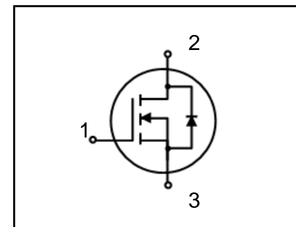
N-channel TO-3P MOSFET

Features

- High ruggedness
- $R_{DS(ON)}$ (Max 0.27Ω)@V_{GS}=10V
- Gate Charge (Typ 103 nC)
- Improved dv/dt Capability
- 100% Avalanche Tested

1. Gate 2. Drain 3. Source

BV_{DSS} : 500V
I_D : 20A
$R_{DS(ON)}$: 0.27Ω



General Description

This power MOSFET is produced with advanced VDMOS technology of SAMWIN. This technology enable power MOSFET to have better characteristics, such as fast switching time, low on resistance, low gate charge and especially excellent avalanche characteristics. It is mainly suitable for half bridge or full bridge resonant topology like a electronic ballast, and also low power switching mode power appliances.

Order Codes

Item	Sales Type	Marking	Package	Packaging
1	SWW 20N50	SW20N50U	TO-3P	TUBE

Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DSS}	Drain to Source Voltage	500	V
I_D	Continuous Drain Current (@T_C=25°C)	20*	A
	Continuous Drain Current (@T_C=100°C)	12.6*	A
I_{DM}	Drain current pulsed (note 1)	80	A
V_{GS}	Gate to Source Voltage	±30	V
E_{AS}	Single pulsed Avalanche Energy (note 2)	2240	mJ
E_{AR}	Repetitive Avalanche Energy (note 1)	500	mJ
dv/dt	Peak diode Recovery dv/dt (note 3)	5	V/ns
P_D	Total power dissipation (@T_C=25°C)	386	W
	Derating Factor above 25°C	3.1	W/°C
T_{STG}, T_J	Operating Junction Temperature & Storage Temperature	-55 ~ + 150	°C
T_L	Maximum Lead Temperature for soldering purpose, 1/8 from Case for 5 seconds.	300	°C

*. Drain current is limited by junction temperature.

Thermal characteristics

Symbol	Parameter	Value	Unit
R_{thjc}	Thermal resistance, Junction to case	0.32	°C/W
R_{thcs}	Thermal resistance, Case to Sink	0.3	°C/W
R_{thja}	Thermal resistance, Junction to ambient	37.1	°C/W

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Electrical characteristic (T_C = 25°C unless otherwise specified)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
Off characteristics						
BV_{DSS}	Drain to source breakdown voltage	V_{GS}=0V, I_D=250uA	500			V
ΔBV_{DSS} / ΔT_J	Breakdown voltage temperature coefficient	I_D=250uA, referenced to 25°C		0.54		V/°C
I_{DSS}	Drain to source leakage current	V_{DS}=500V, V_{GS}=0V			1	uA
		V_{DS}=400V, T_C=125°C			50	uA
I_{GSS}	Gate to source leakage current, forward	V_{GS}=30V, V_{DS}=0V			100	nA
	Gate to source leakage current, reverse	V_{GS}=-30V, V_{DS}=0V			-100	nA
On characteristics						
$V_{GS(TH)}$	Gate threshold voltage	V_{DS}=V_{GS}, I_D=250uA	2		4	V
$R_{DS(ON)}$	Drain to source on state resistance	V_{GS}=10V, I_D =10A		0.19	0.27	Ω
Gfs	Forward Transconductance	V_{DS} = 30 V, I_D =10A	19			S
Dynamic characteristics						
C_{iss}	Input capacitance	V_{GS}=0V, V_{DS}=25V, f=1MHz		4157		pF
C_{oss}	Output capacitance			374		
C_{rss}	Reverse transfer capacitance			36		
$t_{d(on)}$	Turn on delay time	V_{DS}=250V, I_D=20A, R_G=25Ω (note 4,5)		53	75	ns
tr	Rising time			74	95	
$t_{d(off)}$	Turn off delay time			272	320	
t_f	Fall time			77	100	
Q_g	Total gate charge	V_{DS}=400V, V_{GS}=10V, I_D=20A (note 4,5)		103	150	nC
Q_{gs}	Gate-source charge			23		
Q_{gd}	Gate-drain charge			41		

