

| | |
|---------------------|-------|
| V_{DSS} | 1200V |
| $R_{DS(on)}$ (Typ.) | 105mΩ |
| I_D^{*1} | 24A |
| P_D | 134W |

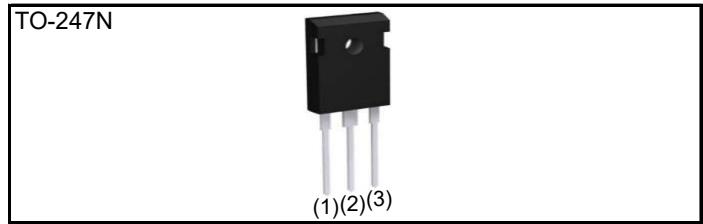
●Features

- 1) Qualified to AEC-Q101
- 2) Low on-resistance
- 3) Fast switching speed
- 4) Fast reverse recovery
- 5) Easy to parallel
- 6) Simple to drive
- 7) Pb-free lead plating ; RoHS compliant

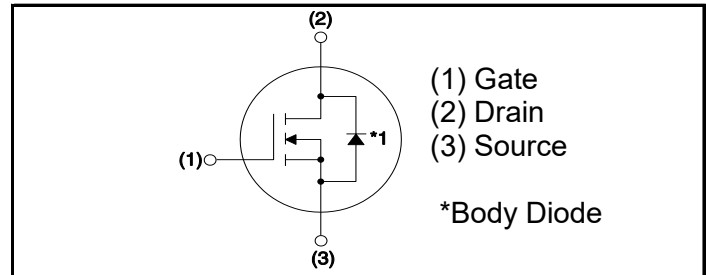
●Application

- Automobile
- Switch mode power supplies

●Outline



●Inner circuit



●Packaging specifications

| Type | Packing | Tube |
|------|---------------------------|-----------|
| | Reel size (mm) | - |
| | Tape width (mm) | - |
| | Basic ordering unit (pcs) | 30 |
| | Taping code | C11 |
| | Marking | SCT3105KL |

●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} | 24 | A |
| | $T_c = 100^\circ\text{C}$ | I_D^{*1} | 17 | A |
| Pulsed Drain current | $I_{D,pulse}^{*2}$ | 60 | 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 | $^\circ\text{C}$ | |

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

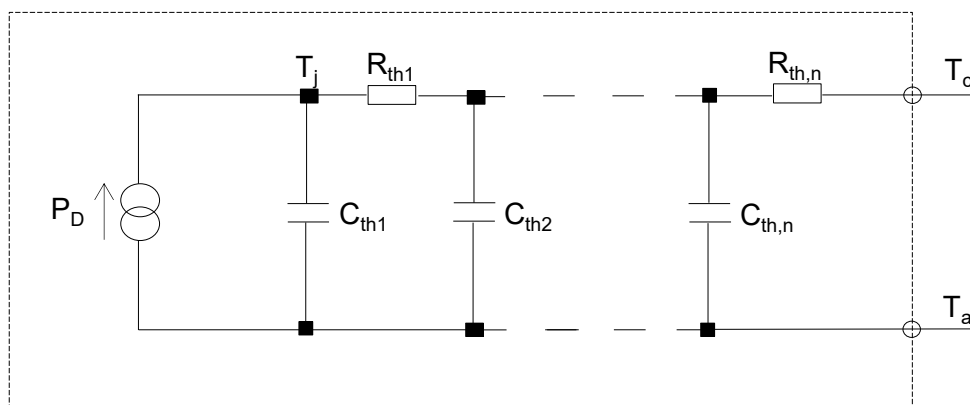
| Parameter | Symbol | Conditions | Values | | | Unit |
|---|-------------------|---|--------------|------------|----------|---------------|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS} = 0\text{V}$, $I_D = 1\text{mA}$ $T_j = 25^\circ\text{C}$ $T_j = -55^\circ\text{C}$ | 1200 1200 | - - | - - | V |
| Zero Gate voltage Drain current | I_{DSS} | $V_{GS} = 0\text{V}$, $V_{DS} = 1200\text{V}$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$ | - - | 1 2 | 10 - | μA |
| Gate - Source leakage current | I_{GSS+} | $V_{GS} = +22\text{V}$, $V_{DS} = 0\text{V}$ | - | - | 100 | nA |
| Gate - Source leakage current | I_{GSS-} | $V_{GS} = -4\text{V}$, $V_{DS} = 0\text{V}$ | - | - | -100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS} = 10\text{V}$, $I_D = 3.81\text{mA}$ | 2.7 | - | 5.6 | V |
| Static Drain - Source on - state resistance | $R_{DS(on)}^{*5}$ | $V_{GS} = 18\text{V}$, $I_D = 7.6\text{A}$ $T_j = 25^\circ\text{C}$ $T_j = 150^\circ\text{C}$ | - - | 105 179 | 137 - | m Ω |
| Gate input resistance | R_G | $f = 1\text{MHz}$, open drain | - | 13 | - | Ω |

●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|-------------------------------------|------------|--------|------|------|--------------------|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - case | R_{thJC} | - | 0.86 | 1.12 | $^\circ\text{C/W}$ |

●Typical Transient Thermal Characteristics

| Symbol | Value | Unit | Symbol | Value | Unit |
|-----------|----------|------|-----------|----------|------|
| R_{th1} | 1.08E-01 | K/W | C_{th1} | 4.72E-04 | Ws/K |
| R_{th2} | 3.73E-01 | | C_{th2} | 3.97E-03 | |
| R_{th3} | 3.41E-01 | | C_{th3} | 1.31E-02 | |



