



## Description

The NTD4960NT4G 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

$V_{DS} = 30V$   $I_D = 80A$

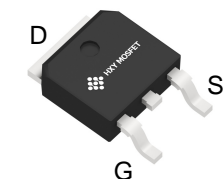
$R_{DS(ON)} < 6.8m\Omega$  @  $V_{GS}=10V$

## Application

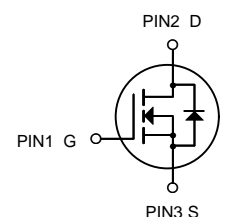
Battery protection

Load switch

Uninterruptible power supply



TO-252-2L  
(TO-252(DPAK))



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID  | Pack                    | Brand      | Qty(PCS) |
|-------------|-------------------------|------------|----------|
| NTD4960NT4G | TO-252-2L(TO-252(DPAK)) | 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             |
| $I_D$           | Drain Current – Continuous ( $T_c=25^\circ C$ )  | 80         | A             |
|                 | Drain Current – Continuous ( $T_c=100^\circ C$ ) | 51         | A             |
| $I_{DM}$        | Drain Current – Pulsed <sup>1</sup>              | 320        | A             |
| EAS             | Single Pulse Avalanche Energy <sup>2</sup>       | 88         | mJ            |
| IAS             | Single Pulse Avalanche Current <sup>2</sup>      | 42         | A             |
| $P_D$           | Power Dissipation ( $T_c=25^\circ C$ )           | 54         | W             |
|                 | Power Dissipation – Derate above $25^\circ C$    | 0.43       | W/ $^\circ C$ |
| $T_{STG}$       | 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 to ambient           | 62         | $^\circ C/W$  |
| $R_{\theta JC}$ | Thermal Resistance Junction to Case              | 2.3        | $^\circ C/W$  |



**Electrical Characteristics ( $T_J=25\text{ }^{\circ}\text{C}$ , unless otherwise noted)**

| Symbol                    | Parameter                                      | Conditions  | Min. | Typ. | Max.      | Unit                   |
|---------------------------|--|---|------|------|-----------|------------------------|
| BVDSS                     | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                                      | 30   | ---  | ---       | V                      |
| $\Delta BVDSS/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^{\circ}\text{C}$ , $I_D=1mA$                     | ---  | 0.04 | ---       | V/ $^{\circ}\text{C}$  |
| IDSS                      | Drain-Source Leakage Current                   | $V_{DS}=30V$ , $V_{GS}=0V$ , $T_J=25^{\circ}\text{C}$             | ---  | ---  | 1         | $\mu A$                |
|                           |  | $V_{DS}=24V$ , $V_{GS}=0V$ , $T_J=125^{\circ}\text{C}$            | ---  | ---  | 10        | $\mu A$                |
| IGSS                      | Gate-Source Leakage Current                    | $V_{GS}=\pm 20V$ , $V_{DS}=0V$                                    | ---  | ---  | $\pm 100$ | nA                     |
| RDS(ON)                   | Static Drain-Source On-Resistance <sup>3</sup> | $V_{GS}=10V$ , $I_D=20A$  | ---  | 5    | 6.8       | m $\Omega$             |
|                           |  | $V_{GS}=4.5V$ , $I_D=10A$   | ---  | 6.5  | 9         | m $\Omega$             |
| VGS(th)                   | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                                  | 1    | 1.6  | 2.5       | V                      |
