

## NCE N-Channel Enhancement Mode Power MOSFET

### Description

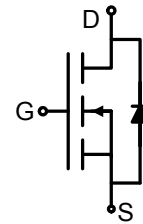
The NCE0106R uses advanced trench technology and design to provide excellent  $R_{DS(ON)}$  with low gate charge. It can be used in a wide variety of applications.

### General Features

- $V_{DS} = 100V, I_D = 6A$   
 $R_{DS(ON)} < 140m\Omega @ V_{GS}=10V$  (Typ:110m $\Omega$ )
- High density cell design for ultra low  $R_{dson}$
- 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



SOT-223 top view

### Package Marking and Ordering Information

| Device Marking | Device   | Device Package | Reel Size | Tape width | Quantity   |
|----------------|----------|----------------|-----------|------------|------------|
| NCE0106R       | NCE0106R | SOT-223-3L     | Ø330mm    | 12mm       | 2500 units |

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

| Parameter  | Symbol         | Limit      | Unit             |
|--|----------------|------------|------------------|
| Drain-Source Voltage                             | $V_{DS}$       | 100        | V                |
| Gate-Source Voltage                              | $V_{GS}$       | $\pm 20$   | V                |
| Drain Current-Continuous                         | $I_D$          | 6          | A                |
| Drain Current-Pulsed <sup>(Note 1)</sup>         | $I_{DM}$       | 24         | A                |
| Maximum Power Dissipation                        | $P_D$          | 3          | W                |
| Operating Junction and Storage Temperature Range | $T_J, T_{STG}$ | -55 To 150 | $^\circ\text{C}$ |

### Thermal Characteristic

|   |                 |      |                    |
|---|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Ambient <sup>(Note 2)</sup> | $R_{\theta JA}$ | 41.7 | $^\circ\text{C/W}$ |
|---|-----------------|------|--------------------|

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

| Parameter                       | Symbol     | Condition                 | Min | Typ | Max | Unit    |
|---------------------------------|------------|---------------------------|-----|-----|-----|---------|
| <b>Off Characteristics</b>      |            |                           |     |     |     |         |
| Drain-Source Breakdown Voltage  | $BV_{DSS}$ | $V_{GS}=0V, I_D=250\mu A$ | 100 | 110 | -   | V       |
| Zero Gate Voltage Drain Current | $I_{DSS}$  | $V_{DS}=100V, V_{GS}=0V$  | -   | -   | 1   | $\mu A$ |

