

## Features

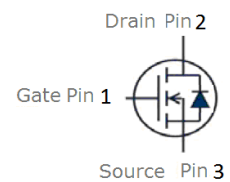
- N-Channel, 10V Logic Level Control
- Enhancement mode
- Low on-resistance  $R_{DS(on)}$  @  $V_{GS}=10V$
- Fast Switching
- Pb-free lead plating; RoHS compliant



Part ID	Package Type	Marking	Tape and reel information
VS7N65AF	TO-220F	7N65AF	50pcs/Tube

$V_{DS}$	650	V
$R_{DS(on),TYP} @ V_{GS}=10V$	1.1	$\Omega$
$I_D$	7	A

### TO-220F



## Maximum ratings, at $T_A = 25^\circ C$ , unless otherwise specified

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	650	V
$V_{GS}$	Gate-Source voltage	$\pm 30$	V
$I_S$	Diode continuous forward current	$T_C = 25^\circ C$	7 A
$I_D$	Continuous drain current @ $V_{GS}=10V$	$T_C = 25^\circ C$	7 A
		$T_C = 100^\circ C$	4.4 A
$I_{DM}$	Pulse drain current tested ①	$T_C = 25^\circ C$	28 A
$I_{DSM}$	Continuous drain current @ $V_{GS}=10V$	$T_A = 25^\circ C$	0.9 A
		$T_A = 70^\circ C$	0.7 A
EAS	Avalanche energy, single pulsed ②	660	mJ
$P_D$	Maximum power dissipation	$T_C = 25^\circ C$	28 W
$P_{DSM}$	Maximum power dissipation ③	$T_A = 25^\circ C$	2 W
MSL		Level 3	
$T_{STG}, T_J$	Storage and Junction Temperature Range	-55 to 150	$^\circ C$

## Thermal Characteristics

Symbol	Parameter	Typical	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	4.5	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5	$^\circ C/W$

Symbol	Parameter	Condition	Min.	Typ.	Max.	Unit
<b>Static Electrical Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
V <sub>(BR)DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	650	720	--	V
I <sub>DSS</sub>	Zero Gate Voltage Drain Current	V <sub>DS</sub> =650V, V <sub>GS</sub> =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T <sub>j</sub> =125°C)	V <sub>DS</sub> =520V, V <sub>GS</sub> =0V	--	--	50	μA
I <sub>GSS</sub>	Gate-Body Leakage Current	V <sub>GS</sub> =±30V, V <sub>DS</sub> =0V	--	--	±100	nA
V <sub>GS(TH)</sub>	Gate Threshold Voltage	V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA	2.8	3.3	3.8	V
R <sub>DS(ON)</sub>	Drain-Source On-State Resistance <sup>④</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =3.5A	--	1.1	1.35	Ω
<b>Dynamic Electrical Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz	950	1070	1200	pF
C <sub>oss</sub>	Output Capacitance		30	85	140	pF
C <sub>rss</sub>	Reverse Transfer Capacitance		--	15	60	pF
R <sub>g</sub>	Gate Resistance	f=1MHz	--	3.9	--	Ω
Q <sub>g</sub>	Total Gate Charge	V <sub>DS</sub> =520V, I <sub>D</sub> =7A, V <sub>GS</sub> =10V	--	24	--	nC
Q <sub>gs</sub>	Gate-Source Charge		--	7	--	nC
Q <sub>gd</sub>	Gate-Drain Charge		--	8	--	nC
<b>Switching Characteristics</b>						
t <sub>d(on)</sub>	Turn-on Delay Time	V <sub>DD</sub> =350V, I <sub>D</sub> =7A, R <sub>G</sub> =25Ω, V <sub>GS</sub> =10V	--	21	--	ns
t <sub>r</sub>	Turn-on Rise Time		--	15	--	ns
t <sub>d(off)</sub>	Turn-Off Delay Time		--	67	--	ns
t <sub>f</sub>	Turn-Off Fall Time		--	39	--	ns
<b>Source- Drain Diode Characteristics @ T<sub>j</sub> = 25°C (unless otherwise stated)</b>						
V <sub>SD</sub>	Forward on voltage	I <sub>SD</sub> =7A, V <sub>GS</sub> =0V	--	0.9	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	T <sub>j</sub> =25°C, I <sub>sd</sub> =7A, V <sub>GS</sub> =0V	--	360	--	ns
Q <sub>rr</sub>	Reverse Recovery Charge	di/dt=100A/μs	--	2.3	--	uC

NOTE:

- ① Repetitive rating; pulse width limited by max junction temperature.
- ② Limited by T<sub>Jmax</sub>, starting T<sub>J</sub> = 25°C, L = 27mH, R<sub>G</sub> = 25Ω, I<sub>AS</sub> = 7A, V<sub>GS</sub> = 10V. Part not recommended for use above this value
- ③ The power dissipation P<sub>DSM</sub> is based on R<sub>θJA</sub> and the maximum allowed junction temperature of 150°C.
- ④ Pulse width ≤ 300μs; duty cycle ≤ 2%.

