## TO-247 Plastic-Encapsulate MOSFETS

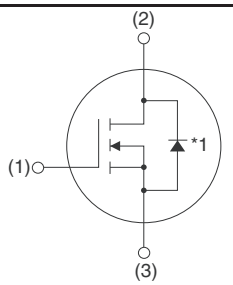
### Features

- Low on-resistance
- Fast switching speed
- Fast reverse recovery
- Easy to parallel
- Simple to drive
- Pb-free lead plating ; RoHS compliant
- N-channel SiC power MOSFET

### MECHANICAL DATA

- Case style:TO-247 molded plastic
- Mounting position:any

### ●Inner circuit




(1) Gate
(2) Drain
(3) Source

*1 Body Diode

### ●Packaging specifications

| | | |
|---|---|---|
| Type | Packing | Tube |
| | Basic ordering unit (pcs) | 30 |
| | Taping code | C11 |
| | Marking | SCT3022KL |

## MAXIMUM RATINGS AND CHARACTERISTICS

@ 25°C Ambient Temperature (unless otherwise noted)

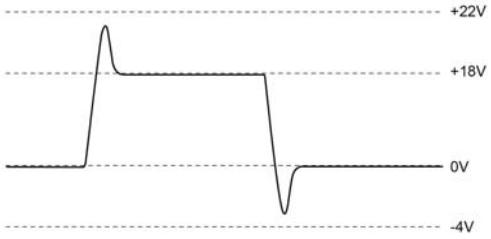
| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain - Source voltage | | $V_{DSS}$ | 1200 | V |
| Continuous drain current | $T_c$ = 25°C | $I_D$ *1 | 95 | A |
| | $T_c$ = 100°C | $I_D$ *1 | 67 | A |
| Pulsed drain current | | $I_{D,pulse}$ *2 | 237 | A |
| Gate - Source voltage | | $V_{GSS}$ | –4 to 22 | V |
| Gate-Source Surge Voltage | | $V_{GSS\_surge}$ | –4 to 22 | V |
| Recommended Drive Voltage | | $V_{GS\_op}$ | 0 / 18 | V |
| Junction temperature | | $T_j$ | 175 | °C |
| Range of storage temperature | | $T_{stg}$ | –55 to +175 | °C |

| | |
|---|---|
| $V_{DSS}$ | 1200V |
| $R_{DS(on)}$ (Typ.) | 22mΩ |
| $I_D$ | 95A |
| $P_D$ | 427W |

## MOSFET ELECTRICAL CHARACTERISTICS $T_A$ =25 ℃ unless otherwise specified

| 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<br>$T_j$ = 25°C<br>$T_j$ = 150°C | -<br>- | 1<br>2 | 1<br>- | 0μA |
| 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, $I_D$ = 18.2mA | 2.7 | - | 5.6 | V |
| Static drain - source on - state resistance | $R_{DS(on)}$ *3 | $V_{GS}$ = 18V, $I_D$ = 36A<br>$T_j$ = 25°C<br>$T_j$ = 125°C | -<br>- | 22<br>3 | 28.6<br>3 - | mΩ |
| Gate input resistance | $R_G$ | f = 1MHz, open drain | - | 4 | - | Ω |
| Thermal resistance, junction - case | $R_{thJC}$ | | - | 0.27 | 0.35 | °C/W |

### ●Example of acceptable Vgs waveform



# RATINGS AND CHARACTERISTIC CURVES

## ●Electrical characteristics ($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Transconductance | $g_{fs}$ *3 | $V_{DS}$ = 10V, $I_D$ = 36A | - | 14.2 | - | S |
| Input capacitance | $C_{iss}$ | $V_{GS}$ = 0V | - | 2879 | - | pF |
| Output capacitance | $C_{oss}$ | $V_{DS}$ = 800V | - | 237 | - | |
| Reverse transfer capacitance | $C_{rss}$ | f = 1MHz | - | 108 | - | |
| Effective output capacitance, energy related | $C_{o(er)}$ | $V_{GS}$ = 0V<br>$V_{DS}$ = 0V to 600V | - | 213 | - | pF |
| Turn - on delay time | $t_{d(on)}$ *3 | $V_{DD}$ = 400V, $I_D$ = 18A | - | 29 | - | ns |
| Rise time | $t_r$ *3 | $V_{GS}$ = 18V/0V | - | 44 | - | |
| Turn - off delay time | $t_{d(off)}$ *3 | $R_L$ = 22Ω | - | 67 | - | |
| Fall time | $t_f$ *3 | $R_G$ = 0Ω | - | 28 | - | |
| Turn - on switching loss | $E_{on}$ *3 | $V_{DD}$ = 600V, $I_D$=36A<br>$V_{GS}$ = 18V/0V<br>$R_G$ = 0Ω L=250μH<br>*$E_{on}$ includes diode reverse recovery | - | 632 | - | μJ |
| Turn - off switching loss | $E_{off}$ *3 | | - | 243 | - | |

