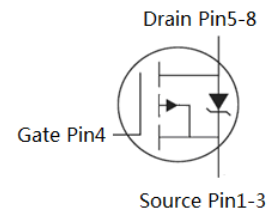


Features

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



V_{DS}	-30	V
$R_{DS(on),TYP} @ V_{GS}=-10V$	4.7	m Ω
$R_{DS(on),TYP} @ V_{GS}=-4.5V$	7	m Ω
I_D	-95	A

PDFN5x6


Part ID	Package Type	Marking	Tape and reel information
VS3504AP	PDFN5x6	3504AP	3000pcs/reel

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

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	-30	V
V_{GS}	Gate-Source voltage	± 20	V
I_S	Diode continuous forward current	$T_C=25^\circ\text{C}$	-95 A
I_D	Continuous drain current @ $V_{GS}=-10V$	$T_C=25^\circ\text{C}$	-95 A
		$T_C=100^\circ\text{C}$	-60 A
I_{DM}	Pulse drain current tested ①	$T_C=25^\circ\text{C}$	-380 A
I_{DM}	Pulse drain current tested	$T_A=25^\circ\text{C}$	-25 A
		$T_A=70^\circ\text{C}$	-20 A
EAS	Avalanche energy, single pulsed ②	163	mJ
P_D	Maximum power dissipation	$T_C=25^\circ\text{C}$	63 W
P_{DSM}	Maximum power dissipation ③	$T_A=25^\circ\text{C}$	4.2 W
MSL		Level 3	
T_{STG}, T_J	Storage and Junction Temperature Range	-55 to 150	$^\circ\text{C}$

Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	30	$^\circ\text{C/W}$

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	-30	--	--	V
I _{DSS}	Zero Gate Voltage Drain Current(Tc=25°C)	V _{DS} =-30V, V _{GS} =0V	--	--	-1	μA
	Zero Gate Voltage Drain Current(Tc=125°C)	V _{DS} =-30V, 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	--	-2.4	V
R _{DS(ON)}	Drain-Source On-State Resistance ④	V _{GS} =-10V, I _D =-20A	--	4.7	6	mΩ
R _{DS(ON)}	Drain-Source On-State Resistance ④	V _{GS} =-4.5V, I _D =-15A	--	7	9	mΩ
Dynamic Electrical Characteristics @ T_J = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f=1MHz	3800	4885	5800	pF
C _{oss}	Output Capacitance		500	735	950	pF
C _{rss}	Reverse Transfer Capacitance		300	485	650	pF
R _g	Gate Resistance	f=1MHz	--	10.3	--	Ω
Q _g	Total Gate Charge	V _{DS} =-15V, I _D =-20A, V _{GS} =-10V	--	89	--	nC
Q _{gs}	Gate-Source Charge		--	14.8	--	nC
Q _{gd}	Gate-Drain Charge		--	19	--	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =-15V, I _D =-20A, R _G =3Ω, V _{GS} =-10V	--	182	--	ns
t _r	Turn-on Rise Time		--	262	--	ns
t _{d(off)}	Turn-Off Delay Time		--	3.2	--	μs
t _f	Turn-Off Fall Time		--	11.7	--	μs
Source- Drain Diode Characteristics @ T_J = 25°C (unless otherwise stated)						
V _{SD}	Forward on voltage	I _{SD} =-20A, V _{GS} =0V	--	-0.8	-1.2	V
t _{rr}	Reverse Recovery Time	T _J =25°C, I _{sd} =-20A, V _{GS} =0V	--	34	--	ns
Q _{rr}	Reverse Recovery Charge	di/dt=-300A/μs		79		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} = -20A, V_{GS} = -10V. Part not recommended for use above this value
- ③ The power dissipation P_{DSM} is based on R_{θJA} and the maximum allowed junction temperature of 150°C.
- ④ Pulse width ≤ 300μs; duty cycles ≤ 2%.

