

## General Description

The WST3013 is the highest performance trench P-Ch MOSFET with extreme high cell density, which provide excellent  $R_{DS(on)}$  and gate charge for most of the synchronous buck converter applications.

The WST3013 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

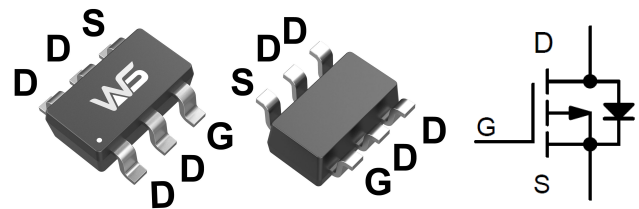
## Product Summary

$BV_{DSS}$	$R_{DS(on)}$	$I_D$
-12V	38m $\Omega$	-4.4A

## Applications

- Portable Equipment and Battery Powered Systems.
- Power Management in Notebook Computer

## SOT- 23-6L Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-12	V
$V_{GS}$	Gate-Source Voltage	$\pm 8$	V
$I_D@T_A=25^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-4.4	A
$I_D@T_A=70^\circ C$	Continuous Drain Current, $V_{GS} @ -4.5V^1$	-3.5	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-17.7	A
$P_D@T_A=25^\circ C$	Total Power Dissipation <sup>3</sup>	2.1	W
$T_{STG}$	Storage Temperature Range	-55 to 150	$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150	$^\circ C$

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup>	---	100	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	80	$^\circ C/W$

**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	-12	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =-1mA	---	-0.014	---	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> =-4.4A	---	38	60	mΩ
		V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3.5A	---	47	90	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA	-0.5	-0.7	-1.0	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	3.95	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =-8V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	-1	uA
		V <sub>DS</sub> =-8V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	-5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±8V, V <sub>DS</sub> =0V	---	---	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A	---	8	---	S
Q <sub>g</sub>	Total Gate Charge (-4.5V)	V <sub>DS</sub> =-10V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.4A	---	5.2	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	0.7	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	1.8	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =-10V, V <sub>GEN</sub> =-4.5V, R <sub>G</sub> =6Ω, I <sub>D</sub> =-1A, R <sub>L</sub> =10Ω.	---	5.6	---	ns
T <sub>r</sub>	Rise Time		---	13.2	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	21	---	
T <sub>f</sub>	Fall Time		---	4.5	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =-10V, V <sub>GS</sub> =0V, f=1MHz	---	357	---	pF
C <sub>oss</sub>	Output Capacitance		---	72	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	61	---	

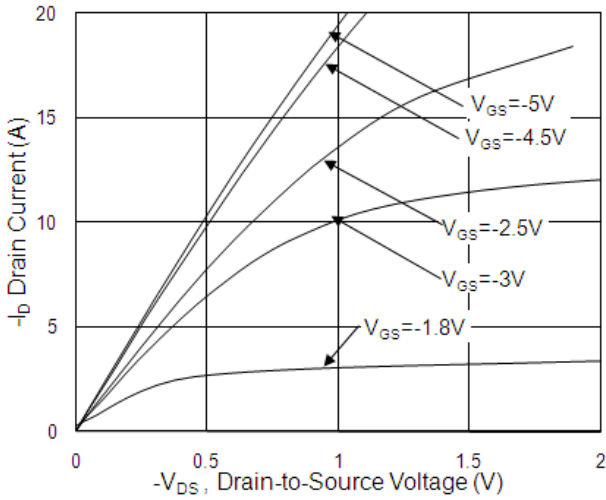
**Diode Characteristics**

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	---	---	-1	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,4</sup>		---	---	-17.7	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	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =-4.4A, dI/dt=100A/μs, T <sub>J</sub> =25°C	---	12	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	6.6	---	nC

