

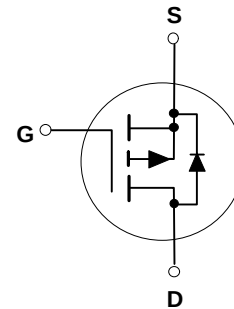
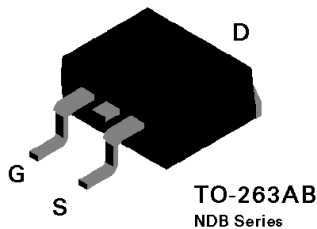
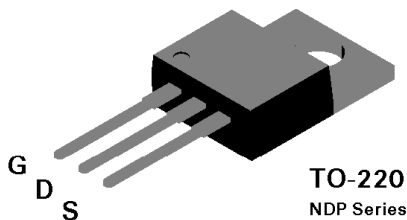
## NDP6030PL / NDB6030PL P-Channel Logic Level Enhancement Mode Field Effect Transistor

### General Description

These P-Channel logic level enhancement mode power field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for low voltage applications such as DC/DC converters and high efficiency switching circuits where fast switching, low in-line power loss, and resistance to transients are needed.

### Features

- -30 A, -30 V.  $R_{DS(ON)} = 0.042 \Omega @ V_{GS} = -4.5 \text{ V}$   
 $R_{DS(ON)} = 0.025 \Omega @ V_{GS} = -10 \text{ V}$ .
- Critical DC electrical parameters specified at elevated temperature.
- Rugged internal source-drain diode can eliminate the need for an external Zener diode transient suppressor.
- High density cell design for extremely low  $R_{DS(ON)}$ .
- 175°C maximum junction temperature rating.



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

| Symbol           | Parameter                        | NDP6030PL | NDB6030PL | Units |
|------------------|----------------------------------|-----------|-----------|-------|
| V <sub>DSS</sub> | Drain-Source Voltage             | -30       |           | V     |
| V <sub>GSS</sub> | Gate-Source Voltage - Continuous | ±16       |           | V     |
| I <sub>D</sub>   | Drain Current    - Continuous    | -30       |           | A     |
|                  |                                  |           |           |       |

### THERMAL CHARACTERISTICS

|                 |                                         |      |                    |
|-----------------|-----------------------------------------|------|--------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction-to-Case    | 2    | $^\circ\text{C/W}$ |
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 62.5 | $^\circ\text{C/W}$ |

