

# NTB5426N, NTP5426N, NVB5426N



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## Power MOSFET 120 Amps, 60 Volts N-Channel D<sup>2</sup>PAK, TO-220

### Features

- Low  $R_{DS(on)}$
- High Current Capability
- Avalanche Energy Specified
- AEC Q101 Qualified – NVB5426N
- These Devices are Pb-Free and are RoHS Compliant

### Applications

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

**MAXIMUM RATINGS** ( $T_J = 25^\circ\text{C}$  Unless otherwise specified)

Parameter	Symbol	Value	Unit	
Drain-to-Source Voltage	$V_{DSS}$	60	V	
Gate-to-Source Voltage – Continuous	$V_{GS}$	$\pm 20$	V	
Gate-to-Source Voltage – Nonrepetitive ( $T_P < 10 \mu\text{s}$ )	$V_{GS}$	30	V	
Continuous Drain Current $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$I_D$ 120	A
		$T_C = 100^\circ\text{C}$	85	
Power Dissipation $R_{\theta JC}$ (Note 1)	Steady State	$T_C = 25^\circ\text{C}$	$P_D$ 215	W
Pulsed Drain Current	$t_p = 10 \mu\text{s}$	$I_{DM}$ 260	A	
Operating and Storage Temperature Range	$T_J, T_{stg}$	-55 to +175	$^\circ\text{C}$	
Source Current (Body Diode)	$I_S$	60	A	
Single Pulse Drain-to-Source Avalanche Energy – Starting $T_J = 25^\circ\text{C}$ ( $V_{DD} = 50 V_{dc}, V_{GS} = 10 V_{dc}, I_{L(pk)} = 70 \text{ A}, L = 0.3 \text{ mH}, R_G = 25 \Omega$ )	$E_{AS}$	735	mJ	
Lead Temperature for Soldering Purposes, 1/8" from Case for 10 Seconds	$T_L$	260	$^\circ\text{C}$	

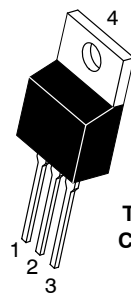
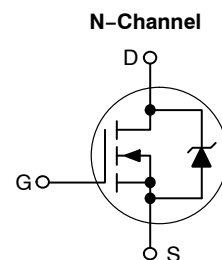
### THERMAL RESISTANCE RATINGS

Parameter	Symbol	Max	Unit
Junction-to-Case (Drain) Steady State (Note 1)	$R_{\theta JC}$	0.7	$^\circ\text{C/W}$

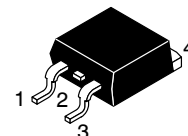
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1. Surface mounted on FR4 board using 1 sq in pad size, (Cu Area 1.127 sq in [1 oz] including traces).

$V_{(BR)DSS}$	$R_{DS(ON) MAX}$	$I_D MAX$ (Note 1)
60 V	6.0 m $\Omega$ @ 10 V	120 A

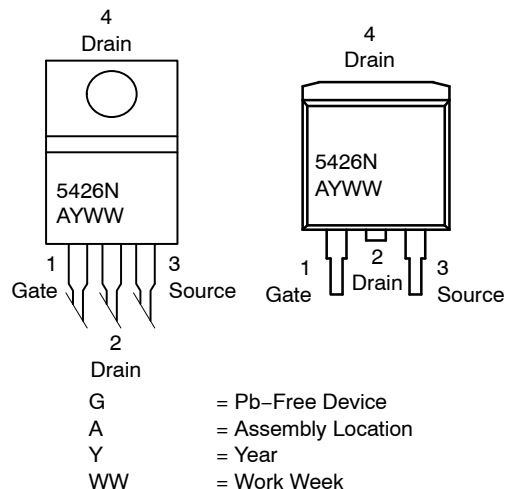


TO-220AB  
CASE 221A  
STYLE 5



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

### MARKING DIAGRAMS & PIN ASSIGNMENTS



### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# NTB5426N, NTP5426N, NVB5426N

