

## N-Channel Enhancement Mode Power MOSFET

## Description

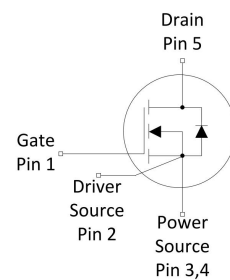
The GC180N65D8 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge. It can be used in a wide variety of applications.

## General Features

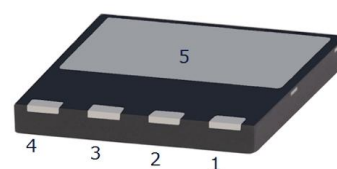
- $V_{DS}$  650V
- $I_D$  (at  $V_{GS} = 10V$ ) 20A
- $R_{DS(ON)}$  (at  $V_{GS} = 10V$ ) < 190mΩ
- 100% Avalanche Tested
- RoHS Compliant

## Application

- Power switch
- DC/DC converters



Schematic diagram



DFN8\*8-4L

## Ordering Information

| Device     | Package   | Marking  | Packaging    |
|------------|-----------|----------|--------------|
| GC180N65D8 | DFN8*8-4L | GC180N65 | 3000pcs/Reel |

Absolute Maximum Ratings  $T_C = 25^\circ\text{C}$ , unless otherwise noted

| Parameter                                        | Symbol         | Value      | Unit             |
|--------------------------------------------------|----------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$       | 650        | V                |
| Continuous Drain Current                         | $I_D$          | 20         | A                |
| Pulsed Drain Current (note1)                     | $I_{DM}$       | 60         | A                |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 30$   | V                |
| Power Dissipation                                | $P_D$          | 151        | W                |
| Single pulse avalanche energy (note2)            | $E_{AS}$       | 245        | mJ               |
| Operating Junction and Storage Temperature Range | $T_J, T_{stg}$ | -55 To 150 | $^\circ\text{C}$ |

## Thermal Resistance

| Parameter                               | Symbol     | Value | Unit               |
|-----------------------------------------|------------|-------|--------------------|
| Thermal Resistance, Junction-to-Ambient | $R_{thJA}$ | 62    | $^\circ\text{C/W}$ |
| Maximum Junction-to-Case                | $R_{thJC}$ | 0.83  | $^\circ\text{C/W}$ |

