

NTP6N50

Preferred Devices

Product Preview

Power MOSFET 6 Amps, 500 Volts N-Channel TO-220

Designed for high voltage, high speed switching applications in power supplies, converters, power motor controls and bridge circuits.

Features

- Higher Current Rating
- Lower $R_{DS(on)}$
- Lower Capacitances
- Lower Total Gate Charge
- Tighter V_{SD} Specifications
- Avalanche Energy Specified

Typical Applications

- Switch Mode Power Supplies
- PWM Motor Controls
- Converters
- Bridge Circuits

MAXIMUM RATINGS ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	500	Vdc
Drain-Gate Voltage ($R_{GS} = 1.0\text{ M}\Omega$)	V_{DGR}	500	Vdc
Gate-Source Voltage <ul style="list-style-type: none">– Continuous– Non-Repetitive ($t_p \leq 10\text{ ms}$)	V_{GS} V_{GS}	± 20 ± 40	Vdc
Drain-Continuous @ $T_A 25^\circ\text{C}$ <ul style="list-style-type: none">– Continuous @ $T_A 100^\circ\text{C}$– Single Pulse ($t_p \leq 10\text{ }\mu\text{s}$)	I_D I_D I_{DM}	6 5.4 21	Adc Adc Apk
Total Power Dissipation @ $T_A 25^\circ\text{C}$ Derate above 25°C Total Power Dissipation @ $T_A 25^\circ\text{C}$ (Note NO TAG)	P_D	96 0.77 1.75	Watts W/ $^\circ\text{C}$ Watts
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to $+150$	$^\circ\text{C}$
Single Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 100\text{ V}$, $V_{GS} = 10\text{ Vdc}$, $I_L(pk) = 6\text{ A}$, $L = 10\text{ mH}$, $V_{DS} = 500\text{ Vdc}$, $R_G = 25\text{ }\Omega$)	E_{AS}	125	mJ
Thermal Resistance <ul style="list-style-type: none">– Junction-to-Case– Junction-to-Ambient	$R_{\theta JC}$ $R_{\theta JA}$	1.3 62.5	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^\circ\text{C}$

1. Repetitive rating; pulse width limited by maximum junction temperature.

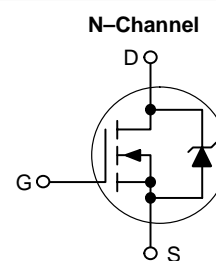
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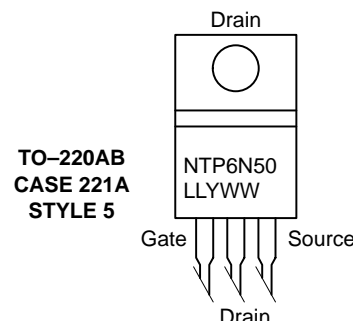
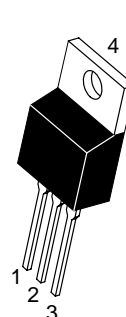
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6 AMPERES
500 VOLTS
 $R_{DS(on)} = 1700\text{ m}\Omega$



MARKING DIAGRAMS AND PIN ASSIGNMENTS



NTP6N50 = Device Code
LL = Location Code
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NTP6N50	TO-220AB	50 Units/Rail

Preferred devices are recommended choices for future use and best overall value.

NTP6N50

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 2.) ($V_{GS} = 0\text{ Vdc}$, $I_D = 250\text{ }\mu\text{Adc}$) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	500 –	– 590	– –	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Drain Current ($V_{DS} = 500\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) ($V_{DS} = 500\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	I_{DSS}	– –	– –	10 100	μAdc
Gate-Body Leakage Current ($V_{GS} = \pm 20\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	–	–	± 100	nAdc

ON CHARACTERISTICS (Note 2.)

