



## Description

The FDS6690AS 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.

## General Features

$V_{DS} = 30V$   $I_D = 15A$

$R_{DS(ON)} < 10m\Omega$  @  $V_{GS}=10V$

## Application

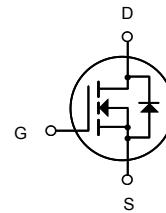
Battery protection

Load switch

Uninterruptible power supply



SOP-8



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID | Pack  | Brand      | Qty(PCS) |
|------------|-------|------------|----------|
| FDS6690AS  | SOP-8 | HXY MOSFET | 3000     |

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

| Symbol               | Parameter  | Rating     | Units |
|----------------------|--|------------|-------|
| $V_{DS}$             | Drain-Source Voltage                                     | 30         | V     |
| $V_{GS}$             | Gate-Source Voltage                                      | $\pm 20$   | V     |
| $I_D@T_A=25^\circ C$ | Continuous Drain Current <sup>1</sup>                    | 15         | A     |
| $I_D@T_A=70^\circ C$ | Continuous Drain Current <sup>1</sup>                    | 8          | A     |
| $I_{DM}$             | Pulsed Drain Current <sup>2</sup>                        | 45         | A     |
| EAS                  | Single Pulse Avalanche Energy <sup>3</sup>               | 12         | mJ    |
| $P_D@T_A=25^\circ C$ | Total Power Dissipation <sup>4</sup>                     | 15         | 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> (t≤10s) | 85         | °C/W  |
|                      | Thermal Resistance Junction-ambient <sup>1</sup>         | 25         | °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   | 30   | ---   | ---   | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BVDSS Temperature Coefficient                  | Reference to 25°C, I <sub>D</sub> =1mA   | ---  | 0.034 | ---   | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =7A   | ---  | 8     | 10    | mΩ    |
|                                     |  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A  | ---  | 12    | 15    |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA                               | 1.2  | 1.4   | 2.5   | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    |  | ---  | -3.84 | ---   | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C                        | ---  | ---   | 1     | uA    |
|                                     |  | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C                        | ---  | ---   | 5     |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V   | ---  | ---   | ±100  | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =5V, I <sub>D</sub> =7A  | ---  | 6.2   | ---   | S     |
| R <sub>g</sub>                      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                                       | ---  | 1.04  | 2.1   | Ω     |
| Q <sub>g</sub>                      | Total Gate Charge (4.5V)                       | V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =7A                        | ---  | 6     | 8.4   | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             |  | ---  | 2.2   | 3.1   |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |  | ---  | 2     | 2.8   |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             | V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3Ω<br>I <sub>D</sub> =7A | ---  | 1.2   | 2.4   | ns    |
| T <sub>r</sub>                      | Rise Time                                      |  | ---  | 40    | 72.0  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            |  | ---  | 18    | 36.0  |       |
| T <sub>f</sub>                      | Fall Time                                      |  | ---  | 7.2   | 14.4  |       |
| C <sub>iss</sub>                    | Input Capacitance                              | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz                                      | ---  | 983   | 1616  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             |  | ---  | 147   | 207.8 |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |  | ---  | 109   | 162.6 |       |
| I <sub>S</sub>                      | Continuous Source Current <sup>1,5</sup>       | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current                                      | ---  | ---   | 7     | A     |
| I <sub>SM</sub>                     | Pulsed Source Current <sup>2,5</sup>           |  | ---  | ---   | 35    | 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                          | ---  | ---   | 1.2   | V     |
| t <sub>rr</sub>                     | Reverse Recovery Time                          | I <sub>F</sub> =7A, di/dt=100A/μs, T <sub>J</sub> =25°C                                | ---  | 7.2   | ---   | nS    |
| Q <sub>rr</sub>                     | Reverse Recovery Charge                        |  | ---  | 2.9   | ---   | nC    |

Note :

