

General Description

The WSD40L60DN56 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 WSD40L60DN56 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

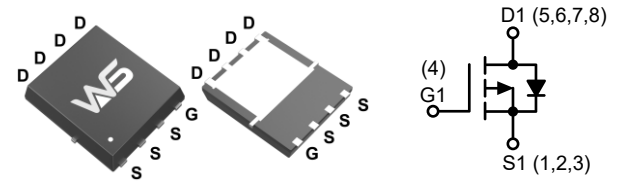
Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D
-40V	10m Ω	-60A

Applications

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

DFN5X6-8L 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	-60	A
$I_D@T_C=100^\circ C$	Continuous Drain Current, $V_{GS} @ -10V$ ¹	-35	
I_{DM}	Pulsed Drain Current ²	-150	
E_{AS}	Single Pulse Avalanche Energy ³	150	mJ
I_{AS}	Avalanche Current	-30	A
$P_D@T_C=25^\circ C$	Total Power Dissipation ⁴	50	W
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	---	62.5	$^\circ C/W$
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient ¹ ($t \leq 10s$)	---	40	
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case ¹	---	2.5	

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	---	-0.030	---	V/°C
R _{DS(ON)}	Static Drain-Source On-Resistance ²	V _{GS} =-10V, I _D =-15A	---	10	14	mΩ
		V _{GS} =-4.5V, I _D =-10A	---	14	21	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =-250μA	-1.2	-1.7	-2.5	V
ΔV _{GS(th)}	V _{GS(th)} Temperature Coefficient		---	4.8	---	mV/°C
I _{DSS}	Zero Gate Voltage Drain 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-Body Leakage Current	V _{GS} =±10V, V _{DS} =0V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =-5V, I _D =-15A	---	25	---	S
R _g	Gate Resistance	V _{DS} =0V, V _{GS} =0V, f = 1.0MHz	---	6.5	---	Ω
Q _g	Total Gate Charge(-4.5)	V _{DS} =-15V, V _{GS} =-4.5V, I _D =-15A	---	35	---	nC
Q _{gs}	Gate-Source Charge		---	3.5	---	
Q _{gd}	Gate-Drain Charge		---	13	---	
T _{d(on)}	Turn-On Delay Time	V _{DD} =-15V, V _{GS} =-10V, R _G =6Ω, I _D =-1A, R _L =15Ω	---	45	---	ns
T _r	Rise Time		---	18	---	
T _{d(off)}	Turn-Off Delay Time		---	180	---	
T _f	Fall Time		---	65	---	
C _{iss}	Input Capacitance	V _{DS} =-15V, V _{GS} =0V, f = 1.0MHz	---	3410	---	pF
C _{oss}	Output Capacitance		---	450	---	
C _{rss}	Reverse Transfer Capacitance		---	288	---	

Diode Characteristics

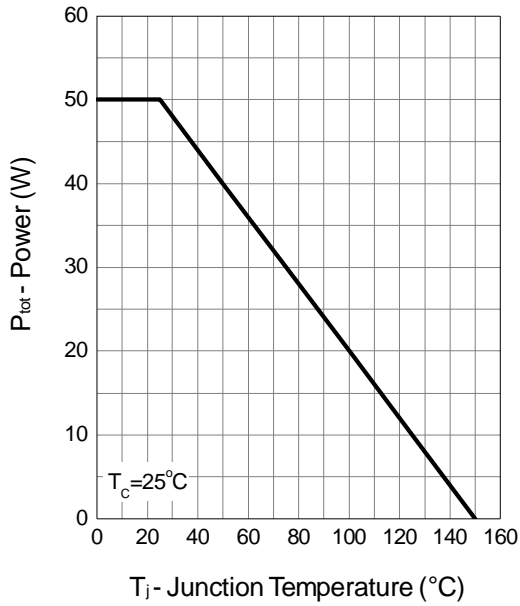
Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I _S	Continuous Source Current ^{1,6}	V _G =V _D =0V, Force Current	---	---	-50	A
I _{SM}	Pulsed Source Current ^{2,6}		---	---	-150	
V _{SD}	Diode Forward Voltage ²	V _{GS} =0V, I _S =-1A, T _J =25°C	---	---	-1.0	V
t _{rr}	Reverse Recovery Time	I _F =-15A, dI/dt=100A/μs, T _J =25°C	---	32	---	ns
Q _{rr}	Reverse Recovery Charge		---	24	---	nC

