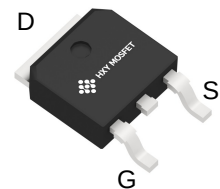




## Description

The FDD5690 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.



TO-252-2L

## General Features

$V_{DS} = 60V$   $I_D = 30A$

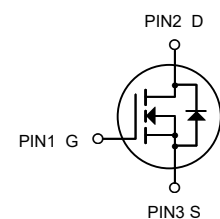
$R_{DS(ON)} < 26m\Omega$  @  $V_{GS}=10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



N-Channel MOSFET

## Ordering Information

| Product ID | Pack      | Brand      | Qty(PCS) |
|------------|-----------|------------|----------|
| FDD5690    | TO-252-2L | HXY MOSFET | 2500     |

## Absolute Maximum Ratings ( $T_c=25^\circ C$ unless otherwise noted)

| Symbol                | Parameter                                             | Rating     | Units        |
|-----------------------|-------------------------------------------------------|------------|--------------|
| $V_{DS}$              | Drain-Source Voltage                                  | 60         | V            |
| $V_{GS}$              | Gate-Source Voltage                                   | $\pm 20$   | V            |
| $I_D@T_c=25^\circ C$  | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 30         | A            |
| $I_D@T_c=100^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 15         | A            |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>                     | 46         | A            |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup>            | 25.5       | mJ           |
| $I_{AS}$              | Avalanche Current                                     | 22.6       | A            |
| $P_D@T_c=25^\circ C$  | Total Power Dissipation <sup>4</sup>                  | 34.7       | W            |
| $P_D@T_A=25^\circ C$  | Total Power Dissipation <sup>4</sup>                  | 2          | W            |
| $T_{STG}$             | Storage Temperature Range                             | -55 to 150 | $^\circ C$   |
| $T_J$                 | Operating Junction Temperature Range                  | -55 to 150 | $^\circ C$   |
| $R_{\theta JA}$       | Thermal Resistance Junction-Ambient <sup>1</sup>      | 62         | $^\circ C/W$ |
| $R_{\theta JC}$       | Thermal Resistance Junction-Case <sup>1</sup>         | 3.6        | $^\circ C/W$ |



**Electrical Characteristics ( $T_J=25^{\circ}\text{C}$ , unless otherwise noted)**

| Symbol                       | Parameter                                      | Conditions                                                      | Min. | Typ.  | Max.      | Unit                  |
|------------------------------|------------------------------------------------|-----------------------------------------------------------------|------|-------|-----------|-----------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                                    | 60   | ---   | ---       | V                     |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^{\circ}\text{C}$ , $I_D=1mA$                   | ---  | 0.063 | ---       | $V/^{\circ}\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=15A$                                        | ---  | 22    | 26        | $m\Omega$             |
|                              |                                                | $V_{GS}=4.5V$ , $I_D=10A$                                       | ---  | 30    | 38        |                       |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                                | 1.2  | ---   | 2.5       | V                     |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                                 | ---  | -5.24 | ---       | $mV/^{\circ}\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=48V$ , $V_{GS}=0V$ , $T_J=25^{\circ}\text{C}$           | ---  | ---   | 1         | $\mu A$               |
|                              |                                                | $V_{DS}=48V$ , $V_{GS}=0V$ , $T_J=55^{\circ}\text{C}$           | ---  | ---   | 5         |                       |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                                  | ---  | ---   | $\pm 100$ | nA                    |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=5V$ , $I_D=15A$                                         | ---  | 17    | ---       | S                     |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                            | ---  | 3.2   | ---       | $\Omega$              |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=48V$ , $V_{GS}=4.5V$ , $I_D=12A$                        | ---  | 12.6  | ---       | nC                    |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                                 | ---  | 3.2   | ---       |                       |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                                 | ---  | 6.3   | ---       |                       |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=30V$ , $V_{GS}=10V$ ,<br>$R_G=3.3\Omega$ ,<br>$I_D=10A$ | ---  | 8     | ---       | ns                    |
| $T_r$                        | Rise Time                                      |                                                                 | ---  | 14.2  | ---       |                       |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                                 | ---  | 24.4  | ---       |                       |
| $T_f$                        | Fall Time                                      |                                                                 | ---  | 4.6   | ---       |                       |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=15V$ , $V_{GS}=0V$ , $f=1MHz$                           | ---  | 1378  | ---       | pF                    |
| $C_{oss}$                    | Output Capacitance                             |                                                                 | ---  | 86    | ---       |                       |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                                 | ---  | 64    | ---       |                       |
| $I_S$                        | Continuous Source Current <sup>1,5</sup>       | $V_G=V_D=0V$ , Force Current                                    | ---  | ---   | 23        | A                     |
| $I_{SM}$                     | Pulsed Source Current <sup>2,5</sup>           |                                                                 | ---  | ---   | 46        | A                     |
| $V_{SD}$                     | Diode Forward Voltage <sup>2</sup>             | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^{\circ}\text{C}$               | ---  | ---   | 1.2       | V                     |

