

NCE N-Channel Enhancement Mode Power MOSFET

Description

The NCE2025I 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

- $V_{DS} = 20V, I_D = 25A$
 $R_{DS(ON)} < 13m\Omega @ V_{GS} = 10V$ (Typ: 10.5m Ω)
- High density cell design for ultra low R_{dson}
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- Special process technology for high ESD capability

Application

- Power switching application
- Load switching
- Uninterruptible power supply

100% UIS TESTED!

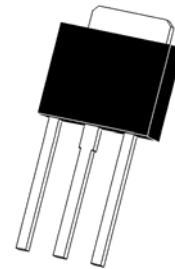
100% ΔV_d s TESTED!



Schematic diagram



Marking and pin assignment



TO-251 top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|----------|----------------|-----------|------------|----------|
| NCE2025I | NCE2025I | TO-251 | - | - | - |

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

| Parameter | Symbol | Limit | Unit |
|---|---------------------|------------|------------|
| Drain-Source Voltage | V_{DS} | 20 | V |
| Gate-Source Voltage | V_{GS} | ± 12 | V |
| Drain Current-Continuous | I_D | 25 | A |
| Drain Current-Continuous ($T_C = 100^\circ C$) | $I_D (100^\circ C)$ | 17.5 | A |
| Pulsed Drain Current | I_{DM} | 75 | A |
| Maximum Power Dissipation | P_D | 40 | W |
| Single pulse avalanche energy ^(Note 5) | E_{AS} | 150 | mJ |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 175 | $^\circ C$ |

Thermal Characteristic

| | | | |
|--|-----------------|-----|--------------|
| Thermal Resistance, Junction-to-Case ^(Note 2) | $R_{\theta JC}$ | 3.8 | $^\circ C/W$ |
|--|-----------------|-----|--------------|

Electrical Characteristics (T_A=25°C unless otherwise noted)

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|---------------------|---|-----|------|------|------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | BV _{DSS} | V _{GS} =0V, I _D =250μA | 20 | - | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =20V, V _{GS} =0V | - | - | 1 | μA |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±12V, V _{DS} =0V | - | - | ±100 | nA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =250μA | 0.5 | 0.7 | 1.2 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =4.5V, I _D =20A | - | 10.5 | 13 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =5V, I _D =20A | 10 | - | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C _{ISS} | V _{DS} =10V, V _{GS} =0V, F=1.0MHz | | 900 | | PF |
| Output Capacitance | C _{OSS} | | | 162 | | PF |
| Reverse Transfer Capacitance | C _{RSS} | | | 105 | | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{GS} =10V, V _{DS} =10V RL=0.5Ω, RGEN=3Ω | - | 4.5 | - | nS |
| Turn-on Rise Time | t _r | | - | 9.2 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 18.7 | - | nS |
| Turn-Off Fall Time | t _f | | - | 3.3 | - | nS |
| Total Gate Charge | Q _g | V _{GS} =10V, V _{DS} =10V, I _D =20A | | 15 | | nC |
| Gate-Source Charge | Q _{gs} | | | 1.8 | | nC |
| Gate-Drain Charge | Q _{gd} | | | 2.8 | | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage | V _{SD} | V _{GS} =0V, I _S =25A | - | - | 1.2 | V |
| Diode Forward Current | I _S | - | - | - | 25 | A |
| Reverse Recovery Time | t _{rr} | T _J = 25°C, I _F = 20A di/dt = 100A/μs (Note 3) | - | 18 | - | nS |
| Reverse Recovery Charge | Q _{rr} | | - | 9.5 | - | nC |
| Forward Turn-On Time | t _{on} | Intrinsic turn-on time is negligible (turn-on is dominated by LS+LD) | | | | |

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
5. EAS condition: T_J=25°C, V_{DD}=10V, V_G=10V, L=0.5mH, R_g=25Ω

