R6009KNX

Nch 600V 9A Power MOSFET

Datasheet

V_{DSS}	600V
$R_{DS(on)}$(Max.)	0.535Ω
I_D	±9A
P_D	48W

●Outline

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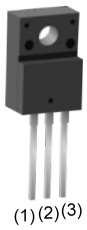
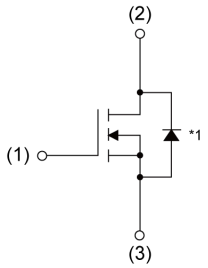


●Inner circuit



(1) Gate
(2) Drain
(3) Source

*1 Body Diode

●Features

1) Low on-resistance.
2) Ultra fast switching speed.
3) Parallel use is easy.
4) Pb-free lead plating ; RoHS compliant

●Packaging specifications

Type	Packing	Bulk
	Reel size (mm)	-
	Tape width (mm)	-
	Basic ordering unit (pcs)	500
	Taping code	-
	Marking	R6009KNX

●Application

Switching

●Absolute maximum ratings (T_a = 25°C ,unless otherwise specified)

Parameter		Symbol	Value	Unit
Drain - Source voltage		V_{DSS}	600	V
Continuous drain current (T_c = 25°C)		I_D*1	±9	A
Pulsed drain current		I_{DP}*2	±27	A
Gate - Source voltage	static	V_{GSS}	±20	V
	AC(f＞1Hz)		±30	V
Avalanche current, single pulse		I_{AS}	1.4	A
Avalanche energy, single pulse		E_{AS}*3	153	mJ
Power dissipation (T_c = 25°C)		P_D	48	W
Junction temperature		T_j	150	℃
Operating junction and storage temperature range		T_{stg}	-55 to +150	℃

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - case	R_{thJC} *4	-	-	2.6	℃/W
Thermal resistance, junction - ambient	R_{thJA}	-	-	70	℃/W
Soldering temperature, wavesoldering for 10s	T_{sold}	-	-	265	℃

●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	600	-	-	V
Zero gate voltage drain current	I_{DSS}	V_{DS} = 600V, V_{GS} = 0V				μA
		T_j = 25°C	-	-	100	
		T_j = 125°C	-	-	1000	
Gate - Source leakage current	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} = 10V, I_D = 1mA	3	-	5	V
Static drain - source on - state resistance	$R_{DS(on)}$ *5	V_{GS} = 10V, I_D = 2.8A				Ω
		T_j = 25°C	-	0.500	0.535	
		T_j = 125°C	-	1.00	-	
Gate resistance	R_G	f = 1MHz, open drain	-	3.0	-	Ω

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Forward Transfer Admittance	$\|Y_{fs}\|$*5	V_{DS} = 10V, I_D = 4.5A	2.3	4.5	-	S
Input capacitance	C_{iss}	V_{GS} = 0V	-	540	-	pF
Output capacitance	C_{oss}	V_{DS} = 25V	-	500	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	25	-	
Turn - on delay time	$t_{d(on)}$*5	V_{DD} ≃ 300V, V_{GS} = 10V	-	20	-	ns
Rise time	t_r*5	I_D = 4.5A	-	33	-	
Turn - off delay time	$t_{d(off)}$*5	R_L ≃ 66.7Ω	-	37	-	
Fall time	t_f*5	R_G = 10Ω	-	28	-	

●Gate charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Total gate charge	Q_g*5	V_{DD} ≃ 300V	-	16.5	-	nC
Gate - Source charge	Q_{gs}*5	I_D = 9A	-	4.5	-	
Gate - Drain charge	Q_{gd}*5	V_{GS} = 10V	-	7.6	-	
Gate plateau voltage	$V_{(plateau)}$	V_{DD} ≃ 300V, I_D = 9A	-	6.8	-	V

*1 Limited only by maximum channel temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 L≒100mH, V_{DD}=50V, R_G=25Ω, STARTING T_j=25℃

