

## General Description

The WSF70P03 is the highest performance trench P-Ch MOSFET with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The WSF70P03 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
- 100% EAS Guaranteed
- Green Device Available

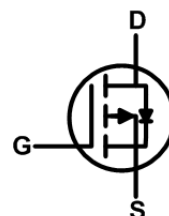
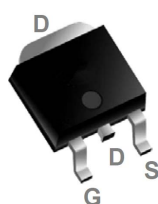
## Product Summery

BVDSS	RDSON	ID
-30V	7.5mΩ	-65A

## Applications

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

## TO-252 Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		10s	Steady State	
$V_{DS}$	Drain-Source Voltage	-30		V
$V_{GS}$	Gate-Source Voltage	$\pm 20$		V
$I_D@T_C=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-57		A
$I_D@T_C=100^{\circ}C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-36		A
$I_D@T_A=25^{\circ}C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-17.8	-11.3	A
$I_D@T_A=70^{\circ}C$	Continuous Drain Current, $V_{GS} @ -10V^1$	-14.2	-9	A
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	-180		A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	408		mJ
$I_{AS}$	Avalanche Current	-55.4		A
$P_D@T_C=25^{\circ}C$	Total Power Dissipation <sup>4</sup>	52.1		W
$P_D@T_A=25^{\circ}C$	Total Power Dissipation <sup>4</sup>	5	2	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	$^{\circ}C/W$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient <sup>1</sup> (t ≤ 10s)	---	25	$^{\circ}C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	2.4	$^{\circ}C/W$

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

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS}=0V$ , $I_D=-250\mu A$	-30	---	---	V
$\Delta BV_{DSS}/\Delta T_J$	$BV_{DSS}$ Temperature Coefficient	Reference to $25^{\circ}\text{C}$ , $I_D=-1\text{mA}$	---	-0.018	---	V/ $^{\circ}\text{C}$
$R_{DS(ON)}$	Static Drain-Source On-Resistance <sup>2</sup>	$V_{GS}=-10V$ , $I_D=-30A$	---	7.5	9.5	$\text{m}\Omega$
		$V_{GS}=-4.5V$ , $I_D=-15A$	---	12	16	
$V_{GS(th)}$	Gate Threshold Voltage	$V_{GS}=V_{DS}$ , $I_D=-250\mu A$	-1.0	-1.6	-2.5	V
$\Delta V_{GS(th)}$	$V_{GS(th)}$ Temperature Coefficient		---	5.04	---	mV/ $^{\circ}\text{C}$
$I_{DSS}$	Drain-Source Leakage Current	$V_{DS}=-24V$ , $V_{GS}=0V$ , $T_J=25^{\circ}\text{C}$	---	---	1	$\mu A$
		$V_{DS}=-24V$ , $V_{GS}=0V$ , $T_J=55^{\circ}\text{C}$	---	---	5	
$I_{GSS}$	Gate-Source Leakage Current	$V_{GS}=\pm 20V$ , $V_{DS}=0V$	---	---	$\pm 100$	nA
$g_{fs}$	Forward Transconductance	$V_{DS}=-5V$ , $I_D=-30A$	---	26.4	---	S
$Q_g$	Total Gate Charge (-4.5V)	$V_{DS}=-15V$ , $V_{GS}=-4.5V$ , $I_D=-15A$	---	33	---	nC
$Q_{gs}$	Gate-Source Charge		---	10.7	---	
$Q_{gd}$	Gate-Drain Charge		---	12.8	---	
$T_{d(on)}$	Turn-On Delay Time	$V_{DD}=-15V$ , $V_{GS}=-10V$ , $R_G=3.3\Omega$ , $I_D=-15A$	---	8	---	ns
$T_r$	Rise Time		---	17.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	78.4	---	
$T_f$	Fall Time		---	43.6	---	
$C_{iss}$	Input Capacitance	$V_{DS}=-15V$ , $V_{GS}=0V$ , $f=1\text{MHz}$	---	3448	---	pF
$C_{oss}$	Output Capacitance		---	508	---	
$C_{rss}$	Reverse Transfer Capacitance		---	421	---	

**Guaranteed Avalanche Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy <sup>5</sup>	$V_{DD}=-25V$ , $L=0.1\text{mH}$ , $I_{AS}=-30A$	120	---	---	mJ

