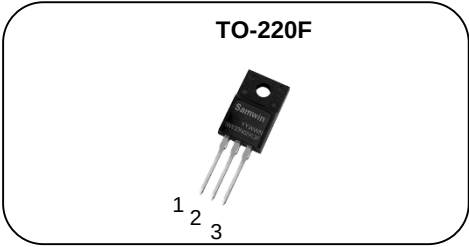


N-channel Enhanced mode TO-220F MOSFET

Features

- High ruggedness
- Low $R_{DS(ON)}$ (Typ 92mΩ)@ $V_{GS}=10V$
- Low Gate Charge (Typ 47nC)
- Improved dv/dt Capability
- 100% Avalanche Tested
- Application: Charger, LED, PC Power



1. Gate 2. Drain 3. Source

BV_{DSS} : 650V
I_D : 30A
R_{DS(ON)} : 92mΩ

A schematic symbol for an N-channel MOSFET. It shows a circle with a vertical line on the left (gate), a horizontal line on the top (drain), and a horizontal line on the bottom (source). The pins are labeled 1, 2, and 3.



General Description

This power MOSFET is produced with advanced super junction technology of SAMWIN. This technology enable the power MOSFET to have better characteristics, including fast switching time, low on resistance, low gate charge and especially excellent avalanche characteristics.

Order Codes

Item	Sales Type	Marking	Package	Packaging
1	SW M 30N65K3F	SW30N65K3F	TO-220F	TUBE

Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{DSS}	Drain to source voltage	650	V
I _D	Continuous drain current (@T _C =25°C)	30*	A
	Continuous drain current (@T _C =100°C)	19*	A
I _{DM}	Drain current pulsed (note 1)	90	A
V _{GS}	Gate to source voltage	±30	V
E _{AS}	Single pulsed avalanche energy (note 2)	500	mJ
E _{AR}	Repetitive avalanche energy (note 1)	50	mJ
dv/dt	MOSFET dv/dt ruggedness (@VDS=0~400V)	30	V/ns
dv/dt	Peak diode recovery dv/dt (note 3)	20	V/ns
P _D	Total power dissipation (@T _C =25°C)	40.3	W
	Derating factor above 25°C	0.3	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	3.1	°C/W
R _{thja}	Thermal resistance, Junction to ambient	47.5	°C/W

Electrical characteristic (T_j = 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 =250μA	650			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} =650V, V _{GS} =0V			10	μA
		V _{DS} =520V, T _j =125°C		100		μA
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 =250μA	2.5		4.5	V
R _{DS(ON)}	Drain to source on state resistance	V _{GS} =10V, I _D =15A, T _j =25°C		92	110	mΩ
		V _{GS} =10V, I _D =15A, T _j =125°C		206		mΩ
G _{fs}	Forward transconductance	V _{DS} =10V, I _D =15A		22		S
Dynamic characteristics						
C _{iss}	Input capacitance	V _{GS} =0V, V _{DS} =200V, f=1MHz		2242		pF
C _{oss}	Output capacitance			65		
C _{rss}	Reverse transfer capacitance			2.3		
t _{d(on)}	Turn on delay time	V _{DS} =325V, I _D =30A, R _G =10Ω, V _{GS} =10V (note 4,5)		29		ns
t _r	Rising time			57		
t _{d(off)}	Turn off delay time			59		
t _f	Fall time			45		
Q _g	Total gate charge	V _{DS} =520V, V _{GS} =10V, I _D =30A I _G =3mA (note 4,5)		47		nC
Q _{gs}	Gate-source charge			14		
Q _{gd}	Gate-drain charge			20		
R _g	Gate resistance	f=1MHz		4.0		Ω

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			30	A
I _{SM}	Pulsed source current				90	A
V _{SD}	Diode forward voltage drop.	I _S =30A, V _{GS} =0V			1.4	V
t _{rr}	Reverse recovery time	I _S =30A, V _{GS} =0V, di _F /dt=100A/μs		169		ns
Q _{rr}	Reverse recovery charge			1.3		μC

