



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: [info@chipsmall.com](mailto:info@chipsmall.com) Web: [www.chipsmall.com](http://www.chipsmall.com)

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



# NDF0610 / NDS0610

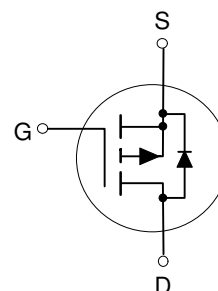
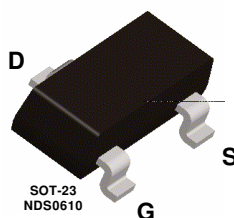
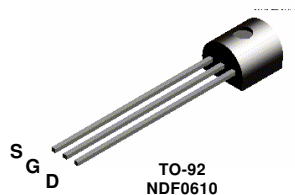
## P-Channel Enhancement Mode Field Effect Transistor

### General Description

These P-Channel enhancement mode power field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process has been designed to minimize on-state resistance, provide rugged and reliable performance and fast switching. They can be used, with a minimum of effort, in most applications requiring up to 180mA DC and can deliver pulsed currents up to 1A. This product is particularly suited to low voltage applications requiring a low current high side switch.

### Features

- -0.18 and -0.12A, -60V.  $R_{DS(ON)} = 10\Omega$
- Voltage controlled p-channel small signal switch
- High density cell design for low  $R_{DS(ON)}$
- TO-92 and SOT-23 packages for both through hole and surface mount applications
- High saturation current



### Absolute Maximum Ratings

$T_A = 25^\circ\text{C}$  unless otherwise noted

| Symbol         | Parameter   | NDF0610    | NDS0610  | Units |
|----------------|---|------------|----------|-------|
| $V_{DSS}$      | Drain-Source Voltage  | -60        | -60      | V     |
| $V_{DGR}$      | Drain-Gate Voltage ( $R_{GS} \leq 1\text{ M}\Omega$ )                                 | -60        | -60      | V     |
| $V_{GSS}$      | Gate-Source Voltage - Continuous<br>- Nonrepetitive ( $t_p < 50\text{ }\mu\text{s}$ ) | $\pm 20$   | $\pm 20$ | V     |
|                |   | $\pm 30$   | $\pm 30$ | V     |
| $I_D$          | Drain Current - Continuous<br>- Pulsed  | -0.18      | -0.12    | A     |
|                |   | -1         | -1       | A     |
| $P_D$          | Maximum Power Dissipation $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | 0.8        | 0.36     | W     |
|                |   | 5          | 2.9      | mW/°C |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range   | -55 to 150 |          | °C    |
| $T_L$          | Maximum lead temperature for soldering purposes,<br>1/16" from case for 10 seconds    | 300        |          | °C    |

### THERMAL CHARACTERISTICS

|                 |   |     |     |      |
|-----------------|---|-----|-----|------|
| $R_{\theta JA}$ | Thermal Resistance, Junction-to-Ambient | 200 | 350 | °C/W |
|-----------------|---|-----|-----|------|

