

General Description

The WSD20L50DN33 is the highest performance trench P-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 WSD20L50DN33 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

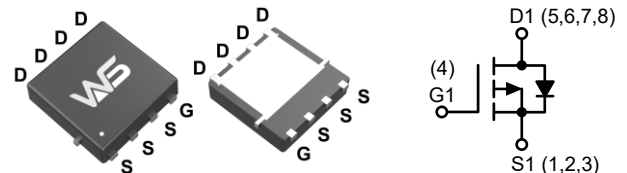
Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D
-20V	9.0m Ω	-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	-20		V
V_{GS}	Gate-Source Voltage	± 12		
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$ ¹	-50		A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$ ¹	-22		
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$ ¹	-13.5	-10	
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$ ¹	-10.5	-8.0	
I_{DM}	Pulsed Drain Current ²	-70		
E_{AS}	Single Pulse Avalanche Energy ³	36		mJ
I_{AS}	Avalanche Current	-12		A
$P_D @ T_C = 25^\circ C$	Total Power Dissipation ⁴	31.25		W
$P_D @ T_A = 25^\circ C$	Total Power Dissipation ⁴	3.1	2.0	
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 ¹	---	80	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ¹ ($t \leq 10s$)	---	40	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case ¹	---	4.0	

Electrical Characteristics (T_J=25°C, Unless Otherwise Noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =-250μA	-20	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.0232	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-4.5V, I _D =-10A	---	9.0	11	mΩ
		V _{GS} =-2.5V, I _D =-8A	---	11	15	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250μA	-0.5	---	-1.0	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	4.6	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-16V, V _{GS} =0V, T _J =25°C	---	---	-1.0	μA
		V _{DS} =-16V, V _{GS} =0V, T _J =55°C	---	---	-5.0	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±12V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-10A	---	13	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f = 1.0MHz	---	9	---	Ω
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-10V, V _{GS} =-4.5V, I _D =-11A	---	25	---	nC
Q _{gs}	Gate-Source Charge		---	1.6	---	
Q _{gd}	Gate-Drain Charge		---	11	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-10V, V _{GS} =-4.5V, R _G =6Ω, I _D =-1A, R _L =15Ω	---	9	---	ns
T _r	Rise Time		---	13	---	
T _{d(off)}	Turn-Off Delay Time		---	26	---	
T _f	Fall Time		---	167	---	
C _{iss}	Input Capacitance	V _{DS} =-10V, V _{GS} =0V, f = 1.0MHz	---	1620	---	pF
C _{oss}	Output Capacitance		---	320	---	
C _{rss}	Reverse Transfer Capacitance		---	290	---	

Diode Characteristics

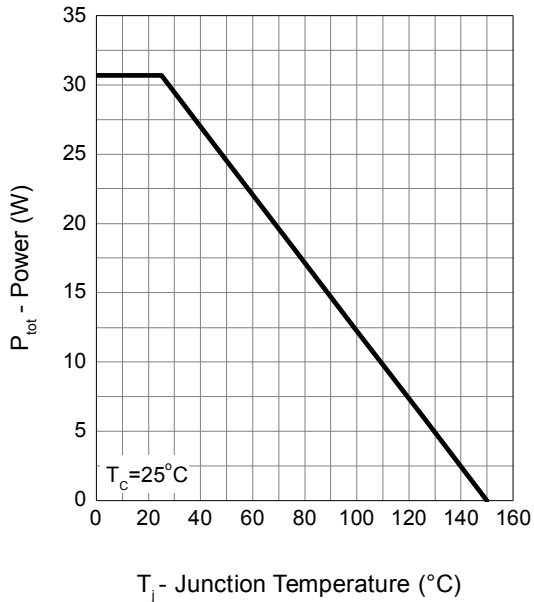
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I _S	Continuous Source Current ^{1,6}	V _G =V _D =0V, Force Current	---	---	-10	A
I _{SM}	Pulsed Source Current ^{2,6}		---	---	-40	
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.0	V
t _{rr}	Reverse Recovery Time	I _F =-20A, dI/dt=100A/μs, T _J =25°C	---	63	---	ns
Q _{rr}	Reverse Recovery Charge		---	54	---	nC

Note:

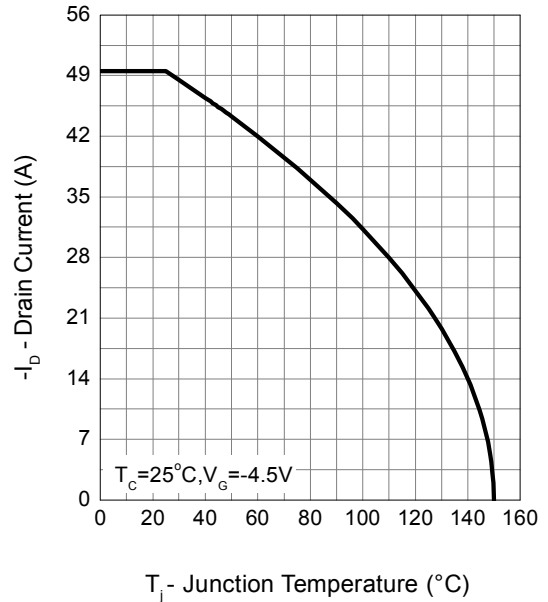
- The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper, t_s≤10sec.
- The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
- The E_{AS} data shows Max. rating. The test condition is V_{DD}=-25V, V_{GS}=-10V, L=0.5mH, I_{AS}=-18A
- The power dissipation is limited by 150°C junction temperature.
- The Min. value is 100% E_{AS} tested guarantee.
- The data is theoretically the same as I_D and I_{DM}, in real applications, should be limited by total power dissipation.

