# R6020KNX

Nch 600V 20A Power MOSFET

Datasheet

| | |
|---|---|
| $V_{DSS}$ | 600V |
| $R_{DS(on)}$(Max.) | 0.196Ω |
| $I_D$ | ±20A |
| $P_D$ | 68W |

## ●Outline

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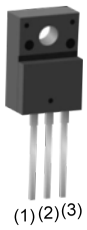
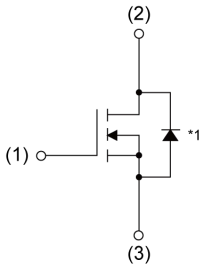



## ●Inner circuit




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

*1 Body Diode

## ●Features

1) Low on-resistance.
2) Ultra Fast switching speed.
3) Parallel use is easy.
4) Pb-free lead plating ; RoHS compliant

## ●Packaging specifications

| | | |
|---|---|---|
| Type | Packing | Bulk |
| | Reel size (mm) | - |
| | Tape width (mm) | - |
| | Basic ordering unit (pcs) | 500 |
| | Taping code | - |
| | Marking | R6020KNX |

## ●Application

Switching

## ●Absolute maximum ratings ($T_a$ = 25°C ,unless otherwise specified)

| Parameter | | Symbol | Value | Unit |
|---|---|---|---|---|
| Drain - Source voltage | | $V_{DSS}$ | 600 | V |
| Continuous drain current ($T_c$ = 25°C) | | $I_D$*1 | ±20 | A |
| Pulsed drain current | | $I_{DP}$*2 | ±60 | A |
| Gate - Source voltage | Static | $V_{GSS}$ | ±20 | V |
| | AC (f＞1Hz) | | ±30 | V |
| Avalanche current, single pulse | | $I_{AS}$ | 3.4 | A |
| Avalanche energy, single pulse | | $E_{AS}$*3 | 418 | mJ |
| Power dissipation ($T_c$ = 25°C) | | $P_D$ | 68 | W |
| Junction temperature | | $T_j$ | 150 | ℃ |
| Operating junction and storage temperature range | | $T_{stg}$ | -55 to +150 | ℃ |

## ●Thermal resistance

| Parameter | Symbol | Values | | | Unit |
|---|---|---|---|---|---|
| | | Min. | Typ. | Max. | |
| Thermal resistance, junction - case | $R_{thJC}$ *4 | - | - | 1.8 | ℃/W |
| Thermal resistance, junction - ambient | $R_{thJA}$ | - | - | 70 | ℃/W |
| Soldering temperature, wavesoldering for 10s | $T_{sold}$ | - | - | 265 | ℃ |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Drain - Source breakdown voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0V, $I_D$ = 1mA | 600 | - | - | V |
| Zero gate voltage drain current | $I_{DSS}$ | $V_{DS}$ = 600V, $V_{GS}$ = 0V | | | | μA |
| | | $T_j$ = 25°C | - | - | 100 | |
| | | $T_j$ = 125°C | - | - | 1000 | |
| Gate - Source leakage current | $I_{GSS}$ | $V_{GS}$ = ±20V, $V_{DS}$ = 0V | - | - | ±100 | nA |
| Gate threshold voltage | $V_{GS(th)}$ | $V_{DS}$ = 10V, $I_D$ = 1mA | 3 | - | 5 | V |
| Static drain - source on - state resistance | $R_{DS(on)}$ *5 | $V_{GS}$ = 10V, $I_D$ = 9.5A | | | | Ω |
| | | $T_j$ = 25°C | - | 0.170 | 0.196 | |
| | | $T_j$ = 125°C | - | 0.36 | - | |
| Gate resistance | $R_G$ | f = 1MHz, open drain | - | 2.3 | - | Ω |

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

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Forward Transfer Admittance | $\|Y_{fs}\|$*5 | $V_{DS}$ = 10V, $I_D$ = 10A | 5 | 10 | - | S |
| Input capacitance | $C_{iss}$ | $V_{GS}$ = 0V | - | 1550 | - | pF |
| Output capacitance | $C_{oss}$ | $V_{DS}$ = 25V | - | 1350 | - | |
| Reverse transfer capacitance | $C_{rss}$ | f = 1MHz | - | 55 | - | |
| Turn - on delay time | $t_{d(on)}$*5 | $V_{DD}$ ≃ 300V, $V_{GS}$ = 10V | - | 30 | - | ns |
| Rise time | $t_r$*5 | $I_D$ = 10A | - | 30 | - | |
| Turn - off delay time | $t_{d(off)}$*5 | $R_L$ ≃ 30Ω | - | 55 | - | |
| Fall time | $t_f$*5 | $R_G$ = 10Ω | - | 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 | - | 40 | - | nC |
| Gate - Source charge | $Q_{gs}$*5 | $I_D$ = 20A | - | 12 | - | |
| Gate - Drain charge | $Q_{gd}$*5 | $V_{GS}$ = 10V | - | 15 | - | |
| Gate plateau voltage | $V_{(plateau)}$ | $V_{DD}$ ≃ 300V, $I_D$ = 20A | - | 6.4 | - | V |

*1 Limited only by maximum channel temperature allowed.

