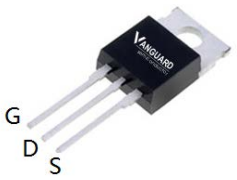
Features

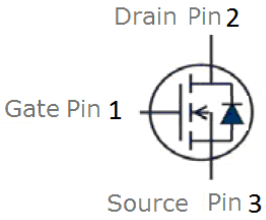
- Enhancement mode
- Very low on-resistance $R_{DS(on)}$ @ V_{GS}=10 V
- 100% Avalanche test
- Pb-free lead plating; RoHS compliant

V_{DS}	100	V
$R_{DS(on),TYP}$@ V_{GS}=10 V	4.5	mΩ
I_D	200	A

TO-220AB



Pb-Free RoHS HF Halogen-Free



Part ID	Package Type	Marking	Tape and reel information
VS1401ATH	TO-220AB	1401ATH	50pcs/Tube

Maximum ratings, at T_A =25°C, unless otherwise specified

Symbol	Parameter		Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage		100	V
V_{GS}	Gate-Source voltage		±25	V
I_S	Diode continuous forward current	T_C =25°C	200	A
I_D	Continuous drain current @VGS=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
I_{DSM}	Continuous drain current @VGS=10V	T_A=25°C	15	A
		T_A=70°C	12	A
EAS	Avalanche energy, single pulsed ②		900	mJ
P_D	Maximum power dissipation	T_C =25°C	375	W
P_{DSM}	Maximum power dissipation ③	T_A=25°C	2	W
T_{STG},T_J	Storage and Junction Temperature Range		-55 to 175	°C

Thermal Characteristics

Symbol	Parameter	Typical	Max	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	0.4	0.5	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	75	°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	100	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=100V,V_{GS}=0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T_j=125℃)	V_{DS}=100V,V_{GS}=0V	--	--	100	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±25V,V_{DS}=0V	--	--	±100	nA
$V_{GS(th)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	2.4	3	3.6	V
$R_{DS(on)}$	Drain-Source On-State Resistance ④	V_{GS}=10V, I_D=80A	--	4.5	5.5	mΩ
		T_j=100℃	--	6.5	--	mΩ
Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated)						
Ciss	Input Capacitance	V_{DS}=30V,V_{GS}=0V, f=1MHz	11065	14755	19625	pF
Coss	Output Capacitance		500	665	885	pF
Crss	Reverse Transfer Capacitance		370	495	660	pF
Rg	Gate Resistance	f=1MHz	0.2	2.3	5	Ω
Qg	Total Gate Charge	V_{DS}=50V,I_D=40A, V_{GS}=10V	--	232	309	nC
Qgs	Gate-Source Charge		--	59	78	nC
Qgd	Gate-Drain Charge		--	60	90	nC
Switching Characteristics						
Td(on)	Turn-on Delay Time	V_{DD}=50V, I_D=40A, R_G=3Ω, V_{GS}=10V	--	35	--	ns
Tr	Turn-on Rise Time		--	67	--	ns
Td(off)	Turn-Off Delay Time		--	128	--	ns
Tf	Turn-Off Fall Time		--	64	--	ns
Source- Drain Diode Characteristics@ T_j = 25°C (unless otherwise stated)						
V_{SD}	Forward on voltage	I_{SD}=80A,V_{GS}=0V	--	0.9	1.2	V
Trr	Reverse Recovery Time	T_j=25℃,I_{sd}=40A, V_{GS}=0V di/dt=100A/μs	--	44	88	ns
Qrr	Reverse Recovery Charge		--	77	154	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} = 60A, V_{GS} =10V. Part not recommended for use above this value

③ The power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C.

④ Pulse width ≤ 380μs; duty cycle≤ 2%.