*4 T_C=25℃

*5 Pulsed

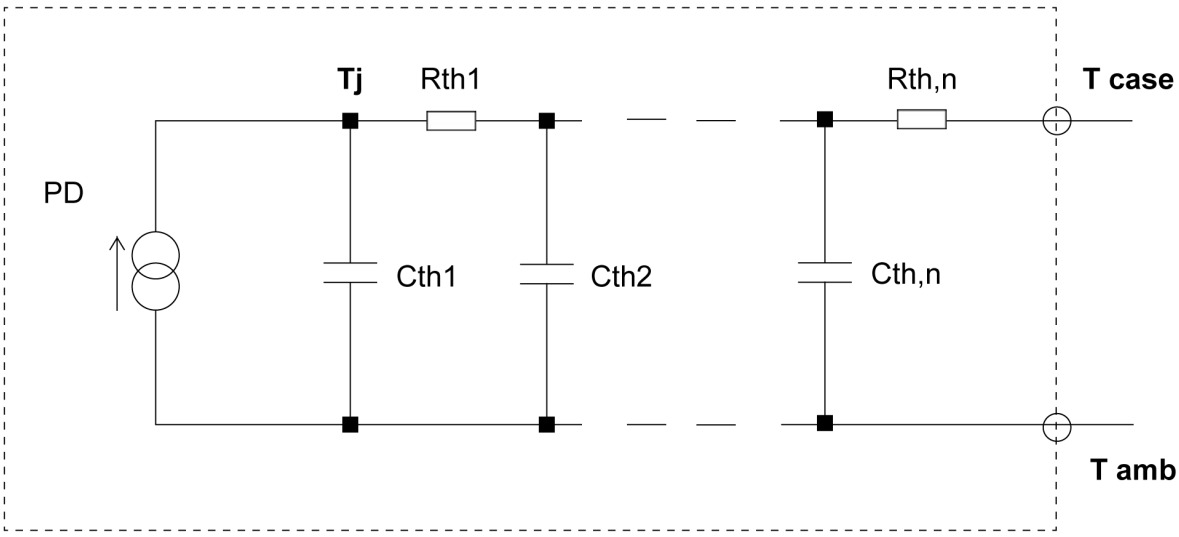
●Body diode electrical characteristics (Source-Drain) (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Continuous forward current	I_S *1	T_C = 25℃	-	-	9	A
Pulse forward current	I_{SP} *2		-	-	27	A
Forward voltage	V_{SD} *5	V_{GS} = 0V, I_S = 9.0A	-	-	1.5	V
Reverse recovery time	t_{rr} *5	I_S = 9A di/dt = 100A/μs	-	345	-	ns
Reverse recovery charge	Q_{rr} *5		-	3.0	-	μC
Peak reverse recovery current	I_{rrm} *5		-	18	-	A

●Typical transient thermal characteristics

Symbol	Value	Unit
R_{th1}	0.344	K/W
R_{th2}	1.15	
R_{th3}	2.2	

Symbol	Value	Unit
C_{th1}	0.00137	Ws/K
C_{th2}	0.0145	
C_{th3}	0.451	



●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

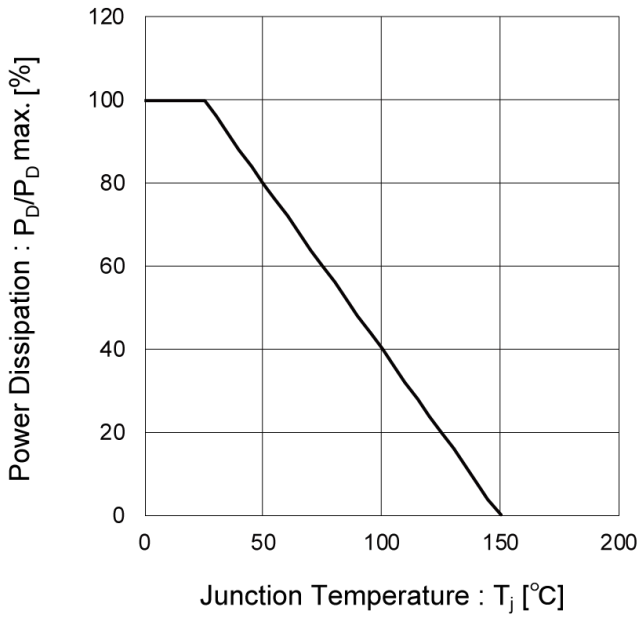


Fig.2 Maximum Safe Operating Area

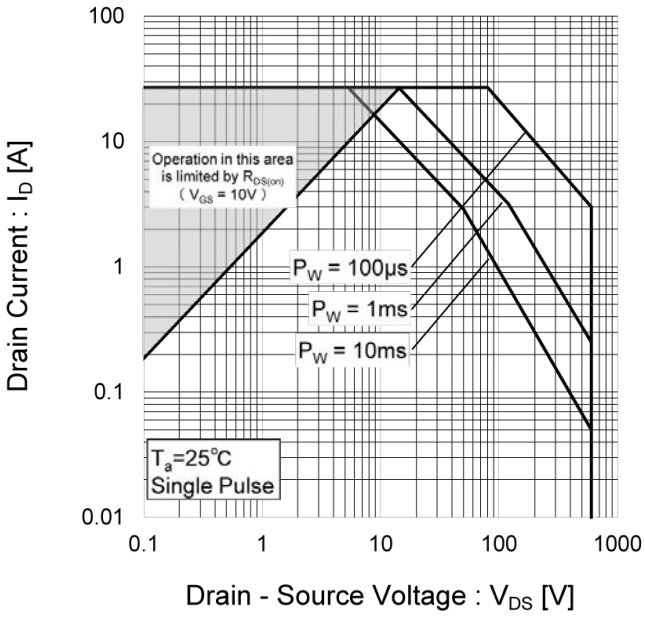
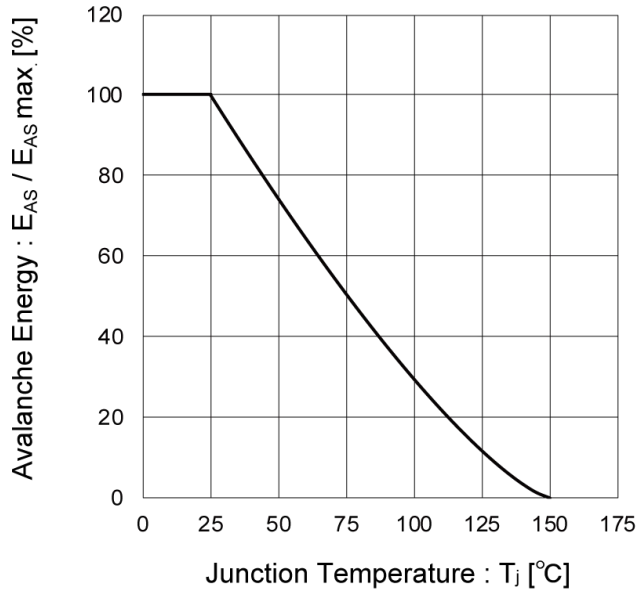


