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Please note: As part of the Fairchild Semiconductor integration, some of the Fairchild orderable part numbers will need to change in order to meet ON Semiconductor's system requirements. Since the ON Semiconductor product management systems do not have the ability to manage part nomenclature that utilizes an underscore (_), the underscore (_) in the Fairchild part numbers will be changed to a dash (-). This document may contain device numbers with an underscore (_). Please check the ON Semiconductor website to verify the updated device numbers. The most current and up-to-date ordering information can be found at www.onsemi.com. Please email any questions regarding the system integration to Fairchild_questions@onsemi.com.

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June 1997

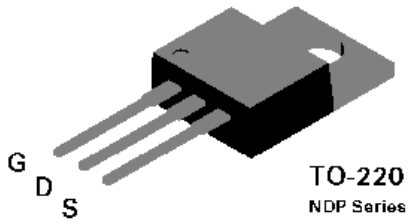
NDP6030PL / NDB6030PL
P-Channel Logic Level Enhancement Mode Field Effect Transistor

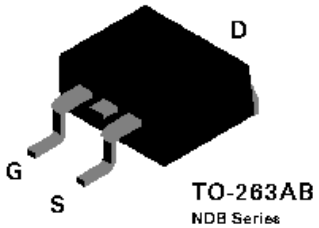
General Description

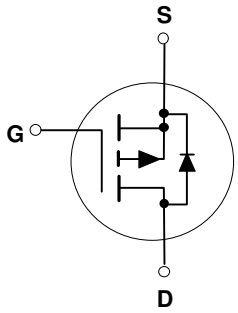
These P-Channel logic level enhancement mode power field effect transistors are produced using Fairchild's proprietary, high cell density, DMOS technology. This very high density process is especially tailored to minimize on-state resistance. These devices are particularly suited for low voltage applications 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 Ω @ V_{GS}= -4.5 V
  $R_{DS(ON)}$ = 0.025 Ω @ V_{GS}= -10 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°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°C	75		W
	Derate above 25°C	0.5		
T_J,T_{STG}	Operating and Storage Temperature Range	-65 to 175		°C
T_L	Maximum lead temperature for soldering purposes, 1/8" from case for 5 seconds	275		°C
T_J,T_{STG}	Operating and Storage Temperature Range	-65 to 175		°C
THERMAL CHARACTERISTICS				
$R_{\theta JC}$	Thermal Resistance, Junction-to-Case	2		°C/W
$R_{\theta JA}$	Thermal Resistance, Junction-to-Ambient	62.5		°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
$\Delta BV_{DSS}/\Delta T_J$	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			-250	µA
		T_J = 125°C			1	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)						
$\Delta V_{GS(th)}/\Delta T_J$	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	-1	-1.4	-2	V
		T_J = 125°C	-0.8	-1.08	-1.6	
$R_{DS(ON)}$	Static Drain-Source On-Resistance	V_{GS} = -4.5 V, I_D = -15 A		0.037	0.042	Ω
		T_J = 125°C		0.053	0.075	
		V_{GS} = -10 V, I_D = -19 A		0.021	0.025	
$I_{D(on)}$	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

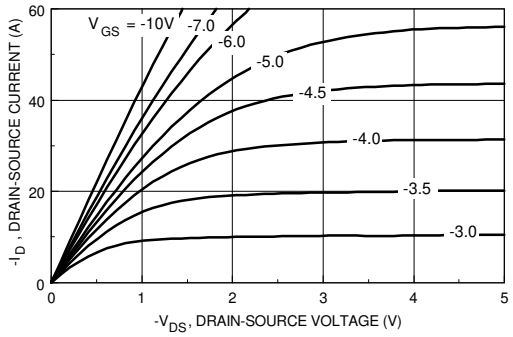


Figure 1. On-Region Characteristics.

