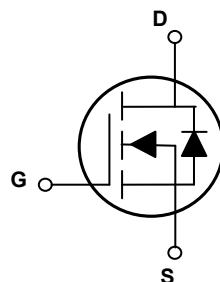
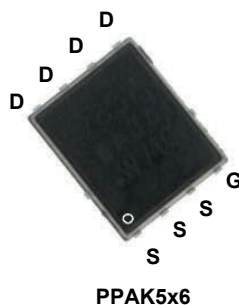


### Main Product Characteristics

|               |                      |
|---------------|----------------------|
| $V_{(BR)DSS}$ | 40V                  |
| $R_{DS(ON)}$  | 2.6m $\Omega$ (Max.) |
| $I_D$         | 142A                 |



Schematic Diagram

### Features and Benefits

- Advanced MOSFET process technology
- Ideal for high efficiency switched mode power supplies
- Low on-resistance with low gate charge
- Fast switching and reverse body recovery
- AEC-Q101 qualified



### Description

The GSGP2R604AU utilizes the latest techniques to achieve high cell density and low on-resistance. These features make this device extremely efficient and reliable for use in high efficiency switch mode power supplies and a wide variety of other applications.

### Absolute Maximum Ratings ( $T_A=25^{\circ}\text{C}$ unless otherwise specified)

| Parameter                                                           | Symbol          | Max.        | Unit                 |
|---------------------------------------------------------------------|-----------------|-------------|----------------------|
| Drain-Source Voltage                                                | $V_{DS}$        | 40          | V                    |
| Gate-to-Source Voltage                                              | $V_{GS}$        | $\pm 20$    | V                    |
| Continuous Drain Current ( $T_C=25^{\circ}\text{C}$ ) <sup>1</sup>  | $I_D$           | 142         | A                    |
| Continuous Drain Current ( $T_C=100^{\circ}\text{C}$ ) <sup>1</sup> |                 | 99          | A                    |
| Pulsed Drain Current ( $T_C=25^{\circ}\text{C}$ ) <sup>2</sup>      | $I_{DM}$        | 560         | A                    |
| Power Dissipation ( $T_C=25^{\circ}\text{C}$ )                      | $P_D$           | 95          | W                    |
| Single Pulse Avalanche Energy <sup>3</sup>                          | $E_{AS}$        | 250         | mJ                   |
| Single Pulse Current <sup>3</sup>                                   | $I_{AS}$        | 41          | A                    |
| Thermal Resistance, Junction-to-Ambient <sup>4</sup>                | $R_{\theta JA}$ | 40          | $^{\circ}\text{C/W}$ |
| Thermal Resistance, Junction-to-Case                                | $R_{\theta JC}$ | 1.58        | $^{\circ}\text{C/W}$ |
| Operating Junction and Storage Temperature Range                    | $T_J/T_{STG}$   | -55 to +175 | $^{\circ}\text{C}$   |
| Soldering Temperature (SMD)                                         | $T_{sld}$       | 260         | $^{\circ}\text{C}$   |

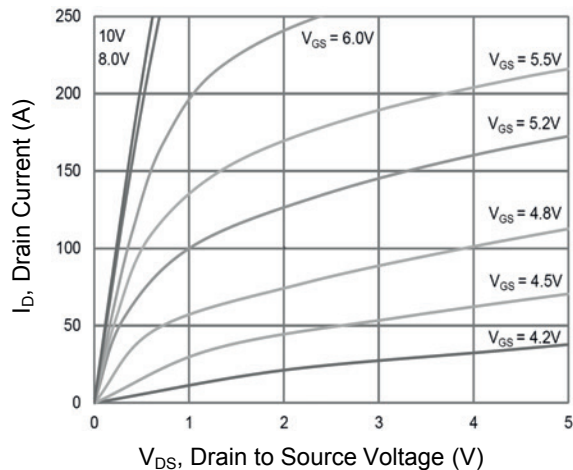
### Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise specified)