- 1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.
- 2.The data tested by pulsed , pulse width ≤ 300us , duty cycle ≤ 2%
- 3.The EAS data shows Max. rating . The test condition is V<sub>DD</sub>=25V,V<sub>GS</sub>=10V,L=0.1mH,I<sub>AS</sub>=20A
- 4.The power dissipation is limited by 150°C junction temperature
- 5.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

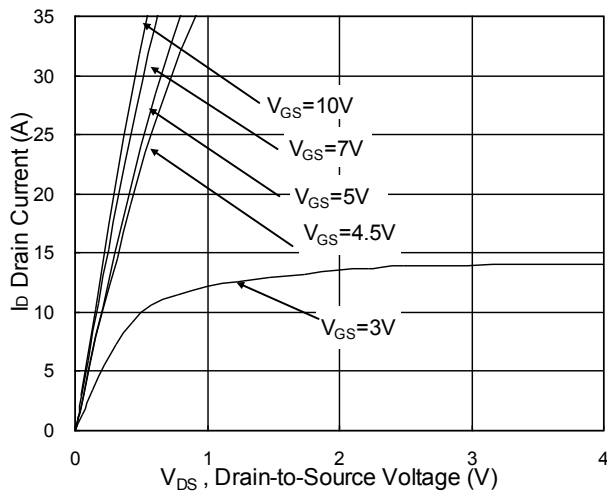


Fig.1 Typical Output Characteristics

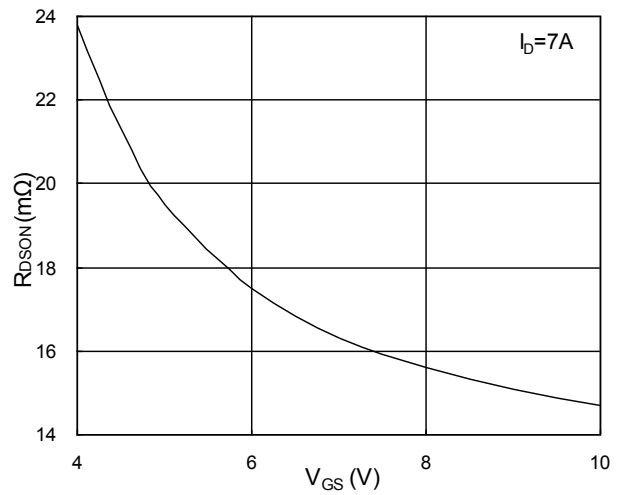


Fig.2 On-Resistance vs. Gate-Source

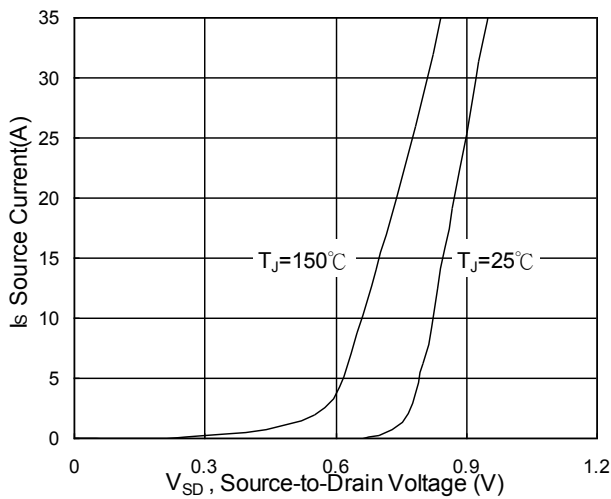


Fig.3 Forward Characteristics Of Reverse

