

## General Description

The WSD20100DN56 is the highest performance trench N-Ch MOSFET with extreme high cell density, which provide excellent RDS(on) and gate charge for most of the synchronous buck converter applications.

The WSD20100DN56 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

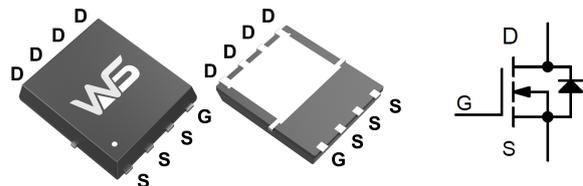
## Product Summary

BVDSS	RDS(on)	ID
20V	1.6mΩ	90A

## Applications

- Switch
- Power System
- Load Switch

## DFN5X6-8 Pin Configuration



## Absolute Maximum Ratings (Tc=25°C unless otherwise noted)

Symbol	Parameter	Rating	Units
V <sub>DS</sub>	Drain-Source Voltage	20	V
V <sub>GS</sub>	Gate-Source Voltage	±12	V
I <sub>D</sub> @T <sub>c</sub> =25°C	Continuous Drain Current <sub>1</sub>	90	A
I <sub>D</sub> @T <sub>c</sub> =100°C	Continuous Drain Current <sub>1</sub>	48	A
I <sub>DM</sub>	Pulsed Drain Current <sub>2</sub>	270	A
E <sub>AS</sub>	Single Pulse Avalanche Energy <sub>3</sub>	80	mJ
I <sub>AS</sub>	Avalanche Current	40	A
P <sub>D</sub> @T <sub>c</sub> =25°C	Total Power Dissipation <sub>4</sub>	83	W
T <sub>STG</sub>	Storage Temperature Range	-55 to 150	°C
T <sub>J</sub>	Operating Junction Temperature Range	-55 to 150	°C
R <sub>θJA</sub>	Thermal Resistance Junction-ambient <sub>1</sub> (t ≤ 10S)	20	°C/W
R <sub>θJA</sub>	Thermal Resistance Junction-ambient <sub>1</sub> (Steady State)	55	°C/W
R <sub>θJC</sub>	Thermal Resistance Junction-case <sub>1</sub>	1.5	°C/W

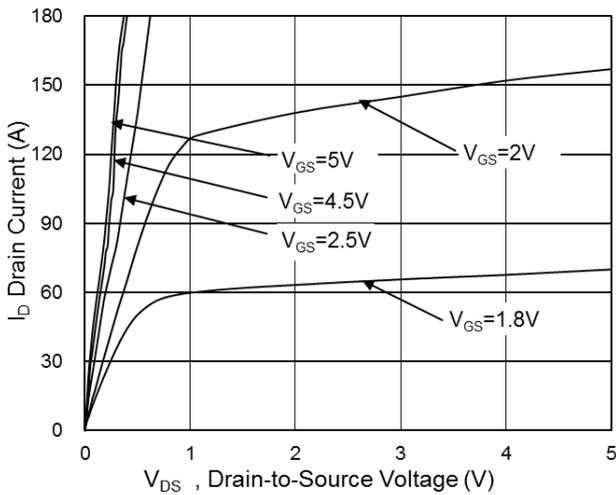
**Electrical Characteristics (T<sub>c</sub>=25°C unless otherwise noted)**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
BV <sub>DSS</sub>	Drain-Source Breakdown Voltage	V <sub>GS</sub> =0V , I <sub>D</sub> =250uA	20	23	---	V
V <sub>GS(th)</sub>	Gate Threshold Voltage	V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA	0.5	0.68	1.0	V
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =10V , I <sub>D</sub> =20A	---	1.6	2.0	mΩ
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =4.5V , I <sub>D</sub> =20A	---	1.9	2.5	mΩ
R <sub>DS(ON)</sub>	Static Drain-Source On-Resistance <sup>2</sup>	V <sub>GS</sub> =2.5V , I <sub>D</sub> =20A	---	2.8	3.8	mΩ
I <sub>DSS</sub>	Drain-Source Leakage Current	V <sub>DS</sub> =16V , V <sub>GS</sub> =0V , T <sub>J</sub> =25°C	---	---	1	uA
		V <sub>DS</sub> =16V , V <sub>GS</sub> =0V , T <sub>J</sub> =125°C	---	---	5	
I <sub>GSS</sub>	Gate-Source Leakage Current	V <sub>GS</sub> =±10V , V <sub>DS</sub> =0V	---	---	±10	uA
R <sub>g</sub>	Gate Resistance	V <sub>DS</sub> =0V , V <sub>GS</sub> =0V , f=1MHz	---	1.2	---	Ω
Q <sub>g</sub>	Total Gate Charge (10V)	V <sub>DS</sub> =15V , V <sub>GS</sub> =10V , I <sub>D</sub> =20A	---	77	---	nC
Q <sub>gs</sub>	Gate-Source Charge		---	8.7	---	
Q <sub>gd</sub>	Gate-Drain Charge		---	14	---	
T <sub>d(on)</sub>	Turn-On Delay Time	V <sub>DD</sub> =15V , V <sub>GS</sub> =10V , R <sub>G</sub> =3 , I <sub>D</sub> =20A	---	10.2	---	ns
T <sub>r</sub>	Rise Time		---	11.7	---	
T <sub>d(off)</sub>	Turn-Off Delay Time		---	56.4	---	
T <sub>f</sub>	Fall Time		---	16.2	---	
C <sub>iss</sub>	Input Capacitance	V <sub>DS</sub> =10V , V <sub>GS</sub> =0V , f=1MHz	---	4307	---	pF
C <sub>oss</sub>	Output Capacitance		---	501	---	
C <sub>rss</sub>	Reverse Transfer Capacitance		---	321	---	
I <sub>S</sub>	Continuous Source Current <sup>1,5</sup>	V <sub>G</sub> =V <sub>D</sub> =0V , Force Current	---	---	50	A
V <sub>SD</sub>	Diode Forward Voltage <sup>2</sup>	V <sub>GS</sub> =0V , I <sub>S</sub> =1A , T <sub>J</sub> =25°C	---	---	1.2	V
t <sub>rr</sub>	Reverse Recovery Time	I <sub>F</sub> =20A , di/dt=100A/μs , T <sub>J</sub> =25°C	---	22	---	nS
Q <sub>rr</sub>	Reverse Recovery Charge		---	72	---	nC

