S4105

N-channel SiC power MOSFET bare die

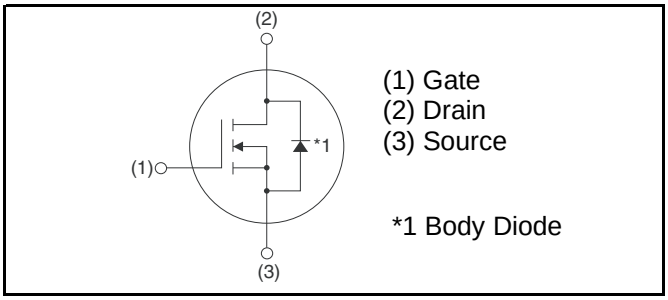
Datasheet

V_{DSS}	1200V
$R_{DS(on)}$ (Typ.)	160mΩ
I_D	17A*1

●Features

1) Low on-resistance
2) Fast switching speed
3) Fast reverse recovery
4) Easy to parallel
5) Simple to drive

●Inner circuit



●Application

・Solar inverters
・DC/DC converters
・Switch mode power supplies
・Induction heating
・Motor drives

●Absolute maximum ratings (T_a = 25°C)

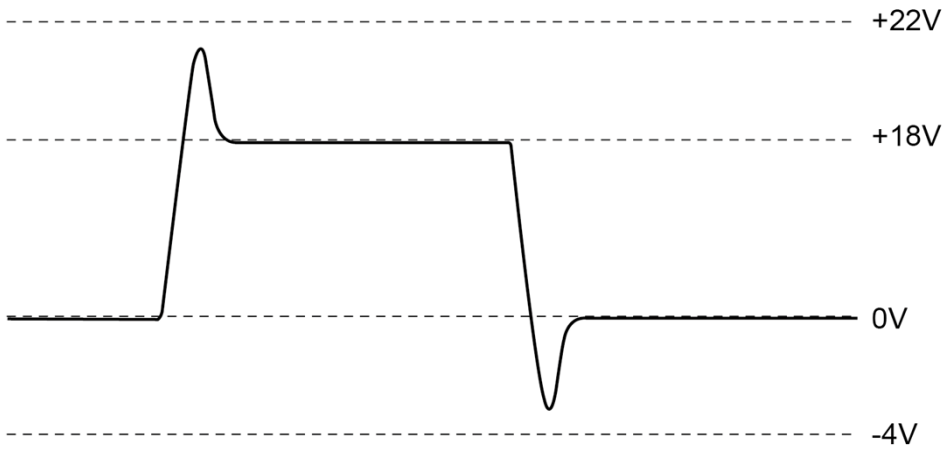
Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	1200	V
Continuous drain current	T_c = 25°C	I_D *1	17	A
Pulsed drain current		$I_{D,pulse}$ *2	42	A
Gate - Source voltage		V_{GSS}	−4 to 22	V
Gate-Source Surge Voltage		V_{GSS_surge}	−4 to 22	V
Recommended Drive Voltage		V_{GS_op}	0 / 18	V
Junction temperature		T_j	175	°C
Range of storage temperature		T_{stg}	−55 to +175	°C

© 2016 ROHM Co., Ltd. All rights reserved.

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V, I_D = 1mA	1200	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 1200V, V_{GS} = 0V T_j = 25°C T_j = 150°C	- -	1 2	10 -	μA
Gate - Source leakage current	I_{GSS+}	V_{GS} = +22V, V_{DS} = 0V	-	-	100	nA
Gate - Source leakage current	I_{GSS-}	V_{GS} = −4V, V_{DS} = 0V	-	-	−100	nA
Gate threshold voltage	$V_{GS\ (th)}$	V_{DS} = 10V, I_D = 2.5mA	2.7	-	5.6	V
Static drain - source on - state resistance	$R_{DS(on)}$ *3	V_{GS} = 18V, I_D = 5A T_j = 25°C T_j = 125°C	- -	160 240	200 -	mΩ
Gate input resistance	R_G	f = 1MHz, open drain	-	18	-	Ω

●Example of acceptable Vgs waveform



© 2016 ROHM Co., Ltd. All rights reserved.

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Transconductance	g_{fs} *3	V_{DS} = 10V, I_D = 5A	-	2.5	-	S
Input capacitance	C_{iss}	V_{GS} = 0V	-	398	-	pF
Output capacitance	C_{oss}	V_{DS} = 800V	-	41	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	18	-	
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V V_{DS} = 0V to 600V	-	45	-	pF
Turn - on delay time	$t_{d(on)}$ *3	V_{DD} = 400V, I_D =5A	-	14	-	ns
Rise time	t_r *3	V_{GS} = 18V/0V	-	18	-	
Turn - off delay time	$t_{d(off)}$ *3	R_L =80Ω	-	24	-	
Fall time	t_f *3	R_G = 0Ω	-	25	-	
Turn - on switching loss	E_{on} *3	V_{DD} = 600V, I_D=5A V_{GS} = 18V/0V R_G = 0Ω L=750μH *E_{on} includes diode reverse recovery	-	62	-	μJ
Turn - off switching loss	E_{off} *3		-	12	-	

●Gate Charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g *3	V_{DD} = 600V	-	42	-	nC
Gate - Source charge	Q_{gs} *3	I_D = 5A	-	11	-	
Gate - Drain charge	Q_{gd} *3	V_{GS} = 18V	-	18	-	
Gate plateau voltage	$V_{(plateau)}$	V_{DD} = 600V, I_D = 5A	-	9.6	-	V

*1 For T_j=175°C and thermal dissiparion to ambience of 103W or more.
Limited only by maximum temperature allowed.

