

NCE Automotive P-Channel Enhancement Mode Power MOSFET

Description

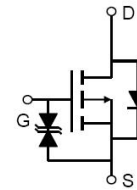
The NCEA01P13K uses advanced trench technology and design to provide excellent $R_{DS(ON)}$ with low gate charge. It can be used in a wide variety of applications. It is ESD protested.

General Features

- $V_{DS} = -100V, I_D = -13A$
 $R_{DS(ON)} < 200m\Omega @ V_{GS} = -10V$ (Typ:170m Ω)
 $R_{DS(ON)} < 240m\Omega @ V_{GS} = -4.5V$ (Typ:184m Ω)
- High density cell design for ultra low Rdson
- Fully characterized avalanche voltage and current
- Good stability and uniformity with high E_{AS}
- Excellent package for good heat dissipation
- 175 °C operating temperature
- Pb-free lead plating: RoHS compliant
- Halogen-free according to IEC61249-2-21
- 100% UIS tested
- 100% ΔV_{ds} tested
- **AEC-Q101 qualified**

Application

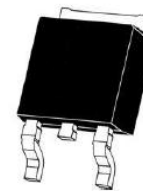
- Automotive application
- High side switch for full bridge converter
- DC/DC converter for LCD display



Schematic diagram



Marking and pin assignment



TO-252-2L top view

Package Marking and Ordering Information

| Device Marking | Device | Device Package | Reel Size | Tape width | Quantity |
|----------------|------------|----------------|-----------|------------|------------|
| A01P13K | NCEA01P13K | TO-252-2L | Ø330mm | 16mm | 2500 units |

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

| Parameter | Symbol | Limit | Unit |
|--|--------------------|------------|---------------|
| Drain-Source Voltage | V_{DS} | -100 | V |
| Gate-Source Voltage | V_{GS} | ± 20 | V |
| Drain Current-Continuous | I_D | -13 | A |
| Drain Current-Continuous($T_C = 100^\circ C$) | $I_D(100^\circ C)$ | -9.2 | A |
| Pulsed Drain Current | I_{DM} | -52 | A |
| Maximum Power Dissipation | P_D | 73 | W |
| Derating factor | | 0.49 | W/ $^\circ C$ |
| Single pulse avalanche energy (Note 5) | E_{AS} | 110 | 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) | $R_{\theta Jc}$ | 2.05 | $^\circ C/W$ |
|---|-----------------|------|--------------|

Electrical Characteristics (T_c=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 | -100 | - | - | V |
| Zero Gate Voltage Drain Current | I _{DSS} | V _{DS} =-100V, V _{GS} =0V | - | - | 1 | μA |
| Gate-Body Leakage Current | I _{GSS} | V _{GS} =±20V, V _{DS} =0V | - | - | ±10 | μA |
| On Characteristics (Note 3) | | | | | | |
| Gate Threshold Voltage | V _{GS(th)} | V _{DS} =V _{GS} , I _D =-250μA | -1 | -1.9 | -3 | V |
| Drain-Source On-State Resistance | R _{DS(ON)} | V _{GS} =-10V, I _D =-10A | - | 170 | 200 | mΩ |
| | | V _{GS} =-4.5V, I _D =-10A | - | 184 | 240 | |
| Forward Transconductance | g _{FS} | V _{DS} =-5V, I _D =-10A | 12 | - | - | S |
| Dynamic Characteristics (Note 4) | | | | | | |
| Input Capacitance | C _{iss} | V _{DS} =-50V, V _{GS} =0V, F=1.0MHz | - | 1492 | - | PF |
| Output Capacitance | C _{oss} | | - | 44 | - | PF |
| Reverse Transfer Capacitance | C _{rss} | | - | 42 | - | PF |
| Switching Characteristics (Note 4) | | | | | | |
| Turn-on Delay Time | t _{d(on)} | V _{DD} =-50V, I _D =-10A V _{GS} =-10V, R _{GEN} =9.1Ω | - | 12 | - | nS |
| Turn-on Rise Time | t _r | | - | 52 | - | nS |
| Turn-Off Delay Time | t _{d(off)} | | - | 28 | - | nS |
| Turn-Off Fall Time | t _f | | - | 38 | - | nS |
| Total Gate Charge | Q _g | V _{DS} =-50V, I _D =-10A, V _{GS} =-10V | - | 32 | - | nC |
| Gate-Source Charge | Q _{gs} | | - | 5 | - | nC |
| Gate-Drain Charge | Q _{gd} | | - | 7 | - | nC |
| Drain-Source Diode Characteristics | | | | | | |
| Diode Forward Voltage (Note 3) | V _{SD} | V _{GS} =0V, I _S =-10A | - | - | -1.2 | V |
| Diode Forward Current (Note 2) | I _S | - | - | - | -13 | A |
| Reverse Recovery Time | t _{rr} | T _J = 25°C, I _F = -10A di/dt = 100A/μs (Note 3) | - | 35 | - | nS |
| Reverse Recovery Charge | Q _{rr} | | - | 46 | - | 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. E_{AS} condition: T_j=25°C, V_{DD}=-50V, V_G=-10V, L=0.5mH, R_g=25Ω

