



## Description

The NTMFS4C06N 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

$V_{DS} = 30V$   $I_D = 90A$

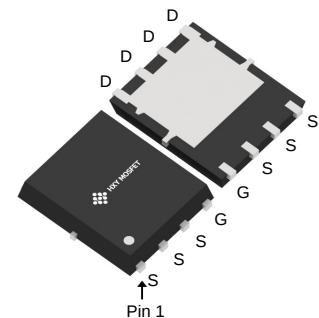
$R_{DS(ON)} < 2.4m\Omega$   $V_{GS} = 10V$

## Application

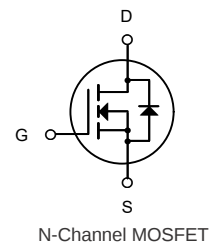
Battery protection

Load switch

Uninterruptible power supply



DFN5X6-8L



N-Channel MOSFET

## Package Marking and Ordering Information

| Product ID | Pack      | Brand      | Qty(PCS) |
|------------|-----------|------------|----------|
| NTMFS4C06N | DFN5X6-8L | HXY MOSFET | 5000     |

## 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, $V_{GS} @ 10V^1$       | 90         | A            |
| $I_D @ T_C = 100^\circ C$ | Continuous Drain Current, $V_{GS} @ 10V^1$       | 65         | A            |
| $I_{DM}$                  | Pulsed Drain Current <sup>2</sup>                | 160        | A            |
| EAS                       | Single Pulse Avalanche Energy <sup>3</sup>       | 180        | mJ           |
| $I_{AS}$                  | Avalanche Current                                | 60         | A            |
| $P_D @ T_C = 25^\circ C$  | Total Power Dissipation <sup>4</sup>             | 187        | 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>    | 1.1        | $^\circ C/W$ |



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

| Symbol                       | Parameter                                      | Conditions                                                  | Min. | Typ.  | Max.      | Unit                |
|------------------------------|------------------------------------------------|-------------------------------------------------------------|------|-------|-----------|---------------------|
| $BV_{DSS}$                   | Drain-Source Breakdown Voltage                 | $V_{GS}=0V$ , $I_D=250\mu A$                                | 30   | ---   | ---       | V                   |
| $\Delta BV_{DSS}/\Delta T_J$ | $BV_{DSS}$ Temperature Coefficient             | Reference to $25^\circ\text{C}$ , $I_D=1mA$                 | ---  | 0.014 | ---       | $V/^\circ\text{C}$  |
| $R_{DS(on)}$                 | Static Drain-Source On-Resistance <sup>2</sup> | $V_{GS}=10V$ , $I_D=30A$                                    | ---  | 2     | 2.4       | $m\Omega$           |
|                              |                                                | $V_{GS}=4.5V$ , $I_D=15A$                                   | ---  | 2.5   | 3.2       |                     |
| $V_{GS(th)}$                 | Gate Threshold Voltage                         | $V_{GS}=V_{DS}$ , $I_D=250\mu A$                            | 1.2  | ---   | 2.5       | V                   |
| $\Delta V_{GS(th)}$          | $V_{GS(th)}$ Temperature Coefficient           |                                                             | ---  | -4    | ---       | $mV/^\circ\text{C}$ |
| $I_{DSS}$                    | 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                       | $V_{DS}=5V$ , $I_D=30A$                                     | ---  | 50    | ---       | S                   |
| $R_g$                        | Gate Resistance                                | $V_{DS}=0V$ , $V_{GS}=0V$ , $f=1MHz$                        | ---  | 1.7   | ---       | $\Omega$            |
| $Q_g$                        | Total Gate Charge (4.5V)                       | $V_{DS}=15V$ , $V_{GS}=10V$ , $I_D=15A$                     | ---  | 56.9  | ---       | nC                  |
| $Q_{gs}$                     | Gate-Source Charge                             |                                                             | ---  | 13.8  | ---       |                     |
| $Q_{gd}$                     | Gate-Drain Charge                              |                                                             | ---  | 23.5  | ---       |                     |
| $T_{d(on)}$                  | Turn-On Delay Time                             | $V_{DD}=15V$ , $V_{GS}=10V$ , $R_G=3.3\Omega$ ,<br>$I_D=1A$ | ---  | 20.1  | ---       | ns                  |
| $T_r$                        | Rise Time                                      |                                                             | ---  | 6.3   | ---       |                     |
| $T_{d(off)}$                 | Turn-Off Delay Time                            |                                                             | ---  | 124.6 | ---       |                     |
| $T_f$                        | Fall Time                                      |                                                             | ---  | 15.8  | ---       |                     |
| $C_{iss}$                    | Input Capacitance                              | $V_{DS}=15V$ , $V_{GS}=0V$ , $f=1MHz$                       | ---  | 4345  | ---       | pF                  |
| $C_{oss}$                    | Output Capacitance                             |                                                             | ---  | 340   | ---       |                     |
| $C_{rss}$                    | Reverse Transfer Capacitance                   |                                                             | ---  | 225   | ---       |                     |