Fig.3 Avalanche Energy Derating Curve vs. Junction Temperature



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

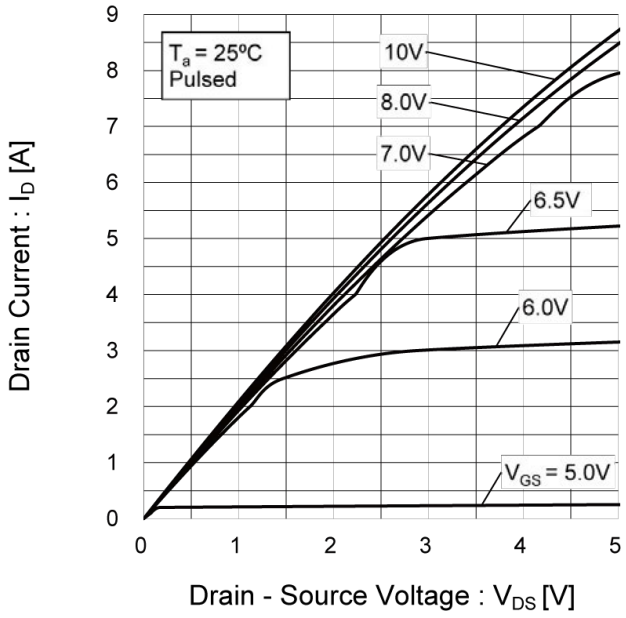
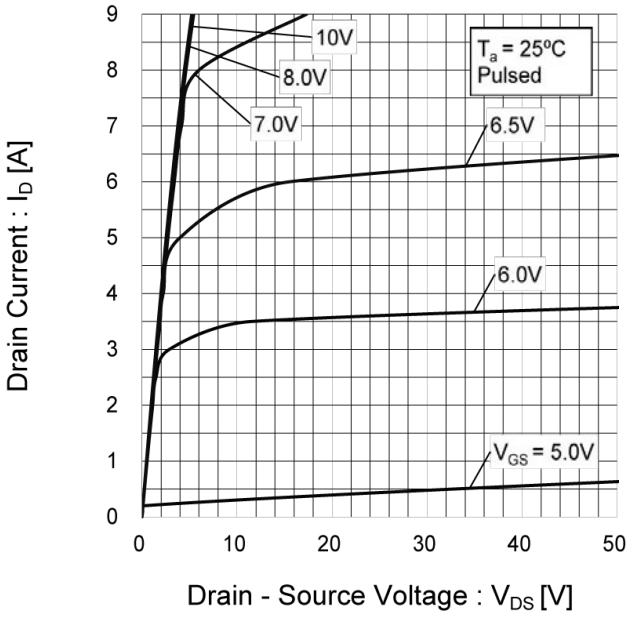


Fig.5 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.6 Breakdown Voltage vs. Junction Temperature