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

Characteristics	Symbol	Test Condition	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>						
Drain-to-Source Breakdown Voltage	V <sub>(BR)DSS</sub>	V <sub>DS</sub> = 0 V, I <sub>D</sub> = 250 μA	60			V
Drain-to-Source Breakdown Voltage Temperature Coefficient	V <sub>(BR)DSS</sub> /T <sub>J</sub>			64		mV/°C
Zero Gate Voltage Drain Current	I <sub>DSS</sub>	V <sub>GS</sub> = 0 V V <sub>DS</sub> = 60 V	T <sub>J</sub> = 25°C		1.0	μA
			T <sub>J</sub> = 150°C		25	
Gate-Body Leakage Current	I <sub>GSS</sub>	V <sub>DS</sub> = 0 V, V <sub>GS</sub> = ±20 V			±100	nA

## ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V <sub>GS(th)</sub>	V <sub>GS</sub> = V <sub>DS</sub> , I <sub>D</sub> = 250 μA	2.0	3.1	4.0	V
Negative Threshold Temperature Coefficient	V <sub>GS(th)</sub> /T <sub>J</sub>			9.2		mV/°C
Drain-to-Source On Voltage	V <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 60 A		0.3	0.36	V
		V <sub>GS</sub> = 10 V, I <sub>D</sub> = 60 A, 150°C		0.6		
Static Drain-to-Source On-Resistance	R <sub>DS(on)</sub>	V <sub>GS</sub> = 10 V, I <sub>D</sub> = 60 A		4.9	6.0	mΩ
Forward Transconductance	g <sub>FS</sub>	V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A		65		S

## CHARGES, CAPACITANCES & GATE RESISTANCE

Input Capacitance	C <sub>iss</sub>	V <sub>DS</sub> = 25 V, V <sub>GS</sub> = 0 V, f = 1 MHz		5800		pF
Output Capacitance	C <sub>oss</sub>			1000		
Transfer Capacitance	C <sub>rss</sub>			370		
Total Gate Charge	Q <sub>G(TOT)</sub>	V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 48 V, I <sub>D</sub> = 60 A		150	170	nC
Threshold Gate Charge	Q <sub>G(TH)</sub>			6.0		
Gate-to-Source Charge	Q <sub>GS</sub>			28		
Gate-to-Drain Charge	Q <sub>GD</sub>			67		

## SWITCHING CHARACTERISTICS, V<sub>GS</sub> = 10 V (Note 3)

Turn-On Delay Time	t <sub>d(on)</sub>	V <sub>GS</sub> = 10 V, V <sub>DD</sub> = 48 V, I <sub>D</sub> = 60 A, R <sub>G</sub> = 3.0 Ω		15		ns
Rise Time	t <sub>r</sub>			100		
Turn-Off Delay Time	t <sub>d(off)</sub>			105		
Fall Time	t <sub>f</sub>			95		

## DRAIN-SOURCE DIODE CHARACTERISTICS

Forward Diode Voltage	V <sub>SD</sub>	V <sub>GS</sub> = 0 V I <sub>S</sub> = 60 A	T <sub>J</sub> = 25°C	0.88	1.1	V <sub>dc</sub>
			T <sub>J</sub> = 100°C	0.78		
Reverse Recovery Time	t <sub>rr</sub>	I <sub>S</sub> = 60 A <sub>dc</sub> , V <sub>GS</sub> = 0 V <sub>dc</sub> , di <sub>S</sub> /dt = 100 A/μs		75		ns
Charge Time	t <sub>a</sub>			50		
Discharge Time	t <sub>b</sub>			25		
Reverse Recovery Stored Charge	Q <sub>RR</sub>			235		

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

## ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
NTP5426N	TO-220AB (Pb-Free)	50 Units / Rail
NTB5426NT4G	D <sup>2</sup> PAK (Pb-Free)	800 / Tape & Reel
NVB5426NT4G	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.

