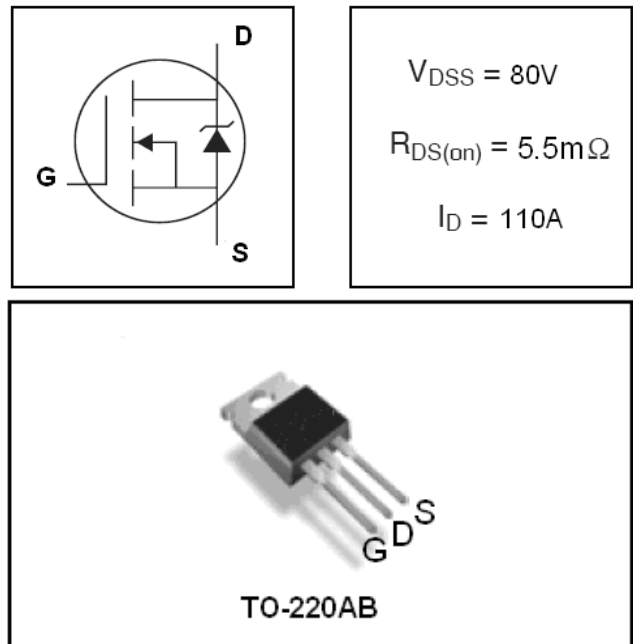


### Features

- ◆ Low On-Resistance
- ◆ Fast Switching
- ◆ 100% Avalanche Tested
- ◆ Repetitive Avalanche Allowed up to  $T_{jmax}$
- ◆ Lead-Free, RoHS Compliant
- ◆

### Description

VS80110AT designed by the trench processing techniques to achieve extremely low on-resistance. Additional features of this design are fast switching speed and improved repetitive avalanche rating. These features combine to make this design an extremely efficient and reliable device for use in Automotive 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 ( $T_A$ ) is  $25^\circ\text{C}$ , 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
$T_J$	Maximum Junction Temperature		150	$^\circ\text{C}$
$T_{STG}$	Storage Temperature Range		-55 to 150	$^\circ\text{C}$
$I_S$	Diode Continuous Forward Current	$T_C = 25^\circ\text{C}$	80	A
<b>Mounted on Large Heat Sink</b>				
$I_{DM}$	Pulse Drain Current Tested	$T_C = 25^\circ\text{C}$	400	A
$I_D$	Continuous Drain Current ( $V_{GS}=10\text{V}$ )	$T_C = 25^\circ\text{C}$	110	A
		$T_C = 100^\circ\text{C}$	72	
$P_D$	Maximum Power Dissipation	$T_C = 25^\circ\text{C}$	250	W
		$T_C = 100^\circ\text{C}$	165	W
$R_{\theta JC}$	Thermal Resistance-Junction to Case		0.50	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient		62.5	$^\circ\text{C/W}$
<b>Drain-Source Avalanche Ratings</b>				
EAS	Avalanche Energy, Single Pulsed		900	mJ

**Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)**

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	80	--	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current(Tc=25°C)	V <sub>DS</sub> =75V, V <sub>GS</sub> =0V	--	--	100	nA
	Zero Gate Voltage Drain Current(Tc=125°C)	V <sub>DS</sub> =75V, V <sub>GS</sub> =0V	--	--	10	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	3	4	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance	V <sub>GS</sub> =10V, I <sub>D</sub> =40A	--	5.5	8	mΩ
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> = 10V, I <sub>D</sub> =15A	--	32	--	S
<b>Dynamic Electrical Characteristics @ T<sub>J</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =40V, V <sub>GS</sub> =0V, f=1MHz	--	4200	--	pF
C <sub>oss</sub>	Output Capacitance		--	660	--	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	180	--	pF
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =40V, I <sub>D</sub> =50A, V <sub>GS</sub> =10V	--	85	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	22	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	32	--	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =40V, I <sub>D</sub> =50A, R <sub>G</sub> =5Ω, V <sub>GS</sub> =10V	--	40	--	nS
t <sub>r</sub>	Turn-on Rise Time		--	20	--	nS
t <sub>d(off)</sub>	Turn-Off Delay Time		--	115	--	nS
t <sub>f</sub>	Turn-Off Fall Time		--	56	--	nS
<b>Source- Drain Diode Characteristics</b>						
I <sub>SD</sub>	Source-drain Continuous Current	T <sub>c</sub> =25°C	--	--	80	A
I <sub>SDM</sub>	Pulsed Source-drain Current (Body Diode)		--	--	320	A
V <sub>SD</sub>	Forward on voltage, T <sub>J</sub> =25°C,	I <sub>SD</sub> =55A, V <sub>GS</sub> =0V	--	--	1.3	V
t <sub>rr</sub>	Reverse Recovery Time, T <sub>J</sub> =25°C	I <sub>F</sub> =40A, V <sub>DD</sub> =25V di/dt=100A/μs	--	100	--	nS