*2 Pw ≤ 10μs, Duty cycle ≤ 1%

*3 L≒70mH, $V_{DD}$=50V, $R_G$=25Ω, STARTING $T_j$=25℃

*4 $T_C$=25℃

*5 Pulsed

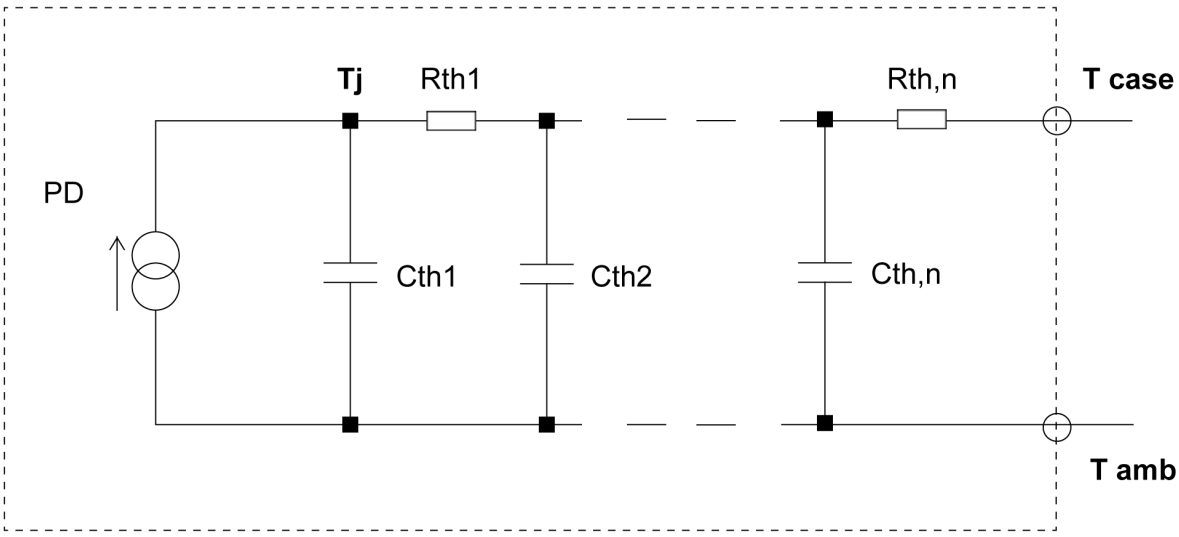
## ●Body diode electrical characteristics (Source-Drain) ($T_a$ = 25°C)

| Parameter | Symbol | Conditions | Values | | | Unit |
|---|---|---|---|---|---|---|
| | | | Min. | Typ. | Max. | |
| Continuous forward current | $I_S$ *1 | $T_C$ = 25℃ | - | - | 20 | A |
| Pulse forward current | $I_{SP}$ *2 | | - | - | 60 | A |
| Forward voltage | $V_{SD}$ *5 | $V_{GS}$ = 0V, $I_S$ = 20A | - | - | 1.5 | V |
| Reverse recovery time | $t_{rr}$ *5 | $I_S$ = 20A<br>di/dt = 100A/μs | - | 500 | - | ns |
| Reverse recovery charge | $Q_{rr}$ *5 | | - | 7.5 | - | μC |
| Peak reverse recovery current | $I_{rrm}$ *5 | | - | 30 | - | A |

## ●Typical transient thermal characteristics

| Symbol | Value | Unit |
|---|---|---|
| $R_{th1}$ | 0.118 | K/W |
| $R_{th2}$ | 0.722 | |
| $R_{th3}$ | 2.15 | |

| Symbol | Value | Unit |
|---|---|---|
| $C_{th1}$ | 0.00216 | Ws/K |
| $C_{th2}$ | 0.0346 | |
| $C_{th3}$ | 0.491 | |



