



# GL50N06AD3

## GL Silicon N-Channel Power MOSFET

### General Description:

The GL50N06AD3 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 QFN3\*3, which accords with the RoHS standard.

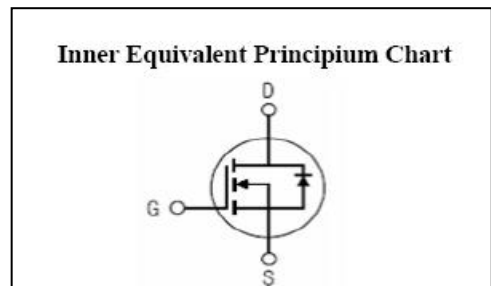
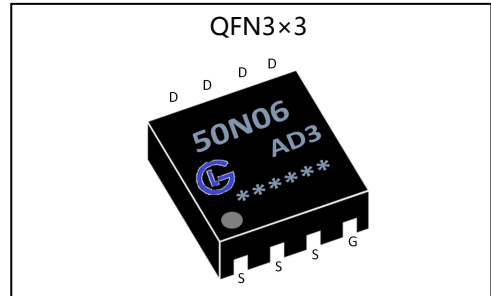
### Features:

- Fast Switching
- Low Gate Charge and  $R_{DS(on)}$
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test

### Applications:

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

|                  |    |           |
|------------------|----|-----------|
| $V_{DSS}$        | 60 | V         |
| $I_D$            | 50 | A         |
| $P_D$            | 85 | W         |
| $R_{DS(ON)type}$ | 12 | $m\Omega$ |



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

| Symbol         | Parameter                                        | Rating          | Units      |
|----------------|--------------------------------------------------|-----------------|------------|
| $V_{DSS}$      | Drain-to-Source Voltage                          | 60              | V          |
| $I_D$          | Continuous Drain Current                         | 50              | A          |
|                | Continuous Drain Current $T_C = 100^\circ C$     | 35              | A          |
| $I_{DM}$       | Pulsed Drain Current                             | 200             | A          |
| $V_{GS}$       | Gate-to-Source Voltage                           | $\pm 20$        | V          |
| $E_{AS}^{a2}$  | Single Pulse Avalanche Energy                    | 300             | mJ         |
| $E_{AR}^{a1}$  | Avalanche Energy ,Repetitive                     | 50              | mJ         |
| $I_{AR}^{a1}$  | Avalanche Current                                | 28              | A          |
| $dv/dt^{a3}$   | Peak Diode Recovery $dv/dt$                      | 5.0             | V/ns       |
| $P_D$          | Power Dissipation                                | 85              | W          |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature Range | 175, -55 to 175 | $^\circ C$ |
| $T_L$          | Maximum Temperature for Soldering                | 300             | $^\circ C$ |



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

| OFF Characteristics          |                                   |                                          |        |      |      |         |
|------------------------------|-----------------------------------|------------------------------------------|--------|------|------|---------|
| Symbol                       | Parameter                         | Test Conditions                          | Rating |      |      | Units   |
|                              |                                   |                                          | Min.   | Typ. | Max. |         |
| $V_{DSS}$                    | Drain to Source Breakdown Voltage | $V_{GS}=0V, I_D=250\mu A$                | 60     | --   | --   | V       |
| $\Delta BV_{DSS}/\Delta T_J$ | Bvdss Temperature Coefficient     | $I_D=250\mu A$ , Reference 25°C          | --     | 0.1  | --   | V/°C    |
| $I_{DSS}$                    | Drain to Source Leakage Current   | $V_{DS}=60V, V_{GS}=0V, T_a=25^\circ C$  | --     | --   | 1    | $\mu A$ |
|                              |                                   | $V_{DS}=48V, V_{GS}=0V, T_a=125^\circ C$ | --     | --   | 250  |         |
| $I_{GSS(F)}$                 | Gate to Source Forward Leakage    | $V_{GS}=+20V$                            | --     | --   | 1    | $\mu A$ |
| $I_{GSS(R)}$                 | Gate to Source Reverse Leakage    | $V_{GS}=-20V$                            | --     | --   | -1   | $\mu A$ |

