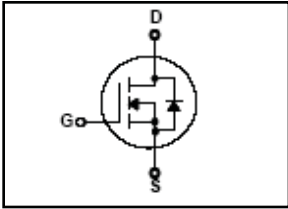
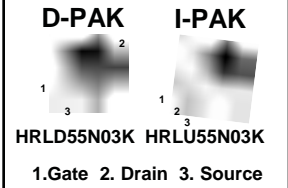


## HRLD55N03K / HRLU55N03K 30V N-Channel Trench MOSFET

$BV_{DSS} = 30\text{ V}$   
 $R_{DS(on) \text{ typ}} = 4.2\text{ m}\Omega$   
 $I_D = 100\text{ A}$



### FEATURES

- Originative New Design
- Superior Avalanche Rugged Technology
- Excellent Switching Characteristics
- Unrivalled Gate Charge : 50nC (Typ.)
- Extended Safe Operating Area
- Lower  $R_{DS(ON)}$  : 4.2 m $\Omega$  (Typ.) @  $V_{GS}=10\text{V}$
- Lower  $R_{DS(ON)}$  : 7.5 m $\Omega$  (Typ.) @  $V_{GS}=4.5\text{V}$
- 100% Avalanche Tested

### Absolute Maximum Ratings $T_C=25^\circ\text{C}$ unless otherwise specified

| Symbol         | Parameter                                                                           | Value       | Units               |
|----------------|-------------------------------------------------------------------------------------|-------------|---------------------|
| $V_{DSS}$      | Drain-Source Voltage                                                                | 30          | V                   |
| $I_D$          | Drain Current – Continuous ( $T_C = 25^\circ\text{C}$ )                             | 100 *       | A                   |
|                | Drain Current – Continuous ( $T_C = 100^\circ\text{C}$ )                            | 70 *        | A                   |
| $I_{DM}$       | Drain Current – Pulsed (Note 1)                                                     | 310 *       | A                   |
| $V_{GS}$       | Gate-Source Voltage                                                                 | $\pm 20$    | V                   |
| $E_{AS}$       | Single Pulsed Avalanche Energy (Note 2)                                             | 300         | mJ                  |
| $E_{AR}$       | Repetitive Avalanche Energy (Note 1)                                                | 7.5         | mJ                  |
| $P_D$          | Power Dissipation ( $T_A = 25^\circ\text{C}$ )*                                     | 3           | W                   |
|                | Power Dissipation ( $T_C = 25^\circ\text{C}$ )<br>- Derate above $25^\circ\text{C}$ | 75          | W                   |
|                |                                                                                     | 0.5         | W/ $^\circ\text{C}$ |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                                             | -55 to +175 | $^\circ\text{C}$    |
| $T_L$          | Maximum lead temperature for soldering purposes,<br>1/8" from case for 5 seconds    | 300         | $^\circ\text{C}$    |

\* Drain current limited by maximum junction temperature

### Thermal Resistance Characteristics

| Symbol          | Parameter            | Typ. | Max. | Units              |
|-----------------|----------------------|------|------|--------------------|
| $R_{\theta JC}$ | Junction-to-Case     | --   | 2.0  | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Junction-to-Ambient* | --   | 50   |                    |
| $R_{\theta JA}$ | Junction-to-Ambient  | --   | 110  |                    |

\* When mounted on the minimum pad size recommended (PCB Mount)

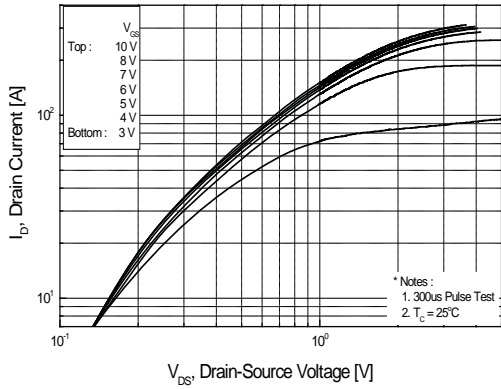
**Electrical Characteristics**  $T_J=25\text{ }^\circ\text{C}$  unless otherwise specified

