## General Description

The WSR3090 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 WSR3090meet 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

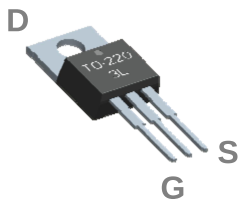
## Product Summery

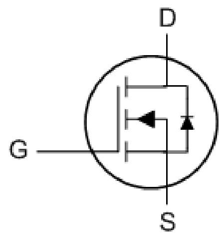
| BVDSS | RDSON | ID |
|---|---|---|
| 30V | 4.5mΩ | 90A |

## Applications

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

## TO-220 Pin Configuration




## Absolute Maximum Ratings

| Symbol | Parameter | Rating | | Units |
|---|---|---|---|---|
| | | 10s | Steady State | |
| $V_{DS}$ | Drain-Source Voltage | 30 | | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | | V |
| $I_D$@$T_C$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 90 | | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 60 | | A |
| $I_D$@$T_A$=25℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 27 | 17 | A |
| $I_D$@$T_A$=70℃ | Continuous Drain Current, $V_{GS}$ @ 10V[1] | 23 | 14.5 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | 160 | | A |
| EAS | Single Pulse Avalanche Energy[3] | 252 | | mJ |
| $I_{AS}$ | Avalanche Current | 48 | | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 53 | | W |
| $P_D$@$T_A$=25℃ | Total Power Dissipation[4] | 6 | 2.0 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 175 | | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 175 | | ℃ |

## Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-ambient (Steady State)[1] | --- | 62 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] (t ≤10s) | --- | 25 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | --- | 2.8 | ℃/W |

### Electrical Characteristics ($T_J$=25 ℃, unless otherwise noted)

| Symbol | Parameter | Conditions | Min. | Typ. | 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℃ , $I_D$=1mA | --- | 0.028 | --- | V/℃ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=10V , $I_D$=30A | --- | 4.5 | 5.5 | mΩ |
| | | $V_{GS}$=4.5V , $I_D$=15A | --- | 7.8 | 9 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}=V_{DS}$ , $I_D$ =250uA | 1.0 | 1.5 | 2.5 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | -6.16 | --- | mV/℃ |
| $I_{DSS}$ | Drain-Source Leakage Current | $V_{DS}$=24V , $V_{GS}$=0V , $T_J$=25℃ | --- | --- | 1 | uA |
| | | $V_{DS}$=24V , $V_{GS}$=0V , $T_J$=55℃ | --- | --- | 5 | |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V , $V_{DS}$=0V | --- | --- | ±100 | nA |
| gfs | Forward Transconductance | $V_{DS}$=5V , $I_D$=30A | --- | 43 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 1.7 | 3.1 | Ω |
| $Q_g$ | Total Gate Charge (4.5V) | $V_{DS}$=15V , $V_{GS}$=4.5V , $I_D$=15A | --- | 20 | 28 | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 7.6 | 10.6 | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 7.2 | 10.1 | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=15V , $V_{GS}$=10V , $R_G$=3.3Ω $I_D$=15A | --- | 11 | 15.6 | ns |
| $T_r$ | Rise Time | | --- | 15 | 27 | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 37.3 | 74.6 | |
| $T_f$ | Fall Time | | --- | 10.6 | 21.2 | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=15V , $V_{GS}$=0V , f=1MHz | --- | 2295 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 570 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 210 | --- | |

### Guaranteed Avalanche Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| EAS | Single Pulse Avalanche Energy[5] | $V_{DD}$=25V , L=0.1mH , $I_{AS}$=24A | 63 | --- | --- | mJ |

### Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,6] | $V_G=V_D$=0V , Force Current | --- | --- | 35 | A |
| $I_{SM}$ | Pulsed Source Current[2,6] | | --- | --- | 160 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=1A , $T_J$=25℃ | --- | --- | 1 | V |
| $t_{rr}$ | Reverse Recovery Time | IF=30A , dI/dt=100A/μs , $T_J$=25℃ | --- | 30 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 24 | --- | nC |

Note :
1.The data tested by surface mounted on a 1 $inch^2$ 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 $V_{DD}$=25V,$V_{GS}$=10V,L=0.1mH,$I_{AS}$=24A
4.The power dissipation is limited by 175℃ 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