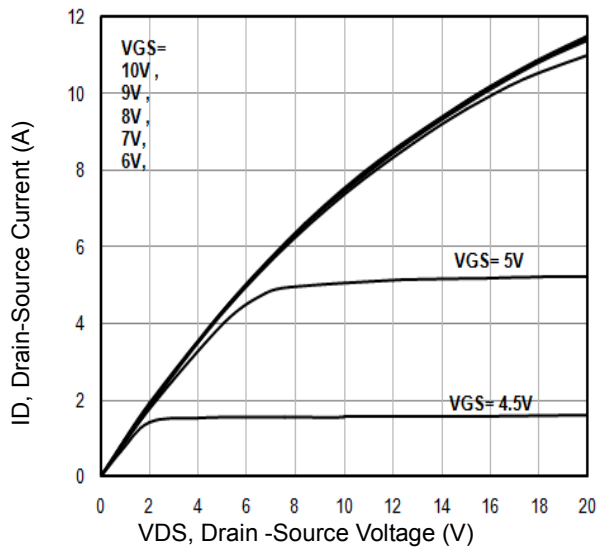


Fig1. Typical Output Characteristics

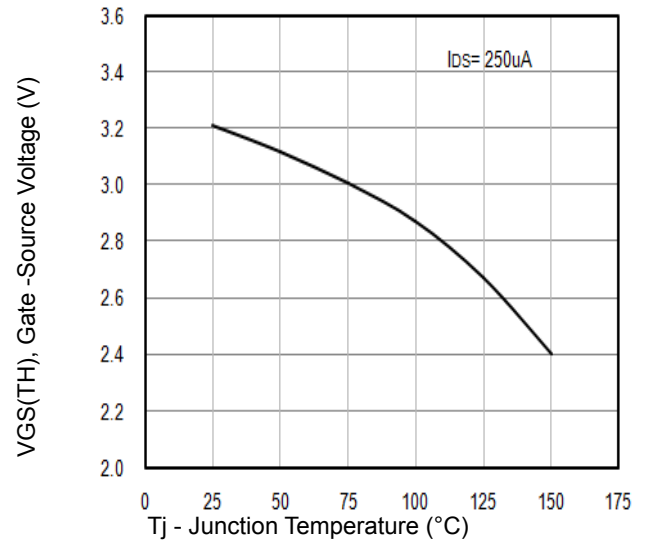


Fig2.  $V_{GS(TH)}$  Gate-Source Voltage Vs.  $T_j$

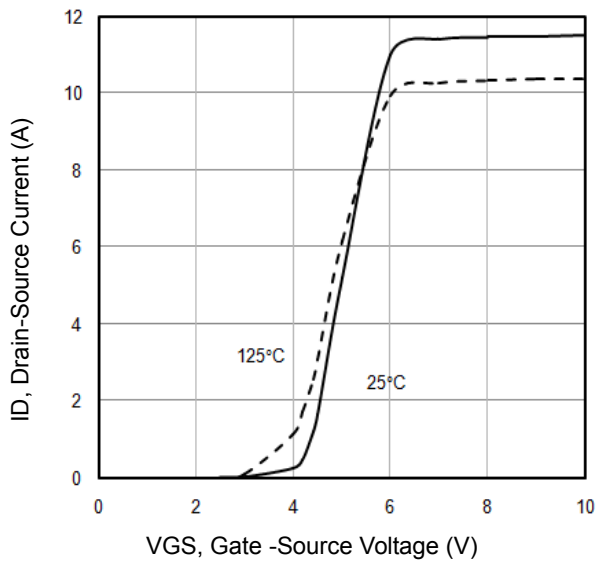


Fig3. Typical Transfer Characteristics

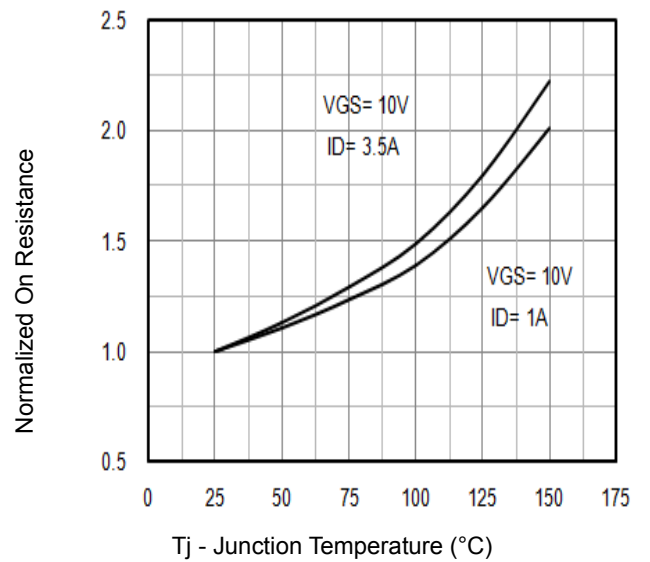


Fig4. Normalized On-Resistance Vs.  $T_j$

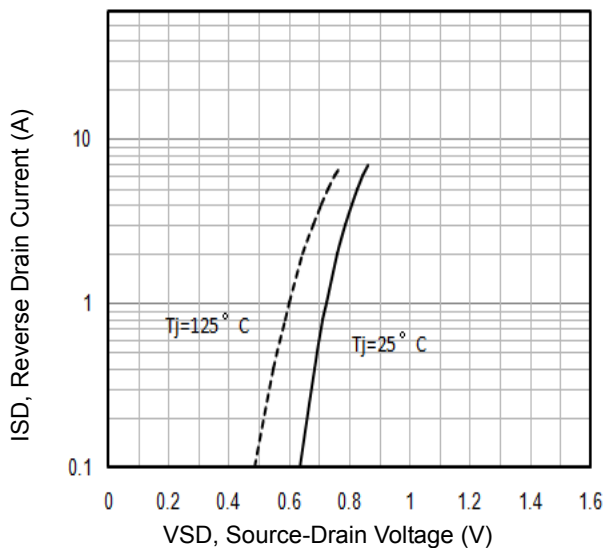


Fig5. Typical Source-Drain Diode Forward Voltage

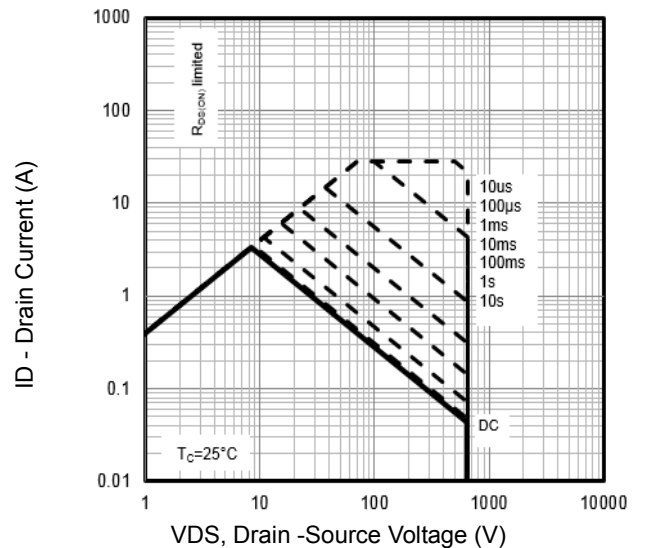


