



30V/110A N-Channel Advanced Power MOSFET

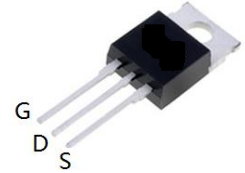
VS3698AT

Features

- Enhancement mode
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}=4.5\text{ V}$
- Fast Switching and High efficiency
- 100% Avalanche Tested
- Pb-free lead plating; RoHS compliant

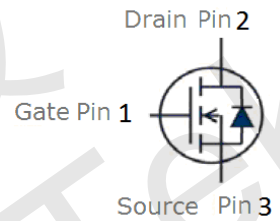
| | | |
|--|-----|------------|
| V_{DS} | 30 | V |
| $R_{DS(on),TYP}$ @ $V_{GS}=10\text{ V}$ | 3.5 | m Ω |
| $R_{DS(on),TYP}$ @ $V_{GS}=4.5\text{ V}$ | 4.7 | m Ω |
| I_D | 110 | A |

TO-220AB



Halogen-Free

| Part ID | Package Type | Marking | Tape and reel information |
|----------|--------------|---------|---------------------------|
| VS3698AT | TO-220AB | 3698AT | 50pcs/Tube |



Maximum ratings, at $T_A=25\text{ }^\circ\text{C}$, unless otherwise specified

| Symbol | Parameter | Rating | Unit |
|----------------|---|-------------------------|------------------|
| $V_{(BR)DSS}$ | Drain-Source breakdown voltage | 30 | V |
| V_{GS} | Gate-Source voltage | ± 20 | V |
| I_S | Diode continuous forward current | $T_C=25^\circ\text{C}$ | 110 A |
| I_D | Continuous drain current @ $V_{GS}=10\text{ V}$ | $T_C=25^\circ\text{C}$ | 110 A |
| | | $T_C=100^\circ\text{C}$ | 78 A |
| I_{DM} | Pulse drain current tested ① | $T_C=25^\circ\text{C}$ | 440 A |
| I_{DSM} | Continuous drain current @ $V_{GS}=10\text{ V}$ | $T_A=25^\circ\text{C}$ | 18 A |
| | | $T_A=70^\circ\text{C}$ | 15 A |
| EAS | Avalanche energy, single pulsed ② | 100 | mJ |
| P_D | Maximum power dissipation | $T_C=25^\circ\text{C}$ | 71 W |
| | | $T_C=100^\circ\text{C}$ | 36 W |
| P_{DSM} | Maximum power dissipation ③ | $T_A=25^\circ\text{C}$ | 2 W |
| | | $T_A=70^\circ\text{C}$ | 1.3 W |
| T_{STG}, T_J | Storage and Junction Temperature Range | -55 to 175 | $^\circ\text{C}$ |

Thermal Characteristics

| Symbol | Parameter | Typical | Unit |
|-----------------|---|---------|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case | 2.1 | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 62.5 | $^\circ\text{C/W}$ |



Electrical Characteristics

| 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 | 30 | -- | -- | V |
| I _{DSS} | Zero Gate Voltage Drain Current | V _{DS} =30V, V _{GS} =0V | -- | -- | 1 | μA |
| | Zero Gate Voltage Drain Current(T _j =125°C) | V _{DS} =30V, 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 Resistance ④ | V _{GS} =10V, I _D =30A | -- | 3.5 | 4.5 | mΩ |
| | | T _j =100°C | -- | 4 | -- | mΩ |
| R _{DS(ON)} | Drain-Source On-State Resistance ④ | V _{GS} =4.5V, I _D =15A | -- | 4.7 | 6.5 | mΩ |
| Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated) | | | | | | |
| C _{iss} | Input Capacitance | V _{DS} =15V, V _{GS} =0V, f=1MHz | 2130 | 2500 | 2870 | pF |
| C _{oss} | Output Capacitance | | 350 | 410 | 470 | pF |
| C _{rss} | Reverse Transfer Capacitance | | 280 | 330 | 380 | pF |
| R _g | Gate Resistance | f=1MHz | -- | 1.2 | -- | Ω |
| Q _g (10V) | Total Gate Charge | V _{DS} =15V, I _D =30A, V _{GS} =10V | -- | 49 | -- | nC |
| Q _g (4.5V) | Total Gate Charge | | -- | 25 | -- | nC |
| Q _{gs} | Gate-Source Charge | | -- | 8.4 | -- | nC |
| Q _{gd} | Gate-Drain Charge | | -- | 11 | -- | nC |
| Switching Characteristics | | | | | | |
| t _{d(on)} | Turn-on Delay Time | V _{DD} =15V, I _D =20A, R _G =3Ω, V _{GS} =10V | -- | 12 | -- | ns |
| t _r | Turn-on Rise Time | | -- | 68 | -- | ns |
| t _{d(off)} | Turn-Off Delay Time | | -- | 34 | -- | ns |
| t _f | Turn-Off Fall Time | | -- | 42 | -- | ns |
| Source- Drain Diode Characteristics @ T_j = 25°C (unless otherwise stated) | | | | | | |
| V _{SD} | Forward on voltage | I _{SD} =30A, V _{GS} =0V | -- | 0.8 | 1.2 | V |
| t _{rr} | Reverse Recovery Time | T _j =25°C, I _{sd} =20A, V _{GS} =0V | -- | 11 | -- | ns |
| Q _{rr} | Reverse Recovery Charge | di/dt=100A/μs | -- | 2.2 | -- | 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} = 20A, V_{GS} = 10V. Part not recommended for use above this value
- ③ The power dissipation P_{DSM} is based on R_{θJA} and the maximum allowed junction temperature of 150°C.
- ④ Pulse width ≤ 380μs; duty cycle ≤ 2%.



