WSD3069DN56

N-Ch and P-Channel MOSFET

General Description

The WSD3069DN56 is the highest performance trench N-Ch and P-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 WSD3069DN56 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

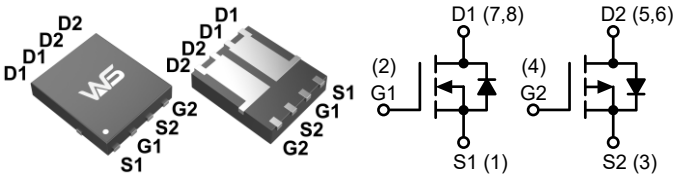
Product Summery

BV_{DSS}	$R_{DS(ON)}$	I_D
30V	15mΩ	16A
-30V	15mΩ	-16A

Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- CCFL Back-light Inverter

DFN5X6-8L Pin Configuration



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

Symbol	Parameter		Rating		Units
			N-Channel	P-Channel	
V_{DS}	Drain-Source Voltage		30	-30	V
V_{GS}	Gate-Source Voltage		±20	±20	
I_D	Continuous Drain Current [7]	T_C=25°C	16	-16	A
		T_C=100°C	10.5	-12.5	
I_{DM}	Pulse Drain Current [3]		35	-65	A
I_{DSM}	Continuous Drain Current	T_A=25°C	9.5	11	A
		T_A=70°C	7.5	-8.5	
P_D	Maximum Power Dissipation [2]	T_C=25°C	10	20	W
		T_C=100°C	4	8	
P_{DSM}	Maximum Power Dissipation [1]	T_C=25°C	3.1	4.1	W
		T_C=100°C	2	2.6	
E_{AS}	Single Pulse Avalanche Energy [3]	L=0.5mH	7	36	mJ
I_{AS}	Single Pulse Avalanche Current	L=0.5mH	12	-27	A
T_{STG}	Storage Temperature Range		-55 to 150	-55 to 150	°C
T_J	Operating Junction Temperature Range		150	150	
$R_{\theta JA}$	Thermal Resistance-Junction to Ambient [1,4]	t≤10s	40	30	°C/W
		Steady State	70	65	
$R_{\theta JC}$	Thermal Resistance-Junction to Case		21	6	

N-Channel 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	30	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V , I_D=10A	---	15	19.5	mΩ
		V_{GS}=4.5V , I_D=5A	---	18	24	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D=250μA	1.0	1.5	2.0	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=24V , V_{GS}=0V , T_J=25°C	---	---	1.0	μA
		V_{DS}=24V , V_{GS}=0V , T_J=55°C	---	---	5.0	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1.0MHz	---	---	2.8	Ω
Q_g	Total Gate Charge (4.5V)	V_{DS}=15V , V_{GS}=10V , I_D=10A	---	3.5	---	nC
Q_g	Total Gate Charge (10V)		---	7.1	---	
Q_{gs}	Gate-Source Charge		---	1.2	---	
Q_{gd}	Gate-Drain Charge		---	1.6	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=15V , V_{GEN}=10V , R_G=3Ω , R_L=1.5Ω	---	4.3	---	ns
T_r	Rise Time		---	2.8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	15.8	---	
T_f	Fall Time		---	3	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , f=1.0MHz	---	373	---	pF
C_{oss}	Output Capacitance		---	67	---	
C_{rss}	Reverse Transfer Capacitance		---	41	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_S	Continuous Source Current	V_G=V_D=0V , Force Current	---	---	10	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_{SD}=1A	---	0.75	1.0	V
t_{rr}	Reverse Recovery Time	I_{DS}=10A , di/dt=500A/μs	---	6	---	ns
Q_{rr}	Reverse Recovery Charge		---	6.6	---	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, rating. assuming a maximum junction temperature of $T_{J(MAX)}$=150°C. The SOA curve provides a single pulse.
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.

