

NCE P-Channel Enhancement Mode Power MOSFET

Description

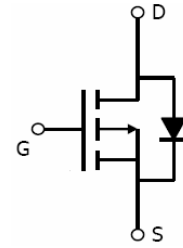
The NCE12P09S uses advanced trench technology to provide excellent $R_{DS(ON)}$, low gate charge and operation with gate voltages. This device is suitable for use as a load switching application and a wide variety of other applications.

General Features

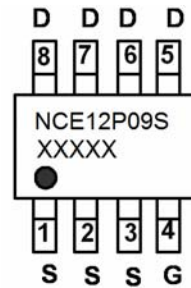
- $V_{DS} = -12V, I_D = -9A$
 $R_{DS(ON)} < 22m\Omega @ V_{GS} = -2.5V$
 $R_{DS(ON)} < 18m\Omega @ V_{GS} = -4.5V$
- Advanced trench MOSFET process technology
- Ultra low on-resistance with low gate charge

Application

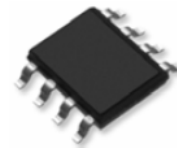
- PWM applications
- Load switch
- Battery charge in cellular handset



Schematic diagram



Marking and pin assignment



SOP-8 top view

Package marking and ordering information

| Device Marking | Device | Device Package | Reel Size | Tape Width | Quantity |
|----------------|-----------|----------------|-----------|------------|------------|
| NCE12P09S | NCE12P09S | SOP-8 | Ø330mm | 12mm | 4000 units |

Absolute maximum ratings ($T_C = 25^\circ C$ unless otherwise noted)

| Parameter | Symbol | Limit | Unit |
|--|----------------|------------|------------|
| Drain-Source Voltage | V_{DS} | -12 | V |
| Gate-Source Voltage | V_{GS} | ± 12 | V |
| Drain Current-Continuous | I_D | -9 | A |
| Drain Current -Pulsed ^(Note 1) | I_{DM} | -36 | A |
| Maximum Power Dissipation | P_D | 2.5 | W |
| Operating Junction and Storage Temperature Range | T_J, T_{STG} | -55 To 150 | $^\circ C$ |

Thermal Characteristic

| | | | |
|---|-----------------|----|--------------|
| Thermal Resistance, Junction-to-Ambient ^(Note 2) | $R_{\theta JA}$ | 50 | $^\circ C/W$ |
|---|-----------------|----|--------------|

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

| Parameter | Symbol | Condition | Min | Typ | Max | Unit |
|---|----------------------|---|------|------|------|------|
| Off Characteristics | | | | | | |
| Drain-Source Breakdown Voltage | V _{(BR)DSS} | V _{GS} =0V, I _D =-250μA | -12 | - | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =-12V, 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 | -0.4 | -0.7 | -1 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =-4.5V, I _D =-9A | - | 11.5 | 18 | mΩ |
| | | V _{GS} =-2.5V, I _D =-8A | - | 14 | 22 | mΩ |
| Forward Transconductance | g _{FS} | V _{DS} =-5V, I _D =-9A | 20 | - | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =-10V, V _{GS} =0V, F=1.0MHz | - | 2700 | - | PF |
| Output Capacitance | C _{oss} | | - | 680 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 590 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =-10V, I _D =-1A V _{GS} =-4.5V, R _{GEN} =10Ω | - | 11 | - | nS |
| Turn-on Rise Time | t _r | | - | 35 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 30 | - | nS |
| Turn-Off Fall Time | t _f | | - | 10 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =-6V, I _D =-9A, V _{GS} =-4.5V | - | 35 | 48 | nC |
| Gate-Source Charge | Q _{gs} | | - | 5 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 10 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =-9A | - | - | -1.2 | V |
| Diode Forward Current (Note 2) | I _S | | - | - | -9 | 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

