

General Description

The WSD4046DN56 is the highest performance trench N-Ch MOSFET with extreme high cell density, which provide excellent RDSON and gate charge for most of the synchronous buck converter applications.

The WSD4046DN 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

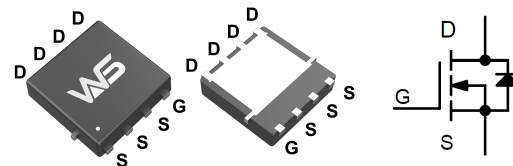
Product Summary

BVDSS	RDSON	ID
40V	8.0mΩ	45A

Applications

- High Frequency Point-of-Load Synchronous Buck Converter
- DC-DC Power System
- Power Tool Application

DFN3x3-8L Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	± 20	V
$I_D@T_C=25^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	45	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ 10V$	28	A
I_{DM}	Pulsed Drain Current ^a	60	A
EAS	Single Pulse Avalanche Energy ^b	25	mJ
I_{AS}	Avalanche Current	10	A
$P_D@T_C=25^\circ C$	Total Power Dissipation	26	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 ¹	---	62	$^\circ C/W$
$R_{\theta JC}$	Thermal Resistance Junction-Case ¹	---	4.7	$^\circ C/W$

Note a : Package is limited to 60A.

Note b : UIS tested and pulse width limited by maximum junction temperature 150 $^\circ C$ (initial temperature $T_J=25^\circ C$).

Electrical Characteristics (T_J=25 °C, unless otherwise noted)

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV _{DSS}	Drain-Source Breakdown Voltage	V _{GS} =0V, I _D =250uA	40	---	---	V
ΔBV _{DSS} /ΔT _J	BV _{DSS} Temperature Coefficient	Reference to 25°C, I _D =1mA	---	0.043	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =10V, I _D =10A	---	8	11	mΩ
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =4.5V, I _D =5A	---	10	14	mΩ
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250uA	1.2	1.6	2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	-6.94	---	mV/°C
I _{DSS}	Drain-Source Leakage Current	V _{DS} =32V, V _{GS} =0V, T _J =25°C	---	---	2	uA
		V _{DS} =32V, V _{GS} =0V, T _J =55°C	---	---	10	
I _{GSS}	Gate-Source Leakage Current	V _{GS} =±20V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =5V, I _D =10A	---	22	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f=1MHz	---	1.7	---	Ω
Q _g	Total Gate Charge (10V)	V _{DS} =20V, V _{GS} =10V, I _D =10A	---	38	---	nC
Q _{gs}	Gate-Source Charge		---	7	---	
Q _{gd}	Gate-Drain Charge		---	8	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =20V, V _{GEN} =10V, R _G =1Ω, I _D =1A, R _L =15Ω.	---	12	---	ns
T _r	Rise Time		---	12	---	
T _{d(off)}	Turn-Off Delay Time		---	39	---	
T _f	Fall Time		---	10	---	
C _{iss}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1MHz	---	2450	---	pF
C _{oss}	Output Capacitance		---	185	---	
C _{rss}	Reverse Transfer Capacitance		---	170	---	

Diode Characteristics

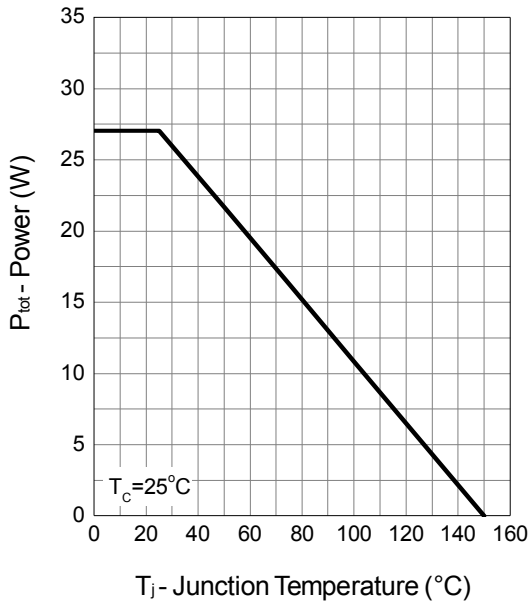
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I _S	Continuous Source Current ^{1,6}	V _G =V _D =0V, Force Current	---	---	20	A
I _{SM}	Pulsed Source Current ^{2,6}		---	---	56	A
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =10A, T _J =25°C	---	---	1.3	V

Note :

