# NCE N-Channel Enhancement Mode Power MOSFET

## Description

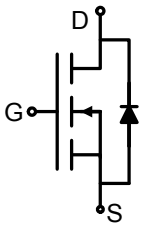
The NCE0202ZA uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications.

## General Features

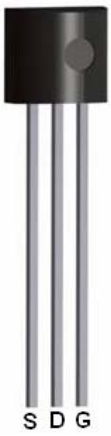
- $V_{DS}$ = 200V,$I_D$ =2A
  $R_{DS(ON)}$ < 580mΩ @ $V_{GS}$=10V (Typ:520mΩ)
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Excellent package for good heat dissipation

## Application

- Power switching application
- Hard switched and high frequency circuits
- Uninterruptible power supply




**Schematic diagram**




**TO-92 view**

## Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|---|---|---|---|---|---|
| N0202 | NCE0202ZA | TO-92 | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|---|---|---|---|
| Drain-Source Voltage | $V_{DS}$ | 200 | V |
| Gate-Source Voltage | $V_{GS}$ | ±20 | V |
| Drain Current-Continuous | $I_D$ | 2 | A |
| Drain Current-Pulsed (Note 1) | $I_{DM}$ | 8 | A |
| Maximum Power Dissipation | $P_D$ | 3 | W |
| Operating Junction and Storage Temperature Range | $T_J$,$T_{STG}$ | -55 To 150 | ℃ |

## Thermal Characteristic

| | | | |
|---|---|---|---|
| Thermal Resistance,Junction-to-Ambient (Note 2) | $R_{\theta JA}$ | 41.7 | ℃/W |

## Electrical Characteristics ($T_A$=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 | 200 | - | - | V |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{DS}$=200V,$V_{GS}$=0V | - | - | 1 | μA |

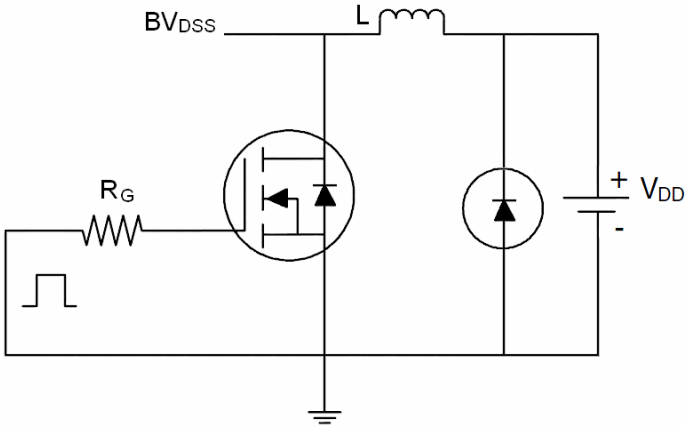
| | | | | | | |
|---|---|---|---|---|---|---|
| Gate-Body Leakage Current | $I_{GSS}$ | $V_{GS}$=±20V,$V_{DS}$=0V | - | - | ±100 | nA |
| **On Characteristics** (Note 3) | | | | | | |
| Gate Threshold Voltage | $V_{GS(th)}$ | $V_{DS}$=$V_{GS}$,$I_D$=250μA | 1.2 | 1.8 | 2.5 | V |
| Drain-Source On-State Resistance | $R_{DS(ON)}$ | $V_{GS}$=10V, $I_D$=2A | - | 520 | 580 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$=15V,$I_D$=2A | - | 8 | - | S |
| **Dynamic Characteristics** (Note4) | | | | | | |
| Input Capacitance | $C_{lss}$ | $V_{DS}$=25V,$V_{GS}$=0V, F=1.0MHz | - | 580 | - | PF |
| Output Capacitance | $C_{oss}$ | | - | 90 | - | PF |
| Reverse Transfer Capacitance | $C_{rss}$ | | - | 3 | - | PF |
| **Switching Characteristics** (Note 4) | | | | | | |
| Turn-on Delay Time | $t_{d(on)}$ | $V_{DD}$=100V, $R_L$=15Ω $V_{GS}$=10V,$R_G$=2.5Ω | - | 10 | - | nS |
| Turn-on Rise Time | $t_r$ | | - | 12 | - | nS |
| Turn-Off Delay Time | $t_{d(off)}$ | | - | 15 | - | nS |
| Turn-Off Fall Time | $t_f$ | | - | 15 | - | nS |
| Total Gate Charge | $Q_g$ | $V_{DS}$=100V,$I_D$=2A, $V_{GS}$=10V | - | 12 | | nC |
| Gate-Source Charge | $Q_{gs}$ | | - | 2.5 | - | nC |
| Gate-Drain Charge | $Q_{gd}$ | | - | 3.8 | - | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| Diode Forward Voltage (Note 3) | $V_{SD}$ | $V_{GS}$=0V,$I_S$=2A | - | - | 1.2 | V |
| Diode Forward Current (Note 2) | $I_S$ | | - | - | 2 | A |