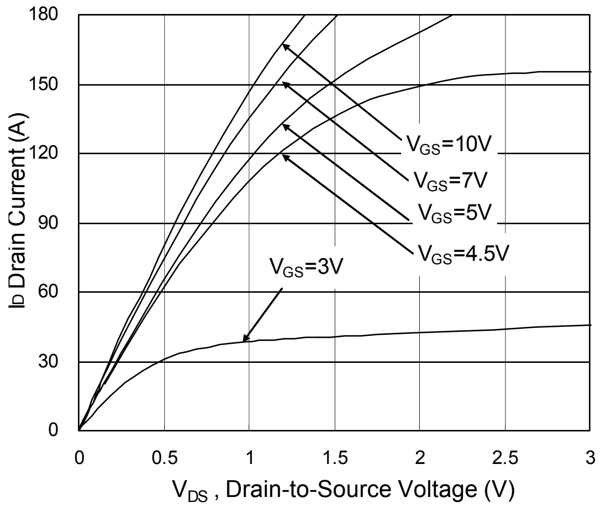



**Fig.1 Typical Output Characteristics**

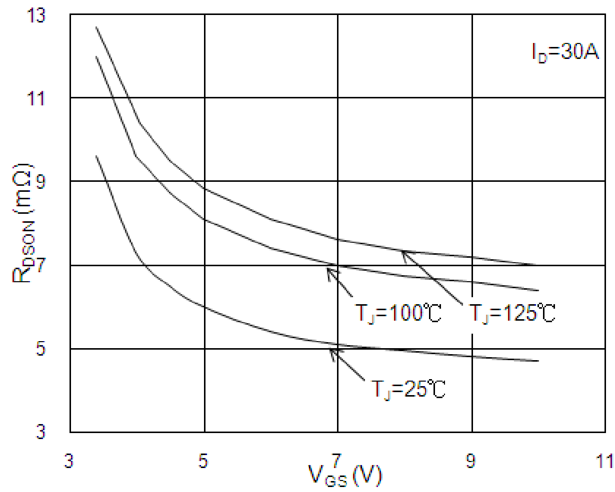



**Fig.2 On-Resistance vs. G-S Voltage**

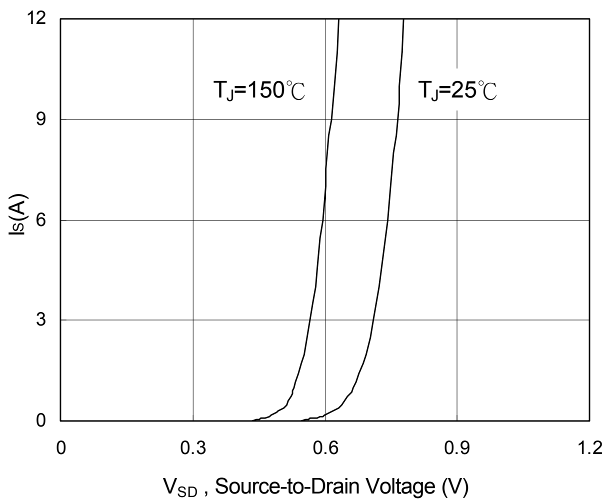



**Fig.3 Forward Characteristics of Reverse**

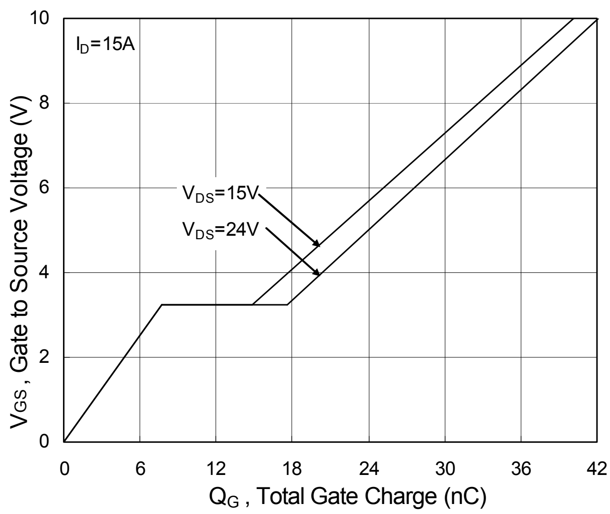



