



June 1997

NDP6030PL / NDB6030PL

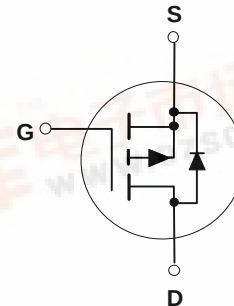
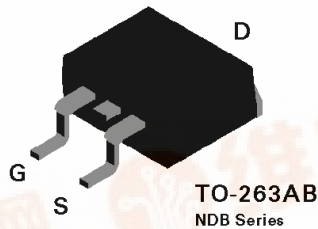
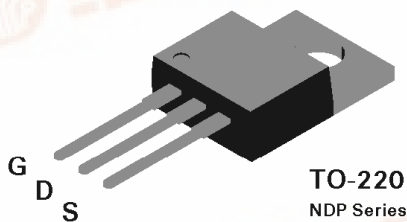
P-Channel Logic Level Enhancement Mode Field Effect Transistor

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_{DSS}	Drain-Source Voltage	-30		V
V_{GSS}	Gate-Source Voltage - Continuous	± 16		V
I_D	Drain Current - Continuous	-30		A
	- Pulsed	-90		
P_D	Total Power Dissipation @ $T_C = 25^\circ\text{C}$	75		W
	Derate above 25°C	0.5		
T_J, T_{STG}	Operating and Storage Temperature Range	-65 to 175		$^\circ\text{C}$
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	275		$^\circ\text{C}$
T_J, T_{STG}	Operating and Storage Temperature Range	-65 to 175		$^\circ\text{C}$

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_c = 25°C unless otherwise noted)

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

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

Typical Electrical Characteristics

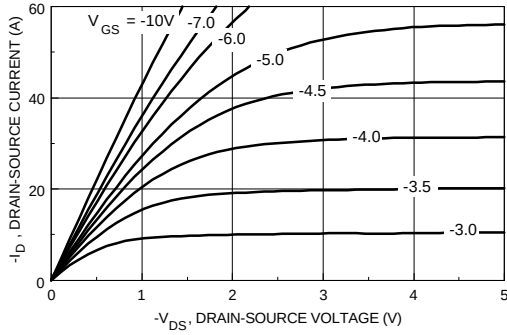


Figure 1. On-Region Characteristics.

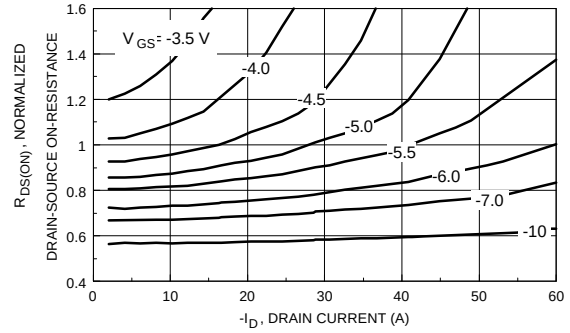


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

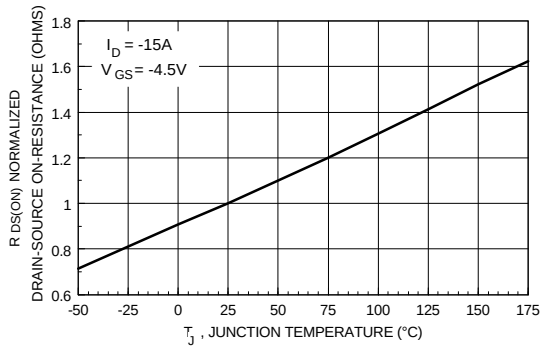


Figure 3. On-Resistance Variation with Temperature.

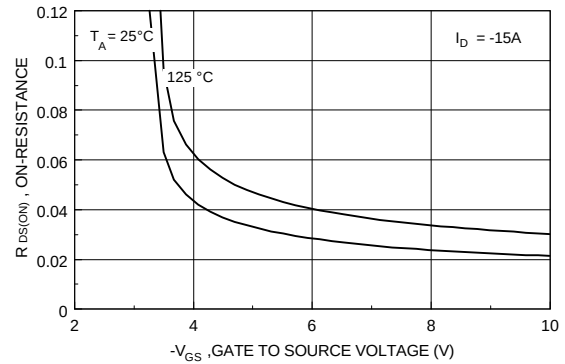


Figure 4. On Resistance Variation with Gate-To- Source Voltage.

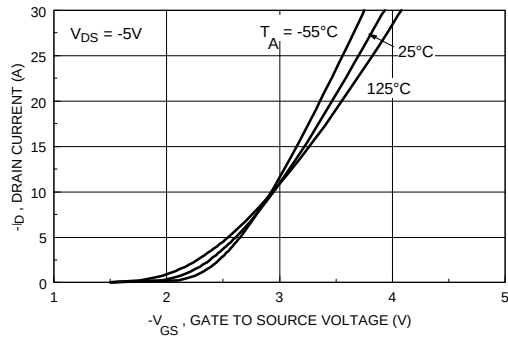


Figure 5. Transfer Characteristics.

