

| | |
|---------------------|-------|
| V_{DSS} | 1200V |
| $R_{DS(on)}$ (Typ.) | 160mΩ |
| I_D | 22A |
| P_D | 165W |

●Features

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

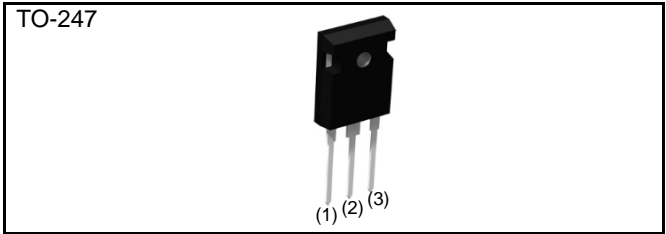
●Application

- Solar inverters
- DC/DC converters
- Switch mode power supplies
- Induction heating
- Motor drives

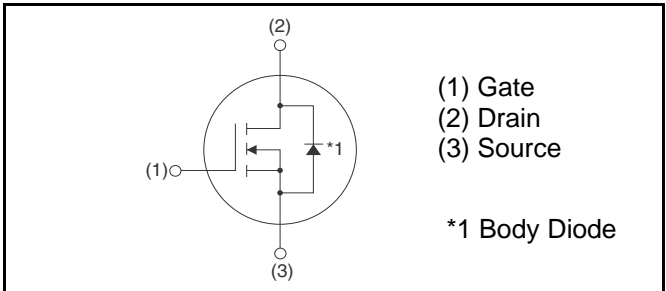
●Absolute maximum ratings (Ta = 25°C)

| Parameter | | Symbol | Value | Unit |
|--------------------------------------------------------------|---------------------------|----------------------|-------------|------|
| Drain - Source voltage | | V_{DSS} | 1200 | V |
| Continuous drain current | $T_c = 25^\circ\text{C}$ | I_D^{*1} | 22 | A |
| | $T_c = 100^\circ\text{C}$ | I_D^{*1} | 16 | A |
| Pulsed drain current | | $I_{D,pulse}^{*2}$ | 55 | 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 | 165 | W |
| Junction temperature | | T_j | 175 | °C |
| Range of storage temperature | | T_{stg} | -55 to +175 | °C |

●Outline



●Inner circuit



●Packaging specifications

| Type | Packaging | Tube |
|------|---------------------------|-----------|
| | Reel size (mm) | - |
| | Tape width (mm) | - |
| | Basic ordering unit (pcs) | 30 |
| | Packing code | C |
| | Marking | SCT2160KE |

●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|----------------------------------------------|------------|--------|------|------|------|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - case | R_{thJC} | - | 0.70 | 0.91 | °C/W |
| Thermal resistance, junction - ambient | R_{thJA} | - | - | 50 | °C/W |
| Soldering temperature, wavesoldering for 10s | T_{sold} | - | - | 265 | °C |

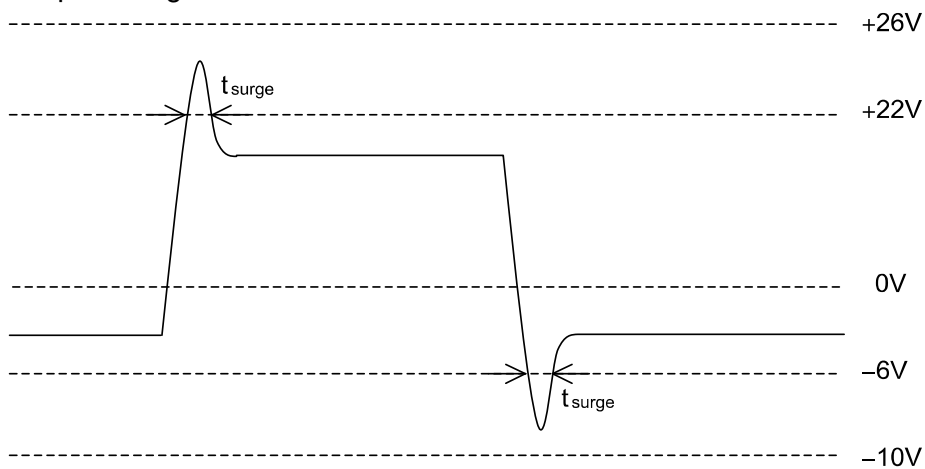
●Electrical characteristics ($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|----------------------------------|---------------|-----------------------------------------------------------|--------|------|------|---------------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 1mA$ | 1200 | - | - | V |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 1200V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$ | - | 1 | 10 | μA |
| | | $T_j = 150^\circ\text{C}$ | - | 2 | - | |
| Gate - Source leakage current | I_{GSS+} | $V_{GS} = +22V, V_{DS} = 0V$ | - | - | 100 | nA |
| Gate - Source leakage current | I_{GSS-} | $V_{GS} = -6V, V_{DS} = 0V$ | - | - | -100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = V_{GS}, I_D = 2.5mA$ | 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_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|----------------------------------------------|-----------------------------------|-----------------------------------------------------------------------------------------------|--------|------------|----------|------|
| | | | Min. | Typ. | Max. | |
| Static drain - source on - state resistance | R _{DS(on)} ^{*4} | V _{GS} = 18V, I _D = 7A T _j = 25°C T _j = 125°C | - - | 160 226 | 208 - | mΩ |
| Gate input resistance | R _G | f = 1MHz, open drain | - | 13.7 | - | Ω |
| Transconductance | g _{fs} ^{*4} | V _{DS} = 10V, I _D = 7A | - | 2.4 | - | S |
| Input capacitance | C _{iss} | V _{GS} = 0V | - | 1200 | - | pF |
| Output capacitance | C _{oss} | V _{DS} = 800V | - | 45 | - | |
| Reverse transfer capacitance | C _{rss} | f = 1MHz | - | 7 | - | |
| Effective output capacitance, energy related | C _{o(er)} | V _{GS} = 0V V _{DS} = 0V to 500V | - | 71 | - | pF |
| Turn - on delay time | t _{d(on)} ^{*4} | V _{DD} = 400V, I _D = 7A | - | 23 | - | ns |
| Rise time | t _r ^{*4} | V _{GS} = 18V/0V | - | 25 | - | |
| Turn - off delay time | t _{d(off)} ^{*4} | R _L = 57Ω | - | 67 | - | |
| Fall time | t _f ^{*4} | R _G = 0Ω | - | 27 | - | |
| Turn - on switching loss | E _{on} ^{*4} | V _{DD} = 600V, I _D = 7A V _{GS} = 18V/0V | - | 126 | - | μJ |
| Turn - off switching loss | E _{off} ^{*4} | R _G = 0Ω, L = 500μH *E _{on} includes diode reverse recovery | - | 55 | - | |

