



## Description

The HSNN1000L10D 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

$V_{DS} = 100V$   $I_D = 20A$

$R_{DS(ON)} < 87m\Omega$  @  $V_{GS}=10V$

## Application

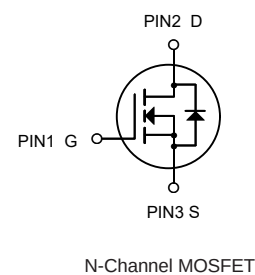
Battery protection

Load switch

Uninterruptible power supply



TO-252-2L



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID   | Pack      | Brand      | Qty(PCS) |
|--------------|-----------|------------|----------|
| HSNN1000L10D | 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                                  | 100        | 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> | 20         | A            |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS}$ @ 10V <sup>1</sup> | 10         | A            |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>                     | 30         | A            |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup>            | 6.1        | mJ           |
| $I_{AS}$              | Avalanche Current                                     | 15         | 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                 | $V_{GS}=0V$ , $I_D=250\mu A$                               | 100  | ---   | ---       | V                   |
| $\Delta BV_{DSS}/\Delta T$ | BVDSS Temperature Coefficient                  | Reference to $25^\circ\text{C}$ , $I_D=1mA$                | ---  | 0.098 | ---       | $V/^\circ\text{C}$  |
| $R_{DS(ON)}$               | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=10A$                                   | ---  | 80    | 87        | $m\Omega$           |
|                            |                                                | $V_{GS}=4.5V$ , $I_D=8A$                                   | ---  | 95    | 105       | $m\Omega$           |
| $V_{GS(th)}$               | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                           | 1.0  | ---   | 2.5       | V                   |
| $\Delta V_{GS(th)}$        | $V_{GS(th)}$ Temperature Coefficient           |                                                            | ---  | -4.57 | ---       | $mV/^\circ\text{C}$ |
| $I_{DSS}$                  | Drain-Source Leakage Current                   | $V_{DS}=80V$ , $V_{GS}=0V$ , $T_J=25^\circ\text{C}$        | ---  | ---   | 1         | $\mu A$             |
|                            |                                                | $V_{DS}=80V$ , $V_{GS}=0V$ , $T_J=55^\circ\text{C}$        | ---  | ---   | 5         | $\mu A$             |
| $I_{GSS}$                  | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                             | ---  | ---   | $\pm 100$ | nA                  |
| $g_{fs}$                   | Forward Transconductance                       | $V_{DS}=5V$ , $I_D=10A$                                    | ---  | 13    | ---       | S                   |
| $R_g$                      | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                       | ---  | 2     | ---       | $\Omega$            |
| $Q_g$                      | Total Gate Charge (10V)                        | $V_{DS}=80V$ , $V_{GS}=10V$ , $I_D=10A$                    | ---  | 26.2  | ---       | nC                  |
| $Q_{gs}$                   | Gate-Source Charge                             |                                                            | ---  | 4.6   | ---       |                     |
| $Q_{gd}$                   | Gate-Drain Charge                              |                                                            | ---  | 5.1   | ---       |                     |
| $T_{d(on)}$                | Turn-On Delay Time                             | $V_{DD}=50V$ , $V_{GS}=10V$ , $R_G=3.3\Omega$<br>$I_D=10A$ | ---  | 4.2   | ---       | ns                  |
| $T_r$                      | Rise Time                                      |                                                            | ---  | 8.2   | ---       |                     |
| $T_{d(off)}$               | Turn-Off Delay Time                            |                                                            | ---  | 35.6  | ---       |                     |
| $T_f$                      | Fall Time                                      |                                                            | ---  | 9.6   | ---       |                     |
| $C_{iss}$                  | Input Capacitance                              | $V_{DS}=15V$ , $V_{GS}=0V$ , $f=1MHz$                      | ---  | 1535  | ---       | pF                  |
| $C_{oss}$                  | Output Capacitance                             |                                                            | ---  | 60    | ---       |                     |
| $C_{rss}$                  | Reverse Transfer Capacitance                   |                                                            | ---  | 37    | ---       |                     |
| $I_S$                      | Continuous Source Current <sup>1,5</sup>       | $V_G=V_D=0V$ , Force Current                               | ---  | ---   | 20        | A                   |
| $I_{SM}$                   | Pulsed Source Current <sup>2,5</sup>           |                                                            | ---  | ---   | 30        | A                   |
| $V_{SD}$                   | Diode Forward Voltage <sup>2</sup>             | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^\circ\text{C}$            | ---  | ---   | 1.2       | V                   |
| $t_{rr}$                   | Reverse Recovery Time                          | $I_F=10A$ , $dI/dt=100A/\mu s$ , $T_J=25^\circ\text{C}$    | ---  | 37    | ---       | nS                  |
| $Q_{rr}$                   | Reverse Recovery Charge                        |                                                            | ---  | 27.3  | ---       | nC                  |

