WiNSOK SEMICONDUCTOR

General Description

The WSF09N20G is the highest performance trench N-Ch MOSFET with extreme high cell density,which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .
The WSF09N20G meet the RoHS and Green Product requirement , 100% EAS guaranteed with full function reliability approved.

Features

● Advanced high cell density Trench technology
● Super Low Gate Charge
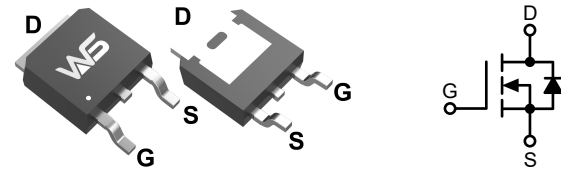● Excellent Cdv/dt effect decline
● Green Device Available

Product Summery

BVDSS	RDSON	ID
200V	210mΩ	9A

Applications

● High Frequency Point-of-Load Synchronous Buck Converter
● Networking DC-DC Power System
● Load Switch

TO-252-2L Pin Configuration

Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	200	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25℃$	Continuous Drain Current, V_{GS} @ 10V[1]	9	A
$I_D@T_C=100℃$	Continuous Drain Current, V_{GS} @ 10V[1]	3.13	A
$I_D@T_A=25℃$	Continuous Drain Current, V_{GS} @ 10V[1]	9	A
$I_D@T_A=70℃$	Continuous Drain Current, V_{GS} @ 10V[1]	5.8	A
I_{DM}	Pulsed Drain Current[2]	36	A
EAS	Single Pulse Avalanche Energy[3]	320	mJ
I_{AS}	Avalanche Current	9	A
$P_D@T_C=25℃$	Total Power Dissipation[3]	83	W
$P_D@T_c=100℃$	Total Power Dissipation[3]	47	W
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{θJA}$	Thermal Resistance Junction-ambient [1]	---	30	℃/W
$R_{θJC}$	Thermal Resistance Junction-Case[1]	---	1.6	℃/W

Electrical Characteristics (T$_J$=25 ℃, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV$_{DSS}$	Drain-Source Breakdown Voltage	V$_{GS}$=0V , I$_D$=250uA	200	---	---	V
△BV$_{DSS}$/△T$_J$	BVDSS Temperature Coefficient	Reference to 25℃ , I$_D$=1mA	---	0.25	---	V/℃
R$_{DS(ON)}$	Static Drain-Source On-Resistance[2]	V$_{GS}$=10V , I$_D$=4.5A	---	210	250	mΩ
		V$_{GS}$=6.0V , I$_D$=3.6A	---	260	290	mΩ
V$_{GS(th)}$	Gate Threshold Voltage	V$_{GS}$=V$_{DS}$, I$_D$ =250uA	2.0	3.0	4.0	V
△V$_{GS(th)}$	V$_{GS(th)}$ Temperature Coefficient		---	-4.63	---	mV/℃
I$_{DSS}$	Drain-Source Leakage Current	V$_{DS}$=200V , V$_{GS}$=0V , T$_J$=25℃	---	---	1	uA
		V$_{DS}$=160V , V$_{GS}$=0V , T$_J$=125℃	---	---	10	
I$_{GSS}$	Gate-Source Leakage Current	V$_{GS}$=±30V , V$_{DS}$=0V	---	---	±100	nA
gfs	Forward Transconductance	V$_{DS}$=30V , I$_D$=4.5A	---	0.21	---	S
R$_g$	Gate Resistance	V$_{DS}$=0V , V$_{GS}$=0V , f=1MHz	---	2	4	Ω
Q$_g$	Total Gate Charge (10V)	V$_{DS}$=160V , V$_{GS}$=10V , I$_D$=9A	---	11.8	---	nC
Q$_{gs}$	Gate-Source Charge		---	2.36	---	
Q$_{gd}$	Gate-Drain Charge		---	3.98	---	
T$_{d(on)}$	Turn-On Delay Time	V$_{DD}$=100V , V$_{GS}$=10V , R$_G$=10Ω I$_D$=9A R$_L$=10Ω	---	10.33	---	ns
T$_r$	Rise Time		---	10.7	---	
T$_{d(off)}$	Turn-Off Delay Time		---	29.1	---	
T$_f$	Fall Time		---	11.1	---	
C$_{iss}$	Input Capacitance	V$_{DS}$=25V , V$_{GS}$=0V , f=1MHz	---	780	---	pF
C$_{oss}$	Output Capacitance		---	51.2	---	
C$_{rss}$	Reverse Transfer Capacitance		---	3.2	---	

