# NCE N-Channel Super Trench Power MOSFET

## Description

The series of devices uses **Super Trench** 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

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

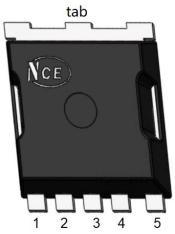
## General Features

- $V_{DS}$ =40V,$I_D$ =340A
  $R_{DS(ON)}$=1.1mΩ , 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

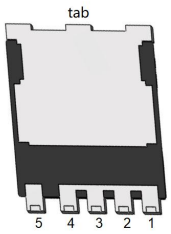
***100% UIS TESTED!***

***100% ΔVds TESTED!***

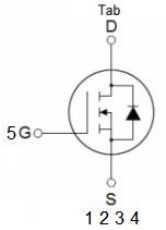
sTOLL




**Top View**




**Bottom View**




**Schematic Diagram**

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| NCEP40T20ASL | NCEP40T20ASL | sTOLL | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 40 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 340 | A |
| Drain Current-Continuous($T_C$=100℃) | $I_D$ (100℃) | 238 | A |
| Pulsed Drain Current | $I_{DM}$ | 1360 | A |
| Maximum Power Dissipation | $P_D$ | 270 | W |
| Derating factor | | 1.8 | W/℃ |
| Single pulse avalanche energy (Note 1) | $E_{AS}$ | 1692 | mJ |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 175 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Case | $R_{\theta JC}$ | 0.56 | ℃/W |

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Drain-Source Breakdown Voltage | $BV_{DSS}$ | $V_{GS}$=0V $I_D$=250μA | 40 | | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=40V,$V_{GS}$=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 | - | 1.1 | 1.3 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=5V,$I_D$=100A | | 90 | - | S |
| **Dynamic Characteristics** | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=20V,$V_{GS}$=0V, F=1.0MHz | - | 5400 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 2150 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 55 | - | PF |
| **Switching Characteristics** (Note 2) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=20V,$I_D$=20A $V_{GS}$=10V,$R_G$=1.6Ω | - | 14.5 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 8 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 58 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 10 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=20V,$I_D$=20A, $V_{GS}$=10V | - | 72 | - | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 24.8 | | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 9.5 | | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage | $V_{SD}$ | $V_{GS}$=0V,$I_S$=20A | - | | 1.2 | V |
| Diode Forward Current | $I_S$ | | - | - | 250 | A |
| Reverse Recovery Time | $t_{rr}$ | $T_J$ = 25°C, $I_F$ = $I_S$ di/dt = 100A/μs | - | - | 38 | nS |
| Reverse Recovery Charge | Qrr | | - | - | 125 | nC |

## Notes:

1. EAS condition : Tj=25℃,$V_{DD}$=20V,$V_G$=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 TJ(MAX)=175°C. The SOA curve provides a single pulse rating.

