

NCE 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

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

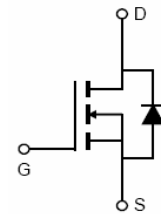
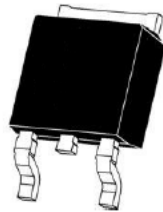
General Features

- $V_{DS} = 120V, I_D = 65A$
 $R_{DS(ON)} = 8.7m\Omega$, 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% ΔV_{ds} TESTED!

TO-252



Schematic Diagram

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|------------|----------------|-----------|------------|----------|
| NCEP10N12K | NCEP10N12K | TO-252-2L | - | - | - |

Absolute Maximum Ratings ($T_C = 25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|---|--------------------|------------|---------------|
| Drain-Source Voltage | V_{DS} | 120 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | 65 | A |
| Drain Current-Continuous($T_C = 100^\circ C$) | $I_D(100^\circ C)$ | 46 | A |
| Pulsed Drain Current | I_{DM} | 260 | A |
| Maximum Power Dissipation | P_D | 100 | W |
| Derating factor | | 0.67 | W/ $^\circ C$ |
| Single pulse avalanche energy ^(Note 4) | E_{AS} | 352 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | $^\circ C$ |

Thermal Characteristic

| | | | |
|--------------------------------------|-----------------|-----|--------------|
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 1.5 | $^\circ C/W$ |
|--------------------------------------|-----------------|-----|--------------|

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|--------------|--|-----|------|-----------|------------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV_{DSS} | $V_{GS}=0V, I_D=250\mu A$ | 120 | | - | V |
| Zero Gate Voltage Drain Current | I_{DSS} | $V_{DS}=120V, V_{GS}=0V$ | - | - | 1 | μA |
| Gate-Body Leakage Current | I_{GSS} | $V_{GS}=\pm 20V, V_{DS}=0V$ | - | - | ± 100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$ | 2.0 | 3.0 | 4.0 | V |
| Drain-Source On-State Resistance | $R_{DS(on)}$ | $V_{GS}=10V, I_D=35A$ | - | 8.7 | 10.0 | m Ω |
| Forward Transconductance | g_{FS} | $V_{DS}=5V, I_D=35A$ | | 60 | - | S |
| Dynamic Characteristics (Note 3) | | | | | | |
| Input Capacitance | C_{ISS} | $V_{DS}=60V, V_{GS}=0V,$ $F=1.0MHz$ | - | 3050 | - | pF |
| Output Capacitance | C_{OSS} | | - | 280 | - | pF |
| Reverse Transfer Capacitance | C_{RSS} | | - | 22 | - | pF |
| Switching Characteristics (Note 3) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}=60V, I_D=35A$ $V_{GS}=10V, R_G=1.6\Omega$ | - | 15 | - | nS |
| Turn-on Rise Time | t_r | | - | 10 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 34 | - | nS |
| Turn-Off Fall Time | t_f | | - | 8 | - | nS |
| Total Gate Charge | Q_g | $V_{DS}=60V, I_D=35A,$ $V_{GS}=10V$ | - | 53 | - | nC |
| Gate-Source Charge | Q_{gs} | | - | 20 | - | nC |
| Gate-Drain Charge | Q_{gd} | | - | 12.5 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 2) | V_{SD} | $V_{GS}=0V, I_S=35A$ | - | - | 1.2 | V |
| Diode Forward Current | I_S | | - | - | 65 | A |
| Reverse Recovery Time | t_{rr} | $T_J = 25^\circ\text{C}, I_F = 35A$ $di/dt = 100A/\mu s$ (Note 3) | - | 60 | - | nS |
| Reverse Recovery Charge | Q_{rr} | | - | 106 | - | nC |

Notes:

1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Pulse Test: Pulse Width $\leq 300\mu s$, Duty Cycle $\leq 2\%$.
3. Guaranteed by design, not subject to production
4. EAS condition : $T_J=25^\circ\text{C}, V_{DD}=50V, V_G=10V, L=0.25mH, R_g=25\Omega$

