

## GL Silicon N-Channel Super-Junction Power MOSFET

### General Description:

GL20J60A8the silicon N-channel Enhanced VDMOSFETS, is obtained by the self-aligned Superjunction Technology which reduce the conduction loss, improve switching performance and enhance the avalanche energy. The transistor can be used in various power switching circuit for system miniaturization and higher efficiency. The package form is TO-220AB, which accords with the RoHS standard.

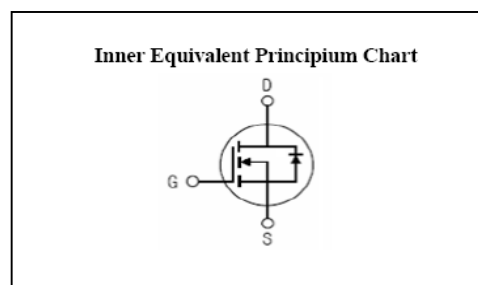
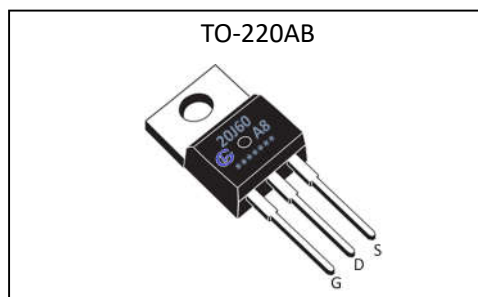
### Features:

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

### Applications:

- Switch Mode Power Supply(SMPS)
- Uninterruptible Power Supply(UPS)
- Power Factor Correction(PFC)

|                             |      |          |
|-----------------------------|------|----------|
| $V_{DSS}(T_C=150^{\circ}C)$ | 650  | V        |
| $V_{DSS}(T_C=25^{\circ}C)$  | 600  | V        |
| $I_D$                       | 20   | A        |
| $P_D(T_C=25^{\circ}C)$      | 150  | W        |
| $R_{DS(ON)}$                | 0.12 | $\Omega$ |



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

| Symbol         | Parameter                                        | Rating          | Units |
|----------------|--------------------------------------------------|-----------------|-------|
| $V_{DSS}$      | Drain-to-Source Voltage                          | 600             | V     |
| $I_D$          | Continuous Drain Current                         | 20              | A     |
|                | Continuous Drain Current $T_C = 100^{\circ}C$    | 15              | A     |
| $I_{DM}^{a1}$  | Pulsed Drain Current                             | 60              | A     |
| $V_{GS}$       | Gate-to-Source Voltage                           | $\pm 30$        | V     |
| $E_{AS}^{a2}$  | Single Pulse Avalanche Energy                    | 532             | mJ    |
| $E_{AR}^{a1}$  | Avalanche Energy ,Repetitive                     | 166             | mJ    |
| $I_{AR}^{a1}$  | Avalanche Current                                | 12              | A     |
| $dv/dt^{a3}$   | Peak Diode Recovery dv/dt                        | 15.0            | V/ns  |
| $P_D$          | Power Dissipation                                | 150             | W     |
|                | Derating Factor above 25°C                       | 1.2             | W/°C  |
| $T_J, T_{stg}$ | Operating Junction and Storage Temperature Range | 150, -55 to 150 | °C    |
| $T_L$          | MaximumTemperature for Soldering                 | 300             | °C    |



# GL20J60A8

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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 | $V_{GS}=0V, I_D=250\mu A$                 | 600    | --   | --   | V       |
| $\Delta BV_{DSS}/\Delta T_J$ | Bvdss Temperature Coefficient     | $I_D=250\mu A$ , Reference 25°C           | --     | 0.60 | --   | V/°C    |
| $I_{DSS}$                    | Drain to Source Leakage Current   | $V_{DS}=600V, V_{GS}=0V, T_a=25^\circ C$  | --     | --   | 1    | $\mu A$ |
|                              |                                   | $V_{DS}=480V, V_{GS}=0V, T_a=125^\circ C$ | --     | --   | 250  |         |
| $I_{GSS(F)}$                 | Gate to Source Forward Leakage    | $V_{GS}=+30V$                             | --     | --   | 10   | $\mu A$ |
| $I_{GSS(R)}$                 | Gate to Source Reverse Leakage    | $V_{GS}=-30V$                             | --     | --   | -10  | $\mu A$ |

