

## 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

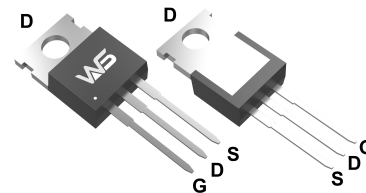
## Product Summary

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

## Applications

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

## TO-220F Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	200	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	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 <sup>2</sup>	72	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	340	mJ
$P_D$	Total Power Dissipation <sup>3</sup>	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 <sup>1</sup>	---	62.5	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	1.2	$^\circ C/W$

**Electrical Characteristics (T<sub>J</sub>=25 °C, unless otherwise noted)**

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

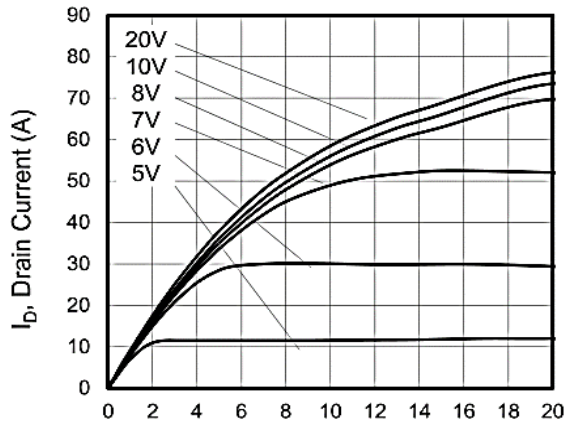
**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,6</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	18	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,6</sup>		---	---	72	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =18A, T <sub>J</sub> =25°C	---	---	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =18A, dI/dt=100A/μs, T <sub>J</sub> =25°C	---	230	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	1800	---	nC

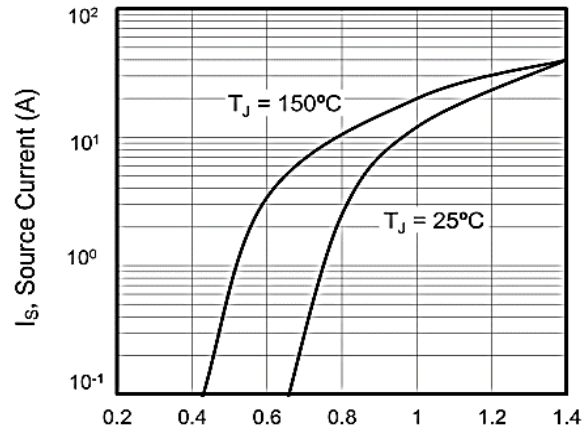
**Notes:**

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<sub>J</sub>=25°C, V<sub>DD</sub>=50V, V<sub>G</sub>=10V, L=0.5mH, R<sub>G</sub>=25Ω

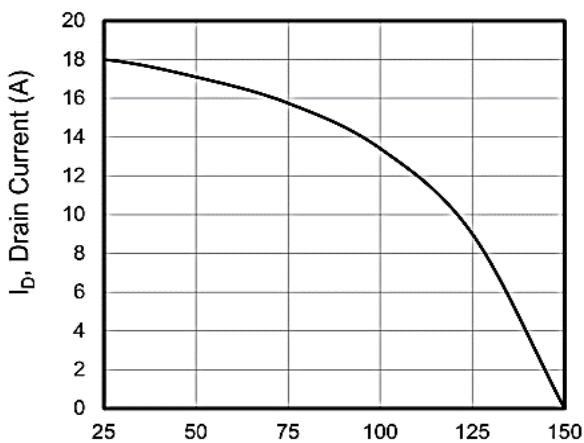
**Typical Characteristics**



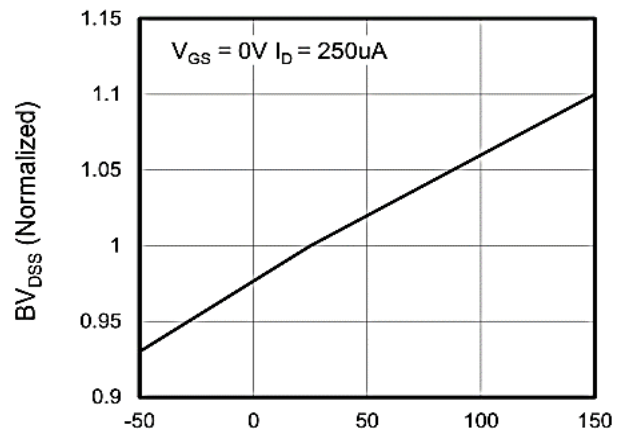
$V_{DS}$ , Drain-to-Source Voltage (V)  
**Figure 1. Output Characteristics ( $T_J = 25^\circ\text{C}$ )**



