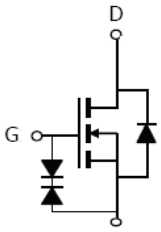
V_{DS}	700	V
$R_{DS(on),TYP}$@ V_{GS}=10V	150	mΩ
I_D	20	A

Features

- Enhancement mode
- Low on-resistance $R_{DS(on)}$ @ V_{GS}=10V
- Super Junction Technology
- ESD Protection HBM 8KV
- Pb-free lead plating; RoHS compliant; Halogen free

Pb-Free RoHS HF Halogen-Free

TO-220WF



Part ID	Package Type	Marking	Tube Information
VSF190N70HS2	TO-220WF	190N70H	50pcs/Tube

Maximum ratings, at T_A =25°C, unless otherwise specified

Symbol	Parameter		Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage		700	V
VGS	Gate-Source voltage		±30	V
I_S	Diode continuous forward current	T_C =25°C	20	A
I_D	Continuous drain current @VGS=10V	T_C =25°C	20	A
		T_C =100°C	13	A
I_{DM}	Pulse drain current tested ①	T_C =25°C	80	A
EAS	Avalanche energy, single pulsed ②		640	mJ
P_D	Maximum power dissipation	T_C =25°C	30	W
		T_C =100°C	12	W
T_{STG} , T_J	Storage and Junction Temperature Range		-55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	4.2	°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	°C/W

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	700	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=700V,V_{GS}=0V	--	--	1	μA
	Zero Gate Voltage Drain Current(Tj=125℃)	V_{DS}=560V,V_{GS}=0V	--	--	50	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±30V,V_{DS}=0V	--	--	±5	μA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	3.0	--	4.3	V
$R_{DS(ON)}$	Drain-Source On-State Resistance ③	V_{GS}=10V, I_D=10A	--	150	190	mΩ
		Tj=100℃	--	230	--	mΩ
Dynamic Electrical Characteristics @ T_j= 25°C (unless otherwise stated)						
C_{iss}	Input Capacitance	V_{DS}=30V,V_{GS}=0V, f=1MHz	1570	1850	2130	pF
C_{oss}	Output Capacitance		725	855	985	pF
C_{rss}	Reverse Transfer Capacitance		25	35	45	pF
Q_g	Total Gate Charge	V_{DS}=350V,I_D=10A, V_{GS}=10V	--	39	--	nC
Q_{gs}	Gate-Source Charge		--	11	--	nC
Q_{gd}	Gate-Drain Charge		--	14	--	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=350V, I_D=10A, R_G=10Ω, V_{GS}=10V	--	39	--	ns
t_r	Turn-on Rise Time		--	32	--	ns
$t_{d(off)}$	Turn-Off Delay Time		--	121	--	ns
t_f	Turn-Off Fall Time		--	29	--	ns
Source- Drain Diode Characteristics@ T_j = 25°C (unless otherwise stated)						
V_{SD}	Forward on voltage	I_{SD}=10A,V_{GS}=0V	--	0.9	1.2	V
t_{rr}	Reverse Recovery Time	T_j=25℃,I_{sd}=10A, V_{GS}=0V di/dt=100A/μs	--	280	--	ns
Q_{rr}	Reverse Recovery Charge		--	3.7	--	μC

NOTE: ① Repetitive rating; pulse width limited by max junction temperature.

② Limited by T_{Jmax}, starting T_J = 25°C, L = 26mH, R_G = 25Ω, I_{AS} = 7A, V_{GS} =10V. Part not recommended for use above this value.

③ Pulse width ≤ 380μs; duty cycle≤ 2%.

