

|                     |       |
|---------------------|-------|
| $V_{DSS}$           | 1200V |
| $R_{DS(on)}$ (Typ.) | 80mΩ  |
| $I_D$               | 40A   |
| $P_D$               | 262W  |

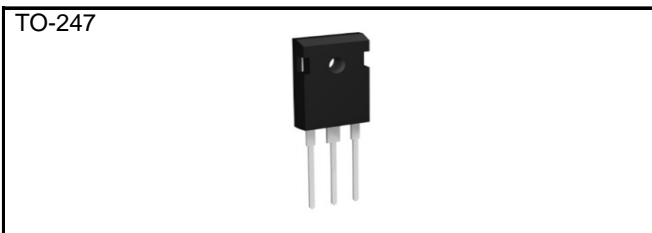
#### ●Features

- 1) Low on-resistance
- 2) Fast switching speed
- 3) Fast reverse recovery
- 4) Low  $V_{SD}$
- 5) Easy to parallel
- 6) Simple to drive
- 7) Pb-free lead plating ; RoHS compliant

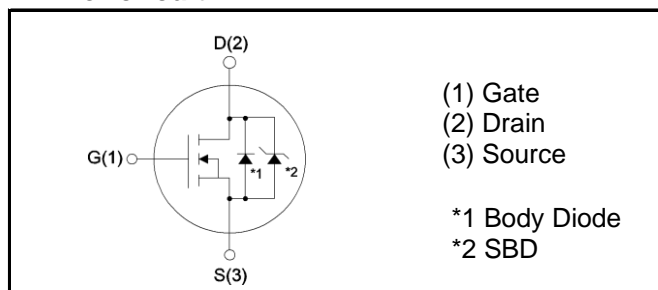
#### ●Application

- Solar inverters
- DC/DC converters
- Induction heating
- Motor drives

#### ●Outline



#### ●Inner circuit



#### ●Packaging specifications

| Type | Packing                   | Tube      |
|------|---------------------------|-----------|
|      | Reel size (mm)            | -         |
|      | Tape width (mm)           | -         |
|      | Basic ordering unit (pcs) | 30        |
|      | Packing code              | C         |
|      | Marking                   | SCH2080KE |

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

| Parameter  | Symbol                    | Value       | Unit             |
|--|---------------------------|-------------|------------------|
| Drain - Source voltage                                       | $V_{DSS}$                 | 1200        | V                |
| Continuous drain current                                     | $T_c = 25^\circ\text{C}$  | $I_D^{*1}$  | 40<br>A          |
|  | $T_c = 100^\circ\text{C}$ | $I_D^{*1}$  | 28<br>A          |
| Pulsed drain current   | $I_{D,pulse}^{*2}$        | 80          | A                |
| Gate - Source voltage (DC)                                   | $V_{GSS}$                 | -6 to 22    | V                |
| Gate - Source surge voltage ( $T_{surge} < 300\text{nsec}$ ) | $V_{GSS-surge}^{*3}$      | -10 to 26   | V                |
| Power dissipation ( $T_c = 25^\circ\text{C}$ )               | $P_D$                     | 262         | W                |
| Junction temperature   | $T_j$                     | 175         | $^\circ\text{C}$ |
| Range of storage temperature                                 | $T_{stg}$                 | -55 to +175 | $^\circ\text{C}$ |

### ● Thermal resistance

| Parameter                           | Symbol     | Values |      |      | Unit |
|-------------------------------------|------------|--------|------|------|------|
|                                     |            | Min.   | Typ. | Max. |      |
| Thermal resistance, junction - case | $R_{thJC}$ | -      | 0.44 | 0.57 | °C/W |

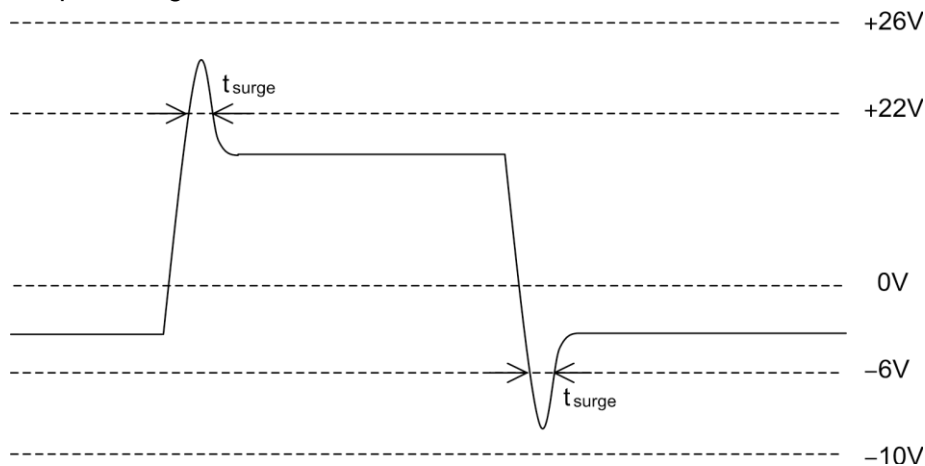
### ● Electrical characteristics ( $T_a = 25^\circ\text{C}$ )

| Parameter                        | Symbol        | Conditions  | Values |      |      | Unit          |
|----------------------------------|---------------|---|--------|------|------|---------------|
|                                  |               |   | Min.   | Typ. | Max. |               |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{V}, I_D = 1\text{mA}$                                  | 1200   | -    | -    | V             |
| Zero gate voltage drain current  | $I_{DSS}$     | $V_{DS} = 1200\text{V}, V_{GS} = 0\text{V}$<br>$T_j = 25^\circ\text{C}$ | -      | 20   | 400  | $\mu\text{A}$ |
|                                  |               | $T_j = 150^\circ\text{C}$   | -      | 170  | -    |               |
| Gate - Source leakage current    | $I_{GSS+}$    | $V_{GS} = +22\text{V}, V_{DS} = 0\text{V}$                              | -      | -    | 100  | nA            |
| Gate - Source leakage current    | $I_{GSS-}$    | $V_{GS} = -6\text{V}, V_{DS} = 0\text{V}$                               | -      | -    | -100 | nA            |
| Gate threshold voltage           | $V_{GS(th)}$  | $V_{DS} = V_{GS}, I_D = 4.4\text{mA}$                                   | 1.6    | 2.8  | 4.0  | V             |

\*1 Limited only by maximum temperature allowed.

