

General Description

The WSD40100DN56 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 WSD40100DN56 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)

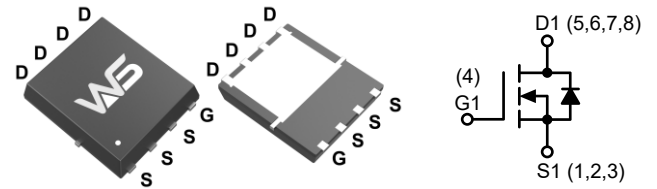
Product Summary

BV_{DSS}	$R_{DS(ON)}$	I_D
40V	2.0m Ω	100A

Applications

- Power Management for Industrial DC/DC Converters

DFN5X6-8L Pin Configuration



Absolute Maximum Ratings ($T_A=25^\circ\text{C}$, Unless Otherwise Noted)

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	40	V
V_{GS}	Gate-Source Voltage	± 20	
I_D^7	Continuous Drain Current	$T_C=25^\circ\text{C}$	A
		$T_C=100^\circ\text{C}$	
I_{DM}^3	Pulse Drain Current	300	
P_D^2	Power Dissipation	$T_C=25^\circ\text{C}$	W
		$T_C=100^\circ\text{C}$	
I_{AS}^3	Single pulse Avalanche Current	47	A
E_{AS}^3	Single pulse Avalanche Energy	$L=0.3\text{mH}$	mJ
T_{STG}	Storage Temperature Range	-55 to 150	$^\circ\text{C}$
T_J	Operating Junction Temperature Range	-55 to 150	
$R_{\theta JA}^{1,4}$	Thermal Resistance-Junction to Ambient	$t \leq 10\text{s}$	$^\circ\text{C/W}$
		Steady State	
$R_{\theta JC}$	Thermal Resistance-Junction to Case	0.8	

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)}	Static Drain-Source On-Resistance	V _{GS} =10V, I _D =20A	---	2.0	3.5	mΩ
		T _J =125°C	---	3.25	4.0	
		V _{GS} =4.5V, I _D =20A	---	3.0	4.5	
V _{GS(th)}	Gate Threshold Voltage	V _{GS} =V _{DS} , I _D =250μA	1.0	1.9	2.5	V
I _{DSS}	Drain-Source Leakage Current	V _{DS} =40V, V _{GS} =0V	---	---	1.0	μA
		T _J =55°C	---	---	5.0	
I _{GSS}	Gate-Source Leakage Current	V _{DS} =0V, V _{GS} =±20V	---	---	±100	nA
g _{fs}	Forward Transconductance	V _{DS} =5V, I _D =20A	---	100	---	S
R _G	Gate Resistance	f=1.0MHz	1.0	2.0	3.1	Ω
Q _g	Total Gate Charge (10V)	V _{DS} =20V, V _{GS} =10V, I _D =20A	---	68	95	nC
Q _g	Total Gate Charge (4.5V)		---	28	40	
Q _{gs}	Gate-Source Charge		---	16.5	---	
Q _{gd}	Gate-Drain Charge		---	4.5	---	
Q _{oss}	Output Charge		V _{DS} =20V, V _{GS} =0V	---	37	
T _{d(on)}	Turn-On Delay Time	V _{DS} =20V, V _{GS} =10V, R _L =1Ω, R _{GEN} =3Ω	---	12.5	---	ns
T _r	Rise Time		---	9.5	---	
T _{d(off)}	Turn-Off Delay Time		---	57.5	---	
T _f	Fall Time		---	10.5	---	
C _{iSS}	Input Capacitance	V _{DS} =20V, V _{GS} =0V, f=1.0MHz	---	5225	---	pF
C _{oss}	Output Capacitance		---	895	---	
C _{rSS}	Reverse Transfer Capacitance		---	200	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I _S ⁷	Continuous Source Current		---	---	100	A
V _{SD}	Diode Forward Voltage	V _{GS} =0V, I _S =1A	---	0.7	1.0	V
t _{rr}	Reverse Recovery Time	I _F =20A, di/dt=500A/μs	---	20	---	ns
Q _{rr}	Reverse Recovery Charge		---	60	---	nC

Note:

- The value of R_{θJA} is measured with the device mounted on 1in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The Power dissipation P_{DSM} is based on R_{θJA} ≤ 10s and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.
- The power dissipation P_D is based on T_{J(MAX)}=150°C, using junction-to-case thermal resistance, and is more useful in setting the upper dissipation limit for cases where additional heatsinking is used.
- Single pulse width limited by junction temperature T_{J(MAX)}=150°C.
- The R_{θJA} is the sum of the thermal impedance from junction to case R_{θJC} and case to ambient.
- The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
- These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of T_{J(MAX)}=150°C. The SOA curve provides a single pulse rating.
- The maximum current rating is package limited.
- These tests are performed with the device mounted on 1 in² FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.
- The maximum current rating is silicon limited

Typical Characteristics

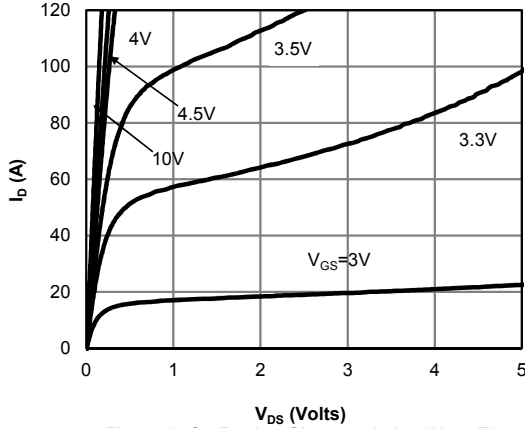


Figure 1: On-Region Characteristics (Note E)

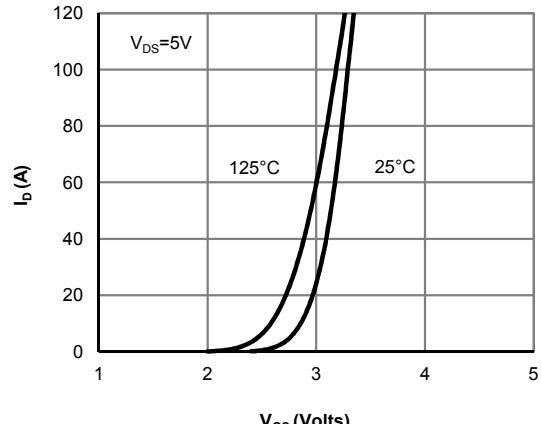


Figure 2: Transfer Characteristics (Note E)

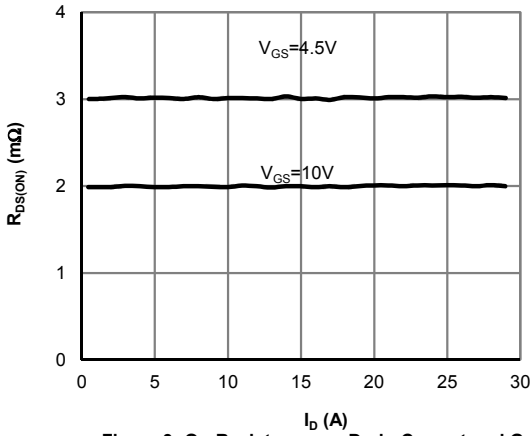


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

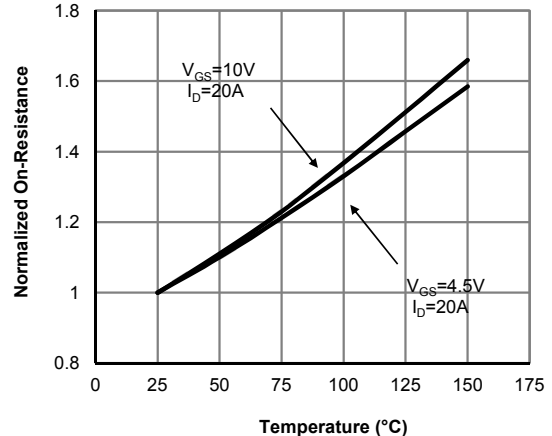


Figure 4: On-Resistance vs. Junction Temperature (Note E)