Typical Electrical and Thermal Characteristics (Curves)

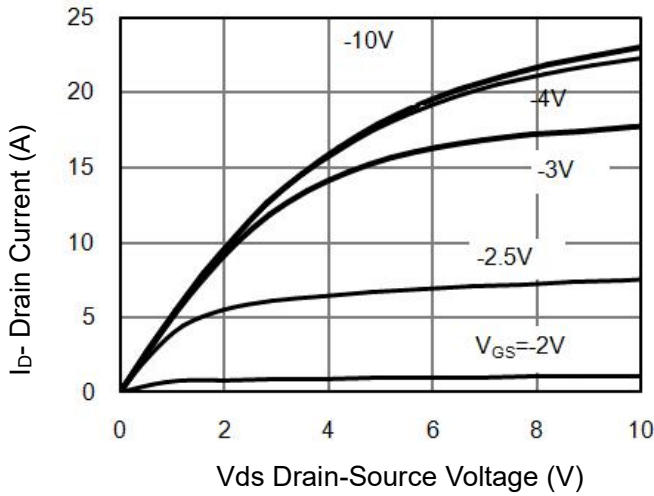


Figure 1 Output Characteristics

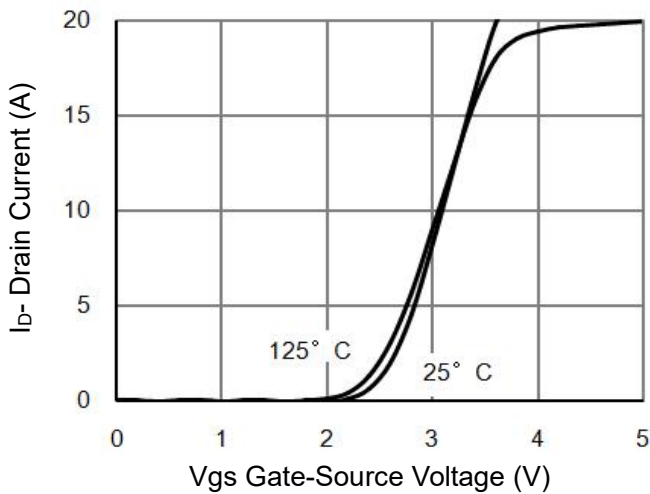


Figure 2 Transfer Characteristics

