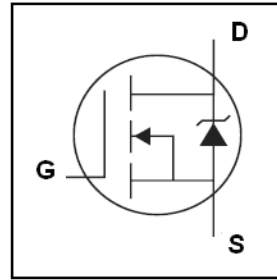


Features

- ◆ Low On-Resistance
- ◆ Fast Switching
- ◆ 100% Avalanche Tested
- ◆ Repetitive Avalanche Allowed up to Tjmax
- ◆ Lead-Free, RoHS Compliant

Description

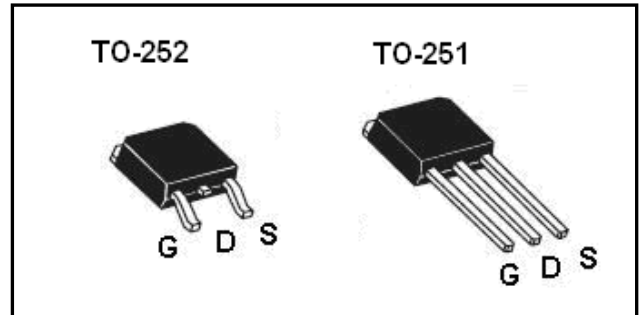
VS6038AD designed by the trench processing techniques to achieve extremely low on-resistance. Additional features of this design are a 175°C junction operating temperature, fast switching speed and improved repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in Power applications and a wide variety of other supply applications.



V_{DSS}	60V
$R_{DS(on)}$	35 mΩ
I_D	25A

Absolute Maximum Ratings

Stresses beyond those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. These are stress ratings only; and functional operation of the device at these or any other condition beyond those indicated in the specifications is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability. The thermal resistance and power dissipation ratings are measured under board mounted and still air conditions. Ambient temperature (TA) is 25°C, unless otherwise specified.



Symbol	Parameter	Rating	Unit
Common Ratings (Tc=25°C Unless Otherwise Noted)			
V_{GS}	Gate-Source Voltage	±20	V
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	60	V
T_J	Maximum Junction Temperature	175	°C
T_{STG}	Storage Temperature Range	-55 to 175	°C
I_S	Diode Continuous Forward Current	$T_C = 25^\circ C$ 25	A
Mounted on Large Heat Sink			
I_{DM}	Pulse Drain Current Tested ①	$T_C = 25^\circ C$ 100	A
I_D	Continuous Drain current@VGS=10V	$T_C = 25^\circ C$ 25	A
P_D	Maximum Power Dissipation	$T_C = 25^\circ C$ 35	W
$R_{\theta JC}$	Thermal Resistance-Junction to Case	3	°C/W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	75	°C/W
Drain-Source Avalanche Ratings			
EAS	Avalanche Energy, Single Pulsed ②	38	mJ

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	60	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current(Tc=25°C)	V _{DS} =60V,V _{GS} =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(Tc=125°C)	V _{DS} =60V,V _{GS} =0V	--	--	100	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±16V,V _{DS} =0V	--	--	±10	μA
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} =V _{GS} ,I _D =250μA	1.0	1.6	2.5	V
R _{DS(ON)}	Drain-Source On-State Resistance ^③	V _{GS} =10V, I _D =16A	--	35	45	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance ^③	V _{GS} =5V, I _D =8A	--	38	55	mΩ
g _{fs}	Forward Transconductance	V _{DS} = 25V, I _D =18A	--	25	--	S
Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance	V _{DS} =30V,V _{GS} =0V, f=1MHz	--	650	--	pF
C _{oss}	Output Capacitance		--	95	--	pF
C _{rss}	Reverse Transfer Capacitance		--	60	--	pF
Q _g	Total Gate Charge	V _{DS} =30V,I _D =18A, V _{GS} =10V	--	20	--	nC
Q _{gs}	Gate-Source Charge		--	7	--	nC
Q _{gd}	Gate-Drain Charge		--	5	--	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =30V, I _D =1A, R _G =6.8Ω, V _{GS} =10V	--	18	--	nS
t _r	Turn-on Rise Time		--	15	--	nS
t _{d(off)}	Turn-Off Delay Time		--	60	--	nS
t _f	Turn-Off Fall Time		--	31	--	nS
Source- Drain Diode Characteristics @ T_J = 25°C (unless otherwise stated)						
I _{SD}	Source-drain current(Body Diode)	T _c =25°C	--	--	25	A
V _{SD}	Forward on voltage	I _{SD} =20A,V _{GS} =0V	--	--	1.3	V
t _{rr}	Reverse Recovery Time	T _J =25°C,I _{sd} =20A, V _{GS} =0V	--	65	--	nS
Q _{rr}	Reverse Recovery Charge	di/dt=100A/μs		85		nC