●Electrical characteristics (T_a = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|--|-------------------|---|--------|------|------|---------|
| | | | Min. | Typ. | Max. | |
| Transconductance | g_{fs}^{*5} | $V_{DS} = 10V, I_D = 7.6A$ | - | 3.4 | - | S |
| Input capacitance | C_{iss} | $V_{GS} = 0V$ | - | 574 | - | pF |
| Output capacitance | C_{oss} | $V_{DS} = 800V$ | - | 59 | - | |
| Reverse transfer capacitance | C_{rss} | $f = 1MHz$ | - | 28 | - | |
| Effective output capacitance, energy related | $C_{o(er)}$ | $V_{GS} = 0V$ $V_{DS} = 0V \text{ to } 600V$ | - | 159 | - | pF |
| Total Gate charge | Q_g^{*5} | $V_{DS} = 600V$ $I_D = 7.6A$ | - | 51 | - | nC |
| Gate - Source charge | Q_{gs}^{*5} | $V_{GS} = 18V$ | - | 10 | - | |
| Gate - Drain charge | Q_{gd}^{*5} | See Fig. 1-1. | - | 25 | - | |
| Turn - on delay time | $t_{d(on)}^{*5}$ | $V_{DS} = 400V$ $I_D = 7.6A$ | - | 17 | - | ns |
| Rise time | t_r^{*5} | $V_{GS} = 0V/+18V$ | - | 27 | - | |
| Turn - off delay time | $t_{d(off)}^{*5}$ | $R_G = 0\Omega$ $R_L = 53\Omega$ | - | 31 | - | |
| Fall time | t_f^{*5} | See Fig. 1-1, 1-2. | - | 17 | - | |
| Turn - on switching loss | E_{on}^{*5} | $V_{DS} = 600V$ $V_{GS}=0V/18V, I_D = 7.6A$ $R_G = 0\Omega, L = 750\mu H$ | - | 159 | - | μJ |
| Turn - off switching loss | E_{off}^{*5} | E_{on} includes diode reverse recovery $L_\sigma = 50nH, C_\sigma = 200pF$ See Fig. 2-1, 2-2. | - | 2 | - | |

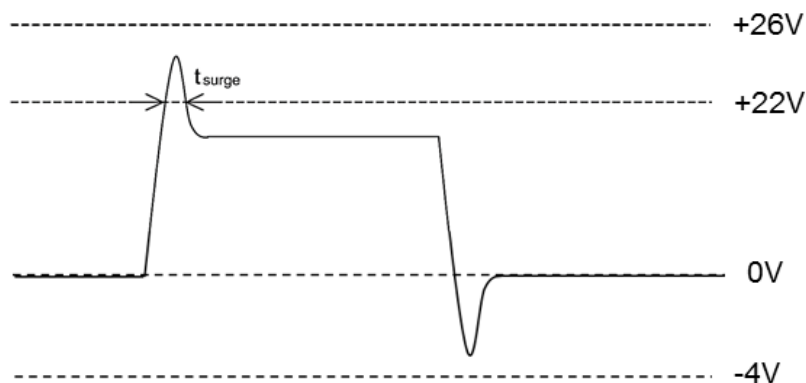
●Body diode electrical characteristics (Source-Drain) ($T_a = 25^\circ\text{C}$)

| Parameter | Symbol | Conditions | Values | | | Unit |
|--|--------------|--|---|------|------|------|
| | | | Min. | Typ. | Max. | |
| Body diode continuous, forward current | I_S *1 | $T_c = 25^\circ\text{C}$ | - | - | 24 | A |
| Body diode direct current, pulsed | I_{SM} *2 | | - | - | 60 | A |
| Forward voltage | V_{SD} *5 | $V_{GS} = 0\text{V}, I_D = 7.6\text{A}$ | - | 3.2 | - | V |
| Reverse recovery time | t_{rr} *5 | $I_F = 7.6\text{A}$ $V_R = 600\text{V}$ $di/dt = 1100\text{A}/\mu\text{s}$ | - | 15 | - | ns |
| Reverse recovery charge | Q_{rr} *5 | | - | 53 | - | nC |
| Peak reverse recovery current | I_{rrm} *5 | | $L_\sigma = 50\text{nH}, C_\sigma = 200\text{pF}$ See Fig. 3-1, 3-2. | - | 6.5 | - |

*1 Limited by maximum temperature allowed.

*2 $P_W \leq 10\mu\text{s}$, 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

