

Features

- N-Channel, 2.5V Logic Level Control
- Enhancement mode
- Very low on-resistance $R_{DS(on)}$ @ $V_{GS}=2.5\text{ V}$
- Fast Switching
- 100% Avalanche Tested
- Pb-free lead plating; RoHS compliant


Halogen-Free

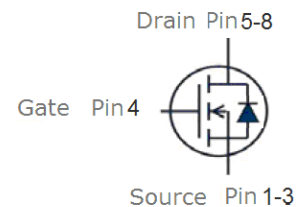
Part ID	Package Type	Marking	Tape and reel information
VSE004N02KS	PDFN3333	004N02K	5000pcs/Reel

V_{DS}	20	V
$R_{DS(on),TYP} @ V_{GS}=4.5\text{ V}$	3.6	m Ω
$R_{DS(on),TYP} @ V_{GS}=2.5\text{ V}$	4.5	m Ω
I_D	72	A

PDFN3333



Pin1



Absolute aximum ratings, at $T_J=25\text{ }^\circ\text{C}$, unless otherwise specified

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	20	V
I_S	Diode continuous forward current	$T_C=25^\circ\text{C}$ 72	A
I_D	Continuous drain current @ $V_{GS}=4.5\text{ V}$	$T_C=25^\circ\text{C}$ 72	A
		$T_C=100^\circ\text{C}$ 46	A
I_{DM}	Pulse drain current tested ①	$T_C=25^\circ\text{C}$ 236	A
P_D	Maximum power dissipation	$T_C=25^\circ\text{C}$ 38	W
V_{GS}	Gate-Source voltage	± 12	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	3.3	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	35	$^\circ\text{C/W}$

Drain-Source Avalanche Ratings

EAS	Avalanche Energy, Single Pulsed ②	72	mJ
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Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
Static Electrical Characteristics @ $T_j=25^\circ\text{C}$ (unless otherwise stated)						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	20	--	--	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS}=20V, V_{GS}=0V$	--	--	1	μA
	Zero Gate Voltage Drain Current($T_j=125^\circ\text{C}$)	$V_{DS}=20V, V_{GS}=0V$	--	--	100	μA
I_{GSS}	Gate-Body Leakage Current	$V_{GS}=\pm 12V, V_{DS}=0V$	--	--	± 100	nA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	0.4	0.65	1.0	V
$R_{DS(ON)}$	Drain-Source On-State Resistance ^③	$V_{GS}=4.5V, I_D=15A$	--	3.6	4	m Ω
$R_{DS(ON)}$	Drain-Source On-State Resistance ^③	$V_{GS}=2.5V, I_D=5A$	--	4.5	6.5	m Ω
$R_{DS(ON)}$	Drain-Source On-State Resistance ^③	$V_{GS}=1.8V, I_D=3A$	--	6	9	m Ω
Dynamic Electrical Characteristics @ $T_j=25^\circ\text{C}$ (unless otherwise stated)						
C_{iss}	Input Capacitance	$V_{DS}=10V, V_{GS}=0V,$ $f=1\text{MHz}$	--	3690	--	pF
C_{oss}	Output Capacitance		--	610	--	pF
C_{rss}	Reverse Transfer Capacitance		--	530	--	pF
R_g	Gate Resistance	$f=1\text{MHz}$		1.8		Ω
Q_g	Total Gate Charge	$V_{DS}=10V, I_D=15A,$ $V_{GS}=4.5V$	--	38	--	nC
Q_{gs}	Gate-Source Charge		--	10	--	nC
Q_{gd}	Gate-Drain Charge		--	14	--	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=15V,$ $I_D=10A,$ $R_G=3.5\Omega,$ $V_{GS}=4.5V$	--	11	--	nS
t_r	Turn-on Rise Time		--	15	--	nS
$t_{d(off)}$	Turn-Off Delay Time		--	79	--	nS
t_f	Turn-Off Fall Time		--	24	--	nS
Source- Drain Diode Characteristics @ $T_j=25^\circ\text{C}$ (unless otherwise stated)						
V_{SD}	Forward on voltage	$I_{SD}=15A, V_{GS}=0V$	--	0.72	1.2	V
t_{rr}	Reverse Recovery Time	$T_j=25^\circ\text{C}, I_{sd}=20A,$ $di/dt=500A/\mu s$	--	19	--	nS
Q_{rr}	Reverse Recovery Charge				40	