NOTE:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T_{Jmax}, starting T_J = 25°C, L = 0.3mH,R_G = 25Ω, I_{AS} = 16A, V_{GS} = 10V. Part not recommended for use above this value
- ③ Pulse width ≤ 300μs; duty cycle ≤ 2%.

Typical Characteristics

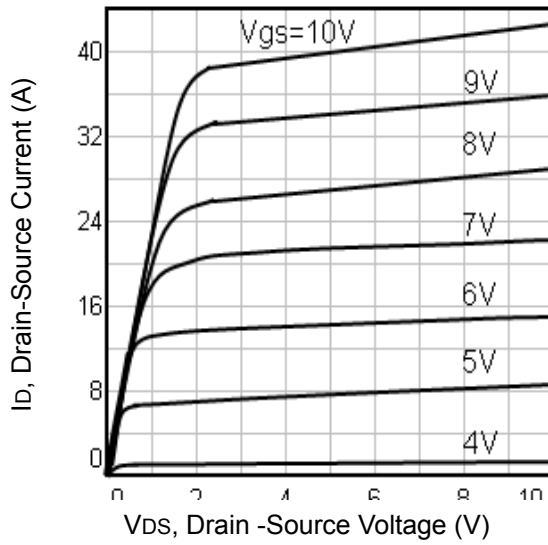


Fig1. Typical Output Characteristics

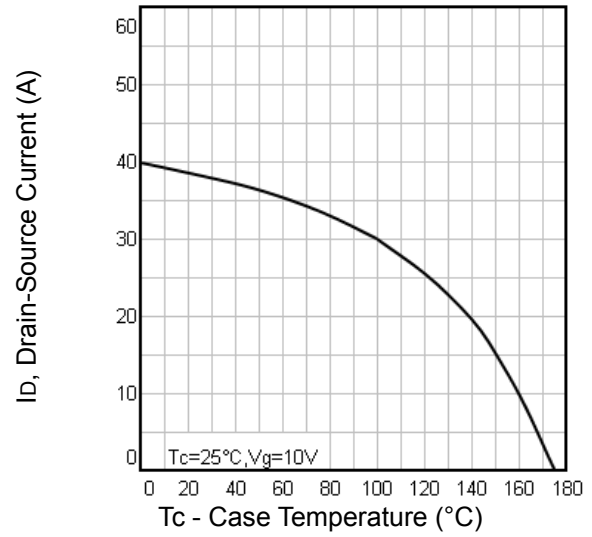


Fig2. Maximum Drain Current Vs. Case Temperature

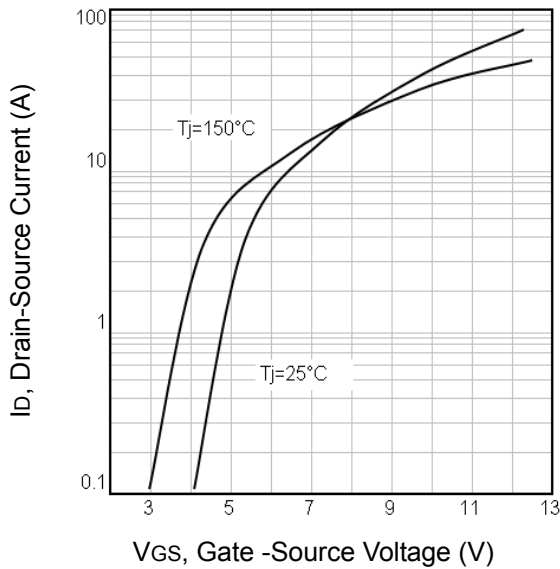


Fig3. Typical Transfer Characteristics

