General Description

The WSD170N06DN56 is the highest performance SGT 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 WSD170N06DN56 meet the RoHS and Green Product requirement, 100% E_{AS} guaranteed with full function reliability approved.

Features

- 100% UIS Tested.
- Reliable and Rugged
- Lead Free and Green Devices Available (RoHS Compliant)

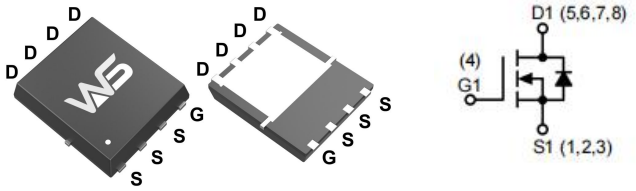
Product Summery

BV_{DSS}	$R_{DS(ON)}$	I_D
60V	2.0mΩ	170A

Applications

- Power Management for Industrial DC/DC Converters
- Ldeal for high-frequency switching and synchronous rectification

DFN5*6-8L Pin Configuration



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

Symbol	Parameter		Rating	Units
V_{DS}	Drain-Source Voltage		60	V
V_{GS}	Gate-Source Voltage		±20	
I_D [7]	Continuous Drain Current	T_C=25°C	170	A
		T_C=100°C	90	
I_{DM} [3]	Pulse Drain Current		460	
P_D [2]	Power Dissipation	T_C=25°C	156	W
I_{AS} [3]	Single pulse Avalanche Current		50	A
E_{AS} [3]	Single pulse Avalanche Energy	L=0.5mH	535	mJ
T_{STG}	Storage Temperature Range		-55 to 150	°C
T_J	Operating Junction Temperature Range		-55 to 150	
$R_{\theta JA}$ [1,4]	Thermal Resistance-Junction to Ambient	t≤10s	30	°C/W
		Steady State	60.5	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		0.62	

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	60	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V , I_D=20A	---	2.0	2.5	mΩ
		V_{GS}=4.5V , I_D=10A	---	2.5	3.5	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D=250μA	1.0	1.7	2.5	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=60V , 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	---	60	---	S
R_G	Gate Resistance	f=1.0MHz	---	2.5	---	Ω
Q_g	Total Gate Charge (10V)	V_{DS}=30V , V_{GS}=10V , I_D=20A	---	75	---	nC
Q_{gs}	Gate-Source Charge		---	20	---	
Q_{gd}	Gate-Drain Charge		---	14	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=30V , V_{GS}=10V , I_D=20A R_L=1Ω , R_{GEN}=3Ω	---	19	---	ns
T_r	Rise Time		---	13	---	
$T_{d(off)}$	Turn-Off Delay Time		---	75	---	
T_f	Fall Time		---	10	---	
C_{iss}	Input Capacitance	V_{DS}=30V , V_{GS}=0V , f=1.0MHz	---	5735	---	pF
C_{oss}	Output Capacitance		---	1100	---	
C_{rss}	Reverse Transfer Capacitance		---	20	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_S [7]	Continuous Source Current		---	---	170	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=1A	---	0.7	1.2	V
t_{rr}	Reverse Recovery Time	I_F=20A , di/dt=500A/μs	---	30	---	ns
Q_{rr}	Reverse Recovery Charge		---	89	---	nC

Note:

1. The value of $R_{\theta JA}$ is measured with the device mounted on 1in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C. The Power dissipation P_{DSM} is based on $R_{\theta JA}$ t≤ 10s and the maximum allowed junction temperature of 150°C. The value in any given application depends on the user's specific board design.
2. 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.
3. Single pulse width limited by junction temperature $T_{J(MAX)}$=150°C.
4. The $R_{\theta JA}$ is the sum of the thermal impedance from junction to case $R_{\theta JC}$ and case to ambient.
5. The static characteristics in Figures 1 to 6 are obtained using <300μs pulses, duty cycle 0.5% max.
6. 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.
7. The maximum current rating is package limited.
8. These tests are performed with the device mounted on 1 in^2 FR-4 board with 2oz. Copper, in a still air environment with T_A=25°C.
9. The maximum current rating is silicon limited

