

### General Description

The WSD3050DN33 is the highest performance trench N-Channel MOSFETs with extreme high cell density, which provide excellent  $R_{DS(ON)}$  and gate charge for most of the synchronous buck converter applications .

The WSD3050DN33 meet the RoHS and Green Product requirement, 100%  $E_{AS}$  guaranteed with full function reliability approved.

### Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100%  $E_{AS}$  Guaranteed
- Green Device Available

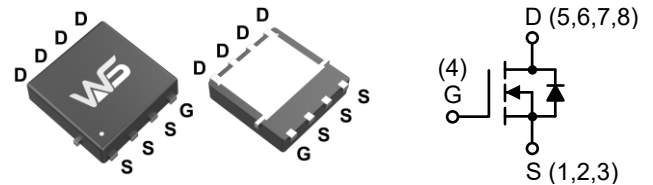
### Product Summary

$BV_{DSS}$	$R_{DS(ON)}$	$I_D$
30V	6.7m $\Omega$	50A

### Applications

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

### DFN3X3-8L Pin Configuration



### Absolute Maximum Ratings

Symbol	Parameter	Rating		Units
		10s	Steady State	
$V_{DS}$	Drain-Source Voltage	30		V
$V_{GS}$	Gate-Source Voltage	$\pm 20$		
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ <sup>1</sup>	50		A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ <sup>1</sup>	37		
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ <sup>1</sup>	14	12	
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$ <sup>1</sup>	11.4	9.7	
$I_{DM}$	Pulsed Drain Current <sup>2</sup>	100		
$E_{AS}$	Single Pulse Avalanche Energy <sup>3</sup>	50		mJ
$I_{AS}$	Avalanche Current	14		A
$P_D @ T_C = 25^\circ C$	Power Dissipation <sup>4</sup>	26		W
$P_D @ T_A = 25^\circ C$	Power Dissipation <sup>4</sup>	2.5	1.6	
$T_{STG}$	Storage Temperature Range	-55 to 150		$^\circ C$
$T_J$	Operating Junction Temperature Range	-55 to 150		

### Thermal Data

Symbol	Parameter	Typ.	Max.	Units
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient <sup>1</sup>	---	70	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient <sup>1</sup> ( $t \leq 10s$ )	---	50	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case <sup>1</sup>	---	4.7	

**Electrical Characteristics (T<sub>J</sub>=25°C, Unless Otherwise Noted)**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V, I <sub>D</sub> =250μA	30	---	---	V
ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>	BV <sub>DSS</sub> Temperature Coefficient	Reference to 25°C, I <sub>D</sub> =1mA	---	0.024	---	V/°C
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V, I <sub>D</sub> =15A	---	6.7	8.5	mΩ
		V <sub>GS</sub> =4.5V, I <sub>D</sub> =10A	---	8.2	11	
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250μA	1.5	1.8	2.5	V
ΔV <sub>GS(th)</sub>	V <sub>GS(th)</sub> Temperature Coefficient		---	-3.5	---	mV/°C
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C	---	---	1.0	μA
		V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C	---	---	5.0	
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> =30A	---	40	---	S
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f = 1.0MHz	---	1.0	1.5	Ω
Q <sub>g</sub>	Total Gate Charge (4.5V)	V <sub>DS</sub> =15V, V <sub>GS</sub> =10V, I <sub>D</sub> =15A	---	10	12	nC
Q <sub>gs</sub>	Gate-Source Charge		---	3.5	4.1	
Q <sub>gd</sub>	Gate-Drain Charge		---	4.2	4.7	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, R <sub>G</sub> =6Ω I <sub>D</sub> =1A, R <sub>L</sub> =15Ω	---	9	17	ns
T <sub>r</sub>	Rise Time		---	11	23	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	29	52	
T <sub>f</sub>	Fall Time		---	7	12	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f = 1.0MHz	---	1200	1400	pF
C <sub>oss</sub>	Output Capacitance		---	185	220	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	113	140	

