



Transistors

N-ch

●Electrical characteristics (Ta=25°C)

| Parameter                               | Symbol                | Min. | Typ. | Max. | Unit | Conditions                                  |
|---|-----------------------|------|------|------|------|---|
| Gate-source leakage                     | I <sub>gss</sub>      | –    | –    | 10   | μA   | V <sub>GS</sub> =20V, V <sub>DS</sub> =0V   |
| Drain-source breakdown voltage          | V <sub>(BR) DSS</sub> | 30   | –    | –    | V    | I <sub>D</sub> =1mA, V <sub>GS</sub> =0V    |
| Zero gate voltage drain current         | I <sub>DSS</sub>      | –    | –    | 1    | μA   | V <sub>DS</sub> =30V, V <sub>GS</sub> =0V   |
| Gate threshold voltage                  | V <sub>GS(th)</sub>   | 1.0  | –    | 2.5  | V    | V <sub>DS</sub> =10V, I <sub>D</sub> =1mA   |
| Static drain-source on-state resistance | R <sub>DS(on)</sub> * | –    | 170  | 240  | mΩ   | I <sub>D</sub> =1.4A, V <sub>GS</sub> =10V  |
|   |                       | –    | 250  | 350  |      | I <sub>D</sub> =1.4A, V <sub>GS</sub> =4.5V |
|   |                       | –    | 270  | 380  |      | I <sub>D</sub> =1.4A, V <sub>GS</sub> =4V   |
| Forward transfer admittance             | Y <sub>fs</sub>  *    | 1.0  | –    | –    | S    | I <sub>D</sub> =1.4A, V <sub>DS</sub> =10V  |
| Input capacitance                       | C <sub>iss</sub>      | –    | 70   | –    | pF   | V <sub>DS</sub> =10V                        |
| Output capacitance                      | C <sub>oss</sub>      | –    | 15   | –    | pF   | V <sub>GS</sub> =0V                         |
| Reverse transfer capacitance            | C <sub>rss</sub>      | –    | 12   | –    | pF   | f=1MHz                                      |
| Turn-on delay time                      | t <sub>d(on)</sub> *  | –    | 6    | –    | ns   | I <sub>D</sub> =0.7A, V <sub>DD</sub> ≐15V  |
| Rise time                               | t <sub>r</sub> *      | –    | 6    | –    | ns   | V <sub>GS</sub> =10V                        |
| Turn-off delay time                     | t <sub>d(off)</sub> * | –    | 13   | –    | ns   | R <sub>L</sub> =21Ω                         |
| Fall time                               | t <sub>f</sub> *      | –    | 8    | –    | ns   | R <sub>G</sub> =10Ω                         |
| Total gate charge                       | Q <sub>g</sub> *      | –    | 1.4  | 2.0  | nC   | V <sub>DD</sub> ≐15V R <sub>L</sub> =11Ω    |
| Gate-source charge                      | Q <sub>gs</sub> *     | –    | 0.6  | –    | nC   | V <sub>GS</sub> =5V R <sub>G</sub> =10Ω     |
| Gate-drain charge                       | Q <sub>gd</sub> *     | –    | 0.3  | –    | nC   | I <sub>D</sub> =1.4A                        |

\*Pulsed

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

| Parameter       | Symbol          | Min. | Typ. | Max. | Unit | Test Conditions                           |
|-----------------|-----------------|------|------|------|------|---|
| Forward voltage | V <sub>SD</sub> | –    | –    | 1.2  | V    | I <sub>S</sub> =0.6A, V <sub>GS</sub> =0V |

Transistors

P-ch

●Electrical characteristics (Ta=25°C)