Typical Characteristics

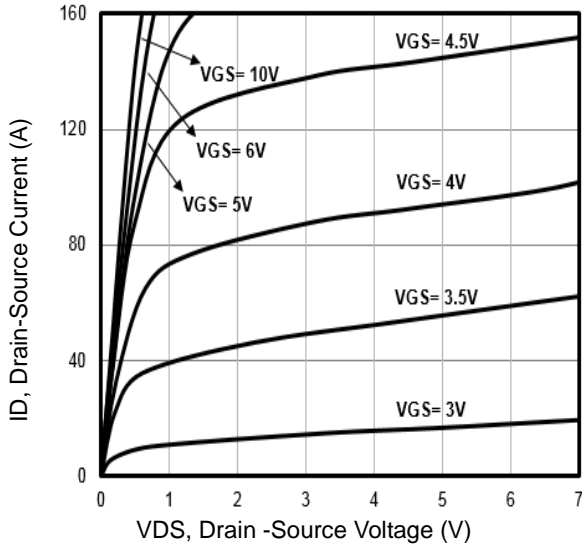


Fig1. Typical Output Characteristics

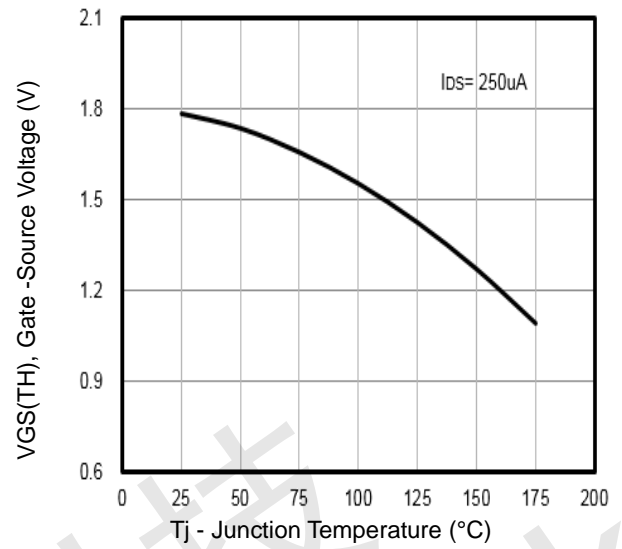


Fig2. $V_{GS(TH)}$ Gate -Source Voltage Vs. T_j

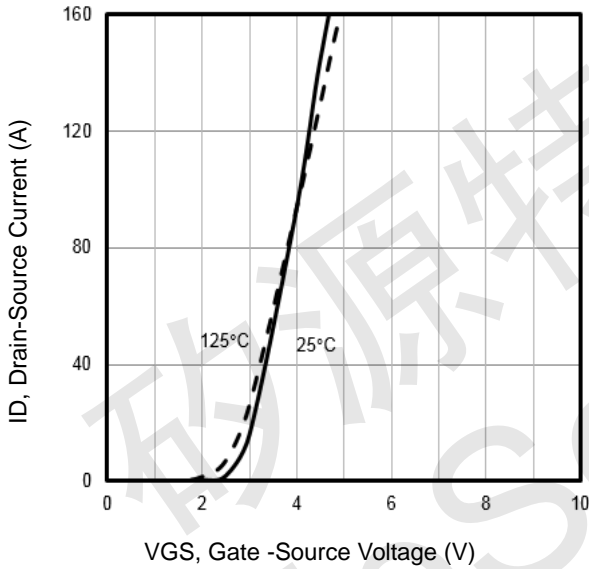


Fig3. Typical Transfer Characteristics

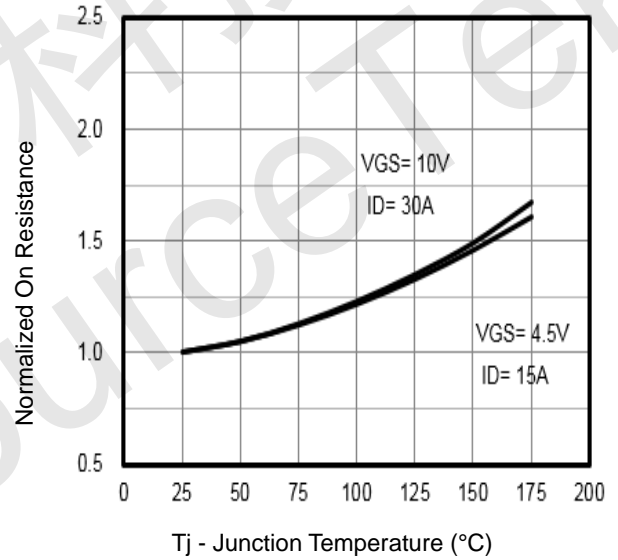


Fig4. Normalized On-Resistance Vs. Temperature

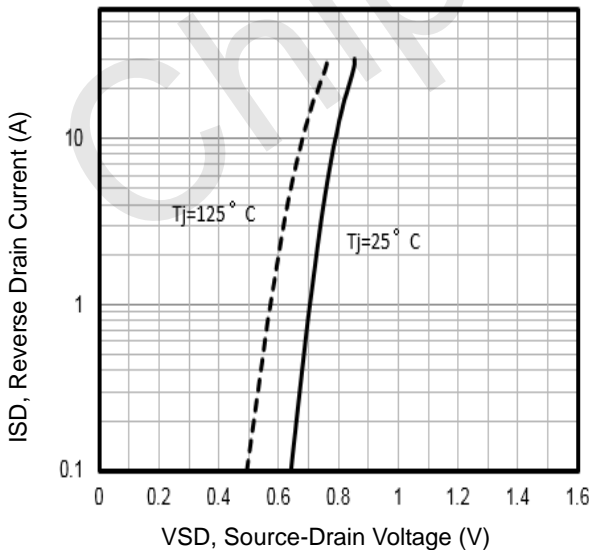


Fig5. Typical Source-Drain Diode Forward Voltage

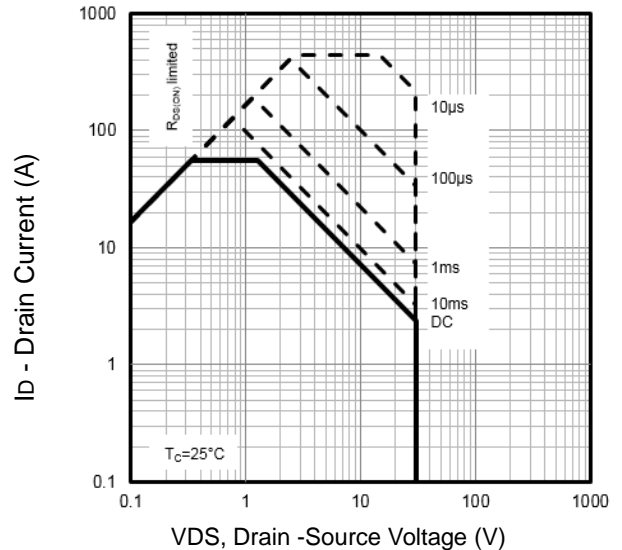


Fig6. Maximum Safe Operating Area



Typical Characteristics

