RS3E075AT

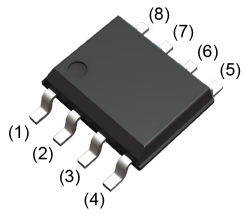
Pch -30V -7.5A Middle Power MOSFET

Datasheet

V_{DSS}	-30V
$R_{DS(on)}$(Max.)	23.5mΩ
I_D	
P_D	2.0W

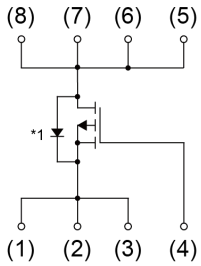
●Outline

SOP8



●Inner circuit

(1) Source
(2) Source
(3) Source
(4) Gate
(5) Drain
(6) Drain
(7) Drain
(8) Drain
*1 Body Diode



●Features

1) Low on - resistance.
2) Small Surface Mount Package (SOP8).
3) Pb-free lead plating ; RoHS compliant.

●Application

Switching

●Packaging specifications

Type	Packing	Embossed Tape
	Reel size (mm)	330
	Tape width (mm)	12
	Basic ordering unit (pcs)	2500
	Taping code	TB
	Marking	RS3E075AT

●Absolute maximum ratings (T_a = 25°C)

Parameter	Symbol	Value	Unit
Drain - Source voltage	V_{DSS}	-30	V
Continuous drain current	I_D *1		
Pulsed drain current	$I_{D,pulse}$ *2	±30	A
Gate - Source voltage	V_{GSS}	±20	V
Avalanche energy, single pulse	E_{AS} *3	4.2	mJ
Avalanche current	I_{AS} *3	-7.5	A
Power dissipation	P_D *4	2.0	W
Junction temperature	T_j	150	℃
Range of storage temperature	T_{stg}	-55 to +150	℃

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA} *4	-	62.5	-	℃/W

●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	-30	-	-	V
Breakdown voltage temperature coefficient	$\frac{\Delta V_{(BR)DSS}}{\Delta T_j}$	I_D = -1mA referenced to 25℃	-	-22	-	mV/℃
Zero gate voltage drain current	I_{DSS}	V_{DS} = -30V, V_{GS} = 0V	-	-	-1	μA
Gate - Source leakage current	I_{GSS}	V_{GS} = ±20V, V_{DS} = 0V	-	-	±100	nA
Gate threshold voltage	$V_{GS(th)}$	V_{DS} = -10, I_D = -1mA	-1.0	-	-2.5	V
Gate threshold voltage temperature coefficient	$\frac{\Delta V_{GS(th)}}{\Delta T_j}$	I_D = -1mA referenced to 25℃	-	2.9	-	mV/℃
Static drain - source on - state resistance	$R_{DS(on)}$ *5	V_{GS} = -10V, I_D = -7.5A	-	18.0	23.5	mΩ
		V_{GS} = -4.5V, I_D = -7.5A	-	24.0	31.0	
Forward Transfer Admittance	$\|Y_{fs}\|$ *5	V_{DS} = -5V, I_D = -7.5A	7.5	-	-	S

*1 Limited only by maximum temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 L ≃ 100μH, V_{DD} = -15V, R_G = 25Ω, STARTING T_{ch} = 25℃ Fig.3-1,3-2

*4 Mounted on a ceramic boad (30×30×0.8mm)

*5 Pulsed

●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	V_{GS} = 0V	-	1250	-	pF
Output capacitance	C_{oss}	V_{DS} = -15V	-	220	-	
Reverse transfer capacitance	C_{rss}	f = 1MHz	-	170	-	
Turn - on delay time	$t_{d(on)}$ *5	V_{DD} ≃ -15V, V_{GS} = -10V	-	10	-	ns
Rise time	t_r *5	I_D = -3.75A	-	20	-	
Turn - off delay time	$t_{d(off)}$ *5	R_L ≃ 4Ω	-	80	-	
Fall time	t_f *5	R_G = 10Ω	-	60	-	

●Gate charge characteristics (T_a = 25°C)

Parameter	Symbol	Conditions		Values			Unit
				Min.	Typ.	Max.	
Total gate charge	Q_g *5	V_{DD} ≃ -15V I_D = -7.5A	V_{GS} = -10V	-	25	-	nC
			V_{GS} = -4.5V	-	12.8	-	
Gate - Source charge	Q_{gs} *5			-	4.5	-	
Gate - Drain charge	Q_{gd} *5			-	4.7	-	

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

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Body diode continuous forward current	I_S *1	T_a = 25℃	-	-	-1.67	A
Body diode pulse current	I_{SP} *2		-	-	-30	A
Forward voltage	V_{SD} *5	V_{GS} = 0V, I_S = -1.67A	-	-	-1.2	V