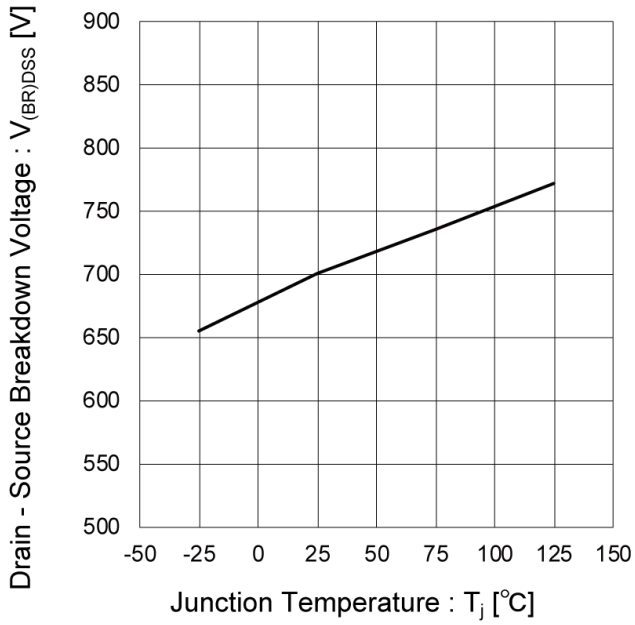


Fig.7 Typical Transfer Characteristics

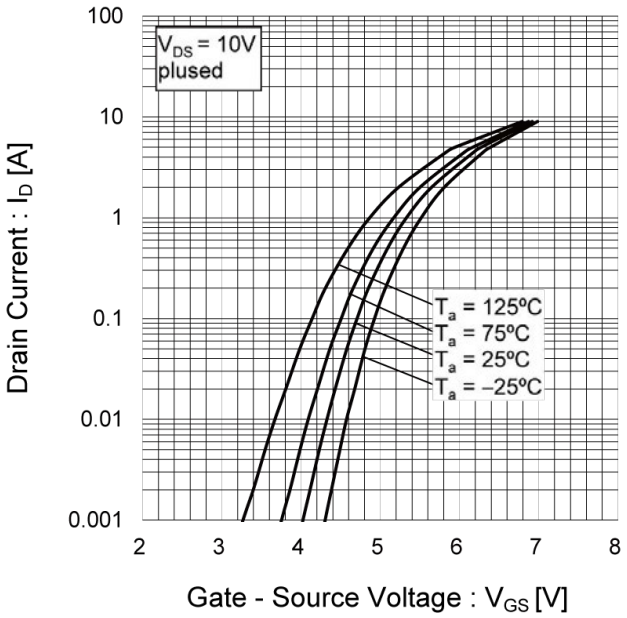


Fig.8 Gate Threshold Voltage vs. Junction Temperature

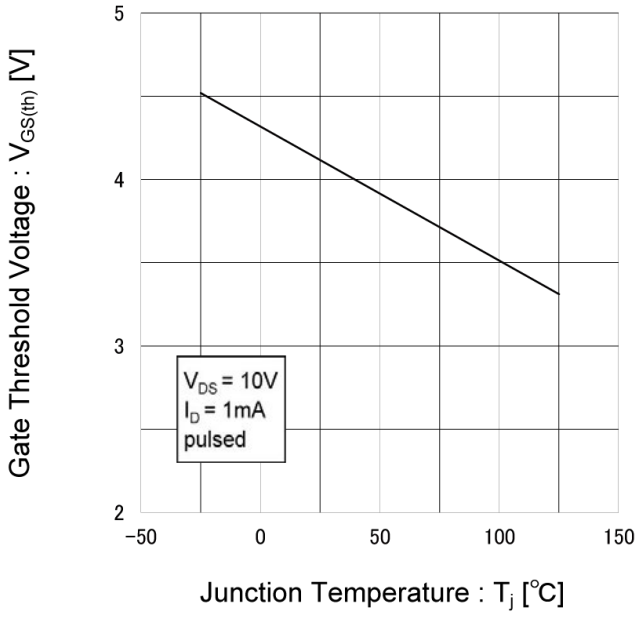
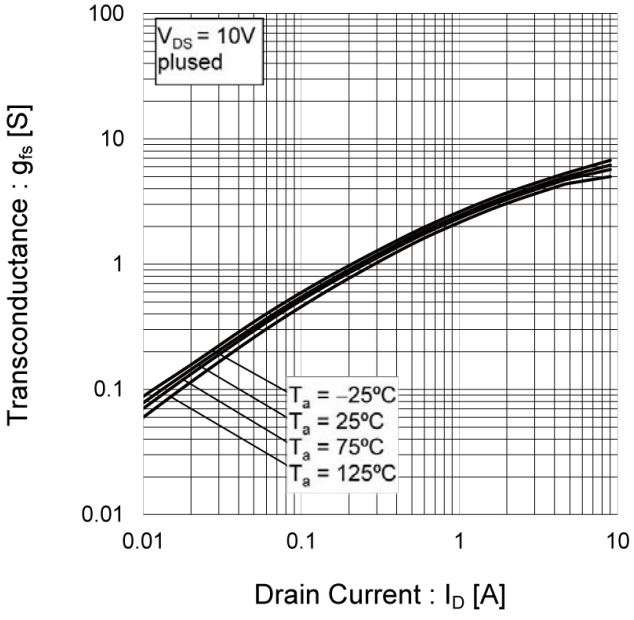


