

$V_{DSS}$	650V
$R_{DS(on)}$ (Typ.)	150m $\Omega$
$Q_G$ , typ.	2.7nC
$I_{D(Tc=25^\circ C)}$ *1	11A
$Q_{OSS}$ @ 400V	18.5nC
$Q_{rr}$	0nC

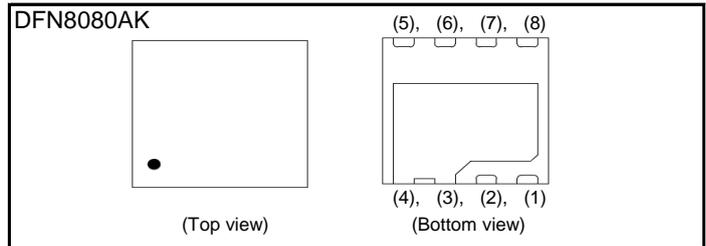
### ●Features

- 650V E-mode GaN FET
- 150m $\Omega$  Resistance
- 2.7nC Gate Charge

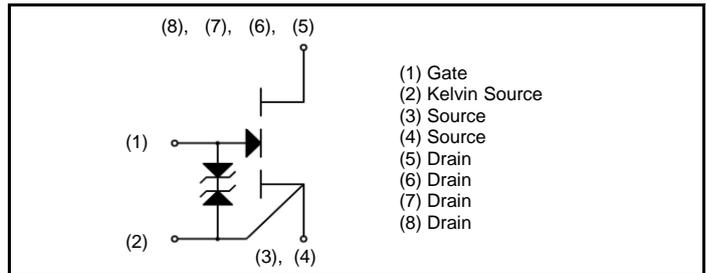
### ●Application

- High switching frequency converter
- High density converter

### ●Outline



### ●Inner circuit



### ●Packaging specifications

Type	Packing	Embossed tape
	Reel size (mm)	330
	Tape width (mm)	16
	Basic ordering unit (pcs)	3500
	Taping code	E2
	Marking	GNP1150TCA

### ●Absolute maximum ratings ( $T_a = 25^\circ C$ )

Parameter	Symbol	Value	Unit	
Continuous Drain current	$I_D$ *1	$T_c = 25^\circ C$	11	A
		$T_c = 125^\circ C$	5	A
Pulse Drain current	$I_{D,pulse}$ *1*2	$T_c = 25^\circ C$	35	A
		$T_c = 125^\circ C$	17	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( $T_c=25^\circ C$ )	$P_{tot}$	46.3	W	
Junction temperature	$T_j$	150	$^\circ C$	

●Electrical characteristics ( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Drain - Source breakdown voltage	$V_{(BR)DSS}$	$V_{GS} = 0V$ $T_j = 25^\circ\text{C}$	650	-	-	V
Zero Gate voltage Drain current	$I_{DSS}$	$V_{GS} = 0V, V_{DS}=650V$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	-	1 90	100 -	$\mu\text{A}$
Gate - Source leakage current	$I_{GSS+}$	$V_{GS} = 6.0V, V_{DS} = 0V$	-	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	$R_{DS(on)}^{*5}$	$V_{GS} = 5.0V, I_D = 1.9A$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	-	155 388	202 -	$m\Omega$
		$V_{GS} = 5.5V, I_D = 1.9A$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$	-	150 375	195 -	$m\Omega$
Gate input resistance	$R_G$	$f = 100MHz, \text{open drain}$	-	2.6	-	$\Omega$

## ●Thermal resistance

Parameter	Symbol	Values			Unit
		Min.	Typ.	Max.	
Thermal resistance, junction - ambient	$R_{thJA}$	-	46.5	-	$^\circ\text{C/W}$
Thermal resistance, junction - case	$R_{thJC}$	-	2.7	-	$^\circ\text{C/W}$
Reflow soldering temperature	$T_{solder}^{*6}$	-	-	260	$^\circ\text{C}$