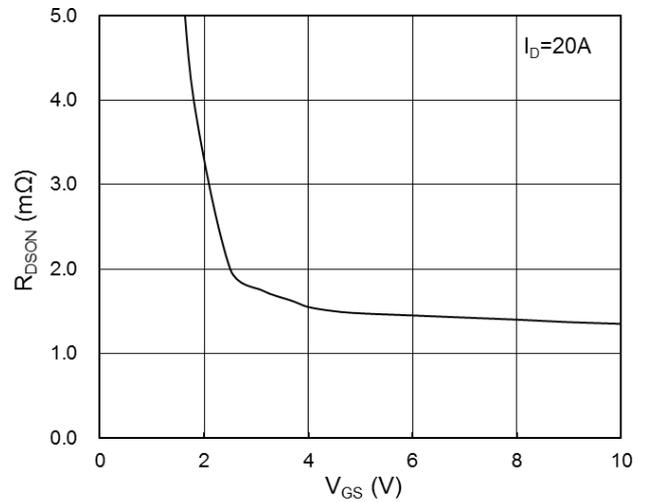
**Note :**

- 1、 The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.
- 2、 The data tested by pulsed , pulse width ≦ 300us , duty cycle ≦ 2%
- 3、 The EAS data shows Max. rating . The test condition is V<sub>DD</sub>=16V,V<sub>GS</sub>=10V,L=0.1mH,I<sub>AS</sub>=39A
- 4、 The power dissipation is limited by 175°C junction temperature
- 5、 The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.

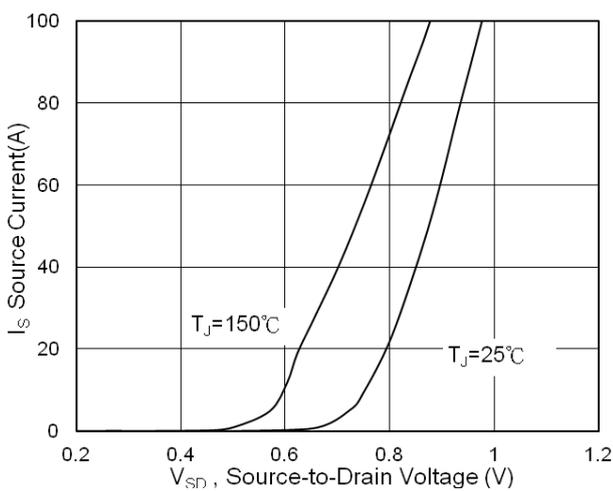
**Typical Characteristics**



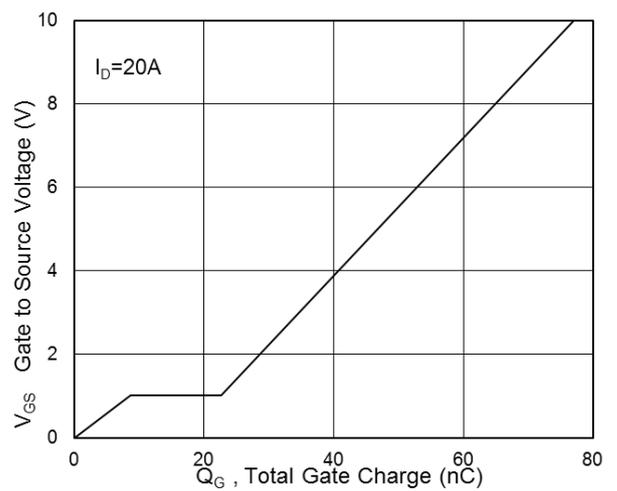
**Fig.1 Typical Output Characteristics**