## Typical Electrical and Thermal Characteristics

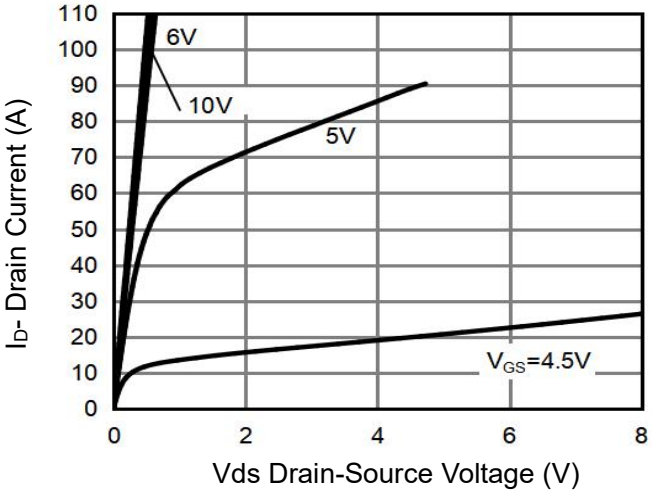



**Figure 1 Output Characteristics**

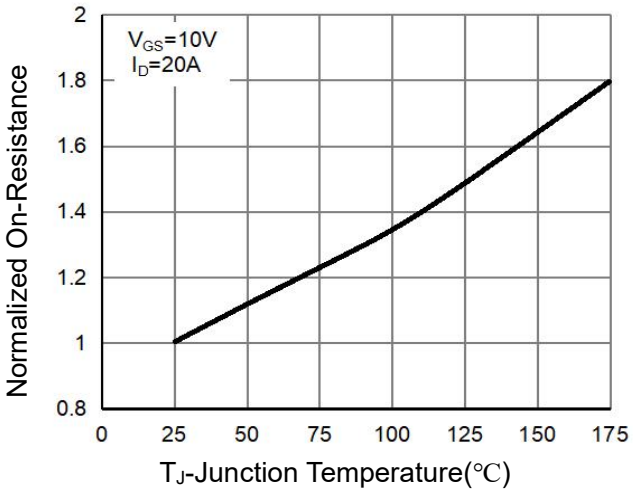



**Figure 4 Rdson-Junction Temperature**

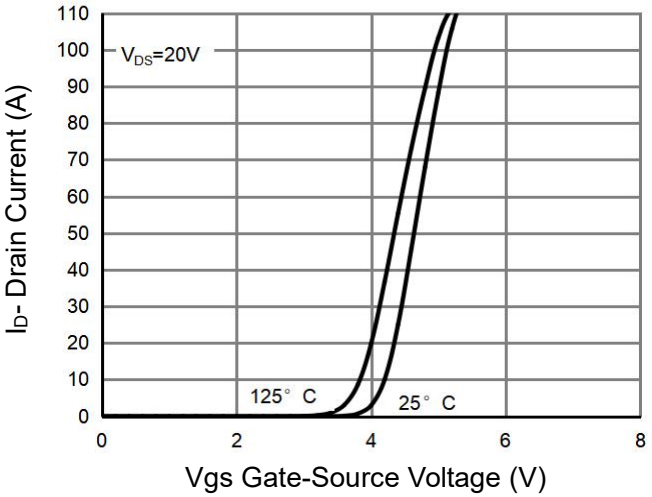