| Symbol                                                        | Parameter                                     | Test Conditions                                                                | Min | Typ  | Max       | Units         |
|---------------------------------------------------------------|-----------------------------------------------|--------------------------------------------------------------------------------|-----|------|-----------|---------------|
| <b>On Characteristics</b>                                     |                                               |                                                                                |     |      |           |               |
| $V_{GS}$                                                      | Gate Threshold Voltage                        | $V_{DS} = V_{GS}, I_D = 250\ \mu\text{A}$                                      | 1.0 | --   | 2.4       | V             |
| $R_{DS(ON)}$                                                  | Static Drain-Source On-Resistance             | $V_{GS} = 10\ \text{V}, I_D = 20\ \text{A}$                                    | --  | 4.2  | 5.5       | m $\Omega$    |
|                                                               |                                               | $V_{GS} = 4.5\ \text{V}, I_D = 20\ \text{A}$                                   | --  | 7.5  | 9         | m $\Omega$    |
| $g_{FS}$                                                      | Forward Transconductance                      | $V_{DS} = 15, I_D = 20\ \text{A}$                                              | --  | 60   | --        | S             |
| <b>Off Characteristics</b>                                    |                                               |                                                                                |     |      |           |               |
| $BV_{DSS}$                                                    | Drain-Source Breakdown Voltage                | $V_{GS} = 0\ \text{V}, I_D = 250\ \mu\text{A}$                                 | 30  | --   | --        | V             |
| $I_{DSS}$                                                     | Zero Gate Voltage Drain Current               | $V_{DS} = 24\ \text{V}, V_{GS} = 0\ \text{V}$                                  | --  | --   | 1         | $\mu\text{A}$ |
|                                                               |                                               | $V_{DS} = 24\ \text{V}, T_J = 125\text{ }^\circ\text{C}$                       | --  | --   | 100       | $\mu\text{A}$ |
| $I_{GSS}$                                                     | Gate-Body Leakage Current                     | $V_{GS} = \pm 20\ \text{V}, V_{DS} = 0\ \text{V}$                              | --  | --   | $\pm 100$ | nA            |
| <b>Dynamic Characteristics</b>                                |                                               |                                                                                |     |      |           |               |
| $C_{iss}$                                                     | Input Capacitance                             | $V_{DS} = 25\ \text{V}, V_{GS} = 0\ \text{V}, f = 1.0\ \text{MHz}$             | --  | 1950 | --        | pF            |
| $C_{oss}$                                                     | Output Capacitance                            |                                                                                | --  | 250  | --        | pF            |
| $C_{riss}$                                                    | Reverse Transfer Capacitance                  |                                                                                | --  | 190  | --        | pF            |
| $R_g$                                                         | Gate Resistance                               | $V_{GS} = 0\ \text{V}, V_{DS} = 0\ \text{V}, f = 1\text{MHz}$                  | --  | 1    | --        | $\Omega$      |
| <b>Switching Characteristics</b>                              |                                               |                                                                                |     |      |           |               |
| $t_{d(on)}$                                                   | Turn-On Time                                  | $V_{DS} = 15\ \text{V}, I_D = 20\ \text{A}, R_G = 6\ \Omega$                   | --  | 15   | --        | ns            |
| $t_r$                                                         | Turn-On Rise Time                             |                                                                                | --  | 20   | --        | ns            |
| $t_{d(off)}$                                                  | Turn-Off Delay Time                           |                                                                                | --  | 65   | --        | ns            |
| $t_f$                                                         | Turn-Off Fall Time                            |                                                                                | --  | 70   | --        | ns            |
| $Q_g$                                                         | Total Gate Charge                             | $V_{DS} = 24\ \text{V}, I_D = 20\ \text{A}, V_{GS} = 10\ \text{V}$             | --  | 50   | --        | nC            |
| $Q_{gs}$                                                      | Gate-Source Charge                            |                                                                                | --  | 8    | --        | nC            |
| $Q_{gd}$                                                      | Gate-Drain Charge                             |                                                                                | --  | 8    | --        | nC            |
| <b>Source-Drain Diode Maximum Ratings and Characteristics</b> |                                               |                                                                                |     |      |           |               |
| $I_S$                                                         | Continuous Source-Drain Diode Forward Current |                                                                                | --  | --   | 100       | A             |
| $I_{SM}$                                                      | Pulsed Source-Drain Diode Forward Current     |                                                                                | --  | --   | 310       |               |
| $V_{SD}$                                                      | Source-Drain Diode Forward Voltage            | $I_S = 20\ \text{A}, V_{GS} = 0\ \text{V}$                                     | --  | --   | 1.3       | V             |
| $t_{rr}$                                                      | Reverse Recovery Time                         | $I_S = 20\ \text{A}, V_{GS} = 0\ \text{V}, di_F/dt = 55\ \text{A}/\mu\text{s}$ | --  | 20   | --        | ns            |
| $Q_{rr}$                                                      | Reverse Recovery Charge                       |                                                                                | --  | 10   | --        | nC            |