| Parameter                                       | Symbol        | Conditions                                                     | Min. | Typ. | Max.      | Unit       |
|-------------------------------------------------|---------------|----------------------------------------------------------------|------|------|-----------|------------|
| <b>On / Off Characteristics</b>                 |               |                                                                |      |      |           |            |
| Drain-to-Source Breakdown Voltage               | $V_{(BR)DSS}$ | $V_{GS}=0V, I_D=250\mu A$                                      | 40   | -    | -         | V          |
| Drain-to-Source Leakage Current                 | $I_{DSS}$     | $V_{DS}=40V, V_{GS}=0V, T_J=25^{\circ}\text{C}$                | -    | -    | 1.0       | $\mu A$    |
|                                                 |               | $V_{DS}=32V, V_{GS}=0V, T_J=125^{\circ}\text{C}$               | -    | -    | 100       |            |
| Gate-to-Source Forward Leakage                  | $I_{GSS}$     | $V_{DS}=0V, V_{GS}=\pm 20V$                                    | -    | -    | $\pm 100$ | nA         |
| Gate Threshold Voltage                          | $V_{GS(th)}$  | $V_{DS}=V_{GS}, I_D=250\mu A$                                  | 2.0  | 3.0  | 4.0       | V          |
| Static Drain-to-Source On-Resistance            | $R_{DS(ON)}$  | $V_{GS}=10V, I_D=20A$                                          | -    | 2.1  | 2.6       | m $\Omega$ |
| <b>Dynamic and Switching Characteristics</b>    |               |                                                                |      |      |           |            |
| Input Capacitance                               | $C_{iss}$     | $V_{GS}=0V, V_{DS}=20V, f=1\text{MHz}$                         | -    | 1542 | -         | pF         |
| Output Capacitance                              | $C_{oss}$     |                                                                | -    | 849  | -         |            |
| Reverse Transfer Capacitance                    | $C_{rss}$     |                                                                | -    | 50   | -         |            |
| Total Gate Charge ( $V_{GS}=10V$ )              | $Q_g$         | $I_D=20A, V_{DD}=20V, V_{GS}=10V$                              | -    | 22   | -         | nC         |
| Total Gate Charge ( $V_{GS}=6V$ )               | $Q_g$         |                                                                | -    | 13.7 | -         |            |
| Gate-to-Source Charge                           | $Q_{gs}$      |                                                                | -    | 6.1  | -         |            |
| Gate-to-Drain ("Miller") Charge                 | $Q_{gd}$      |                                                                | -    | 3.8  | -         |            |
| Gate-to-Plateau                                 | $V_{plateau}$ |                                                                | -    | 4.3  | -         | V          |
| Turn-On Delay Time                              | $t_{d(on)}$   | $V_{DD}=20V, V_{GS}=10V, R_G=3.0\Omega, I_D=20A$               | -    | 4.1  | -         | nS         |
| Rise Time                                       | $t_r$         |                                                                | -    | 4.3  | -         |            |
| Turn-Off Delay Time                             | $t_{d(off)}$  |                                                                | -    | 18.2 | -         |            |
| Fall Time                                       | $t_f$         |                                                                | -    | 8.5  | -         |            |
| Gate Resistance                                 | $R_g$         | $f=1\text{MHz}$                                                | -    | 3.6  | -         | $\Omega$   |
| <b>Source-Drain Ratings and Characteristics</b> |               |                                                                |      |      |           |            |
| Continuous Source Current (Body Diode)          | $I_S$         | MOSFET symbol showing the integral reverse p-n junction diode. | -    | -    | 166       | A          |
| Diode Forward Voltage                           | $V_{SD}$      | $I_S=10A, V_{GS}=0V$                                           | -    | 0.9  | 1.4       | V          |
| Reverse Recovery Time                           | $T_{rr}$      | $I_F=20A, dI_F/dt=100A/\mu s, T_J=25^{\circ}\text{C}$          | -    | 33   | -         | nS         |
| Reverse Recovery Charge                         | $Q_{rr}$      |                                                                | -    | 18   | -         | nC         |

