Description

These N-Channel enhancement mode power field effect transistors are using **shielded gate 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

- 40V,65A,$R_{DS(on).max}$=3.5mΩ@V_{GS} = 10V
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green device available

Applications

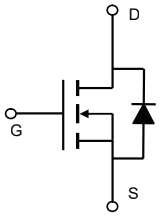
- Motor Drives
- UPS
- DC-DC Converter

Product Summary

V_{DSS}	40V
$R_{DS(on).max}$@ V_{GS}=10V	3.5mΩ
I_D	65A

Pin Configuration

TO-220F



Schematic

Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	40	V
Continuous drain current (T_C = 25°C)	I_D	65	A
(T_C = 100°C)		41	A
Pulsed drain current[1]	I_{DM}	260	A
Gate-Source voltage	V_{GSS}	±20	V
Avalanche energy[2]	E_{AS}	121	mJ
Power Dissipation	P_D	25	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	$R_{\theta JC}$	5.0	°C/W
Thermal Resistance, Junction-to-Ambient[3]	$R_{\theta JA}$	65	°C/W

Package Marking and Ordering Information

Device	Device Package	Marking	Units/Tube
VST04N035-TF	TO-220F	VST04N035-TF	50

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	40	---	---	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250uA	1.1	---	2.3	V
Drain-source leakage current	I_{DSS}	V_{DS}=40 V, V_{GS}=0 V, T_J = 25°C	---	---	1	μA
		V_{DS}=40 V, V_{GS}=0 V, T_J = 150°C	---	---	10	mA
Gate leakage current, Forward	I_{GSSF}	V_{GS}=20 V, V_{DS}=0 V	---	---	100	nA
Gate leakage current, Reverse	I_{GSSR}	V_{GS}=-20 V, V_{DS}=0 V	---	---	-100	nA
Drain-source on-state resistance	$R_{DS(on)}$	V_{GS}=10 V, I_D=40 A,T_J = 25°C	---	3.1	3.5	mΩ
Forward transconductance	g_{fs}	V_{DS} =20 V , I_D=30A	---	60	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 20 V, V_{GS} = 0 V, f = 1MHz	---	2038	---	pF
Output capacitance	C_{oss}		---	762.6	---	
Reverse transfer capacitance	C_{rss}		---	68.4	---	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 20V,V_{GS}=15V, I_D =40 A	---	9	---	ns
Rise time	t_r		---	9	---	
Turn-off delay time	$t_{d(off)}$		---	74.4	---	
Fall time	t_f		---	19.6	---	
Gate resistance	R_g	V_{GS}=0V, V_{DS}=0V, f=1MHz	---	1.8	---	Ω
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DS}=32 V, I_D=40A, V_{GS}= 10 V	---	5.82	---	nC
Gate to drain charge	Q_{gd}		---	7.1	---	
Gate charge total	Q_g		---	34.5	---	
Gate plateau voltage	$V_{plateau}$		---	3.1	---	V
Output Charge	Q_{oss}	V_{DS}=32 V,V_{GS}= 0V	---	31	---	nC
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	20	A
Pulsed Source Current[4)]	I_{SM}		---	---	80	A
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=40A, T_J=25℃	---	---	1.2	V
Reverse Recovery Time	t_{rr}	I_S=40A, di/dt=100A/us, T_J=25℃	---	36	---	ns
Reverse Recovery Charge	Q_{rr}		---	37.9	---	nC

Notes:

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

2: V_{DD}=20V, V_{GS}=10V, L=0.5mH, I_{AS}=22A, R_G=25Ω, Starting T_J=25℃.

3: The value of R_{thJA} is measured by placing the device in a still air box which is one cubic foot.

