

## GSS6900S

DUAL N-CANNEL MOSFET WITH SCHOTTKY DIODE

|     |                     |      |
|-----|---------------------|------|
| CH1 | BV <sub>DSS</sub>   | 30V  |
|     | R <sub>DS(ON)</sub> | 30mΩ |
|     | I <sub>D</sub>      | 5.7A |
| CH2 | BV <sub>DSS</sub>   | 30V  |
|     | R <sub>DS(ON)</sub> | 22mΩ |
|     | I <sub>D</sub>      | 9.8A |

### Description

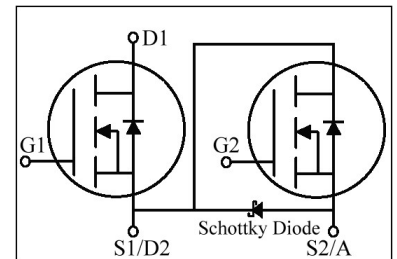
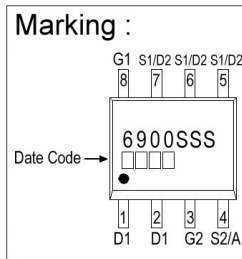
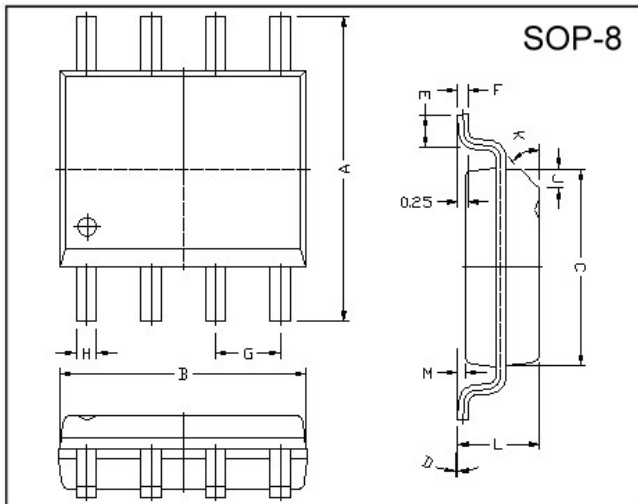
The GSS6900S provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

The SOP-8 package is universally preferred for all commercial-industrial surface mount applications and suited for low voltage applications such as DC/DC converters.

### Features

- \*Simple Drive Requirement
- \*DC-DC Converter Suitable
- \*Fast Switching Performance

### Package Dimensions



| REF. | Millimeter |      | REF. | Millimeter |      |
|------|------------|------|------|------------|------|
|      | Min.       | Max. |      | Min.       | Max. |
| A    | 5.80       | 6.20 | M    | 0.10       | 0.25 |
| B    | 4.80       | 5.00 | H    | 0.35       | 0.49 |
| C    | 3.80       | 4.00 | L    | 1.35       | 1.75 |
| D    | 0°         | 8°   | J    | 0.375 REF. |      |
| E    | 0.40       | 0.90 | K    | 45°        |      |
| F    | 0.19       | 0.25 | G    | 1.27 TYP.  |      |

### Absolute Maximum Ratings

| Parameter  | Symbol                            | Ratings    |      | Unit |
|--|-----------------------------------|------------|------|------|
|  |                                   | CH-1       | CH-2 |      |
| Drain-Source Voltage                             | V <sub>DS</sub>                   | 30         | 30   | V    |
| Gate-Source Voltage                              | V <sub>GS</sub>                   | ±20        | ±20  | V    |
| Continuous Drain Current <sup>3</sup>            | I <sub>D</sub> @TA=25°C           | 5.7        | 9.8  | A    |
| Continuous Drain Current <sup>3</sup>            | I <sub>D</sub> @TA=70°C           | 4.6        | 7.8  | A    |
| Pulsed Drain Current <sup>1</sup>                | I <sub>DM</sub>                   | 20         | 30   | A    |
| Total Power Dissipation                          | P <sub>D</sub> @TA=25°C           | 1.4        | 3.1  | W    |
| Linear Derating Factor                           |                                   | 0.01       | 0.02 | W/°C |
| Operating Junction and Storage Temperature Range | T <sub>j</sub> , T <sub>stg</sub> | -55 ~ +150 |      | °C   |

### Thermal Data

| Parameter  | Symbol                        | Value |      | Unit |
|--|-------------------------------|-------|------|------|
|  |                               | Typ.  | Max. |      |
| Thermal Resistance Junction-ambient <sup>3</sup> | R <sub>thj-a</sub> (CH-1)     | 70    | 90   | °C/W |
| Thermal Resistance Junction-ambient <sup>3</sup> | R <sub>thj-a</sub> (CH-2)     | 42    | 40   | °C/W |
| Thermal Resistance Junction-ambient <sup>3</sup> | R <sub>thj-a</sub> (Schottky) | 52    | 60   | °C/W |