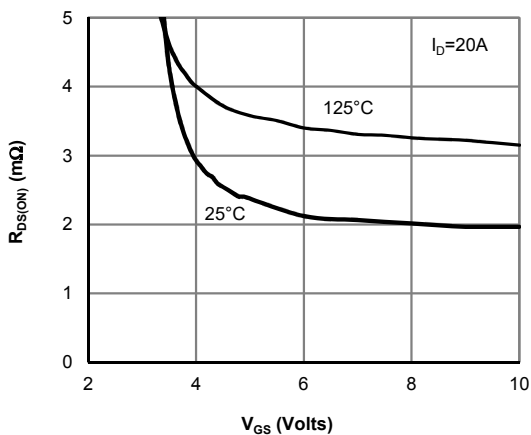


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

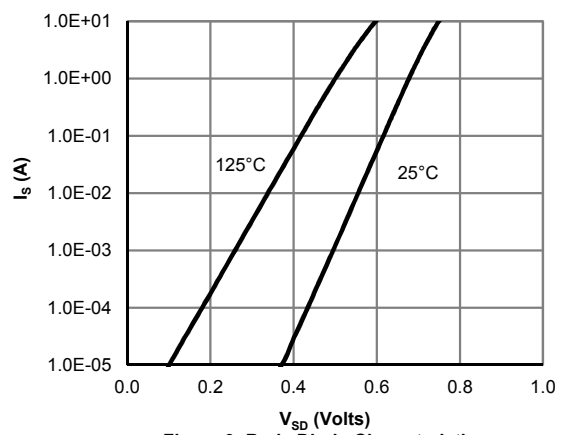


Figure 6: Body-Diode Characteristics (Note E)

Typical Characteristics (Cont.)