*2 PW ≤ 10μs, Duty cycle ≤ 1%

*3 Pulsed

© 2016 ROHM Co., Ltd. All rights reserved.

●**Body diode electrical characteristics** (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Inverse diode continuous, forward current	I_S *1	T_c = 25°C	-	-	17	A
Inverse diode direct current, pulsed	I_{SM} *2		-	-	42	A
Forward voltage	V_{SD} *3	V_{GS} = 0V, I_S = 5A	-	3.2	-	V
Reverse recovery time	t_{rr} *3	I_F =5A, V_R = 600V di/dt = 1100A/μs	-	13	-	ns
Reverse recovery charge	Q_{rr} *3		-	26	-	nC
Peak reverse recovery current	I_{rrm} *3		-	4	-	A

© 2016 ROHM Co., Ltd. All rights reserved.

●Electrical characteristic curves

Fig.1 Typical Output Characteristics(I)

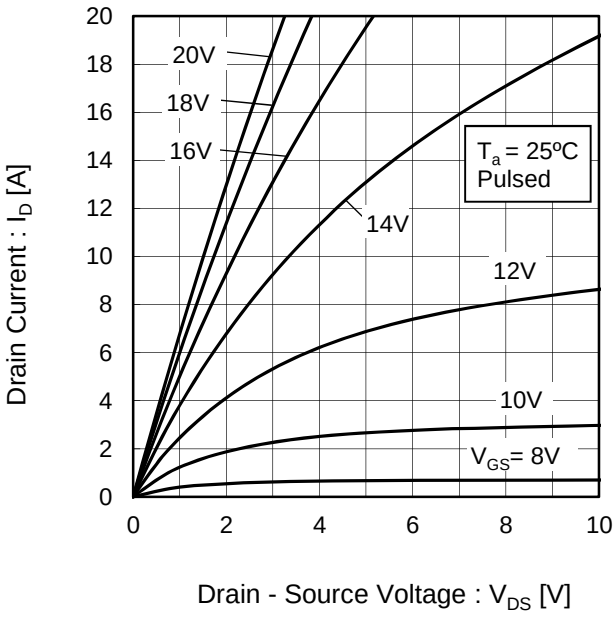


Fig.2 Typical Output Characteristics(II)

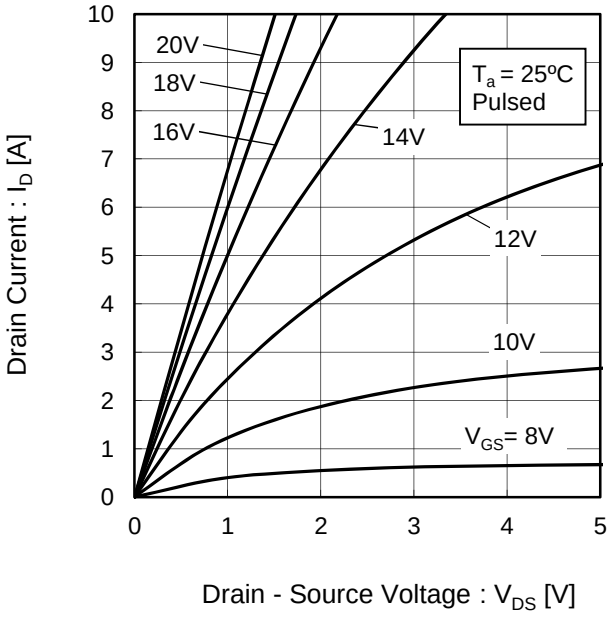


Fig.3 T_j = 150ºC Typical Output Characteristics(I)

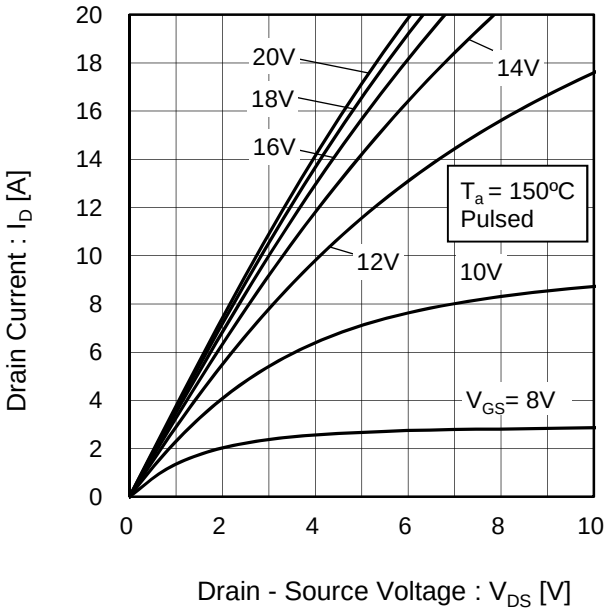
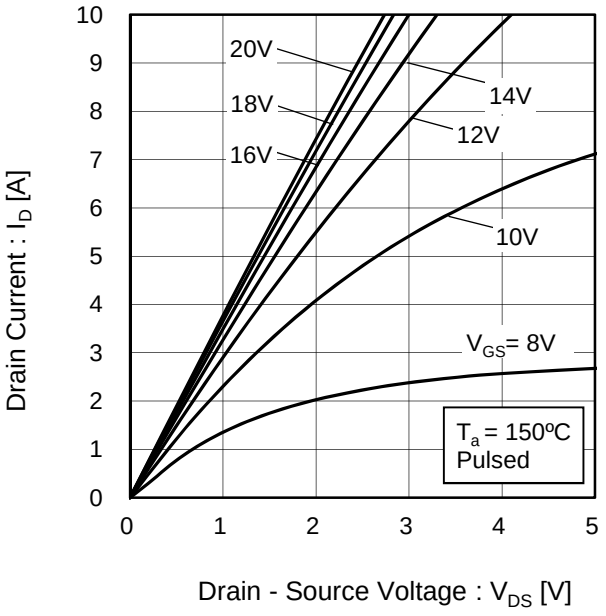