Typical Electrical and Thermal Characteristics

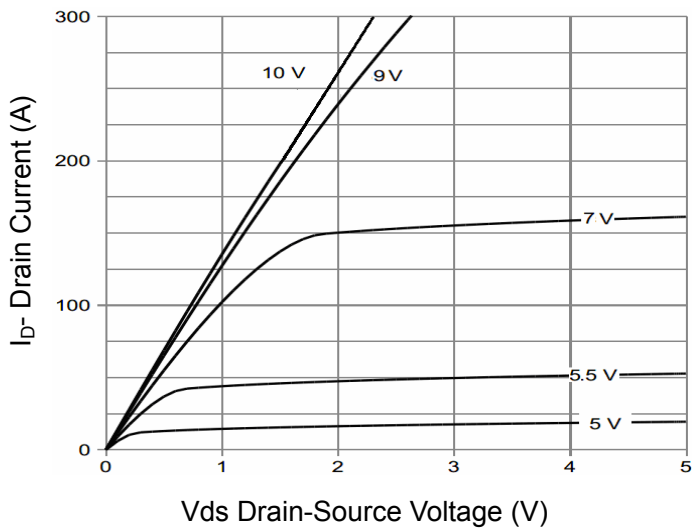


Figure 1 Output Characteristics

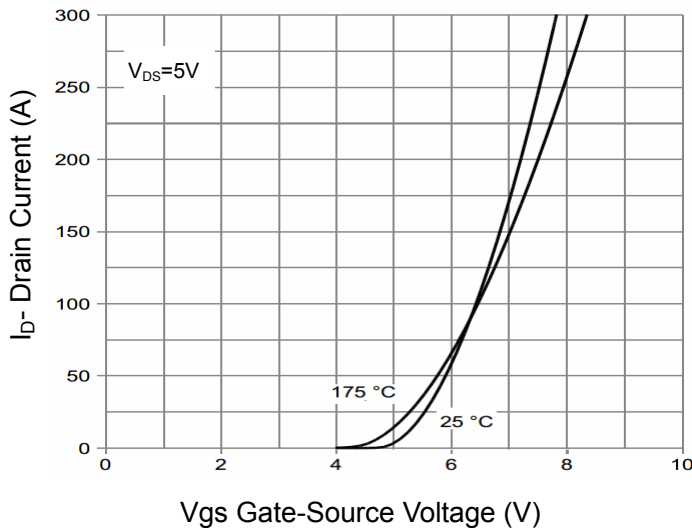


Figure 2 Transfer Characteristics

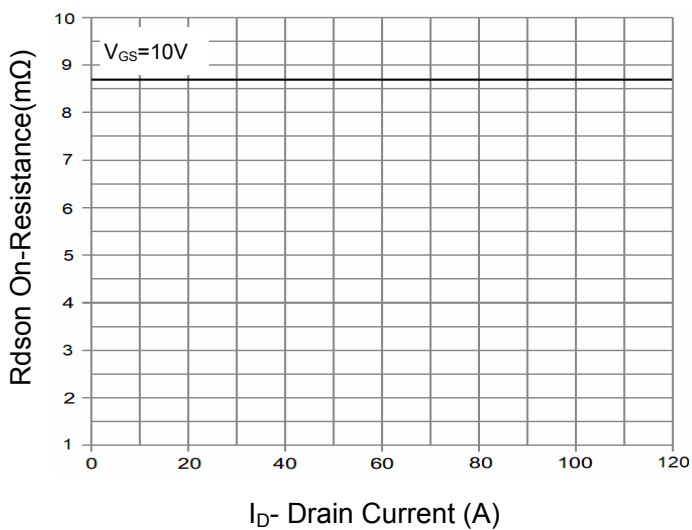


Figure 3 Rdson- Drain Current