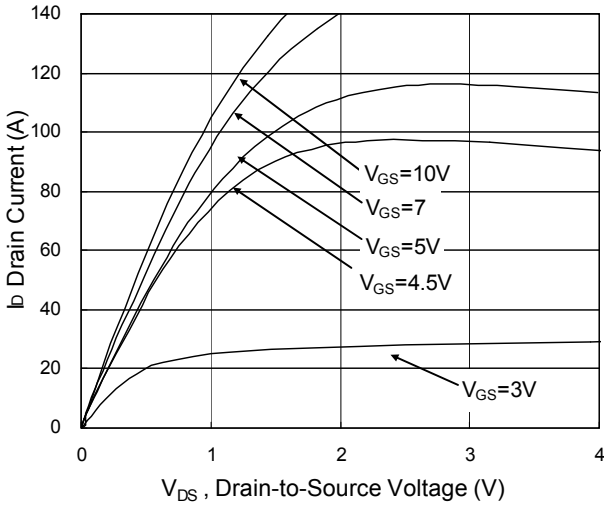
**Diode Characteristics**

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I <sub>S</sub>	Continuous Source Current <sup>1,6</sup>	V <sub>G</sub> =V <sub>D</sub> =0V, Force Current	---	---	20	A
I <sub>SM</sub>	Pulsed Source Current <sup>2,6</sup>		---	---	100	
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V, I <sub>S</sub> =2A, T <sub>J</sub> =25°C	---	---	1.0	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =15A, dI <sub>SD</sub> /dt=100A/μs, T <sub>J</sub> =25°C	---	15	---	ns
Q <sub>rr</sub>	Reverse Recovery Charge		---	7	---	nC

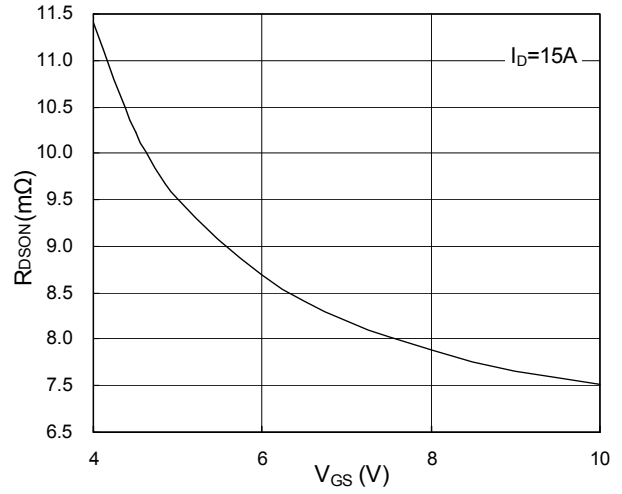
**Note:**

- The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper, t<sub>s</sub>≤10sec.
- The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
- The E<sub>AS</sub> data shows Max. rating. The test condition is V<sub>DD</sub>=25V, V<sub>GS</sub>=10V, L=0.1mH, I<sub>AS</sub>=20A
- The power dissipation is limited by 150°C junction temperature.
- The Min. value is 100% E<sub>AS</sub> 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.

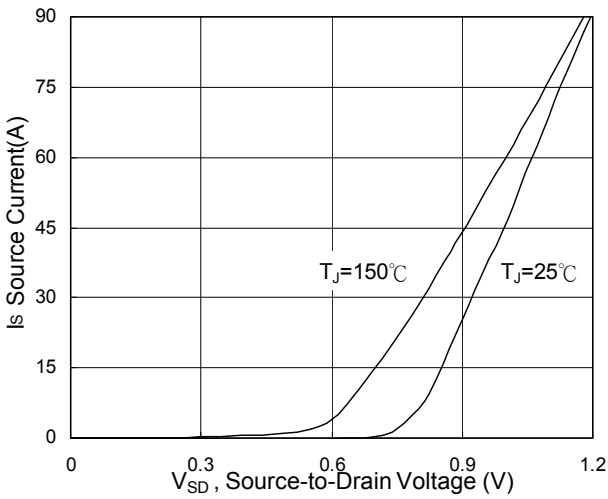
**Typical Characteristics**



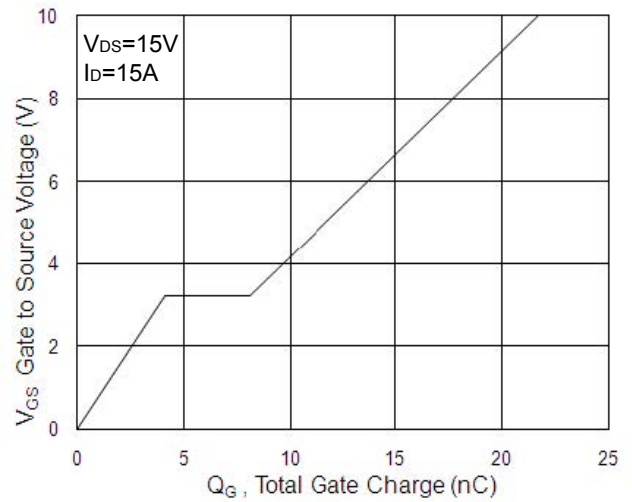
**Fig.1 Typical Output Characteristics**



