

# GS138K

## N-CHANNEL ENHANCEMENT MODE POWER MOSFET

|         |       |
|---------|-------|
| BVDSS   | 50V   |
| RDS(ON) | 2Ω    |
| ID      | 640mA |

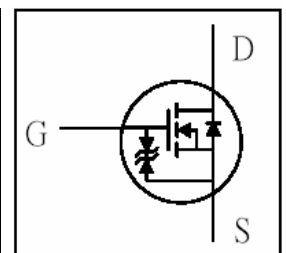
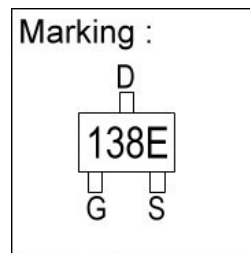
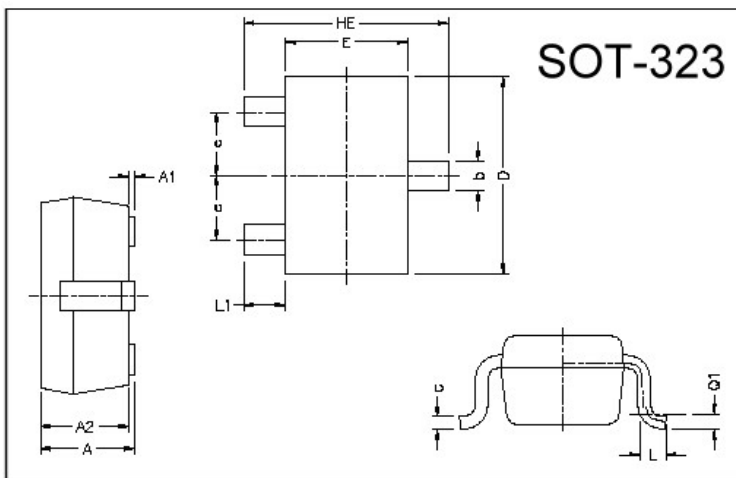
### Description

The GS138K utilized advanced processing techniques to achieve the lowest possible on-resistance, extremely efficient and cost-effectiveness device.  
The GS138K is universally used for all commercial-industrial applications.

### Features

- \*Simple Drive Requirement
- \*Small Package Outline
- \*RoHS Compliant

### 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                                 | $V_{DS}$              | 50         | V    |
| Gate-Source Voltage                                  | $V_{GS}$              | ±20        | V    |
| Continuous Drain Current <sup>3</sup> , $V_{GS}@10V$ | $I_D @TA=25^{\circ}C$ | 640        | mA   |
| Continuous Drain Current <sup>3</sup> , $V_{GS}@10V$ | $I_D @TA=70^{\circ}C$ | 500        | mA   |
| Pulsed Drain Current <sup>1,2</sup>                  | $I_{DM}$              | 950        | mA   |
| Power Dissipation                                    | $P_D @TA=25^{\circ}C$ | 0.35       | W    |
| Linear Derating Factor                               |                       | 0.003      | W/°C |
| Operating Junction and Storage Temperature Range     | $T_j, T_{stg}$        | -55 ~ +150 | °C   |

### Thermal Data

| Parameter   | Symbol      | Ratings | Unit |
|---|-------------|---------|------|
| Thermal Resistance Junction-ambient <sup>3</sup> Max. | $R_{thj-a}$ | 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>              | 50   | -    | -    | V    | V <sub>GS</sub> =0, I <sub>D</sub> =250uA  |
| Breakdown Voltage Temperature Coefficient          | $\Delta BV_{DSS} / \Delta T_j$ | -    | 0.06 | -    | V/°C | Reference to 25°C, I <sub>D</sub> =1mA   |
| Gate Threshold Voltage                             | V <sub>GS(th)</sub>            | 0.5  | -    | 2.0  | V    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =1mA   |
| Forward Transconductance                           | g <sub>fs</sub>                | -    | 600  | -    | mS   | V <sub>DS</sub> =10V, I <sub>D</sub> =600mA  |
| Gate-Source Leakage Current                        | I <sub>GSS</sub>               | -    | -    | ±10  | uA   | 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> =50V, V <sub>GS</sub> =0   |
| Drain-Source Leakage Current(T <sub>j</sub> =70°C) |                                | -    | -    | 100  | uA   | V <sub>DS</sub> =40V, V <sub>GS</sub> =0   |
| Static Drain-Source On-Resistance                  | R <sub>DS(ON)</sub>            | -    | -    | 2    | Ω    | V <sub>GS</sub> =10V, I <sub>D</sub> =500mA  |
|  |                                | -    | -    | 4    |      | V <sub>GS</sub> =4.5V, I <sub>D</sub> =400mA   |
| Total Gate Charge <sup>2</sup>                     | Q <sub>g</sub>                 | -    | 1    | 1.6  | nC   | I <sub>D</sub> =600mA<br>V <sub>DS</sub> =50V<br>V <sub>GS</sub> =4.5V   |
| Gate-Source Charge                                 | Q <sub>gs</sub>                | -    | 0.5  | -    |      |  |
| Gate-Drain ("Miller") Change                       | Q <sub>gd</sub>                | -    | 0.5  | -    |      |  |
| Turn-on Delay Time <sup>2</sup>                    | T <sub>d(on)</sub>             | -    | 12   | -    | ns   | V <sub>DS</sub> =30V<br>I <sub>D</sub> =600mA<br>V <sub>GS</sub> =10V<br>R <sub>G</sub> =3.3Ω<br>R <sub>D</sub> =52Ω |
| Rise Time  | T <sub>r</sub>                 | -    | 10   | -    |      |  |
| Turn-off Delay Time                                | T <sub>d(off)</sub>            | -    | 56   | -    |      |  |
| Fall Time  | T <sub>f</sub>                 | -    | 29   | -    |      |  |
| Input Capacitance                                  | C <sub>iss</sub>               | -    | 32   | 50   | pF   | V <sub>GS</sub> =0V<br>V <sub>DS</sub> =25V<br>f=1.0MHz  |
| Output Capacitance                                 | C <sub>oss</sub>               | -    | 8    | -    |      |  |
| Reverse Transfer Capacitance                       | C <sub>rss</sub>               | -    | 6    | -    |      |  |

