KSN60G12Q

N&P-Channel complementary Power MOSFET

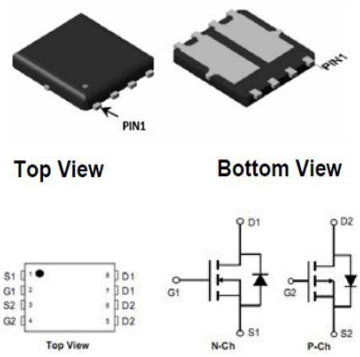
General Description

The KSN60G12Q uses advanced trench technology and design to provide excellent $R_{DS}(ON)$ with low gate charge.It can be used in a wide variety of applications.

Product Summary

	V_{DS} (V)	$R_{DS}(ON)$(mΩ)	$I_D(A)$
N-ch	60	40 at VGS = 10 V	12
		52 at VGS = 4.5 V	10
P-ch	-60	69 at VGS = 10 V	-9
		80 at VGS = 4.5 V	-7

PDFN3*3 Pin Configuration



Features

- Hiht density cell design for ultra low $R_{DS}(ON)$.
- Fully characterized avalanche voltage and current.
- Good stability and uniformity with high E_{AS}.
- Excellent package for good heat dissipation.

Applications

- H-bridge
- Inverter

Absolute Maximum Ratings Tc=25℃ unless otherwise noted

Symbol	Parameter	N-ch Rating	P-ch Rating	Units
V_{DS}	Drain-Source Voltage	60	-60	V
V_{GS}	Gate-Source Voltage	±20	±20	V
I_D	Drain Current – Continuous (Tc=25℃)	12	-9	A
	Drain Current – Continuous (Tc=100℃)	8	-5	A
I_{DM}	Drain Current – Pulsed[1]	30	-25	A
P_D	Power Dissipation (Tc=25℃)	11		W
	Power Dissipation (Tc=100℃)	0.8		W/℃
T_{STG}	Storage Temperature Range	-55 to 150		℃
T_J	Operating Junction Temperature Range	-55 to 150		℃

Thermal Characteristics

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction to ambient	---	49	℃/W
$R_{\theta JC}$	Thermal Resistance Junction to Case	---	1.3	℃/W

N-Channel Electrical Characteristics (TJ=25℃, unless otherwisenoted) Off

Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=250uA	60	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=40V , V_{GS}=0V , T_J=25℃	---	---	1	uA
		V_{DS}=40V , V_{GS}=0V , T_J=125℃	---	---	10	uA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=±20V , V_{DS}=0V	---	---	±100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=10V , I_D=5A	---	40	48	mΩ
		V_{GS}=4.5V , I_D=3A	---	52	64	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	1.0	1.5	2.5	V
gfs	Forward Transconductance	V_{DS}=10V , I_S=3A	---	20	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge[2,3]	V_{DS}=15V , V_{GS}=10V , I_D=6A	---	18	---	nC
Q_{gs}	Gate-Source Charge[2,3]		---	3	---	
Q_{gd}	Gate-Drain Charge[2,3]		---	5	---	
$T_{d(on)}$	Turn-On Delay Time[2,3]	V_{DS}=15V, R_L=1.25Ω V_{GS}=10V,R_G=3Ω	---	6	---	ns
T_r	Rise Time[2,3]		---	12	---	
$T_{d(off)}$	Turn-Off Delay Time[2,3]		---	20	---	
T_f	Fall Time[2,3]		---	7	---	
C_{iss}	Input Capacitance	V_{DS}=15V , V_{GS}=0V , F=1MHz	---	930	---	pF
C_{oss}	Output Capacitance		---	115	---	
C_{rss}	Reverse Transfer Capacitance		---	85	---	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	V_G=V_D=0V , Force Current	---	---	10	A
I_{SM}	Pulsed Source Current		---	---	25	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=1A , T_J=25℃	---	---	1.2	V

N-Channel Typical Electrical and Thermal Characteristics (Curves)

