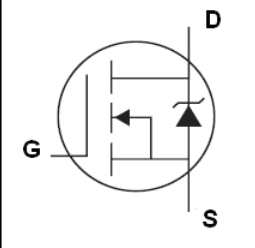


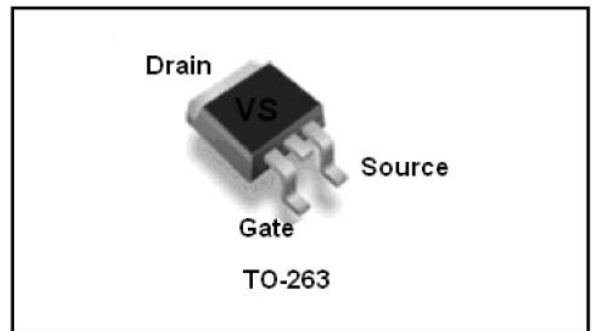
**Features**

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

**Description**

VS4310ATD designed by the trench processing techniques to achieve extremely low on-resistance, fast switching speed and improved repetitive avalanche rating . These features combine to make this design an extremely efficient and reliable device for use in Motor applications and a wide variety of other applications.

	$V_{DSS}$	100V
	$R_{DS(on)}$	5.5m $\Omega$
	$I_D$	130A


**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	
<b>Common Ratings (Tc=25°C Unless Otherwise Noted)</b>				
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V	
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	100	V	
$T_J$	Maximum Junction Temperature	150	°C	
$T_{STG}$	Storage Temperature Range	-55 to 150	°C	
$I_S$	Maxium Diode Continuous Forward Current	$T_C = 25^\circ C$	130	A
<b>Mounted on Large Heat Sink</b>				
$I_{DM}$	Pulse Drain Current Tested ①	$T_C = 25^\circ C$	450	A
$I_D$	Continuous Drain current@VGS=10V	$T_C = 25^\circ C$	130	A
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ C$	320	W
$R_{\theta JC}$	Thermal Resistance-Junction to Case		0.38	°C/W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient		62.5	°C/W
<b>Drain-Source Avalanche Ratings</b>				
EAS	Avalanche Energy, Single Pulsed ②		625	mJ

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	100	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current(Tc=25°C)	V <sub>DS</sub> =100V,V <sub>GS</sub> =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(Tc=125°C)	V <sub>DS</sub> =100V,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	2	--	4	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance <sup>③</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =65A	--	5.5	7.0	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> =50V,V <sub>GS</sub> =0V, f=1MHz	--	6950	--	pF
C <sub>oss</sub>	Output Capacitance		--	520	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	195	--	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =50V,I <sub>D</sub> =50A, V <sub>GS</sub> =10V	--	140	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	30	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	33	--	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =60V, I <sub>D</sub> =30A, R <sub>G</sub> =2.8Ω, V <sub>GS</sub> =10V	--	23	--	nS
t <sub>r</sub>	Turn-on Rise Time		--	62	--	nS
t <sub>d(off)</sub>	Turn-Off Delay Time		--	70	--	nS
t <sub>f</sub>	Turn-Off Fall Time		--	80	--	nS
<b>Source- Drain Diode Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
I <sub>SD</sub>	Source-drain current(Body Diode)	T <sub>c</sub> =25°C	--	--	100	A
V <sub>SD</sub>	Forward on voltage	I <sub>SD</sub> =50A,V <sub>GS</sub> =0V	--	--	1.3	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>j</sub> =25°C,I <sub>sd</sub> =50A, V <sub>GS</sub> =0V di/dt=100A/μs	--	60	--	nS
Q <sub>rr</sub>	Reverse Recovery Charge		--	105	--	nC

**NOTE:**

① Pulse width ≤ 300μs; duty cycles ≤ 2%; 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> =50A, V<sub>GS</sub> =10V.