●Gate Charge characteristics (T_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|----------------------|-------------------------------|---------------------------------------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Total gate charge | Q _g ^{*4} | V _{DD} = 400V | - | 62 | - | nC |
| Gate - Source charge | Q _{gs} ^{*4} | I _D = 7A | - | 14 | - | |
| Gate - Drain charge | Q _{gd} ^{*4} | V _{GS} = 18V | - | 20 | - | |
| Gate plateau voltage | V _(plateau) | V _{DD} = 400V, I _D = 7A | - | 9.6 | - | V |

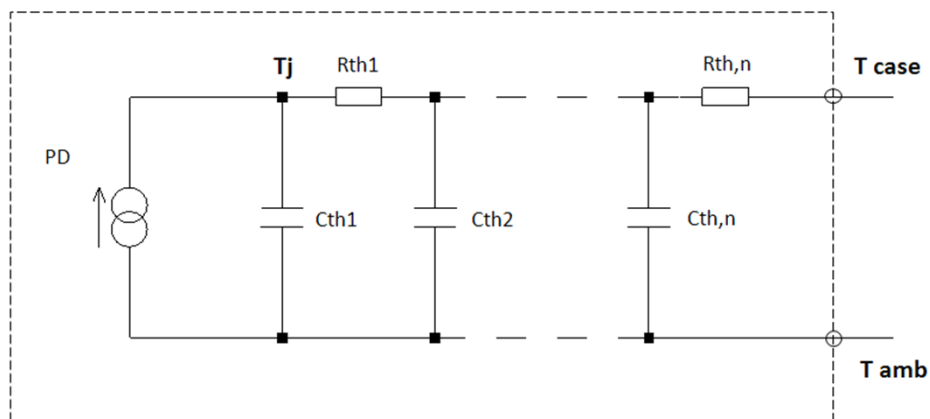
●Body diode electrical characteristics (Source-Drain) ($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|-------------------------------------------|----------------|---------------------------------------------------------------------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Inverse diode continuous, forward current | I_S^{*1} | $T_C = 25^\circ\text{C}$ | - | - | 22 | A |
| Inverse diode direct current, pulsed | I_{SM}^{*2} | | - | - | 55 | A |
| Forward voltage | V_{SD}^{*4} | $V_{GS} = 0\text{V}, I_S = 7\text{A}$ | - | 4.1 | - | V |
| Reverse recovery time | t_{rr}^{*4} | $I_F = 7\text{A}, V_R = 400\text{V}$ $di/dt = 160\text{A}/\mu\text{s}$ | - | 26 | - | ns |
| Reverse recovery charge | Q_{rr}^{*4} | | - | 39 | - | nC |
| Peak reverse recovery current | I_{rrm}^{*4} | | - | 3.0 | - | A |

●Typical Transient Thermal Characteristics

| Symbol | Value | Unit |
|-----------|-------|------|
| R_{th1} | 96.1m | K/W |
| R_{th2} | 404m | |
| R_{th3} | 196m | |

| Symbol | Value | Unit |
|-----------|-------|------|
| C_{th1} | 1.55m | Ws/K |
| C_{th2} | 5.23m | |
| C_{th3} | 83.3m | |