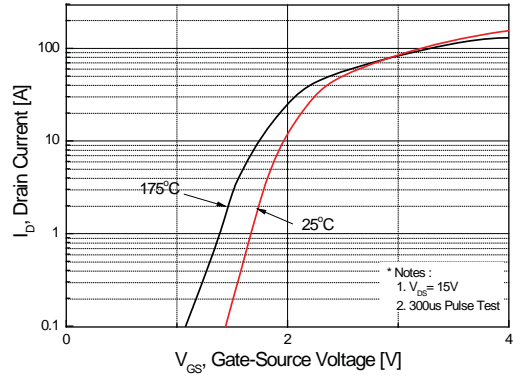
**Notes :**

1. Repetitive Rating : Pulse width limited by maximum junction temperature
2.  $L=1\text{mH}, I_{AS}=10\text{A}, V_{DD}=25\text{V}, R_G=25\Omega,$  Starting  $T_J=25^\circ\text{C}$

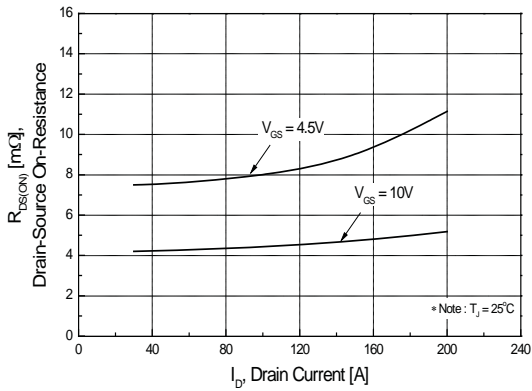
## Typical Characteristics



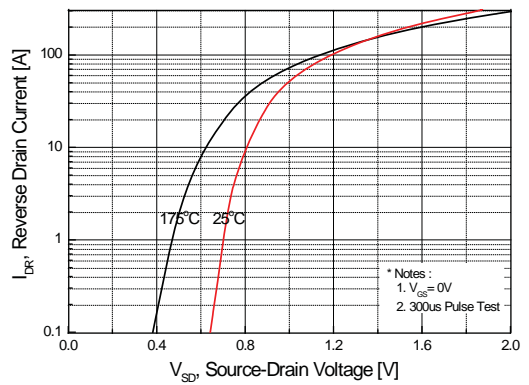
**Figure 1. On Region Characteristics**



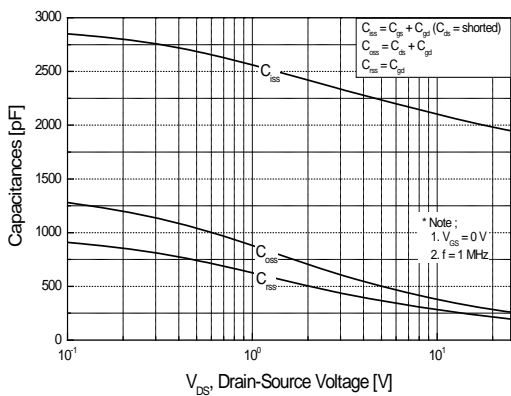
**Figure 2. Transfer Characteristics**



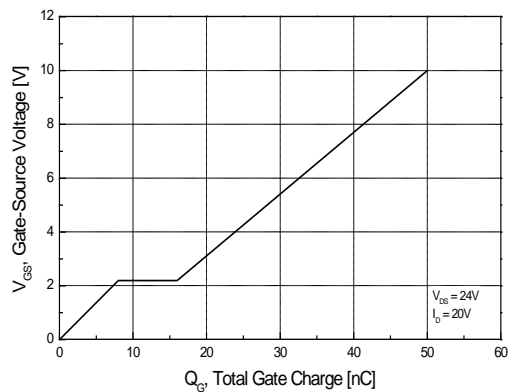
**Figure 3. On Resistance Variation vs Drain Current and Gate Voltage**