\*2  $PW \leq 10\mu\text{s}$ , Duty cycle  $\leq 1\%$

\*3 Example of acceptable Vgs waveform



\*4 Pulsed

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

| Parameter                                   | Symbol                            | Conditions   | Values |           |          | Unit |
|---|-----------------------------------|--|--------|-----------|----------|------|
|   |                                   |  | Min.   | Typ.      | Max.     |      |
| Static drain - source on - state resistance | R <sub>DS(on)</sub> <sup>*4</sup> | V <sub>GS</sub> = 18V, I <sub>D</sub> = 10A<br>T <sub>j</sub> = 25°C<br>T <sub>j</sub> = 125°C | -      | 80<br>125 | 117<br>- | mΩ   |
| Gate input resistance                       | R <sub>G</sub>                    | f = 1MHz, open drain   | -      | 6.3       | -        | Ω    |
| Transconductance                            | g <sub>fs</sub> <sup>*4</sup>     | V <sub>DS</sub> = 10V, I <sub>D</sub> = 10A  | -      | 3.7       | -        | S    |
| Input capacitance                           | C <sub>iss</sub>                  | V <sub>GS</sub> = 0V   | -      | 1850      | -        | pF   |
| Output capacitance                          | C <sub>oss</sub>                  | V <sub>DS</sub> = 800V   | -      | 175       | -        |      |
| Reverse transfer capacitance                | C <sub>rss</sub>                  | f = 1MHz   | -      | 20        | -        |      |
| Turn - on delay time                        | t <sub>d(on)</sub> <sup>*4</sup>  | V <sub>DD</sub> = 400V, V <sub>GS</sub> = 18V  | -      | 37        | -        | ns   |
| Rise time                                   | t <sub>r</sub> <sup>*4</sup>      | I <sub>D</sub> = 10A   | -      | 33        | -        |      |
| Turn - off delay time                       | t <sub>d(off)</sub> <sup>*4</sup> | R <sub>L</sub> = 40Ω   | -      | 70        | -        |      |
| Fall time                                   | t <sub>f</sub> <sup>*4</sup>      | R <sub>G</sub> = 0Ω  | -      | 28        | -        |      |
| Turn - on switching loss                    | E <sub>on</sub> <sup>*4</sup>     | V <sub>DD</sub> = 600V, I <sub>D</sub> = 10A<br>V <sub>GS</sub> = 18V/0V                       | -      | 218       | -        | μJ   |
| Turn - off switching loss                   | E <sub>off</sub> <sup>*4</sup>    | R <sub>G</sub> = 0Ω, L = 500μH<br>*E <sub>on</sub> includes diode reverse recovery             | -      | 64        | -        |      |

**●Gate Charge characteristics (T<sub>a</sub> = 25°C)**

| Parameter            | Symbol                        | Conditions                                   | Values |      |      | Unit |
|----------------------|-------------------------------|--|--------|------|------|------|
|                      |                               |  | Min.   | Typ. | Max. |      |
| Total gate charge    | Q <sub>g</sub> <sup>*4</sup>  | V <sub>DD</sub> = 400V                       | -      | 106  | -    | nC   |
| Gate - Source charge | Q <sub>gs</sub> <sup>*4</sup> | I <sub>D</sub> = 10A                         | -      | 27   | -    |      |
| Gate - Drain charge  | Q <sub>gd</sub> <sup>*4</sup> | V <sub>GS</sub> = 18V                        | -      | 31   | -    |      |
| Gate plateau voltage | V <sub>(plateau)</sub>        | V <sub>DD</sub> = 400V, I <sub>D</sub> = 10A | -      | 9.7  | -    | V    |

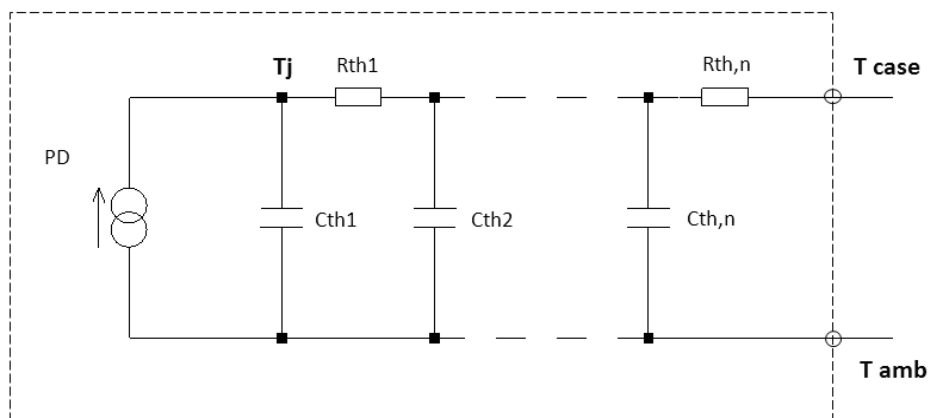
**●Internal diode electrical characteristics (Source-Drain) ( $T_a = 25^\circ\text{C}$ )**

| Parameter                                 | Symbol         | Conditions   | Values |      |      | Unit |
|---|----------------|--|--------|------|------|------|
|   |                |  | Min.   | Typ. | Max. |      |
| Inverse diode continuous, forward current | $I_S^{*1}$     | $T_c = 25^\circ\text{C}$   | -      | -    | 40   | A    |
| Inverse diode direct current, pulsed      | $I_{SM}^{*2}$  |  | -      | -    | 80   | A    |
| Forward voltage                           | $V_{SD}^{*4}$  | $V_{GS} = 0\text{V}, I_S = 10\text{A}$                                     | -      | 1.3  | -    | V    |
| Reverse recovery time                     | $t_{rr}^{*4}$  | $I_F = 10\text{A}, V_R = 400\text{V}$<br>$di/dt = 150\text{A}/\mu\text{s}$ | -      | 37   | -    | ns   |
| Reverse recovery charge                   | $Q_{rr}^{*4}$  |  | -      | 60   | -    | nC   |
| Peak reverse recovery current             | $I_{rrm}^{*4}$ |  | -      | 2.4  | -    | A    |

