

## Features

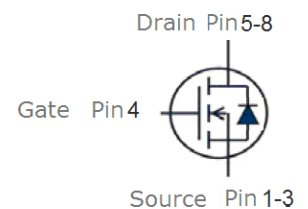
- N-Channel, 5V Logic Level Control
- Enhancement mode
- Very low on-resistance  $R_{DS(on)}$  @  $V_{GS}=4.5\text{ V}$
- Fast Switching
- 100% Avalanche Tested
- Pb-free lead plating; RoHS compliant



Part ID	Package Type	Marking	Tape and reel information
VSE006N03MS	PDFN3333	006N03M	5000pcs/Reel

$V_{DS}$	30	V
$R_{DS(on),TYP} @ V_{GS}=10\text{ V}$	5.4	m $\Omega$
$R_{DS(on),TYP} @ V_{GS}=4.5\text{ V}$	7.4	m $\Omega$
$I_D$	58	A

### PDFN3333



### Absolute maximum ratings, at $T_j=25\text{ }^\circ\text{C}$ , unless otherwise specified

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	30	V
$I_S$	Diode continuous forward current	$T_C=25\text{ }^\circ\text{C}$	58 A
$I_D$	Continuous drain current @ $V_{GS}=10\text{ V}$	$T_C=25\text{ }^\circ\text{C}$	58 A
		$T_C=100\text{ }^\circ\text{C}$	37 A
$I_{DM}$	Pulse drain current tested ①	$T_C=25\text{ }^\circ\text{C}$	190 A
$P_D$	Maximum power dissipation	$T_C=25\text{ }^\circ\text{C}$	36.5 W
$V_{GS}$	Gate-Source voltage	$\pm 20$	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	3.4	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	40	$^\circ\text{C/W}$

### Drain-Source Avalanche Ratings

EAS	Avalanche Energy, Single Pulsed ②	144	mJ
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Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
<b>Static Electrical Characteristics @ <math>T_j = 25^\circ\text{C}</math> (unless otherwise stated)</b>						
$V_{(BR)DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=250\mu A$	30	--	--	V
$I_{DSS}$	Zero Gate Voltage Drain Current(	$V_{DS}=30V, V_{GS}=0V$	--	--	1	$\mu A$
	Zero Gate Voltage Drain Current( $T_j=125^\circ\text{C}$ )	$V_{DS}=30V, V_{GS}=0V$	--	--	100	$\mu A$
$I_{GSS}$	Gate-Body Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	--	--	$\pm 100$	nA
$V_{GS(TH)}$	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.6	2.5	V
$R_{DS(ON)}$	Drain-Source On-State Resistance <sup>③</sup>	$V_{GS}=10V, I_D=15A$	--	5.4	6.5	m $\Omega$
$R_{DS(ON)}$	Drain-Source On-State Resistance <sup>③</sup>	$V_{GS}=4.5V, I_D=10A$	--	7.4	9.0	m $\Omega$
<b>Dynamic Electrical Characteristics @ <math>T_j = 25^\circ\text{C}</math> (unless otherwise stated)</b>						
$C_{iss}$	Input Capacitance	$V_{DS}=15V, V_{GS}=0V,$ $f=1\text{MHz}$	--	1595	--	pF
$C_{oss}$	Output Capacitance		--	185	--	pF
$C_{rss}$	Reverse Transfer Capacitance		--	160	--	pF
$R_g$	Gate Resistance	$f=1\text{MHz}$		2.9		$\Omega$
$Q_g$	Total Gate Charge	$V_{DS}=15V, I_D=15A,$ $V_{GS}=10V$	--	36	--	nC
$Q_{gs}$	Gate-Source Charge		--	6.2	--	nC
$Q_{gd}$	Gate-Drain Charge		--	7.5	--	nC
<b>Switching Characteristics</b>						
$t_{d(on)}$	Turn-on Delay Time	$V_{DD}=15V,$ $I_D=10A,$ $R_G=3.5\Omega,$ $V_{GS}=10V$	--	8	--	nS
$t_r$	Turn-on Rise Time		--	10.5	--	nS
$t_{d(off)}$	Turn-Off Delay Time		--	29	--	nS
$t_f$	Turn-Off Fall Time		--	9.5	--	nS
<b>Source- Drain Diode Characteristics @ <math>T_j = 25^\circ\text{C}</math> (unless otherwise stated)</b>						
$V_{SD}$	Forward on voltage	$I_{SD}=15A, V_{GS}=0V$	--	0.81	1.2	V
$t_{rr}$	Reverse Recovery Time	$T_j=25^\circ\text{C}, I_{sd}=20A,$ $di/dt=500A/\mu s$	--	31	--	nS
$Q_{rr}$	Reverse Recovery Charge				26	

