



## Description

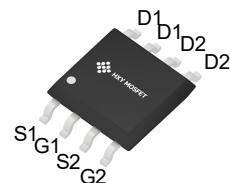
The HFDS3890 uses advanced trench technology to provide excellent  $R_{DS(ON)}$ , low gate charge and operation with gate voltages as low as 2.5V. This device is suitable for use as a Battery protection or in other Switching application.

## General Features

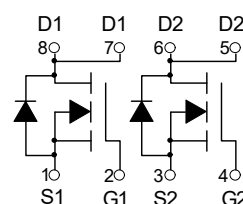
$V_{DS} = 60V$   $I_D = 6.5A$   
 $R_{DS(ON)} < 36m\Omega$  @  $V_{GS}=10V$   
 $R_{DS(ON)} < 48m\Omega$  @  $V_{GS}=4.5V$

## Application

Battery protection  
Load switch  
Uninterruptible power supply



SOP-8  
(SO-8)



Dual N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID | Pack        | Brand      | Qty(PCS) |
|------------|-------------|------------|----------|
| HFDS3890   | SOP-8(SO-8) | HXY MOSFET | 3000     |

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

| Symbol                | Parameter                                                 | Rating     | Units         |
|-----------------------|-----------------------------------------------------------|------------|---------------|
| $V_{DS}$              | Drain-Source Voltage                                      | 60         | V             |
| $V_{GS}$              | Gate-Source Voltage                                       | $\pm 20$   | V             |
| $I_D@T_A=25^{\circ}C$ | Drain Current, $V_{GS}$ @ 4.5V <sup>3</sup>               | 6.5        | A             |
| $I_D@T_A=70^{\circ}C$ | Drain Current, $V_{GS}$ @ 4.5V <sup>3</sup>               | 5          | A             |
| $I_{DM}$              | Pulsed Drain Current <sup>1</sup>                         | 30         | A             |
| $P_D@T_A=25^{\circ}C$ | Total Power Dissipation                                   | 2.1        | W             |
| $T_{STG}$             | Storage Temperature Range                                 | -55 to 150 | $^{\circ}C$   |
| $T_J$                 | Operating Junction Temperature Range                      | -55 to 150 | $^{\circ}C$   |
| $R_{thj-a}$           | Maximum Thermal Resistance, Junction-ambient <sup>3</sup> | 60         | $^{\circ}C/W$ |