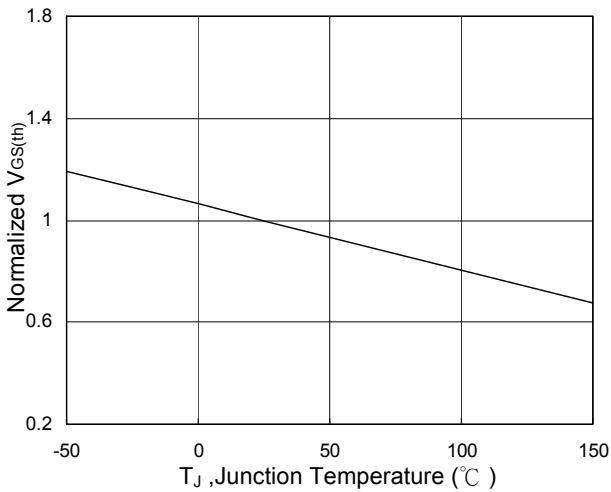
**Fig.2 On-Resistance vs. Gate-Source**



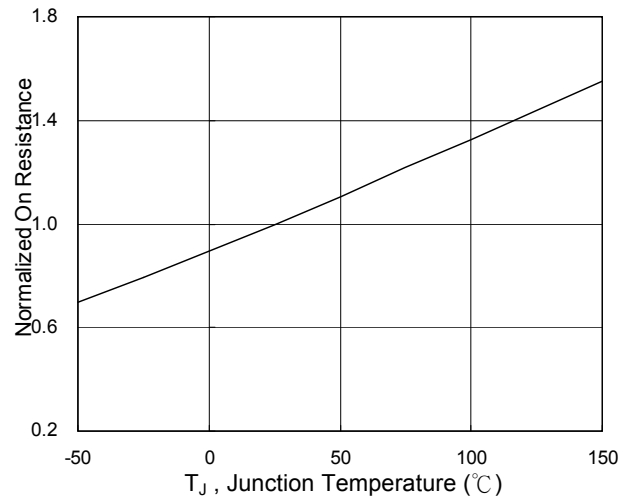
**Fig.3 Forward Characteristics of Reverse**