**CH-1 Electrical Characteristics (T<sub>j</sub> = 25°C unless otherwise specified)**

| Parameter  | Symbol                         | Min. | Typ. | Max. | Unit | Test Conditions  |
|--|--------------------------------|------|------|------|------|--|
| Drain-Source Breakdown Voltage                     | BV <sub>DSS</sub>              | 30   | -    | -    | V    | V <sub>GS</sub> =0, I <sub>D</sub> =250uA  |
| Breakdown Voltage Temperature Coefficient          | $\Delta BV_{DSS} / \Delta T_j$ | -    | 0.01 | -    | V/°C | Reference to 25°C, I <sub>D</sub> =1mA   |
| Gate Threshold Voltage                             | V <sub>GS(th)</sub>            | 1.0  | -    | 3.0  | V    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA   |
| Forward Transconductance                           | g <sub>fs</sub>                | -    | 5.7  | -    | S    | V <sub>DS</sub> =10V, I <sub>D</sub> =5A   |
| Gate-Source Leakage Current                        | I <sub>GSS</sub>               | -    | -    | ±100 | nA   | V <sub>GS</sub> = ±20V   |
| Drain-Source Leakage Current(T <sub>j</sub> =25°C) | I <sub>DSS</sub>               | -    | -    | 1    | uA   | V <sub>DS</sub> =30V, V <sub>GS</sub> =0   |
| Drain-Source Leakage Current(T <sub>j</sub> =70°C) |                                | -    | -    | 25   | uA   | V <sub>DS</sub> =24V, V <sub>GS</sub> =0   |
| Static Drain-Source On-Resistance <sup>2</sup>     | R <sub>DS(ON)</sub>            | -    | -    | 30   | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =5A   |
|  |                                | -    | -    | 37   |      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A  |
| Total Gate Charge <sup>2</sup>                     | Q <sub>g</sub>                 | -    | 9    | 15   | nC   | I <sub>D</sub> =6A<br>V <sub>DS</sub> =24V<br>V <sub>GS</sub> =4.5V  |
| Gate-Source Charge                                 | Q <sub>gs</sub>                | -    | 2    | -    |      |  |
| Gate-Drain ("Miller") Change                       | Q <sub>gd</sub>                | -    | 6    | -    |      |  |
| Turn-on Delay Time <sup>2</sup>                    | T <sub>d(on)</sub>             | -    | 8    | -    | ns   | V <sub>DS</sub> =15V<br>I <sub>D</sub> =1A<br>V <sub>GS</sub> =10<br>R <sub>G</sub> =3.3Ω<br>R <sub>D</sub> =15Ω |
| Rise Time  | T <sub>r</sub>                 | -    | 7    | -    |      |  |
| Turn-off Delay Time                                | T <sub>d(off)</sub>            | -    | 19   | -    |      |  |
| Fall Time  | T <sub>f</sub>                 | -    | 6    | -    |      |  |
| Input Capacitance                                  | C <sub>iss</sub>               | -    | 610  | 970  | pF   | V <sub>GS</sub> =0V<br>V <sub>DS</sub> =25V<br>f=1.0MHz  |
| Output Capacitance                                 | C <sub>oss</sub>               | -    | 160  | -    |      |  |
| Reverse Transfer Capacitance                       | C <sub>rss</sub>               | -    | 120  | -    |      |  |
| Gate Resistance                                    | R <sub>g</sub>                 | -    | 1.6  | -    |      |  |

**Source-Drain Diode**

| Parameter                          | Symbol          | Min. | Typ. | Max. | Unit | Test Conditions  |
|------------------------------------|-----------------|------|------|------|------|--|
| Forward On Voltage <sup>2</sup>    | V <sub>SD</sub> | -    | -    | 1.2  | V    | I <sub>S</sub> =1.2A, V <sub>GS</sub> =0V                |
| Reverse Recovery Time <sup>2</sup> | T <sub>rr</sub> | -    | 18   | -    | ns   | I <sub>S</sub> =6A, V <sub>GS</sub> =0V<br>di/dt=100A/μs |
| Reverse Recovery Charge            | Q <sub>rr</sub> | -    | 11   | -    | nC   |  |

Notes: 1. Pulse width limited by Max. junction temperature.

2. Pulse width ≤ 300us, duty cycle ≤ 2%.

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board, t ≤ 10sec.