Fig6. Maximum Safe Operating Area

Typical Characteristics

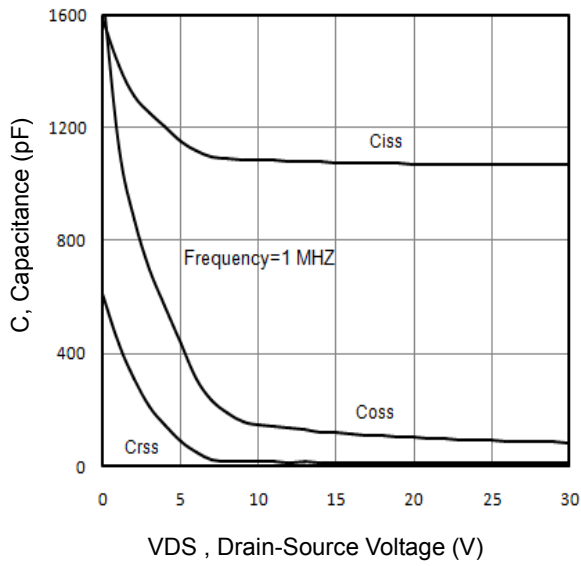


Fig7. Typical Capacitance Vs.Drain-Source Voltage

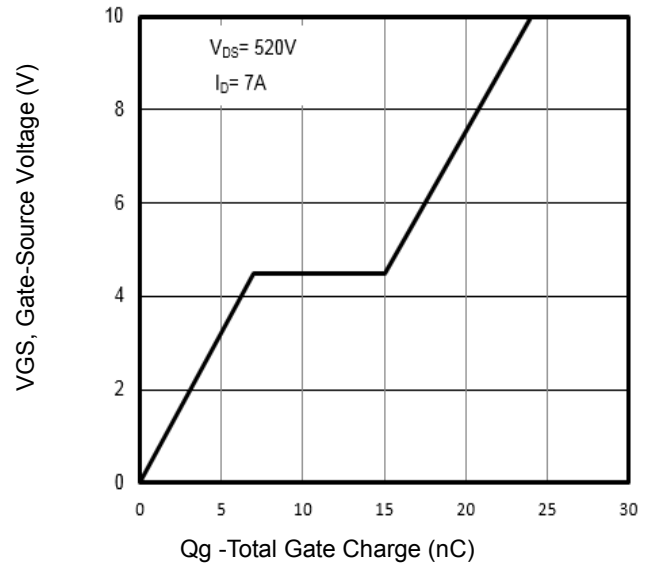


Fig8. Typical Gate Charge Vs.Gate-Source Voltage

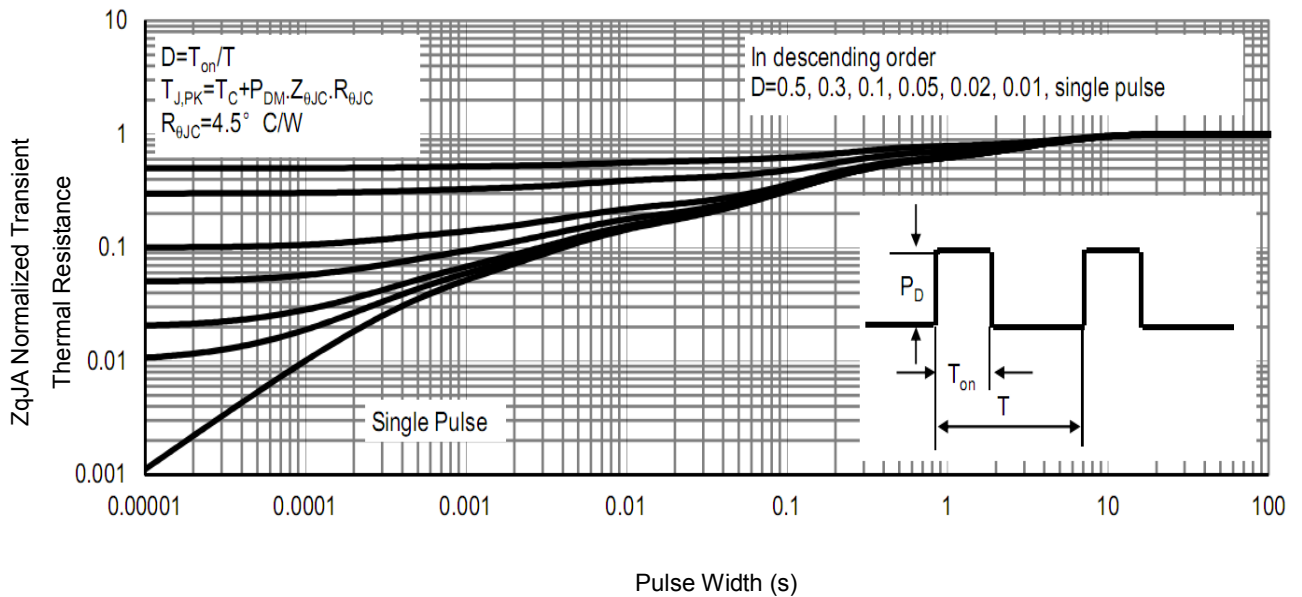


Fig9. Normalized Maximum Transient Thermal Impedance

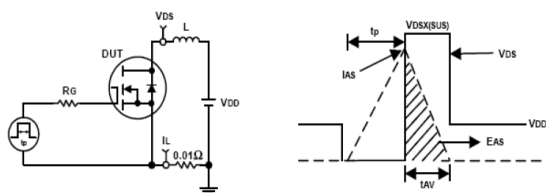


Fig10. Unclamped Inductive Test Circuit and waveforms

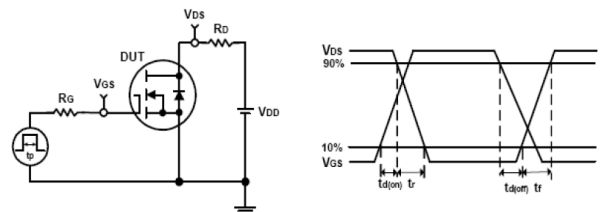
