Description

These N-Channel enhancement mode power field effect transistors are using split 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

- 100V,120A,RDS(ON)=4.0mΩ@VGS = 10V
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green device available

Applications

- Motor Drives
- UPS
- DC-DC Converter

Product Summary

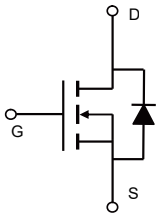
V_{DSS}	100V
$R_{DS(on),max}$@ V_{GS}=10V	4.0mΩ
I_D	120A

Pin Configuration

TO-263

TO-220F

TO-220C



Schematic

Absolute Maximum Ratings T_C = 25°C unless otherwise noted

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	100	V
Continuous drain current (T_C = 25°C)[1]	I_D	120	A
Continuous drain current (T_C = 100°C)[1]		100	A
Pulsed drain current[2]	I_{DM}	480	A
Gate-Source voltage	V_{GSS}	±20	V
Avalanche energy[3]	E_{AS}	300	mJ
Power Dissipation (T_C = 25°C) TO-220C /TO-263	P_D	227	W
Power Dissipation (T_C = 25°C) TO-220F		57	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 TO-220C /TO-263	$R_{\theta JC}$	0.55	°C/W
Thermal Resistance, Junction-to-Case TO-220F		2.2	°C/W
Thermal Resistance, Junction-to-Ambient TO-220C /TO-263	$R_{\theta JA}$	62	°C/W
Thermal Resistance, Junction-to-Case TO-220F		80	°C/W

Package Marking and Ordering Information

Device	Device Package	Marking
VST10N040-T3	TO-263	VST10N040-T3
VST10N040-TF	TO-220F	VST10N040-TF
VST10N040-TC	TO-220C	VST10N040-TC

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	100	---	---	V
Gate threshold voltage	$V_{GS(th)}$	V_{DS}=V_{GS}, I_D=250uA	2.0	3.0	4.0	V
Drain-source leakage current	I_{DSS}	V_{DS}=100 V, V_{GS}=0V, T_J = 25°C	---	---	1	μA
		V_{DS}=80 V, V_{GS}=0V, T_J = 125°C	---	---	10	μA
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=50 A	---	3.3	4.0	mΩ
Forward transconductance	g_{fs}	V_{DS} =10V , I_D=20A	---	85	---	S
Dynamic characteristics						
Input capacitance	C_{iss}	V_{DS} = 50 V, V_{GS} = 0 V, F = 1MHz	---	8229	---	pF
Output capacitance	C_{oss}		---	909	---	
Reverse transfer capacitance	C_{rss}		---	20	---	
Turn-on delay time	$t_{d(on)}$	V_{DD} = 50V,V_{GS}=10V, I_D = 20A	---	42	---	ns
Rise time	t_r		---	49.2	---	
Turn-off delay time	$t_{d(off)}$		---	239	---	
Fall time	t_f		---	68.4	---	
Gate resistance	R_g	V_{GS}=0V, V_{DS}=0V, F=1MHz	---	2.53	---	Ω
Gate charge characteristics						
Gate to source charge	Q_{gs}	V_{DS}=50 V, I_D=20A, V_{GS}= 10 V	---	33	---	nC
Gate to drain charge	Q_{gd}		---	35	---	
Gate charge total	Q_g		---	117	---	
Drain-Source diode characteristics and Maximum Ratings						
Continuous Source Current	I_S		---	---	120	A
Pulsed Source Current[4)]	I_{SM}		---	---	480	A
Diode Forward Voltage	V_{SD}	V_{GS}=0V, I_S=50A, T_J=25℃	---	0.85	1.3	V
Reverse Recovery Time	t_{rr}	I_S=20A, di/dt=60A/us, T_J=25℃	---	110	---	ns
Reverse Recovery Charge	Q_{rr}		---	232	---	nC

Notes:

1: The maximum junction current rating is package limited.

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

3: V_{DD}=50V, V_{GS}=10V, L=0.5mH, I_{AS}=35A, R_G=25Ω, Starting T_J=25℃.

