

MOSFET – N-Channel Enhancement Mode Field Effect Transistor

60 V, 0.28 A, 2 Ω

2N7002V/2N7002VA

Features

- Dual N-Channel MOSFET
- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- This Device is Pb-Free, Halide Free and RoHS Compliant

MOSFET MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

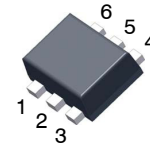
Symbol	Parameter		Ratings	Unit
V _{DSS}	Drain – Source Voltage		60	V
V _{DGR}	Gate – Gate Voltage (R _{GS} ≤ 1.0 MΩ)		60	V
V _{GSS}	Gate–Source Voltage	– Continuous	±20	V
		– Pulsed	±40	
I _D	Drain Current	– Continuous	280	mA
		– Pulsed	1.5	
T _J , T _{STG}	Junction and Storage Temperature Range		–55 to +150	°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 CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Symbol	Parameter	Ratings	Unit
P _D	Total Device Dissipation	250	mW
	Derate Above T _A = 25°C	2.0	mW/°C
R _{θJA}	Thermal Resistance, Junction-to-Ambient (Note 1)	500	°C/W

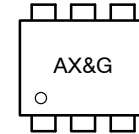
1. Device mounted on FR-4 PCB, 1 inch x 0.85 inch x 0.062 inch. Minimum land pad size.



SOT-563
CASE 419BH

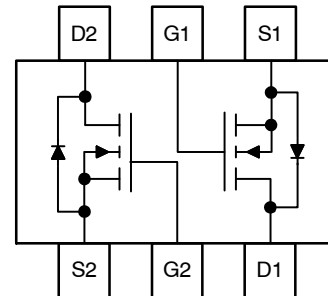
*Pin 1 and Pin 4 are exchangeable.

MARKING DIAGRAM

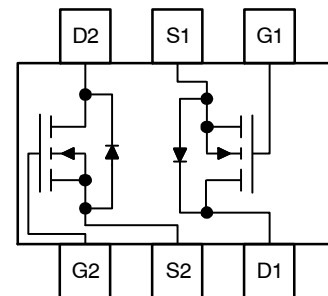


AX = Device Code (X = B or C)
&G = 1-Digit Weekly Date Code

PIN ASSIGNMENT



2N7002V



2N7002VA

ORDERING INFORMATION

See detailed ordering and shipping information on page 4 of this data sheet.

2N7002V/2N7002VA

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Unit
--------	-----------	-----------------	-----	-----	-----	------

OFF CHARACTERISTICS

BV_{DSS}	Drain to Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 10\text{ }\mu\text{A}$	60	78	–	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$	–	0.001	1.0	μA
		$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ$		7	500	
I_{GSS}	Gate–Body Leakage	$V_{GS} = \pm 20\text{ V}, V_{DS} = 0\text{ V}$	–	0.2	± 100	nA

ON CHARACTERISTICS (Note 2)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.00	1.76	2.50	V
$R_{DS(on)}$	Static Drain–Source On–Resistance	$V_{GS} = 5\text{ V}, I_D = 0.05\text{ A}$	–	1.6	7.5	Ω
		$V_{GS} = 10\text{ V}, I_D = 0.5\text{ A}$	–	–	2.0	
		$V_{GS} = 10\text{ V}, I_D = 0.5\text{ A}, T_J = 125^\circ\text{C}$	–	2.53	13.5	
$I_{D(on)}$	On–State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 7.5\text{ V}$	1.50	1.43	–	A
g_{FS}	Forward Transconductance	$V_{DS} = 10\text{ V}, I_D = 0.2\text{ A}$	80	356.5	–	mS

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	–	37.8	50	pF
C_{oss}	Output Capacitance		–	12.4	25	pF
C_{rss}	Reverse Transfer Capacitance		–	6.5	7	pF

SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn–On Delay Time	$V_{DD} = 30\text{ V}, I_D = 0.2\text{ A}, V_{GEN} = 10\text{ V},$ $R_L = 150\text{ }\Omega, R_{GEN} = 25\text{ }\Omega$	–	5.85	20	ns
$t_{d(off)}$	Turn–Off Delay Time		–	12.5	20	ns

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.

