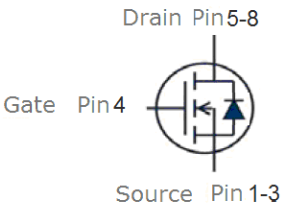
Features

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

Pb-Free RoHS HF Halogen-Free

V_{DS}	20	V
$R_{DS(on),TYP}$@ V_{GS}=4.5 V	4.6	mΩ
$R_{DS(on),TYP}$@ V_{GS}=2.5 V	6	mΩ
I_D	59	A

PDFN3333



Part ID	Package Type	Marking	Tape and reel information
VSE005N02KS	PDFN3333	005N02K	5000pcs/Reel

Absolute aximum ratings, at T_j=25 °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°C	59	A
I_D	Continuous drain current@VGS=4.5V	T_C=25°C	59	A
		T_C=100°C	37	A
I_{DM}	Pulse drain current tested ①	T_C=25°C	236	A
P_D	Maximum power dissipation	T_C=25°C	32	W
VGS	Gate-Source voltage		±12	V
T_{STG} T_J	Storage and operating temperature range		-55 to 150	°C

Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	3.9	°C/W
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	35	°C/W
Drain-Source Avalanche Ratings			
EAS	Avalanche Energy, Single Pulsed ②	42	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	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℃)	V_{DS}=20V,V_{GS}=0V	--	--	100	μA
I_{GSS}	Gate-Body Leakage Current	V_{GS}=±12V,V_{DS}=0V	--	--	±100	nA
$V_{GS(TH)}$	Gate Threshold Voltage	V_{DS}=V_{GS},I_D=250μA	0.3	0.67	1.1	V
$R_{DS(ON)}$	Drain-Source On-State Resistance③	V_{GS}=4.5V, I_D=15A	--	4.6	5.5	mΩ
$R_{DS(ON)}$	Drain-Source On-State Resistance③	V_{GS}=2.5V, I_D=5A	--	6	9	mΩ
$R_{DS(ON)}$	Drain-Source On-State Resistance③	V_{GS}=1.8V, I_D=3A	--	8.7	11	mΩ
Dynamic Electrical Characteristics @ T_j= 25°C (unless otherwise stated)						
C_{iss}	Input Capacitance	V_{DS}=10V,V_{GS}=0V, f=1MHz	--	2525	--	pF
C_{oss}	Output Capacitance		--	395	--	pF
C_{rss}	Reverse Transfer Capacitance		--	380	--	pF
R_g	Gate Resistance	f=1MHz		2.8		Ω
Q_g	Total Gate Charge	V_{DS}=10V,I_D=15A, V_{GS}=4.5V	--	42	--	nC
Q_{gs}	Gate-Source Charge		--	10	--	nC
Q_{gd}	Gate-Drain Charge		--	15	--	nC
Switching Characteristics						
$t_{d(on)}$	Turn-on Delay Time	V_{DD}=15V, I_D=10A, R_G=3.5Ω, V_{GS}=4.5V	--	8	--	nS
t_r	Turn-on Rise Time		--	11	--	nS
$t_{d(off)}$	Turn-Off Delay Time		--	75	--	nS
t_f	Turn-Off Fall Time		--	19	--	nS
Source- Drain Diode Characteristics@ T_j= 25°C (unless otherwise stated)						
V_{SD}	Forward on voltage	I_{SD}=15A,V_{GS}=0V	--	0.78	1.2	V
t_{rr}	Reverse Recovery Time	T_j=25℃,I_{sd}=20A, di/dt=500A/μs	--	25	--	nS
Q_{rr}	Reverse Recovery Charge			41		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} = 13A, V_{GS} =10V. Part not recommended for use above this value

③ Pulse width ≤ 300μs; duty cycle≤ 2%.

