

Description

The VSM235N03 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.

Application

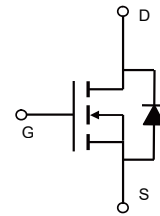
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS}=40V, I_D=235A$
 $R_{DS(ON)}=1.3m\Omega$ (typical) @ $V_{GS}=10V$
 $R_{DS(ON)}=2.1m\Omega$ (typical) @ $V_{GS}=4.5V$
- High density cell design for ultra low $R_{DS(on)}$
- Very low on-resistance $R_{DS(on)}$
- Good stability and uniformity with high E_{AS}
- 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
VSM235N03	VSM235N03-D56	DFN5x6	Ø330mm	12mm	5000units

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

Parameter		Symbol	Limit	Unit
Drain-Source Voltage		V_{DS}	40	V
Gate-Source Voltage		V_{GS}	± 20	V
Drain Current-Continuous	($T_C=25^\circ C$)	I_D	235	A
	($T_C=100^\circ C$)	$I_D (100^\circ C)$	148	A
Pulsed Drain Current ($T_C=25^\circ C$)		I_{DM}	940	A
Maximum Power Dissipation ($T_C=25^\circ C$)		P_D	175	W
Derating factor			1.4	W/°C
Single pulse avalanche energy (Note 1)		E_{AS}	1413	mJ
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55 To 150	°C

Thermal Characteristic

Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.72	°C/W
Thermal Resistance, Junction-to-Ambient (Note 4)	$R_{\theta JA}$	50	°C/W

Electrical Characteristics (TC=25°C unless otherwise noted)

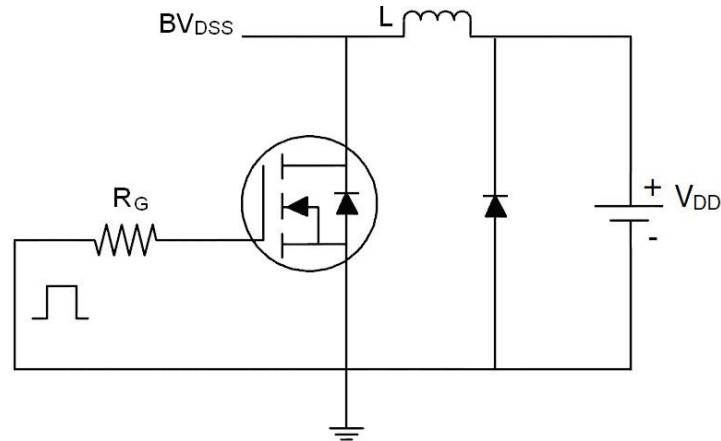
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	40	-	-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =30V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	1	1.6	2.1	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =20A	-	1.3	1.8	mΩ
		V _{GS} =4.5V, I _D =20A	-	2.1	3.0	
Forward Transconductance	g _{FS}	V _{DS} =5V, I _D =20A	-	40	-	S
Dynamic Characteristics						
Input Capacitance	C _{iss}	V _{DS} =20V, V _{GS} =0V, F=1.0MHz	-	6116	-	pF
Output Capacitance	C _{oss}		-	693	-	pF
Reverse Transfer Capacitance	C _{rss}		-	659	-	pF
Switching Characteristics (Note 2)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =20V, I _D =20A V _{GS} =10V, R _{GEN} =6Ω	-	15	-	nS
Turn-on Rise Time	t _r		-	70	-	nS
Turn-Off Delay Time	t _{d(off)}		-	80	-	nS
Turn-Off Fall Time	t _f		-	30	-	nS
Total Gate Charge	Q _g	V _{DS} =20V, I _D =20A, V _{GS} =10V	-	155	-	nC
Gate-Source Charge	Q _{gs}		-	15	-	nC
Gate-Drain Charge	Q _{gd}		-	42	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A	-	0.85	1.2	V
Diode Forward Current	I _S		-	-	235	A
Reverse Recovery Time	t _{rr}	T _J = 25°C, I _F = 40A di/dt = 100A/μs	-	52	-	nS
Reverse Recovery Charge	Q _{rr}		-	64	-	nC
Forward Turn-On Time	t _{on}	Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)				

Notes:

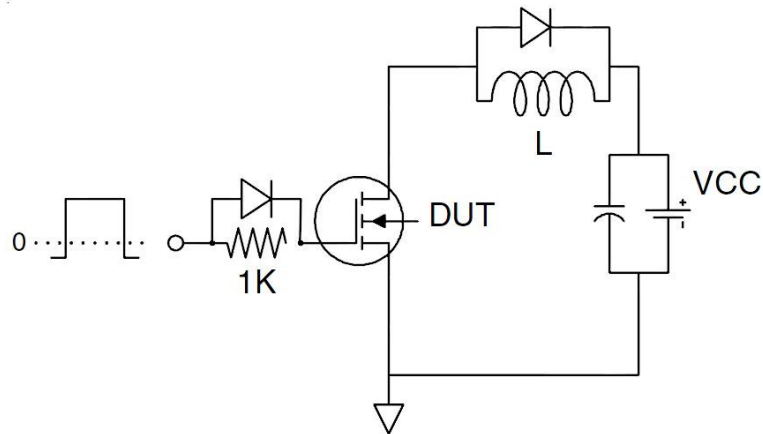
1. EAS condition : $T_J=25^\circ C, V_{DD}=20V, V_G=10V, L=0.5mH, R_g=25\Omega$
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}=150^\circ C$. The SOA curve provides a single pulse rating.
4. The value of $R_{\theta JA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with $T_A=25^\circ C$. The maximum allowed junction temperature of $150^\circ C$. The value in any given application depends on the user's specific board design, and the maximum temperature of $150^\circ C$ may be used if the PCB allows it.

