

General Description

The WSD40L48DN33 is the highest performance trench P-Channel MOSFET with extreme high cell density, which provide excellent $R_{DS(ON)}$ and gate charge for most of the synchronous buck converter applications.

The WSD40L48DN33 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

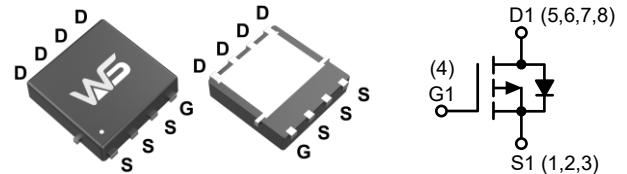
Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D
-40V	16m Ω	-30A

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
V_{DS}	Drain-Source Voltage	-40	V
V_{GS}	Gate-Source Voltage	± 20	
$I_D @ T_C = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$ ¹	-30	A
$I_D @ T_C = 100^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$ ¹	-10	
$I_D @ T_A = 25^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$ ¹	-13	
$I_D @ T_A = 70^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$ ¹	-8	
I_{DM}	Pulsed Drain Current ²	-75	
E_{AS}	Single Pulse Avalanche Energy ³	49	mJ
I_{AS}	Avalanche Current	-14	A
$P_D @ T_C = 25^\circ C$	Power Dissipation ⁴	35	W
$P_D @ T_A = 25^\circ C$	Power Dissipation ⁴	3.1	
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	---	50	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ¹ ($t \leq 10s$)	---	40	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case ¹	---	3.5	

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	-40	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =-1mA	---	-0.022	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-15A	---	16	24	mΩ
		V _{GS} =-4.5V, I _D =-10A	---	20	30	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250μA	-1.3	-1.9	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	4.6	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =-32V, V _{GS} =0V, T _J =25°C	---	---	-1.0	μA
		V _{DS} =-32V, V _{GS} =0V, T _J =55°C	---	---	-5.0	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-15A	30	---	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f = 1.0MHz	---	2.1	---	Ω
Q _g	Total Gate Charge (-4.5V)	V _{DS} =-15V, V _{GS} =-4.5V, I _D =-15A	---	33	---	nC
Q _{gs}	Gate-Source Charge		---	5.5	---	
Q _{gd}	Gate-Drain Charge		---	8.3	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-20V, V _{GS} =-10V, R _G =6Ω, I _D =-1A, R _L =20Ω	---	15	---	ns
T _r	Rise Time		---	13	---	
T _{d(off)}	Turn-Off Delay Time		---	42	---	
T _f	Fall Time		---	23	---	
C _{iss}	Input Capacitance	V _{DS} =-20V, V _{GS} =0V, f = 1.0MHz	---	1760	---	pF
C _{OSS}	Output Capacitance		---	228	---	
C _{rss}	Reverse Transfer Capacitance		---	185	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
E _{AS}	Single Pulse Avalanche Energy ⁵	V _{DD} =-25V, L=0.5mH, I _{AS} =-14A	38	---	---	mJ

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I _S	Continuous Source Current ^{1,6}	V _G =V _D =0V, Force Current	---	---	-20	A
I _{SM}	Pulsed Source Current ^{2,6}		---	---	-80	
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-10A, T _J =25°C	---	0.74	-1.2	V
t _{rr}	Reverse Recovery Time	I _F =-10A, dI/dt=100A/μs, T _J =25°C	---	20	---	ns
Q _{rr}	Reverse Recovery Charge		---	18	---	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 ≤ 300us, 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}=-14A
- 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