Fig.4 T_j = 150ºC Typical Output Characteristics(II)



© 2016 ROHM Co., Ltd. All rights reserved.

●Electrical characteristic curves

Fig.5 Typical Transfer Characteristics (I)

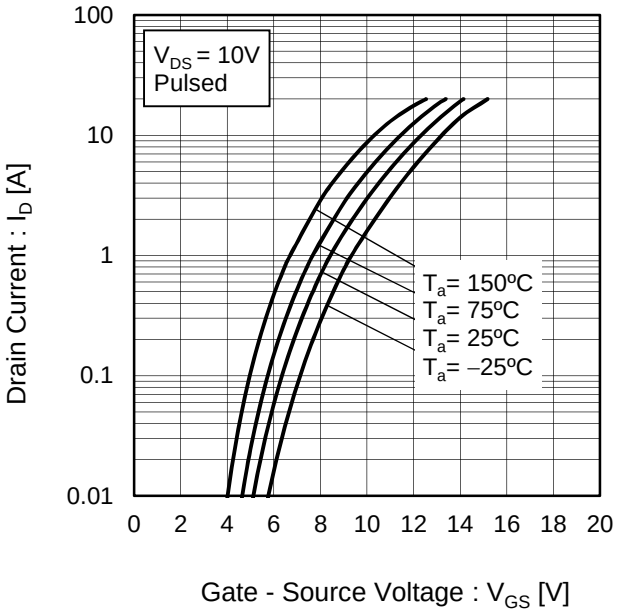


Fig.6 Typical Transfer Characteristics (II)

