## 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

- 85V,120A,$R_{DS(ON).max}$=5.5mΩ@VGS = 10V
- Improved dv/dt capability
- Fast switching
- 100% EAS Guaranteed
- Green device available

## Applications

- Motor Drives
- UPS
- DC-DC Converter

## Product Summary

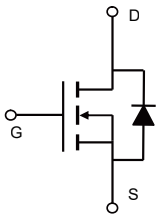
| | |
|---|---|
| $V_{DSS}$ | 85V |
| $R_{DS(on).max}$@ $V_{GS}$=10V | 5.5mΩ |
| $I_D$ | 120A |

## 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 | $V_{DSS}$ | 85 | V |
| Continuous drain current ( $T_C$ = 25°C )[1] | $I_D$ | 120 | A |
| Continuous drain current ( $T_C$ = 100°C )[1] | | 87 | A |
| Pulsed drain current[2] | $I_{DM}$ | 480 | A |
| Gate-Source voltage | $V_{GSS}$ | ±20 | V |
| Avalanche energy[3] | $E_{AS}$ | 144 | mJ |
| Power Dissipation ( $T_C$ = 25°C ) TO-220C /TO-263 | $P_D$ | 189 | W |
| Power Dissipation ( $T_C$ = 25°C ) TO-220F | | 56 | 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 | $R_{\theta JC}$ | 0.66 | °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 |
|---|---|---|
| VST08N055-T3 | TO-263 | VST08N055-T3 |
| VST08N055-TF | TO-220F | VST08N055-TF |
| VST08N055-TC | TO-220C | VST08N055-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 | 85 | --- | --- | 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 | $I_{DSS}$ | $V_{DS}$=85 V, $V_{GS}$=0 V, $T_J$= 25°C | --- | --- | 1 | μA |
| | | $V_{DS}$=85 V, $V_{GS}$=0 V, $T_J$= 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 | --- | 4.6 | 5.5 | mΩ |
| Forward transconductance | $g_{fs}$ | $V_{DS}$ =5 V , $I_D$=50A | --- | 84.2 | --- | S |
| **Dynamic characteristics** | | | | | | |
| Input capacitance | $C_{iss}$ | $V_{DS}$ = 40 V, $V_{GS}$ = 0 V, F = 1MHz | --- | 3948 | --- | pF |
| Output capacitance | $C_{oss}$ | | --- | 888 | --- | |
| Reverse transfer capacitance | $C_{rss}$ | | --- | 9 | --- | |
| Turn-on delay time | $t_{d(on)}$ | $V_{DD}$ = 40V,$V_{GS}$=10V, $I_D$ = 13A | --- | 20.1 | --- | ns |
| Rise time | $t_r$ | | --- | 38.9 | --- | |
| Turn-off delay time | $t_{d(off)}$ | | --- | 45.1 | --- | |
| Fall time | $t_f$ | | --- | 22.8 | --- | |
| Gate resistance | $R_g$ | $V_{GS}$=0V, $V_{DS}$=0V, F=1MHz | --- | 4.0 | --- | Ω |
| **Gate charge characteristics** | | | | | | |
| Gate to source charge | $Q_{gs}$ | $V_{DS}$=40 V, $I_D$=50A, $V_{GS}$= 10 V | --- | 16 | --- | nC |
| Gate to drain charge | $Q_{gd}$ | | --- | 10 | --- | |
| Gate charge total | $Q_g$ | | --- | 46 | --- | |
| **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℃ | --- | 0.95 | 1.4 | V |
| Reverse Recovery Time | $t_{rr}$ | $I_S$=20A, di/dt=60A/us, $T_J$=25℃ | --- | 107 | --- | ns |
| Reverse Recovery Charge | $Q_{rr}$ | | --- | 123 | --- | 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, $I_{AS}$=24A, $R_G$=25Ω, Starting $T_J$=25℃.