Gate Threshold Voltage ($V_{DS} = V_{GS}$, $I_D = 250\text{ }\mu\text{Adc}$) Temperature Coefficient (Negative)	$V_{GS(th)}$	2.0 –	2.7 6.4	4.0 –	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance ($V_{GS} = 10\text{ Vdc}$, $I_D = 3\text{ Adc}$)	$R_{DS(on)}$	–	1300	1700	mOhm
Static Drain-to-Source On-Resistance ($V_{GS} = 10\text{ Vdc}$, $I_D = 6\text{ Adc}$) ($V_{GS} = 10\text{ Vdc}$, $I_D = 3\text{ Adc}$, $T_J = 125^\circ\text{C}$)	$V_{DS(on)}$	– –	– –	12.2 11.0	V
Forward Transconductance ($V_{DS} = 15\text{ Vdc}$, $I_D = 3\text{ Adc}$)	g_{FS}	2.0	4.0	–	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 25\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{iss}	–	520	730	pF
Output Capacitance		C_{oss}	–	170	240	
Transfer Capacitance		C_{rss}	–	11	20	

SWITCHING CHARACTERISTICS (Note 3.)

Turn-On Delay Time	$(V_{DD} = 250\text{ Vdc}$, $I_D = 6\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$, $R_G = 9.1\text{ }\Omega$)	$t_{d(on)}$	–	7.0	10	ns
Rise Time		t_r	–	9.0	20	
Turn-Off Delay Time		$t_{d(off)}$	–	20	40	
Fall Time		t_f	–	10	20	
Gate Charge	$(V_{DS} = 400\text{ Vdc}$, $I_D = 6\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$)	Q_T	–	10	20	nC
		Q_1	–	2.0	–	
		Q_2	–	3.0	–	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage (Note 2.)	$(I_S = 6\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) $(I_S = 6\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	V_{SD}	– –	0.9 0.8	1.0 –	Vdc
Reverse Recovery Time	$(I_S = 6\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $di_S/dt = 100\text{ A}/\mu\text{s}$)	t_{rr}	–	415	–	ns
		t_a	–	100	–	
		t_b	–	315	–	
Reverse Recovery Stored Charge		Q_{RR}	–	1.8	–	μC

2. Pulse Test: Pulse Width $\leq 300\text{ }\mu\text{s}$, Duty Cycle $\leq 2\%$.
3. Switching characteristics are independent of operating junction temperature.

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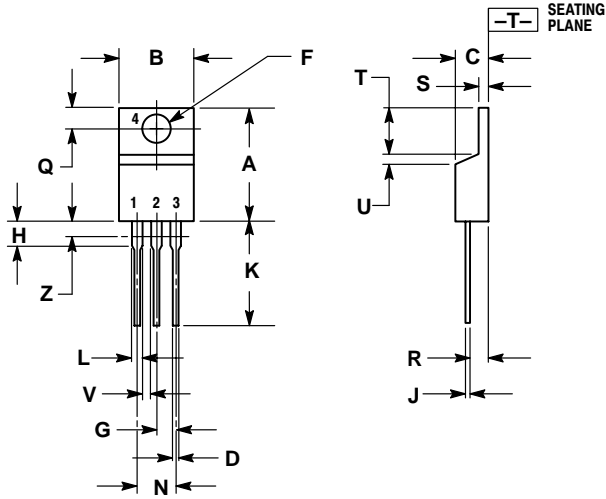
PACKAGE DIMENSIONS

TO-220 THREE-LEAD

TO-220AB

CASE 221A-09

ISSUE AA



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.570	0.620	14.48	15.75
B	0.380	0.405	9.66	10.28
C	0.160	0.190	4.07	4.82
D	0.025	0.035	0.64	0.88
F	0.142	0.147	3.61	3.73
G	0.095	0.105	2.42	2.66
H	0.110	0.155	2.80	3.93
J	0.018	0.025	0.46	0.64
K	0.500	0.562	12.70	14.27
L	0.045	0.060	1.15	1.52
N	0.190	0.210	4.83	5.33
Q	0.100	0.120	2.54	3.04
R	0.080	0.110	2.04	2.79
S	0.045	0.055	1.15	1.39
T	0.235	0.255	5.97	6.47
U	0.000	0.050	0.00	1.27
V	0.045	---	1.15	---
Z	---	0.080	---	2.04

STYLE 5:

- PIN 1. GATE
2. DRAIN
3. SOURCE
4. DRAIN

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