**Figure 2 Transfer Characteristics**

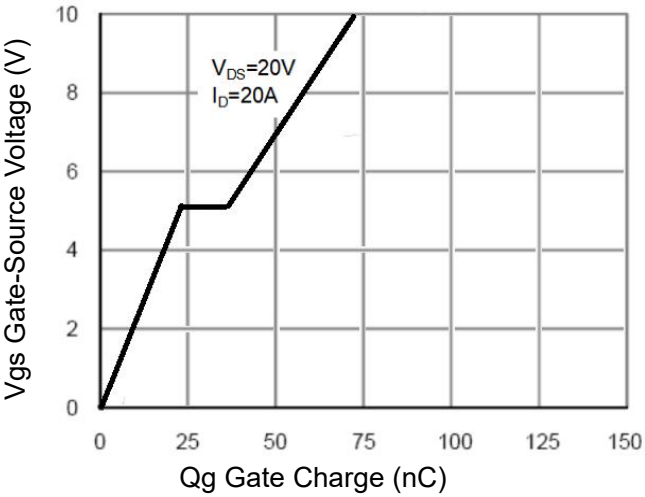



**Figure 5 Gate Charge**

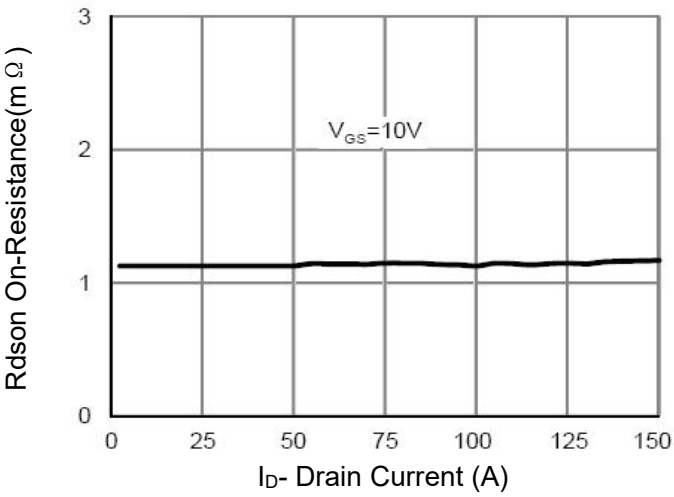



**Figure 3 Rdson- Drain Current**

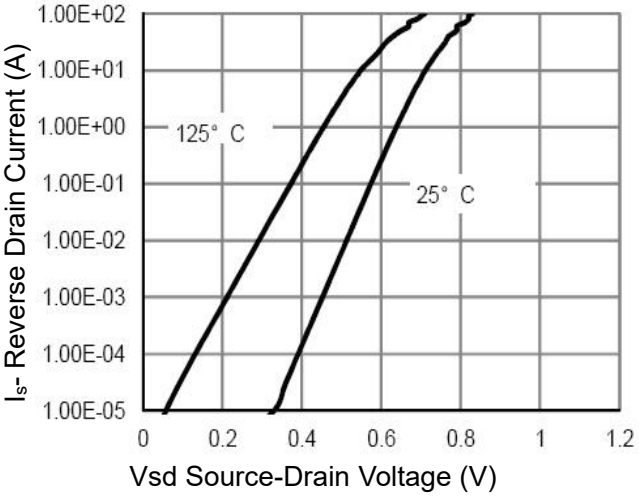



**Figure 6 Source- Drain Diode Forward**

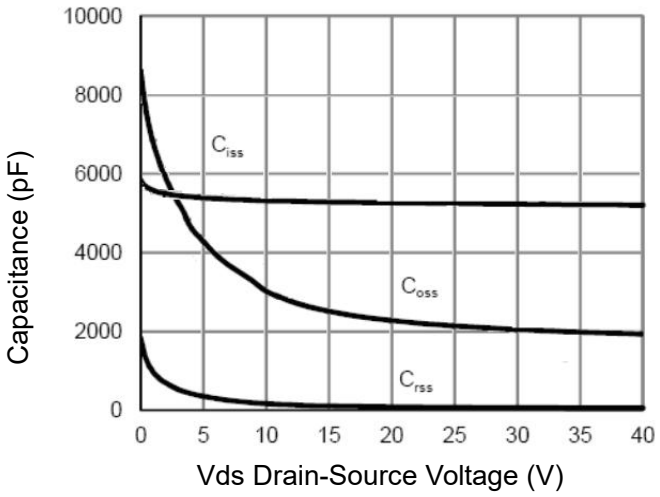