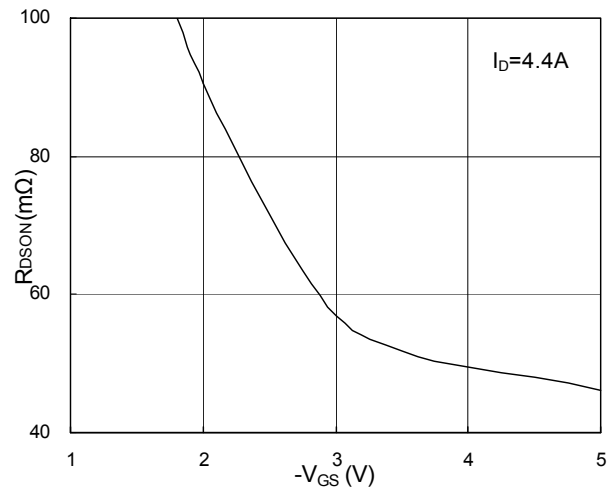
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup>FR-4 board with 2OZ copper.
- 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.

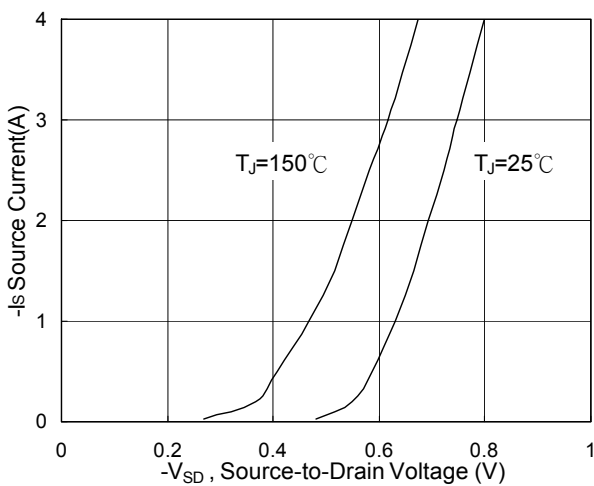
**Typical Characteristics**



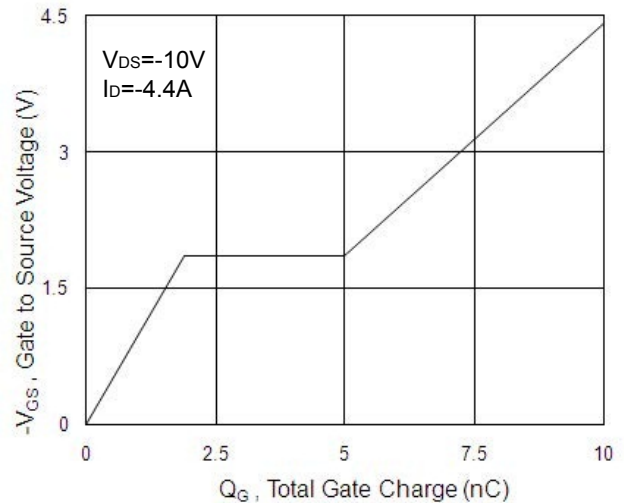
**Fig.1 Typical Output Characteristics**