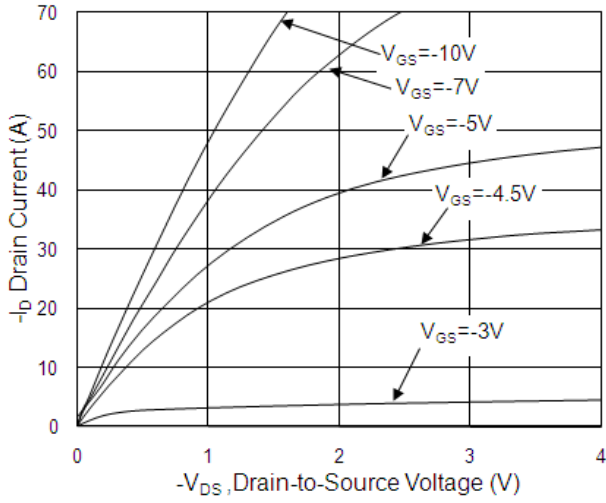


Fig.1 Typical Output Characteristics

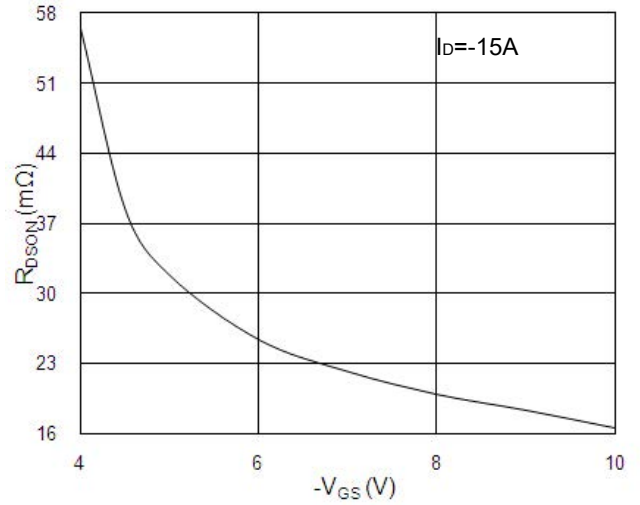


Fig.2 On-Resistance v.s Gate-Source

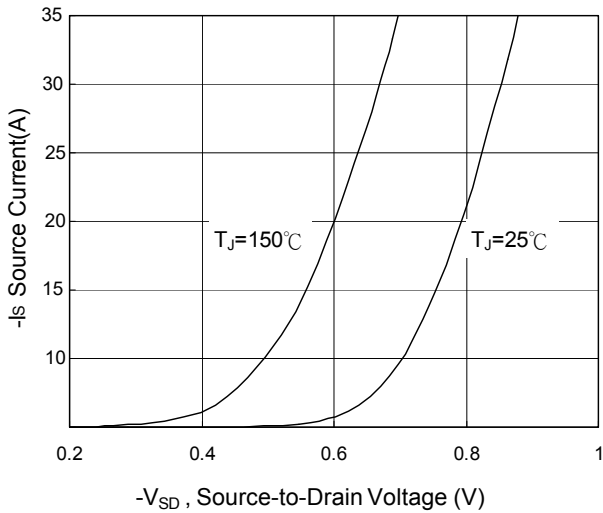


Fig.3 Forward Characteristics of Reverse

