

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,45A, $R_{DS(ON).max}=14m\Omega@V_{GS}=10V$
- ◆ Improved dv/dt capability
- ◆ Fast switching
- ◆ 100% EAS Guaranteed
- ◆ Green device available

Applications

- ◆ Motor Drives
- ◆ UPS
- ◆ DC-DC Converter

Product Summary

V_{DSS}	60V
$R_{DS(on).max}@V_{GS}=10V$	14m Ω
I_D	45A

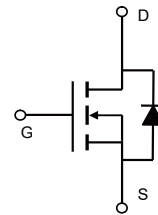
Pin Configuration



TO-252



TO-251



Schematic

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	60	V
Continuous drain current ($T_C = 25^\circ\text{C}$)	I_D	45	A
Continuous drain current ($T_C = 100^\circ\text{C}$)		31	A
Pulsed drain current ¹⁾	I_{DM}	180	A
Gate-Source voltage	V_{GSS}	± 20	V
Avalanche energy ²⁾	E_{AS}	56	mJ
Power Dissipation ($T_C = 25^\circ\text{C}$)	P_D	62.5	W
Storage Temperature Range	T_{STG}	-55 to +150	$^\circ\text{C}$
Operating Junction Temperature Range	T_J	-55 to +150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Value	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	2	$^\circ\text{C/W}$

Package Marking and Ordering Information

Device	Device Package	Marking
VSM45N06-T2	TO-252	VSM45N06-T2
VSM45N06-T1	TO-251	VSM45N06-T1

Electrical Characteristics

 $T_J = 25^{\circ}\text{C}$ 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	0.9	1.4	1.9	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	---	10	14	mΩ
		V _{GS} =4.5V, I _D =10A	---	11.5	15	mΩ
Forward transconductance	g _{fs}	V _{DS} =5V , I _D =20A	---	86	---	S
Dynamic characteristics						
Input capacitance	C _{iss}	V _{DS} = 25V, V _{GS} = 0V, F = 1MHz	---	2320	---	pF
Output capacitance	C _{oss}		---	168	---	
Reverse transfer capacitance	C _{rss}		---	128	---	
Turn-on delay time	t _{d(on)}	V _{DD} = 30V,V _{GS} =15V, I _D =20A	---	18.5	---	ns
Rise time	t _r		---	16.1	---	
Turn-off delay time	t _{d(off)}		---	107.6	---	
Fall time	t _f		---	55.7	---	
Gate resistance	R _g	V _{GS} =0V, V _{DS} =0V, F=1MHz	---	1.84	---	Ω
Gate charge characteristics						
Gate to source charge	Q _{gs}	V _{DS} =30V, I _D =20A, V _{GS} = 10V	---	10	---	nC
Gate to drain charge	Q _{gd}		---	8.1	---	
Gate charge total	Q _g		---	50	---	
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I _S		---	---	45	A
Pulsed Source Current ⁽³⁾	I _{SM}		---	---	180	A
Diode Forward Voltage	V _{SD}	V _{GS} =0V, I _S =20A, T _J =25°C	---	---	1.2	V
Reverse Recovery Time	t _{rr}	I _S =20A,di/dt=100A/us, T _J =25°C	---	38.2	---	ns
Reverse Recovery Charge	Q _{rr}		---	32.5	---	nC

Notes:

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

2: $V_{DD}=25\text{V}, V_{GS}=10\text{V}, L=0.5\text{mH}, I_{AS}=15\text{A}, R_G=25\Omega$, Starting $T_J=25^{\circ}\text{C}$.

3: Pulse Test: Pulse Width $\leq 300\mu\text{s}$, Duty Cycle $\leq 2\%$.

Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

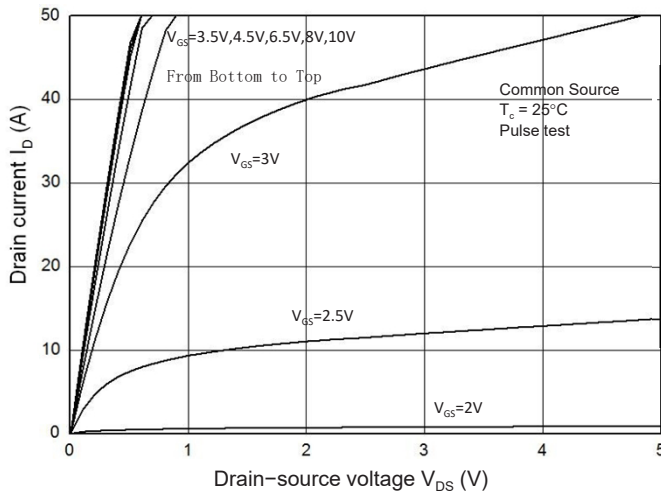


Figure 2. Transfer Characteristics

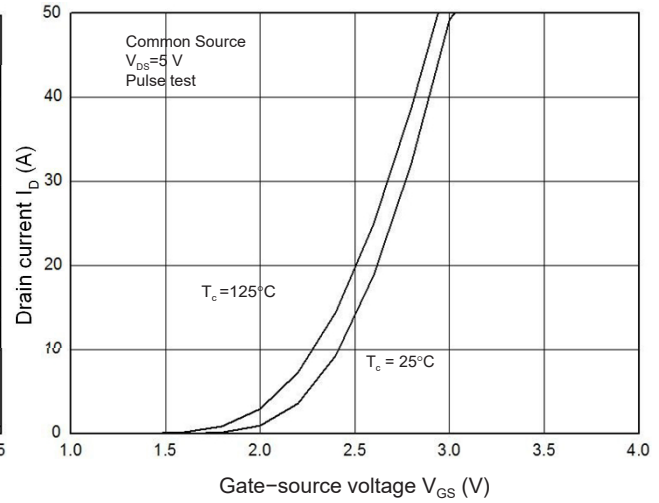


Figure 3. Capacitance Characteristics

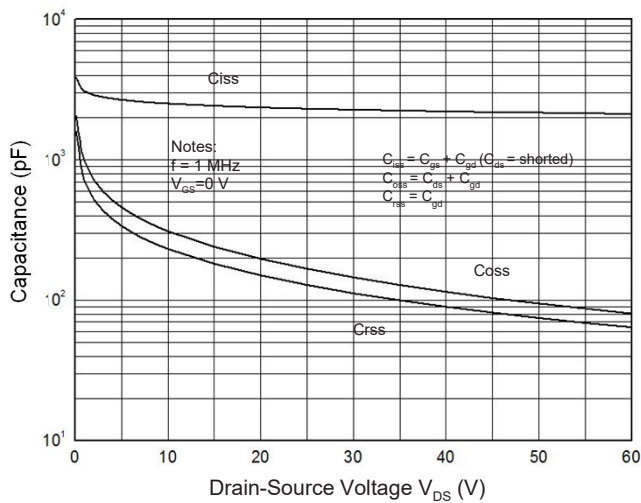


Figure 4. Gate Charge Waveform

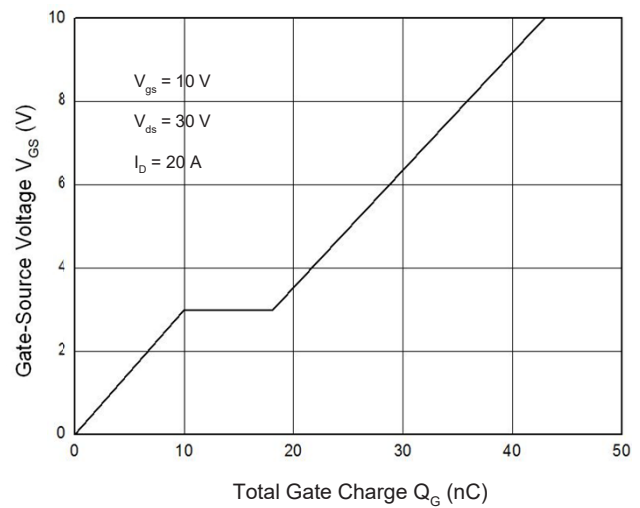