**CH-2 Electrical Characteristics (T<sub>j</sub> = 25°C unless otherwise specified)**

| Parameter  | Symbol                         | Min. | Typ. | Max. | Unit | Test Conditions  |
|--|--------------------------------|------|------|------|------|--|
| Drain-Source Breakdown Voltage                     | BV <sub>DSS</sub>              | 30   | -    | -    | V    | V <sub>GS</sub> =0, I <sub>D</sub> =250uA  |
| Breakdown Voltage Temperature Coefficient          | $\Delta BV_{DSS} / \Delta T_j$ | -    | 0.1  | -    | V/°C | Reference to 25°C, I <sub>D</sub> =1mA   |
| Gate Threshold Voltage                             | V <sub>GS(th)</sub>            | 1.0  | -    | 3.0  | V    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250uA   |
| Forward Transconductance                           | g <sub>fs</sub>                | -    | 11   | -    | S    | V <sub>DS</sub> =10V, I <sub>D</sub> =9A   |
| Gate-Source Leakage Current                        | I <sub>GSS</sub>               | -    | -    | ±100 | nA   | V <sub>GS</sub> = ±20V   |
| Drain-Source Leakage Current(T <sub>j</sub> =25°C) | I <sub>DSS</sub>               | -    | -    | 100  | uA   | V <sub>DS</sub> =30V, V <sub>GS</sub> =0   |
| Drain-Source Leakage Current(T <sub>j</sub> =70°C) |                                | -    | -    | 1    | mA   | V <sub>DS</sub> =24V, V <sub>GS</sub> =0   |
| Static Drain-Source On-Resistance <sup>2</sup>     | R <sub>DS(ON)</sub>            | -    | -    | 22   | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =9A   |
|  |                                | -    | -    | 29   |      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A  |
| Total Gate Charge <sup>2</sup>                     | Q <sub>g</sub>                 | -    | 25   | 40   | nC   | I <sub>D</sub> =7A<br>V <sub>DS</sub> =24V<br>V <sub>GS</sub> =10V   |
| Gate-Source Charge                                 | Q <sub>gs</sub>                | -    | 4    | -    |      |  |
| Gate-Drain ("Miller") Change                       | Q <sub>gd</sub>                | -    | 7    | -    |      |  |
| Turn-on Delay Time <sup>2</sup>                    | T <sub>d(on)</sub>             | -    | 10   | -    | ns   | V <sub>DS</sub> =20V<br>I <sub>D</sub> =1A<br>V <sub>GS</sub> =10<br>R <sub>G</sub> =5.7Ω<br>R <sub>D</sub> =20Ω |
| Rise Time  | T <sub>r</sub>                 | -    | 6    | -    |      |  |
| Turn-off Delay Time                                | T <sub>d(off)</sub>            | -    | 26   | -    |      |  |
| Fall Time  | T <sub>f</sub>                 | -    | 12   | -    |      |  |
| Input Capacitance                                  | C <sub>iss</sub>               | -    | 1170 | 1860 | pF   | V <sub>GS</sub> =0V<br>V <sub>DS</sub> =25V<br>f=1.0MHz  |
| Output Capacitance                                 | C <sub>oss</sub>               | -    | 205  | -    |      |  |
| Reverse Transfer Capacitance                       | C <sub>rss</sub>               | -    | 142  | -    |      |  |
| Gate Resistance                                    | R <sub>g</sub>                 | -    | 1.7  | -    |      |  |

**Source-Drain Diode**

| Parameter                          | Symbol          | Min. | Typ. | Max. | Unit | Test Conditions                           |
|------------------------------------|-----------------|------|------|------|------|---|
| Forward On Voltage <sup>2</sup>    | V <sub>SD</sub> | -    | -    | 1.2  | V    | I <sub>S</sub> =2.6A, V <sub>GS</sub> =0V |
| Reverse Recovery Time <sup>2</sup> | T <sub>rr</sub> | -    | 21   | -    | ns   | I <sub>S</sub> =7A, V <sub>GS</sub> =0V   |
| Reverse Recovery Charge            | Q <sub>rr</sub> | -    | 16   | -    | nC   | dI/dt=100A/μs                             |

**Schottky Characteristics @ T<sub>j</sub>=25°C(unless otherwise specified)**

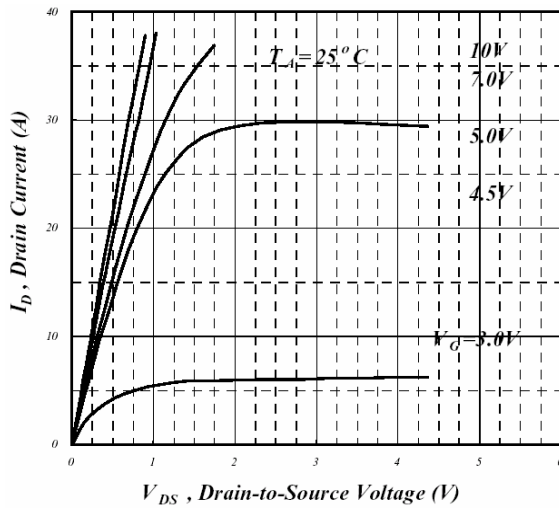
| Parameter                    | Symbol          | Min. | Typ.  | Max. | Unit | Test Conditions                            |
|------------------------------|-----------------|------|-------|------|------|--|
| Forward Voltage Drop         | V <sub>F</sub>  | -    | 0.47  | 0.5  | V    | I <sub>F</sub> =1A                         |
| Max. Reverse Leakage Current | I <sub>RM</sub> | -    | 0.004 | 0.2  | mA   | V <sub>R</sub> =30V                        |
|                              |                 | -    | 0.5   | 1    | mA   | V <sub>R</sub> =30V, T <sub>j</sub> =100°C |
| Junction Capacitance         | C <sub>T</sub>  | -    | 66    | -    | pF   | V <sub>R</sub> =10V                        |

Notes: 1. Pulse width limited by Max. junction temperature.