Typical Characteristics

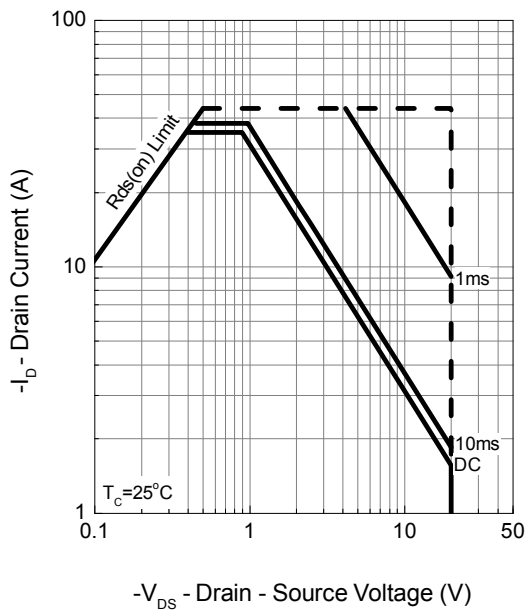
Power Dissipation



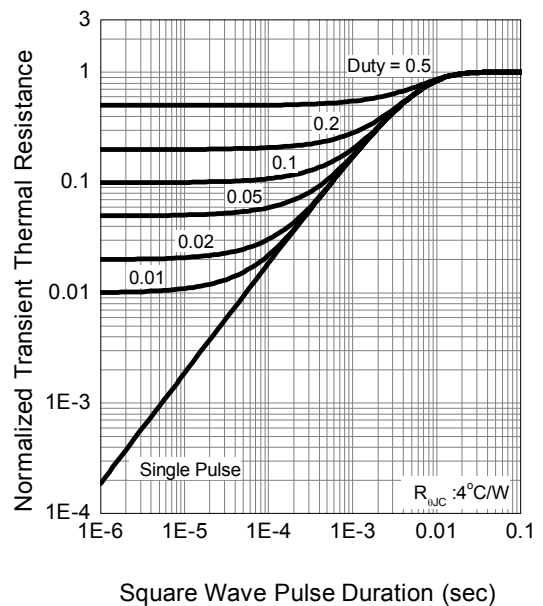
Drain Current



Safe Operation Area

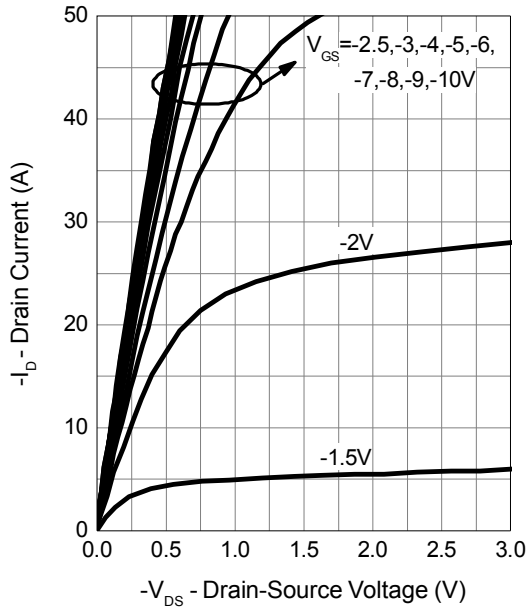


Thermal Transient Impedance

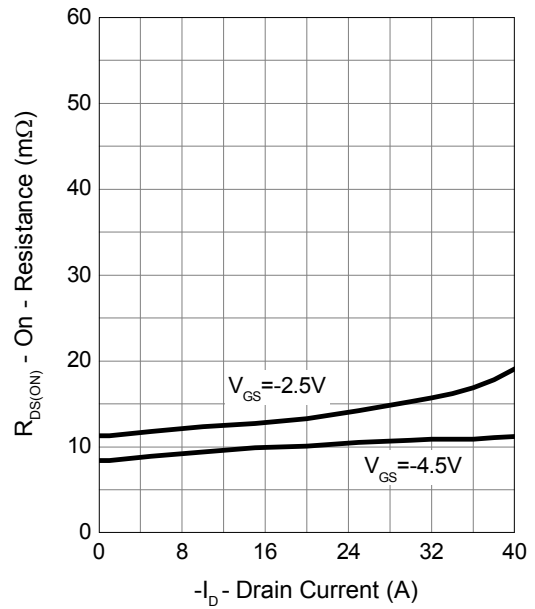


Typical Characteristics (Cont.)