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

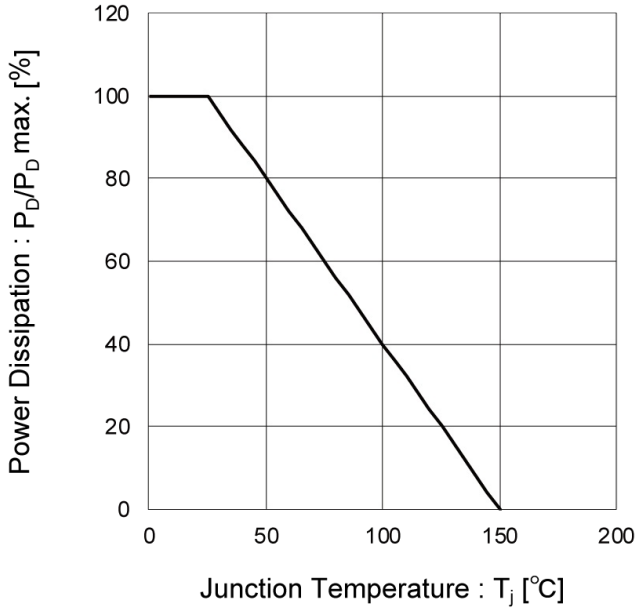


Fig.2 Maximum Safe Operating Area

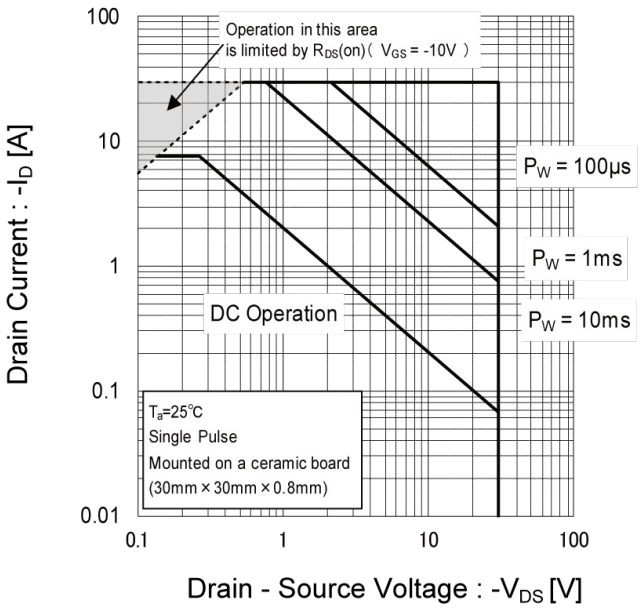


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

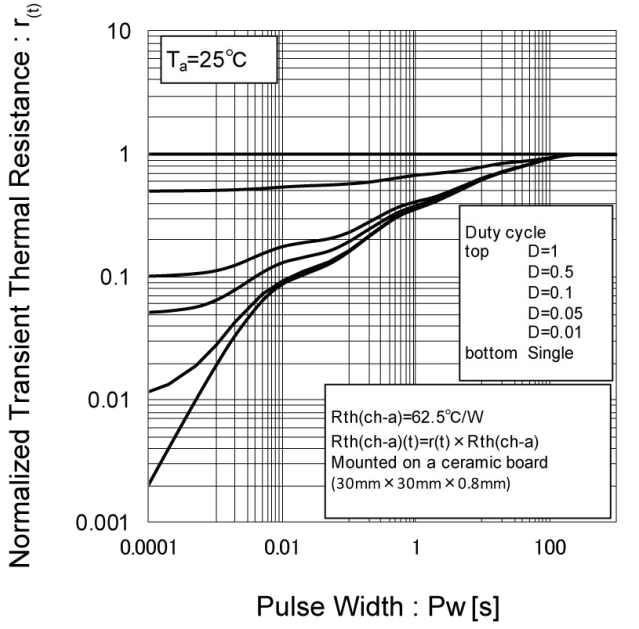
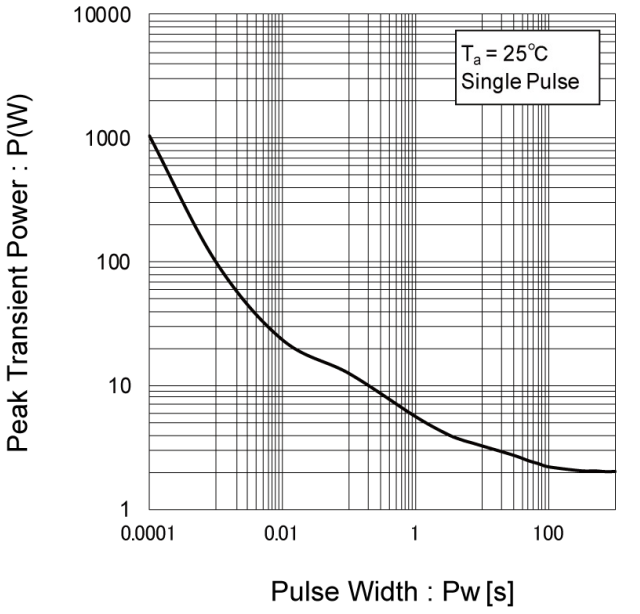


Fig.4 Single Pulse Maximum Power dissipation



●Electrical characteristic curves

Fig.5 Typical Output Characteristics(I)

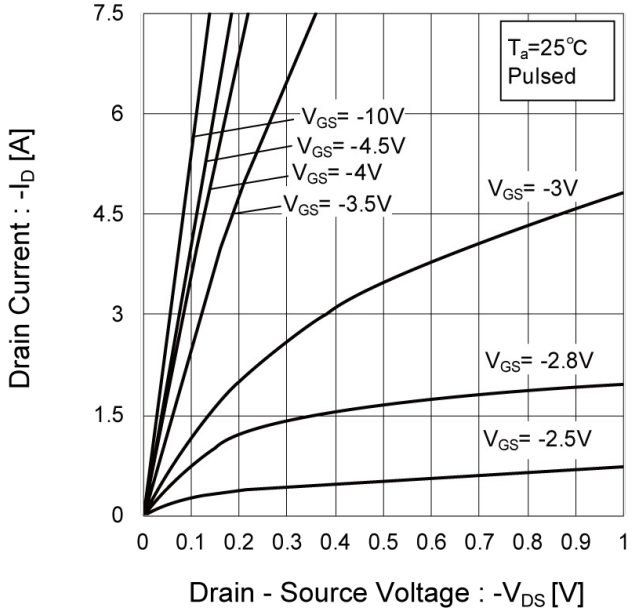


Fig.6 Typical Output Characteristics(II)

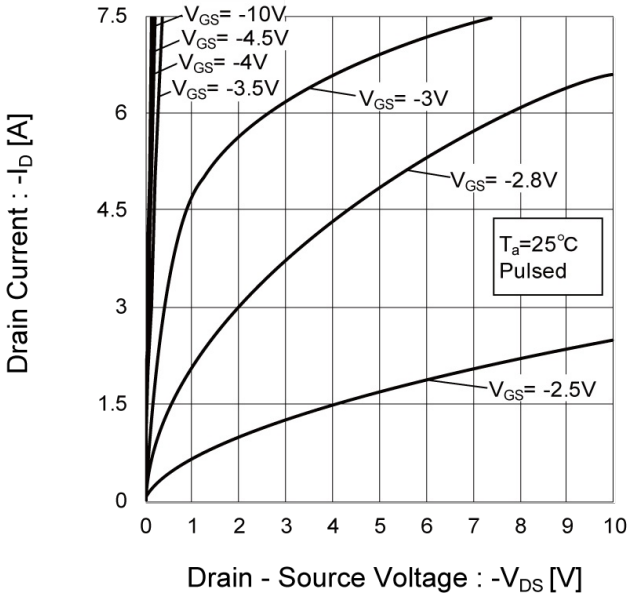
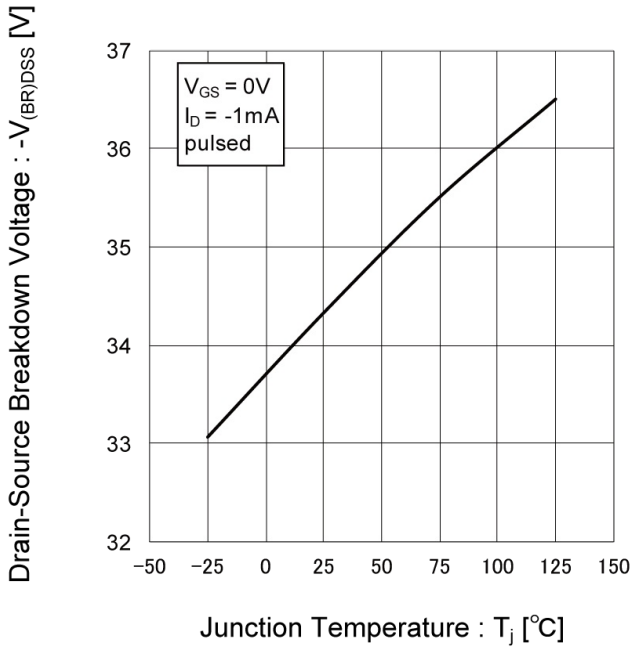


