General Description

The WSD4090DN56 is the highest performance trench N-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 WSD4090DN56 meet the RoHS and Green Product requirement, 100% E_{AS} guaranteed with full function reliability approved.

Features

- 100% UIS + R_g Tested.
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)
- Moisture Sensitivity Level MSL1 (per JEDEC J-STD-020D)

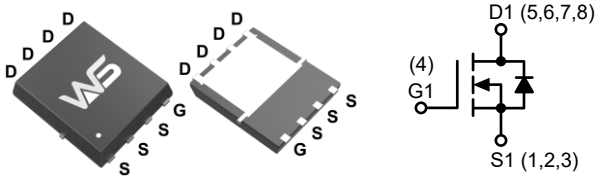
Product Summery

BV_{DSS}	$R_{DS(ON)}$	I_D
40V	4.0mΩ	90A

Applications

- Brushed motor drive applications.
- BLDC motor drive applications.
- Battery powered circuits.
- Load Switch.
- Synchronous rectifier applications.

DFN5X6-8L Pin Configuration



Absolute Maximum Ratings (T_A=25°C, Unless Otherwise Noted)

Symbol	Parameter		Rating	Units
V_{DS}	Drain-Source Voltage		40	V
V_{GS}	Gate-Source Voltage		±20	
I_D	Continuous Drain Current	T_C=25°C	90	A
		T_C=100°C	36	
I_{DM} [2]	Pulse Drain Current	T_C=25°C	150	
P_D	Maximum Power Dissipation	T_C=25°C	65	W
		T_C=100°C	33	
E_{AS} [4]	Avalanche Energy, Single pulse	L=0.1mH	56	mJ
I_{AS} [4]	Avalanche Current, Single pulse	L=0.1mH	34	A
T_{STG}	Storage Temperature Range		-55 to 150	°C
T_J	Operating Junction Temperature Range		150	
$R_{\theta JA}$ [3]	Thermal Resistance-Junction to Ambient	t≤10s	22	°C/W
		Steady State	55	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		2.3	

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
$R_{DS(ON)}$ [5]	Static Drain-Source On-Resistance	V_{GS}=10V , I_D=20A	---	4.0	5.0	mΩ
		T_J=125°C	---	5.9	---	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D=250μA	2.0	3.0	4.0	V
I_{DSS}	Zero Gate Voltage Drain Current	V_{DS}=32V , V_{GS}=0V	---	---	1.0	μA
		T_J=85°C	---	---	30	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
g_{fs}	Forward Transconductance	V_{DS}=5V , I_D=20A	---	24	---	S
R_G [6]	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1.0MHz	---	0.6	---	Ω
Q_g [6]	Total Gate Charge	V_{DS}=20V , V_{GS}=10V , I_D=20A	---	21	29	nC
Q_{gth} [6]	Threshold Gate Charge		---	2.4	---	
Q_{gs} [6]	Gate-Source Charge		---	6.3	---	
Q_{gd} [6]	Gate-Drain Charge		---	4.0	---	
$T_{d(on)}$ [6]	Turn-On Delay Time	V_{DD}=20V , R_L=20Ω , I_{DS}=1A , V_{GEN}=10V , R_G=6Ω	---	16	29	ns
T_r [6]	Rise Time		---	9	17	
$T_{d(off)}$ [6]	Turn-Off Delay Time		---	26	47	
T_f [6]	Fall Time		---	29	53	
C_{iss} [6]	Input Capacitance	V_{DS}=20V , V_{GS}=0V , f=1.0MHz	---	1492	1940	pF
C_{oss} [6]	Output Capacitance		---	391	---	
C_{rss} [6]	Reverse Transfer Capacitance		---	49	---	

Diode Characteristics

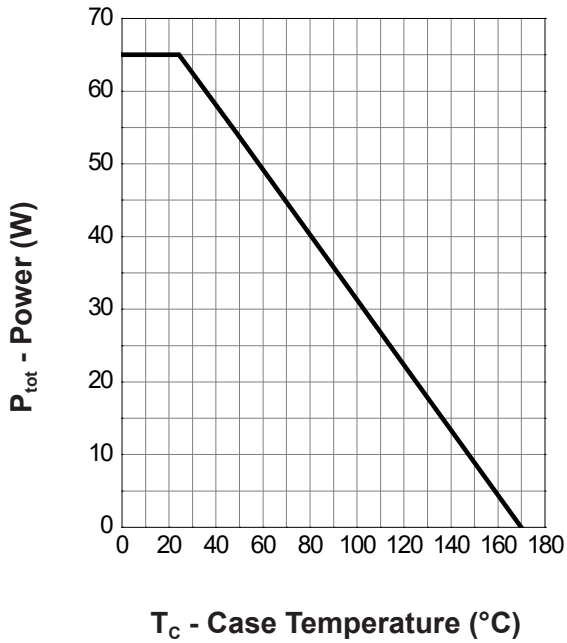
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_S	Continuous Source Current	T_C=25°C	---	---	50	A
V_{SD} [5]	Diode Forward Voltage	V_{GS}=0V , I_{SD}=25A	---	0.85	1.1	V
t_{rr}	Reverse Recovery Time	I_{SD}=20A , di_{SD}/dt=100A/μs	---	15	---	ns
Q_{rr}	Reverse Recovery Charge		---	15	---	nC

