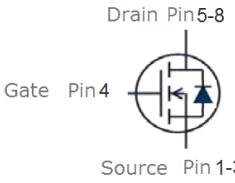
Features

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

V_{DS}	40	V
$R_{DS(on),TYP}$@ V_{GS}=10 V	6.0	mΩ
$R_{DS(on),TYP}$@ V_{GS}=4.5 V	7.5	mΩ
I_D	18	A



Description

VS4020AS designed by the trench processing techniques to achieve extremely low on-resistance. Additional features of this design are a 150°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 Motor applications and a wide variety of other 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 (T_C=25°C Unless Otherwise Noted)				
V_{GS}	Gate-Source Voltage		±20	V
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage		40	V
ESD	Human Body Mode		±800	V
T_J	Maximum Junction Temperature		150	°C
T_{STG}	Storage Temperature Range		-55 to 150	°C
I_S	Diode Continuous Forward Current	T_C =25°C	2.6	A
EAS	Avalanche energy, single pulsed ②		58	mJ
Mounted on Large Heat Sink				
I_{DM}	Pulse Drain Current Tested (Sillicon Limit) ①	T_C =25°C	72	A
I_D	Continuous Drain current@V_{GS}=10V	T_C =25°C	18	A
P_D	Maximum Power Dissipation	T_C =25°C	3.1	W
		T_C =75°C	1.9	W
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient		40	°C/W

Typicle Electrical Characteristics

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(Tj=25℃)		V_{DS}=32V,V_{GS}=0V	--	--	1	μA
	Zero Gate Voltage Drain Current(Tj=125℃)		V_{DS}=32V,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	1.0	2.0	2.5	V
$R_{DS(ON)}$	Drain-Source On-State Resistance③		V_{GS}=10V, I_D=10A	--	6.0	7.5	mΩ
$R_{DS(ON)}$	Drain-Source On-State Resistance③		V_{GS}=4.5V, I_D=6A	--	7.5	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	--	2250	--	pF
C_{oss}	Output Capacitance			--	320	--	pF
C_{rss}	Reverse Transfer Capacitance			--	195	--	pF
Q_g	Total Gate Charge	V_{GS}=10V	V_{DS}=20V,I_D=10A, V_{GS}=10V	--	42	--	nC
		V_{GS}=4.5V			25		nC
Q_{gs}	Gate-Source Charge			--	7	--	nC
Q_{gd}	Gate-Drain Charge			--	9.5	--	nC
Switching Characteristics							
$t_{d(on)}$	Turn-on Delay Time		V_{DD}=20V, I_D=9A, R_G=6.8Ω, V_{GS}=10V	--	16.5	--	nS
t_r	Turn-on Rise Time			--	17.5	--	nS
$t_{d(off)}$	Turn-Off Delay Time			--	24	--	nS
t_f	Turn-Off Fall Time			--	16	--	nS
Source- Drain Diode Characteristics@ T_J = 25°C (unless otherwise stated)							
V_{SD}	Forward on voltage		I_{SD}=10A,V_{GS}=0V	--	--	1.2	V
t_{rr}	Reverse Recovery Time		T_j=25℃,I_{sd}=9A, V_{GS}=0V di/dt=100A/μs	--	28	--	nS
Q_{rr}	Reverse Recovery Charge				16	--	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} = 12A, V_{GS} =10V. Part not recommended for use above this value

