

Features

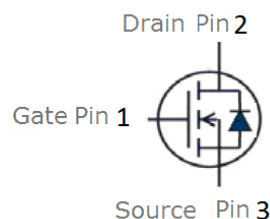
- N-Channel, 10V Logic Level Control
- Enhancement mode
- Low on-resistance $R_{DS(on)}$ @ $V_{GS}=10\text{ V}$
- Fast Switching
- Pb-free lead plating; RoHS compliant


Halogen-Free

Part ID	Package Type	Marking	Tape and reel information
VS4N50AI	TO-251SL	4N50AI	75pcs/Tube

V_{DS}	500	V
$R_{DS(on),TYP} @ V_{GS}=10\text{ V}$	1.9	Ω
I_D	4	A

TO-251SL



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

Symbol	Parameter	Rating	Unit
$V_{(BR)DSS}$	Drain-Source breakdown voltage	500	V
V_{GS}	Gate-Source voltage	± 30	V
I_S	Diode continuous forward current	$T_C = 25^\circ\text{C}$	4
I_D	Continuous drain current @ $V_{GS}=10\text{V}$	$T_C = 25^\circ\text{C}$	4
		$T_C = 100^\circ\text{C}$	2.5
I_{DM}	Pulse drain current tested ①	$T_C = 25^\circ\text{C}$	16
I_{DSM}	Continuous drain current @ $V_{GS}=10\text{V}$	$T_A = 25^\circ\text{C}$	0.6
		$T_A = 70^\circ\text{C}$	0.5
EAS	Avalanche energy, single pulsed ②	35	mJ
P_D	Maximum power dissipation	$T_C = 25^\circ\text{C}$	63
P_{DSM}	Maximum power dissipation ③	$T_A = 25^\circ\text{C}$	1.25
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	100	$^\circ\text{C/W}$

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	500	555	--	V
I _{DSS}	Zero Gate Voltage Drain Current	V _{DS} =500V,V _{GS} =0V	--	--	1	μA
	Zero Gate Voltage Drain Current(T _j =125°C)	V _{DS} =400V,V _{GS} =0V	--	--	50	μA
I _{GSS}	Gate-Body Leakage Current	V _{GS} =±30V,V _{DS} =0V	--	--	±100	nA
V _{GS(TH)}	Gate Threshold Voltage	V _{DS} =V _{GS} ,I _D =250μA	2.4	3	3.6	V
R _{DS(ON)}	Drain-Source On-State Resistance ④	V _{GS} =10V, I _D =2A	--	1.9	2.4	Ω
Dynamic Electrical Characteristics @ T _j = 25°C (unless otherwise stated)						
C _{iss}	Input Capacitance	V _{DS} =30V,V _{GS} =0V, f=1MHz	290	370	450	pF
C _{oss}	Output Capacitance		25	40	55	pF
C _{rss}	Reverse Transfer Capacitance		--	6	10	pF
R _g	Gate Resistance	f=1MHz	--	3.1	--	Ω
Q _g	Total Gate Charge	V _{DS} =400V,I _D =4A, V _{GS} =10V	--	13	--	nC
Q _{gs}	Gate-Source Charge		--	4.7	--	nC
Q _{gd}	Gate-Drain Charge		--	5.8	--	nC
Switching Characteristics						
t _{d(on)}	Turn-on Delay Time	V _{DD} =250V, I _D =4A, R _G =25Ω, V _{GS} =10V	--	20	--	ns
t _r	Turn-on Rise Time		--	35	--	ns
t _{d(off)}	Turn-Off Delay Time		--	33	--	ns
t _f	Turn-Off Fall Time		--	28	--	ns
Source- Drain Diode Characteristics@ T _j = 25°C (unless otherwise stated)						
V _{SD}	Forward on voltage	I _{SD} =4A,V _{GS} =0V	--	0.9	1.2	V
t _{rr}	Reverse Recovery Time	T _j =25 °C ,I _{sd} =4A, V _{GS} =0V	--	89	--	ns
Q _{rr}	Reverse Recovery Charge	di/dt=100A/μs	--	0.2	--	μC

NOTE:

- ① Repetitive rating; pulse width limited by max. junction temperature.
- ② Limited by T_{jmax} , starting $T_j = 25^{\circ}\text{C}$, $L = 1\text{mH}$, $R_G = 25\Omega$, $I_{AS} = 8A$, $V_{GS} = 10V$. Part not recommended for use above this value
- ③ The power dissipation P_{DSM} is based on $R_{\theta JA}$ and the maximum allowed junction temperature of 150°C .
- ④ Pulse width $\leq 300\mu s$; duty cycles $\leq 2\%$.