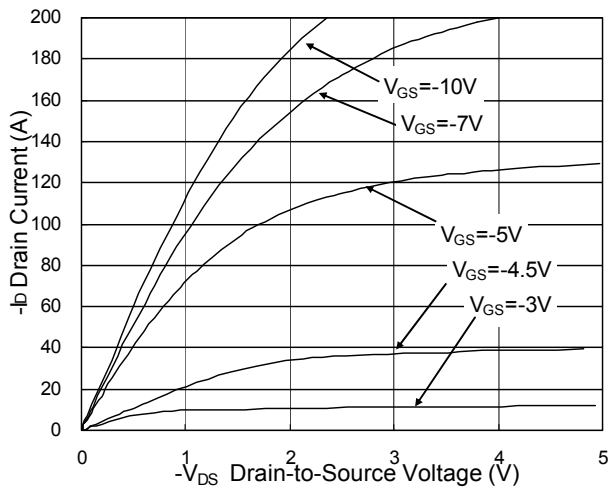
**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
$I_S$	Continuous Source Current <sup>1,6</sup>	$V_G=V_D=0V$ , Force Current	---	---	-18	A
$I_{SM}$	Pulsed Source Current <sup>2,6</sup>		---	---	-180	A
$V_{SD}$	Diode Forward Voltage <sup>2</sup>	$V_{GS}=0V$ , $I_S=-1A$ , $T_J=25^{\circ}\text{C}$	---	---	-1.2	V
$t_{rr}$	Reverse Recovery Time	$I_F=-15A$ , $dI/dt=100A/\mu s$ , $T_J=25^{\circ}\text{C}$	---	29	---	nS
$Q_{rr}$	Reverse Recovery Charge		---	15	---	nC

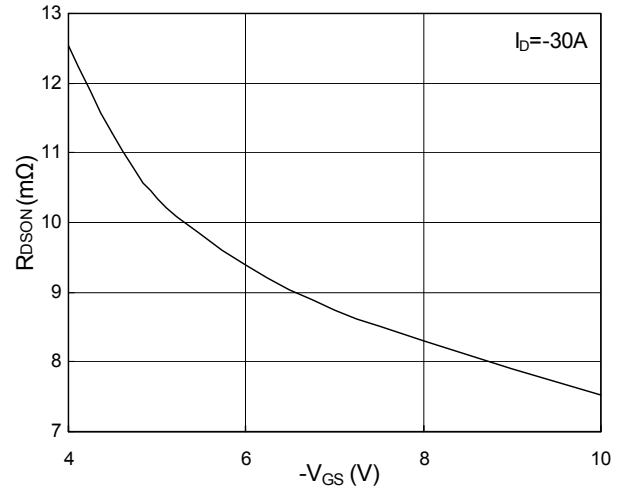
Note :

- 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 EAS data shows Max. rating. The test condition is  $V_{DD}=-25V$ ,  $V_{GS}=-10V$ ,  $L=0.1\text{mH}$ ,  $I_{AS}=-30A$
- 4.The power dissipation is limited by  $150^{\circ}\text{C}$  junction temperature
- 5.The Min. value is 100% EAS tested guarantee.
- 6.The data is theoretically the same as  $I_D$  and  $I_{DM}$ , in real applications, should be limited by total power dissipation.

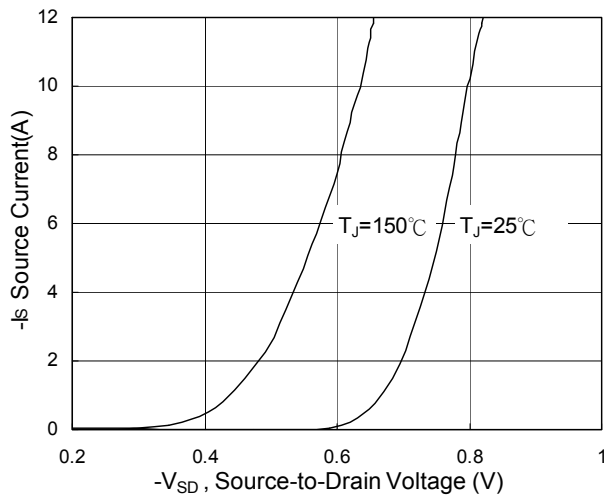
### Typical Characteristics



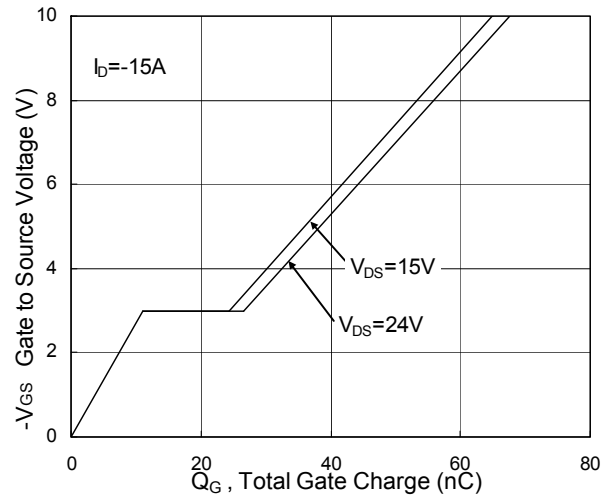
**Fig.1 Typical Output Characteristics**