# Electrical Characteristics (T<sub>c</sub> = 25°C unless otherwise noted)

| Symbol                                | Parameter                                            | Conditions                                                                                        | Min  | Typ   | Max   | Unit  |
|---------------------------------------|------------------------------------------------------|---------------------------------------------------------------------------------------------------|------|-------|-------|-------|
| OFF CHARACTERISTICS                   |                                                      |                                                                                                   |      |       |       |       |
| BV <sub>DSS</sub>                     | Drain-Source Breakdown Voltage                       | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -250 μA                                                   | -30  |       |       | V     |
| ΔBV <sub>DSS</sub> /ΔT <sub>J</sub>   | Breakdown Voltage Temp. Coefficient                  | I <sub>D</sub> = -250 μA, Referenced to 25 °C                                                     |      | -36   |       | mV/°C |
| I <sub>DSS</sub>                      | Zero Gate Voltage Drain Current                      | V <sub>DS</sub> = -24 V, V <sub>GS</sub> = 0 V                                                    |      |       | -250  | μA    |
|                                       |                                                      | T <sub>J</sub> = 125°C                                                                            |      |       | 1     | mA    |
| I <sub>GSSF</sub>                     | Gate - Body Leakage, Forward                         | V <sub>GS</sub> = 16 V, V <sub>DS</sub> = 0 V                                                     |      |       | -100  | nA    |
| I <sub>GSSR</sub>                     | Gate - Body Leakage, Reverse                         | V <sub>GS</sub> = -16 V, V <sub>DS</sub> = 0 V                                                    |      |       | -100  | nA    |
| ON CHARACTERISTICS (Note)             |                                                      |                                                                                                   |      |       |       |       |
| ΔV <sub>GS(th)</sub> /ΔT <sub>J</sub> | Gate Threshold Voltage Temp.Coefficient              | I <sub>D</sub> = -250 μA, Referenced to 25 °C                                                     |      | 2.2   |       | mV/°C |
| V <sub>GS(th)</sub>                   | Gate Threshold Voltage                               | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -250 μA                                      | -1   | -1.4  | -2    | V     |
|                                       |                                                      | T <sub>J</sub> = 125°C                                                                            | -0.8 | -1.08 | -1.6  |       |
| R <sub>DS(ON)</sub>                   | Static Drain-Source On-Resistance                    | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -15 A                                                  |      | 0.037 | 0.042 | Ω     |
|                                       |                                                      | T <sub>J</sub> = 125°C                                                                            |      | 0.053 | 0.075 |       |
|                                       |                                                      | V <sub>GS</sub> = -10 V, I <sub>D</sub> = -19 A                                                   |      | 0.021 | 0.025 |       |
| I <sub>D(on)</sub>                    | On-State Drain Current                               | V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -5 V                                                  | -20  |       |       | A     |
| g <sub>FS</sub>                       | Forward Transconductance                             | V <sub>DS</sub> = -4.5 V, I <sub>D</sub> = -19 A                                                  |      | 20    |       | S     |
| DYNAMIC CHARACTERISTICS               |                                                      |                                                                                                   |      |       |       |       |
| C <sub>iss</sub>                      | Input Capacitance                                    | V <sub>DS</sub> = -15 V, V <sub>GS</sub> = 0 V,<br>f = 1.0 MHz                                    |      | 1570  |       | pF    |
| C <sub>oss</sub>                      | Output Capacitance                                   |                                                                                                   |      | 975   |       | pF    |
| C <sub>rss</sub>                      | Reverse Transfer Capacitance                         |                                                                                                   |      | 360   |       | pF    |
| SWITCHING CHARACTERISTICS (Note)      |                                                      |                                                                                                   |      |       |       |       |
| t <sub>D(on)</sub>                    | Turn - On Delay Time                                 | V <sub>DD</sub> = -15 V, I <sub>D</sub> = -5 A,<br>V <sub>GS</sub> = -5 V, R <sub>GEN</sub> = 6 Ω |      | 12.5  | 25    | nS    |
| t <sub>r</sub>                        | Turn - On Rise Time                                  |                                                                                                   |      | 60    | 120   | nS    |
| t <sub>D(off)</sub>                   | Turn - Off Delay Time                                |                                                                                                   |      | 50    | 100   | nS    |
| t <sub>f</sub>                        | Turn - Off Fall Time                                 |                                                                                                   |      | 52    | 100   | nS    |
| Q <sub>g</sub>                        | Total Gate Charge                                    | V <sub>DS</sub> = -12 V<br>I <sub>D</sub> = -30 A, V <sub>GS</sub> = -5 V                         |      | 26    | 36    | nC    |
| Q <sub>gs</sub>                       | Gate-Source Charge                                   |                                                                                                   |      | 6.5   |       | nC    |
| Q <sub>gd</sub>                       | Gate-Drain Charge                                    |                                                                                                   |      | 11.5  |       | nC    |
| DRAIN-SOURCE DIODE CHARACTERISTICS    |                                                      |                                                                                                   |      |       |       |       |
| I <sub>S</sub>                        | Maximum Continuos Drain-Source Diode Forward Current |                                                                                                   |      |       | -30   | A     |
| I <sub>SM</sub>                       | Maximum Pulsed Drain-Source Diode Forward Current    |                                                                                                   |      |       | -100  | A     |
| V <sub>SD</sub>                       | Drain-Source Diode Forward Voltage                   | V <sub>GS</sub> = 0 V, I <sub>S</sub> = -15 A (Note)                                              |      | -0.92 | -1.3  | V     |
| t <sub>rr</sub>                       | Reverse Recovery Time                                | V <sub>GS</sub> = 0 V, I <sub>F</sub> = -30 A                                                     |      | 58    |       | ns    |
| I <sub>rr</sub>                       | Reverse Recovery Current                             | di <sub>F</sub> /dt = 100 A/μs                                                                    |      | -1.5  |       | A     |

Note:  
Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

## Typical Electrical Characteristics

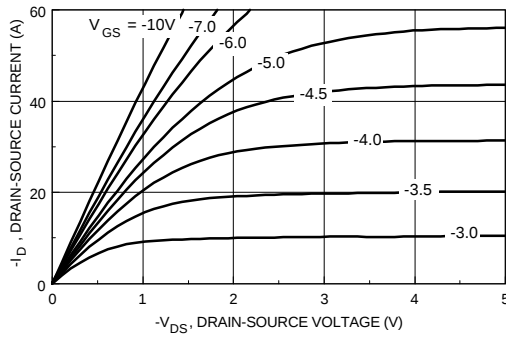


Figure 1. On-Region Characteristics.