Note:

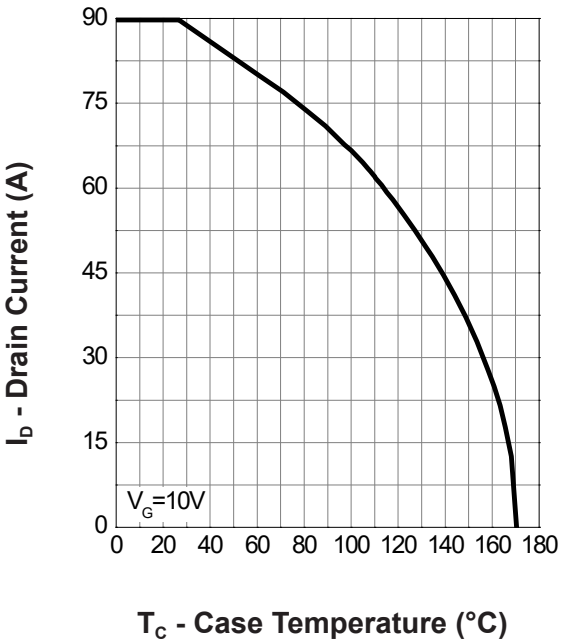
1. Maximum continuous current is limited by bonding wire.
2. Pulse width limited by maximum junction temperature.
3. Surface mounted on 1in^2 pad area, steady state t=999s.
4. UIS tested and pulse width limited by maximum junction temperature (initial temperature T_J=25°C).
5. Pulse test; pulse width≤300μs, duty cycle≤2%.
6. Guaranteed by design, not subject to production testing.