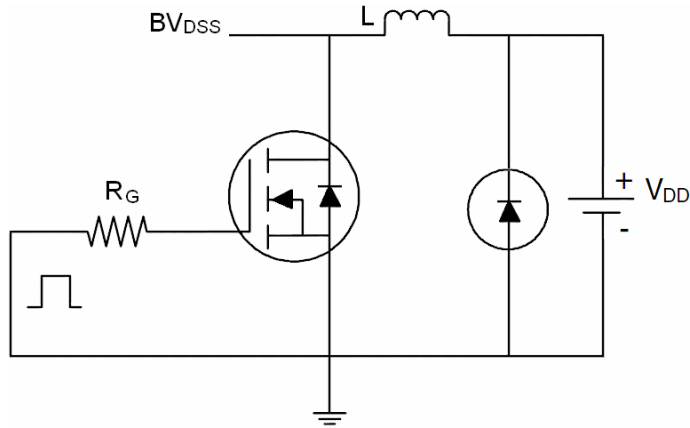
|   |              |   |     |      |           |            |
|---|--------------|---|-----|------|-----------|------------|
| Gate-Body Leakage Current                 | $I_{GSS}$    | $V_{GS}=\pm 20V, V_{DS}=0V$                                       | -   | -    | $\pm 100$ | nA         |
| <b>On Characteristics</b> (Note 3)        |              |   |     |      |           |            |
| Gate Threshold Voltage                    | $V_{GS(th)}$ | $V_{DS}=V_{GS}, I_D=250\mu A$                                     | 1.2 | 1.8  | 2.5       | V          |
| Drain-Source On-State Resistance          | $R_{DS(ON)}$ | $V_{GS}=10V, I_D=5A$  | -   | 110  | 140       | m $\Omega$ |
| Forward Transconductance                  | $g_{FS}$     | $V_{DS}=5V, I_D=2.9A$   | -   | 8    | -         | S          |
| <b>Dynamic Characteristics</b> (Note4)    |              |   |     |      |           |            |
| Input Capacitance                         | $C_{ISS}$    | $V_{DS}=25V, V_{GS}=0V,$<br>$F=1.0MHz$                            | -   | 690  | -         | PF         |
| Output Capacitance                        | $C_{OSS}$    |   | -   | 120  | -         | PF         |
| Reverse Transfer Capacitance              | $C_{RSS}$    |   | -   | 90   | -         | PF         |
| <b>Switching Characteristics</b> (Note 4) |              |   |     |      |           |            |
| Turn-on Delay Time                        | $t_{d(on)}$  | $V_{DD}=30V, I_D=2A, R_L=15\Omega$<br>$V_{GS}=10V, R_G=2.5\Omega$ | -   | 11   | -         | nS         |
| Turn-on Rise Time                         | $t_r$        |   | -   | 7.4  | -         | nS         |
| Turn-Off Delay Time                       | $t_{d(off)}$ |   | -   | 35   | -         | nS         |
| Turn-Off Fall Time                        | $t_f$        |   | -   | 9.1  | -         | nS         |
| Total Gate Charge                         | $Q_g$        | $V_{DS}=30V, I_D=3A,$<br>$V_{GS}=10V$                             | -   | 15.5 | -         | nC         |
| Gate-Source Charge                        | $Q_{gs}$     |   | -   | 3.2  | -         | nC         |
| Gate-Drain Charge                         | $Q_{gd}$     |   | -   | 4.7  | -         | nC         |
| <b>Drain-Source Diode Characteristics</b> |              |   |     |      |           |            |
| Diode Forward Voltage (Note 3)            | $V_{SD}$     | $V_{GS}=0V, I_S=6A$   | -   | -    | 1.2       | V          |
| Diode Forward Current (Note 2)            | $I_S$        |   | -   | -    | 6         | A          |

### Notes:

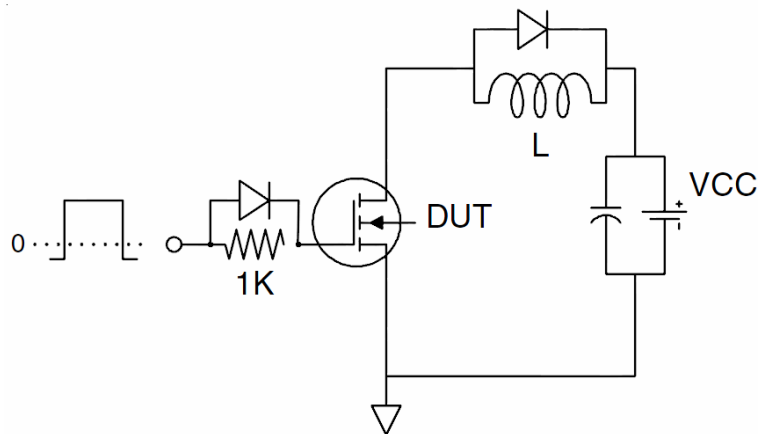
1. Repetitive Rating: Pulse width limited by maximum junction temperature.
2. Surface Mounted on FR4 Board,  $t \leq 10$  sec.
3. Pulse Test: Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2\%$ .
4. Guaranteed by design, not subject to product

