

# 10V Drive Nch MOSFET

## R6020ANJ

### ●Structure

Silicon N-channel MOSFET

### ●Features

- 1) Low on-resistance.
- 2) Fast switching speed.
- 3) Gate-source voltage ( $V_{GS}$ ) guaranteed to be  $\pm 30V$ .
- 4) Drive circuits can be simple.
- 5) Parallel use is easy.

### ●Applications

Switching

### ●Packaging specifications

#### <LPTS>

| Type     | Package                      | Taping |
|----------|------------------------------|--------|
|          | Code                         | TL     |
|          | Basic ordering unit (pieces) | 1000   |
| R6020ANJ |                              | ○      |

#### <LPTL>

| Type     | Package                      | Taping |
|----------|------------------------------|--------|
|          | Code                         | TLL    |
|          | Basic ordering unit (pieces) | 1000   |
| R6020ANJ |                              | ○      |

### ●Absolute maximum ratings ( $T_a=25^\circ C$ )

| Parameter                                    |            | Symbol      | Limits          | Unit       |
|----------------------------------------------|------------|-------------|-----------------|------------|
| Drain-source voltage                         |            | $V_{DS}$    | 600             | V          |
| Gate-source voltage                          |            | $V_{GS}$    | $\pm 30$        | V          |
| Drain current                                | Continuous | $I_D$ *3    | $\pm 20$        | A          |
|                                              | Pulsed     | $I_{DP}$ *1 | $\pm 80$        | A          |
| Source current (Body Diode)                  | Continuous | $I_S$ *3    | 20              | A          |
|                                              | Pulsed     | $I_{SP}$ *1 | 80              | A          |
| Avalanche Current                            |            | $I_{AS}$ *2 | 10              | A          |
| Avalanche Energy                             |            | $E_{AS}$ *2 | 26.7            | mJ         |
| Total power dissipation ( $T_c=25^\circ C$ ) |            | $P_D$       | 100             | W          |
| Channel temperature                          |            | $T_{ch}$    | 150             | $^\circ C$ |
| Range of storage temperature                 |            | $T_{stg}$   | $-55$ to $+150$ | $^\circ C$ |

 \*1  $P_w \leq 10\mu s$ , Duty cycle  $\leq 1\%$ 

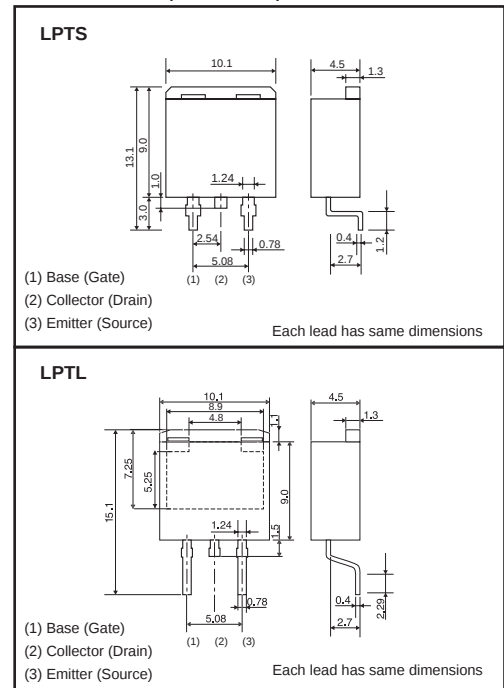
 \*2  $L = 500\mu H$ ,  $V_{DD} = 50V$ ,  $R_G = 25\Omega$ , Starting,  $T_{ch} = 25^\circ C$ 

\*3 Limited only by maximum temperature allowed

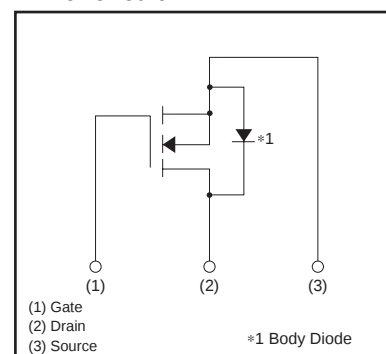
### ●Thermal resistance

| Parameter       | Symbol         | Limits | Unit         |
|-----------------|----------------|--------|--------------|
| Channel to case | $R_{th(ch-c)}$ | 1.25   | $^\circ C/W$ |