NOTE:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T_{Jmax} , starting $T_j = 25^\circ\text{C}$, $L = 0.5\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 17A$, $V_{GS} = 10V$. Part not recommended for use above this value
- ③ Pulse width $\leq 300\mu s$; duty cycle $\leq 2\%$.

Typical Characteristics

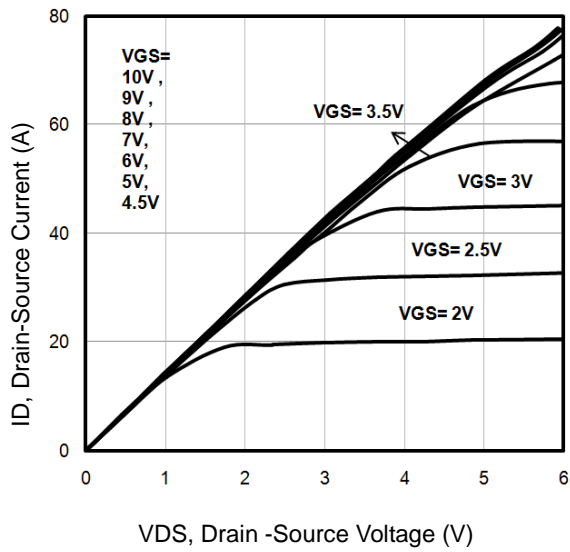