**Test Circuit**

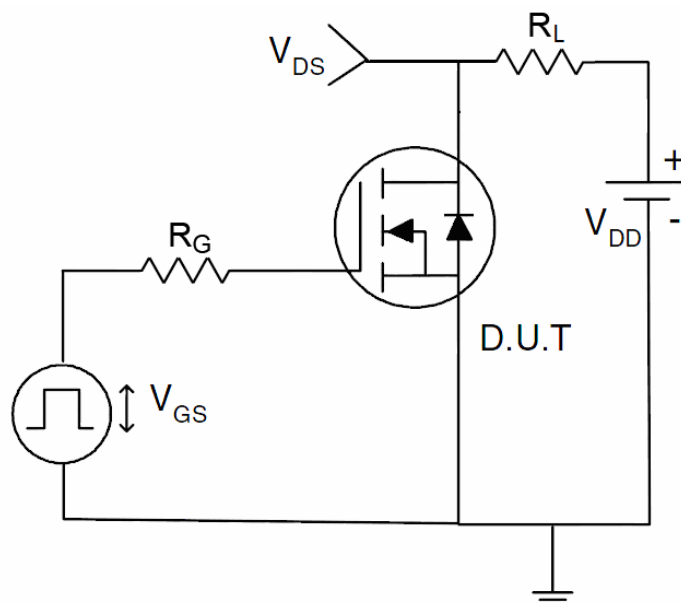
**1)  $E_{AS}$  test circuit**



**2) Gate charge test circuit**



**3) Switch Time Test Circuit**



Typical Electrical and Thermal Characteristics (curves)

