

NTP12N50, NTB12N50

Preferred Device

Advance Information

Power MOSFET

12 Amps, 500 Volts

N-Channel TO-220 and D2PAK

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	V_{GS}	± 20	Vdc
– Continuous	V_{GSM}	± 40	
– Non-Repetitive ($t_p \leq 10\text{ ms}$)			
Drain	I_D	12	Adc
– Continuous	I_D	10	
– Continuous @ 100°C	I_{DM}	42	
– Single Pulse ($t_p \leq 10\text{ }\mu\text{s}$)			
Total Power Dissipation	P_D	202	Watts
Derate above 25°C		1.61	$\text{W}/^\circ\text{C}$
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Single Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 100\text{ V}$, $V_{GS} = 10\text{ Vdc}$, $I_L = 12\text{ A}$, $L = 10\text{ mH}$, $R_G = 25\text{ }\Omega$)	E_{AS}	720	mJ
Thermal Resistance	$R_{\theta JC}$	0.62	$^\circ\text{C}/\text{W}$
– Junction-to-Case	$R_{\theta JA}$	62.5	
– Junction-to-Ambient	$R_{\theta JA}$	50	
– Junction-to-Ambient (Note 1.)			
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^\circ\text{C}$

1. When surface mounted to an FR4 board using the minimum recommended pad size.

This document contains information on a new product. Specifications and information herein are subject to change without notice.



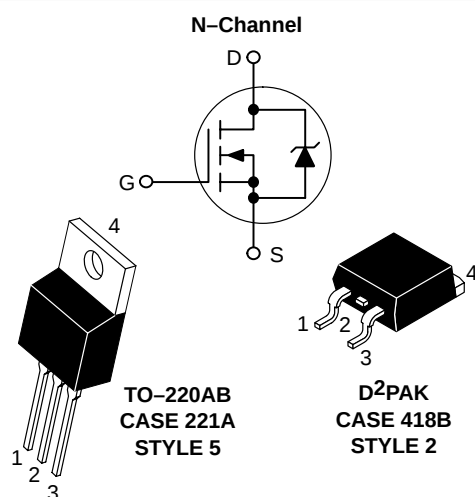
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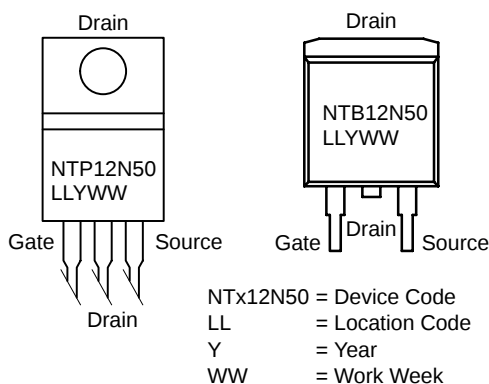
12 AMPERES

500 VOLTS

$R_{DS(on)} = 500\text{ m}\Omega$



MARKING DIAGRAMS AND PIN ASSIGNMENTS



NTx12N50 = Device Code
LL = Location Code
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NTP12N50	TO-220AB	50 Units/Rail
NTB12N50	D2PAK	50 Units/Rail
NTB12N50T4	D2PAK	800/Tape & Reel

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

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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 ($V_{GS} = 0\text{ Vdc}$, $I_D = 0.25\text{ mAdc}$) Temperature Coefficient (Positive)	$V_{(BR)DSS}$	500 —	— 583	— —	Vdc mV/ $^\circ\text{C}$
Zero Gate Voltage Collector 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 ($V_{GS} = \pm 20\text{ Vdc}$, $V_{DS} = 0$)	$I_{GSS(f)}$ $I_{GSS(r)}$	— —	— —	100 100	nAdc

ON CHARACTERISTICS (Note 2.)

Gate Threshold Voltage $I_D = 0.25\text{ mA}$, $V_{DS} = V_{GS}$ Temperature Coefficient (Negative)	$V_{GS(th)}$	2.0 —	2.5 6.7	4.0 —	Vdc mV/ $^\circ\text{C}$
Static Drain-to-Source On-Resistance ($V_{GS} = 10\text{ Vdc}$, $I_D = 6\text{ Adc}$)	$R_{DS(on)}$	—	380	500	mOhm
Drain-to-Source On-Voltage ($V_{GS} = 10\text{ Vdc}$, $I_D = 12\text{ Adc}$) ($V_{GS} = 10\text{ Vdc}$, $I_D = 6\text{ Adc}$, $T_J = 125^\circ\text{C}$)	$V_{DS(on)}$	— —	— —	7.2 6.5	Vdc
Forward Transconductance ($V_{DS} = 15\text{ Vdc}$, $I_D = 6\text{ Adc}$)	g_{FS}	8.0	11	—	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	$(V_{DS} = 25\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$, $f = 1.0\text{ MHz}$)	C_{iss}	—	1800	2520	pF
Output Capacitance		C_{oss}	—	620	870	
Transfer Capacitance		C_{rss}	—	40	80	

SWITCHING CHARACTERISTICS (Note 3.)

