

# GTM CORPORATION

ISSUED DATE :2005/11/18  
REVISED DATE :

## GSS9510

### N AND P-CHANNEL ENHANCEMENT MODE POWER MOSFET

|                        |       |
|------------------------|-------|
| N-CH BV <sub>DSS</sub> | 30V   |
| R <sub>DS(ON)</sub>    | 28mΩ  |
| I <sub>D</sub>         | 6.9A  |
| P-CH BV <sub>DSS</sub> | -30V  |
| R <sub>DS(ON)</sub>    | 55mΩ  |
| I <sub>D</sub>         | -5.3A |

### Description

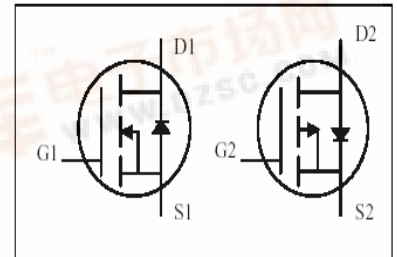
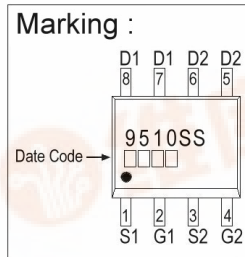
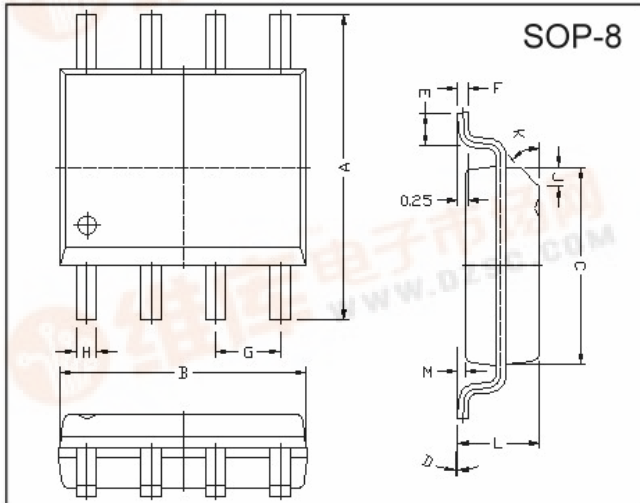
The GSS9510 provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

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
- \*Low On-resistance
- \*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 |
|--|-----------------------------------|------------|-----------|------|
|  |                                   | N-channel  | P-channel |      |
| 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           | 6.9        | -5.3      | A    |
| Continuous Drain Current <sup>3</sup>            | I <sub>D</sub> @TA=70°C           | 5.5        | -4.2      | A    |
| Pulsed Drain Current <sup>1</sup>                | I <sub>DM</sub>                   | 30         | -30       | A    |
| Total Power Dissipation                          | P <sub>D</sub> @TA=25°C           | 2.0        |           | W    |
| Linear Derating Factor                           |                                   | 0.016      |           | 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 |
|---|--------------------|-------|------|
| Thermal Resistance Junction-ambient <sup>3</sup> Max. | R <sub>thj-a</sub> | 62.5  | °C/W |

**N-Channel 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          | $\Delta BV_{DSS} / \Delta T_j$ | -    | 0.02 | -    | 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>                | -    | 4.6  | -    | 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>            | -    | -    | 28   | mΩ   | V <sub>GS</sub> =10V, I <sub>D</sub> =5A  |
|  |                                | -    | -    | 40   |      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =3A   |
| Total Gate Charge <sup>2</sup>                     | Q <sub>g</sub>                 | -    | 10   | 16   | nC   | I <sub>D</sub> =6.9A<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> =10V<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>            | -    | 20   | -    |      |   |
| Fall Time  | T <sub>f</sub>                 | -    | 6    | -    |      |   |
| Input Capacitance                                  | C <sub>iss</sub>               | -    | 540  | 870  | 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  | -    |      |   |

**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> =1.7A, V <sub>GS</sub> =0V                  |
| Reverse Recovery Time           | T <sub>rr</sub> | -    | 20   | -    | ns   | I <sub>S</sub> =6.9A, 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; 135°C/W when mounted on Min. copper pad.

