

Description

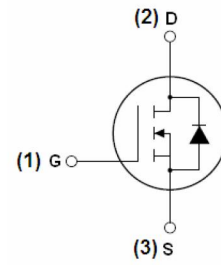
The **VS60N10-TC** uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

General Features

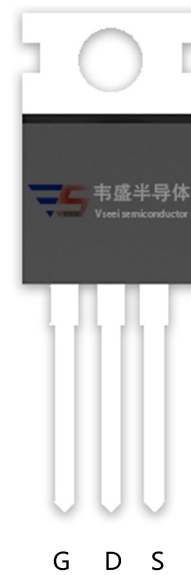
- $V_{DS} = 100V, I_D = 60A$
 $R_{DS(ON)} < 17m\Omega @ V_{GS}=10V$ (Typ:14m Ω)
- Special process technology for high ESD capability
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation

Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



Schematic diagram



Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|------------|----------------|-----------|------------|----------|
| VS60N10-TC | VS60N10-TC | TO-220-3L | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|--|---------------------|----------|----------------|
| Drain-Source Voltage | V_{DS} | 100 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 60 | A |
| Drain Current-Continuous($T_C=100^{\circ}C$) | $I_D(100^{\circ}C)$ | 40 | A |
| Pulsed Drain Current | I_{DM} | 160 | A |
| Maximum Power Dissipation | P_D | 160 | W |
| Derating factor | - | 1.06 | W/ $^{\circ}C$ |
| Single pulse avalanche energy (Note 5) | E_{AS} | 580 | mJ |

| | | | |
|--|----------------|------------|----|
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | °C |
|--|----------------|------------|----|

Thermal Characteristic

| | | | |
|---|-----------------|------|------|
| Thermal Resistance, Junction-to-Case (Note 2) | $R_{\theta JC}$ | 0.94 | °C/W |
|---|-----------------|------|------|

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

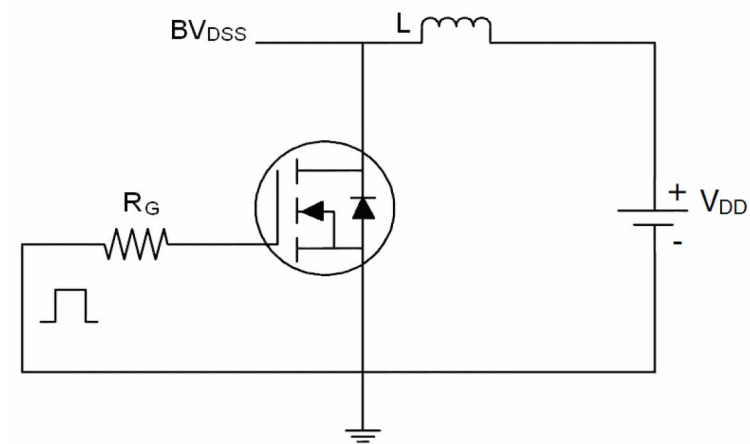
| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|------------------------------------|---------------------|---|-----|------|------|------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V I _D =250μA | 100 | 110 | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =100V, V _{GS} =0V | - | - | 1 | μA |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±20V, V _{DS} =0V | - | - | ±100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 2 | 3 | 4 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =10V, I _D =28A | - | 14 | 17 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =25V, I _D =28A | 32 | - | - | S |
| Dynamic Characteristics (Note4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =25V, V _{GS} =0V, F=1.0MHz | - | 3400 | - | PF |
| Output Capacitance | C _{oss} | | - | 260 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 210 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =30V, I _D =2A, R _L =15Ω V _{GS} =10V, R _G =2.5Ω | - | 15 | - | nS |
| Turn-on Rise Time | t _r | | - | 11 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 52 | - | nS |
| Turn-Off Fall Time | t _f | | - | 13 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =30V, I _D =30A, V _{GS} =10V | - | 94 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 16 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 24 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =28A | - | 0.85 | 1.2 | V |
| Diode Forward Current (Note 2) | I _S | | - | - | 60 | A |
| Reverse Recovery Time | t _{rr} | TJ = 25°C, IF = 28A | - | 33 | - | nS |
| Reverse Recovery Charge | Q _{rr} | di/dt = 100A/μs(Note3) | - | 54 | - | nC |
| Forward Turn-On Time | t _{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