Note:

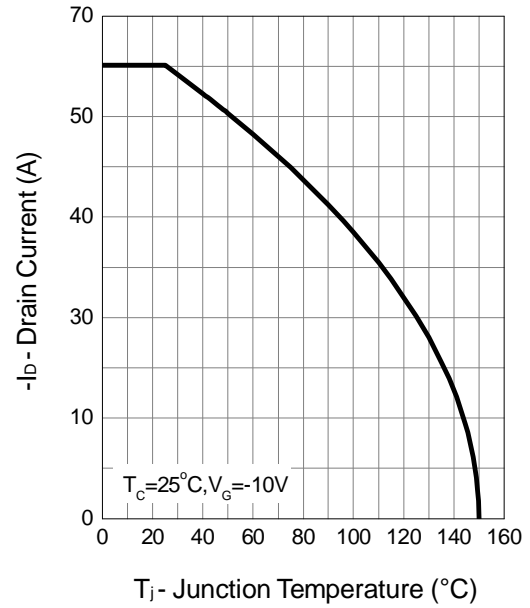
- The data tested by surface mounted on a 1 inch² FR-4 board with 20Z copper, t_s≤10sec.
- The data tested by pulsed, pulse width ≤ 300μs, duty cycle ≤ 2%
- The E_{AS} data shows Max. rating. The test condition is V_{DD}=-20V, V_{GS}=-10V, L=0.5mH, I_{AS}=-24A
- The power dissipation is limited by 150°C 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