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

| Parameter                                     | Symbol              | Condition                                                                                | Min | Typ  | Max  | Unit |
|-----------------------------------------------|---------------------|------------------------------------------------------------------------------------------|-----|------|------|------|
| Off Characteristics                           |                     |                                                                                          |     |      |      |      |
| Drain-Source Breakdown Voltage                | BV <sub>DSS</sub>   | V <sub>GS</sub> =0V I <sub>D</sub> =250μA                                                | 60  | 69   | -    | V    |
| Zero Gate Voltage Drain Current               | I <sub>DSS</sub>    | V <sub>DS</sub> =60V, V <sub>GS</sub> = 0V                                               | -   | -    | 1    | μA   |
| Gate-Body Leakage Current                     | I <sub>GSS</sub>    | V <sub>GS</sub> =±20V, V <sub>DS</sub> = 0V                                              | -   | -    | ±100 | nA   |
| On Characteristics <sup>(Note 3)</sup>        |                     |                                                                                          |     |      |      |      |
| Gate Threshold Voltage                        | V <sub>GS(th)</sub> | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> =250μA                                 | 1.0 | 1.4  | 2.0  | V    |
| Drain-Source On-State Resistance              | R <sub>DS(ON)</sub> | V <sub>GS</sub> =10V, I <sub>D</sub> =6A                                                 |     | 32   | 36   | mΩ   |
|                                               |                     | V <sub>GS</sub> =4.5V, I <sub>D</sub> =4A                                                |     | 34   | 48   | mΩ   |
| Forward Transconductance                      | g <sub>FS</sub>     | V <sub>DS</sub> =5V, I <sub>D</sub> =6A                                                  |     | 20   | -    | S    |
| Dynamic Characteristics <sup>(Note4)</sup>    |                     |                                                                                          |     |      |      |      |
| Input Capacitance                             | C <sub>iss</sub>    | V <sub>DS</sub> =25V, V <sub>GS</sub> =0V,<br>F=1.0MHz                                   |     | 1920 |      | PF   |
| Output Capacitance                            | C <sub>oss</sub>    |                                                                                          |     | 155  |      | PF   |
| Reverse Transfer Capacitance                  | C <sub>rss</sub>    |                                                                                          |     | 116  |      | PF   |
| Switching Characteristics <sup>(Note 4)</sup> |                     |                                                                                          |     |      |      |      |
| Turn-on Delay Time                            | t <sub>d(on)</sub>  | V <sub>DS</sub> =30V, R <sub>L</sub> =4.7Ω<br>V <sub>GS</sub> =10V, R <sub>GEN</sub> =3Ω | -   | 8    | -    | nS   |
| Turn-on Rise Time                             | t <sub>r</sub>      |                                                                                          | -   | 5    | -    | nS   |
| Turn-Off Delay Time                           | t <sub>d(off)</sub> |                                                                                          | -   | 29   | -    | nS   |
| Turn-Off Fall Time                            | t <sub>f</sub>      |                                                                                          | -   | 6    | -    | nS   |
| Total Gate Charge                             | Q <sub>g</sub>      | V <sub>DS</sub> =30V, I <sub>D</sub> =6A,<br>V <sub>GS</sub> =10V                        | -   | 50   | -    | nC   |
| Gate-Source Charge                            | Q <sub>gs</sub>     |                                                                                          | -   | 8    | -    | nC   |
| Gate-Drain Charge                             | Q <sub>gd</sub>     |                                                                                          | -   | 16   | -    | nC   |
| Drain-Source Diode Characteristics            |                     |                                                                                          |     |      |      |      |
| Diode Forward Voltage <sup>(Note 3)</sup>     | V <sub>SD</sub>     | V <sub>GS</sub> =0V, I <sub>S</sub> = 6A                                                 | -   | -    | 1.2  | V    |
| Diode Forward Current <sup>(Note 2)</sup>     | I <sub>S</sub>      |                                                                                          | -   | -    | 7    | A    |
| Reverse Recovery Time                         | t <sub>rr</sub>     | TJ = 25°C, I <sub>F</sub> =7A<br>di/dt = 100A/μs <sup>(Note3)</sup>                      | -   | 35   | -    | nS   |
| Reverse Recovery Charge                       | Q <sub>rr</sub>     |                                                                                          | -   | 43   | -    | nC   |
| Forward Turn-On Time                          | t <sub>on</sub>     | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD)                     |     |      |      |      |