Typical Characteristics

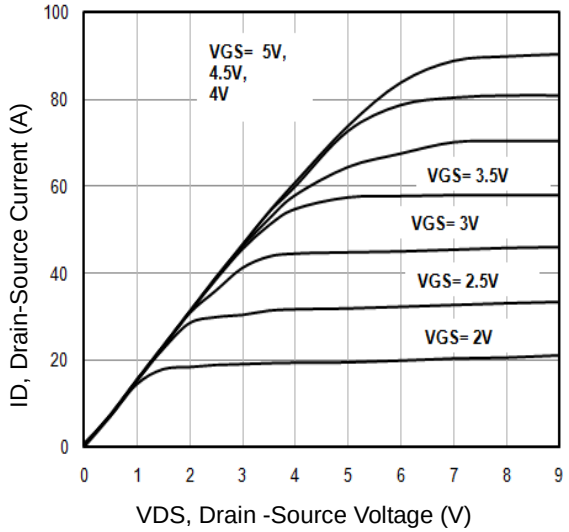


Fig1. Typical Output Characteristics

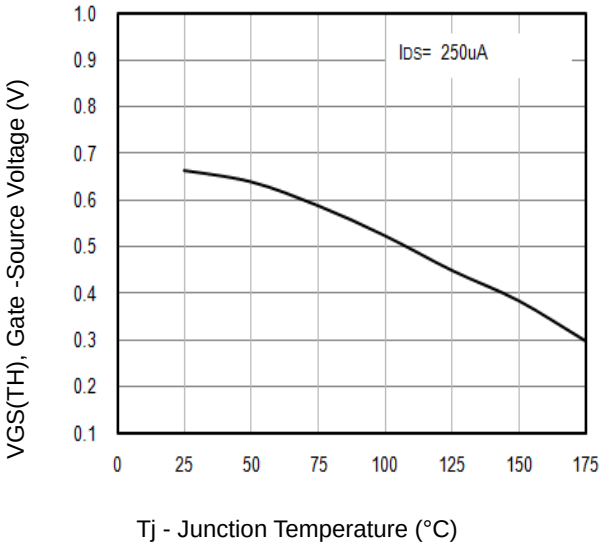


Fig2. $V_{GS(TH)}$ Gate -Source Voltage Vs.Tj

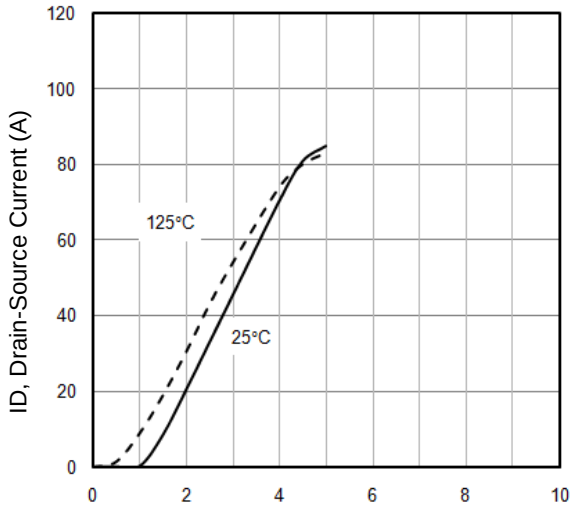


Fig3. Typical Transfer Characteristics

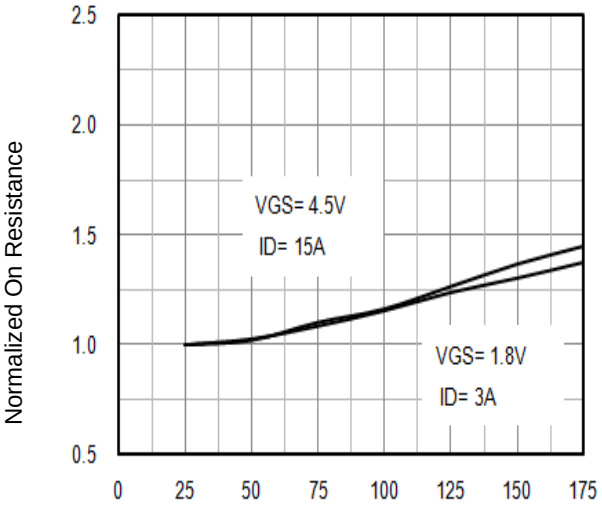


Fig4. Normalized On-Resistance Vs. Tj

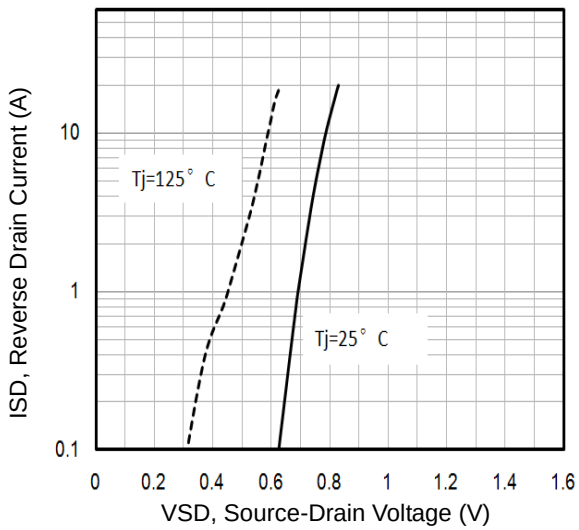


