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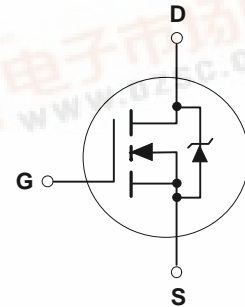
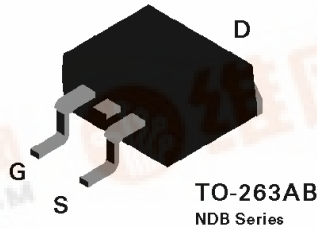
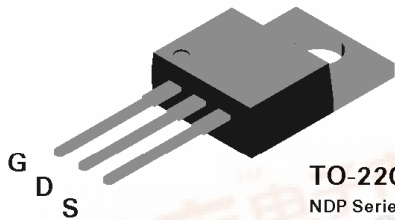
## NDP6030 / NDB6030 N-Channel Enhancement Mode Field Effect Transistor

### General Description

These N-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 especially tailored to minimize on-state resistance and provide superior switching performance. These devices are particularly suited for low voltage applications such as DC/DC converters and other battery powered circuits where fast switching, low in-line power loss, and resistance to transients are needed.

### Features

- 46 A, 30 V.  $R_{DS(ON)} = 0.018 @ V_{GS}=10 \text{ V}$ .
- Critical DC electrical parameters specified at elevated temperature.
- Rugged internal source-drain diode can eliminate the need for an external Zener diode transient suppressor.
- 175°C maximum junction temperature rating.
- High density cell design for extremely low  $R_{DS(ON)}$ .
- TO-220 and TO-263 (D<sup>2</sup>PAK) package for both through hole and surface mount applications

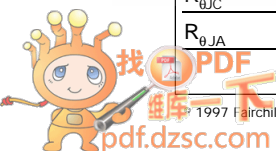


### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted

Symbol	Parameter	NDP6030	NDB6030	Units
$V_{DSS}$	Drain-Source Voltage	30		V
$V_{DGR}$	Drain-Gate Voltage ( $R_{GS} \leq 1 \text{ M}\Omega$ )	30		V
$V_{GSS}$	Gate-Source Voltage - Continuous	$\pm 20$		V
$I_D$	Drain Current	- Continuous	46	A
		- Pulsed	135	
$P_D$	Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	75		W
		0.5		W/ $^\circ\text{C}$
$T_J, T_{STG}$	Operating and Storage Temperature Range	-65 to 175		$^\circ\text{C}$

### THERMAL CHARACTERISTICS

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



**Electrical Characteristics** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Symbol	Parameter	Conditions	Min	Typ	Max	Units
<b>DRAIN-SOURCE AVALANCHE RATINGS</b> (Note)						
$W_{DSS}$	Single Pulse Drain-Source Avalanche Energy	$V_{DD} = 15\text{ V}$ , $I_D = 46\text{ A}$			100	mJ
$I_{AR}$	Maximum Drain-Source Avalanche Current				46	A
<b>OFF CHARACTERISTICS</b>						
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}$ , $I_D = 250\text{ }\mu\text{A}$	30			V
$\Delta BV_{DSS}/\Delta T_J$	Breakdown Voltage Temp. Coefficient	$I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$		30		mV/ $^\circ\text{C}$
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 24\text{ V}$ , $V_{GS} = 0\text{ V}$			10	$\mu\text{A}$
				$T_J = 125^\circ\text{C}$	1	mA
$I_{GSSF}$	Gate - Body Leakage, Forward	$V_{GS} = 20\text{ V}$ , $V_{DS} = 0\text{ V}$			100	nA
$I_{GSSR}$	Gate - Body Leakage, Reverse	$V_{GS} = -20\text{ V}$ , $V_{DS} = 0\text{ V}$			-100	nA
<b>ON CHARACTERISTICS</b> (Note)						
$\Delta V_{GS(th)}/\Delta T_J$	Gate Threshold Voltage Temp. Coefficient	$I_D = 250\text{ }\mu\text{A}$ , Referenced to $25^\circ\text{C}$		-6		mV/ $^\circ\text{C}$
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}$ , $I_D = 250\text{ }\mu\text{A}$	2	2.3	4	V
			$T_J = 125^\circ\text{C}$	1.4	1.7	2.8
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}$ , $I_D = 23\text{ A}$		0.014	0.018	$\Omega$
			$T_J = 125^\circ\text{C}$		0.019	0.032
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}$ , $V_{DS} = 10\text{ V}$	60			A
$g_{FS}$	Forward Transconductance	$V_{DS} = 10\text{ V}$ , $I_D = 23\text{ A}$		22		S
<b>DYNAMIC CHARACTERISTICS</b>						
$C_{iss}$	Input Capacitance	$V_{DS} = 15\text{ V}$ , $V_{GS} = 0\text{ V}$ , $f = 1.0\text{ MHz}$		1165		pF
$C_{oss}$	Output Capacitance			915		pF
$C_{rss}$	Reverse Transfer Capacitance			385		pF
<b>SWITCHING CHARACTERISTICS</b> (Note)						
$t_{D(on)}$	Turn - On Delay Time	$V_{DD} = 30\text{ V}$ , $I_D = 46\text{ A}$ , $V_{GS} = 10\text{ V}$ , $R_{GEN} = 11\text{ }\Omega$		9	18	nS
$t_r$	Turn - On Rise Time			103	200	nS
$t_{D(off)}$	Turn - Off Delay Time			40	80	nS
$t_f$	Turn - Off Fall Time			98	200	nS
$Q_g$	Total Gate Charge	$V_{DS} = 15\text{ V}$ , $I_D = 46\text{ A}$ , $V_{GS} = 10\text{ V}$		34	47	nC
$Q_{gs}$	Gate-Source Charge			7		nC
$Q_{gd}$	Gate-Drain Charge			13		nC
<b>DRAIN-SOURCE DIODE CHARACTERISTICS</b>						
$I_S$	Maximum Continuous Drain-Source Diode Forward Current				46	A
$I_{SM}$	Maximum Pulsed Drain-Source Diode Forward Current				135	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0\text{ V}$ , $I_S = 23\text{ A}$ (Note)		0.9	1.3	V

