



## Description

The HRS3E075AT 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

$V_{DS} = -30V$   $I_D = -11A$

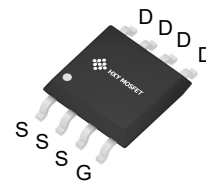
$R_{DS(ON)} < 16m\Omega$  @  $V_{GS}=10V$

## Application

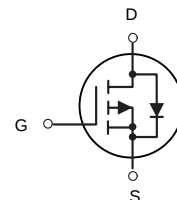
Battery protection

Load switch

Uninterruptible power supply



SOP-8  
(SOIC-8)



P-Channel MOSFET

## Package Marking and Ordering Information

| Product ID | Pack          | Brand      | Qty(PCS) |
|------------|---------------|------------|----------|
| HRS3E075AT | SOP-8(SOIC-8) | HXY MOSFET | 3000     |

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

| Symbol               | Parameter                                                 | Rating     | Units        |
|----------------------|-----------------------------------------------------------|------------|--------------|
| $V_{DS}$             | Drain-Source Voltage                                      | - 30       | V            |
| $V_{GS}$             | Gate-Source Voltage                                       | $\pm 20$   | V            |
| $I_D@T_A=25^\circ C$ | Drain Current <sup>3</sup> , $V_{GS}$ @ 10V               | -11        | A            |
| $I_{DM}$             | Pulsed Drain Current <sup>1</sup>                         | -40        | A            |
| $P_D@T_A=25^\circ C$ | Total Power Dissipation                                   | 3.7        | 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> | 33.8       | $^\circ C/W$ |



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

| Symbol                                                 | Parameter                                                | Test Condition                                                                                  | Min. | Typ. | Max. | Units |
|--------------------------------------------------------|----------------------------------------------------------|-------------------------------------------------------------------------------------------------|------|------|------|-------|
| Off Characteristic                                     |                                                          |                                                                                                 |      |      |      |       |
| V <sub>(BR)DSS</sub>                                   | Drain-Source Breakdown Voltage                           | V <sub>GS</sub> =0V, I <sub>D</sub> = -250μA                                                    | -30  | -    | -    | V     |
| I <sub>DSS</sub>                                       | Zero Gate Voltage Drain Current                          | V <sub>DS</sub> = -30V, V <sub>GS</sub> =0V,                                                    | -    | -    | -1   | μA    |
| I <sub>GSS</sub>                                       | Gate to Body Leakage Current                             | V <sub>DS</sub> =0V, V <sub>GS</sub> = ±20V                                                     | -    | -    | ±100 | nA    |
| On Characteristics                                     |                                                          |                                                                                                 |      |      |      |       |
| V <sub>GS(th)</sub>                                    | Gate Threshold Voltage                                   | V <sub>DS</sub> =V <sub>GS</sub> , I <sub>D</sub> = -250μA                                      | -1.0 | -1.6 | -2.5 | V     |
| R <sub>DS(on)</sub>                                    | Static Drain-Source on-Resistance<br>Note3               | V <sub>GS</sub> = -10V, I <sub>D</sub> = -10A                                                   | -    | 13   | 16   | mΩ    |
|                                                        |                                                          | V <sub>GS</sub> = -4.5V, I <sub>D</sub> = -5A                                                   | -    | 18   | 27   |       |
| Dynamic Characteristics                                |                                                          |                                                                                                 |      |      |      |       |
