

## GL Silicon N-Channel Power MOSFET

### General Description:

The GL6003 uses advanced trench technology and design to provide excellent RDS(ON) with low gate charge. It can be used in a wide variety of applications. The package form is SOT-23-3L, which accords with the RoHS standard.

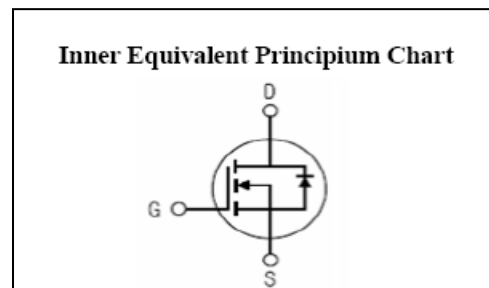
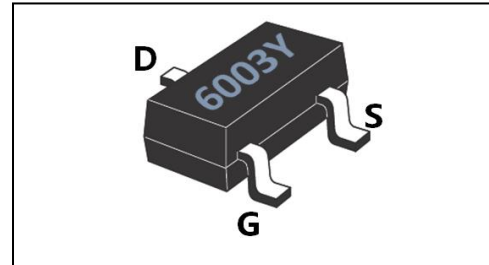
### Features :

- Fast Switching
- Low Gate Charge and Rdson
- Low Reverse transfer capacitances
- 100% Single Pulse avalanche energy Test

### Applications :

- PWM applications
- Load switch
- Power management

|              |     |    |
|--------------|-----|----|
| $V_{DSS}$    | 60  | V  |
| $I_D$        | 3.0 | A  |
| $P_D$        | 1.7 | W  |
| $R_{DS(ON)}$ | 105 | mΩ |



**Absolute** (  $T_c = 25^\circ\text{C}$  unless otherwise specified ) :

| Symbol         | Parameter   | Rating           | Units            |
|----------------|---|------------------|------------------|
| $V_{DSS}$      | Drain-to-Source Voltage                           | 60               | V                |
| $I_D$          | Continuous Drain Current                          | 3.0              | A                |
|                | Continuous Drain Current $T_C = 70^\circ\text{C}$ | 2.4              | A                |
| $I_{DM}^{a1}$  | Pulsed Drain Current                              | 10               | A                |
| $V_{GS}$       | Gate-to-Source Voltage                            | $\pm 20$         | V                |
| $dv/dt^{a3}$   | Peak Diode Recovery $dv/dt$                       | 5.0              | V/ns             |
| $P_D$          | Power Dissipation                                 | 1.7              | W                |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature Range  | 150 , -55 to 150 | $^\circ\text{C}$ |
| $T_L$          | Maximum Temperature for Soldering                 | 300              | $^\circ\text{C}$ |



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**Electrical Characteristics** (  $T_c = 25^\circ\text{C}$  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     | $I_D = -250\mu A, \text{Reference } 25^\circ\text{C}$ | --     | 0.1  | --   | V/ $^\circ\text{C}$ |
| $I_{DSS}$                    | Drain to Source Leakage Current   | $V_{DS} = 60V, V_{GS} = 0V, T_a = 25^\circ\text{C}$   | --     | --   | 1    | $\mu A$             |
|                              |                                   | $V_{DS} = 48V, V_{GS} = 0V, T_a = 125^\circ\text{C}$  | --     | --   | 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 | $V_{GS} = 10V, I_D = 3.0A$        | --     | 78   | 100  | m $\Omega$ |
| $R_{DS(ON)}$                                     | Drain-to-Source On-Resistance | $V_{GS} = 4.5V, I_D = 3.0A$       | --     | 95   | 130  | m $\Omega$ |
| $V_{GS(TH)}$                                     | Gate Threshold Voltage        | $V_{DS} = V_{GS}, I_D = 250\mu A$ | 1.0    | 1.3  | 2.0  | 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     | $V_{DS} = 15V, I_D = 2.0A$                         | 3      | --   | --   | S     |
| $C_{iss}$               | Input Capacitance            | $V_{GS} = 0V, V_{DS} = 30V$<br>$f = 1.0\text{MHz}$ | --     | 250  | --   | pF    |
| $C_{oss}$               | Output Capacitance           |  | --     | 35   | --   |       |
| $C_{rss}$               | Reverse Transfer Capacitance |  | --     | 20   | --   |       |