Typical Characteristics

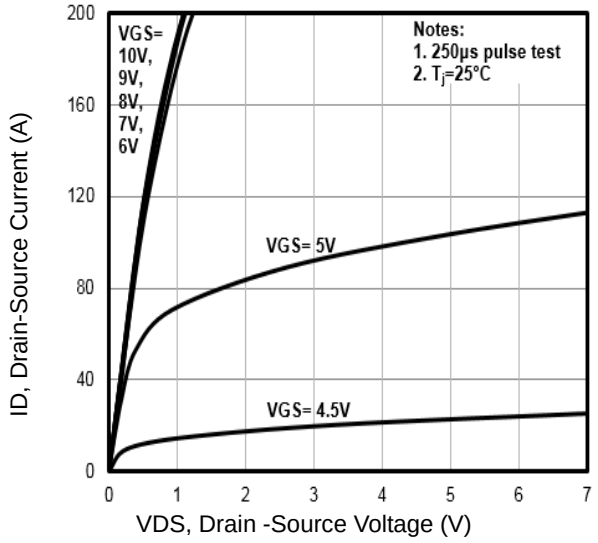


Fig1. Typical Output Characteristics

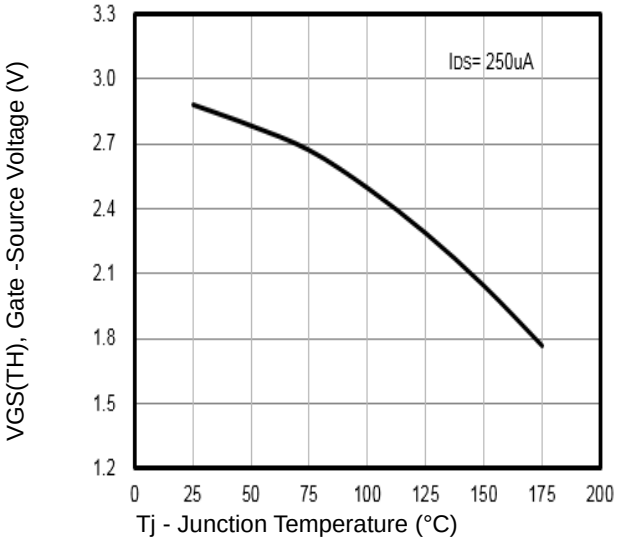


Fig2. $V_{GS(TH)}$ Gate -Source Voltage Vs.Tj

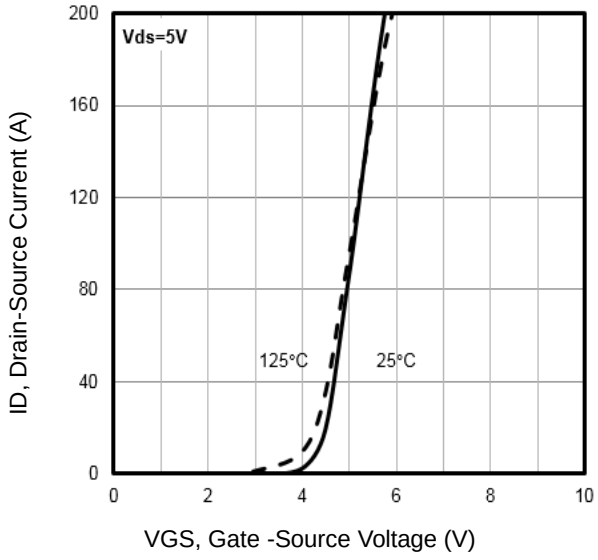


Fig3. Typical Transfer Characteristics

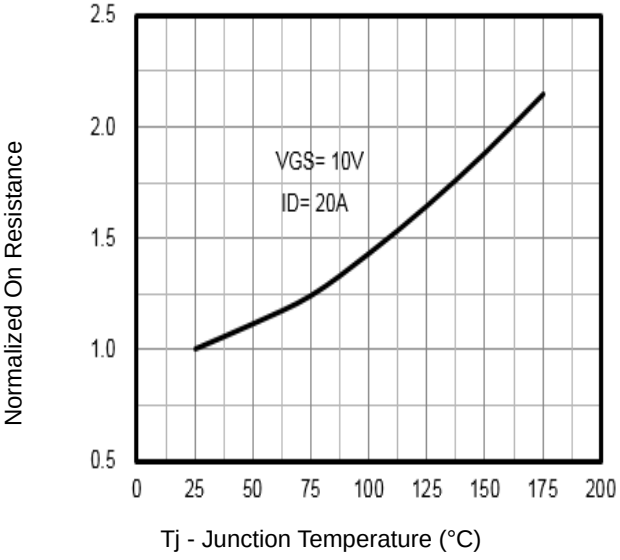


