

| | |
|---------------------|------|
| V_{DSS} | 650V |
| $R_{DS(on)}$ (Typ.) | 60mΩ |
| I_D | 39A |
| 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

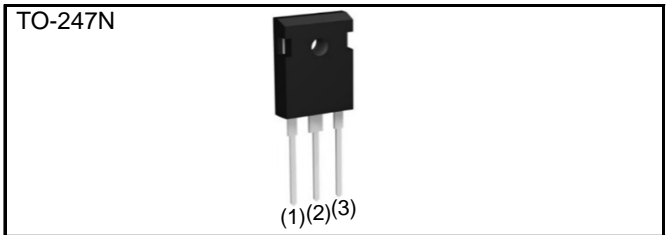
●Application

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

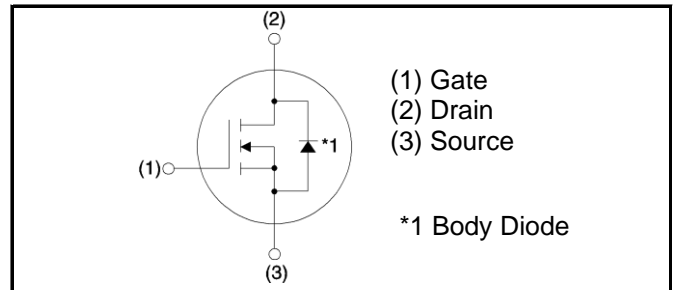
●Absolute maximum ratings ($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Value | Unit |
|--|---------------------------|---------------|------------------|
| Drain - Source voltage | V_{DSS} | 650 | V |
| Continuous drain current | $T_c = 25^\circ\text{C}$ | I_D^{*1} 39 | A |
| | $T_c = 100^\circ\text{C}$ | I_D^{*1} 27 | A |
| Pulsed drain current | $I_{D,pulse}^{*2}$ | 97 | A |
| Gate - Source voltage (DC) | V_{GSS} | -4 to +22 | V |
| Gate-Source Surge Voltage ($t_{surge} < 300\text{nsec}$) | $V_{GSS,surge}^{*3}$ | -4 to +26 | V |
| Recommended Drive Voltage | $V_{GS,op}^{*4}$ | 0 / +18 | V |
| Junction temperature | T_j | 175 | $^\circ\text{C}$ |
| Range of storage temperature | T_{stg} | -55 to +175 | $^\circ\text{C}$ |

●Outline



●Inner circuit



●Packaging specifications

| Type | Packing | Tube |
|------|---------------------------|-----------|
| | Reel size (mm) | - |
| | Tape width (mm) | - |
| | Basic ordering unit (pcs) | 30 |
| | Taping code | C11 |
| | Marking | SCT3060AL |

● Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|-------------------------------------|------------|--------|------|------|------|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - case | R_{thJC} | - | 0.70 | 0.91 | °C/W |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|-------------------|--|--------|------|------|---------------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0V, I_D = 1mA$ | 650 | - | - | V |
| Zero gate voltage drain current | I_{DSS} | $V_{DS} = 650V, V_{GS} = 0V$ $T_j = 25^\circ\text{C}$ | - | 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-} | $V_{GS} = -4V, V_{DS} = 0V$ | - | - | -100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = 10V, I_D = 6.67mA$ | 2.7 | - | 5.6 | V |
| Static drain - source on - state resistance | $R_{DS(on)}^{*5}$ | $V_{GS} = 18V, I_D = 13A$ $T_j = 25^\circ\text{C}$ | - | 60 | 78 | $m\Omega$ |
| | | $T_j = 125^\circ\text{C}$ | - | 79.2 | - | |
| Gate input resistance | R_G | $f = 1MHz, \text{open drain}$ | - | 12 | - | Ω |

●Electrical characteristics (T_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|--|-------------------|---|--------|------|------|---------|
| | | | Min. | Typ. | Max. | |
| Transconductance | g_{fs}^{*5} | $V_{DS} = 10V, I_D = 13A$ | - | 4.9 | - | S |
| Input capacitance | C_{iss} | $V_{GS} = 0V$ | - | 852 | - | pF |
| Output capacitance | C_{oss} | $V_{DS} = 500V$ | - | 55 | - | |
| Reverse transfer capacitance | C_{rss} | $f = 1MHz$ | - | 24 | - | |
| Effective output capacitance, energy related | $C_{o(er)}$ | $V_{GS} = 0V$ $V_{DS} = 0V \text{ to } 300V$ | - | 126 | - | pF |
| Turn - on delay time | $t_{d(on)}^{*5}$ | $V_{DD} = 300V, I_D = 13A$ | - | 19 | - | ns |
| Rise time | t_r^{*5} | $V_{GS} = 18V/0V$ | - | 37 | - | |
| Turn - off delay time | $t_{d(off)}^{*5}$ | $R_L = 23\Omega$ | - | 34 | - | |
| Fall time | t_f^{*5} | $R_G = 0\Omega$ | - | 21 | - | |
| Turn - on switching loss | E_{on}^{*5} | $V_{DD} = 300V, I_D = 13A$ $V_{GS} = 18V/0V$ | - | 70 | - | μJ |
| Turn - off switching loss | E_{off}^{*5} | $R_G = 0\Omega, L = 500\mu H$ * E_{on} includes diode reverse recovery | - | 10 | - | |

