Vanguard Semiconductor

VS4604AD

40V/140A N-Channel Advanced Power MOSFET

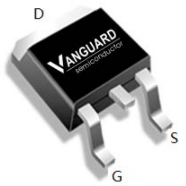
V_{DS}	40	V
$R_{DS(on),TYP}$@ V_{GS}=10 V	2.8	mΩ
$R_{DS(on),TYP}$@ V_{GS}=4.5 V	3.8	mΩ
I_D	140	A

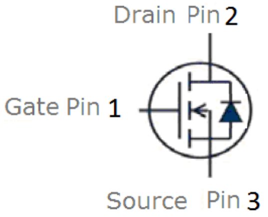
Features

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

Pb-Free RoHS HF Halogen-Free

TO-252





Part ID	Package Type	Marking	Tape and reel information
VS4604AD	TO-252	4604AD	2500pcs/Reel

Maximum ratings, at T_A =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	140	A
I_D	Continuous drain current @VGS=10V	T_C =25°C	140	A
		T_C =100°C	99	A
I_{DM}	Pulse drain current tested ①	T_C =25°C	560	A
EAS	Avalanche energy, single pulsed ②		117	mJ
P_D	Maximum power dissipation	T_C =25°C	100	W
V_{GS}	Gate-Source voltage		±20	V
T_{STG} T_J	Storage and operating temperature range		-55 to 175	°C

Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	1.5	°C/W
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	100	°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	1.3	1.7	2.4	V
$R_{DS(ON)}$	Drain-Source On-State Resistance③	V_{GS}=10V, I_D=30A	--	2.8	3.5	mΩ
$R_{DS(ON)}$	Drain-Source On-State Resistance③	V_{GS}=4.5V, I_D=15A	--	3.8	5	mΩ
Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated)						
C_{iss}	Input Capacitance	V_{DS}=20V,V_{GS}=0V, f=1MHz	4700	5200	5700	pF
C_{oss}	Output Capacitance		300	400	500	pF
C_{rss}	Reverse Transfer Capacitance		300	390	500	pF
R_g	Gate Resistance	f=1MHz	--	1.9	--	Ω
Q_g	Total Gate Charge	V_{DS}=20V,I_D=30A, V_{GS}=10V	--	83	--	nC
Q_{gs}	Gate-Source Charge		--	16	--	nC
Q_{gd}	Gate-Drain Charge		--	17	--	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=20V, I_D=30A, R_G=3Ω, V_{GS}=10V	--	15.7	--	nS
t_r	Turn-on Rise Time		--	6.5	--	nS
$t_{d(off)}$	Turn-Off Delay Time		--	56	--	nS
t_f	Turn-Off Fall Time		--	12	--	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℃,I_{sd}=30A, V_{GS}=0V di/dt=500A/μs	--	18	--	nS
Q_{rr}	Reverse Recovery Charge			40		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} = 17A, V_{GS} =10V. Part not recommended for use above this value

