

Description

The VSM57N10 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

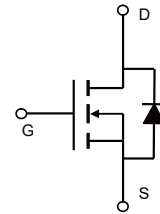
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

- $V_{DS} = 100V, I_D = 57A$
 $R_{DS(ON)} < 14.5m\Omega @ V_{GS} = 10V$ (Typ: 12.5m Ω)
- 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
VSM57N10	VSM57N10-D56	DFN5x6	-	-	-

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

Parameter	Symbol	Limit	Unit
Drain-Source Voltage	V_{DS}	100	V
Gate-Source Voltage	V_{GS}	± 20	V
Drain Current-Continuous	I_D	57	A
Drain Current-Continuous($T_c = 100^\circ\text{C}$)	$I_D (100^\circ\text{C})$	40	A
Pulsed Drain Current	I_{DM}	160	A
Single pulse avalanche energy (Note 5)	E_{AS}	320	mJ
Maximum Power Dissipation	P_D	100	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 To 150	$^\circ\text{C}$

Thermal Characteristic

Thermal Resistance, Junction-to-Case (Note 2)	$R_{\theta JC}$	1.25	$^\circ\text{C/W}$
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Electrical Characteristics (T_c=25°C unless otherwise noted)

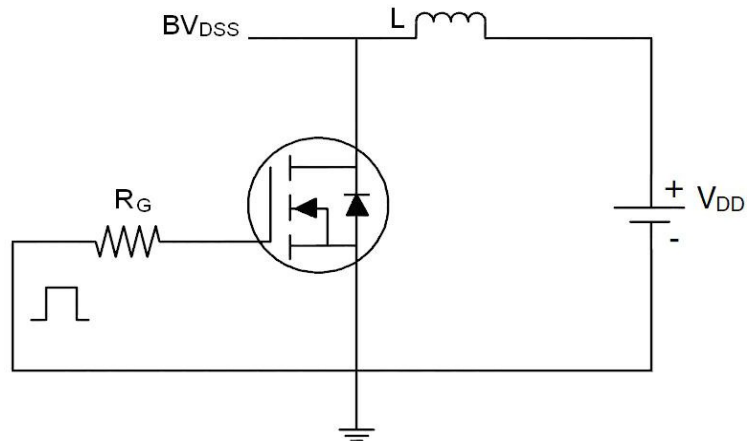
Parameter	Symbol	Condition	Min	Typ	Max	Unit
Off Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	V _{GS} =0V I _D =250μA	100		-	V
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} =60V, V _{GS} =0V	-	-	1	μA
Gate-Body Leakage Current	I _{GSS}	V _{GS} =±20V, V _{DS} =0V	-	-	±100	nA
On Characteristics (Note 3)						
Gate Threshold Voltage	V _{GS(th)}	V _{DS} =V _{GS} , I _D =250μA	2	3	4	V
Drain-Source On-State Resistance	R _{DS(ON)}	V _{GS} =10V, I _D =28A	-	12.5	14.5	mΩ
Forward Transconductance	g _{FS}	V _{DS} =20V, I _D =28A	-	35	-	S
Dynamic Characteristics (Note4)						
Input Capacitance	C _{iss}	V _{DS} =50V, V _{GS} =0V, F=1.0MHz	-	3778	-	PF
Output Capacitance	C _{oss}		-	170	-	PF
Reverse Transfer Capacitance	C _{rss}		-	132.3	-	PF
Switching Characteristics (Note 4)						
Turn-on Delay Time	t _{d(on)}	V _{DD} =30V, I _D =5A, R _L =10Ω V _{GS} =10V, R _G =1Ω	-	17	-	nS
Turn-on Rise Time	t _r		-	13	-	nS
Turn-Off Delay Time	t _{d(off)}		-	55	-	nS
Turn-Off Fall Time	t _f		-	16	-	nS
Total Gate Charge	Q _g	V _{DS} =50V, I _D =20A, V _{GS} =10V	-	81.6	-	nC
Gate-Source Charge	Q _{gs}		-	19.4	-	nC
Gate-Drain Charge	Q _{gd}		-	26.1	-	nC
Drain-Source Diode Characteristics						
Diode Forward Voltage (Note 3)	V _{SD}	V _{GS} =0V, I _S =28A	-	-	1.2	V
Diode Forward Current (Note 2)	I _S		-	-	57	A
Reverse Recovery Time	t _{rr}	TJ = 25°C, IF=28A di/dt = 100A/μs (Note3)	-	35	-	nS
Reverse Recovery Charge	Q _{rr}		-	58	-	nC