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

Typical Characteristics

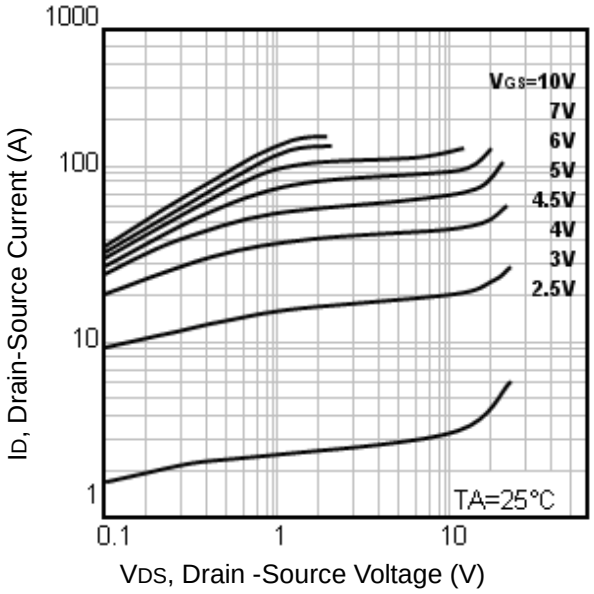


Fig1. Typical Output Characteristics

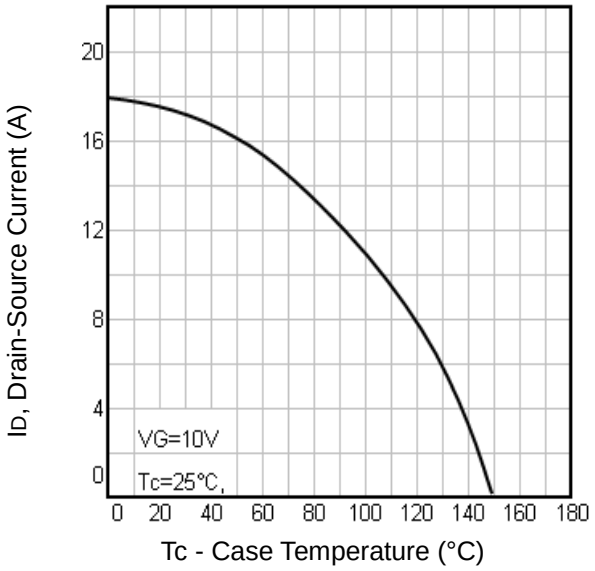


Fig2. Maximum Drain Current Vs.Case Temperature

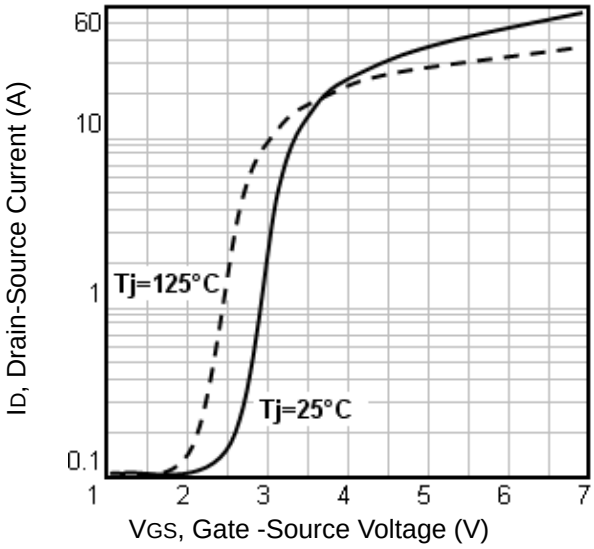


Fig3. Typical Transfer Characteristics

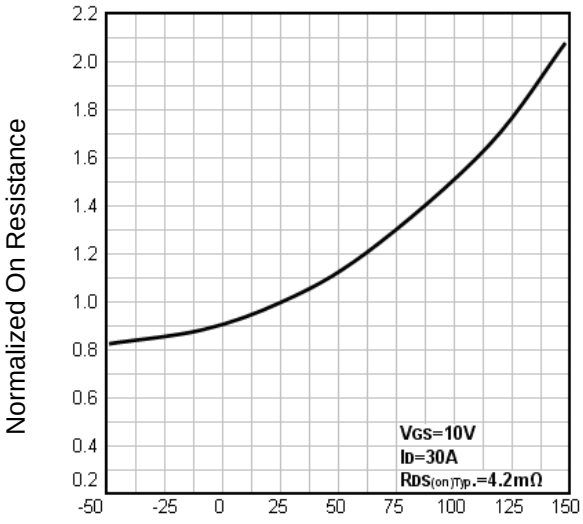


Fig4. Normalized On-Resistance Vs. Temperature

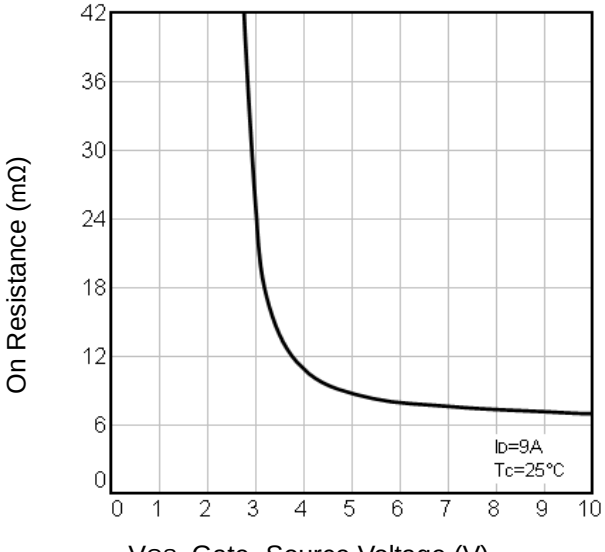


Fig5. On Resistance Vs. Gate -Source Voltage

