

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

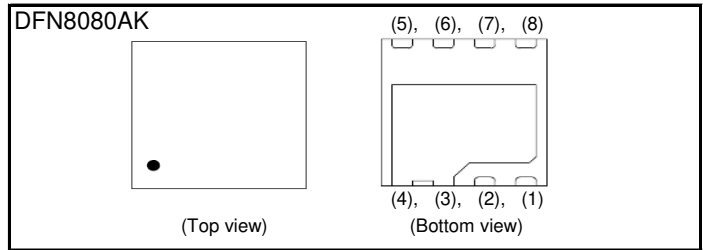
### ●Features

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

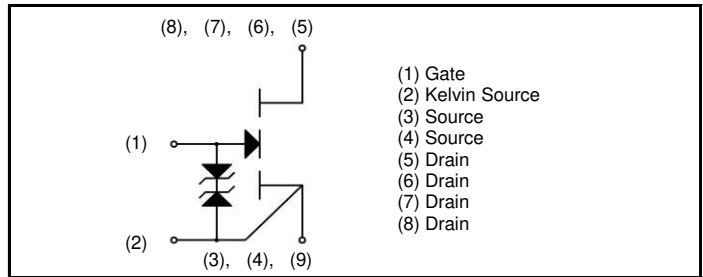
### ●Application

- 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              | $I_D$ <sup>*1</sup>                | $T_c = 25^\circ C$  | 11         | A |
|                                       |                                    | $T_c = 125^\circ C$ | 5          | A |
| Pulse Drain current                   | $I_{D,pulse}$ <sup>*1*2</sup>      | $T_c = 25^\circ C$  | 35         | A |
|                                       |                                    | $T_c = 125^\circ C$ | 17         | A |
| Drain - Source Voltage                | $V_{DSS}$                          | 650                 | V          |   |
| Transient Drain - Source Voltage      | $V_{DSS(transient)}$ <sup>*3</sup> | 750                 | V          |   |
| Gate - Source voltage (DC)            | $V_{GSS}$                          | -10 to +6           | V          |   |
| Transient Gate - Source voltage       | $V_{GSS(transient)}$ <sup>*4</sup> | 8.5                 | V          |   |
| Power dissipation( $T_c=25^\circ C$ ) | $P_{tot}$                          | 62.5                | 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            | $V_{(BR)DSS}$     | $V_{GS} = 0V$<br>$T_j = 25^\circ\text{C}$  | 650    | -          | -        | V             |
| Zero Gate voltage Drain current             | $I_{DSS}$         | $V_{GS} = 0V, V_{DS}=650V$<br>$T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$  | -<br>- | 1<br>90    | 100<br>- | $\mu\text{A}$ |
| 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 | $R_{DS(on)}^{*5}$ | $V_{GS} = 5.0V, I_D = 1.9A$<br>$T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | -<br>- | 155<br>388 | 202<br>- | $m\Omega$     |
|   |                   | $V_{GS} = 5.5V, I_D = 1.9A$<br>$T_j = 25^\circ\text{C}$<br>$T_j = 150^\circ\text{C}$ | -<br>- | 150<br>375 | 195<br>- | $m\Omega$     |
| 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    | $R_{thJC}$        | -      | 2.0  | -    | $^\circ\text{C/W}$ |
| 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<br>V <sub>DS</sub> = 0V to 400V | -      | 29   | -    | pF   |
| Effective output capacitance, time related   | C <sub>o(tr)</sub>                | V <sub>GS</sub> = 0V<br>V <sub>DS</sub> = 0V to 400V | -      | 47   | -    | pF   |
| Output charge                                | Q <sub>oss</sub>                  | V <sub>GS</sub> = 0V<br>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<br>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<br>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