●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

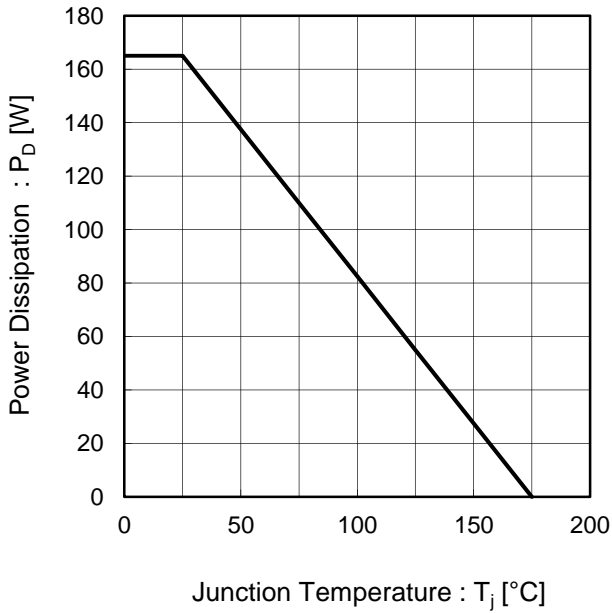


Fig.2 Maximum Safe Operating Area

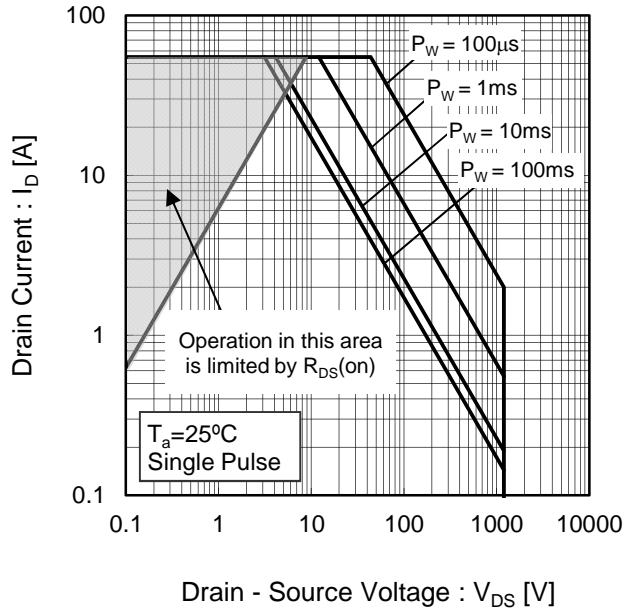
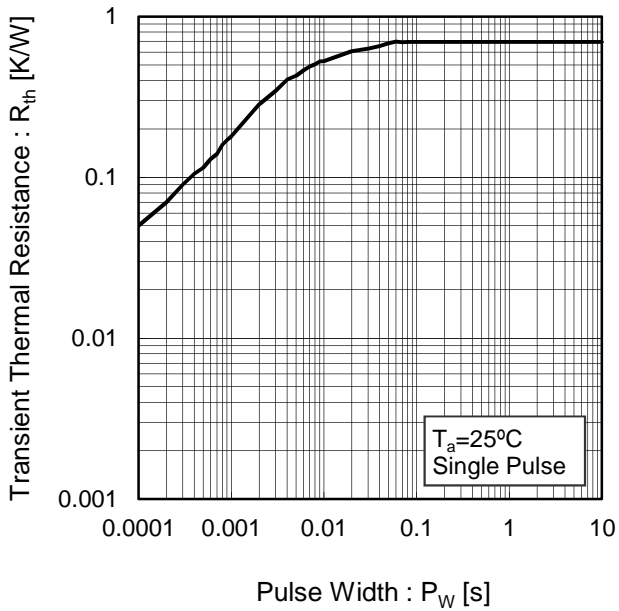


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

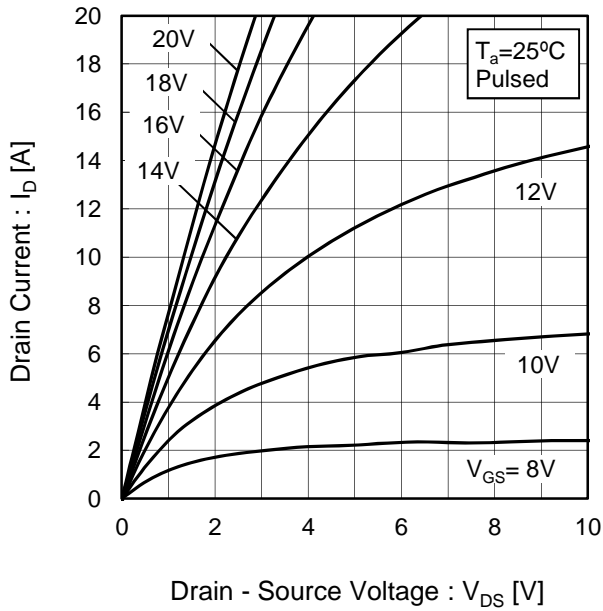


Fig.5 Typical Output Characteristics(II)

