

## Features

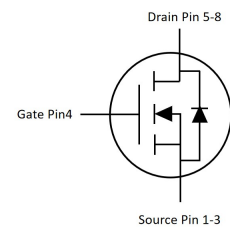
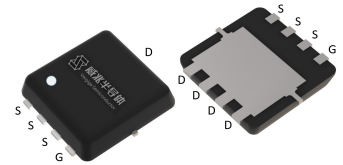
- Enhancement mode
- Very low on-resistance
- Fast Switching
- 100% Avalanche Tested
- 100% 1x reflow implemented in semiconductor assembly process



Part ID	Package Type	Marking	Packing
VS3698AE	PDFN3333	3698AE	5000PCS/Reel

$V_{DS}$	30	V
$R_{DS(on),TYP@ V_{GS}=10V}$	3.0	m $\Omega$
$R_{DS(on),TYP@ V_{GS}=4.5V}$	4.4	m $\Omega$
$I_D$	76	A

### PDFN3333



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

Symbol	Parameter	Rating	Unit	
$V_{(BR)DSS}$	Drain-Source breakdown voltage	30	V	
$V_{GS}$	Gate-Source voltage	$\pm 20$	V	
$I_S$	Diode continuous forward current	$T_C=25^\circ\text{C}$	76	A
$I_D$	Continuous drain current@ $V_{GS}=10V$	$T_C=25^\circ\text{C}$	76	A
		$T_C=100^\circ\text{C}$	49	A
$I_{DM}$	Pulse drain current tested ①	$T_C=25^\circ\text{C}$	300	A
$E_{AS}$	Avalanche energy, single pulsed ②		256	mJ
$P_D$	Maximum power dissipation	$T_C=25^\circ\text{C}$	36.5	W
$T_{STG,TJ}$	Storage and operating temperature range		-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Typical	Max	Unit
$R_{\theta JC}$	Thermal Resistance-Junction to Case	3.4	4.1	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient	40	48	$^\circ\text{C/W}$

**Electrical Characteristics**

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
IDSS	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	$\mu A$
IGSS	Gate-Body Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	--	--	$\pm 100$	nA
VGS(th)	Gate Threshold Voltage	$V_{DS}=V_{GS}, I_D=250\mu A$	1.0	1.8	2.5	V
RDS(on)	Drain-Source On-State Resistance <sup>③</sup>	$V_{GS}=10V, I_D=15A$	--	3.0	4.5	m $\Omega$
RDS(on)	Drain-Source On-State Resistance <sup>③</sup>	$V_{GS}=4.5V, I_D=10A$	--	4.4	6.0	m $\Omega$
<b>Dynamic Electrical Characteristics @ <math>T_j = 25^\circ\text{C}</math> (unless otherwise stated)</b>						
Ciss	Input Capacitance	$V_{DS}=15V, V_{GS}=0V,$ $f=1\text{MHz}$	1900	2530	3365	pF
Coss	Output Capacitance		285	380	505	pF
Crss	Reverse Transfer Capacitance		220	295	390	pF
Rg	Gate Resistance	$f=1\text{MHz}$	0.2	0.5	5	$\Omega$
Qg(10V)	Total Gate Charge	$V_{DS}=15V, I_D=20A,$ $V_{GS}=10V$	--	50	67	nC
Qg(4.5V)	Total Gate Charge		--	24	32	nC
Qgs	Gate-Source Charge		--	8.8	12	nC
Qgd	Gate-Drain Charge		--	9.8	15	nC
<b>Switching Characteristics</b>						
Td(on)	Turn-on Delay Time	$V_{DD}=15V,$ $I_D=10A,$ $R_G=3\Omega,$ $V_{GS}=10V$	--	9.4	--	ns
Tr	Turn-on Rise Time		--	34	--	ns
Td(off)	Turn-Off Delay Time		--	33	--	ns
Tf	Turn-Off Fall Time		--	16	--	ns
<b>Source- Drain Diode Characteristics @ <math>T_j = 25^\circ\text{C}</math> (unless otherwise stated)</b>						
VSD	Forward on voltage	$I_{SD}=20A, V_{GS}=0V$	--	0.81	1.2	V
Trr	Reverse Recovery Time	$T_j=25^\circ\text{C}, I_{sd}=20A,$ $di/dt=100A/\mu s$	--	8.1	16.2	ns
Qrr	Reverse Recovery Charge		1.7	3.4	nC	

**NOTE:**

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by  $T_{Jmax}$ , starting  $T_j = 25^\circ\text{C}$ ,  $L = 0.5\text{mH}$ ,  $R_G = 25\Omega$ ,  $I_{AS} = 32A$ ,  $V_{GS} = 10V$ . Part not recommended for use above this value
- ③ Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .

Typical Characteristics

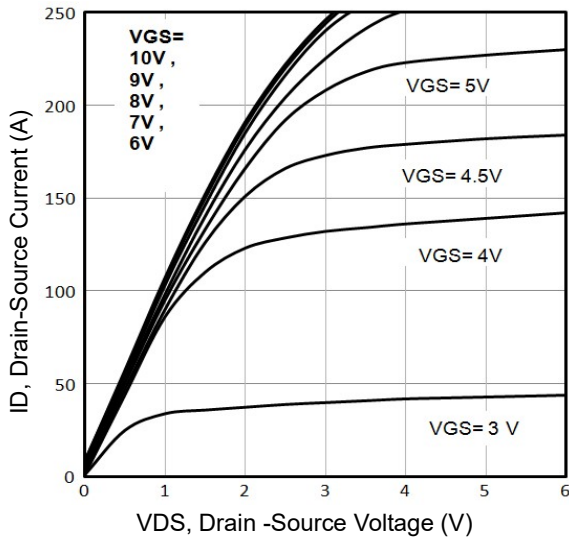


Fig1. Typical Output Characteristics

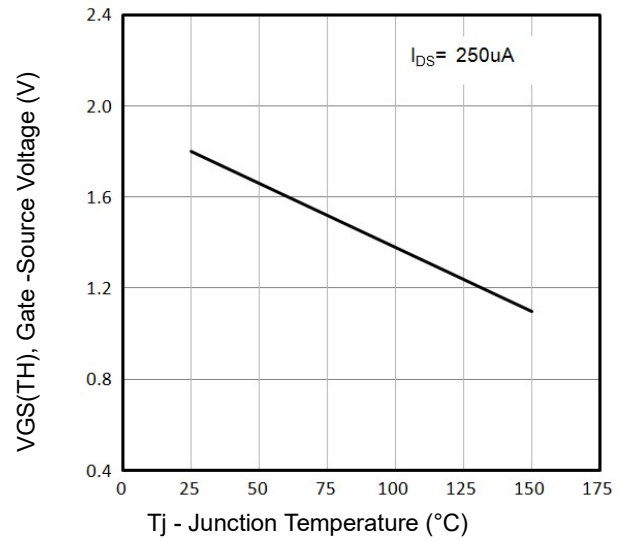


Fig2.  $V_{GS(TH)}$  Gate-Source Voltage Vs.  $T_j$

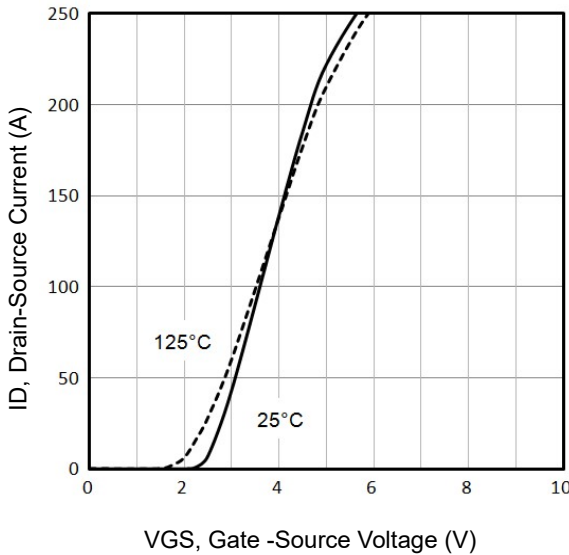


Fig3. Typical Transfer Characteristics

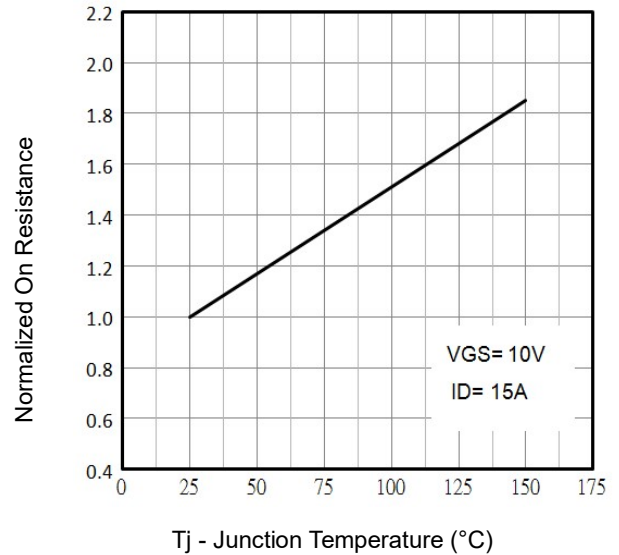


Fig4. Normalized On-Resistance Vs.  $T_j$

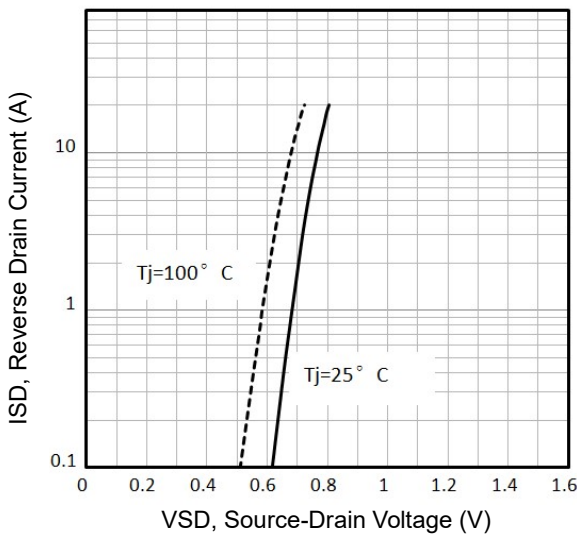