| ON Characteristics                               |                               |                               |        |      |      |       |
|--------------------------------------------------|-------------------------------|-------------------------------|--------|------|------|-------|
| Symbol                                           | Parameter                     | Test Conditions               | Rating |      |      | Units |
|                                                  |                               |                               | Min.   | Typ. | Max. |       |
| $R_{DS(ON)}$                                     | Drain-to-Source On-Resistance | $V_{GS}=10V, I_D=20A$         | --     | 12   | 16   | mΩ    |
| $V_{GS(TH)}$                                     | Gate Threshold Voltage        | $V_{DS}=V_{GS}, I_D=250\mu A$ | 1.5    | --   | 3.0  | V     |
| Pulse width $t_p \leq 380\mu s, \delta \leq 2\%$ |                               |                               |        |      |      |       |

| Dynamic Characteristics |                              |                                       |        |      |      |       |
|-------------------------|------------------------------|---------------------------------------|--------|------|------|-------|
| Symbol                  | Parameter                    | Test Conditions                       | Rating |      |      | Units |
|                         |                              |                                       | Min.   | Typ. | Max. |       |
| $g_{fs}$                | Forward Transconductance     | $V_{DS}=5V, I_D=20A$                  | 18     | --   | --   | S     |
| $C_{iss}$               | Input Capacitance            | $V_{GS}=0V, V_{DS}=30V$<br>$f=1.0MHz$ | --     | 780  | --   | pF    |
| $C_{oss}$               | Output Capacitance           |                                       | --     | 158  | --   |       |
| $C_{rss}$               | Reverse Transfer Capacitance |                                       | --     | 120  | --   |       |

| Resistive Switching Characteristics |                                   |                                                      |        |      |      |       |
|-------------------------------------|-----------------------------------|------------------------------------------------------|--------|------|------|-------|
| Symbol                              | Parameter                         | Test Conditions                                      | Rating |      |      | Units |
|                                     |                                   |                                                      | Min.   | Typ. | Max. |       |
| $t_{d(ON)}$                         | Turn-on Delay Time                | $I_D=20A, V_{DD}=30V$<br>$V_{GS}=10V, R_G=3.0\Omega$ | --     | 7.5  | --   | ns    |
| $t_r$                               | Rise Time                         |                                                      | --     | 5.0  | --   |       |
| $t_{d(OFF)}$                        | Turn-Off Delay Time               |                                                      | --     | 28.0 | --   |       |
| $t_f$                               | Fall Time                         |                                                      | --     | 5.5  | --   |       |
| $Q_g$                               | Total Gate Charge                 | $I_D=20A, V_{DD}=30V$<br>$V_{GS}=10V$                | --     | 50   | --   | nC    |
| $Q_{gs}$                            | Gate to Source Charge             |                                                      | --     | 6    | --   |       |
| $Q_{gd}$                            | Gate to Drain ( "Miller" ) Charge |                                                      | --     | 15   | --   |       |

### Source-Drain Diode Characteristics

| Symbol   | Parameter                              | Test Conditions                     | Rating |      |      | Units |
|----------|----------------------------------------|-------------------------------------|--------|------|------|-------|
|          |                                        |                                     | Min.   | Typ. | Max. |       |
| $I_S$    | Continuous Source Current (Body Diode) |                                     | --     | --   | 50   | A     |
| $I_{SM}$ | Maximum Pulsed Current (Body Diode)    |                                     | --     | --   | 200  | A     |
| $V_{SD}$ | Diode Forward Voltage                  | $I_S = 50A, V_{GS} = 0V$            | --     | --   | 1.5  | V     |
| $t_{rr}$ | Reverse Recovery Time                  | $I_S = 20A, T_j = 25^\circ C$       | --     | 30   | --   | ns    |
| $Q_{rr}$ | Reverse Recovery Charge                | $dI_F/dt = 100A/\mu s, V_{GS} = 0V$ | --     | 40   | --   | nC    |

Pulse width  $t_p \leq 380\mu s, \delta \leq 2\%$

| Symbol          | Parameter        | Typ. | Units        |
|-----------------|------------------|------|--------------|
| $R_{\theta JC}$ | Junction-to-Case | 1.8  | $^\circ C/W$ |

<sup>a1</sup>: Repetitive rating; pulse width limited by maximum junction temperature

<sup>a2</sup>: EAS condition:  $T_j = 25^\circ C, V_{DD} = 30V, V_G = 10V, L = 0.5mH, R_g = 25\Omega$

<sup>a3</sup>:  $I_{SD} = 20A, di/dt \leq 100A/\mu s, V_{DD} \leq BV_{DS}, \text{Start } T_j = 25^\circ C$