## Notes:

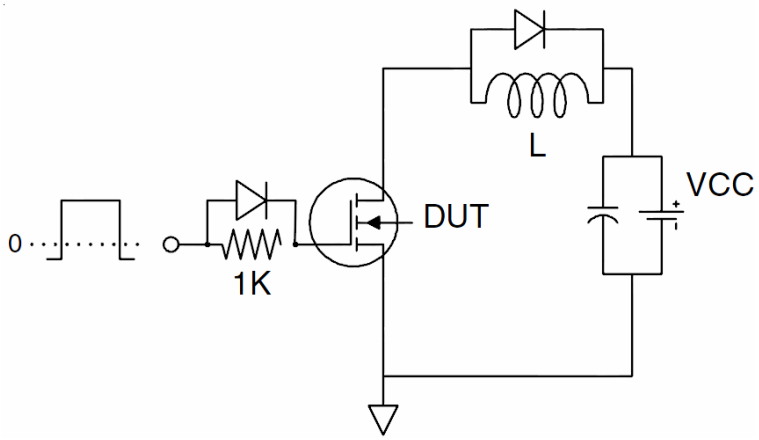
**1.** Repetitive Rating: Pulse width limited by maximum junction temperature.
**2.** Surface Mounted on FR4 Board, t ≤ 10 sec.
**3.** Pulse Test: Pulse Width ≤ 300μs, Duty Cycle ≤ 2%.
**4.** Guaranteed by design, not subject to production