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

Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

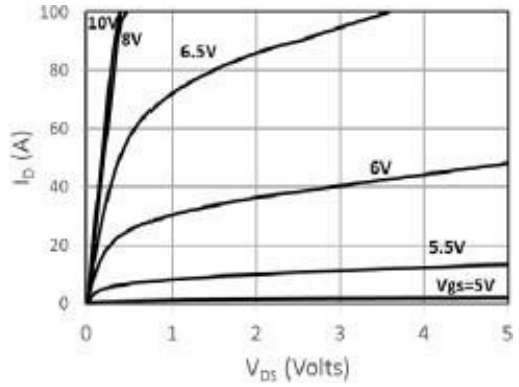


Figure 2. Transfer Characteristics

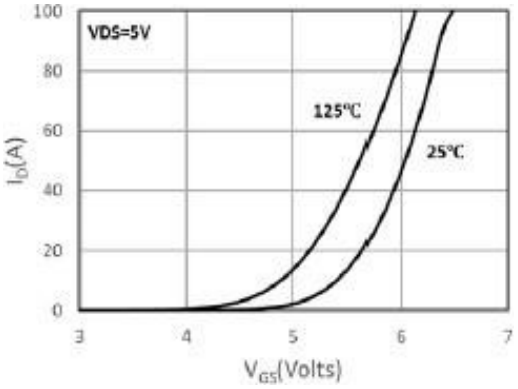


Figure 3. Capacitance Characteristics

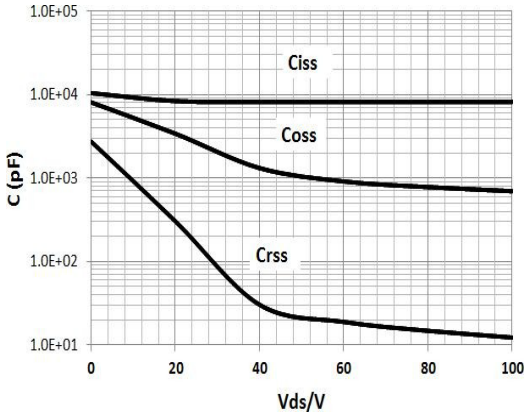


Figure 4. Gate Charge Waveform

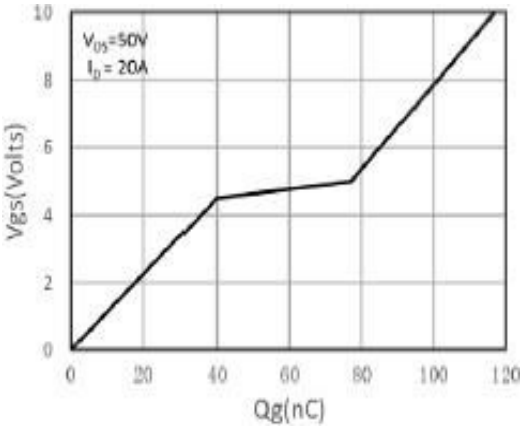


Figure 5. Body-Diode Characteristics

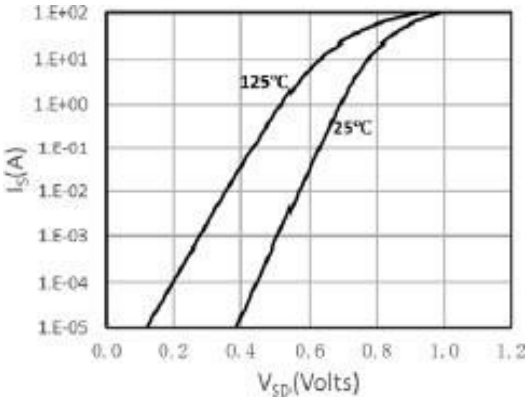


Figure 6. Maximum Safe Operating Area

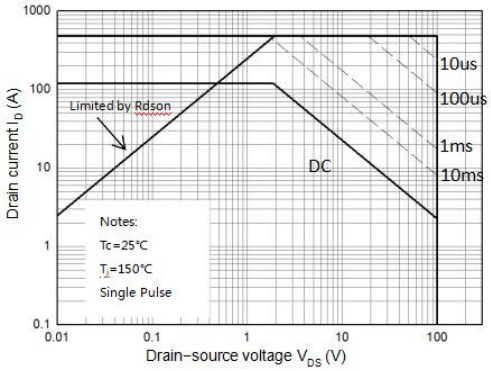


Figure 6. Normalized Maximum Transient Thermal Impedance(RthJC)