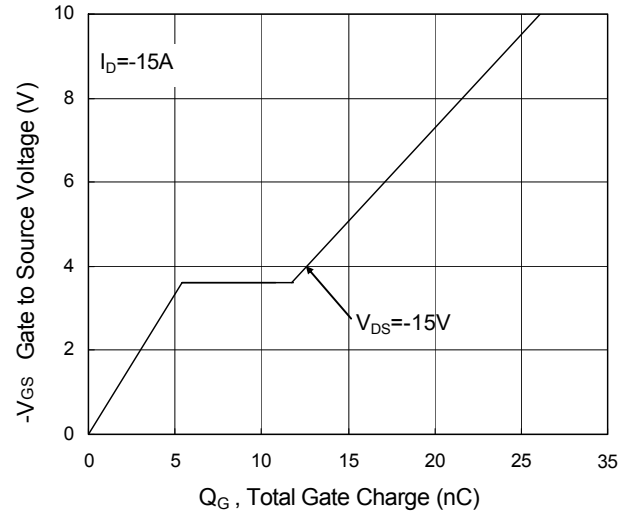


Fig.4 Gate-Charge Characteristics

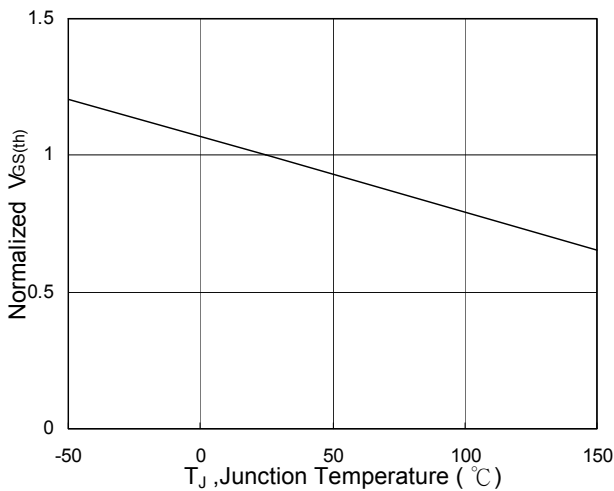


Fig.5 Normalized $V_{GS(th)}$ vs. T_J

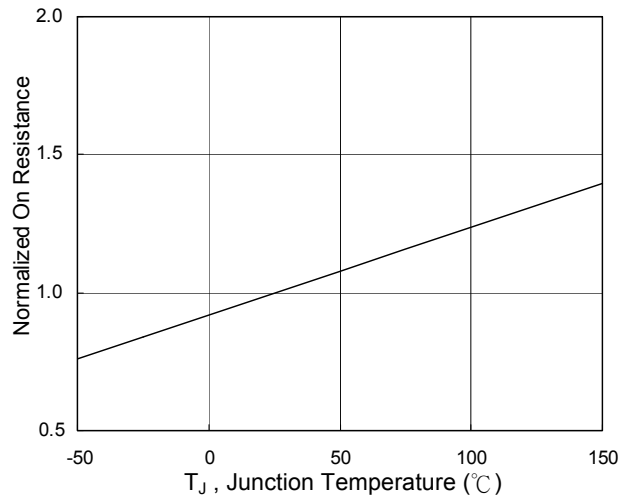


Fig.6 Normalized $R_{DS(on)}$ vs. T_J

Typical Characteristics (Cont.)

