Description

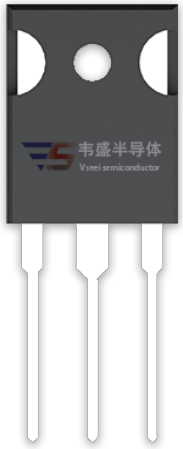
The VSM290N10 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of other applications.

General Features

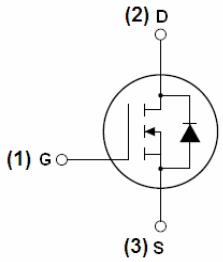
- V_{DSS} =100V,I_D =290A
  $R_{DS(ON)}$ < 3.2mΩ @ V_{GS}=10V （Typ：2.7mΩ）
- Good stability and uniformity with high E_{AS}
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

- DC motor drive
- High efficiency synchronous rectification in SMPS
- Uninterruptible power supply
- High speed power switching
- Hard switched and high frequency circuits



TO-247



Schematic Diagram

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM290N10-T7	VSM290N10	TO-247	-	-	-

Absolute Maximum Ratings (T_C=25℃unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DSS}	100	V
Gate-Source Voltage	V_{GS}	±20	V
Drain Current-Continuous	I_D	290	A
Drain Current-Continuous(T_C=100℃)	I_D (100℃)	200	A
Pulsed Drain Current	I_{DM}	1120	A
Maximum Power Dissipation	P_D	460	W
Derating factor		3.07	W/℃
Single pulse avalanche energy (Note 3)	E_{AS}	3500	mJ
Peak Diode Recovery dv/dt (Note 4)	dv/dt	10	V/ns
Operating Junction and Storage Temperature Range	T_J,T_{STG}	-55 To 175	℃

Thermal Characteristic

Thermal Resistance,Junction-to-Case (Note 1)	$R_{\theta JC}$	0.33	℃/W

Electrical Characteristics (T_C=25℃unless otherwise noted)

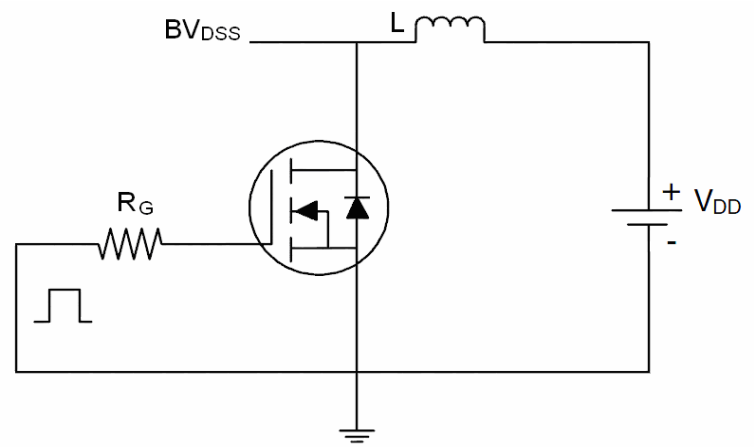
Parameter		Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV_{DSS}	V_{GS}=0V I_D=250μA	100	110	-	V
Zero Gate Voltage Drain Current		I_{DSS}	V_{DS}=100V,V_{GS}=0V	-	-	1	μA
Gate-Body Leakage Current		I_{GSS}	V_{GS}=±20V,V_{DS}=0V	-	-	±200	nA
On Characteristics							
Gate Threshold Voltage		$V_{GS(th)}$	V_{DS}=V_{GS},I_D=250μA	2	3	4	V
Drain-Source On-State Resistance	25℃	$R_{DS(ON)}$	V_{GS}=10V, I_D=40A	-	2.7	3.2	mΩ
Forward Transconductance		g_{FS}	V_{DS}=25V,I_D=40A	310	-	-	S
Dynamic Characteristics							
Input Capacitance		C_{lss}	V_{DS}=50V,V_{GS}=0V, F=1.0MHz	-	16000	-	PF
Output Capacitance		C_{oss}		-	1352	-	PF
Reverse Transfer Capacitance		C_{rss}		-	1061	-	PF
Switching Characteristics							
Turn-on Delay Time		$t_{d(on)}$	V_{DD}=50V,I_D=40A V_{GS}=10V,R_{GEN}=1.2Ω (Note2)	-	44.6	-	nS
Turn-on Rise Time		t_r		-	29.4	-	nS
Turn-Off Delay Time		$t_{d(off)}$		-	139.8	-	nS
Turn-Off Fall Time		t_f		-	36.4	-	nS
Total Gate Charge		Q_g	V_{DS}=30V,I_D=30A V_{GS}=10V	-	469	-	nC
Gate-Source Charge		Q_{gs}		-	99	-	nC
Gate-Drain Charge		Q_{gd}		-	148	-	nC
Drain-Source Diode Characteristics							
Diode Forward Voltage		V_{SD}	V_{GS}=0V,I_S=40A	-	-	1.2	V
Reverse Recovery Time		t_{rr}	TJ = 25°C, IF = 40A di/dt = 100A/μs (Note2)	-	87.9	-	nS
Reverse Recovery Charge		Qrr		-	129	-	nC
Forward Turn-On Time		t_{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes

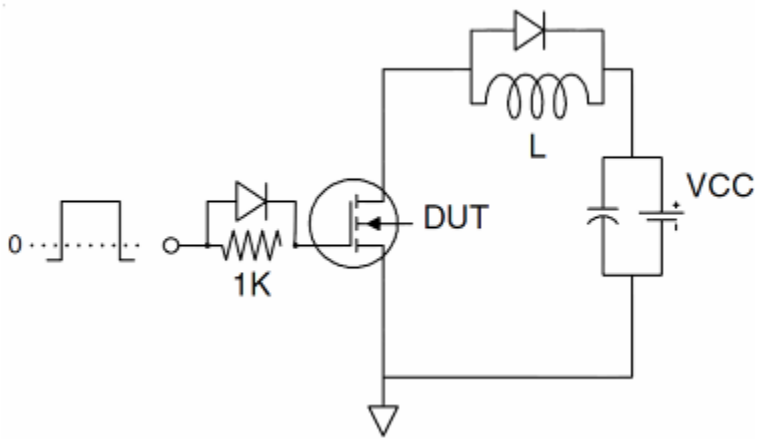
1. Surface Mounted on FR4 Board, t ≤ 10 sec.
2. Pulse Test: Pulse Width ≤ 400μs, Duty Cycle ≤ 2%.
3. EAS condition：Tj=25℃,V_{DD}=50V,V_G=10V,L=1mH,Rg=25Ω
4. I_{SD}≤125A, di/dt≤260A/μs, V_{DD}≤$V_{(BR)DSS}$，T_J ≤175°C

Test Circuit

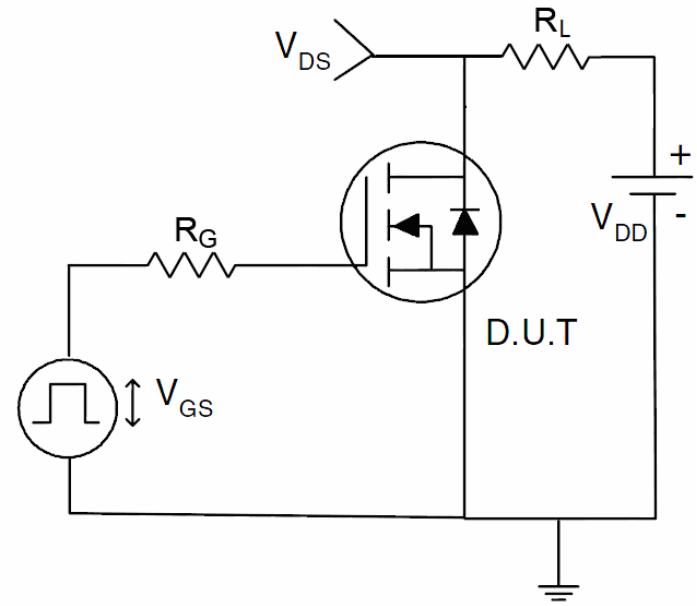
1) E_{AS} Test Circuits



2) Gate Charge Test Circuit:



3) Switch Time Test Circuit:



Typical Electrical and Thermal Characteristics

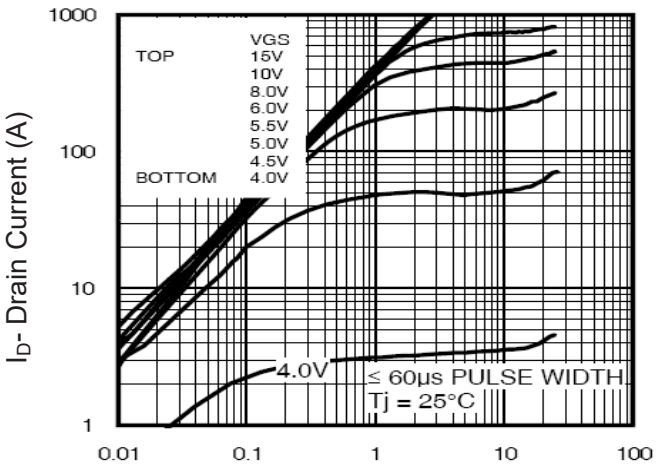


Figure 1 Output Characteristics

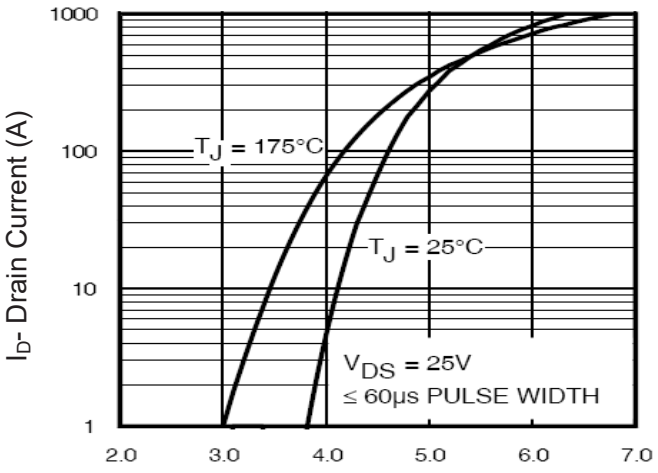


Figure 2 Transfer Characteristics

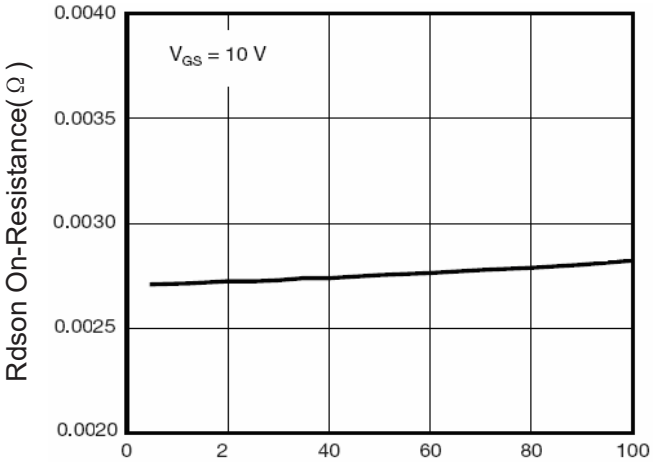


Figure 3 Rdson- Drain Current

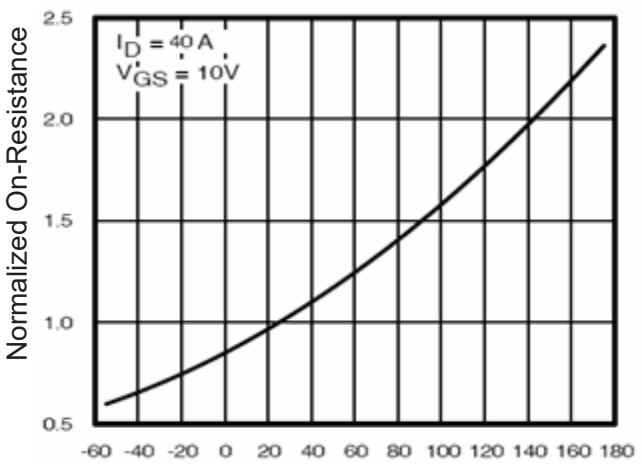


