

# GSC4409

## P-CHANNEL ENHANCEMENT MODE POWER MOSFET

|         |       |
|---------|-------|
| BVDSS   | -30V  |
| RDS(ON) | 7.5mΩ |
| ID      | -15A  |

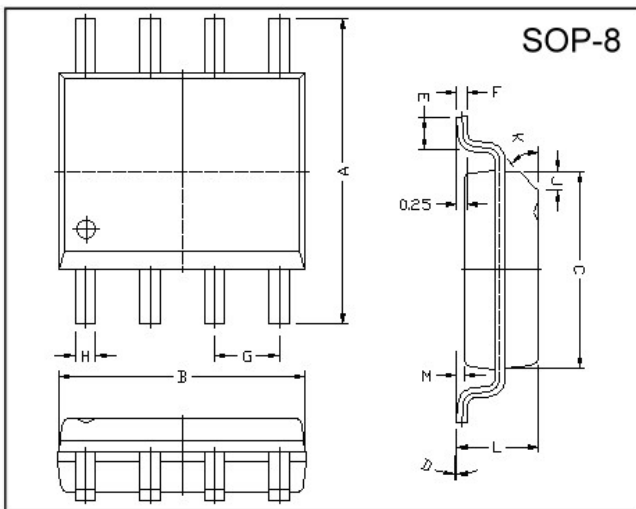
### Description

The GSC4409 uses advanced trench technology to provide excellent on-resistance and ultra low gate charge. The SOP-8 package is universally preferred for all commercial-industrial surface mount applications and suited for use as a load switch or in PWM applications.

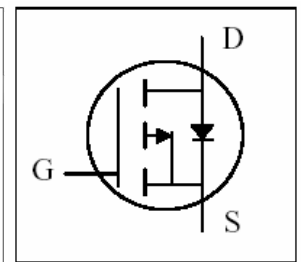
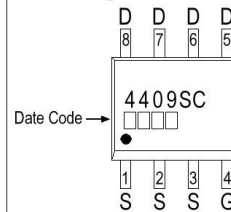
### Features

- \*Simple Drive Requirement
- \*Lower On-resistance
- \*Fast Switching Characteristic

### Package Dimensions



### Marking :



| 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 |
|--|-----------------------|------------|------|
| Drain-Source Voltage                             | $V_{DS}$              | -30        | V    |
| Gate-Source Voltage                              | $V_{GS}$              | $\pm 20$   | V    |
| Continuous Drain Current <sup>3</sup>            | $I_D @ TA=25^\circ C$ | -15        | A    |
| Continuous Drain Current <sup>3</sup>            | $I_D @ TA=70^\circ C$ | -12.8      | A    |
| Pulsed Drain Current <sup>1</sup>                | $I_{DM}$              | -80        | A    |
| Total Power Dissipation                          | $P_D @ TA=25^\circ C$ | 2.5        | W    |
| Linear Derating Factor                           |                       | 0.02       | W/°C |
| Operating Junction and Storage Temperature Range | $T_j, T_{stg}$        | -55 ~ +150 | °C   |

### Thermal Data

| Parameter   | Symbol        | Value | Unit |
|---|---------------|-------|------|
| Thermal Resistance Junction-ambient <sup>3</sup> Max. | $R_{thj-amb}$ | 50    | °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>   | -30  | -    | -    | V    | V <sub>GS</sub> =0, I <sub>D</sub> =-250uA   |
| Gate Threshold Voltage                             | V <sub>GS(th)</sub> | -1.4 | -    | -2.7 | V    | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =-250uA                                  |
| Forward Transconductance                           | g <sub>fs</sub>     | -    | 50   | -    | S    | V <sub>DS</sub> =-5V, I <sub>D</sub> =-15A   |
| 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>    | -    | -    | -5   | uA   | V <sub>DS</sub> =-30V, V <sub>GS</sub> =0  |
| Drain-Source Leakage Current(T <sub>j</sub> =55°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> | -    | -    | 7.5  | mΩ   | V <sub>GS</sub> =-10V, I <sub>D</sub> =-15A  |
|  |                     | -    | -    | 12   |      | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-10A   |
| Total Gate Charge <sup>2</sup>                     | Q <sub>g</sub>      | -    | 100  | 120  | nC   | I <sub>D</sub> =-15A<br>V <sub>DS</sub> =-15V<br>V <sub>GS</sub> =-10V                     |
| Gate-Source Charge                                 | Q <sub>gs</sub>     | -    | 14.5 | -    |      |  |
| Gate-Drain ("Miller") Change                       | Q <sub>gd</sub>     | -    | 23   | -    |      |  |
| Turn-on Delay Time <sup>2</sup>                    | T <sub>d(on)</sub>  | -    | 14   | -    | ns   | V <sub>DS</sub> =-15V<br>V <sub>GS</sub> =-10V<br>R <sub>G</sub> =3Ω<br>R <sub>L</sub> =1Ω |
| Rise Time  | T <sub>r</sub>      | -    | 16.5 | -    |      |  |
| Turn-off Delay Time                                | T <sub>d(off)</sub> | -    | 76.5 | -    |      |  |
| Fall Time  | T <sub>f</sub>      | -    | 37.5 | -    |      |  |
| Input Capacitance                                  | C <sub>iss</sub>    | -    | 5270 | 6400 | pF   | V <sub>GS</sub> =0V<br>V <sub>DS</sub> =-15V<br>f=1.0MHz                                   |
| Output Capacitance                                 | C <sub>oss</sub>    | -    | 945  | -    |      |  |
| Reverse Transfer Capacitance                       | C <sub>rss</sub>    | -    | 745  | -    |      |  |

