



## Description

The NTD4302 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.



TO-252-2L

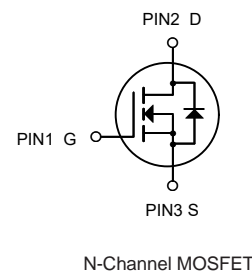
## General Features

$V_{DS} = 30V$   $I_D = 50A$

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

## Application

- Battery protection
- Load switch
- Uninterruptible power supply



## Package Marking and Ordering Information

| Product ID | Pack      | Brand      | Qty(PCS) |
|------------|-----------|------------|----------|
| NTD4302    | 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                             | 30         | V            |
| $V_{GS}$              | Gate-Source Voltage                              | $\pm 20$   | V            |
| $I_D@T_C=25^\circ C$  | Continuous Drain Current, $V_{GS} @ 10V^1$       | 50         | A            |
| $I_D@T_C=100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$       | 30         | A            |
| $I_{DM}$              | Pulsed Drain Current <sup>2</sup>                | 112        | A            |
| EAS                   | Single Pulse Avalanche Energy <sup>3</sup>       | 24.2       | mJ           |
| $I_{AS}$              | Avalanche Current                                | 22         | A            |
| $P_D@T_C=25^\circ C$  | Total Power Dissipation <sup>4</sup>             | 37.5       | W            |
| $T_{STG}$             | Storage Temperature Range                        | -55 to 175 | $^\circ C$   |
| $T_J$                 | Operating Junction Temperature Range             | -55 to 175 | $^\circ C$   |
| $R_{\theta JA}$       | Thermal Resistance Junction-Ambient <sup>1</sup> | 62         | $^\circ C/W$ |
| $R_{\theta JC}$       | Thermal Resistance Junction-Case <sup>1</sup>    | 4          | $^\circ C/W$ |



**Electrical Characteristics (T<sub>J</sub>=25°C, unless otherwise noted)**

| Symbol                              | Parameter                                      | Conditions   | Min. | Typ.   | Max. | Unit  |
|-------------------------------------|--|--|------|--------|------|-------|
| BV <sub>DSS</sub>                   | Drain-Source Breakdown Voltage                 | V <sub>GS</sub> =0V, I <sub>D</sub> =250uA                       | 30   | ---    | ---  | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub> | BVDSS Temperature Coefficient                  | Reference to 25°C, I <sub>D</sub> =1mA                           | ---  | 0.0193 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V, I <sub>D</sub> =30A                        | ---  | 7.5    | 10   | mΩ    |
|                                     |  | V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A                       | ---  | 11     | 18   |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         |  | 1.2  | ---    | 2.5  | V     |
| ΔV <sub>GS(th)</sub>                | V <sub>GS(th)</sub> Temperature Coefficient    | V <sub>GS</sub> =V <sub>DS</sub> , I <sub>D</sub> =250uA         | ---  | -3.97  | ---  | mV/°C |
| I <sub>DSS</sub>                    | Drain-Source Leakage Current                   | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =25°C  | ---  | ---    | 1    | uA    |
|                                     |  | V <sub>DS</sub> =24V, V <sub>GS</sub> =0V, T <sub>J</sub> =55°C  | ---  | ---    | 5    |       |
| I <sub>GSS</sub>                    | Gate-Source Leakage Current                    | V <sub>GS</sub> =±20V, V <sub>DS</sub> =0V                       | ---  | ---    | ±100 | nA    |
| g <sub>fs</sub>                     | Forward Transconductance                       | V <sub>DS</sub> =5V, I <sub>D</sub> =30A                         | ---  | 34     | ---  | S     |
| R <sub>g</sub>                      | Gate Resistance                                | V <sub>DS</sub> =0V, V <sub>GS</sub> =0V, f=1MHz                 | ---  | 1.8    | ---  | Ω     |
| Q <sub>g</sub>                      | Total Gate Charge (4.5V)                       |  | ---  | 9.8    | ---  | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             | V <sub>DS</sub> =15V, V <sub>GS</sub> =4.5V, I <sub>D</sub> =15A | ---  | 4.2    | ---  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |  | ---  | 3.6    | ---  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             |  | ---  | 4      | ---  | ns    |
| T <sub>r</sub>                      | Rise Time                                      | V <sub>DD</sub> =15V, V <sub>GS</sub> =10V, R <sub>G</sub> =3.3  | ---  | 8      | ---  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            | I <sub>D</sub> =15A  | ---  | 31     | ---  |       |
| T <sub>f</sub>                      | Fall Time                                      |  | ---  | 4      | ---  |       |
| C <sub>iss</sub>                    | Input Capacitance                              |  | ---  | 940    | ---  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             | V <sub>DS</sub> =15V, V <sub>GS</sub> =0V, f=1MHz                | ---  | 131    | ---  |       |
| C <sub>rss</sub>                    | Reverse Transfer Capacitance                   |  | ---  | 109    | ---  |       |
| I <sub>S</sub>                      | Continuous Source Current <sup>1,5</sup>       |  | ---  | ---    | 43   | A     |
| I <sub>SM</sub>                     | Pulsed Source Current <sup>2,5</sup>           | V <sub>G</sub> =V <sub>D</sub> =0V, Force Current                | ---  | ---    | 112  | A     |
| V <sub>SD</sub>                     | Diode Forward Voltage <sup>2</sup>             | V <sub>GS</sub> =0V, I <sub>S</sub> =1A, T <sub>J</sub> =25°C    | ---  | ---    | 1    | V     |
| t <sub>rr</sub>                     | Reverse Recovery Time                          | I <sub>F</sub> =30A, di/dt=100A/μs, T <sub>J</sub> =25°C         | ---  | 8.5    | ---  | nS    |
| Q <sub>rr</sub>                     | Reverse Recovery Charge                        |  | ---  | 2.2    | ---  | 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 ≤ 300us , duty cycle ≤ 2%
- 3 .The EAS data shows Max. rating . The test condition is V<sub>DD</sub>=25V,V<sub>GS</sub>=10V,L=0.1mH,I<sub>AS</sub>=22A
- 4.The power dissipation is limited by 175°C junction temperature
- 5.The data is theoretically the same as I<sub>D</sub> and I<sub>DM</sub> , in real applications , should be limited by total power dissipation.