**Fig.4 Gate-Charge Characteristics**

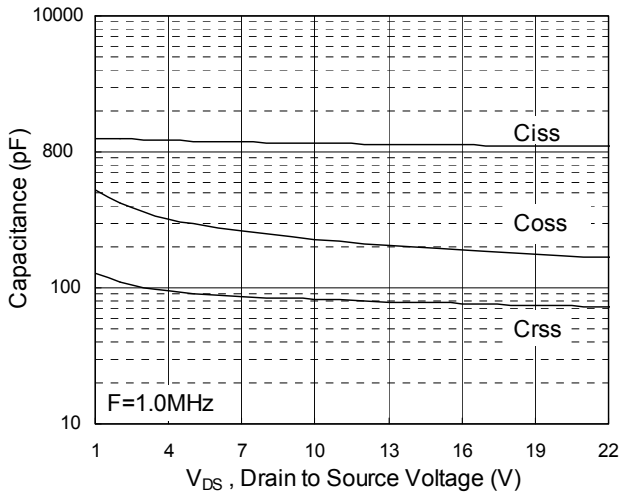


**Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$**

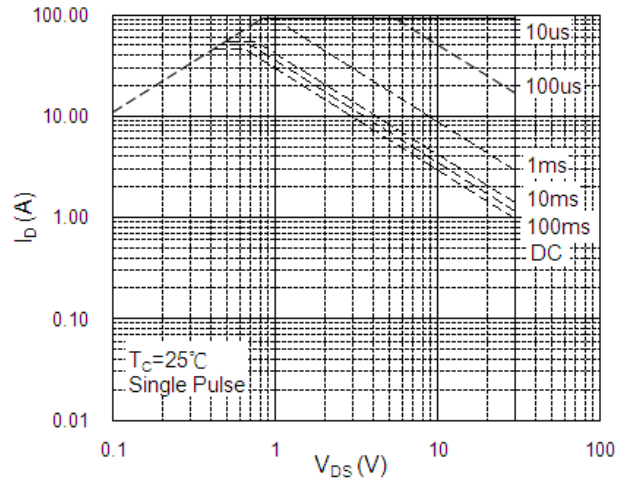


**Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$**

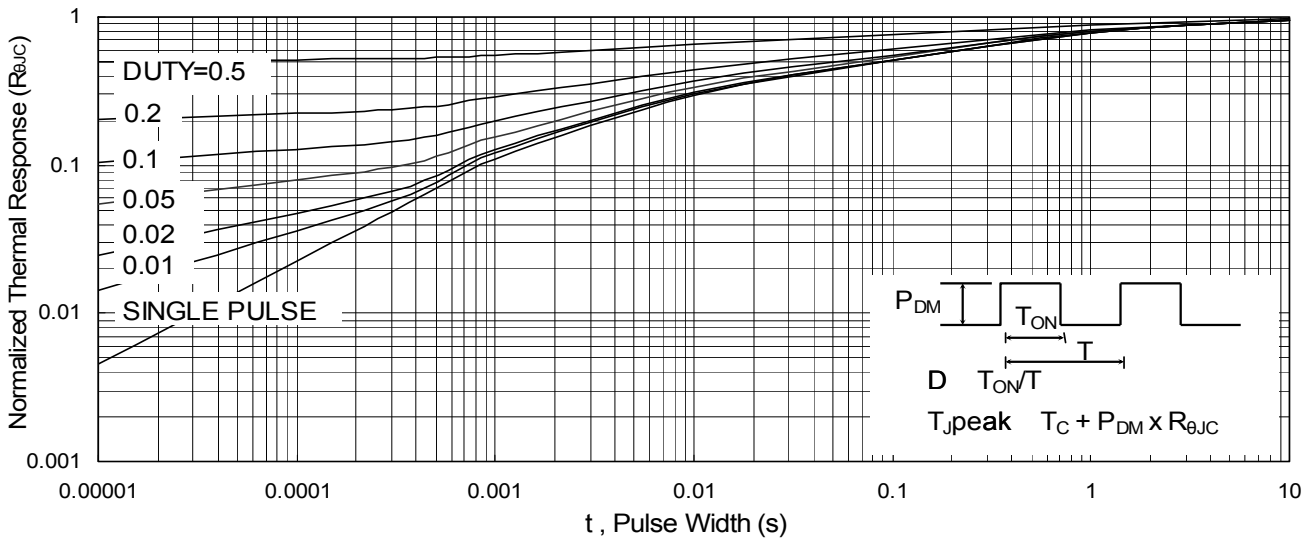
**Typical Characteristics (Cont.)**



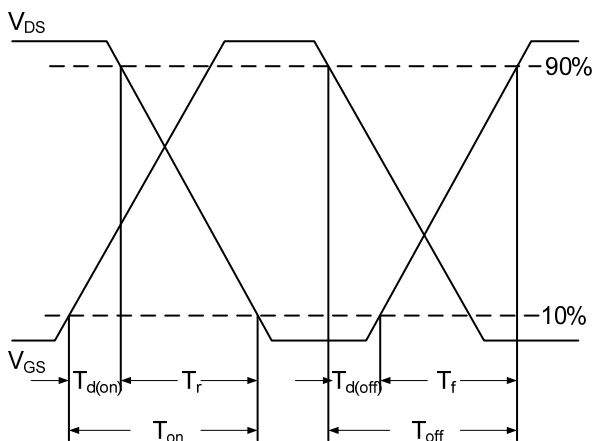
**Fig.7 Capacitance**



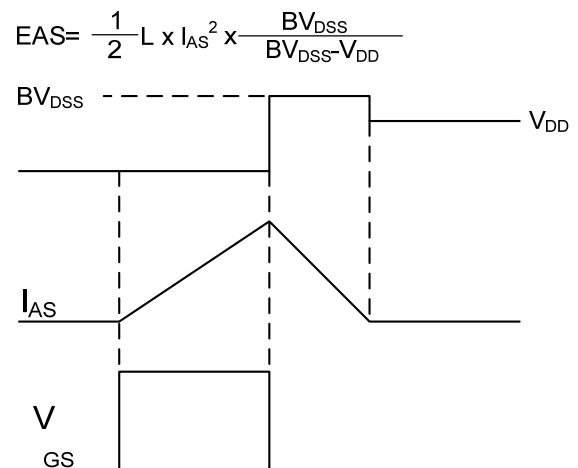