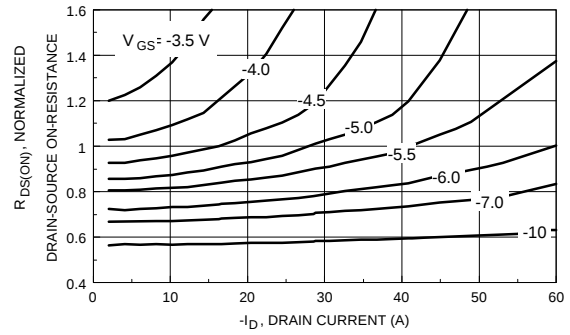


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

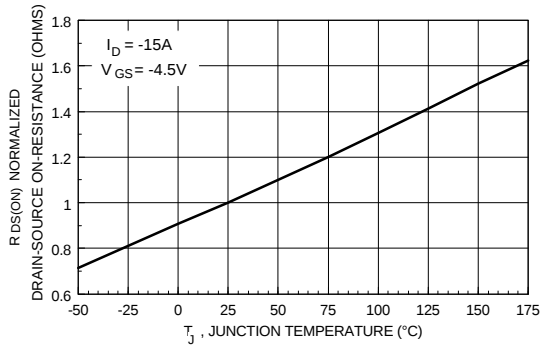


Figure 3. On-Resistance Variation with Temperature.

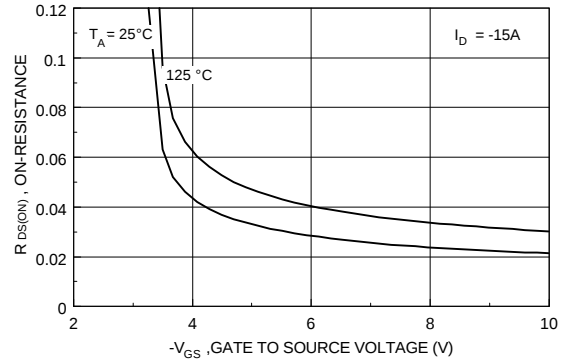


Figure 4. On Resistance Variation with Gate-To-Source Voltage.

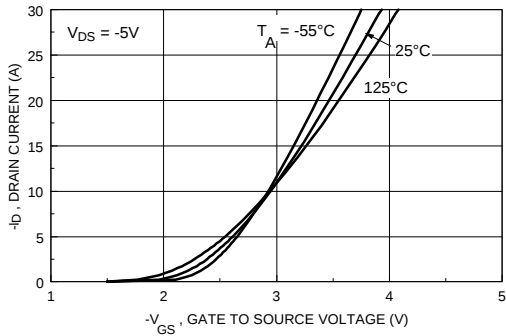


Figure 5. Transfer Characteristics.

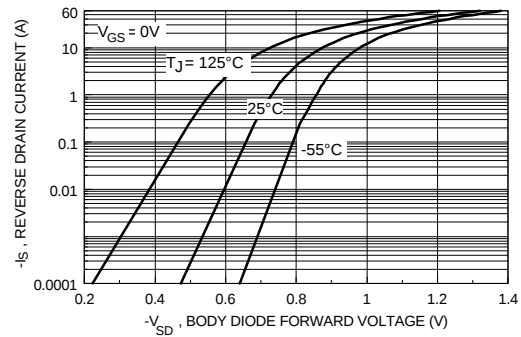


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

## Typical Electrical Characteristics (continued)

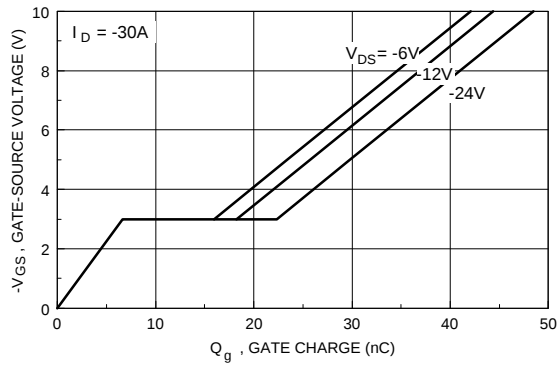


Figure 7. Gate Charge Characteristics.