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

Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

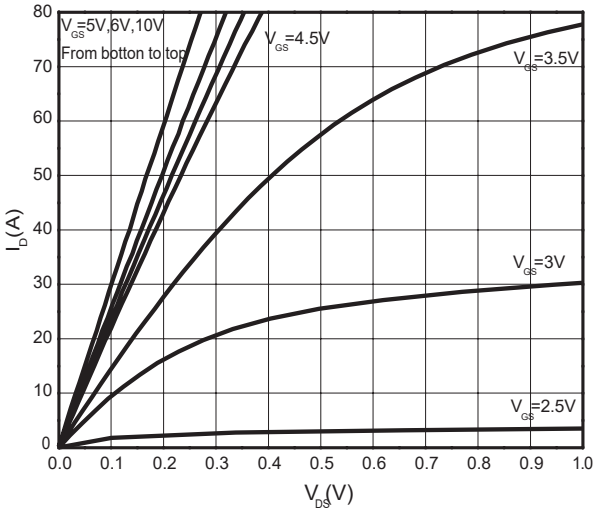


Figure 2. Transfer Characteristics

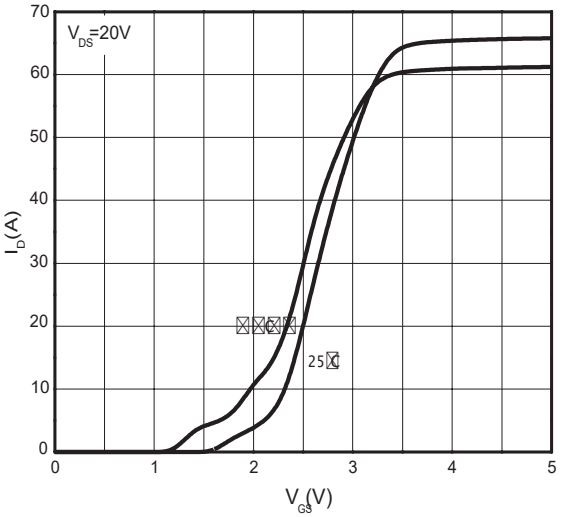


Figure 3. On-Resistance Variation vs.Drain Current

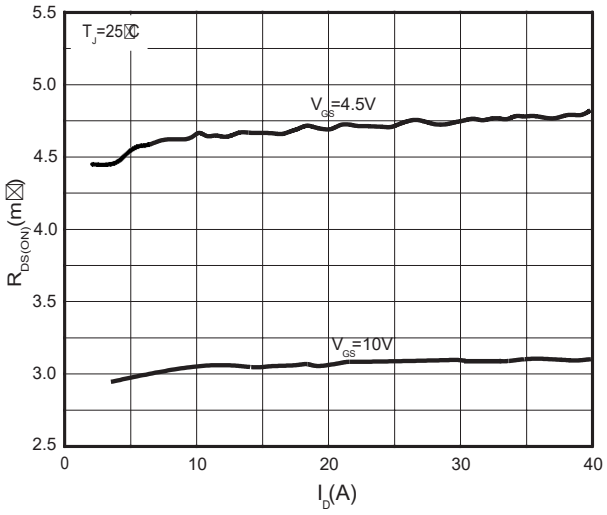


