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GNP1070TC-Z

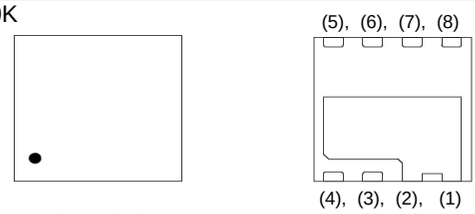
GaN Enhancement Mode Power Transistor

Datasheet

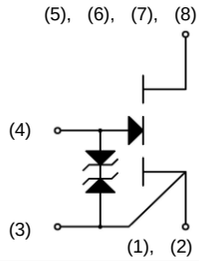
V_{DSS}	650V
$R_{DS(on)}$ (Typ.)	70mΩ
$Q_{G,\ typ.}$	5.2nC
$I_{D(Tc=25°C)}$ *1	20A
Q_{oss} @ 400V	44nC
Q_{rr}	0nC

●Outline

DFN8080K



●Inner circuit



(1) Source
(2) Source
(3) Kelvin Source
(4) Gate
(5) Drain
(6) Drain
(7) Drain
(8) Drain

●Features

- 650V E-mode GaN FET
- 70mΩ Resistance
- 5.2nC Gate Charge

●Application

- High switching frequency converter
- High density converter

●Packaging specifications

Type	Packing	Embossed tape
	Reel size (mm)	330
	Tape width (mm)	16
	Basic ordering unit (pcs)	3500
	Taping code	E2
	Marking	GNP1070TC

●Absolute maximum ratings (T_a = 25°C)

Parameter		Symbol	Value	Unit
Continuous Drain current	T_c = 25°C	I_D *1	20	A
	T_c = 125°C		7.3	A
Pulse Drain current	T_c = 25°C	$I_{D,pulse}$ *1*2	66	A
	T_c = 125°C		24	A
Drain - Source Voltage		V_{DSS}	650	V
Transient Drain - Source Voltage		$V_{DSS(transient)}$ *3	750	V
Gate - Source voltage (DC)		V_{GSS}	-10 to +6	V
Transient Gate - Source voltage		$V_{GSS(transient)}$ *4	8.5	V
Power dissipation(Tc=25°C)		P_{tot}	56	W
Junction temperature		T_j	150	°C

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●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	V_{GS} = 0V T_j = 25°C	650	-	-	V
Zero Gate voltage Drain current	I_{DSS}	V_{GS} = 0V, V_{DS}=650V T_j = 25°C T_j = 150°C	- -	1.5 90	150 -	μA
Gate - Source leakage current	I_{GSS+}	V_{GS} = 6.0V, VDS = 0V	-	0.1	3	mA
Gate threshold voltage	$V_{GS\ (th)}$	V_{DS} = 50mV, I_D = 18mA	1	1.45	2.4	V
Static Drain - Source on - state resistance	$R_{DS(on)}$ *5	V_{GS} = 5.0V, I_D = 1.9A T_j = 25°C T_j = 150°C	- -	73 183	103 -	mΩ
		V_{GS} = 5.5V, I_D = 1.9A T_j = 25°C T_j = 150°C	- -	70 175	98 -	mΩ
Gate input resistance	R_G	f = 100MHz, open drain	-	0.86	-	Ω

●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	R_{thJA}	-	46.5	-	°C/W
Thermal resistance, junction - case	R_{thJC}	-	2.20	-	°C/W
Reflow soldering temperature	T_{solder} *6	-	-	260	°C

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●Electrical characteristics (T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C_{iss}	V_{GS} = 0V V_{DS} = 400V f = 1MHz	-	200	-	pF
Output capacitance	C_{oss}		-	50	-	
Reverse transfer capacitance	C_{rss}		-	0.6	-	
Effective output capacitance, energy related	$C_{o(er)}$	V_{GS} = 0V V_{DS} = 0V to 400V	-	70	-	pF
Effective output capacitance, time related	$C_{o(tr)}$	V_{GS} = 0V V_{DS} = 0V to 400V	-	110	-	pF
Output charge	Q_{oss}	V_{GS} = 0V V_{DS} = 0V to 400V	-	44	-	nC
Total Gate charge	Q_g *7	V_{DS} = 400V I_D = 8A V_{GS} = 6V/0V	-	5.2	-	nC
Gate - Source charge	Q_{gs} *7		-	0.6	-	
Gate - Drain charge	Q_{gd} *7		-	1.2	-	
Gate plateau voltage	V_{plat} *7		-	2.0	-	V
Turn - on delay time	$t_{d(on)}$ *7	V_{DS} = 400V I_D = 8A V_{GS} = 6V/0V R_G = 10Ω	-	5.9	-	ns
Rise time	t_r *7		-	6.9	-	
Turn - off delay time	$t_{d(off)}$ *7		-	8.0	-	
Fall time	t_f *7		-	8.7	-	

