

## General Description

The WSP4953A is the highest performance trench P-ch MOSFETs with extreme high cell density , which provide excellent  $R_{DS(on)}$  and gate charge for most of the synchronous buck converter applications .

The WSP4953A 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

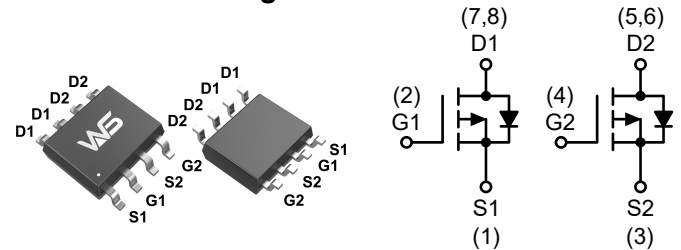
## Product Summary

$BV_{DSS}$	$R_{DS(on)}$	$I_D$
-20V	40m $\Omega$	-5.8A

## Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- Load Switch

## SOP-8L Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	-20	V
$V_{GS}$	Gate-Source Voltage	$\pm 12$	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $-V_{GS} @ -10V^1$	-5.8	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $-V_{GS} @ -10V^1$	-4.6	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-20	A
$P_D@T_C=25^\circ C$	Total Power Dissipation <sup>3</sup>	2.0	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>	---	62.5	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	36	$^\circ C/W$

**Electrical Characteristics ( $T_J=25^\circ\text{C}$ , unless otherwise noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V, I_D=-250\mu A$	-20	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to $25^\circ\text{C}$ , $I_D=-1mA$	---	-0.02	---	V/ $^\circ\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-10V, I_D=-5.8A$	---	40	55	m $\Omega$
		$V_{GS}=-4.5V, I_D=-3.5A$	---	60	85	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}, I_D=-250\mu A$	-1.0	-1.5	-2.0	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	4.32	---	mV/ $^\circ\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-16V, V_{GS}=0V, T_J=25^\circ\text{C}$	---	---	-1	$\mu A$
		$V_{DS}=-16V, V_{GS}=0V, T_J=55^\circ\text{C}$	---	---	-5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V, V_{DS}=0V$	---	---	$\pm 100$	nA
$g_{fs}$	Forward Transconductance	$V_{DS}=-5V, I_D=-3A$	---	5.5	---	S
$R_g$	Gate Resistance	$V_{DS}=0V, V_{GS}=0V, f=1MHz$	---	24	48	$\Omega$
$Q_g$	Total Gate Charge (-4.5V)	$V_{DS}=-16V, V_{GS}=-4.5V, I_D=-5.8A$	---	11.6	16	nC
$Q_{gs}$	Gate-Source Charge		---	1.3	---	
$Q_{gd}$	Gate-Drain Charge		---	2.5	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V, V_{GS}=-10V, R_G=6\Omega$ $I_D=-1A, R_G=10\Omega$	---	6	12	ns
$T_r$	Rise Time		---	12	23	
$T_{d(off)}$	Turn-Off Delay Time		---	6	12	
$T_f$	Fall Time		---	25	46	
$C_{iss}$	Input Capacitance	$V_{DS}=-15V, V_{GS}=0V, f=1MHz$	---	625	---	pF
$C_{oss}$	Output Capacitance		---	100	---	
$C_{rss}$	Reverse Transfer Capacitance		---	60	---	