Figure 4.Threshold Voltage vs.Temperature

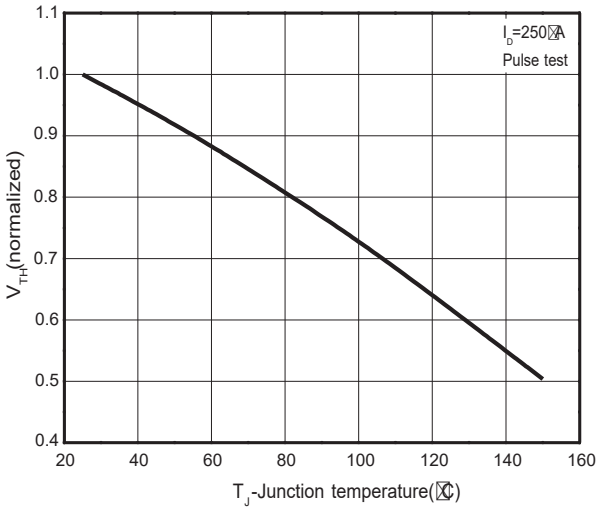


Figure 5.Breakdown Voltage vs.Temperature

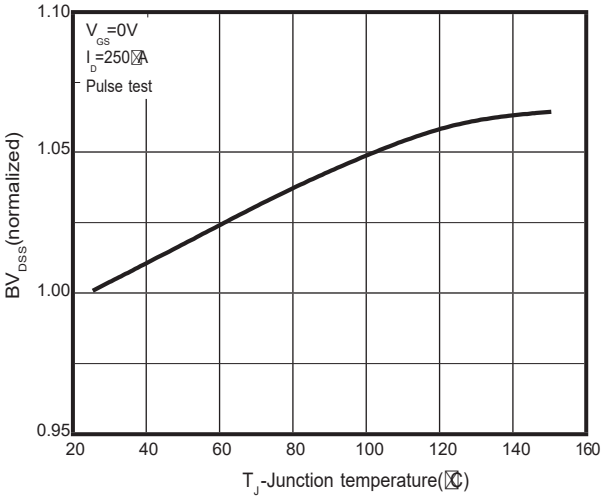


Figure 6.On-Resistance vs.Temperature

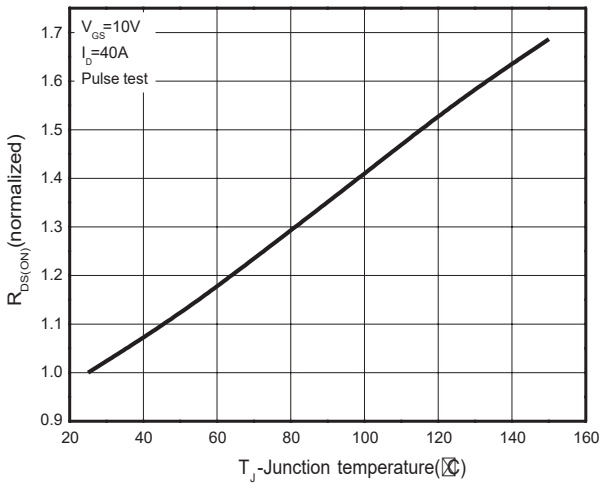


Figure 7.Rds(on) vs. Gate Voltage

