# MOSFET – Power, Single N-Channel, D²PAK7

## 100 V, 4.1 mΩ, 203 A

# NTBGS004N10G

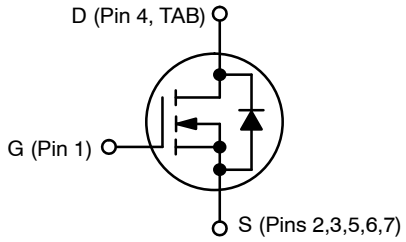
| $V_{(BR)DSS}$ | $R_{DS(ON)}$ MAX | $I_D$ MAX |
|---|---|---|
| 100 V | 4.1 mΩ @ 10 V | 203 A |

### Features

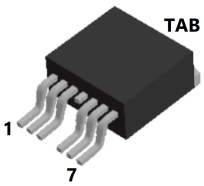
- Low $R_{DS(on)}$
- High Current Capability
- Wide SOA
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- Hot Swap in 48 V Systems




**N-CHANNEL MOSFET**




**D²PAK7**
**CASE 418AY**

**MARKING DIAGRAM**

AYWWZZ
NTBG
S004N10G

A = Assembly Location
Y = Year
WW = Work Week
ZZ = Assembly Lot Code
NTBGS004N10G = Specific Device Code

**MAXIMUM RATINGS** ($T_J$ = 25 °C unless otherwise noted)

| Parameter | | | Symbol | Value | Unit |
|---|---|---|---|---|---|
| Drain-to-Source Voltage | | | $V_{DSS}$ | 100 | V |
| Gate-to-Source Voltage | | | $V_{GS}$ | ±20 | V |
| Continuous Drain Current $R_{\theta JC}$ (Note 2) | Steady State | $T_C$ = 25 °C | $I_D$ | 203 | A |
| Power Dissipation $R_{\theta JC}$ (Note 2) | | | $P_D$ | 340 | W |
| Continuous Drain Current $R_{\theta JA}$ (Notes 1, 2) | Steady State | $T_A$ = 25 °C | $I_D$ | 21 | A |
| Power Dissipation $R_{\theta JA}$ (Notes 1, 2) | | | $P_D$ | 3.7 | W |
| Pulsed Drain Current | $T_A$ = 25 °C, $t_p$ = 10 μs | | $I_{DM}$ | 2983 | A |
| Operating Junction and Storage Temperature | | | $T_J$, $T_{stg}$ | −55 to + 175 | °C |
| Source Current (Body Diode) | | | $I_S$ | 283 | A |
| Single Pulse Drain-to-Source Avalanche Energy ($I_L$ = 106 $A_{pk}$, L = 0.1 mH) | | | $E_{AS}$ | 561 | mJ |
| Lead Temperature for Soldering Purposes (1/8″ from case for 10 s) | | | $T_L$ | 260 | °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.

1. Surface-mounted on FR4 board using a 1 $in^2$, 1 oz. Cu pad.
2. The entire application environment impacts the thermal resistance values shown, they are not constants and are only valid for the particular conditions noted.

**ORDERING INFORMATION**

| Device | Package | Shipping† |
|---|---|---|
| NTBGS004N10G | D²PAK7 (Pb-Free) | 800 / Tape & Reel |

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

© Semiconductor Components Industries, LLC, 2019

## THERMAL RESISTANCE MAXIMUM RATINGS

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Junction-to-Case – Steady State (Note 2) | $R_{\theta JC}$ | 0.44 | °C/W |
| Junction-to-Ambient – Steady State (Note 2) | $R_{\theta JA}$ | 40 | |