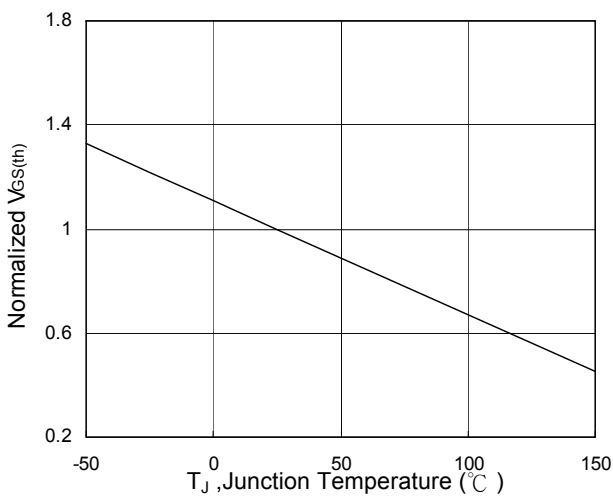
**Fig.2 On-Resistance vs. G-S Voltage**



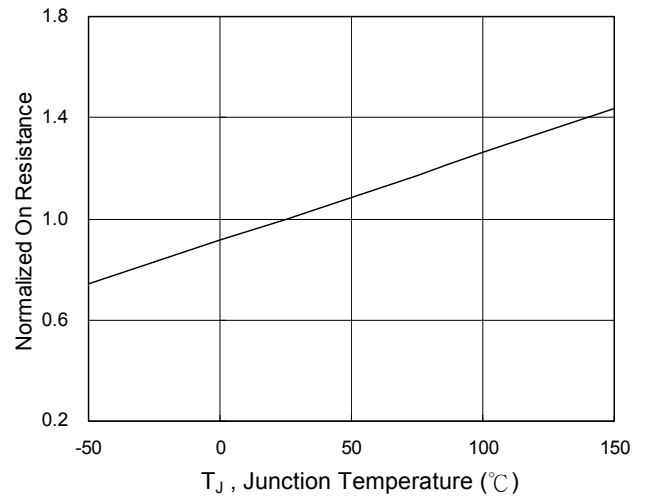
**Fig.3 Forward Characteristics of Reverse**



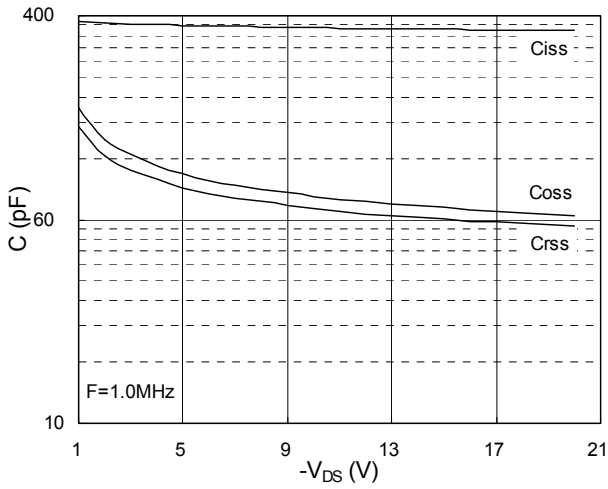
**Fig.4 Gate-charge Characteristics**



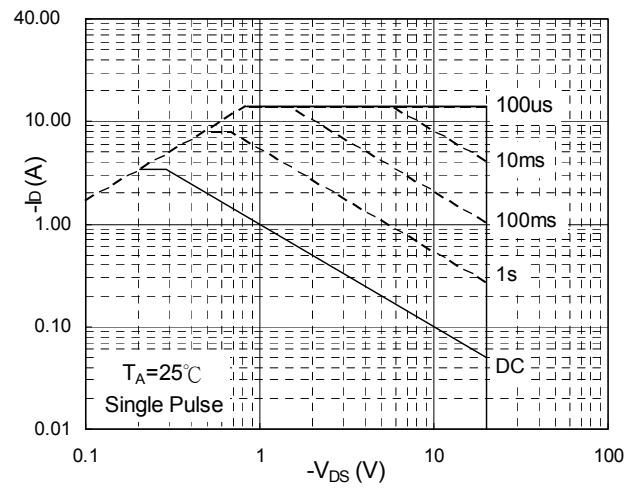
**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