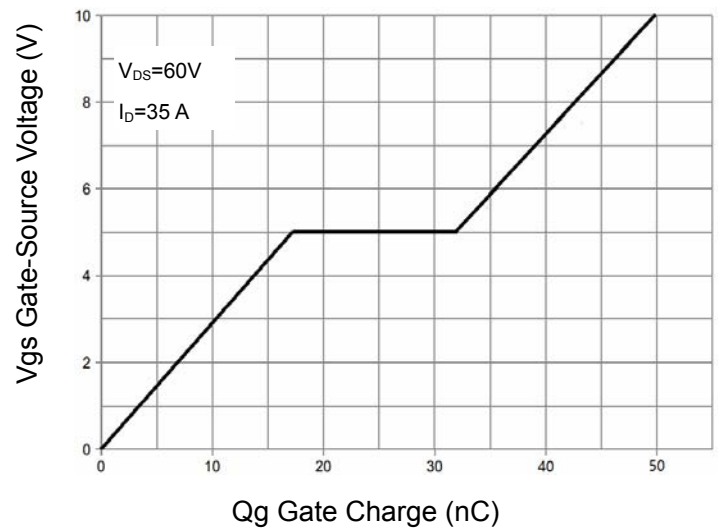


Figure 4 Gate Charge

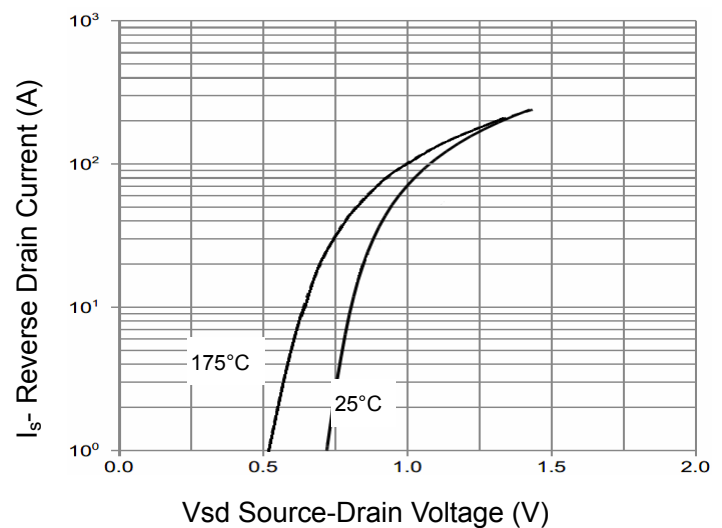


Figure 5 Source- Drain Diode Forward

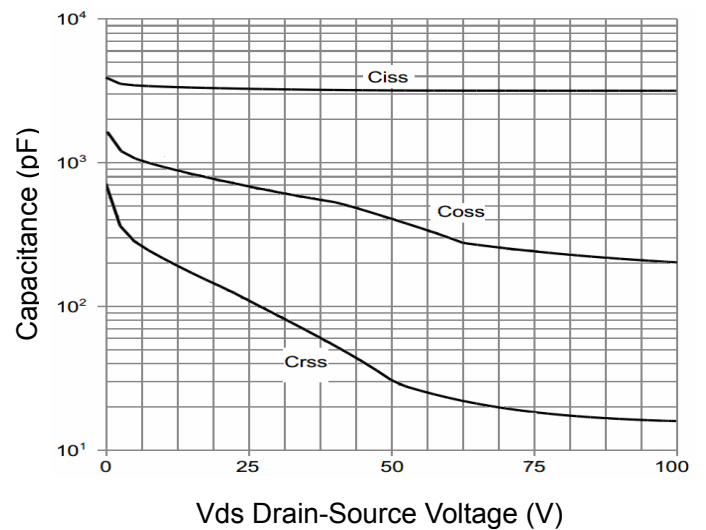
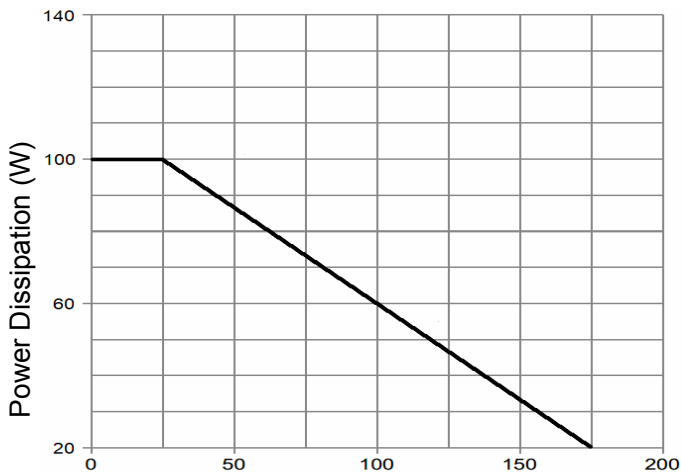
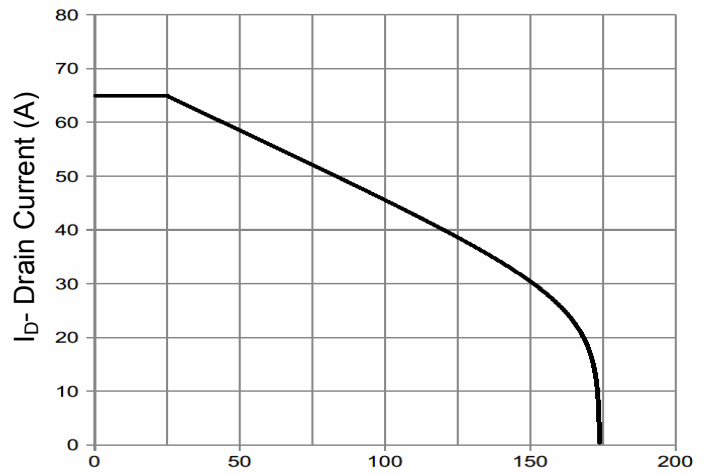