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  $V_{DD}=25V$ ,  $V_{GS}=10V$ ,  $L=0.1mH$ ,  $I_{AS}=11A$
- 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

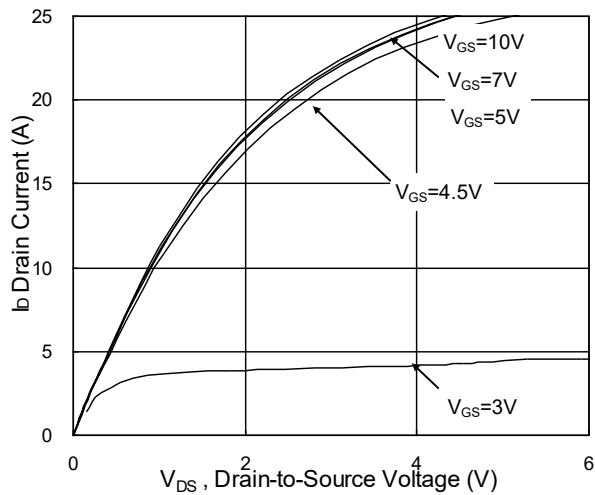


Fig.1 Typical Output Characteristics

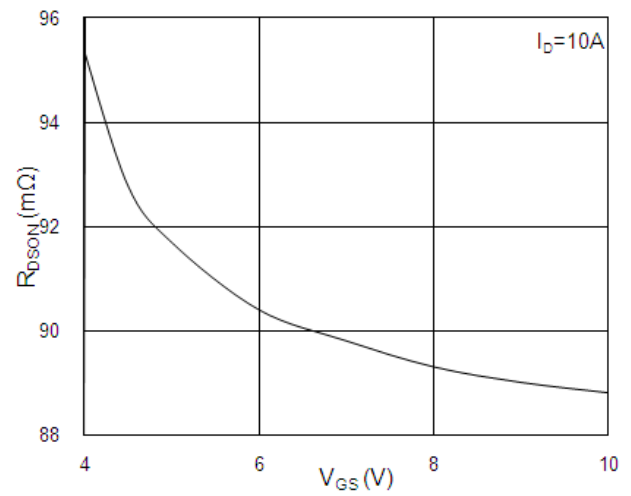


Fig.2 On-Resistance vs. Gate-Source

