

NTP10N40, NTB10N40

Preferred Device

Advance Information

Power MOSFET 10 Amps, 400 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}	400	Vdc
Drain-Gate Voltage ($R_{GS} = 1.0\text{ M}\Omega$)	V_{DGR}	400	Vdc
Gate-Source Voltage	V_{GS} V_{GSM}	± 20	Vdc
- Continuous		± 40	
- Non-Repetitive ($t_p \leq 10\text{ ms}$)			
Drain	I_D $I_{D@100^\circ\text{C}}$ I_{DM}	10	Adc
- Continuous		7.5	
- Single Pulse ($t_p \leq 10\text{ }\mu\text{s}$)		35	
Total Power Dissipation	P_D	142	Watts
Derate above 25°C		1.14	$\text{W}/^\circ\text{C}$
Operating and Storage Temperature Range	T_J, T_{stg}	-55 to 150	$^\circ\text{C}$
Single Drain-to-Source Avalanche Energy - Starting $T_J = 25^\circ\text{C}$ ($V_{DD} = 100\text{ Vdc}$, $V_{GS} = 10\text{ Vdc}$, $I_L = 10\text{ A}$, $L = 10\text{ mH}$, $R_G = 25\text{ }\Omega$)	E_{AS}	500	mJ
Thermal Resistance	$R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	0.88	$^\circ\text{C}/\text{W}$
- Junction-to-Case		62.5	
- Junction-to-Ambient (Note 1.)		50	
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.

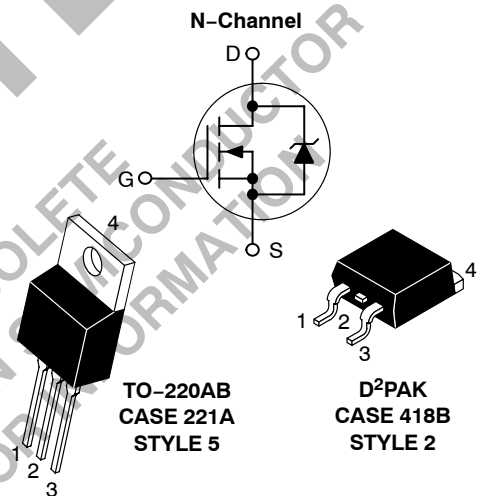


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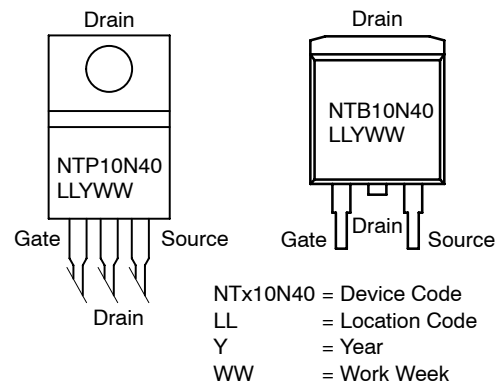
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**10 AMPERES
400 VOLTS**

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



MARKING DIAGRAMS AND PIN ASSIGNMENTS



ORDERING INFORMATION

Device	Package	Shipping
NTP10N40	TO-220AB	50 Units/Rail
NTB10N40	D ² PAK	50 Units/Rail
NTB10N40T4	D ² PAK	800/Tape & Reel

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

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ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Drain-to-Source Breakdown Voltage (V _{GS} = 0 Vdc, I _D = 0.25 mAdc) Temperature Coefficient (Positive)	V _{(BR)DSS}	400 -	- 475	- -	Vdc mV/°C
Zero Gate Voltage Collector Current (V _{DS} = 400 Vdc, V _{GS} = 0 Vdc) (V _{DS} = 400 Vdc, V _{GS} = 0 Vdc, T _J = 125°C)	I _{DSS}	- -	- -	10 100	μAdc
Gate-Body Leakage Current (V _{GS} = ±20 Vdc, V _{DS} = 0)	I _{GSS(f)} I _{GSS(r)}	- -	- -	100 100	nAdc

ON CHARACTERISTICS (Note 1)

