



# MPC05N50/NPC830

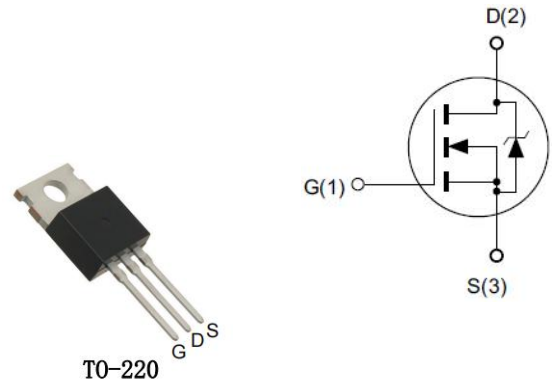
## N-Channel Power MOSFET

### Features

- ◆ 500V, 5A,  $R_{DS(ON)}(Typ.) = 1.35\Omega @ V_{GS} = 10V$ .
- ◆ Low  $C_{rss}$
- ◆ Fast Switching
- ◆ 100% Avalanche Tested

### Application

- ◆ Charger
- ◆ Standby Power



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

Symbol	Parameter	Limit	Unit
		TO-220	
$V_{DS}$	Drain-Source Voltage <sup>a</sup>	500	V
$V_{GS}$	Gate-Source Voltage	$\pm 30$	V
$I_D$	Drain Current-Continuous, $T_C = 25^\circ\text{C}$	5	A
	Drain Current-Continuous, $T_C = 100^\circ\text{C}$	3.1	A
$I_{DM}$	Drain Current-Pulsed <sup>b</sup>	20	A
$P_D$	Maximum Power Dissipation @ $T_J = 25^\circ\text{C}$	75	W
$E_{AS}$	Single Pulsed Avalanche Energy <sup>d</sup>	180	mJ
dv/dt	Peak Diode Recovery dv/dt <sup>e</sup>	5.0	V/ns
$T_J, T_{STG}$	Operating and Store Temperature Range	-55 to 150	$^\circ\text{C}$

### Thermal Characteristics

Symbol	Parameter	Value	Unit
$R_{\theta JC}$	Thermal Resistance, Junction-Case Max.	1.67	$^\circ\text{C/W}$
$R_{\theta JA}$	Thermal Resistance Junction-Ambient Max.	62.5	$^\circ\text{C/W}$

### Electrical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted.

#### Off Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$BV_{DSS}$	Drain-Source Breakdown Voltage	$V_{GS} = 0V, I_D = 250\mu\text{A}$	500	-	-	V
$I_{DSS}$	Zero Gate Voltage Drain Current	$V_{DS} = 500V, V_{GS} = 0V$	-	-	1	$\mu\text{A}$
$I_{GSS}$	Forward Gate Body Leakage Current	$V_{DS} = 0V, V_{GS} = \pm 30V$	-	-	$\pm 100$	nA



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### ■ On Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\mu A$	2	-	4	V
$R_{DS(on)}$	Static Drain-Source On-Resistance <sup>c</sup>	$V_{GS} = 10V, I_D = 2.5A$	-	1.35	1.55	$\Omega$

### ■ Dynamic Characteristics

Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$g_{fs}$	Forward Transconductance	$V_{DS}=15V, I_D = 2.5A$	-	4	-	S
$C_{iss}$	Input Capacitance	$V_{DS} = 25V,$ $V_{GS} = 0V,$ $f = 1.0MHz$	-	580	-	pF
$C_{oss}$	Output Capacitance		-	60	-	pF
$C_{rss}$	Reverse Transfer Capacitance		-	4	-	pF