Fig1. Typical Output Characteristics

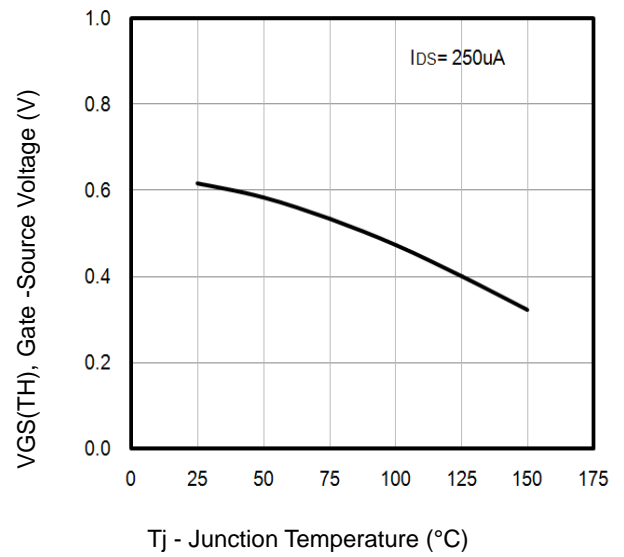


Fig2. $V_{GS(TH)}$ Gate-Source Voltage Vs. T_j

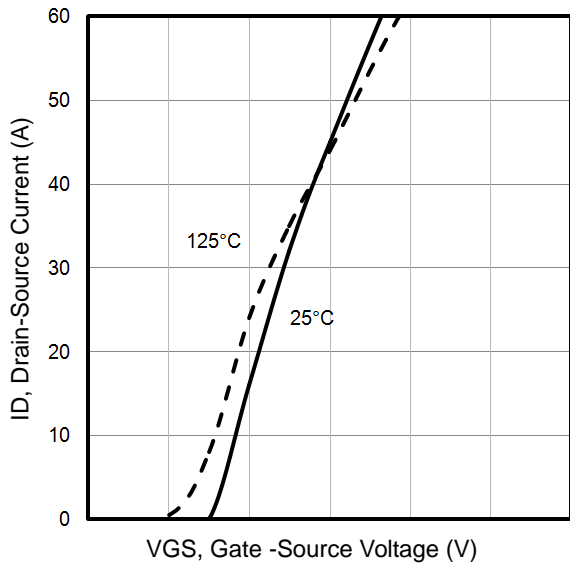


Fig3. Typical Transfer Characteristics

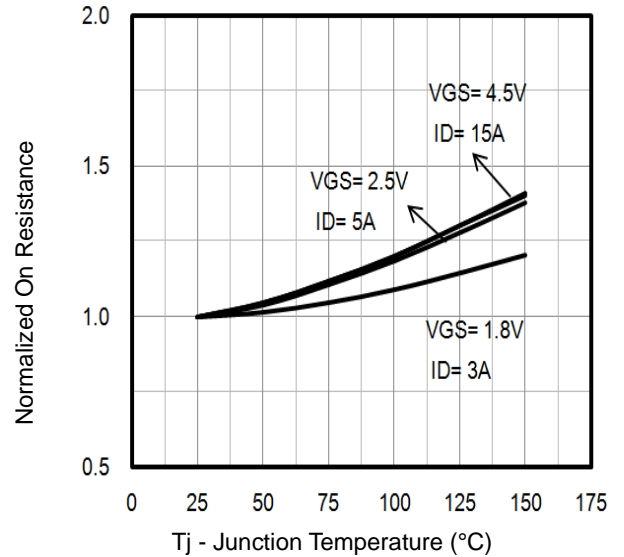


Fig4. Normalized On-Resistance Vs. T_j

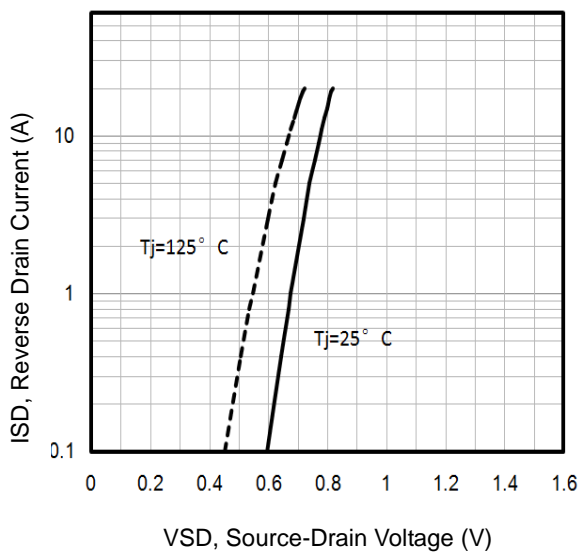