●Electrical characteristics (T<sub>a</sub> = 25°C)

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Input capacitance	C <sub>iss</sub>	V <sub>GS</sub> = 0V	-	112	-	pF
Output capacitance	C <sub>oss</sub>	V <sub>DS</sub> = 400V	-	19	-	
Reverse transfer capacitance	C <sub>rss</sub>	f = 1MHz	-	0.3	-	
Effective output capacitance, energy related	C <sub>o(er)</sub>	V <sub>GS</sub> = 0V V <sub>DS</sub> = 0V to 400V	-	29	-	pF
Effective output capacitance, time related	C <sub>o(tr)</sub>	V <sub>GS</sub> = 0V V <sub>DS</sub> = 0V to 400V	-	47	-	pF
Output charge	Q <sub>oss</sub>	V <sub>GS</sub> = 0V V <sub>DS</sub> = 0V to 400V	-	18.5	-	nC
Total Gate charge	Q <sub>g</sub> <sup>*7</sup>	V <sub>DS</sub> = 400V	-	2.7	-	nC
Gate - Source charge	Q <sub>gs</sub> <sup>*7</sup>	I <sub>D</sub> = 5A V <sub>GS</sub> = 6V/0V	-	0.3	-	
Gate - Drain charge	Q <sub>gd</sub> <sup>*7</sup>		-	1.1	-	
Gate plateau voltage	V <sub>plat</sub> <sup>*7</sup>		-	2.4	-	
Turn - on delay time	t <sub>d(on)</sub> <sup>*7</sup>	V <sub>DS</sub> = 400V	-	4.7	-	ns
Rise time	t <sub>r</sub> <sup>*7</sup>	I <sub>D</sub> = 5A V <sub>GS</sub> = 6V/0V	-	5.3	-	
Turn - off delay time	t <sub>d(off)</sub> <sup>*7</sup>	R <sub>G</sub> = 10Ω	-	6.2	-	
Fall time	t <sub>f</sub> <sup>*7</sup>		-	8.3	-	

**●Reverse conduction electrical characteristics**( $T_a = 25^\circ\text{C}$ )

Parameter	Symbol	Conditions	Values			Unit
			Min.	Typ.	Max.	
Source-Drain reverse voltage	$V_{SD}$	$V_{GS} = 0V, I_{SD}=1.9A$	-	2.3	-	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  $V_{GS}=6V, \text{Duty}=0.1, t_{\text{pulse}}=1\mu\text{s}$ .

\*3  $t_{\text{pulse}}=1\mu\text{s}$ , <10 hrs of total time.

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

\*5 Maximum  $I_d$  applied at Final Test is 1.9A.

\*6 MSL 3.

\*7 Pulsed.