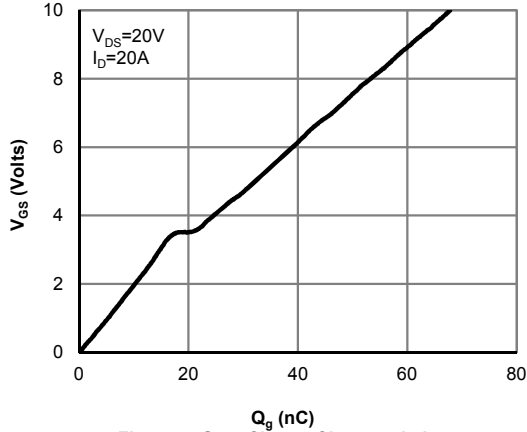


Figure 7: Gate-Charge Characteristics

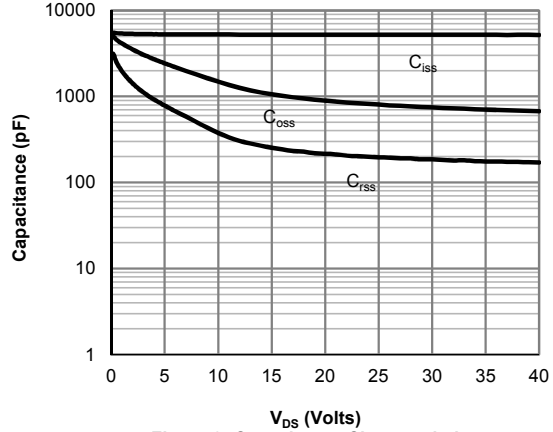


Figure 8: Capacitance Characteristics

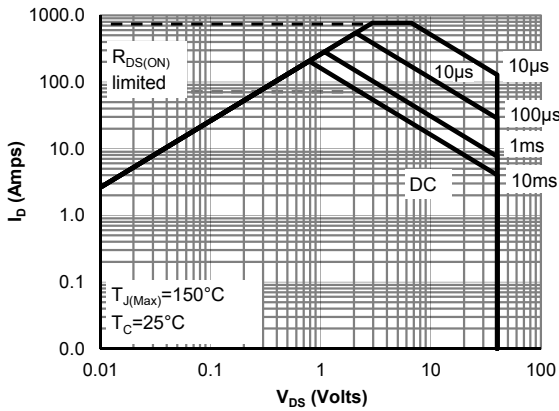


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

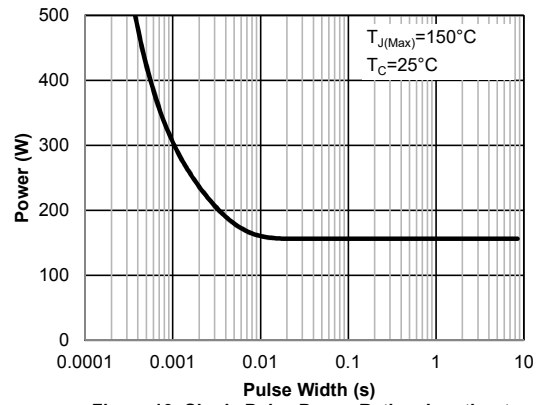


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

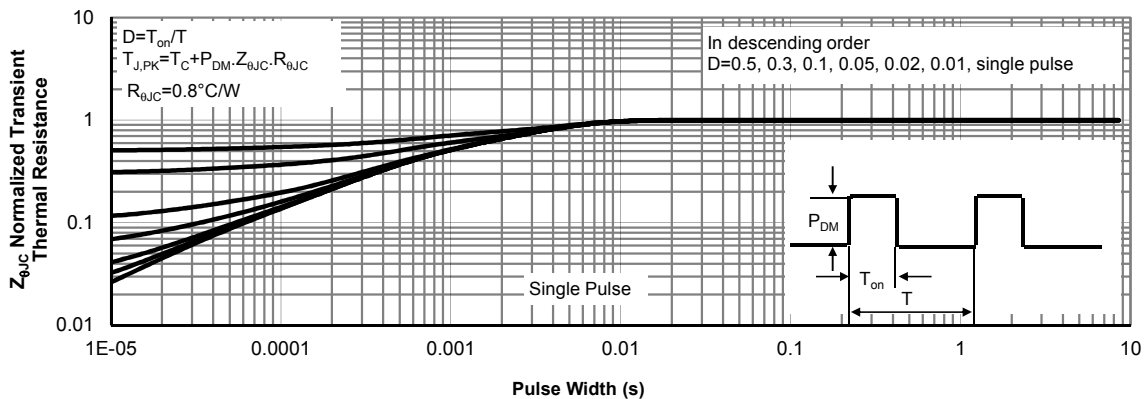


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Typical Characteristics (Cont.)

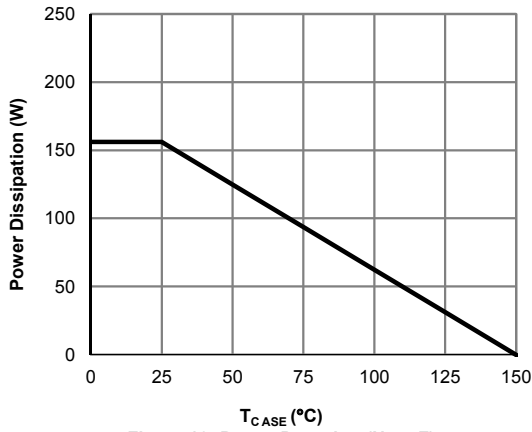


Figure 12: Power De-rating (Note F)

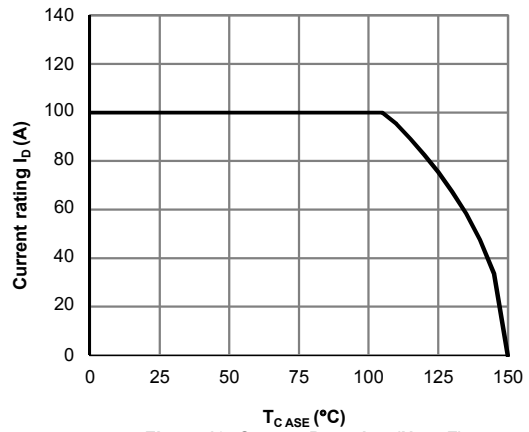


Figure 13: Current De-rating (Note F)

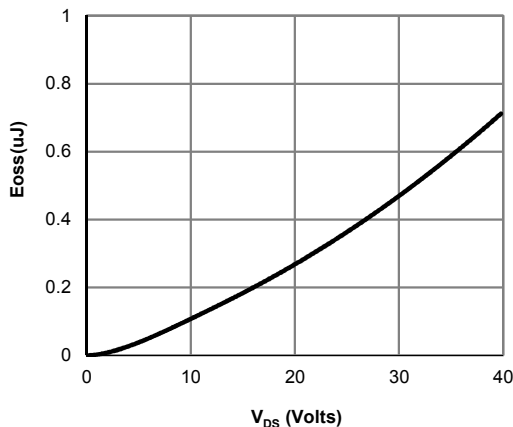


Figure 14: Coss stored Energy

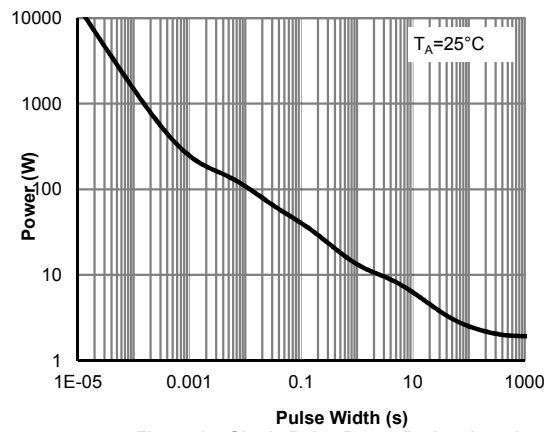


Figure 15: Single Pulse Power Rating Junction-to-Ambient (Note H)