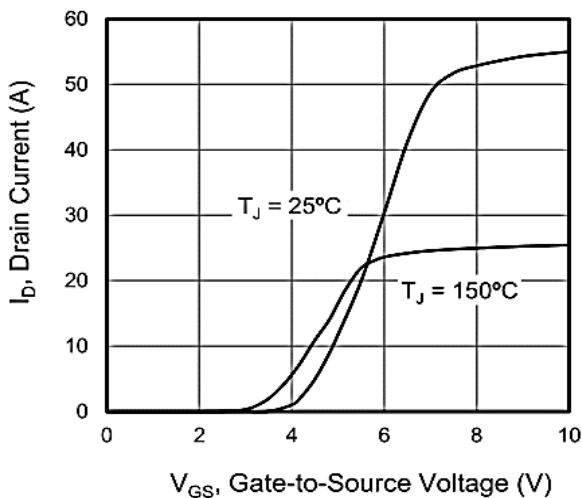
$V_{SD}$ , Source-to-Drain Voltage (V)  
**Figure 2. Body Diode Forward Voltage**



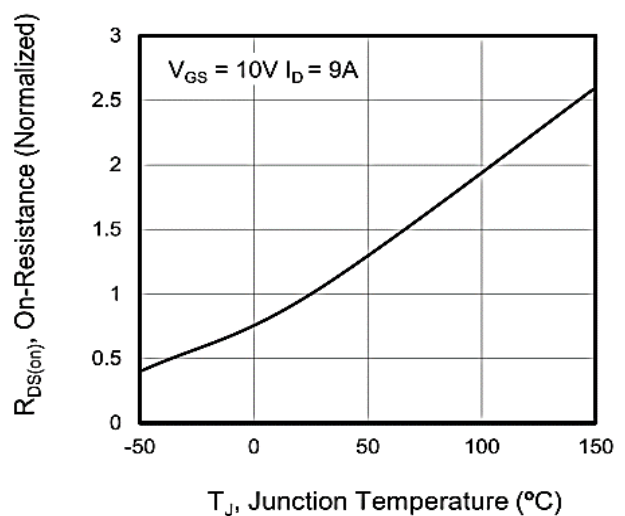
$T_C$ , Case Temperature (A)  
**Figure 3. Drain Current vs. Temperature**



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

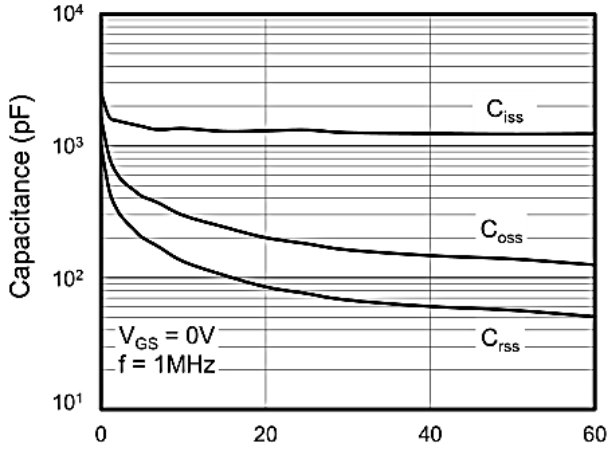


$V_{GS}$ , Gate-to-Source Voltage (V)  
**Figure 5. Transfer Characteristics**



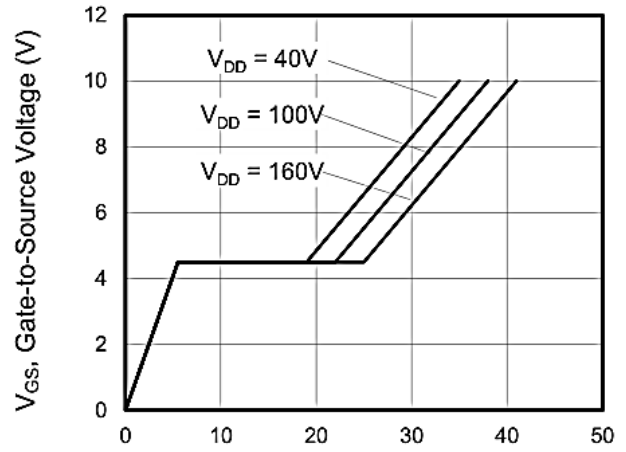
$T_J$ , Junction Temperature ( $^\circ\text{C}$ )  
**Figure 6. On-Resistance vs. Temperature**