| Resistive Switching Characteristics |                                   |   |        |      |      |       |
|-------------------------------------|-----------------------------------|---|--------|------|------|-------|
| Symbol                              | Parameter                         | Test Conditions   | Rating |      |      | Units |
|                                     |                                   |   | Min.   | Typ. | Max. |       |
| $t_{d(ON)}$                         | Turn-on Delay Time                | $I_D = 1.5A, V_{DD} = 30V$<br>$V_{GS} = 10V, R_G = 1.0\Omega$ | --     | 6.0  | --   | ns    |
| $t_r$                               | Rise Time                         |   | --     | 15   | --   |       |
| $t_{d(OFF)}$                        | Turn-Off Delay Time               |   | --     | 15   | --   |       |
| $t_f$                               | Fall Time                         |   | --     | 10   | --   |       |
| $Q_g$                               | Total Gate Charge                 | $I_D = 3.0A, V_{DD} = 30V$<br>$V_{GS} = 10V$                  | --     | 6.0  | --   | nC    |
| $Q_{gs}$                            | Gate to Source Charge             |   | --     | 1.0  | --   |       |
| $Q_{gd}$                            | 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 (Body Diode) |                              | --     | --   | 3.0  | A     |
| $I_{SM}$  | Maximum Pulsed Current (Body Diode)    |                              | --     | --   | 10   | A     |
| $V_{SD}$  | Diode Forward Voltage                  | $I_S=3.0A, V_{GS}=0V$        | --     | --   | 1.5  | V     |
| trr   | Reverse Recovery Time                  | $I_S=3.0A, T_j = 25^\circ C$ | --     | 70   | --   | ns    |
| Qrr   | Reverse Recovery Charge                | $di_F/dt=100A/us, V_{GS}=0V$ | --     | 140  | --   | nC    |
| Pulse width $tp \leq 380\mu s, \delta \leq 2\%$ |  |                              |        |      |      |       |

| Symbol          | Parameter           | Typ. | Units        |
|-----------------|---------------------|------|--------------|
| $R_{\theta JA}$ | Junction-to-Ambient | 74   | $^\circ C/W$ |

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

<sup>a3</sup>:  $I_{SD}=3.0A, di/dt \leq 100A/us, V_{DD} \leq BV_{DS}, Start T_j=25^\circ C$

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### Typical Electrical and Thermal Characteristics