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  $\leq 300\mu s$  , duty cycle  $\leq 2\%$
- 3.The EAS data shows Max. rating . The test condition is  $V_{DD}=25V, V_{GS}=10V, L=0.1mH, I_{AS}=22.6A$
- 4.The power dissipation is limited by  $150^{\circ}\text{C}$  junction temperature
- 5.The data is theoretically the same as  $I_D$  and  $I_{DM}$  , in real applications , should be limited by total power dissipation.



## Typical Characteristics

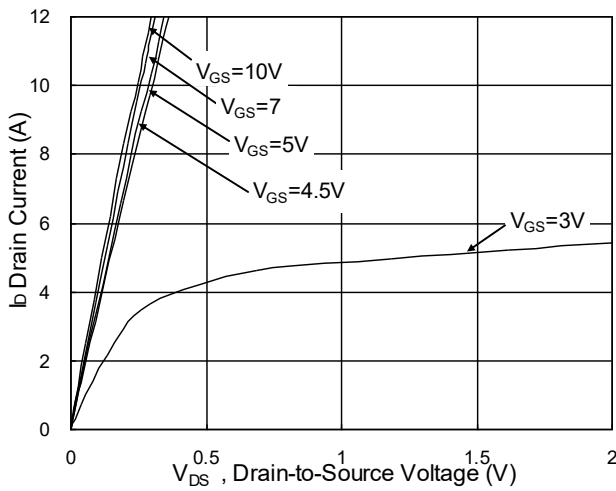


Fig.1 Typical Output Characteristics

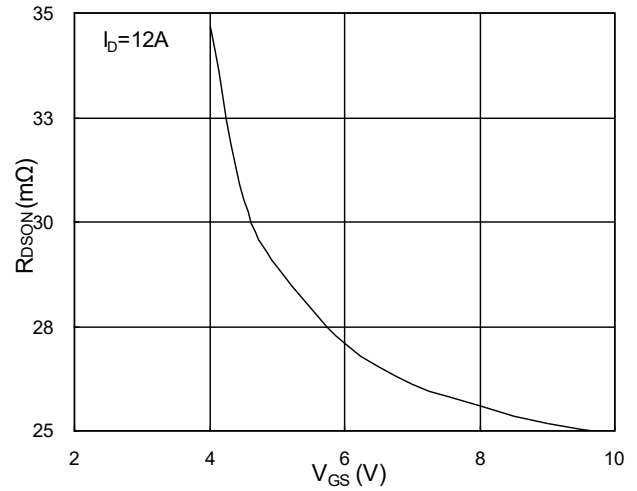


Fig.2 On-Resistance v.s Gate-Source

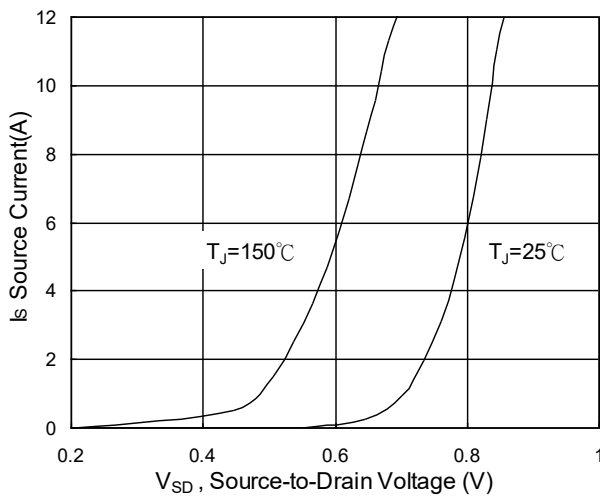


Fig.3 Forward Characteristics of Reverse

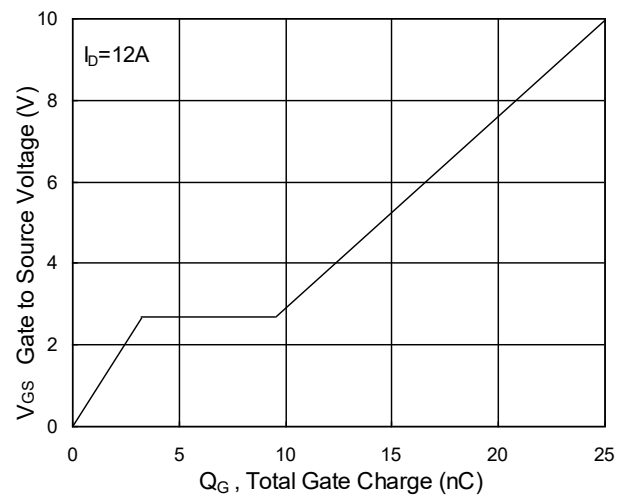


Fig.4 Gate-Charge Characteristics