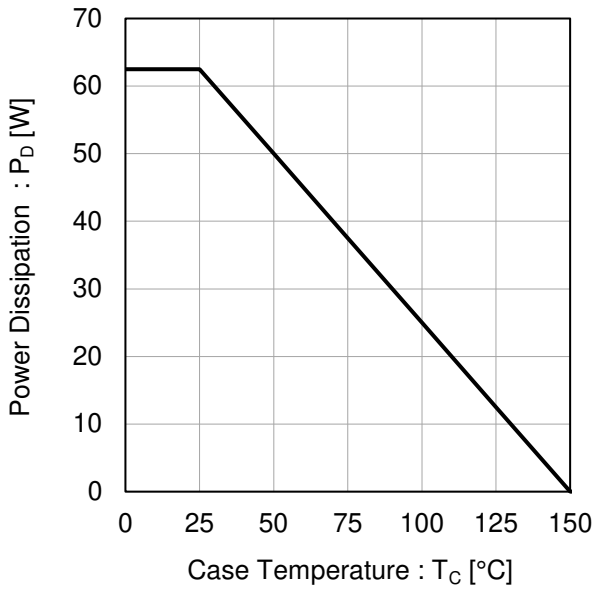


Fig.2 Normalized Transient Thermal Resistance vs. Pulse Width

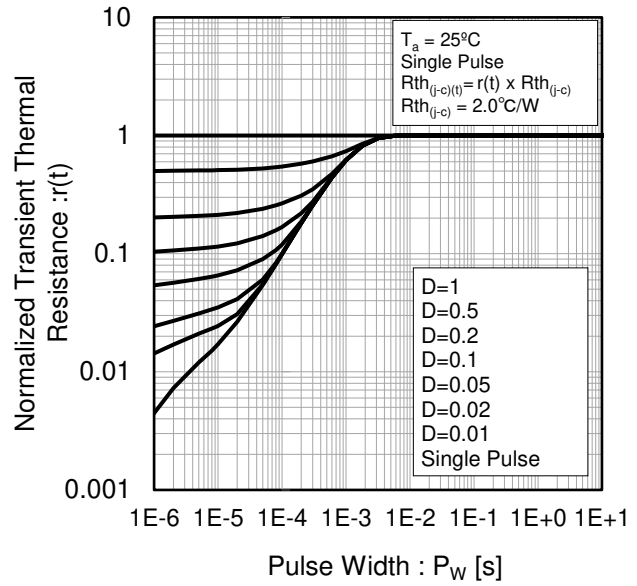


Fig.3 Maximum Safe Operating Area (Ta=25°C)

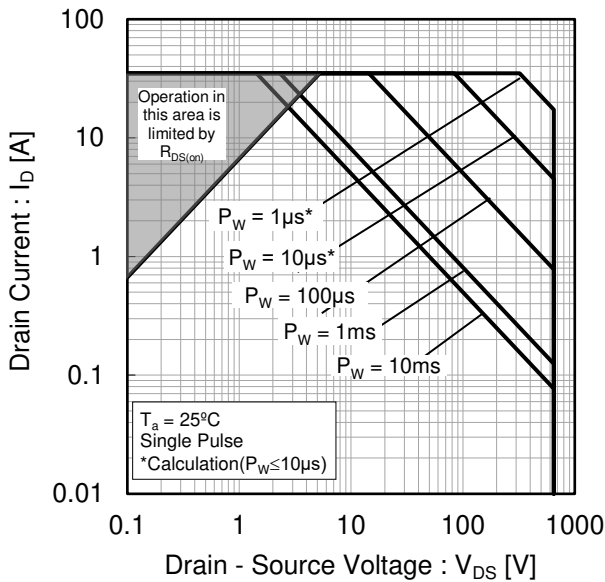
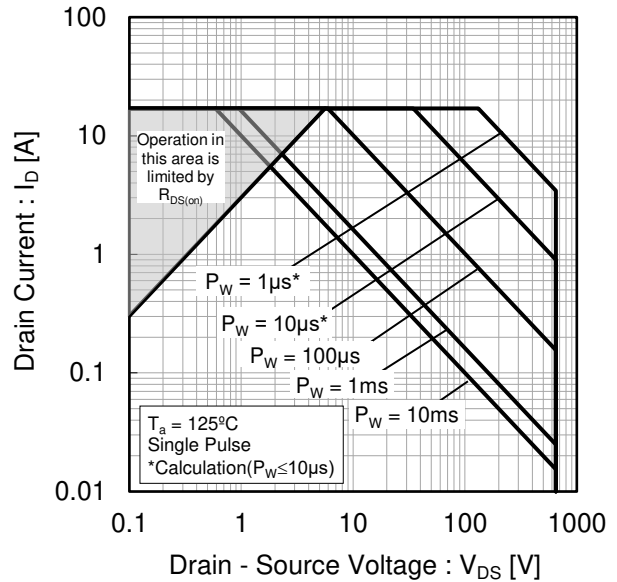