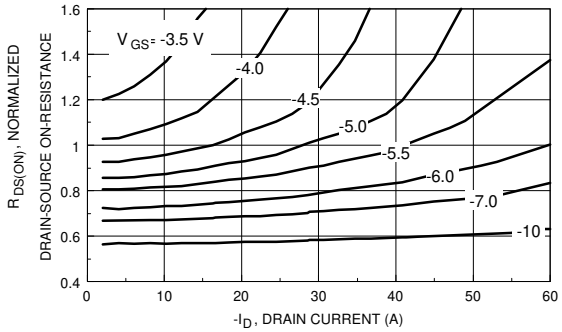


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

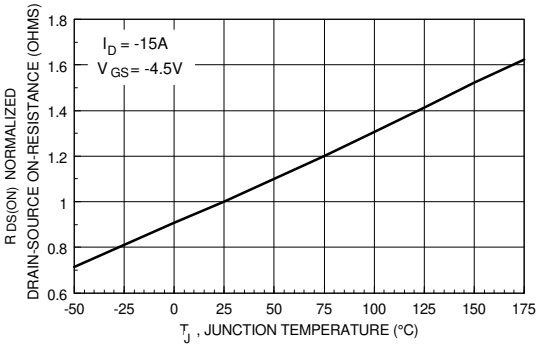


Figure 3. On-Resistance Variation with Temperature.

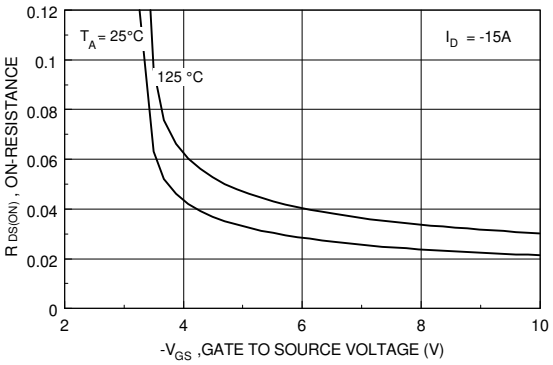


Figure 4. On Resistance Variation with Gate-To- Source Voltage.

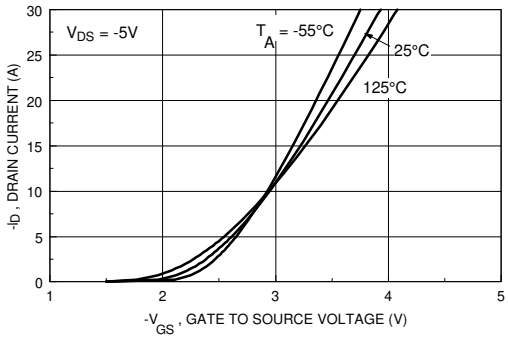


Figure 5. Transfer Characteristics.

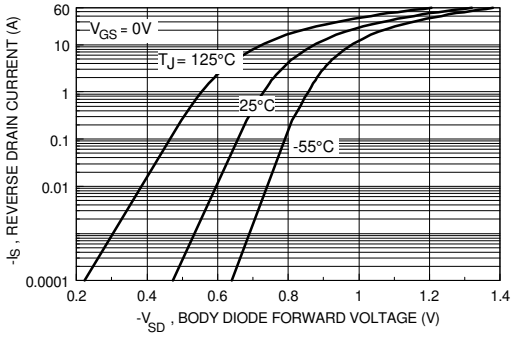


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

Typical Electrical Characteristics (continued)

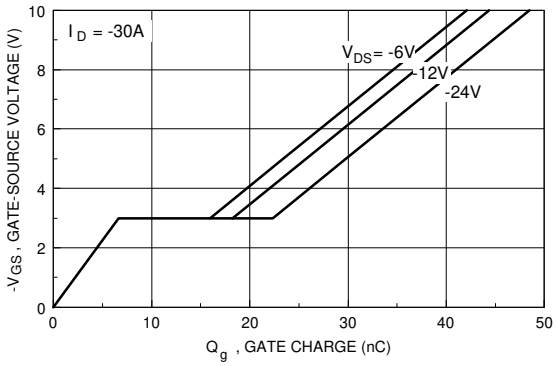


Figure 7. Gate Charge Characteristics.