※. Notes

1. Repeative rating : pulse width limited by junction temperature.
2. L =40mH, I_{AS} =5A, V_{DD}=100V, R_G=25Ω, Starting T_j = 25°C
3. I_{SD} ≤ 30A, di/dt = 100A/μs, V_{DD} ≤ BV_{DSS}, Staring T_j =25°C
4. Pulse Test : Pulse Width ≤ 300μs, duty cycle ≤ 2%.
5. Essentially independent of operating temperature.

Fig. 1. On-state characteristics

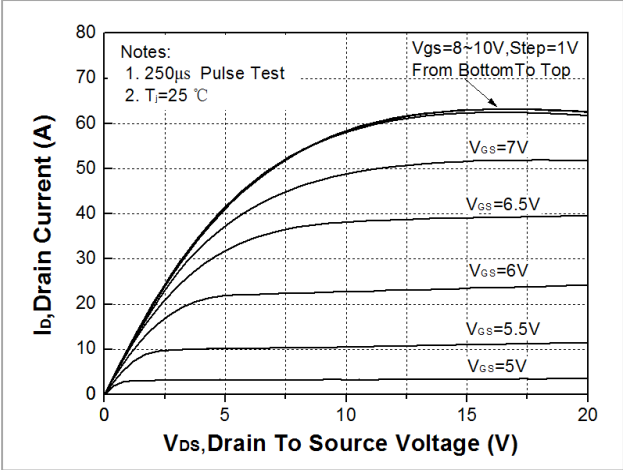