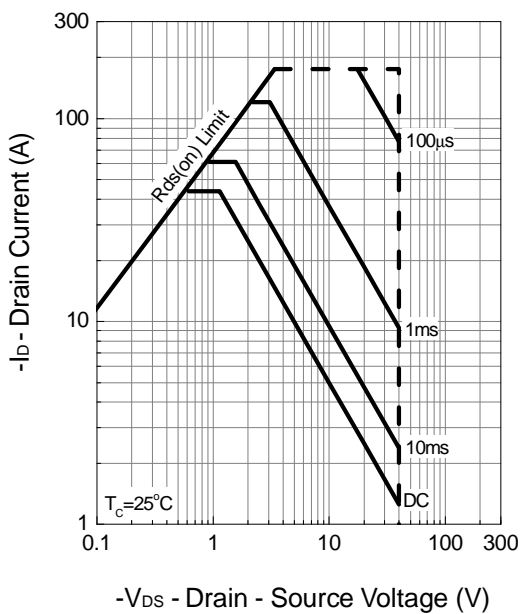
Power Dissipation



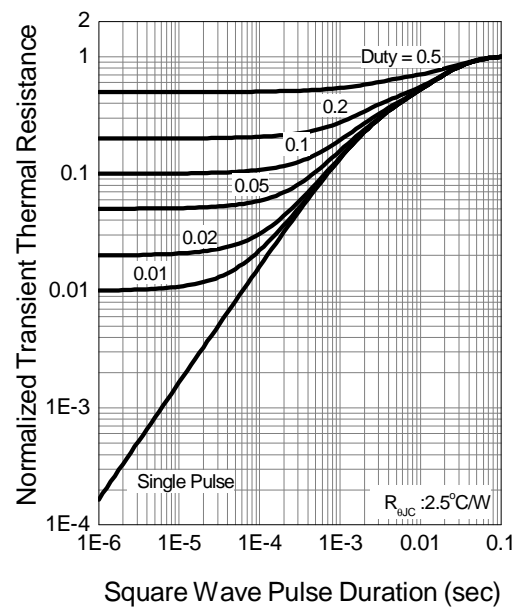
Drain Current



Safe Operation Area

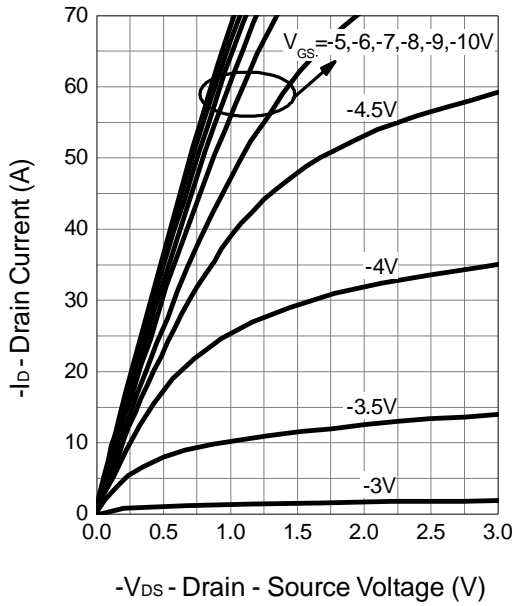


Thermal Transient Impedance

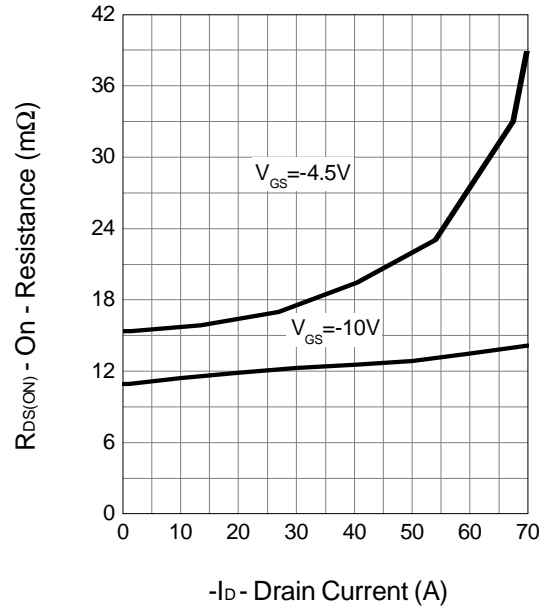


Typical Characteristics (Cont.)