**Typical Characteristics**

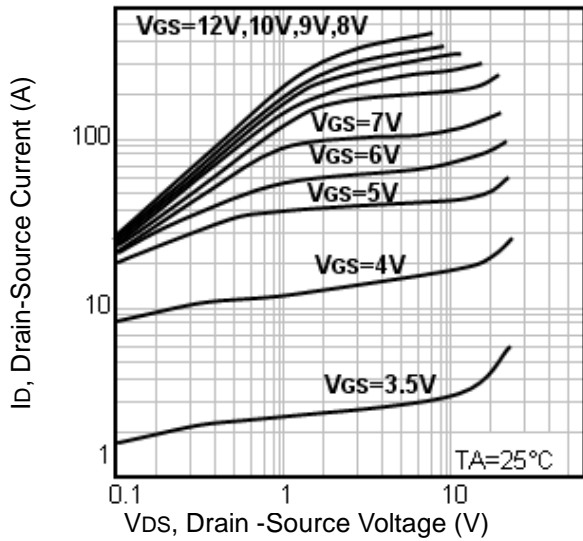


Fig1. Typical Output Characteristics

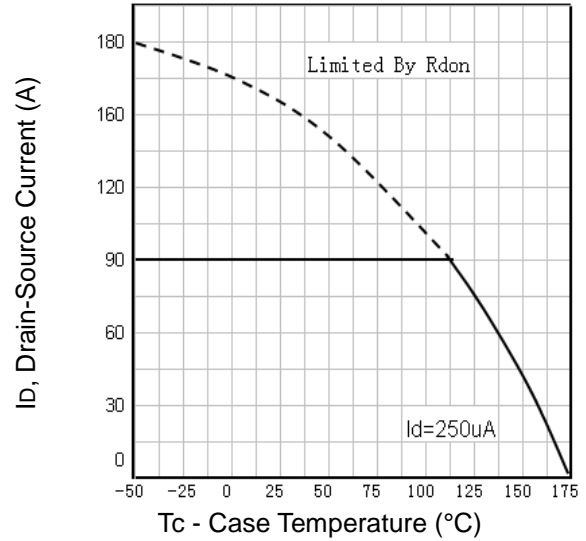


Fig2. Maximum Drain Current Vs. Case Temperature

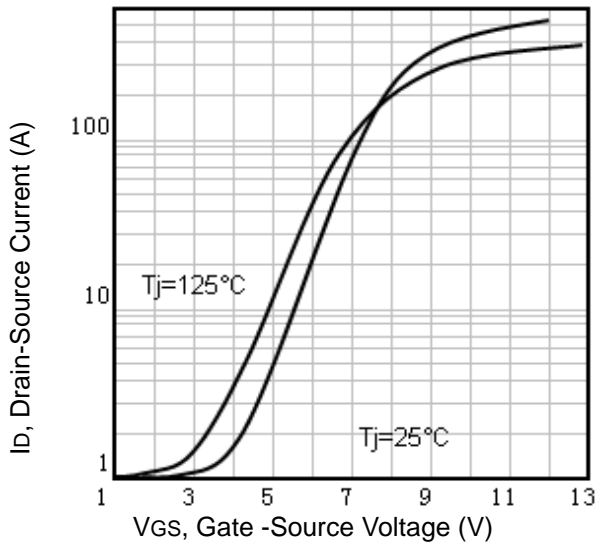


Fig3. Typical Transfer Characteristics

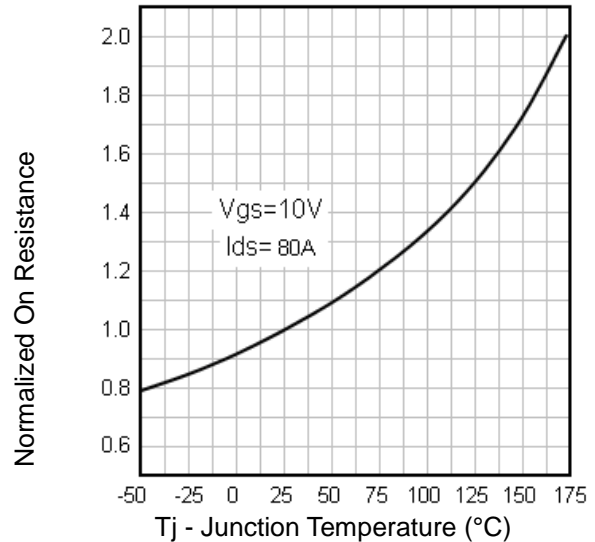


Fig4. Normalized On-Resistance Vs. Temperature

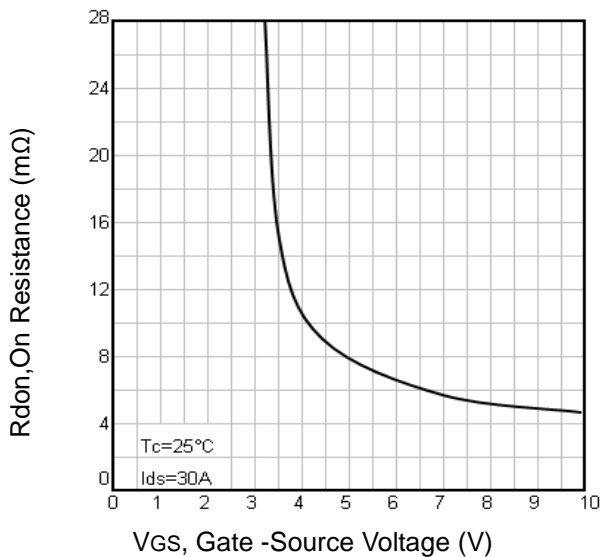