Fig. 2. Transfer Characteristics

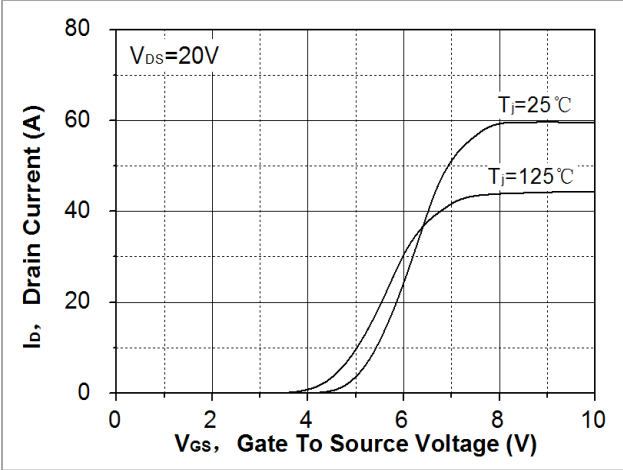


Fig. 3. On-resistance variation vs. drain current and gate voltage

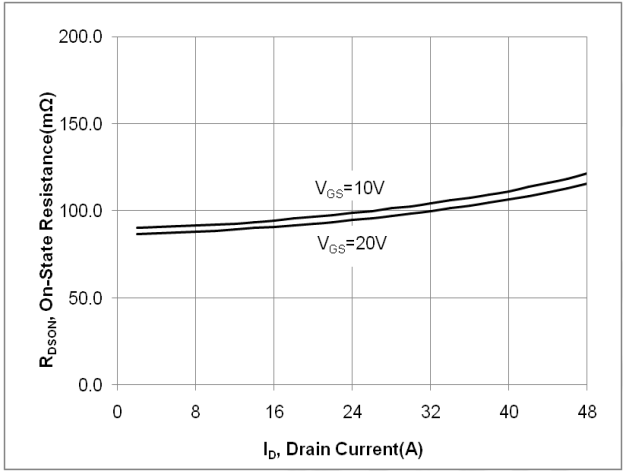


Fig. 4. On-state current vs. diode forward voltage

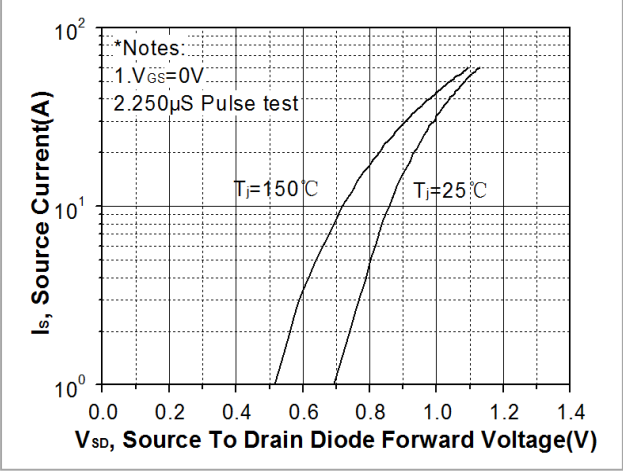


Fig 5. Breakdown voltage variation vs. junction temperature

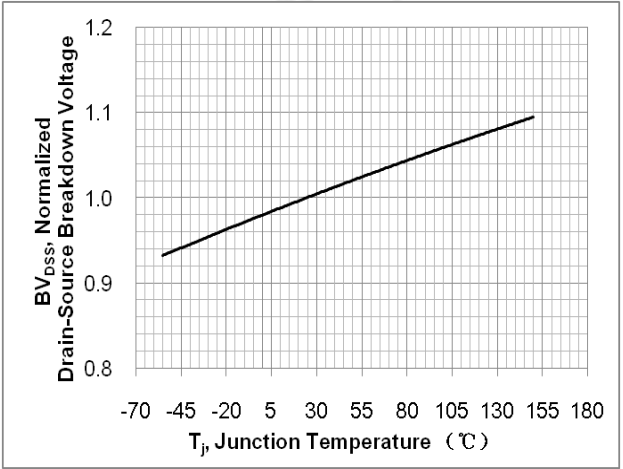


