

### Description

The DMG2305UXQ uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 4.5V. This device is suitable for use as a Battery protection or in other Switching application.

### Dimensions SOT-23



### General Features

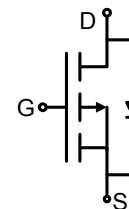
$V_{DS} = -20V$   $I_D = -4.9A$

$R_{DS(ON)} < 38m\Omega$  @  $V_{GS} = -4.5V$

### Application

- Battery protection
- Load switch
- Uninterruptible power supply

### Pin Configuration



### Package Marking and Ordering Information

| Device     | Device Marking | Device Package | Reel Size | Tape width | Quantity   |
|------------|----------------|----------------|-----------|------------|------------|
| DMG2305UXQ | A5SHB          | SOT-23         | Ø180mm    | 8 mm       | 3000 units |

### Absolute Maximum Ratings (TC=25°C unless otherwise noted)

| Symbol                   | Parameter  | Rating     | Units |
|--------------------------|--|------------|-------|
| $V_{DS}$                 | Drain-Source Voltage                                       | -20        | V     |
| $V_{GS}$                 | Gate-Source Voltage  | $\pm 12$   | V     |
| $I_D @ T_A = 25^\circ C$ | Continuous Drain Current, $V_{GS} @ -4.5V^1$               | -4.9       | A     |
| $I_D @ T_A = 70^\circ C$ | Continuous Drain Current, $V_{GS} @ -4.5V^1$               | -3.9       | A     |
| $I_{DM}$                 | Pulsed Drain Current <sup>2</sup>                          | -14        | A     |
| $P_D @ T_A = 25^\circ C$ | Total Power Dissipation <sup>3</sup>                       | 1.31       | W     |
| $P_D @ T_A = 70^\circ C$ | Total Power Dissipation <sup>3</sup>                       | 0.84       | W     |
| $T_{STG}$                | Storage Temperature Range                                  | -55 to 150 | °C    |
| $T_J$                    | Operating Junction Temperature Range                       | -55 to 150 | °C    |
| $R_{\theta JA}$          | Thermal Resistance Junction-Ambient <sup>1</sup>           | 120        | °C/W  |
| $R_{\theta JA}$          | Thermal Resistance Junction-Ambient <sup>1</sup> (t ≤ 10s) | 95         | °C/W  |

**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

| Symbol                              | Parameter                                      | Conditions   | Min. | Typ.   | Max. | Unit  |
|-------------------------------------|--|--|------|--------|------|-------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =-250uA                        | -20  | ---    | ---  | V     |
| ∂BV <sub>DSS</sub> /∂T <sub>J</sub> | BV <sub>DSS</sub> Temperature Coefficient      | Reference to 25°C, I <sub>D</sub> =-1mA                            | ---  | -0.014 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-4.9A                      | ---  | 32     | 38   | mΩ    |
|                                     |  | V <sub>GS</sub> =-2.5V, I <sub>D</sub> =-3.4A                      | ---  | 45     | 55   |       |
|                                     |  | V <sub>GS</sub> =-1.8V, I <sub>D</sub> =-2A                        | ---  | 65     | 85   |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         |  | -0.4 | ---    | -1.0 | V     |
| ∂V <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =-250uA          | ---  | 3.95   | ---  | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C   | ---  | ---    | -1   | uA    |
|                                     |  | V <sub>DS</sub> =-16V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C   | ---  | ---    | -5   |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±12V, V <sub>DS</sub> =0V                         | ---  | ---    | ±100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =-5V, I <sub>D</sub> =-3A                          | ---  | 12.8   | ---  | S     |
| Q <sub>g</sub>                      | Total Gate Charge (-4.5V)                      |  | ---  | 10.2   | 14.3 | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             | V <sub>DS</sub> =-15V, V <sub>GS</sub> =-4.5V, I <sub>D</sub> =-3A | ---  | 1.89   | 2.6  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |  | ---  | 3.1    | 4.3  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             |  | ---  | 5.6    | 11.2 | ns    |
| T <sub>r</sub>                      | Rise Time                                      | V <sub>DD</sub> =-10V, V <sub>GS</sub> =-4.5V,                     | ---  | 40.8   | 73   |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            | R <sub>G</sub> =3.3, I <sub>D</sub> =-3A                           | ---  | 33.6   | 67   |       |
| T <sub>f</sub>                      | Fall Time                                      |  | ---  | 18     | 36   |       |
| C <sub>iss</sub>                    | Input Capacitance                              |  | ---  | 857    | 1200 | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             | V <sub>DS</sub> =-15V, V <sub>GS</sub> =0V, f=1MHz                 | ---  | 114    | 160  |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |  | ---  | 108    | 151  |       |
| I <sub>S</sub>                      | Continuous Source Current <sup>1,4</sup>       |  | ---  | ---    | -4.9 | A     |
| I <sub>SM</sub>                     | Pulsed Source Current <sup>2,4</sup>           | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current                  | ---  | ---    | -14  | A     |
| V <sub>SD</sub>                     | Diode Forward Voltage <sup>2</sup>             | V <sub>GS</sub> =0V, I <sub>S</sub> =-1A, T <sub>J</sub> =25°C     | ---  | ---    | -1   | V     |
| t <sub>rr</sub>                     | Reverse Recovery Time                          | I <sub>F</sub> =-3A, di/dt=100A/μs,                                | ---  | 21.8   | ---  | nS    |
| Q <sub>rr</sub>                     | Reverse Recovery Charge                        | T <sub>J</sub> =25°C   | ---  | 6.9    | ---  | nC    |