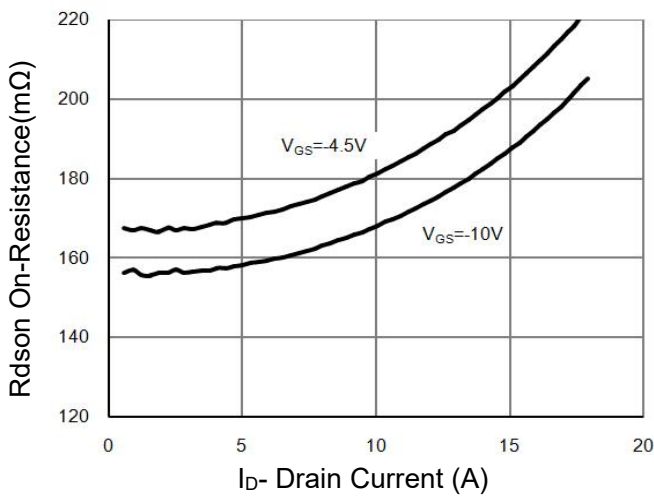


Figure 3 Rdson- Drain Current

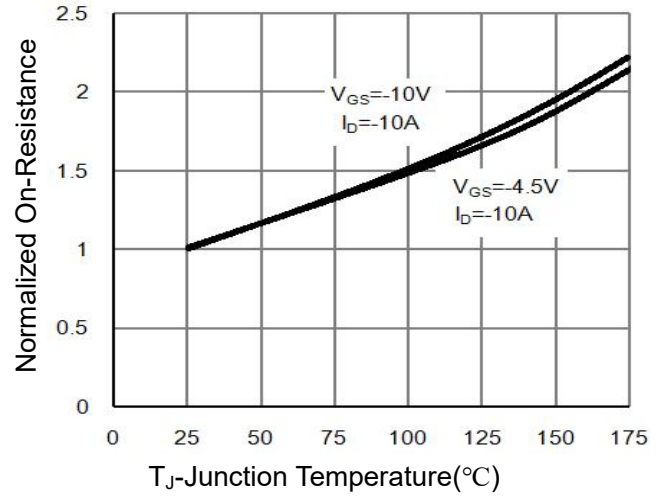


Figure 4 Rdson-Junction Temperature

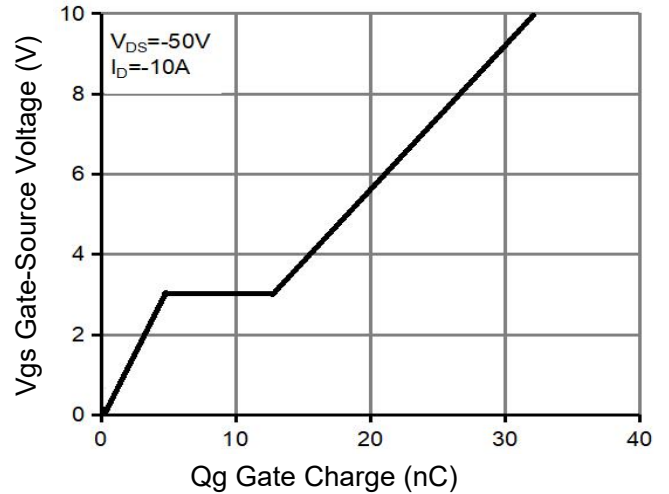


Figure 5 Gate Charge