Typical Characteristics

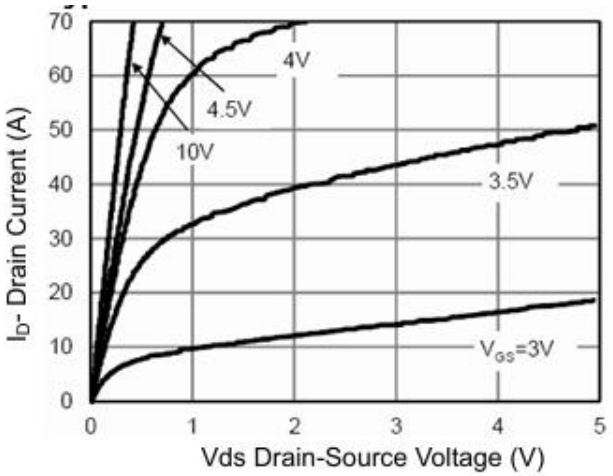


Figure 1 Output Characteristics

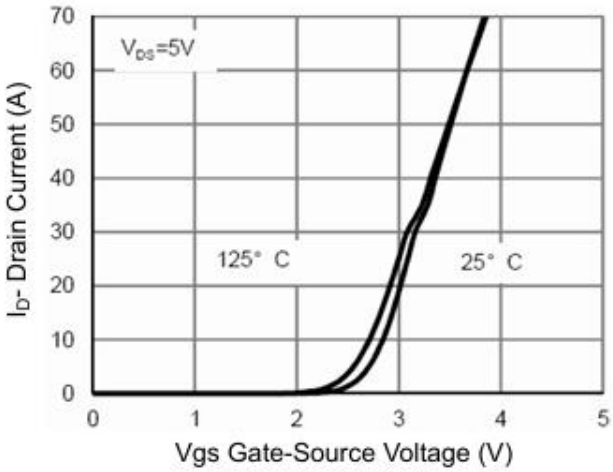


Figure 2 Transfer Characteristics

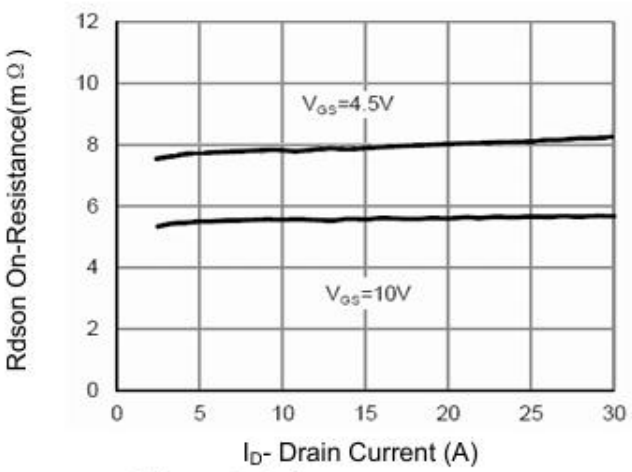


Figure 3 Rdson- Drain Current

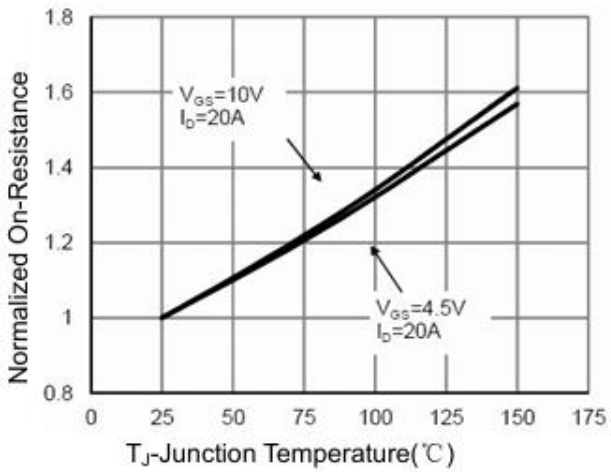


Figure 4 Rdson-Junction Temperature