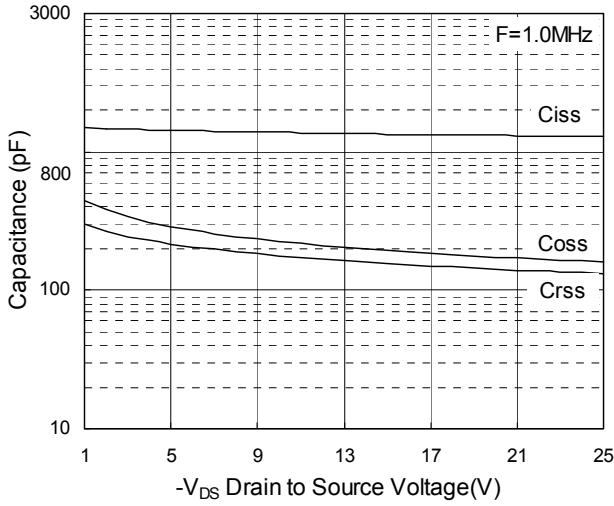


Fig.7 Capacitance

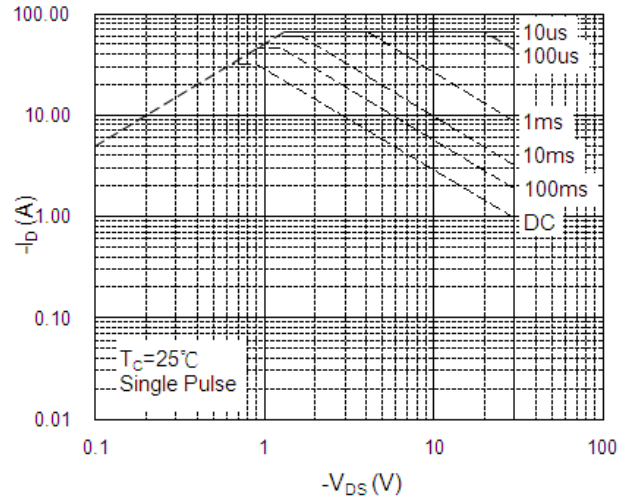


Fig.8 Safe Operating Area

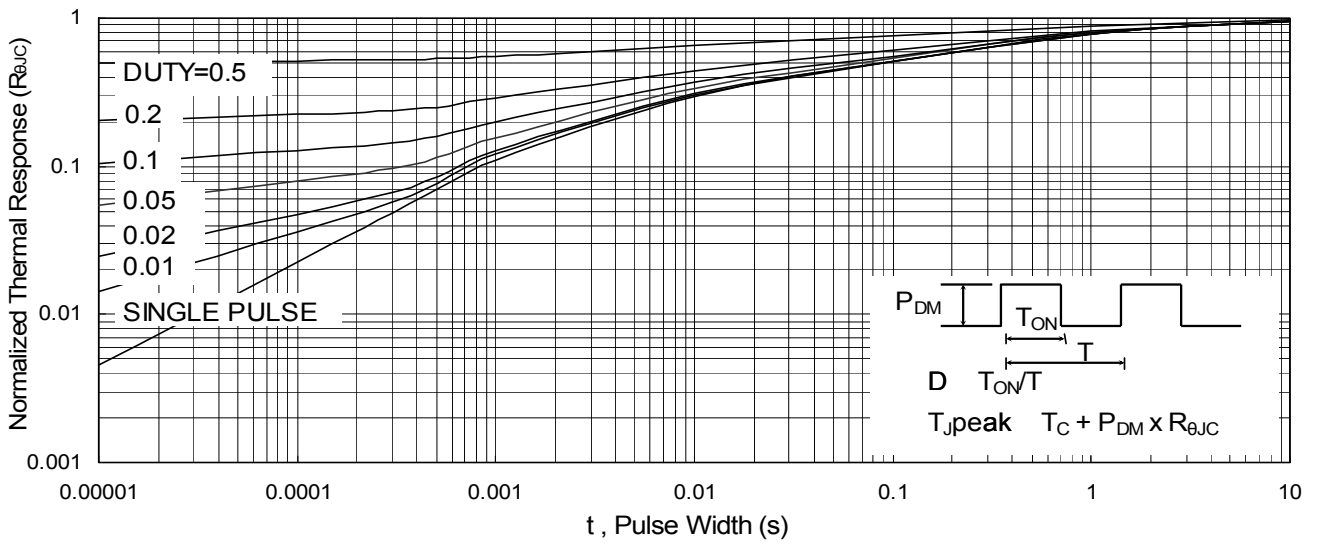


Fig.9 Normalized Maximum Transient Thermal Impedance

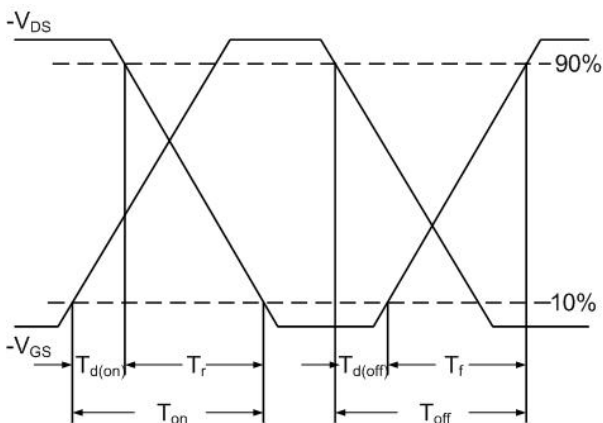


