

General Description

The WST4041 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 WST4041 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

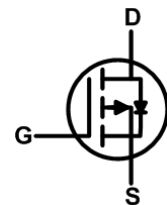
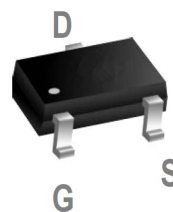
Product Summary

| BVDSS | RDSON | ID |
|-------|-------|-----|
| -40V | 30mΩ | -6A |

Applications

- High Frequency Point-of-Load Synchronous Buck Converter.
- Networking DC-DC Power System
- Load Switch

SOT-23-3L Pin Configuration



Absolute Maximum Ratings

| Symbol | Parameter | Rating | Units |
|-----------------------|---|------------|------------|
| V_{DS} | Drain-Source Voltage | -40 | V |
| V_{GS} | Gate-Source Voltage | ± 20 | V |
| $I_D@T_C=25^\circ C$ | Continuous Drain Current, $V_{GS} @ -10V^1$ | -6.0 | A |
| $I_D@T_C=100^\circ C$ | 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 | -7 | A |
| $P_D@T_C=25^\circ C$ | Total Power Dissipation ⁴ | 1.4 | 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 ¹ | --- | 125 | $^\circ C/W$ |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case ¹ | --- | 36 | $^\circ C/W$ |

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 | -40 | --- | --- | V |
| ΔBV _{DSS} /ΔT _J | BV _{DSS} Temperature Coefficient | Reference to 25°C, I _D =-1mA | --- | -0.03 | --- | V/°C |
| R _{DS(ON)} | Static Drain-Source On-Resistance ² | V _{GS} =-10V, I _D =-3A | --- | 30 | 40 | mΩ |
| | | V _{GS} =-4.5V, I _D =-1A | --- | 40 | 58 | |
| V _{GS(th)} | Gate Threshold Voltage | V _{GS} =V _{DS} , I _D =-250uA | -0.8 | -1.2 | -2.2 | V |
| ΔV _{GS(th)} | V _{GS(th)} Temperature Coefficient | | --- | 4.56 | --- | mV/°C |
| I _{DSS} | Drain-Source Leakage Current | V _{DS} =-28V, V _{GS} =0V, T _J =25°C | --- | --- | 1 | uA |
| | | V _{DS} =-28V, 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 =-3A | --- | 15 | --- | S |
| R _g | Gate Resistance | V _{DS} =0V, V _{GS} =0V, f=1MHz | --- | 3.8 | --- | Ω |
| Q _g | Total Gate Charge (-4.5V) | V _{DS} =-18V, V _{GS} =-10V, I _D =-4A | --- | 9.5 | --- | nC |
| Q _{gs} | Gate-Source Charge | | --- | 1.7 | --- | |
| Q _{gd} | Gate-Drain Charge | | --- | 2.0 | --- | |
| T _{d(on)} | Turn-On Delay Time | V _{DD} =-15V, V _{GS} =-10V, R _G =6Ω, I _D =-1A, R _L =15Ω | --- | 8 | --- | ns |
| T _r | Rise Time | | --- | 10 | --- | |
| T _{d(off)} | Turn-Off Delay Time | | --- | 18 | --- | |
| T _f | Fall Time | | --- | 8 | --- | |
| C _{iss} | Input Capacitance | V _{DS} =-15V, V _{GS} =0V, f=1MHz | --- | 420 | --- | pF |
| C _{oss} | Output Capacitance | | --- | 77 | --- | |
| C _{rss} | Reverse Transfer Capacitance | | --- | 55 | --- | |

Guaranteed Avalanche Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|--------|--|--|------|------|------|------|
| EAS | Single Pulse Avalanche Energy ⁵ | V _{DD} =-25V, L=0.1mH, I _{AS} =-8A | 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 | --- | --- | -1.0 | A |
| I _{SM} | Pulsed Source Current ^{2,6} | | --- | --- | -16 | A |
| V _{SD} | Diode Forward Voltage ² | V _{GS} =0V, I _S =-1A, T _J =25°C | --- | --- | -1.2 | V |

Note :

1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
3. The EAS data shows Max. rating. The test condition is V_{DD}=-25V, V_{GS}=-10V, L=0.1mH, I_{AS}=-8A
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_D and I_{DM}, in real applications, should be limited by total power dissipation.