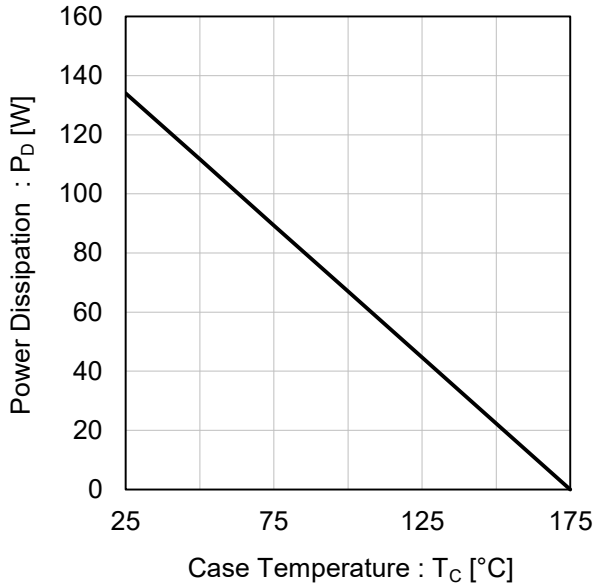


Fig.2 Maximum Safe Operating Area

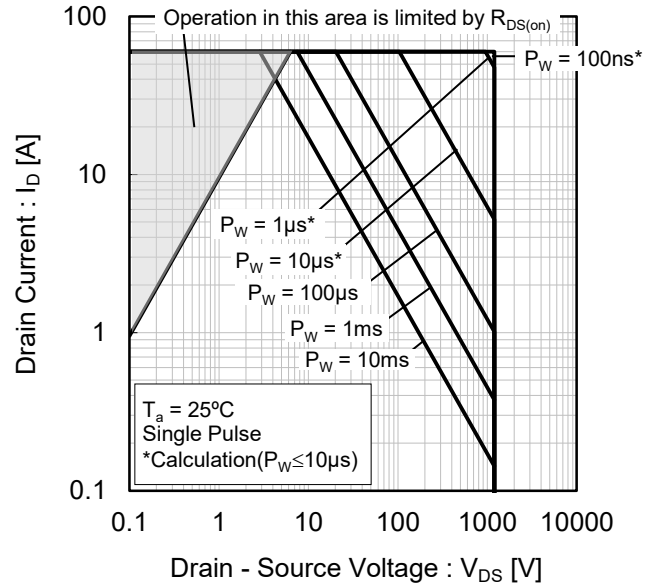
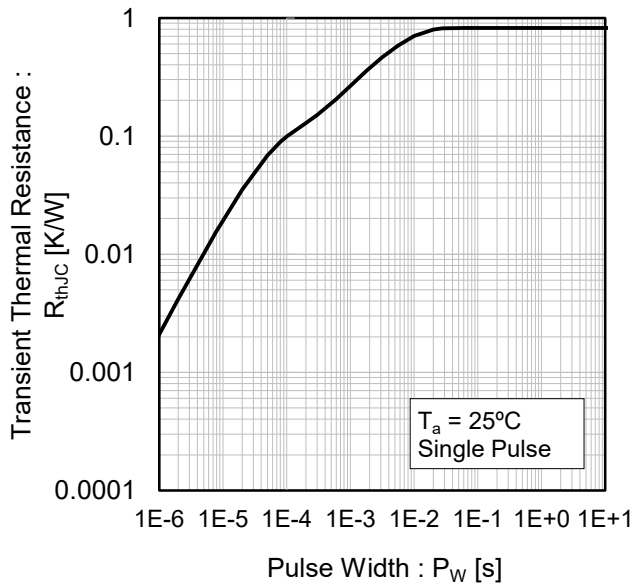


Fig.3 Typical Transient Thermal Resistance vs. Pulse Width



●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

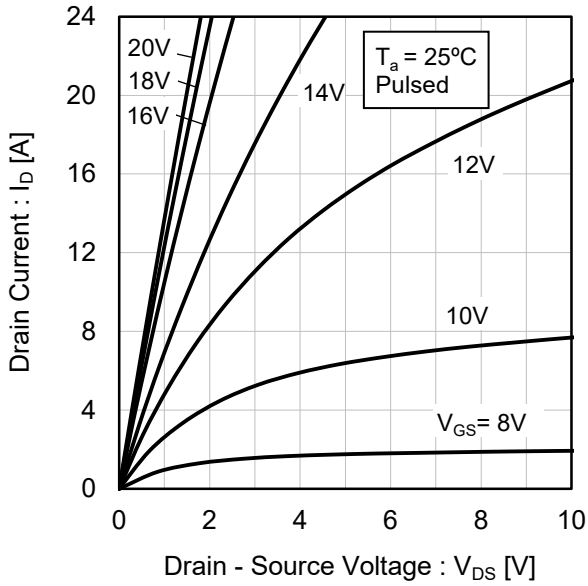


Fig.5 Typical Output Characteristics(II)

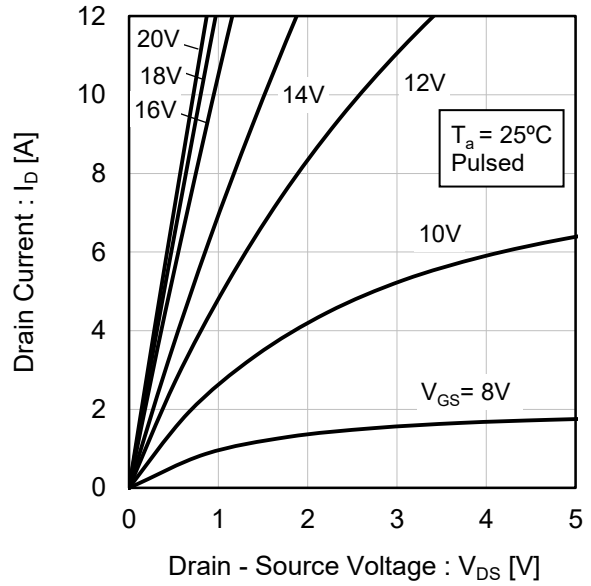
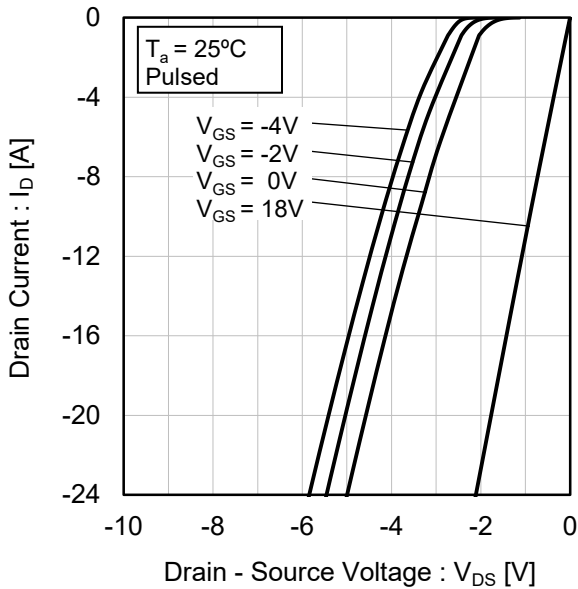