●Gate Charge characteristics (T_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|----------------------|-----------------|----------------------------|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Total gate charge | Q_g^{*5} | $V_{DD} = 300V$ | - | 58 | - | nC |
| Gate - Source charge | Q_{gs}^{*5} | $I_D = 13A$ | - | 15 | - | |
| Gate - Drain charge | Q_{gd}^{*5} | $V_{GS} = 18V$ | - | 23 | - | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD} = 300V, I_D = 13A$ | - | 9.6 | - | V |

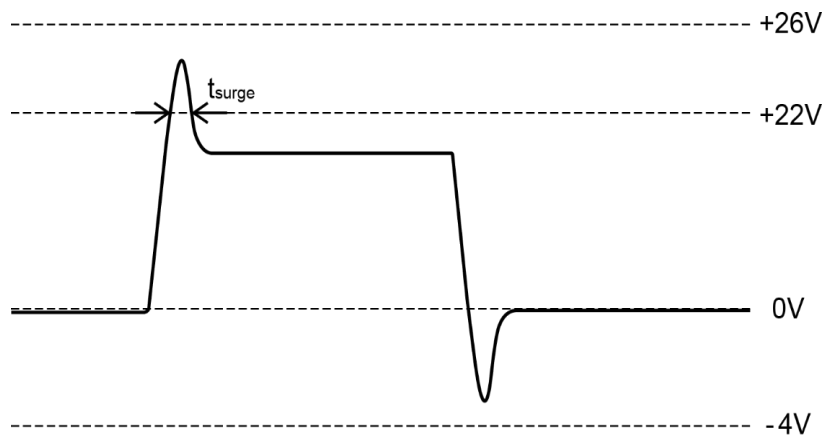
●Body diode electrical characteristics (Source-Drain) ($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|----------------|---|--------|------|------|------|
| | | | Min. | Typ. | Max. | |
| Inverse diode continuous, forward current | I_S^{*1} | $T_c = 25^\circ\text{C}$ | - | - | 39 | A |
| Inverse diode direct current, pulsed | I_{SM}^{*2} | | - | - | 97 | A |
| Forward voltage | V_{SD}^{*5} | $V_{GS} = 0\text{V}, I_S = 13\text{A}$ | - | 3.2 | - | V |
| Reverse recovery time | t_{rr}^{*5} | $I_F = 13\text{A}, V_R = 300\text{V}$ $di/dt = 1100\text{A}/\mu\text{s}$ | - | 15 | - | ns |
| Reverse recovery charge | Q_{rr}^{*5} | | - | 55 | - | nC |
| Peak reverse recovery current | I_{rrm}^{*5} | | - | 8 | - | A |

*1 Limited only by maximum temperature allowed.

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

*3 Example of acceptable V_{gs} waveform



*4 Please be advised not to use SiC-MOSFETs with V_{gs} below 13V as doing so may cause thermal runaway.

*5 Pulsed

●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

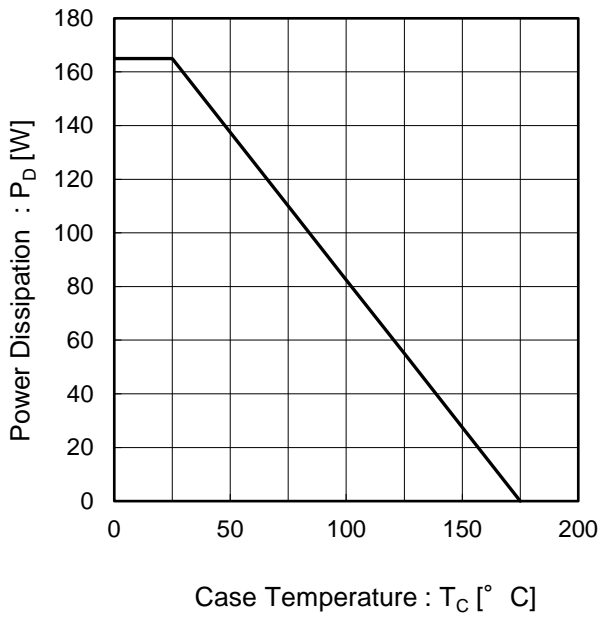


Fig.2 Maximum Safe Operating Area

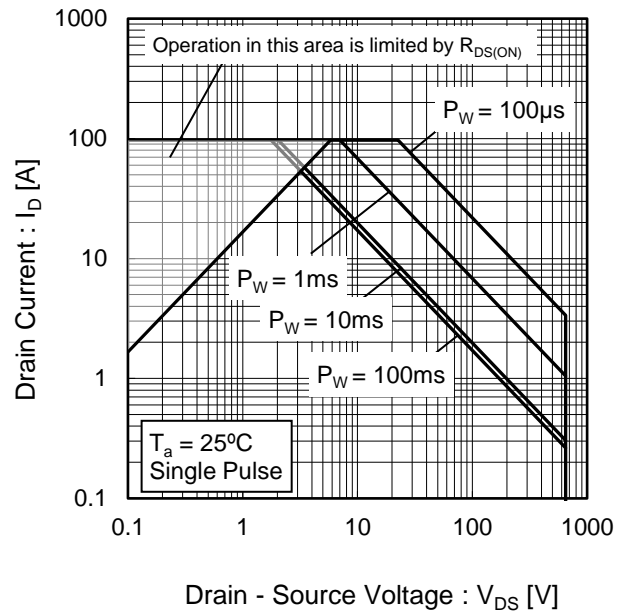
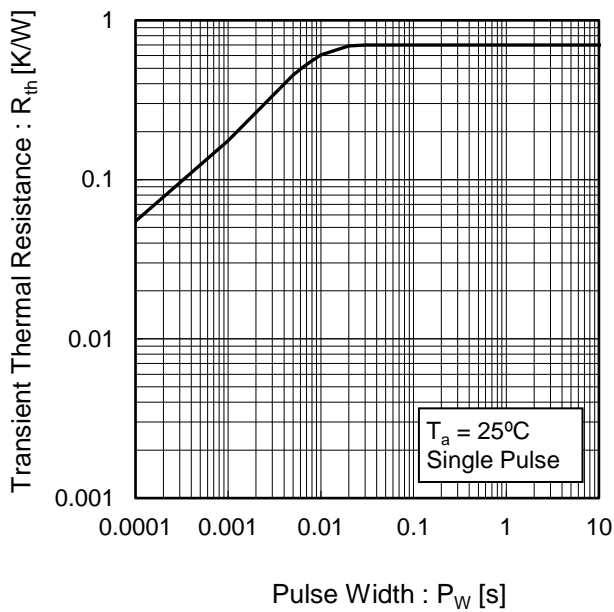