**Source-Drain Diode**

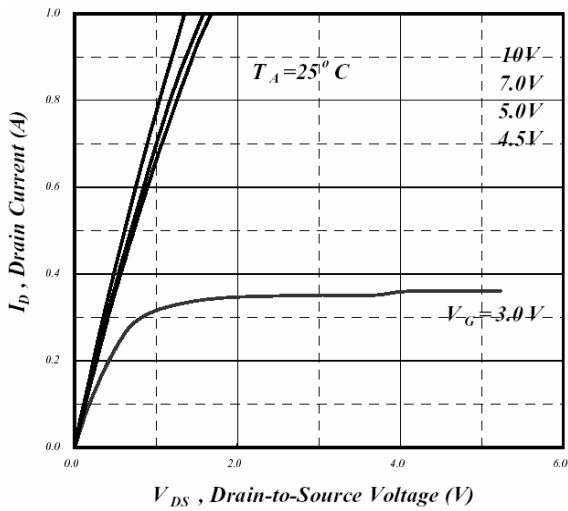
| Parameter                       | Symbol          | Min. | Typ. | Max. | Unit | Test Conditions                            |
|---------------------------------|-----------------|------|------|------|------|--|
| Forward On Voltage <sup>2</sup> | V <sub>SD</sub> | -    | -    | 1.2  | V    | I <sub>S</sub> =200mA, V <sub>GS</sub> =0V |

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

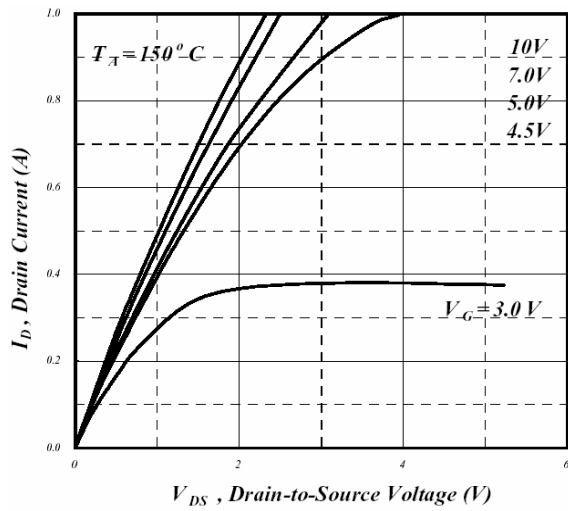
2. Pulse width ≤ 300us, duty cycle ≤ 2%.