2. Short duration test pulse used to minimize self–heating effect.

TYPICAL PERFORMANCE CHARACTERISTICS

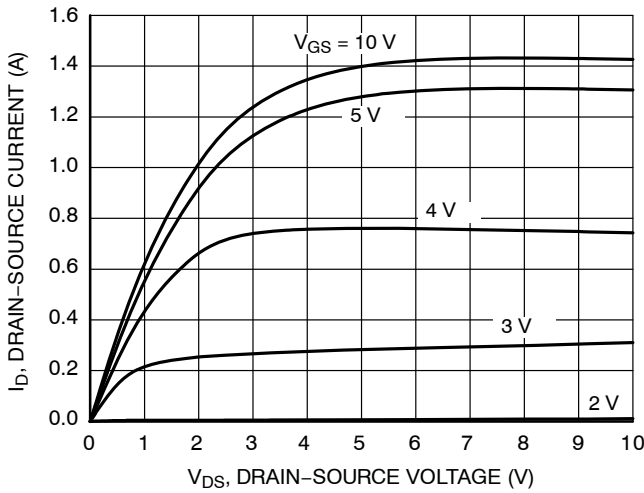


Figure 1. On - Region Characteristics

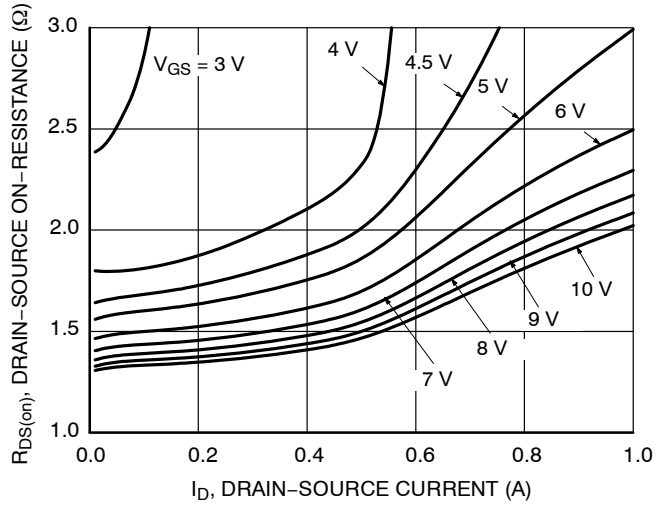


Figure 2. On-Resistance Variation with Gate Voltage and Drain Current

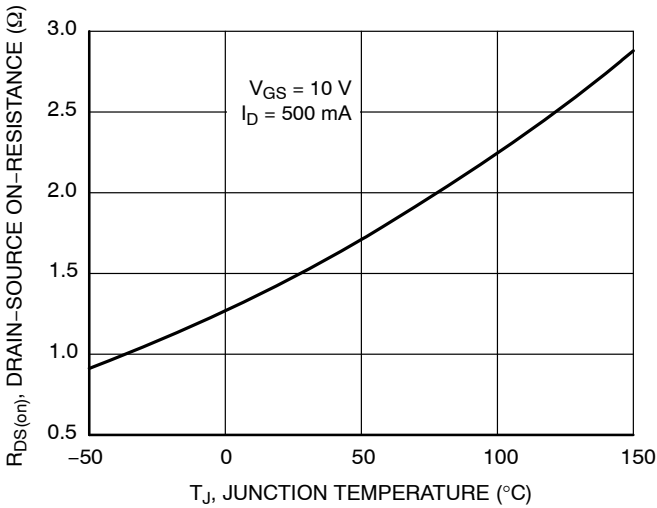


Figure 3. On-Resistance Variation with Temperature

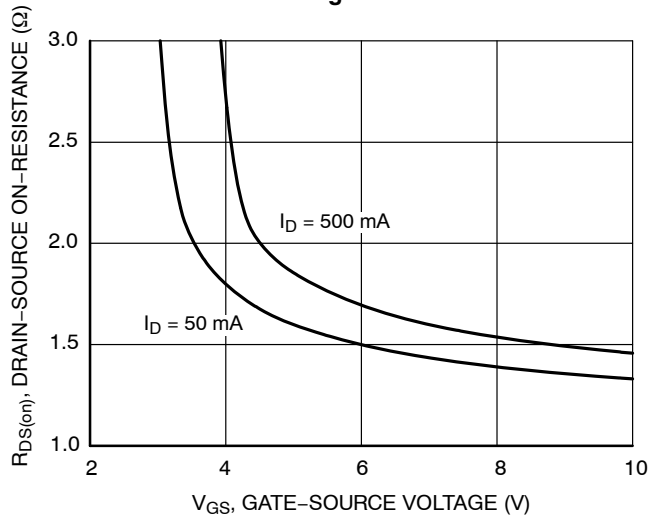


