

**GS1333****P-CHANNEL ENHANCEMENT MODE POWER MOSFET**

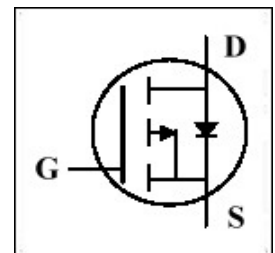
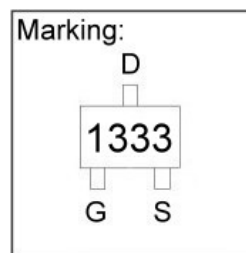
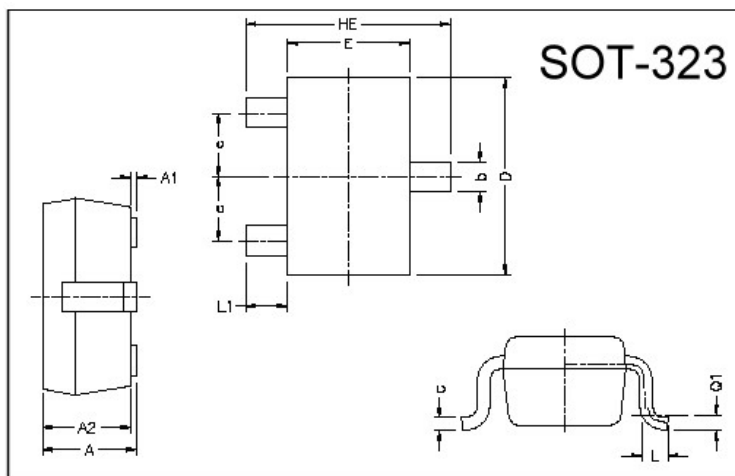
|                     |        |
|---------------------|--------|
| BV <sub>DSS</sub>   | -20V   |
| R <sub>DS(ON)</sub> | 800mΩ  |
| I <sub>D</sub>      | -550mA |

**Description**

The GS1333 provide the designer with best combination of fast switching, low on-resistance and cost-effectiveness.

**Features**

- \*Simple Gate Drive
- \*Small Package Outline
- \*Fast Switching Speed

**Package Dimensions**

| REF. | Millimeter |      | REF. | Millimeter |      |
|------|------------|------|------|------------|------|
|      | Min.       | Max. |      | Min.       | Max. |
| A    | 0.80       | 1.10 | L1   | 0.42 REF.  |      |
| A1   | 0          | 0.10 | L    | 0.15       | 0.35 |
| A2   | 0.80       | 1.00 | b    | 0.25       | 0.40 |
| D    | 1.80       | 2.20 | c    | 0.10       | 0.25 |
| E    | 1.15       | 1.35 | e    | 0.65 REF.  |      |
| HE   | 1.80       | 2.40 | Q1   | 0.15 BSC.  |      |

**Absolute Maximum Ratings**

| Parameter                                        | Symbol                            | Ratings    | Unit |
|--------------------------------------------------|-----------------------------------|------------|------|
| Drain-Source Voltage                             | V <sub>DS</sub>                   | -20        | V    |
| Gate-Source Voltage                              | V <sub>GS</sub>                   | ±12        | V    |
| Continuous Drain Current <sup>3</sup>            | I <sub>D</sub> @TA=25°C           | -550       | mA   |
| Continuous Drain Current <sup>3</sup>            | I <sub>D</sub> @TA=70°C           | -440       | mA   |
| Pulsed Drain Current <sup>1,2</sup>              | I <sub>DM</sub>                   | 2.5        | A    |
| Total Power Dissipation                          | P <sub>D</sub> @TA=25°C           | 0.35       | W    |
| Linear Derating Factor                           |                                   | 0.003      | W/°C |
| Operating Junction and Storage Temperature Range | T <sub>j</sub> , T <sub>stg</sub> | -55 ~ +150 | °C   |

**Thermal Data**

| Parameter                                             | Symbol             | Ratings | Unit |
|-------------------------------------------------------|--------------------|---------|------|
| Thermal Resistance Junction-ambient <sup>3</sup> Max. | R <sub>thj-a</sub> | 360     | °C/W |