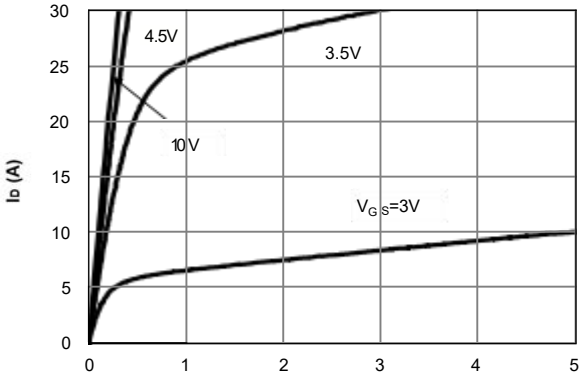


Figure 1: On-Region Characteristics (Note E)

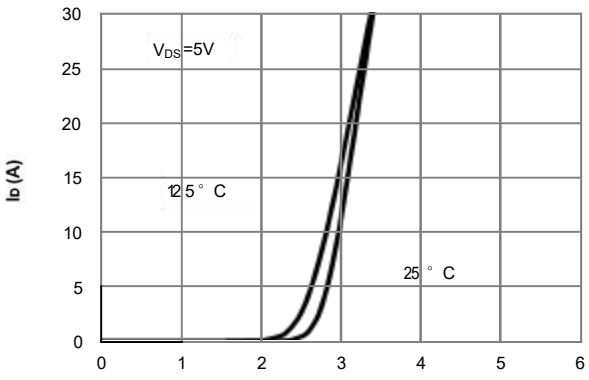


Figure 2: Transfer Characteristics (Note E)

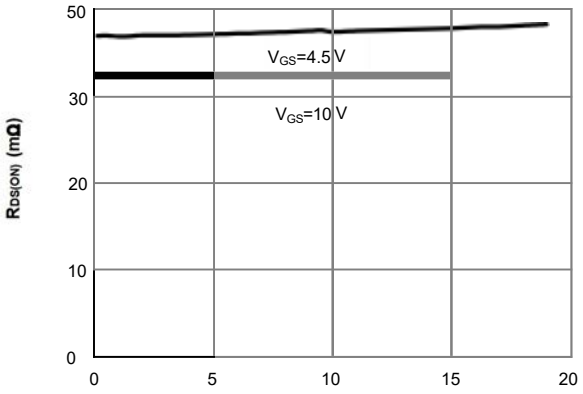


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

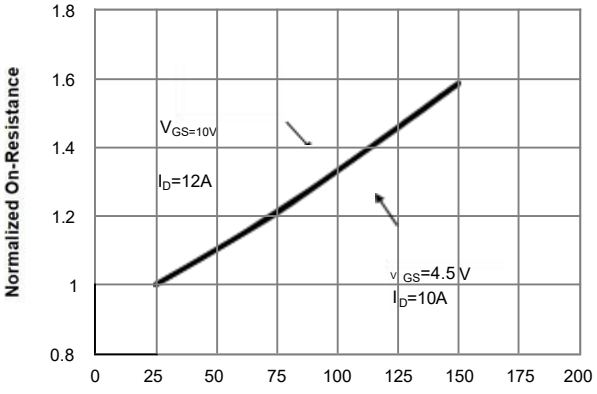


Figure 4: On-Resistance vs. Junction Temperature (Note E)

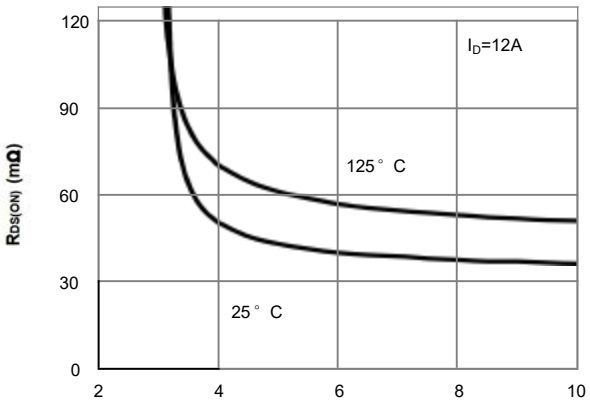


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

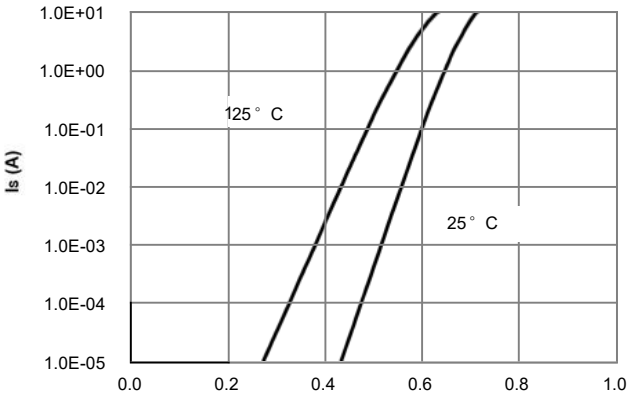


Figure 6: Body-Diode Characteristics (Note E)

