

# NTP5864N

## MOSFET – Power 60 V, 63 A, 12.4 mΩ

### Features

- Low  $R_{DS(on)}$
- High Current Capability
- Avalanche Energy Specified
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

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

| Parameter  |                        | Symbol         | Value                     | Units            |   |
|--|------------------------|----------------|---------------------------|------------------|---|
| Drain-to-Source Voltage  |                        | $V_{DSS}$      | 60                        | V                |   |
| Gate-to-Source Voltage – Continuous                                      |                        | $V_{GS}$       | $\pm 20$                  | V                |   |
| Gate-to-Source Voltage – Non-Repetitive ( $t_p = 10 \mu\text{s}$ )       |                        | $V_{GS}$       | $\pm 30$                  | V                |   |
| Continuous Drain Current – $R_{\theta JC}$ (Note 1)                      | Steady State           | $I_D$          | $T_C = 25^\circ\text{C}$  | 63               | A |
|  |                        |                | $T_C = 100^\circ\text{C}$ | 45               |   |
| Power Dissipation – $R_{\theta JC}$ (Note 1)                             | Steady State           | $P_D$          | $T_C = 25^\circ\text{C}$  | 107              | W |
|  |                        |                | $T_C = 100^\circ\text{C}$ | 54               |   |
| Pulsed Drain Current   | $t_p = 10 \mu\text{s}$ | $I_{DM}$       | 252                       | A                |   |
| Operating Junction and Storage Temperature                               |                        | $T_J, T_{STG}$ | -55 to 175                | $^\circ\text{C}$ |   |
| Source Current (Body Diode) Pulsed                                       |                        | $I_S$          | 63                        | A                |   |
| Single Pulse Drain-to-Source Avalanche Energy – ( $L = 0.1 \text{ mH}$ ) |                        | EAS            | 80                        | mJ               |   |
|  |                        | IAS            | 40                        | A                |   |
| Lead Temperature for Soldering Purposes (1/8" from case for 10 s)        |                        | $T_L$          | 260                       | $^\circ\text{C}$ |   |

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

### THERMAL RESISTANCE RATINGS

| Parameter  | Symbol          | Max | Units              |
|--|-----------------|-----|--------------------|
| Junction-to-Case (Drain) – Steady State (Note 1) | $R_{\theta JC}$ | 1.4 | $^\circ\text{C/W}$ |
| Junction-to-Ambient – Steady State (Note 1)      | $R_{\theta JA}$ | 33  | $^\circ\text{C/W}$ |

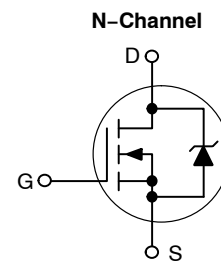
1. Surface mounted on FR4 board using 1 in sq pad size (Cu area = 1.127 in sq [2 oz] including traces).



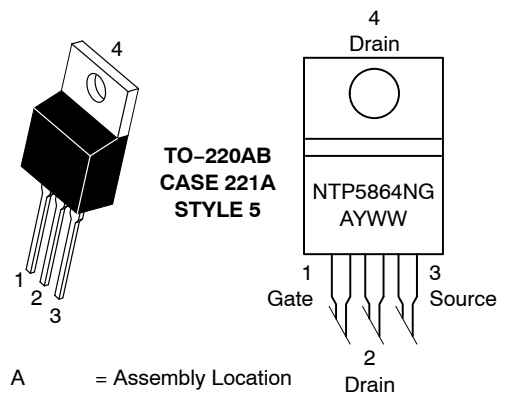
ON Semiconductor®

[www.onsemi.com](http://www.onsemi.com)

| $V_{(BR)DSS}$ | $R_{DS(ON) MAX}$ | $I_D MAX$ (Note 1) |
|---------------|------------------|--------------------|
| 60 V          | 12.4 mΩ @ 10 V   | 63 A               |