Source to drain diode ratings characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_S	Continuous source current	Integral reverse p-n Junction diode in the MOSFET			20	A
I_{SM}	Pulsed source current				80	A
V_{SD}	Diode forward voltage drop.	I_S=20A, V_{GS}=0V			1.5	V
T_{rr}	Reverse recovery time	I_S=20A, V_{GS}=0V, dI_F/dt=100A/us		436		ns
Q_{rr}	Reverse recovery Charge			6.9		uC

※. Notes

1. Repeatitive rating : pulse width limited by junction temperature.
2. L = 11.2 mH, I_{AS} = 20A, V_{DD} = 50V, R_G=25Ω, Starting T_J = 25°C
3. I_{SD} ≤ 20A, di/dt = 100A/us, V_{DD} ≤ BV_{DSS}, Staring T_J =25°C
4. Pulse Test : Pulse Width ≤ 300us, duty cycle ≤ 2%
5. Essentially independent of operating temperature.

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Fig. 1. On-state characteristics

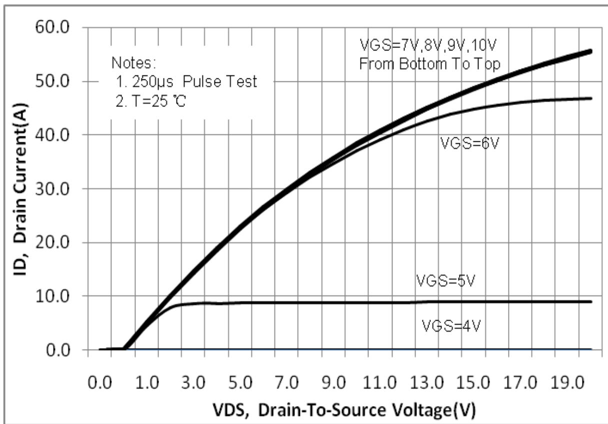