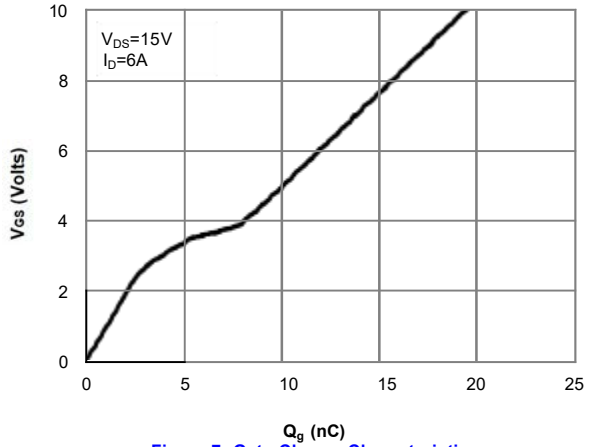


Figure 7: Gate-Charge Characteristics

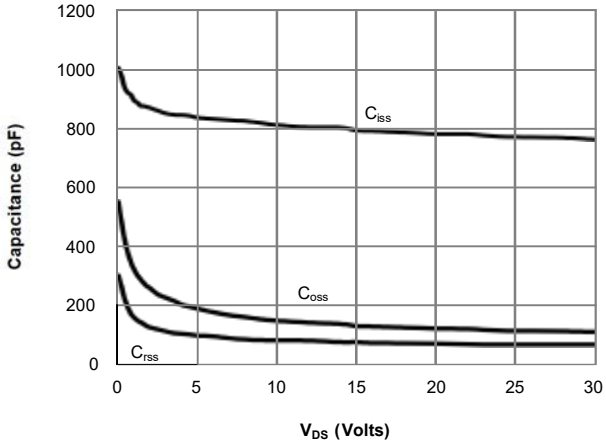


Figure 8: Capacitance Characteristics

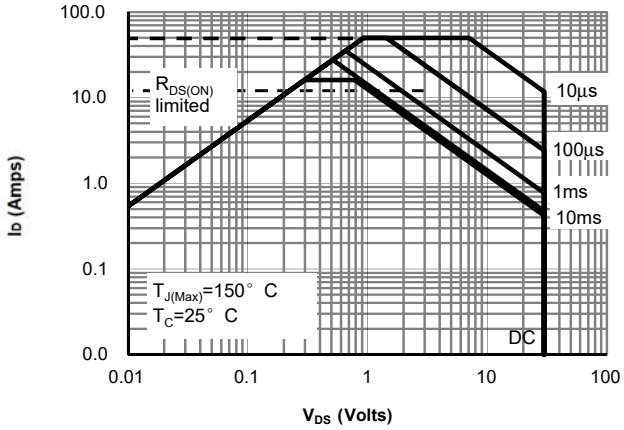


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

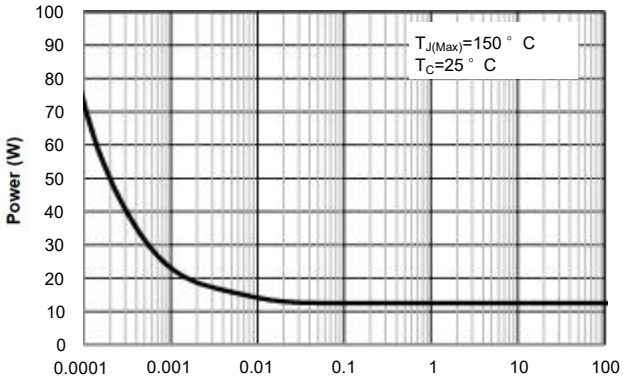


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

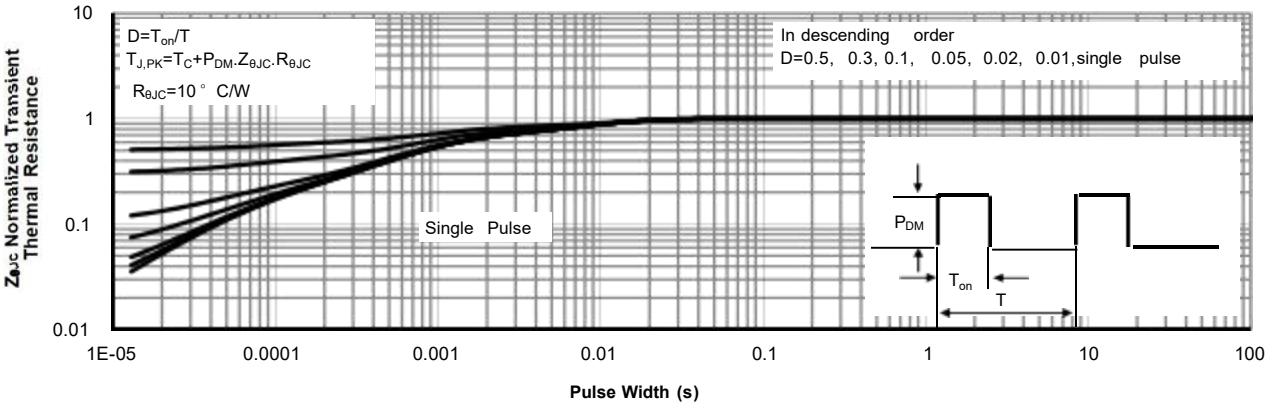


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

P-Channel Electrical Characteristics (T_J=25 ℃, unless otherwisenoted)

Off Characteristics

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
BV_{DSS}	Drain-Source Breakdown Voltage	V_{GS}=0V , I_D=-250uA	-60	---	---	V
I_{DSS}	Drain-Source Leakage Current	V_{DS}=-40V , V_{GS}=0V , T_J=25℃	---	---	-1	uA
		V_{DS}=-40V , V_{GS}=0V , T_J=125℃	---	---	-10	uA
I_{GSS}	Gate-Source Leakage Current	V_{GS}=： 20V , V_{DS}=0V	---	---	±100	nA

On Characteristics

$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS}=-10V , I_D=-10A	---	69	84	mΩ
		V_{GS}=-4.5V , I_D=-10A	---	89	100	mΩ
$V_{GS(th)}$	Gate Threshold Voltage	V_{GS}=V_{DS} , I_D =250uA	-1.0	-1.6	-3	V
