

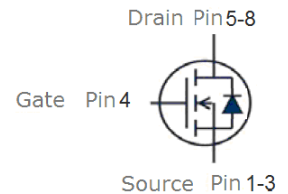
Features

- N-Channel, 5V Logic Level Control
- Enhancement mode
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}=4.5\text{ V}$
- VitoMOS[®] Technology
- 100% Avalanche test
- Pb-free lead plating; RoHS compliant



Part ID	Package Type	Marking	Tape and reel information
VS6412AE	PDFN3333	6412AE	5000PCS/Reel

V_{DS}	65	V
$R_{DS(on),TYP} @ V_{GS}=10\text{ V}$	19	m Ω
$R_{DS(on),TYP} @ V_{GS}=4.5\text{ V}$	22	m Ω
I_D	30	A

PDFN3333


Maximum ratings, at $T_A = 25^\circ\text{C}$, unless otherwise specified

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	65	V
I_S	Diode continuous forward current	$T_C = 25^\circ\text{C}$	30 A
I_D	Continuous drain current @ $V_{GS}=10\text{V}$	$T_C = 25^\circ\text{C}$	30 A
		$T_C = 100^\circ\text{C}$	19 A
I_{DM}	Pulse drain current tested ①	$T_C = 25^\circ\text{C}$	120 A
EAS	Avalanche energy, single pulsed ②	121	mJ
P_D	Maximum power dissipation	$T_C = 25^\circ\text{C}$	32 W
V_{GS}	Gate-Source voltage	± 20	V
$T_{STG} T_J$	Storage and operating temperature range	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	3.9	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient	35	$^\circ\text{C/W}$



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	65	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =65V, V _{GS} =0V	--	--	0.1	μA
	Zero Gate Voltage Drain Current(T _j =125°C)	V _{DS} =65V, 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	1.8	2.5	V
R _{DS(ON)}	Drain-Source On-State Resistance ^③	V _{GS} =10V, I _D =15A	--	19	24	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance ^③	V _{GS} =4.5V, I _D =10A	--	22	26	mΩ
Dynamic Electrical Characteristics @ T_j = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance	V _{DS} =30V, V _{GS} =0V, f=1MHz	--	1240	--	pF
C _{oss}	Output Capacitance		--	95	--	pF
C _{rss}	Reverse Transfer Capacitance		--	85	--	pF
R _g	Gate Resistance	f=1MHz	--	2.4	--	Ω
Q _g	Total Gate Charge	V _{DS} =30V, I _D =5A, V _{GS} =10V	--	21	--	nC
Q _{gs}	Gate-Source Charge		--	6	--	nC
Q _{gd}	Gate-Drain Charge		--	8.5	--	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =30V, I _D =5A, R _G =6.8Ω, V _{GS} =10V	--	12	--	nS
t _r	Turn-on Rise Time		--	8.5	--	nS
t _{d(off)}	Turn-Off Delay Time		--	42	--	nS
t _f	Turn-Off Fall Time		--	6	--	nS
Source- Drain Diode Characteristics @ T_j = 25°C (unless otherwise stated)						
V _{SD}	Forward on voltage	I _{SD} =15A, V _{GS} =0V	--	0.8	1.2	V
t _{rr}	Reverse Recovery Time	T _j =25°C, I _{sd} =5A, V _{GS} =0V	--	22	--	nS
Q _{rr}	Reverse Recovery Charge	di/dt=100A/μs		86		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} = 22A, V_{GS} = 10V. Part not recommended for use above this value
- ③ Pulse width ≤ 300μs; duty cycle ≤ 2%.

