



30V/110A N-Channel Advanced Power MOSFET

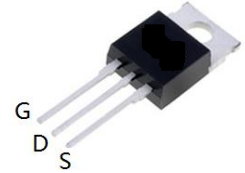
VS3698AT

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

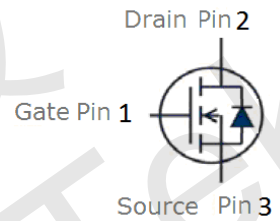
$V_{DS}$	30	V
$R_{DS(on),TYP}$ @ $V_{GS}=10\text{ V}$	3.5	m $\Omega$
$R_{DS(on),TYP}$ @ $V_{GS}=4.5\text{ V}$	4.7	m $\Omega$
$I_D$	110	A

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	$\pm 20$	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
<b>Static Electrical Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	30	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T <sub>j</sub> =125°C)	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V	--	--	100	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	--	--	±100	nA
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	1.2	1.8	2.4	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance ④	V <sub>GS</sub> =10V, I <sub>D</sub> =30A	--	3.5	4.5	mΩ
		T <sub>j</sub> =100°C	--	4	--	mΩ
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance ④	V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A	--	4.7	6.5	mΩ
<b>Dynamic Electrical Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	2130	2500	2870	pF
C <sub>oss</sub>	Output Capacitance		350	410	470	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		280	330	380	pF
R <sub>g</sub>	Gate Resistance	f=1MHz	--	1.2	--	Ω
Q <sub>g(10V)</sub>	Total Gate Charge	V <sub>DS</sub> =15V, I <sub>D</sub> =30A, V <sub>GS</sub> =10V	--	49	--	nC
Q <sub>g(4.5V)</sub>	Total Gate Charge		--	25	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	8.4	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	11	--	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =15V, I <sub>D</sub> =20A, R <sub>G</sub> =3Ω, V <sub>GS</sub> =10V	--	12	--	ns
t <sub>r</sub>	Turn-on Rise Time		--	68	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	34	--	ns
t <sub>f</sub>	Turn-Off Fall Time		--	42	--	ns
<b>Source- Drain Diode Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
V <sub>SD</sub>	Forward on voltage	I <sub>SD</sub> =30A, V <sub>GS</sub> =0V	--	0.8	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>j</sub> =25°C, I <sub>sd</sub> =20A, V <sub>GS</sub> =0V	--	11	--	ns
Q <sub>rr</sub>	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<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 0.5mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 20A, V<sub>GS</sub> = 10V. Part not recommended for use above this value
- ③ The power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150°C.
- ④ Pulse width ≤ 380μs; duty cycle ≤ 2%.