P-Channel 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	-30	---	---	V
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V , I_D=-9.7A	---	15	20	mΩ
		V_{GS}=-4.5V , I_D=-7A	---	20	27	
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D=-250μA	-1.0	-1.5	-2.0	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-24V , V_{GS}=0V , T_J=25°C	---	---	-1.0	μA
		V_{DS}=-24V , V_{GS}=0V , T_J=55°C	---	---	-5.0	
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA
R_g	Gate Resistance	V_{DS}=0V , V_{GS}=0V , f=1.0MHz	---	4	---	Ω
Q_g	Total Gate Charge (-4.5V)	V_{DS}=-15V , V_{GS}=-10V , I_D=-9.7A	---	9.6	---	nC
Q_g	Total Gate Charge (-10V)		---	19	---	
Q_{gs}	Gate-Source Charge		---	3.6	---	
Q_{gd}	Gate-Drain Charge		---	4.6	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DD}=-15V , V_{GEN}=-10V , R_G=3Ω , R_L=1.5Ω	---	10	---	ns
T_r	Rise Time		---	5.5	---	
$T_{d(off)}$	Turn-Off Delay Time		---	26	---	
T_f	Fall Time		---	9.0	---	
C_{iss}	Input Capacitance	V_{DS}=-15V , V_{GS}=0V , f=1.0MHz	---	1040	---	pF
C_{oss}	Output Capacitance		---	180	---	
C_{rss}	Reverse Transfer Capacitance		---	125	---	

Diode Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Units
I_S	Continuous Source Current	V_G=V_D=0V , Force Current	---	---	-16	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_{SD}=-1A	---	-0.75	-1.1	V
t_{rr}	Reverse Recovery Time	I_{DS}=-9.7A , di/dt=500A/μs	---	11.5	---	ns
Q_{rr}	Reverse Recovery Charge		---	25	---	nC

N-Channel Typical Characteristics

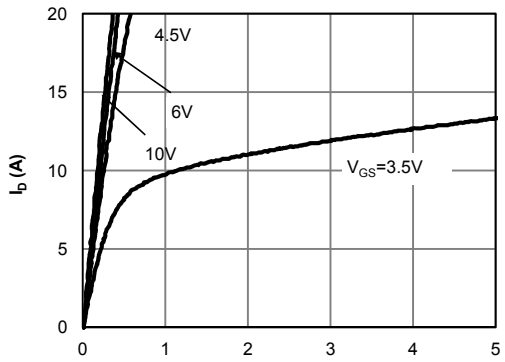


Figure 1: On-Region Characteristics (Note E)

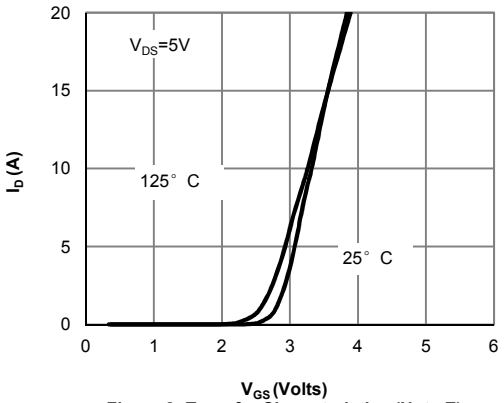


Figure 2: Transfer Characteristics (Note E)

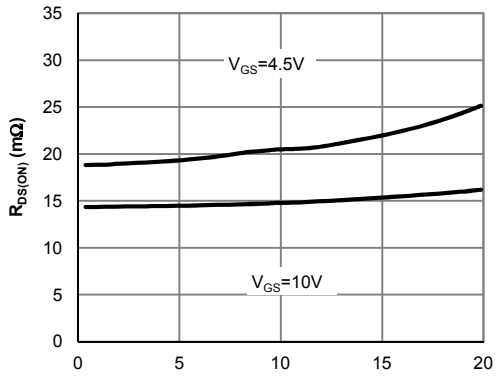


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

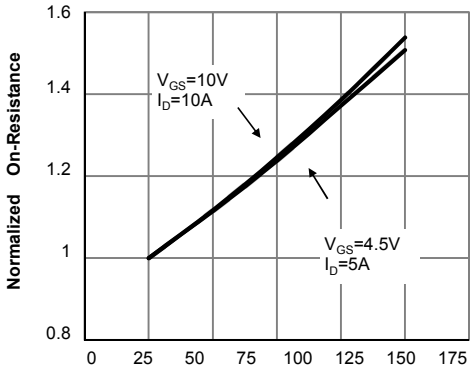


Figure 4: On-Resistance vs. Junction Temperature (Note E)