### Typical Characteristics

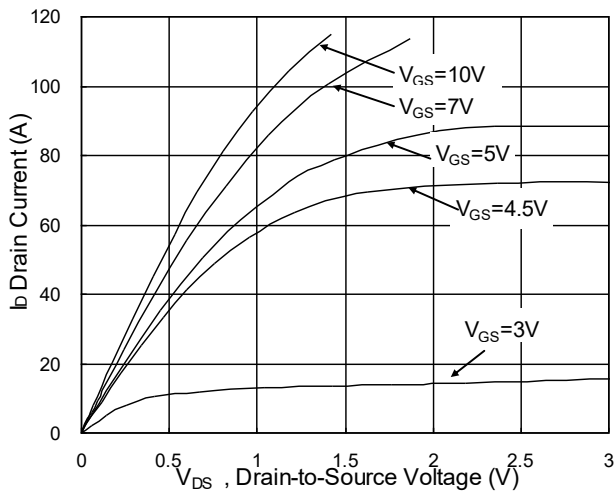


Fig.1 Typical Output Characteristics

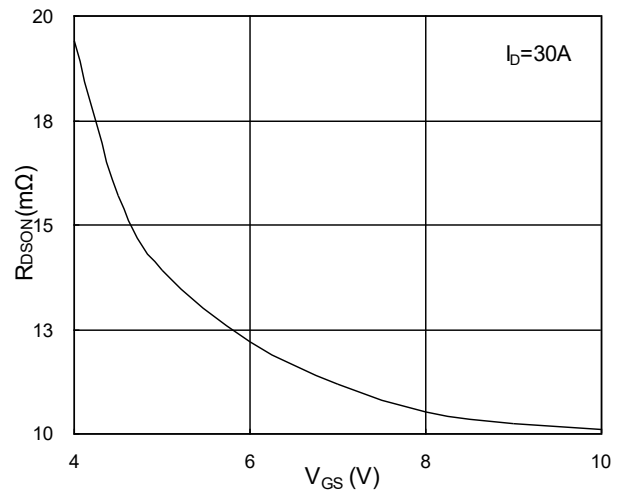


Fig.2 On-Resistance vs. G-S Voltage

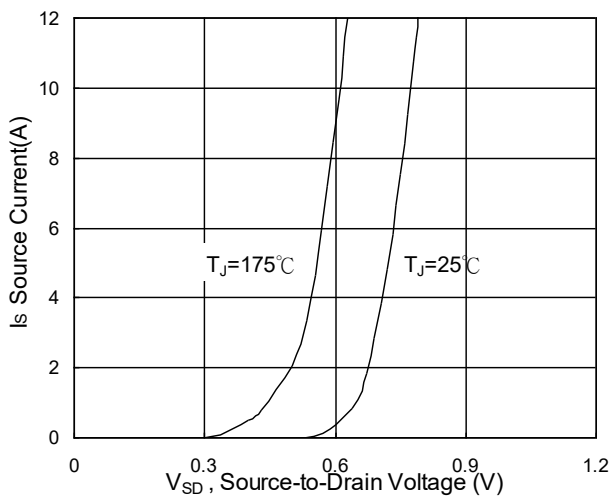


Fig.3 Forward Characteristics of Reverse