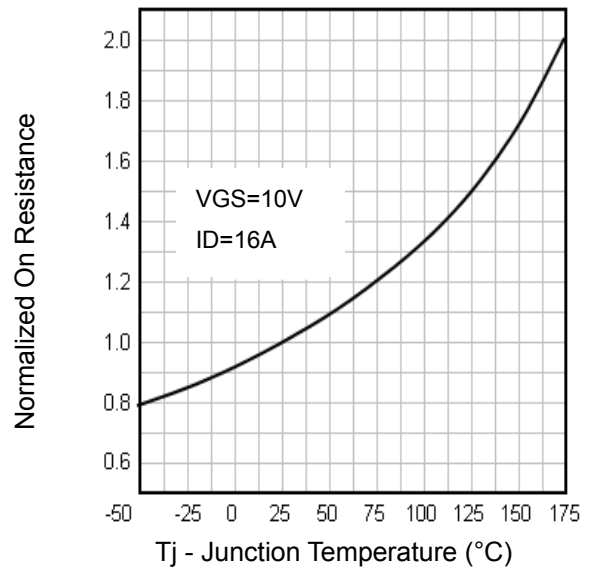


Fig4. Normalized On-Resistance Vs. Temperature

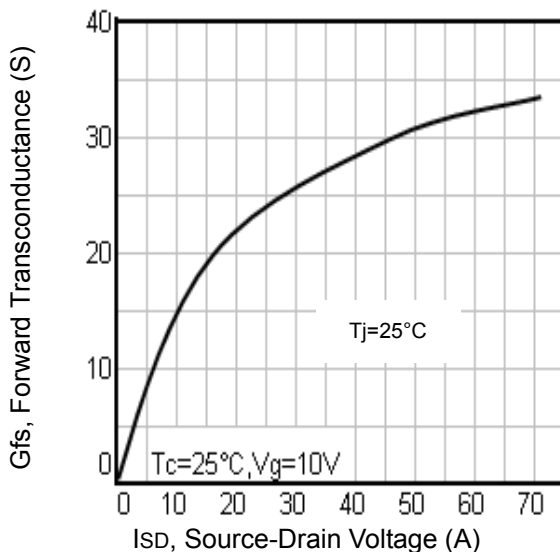


Fig5. Typical Forward Transconductance Vs. Drain Current

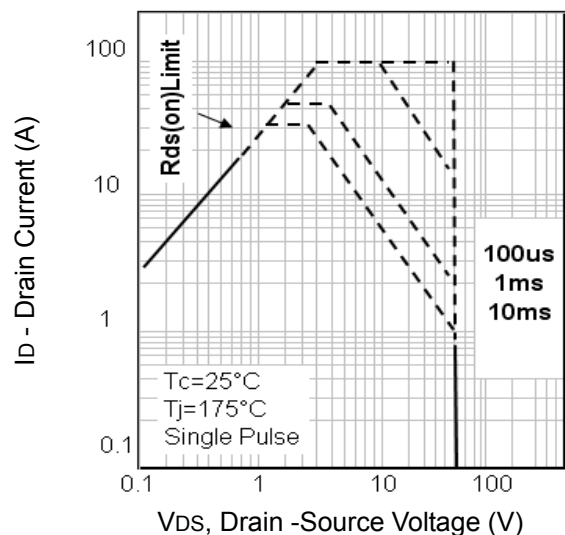


Fig6. Maximum Safe Operating Area

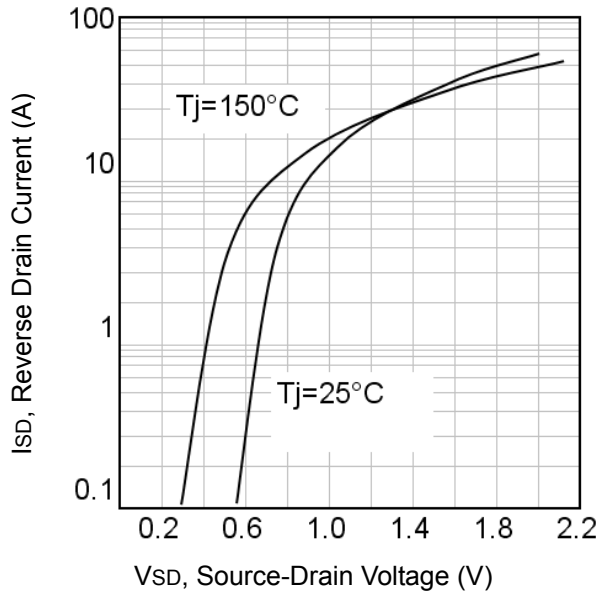


Fig7. Typical Source-Drain Diode Forward Voltage

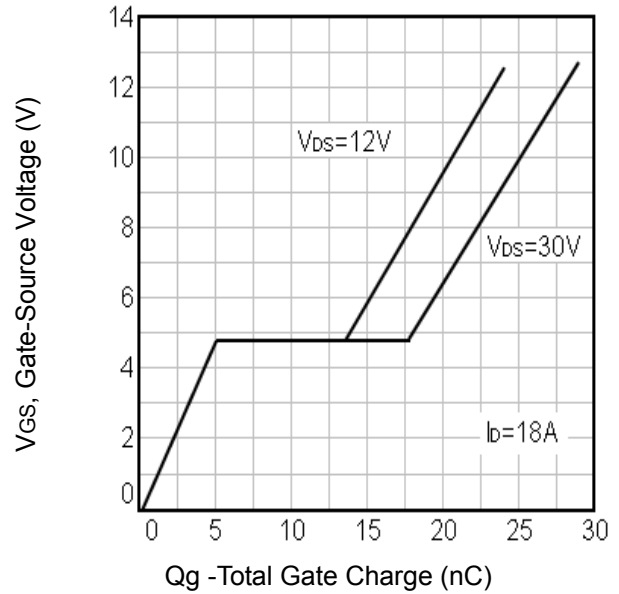


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