Figure 5. Body-Diode Characteristics

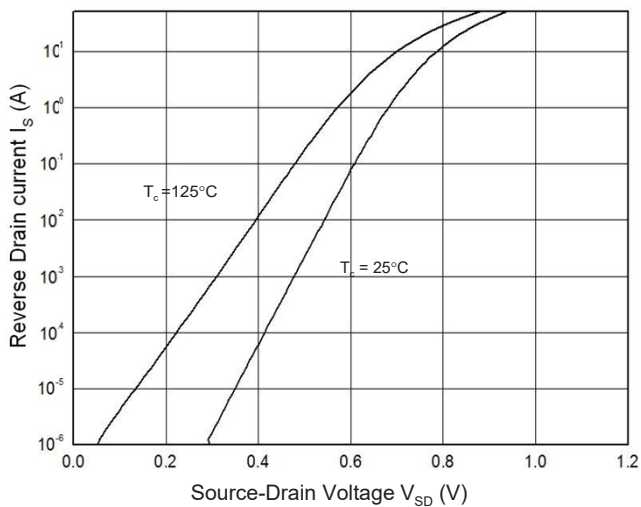


Figure 6. Rdson-Drain Current

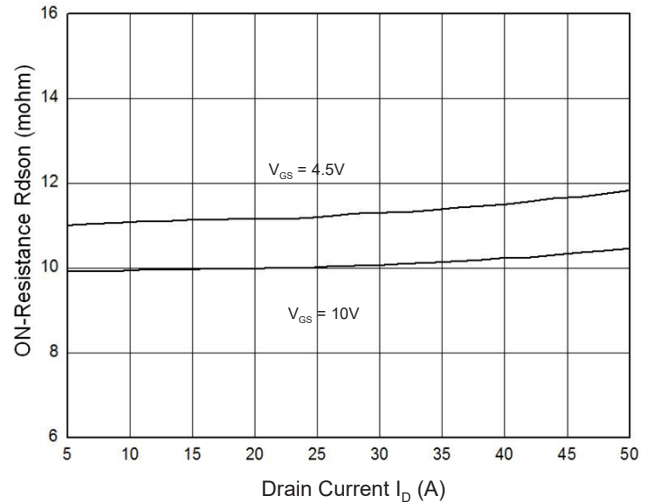


Figure 7. Rdson-Junction Temperature(°C)

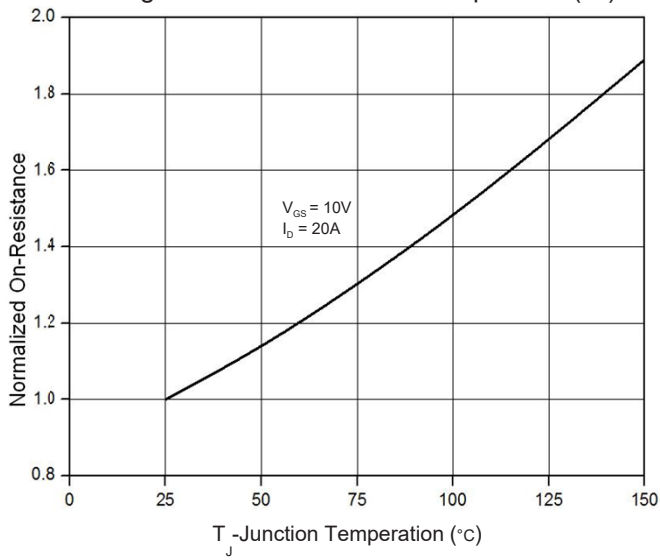


Figure 8. Maximum Safe Operating Area

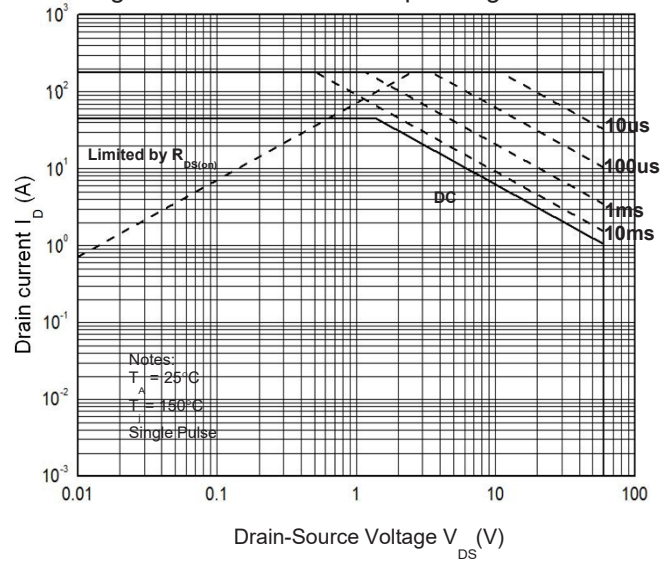
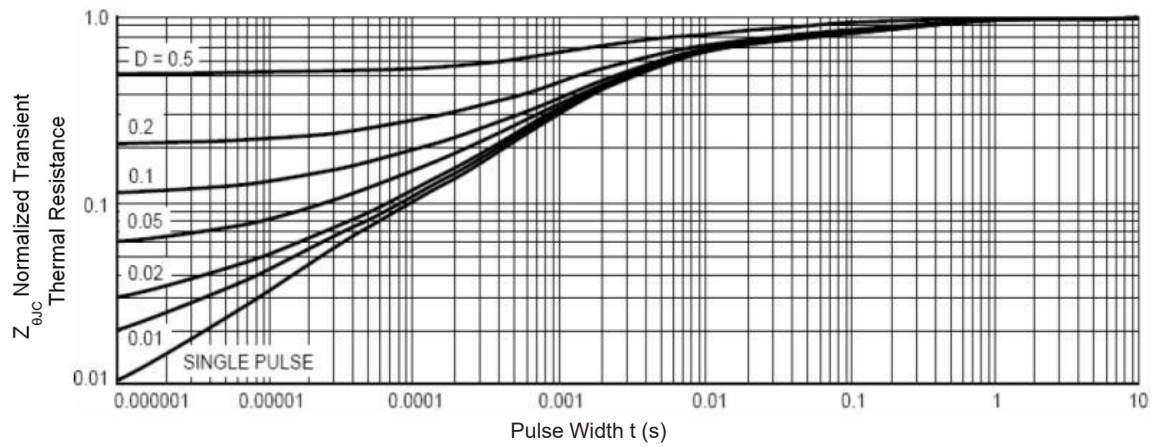