Typical Characteristics

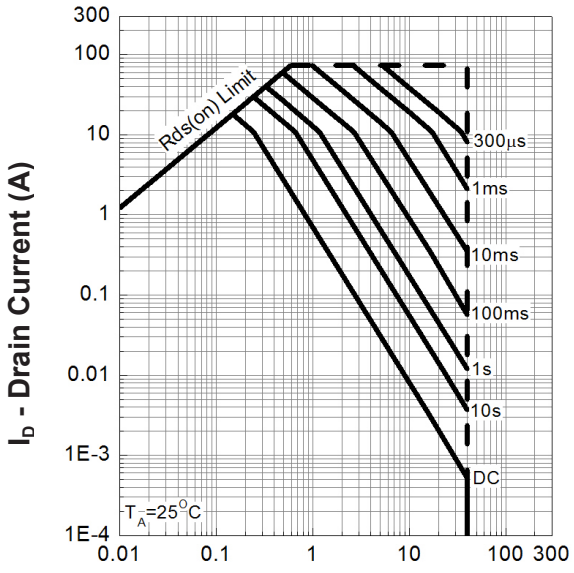
Power Dissipation



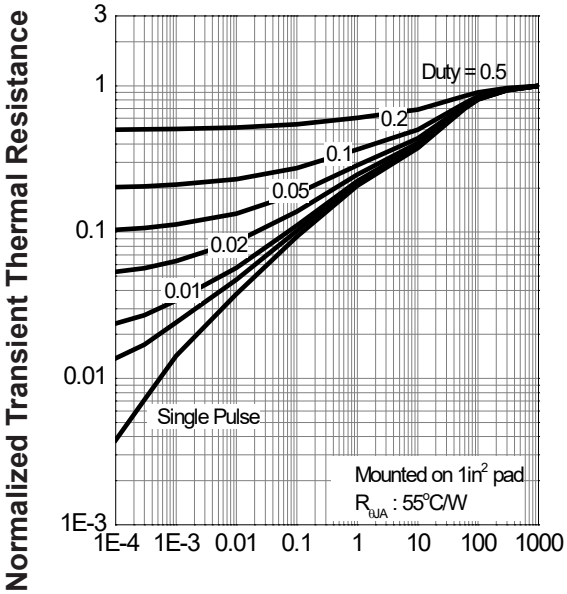
Drain Current



Safe Operation Area

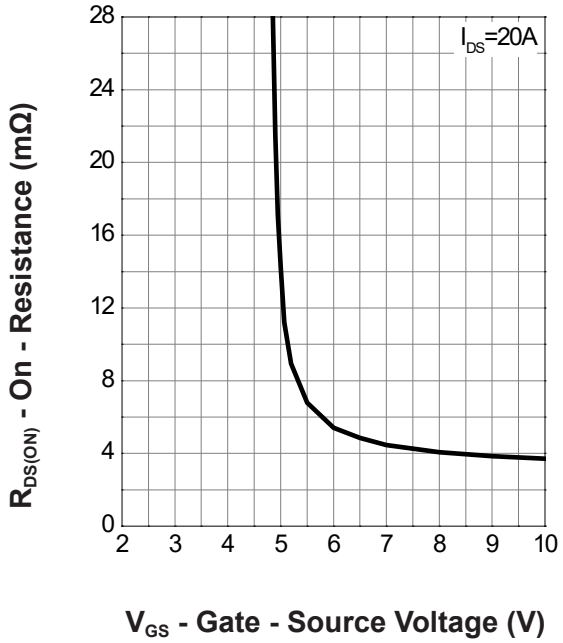


Thermal Transient Impedance

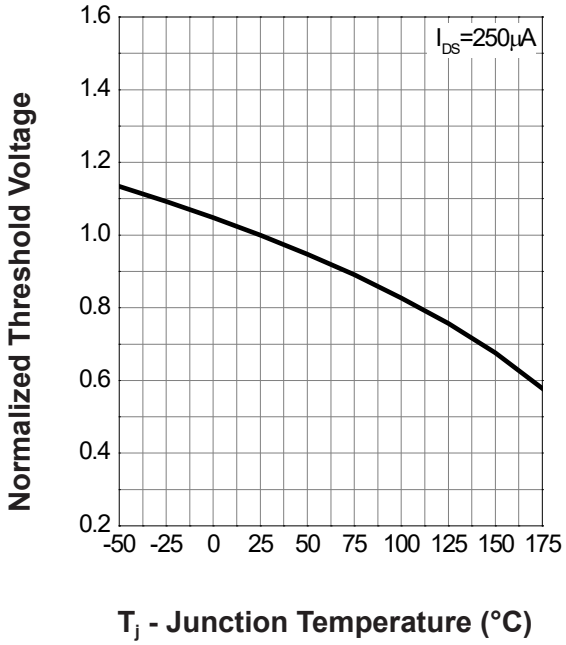


Typical Characteristics (Cont.)