| $\Delta V_{GS(th)}$       | $V_{GS(th)}$ Temperature Coefficient           |   | ---  | -4   | ---       | mV/ $^{\circ}\text{C}$ |
| gfs                       | Forward Transconductance                       | $V_{DS}=10V$ , $I_D=10A$  | ---  | 18   | ---       | S                      |
| $Q_g$                     | Total Gate Charge <sup>3, 4</sup>              | $V_{DS}=15V$ , $V_{GS}=4.5V$ , $I_D=20A$                          | ---  | 11.1 | ---       | nC                     |
| $Q_{gs}$                  | Gate-Source Charge <sup>3, 4</sup>             |   | ---  | 1.85 | ---       |                        |
| $Q_{gd}$                  | Gate-Drain Charge <sup>3, 4</sup>              |   | ---  | 6.8  | ---       |                        |
| $T_{d(on)}$               | Turn-On Delay Time <sup>3, 4</sup>             | $V_{DD}=15V$ , $V_{GS}=10V$ , $R_G=3.3\Omega$<br>$I_D=15A$        | ---  | 7.5  | ---       | ns                     |
| $T_r$                     | Rise Time <sup>3, 4</sup>                      |   | ---  | 14.5 | ---       |                        |
| $T_{d(off)}$              | Turn-Off Delay Time <sup>3, 4</sup>            |   | ---  | 35.2 | ---       |                        |
| $T_f$                     | Fall Time <sup>3, 4</sup>                      |   | ---  | 9.6  | ---       |                        |
| Ciss                      | Input Capacitance                              | $V_{DS}=25V$ , $V_{GS}=0V$ , $F=1MHz$                             | ---  | 1160 | ---       | pF                     |
| Coss                      | Output Capacitance                             | $V_{GS}=0V$ , $V_{DS}=0V$ , $F=1MHz$                              | ---  | 200  | ---       | $\Omega$               |
| Crss                      | Reverse Transfer Capacitance                   |   | ---  | 180  | ---       |                        |
| $R_g$                     | Gate resistance                                |   | ---  | 2.5  | ---       |                        |
| EAS                       | Single Pulse Avalanche Energy                  | $V_{DD}=25V$ , $L=0.1mH$ , $I_{AS}=20A$                           | 20   | ---  | ---       | mJ                     |
| IS                        | Continuous Source Current                      | $V_G=V_D=0V$ , Force Current                                      | ---  | ---  | 80        | A                      |
| ISM                       | Pulsed Source Current <sup>3</sup>             |   | ---  | ---  | 320       | A                      |
| VSD                       | Diode Forward Voltage <sup>3</sup>             | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^{\circ}\text{C}$                 | ---  | ---  | 1         | V                      |
| trr                       | Reverse Recovery Time                          | $V_{GS}=0V, I_S=1A$ , $di/dt=100A/\mu s$ $T_J=25^{\circ}\text{C}$ | ---  | ---  | ---       | ns                     |
| $Q_{rr}$                  | Reverse Recovery Charge                        |   | ---  | ---  | ---       | nC                     |