**NOTE:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by  $T_{jmax}$ , starting  $T_j = 25^\circ\text{C}$ ,  $L = 0.5\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 24A$ ,  $V_{GS} = 10V$ . Part not recommended for use above this value
- ③ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

Typical Characteristics

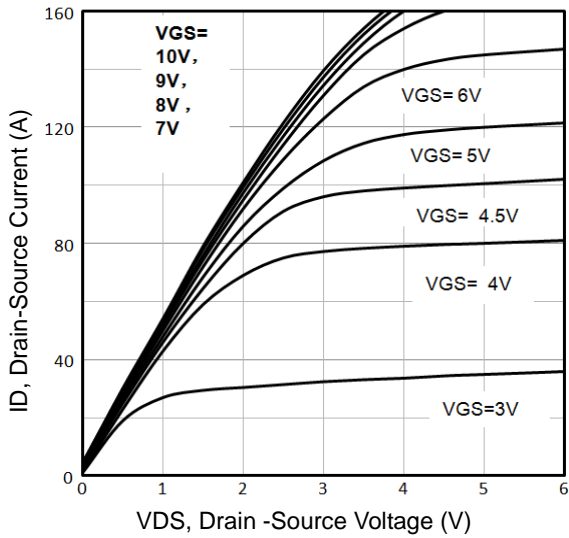


