

Description

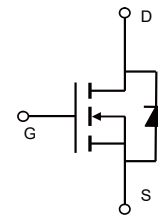
The VSM210N07 uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in Automotive applications and a wide variety of other applications.

General Features

- $V_{DSS}=75V, I_D=210A$
 $R_{DS(ON)} < 4m\Omega @ V_{GS}=10V$
- Good stability and uniformity with high E_{AS}
- Special process technology for high ESD capability
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

Application

- Automotive applications
- Hard switched and high frequency circuits
- Uninterruptible power supply



Schematic

Package Marking and Ordering Information

Device Marking	Device	Device Package	Reel Size	Tape width	Quantity
VSM210N07	VSM210N07-TC	TO-220	-	-	-

Absolute Maximum Ratings (TC=25°C unless otherwise noted)

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DSS}	75	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	210	A
Drain Current-Continuous($T_C=100^\circ C$)	$I_D(100^\circ C)$	150	A
Pulsed Drain Current	I_{DM}	840	A
Maximum Power Dissipation	P_D	310	W
Derating factor		2.07	W/ $^\circ C$
Single pulse avalanche energy (Note 4)	E_{AS}	2200	mJ

Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 175	°C
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Thermal Characteristic

Thermal Resistance, Junction-to-Case ^(Note 1)	$R_{\theta JC}$	0.48	°C/W
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Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

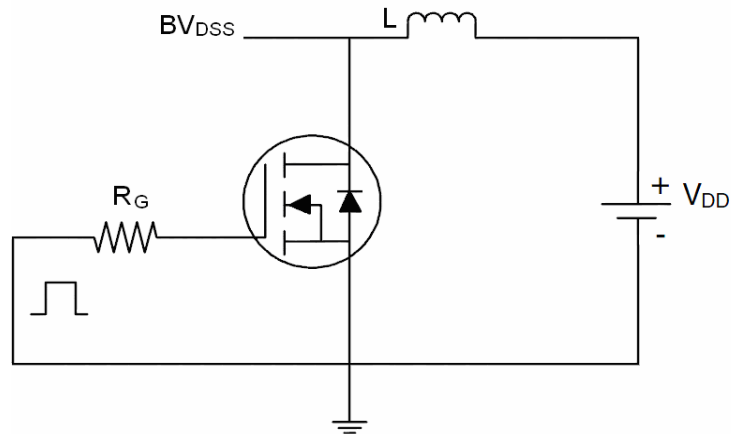
Parameter		Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics							
Drain-Source Breakdown Voltage		BV _{DSS}	V _{GS} =0V I _D =250μA	75			V
Zero Gate Voltage Drain Current		I _{DSS}	V _{DS} =75V, V _{GS} =0V			1	μA
Gate-Body Leakage Current		I _{GSS}	V _{GS} =±20V, V _{DS} =0V			±200	nA
On Characteristics							
Gate Threshold Voltage		V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2	3	4	V
Drain-Source On-State Resistance	25°C	R _{DS(ON)}	V _{GS} =10V, I _D =40A		2.8	4	mΩ
	125°C				4.7	6.5	mΩ
Forward Transconductance		g _{FS}	V _{DS} =25V, I _D =40A	100	165		S
Dynamic Characteristics							
Input Capacitance		C _{iss}	V _{DS} =25V, V _{GS} =0V, F=1.0MHz		11000		PF
Output Capacitance		C _{oss}			914		PF
Reverse Transfer Capacitance		C _{rss}			695		PF
Switching Characteristics							
Turn-on Delay Time		t _{d(on)}	V _{DD} =30V, I _D =2A, R _L =15Ω V _{GS} =10V, R _G =2.5Ω		23		nS
Turn-on Rise Time		t _r			190		nS
Turn-Off Delay Time		t _{d(off)}			130		nS
Turn-Off Fall Time		t _f			120		nS
Total Gate Charge		Q _g	I _D =30A, V _{DD} =30V, V _{GS} =10V	-	250		nC
Gate-Source Charge		Q _{gs}		-	48		nC
Gate-Drain Charge		Q _{gd}		-	98		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		63		nS
Reverse Recovery Charge		Q _{rr}	di/dt = 100A/μs ^(Note2)		98		nC
Forward Turn-On Time		t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