**Typical Characteristics**



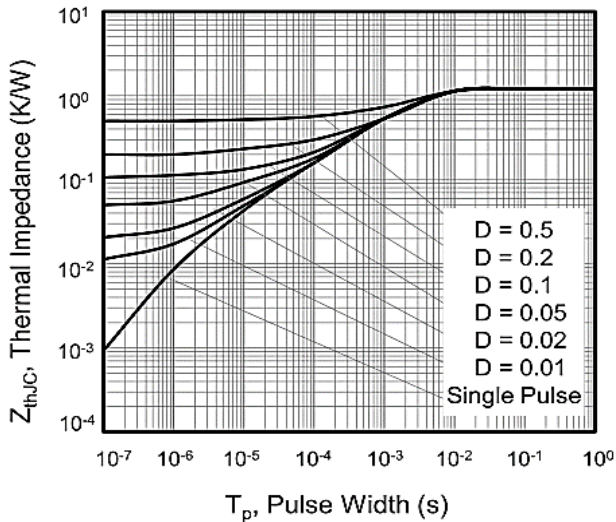
$V_{DS}$ , Drain-to-Source Voltage (V)

**Figure 7. Capacitance**



$Q_g$ , Total Gate Charge (nC)

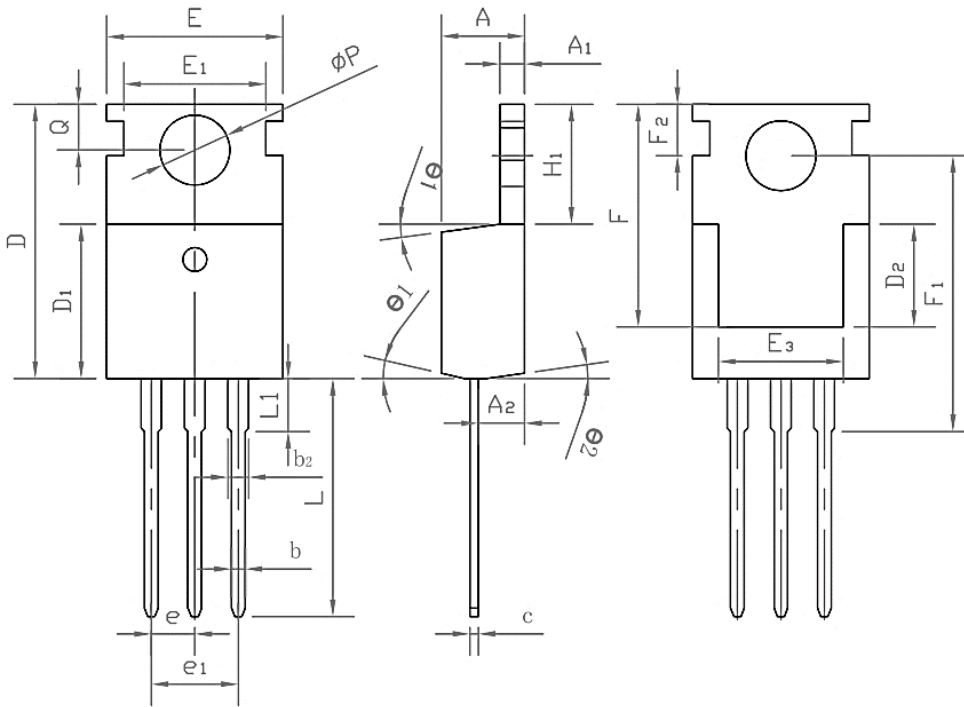
**Figure 8. Gate Charge**



$T_p$ , Pulse Width (s)

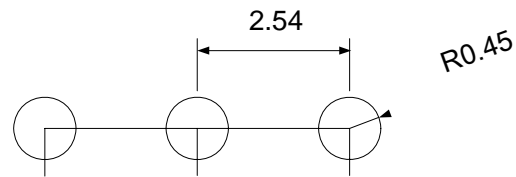
**Figure 10. Transient Thermal Impedance**

**TO-220 Package Information**



TO-220	TO-220			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	4.20	4.80	0.165	0.189
A1	2.34	3.20	0.092	0.126
A2	2.10	2.90	0.083	0.114
b	0.50	0.90	0.020	0.035
b2	0.91	1.90	0.035	0.075
c	0.30	0.80	0.012	0.031
D	8.10	9.40	0.319	0.370
d1	14.50	16.50	0.571	0.650
d2	12.10	12.90	0.476	0.508
E	9.70	10.70	0.382	0.421
e	2.54 BSC		0.100 BSC	
L	13.00	14.50	0.512	0.570
L1	1.60	4.00	0.063	0.157
P	3.00	3.60	0.118	0.142

**RECOMMENDED LAND PATTERN**



UNIT: mm



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