### ●Dimensions (Unit : mm)



### ●Inner circuit



## ●Electrical characteristics (Ta=25°C)

| Parameter                               | Symbol         | Min. | Typ. | Max. | Unit | Conditions                                      |
|-----------------------------------------|----------------|------|------|------|------|-------------------------------------------------|
| Gate-source leakage                     | $I_{GSS}$      | —    | —    | ±100 | nA   | $V_{GS}=\pm 30V$ , $V_{DS}=0V$                  |
| Drain-source breakdown voltage          | $V_{(BR)DSS}$  | 600  | —    | —    | V    | $I_D=1mA$ , $V_{GS}=0V$                         |
| Zero gate voltage drain current         | $I_{DSS}$      | —    | —    | 100  | μA   | $V_{DS}=600V$ , $V_{GS}=0V$                     |
| Gate threshold voltage                  | $V_{GS(th)}$   | 2.5  | —    | 4.5  | V    | $V_{DS}=10V$ , $I_D=1mA$                        |
| Static drain-source on-state resistance | $R_{DS(on)}^*$ | —    | 0.19 | 0.25 | Ω    | $I_D=10A$ , $V_{GS}=10V$                        |
| Forward transfer admittance             | $ Y_{fs} ^*$   | 7    | —    | —    | S    | $I_D=10A$ , $V_{DS}=10V$                        |
| Input capacitance                       | $C_{iss}$      | —    | 2040 | —    | pF   | $V_{DS}=25V$                                    |
| Output capacitance                      | $C_{oss}$      | —    | 1660 | —    | pF   | $V_{GS}=0V$                                     |
| Reverse transfer capacitance            | $C_{rss}$      | —    | 70   | —    | pF   | $f=1MHz$                                        |
| Turn-on delay time                      | $t_{d(on)}^*$  | —    | 40   | —    | ns   | $I_D=10A$ , $V_{DD}\approx 300V$                |
| Rise time                               | $t_r^*$        | —    | 60   | —    | ns   | $V_{GS}=10V$                                    |
| Turn-off delay time                     | $t_{d(off)}^*$ | —    | 230  | —    | ns   | $R_L=30\Omega$                                  |
| Fall time                               | $t_f^*$        | —    | 70   | —    | ns   | $R_G=10\Omega$                                  |
| Total gate charge                       | $Q_g^*$        | —    | 65   | —    | nC   | $V_{DD}\approx 300V$                            |
| Gate-source charge                      | $Q_{gs}^*$     | —    | 10   | —    | nC   | $I_D=20A$                                       |
| Gate-drain charge                       | $Q_{gd}^*$     | —    | 25   | —    | nC   | $V_{GS}=10V$<br>$R_L=15\Omega$ / $R_G=10\Omega$ |

\* Pulsed

## ●Body diode characteristics (Source-drain) (Ta=25°C)

| Parameter       | Symbol     | Min. | Typ. | Max. | Unit | Conditions              |
|-----------------|------------|------|------|------|------|-------------------------|
| Forward voltage | $V_{SD}^*$ | —    | —    | 1.5  | V    | $I_S=10A$ , $V_{GS}=0V$ |