**●Typical Transient Thermal Characteristics**

| Symbol    | Value | Unit |
|-----------|-------|------|
| $R_{th1}$ | 0.078 | K/W  |
| $R_{th2}$ | 0.197 |      |
| $R_{th3}$ | 0.162 |      |

| Symbol    | Value | Unit |
|-----------|-------|------|
| $C_{th1}$ | 0.005 | Ws/K |
| $C_{th2}$ | 0.018 |      |
| $C_{th3}$ | 0.249 |      |



●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

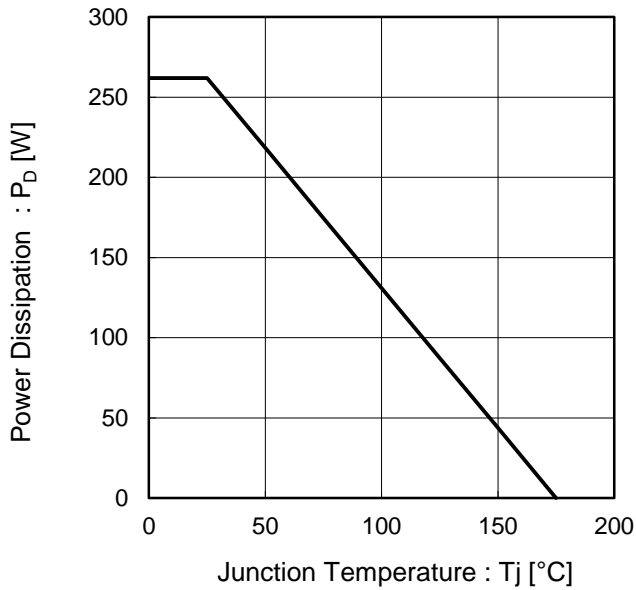


Fig.2 Maximum Safe Operating Area

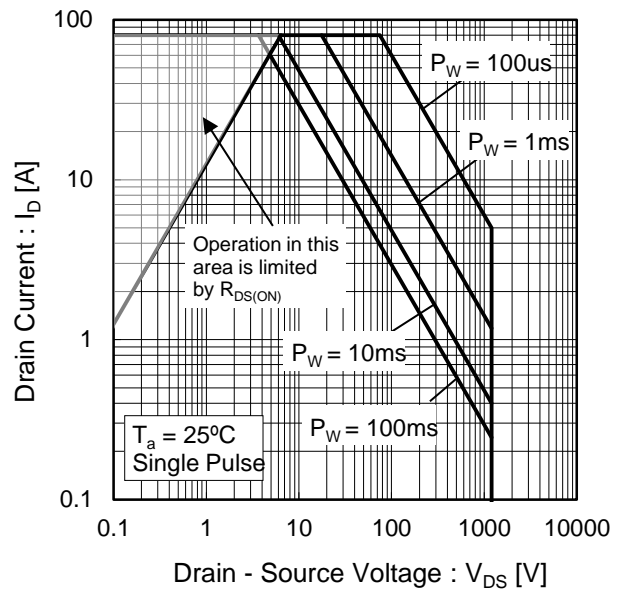
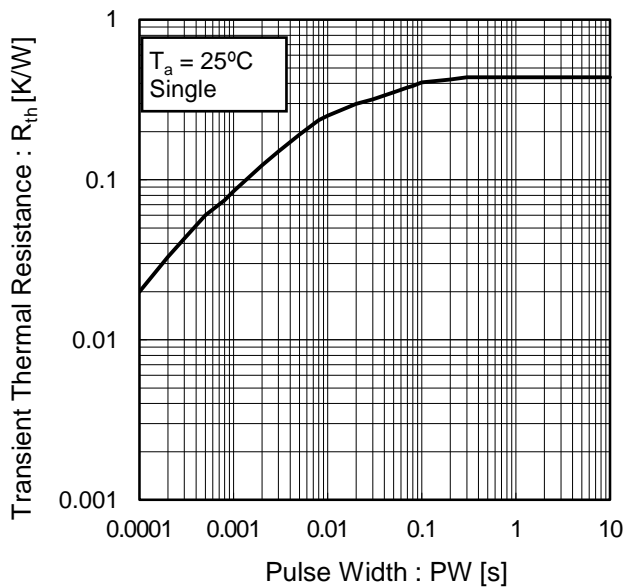


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

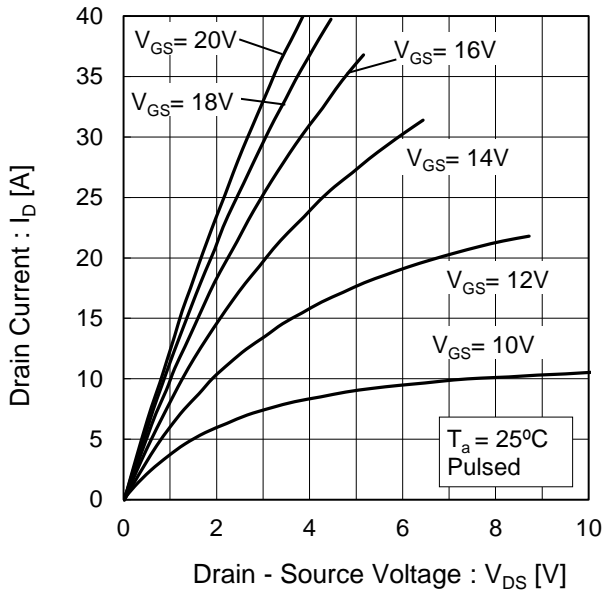


Fig.5 Typical Output Characteristics(II)

