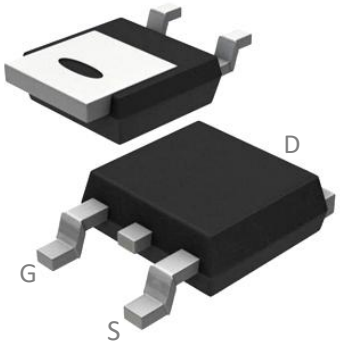
## Description：

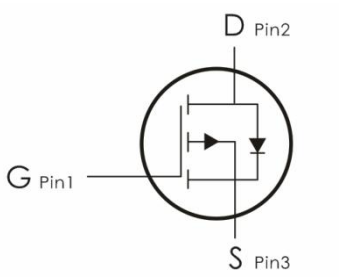
This P-Channel MOSFET uses advanced trench technology and design to provide excellent $R_{DS(on)}$ with low gate charge.

It can be used in a wide variety of applications.




## Features：

1) $V_{DS}$=-40V,$I_D$=-45A,$R_{DS(ON)}$<13mΩ @$V_{GS}$=-10V（Typ：9.5mΩ）
2) Low gate charge.
3) Green device available.
4) Advanced high cell denity trench technology for ultra low $R_{DS(ON)}$.
5) Excellent package for good heat dissipation.
6) MSL3




## Package Marking and Ordering Information：

| Part NO. | Marking | Package | Packing |
|---|---|---|---|
| NCE40P40K | NCE40P40K | TO- 252 | 2500 pcs/Reel |

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

| Symbol | Parameter | Ratings | Units |
|---|---|---|---|
| $V_{DS}$ | Drain-Source Voltage | -40 | V |
| $V_{GS}$ | Gate-Source Voltage | ±20 | V |
| $I_D$ | Continuous Drain Current [1] | -45 | A |
| | Continuous Drain Current-$T_C$=100℃ [1] | -31.5 | |
| $I_{DM}$ | Pulsed Drain Current [2] | -180 | |
| $P_D$ | Power Dissipation | 73.5 | W |
| $E_{AS}$ | Single pulse avalanche energy [3] | 125 | mJ |
| $T_J$, $T_{STG}$ | Operating and Storage Junction Temperature Range | -55-+150 | ℃ |

## Thermal Characteristics：

| Symbol | Parameter | Max | Units |
|---|---|---|---|
| $R_{\Theta JC}$ | Thermal Resistance,Junction to Case | 1.7 | ℃/W |
| $R_{\Theta JA}$ | Thermal Resistance,Junction to Ambient | 62 | |

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## Electrical Characteristics: ($T_C$=25℃ unless otherwise noted)

| Symbol | Parameter | Conditions | Min | Typ | Max | Units |
|---|---|---|---|---|---|---|
| **Off Characteristics** | | | | | | |
| $BV_{DSS}$ | Drain-Sourtce Breakdown Voltage | $V_{GS}$=0V,$I_D$=250μA | -40 | --- | --- | V |
| $I_{DSS}$ | Zero Gate Voltage Drain Current | $V_{GS}$=0V, $V_{DS}$=-40V | --- | --- | -1 | μA |
| $I_{GSS}$ | Gate-Source Leakage Current | $V_{GS}$=±20V, $V_{DS}$=0A | --- | --- | ±100 | nA |
| **On Characteristics** | | | | | | |
| $V_{GS(th)}$ | Gate-Source Threshold Voltage | $V_{GS}$=$V_{DS}$, $I_D$=250μA | -1 | -1.6 | -2.5 | V |
| $R_{DS(ON)}$ | Drain-Source On Resistance[4] | $V_{GS}$=-10V,$I_D$=-20A | --- | 9.5 | 13 | mΩ |
| | | $V_{GS}$=-4.5V,$I_D$=-10A | --- | 12.5 | 17 | mΩ |
| **Dynamic Characteristics** | | | | | | |
| $C_{iss}$ | Input Capacitance | $V_{DS}$=-25V, $V_{GS}$=0V, f=1MHz | --- | 2100 | --- | pF |
| $C_{oss}$ | Output Capacitance | | --- | 240 | -- | |
| $C_{rss}$ | Reverse Transfer Capacitance | | --- | 203 | --- | |
| **Switching Characteristics** | | | | | | |
| $t_{d(on)}$ | Turn-On Delay Time | $V_{DS}$=-20V, $I_D$=-1A, $R_{ENG}$=6Ω ,$V_{GS}$=-10V | --- | 23 | --- | ns |
| $t_r$ | Rise Time | | --- | 10 | --- | ns |
| $t_{d(off)}$ | Turn-Off Delay Time | | --- | 135 | --- | ns |
| $t_f$ | Fall Time | | --- | 46 | --- | ns |
| $Q_g$ | Total Gate Charge | $V_{GS}$=-10 V, $V_{DS}$=-20V, $I_D$=-10A | --- | 35 | --- | nC |
| $Q_{gs}$ | Gate-Source Charge | | --- | 8.2 | --- | nC |
| $Q_{gd}$ | Gate-Drain “Miller” Charge | | --- | 8.8 | --- | nC |
| **Drain-Source Diode Characteristics** | | | | | | |
| $V_{SD}$ | Diode Forward Voltage | $V_{GS}$=0V, $I_{SD}$=-1A | --- | --- | -1 | V |
| $I_S$ | Continuous Drain Curren | $V_D$=$V_G$=0V | --- | --- | -45 | A |
| $I_{SM}$ | Pulsed Drain Current | | --- | --- | -180 | A |