gfs	Forward Transconductance	V_{DS}=-5V , I_S=-4A	---	20	---	S

Dynamic and switching Characteristics

Q_g	Total Gate Charge	V_{DS}=-15V , V_{GS}=-10V , I_D=-4A	---	47	---	nC
Q_{gs}	Gate-Source Charge		---	5.8	---	
Q_{gd}	Gate-Drain Charge		---	11	---	
$T_{d(on)}$	Turn-On Delay Time	V_{DS}=-15V, R_L=0.9Ω V_{GS}=-10V,R_G=3Ω	---	11	---	ns
T_r	Rise Time		---	8	---	
$T_{d(off)}$	Turn-Off Delay Time		---	38	---	
T_f	Fall Time		---	15	---	
C_{iss}	Input Capacitance	V_{DS}=-15V , V_{GS}=0V , F=1MHz	---	1760	---	pF
C_{oss}	Output Capacitance		---	272	---	
C_{rss}	Reverse Transfer Capacitance		---	185	---	

Drain-Source Diode Characteristics and Maximum Ratings

Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
I_S	Continuous Source Current	V_G=V_D=0V , Force Current	---	---	-9	A
I_{SM}	Pulsed Source Current		---	---	-20	A
V_{SD}	Diode Forward Voltage	V_{GS}=0V , I_S=-1A , T_J=25℃	---	---	-1.2	V

Note :

1. Repetitive Rating: Pulse width limited by maximum junction temperature.

2. Surface Mounted on FR4 Board, t ≤ 10 sec.

3. Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.