Typical Characteristics

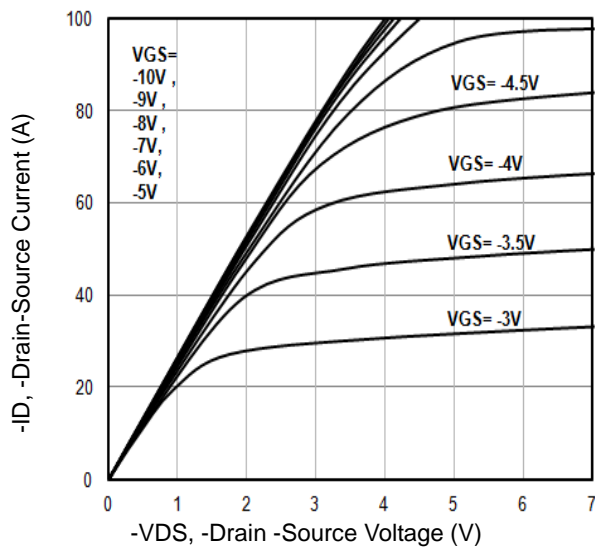


Fig1. Typical Output Characteristics

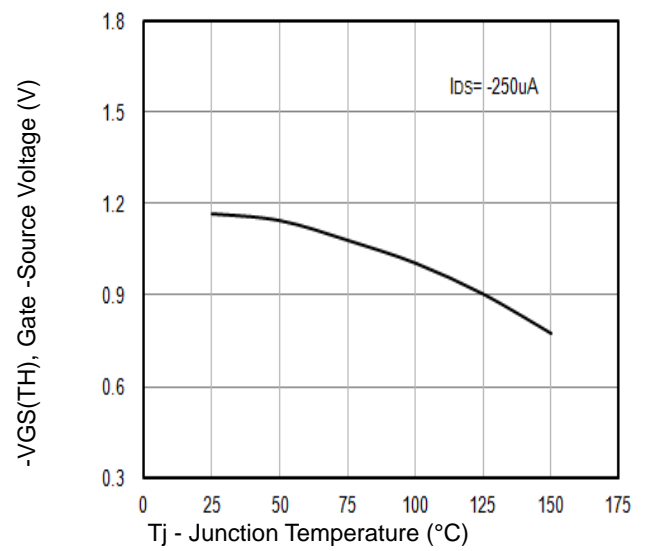


Fig2. -VGS(TH) Gate -Source Voltage Vs. Tj

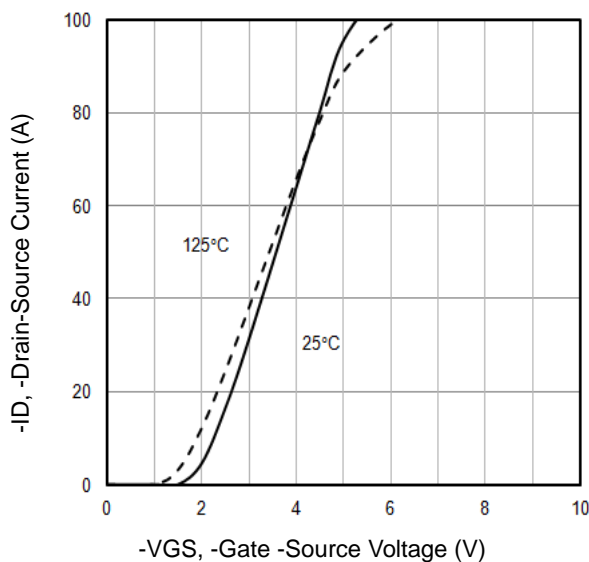


Fig3. Typical Transfer Characteristics

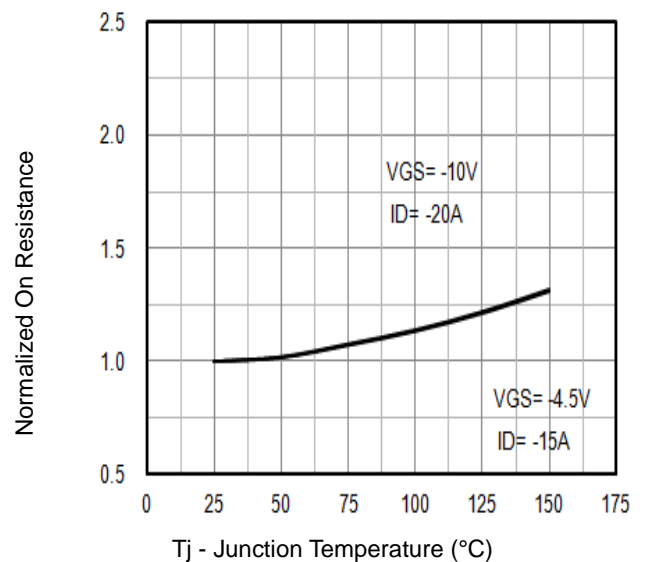


Fig4. Normalized On-Resistance Vs. Tj

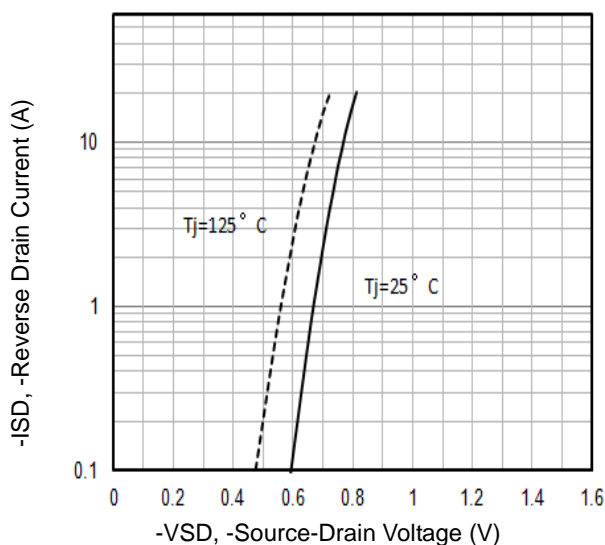