| C <sub>iss</sub>                                       | Input Capacitance                                        | V <sub>DS</sub> = -15V, V <sub>GS</sub> =0V,<br>f=1.0MHz                                        | -    | 1330 | -    | pF    |
| C <sub>oss</sub>                                       | Output Capacitance                                       |                                                                                                 | -    | 183  | -    | pF    |
| C <sub>rss</sub>                                       | Reverse Transfer Capacitance                             |                                                                                                 | -    | 156  | -    | pF    |
| Q <sub>g</sub>                                         | Total Gate Charge                                        | V <sub>DS</sub> = -15V, I <sub>D</sub> = -5A,<br>V <sub>GS</sub> = -10V                         | -    | 22   | -    | nC    |
| Q <sub>gs</sub>                                        | Gate-Source Charge                                       |                                                                                                 | -    | 1.0  | -    | nC    |
| Q <sub>gd</sub>                                        | Gate-Drain(“Miller”) Charge                              |                                                                                                 | -    | 1.8  | -    | nC    |
| Switching Characteristics                              |                                                          |                                                                                                 |      |      |      |       |
| t <sub>d(on)</sub>                                     | Turn-on Delay Time                                       | V <sub>DD</sub> = -15V, I <sub>D</sub> = -10A,<br>V <sub>GS</sub> =-10V, R <sub>GEN</sub> =2.5Ω | -    | 9    | -    | ns    |
| t <sub>r</sub>                                         | Turn-on Rise Time                                        |                                                                                                 | -    | 13   | -    | ns    |
| t <sub>d(off)</sub>                                    | Turn-off Delay Time                                      |                                                                                                 | -    | 48   | -    | ns    |
| t <sub>f</sub>                                         | Turn-off Fall Time                                       |                                                                                                 | -    | 20   | -    | ns    |
| Drain-Source Diode Characteristics and Maximum Ratings |                                                          |                                                                                                 |      |      |      |       |
| I <sub>S</sub>                                         | Maximum Continuous Drain to Source Diode Forward Current |                                                                                                 | -    | -    | -11  | A     |
| I <sub>SM</sub>                                        | Maximum Pulsed Drain to Source Diode Forward Current     |                                                                                                 | -    | -    | -40  | A     |
| V <sub>SD</sub>                                        | Drain to Source Diode Forward Voltage                    | V <sub>GS</sub> =0V, I <sub>S</sub> = -15A                                                      | -    | -0.8 | -1.2 | V     |
| t <sub>rr</sub>                                        | Reverse Recovery Time                                    | T <sub>J</sub> =25℃,                                                                            | -    | 64   | -    | ns    |
| Q <sub>rr</sub>                                        | Reverse Recovery Charge                                  | V <sub>DD</sub> = -24V, I <sub>F</sub> =-2.8A,<br>dI/dt=-100A/μs                                | -    | 25   | -    | nC    |