Fig5. Typical Source-Drain Diode Forward Voltage

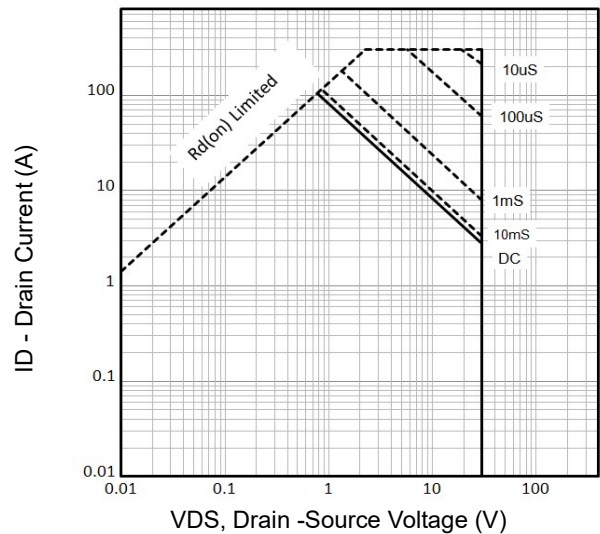


Fig6. Maximum Safe Operating Area

Typical Characteristics

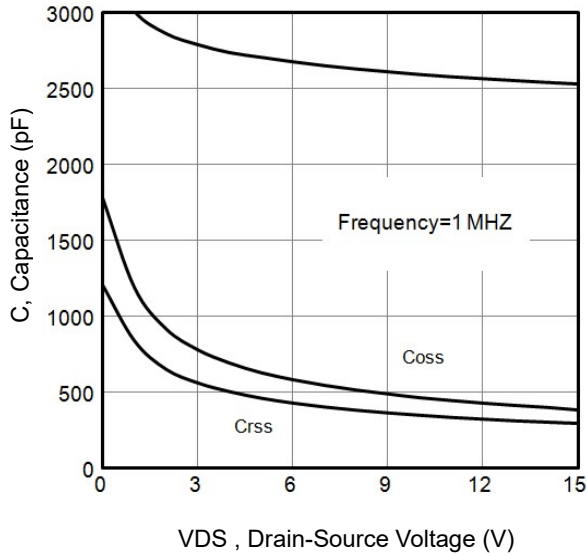


Fig7. Typical Capacitance Vs. Drain-Source Voltage

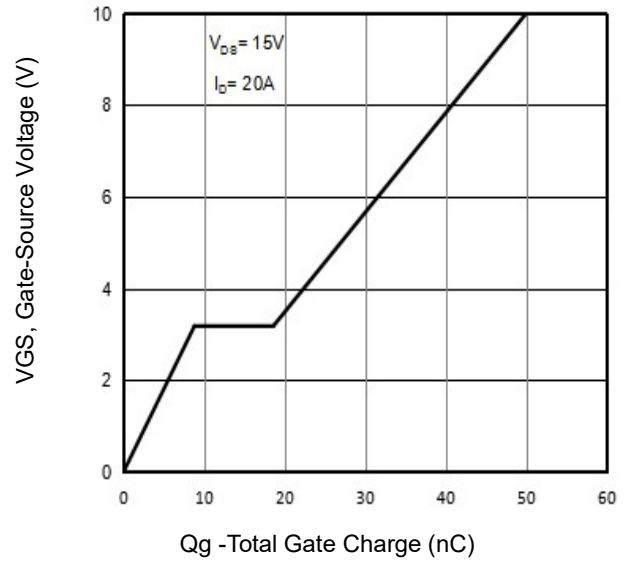


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

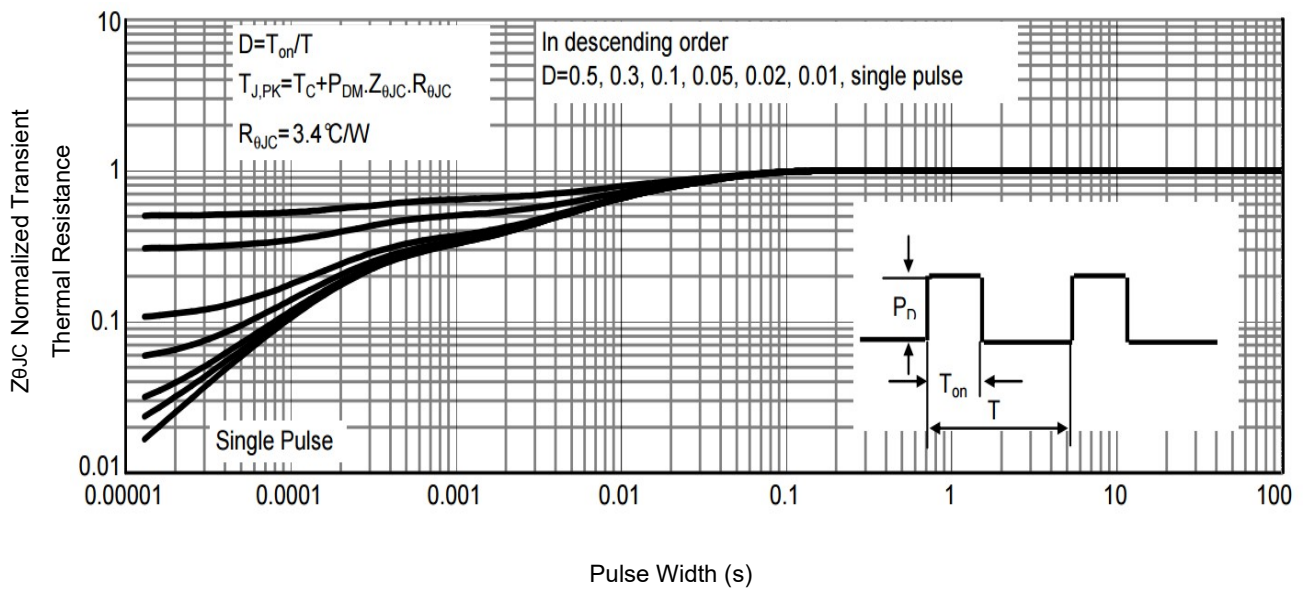