**P-Channel 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          | $\Delta BV_{DSS} / \Delta T_j$ | -    | -0.023 | -    | 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>                | -    | 4.9    | -    | 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>            | -    | -      | 55   | mΩ   | V <sub>GS</sub> =-10V, I <sub>D</sub> =-5A   |
|  |                                | -    | -      | 90   |      | 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> =-5.3A<br>V <sub>DS</sub> =-24V<br>V <sub>GS</sub> =-4.5V   |
| Gate-Source Charge                                 | Q <sub>gs</sub>                | -    | 2      | -    |      |  |
| Gate-Drain ("Miller") Charge                       | Q <sub>gd</sub>                | -    | 6      | -    |      |  |
| Turn-on Delay Time <sup>2</sup>                    | T <sub>d(on)</sub>             | -    | 10     | -    | ns   | V <sub>DS</sub> =-10V<br>I <sub>D</sub> =-1A<br>V <sub>GS</sub> =-10V<br>R <sub>G</sub> =3.3Ω<br>R <sub>D</sub> =10Ω |
| Rise Time  | T <sub>r</sub>                 | -    | 8      | -    |      |  |
| Turn-off Delay Time                                | T <sub>d(off)</sub>            | -    | 25     | -    |      |  |
| Fall Time  | T <sub>f</sub>                 | -    | 13     | -    |      |  |
| Input Capacitance                                  | C <sub>iss</sub>               | -    | 580    | 930  | pF   | V <sub>GS</sub> =0V<br>V <sub>DS</sub> =-25V<br>f=1.0MHz   |
| Output Capacitance                                 | C <sub>oss</sub>               | -    | 180    | -    |      |  |
| Reverse Transfer Capacitance                       | C <sub>rss</sub>               | -    | 120    | -    |      |  |

**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> =-1.7A, V <sub>GS</sub> =0V                  |
| Reverse Recovery Time           | T <sub>rr</sub> | -    | 21   | -    | ns   | I <sub>S</sub> =-5.3A, V <sub>GS</sub> =0V<br>dI/dt=100A/μs |
| Reverse Recovery Charge         | Q <sub>rr</sub> | -    | 17   | -    | 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; 135°C/W when mounted on Min. copper pad.