Test Circuit

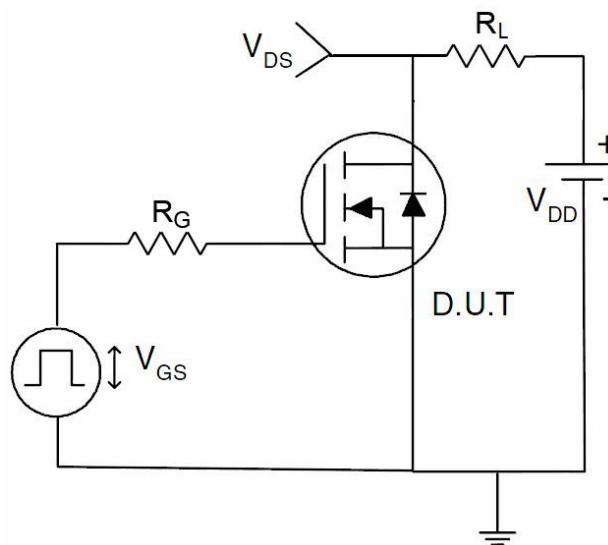
1) E_{AS} Test Circuits



2) Gate Charge Test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

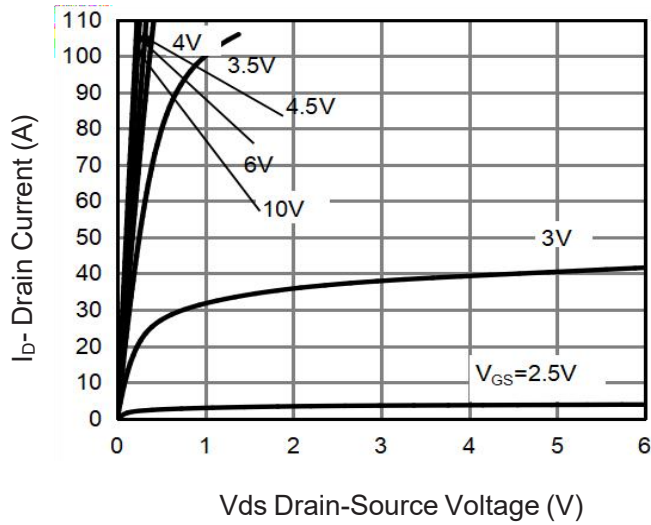


Figure 1 Output Characteristics

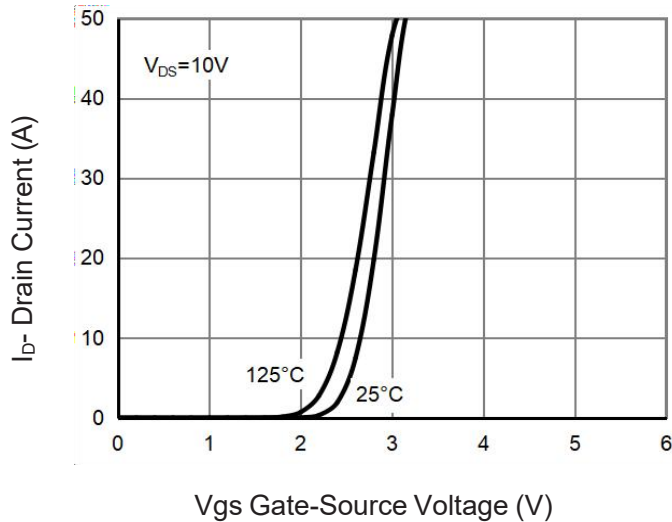


Figure 2 Transfer Characteristics