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●Reverse conduction electrical characteristics(T_a = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Source-Drain reverse voltage	V_{SD}	V_{GS} = 0V, I_{SD}=1.9A	-	2.0	-	V
Reverse recovery time	t_{rr} *7		-	0	-	ns
Reverse recovery charge	Q_{rr} *7		-	0	-	nC
Peak reverse recovery current	I_{rrm} *7		-	0	-	A

*1 Limited and calculated by maximum temperature allowed..

*2 V_{GS}=6V,Duty=0.1, t_{pulse}=1μs.

*3 t_{pulse}=1μs, <10 hrs of total time.

*4 $t_{pulse<}$20ns, <0.5 hr of total time.

*5 Maximum Id applied at FT is 1.9A.

*6 MSL 3.

*7 Pulsed.

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●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

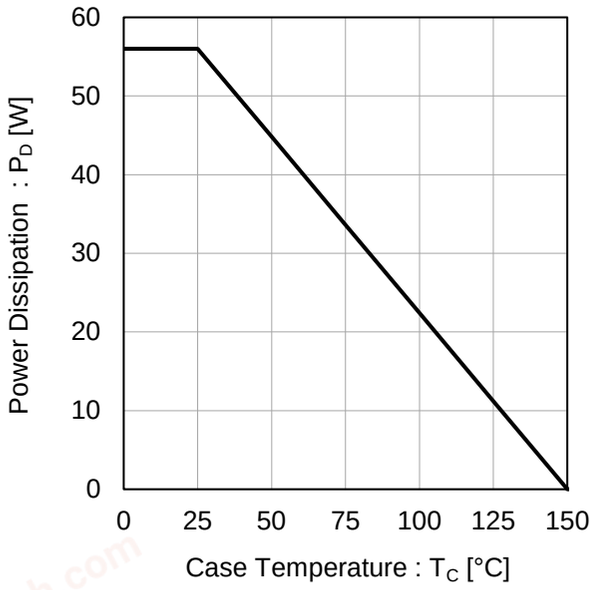


Fig.2 Maximum Safe Operating Area(T_a=25°C)