Typical Electrical and Thermal Characteristics

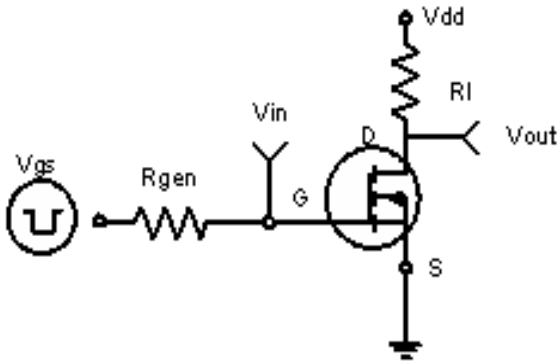


Figure 1: Switching Test Circuit

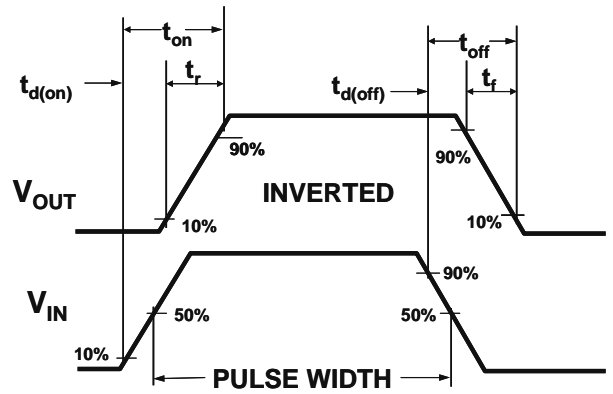


Figure 2: Switching Waveforms

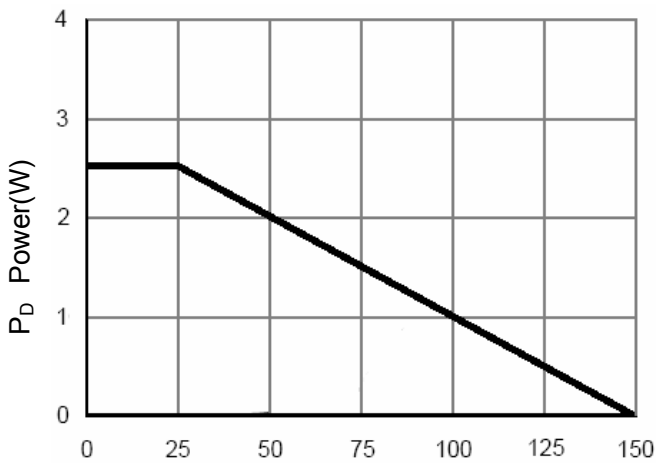


Figure 3 Power Dissipation

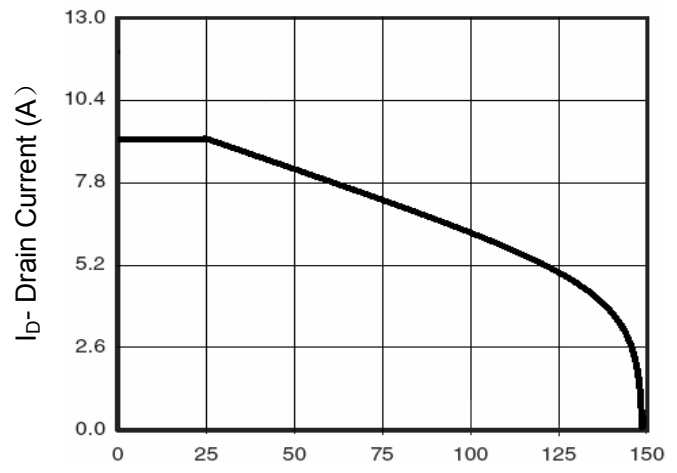


Figure 4 Drain Current

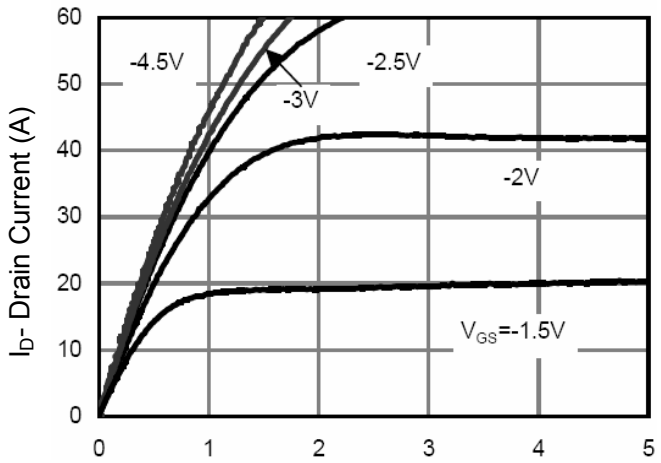


Figure 5 Output Characteristics

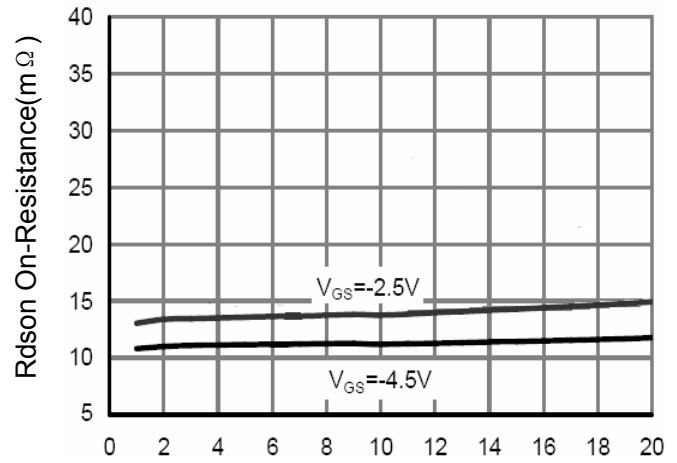