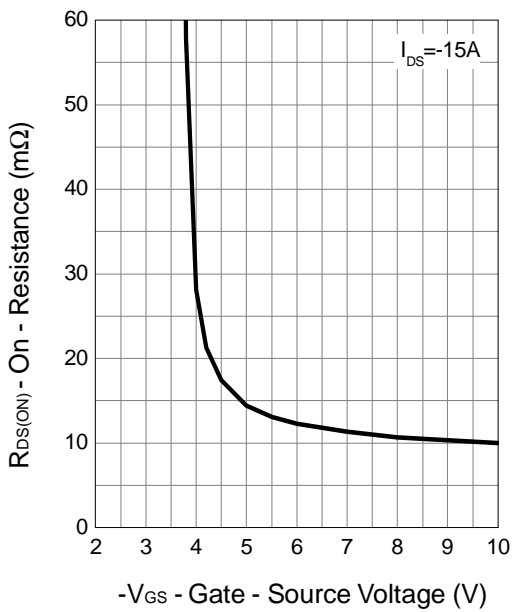
Output Characteristics



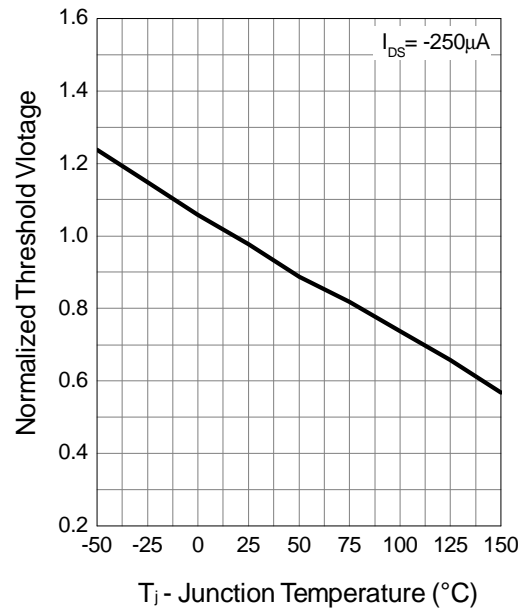
Drain-Source On Resistance



Gate-Source On Resistance

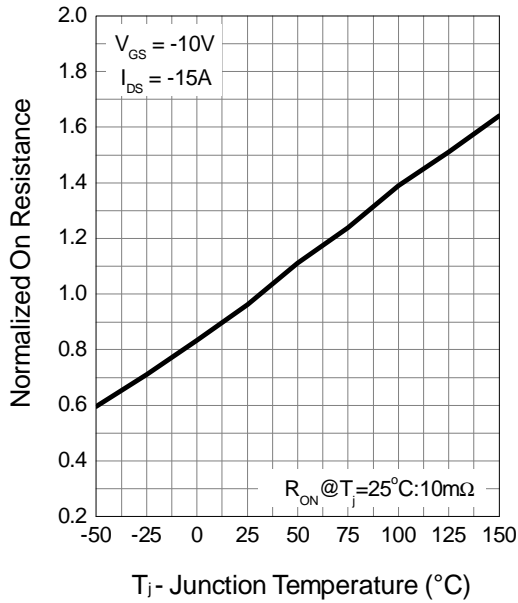


Gate Threshold Voltage

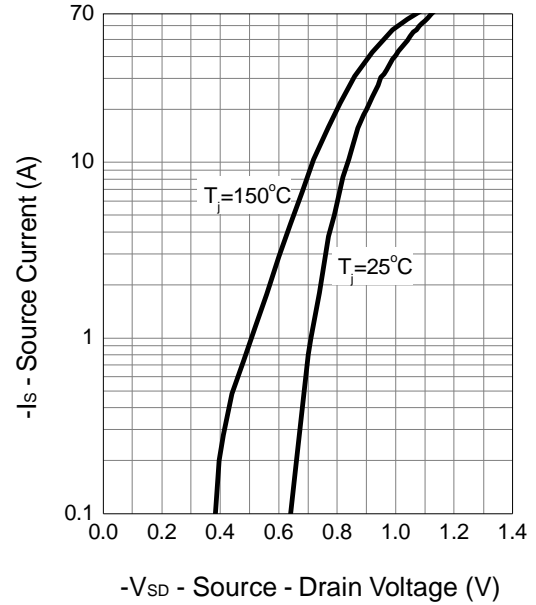


Typical Characteristics (Cont.)