Typical Characteristics

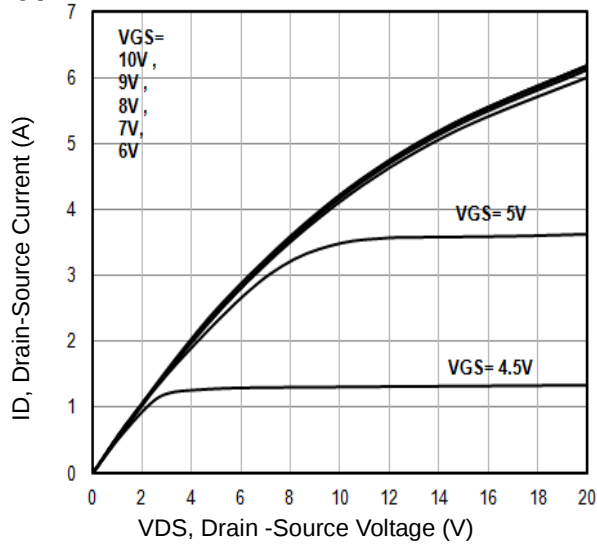


Fig1. Typical Output Characteristics

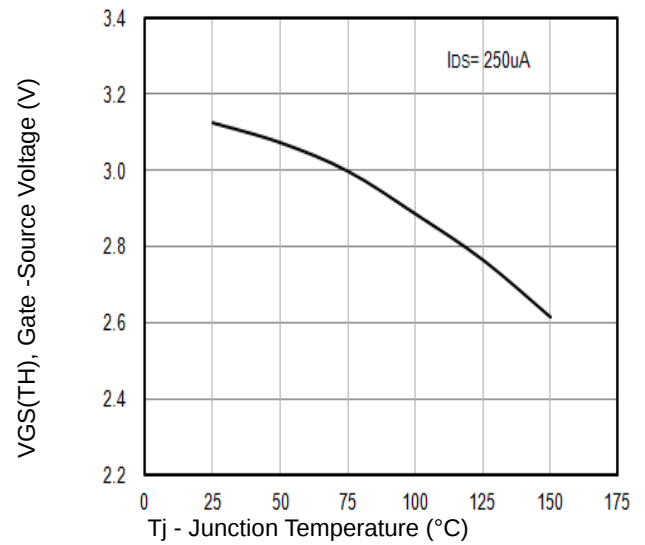


Fig2. $V_{GS(TH)}$ Gate-Source Voltage Vs. T_J

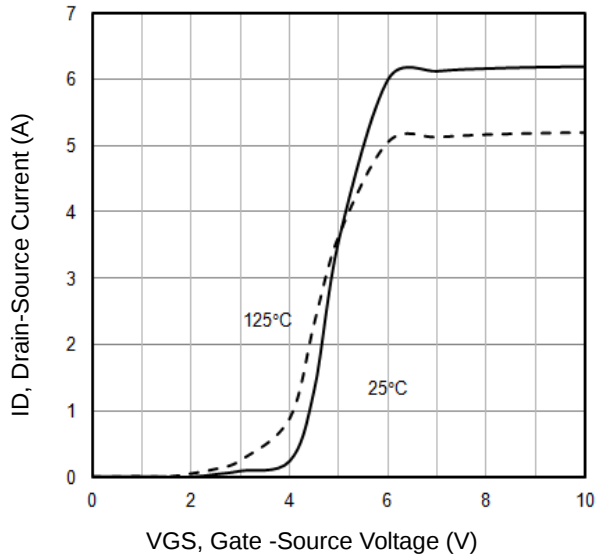


Fig3. Typical Transfer Characteristics

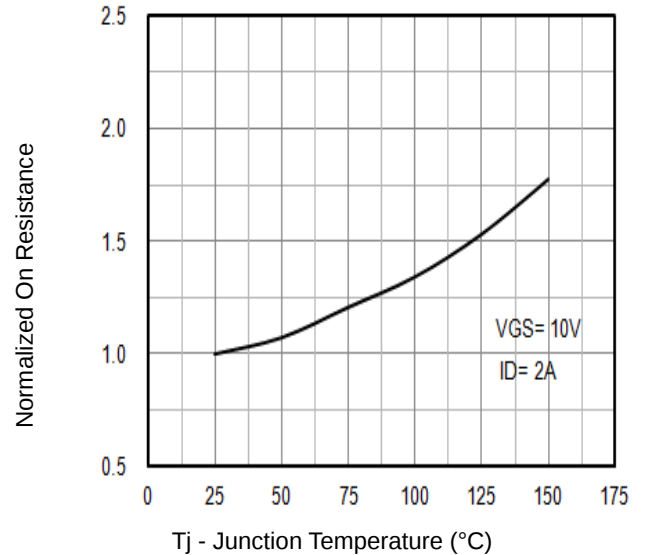


Fig4. Normalized On-Resistance Vs. T_J

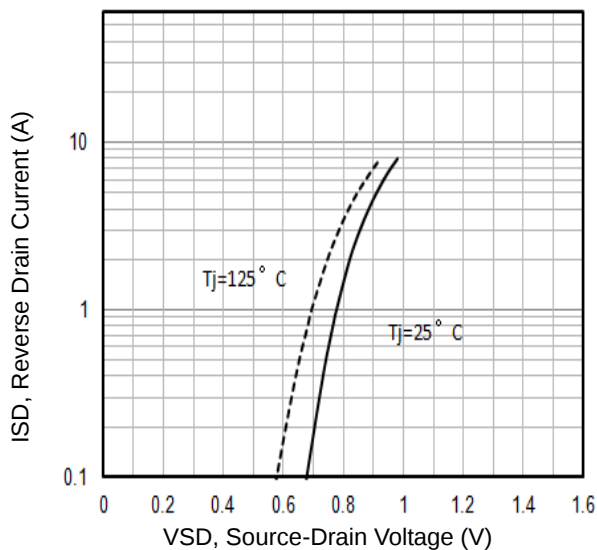


Fig5. Typical Source-Drain Diode Forward Voltage

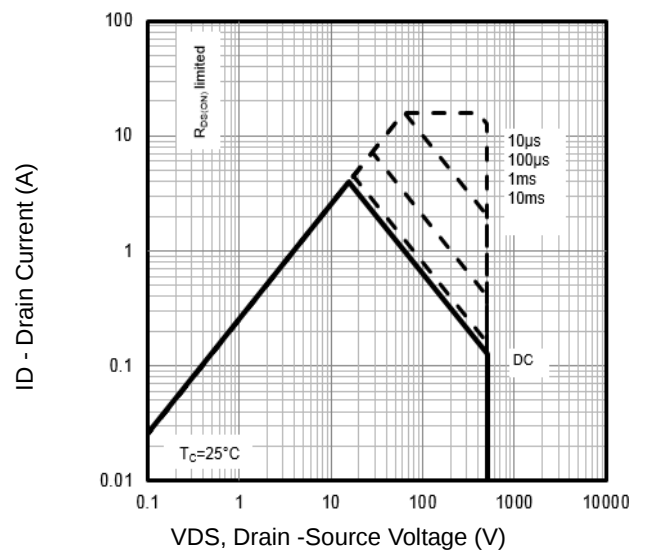