## ●Electrical characteristic curves

Fig.1 Power Dissipation Derating Curve

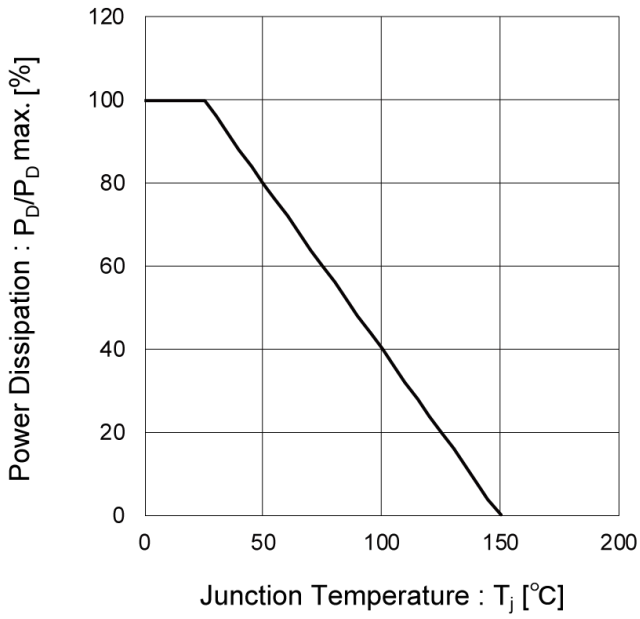



Fig.2 Maximum Safe Operating Area

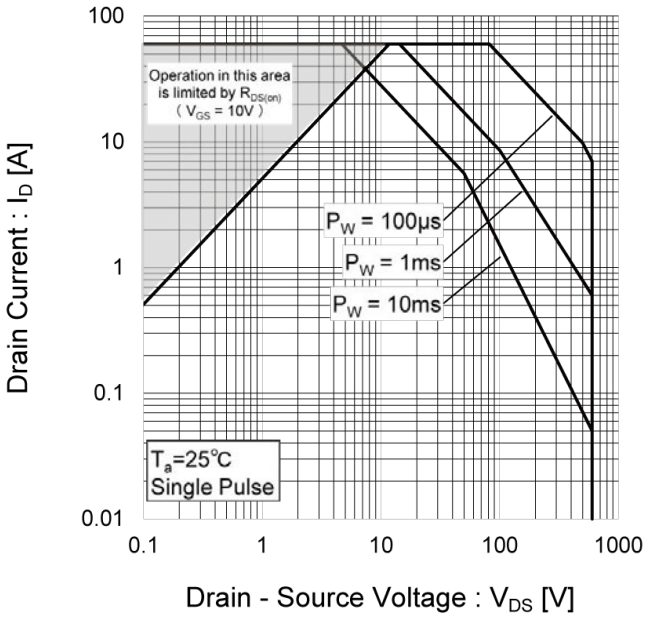
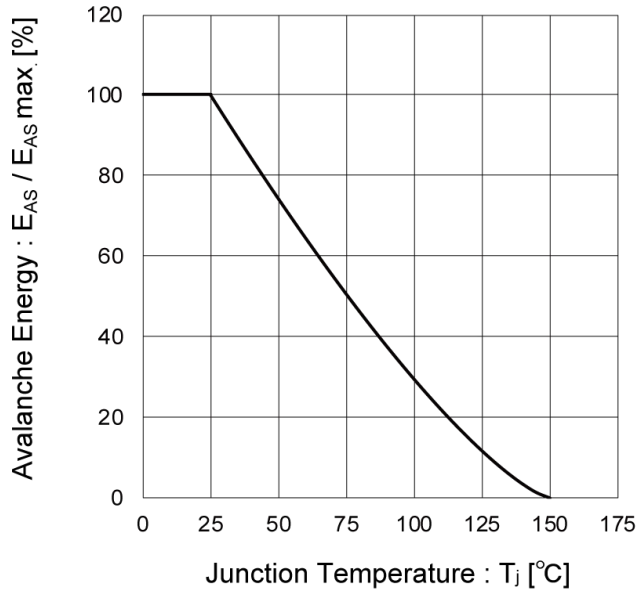



Fig.3 Avalanche Energy Derating Curve vs. Junction Temperature



## ●Electrical characteristic curves

Fig.4 Typical Output Characteristics(I)

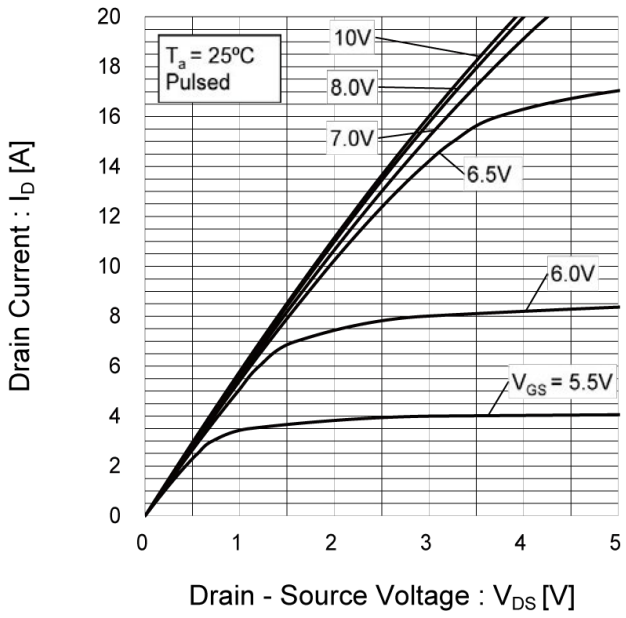
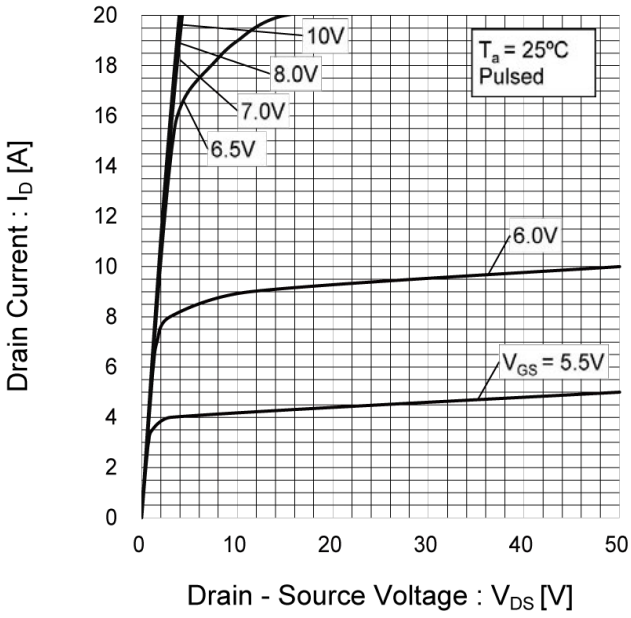



Fig.5 Typical Output Characteristics(II)