Typical Characteristics

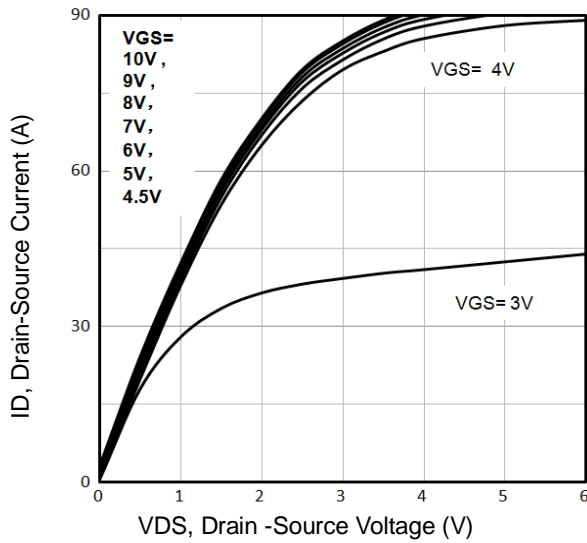


Fig1. Typical Output Characteristics

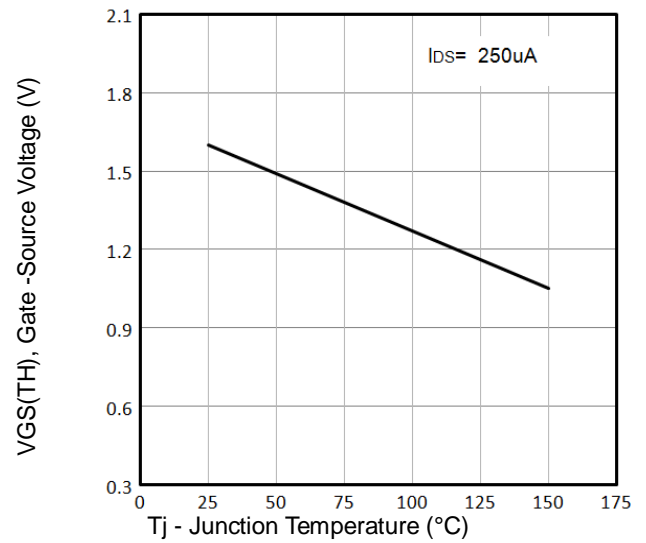


Fig2. $V_{GS(TH)}$ Gate-Source Voltage Vs. T_j

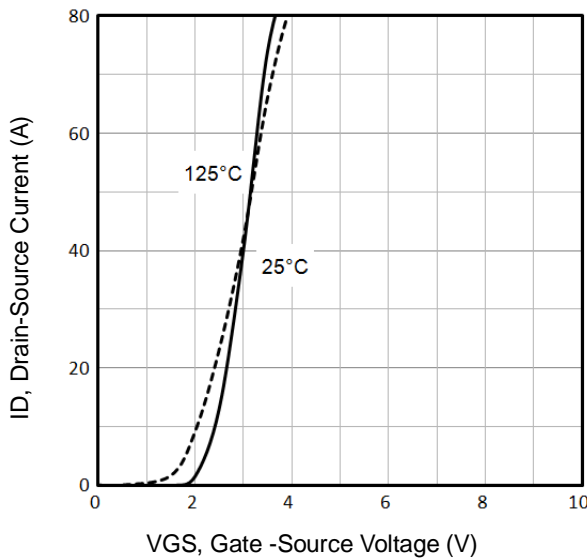


Fig3. Typical Transfer Characteristics

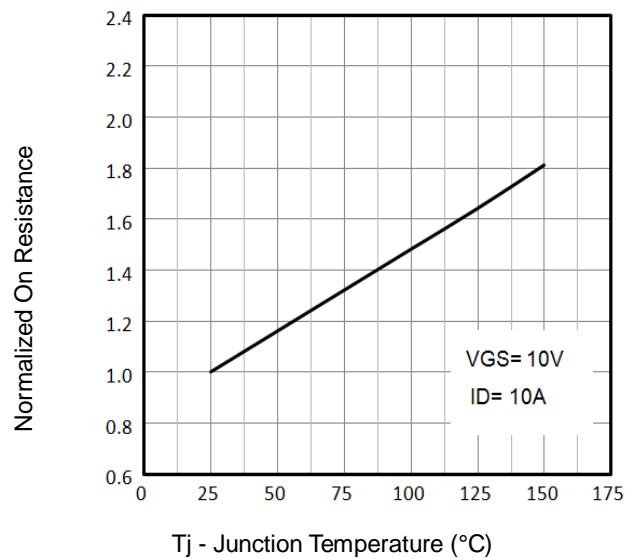


Fig4. Normalized On-Resistance Vs. T_j

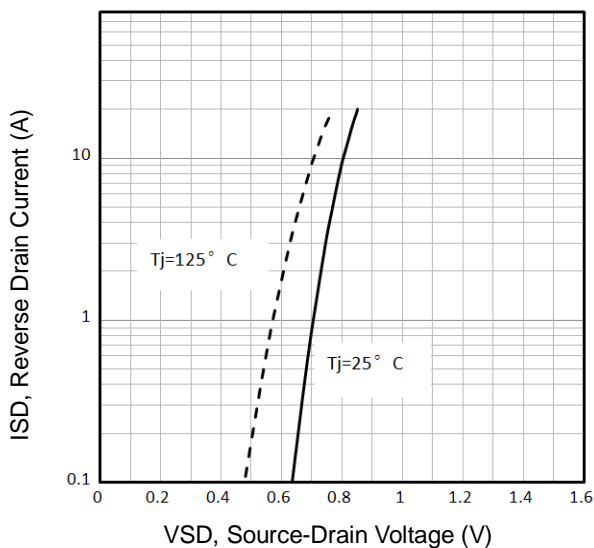