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

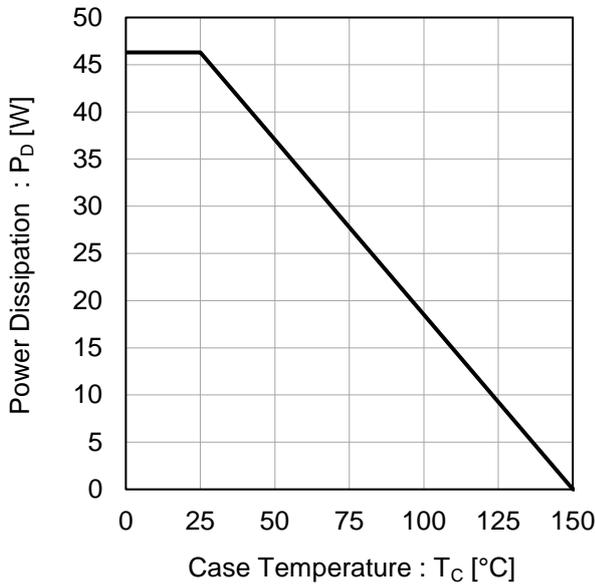


Fig.2 Normalized Transient Thermal Resistance vs. Pulse Width

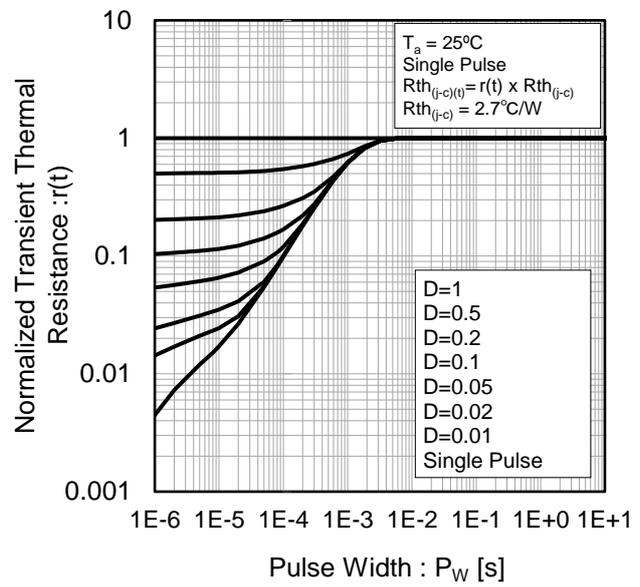


Fig.3 Maximum Safe Operating Area ( $T_a=25^\circ\text{C}$ )

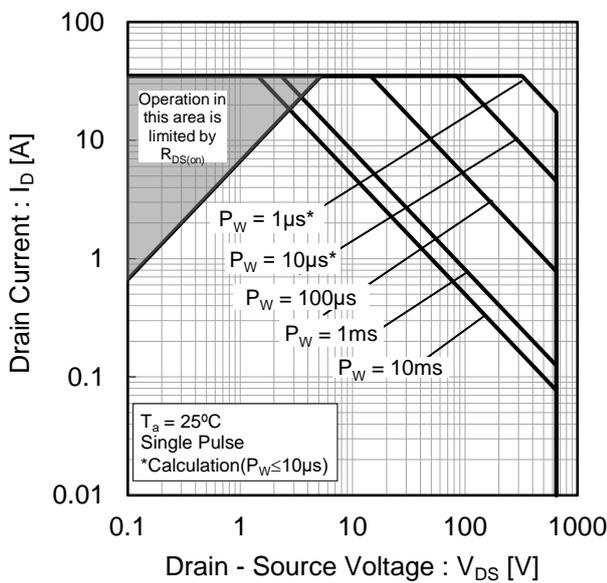
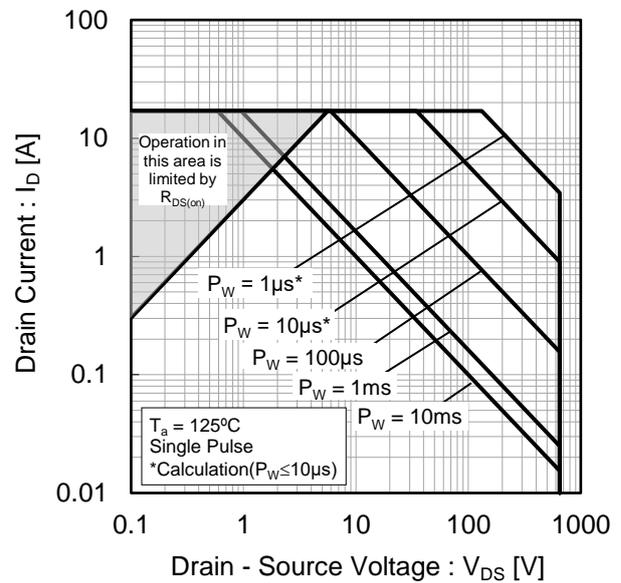


Fig.4 Maximum Safe Operating Area ( $T_a=125^\circ\text{C}$ )