Notes:

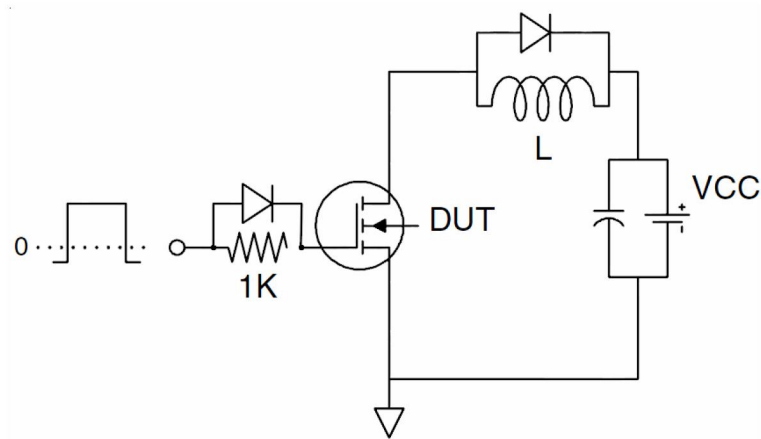
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, $t \leq 10$ sec.
3. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
4. Guaranteed by design, not subject to production
5. EAS condition: $T_J=25^{\circ}\text{C}, V_{DD}=50V, V_G=10V, L=0.5\text{mH}, R_G=25\Omega$

Test Circuit

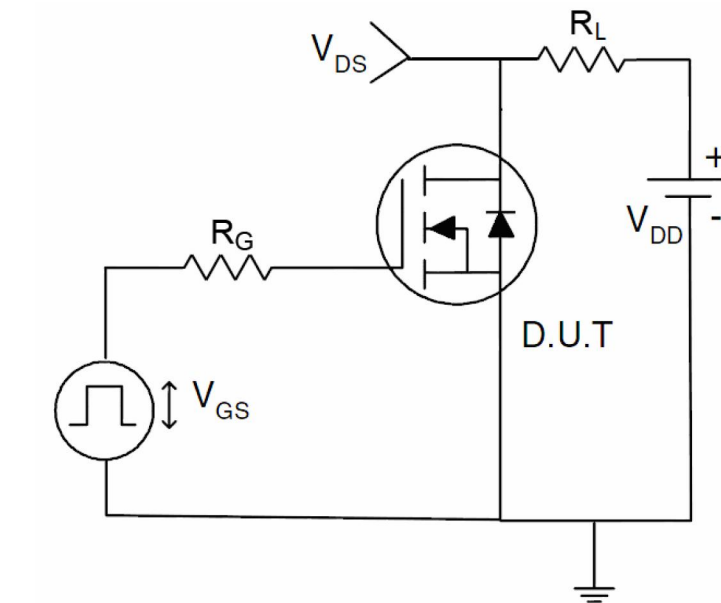
1) E_{AS} test Circuit



2) Gate charge test Circuit



3) Switch Time Test Circuit



Typical Electrical and Thermal Characteristics (Curves)

