# NCE Automotive N-Channel Super Trench II Power MOSFET

## Description

The series of devices uses **Super Trench II** technology that is uniquely optimized to provide the most efficient high frequency switching performance. Both conduction and switching power losses are minimized due to an extremely low combination of $R_{DS(ON)}$ and $Q_g$. This device is ideal for high-frequency switching and synchronous rectification.

## Application

- Automotive application
- DC/DC Converter
- Ideal for high-frequency switching and synchronous rectification

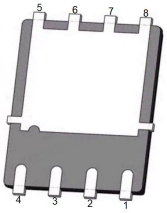
## General Features

- $V_{DS}$ =85V,$I_D$ =175A
  $R_{DS(ON)}$=2.8mΩ , typical@ $V_{GS}$=10V
- Excellent gate charge x $R_{DS(on)}$ product(FOM)
- Very low on-resistance $R_{DS(on)}$
- 175 °C operating temperature
- Pb-free lead plating
- 100% UIS tested
- 100% ΔVds tested
- **AEC-Q101 qualified**

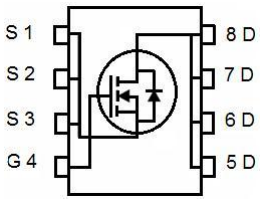
**PDFN 5X6-DSC-8L**




**Top View**




**Bottom View**




**Schematic Diagram**

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| AP030N85GW | NCEAP030N85GW | PDFN5x6-DSC-8L | - | - | - |

## Absolute Maximum Ratings ($T_C$=25℃unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 85 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous ($T_C$=25℃) | $I_D$ ($T_C$=25℃) | 175 | A |
| Drain Current-Continuous($T_C$=100℃) | $I_D$ ($T_C$=100℃) | 124 | A |
| Pulsed Drain Current | $I_{DM}$ | 700 | A |
| Maximum Power Dissipation ($T_C$=25℃) | $P_D$ ($T_C$=25℃) | 202 | W |
| Derating factor | | 1.35 | W/℃ |
| Single pulse avalanche energy (Note 1) | $E_{AS}$ | 1013 | mJ |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 175 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Case | $R_{\theta JC}$ | 0.74 | ℃/W |
| Thermal Resistance,Junction-to-Ambient (Note4) | $R_{\theta JA}$ | 50 | ℃/W |

## Electrical Characteristics ($T_C$=25℃unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 85 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=85V,$V_{GS}$=0V | - | - | 1 | μA |
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 2.0 | 3.0 | 4.0 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=20A | - | 2.8 | 3.45 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=10V,$I_D$=20A | - | 70 | - | S |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=40V,$V_{GS}$=0V, F=1.0MHz | - | 6776 | - | pF |
| Output Capacitance | $C_{oss}$ | | - | 930 | - | pF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 52 | - | pF |
| **Switching Characteristics** (Note 2) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=40V,$I_D$=20A $V_{GS}$=10V,$R_G$=3Ω | - | 13 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 14 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 87 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 38 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=40V,$I_D$=20A, $V_{GS}$=10V | - | 89.7 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 27.5 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 21.5 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V,$I_S$=20A | - | - | 1.2 | V |
| Diode Forward Current | $I_S$ | | - | - | 175 | A |
| Reverse Recovery Time | $t_{rr}$ | $T_J$ = 25°C, $I_F$ = 20A di/dt = 100A/μs | - | 62 | - | nS |
| Reverse Recovery Charge | Qrr | | - | 119 | - | nC |

1. EAS condition : Tj=25℃,$V_{DD}$=40V,$V_G$=10V,L=0.5mH,Rg=25Ω
2. Guaranteed by design, not subject to production
3. These curves are based on the junction-to-case thermal impedance which is measured with the device mounted to a large heatsink, assuming a maximum junction temperature of $T_{J(MAX)}$=175°C. The SOA curve provides a single pulse rating
4. The value of $R_{\theta JA}$ is measured with the device mounted on 1in2 FR-4 board with 2oz. Copper, in a still air environment with $T_A$ =25° C. The value in any given application depends on the user's specific board design, and the maximum temperature of 175° C may be used if the PCB allows it.