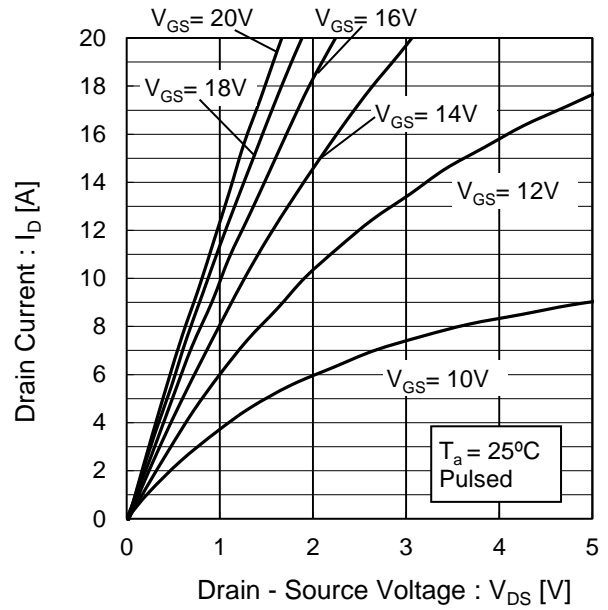


Fig.6 Typical Output Characteristics(I)

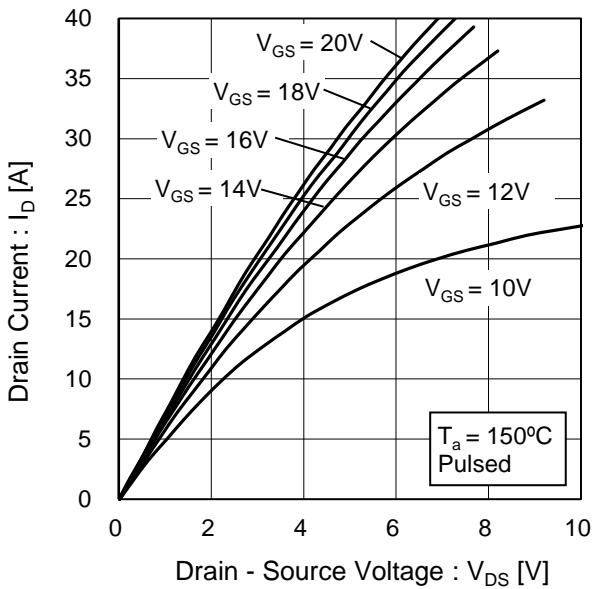
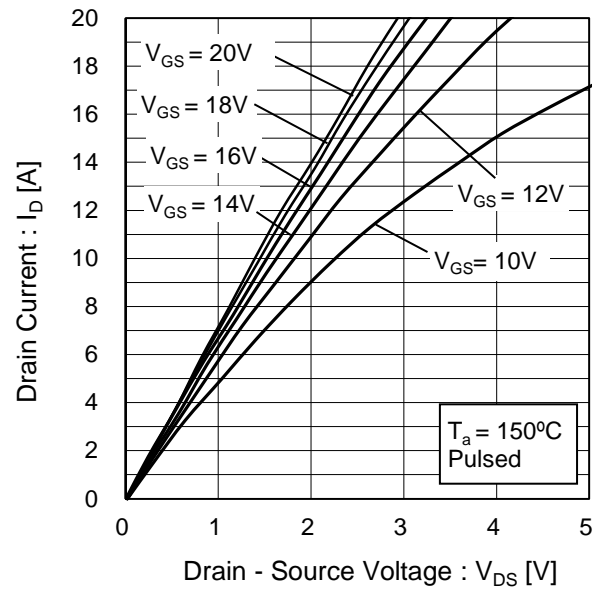


Fig.7 Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics

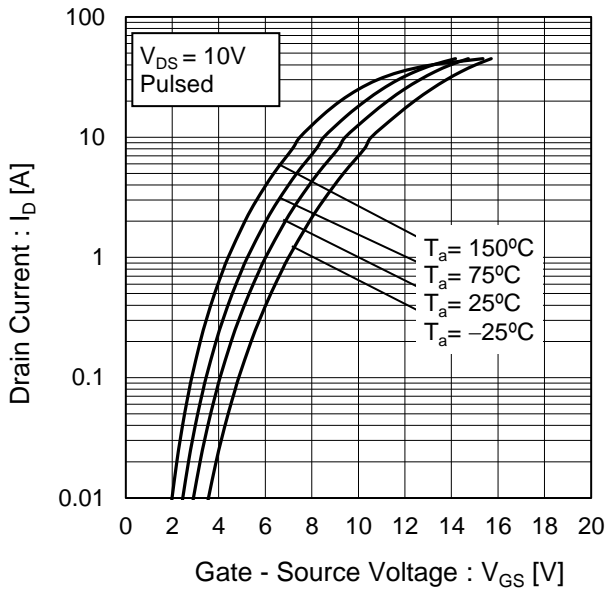


Fig.9 Typical Transfer Characteristics (II)