Notes:

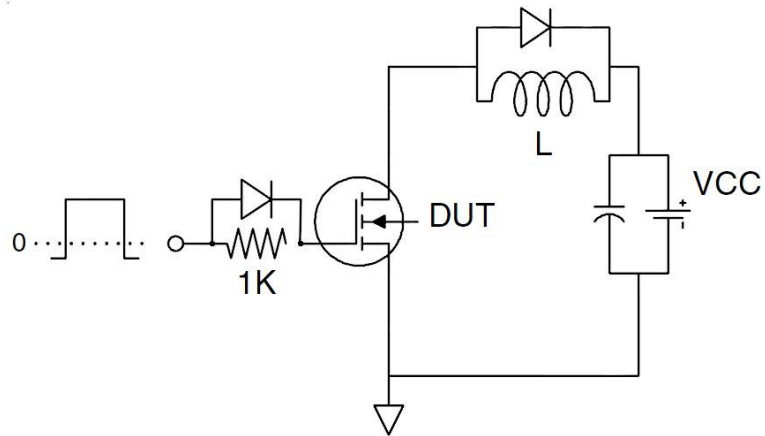
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. E_{AS} condition: T_J=25°C, V_{DD}=30V, V_G=10V, L=0.5mH, R_G=25Ω

Test Circuit

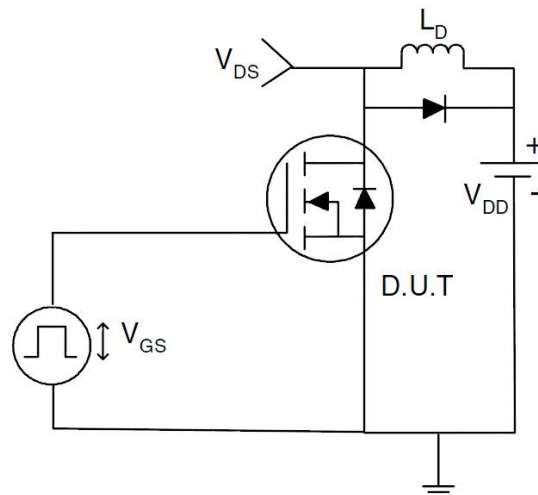
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