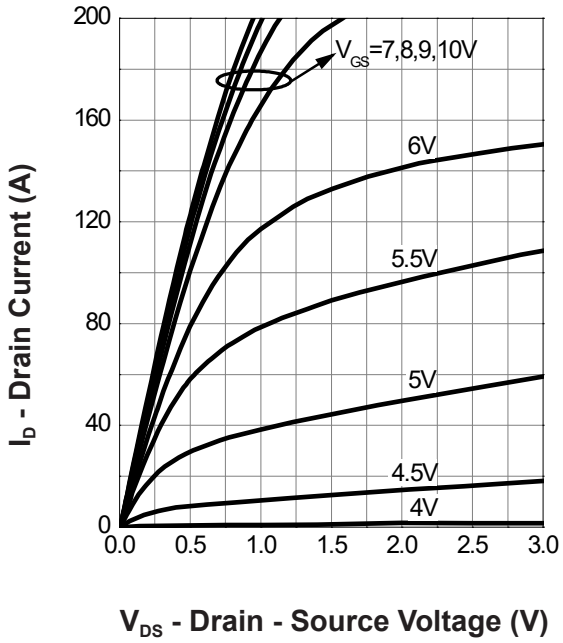
Gate-Source On Resistance



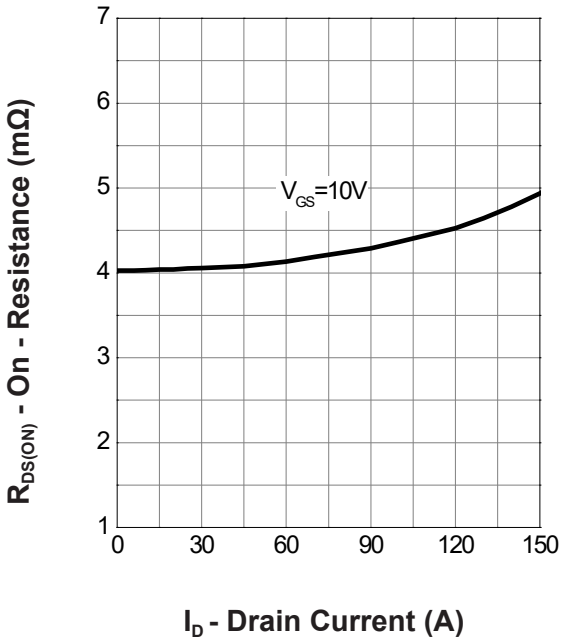
Gate Threshold Voltage



Output Characteristics

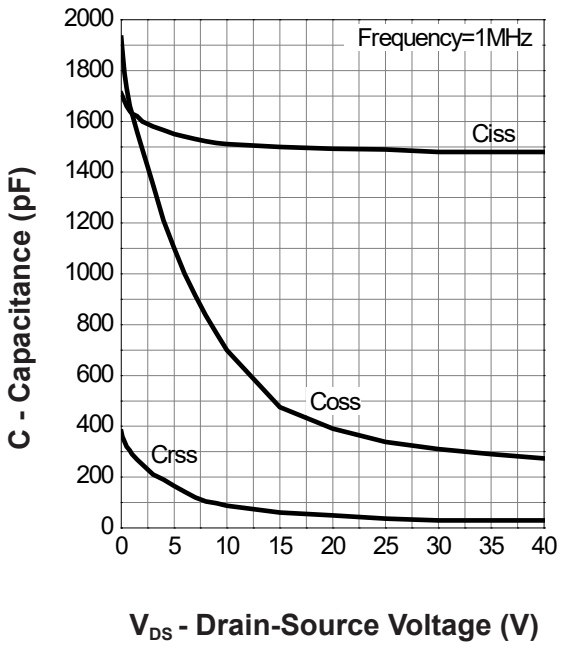


Drain-Source On Resistance

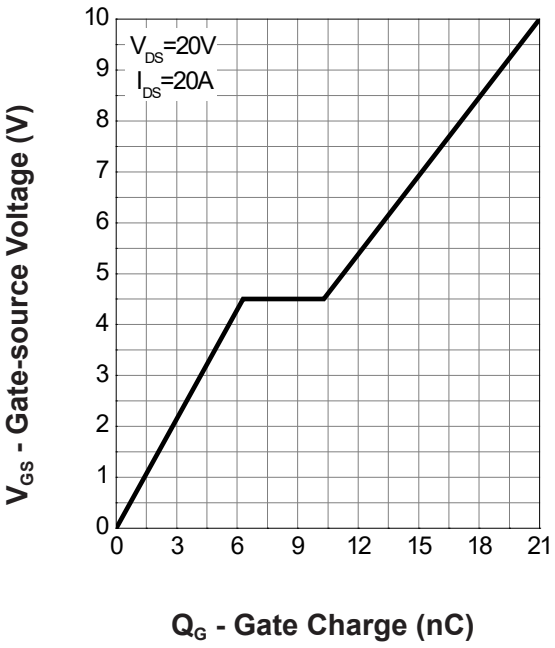


Typical Characteristics (Cont.)

