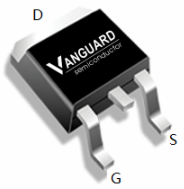
Features

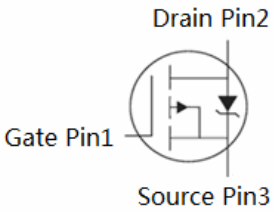
- P-Channel，-5V Logic Level Control
- Very low on-resistance RDS(on) @ V_{GS}=-4.5 V
- Fast Switching
- Enhancement mode
- 100% Avalanche Tested
- Pb-free lead plating; RoHS compliant

V_{DS}	-40	V
$R_{DS(on),TYP}$@ V_{GS}=-10 V	42	mΩ
$R_{DS(on),TYP}$@ V_{GS}=-4.5V	55	mΩ
I_D	-14	A

Pb-Free RoHS HF Halogen-Free

TO-252





Part ID	Package Type	Marking	Tape and reel information
VSD050P04MS	TO-252	050P04M	2500pcs/Reel

Maximum ratings, at T_j=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		175	°C
T_{STG}	Storage Temperature Range①		-55 to 175	°C
I_S	Diode Continuous Forward Current	T_C=25°C	-14	A
Mounted on Large Heat Sink				
I_D	Continuous Drain current @V_{GS}=-10V	T_C=25°C	-14	A
		T_C=100°C	-8.9	A
I_{DM}	Pulse Drain Current Tested ②	T_C=25°C	-50	A
P_D	Maximum Power Dissipation	T_C=25°C	30	W
$R_{\theta JC}$	Thermal Resistance-Junction to Case		5.0	°C/W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient		50	°C/W
Drain-Source Avalanche Ratings				
EAS	Avalanche Energy, Single Pulsed ③		5.4	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℃)	V_{DS}=-32V,V_{GS}=0V	--	--	-1	μA
	Zero Gate Voltage Drain Current(Tc=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	-1.6	-2.5	V
$R_{DS(ON)}$	Drain-Source On-State Resistance ②	V_{GS}=-10V, I_D=-10A	--	42	50	mΩ
$R_{DS(ON)}$	Drain-Source On-State Resistance ②	V_{GS}=-4.5V, I_D=-5A	--	55	60	mΩ
Dynamic Electrical Characteristics @ T_J= 25°C (unless otherwise stated)						
C_{iss}	Input Capacitance	V_{DS}=-25V,V_{GS}=0V, f=1MHz	--	855	--	pF
C_{oss}	Output Capacitance		--	135	--	pF
C_{rss}	Reverse Transfer Capacitance		--	85	--	pF
Q_g	Total Gate Charge	V_{DS}=-20V,I_D=-10A, V_{GS}=-10V	--	13.5	--	nC
Q_{gs}	Gate-Source Charge		--	3.8	--	nC
Q_{gd}	Gate-Drain Charge		--	2.4	--	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=-20V, I_D=-5A, R_G=6.8Ω, V_{GS}=-10V	--	8.8	--	nS
t_r	Turn-on Rise Time		--	6.3	--	nS
$t_{d(off)}$	Turn-Off Delay Time		--	26	--	nS
t_f	Turn-Off Fall Time		--	9.4	--	nS
Source- Drain Diode Characteristics@ T_J= 25°C (unless otherwise stated)						
V_{SD}	Forward on voltage	I_{SD}=-10A,V_{GS}=0V	--	-0.90	-1.3	V
t_{rr}	Reverse Recovery Time	T_j=25℃,I_{sd}=-10A, V_{GS}=0V di/dt=-100A/μs	--	28	--	nS
Q_{rr}	Reverse Recovery Charge			19		nC

NOTE:

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

②Pulse width ≤ 300μs; duty cycle≤ 2%.