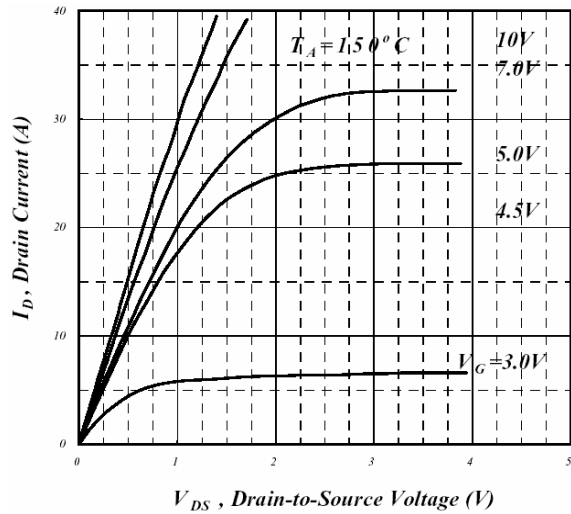
2. Pulse width ≤ 300us, duty cycle ≤ 2%.

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board, t ≤ 10sec.

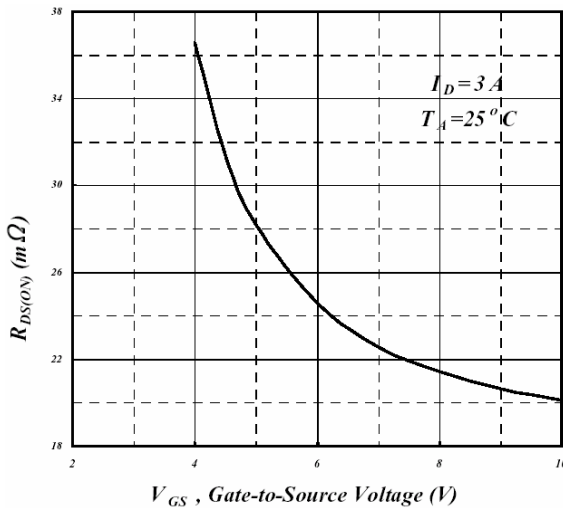
## Characteristics Curve CH-1



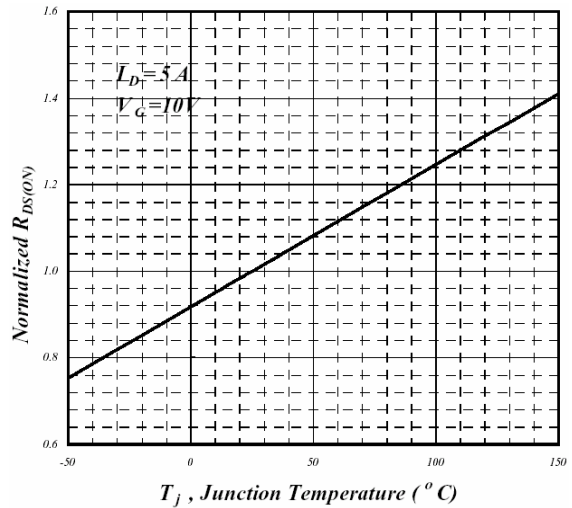
**Fig 1. Typical Output Characteristics**



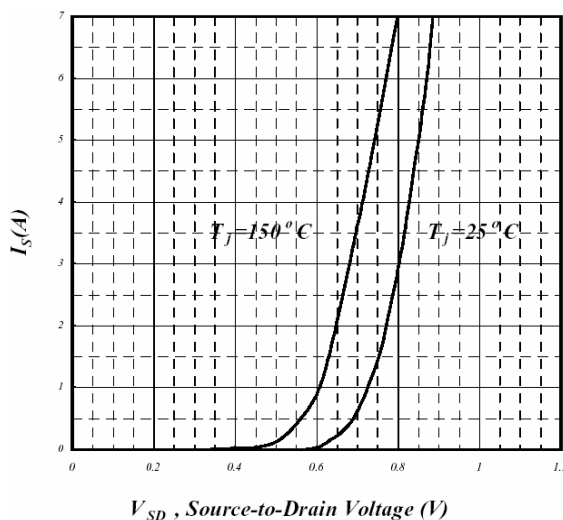
**Fig 2. Typical Output Characteristics**



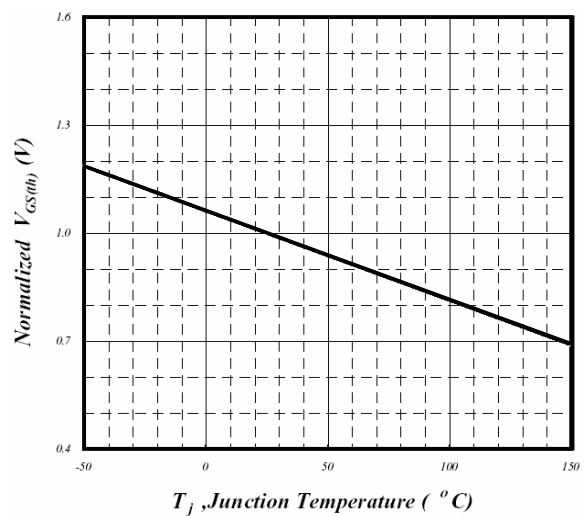
**Fig 3. On-Resistance v.s. Gate Voltage**