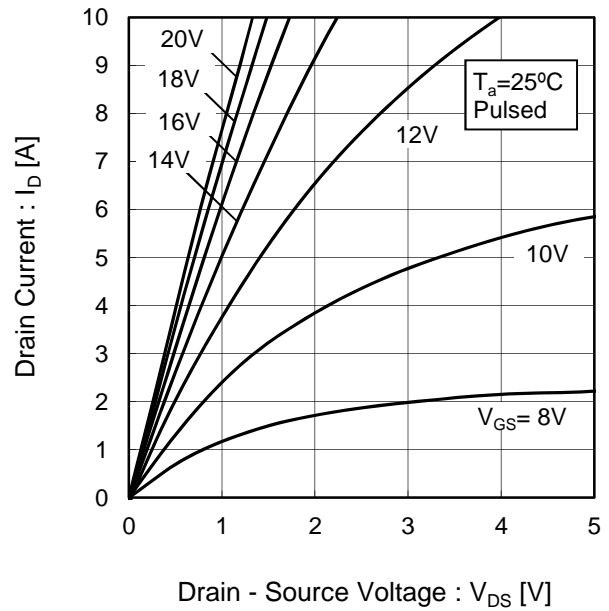


Fig.6 $T_j = 150^\circ\text{C}$ Typical Output Characteristics(I)

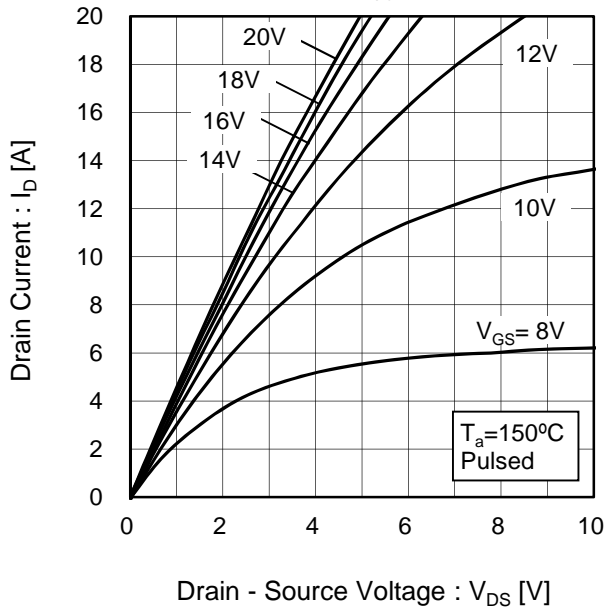
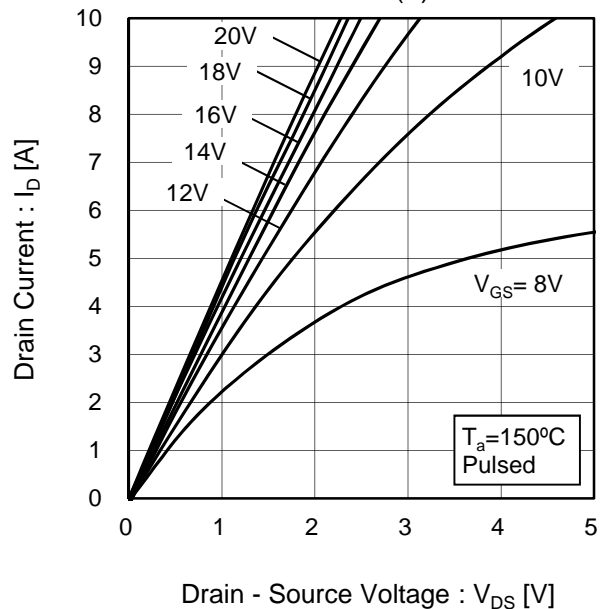


Fig.7 $T_j = 150^\circ\text{C}$ Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics (I)

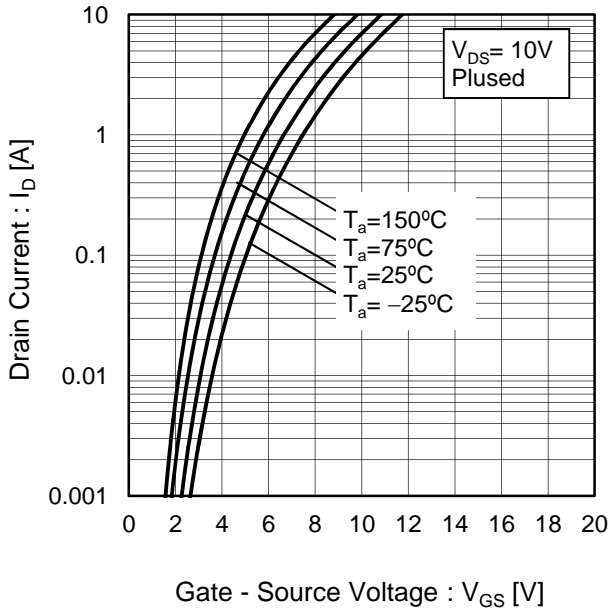


Fig.9 Typical Transfer Characteristics (II)