| Specifications T <sub>J</sub> = 25°C, unless otherwise noted |                      |                                                                           |       |      |      |      |
|--------------------------------------------------------------|----------------------|---------------------------------------------------------------------------|-------|------|------|------|
| Parameter                                                    | Symbol               | Test Conditions                                                           | Value |      |      | Unit |
|                                                              |                      |                                                                           | Min.  | Typ. | Max. |      |
| Static Parameters                                            |                      |                                                                           |       |      |      |      |
| Drain-Source Breakdown Voltage                               | V <sub>(BR)DSS</sub> | V <sub>GS</sub> = 0V, I <sub>D</sub> = 250μA                              | 650   | --   | --   | V    |
| Zero Gate Voltage Drain Current                              | I <sub>DSS</sub>     | V <sub>DS</sub> = 650V, V <sub>GS</sub> = 0V                              | --    | --   | 1    | μA   |
| Gate-Source Leakage                                          | I <sub>GSS</sub>     | V <sub>GS</sub> = ±30V                                                    | --    | --   | ±100 | nA   |
| Gate-Source Threshold Voltage                                | V <sub>GS(th)</sub>  | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250μA                | 2.0   | 3.0  | 4.0  | V    |
| Drain-Source On-Resistance                                   | R <sub>DS(on)</sub>  | V <sub>GS</sub> = 10V, I <sub>D</sub> = 10A                               | --    | 156  | 190  | mΩ   |
| Forward Transconductance                                     | g <sub>FS</sub>      | V <sub>GS</sub> = 5V, I <sub>D</sub> = 10A                                | --    | 17   | --   | S    |
| Dynamic Parameters                                           |                      |                                                                           |       |      |      |      |
| Input Capacitance                                            | C <sub>iss</sub>     | V <sub>GS</sub> = 0V,<br>V <sub>DS</sub> = 400V,<br>f = 1.0MHz            | --    | 1700 | --   | pF   |
| Output Capacitance                                           | C <sub>oss</sub>     |                                                                           | --    | 46   | --   |      |
| Reverse Transfer Capacitance                                 | C <sub>rss</sub>     |                                                                           | --    | 2    | --   |      |
| Total Gate Charge                                            | Q <sub>g</sub>       | V <sub>DD</sub> = 400V,<br>I <sub>D</sub> = 10A,<br>V <sub>GS</sub> = 10V | --    | 42   | --   | nC   |
| Gate-Source Charge                                           | Q <sub>gs</sub>      |                                                                           | --    | 12   | --   |      |
| Gate-Drain Charge                                            | Q <sub>gd</sub>      |                                                                           | --    | 18   | --   |      |
| Turn-on Delay Time                                           | t <sub>d(on)</sub>   | V <sub>DD</sub> = 400V,<br>I <sub>D</sub> = 10A,<br>R <sub>G</sub> = 25Ω  | --    | 31   | --   | ns   |
| Turn-on Rise Time                                            | t <sub>r</sub>       |                                                                           | --    | 114  | --   |      |
| Turn-off Delay Time                                          | t <sub>d(off)</sub>  |                                                                           | --    | 272  | --   |      |
| Turn-off Fall Time                                           | t <sub>f</sub>       |                                                                           | --    | 87   | --   |      |
| Drain-Source Body Diode Characteristics                      |                      |                                                                           |       |      |      |      |
| Continuous Body Diode Current                                | I <sub>S</sub>       | T <sub>C</sub> = 25°C                                                     | --    | --   | 20   | A    |
| Body Diode Voltage                                           | V <sub>SD</sub>      | T <sub>J</sub> = 25°C, I <sub>SD</sub> = 10A, V <sub>GS</sub> = 0V        | --    | --   | 1.2  | V    |
| Reverse Recovery Charge                                      | Q <sub>rr</sub>      | I <sub>F</sub> = 10A, V <sub>GS</sub> = 0V<br>di/dt=100A/us               | --    | 7    | --   | nC   |
| Reverse Recovery Time                                        | T <sub>rr</sub>      |                                                                           | --    | 445  | --   | ns   |

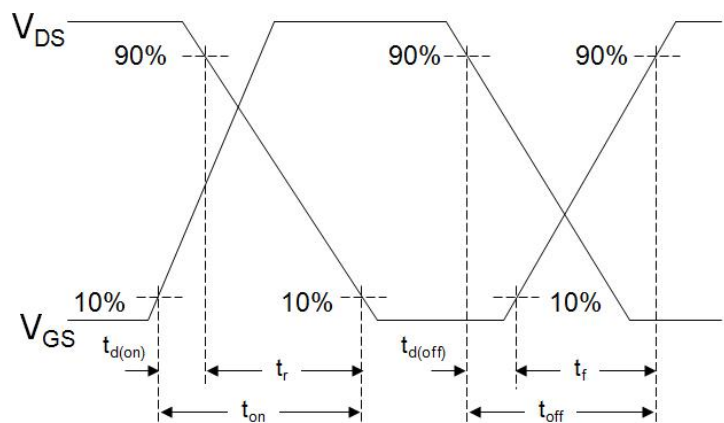
## Notes

1. Repetitive Rating: Pulse width limited by maximum junction temperature
2. EAS condition :  $T_J = 25^{\circ}\text{C}$ ,  $V_{DD} = 50V$ ,  $V_{GS} = 10V$ ,  $L = 10mH$ ,  $R_G = 25\Omega$
3. Identical low side and high side switch with identical  $R_G$

### Gate Charge Test Circuit



### Switch Time Test Circuit

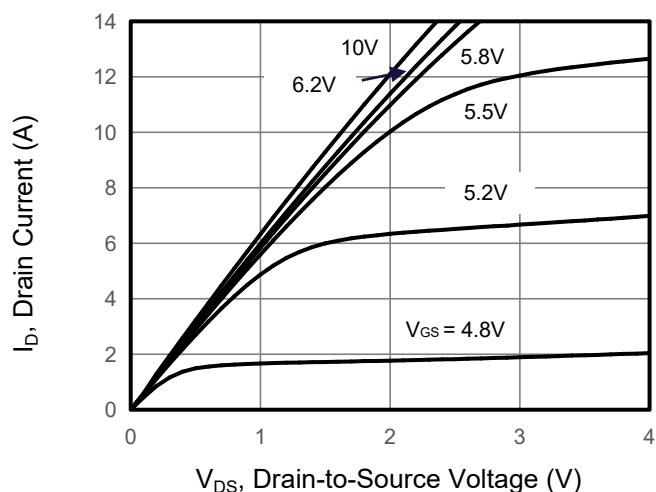


### EAS Test Circuit

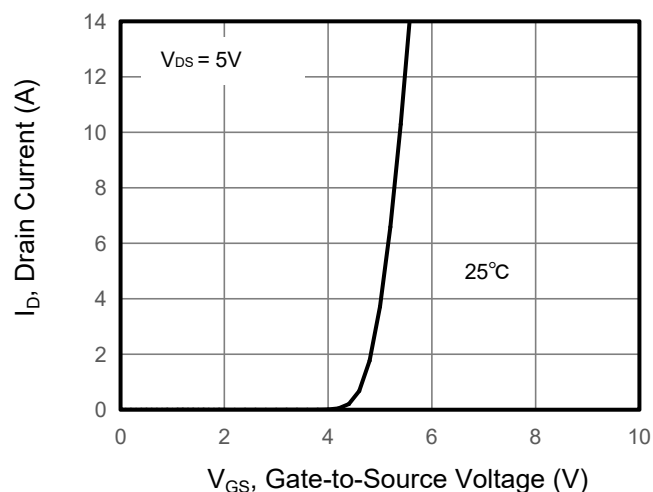


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

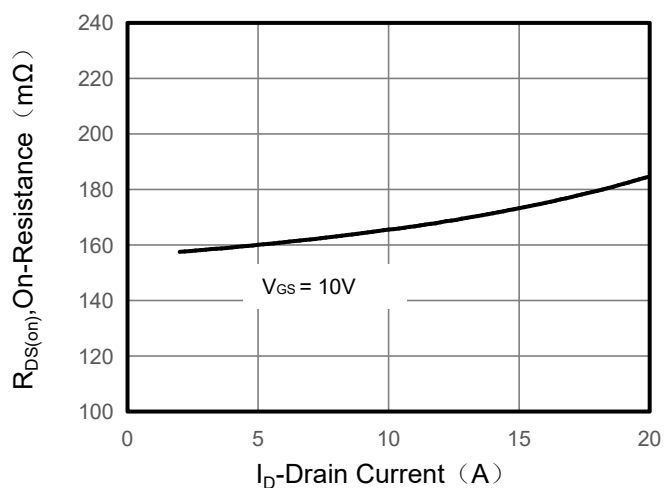
**Figure 1. Output Characteristics**



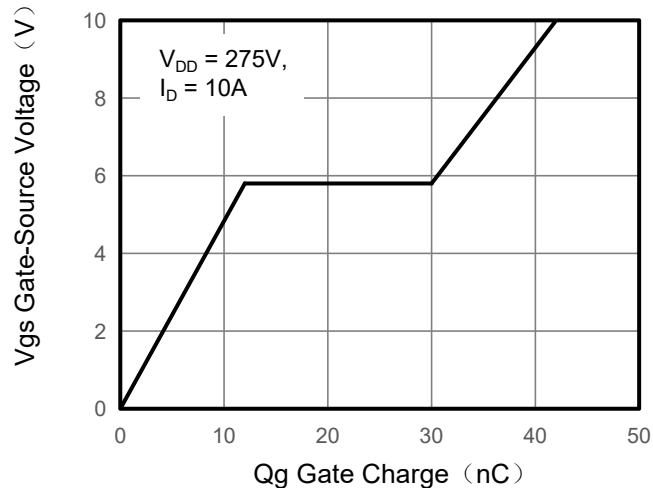
**Figure 2. Transfer Characteristics**



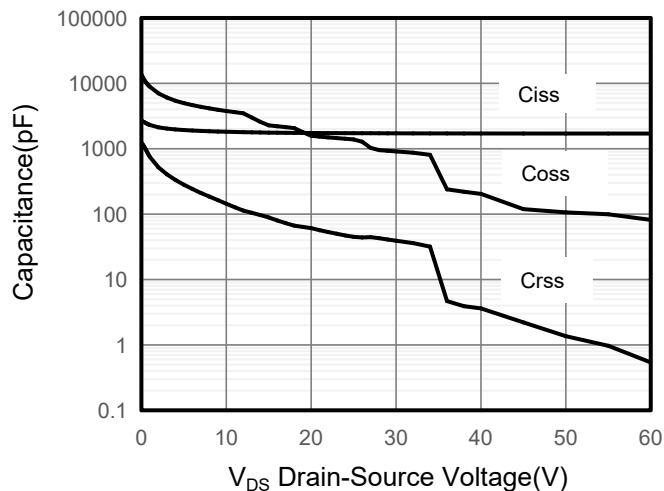
**Figure 3. Drain Source On Resistance**