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

## Electrical Characteristics Diagrams

Figure 1. Typ. Output Characteristics

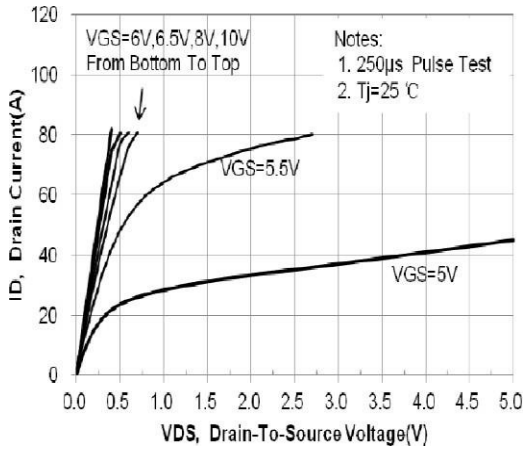



Figure 2. Transfer Characteristics

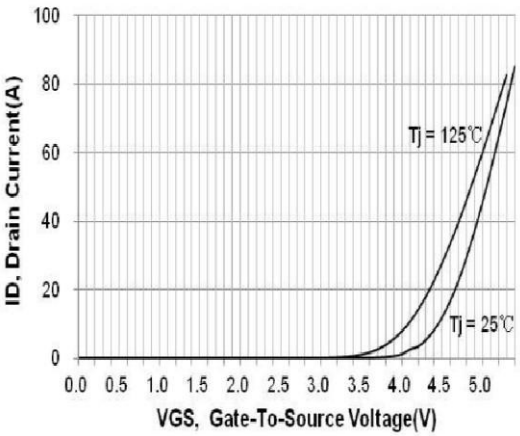



Figure 3. Capacitance Characteristics

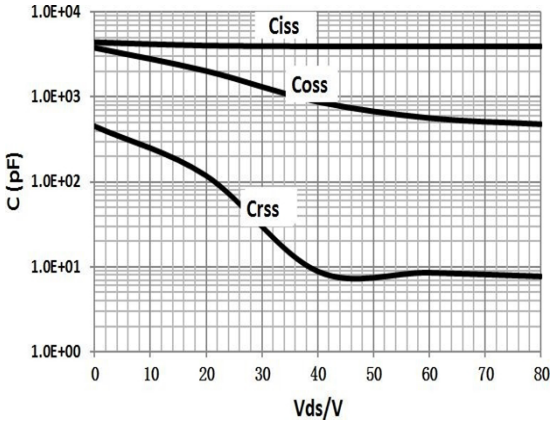



Figure 4. Gate Charge Waveform