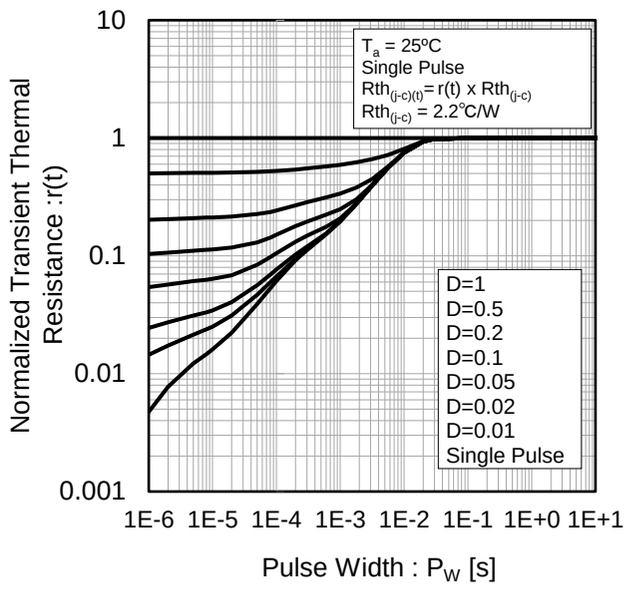


Fig.3 Normalized Transient Thermal Resistance vs. Pulse Width

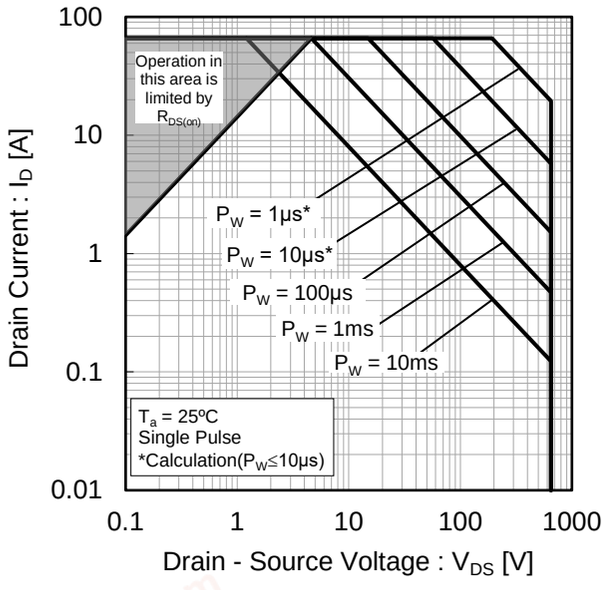
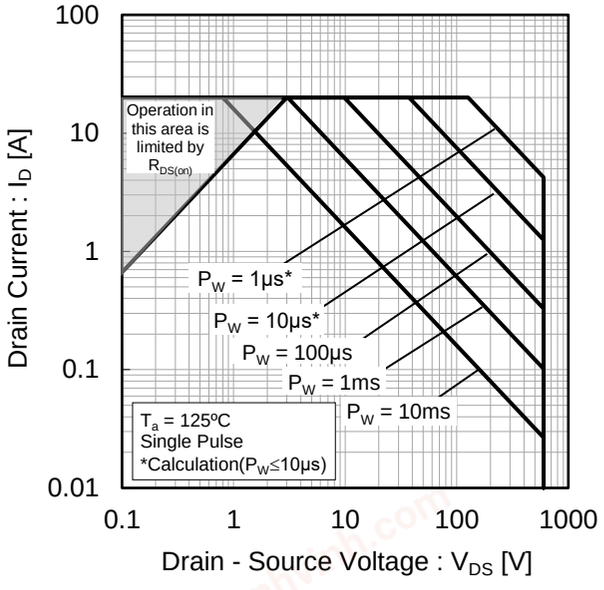


Fig.4 Maximum Safe Operating Area(T_a=125°C)



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●Electrical characteristic curves