**Fig.4 Gate-Charge Characteristics**

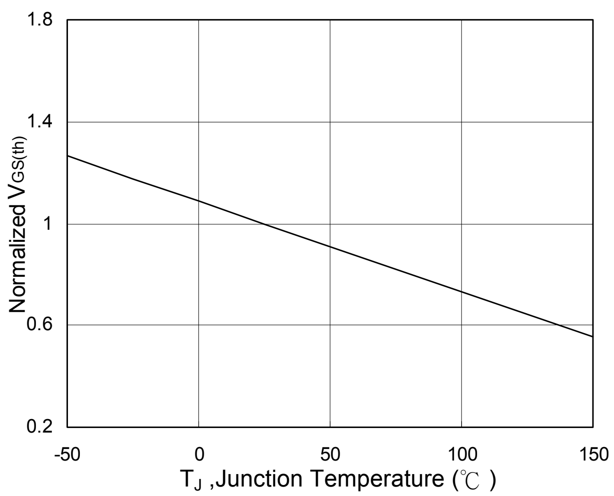



**Fig.5 Normalized $V_{GS(th)}$ vs. $T_J$**

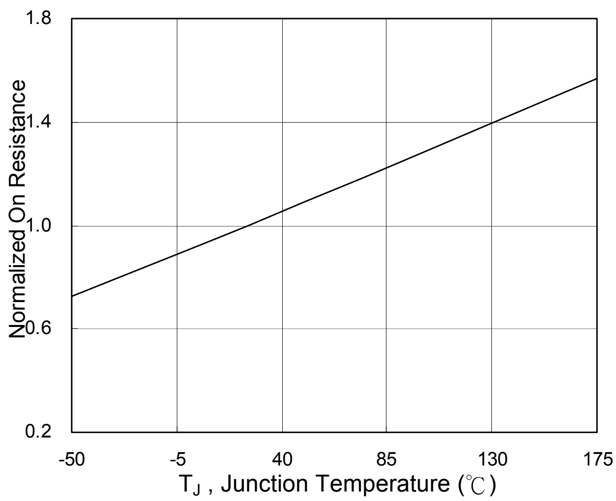



**Fig.6 Normalized $R_{DSON}$ vs. $T_J$**

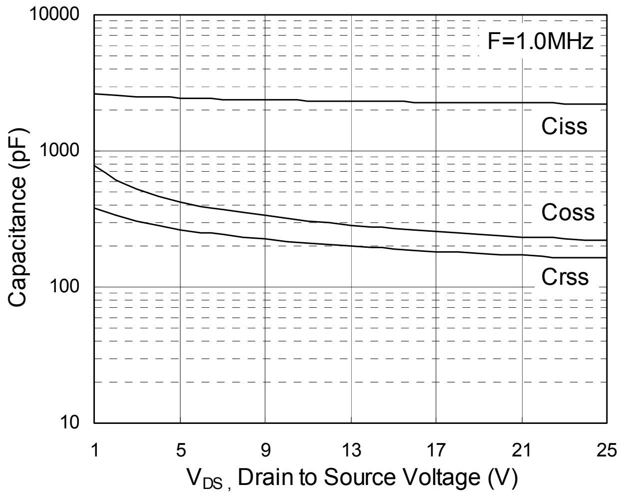



Fig.7 Capacitance

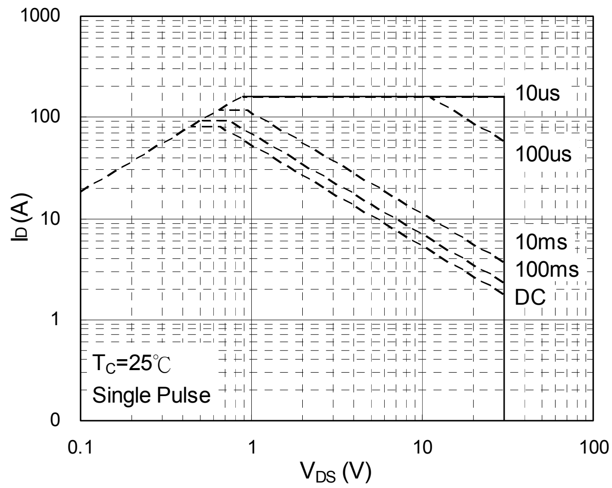



Fig.8 Safe Operating Area

