

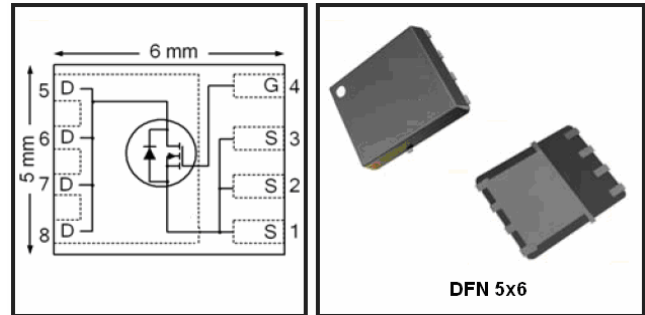
Features

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

Description

VS4020AP 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.

V_{DS}	40	V
$R_{DS(on),Typ}$	4.0	mΩ
I_D	60	A


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	40	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	60	A
Mounted on Large Heat Sink				
I _{DM}	Pulse Drain Current Tested (Silicon Limit)	T _C =25°C	180	A
I _D	Continuous Drain current@V _{GS} =10V (See Fig2)	T _C =25°C	60	A
P _D	Maximum Power Dissipation	T _C =25°C	60	W
R _{θJA}	Thermal Resistance-Junction to Ambient		1.68	°C/W
Drain-Source Avalanche Ratings				
EAS	Avalanche Energy, Single Pulsed ②		225	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	40	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current(Tc=25°C)	V _{DS} =32V, V _{GS} =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(Tc=125°C)	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 Resistance①	V _{GS} =10V, I _D =30A	--	4.0	5.5	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance①	V _{GS} =4.5V, I _D =15A	--	5.5	6.5	mΩ
Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance	V _{DS} =15V, V _{GS} =0V, Frequency=1MHz	--	2250	--	pF
C _{oss}	Output Capacitance		--	320	--	pF
C _{rss}	Reverse Transfer Capacitance		--	195	--	pF
Q _g	Total Gate Charge	V _{GS} =10V	--	39	--	nC
		V _{GS} =4.5V	--	23	--	nC
Q _{gs}	Gate-Source Charge	V _{DS} =20V, I _D =20A, V _{GS} =10V	--	7.5	--	nC
Q _{gd}	Gate-Drain Charge		--	9.8	--	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =20V, I _D =10A, 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)						
I _{SD}	Source-drain current(Body Diode)	T _c =25°C	--	--	60	A
V _{SD}	Forward on voltage	I _{SD} =30A, V _{GS} =0V	--	--	1.3	V
t _{rr}	Reverse Recovery Time	T _j =25°C, I _{sd} =30A, V _{GS} =0V di/dt=100A/μs	--	26	--	nS
Q _{rr}	Reverse Recovery Charge		--	15	--	nC

NOTE:

① Pulse width ≤ 300μs; duty cycles ≤ 2%.

② Limited by T_{jmax}, starting T_J = 25°C, L = 0.5mH, R_G = 25Ω, I_{AS} = 30A, V_{GS} = 10V.

Part not recommended for use above this value

③ Repetitive rating; pulse width limited by max. junction temperature.