Fig4. Normalized On-Resistance Vs. Tj

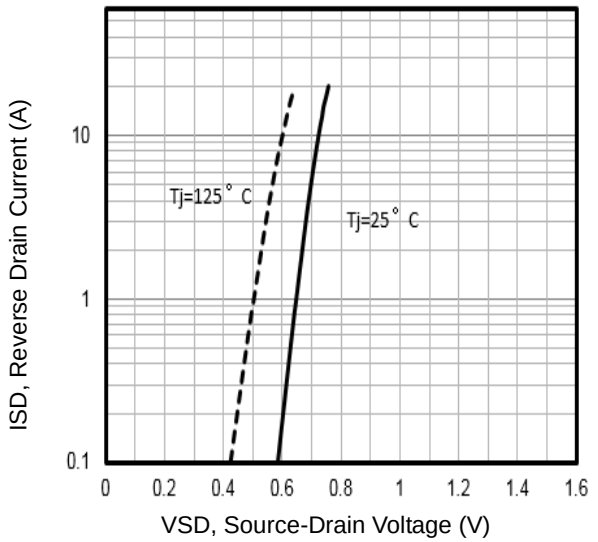


Fig5. Typical Source-Drain Diode Forward Voltage

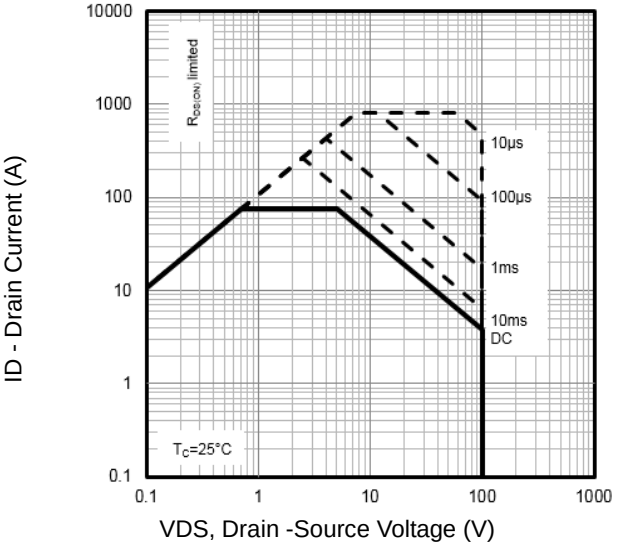


Fig6. Maximum Safe Operating Area

Typical Characteristics

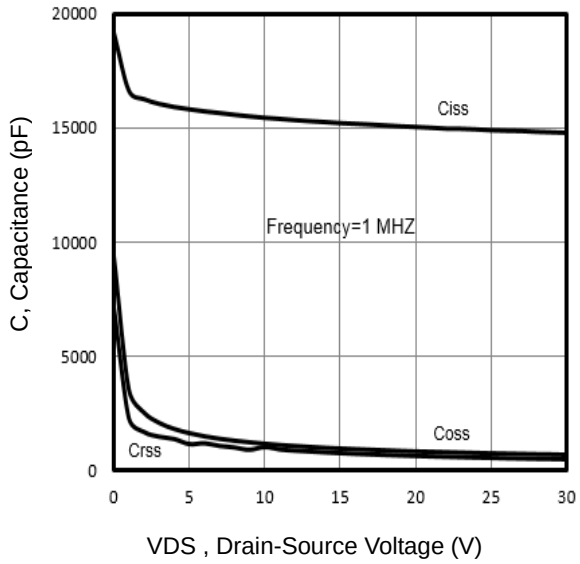


Fig7. Typical Capacitance Vs.Drain-Source Voltage