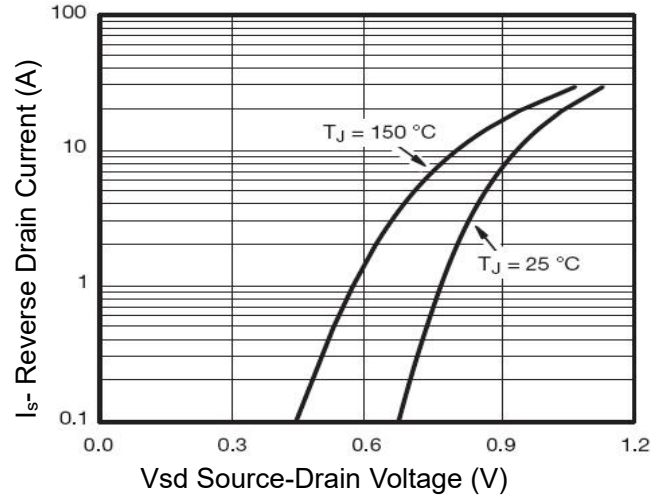


Figure 6 Source- Drain Diode Forward

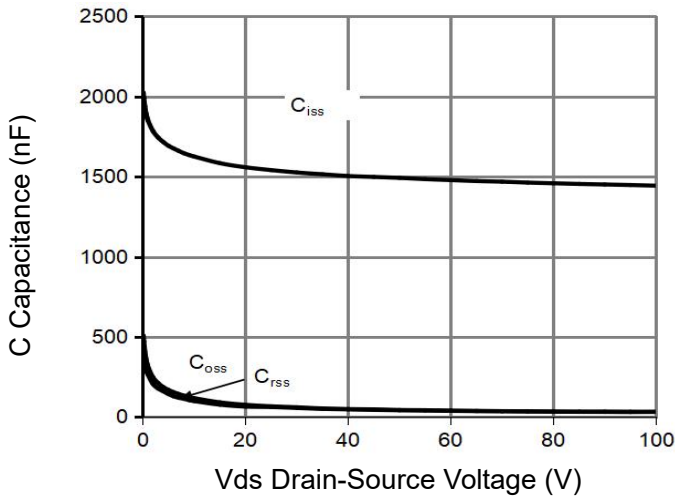


Figure 7 Capacitance vs Vds

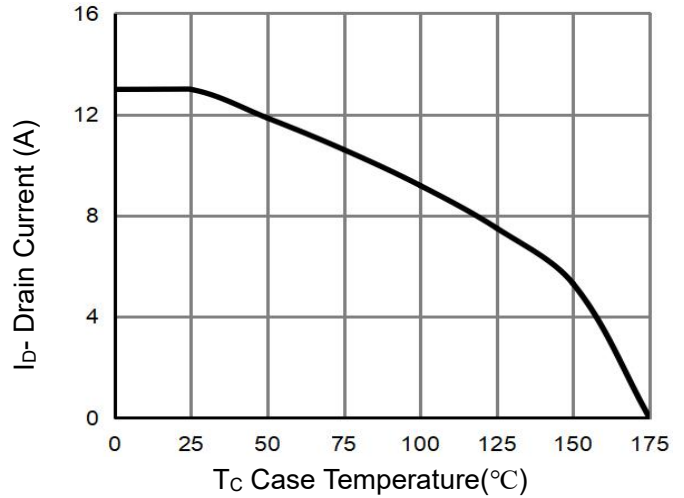


Figure 9 Drain Current vs Case Temperature