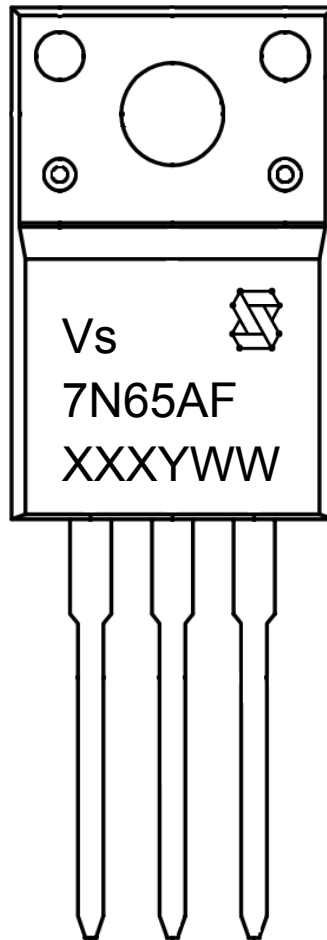


Fig11. Switching Time Test Circuit and waveforms



## Marking Information



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

2nd line: Part Number (7N65AF)

3rd line: Date code (XXXYWW)

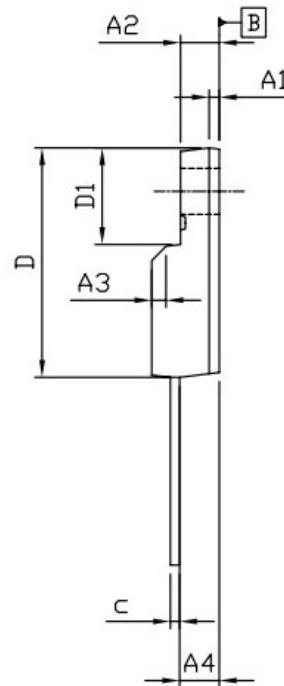
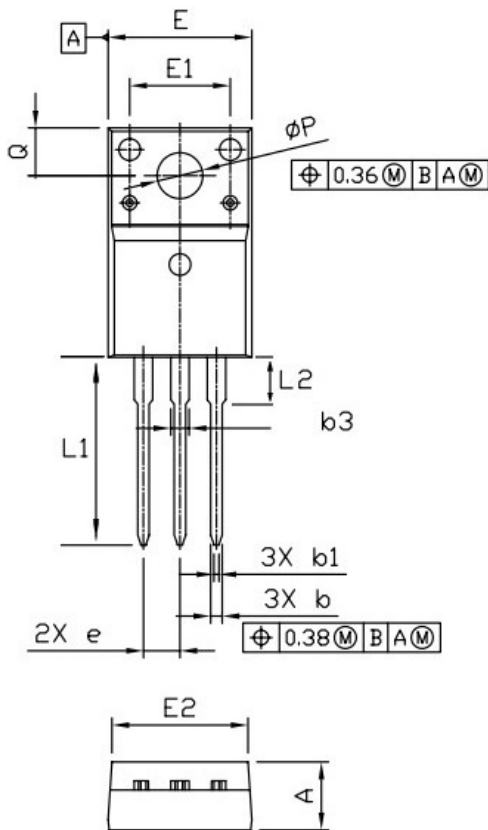
XXX: Wafer Lot Number

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

WW: Week Code



TO-220F Package Outline Data



Symbol	Dimensions (unit: mm)		
	Min	Typ	Max
A	4.40	4.70	5.00
A1	0.45	0.70	0.95
A2	2.30	2.55	2.80
A3	1.0 x 45°		
A4	2.45	2.76	3.05
b	0.60	0.80	1.00
b1	0.25	0.35	0.45
b3	1.18	--	1.47
c	0.30	0.50	0.70
D	15.40	15.90	16.40
D1	6.40	6.70	7.00
e	--	2.54	--
E	9.86	10.16	10.46
E1	6.80	7.00	7.20
E2	9.40	9.70	10.00
L1	12.30	12.80	13.30
L2	2.95	3.25	3.55
Q	3.05	3.30	3.55
φP	2.92	3.12	3.32

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Sales and Service:

[sales@vgsemi.com](mailto:sales@vgsemi.com)

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