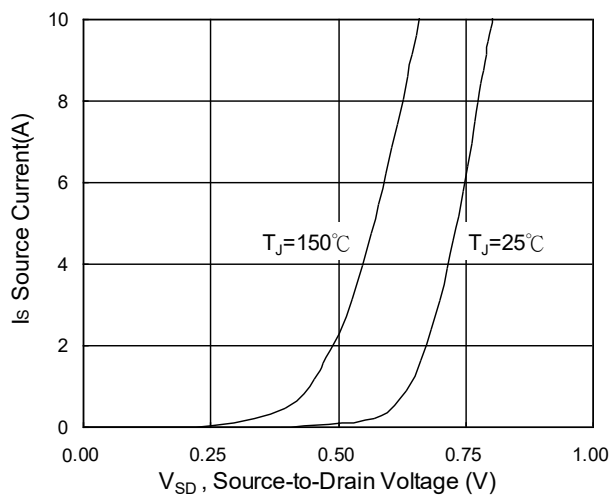


Fig.3 Forward Characteristics Of Reverse

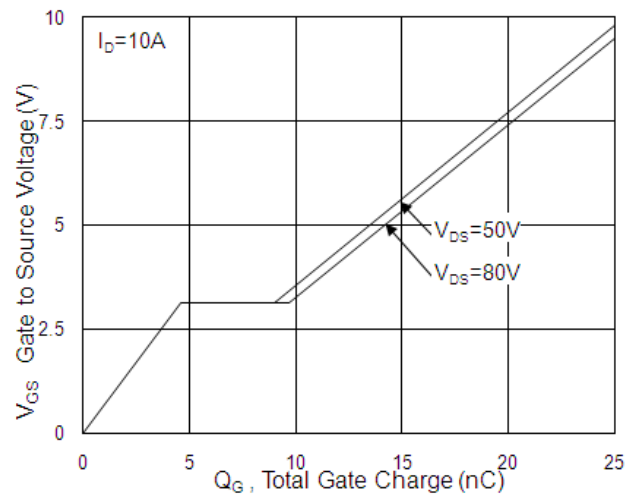


Fig.4 Gate-Charge Characteristics

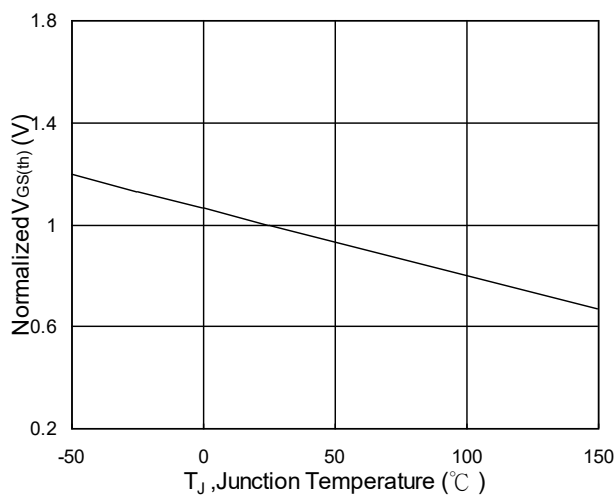


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

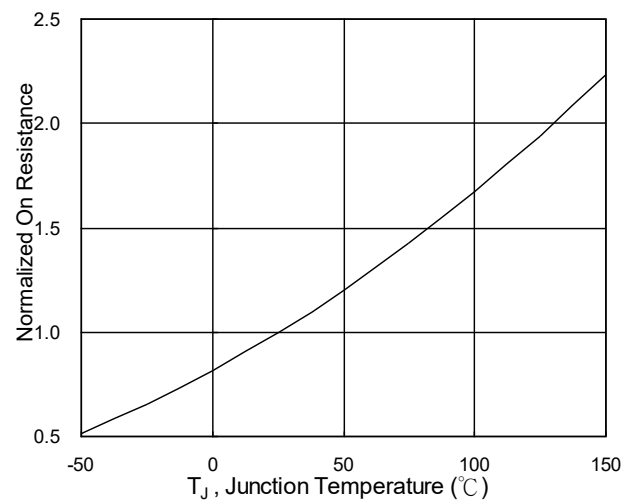


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

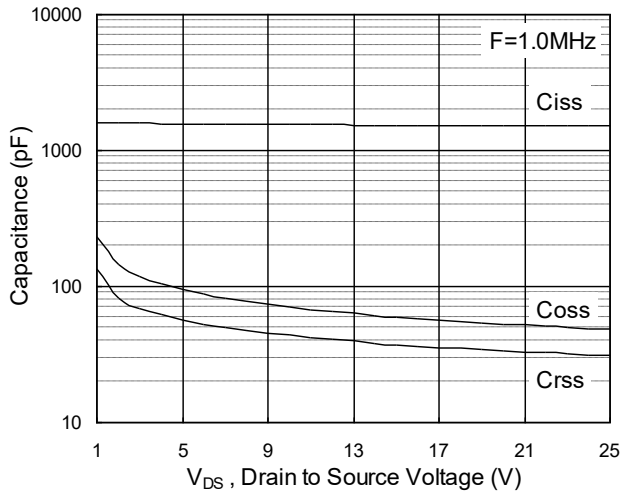


Fig.7 Capacitance

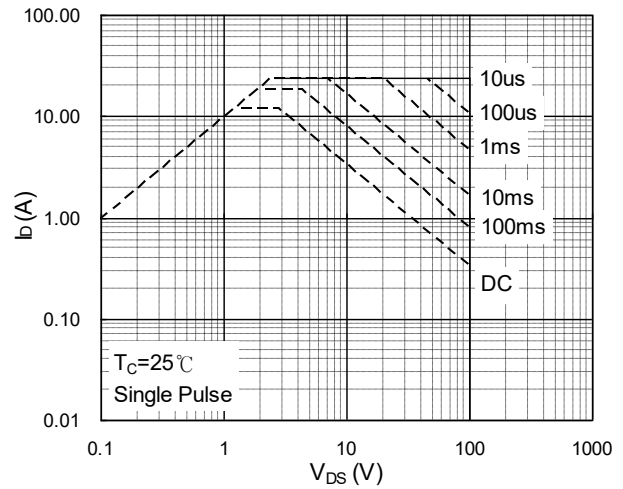


Fig.8 Safe Operating Area

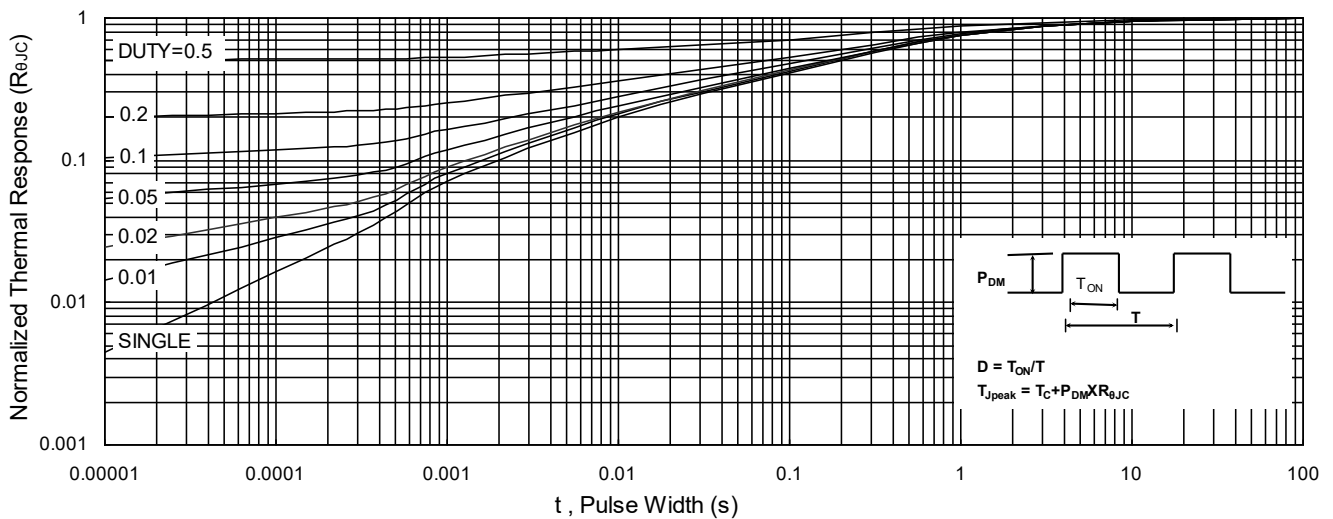


Fig.9 Normalized Maximum Transient Thermal Impedance

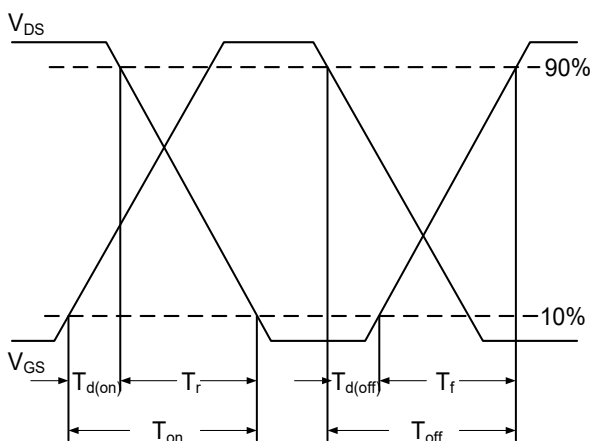


Fig.10 Switching Time Waveform