Fig5. Typical Source-Drain Diode Forward Voltage

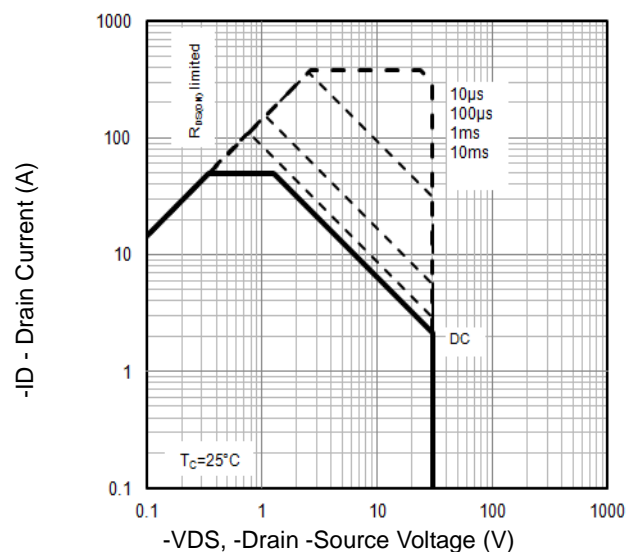


Fig6. Maximum Safe Operating Area

Typical Characteristics

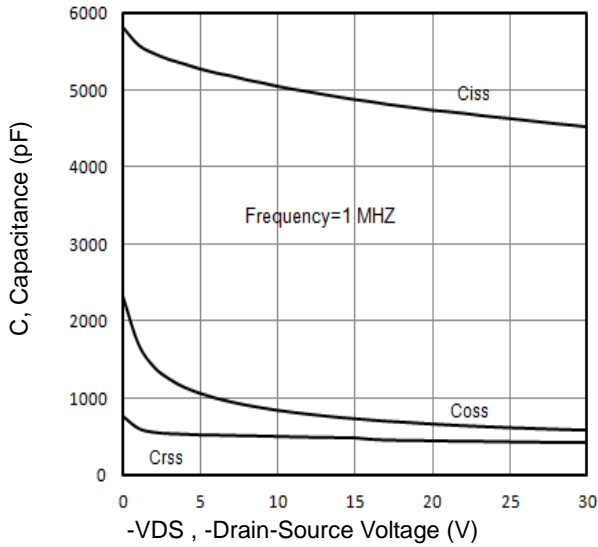


Fig7. Typical Capacitance Vs.Drain-Source Voltage

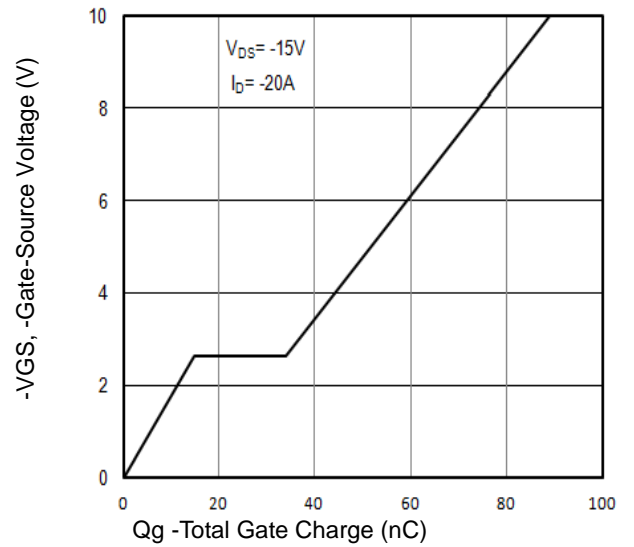


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

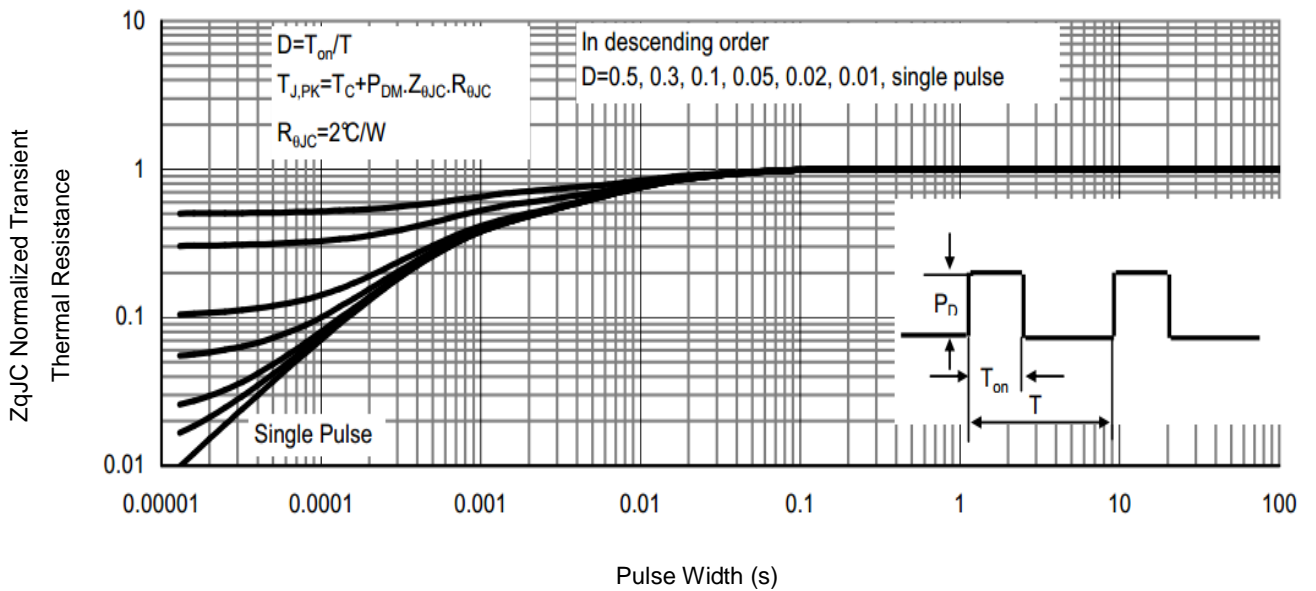