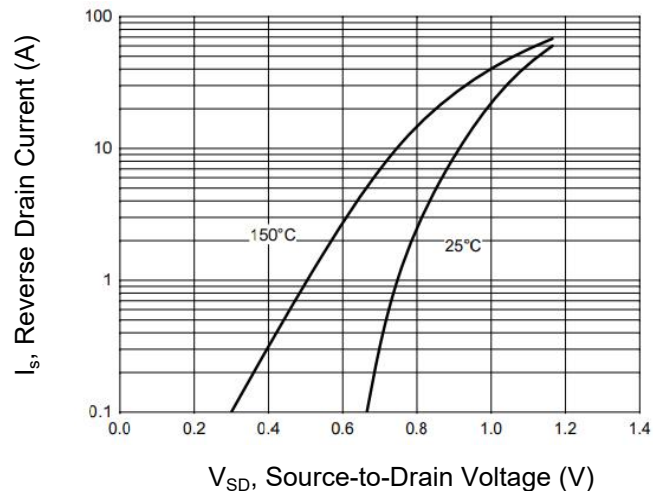
**Figure 4. Gate Charge**



**Figure 5. Capacitance**

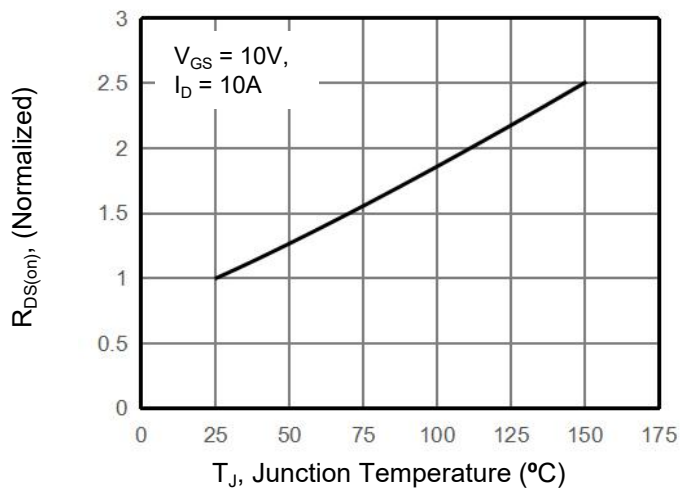


**Figure 6. Source-Drain Diode Forward**