TYPICAL CHARACTERISTICS

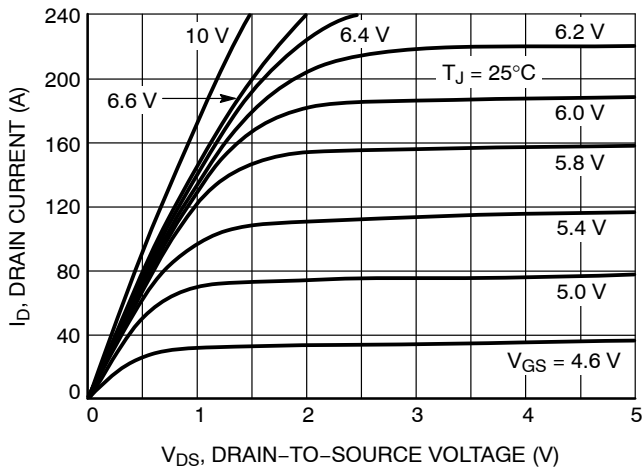


Figure 1. On-Region Characteristics

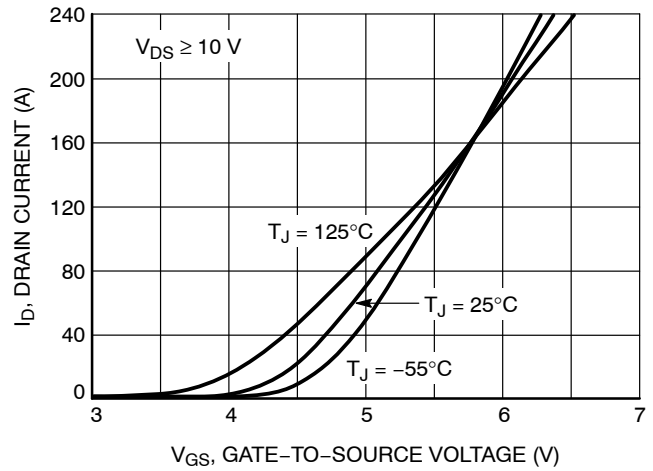


Figure 2. Transfer Characteristics

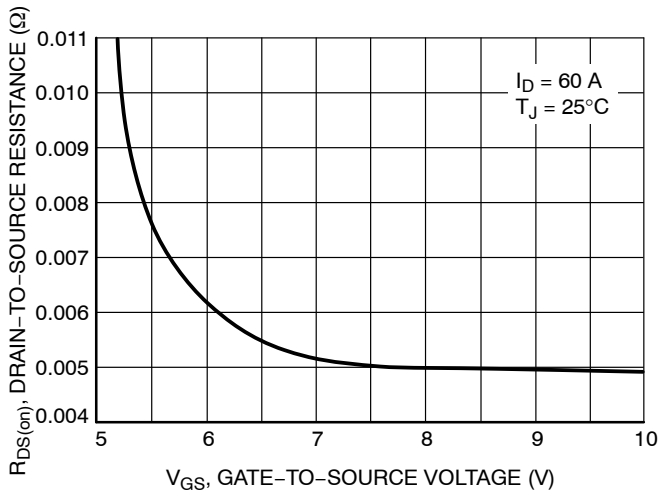


Figure 3. On-Resistance vs. Gate Voltage

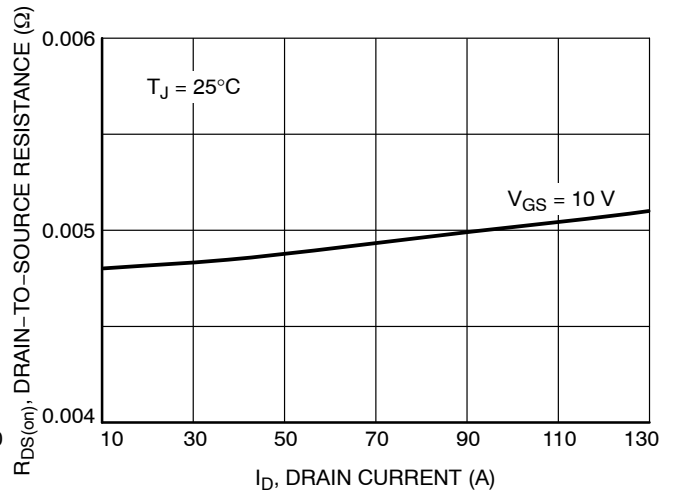


Figure 4. On-Resistance vs. Drain Current and Gate Voltage

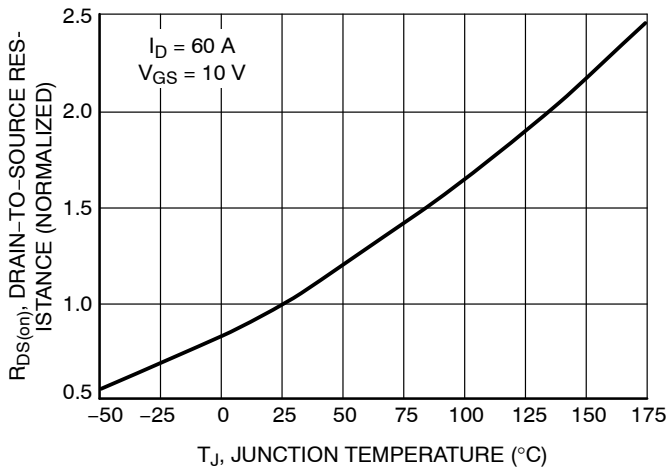


Figure 5. On-Resistance Variation with Temperature

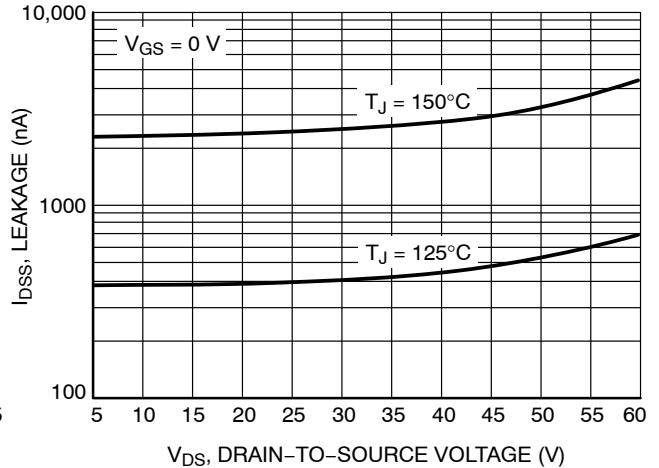


Figure 6. Drain-to-Source Leakage Current vs. Voltage

TYPICAL CHARACTERISTICS

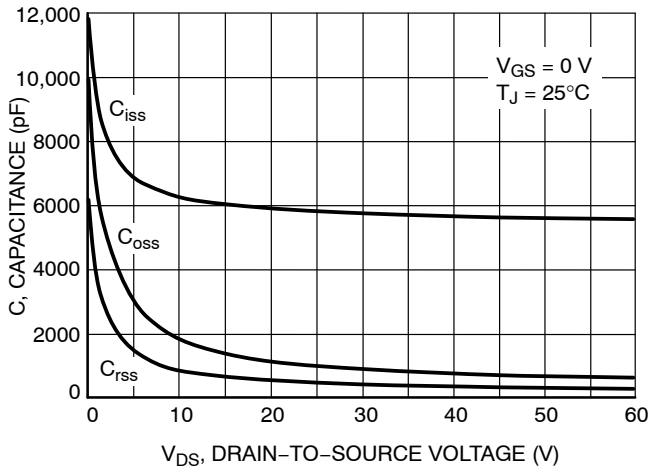


Figure 7. Capacitance Variation