Gate Threshold Voltage I _D = 0.25 mA, V _{DS} = V _{GS} Temperature Coefficient (Negative)	V _{GS(th)}	2.0 -	2.5 6.5	4.0 -	Vdc mV/°C
Static Drain-to-Source On-Resistance (V _{GS} = 10 Vdc, I _D = 5.0 Adc)	R _{DS(on)}	-	350	500	mOhm
Drain-to-Source On-Voltage (V _{GS} = 10 Vdc, I _D = 10 Adc) (V _{GS} = 10 Vdc, I _D = 5.0 Adc, T _J = 125°C)	V _{DS(on)}	- -	- -	6.0 5.3	Vdc
Forward Transconductance (V _{DS} = 15 Vdc, I _D = 5.0 Adc)	g _{FS}	2.0	7.0	-	Mhos

DYNAMIC CHARACTERISTICS

Input Capacitance	(V _{DS} = 25 Vdc, V _{GS} = 0 Vdc, f = 1.0 MHz)	C _{ISS}	-	1440	2020	pF
Output Capacitance		C _{OSS}	-	360	500	
Transfer Capacitance		C _{rSS}	-	15	30	

SWITCHING CHARACTERISTICS (Note 2)

Turn-On Delay Time	(V _{DD} = 200 Vdc, I _D = 10 Adc, V _{GS} = 10 Vdc, R _G = 9.1 Ω)	t _{d(on)}	-	10	20	ns
Rise Time		t _r	-	20	40	
Turn-Off Delay Time		t _{d(off)}	-	33	70	
Fall Time		t _f	-	24	50	
Gate Charge	(V _{DS} = 320 Vdc, I _D = 10 Adc, V _{GS} = 10 Vdc)	Q _T	-	24	30	nC
		Q ₁	-	6.0	-	
		Q ₂	-	7.0	-	
		Q ₃	-	12	-	

SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage (Note 1)	(I _S = 10 Adc, V _{GS} = 0 Vdc) (I _S = 10 Adc, V _{GS} = 0 Vdc, T _J = 125°C)	V _{SD}	- -	0.9 0.8	1.1 -	Vdc
Reverse Recovery Time		t _{rr}	-	305	-	
	(I _S = 10 Adc, V _{GS} = 0 Vdc, dI _S /dt = 100 A/μs)	t _a	-	155	-	
		t _b	-	150	-	
Reverse Recovery Stored Charge		Q _{RR}	-	2.5	-	μC

INTERNAL PACKAGE INDUCTANCE

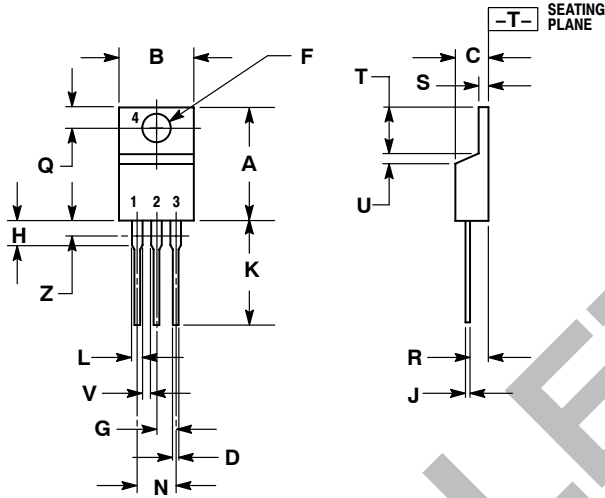
Internal Drain Inductance (Measured from contact screw on tab to center of die) (Measured from the drain lead 0.25" from package to center of die)	L _D	- -	3.5 4.5	- -	nH
Internal Source Inductance (Measured from the source lead 0.25" from package to source bond pad)	L _S	-	7.5	-	

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
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:

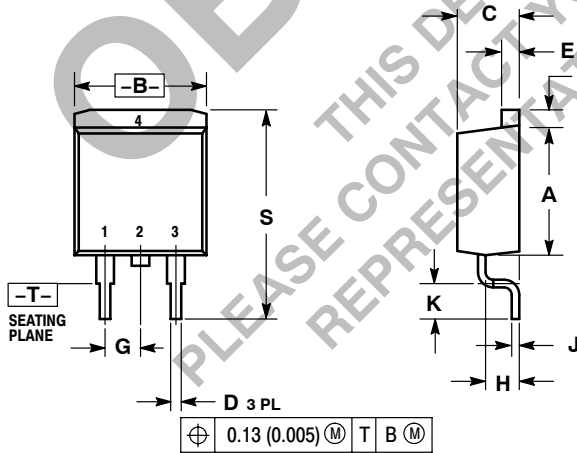
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

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	4.89	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
- DRAIN
- SOURCE
- 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
- DRAIN
- SOURCE
- DRAIN

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