●Electrical characteristic curves

Fig.5  $T_j = 25^\circ\text{C}$  Typical Output Characteristics

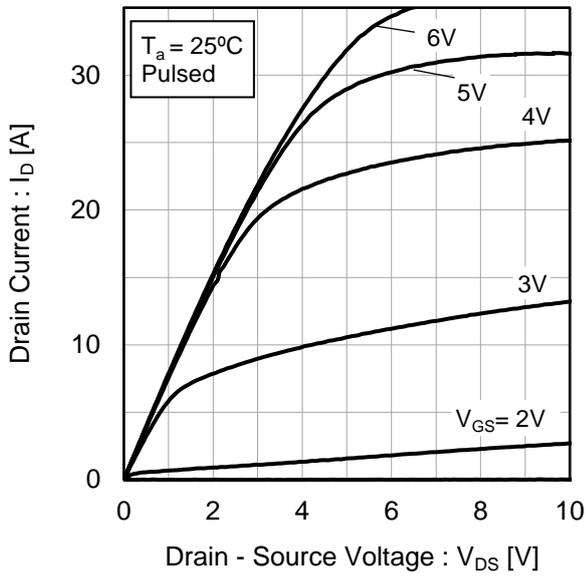


Fig.6  $T_j = 125^\circ\text{C}$  Typical Output Characteristics

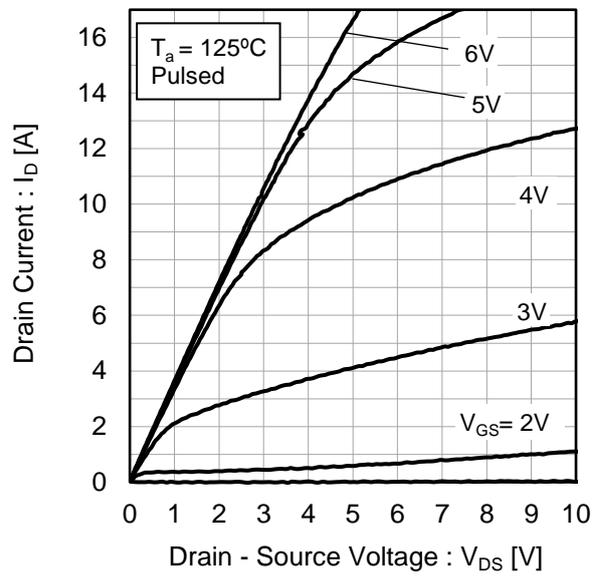


Fig.7 Typical Transfer Characteristics

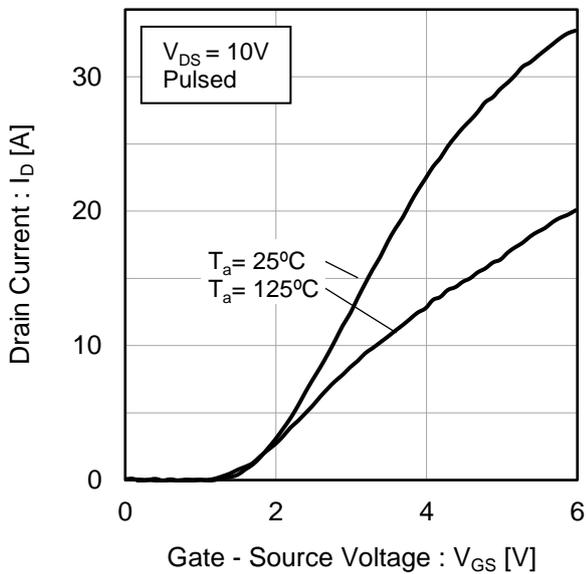
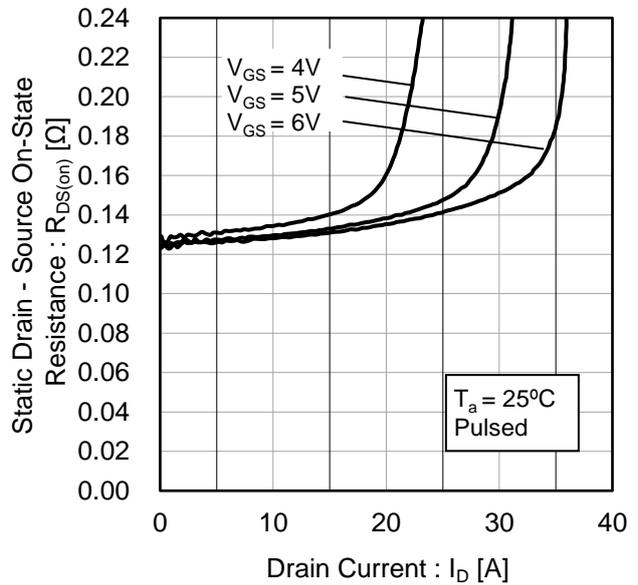


