



## Description

The HXY20N03D 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.



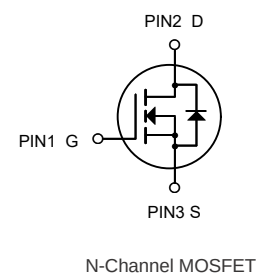
## General Features

$V_{DS} = 30V$   $I_D = 20A$

$R_{DS(ON)} < 25m\Omega @ V_{GS}=10V$

## Application

Battery protection  
Load switch  
Uninterruptible power supply



## Package Marking and Ordering Information

| Product ID | Pack     | Marking         | Qty(PCS) |
|------------|----------|-----------------|----------|
| HXY20N03D  | TO252-2L | 20N03D XXX YYYY | 2500     |

## 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             |
| $I_D @ T_C=25^{\circ}C$  | Continuous Drain Current, $V_{GS} @ 10V^1$       | 20         | A             |
| $I_D @ T_C=100^{\circ}C$ | Continuous Drain Current, $V_{GS} @ 10V^1$       | 15         | A             |
| $I_D @ T_A=25^{\circ}C$  | Continuous Drain Current, $V_{GS} @ 10V^1$       | 7.3        | A             |
| $I_D @ T_A=70^{\circ}C$  | Continuous Drain Current, $V_{GS} @ 10V^1$       | 5.8        | A             |
| $I_{DM}$                 | Pulsed Drain Current <sup>2</sup>                | 50         | A             |
| EAS                      | Single Pulse Avalanche Energy <sup>3</sup>       | 8.1        | mJ            |
| $I_{AS}$                 | Avalanche Current                                | 12.7       | A             |
| $P_D @ T_C=25^{\circ}C$  | Total Power Dissipation <sup>4</sup>             | 20.8       | 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>    | 6          | $^{\circ}C/W$ |



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

| Symbol                       | Parameter                                      | Conditions                                                   | Min. | Typ.  | Max.      | Unit                  |
|------------------------------|------------------------------------------------|--------------------------------------------------------------|------|-------|-----------|-----------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                                 | 30   | ---   | ---       | V                     |
| $\Delta BV_{DSS}/\Delta T_J$ | BVDSS Temperature Coefficient                  | Reference to $25^{\circ}\text{C}$ , $I_D=1mA$                | ---  | 0.023 | ---       | $V/^{\circ}\text{C}$  |
| $R_{DS(ON)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=10A$                                     | ---  | 18    | 25        | $m\Omega$             |
|                              |                                                | $V_{GS}=4.5V$ , $I_D=8A$                                     | ---  | 25    | 38        |                       |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         |                                                              | 1.0  | 1.2   | 2.5       | V                     |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                             | ---  | -4.2  | ---       | $mV/^{\circ}\text{C}$ |
| $I_{DSS}$                    | Drain-Source Leakage Current                   | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=25^{\circ}\text{C}$        | ---  | ---   | 1         | $\mu A$               |
|                              |                                                | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=55^{\circ}\text{C}$        | ---  | ---   | 5         |                       |
| $I_{GSS}$                    | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                               | ---  | ---   | $\pm 100$ | nA                    |
| $g_{fs}$                     | Forward Transconductance                       | $V_{DS}=5V$ , $I_D=10A$                                      | ---  | 5.5   | ---       | S                     |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                         | ---  | 2.3   | ---       | $\Omega$              |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=15V$ , $V_{GS}=4.5V$ , $I_D=10A$                     | ---  | 4.9   | ---       | nC                    |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                              | ---  | 1.66  | ---       |                       |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                              | ---  | 1.85  | ---       |                       |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=15V$ , $V_{GS}=10V$ ,<br>$R_G=3.3$<br>$I_D=10A$      | ---  | 1.6   | ---       | ns                    |
| $T_r$                        | Rise Time                                      |                                                              | ---  | 15.8  | ---       |                       |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                              | ---  | 13    | ---       |                       |
| $T_f$                        | Fall Time                                      |                                                              | ---  | 4.8   | ---       |                       |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=15V$ , $V_{GS}=0V$ , $f=1MHz$                        | ---  | 416   | ---       | pF                    |
| $C_{oss}$                    | Output Capacitance                             |                                                              | ---  | 62    | ---       |                       |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                              | ---  | 51    | ---       |                       |
| $I_S$                        | Continuous Source Current <sup>1,5</sup>       | $V_G=V_D=0V$ , Force Current                                 | ---  | ---   | 24        | A                     |
| $I_{SM}$                     | Pulsed Source Current <sup>2,5</sup>           |                                                              | ---  | ---   | 50        | 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                          | $I_F=10A$ , $dI/dt=100A/\mu s$ ,<br>$T_J=25^{\circ}\text{C}$ | ---  | 8.7   | ---       | nS                    |
| $Q_{rr}$                     | Reverse Recovery Charge                        |                                                              | ---  | 1.95  | ---       | nC                    |