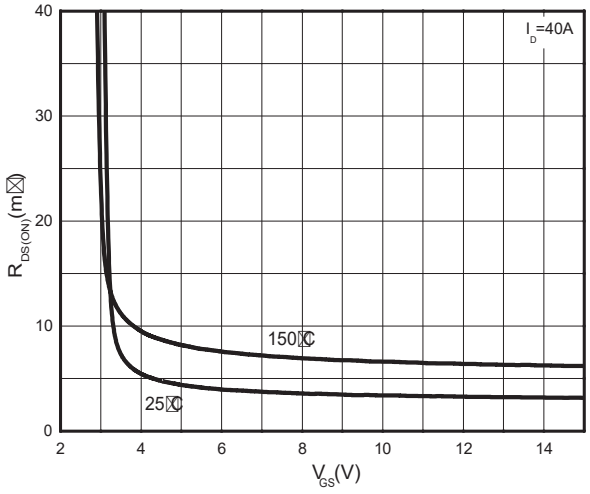


Figure 8.Body-Diode Characteristics

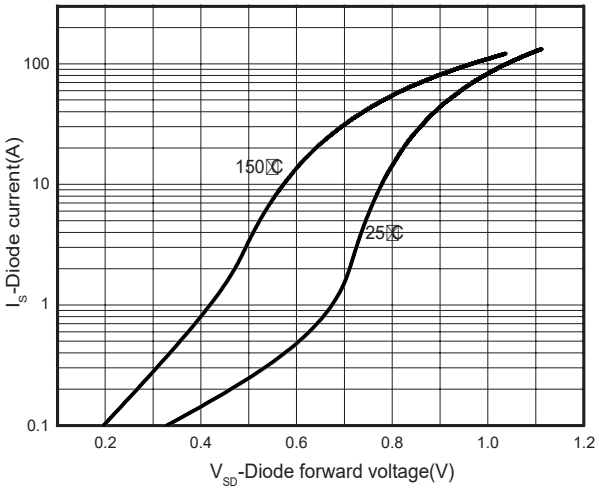


Figure 9.Capacitance Characteristics

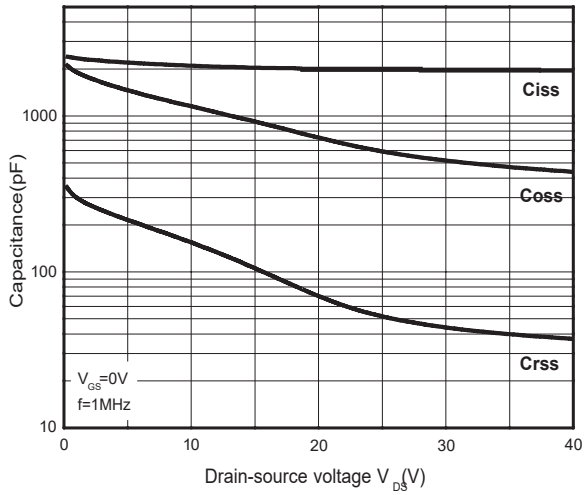


Figure 10.Gate Charge Characteristics

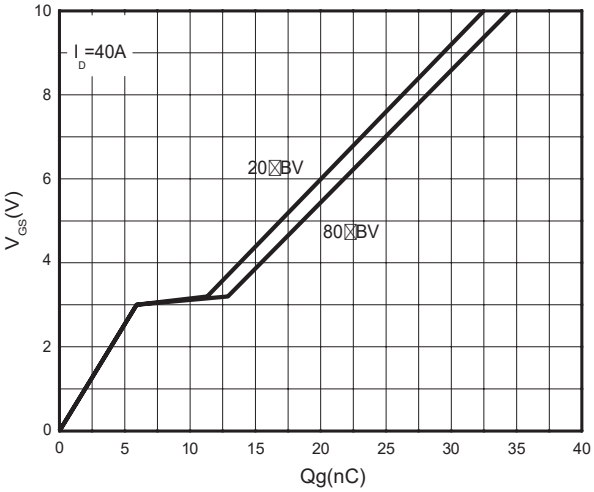