Fig.9 Forward Transfer Admittance vs. Drain Current



●Electrical characteristic curves

Fig.10 Static Drain - Source On - State Resistance vs. Gate Source Voltage

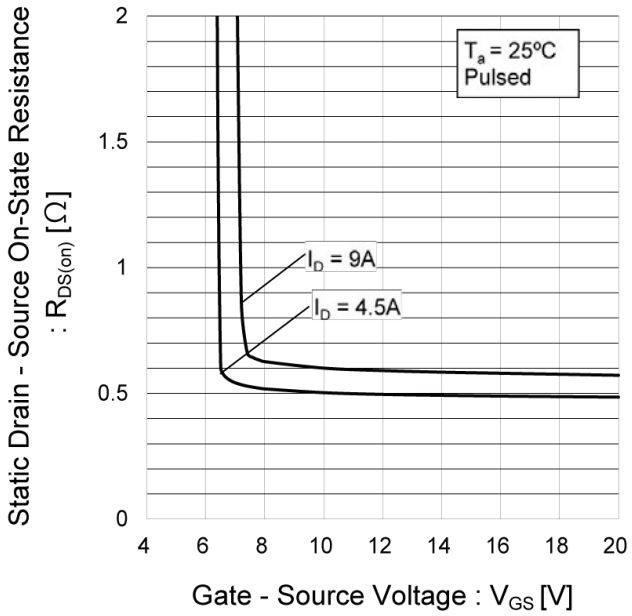


Fig.11 Static Drain - Source On - State Resistance vs. Junction Temperature

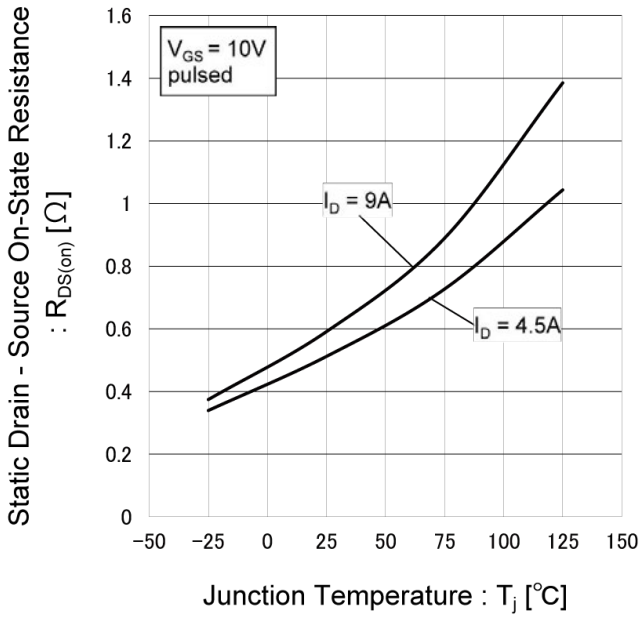
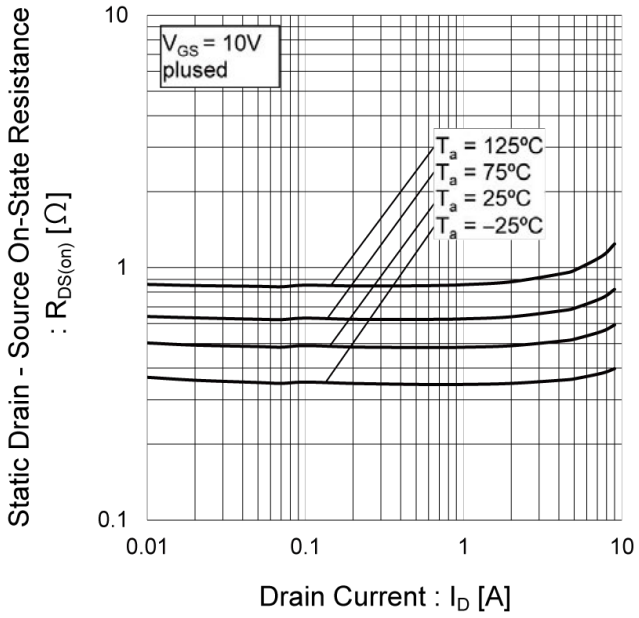


Fig.12 Static Drain - Source On - State Resistance vs. Drain Current(I)



