



**THE DATASHEET OF  
NTP4302G**



# NTP4302, NTB4302

## Power MOSFET 74 Amps, 30 Volts

### N-Channel TO-220 & D<sup>2</sup>PAK

#### Features

- Low  $R_{DS(on)}$
- Higher Efficiency Extending Battery Life
- Diode Exhibits High Speed, Soft Recovery
- Avalanche Energy Specified
- $I_{DSS}$  Specified at Elevated Temperature
- Pb-Free Packages are Available

#### Typical Applications

- DC-DC Converters
- Low Voltage Motor Control
- Power Management in Portable and Battery Powered Products:  
Ie: Computers, Printers, Cellular and Cordless Telephones, and PCMCIA Cards

#### MAXIMUM RATINGS ( $T_J = 25^\circ\text{C}$ unless otherwise noted)

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	$V_{DSS}$	30	Vdc
Drain-to-Gate Voltage ( $R_{GS} = 10\text{ M}\Omega$ )	$V_{DGR}$	30	Vdc
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 20$	Vdc
Drain Current	$I_D$	74	Adc
– Continuous @ $T_C = 25^\circ\text{C}$	$I_D$	47	
– Continuous @ $T_C = 100^\circ\text{C}$	$I_{DM}$	175	Apk
– Single Pulse ( $t_p \leq 10\ \mu\text{s}$ )			
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	80 0.66	W W/ $^\circ\text{C}$
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ( $V_{DD} = 30\text{ Vdc}$ , $V_{GS} = 10\text{ Vdc}$ , $L = 5.0\text{ mH}$ $I_{L(pk)} = 17\text{ A}$ , $V_{DS} = 30\text{ Vdc}$ , $R_G = 25\ \Omega$ )	$E_{AS}$	722	mJ
Thermal Resistance	$R_{\theta JC}$ $R_{\theta JA}$	1.55 70	$^\circ\text{C/W}$
– Junction-to-Case			
– Junction-to-Ambient (Note 1)			
Maximum Lead Temperature for Soldering Purposes, 1/8 in from case for 10 seconds	$T_L$	260	$^\circ\text{C}$

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

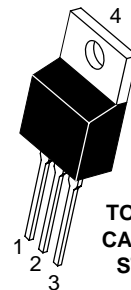
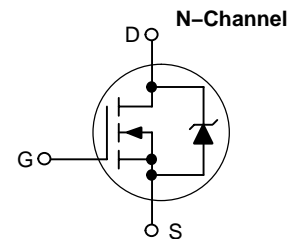
1. When surface mounted to an FR4 Board using minimum recommended Pad Size, (Cu Area 0.412 in<sup>2</sup>).
2. Current limited by internal lead wires.



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$V_{DSS}$	$R_{DS(ON)}\text{ MAX}$	$I_D\text{ MAX}$
30 V	9.3 m $\Omega$ @ 10 V	74 A

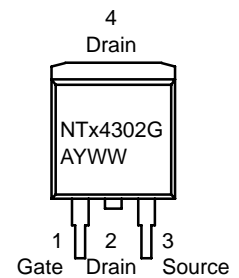
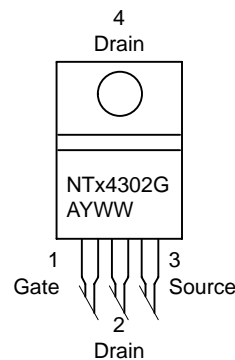


TO-220AB  
CASE 221A  
STYLE 5



D<sup>2</sup>PAK  
CASE 418AA  
STYLE 2

#### MARKING DIAGRAMS & PIN ASSIGNMENTS



NTx4302 = Device Code  
x = B or P  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

#### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

# NTP4302, NTB4302

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

Characteristic	Symbol	Min	Typ	Max	Unit
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### OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 3) (V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 250 μAdc) Temperature Coefficient (Positive)	V <sub>(BR)DSS</sub>	30 –	– 25	– –	Vdc mV/°C
Zero Gate Voltage Drain Current (V <sub>DS</sub> = 30 Vdc, V <sub>GS</sub> = 0 Vdc) (V <sub>DS</sub> = 30 Vdc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	I <sub>DSS</sub>	– –	– –	1.0 10	μAdc
Gate-Body Leakage Current (V <sub>GS</sub> = ±20 Vdc, V <sub>DS</sub> = 0 Vdc)	I <sub>GSS</sub>	–	–	±100	nAdc