### ■ On Characteristics

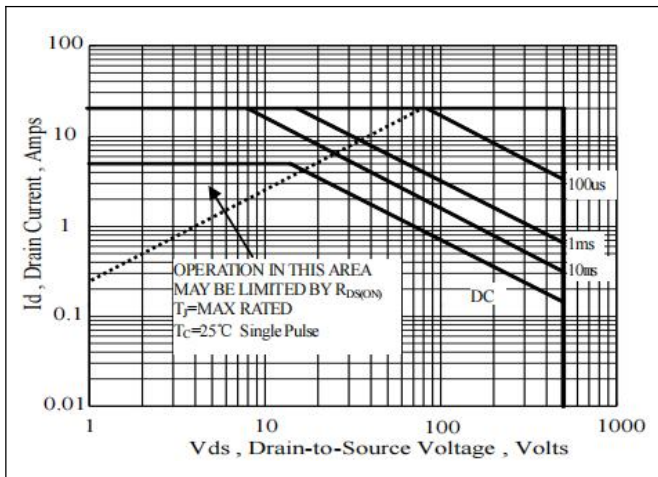
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 250V, I_D = 5A,$ $R_G = 10\Omega, V_{GS} = 10V$	-	14	-	ns
$t_r$	Turn-On Rise Time		-	18	-	ns
$t_{d(off)}$	Turn-Off Delay Time		-	31	-	ns
$t_f$	Turn-Off Fall Time		-	11	-	ns
$Q_g$	Total Gate Charge	$V_{DS} = 400V, I_D = 5A,$ $V_{GS} = 10V$	-	12.4	-	nC
$Q_{gs}$	Gate-Source Charge		-	3.1	-	nC
$Q_{gd}$	Gate-Drain Charge		-	4.8	-	nC

### ■ Drain-Source Diode Characteristics

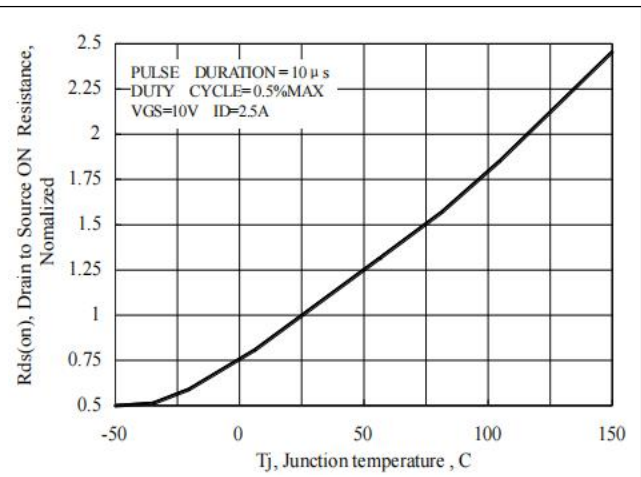
Symbol	Parameter	Test Condition	Min.	Typ.	Max.	Unit
$I_S$	Drain-Source Diode Forward Continuous Current	$V_{GS} = 0V$	-	-	5	A
$I_{SM}$	Maximum Pulsed Current	$V_{GS} = 0V$	-	-	20	A
$V_{SD}$	Drain-Source Diode Forward Voltage	$V_{GS} = 0V, I_S = 5A$	-	-	1.4	V
$T_{rr}$	Body Diode Reverse Recovery Time	$di/dt=100A/us$ $I_F=5A, V_{GS}=0V$	-	260	-	ns
$Q_{rr}$	Reverse Recovery Charge		-	2.0	-	$\mu C$

Notes:

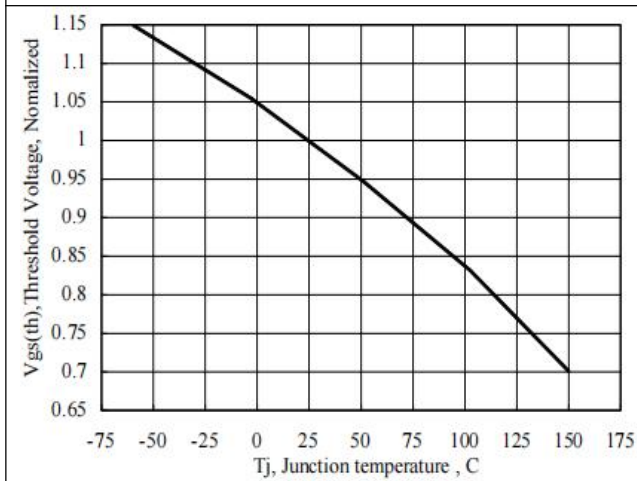
- $T_J = +25^\circ C$  to  $+150^\circ C$
- Repetitive rating; pulse width limited by maximum junction temperature.
- Pulse width  $\leq 300\mu s$ ; duty cycle  $\leq 2\%$ .
- $L=10mH, V_{DD}=50V, I_D=6.0A, \text{Start } T_J=25^\circ C.$