Figure 6 Drain-Source On-Resistance

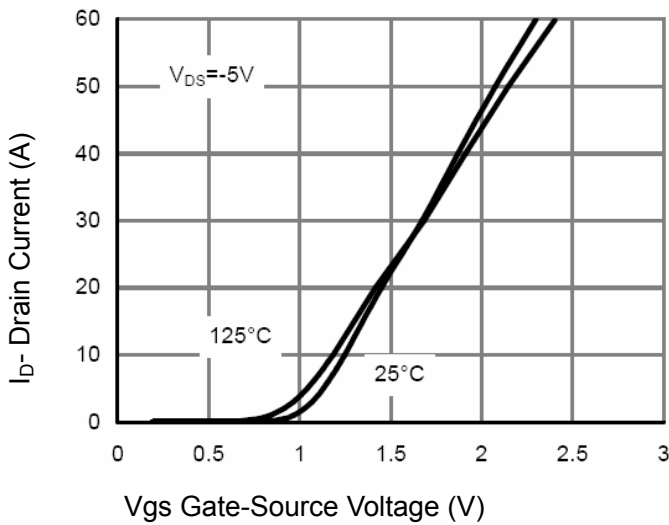


Figure 7 Transfer Characteristics

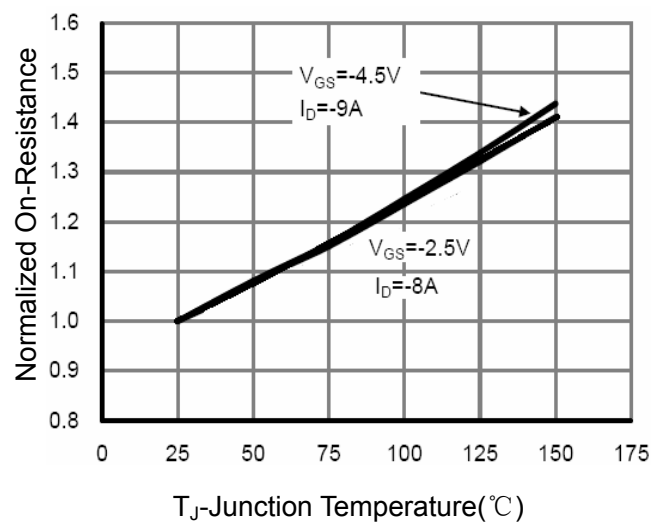


Figure 8 Drain-Source On-Resistance

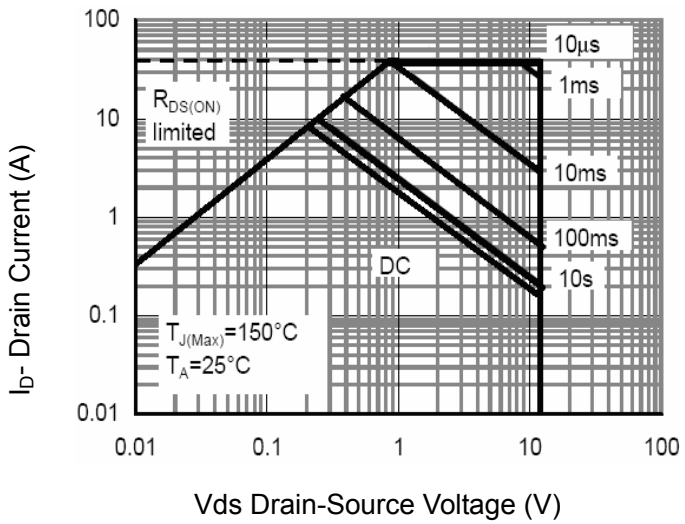


Figure 9 Safe Operation Area

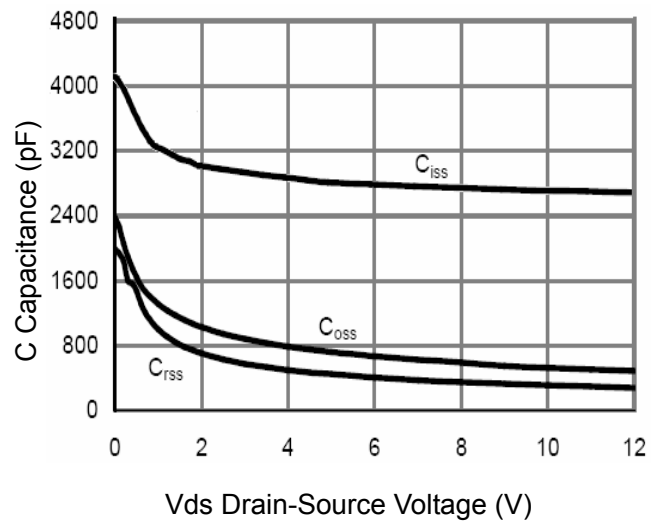


Figure 10 Capacitance vs V_DS

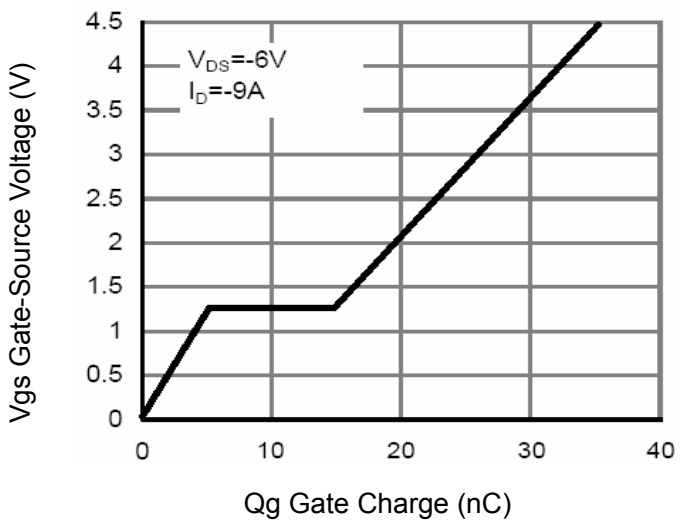


Figure 11 Gate Charge

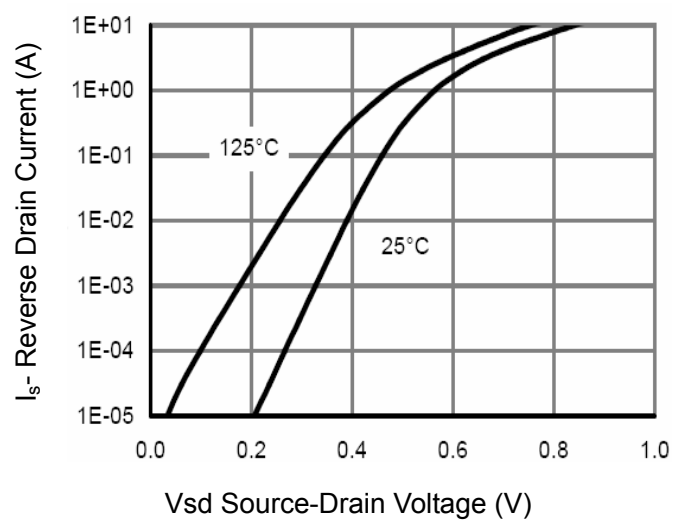


Figure 12 Source-Drain Diode Forward