## ELECTRICAL CHARACTERISTICS ($T_J$ = 25 °C unless otherwise specified)

| Parameter | Symbol | Test Condition | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **OFF CHARACTERISTICS** | | | | | | | |
| Drain-to-Source Breakdown Voltage | $V_{(BR)DSS}$ | $V_{GS}$ = 0 V, $I_D$ = 250 μA | | 100 | | | V |
| Drain-to-Source Breakdown Voltage Temperature Coefficient | $V_{(BR)DSS}/T_J$ | $I_D$ = 250 μA, ref to 25 °C | | | 81.3 | | mV/°C |
| Zero Gate Voltage Drain Current | $I_{DSS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 80 V | $T_J$ = 25 °C | | | 1.0 | μA |
| | | | $T_J$ = 125 °C | | | 100 | μA |
| Gate-to-Source Leakage Current | $I_{GSS}$ | $V_{DS}$ = 0 V, $V_{GS}$ = 20 V | | | | 100 | nA |
| **ON CHARACTERISTICS** (Note 3) | | | | | | | |
| Gate Threshold Voltage | $V_{GS(TH)}$ | $V_{GS}$ = $V_{DS}$, $I_D$ = 500 μA | | 2.0 | | 4.0 | V |
| Negative Threshold Temperature Coefficient | $V_{GS(TH)}/T_J$ | $I_D$ = 500 μA, ref to 25 °C | | | –9.3 | | mV/°C |
| Drain-to-Source On Resistance | $R_{DS(on)}$ | $V_{GS}$ = 10 V, $I_D$ = 100 A | | | 3.0 | 4.1 | mΩ |
| Forward Transconductance | $g_{FS}$ | $V_{DS}$ = 5 V, $I_D$ = 100 A | | | 71 | | S |
| Gate-Resistance | $R_G$ | $T_A$ = 25 °C | | | 0.42 | | Ω |
| **CHARGES, CAPACITANCES & GATE RESISTANCE** | | | | | | | |
| Input Capacitance | $C_{ISS}$ | $V_{GS}$ = 0 V, $V_{DS}$ = 50 V, f = 1 MHz | | | 12100 | | pF |
| Output Capacitance | $C_{OSS}$ | | | | 1170 | | |
| Reverse Transfer Capacitance | $C_{RSS}$ | | | | 165 | | |
| Total Gate Charge | $Q_{G(TOT)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 50 V; $I_D$ = 100 A | | | 178 | | nC |
| Threshold Gate Charge | $Q_{G(TH)}$ | | | | 79 | | |
| Gate-to-Source Charge | $Q_{GS}$ | | | | 66 | | |
| Gate-to-Drain Charge | $Q_{GD}$ | | | | 43 | | |
| Plateau Voltage | $V_{GP}$ | | | | 6.0 | | V |
| **SWITCHING CHARACTERISTICS** (Note 4) | | | | | | | |
| Turn-On Delay Time | $t_{d(ON)}$ | $V_{GS}$ = 10 V, $V_{DS}$ = 50 V, $I_D$ = 100 A, $R_G$ = 4.7 Ω | | | 44 | | ns |
| Rise Time | $t_r$ | | | | 41 | | |
| Turn-Off Delay Time | $t_{d(OFF)}$ | | | | 81 | | |
| Fall Time | $t_f$ | | | | 29 | | |
| **DRAIN-SOURCE DIODE CHARACTERISTICS** | | | | | | | |
| Forward Diode Voltage | $V_{SD}$ | $V_{GS}$ = 0 V, $I_S$ = 100 A | $T_J$ = 25 °C | | 0.88 | 1.2 | V |
| | | | $T_J$ = 125 °C | | 0.77 | | |
| Reverse Recovery Time | $t_{RR}$ | $V_{GS}$ = 0 V, $dI_S/dt$ = 100 A/μs, $I_S$ = 50 A | | | 74 | | ns |
| Charge Time | $t_a$ | | | | 46 | | |
| Discharge Time | $t_b$ | | | | 29 | | |
| Reverse Recovery Charge | $Q_{RR}$ | | | | 151 | | nC |

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

3. Pulse Test: pulse width ≤ 300 μs, duty cycle ≤ 2%.
4. Switching characteristics are independent of operating junction temperatures.