| ON Characteristics                               |                               |                               |        |      |      |          |
|--------------------------------------------------|-------------------------------|-------------------------------|--------|------|------|----------|
| Symbol                                           | Parameter                     | Test Conditions               | Rating |      |      | Units    |
|                                                  |                               |                               | Min.   | Typ. | Max. |          |
| $R_{DS(ON)}$                                     | Drain-to-Source On-Resistance | $V_{GS}=10V, I_D=10A$         | --     | 0.12 | 0.15 | $\Omega$ |
| $V_{GS(TH)}$                                     | Gate Threshold Voltage        | $V_{DS}=V_{GS}, I_D=250\mu A$ | 2.0    | 3.0  | 4.0  | 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     | $V_{DS}=10V, I_D=20A$                 | --     | 18.8 | --   | S     |
| $C_{iss}$               | Input Capacitance            | $V_{GS}=0V, V_{DS}=25V$<br>$f=1.0MHz$ | --     | 1600 | --   | pF    |
| $C_{oss}$               | Output Capacitance           |                                       | --     | 14   | --   |       |
| $C_{rss}$               | Reverse Transfer Capacitance |                                       | --     | 225  | --   |       |

| Resistive Switching Characteristics |                                   |                                                       |        |      |      |       |
|-------------------------------------|-----------------------------------|-------------------------------------------------------|--------|------|------|-------|
| Symbol                              | Parameter                         | Test Conditions                                       | Rating |      |      | Units |
|                                     |                                   |                                                       | Min.   | Typ. | Max. |       |
| $t_{d(ON)}$                         | Turn-on Delay Time                | $V_{DD}=300V, I_D=20A,$<br>$V_{GS}=10V, R_g=25\Omega$ | --     | 48   | --   | ns    |
| $t_r$                               | Rise Time                         |                                                       | --     | 108  | --   |       |
| $t_{d(OFF)}$                        | Turn-Off Delay Time               |                                                       | --     | 176  | --   |       |
| $t_f$                               | Fall Time                         |                                                       | --     | 50   | --   |       |
| $Q_g$                               | Total Gate Charge                 | $I_D=20A, V_{DD}=480V$<br>$V_{GS}=0$ to 10V           | --     | 41   | --   | nC    |
| $Q_{gs}$                            | Gate to Source Charge             |                                                       | --     | 8    | --   |       |
| $Q_{gd}$                            | Gate to Drain ( "Miller" ) Charge |                                                       | --     | 15   | --   |       |

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### Source-Drain Diode Characteristics

| Symbol   | Parameter                              | Test Conditions              | Rating |      |      | Units |
|----------|----------------------------------------|------------------------------|--------|------|------|-------|
|          |                                        |                              | Min.   | Typ. | Max. |       |
| $I_S$    | Continuous Source Current (Body Diode) |                              | --     | --   | 20   | A     |
| $I_{SM}$ | Maximum Pulsed Current (Body Diode)    |                              | --     | --   | 60   | A     |
| $V_{SD}$ | Diode Forward Voltage                  | $I_S=20A, V_{GS}=0V$         | --     | 0.95 | 1.5  | V     |
| $t_{rr}$ | Reverse Recovery Time                  | $I_S=20A, T_J=25^\circ C$    | --     | 440  | --   | ns    |
| $Q_{rr}$ | Reverse Recovery Charge                | $di_F/dt=100A/us, V_{GS}=0V$ | --     | 5    | --   | uC    |

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

| Symbol          | Parameter           | Typ. | Units        |
|-----------------|---------------------|------|--------------|
| $R_{\theta JC}$ | Junction-to-Case    | 0.83 | $^\circ C/W$ |
| $R_{\theta JA}$ | Junction-to-Ambient | 62.5 | $^\circ C/W$ |

a1: Repetitive rating; pulse width limited by maximum junction temperature

a2:  $I_{AS}=6A, V_{DD}=50V, R_G=25\Omega$ , Starting  $T_J=25^\circ C$

a3:  $I_{SD}=20A, di/dt \leq 100A/us, V_{DD} \leq BV_{DS}$ , Start  $T_J=25^\circ C$

