

Description

The series of devices uses **Super Trench II** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and Q_g . This device is ideal for high-frequency switching and synchronous rectification.

Application

- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

General Features

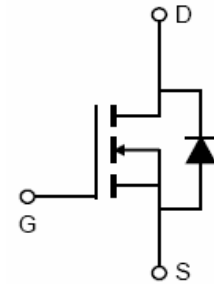
- $V_{DS} = 85V, I_D = 95A$
 $R_{DS(ON)} = 5.4m\Omega$, typical (TO-220) @ $V_{GS} = 10V$
 $R_{DS(ON)} = 5.2m\Omega$, typical (TO-263) @ $V_{GS} = 10V$
- Excellent gate charge x $R_{DS(on)}$ product (FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating



TO-220C



TO-263



Schematic Diagram

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|-----------|----------------|-----------|------------|----------|
| VST08N054-TC | VST08N054 | TO-220C | - | - | - |
| VST08N054-T3 | VST08N054 | TO-263 | - | - | - |

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|--------------------|------------|------|
| Drain-Source Voltage | V_{DS} | 85 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 95 | A |
| Drain Current-Continuous ($T_C = 100^\circ C$) | $I_D(100^\circ C)$ | 70 | A |
| Pulsed Drain Current | I_{DM} | 380 | A |
| Maximum Power Dissipation | P_D | 125 | W |
| Derating factor | | 0.83 | W/°C |
| Single pulse avalanche energy ^(Note 5) | E_{AS} | 599 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | °C |

