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°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain–Source Voltage	V_{DSS}	400	Vdc
Drain–Gate Voltage (R_{GS} = 1.0 MΩ)	V_{DGR}	400	Vdc
Gate–Source Voltage – Continuous – Non–Repetitive ($t_p \le 10$ ms)	 V_{GS} V_{GSM}	 ±20 ±40	Vdc
Drain – Continuous – Continuous @ 100°C – Single Pulse ($t_p \le 10$ μs)	 I_D I_D I_{DM}	 10 7.5 35	Adc
Total Power Dissipation Derate above 25°C	P_D	142 1.14	Watts W/°C
Operating and Storage Temperature Range	T_J, T_{stg}	–55 to 150	°C
Single Drain–to–Source Avalanche Energy – Starting T_J = 25°C (V_{DD} = 100 Vdc, V_{GS} = 10 Vdc, I_L = 10 A, L = 10 mH, R_G = 25 Ω)	E_{AS}	500	mJ
Thermal Resistance – Junction–to–Case – Junction–to–Ambient – Junction–to–Ambient (Note 1.)	 $R_{\theta JC}$ $R_{\theta JA}$ $R_{\theta JA}$	 0.88 62.5 50	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8″ from case for 10 seconds	T_L	260	°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.

ON Semiconductor™

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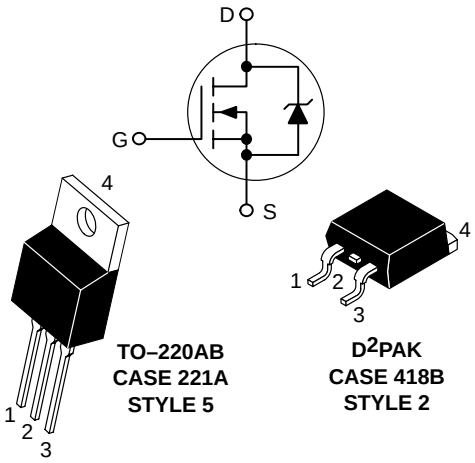
10 AMPERES
400 VOLTS
$R_{DS(on)}$ = 500 mΩ

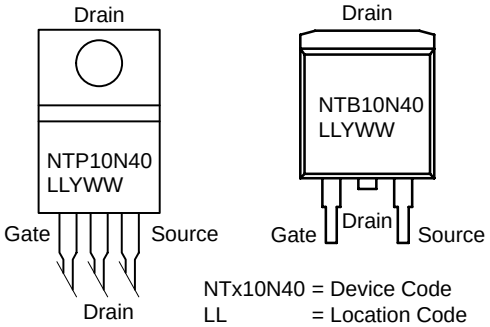
N–Channel



TO–220AB
CASE 221A
STYLE 5

D²PAK
CASE 418B
STYLE 2

MARKING DIAGRAMS AND PIN ASSIGNMENTS



NTx10N40 = Device Code
LL = Location Code
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NTP10N40	TO–220AB	50 Units/Rail
NTB10N40	D²PAK	50 Units/Rail
NTB10N40T4	D²PAK	800/Tape & Reel

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

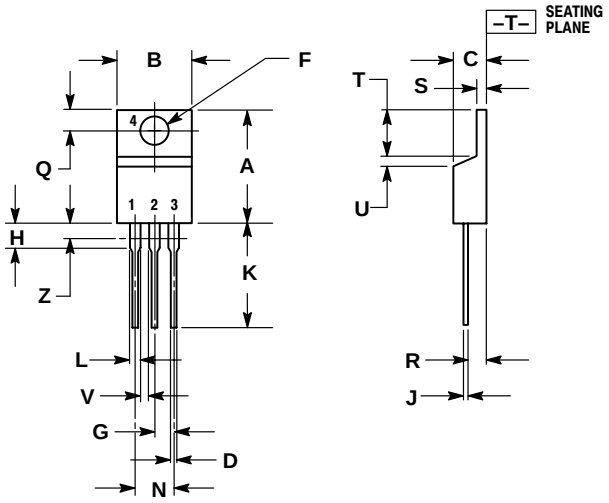
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
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 2.)						
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 3.)						
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 2.)	(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	(I_S = 10 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs)	t_{rr}	–	305	–	ns
		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	–	

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
3. Switching characteristics are independent of operating junction temperature.

PACKAGE DIMENSIONS

TO–220 THREE–LEAD
TO–220AB
CASE 221A–09
ISSUE AA

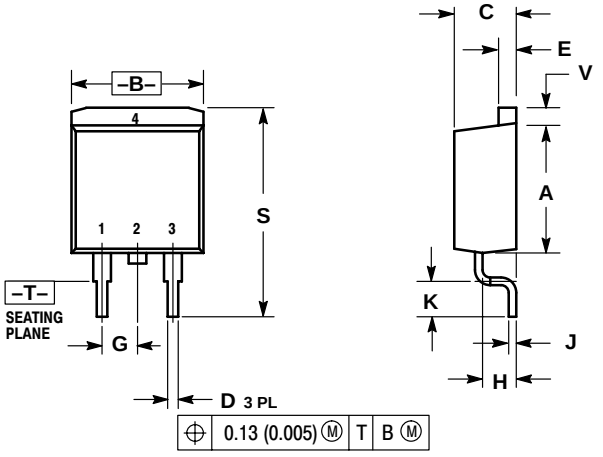


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	INCHES		MILLIMETERS	
DIM	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

D^2PAK
CASE 418B–03
ISSUE D



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

	INCHES		MILLIMETERS	
DIM	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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