| Parameter                               | Symbol                | Min. | Typ. | Max. | Unit | Conditions                                    |
|---|-----------------------|------|------|------|------|---|
| Gate-source leakage                     | I <sub>gss</sub>      | –    | –    | –10  | μA   | V <sub>GS</sub> =12V, V <sub>DS</sub> =0V     |
| Drain-source breakdown voltage          | V <sub>(BR)DSS</sub>  | –20  | –    | –    | V    | I <sub>D</sub> =–1mA, V <sub>GS</sub> =0V     |
| Zero gate voltage drain current         | I <sub>DSS</sub>      | –    | –    | –1   | μA   | V <sub>DS</sub> =–20V, V <sub>GS</sub> =0V    |
| Gate threshold voltage                  | V <sub>GS(th)</sub>   | –0.7 | –    | –2.0 | V    | V <sub>DS</sub> =–10V, I <sub>D</sub> =–1mA   |
| Static drain-source on-state resistance | R <sub>DS(on)</sub> * | –    | 280  | 390  | mΩ   | I <sub>D</sub> =–1A, V <sub>GS</sub> =–4.5V   |
|   |                       | –    | 310  | 430  |      | I <sub>D</sub> =–1A, V <sub>GS</sub> =–4V     |
|   |                       | –    | 570  | 800  |      | I <sub>D</sub> =–0.5A, V <sub>GS</sub> =–2.5V |
| Forward transfer admittance             | Y <sub>fs</sub>  *    | 0.7  | –    | –    | S    | I <sub>D</sub> =–0.5A, V <sub>DS</sub> =–10V  |
| Input capacitance                       | C <sub>iss</sub>      | –    | 150  | –    | pF   | V <sub>DS</sub> =–10V                         |
| Output capacitance                      | C <sub>oss</sub>      | –    | 20   | –    | pF   | V <sub>GS</sub> =0V                           |
| Reverse transfer capacitance            | C <sub>rss</sub>      | –    | 20   | –    | pF   | f=1MHz  |
| Turn-on delay time                      | t <sub>d(on)</sub> *  | –    | 9    | –    | ns   | I <sub>D</sub> =–0.5A, V <sub>DD</sub> =–15V  |
| Rise time                               | t <sub>r</sub> *      | –    | 8    | –    | ns   | V <sub>GS</sub> =–4.5V                        |
| Turn-off delay time                     | t <sub>d(off)</sub> * | –    | 25   | –    | ns   | R <sub>L</sub> =30Ω                           |
| Fall time                               | t <sub>f</sub> *      | –    | 10   | –    | ns   | R <sub>G</sub> =10Ω                           |
| Total gate charge                       | Q <sub>g</sub> *      | –    | 2.1  | –    | nC   | V <sub>DD</sub> =–15V R <sub>L</sub> =15Ω     |
| Gate-source charge                      | Q <sub>gs</sub> *     | –    | 0.5  | –    | nC   | V <sub>GS</sub> =–4.5V R <sub>G</sub> =10Ω    |
| Gate-drain charge                       | Q <sub>gd</sub> *     | –    | 0.5  | –    | nC   | I <sub>D</sub> =–1A                           |

\*Pulsed

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

| Parameter       | Symbol          | Min. | Typ. | Max. | Unit | Test Conditions                            |
|-----------------|-----------------|------|------|------|------|--|
| Forward voltage | V <sub>SD</sub> | –    | –    | –1.2 | V    | I <sub>S</sub> =–0.4A, V <sub>GS</sub> =0V |