Fig.5 T_j = 25ºC Typical Output Characteristics

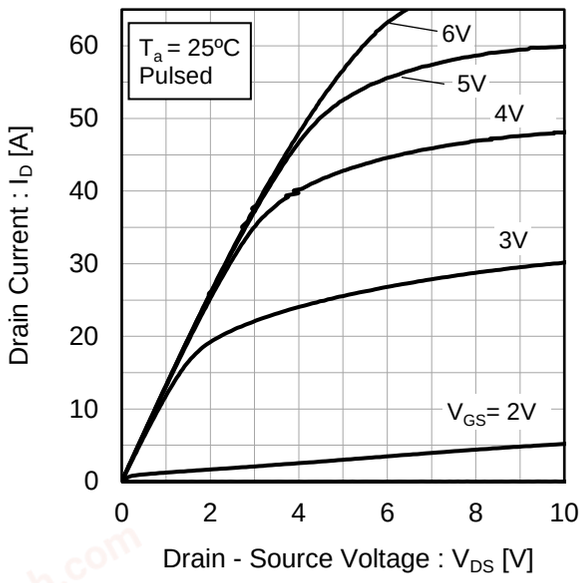


Fig.6 T_j = 125ºC Typical Output Characteristics

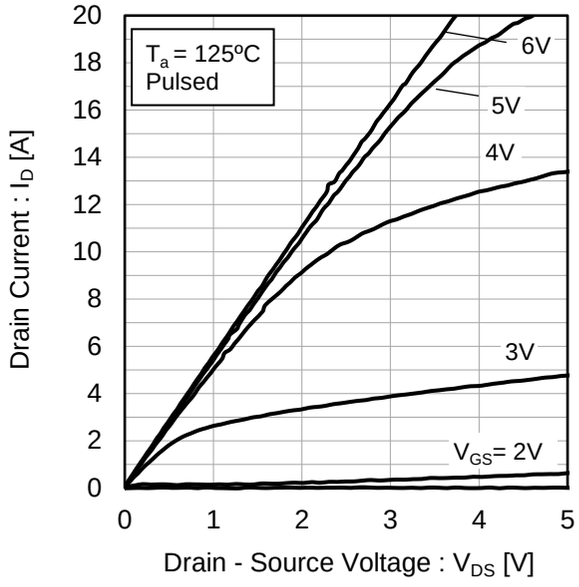


Fig.7 Typical Transfer Characteristics

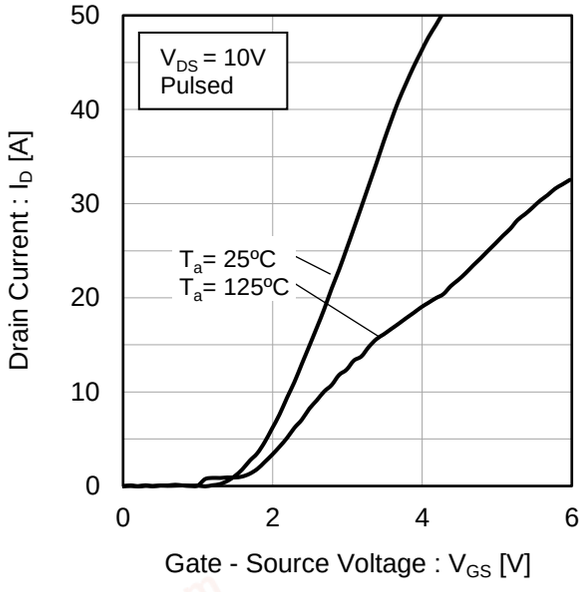
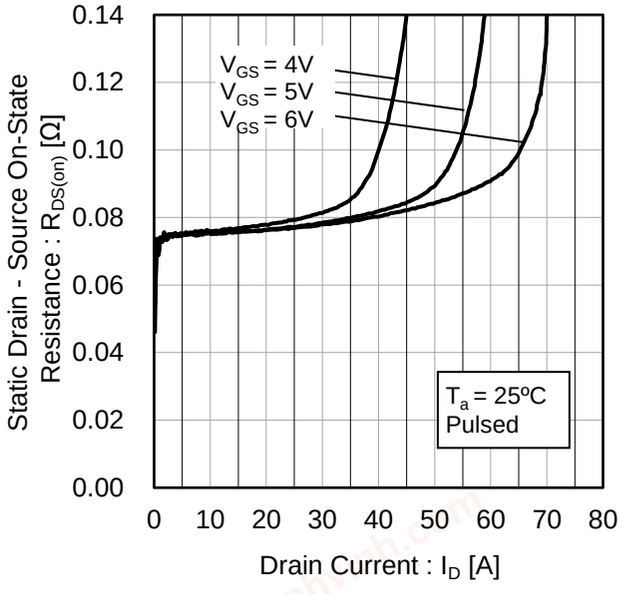


Fig.8 Static Drain - Source On - State Resistance vs. Drain - Source Current



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●Electrical characteristic curves