Share Feedback
Your Opinion Matters

## TYPICAL CHARACTERISTICS

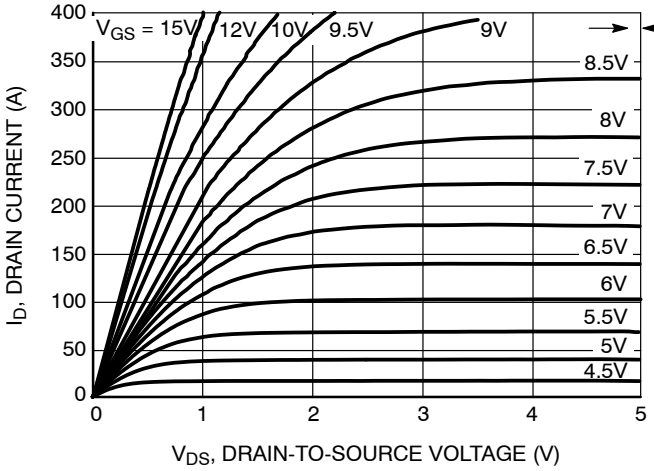



**Figure 1. On-Region Characteristics**

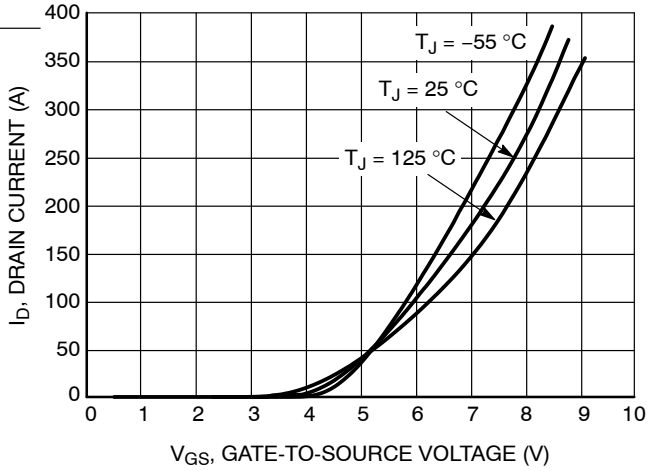



**Figure 2. Transfer Characteristics**

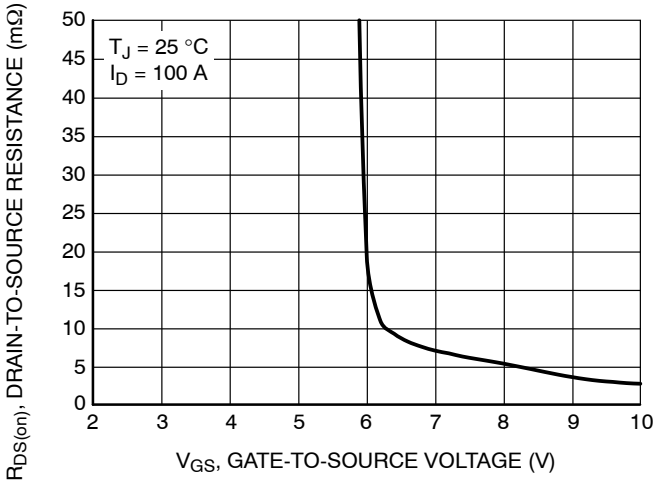



**Figure 3. On-Resistance vs. Gate-to-Source Voltage**

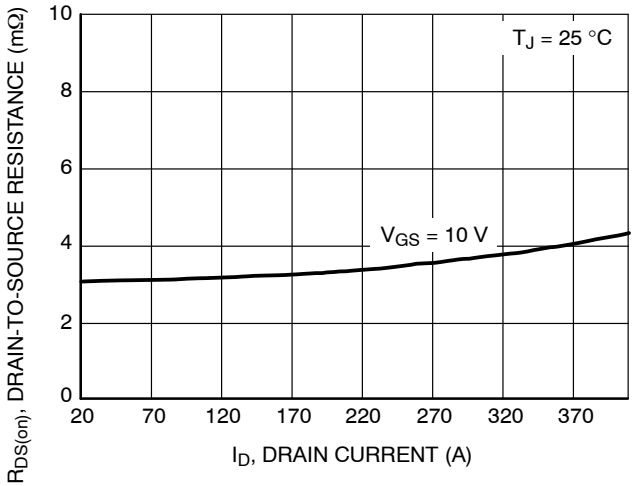



**Figure 4. On-Resistance vs. Drain Current and Gate Voltage**

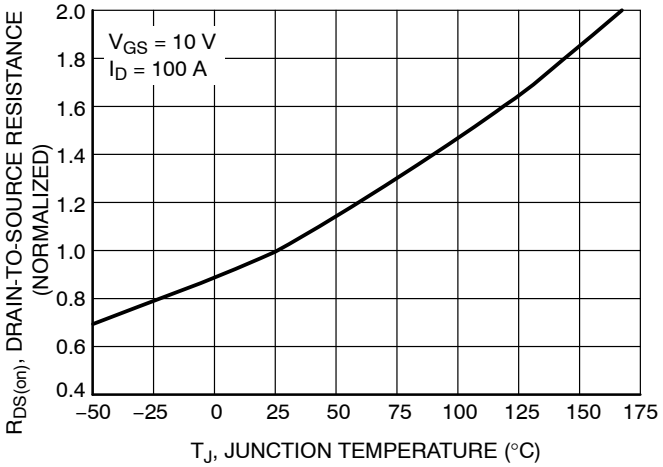