Fig5. Typical On-Resistance Vs. Gate-Source Voltage

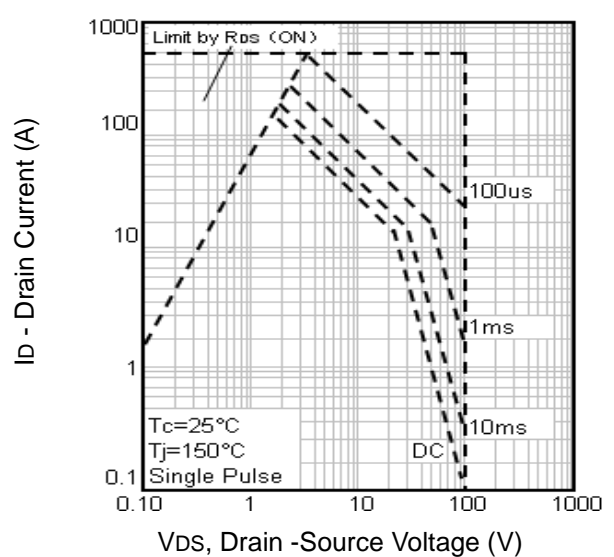


Fig6. Maximum Safe Operating Area

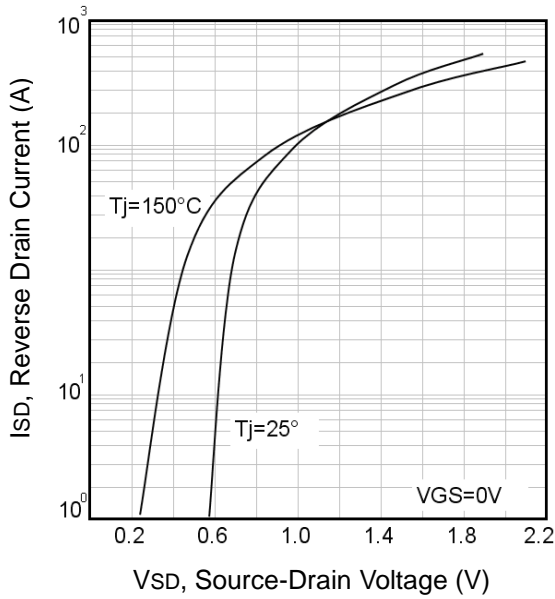


Fig7. Typical Source-Drain Diode Forward Voltage

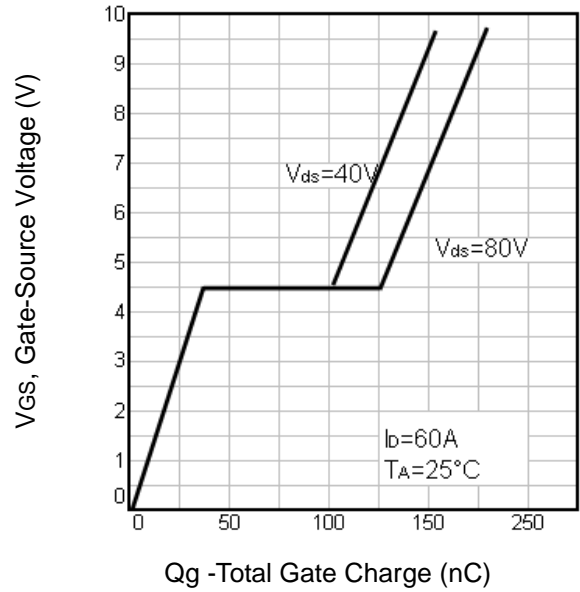


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

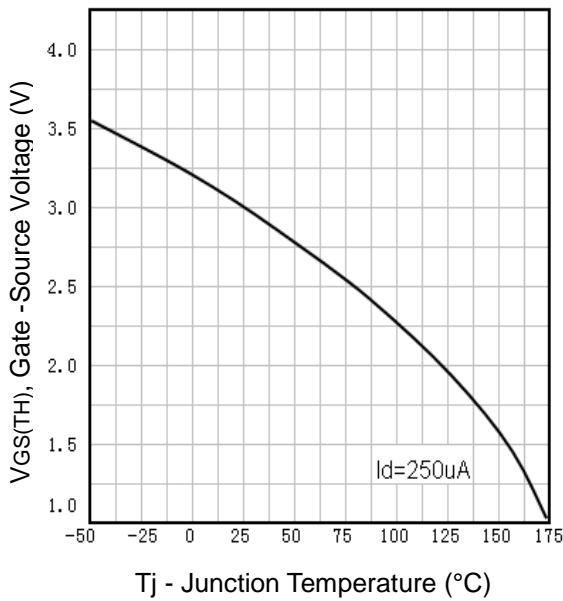


Fig9. Threshold Voltage Vs. Temperature

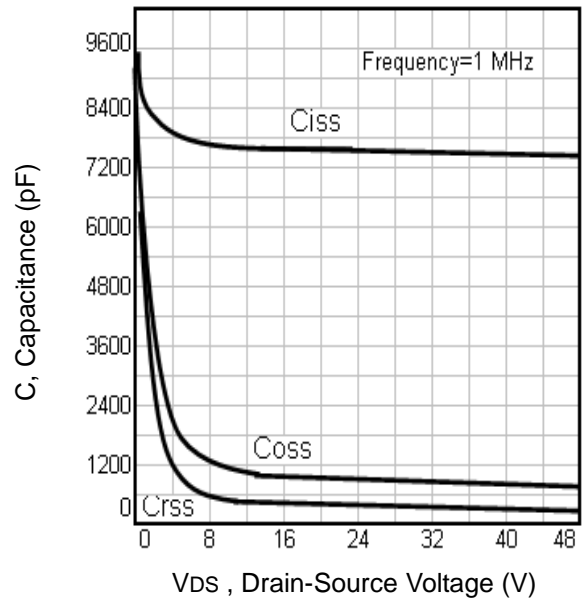


