

## General Description

The WST2304 is the highest performance trench N-ch MOSFET with extreme high cell density, which provide excellent RDSON and gate charge, for most of the small power switching and load switch applications.

The WST2304 meet the RoHS and Green Product requirement with full function reliability approved.

## Features

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

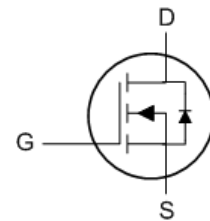
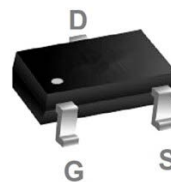
## Product Summary

BVDSS	RDSON	ID
20V	20mΩ	6.3A

## Applications

- Power management in portable and battery operated products
- One cell battery pack protection
- Load Switch

## SOT-23N Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	20	V
$V_{GS}$	Gate-Source Voltage	$\pm 8$	V
$I_D@T_c=25^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 4.5\text{V}^1$	6.3	A
$I_D@T_c=70^\circ\text{C}$	Continuous Drain Current, $V_{GS} @ 4.5\text{V}^1$	5.0	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	22	A
$P_D@T_A=25^\circ\text{C}$	Total Power Dissipation <sup>3</sup>	1.0	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ\text{C}$

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-ambient <sup>1</sup>	---	110	$^\circ\text{C/W}$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	70	$^\circ\text{C/W}$

**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	20	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BVDSS Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.028	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A	---	20	25	mΩ
		V <sub>GS</sub> =2.5V, I <sub>D</sub> =3A	---	24	35	
		V <sub>GS</sub> =1.8V, I <sub>D</sub> =2A	---	32	44	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	0.3	0.7	1.0	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-3.21	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =16V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =5A	---	24	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	1.8	4.2	Ω
Q <sub>g</sub>	Total Gate Charge (4.5V)	V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A	---	8.5	13	nC
Q <sub>gs</sub>	Gate-Source Charge		---	1.56	2.5	
Q <sub>gd</sub>	Gate-Drain Charge		---	2.6	4.7	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =10V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω I <sub>D</sub> =5A	---	6.0	8.7	ns
T <sub>r</sub>	Rise Time		---	27	50	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	23	38	
T <sub>f</sub>	Fall Time		---	8.5	17.1	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	---	574	---	pF
C <sub>oss</sub>	Output Capacitance		---	67	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	60	---	

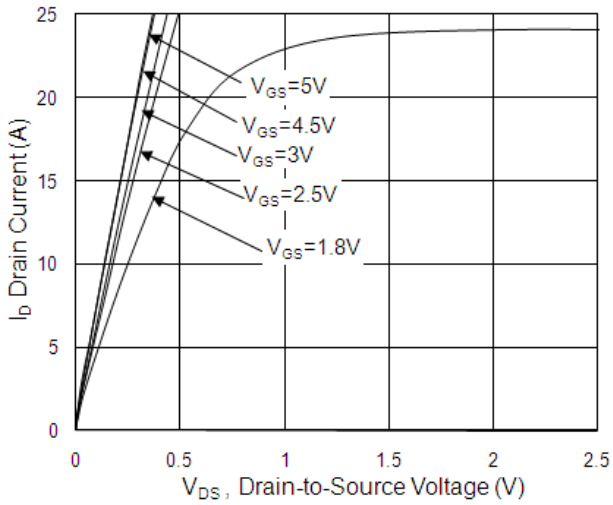
**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,4</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	2.8	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,4</sup>		---	---	22	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C	---	---	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =5A, di/dt=100A/μs, T <sub>J</sub> =25°C	---	10.2	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	2.9	---	nC