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

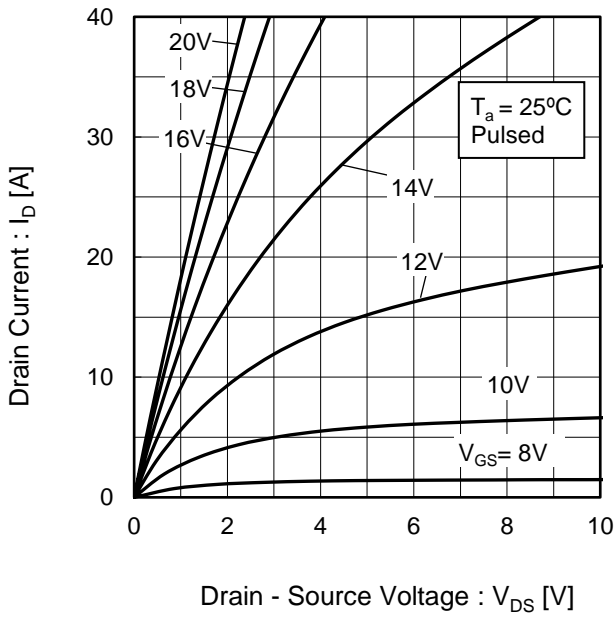


Fig.5 Typical Output Characteristics(II)

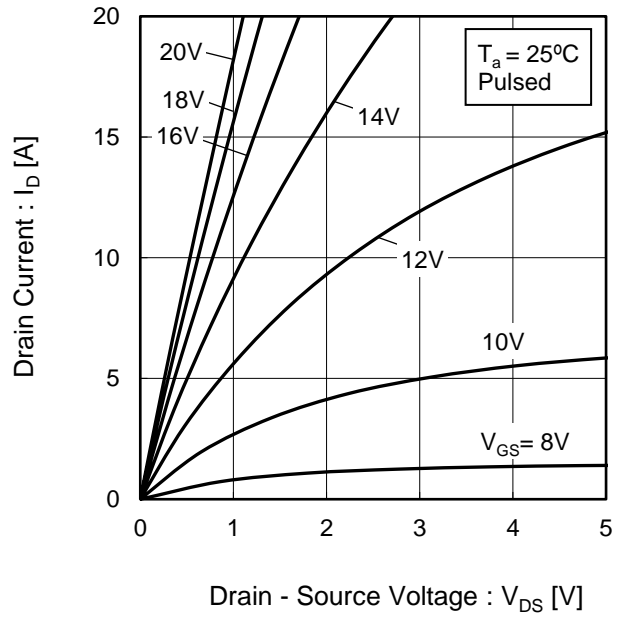


Fig.6 $T_j = 150^\circ\text{C}$ Typical Output Characteristics(I)

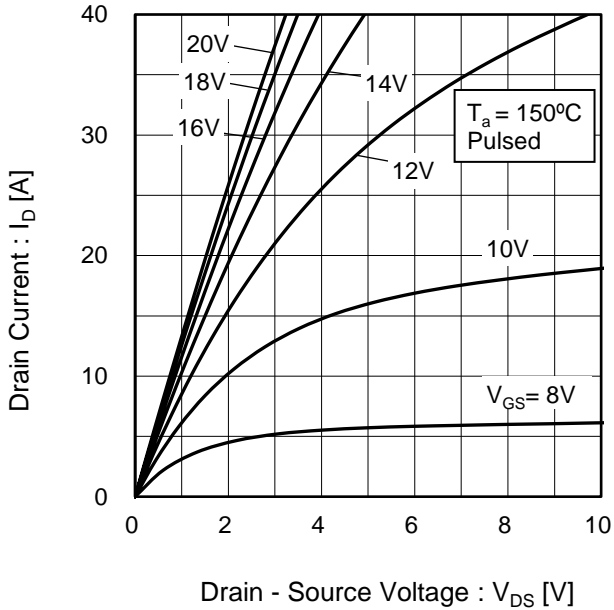
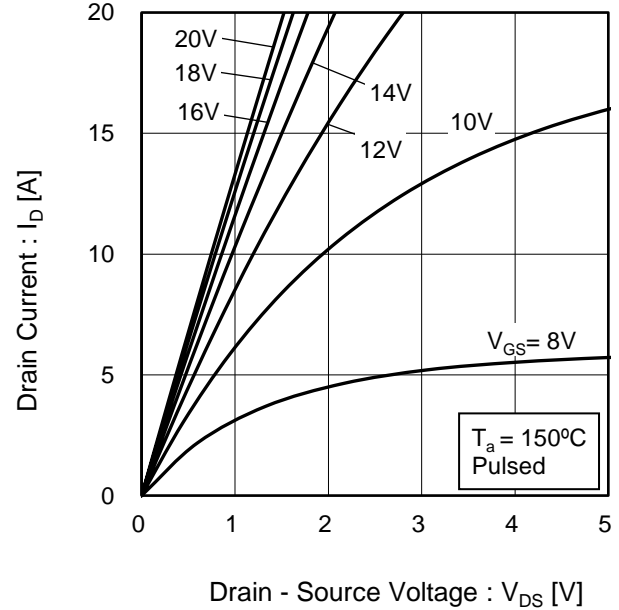


