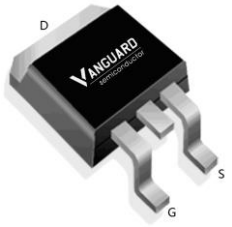
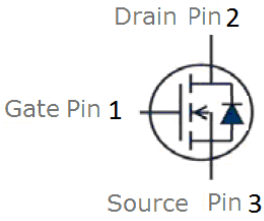
## Features

- N-Channel，5V Logic Level Control
- Enhancement mode
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}$=4.5V
- 100% Avalanche test
- Pb-free lead plating; RoHS compliant

| | | |
|---|---|---|
| $V_{DS}$ | 40 | V |
| $R_{DS(on),TYP}$@ $V_{GS}$=10V | 2.3 | mΩ |
| $R_{DS(on),TYP}$@ $V_{GS}$=4.5V | 3.3 | mΩ |
| $I_D$ | 200 | A |

**TO-263**




Pb-Free RoHS Halogen-Free

| Part ID | Package Type | Marking | Tape and reel information |
|---|---|---|---|
| VS40200ATD | TO-263 | 40200ATD | 1000pcs/Reel |

## Maximum ratings, at $T_j$=25°C, unless otherwise specified

| Symbol | Parameter | | Rating | Unit |
|---|---|---|---|---|
| $V_{(BR)DSS}$ | Drain-Source breakdown voltage | | 40 | V |
| $I_S$ | Diode continuous forward current | $T_C$=25°C | 200 | A |
| $I_D$ | Continuous drain current @$V_{GS}$=-10V | $T_C$=25°C | 200 | A |
| | | $T_C$=100°C | 142 | A |
| $I_{DM}$ | Pulse drain current tested ① | $T_C$=25°C | 800 | A |
| EAS | Avalanche energy, single pulsed ② | | 390 | mJ |
| $P_D$ | Maximum power dissipation | $T_C$=25°C | 150 | W |
| $V_{GS}$ | Gate-Source voltage | | ±20 | V |
| $T_{STG}$ $T_J$ | Storage and operating temperature range | | -55 to 175 | °C |
| **Thermal Characteristics** | | | | |
| $R_{\theta JC}$ | Thermal Resistance-Junction to Case | | 1.0 | °C/W |
| $R_{\theta JA}$ | Thermal Resistance-Junction to Ambient | | 62.5 | °C/W |

| Symbol | Parameter | Condition | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| **Static Electrical Characteristics @$T_j$= 25°C (unless otherwise stated)** | | | | | | |
| $V_{(BR)DSS}$ | Drain-Source Breakdown Voltage | $V_{GS}$=0V, $I_D$=250μA | 40 | -- | -- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{DS}$=40V,$V_{GS}$=0V | -- | -- | 1 | μA |
| | Zero Gate Voltage Drain Current($T_j$=125℃) | $V_{DS}$=40V,$V_{GS}$=0V | -- | -- | 100 | μA |
| $I_{GSS}$ | Gate-Body Leakage Current | $V_{GS}$=±20V,$V_{DS}$=0V | -- | -- | ±100 | nA |
| $V_{GS(TH)}$ | Gate Threshold Voltage | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 1.2 | 1.8 | 2.4 | V |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance③ | $V_{GS}$=10V, $I_D$=60A | -- | 2.3 | 4 | mΩ |
| $R_{DS(ON)}$ | Drain-Source On-State Resistance③ | $V_{GS}$=4.5V, $I_D$=30A | -- | 3.3 | 6 | mΩ |
| **Dynamic Electrical Characteristics @ $T_j$ = 25°C (unless otherwise stated)** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=20V,$V_{GS}$=0V, f=1MHz | 5600 | 6605 | 7600 | pF |
| $C_{oss}$ | Output Capacitance | | 400 | 550 | 700 | pF |
| $C_{rss}$ | Reverse Transfer Capacitance | | 320 | 440 | 560 | pF |
| $R_g$ | Gate Resistance | f=1MHz | -- | 1.9 | -- | Ω |
| $Q_g$ | Total Gate Charge | $V_{DS}$=20V,$I_D$=30A, $V_{GS}$=10V | -- | 109 | -- | nC |
| $Q_{gs}$ | Gate-Source Charge | | -- | 30.5 | -- | nC |
| $Q_{gd}$ | Gate-Drain Charge | | -- | 42 | -- | nC |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-on Delay Time | $V_{DD}$=20V, $I_D$=30A, $R_G$=3Ω, $V_{GS}$=10V | -- | 30 | -- | nS |
| $t_r$ | Turn-on Rise Time | | -- | 24 | -- | nS |
| $t_{d(off)}$ | Turn-Off Delay Time | | -- | 45.5 | -- | nS |
| $t_f$ | Turn-Off Fall Time | | -- | 16.5 | -- | nS |
| **Source- Drain Diode Characteristics@ $T_j$ = 25°C (unless otherwise stated)** | | | | | | |
| $V_{SD}$ | Forward on voltage | $I_{SD}$=30A,$V_{GS}$=0V | -- | 0.9 | 1.2 | V |
| $t_{rr}$ | Reverse Recovery Time | $T_j$=25℃,$I_{sd}$=30A, $V_{GS}$=0V di/dt=500A/μs | -- | 29 | -- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | | 179 | | nC |