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. Starting T<sub>J</sub>=25°C, R<sub>G</sub>=25Ω, I<sub>D</sub>=40A, V<sub>GS</sub>=10V

**Electrical characteristics (curves)**

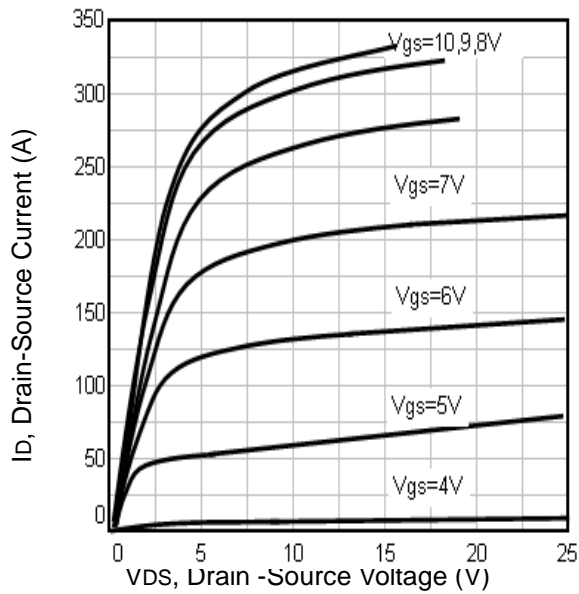


Fig1. Typical Output Characteristics

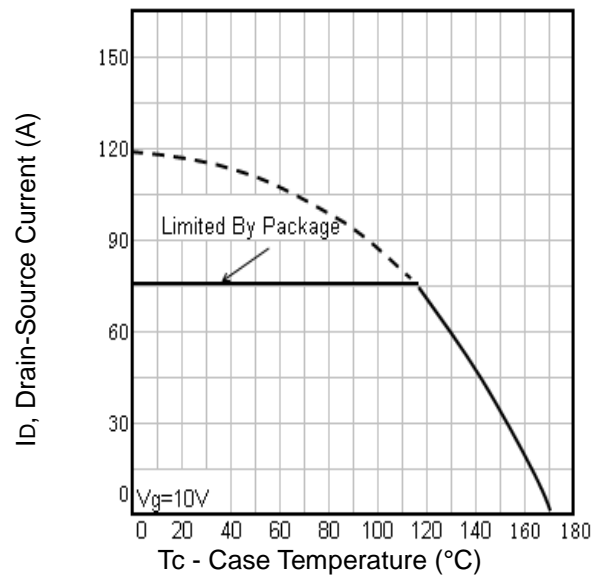


Fig2. Maximum Drain Current Vs. Case Temperature

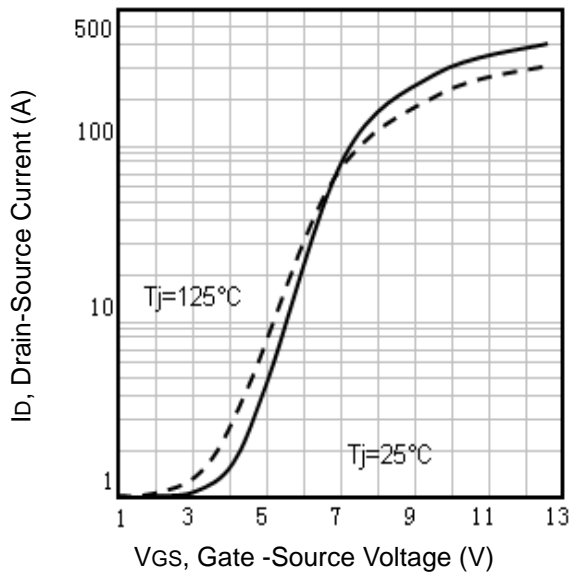


Fig3. Typical Transfer Characteristics