Note :

1 .The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 2OZ copper.

2.The data tested by pulsed , pulse width ∅ 300us , duty cycle ∅ 2%

3.The power dissipation is limited by 150°C junction temperature

4.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.

Typical Characteristics

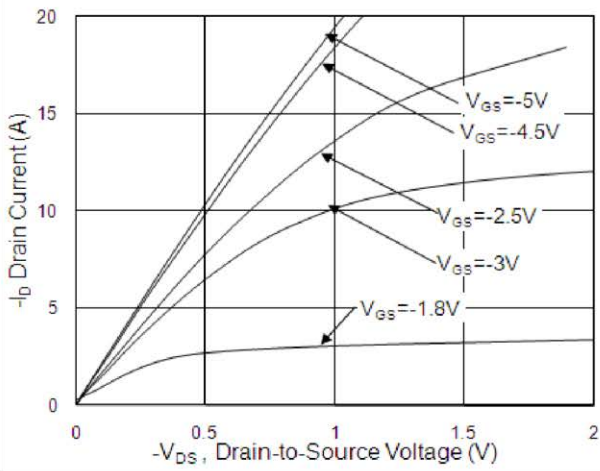


Fig.1 Typical Output Characteristics

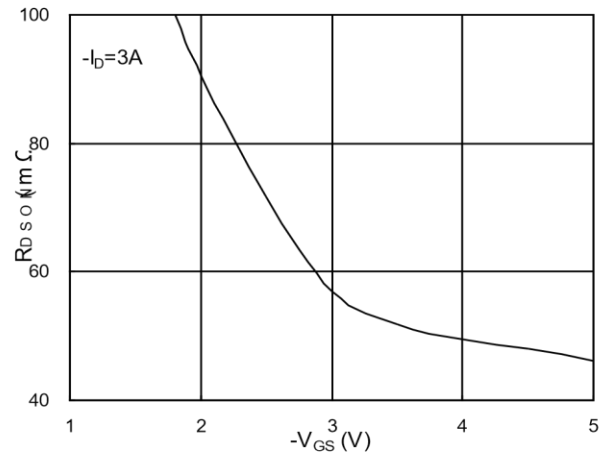