Fig.7 Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

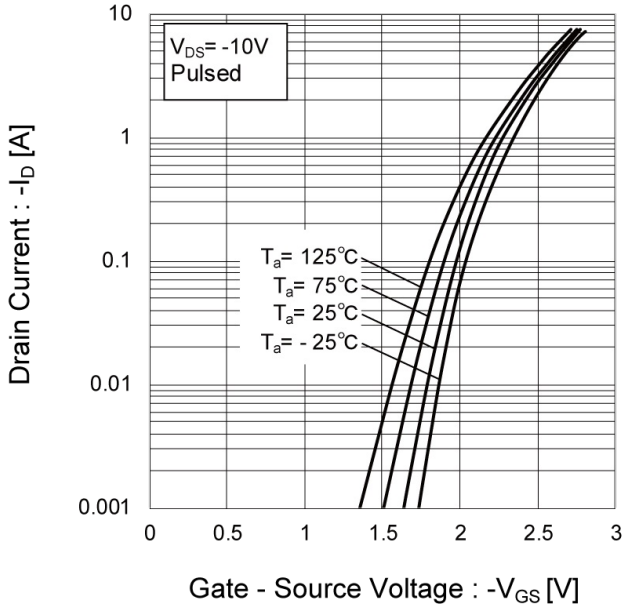


Fig.9 Gate Threshold Voltage vs. Junction Temperature

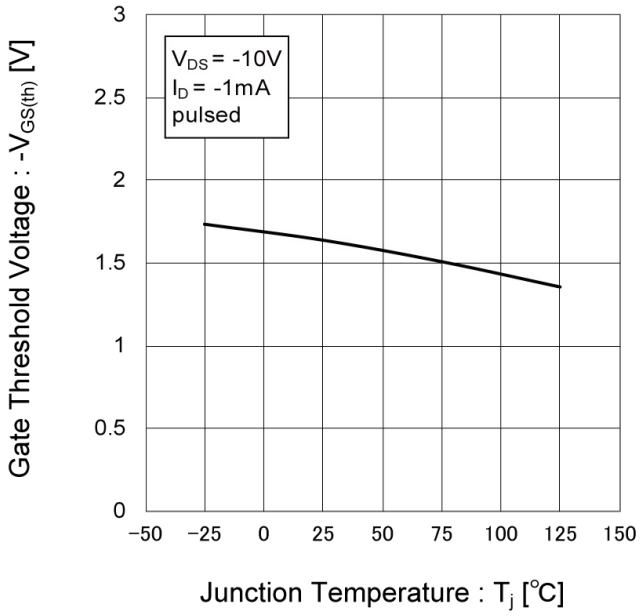
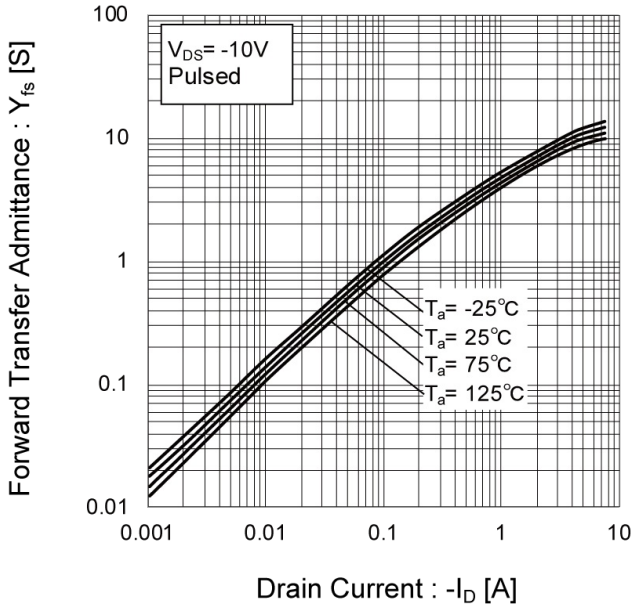


Fig.10 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.11 Drain Current Derating Curve

