



## Description

The NTD20N03L27 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

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

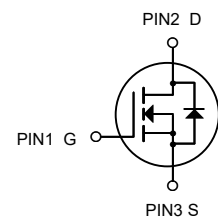
$R_{DS(ON)} < 25m\Omega @ V_{GS} = 10V$

## Application

Battery protection

Load switch

Uninterruptible power supply



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID  | Pack      | Brand      | Qty(PCS) |
|-------------|-----------|------------|----------|
| NTD20N03L27 | 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, $V_{GS} @ 10V^1$       | 20         | A            |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$       | 15         | 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            |
| $T_{STG}$                 | 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<sub>C</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                              | ---  | 0.023 | ---  | V/°C  |
| R <sub>DS(ON)</sub>                 | Static Drain-Source On-Resistance <sup>2</sup> | V <sub>GS</sub> =10V , I <sub>D</sub> =10A                           | ---  | 18    | 25   | mΩ    |
|                                     |  | V <sub>GS</sub> =4.5V , I <sub>D</sub> =8A                           | ---  | 25    | 38   |       |
| V <sub>GS(th)</sub>                 | Gate Threshold Voltage                         |  | 1.0  | 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             | ---  | -4.2  | ---  | 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> =10A                            | ---  | 5.5   | ---  | S     |
| R <sub>g</sub>                      | Gate Resistance                                | V <sub>DS</sub> =0V , V <sub>GS</sub> =0V , f=1MHz                   | ---  | 2.3   | ---  | Ω     |
| Q <sub>g</sub>                      | Total Gate Charge (4.5V)                       |  | ---  | 4.9   | ---  | nC    |
| Q <sub>gs</sub>                     | Gate-Source Charge                             | V <sub>DS</sub> =15V , V <sub>GS</sub> =4.5V , I <sub>D</sub> =10A   | ---  | 1.66  | ---  |       |
| Q <sub>gd</sub>                     | Gate-Drain Charge                              |  | ---  | 1.85  | ---  |       |
| T <sub>d(on)</sub>                  | Turn-On Delay Time                             |  | ---  | 1.6   | ---  | ns    |
| T <sub>r</sub>                      | Rise Time                                      | V <sub>DD</sub> =15V , V <sub>GS</sub> =10V ,<br>R <sub>G</sub> =3.3 | ---  | 15.8  | ---  |       |
| T <sub>d(off)</sub>                 | Turn-Off Delay Time                            | I <sub>D</sub> =10A  | ---  | 13    | ---  |       |
| T <sub>f</sub>                      | Fall Time                                      |  | ---  | 4.8   | ---  |       |
| C <sub>iss</sub>                    | Input Capacitance                              |  | ---  | 416   | ---  | pF    |
| C <sub>oss</sub>                    | Output Capacitance                             | V <sub>DS</sub> =15V , V <sub>GS</sub> =0V , f=1MHz                  | ---  | 62    | ---  |       |
| C <sub>riss</sub>                   | Reverse Transfer Capacitance                   |  | ---  | 51    | ---  |       |
| I <sub>S</sub>                      | Continuous Source Current <sup>1,5</sup>       |  | ---  | ---   | 24   | A     |
| I <sub>SM</sub>                     | Pulsed Source Current <sup>2,5</sup>           | V <sub>G</sub> =V <sub>D</sub> =0V , Force Current                   | ---  | ---   | 50   | 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      | ---  | ---   | 1.2  | V     |
| t <sub>rr</sub>                     | Reverse Recovery Time                          | I <sub>F</sub> =10A , di/dt=100A/μs ,<br>T <sub>J</sub> =25°C        | ---  | 8.7   | ---  | nS    |
| Q <sub>rr</sub>                     | 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 2OZ copper.