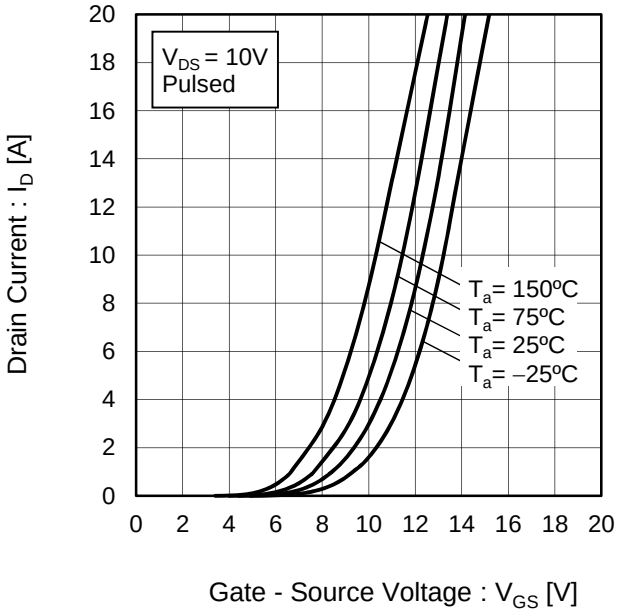


Fig.7 Gate Threshold Voltage vs. Junction Temperature

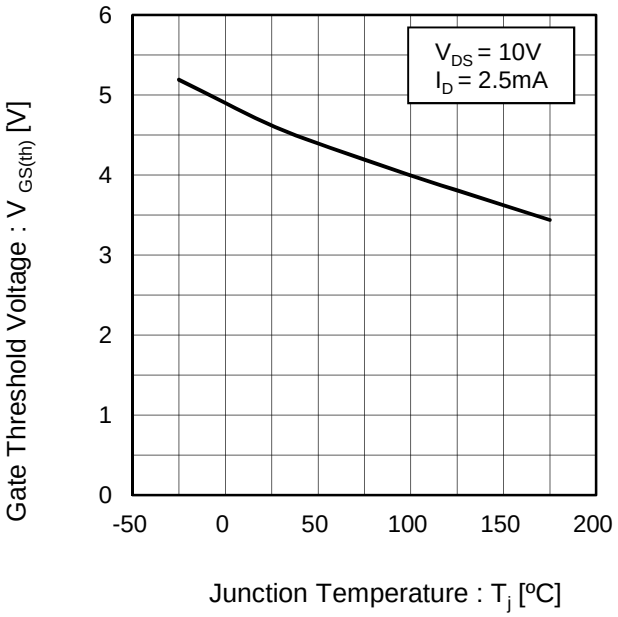
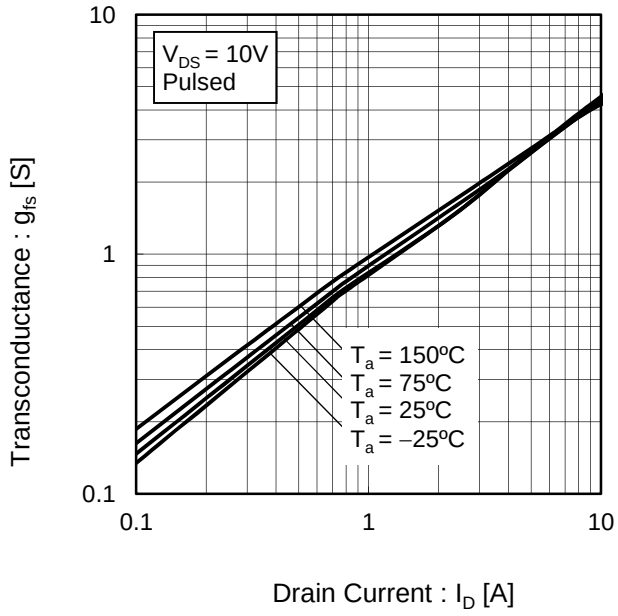


Fig.8 Transconductance vs. Drain Current



© 2016 ROHM Co., Ltd. All rights reserved.

●Electrical characteristic curves

Fig.9 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

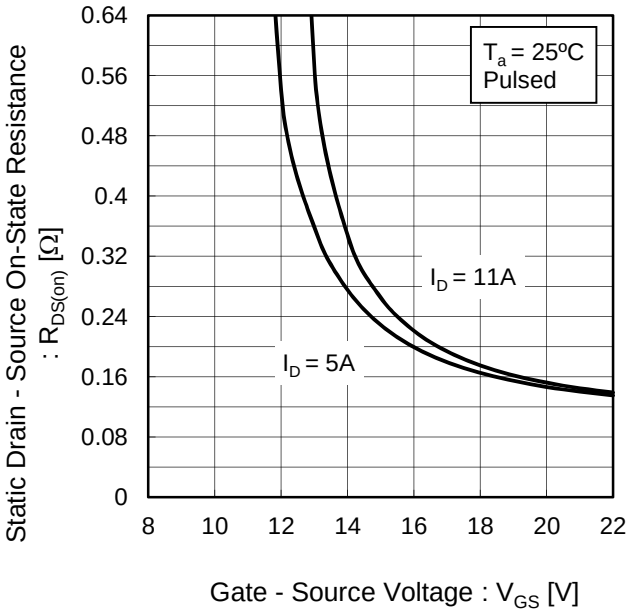


Fig.10 Static Drain - Source On - State Resistance vs. Junction Temperature

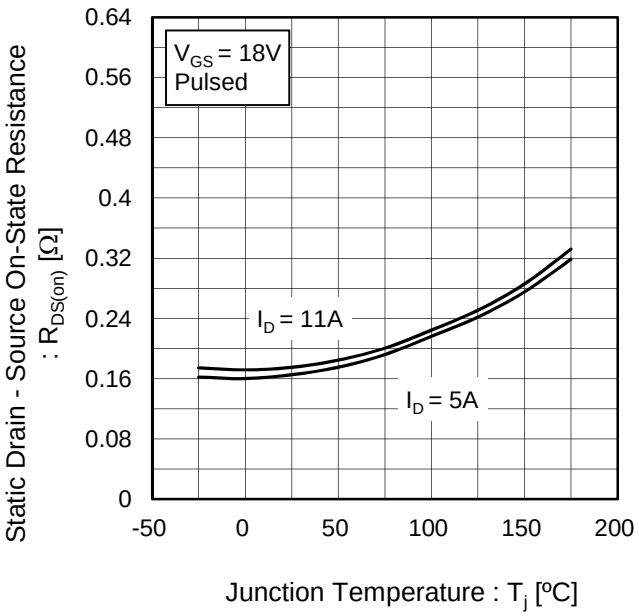
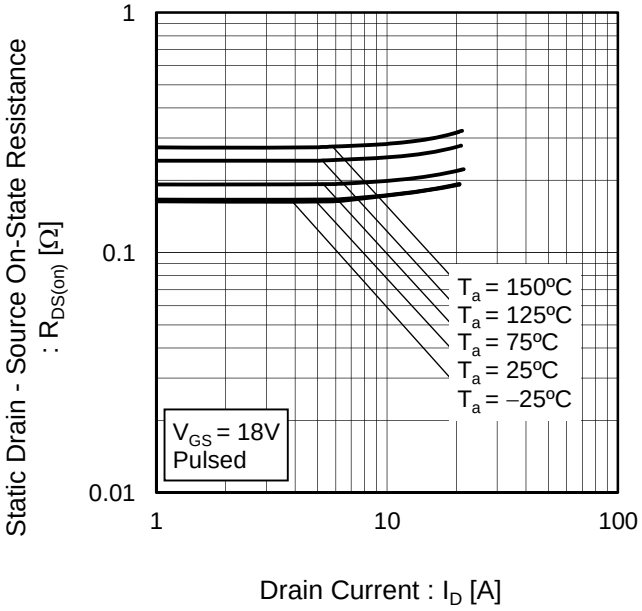


Fig.11 Static Drain - Source On - State Resistance vs. Drain Current



© 2016 ROHM Co., Ltd. All rights reserved.