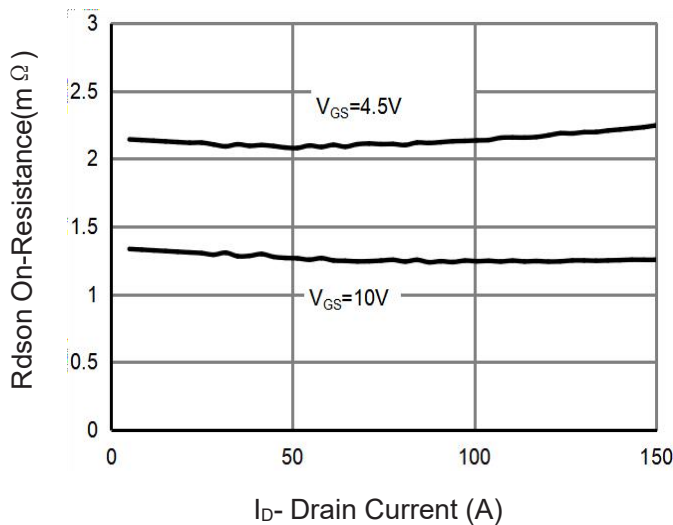


Figure 3 $R_{DS(on)}$ - Drain Current

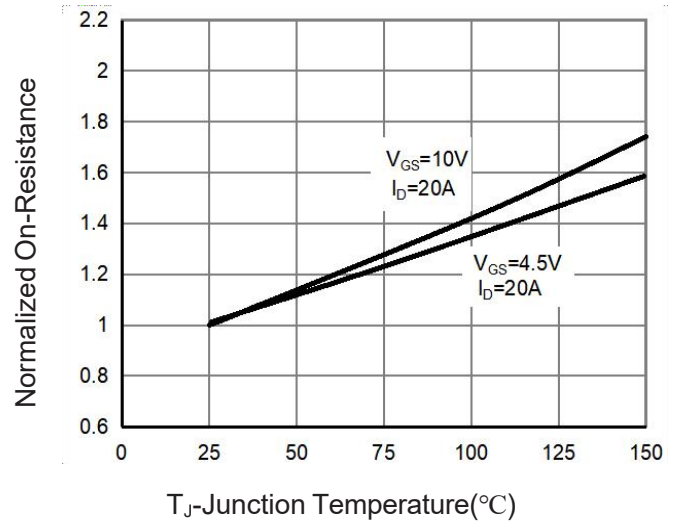


Figure 4 $R_{DS(on)}$ -Junction Temperature

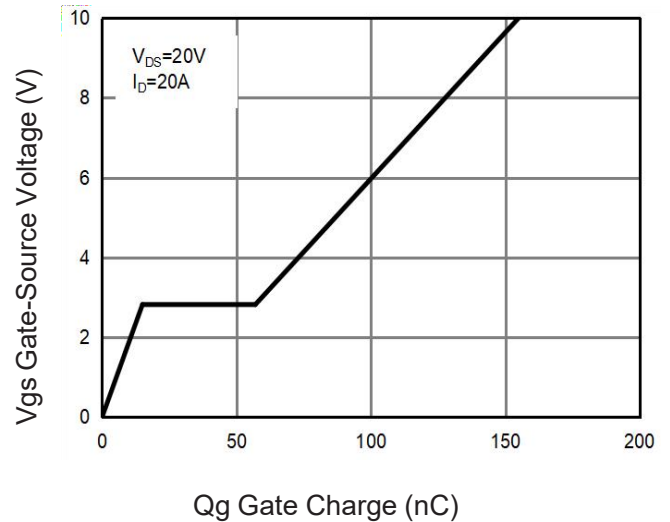


Figure 5 Gate Charge

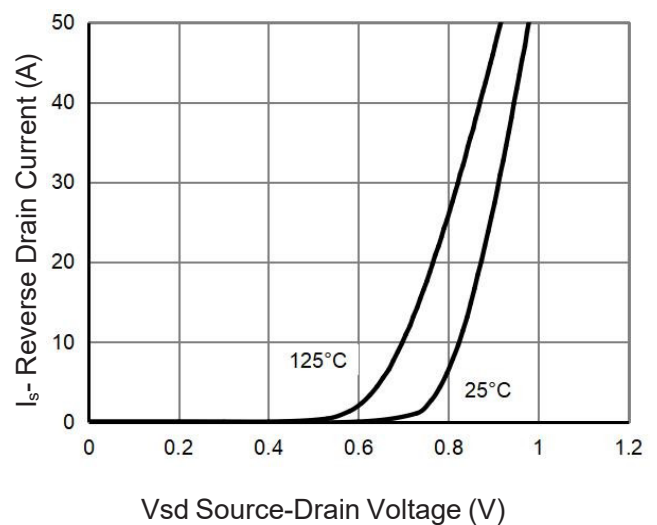
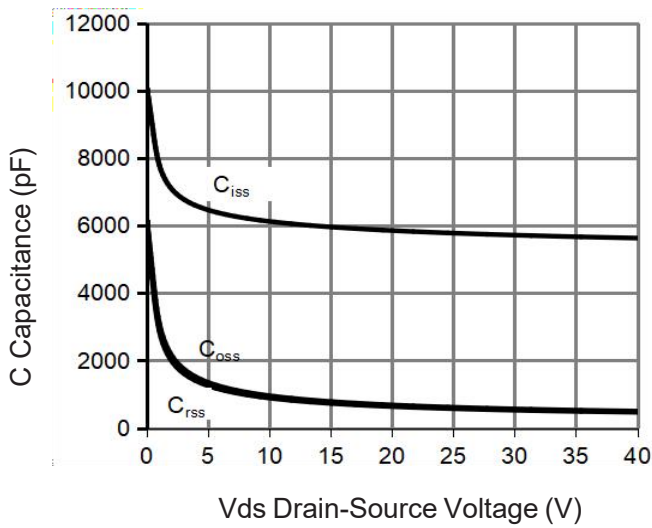
