Description

These N-Channel enhancement mode power field effect transistors are using trench DMOS technology. This advanced technology has been especially tailored to minimize on-state resistance, provide superior switching performance, and with stand high energy pulse in the avalanche and commutation mode. These devices are well suited for high efficiency fast switching applications.

Features

- 60V,60A,$R_{DS(ON).max}$=11mΩ@V_{GS}=10V
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green device available

Applications

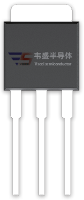
- Motor Drives
- UPS
- DC-DC Converter

Product Summary

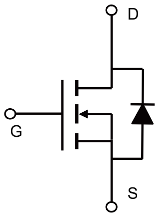
V_{DSS}	60V
$R_{DS(on).max}$@ V_{GS}=10V	11mΩ
I_D	60A

Pin Configuration

TO-252



TO-251



Schematic

Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	60	V
Continuous drain current (T_C = 25°C)	I_D	60	A
Continuous drain current (T_C = 100°C)		39	A
Pulsed drain current[1)]	I_{DM}	240	A
Gate-Source voltage	V_{GSS}	±20	V
Avalanche energy[2)]	E_{AS}	132	mJ
Power Dissipation (T_C = 25°C)	P_D	83	W
Storage Temperature Range	T_{STG}	-55 to +150	°C
Operating Junction Temperature Range	T_J	-55 to +150	°C

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	1.5	°C/W

Package Marking and Ordering Information

Device	Device Package	Marking
VSM60N06-T2	TO-252	VSM60N06-T2
VSM60N06-T1	TO-251	VSM60N06-T1

Electrical Characteristics

T_J = 25°C unless otherwise noted

Parameter	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Static characteristics						
Drain-source breakdown voltage	BV_{DSS}	V_{GS}=0 V, I_D=250uA	60	---	---	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250uA	1	1.6	2.5	V
Drain-source leakage current	I_{DSS}	V_{DS}=60V, V_{GS}=0V, T_J = 25°C	---	---	1	μA
		V_{DS}=48V, V_{GS}=0V, T_J = 125°C	---	---	30	μA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=20V, V_{DS}=0 V	---	---	100	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-20V, V_{DS}=0 V	---	---	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10V, I_D=20A	---	8	11	mΩ
		V_{GS}=4.5V, I_D=10A	---	11	14	mΩ
Forward transconductance	g_{fs}	V_{DS} =5V , I_D=20A	---	38	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 25V, V_{GS} = 0V, F = 1MHz	---	2767	---	pF
Output capacitance	C_{oss}		---	209	---	
Reverse transfer capacitance	C_{rss}		---	162	---	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 30V,V_{GS}=10V, I_D =25A	---	17	---	ns
Rise time	t_r		---	167.5	---	
Turn-off delay time	$t_{d(off)}$		---	315	---	
Fall time	t_f		---	73.5	---	
Gate resistance	R_g	V_{GS}=0V, V_{DS}=0V, F=1MHz	---	1.7	---	Ω
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DS}=48V, I_D=25A, V_{GS}= 10V	---	11.2	---	nC
Gate to drain charge	Q_{gd}		---	12.6	---	
Gate charge total	Q_g		---	55	---	
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	60	A
Pulsed Source Current$^{3)}$	I_{SM}		---	---	240	A
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=20A, T_J=25℃	---	---	1.2	V
Reverse Recovery Time	t_{rr}	I_S=25A,di/dt=100A/us, T_J=25℃	---	29.6	---	ns
Reverse Recovery Charge	Q_{rr}		---	40.5	---	nC

Notes:

1: Repetitive Rating: Pulse width limited by maximum junction temperature.

2: V_{DD}=25V, V_{GS}=10V, L=0.5mH, I_{AS}=23A, R_G=25Ω, Starting T_J=25℃.

3: Pulse Test：Pulse Width ≤300 μs, Duty Cycle≤2%.

Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

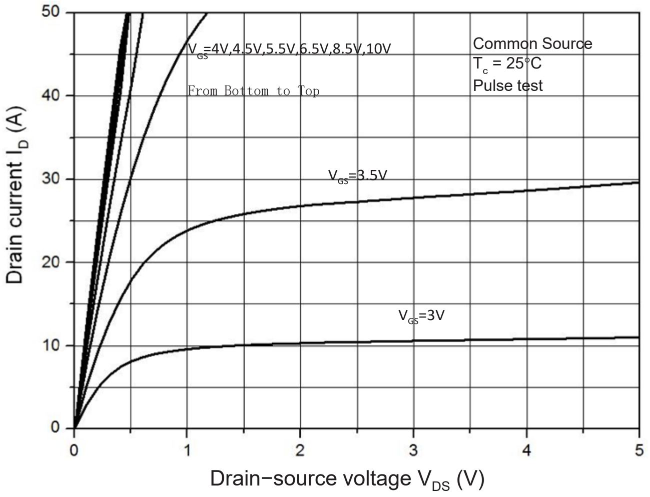


Figure 2. Transfer Characteristics

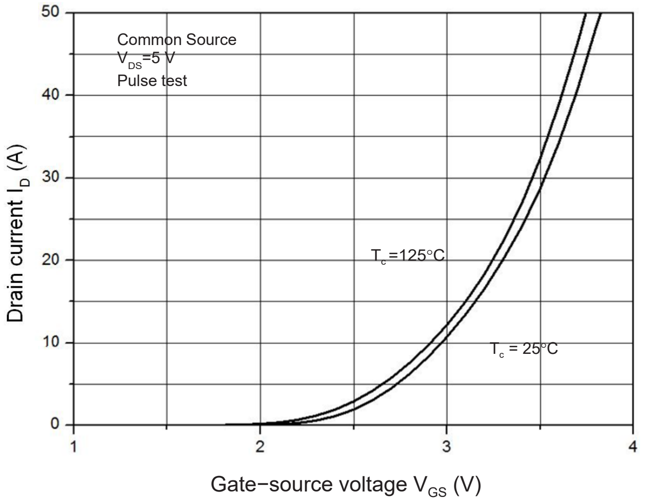


Figure 3. Capacitance Characteristics

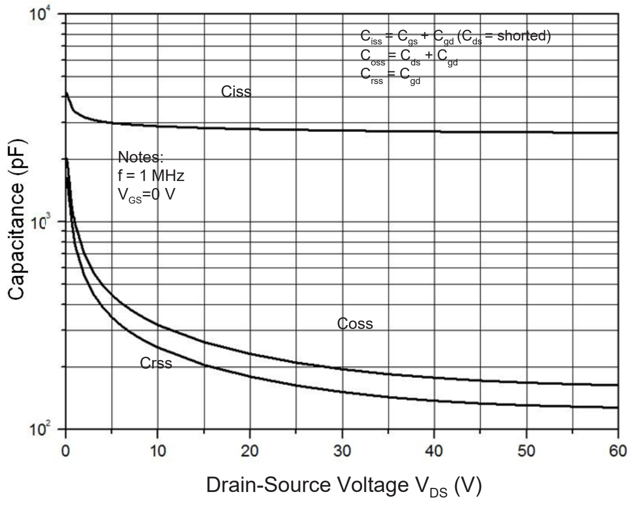


Figure 4. Gate Charge Waveform

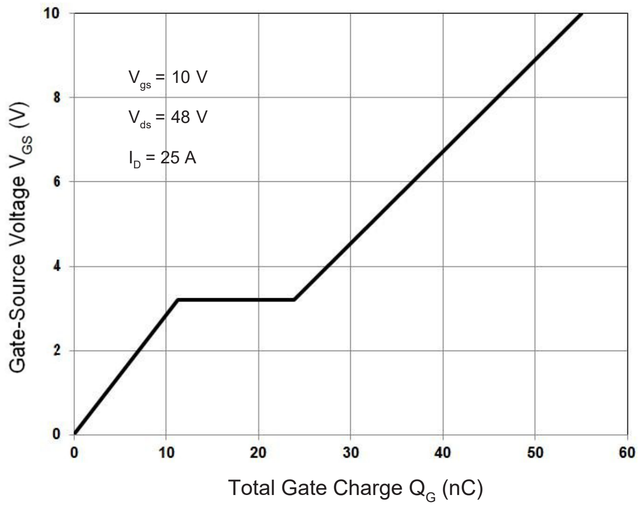