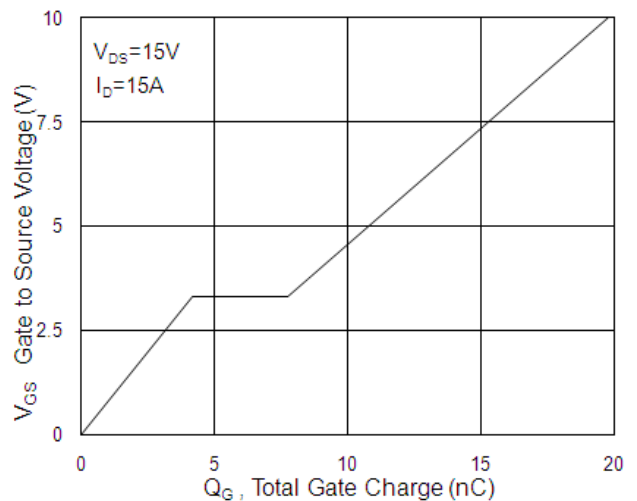


Fig.4 Gate-Charge Characteristics

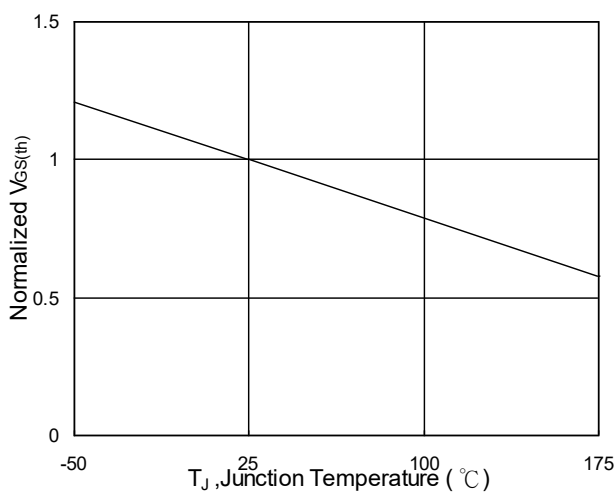


Fig.5 Normalized V<sub>GS(th)</sub> vs. T<sub>J</sub>

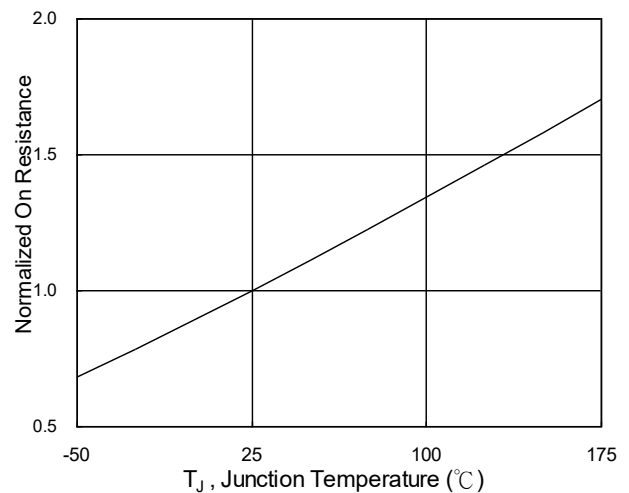


Fig.6 Normalized R<sub>DS(on)</sub> vs. T<sub>J</sub>