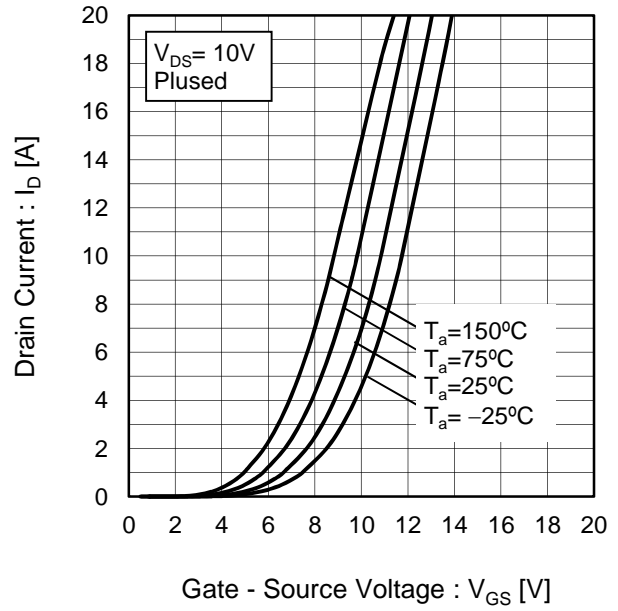


Fig.10 Gate Threshold Voltage vs. Junction Temperature

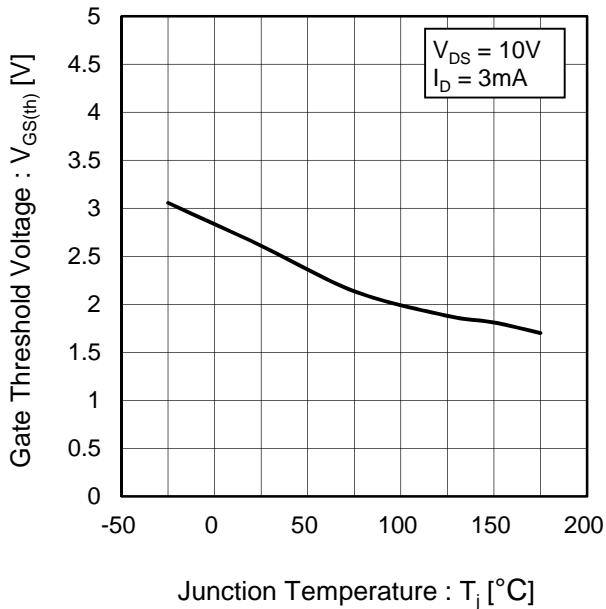
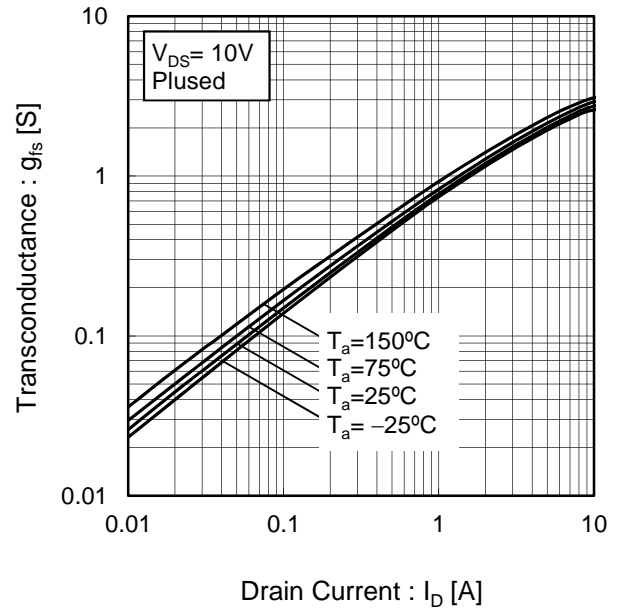


