

### 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

- ◆ 100V,80A, $R_{DS(on).max}=18m\Omega@V_{GS}=10V$
- ◆ Improved dv/dt capability
- ◆ Fast switching
- ◆ 100% EAS Guaranteed
- ◆ Green device available

### Applications

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

### Product Summary

$V_{DSS}$	100V
$R_{DS(on).max}@V_{GS}=10V$	18m $\Omega$
$I_D$	80A

### Pin Configuration



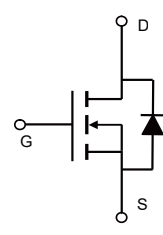
TO-263



TO-220C



TO-220F



Schematic

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

Parameter	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	100	V
Continuous drain current ( $T_C = 25^\circ\text{C}$ ) <sup>1)</sup>	$I_D$	80	A
Continuous drain current ( $T_C = 100^\circ\text{C}$ ) <sup>1)</sup>		57	A
Pulsed drain current <sup>2)</sup>	$I_{DM}$	320	A
Gate-Source voltage	$V_{GSS}$	$\pm 20$	V
Avalanche energy <sup>3)</sup>	$E_{AS}$	240	mJ
Power Dissipation ( $T_C = 25^\circ\text{C}$ ) C C TO-220/TO-263	$P_D$	147	W
Power Dissipation ( $T_C = 25^\circ\text{C}$ ) C C TO-220F		49	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 C C TO-220/TO-263	$R_{\theta JC}$	0.85	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case C C TO-220F		2.55	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient C C TO-220/TO-263	$R_{\theta JA}$	62	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Ambient C C TO-220F		80	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Device	Device Package	Marking
VSM80N10-T3	TO-263	VSM80N10-T3
VSM80N10-TF	TO-220F	VSM80N10-TF
VSM80N10-TC	TO-220C	VSM80N10-TC

## 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 <sub>DSS</sub>	V <sub>GS</sub> =0 V, I <sub>D</sub> =250uA	100	---	---	V
Gate threshold voltage	V <sub>GS(th)</sub>	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA	1.0	---	3.0	V
Drain-source leakage current	I <sub>DSS</sub>	V <sub>DS</sub> =100V, V <sub>GS</sub> =0V, T <sub>J</sub> = 25°C	---	---	1	μA
		V <sub>DS</sub> =80V, V <sub>GS</sub> =0V, T <sub>J</sub> = 125°C	---	---	10	μA
Gate leakage current, Forward	I <sub>GSSF</sub>	V <sub>GS</sub> =20 V, V <sub>DS</sub> =0 V	---	---	100	nA
Gate leakage current, Reverse	I <sub>GSSR</sub>	V <sub>GS</sub> =-20 V, V <sub>DS</sub> =0 V	---	---	-100	nA
Drain-source on-state resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> =10 V, I <sub>D</sub> =16 A	---	13.5	18	mΩ
		V <sub>GS</sub> =4.5 V, I <sub>D</sub> =8 A	---	16	23	mΩ
Forward transconductance	g <sub>fs</sub>	V <sub>DS</sub> =10V , I <sub>D</sub> =20A	---	85	---	S
Dynamic characteristics						
Input capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 50 V, V <sub>GS</sub> = 0 V, F = 1MHz	---	6102	---	pF
Output capacitance	C <sub>oss</sub>		---	215	---	
Reverse transfer capacitance	C <sub>rss</sub>		---	159	---	
Turn-on delay time	t <sub>d(on)</sub>	V <sub>DD</sub> = 50V,V <sub>GS</sub> =10V, I <sub>D</sub> = 20A	---	20	---	ns
Rise time	t <sub>r</sub>		---	56	---	
Turn-off delay time	t <sub>d(off)</sub>		---	75	---	
Fall time	t <sub>f</sub>		---	36	---	
Gate resistance	R <sub>g</sub>	V <sub>GS</sub> =0V, V <sub>DS</sub> =0V, F=1MHz	---	1.5	---	Ω
Gate charge characteristics						
Gate to source charge	Q <sub>gs</sub>	V <sub>DS</sub> =50 V, I <sub>D</sub> =20A, V <sub>GS</sub> = 10 V	---	18	---	nC
Gate to drain charge	Q <sub>gd</sub>		---	32	---	
Gate charge tota	Q <sub>g</sub>		---	127	---	
Drain-Source diode characteristics and Maximum Ratings						
Diode Forward Voltage <sup>4)</sup>	V <sub>SD</sub>	V <sub>GS</sub> =0V, I <sub>S</sub> =50A, T <sub>J</sub> =25°C	---	0.85	1.3	V
Reverse Recovery Time	t <sub>rr</sub>	I <sub>S</sub> =20A, di/dt=60A/us, T <sub>J</sub> =25°C	---	160	---	ns
Reverse Recovery Charge	Q <sub>rr</sub>		---	136	---	nC