③Limited by TJmax, starting TJ = 25°C, L = 0.3mH,RG = 25Ω, IAS = -6A, VGS =-10V. Part not recommended for use above this value

Typical Characteristics

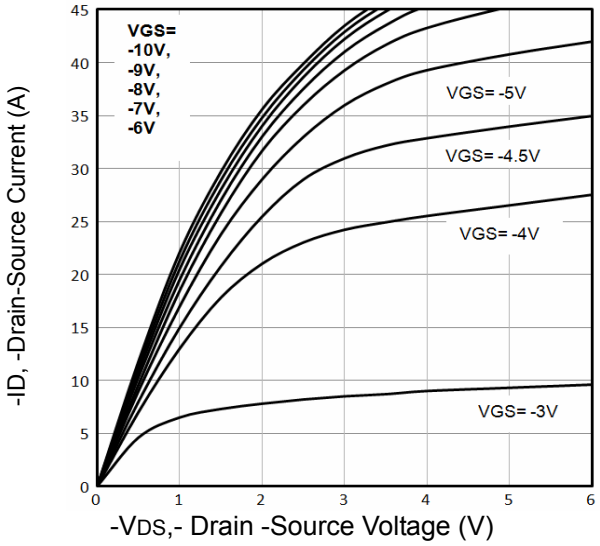


Fig1. Typical Output Characteristics

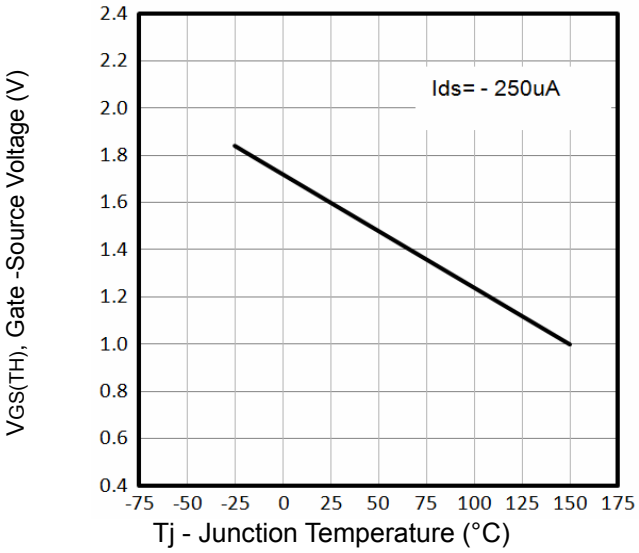


Fig2. Threshold Voltage Vs. Temperature

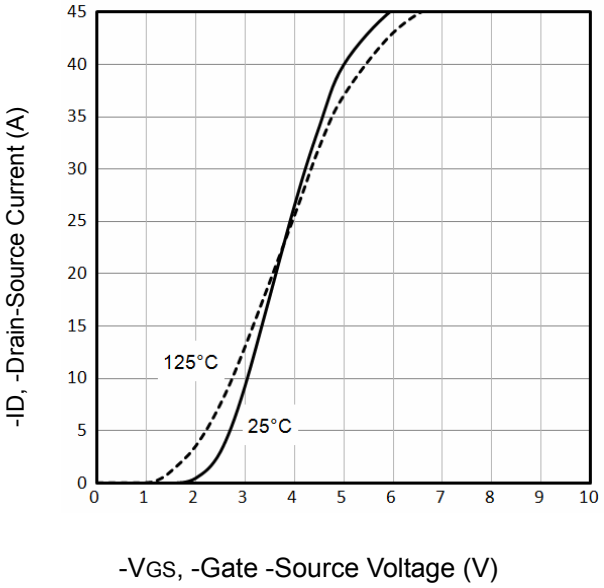


Fig3. Typical Transfer Characteristics

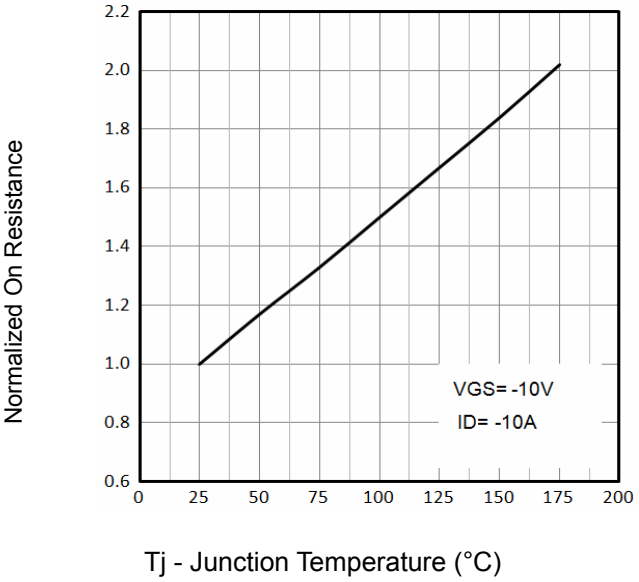