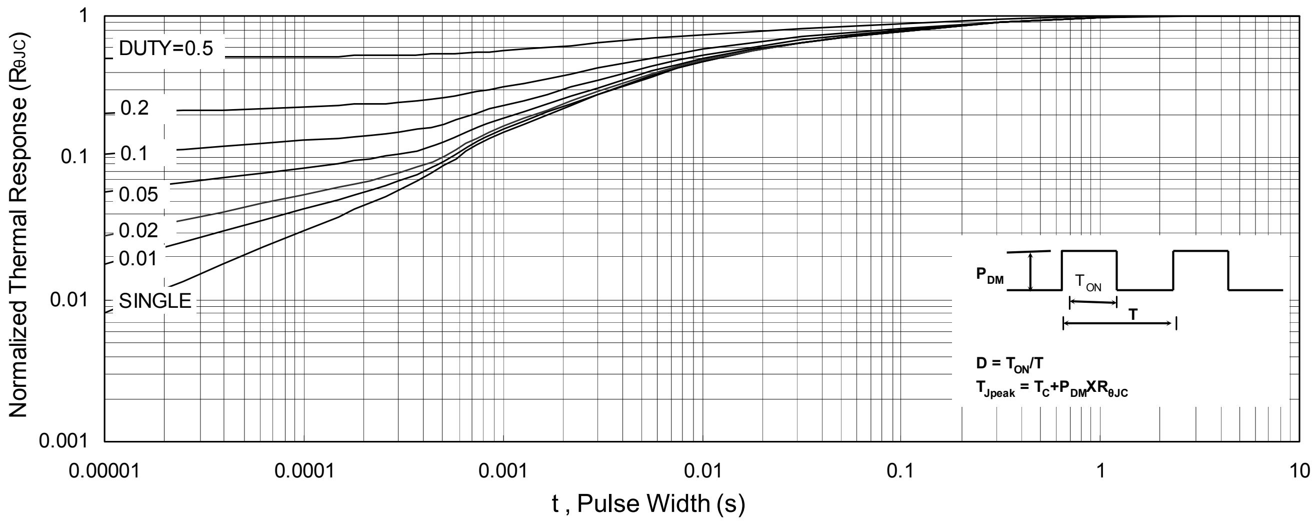



Fig.9 Normalized Maximum Transient Thermal Impedance

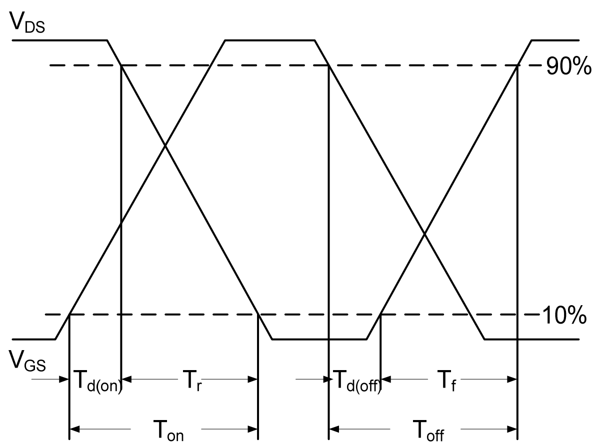



Fig.10 Switching Time Waveform

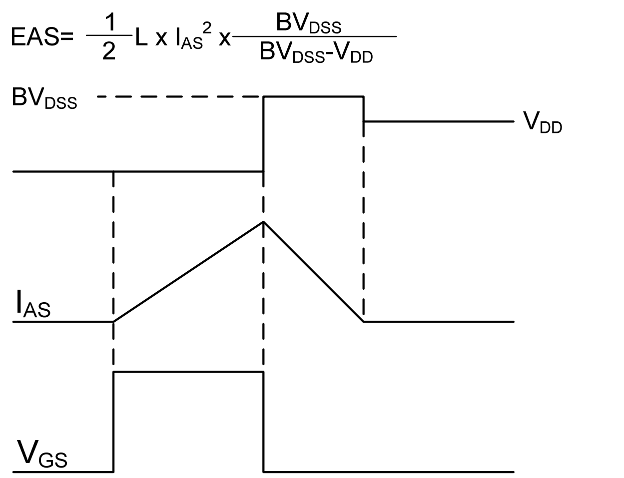



Fig.11 Unclamped Inductive Switching Waveform

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