●Electrical characteristic curves

Fig.12 Typical Capacitance vs. Drain - Source Voltage

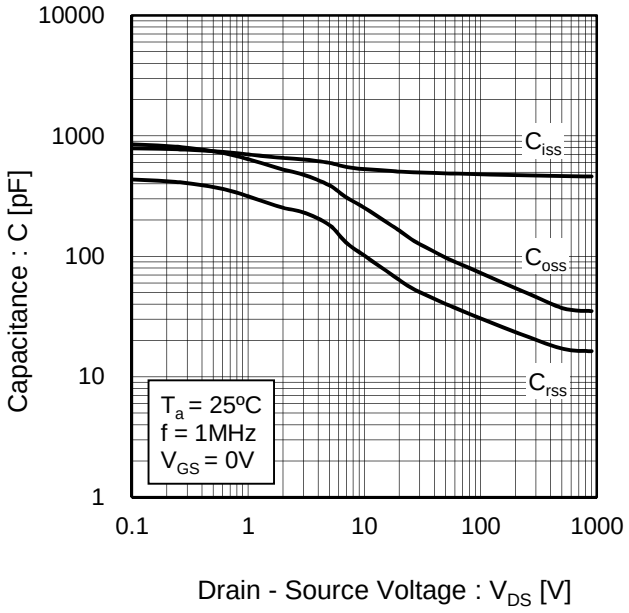


Fig.13 Coss Stored Energy

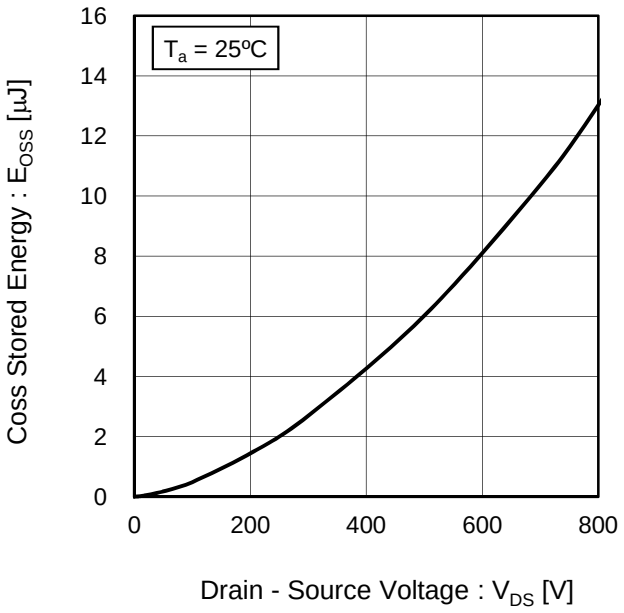


Fig.14 Switching Characteristics

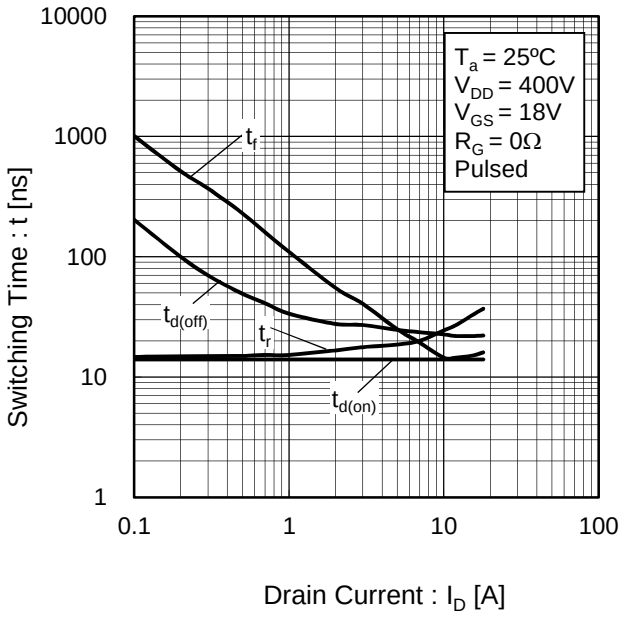
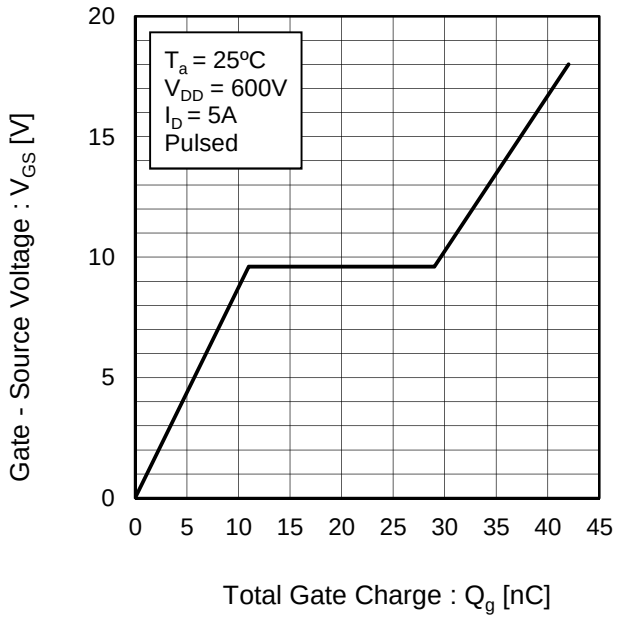


Fig.15 Dynamic Input Characteristics



© 2016 ROHM Co., Ltd. All rights reserved.