## Typical Electrical and Thermal Characteristics

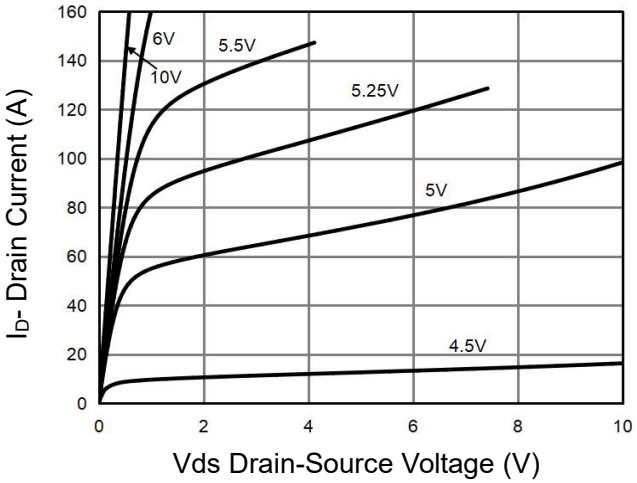



**Figure 1 Output Characteristics**

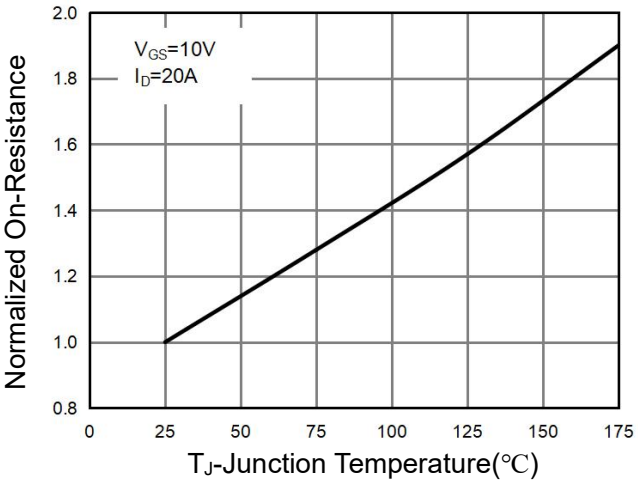



**Figure 4 Rdson-Junction Temperature**

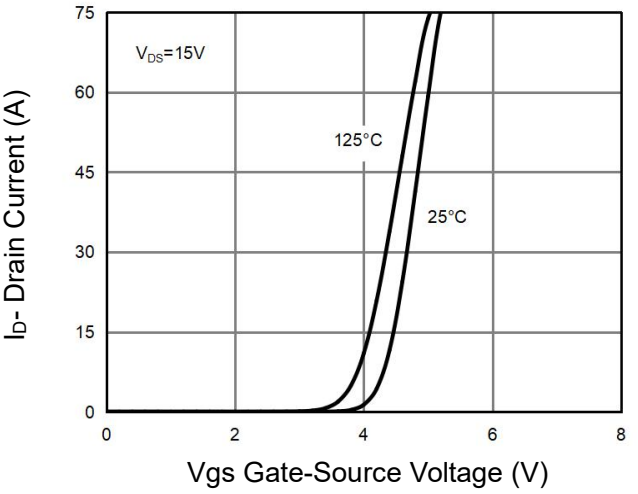



**Figure 2 Transfer Characteristics**

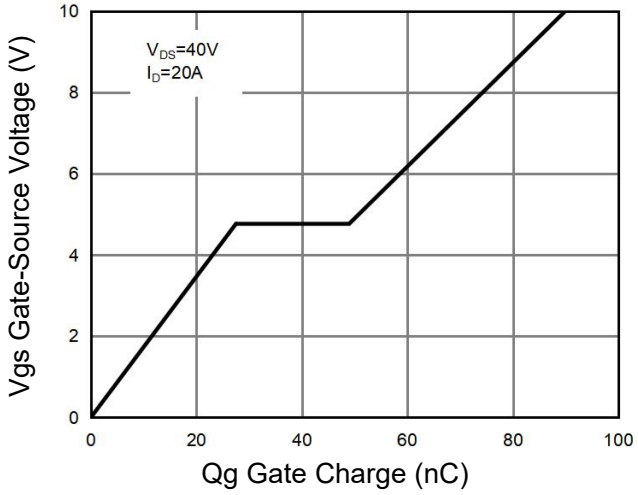