**Figure 7 Capacitance vs Vds**

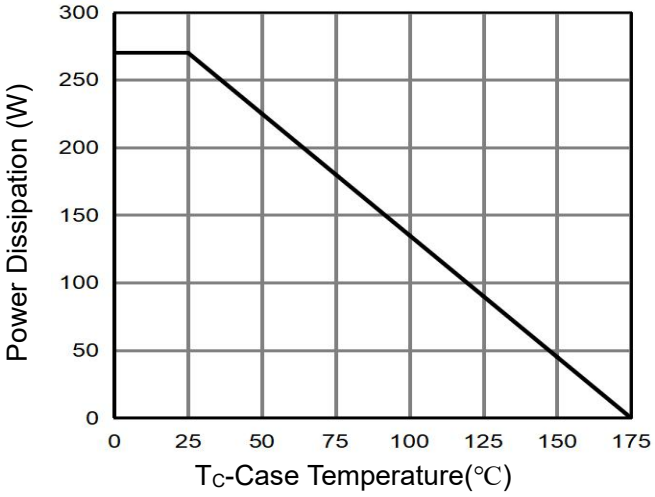



**Figure 9 Power De-rating**

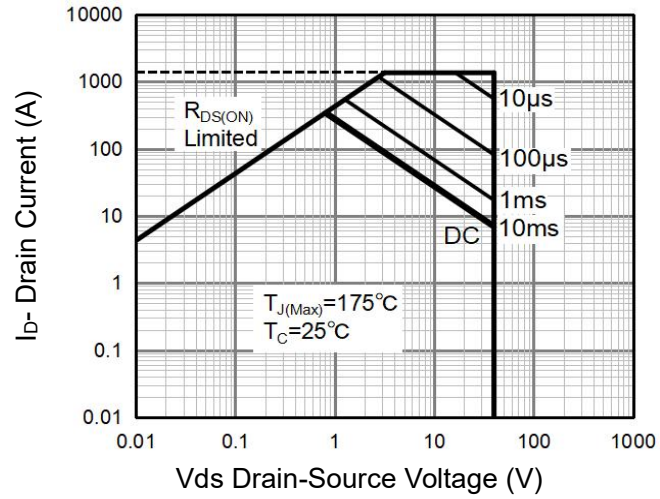



**Figure 8 Safe Operation Area** (Note3)

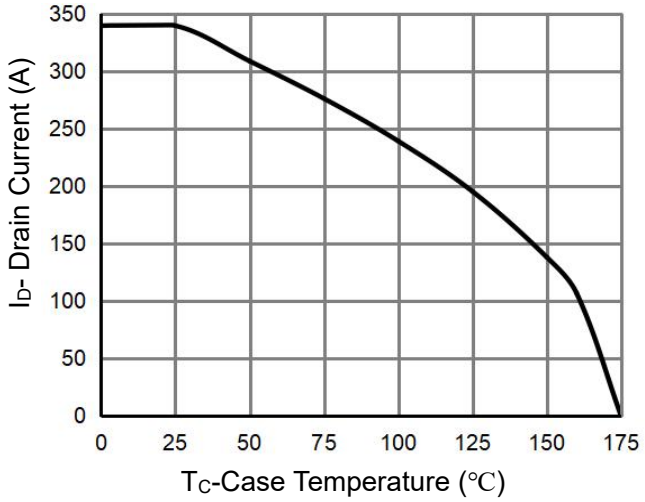