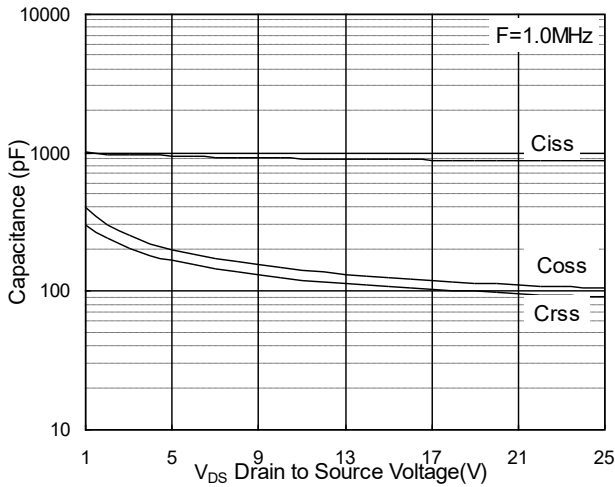


Fig.7 Capacitance

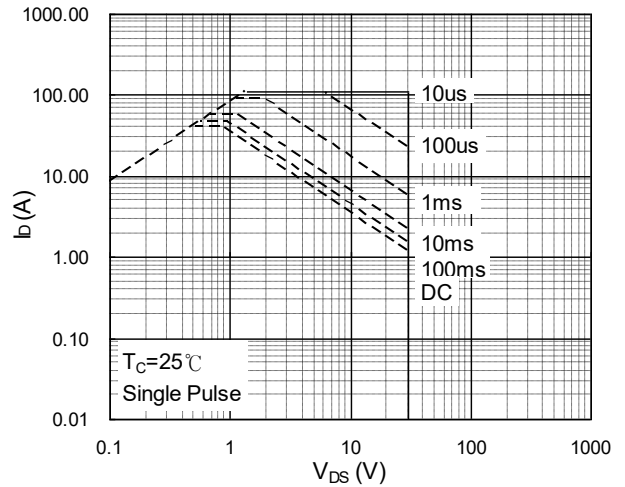


Fig.8 Safe Operating Area

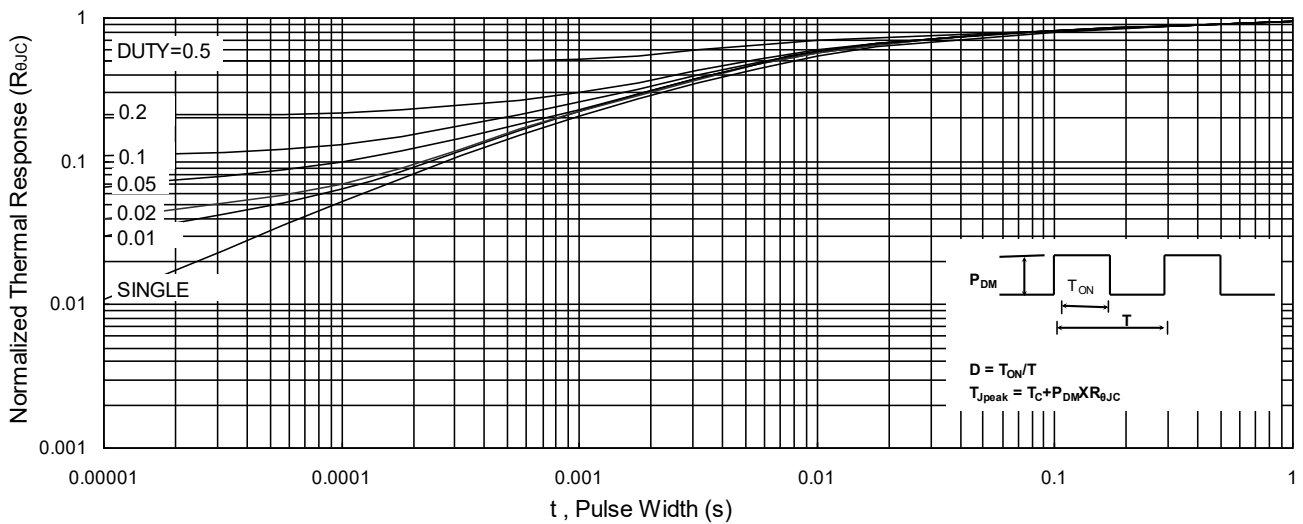


Fig.9 Normalized Maximum Transient Thermal Impedance

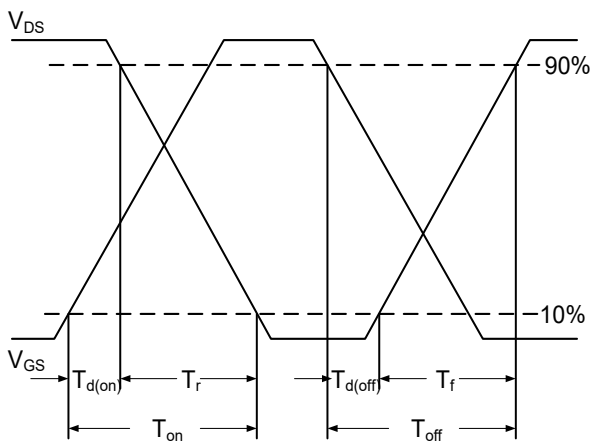


