

General Description

The WSP4406 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 WSP4406 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

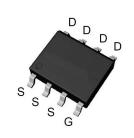
Product Summery

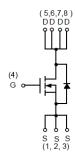
BVDSS	RDSON	ID
30V	9.5mΩ	12A

Applications

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

S0P-8 Pin Configuration





Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V _{DS}	Drain-Source Voltage	30	V
V _{GS}	Gate-Source Voltage	±20	V
I _D @T _C =25℃	Continuous Drain Current, V _{GS} @ 10V ¹	12	Α
I _D @T _C =70°C	Continuous Drain Current, V _{GS} @ 10V ¹	10	А
I _{DM}	Pulsed Drain Current ²	40	А
EAS	Single Pulse Avalanche Energy ³	25	mJ
I _{AS}	Avalanche Current	23	Α
P _D @T _A =25℃	Total Power Dissipation⁴	3.1	W
T _{STG}	Storage Temperature Range	-55 to 150	$^{\circ}$
TJ	Operating Junction Temperature Range -55 to 150		℃

Thermal Data

Symbol	Parameter	Тур.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient ¹		65	°C/W
$R_{ heta JC}$	Thermal Resistance Junction-Case ¹		20	°C/W



Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V , I _D =250uA	30			V
$\triangle BV_{DSS}/\triangle T_{J}$	BVDSS Temperature Coefficient	Reference to 25°C , I _D =1mA		0.023		V/°C
Б	Static Drain-Source On-Resistance ²	V _{GS} =10V , I _D =12A		9.5	12	0
$R_{DS(ON)}$		V _{GS} =4.5V , I _D =10A		13	18	mΩ
V _{GS(th)}	Gate Threshold Voltage	\/ -\/ -250A	1.2	1.9	2.5	V
$\triangle V_{GS(th)}$	V _{GS(th)} Temperature Coefficient	$V_{GS}=V_{DS}$, $I_D=250uA$		-5.08		mV/℃
	Drain Source Leakage Current	V _{DS} =24V , V _{GS} =0V , T _J =25℃			1	- uA
I _{DSS}	Drain-Source Leakage Current	V _{DS} =24V , V _{GS} =0V , T _J =55℃			5	
I _{GSS}	Gate-Source Leakage Current	V_{GS} = $\pm 20 V$, V_{DS} = $0 V$			±100	nA
gfs	Forward Transconductance	V _{DS} =5V , I _D =8A		50		S
Rg	Gate Resistance	V _{DS} =0V , V _{GS} =0V , f=1MHz		2.5	3	Ω
Q_g	Total Gate Charge (4.5V)	V _{DS} =15V , V _{GS} =4.5V , I _D =12A		6.3		
Q_{gs}	Gate-Source Charge			2.9		nC
Q_{gd}	Gate-Drain Charge			2.0		
T _{d(on)}	Turn-On Delay Time			8	14	
Tr	Rise Time	V_{DD} =15V , V_{GS} =10V , R_G =6 Ω		10	17	1
T _{d(off)}	Turn-Off Delay Time	$I_D=1A$,RL=15 Ω		23	42	ns
T _f	Fall Time			4.5	12	
C _{iss}	Input Capacitance	V _{DS} =15V , V _{GS} =0V , f=1MHz		770	890	
C _{oss}	Output Capacitance			130	183	pF
C _{rss}	Reverse Transfer Capacitance			76	110	

Guaranteed Avalanche Characteristics

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
EAS	Single Pulse Avalanche Energy ⁵	V _{DD} =25V , L=0.1mH , I _{AS} =23A	24.6			mJ

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Тур.	Max.	Unit
I _S	Continuous Source Current ^{1,6}	V =V =0V Force Current			9	Α
I _{SM}	Pulsed Source Current ^{2,6}	V _G =V _D =0V , Force Current			36	Α
V_{SD}	Diode Forward Voltage ²	V_{GS} =0V , I_S =1A , T_J =25 $^{\circ}$ C			1.1	V
t _{rr}	Reverse Recovery Time			18		nS
Q _{rr}	Reverse Recovery Charge	IF=12A , dI/dt=100A/ μ s , T $_{J}$ =25 $^{\circ}$ C		10		nC

Note

- 1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper, t<10 sec.
- 2.The data tested by pulsed , pulse width $\,\leq\,300\text{us}$, duty cycle $\,\leq\,2\%$
- 3. The EAS data shows Max. rating . The test condition is V_{DD} =25V, V_{GS} =10V,L=0.1mH, I_{AS} =23A
- 4.The power dissipation is limited by 150 $^{\circ}\mathrm{C}\,$ 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