Fig9 . Normalized Maximum Transient Thermal Impedance

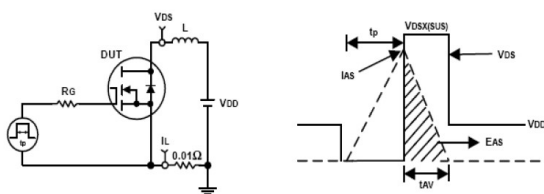


Fig10. Unclamped Inductive Test Circuit and waveforms

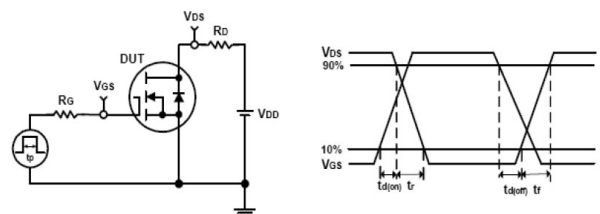
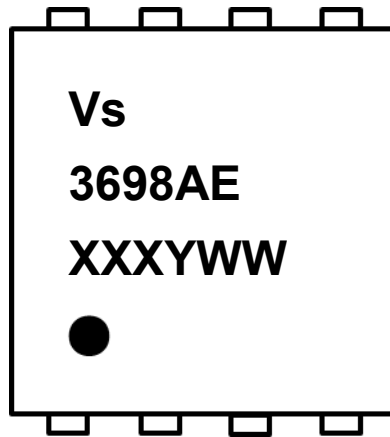


Fig11. Switching Time Test Circuit and waveforms

**Marking Information**


1<sup>st</sup> line: Vergiga Code (Vs)

2<sup>nd</sup> line: Part Number (3698AE)