### MARKING DIAGRAM & PIN ASSIGNMENT



- A = Assembly Location
- Y = Year
- WW = Work Week
- G = Pb-Free Package

### ORDERING INFORMATION

| Device    | Package          | Shipping        |
|-----------|------------------|-----------------|
| NTP5864NG | TO-220 (Pb-Free) | 50 Units / Rail |

# NTP5864N

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

| Parameter   | Symbol                               | Test Condition   | Min | Typ | Max  | Unit  |
|---|--------------------------------------|--|-----|-----|------|-------|
| <b>OFF CHARACTERISTICS</b>                                |                                      |  |     |     |      |       |
| Drain-to-Source Breakdown Voltage                         | V <sub>(BR)DSS</sub>                 | V <sub>GS</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> |  |     | 58  |      | 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    |
| Gate-to-Source 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 |      | 4.0  | V     |
| Gate Threshold Temperature Coefficient | V <sub>GS(TH)</sub> /T <sub>J</sub> |   |     | -10  |      | mV/°C |
| Drain-to-Source On Resistance          | R <sub>DS(on)</sub>                 | V <sub>GS</sub> = 10 V, I <sub>D</sub> = 20 A               |     | 10.2 | 12.4 | mΩ    |
| Forward Transconductance               | g <sub>FS</sub>                     | V <sub>DS</sub> = 15 V, I <sub>D</sub> = 20 A               |     | 10   |      | S     |

## CHARGES AND CAPACITANCES

|                              |                     |   |  |      |  |    |
|------------------------------|---------------------|---|--|------|--|----|
| Input Capacitance            | C <sub>ISS</sub>    | V <sub>GS</sub> = 0 V, f = 1.0 MHz, V <sub>DS</sub> = 25 V            |  | 1680 |  | pF |
| Output Capacitance           | C <sub>OSS</sub>    |   |  | 189  |  |    |
| Reverse Transfer Capacitance | C <sub>RSS</sub>    |   |  | 124  |  |    |
| Total Gate Charge            | Q <sub>G(TOT)</sub> | V <sub>GS</sub> = 10 V, V <sub>DS</sub> = 48 V, I <sub>D</sub> = 20 A |  | 31   |  | nC |
| Threshold Gate Charge        | Q <sub>G(TH)</sub>  |   |  | 2.0  |  |    |
| Gate-to-Source Charge        | Q <sub>GS</sub>     |   |  | 7.3  |  |    |
| Gate-to-Drain Charge         | Q <sub>GD</sub>     |   |  | 10   |  |    |
| Gate Resistance              | R <sub>g</sub>      |   |  | 0.5  |  | Ω  |

## 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> = 20 A, R <sub>G</sub> = 2.5 Ω |  | 10  |  | ns |
| Rise Time           | t <sub>r</sub>      |   |  | 6.4 |  |    |
| Turn-Off Delay Time | t <sub>d(OFF)</sub> |   |  | 18  |  |    |
| Fall Time           | t <sub>f</sub>      |   |  | 4.6 |  |    |

## DRAIN-SOURCE DIODE CHARACTERISTICS

|                         |                 |   |                        |      |     |    |
|-------------------------|-----------------|---|------------------------|------|-----|----|
| Forward Diode Voltage   | V <sub>SD</sub> | V <sub>GS</sub> = 0 V, I <sub>S</sub> = 40 A                                  | T <sub>J</sub> = 25°C  | 0.94 | 1.2 | V  |
|                         |                 |   | T <sub>J</sub> = 125°C | 0.84 |     |    |
| Reverse Recovery Time   | t <sub>RR</sub> | V <sub>GS</sub> = 0 V, dI <sub>SD</sub> /dt = 100 A/μs, I <sub>S</sub> = 20 A |                        | 24   |     | ns |
| Charge Time             | t <sub>a</sub>  |   |                        | 16   |     |    |
| Discharge Time          | t <sub>b</sub>  |   |                        | 7.9  |     |    |
| Reverse Recovery Charge | Q <sub>RR</sub> |   |                        | 20   |     |    |

2. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.

