

# NTP30N06L, NTB30N06L

## Power MOSFET 30 Amps, 60 Volts, Logic Level N-Channel TO-220 and D<sup>2</sup>PAK

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

### Typical Applications

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

### MAXIMUM RATINGS (T<sub>J</sub> = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V <sub>DSS</sub>	60	Vdc
Drain-to-Gate Voltage (R <sub>GS</sub> = 10 MΩ)	V <sub>DGR</sub>	60	Vdc
Gate-to-Source Voltage	V <sub>GS</sub>		Vdc
– Continuous	V <sub>GS</sub>	±15	
– Non-Repetitive (t <sub>p</sub> ≤ 10 ms)	V <sub>GS</sub>	±20	
Drain Current	I <sub>D</sub>		Adc
– Continuous @ T <sub>A</sub> = 25°C	I <sub>D</sub>	30	
– Continuous @ T <sub>A</sub> = 100°C	I <sub>D</sub>	15	
– Single Pulse (t <sub>p</sub> ≤ 10 μs)	I <sub>DM</sub>	90	Apk
Total Power Dissipation @ T <sub>A</sub> = 25°C	P <sub>D</sub>	88.2	W
Derate above 25°C		0.59	W/°C
Operating and Storage Temperature Range	T <sub>J</sub> , T <sub>stg</sub>	–55 to +175	°C
Single Pulse Drain-to-Source Avalanche Energy – Starting T <sub>J</sub> = 25°C (V <sub>DD</sub> = 50 Vdc, V <sub>GS</sub> = 5.0 Vdc, L = 0.3 mH I <sub>L(pk)</sub> = 26 A, V <sub>DS</sub> = 60 Vdc)	E <sub>AS</sub>	101	mJ
Thermal Resistance – Junction-to-Case	R <sub>θJC</sub>	1.7	°C/W
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T <sub>L</sub>	260	°C

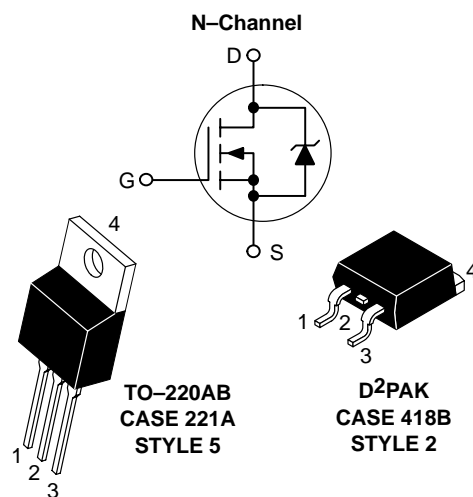


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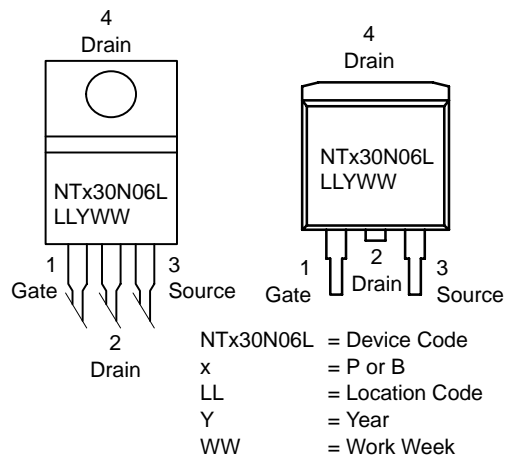
<http://onsemi.com>

**30 AMPERES  
60 VOLTS**

**RDS(on) = 46 mΩ**



### MARKING DIAGRAMS & PIN ASSIGNMENTS



### ORDERING INFORMATION

Device	Package	Shipping
NTP30N06L	TO-220AB	50 Units/Rail
NTB30N06L	D <sup>2</sup> PAK	50 Units/Rail
NTB30N06LT4	D <sup>2</sup> PAK	800/Tape & Reel

# NTP30N06L, NTB30N06L

## ELECTRICAL CHARACTERISTICS (T<sub>J</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-to-Source Breakdown Voltage (Note 1.) (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μAdc) Temperature Coefficient (Positive)	V <sub>(BR)DSS</sub>	60 –	71.8 69	– –	Vdc mV/°C
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 60 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 60 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 150°C)	I <sub>DSS</sub>	– –	– –	1.0 10	μAdc
Gate-Body Leakage Current (V <sub>GS</sub> = ±15 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	–	–	±100	nAdc

## ON CHARACTERISTICS (Note 1.)

Gate Threshold Voltage (Note 1.) (V <sub>DS</sub> = V <sub>GS</sub> , I <sub>D</sub> = 250 μAdc) Threshold Temperature Coefficient (Negative)	V <sub>GS(th)</sub>	1.0 –	1.7 4.8	2.0 –	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 1.) (V <sub>GS</sub> = 5.0 Vdc, I <sub>D</sub> = 15 Adc)	R <sub>DS(on)</sub>	–	38	46	mΩ
Static Drain-to-Source On-Voltage (Note 1.) (V <sub>GS</sub> = 5.0 Vdc, I <sub>D</sub> = 30 Adc) (V <sub>GS</sub> = 5.0 Vdc, I <sub>D</sub> = 15 Adc, T <sub>J</sub> = 150°C)	V <sub>DS(on)</sub>	– –	1.3 1.06	1.7 –	Vdc
Forward Transconductance (Note 1.) (V <sub>DS</sub> = 7.0 Vdc, I <sub>D</sub> = 15 Adc)	g <sub>FS</sub>	–	21	–	mhos

## DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 25 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	–	810	1150	pF
Output Capacitance		C <sub>oss</sub>	–	260	370	
Transfer Capacitance		C <sub>rss</sub>	–	80	115	

## SWITCHING CHARACTERISTICS (Note 2.)

Turn-On Delay Time	(V <sub>DD</sub> = 30 Vdc, I <sub>D</sub> = 30 Adc, V <sub>GS</sub> = 5.0 Vdc, R <sub>G</sub> = 9.1 Ω) (Note 1.)	t <sub>d(on)</sub>	–	10	20	ns
Rise Time		t <sub>r</sub>	–	200	400	
Turn-Off Delay Time		t <sub>d(off)</sub>	–	15.6	30	
Fall Time		t <sub>f</sub>	–	62	120	
Gate Charge	(V <sub>DS</sub> = 48 Vdc, I <sub>D</sub> = 30 Adc, V <sub>GS</sub> = 5.0 Vdc) (Note 1.)	Q <sub>T</sub>	–	16	32	nC
		Q <sub>1</sub>	–	3.9	–	
		Q <sub>2</sub>	–	10	–	

## SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	(I <sub>S</sub> = 30 Adc, V <sub>GS</sub> = 0 Vdc) (Note 1.) (I <sub>S</sub> = 30 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 150°C)	V <sub>SD</sub>	– –	1.01 1.03	1.2 –	Vdc
Reverse Recovery Time	(I <sub>S</sub> = 30 Adc, V <sub>GS</sub> = 0 Vdc, di <sub>S</sub> /dt = 100 A/μs) (Note 1.)	t <sub>rr</sub>	–	50	–	ns
		t <sub>a</sub>	–	32	–	
		t <sub>b</sub>	–	17	–	
Reverse Recovery Stored Charge		Q <sub>RR</sub>	–	0.082	–	μC

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

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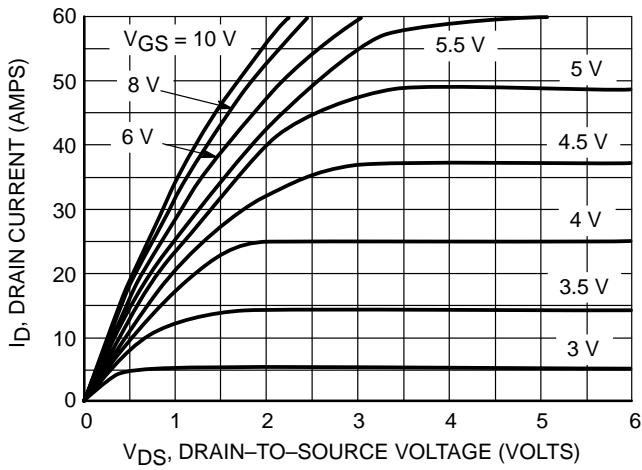


Figure 1. On-Region Characteristics

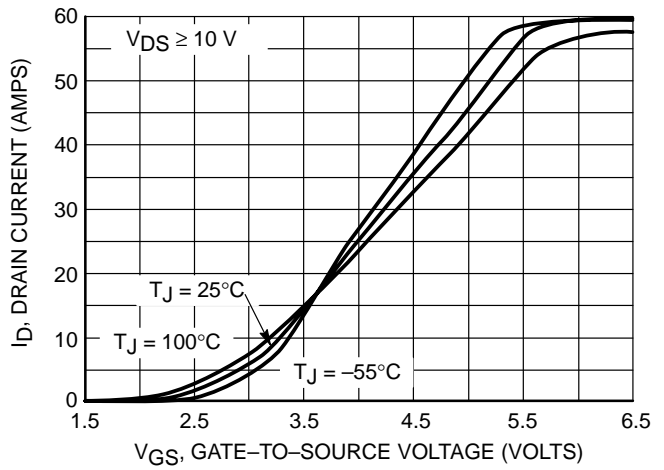


Figure 2. Transfer Characteristics

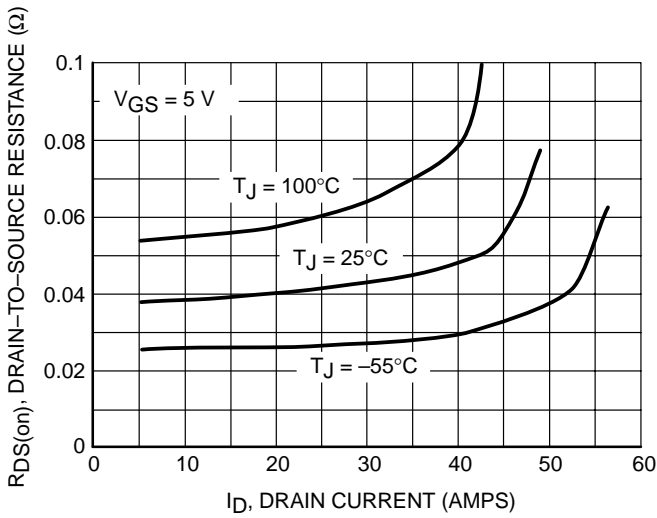


Figure 3. On-Resistance versus Gate-to-Source Voltage

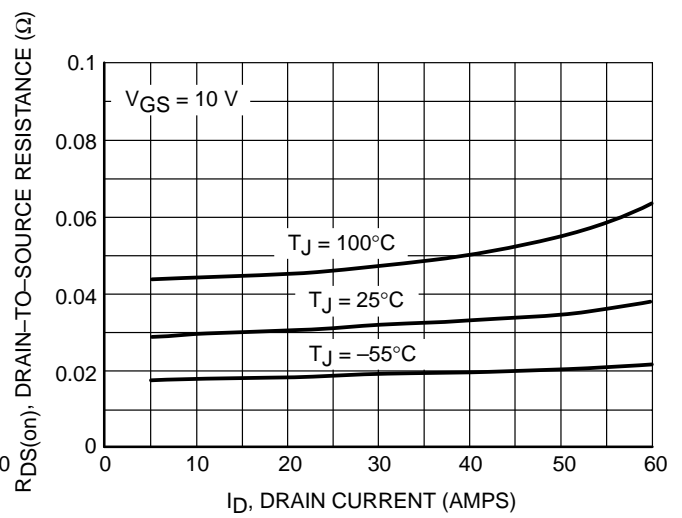