Fig. 2. On-resistance variation vs. drain current and gate voltage

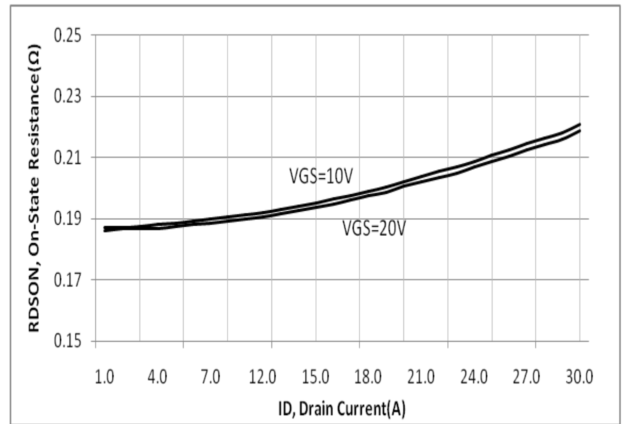

Fig. 3. Gate charge characteristics

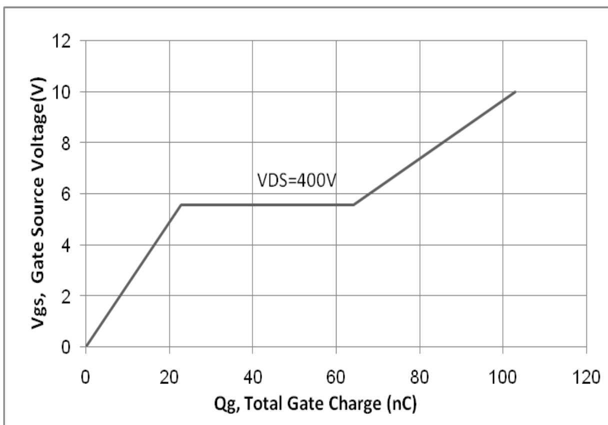

Fig. 4. On state current vs. diode forward voltage

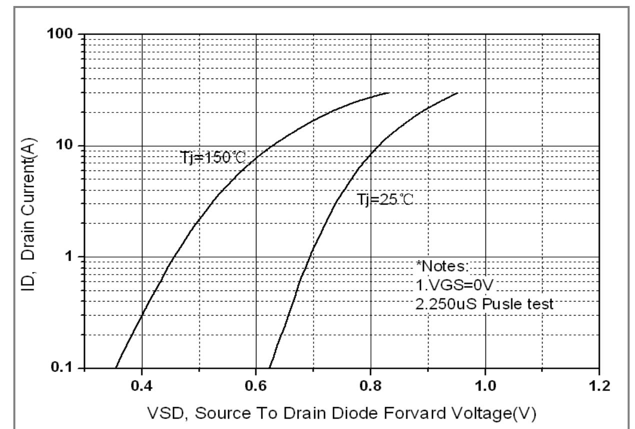

Fig 5. Breakdown Voltage Variation vs. Junction Temperature

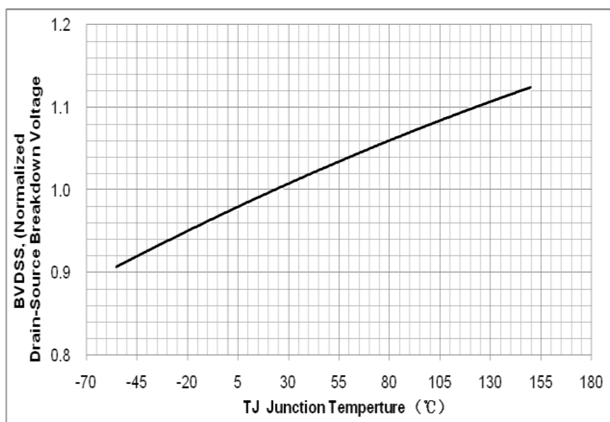

Fig. 6. On resistance variation vs. junction temperature

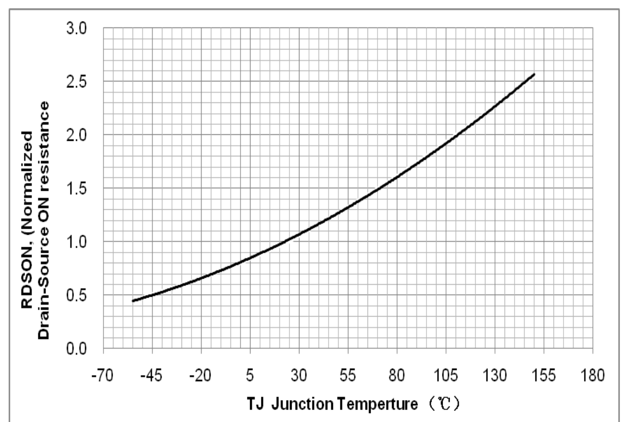

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Fig. 7. Maximum safe operating area

Fig. 8. Transient thermal response curve

Fig. 9. Gate charge test circuit & waveform

Fig. 10. Switching time test circuit & waveform

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Fig. 11. Unclamped Inductive switching test circuit & waveform