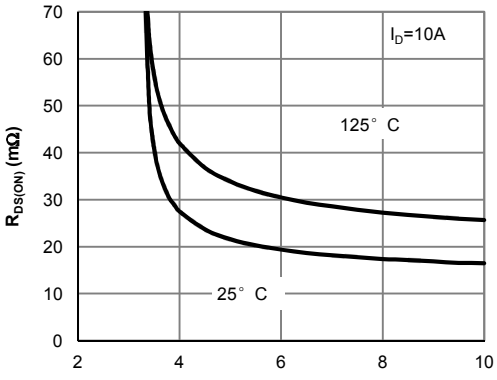


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

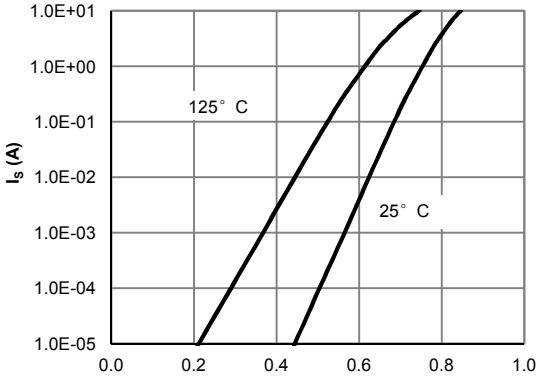


Figure 6: Body-Diode Characteristics (Note E)

N-Channel Typical Characteristics (Cont.)

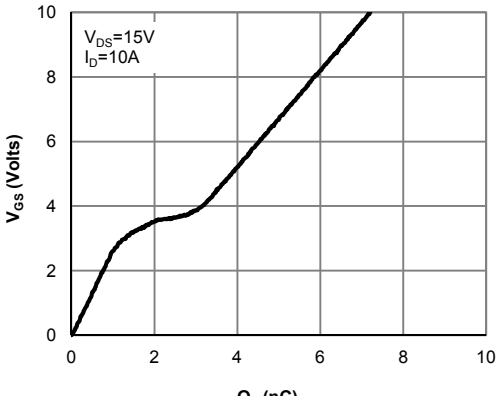


Figure 7: Gate-Charge Characteristics

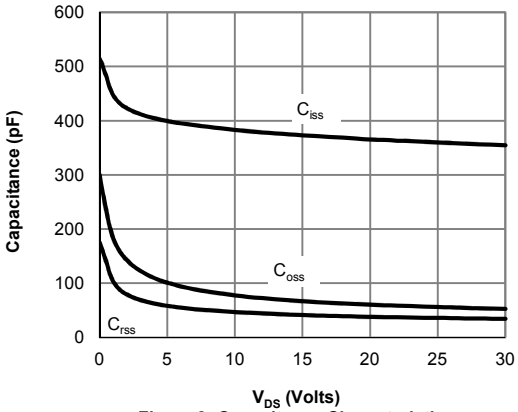
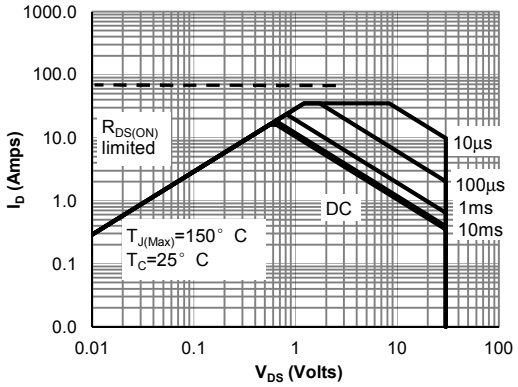