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

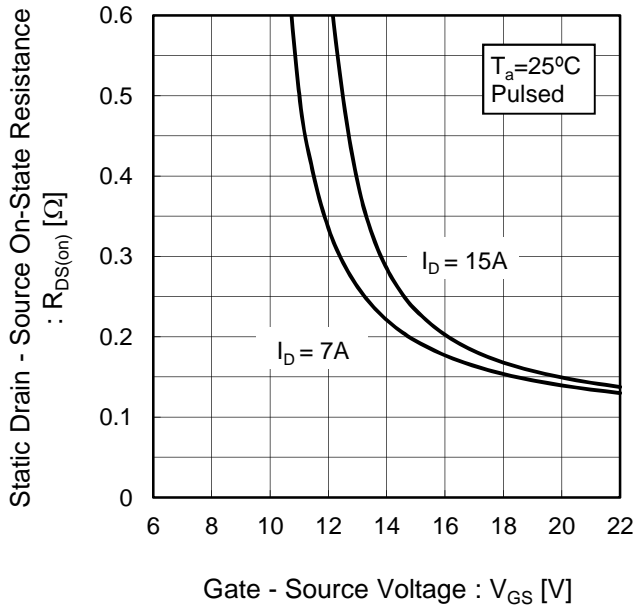


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

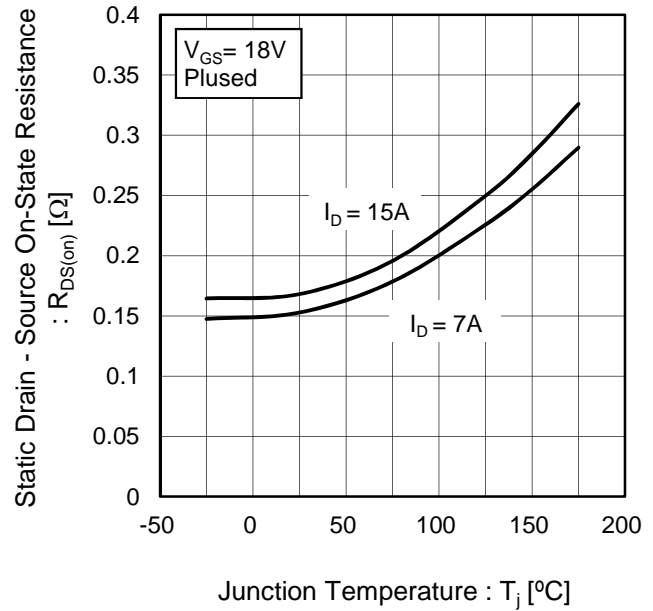
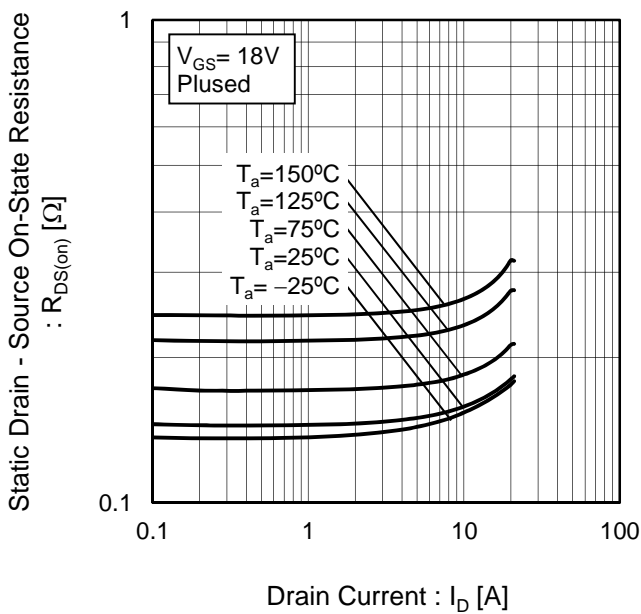