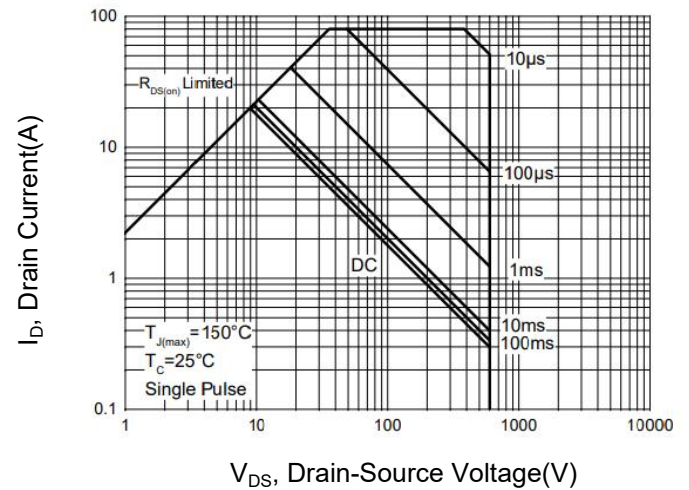


**Typical Characteristics**  $T_J = 25^\circ\text{C}$ , unless otherwise noted

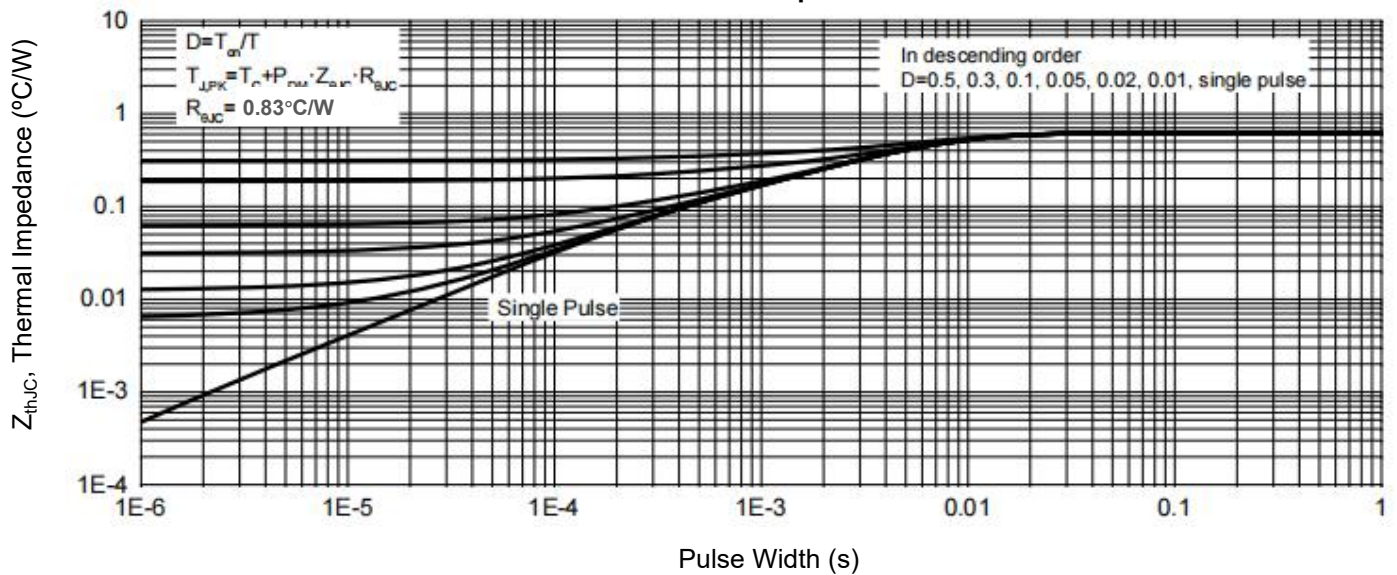
**Figure 7. Drain-Source On-Resistance**