Guaranteed Avalanche Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy[5]	V$_{DD}$=25V , L=0.1mH , I$_{AS}$=5A	---	320	---	mJ

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I$_S$	Continuous Source Current[1,6]	V$_G$=V$_D$=0V , Force Current	---	---	9	A
I$_{SM}$	Pulsed Source Current[2,6]		---	---	36	A
V$_{SD}$	Diode Forward Voltage[2]	V$_{GS}$=0V , I$_S$=5A , T$_J$=25℃	---	---	1.4	V
t$_{rr}$	Reverse Recovery Time	I$_F$=5A , dI/dt=100A/μs , T$_J$=25℃	---	201	---	nS
Q$_{rr}$	Reverse Recovery Charge		---	663	---	nC

Note :
1.The data tested by surface mounted on a 1 inch^2 FR-4 board with 2OZ copper,t<10sec.
2.The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
3.The EAS data shows Max. rating . The test condition is V$_{DD}$=25V,V$_{GS}$=10V,L=0.1mH,I$_{AS}$=5A
4.The power dissipation is limited by 150℃ junction temperature
5.The Min. value is 100% EAS tested guarantee.
6.The data is theoretically the same as I$_D$ and I$_{DM}$, in real applications , should be limited by total power dissipation.
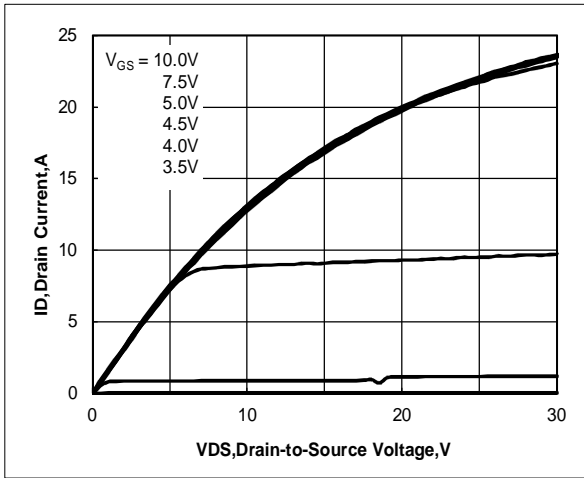
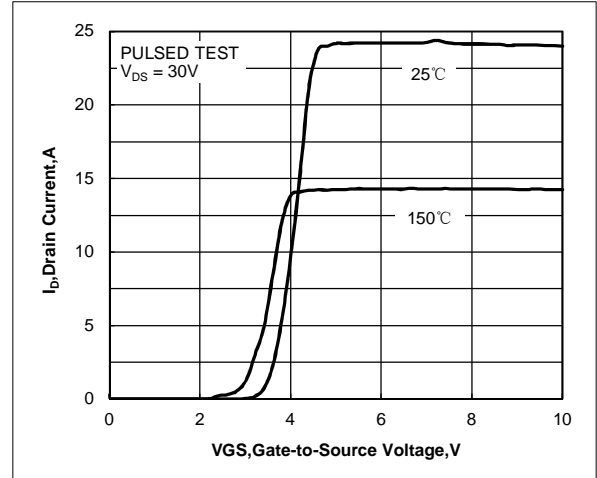## Typical Characteristics