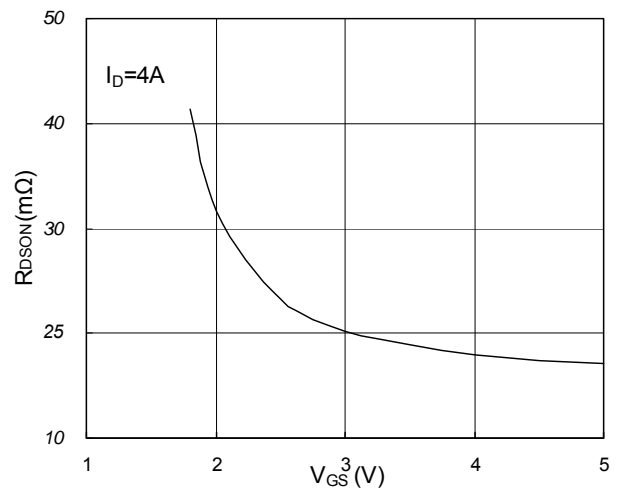
Note :

1. The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper, t<10sec.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
3. The power dissipation is limited by 150°C junction temperature
4. The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.

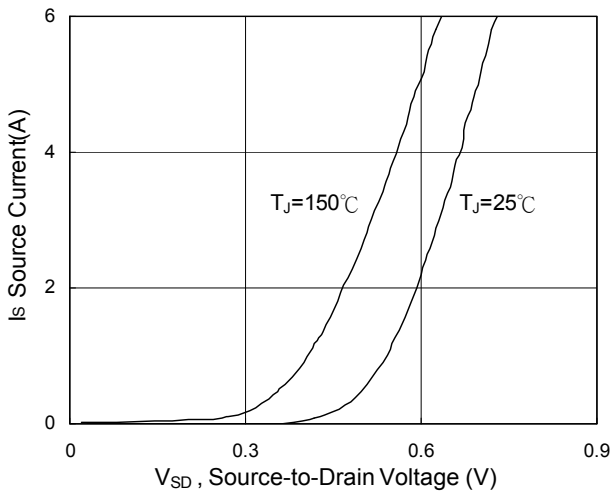
**Typical Characteristics**



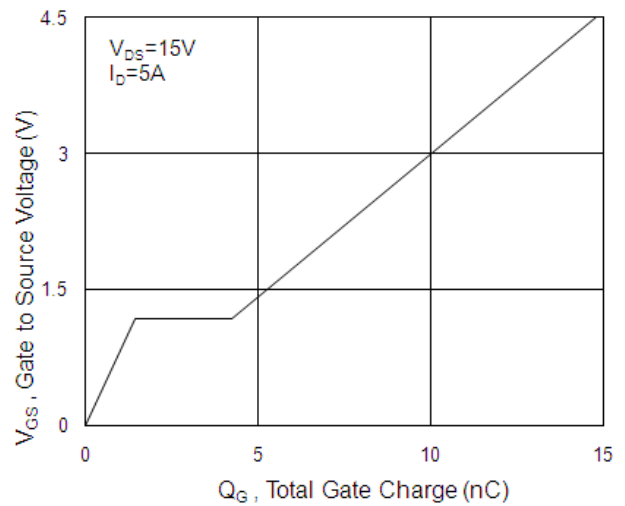
**Fig.1 Typical Output Characteristics**



