

General Description

The WSP6946 is the highest performance trench N-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 WSP6946 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

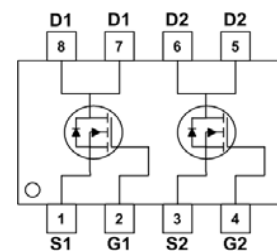
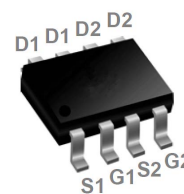
Product Summary

| BVDSS | R _{DS(on)} | I _D |
|-------|---------------------|----------------|
| 60V | 33mΩ | 6.5A |

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 _{DS} | Drain-Source Voltage | 60 | V |
| V _{GS} | Gate-Source Voltage | ±20 | V |
| I _D @T _C =25°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 6.5 | A |
| I _D @T _C =70°C | Continuous Drain Current, V _{GS} @ 10V ¹ | 4.5 | A |
| I _{DM} | Pulsed Drain Current ² | 24 | A |
| EAS | Single Pulse Avalanche Energy ³ | 12 | mJ |
| I _{AS} | Avalanche Current | 16 | A |
| P _D @T _A =25°C | Total Power Dissipation ⁴ | 2.5 | W |
| T _{STG} | Storage Temperature Range | -55 to 150 | °C |
| T _J | Operating Junction Temperature Range | -55 to 150 | °C |

Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|------------------|--|------|------|------|
| R _{θJA} | Thermal Resistance Junction-ambient ¹ | --- | 90 | °C/W |
| R _{θJC} | Thermal Resistance Junction-Case ¹ | --- | 50 | °C/W |

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

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|--|--|------|-------|------|-------|
| BV _{DSS} | Drain-Source Breakdown Voltage | V _{GS} =0V, I _D =250uA | 60 | --- | --- | V |
| ΔBV _{DSS} /ΔT _J | BVDSS Temperature Coefficient | Reference to 25°C, I _D =1mA | --- | 0.044 | --- | V/°C |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =10V, I _D =6.3A | --- | 33 | 45 | mΩ |
| | | V _{GS} =4.5V, I _D =4A | --- | 37 | 50 | |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =250uA | 1.0 | 2.0 | 3.0 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | | --- | -4.8 | --- | mV/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =48V, V _{GS} =0V, T _J =25°C | --- | --- | 1 | uA |
| | | V _{DS} =48V, V _{GS} =0V, T _J =55°C | --- | --- | 5 | |
| I _{GSS} | Gate-Source Leakage Current | V _{GS} =±20V, V _{DS} =0V | --- | --- | ±100 | nA |
| g _{fs} | Forward Transconductance | V _{DS} =5V, I _D =4A | --- | 28.3 | --- | S |
| R _g | Gate Resistance | V _{DS} =0V, V _{GS} =0V, f=1MHz | --- | 2.5 | 5 | Ω |
| Q _g | Total Gate Charge (10V) | V _{DS} =48V, V _{GS} =10V, I _D =6.3A | --- | 14 | 20 | nC |
| Q _{gs} | Gate-Source Charge | | --- | 2.6 | --- | |
| Q _{gd} | Gate-Drain Charge | | --- | 2.2 | --- | |
| T _{d(on)} | Turn-On Delay Time | V _{DD} =30V, V _{GEN} =10V, R _G =6Ω I _D =4A, R _L =30Ω | --- | 8 | 15 | ns |
| T _r | Rise Time | | --- | 6 | 11 | |
| T _{d(off)} | Turn-Off Delay Time | | --- | 23 | 42 | |
| T _f | Fall Time | | --- | 6 | 11 | |
| C _{iss} | Input Capacitance | V _{DS} =15V, V _{GS} =0V, f=1MHz | --- | 670 | 940 | pF |
| C _{oss} | Output Capacitance | | --- | 70 | 91 | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 35 | 64 | |

Guaranteed Avalanche Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------|--|---|------|------|------|------|
| EAS | Single Pulse Avalanche Energy ⁵ | V _{DD} =25V, L=0.1mH, I _{AS} =12A | 10 | --- | --- | mJ |

Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|-----------------|--|---|------|------|------|------|
| I _S | Continuous Source Current ^{1,6} | V _G =V _D =0V, Force Current | --- | --- | 2.5 | A |
| I _{SM} | Pulsed Source Current ^{2,6} | | --- | --- | 24 | A |
| V _{SD} | Diode Forward Voltage ² | V _{GS} =0V, I _S =1A, T _J =25°C | --- | --- | 1.1 | V |
| t _{rr} | Reverse Recovery Time | I _F =6.3A, dI/dt=100A/μs, T _J =25°C | --- | 20 | --- | nS |
| Q _{rr} | Reverse Recovery Charge | | --- | 18 | --- | nC |

