

## General Description

The WSP6020 is the highest performance trench N-ch MOSFETs with extreme high cell density , which provide excellent R<sub>DS(on)</sub> and gate charge for most of the synchronous buck converter applications .

The WSP6020 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

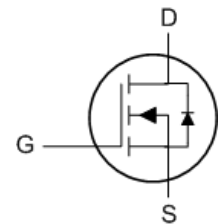
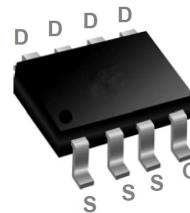
## Product Summary

BVDSS	R <sub>DS(on)</sub>	I <sub>D</sub>
60V	7mΩ	18A

## Applications

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

## SOP-8 Pin Configuration



## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	60	V
V <sub>GS</sub>	Gate-Source Voltage	±20	V
I <sub>D</sub> @T <sub>C</sub> =25°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	18	A
I <sub>D</sub> @T <sub>C</sub> =70°C	Continuous Drain Current, V <sub>GS</sub> @ 10V <sup>1</sup>	12	A
I <sub>DM</sub>	Pulsed Drain Current <sup>2</sup>	72	A
EAS	Single Pulse Avalanche Energy <sup>3</sup>	196	mJ
I <sub>AS</sub>	Avalanche Current	16	A
P <sub>D</sub> @T <sub>A</sub> =25°C	Total Power Dissipation <sup>4</sup>	2.5	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	150	°C

## Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
R <sub>θJA</sub>	Thermal Resistance Junction-ambient <sup>1</sup>	---	72	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-Case <sup>1</sup>	---	1.2	°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	60	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BVDSS Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.044	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =15A	---	7	9	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A	---	8	12	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.0	2.0	3.0	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-4.6	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =60V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =60V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	100	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	---	±100	nA
Q <sub>g</sub>	Total Gate Charge (10V)	V <sub>DS</sub> =24V, V <sub>GS</sub> =10V, I <sub>D</sub> =10A	---	82	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	13	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	17	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =30V, V <sub>GEN</sub> =10V, R <sub>G</sub> =6Ω I <sub>D</sub> =4A, R <sub>L</sub> =30Ω	---	26	---	ns
T <sub>r</sub>	Rise Time		---	125	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	58	---	
T <sub>f</sub>	Fall Time		---	112	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz	---	3760	---	pF
C <sub>oss</sub>	Output Capacitance		---	340	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	200	---	

**Guaranteed Avalanche Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
EAS	Single Pulse Avalanche Energy <sup>5</sup>	V <sub>DD</sub> =25V, L=0.1mH, I <sub>AS</sub> =12A	---	196	---	mJ

**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
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> =6.3A, dI/dt=100A/μs, T <sub>J</sub> =25°C	---	38	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	44	---	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 EAS data shows Max. rating . The test condition is V<sub>DD</sub>=25V,V<sub>GS</sub>=10V,L=0.1mH,I<sub>AS</sub>=12A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.The Min. value is 100% EAS tested guarantee.
- 6.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**

