Features
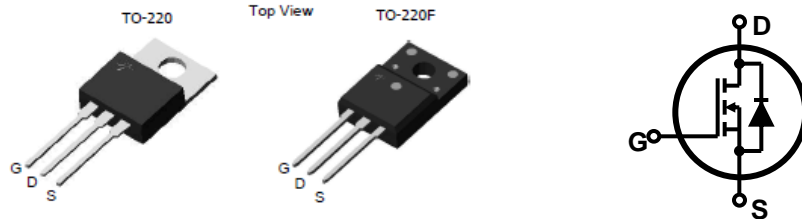
- Low gate charge
- 100% avalanche tested
- Improved dv/dt capability
- RoHS compliant
- Halogen free package
- JEDEC Qualification

V_{DSS} = 550 V @T_{jmax}
I_D = 13A
$R_{DS(on)}$ = 0.48 Ω(max) @ V_{GS}= 10 V

Device	Package	Marking	Remark
SW13N50 / SWF13N50	TO-220 / TO-220F	SW13N50 / SWF13N50	RoHS
SW13N50G / SWF13N50G	TO-220 / TO-220F	SW13N50G / SWF13N50G	Halogen Free

Absolute Maximum Ratings

Parameter		Symbol	SW13N50(G)	SWF13N50(G)	Unit
Drain-Source Voltage		V_{DS}	500		V
Gate-Source Voltage		V_{GS}	±30		V
Continuous Drain Current	T_C = 25 ℃	I_D	13	13*	A
	T_C = 100 ℃		8.2	8.2*	A
Pulsed Drain Current (Note 1)		I_{DM}	52	52*	A
Single Pulse Avalanche Energy (Note 2)		E_{AS}	563		mJ
Repetitive Avalanche Current (Note 1)		I_{AR}	13		A
Repetitive Avalanche Energy (Note 1)		E_{AR}	18.3		mJ
Power Dissipation	T_C = 25 ℃	P_D	183	52	W
	Derate above 25 ℃		1.46	0.41	W/℃
Peak Diode Recovery dv/dt (Note 3)		dv/dt	4.5		V/ns
Operating Junction and Storage Temperature Range		T_J, T_{STG}	-55~150		℃
Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds		T_L	300		℃

* Limited only by maximum junction temperature

Thermal Characteristics   QQ845200166

Parameter	Symbol	SW13N50(G)	SWF13N50(G)	Unit
Maximum Thermal resistance, Junction-to-Case	$R_{\theta JC}$	0.63	2.4	℃/W
Maximum Thermal resistance, Junction-to-Ambient	$R_{\theta JA}$	62.5	62.5	℃/W

Electrical Characteristics : T_C=25℃, unless otherwise noted

Parameter	Symbol	Test condition	Min	Typ	Max	Units
OFF						
Drain-Source Breakdown Voltage	BV_{DSS}	$V_{GS} = 0$ V, $I_D = 250$ µA	500	--	--	V
Zero Gate Voltage Drain Current	I_{DSS}	$V_{DS} = 500$ V, $V_{GS} = 0$ V	--	--	1	µA
		$V_{DS} = 400$ V, $T_C = 125°C$	--	--	10	µA
Forward Gate-Source Leakage Current	I_{GSSF}	$V_{GS} = 30$ V, $V_{DS} = 0$ V	--	--	100	nA
Reverse Gate-Source Leakage Current	I_{GSSR}	$V_{GS} = -30$ V, $V_{DS} = 0$ V	--	--	-100	nA
ON						
Gate Threshold Voltage	$V_{GS(th)}$	$V_{DS} = V_{GS}$, $I_D = 250$ µA	2	--	4	V
Drain-Source On-Resistance	$R_{DS(on)}$	$V_{GS} = 10$ V, $I_D = 6.5$ A	--	0.38	0.48	Ω
Forward Transconductance [Note 4]	g_{FS}	$V_{DS} = 30$ V, $I_D = 6.5$ A	--	14	--	S
DYNAMIC						
Input Capacitance	C_{iss}	$V_{DS} = 25$ V, $V_{GS} = 0$ V,	--	1918	--	pF
Output Capacitance	C_{oss}	f = 1.0 MHz	--	187	--	pF
Reverse Transfer Capacitance	C_{rss}		--	7.7	--	pF
SWITCHING						
Turn-On Delay Time [Note 4,5]	$t_{d(on)}$	$V_{DD} = 250$ V, $I_D = 13$ A,	--	53	--	ns
Turn-On Rise Time [Note 4,5]	t_r	$R_G = 25$ Ω	--	45	--	ns
Turn-Off Delay Time [Note 4,5]	$t_{d(off)}$		--	156	--	ns
Turn-Off Fall Time [Note 4,5]	t_f		--	59	--	ns
Total Gate Charge [Note 4,5]	Q_g	$V_{DS} = 400V$, $I_D = 13$ A,	--	36	--	nC
Gate-Source Charge [Note 4,5]	Q_{gs}	$V_{GS} = 10$ V	--	8.5	--	nC
Gate-Drain Charge [Note 4,5]	Q_{gd}		--	8.7	--	nC
SOURCE DRAIN DIODE						
Maximum Continuous Drain-Source Diode Forward Current	I_S	---	--	--	13	A
Maximum Pulsed Drain-Source Diode Forward Current	I_{SM}	---	--	--	52	A
Drain-Source Diode Forward Voltage	V_{SD}	$V_{GS} = 0$ V, $I_S = 13$ A	--	--	1.5	V
Reverse Recovery Time [Note 4]	t_{rr}	$V_{GS} = 0$ V, $I_S = 13$ A	--	325	--	ns
Reverse Recovery Charge [Note 4]	Q_{rr}	$dI_F / dt = 100$ A/µs	--	3.3	--	µC