Test circuit

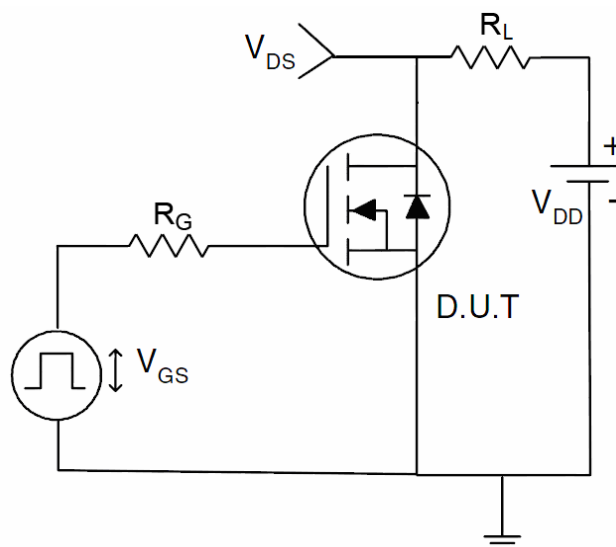
1) E_{AS} test Circuits



2) Gate charge test Circuit:



3) Switch Time Test Circuit:



Typical Electrical and Thermal Characteristics (Curves)

