

## GSS4503

### 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>    | 36mΩ  |
| I <sub>D</sub>         | -6.3A |

### Description

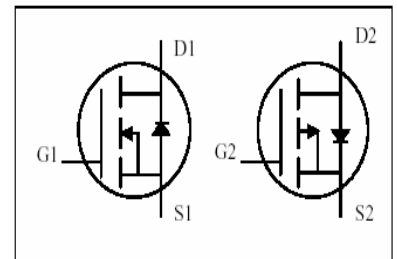
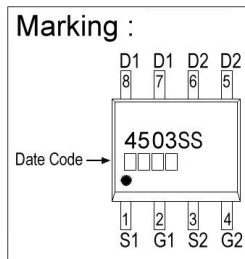
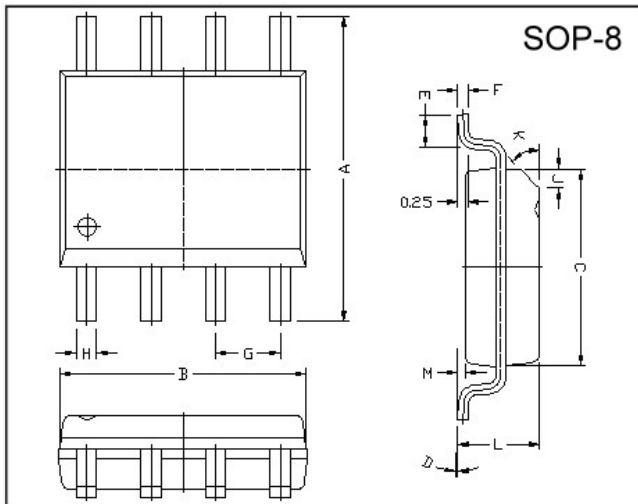
The GSS4503 provide the designer with the best combination of fast switching, ruggedized device design, low on-resistance and cost-effectiveness.

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
- \*Lower 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        | -6.3      | A    |
| Continuous Drain Current <sup>3</sup>            | I <sub>D</sub> @TA=70°C           | 5.5        | -5.0      | 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                     | $BV_{DSS}$                     | 30   | -     | -    | V    | $V_{GS}=0, I_D=250\mu A$  |
| Breakdown Voltage Temperature Coefficient          | $\Delta BV_{DSS} / \Delta T_j$ | -    | 0.005 | -    | V/°C | Reference to 25°C, $I_D=1mA$  |
| Gate Threshold Voltage                             | $V_{GS(th)}$                   | 1.0  | -     | 3.0  | V    | $V_{DS}=V_{GS}, I_D=250\mu A$   |
| Forward Transconductance                           | $g_{fs}$                       | -    | 5.7   | -    | S    | $V_{DS}=10V, I_D=6A$  |
| Gate-Source Leakage Current                        | $I_{GSS}$                      | -    | -     | ±100 | nA   | $V_{GS}= \pm 20V$   |
| Drain-Source Leakage Current(T <sub>j</sub> =25°C) | $I_{DSS}$                      | -    | -     | 1    | uA   | $V_{DS}=30V, V_{GS}=0$  |
| Drain-Source Leakage Current(T <sub>j</sub> =70°C) |                                | -    | -     | 25   | uA   | $V_{DS}=24V, V_{GS}=0$  |
| Static Drain-Source On-Resistance <sup>2</sup>     | $R_{DS(on)}$                   | -    | -     | 28   | mΩ   | $V_{GS}=10V, I_D=6A$  |
|  |                                | -    | -     | 42   |      | $V_{GS}=4.5V, I_D=4A$   |
| Total Gate Charge <sup>2</sup>                     | $Q_g$                          | -    | 9     | 15   | nC   | $I_D=6A$<br>$V_{DS}=24V$<br>$V_{GS}=4.5V$                                     |
| Gate-Source Charge                                 | $Q_{gs}$                       | -    | 2     | -    |      |   |
| Gate-Drain ("Miller") Charge                       | $Q_{gd}$                       | -    | 6     | -    |      |   |
| Turn-on Delay Time <sup>2</sup>                    | $T_{d(on)}$                    | -    | 8     | -    | ns   | $V_{DS}=15V$<br>$I_D=1A$<br>$V_{GS}=10V$<br>$R_G=3.3\Omega$<br>$R_D=15\Omega$ |
| Rise Time  | $T_r$                          | -    | 7     | -    |      |   |
| Turn-off Delay Time                                | $T_{d(off)}$                   | -    | 19    | -    |      |   |
| Fall Time  | $T_f$                          | -    | 6     | -    |      |   |
| Input Capacitance                                  | $C_{iss}$                      | -    | 610   | 970  | pF   | $V_{GS}=0V$<br>$V_{DS}=25V$<br>$f=1.0MHz$                                     |
| Output Capacitance                                 | $C_{oss}$                      | -    | 160   | -    |      |   |
| Reverse Transfer Capacitance                       | $C_{rss}$                      | -    | 120   | -    |      |   |