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

3he test condition is V<sub>GS</sub> ≤ 300us , duty cycle  $\frac{t_{ON}}{T} \leq 2\%$  , V<sub>GS</sub> =10V, L=0.1mH, I<sub>AS</sub>=12.7A

4.The power dissipation is limited by 150°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

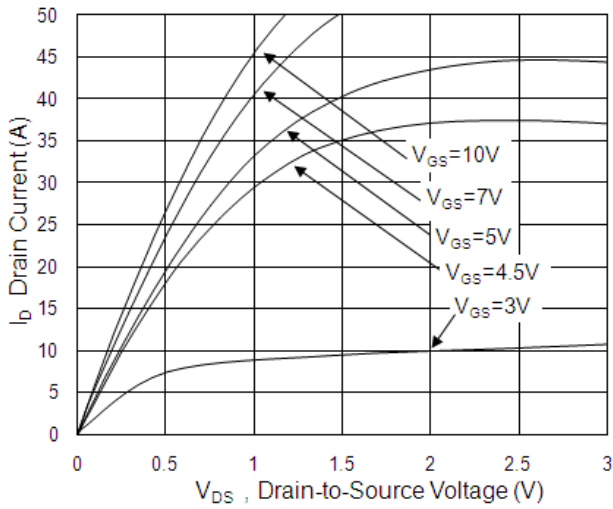


Fig.1 Typical Output Characteristics

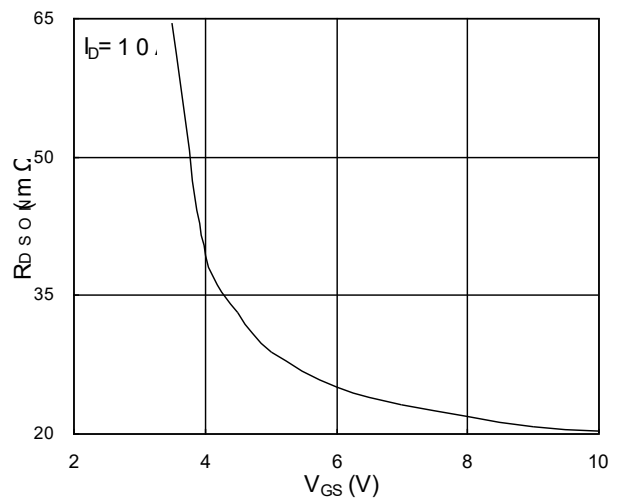