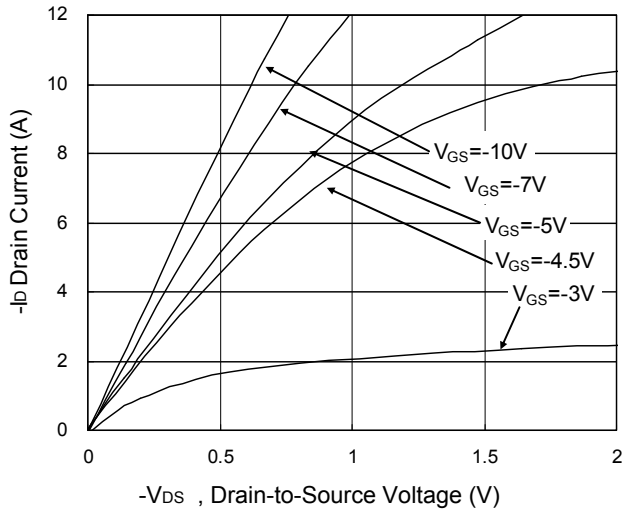
**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current <sup>1,4</sup>	$V_G=V_D=0V$ , Force Current	---	---	-2.0	A
$I_{SM}$	Pulsed Source Current <sup>2,4</sup>		---	---	-20	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V, I_S=-1.7A, T_J=25^\circ\text{C}$	---	---	-1	V

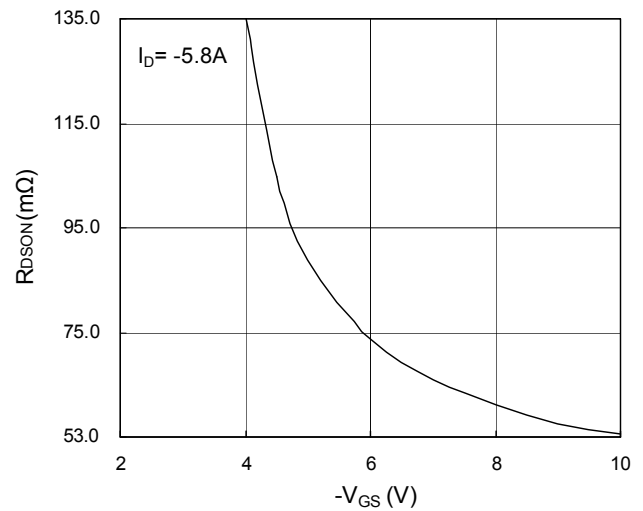
Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper,  $t < 10\text{sec}$ .
- 2.The data tested by pulsed , pulse width  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The power dissipation is limited by  $150^\circ\text{C}$  junction temperature
- 4.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.

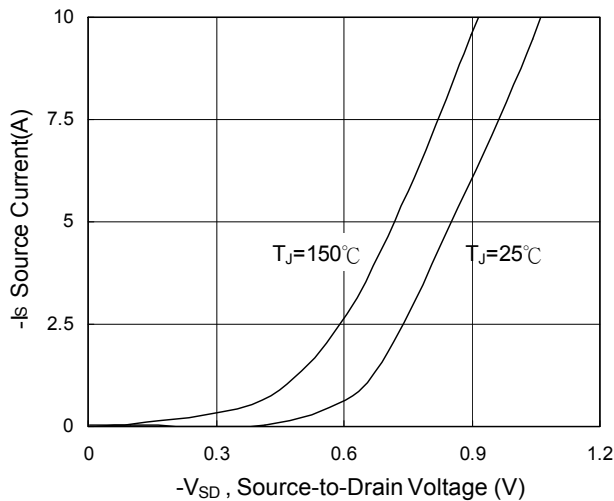
## Typical Characteristics



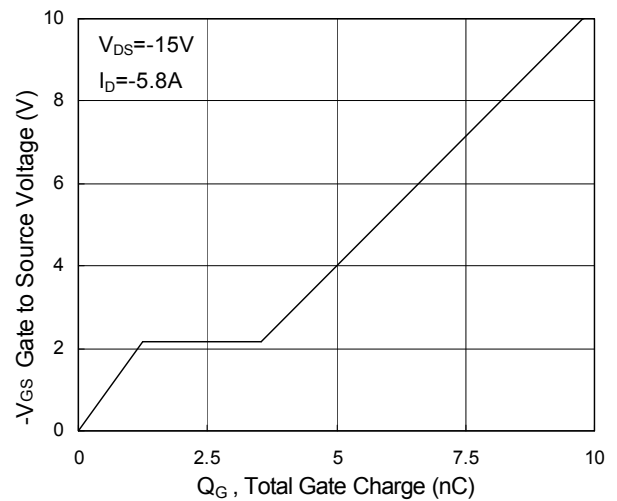
**Fig.1 Typical Output Characteristics**



