

Features

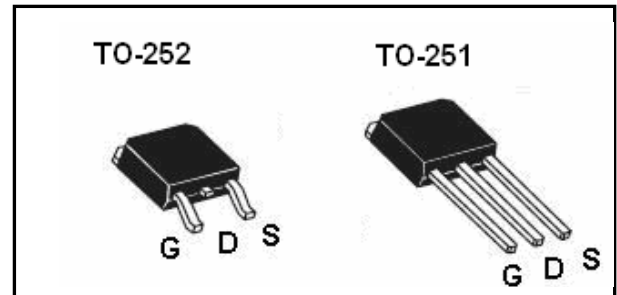
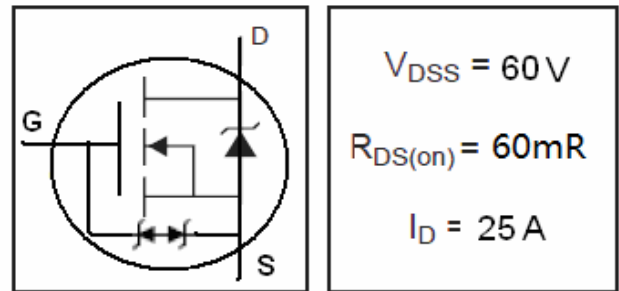
- ◆ Low On-Resistance
- ◆ Fast Switching
- ◆ 100% Avalanche Tested
- ◆ Repetitive Avalanche Allowed up to Tjmax
- ◆ ESD Protection
- ◆ Lead-Free, RoHS Compliant

Description

VS6038BI/D 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.

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	±16	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°C 25	A
Mounted on Large Heat Sink			
I _{DM}	Pulse Drain Current Tested ①	T _C =25°C 50	A
I _D	Continuous Drain current@VGS=10V	T _C =25°C 25	A
P _D	Maximum Power Dissipation	T _C =25°C 35	W
R _{θJC}	Thermal Resistance-Junction to Case	3	°C/W
R _{θJA}	Thermal Resistance Junction-Ambient	75	°C/W
Drain-Source Avalanche Ratings			
EAS	Avalanche Energy, Single Pulsed ②	80	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	3.0	V
R _{DS(ON)}	Drain-Source On-State Resistance ^③	V _{GS} =10V, I _D =10A	--	60	70	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance ^③	V _{GS} =5V, I _D =6A	--	65	75	mΩ
Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance	V _{DS} =24V, 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 di/dt=100A/μs	--	65	--	nS
Q _{rr}	Reverse Recovery Charge		--	85	--	nC

NOTE:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T_{Jmax}, starting T_J = 25°C, L = 0.1mH, 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