Figure 4. On-Resistance versus Drain Current and Gate Voltage

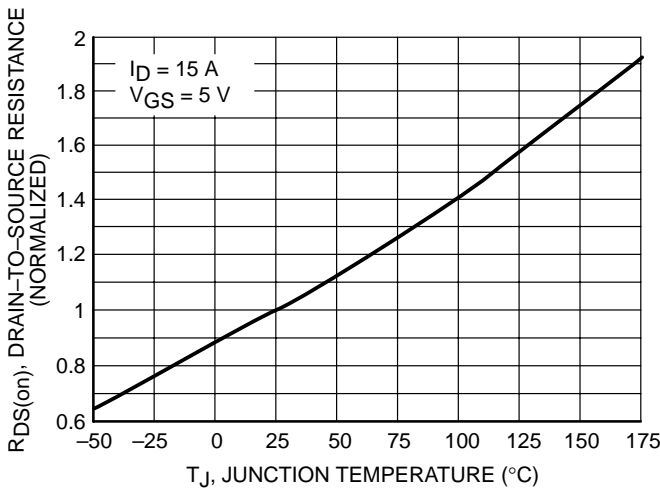


Figure 5. On-Resistance Variation with Temperature

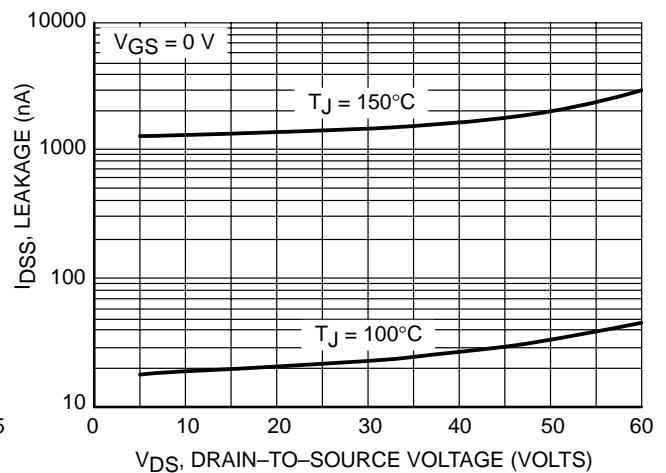
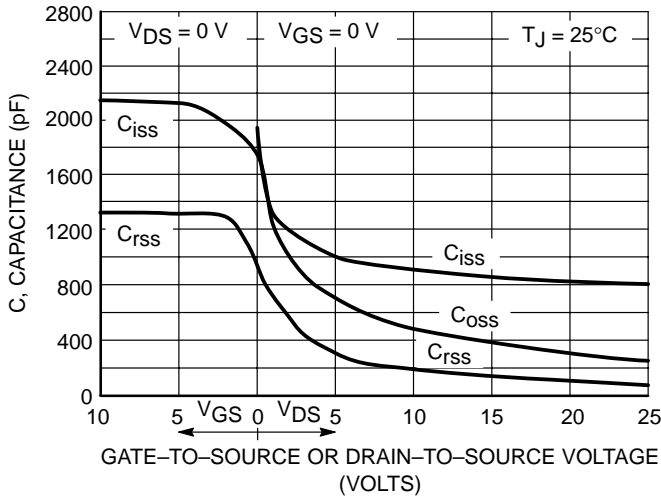
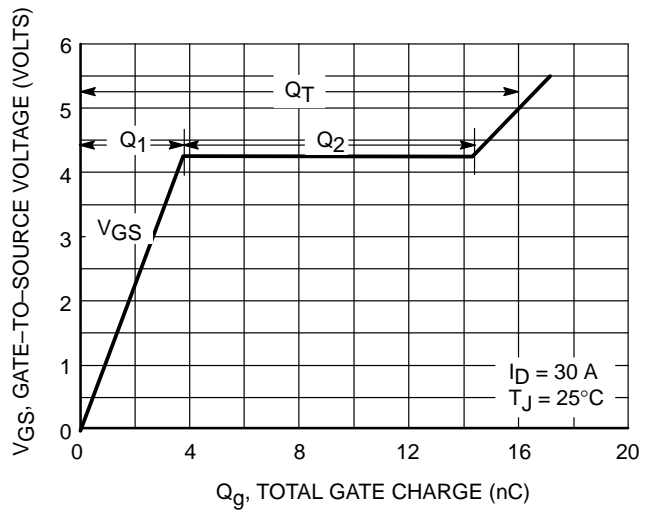