Figure 8: Capacitance Characteristics



V_{GS}> or equal to 4.5V

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

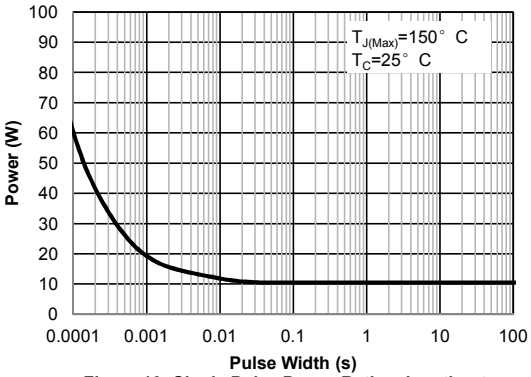


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

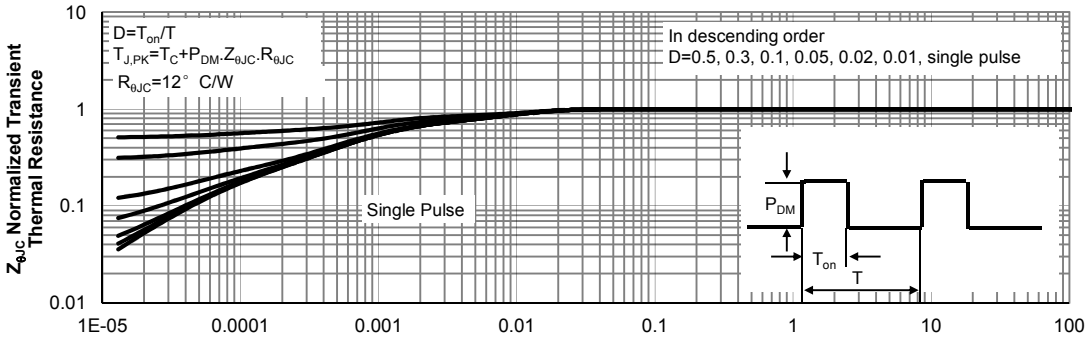


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

N-Channel Typical Characteristics (Cont.)

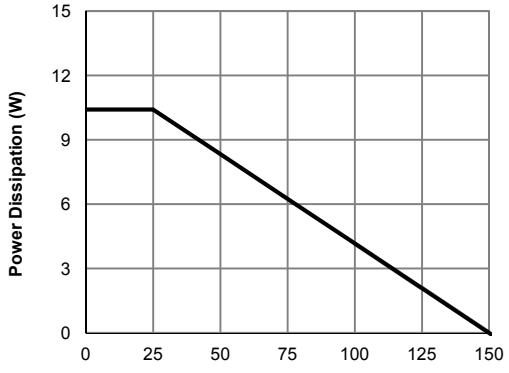


Figure 12: Power De-rating (Note F)

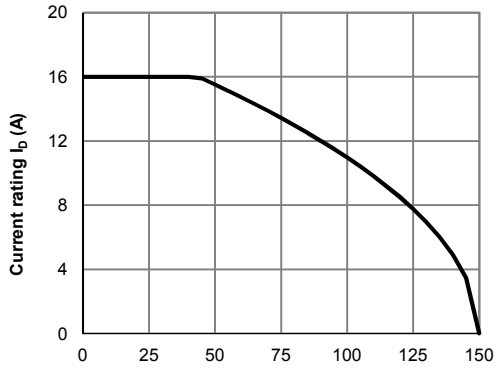


Figure 13: Current De-rating (Note F)