Turn-On Delay Time	$(V_{DD} = 250\text{ Vdc}$, $I_D = 12\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$, $R_G = 9.1\ \Omega$)	$t_{d(on)}$	—	12	20	ns
Rise Time		t_r	—	27	50	
Turn-Off Delay Time		$t_{d(off)}$	—	52	100	
Fall Time		t_f	—	35	70	
Gate Charge	$(V_{DS} = 400\text{ Vdc}$, $I_D = 12\text{ Adc}$, $V_{GS} = 10\text{ Vdc}$)	Q_T	—	37	50	nC
		Q_1	—	8.0	—	
		Q_2	—	12	—	
		Q_3	—	20	—	

SOURCE-DrAIN DIODE CHARACTERISTICS

Forward On-Voltage (Note 2.)	$(I_S = 12\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$) $(I_S = 12\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $T_J = 125^\circ\text{C}$)	V_{SD}	— —	0.90 0.80	1.0 —	Vdc
Reverse Recovery Time	$(I_S = 12\text{ Adc}$, $V_{GS} = 0\text{ Vdc}$, $di_S/dt = 100\text{ A}/\mu\text{s}$)	t_{rr}	—	380	—	ns
		t_a	—	165	—	
		t_b	—	215	—	
Reverse Recovery Stored Charge		Q_{RR}	—	3.9	—	μC

INTERNAL PACKAGE INDUCTANCE

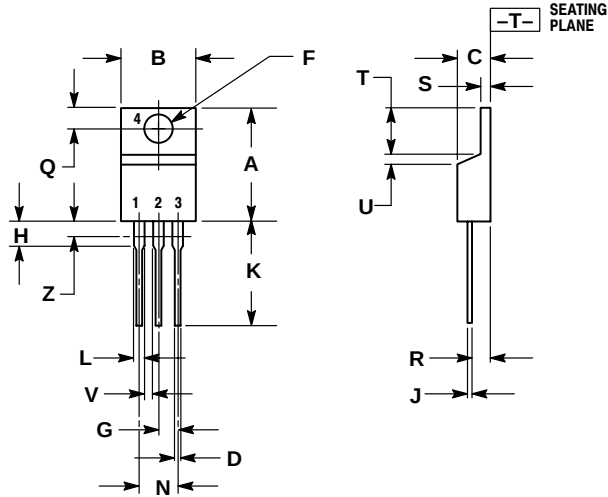
Internal Drain Inductance (Measured from contact screw on tab to center of die) (Measured from the drain lead 0.25" from package to center of die)	L_D	— —	3.5 4.5	— —	nH
Internal Source Inductance (Measured from the source lead 0.25" from package to source bond pad)	L_S	—	7.5	—	

- Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2\%$.
- 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:

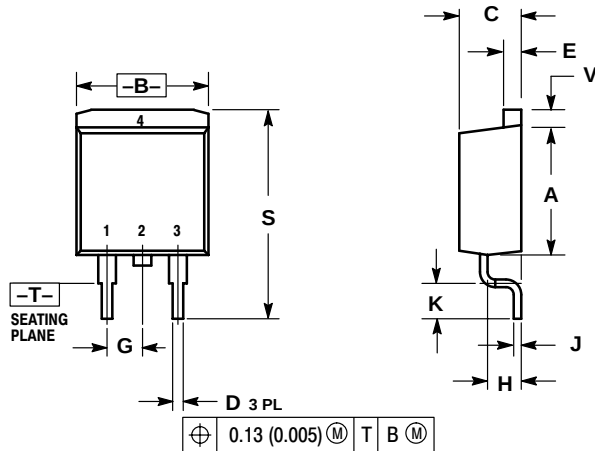
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

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

D²PAK CASE 418B-03 ISSUE D



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.340	0.380	8.64	9.65
B	0.380	0.405	9.65	10.29
C	0.160	0.190	4.06	4.83
D	0.020	0.035	0.51	0.89
E	0.045	0.055	1.14	1.40
G	0.100 BSC		2.54 BSC	
H	0.080	0.110	2.03	2.79
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

STYLE 2:

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

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