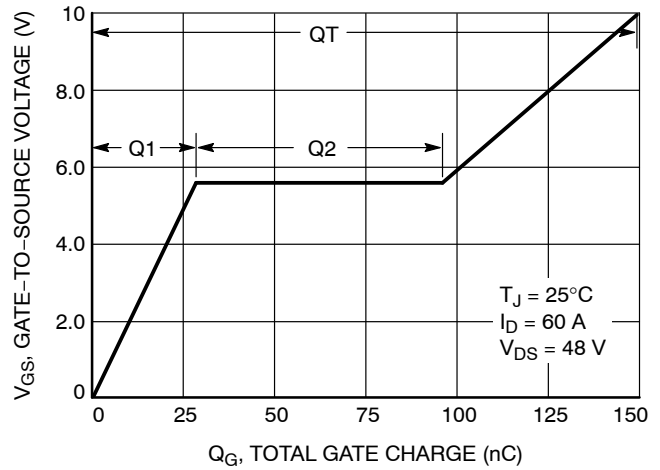


Figure 8. Gate-to-Source Voltage vs. Total Charge

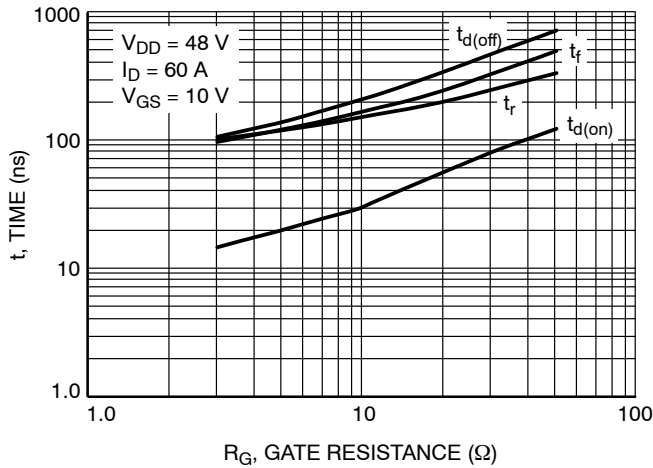


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

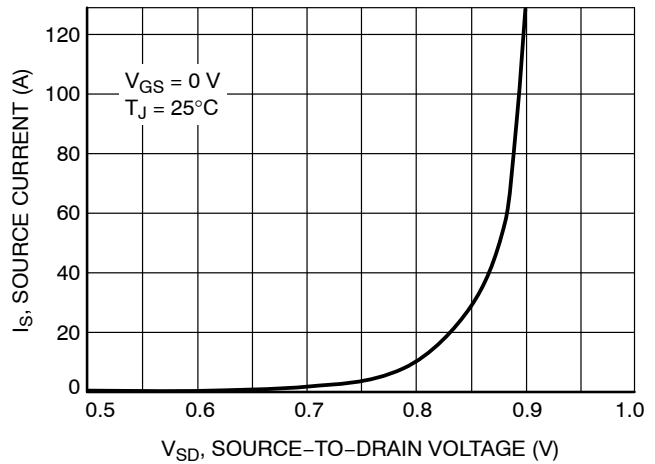


Figure 10. Diode Forward Voltage vs. Current

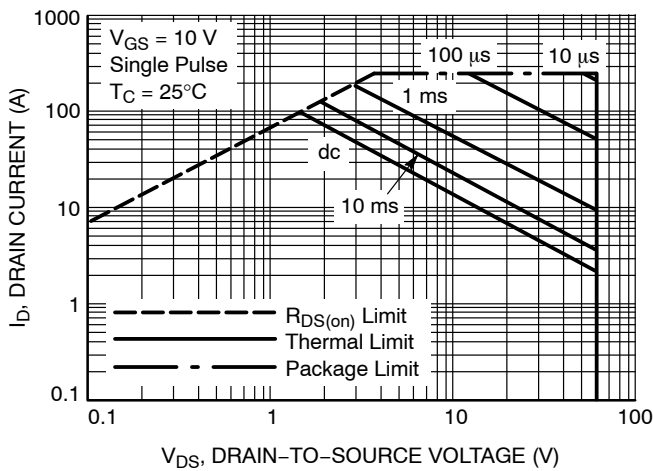


Figure 11. Maximum Rated Forward Biased Safe Operating Area

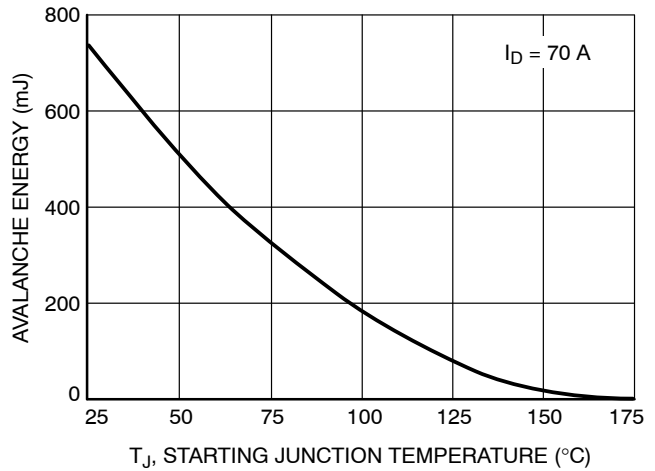


Figure 12. Maximum Avalanche Energy vs. Starting Junction Temperature

# NTB5426N, NTP5426N, NVB5426N

## TYPICAL CHARACTERISTICS

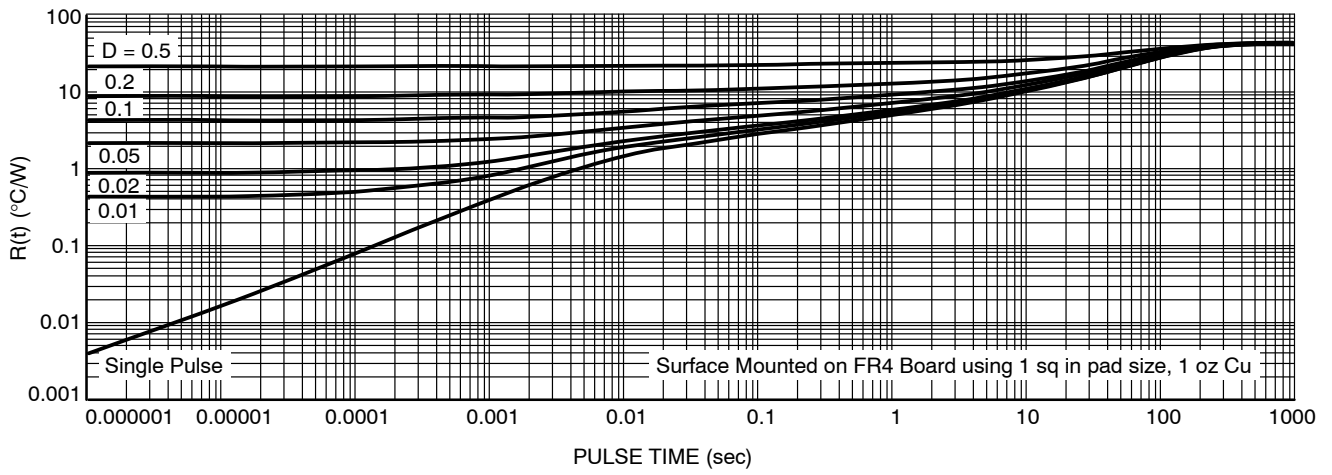


Figure 13. Thermal Response

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