**Notes:**

1. Computed continuous current assumes the condition of $T_{j,Max}$ while the actual continuous current depends on the thermal & electro-mechanical application board design
2. Repetitive Rating: Pulse Width Limited by Maximum Junction Temperature
3. EAS condition : TJ=25℃,VDD=20V,$V_G$=10V,L=0.5mH
4. Pulse Test: Pulse Width≤300μs, Duty Cycle≤0.5%

## Typical Characteristics： ($T_C$=25℃ unless otherwise noted)

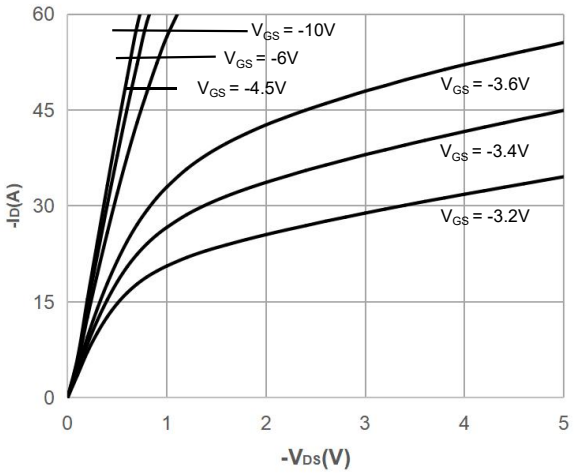


Figure 1: Output Characteristics