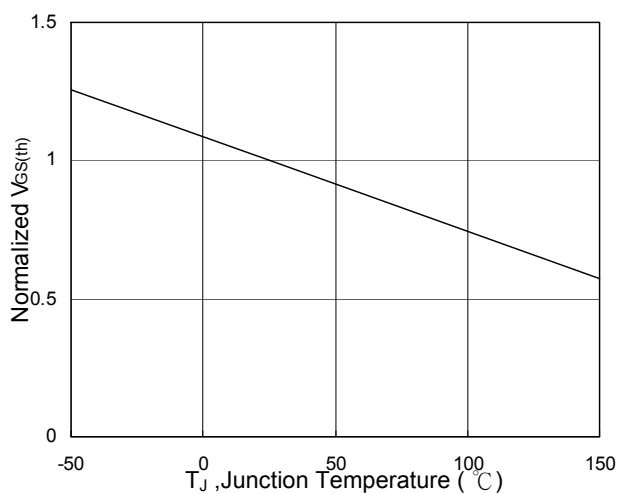
**Fig.2 On-Resistance v.s Gate-Source**



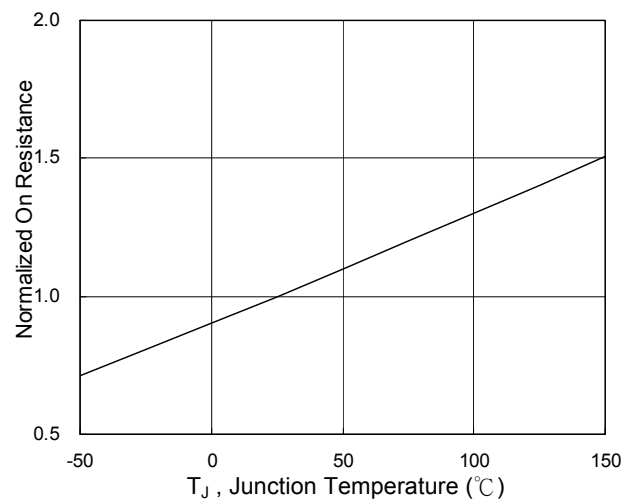
**Fig.3 Forward Characteristics Of Reverse**



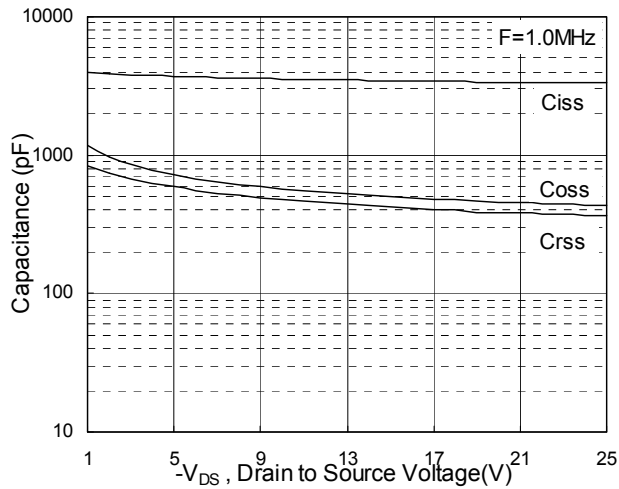
**Fig.4 Gate-Charge Characteristics**



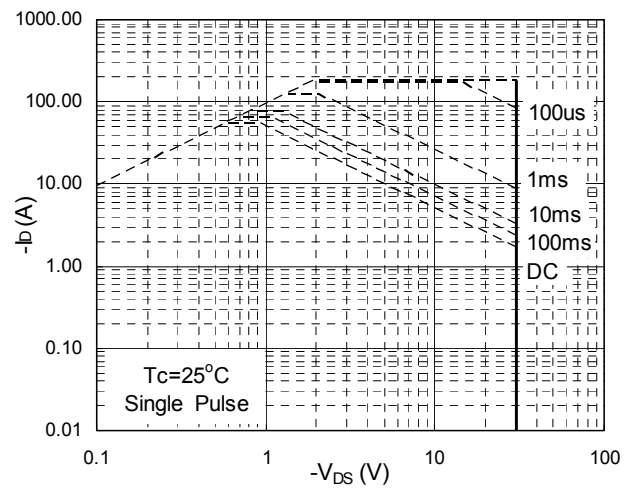
**Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$**