Fig6. Maximum Safe Operating Area

Typical Characteristics

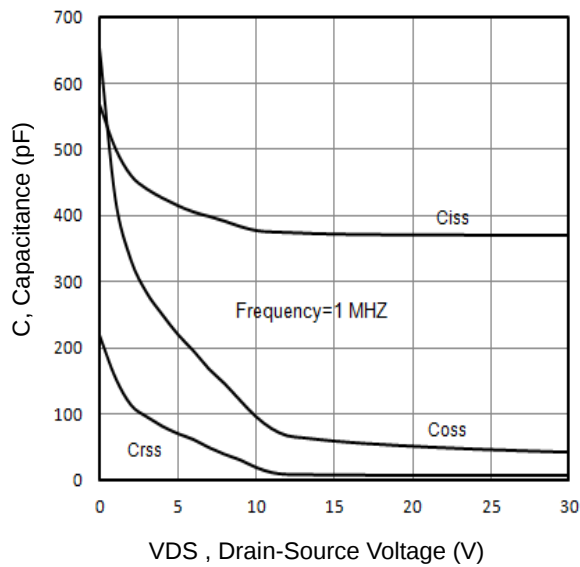


Fig7. Typical Capacitance Vs. Drain-Source Voltage

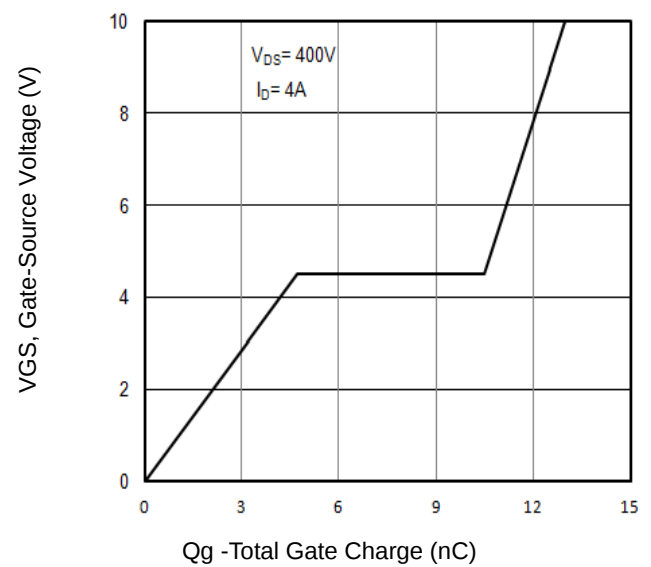


Fig8. Typical Gate Charge Vs. Gate-Source Voltage

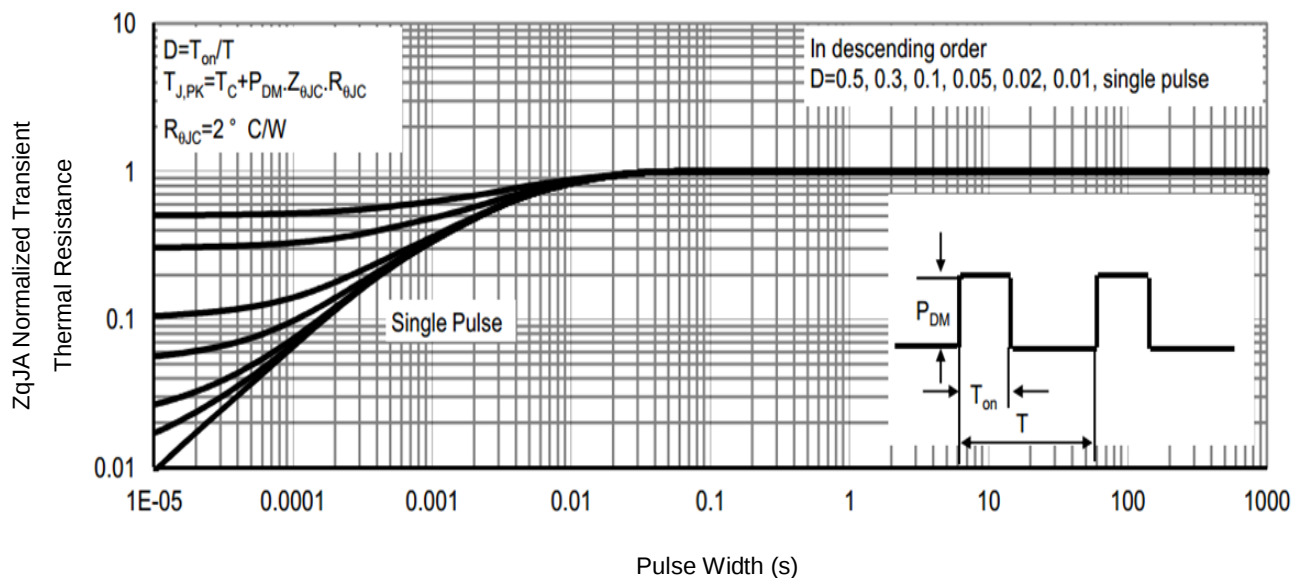


Fig9. Normalized Maximum Transient Thermal Impedance

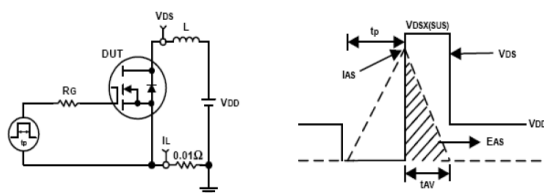


Fig10. Unclamped Inductive Test Circuit and waveforms