Fig.7 $T_j = 150^\circ\text{C}$ Typical Output Characteristics(II)



●Electrical characteristic curves

Fig.8 Typical Transfer Characteristics (I)

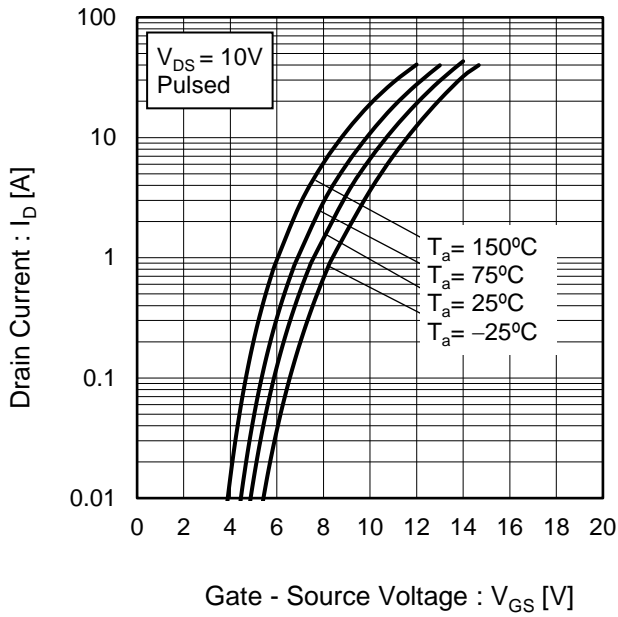


Fig.9 Typical Transfer Characteristics (II)

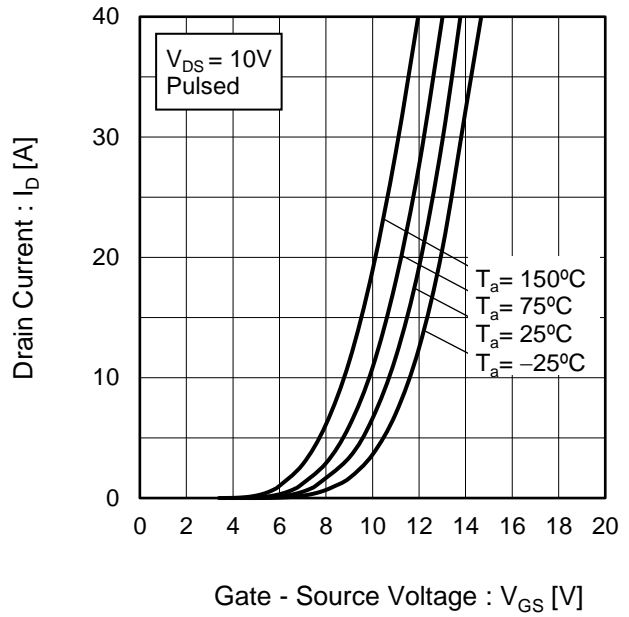


Fig.10 Gate Threshold Voltage vs. Junction Temperature

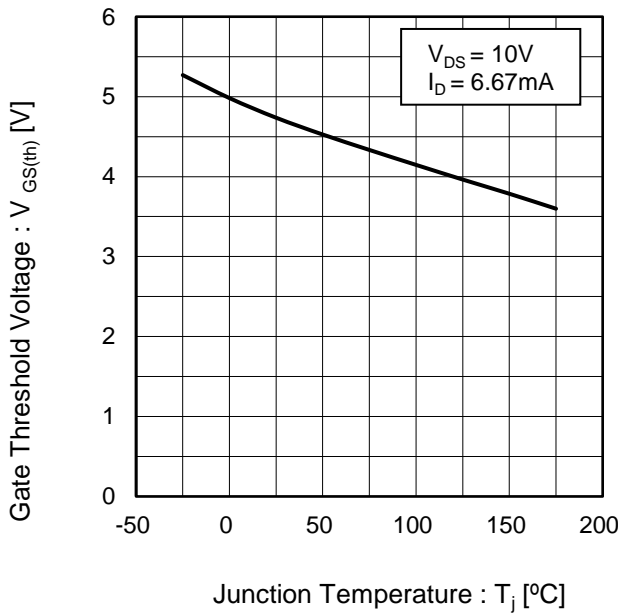
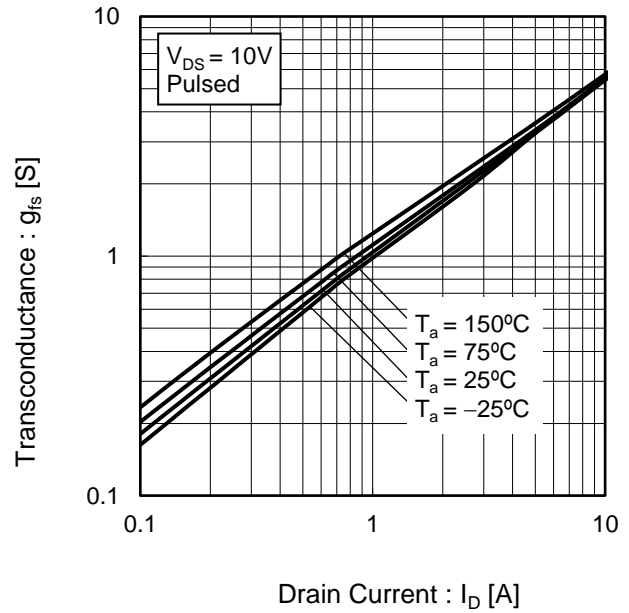