Fig5. Typical Source-Drain Diode Forward Voltage

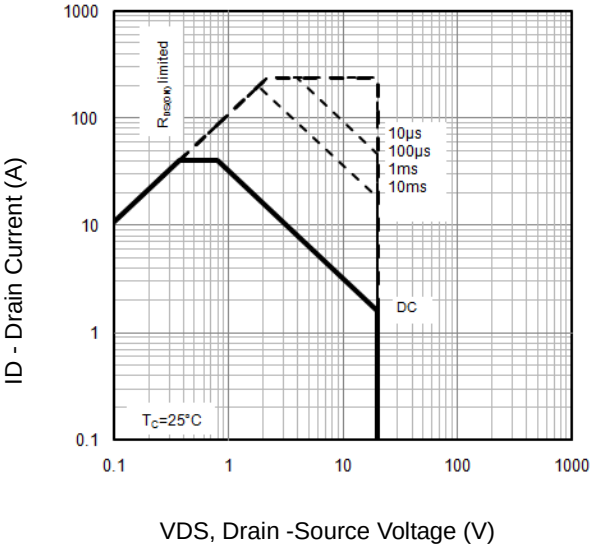


Fig6. Maximum Safe Operating Area

Typical Characteristics

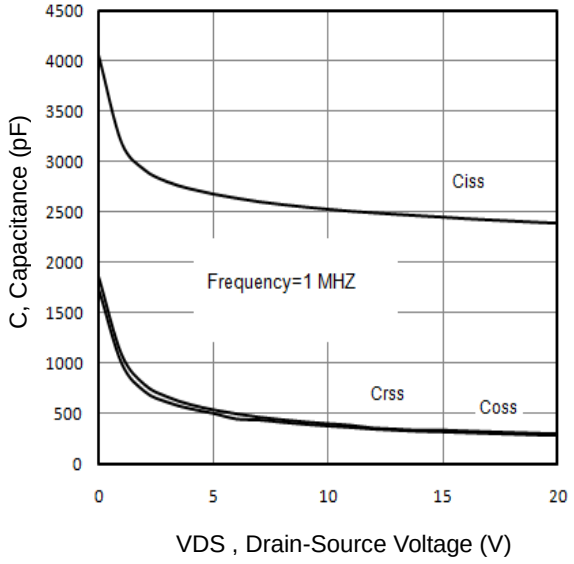


Fig7. Typical Capacitance Vs.Drain-Source Voltage

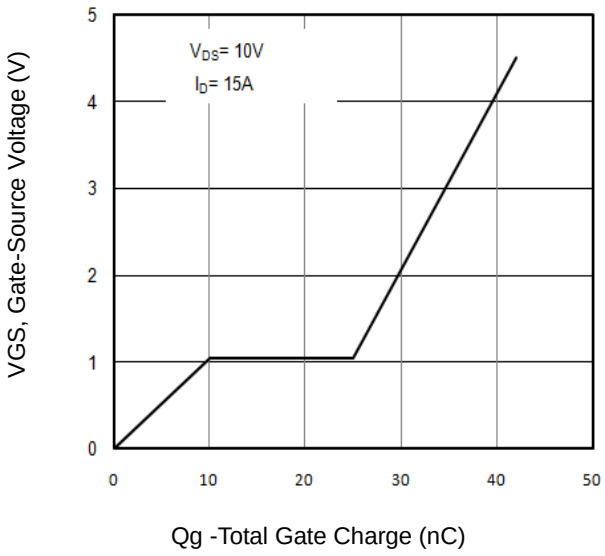


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

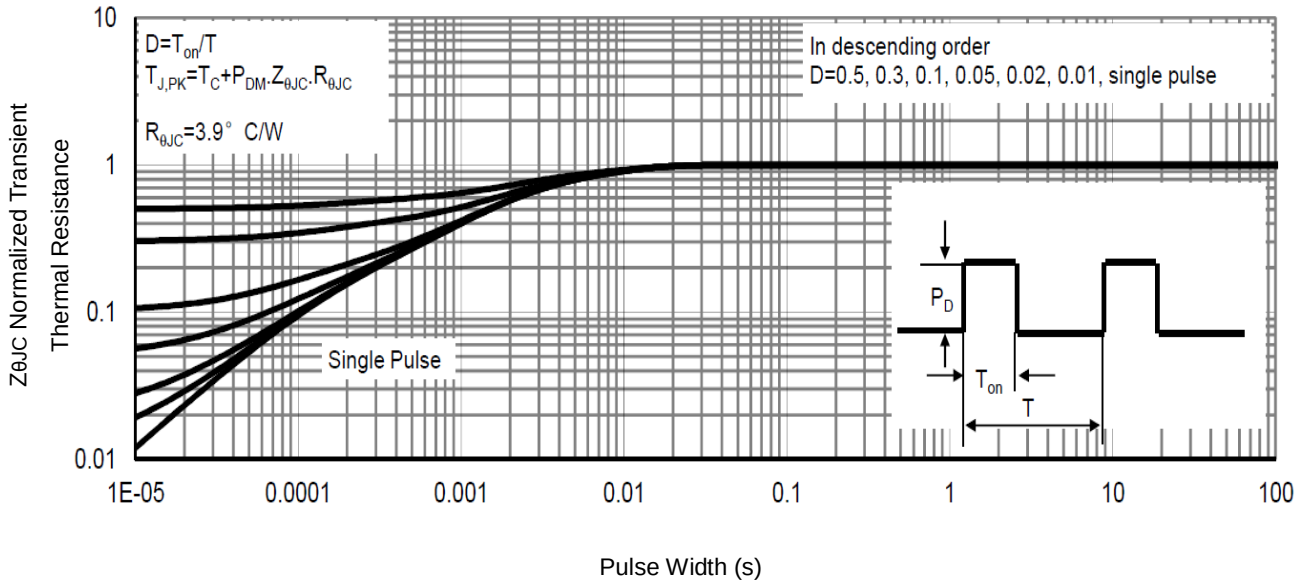