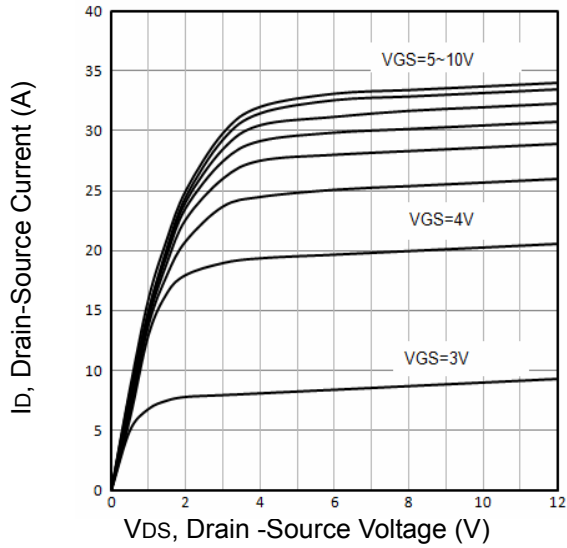


Fig1. Typical Output Characteristics

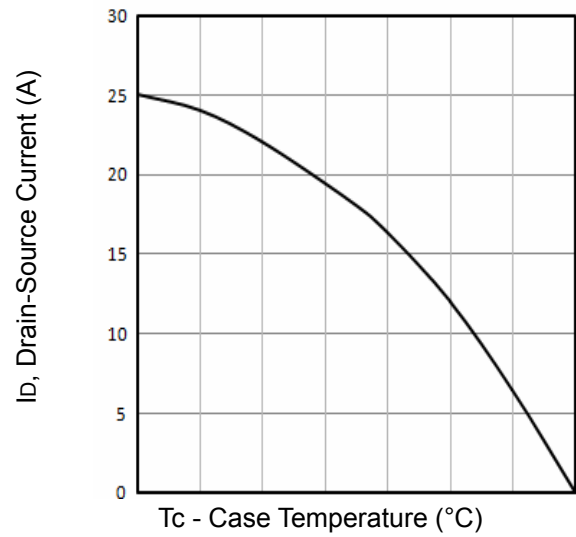


Fig2. Maximum Drain Current Vs. Case Temperature

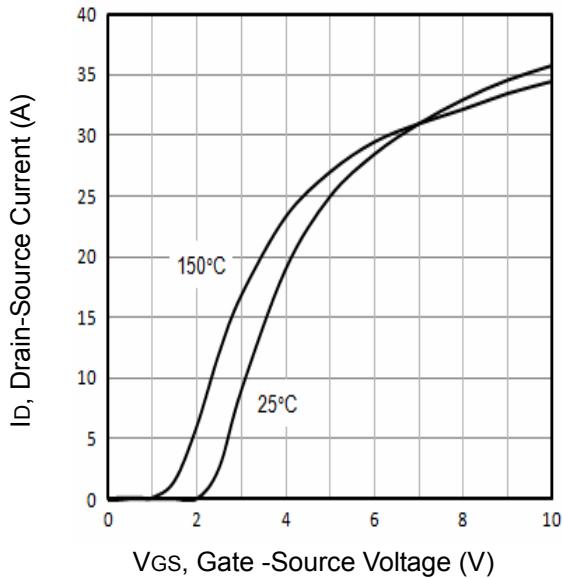


Fig3. Typical Transfer Characteristics

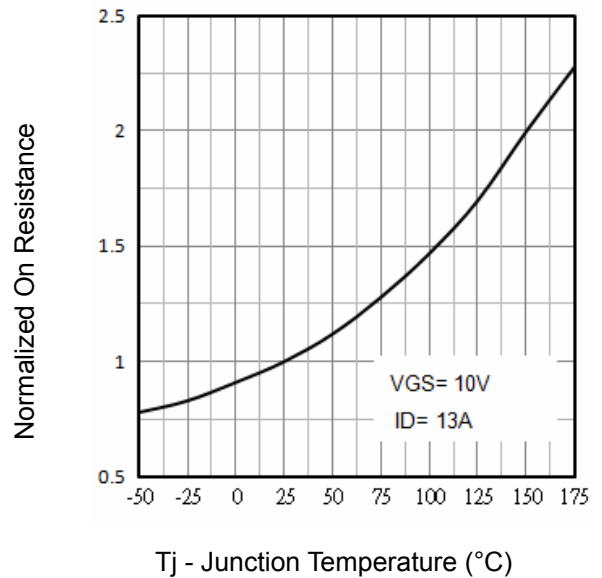


Fig4. Normalized On-Resistance Vs. Temperature

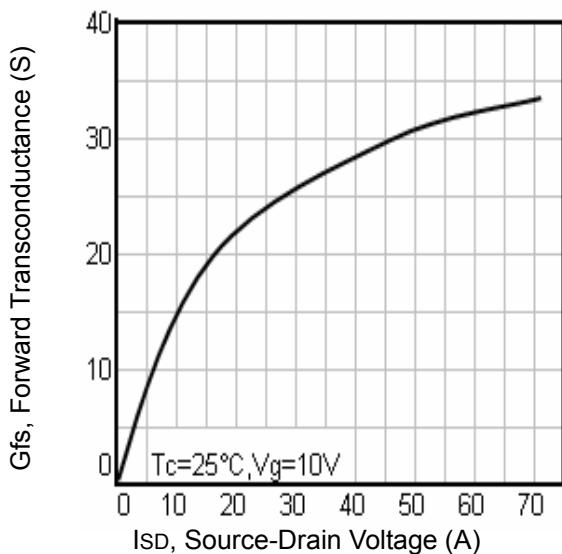


Fig5. Typical Forward Transconductance Vs. Drain Current

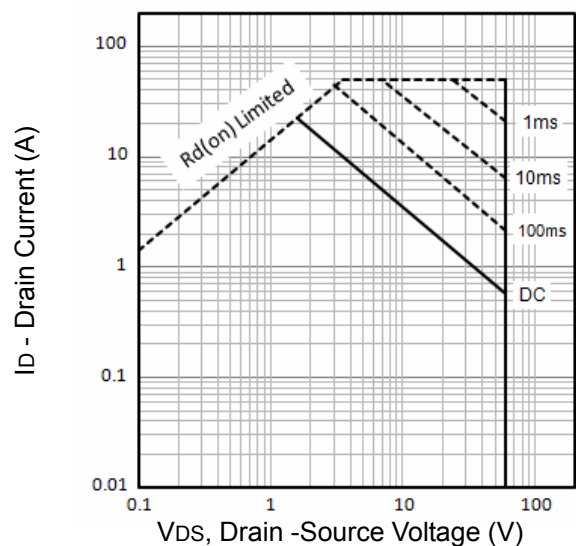


Fig6. Maximum Safe Operating Area

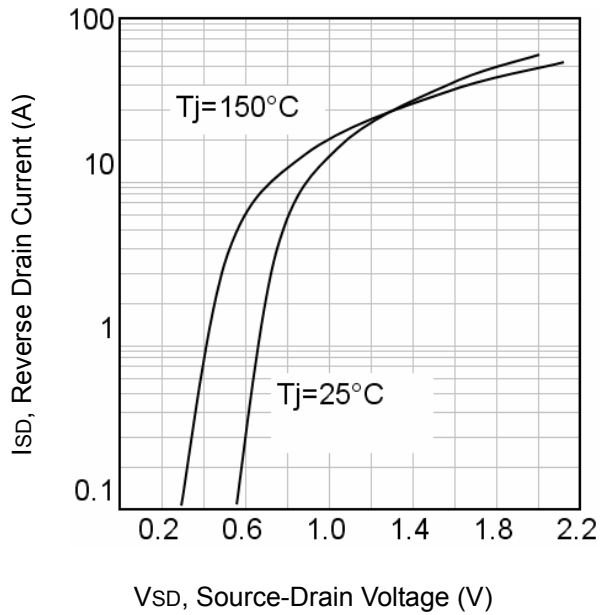


Fig7. Typical Source-Drain Diode Forward Voltage

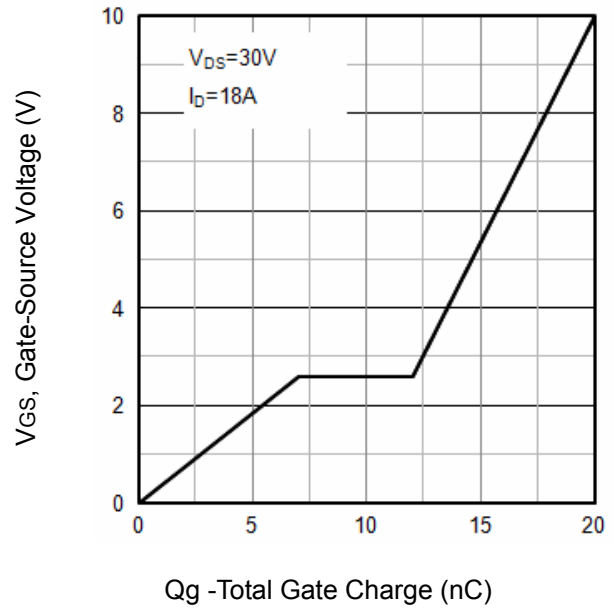


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