### ON CHARACTERISTICS (Note 3)

Gate Threshold Voltage (Note 3) (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 –	1.9 –3.8	3.0 –	Vdc mV/°C
Static Drain-to-Source On-Resistance (Note 3) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 37 Adc) (V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 20 Adc) (V <sub>GS</sub> = 4.5 Vdc, I <sub>D</sub> = 10 Adc)	R <sub>DS(on)</sub>	–	6.8 6.8 9.5	9.3 9.3 12.5	mΩ
Forward Transconductance (Note 3) (V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 20 Adc)	g <sub>FS</sub>	–	40	–	mhos

### DYNAMIC CHARACTERISTICS

Input Capacitance	(V <sub>DS</sub> = 24 Vdc, V <sub>GS</sub> = 0 Vdc, f = 1.0 MHz)	C <sub>iss</sub>	–	2050	2400	pF
Output Capacitance		C <sub>oss</sub>	–	640	800	
Transfer Capacitance		C <sub>rss</sub>	–	225	310	

### SWITCHING CHARACTERISTICS (Note 4)

Turn-On Delay Time	(V <sub>DD</sub> = 24 Vdc, I <sub>D</sub> = 20 Adc, V <sub>GS</sub> = 10 Vdc, R <sub>G</sub> = 2.5 Ω) (Note 3)	t <sub>d(on)</sub>	–	10	18	ns
Rise Time		t <sub>r</sub>	–	22	35	
Turn-Off Delay Time		t <sub>d(off)</sub>	–	45	75	
Fall Time		t <sub>f</sub>	–	35	70	
Turn-On Delay Time	(V <sub>DD</sub> = 24 Vdc, I <sub>D</sub> = 10 Adc, V <sub>GS</sub> = 4.5 Vdc, R <sub>G</sub> = 2.5 Ω) (Note 3)	t <sub>d(on)</sub>	–	18	–	ns
Rise Time		t <sub>r</sub>	–	70	–	
Turn-Off Delay Time		t <sub>d(off)</sub>	–	32	–	
Fall Time		t <sub>f</sub>	–	30	–	
Gate Charge	(V <sub>DS</sub> = 24 Vdc, I <sub>D</sub> = 37 Adc, V <sub>GS</sub> = 4.5 Vdc) (Note 3)	Q <sub>T</sub>	–	28	–	nC
		Q <sub>gs</sub>	–	7.5	–	
		Q <sub>gd</sub>	–	19	–	

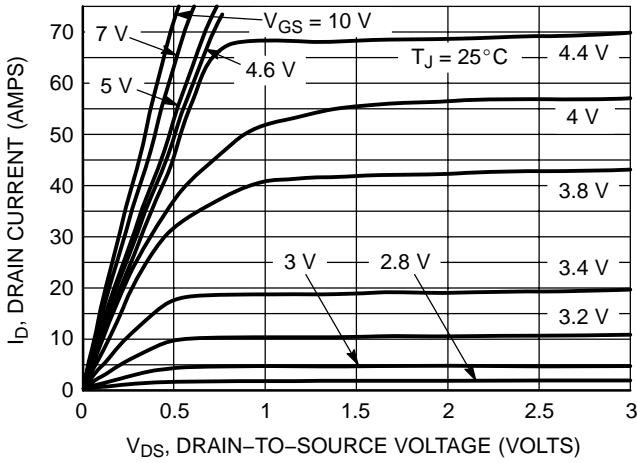
### SOURCE-DRAIN DIODE CHARACTERISTICS

Forward On-Voltage	(I <sub>S</sub> = 20 Adc, V <sub>GS</sub> = 0 Vdc) (Note 3) (I <sub>S</sub> = 20 Adc, V <sub>GS</sub> = 0 Vdc, T <sub>J</sub> = 125°C)	V <sub>SD</sub>	– –	0.90 0.75	1.3 –	Vdc
Reverse Recovery Time	(I <sub>S</sub> = 20 Adc, V <sub>GS</sub> = 0 Vdc, di <sub>S</sub> /dt = 100 A/μs) (Note 3)	t <sub>rr</sub>	–	37	–	ns
		t <sub>a</sub>	–	21	–	
		t <sub>b</sub>	–	16	–	
Reverse Recovery Stored Charge		Q <sub>RR</sub>	–	0.035	–	μC