Typical Characteristics

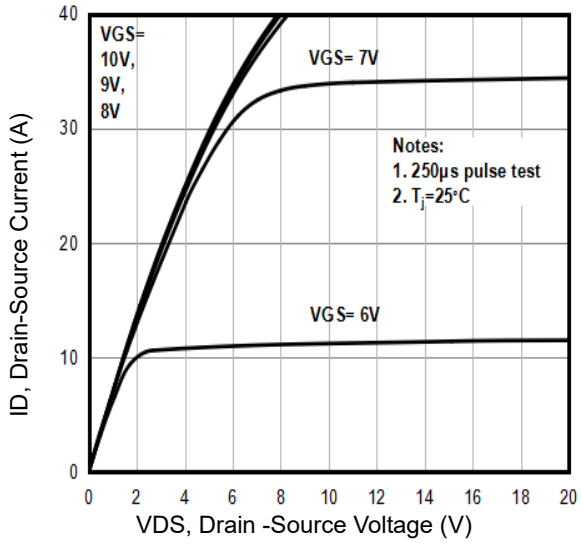


Fig1. Typical Output Characteristics

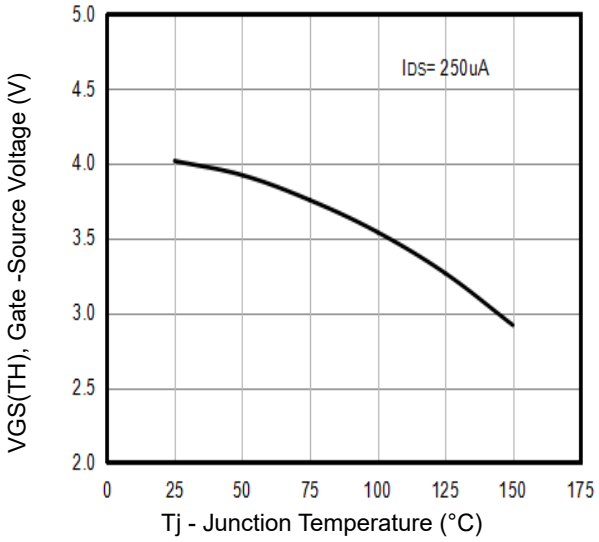


Fig2. $V_{GS(TH)}$ Gate -Source Voltage Vs. Tj

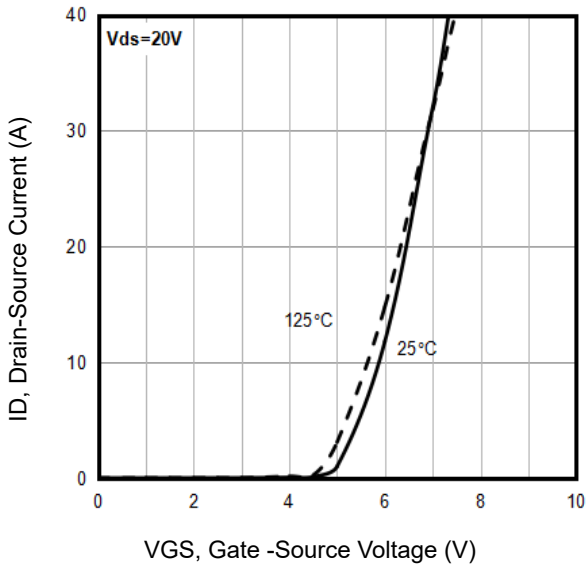


Fig3. Typical Transfer Characteristics

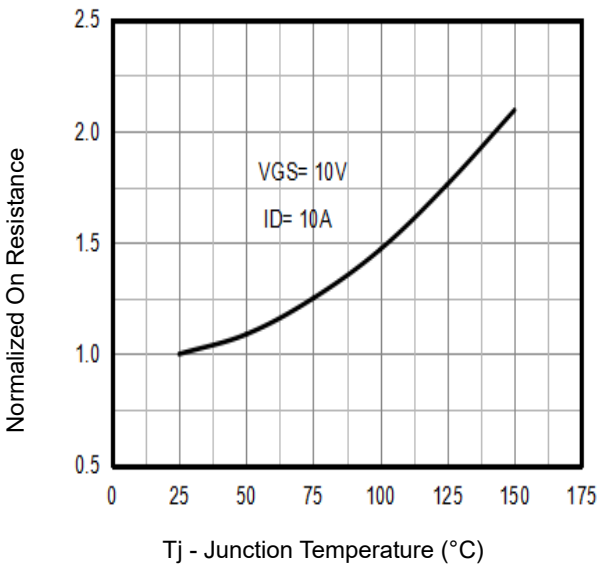