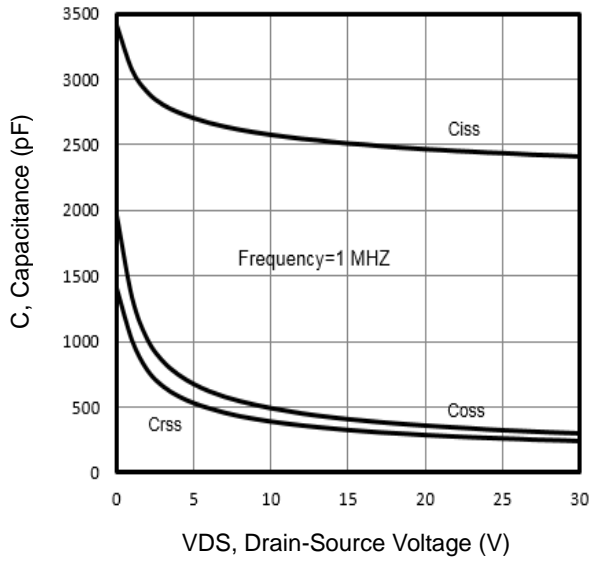


Fig7. Typical Capacitance Vs. Drain-Source Voltage

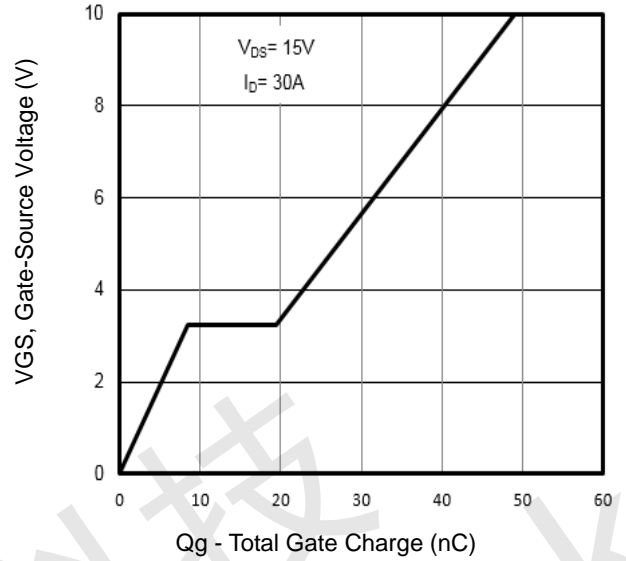


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

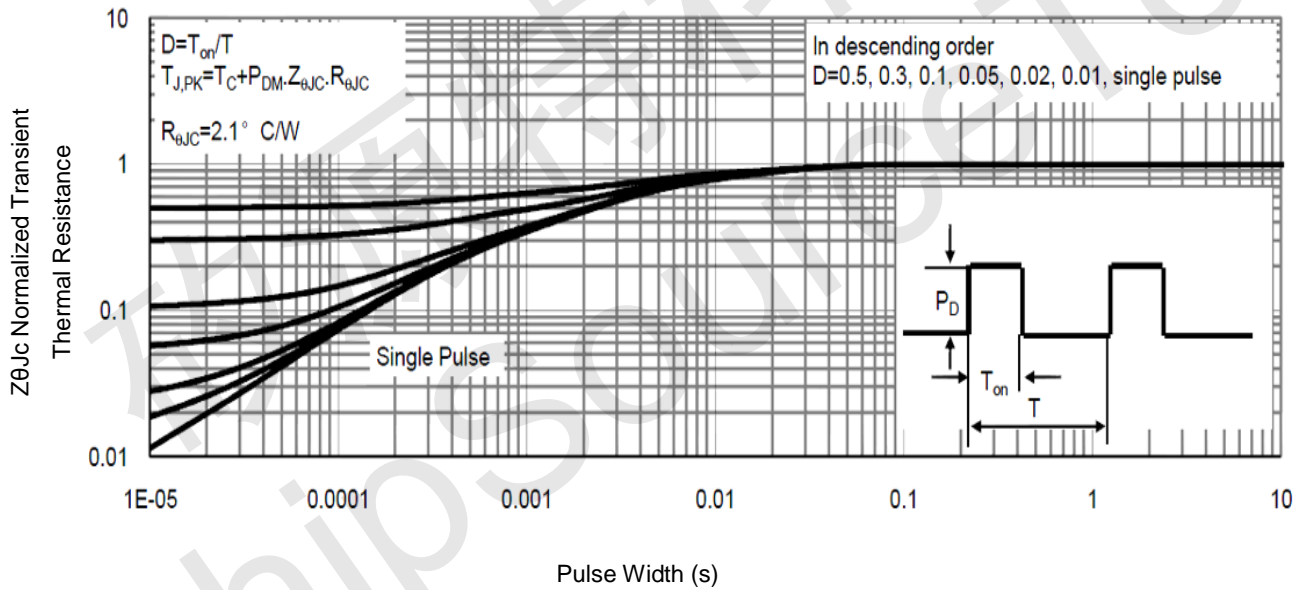


Fig9. Normalized Maximum Transient Thermal Impedance

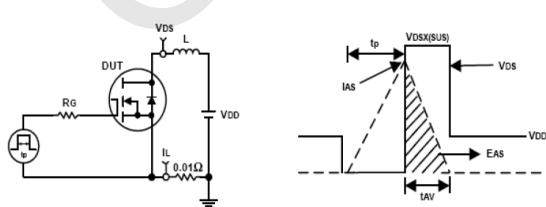


Fig10. Unclamped Inductive Test Circuit and waveforms

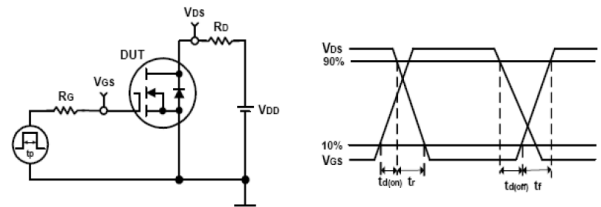
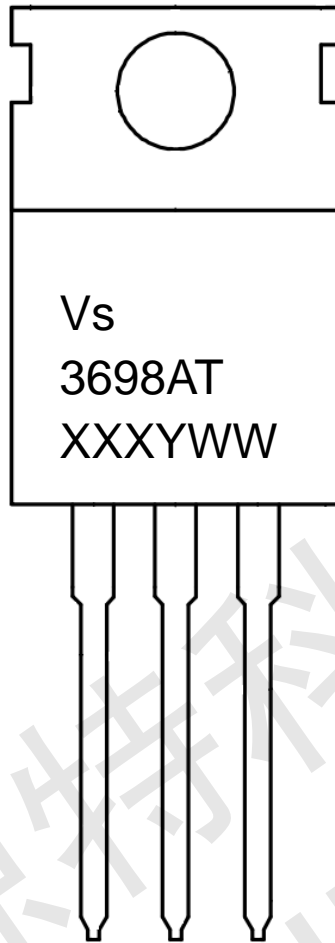


Fig11. Switching Time Test Circuit and waveforms



Marking Information