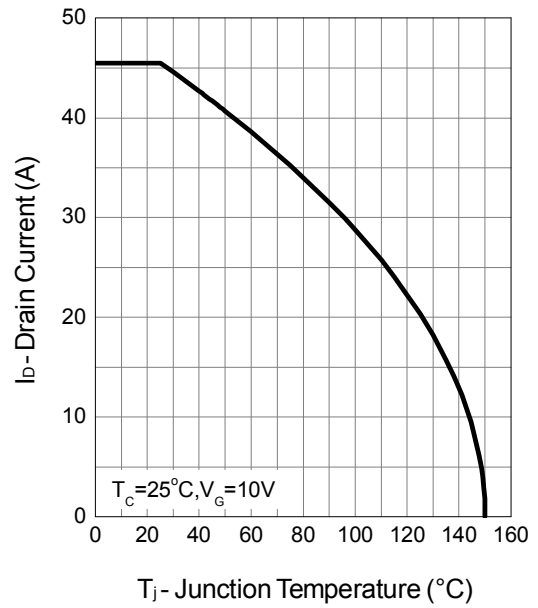
1. The data tested by surface mounted on a 1 inch² FR-4 board with 2OZ copper, t<10sec.
2. The data tested by pulsed, pulse width ≤ 300us, duty cycle ≤ 2%
3. The EAS data shows Max. rating. The test condition is V_{DD}=20V, V_{GS}=10V, L=0.5mH, I_{AS}=10A
4. The power dissipation is limited by 150°C 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.
7. Package limitation current is 60A.

