

## General Description

The WSR25N20 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 WSR25N20 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

$BV_{DSS}$	$R_{DSON}$	$I_D$
200V	60mΩ	25A

## 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	±20	V
$I_D@T_C=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	25	A
$I_D@T_C=100^{\circ}C$	Continuous Drain Current, $V_{GS} @ 10V^1$	17	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	100	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	250	mJ
$P_D$	Total Power Dissipation <sup>3</sup>	45	W
$T_{STG}$	Storage Temperature Range	-55 to 175	°C
$T_J$	Operating Junction Temperature Range	-55 to 175	°C

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient <sup>1</sup>	---	3.3	°C/W
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	0.2	°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> =15A	---	60	75	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.0	1.5	2.5	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> =15A	---	32	---	S
Q <sub>g</sub>	Total Gate Charge (10V)	V <sub>DS</sub> =100V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A	---	60	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	19	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	17	---	
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> =15A, R <sub>L</sub> =30Ω	---	10	---	ns
T <sub>r</sub>	Rise Time		---	18	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	22	---	
T <sub>f</sub>	Fall Time		---	5	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =30V, V <sub>GS</sub> =0V, f=1MHz	---	4200	---	pF
C <sub>oss</sub>	Output Capacitance		---	163	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	75	---	

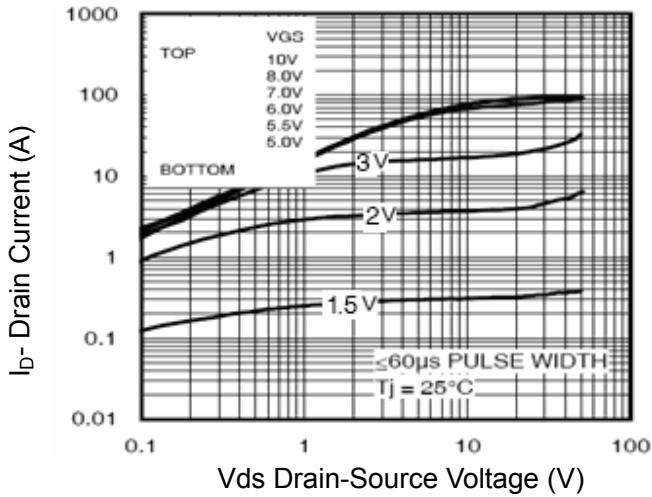
**Diode Characteristics**

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	---	---	24	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,6</sup>		---	---	48	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =12A, T <sub>J</sub> =25°C	---	---	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =12A, dI/dt=100A/μs, T <sub>J</sub> =25°C	---	90	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	300	---	nC