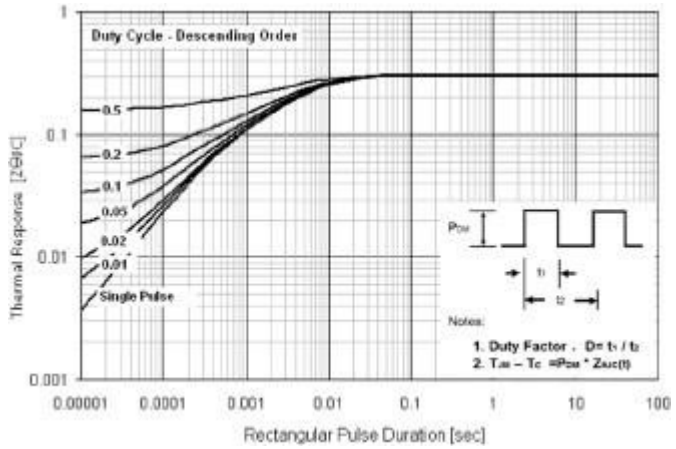
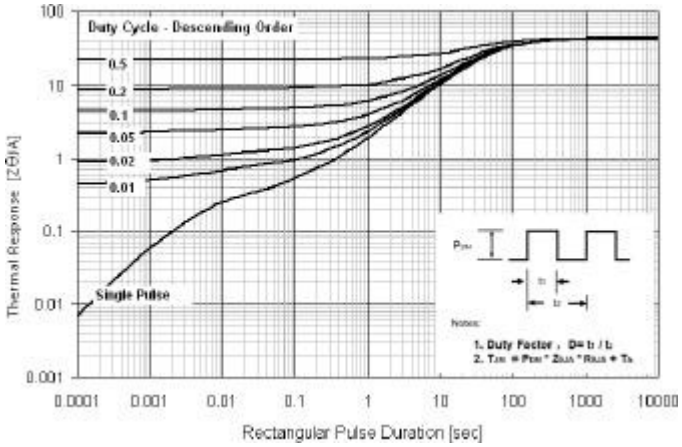


Figure 7. Normalized Maximum Transient Thermal Impedance(RthJA)