Typical Characteristics

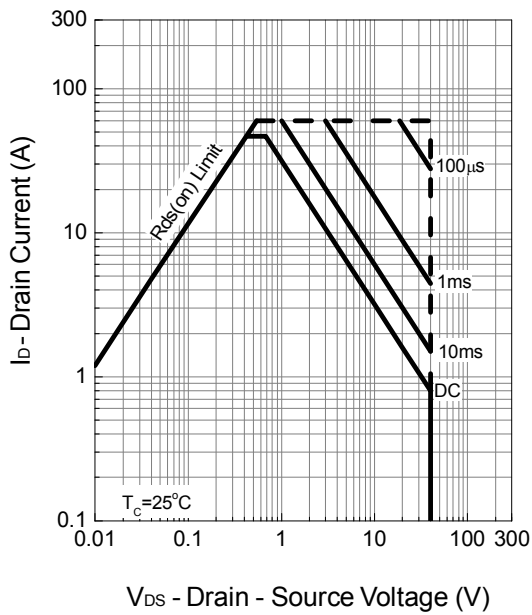
Power Dissipation



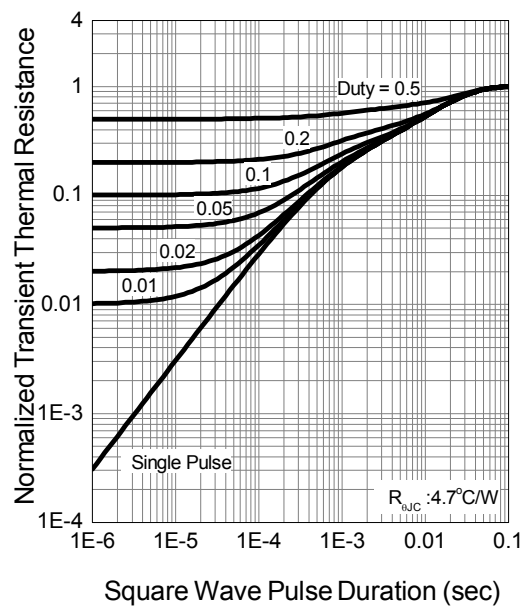
Drain Current



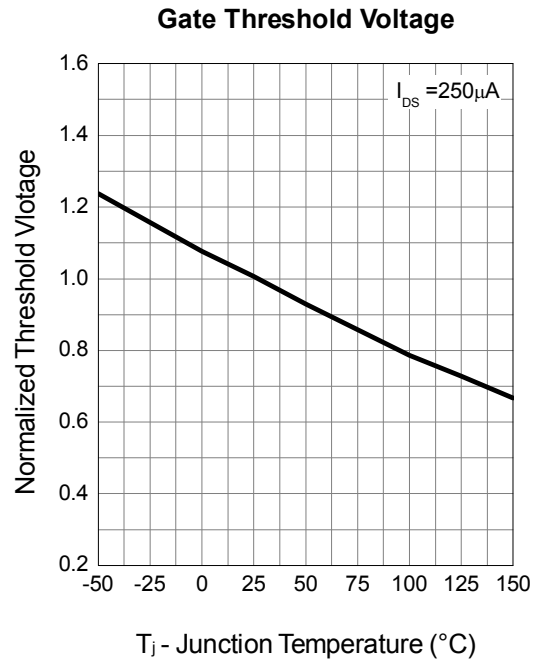
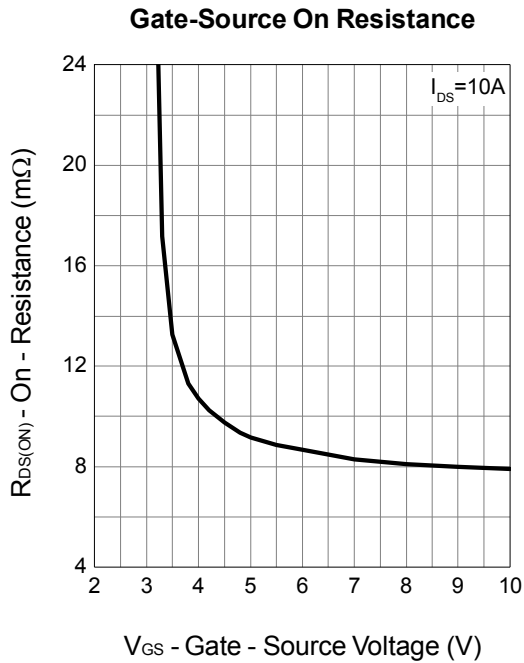
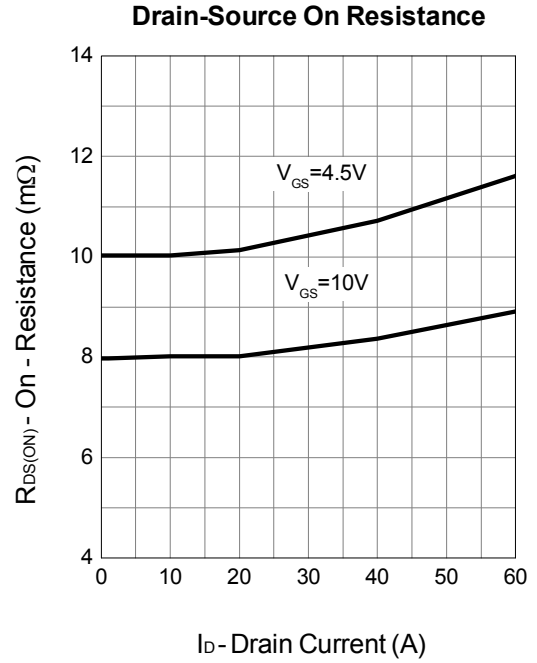
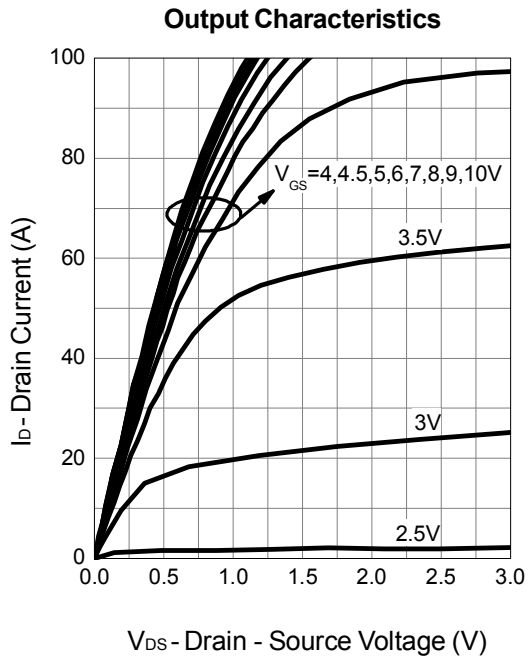
Safe Operation Area