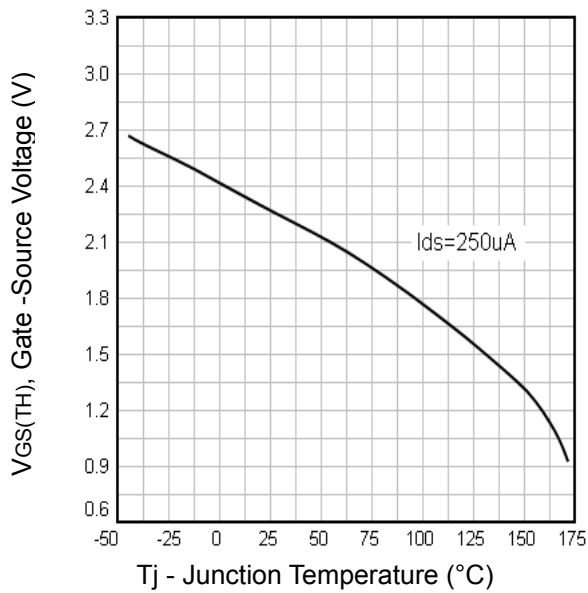


Fig9. Threshold Voltage Vs. Temperature

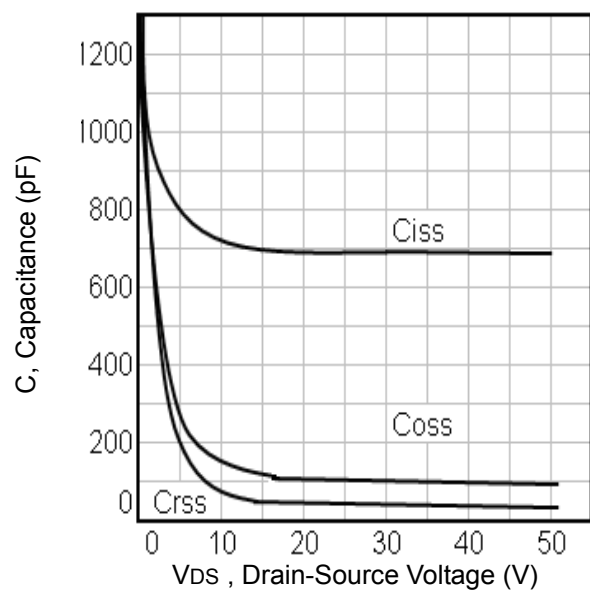


Fig10. Typical Capacitance Vs. Drain-Source Voltage

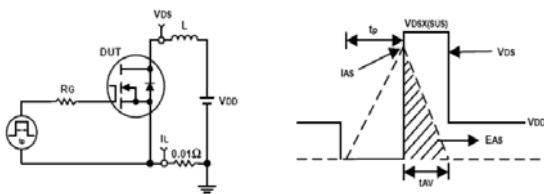


Fig11. Unclamped Inductive Test Circuit and waveforms

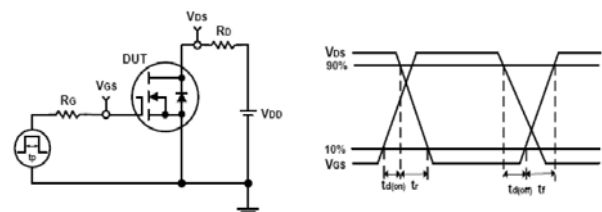
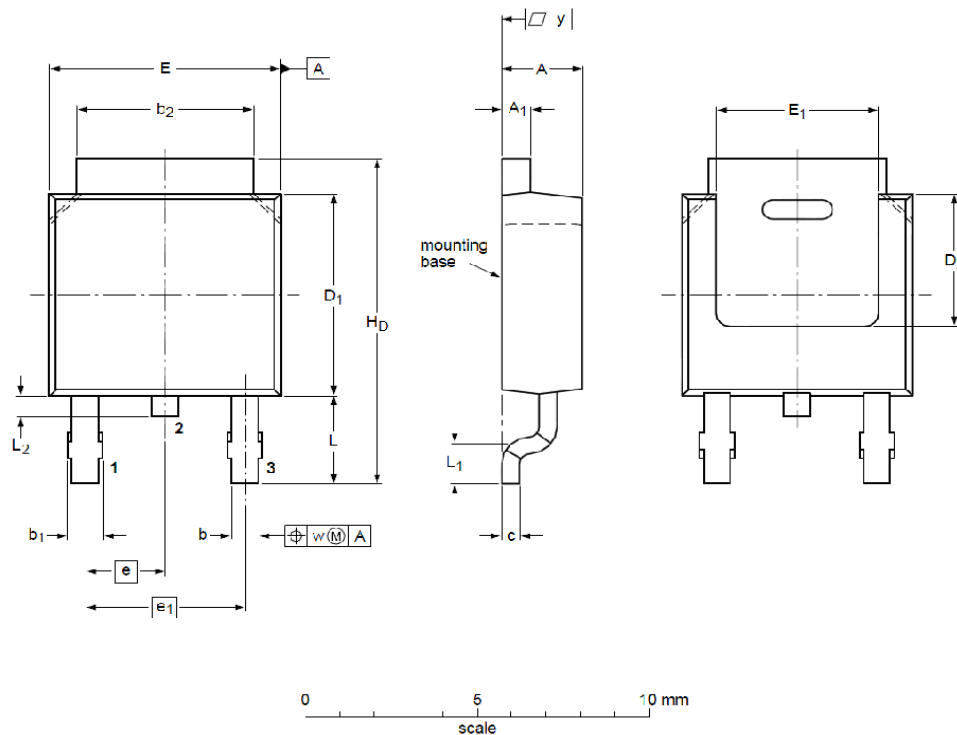


Fig12. Switching Time Test Circuit and waveforms

TO-252 Package Outline Data



DIMENSIONS (unit : mm)

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	2.22	2.30	2.38	A ₁	0.46	0.58	0.93
b	0.71	0.79	0.89	b ₁	0.90	0.98	1.10
b ₂	5.00	5.30	5.46	c	0.20	0.40	0.56
D ₁	5.98	6.05	6.22	D ₂	--	4.00	--
E	6.47	6.60	6.73	E ₁	5.10	5.28	5.45
e	--	2.28	--	e ₁	--	4.57	--
H _b	9.60	10.08	10.40	L	2.75	2.95	3.05
L ₁	--	0.50	--	L ₂	0.80	0.90	1.10
w	--	0.20	--	y	0.20	--	--

Order Information

Product	Marking	Package	Packaging	Min Unit Quantity
VS6038AD	6038AD	TO-252	2500/Reel	5000

Customer Service

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