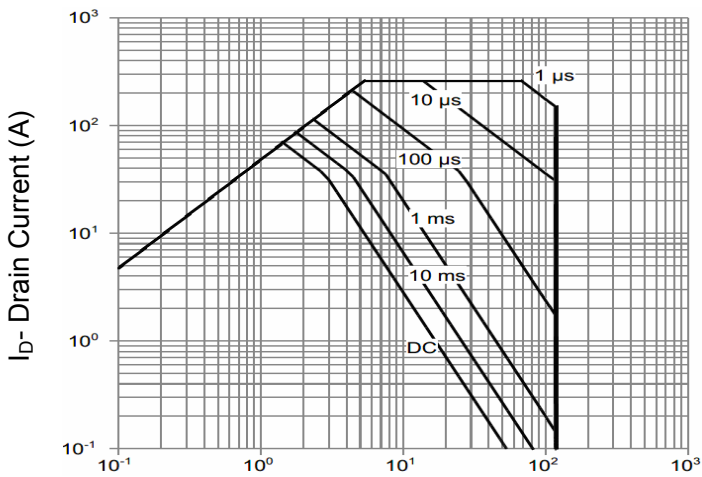
Figure 6 Capacitance vs Vds



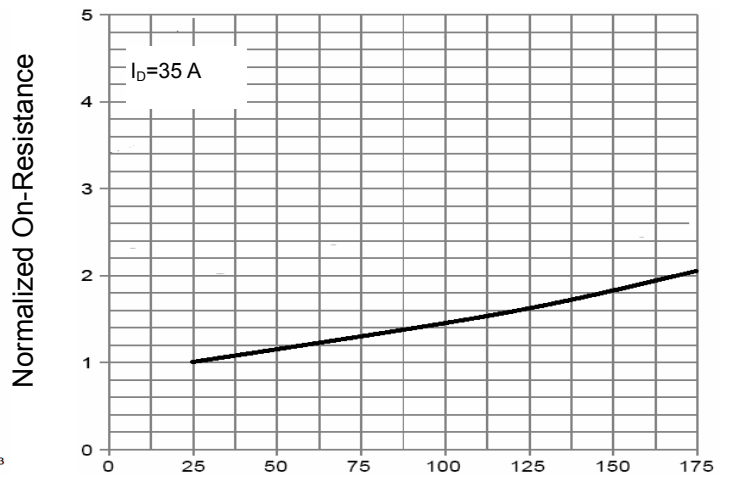
T_J-Junction Temperature(°C)
Figure 7 Power De-rating



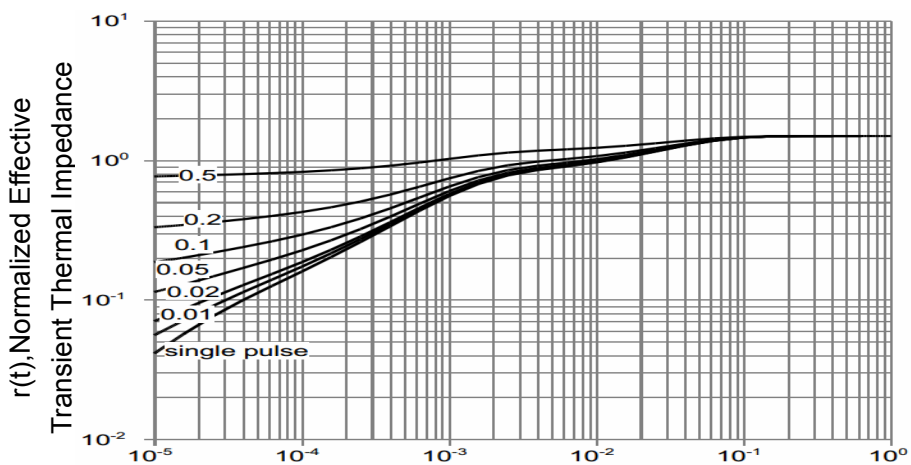
T_J-Junction Temperature (°C)
Figure 9 Current De-rating