Fig.11 Transconductance vs. Drain Current



●Electrical characteristic curves

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

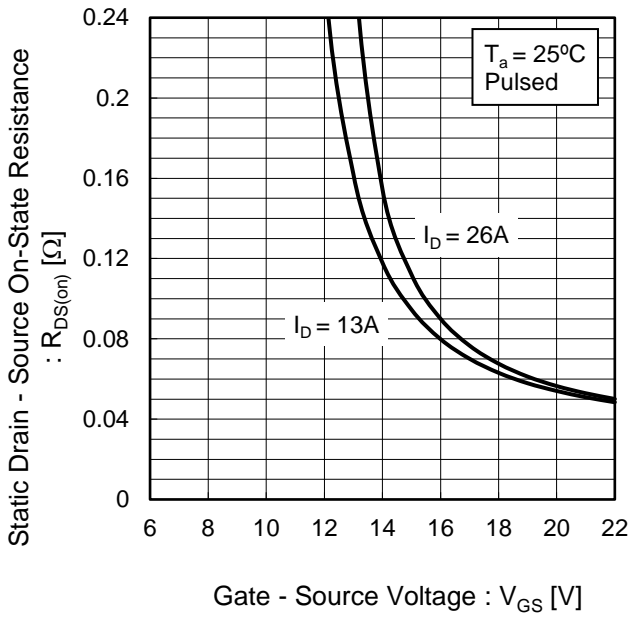


Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

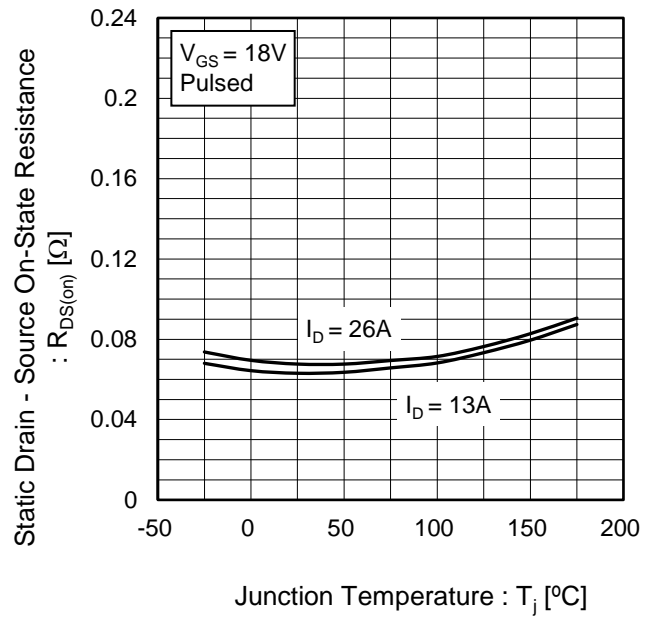
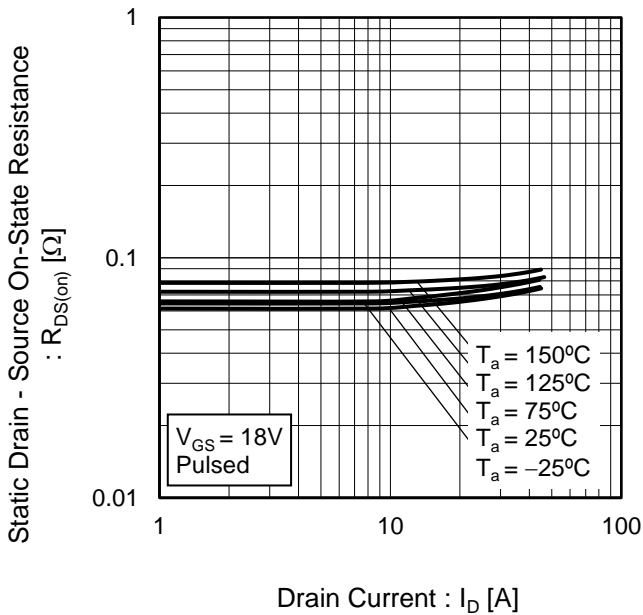