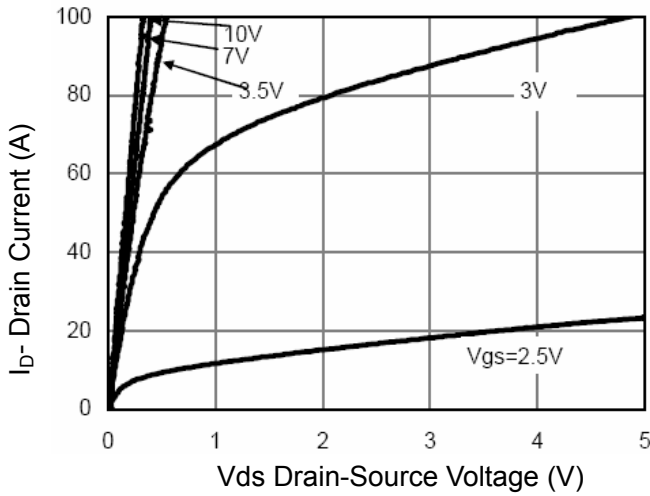


Figure 1 Output Characteristics

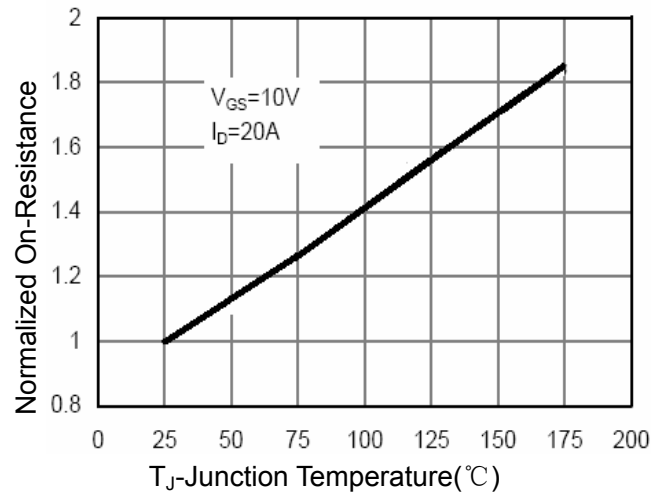


Figure 4 Rdson-Junction Temperature

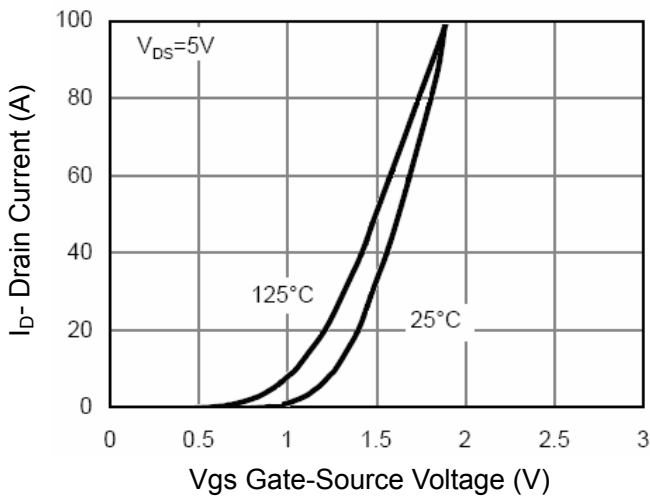


Figure 2 Transfer Characteristics

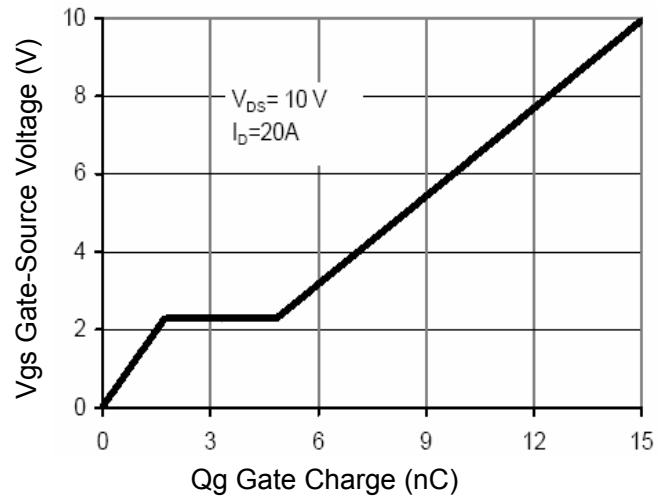


Figure 5 Gate Charge

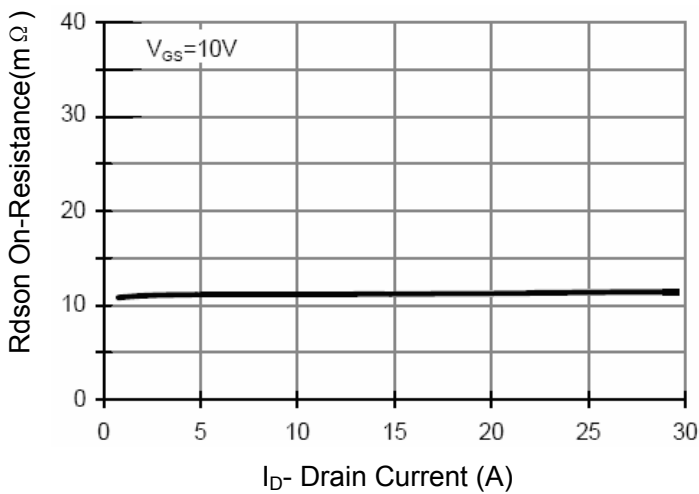


Figure 3 Rdson- Drain Current

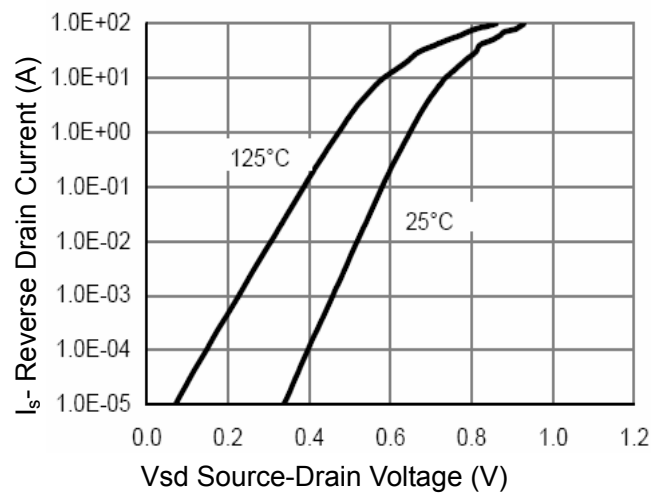


Figure 6 Source- Drain Diode Forward

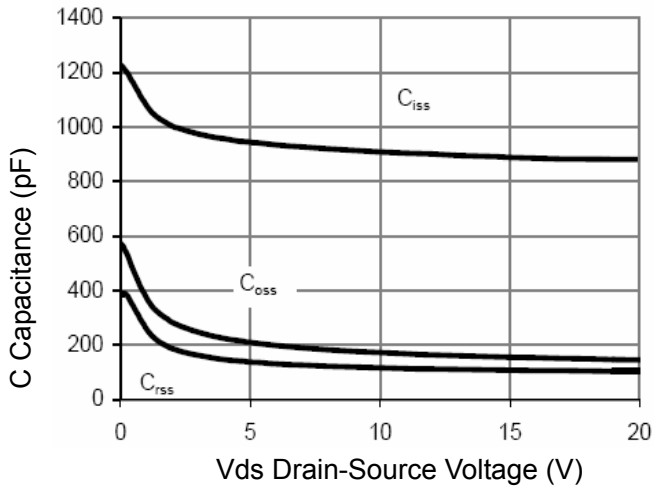


Figure 7 Capacitance vs Vds

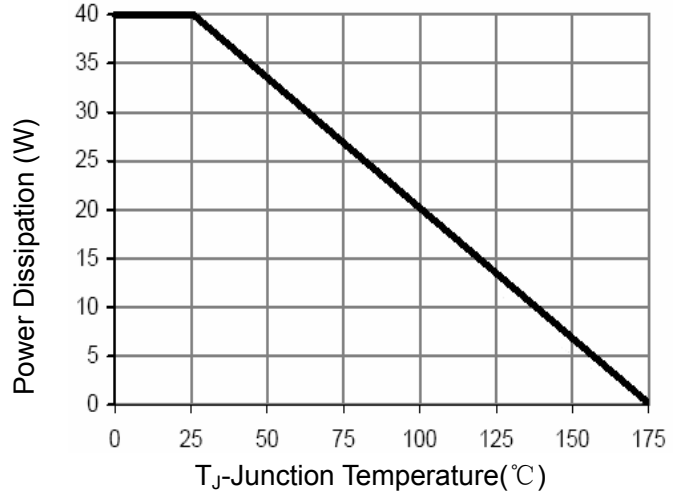


Figure 9 Power De-rating