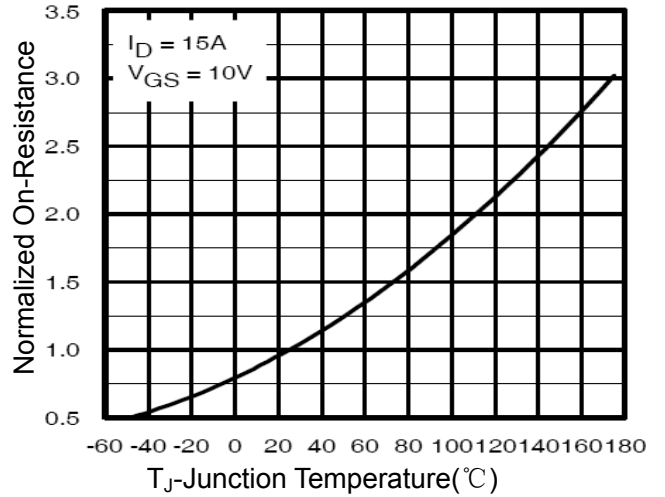
**Notes:**

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

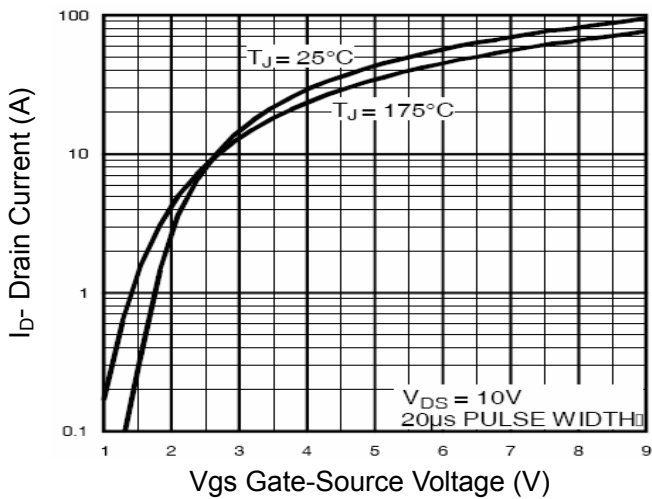
**Typical Characteristics**



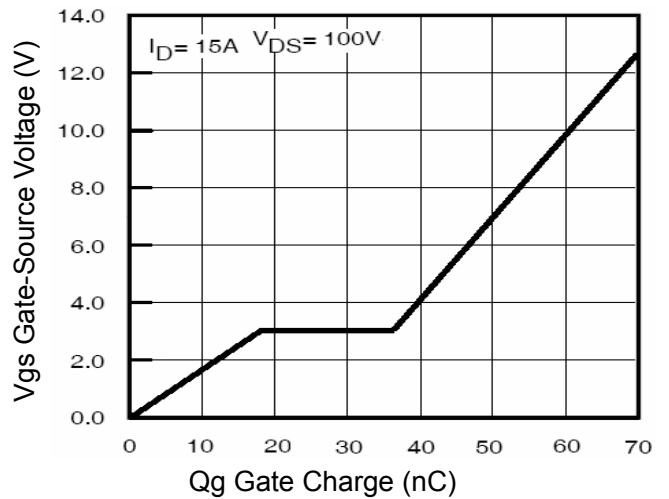
**Figure 1 Output Characteristics**



**Figure 4 Rdson-Junction Temperature**



**Figure 2 Transfer Characteristics**



**Figure 5 Gate Charge**

Typical Characteristics

