

## Description

The VSM75N06 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

## General Features

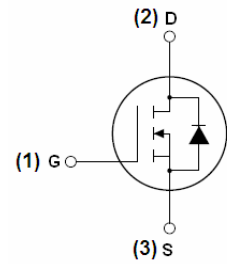
- $V_{DS}=60V, I_D=75A$   
 $R_{DS(ON)} < 11.5m\Omega @ V_{GS}=10V$  (Typ:9.1m $\Omega$ )
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high  $E_{AS}$
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

## Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible Power Supply



TO-252



Schematic Diagram

## Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM75N06-T2	VSM75N06	TO-252	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	$V_{DS}$	60	V
Gate-Source Voltage	$V_{GS}$	$\pm 20$	V
Drain Current-Continuous	$I_D$	75	A
Drain Current-Continuous( $T_C=100^{\circ}C$ )	$I_D(100^{\circ}C)$	50	A
Pulsed Drain Current	$I_{DM}$	300	A
Maximum Power Dissipation	$P_D$	110	W
Derating factor		0.73	W/ $^{\circ}C$
Single pulse avalanche energy <sup>(Note 5)</sup>	$E_{AS}$	450	mJ
Operating Junction and Storage Temperature Range	$T_J, T_{STG}$	-55 To 175	$^{\circ}C$

## Thermal Characteristic

Thermal Resistance, Junction-to-Case <sup>(Note 2)</sup>	$R_{\theta JC}$	1.36	$^{\circ}C/W$
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**Electrical Characteristics (T<sub>C</sub>=25°C unless otherwise noted)**

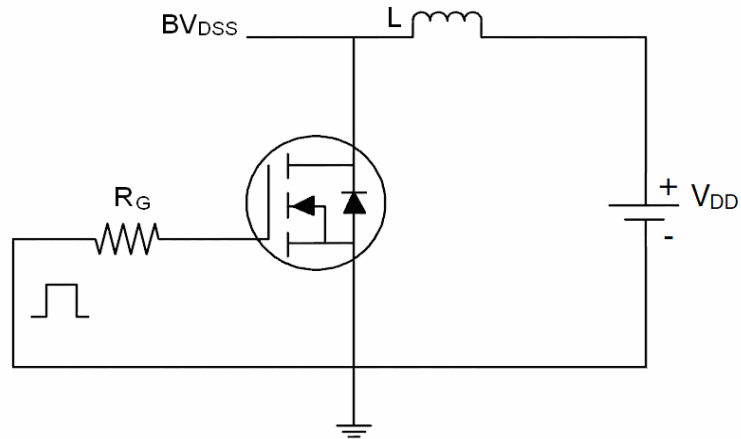
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV <sub>DSS</sub>	V <sub>GS</sub> =0V I <sub>D</sub> =250μA	60	68	-	V
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V	-	-	1	μA
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	-	-	±100	nA
On Characteristics <sup>(Note 3)</sup>						
Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2	3	4	V
Drain-Source On-State Resistance	R <sub>DS(ON)</sub>	V <sub>GS</sub> =10V, I <sub>D</sub> =30A	-	9.1	11.5	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> =25V, I <sub>D</sub> =30A	20	-	-	S
Dynamic Characteristics <sup>(Note4)</sup>						
Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> =25V, V <sub>GS</sub> =0V, F=1.0MHz	-	2350	-	PF
Output Capacitance	C <sub>Oss</sub>		-	237	-	PF
Reverse Transfer Capacitance	C <sub>rss</sub>		-	205	-	PF
Switching Characteristics <sup>(Note 4)</sup>						
Turn-on Delay Time	t <sub>d(on)</sub>	V <sub>DD</sub> =30V, I <sub>D</sub> =2A, R <sub>L</sub> =15Ω V <sub>GS</sub> =10V, R <sub>G</sub> =2.5Ω	-	16	-	nS
Turn-on Rise Time	t <sub>r</sub>		-	10	-	nS
Turn-Off Delay Time	t <sub>d(off)</sub>		-	45	-	nS
Turn-Off Fall Time	t <sub>f</sub>		-	12	-	nS
Total Gate Charge	Q <sub>g</sub>	V <sub>DS</sub> =30V, I <sub>D</sub> =30A, V <sub>GS</sub> =10V	-	50	-	nC
Gate-Source Charge	Q <sub>gs</sub>		-	12	-	nC
Gate-Drain Charge	Q <sub>gd</sub>		-	16	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage <sup>(Note 3)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =30A	-	-	1.2	V
Diode Forward Current <sup>(Note 2)</sup>	I <sub>S</sub>		-	-	75	A
Reverse Recovery Time	t <sub>rr</sub>	TJ = 25°C, IF =75A	-	28		nS
Reverse Recovery Charge	Q <sub>rr</sub>	di/dt = 100A/μs <sup>(Note3)</sup>	-	49		nC
Forward Turn-On Time	t <sub>on</sub>	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