Note :

- The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper, t<10sec.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=12A
- The power dissipation is limited by 150°C junction temperature
- The Min. value is 100% EAS tested guarantee.
- The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

Typical Characteristics

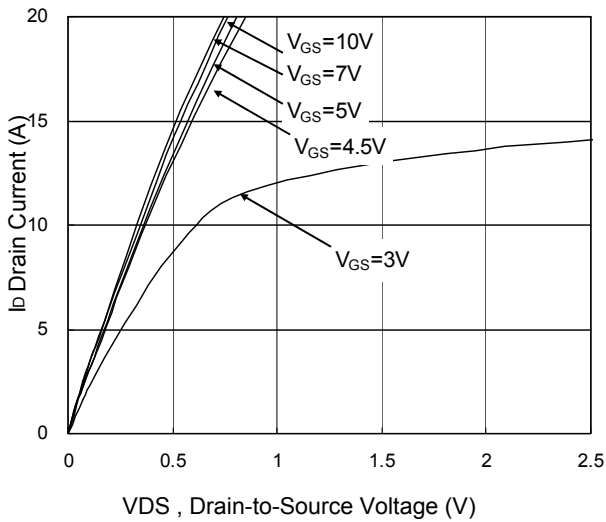


Fig.1 Typical Output Characteristics