3. Switching characteristics are independent of operating junction temperatures.

TYPICAL CHARACTERISTICS

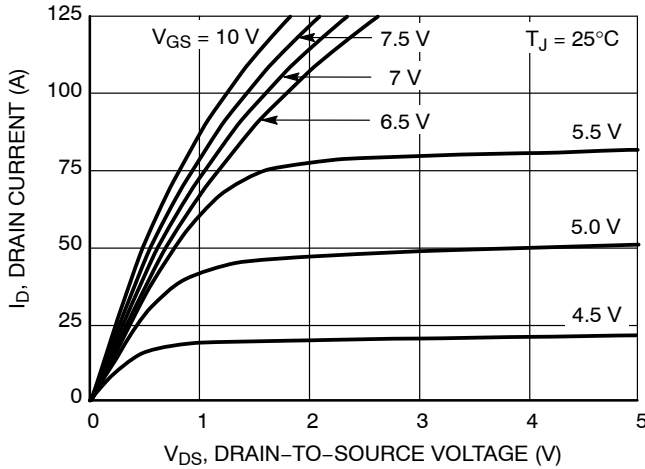


Figure 1. On-Region Characteristics

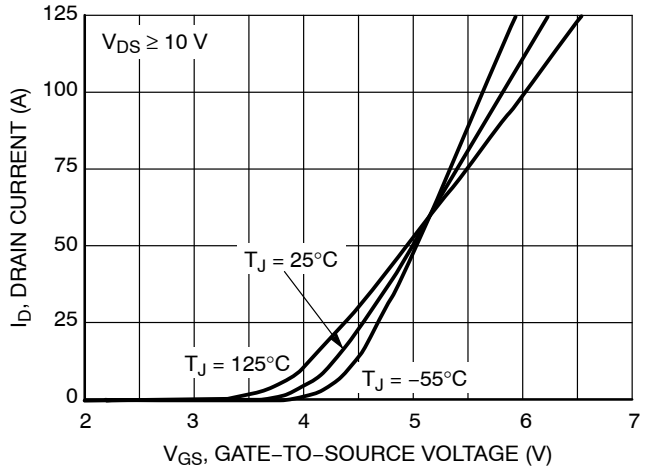


Figure 2. Transfer Characteristics

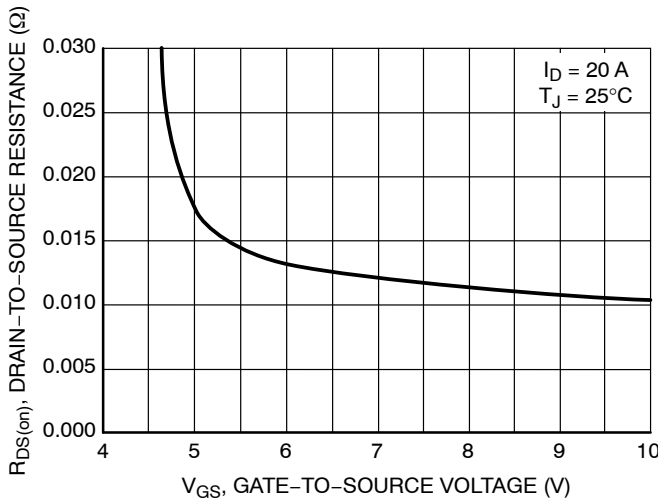


Figure 3. On-Resistance vs. Gate Voltage