Typical Characteristics

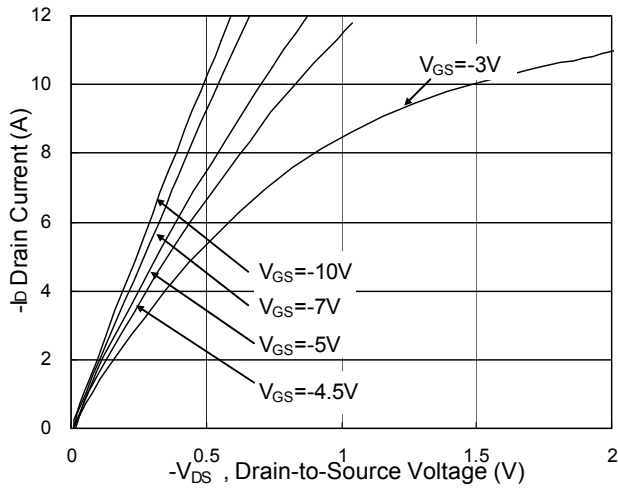


Fig.1 Typical Output Characteristics

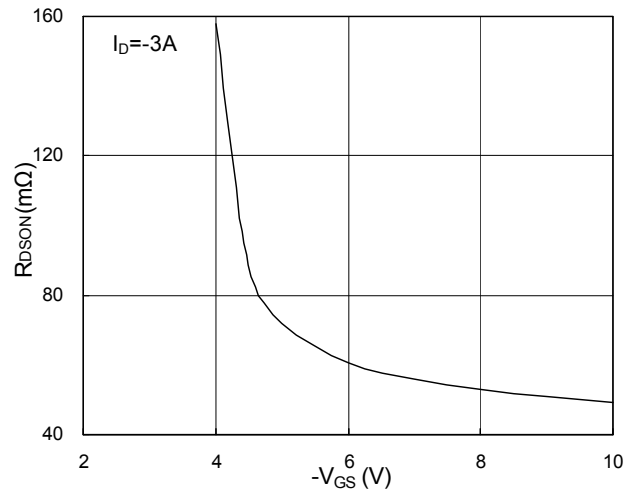


Fig.2 On-Resistance v.s Gate-Source

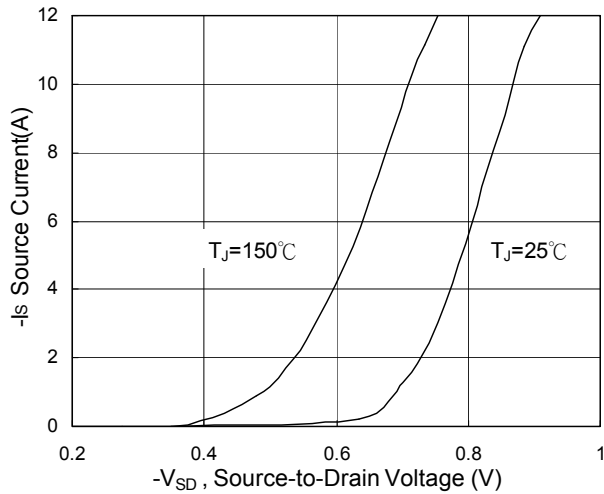


Fig.3 Forward Characteristics of Reverse

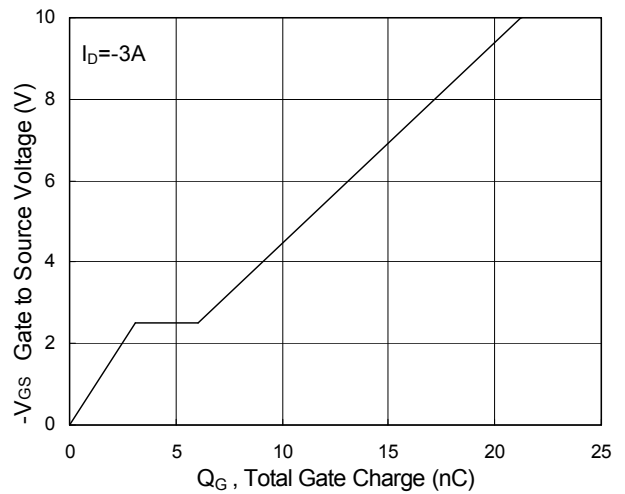


Fig.4 Gate-Charge Characteristics