Fig1. Typical Output Characteristics

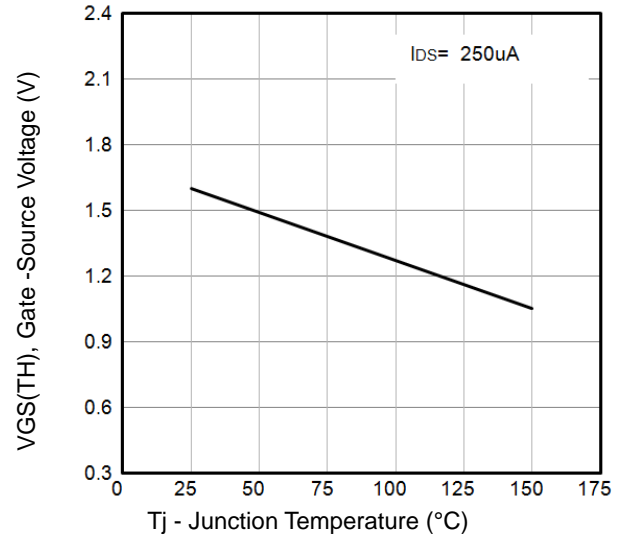


Fig2.  $V_{GS(TH)}$  Gate-Source Voltage Vs.  $T_j$

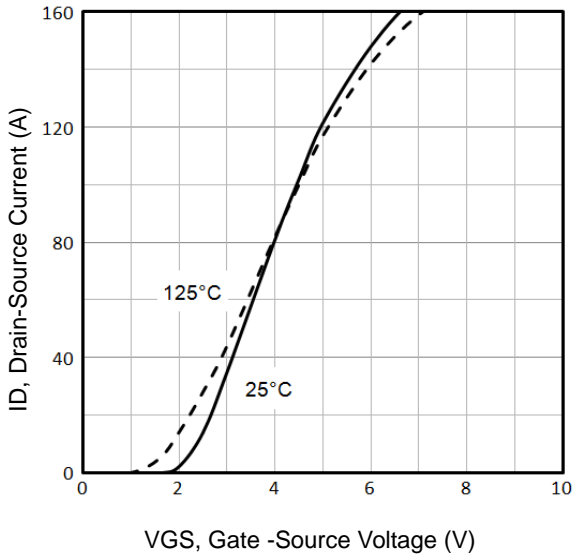


Fig3. Typical Transfer Characteristics

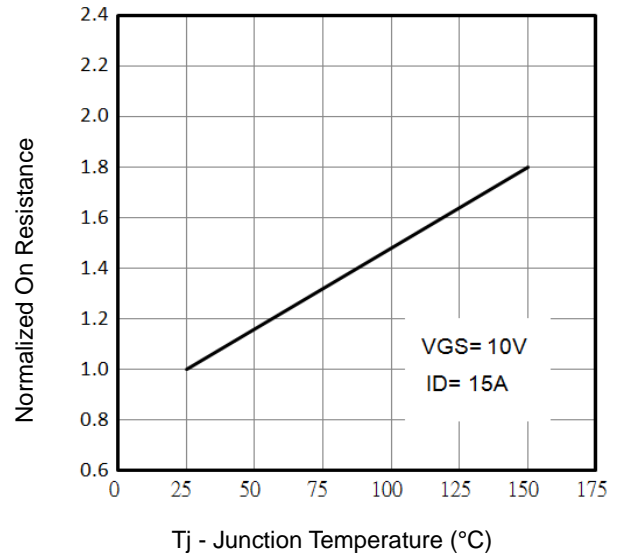


Fig4. Normalized On-Resistance Vs.  $T_j$

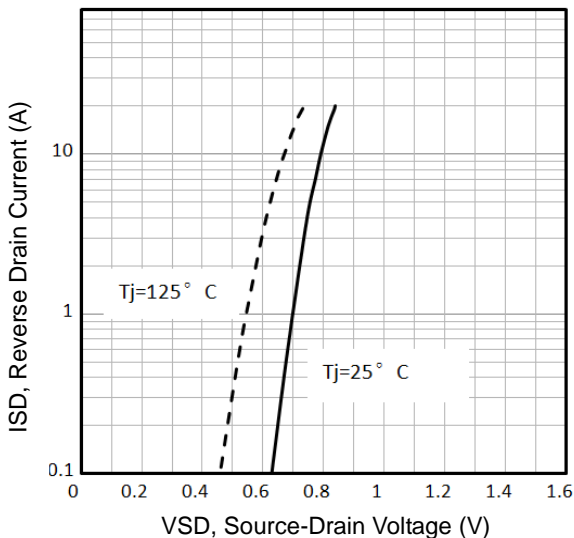


Fig5. Typical Source-Drain Diode Forward Voltage