●Electrical characteristic curves

Fig.16 Typical Switching Loss vs. Drain - Source Voltage

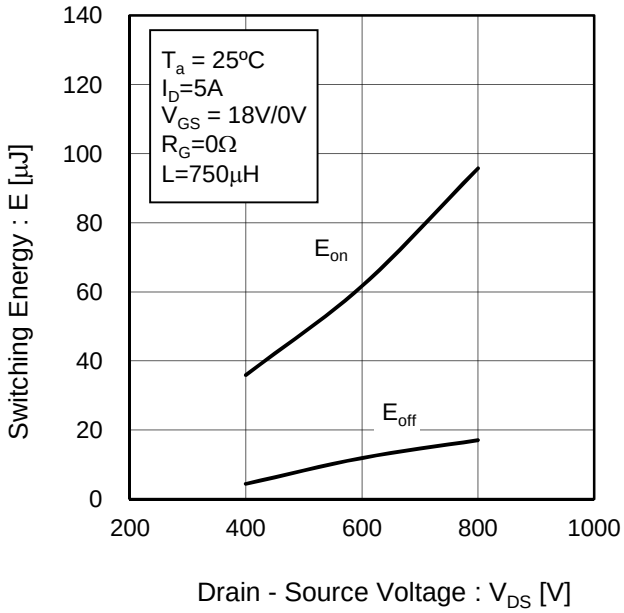


Fig.17 Typical Switching Loss vs. Drain Current

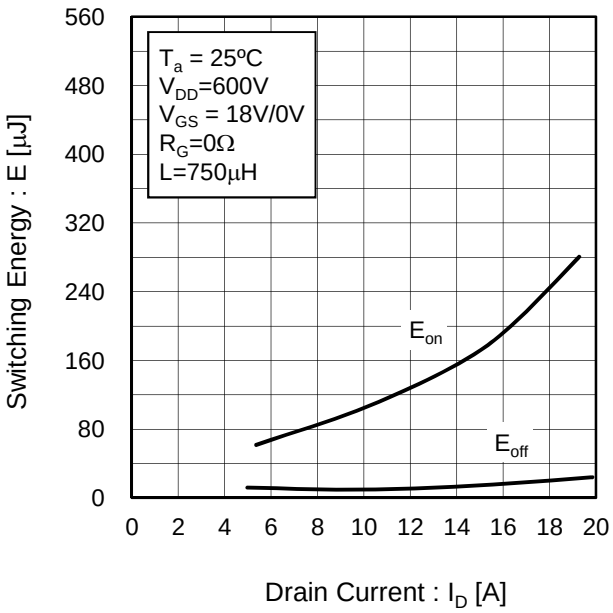
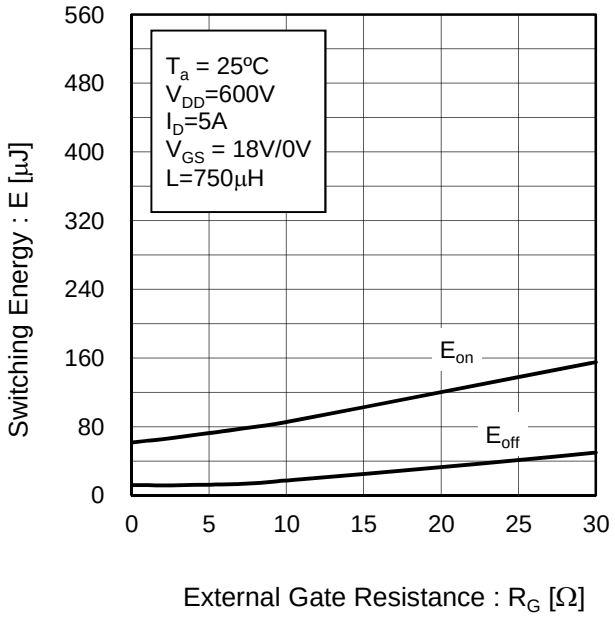


Fig.18 Typical Switching Loss vs. External Gate Resistance



© 2016 ROHM Co., Ltd. All rights reserved.