**Figure 4. Body Diode Forward Voltage Variation with Source Current and Temperature**

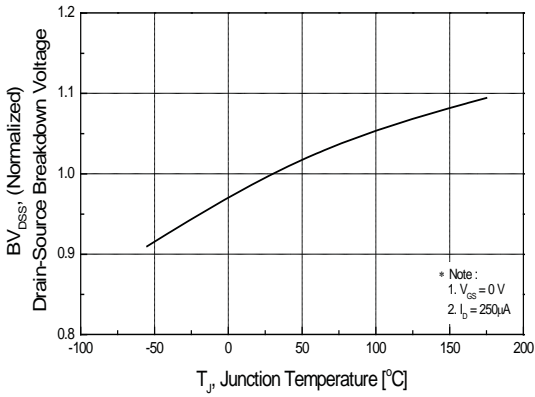


**Figure 5. Capacitance Characteristics**

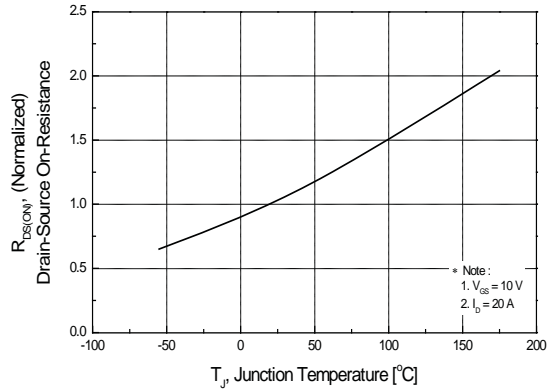


**Figure 6. Gate Charge Characteristics**

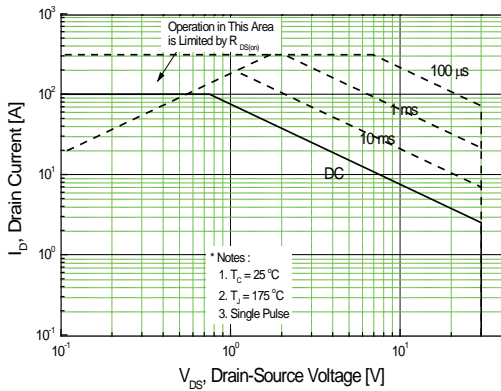
**Typical Characteristics (continued)**



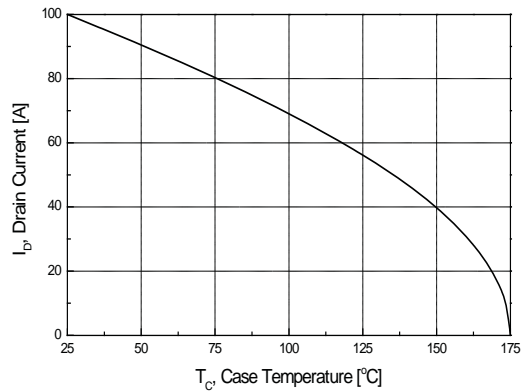
**Figure 7. Breakdown Voltage Variation vs Temperature**



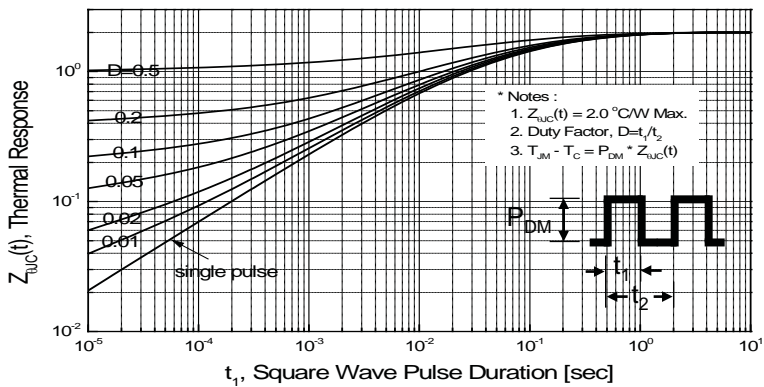
**Figure 8. On-Resistance Variation vs Temperature**



**Figure 9. Maximum Safe Operating Area**



**Figure 10. Maximum Drain Current vs Case Temperature**



**Figure 11. Transient Thermal Response Curve**

**Fig 12. Gate Charge Test Circuit & Waveform**



**Fig 13. Resistive Switching Test Circuit & Waveforms**



**Fig 14. Unclamped Inductive Switching Test Circuit & Waveforms**



Fig 15. Peak Diode Recovery dv/dt Test Circuit & Waveforms



Package Dimension

D-PAK  
(TO-252A)