Transistors

N-ch

●Electrical characteristic curves

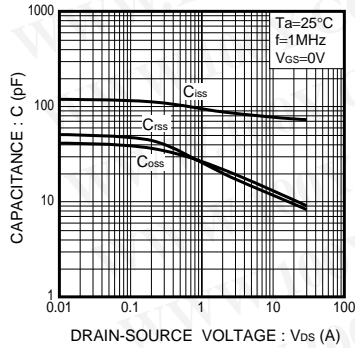


Fig.1 Typical Capacitance vs. Drain-Source Voltage

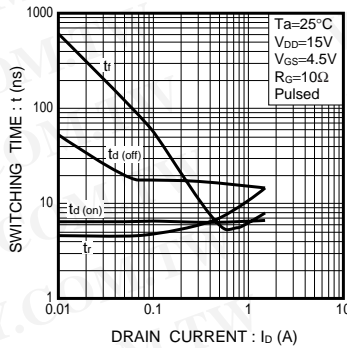


Fig.2 Switching Characteristics

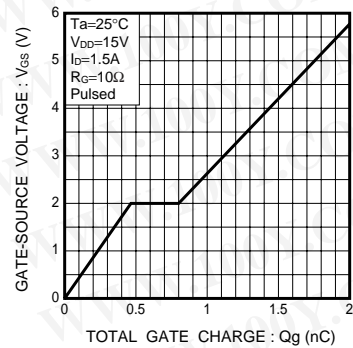


Fig.3 Dynamic Input Characteristics

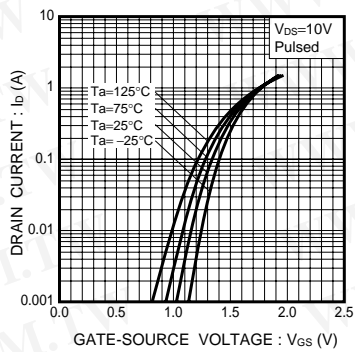


Fig.4 Typical Transfer Characteristics

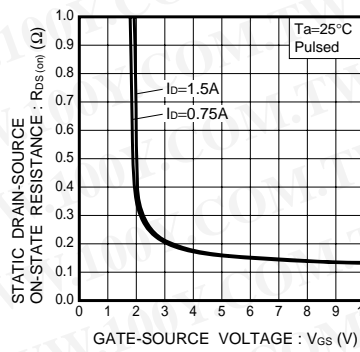


Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage

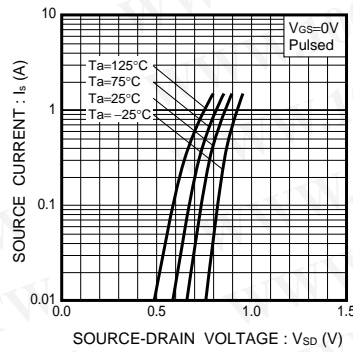


Fig.6 Source Current vs. Source-Drain Voltage

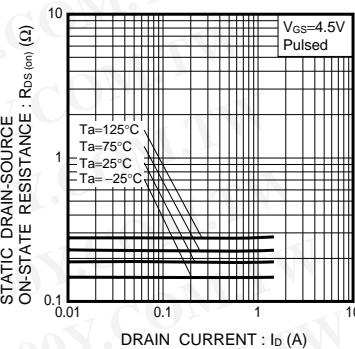


Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)

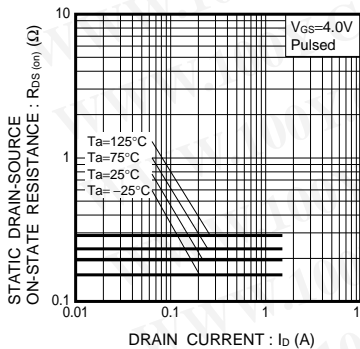


Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)

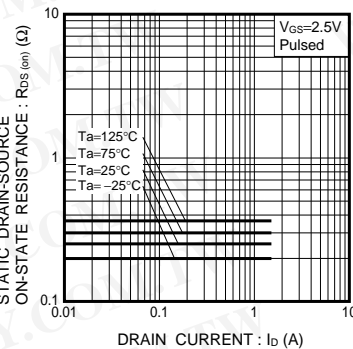
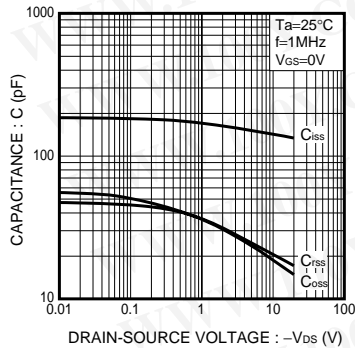


Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)

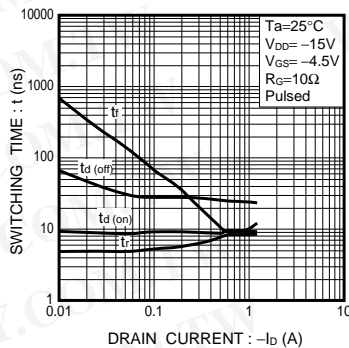
**Transistors**

**P-ch**

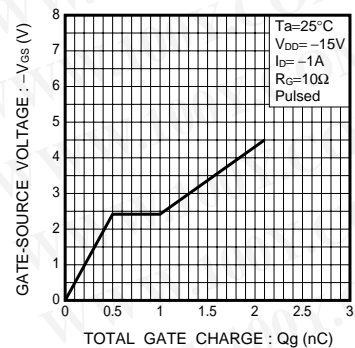
**●Electrical characteristic curves**



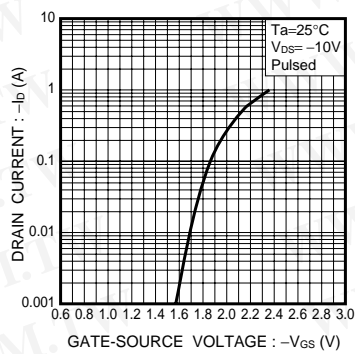
**Fig.1 Typical Capacitance vs. Drain-Source Voltage**



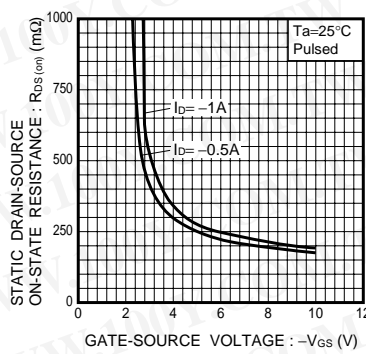
**Fig.2 Switching Characteristics**



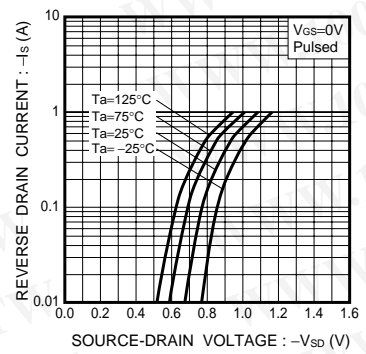
**Fig.3 Dynamic Input Characteristics**



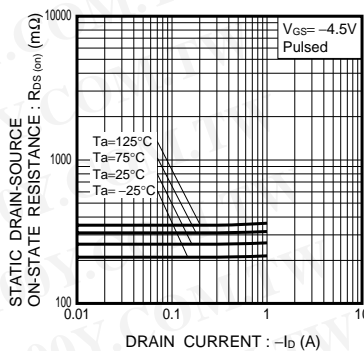
**Fig.4 Typical Transfer Characteristics**