V_{ds} Drain-Source Voltage (V)
Figure 8 Safe Operation Area

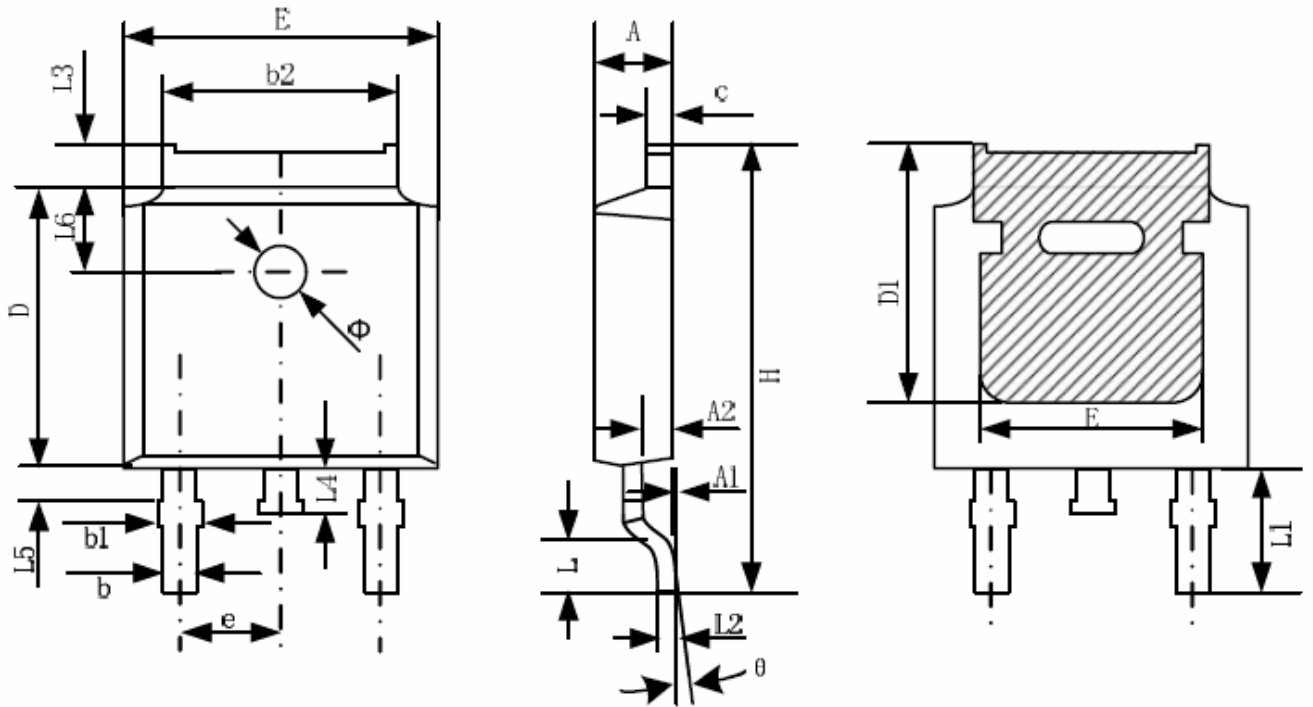


T_J-Junction Temperature(°C)
Figure 10 Rdson-Junction Temperature



Square Wave Pluse Duration(sec)
Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252-2L Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.20 | 2.38 | 0.087 | 0.094 |
| A1 | 0.00 | 0.10 | 0.000 | 0.004 |
| A2 | 0.90 | 1.10 | 0.035 | 0.043 |
| b | 0.72 | 0.85 | 0.028 | 0.033 |
| b1 | 0.72 | 0.90 | 0.028 | 0.035 |
| b2 | 5.13 | 5.46 | 0.202 | 0.215 |
| c | 0.47 | 0.60 | 0.019 | 0.024 |
| D | 6.00 | 6.20 | 0.236 | 0.244 |
| D1 | 5.25 | -- | 0.207 | -- |
| E | 6.50 | 6.70 | 0.256 | 0.264 |
| E1 | 4.70 | -- | 0.185 | -- |
| e | 2.19 | 2.39 | 0.086 | 0.094 |
| H | 9.80 | 10.40 | 0.386 | 0.409 |
| L | 1.40 | 1.70 | 0.055 | 0.067 |
| L1 | 2.90 REF | | 0.114 REF | |
| L2 | 0.508 BSC | | 0.020 BSC | |
| L3 | 0.90 | 1.25 | 0.035 | 0.049 |
| L4 | 0.60 | 1.00 | 0.024 | 0.039 |
| L5 | 0.15 | 0.75 | 0.006 | 0.030 |
| L6 | 1.80 REF | | 0.071 REF | |
| Φ | 1.20 | 1.40 | 0.047 | 0.055 |
| θ | 0° | 8° | 0° | 8° |

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