Fig.6 $T_j = 25^\circ\text{C}$ 3rd Quadrant Characteristics



●Electrical characteristic curves

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

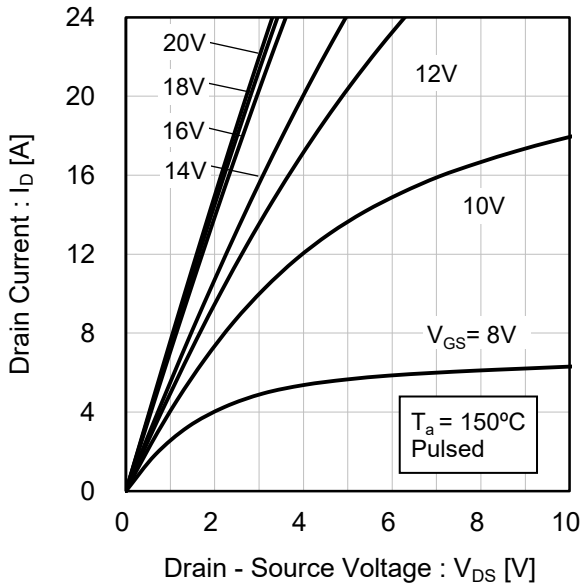


Fig.8 $T_j = 150^\circ\text{C}$ Typical Output Characteristics(II)

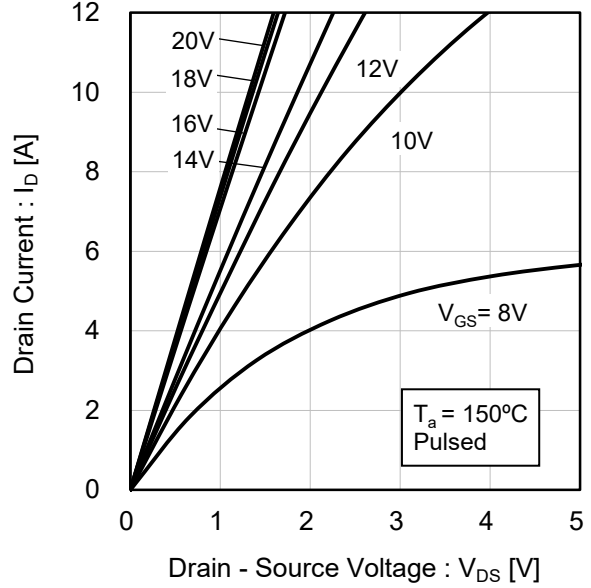


Fig.9 $T_j = 150^\circ\text{C}$ 3rd Quadrant Characteristics

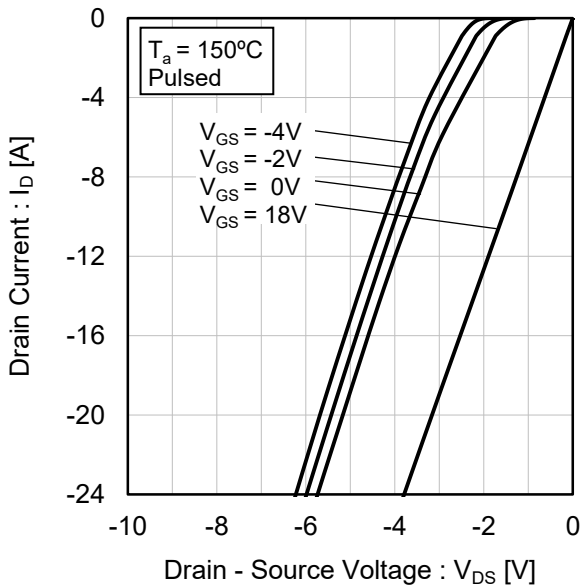
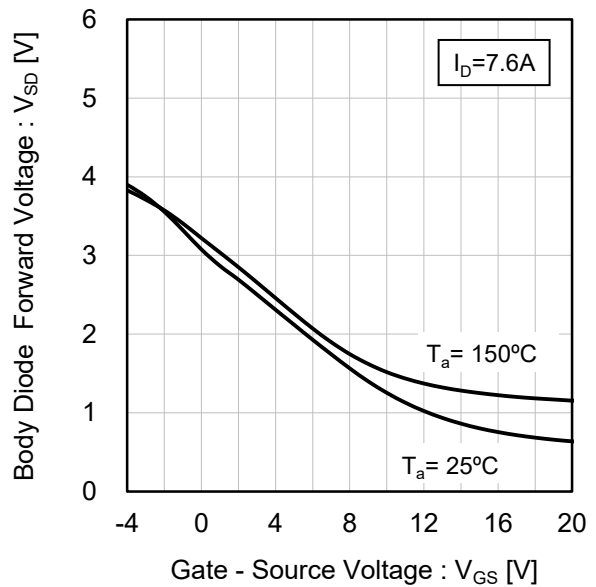


Fig.10 Body Diode Forward Voltage vs. Gate - Source Voltage



●Electrical characteristic curves

Fig.11 Typical Transfer Characteristics (I)

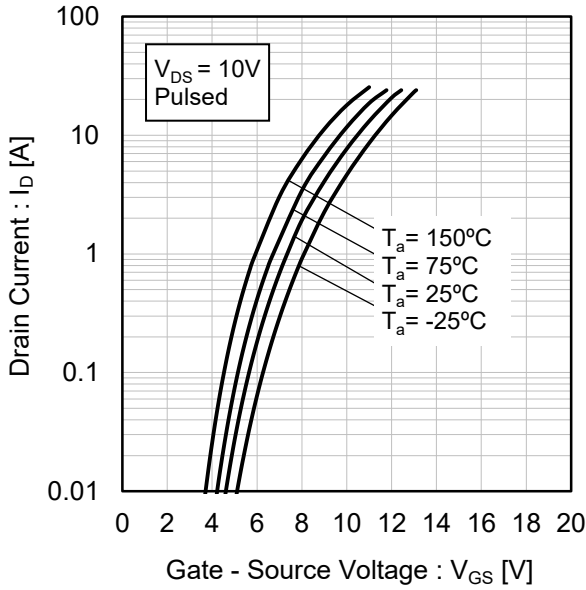


Fig.12 Typical Transfer Characteristics (II)