Fig.4 Maximum Safe Operating Area (Ta=125°C)



●Electrical characteristic curves

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

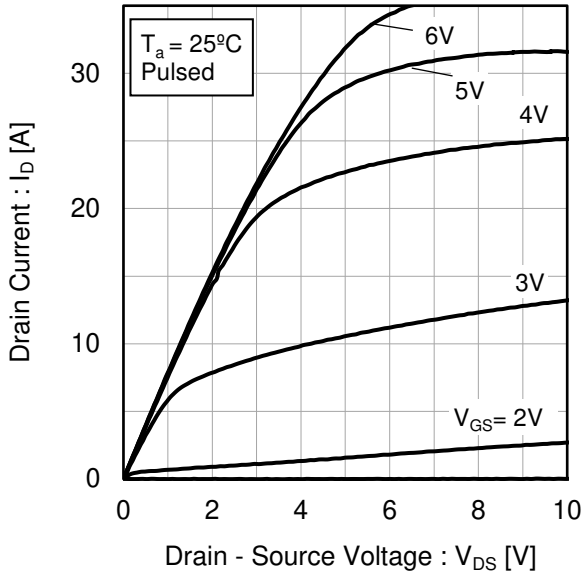


Fig.6  $T_j = 125^\circ\text{C}$  Typical Output Characteristics

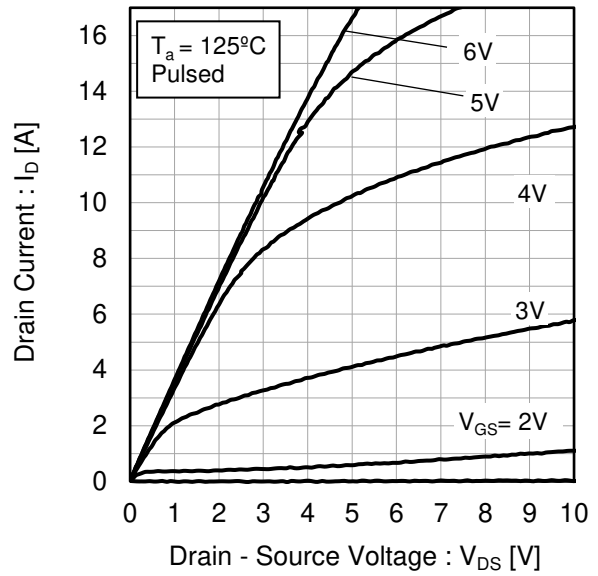


Fig.7 Typical Transfer Characteristics

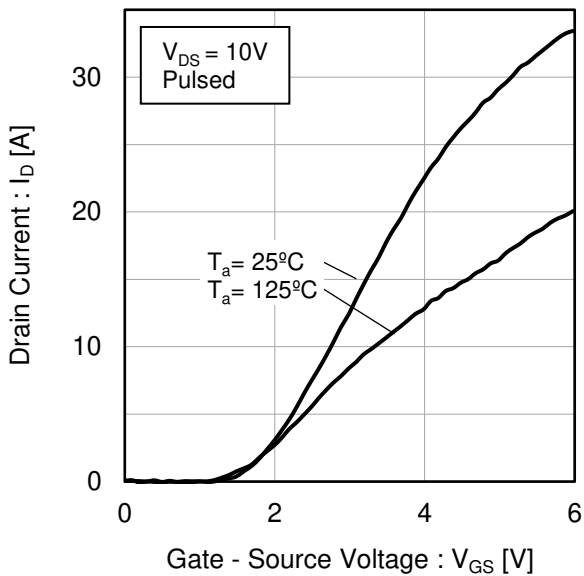
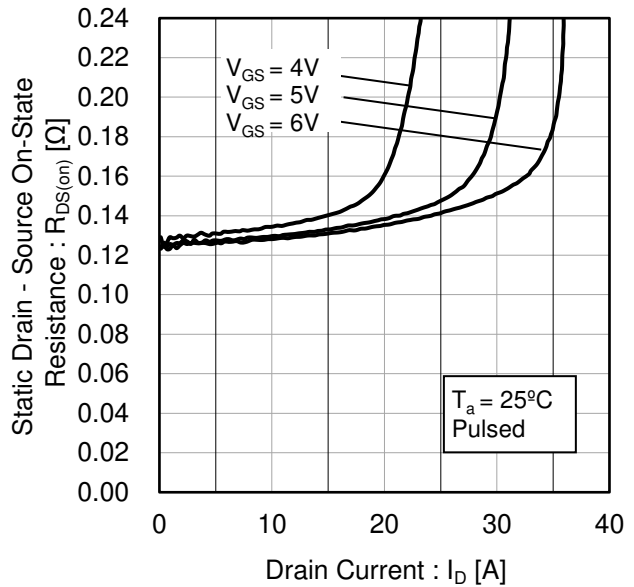