Typical Characteristics

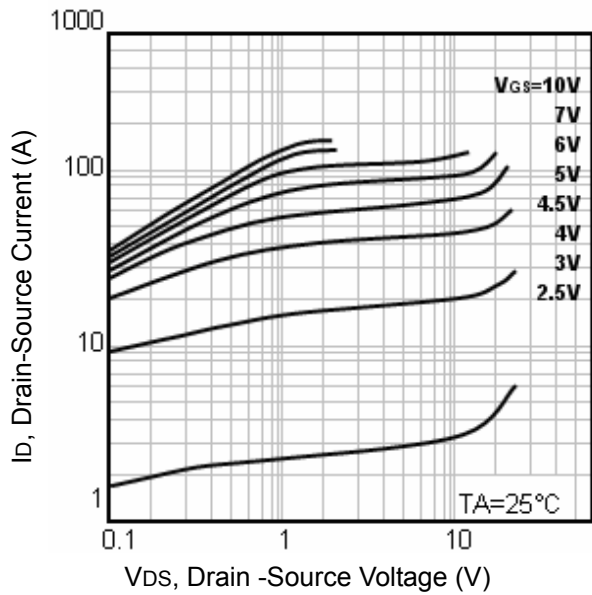


Fig1. Typical Output Characteristics

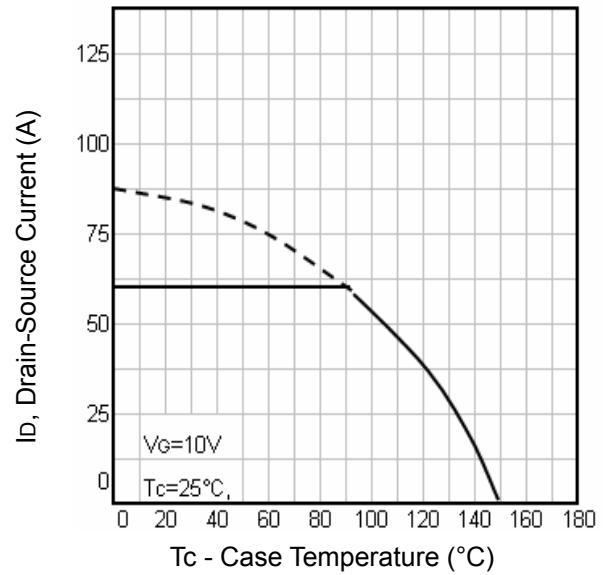


Fig2. Maximum Drain Current Vs. Case Temperature

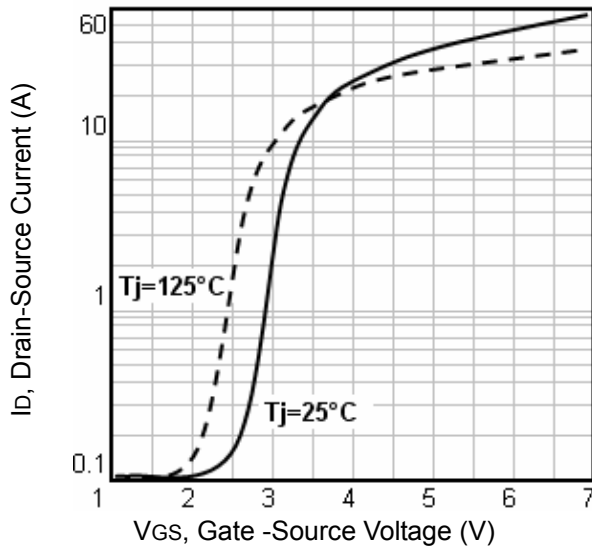


Fig3. Typical Transfer Characteristics

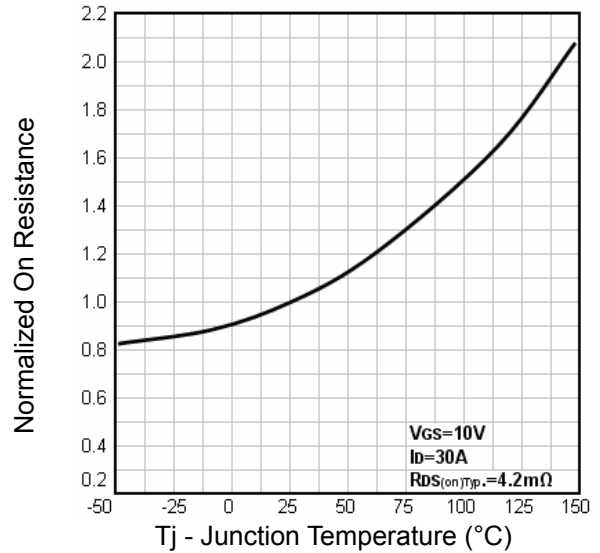


Fig4. Normalized On-Resistance Vs. Temperature

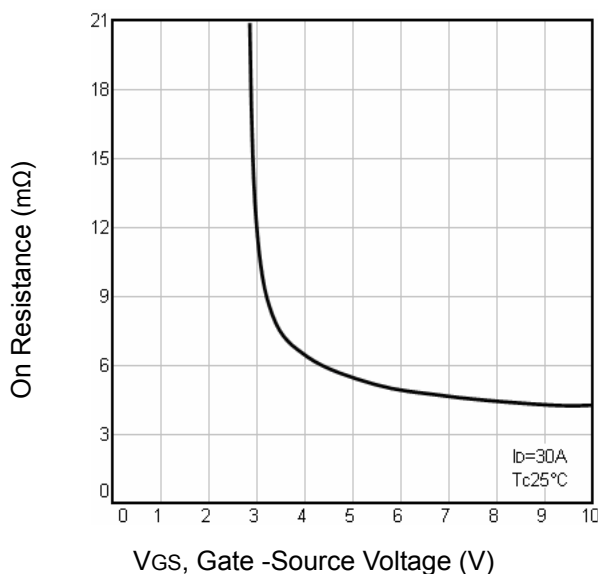


Fig5. On Resistance Vs. Gate-Source Voltage