## Characteristics Curve N-Channel

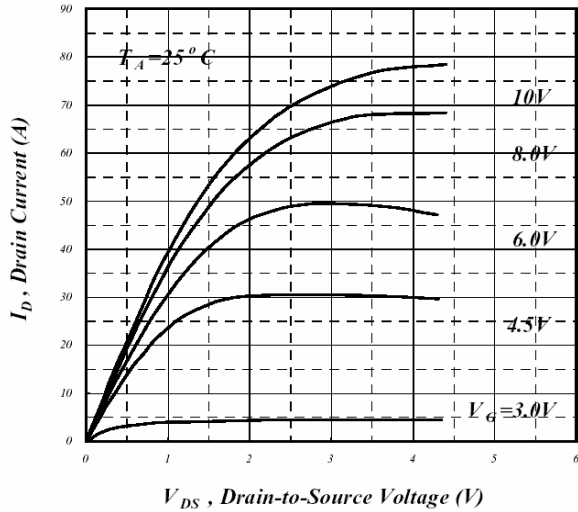


Fig 1. Typical Output Characteristics

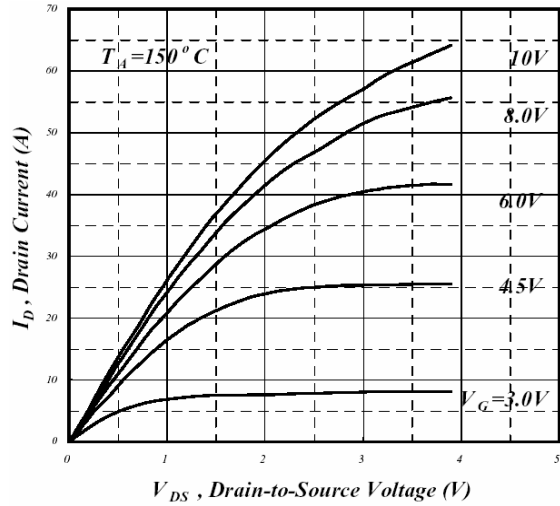


Fig 2. Typical Output Characteristics

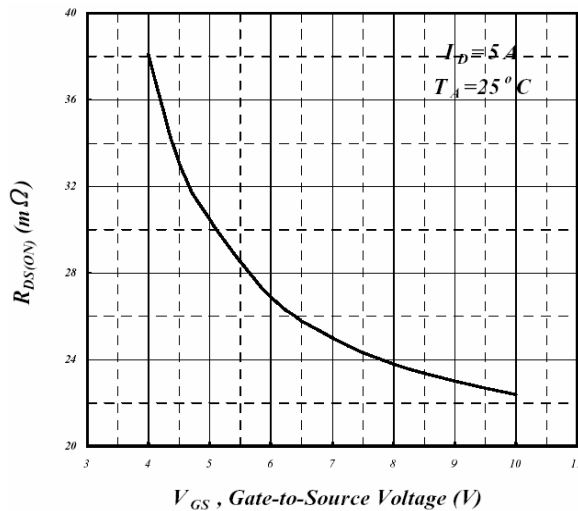


Fig 3. On-Resistance v.s. Gate Voltage

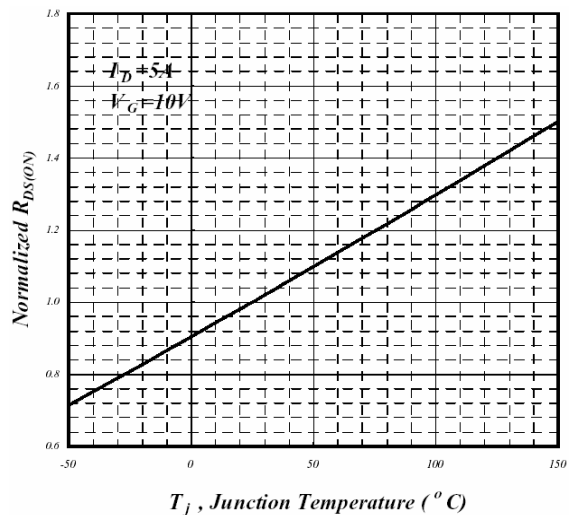


Fig 4. Normalized On-Resistance v.s. Junction Temperature

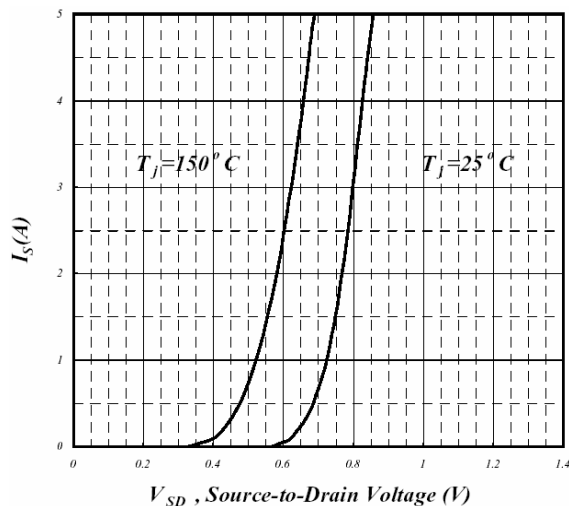