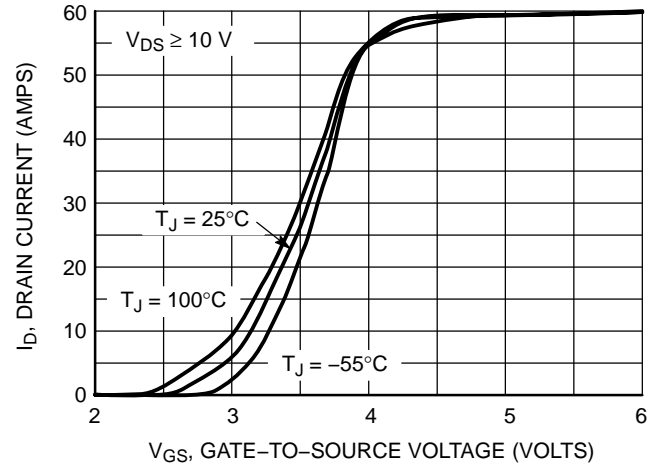
3. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

4. Switching characteristics are independent of operating junction temperatures.

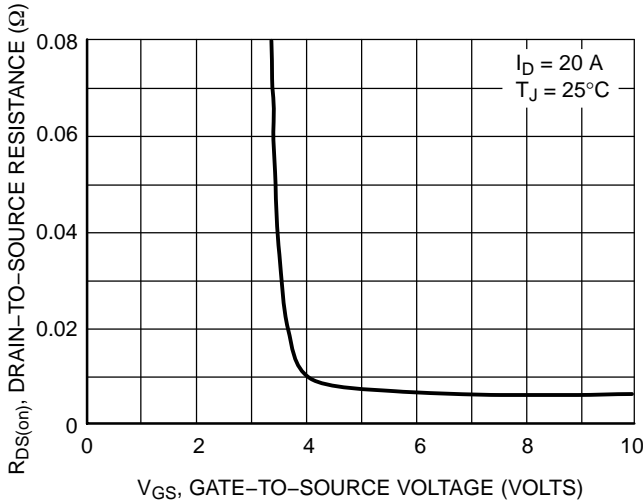
# NTP4302, NTB4302



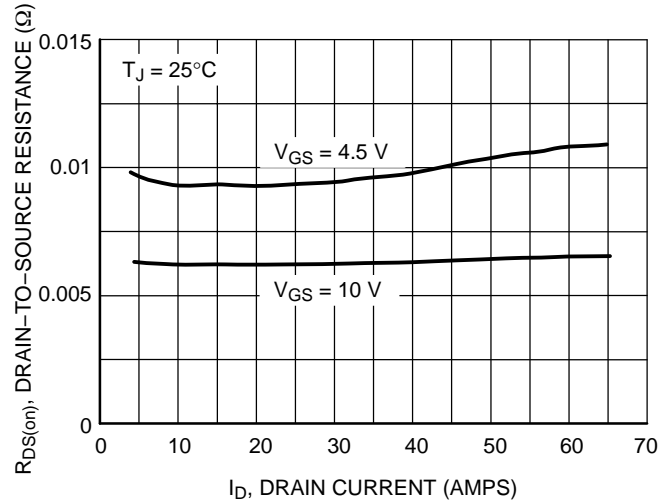
**Figure 1. On-Region Characteristics**



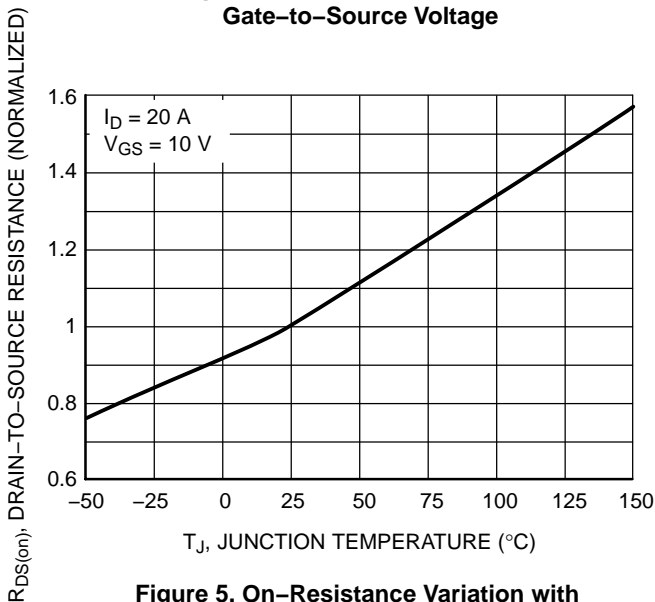
**Figure 2. Transfer Characteristics**



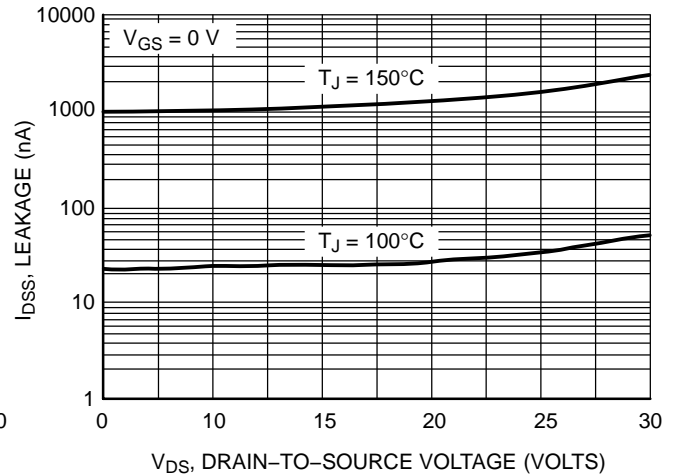
**Figure 3. On-Resistance versus Gate-to-Source Voltage**