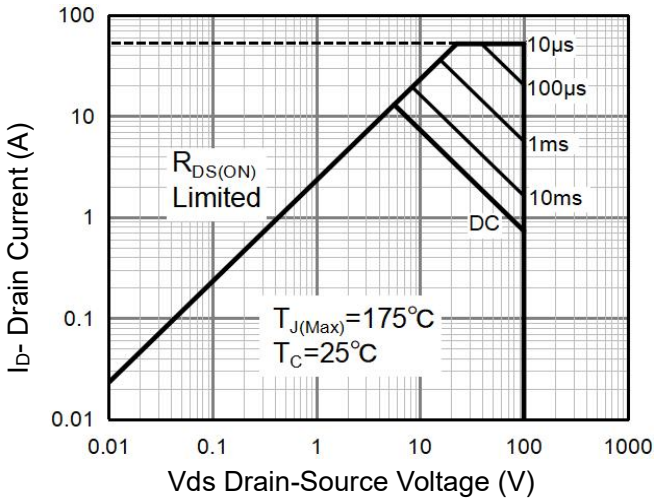


Figure 8 Safe Operation Area

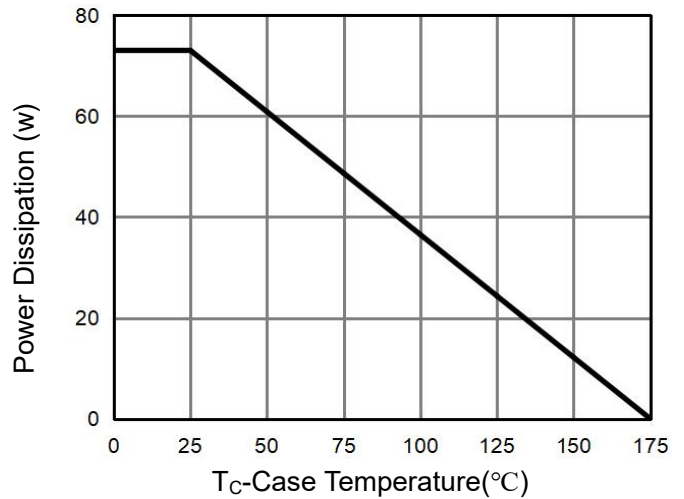


Figure 10 Power De-rating

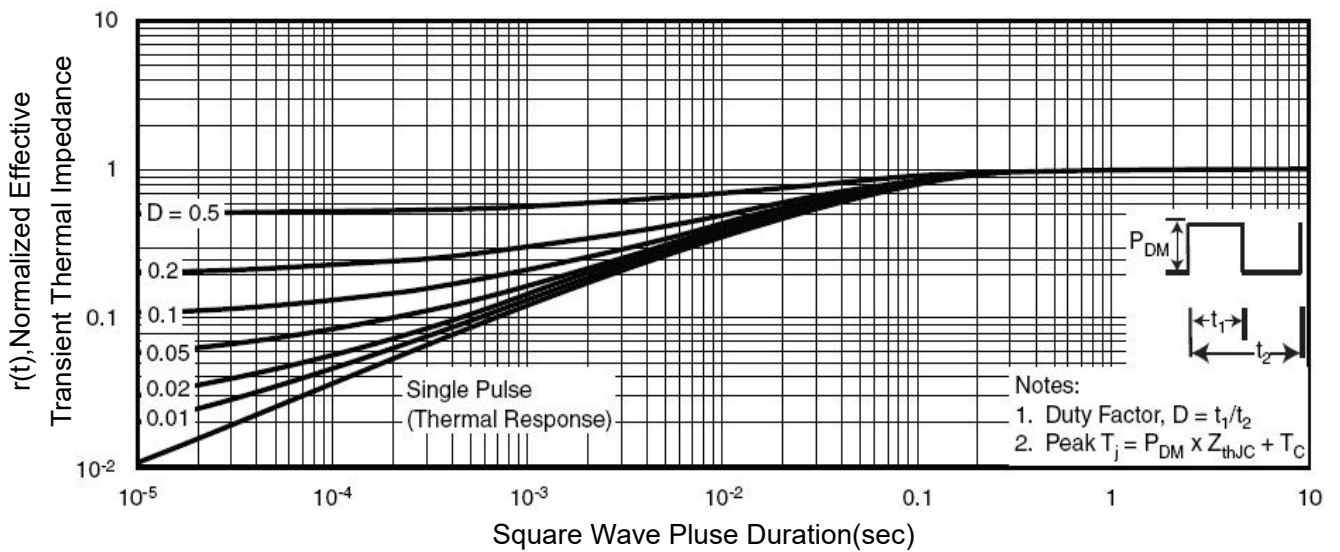
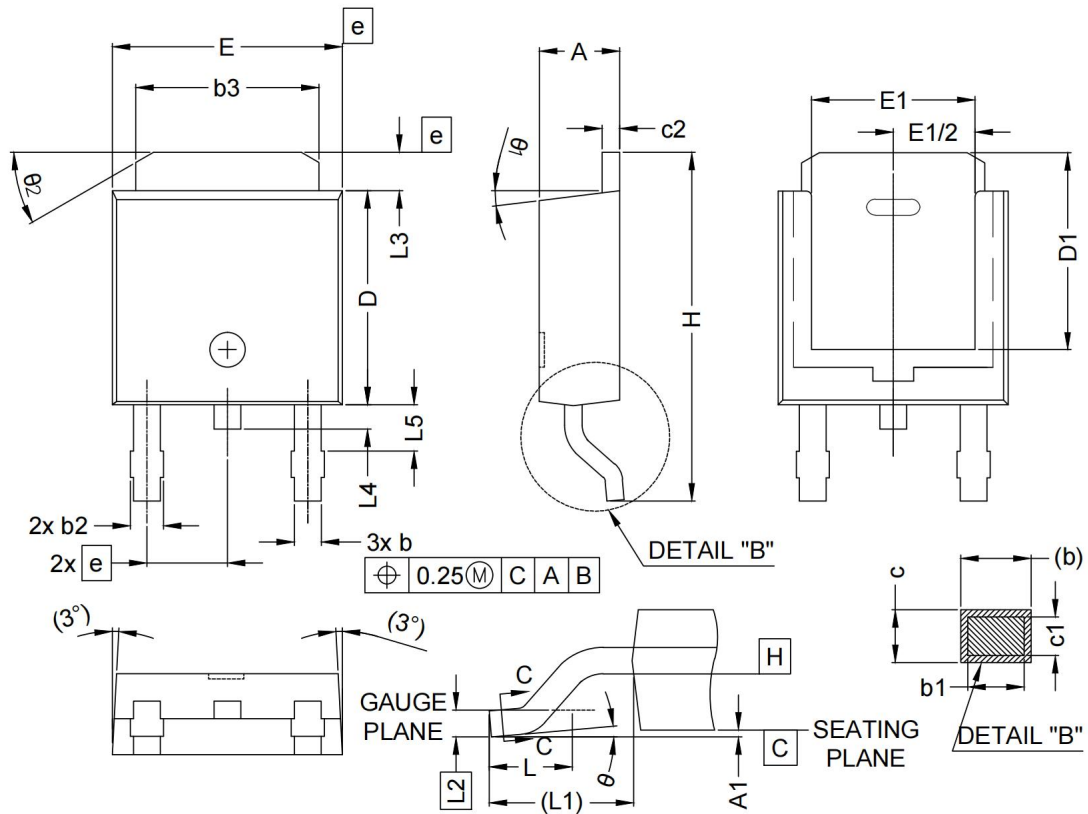