Figure1. Source-Drain Diode Forward Voltage

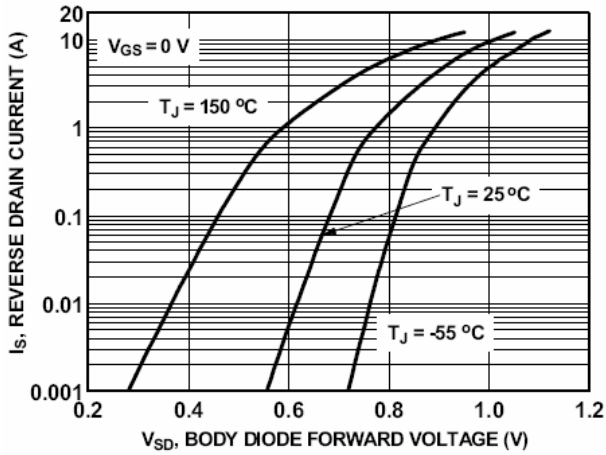


Figure2. Safe operating area

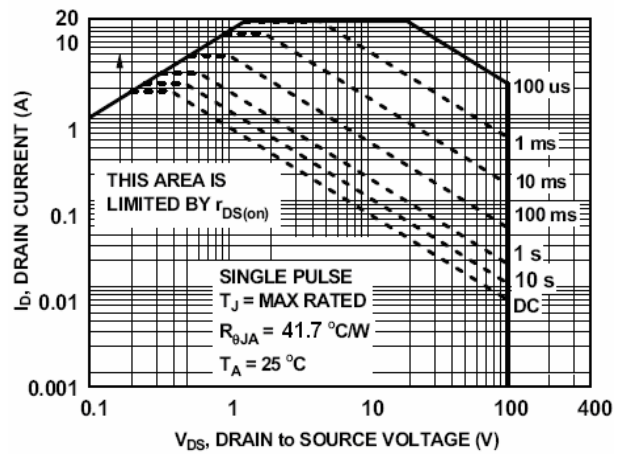


Figure3. Output characteristics

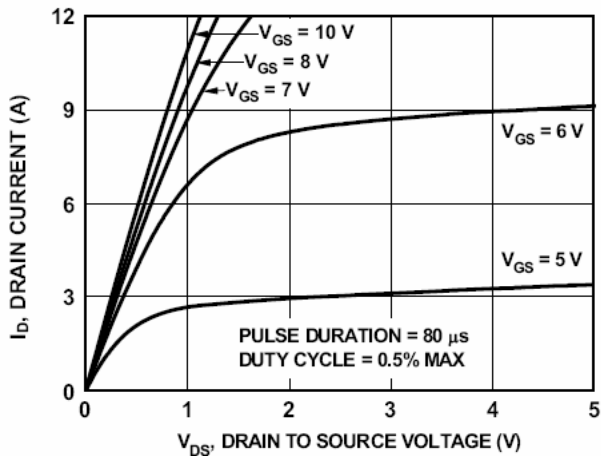


Figure4. Transfer characteristics

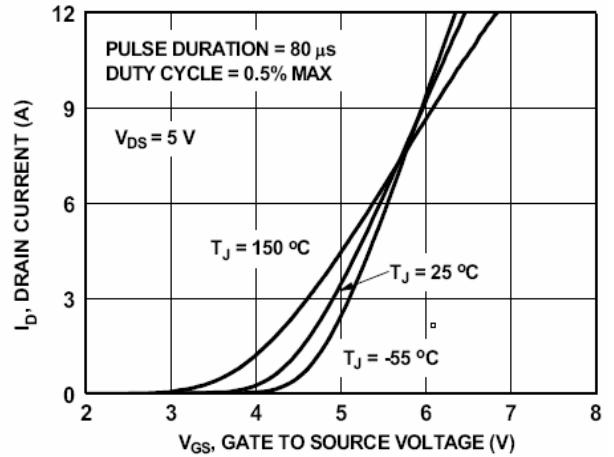


Figure5. Static drain-source on resistance

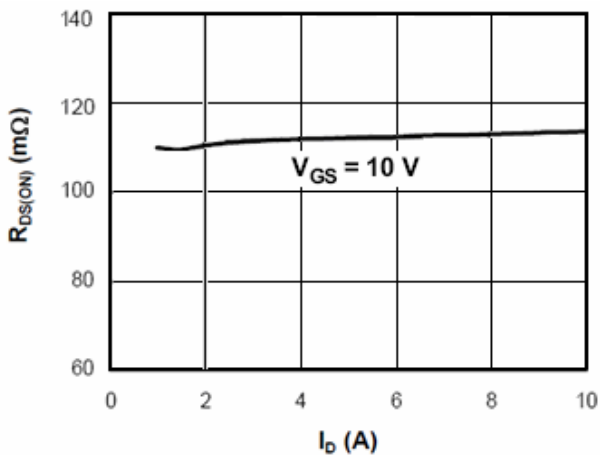


Figure6.  $R_{DS(ON)}$  vs Junction Temperature

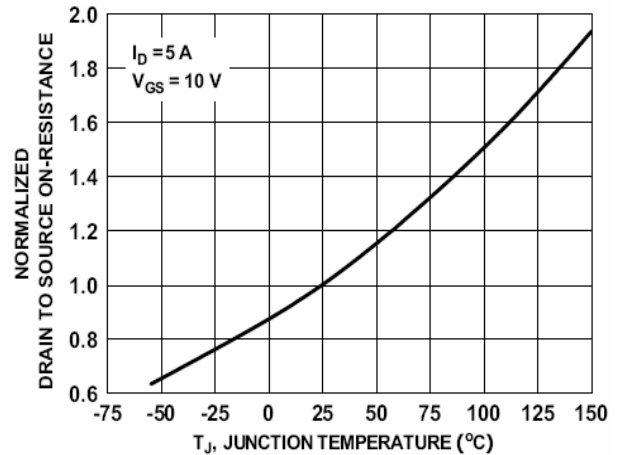


Figure7.  $BV_{DSS}$  vs Junction Temperature

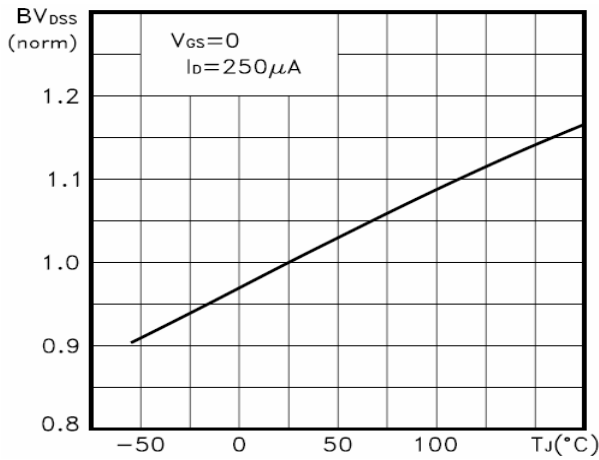


Figure8.  $V_{GS(th)}$  vs Junction Temperature

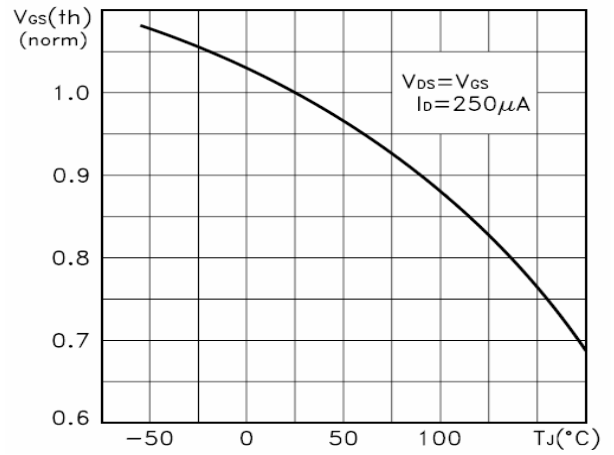


Figure9. Gate charge waveforms

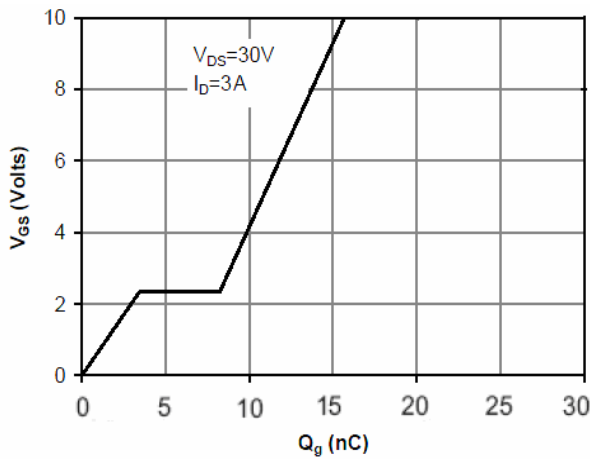


Figure10. Capacitance