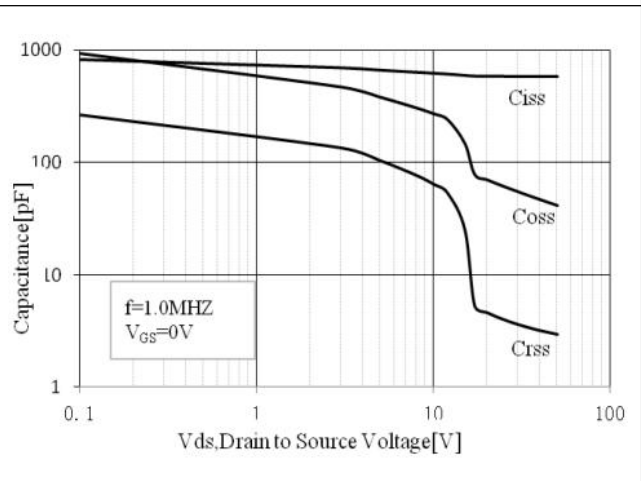
**Figure 1. Maximum Safe Operating Area**



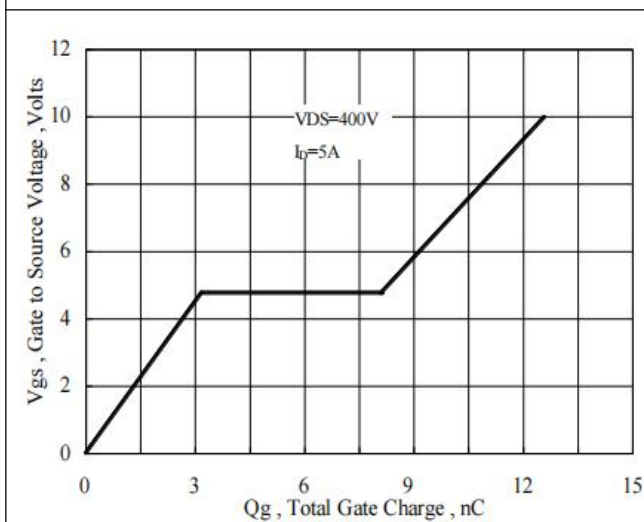
**Figure 2. Normalized On-Resistance Variation with Temperature**



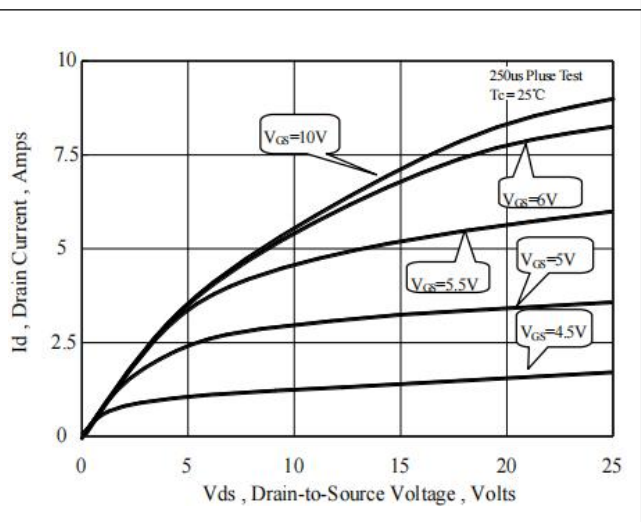
**Figure 3. Typical Threshold Voltage vs Junction Temperature**