Thermal Characteristic

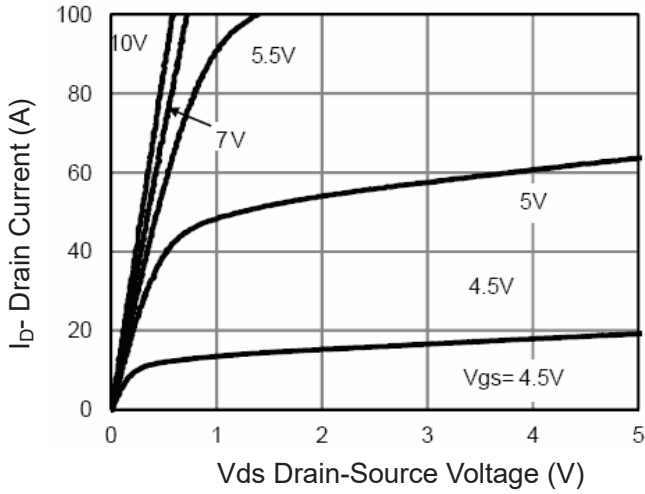
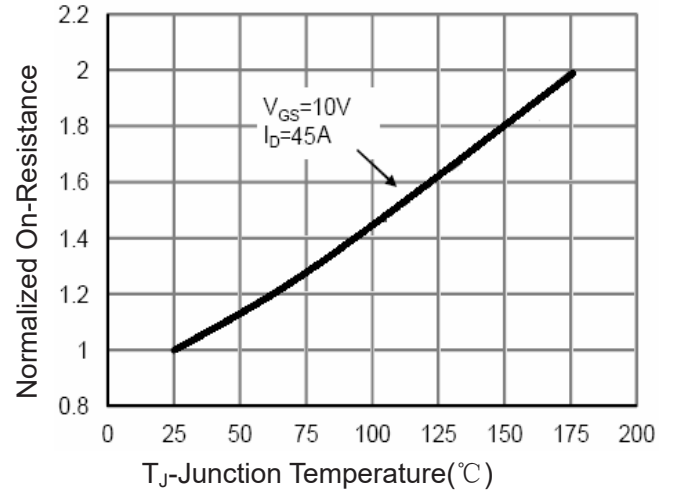
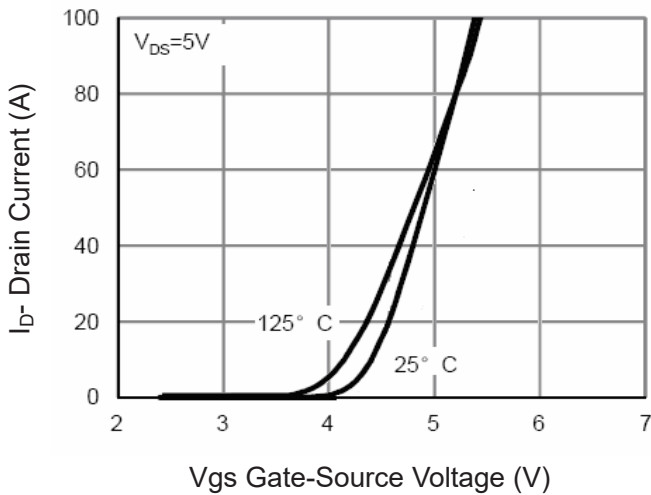
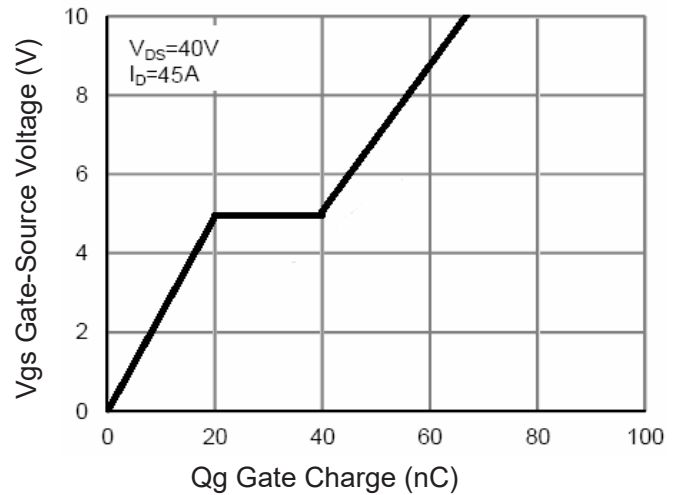
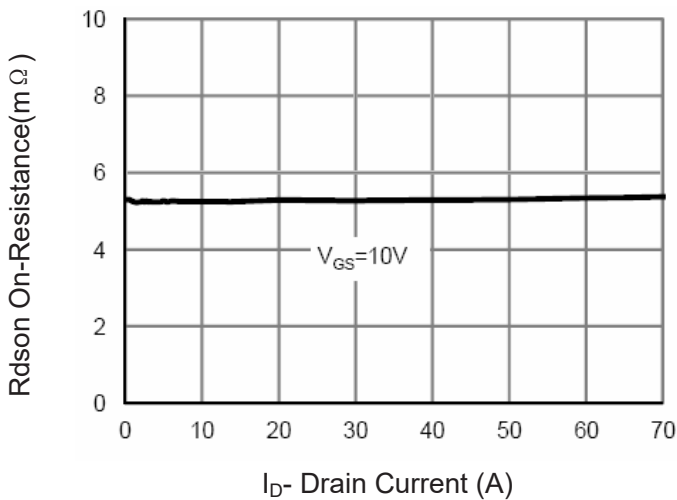
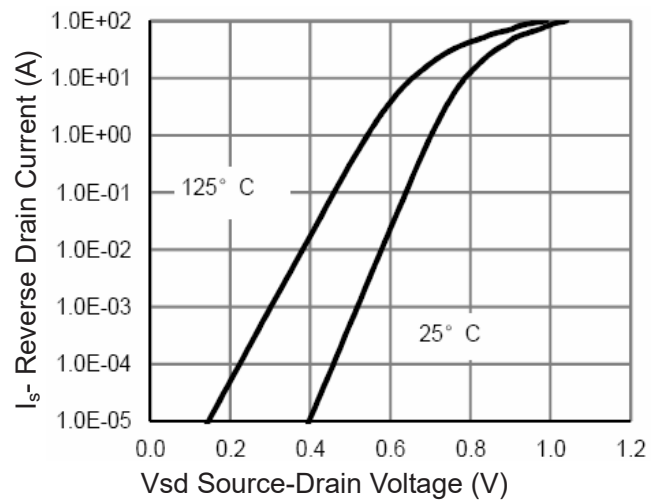
| | | | |
|--|-----------------|-----|----------------------|
| Thermal Resistance, Junction-to-Case ^(Note 2) | $R_{\theta JC}$ | 1.2 | $^{\circ}\text{C/W}$ |
|--|-----------------|-----|----------------------|