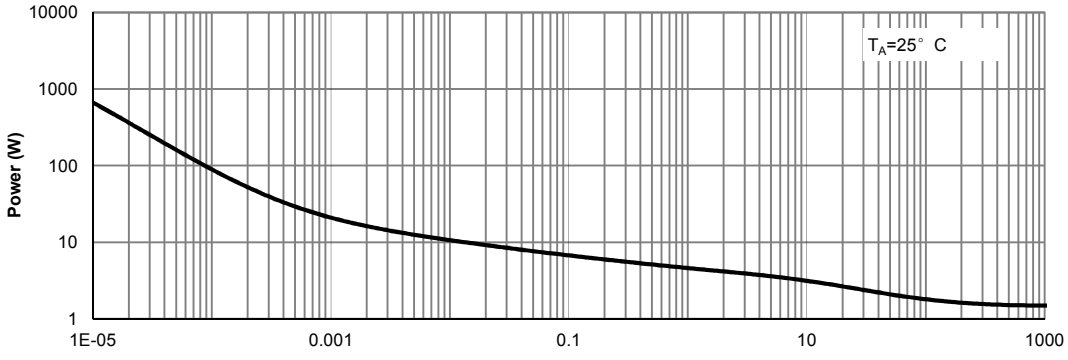


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

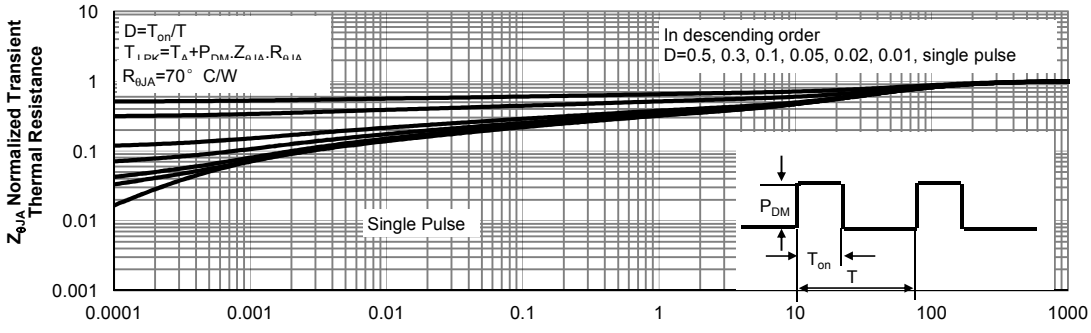


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

P-Channel Typical Characteristics

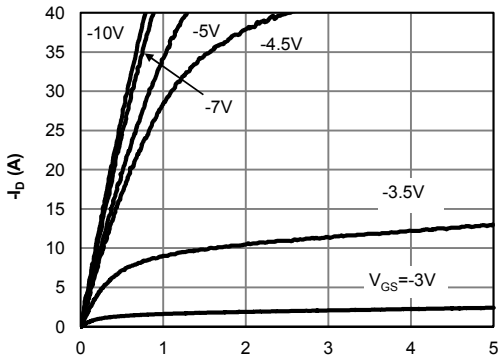


Figure 1: On-Region Characteristics (Note E)

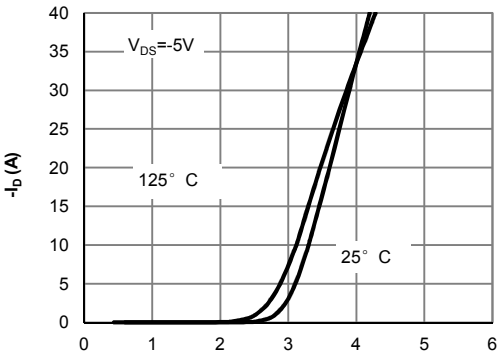


Figure 2: Transfer Characteristics (Note E)

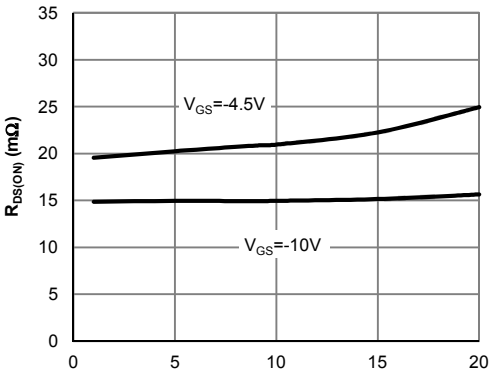


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

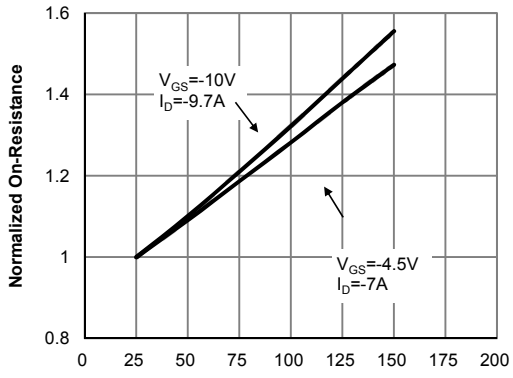


Figure 4: On-Resistance vs. Junction Temperature (Note E)