Fig.2 On-Resistance vs. G-S Voltage

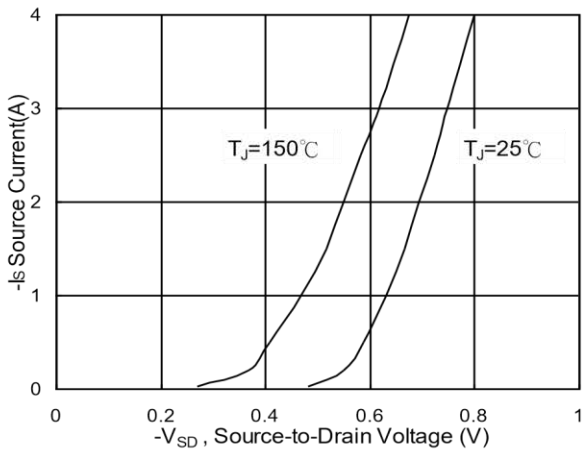


Fig.3 Forward Characteristics of Reverse

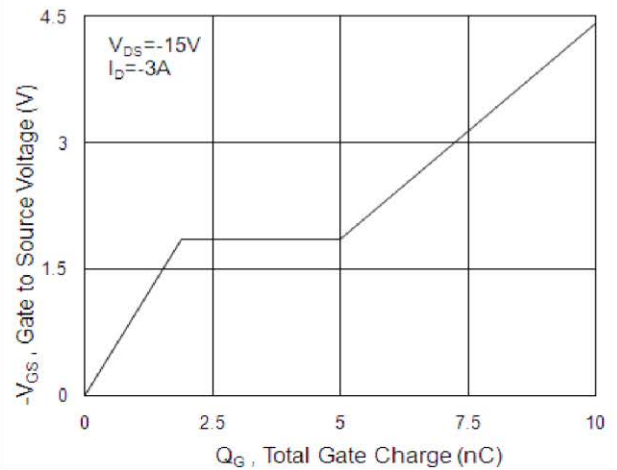


Fig.4 Gate-charge Characteristics

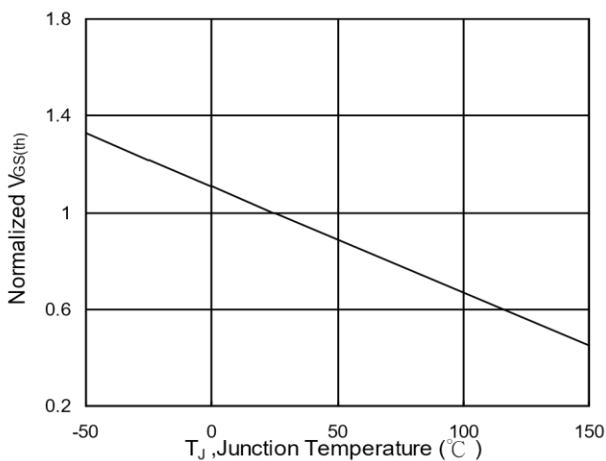


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

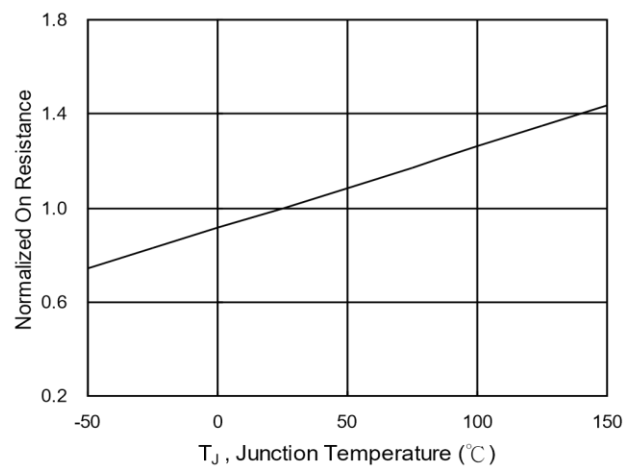
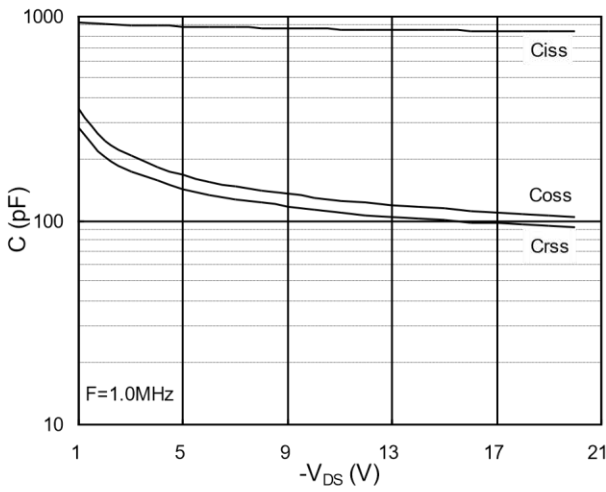
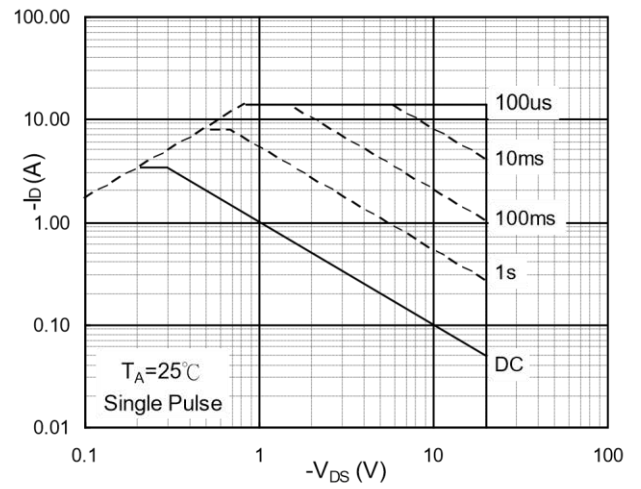