●Electrical characteristic curves

Fig.19 Inverse Diode Forward Current vs. Source - Drain Voltage

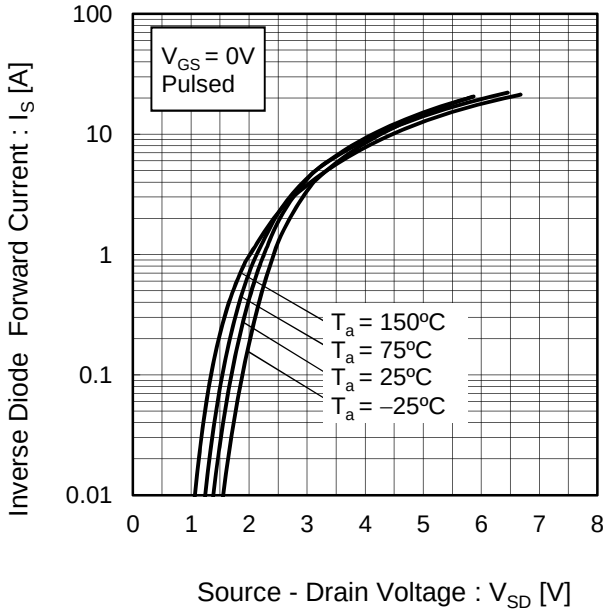
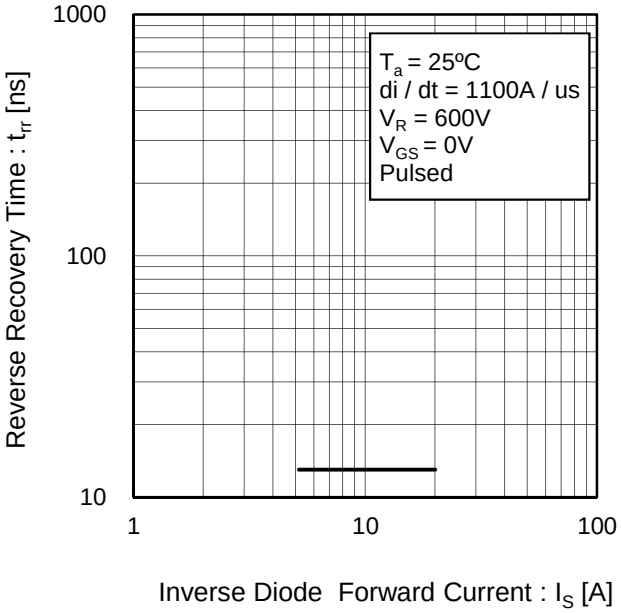


Fig.20 Reverse Recovery Time vs.Inverse Diode Forward Current



© 2016 ROHM Co., Ltd. All rights reserved.