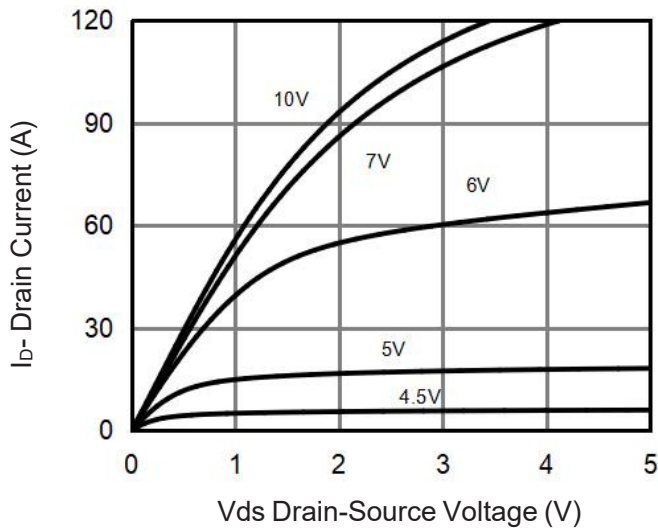


Figure 1 Output Characteristics

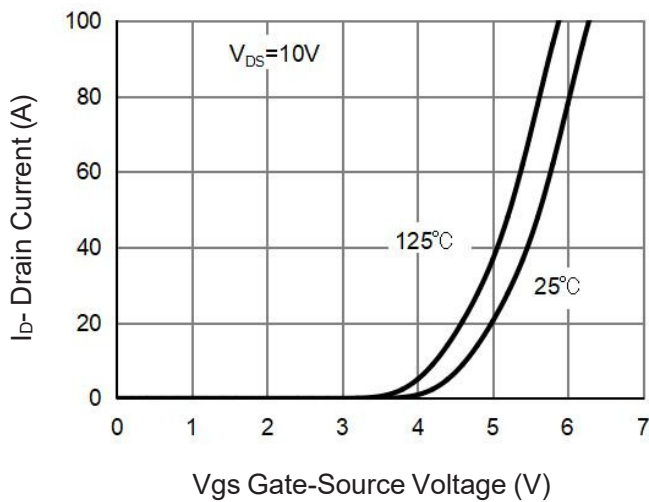


Figure 2 Transfer Characteristics

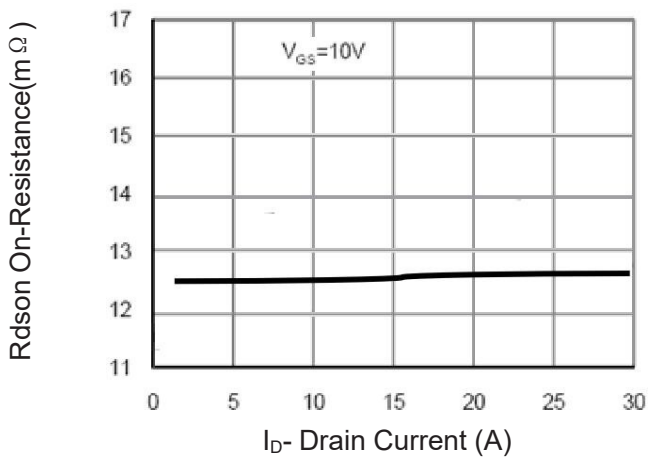


Figure 3 Rdson- Drain Current

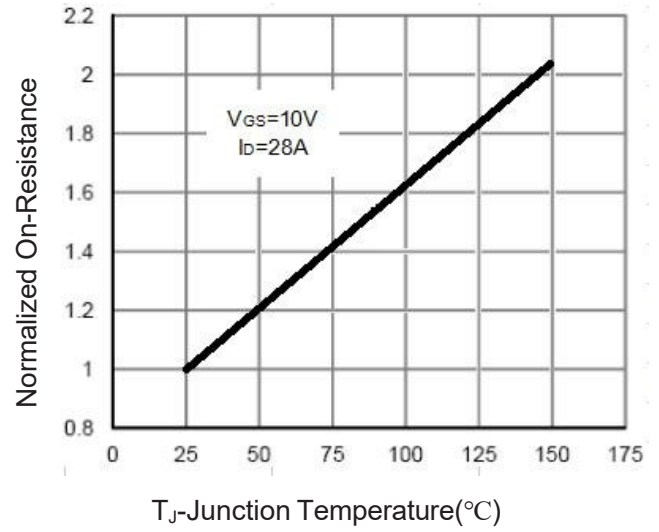