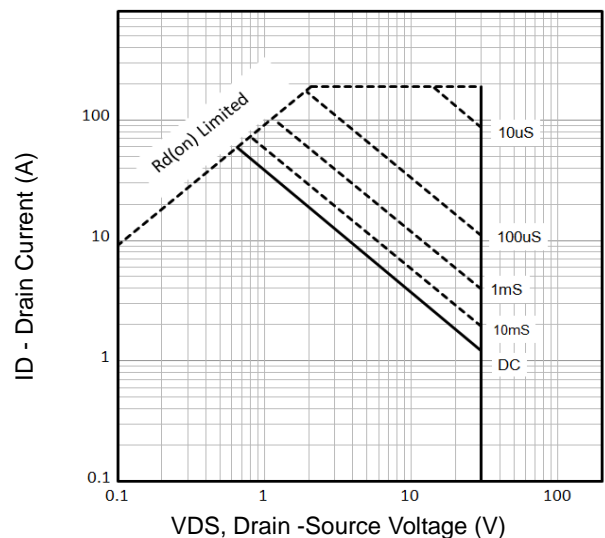


Fig6. Maximum Safe Operating Area

Typical Characteristics

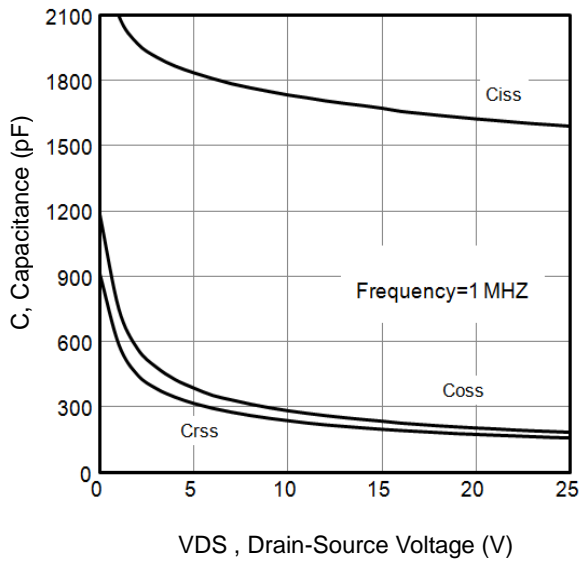


Fig7. Typical Capacitance Vs.Drain-Source Voltage

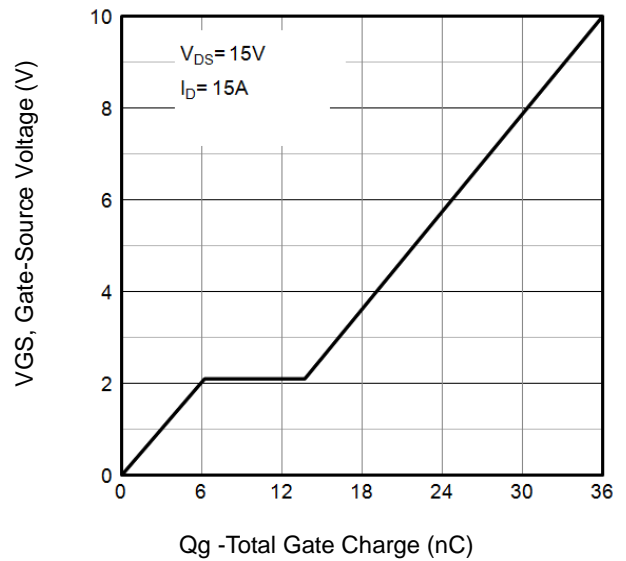


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

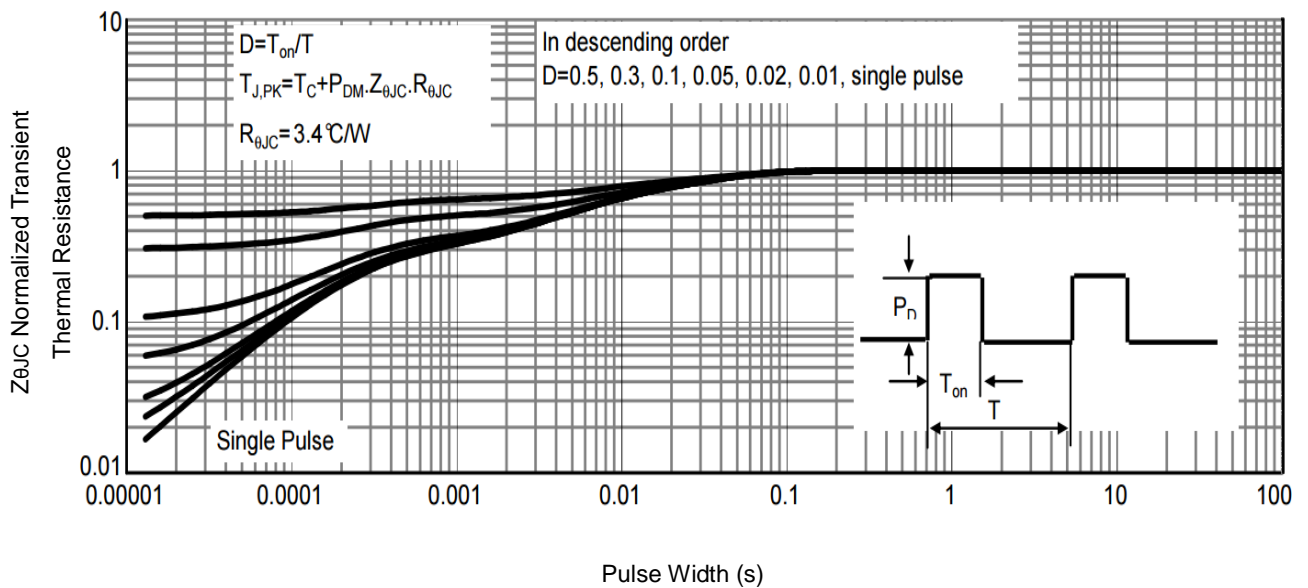