Notes:1. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature

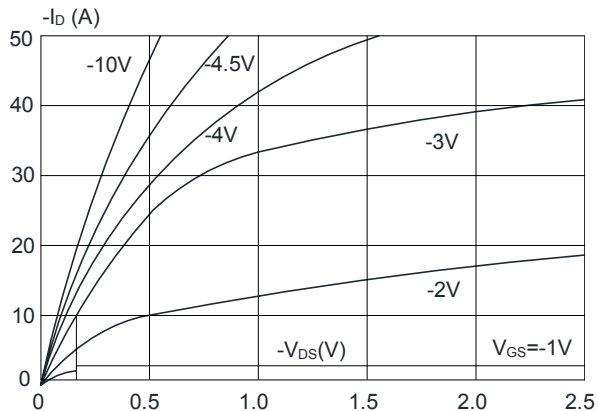
2. EAS condition:  $T_J=25^\circ\text{C}$ ,  $V_{GS}=10V$ ,  $R_G=25\Omega$ ,  $L=0.5mH$ ,  $I_{AS}=-12.7A$

3. Pulse Test: Pulse Width $\leq 300\mu s$ , Duty Cycle $\leq 0.5\%$

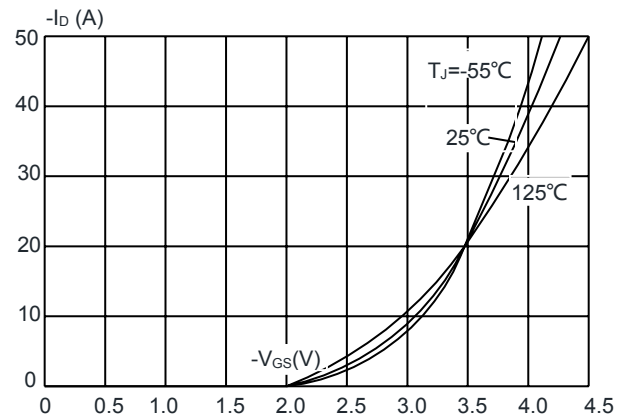


## Typical Characteristics

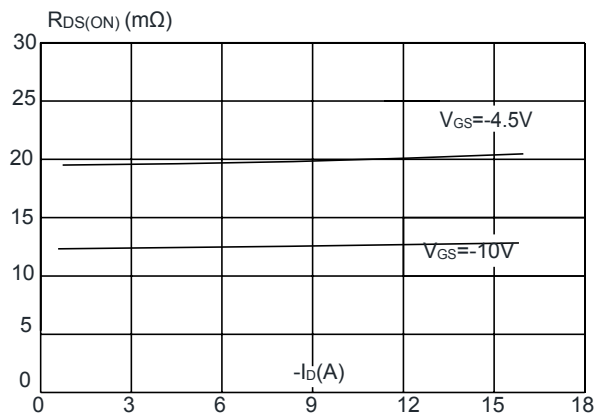
**Figure1:** Output Characteristics



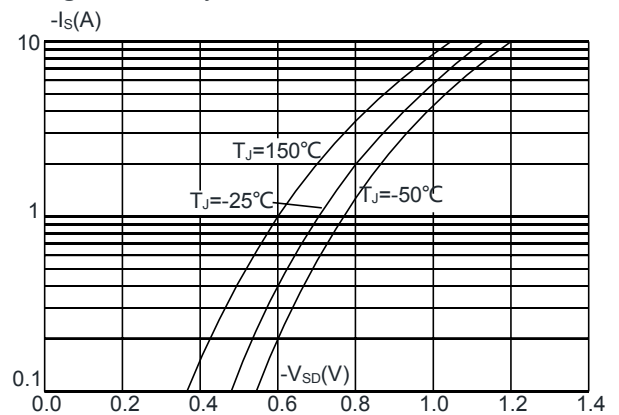
**Figure 2:** Typical Transfer Characteristics



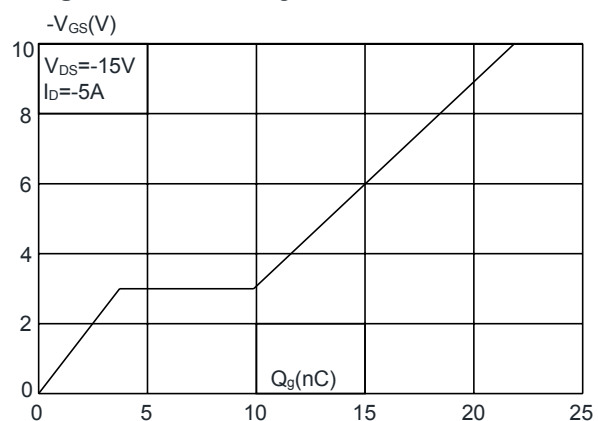
**Figure 3:** On-resistance vs. Drain Current



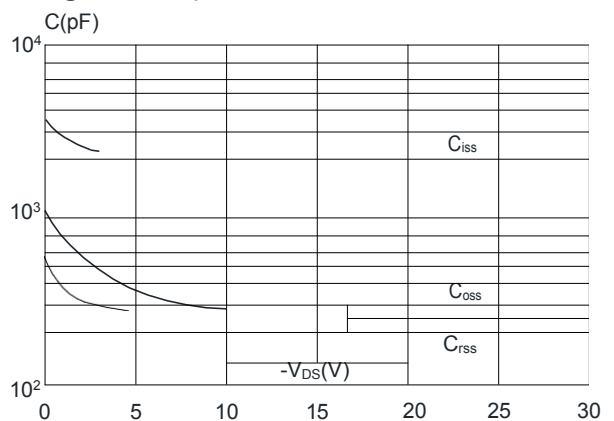
**Figure 4:** Body Diode Characteristics