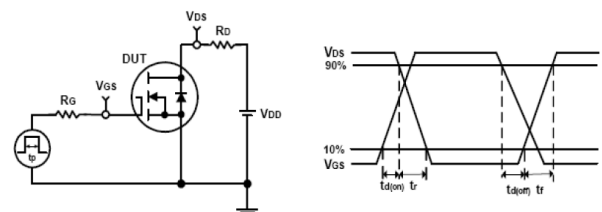
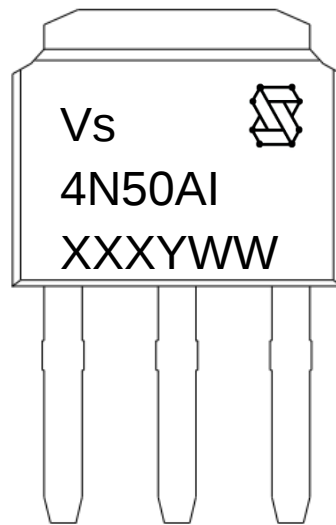
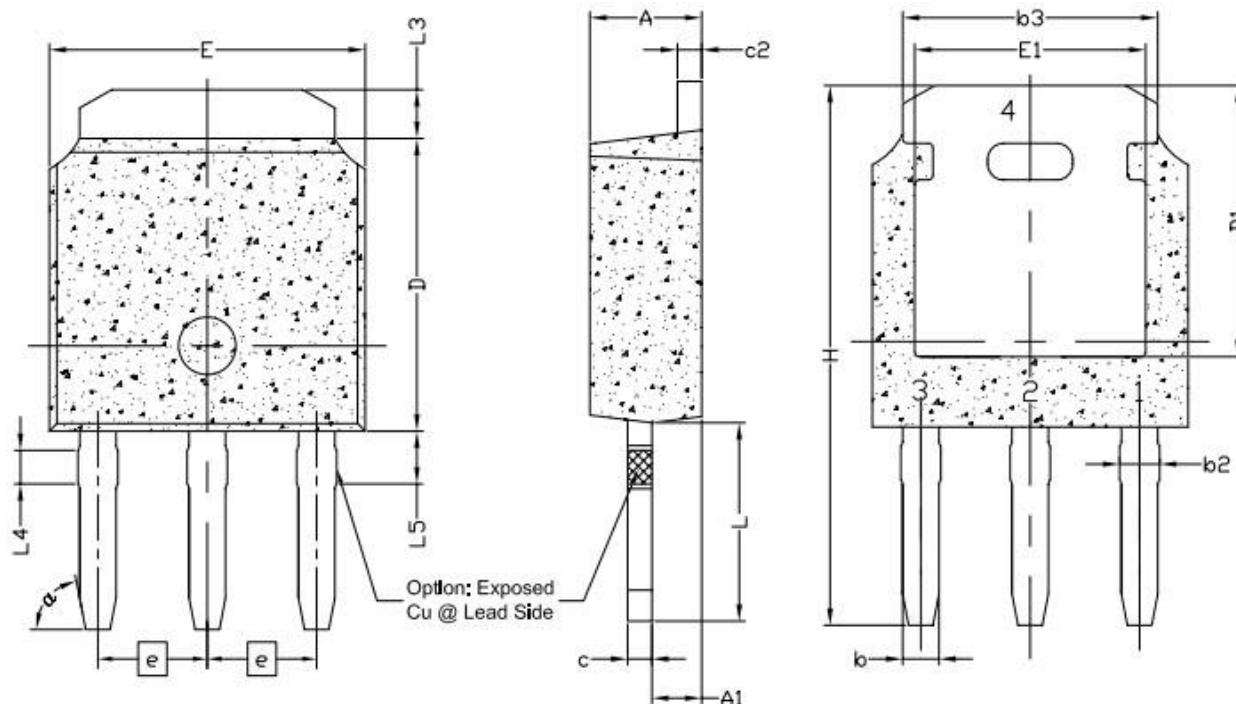


Fig11. Switching Time Test Circuit and waveforms

Marking Information

- 1st line: Vanguard Code (Vs), Vanguard Logo
2nd line: Part Number (4N50AI)
3rd line: Date code (XXXYWW)
XXX: Wafer Lot Number
Y: Year Code, e.g. E means 2017
WW: Week Code

TO-251SL Package Outline Data



Symbol	Dimensions (unit: mm)		
	Min	Typ	Max
A	2.20	2.30	2.39
A1	0.89	1.04	1.15
b	0.64	0.76	0.89
b2	0.77	0.84	1.14
b3	5.21	5.34	5.46
c	0.46	0.50	0.60
c2	0.46	0.50	0.60
D	5.98	6.10	6.223
D1	5.10	--	--
E	6.40	6.60	6.731
E1	4.40	--	--
e	2.286 BSC		
H	11.05	11.25	11.45
L	3.98	4.13	4.35
L3	0.89	--	1.27
L4	0.698 REF		
L5	0.972	1.099	1.226
α	79° REF		

Notes:

1. Dimension "D" and "E" do NOT include mold flash, protrusion or gate burrs. Mold flash, protrusion or gate burrs shall not exceed 0.1mm per side.

Customer Service

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