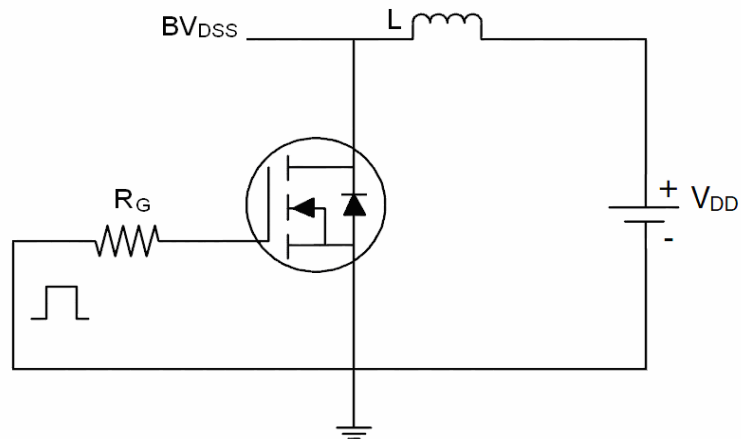
**Notes:**

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to production

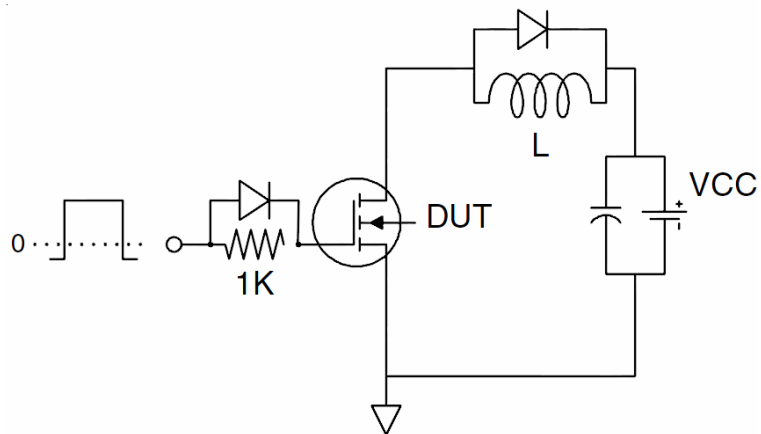


## Test Circuit

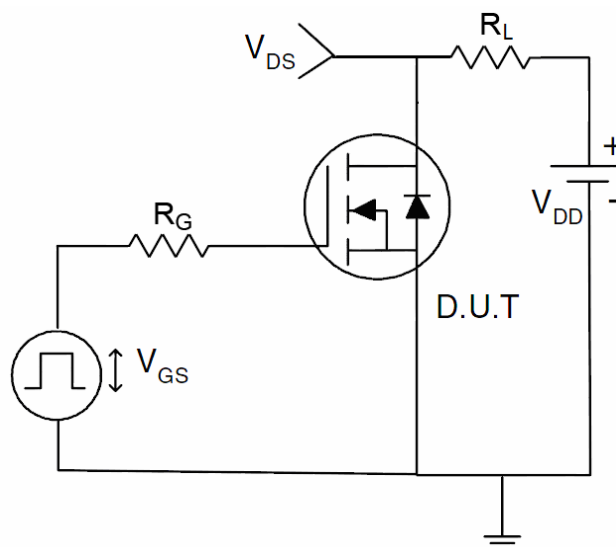
### 1) $E_{AS}$ test Circuits



### 2) Gate charge test Circuit



### 3) Switch Time Test Circuit