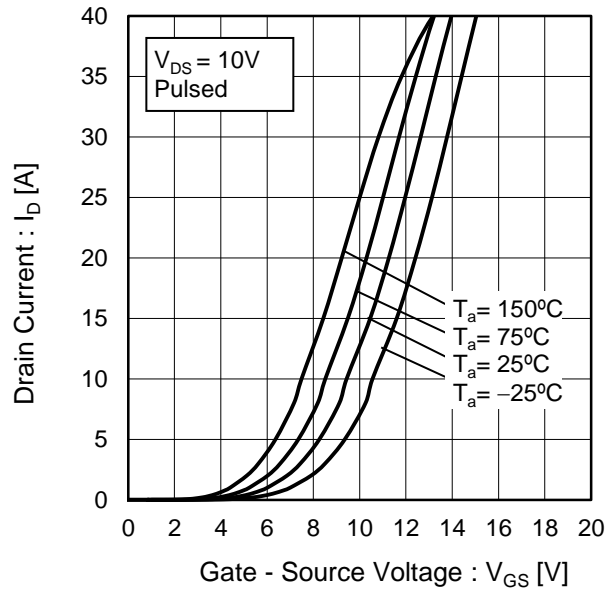


Fig.10 Gate Threshold Voltage vs. Junction Temperature

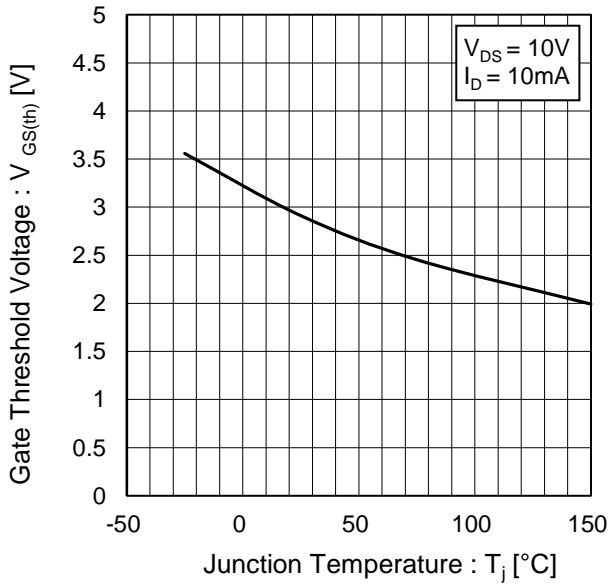
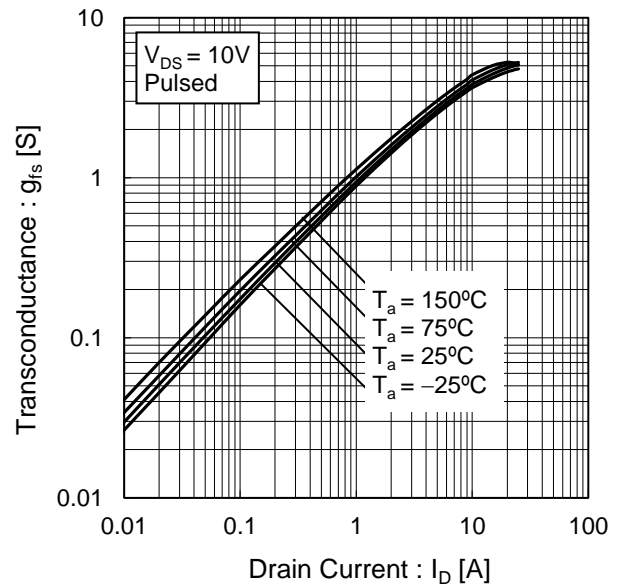