Fig5. Typical Source-Drain Diode Forward Voltage

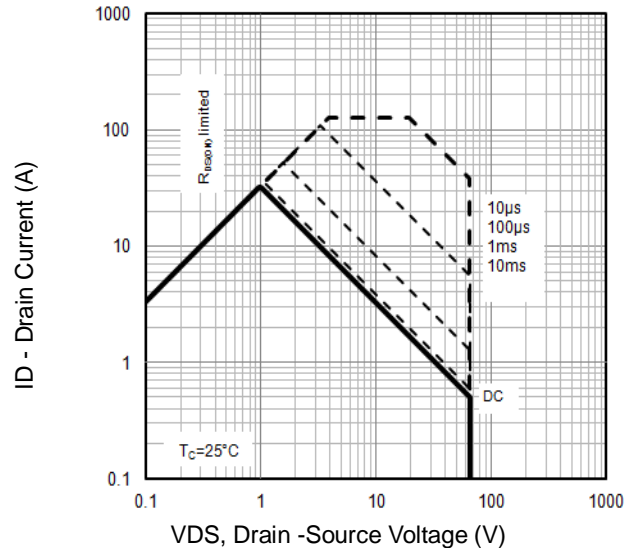


Fig6. Maximum Safe Operating Area

Typical Characteristics

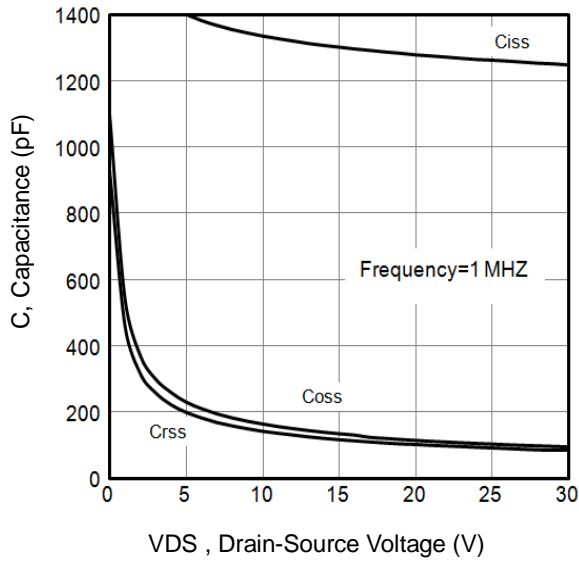


Fig7. Typical Capacitance Vs.Drain-Source Voltage

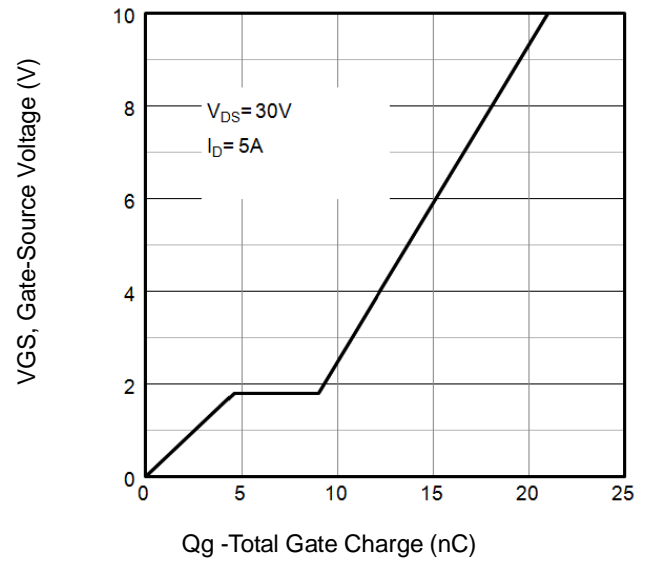


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

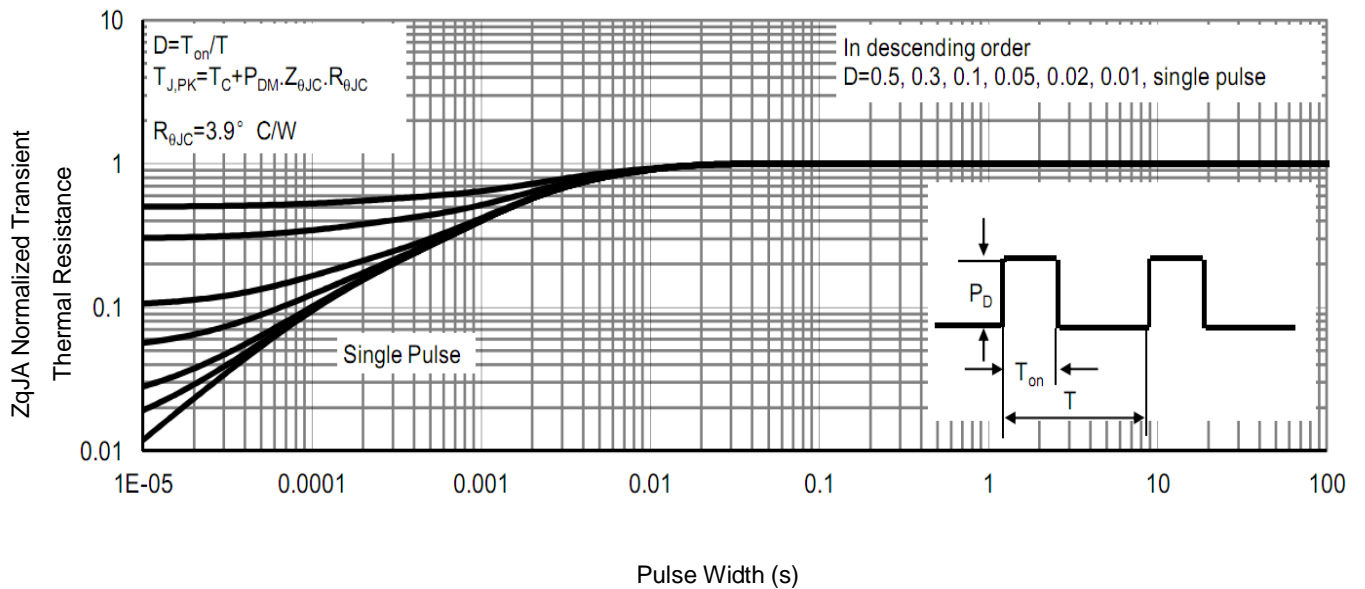