Notes:

- 1: The maximum junction current rating is package limited.
- 2: Repetitive Rating: Pulse width limited by maximum junction temperature.
- 3:  $V_{DD}=50\text{V}, V_{GS}=10\text{V}, L=0.5\text{mH}, I_{AS}=31\text{A}, R_G=25\Omega$ , Starting  $T_J=25^{\circ}\text{C}$ .
- 4: Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

## Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

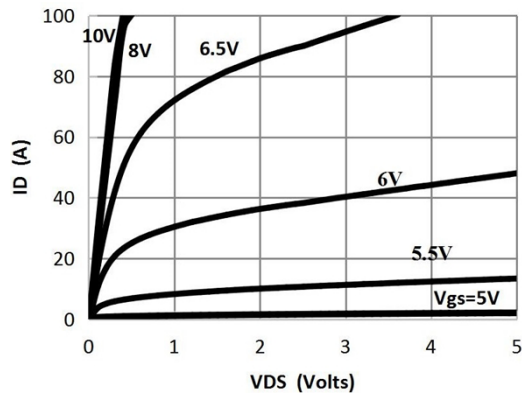


Figure 2. Transfer Characteristics

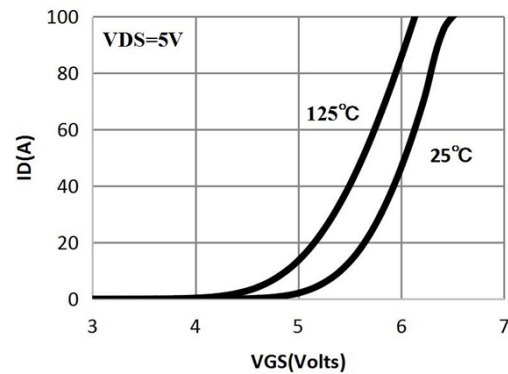


