

## General Description

The WSD4038DN is the highest performance trench N-ch MOSFETs with extreme high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The WSD4038DN 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

## Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
$V_{DS}$	Drain-Source Voltage	40	V
$V_{GS}$	Gate-Source Voltage	$\pm 20$	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	38	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	20	A
$I_D@T_A=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	15	A
$I_D@T_A=70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V^1$	10	A
$I_{DM}@T_C=25^\circ C$	Pulsed Drain Current <sup>2</sup>	36	A
EAS	Avalanche Energy, Single Pulse ( $L=0.1mH$ ) <sup>3</sup>	26	mJ
$I_{AS}$	Avalanche Current, Single pulse( $L=0.1mH$ ) <sup>3</sup>	36	A
$P_D@T_A=25^\circ C$	Total Power Dissipation <sup>4</sup>	2.1	W
$P_D@T_A=70^\circ C$	Total Power Dissipation <sup>4</sup>	1.78	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 <sup>1</sup>	---	60	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case <sup>1</sup>	---	2.1	$^\circ C/W$

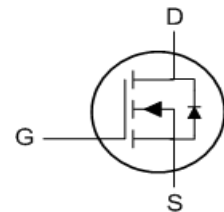
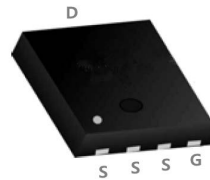
## Product Summary

BVDSS	RDSON	ID
40V	13m $\Omega$	38A

## Applications

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

## DFN3.3X3.3-EP Pin Configuration



**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	40	---	---	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =7A	---	10.5	13	mΩ
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =4.5V, I <sub>D</sub> =5A	---	12	16	mΩ
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	1.5	1.8	2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-6.	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =32V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	-	2	uA
		V <sub>DS</sub> =32V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	-	10	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V	---	-	±100	nA
g <sub>fs</sub>	Forward Transconductance	V <sub>DS</sub> =5V, I <sub>D</sub> =20A	---	31	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz	---	1.1	1.8	Ω
Q <sub>g</sub>	Total Gate Charge (10V)	V <sub>DS</sub> =20V, V <sub>GS</sub> =10V, I <sub>DS</sub> =7A	---	20	28	nC
Q <sub>gs</sub>	Gate-Source Charge		---	3.9	7.5	
Q <sub>gd</sub>	Gate-Drain Charge		---	3.0	5.1	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =20V, R <sub>L</sub> =20Ω, I <sub>DS</sub> =1A, V <sub>GEN</sub> =10V, R <sub>G</sub> =1Ω.	---	12.6	16	ns
T <sub>r</sub>	Rise Time		---	10	12	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	23.6	32	
T <sub>f</sub>	Fall Time		---	6	9	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =20V, V <sub>GS</sub> =0V, f=1MHz	---	1125	---	pF
C <sub>oss</sub>	Output Capacitance		---	132	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	70	---	

**Diode Characteristics**

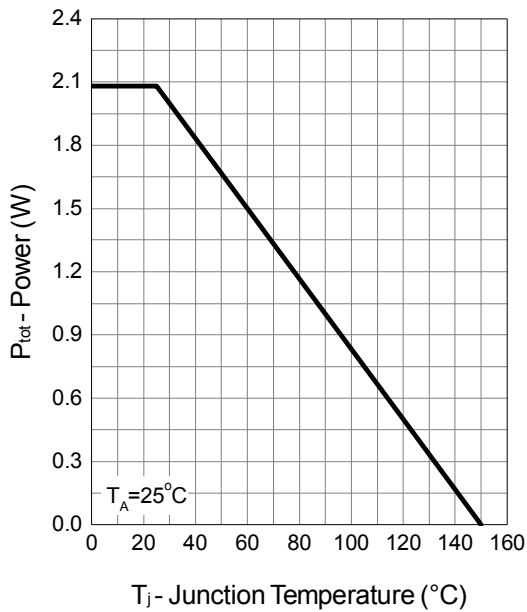
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I <sub>S</sub>	Continuous Source Current <sup>1,6</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	5	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,6</sup>		---	-	15	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =20A, T <sub>J</sub> =25°C	---	-	1.1	V

Note :