Fig.8 Static Drain - Source On - State Resistance vs. Drain - Source Current



●Electrical characteristic curves

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

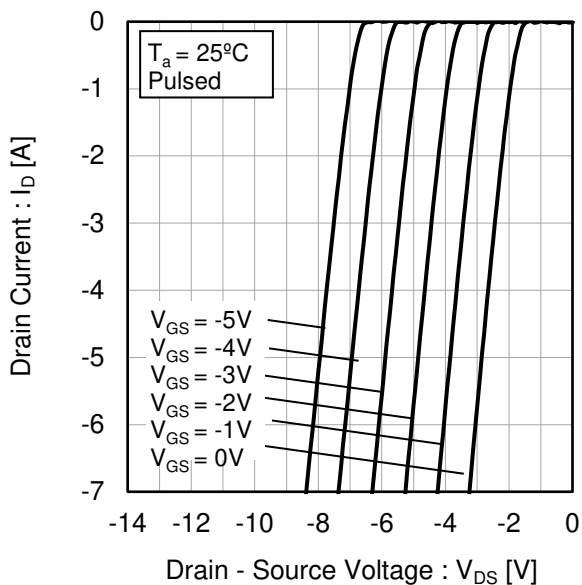


Fig.10  $T_j = 125^\circ\text{C}$  3rd Quadrant Characteristics

