NTP60N06, NTB60N06

Advance Information

Power MOSFET
60 Amps, 60 Volts
N–Channel TO–220 and D^{2}PAK

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

Typical Applications

- Power Supplies
- Converters
- Power Motor Controls
- Bridge Circuits

MAXIMUM RATINGS (T_C = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain–to–Source Voltage	V_{DSS}	60	Vdc
Drain– to–Gate Voltage (R_{GS} = 1.0 MΩ)	V_{DGR}	60	Vdc
Gate–to–Source Voltage – Continuous – Non–Repetitive ($t_p \le 10$ ms)	 V_{GS} V_{GS}	 ±20 ±20	Vdc
Drain Current – Continuous @ T_A = 25°C – Continuous @ T_A 100°C – Single Pulse ($t_p \le 10$ μs)	 I_D I_D I_{DM}	 60 42.3 180	 Adc Apk
Total Power Dissipation @ T_A = 25°C Derate above 25°C Total Power Dissipation @ T_A = 25°C (Note 1.)	P_D	136.4 0.91 2.4	W W/°C W
Operating and Storage Temperature Range	T_J, T_{stg}	–55 to 175	°C
Single Pulse Drain–to–Source Avalanche Energy – Starting T_J = 25°C (V_{DD} = 50 Vdc, V_{GS} = 10 Vdc, L = 0.31 mH, I_L(pk) = 47.6 A, V_{DS} = 60 Vdc)	E_{AS}	352	mJ
Thermal Resistance – Junction–to–Case – Junction–to–Ambient (Note 1.)	 $R_{\theta JC}$ $R_{\theta JA}$	 1.2 63.2	°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, (Cu Area 0.412 in^2).

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

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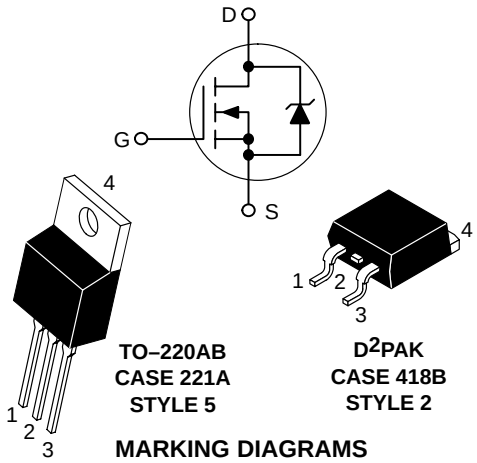
60 AMPERES
60 VOLTS
$R_{DS(on)}$ = 0.014 Ω

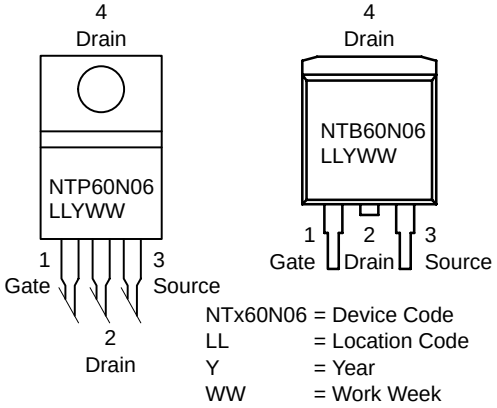
N–Channel



TO–220AB
CASE 221A
STYLE 5

D^{2}PAK
CASE 418B
STYLE 2

MARKING DIAGRAMS & PIN ASSIGNMENTS



NTx60N06 = Device Code
LL = Location Code
Y = Year
WW = Work Week

ORDERING INFORMATION

Device	Package	Shipping
NTP60N06	TO–220AB	50 Units/Rail
NTB60N06	D^{2}PAK	50 Units/Rail
NTB60N06T4	D^{2}PAK	800/Tape & Reel