**Source-Drain Diode**

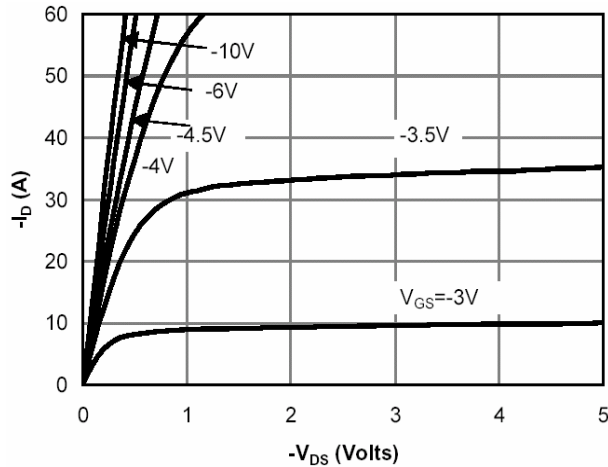
| Parameter                              | Symbol          | Min. | Typ. | Max. | Unit | Test Conditions  |
|--|-----------------|------|------|------|------|--|
| Forward On Voltage <sup>2</sup>        | V <sub>SD</sub> | -    | -    | -1.0 | V    | I <sub>S</sub> =-1.0A, V <sub>GS</sub> =0V                 |
| Continuous Source Current (Body Diode) | I <sub>S</sub>  | -    | -    | -5   | A    | V <sub>D</sub> = V <sub>G</sub> =0V, V <sub>S</sub> =-1.0V |
| Reverse Recovery Time <sup>2</sup>     | T <sub>rr</sub> | -    | 36.7 | -    | ns   | I <sub>S</sub> =-15A, V <sub>GS</sub> =0V<br>di/dt=100A/μs |
| Reverse Recovery Charge                | Q <sub>rr</sub> | -    | 28   | -    | nC   |  |

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

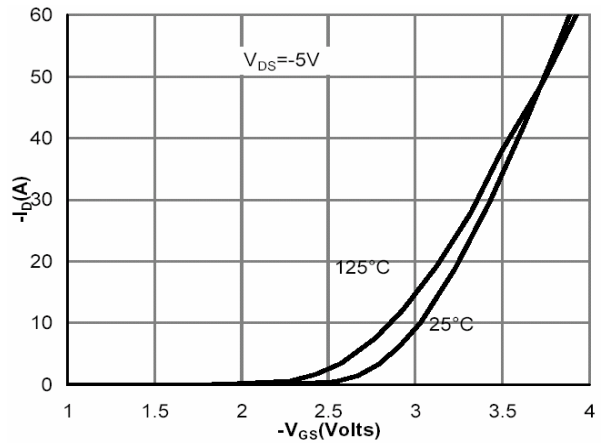
2. Pulse width ≤ 300us, duty cycle ≤ 2%.

3. Surface mounted on 1 in<sup>2</sup> copper pad of FR4 board; 125°C/W when mounted on Min. copper pad.

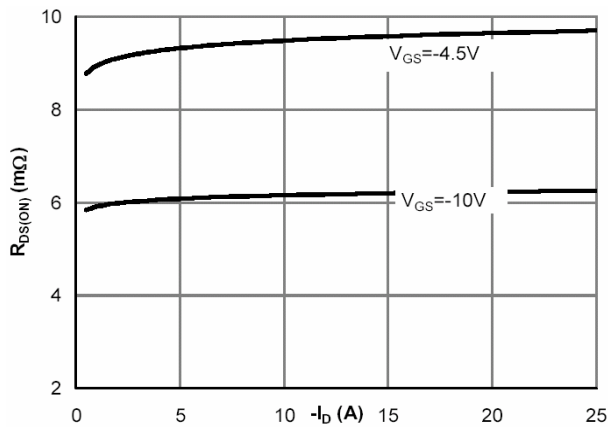
**Characteristics Curve**



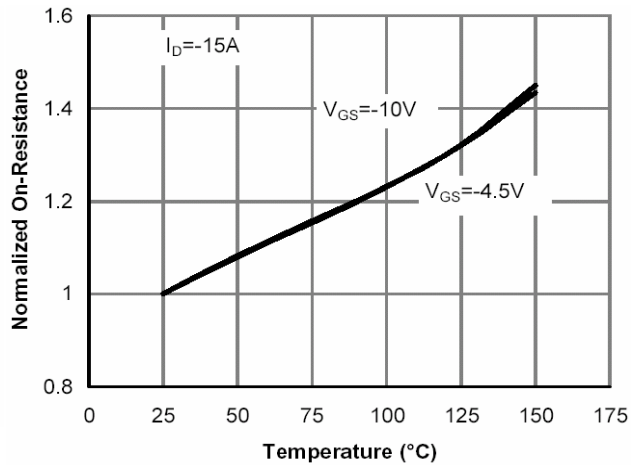
**Fig 1. Typical Output Characteristics**



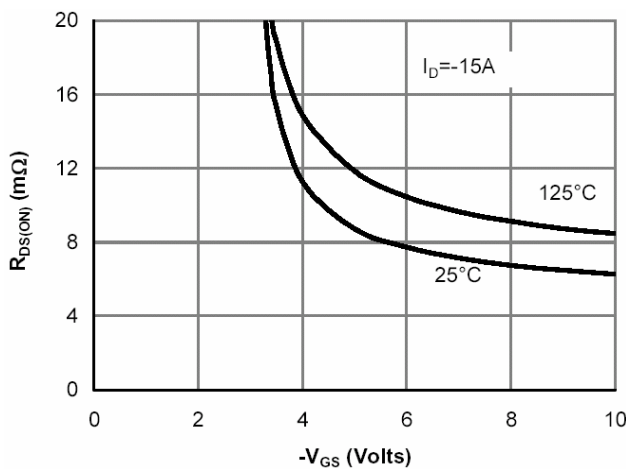
**Fig 2. Transfer Characteristics**



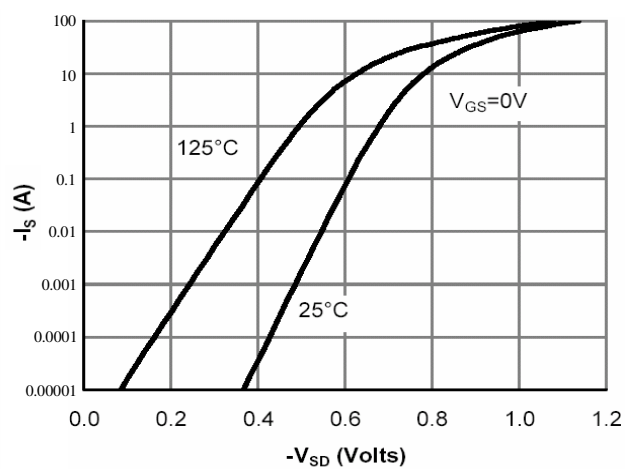
**Fig 3. On-Resistance v.s. Drain Current and Gate Voltage**



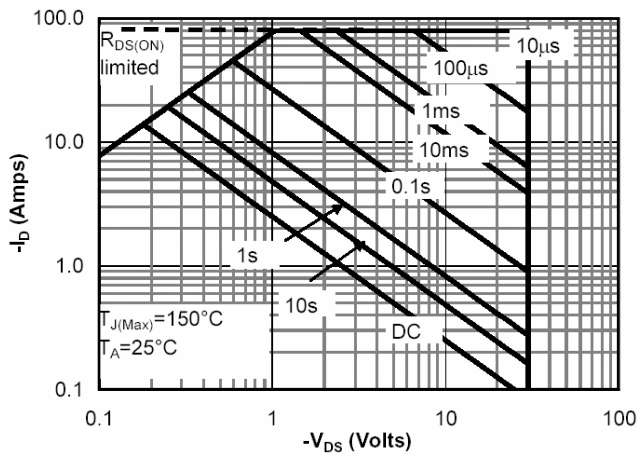
**Fig 4. On-Resistance v.s. Junction Temperature**