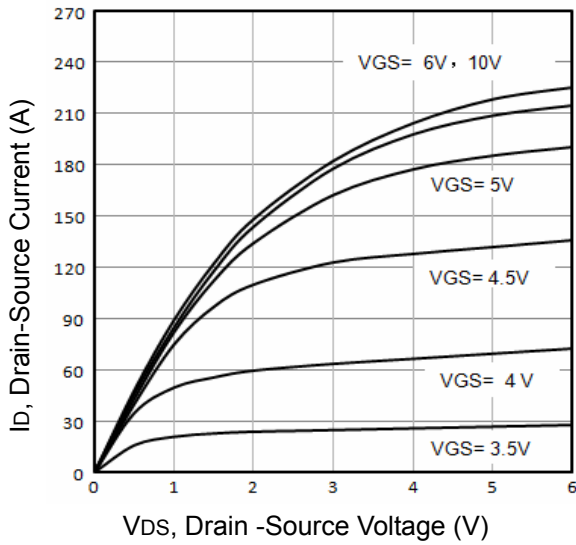


Fig1. Typical Output Characteristics

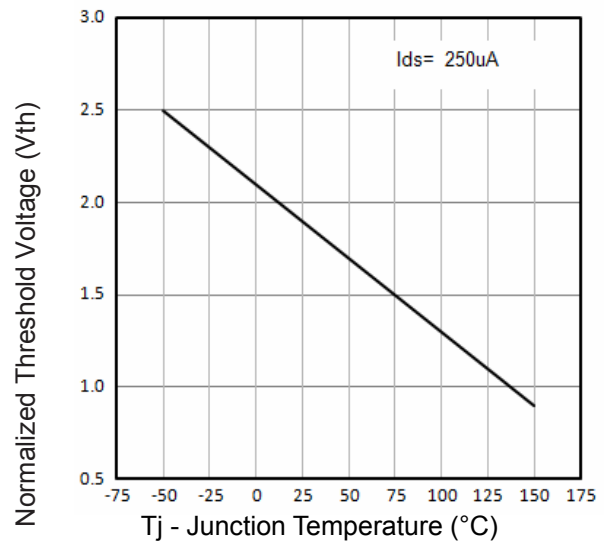


Fig2. Normalized Threshold Voltage Vs. Temperature

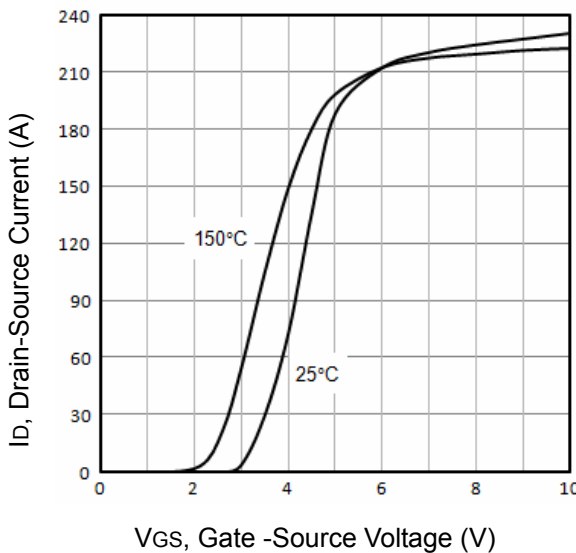


Fig3. Typical Transfer Characteristics

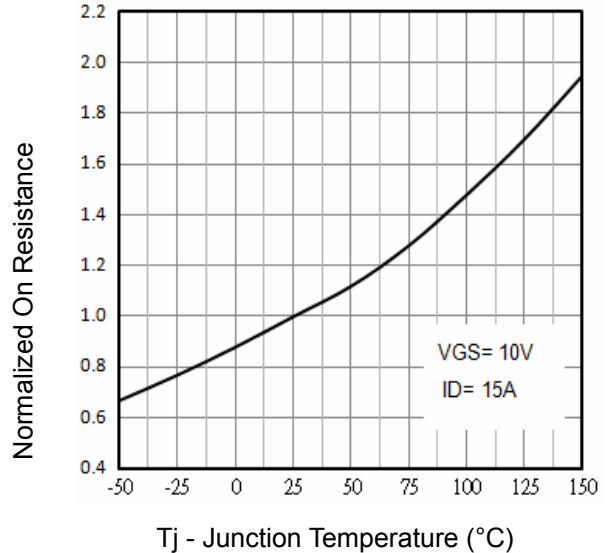