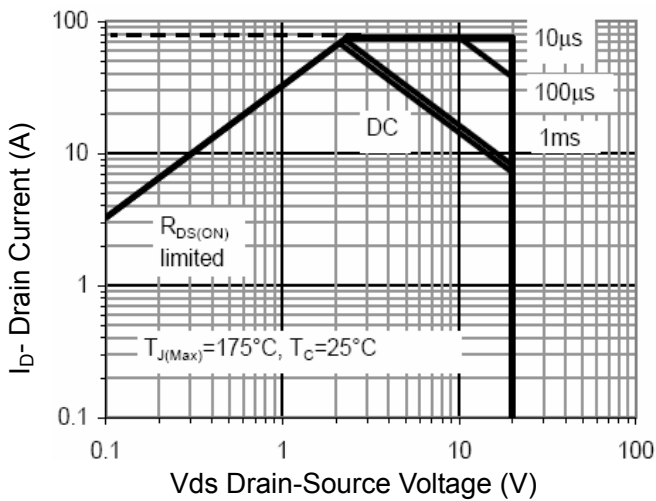


Figure 8 Safe Operation Area

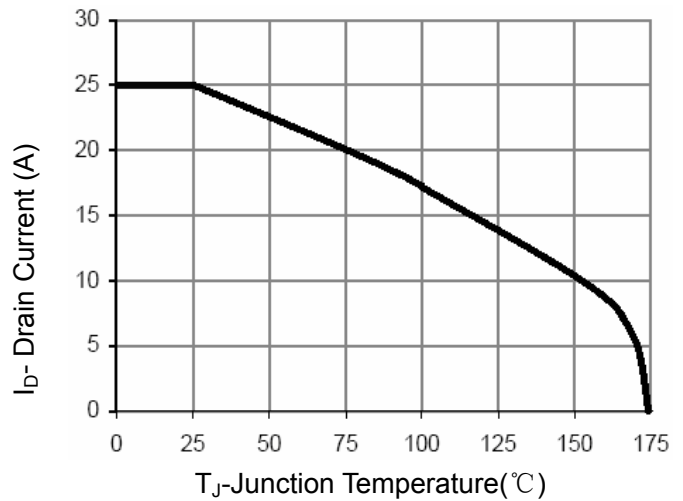


Figure 10 Current De-rating

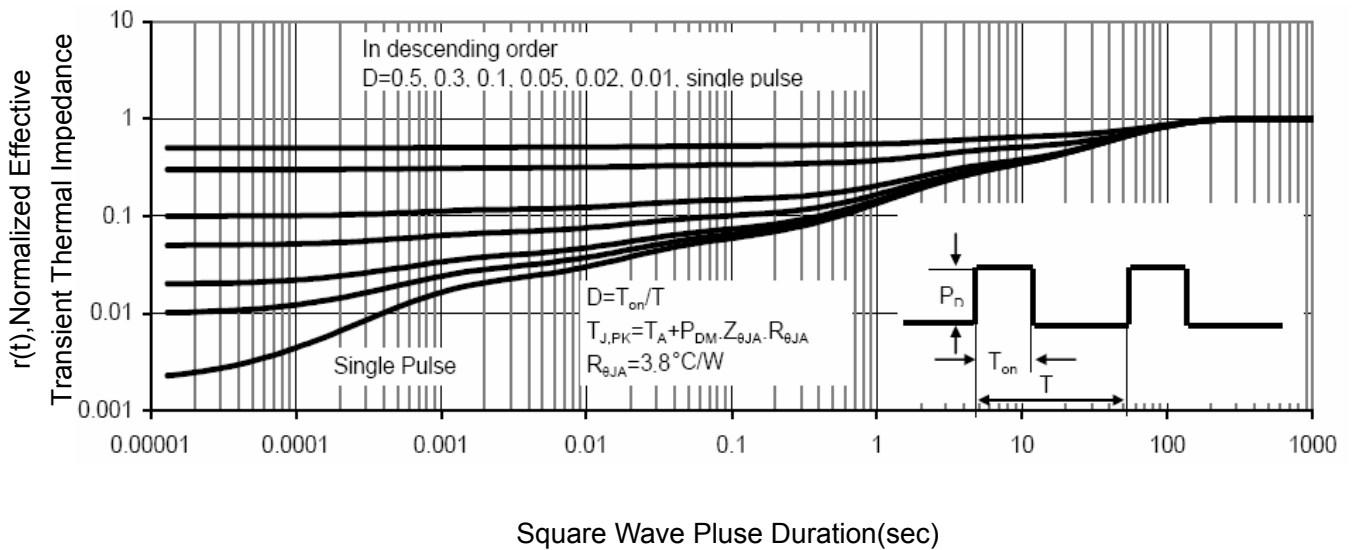
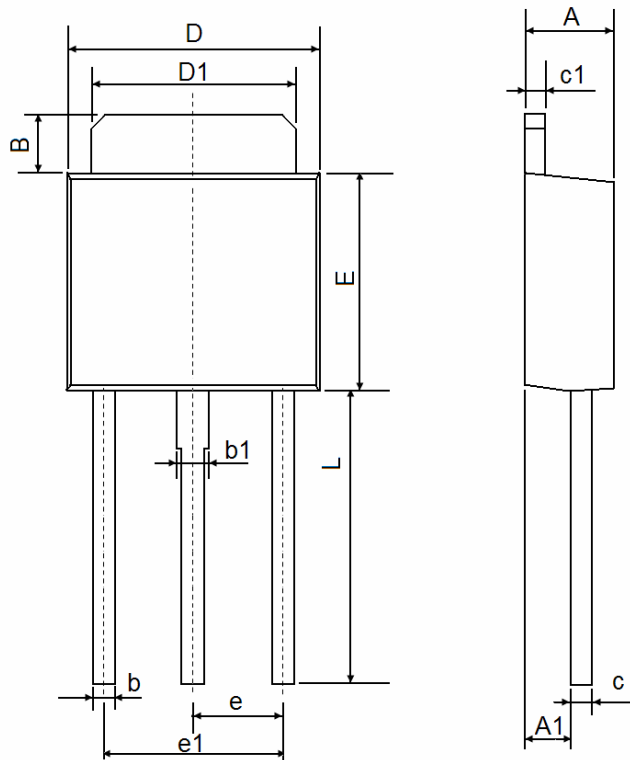


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-251 Package Information



| Symbol | Dimensions In Millimeters | | Dimensions In Inches | |
|--------|---------------------------|-------|----------------------|-------|
| | Min. | Max. | Min. | Max. |
| A | 2.200 | 2.400 | 0.087 | 0.094 |
| A1 | 1.050 | 1.350 | 0.042 | 0.054 |
| B | 1.350 | 1.650 | 0.053 | 0.065 |
| b | 0.500 | 0.700 | 0.020 | 0.028 |
| b1 | 0.700 | 0.900 | 0.028 | 0.035 |
| c | 0.430 | 0.580 | 0.017 | 0.023 |
| c1 | 0.430 | 0.580 | 0.017 | 0.023 |
| D | 6.350 | 6.650 | 0.250 | 0.262 |
| D1 | 5.200 | 5.400 | 0.205 | 0.213 |
| E | 5.400 | 5.700 | 0.213 | 0.224 |
| e | 2.300 TYP. | | 0.091 TYP. | |
| e1 | 4.500 | 4.700 | 0.177 | 0.185 |
| L | 7.500 | 7.900 | 0.295 | 0.311 |

Notes

1. All dimensions are in millimeters.
2. Tolerance $\pm 0.10\text{mm}$ (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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