Figure 4 Rdson-Junction Temperature

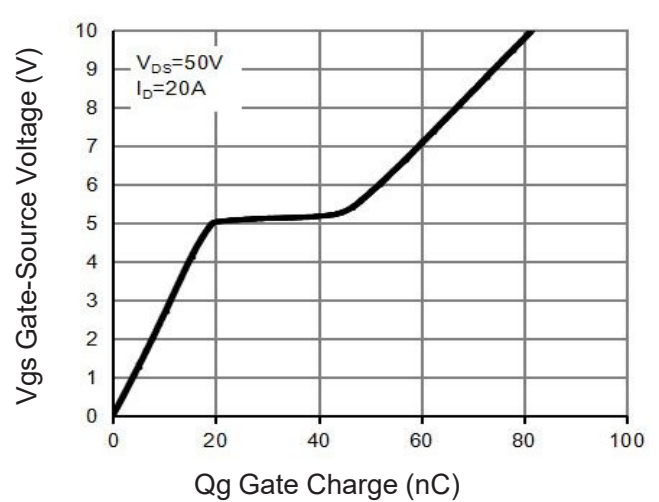


Figure 5 Gate Charge

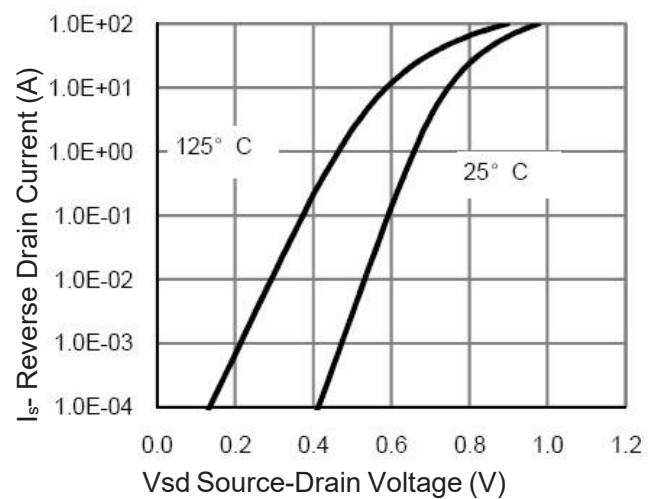
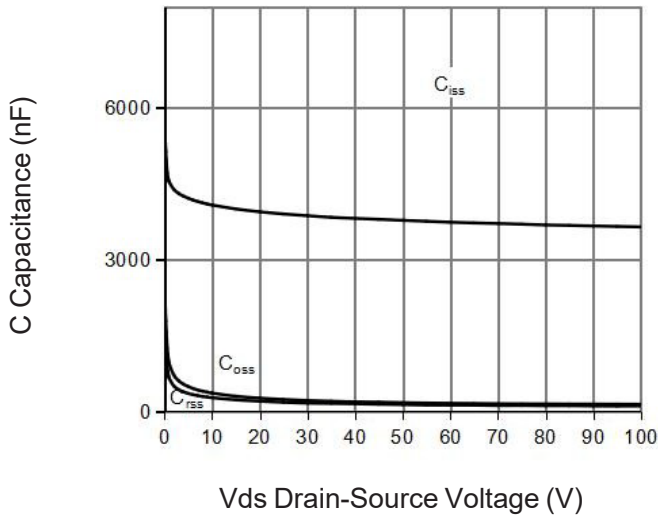
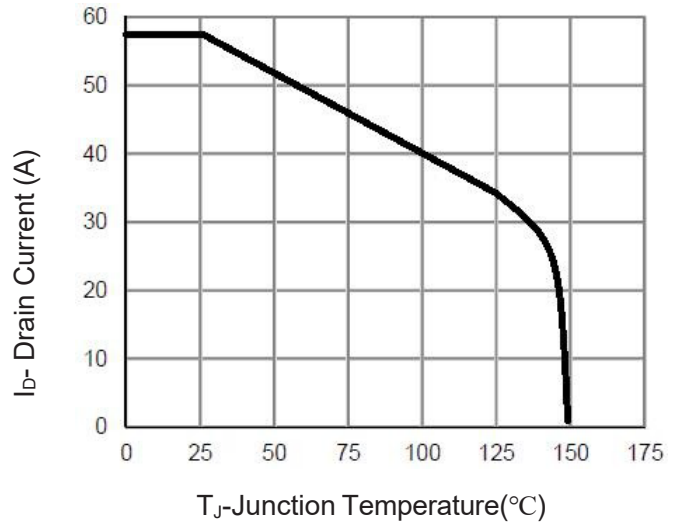
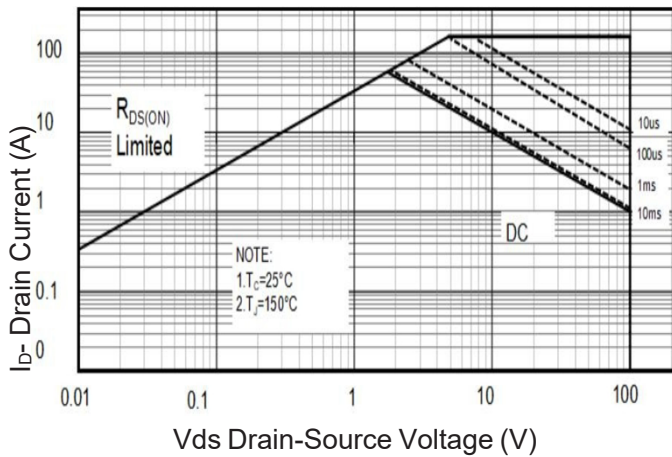