**Figure 5:** Gate Charge Characteristics

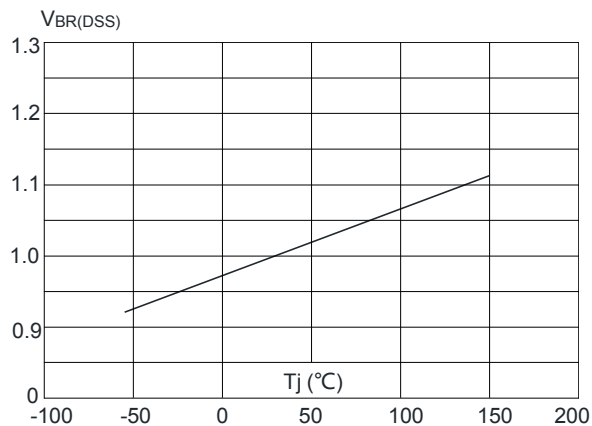


**Figure 6:** Capacitance Characteristics

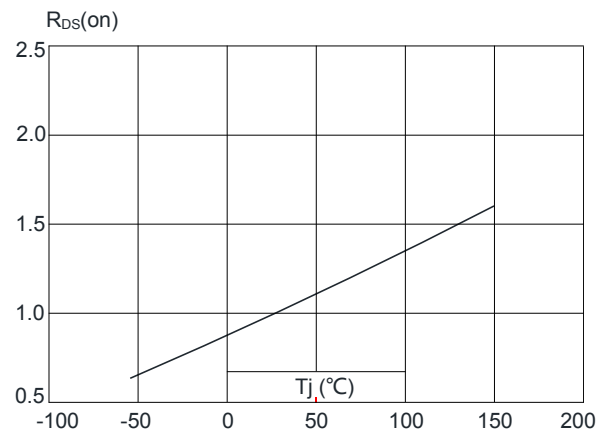




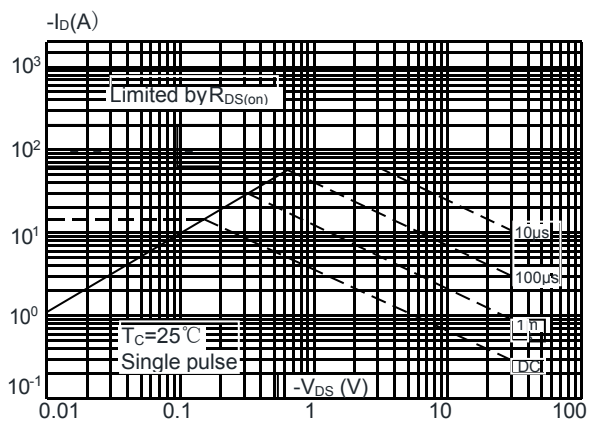
**Figure 7:** Normalized Breakdown Voltage vs. Junction Temperature



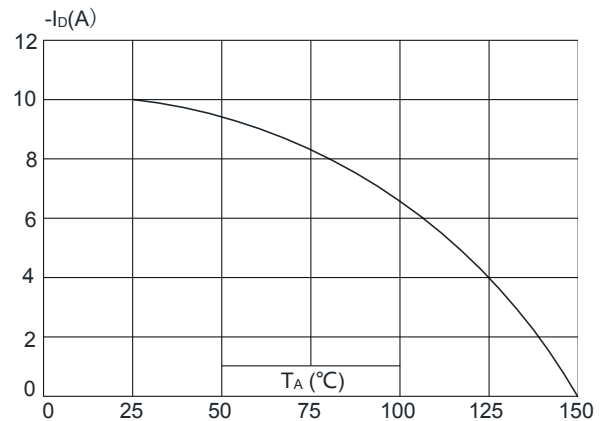
**Figure 8:** Normalized on Resistance vs. Junction Temperature