Fig9. Normalized Maximum Transient Thermal Impedance

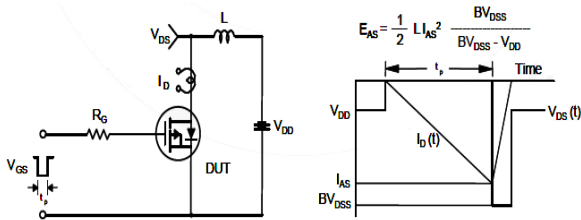


Fig10. Unclamped Inductive Test Circuit and Waveforms

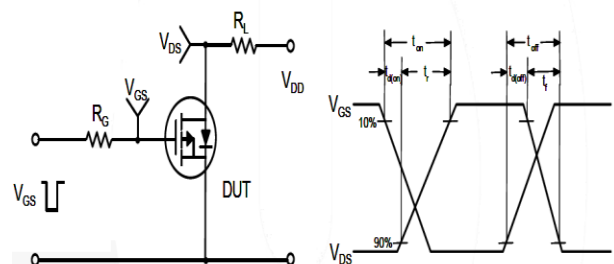
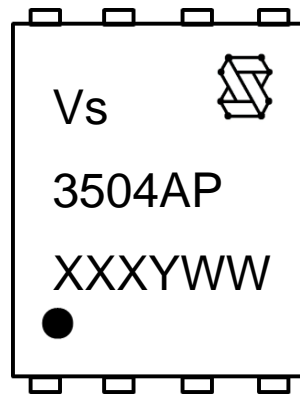


Fig11. Switching Time Test Circuit and waveforms



Marking Information



1st line: Company Code (Vs), Company Logo

2nd line: Part Number (3504AP)