**Figure 4. Capacitance Characteristics**



**Figure 5. Gate Charge Characteristics**



**Figure 6. On-State Characteristics**

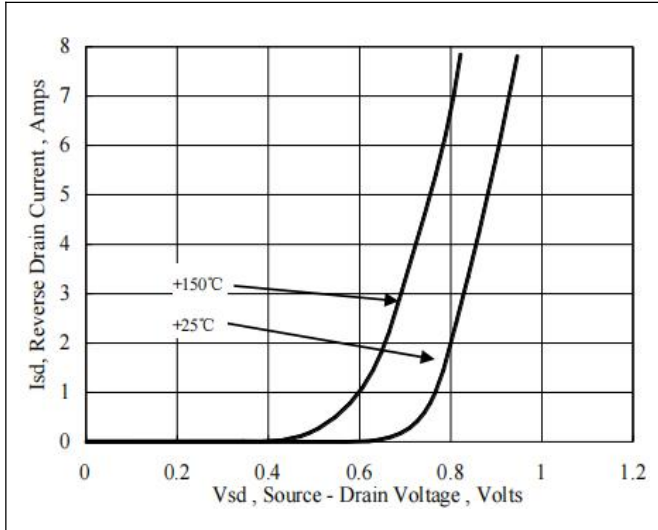


Figure 7. Typical Body Diode Transfer Characteristics

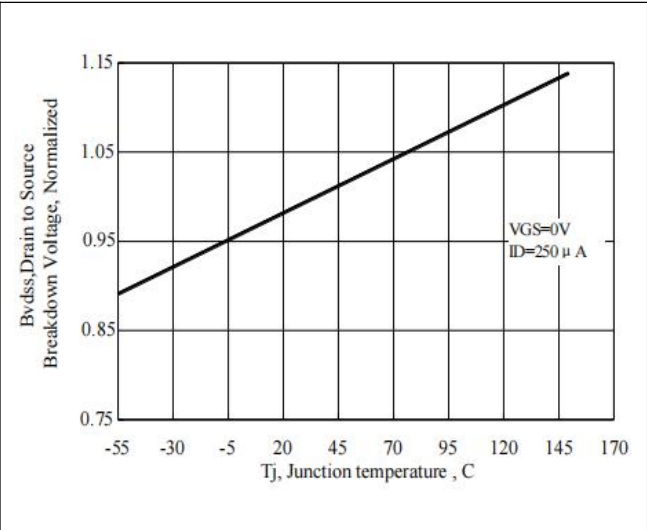


Figure 8. Typical Breakdown Voltage vs Junction Temperature

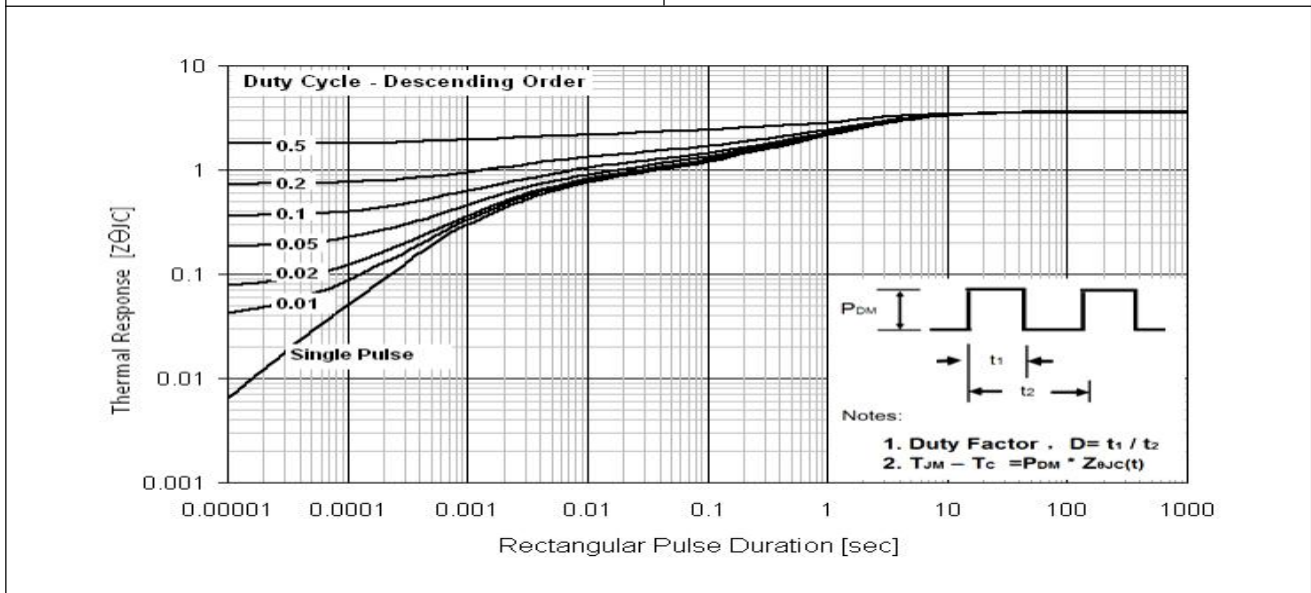


Figure 9. Normalized Effective Transient Thermal Impedance With Pulse Duration

### Package Information