Fig. 6. On-resistance variation vs. junction temperature

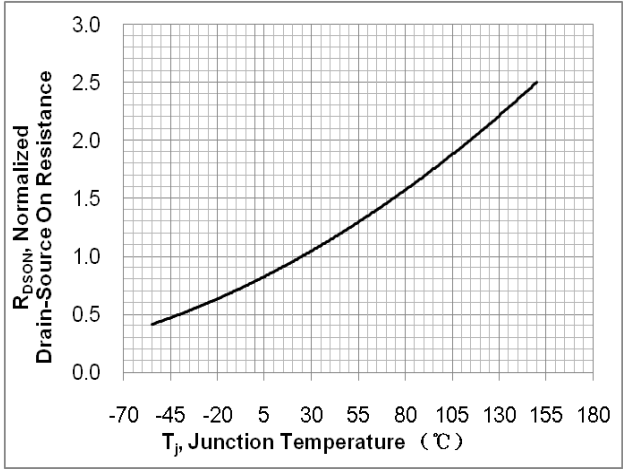


Fig. 7. Gate charge characteristics

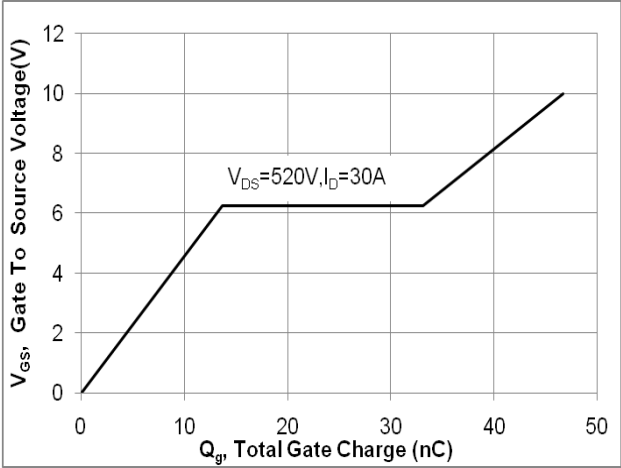


Fig. 8. Capacitance Characteristics

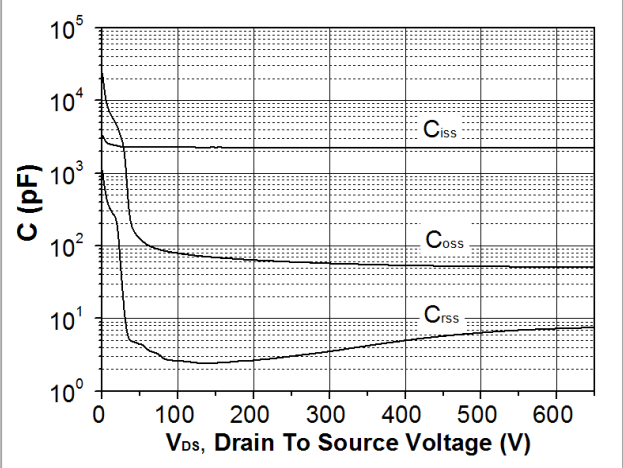


Fig. 9. Maximum safe operating area

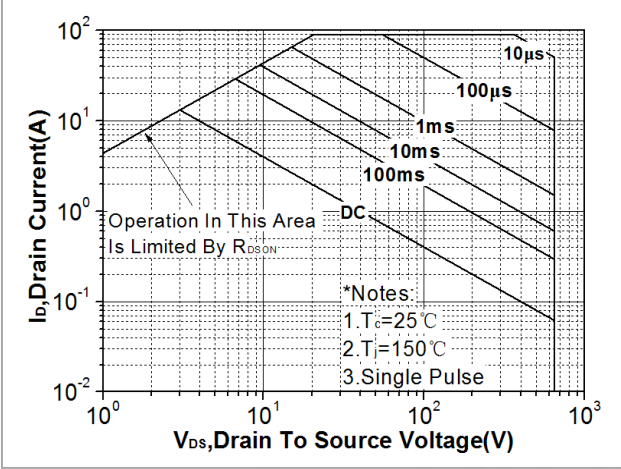


Fig. 10. Transient thermal response curve

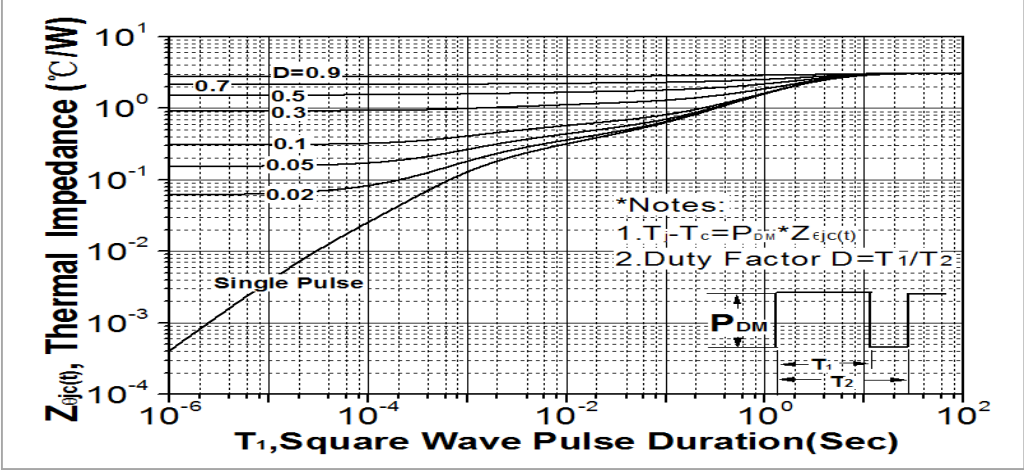