Figure 1. Output Characteristics
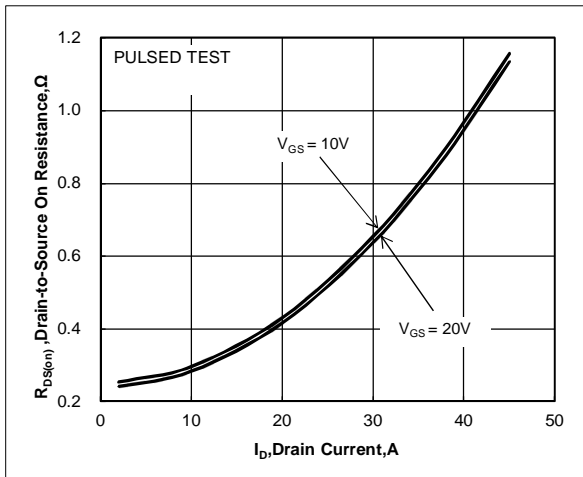

Figure 2. Transfer Characteristics

Figure 3. Drain-to-Source On Resistance vs.
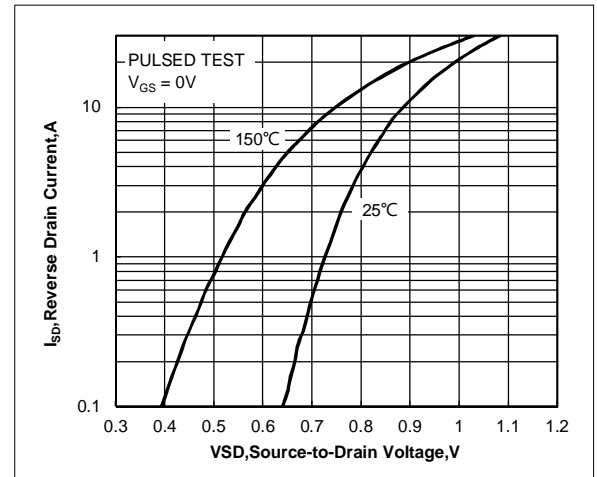
Drain Current and Gate Voltage

Figure 4. Body Diode Forward Voltage vs.
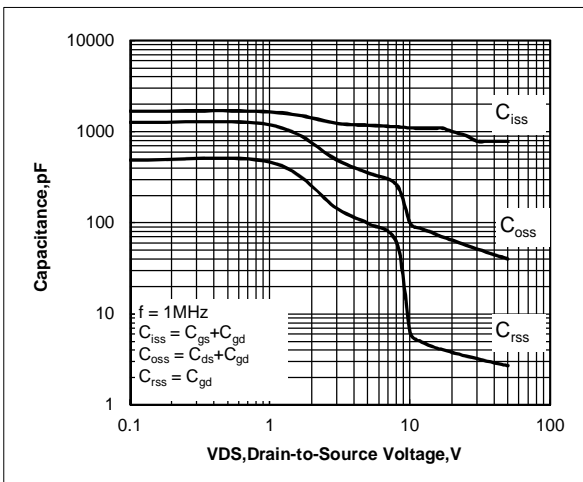
Source Current and Temperature
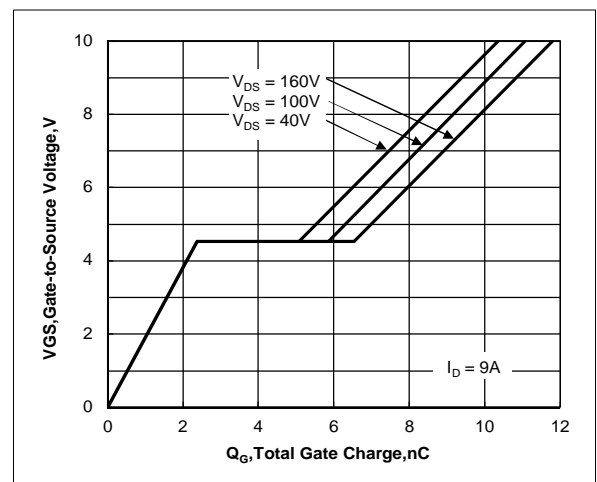