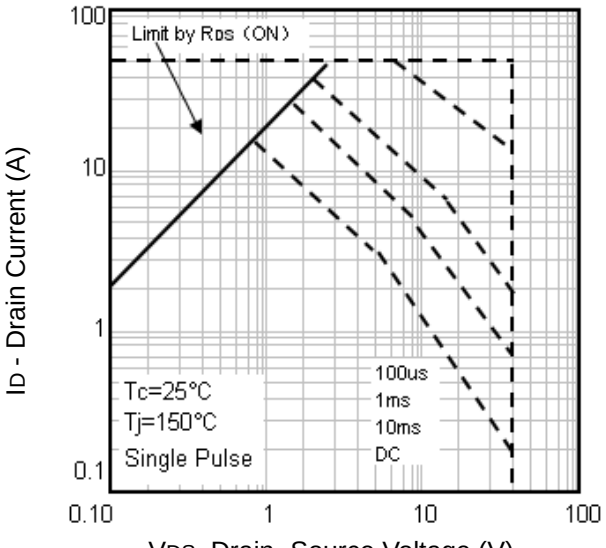


Fig6. Maximum Safe Operating Area

Typical Characteristics

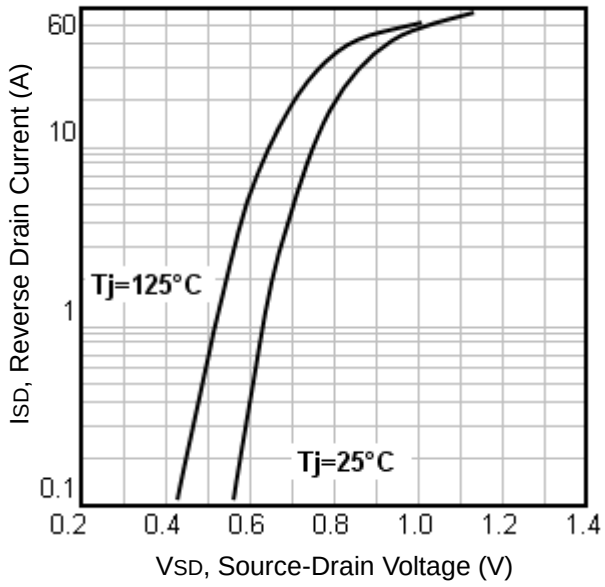


Fig7. Typical Source-Drain Diode Forward Voltage

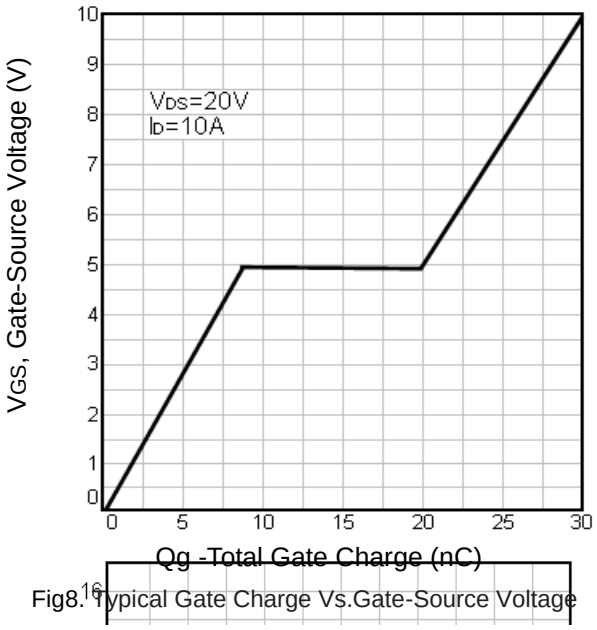


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

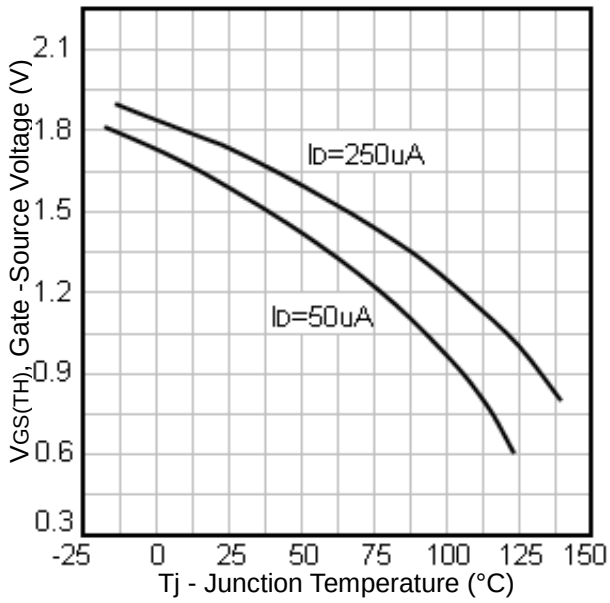


Fig9. Threshold Voltage Vs. Temperature

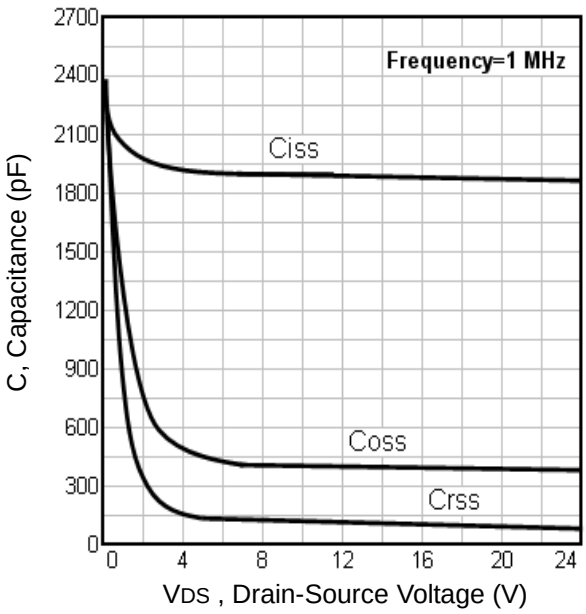


Fig10. Typical Capacitance Vs.Drain-Source Voltage

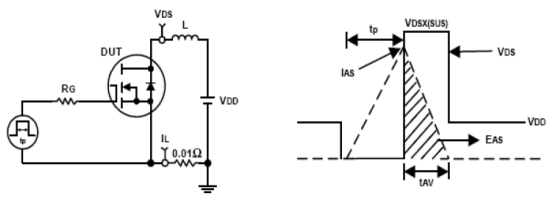


Fig11. Unclamped Inductive Test Circuit and waveforms