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

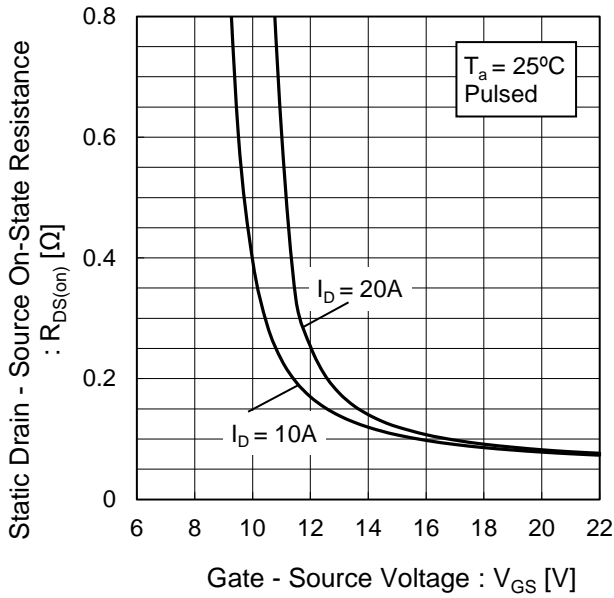


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

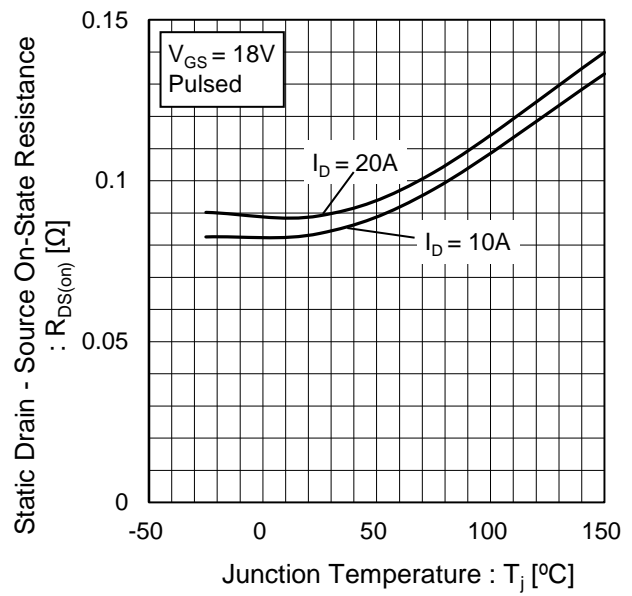
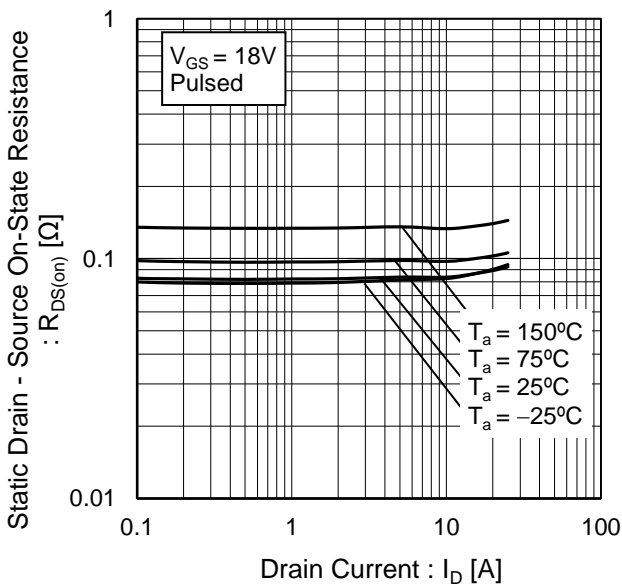


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current





●Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

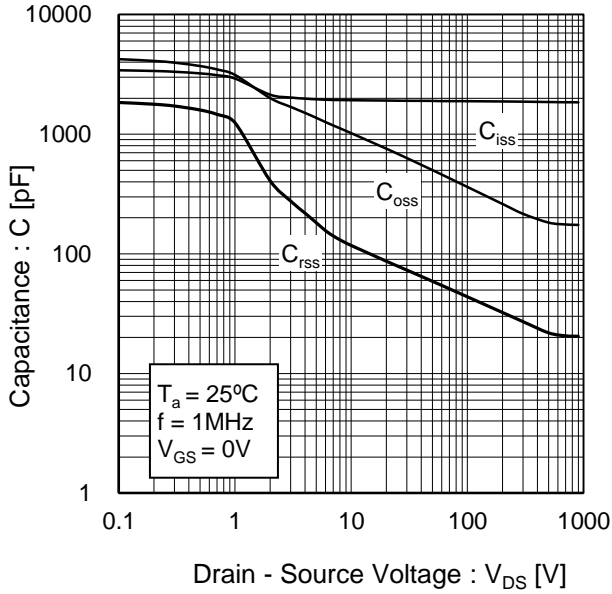


Fig.16 Coss Stored Energy

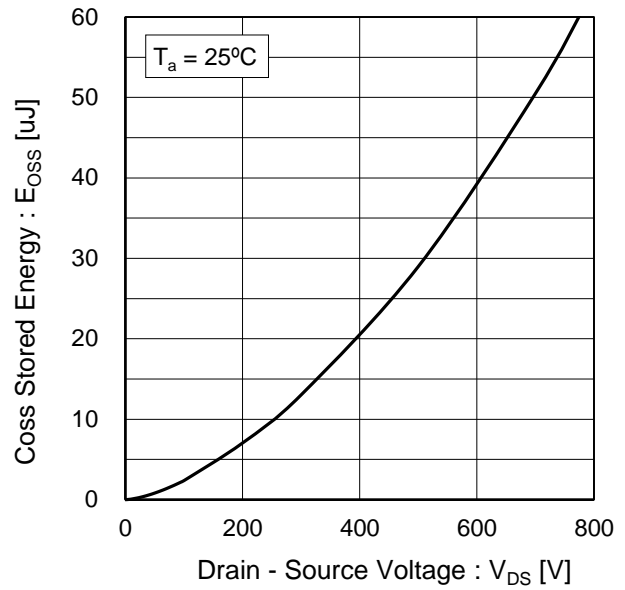


Fig.17 Switching Characteristics

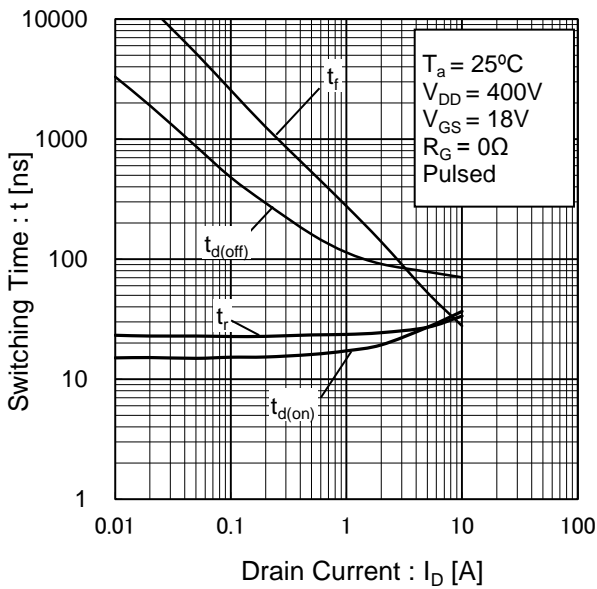
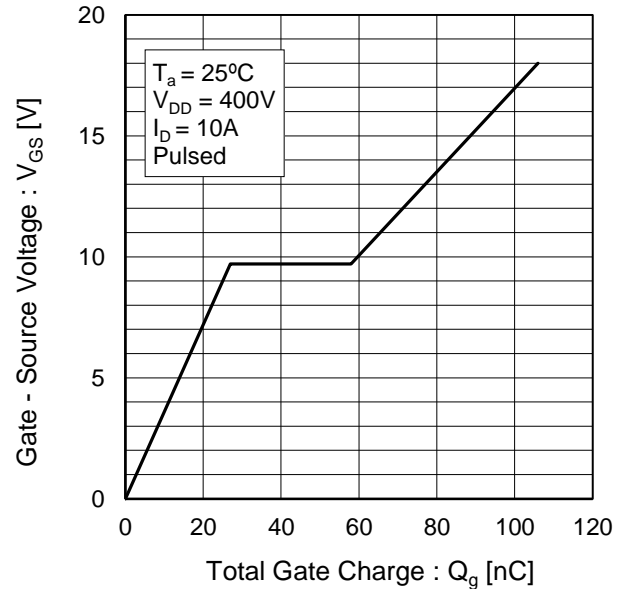