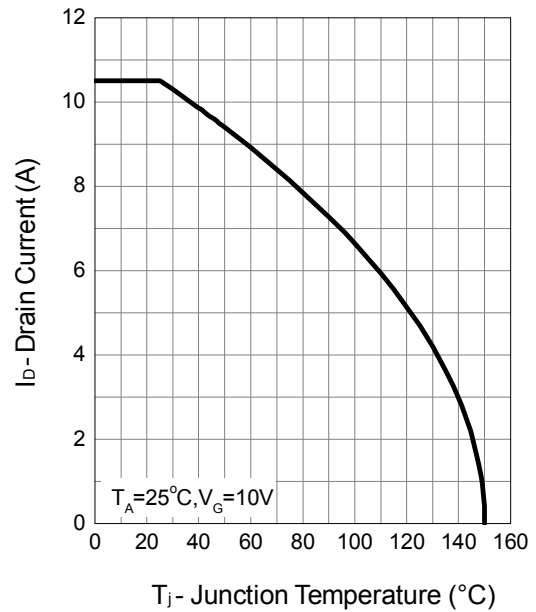
- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper, t<10sec.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The EAS data shows Max. rating. The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.5mH, I<sub>AS</sub>=13A
- The power dissipation is limited by 150°C junction temperature
- The Min. value is 100% EAS tested guarantee.
- The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub>, in real applications, should be limited by total power dissipation.
- Package limitation current is 60A.