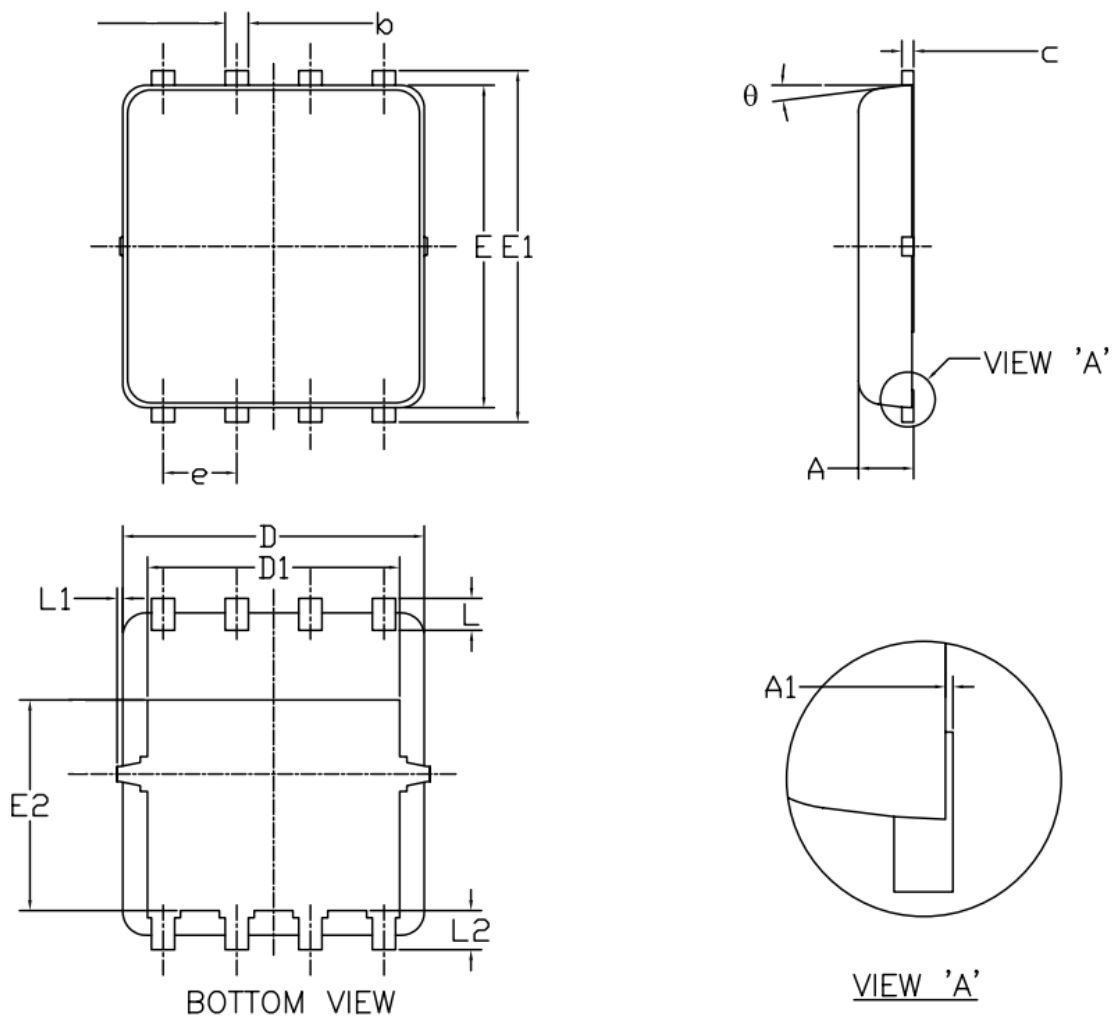
3rd line: Date code (XXXYWW)

XXX: Wafer Lot Number

Y: Year Code, e.g. E means 2017

WW: Week Code

PDFN5x6 Package Outline Data



Symbol	DIMENSIONS (unit : mm)		
	Min	Typ	Max
A	0.90	1.00	1.20
A1	0.00	--	0.05
b	0.30	0.40	0.51
c	0.20	0.25	0.33
D	4.80	4.90	5.40
D1	3.61	4.00	4.25
E	5.65	5.80	6.06
E1	5.90	6.10	6.35
E2	3.38	3.58	3.92
e	1.27 BSC		
L	0.51	0.61	0.71
L1	--	--	0.15
L2	0.41	0.51	0.61
θ	0°	--	12°

Notes:

1. Refer to JEDEC MO-240 variation AA.
2. Dimensions "D" and "E" do NOT include mold flash protrusions or gate burrs.
3. Dimensions "D" and "E" include interterminal flash or protrusion. Interterminal flash or protrusion shall not exceed 0.25mm per side.

Customer Service

Sales and Service:

sales@vgsemi.com

Vanguard Semiconductor CO., LTD

TEL: (86-755) -26902410

FAX: (86-755) -26907027

WEB: www.vgsemi.com