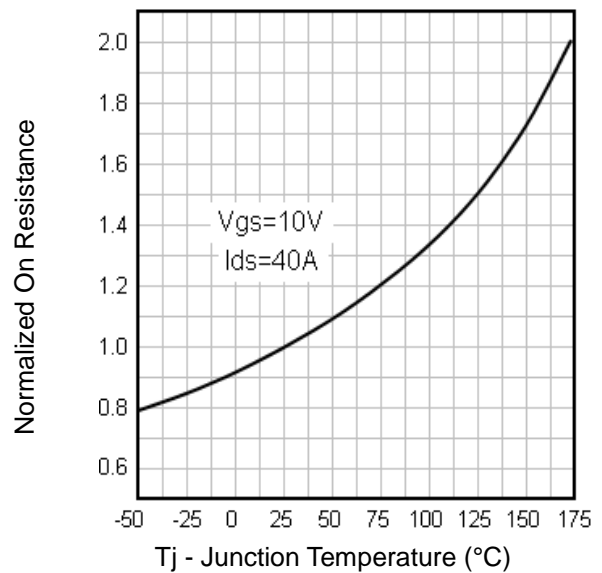


Fig4. Normalized On-Resistance Vs. Temperature

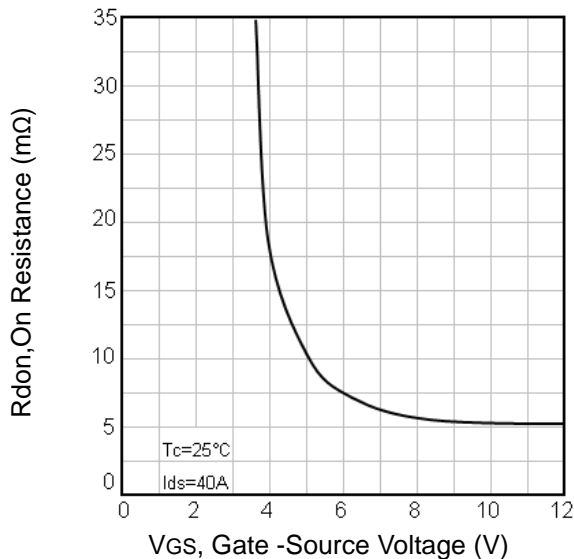


Fig5. Typical On-Resistance Vs. Gate-Source Voltage

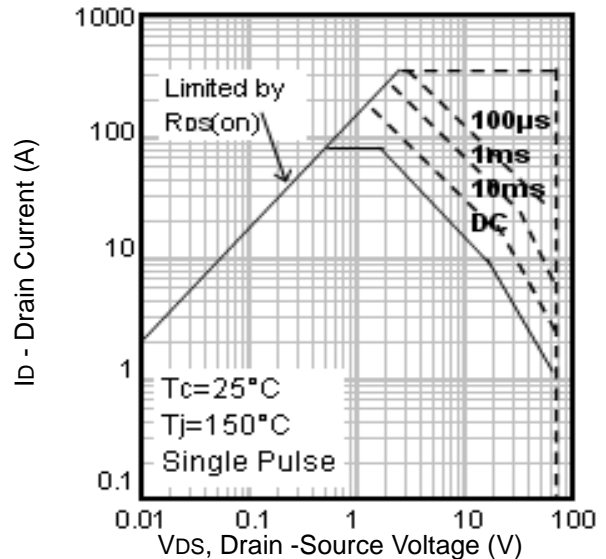


Fig6. Maximum Safe Operating Area

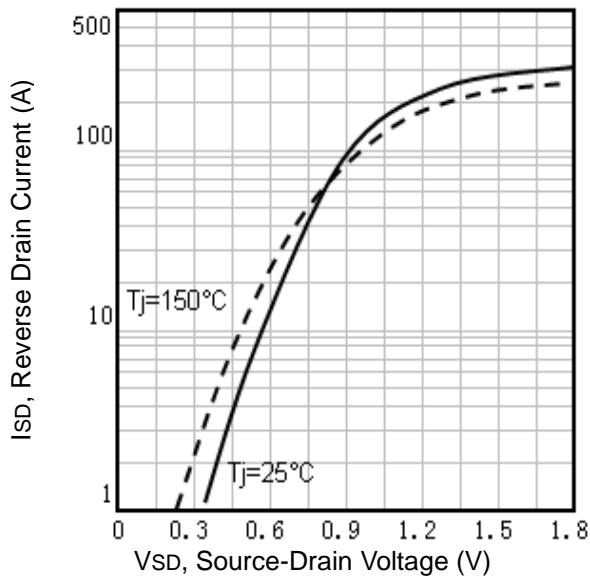


Fig7. Typical Source-Drain Diode Forward Voltage

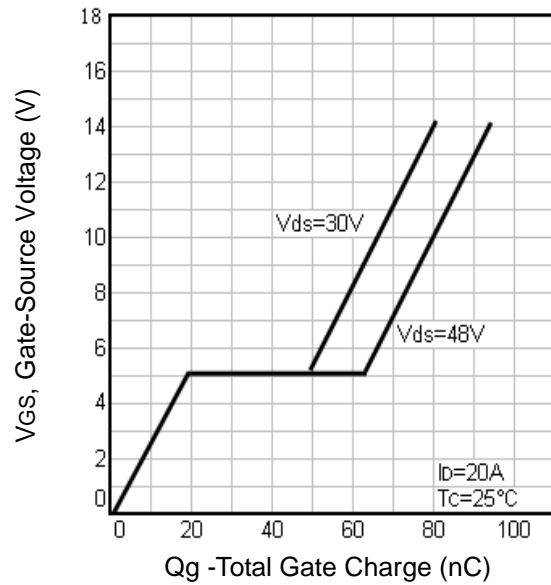


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