●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

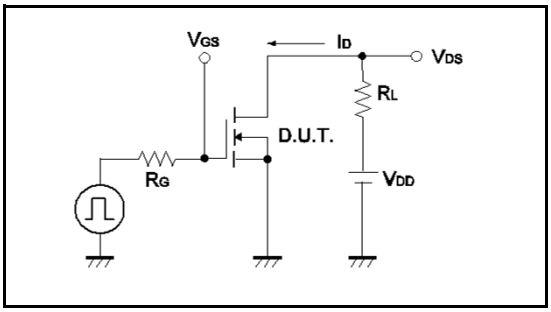


Fig.1-2 Switching Waveforms

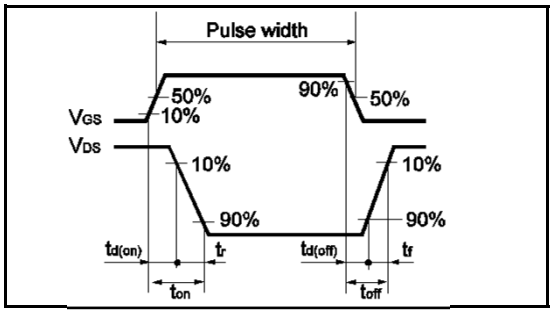


Fig.2-1 Gate Charge Measurement Circuit

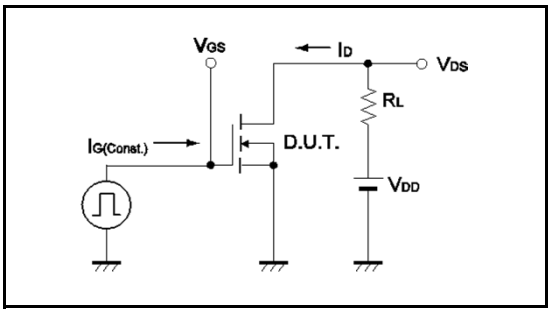


Fig.2-2 Gate Charge Waveform

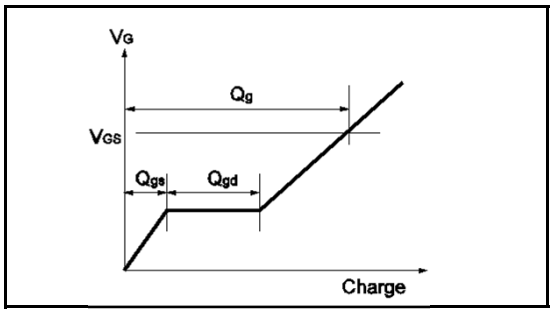


Fig.3-1 Switching Energy Measurement Circuit

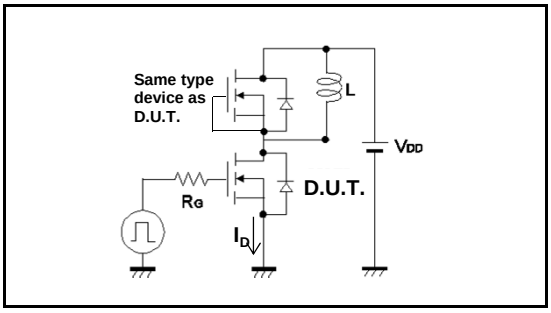


Fig.3-2 Switching Waveforms

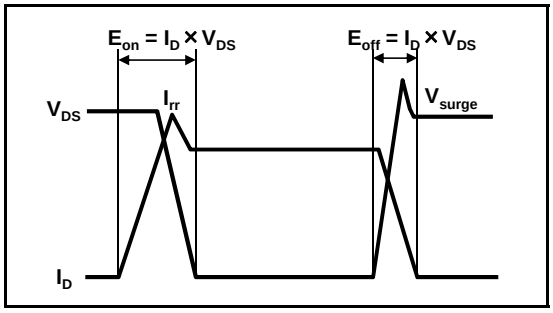


Fig.4-1 Reverse Recovery Time Measurement Circuit

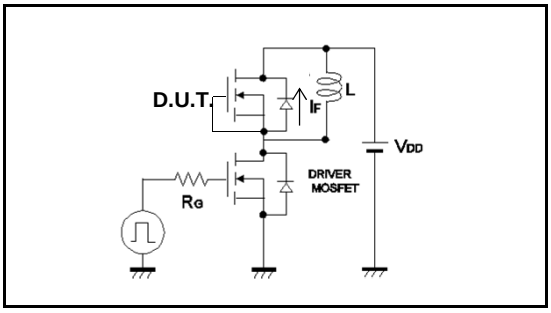
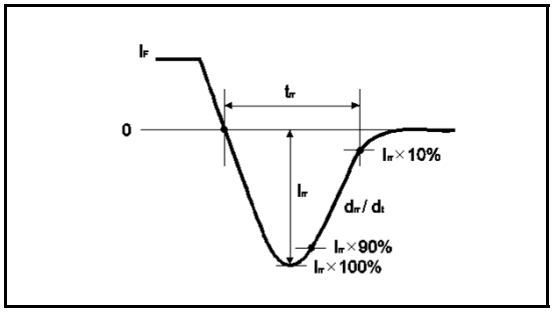


Fig.4-2 Reverse Recovery Waveform



© 2016 ROHM Co., Ltd. All rights reserved.

Notes

1) The information contained herein is subject to change without notice.

2) Before you use our Products, please contact our sales representative and verify the latest specifications :

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
Therefore, in order to prevent personal injury or fire arising from failure, please take safety measures such as complying with the derating characteristics, implementing redundant and fire prevention designs, and utilizing backups and fail-safe procedures. ROHM shall have no responsibility for any damages arising out of the use of our Poducts beyond the rating specified by ROHM.

4) Examples of application circuits, circuit constants and any other information contained herein are provided only to illustrate the standard usage and operations of the Products. The peripheral conditions must be taken into account when designing circuits for mass production.

5) The technical information specified herein is intended only to show the typical functions of and examples of application circuits for the Products. ROHM does not grant you, explicitly or implicitly, any license to use or exercise intellectual property or other rights held by ROHM or any other parties. ROHM shall have no responsibility whatsoever for any dispute arising out of the use of such technical information.

6) The Products are intended for use in general electronic equipment (i.e. AV/OA devices, communication, consumer systems, gaming/entertainment sets) as well as the applications indicated in this document.

7) The Products specified in this document are not designed to be radiation tolerant.

8) For use of our Products in applications requiring a high degree of reliability (as exemplified below), please contact and consult with a ROHM representative : transportation equipment (i.e. cars, ships, trains), primary communication equipment, traffic lights, fire/crime prevention, safety equipment, medical systems, servers, solar cells, and power transmission systems.

9) Do not use our Products in applications requiring extremely high reliability, such as aerospace equipment, nuclear power control systems, and submarine repeaters.

10) ROHM shall have no responsibility for any damages or injury arising from non-compliance with the recommended usage conditions and specifications contained herein.

11) ROHM has used reasonable care to ensur the accuracy of the information contained in this document. However, ROHM does not warrants that such information is error-free, and ROHM shall have no responsibility for any damages arising from any inaccuracy or misprint of such information.

12) Please use the Products in accordance with any applicable environmental laws and regulations, such as the RoHS Directive. For more details, including RoHS compatibility, please contact a ROHM sales office. ROHM shall have no responsibility for any damages or losses resulting non-compliance with any applicable laws or regulations.

13) When providing our Products and technologies contained in this document to other countries, you must abide by the procedures and provisions stipulated in all applicable export laws and regulations, including without limitation the US Export Administration Regulations and the Foreign Exchange and Foreign Trade Act.

14) This document, in part or in whole, may not be reprinted or reproduced without prior consent of ROHM.

ROHM SEMICONDUCTOR

Thank you for your accessing to ROHM product informations.
More detail product informations and catalogs are available, please contact us.

ROHM Customer Support System

http://www.rohm.com/contact/

© 2015 ROHM Co., Ltd. All rights reserved.

S4105 - Web Page

Part Number	S4105
Package	
Unit Quantity	
Minimum Package Quantity	
Packing Type	
Constitution Materials List	inquiry
RoHS	Yes