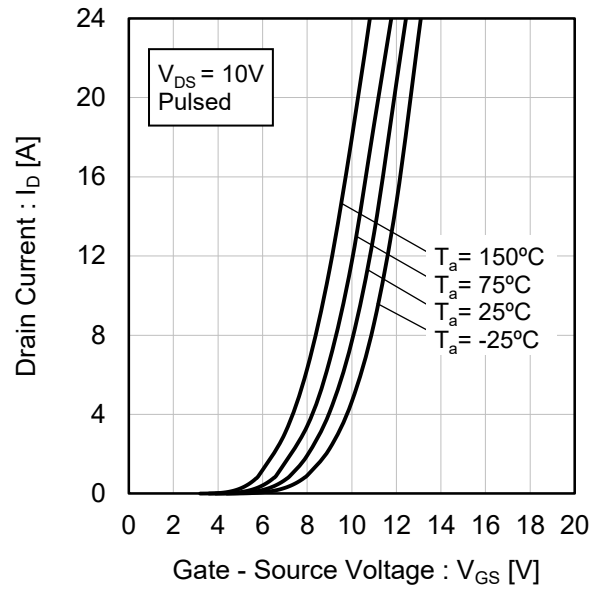


Fig.13 Gate Threshold Voltage vs. Junction Temperature

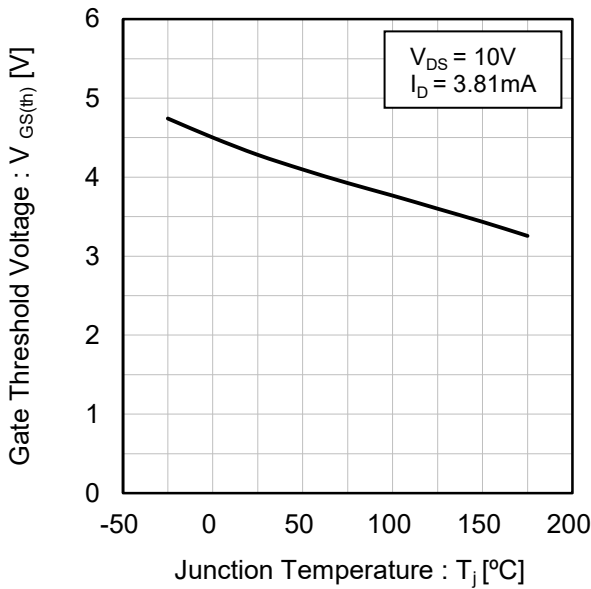
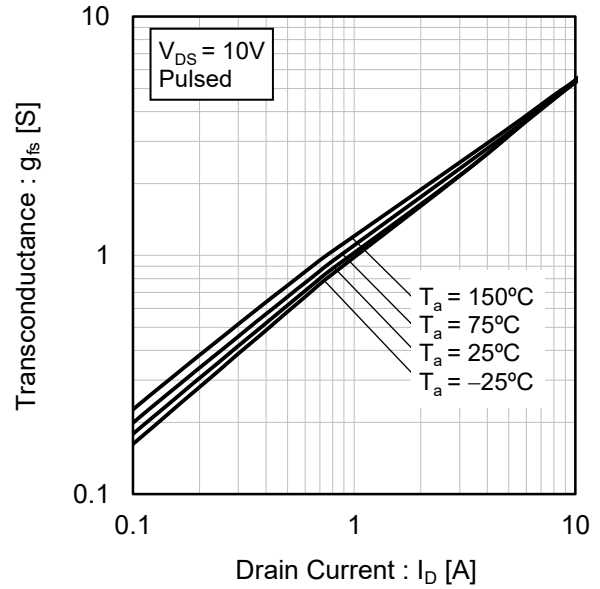