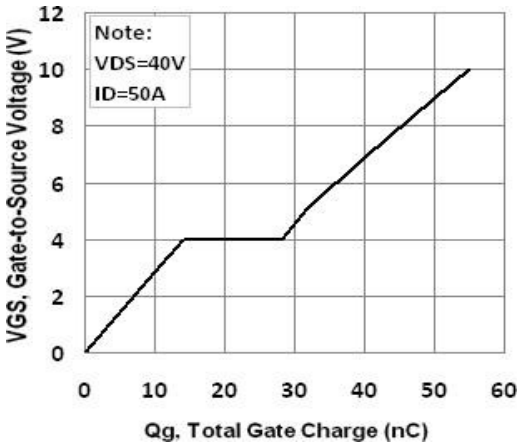



Figure 5. Body-Diode Characteristics

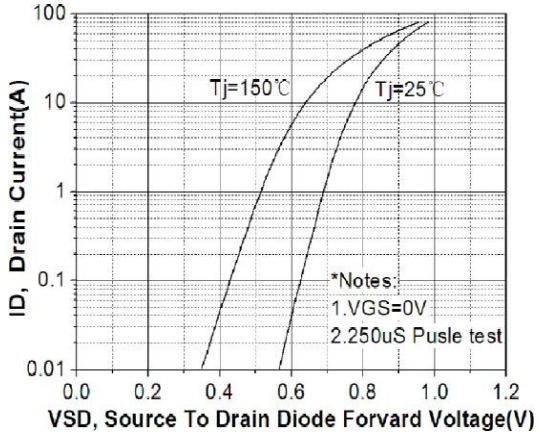



Figure 6. Rdson-Drain Current

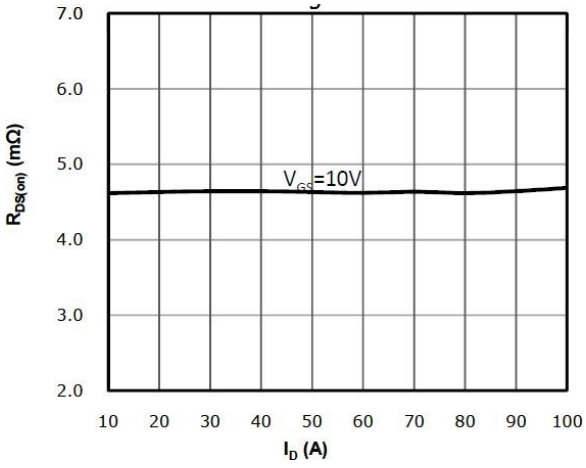


Figure 7. Rdson-Junction Temperature(℃)

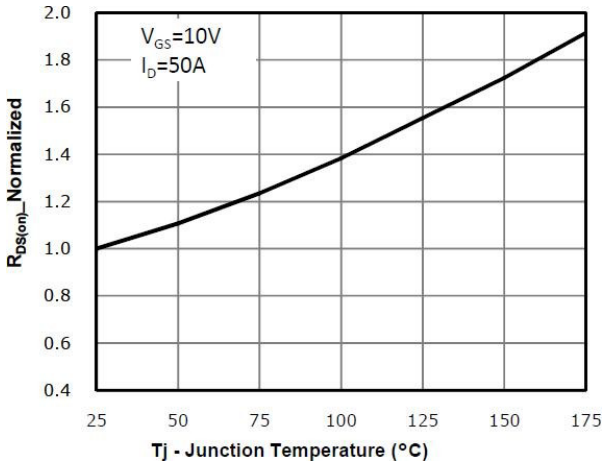



Figure 8. Maximum Safe Operating Area

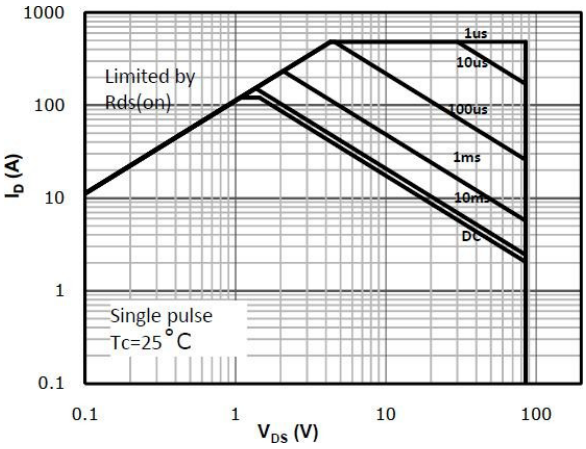
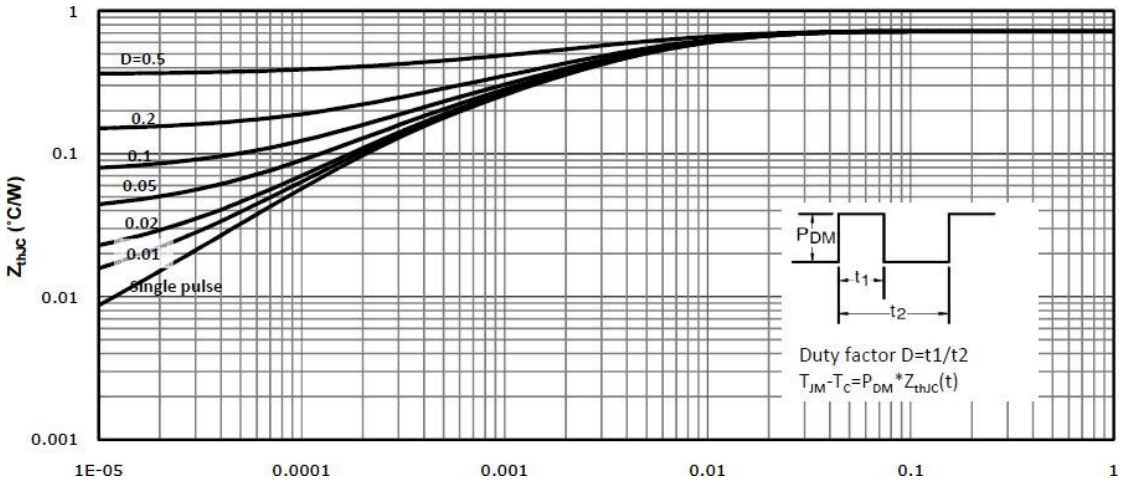