Fig4. Normalized On-Resistance Vs. Temperature

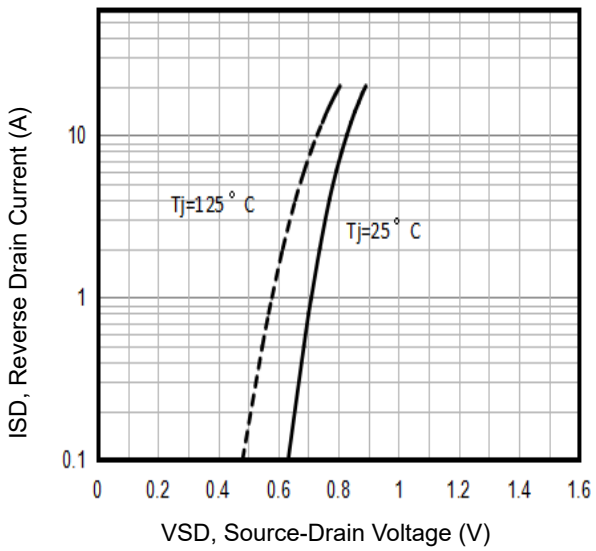


Fig5. Typical Source-Drain Diode Forward Voltage

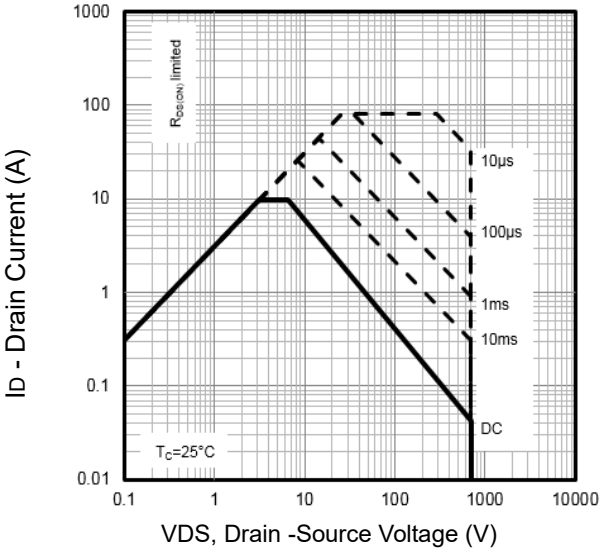


Fig6. Maximum Safe Operating Area

Typical Characteristics

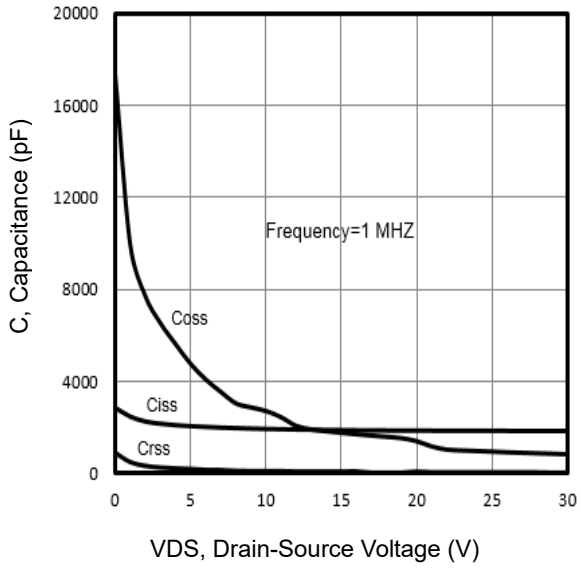


Fig7. Typical Capacitance Vs. Drain-Source Voltage

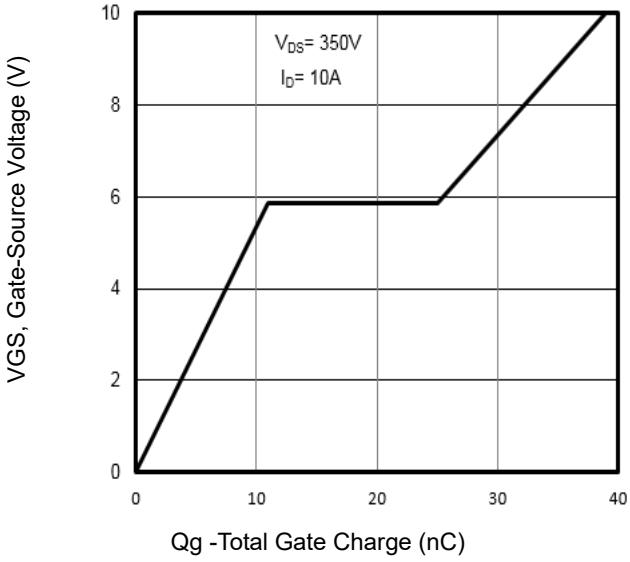