NOTE:

① Repetitive rating; pulse width limited by max. junction temperature.

② Limited by $T_{Jmax}$, starting $T_J$ = 25°C, L = 0.5mH,$R_G$ = 25Ω, $I_{AS}$ = 29A,$V_{GS}$ =10V. Part not recommended for use above this value

③ Pulse width ≤ 300μs; duty cycle≤ 2%.

## Typical Characteristics

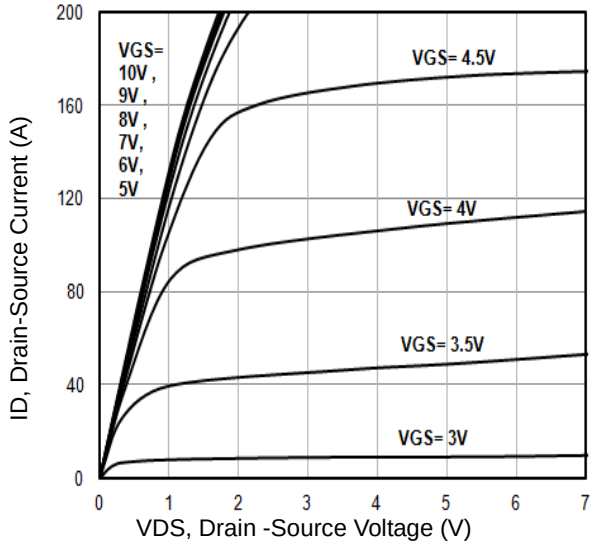



**Fig1.** Typical Output Characteristics

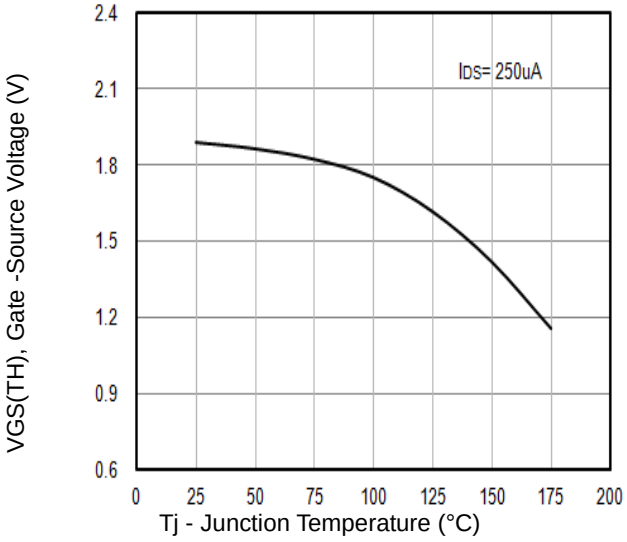