Fig.10 Switching Time Waveform

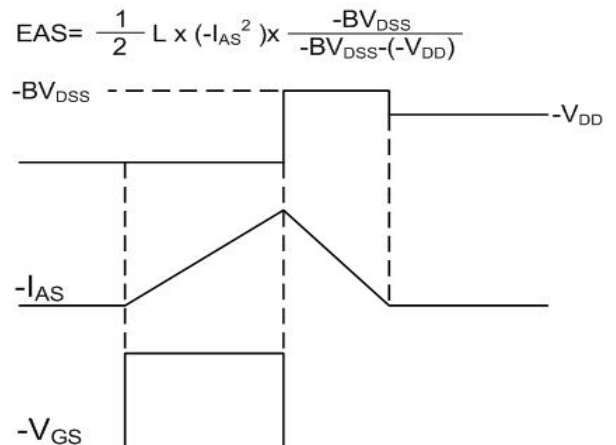
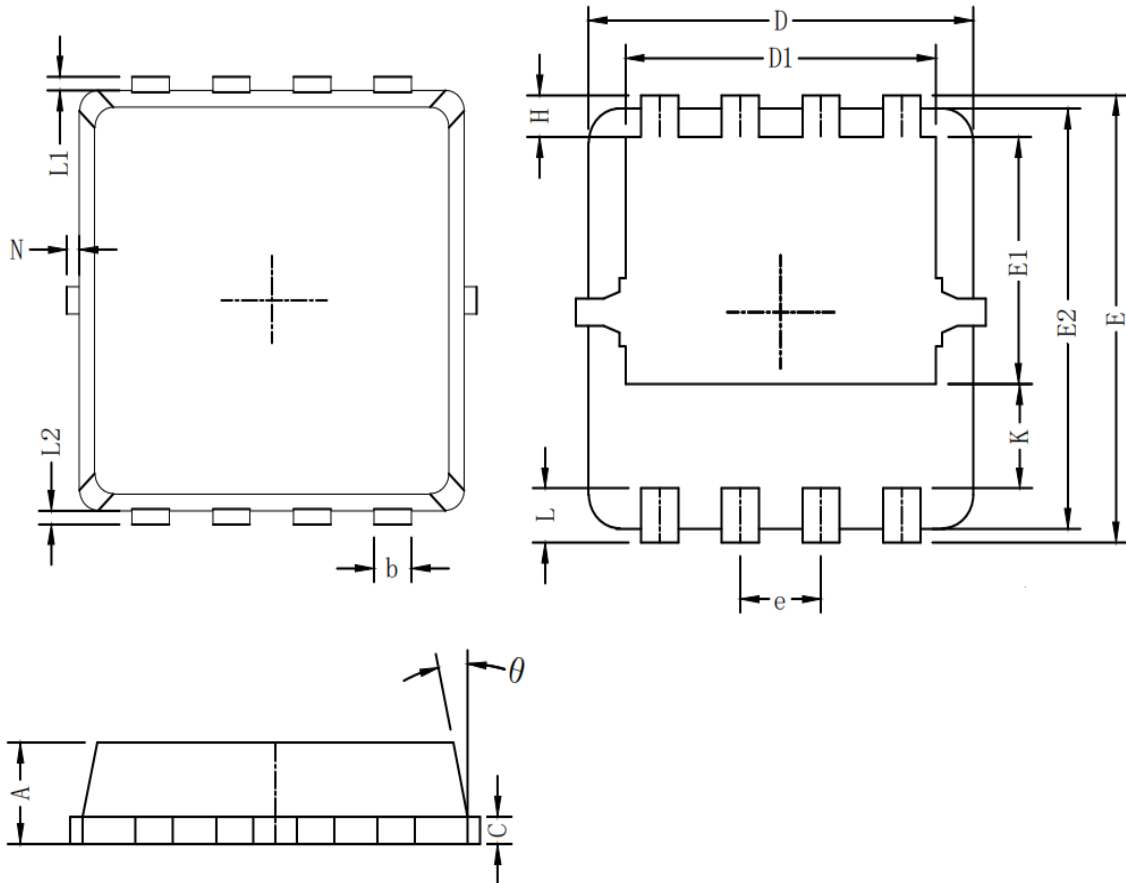


Fig.11 Unclamped Inductive Switching Waveform

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		
θ	8°	10°	13°
N	0		0.15

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