Figure 11 Normalized Maximum Transient Thermal Impedance

TO-252-2L Package Information



| SYMBOL | MIN. | MAX. | SYMBOL | MIN. | MAX. | SYMBOL | MIN. | MAX. |
|--------|------|------|----------|----------|-------|------------|------|------|
| A | 2.18 | 2.39 | E | 6.35 | 6.73 | $\theta 1$ | 0° | 15° |
| A1 | - | 0.13 | E1 | 4.32 | - | $\theta 2$ | 25° | 35° |
| b | 0.65 | 0.89 | e | 2.29 BSC | | | | |
| b1 | 0.64 | 0.79 | H | 9.94 | 10.34 | | | |
| b2 | 0.76 | 1.13 | L | 1.50 | 1.78 | | | |
| b3 | 4.95 | 5.46 | L1 | 2.74 REF | | | | |
| c | 0.46 | 0.61 | L2 | 0.51 BSC | | | | |
| c1 | 0.41 | 0.56 | L3 | 0.89 | 1.27 | | | |
| c2 | 0.46 | 0.60 | L4 | - | 1.02 | | | |
| D | 5.97 | 6.22 | L5 | 1.14 | 1.49 | | | |
| D1 | 5.21 | - | θ | 0° | 10° | | | |

NOTE ; 1.0 DIMENSIONING & TOLERANCEING CONFIRM TO ASME Y14.5M-1994.
 2.0 ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES ARE IN DEGREES.
 3.0 HEAT SINK SIDE FLASH IS MAX. 0.8mm.
 4.0 RADIUS ON TERMINAL IS OPTIONAL.

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