## ●Gate Charge characteristics ($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Total gate charge | $Q_g$ *3 | $V_{DD}$ = 600V | - | 178 | - | nC |
| Gate - Source charge | $Q_{gs}$ *3 | $I_D$ = 36A | - | 40 | - | |
| Gate - Drain charge | $Q_{gd}$ *3 | $V_{GS}$ = 18V | - | 80 | - | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD}$ = 600V, $I_D$ = 36A | - | 9.6 | - | V |

*1 Limited only by maximum temperature allowed.

*2 PW ≤ 10μs, Duty cycle ≤ 1%

*3 Pulsed

## ●Body diode electrical characteristics (Source-Drain) ($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Inverse diode continuous, forward current | $I_S$ *1 | $T_c$ = 25°C | - | - | 95 | A |
| Inverse diode direct current, pulsed | $I_{SM}$ *2 | | - | - | 237 | A |
| Forward voltage | $V_{SD}$ *3 | $V_{GS}$ = 0V, $I_S$ = 36A | - | 3.2 | - | V |
| Reverse recovery time | $t_{rr}$ *3 | $I_F$ =36A, $V_R$ = 600V<br>di/dt = 1100A/μs | - | 28 | - | ns |
| Reverse recovery charge | $Q_{rr}$ *3 | | - | 175 | - | nC |
| Peak reverse recovery current | $I_{rrm}$ *3 | | - | 12 | - | A |

# RATINGS AND CHARACTERISTIC CURVES

Fig.1 Power Dissipation Derating Curve

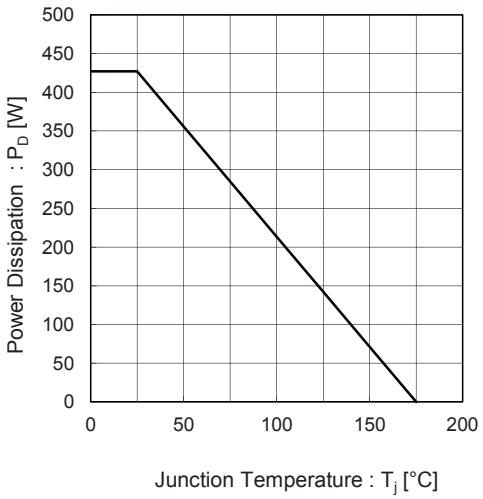



Fig.2 Maximum Safe Operating Area

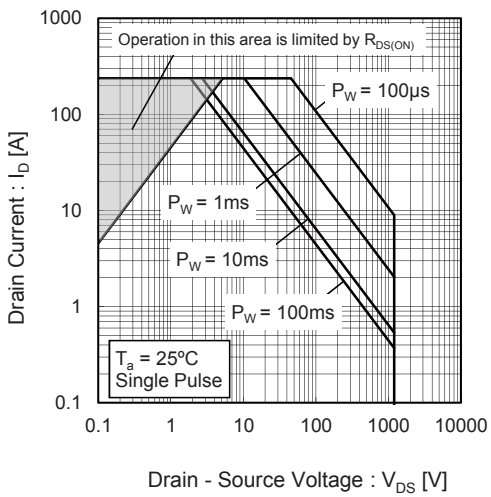



Fig.3 Typical Transient Thermal Resistance vs. Pulse Width

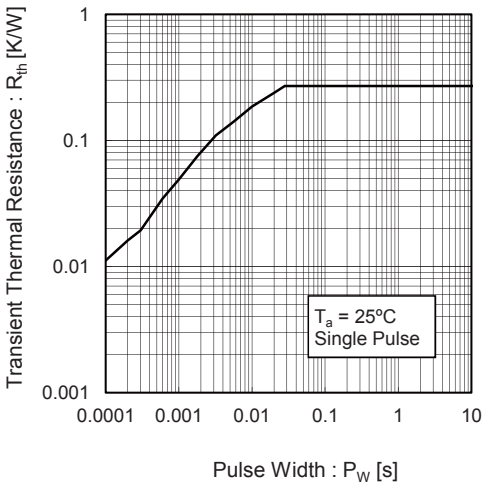



Fig.4 Typical Output Characteristics(I)