### Test Circuit and Waveform

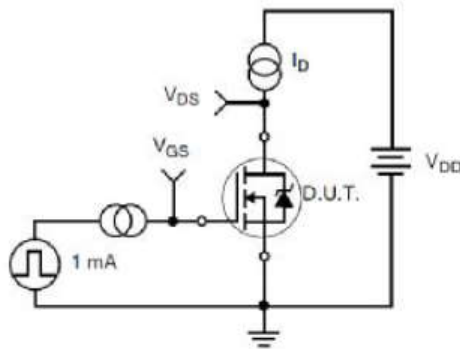


Figure 17. Gate Charge Test Circuit

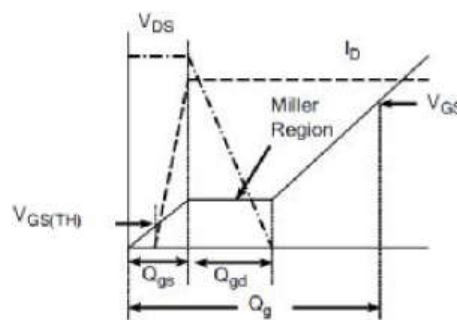


Figure 18. Gate Charge Waveform

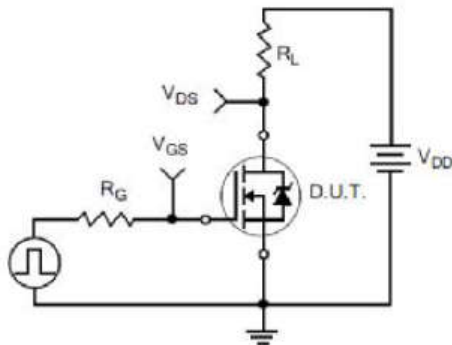


Figure 19. Resistive Switching Test Circuit

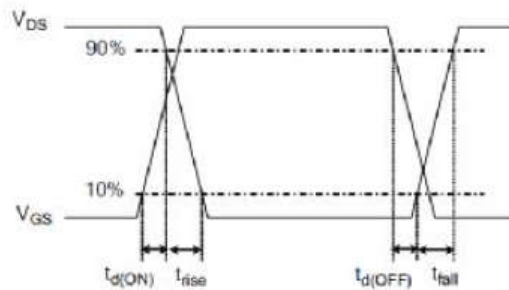
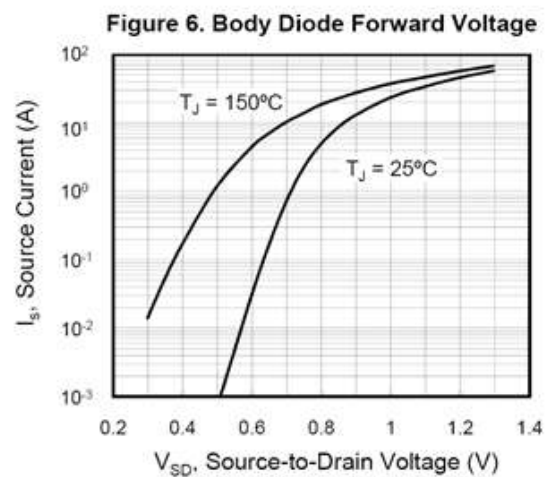
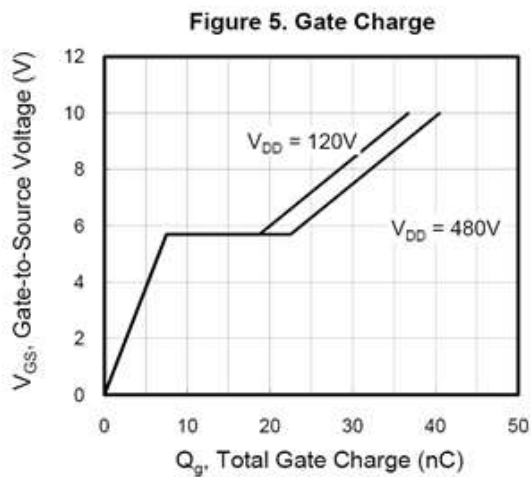