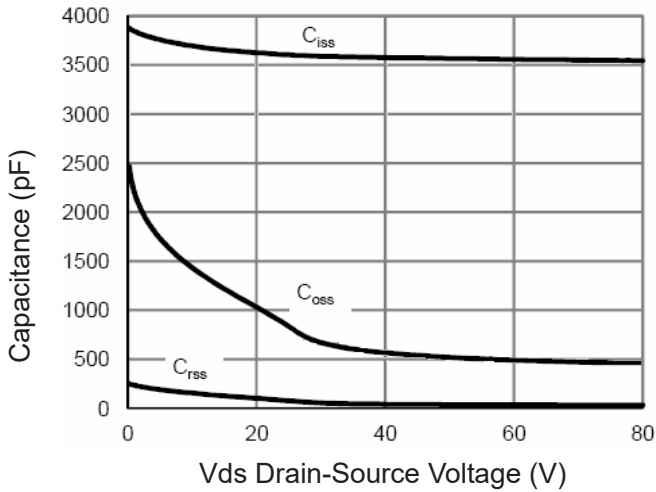
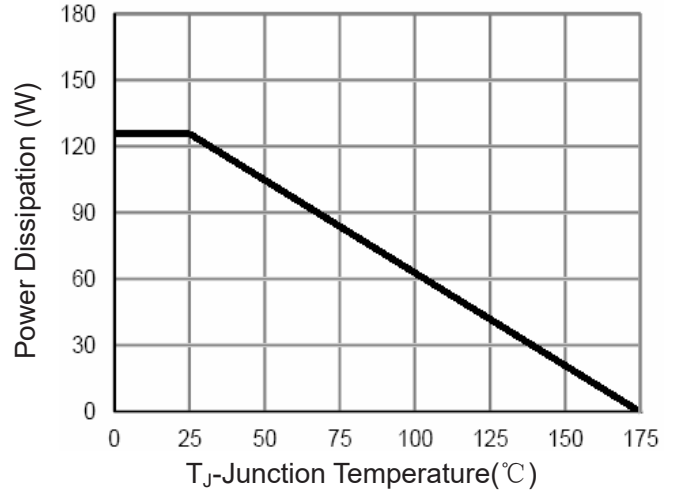
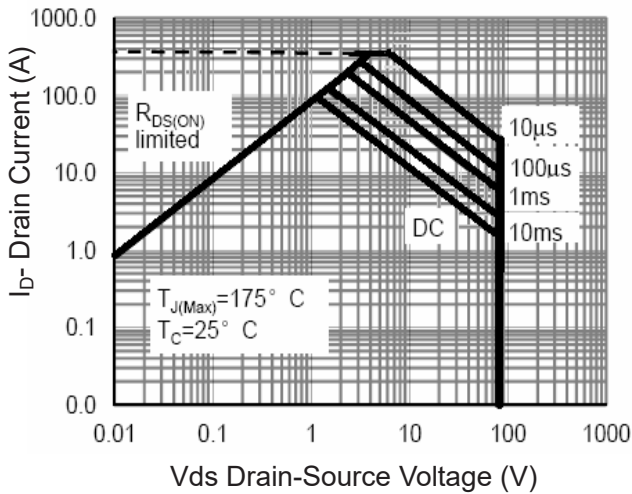
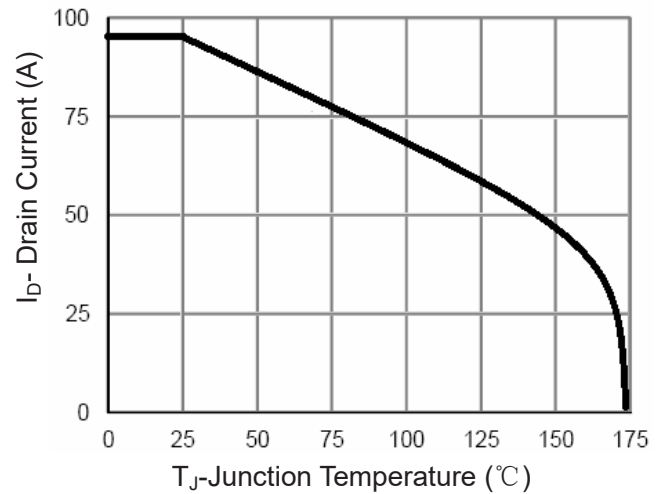
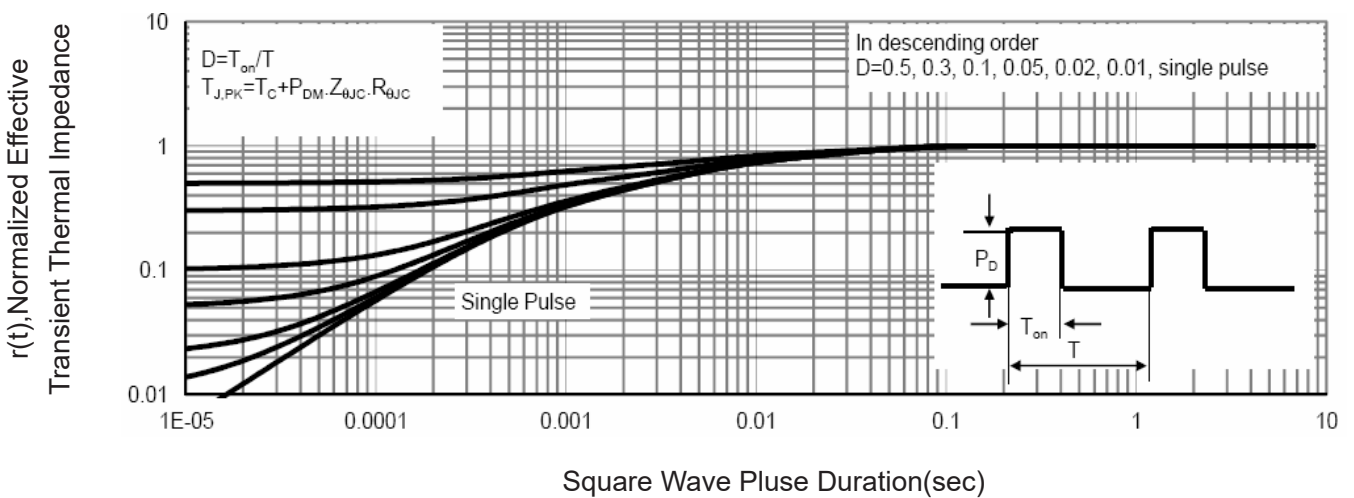
Electrical Characteristics ($T_C=25^{\circ}\text{C}$ unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit | |
|--|--------------|---|--------|------|-----------|---------|------------|
| Off Characteristics | | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 85 | | - | V | |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=85V, V_{GS}=0V$ | - | - | 1 | μA | |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA | |
| On Characteristics ^(Note 3) | | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 2.0 | 3.0 | 4.0 | V | |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=45A$ | TO-220 | - | 5.4 | 5.8 | m Ω |
| | | | TO-263 | | 5.2 | 5.8 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=5V, I_D=45A$ | | 60 | - | S | |
| Dynamic Characteristics ^(Note 4) | | | | | | | |
| Input Capacitance | C_{iss} | $V_{DS}=40V, V_{GS}=0V,$ $F=1.0MHz$ | - | 3550 | - | PF | |
| Output Capacitance | C_{oss} | | - | 540 | - | PF | |
| Reverse Transfer Capacitance | C_{rss} | | - | 22 | - | PF | |
| Switching Characteristics ^(Note 4) | | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=40V, I_D=45A$ $V_{GS}=10V, R_G=1.6\Omega$ | - | 14.5 | - | nS | |