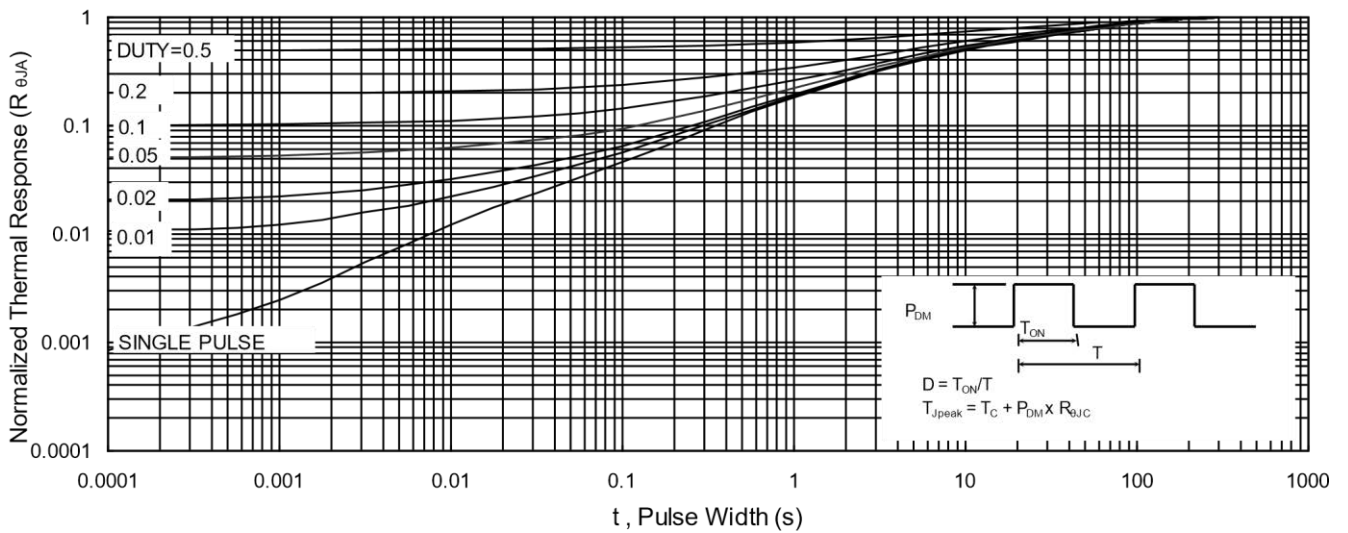
Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$