Typical Characteristics

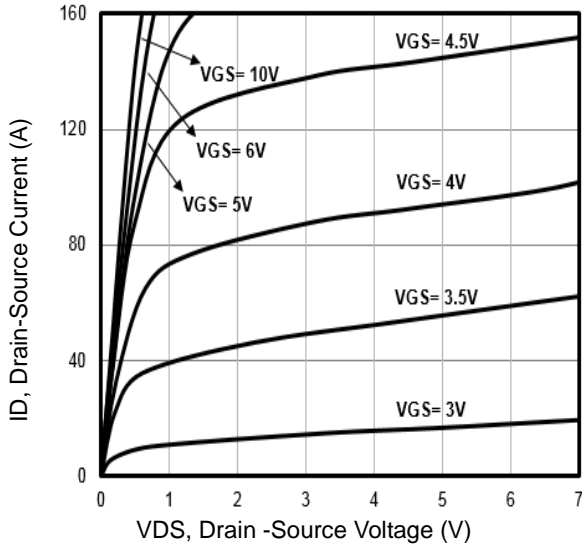


Fig1. Typical Output Characteristics

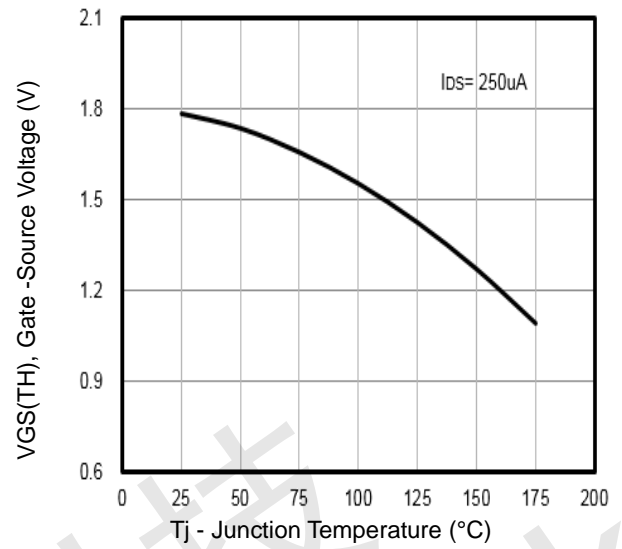


Fig2.  $V_{GS(TH)}$  Gate -Source Voltage Vs.  $T_j$

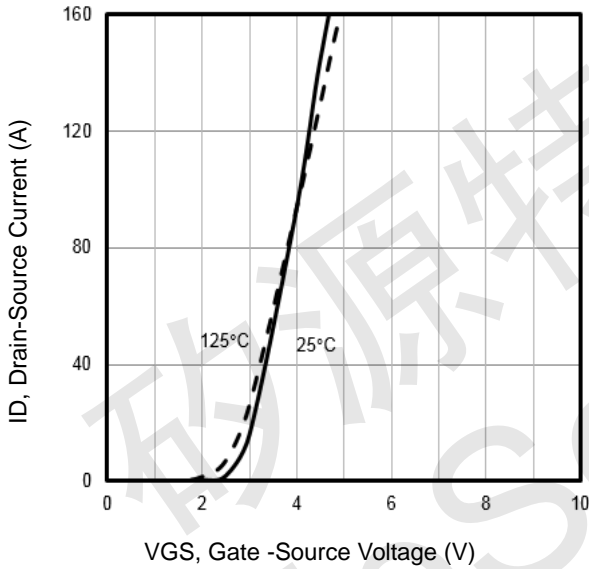


Fig3. Typical Transfer Characteristics

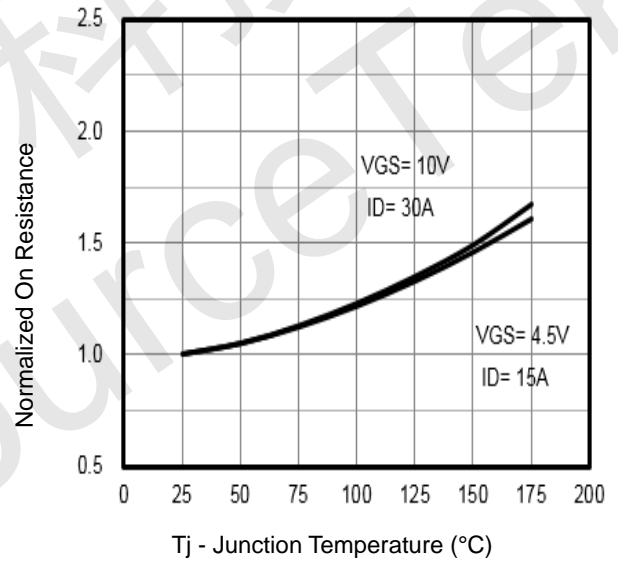


Fig4. Normalized On-Resistance Vs. Temperature