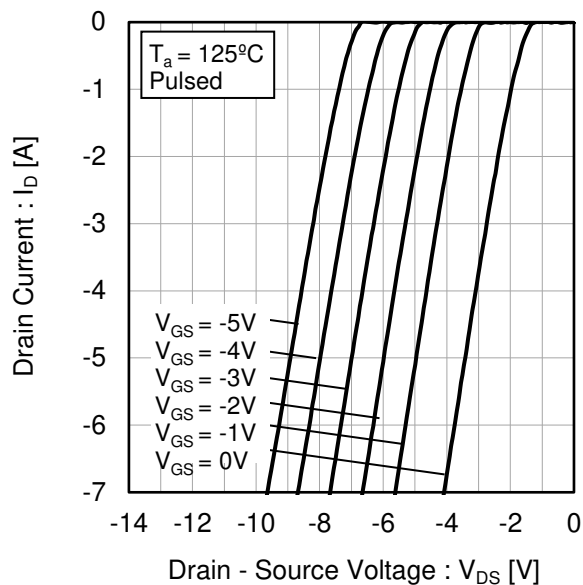


Fig.11 Typical Capacitance vs. Drain - Source Voltage

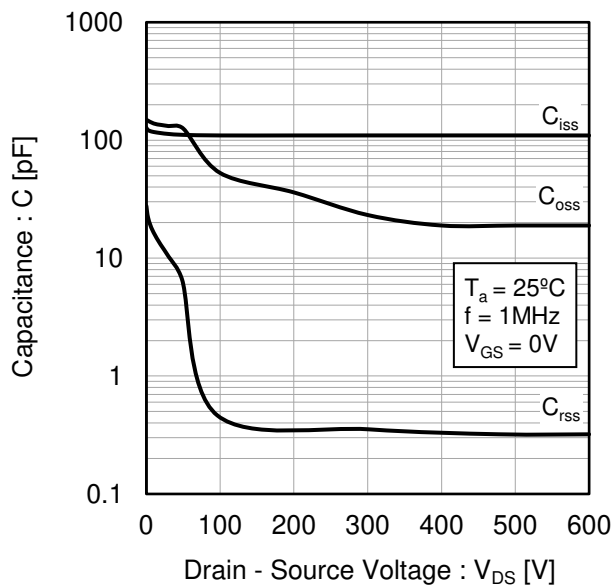
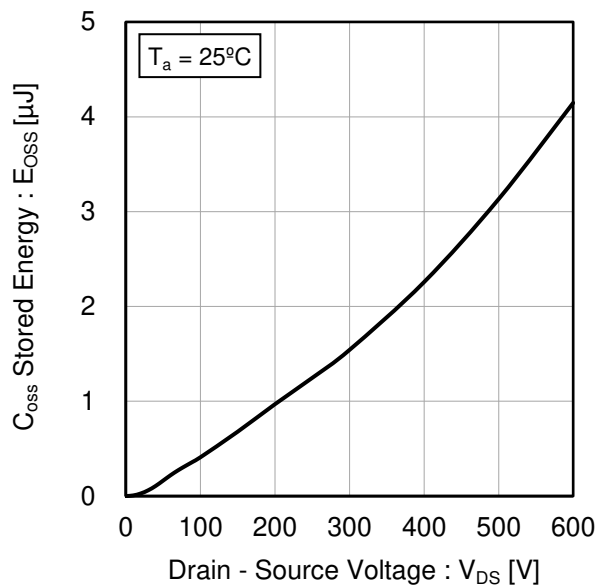
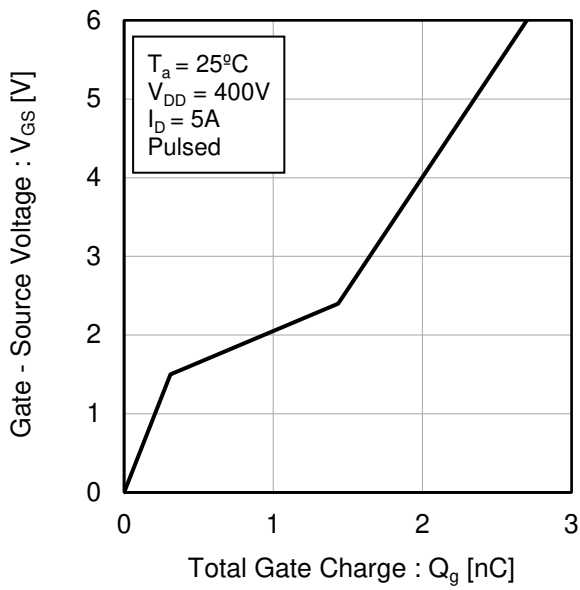