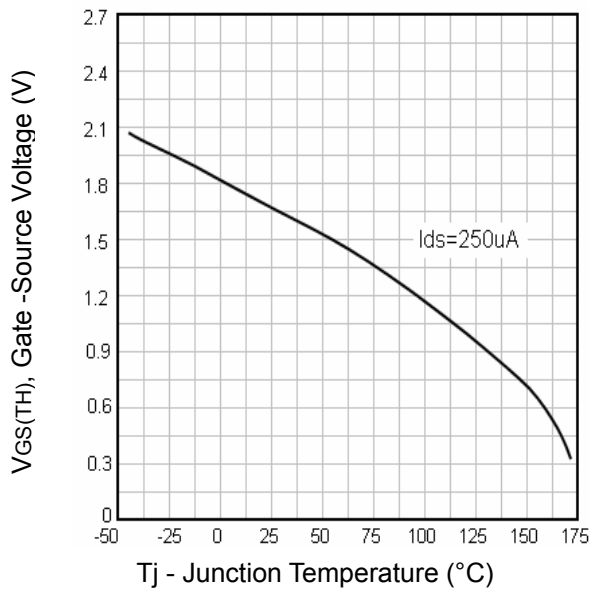


Fig9. Threshold Voltage Vs. Temperature

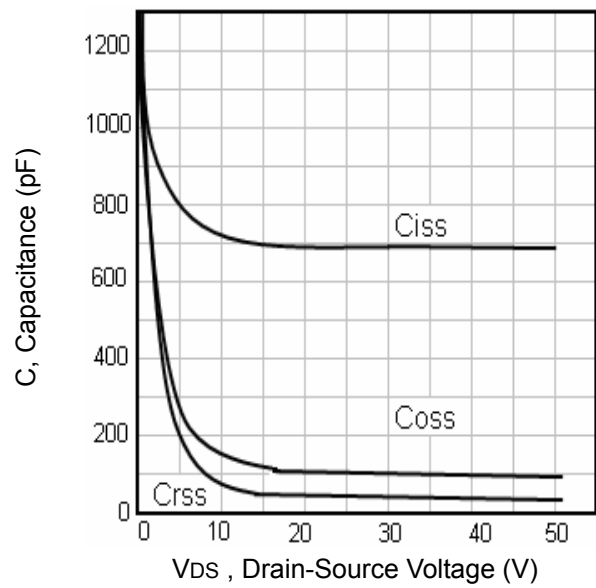


Fig10. Typical Capacitance Vs. Drain-Source Voltage

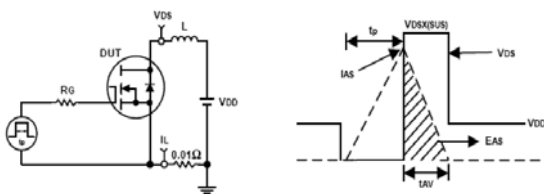


Fig11. Unclamped Inductive Test Circuit and waveforms

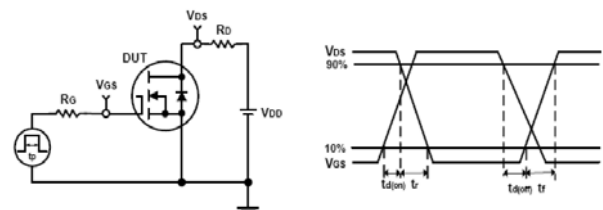
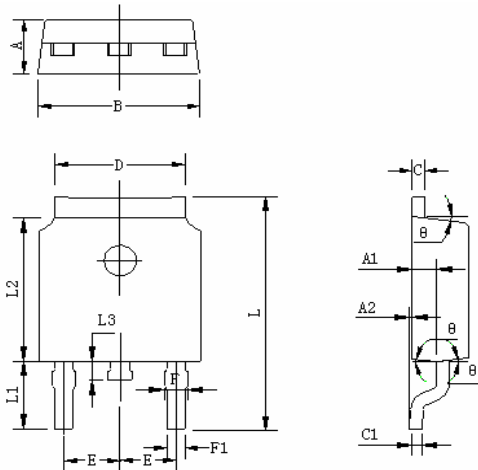


Fig12. Switching Time Test Circuit and waveforms

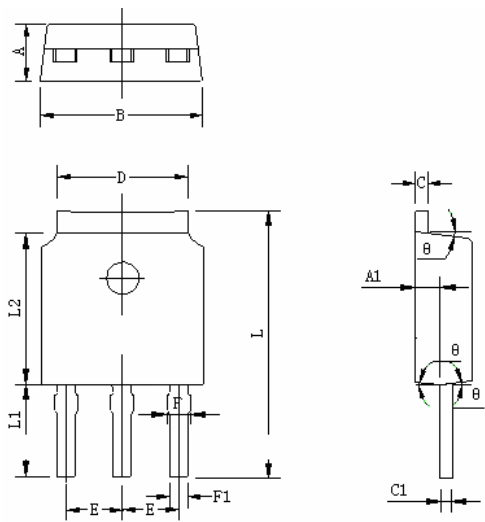
TO-252 Mechanical Data



TO-252 Dimensions (Unit:mm)

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	2.25	2.3	2.35	F	0.075	0.085	0.095
A1	0.96	1.01	1.06	F1	0.660	0.76	0.860
A2	0.05	0.1	0.15	L	9.80	9.825	10.40
B	6.05	6.6	6.65	L1	2.9REF		
C	0.46	0.508	0.580	L2	6.05	6.1	6.15
C1	0.508	0.508	0.508	L3	0.79	0.8	0.81
D	5.31	5.32	5.33	θ	7°	7°	7°
E	2.186	2.286	2.386				

TO-251 Mechanical Data



TO-251 Dimensions (Unit:mm)

Symbol	Min	Nom	Max	Symbol	Min	Nom	Max
A	2.20	2.30	2.40	F	0.074	0.084	0.094
A1	0.91	1.01	1.11	F1	0.660	0.760	0.860
B	6.05	6.60	6.70	L	11.70	12.00	12.30
C	0.46	0.508	0.580	L1	4.80	5.00	5.20
C1	0.46	0.508	0.508	L2	6.00	6.10	6.20
D	5.10	5.32	5.46	θ	7°	7°	7°
E	2.186	2.286	2.386				

Order Information

Product	Marking	Package	Packaging	Min Unit Quantity
VS6038BD	VS6038BD	TO-252	2500/Reel	5000
VS6038BI	VS6038BI	TO-251	80/Tube	2000

Customer Service

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