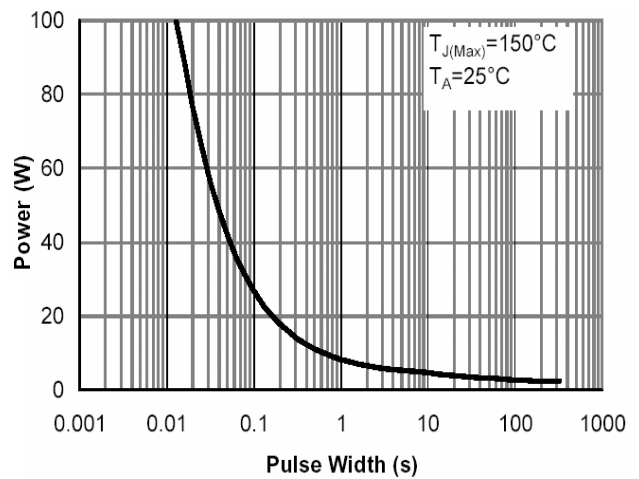
**Fig 5. On-Resistance v.s. Gate-Source Voltage**



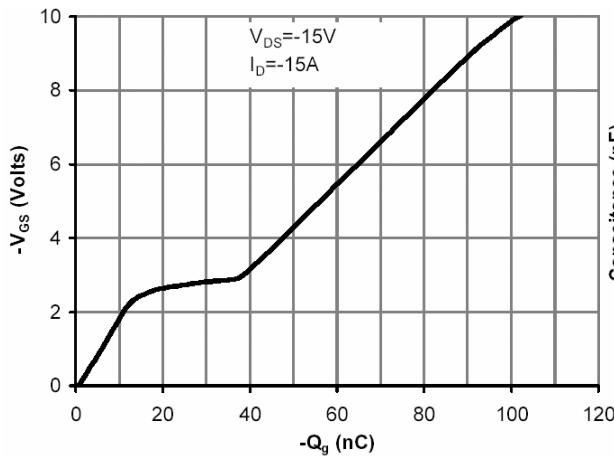
**Fig 6. Body Diode Characteristics**



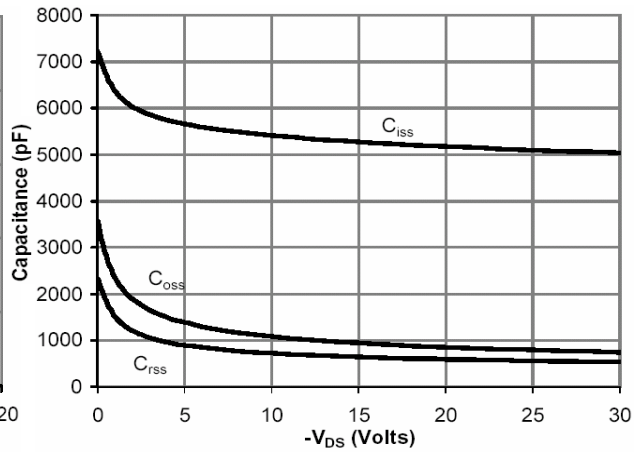
**Fig 7. Maximum Safe Operating Area**



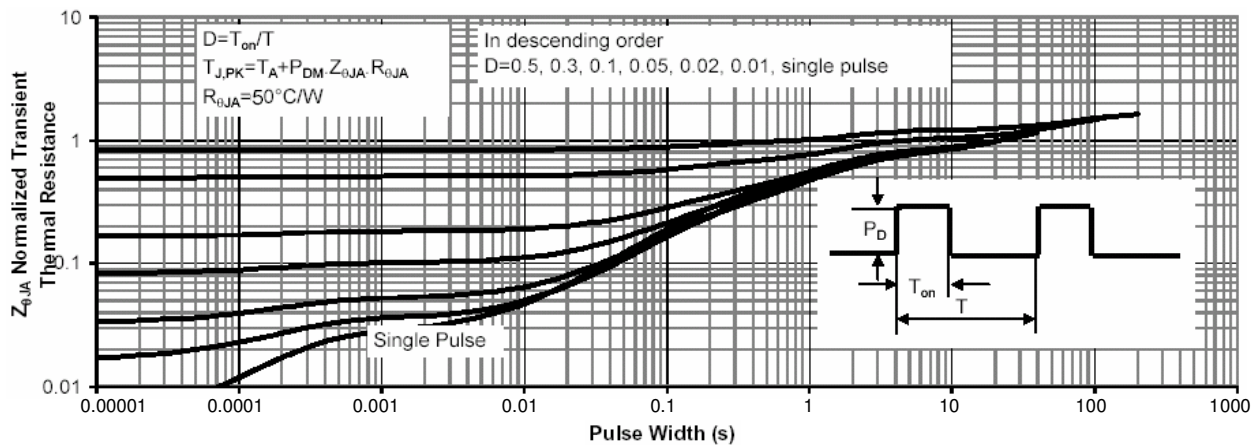
**Fig 8. Single Pulse Maximum Power Dissipation**



**Fig 9. Gate Charge Characteristics**



**Fig 10. Typical Capacitance Characteristics**



**Fig 11. Normalized Maximum Transient Thermal Impedance**

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