### Test Circuit and Waveform

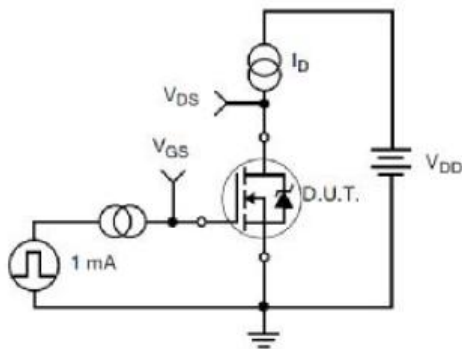


Figure 17. Gate Charge Test Circuit

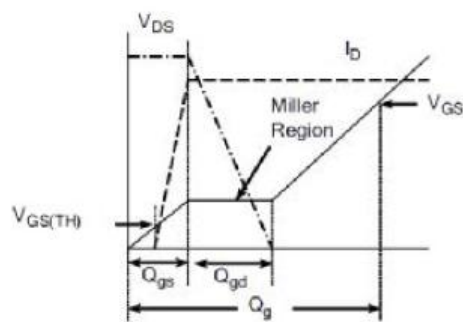


Figure 18. Gate Charge Waveform

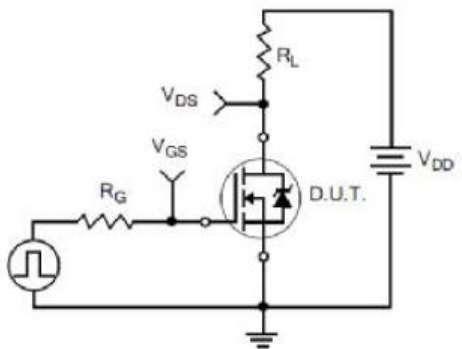


Figure 19. Resistive Switching Test Circuit

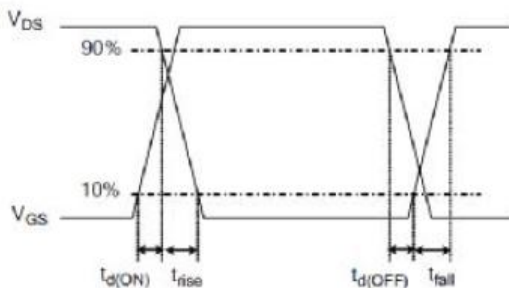
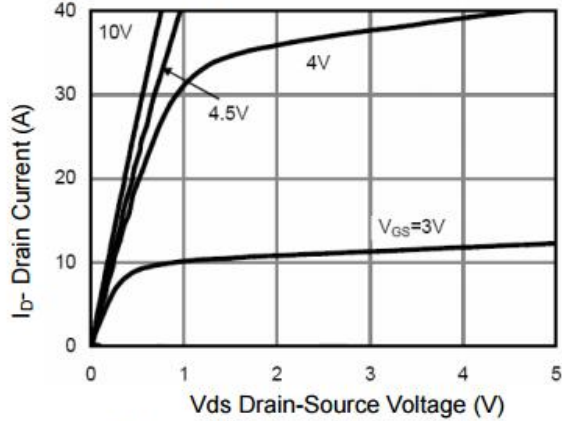
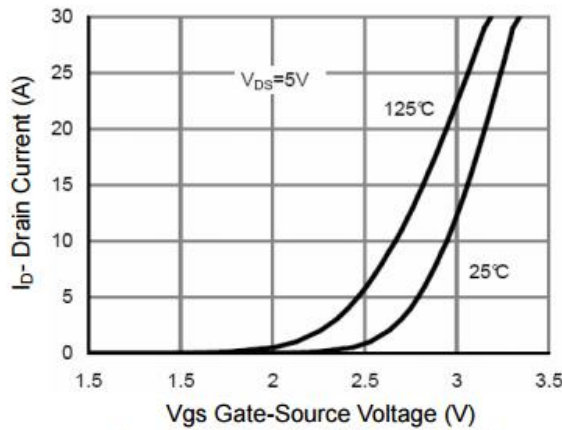