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| Symbol                             | Parameter                             | Conditions  | Min  | Typ   | Max   | Units |
|------------------------------------|---------------------------------------|---|------|-------|-------|-------|
| OFF CHARACTERISTICS                |                                       |   |      |       |       |       |
| BV <sub>DSS</sub>                  | Drain-Source Breakdown Voltage        | V <sub>GS</sub> = 0 V, I <sub>D</sub> = -10 μA  | -60  |       |       | V     |
| I <sub>DSS</sub>                   | Zero Gate Voltage Drain Current       | V <sub>DS</sub> = -48 V, V <sub>GS</sub> = 0 V  |      |       | -1    | μA    |
|                                    |                                       | T <sub>J</sub> = 125°C  |      |       | -200  | μA    |
| I <sub>GSSF</sub>                  | Gate - Body Leakage, Forward          | V <sub>GS</sub> = 20 V, V <sub>DS</sub> = 0 V   |      |       | 10    | nA    |
| I <sub>GSSR</sub>                  | Gate - Body Leakage, Reverse          | V <sub>GS</sub> = -20 V, V <sub>DS</sub> = 0 V  |      |       | -10   | nA    |
| ON CHARACTERISTICS (Note 1)        |                                       |   |      |       |       |       |
| V <sub>GS(th)</sub>                | Gate Threshold Voltage                | V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = -1 mA  | -1   | -2.4  | -3.5  | V     |
| R <sub>DS(ON)</sub>                | Static Drain-Source On-Resistance     | T <sub>J</sub> = 125°C  | -0.6 | -2.1  | -3.2  |       |
|                                    |                                       | T <sub>J</sub> = 125°C  |      | 3.6   | 10    | Ω     |
|                                    |                                       | V <sub>GS</sub> = -4.5 V, I <sub>D</sub> = -0.25 A  |      | 5.9   | 16    |       |
|                                    |                                       | T <sub>J</sub> = 125°C  |      | 5.2   | 20    |       |
| I <sub>D(on)</sub>                 | On-State Drain Current                | V <sub>GS</sub> = -10 V, V <sub>DS</sub> = -10 V  | -0.6 | -1.6  |       | A     |
|                                    |                                       | V <sub>GS</sub> = -4.5 V, V <sub>DS</sub> = -10 V   |      | -0.35 |       |       |
| g <sub>FS</sub>                    | Forward Transconductance              | V <sub>DS</sub> = -10 V, I <sub>D</sub> = -0.1 A  | 70   | 170   |       | mS    |
| DYNAMIC CHARACTERISTICS            |                                       |   |      |       |       |       |
| C <sub>iss</sub>                   | Input Capacitance                     | V <sub>DS</sub> = -25 V, V <sub>GS</sub> = 0 V, f = 1.0 MHz   |      | 40    | 60    | pF    |
| C <sub>oss</sub>                   | Output Capacitance                    |   |      | 11    | 25    | pF    |
| C <sub>rss</sub>                   | Reverse Transfer Capacitance          |   |      | 3.2   | 5     | pF    |
| SWITCHING CHARACTERISTICS (Note 1) |                                       |   |      |       |       |       |
| t <sub>D(on)</sub>                 | Turn - On Delay Time                  | V <sub>DD</sub> = -25 V, I <sub>D</sub> = -0.18 A, V <sub>GS</sub> = -10 V, R <sub>GEN</sub> = 25 Ω |      | 7     | 10    | nS    |
| t <sub>r</sub>                     | Turn - On Rise Time                   |   |      | 5     | 15    | nS    |
| t <sub>D(off)</sub>                | Turn - Off Delay Time                 |   |      | 13    | 15    | nS    |
| t <sub>f</sub>                     | Turn - Off Fall Time                  |   |      | 10    | 20    | nS    |
| Q <sub>g</sub>                     | Total Gate Charge                     | V <sub>DS</sub> = -48 V, I <sub>D</sub> = -0.5 A, V <sub>GS</sub> = -10 V                           |      | 1.43  |       | nC    |
| Q <sub>gs</sub>                    | Gate-Source Charge                    |   |      | 0.6   |       | nC    |
| Q <sub>gd</sub>                    | Gate-Drain Charge                     |   |      | 0.25  |       | nC    |
| DRAIN-SOURCE DIODE CHARACTERISTICS |                                       |   |      |       |       |       |
| I <sub>S</sub>                     | Maximum Continuous Source Current     |   |      |       | -0.18 | A     |
| I <sub>SM</sub>                    | Maximum Pulse Source Current (Note 1) |   |      |       | -1    | A     |
| V <sub>SD</sub>                    | Drain-Source Diode Forward Voltage    | V <sub>GS</sub> = 0 V, I <sub>S</sub> = -0.5 A (Note 1)   |      | -1.2  | -1.5  | V     |
|                                    |                                       | T <sub>J</sub> = 125°C  |      | -0.98 | -1.3  |       |
| t <sub>rr</sub>                    | Reverse Recovery Time                 | V <sub>GS</sub> = 0 V, I <sub>S</sub> = -0.5 A, dI <sub>F</sub> /dt = 100 A/μs                      |      | 40    |       | ns    |
| I <sub>rr</sub>                    | Reverse Recovery Current              |   |      | 2.8   |       | A     |

Note:

1. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

## Typical Electrical Characteristics

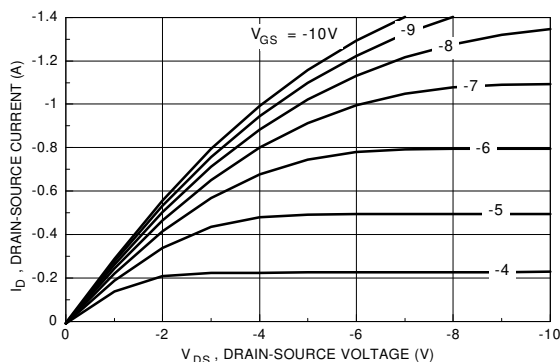


Figure 1. On-Region Characteristics

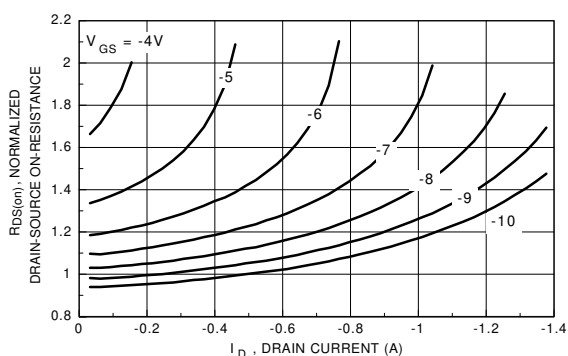


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

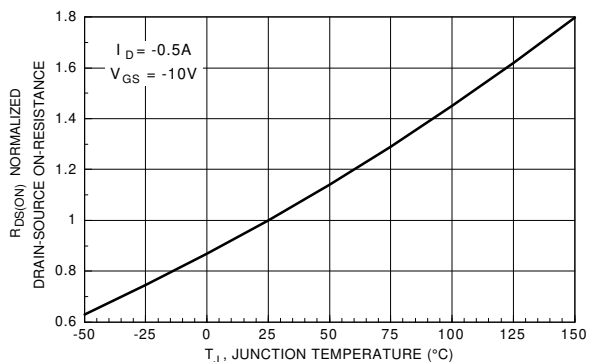


Figure 3. On-Resistance Variation with Temperature

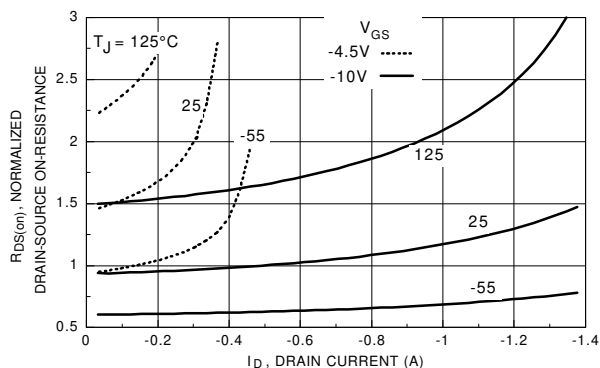


Figure 4. On-Resistance Variation with Drain Current and Temperature

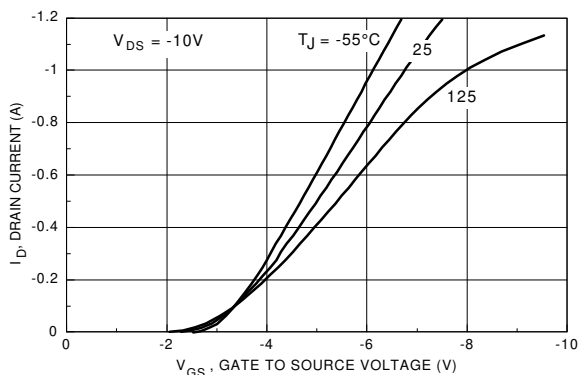