Figure 5. Capacitance Characteristics
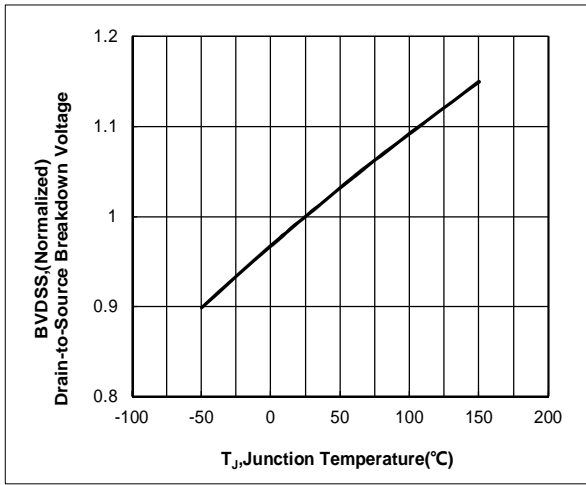

Figure 6. Gate Charge Characteristics

Figure 7. Normalized Breakdown Voltage vs. Junction Temperature
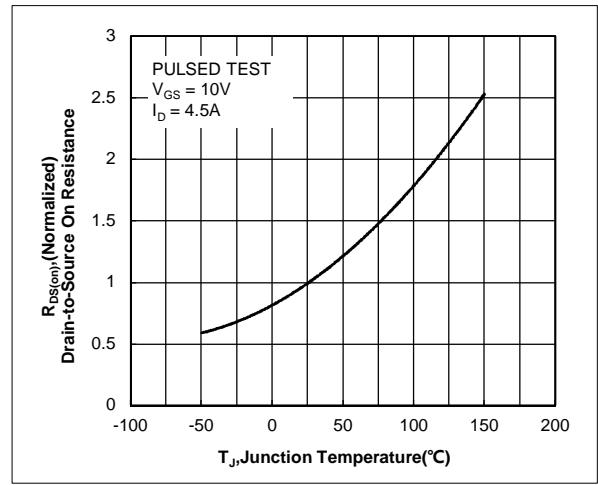

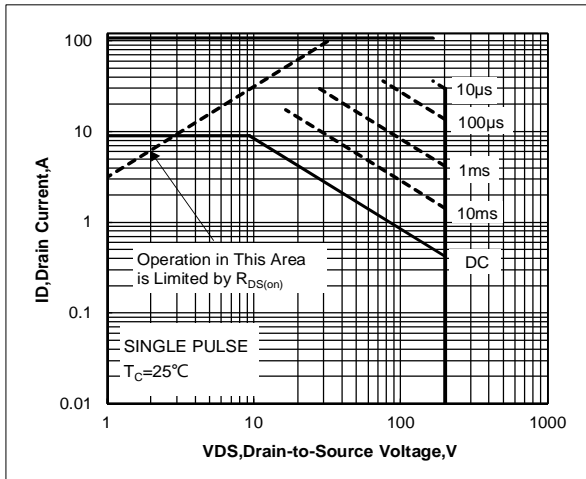Figure 8. Normalized On Resistance vs. Junction Temperature

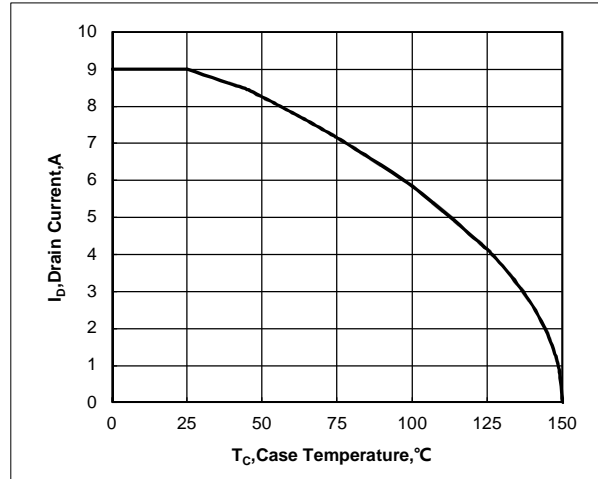Figure 9. Maximum Safe Operating Area for RU9N20A