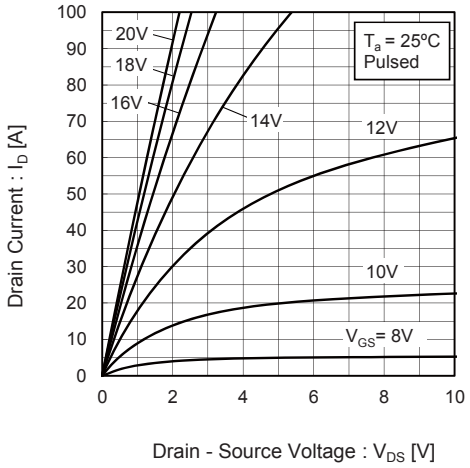



Fig.5 Typical Output Characteristics(II)

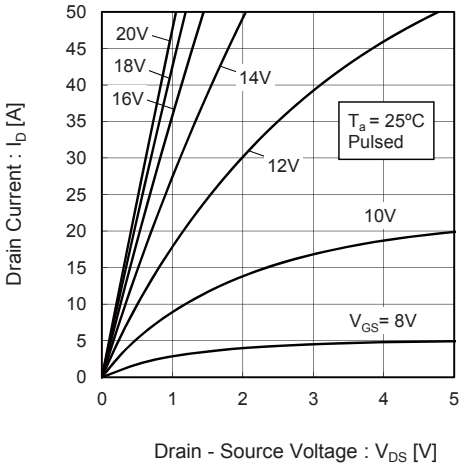



Fig.6 $T_j$ = 150°C Typical Output Characteristics(I)

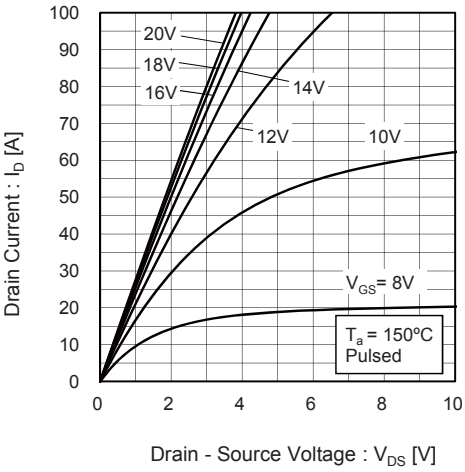



Fig.7 $T_j$ = 150°C Typical Output Characteristics(II)

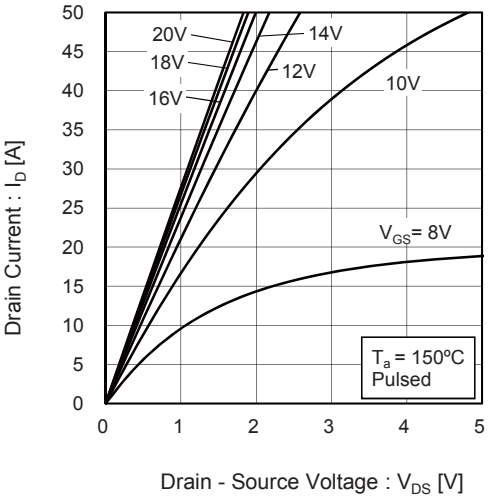



Fig.8 Typical Transfer Characteristics (I)