Fig.14 Static Drain - Source On - State Resistance vs. Drain Current



●Electrical characteristic curves

Fig.15 Typical Capacitance vs. Drain - Source Voltage

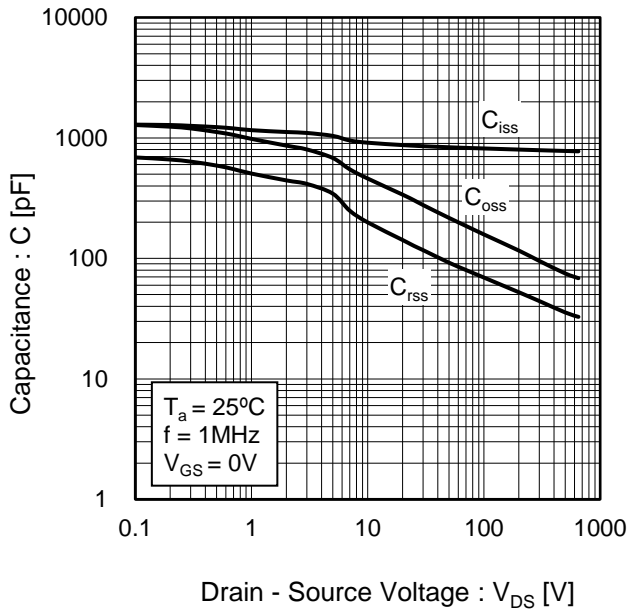


Fig.16 Coss Stored Energy

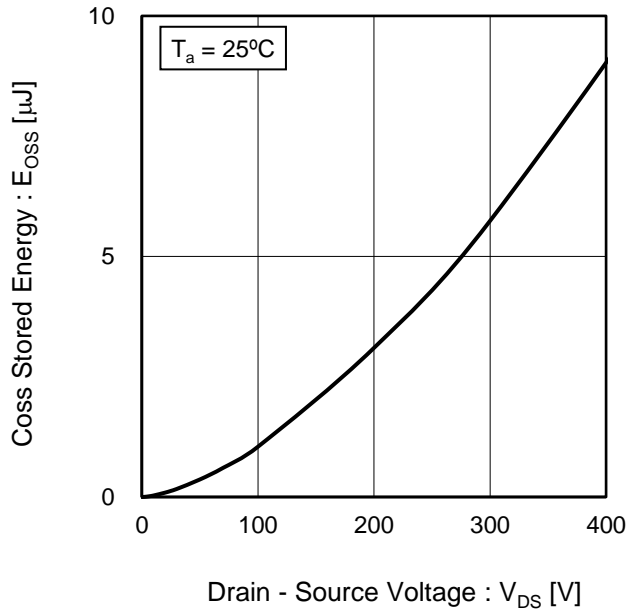


Fig.17 Switching Characteristics

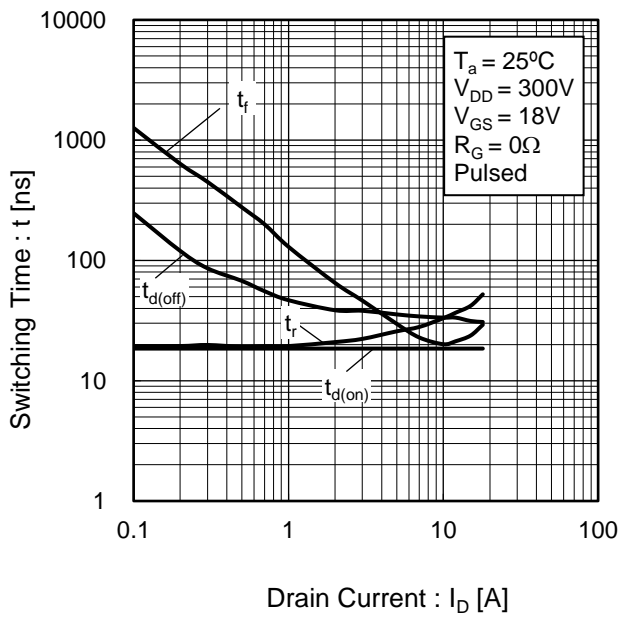
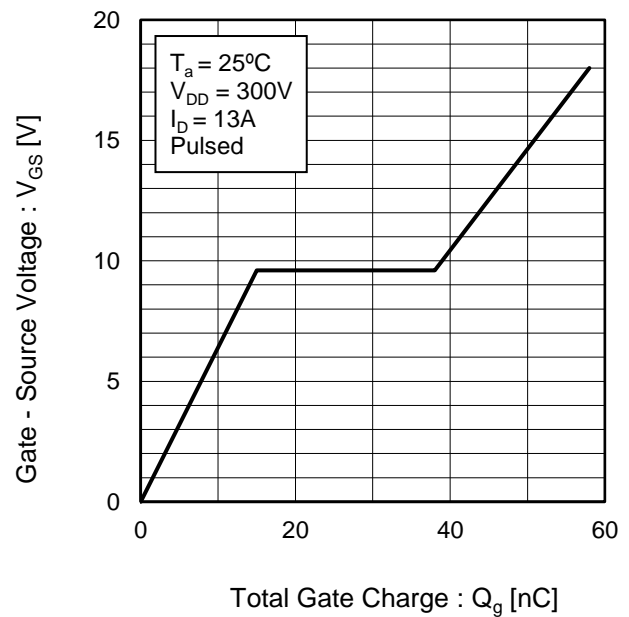