Fig.10 Switching Time Waveform

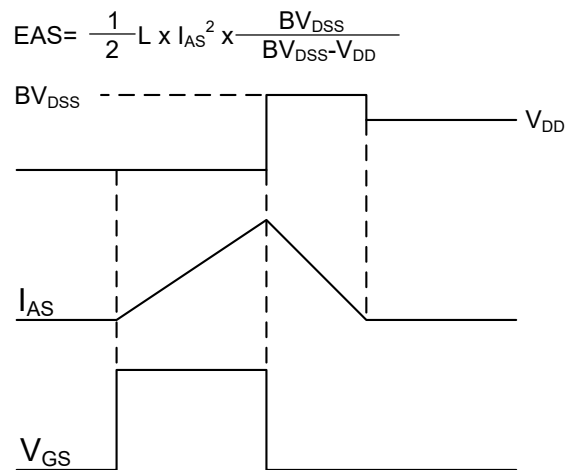
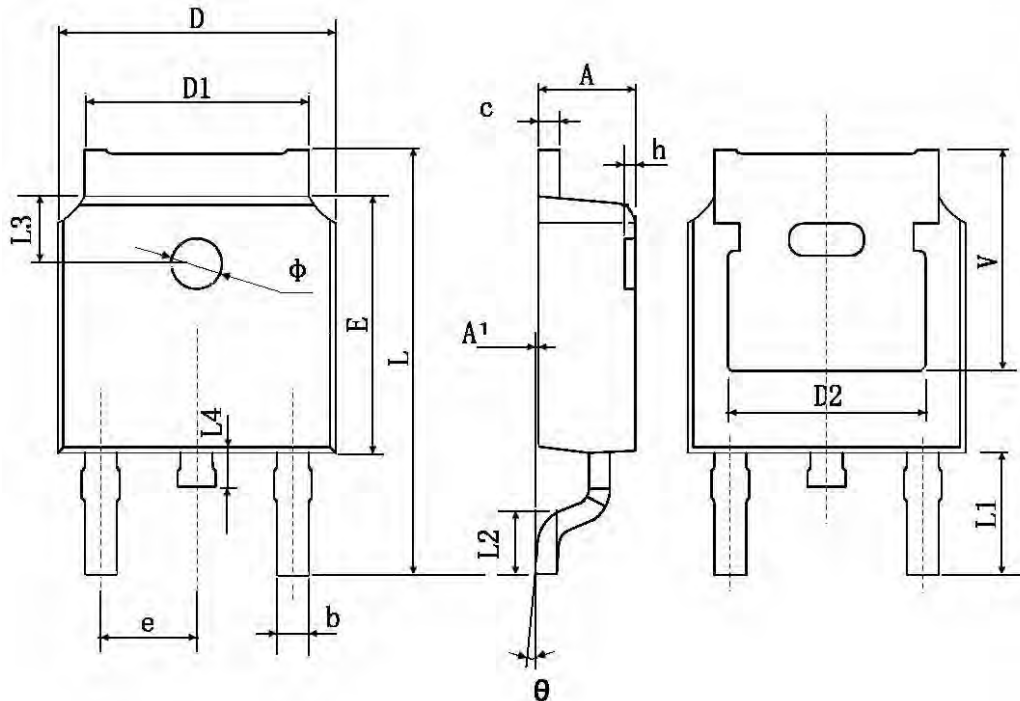


Fig.11 Unclamped Inductive Switching Waveform



### 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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