



# GL20N04A4

## GL Silicon N-Channel Power MOSFET

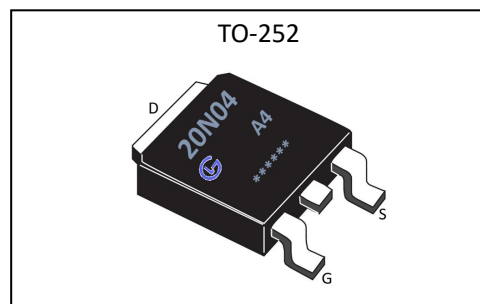
### General Description:

The GL20N04A4 uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications. The package form is TO-252, which accords with the RoHS standard.

|                 |      |            |
|-----------------|------|------------|
| $V_{DSS}$       | 40   | V          |
| $I_D$           | 20   | A          |
| $P_D$           | 32.5 | W          |
| $R_{DS(ON)MAX}$ | 25   | m $\Omega$ |

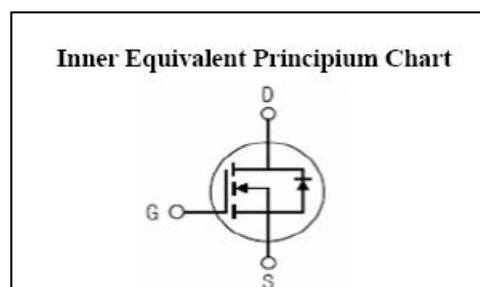
### Features:

- $R_{DS(ON)} < 25m\Omega$  @  $V_{GS}=10V$
- High density cell design for ultra low  $R_{dson}$
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation



### Applications:

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply



### Absolute (Tc= 25°C unless otherwise specified):

| Symbol         | Parameter                                        | Rating          | Units       |
|----------------|--------------------------------------------------|-----------------|-------------|
| $V_{DSS}$      | Drain-to-Source Voltage                          | 40              | V           |
| $I_D$          | Continuous Drain Current                         | 20              | A           |
| $I_{DM}$       | Pulsed Drain Current                             | 80              | A           |
| $V_{GS}$       | Gate-to-Source Voltage                           | $\pm 20$        | V           |
| $P_D$          | Power Dissipation                                | 32.5            | W           |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature Range | 150, -55 to 150 | $^{\circ}C$ |



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Electrical Characteristics (Tc= 25°C unless otherwise specified):

### OFF Characteristics

| Symbol              | Parameter                         | Test Conditions                                                 | Rating |      |      | Units |
|---------------------|-----------------------------------|-----------------------------------------------------------------|--------|------|------|-------|
|                     |                                   |                                                                 | Min.   | Typ. | Max. |       |
| V <sub>DSS</sub>    | Drain to Source Breakdown Voltage | V <sub>GS</sub> =0V, I <sub>D</sub> =250μA                      | 40     | --   | --   | V     |
| I <sub>DSS</sub>    | Drain to Source Leakage Current   | V <sub>DS</sub> =40V, V <sub>GS</sub> =0V, T <sub>a</sub> =25°C | --     | --   | 1.0  | μA    |
| I <sub>GSS(F)</sub> | Gate to Source Forward Leakage    | V <sub>GS</sub> =+20V                                           | --     | --   | 0.1  | μA    |
| I <sub>GSS(R)</sub> | Gate to Source Reverse Leakage    | V <sub>GS</sub> =-20V                                           | --     | --   | -0.1 | μA    |

### ON Characteristics<sup>a3</sup>

| Symbol              | Parameter                     | Test Conditions                                          | Rating |      |      | Units |
|---------------------|-------------------------------|----------------------------------------------------------|--------|------|------|-------|
|                     |                               |                                                          | Min.   | Typ. | Max. |       |
| R <sub>DS(ON)</sub> | Drain-to-Source On-Resistance | V <sub>GS</sub> =10V, I <sub>D</sub> =10A                | --     | --   | 25   | mΩ    |
| V <sub>GS(TH)</sub> | Gate Threshold Voltage        | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA | 1.0    | --   | 2.5  | V     |

Pulse width tp≤380μs, δ≤2%

### Dynamic Characteristics<sup>a4</sup>

| Symbol           | Parameter                    | Test Conditions                                       | Rating |      |      | Units |
|------------------|------------------------------|-------------------------------------------------------|--------|------|------|-------|
|                  |                              |                                                       | Min.   | Typ. | Max. |       |
| g <sub>fs</sub>  | Forward Transconductance     | V <sub>DS</sub> =15V, I <sub>D</sub> =2A              | --     | 3    | --   | S     |
| C <sub>iss</sub> | Input Capacitance            | V <sub>GS</sub> =0V, V <sub>DS</sub> =20V<br>f=1.0MHz | --     | 247  | --   | pF    |
| C <sub>oss</sub> | Output Capacitance           |                                                       | --     | 34   | --   |       |
| C <sub>rss</sub> | Reverse Transfer Capacitance |                                                       | --     | 19.5 | --   |       |