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

Typical Characteristics

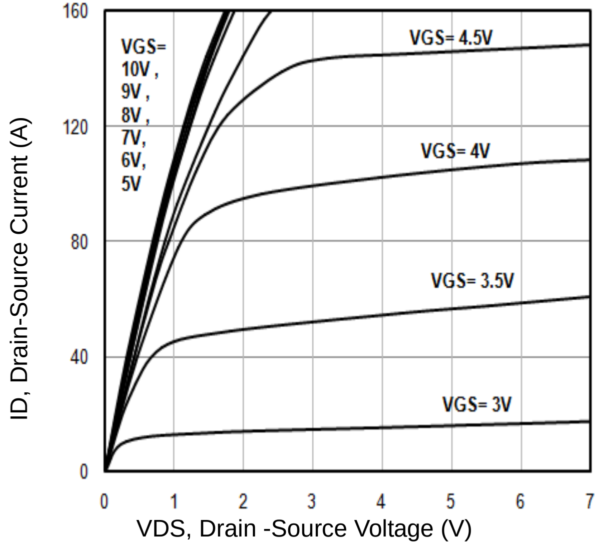


Fig1. Typical Output Characteristics

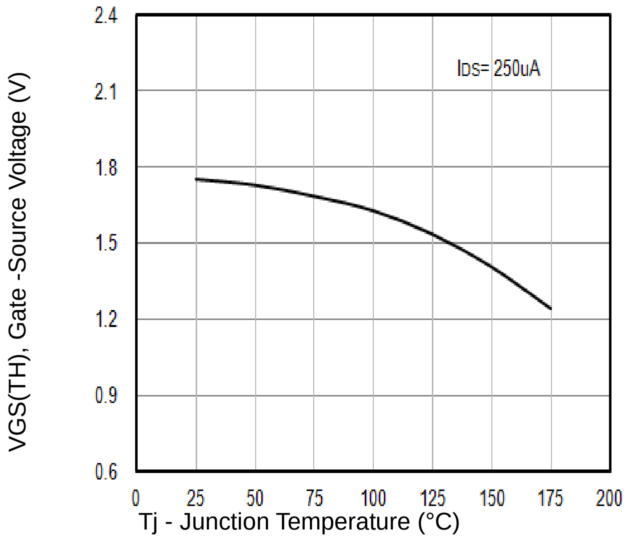


Fig2. $V_{GS(TH)}$ Gate -Source Voltage Vs.Tj

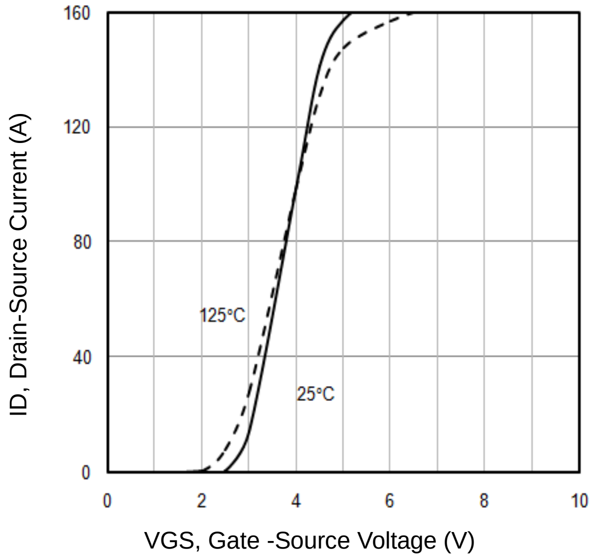


Fig3. Typical Transfer Characteristics

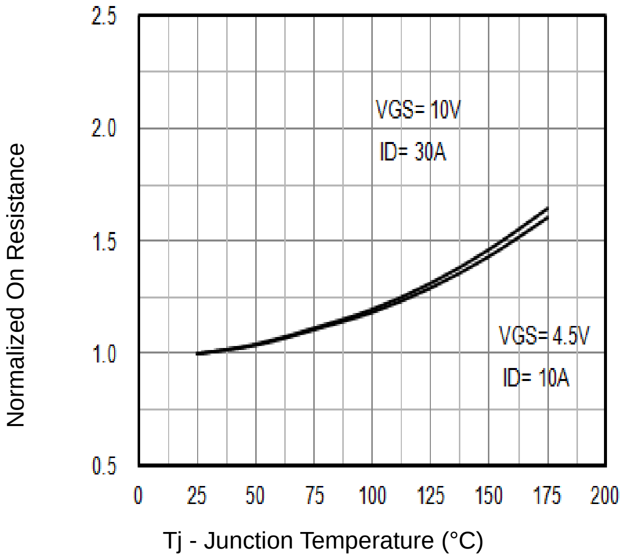


Fig4. Normalized On-Resistance Vs. Tj

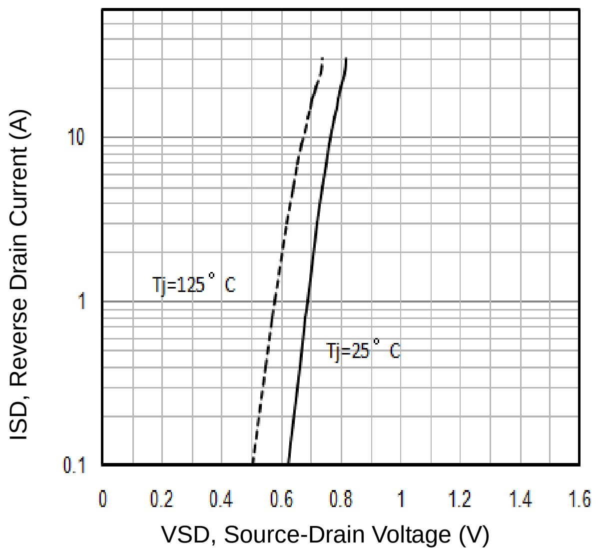