Fig.18 Dynamic Input Characteristics



●Electrical characteristic curves

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

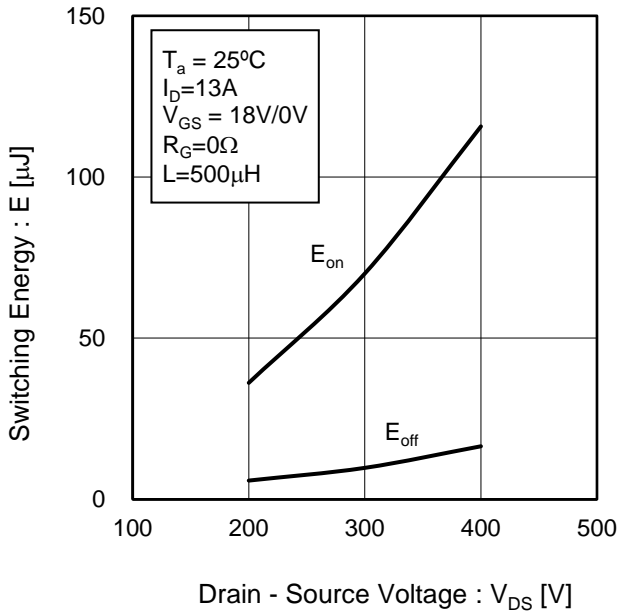


Fig.20 Typical Switching Loss vs. Drain Current

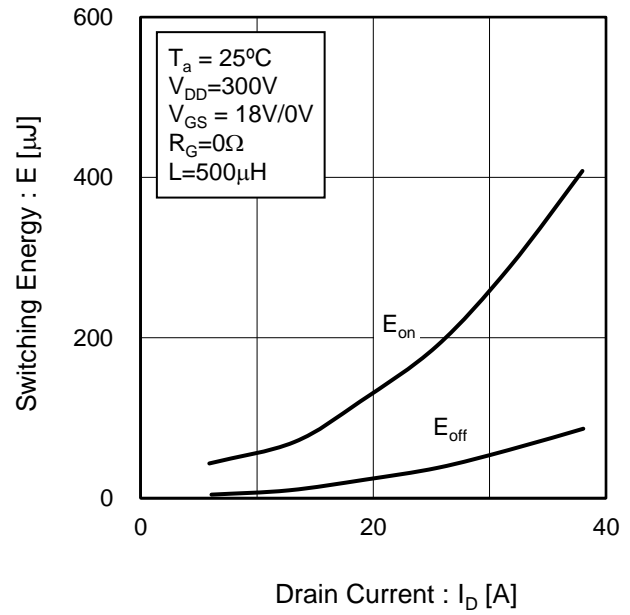
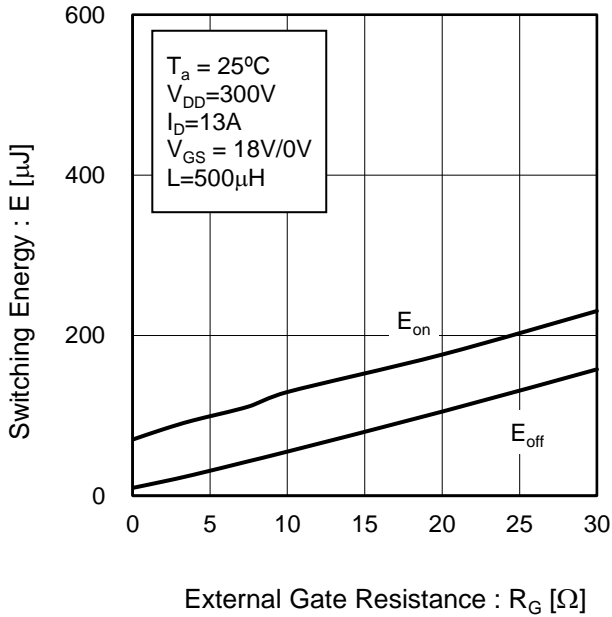


Fig.21 Typical Switching Loss vs. External Gate Resistance



●Electrical characteristic curves

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

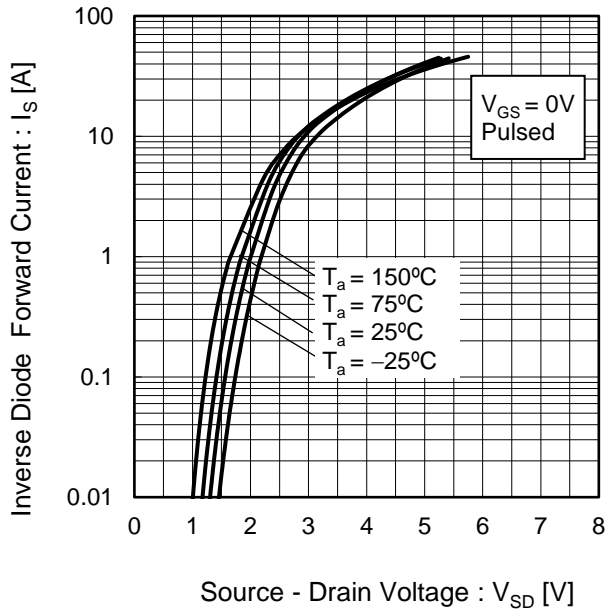
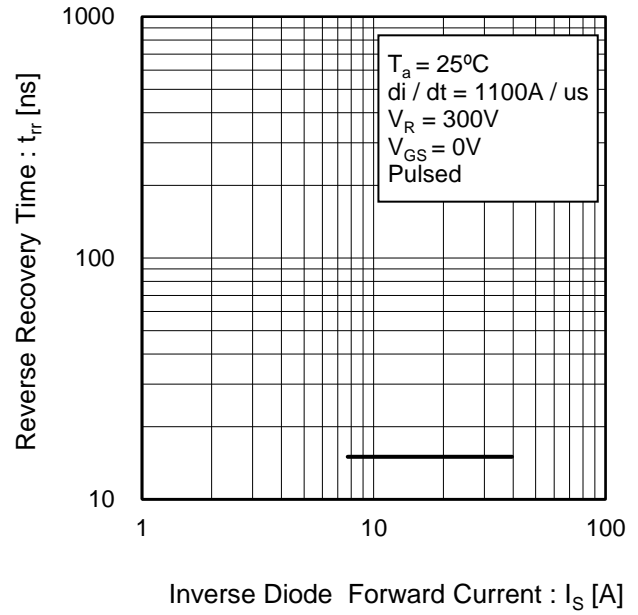