### Resistive Switching Characteristics<sup>a4</sup>

| Symbol              | Parameter                         | Test Conditions                                                                      | Rating |      |      | Units |
|---------------------|-----------------------------------|--------------------------------------------------------------------------------------|--------|------|------|-------|
|                     |                                   |                                                                                      | Min.   | Typ. | Max. |       |
| t <sub>d(ON)</sub>  | Turn-on Delay Time                | V <sub>DD</sub> =20V, I <sub>D</sub> =3A<br>V <sub>GS</sub> =10V, R <sub>G</sub> =1Ω | --     | 6    | --   | ns    |
| t <sub>r</sub>      | Rise Time                         |                                                                                      | --     | 15   | --   |       |
| t <sub>d(OFF)</sub> | Turn-Off Delay Time               |                                                                                      | --     | 15   | --   |       |
| t <sub>f</sub>      | Fall Time                         |                                                                                      | --     | 10   | --   |       |
| Q <sub>g</sub>      | Total Gate Charge                 | V <sub>DD</sub> =20V, I <sub>D</sub> =3A<br>V <sub>GS</sub> =4.5V                    | --     | 6    | --   | nC    |
| Q <sub>gs</sub>     | Gate to Source Charge             |                                                                                      | --     | 1    | --   |       |
| Q <sub>gd</sub>     | Gate to Drain ( "Miller" ) Charge |                                                                                      | --     | 1.3  | --   |       |



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| Source-Drain Diode Characteristics |                                                      |                      |        |      |      |       |
|------------------------------------|------------------------------------------------------|----------------------|--------|------|------|-------|
| Symbol                             | Parameter                                            | Test Conditions      | Rating |      |      | Units |
|                                    |                                                      |                      | Min.   | Typ. | Max. |       |
| $I_S$                              | Continuous Source Current <sup>a2</sup> (Body Diode) |                      | --     | --   | 20   | A     |
| $V_{SD}$                           | Diode Forward Voltage <sup>a3</sup>                  | $I_S=20A, V_{GS}=0V$ | --     | --   | 1.5  | V     |

| Symbol          | Parameter                      | Typ.  | Units |
|-----------------|--------------------------------|-------|-------|
| $R_{\theta JC}$ | Junction-to-Case <sup>a2</sup> | 3.846 | °C/W  |

<sup>a1</sup>: Repetitive Rating: Pulse width limited by maximum junction temperature.

<sup>a2</sup>: Surface Mounted on FR4 Board,  $t \leq 10\text{sec}$ .

<sup>a3</sup>: Pulse Test: Pulse Width  $\leq 300\mu\text{s}$ , Duty Cycle  $\leq 2\%$ .