Figure 6. Normalized Maximum Transient Thermal Impedance (RthJC)



Test Circuit & Waveform

Figure 8. Gate Charge Test Circuit & Waveform

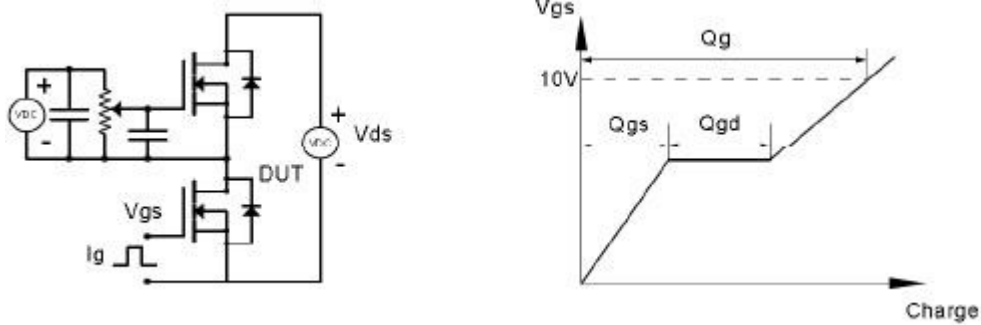


Figure 9. Resistive Switching Test Circuit & Waveforms

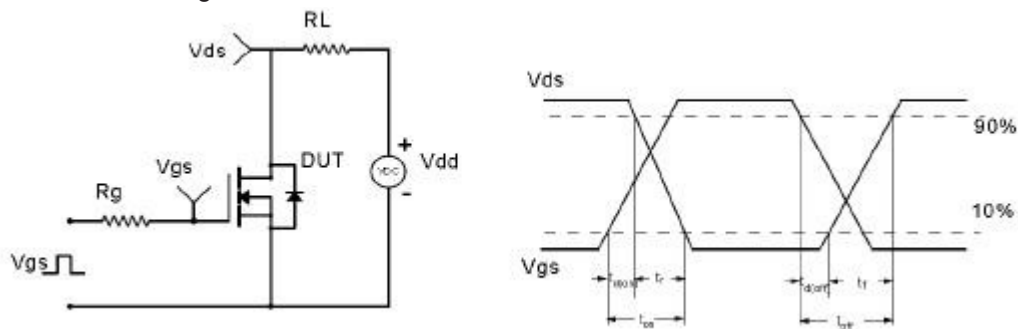


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

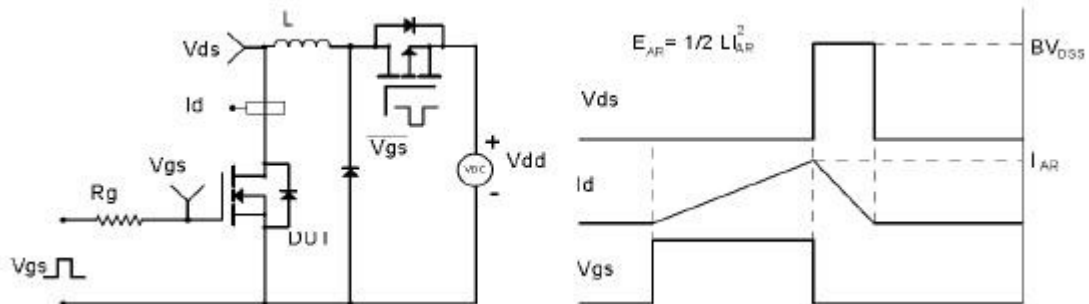


Figure 11. Diode Recovery Circuit & Waveform