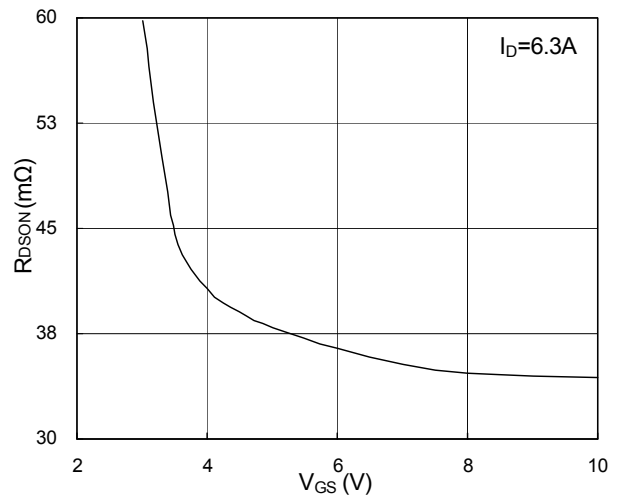


Fig.2 On-Resistance vs. Gate-Source

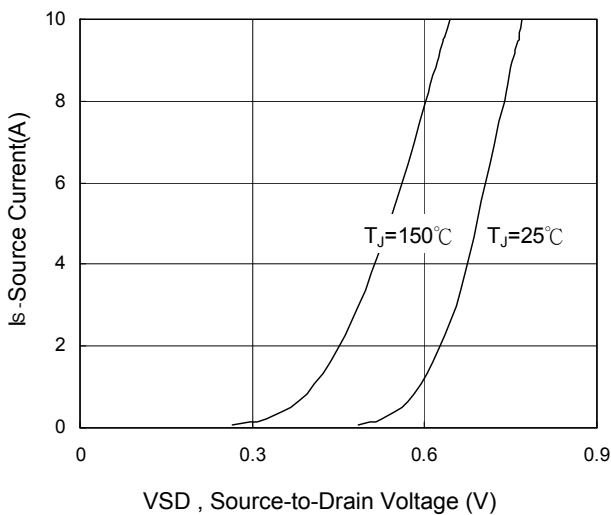


Fig.3 Forward Characteristics Of Reverse

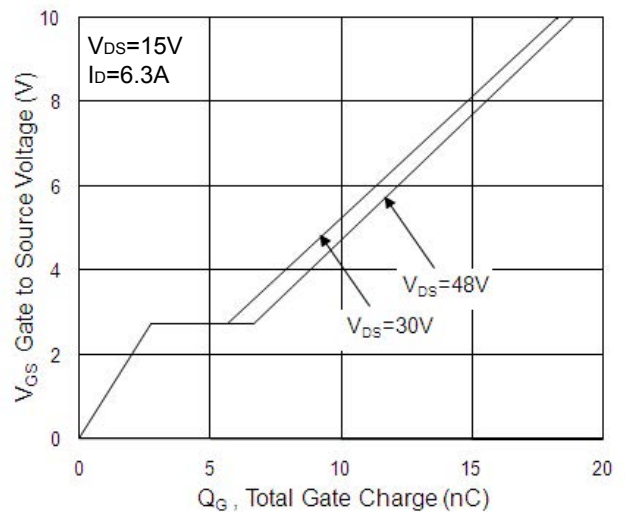


Fig.4 Gate-Charge Characteristics

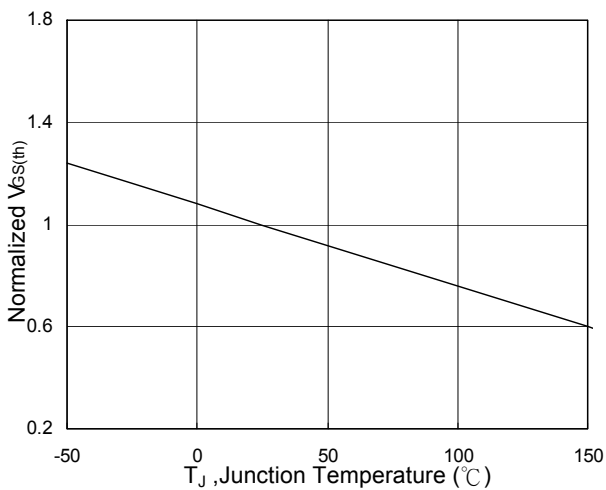


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

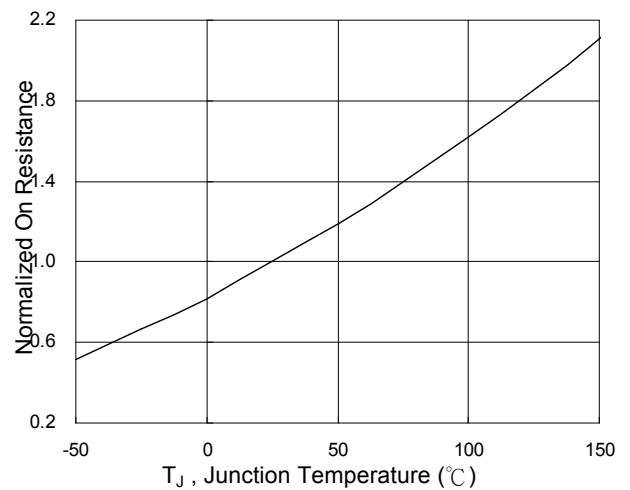


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