Fig. 11. Gate charge test circuit & waveform

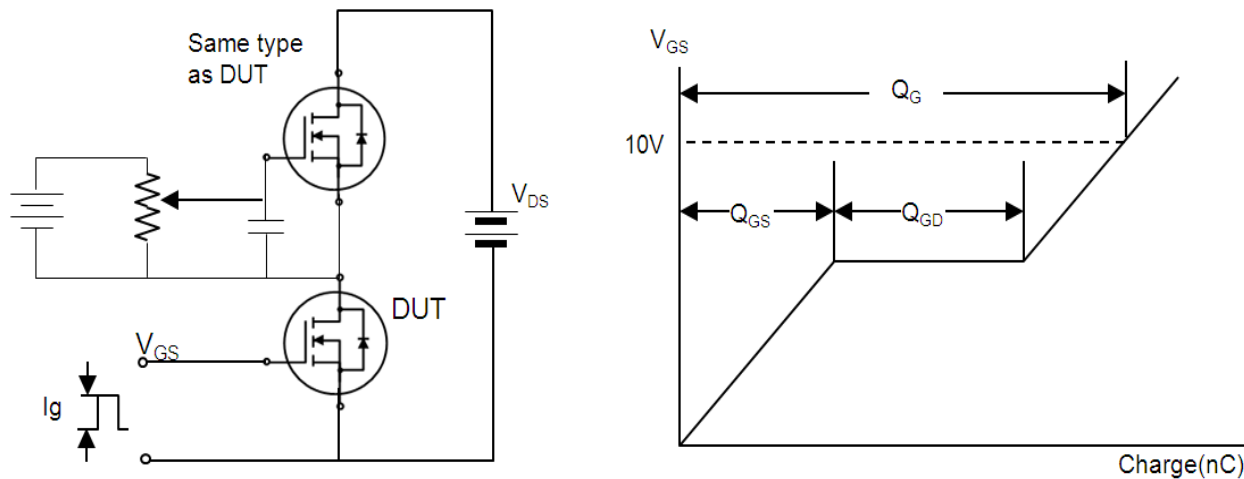


Fig. 12. Switching time test circuit & waveform

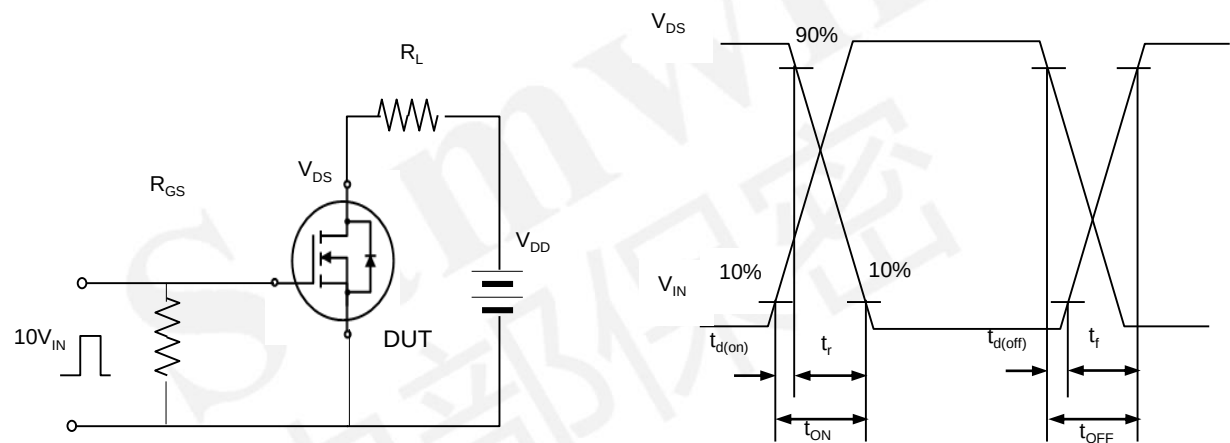


Fig. 13. Unclamped Inductive switching test circuit & waveform

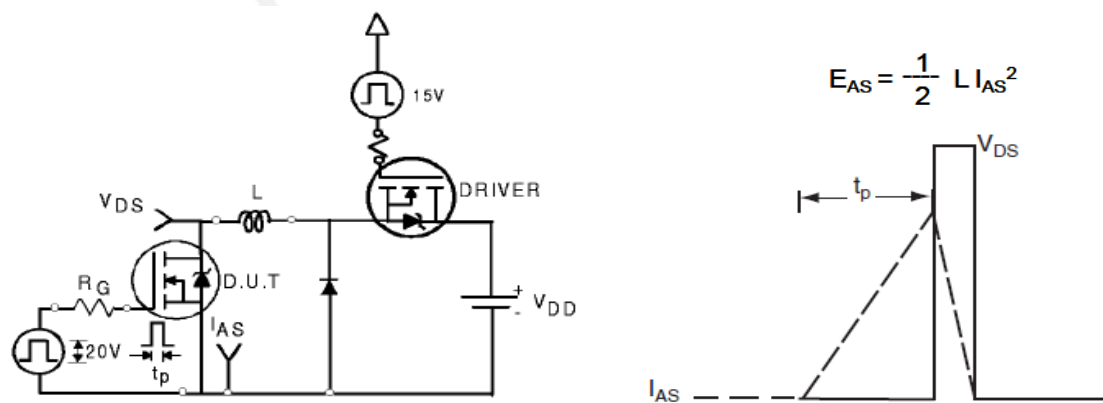
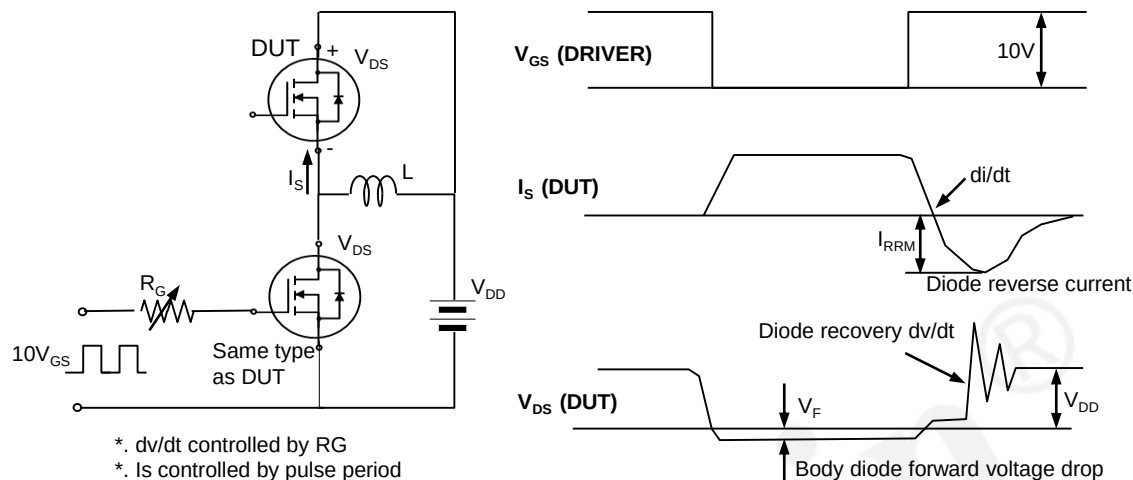


Fig. 14. Peak diode recovery dv/dt test circuit & waveform



DISCLAIMER

- * All the data & curve in this document was tested in SEMIPOWER TESTING & APPLICATION CENTER.
- * This product has passed the PCT,TC,HTRB,HTGB,HAST,PC and Solderdunk reliability testing.
- * Qualification standards can also be found on the Web site (<http://www.semipower.com.cn>) 
- * Suggestions for improvement are appreciated, Please send your suggestions to samwin@samwinsemi.com