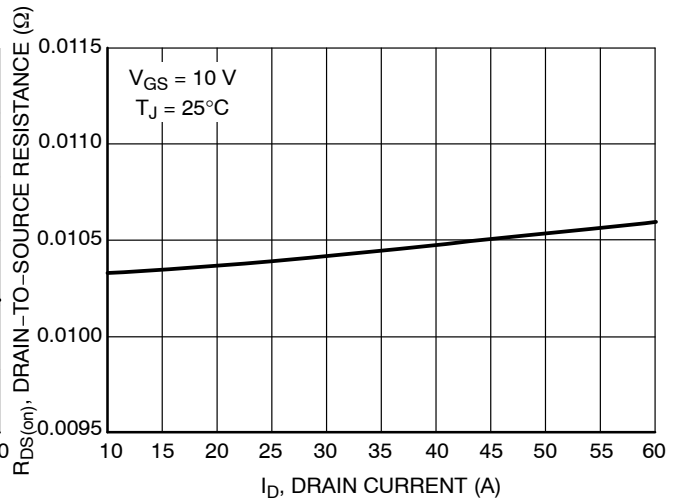


Figure 4. On-Resistance vs. Drain Current

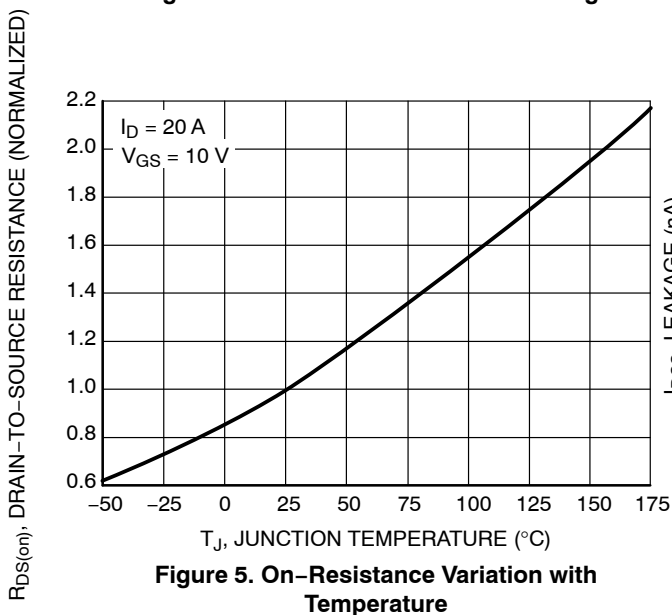


Figure 5. On-Resistance Variation with Temperature

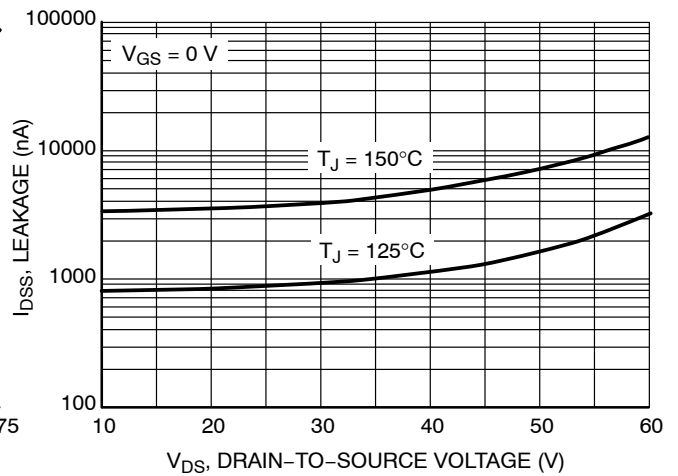


Figure 6. Drain-to-Source Leakage Current vs. Voltage

# NTP5864N

## TYPICAL CHARACTERISTICS

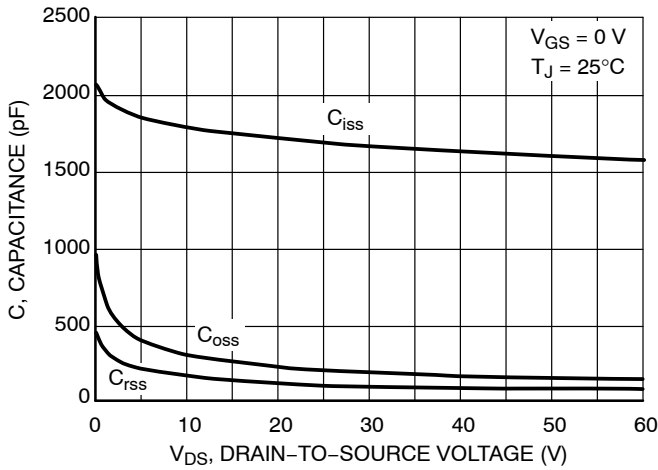


