# WSD30L40DN

**P-Ch MOSFET**

## General Description

The WSD30L40DN is the highest performance trench P-ch MOSFETs with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The WSD30L40DN meet the RoHS and Green Product requirement 100% EAS guaranteed with full function reliability approved.

## Product Summery

| BVDSS | RDSON | ID |
|---|---|---|
| -30V | 11mΩ | -40A |

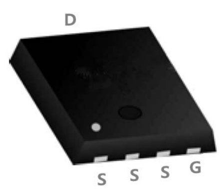
## Applications

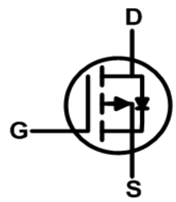
- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- Load Switch

## Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

## DFN3X3-8 Pin Configuration




## Absolute Maximum Ratings

| Symbol | Parameter | Rating: 10s | Rating: Steady State | 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] | -40 | | A |
| $I_D$@$T_C$=100℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1] | -25 | | A |
| $I_D$@$T_A$=25℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1] | -14.5 | -12 | A |
| $I_D$@$T_A$=70℃ | Continuous Drain Current, $V_{GS}$ @ -10V[1] | -10.5 | -9.8 | A |
| $I_{DM}$ | Pulsed Drain Current[2] | -70 | | A |
| EAS | Single Pulse Avalanche Energy[3] | 81 | | mJ |
| $I_{AS}$ | Avalanche Current | -18 | | A |
| $P_D$@$T_C$=25℃ | Total Power Dissipation[4] | 32.9 | | W |
| $P_D$@$T_A$=25℃ | Total Power Dissipation[4] | 3.6 | 3.1 | W |
| $T_{STG}$ | Storage Temperature Range | -55 to 150 | | ℃ |
| $T_J$ | Operating Junction Temperature Range | -55 to 150 | | ℃ |

## Thermal Data

| Symbol | Parameter | Typ. | Max. | Unit |
|---|---|---|---|---|
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] | --- | 75 | ℃/W |
| $R_{\theta JA}$ | Thermal Resistance Junction-Ambient [1] (t ≤10s) | --- | 40 | ℃/W |
| $R_{\theta JC}$ | Thermal Resistance Junction-Case[1] | --- | 3.8 | ℃/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 | --- | -0.0232 | --- | V/℃ |
| $R_{DS(ON)}$ | Static Drain-Source On-Resistance[2] | $V_{GS}$=-10V , $I_D$=-20A | --- | 11 | 14 | mΩ |
| | | $V_{GS}$=-4.5V , $I_D$=-10A | --- | 18 | 24 | |
| $V_{GS(th)}$ | Gate Threshold Voltage | $V_{GS}$=$V_{DS}$ , $I_D$ =-250uA | -1.3 | -1.8 | -2.3 | V |
| $\triangle V_{GS(th)}$ | $V_{GS(th)}$ Temperature Coefficient | | --- | 4.6 | --- | 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 | --- | 15 | --- | S |
| $R_g$ | Gate Resistance | $V_{DS}$=0V , $V_{GS}$=0V , f=1MHz | --- | 9 | --- | Ω |
| $Q_g$ | Total Gate Charge (-4.5V) | $V_{DS}$=-15V , $V_{GS}$=-4.5V , $I_D$=-20A | --- | 30 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 1.2 | --- | |
| $Q_{gd}$ | Gate-Drain Charge | | --- | 11 | --- | |
| $T_{d(on)}$ | Turn-On Delay Time | $V_{DD}$=-15V , $V_{GS}$=-10V , $R_G$=6Ω $I_D$=-1A ,$R_L$=15Ω | --- | 11 | --- | ns |
| $T_r$ | Rise Time | | --- | 11 | --- | |
| $T_{d(off)}$ | Turn-Off Delay Time | | --- | 101 | --- | |
| $T_f$ | Fall Time | | --- | 60 | --- | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-15V , $V_{GS}$=0V , f=1MHz | --- | 1380 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 280 | --- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 217 | --- | |

## Guaranteed Avalanche Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| EAS | Single Pulse Avalanche Energy[5] | $V_{DD}$=-25V , L=0.5mH , $I_{AS}$=-18A | 78 | --- | --- | mJ |