| Turn-on Rise Time | t_r | | - | 12 | - | nS | |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 35 | - | nS | |
| Turn-Off Fall Time | t_f | | - | 13 | - | nS | |
| Total Gate Charge | Q_g | $V_{DS}=40V, I_D=45A,$ $V_{GS}=10V$ | - | 67 | - | nC | |
| Gate-Source Charge | Q_{gs} | | - | 20 | | nC | |
| Gate-Drain Charge | Q_{gd} | | - | 20 | | nC | |
| Drain-Source Diode Characteristics | | | | | | | |
| Diode Forward Voltage ^(Note 3) | V_{SD} | $V_{GS}=0V, I_S=45A$ | - | | 1.2 | V | |
| Diode Forward Current ^(Note 2) | I_S | | - | - | 95 | A | |
| Reverse Recovery Time | t_{rr} | $T_J = 25^{\circ}\text{C}, I_F = I_S$ $di/dt = 100A/\mu s$ ^(Note 3) | - | 66 | - | nS | |
| Reverse Recovery Charge | Q_{rr} | | - | 140 | - | nC | |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition : $T_J=25^{\circ}\text{C}, V_{DD}=40V, V_G=10V, L=0.5mH, R_G=25\Omega$

Typical Electrical and Thermal Characteristics

Figure 1 Output Characteristics

Figure 4 Rdson-Junction Temperature

Figure 2 Transfer Characteristics

Figure 5 Gate Charge

Figure 3 Rdson- Drain Current

Figure 6 Source- Drain Diode Forward


Figure 7 Capacitance vs Vds

Figure 9 Power De-rating

Figure 8 Safe Operation Area

Figure 10 Current De-rating

Figure 11 Normalized Maximum Transient Thermal Impedance