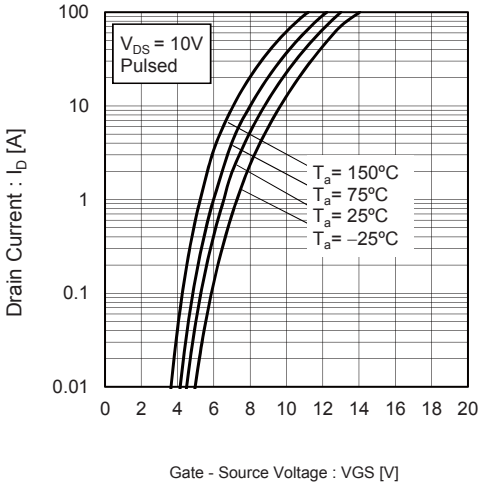
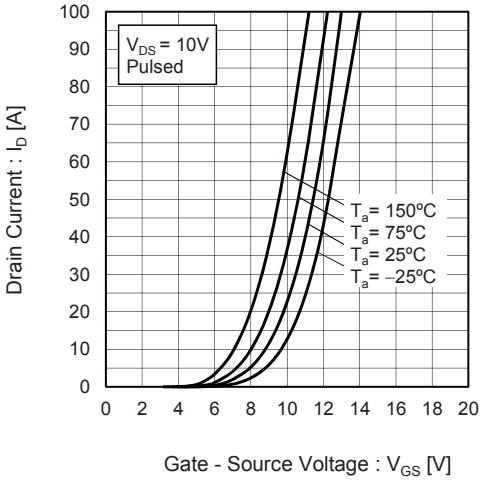



Fig.9 Typical Transfer Characteristics (II)