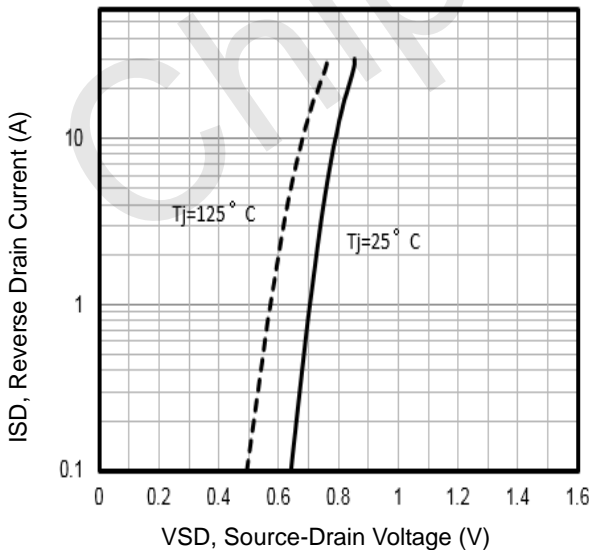


Fig5. Typical Source-Drain Diode Forward Voltage

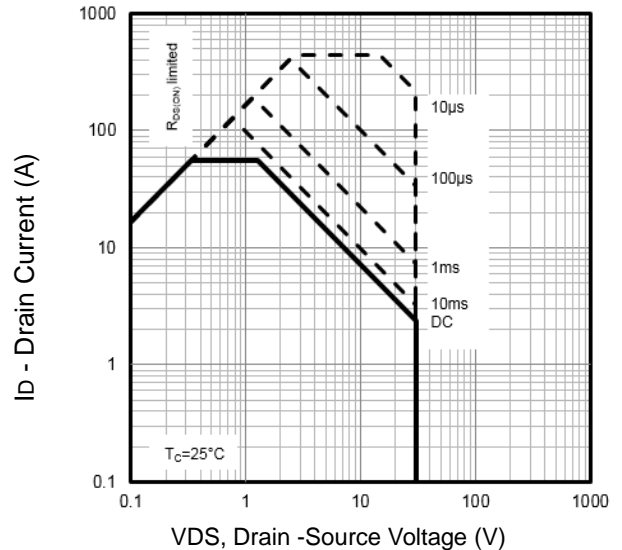


Fig6. Maximum Safe Operating Area



Typical Characteristics

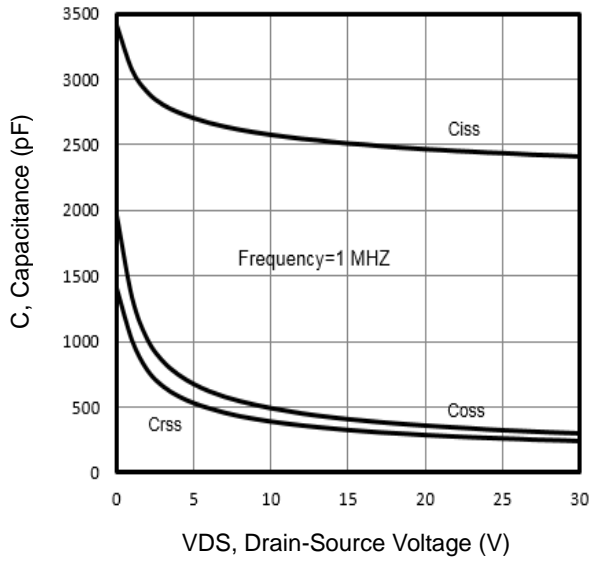


Fig7. Typical Capacitance Vs. Drain-Source Voltage

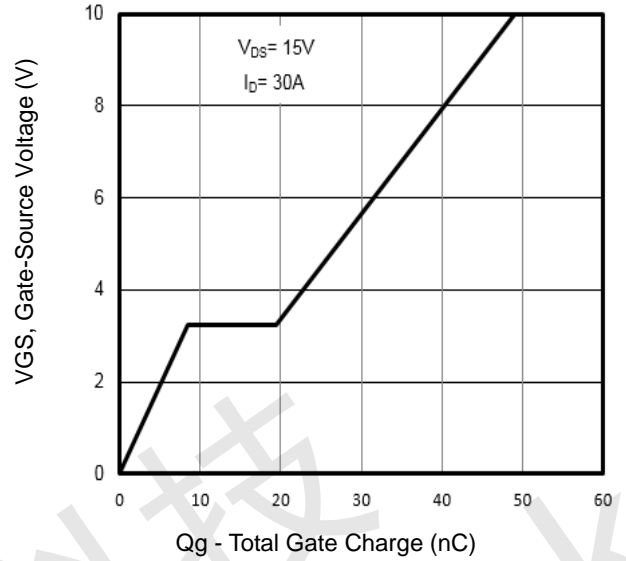


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