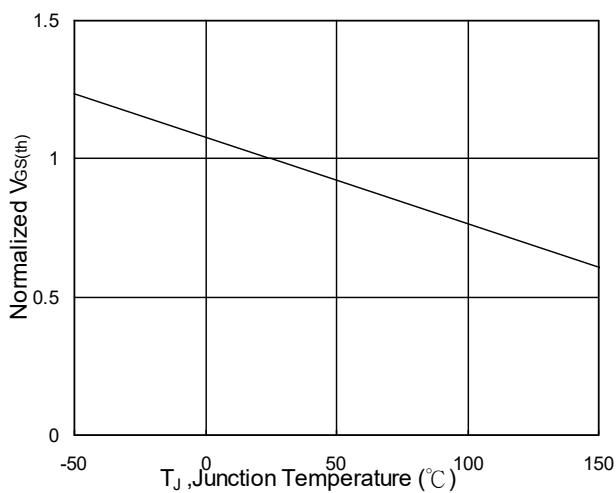


Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$

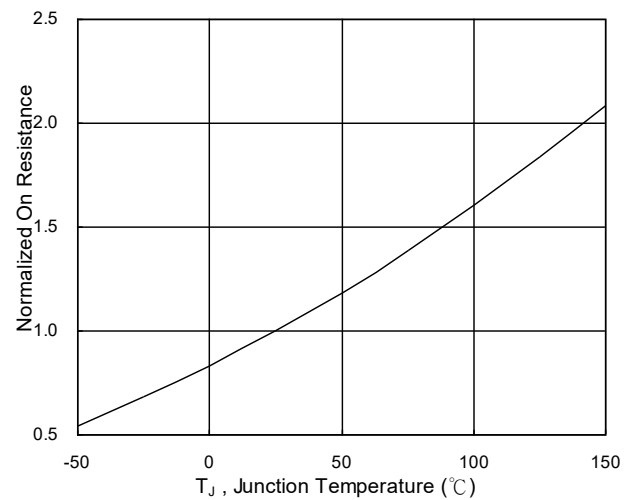


Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$

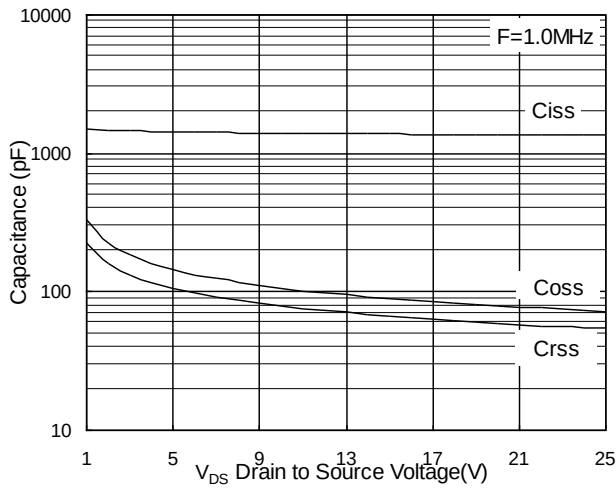


Fig.7 Capacitance

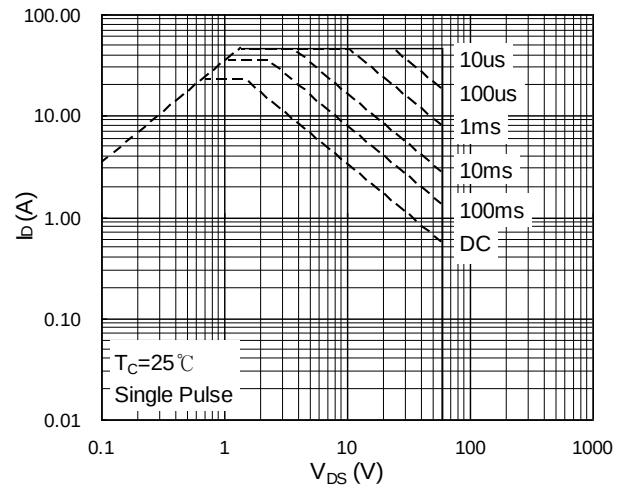


Fig.8 Safe Operating Area

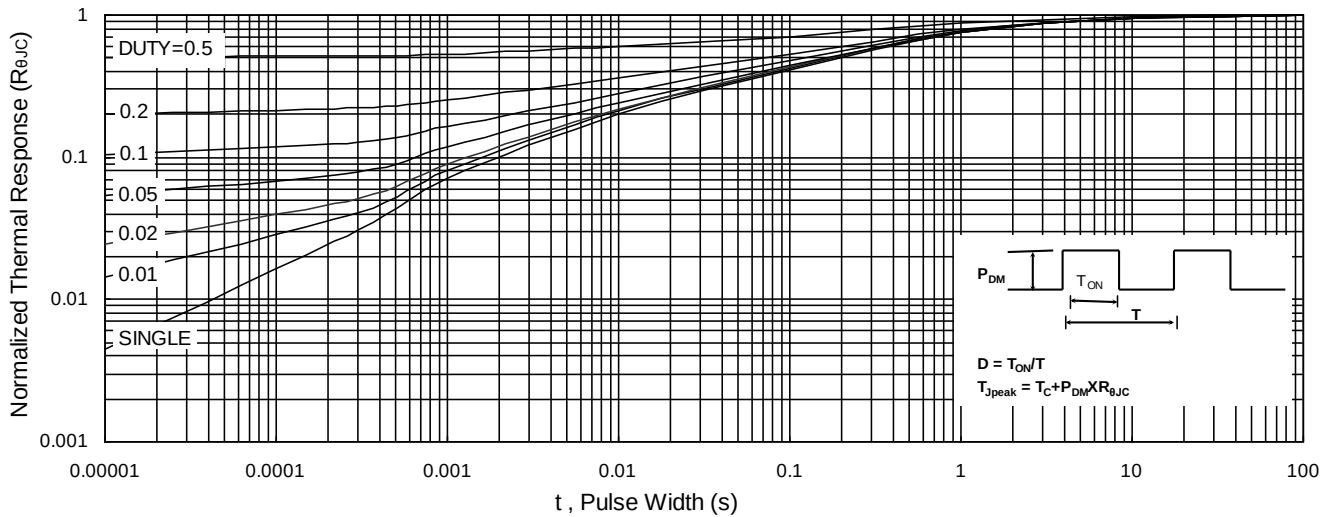


Fig.9 Normalized Maximum Transient Thermal Impedance

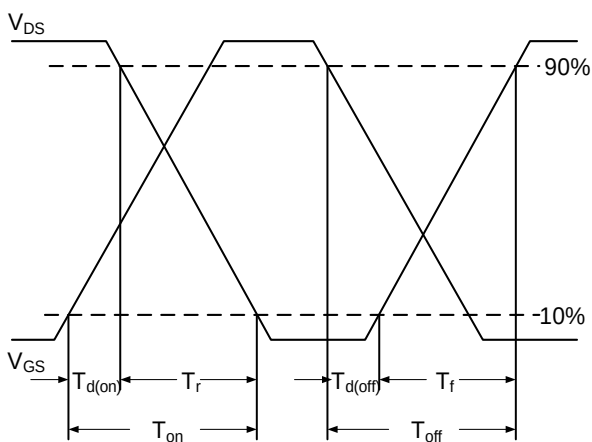


Fig.10 Switching Time Waveform

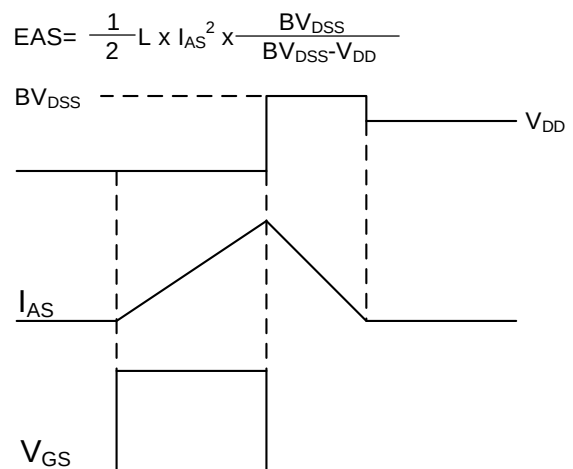


Fig.11 Unclamped Inductive Waveform



## N-Channel Enhancement Mode MOSFET

| Symbol | Dimensions In Millimeters |        | Dimensions In Inches |       |
|--------|---------------------------|--------|----------------------|-------|