## ●Electrical characteristic curves

Fig.6 Breakdown Voltage vs. Junction Temperature

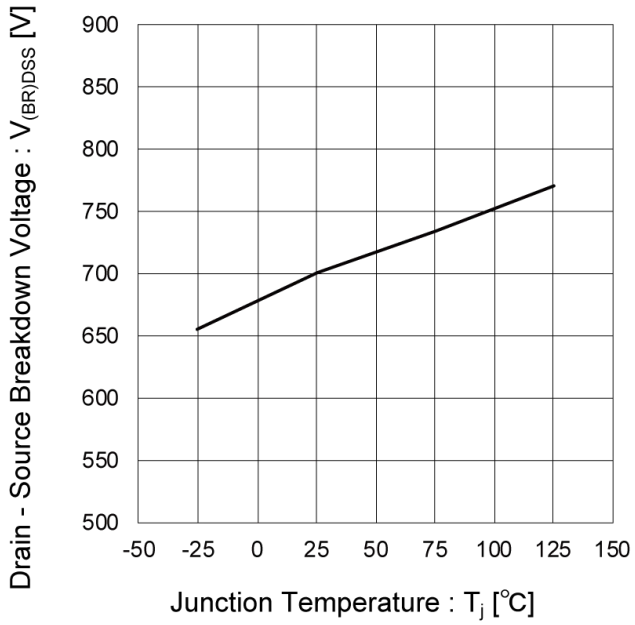



Fig.7 Typical Transfer Characteristics

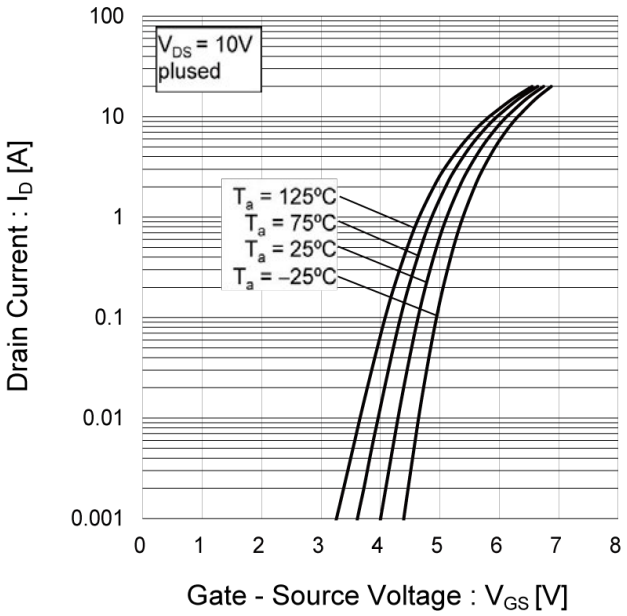



Fig.8 Gate Threshold Voltage vs. Junction Temperature

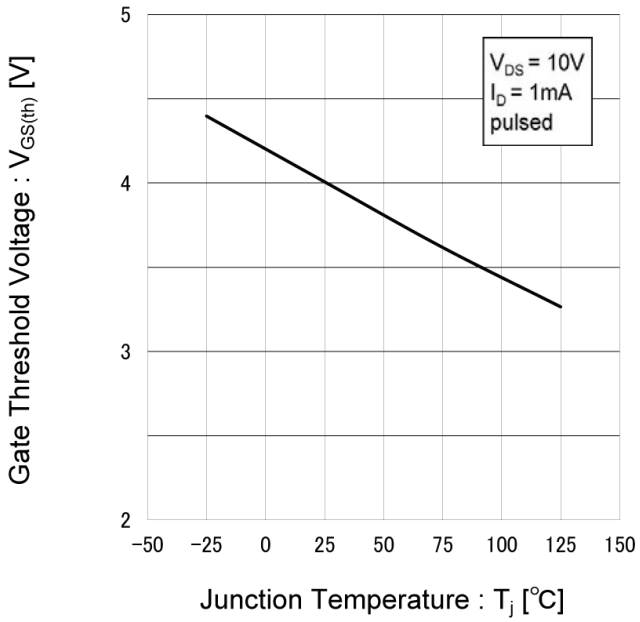
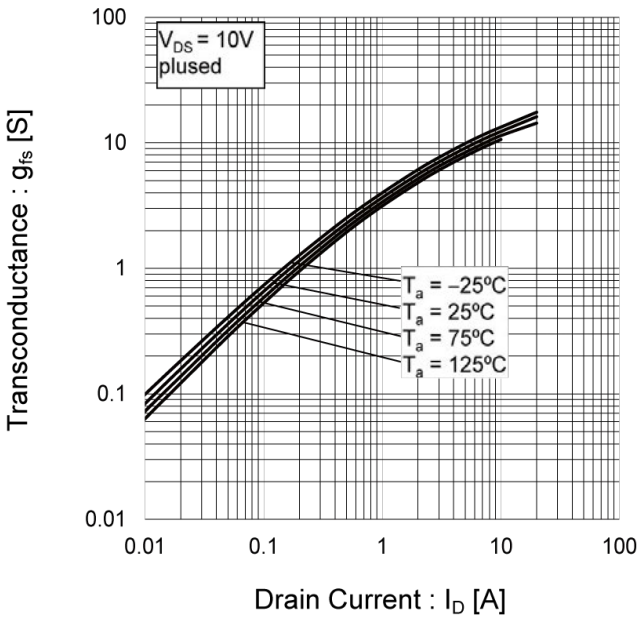