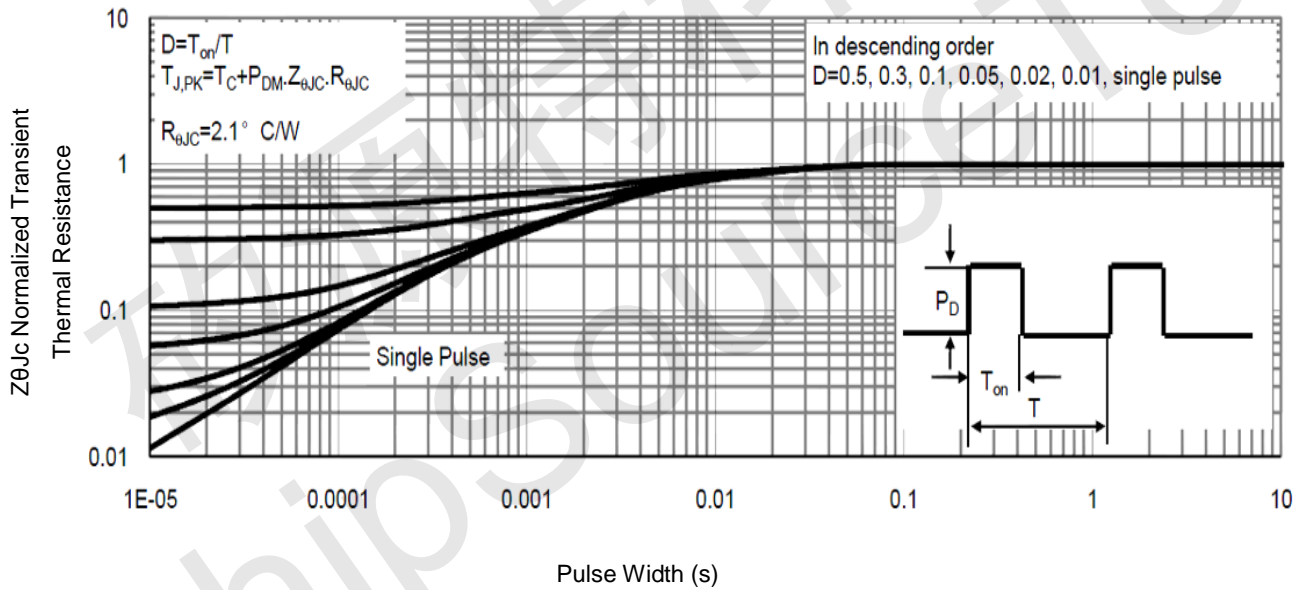


Fig9. Normalized Maximum Transient Thermal Impedance

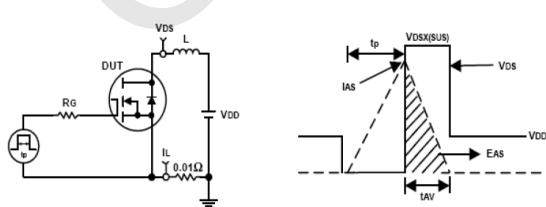


Fig10. Unclamped Inductive Test Circuit and waveforms

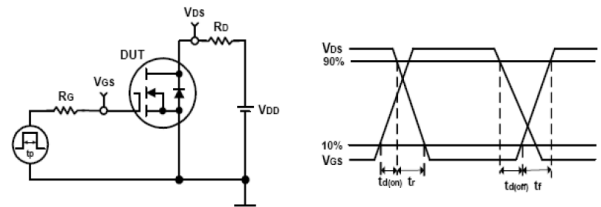
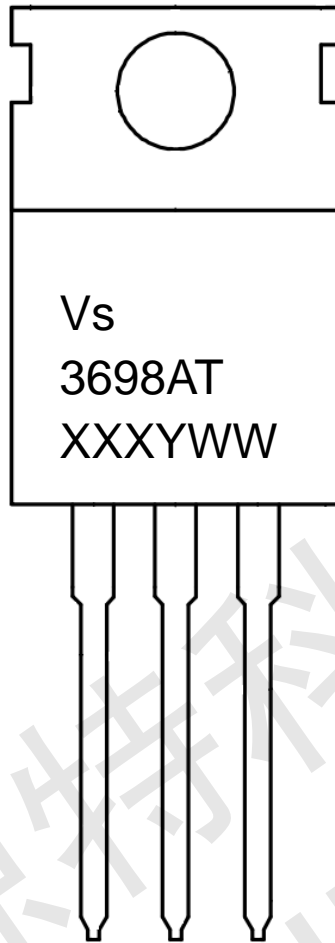


Fig11. Switching Time Test Circuit and waveforms



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.