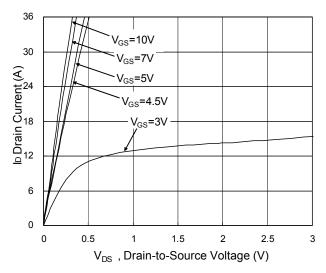


Fig.1 Typical Output Characteristics

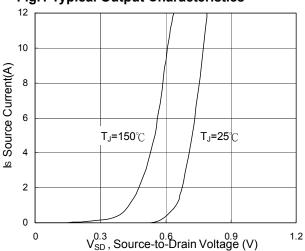


Fig.3 Forward Characteristics of Reverse

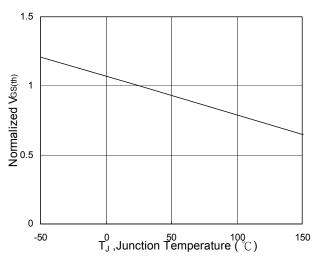


Fig.5 Normalized $V_{\text{GS(th)}}$ vs. T_{J}

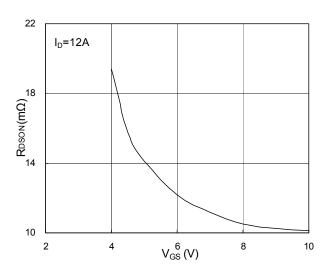


Fig.2 On-Resistance vs. G-S Voltage

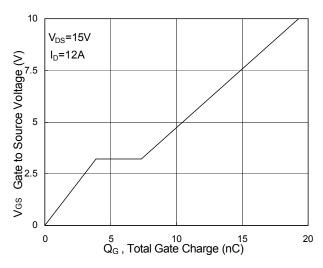


Fig.4 Gate-Charge Characteristics

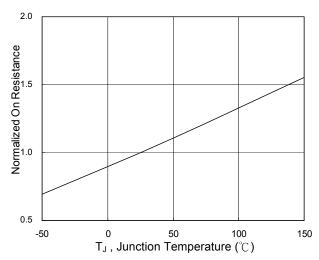
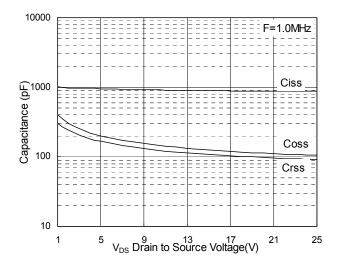


Fig.6 Normalized R_{DSON} vs. T_J





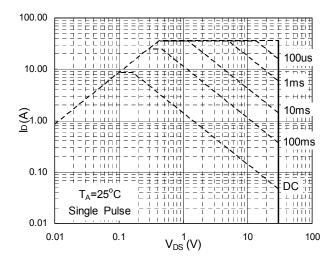


Fig.7 Capacitance

Fig.8 Safe Operating Area

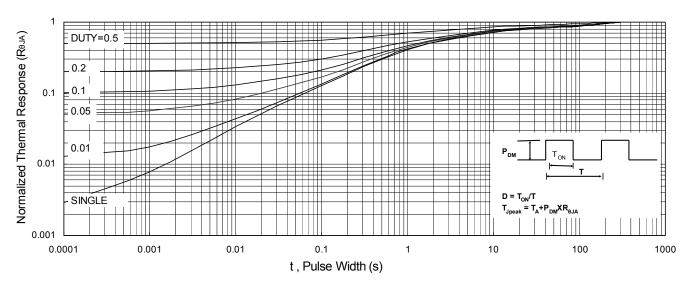


Fig.9 Normalized Maximum Transient Thermal Impedance

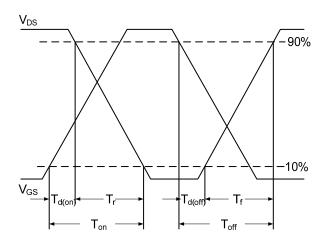


Fig.10 Switching Time Waveform

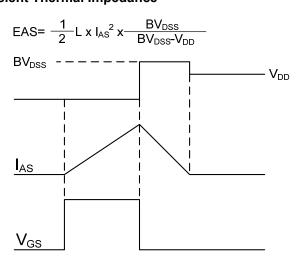


Fig.11 Unclamped Inductive Switching Waveform



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