Figure 6. Drain-to-Source Leakage Current versus Voltage

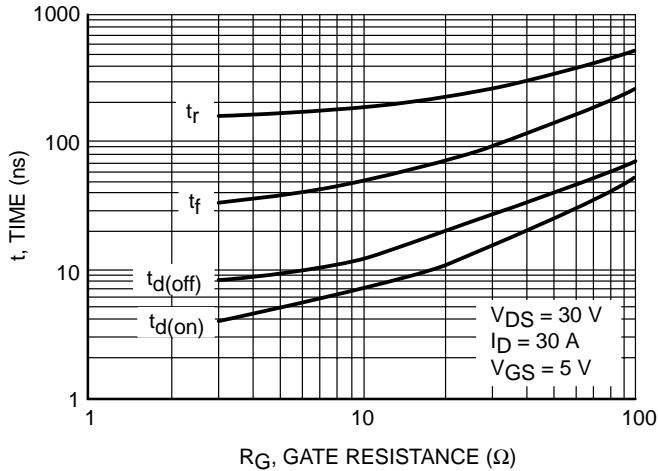
# NTP30N06L, NTB30N06L



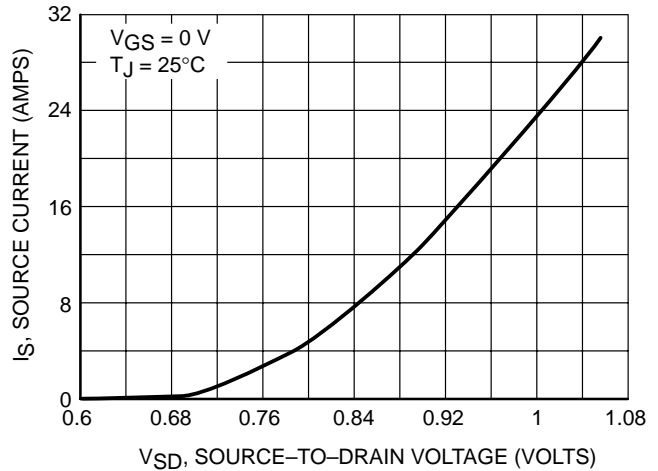
**Figure 7. Capacitance Variation**



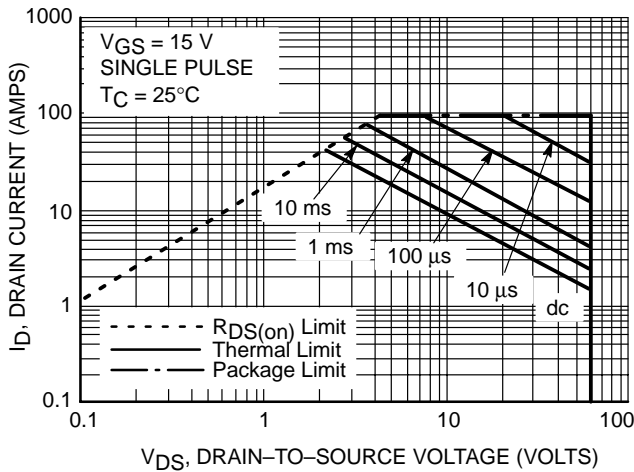
**Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge**



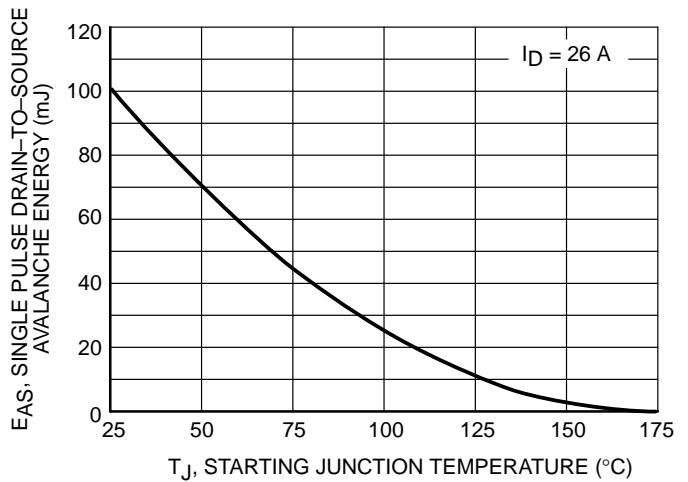
**Figure 9. Resistive Switching Time Variation versus Gate Resistance**