## Test Circuit

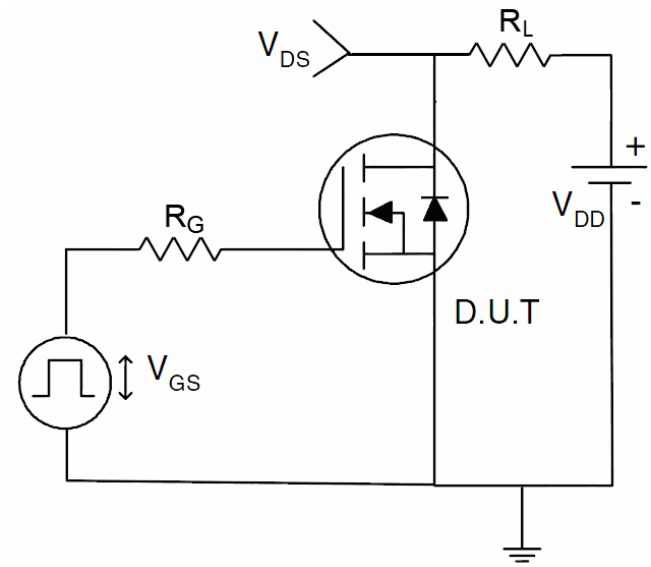
**1）$E_{AS}$ test circuit**




**2）Gate charge test circuit**




**3）Switch Time Test Circuit**



## Typical Electrical and Thermal Characteristics (Curves)

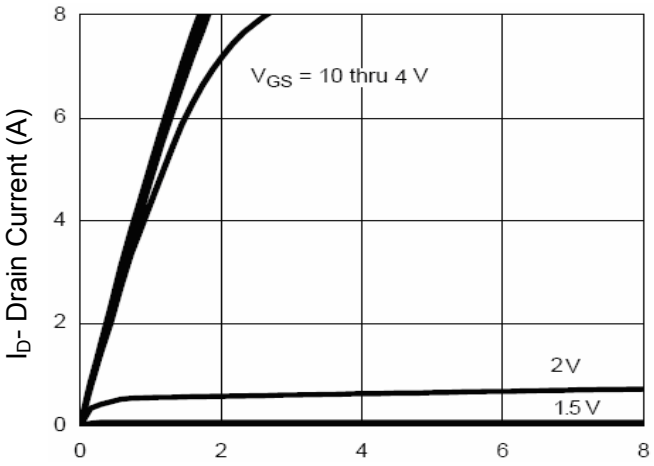



**Figure 1 Output Characteristics**

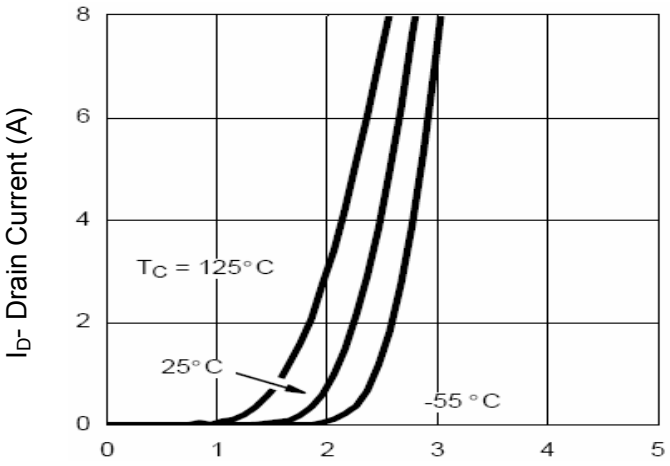



**Figure 2 Transfer Characteristics**

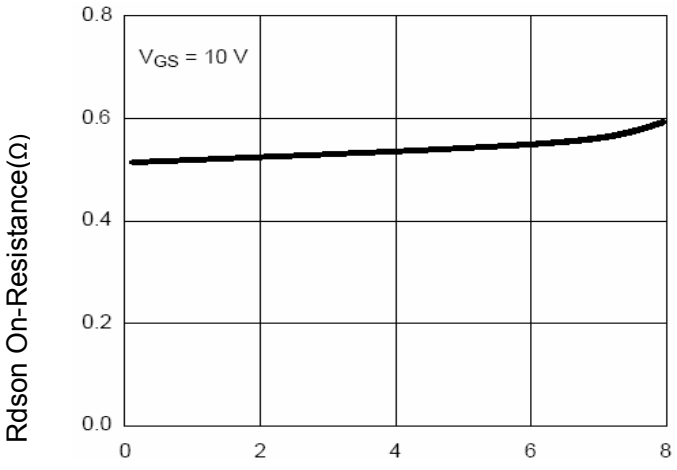



**Figure 3 Rdson- Drain Current**

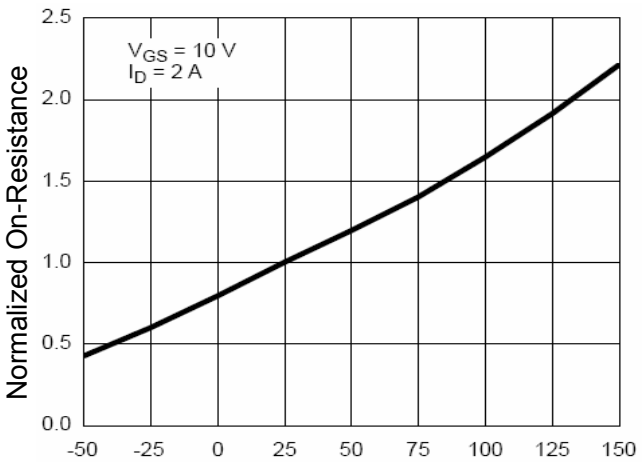