**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**

# NTP4302, NTB4302

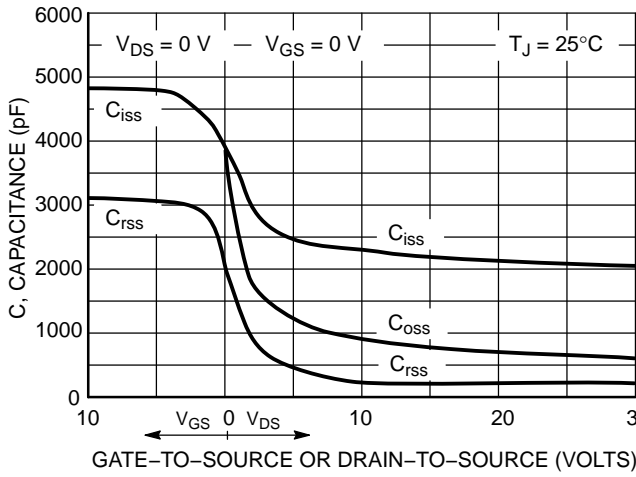


Figure 7. Capacitance Variation

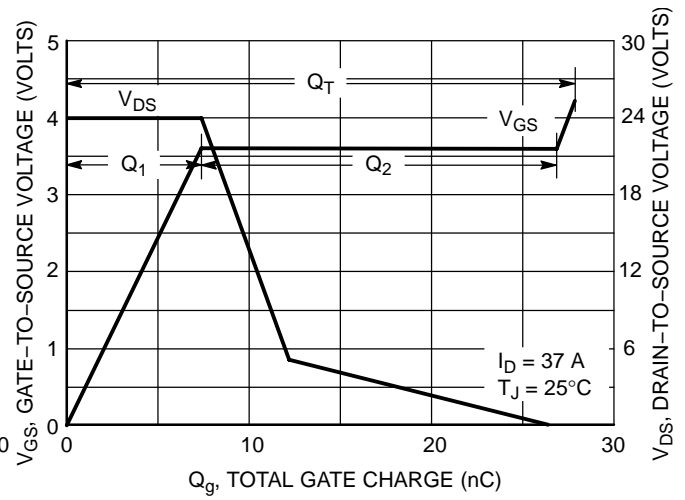


Figure 8. Gate-to-Source and Drain-to-Source Voltage versus Total Charge

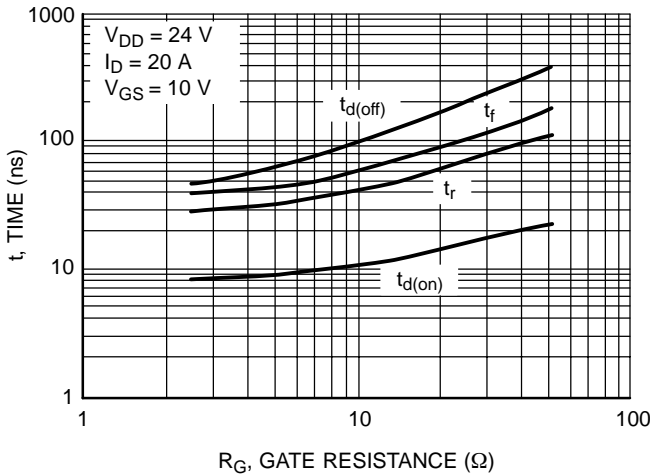


Figure 9. Resistive Switching Time Variations versus Gate Resistance

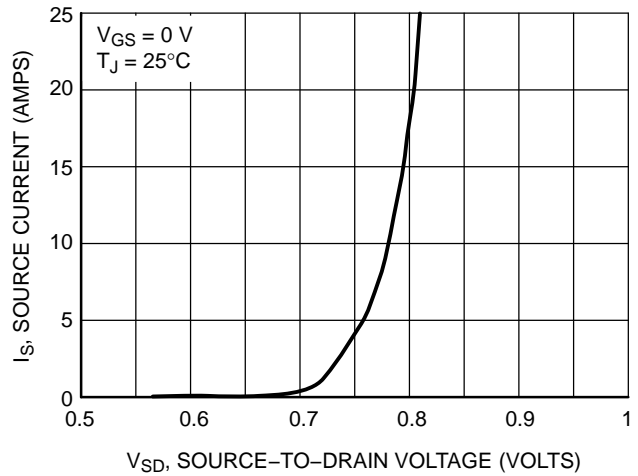


Figure 10. Diode Forward Voltage versus Current

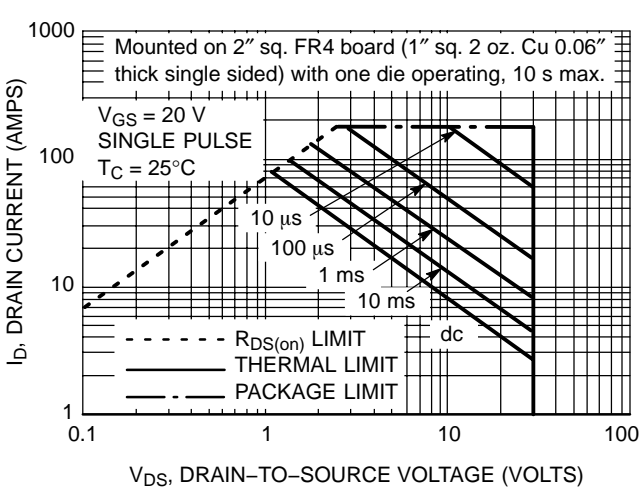