Fig.8 Static Drain - Source On - State Resistance vs. Drain - Source Current



●Electrical characteristic curves

Fig.9  $T_j = 25^\circ\text{C}$  3rd Quadrant Characteristics

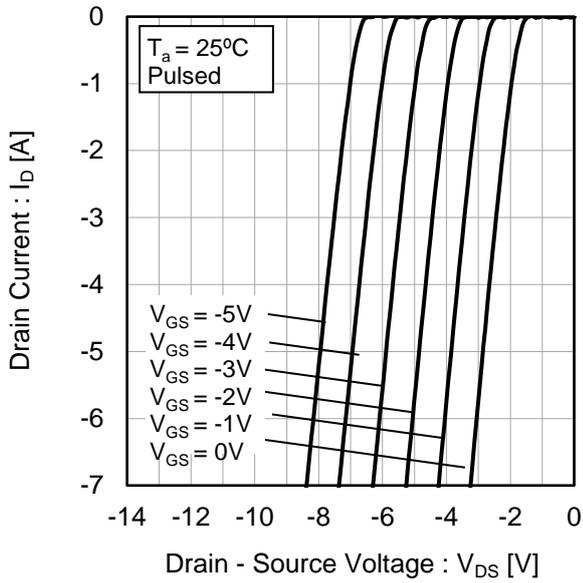


Fig.10  $T_j = 125^\circ\text{C}$  3rd Quadrant Characteristics