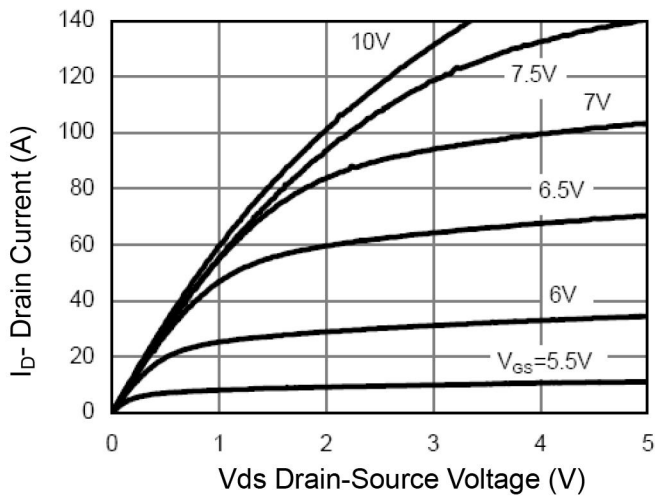


Figure 1 Output Characteristics

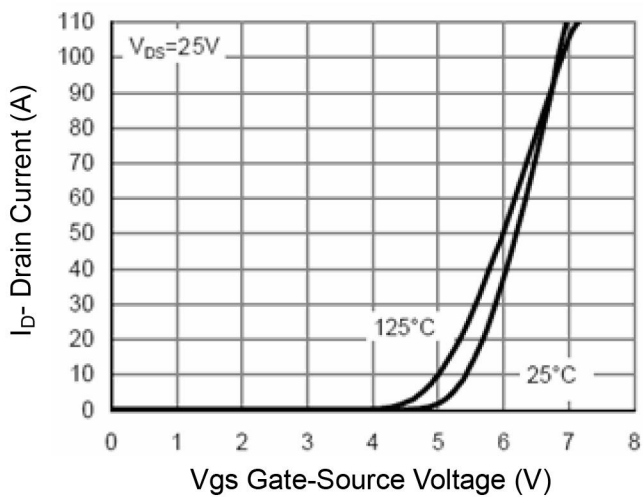


Figure 2 Transfer Characteristics

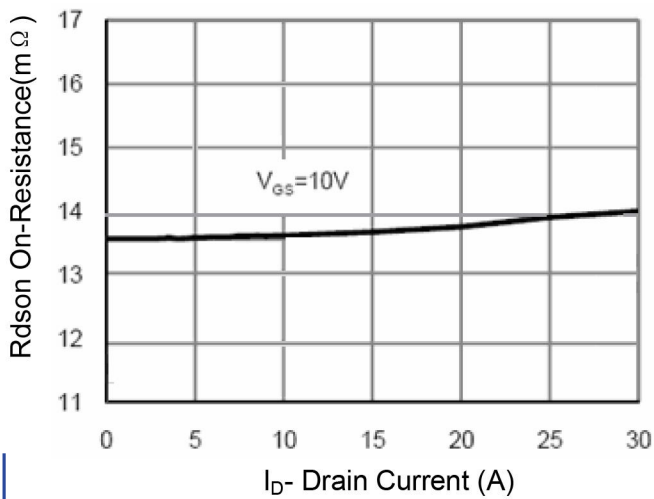


Figure 3 $R_{DS(on)}$ - Drain Current

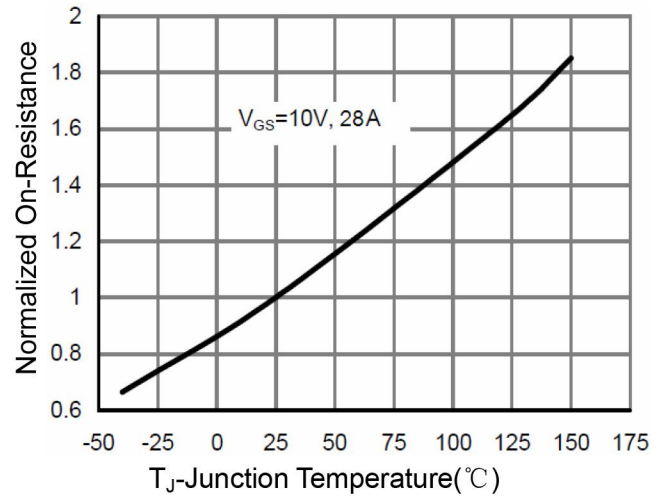


Figure 4 $R_{DS(on)}$ -Junction Temperature