Fig9 . Normalized Maximum Transient Thermal Impedance

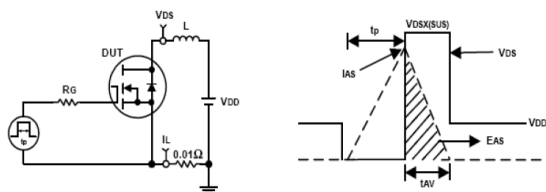


Fig10. Unclamped Inductive Test Circuit and waveforms

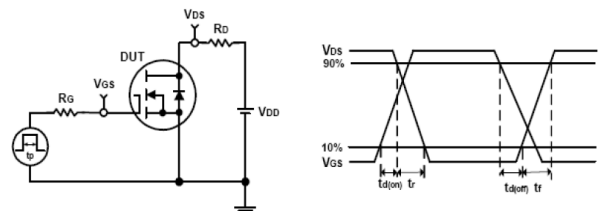
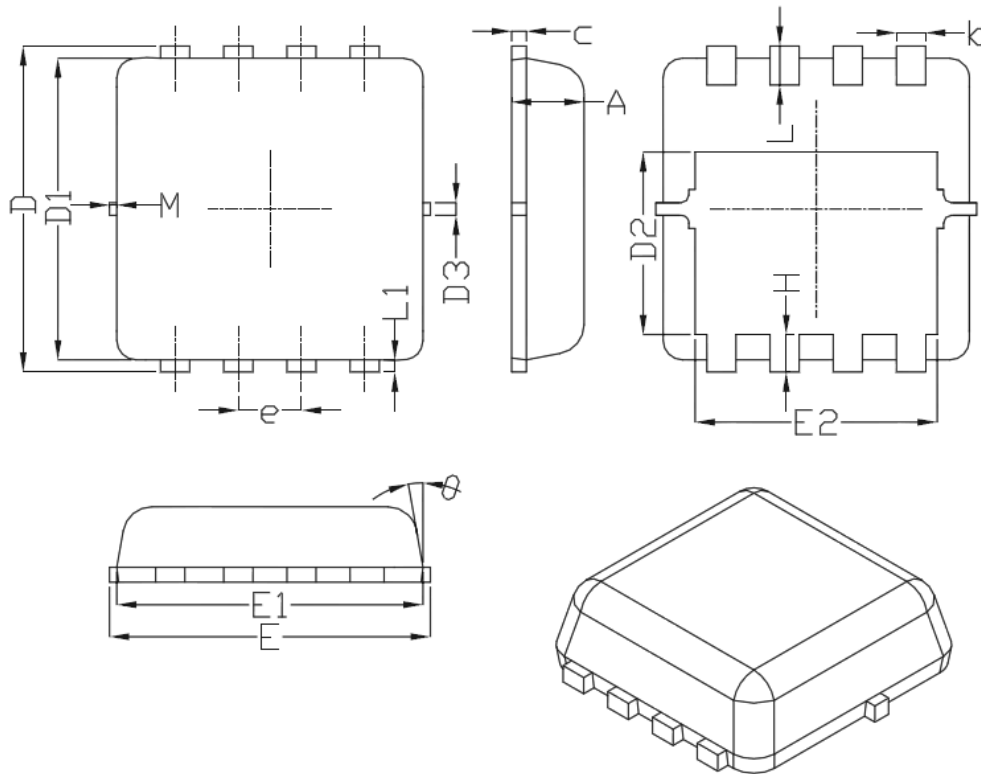


Fig11. Switching Time Test Circuit and waveforms

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

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