Figure 5. Body-Diode Characteristics

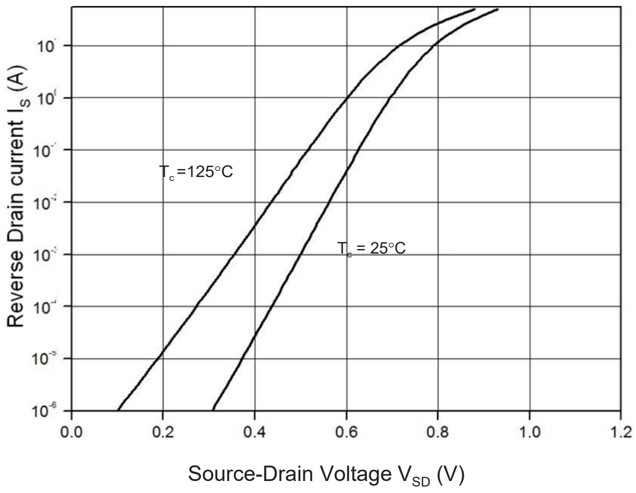


Figure 6. Rdson-Drain Current

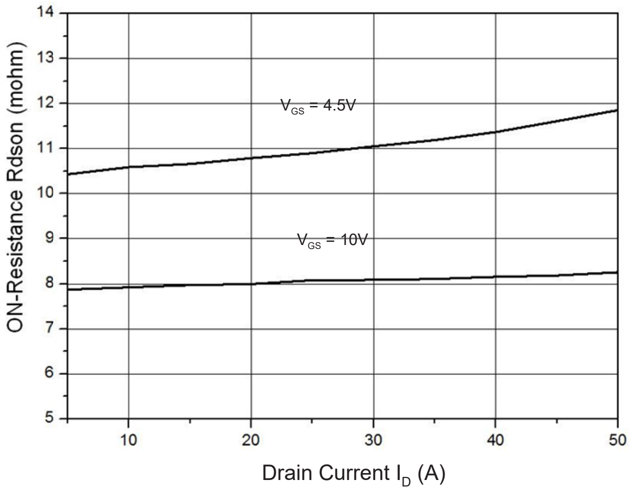


Figure 7. Rdson-Junction Temperature(℃)

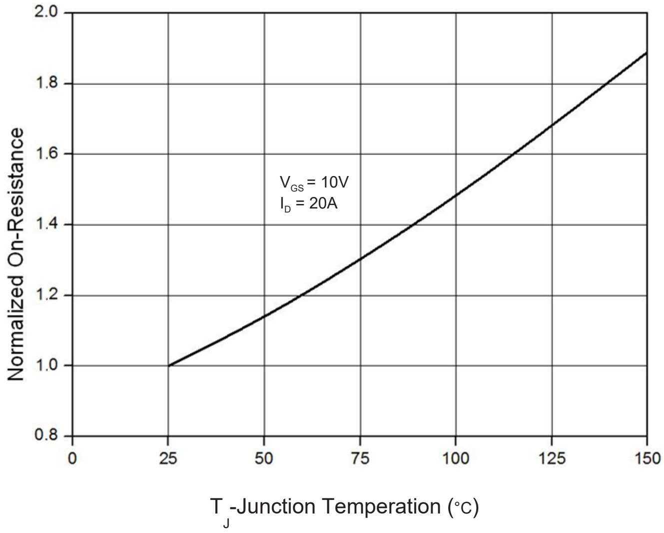


Figure 8. Maximum Safe Operating Area

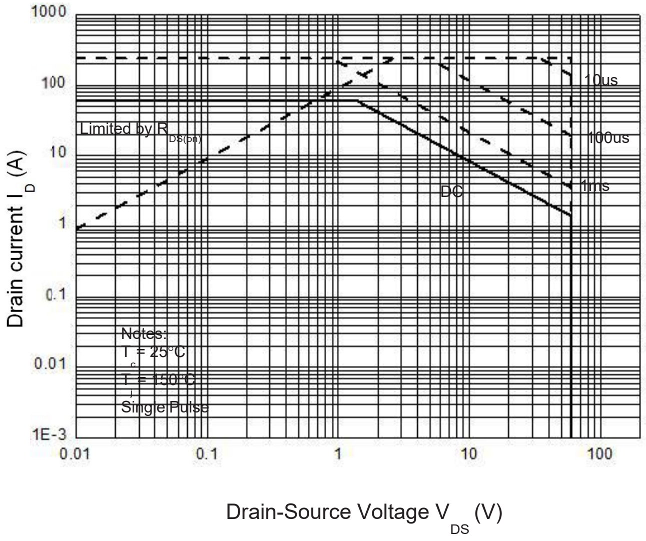
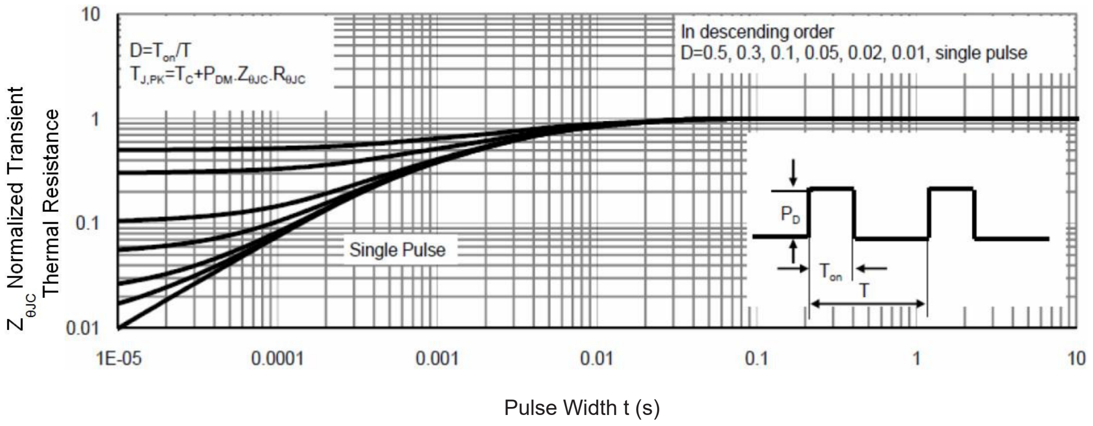