Fig.14 Transconductance vs. Drain Current



●Electrical characteristic curves

Fig.15 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

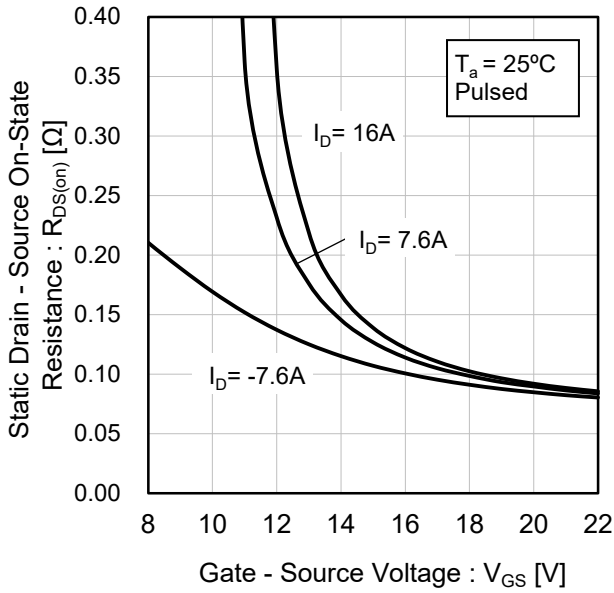


Fig.16 Static Drain - Source On - State Resistance vs. Junction Temperature

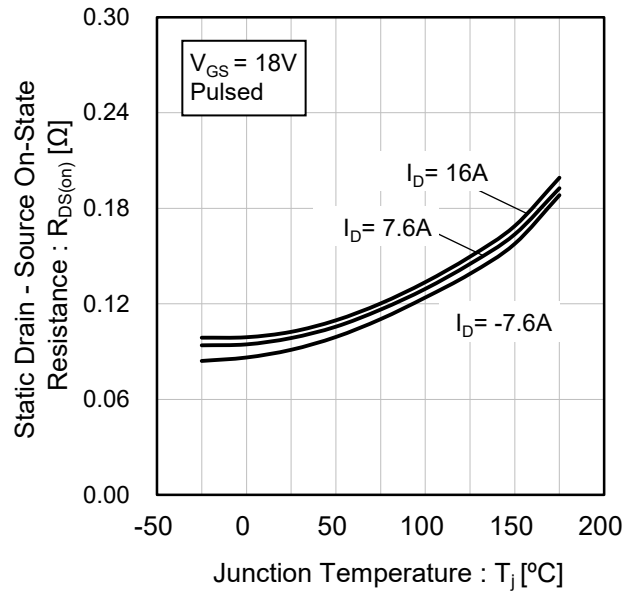


Fig.17 Static Drain - Source On - State Resistance vs. Drain Current

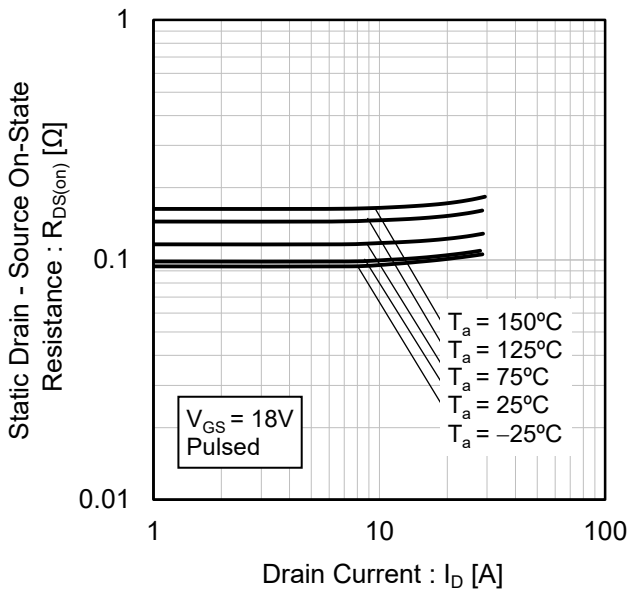
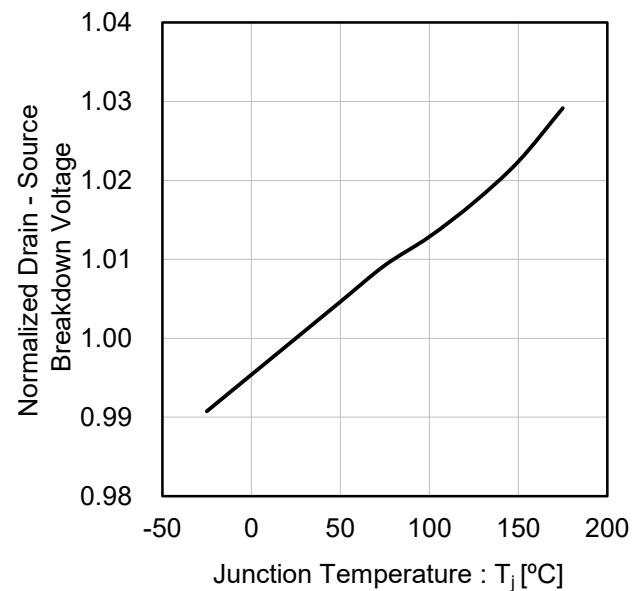