## Typical Characteristics

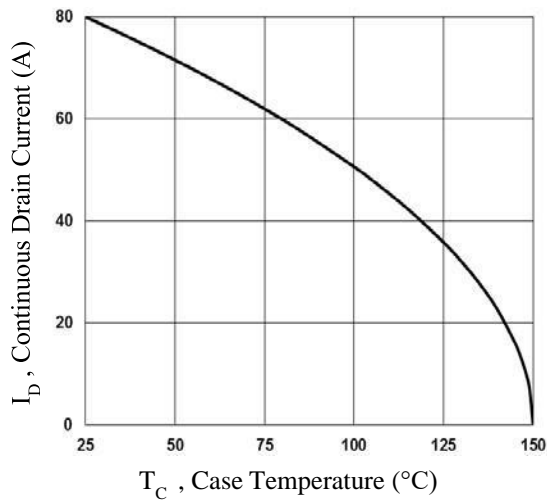


Fig.1 Continuous Drain Current vs.  $T_C$

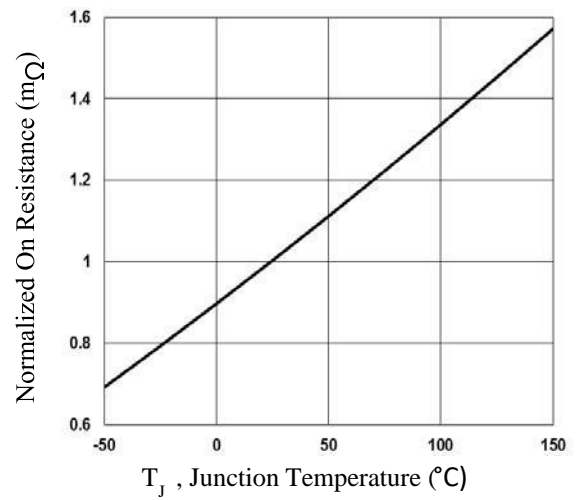


Fig.2 Normalized  $R_{DS(on)}$  vs.  $T_J$

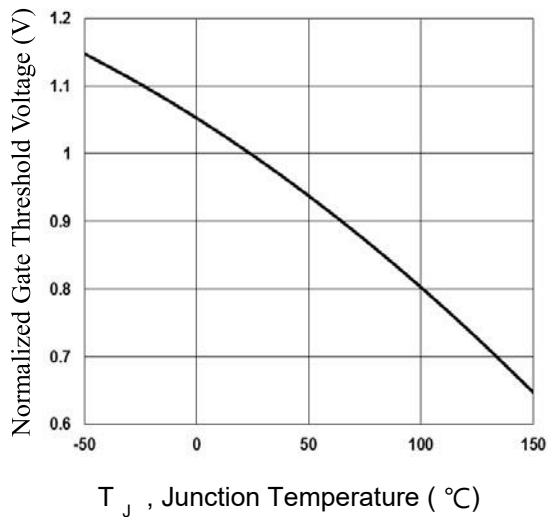


Fig.3 Normalized  $V_{th}$  vs.  $T_J$

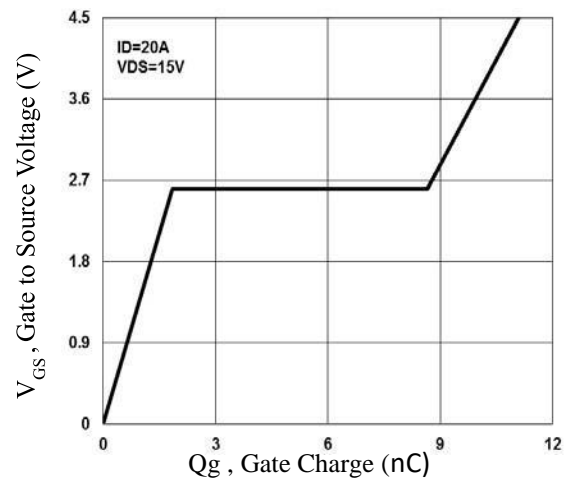


Fig.4 Gate Charge Waveform

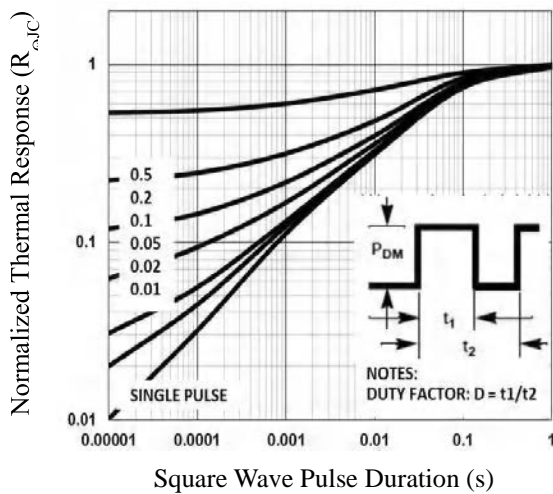


Fig.5 Normalized Transient Impedance

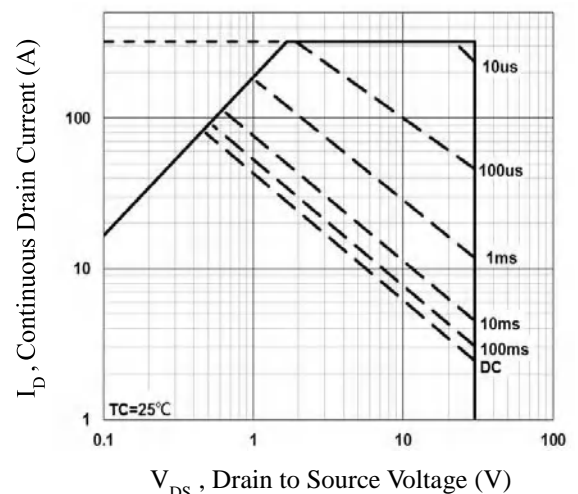