**Fig.8 Safe Operating Area**



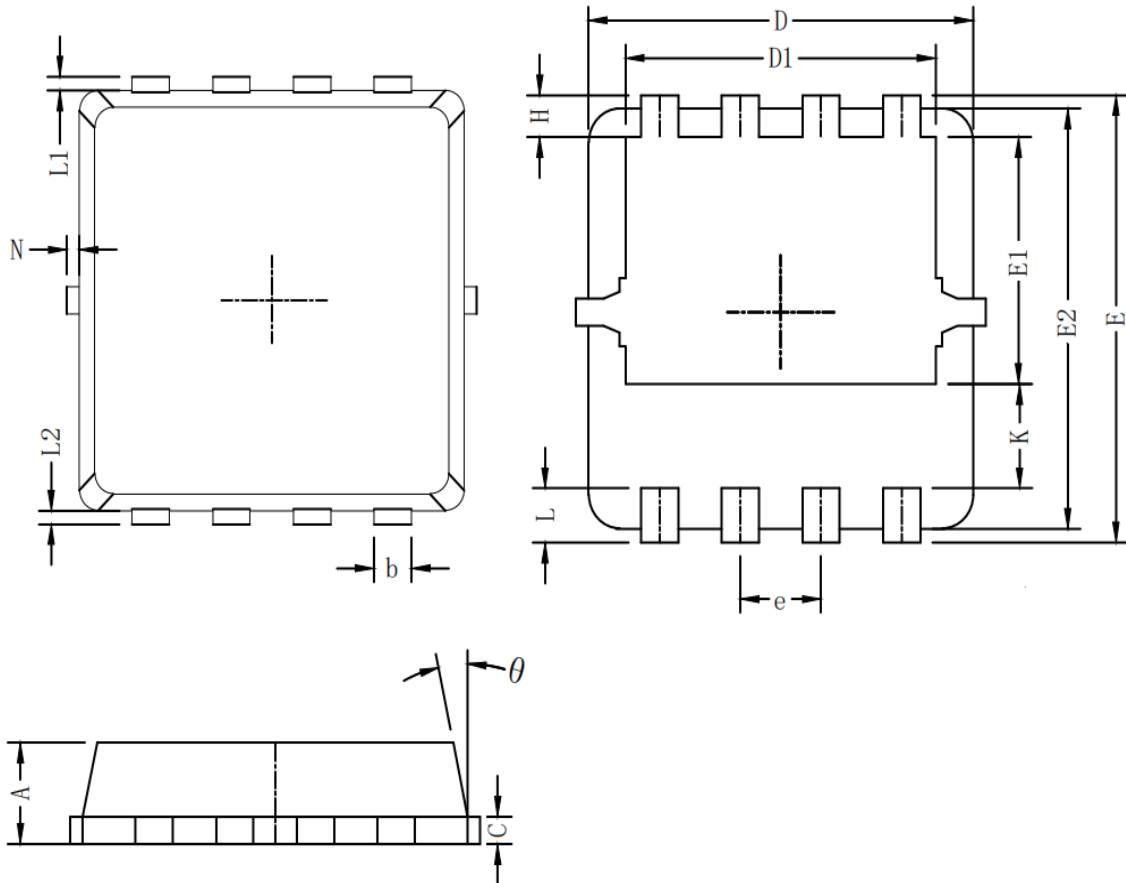
**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**

**Packaging information**


Symbol	Dim in mm		
	min	typ	max
A	0.6	0.75	0.9
b	0.2	0.3	0.4
C	0.15	0.2	0.25
D	3	3.1	3.2
D1	2.3	2.45	2.6
E	3.15	3.3	3.45
E1	1.43	1.73	1.93
E2	2.9	3.05	3.2
e	0.65BSC		
H	0.2	0.35	0.5
K	0.57	0.77	0.87
L	0.3	0.4	0.5
L1/L2	0.1REF		
$\theta$	8°	10°	13°
N	0		0.15

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