**Notes:**

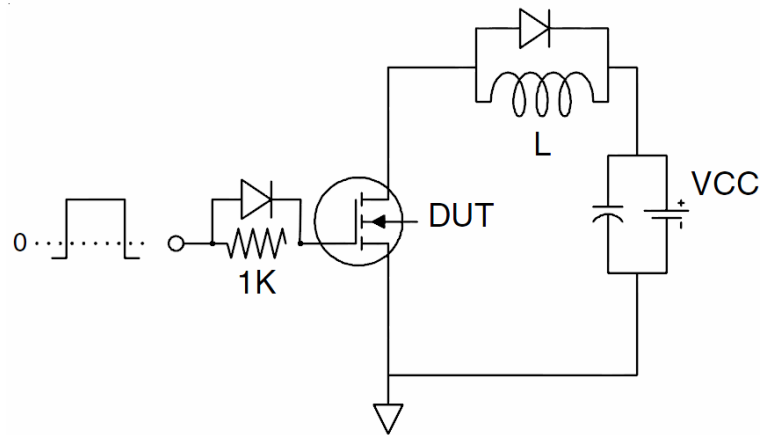
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E<sub>AS</sub> condition : T<sub>J</sub>=25°C, V<sub>DD</sub>=30V, V<sub>G</sub>=10V, L=0.5mH, R<sub>g</sub>=25Ω

