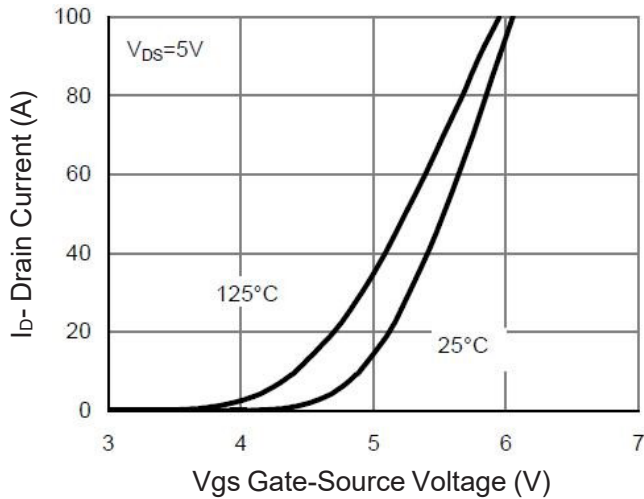
### 3) Switch Time Test Circuit



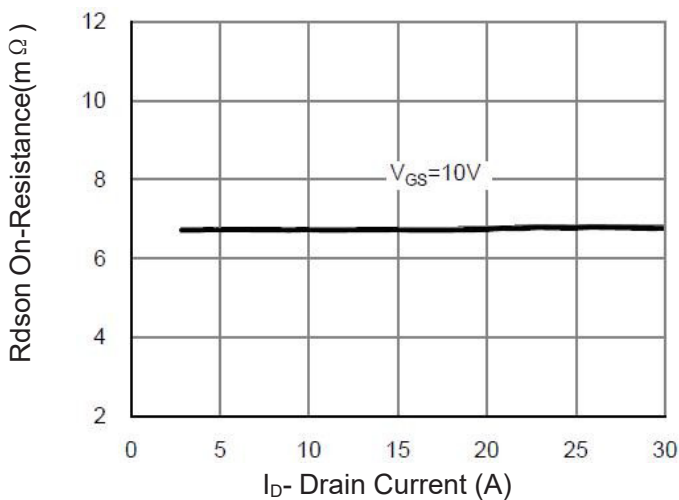
## Typical Electrical and Thermal Characteristics (Curves)