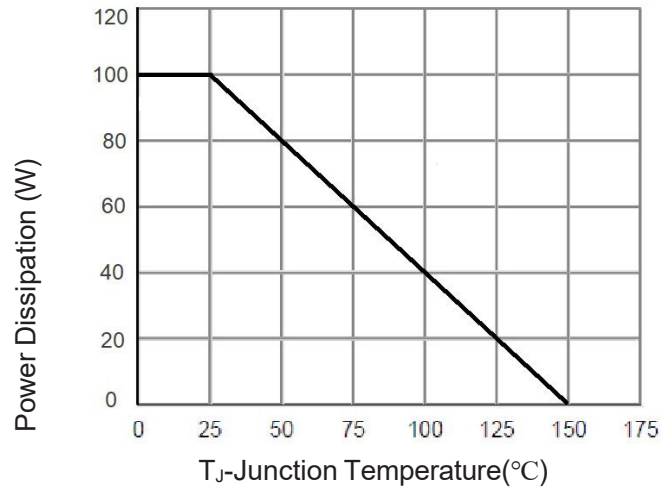
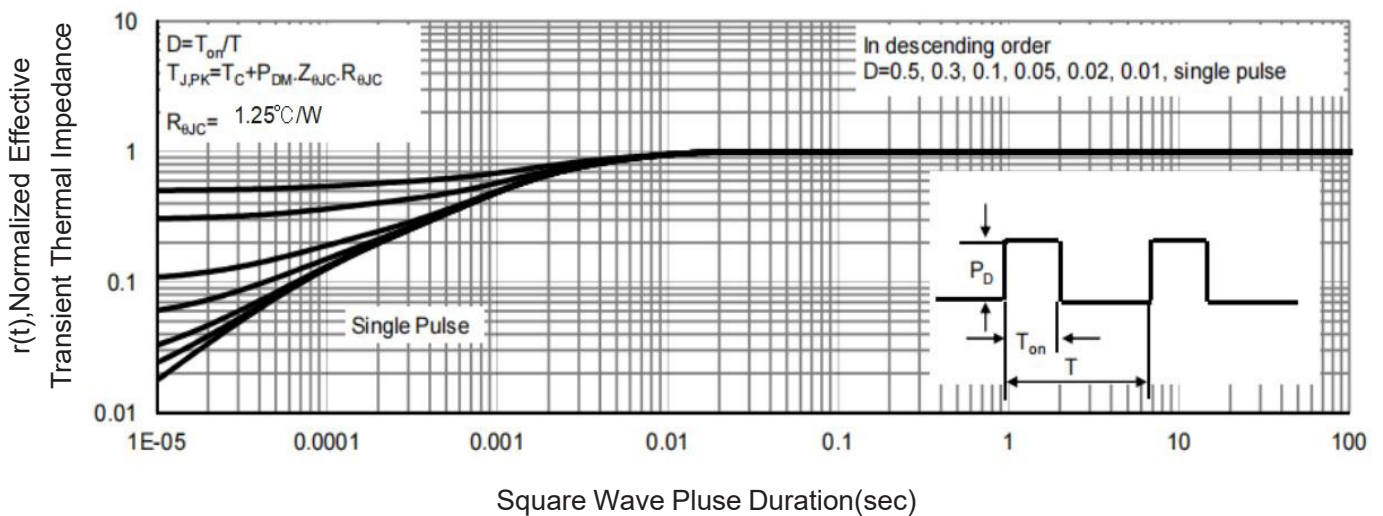


Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Current De-rating

Figure 8 Safe Operation Area

Figure 10 Power De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance