

# 10V Drive Nch MOSFET

## R6046FNZ

### ● Structure

Silicon N-channel MOSFET

### ● Features

- 1) Low on-resistance.
- 2) Low input capacitance.
- 3) High ESD.

### ● Application

Switching

### ● Packaging specifications

| Type     | Package                      | Bulk |
|----------|------------------------------|------|
|          | Code                         | -    |
|          | Basic ordering unit (pieces) | 360  |
| R6046FNZ |                              | ○    |

### ● Absolute maximum ratings (Ta = 25°C)

| Parameter                      |            | Symbol      | Limits      | Unit |
|--------------------------------|------------|-------------|-------------|------|
| Drain-source voltage           |            | $V_{DS}$    | 600         | V    |
| Gate-source voltage            |            | $V_{GS}$    | ±30         | V    |
| Drain current                  | Continuous | $I_D$ *3    | ±46         | A    |
|                                | Pulsed     | $I_{DP}$ *1 | ±115        | A    |
| Source current<br>(Body Diode) | Continuous | $I_S$ *3    | 46          | A    |
|                                | Pulsed     | $I_{SP}$ *1 | 115         | A    |
| Avalanche current              |            | $I_{AS}$ *2 | 23          | A    |
| Avalanche energy               |            | $E_{AS}$ *2 | 142         | mJ   |
| Power dissipation              |            | $P_D$ *4    | 120         | W    |
| Channel temperature            |            | $T_{ch}$    | 150         | °C   |
| Range of storage temperature   |            | $T_{stg}$   | -55 to +150 | °C   |

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

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

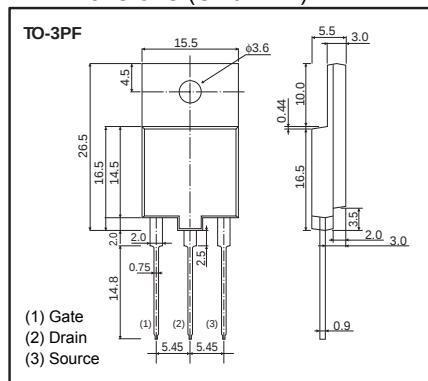
\*3 Limited only by maximum channel temperature allowed.

 \*4  $T_C = 25^\circ C$ 

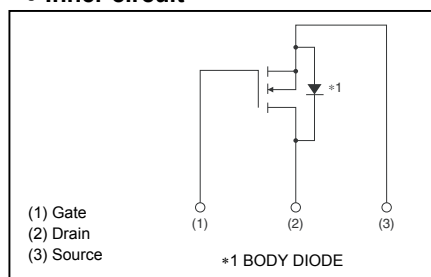
### ● Thermal resistance

| Parameter       | Symbol         | Limits | Unit   |
|-----------------|----------------|--------|--------|
| Channel to Case | $R_{th(ch-c)}$ | 1.04   | °C / W |

### ● Dimensions (Unit : mm)



### ● Inner circuit



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

| Parameter                               | Symbol         | Min. | Typ. | Max.      | Unit       | Conditions                          |
|-----------------------------------------|----------------|------|------|-----------|------------|-------------------------------------|
| Gate-source leakage                     | $I_{GSS}$      | -    | -    | $\pm 100$ | 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       | $\mu A$    | $V_{DS} = 600V$ , $V_{GS} = 0V$     |
| Gate threshold voltage                  | $V_{GS(th)}$   | 3.0  | -    | 5.0       | V          | $V_{DS} = 10V$ , $I_D = 1mA$        |
| Static drain-source on-state resistance | $R_{DS(on)}^*$ | -    | 75   | 93        | m $\Omega$ | $I_D = 23A$ , $V_{GS} = 10V$        |
| Forward transfer admittance             | $ Y_{fs} ^*$   | 21   | 35   | -         | S          | $V_{DS} = 10V$ , $I_D = 23A$        |
| Input capacitance                       | $C_{iss}$      | -    | 6100 | -         | pF         | $V_{DS} = 25V$                      |
| Output capacitance                      | $C_{oss}$      | -    | 3600 | -         | pF         | $V_{GS} = 0V$                       |
| Reverse transfer capacitance            | $C_{rss}$      | -    | 90   | -         | pF         | $f = 1MHz$                          |
| Turn-on delay time                      | $t_{d(on)}^*$  | -    | 77   | -         | ns         | $V_{DD} \approx 300V$ , $I_D = 23A$ |
| Rise time                               | $t_r^*$        | -    | 150  | -         | ns         | $V_{GS} = 10V$                      |
| Turn-off delay time                     | $t_{d(off)}^*$ | -    | 230  | -         | ns         | $R_L = 13.04\Omega$                 |
| Fall time                               | $t_f^*$        | -    | 80   | -         | ns         | $R_G = 10\Omega$                    |
| Total gate charge                       | $Q_g^*$        | -    | 150  | -         | nC         | $V_{DD} \approx 300V$               |
| Gate-source charge                      | $Q_{gs}^*$     | -    | 40   | -         | nC         | $I_D = 46A$                         |
| Gate-drain charge                       | $Q_{gd}^*$     | -    | 60   | -         | nC         | $V_{GS} = 10V$                      |

\*Pulsed

## ● Body diode characteristics (Source-Drain)

| Parameter             | Symbol     | Min. | Typ. | Max. | Unit | Conditions                         |
|-----------------------|------------|------|------|------|------|------------------------------------|
| Forward voltage       | $V_{SD}^*$ | -    | -    | 1.5  | V    | $I_S = 12.5A$ , $V_{GS} = 0V$      |
| Reverse recovery time | $t_{rr}^*$ | -    | 145  | -    | ns   | $I_S = 46A$ , $di/dt = 100A/\mu s$ |

\*Pulsed

●Electrical characteristic curves (Ta=25°C)

Fig.1 Typical Output Characteristics ( I )

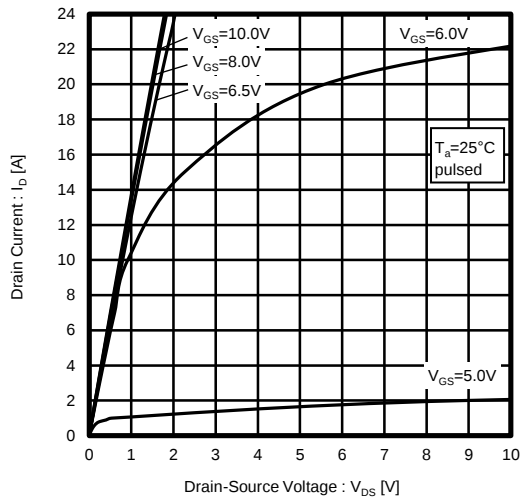


Fig.2 Typical Output Characteristics ( II )

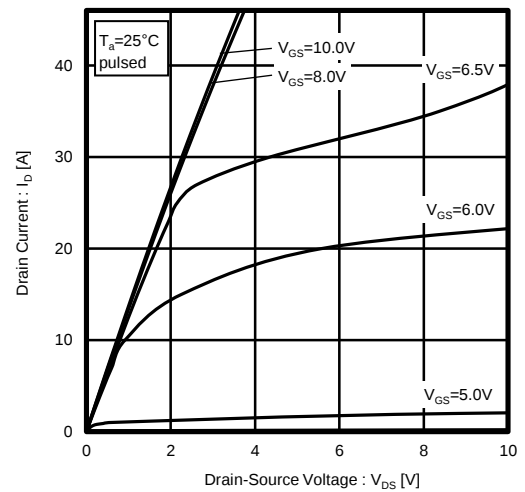


Fig.3 Typical Transfer Characteristics

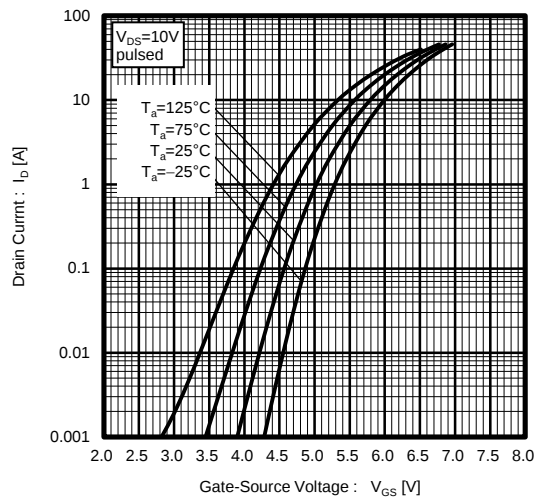


Fig.4 Gate Threshold Voltage vs. Channel Temperature

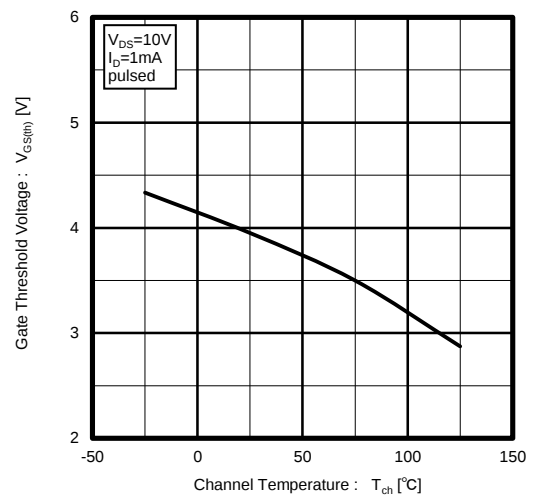


Fig.5 Static Drain-Source On-State Resistance vs. Drain Current

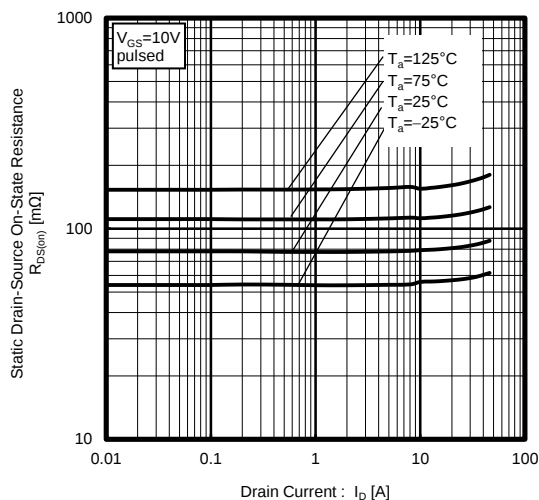


Fig.6 Static Drain-Source On-State Resistance vs. Channel Temperature

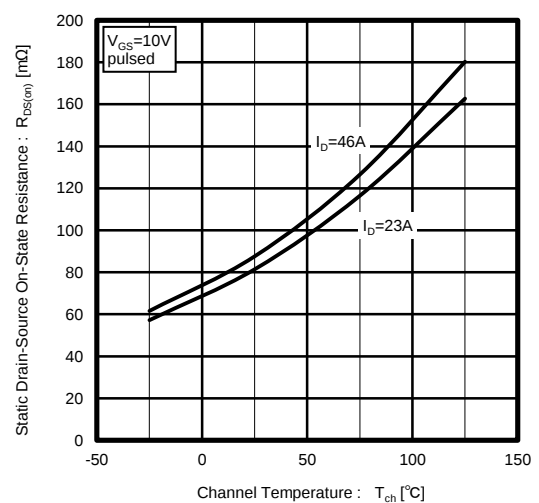


Fig.7 Forward Transfer Admittance vs. Drain Current

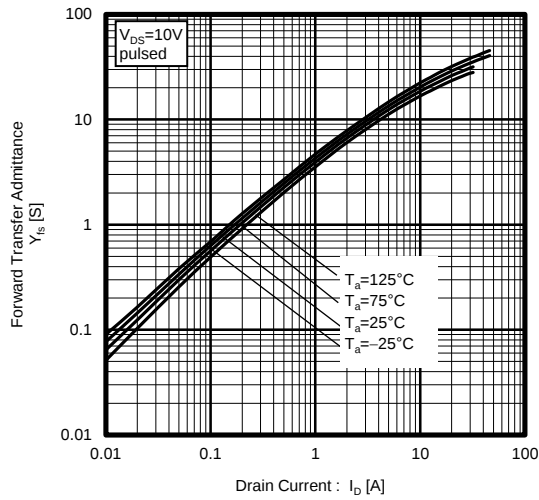


Fig.8 Source Current vs. Source-Drain Voltage

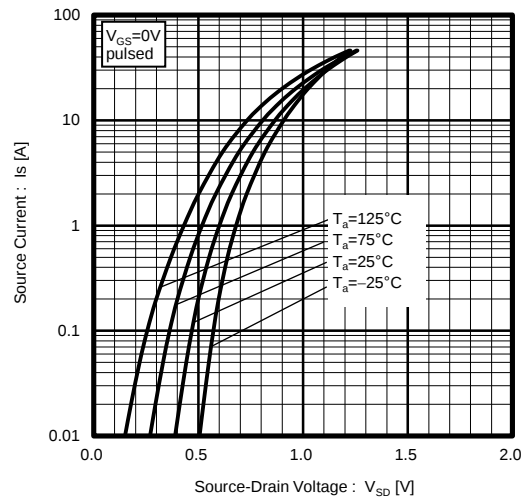


Fig.9 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

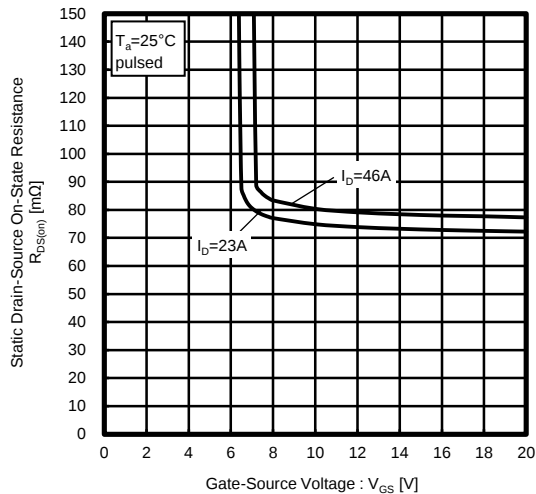


Fig.10 Switching Characteristics

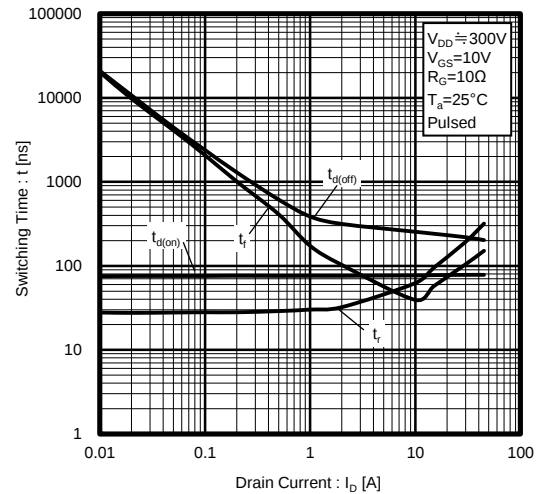


Fig.11 Dynamic Input Characteristics

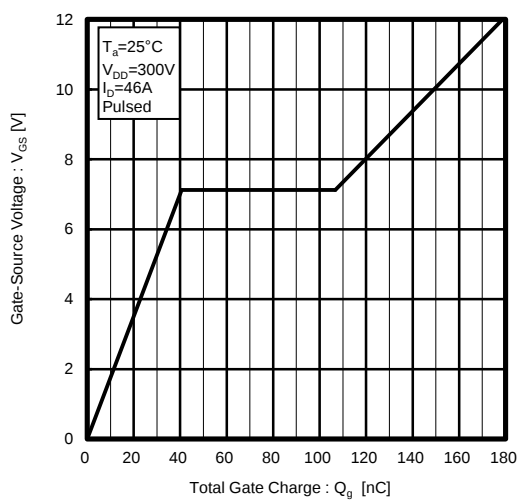


Fig.12 Typical Capacitance vs. Drain-Source Voltage

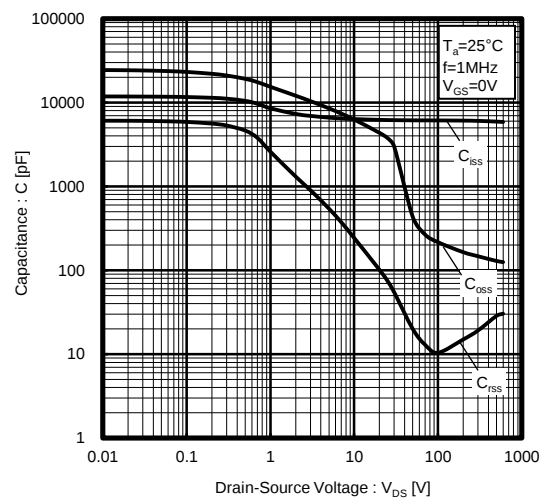
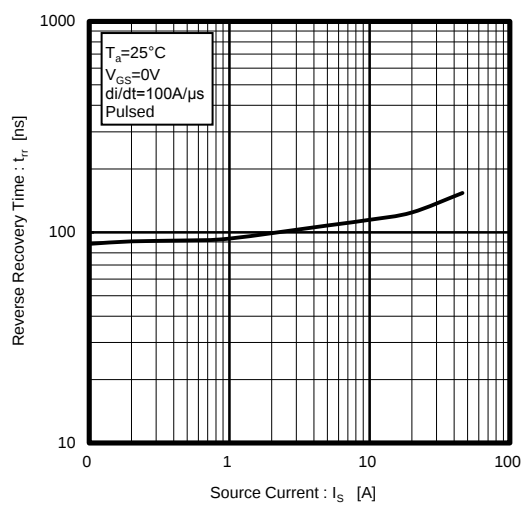


Fig.13 Reverse Recovery Time vs. Source Current



## ● Measurement circuits

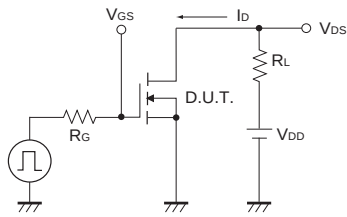


Fig.1-1 Switching Time Measurement Circuit

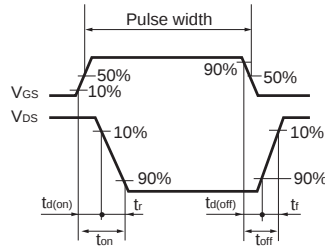


Fig.1-2 Switching Waveforms

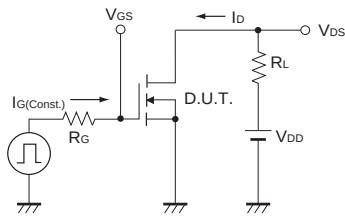


Fig.2-1 Gate Charge Measurement Circuit

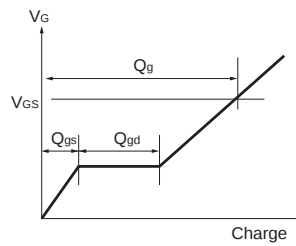


Fig.2-2 Gate Charge Waveform

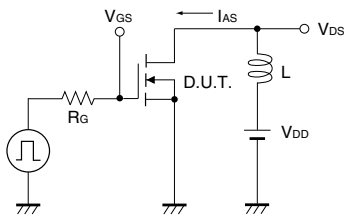


Fig.3-1 Avalanche Measurement Circuit

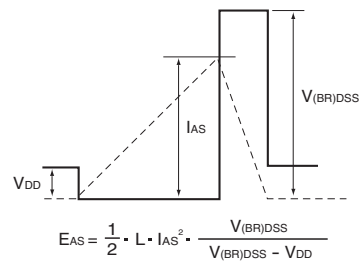


Fig.3-2 Avalanche Waveform

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