<sup>a4</sup>: Guaranteed by design, not subject to production

### Characteristics Curve:

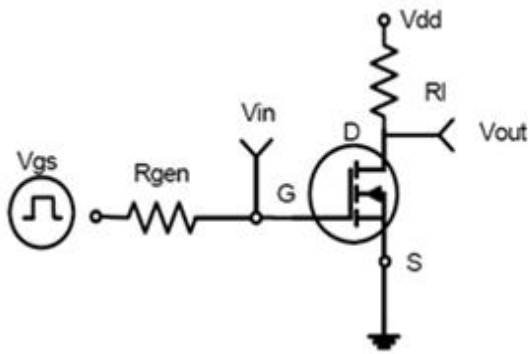


Figure 1: Switching Test Circuit

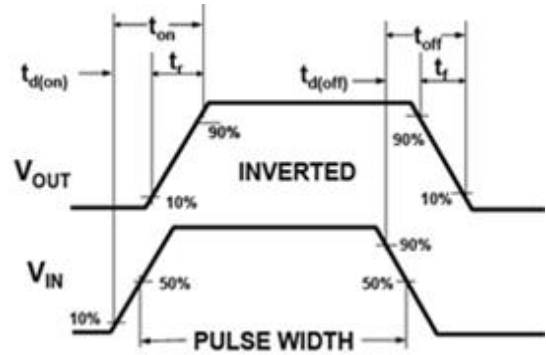


Figure 2: Switching Waveforms

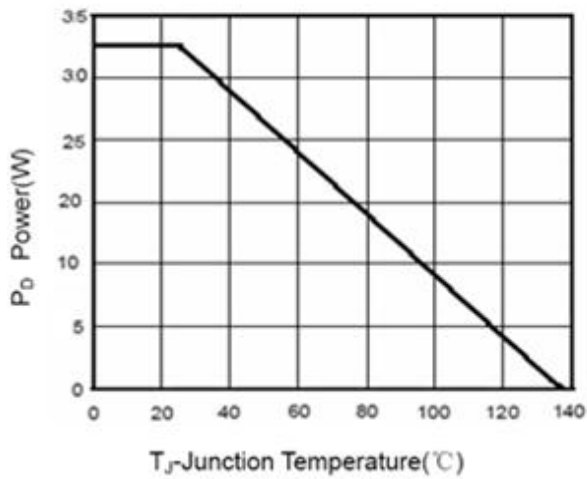


Figure 3 Power Dissipation

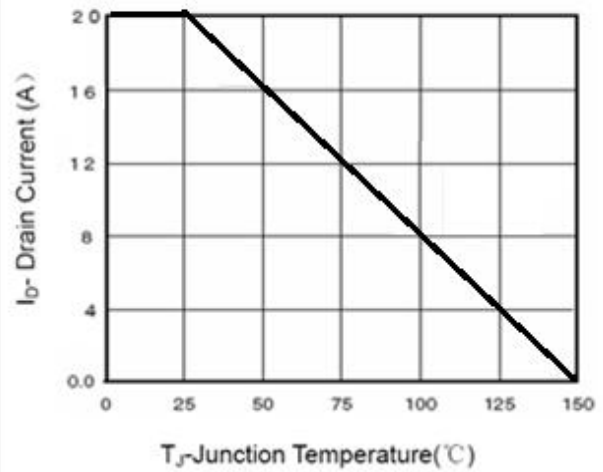


Figure 4 Drain Current

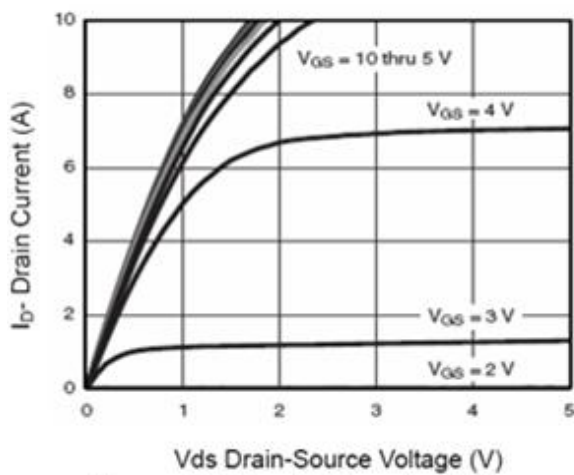


Figure 5 Output Characteristics

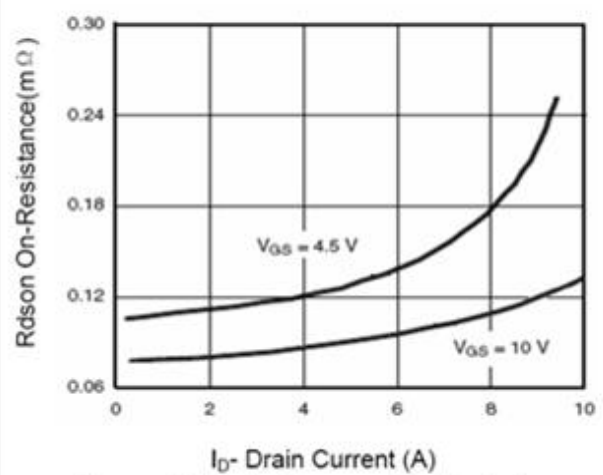
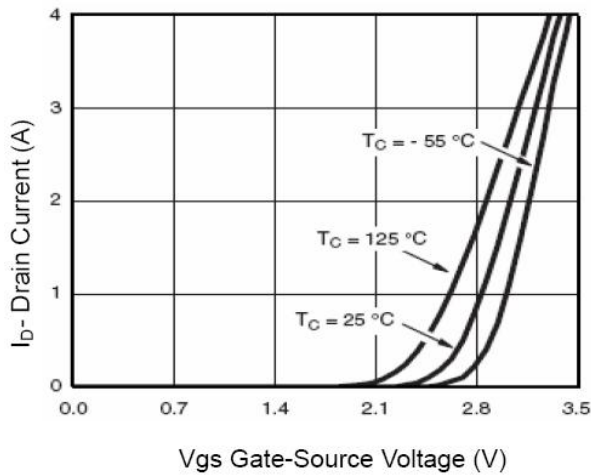
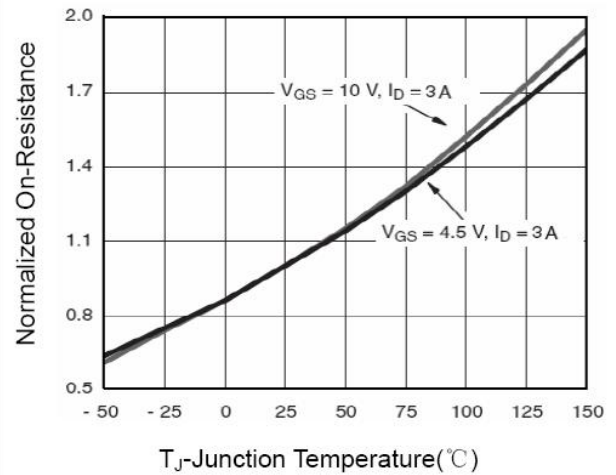