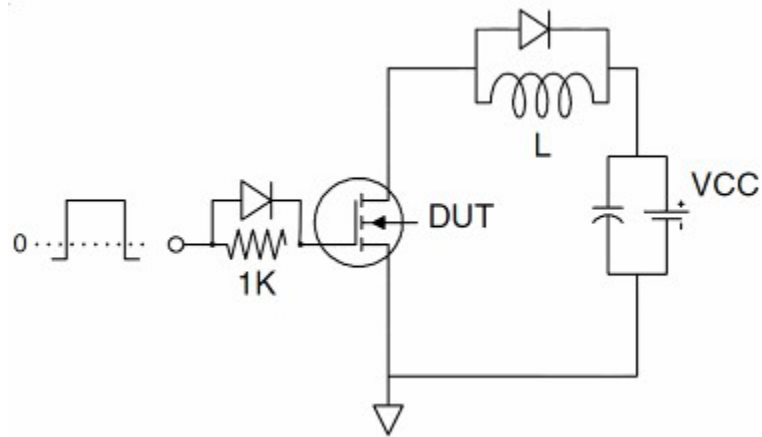
1. Surface Mounted on FR4 Board, $t \leq 10$ sec.
2. Pulse Test: Pulse Width $\leq 400\mu s$, Duty Cycle $\leq 2\%$.
3. EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=37.5V, V_G=10V, L=2mH, R_G=25\Omega, I_{AS}=37A$

Test circuit

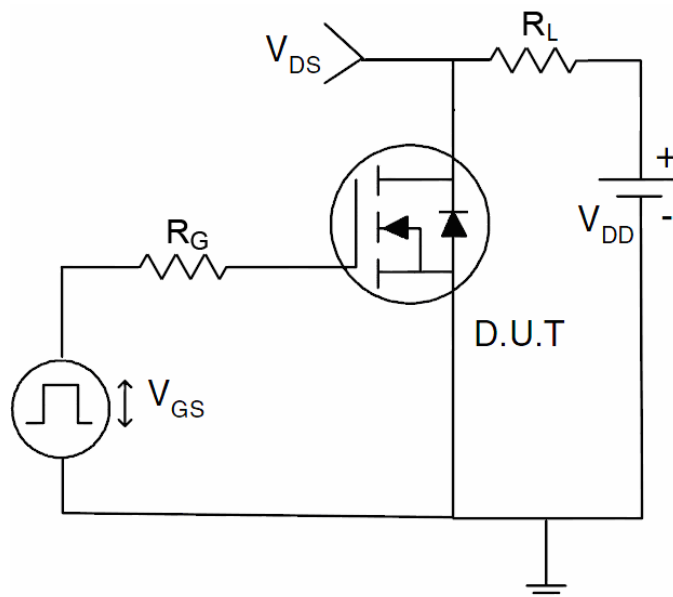
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics

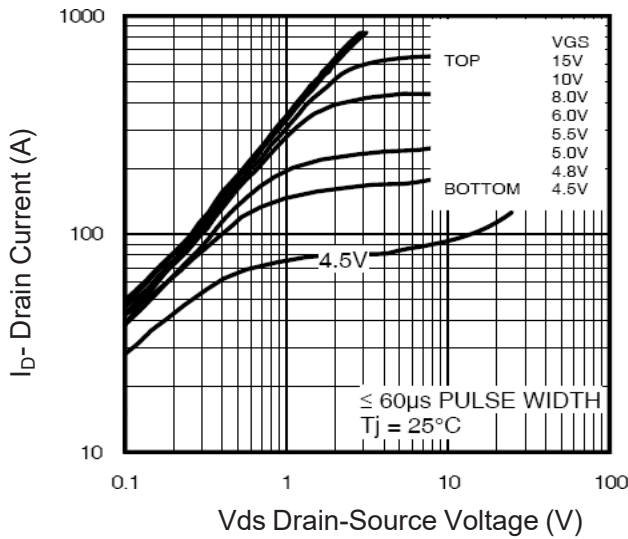


Figure 1 Output Characteristics

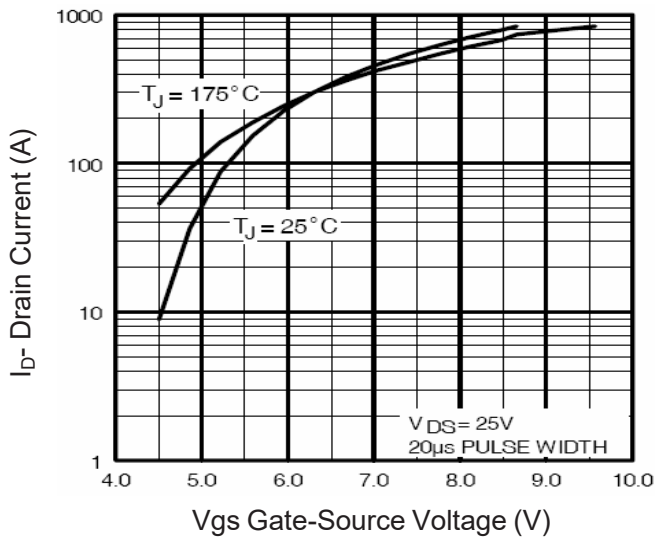


Figure 2 Transfer Characteristics

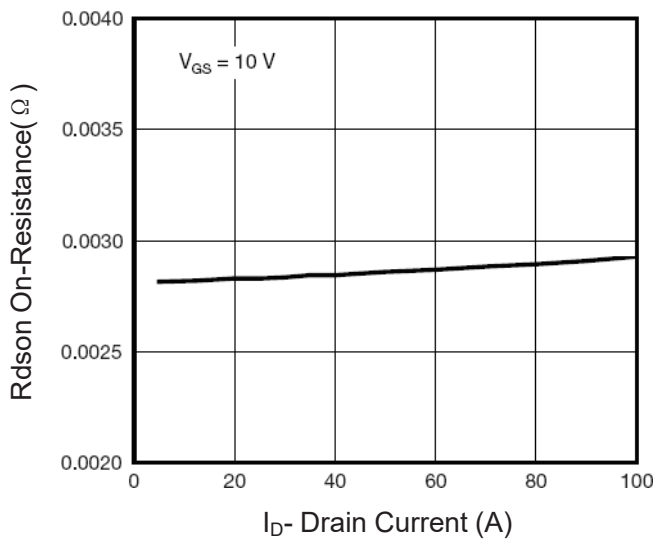


Figure 3 Rdson- Drain Current