Figure 4. On-Resistance Variation with Gate-Source Voltage

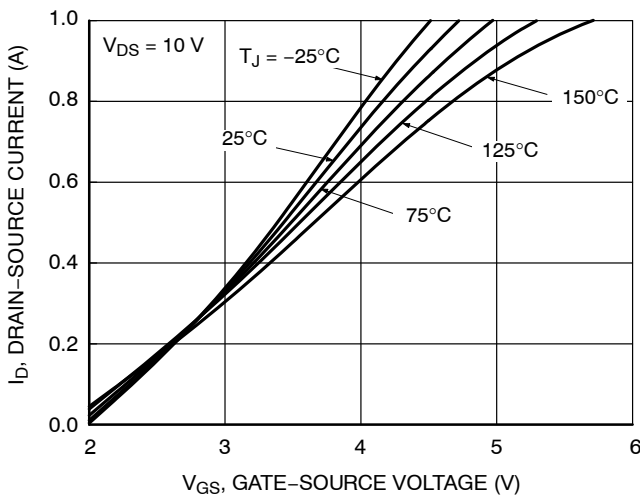


Figure 5. Transfer Characteristics

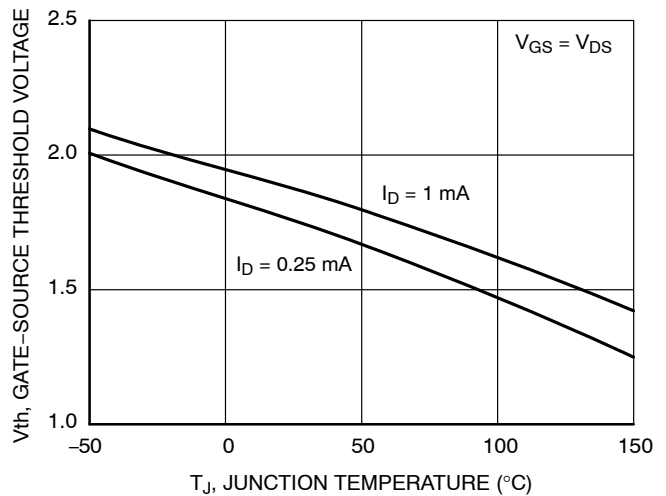


Figure 6. Gate Threshold Variation with Temperature

TYPICAL ELECTRICAL CHARACTERISTICS (continued)

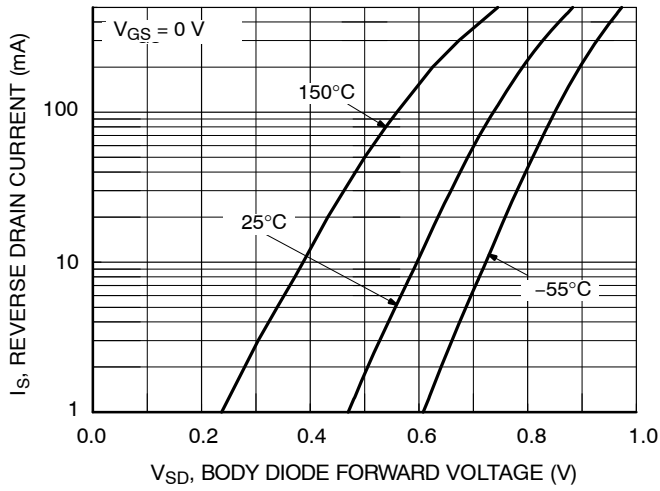


Figure 7. Reverse Drain Current Variation with Diode Forward Voltage and Temperature