## Typical Electrical and Thermal Characteristics (Curves)

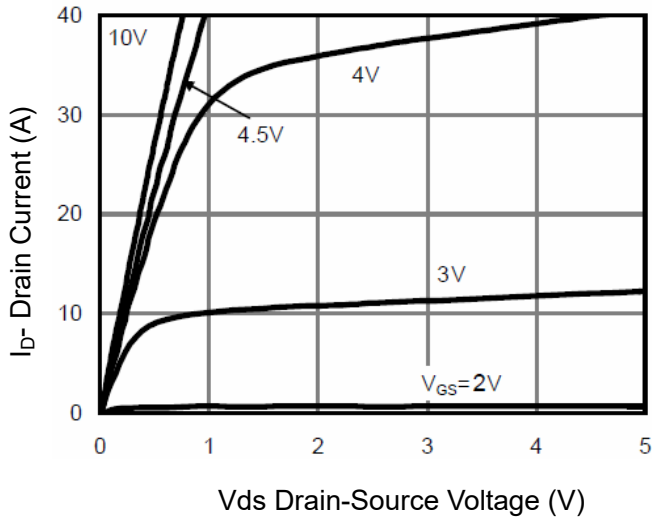


Figure 1 Output Characteristics

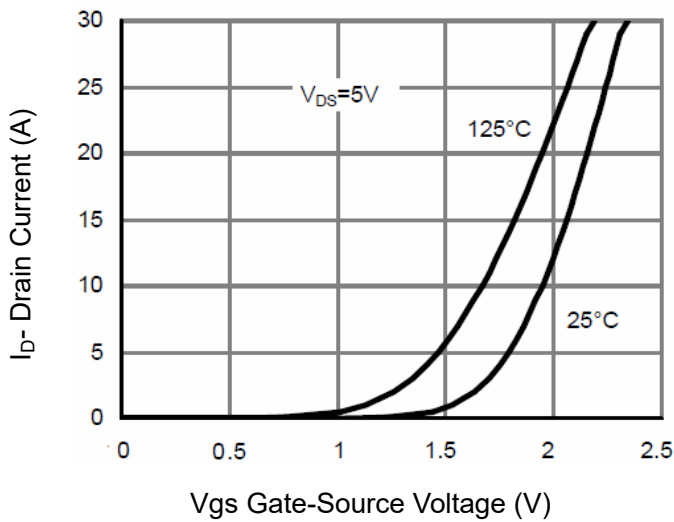


Figure 2 Transfer Characteristics

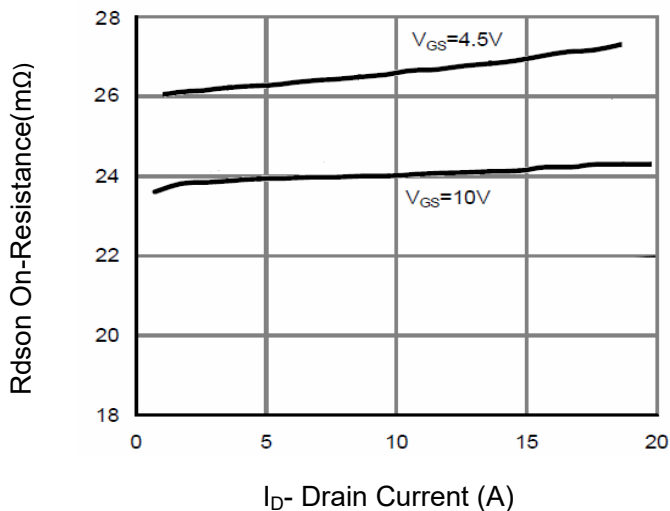


Figure 3  $R_{DS(on)}$ - Drain Current

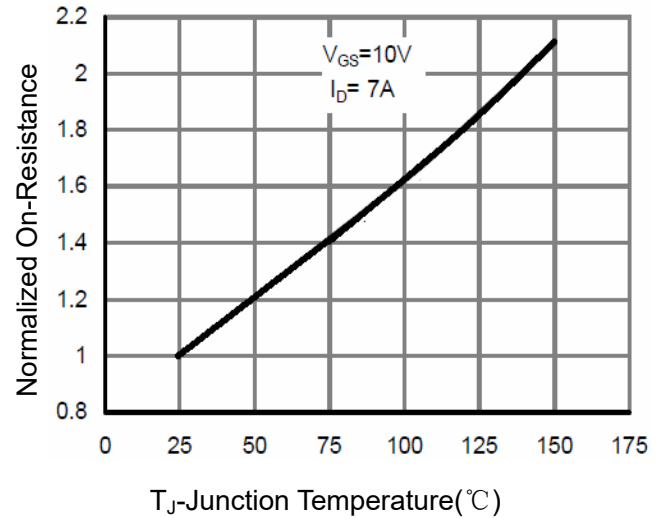