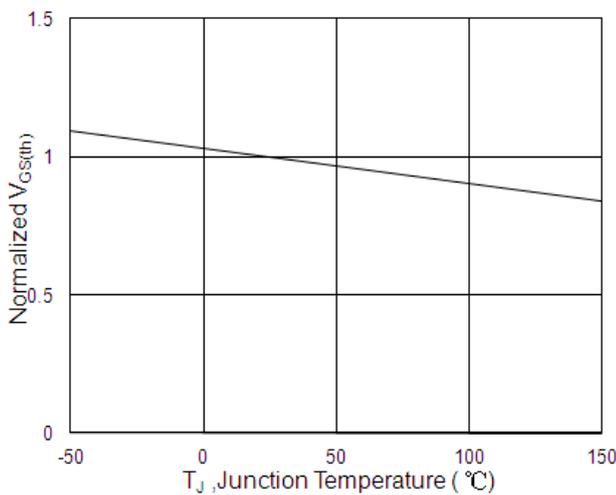
**Fig.2 On-Resistance vs. Gate-Source Voltage**



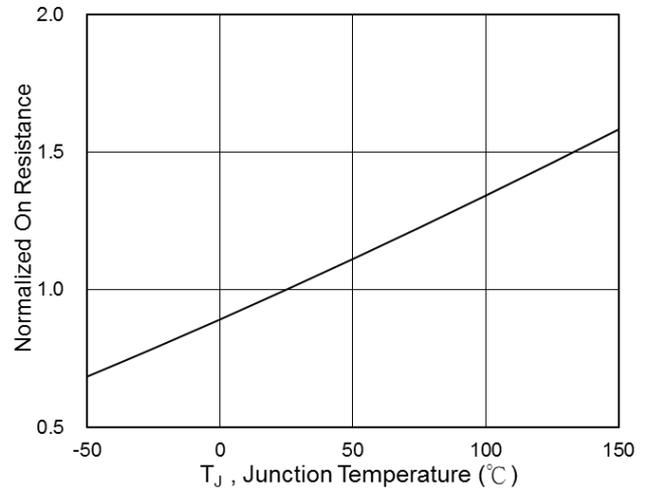
**Fig.3 Forward Characteristics of Reverse**



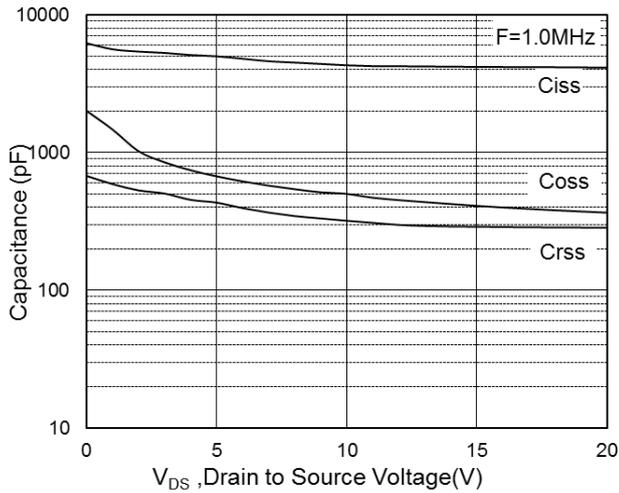
**Fig.4 Gate-Charge Characteristics**



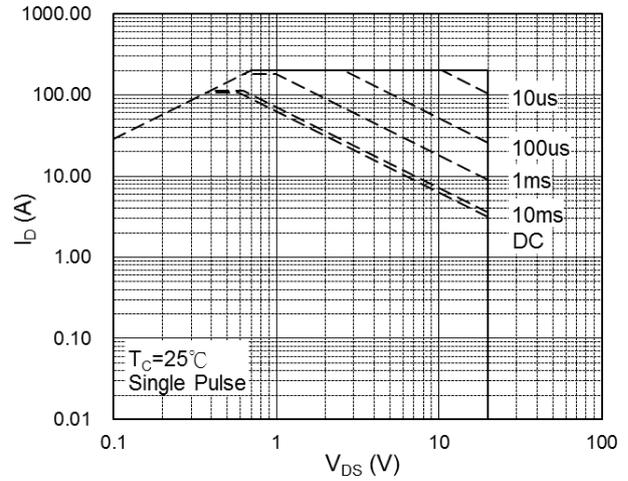
**Fig.5 Normalized V<sub>GS(th)</sub> vs. T<sub>J</sub>**