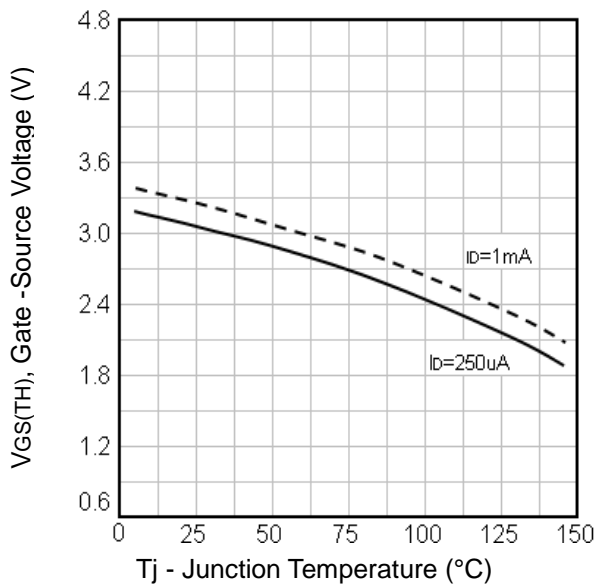


Fig9. Threshold Voltage Vs. Temperature

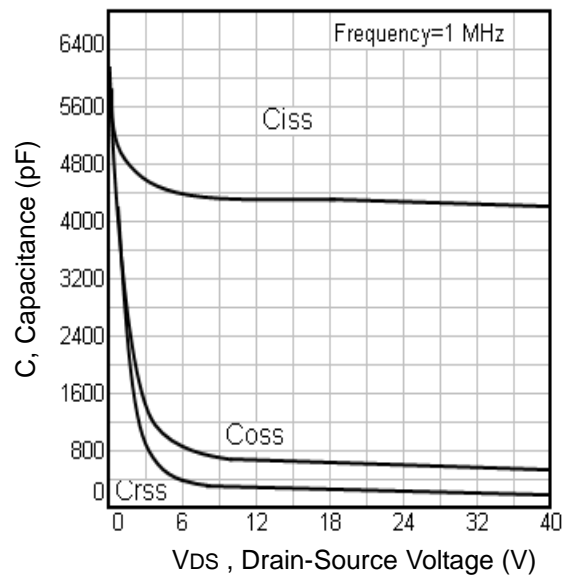


Fig10. Typical Capacitance Vs. Drain-Source Voltage

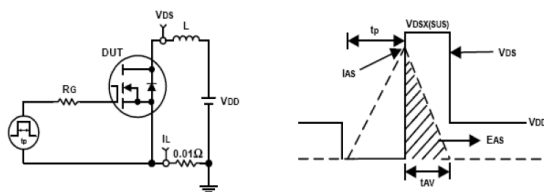


Fig11. Unclamped Inductive Test Circuit and waveforms

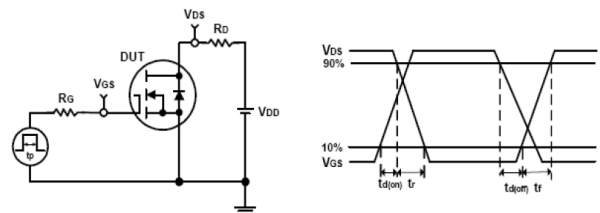
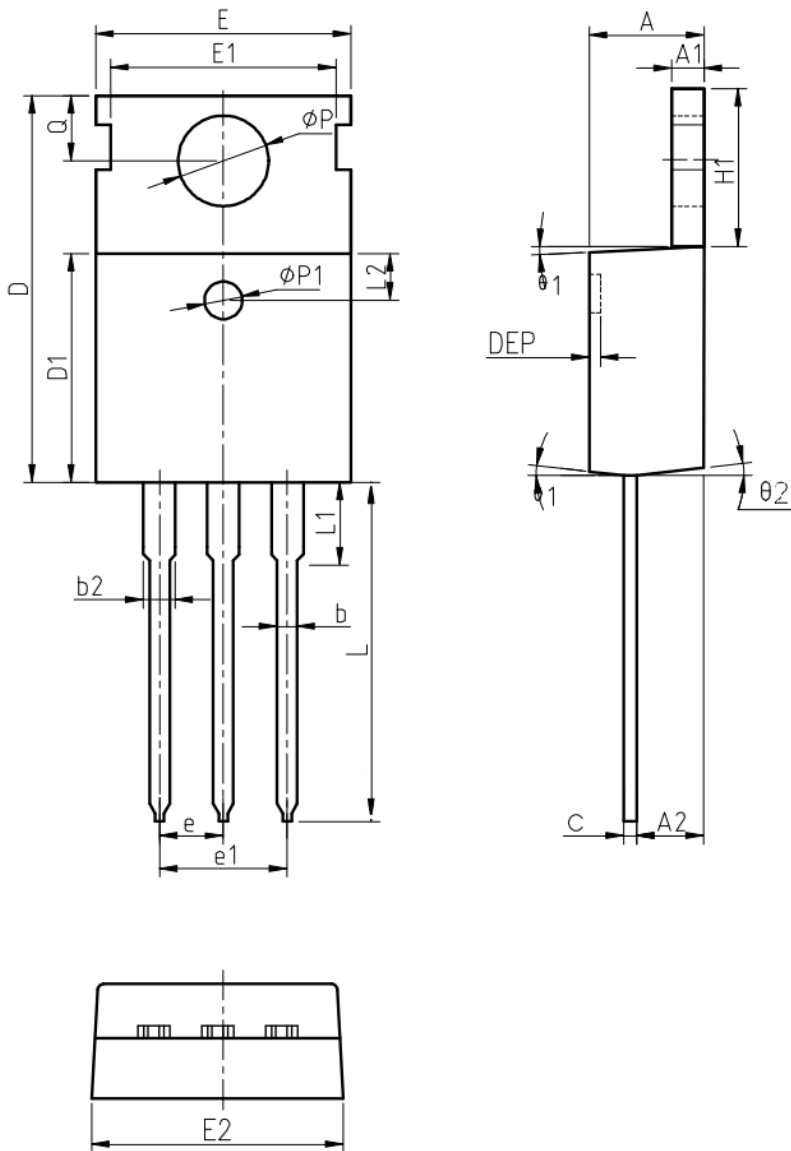


Fig12. Switching Time Test Circuit and waveforms

## TO-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
$\phi P1$	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
$\phi P$	3.53	3.60	3.70
Q	2.70	2.80	2.90
$\theta 1$	5 °	7 °	9 °
$\theta 2$	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.

## Customer Service

### Sales and Service:

[sales@vgsemi.com](mailto:sales@vgsemi.com)

Vanguard Semiconductor CO., LTD

TEL: (86-755) -26902410

FAX: (86-755) -26907027

WEB: [www.vgsemi.com](http://www.vgsemi.com)