Fig 5. Forward Characteristics of Reverse Diode

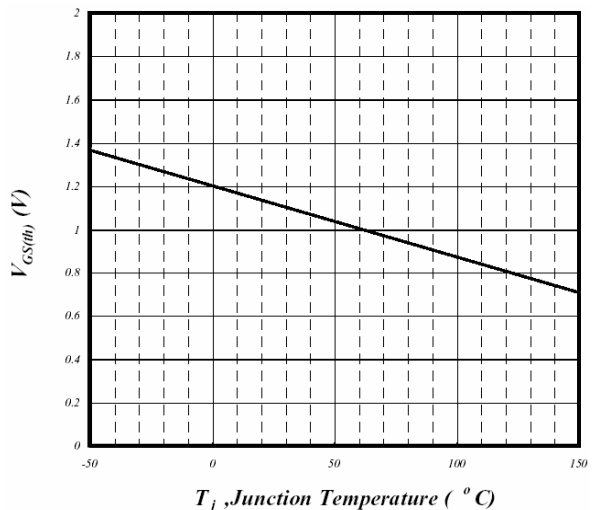
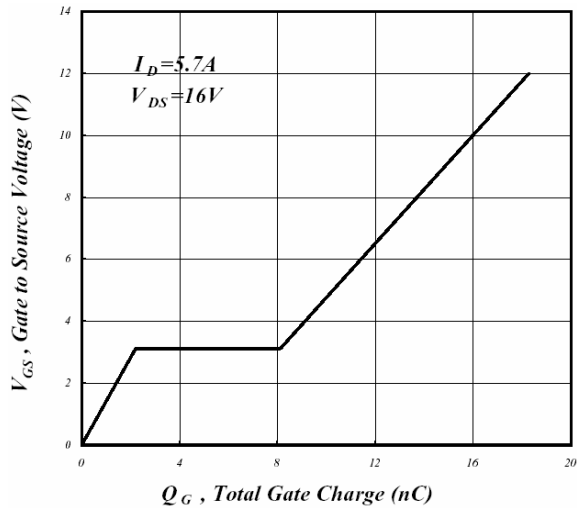
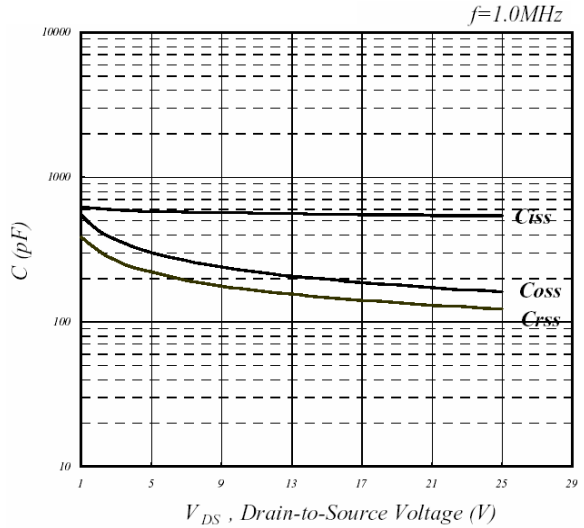


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

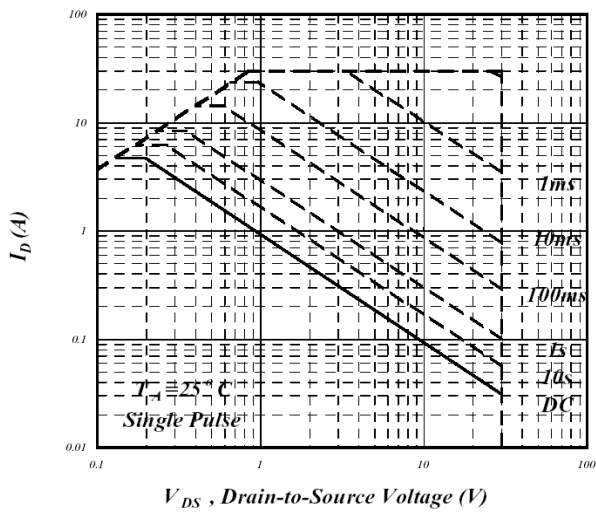
## N-Channel



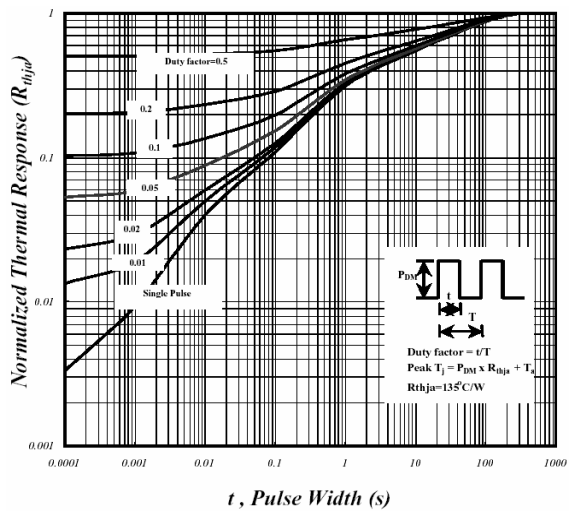
**Fig 7. Gate Charge Characteristics**



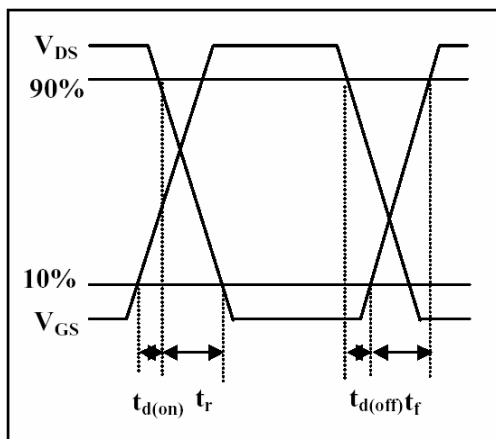
**Fig 8. Typical Capacitance Characteristics**