## Test Circuit

### 1) $E_{AS}$ test Circuit



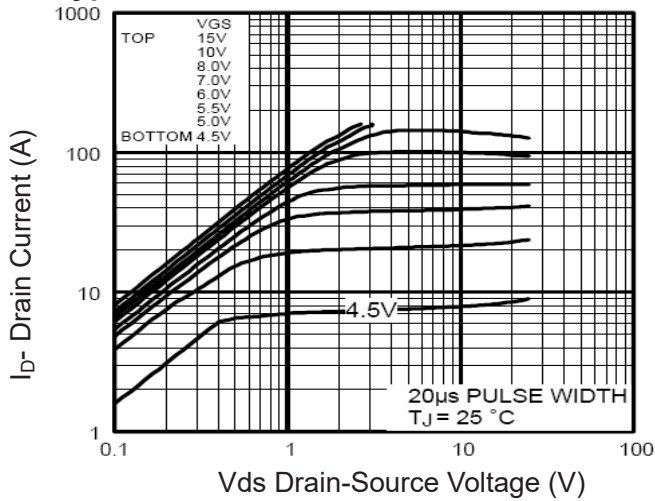
### 2) Gate charge test Circuit



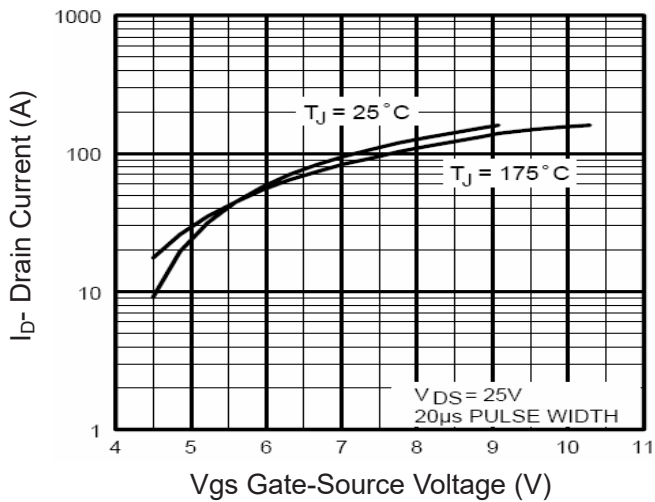
### 3) Switch Time Test Circuit



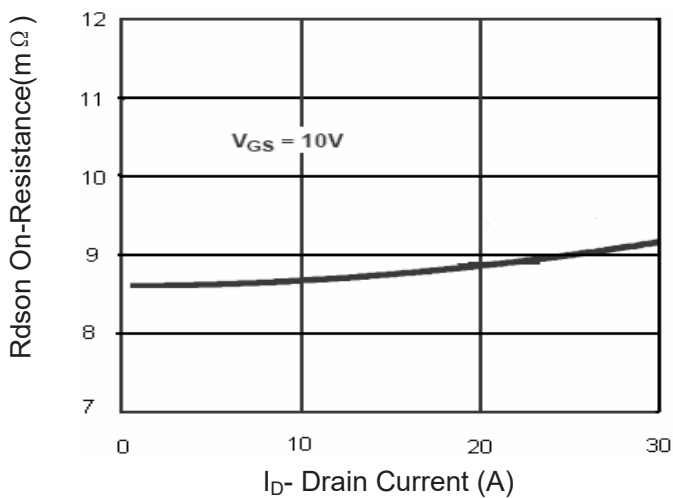
## Typical Electrical and Thermal Characteristics (Curves)