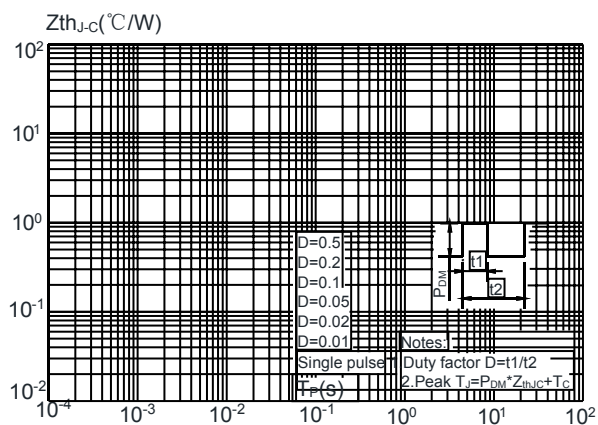
**Figure 9:** Maximum Safe Operating Area



**Figure 10:** Maximum Continuous Drain Current vs. Ambient Temperature



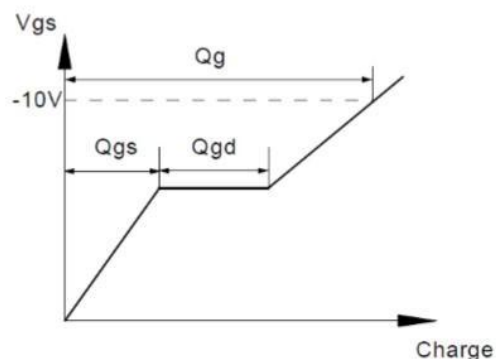
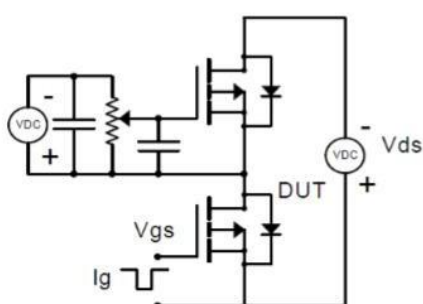
**Figure.11:** Maximum Effective Transient Thermal Impedance, Junction-to-Case



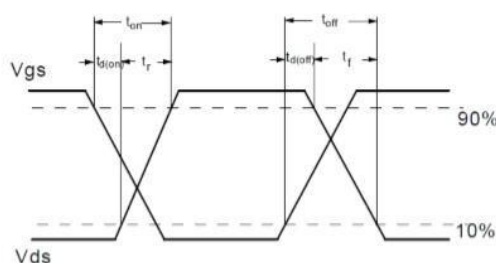
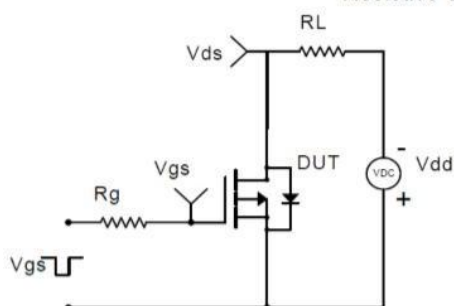


## Test Circuit

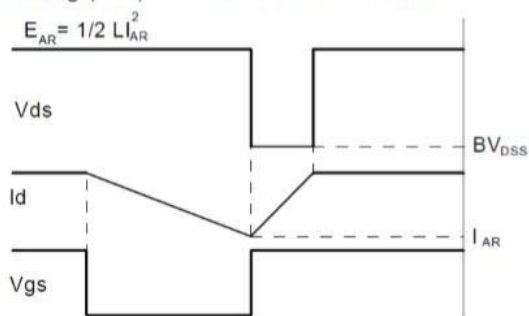
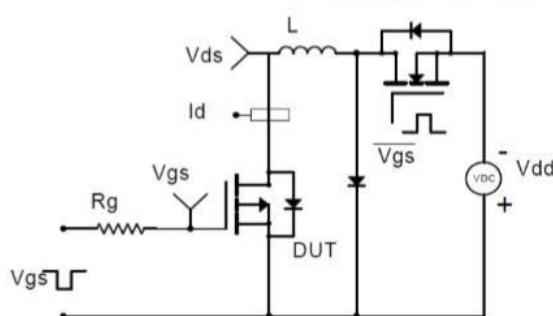
Gate Charge Test Circuit & Waveform