Fig9. Normalized Maximum Transient Thermal Impedance

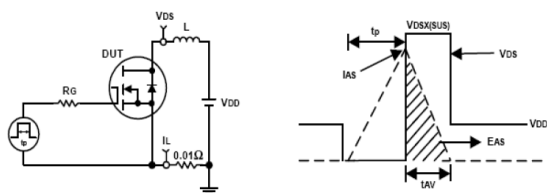


Fig10. Unclamped Inductive Test Circuit and waveforms

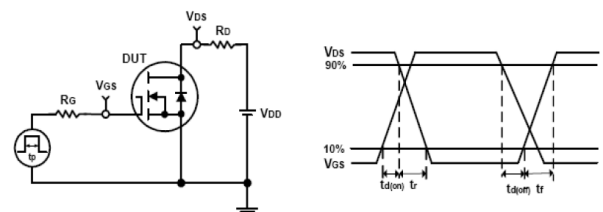
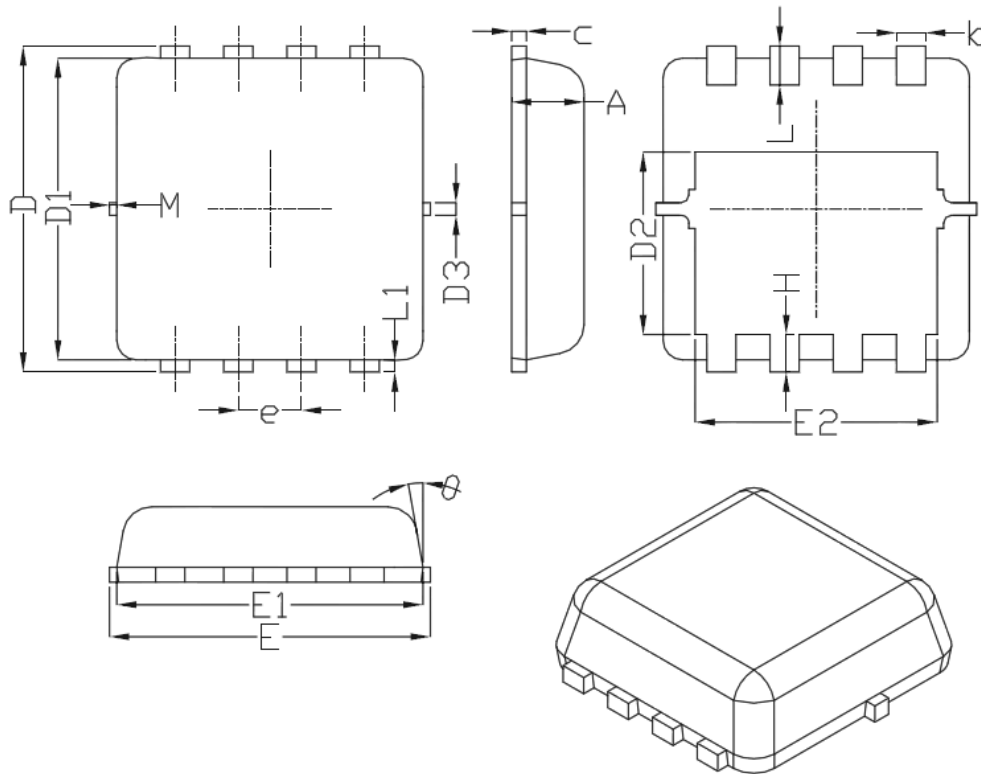


Fig11. Switching Time Test Circuit and waveforms



PDFN3333 Package Outline Data



DIMENSIONS (unit : mm)

Symbol	Min	Typ	Max	Symbol	Min	Typ	Max
A	0.70	0.75	0.80	b	0.25	0.30	0.35
C	0.10	0.15	0.25	D	3.25	3.35	3.45
D1	3.00	3.10	3.20	D2	1.78	1.88	1.98
D3	--	0.13	--	E	3.20	3.30	3.40
E1	3.00	3.15	3.20	E2	2.39	2.49	2.59
e	0.65BSC			H	0.30	0.39	0.50
L	0.30	0.40	0.50	L1	--	0.13	--
θ	--	10°	12°	M	*	*	0.15
*Not specified							

Customer Service

Sales and Service:

sales@vgsemi.com

Vanguard Semiconductor CO., LTD

TEL: (86-755) -26902410

FAX: (86-755) -26907027

WEB: www.vgsemi.com