Figure 20. Resistive Switching Waveforms

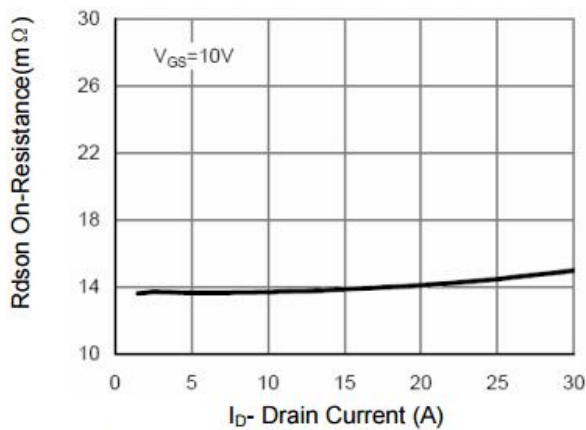
### Typical Electrical and Thermal Characteristics (Curves)



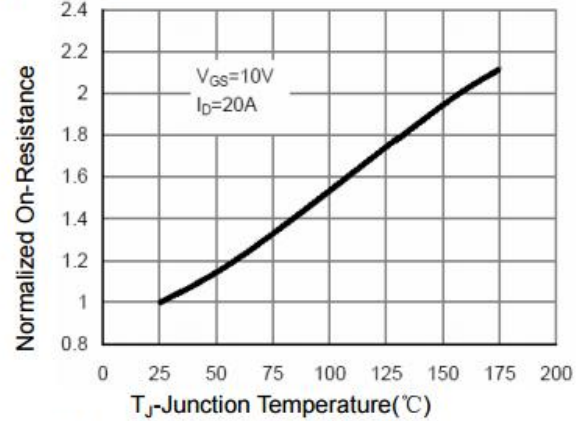
**Figure 1 Output Characteristics**



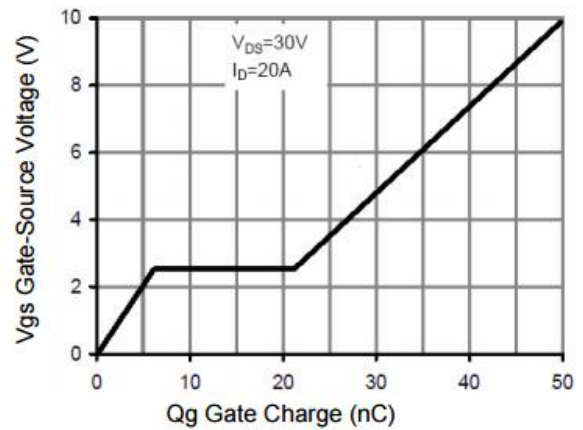
**Figure 2 Transfer Characteristics**



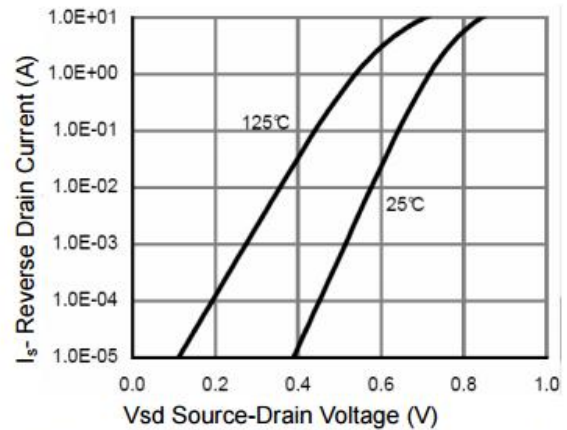
**Figure 3 Rdson- Drain Current**



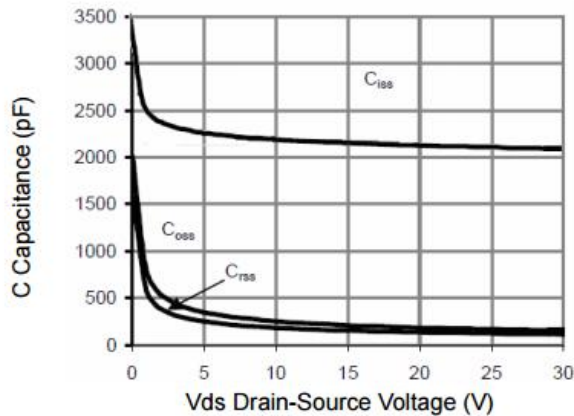
**Figure 4 Rdson-Junction Temperature**



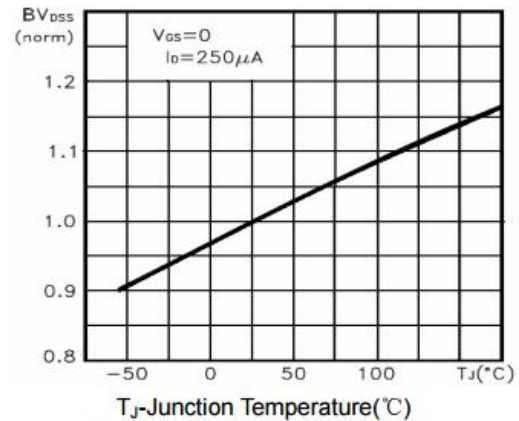