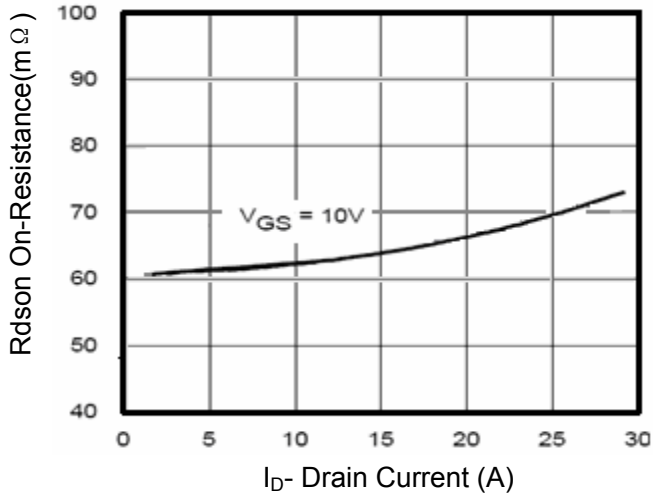


Figure 3 Rdson- Drain Current

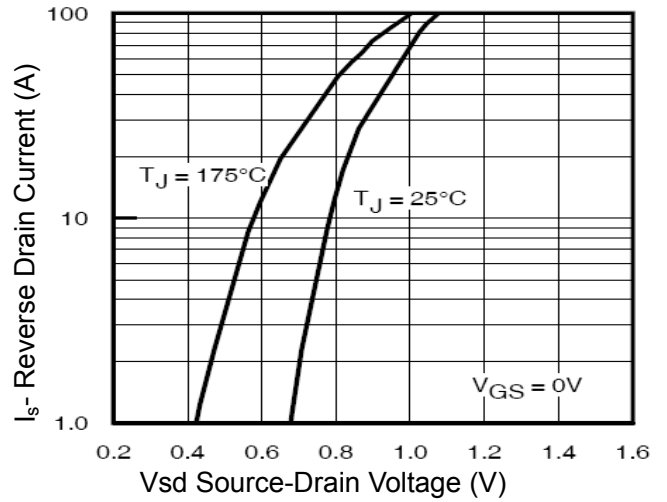


Figure 6 Source- Drain Diode Forward

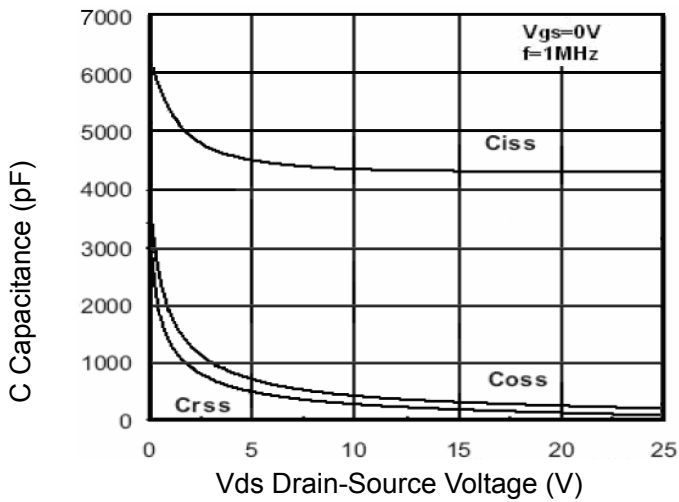


Figure 7 Capacitance vs Vds

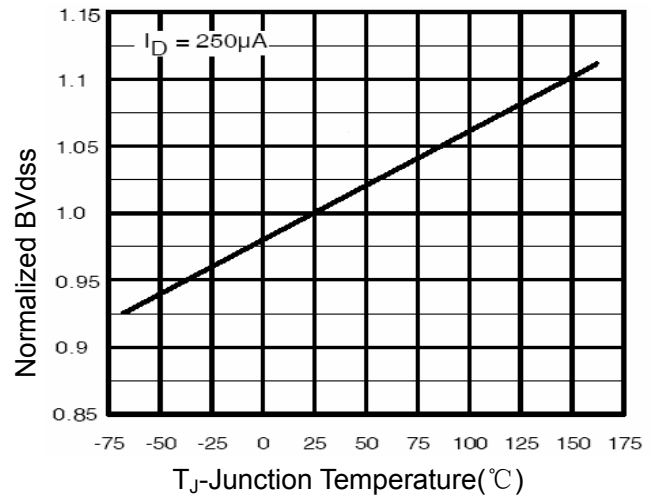
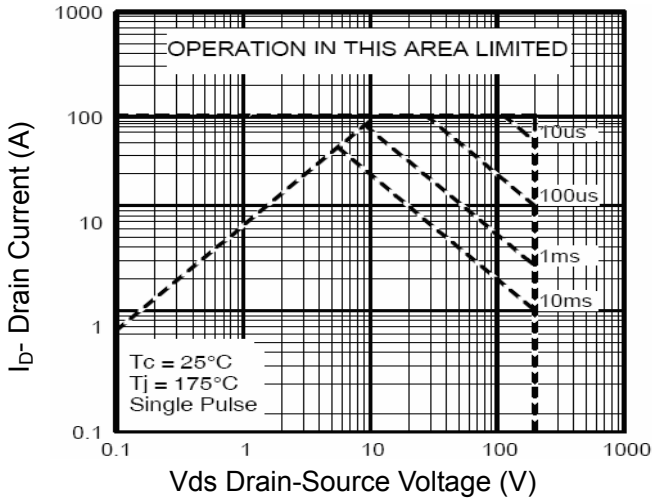
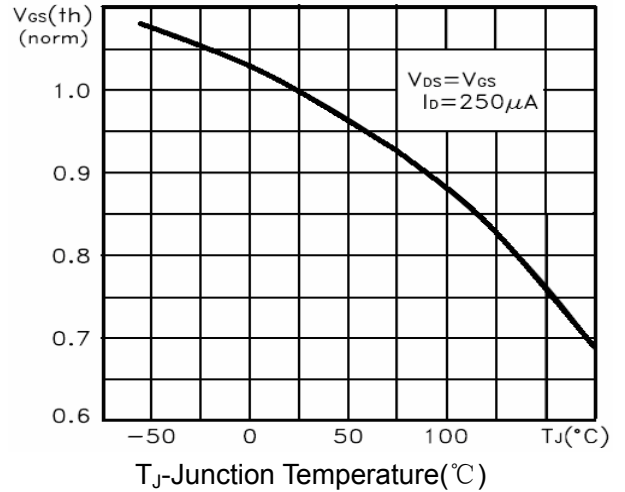