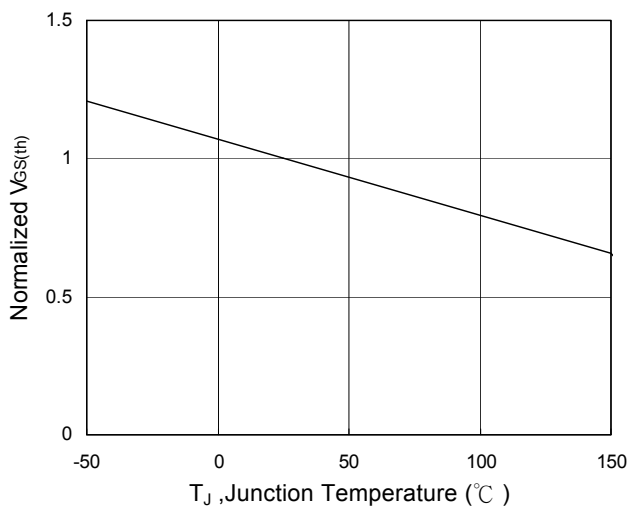
**Fig.2 On-Resistance vs. G-S Voltage**



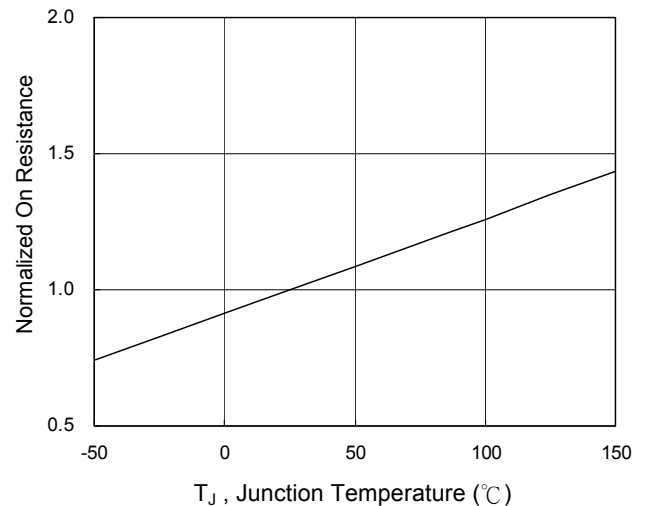
**Fig.3 Forward Characteristics of Reverse**