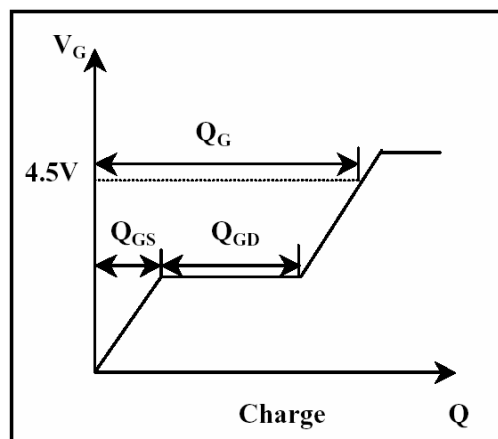
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**



**Fig 11. Switching Time Waveform**



**Fig 12. Gate Charge Waveform**

## P-Channel

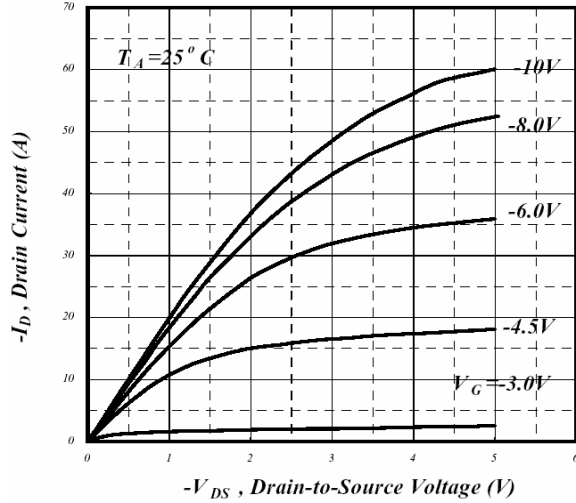


Fig 1. Typical Output Characteristics

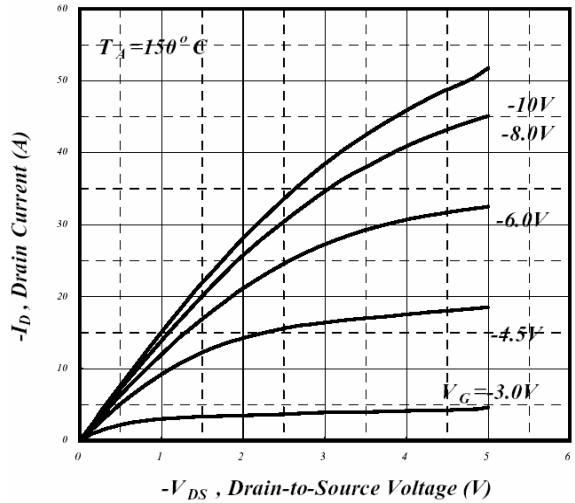


Fig 2. Typical Output Characteristics

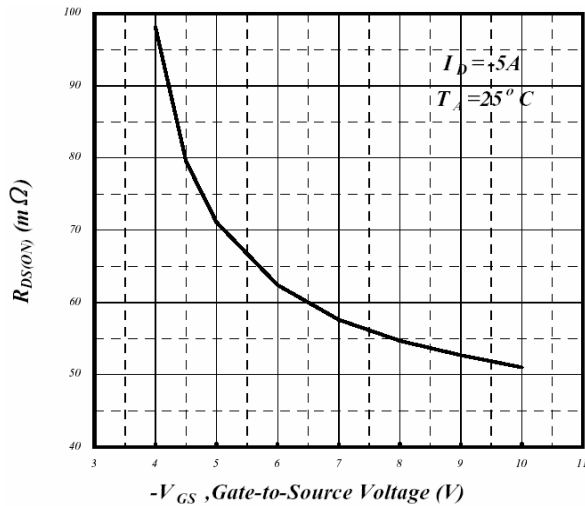


Fig 3. On-Resistance v.s. Gate Voltage