Fig.9 Forward Transfer Admittance vs. Drain Current



## ●Electrical characteristic curves

Fig.10 Static Drain - Source On - State Resistance vs. Gate Source Voltage

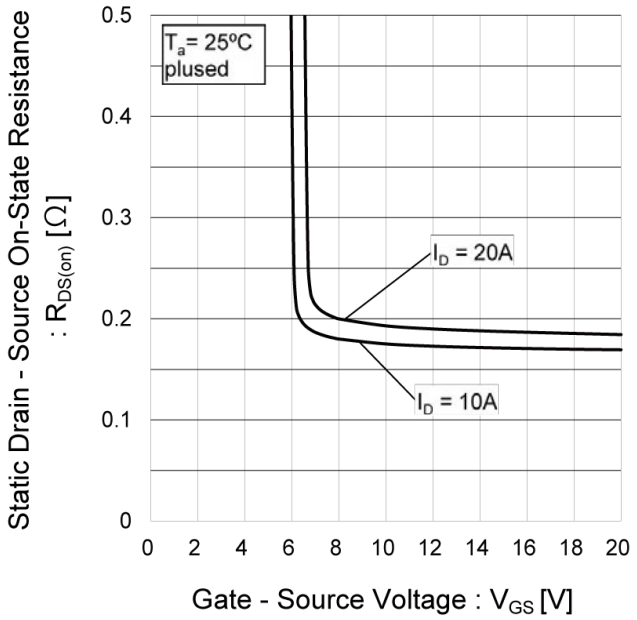



Fig.11 Static Drain - Source On - State Resistance vs. Junction Temperature

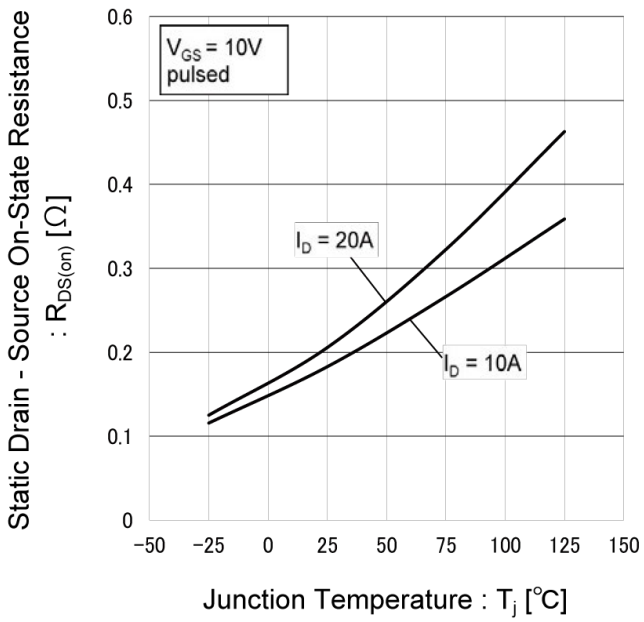
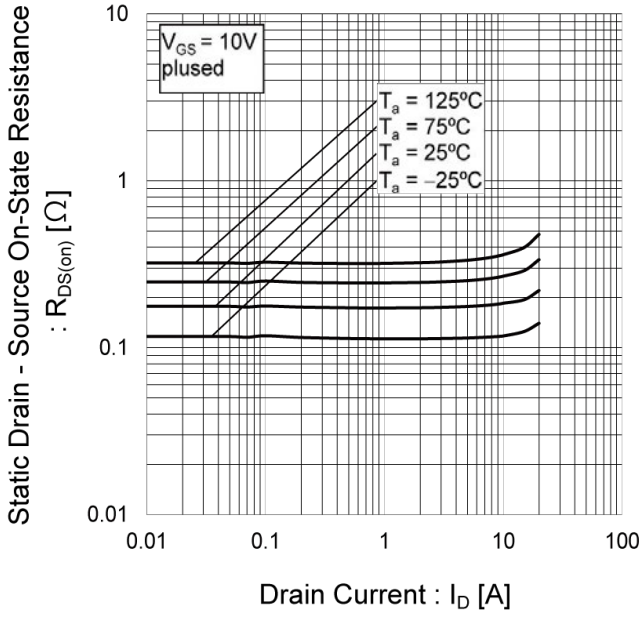