## Diode Characteristics

| Symbol | Parameter | Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $I_S$ | Continuous Source Current[1,6] | $V_G$=$V_D$=0V , Force Current | --- | --- | -20 | A |
| $I_{SM}$ | Pulsed Source Current[2,6] | | --- | --- | -70 | A |
| $V_{SD}$ | Diode Forward Voltage[2] | $V_{GS}$=0V , $I_S$=-1A , $T_J$=25℃ | --- | --- | -1 | V |
| $t_{rr}$ | Reverse Recovery Time | $I_F$=-20A,dI/dt=100A/µs, $T_J$=25℃ | --- | 20 | --- | nS |
| $Q_{rr}$ | Reverse Recovery Charge | | --- | 8 | --- | 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=0.5mH,$I_{AS}$=-18A
4.The power dissipation is limited by 150℃ 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

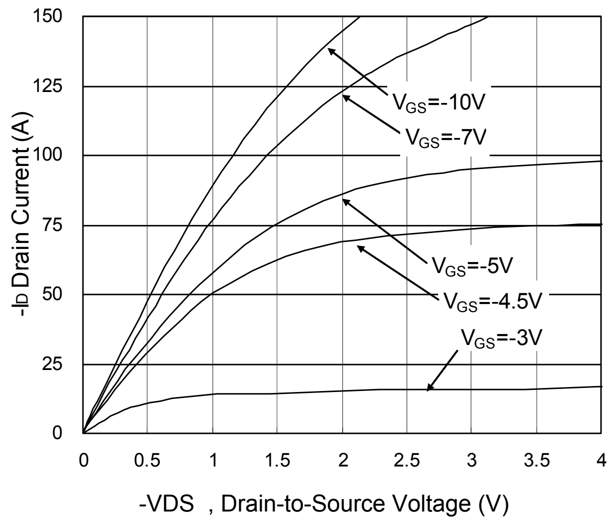



**Fig.1 Typical Output Characteristics**

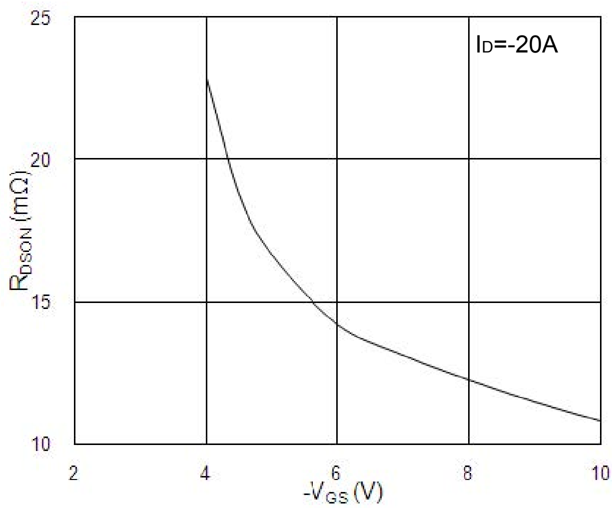



**Fig.2 On-Resistance vs. G-S Voltage**

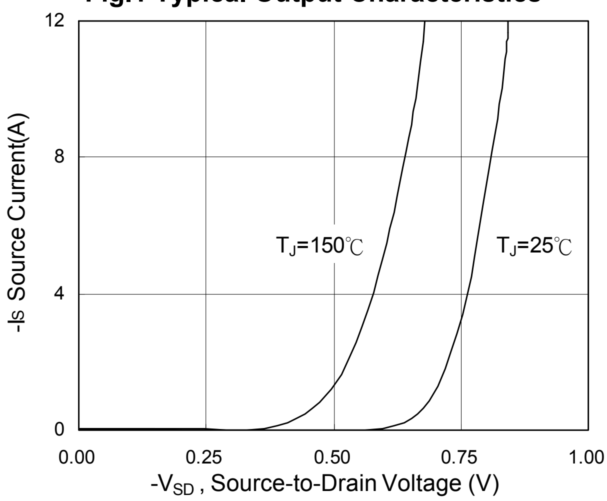



**Fig.3 Forward Characteristics of Reverse**

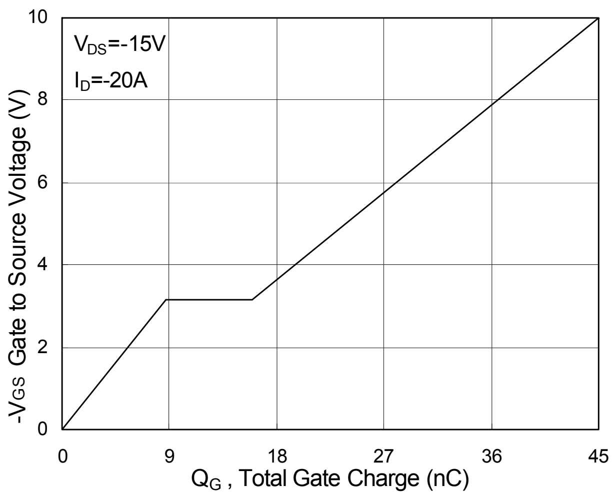



**Fig.4 Gate-Charge Characteristics**

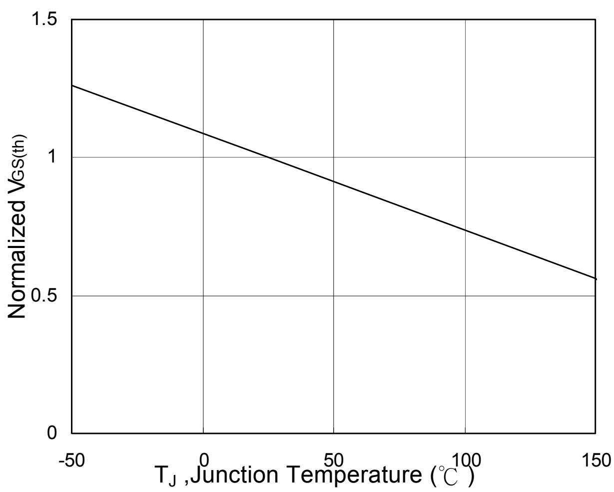



**Fig.5 Normalized $V_{GS(th)}$ vs. $T_J$**

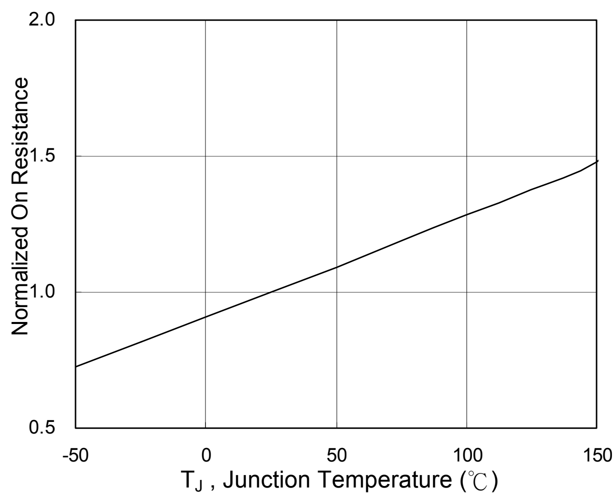