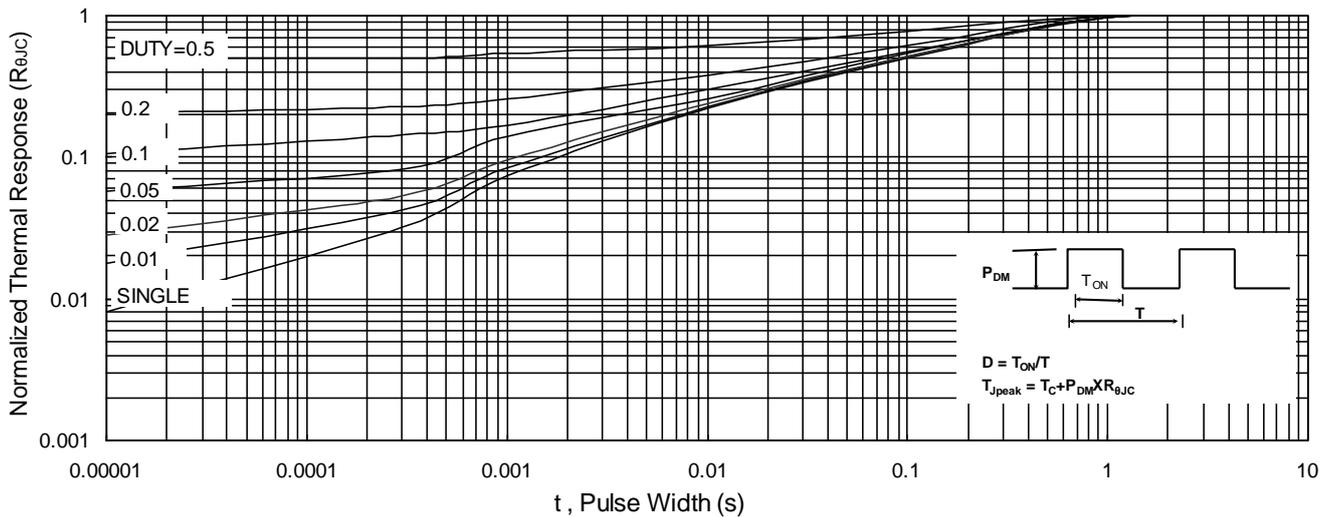
**Fig.6 Normalized R<sub>DS(on)</sub> vs. T<sub>J</sub>**



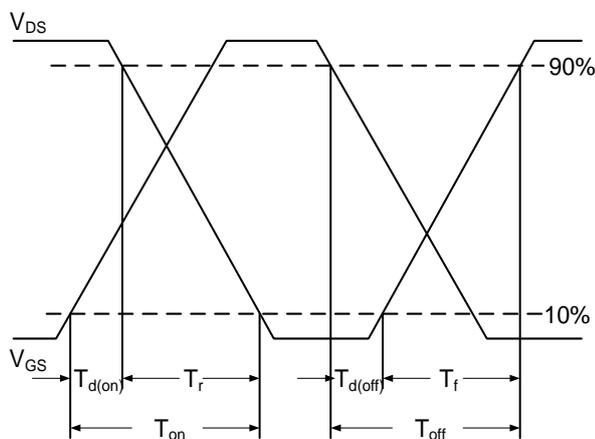
**Fig.7 Capacitance**



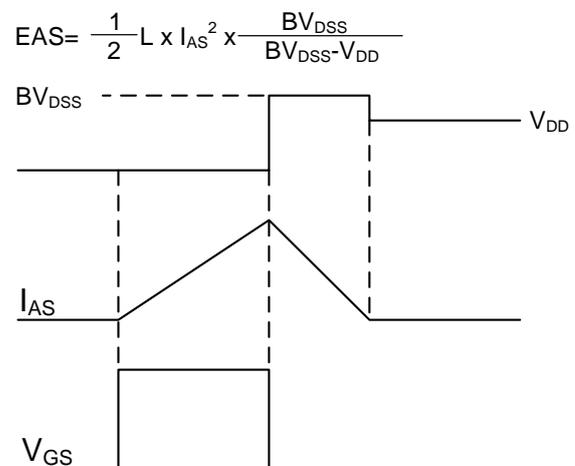
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**



**Fig.10 Switching Time Waveform**



**Fig.11 Unclamped Inductive Switching Waveform**



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