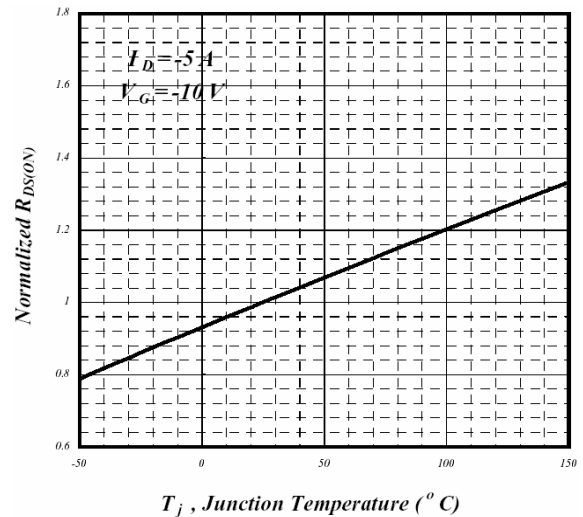


Fig 4. Normalized On-Resistance v.s. Junction Temperature

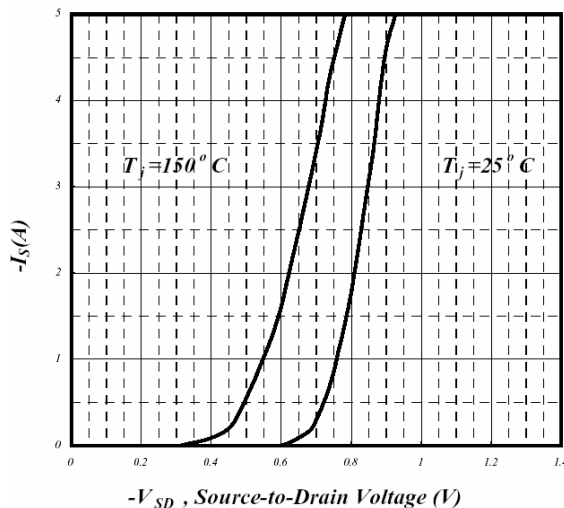


Fig 5. Forward Characteristics of Reverse Diode

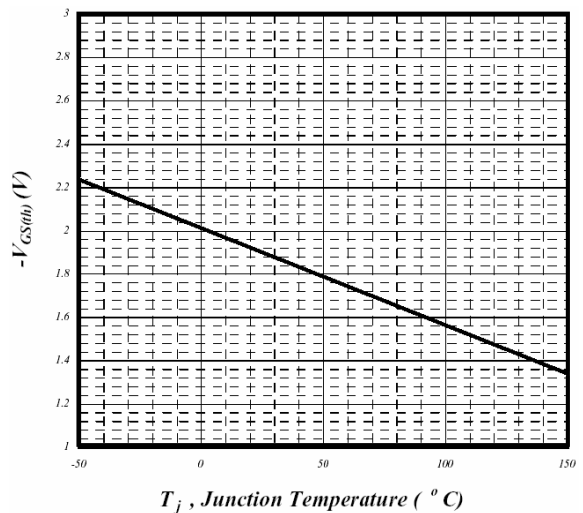


Fig 6. Gate Threshold Voltage v.s. Junction Temperature

## P-Channel

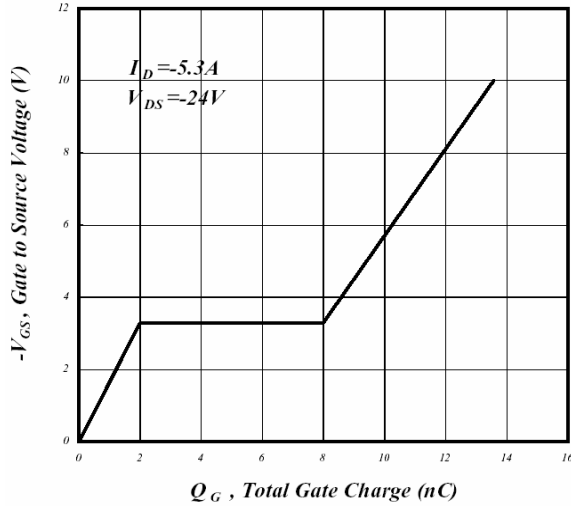


Fig 7. Gate Charge Characteristics

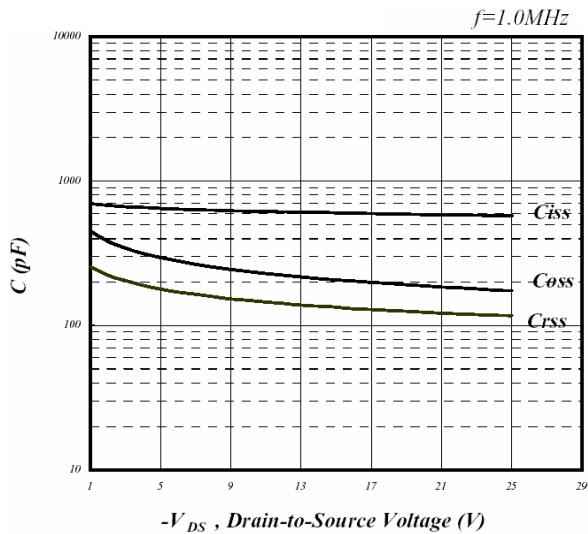