**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>              | -20  | -    | -     | 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>            | -0.5 | -    | -1.2  | V    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA                                                              |
| Forward Transconductance                           | g <sub>fs</sub>                | -    | 1    | -     | S    | V <sub>DS</sub> =-5V, I <sub>D</sub> =-550mA                                                                           |
| Gate-Source Leakage Current                        | I <sub>GSS</sub>               | -    | -    | ±100  | nA   | V <sub>GS</sub> = ±12V                                                                                                 |
| Drain-Source Leakage Current(T <sub>j</sub> =25°C) | I <sub>DSS</sub>               | -    | -    | -1    | uA   | V <sub>DS</sub> =-20V, V <sub>GS</sub> =0                                                                              |
| Drain-Source Leakage Current(T <sub>j</sub> =70°C) |                                | -    | -    | -10   | uA   | V <sub>DS</sub> =-16V, V <sub>GS</sub> =0                                                                              |
| Static Drain-Source On-Resistance                  | R <sub>DS(ON)</sub>            | -    | -    | 600   | mΩ   | V <sub>GS</sub> =-10V, I <sub>D</sub> =-550mA                                                                          |
|                                                    |                                | -    | -    | 800   |      | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-500mA                                                                         |
|                                                    |                                | -    | -    | 1000  |      | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-300mA                                                                         |
| Total Gate Charge <sup>2</sup>                     | Q <sub>g</sub>                 | -    | 1.7  | 2.7   | nC   | I <sub>D</sub> =-500mA<br>V <sub>DS</sub> =-16V<br>V <sub>GS</sub> =-4.5V                                              |
| Gate-Source Charge                                 | Q <sub>gs</sub>                | -    | 0.3  | -     |      |                                                                                                                        |
| Gate-Drain ("Miller") Change                       | Q <sub>gd</sub>                | -    | 0.4  | -     |      |                                                                                                                        |
| Turn-on Delay Time <sup>2</sup>                    | T <sub>d(on)</sub>             | -    | 5    | -     | ns   | V <sub>DS</sub> =-10V<br>I <sub>D</sub> =-500mA<br>V <sub>GS</sub> =-5V<br>R <sub>G</sub> =3.3Ω<br>R <sub>D</sub> =20Ω |
| Rise Time                                          | T <sub>r</sub>                 | -    | 8    | -     |      |                                                                                                                        |
| Turn-off Delay Time                                | T <sub>d(off)</sub>            | -    | 10   | -     |      |                                                                                                                        |
| Fall Time                                          | T <sub>f</sub>                 | -    | 2    | -     |      |                                                                                                                        |
| Input Capacitance                                  | C <sub>iss</sub>               | -    | 66   | 105.6 | pF   | V <sub>GS</sub> =0V<br>V <sub>DS</sub> =-10V<br>f=1.0MHz                                                               |
| Output Capacitance                                 | C <sub>oss</sub>               | -    | 25   | -     |      |                                                                                                                        |
| Reverse Transfer Capacitance                       | C <sub>rss</sub>               | -    | 20   | -     |      |                                                                                                                        |

**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> =-300mA, V <sub>GS</sub> =0V |

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

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

3. Surface mounted on FR4 board, t ≤ 10sec.

## Characteristics Curve

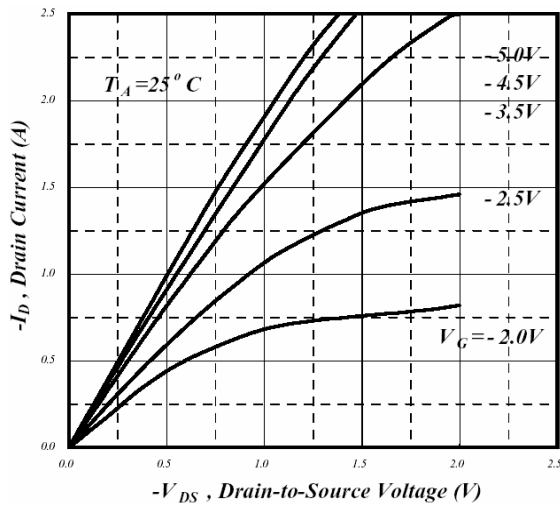


Fig 1. Typical Output Characteristics

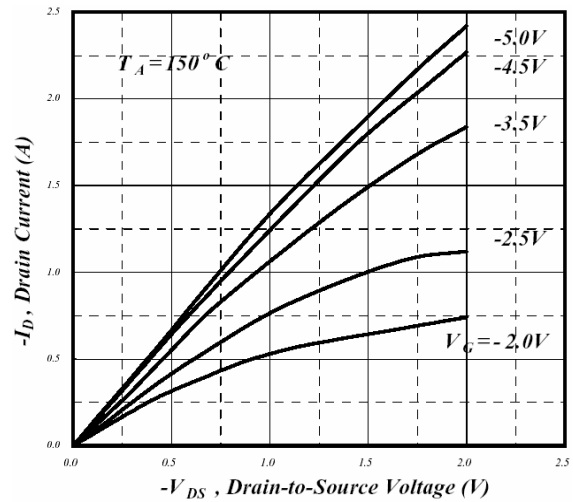


Fig 2. Typical Output Characteristics

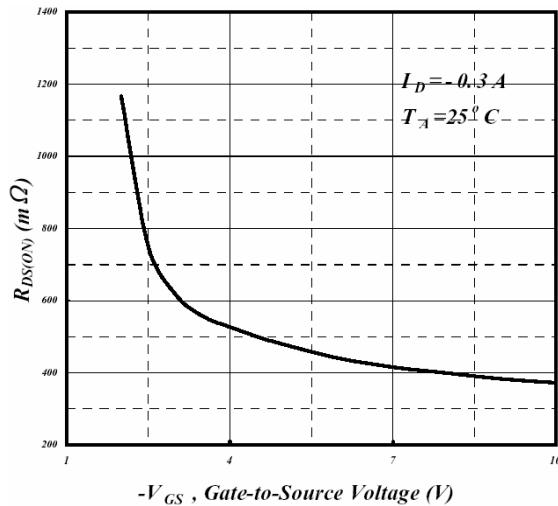


Fig 3. On-Resistance v.s. Gate Voltage

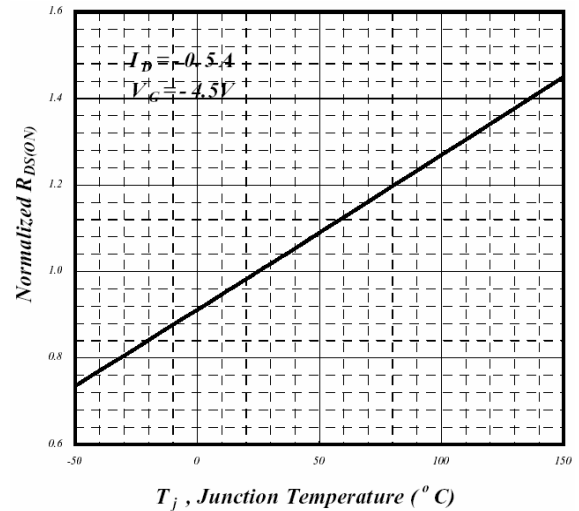


Fig 4. Normalized On-Resistance v.s. Junction Temperature

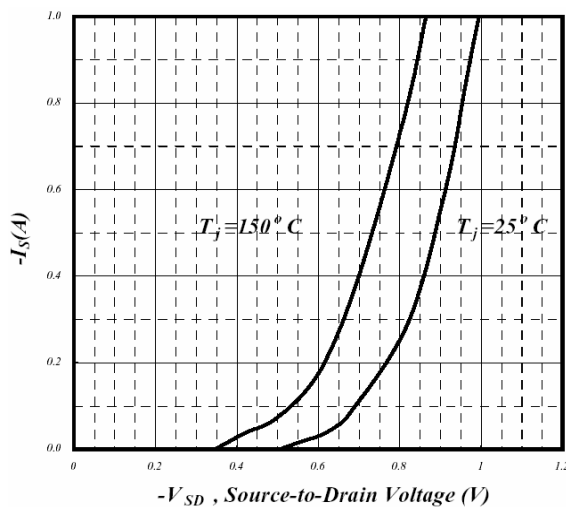


Fig 5. Forward Characteristics of Reverse Diode

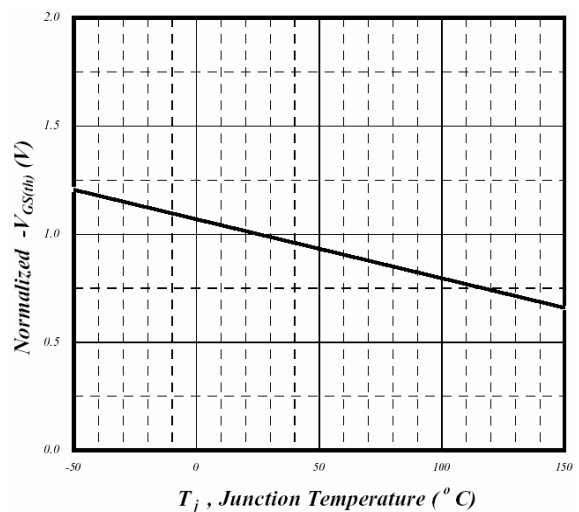
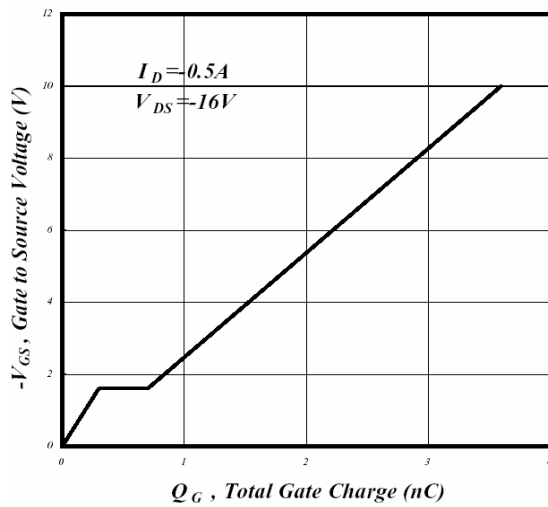
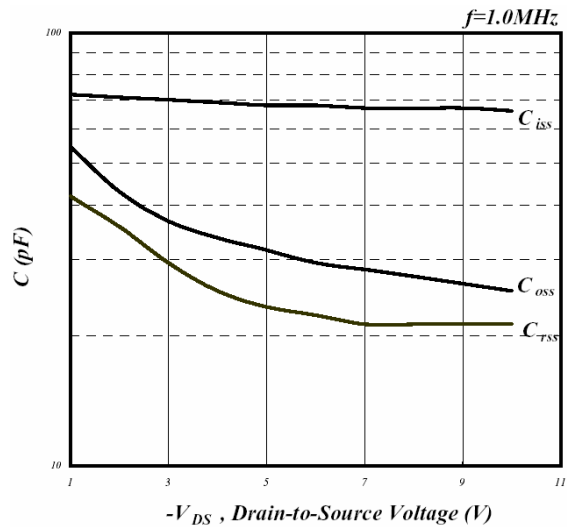