Figure 4 Rdson-JunctionTemperature

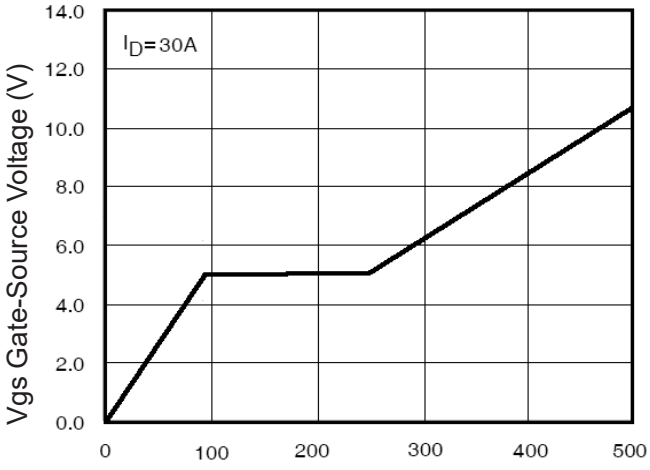


Figure 5 Gate Charge

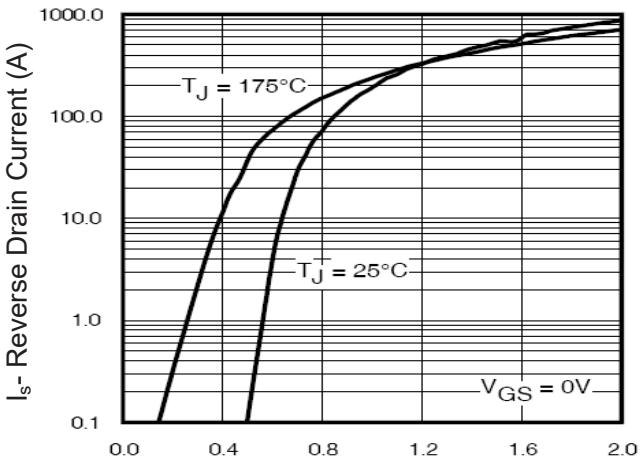


Figure 6 Source- Drain Diode Forward

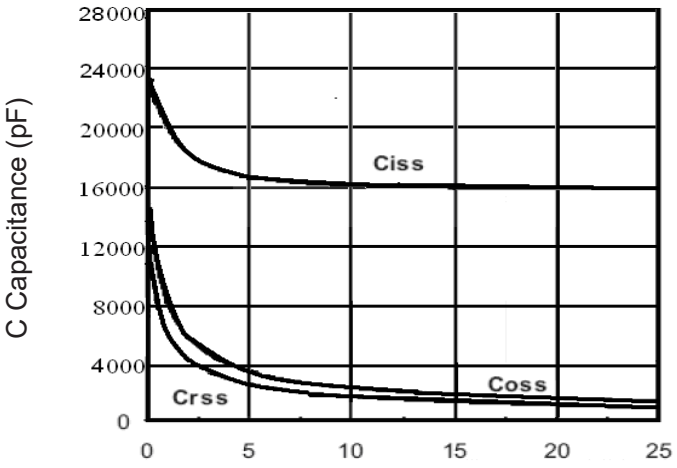


Figure 7 Capacitance vs Vds

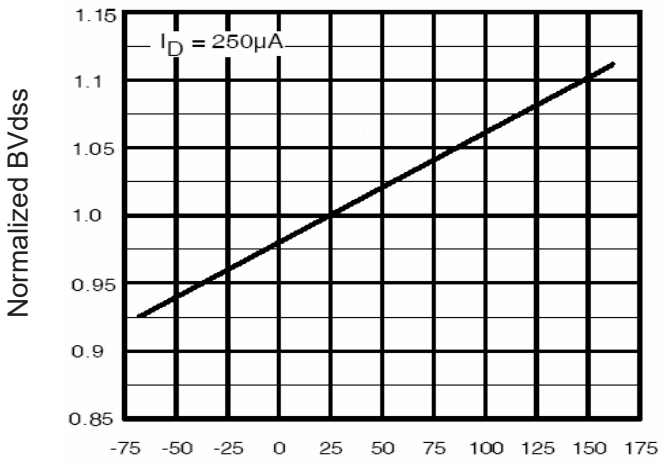