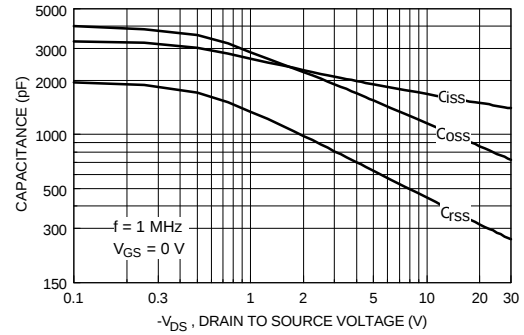


Figure 8. Capacitance Characteristics.

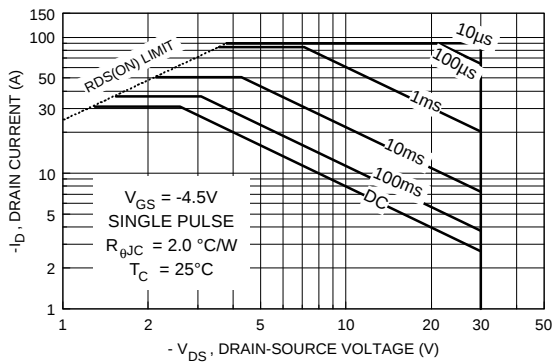


Figure 9. Maximum Safe Operating Area.

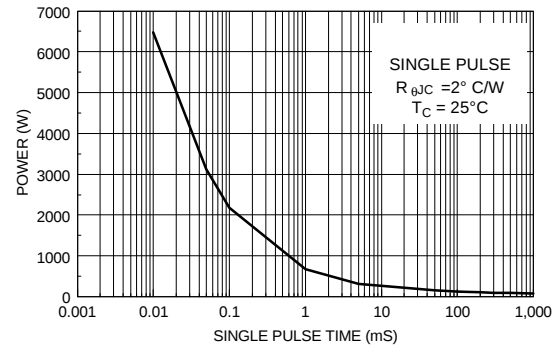


Figure 10. Single Pulse Maximum Power Dissipation.

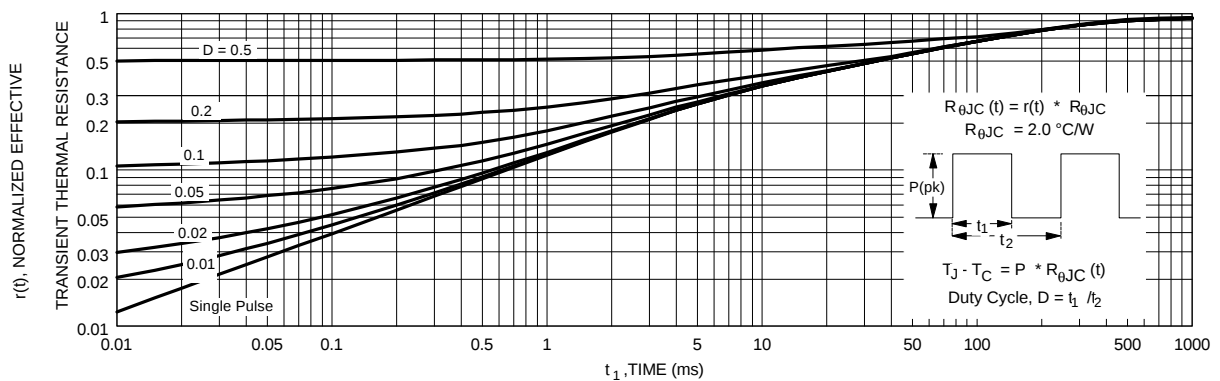


Figure 11. Transient Thermal Response Curve.

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