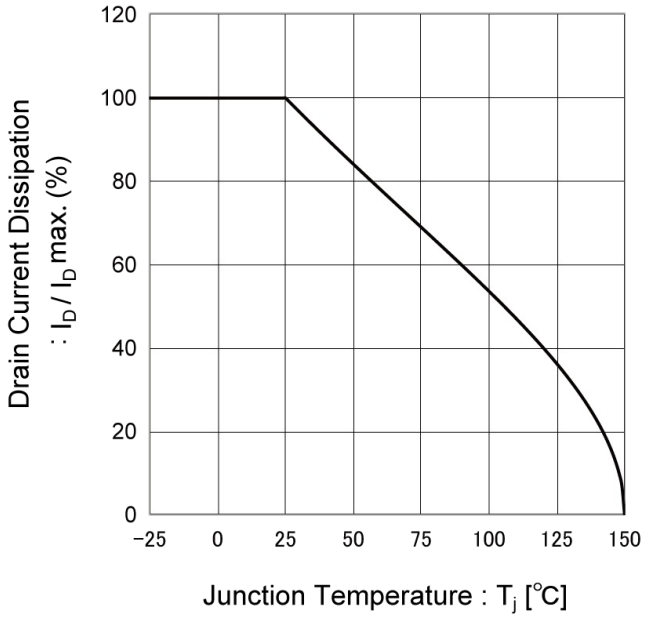


Fig.12 Static Drain - Source On - State Resistance vs. Gate Source Voltage

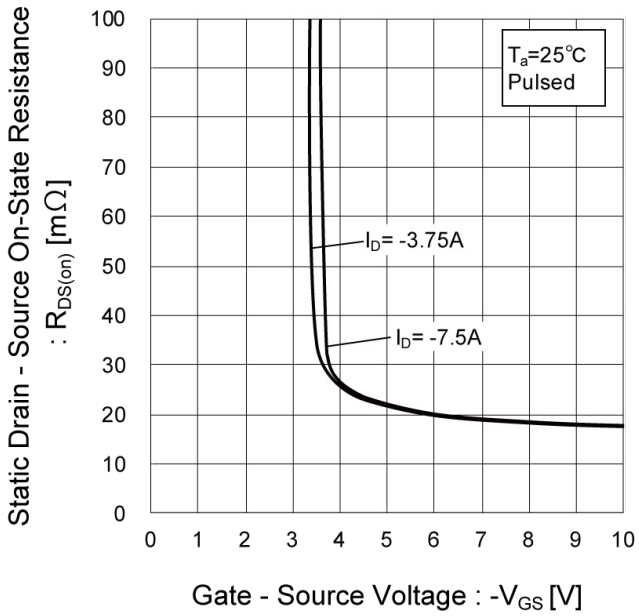
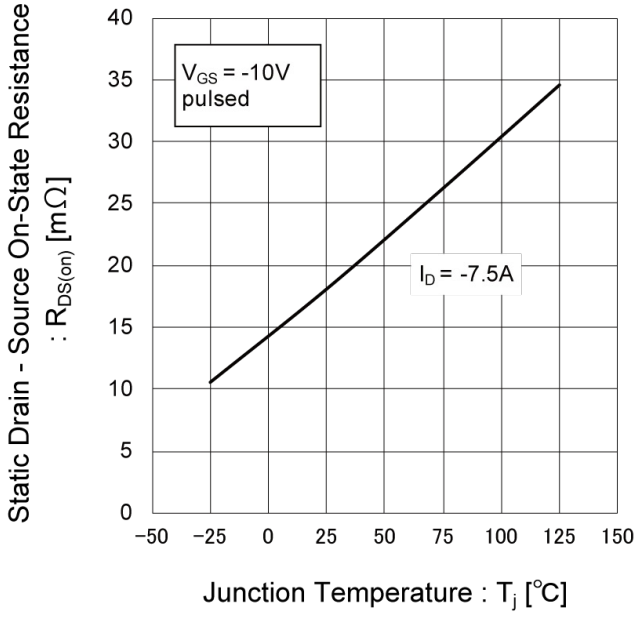


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature



●Electrical characteristic curves

Fig.14 Static Drain - Source On - State Resistance vs. Drain Current(I)

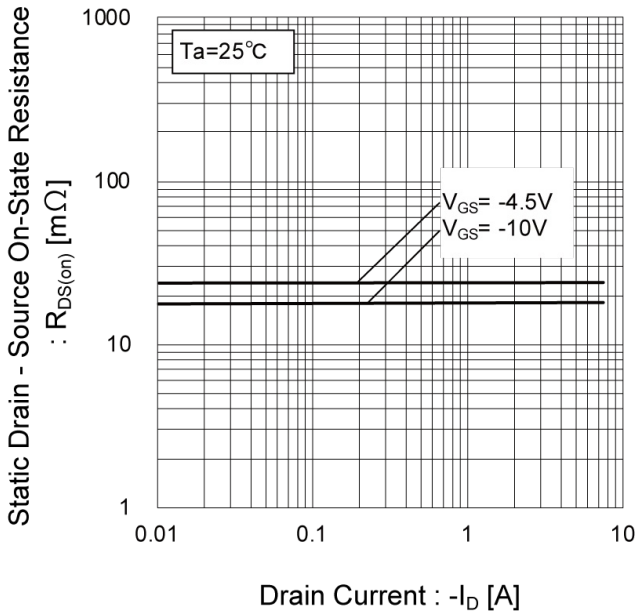


Fig.15 Static Drain - Source On - State Resistance vs. Drain Current(II)

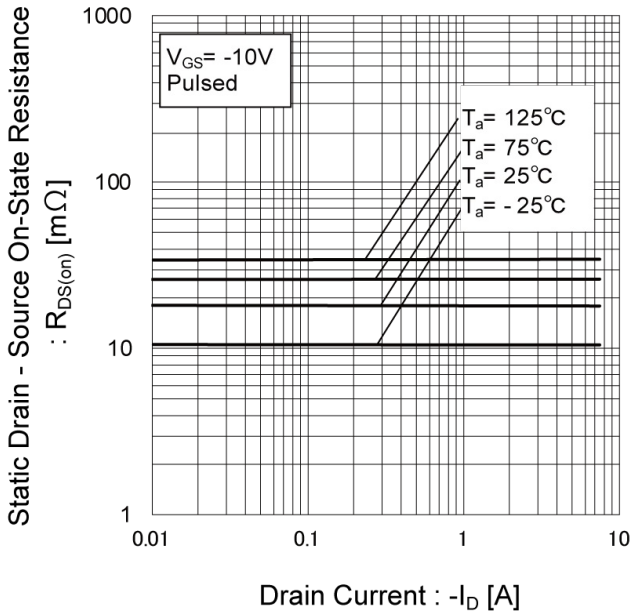
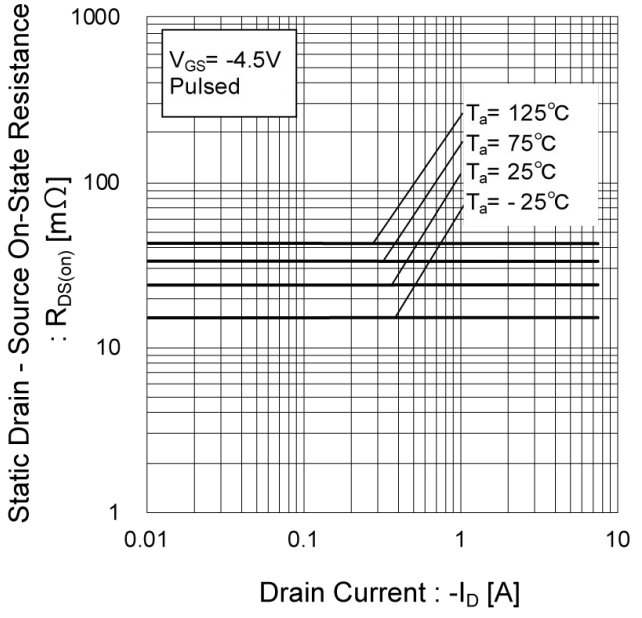