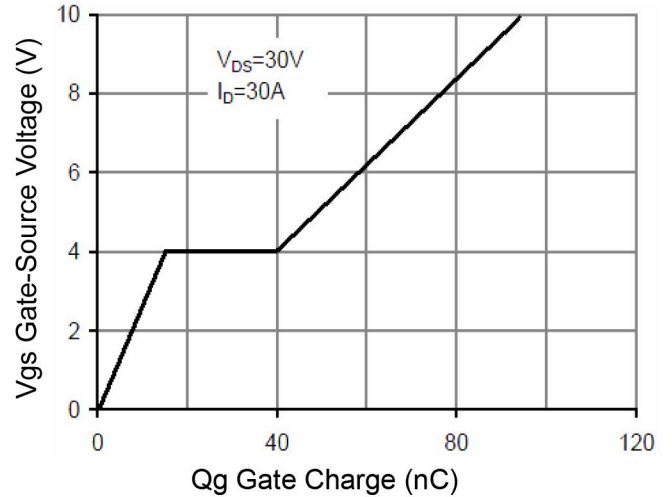


Figure 5 Gate Charge

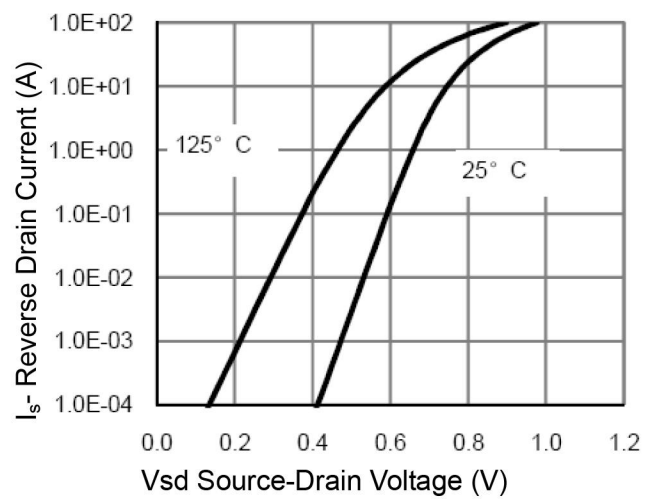


Figure 6 Source- Drain Diode Forward

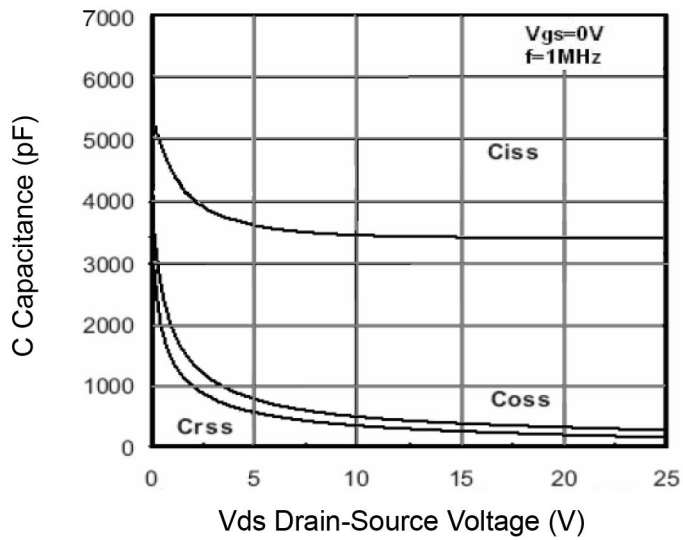


Figure 7 Capacitance vs Vds

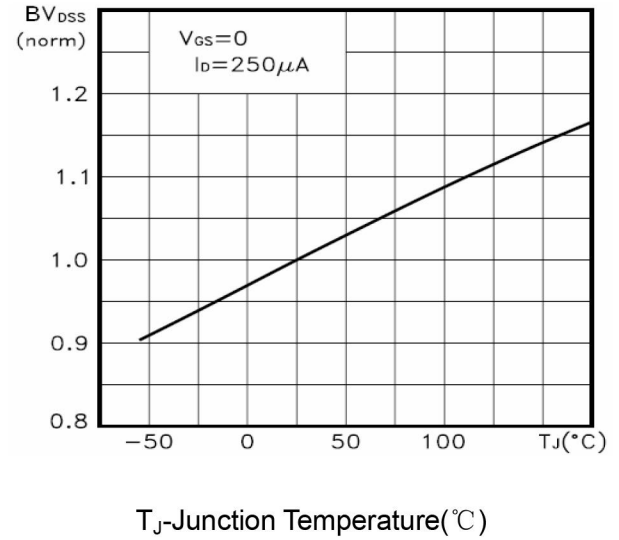
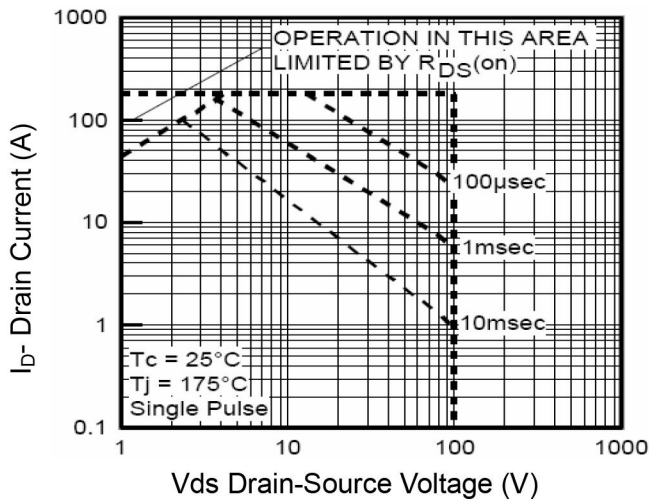