# RATINGS AND CHARACTERISTIC CURVES

Fig.10 Gate Threshold Voltage vs. Junction Temperature

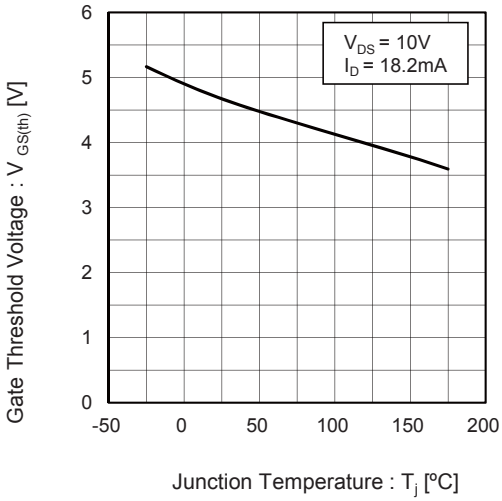



Fig.11 Transconductance vs. Drain Current

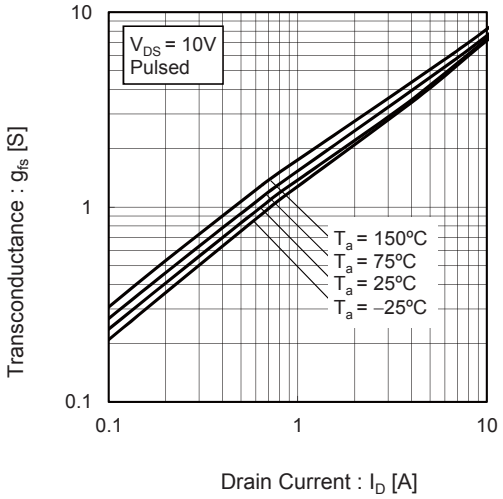



Fig.12 Static Drain - Source On - State Resistance vs. Gate - Source Voltage

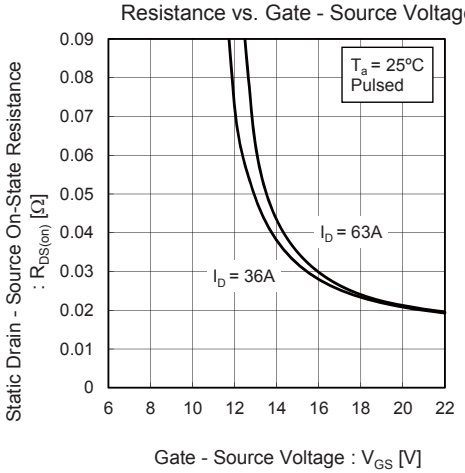



Fig.13 Static Drain - Source On - State Resistance vs. Junction Temperature

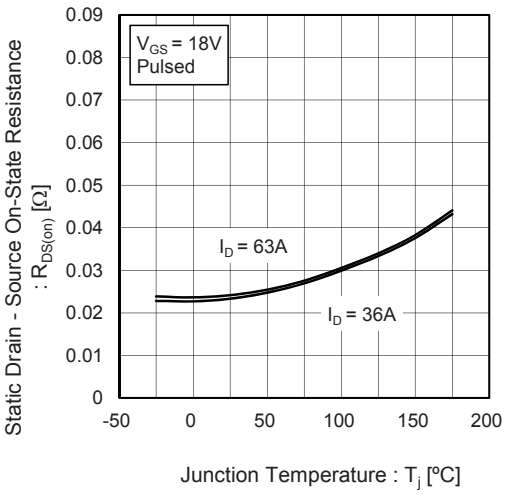



Fig.14 Static Drain - Source On - State Resistance vs. Drain Current

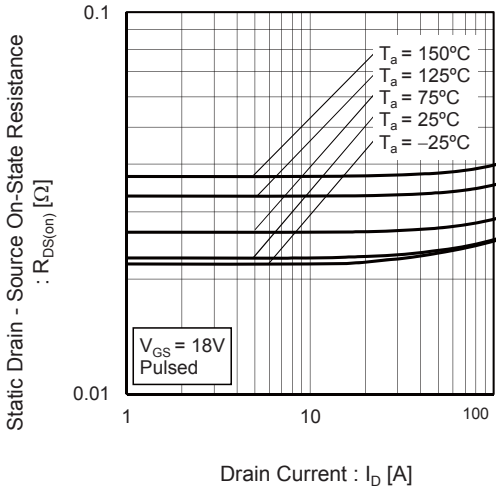



Fig.15 Typical Capacitance vs. Drain - Source Voltage

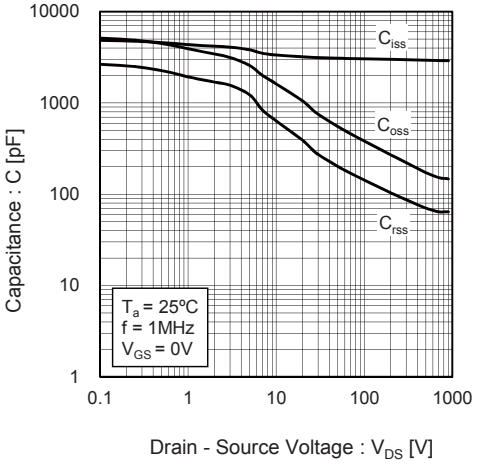



Fig.16 Coss Stored Energy

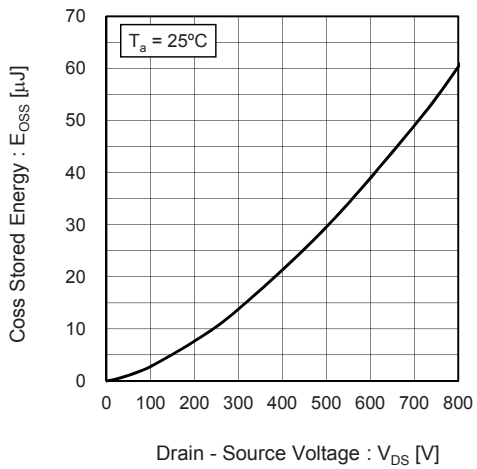



Fig.17 Switching Characteristics

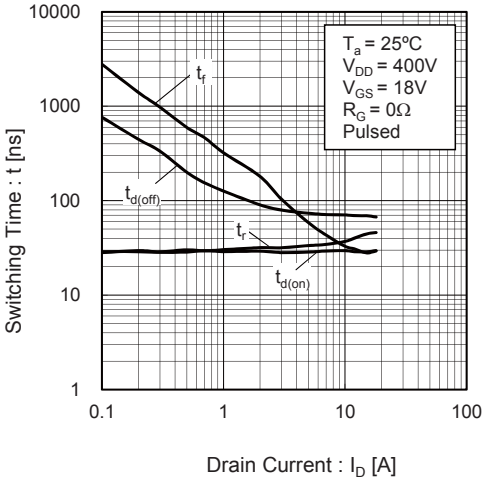
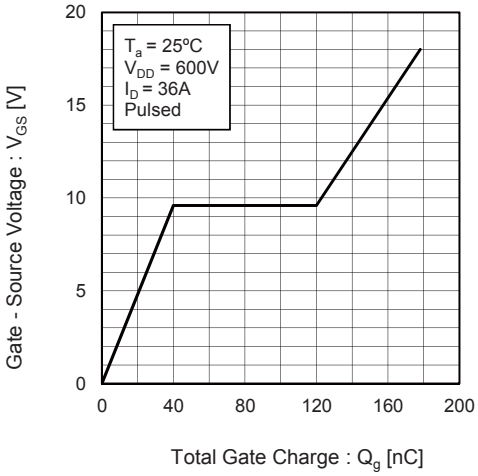