Fig4. Normalized On-Resistance Vs. Temperature

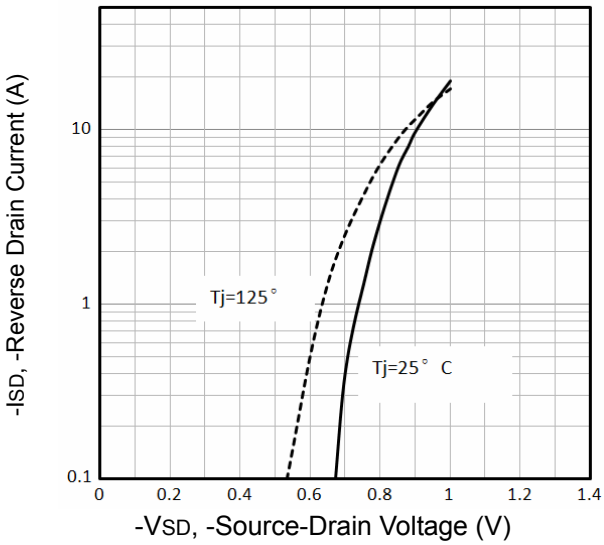


Fig5. Typical Source-Drain Diode Forward Voltage

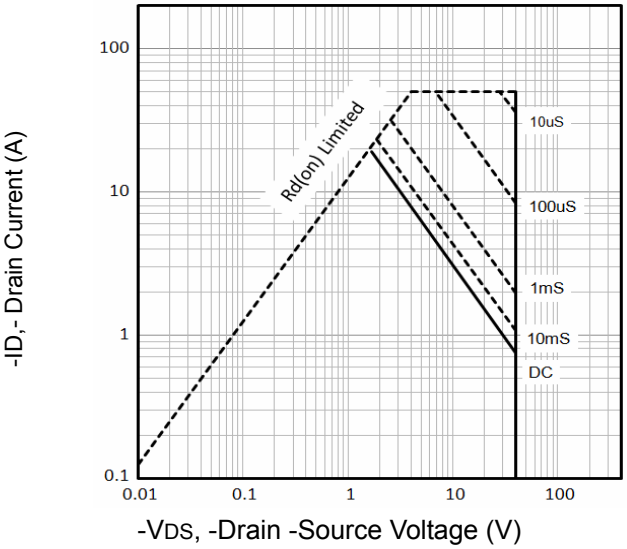


Fig6. Maximum Safe Operating Area

Typical Characteristics

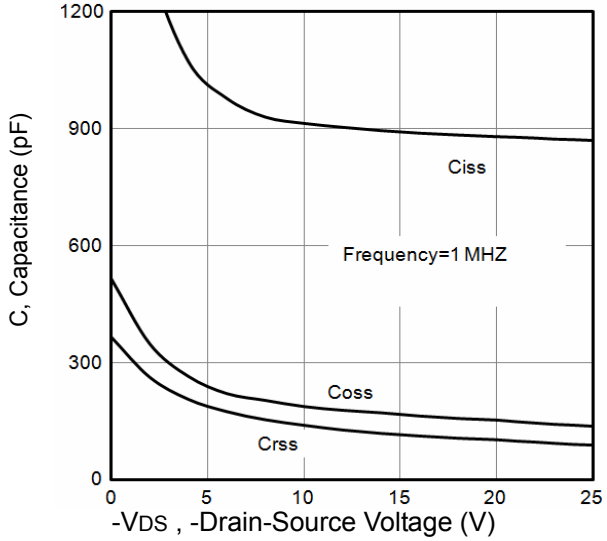


Fig7. Typical Capacitance Vs.Drain-Source Voltage

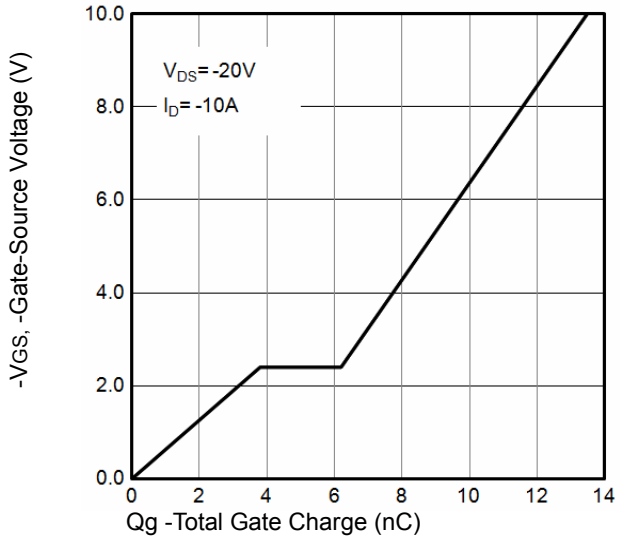