Figure 3. Capacitance Characteristics

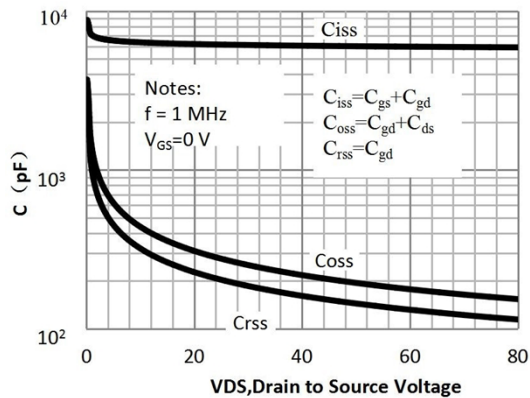


Figure 4. Gate Charge Waveform

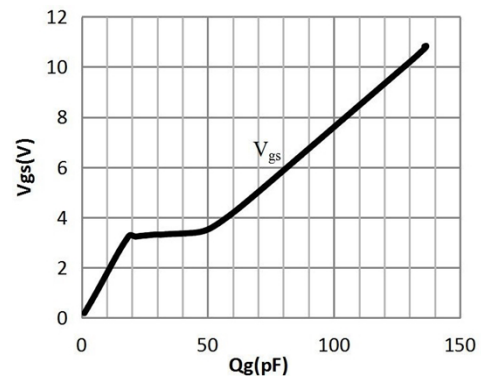


Figure 5. Body-Diode Characteristics

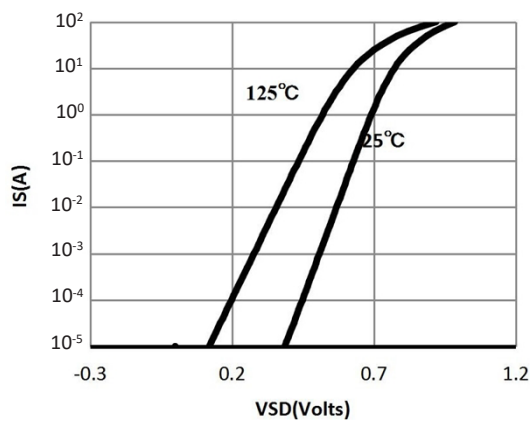


Figure 6. Maximum Safe Operating Area

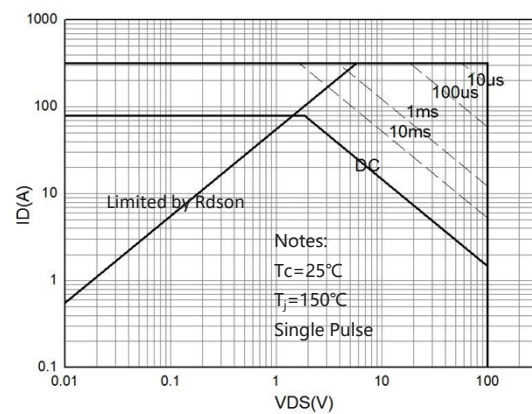
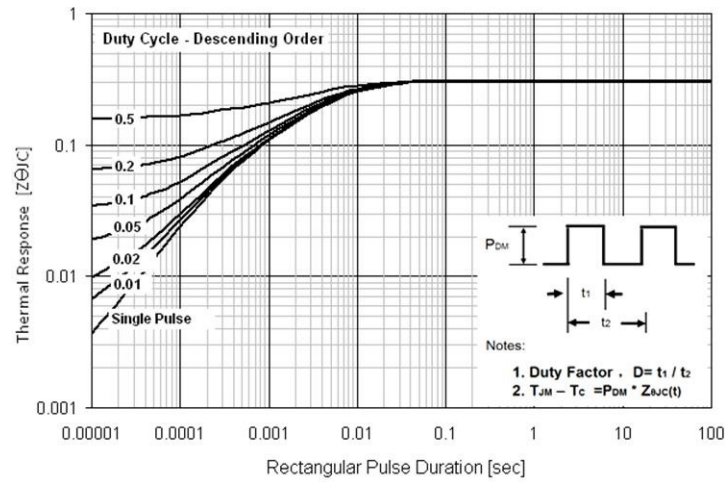
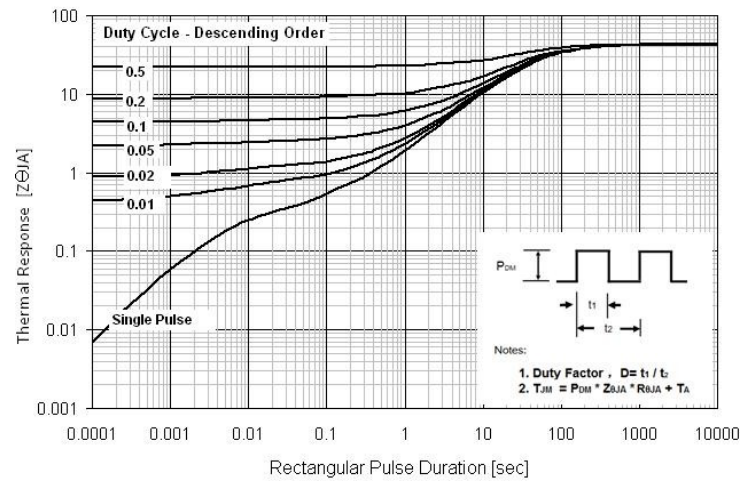


Figure 6. Normalized Maximum Transient Thermal Impedance ( $R_{thJC}$ )

Figure 7. Normalized Maximum Transient Thermal Impedance ( $R_{thJA}$ )