Figure 7. Capacitance Variation

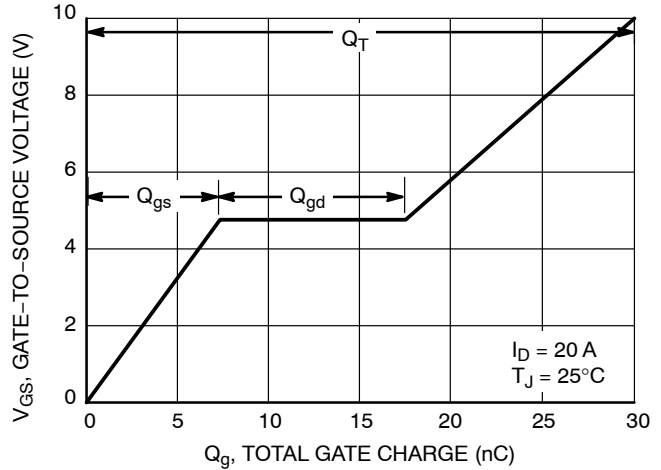


Figure 8. Gate-to-Source vs. Total Charge

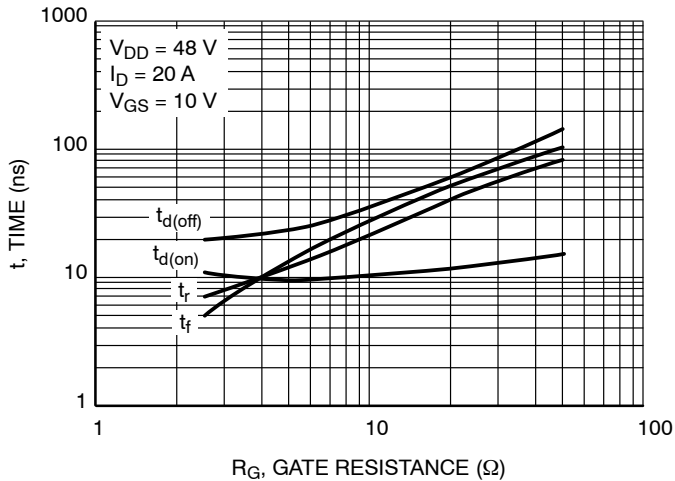


Figure 9. Resistive Switching Time Variation vs. Gate Resistance

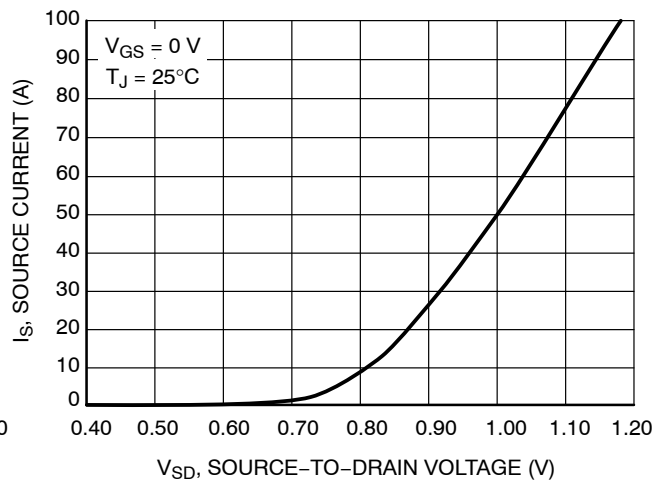


Figure 10. Diode Forward Voltage vs. Current

