

General Description

The WSR20N20 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 WSR20N20 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

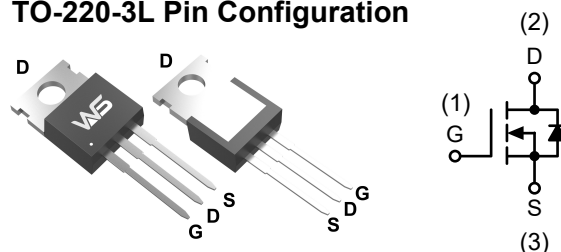
Product Summary

BV_{DSS}	$R_{DS(on)}$	I_D
200V	120mΩ	20A

Applications

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

TO-220-3L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	200	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	20	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	11	A
I_{DM}	Pulsed Drain Current ²	72	A
EAS	Single Pulse Avalanche Energy ³	340	mJ
P_D	Total Power Dissipation ³	104	W
T_{STG}	Storage Temperature Range	-55 to 175	$^\circ C$
T_J	Operating Junction Temperature Range	-55 to 175	$^\circ C$

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient ¹	---	62.5	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	1.2	$^\circ C/W$

Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	200	---	---	V
ΔBV _{DSS} /ΔT _J	BVDSS Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.098	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =9A	---	120	150	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	2.0	3.0	4.0	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-4.57	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =160V, V _{GS} =0V, T _J =25°C	---	---	1	uA
		V _{DS} =160V, V _{GS} =0V, T _J =55°C	---	---	5	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±25V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =5V, I _D =9A	---	32	---	S
Q _g	Total Gate Charge (10V)	V _{DS} =100V, V _{GS} =10V, I _D =18A	---	41	---	nC
Q _{gs}	Gate-Source Charge		---	5.5	---	
Q _{gd}	Gate-Drain Charge		---	75	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =30V, V _{GS} =10V, R _G =6Ω, I _D =18A, R _L =30Ω	---	24	---	ns
T _r	Rise Time		---	45	---	
T _{d(off)}	Turn-Off Delay Time		---	95	---	
T _f	Fall Time		---	101	---	
C _{iss}	Input Capacitance	V _{DS} =30V, V _{GS} =0V, f=1MHz	---	1318	---	pF
C _{oss}	Output Capacitance		---	180	---	
C _{rss}	Reverse Transfer Capacitance		---	75	---	

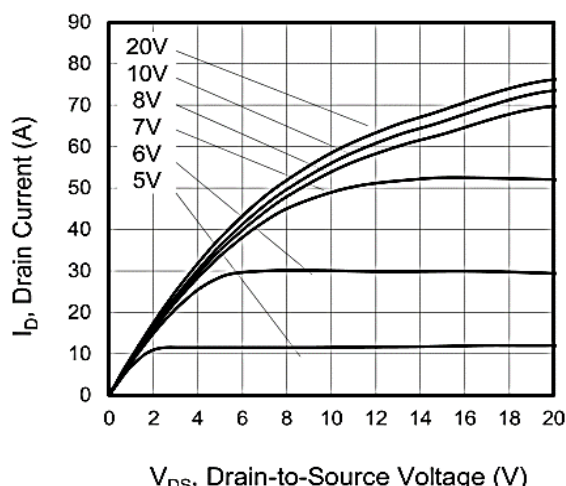
Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,6}	V _G =V _D =0V, Force Current	---	---	18	A
I _{SM}	Pulsed Source Current ^{2,6}		---	---	72	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =18A, T _J =25°C	---	---	1.2	V
t _{rr}	Reverse Recovery Time	I _F =18A, dI/dt=100A/μs, T _J =25°C	---	230	---	nS
Q _{rr}	Reverse Recovery Charge		---	1800	---	nC