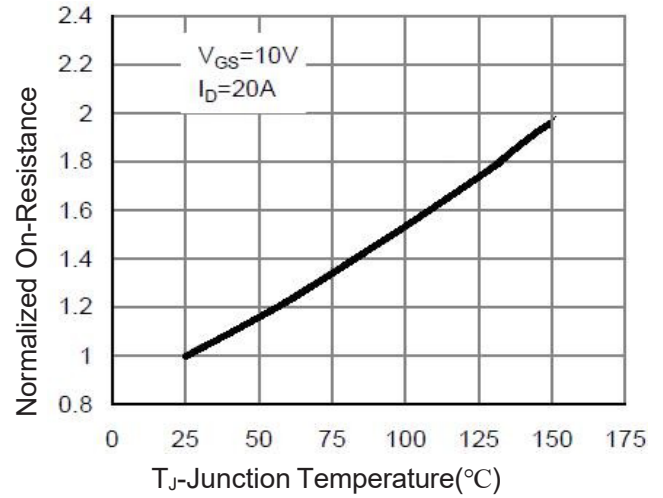
**Figure 1 Output Characteristics**



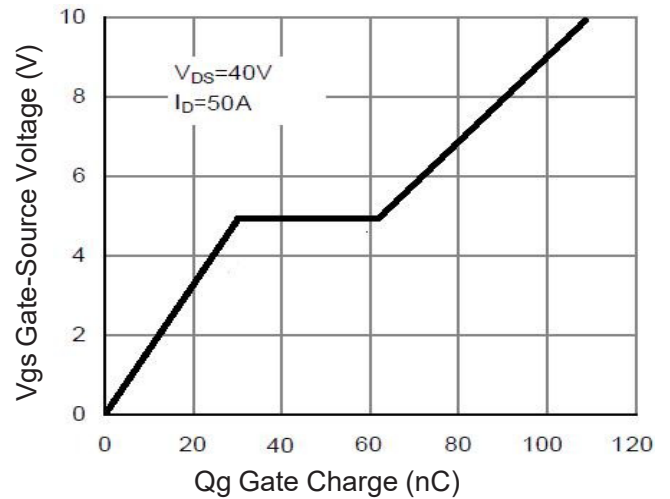
**Figure 2 Transfer Characteristics**



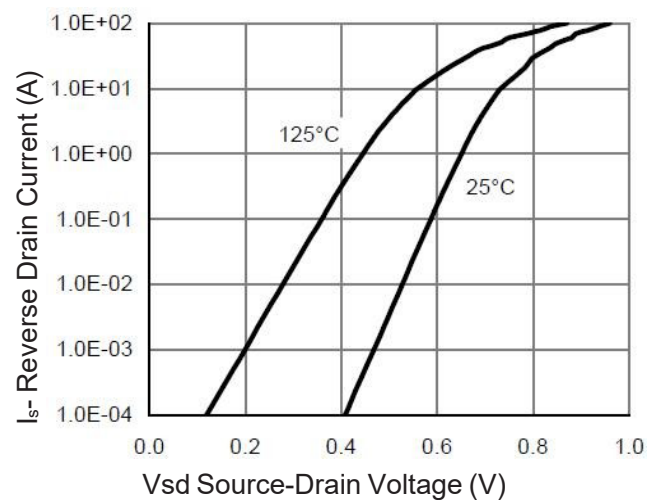
**Figure 3  $R_{DS(on)}$ - Drain Current**