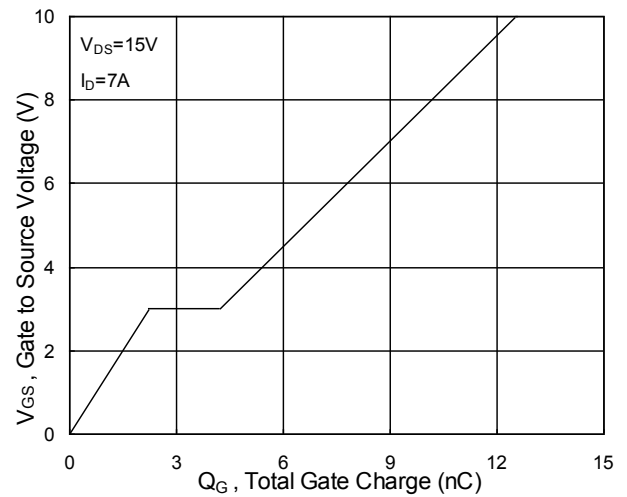


Fig.4 Gate-Charge Characteristics

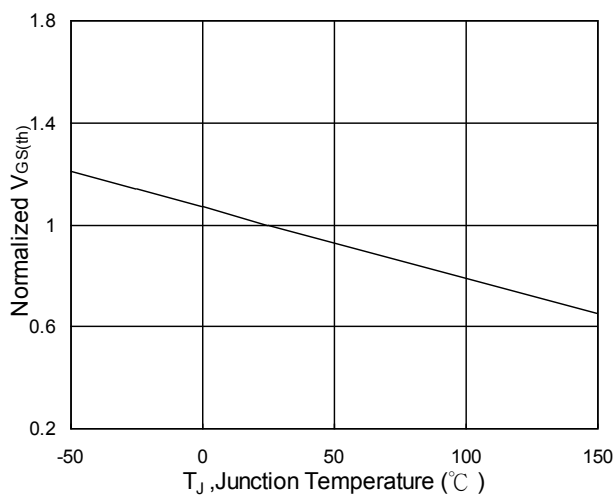


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

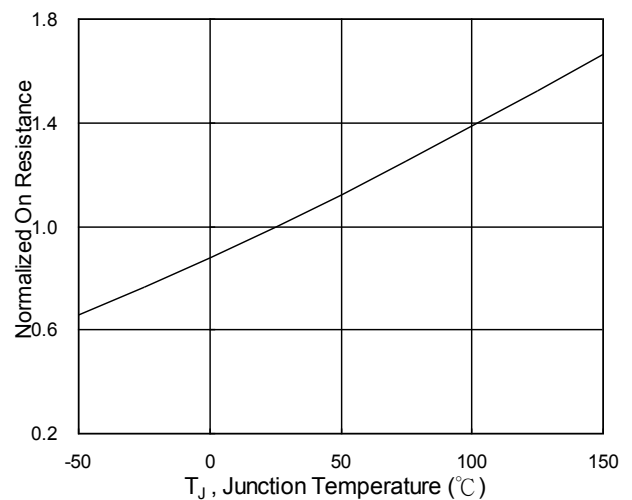


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

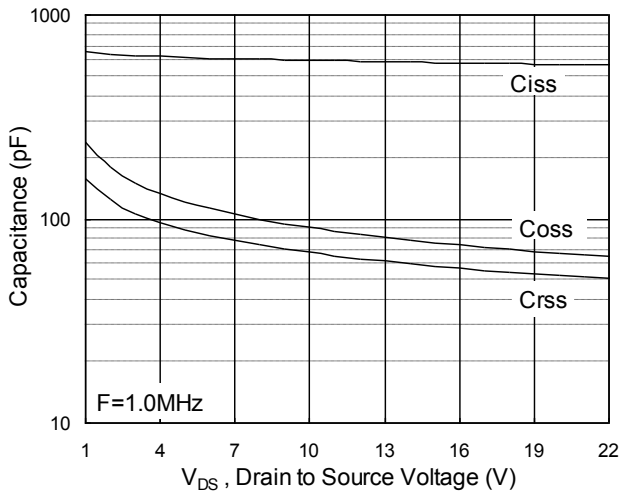


Fig.7 Capacitance

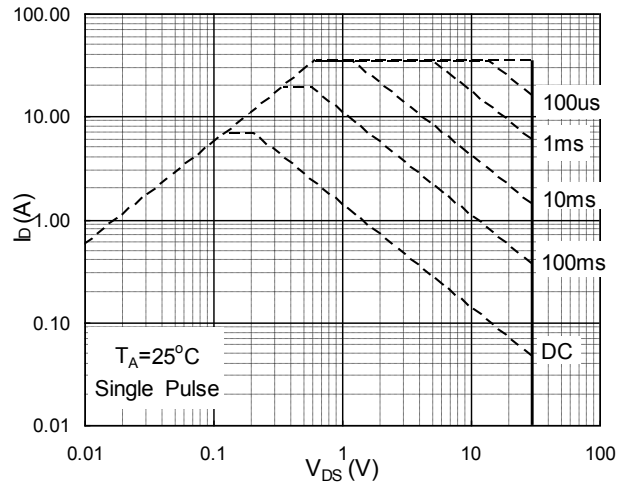


Fig.8 Safe Operating Area

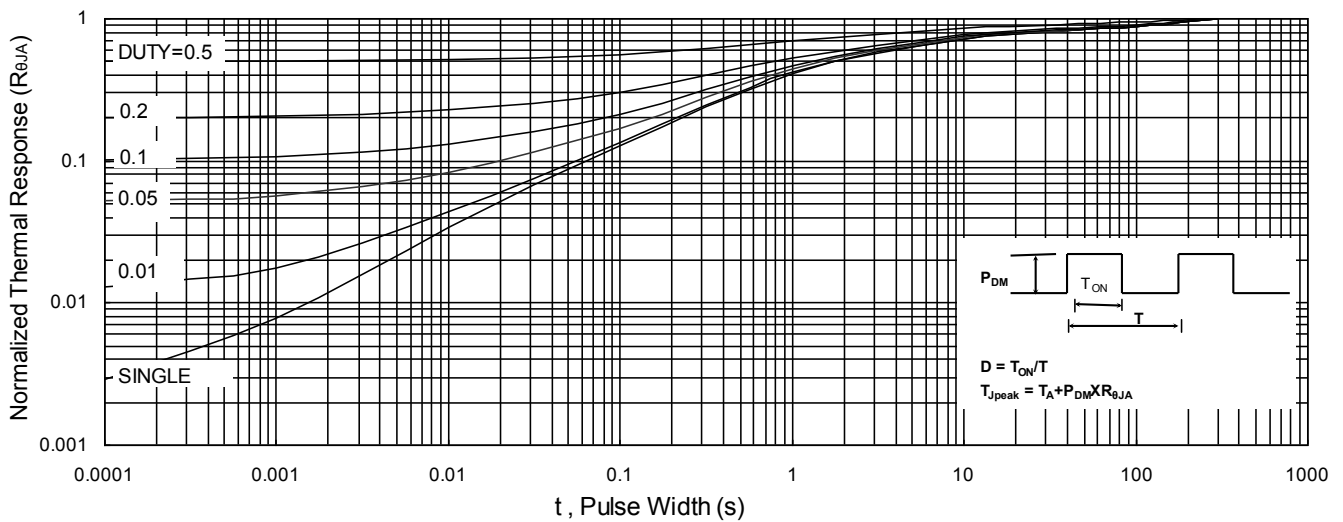


Fig.9 Normalized Maximum Transient Thermal Impedance

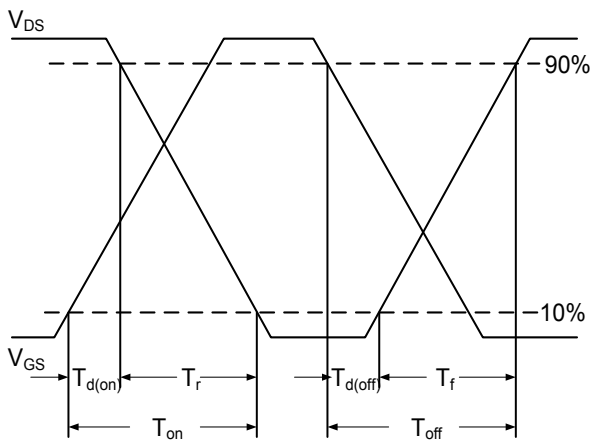


Fig.10 Switching Time Waveform

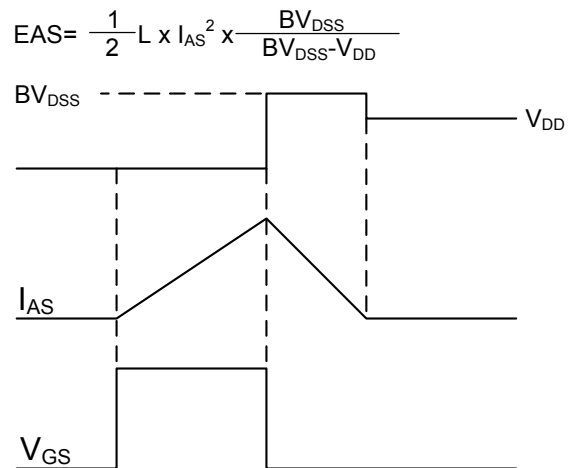