Figure 11. Maximum Rated Forward Biased Safe Operating Area

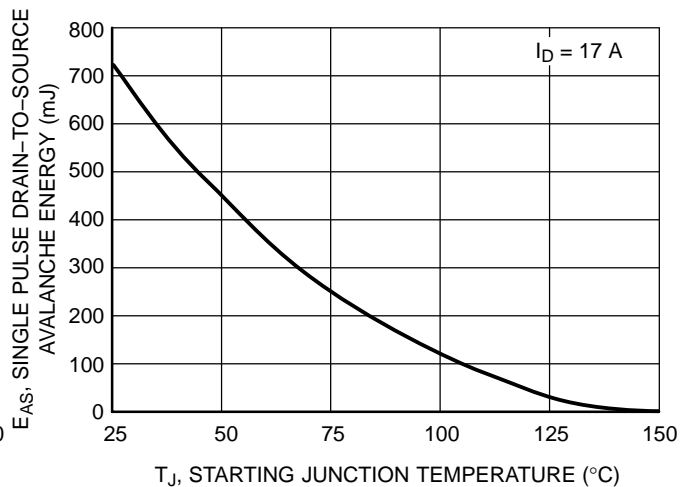


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

# NTP4302, NTB4302

## SAFE OPERATING AREA

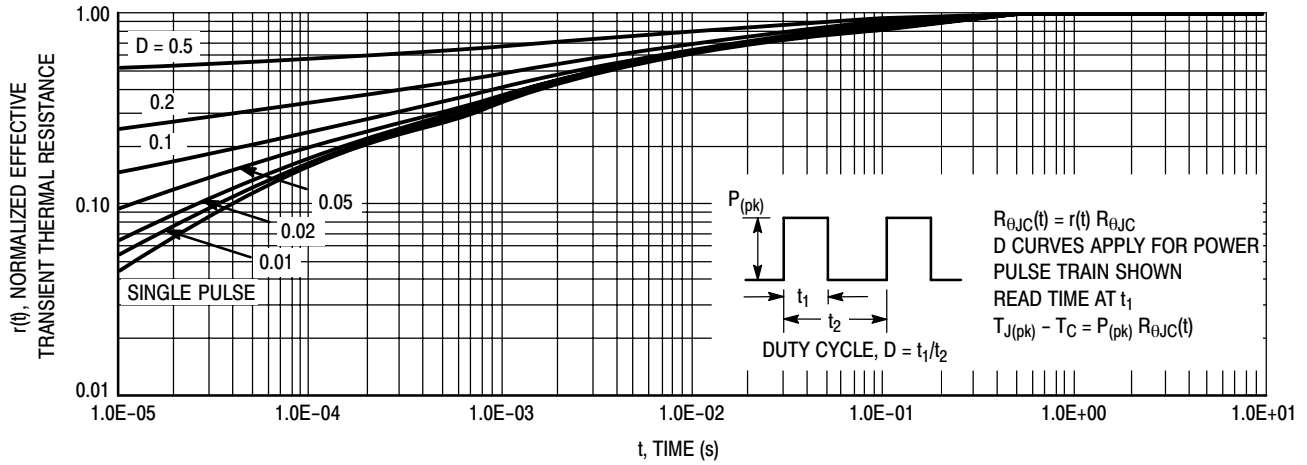


Figure 13. Thermal Response

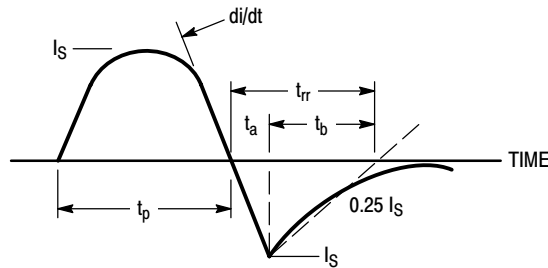


Figure 14. Diode Reverse Recovery Waveform

### ORDERING INFORMATION

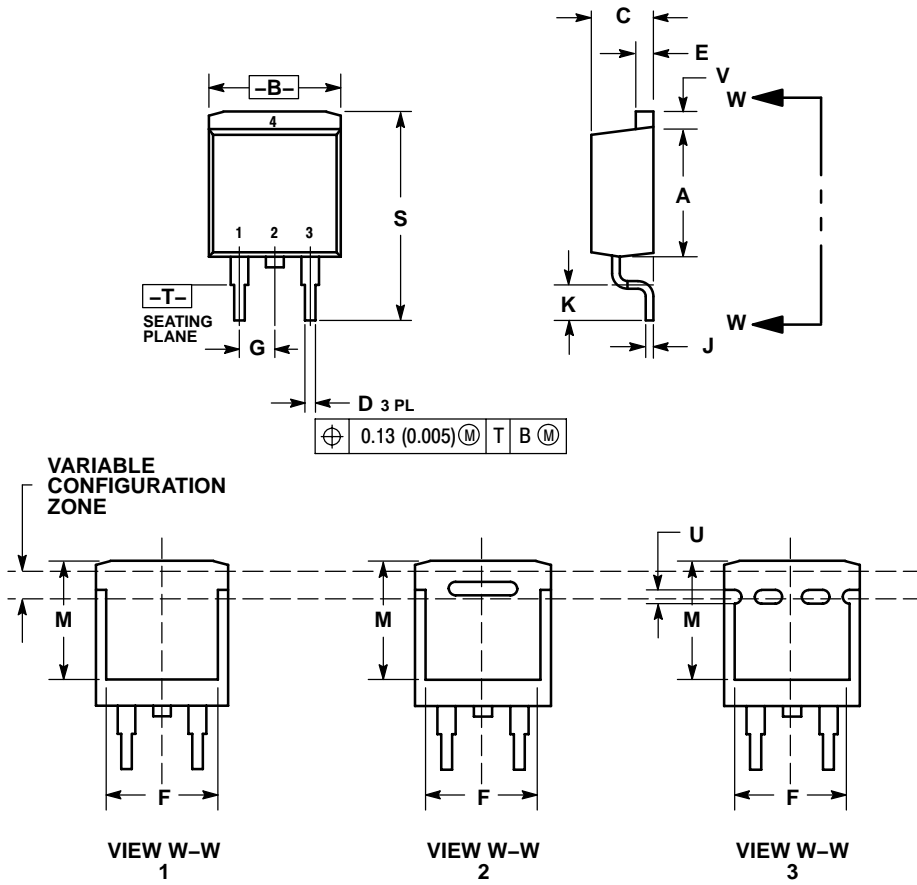
Device	Package	Shipping <sup>†</sup>
NTP4302	TO-220AB	50 Units / Rail