Fig.2 On-Resistance vs. Gate-Source

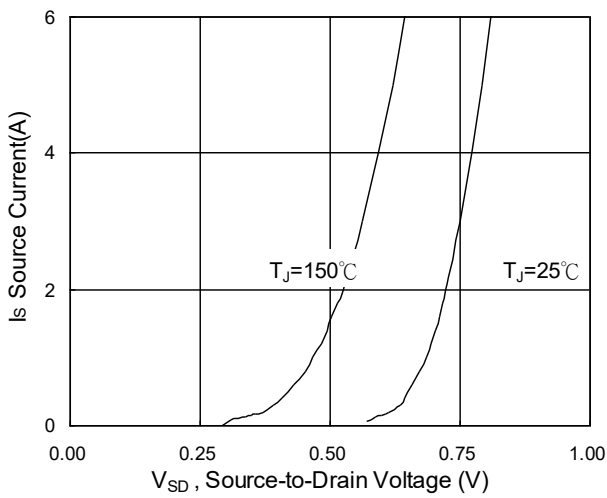


Fig.3 Forward Characteristics Of Reverse

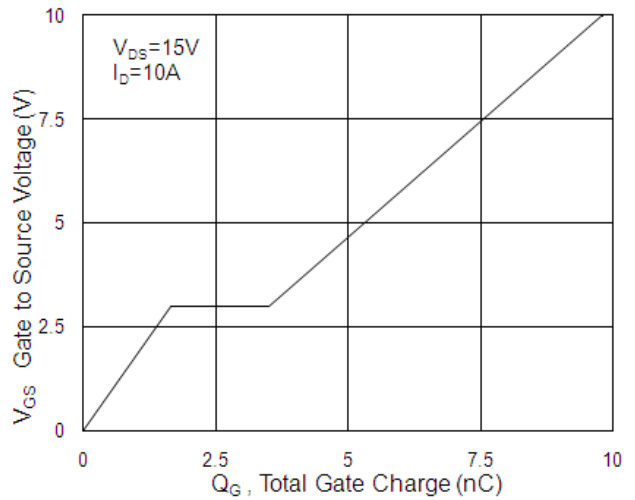


Fig.4 Gate-Charge Characteristics

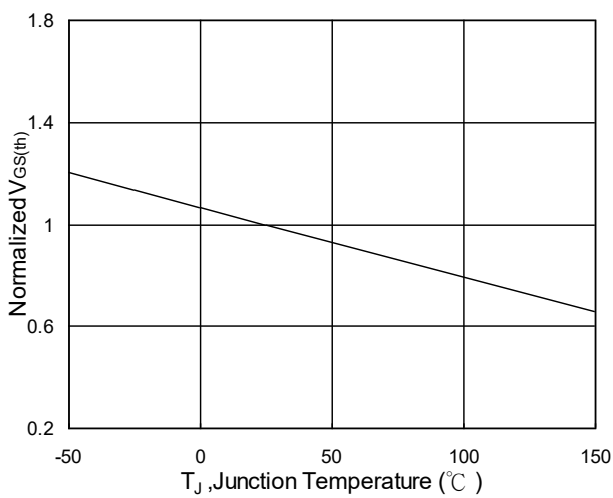


Fig.5 Normalized V<sub>GS(th)</sub> vs. T<sub>J</sub>

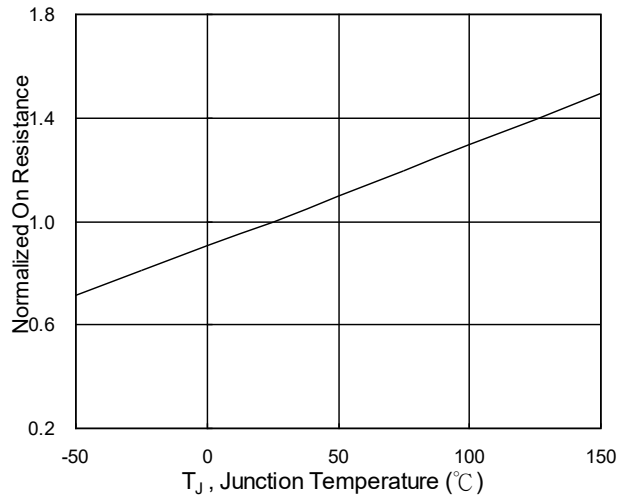


Fig.6 Normalized R<sub>DS(on)</sub> vs. T<sub>J</sub>

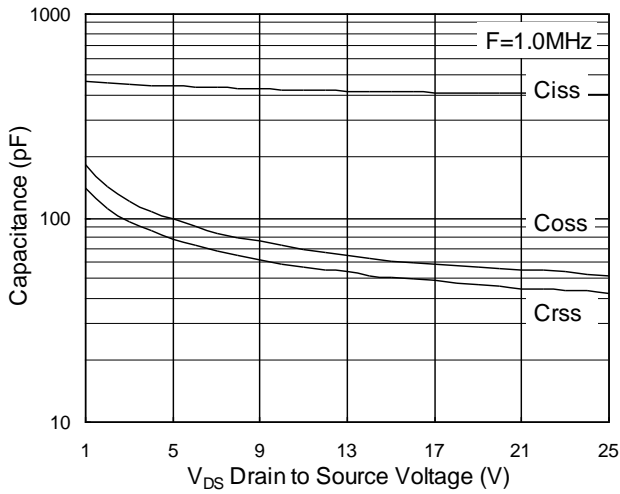


Fig.7 Capacitance

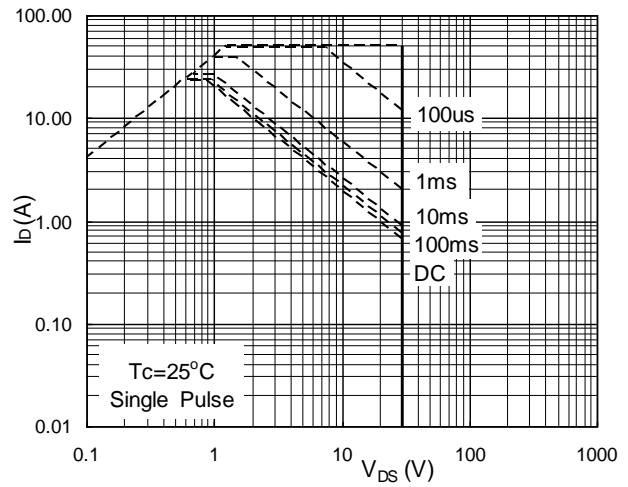


Fig.8 Safe Operating Area

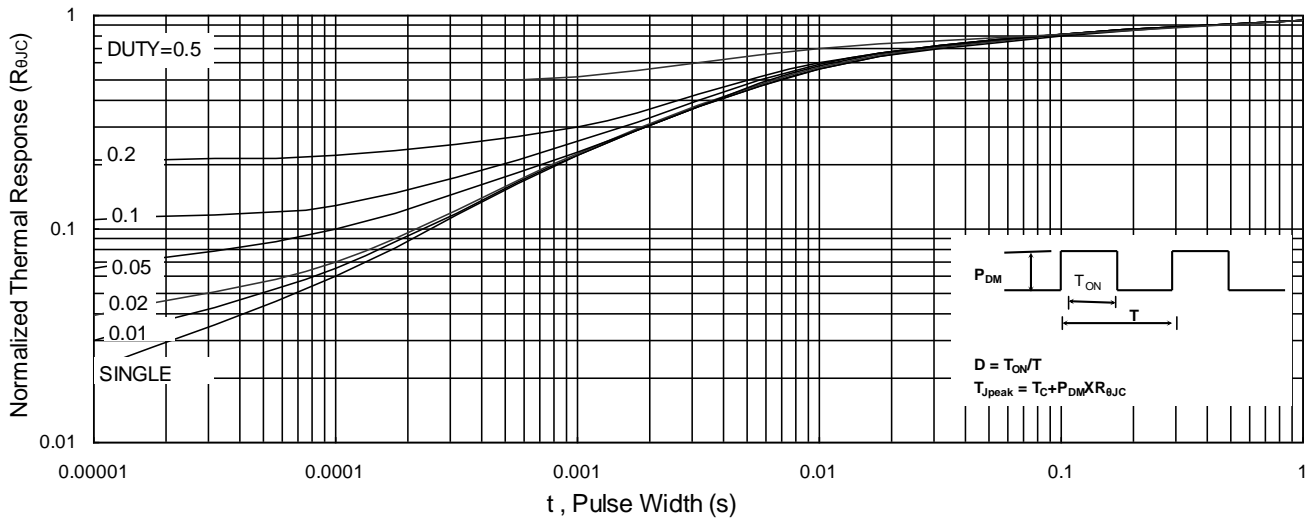


Fig.9 Normalized Maximum Transient Thermal Impedance

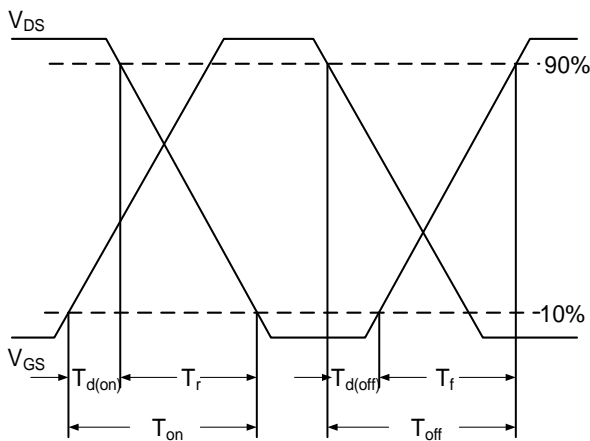


Fig.10 Switching Time Waveform

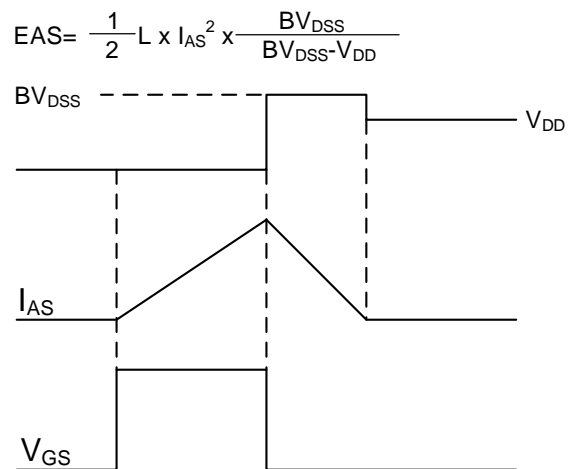


Fig.11 Unclamped Inductive Switching Waveform





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