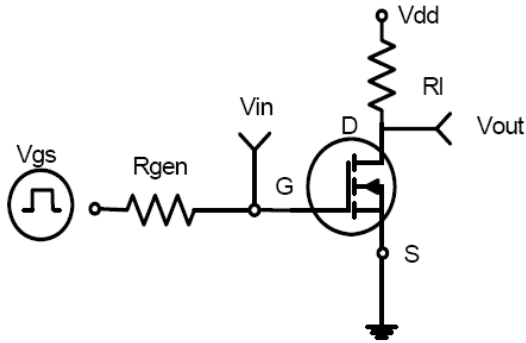


Figure 1: Switching Test Circuit

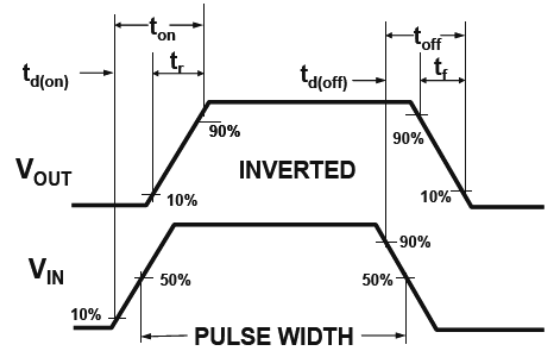


Figure 2: Switching Waveforms

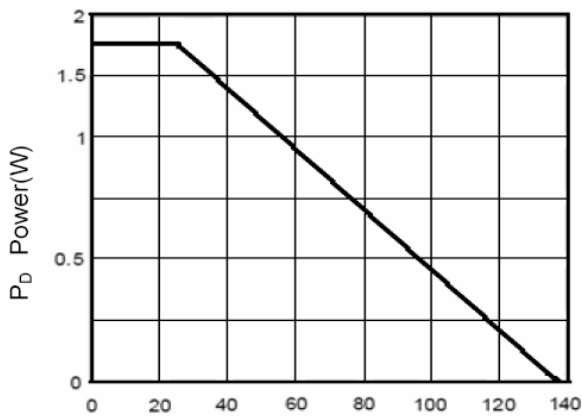


Figure 3 Power Dissipation

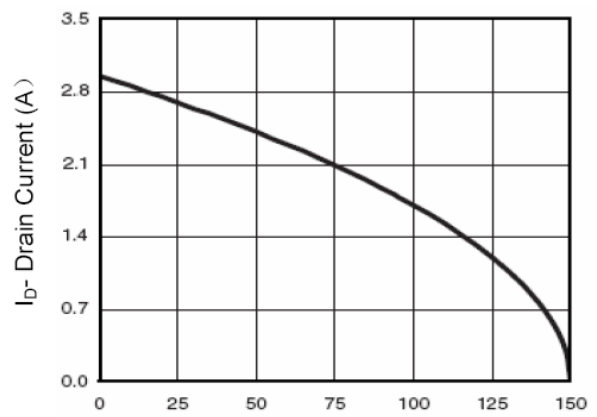


Figure 4 Drain Current

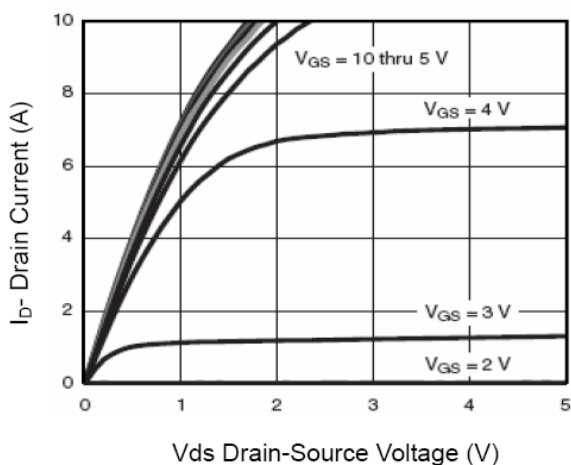


Figure 5 Output Characteristics

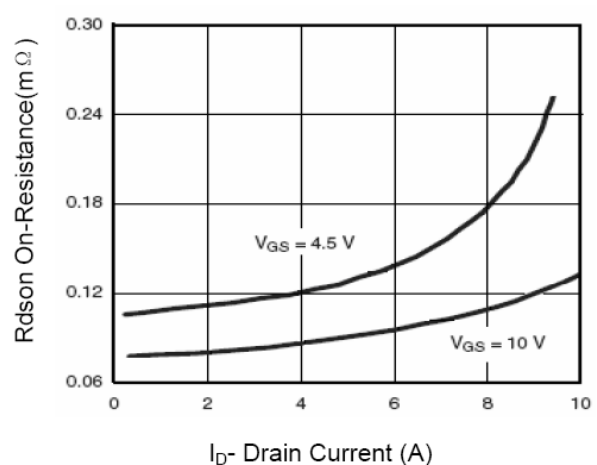
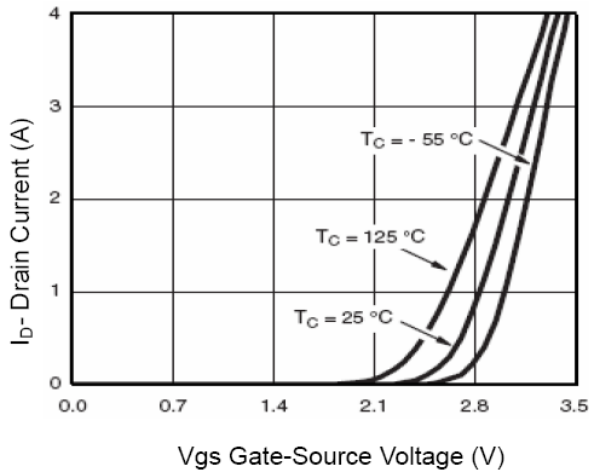
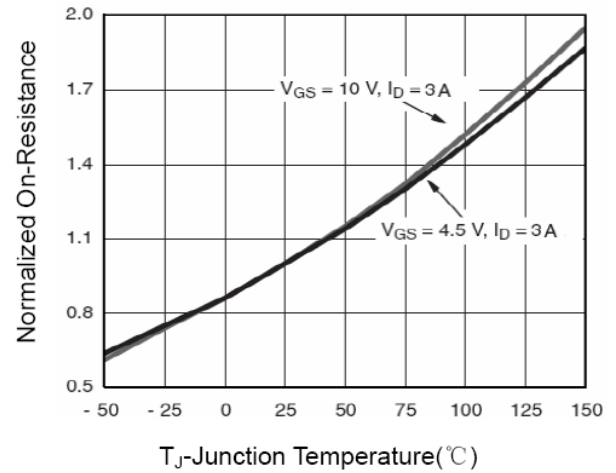