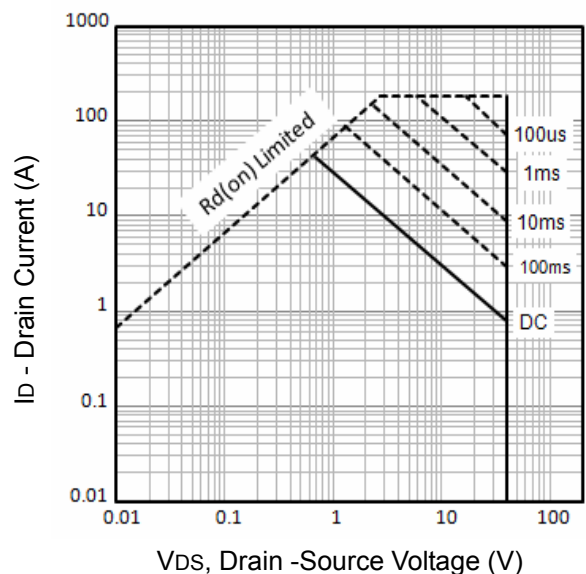


Fig6. Maximum Safe Operating Area

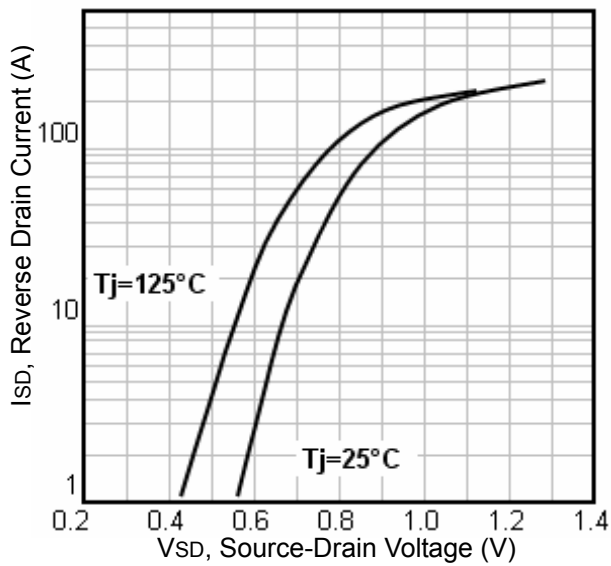


Fig7. Typical Source-Drain Diode Forward Voltage

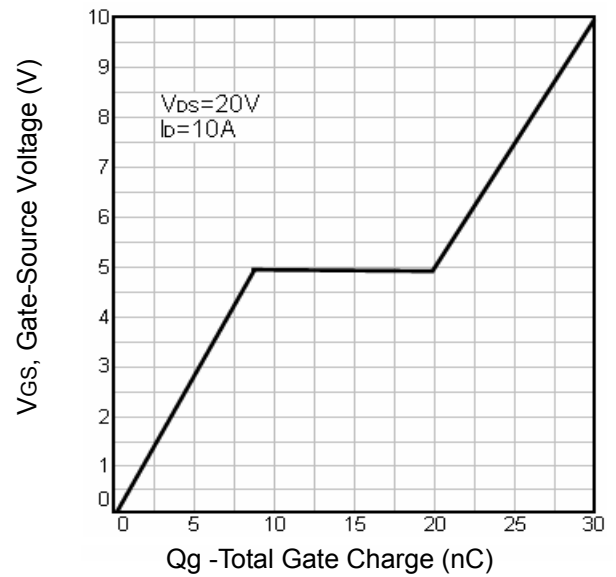


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

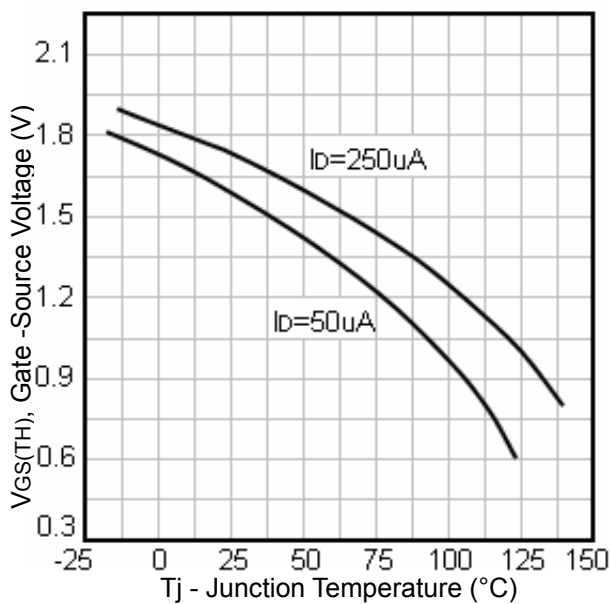


Fig9. Threshold Voltage Vs. Temperature

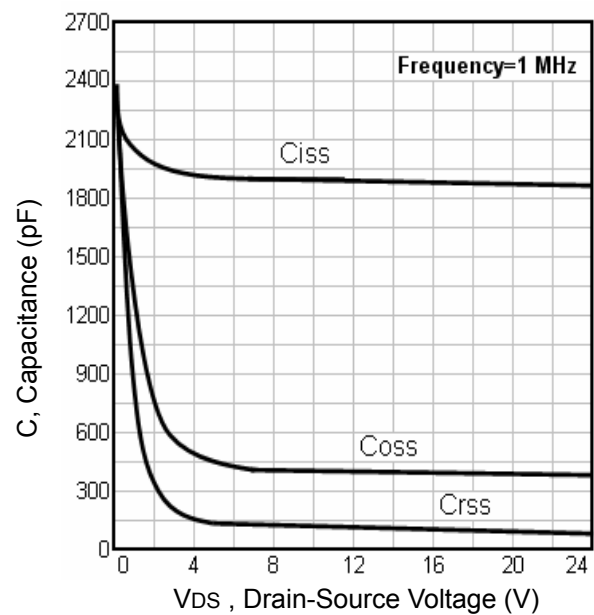


Fig10. Typical Capacitance Vs. Drain-Source Voltage

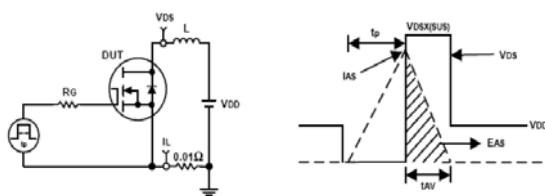