Figure 9 BV_{DSS} vs Junction Temperature


Figure 8 Safe Operation Area

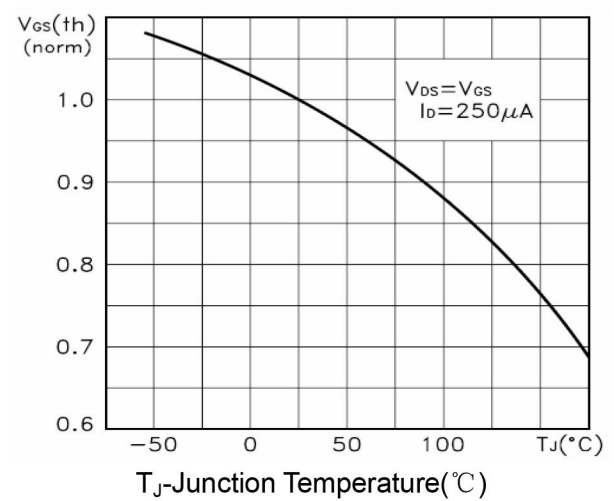
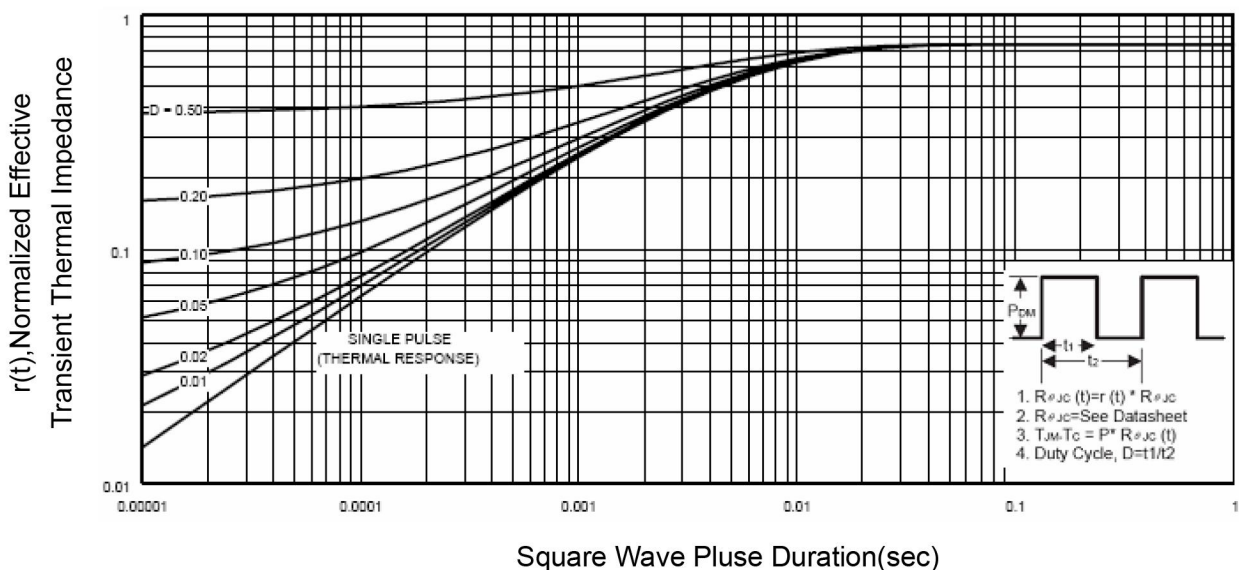

Figure 10 V_{GS(th)} vs Junction Temperature


Figure 11 Normalized Maximum Transient Thermal Impedance