Test Circuit & Waveform

Figure 8. Gate Charge Test Circuit & Waveform

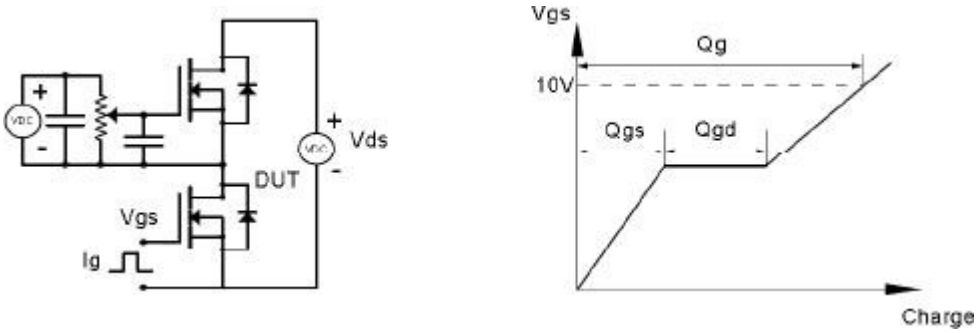


Figure 9. Resistive Switching Test Circuit & Waveforms

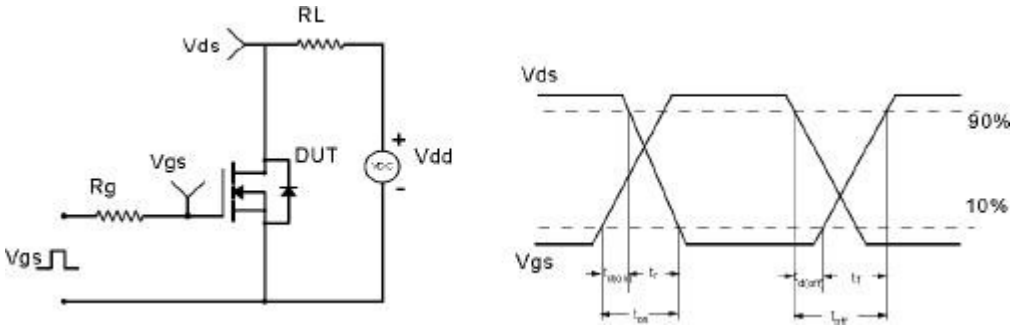


Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

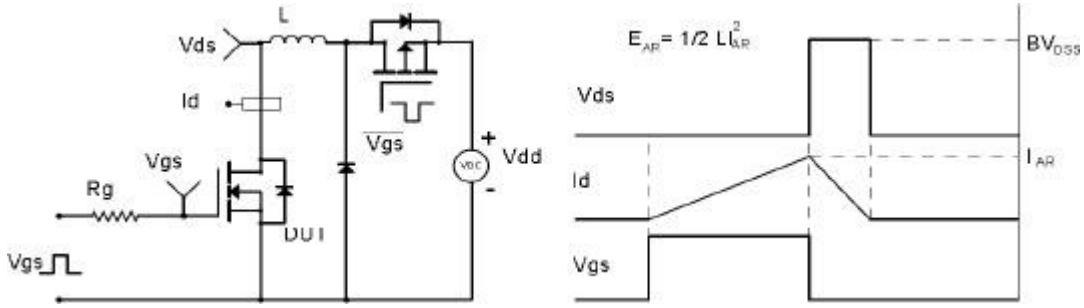
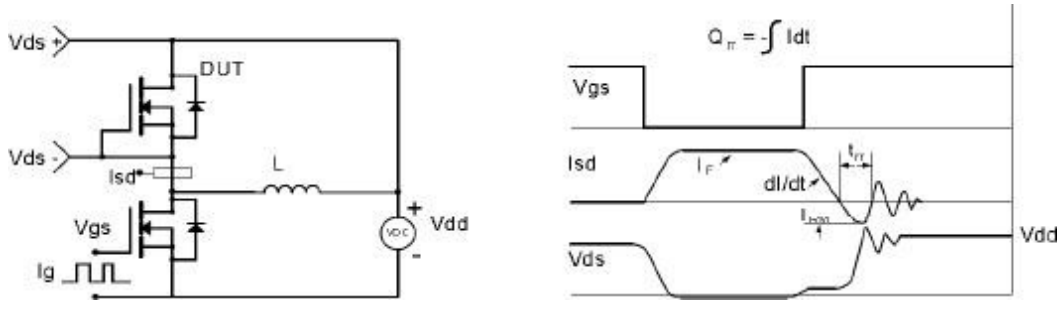
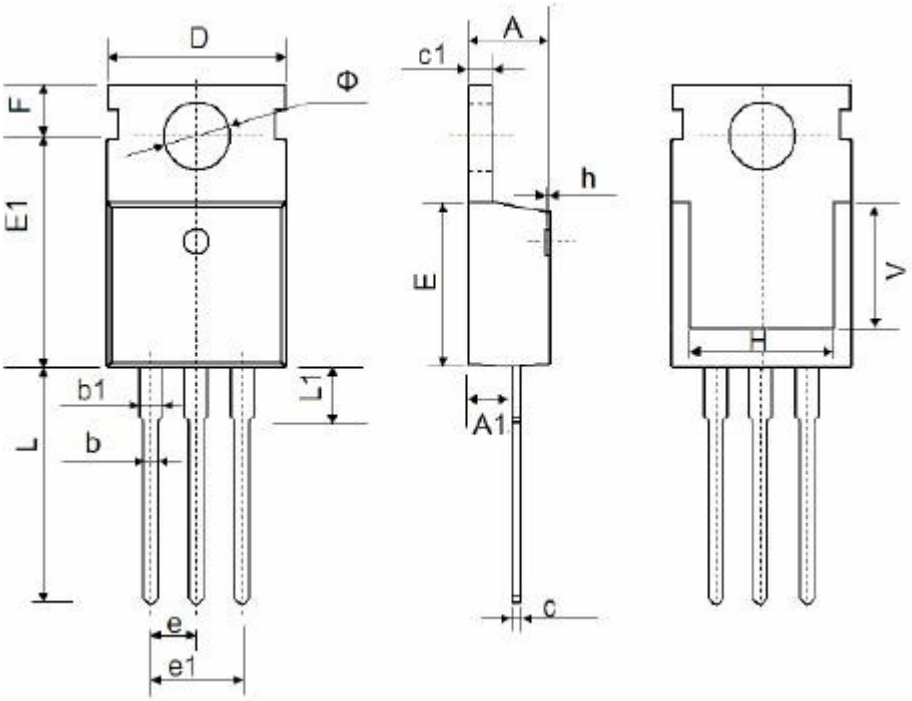