Note :

1.The data tested by surface mounted on a 1 inch<sup>2</sup> FR-4 board with 20Z copper.

2The data tested by pulsed , pulse width .The EAS data shows Max. rating .

3he test condition is  $V \leq 300\mu s$  , duty cycle  $_{DD=25} \leq V, V 2\%_{GS} = 10V, L=0.1mH, I_{AS}=12.7A$

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

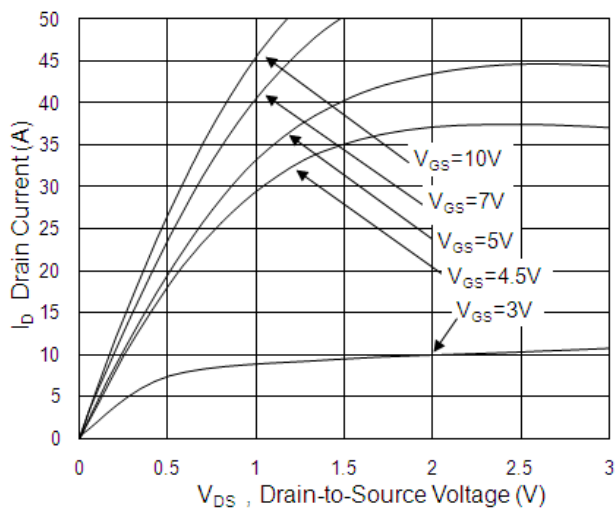


Fig.1 Typical Output Characteristics

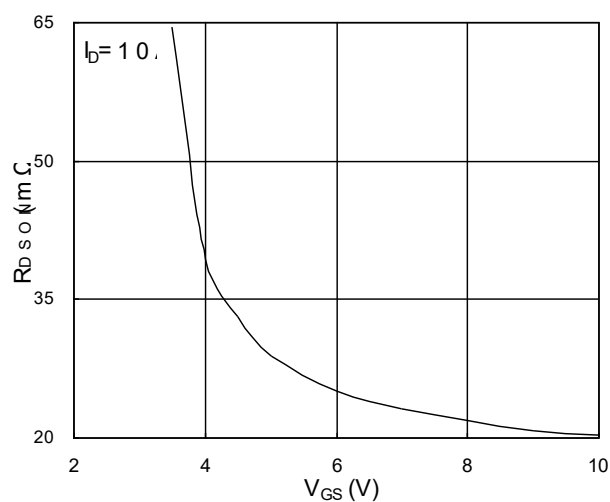


Fig.2 On-Resistance vs. Gate-Source

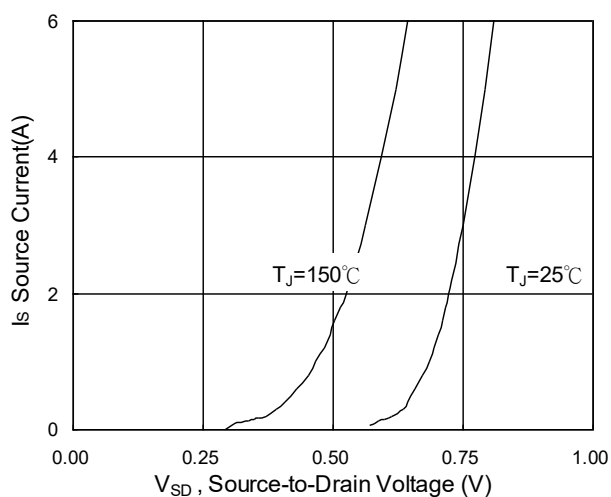


Fig.3 Forward Characteristics Of Reverse

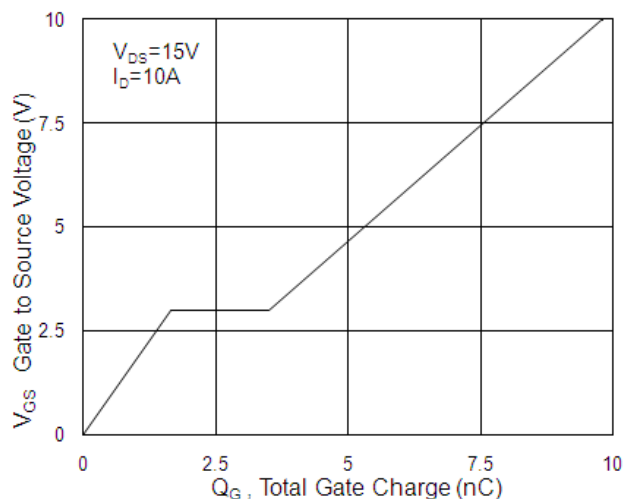


Fig.4 Gate-Charge Characteristics

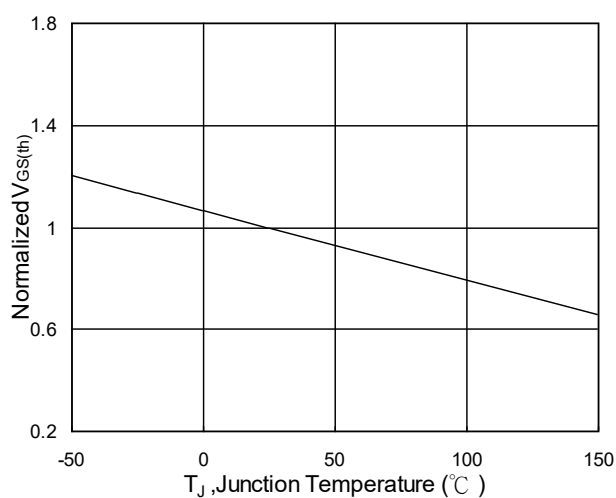


