

NTP60N06, NTB60N06

Advance Information

Power MOSFET 60 Amps, 60 Volts N-Channel TO-220 and D²PAK

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	V _{GS}	±20	Vdc
– Continuous	V _{GS}	±20	
– Non-Repetitive (t _p ≤ 10 ms)			
Drain Current	I _D	60	Adc
– Continuous @ T _A = 25°C	I _D	42.3	
– Continuous @ T _A 100°C	I _{DM}	180	Apk
– Single Pulse (t _p ≤ 10 μs)			
Total Power Dissipation @ T _A = 25°C	P _D	136.4	W
Derate above 25°C		0.91	W/°C
Total Power Dissipation @ T _A = 25°C (Note 1.)		2.4	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			°C/W
– Junction-to-Case	R _{θJC}	1.2	
– Junction-to-Ambient (Note 1.)	R _{θJA}	63.2	
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 in²).



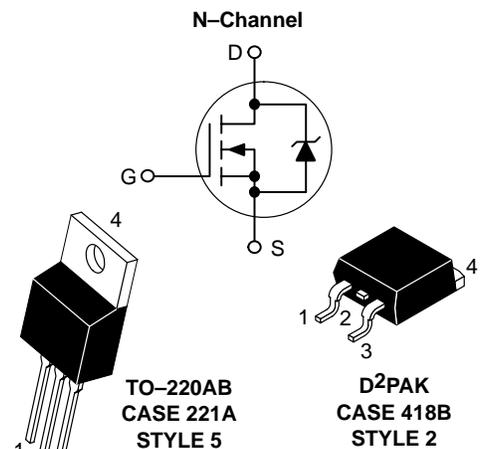
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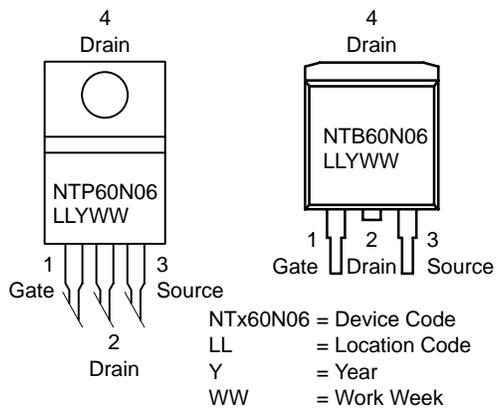
60 AMPERES

60 VOLTS

R_{DS(on)} = 0.014 Ω



MARKING DIAGRAMS & PIN ASSIGNMENTS



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

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

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ELECTRICAL CHARACTERISTICS (T_C = 25°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 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

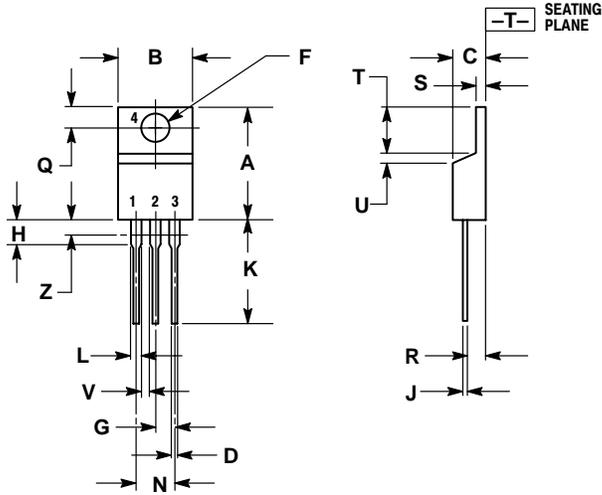
Forward On-Voltage	(I _S = 60 Adc, V _{GS} = 0 Vdc) (Note 2.) (I _S = 45 Adc, V _{GS} = 0 Vdc, T _J = 150°C)	V _{SD}	– –	0.99 0.87	1.05 –	Vdc
Reverse Recovery Time	(I _S = 60 Adc, V _{GS} = 0 Vdc, di _S /dt = 100 A/μs) (Note 2.)	t _{rr}	–	64.9	–	ns
		t _a	–	44.1	–	
		t _b	–	20.8	–	
Reverse Recovery Stored 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.

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PACKAGE DIMENSIONS

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



NOTES:

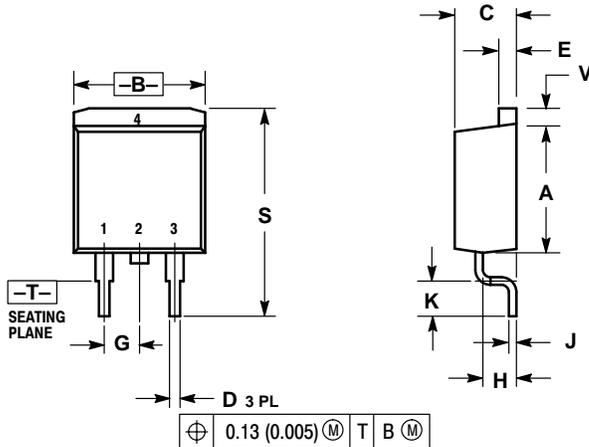
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.

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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Email: ONlit-asia@hibbertco.com

JAPAN: ON Semiconductor, Japan Customer Focus Center

4-32-1 Nishi-Gotanda, Shinagawa-ku, Tokyo, Japan 141-0031

Phone: 81-3-5740-2700

Email: r14525@onsemi.com

ON Semiconductor Website: <http://onsemi.com>

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