**Figure 5. On-Resistance Variation with Temperature**

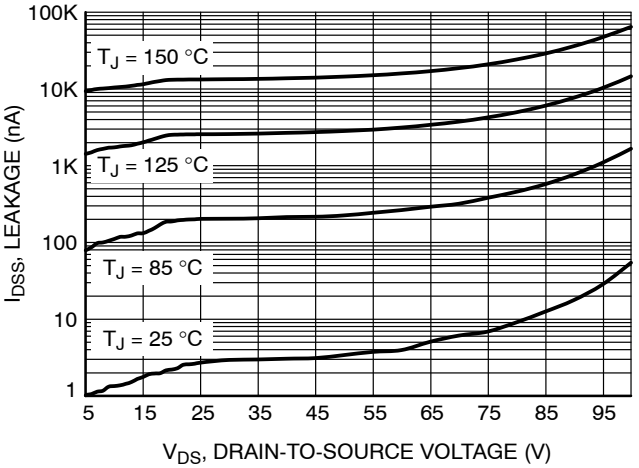



**Figure 6. Drain-to-Source Leakage Current vs. Voltage**



Share Feedback
Your Opinion Matters

## TYPICAL CHARACTERISTICS

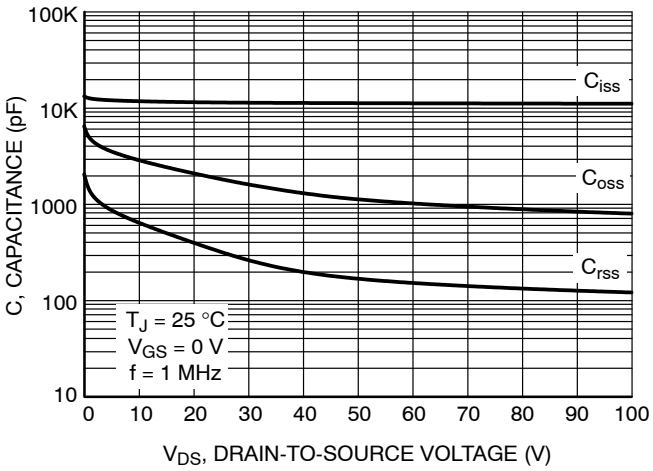



**Figure 7. Capacitance Variation**

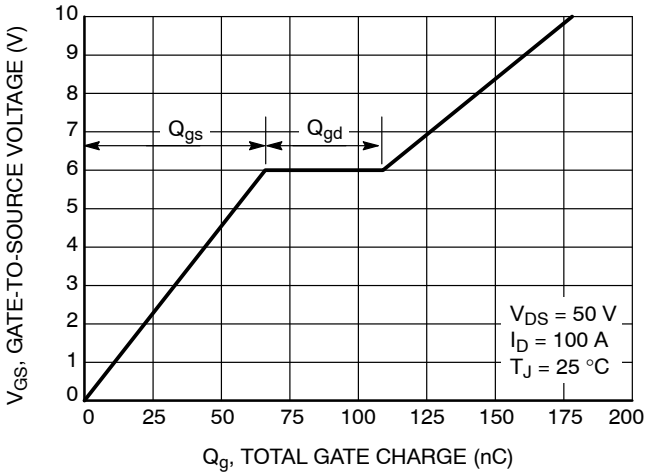



**Figure 8. Gate-to-Source vs. Total Charge**

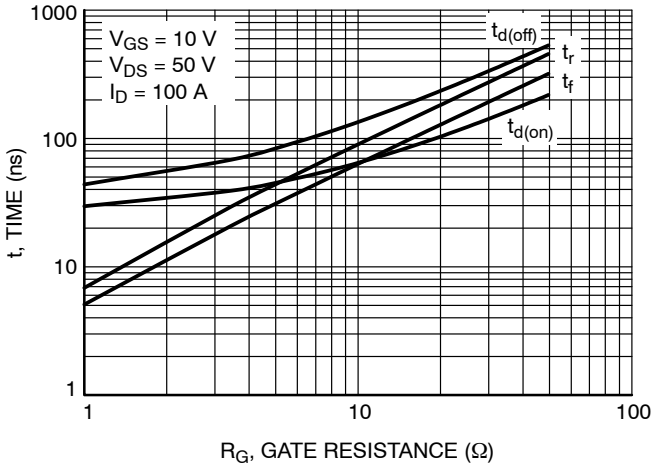