Figure 11. Diode Recovery Circuit & Waveform

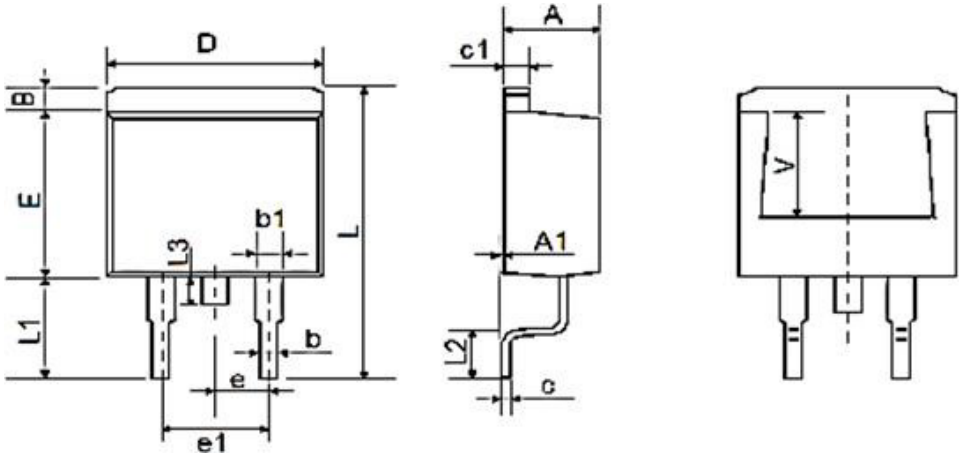


TO-220C PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.400	4.600	0.173	0.181
A1	2.250	2.550	0.089	0.100
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.330	0.650	0.013	0.026
c1	1.200	1.400	0.047	0.055
D	9.910	10.250	0.390	0.404
E	8.9500	9.750	0.352	0.384
E1	12.650	12.950	0.498	0.510
e	2.540 Typ.		0.100 Typ.	
e1	4.980	5.180	0.196	0.204
F	2.650	2.950	0.104	0.116
H	7.900	8.100	0.311	0.319
h	0.000	0.300	0.000	0.012
L	12.900	13.400	0.508	0.528
L1	2.850	3.250	0.112	0.128
V	7.500 Ref.		0.295 Ref.	
Φ	3.400	3.800	0.134	0.150

TO-263 PACKAGE INFORMATION



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	4.47	4.67	0.176	0.184
A1	0	0.15	0	0.006
B	1.17	1.37	0.046	0.054
b	0.71	0.91	0.028	0.036
b1	1.17	1.37	0.046	0.054
c	0.31	0.53	0.012	0.021
c1	1.17	1.37	0.046	0.054
D	10.01	10.31	0.394	0.406
E	8.5	8.9	0.335	0.35
e	2.540 Typ.		0.100 Typ.	
e1	4.98	5.18	0.196	0.204
L	15.05	15.45	0.593	0.608
L1	5.08	5.48	0.2	0.216
L2	2.34	2.74	0.092	0.108
L3	1.3	1.7	0.051	0.067
V	5.600 Ref.		0.220 Ref.	