**Figure 10. Diode Forward Voltage versus Current**



**Figure 11. Maximum Rated Forward Biased Safe Operating Area**



**Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature**

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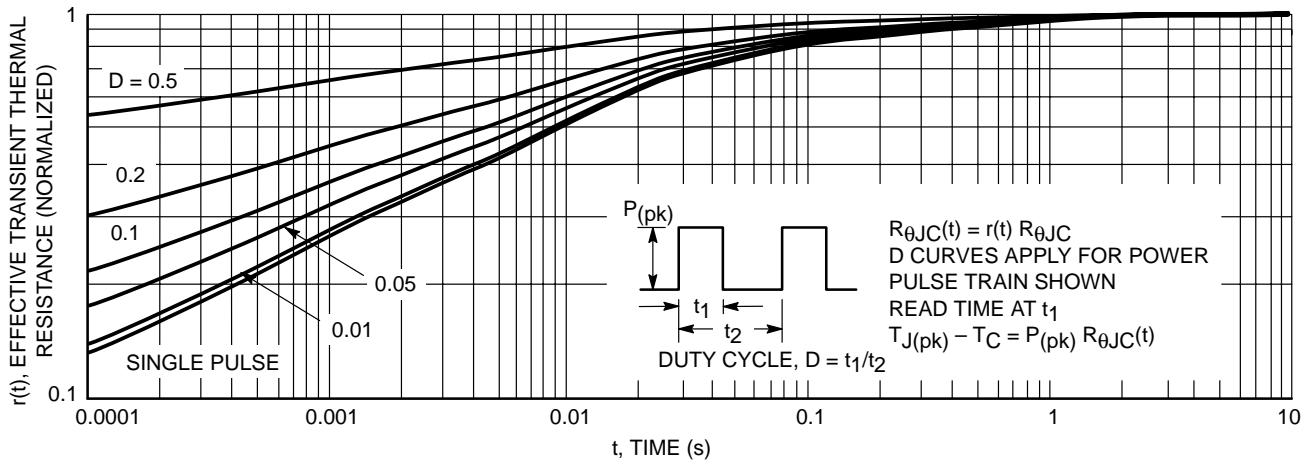


Figure 13. Thermal Response

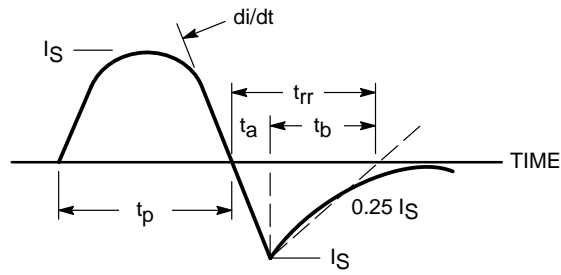


Figure 14. Diode Reverse Recovery Waveform

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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

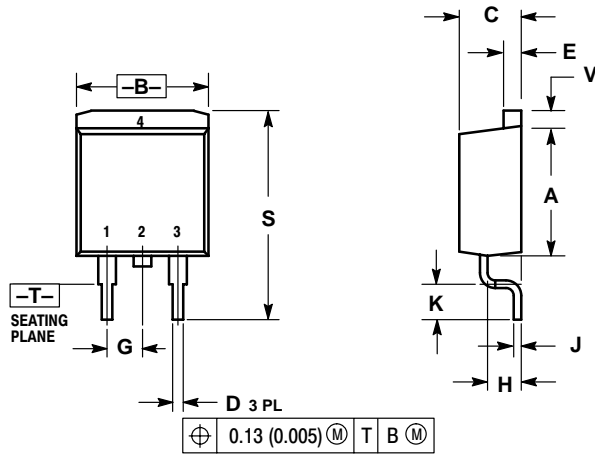
STYLE 5:

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

# NTP30N06L, NTB30N06L

## PACKAGE DIMENSIONS

**D<sup>2</sup>PAK**  
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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