●Electrical characteristic curves

Fig.13 Typical Capacitance vs. Drain - Source Voltage

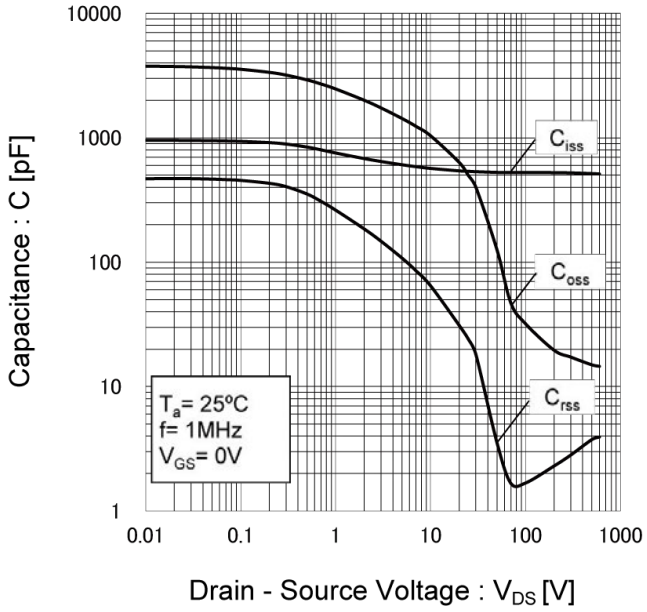


Fig.14 Switching Characteristics

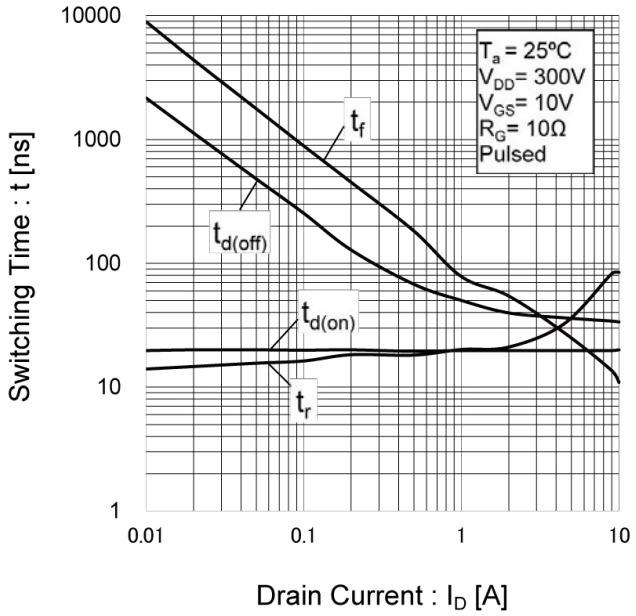
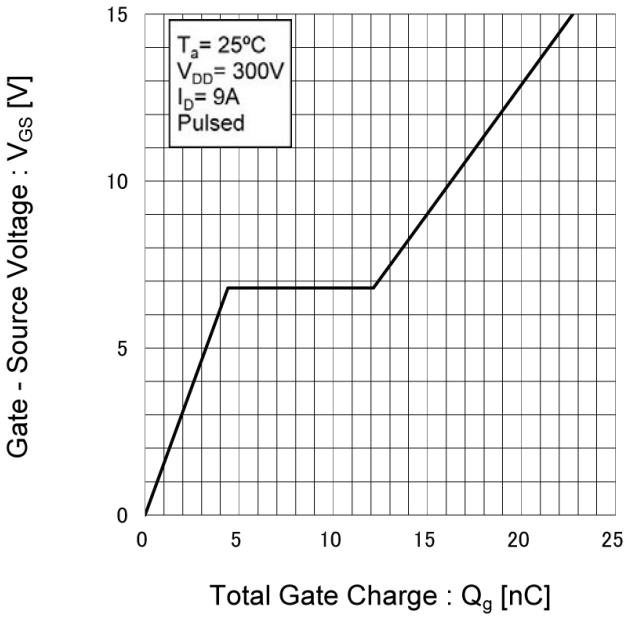


Fig.15 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.16 Inverse Diode Forward Current vs. Source - Drain Voltage

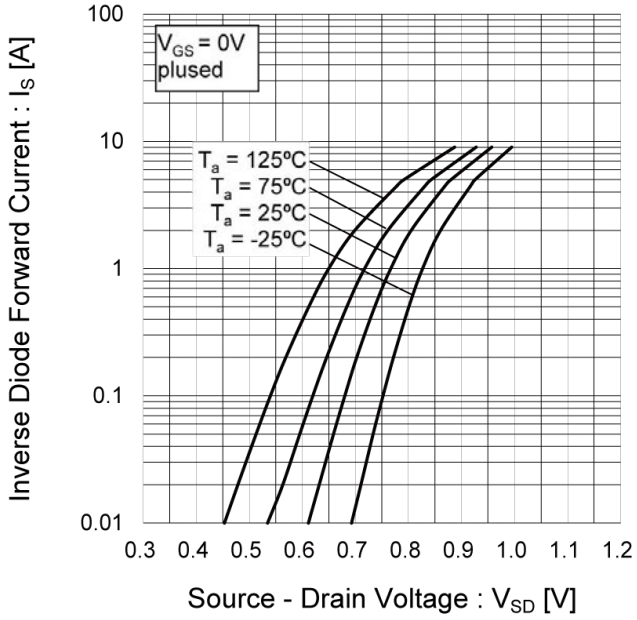
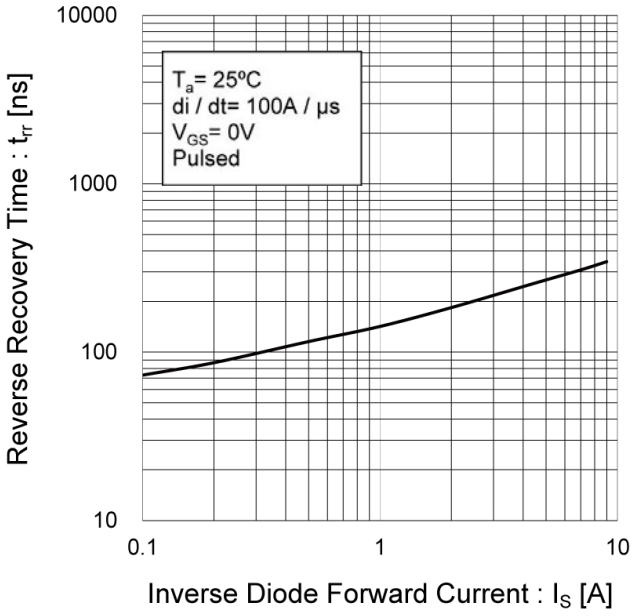