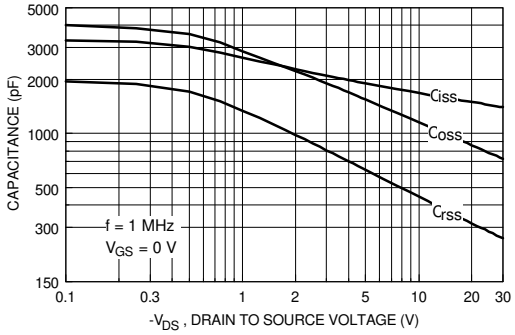


Figure 8.Capacitance Characteristics.

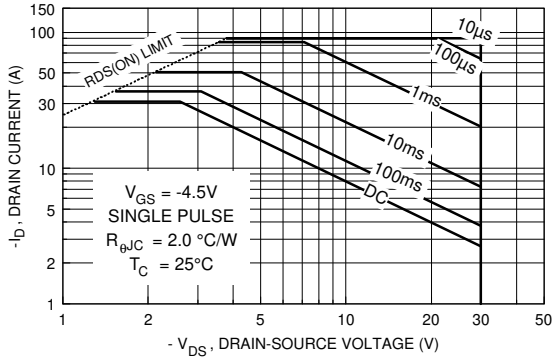


Figure 9. Maximum Safe Operating Area.

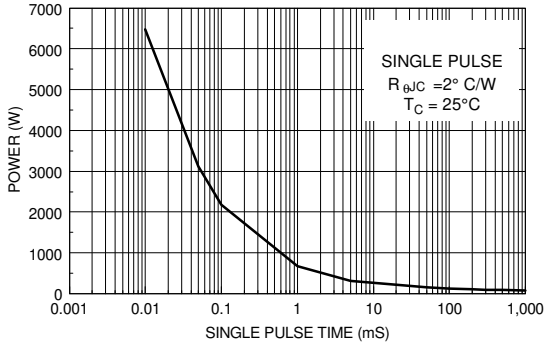


Figure 10. Single Pulse Maximum Power Dissipation.

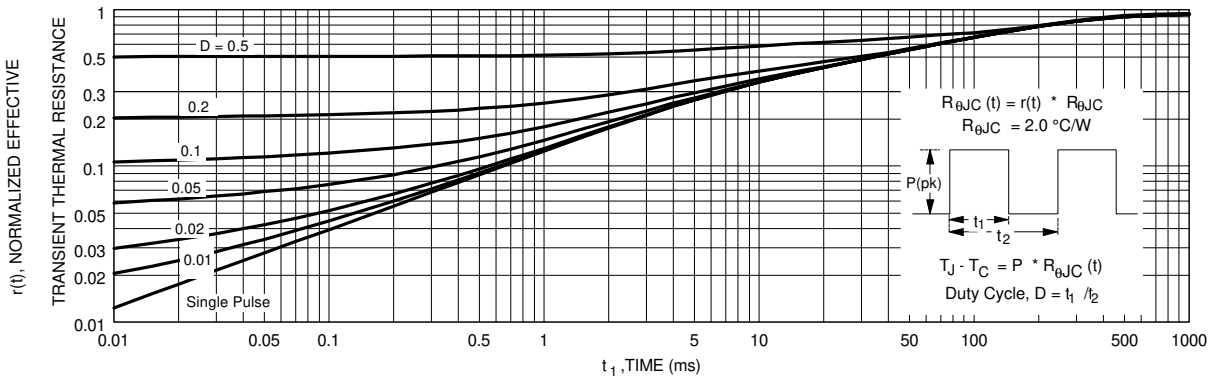


Figure 11. Transient Thermal Response Curve.

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