Fig.9 T_j = 25ºC 3rd Quadrant Characteristics

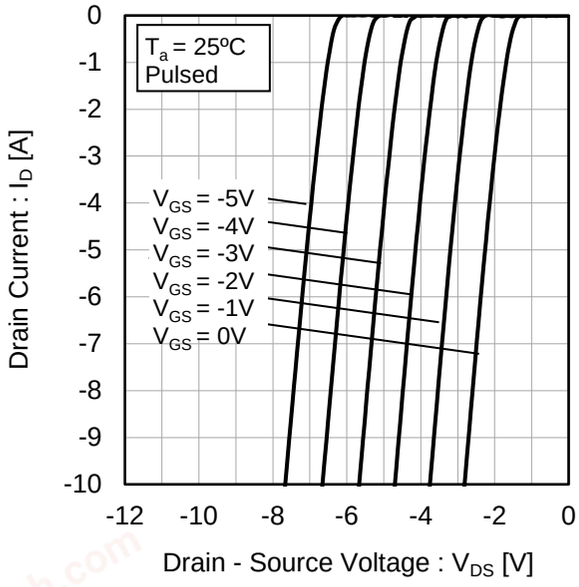


Fig.10 T_j = 125ºC 3rd Quadrant Characteristics

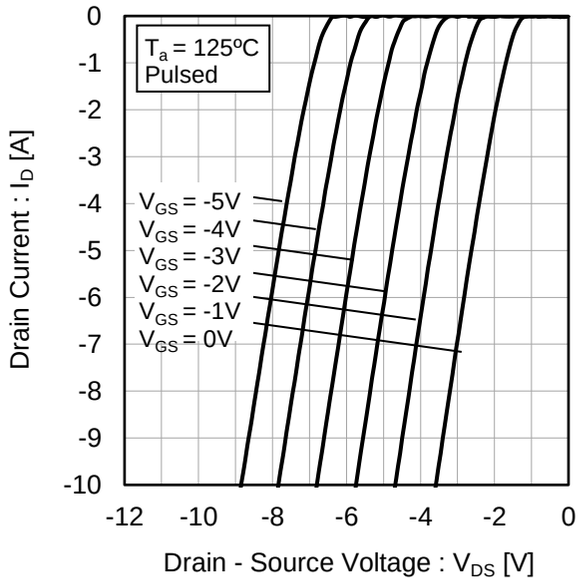


Fig.11 Typical Capacitance vs. Drain - Source Voltage

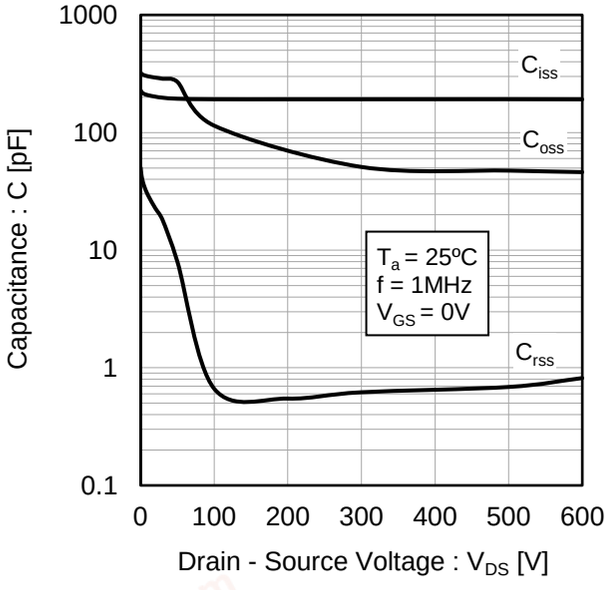
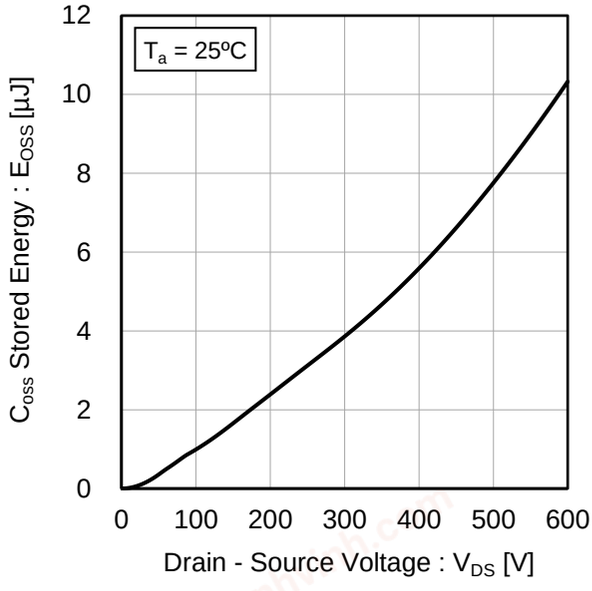