**Source-Drain Diode**

| Parameter                       | Symbol   | Min. | Typ. | Max. | Unit | Test Conditions                           |
|---------------------------------|----------|------|------|------|------|---|
| Forward On Voltage <sup>2</sup> | $V_{SD}$ | -    | -    | 1.2  | V    | $I_S=6A, V_{GS}=0V, T_j=25^\circ C$       |
| Reverse Recovery Time           | $T_{rr}$ | -    | 18   | -    | ns   | $I_S=6A, V_{GS}=0V$<br>$di/dt=100A/\mu s$ |
| Reverse Recovery Charge         | $Q_{rr}$ | -    | 11   | -    | nC   |   |

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

2. Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .

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          | $\Delta BV_{DSS} / \Delta T_j$ | -    | -0.004 | -    | 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>                | -    | 5.8    | -    | S    | V <sub>DS</sub> =-10V, I <sub>D</sub> =-6A   |
| 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>            | -    | -      | 36   | mΩ   | V <sub>GS</sub> =-10V, I <sub>D</sub> =-6A   |
|  |                                | -    | -      | 55   |      | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4A  |
| Total Gate Charge <sup>2</sup>                     | Q <sub>g</sub>                 | -    | 15     | 24   | 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>                | -    | 3      | -    |      |  |
| Gate-Drain ("Miller") Charge                       | Q <sub>gd</sub>                | -    | 9      | -    |      |  |
| Turn-on Delay Time <sup>2</sup>                    | T <sub>d(on)</sub>             | -    | 12     | -    | 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>                 | -    | 8      | -    |      |  |
| Turn-off Delay Time                                | T <sub>d(off)</sub>            | -    | 42     | -    |      |  |
| Fall Time  | T <sub>f</sub>                 | -    | 34     | -    |      |  |
| Input Capacitance                                  | C <sub>iss</sub>               | -    | 960    | 1540 | pF   | V <sub>GS</sub> =0V<br>V <sub>DS</sub> =-25V<br>f=1.0MHz   |
| Output Capacitance                                 | C <sub>oss</sub>               | -    | 300    | -    |      |  |
| Reverse Transfer Capacitance                       | C <sub>rss</sub>               | -    | 220    | -    |      |  |

**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> =-6A, V <sub>GS</sub> =0V, T <sub>j</sub> =25°C |
| Reverse Recovery Time           | T <sub>rr</sub> | -    | 24   | -    | ns   | I <sub>S</sub> =-6A, V <sub>GS</sub> =0V<br>di/dt=100A/μs      |
| Reverse Recovery Charge         | Q <sub>rr</sub> | -    | 18   | -    | 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