**Figure 9. Resistive Switching Time Variation vs. Gate Resistance**

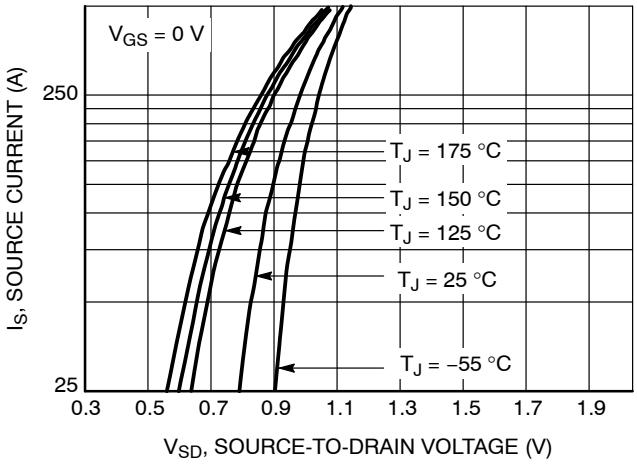



**Figure 10. Diode Forward Voltage vs. Current**

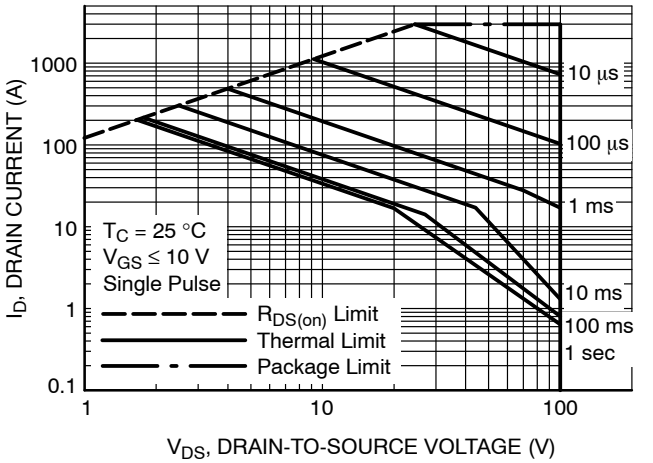



**Figure 11. Maximum Rated Forward Biased Safe Operating Area**

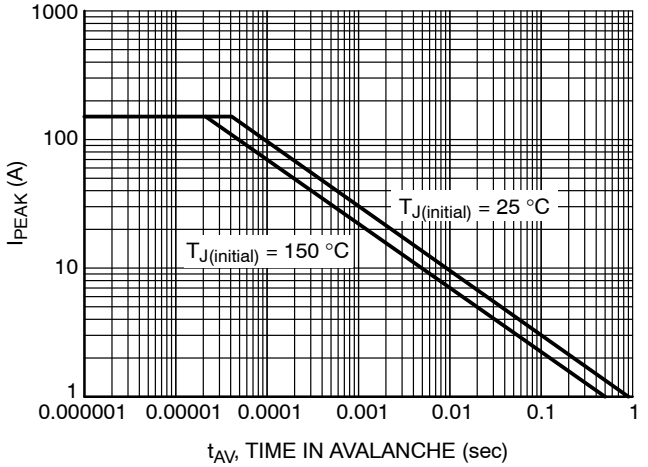



**Figure 12. Maximum Drain Current vs. Time in Avalanche**



Share Feedback
Your Opinion Matters