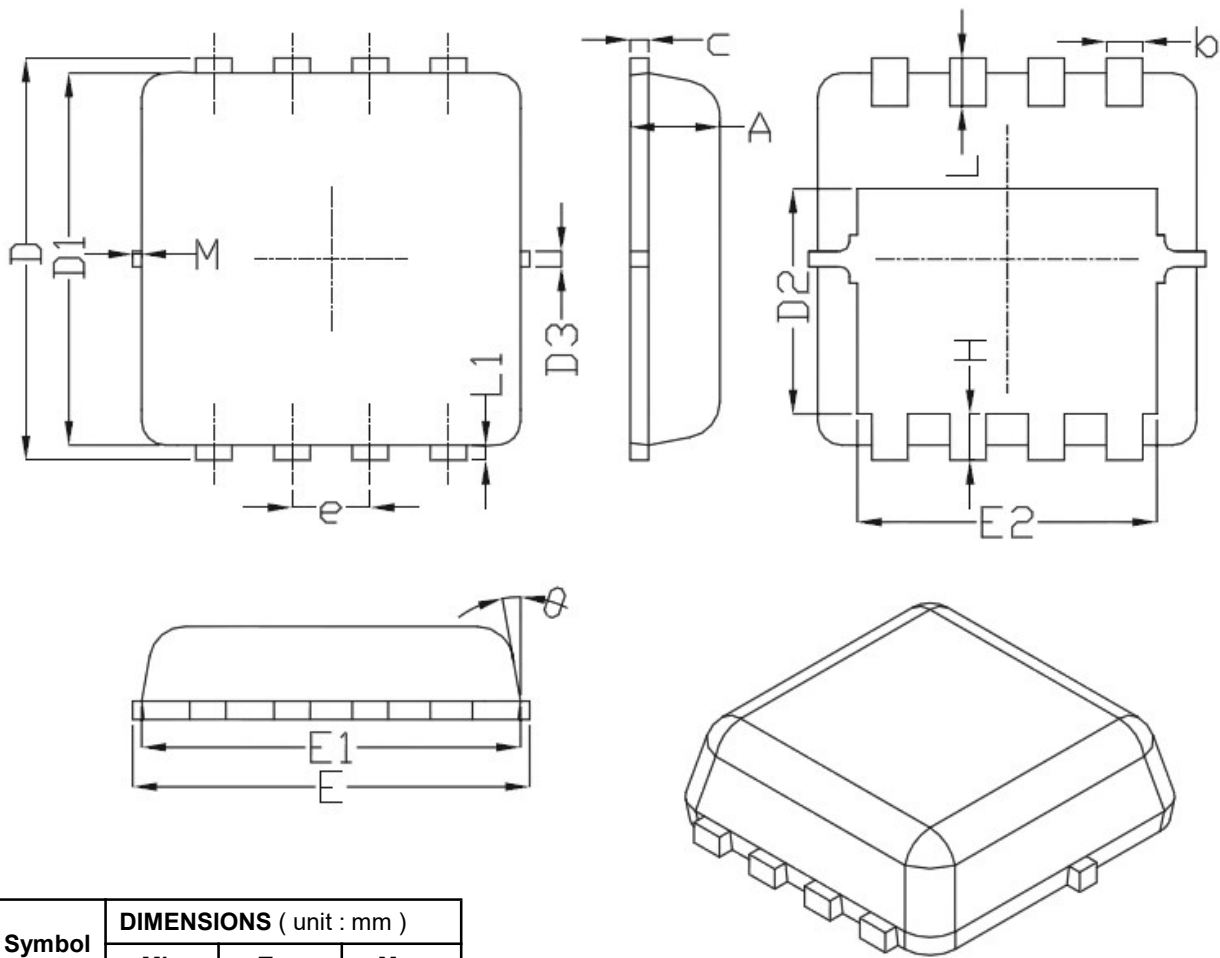
3<sup>rd</sup> line: Date code (XXXYWW)

XXX: Wafer Lot Number Code , code changed with Lot Number

Y: Year Code, refer to table below

WW: Week Code (01 to 53)

Code	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T
Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030

**PDFN3333 Package Outline Data**


Symbol	DIMENSIONS ( unit : mm )		
	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	3.00	3.20	3.40
E1	3.00	3.10	3.20
E2	2.39	2.49	2.59
e	0.65 BSC		
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			

**Notes:**

1. Follow JEDEC MO-240 variation CA.
2. Dimensions "D1" and "E1" do NOT include mold flash protrusions or gate burrs.
3. Dimensions "D1" and "E1" include interterminal flash or protrusion. Interterminal flash or protrusion shall not exceed 0.25mm per side.

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