Fig.12  $C_{oss}$  Stored Energy

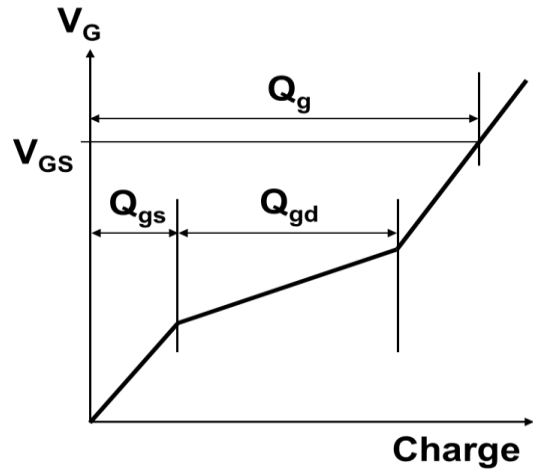


●Electrical characteristic curves

Fig.13 Dynamic Input Characteristics



\*Gate Charge Waveform





● Measurement circuits and waveforms

Fig.1-1 Gate Charge Measurement Circuit

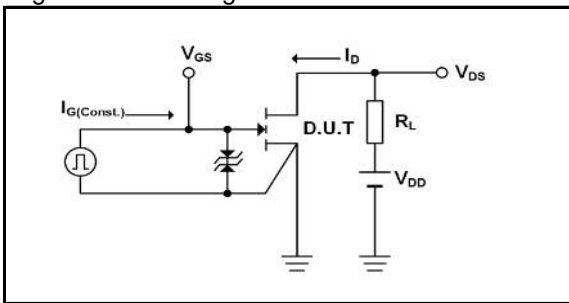


Fig.2-1 Switching Characteristics Measurement Circuit

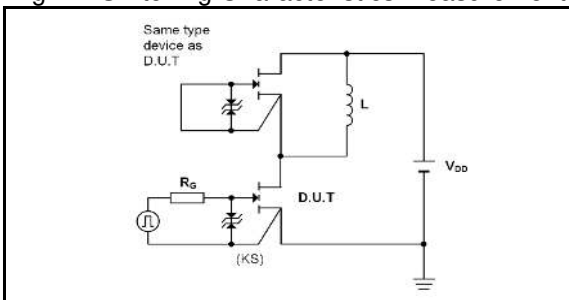


Fig.2-2 Waveforms for Switching Time

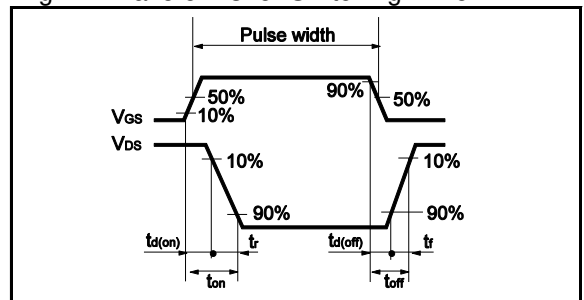
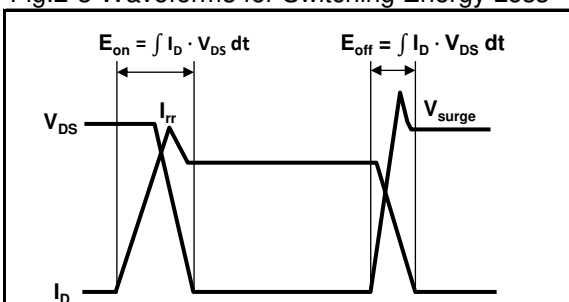


Fig.2-3 Waveforms for Switching Energy Loss



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  - Use of the Products in places subject to dew condensation
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- 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.
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- Confirm that operation temperature is within the specified range described in the product specification.
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  - [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.
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