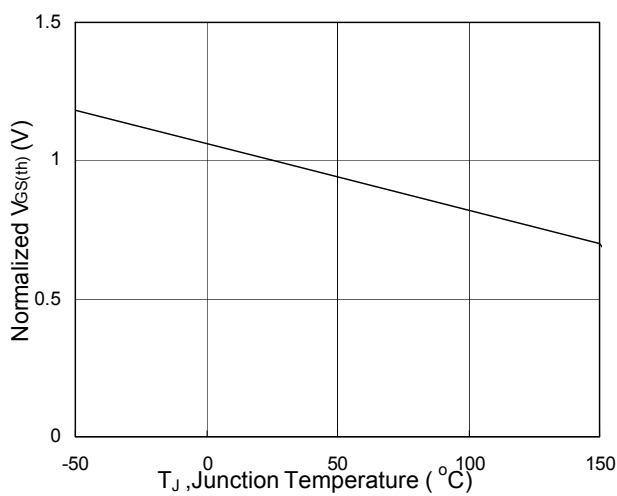


Fig.5 Normalized $V_{GS(th)}$ v.s T_J

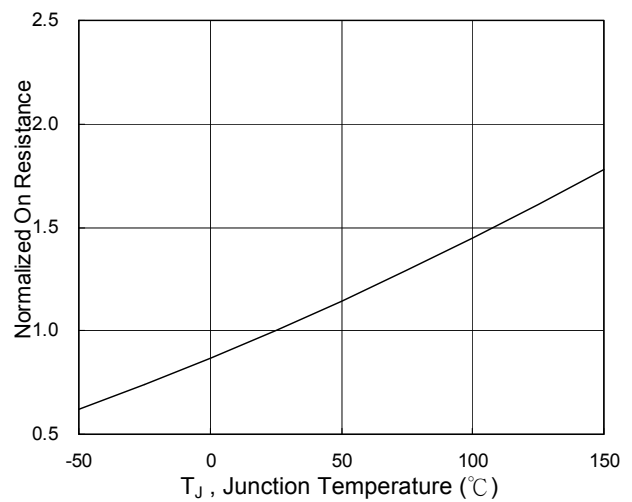


Fig.6 Normalized $R_{DS(on)}$ v.s T_J

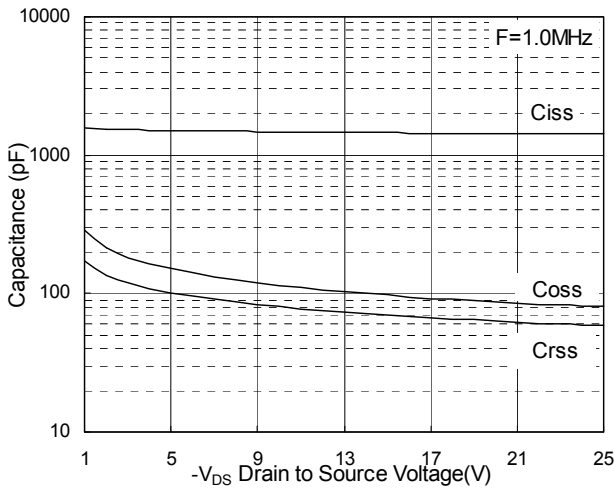


Fig.7 Capacitance

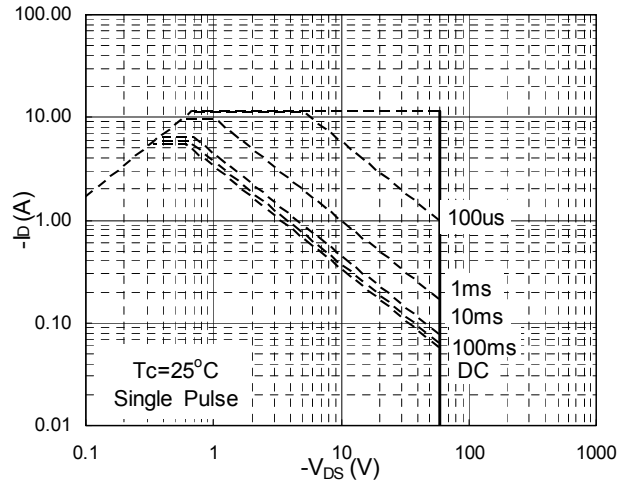


Fig.8 Safe Operating Area

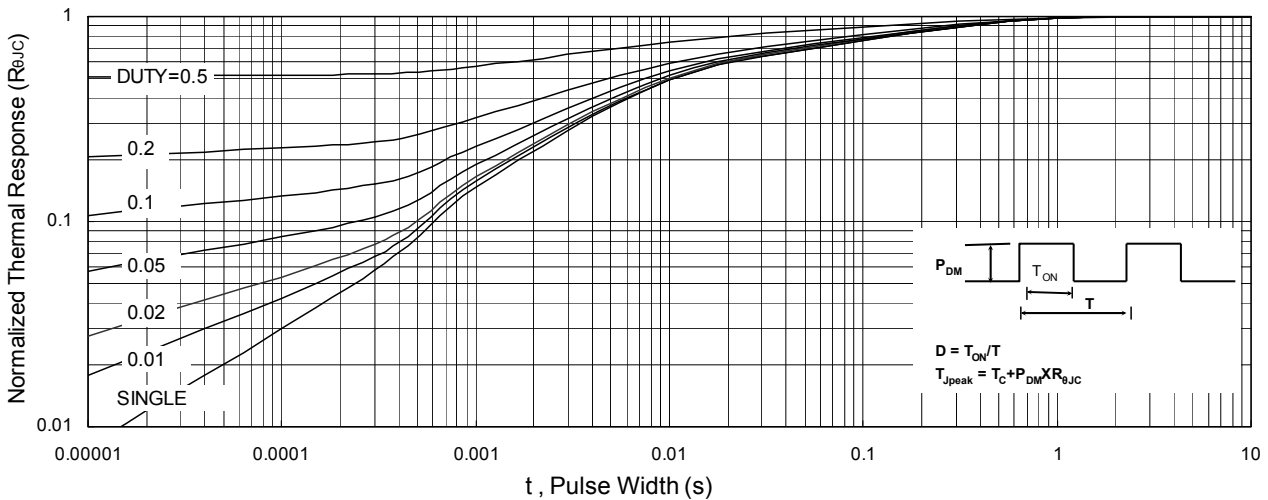