Figure 4  $R_{DS(on)}$ -Junction Temperature

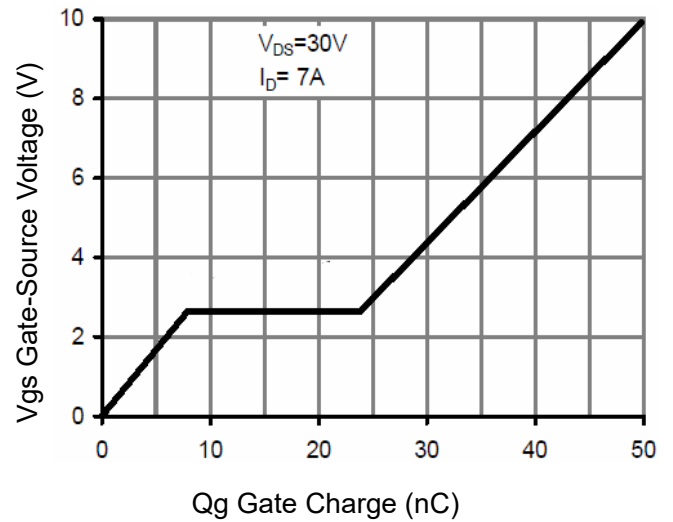


Figure 5 Gate Charge

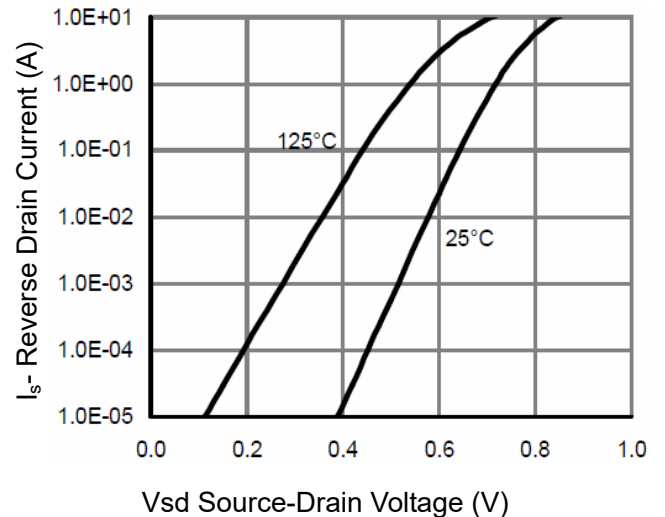
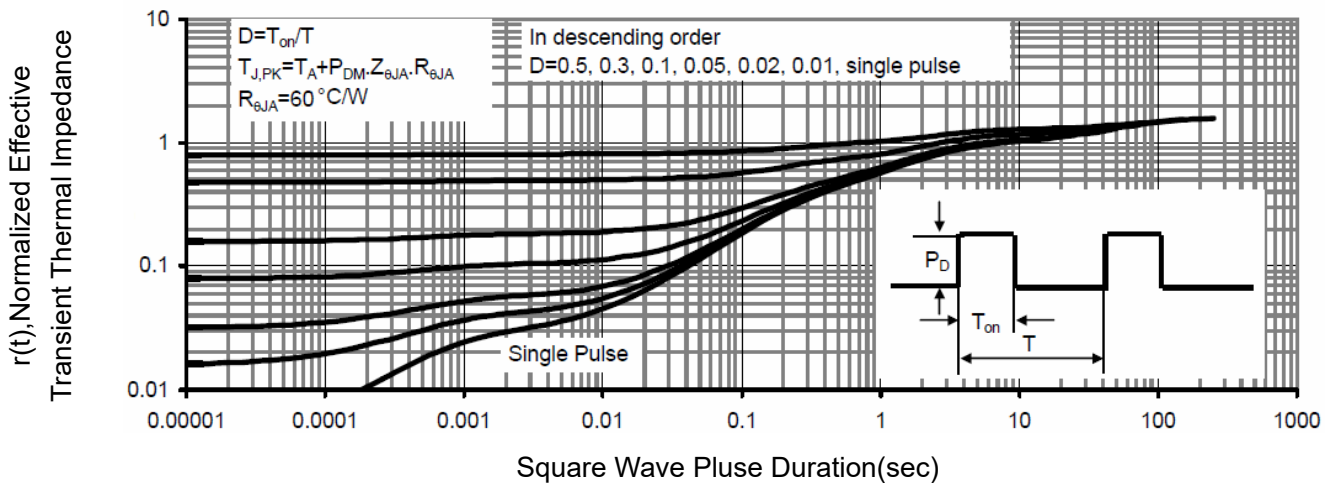
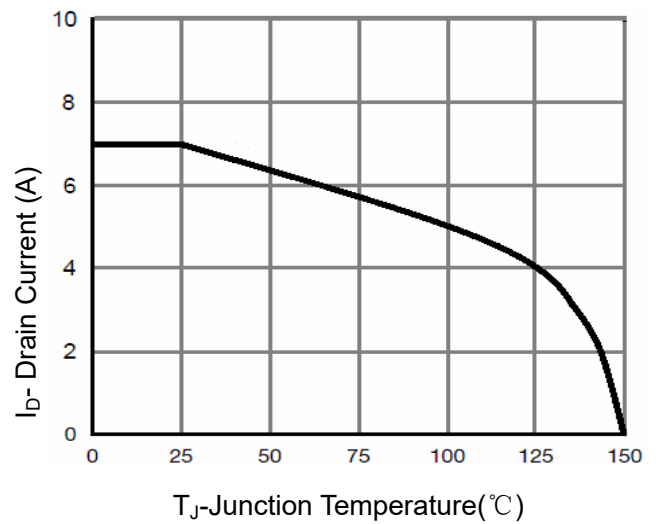
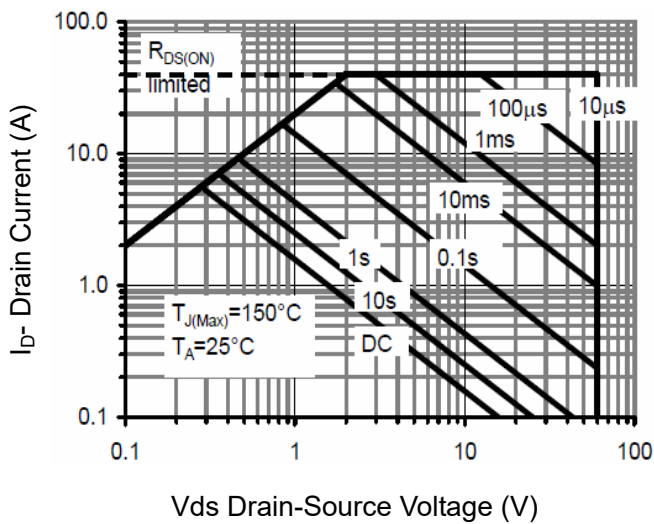
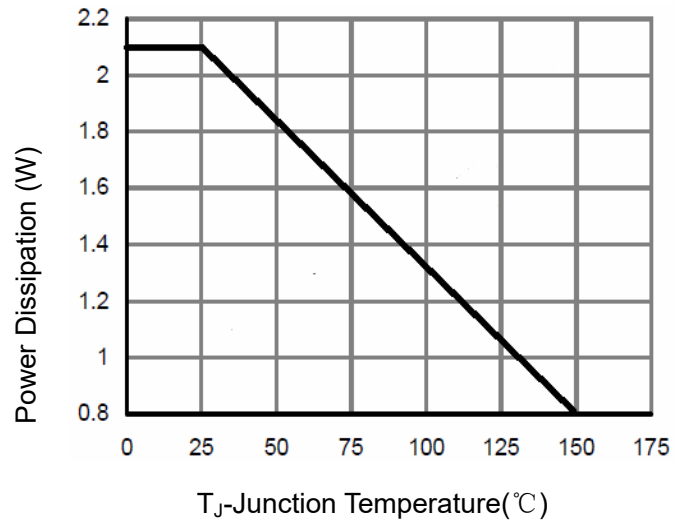