Fig.18 Normalized Drain - Source Breakdown Voltage vs. Junction Temperature



●Electrical characteristic curves

Fig.19 Typical Capacitance vs. Drain - Source Voltage

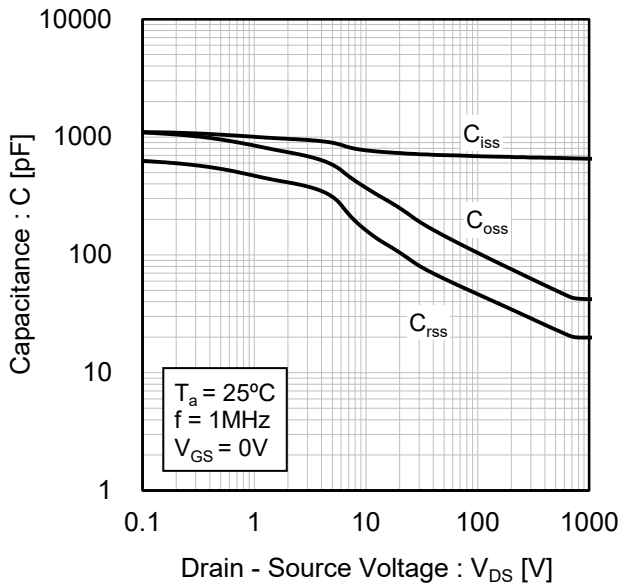


Fig.20 C_{oss} Stored Energy

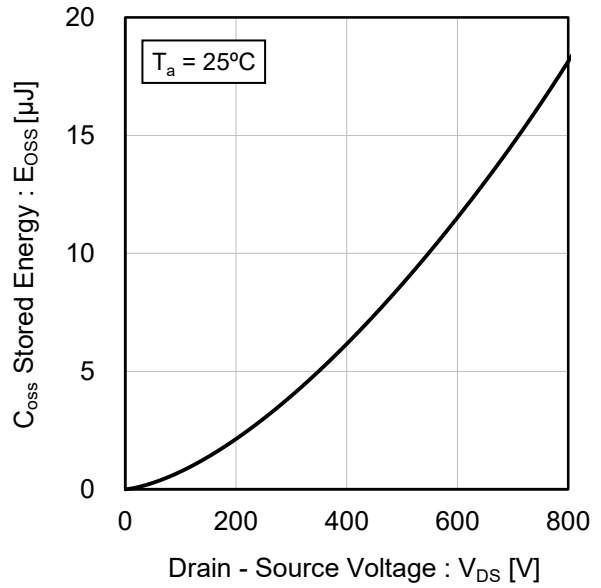
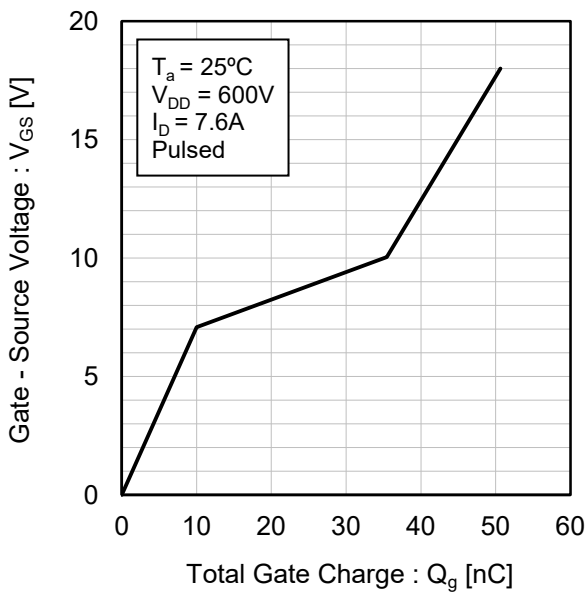
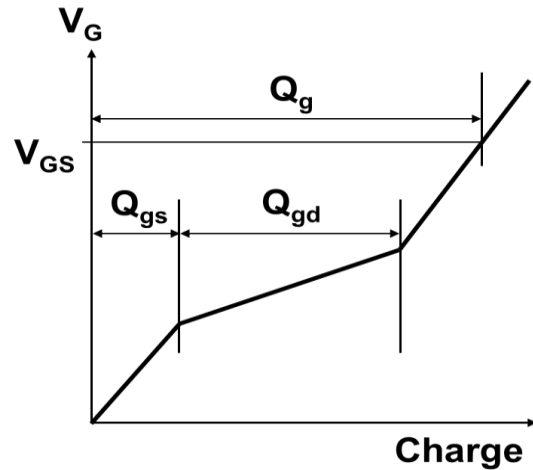