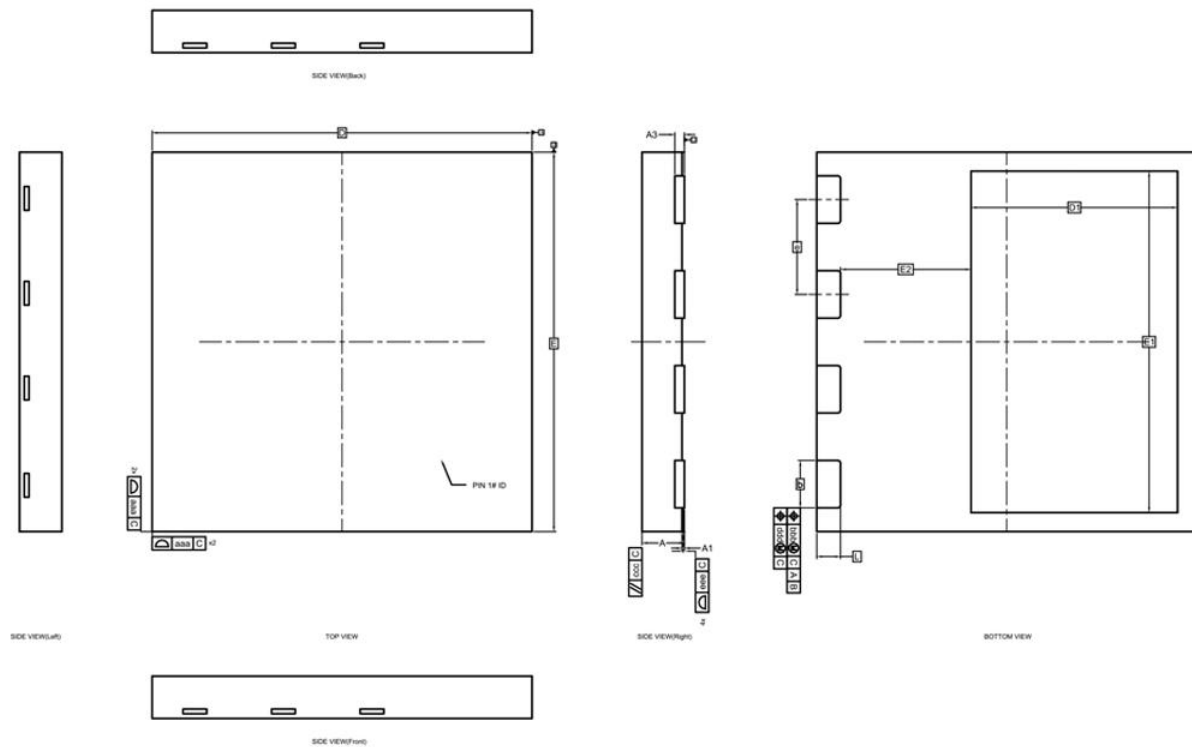
**Figure 8. Safe Operation Area**



**Figure 9. Normalized Maximum Transient Thermal Impedance**



## DFN8\*8-4L Package Information



| DIM<br>SYMBOL | MIN.    | NOM.     | MAX. |
|---------------|---------|----------|------|
| A             | 0.75    | 0.85     | 0.95 |
|               | 0.80    | 0.90     | 1.00 |
| A1            | 0       | 0.02     | 0.05 |
| A3            | -       | 0.203REF | -    |
| D             | 8.00BSC |          |      |
| E             | 8.00BSC |          |      |
| D1            | 4.25    | 4.35     | 4.45 |
| E1            | 7.10    | 7.20     | 7.30 |
| E2            | 2.65    | 2.75     | 2.85 |
| e             | 2.00BSC |          |      |
| b             | 0.90    | 1.00     | 1.10 |
| L             | 0.40    | 0.50     | 0.60 |
| aaa           | 0.15    |          |      |
| bbb           | 0.10    |          |      |
| ccc           | 0.10    |          |      |
| ddd           | 0.05    |          |      |
| eee           | 0.08    |          |      |