Fig4. Normalized On-Resistance Vs. Temperature

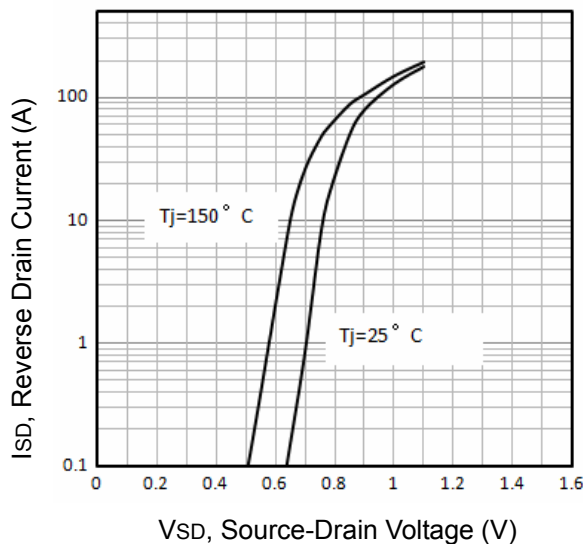


Fig5. Typical Source-Drain Diode Forward Voltage

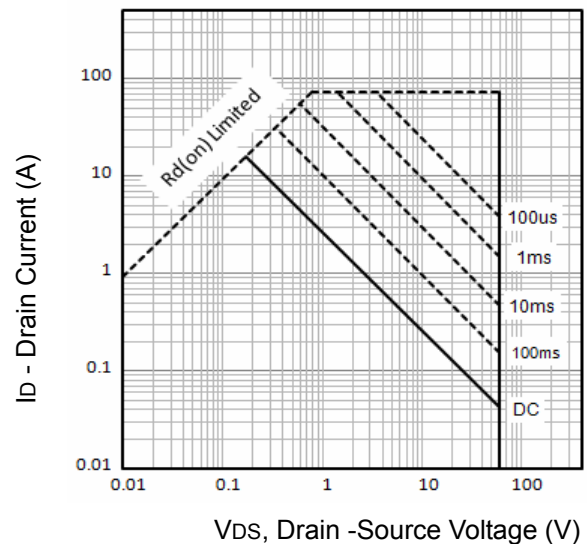
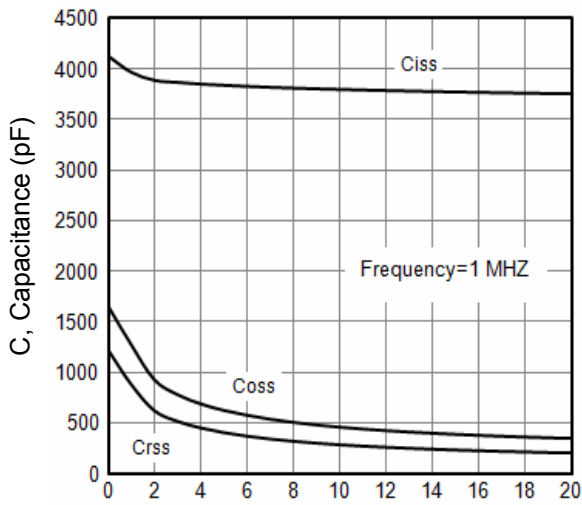
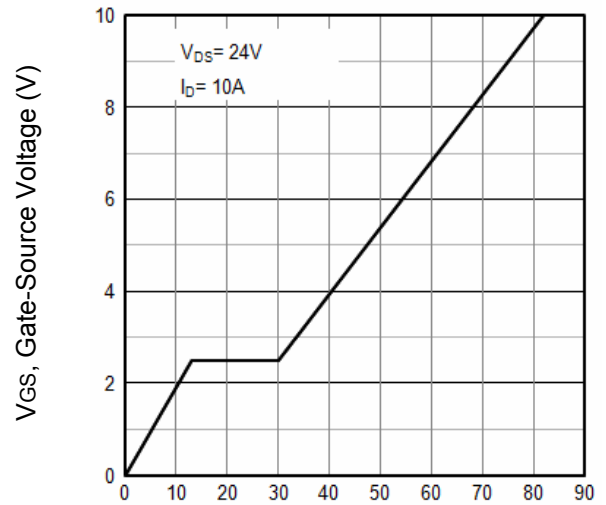