**Fig2.** $V_{GS(TH)}$ Gate -Source Voltage Vs.Tj

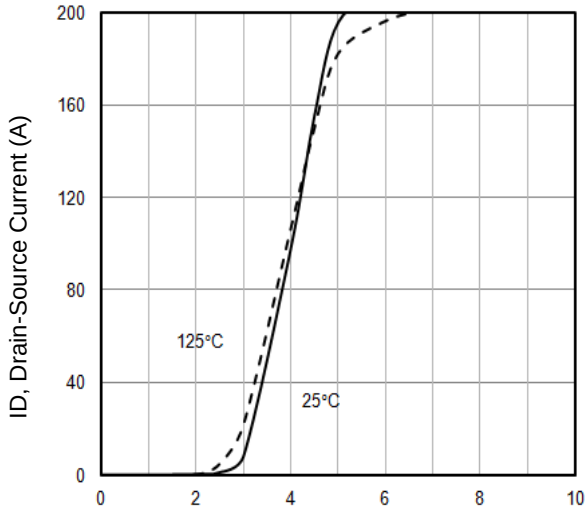



**Fig3.** Typical Transfer Characteristics

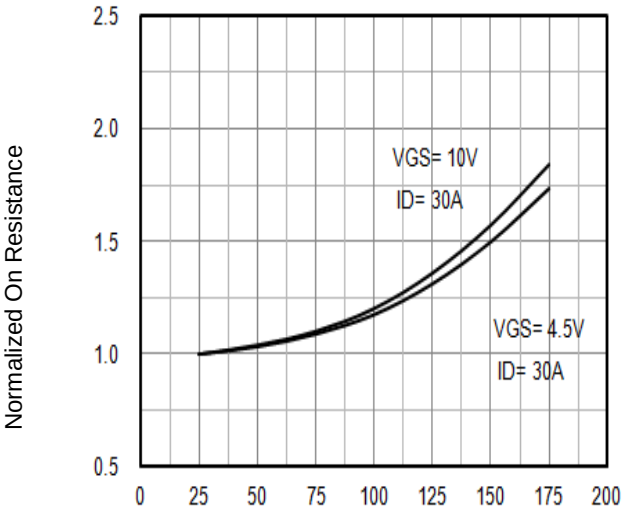



**Fig4.** Normalized On-Resistance Vs. Tj

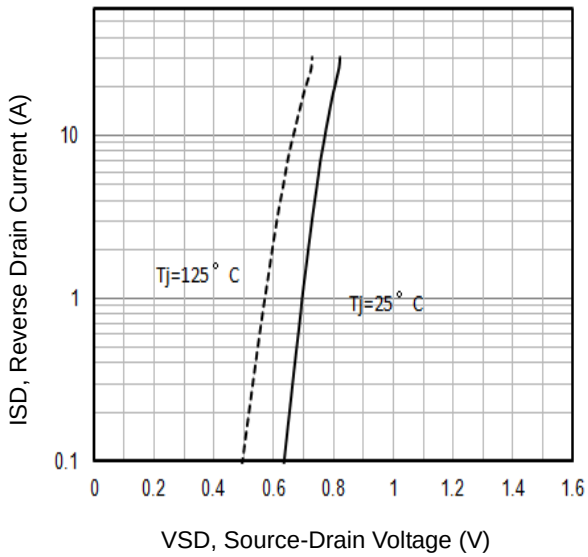



**Fig5.** Typical Source-Drain Diode Forward Voltage

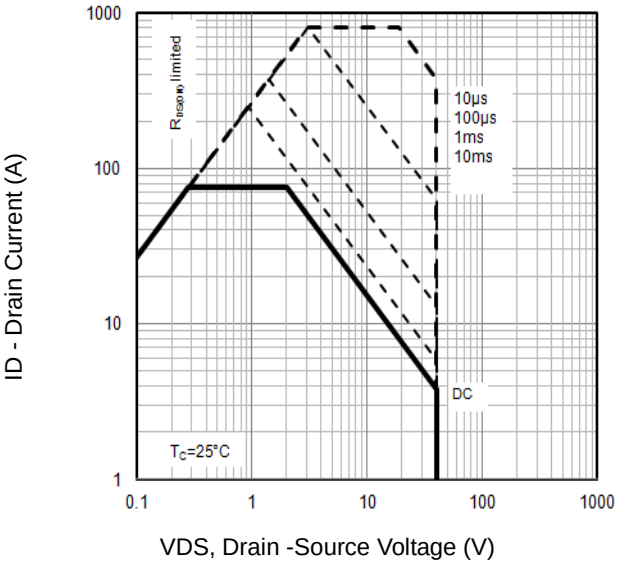



**Fig6.** Maximum Safe Operating Area

## Typical Characteristics

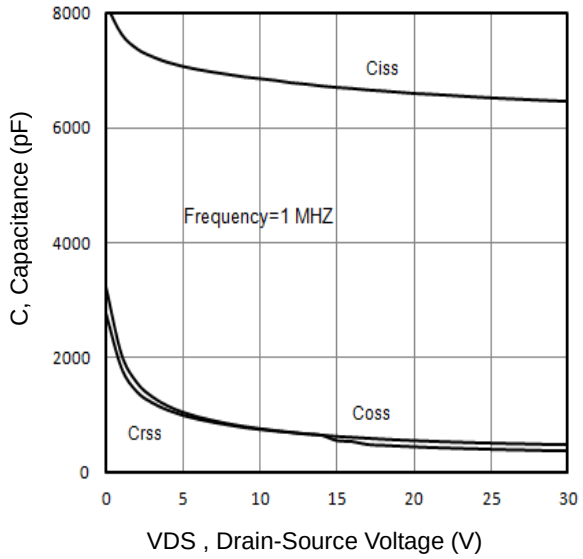