**Figure 5 Gate Charge**

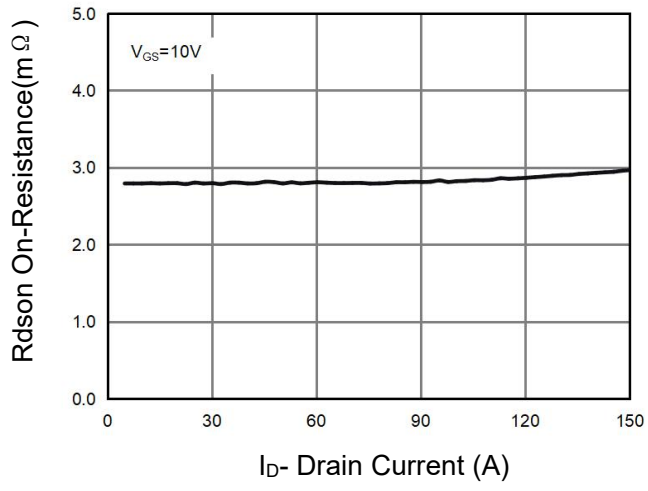



**Figure 3 Rdson- Drain Current**

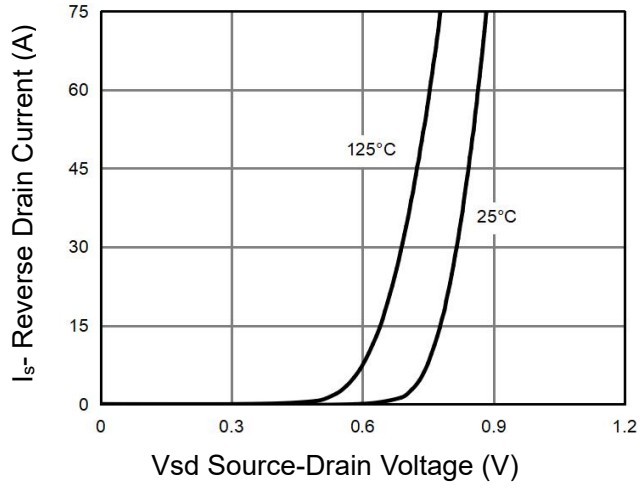



**Figure 6 Source- Drain Diode Forward**

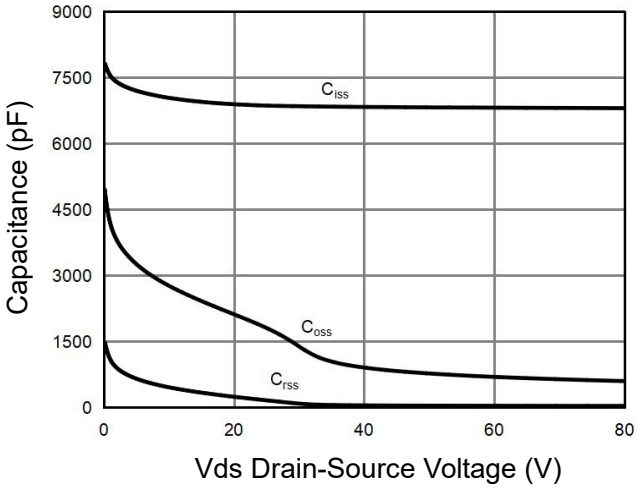



**Figure 7 Capacitance vs Vds**

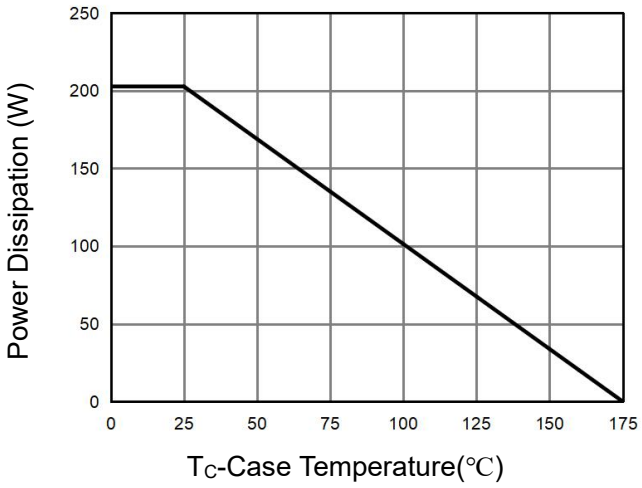