Fig9 . Normalized Maximum Transient Thermal Impedance

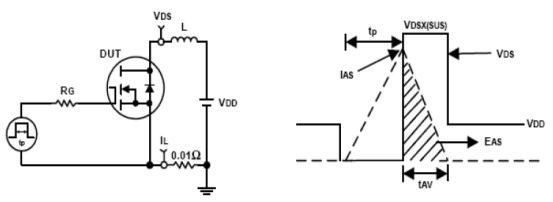


Fig10. Unclamped Inductive Test Circuit and waveforms

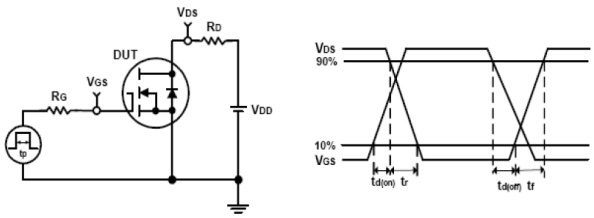
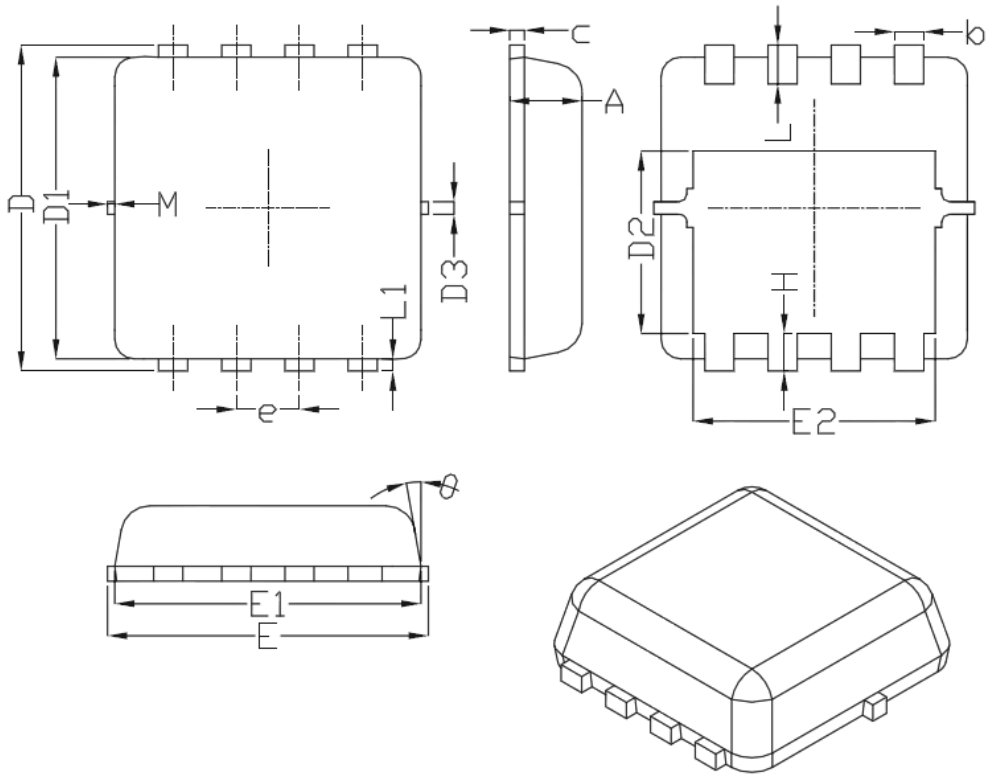


Fig11. Switching Time Test Circuit and waveforms

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							

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