Fig.12 C_{oss} Stored Energy

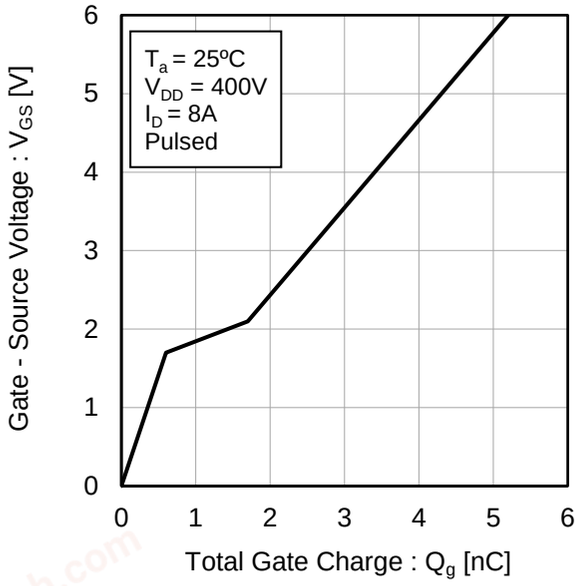


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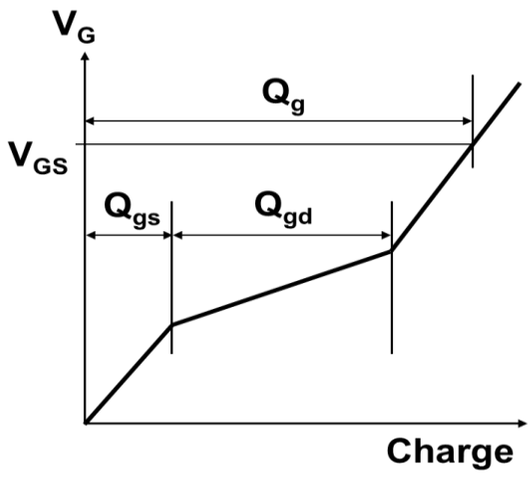
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●Electrical characteristic curves

Fig.13 Dynamic Input Characteristics



*Gate Charge Waveform



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●Measurement circuits and waveforms

Fig.1-1 Gate Charge Measurement Circuit

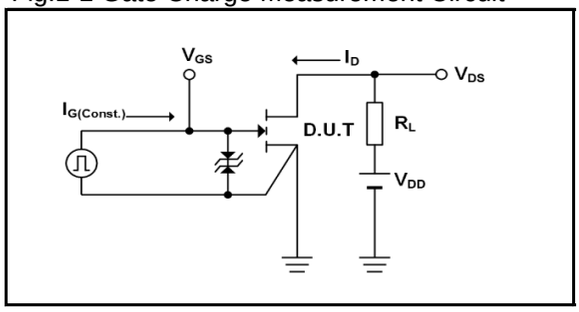


Fig.2-1 Switching Characteristics Measurement Circuit

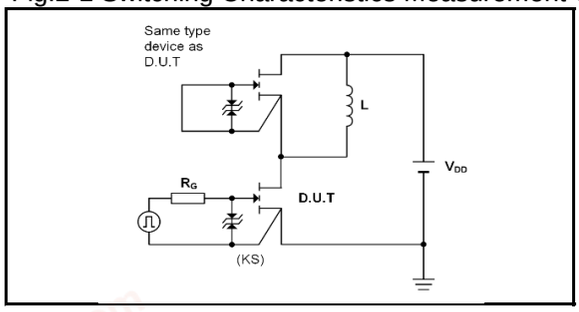


Fig.2-2 Waveforms for Switching Time

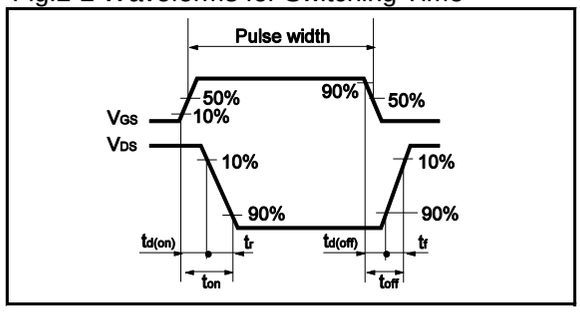
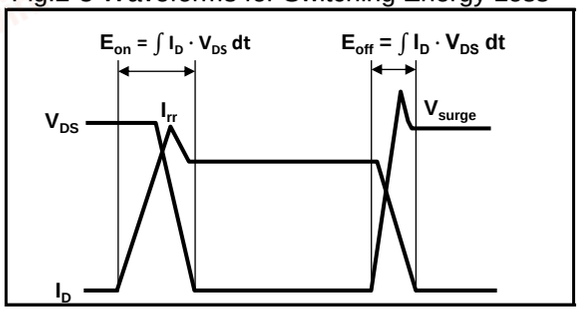