**Figure 9 Power De-rating**

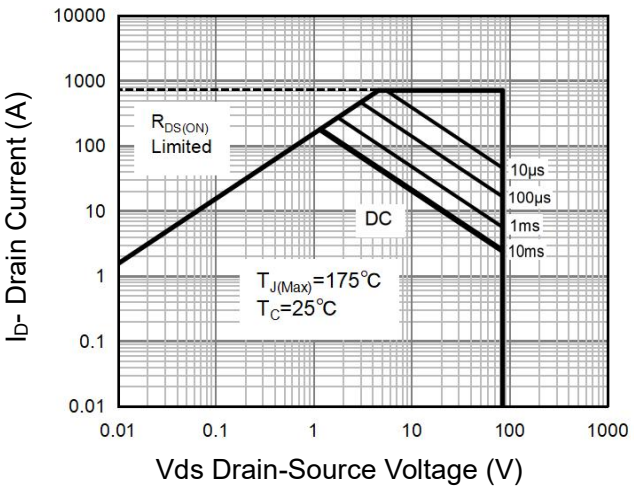



**Figure 8 Safe Operation Area**(Note3)

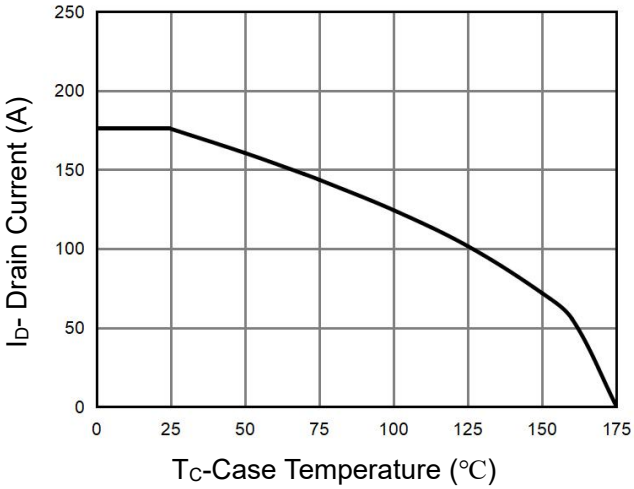



**Figure 10 Current De-rat**

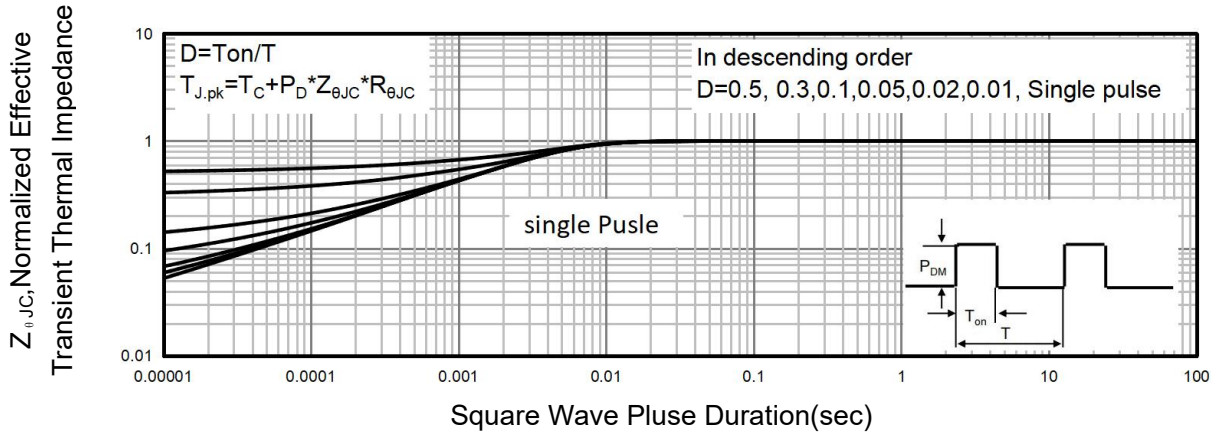
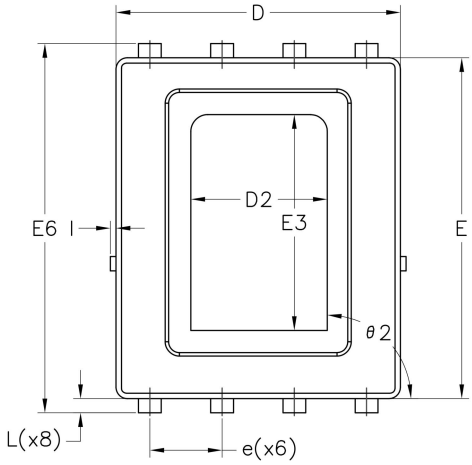
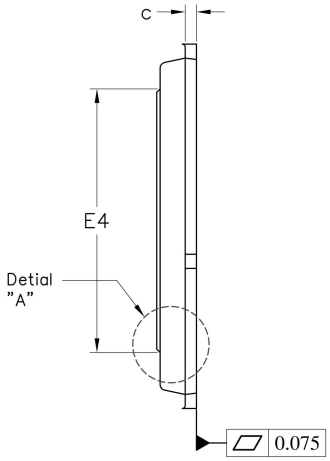
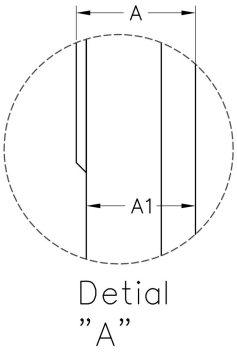