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

Fig.19 Typical Switching Loss vs. Drain - Source Voltage

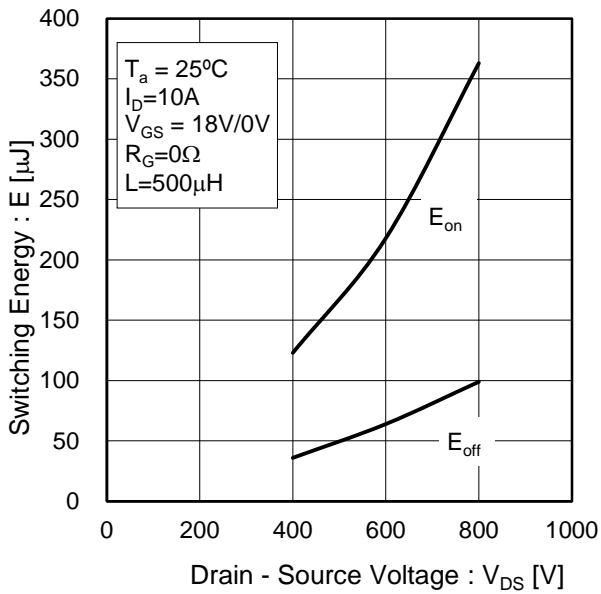


Fig.20 Typical Switching Loss vs. Drain Current

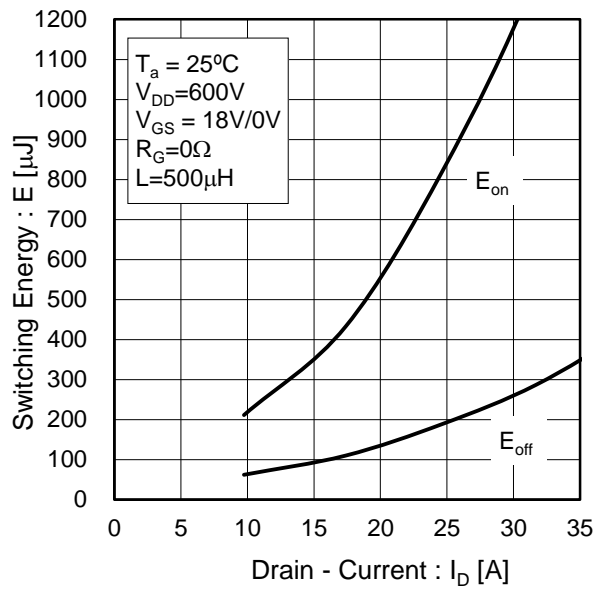
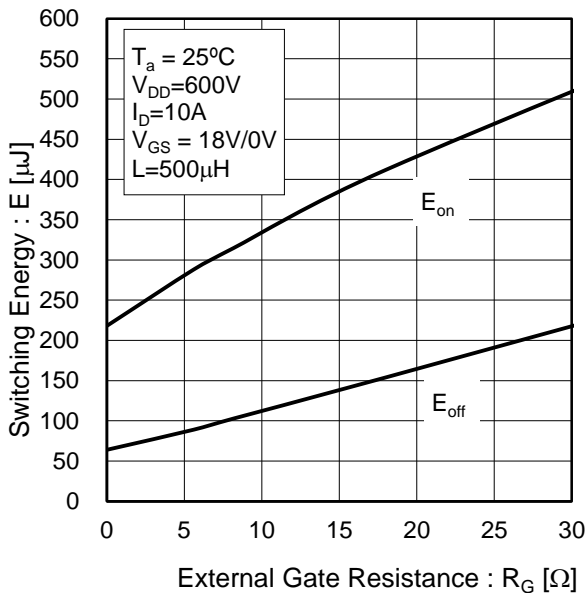


Fig.21 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

Fig.22 Inverse Diode Forward Current vs. Source - Drain Voltage

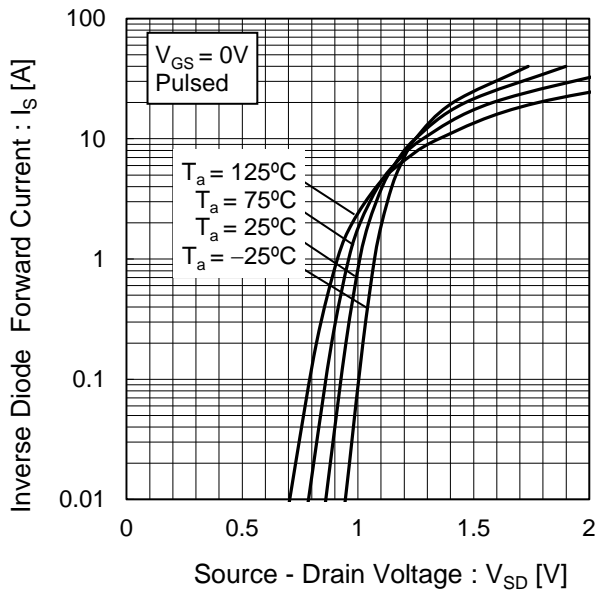
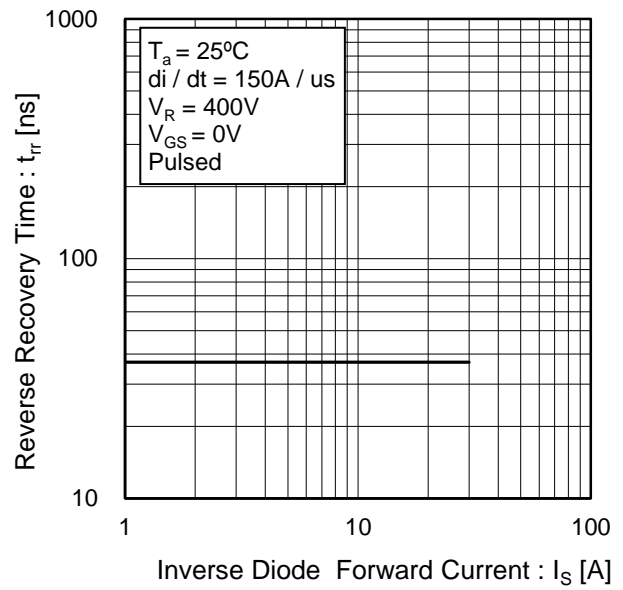