**Fig 4. Normalized On-Resistance v.s. Junction Temperature**

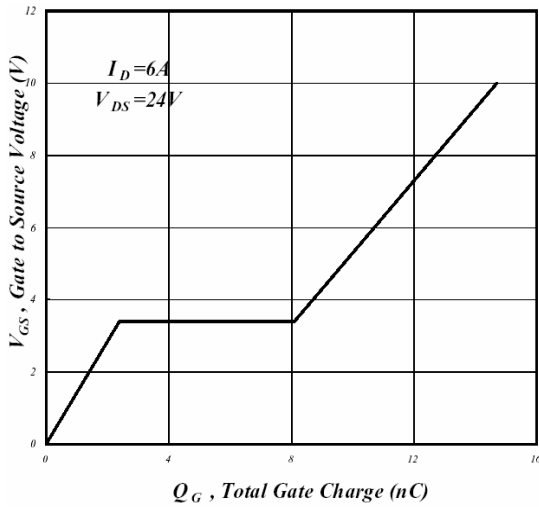


**Fig 5. Forward Characteristics of Reverse Diode**

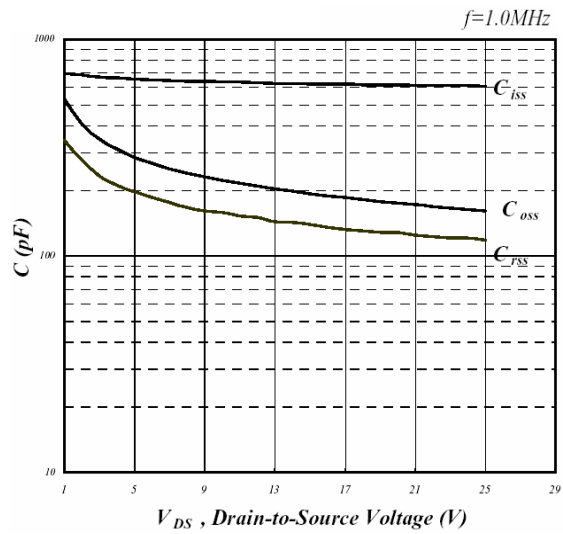


**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**

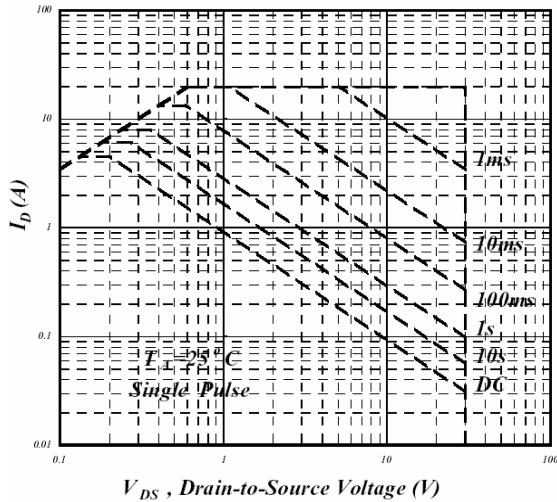
## CH-1



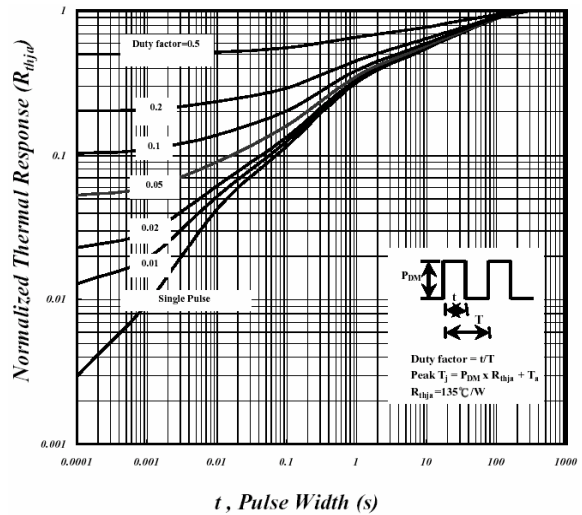
**Fig 7. Gate Charge Characteristics**



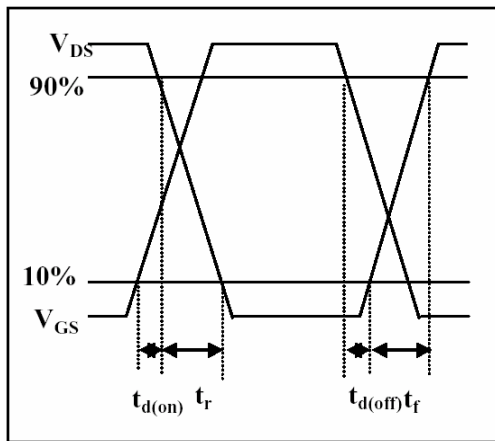
**Fig 8. Typical Capacitance Characteristics**



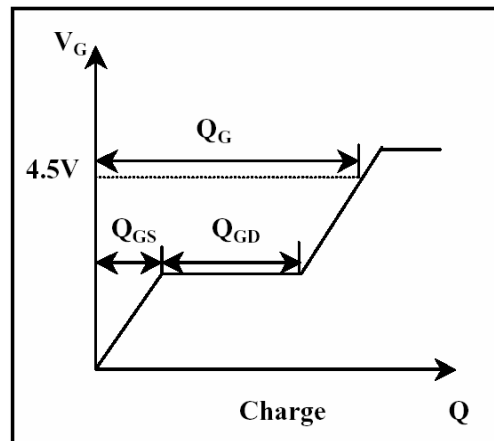
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**