## TYPICAL CHARACTERISTICS

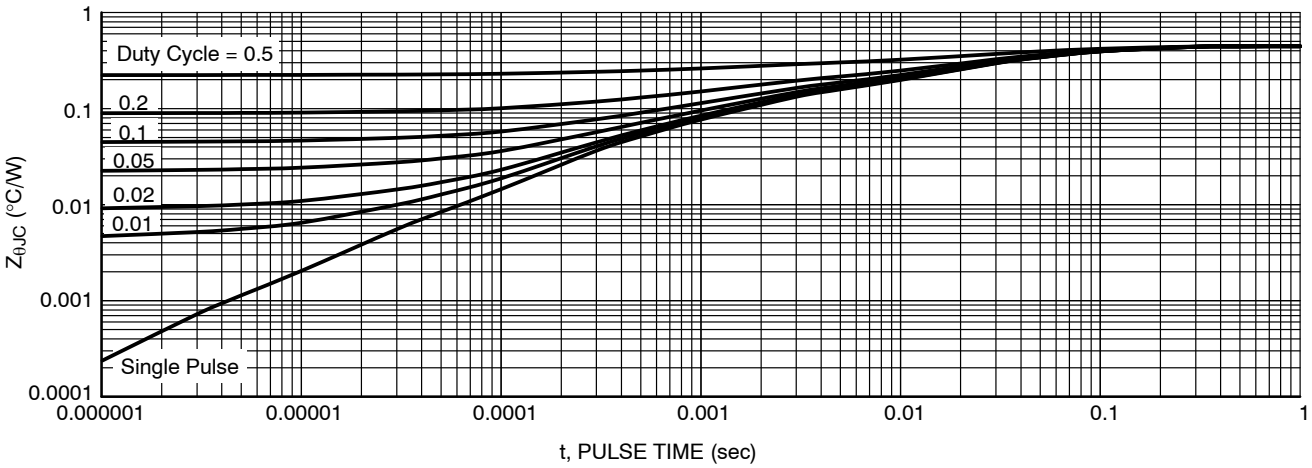



**Figure 13. Transient Thermal Impedance**



Share Feedback
Your Opinion Matters

## REVISION HISTORY

| Revision | Description of Changes | Date |
|---|---|---|
| 1 | Rebranded the Data Sheet to **onsemi** format and corrected curves in Figure 11 ($R_{ds(on)}$, thermal, package limits). | 1/28/2025 |

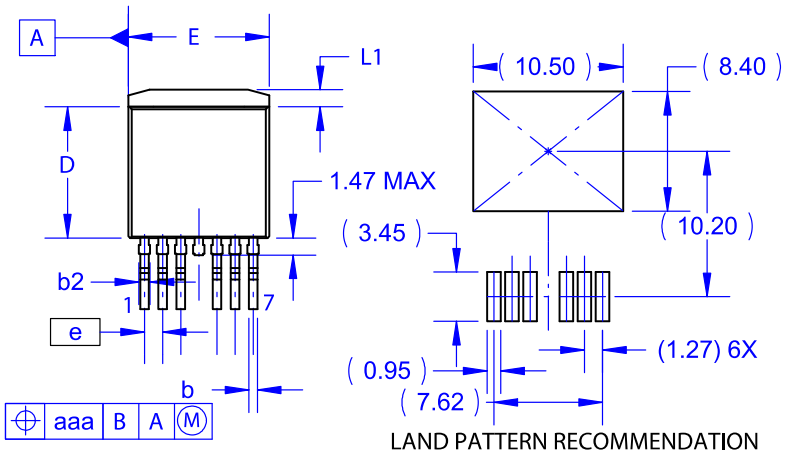
This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.