Fig.6 Maximum Safe Operation Area

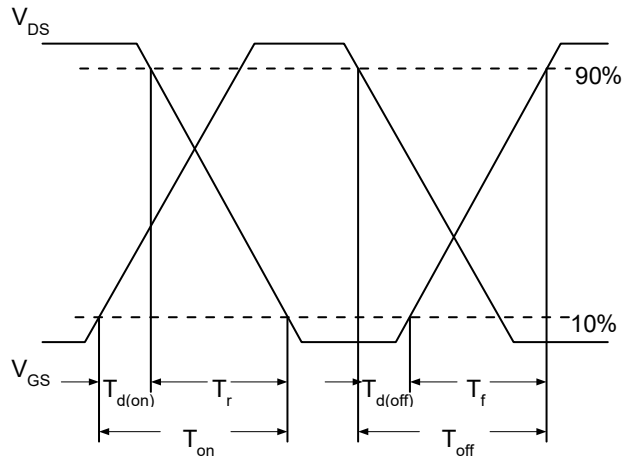


Fig.7 Switching Time Waveform

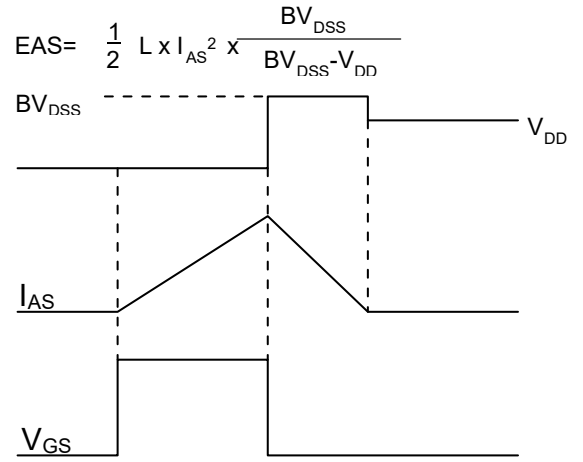
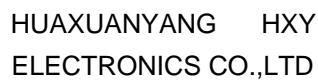


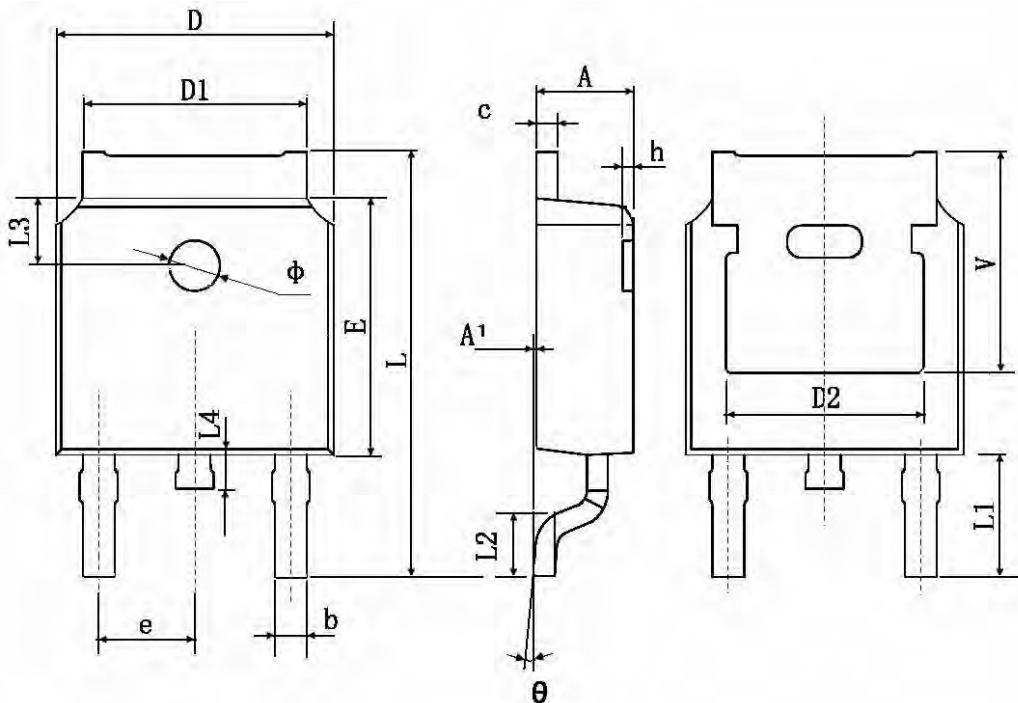
Fig.8 EAS Waveform



NTD4960NT4G

## N-Channel Enhancement Mode MOSFET

## TO252-2L(TO-252(DPAK)) 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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