Figure 11.Drain Current Derating

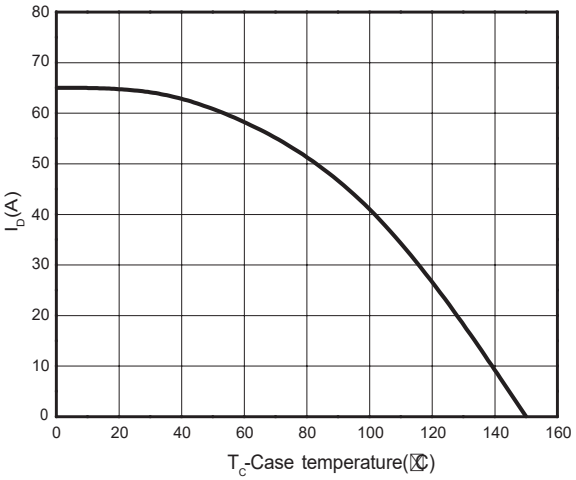


Figure 12.Power Dissipation vs.Temperature

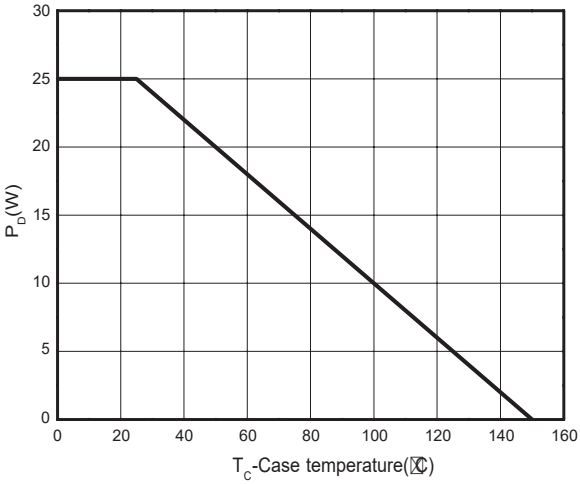


Figure 13: Safe Operating Area

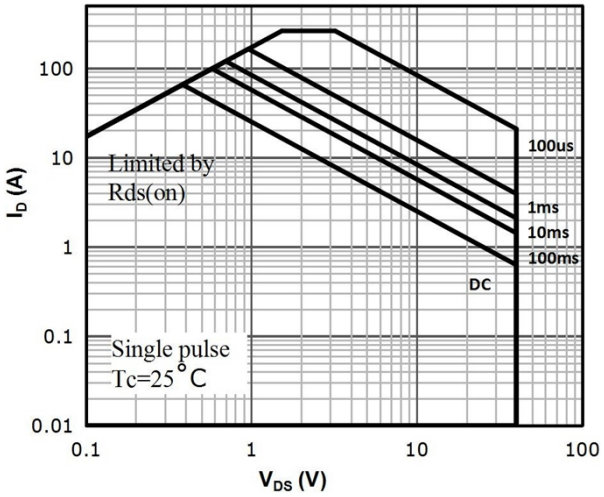
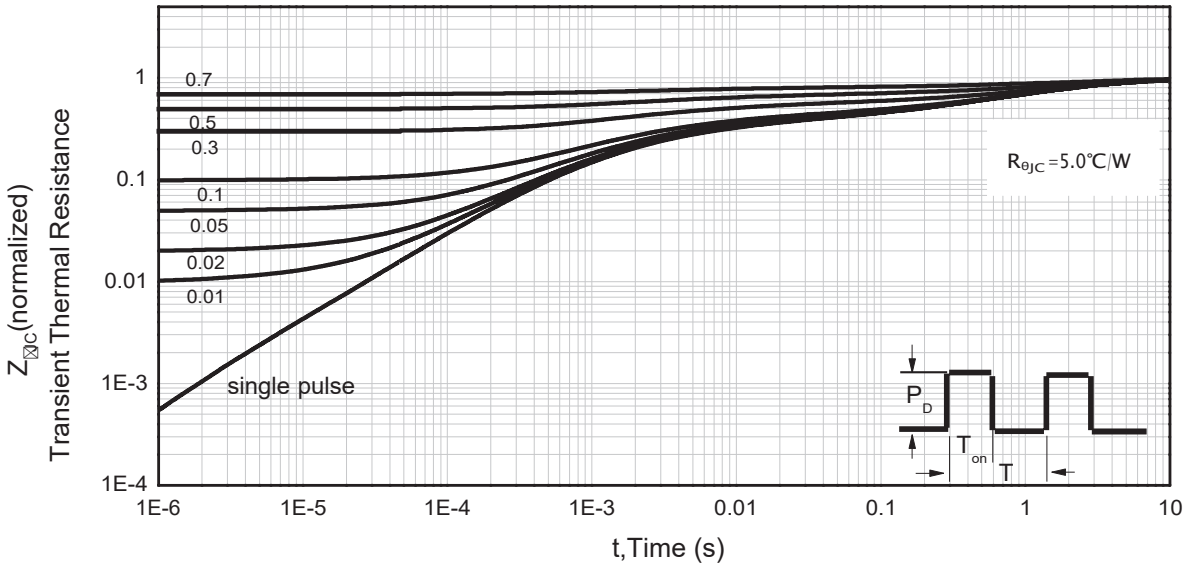
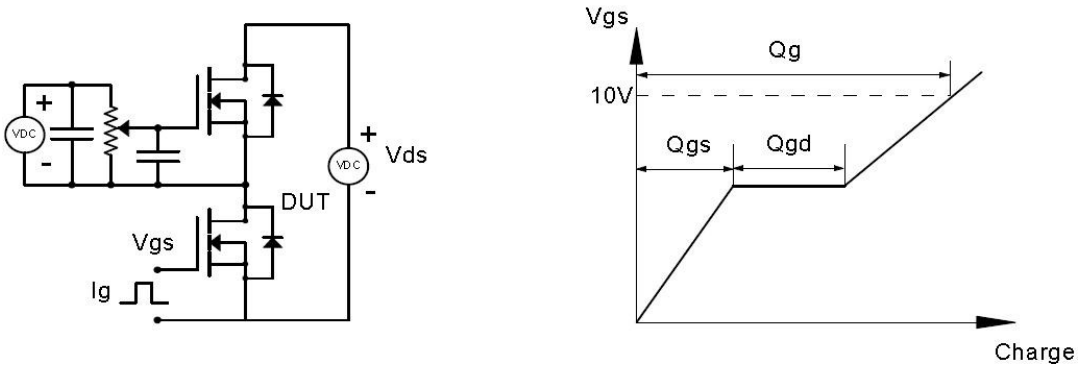