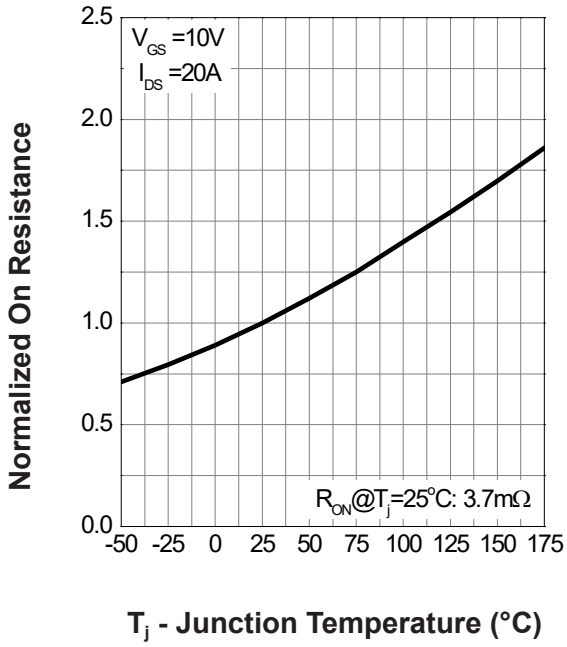
Capacitance



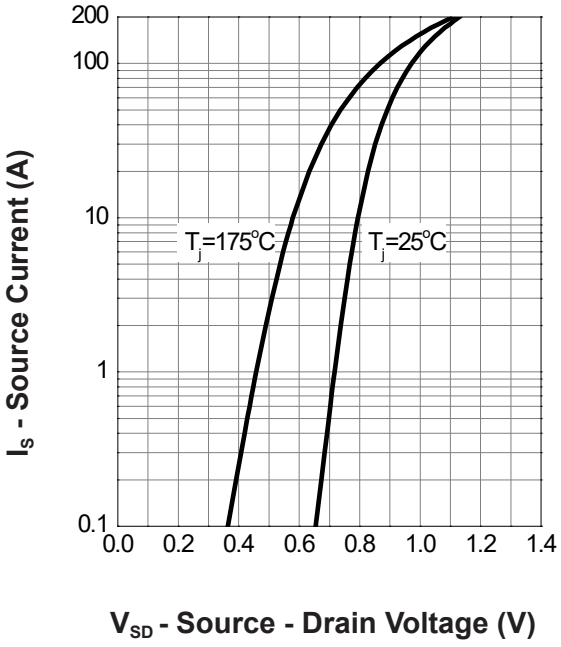
Gate Charge



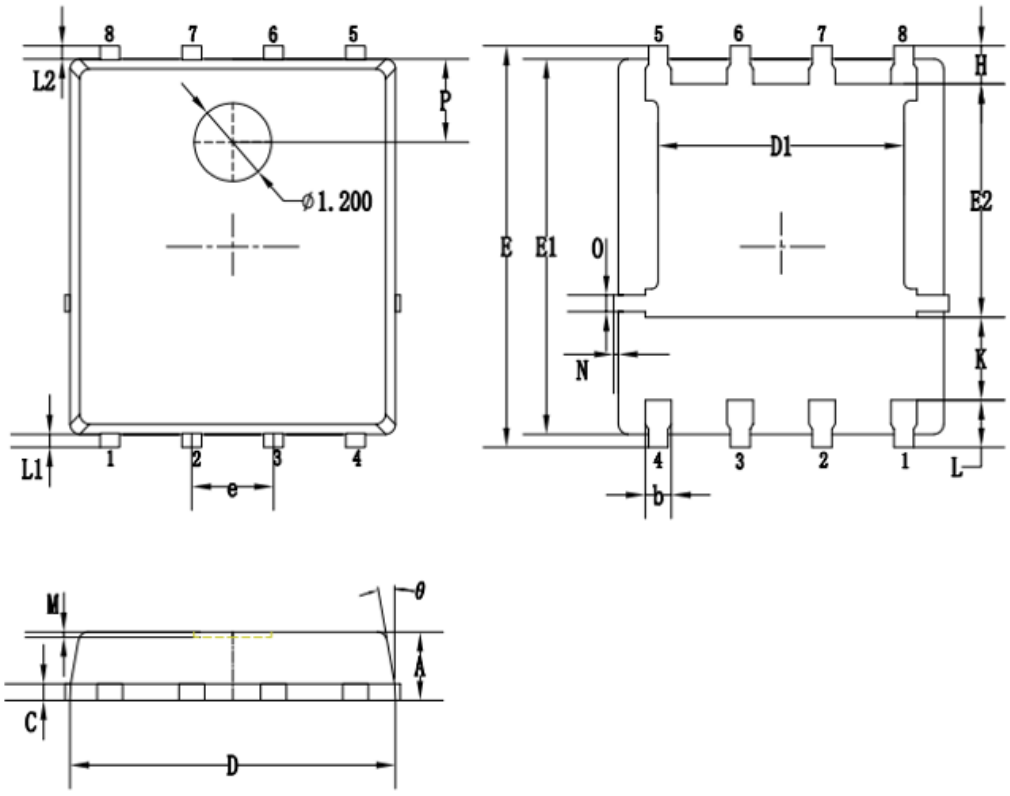
Drain-Source On Resistance



Source-Drain Diode Forward



Packaging information



SYMBOLS	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.90	1.05	1.20
b	0.35	0.40	0.50
C	0.20	0.25	0.35
D	4.90	5.05	5.20
D1	3.72	3.82	3.92
E	6.00	6.15	6.30
E1	5.60	5.75	5.90
E2	3.47	3.57	3.67
e	1.27 BSC.		
H	0.48	0.58	0.68
K	1.17	1.27	1.37
L	0.64	0.74	0.84
L1/L2	0.20 REF.		
θ	8°	10°	12°
M	0.08 REF.		
N	0	-	0.15
O	0.25 REF.		
P	1.28 REF.		

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