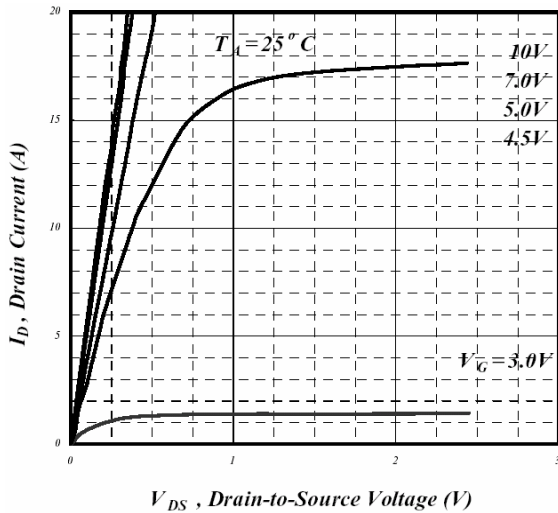


**Fig 11. Switching Time Waveform**

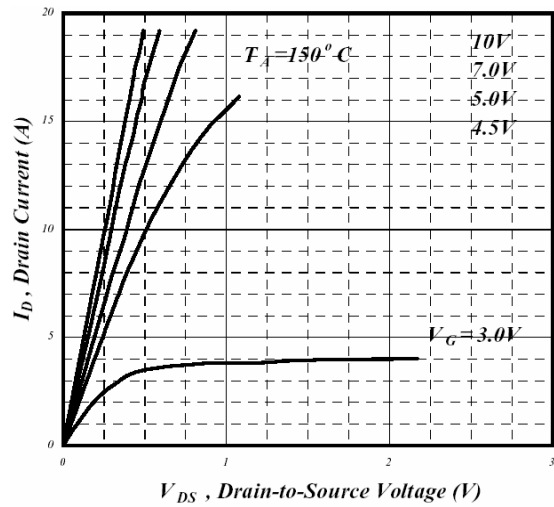


**Fig 12. Gate Charge Waveform**

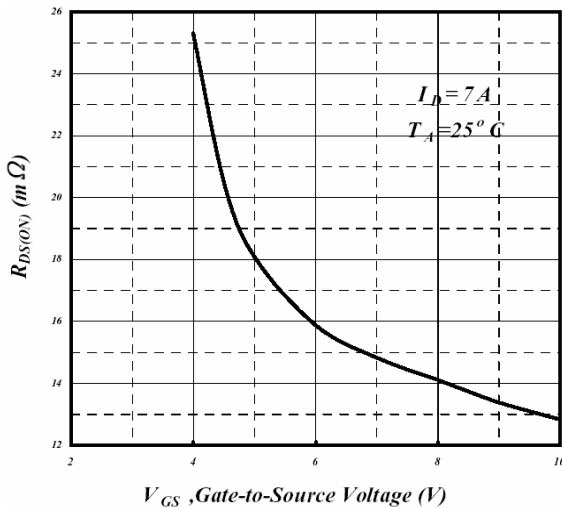
## CH-2



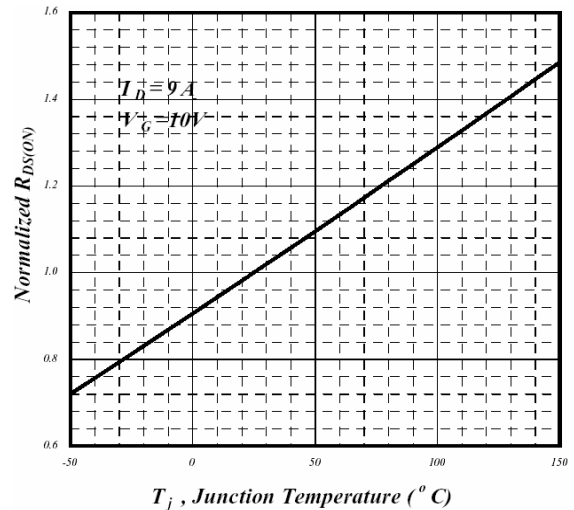
**Fig 1. Typical Output Characteristics**



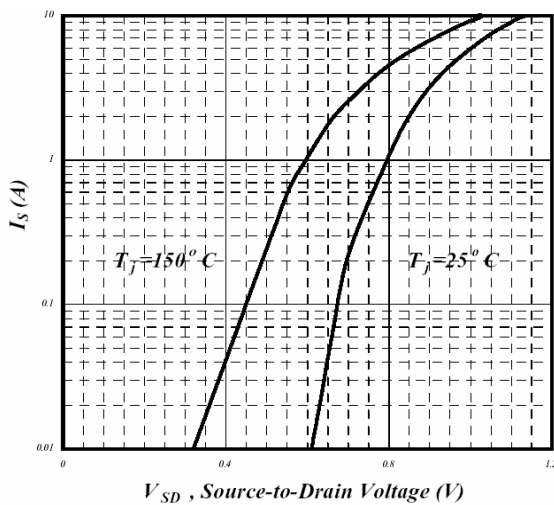
**Fig 2. Typical Output Characteristics**