Fig 8. Typical Capacitance Characteristics

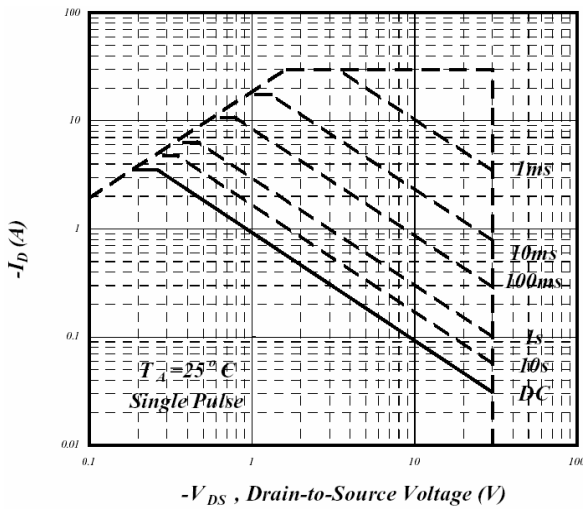


Fig 9. Maximum Safe Operating Area

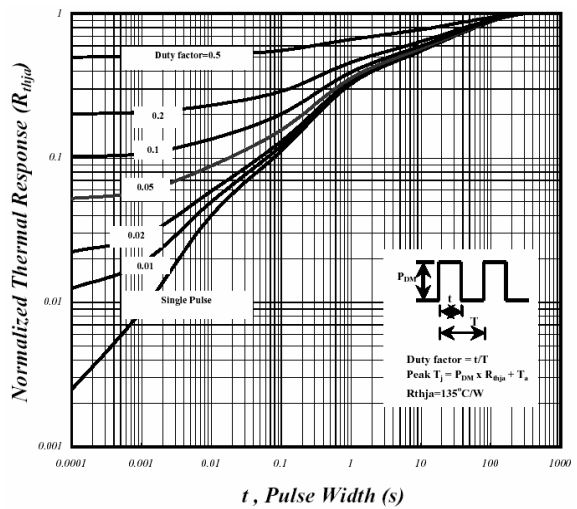


Fig 10. Effective Transient Thermal Impedance

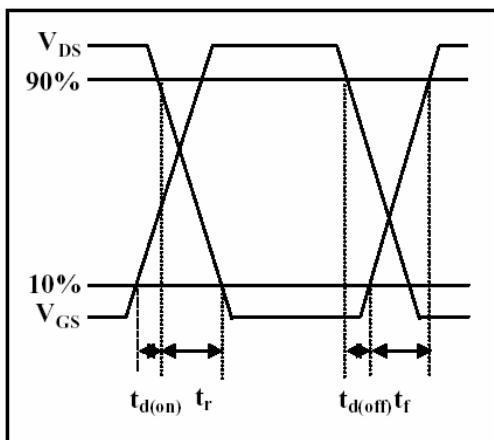


Fig 11. Switching Time Waveform

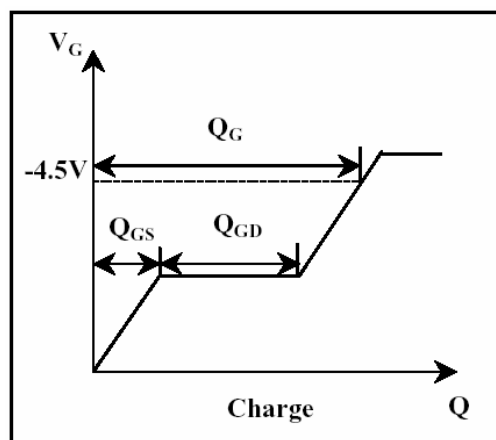


Fig 12. Gate Charge Waveform

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