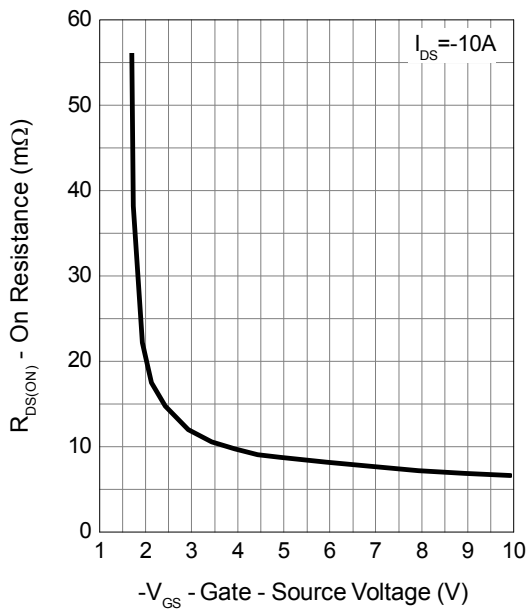
Output Characteristics



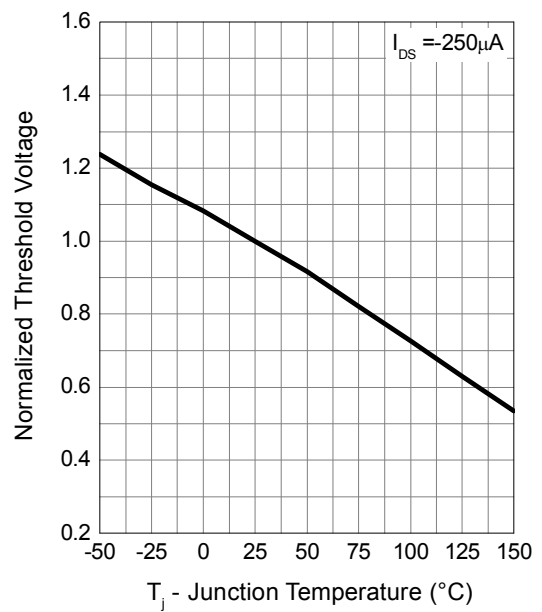
Drain-Source On Resistance



Gate-Source On Resistance

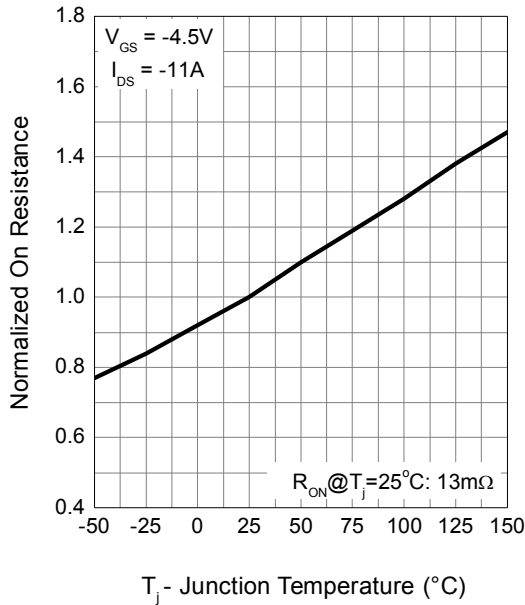


Gate Threshold Voltage

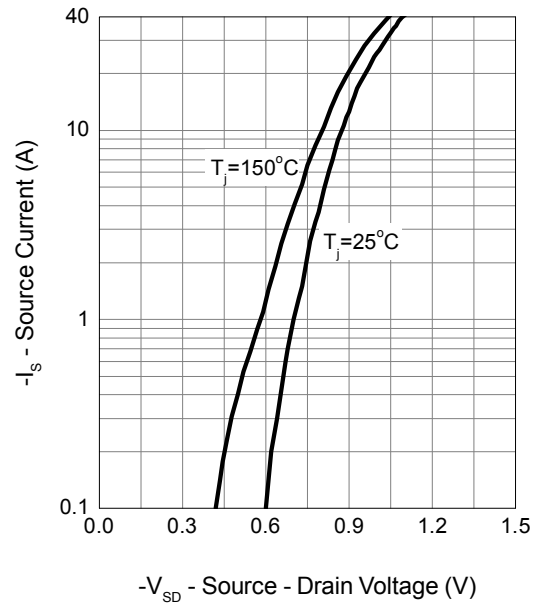


Typical Characteristics (Cont.)