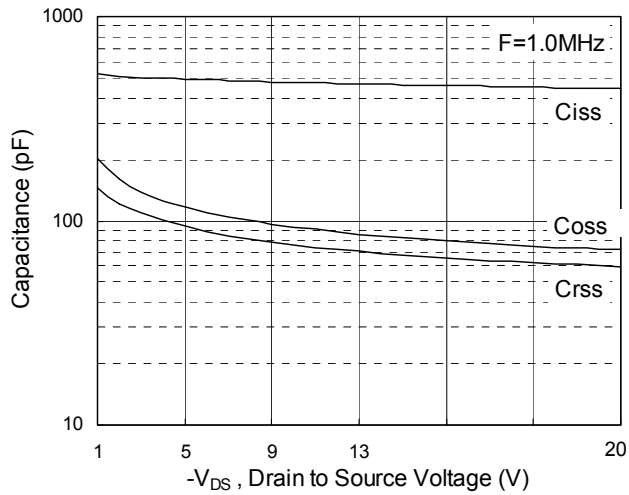
**Fig.4 Gate-Charge Characteristics**



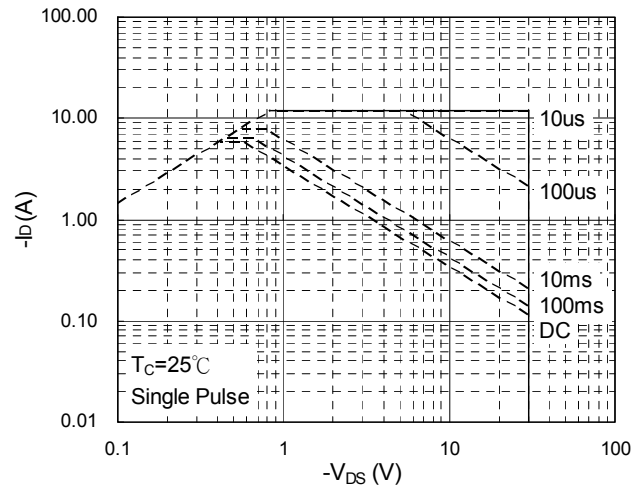
**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**



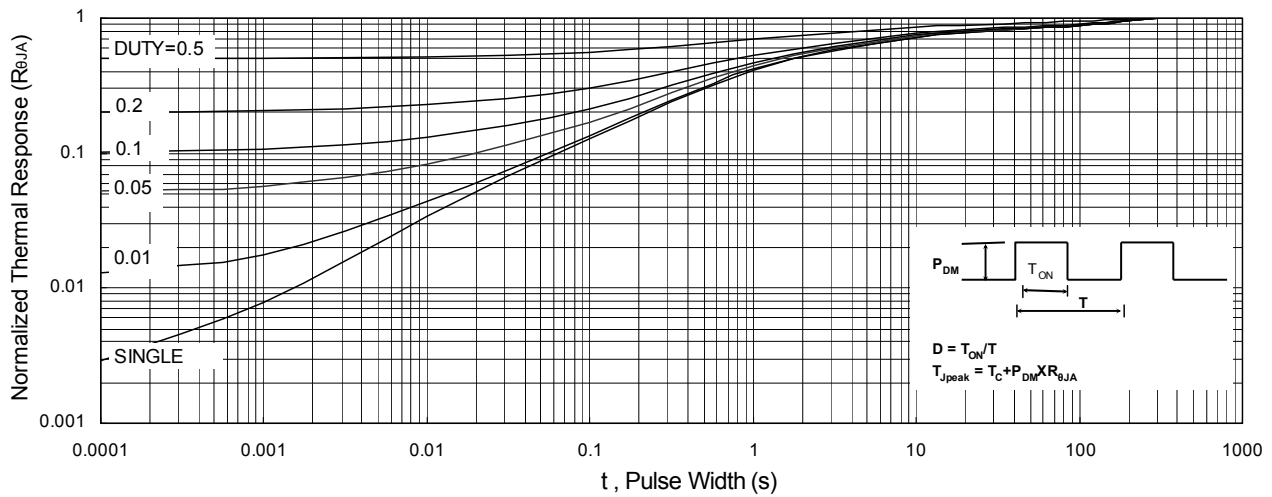
**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**