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

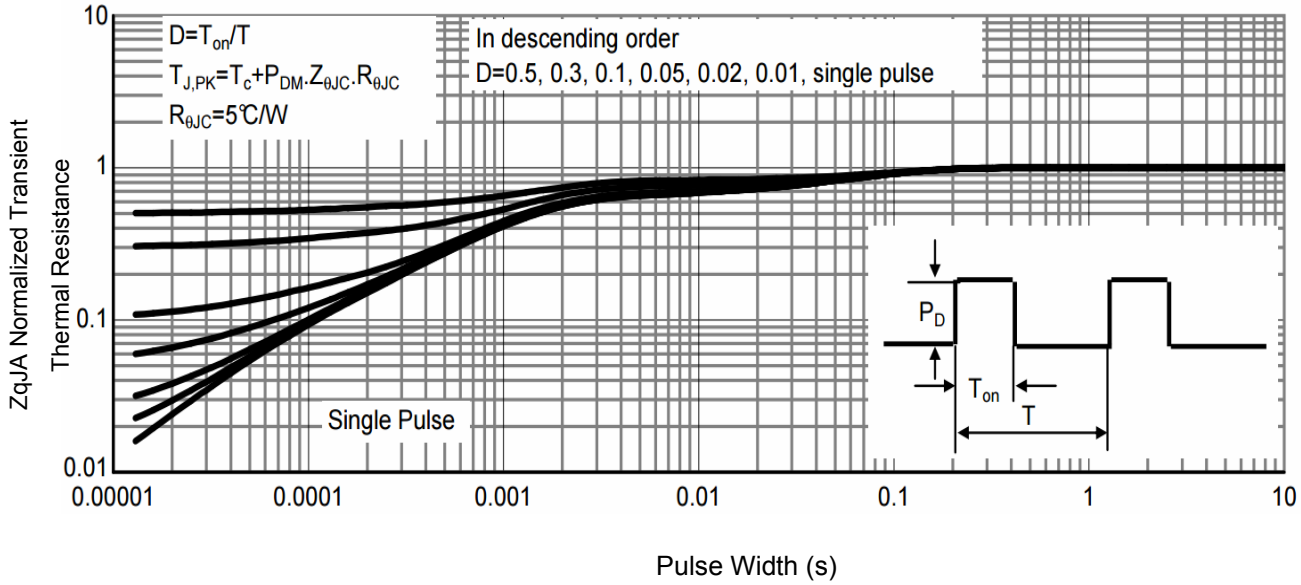


Fig9. Normalized Maximum Transient Thermal Impedance

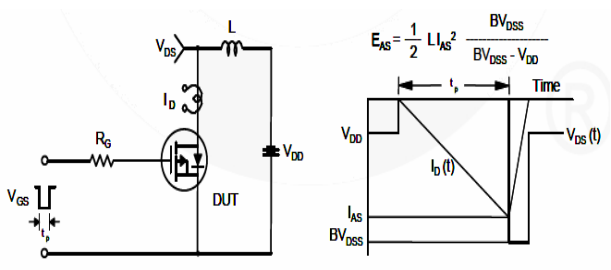


Fig10. Unclamped Inductive Test Circuit and Waveforms

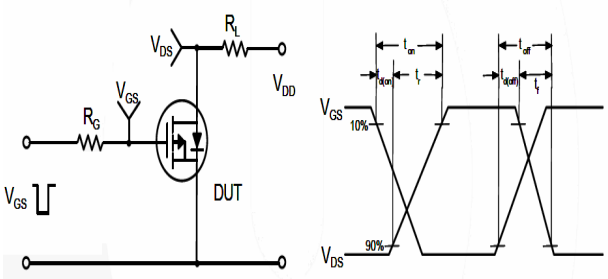
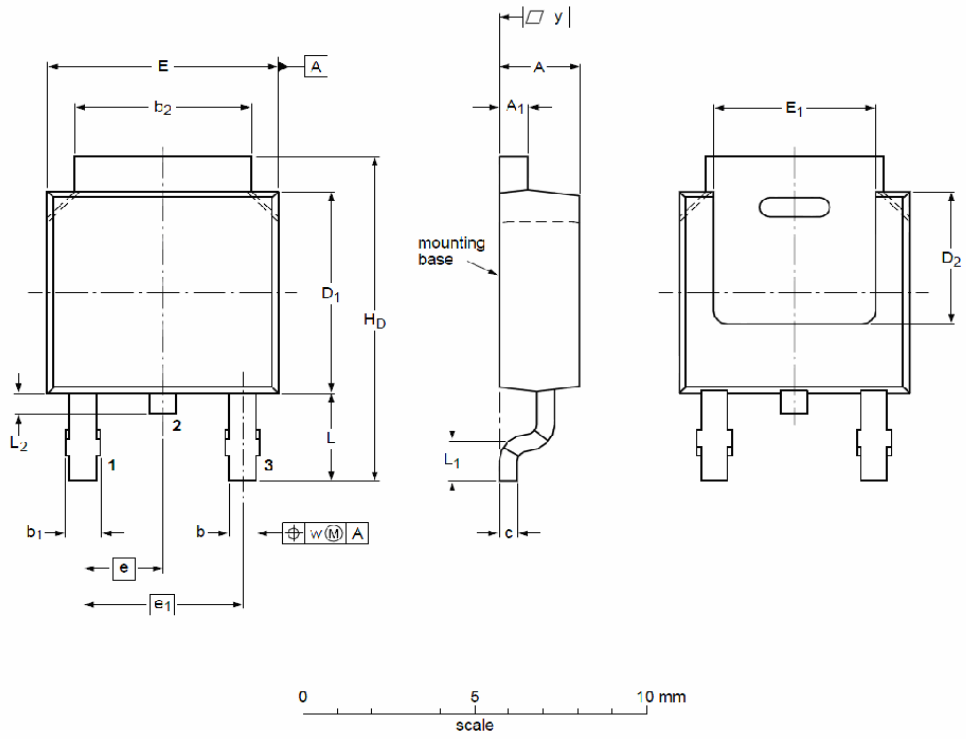


Fig11. Switching Time Test Circuit and waveforms

TO-252 Package Outline



DIMENSIONS (unit : mm)

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	2.22	2.30	2.38	**A_1**	0.46	0.58	0.93
b	0.71	0.79	0.89	**b_1**	0.90	0.98	1.10
b_2	5.00	5.30	5.46	**c**	0.20	0.40	0.56
D_1	5.98	6.05	6.22	**D_2**	--	4.00	--
E	6.47	6.60	6.73	**E_1**	5.10	5.28	5.45
e	--	2.28	--	**e_1**	--	4.57	--
H_D	9.60	10.08	10.40	**L**	2.75	2.95	3.05
L_1	--	0.50	--	**L_2**	0.80	0.90	1.10
w	--	0.20	--	**y**	0.20	--	--

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