Fig.23 Reverse Recovery Time vs. Inverse Diode Forward Current



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

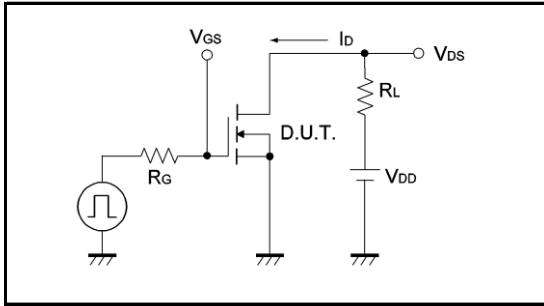


Fig.1-2 Switching Waveforms

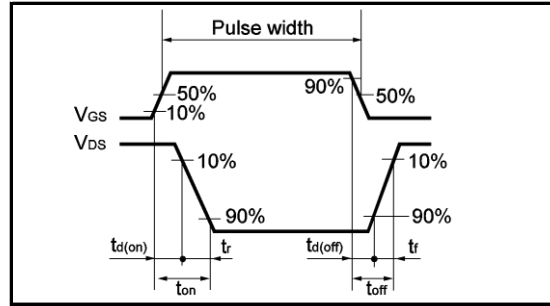


Fig.2-1 Gate Charge Measurement Circuit

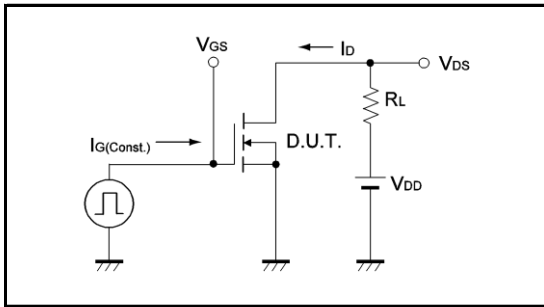


Fig.2-2 Gate Charge Waveform

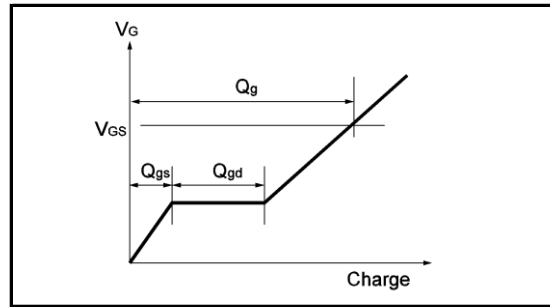


Fig.3-1 Switching Energy Measurement Circuit

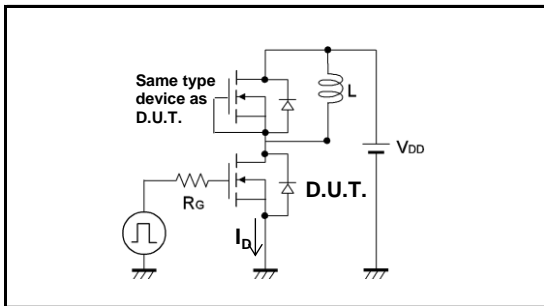


Fig.3-2 Switching Waveforms

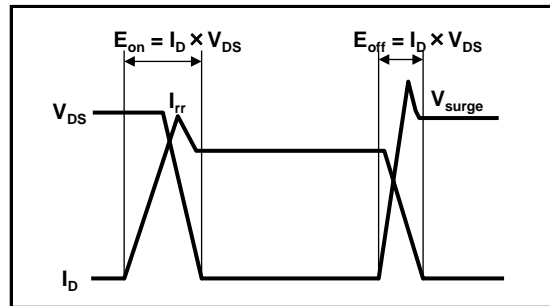


Fig.4-1 Reverse Recovery Time Measurement Circuit

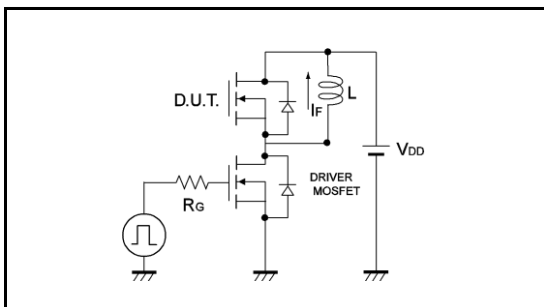
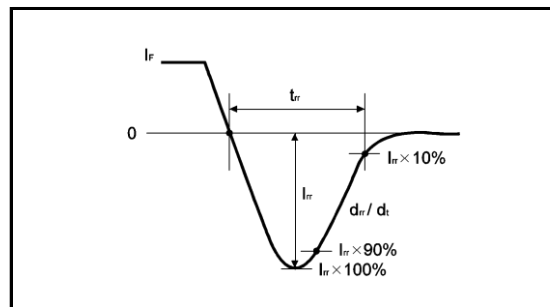


Fig.4-2 Reverse Recovery Waveform



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