Fig.5 Normalized  $V_{GS(th)}$  vs.  $T_J$

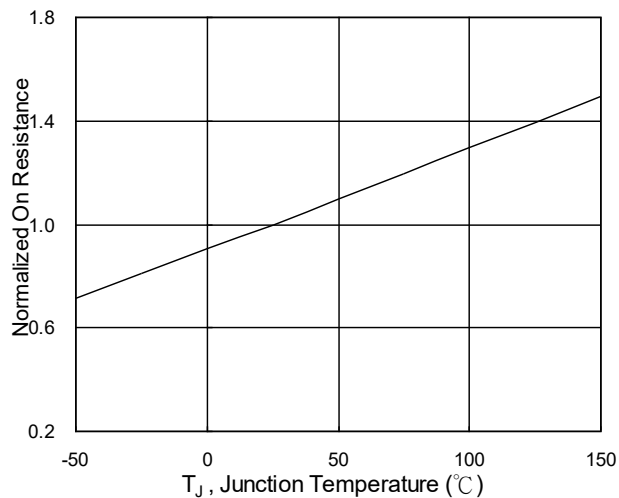


Fig.6 Normalized  $R_{DS(on)}$  vs.  $T_J$

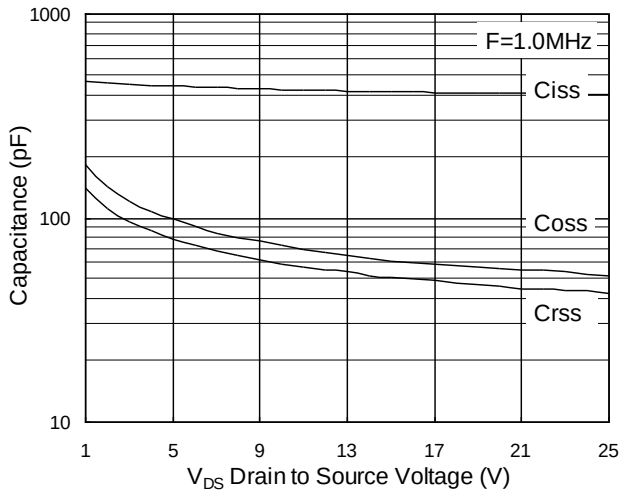


Fig.7 Capacitance

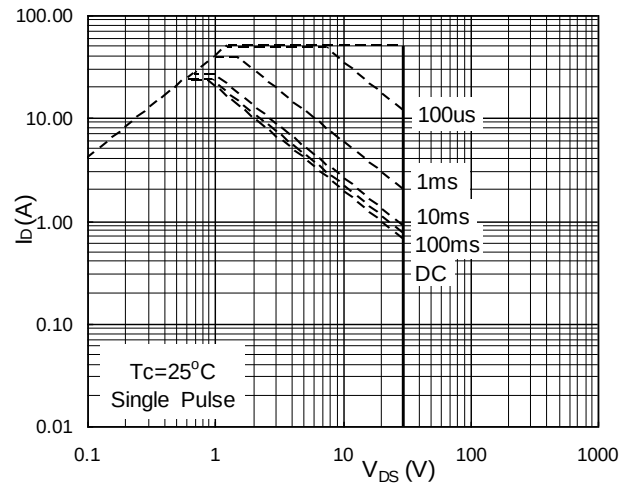


Fig.8 Safe Operating Area

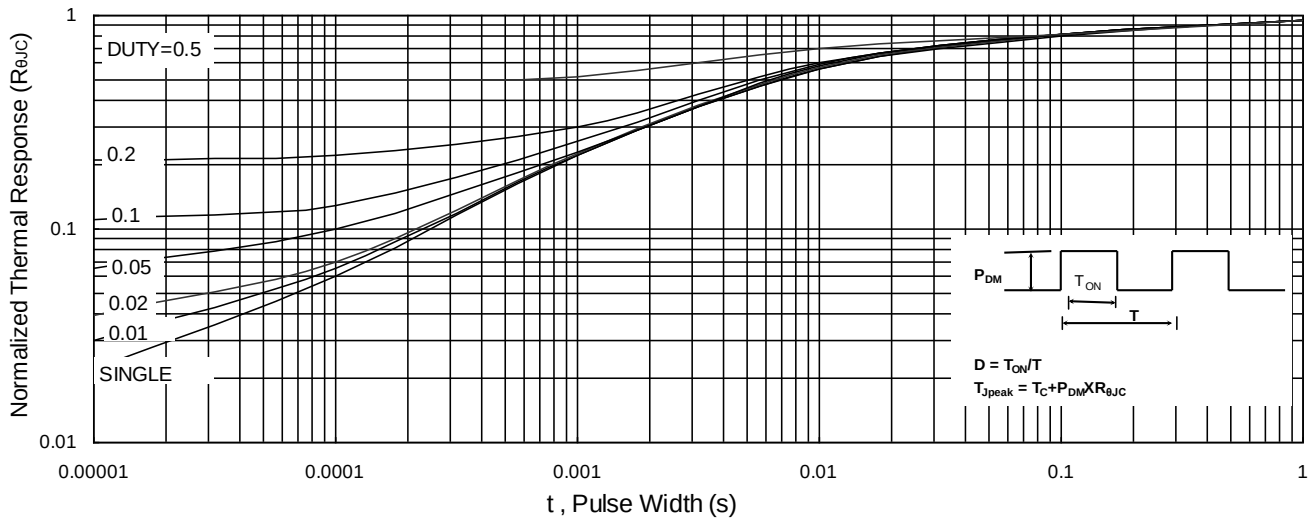


Fig.9 Normalized Maximum Transient Thermal Impedance