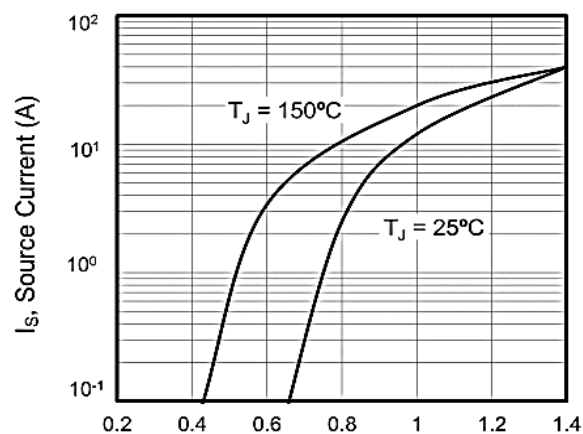
Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board, t ≤ 10 sec.
3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
4. Guaranteed by design, not subject to production
5. EAS condition: T_J=25°C, V_{DD}=50V, V_G=10V, L=0.5mH, R_G=25Ω

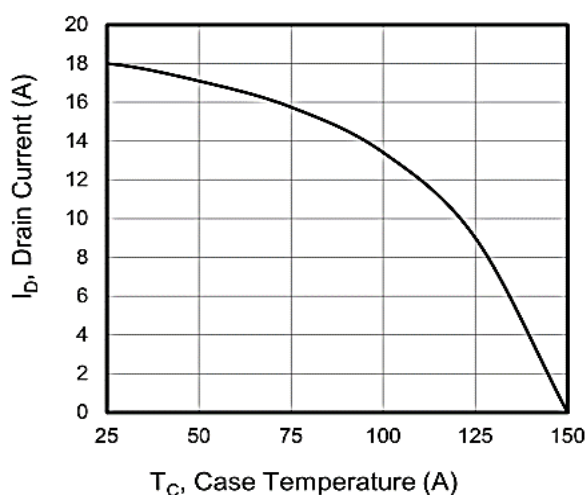
Typical Characteristics



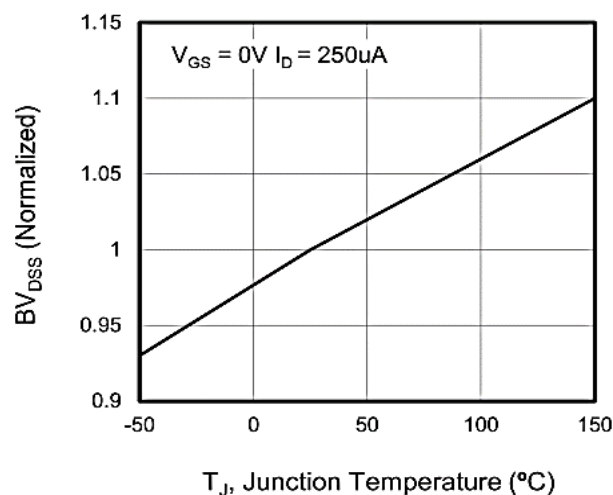
V_{DS} , Drain-to-Source Voltage (V)
Figure 1. Output Characteristics ($T_J = 25^\circ\text{C}$)



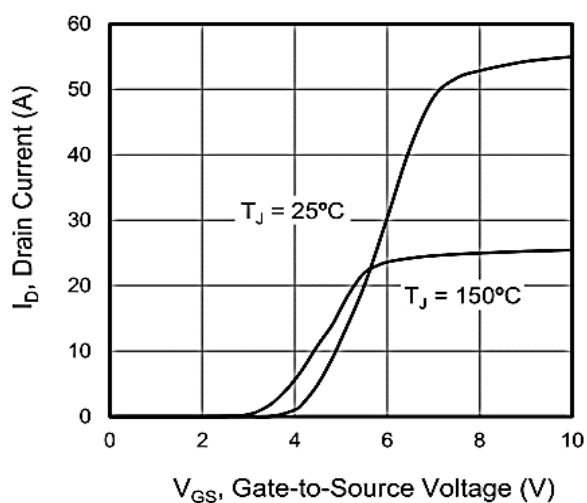
V_{SD} , Source-to-Drain Voltage (V)
Figure 2. Body Diode Forward Voltage