## Test Circuit & Waveform

Figure 8. Gate Charge Test Circuit &amp; Waveform

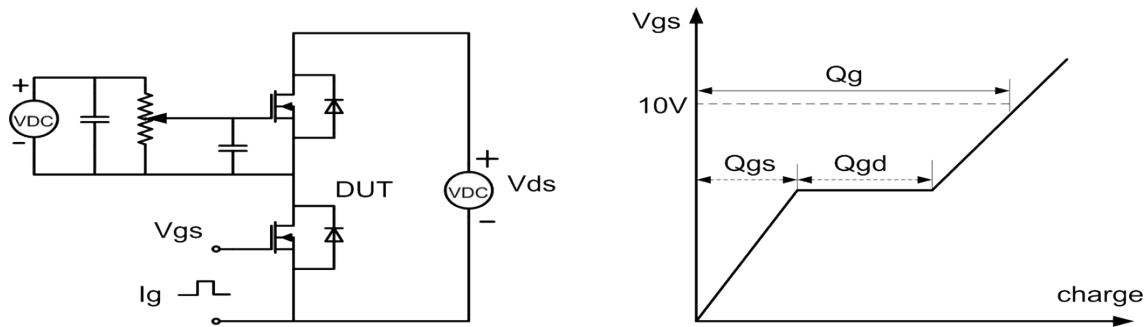


Figure 9. Resistive Switching Test Circuit &amp; Waveforms

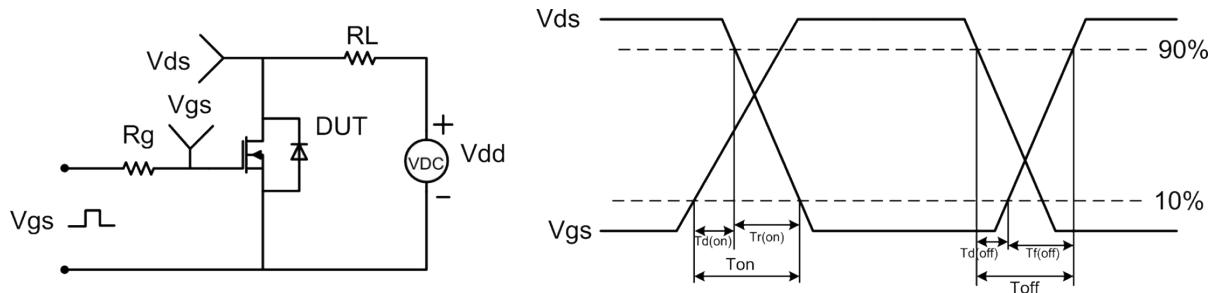


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit &amp; Waveform

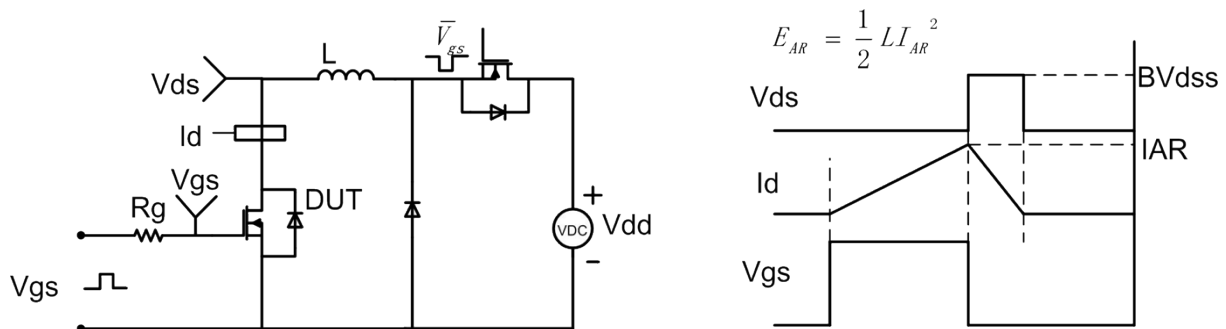


Figure 11. Diode Recovery Circuit &amp; Waveform