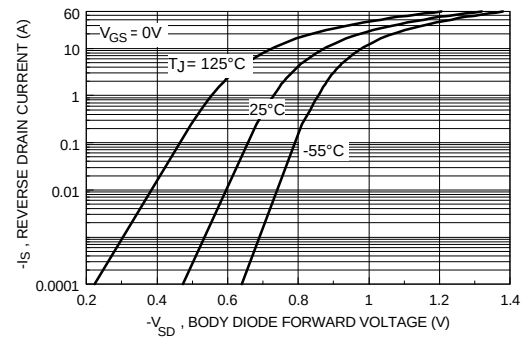


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics (continued)

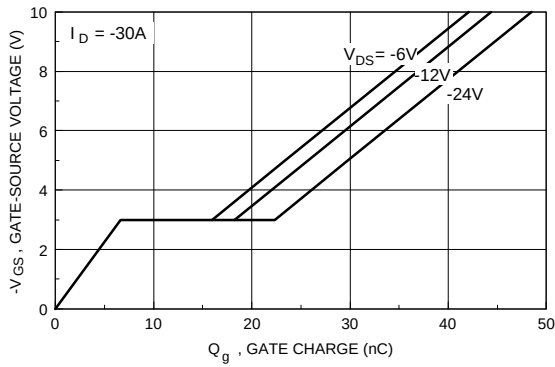


Figure 7. Gate Charge Characteristics.

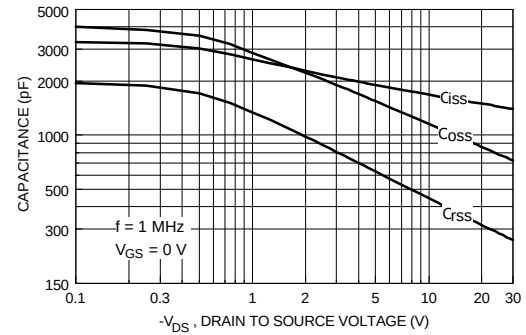


Figure 8. Capacitance Characteristics.

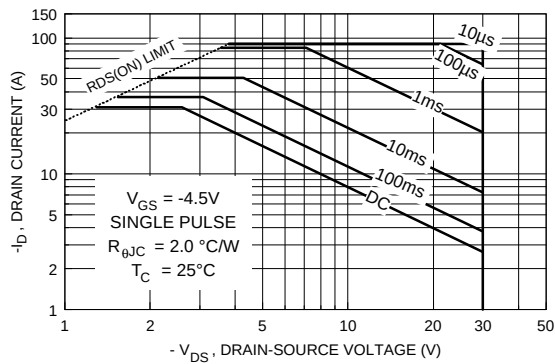


Figure 9. Maximum Safe Operating Area.

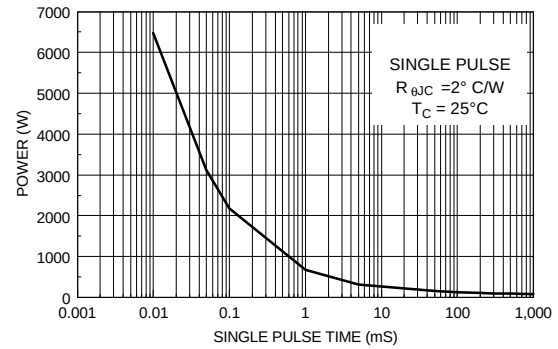


Figure 10. Single Pulse Maximum Power Dissipation.

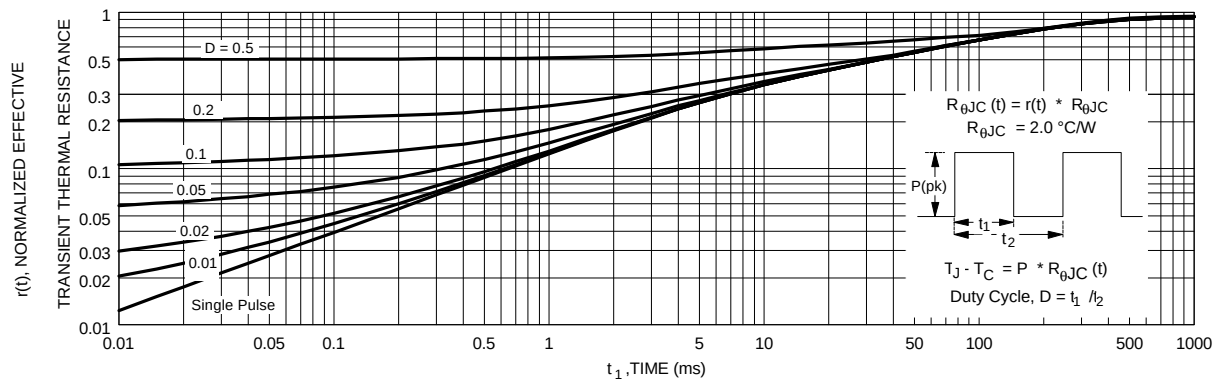


Figure 11. Transient Thermal Response Curve.