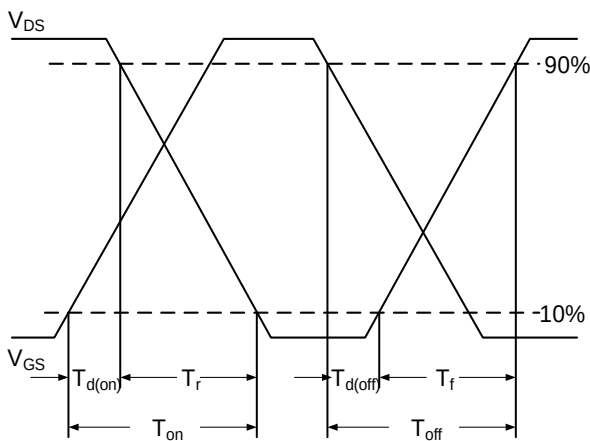


Fig.10 Switching Time Waveform

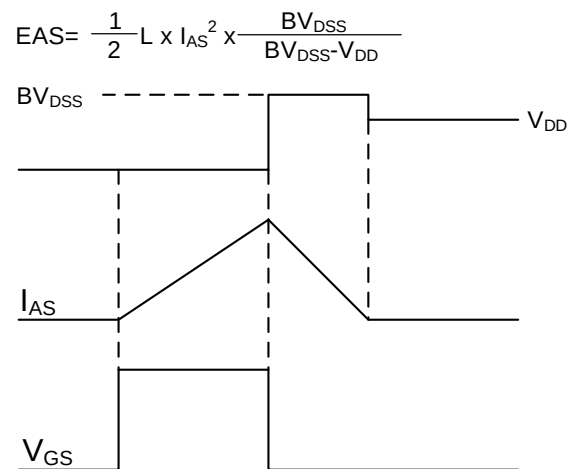
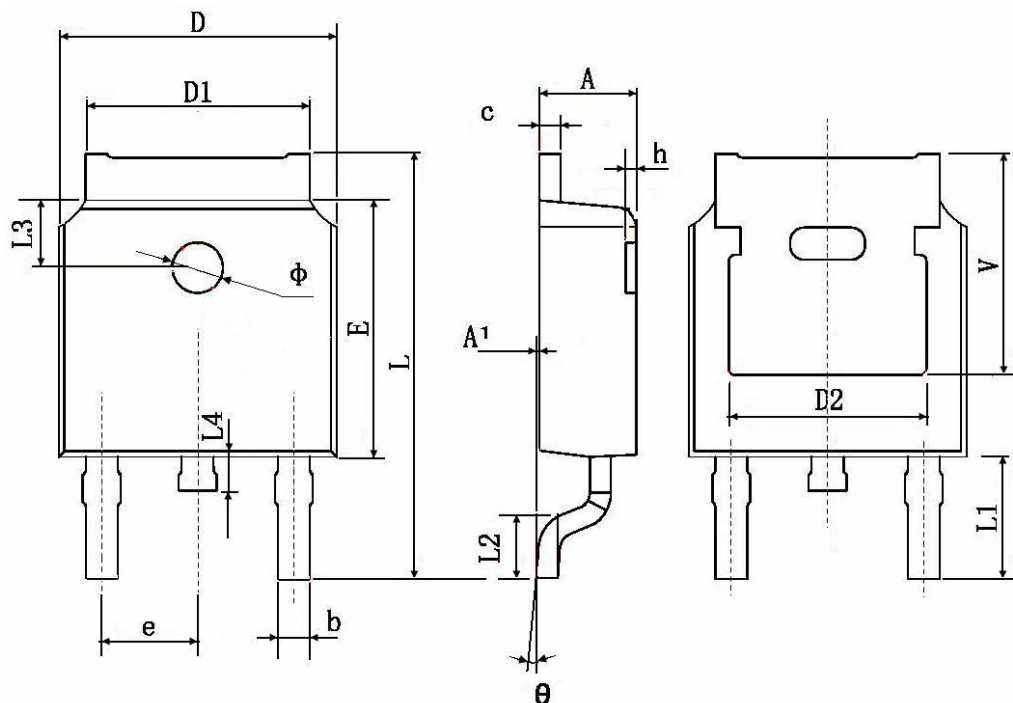


Fig.11 Unclamped Inductive Switching Waveform



## TO252-2L 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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