Figure 5. Transfer Characteristics

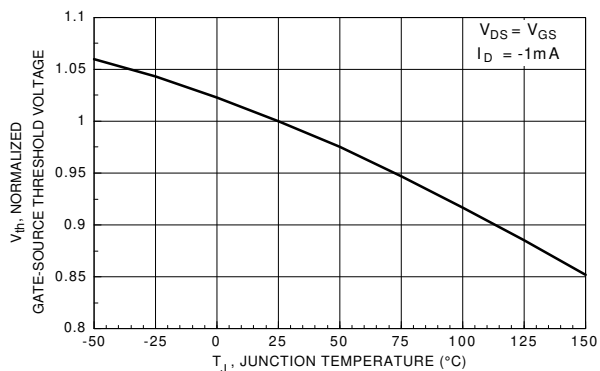
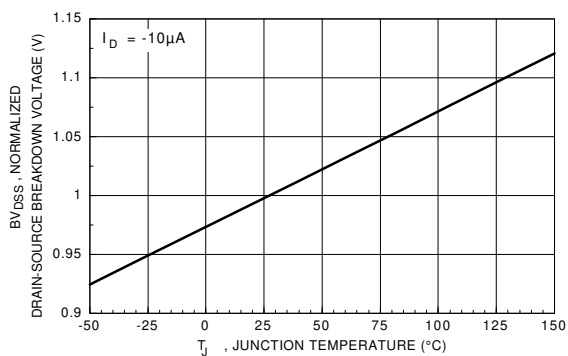
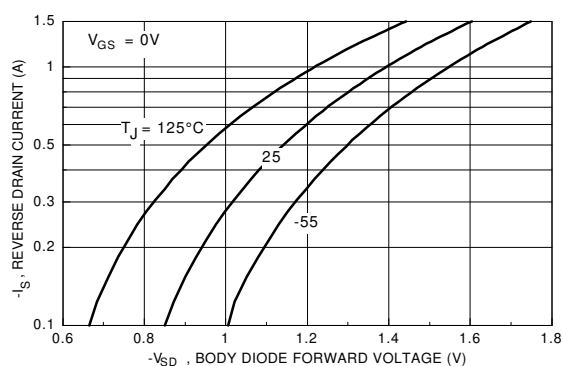


Figure 6. Gate Threshold Variation with Temperature

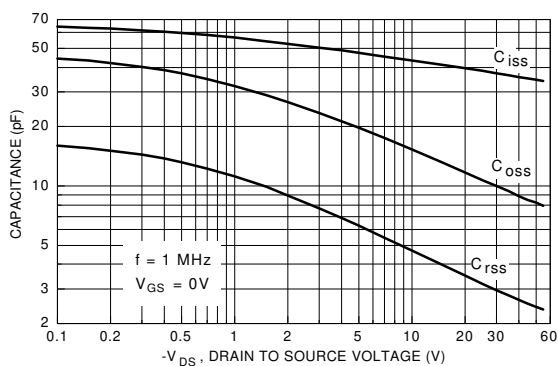
## Typical Electrical Characteristics (continued)



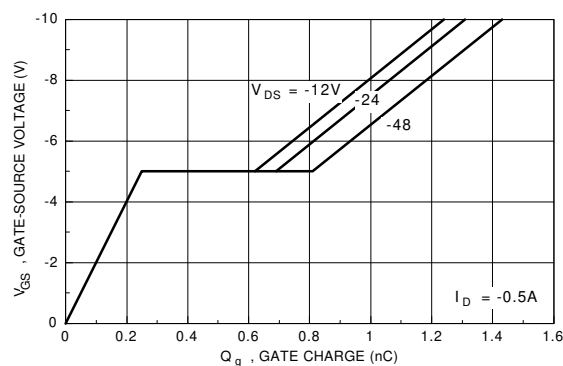
**Figure 7. Breakdown Voltage Variation with Temperature**



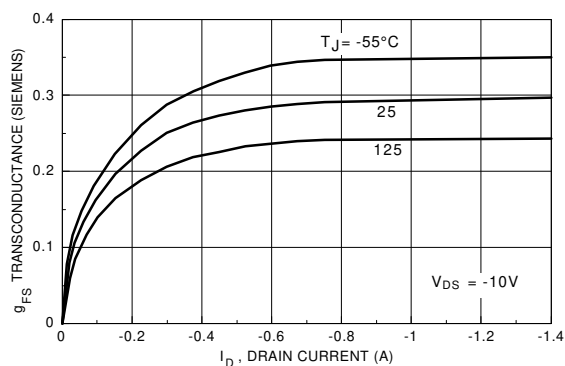
**Figure 8. Body Diode Forward Voltage Variation with Current and Temperature**