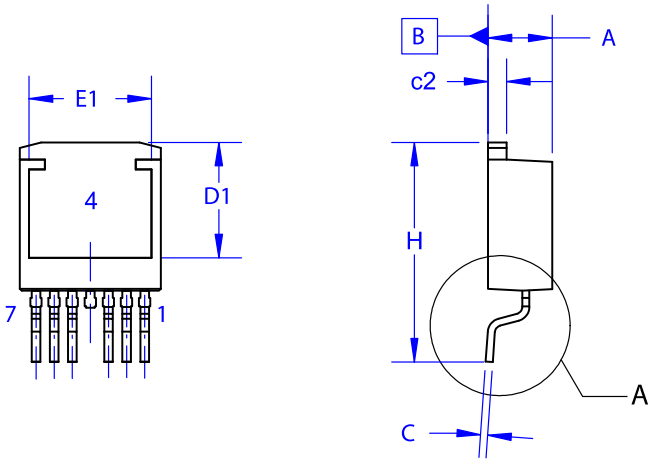
Share Feedback
Your Opinion Matters

**D2PAK7 (TO−263 7 LD)**
CASE 418AY
ISSUE C

DATE 15 JUL 2019




LAND PATTERN RECOMMENDATION




NOTES:

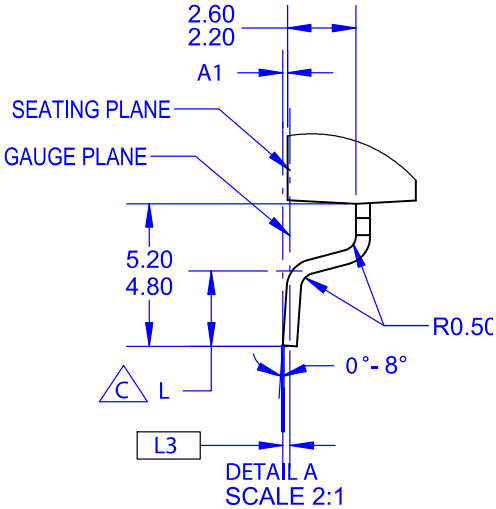
A. PACKAGE CONFORMS TO JEDEC TO-263 VARIATION CB EXCEPT WHERE NOTED.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. OUT OF JEDEC STANDARD VALUE.
D. DIMENSION AND TOLERANCE AS PER ASME Y14.5-1994.
E. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.
F. LAND PATTERN RECOMMENDATION PER IPC. TO127P1524X465-8N.

| DIM | MILLIMETERS | | |
|---|---|---|---|
| | MIN | NOM | MAX |
| A | 4.30 | 4.50 | 4.70 |
| A1 | 0.00 | 0.10 | 0.20 |
| b2 | 0.70 | 0.80 | 0.90 |
| b | 0.50 | 0.60 | 0.70 |
| c | 0.40 | 0.50 | 0.60 |
| c2 | 1.20 | 1.30 | 1.40 |
| D | 9.00 | 9.20 | 9.40 |
| D1 | 7.70 | ~ | ~ |
| E | 9.70 | 9.90 | 10.20 |
| E1 | 8.38 | 8.58 | 8.78 |
| e | ~ | 1.27 | ~ |
| H | 15.10 | 15.40 | 15.70 |
| L | 2.44 | 2.64 | 2.84 |
| L1 | 1.00 | 1.20 | 1.40 |
| L3 | ~ | 0.25 | ~ |
| aaa | ~ | ~ | 0.25 |

**GENERIC MARKING DIAGRAM***

XXXX = Specific Device Code
A = Assembly Location
Y = Year
WW = Work Week
G = Pb−Free Package

*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. Some products may not follow the Generic Marking.




| | | |
|---|---|---|
| **DOCUMENT NUMBER:** | **98AON13798G** | Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red. |
| **DESCRIPTION:** | **D2PAK7 (TO−263 7 LD)** | **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.

© Semiconductor Components Industries, LLC, 2016

**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. **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.

## ADDITIONAL INFORMATION

**TECHNICAL PUBLICATIONS**:
**Technical Library:** www.onsemi.com/design/resources/technical−documentation
**onsemi Website:** www.onsemi.com

**ONLINE SUPPORT**: www.onsemi.com/support
**For additional information, please contact your local Sales Representative at**
www.onsemi.com/support/sales