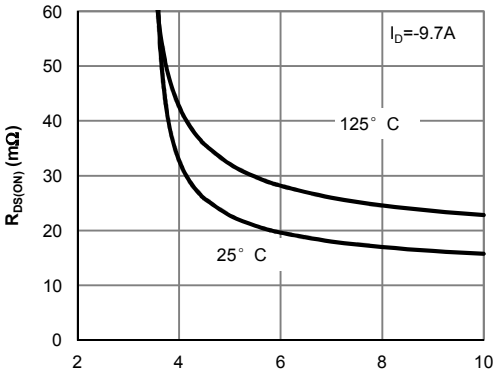


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

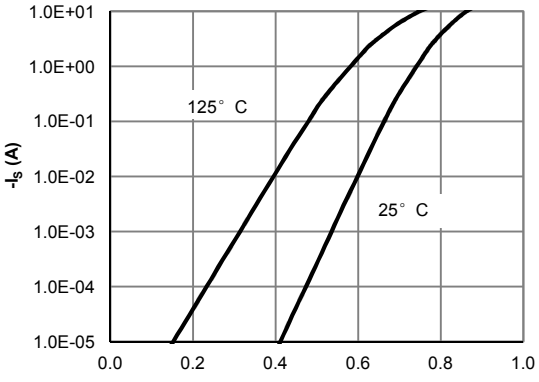


Figure 6: Body-Diode Characteristics (Note E)

P-Channel Typical Characteristics (Cont.)