Figure 6 Drain-Source On-Resistance

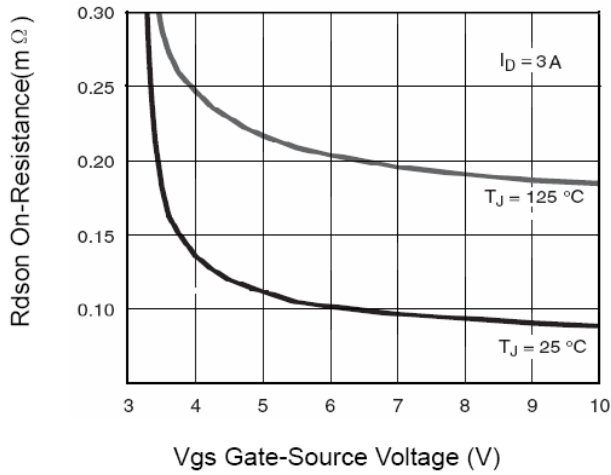
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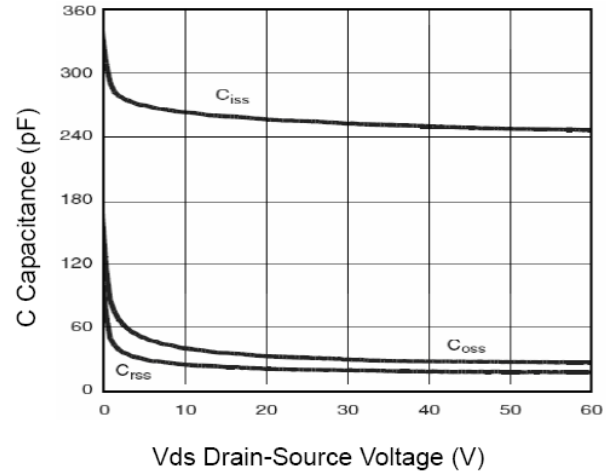
**Figure 7 Transfer Characteristics**