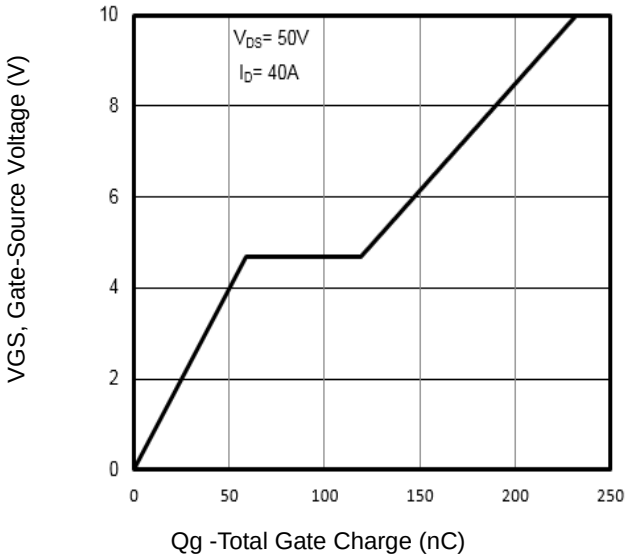


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

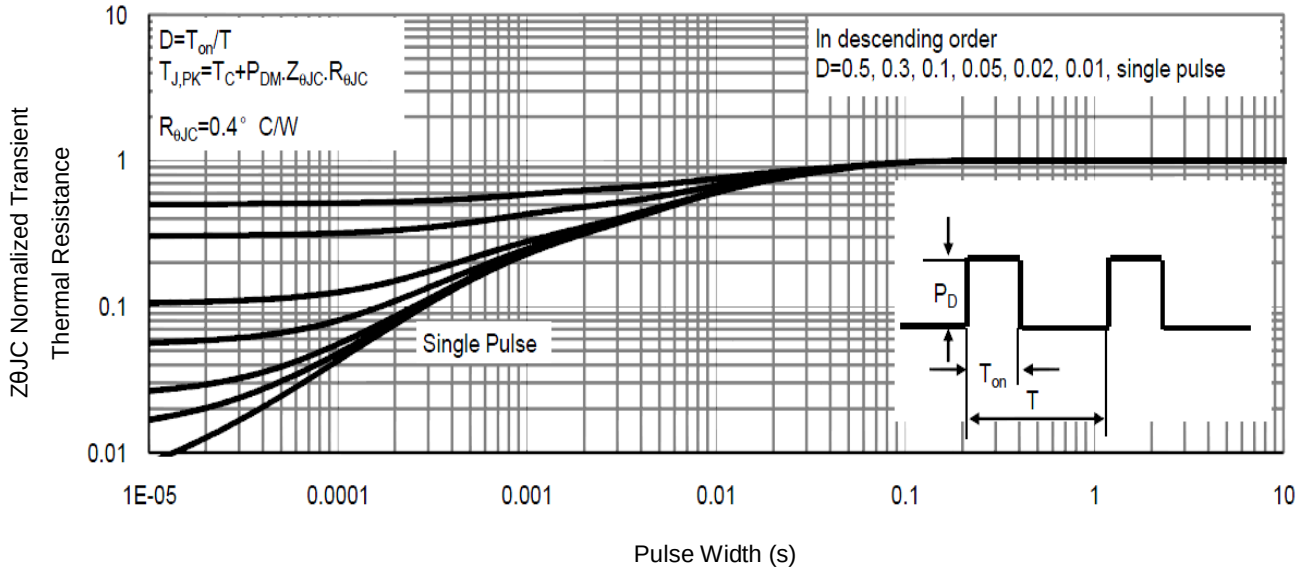


Fig9. Normalized Maximum Transient Thermal Impedance

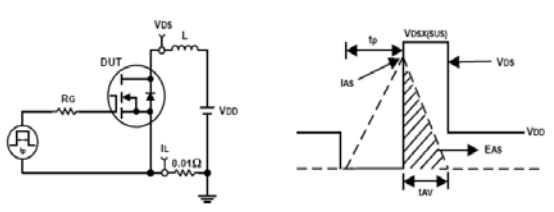


Fig10. Unclamped Inductive Test Circuit and waveforms

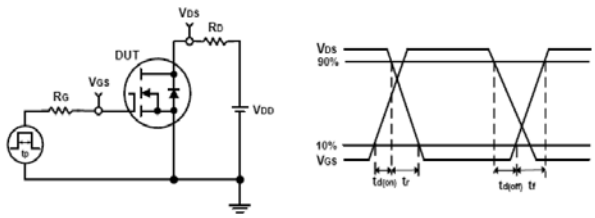