Fig.18 Dynamic Input Characteristics



# RATINGS AND CHARACTERISTIC CURVES

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

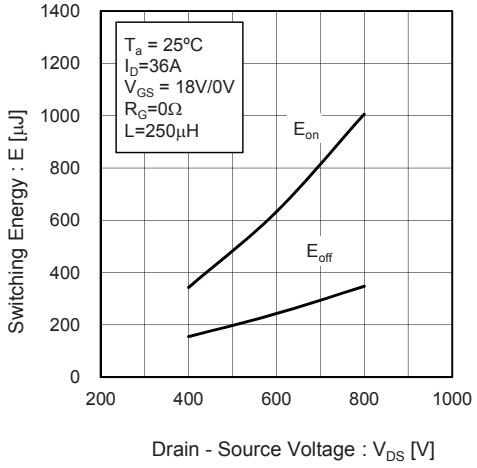



Fig.20 Typical Switching Loss vs. Drain Current

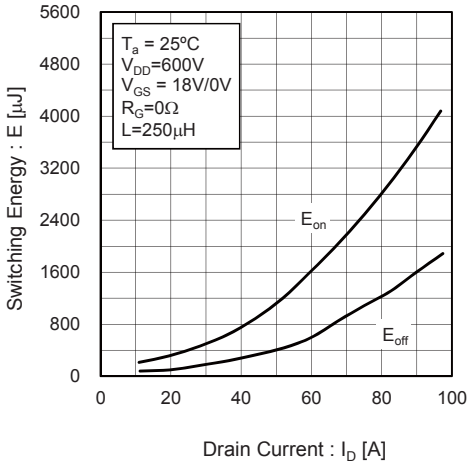



Fig.21 Typical Switching Loss vs. External Gate Resistance

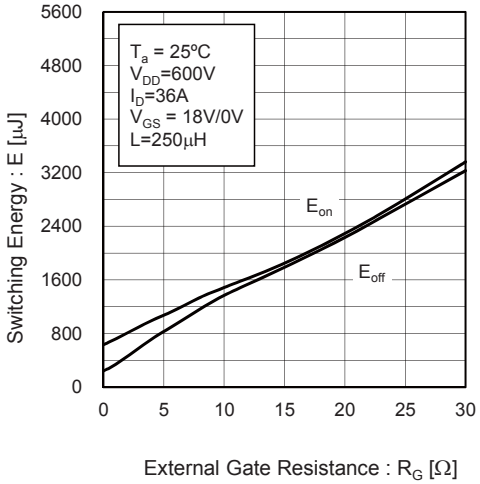



Fig.22 Inverse Diode Forward Current vs. Source - Drain Voltage

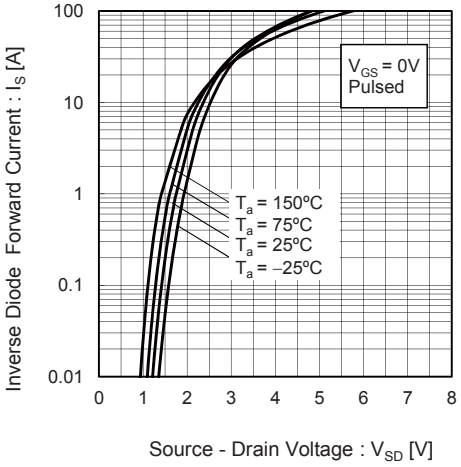
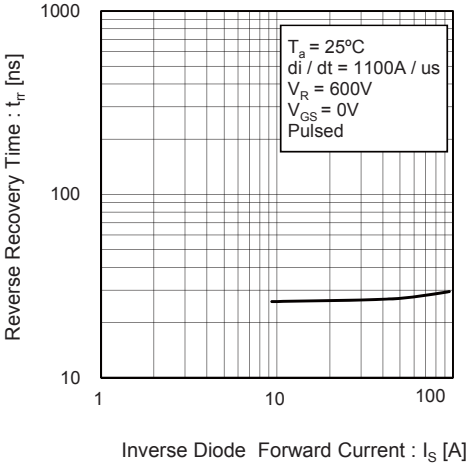