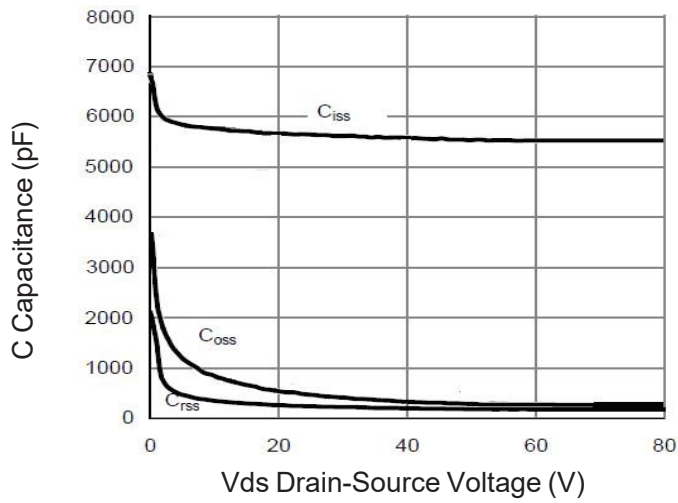
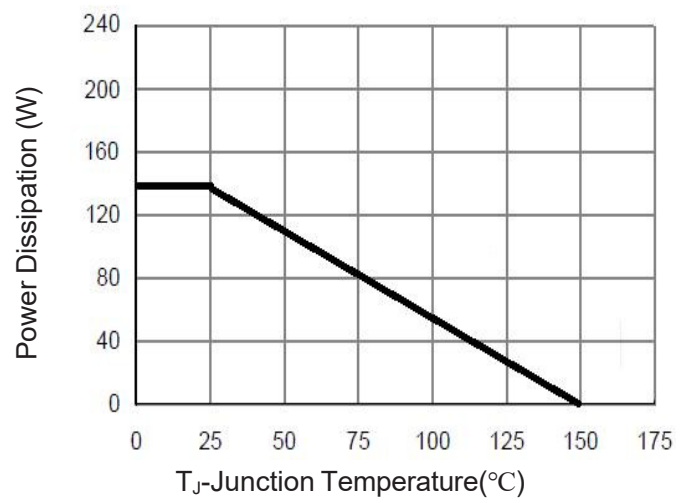
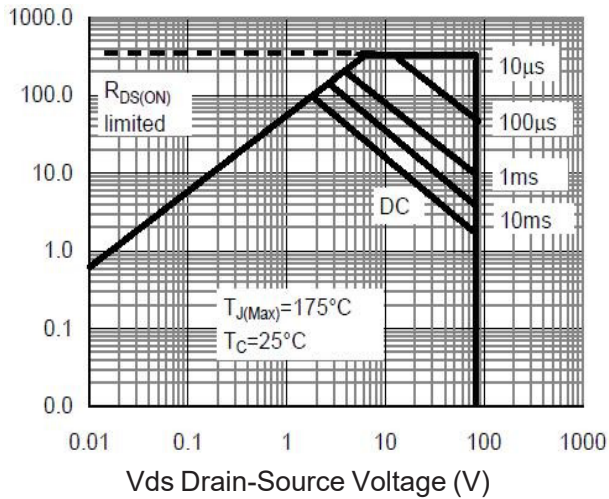
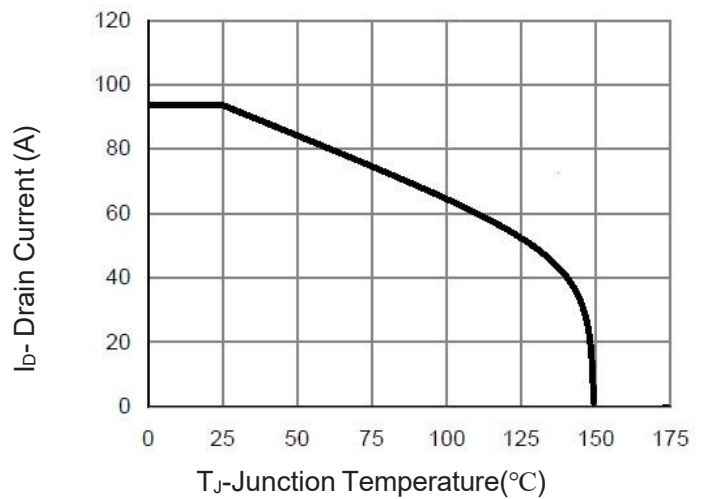
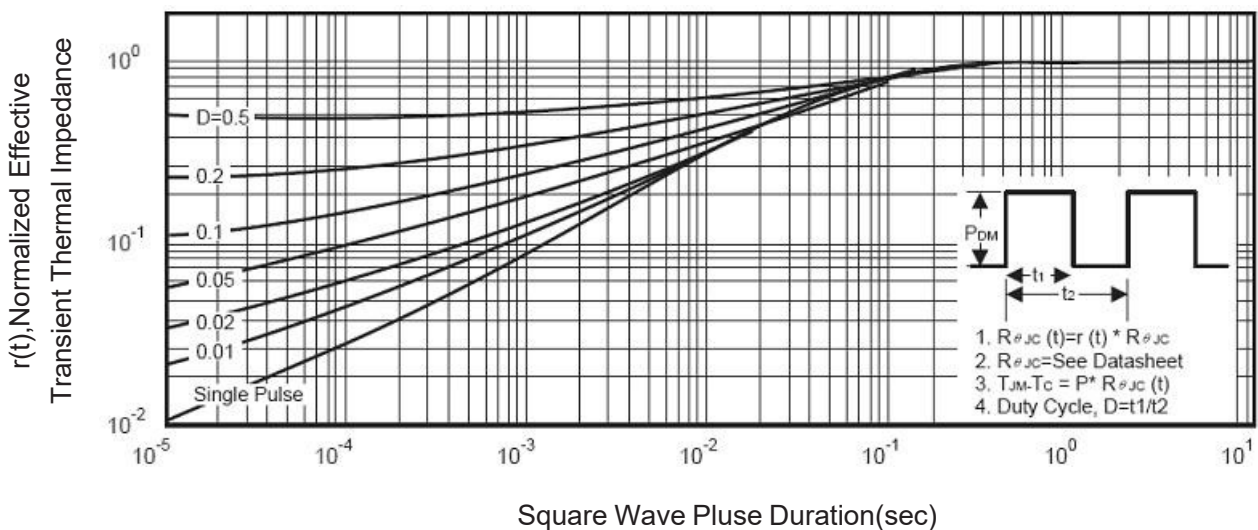
**Figure 4  $R_{DS(on)}$ -Junction Temperature**



**Figure 5 Gate Charge**



**Figure 6 Source- Drain Diode Forward**


**Figure 7 Capacitance vs Vds**

**Figure 9 Power De-rating**

**Figure 8 Safe Operation Area**

**Figure 10 Id Current De-rating**

**Figure 11 Normalized Maximum Transient Thermal Impedance**