Fig.2-3 Waveforms for Switching Energy Loss



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(Note1) Medical Equipment Classification of the Specific Applications

JAPAN	USA	EU	CHINA
CLASSⅢ	CLASSⅢ	CLASSⅡb	CLASSⅢ
CLASSⅣ		CLASSⅢ	

2. ROHM designs and manufactures its Products subject to strict quality control system. However, semiconductor products can fail or malfunction at a certain rate. Please be sure to implement, at your own responsibilities, adequate safety measures including but not limited to fail-safe design against the physical injury, damage to any property, which a failure or malfunction of our Products may cause. The following are examples of safety measures:
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   [e] Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
   [f] Sealing or coating our Products with resin or other coating materials
   [g] Use of our Products without cleaning residue of flux (Exclude cases where no-clean type fluxes is used. However, recommend sufficiently about the residue.) ; or Washing our Products by using water or water-soluble cleaning agents for cleaning residue after soldering
   [h] Use of the Products in places subject to dew condensation

4. The Products are not subject to radiation-proof design.

5. Please verify and confirm characteristics of the final or mounted products in using the Products.

6. In particular, if a transient load (a large amount of load applied in a short period of time, such as pulse, is applied, confirmation of performance characteristics after on-board mounting is strongly recommended. Avoid applying power exceeding normal rated power; exceeding the power rating under steady-state loading condition may negatively affect product performance and reliability.

7. De-rate Power Dissipation depending on ambient temperature. When used in sealed area, confirm that it is the use in the range that does not exceed the maximum junction temperature.

8. Confirm that operation temperature is within the specified range described in the product specification.

9. ROHM shall not be in any way responsible or liable for failure induced under deviant condition from what is defined in this document.

Precaution for Mounting / Circuit board design

1. When a highly active halogenous (chlorine, bromine, etc.) flux is used, the residue of flux may negatively affect product performance and reliability.

2. In principle, the reflow soldering method must be used on a surface-mount products, the flow soldering method must be used on a through hole mount products. If the flow soldering method is preferred on a surface-mount products, please consult with the ROHM representative in advance.

For details, please refer to ROHM Mounting specification

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2. You agree that application notes, reference designs, and associated data and information contained in this document are presented only as guidance for Products use. Therefore, in case you use such information, you are solely responsible for it and you must exercise your own independent verification and judgment in the use of such information contained in this document. ROHM shall not be in any way responsible or liable for any damages, expenses or losses incurred by you or third parties arising from the use of such information.

Precaution for Electrostatic

This Product is electrostatic sensitive product, which may be damaged due to electrostatic discharge. Please take proper caution in your manufacturing process and storage so that voltage exceeding the Products maximum rating will not be applied to Products. Please take special care under dry condition (e.g. Grounding of human body / equipment / solder iron, isolation from charged objects, setting of Ionizer, friction prevention and temperature / humidity control).

Precaution for Storage / Transportation

1. Product performance and soldered connections may deteriorate if the Products are stored in the places where:
   - [a] the Products are exposed to sea winds or corrosive gases, including Cl_2, H_2S, NH_3, SO_2, and NO_2
   - [b] the temperature or humidity exceeds those recommended by ROHM
   - [c] the Products are exposed to direct sunshine or condensation
   - [d] the Products are exposed to high Electrostatic

2. Even under ROHM recommended storage condition, solderability of products out of recommended storage time period may be degraded. It is strongly recommended to confirm solderability before using Products of which storage time is exceeding the recommended storage time period.

3. Store / transport cartons in the correct direction, which is indicated on a carton with a symbol. Otherwise bent leads may occur due to excessive stress applied when dropping of a carton.

4. Use Products within the specified time after opening a humidity barrier bag. Baking is required before using Products of which storage time is exceeding the recommended storage time period.

Precaution for Product Label

A two-dimensional barcode printed on ROHM Products label is for ROHM's internal use only.

Precaution for Disposition

When disposing Products please dispose them properly using an authorized industry waste company.

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