Fig6. Maximum Safe Operating Area



V<sub>DS</sub> , Drain-Source Voltage (V)

Fig7. Typical Capacitance Vs.Drain-Source Voltage



Q<sub>g</sub> -Total Gate Charge (nC)

Fig8. Typical Gate Charge Vs.Gate-Source Voltage

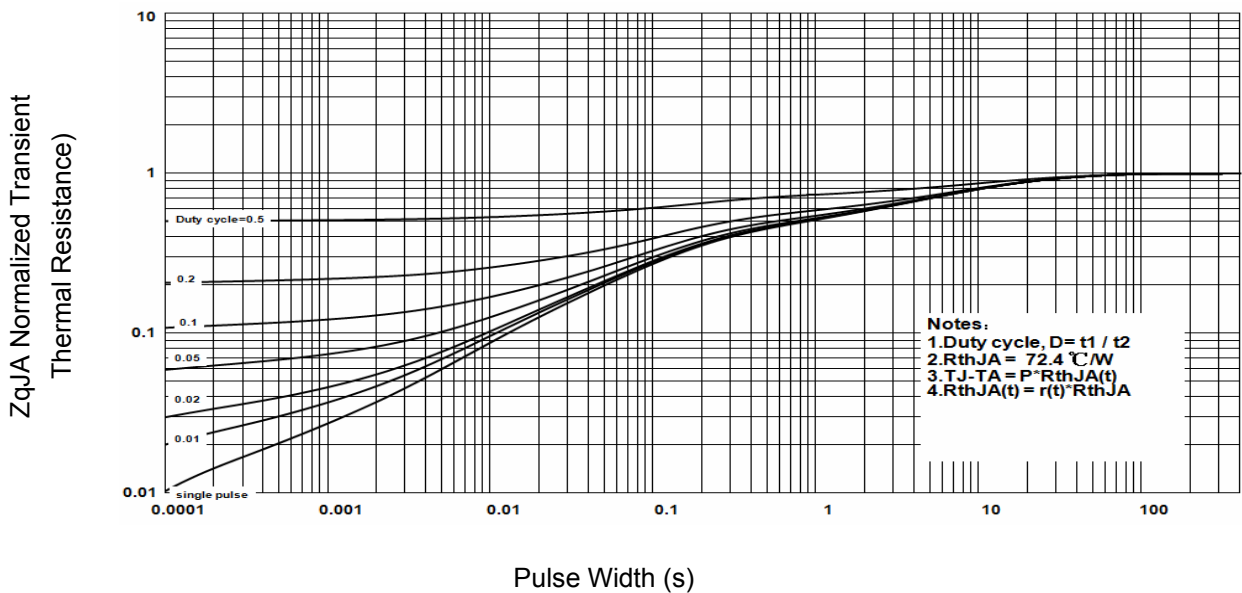


Figure 9: Normalized Maximum Transient Thermal Impedance

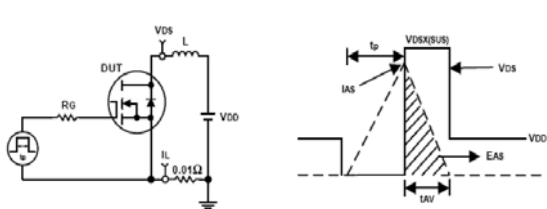


Fig10. Unclamped Inductive Test Circuit and waveforms

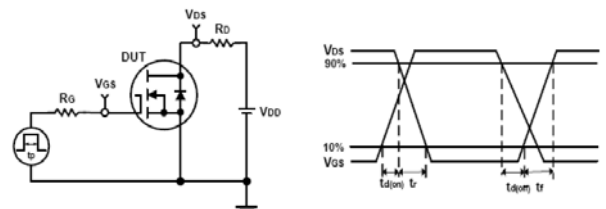


Fig11. Switching Time Test Circuit and waveforms



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