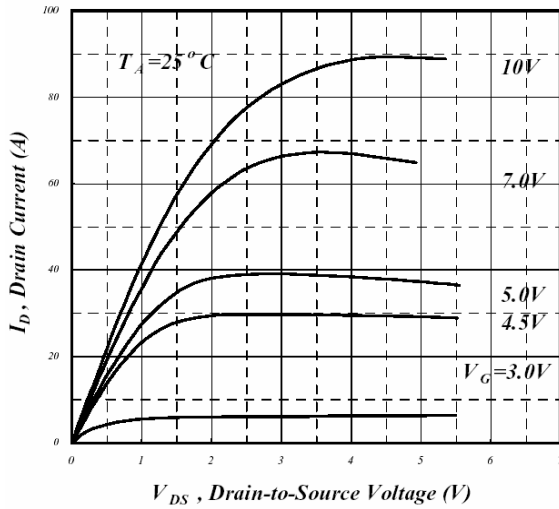


Fig 1. Typical Output Characteristics

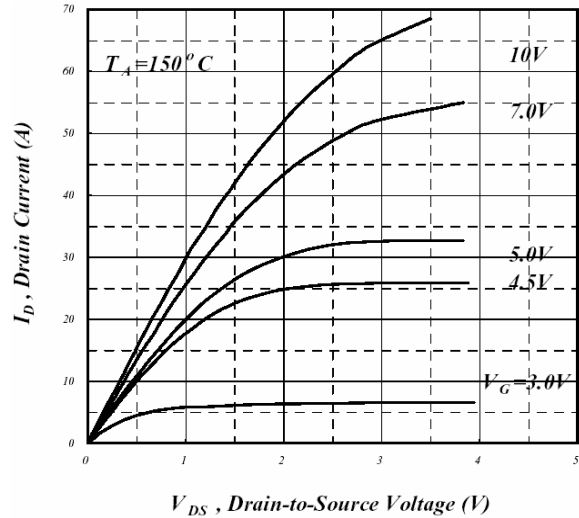


Fig 2. Typical Output Characteristics

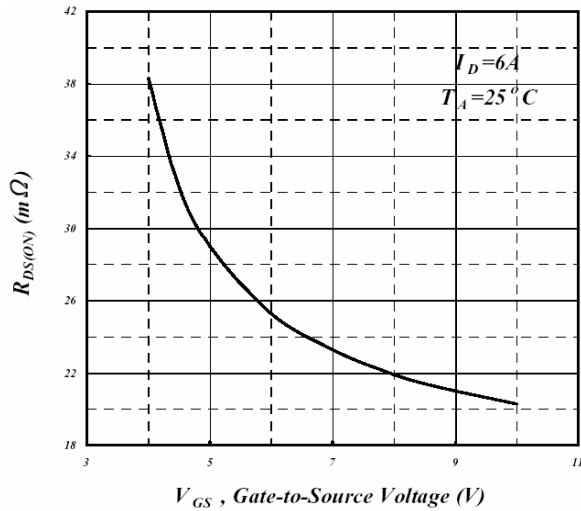


Fig 3. On-Resistance v.s. Gate Voltage

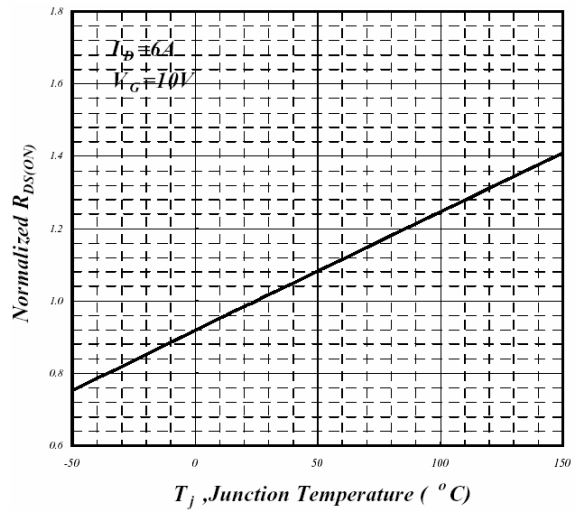


Fig 4. Normalized On-Resistance v.s. Junction Temperature

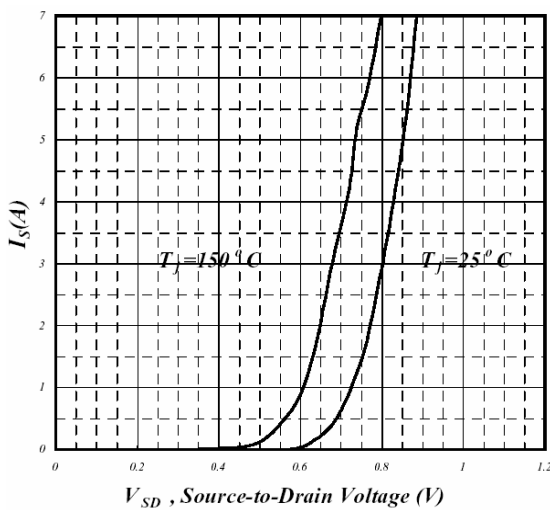


Fig 5. Forward Characteristics of Reverse Diode

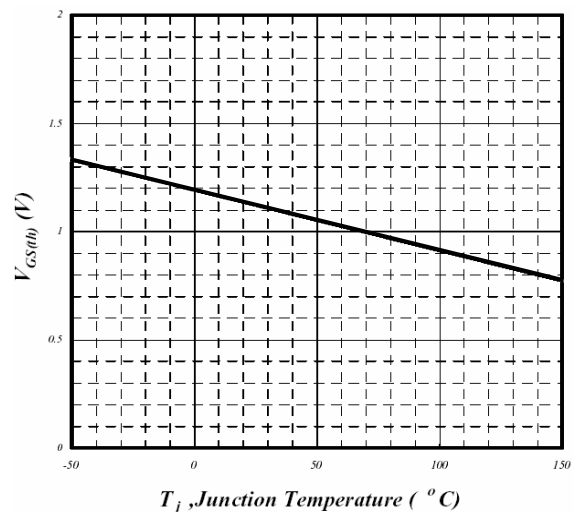
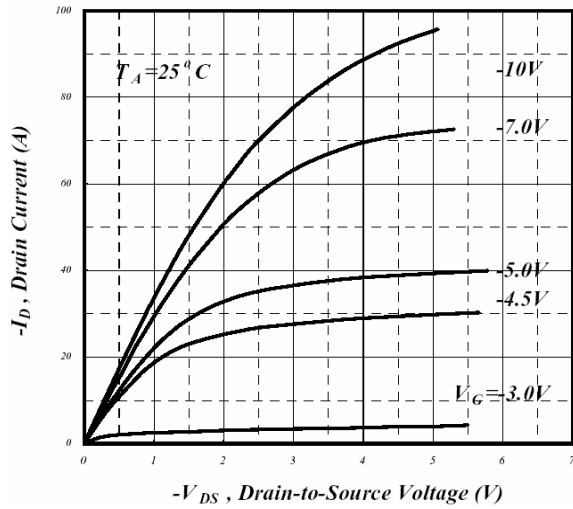


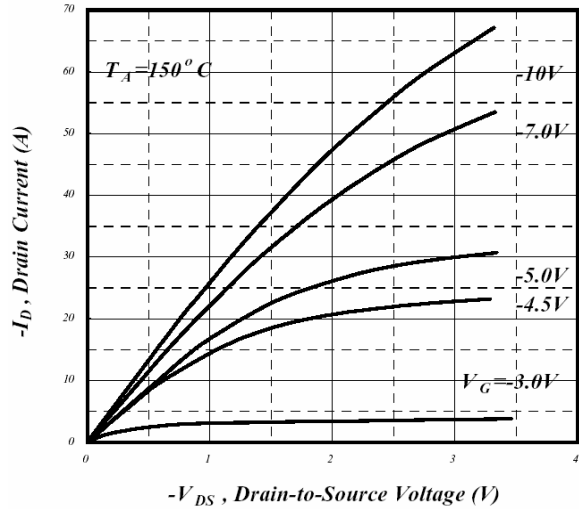
Fig 6. Gate Threshold Voltage v.s. Junction Temperature



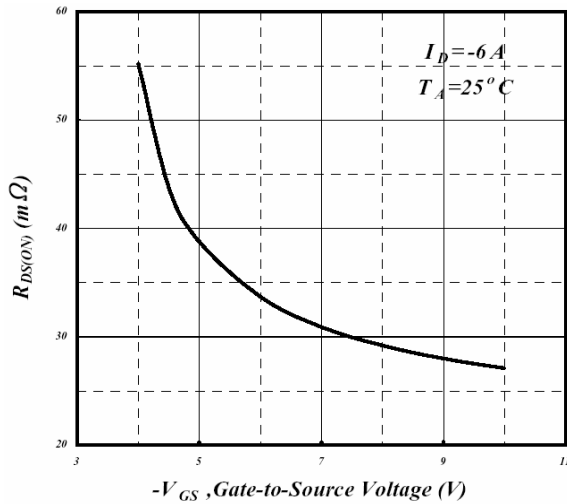
## P-Channel



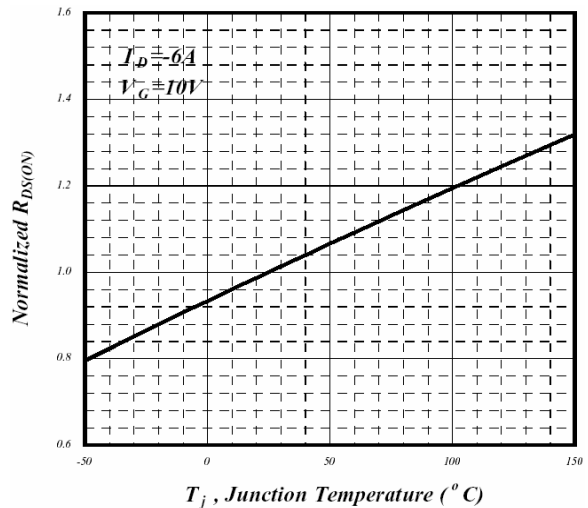
**Fig 1. Typical Output Characteristics**



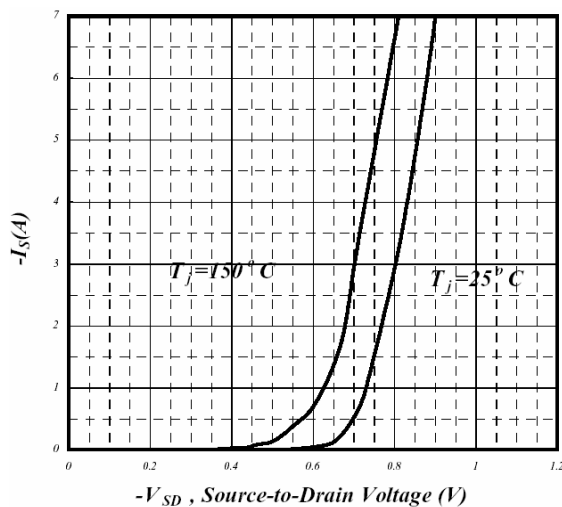
**Fig 2. Typical Output Characteristics**



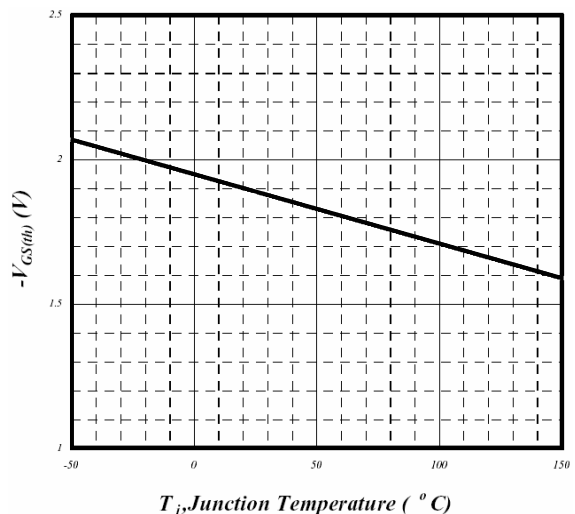
**Fig 3. On-Resistance v.s. Gate Voltage**



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

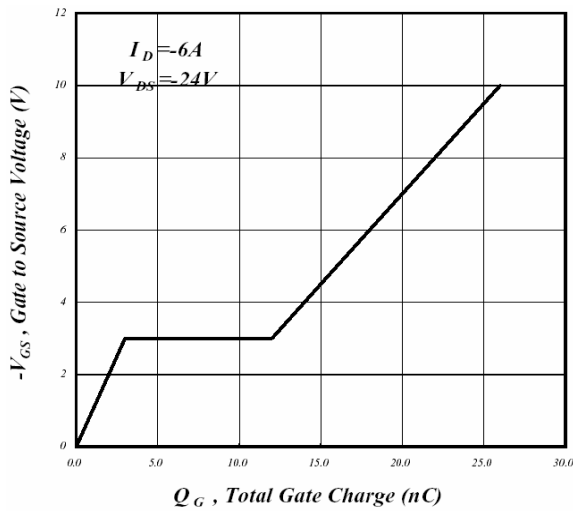


**Fig 5. Forward Characteristics of Reverse Diode**

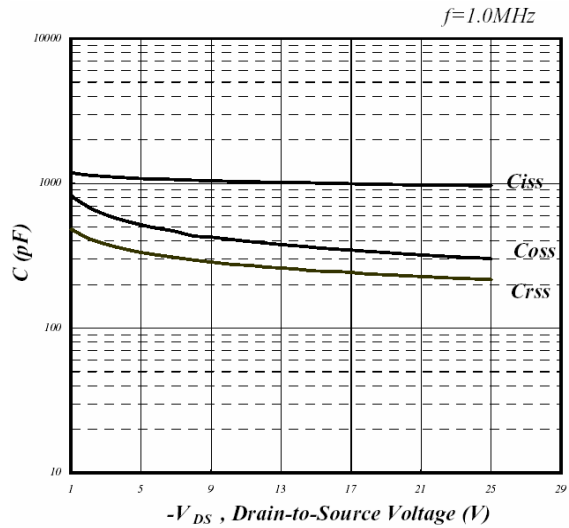


**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**

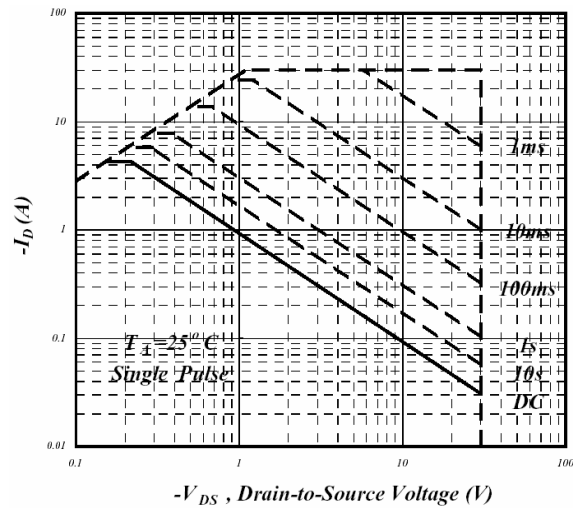
## P-Channel



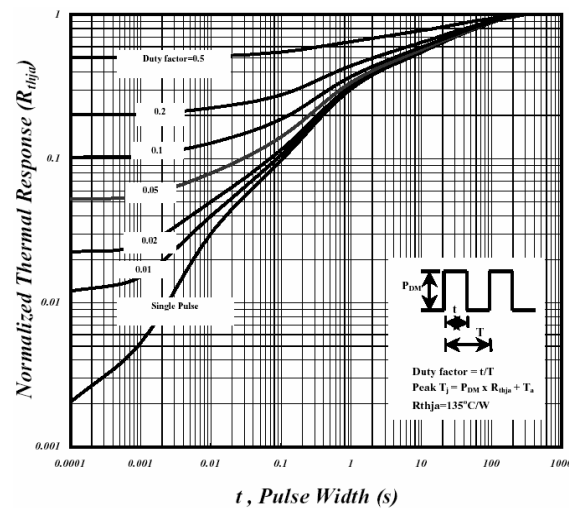
**Fig 7. Gate Charge Characteristics**



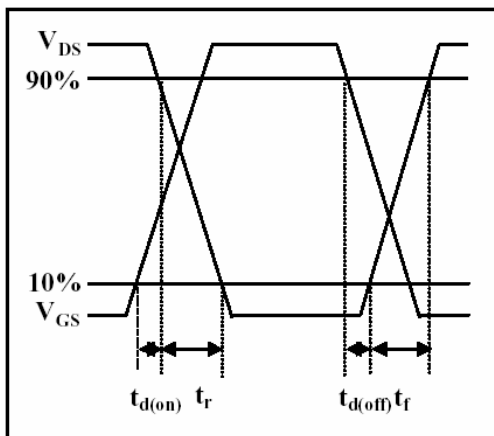
**Fig 8. Typical Capacitance Characteristics**



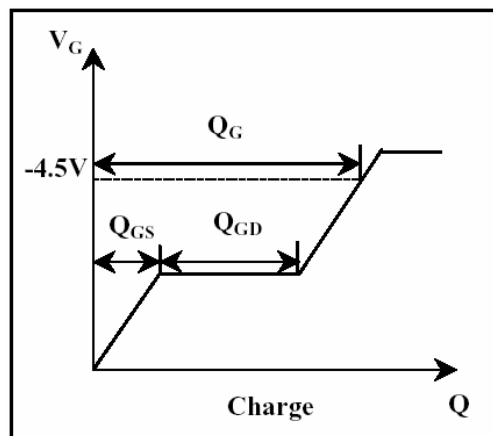
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**



**Fig 11. Switching Time Waveform**



**Fig 12. Gate Charge Waveform**

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