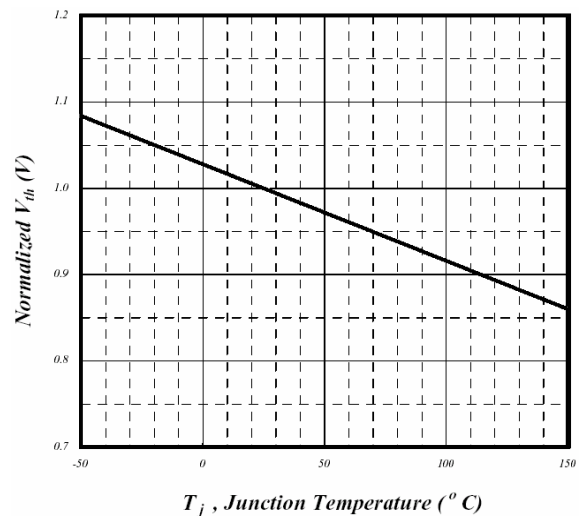
**Fig 3. On-Resistance v.s. Gate Voltage**



**Fig 4. Normalized On-Resistance v.s. Junction Temperature**

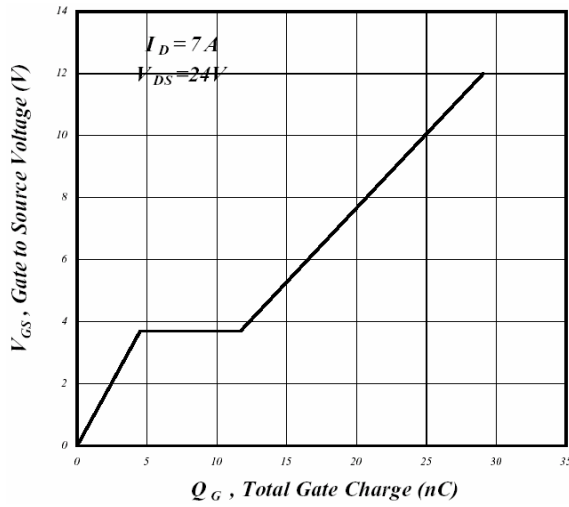


**Fig 5. Forward Characteristics of Reverse Diode**

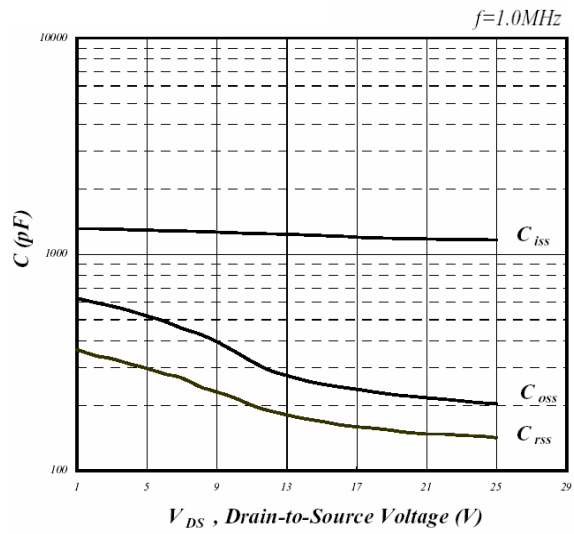


**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**

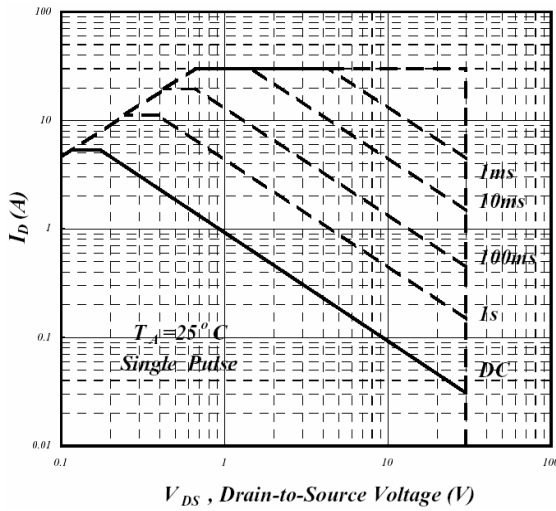
## CH-2



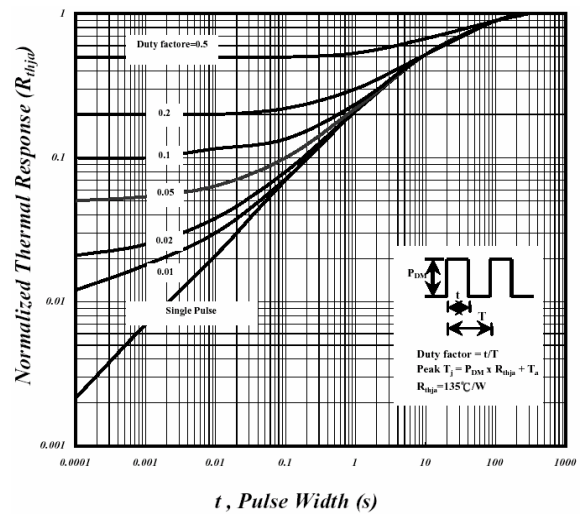
**Fig 7. Gate Charge Characteristics**



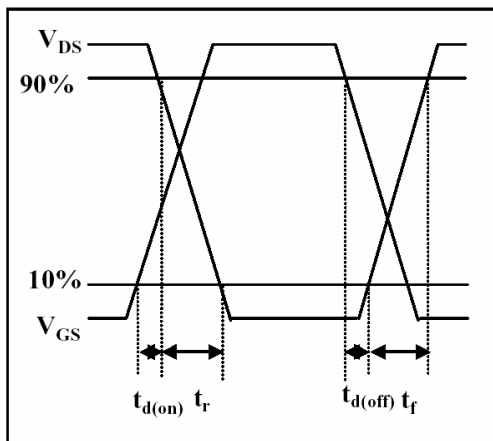