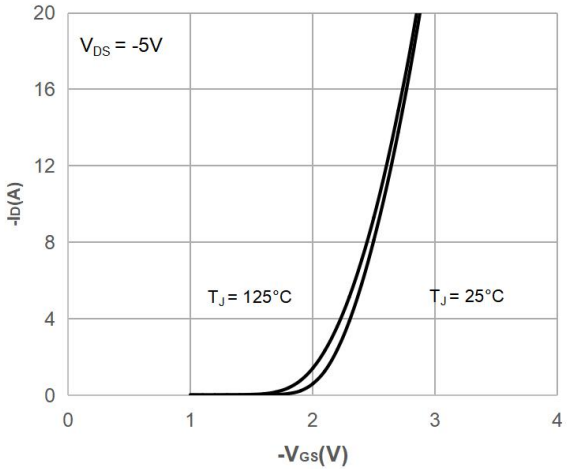


Figure 2: Typical Transfer Characteristics

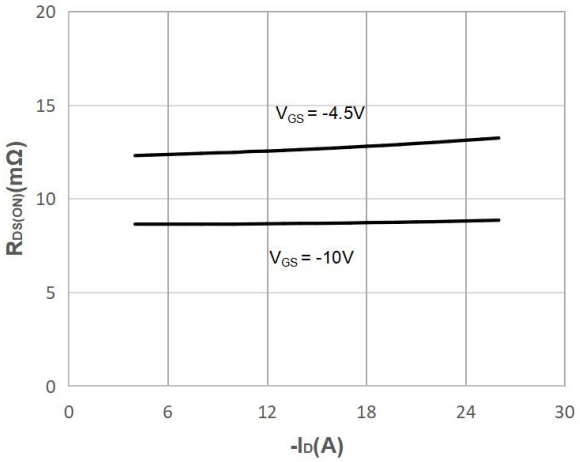


Figure 3: On-resistance vs. Drain Current

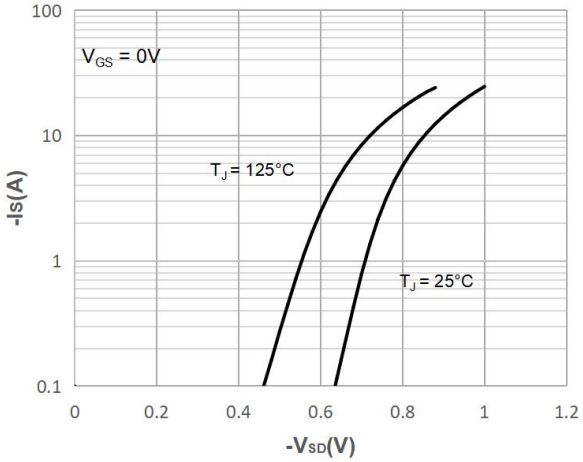


Figure 4: Body Diode Characteristics

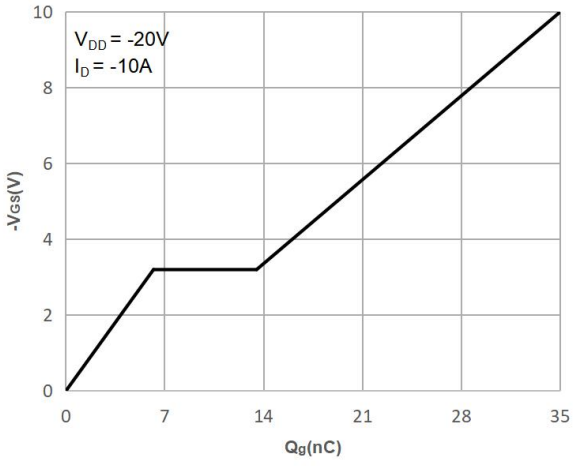


Figure 5: Gate Charge Characteristics

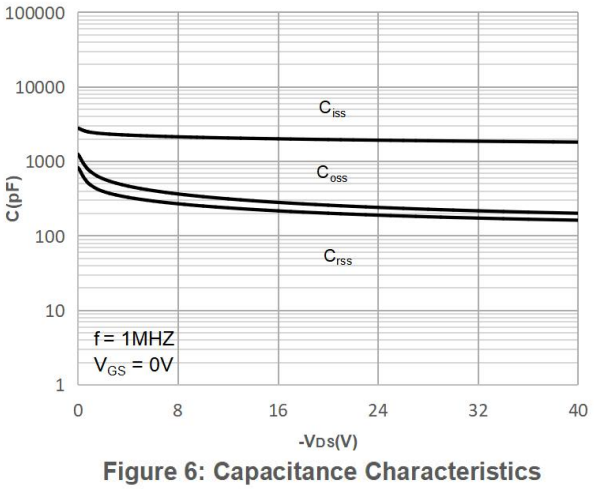


Figure 6: Capacitance Characteristics

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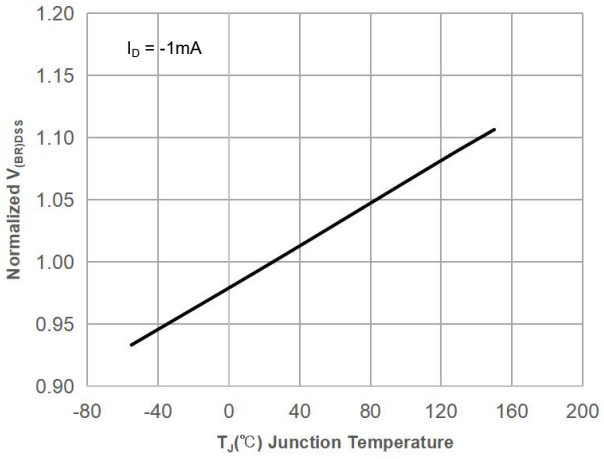