Fig5. Typical Source-Drain Diode Forward Voltage

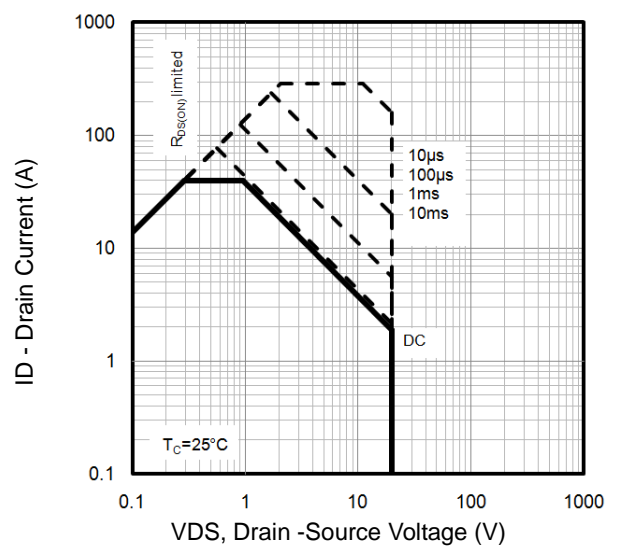


Fig6. Maximum Safe Operating Area

Typical Characteristics

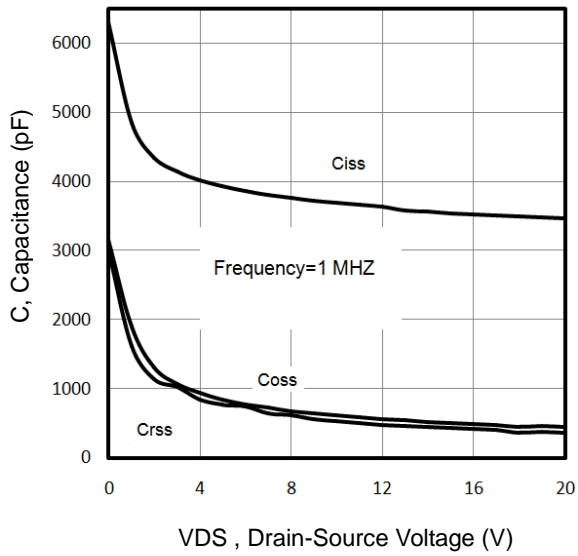


Fig7. Typical Capacitance Vs.Drain-Source Voltage

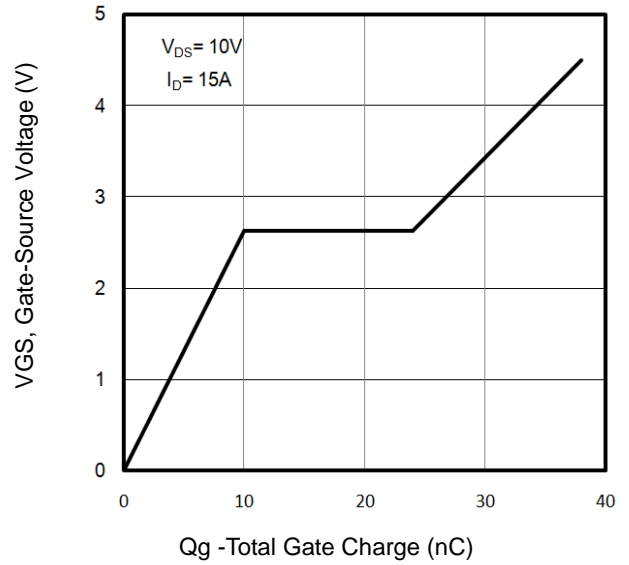


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

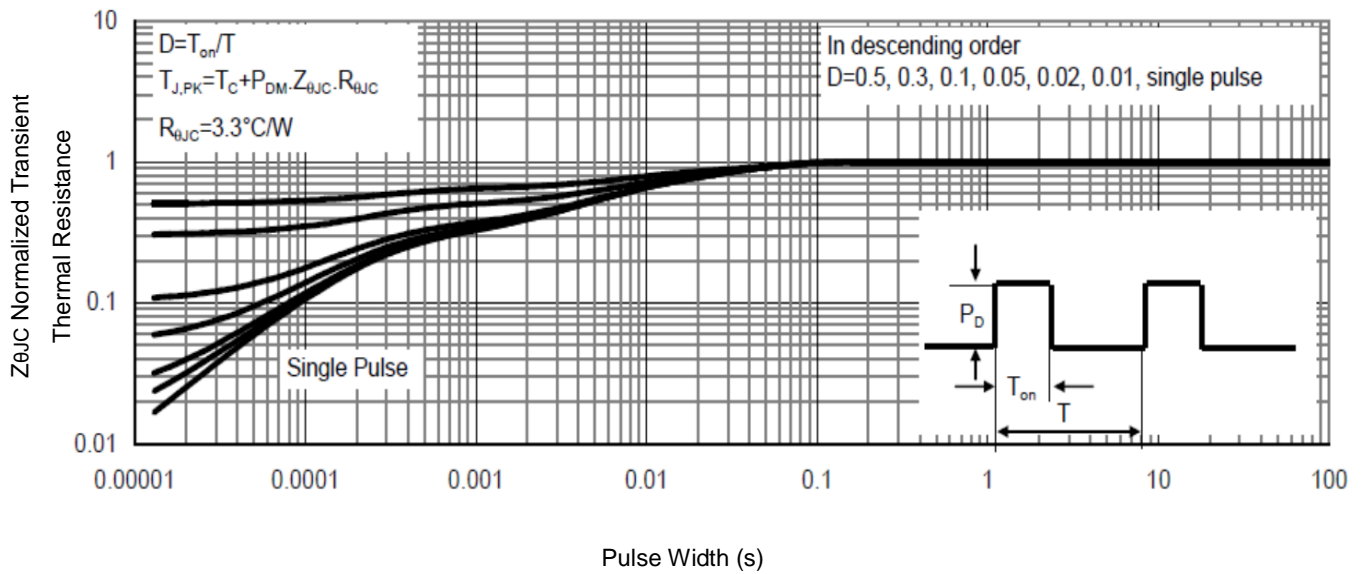