Fig10. Typical Capacitance Vs. Drain-Source Voltage

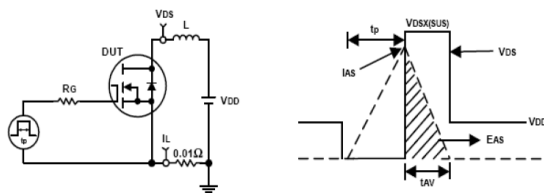


Fig11. Unclamped Inductive Test Circuit and waveforms

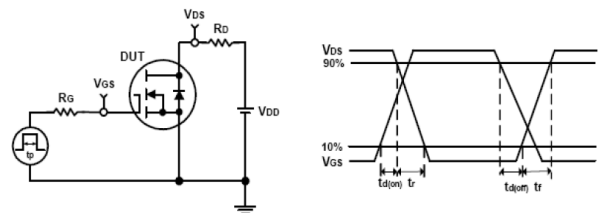
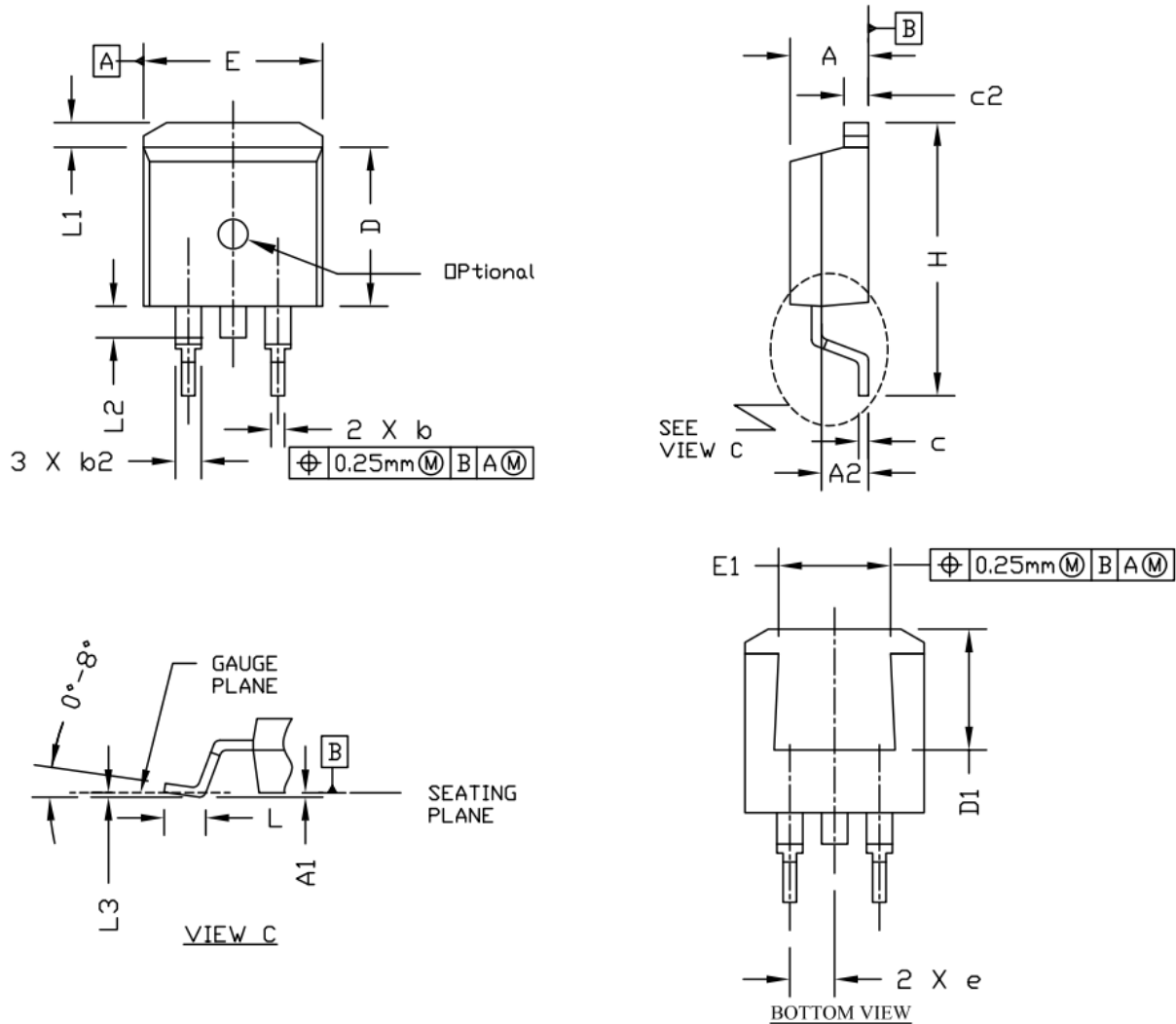


Fig12. Switching Time Test Circuit and waveforms

**TO-263 Package Outline Data**



Symbol	Dimensions (unit: mm)		
	Min	Typ	Max
A	4.400	4.570	4.700
A1	0.000	0.100	0.200
A2	2.300	2.400	2.500
b	0.700	0.800	0.900
b2	1.200	1.270	1.360
c	0.381	0.500	0.737
c2	1.220	1.300	1.350
D	8.600	9.200	9.300
D1	6.860		
e	2.540 BSC		
E	9.780	9.880	10.260
E1	6.225		
H	14.700	15.100	15.500
L	2.000	2.550	2.750
L1	1.000	1.200	1.400
L2	1.300	1.600	1.700
L3	0.255 BSC		

Notes:

1. Refer to JEDEC TO-263 variation AB
2. Dimension "D" & "E" do NOT include mold flash, mold flash shall not exceed 0.127mm per side.

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