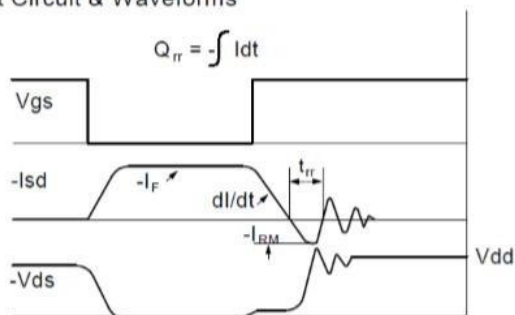
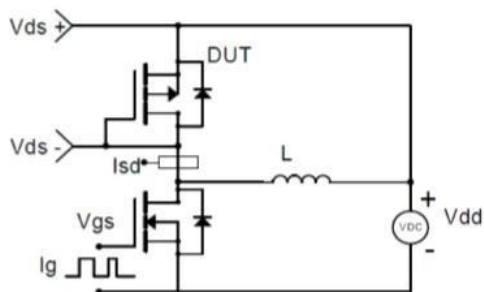
Resistive Switching Test Circuit & Waveforms



Unclamped Inductive Switching (UIS) Test Circuit & Waveforms

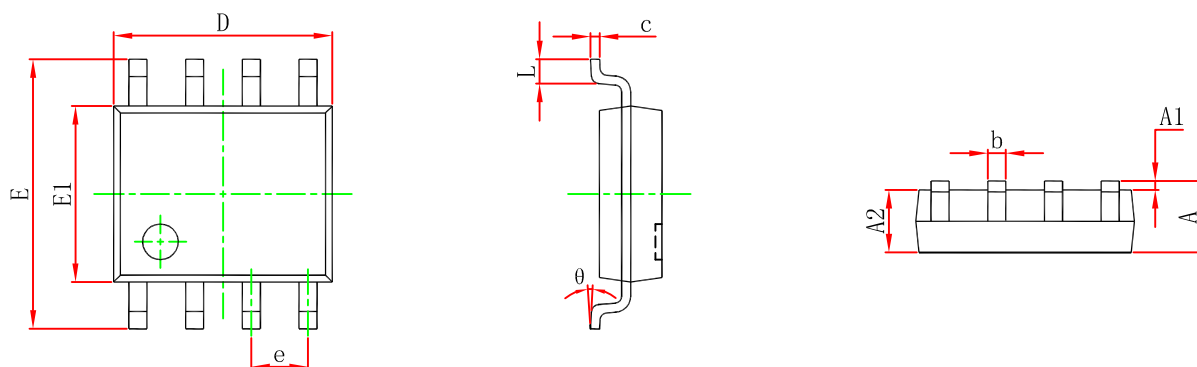


Diode Recovery Test Circuit & Waveforms

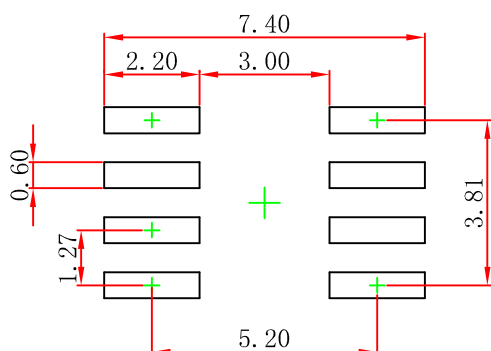




## SOP-8(SOIC-8) Package Outline Dimensions



| 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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