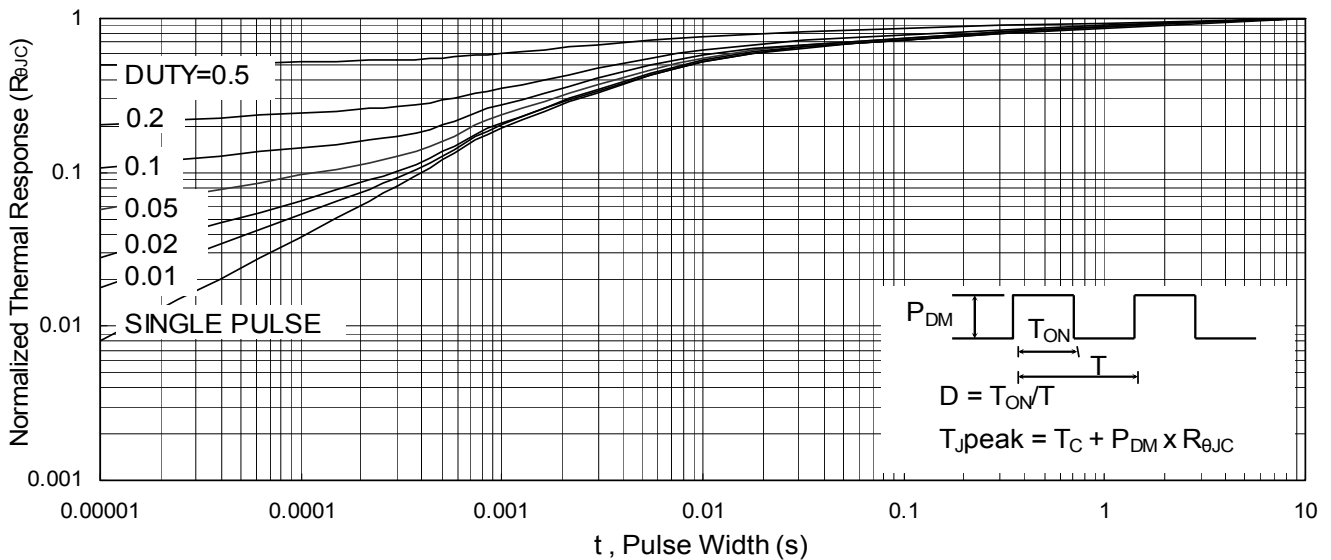
**Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$**



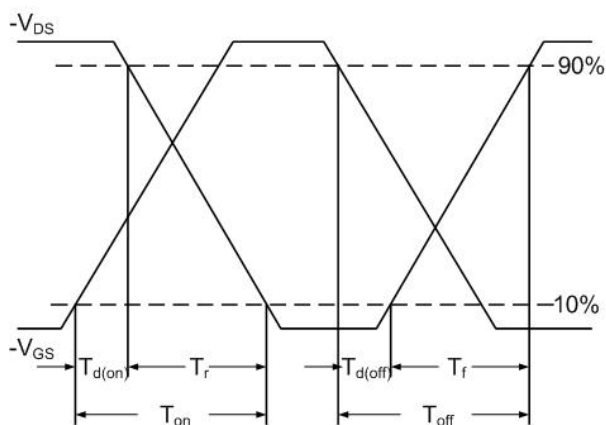
**Fig.7 Capacitance**



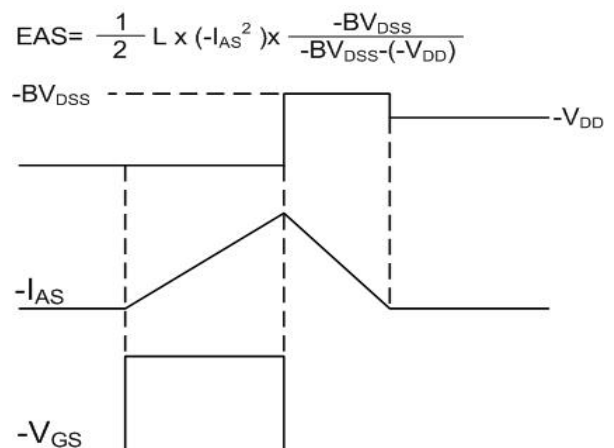
**Fig.8 Safe Operating Area**



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



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

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