\* Pulsed

# ●Electrical characteristics curves

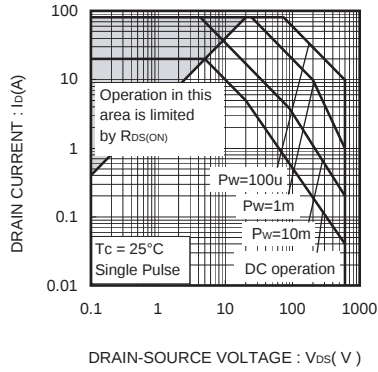


Fig.1 Maximum Safe Operating Area

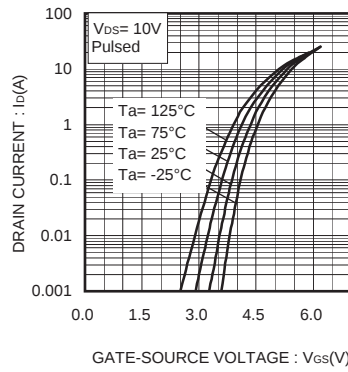


Fig.2 Typical Transfer Characteristics

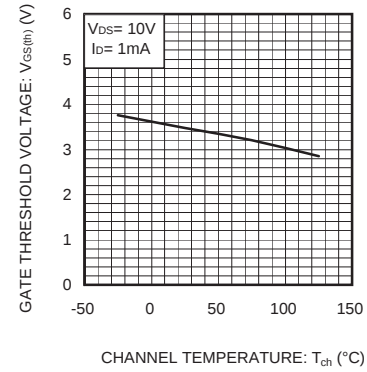


Fig.3 Gate Threshold Voltage vs. Channel Temperature

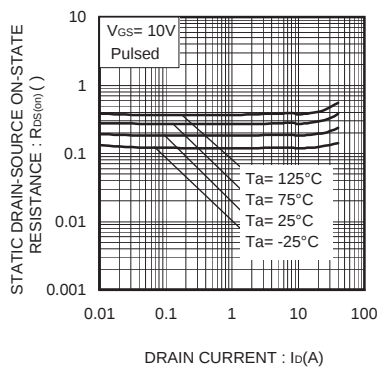


Fig.4 Static Drain-Source On-State Resistance vs. Drain Current

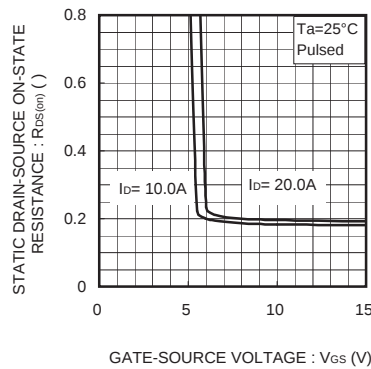


Fig.5 Static Drain-Source On-State Resistance vs. Gate Source

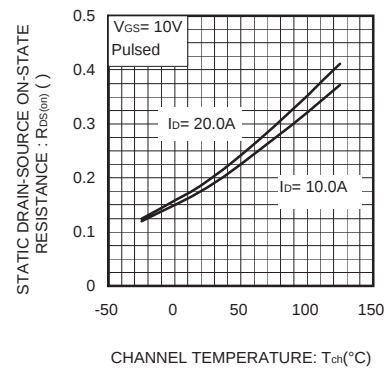


Fig.6 Static Drain-Source On-State Resistance vs. Channel Temperature

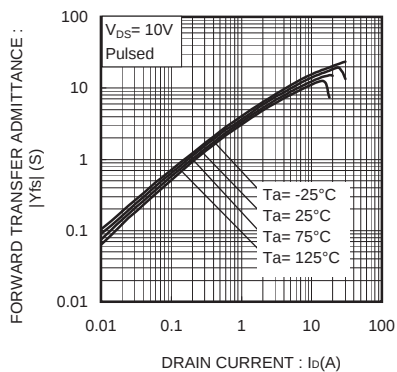


Fig.7 Forward Transfer Admittance vs. Drain Current

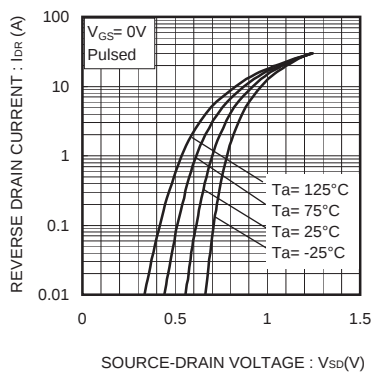


Fig.8 Reverse Drain Current vs. Source-Drain Voltage

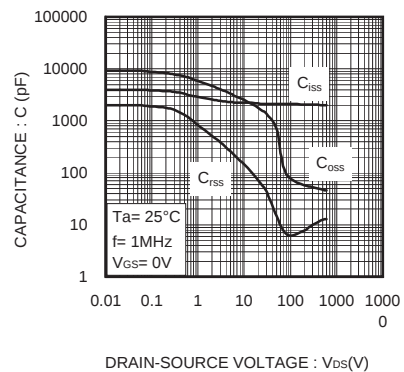


Fig.9 Typical Capacitance vs. Drain-Source Voltage