**Figure 9. Capacitance Characteristics**

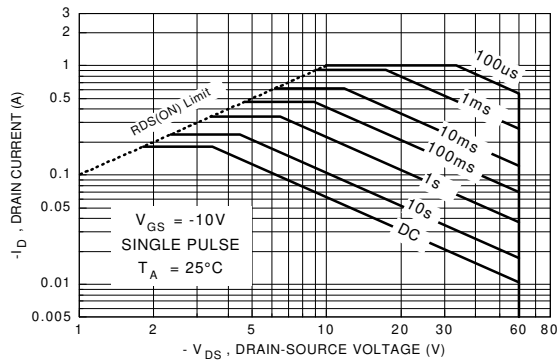


**Figure 10. Gate Charge Characteristics**

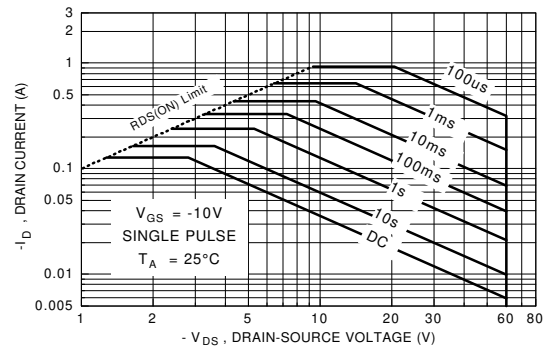


**Figure 11. Transconductance Variation with Drain Current and Temperature**

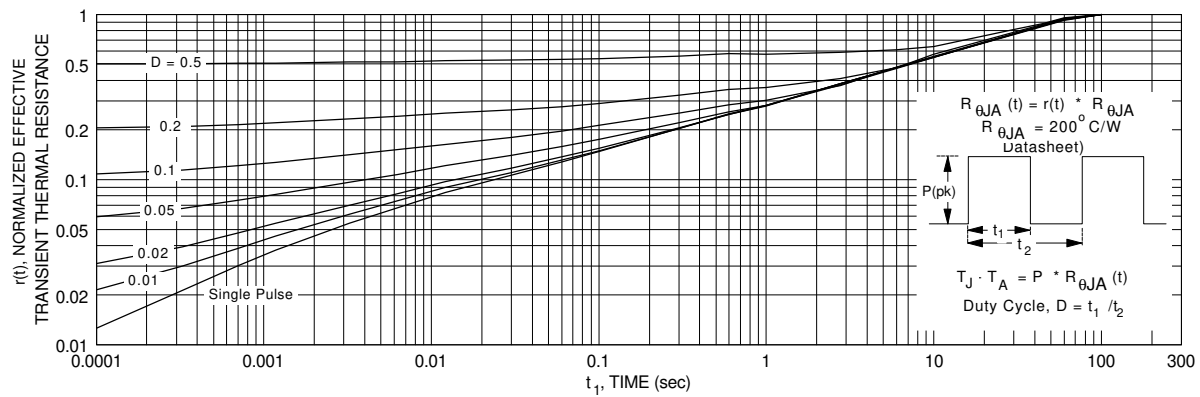
## Typical Electrical Characteristics (continued)



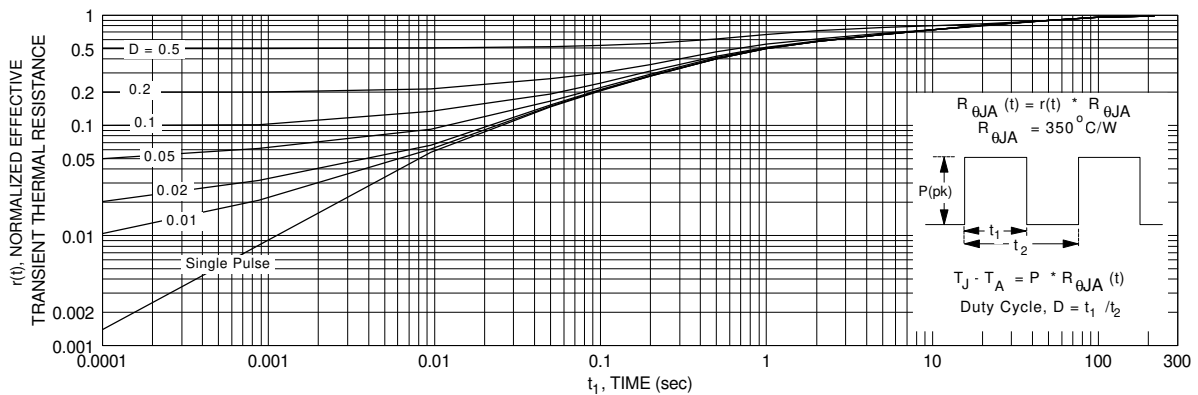
**Figure 12. NDF0610 (TO-92)  
Maximum Safe Operating Area**



**Figure 13. NDS0610 (SOT-23) Maximum Safe  
Operating Area**



**Figure 14. NDF0610 (TO-92) Transient Thermal  
Response Curve.**



**Figure 15. NDS0610 (SOT-23) Transient Thermal  
Response Curve.**