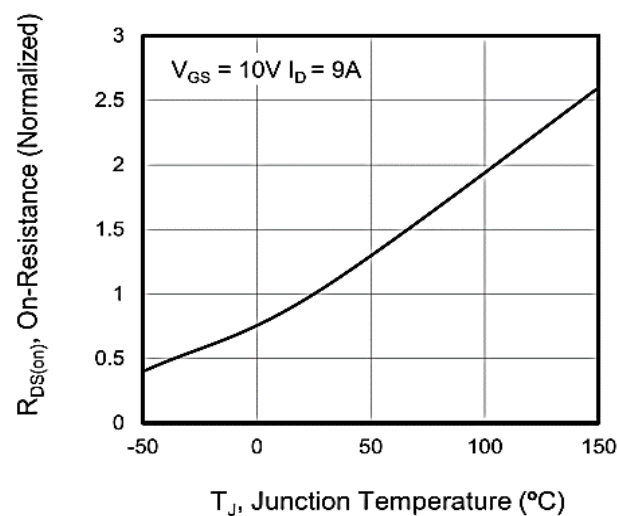
T_C , Case Temperature (A)
Figure 3. Drain Current vs. Temperature



T_J , Junction Temperature ($^\circ\text{C}$)
Figure 4. BV_{DS} Variation vs. Temperature



V_{GS} , Gate-to-Source Voltage (V)
Figure 5. Transfer Characteristics



T_J , Junction Temperature ($^\circ\text{C}$)
Figure 6. On-Resistance vs. Temperature