4. Guaranteed by design, not subject to production

5. E_{AS} condition: Tj=25℃,V_{DD}=-15V,V_G=-10V,L=0.5mH,Rg=25Ω,I_{AS}=-26A

P-Channel Typical Electrical and Thermal Characteristics (Curves)

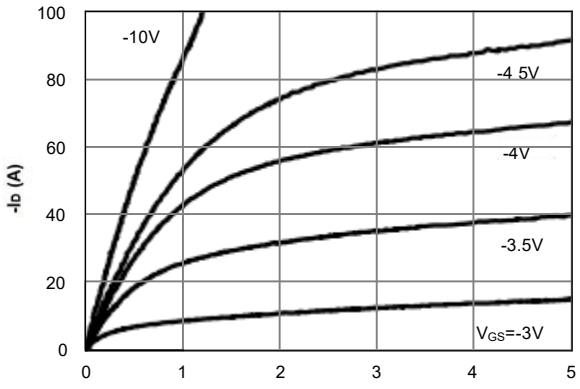


Figure 1: On-Region Characteristics (Note E)

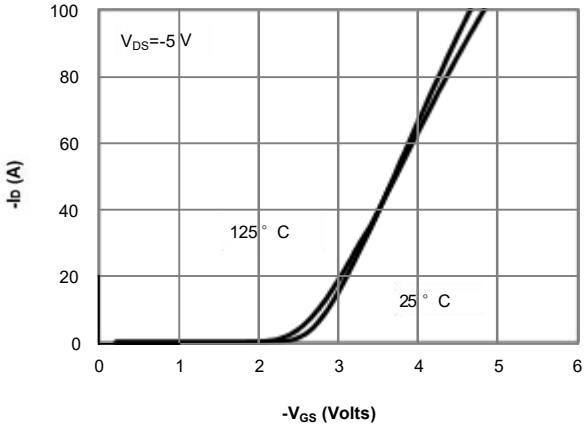


Figure 2: Transfer Characteristics (Note E)

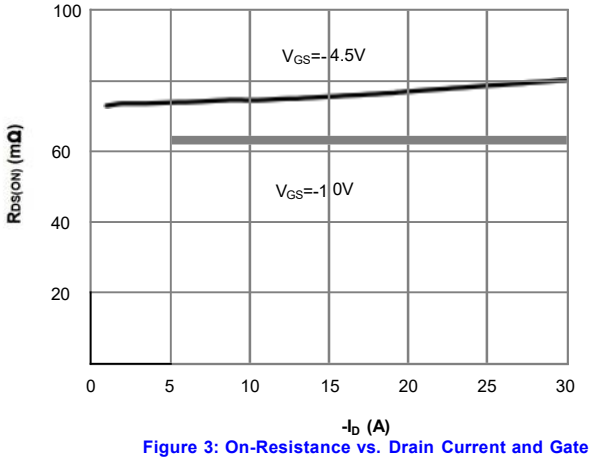


Figure 3: On-Resistance vs. Drain Current and Gate Voltage (Note E)

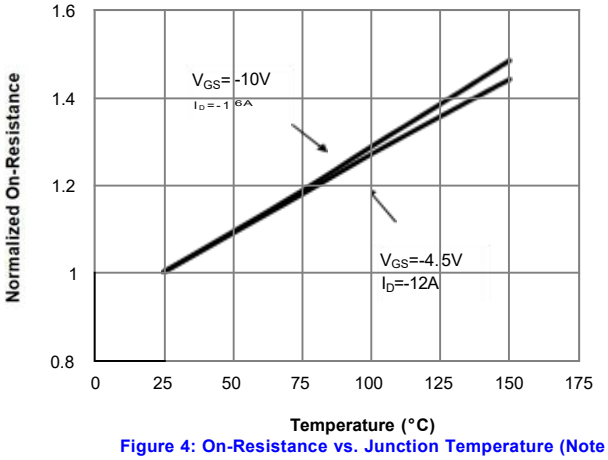


Figure 4: On-Resistance vs. Junction Temperature (Note E)

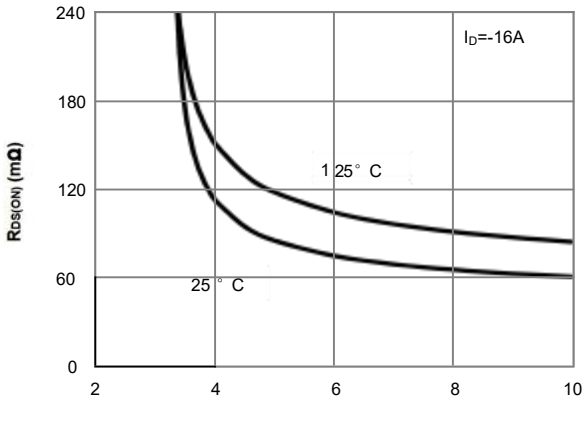


Figure 5: On-Resistance vs. Gate-Source Voltage (Note E)