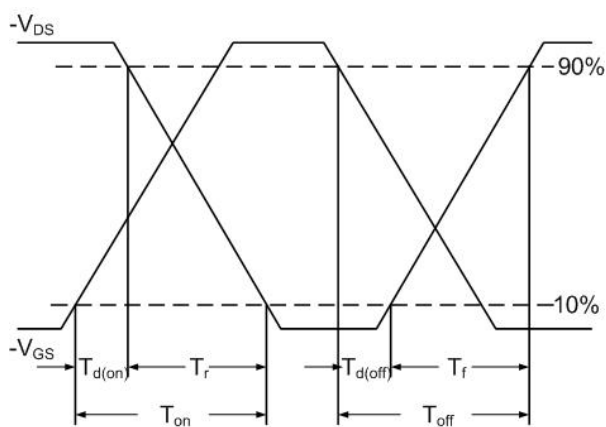
**Fig.7 Capacitance**



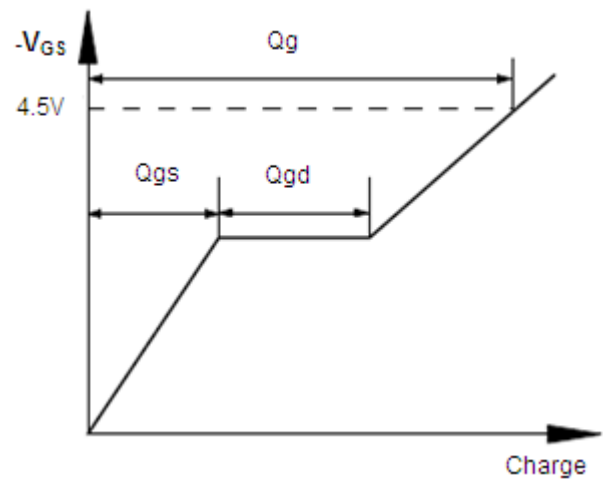
**Fig.8 Safe Operating Area**



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

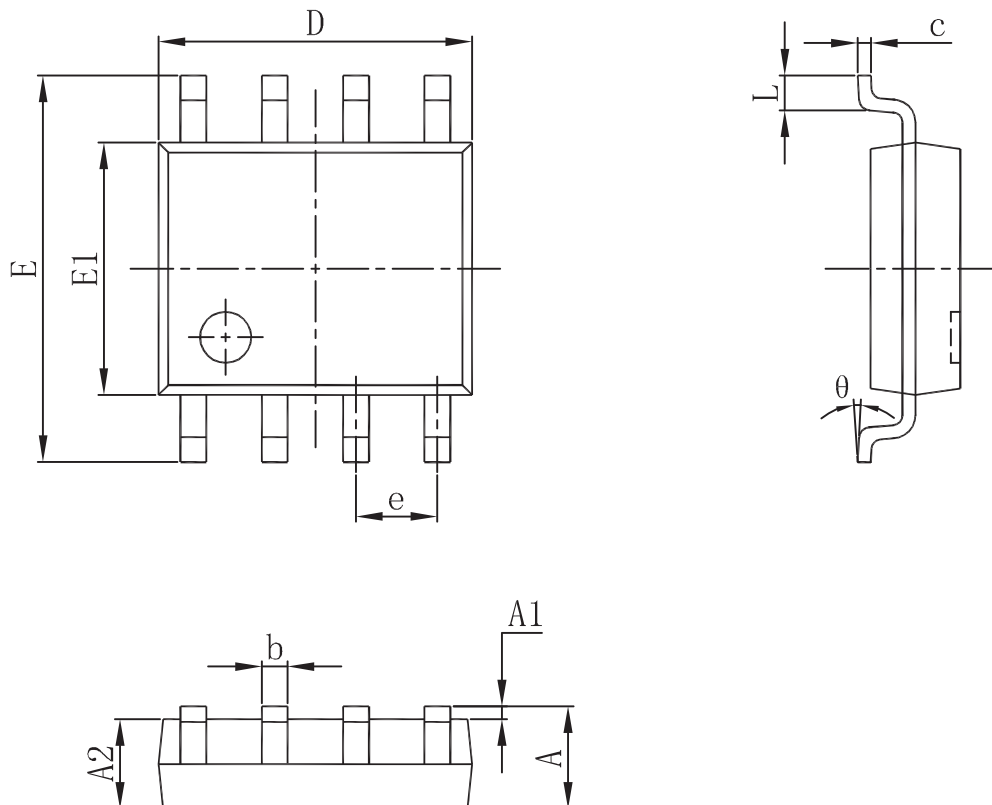


**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**

## Packaging information



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A1	0.100	0.250	0.004	0.010
A2	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	4.800	5.000	0.189	0.197
e	1.270 (BSC)		0.050 (BSC)	
E	5.800	6.200	0.228	0.244
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

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