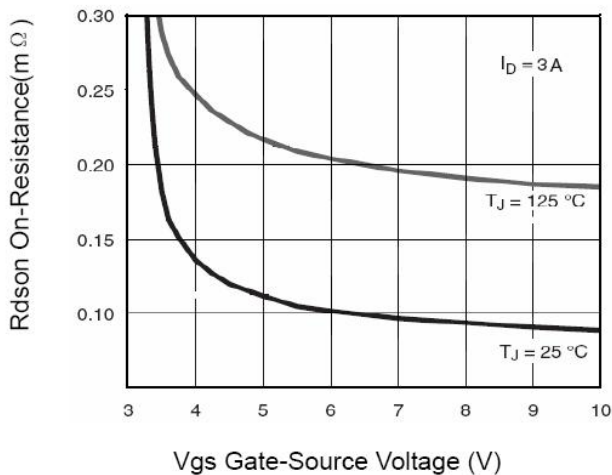
Figure 6 Drain-Source On-Resistance



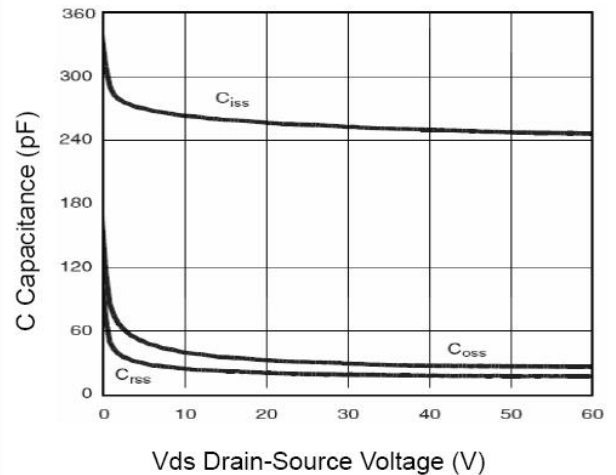
**Figure 7 Transfer Characteristics**



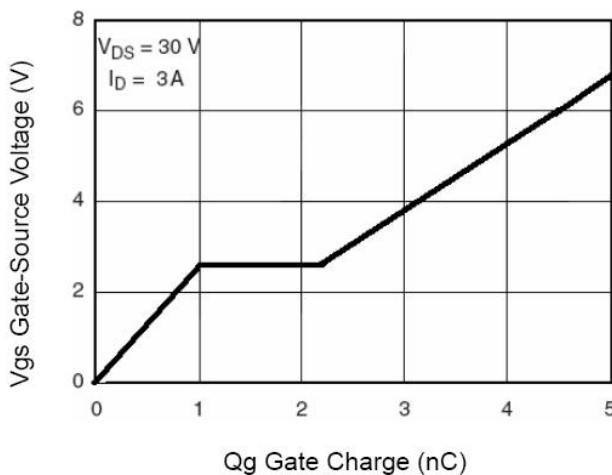
**Figure 8 Drain-Source On-Resistance**



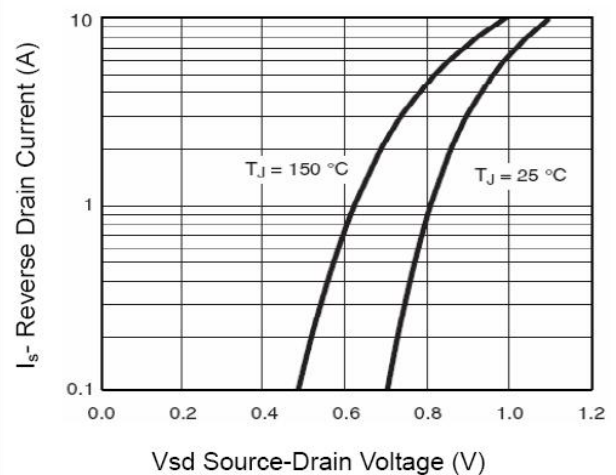
**Figure 9 Rdson vs Vgs**



**Figure 10 Capacitance vs Vds**



**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**