Figure 9 BV_{DSS} vs Junction Temperature

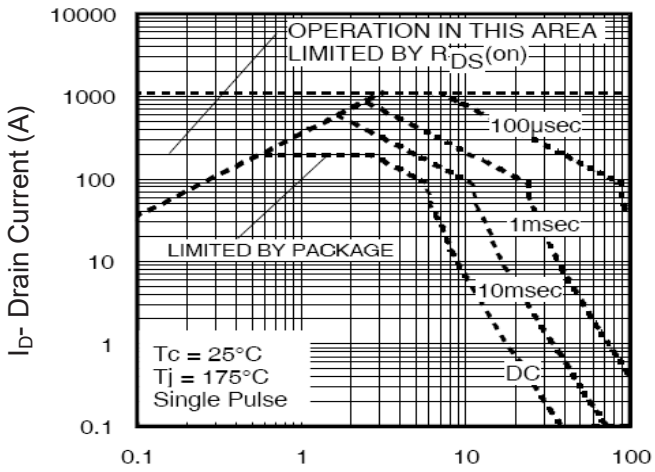


Figure 8 Safe Operation Area

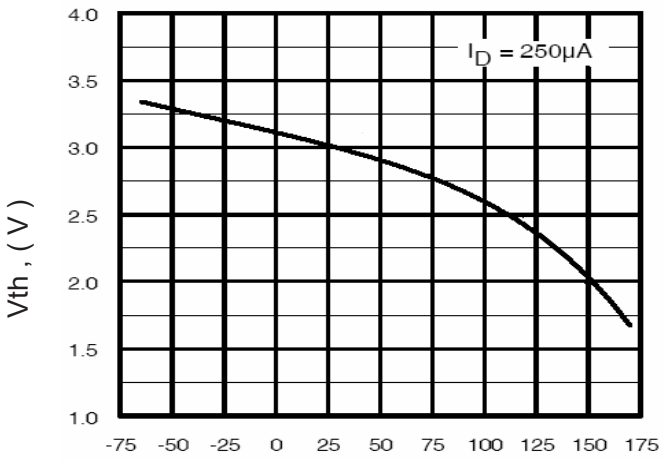


Figure 10 $V_{GS(th)}$ vs Junction Temperature

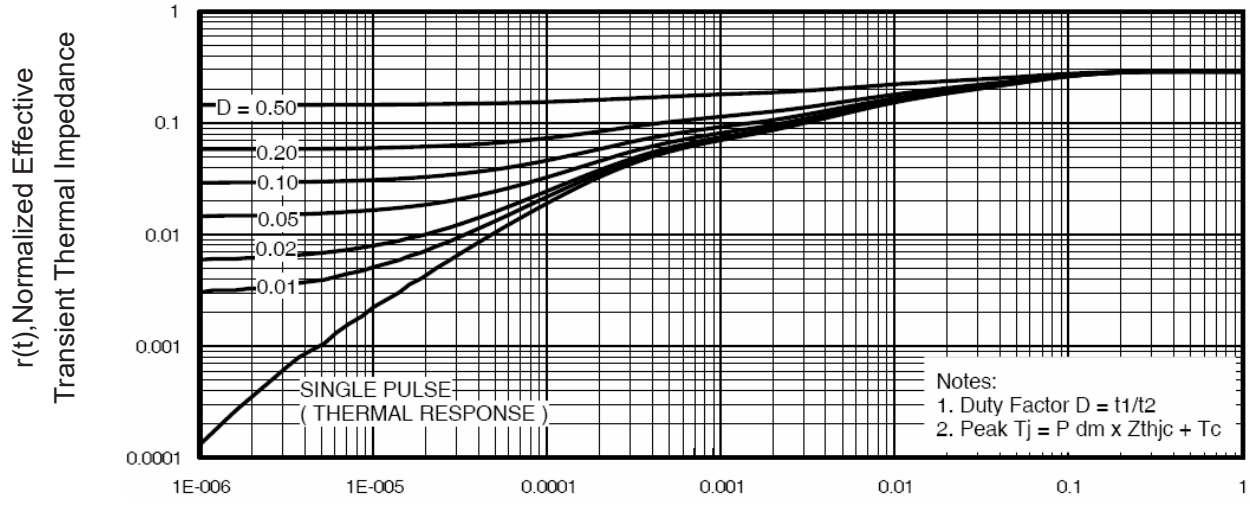


Figure 11 Normalized Maximum Transient Thermal Impedance