**Fig7.** Typical Capacitance Vs.Drain-Source Voltage

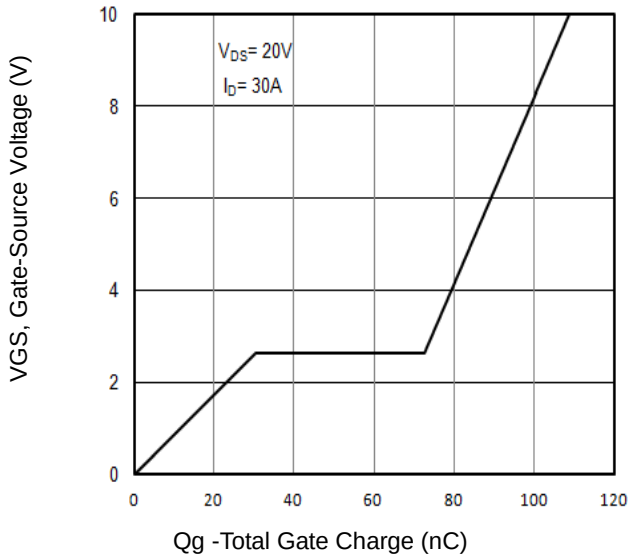



**Fig8.** Typical Gate Charge Vs.Gate-Source Voltage

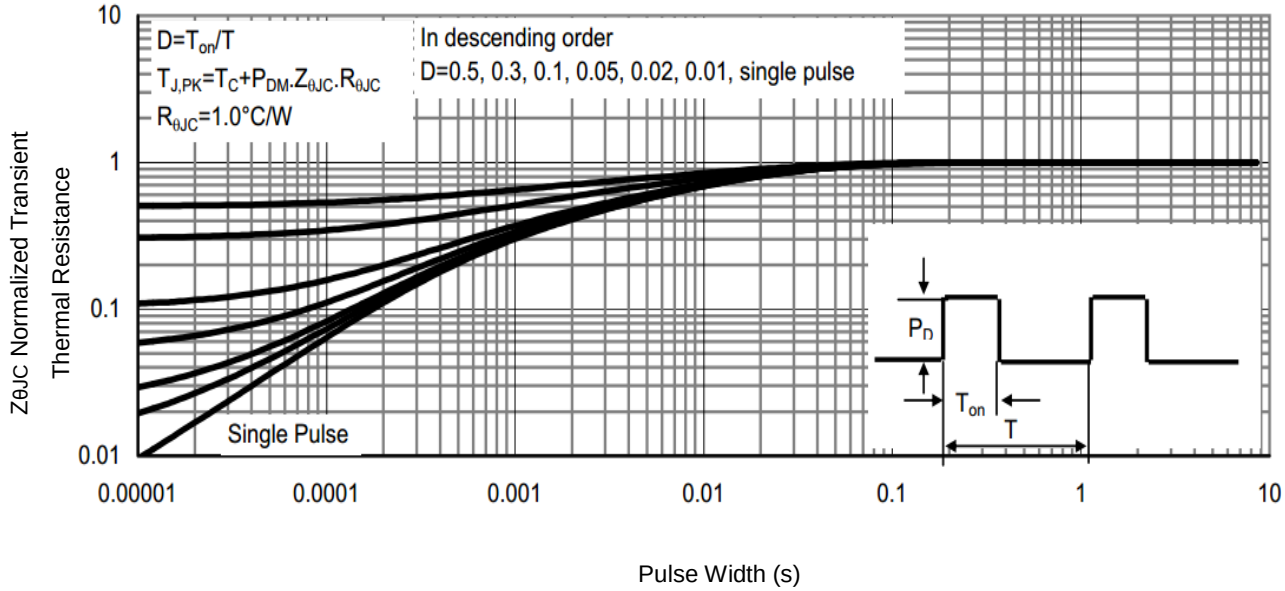



**Fig9.** Normalized Maximum Transient Thermal Impedance

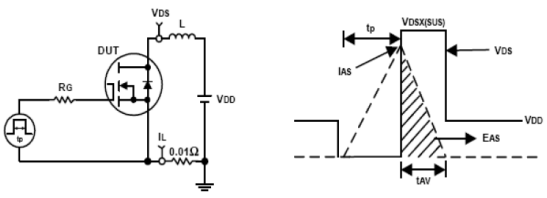



**Fig10.** Unclamped Inductive Test Circuit and waveforms

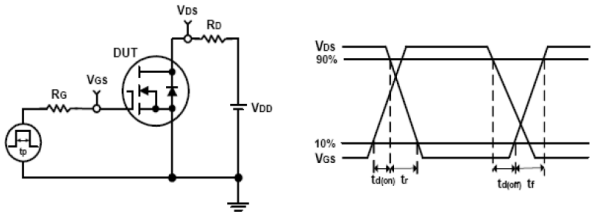
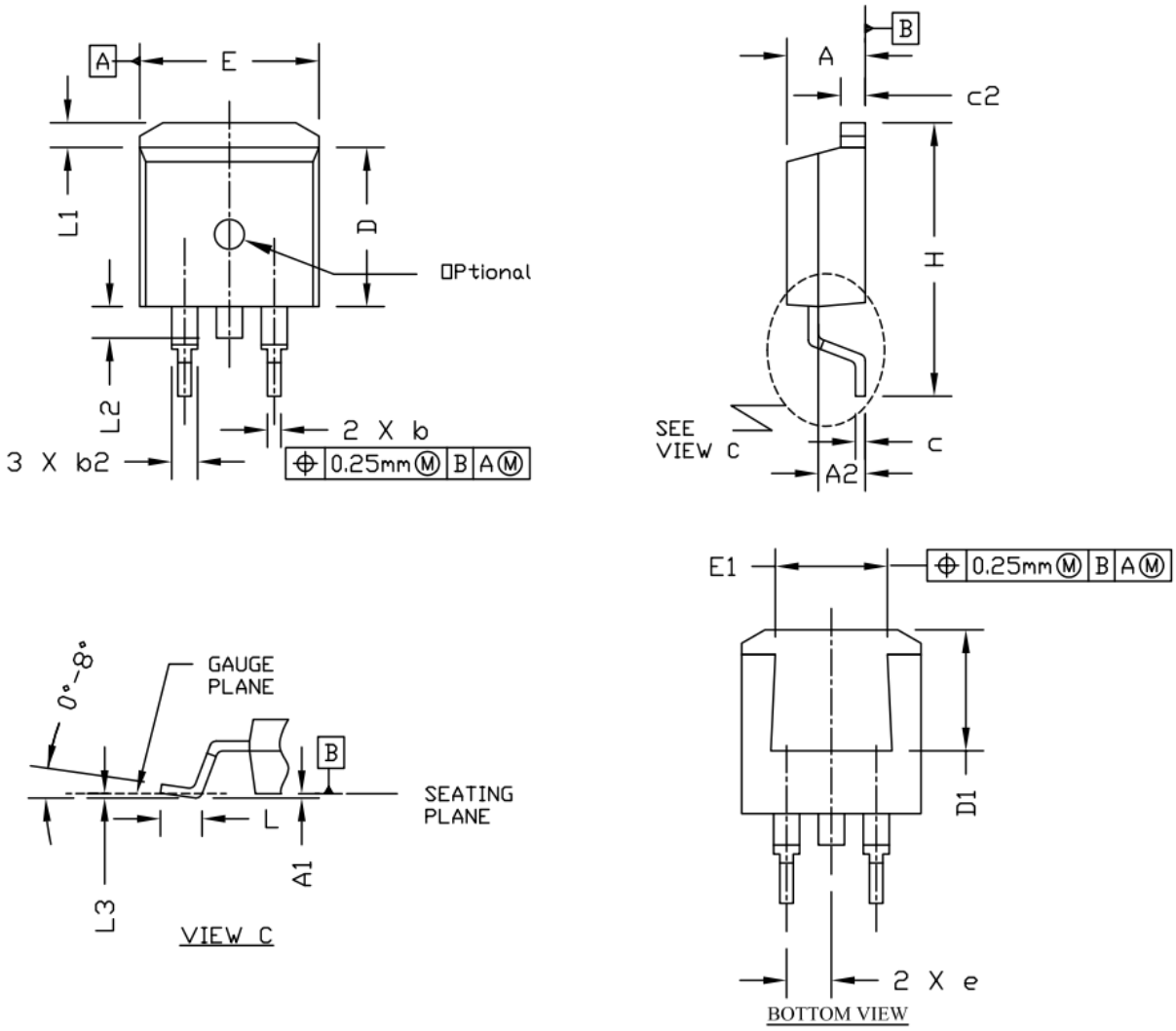