**Diode Characteristics**

| Symbol   | Parameter                                | Conditions                                      | Min. | Typ. | Max. | Unit |
|----------|------------------------------------------|-------------------------------------------------|------|------|------|------|
| $I_S$    | Continuous Source Current <sup>1,6</sup> | $V_G=V_D=0V$ , Force Current                    | ---  | ---  | 90   | A    |
| $V_{SD}$ | Diode Forward Voltage <sup>2</sup>       | $V_{GS}=0V$ , $I_S=1A$ , $T_J=25^\circ\text{C}$ | ---  | ---  | 1.2  | V    |

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  $V_{DD}=25V$ ,  $V_{GS}=10V$ ,  $L=0.1mH$ ,  $I_{AS}=60A$
- 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.
- 6.Package limitation current is 85A.



## Typical Characteristics

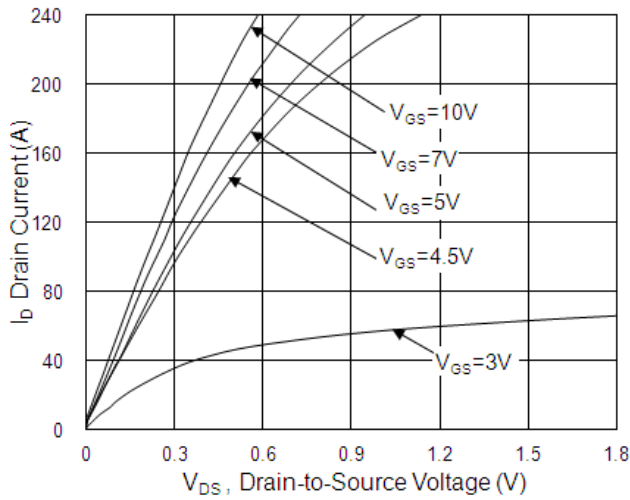


Fig.1 Typical Output Characteristics

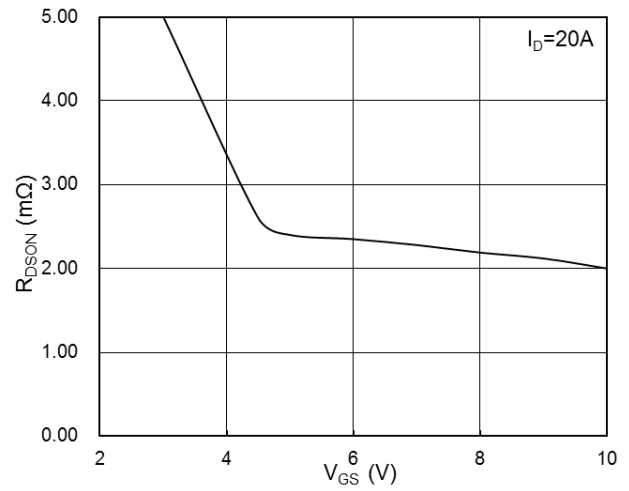


Fig.2 On-Resistance v.s Gate-Source

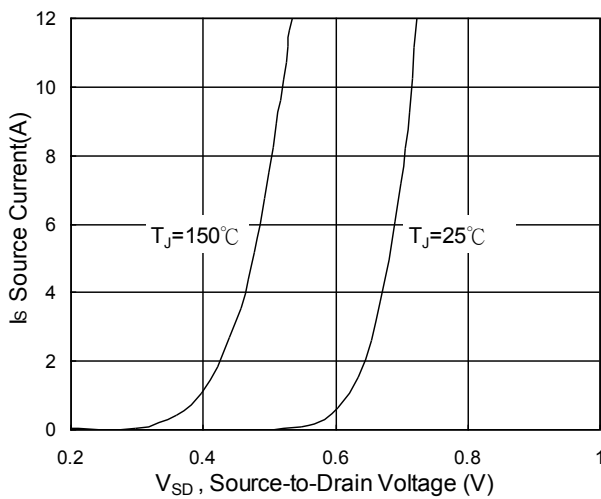


Fig.3 Forward Characteristics of Reverse

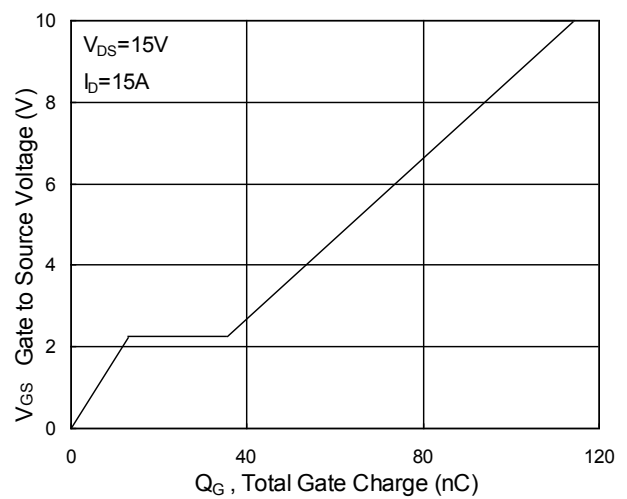


Fig.4 Gate-Charge Characteristics

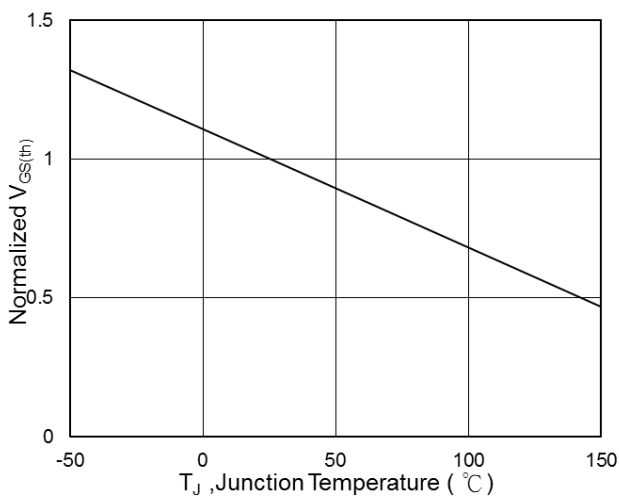


Fig.5 Normalized  $V_{GS(th)}$  v.s  $T_J$

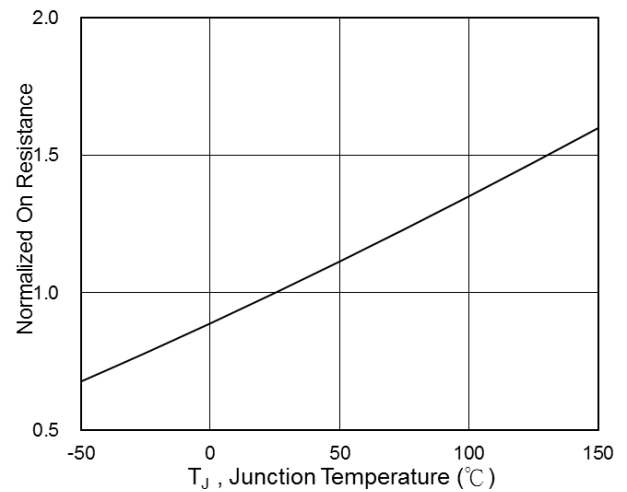


Fig.6 Normalized  $R_{DS(on)}$  v.s  $T_J$

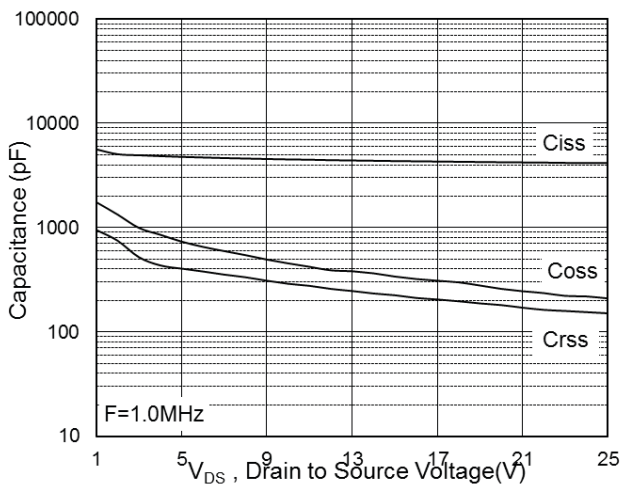


Fig.7 Capacitance

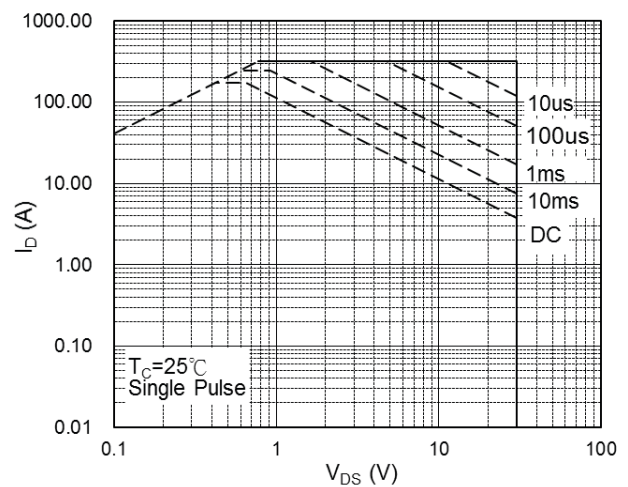


Fig.8 Safe Operating Area

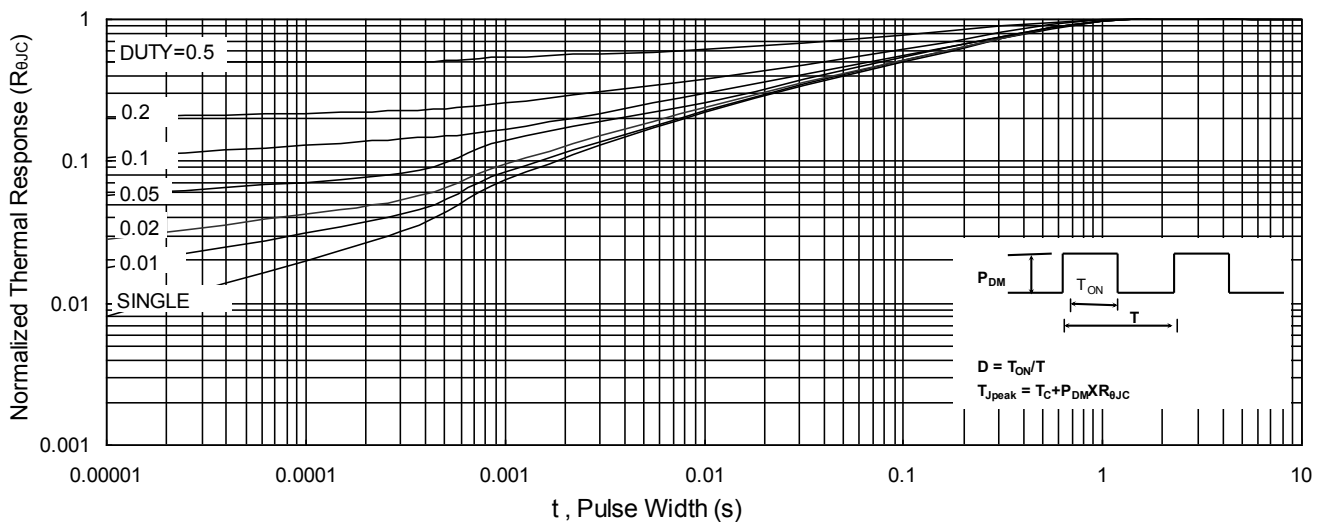