Figure 9 BV<sub>DSS</sub> vs Junction Temperature

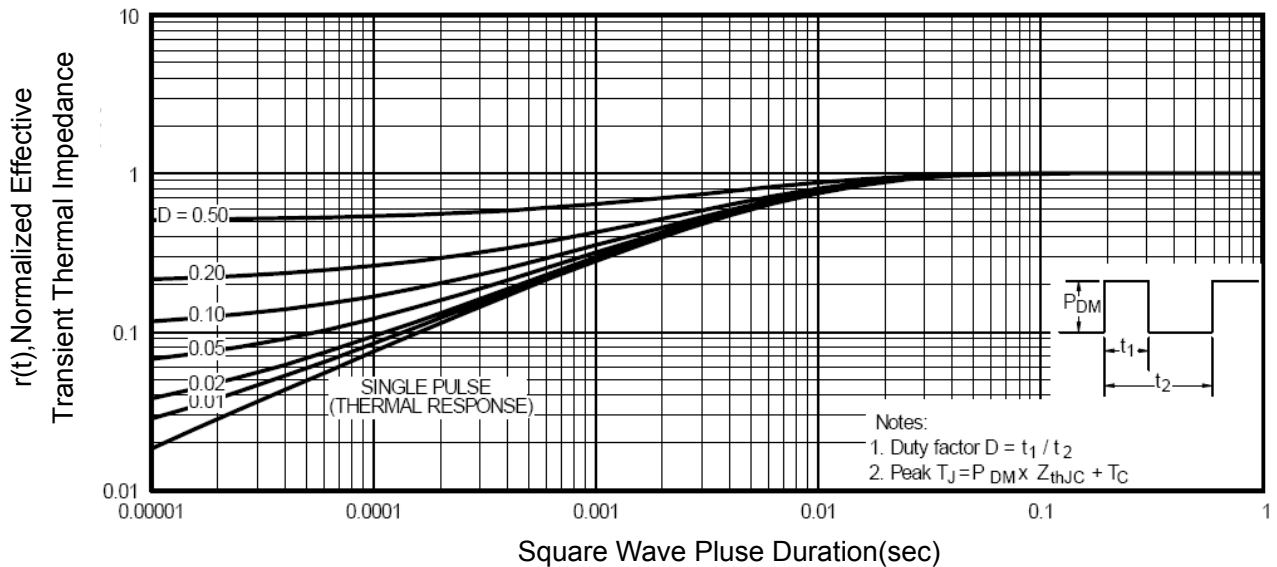
**Typical Characteristics**



**Figure 8 Safe Operation Area**

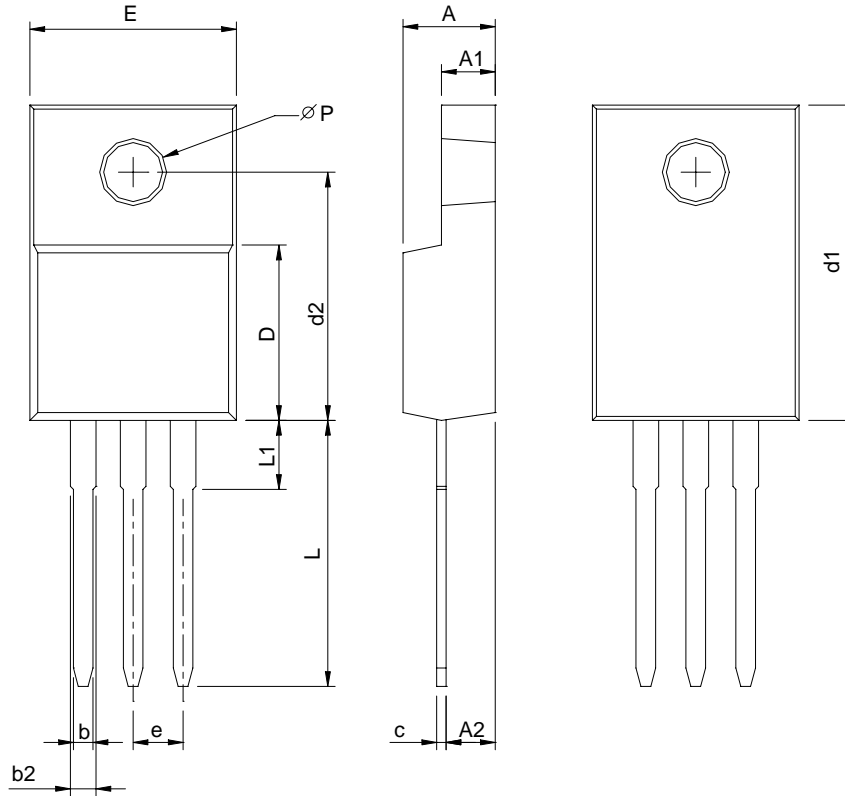


**Figure 10  $V_{GS(th)}$  vs Junction Temperature**



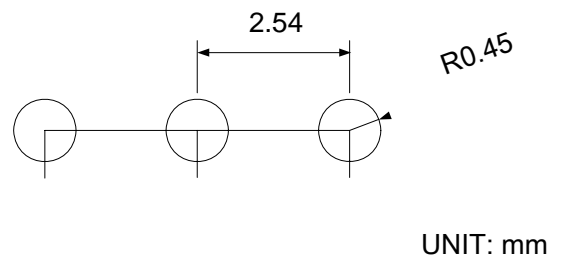
**Figure 11 Normalized Maximum Transient Thermal Impedance**

**TO-220F Package Information**



TO-220F	TO-220F			
	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**





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