**Fig 8. Typical Capacitance Characteristics**



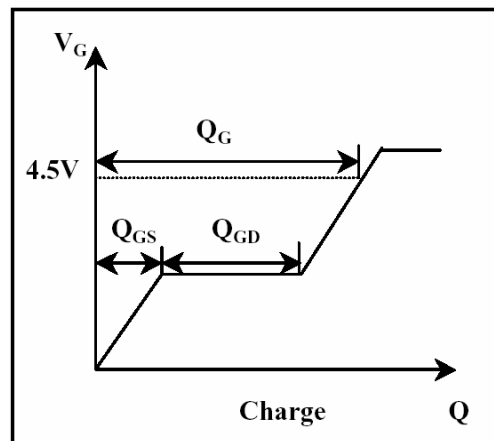
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**

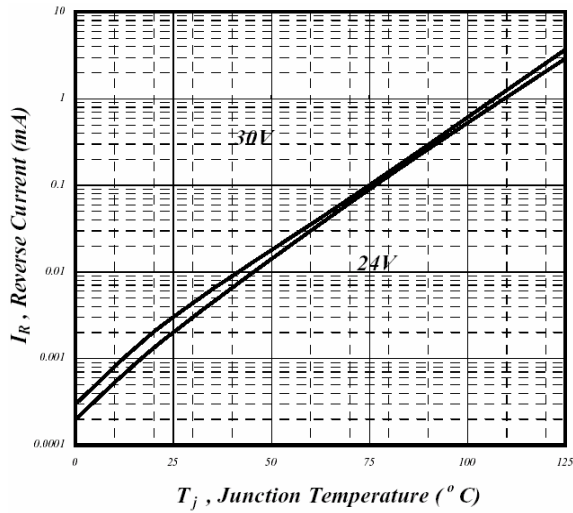


**Fig 11. Switching Time Waveform**

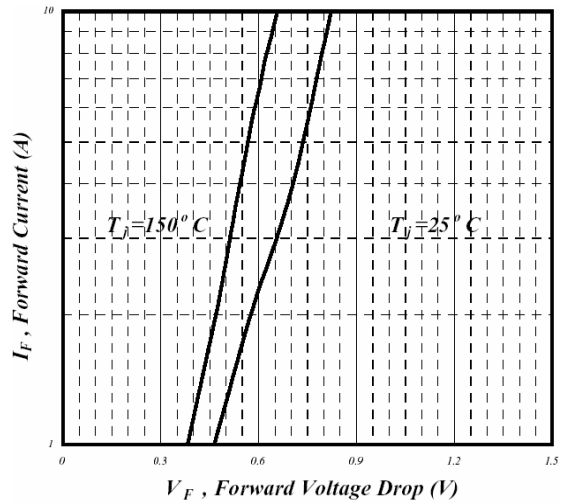


**Fig 12. Gate Charge Waveform**

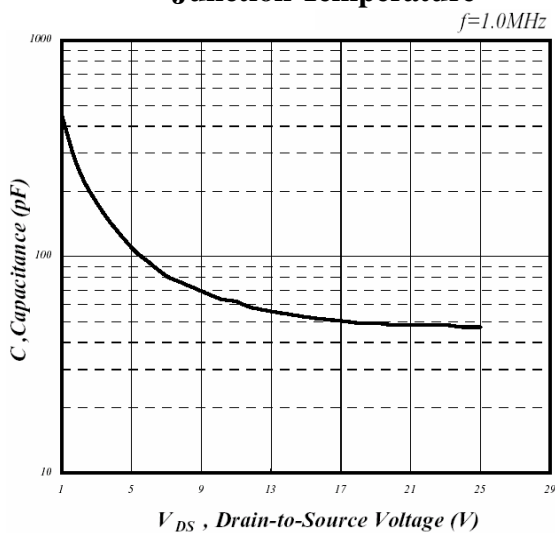
## Schottky



**Fig 1. Reverse Current v.s. Junction Temperature**



**Fig 2. Typical Forward Characteristics**



**Fig 3. Typical Junction Capacitance**

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