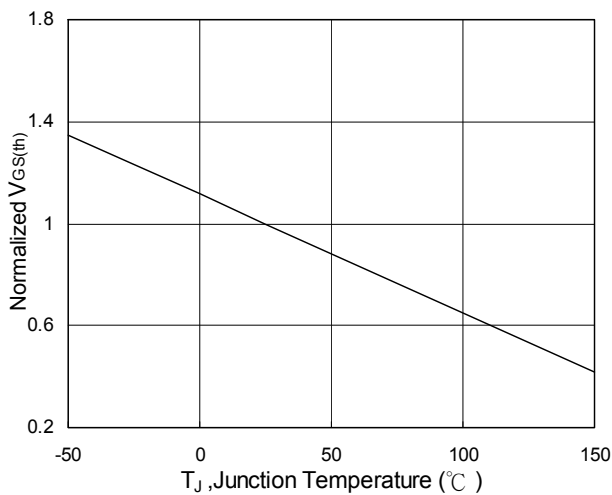
**Fig.2 On-Resistance vs. Gate-Source**



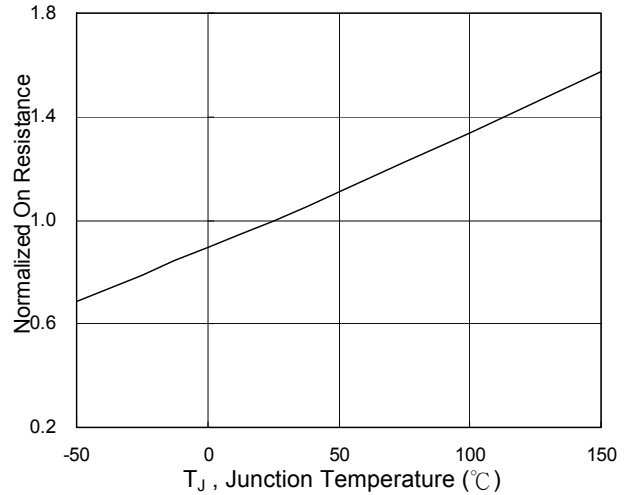
**Fig.3 Forward Characteristics of reverse**



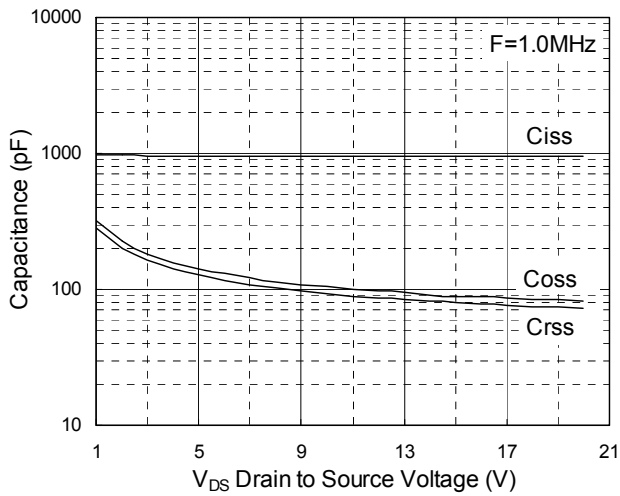
**Fig.4 Gate-Charge Characteristics**



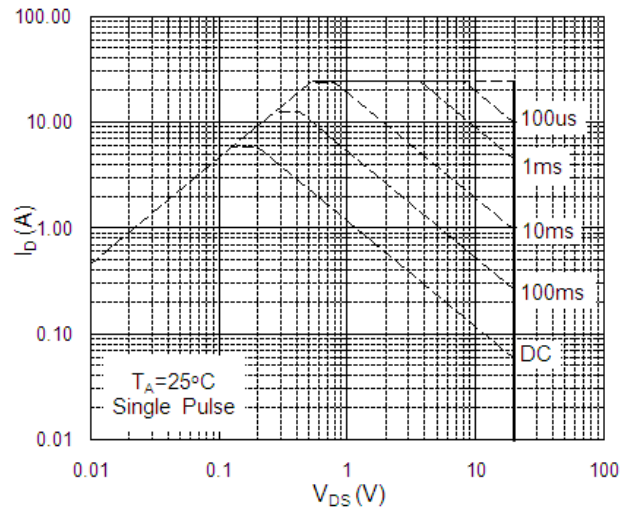
**Fig.5 V<sub>GS(th)</sub> vs. T<sub>J</sub>**