Figure 6. Normalized Maximum Transient Thermal Impedance (RthJC)



Test Circuit & Waveform

Figure 8. Gate Charge Test Circuit & Waveform

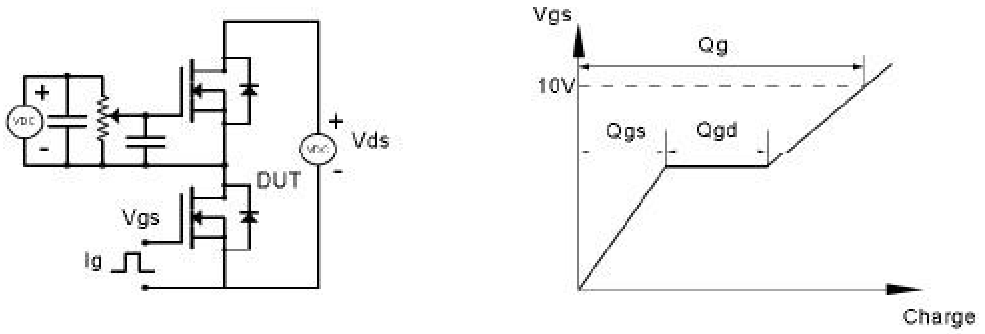


Figure 9. Resistive Switching Test Circuit & Waveforms

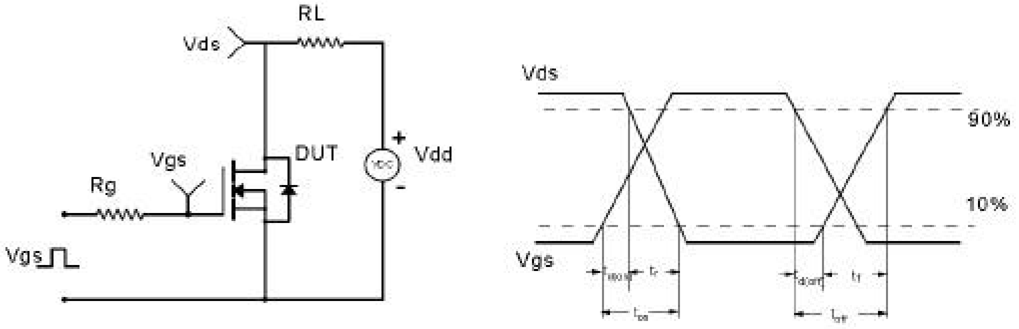


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

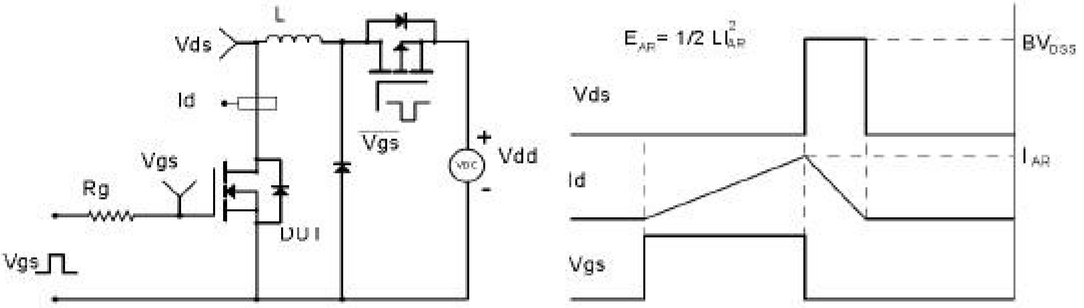


Figure 11. Diode Recovery Circuit & Waveform