Fig11. Unclamped Inductive Test Circuit and waveforms

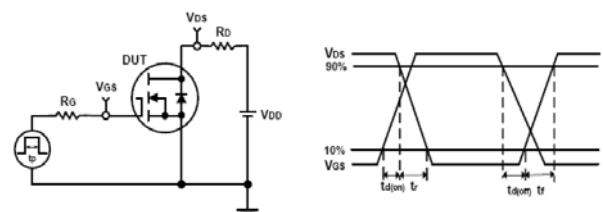
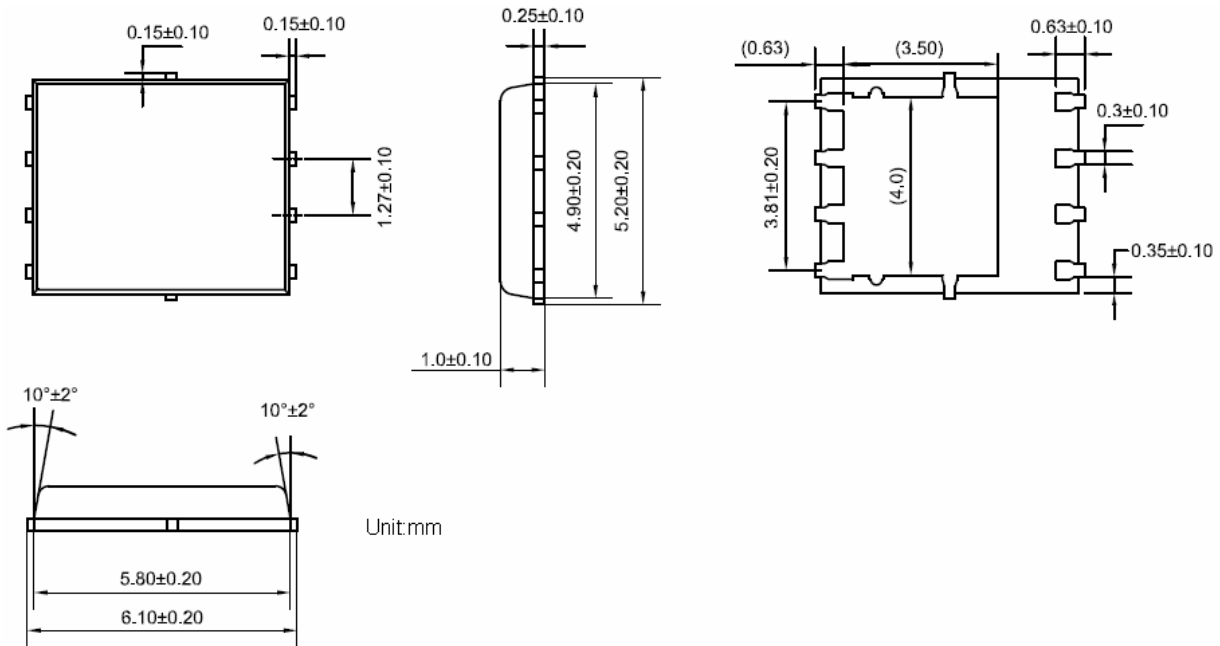


Fig12. Switching Time Test Circuit and waveforms

DFN5X6 Package Outline



Marking



Logo
Product Name
XXX: Product Lot Code; YWW: Year and week Code

Order Information

Product	Package	Packaging	Min Unit Quantity
VS4020AP	DFN5X6	3000PCS/Reel	6000PCS

Customer Service

Sales and Service:
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