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

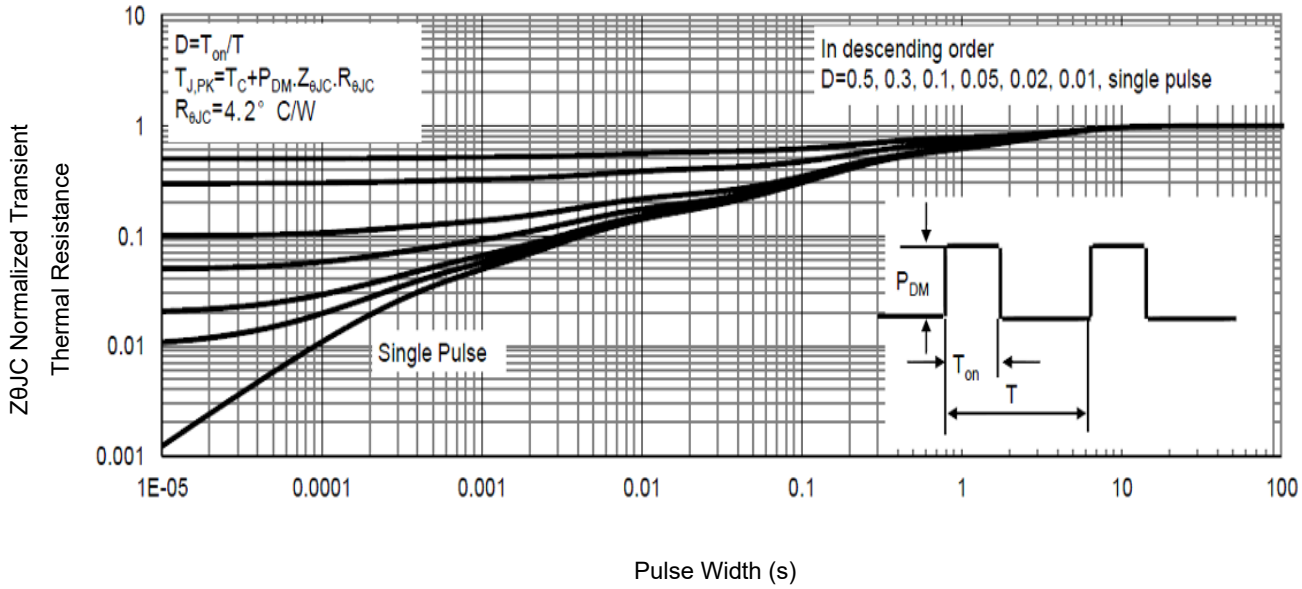


Fig9. Normalized Maximum Transient Thermal Impedance

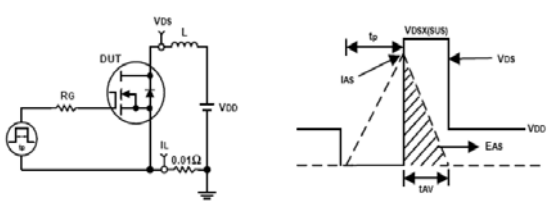


Fig10. Unclamped Inductive Test Circuit and waveforms

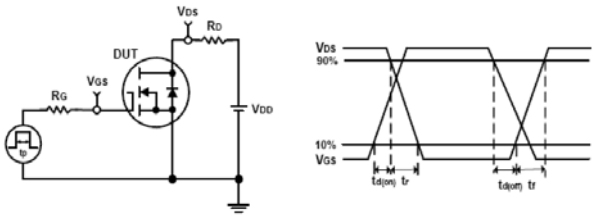
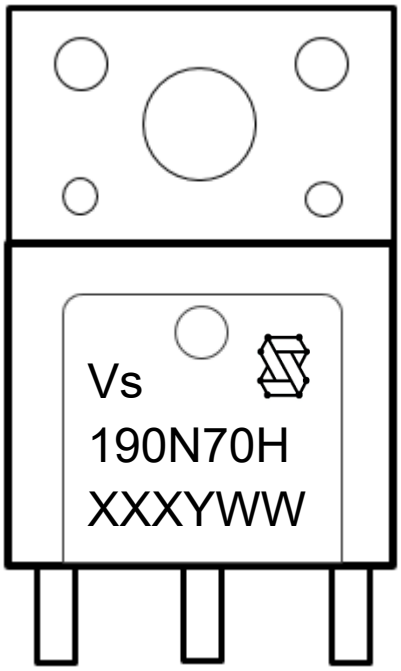