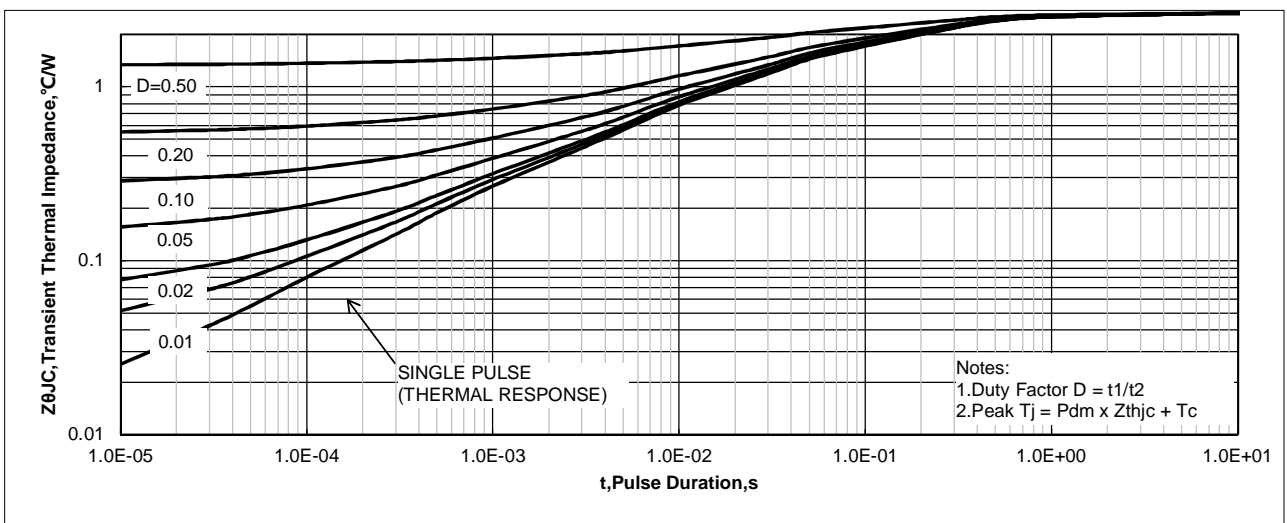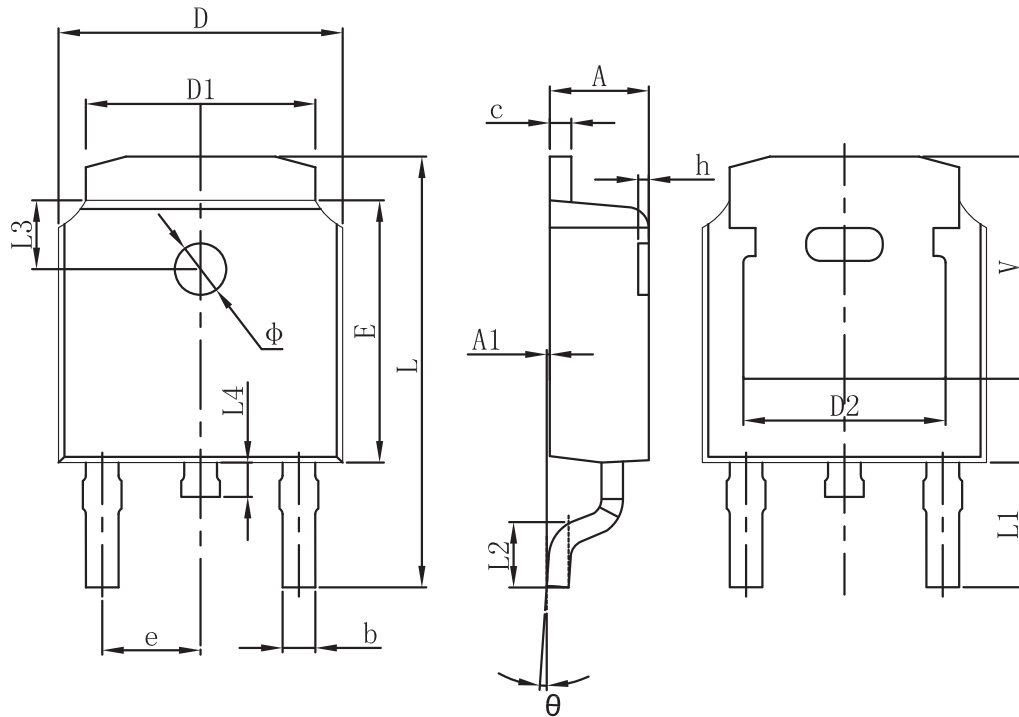Figure 10. Maximum Continuous Drain Current vs. Case Temperature

Figure 11. Maximum Effective Transient Thermal Impedance, Junction-to-Case for RU9N20A

Packaging information

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	2.200	2.400	0.087	0.094
A1	0.000	0.127	0.000	0.005
b	0.635	0.770	0.025	0.030
c	0.460	0.580	0.018	0.023
D	6.500	6.700	0.256	0.264
D1	5.100	5.460	0.201	0.215
D2	4.830 REF.		0.190 REF.	
E	6.000	6.200	0.236	0.244
e	2.186	2.386	0.086	0.094
L	9.712	10.312	0.382	0.406
L1	2.900 REF.		0.114 REF.	
L2	1.400	1.700	0.055	0.067
L3	1.600 REF.		0.063 REF.	
L4	0.600	1.000	0.024	0.039
Φ	1.100	1.300	0.043	0.051
θ	0°	8°	0°	8°
h	0.000	0.300	0.000	0.012
V	5.250 REF.		0.207 REF.	

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