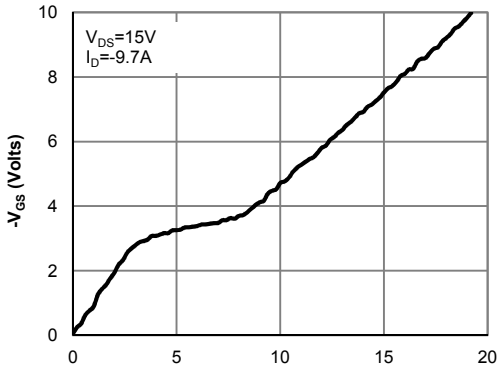


Figure 7: Gate-Charge Characteristics

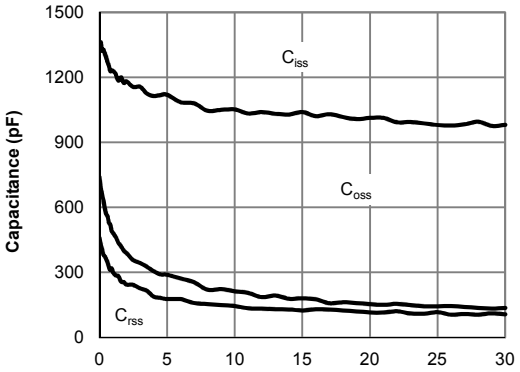


Figure 8: Capacitance Characteristics

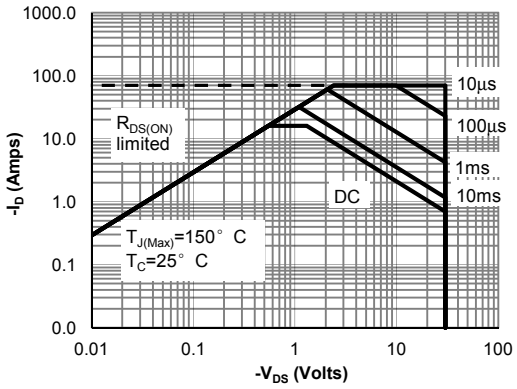


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

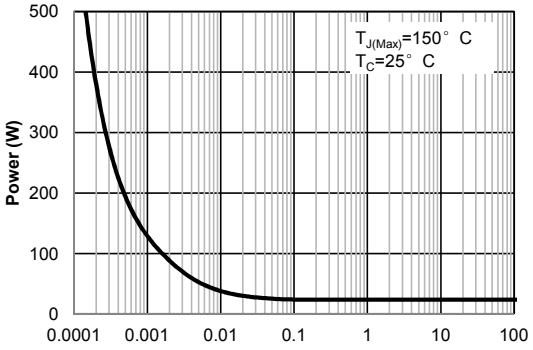


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

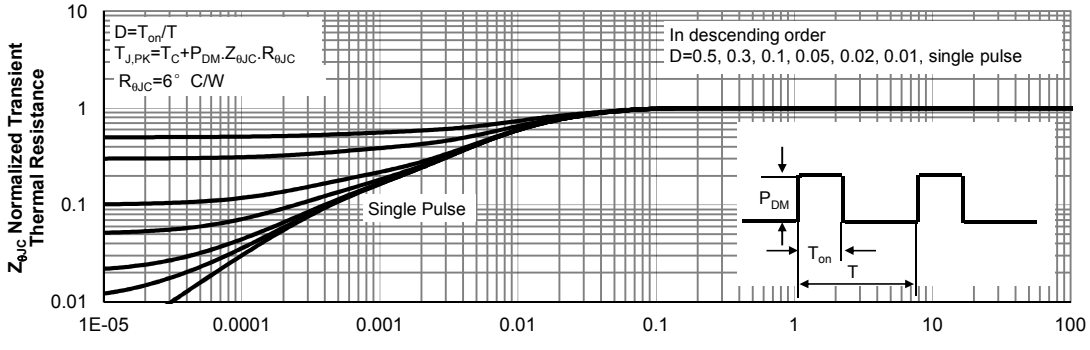


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

P-Channel Typical Characteristics (Cont.)

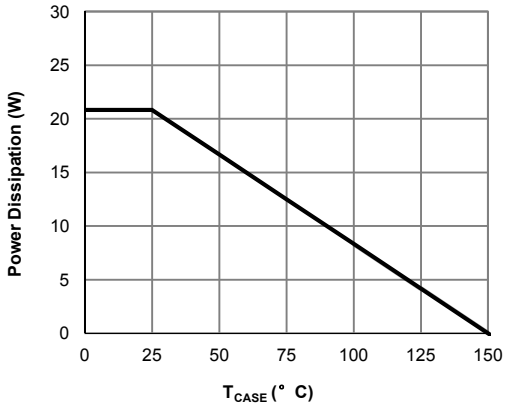


Figure 12: Power De-rating (Note F)

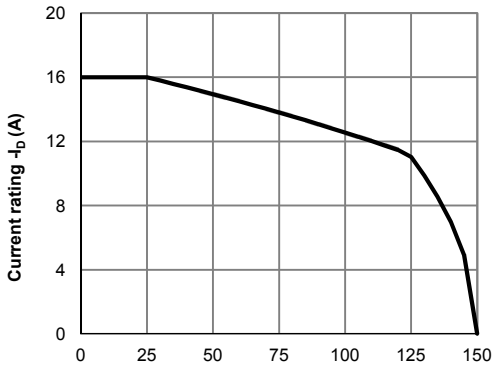


Figure 13: Current De-rating (Note F)

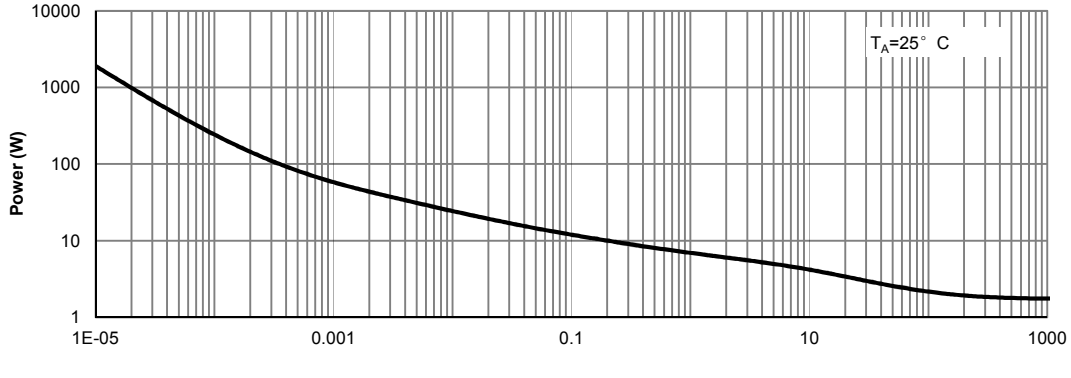


Figure 14: Single Pulse Power Rating Junction-to-Ambient (Note H)