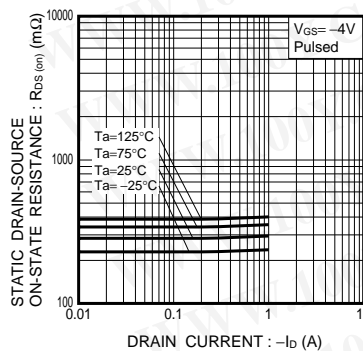
**Fig.5 Static Drain-Source On-State Resistance vs. Gate-Source Voltage**



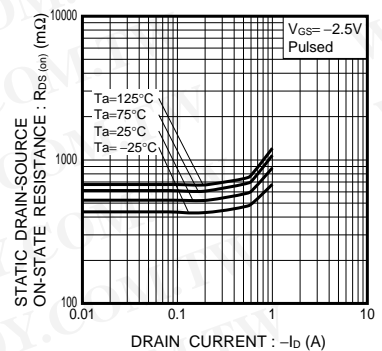
**Fig.6 Source Current vs. Source-Drain Voltage**



**Fig.7 Static Drain-Source On-State Resistance vs. Drain Current (I)**



**Fig.8 Static Drain-Source On-State Resistance vs. Drain Current (II)**



**Fig.9 Static Drain-Source On-State Resistance vs. Drain Current (III)**

Transistors

N-ch

●Measurement circuit

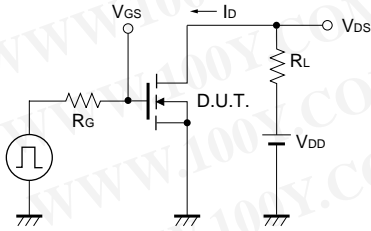


Fig.1-1 Switching Time Measurement Circuit

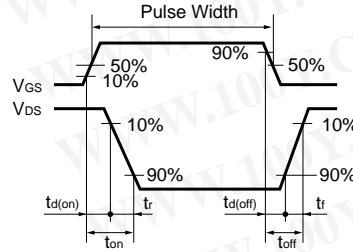


Fig.1-2 Switching Waveforms

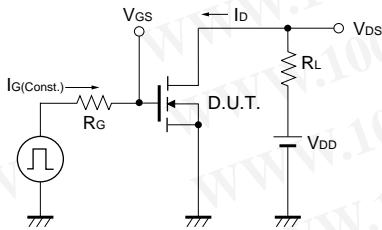


Fig.2-1 Gate Charge Measurement Circuit

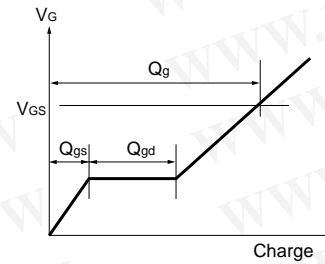


Fig.2-2 Gate Charge Waveform

Transistors

P-ch

●Measurement circuit

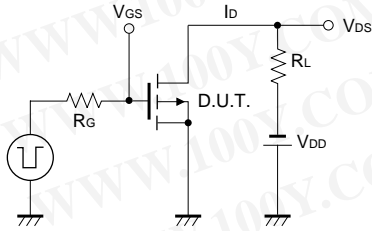


Fig.3-1 Switching Time Measurement Circuit

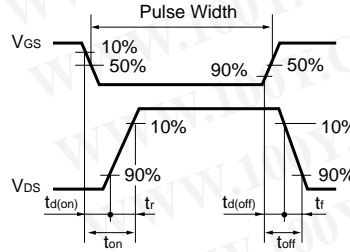


Fig.3-2 Switching Waveforms

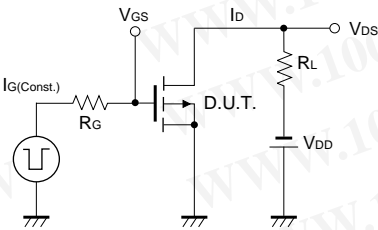


Fig.4-1 Gate Charge Measurement Circuit

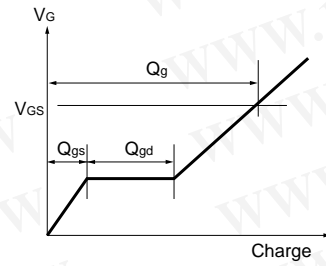


Fig.4-2 Gate Charge Waveform

## Appendix

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