## TO-220 CASE 221A ISSUE AK

DATE 13 JAN 2022



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

DIM	INCHES		MILLIMETERS	
	MIN.	MAX.	MIN.	MAX.
A	0.570	0.620	14.48	15.75
B	0.380	0.415	9.66	10.53
C	0.160	0.190	4.07	4.83
D	0.025	0.038	0.64	0.96
F	0.142	0.161	3.60	4.09
G	0.095	0.105	2.42	2.66
H	0.110	0.161	2.80	4.10
J	0.014	0.024	0.36	0.61
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	1.41
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 1:  
PIN 1. BASE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

STYLE 2:  
PIN 1. BASE  
2. EMITTER  
3. COLLECTOR  
4. EMITTER

STYLE 3:  
PIN 1. CATHODE  
2. ANODE  
3. GATE  
4. ANODE

STYLE 4:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. MAIN TERMINAL 2

STYLE 5:  
PIN 1. GATE  
2. DRAIN  
3. SOURCE  
4. DRAIN

STYLE 6:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. CATHODE

STYLE 7:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. ANODE

STYLE 8:  
PIN 1. CATHODE  
2. ANODE  
3. EXTERNAL TRIP/DELAY  
4. ANODE

STYLE 9:  
PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

STYLE 10:  
PIN 1. GATE  
2. SOURCE  
3. DRAIN  
4. SOURCE

STYLE 11:  
PIN 1. DRAIN  
2. SOURCE  
3. GATE  
4. SOURCE

STYLE 12:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. NOT CONNECTED

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# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