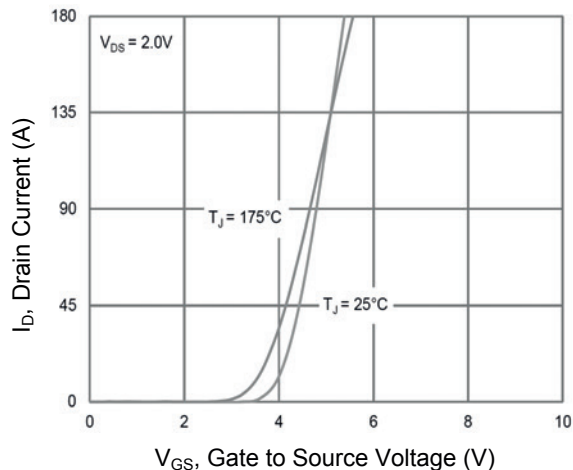
**Notes:**

1. Pulse test: Pulse width  $\leq 300\mu s$ , duty cycle  $\leq 2\%$ .
2. Repetitive rating; pulse width limited by max. junction temperature.
3.  $L=0.1\text{mH}$ ,  $V_{DD}=20V$ ,  $T_J=25^{\circ}\text{C}$ .
4. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch.

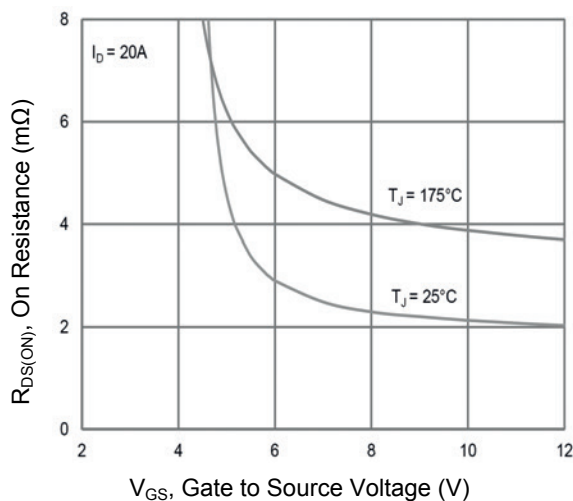
## Typical Electrical and Thermal Characteristic Curves



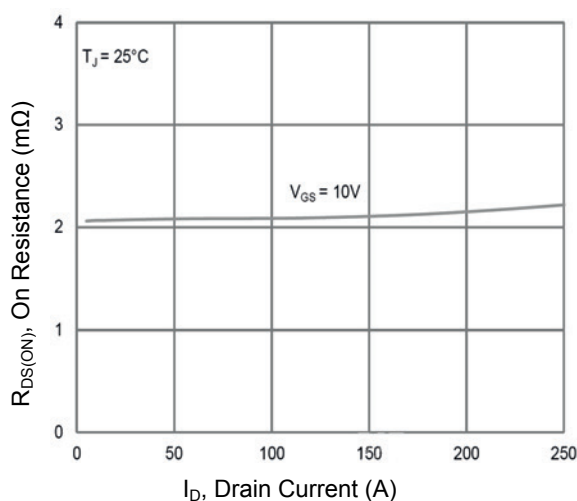
**Figure 1. Output Characteristics**



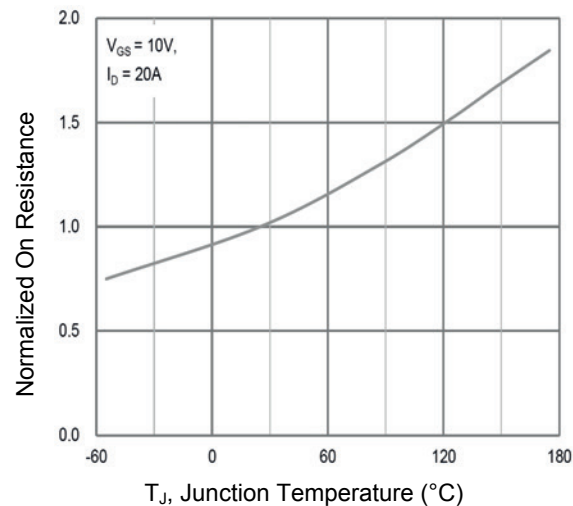
**Figure 2. Transfer Characteristics**



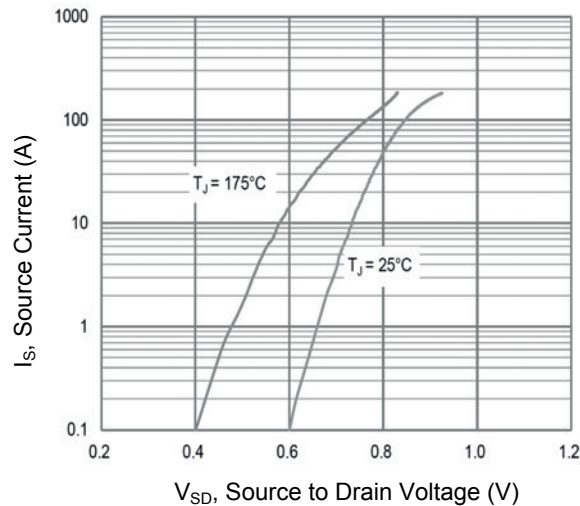
**Figure 3. On Resistance vs. Gate to Source Voltage**