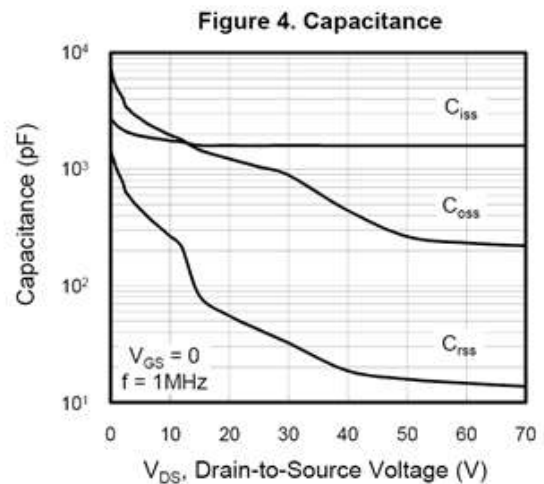
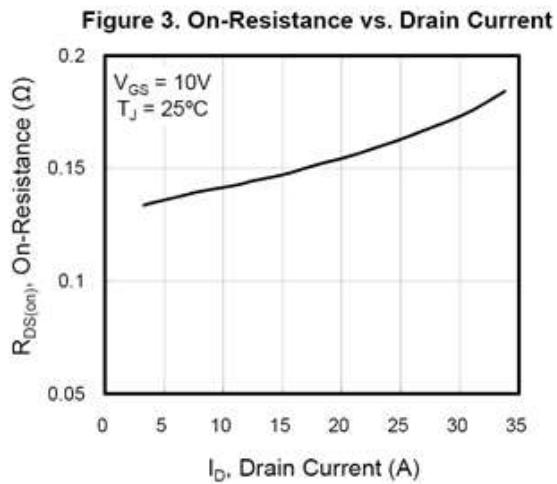
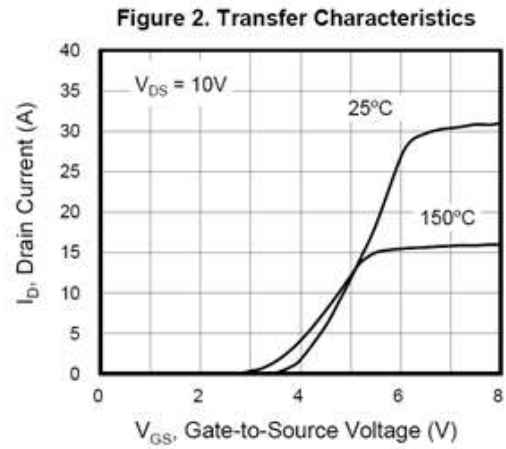
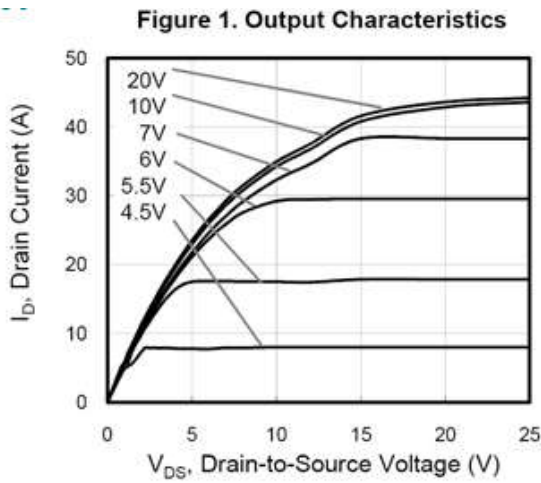


Figure 20. Resistive Switching Waveforms

### Typical Characteristics



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Figure 7. On-Resistance vs. Junction Temperature

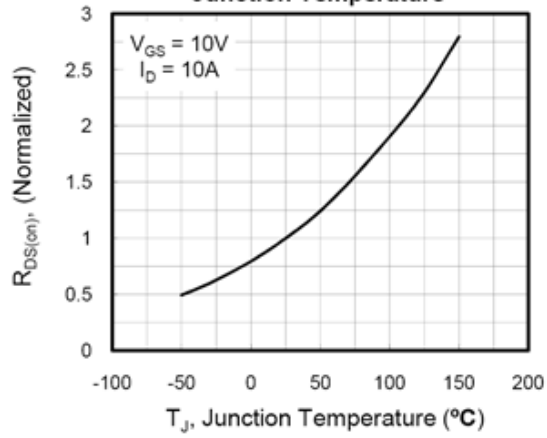


Figure 8. Threshold Voltage vs. Junction Temperature