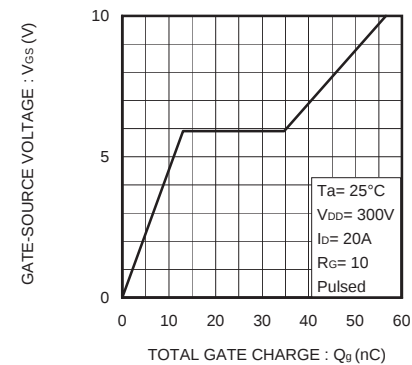


Fig.10 Dynamic Input Characteristics

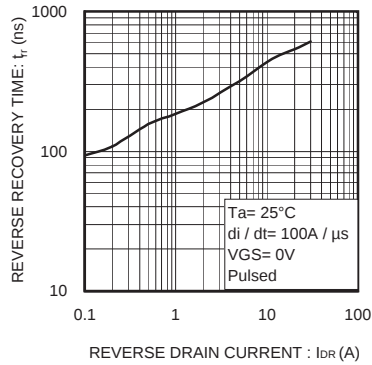


Fig.11 Reverse Recovery Time vs.Reverse Drain Current

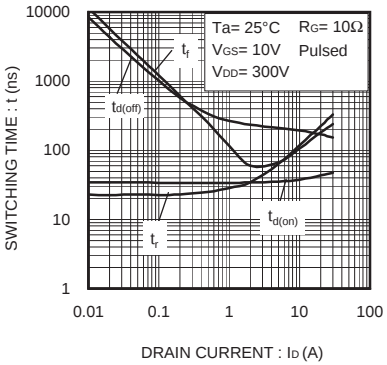


Fig.12 Switching Characteristics

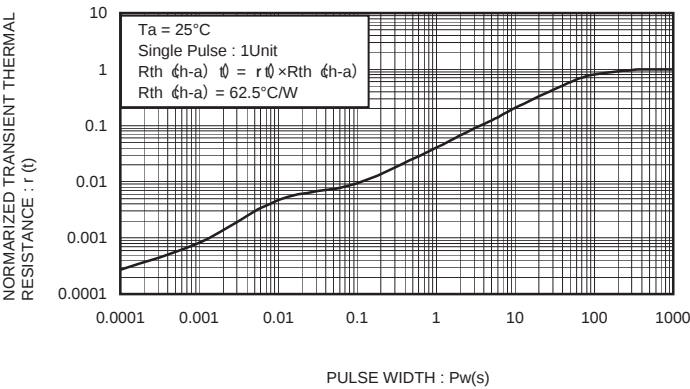


Fig.13 Normalized Transient Thermal Resistance vs. Pulse Width

●Measurement circuits

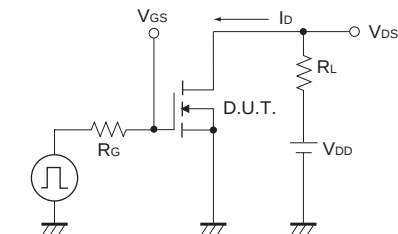


Fig.1-1 Switching time measurement circuit

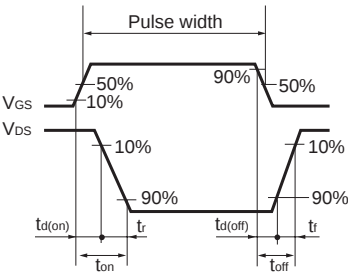


Fig.1-2 Switching waveforms

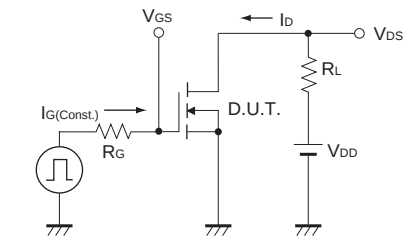


Fig.2-1 Gate charge measurement circuit

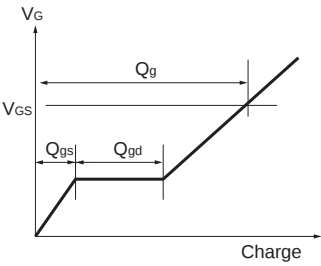


Fig.2-2 Gate charge waveform

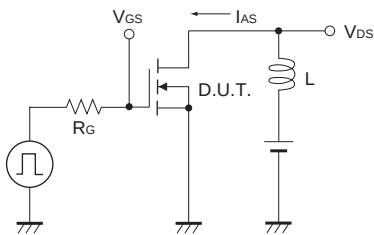


Fig.3-1 Avalanche Measurement circuit

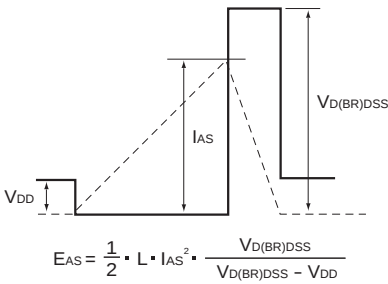


Fig.3-2 Avalanche waveform

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