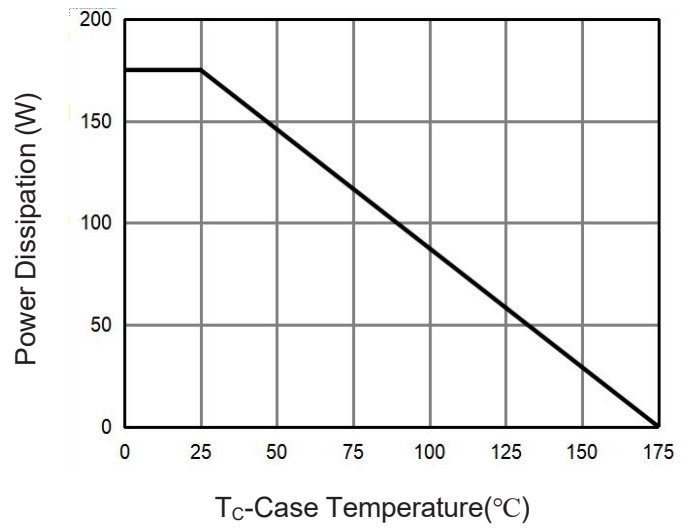
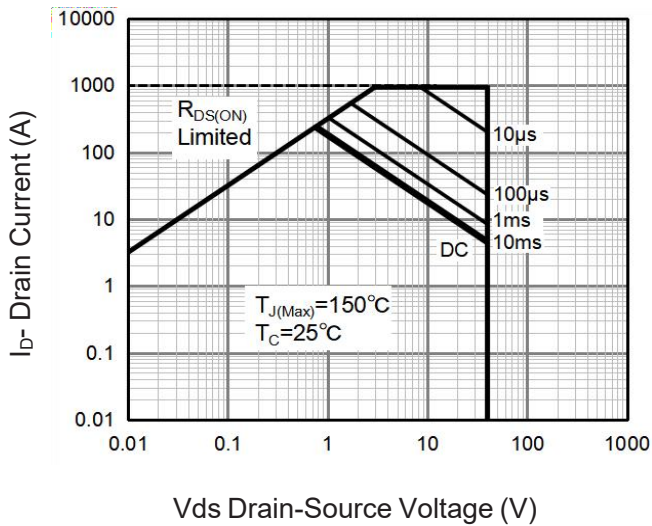
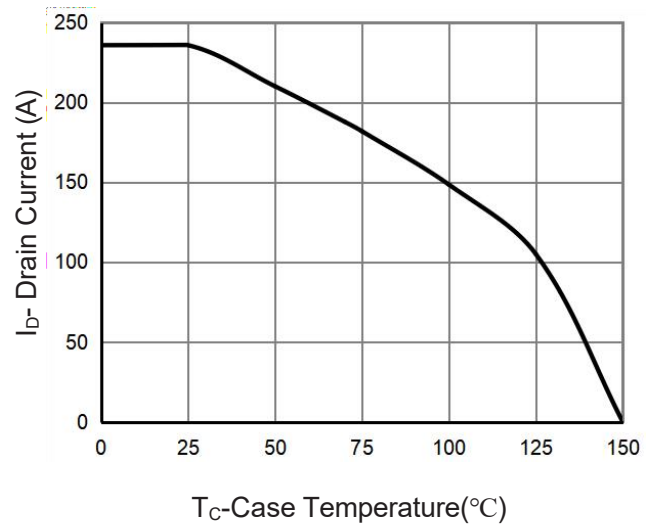
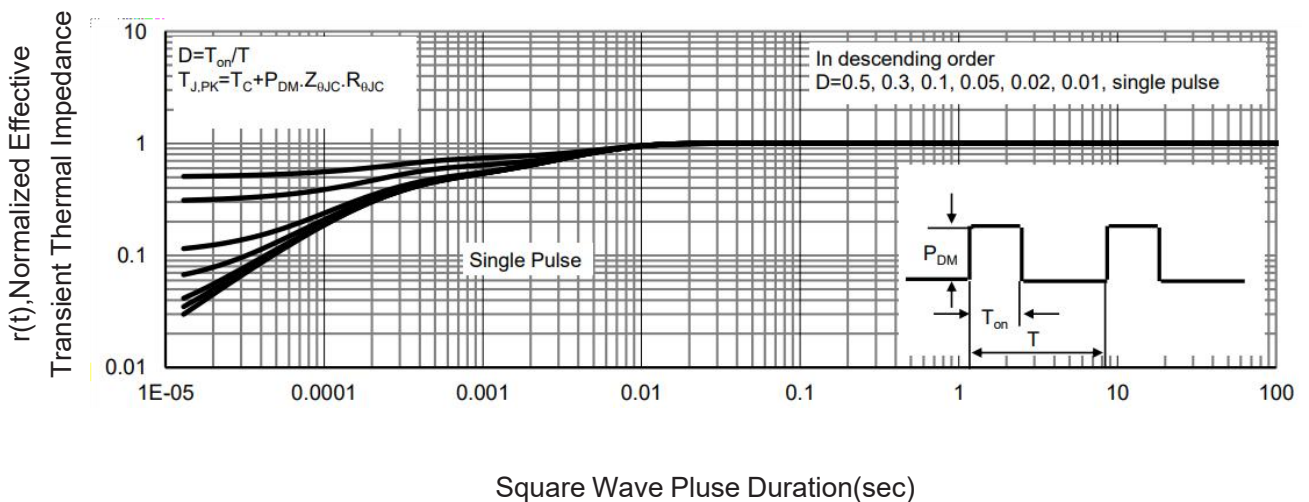


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area (Note3)

Figure10 ID Current- Junction Temperature

Figure 11 Normalized Maximum Transient Thermal Impedance