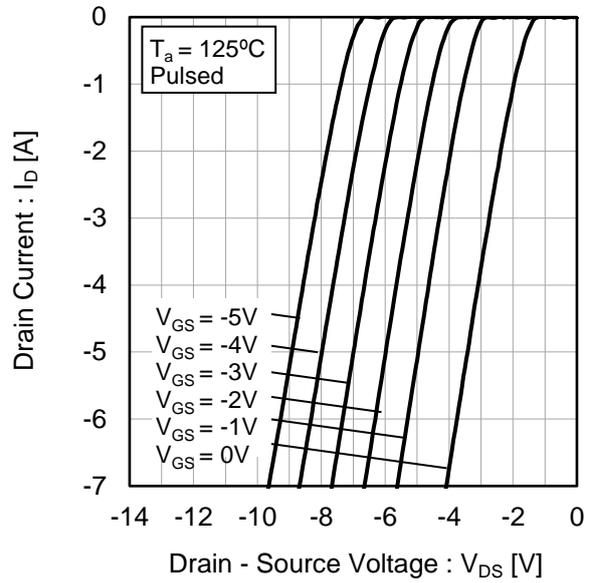


Fig.11 Typical Capacitance vs. Drain - Source Voltage

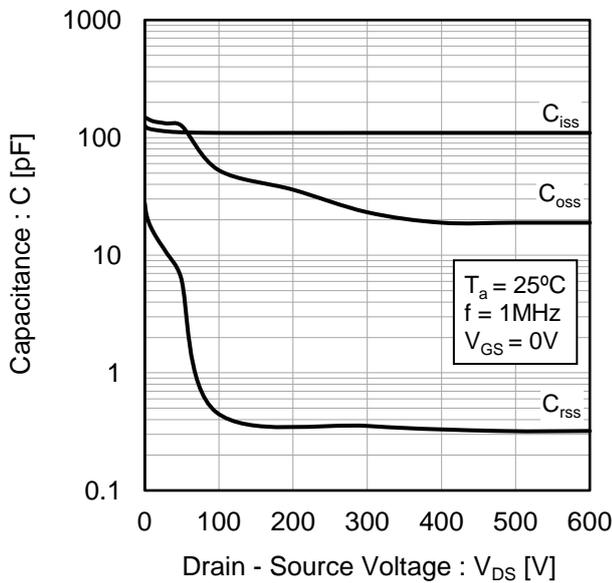
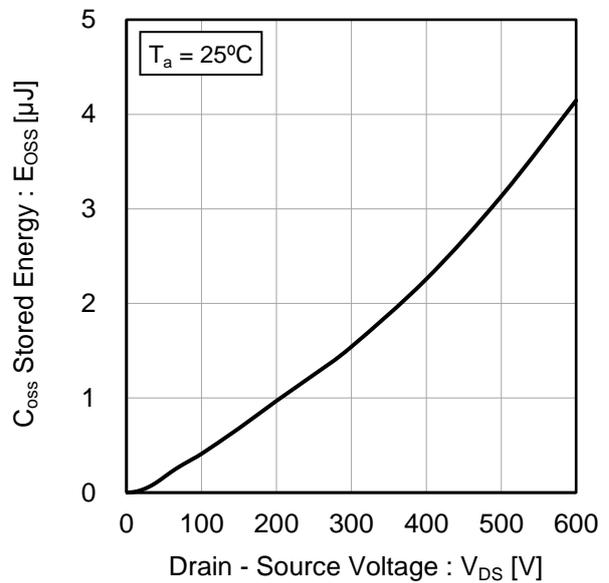
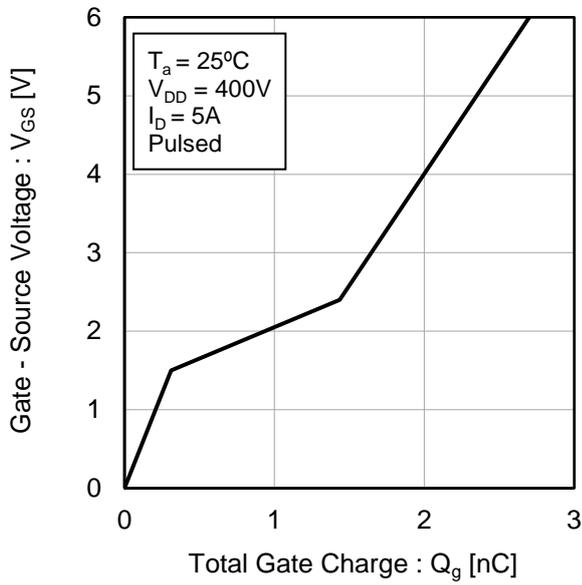