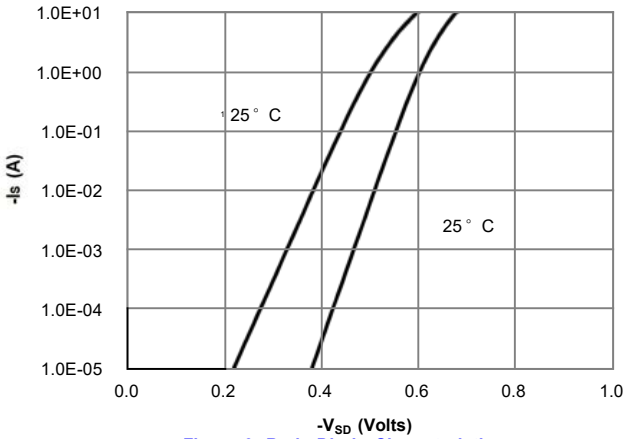


Figure 6: Body-Diode Characteristics (Note E)

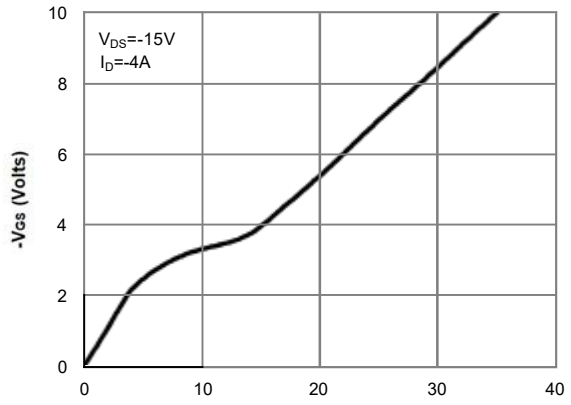


Figure 7: Gate-Charge Characteristics

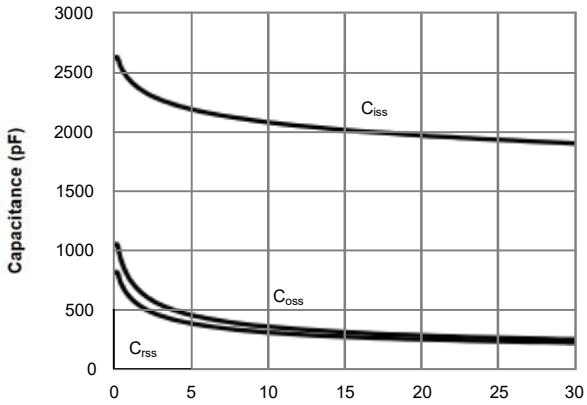


Figure 8: Capacitance Characteristics

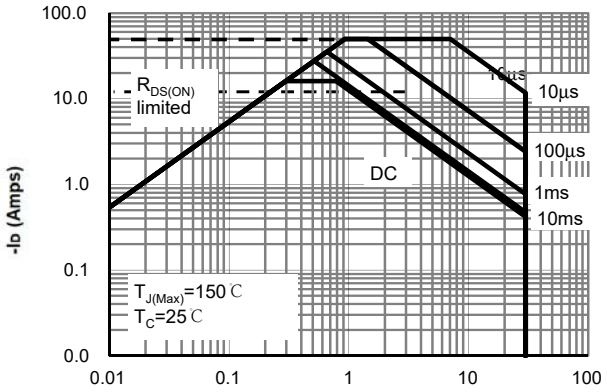


Figure 9: Maximum Forward Biased Safe Operating Area (Note F)

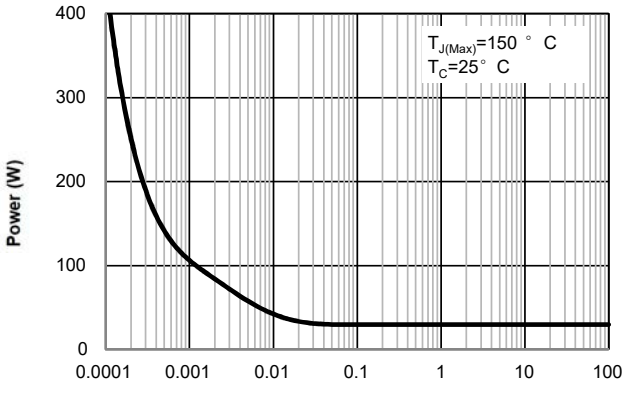


Figure 10: Single Pulse Power Rating Junction-to-Case (Note F)