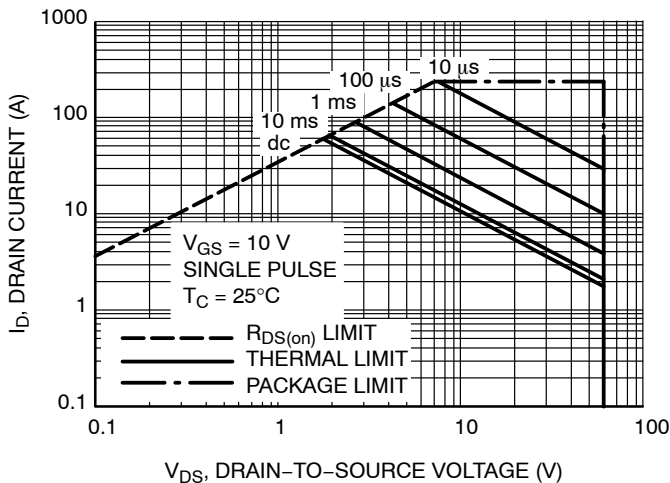


Figure 11. Maximum Rated Forward Biased Safe Operating Area

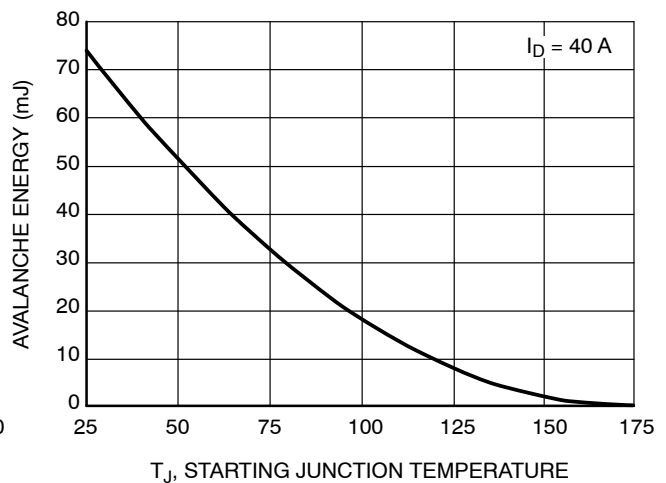


Figure 12. Maximum Avalanche Energy versus Starting Junction Temperature

# NTP5864N

## TYPICAL CHARACTERISTICS

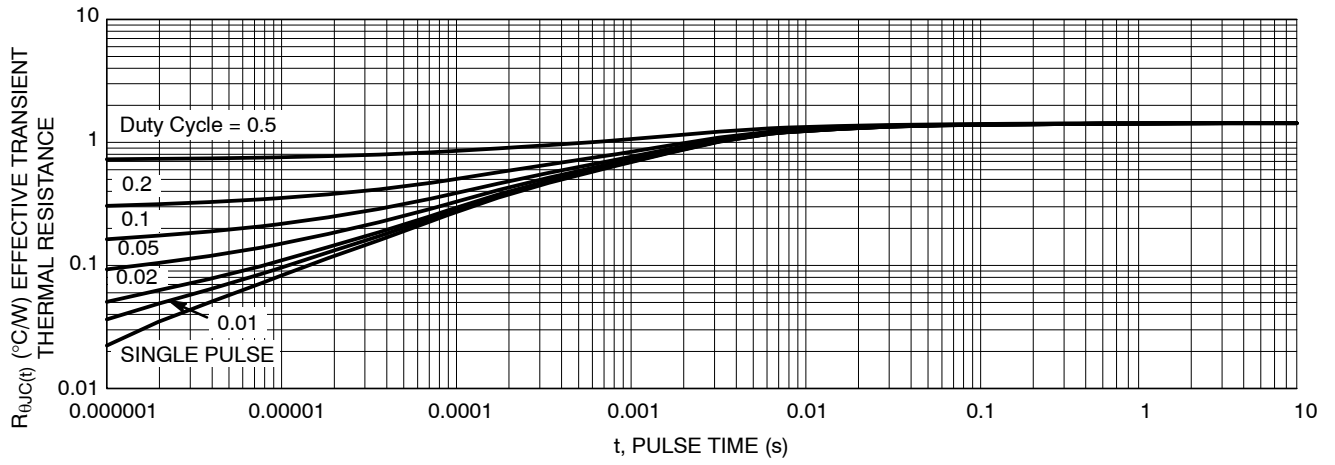
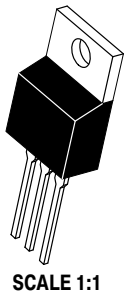