Fig5. Typical Source-Drain Diode Forward Voltage

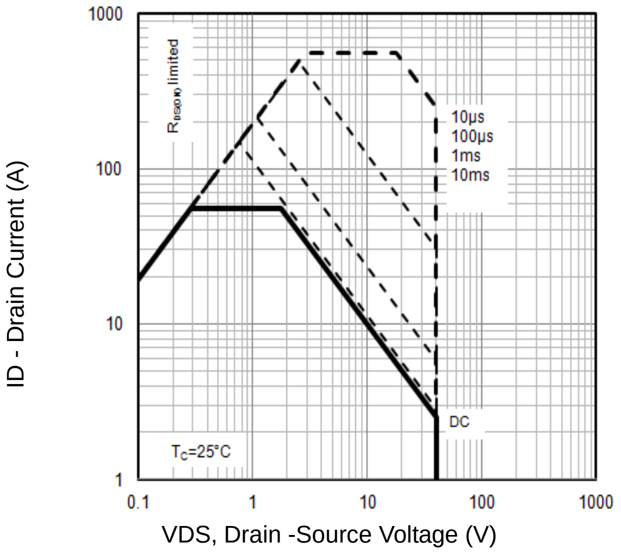


Fig6. Maximum Safe Operating Area

Typical Characteristics

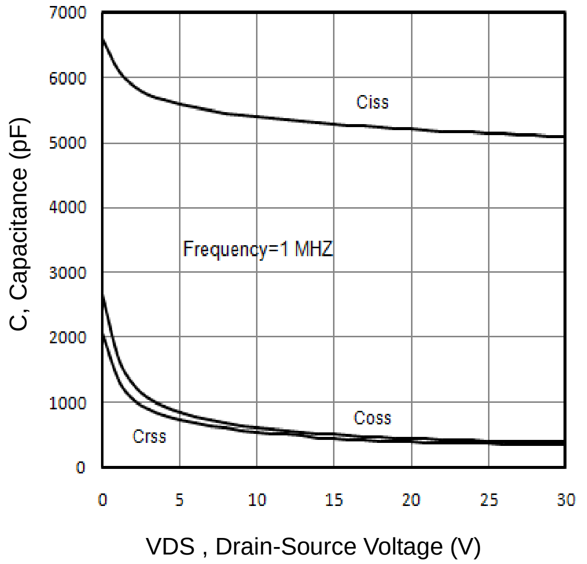


Fig7. Typical Capacitance Vs.Drain-Source Voltage

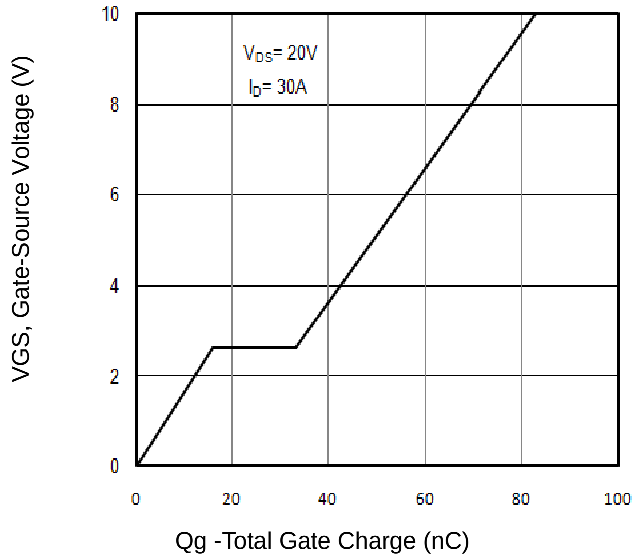


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

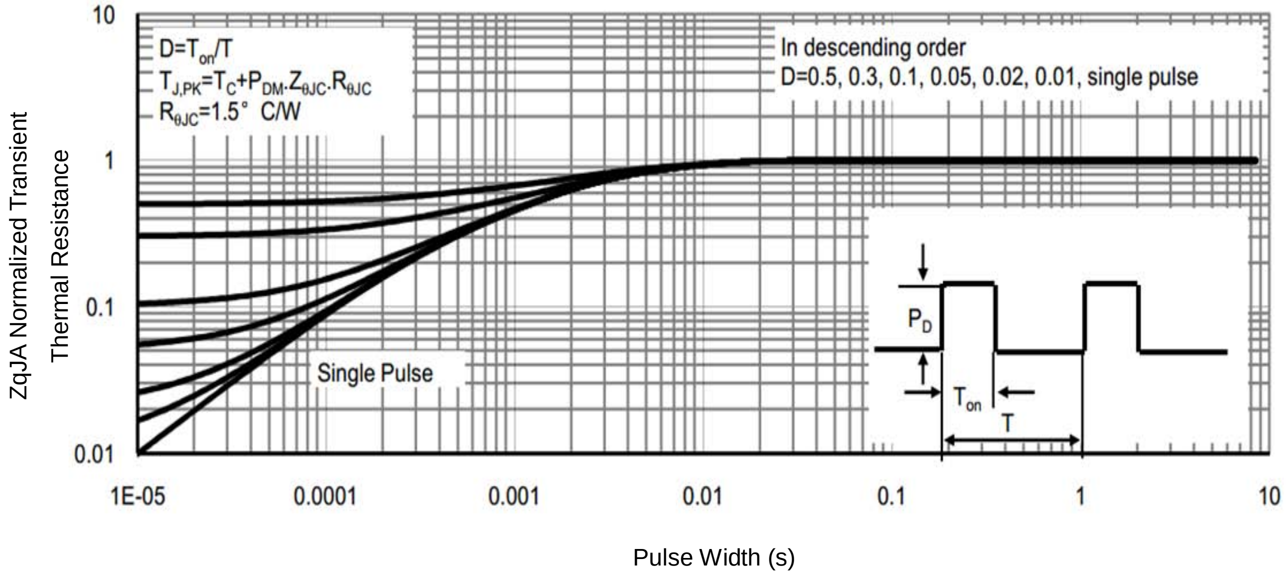


Fig9. Normalized Maximum Transient Thermal Impedance