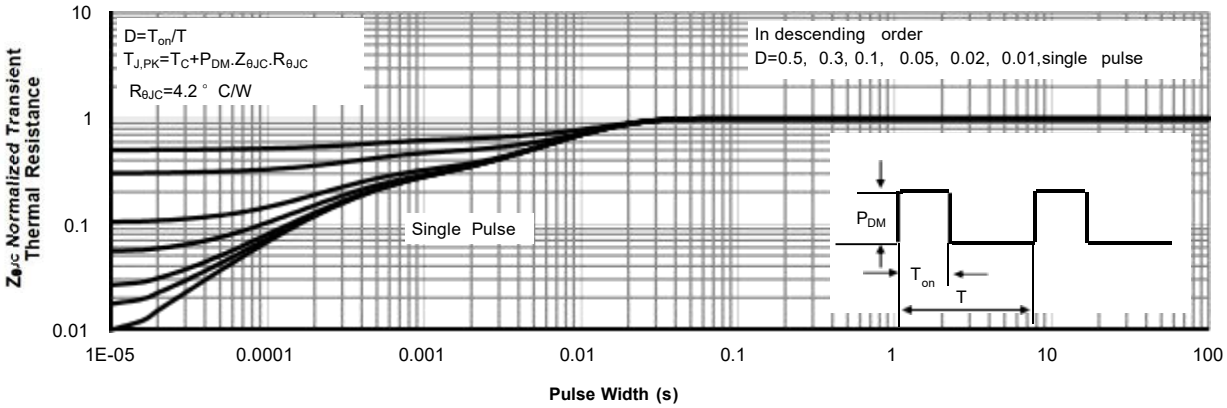


Figure 11: Normalized Maximum Transient Thermal Impedance (Note F)

Disclaimer

1. Any and all Korsun Semiconductor products described or contained hereindo not have specifications that can handle applications that require extremely high levels of reliability, such as life-support systems, aircraft's control systems, or other applications whose failure can be reasonably expected to result in serious physical and/or material damage. Consult with your Korsun Semiconductor representative nearest you before using any Korsun Semiconductor products described or contained herein in such applications.

2.Korsun Semiconductor assumes no responsibility for equipment failures that result from using products at values that exceed, even momentarily, rated values (such as maximum ratings, operating condition ranges, or other parameters) listed in products specifications of any and all Korsun Semiconductor products described or contained herein.

3. Specifications of any and all Korsun Semiconductor products described or contained herein stipulate the performance, characteristics, and functions of the described products in the independent state, and are not guarantees of the performance, characteristics, and functions of the described products as mounted in the customer's products or equipment. To verify symptoms and states that cannot be evaluated in an independent device, the customer should always evaluate and test devices mounted in the customer's products or equipment.

4. Korsun Semiconductor CO.,LTD. strives to supply high-quality high-reliability products. However, any and all semiconductor products fail with some probability. It is possible that these probabilistic failures could give rise to accidents or events that could endanger human lives, that could give rise to smoke or fire, or that could cause damage to other property. When designing equipment, adopt safety measures so that these kinds of accidents or events cannot occur. Such measures include but are not limited to protective circuits and error prevention circuits for safe design, redundant design, and structural design.

5.In the event that any or all Korsun Semiconductor products(including technical data, services described or contained herein are controlled under any of applicable local export control laws and regulations, such products must not be exported without obtaining the export license from the authorities concerned in accordance with the above law.

6. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or any information storage or retrieval system, or otherwise, without the prior written permission of Korsun Semiconductor CO.,LTD.

7. Information (including circuit diagrams and circuit parameters) herein is for example only ; it is not guaranteed for volume production. Korsun Semiconductor believes information herein is accurate and reliable, but no guarantees are made or implied regarding its use or any infringements of intellectual property rights or other rights of third parties.

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 Korsun Semiconductor product that you intend to use.

9. This catalog provides information as of Sep.2010. Specifications and information herein are subject to change without notice.