**Fig.6 Normalized $R_{DSON}$ vs. $T_J$**

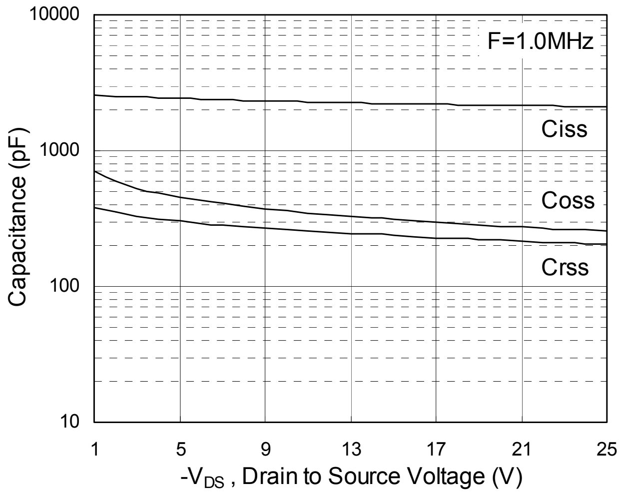



**Fig.7 Capacitance**

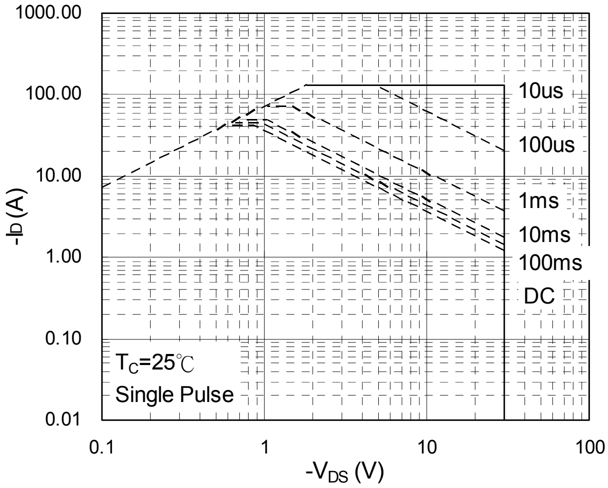



**Fig.8 Safe Operating Area**

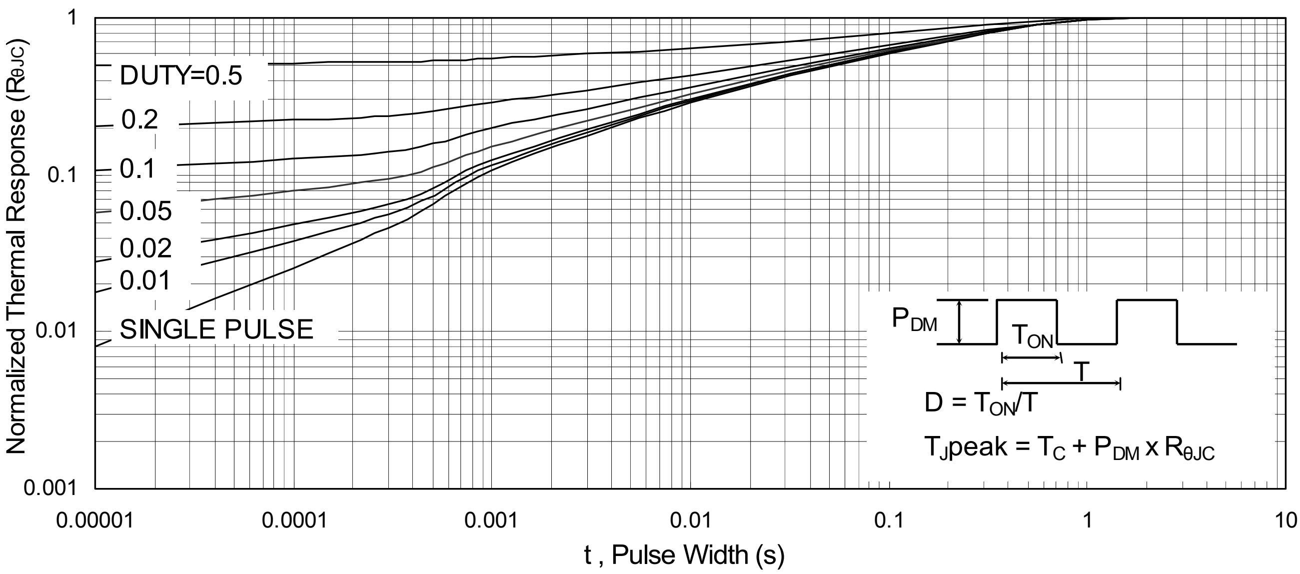



**Fig.9 Normalized Maximum Transient Thermal Impedance**

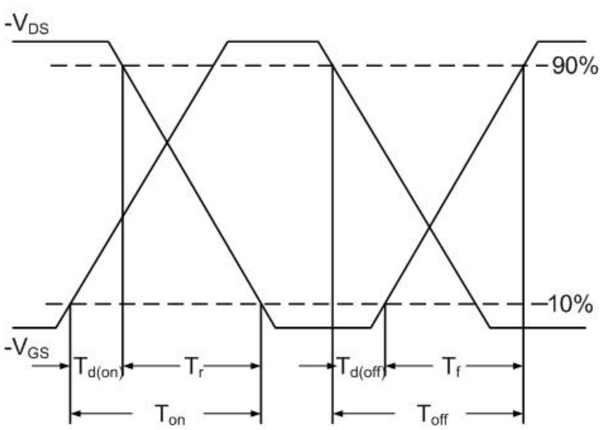



**Fig.10 Switching Time Waveform**

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

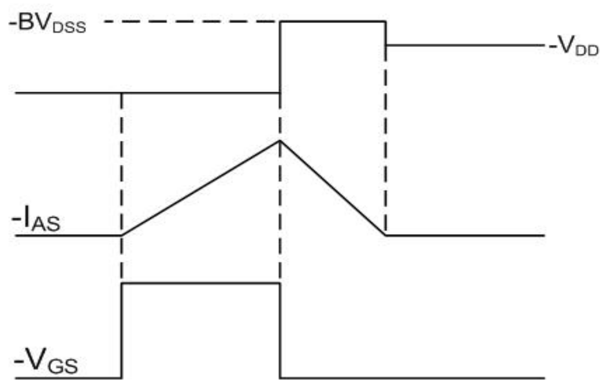



**Fig.11 Unclamped Inductive Switching Waveform**

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