Thermal Transient Impedance

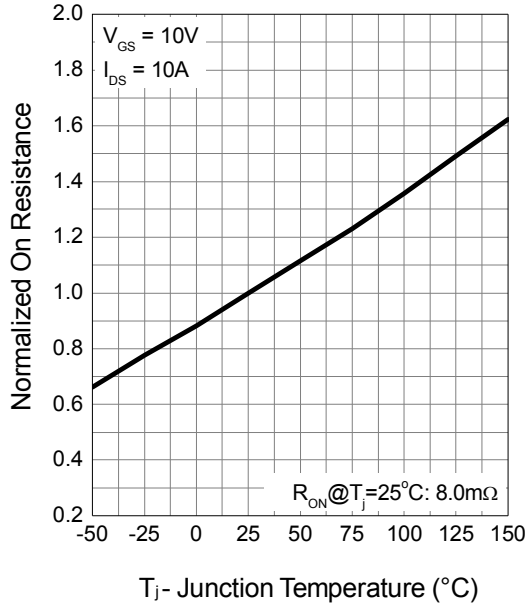


Typical Characteristics

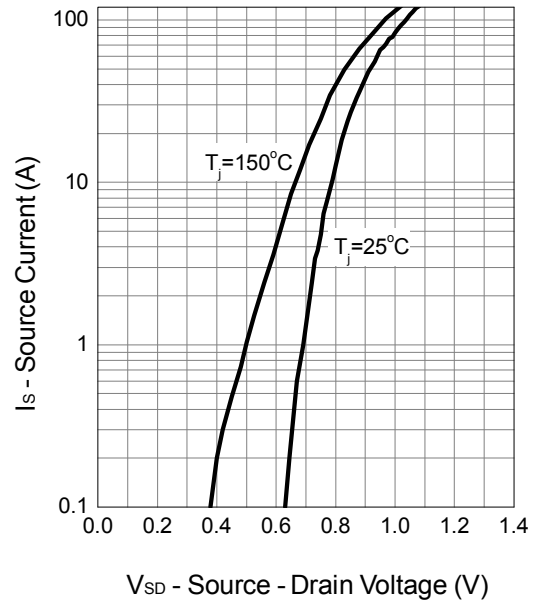


Typical Characteristics

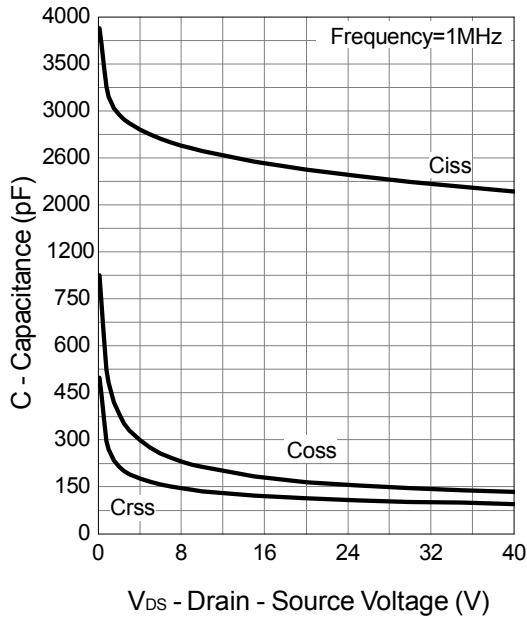
Drain-Source On Resistance



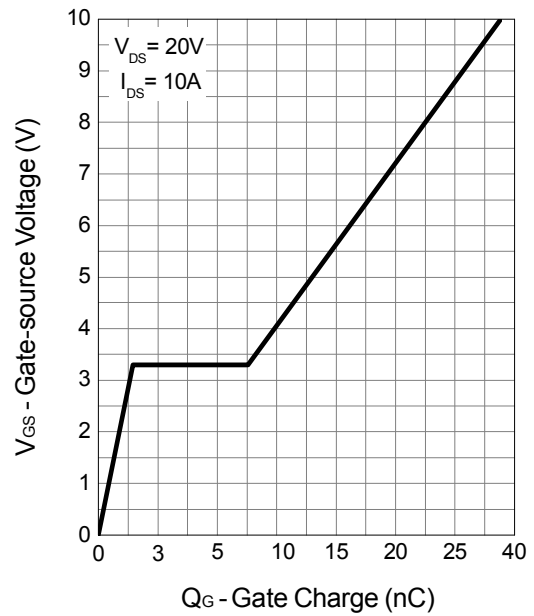
Source-Drain Diode Forward



Capacitance

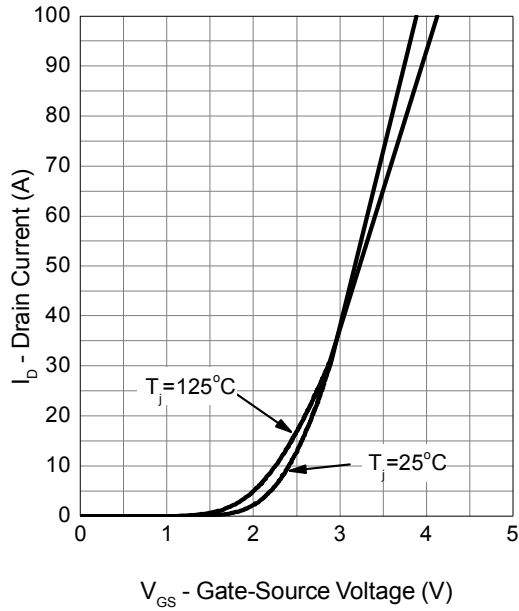


Gate Charge



Typical Characteristics

Transfer Characteristics





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