Fig.16 Static Drain - Source On - State Resistance vs. Drain Current(III)



●Electrical characteristic curves

Fig.17 Typical Capacitance vs. Drain - Source Voltage

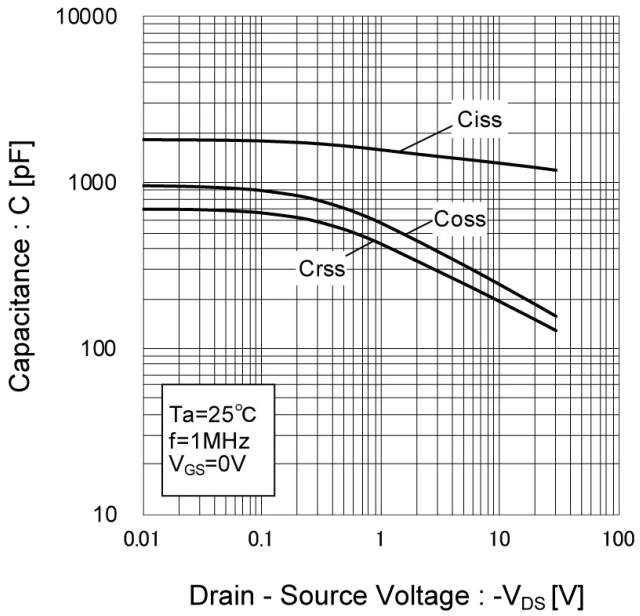


Fig.18 Switching Characteristics

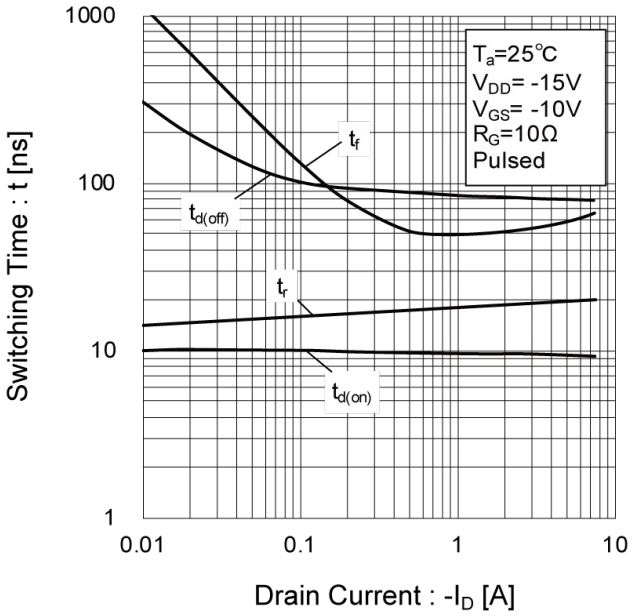


Fig.19 Dynamic Input Characteristics

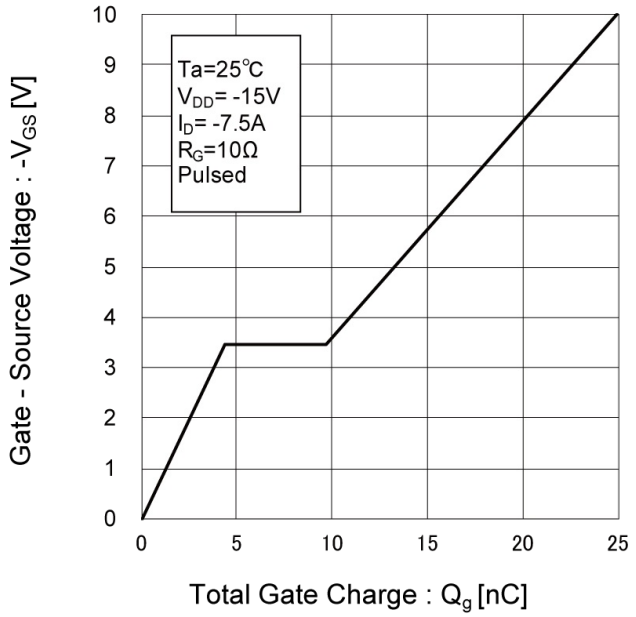
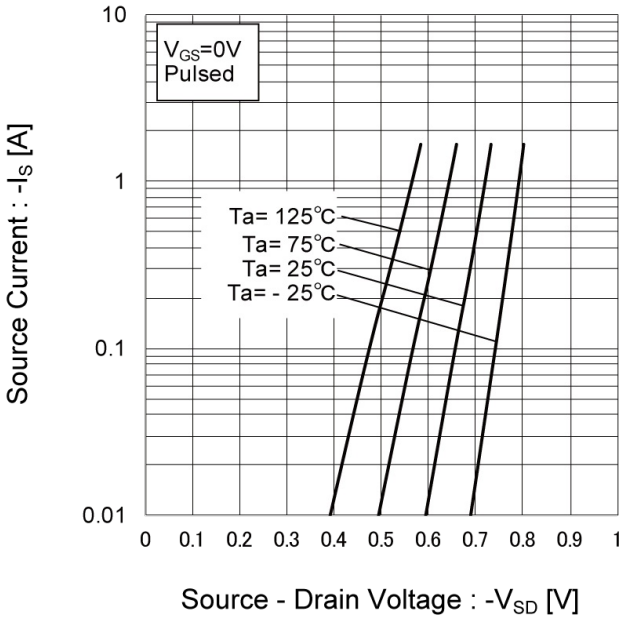