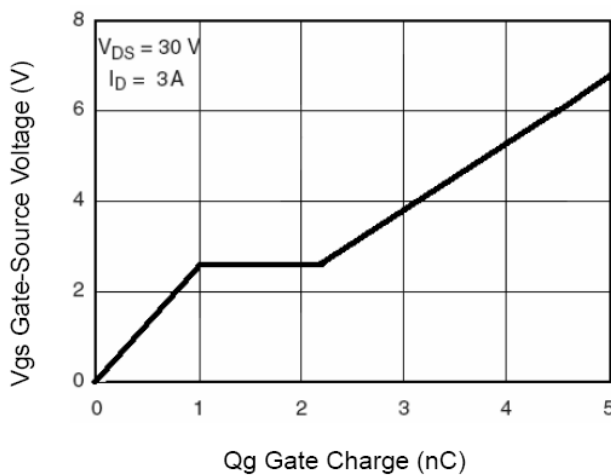
**Figure 8 Drain-Source On-Resistance**



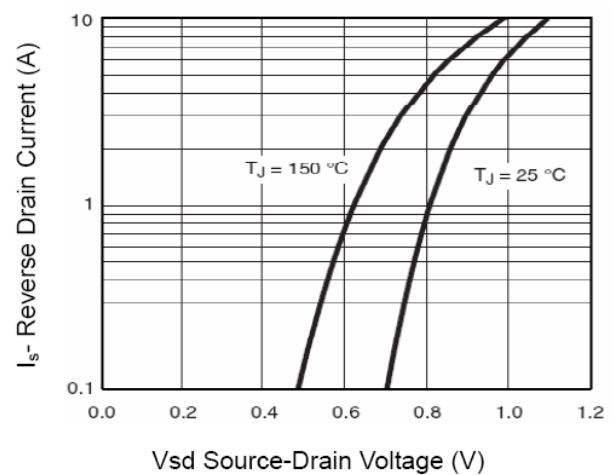
**Figure 9 Rdson vs Vgs**



**Figure 10 Capacitance vs Vds**



**Figure 11 Gate Charge**



**Figure 12 Source- Drain Diode Forward**

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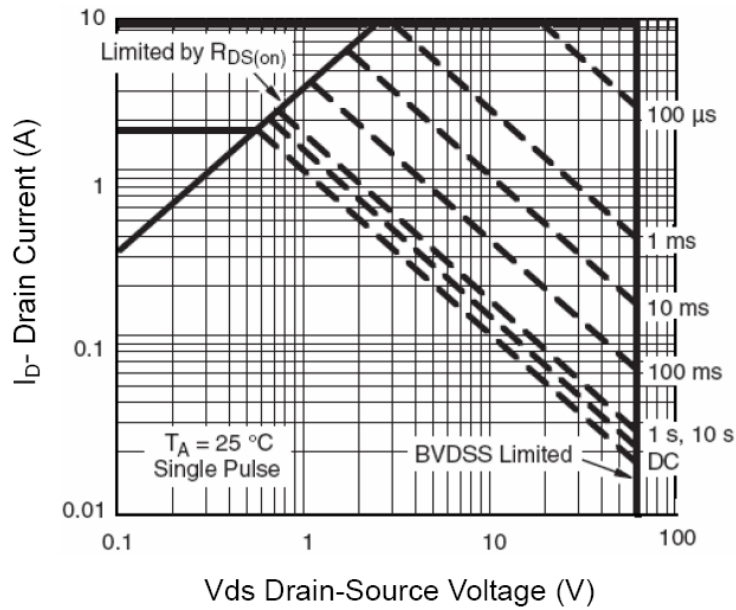


Figure 13 Safe Operation Area

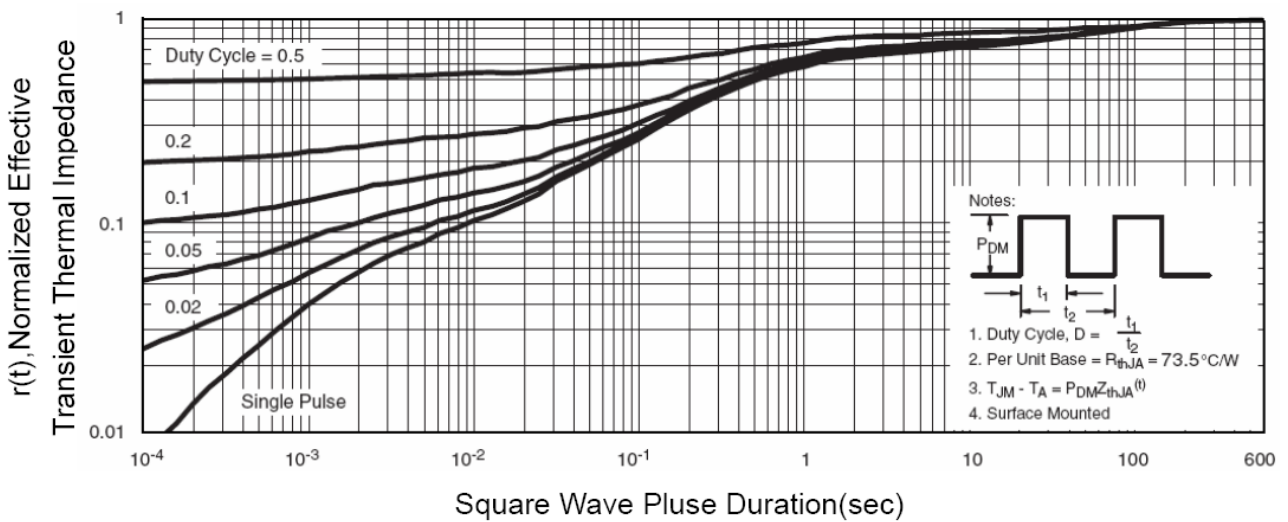


Figure 14 Normalized Maximum Transient Thermal Impedance

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