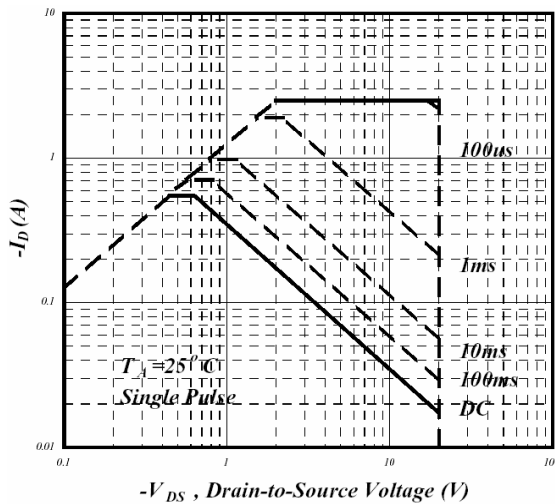
Fig 6. Gate Threshold Voltage v.s. Junction Temperature



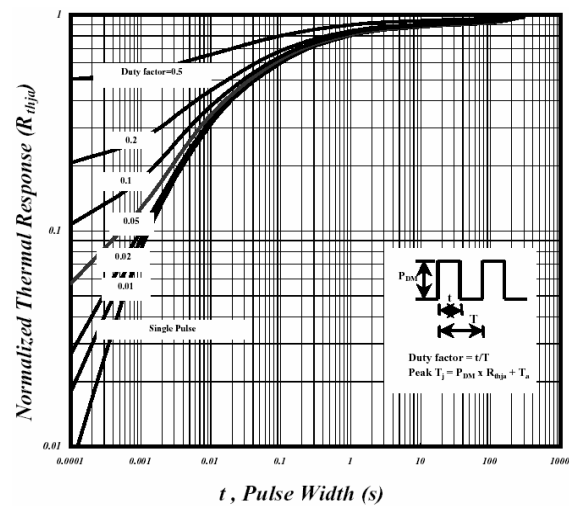
**Fig 7. Gate Charge Characteristics**



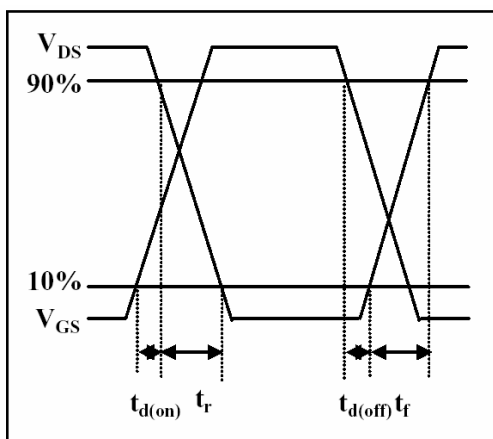
**Fig 8. Typical Capacitance Characteristics**



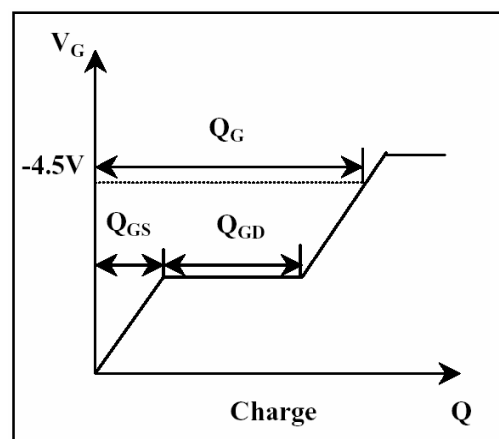
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**



**Fig 11. Switching Time Waveform**



**Fig 12. Gate Charge Waveform**

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