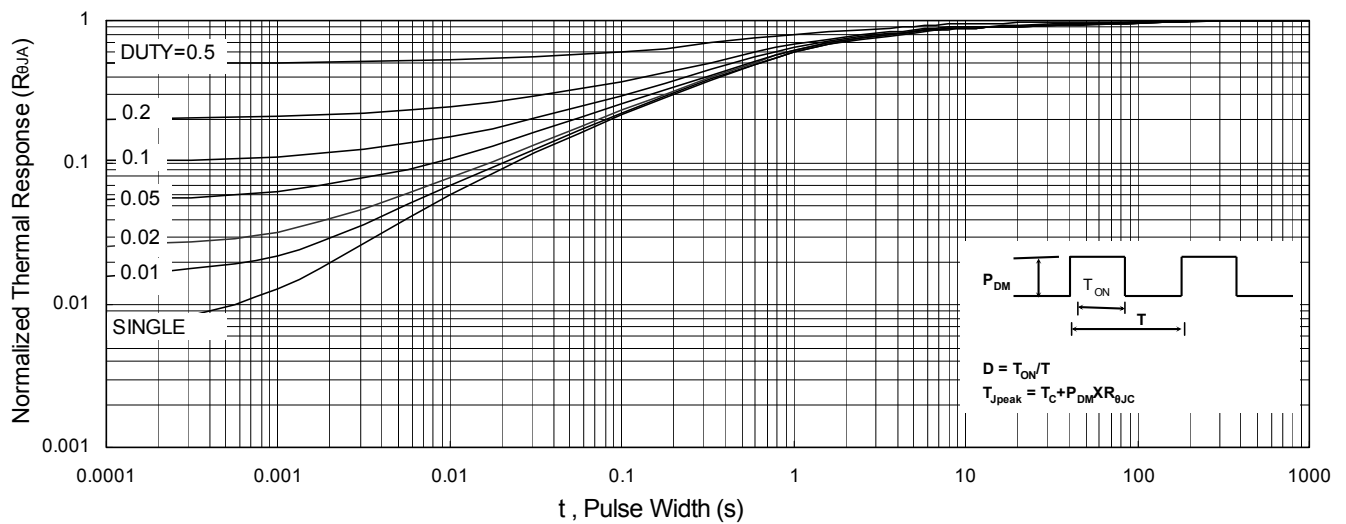
**Fig.6 Normalized R<sub>DSon</sub> vs. T<sub>J</sub>**



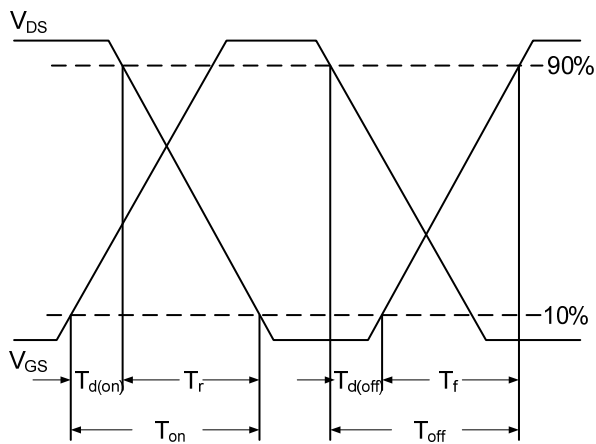
**Fig.7 Capacitance**



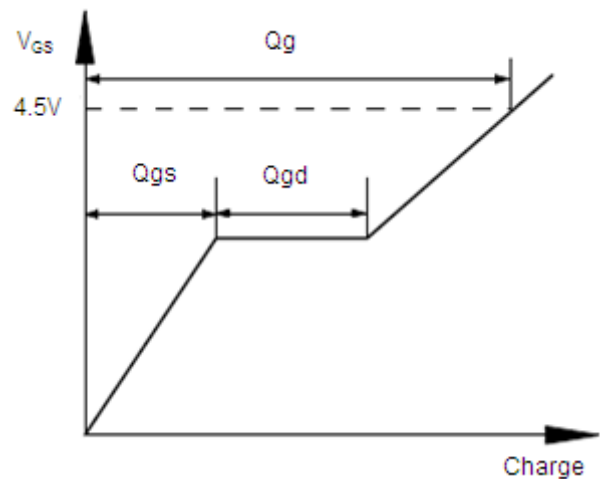
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**



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