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

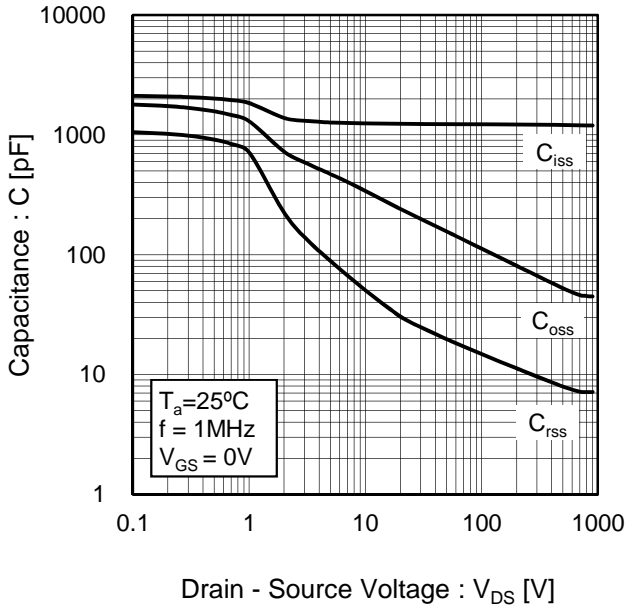


Fig.16 Coss Stored Energy

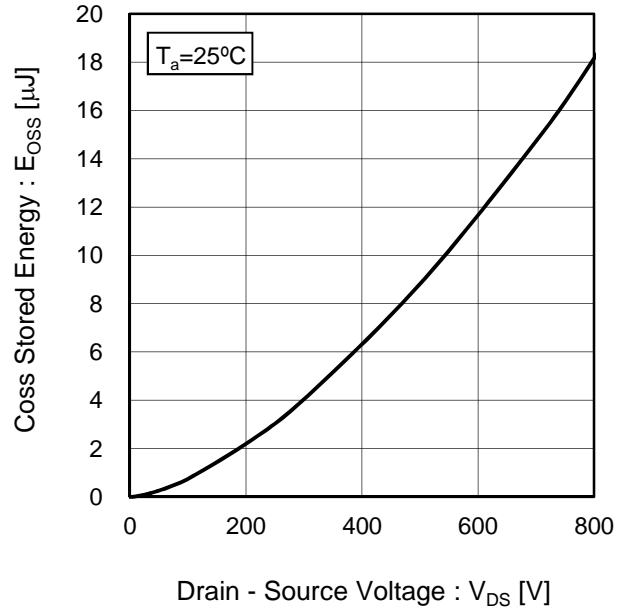


Fig.17 Switching Characteristics

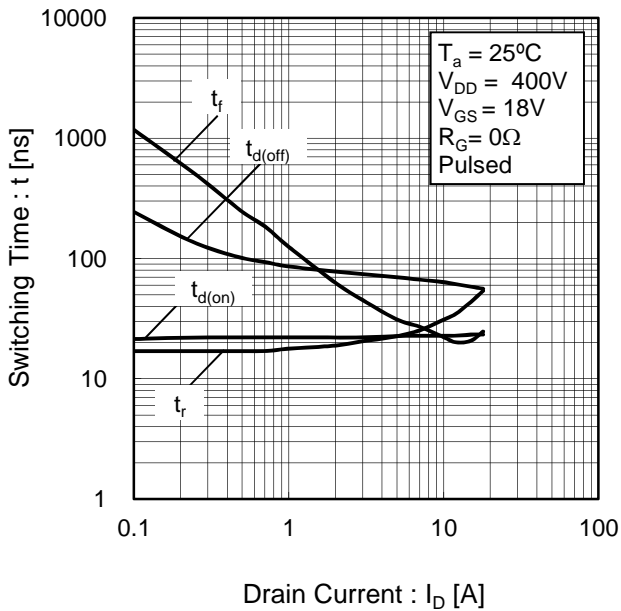
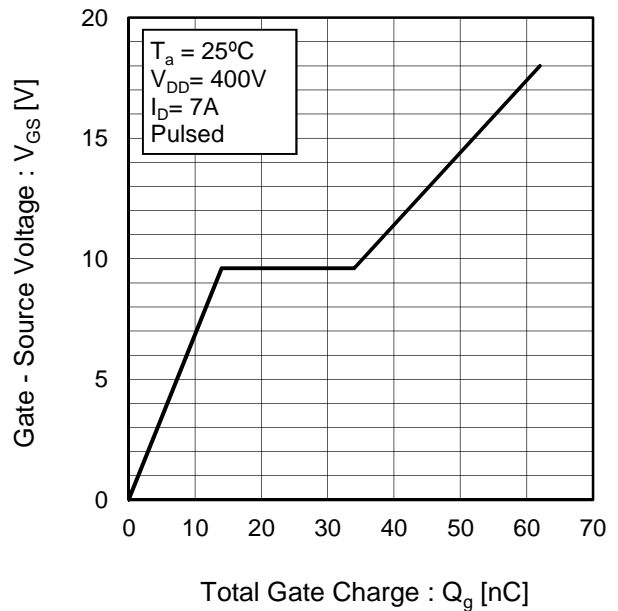


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

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

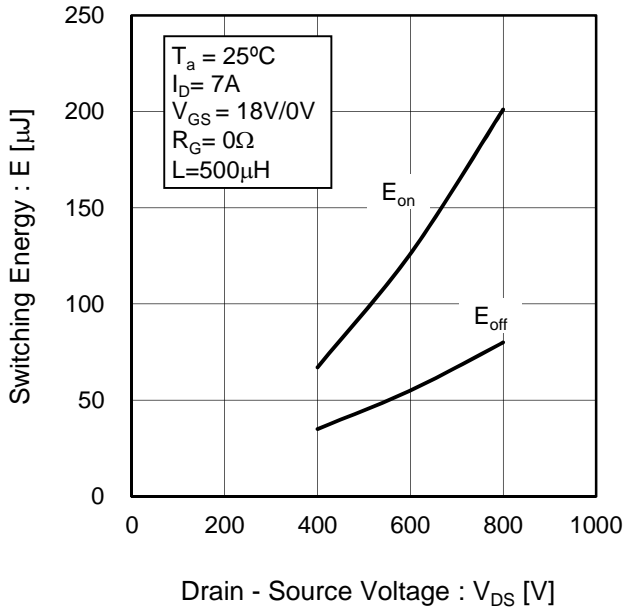


Fig.20 Typical Switching Loss vs. Drain Current

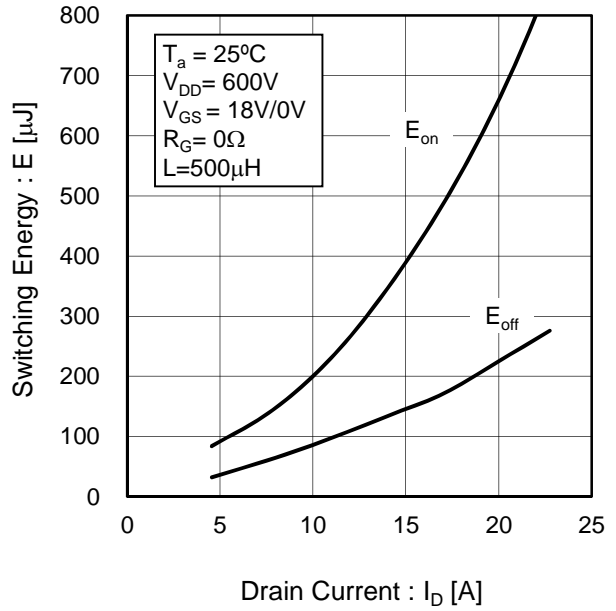
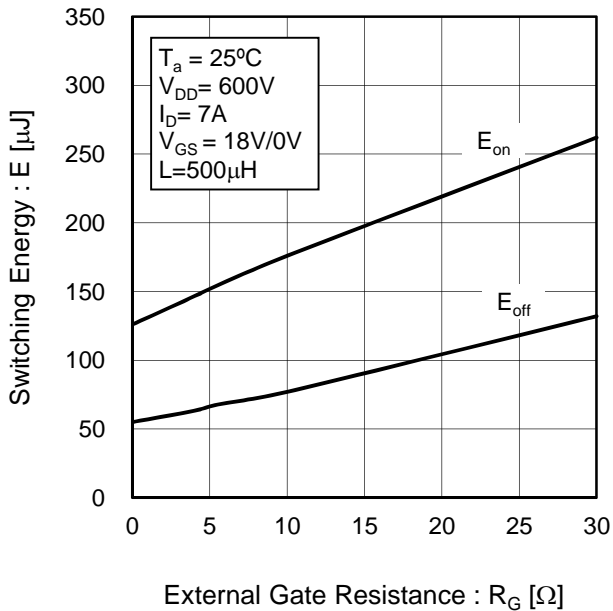