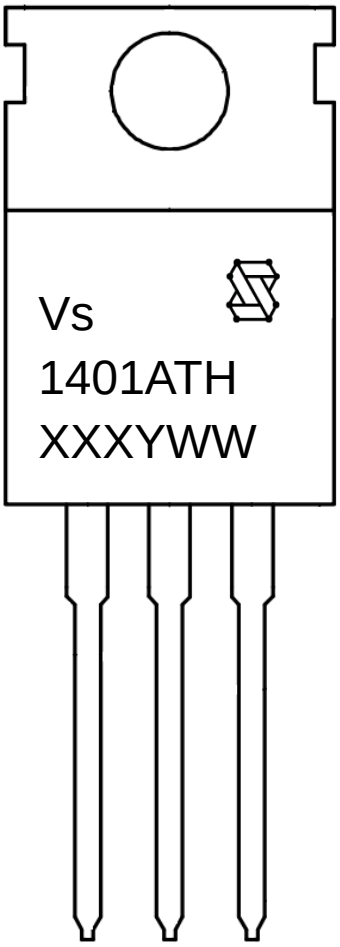


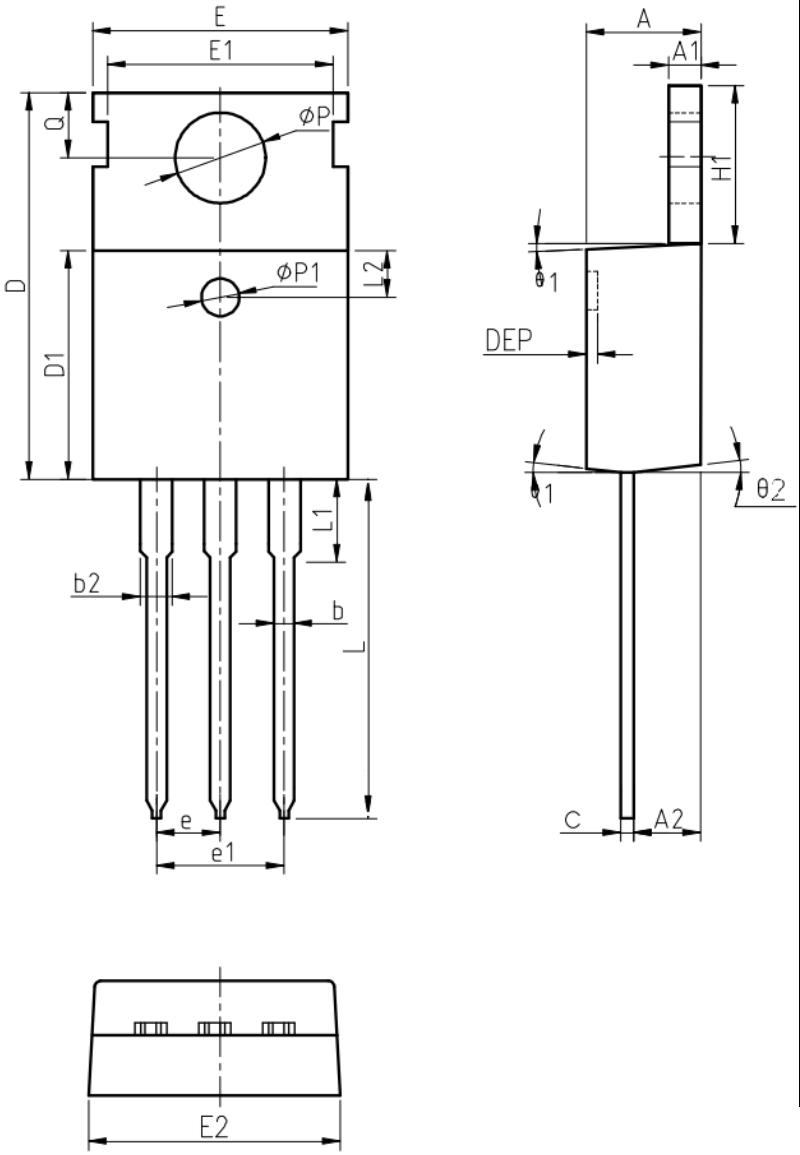
Fig11. Switching Time Test Circuit and waveforms

Marking Information



1st line： Vanguard Code（Vs）， Vanguard Logo
2nd line： Part Number（1401ATH）
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.

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