Figure 14. Normalized Maximum Transient Thermal Impedance (RthJC)

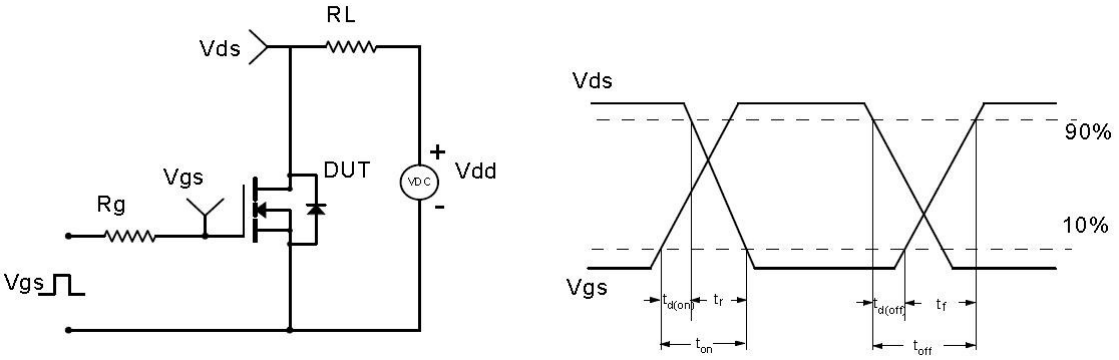


Test Circuit & Waveforms

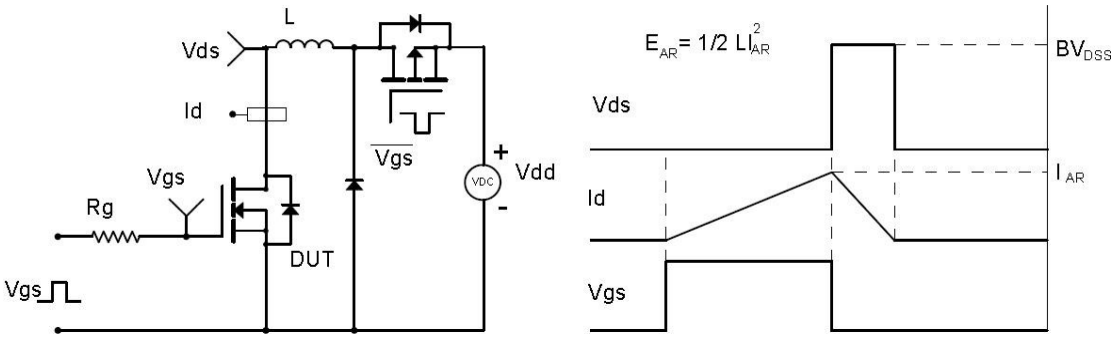
Gate Charge Test Circuit & Waveform



Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms



Diode Recovery Test Circuit & Waveforms