**Figure 5 Gate Charge**



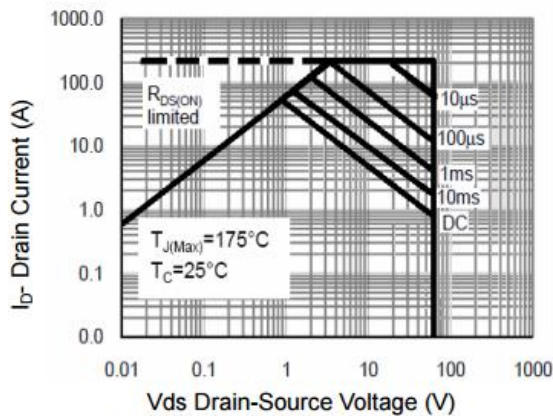
**Figure 6 Source- Drain Diode Forward**



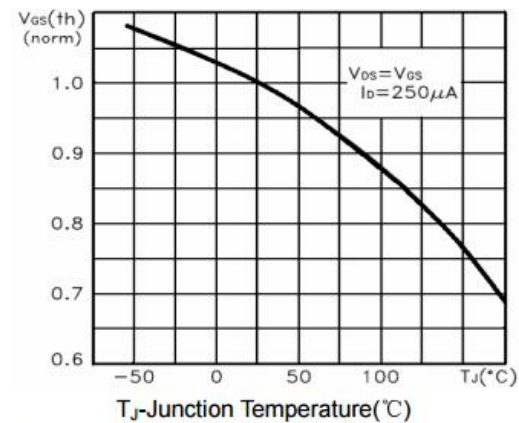
**Figure 7 Capacitance vs Vds**



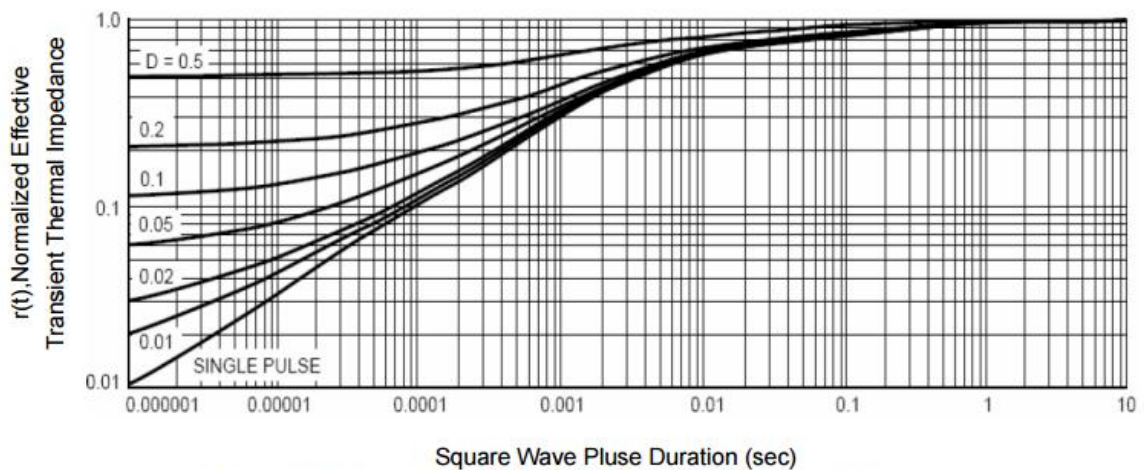
**Figure 9 BV<sub>DSS</sub> vs Junction Temperature**



**Figure 8 Safe Operation Area**



**Figure 10 V<sub>GS(th)</sub> vs Junction Temperature**



**Figure 11 Normalized Maximum Transient Thermal Impedance**