Fig.17 Reverse Recovery Time vs. Inverse Diode Forward Current



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

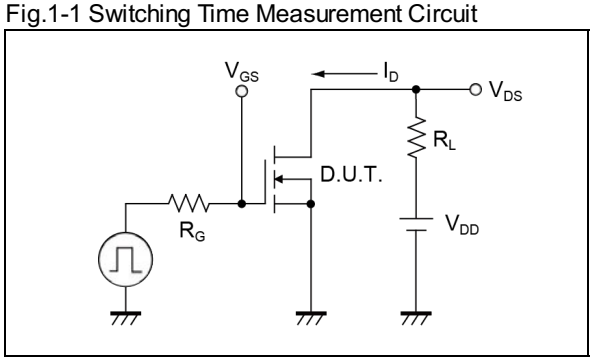


Fig.1-2 Switching Waveforms

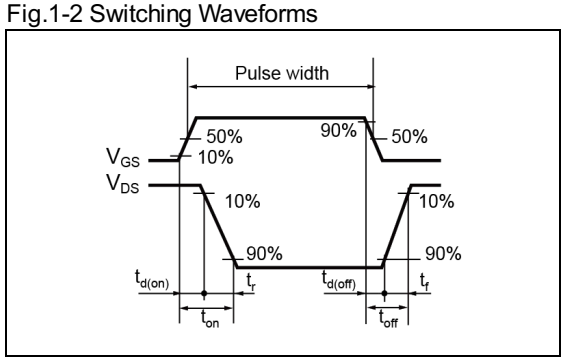


Fig.2-1 Gate Charge Measurement Circuit

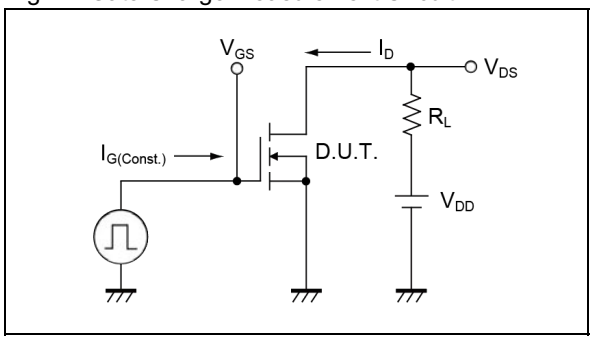


Fig.2-2 Gate Charge Waveform

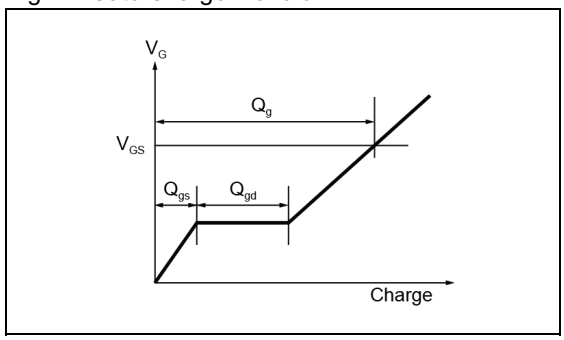


Fig.3-1 Avalanche Measurement Circuit

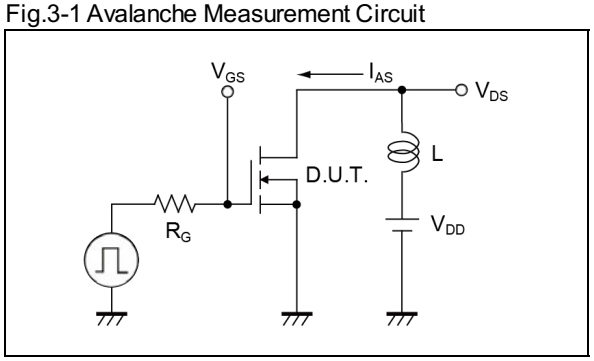


Fig.3-2 Avalanche Waveform

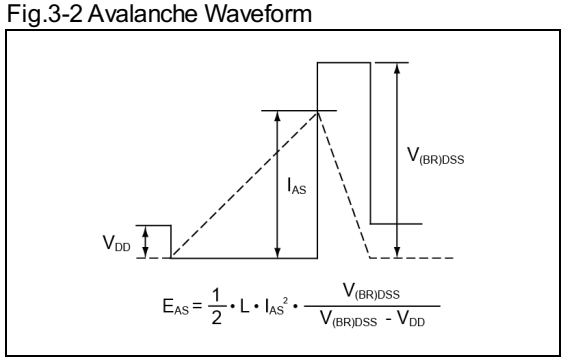


Fig.4-1 dv/dt Measurement Circuit

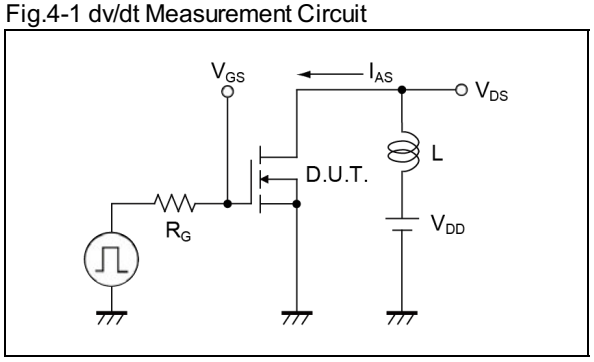


Fig.4-2 dv/dt Waveform

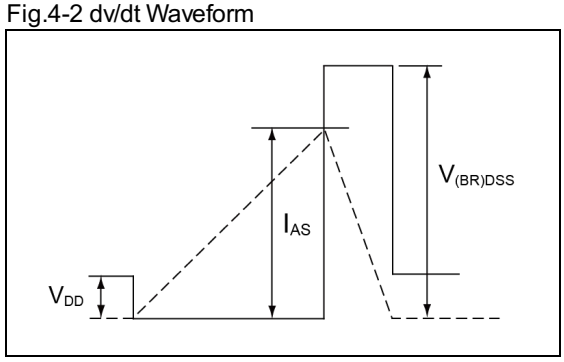


Fig.5-1 dv/dt Measurement Circuit

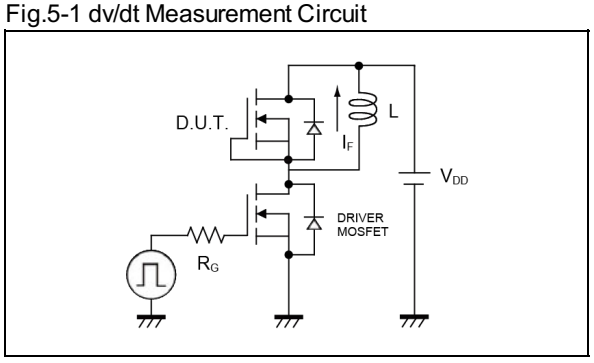
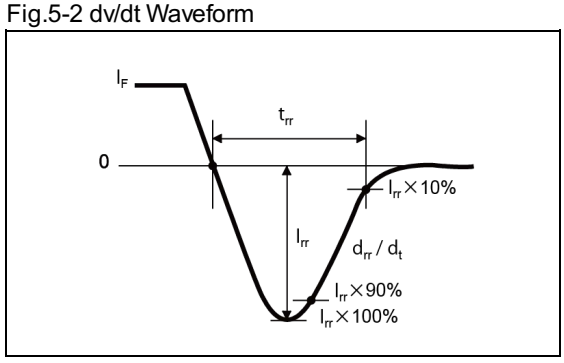