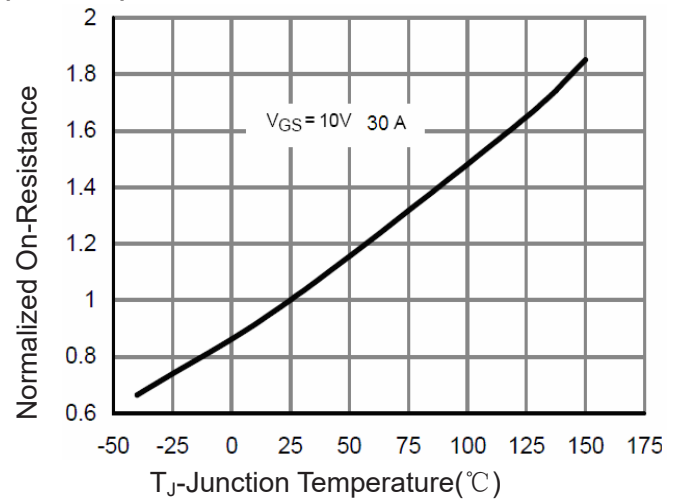
**Figure 1 Output Characteristics**



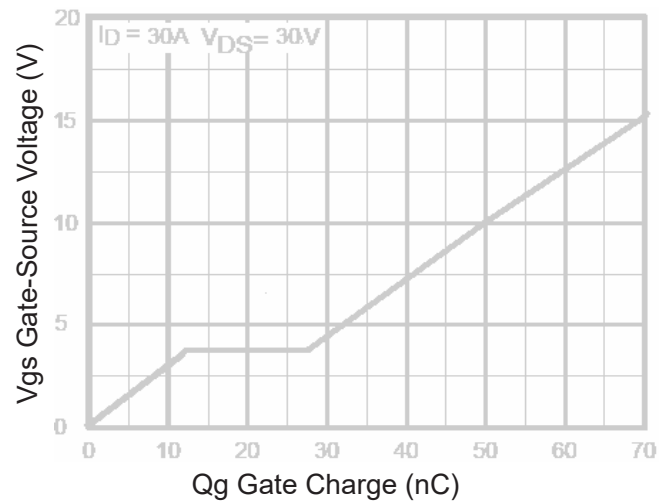
**Figure 2 Transfer Characteristics**



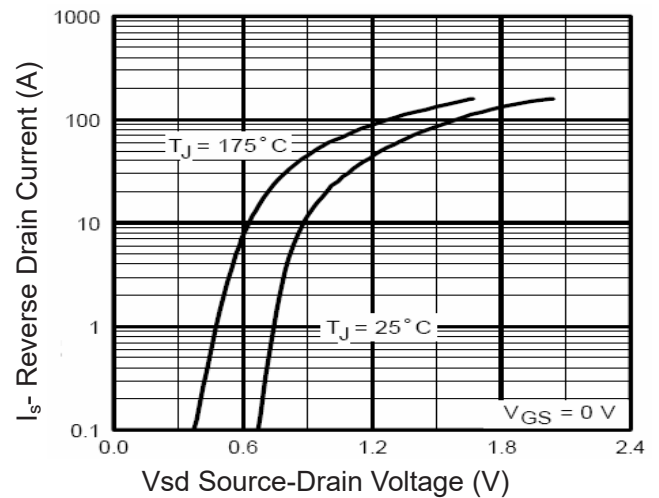
**Figure 3  $R_{DS(on)}$ - Drain Current**