## Typical Operating Characteristics

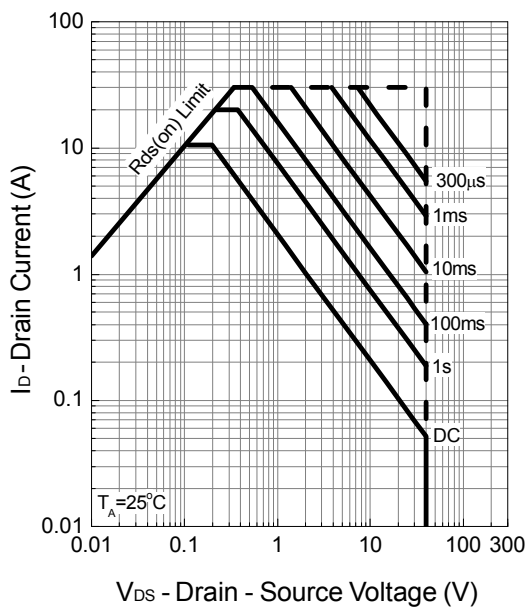
**Power Dissipation**



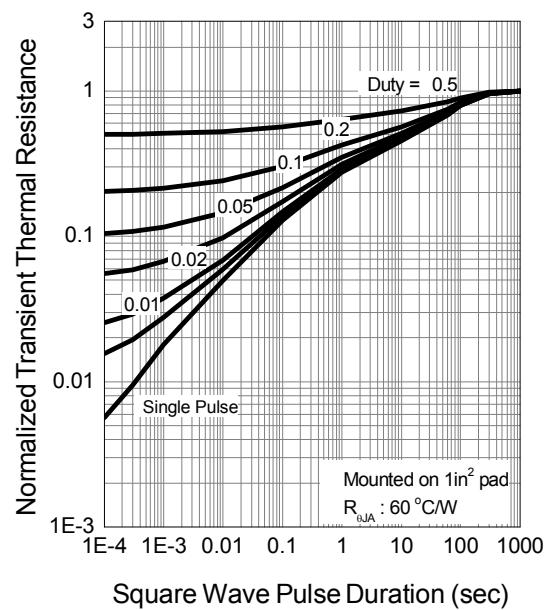
**Drain Current**



**Safe Operation Area**

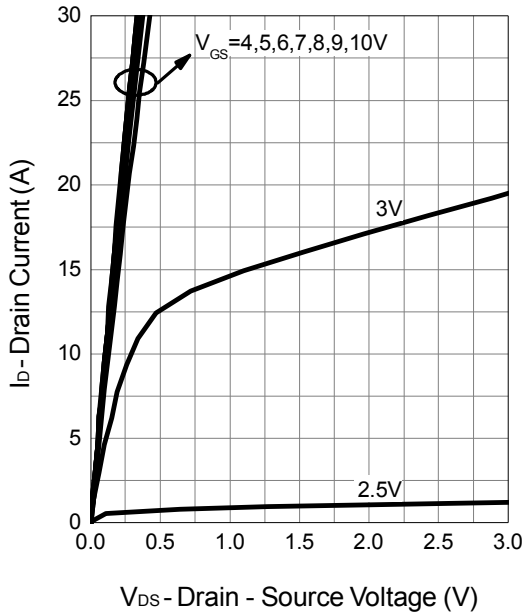


**Thermal Transient Impedance**

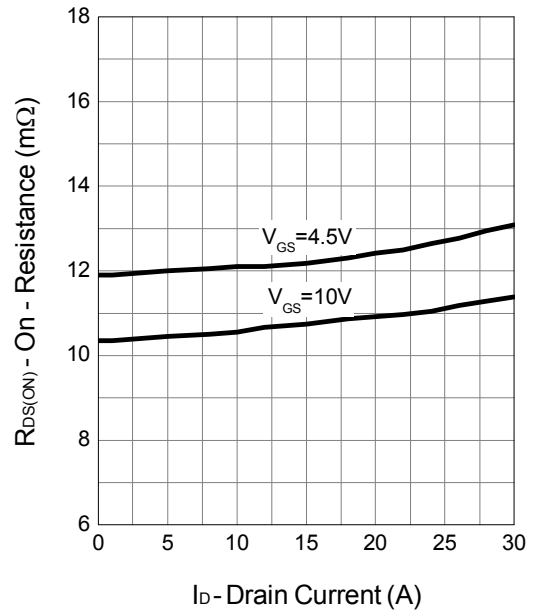


**Typical Operating Characteristics (Cont.)**

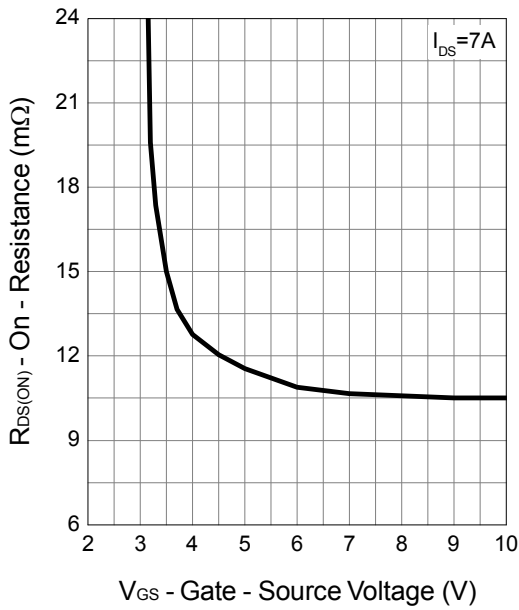
**Output Characteristics**



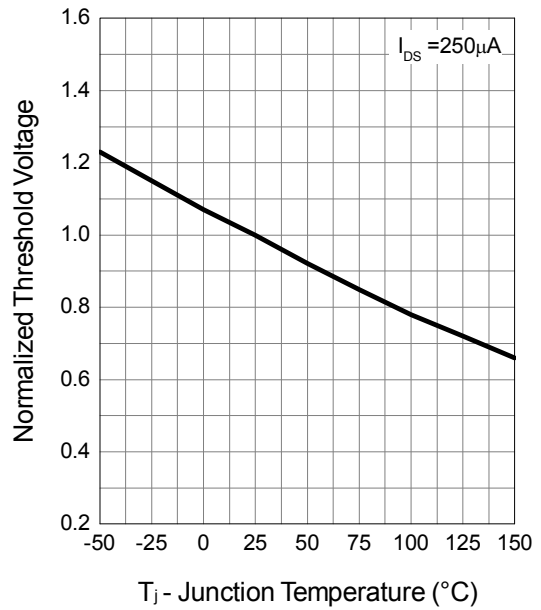
**Drain-Source On Resistance**



**Gate-Source On Resistance**

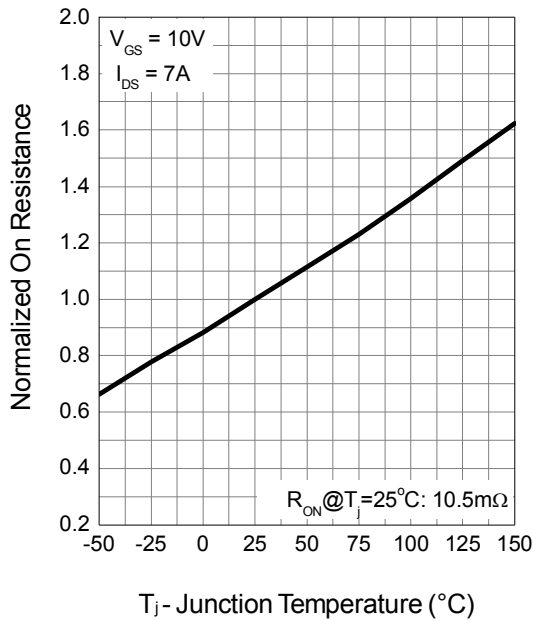