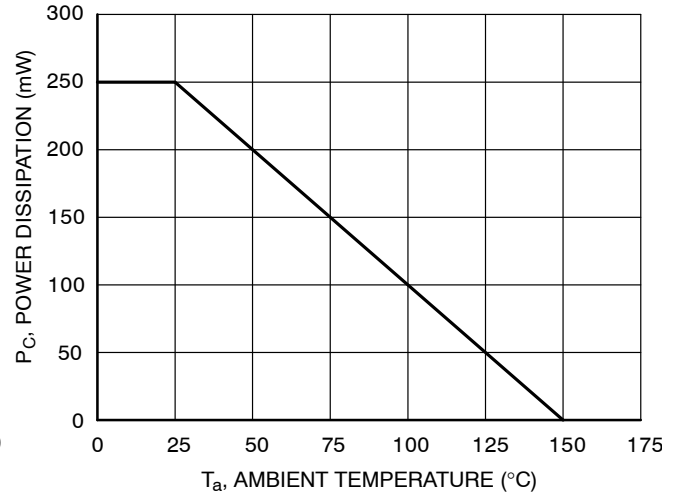


Figure 8. Power Derating

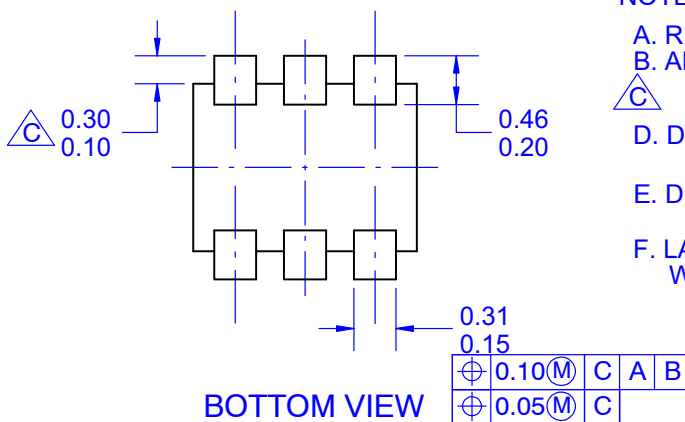
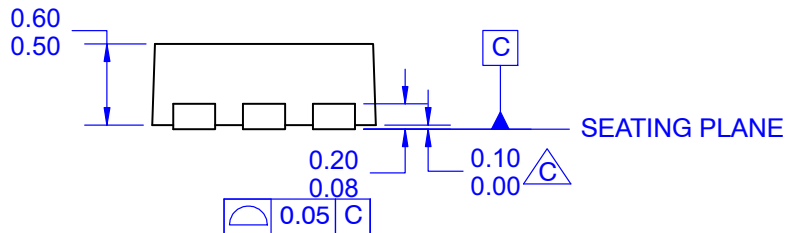
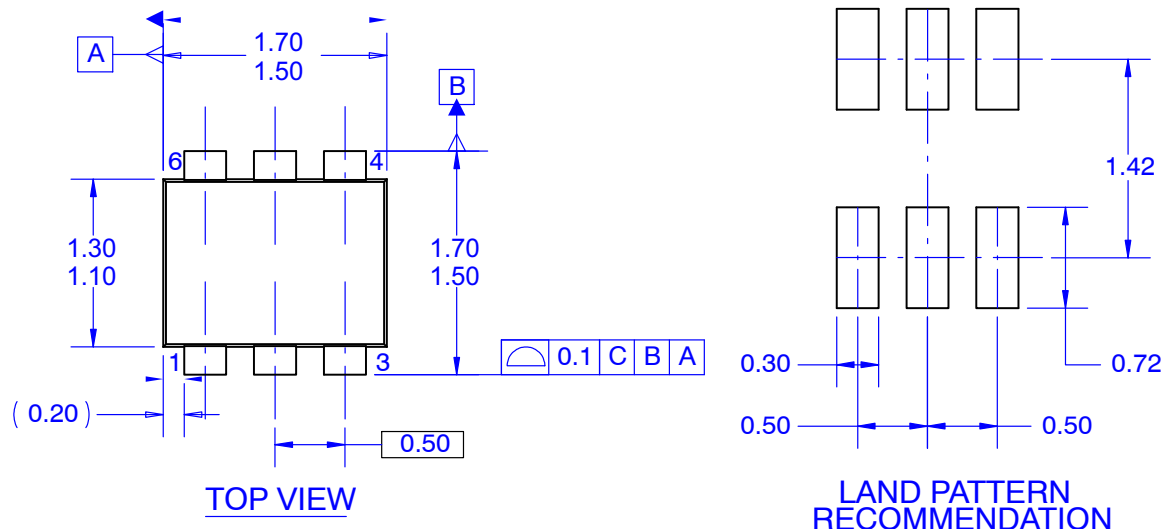
PACKAGE MARKING AND ORDERING INFORMATION

Device	Device Marking	Package	Shipping [†]
2N7002V	AB	SOT-563 (Pb-Free)	3000 / Tape & Reel
2N7002VA	AC	SOT-563 (Pb-Free)	3000 / Tape & Reel

[†]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](#).

SOT-563
CASE 419BH
ISSUE O

DATE 31 AUG 2016



NOTES: UNLESS OTHERWISE SPECIFIED.

A. REFERENCE TO JEDEC MO293.

B. ALL DIMENSIONS ARE IN MILLIMETERS.

△ DOES NOT COMPLY JEDEC STANDARD VALUE.

D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSION.

E. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.

F. LAND PATTERN RECOMMENDATION GENERATED WITH IPC LANDPATTERN GENERATOR

DOCUMENT NUMBER:	98AON13790G	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SOT-563	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. **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