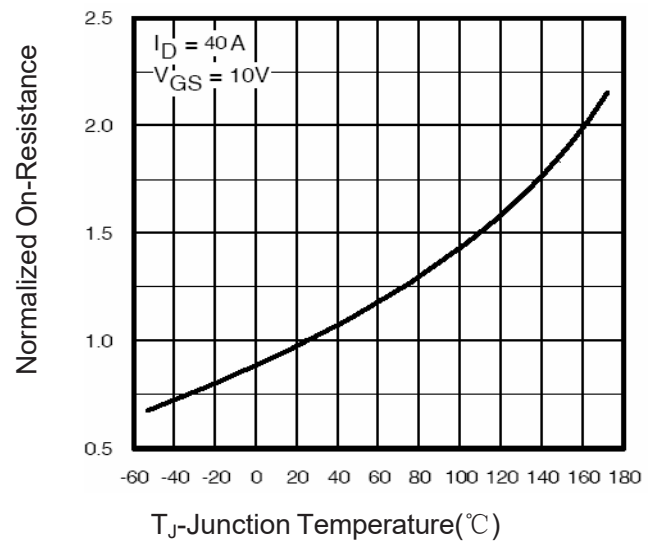


Figure 4 Rdson-Junction Temperature

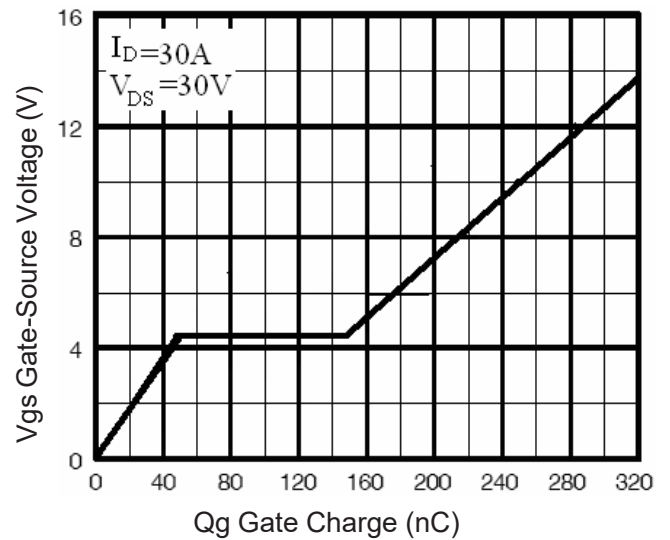


Figure 5 Gate Charge

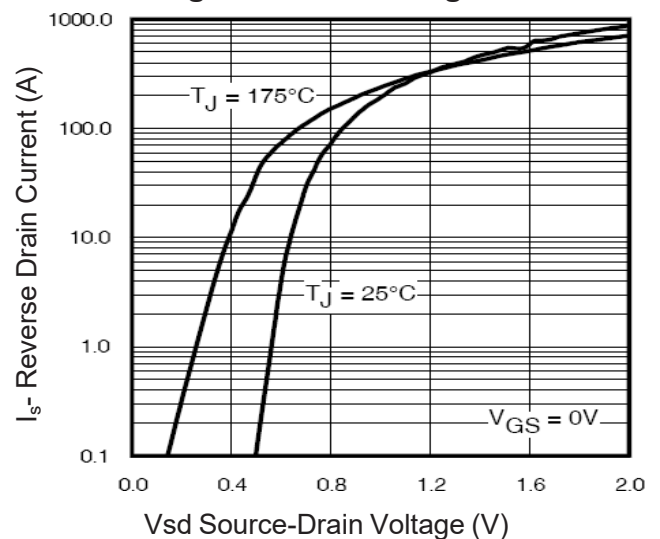
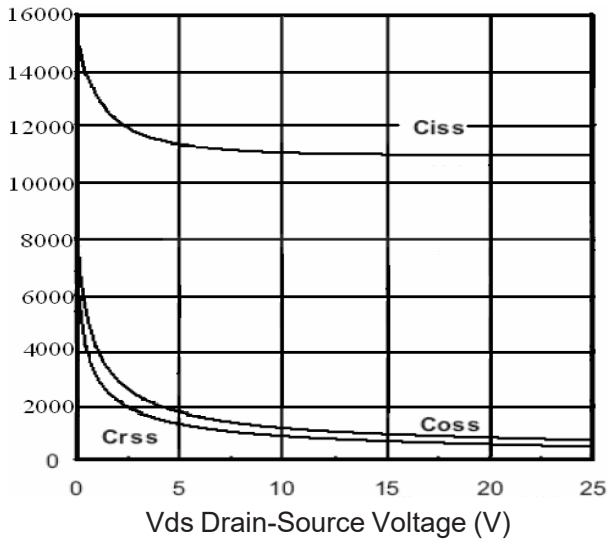