**Figure 4. On Resistance vs. Drain Current**

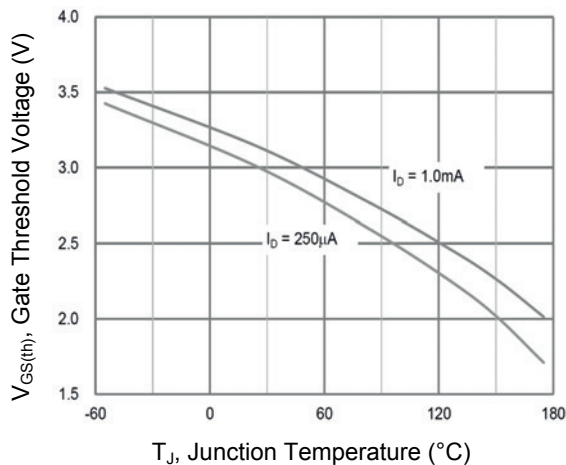


**Figure 5. On Resistance vs.  $T_J$**

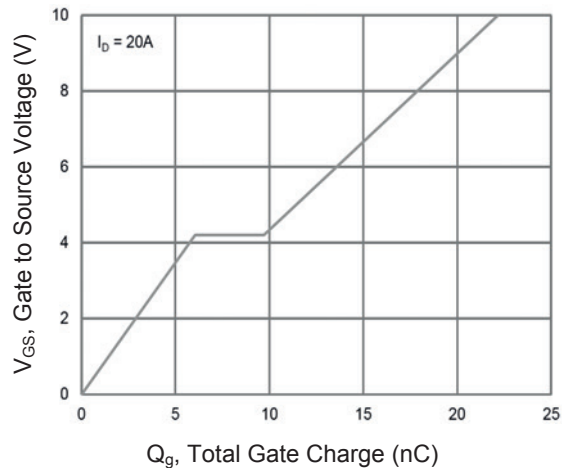


**Figure 6. Source Drain Diode Forward Voltage**

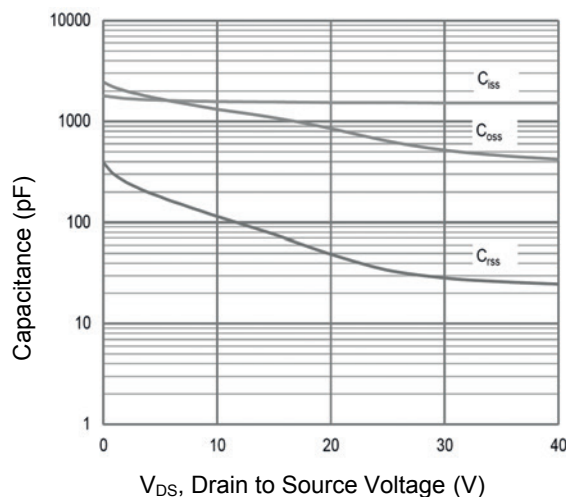
## Typical Electrical and Thermal Characteristic Curves



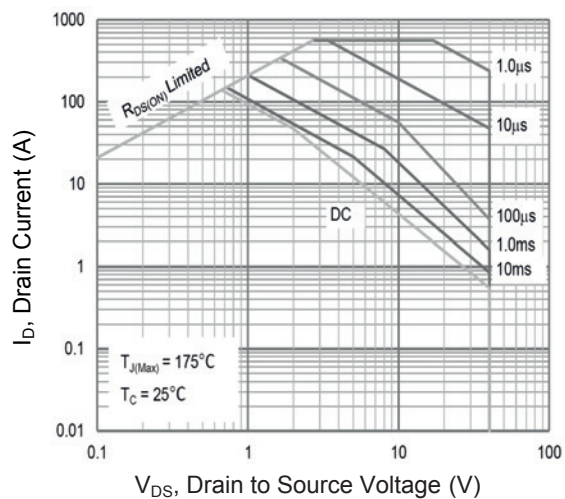
**Figure 7.  $V_{GS(th)}$  vs. Junction Temperature**