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

## Typical Electrical Characteristics

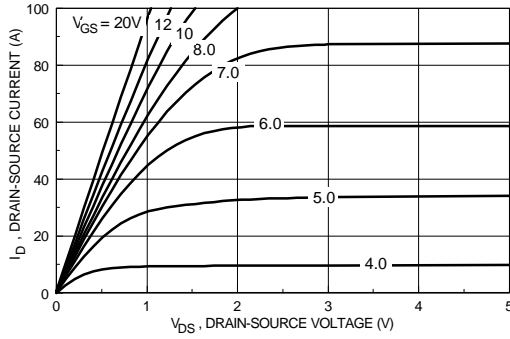


Figure 1. On-Region Characteristics.

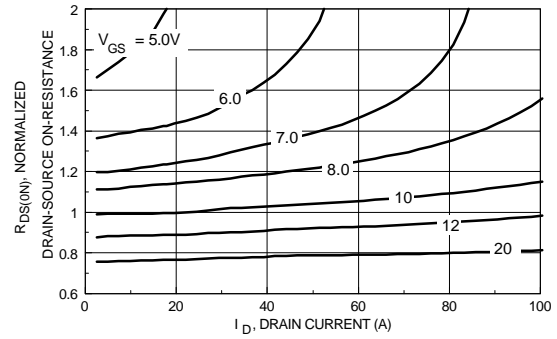


Figure 2. On-Resistance Variation with Drain Current and Gate Voltage.

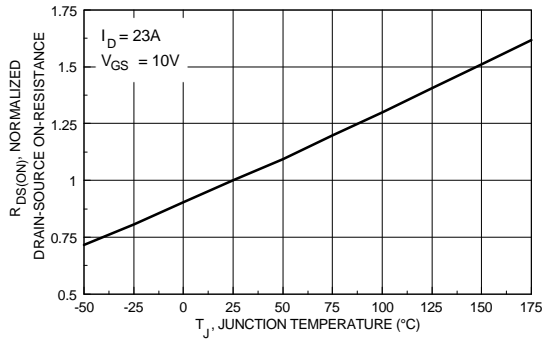


Figure 3. On-Resistance Variation with Temperature.

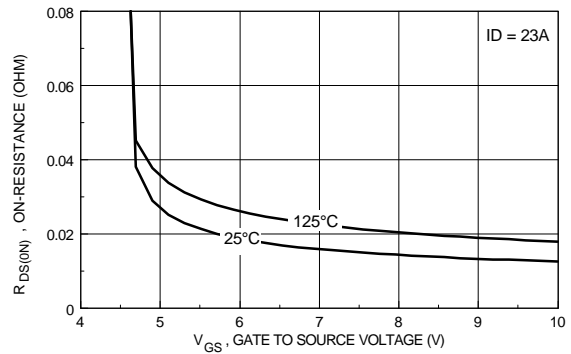


Figure 4. On Resistance Variation with Gate-To-Source Voltage.

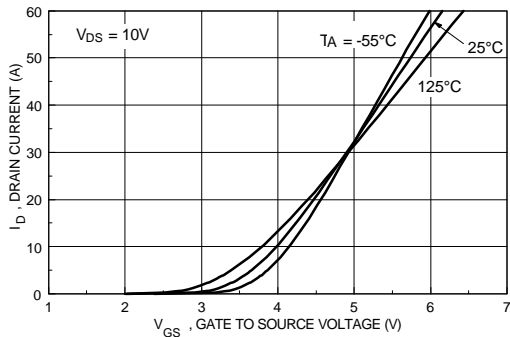


Figure 5. Transfer Characteristics.