Fig.9 Normalized Maximum Transient Thermal Impedance

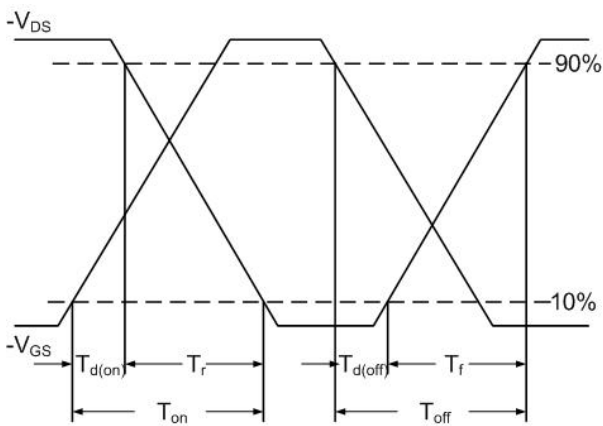


Fig.10 Switching Time Waveform

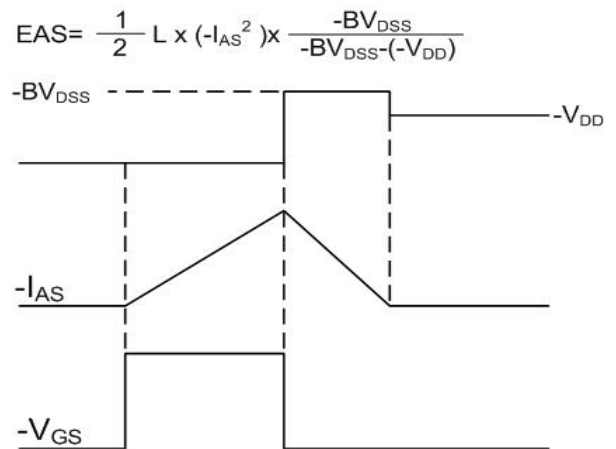


Fig.11 Unclamped Inductive Waveform

$$EAS = \frac{1}{2} L \times (-I_{AS}^2) \times \frac{-BV_{DSS}}{-BV_{DSS} - (-V_{DD})}$$



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