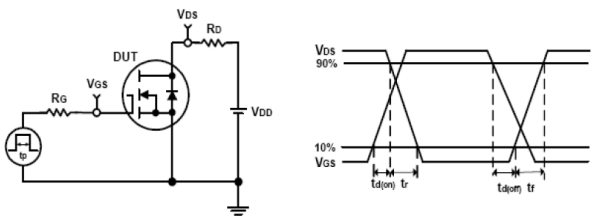
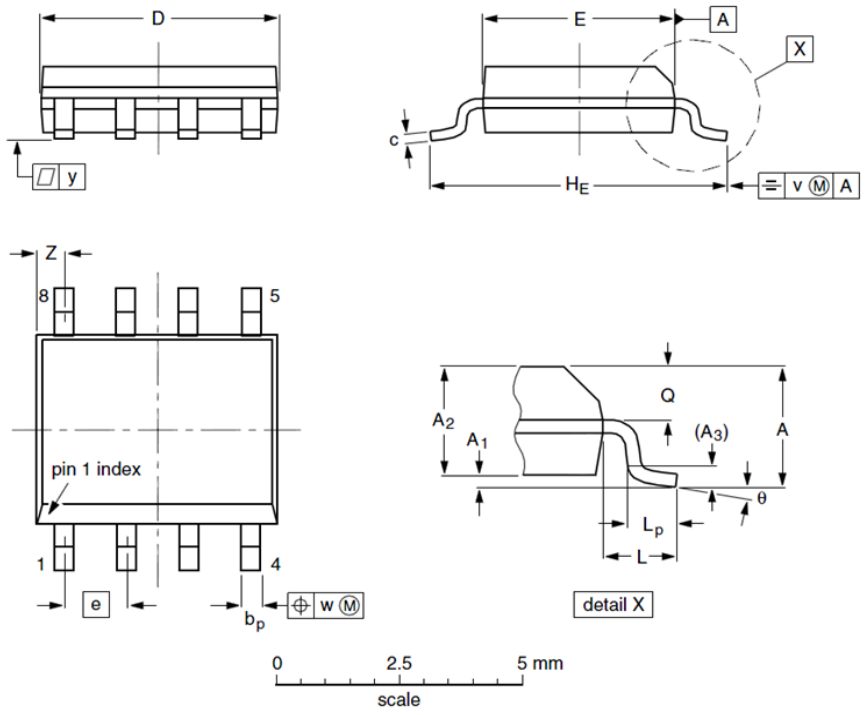


Fig12. Switching Time Test Circuit and waveforms

SOP8 Package Outline Data



Label	Dimensions (unit: mm)		
	Min	Typ	Max
A	--	--	1.75
A_1	0.10	0.18	0.25
A_2	1.25	1.35	1.50
A_3	--	0.25	--
b_p	0.36	0.42	0.51
c	0.19	0.22	0.25
D	4.80	4.92	5.00
E	3.80	3.90	4.00
e	--	1.27	--
H_E	5.80	6.00	6.20
L	--	1.05	--
L_p	0.40	0.68	1.00
Q	0.60	0.65	0.725
v	--	0.25	--
w	--	0.25	--
y	--	0.10	--
Z	0.30	0.50	0.70
θ	0°		8°

Notes:

1. Follow JEDEC MS-012.
2. Dimension "D" does NOT include mold flash, protrusions or gate burrs. Mold flash, protrusions or gate burrs shall not exceed 0.15mm per side.
3. Dimension "E" does NOT include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25mm per side.
4. Dimension "bp" does NOT include dambar protrusion. Allowable dambar protrusion shall be 0.1mm total in excess of "bp" dimension at maximum material condition. The dambar cannot be located on the lower radius of the foot.

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