**Figure 10 Current De-rating**

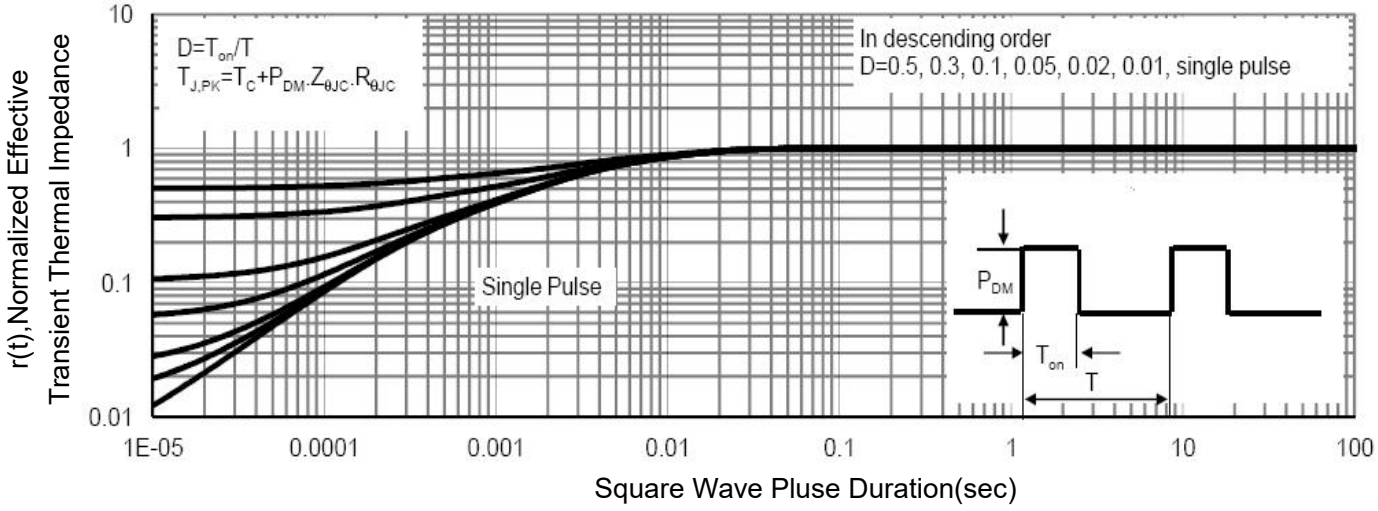
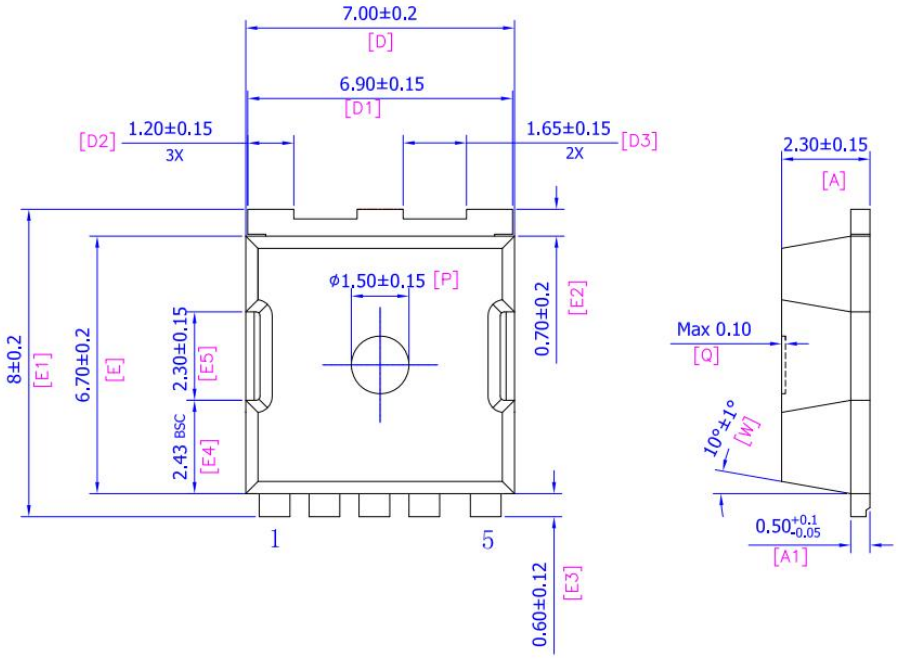
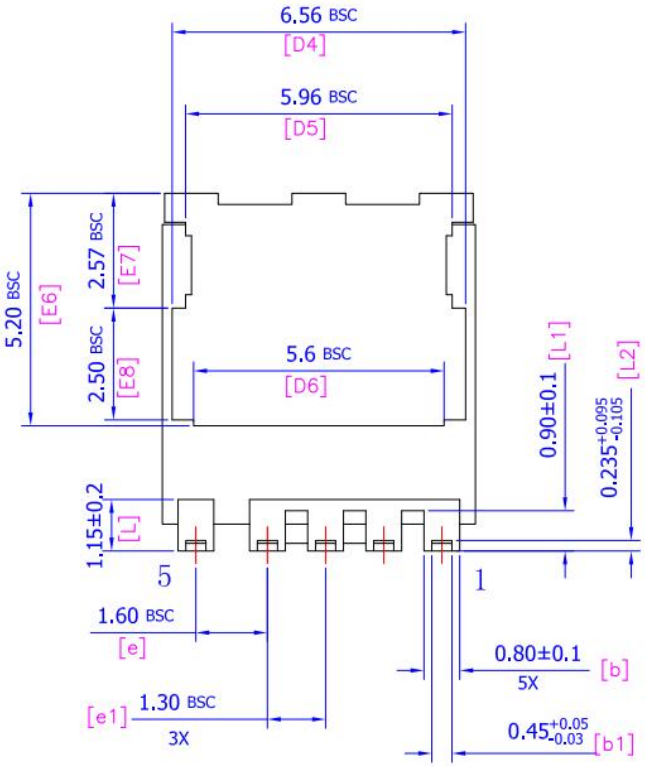



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## sTOLL Package Information



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