NTP4302G	TO-220AB (Pb-Free)	50 Units / Rail
NTB4302	D <sup>2</sup> PAK	50 Units / Rail
NTB4302G	D <sup>2</sup> PAK (Pb-Free)	50 Units / Rail
NTB4302T4	D <sup>2</sup> PAK	800 / Tape & Reel
NTB4302T4G	D <sup>2</sup> PAK (Pb-Free)	800 / Tape & Reel

<sup>†</sup>For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

# NTP4302, NTB4302

## PACKAGE DIMENSIONS

**D<sup>2</sup>PAK**  
CASE 418AA-01  
ISSUE O

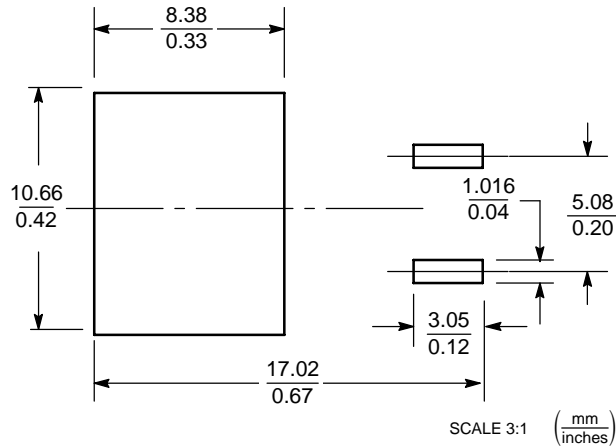


- NOTES:  
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.