Fig.23 Reverse Recovery Time vs. Inverse Diode Forward Current



● Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

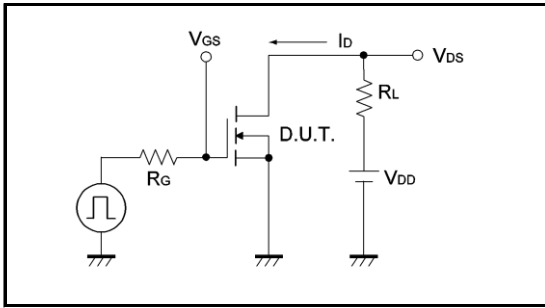


Fig.1-2 Switching Waveforms

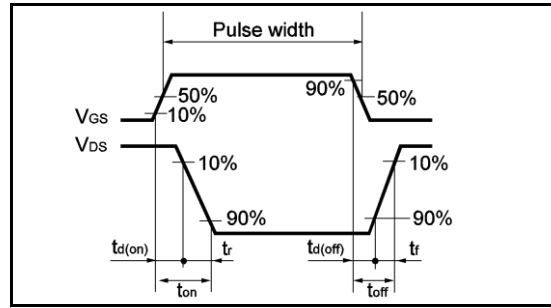


Fig.2-1 Gate Charge Measurement Circuit

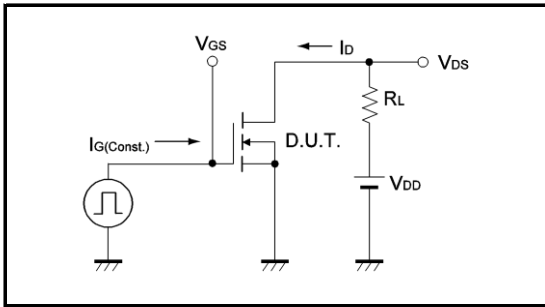


Fig.2-2 Gate Charge Waveform

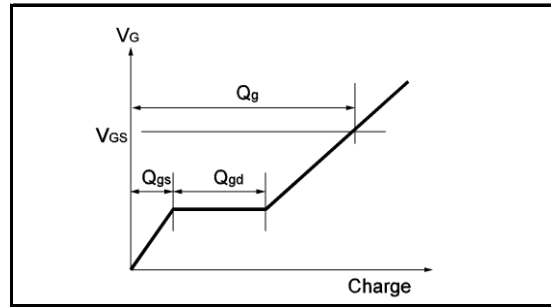


Fig.3-1 Switching Energy Measurement Circuit

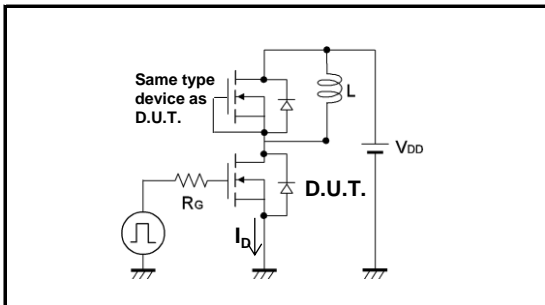


Fig.3-2 Switching Waveforms

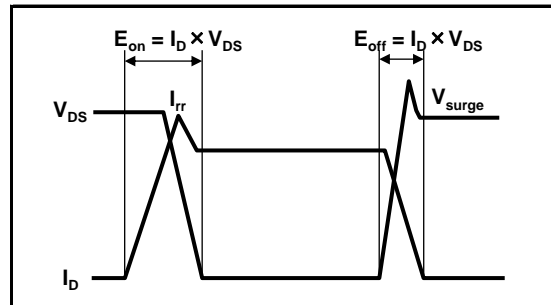


Fig.4-1 Reverse Recovery Time Measurement Circuit

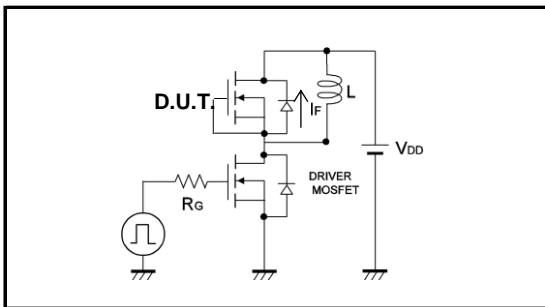
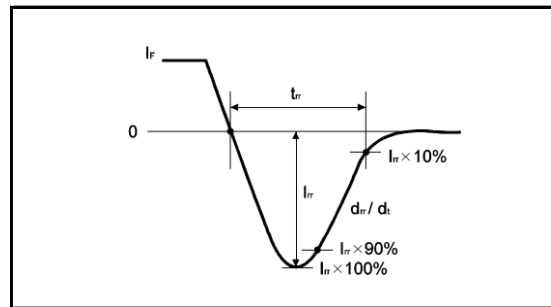


Fig.4-2 Reverse Recovery Waveform



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SCT3060AL - Web Page

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| | |
|-----------------------------|-----------|
| Part Number | SCT3060AL |
| Package | TO-247N |
| Unit Quantity | 450 |
| Minimum Package Quantity | 30 |
| Packing Type | Tube |
| Constitution Materials List | inquiry |
| RoHS | Yes |