Fig.20 Source Current vs. Source Drain Voltage



●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

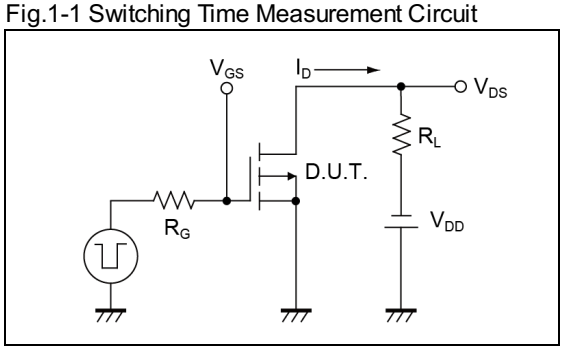


Fig.1-2 Switching Waveforms

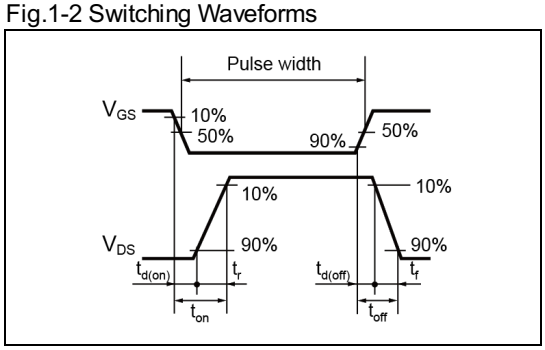


Fig.2-1 Gate Charge Measurement Circuit

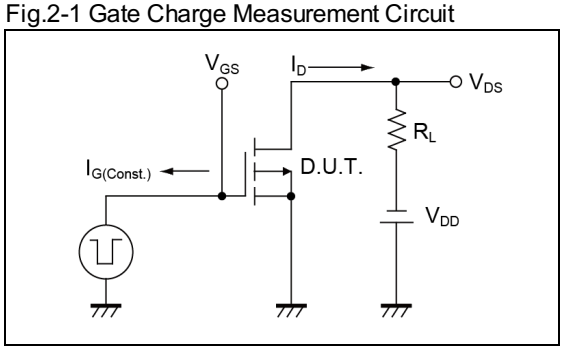


Fig.2-2 Gate Charge Waveform

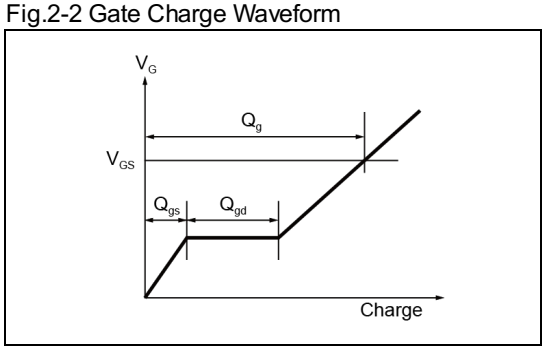


Fig.3-1 AVALANCHE MEASUREMENT CIRCUIT

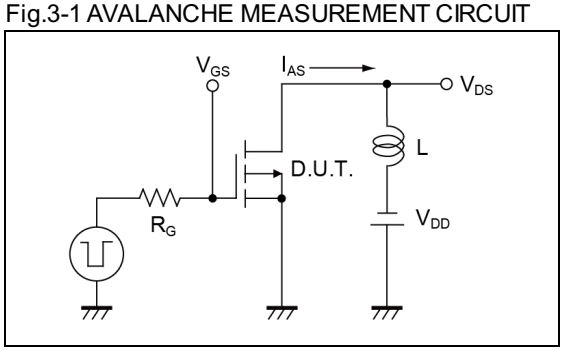
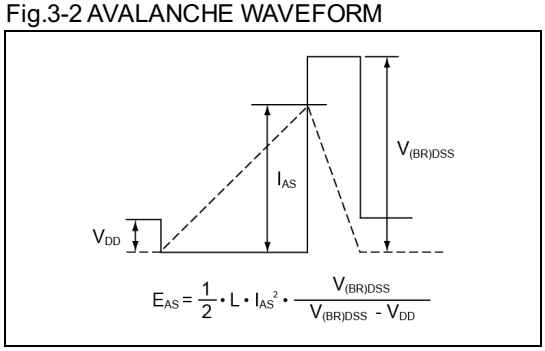
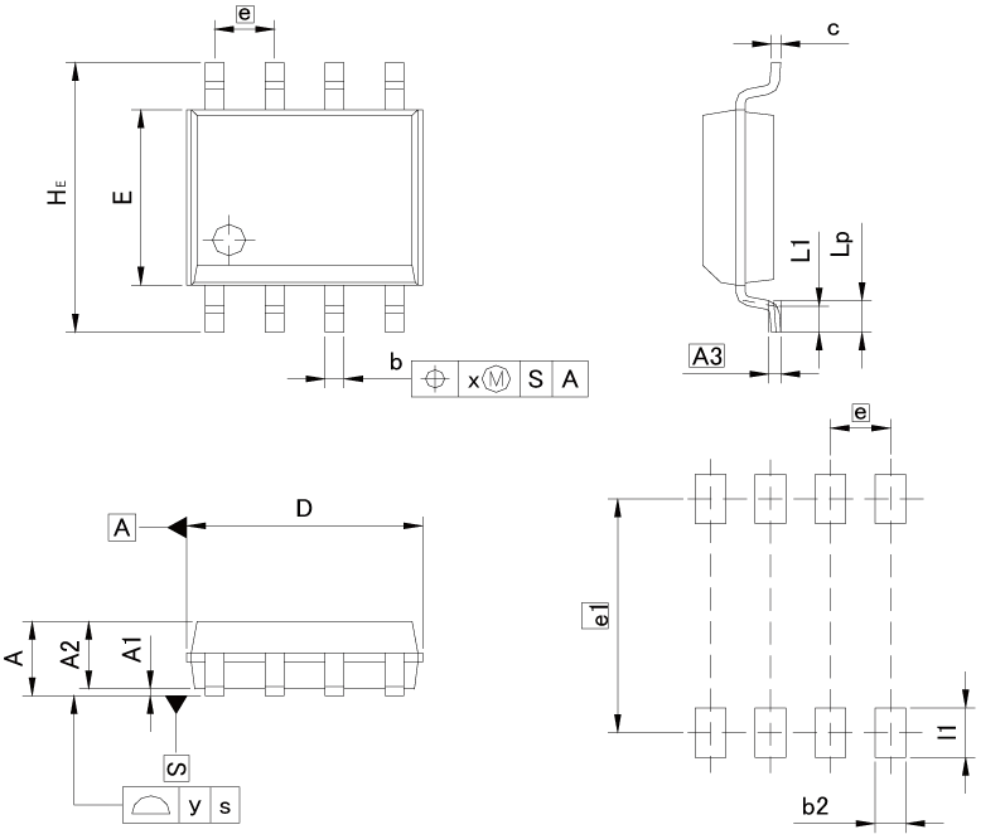