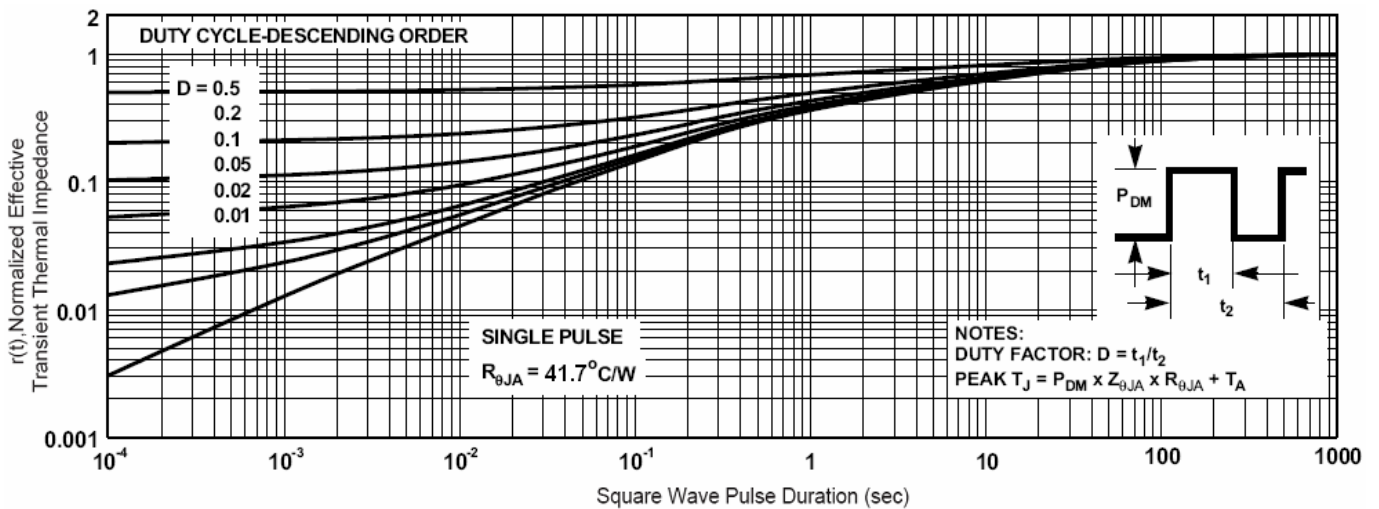
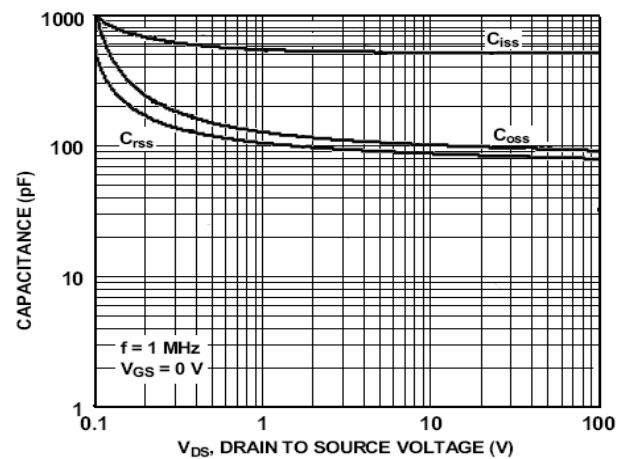
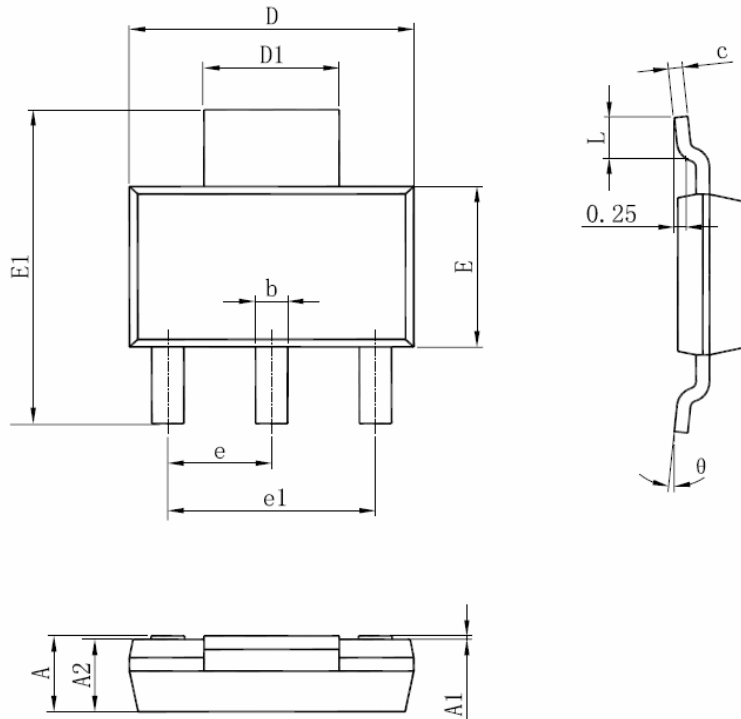


Figure11. Normalized Maximum Transient Thermal Impedance

SOT-223 Package Information



| Symbol | Dimensions In Millimeters |       | Dimensions In Inches |       |
|--------|---------------------------|-------|----------------------|-------|
|        | Min                       | Max   | Min                  | Max   |
| A      | 1.520                     | 1.800 | 0.060                | 0.071 |
| A1     | 0.000                     | 0.100 | 0.000                | 0.004 |
| A2     | 1.500                     | 1.700 | 0.059                | 0.067 |
| b      | 0.660                     | 0.820 | 0.026                | 0.032 |
| c      | 0.250                     | 0.350 | 0.010                | 0.014 |
| D      | 6.200                     | 6.400 | 0.244                | 0.252 |
| D1     | 2.900                     | 3.100 | 0.114                | 0.122 |
| E      | 3.300                     | 3.700 | 0.130                | 0.146 |
| E1     | 6.830                     | 7.070 | 0.269                | 0.278 |
| e      | 2.300(BSC)                |       | 0.091(BSC)           |       |
| e1     | 4.500                     | 4.700 | 0.177                | 0.185 |
| L      | 0.900                     | 1.150 | 0.035                | 0.045 |
| θ      | 0°                        | 10°   | 0°                   | 10°   |

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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