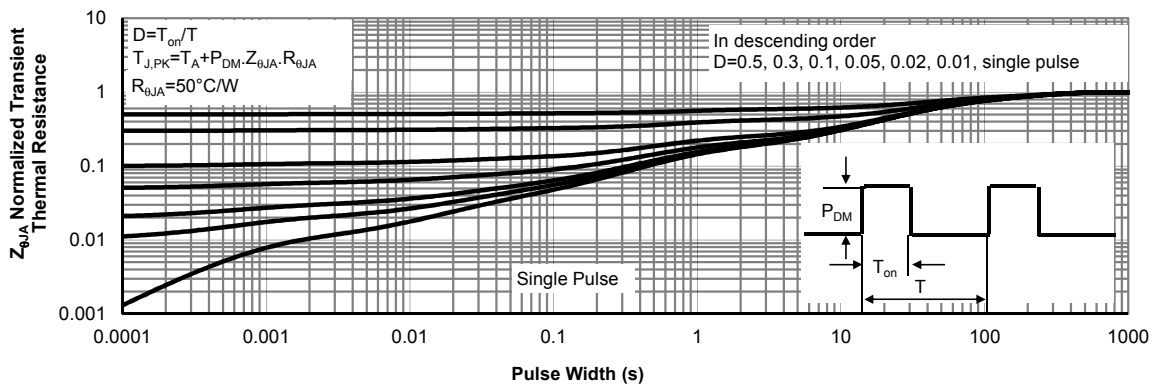
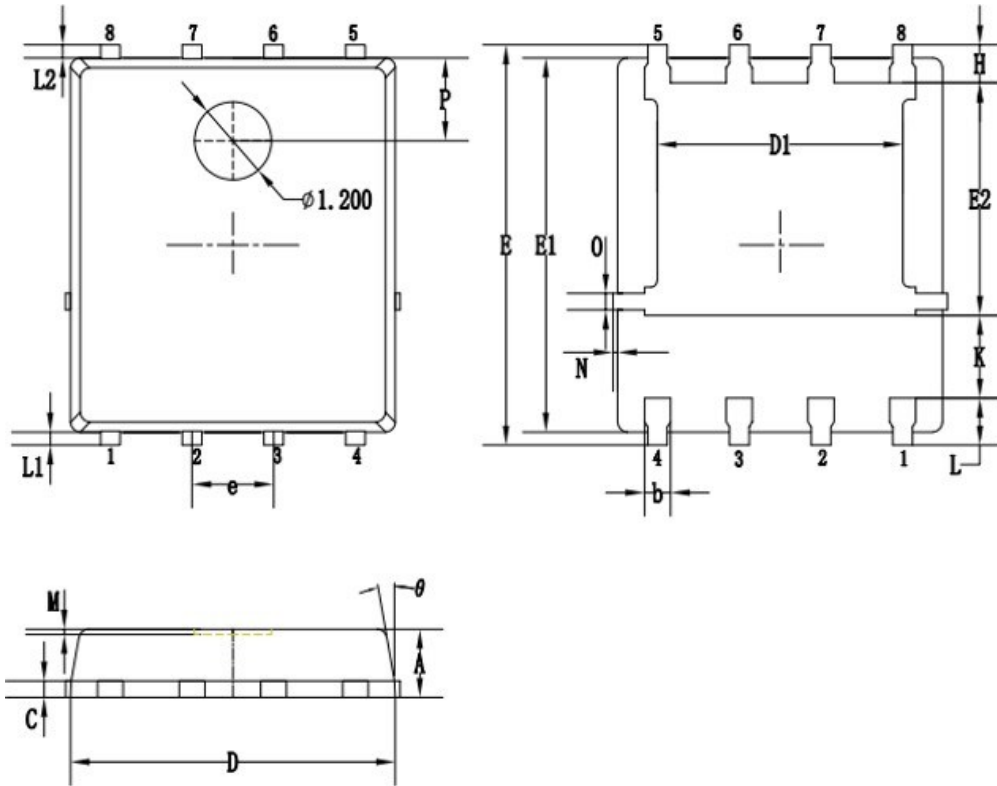


Figure 16: Normalized Maximum Transient Thermal Impedance (Note H)

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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