Fig.12 Static Drain - Source On - State Resistance vs. Drain Current



## ●Electrical characteristic curves

Fig.13 Typical Capacitance vs. Drain - Source Voltage

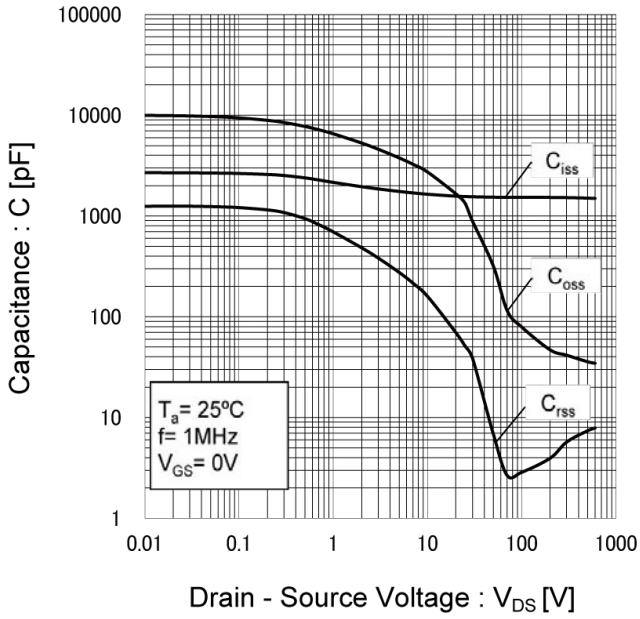



Fig.14 Switching Characteristics

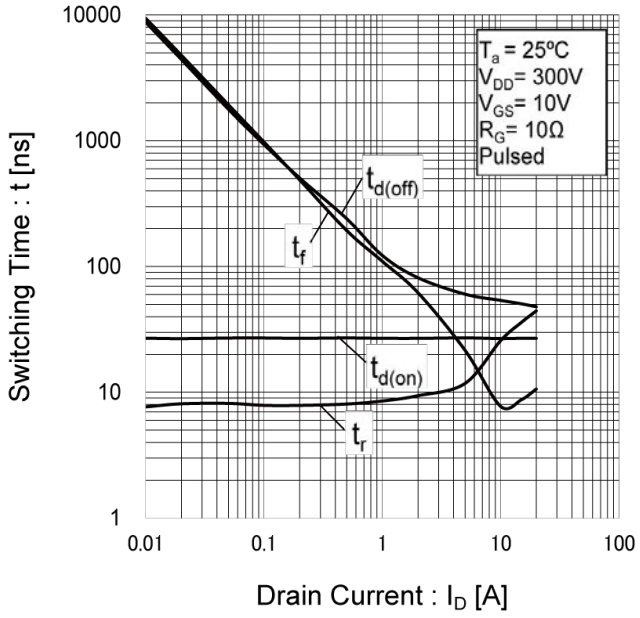
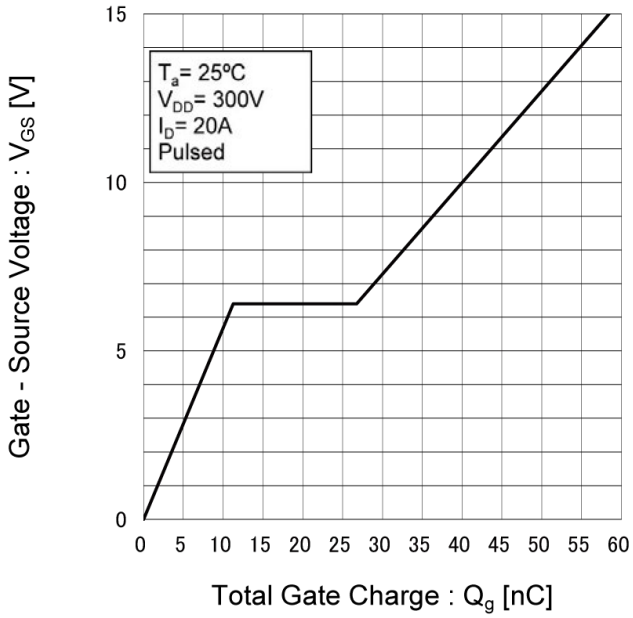



Fig.15 Dynamic Input Characteristics



## ●Electrical characteristic curves

Fig.16 Inverse Diode Forward Current vs. Source - Drain Voltage

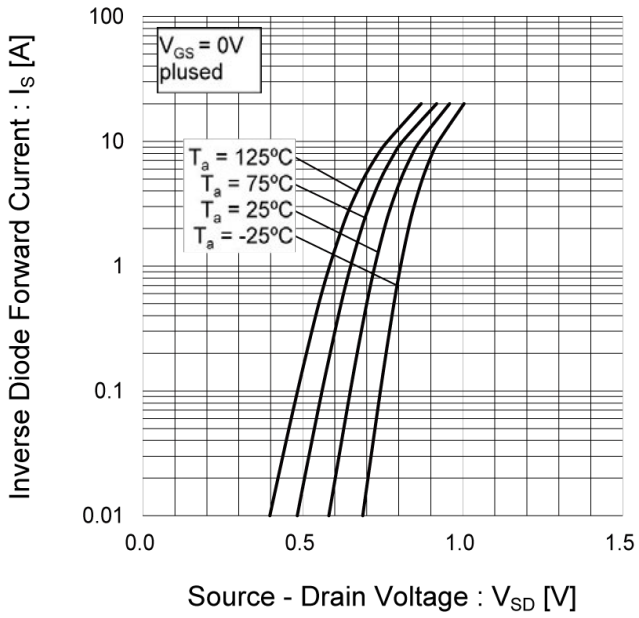
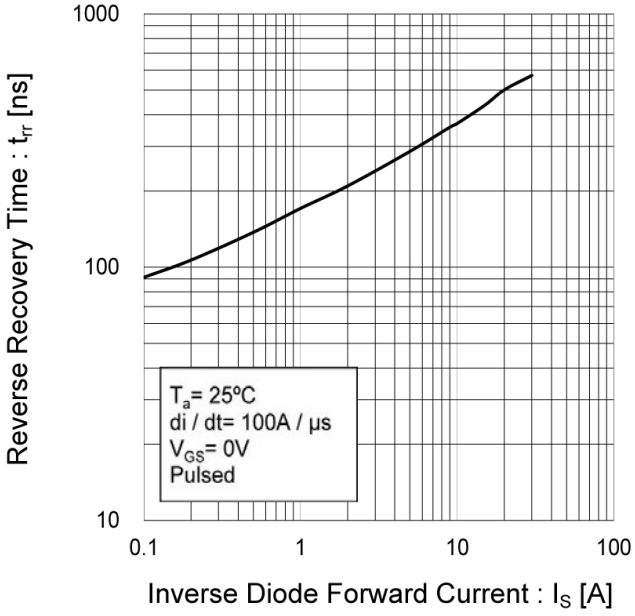