1st line: Vanguard Code (Vs)

2nd line: Part Number (3698AT)

3rd line: Date code (XXXYWW)

XXX: Wafer Lot Number Code , code changed with Lot Number

Y: Year Code, (e.g. E=2017, F=2018, G=2019, H=2020, etc)

WW: Week Code (01 to 53)



TO-220AB Package Outline Data

| Symbol | Dimensions (unit: mm) | | |
|--------|-----------------------|-------|-------|
| | Min | Typ | Max |
| A | 4.30 | 4.52 | 4.70 |
| A1 | 1.15 | 1.30 | 1.40 |
| A2 | 2.20 | 2.40 | 2.60 |
| b | 0.70 | 0.80 | 1.00 |
| b2 | 1.17 | 1.32 | 1.50 |
| c | 0.45 | 0.50 | 0.61 |
| D | 15.30 | 15.65 | 15.90 |
| D1 | 9.00 | 9.20 | 9.40 |
| DEP | 0.05 | 0.10 | 0.25 |
| E | 9.66 | 9.90 | 10.28 |
| E1 | - | 8.70 | - |
| E2 | 9.80 | 10.00 | 10.20 |
| ΦP1 | 1.40 | 1.50 | 1.60 |
| e | 2.54 BSC | | |
| e1 | 5.08 BSC | | |
| H1 | 6.40 | 6.50 | 6.80 |
| L | 12.70 | - | 14.27 |
| L1 | - | - | 3.95 |
| L2 | 2.40 | 2.50 | 2.60 |
| ΦP | 3.53 | 3.60 | 3.70 |
| Q | 2.70 | 2.80 | 2.90 |
| θ1 | 5 ° | 7 ° | 9 ° |
| θ2 | 1 ° | 3 ° | 5 ° |

Notes:

1. Refer to JEDEC TO-220 variation AB
2. Dimension "D" and "E" do NOT include mold flash. Mold flash shall not exceed 0.127mm per side.