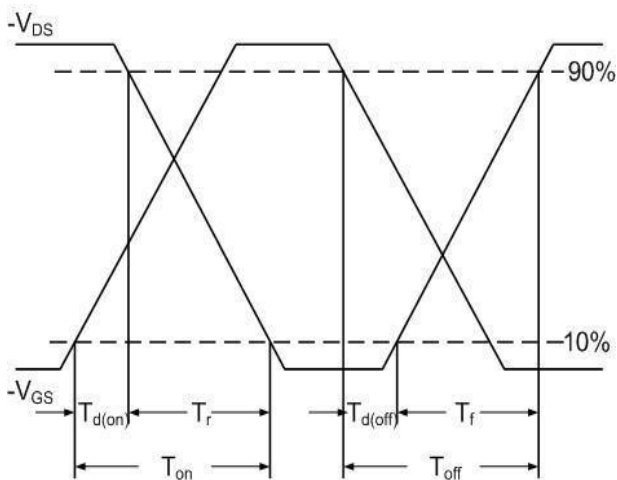
**Fig.7 Capacitance**



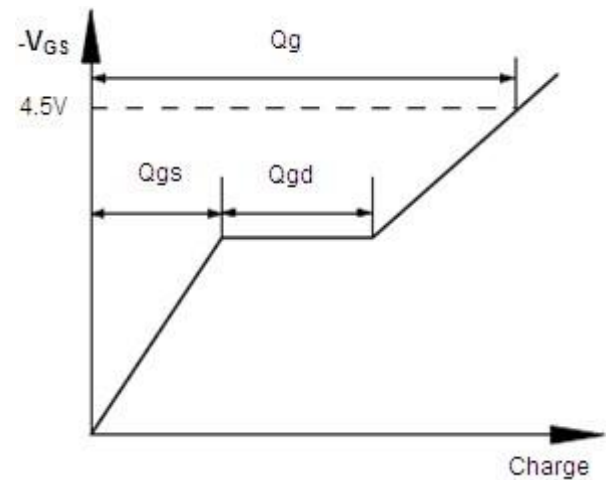
**Fig.8 Safe Operating Area**



**Fig.9 Normalized Maximum Transient Thermal Impedance**

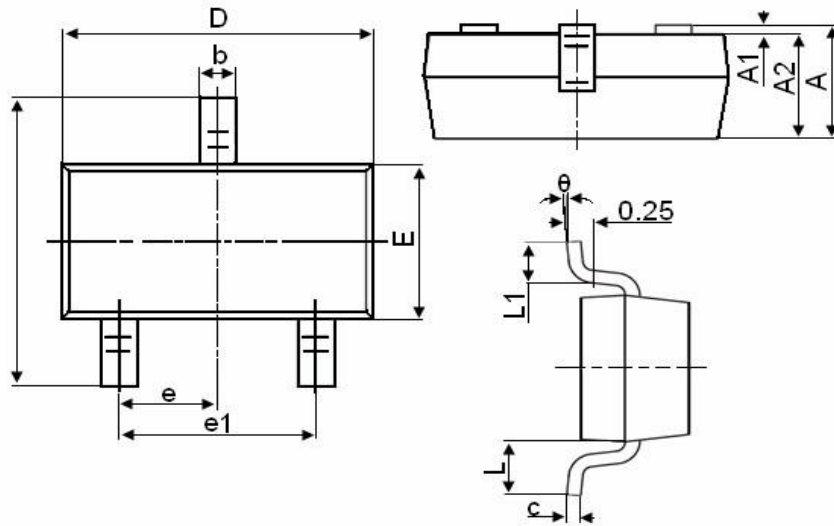


**Fig.10 Switching Time Waveform**



**Fig.11 Gate Charge Waveform**

Package Mechanical Data-SOT-23



| Symbol | Dimensions in Millimeters |       |
|--------|---------------------------|-------|
|        | MIN.                      | MAX.  |
| A      | 0.900                     | 1.150 |
| A1     | 0.000                     | 0.100 |
| A2     | 0.900                     | 1.050 |
| b      | 0.300                     | 0.500 |
| c      | 0.080                     | 0.150 |
| D      | 2.800                     | 3.000 |
| E      | 1.200                     | 1.400 |
| E1     | 2.250                     | 2.550 |
| e      | 0.950TYP                  |       |
| e1     | 1.800                     | 2.000 |
| L      | 0.550REF                  |       |
| L1     | 0.300                     | 0.500 |
| θ      | 0°                        | 8°    |

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