|        | Min.                      | Max.   | Min.                 | Max.  |
| A      | 2.200                     | 2.400  | 0.087                | 0.094 |
| A1     | 0.000                     | 0.127  | 0.000                | 0.005 |
| b      | 0.660                     | 0.860  | 0.026                | 0.034 |
| c      | 0.460                     | 0.580  | 0.018                | 0.023 |
| D      | 6.500                     | 6.700  | 0.256                | 0.264 |
| D1     | 5.100                     | 5.460  | 0.201                | 0.215 |
| D2     | 0.483 TYP.                |        | 0.190 TYP.           |       |
| E      | 6.000                     | 6.200  | 0.236                | 0.244 |
| e      | 2.186                     | 2.386  | 0.086                | 0.094 |
| L      | 9.800                     | 10.400 | 0.386                | 0.409 |
| L1     | 2.900 TYP.                |        | 0.114 TYP.           |       |
| L2     | 1.400                     | 1.700  | 0.055                | 0.067 |
| L3     | 1.600 TYP.                |        | 0.063 TYP.           |       |
| L4     | 0.600                     | 1.000  | 0.024                | 0.039 |
| Φ      | 1.100                     | 1.300  | 0.043                | 0.051 |
| θ      | 0°                        | 8°     | 0°                   | 8°    |
| h      | 0.000                     | 0.300  | 0.000                | 0.012 |
| V      | 5.350 TYP.                |        | 0.211 TYP.           |       |



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