Fig.17 Reverse Recovery Time vs. Inverse Diode Forward Current



## ●Measurement circuits

Fig.1-1 Switching Time Measurement Circuit

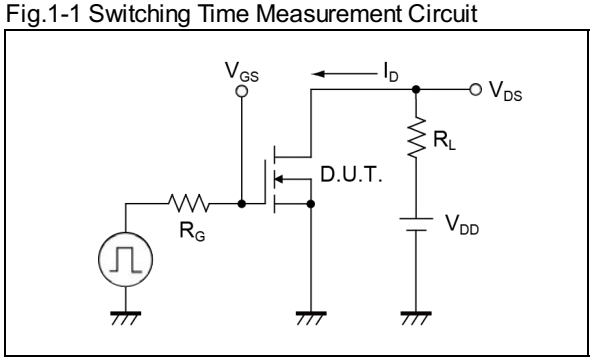



Fig.1-2 Switching Waveforms

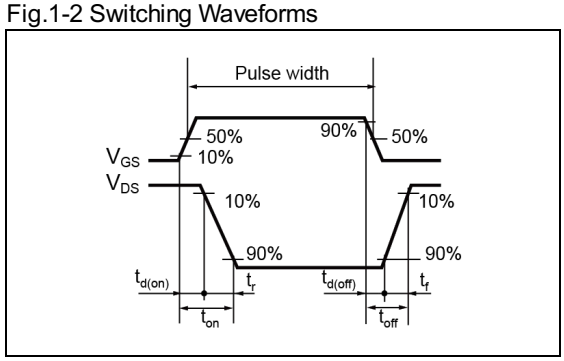



Fig.2-1 Gate Charge Measurement Circuit

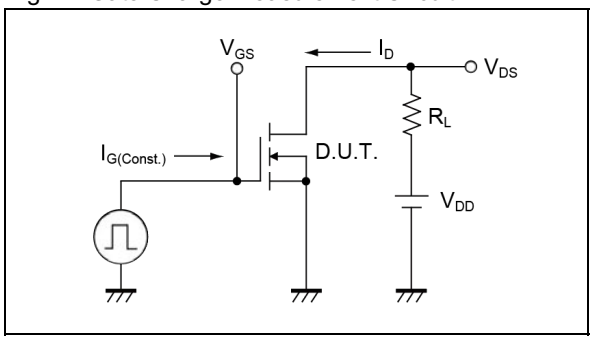



Fig.2-2 Gate Charge Waveform

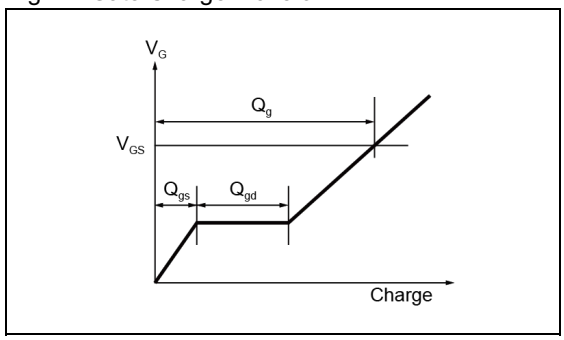



Fig.3-1 Avalanche Measurement Circuit

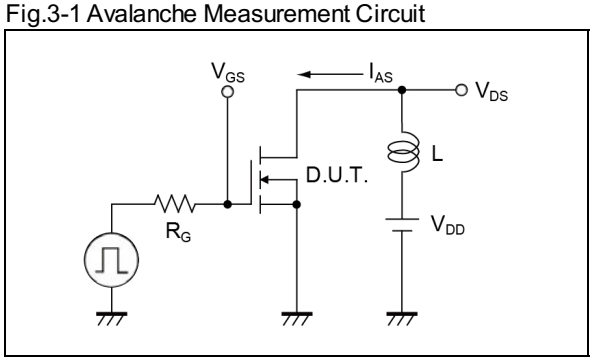



Fig.3-2 Avalanche Waveform

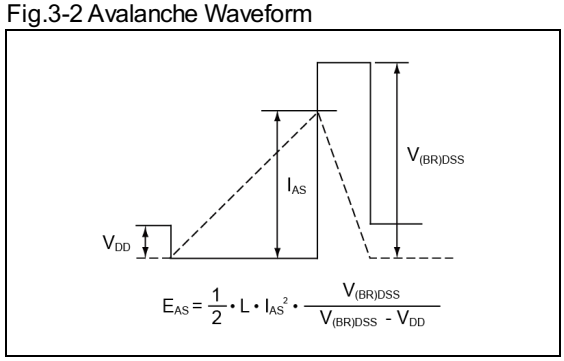



Fig.4-1 dv/dt Measurement Circuit

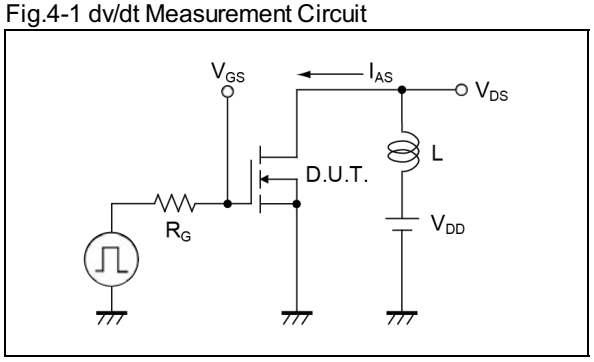



Fig.4-2 dv/dt Waveform

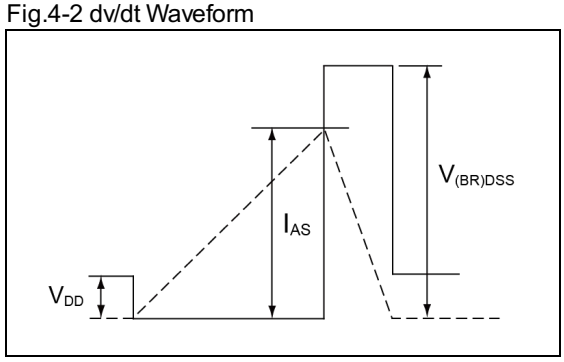



Fig.5-1 dv/dt Measurement Circuit

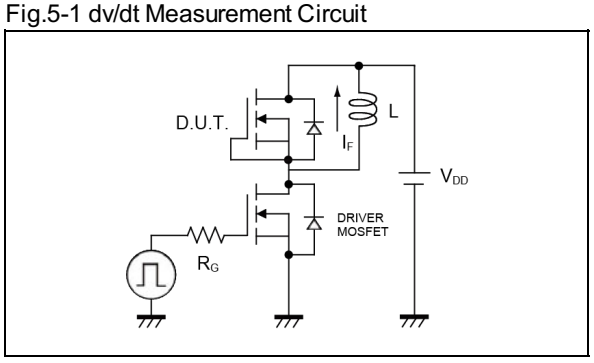
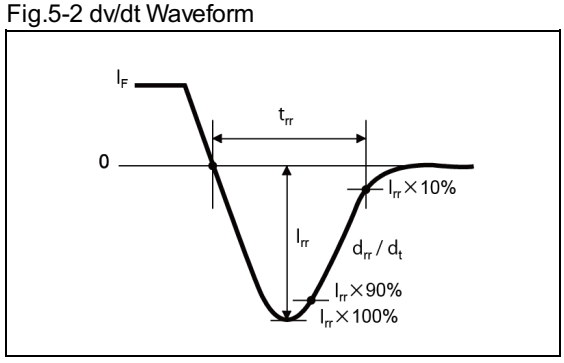



Fig.5-2 dv/dt Waveform



## ●Dimensions

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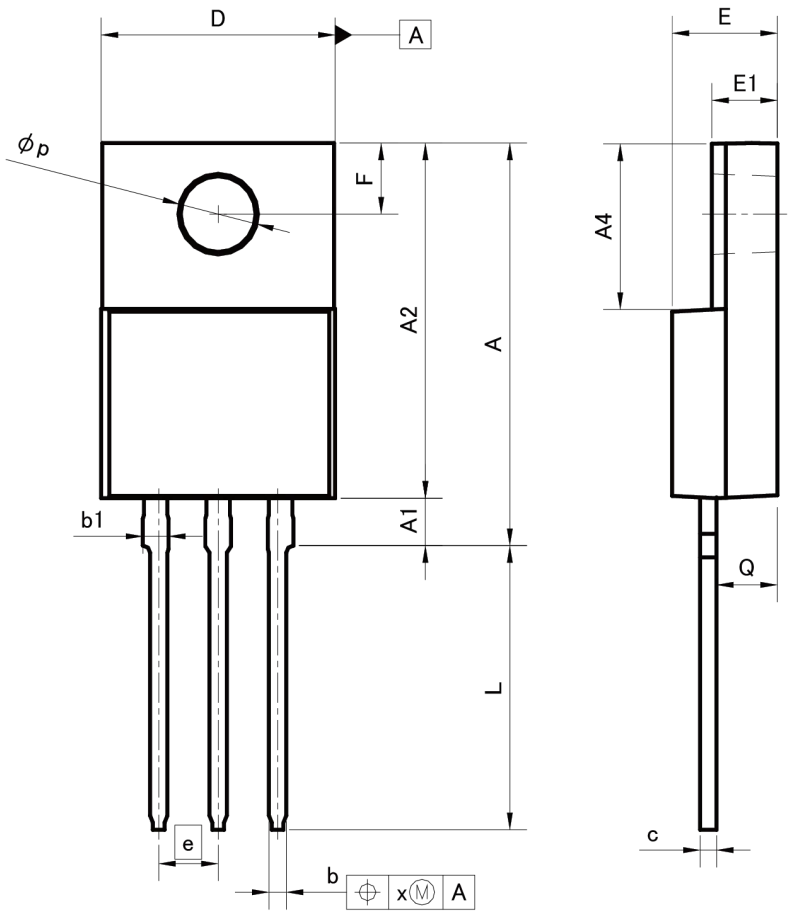


| DIM | MILIMETERS | | INCHES | |
|---|---|---|---|---|
| | MIN | MAX | MIN | MAX |
| A | 16.60 | 17.60 | 0.654 | 0.693 |
| A1 | 1.80 | 2.20 | 0.071 | 0.087 |
| A2 | 14.80 | 15.40 | 0.583 | 0.606 |
| A4 | 6.80 | 7.20 | 0.268 | 0.283 |
| b | 0.70 | 0.85 | 0.028 | 0.033 |
| b1 | 1.10 | 1.50 | 0.043 | 0.059 |
| c | 0.70 | 0.85 | 0.028 | 0.033 |
| D | 9.90 | 10.30 | 0.390 | 0.406 |
| E | 4.40 | 4.80 | 0.173 | 0.189 |
| e | 2.54 | | 0.100 | |
| E1 | 2.70 | 3.00 | 0.106 | 0.118 |
| F | 2.80 | 3.20 | 0.110 | 0.126 |
| L | 11.50 | 12.50 | 0.453 | 0.492 |
| p | 3.00 | 3.40 | 0.118 | 0.134 |
| Q | 2.10 | 3.10 | 0.083 | 0.122 |
| x | – | 0.38 | – | 0.015 |

Dimension in mm/inches

## Notes

1) The information contained herein is subject to change without notice.

2) Before you use our Products, please contact our sales representative and verify the latest specifications :

3) Although ROHM is continuously working to improve product reliability and quality, semiconductors can break down and malfunction due to various factors.
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7) The Products specified in this document are not designed to be radiation tolerant.

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- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

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ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

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