Fig.23 Reverse Recovery Time vs.Inverse Diode Forward Current



## ●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

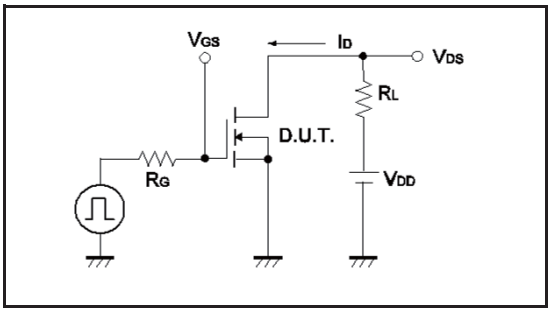



Fig.1-2 Switching Waveforms

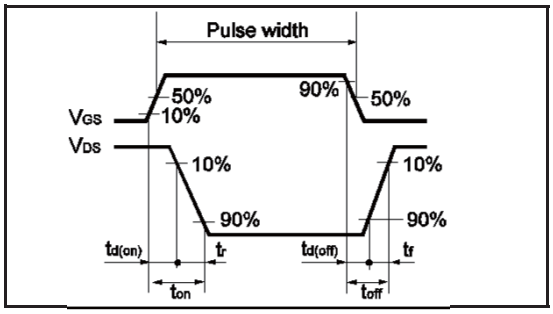



Fig.2-1 Gate Charge Measurement Circuit

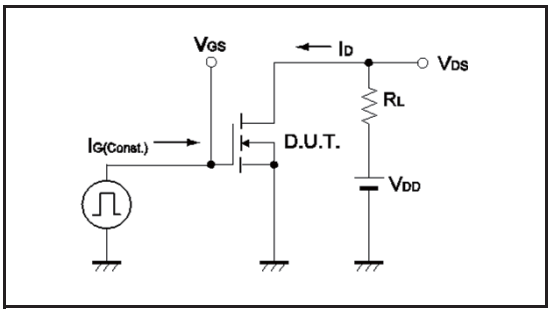



Fig.2-2 Gate Charge Waveform

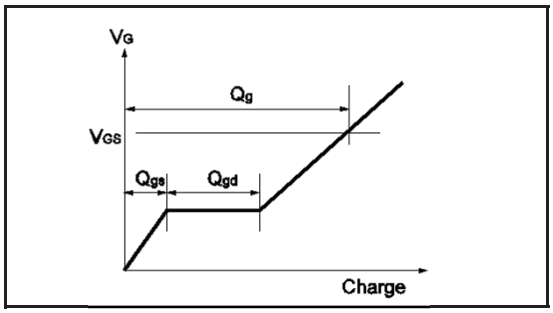



Fig.3-1 Switching Energy Measurement Circuit

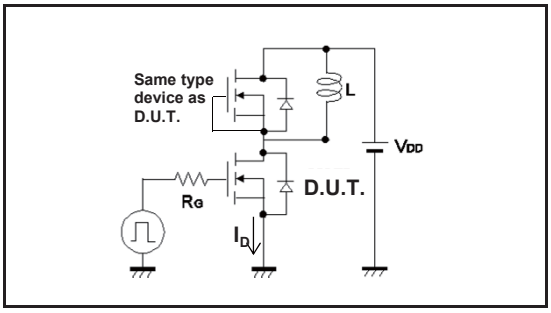



Fig.3-2 Switching Waveforms

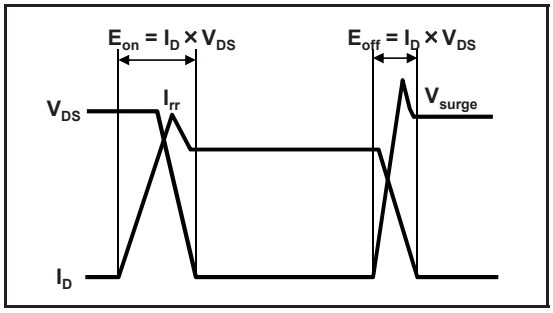



Fig.4-1 Reverse Recovery Time Measurement Circuit

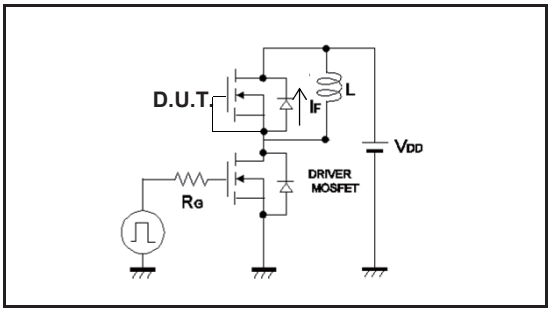



Fig.4-2 Reverse Recovery Waveform