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

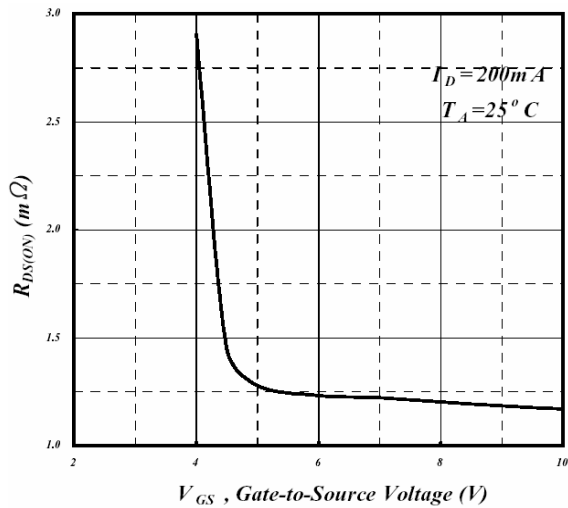
**Characteristics Curve**



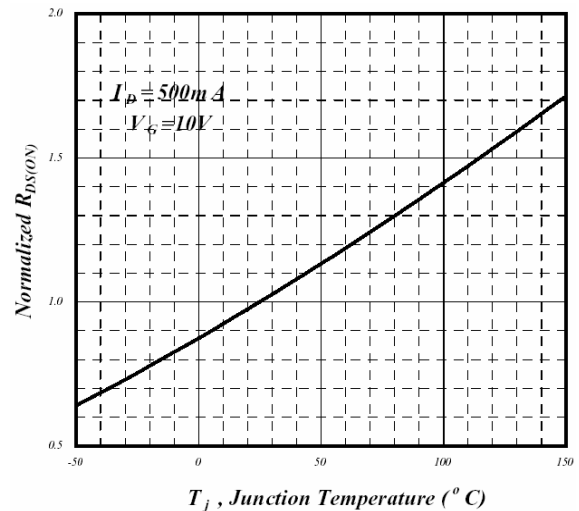
**Fig 1. Typical Output Characteristics**



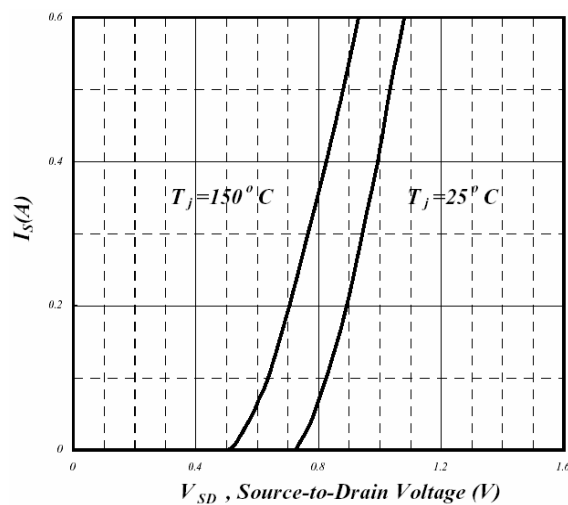
**Fig 2. Typical Output Characteristics**



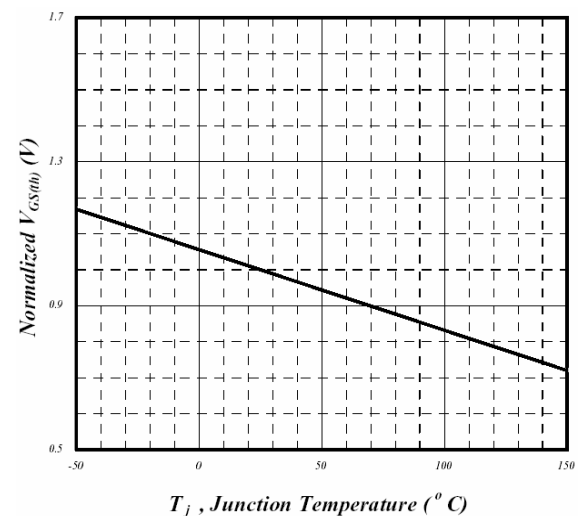
**Fig 3. On-Resistance v.s. Gate Voltage**



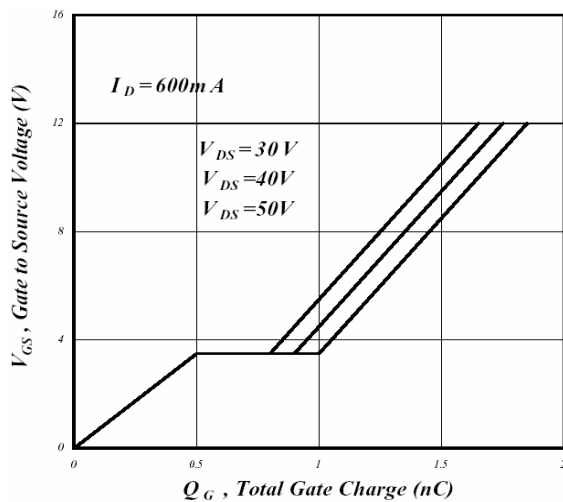
**Fig 4. Normalized On-Resistance v.s. Junction Temperature**