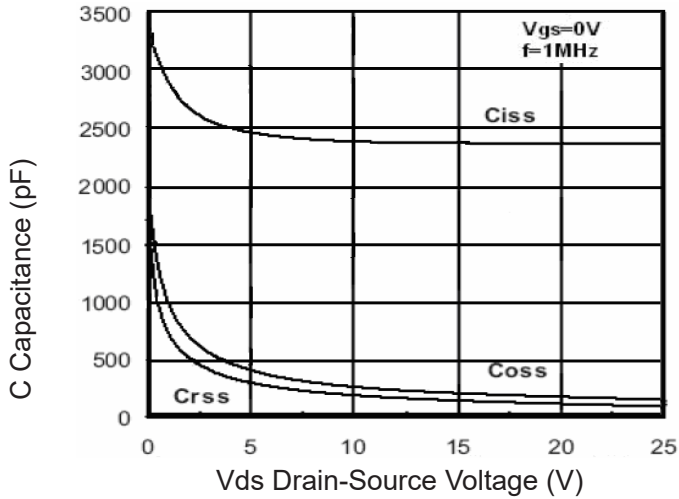
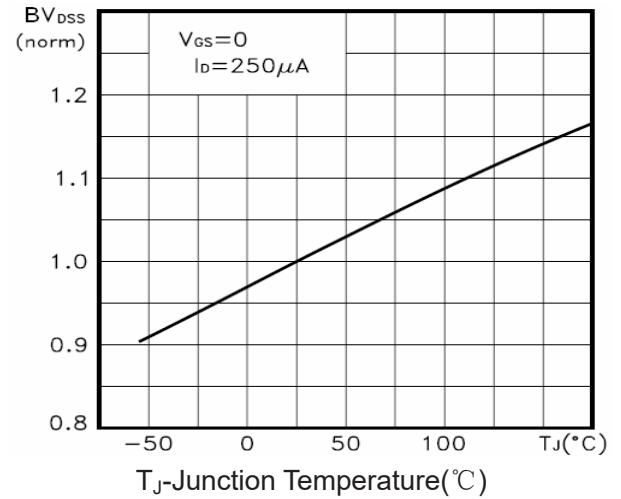
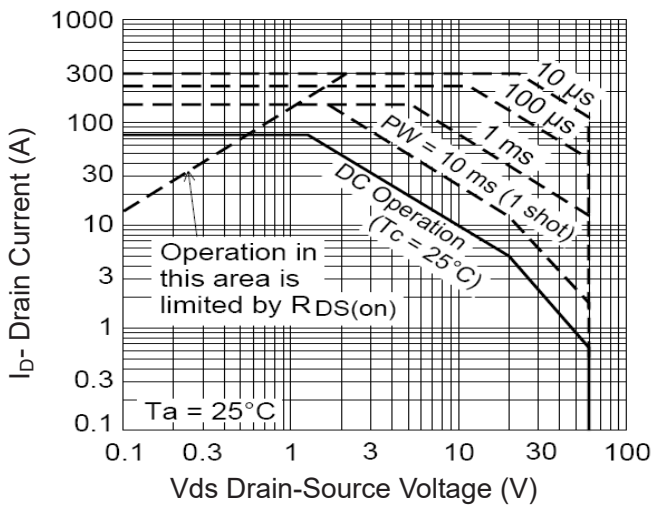
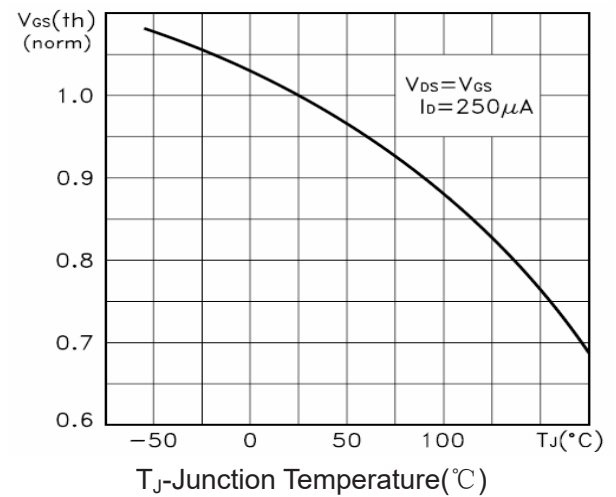
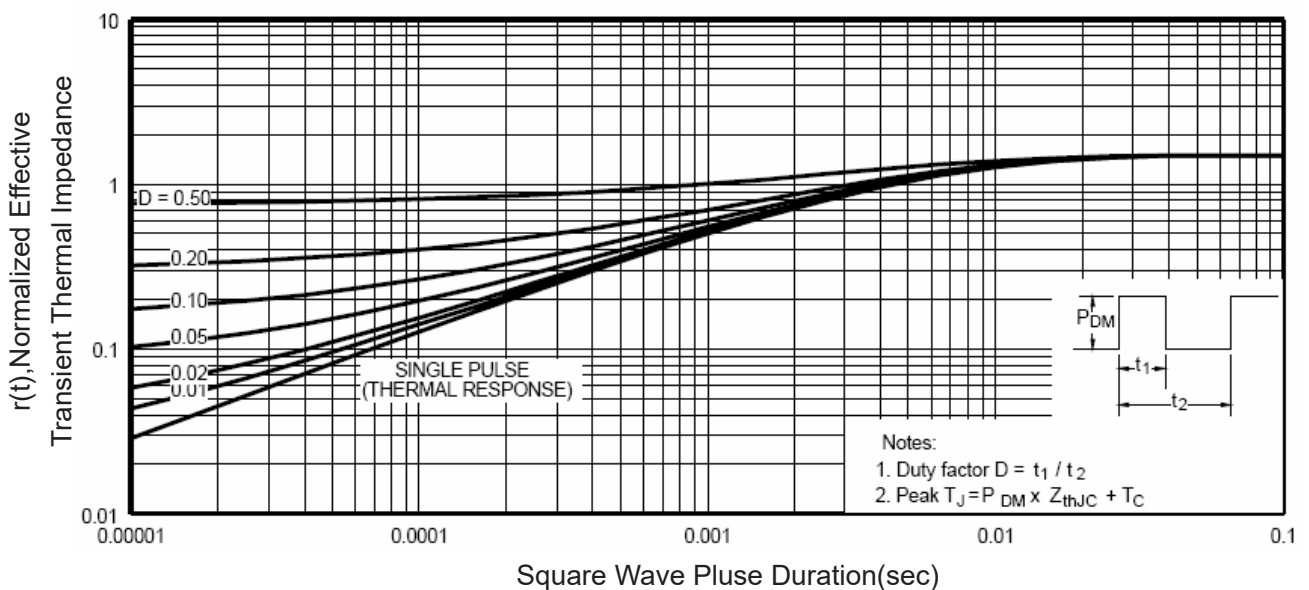
**Figure 4  $R_{DS(on)}$ -Junction Temperature**



**Figure 5 Gate Charge**



**Figure 6 Source- Drain Diode Forward**


**Figure 7 Capacitance vs Vds**

**Figure 9  $BV_{DSS}$  vs Junction Temperature**

**Figure 8 Safe Operation Area**

**Figure 10  $V_{GS(th)}$  vs Junction Temperature**

**Figure 11 Normalized Maximum Transient Thermal Impedance**