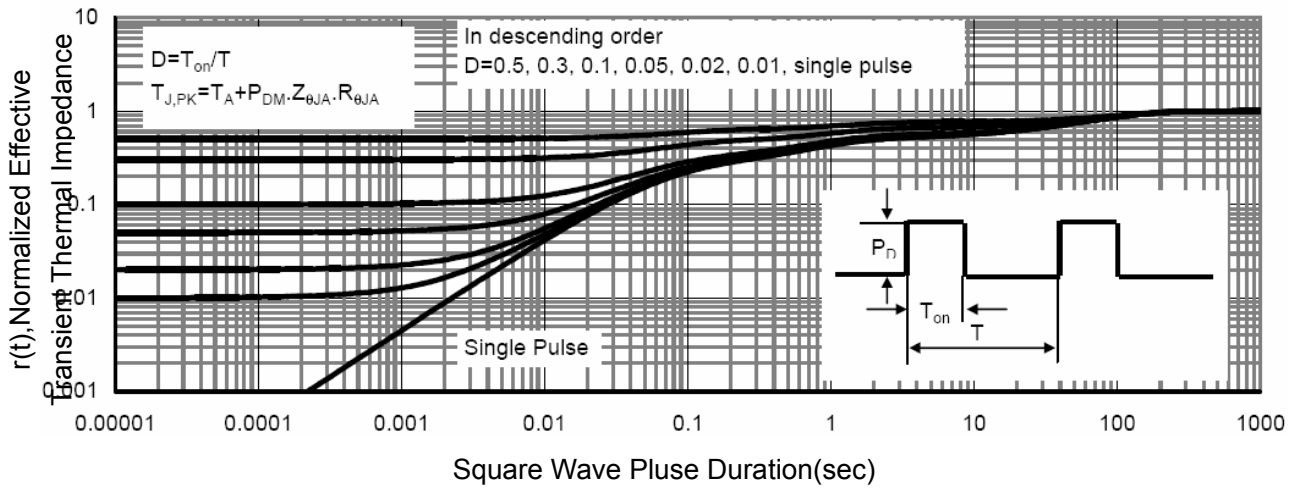
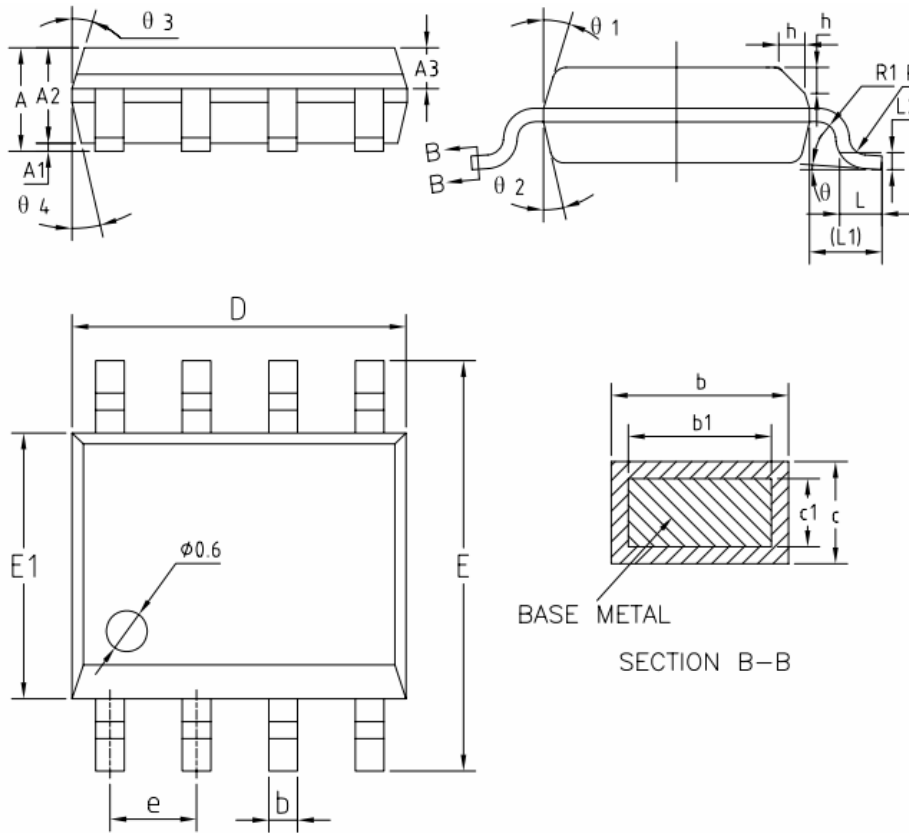


Figure 13 Normalized Maximum Transient Thermal Impedance

SOP-8 Package Information



COMMON DIMENSIONS
(UNITS OF MEASURE=MILLIMETER)

| SYMBOL | MIN | NOM | MAX |
|--------|---------|------|------|
| A | 1.35 | 1.55 | 1.75 |
| A1 | 0.10 | 0.15 | 0.25 |
| A2 | 1.25 | 1.40 | 1.65 |
| A3 | 0.50 | 0.60 | 0.70 |
| b | 0.38 | — | 0.51 |
| b1 | 0.37 | 0.42 | 0.47 |
| c | 0.18 | — | 0.25 |
| c1 | 0.17 | 0.20 | 0.23 |
| D | 4.80 | 4.90 | 5.00 |
| E | 5.80 | 6.00 | 6.20 |
| E1 | 3.80 | 3.90 | 4.00 |
| e | 1.17 | 1.27 | 1.37 |
| L | 0.45 | 0.60 | 0.80 |
| L1 | 1.04REF | | |
| L2 | 0.25BSC | | |
| R | 0.07 | — | — |
| R1 | 0.07 | — | — |
| h | 0.30 | 0.40 | 0.50 |
| θ | 0° | — | 8° |
| θ 1 | 15° | 17° | 19° |
| θ 2 | 11° | 13° | 15° |
| θ 3 | 15° | 17° | 19° |
| θ 4 | 11° | 13° | 15° |



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