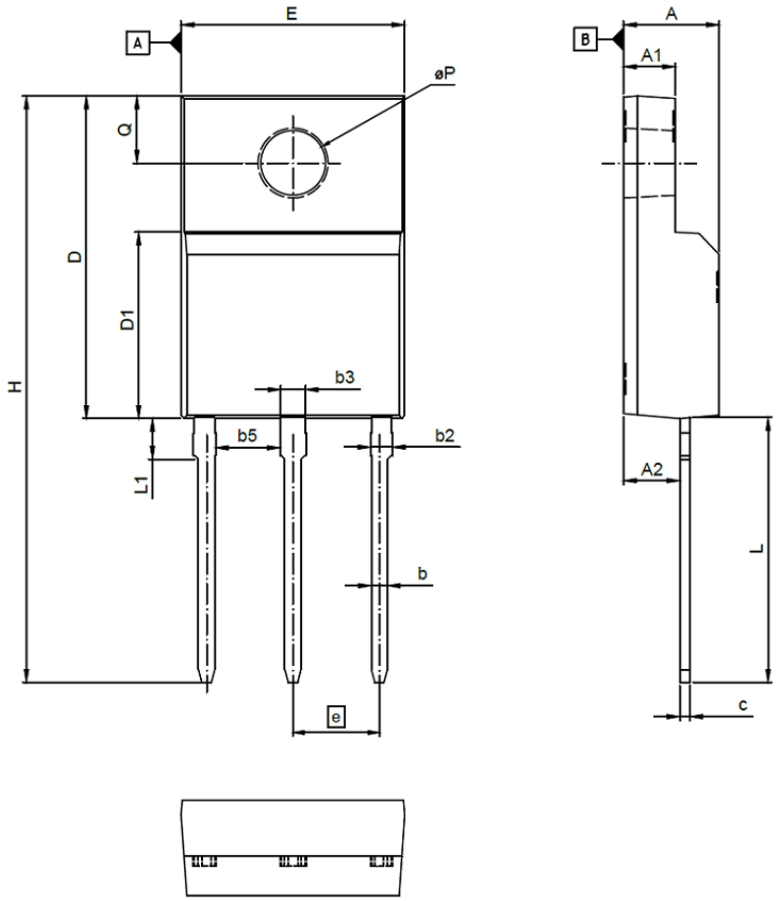
Fig11. Switching Time Test Circuit and waveforms

Marking Information



1st line: Vanguard Code（Vs），Vanguard Logo
2nd line: Part Number（190N70H）
3rd line: Date code （XXXYWW）
XXX: Wafer Lot Number Code , code changed with Lot Number
Y: Year Code，(e.g. E=2017, F=2018, G=2019, H=2020, etc)
WW: Week Code (01 to 53)

TO-220WF Package Outline Data



Symbol	Dimensions (unit: mm)		
	Min	Typ	Max
A	4.50	4.70	4.90
A1	2.34	2.54	2.74
A2	2.65	2.76	2.95
b	0.75	0.80	0.90
b2	0.98	1.08	1.26
b3	1.00	1.20	1.40
b5	3.00	--	--
c	0.40	0.50	0.60
D	15.47	15.87	16.27
D1	--	9.17	--
E	10.70	11.00	11.30
e	3.95	4.25	4.55
H	28.25	28.85	29.45
L	12.58	12.98	13.38
L1	1.70	2.00	2.30
ΦP	2.98	3.18	3.38
Q	3.10	3.30	3.50

Note:
1. Dimensions do NOT include mold flash, protrusions or gate burrs.

Customer Service

Sales and Service:
sales@vgsemi.com

Vanguard Semiconductor CO., LTD
TEL: (86-755) -26902410
FAX: (86-755) -26907027
WEB: www.vgsemi.com