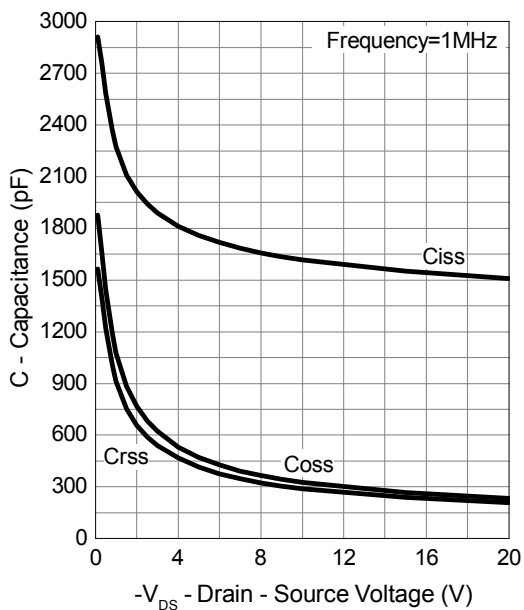
Drain-Source On Resistance



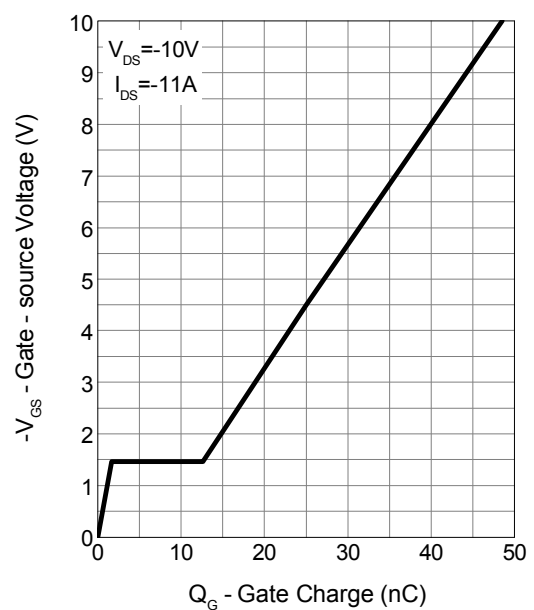
Source-Drain Diode Forward



Capacitance

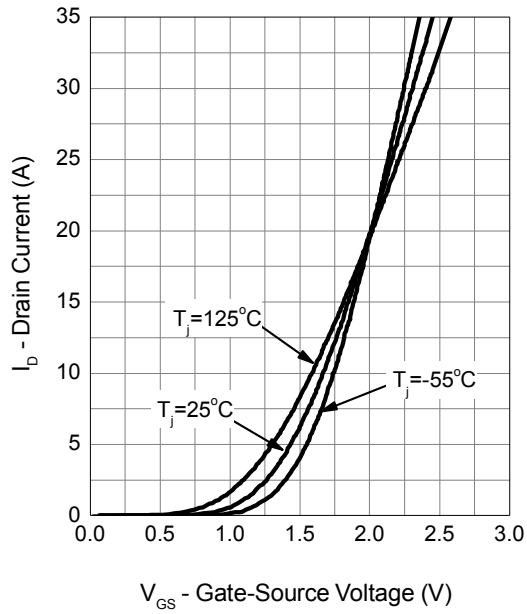


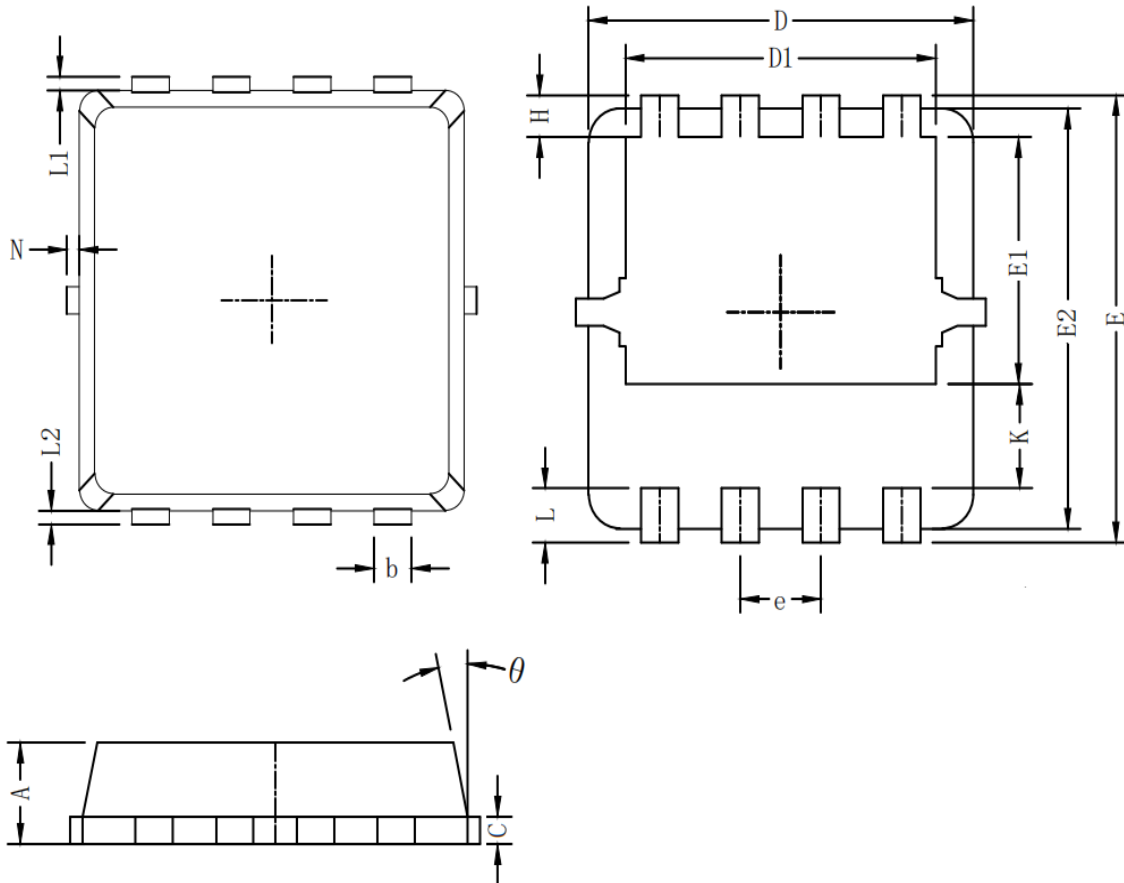
Gate Charge



Typical Characteristics (Cont.)

Transfer Characteristics



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		
θ	8°	10°	13°
N	0		0.15

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