**Figure 8. Gate Charge Characteristics**

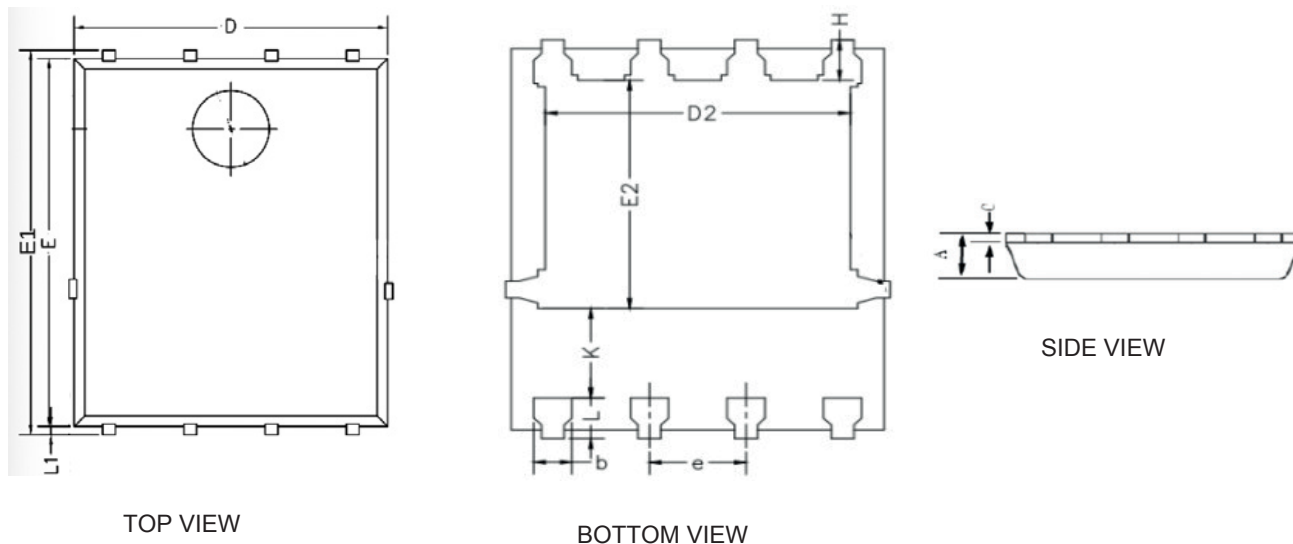


**Figure 9. Capacitance Characteristics**



**Figure 10. Safe Operation Area**

## Package Outline Dimensions (PPAK5x6)



| Symbol | Dimensions In Millimeters |      | Dimensions In Inches |       |
|--------|---------------------------|------|----------------------|-------|
|        | Min.                      | Max. | Min.                 | Max.  |
| A      | 0.90                      | 1.20 | 0.035                | 0.047 |
| b      | 0.30                      | 0.55 | 0.012                | 0.022 |
| C      | 0.15                      | 0.35 | 0.006                | 0.014 |
| D      | 4.70                      | 5.20 | 0.185                | 0.205 |
| D2     | 3.76                      | 4.20 | 0.148                | 0.165 |
| E2     | 3.30                      | 3.85 | 0.130                | 0.152 |
| E      | 5.60                      | 5.90 | 0.220                | 0.232 |
| E1     | 5.80                      | 6.20 | 0.228                | 0.244 |
| K      | 1.10                      | -    | 0.043                | -     |
| H      | 0.45                      | 0.75 | 0.018                | 0.030 |
| L      | 0.45                      | 0.75 | 0.018                | 0.030 |
| L1     | 0.25                      | 0.45 | 0.010                | 0.018 |
| e      | 1.27 BSC                  |      | 0.050 BSC            |       |

## Order Information

| Device      | Package | Marking | Carrier     | Quantity         |
|-------------|---------|---------|-------------|------------------|
| GSGP2R604AU | PPAK5x6 | P2R604  | Tape & Reel | 5,000 Pcs / Reel |