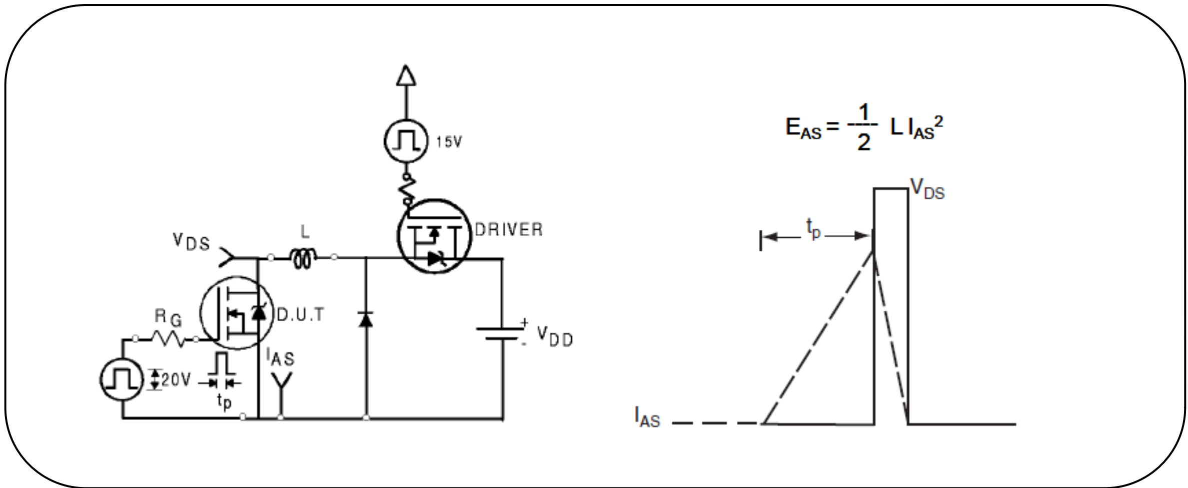
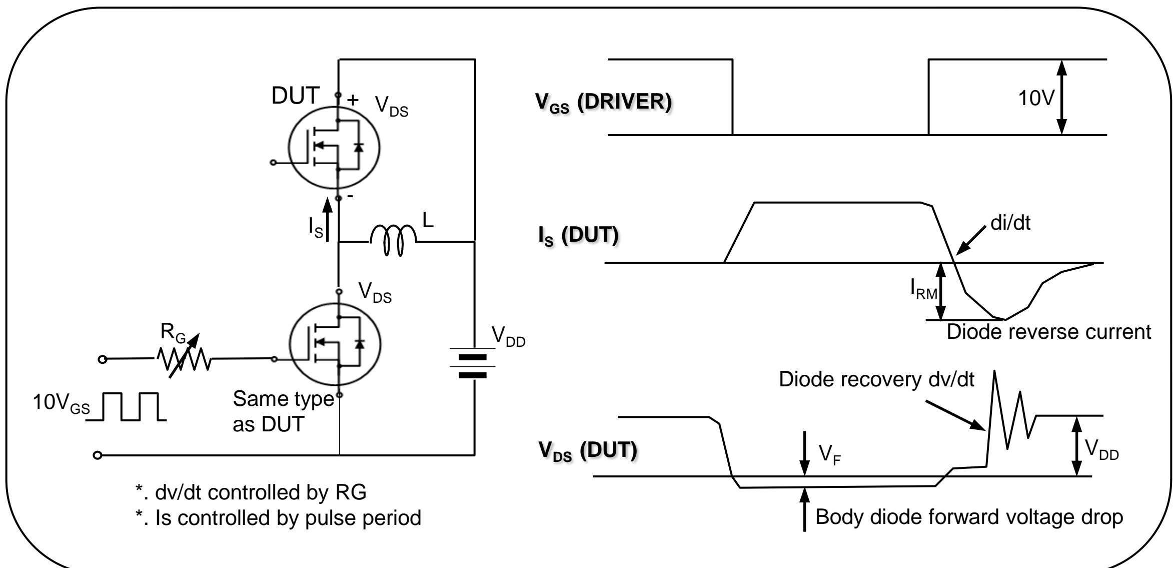


Fig. 12. Peak diode recovery dv/dt test circuit & waveform



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