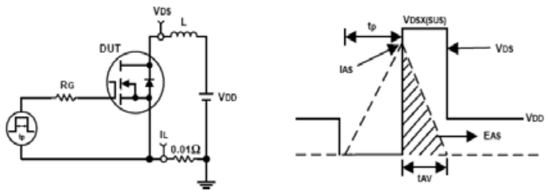


Fig10. Unclamped Inductive Test Circuit and waveforms

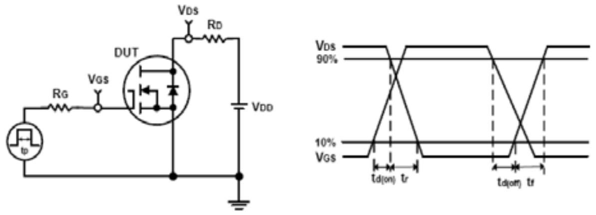
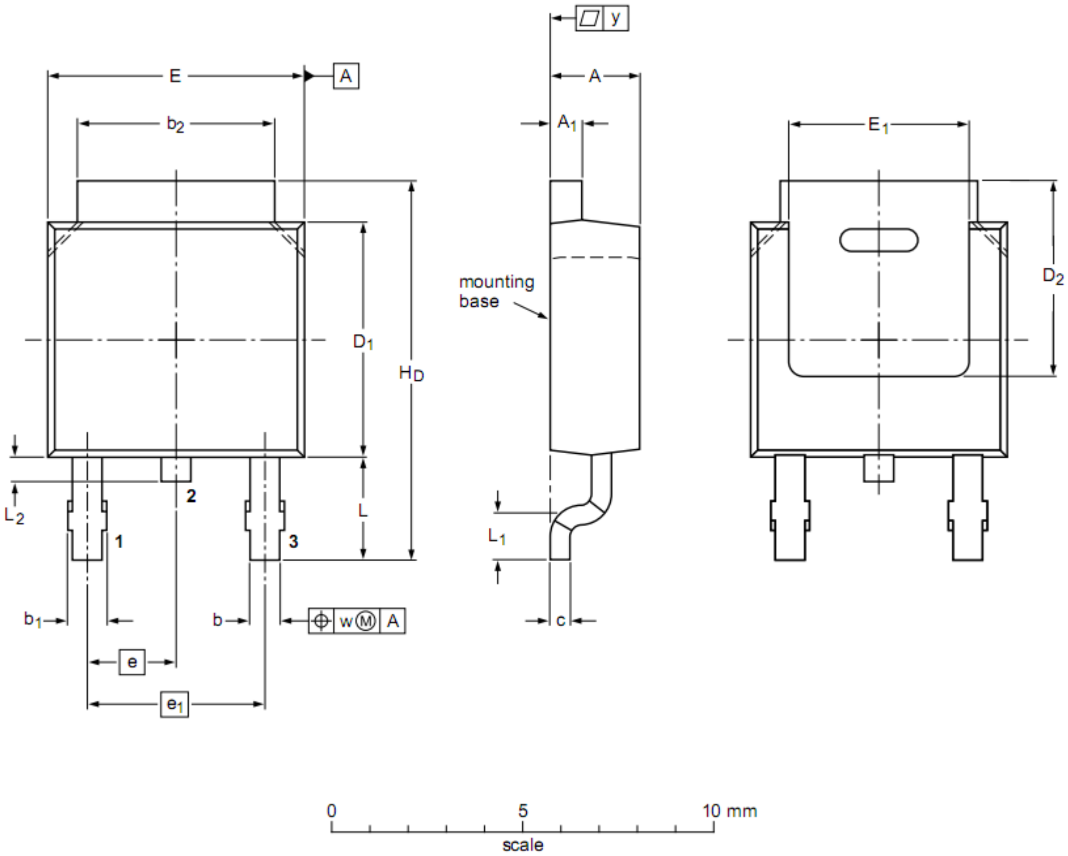


Fig11. Switching Time Test Circuit and waveforms

TO-252 Package Outline Data



Symbol	Dimensions (unit: mm)		
	Min	Typ	Max
A	2.20	2.30	2.38
A_1	0.46	0.50	0.63
b	0.64	0.76	0.89
b_1	0.77	0.85	1.14
b_2	5.00	5.33	5.46
c	0.458	0.508	0.558
D_1	5.98	6.10	6.223
D_2	5.21	--	--
E	6.40	6.60	6.731
E_1	4.40	--	--
e	2.286 BSC		
e_1	--	4.57	--
H_D	9.40	10.00	10.40
L	2.743 REF		
L_1	1.40	1.52	1.77
L_2	0.50	0.80	1.01
w	--	0.20	--
y	--	--	0.20

Notes:

1. Refer to JEDEC TO-252 variation AA
2. Dimension "E" does NOT include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.1524mm per side.
3. Dimension "D1" does NOT include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.1524mm per end.

Customer Service

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