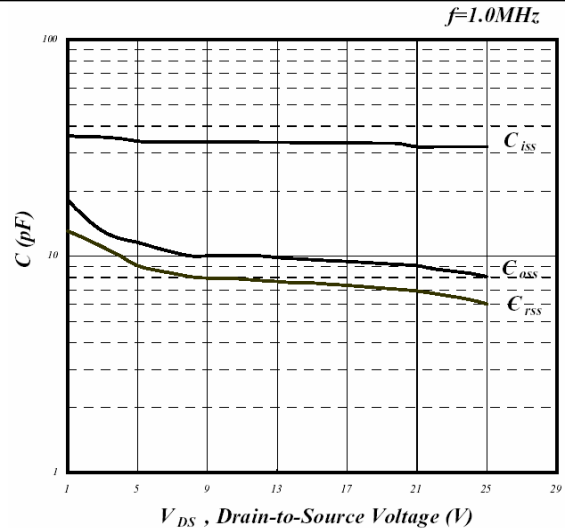
**Fig 5. Forward Characteristics of Reverse Diode**



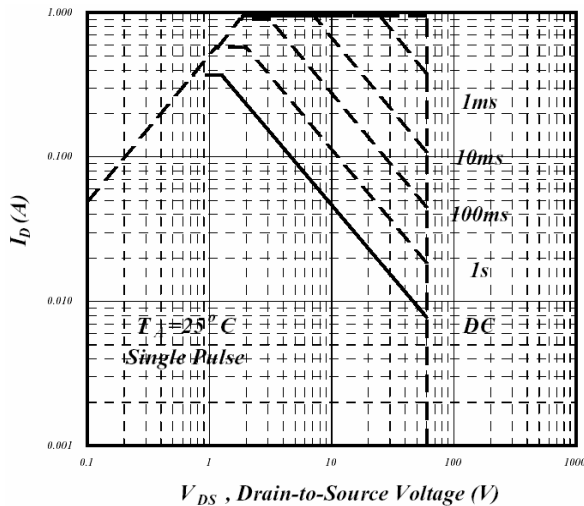
**Fig 6. Gate Threshold Voltage v.s. Junction Temperature**



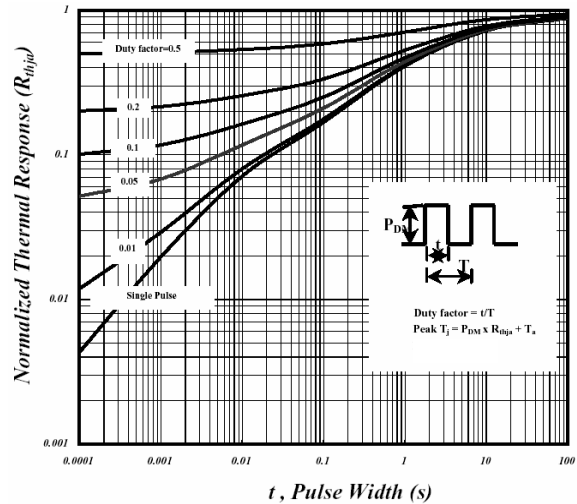
**Fig 7. Gate Charge Characteristics**



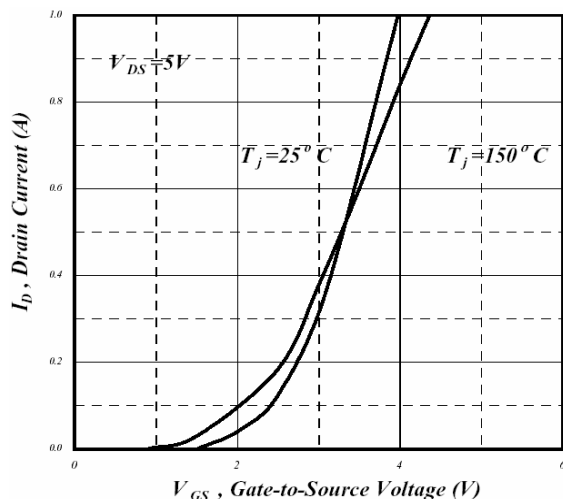
**Fig 8. Typical Capacitance Characteristics**



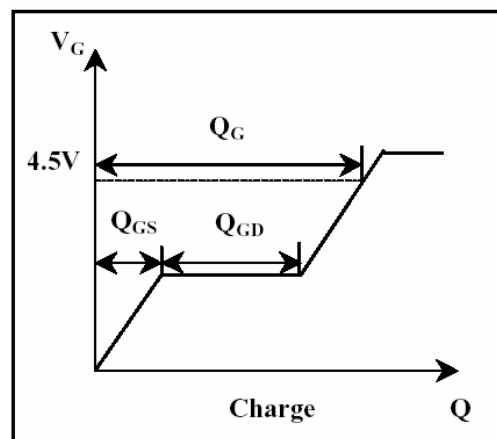
**Fig 9. Maximum Safe Operating Area**



**Fig 10. Effective Transient Thermal Impedance**



**Fig 11. Transfer Characteristics**



**Fig 12. Gate Charge Waveform**

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