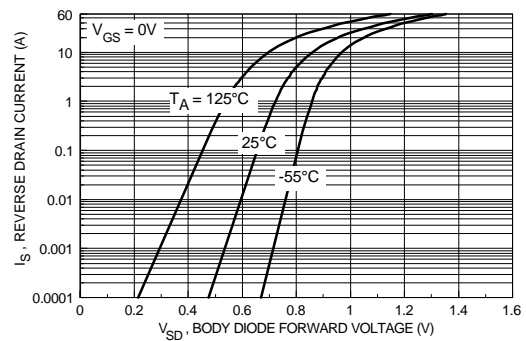


Figure 6. Body Diode Forward Voltage Variation with Source Current and Temperature.

### Typical Electrical Characteristics (continued)

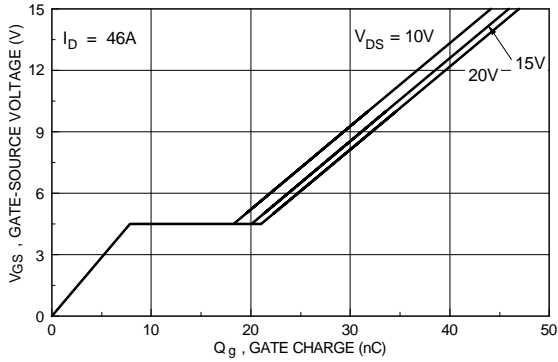


Figure 7. Gate Charge Characteristics.

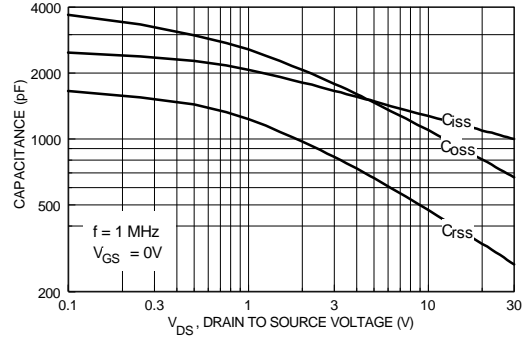


Figure 8. Capacitance Characteristics.

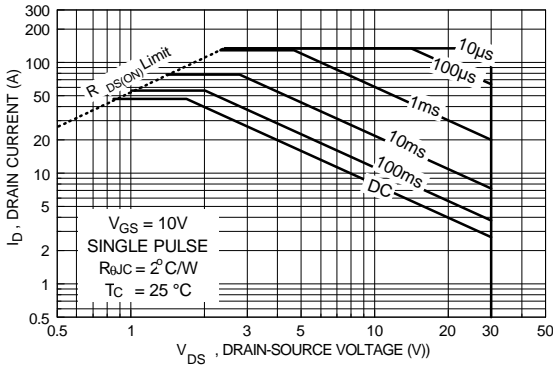


Figure 9. Maximum Safe Operating Area.

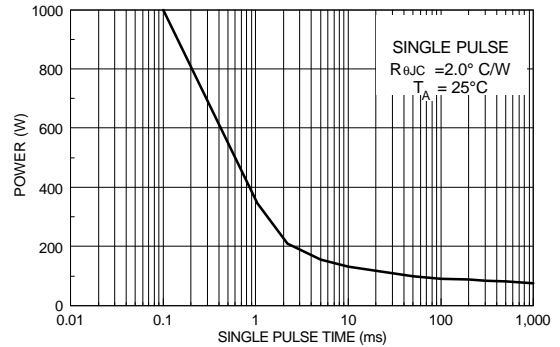


Figure 10. Single Pulse Maximum Power Dissipation.

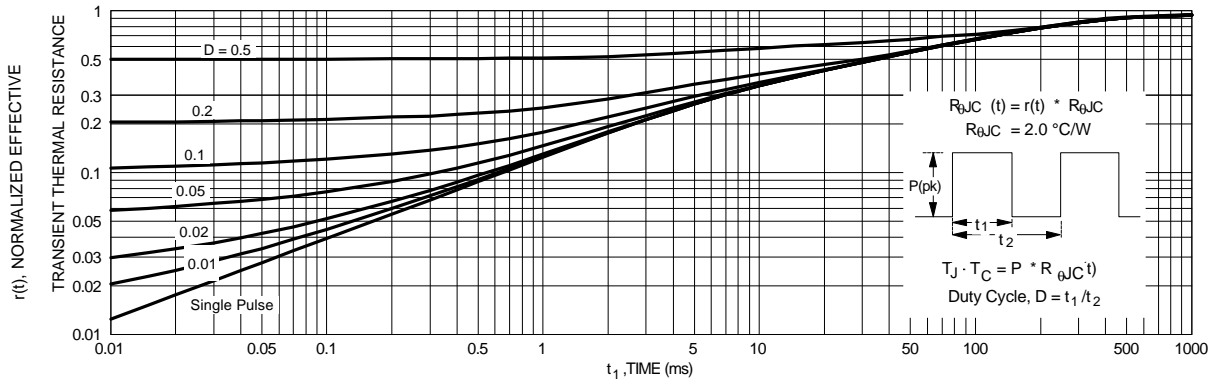


Figure 11. Transient Thermal Response Curve.