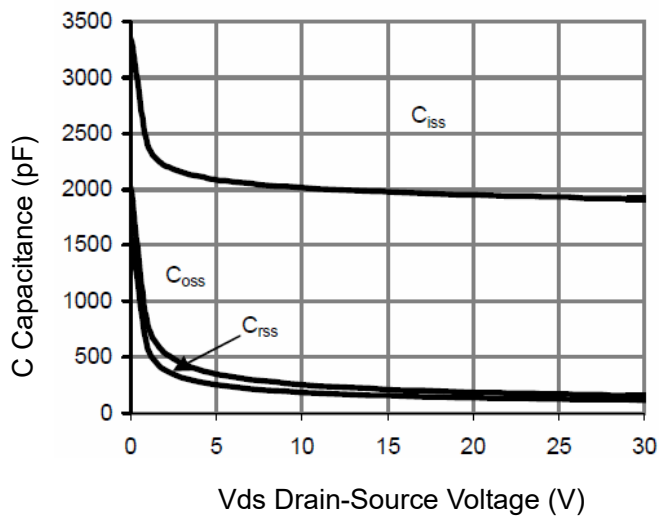
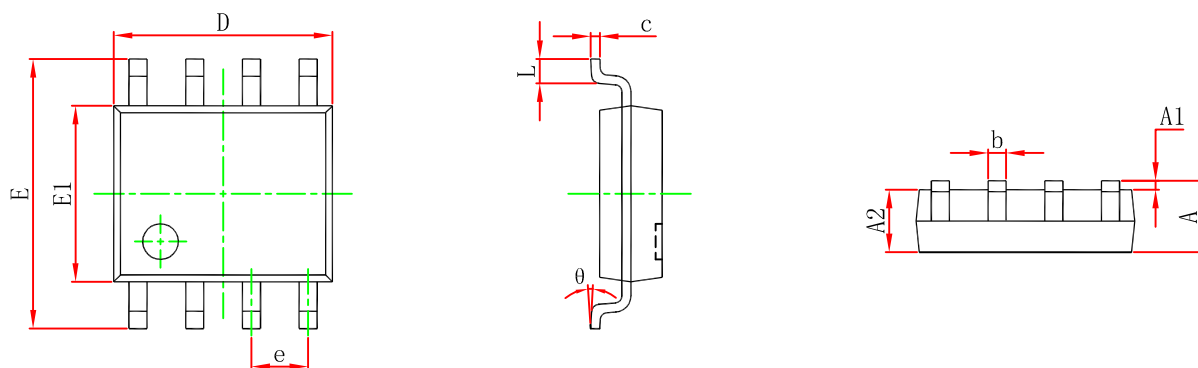


Figure 6 Source- Drain Diode Forward

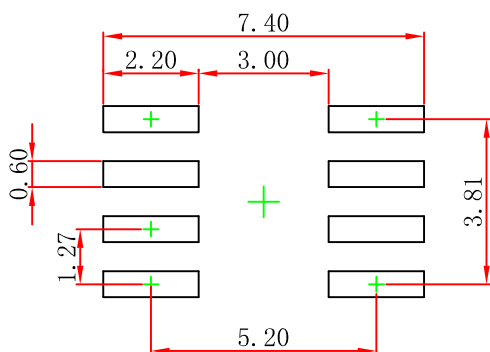




## SOP-8(SO-8) Package Outline Dimensions



| 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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