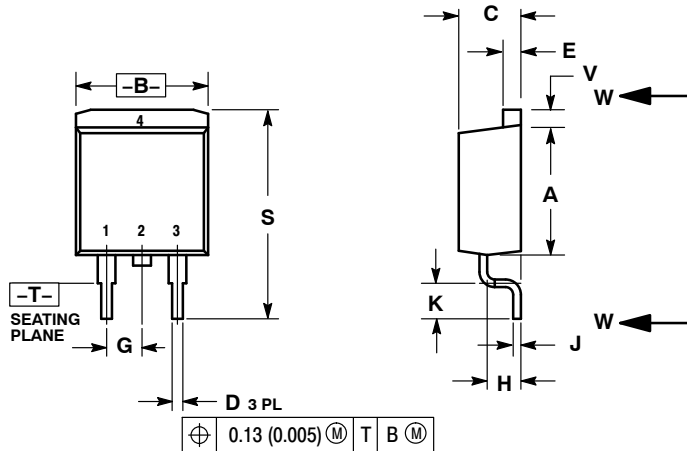
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**D<sup>2</sup>PAK 3**  
CASE 418B-04  
ISSUE L

DATE 17 FEB 2015

SCALE 1:1

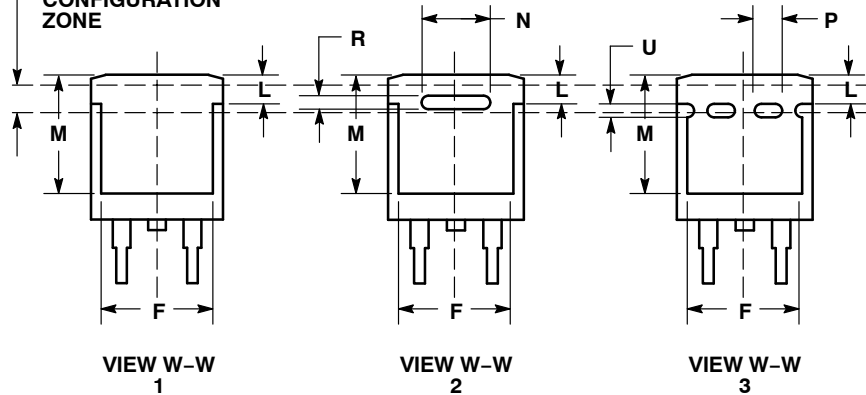


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. 418B-01 THRU 418B-03 OBSOLETE, NEW STANDARD 418B-04.

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
F	0.310	0.350	7.87	8.89
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
L	0.052	0.072	1.32	1.83
M	0.280	0.320	7.11	8.13
N	0.197	REF	5.00	REF
P	0.079	REF	2.00	REF
R	0.039	REF	0.99	REF
S	0.575	0.625	14.60	15.88
V	0.045	0.055	1.14	1.40

**VARIABLE CONFIGURATION ZONE**



- |  |   |   |  |   |  |
|--|---|---|--|---|--|
| <b>STYLE 1:</b><br>PIN 1. BASE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | <b>STYLE 2:</b><br>PIN 1. GATE<br>2. DRAIN<br>3. SOURCE<br>4. DRAIN | <b>STYLE 3:</b><br>PIN 1. ANODE<br>2. CATHODE<br>3. ANODE<br>4. CATHODE | <b>STYLE 4:</b><br>PIN 1. GATE<br>2. COLLECTOR<br>3. EMITTER<br>4. COLLECTOR | <b>STYLE 5:</b><br>PIN 1. CATHODE<br>2. ANODE<br>3. CATHODE<br>4. ANODE | <b>STYLE 6:</b><br>PIN 1. NO CONNECT<br>2. CATHODE<br>3. ANODE<br>4. CATHODE |
|--|---|---|--|---|--|

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**D<sup>2</sup>PAK 3**  
CASE 418B-04  
ISSUE L

DATE 17 FEB 2015

**GENERIC  
MARKING DIAGRAM\***



- xx = Specific Device Code
- A = Assembly Location
- WL = Wafer Lot
- Y = Year
- WW = Work Week
- G = Pb-Free Package
- AKA = Polarity Indicator

\*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "▪", may or may not be present.

**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.

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