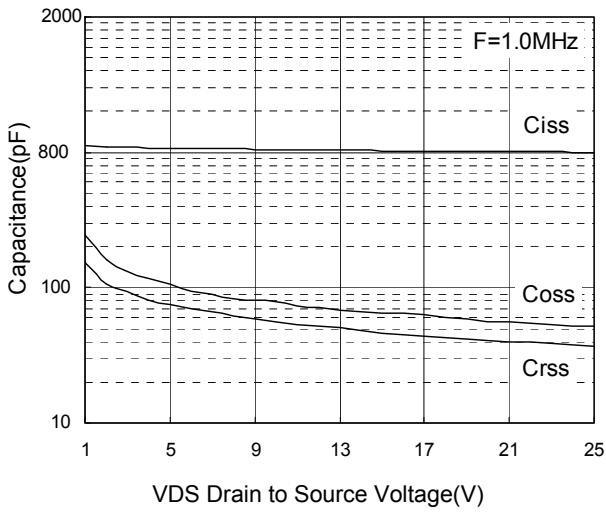


Fig.7 Capacitance

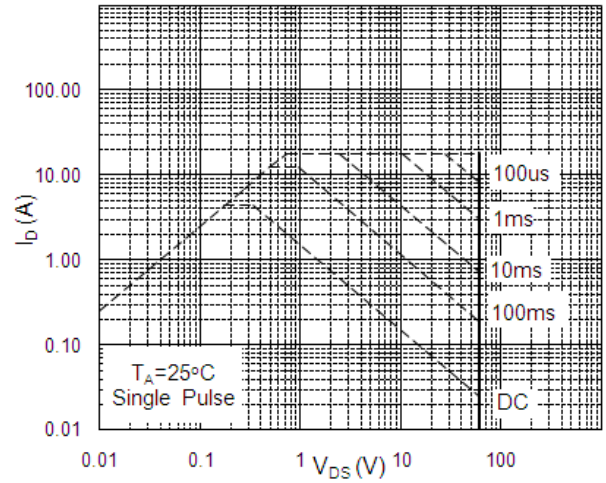


Fig.8 Safe Operating Area

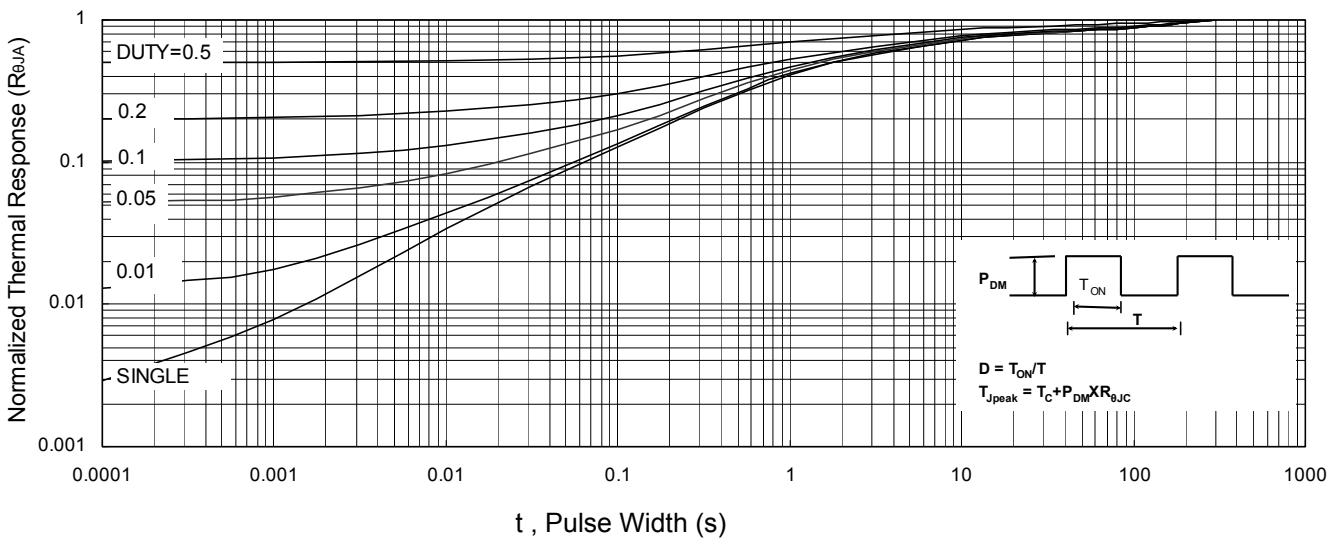


Fig.9 Normalized Maximum Transient Thermal Impedance

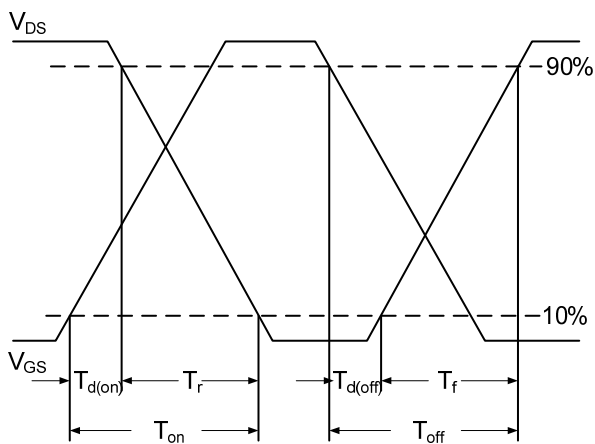


Fig.10 Switching Time Waveform

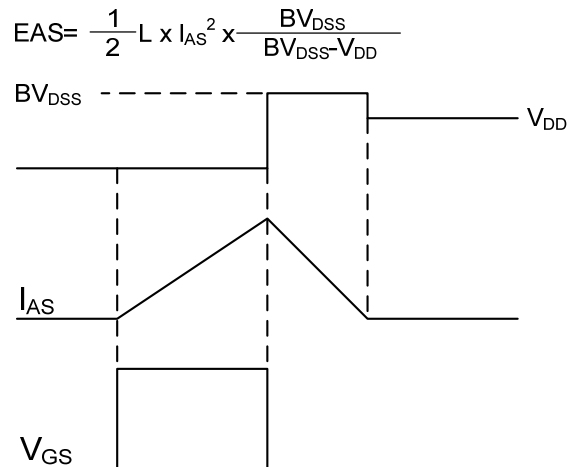


Fig.11 Unclamped Inductive Switching Waveform



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