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	0.036	0.51	0.92
E	0.045	0.055	1.14	1.40
F	0.310	---	7.87	---
G	0.100	BSC	2.54	BSC
J	0.018	0.025	0.46	0.64
K	0.090	0.110	2.29	2.79
M	0.280	---	7.11	---
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

### SOLDERING FOOTPRINT\*

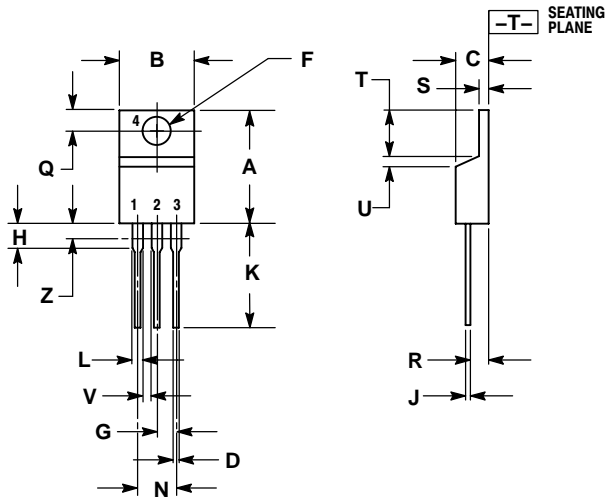


\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# NTP4302, NTB4302

## PACKAGE DIMENSIONS

TO-220  
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

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