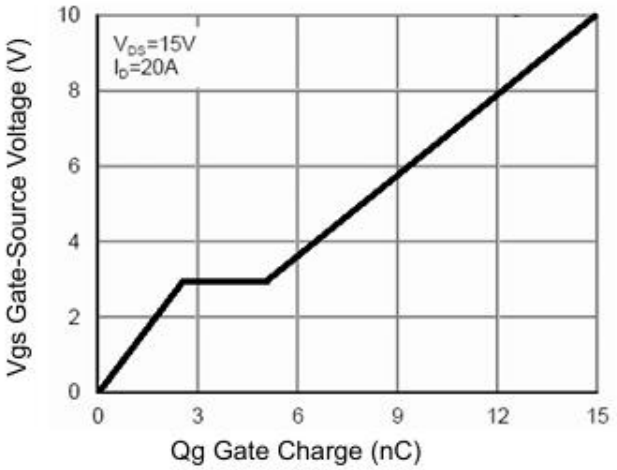


Figure 5 Gate Charge

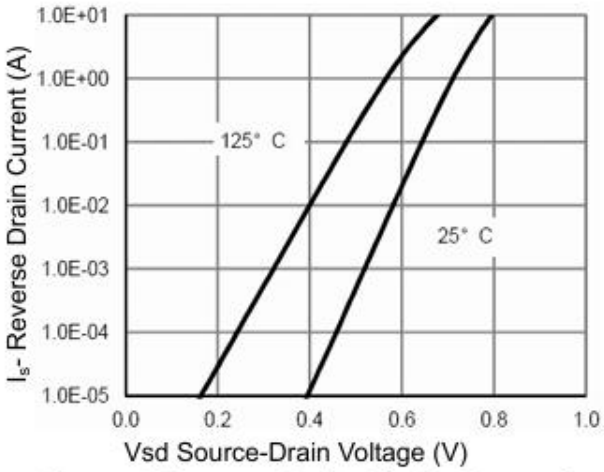


Figure 6 Source- Drain Diode Forward

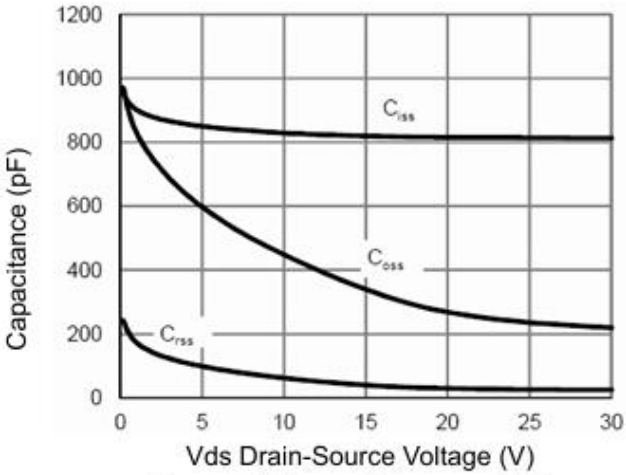


Figure 7 Capacitance vs Vds

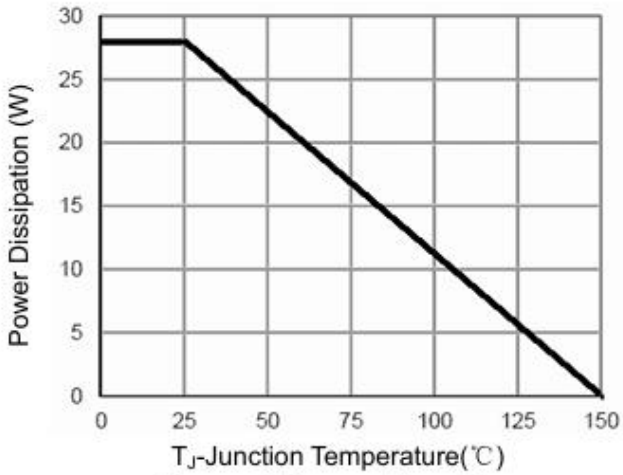


Figure 9 Power De-rating

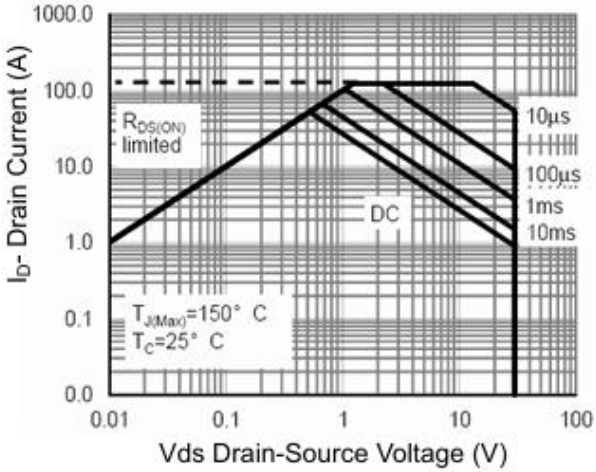