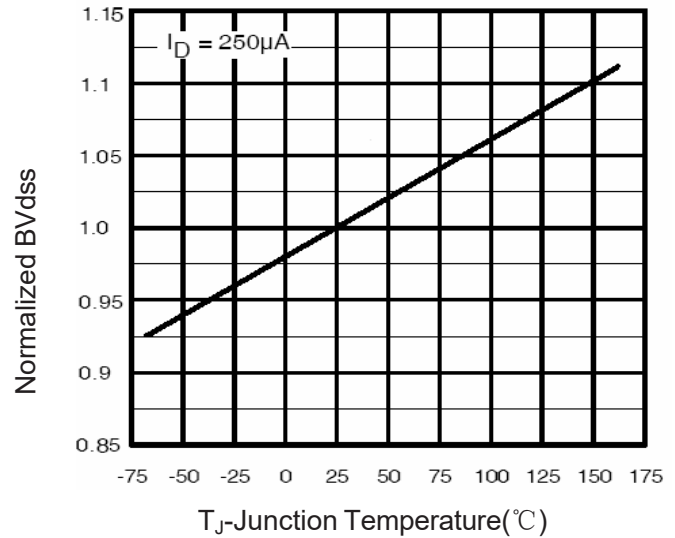
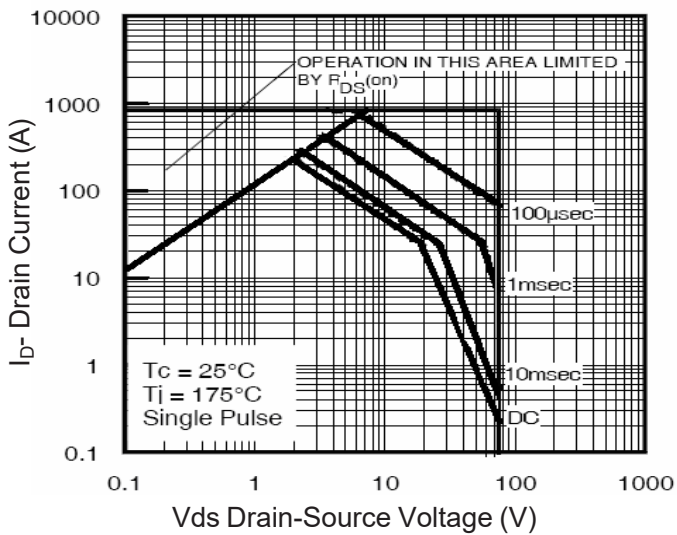
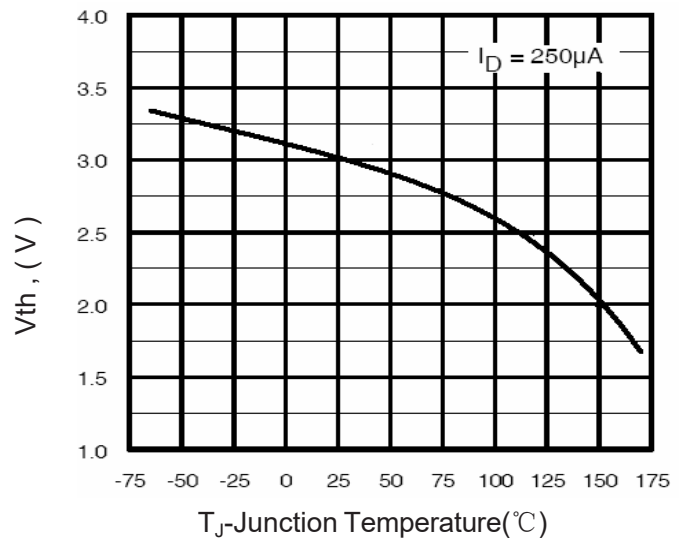
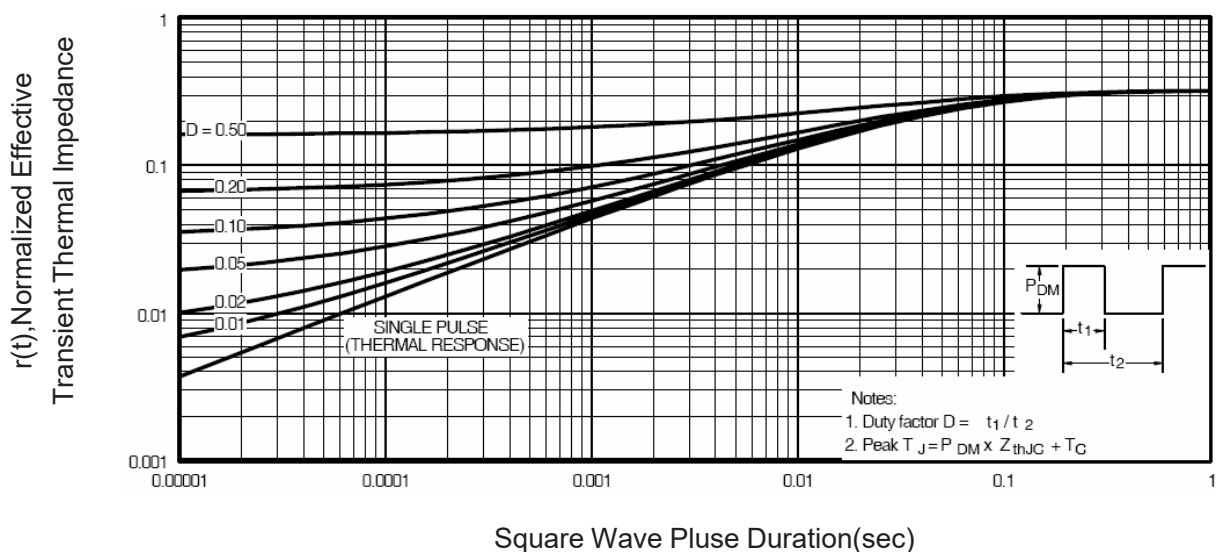


Figure 6 Source- Drain Diode Forward


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