Figure 7: Normalized Breakdown voltage vs. Junction Temperature

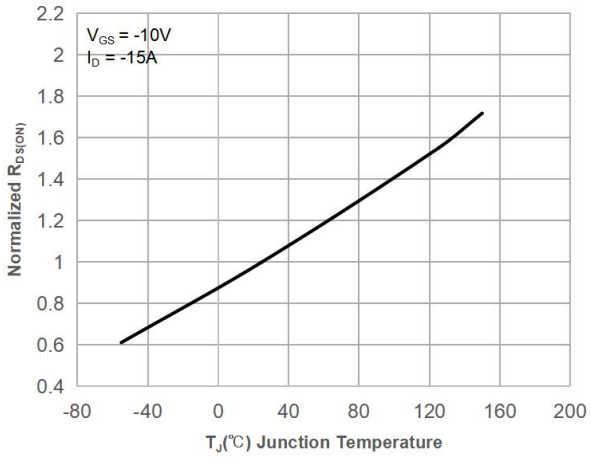



Figure 8: Normalized on Resistance vs. Junction Temperature

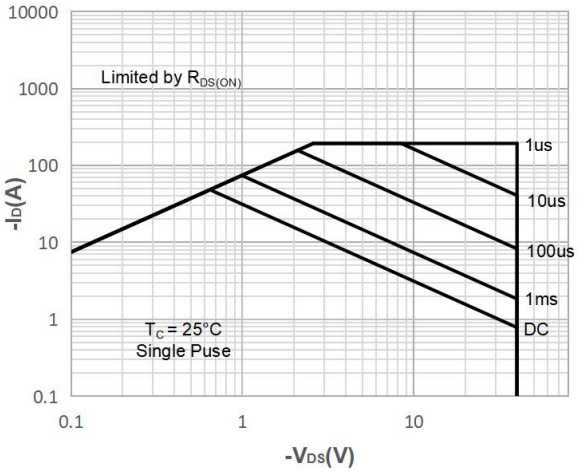



Figure 9: Maximum Safe Operating Area

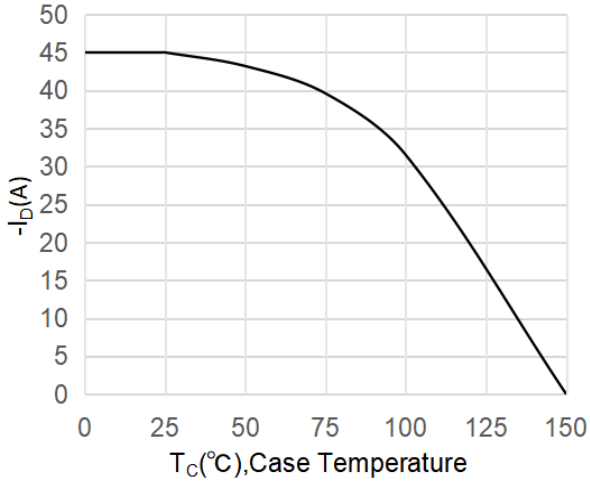



Figure 10: Maximum Continuous Drian Current vs. Case Temperature

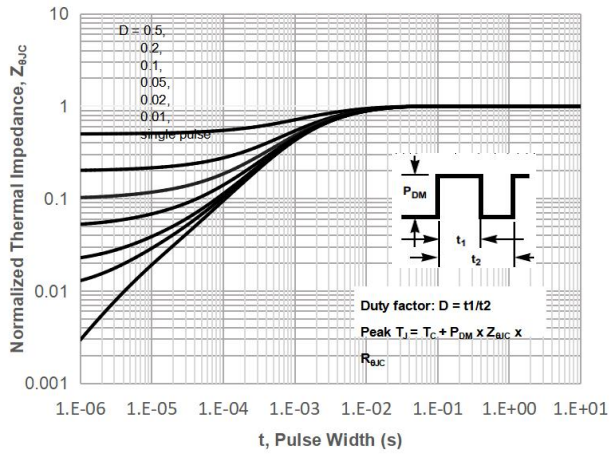



Figure 11: Normalized Maximum Transient Thermal Impedance

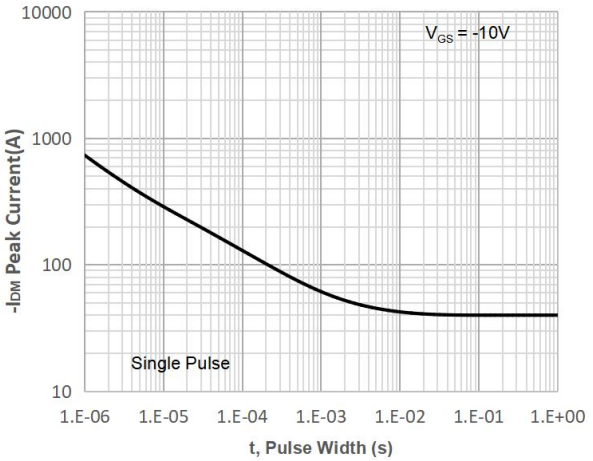
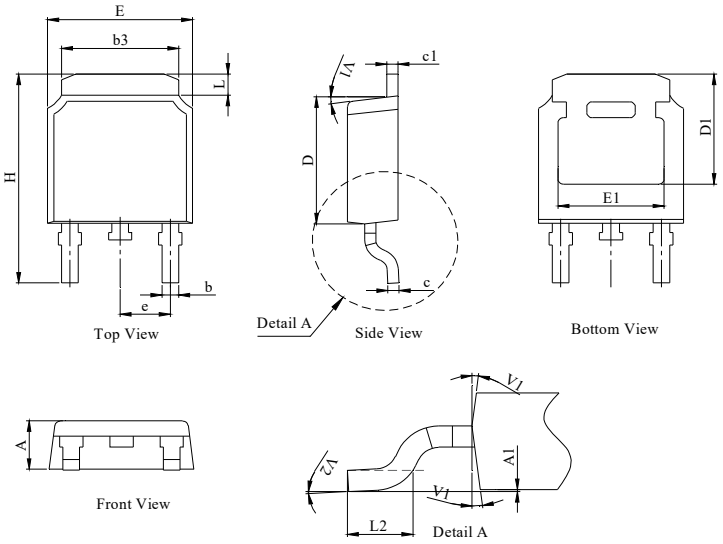



Figure 12: Peak Current Capacity

# TO-252 Package Information

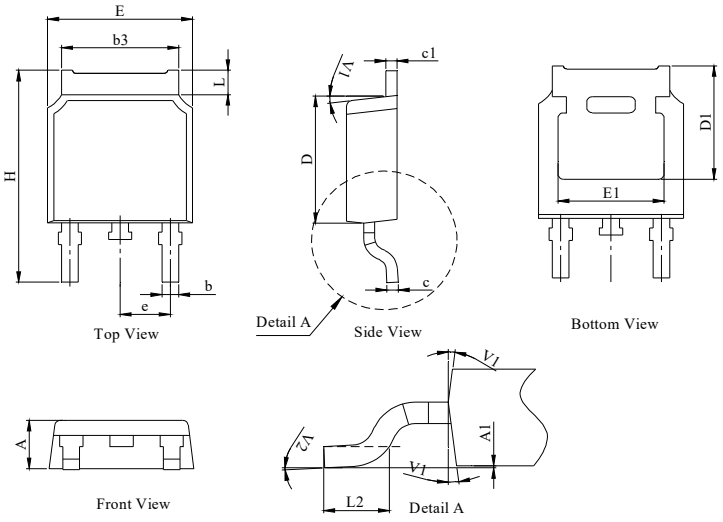
**Package Outline Type-A**

UNIT: mm




| DIM. | MILLIMETER | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 2.18 | 2.30 | 2.39 |
| A1 | 0 | -- | 0.13 |
| b | 0.64 | 0.76 | 0.89 |