Figure 8 Safe Operation Area

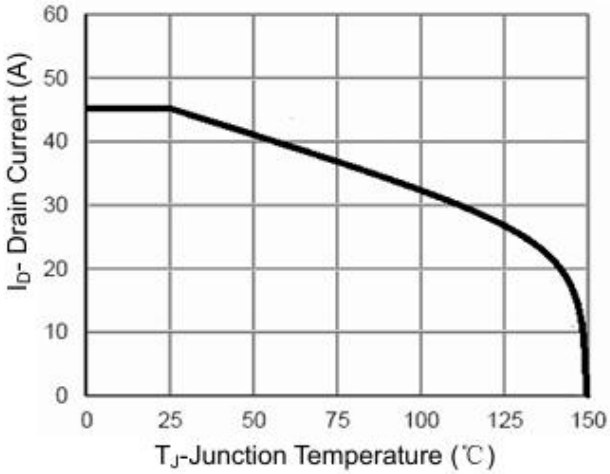


Figure 10 Current De-rating

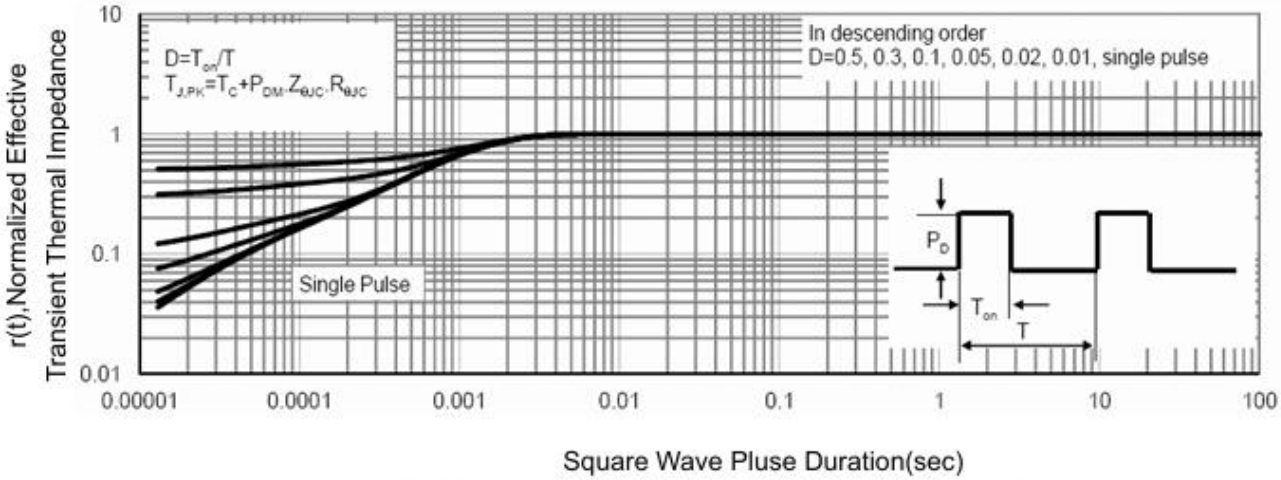
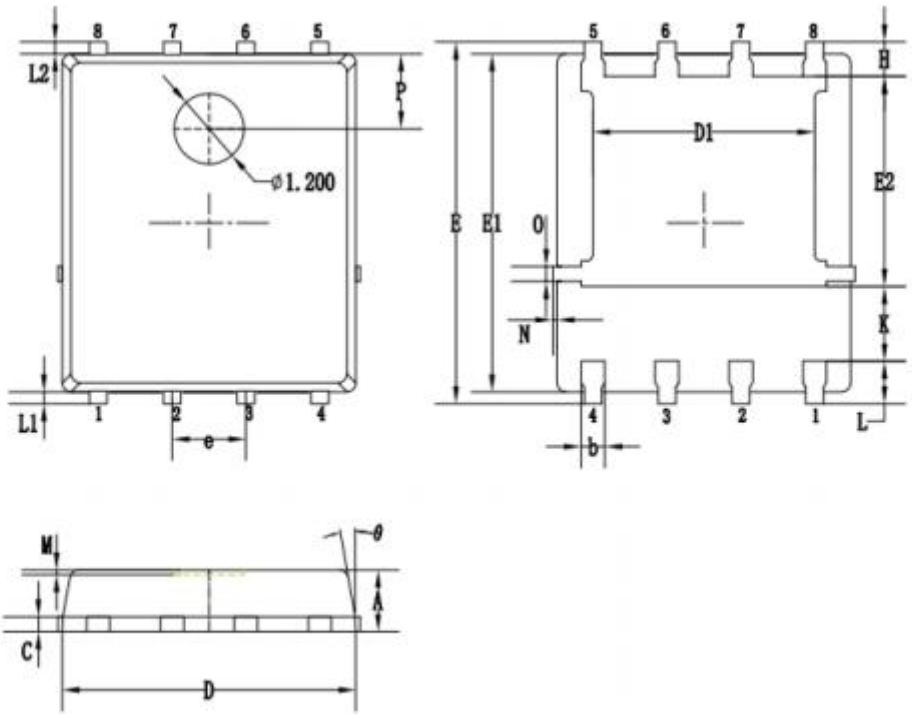


Figure 11 Normalized Maximum Transient Thermal Impedance

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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