Fig.12  $C_{oss}$  Stored Energy

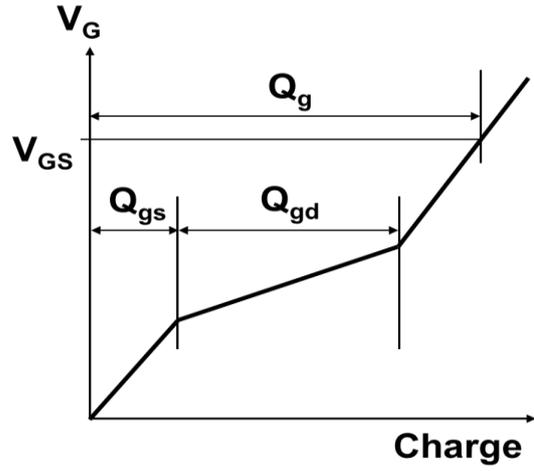


●Electrical characteristic curves

Fig.13 Dynamic Input Characteristics



\*Gate Charge Waveform



● Measurement circuits and waveforms

Fig.1-1 Gate Charge Measurement Circuit

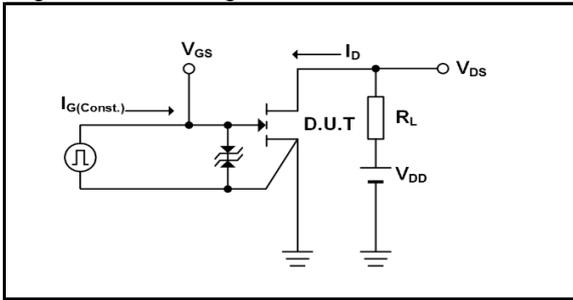


Fig.2-1 Switching Characteristics Measurement Circuit

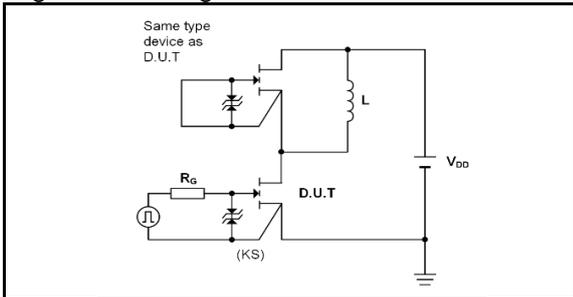


Fig.2-2 Waveforms for Switching Time

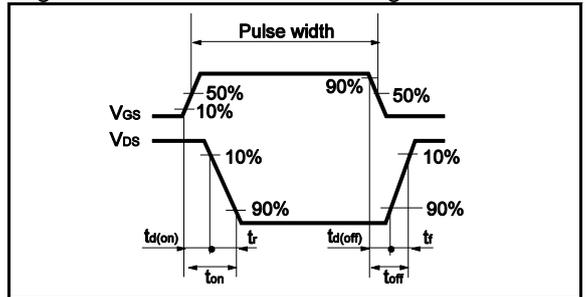
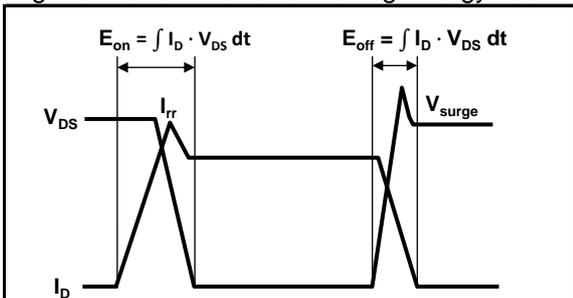


Fig.2-3 Waveforms for Switching Energy Loss



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JAPAN	USA	EU	CHINA
CLASS III	CLASS III	CLASS II b	CLASS III
CLASS IV		CLASS III	

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  - Use of our Products in places where the Products are exposed to static electricity or electromagnetic waves
  - Use of our Products in proximity to heat-producing components, plastic cords, or other flammable items
  - Sealing or coating our Products with resin or other coating materials
  - 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
  - Use of the Products in places subject to dew condensation
- The Products are not subject to radiation-proof design.
- Please verify and confirm characteristics of the final or mounted products in using the Products.
- 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.
- 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.
- Confirm that operation temperature is within the specified range described in the product specification.
- 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

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

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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<sub>2</sub>, H<sub>2</sub>S, NH<sub>3</sub>, SO<sub>2</sub>, and NO<sub>2</sub>
  - [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.

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