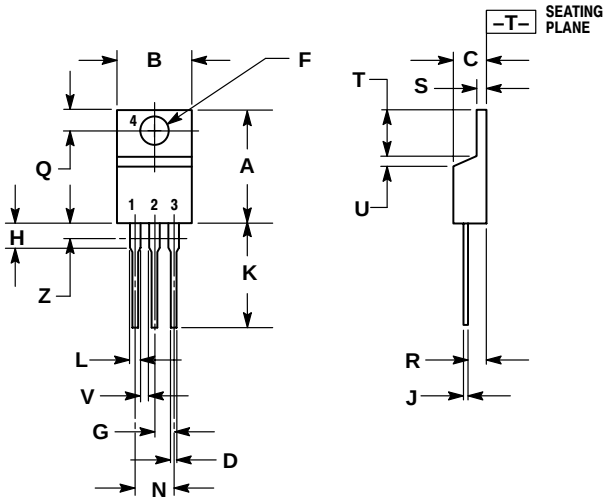
ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain–to–Source Breakdown Voltage (Note 2.) (V_{GS} = 0 Vdc, I_D = 250 μAdc) Temperature Coefficient (Positive)		$V_{(BR)DSS}$	 60 –	 72.3 69.8	 – –	Vdc mV/°C
Zero Gate Voltage Drain Current (V_{DS} = 60 Vdc, V_{GS} = 0 Vdc) (V_{DS} = 60 Vdc, V_{GS} = 0 Vdc, T_J =150°C)		I_{DSS}	 – –	 – –	 1.0 10	μAdc
Gate–Body Leakage Current (V_{GS} = ±20 Vdc, V_{DS} = 0 Vdc)		I_{GSS}	–	–	±100	nAdc
ON CHARACTERISTICS (Note 2.)						
Gate Threshold Voltage (Note 2.) (V_{DS} = V_{GS}, I_D = 250 μAdc) Threshold Temperature Coefficient (Negative)		$V_{GS(th)}$	 2.0 –	 2.85 8.0	 4.0 –	Vdc mV/°C
Static Drain–to–Source On–Resistance (Note 2.) (V_{GS} = 10 Vdc, I_D = 30 Adc)		$R_{DS(on)}$	 –	 11.5	 14	mΩ
Static Drain–to–Source On–Resistance (Note 2.) (V_{GS} = 10 Vdc, I_D = 60 Adc) (V_{GS} = 10 Vdc, I_D = 30 Adc, T_J = 150°C)		$V_{DS(on)}$	 – –	 0.715 1.43	 – –	Vdc
Forward Transconductance (Note 2.) (V_{DS} = 8.0 Vdc, I_D = 12 Adc)		g_{FS}	–	–	–	mhos
DYNAMIC CHARACTERISTICS						
Input Capacitance	(V_{DS} = 25 Vdc, V_{GS} = 0 Vdc, f = 1.0 MHz)	C_{iss}	–	2300	3220	pF
Output Capacitance		C_{oss}	–	660	925	
Transfer Capacitance		C_{rss}	–	144	300	
SWITCHING CHARACTERISTICS (Note 3.)						
Turn–On Delay Time	(V_{DD} = 30 Vdc, I_D = 60 Adc, V_{GS} = 10 Vdc, R_G = 9.1 Ω) (Note 2.)	$t_{d(on)}$	–	25.5	50	ns
Rise Time		t_r	–	180.7	360	
Turn–Off Delay Time		$t_{d(off)}$	–	94.5	200	
Fall Time		t_f	–	142.5	300	
Gate Charge	(V_{DS} = 48 Vdc, I_D = 60 Adc, V_{GS} = 10 Vdc) (Note 2.)	Q_T	–	62	81	nC
		Q_1	–	10.8	–	
		Q_2	–	29.4	–	
SOURCE–DRAIN DIODE CHARACTERISTICS						
Forward On–Voltage	(I_S = 60 Adc, V_{GS} = 0 Vdc) (Note 2.) (I_S = 45 Adc, V_{GS} = 0 Vdc, T_J = 150°C)	V_{SD}	 –	 0.99 0.87	 1.05 –	Vdc
Reverse Recovery Time	(I_S = 60 Adc, V_{GS} = 0 Vdc, dI_S/dt = 100 A/μs) (Note 2.)	t_{rr}	–	64.9	–	ns
		t_a	–	44.1	–	
		t_b	–	20.8	–	
Reverse Recovery Stored Charge		Q_{RR}	–	0.146	–	μC

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

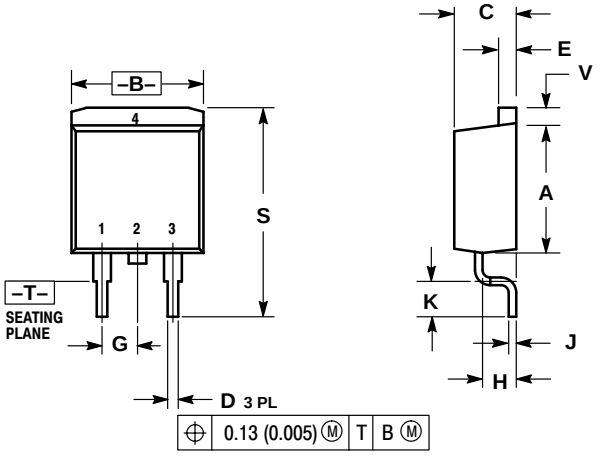


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

	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:
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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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