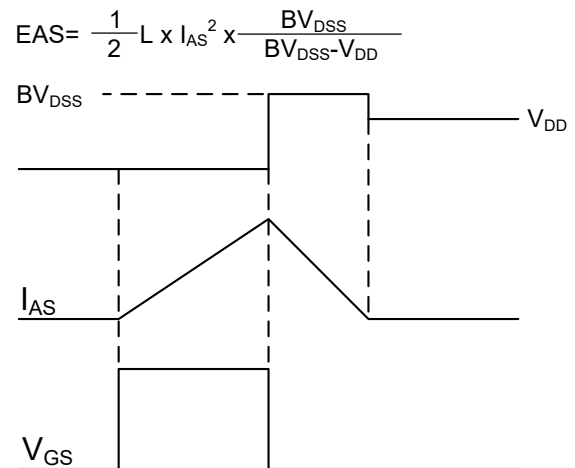


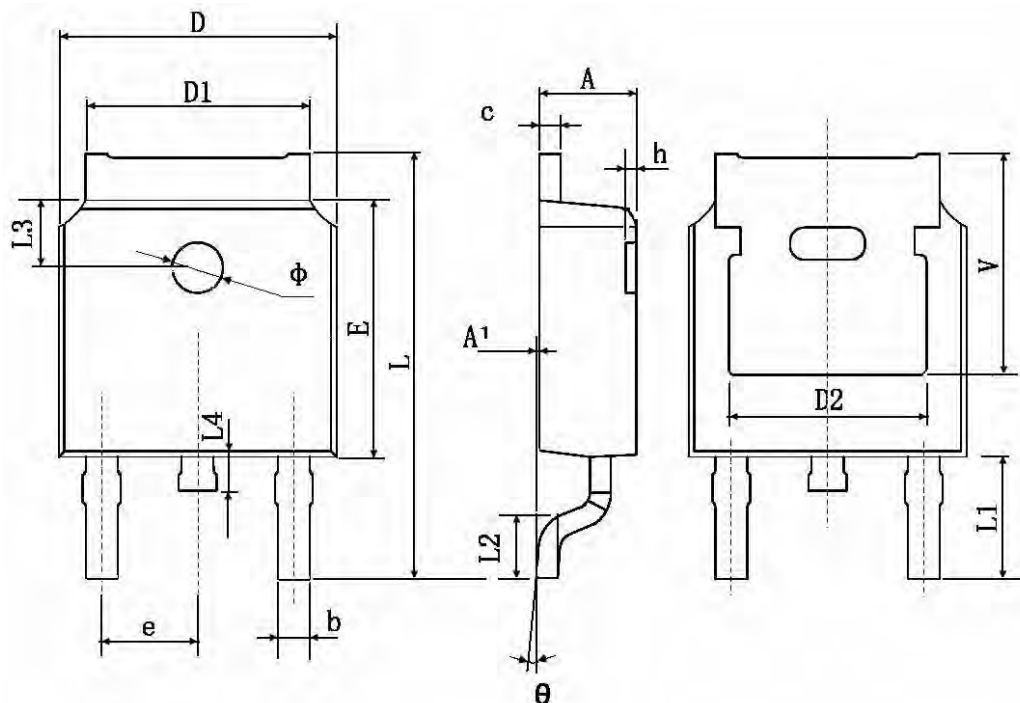
Fig.11 Unclamped Inductive Switching Waveform



# HSNN1000L10D

## N-Channel Enhancement Mode MOSFET

## TO-252-2L Package Information



| 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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