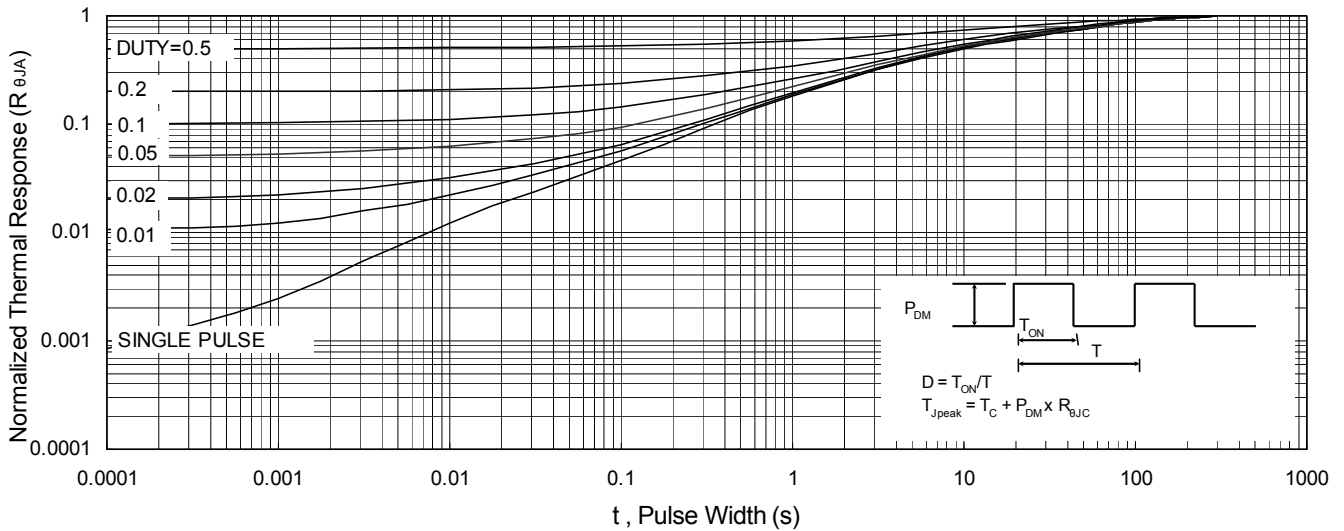
**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**



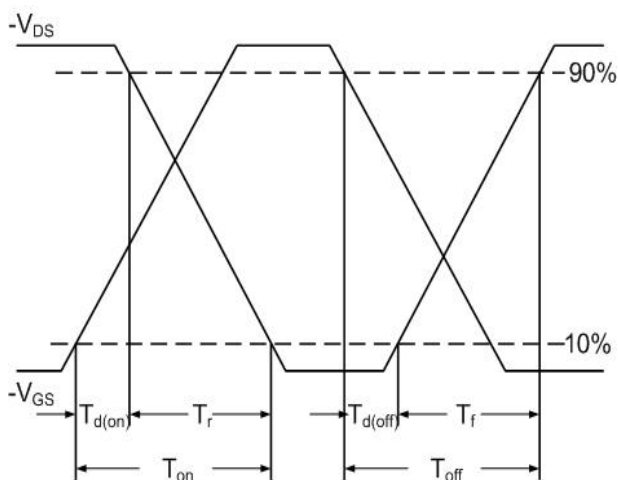
**Fig.7 Capacitance**



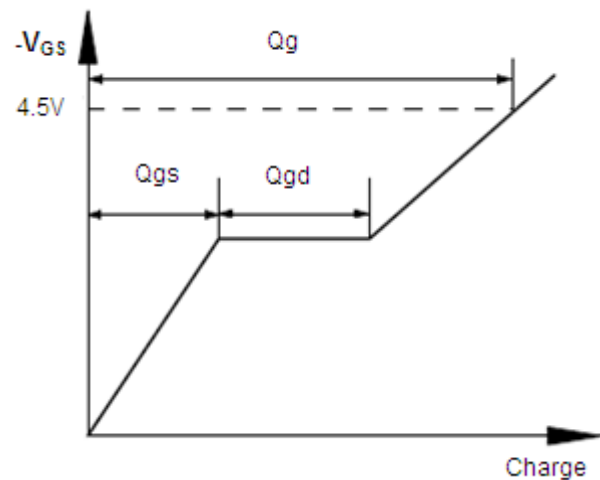
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**



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