Fig.3-2 AVALANCHE WAVEFORM



●Dimensions

SOP8



Pattern of terminal position areas
[Not a pattern of soldering pads]

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	–	1.75	–	0.069
A1	0.15		0.006	
A2	1.40	1.60	0.055	0.063
A3	0.25		0.010	
b	0.30	0.50	0.012	0.020
c	0.10	0.30	0.004	0.012
D	4.80	5.20	0.189	0.205
E	3.75	4.05	0.148	0.159
e	1.27		0.050	
HE	5.70	6.30	0.224	0.248
L1	0.50	0.70	0.020	0.028
Lp	0.65	0.85	0.026	0.033
x	0.15		0.006	
y	0.10		0.004	

DIM	MILIMETERS		INCHES	
	MIN	MAX	MIN	MAX
b2	–	0.65	–	0.026
e1	5.15		0.203	
l1	–	1.15	–	0.045

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.

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.

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ROHM SEMICONDUCTOR

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1.TYPE RS3E075AT

2.STRUCTURE SILICON P-CHANNEL MOS FET

3.APPLICATIONS SWITCHING

4.ABSOLUTE MAXIMUM RATINGS [T_a=25℃]

DRAIN-SOURCE VOLTAGE		V_{DSS}	・・・	−30V	
GATE-SOURCE VOLTAGE		V_{GSS}	・・・	±20V	
DRAIN CURRENT	CONTINUOUS	I_D	・・・	±7.5A	
	PULSED	I_{DP}	・・・	±30A	Pw≤10μs , Duty cycle≤1%
SOURCE CURRENT (BODY DIODE)	CONTINUOUS	I_S	・・・	−1.67A	
	PULSED	I_{SP}	・・・	−30A	Pw≤10μs , Duty cycle≤1%
AVALANCHE CURRENT		I_{AS}	・・・	−7.5A	L≒100uH, V_{DD}=−15V, R_G=25Ω STARTING T_{ch}=25℃ See Fig.3-1, 3-2
AVALANCHE ENERGY		E_{AS}	・・・	4.2mJ	L≒100uH, V_{DD}=−15V, R_G=25Ω STARTING T_{ch}=25℃ See Fig.3-1, 3-2
POWER DISSIPATION		P_D	・・・	2.0W MOUNTED ON A CERAMIC BOARD	
CHANNEL TEMPERATURE		T_{ch}	・・・	150℃	
RANGE OF STORAGE TEMPERATURE		T_{stg}	・・・	−55~150℃	

5.THERMAL RESISTANCE

CHANNEL TO AMBIENT	$R_{th(ch-a)}$	・・・	62.5℃/W MOUNTED ON A CERAMIC BOARD	

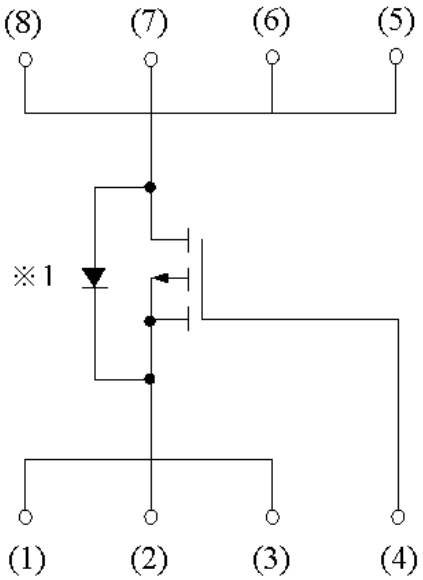
6.ELECTRICAL CHARACTERISTICS [T_a=25℃]

PARAMETER	ITEM	CONDITION		MIN.	TYP.	MAX.
GATE-SOURCE-LEAKAGE	I_{GSS}	V_{GS}=±20V / V_{DS}=0V		-	-	±100nA
DRAIN-SOURCE BREAKDOWN VOLTAGE	$V_{(BR)DSS}$	I_D=-1mA / V_{GS}=0V		-30V	-	-
ZERO GATE VOLTAGE DRAIN CURRENT	I_{DSS}	V_{DS}=-30V / V_{GS}=0V		-	-	-1μA
GATE THRESHOLD VOLTAGE	$V_{GS(th)}$	V_{DS}=-10V / I_D=-1mA		-1.0V	-	-2.5V
STATIC DRAIN-SOURCE ON-STATE RESISTANCE	$R_{DS(on)}$ *PULSED	I_D=-7.5A / V_{GS}=-10V		-	18.0mΩ	23.5mΩ
		I_D=-7.5A / V_{GS}=-4.5V		-	24.0mΩ	31.0mΩ
FORWARD TRANSFER ADMITTANCE	$\|Y_{fs}\|$ *PULSED	V_{DS}=-5V / I_D=-7.5A		7.5S	-	-
INPUT CAPACITANCE	C_{iss}	V_{DS}=-15V V_{GS}=0V f=1MHz		-	1250pF	-
OUTPUT CAPACITANCE	C_{oss}			-	220pF	-
REVERSE TRANSFER CAPACITANCE	C_{rss}			-	170pF	-
TURN-ON DELAY TIME	$t_{d(on)}$ *PULSED	V_{DD}≈-15V I_D=-3.75A V_{GS}=-10V R_L=4Ω R_G=10Ω See Fig.1-1, 1-2		-	10ns	-
RISE TIME	t_r *PULSED			-	20ns	-
TURN-OFF DELAY TIME	$t_{d(off)}$ *PULSED			-	80ns	-
FALL TIME	t_f *PULSED			-	60ns	-
TOTAL GATE CHARGE	Q_g *PULSED	V_{DD}≈-15V I_D=-7.5A See Fig.2-1, 2-2	V_{GS}=-10V	-	25nC	-
			V_{GS}=-4.5V	-	12.8nC	-
GATE-SOURCE CHARGE	Q_{gs} *PULSED			-	4.5nC	-
GATE-DRAIN CHARGE	Q_{gd} *PULSED			-	4.7nC	-

BODY DIODE (SOURCE-DRAIN)