**Gate Threshold Voltage**

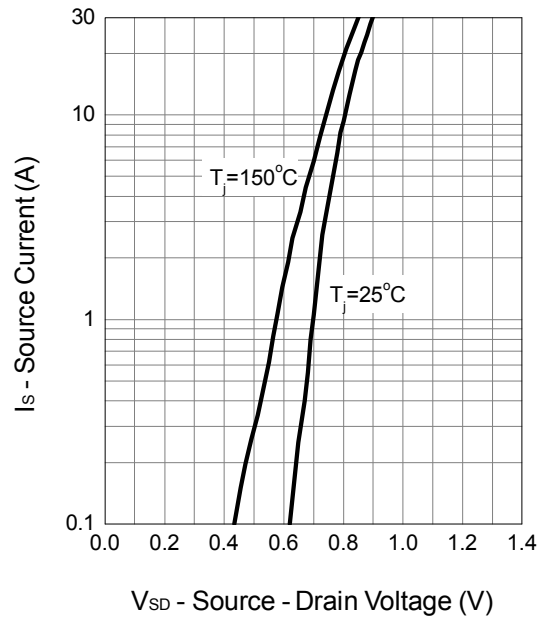


**Typical Operating Characteristics (Cont.)**

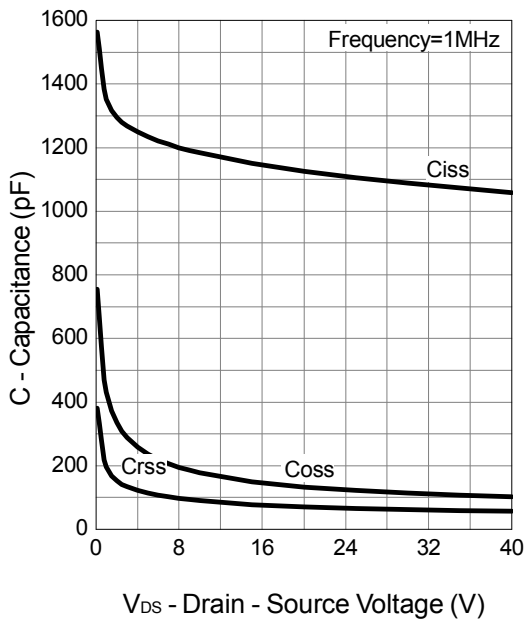
**Drain-Source On Resistance**



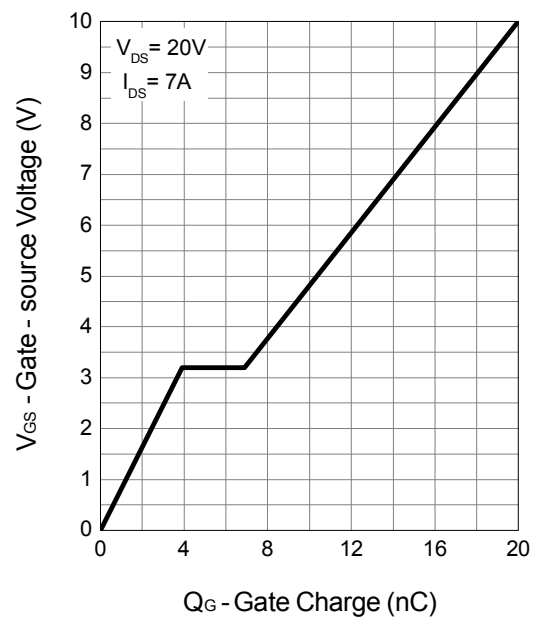
**Source-Drain Diode Forward**

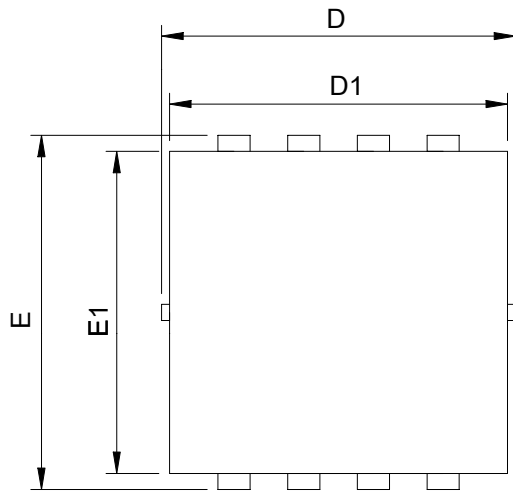
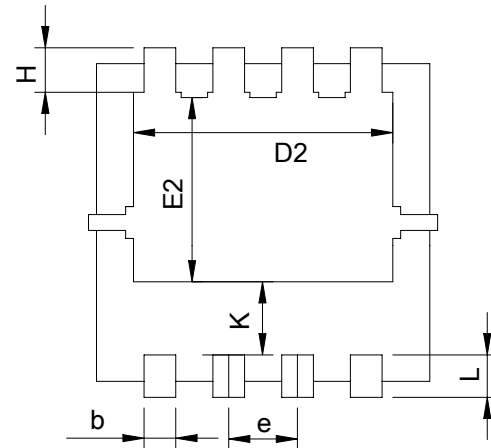
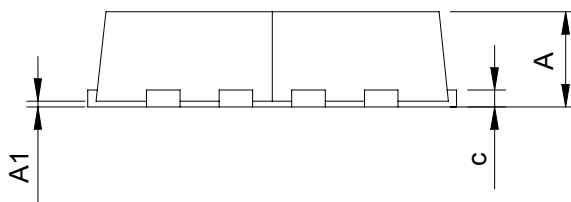


**Capacitance**

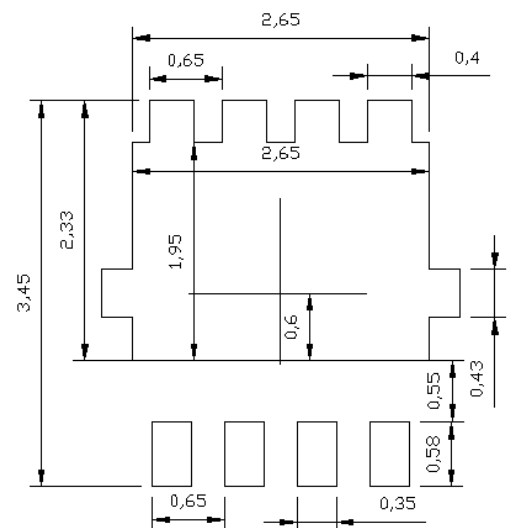


**Gate Charge**




**Top View**

**Bottom View**

**Side View**

SYMBOL	DFN3.3x3.3_EP			
	MILLIMETERS		INCHES	
	MIN.	MAX.	MIN.	MAX.
A	0.70	1.00	0.028	0.039
A1	0.00	0.05	0.000	0.002
b	0.25	0.35	0.010	0.014
c	0.14	0.20	0.006	0.008
D	3.10	3.50	0.122	0.138
D1	3.05	3.25	0.120	0.128
D2	2.35	2.55	0.093	0.100
E	3.10	3.50	0.122	0.138
E1	2.90	3.10	0.114	0.122
E2	1.64	1.84	0.065	0.072
e	0.65 BSC		0.026 BSC	
H	0.32	0.52	0.013	0.020
K	0.59	0.79	0.023	0.031
L	0.25	0.55	0.010	0.022


**UNIT: mm**

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