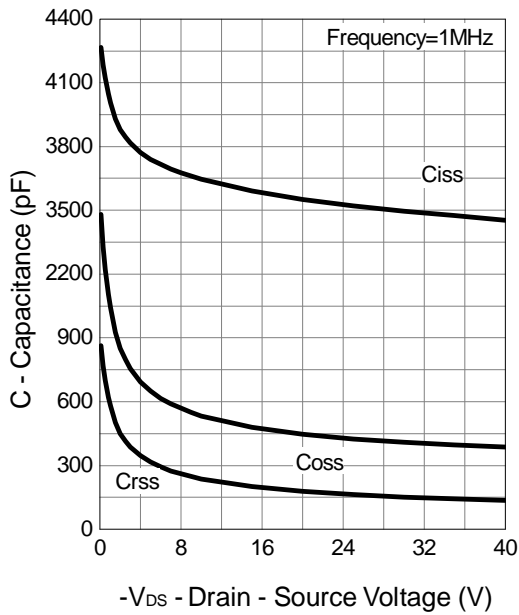
Drain-Source On Resistance



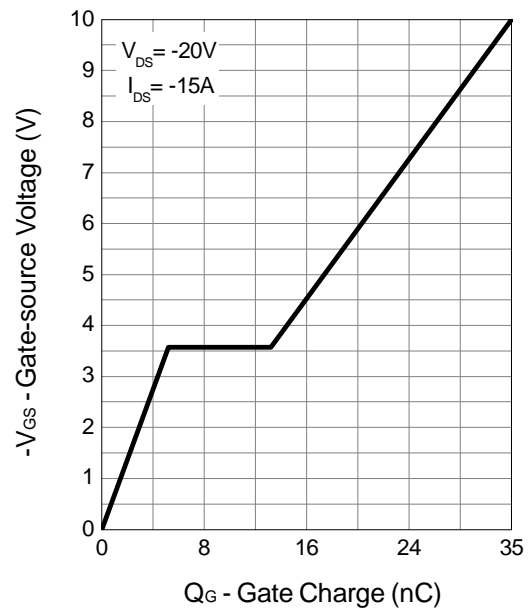
Source-Drain Diode Forward

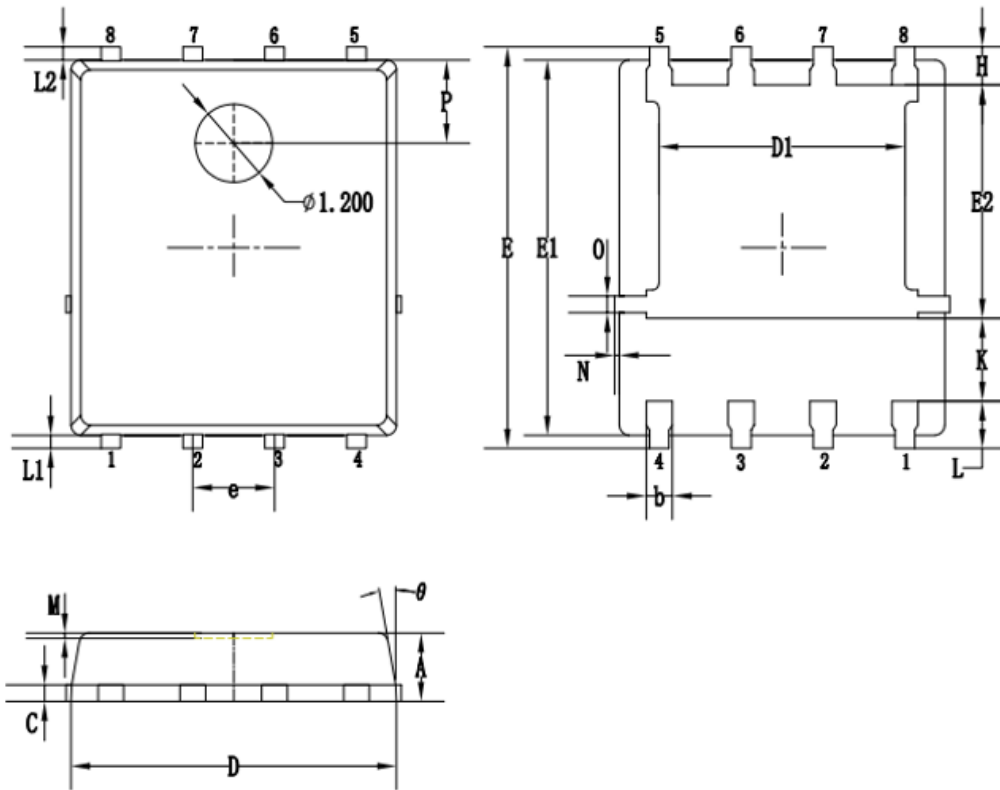


Capacitance



Gate Charge



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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