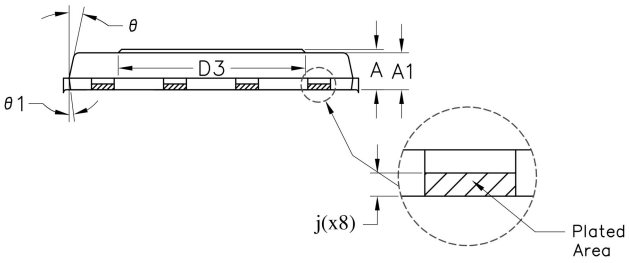

**Figure 11 Normalized Maximum Transient Thermal Impedance**

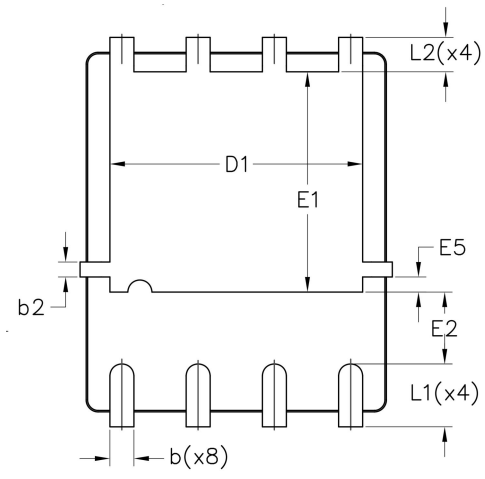
## PDFN 5X6-DCS-8L Package Information




| SYMBOL | COMMON | | |
|---|---|---|---|
| | MIN. | Nom. | MAX. |
| A | 0.660 | 0.710 | 0.760 |
| A1 | 0.600 | ----- | 0.750 |
| b | 0.330 | 0.430 | 0.530 |
| b2 | 0.150 | 0.250 | 0.350 |
| c | 0.150 | 0.203 | 0.300 |
| D | 4.850 | 5.000 | 5.150 |
| D1 | 4.060 | 4.210 | 4.360 |
| D2 | 2.200 | ----- | ----- |
| D3 | 2.800 | 3.300 | 3.800 |
| E | 5.850 | 6.000 | 6.150 |
| E1 | 3.525 | 3.675 | 3.825 |
| E2 | 1.050 | 1.200 | 1.350 |
| E3 | 3.600 | ----- | ----- |
| E4 | 4.200 | 4.700 | 5.200 |
| E5 | 0.150 | 0.250 | 0.350 |
| E6 | 6.400 | 6.500 | 6.600 |
| e | 1.270 Bsc. | | |
| I | ----- | ----- | 0.150 |
| L | 0.150 | 0.250 | 0.350 |
| L1 | 0.925 | 1.050 | 1.175 |
| L2 | 0.450 | 0.575 | 0.700 |
| θ | 12° Bsc. | | |
| θ1 | 7° Bsc. | | |
| θ2 | 85° | 90° | 95° |
| j | 0.100 Bsc. | | |

## Revision History

| Revision | Date | Subjects |
|---|---|---|
| V1.0 | 2025.12.02 | Product data sheet |

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