Figure 6. Normalized Maximum Transient Thermal Impedance (RthJC)



## Test Circuit & Waveform

Figure 8. Gate Charge Test Circuit & Waveform

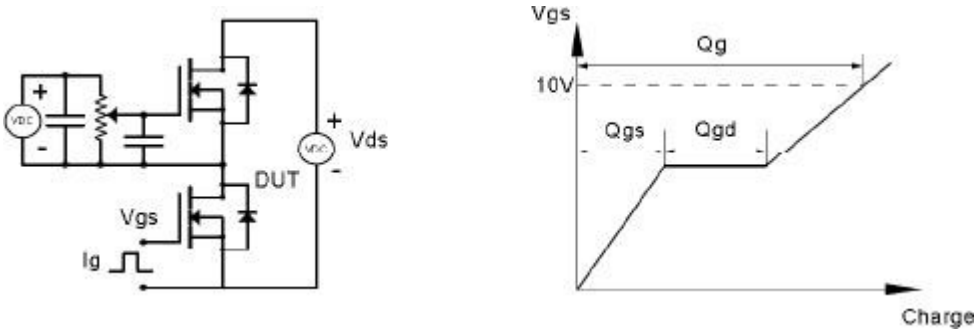



Figure 9. Resistive Switching Test Circuit & Waveforms

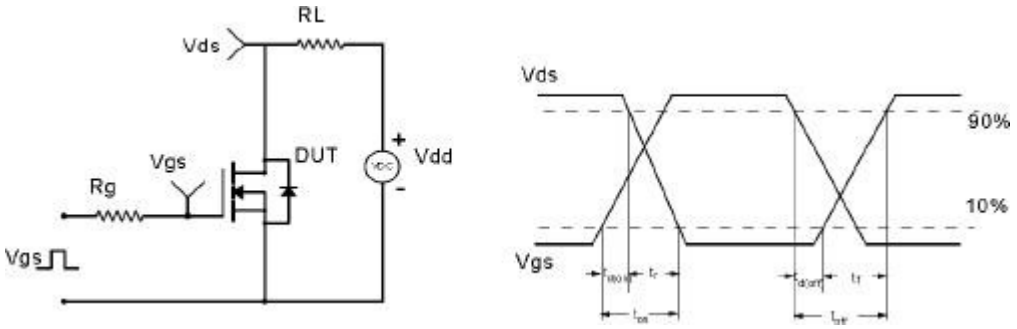



Figure 10. Unclamped Inductive Switching (UIS) Test Circuit & Waveform

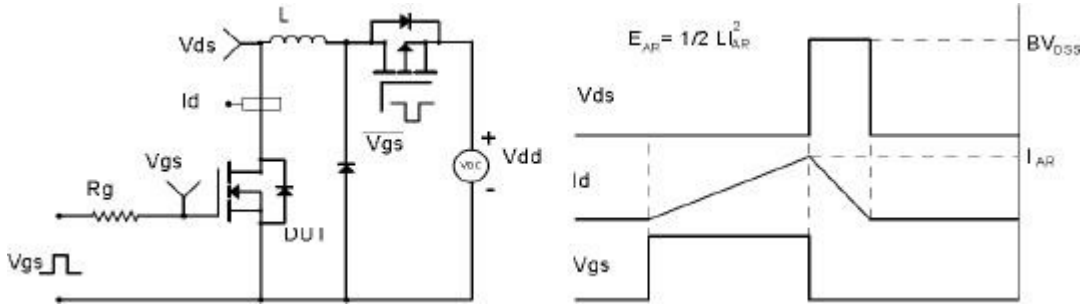



Figure 11. Diode Recovery Circuit & Waveform