| c | 0.40 | 0.50 | 0.61 |
| c1 | 0.46 | 0.50 | 0.58 |
| D | 5.97 | 6.10 | 6.23 |
| D1 | 5.05 | -- | -- |
| E | 6.35 | 6.60 | 6.73 |
| E1 | 4.32 | -- | -- |
| b3 | 5.21 | 5.38 | 5.55 |
| e | 2.29 BSC | | |
| H | 9.40 | 10.00 | 10.40 |
| L | 0.89 | -- | 1.27 |
| L2 | 1.40 | -- | 1.78 |
| V1 | 7° REF | | |
| V2 | 0° | -- | 6° |

**Package Outline Type-B**




| DIM. | MILLIMETER | | |
|---|---|---|---|
| | MIN. | NOM. | MAX. |
| A | 2.10 | 2.30 | 2.40 |
| A1 | 0 | -- | 0.13 |
| b | 0.66 | 0.76 | 0.86 |
| b3 | 5.21 | 5.38 | 5.55 |
| c | 0.40 | 0.50 | 0.60 |
| c1 | 0.44 | 0.50 | 0.58 |
| D | 5.90 | 6.10 | 6.30 |
| D1 | 5.30REF | | |
| E | 6.40 | 6.60 | 6.80 |
| E1 | 4.63 | - | - |
| e | 2.29 BSC | | |
| H | 9.50 | 10.00 | 10.70 |
| L | 1.09 | -- | 1.21 |
| L2 | 1.35 | -- | 1.65 |
| V1 | 7° REF | | |
| V2 | 0° | -- | 6° |

**Recommended Soldering Footprint**