Note :
1. Repeated rating : Pulse width limited by safe operating area
2. L=6mH, $I_{AS} = 13A$, $V_{DD} = 50V$, $R_G = 25Ω$, Starting T_J= 25 ℃
3 $I_{SD} ≤ 13A$, di/dt ≤ 200A/µs , $V_{DD} ≤ BV_{DS}$, Starting T_J= 25 ℃
4. Pulse Test :Pulse width ≤ 300µs, Duty Cycle ≤ 2%
5. Essentially Independent of Operating Temperature Typical Characteristics

Top V_{GS}=15.0V
10.0V
8.0V
7.0V
6.5V
6.0V
Bottom   5.0V

1. T_C = 25℃
2. 250μ s Pulse Test

Drain Current, I_D [A]

Drain-Source Voltage, V_{DS} [V]

V_{DS} = 30V
250 μ s Pulse Test

150℃
25℃
-55℃

Drain Current, I_D [A]

Gate-Source Voltage, V_{GS} [V]

T_J = 25℃

V_{GS} = 10V
V_{GS} = 20V

Drain-Source On-Resistance $R_{DS(ON)}$ [Ω]

Drain Current,I_D [A]

V_{GS} = 0V
250μ s Pulse Test

150℃
25℃

Reverse Drain Current, I_{DR} [A]

Source-Drain Voltage, V_{SD} [V]

C_{iss} = C_{gs} + C_{gd} (C_{ds} = shorted)
C_{oss} = C_{ds} + C_{gd}
C_{rss} = C_{gd}

V_{GS} = 0 V
f = 1 MHz

C_{iss}
C_{oss}
C_{rss}

Capacitance [pF]

Drain-Source Voltage, V_{DS} [V]

I_D = 13A

V_{DS} = 100V
V_{DS} = 250V
V_{DS} = 400V

Gate-Source Voltage, V_{GS} [V]

Total Gate Charge, Q_G [nC]

Drain-Source Breakdown Voltage BV$_{DSS}$' (Normalized)

V_{GS} = 0 V
I_D = 250 μ A

Junction Temperature,T$_J$ [^{o}C]

Drain-Source On-Resistance R$_{DS(ON)}$' (Normalized)

V_{GS} = 10 V
I_D = 6.5 A

Junction Temperature, T$_J$ [^{o}C]

Drain Current, I$_D$ [A]

Case Temperature, T$_C$ [$^{\circ}$C]

SW13N50(G)

Operation in This Area is Limited by R$_{DS(on)}$

10 us
100 us
1 ms
10 ms
100 ms
DC

Drain Current, I$_D$ [A]

T_C = 25 $^{\circ}$C
T_J = 150 $^{\circ}$C
Single Pulse

Drain-Source Voltage, V$_{DS}$ [V]

SWF13N50(G)

Operation in This Area is Limited by R$_{DS(on)}$

10 us
100 us
1 ms
10 ms
100 ms
DC

Drain Current, I$_D$ [A]

T_C = 25 $^{\circ}$C
T_J = 150 $^{\circ}$C
Single Pulse

Drain-Source Voltage, V$_{DS}$ [V]

SW13N50(G)

Transient thermal impedance $Z_{thJC}(t)$

Pulse Width, t [sec]

Duty=0.5
0.2
0.1
0.05
0.02
0.01
single pulse

Duty = t/T
$Z_{thJC}(t) = 0.63$ ℃/W Max.

SWF13N50(G)

Transient thermal impedance $Z_{thJC}(t)$

Pulse Width, t [sec]

Duty=0.5
0.2
0.1
0.05
0.02
0.01
single pulse

Duty = t/T
$Z_{thJC}(t) = 2.4$ ℃/W Max.