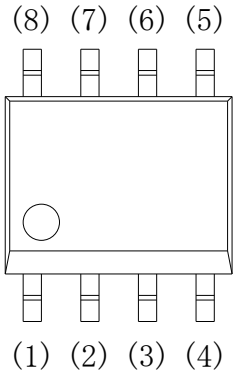
PARAMETER	ITEM	CONDITION	MIN.	TYP.	MAX.
FORWARD VOLTAGE	V_{SD} *PULSED	I_S=-1.67A / V_{GS}=0V	-	-	-1.2V

7.INNER CIRCUIT

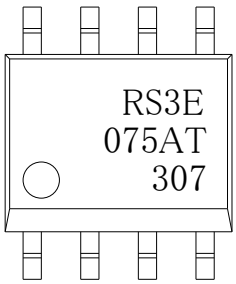


※1 BODY DIODE

(1) SOURCE
(2) SOURCE
(3) SOURCE
(4) GATE
(5) DRAIN
(6) DRAIN
(7) DRAIN
(8) DRAIN



8.MARKING



″ 307 ″ MEANS PRODUCTION YEAR AND WEEK.

″ ○ ″ MEANS 1pin MARK.

9.MEASUREMENT CIRCUIT

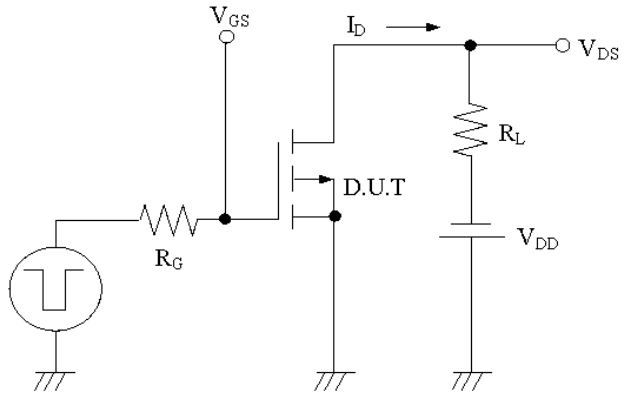


Fig.1-1 SWITCHING TIME MEASUREMENT CIRCUIT

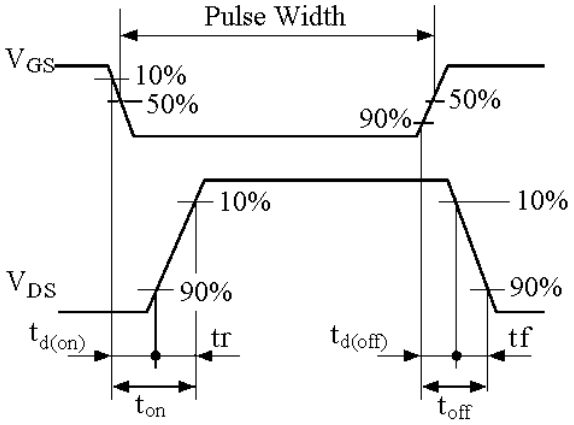


Fig.1-2 SWITCHING WAVEFORMS

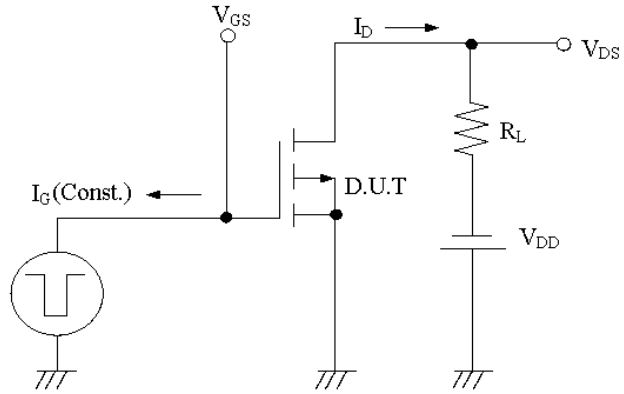


Fig.2-1 GATE CHARGE MEASUREMENT CIRCUIT

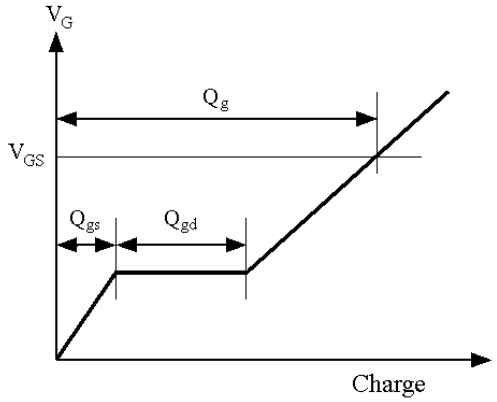


Fig.2-2 GATE CHARGE WAVEFORM

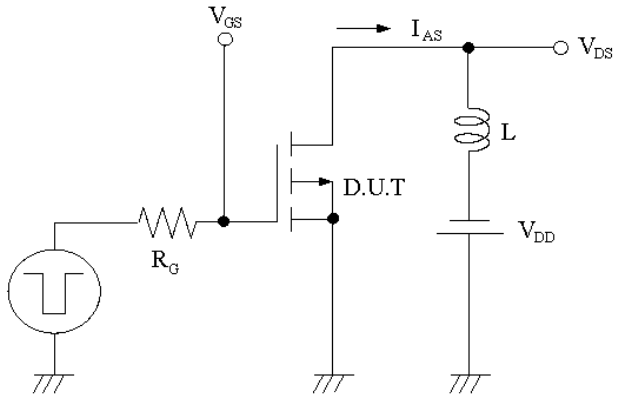


Fig.3-1 AVALANCHE MEASUREMENT CIRCUIT

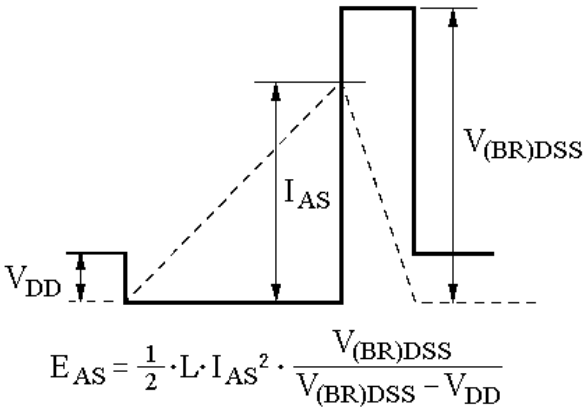


Fig.3-2 AVALANCHE WAVEFORM