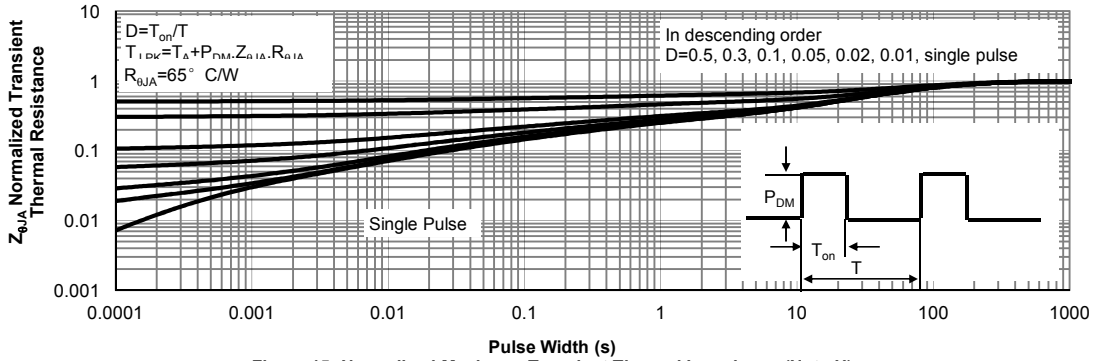
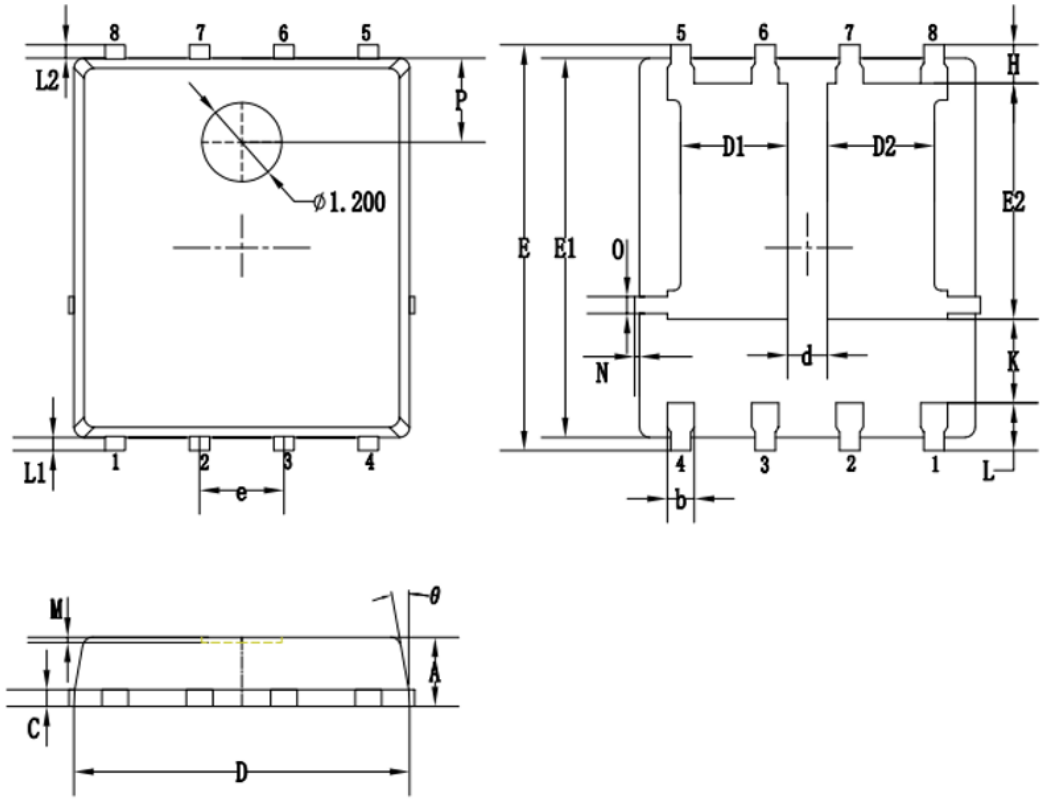


Figure 15: Normalized Maximum Transient Thermal Impedance (Note H)

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/D2	1.51	1.61	1.71
d	0.50	0.60	0.70
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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8, Any and all information described or contained herein are subject to change without notice due to product/technology improvement,etc. When designing equipment, refer to the "Delivery Specification" for the Winsok power product that you Intend to use.

9, this catalog provides information as of Sep.2014. Specifications and information herein are subject to change without notice.