Fig.9 Normalized Maximum Transient Thermal Impedance

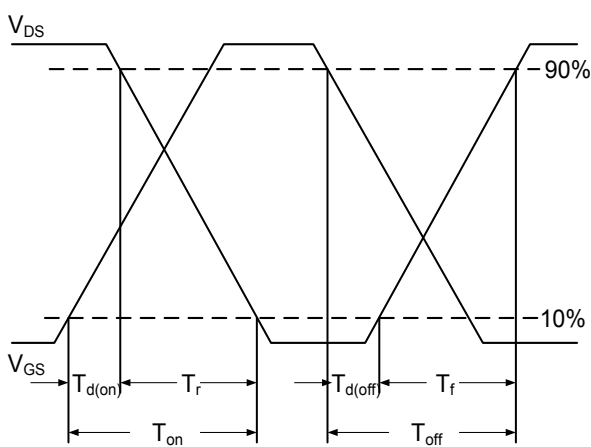


Fig.10 Switching Time Waveform

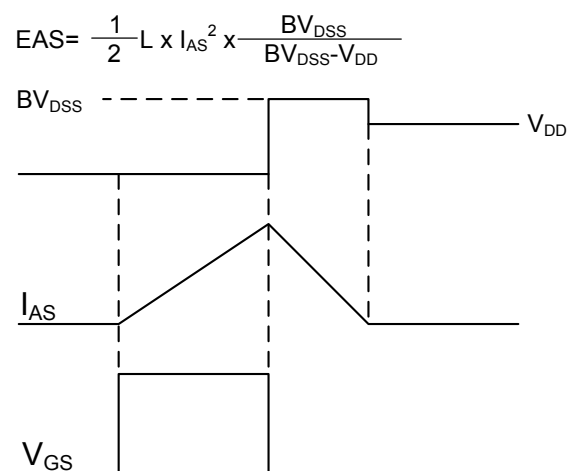
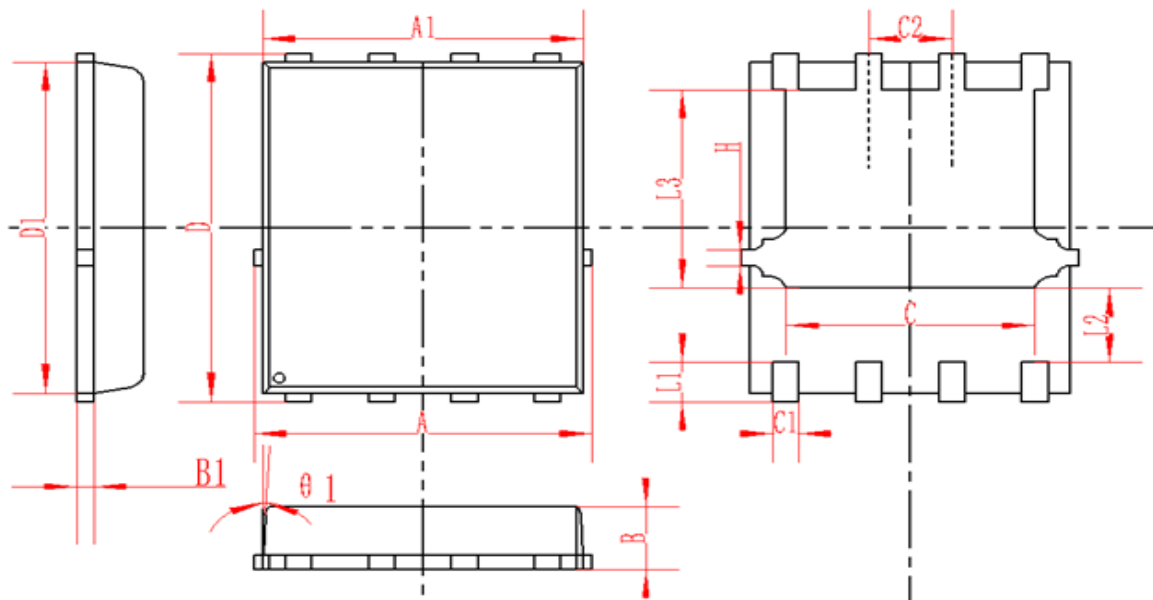


Fig.11 Unclamped Inductive Switching Waveform



## DFN5X6-8L Package Information



| SYMBOL | MM       |      |       | INCH     |       |       |
|--------|----------|------|-------|----------|-------|-------|
|        | MIN      | NOM  | MAX   | MIN      | NOM   | MAX   |
| A      | 5.3      | 5.5  | 5.7   | 0.208    | 0.216 | 0.224 |
| A1     | 5.1      | 5.2  | 5.3   | 0.2      | 0.204 | 0.209 |
| D      | 5.98     | 6    | 6.02  | 0.235    | 0.236 | 0.237 |
| D1     | 5.85     | 6.05 | 6.25  | 0.23     | 0.238 | 0.246 |
| B      | 0.85     | 0.95 | 1.05  | 0.033    | 0.037 | 0.041 |
| B1     | 0.254REF |      |       | 0.010REF |       |       |
| C      | 3.95     | 4    | 4.05  | 0.156    | 0.157 | 0.159 |
| C1     | 0.35     | 0.4  | 0.45  | 0.014    | 0.016 | 0.018 |
| C2     | 1.27TYP  |      |       | 0.5TYP   |       |       |
| θ1     | 8°       | 10°  | 12°   | 8°       | 10°   | 12°   |
| L1     | 0.63     | 0.64 | 0.65  | 0.025    | 0.025 | 0.026 |
| L2     | 1.2      | 1.3  | 1.4   | 0.047    | 0.051 | 0.055 |
| L3     | 3.415    | 3.42 | 3.425 | 0.134    | 0.135 | 0.135 |
| H      | 0.24     | 0.25 | 0.26  | 0.009    | 0.010 | 0.010 |



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