Fig.21 Dynamic Input Characteristics



*Gate Charge Waveform



●Electrical characteristic curves

Fig.19 Typical Switching Time vs. Drain Current

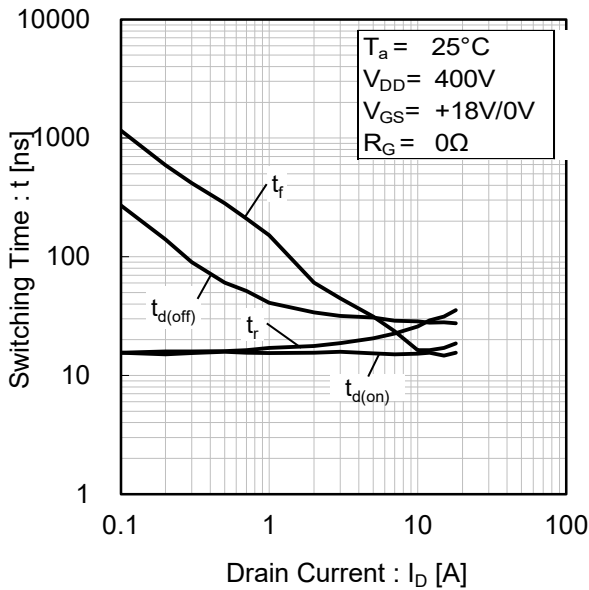


Fig.20 Typical Switching Loss vs. Drain - Source Voltage

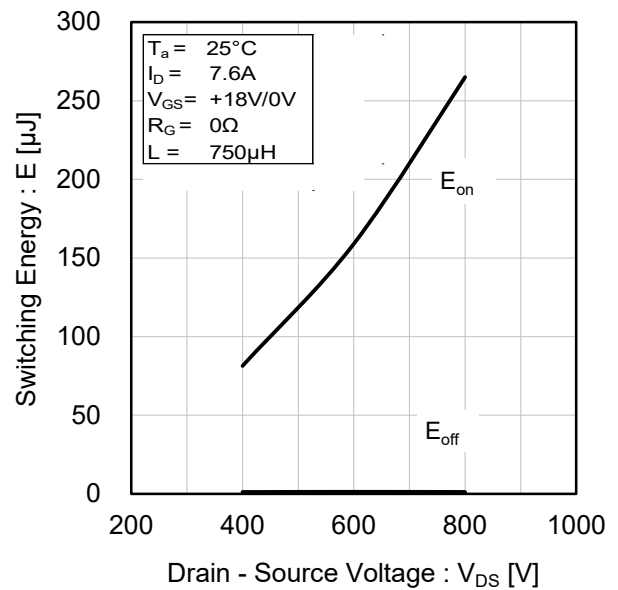


Fig.21 Typical Switching Loss vs. Drain Current

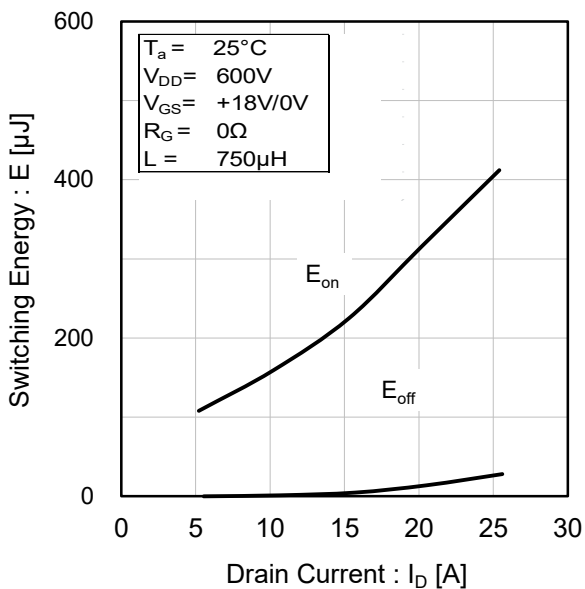
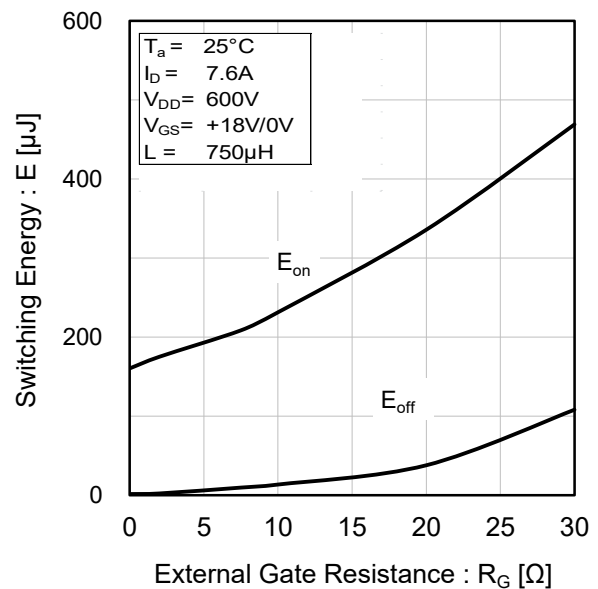


Fig.22 Typical Switching Loss vs. External Gate Resistance



● Measurement circuits and waveforms

Fig.1-1 Gate Charge and Switching Time Measurement Circuit

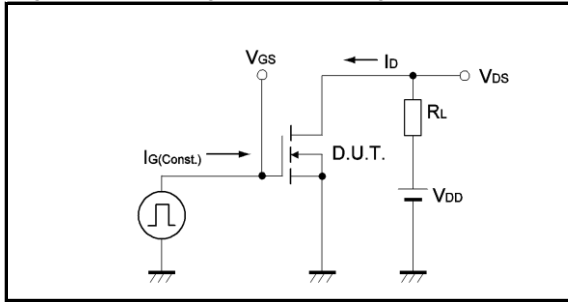


Fig.1-2 Waveforms for Switching Time

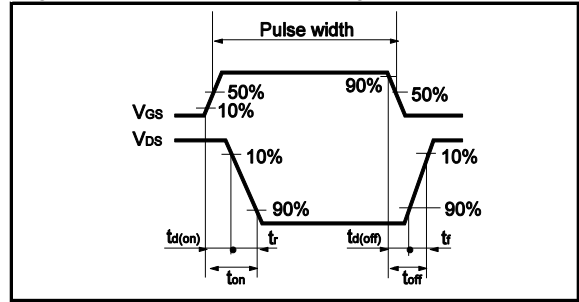


Fig.2-1 Switching Energy Measurement Circuit

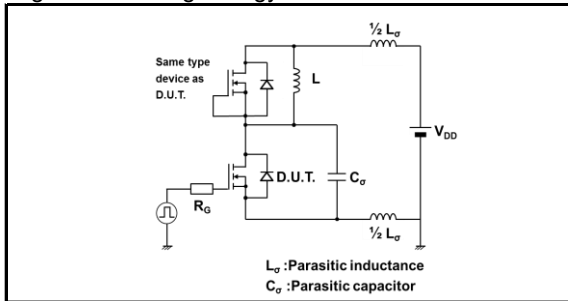


Fig.2-2 Waveforms for Switching Energy Loss

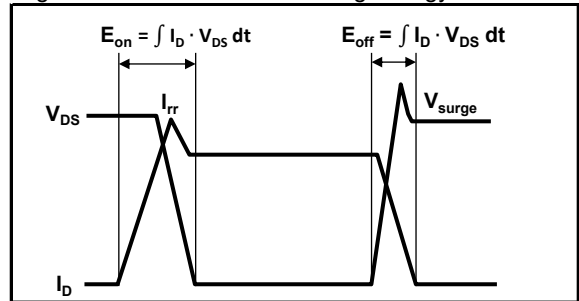


Fig.3-1 Reverse Recovery Time Measurement Circuit

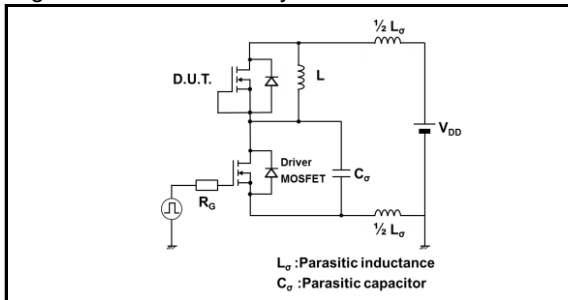
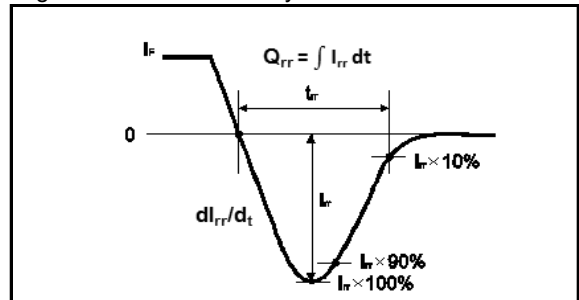


Fig.3-2 Reverse Recovery Waveform



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