Figure 13. Thermal Response

# 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

|                  |             |  |
|------------------|-------------|--|
| DOCUMENT NUMBER: | 98ASB42148B | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red. |
| DESCRIPTION:     | TO-220      | PAGE 1 OF 1  |

onsemi and ONSEMI are trademarks of Semiconductor Components Industries, LLC dba onsemi or its subsidiaries in the United States and/or other countries. onsemi reserves the right to make changes without further notice to any products herein. onsemi makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does onsemi assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. onsemi does not convey any license under its patent rights nor the rights of others.

**onsemi**, **Onsemi**, and other names, marks, and brands are registered and/or common law trademarks of Semiconductor Components Industries, LLC dba "**onsemi**" or its affiliates and/or subsidiaries in the United States and/or other countries. **onsemi** owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of **onsemi**'s product/patent coverage may be accessed at [www.onsemi.com/site/pdf/Patent-Marking.pdf](http://www.onsemi.com/site/pdf/Patent-Marking.pdf). **onsemi** reserves the right to make changes at any time to any products or information herein, without notice. The information herein is provided "as-is" and **onsemi** makes no warranty, representation or guarantee regarding the accuracy of the information, product features, availability, functionality, or suitability of its products for any particular purpose, nor does **onsemi** assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. Buyer is responsible for its products and applications using **onsemi** products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by **onsemi**. "Typical" parameters which may be provided in **onsemi** data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. **onsemi** does not convey any license under any of its intellectual property rights nor the rights of others. **onsemi** products are not designed, intended, or authorized for use as a critical component in life support systems or any FDA Class 3 medical devices or medical devices with a same or similar classification in a foreign jurisdiction or any devices intended for implantation in the human body. Should Buyer purchase or use **onsemi** products for any such unintended or unauthorized application, Buyer shall indemnify and hold **onsemi** and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that **onsemi** was negligent regarding the design or manufacture of the part. **onsemi** is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Email Requests to: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

**onsemi Website:** [www.onsemi.com](http://www.onsemi.com)

### TECHNICAL SUPPORT

**North American Technical Support:**

Voice Mail: 1 800-282-9855 Toll Free USA/Canada

Phone: 011 421 33 790 2910

**Europe, Middle East and Africa Technical Support:**

Phone: 00421 33 790 2910

For additional information, please contact your local Sales Representative

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [MOSFET](#) category:*

*Click to view products by [ON Semiconductor](#) manufacturer:*

Other Similar products are found below :

[614233C](#) [648584F](#) [IRFD120](#) [JANTX2N5237](#) [FCA20N60\\_F109](#) [FDZ595PZ](#) [2SK2545\(Q,T\)](#) [405094E](#) [423220D](#) [TPCC8103,L1Q\(CM](#)  
[MIC4420CM-TR](#) [VN1206L](#) [SBVS138LT1G](#) [614234A](#) [715780A](#) [NTNS3166NZT5G](#) [SSM6J414TU,LF\(T](#) [751625C](#) [BUK954R8-60E](#)  
[NTE6400](#) [SQJ402EP-T1-GE3](#) [2SK2614\(TE16L1,Q\)](#) [2N7002KW-FAI](#) [DMN1017UCP3-7](#) [EFC2J004NUZTDG](#) [ECH8691-TL-W](#)  
[FCAB21350L1](#) [P85W28HP2F-7071](#) [DMN1053UCP4-7](#) [NTE221](#) [NTE2384](#) [NTE2903](#) [NTE2941](#) [NTE2945](#) [NTE2946](#) [NTE2960](#) [NTE2967](#)  
[NTE2969](#) [NTE2976](#) [NTE455](#) [NTE6400A](#) [NTE2910](#) [NTE2916](#) [NTE2956](#) [NTE2911](#) [DMN2080UCB4-7](#) [TK10A80W,S4X\(S](#)  
[SSM6P69NU,LF](#) [DMP22D4UFO-7B](#) [DMN1006UCA6-7](#)