Typical Characteristics

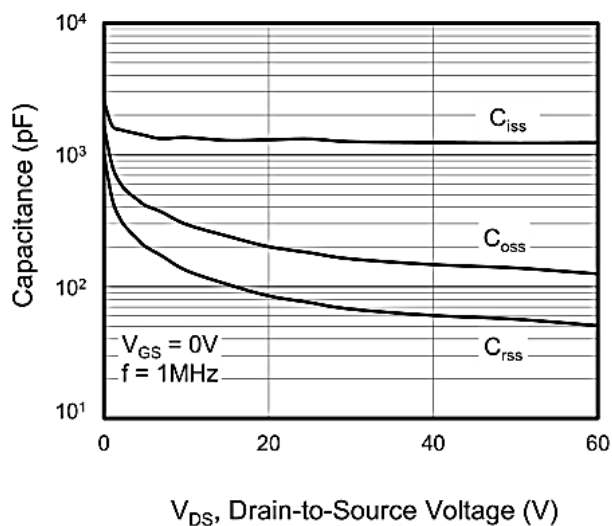


Figure 7. Capacitance

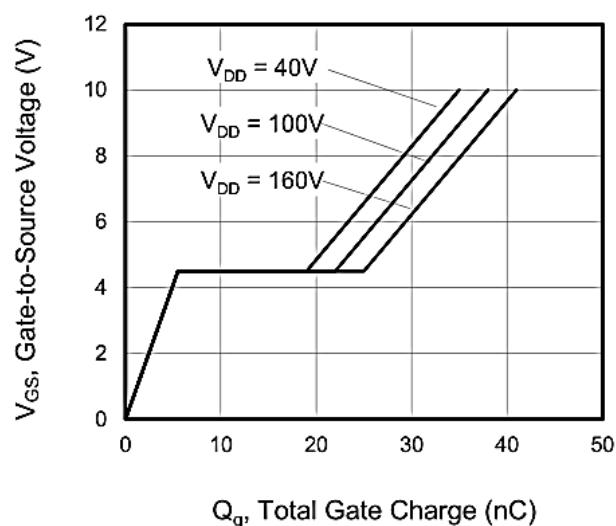


Figure 8. Gate Charge

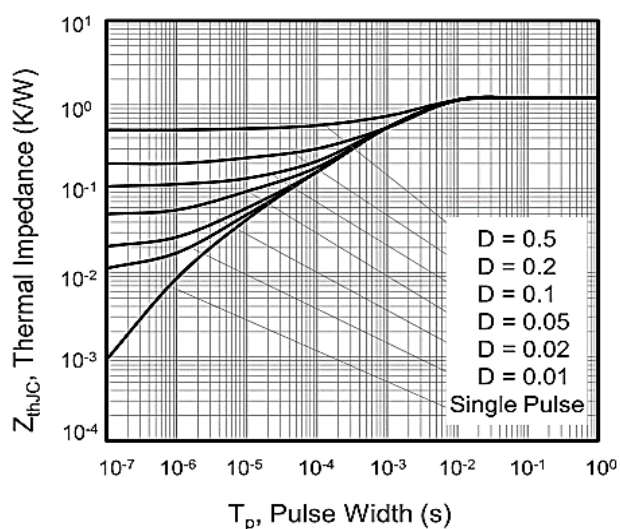
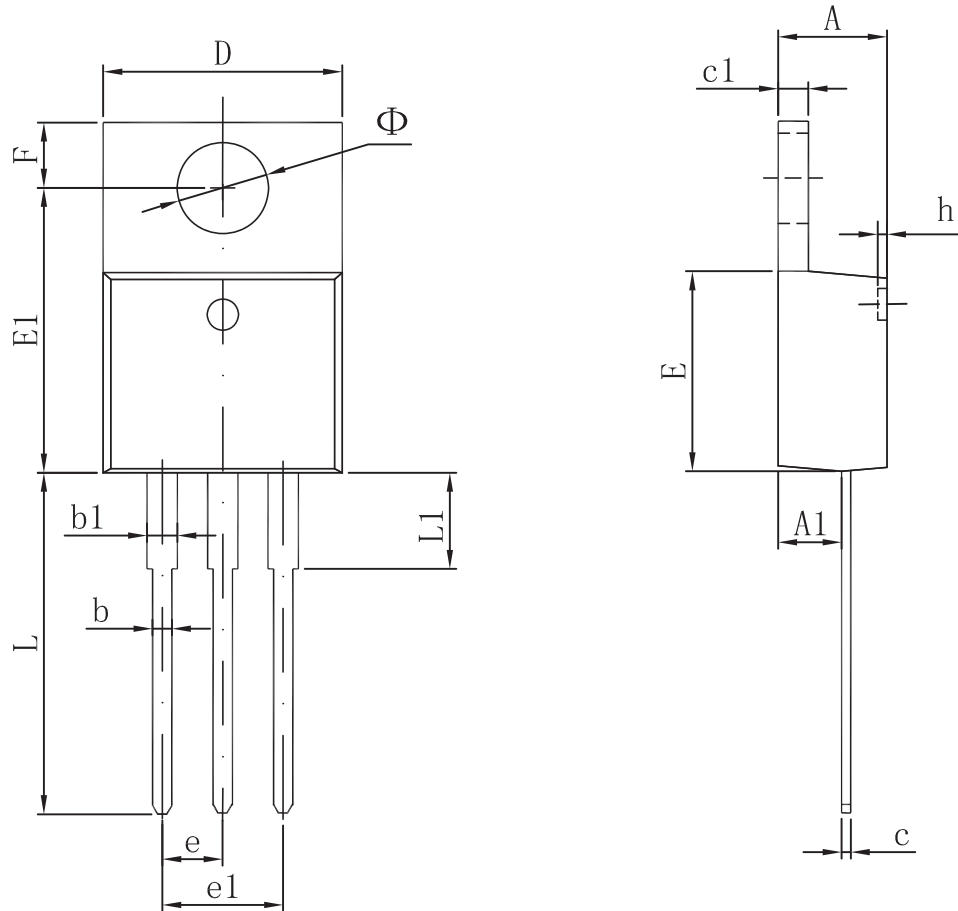


Figure 10. Transient Thermal Impedance

Packaging information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	4.470	4.670	0.176	0.184
A1	2.520	2.820	0.099	0.111
b	0.710	0.910	0.028	0.036
b1	1.170	1.370	0.046	0.054
c	0.310	0.530	0.012	0.021
c1	1.170	1.370	0.046	0.054
D	10.010	10.310	0.394	0.406
E	8.500	8.900	0.335	0.350
E1	12.060	12.460	0.475	0.491
e	2.540 TYP		0.100 TYP	
e1	4.980	5.180	0.196	0.204
F	2.590	2.890	0.102	0.114
h	0.000	0.300	0.000	0.012
L	13.400	13.800	0.528	0.543
L1	3.560	3.960	0.140	0.156
Φ	3.735	3.935	0.147	0.155

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