Fig9 . Normalized Maximum Transient Thermal Impedance

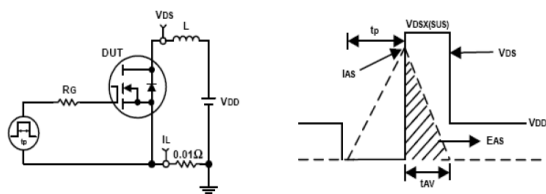


Fig10. Unclamped Inductive Test Circuit and waveforms

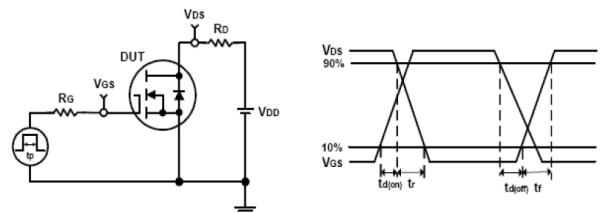
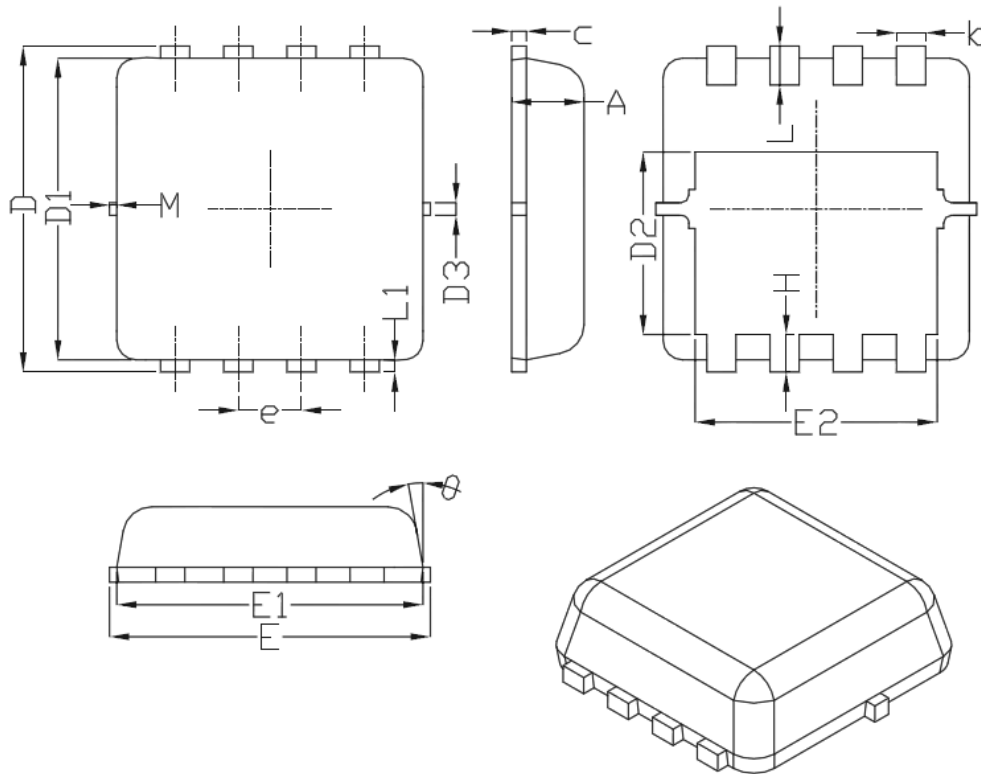


Fig11. Switching Time Test Circuit and waveforms

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