**Figure 4 Rdson-JunctionTemperature**

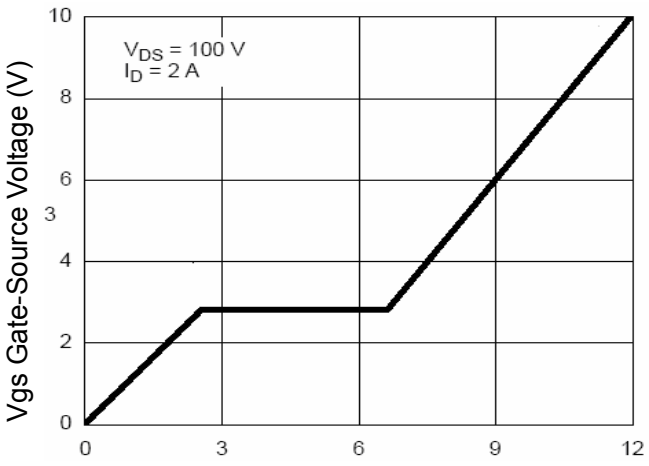



**Figure 5 Gate Charge**

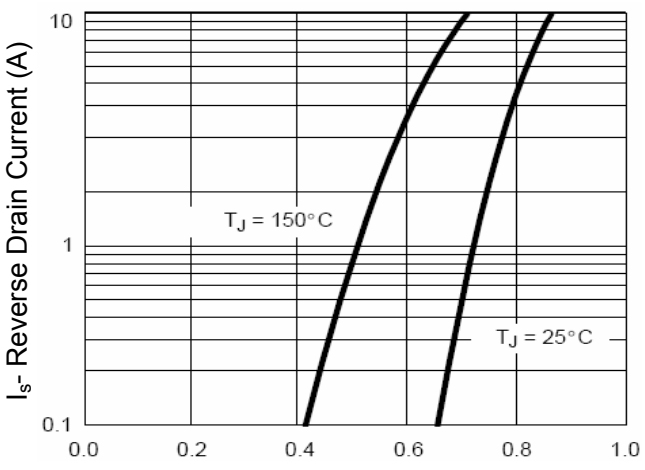



**Figure 6 Source- Drain Diode Forward**

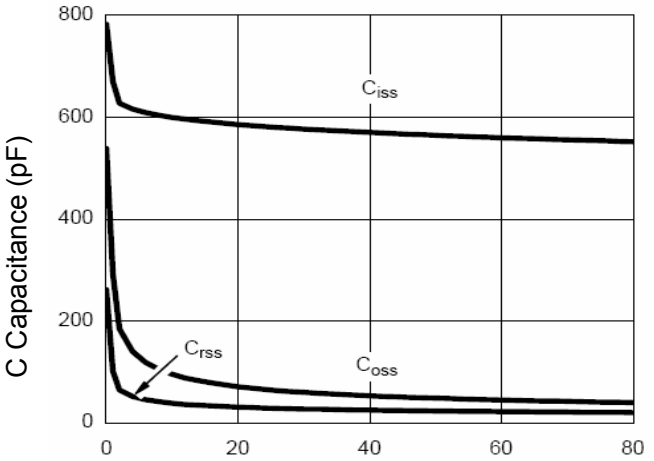



**Figure 7 Capacitance vs Vds**

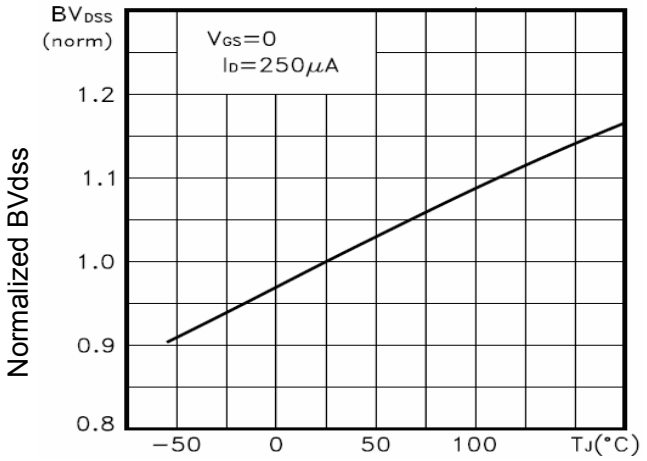



**Figure 9 $BV_{DSS}$ vs Junction Temperature**

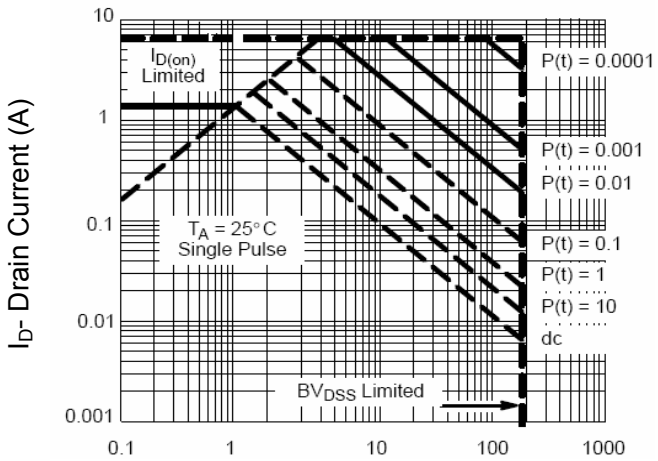



**Figure 8 Safe Operation Area**

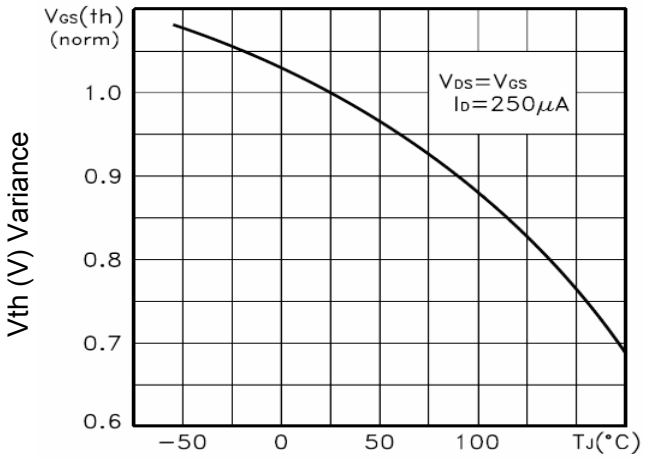



**Figure 10 $V_{GS(th)}$ vs Junction Temperature**

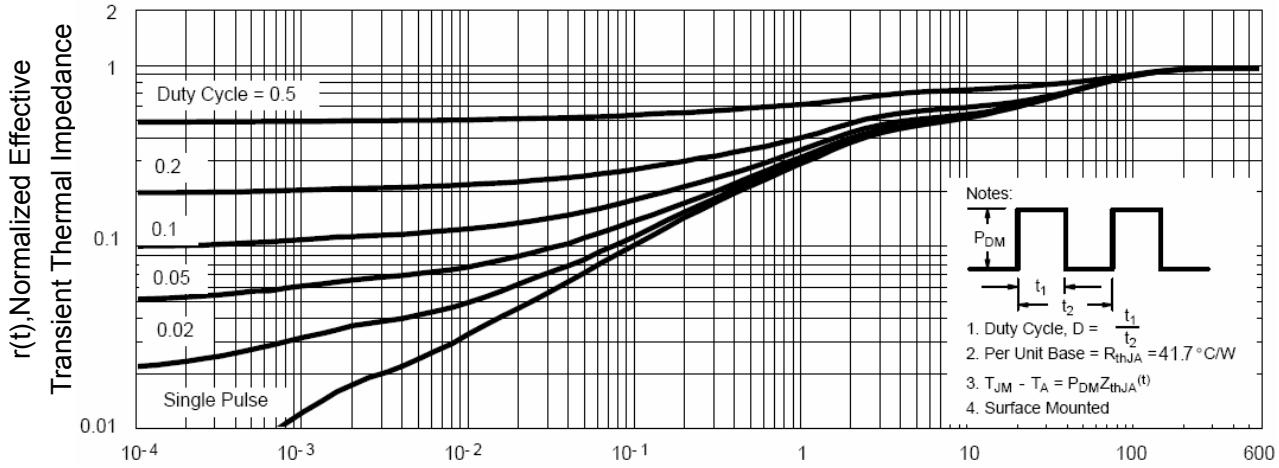