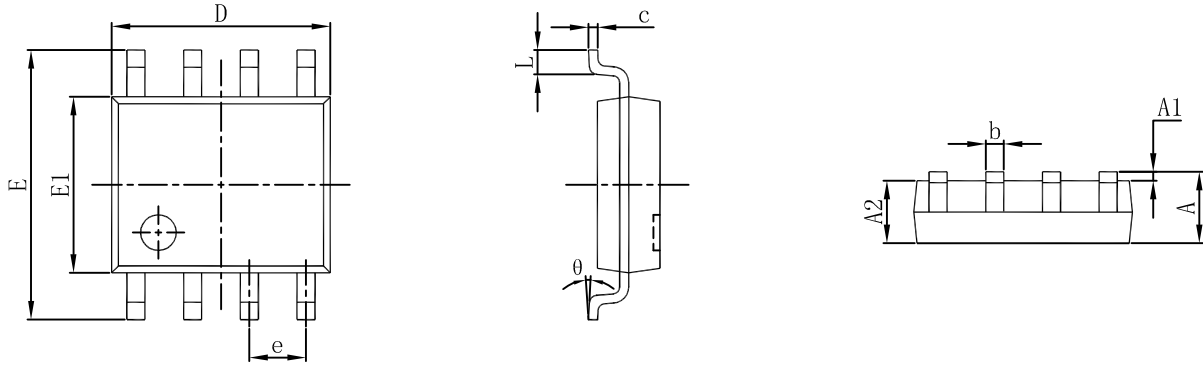


Fig.11 Unclamped Inductive Switching Waveform



### SOP-8 Package Outline Dimensions



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.350                     | 1.750 | 0.053                | 0.069 |
| A1     | 0.100                     | 0.250 | 0.004                | 0.010 |
| A2     | 1.350                     | 1.550 | 0.053                | 0.061 |
| b      | 0.330                     | 0.510 | 0.013                | 0.020 |
| c      | 0.170                     | 0.250 | 0.007                | 0.010 |
| D      | 4.800                     | 5.000 | 0.189                | 0.197 |
| e      | 1.270 (BSC)               |       | 0.050 (BSC)          |       |
| E      | 5.800                     | 6.200 | 0.228                | 0.244 |
| E1     | 3.800                     | 4.000 | 0.150                | 0.157 |
| L      | 0.400                     | 1.270 | 0.016                | 0.050 |
| θ      | 0°                        | 8°    | 0°                   | 8°    |



Note:  
 1. Controlling dimension: in millimeters.  
 2. General tolerance:  $\pm 0.05\text{mm}$ .  
 3. The pad layout is for reference purposes only.



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