Fig.5-2 dv/dt Waveform



●Dimensions

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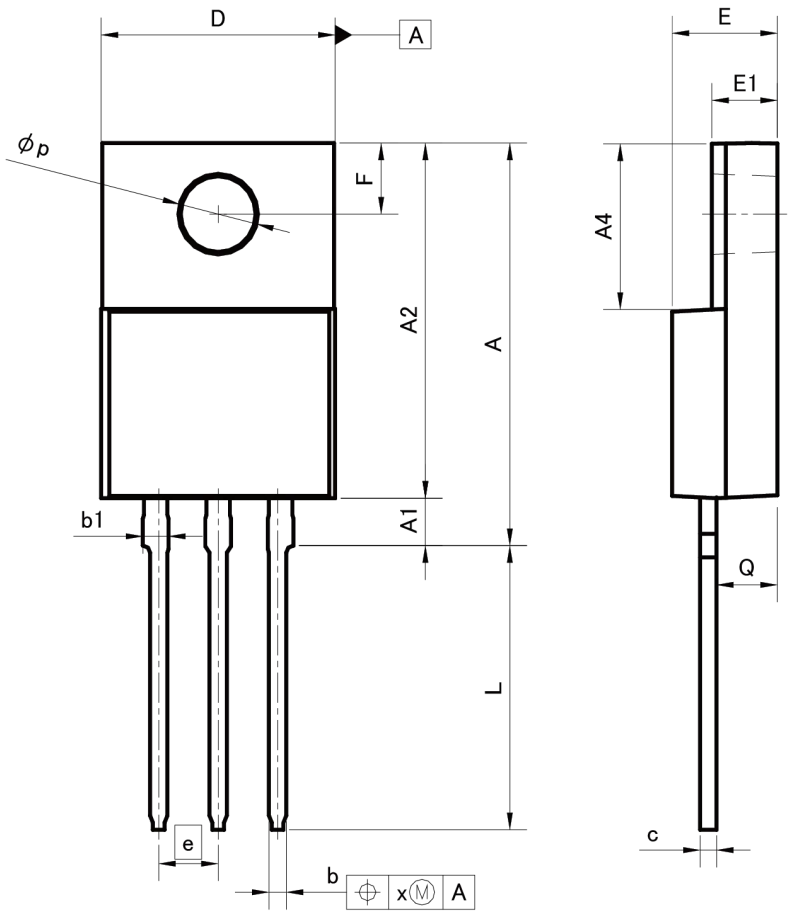

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	16.60	17.60	0.654	0.693
A1	1.80	2.20	0.071	0.087
A2	14.80	15.40	0.583	0.606
A4	6.80	7.20	0.268	0.283
b	0.70	0.85	0.028	0.033
b1	1.10	1.50	0.043	0.059
c	0.70	0.85	0.028	0.033
D	9.90	10.30	0.390	0.406
E	4.40	4.80	0.173	0.189
e	2.54		0.100	
E1	2.70	3.00	0.106	0.118
F	2.80	3.20	0.110	0.126
L	11.50	12.50	0.453	0.492
p	3.00	3.40	0.118	0.134
Q	2.10	3.10	0.083	0.122
x	–	0.38	–	0.015

Dimension in mm/inches

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.

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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.

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