Fig.21 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

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

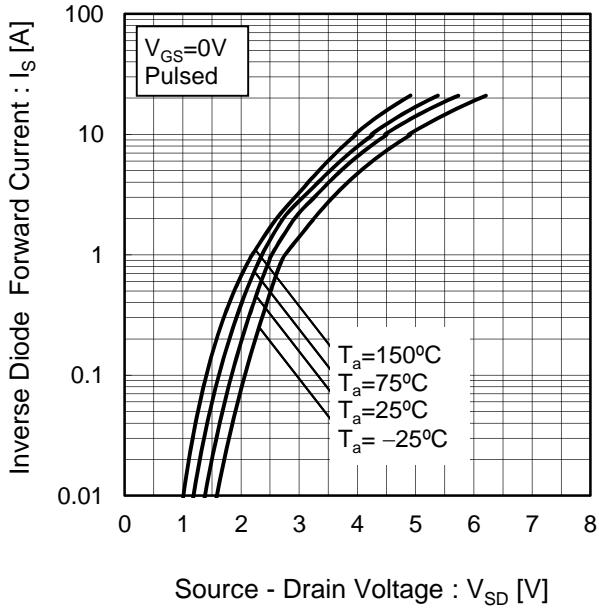
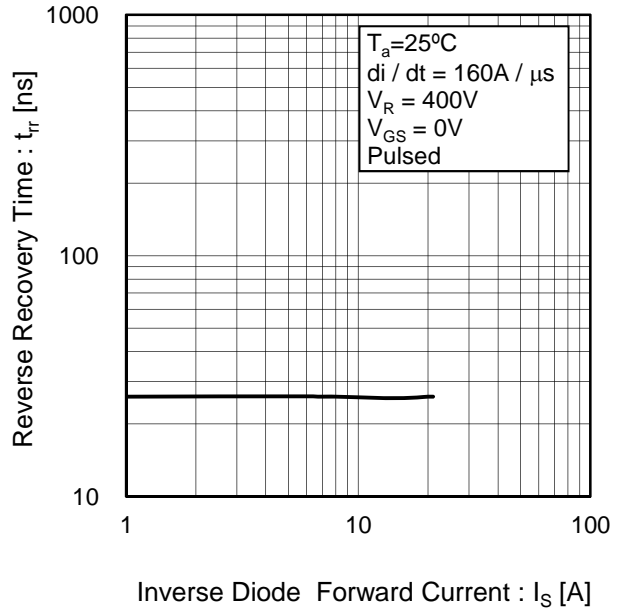


Fig.23 Reverse Recovery Time vs. Inverse Diode Forward Current



●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

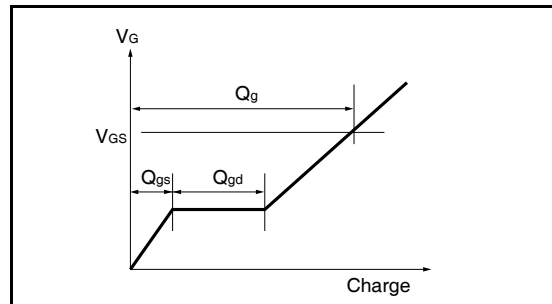


Fig.3-1 Switching Energy Measurement Circuit

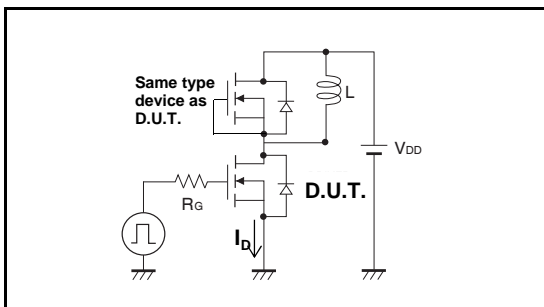


Fig.3-2 Switching Waveforms



Fig.4-1 Reverse Recovery Time Measurement Circuit

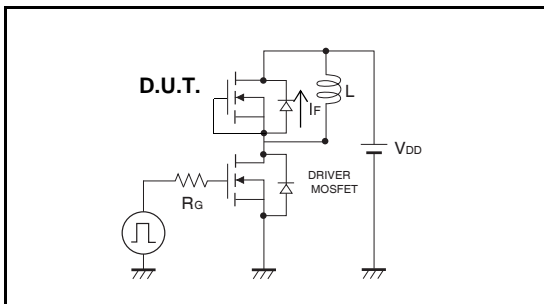
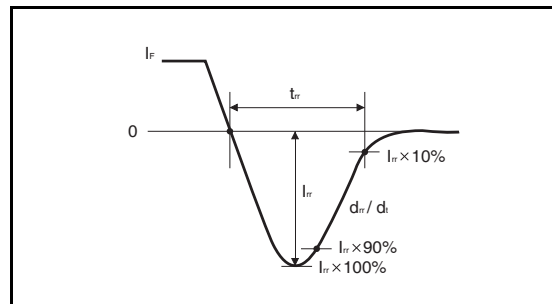


Fig.4-2 Reverse Recovery Waveform



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