**Fig11.** Switching Time Test Circuit and waveforms

## TO-263 Package Outline Data




| Symbol | Dimensions (unit: mm) | | |
|---|---|---|---|
| | Min | Typ | Max |
| A | 4.400 | 4.570 | 4.700 |
| A1 | 0.000 | 0.100 | 0.200 |
| A2 | 2.300 | 2.400 | 2.500 |
| b | 0.700 | 0.800 | 0.900 |
| b2 | 1.200 | 1.270 | 1.360 |
| c | 0.381 | 0.500 | 0.737 |
| c2 | 1.220 | 1.300 | 1.350 |
| D | 8.600 | 9.200 | 9.300 |
| D1 | 6.860 | | |
| e | 2.540 BSC | | |
| E | 9.780 | 9.880 | 10.260 |
| E1 | 6.225 | | |
| H | 14.700 | 15.100 | 15.500 |
| L | 2.000 | 2.550 | 2.750 |
| L1 | 1.000 | 1.200 | 1.400 |
| L2 | 1.300 | 1.600 | 1.700 |
| L3 | 0.255 BSC | | |

Notes:

1. Refer to JEDEC TO-263 variation AB
2. Dimension "D" & "E" do NOT include mold flash, mold flash shall not exceed 0.127mm per side.

## Customer Service

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