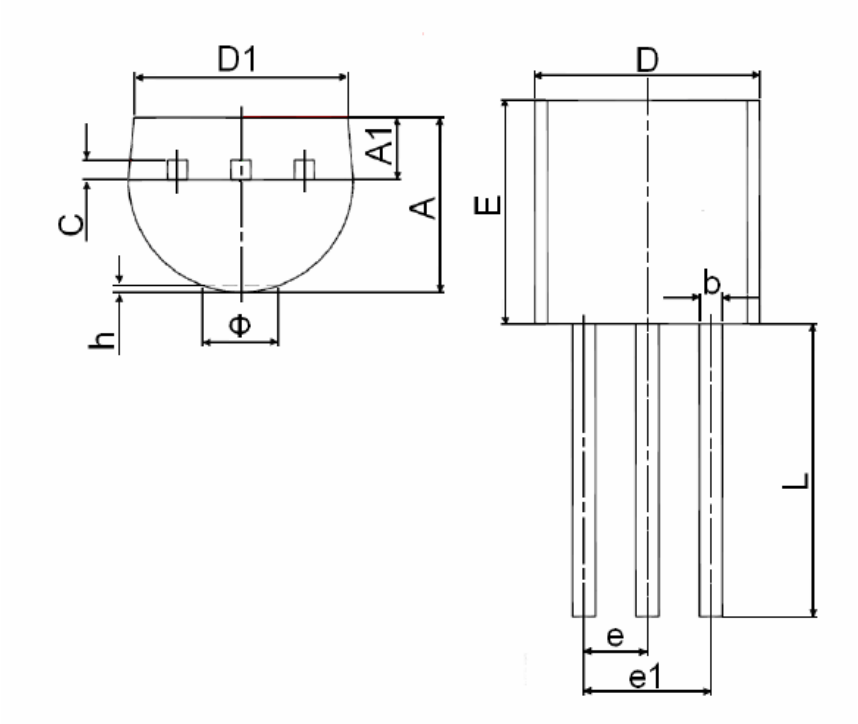



**Figure 11 Normalized Maximum Transient Thermal Impedance**

## TO-92 Package Information




| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 3.300 | 3.700 | 0.130 | 0.146 |
| A1 | 1.100 | 1.400 | 0.043 | 0.055 |
| b | 0.380 | 0.550 | 0.015 | 0.022 |
| c | 0.360 | 0.510 | 0.014 | 0.020 |
| D | 4.400 | 4.700 | 0.173 | 0.185 |
| D1 | 3.430 | | 0.135 | |
| E | 4.300 | 4.700 | 0.169 | 0.185 |
| e | 1.270 TYP | | 0.050 TYP | |
| e1 | 2.440 | 2.640 | 0.096 | 0.104 |
| L | 14.100 | 14.500 | 0.555 | 0.571 |
| Φ | | 1.600 | | 0.063 |
| h | 0.000 | 0.380 | 0.000 | 0.015 |

### Notes

1. All dimensions are in millimeters.
2. Tolerance ±0.10mm (4 mil) unless otherwise specified
3. Package body sizes exclude mold flash and gate burrs. Mold flash at the non-lead sides should be less than 5 mils.
4. Dimension L is measured in gauge plane.
5. Controlling dimension is millimeter, converted inch dimensions are not necessarily exact.

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