

N-Channel Enhancement Mode Field Effect Transistor

2N7002KW

Features

- Low On-Resistance
- Low Gate Threshold Voltage
- Low Input Capacitance
- Fast Switching Speed
- Low Input/Output Leakage
- Ultra-Small Surface Mount Package
- These Devices are Pb-Free and are RoHS Compliant
- ESD HBM = 1000 V as per JESD22 A114 and ESD CDM = 1500 V as per JESD22 C101

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

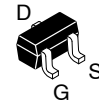
Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	60	V
Gate-Source Voltage	V_{GS}	± 20	V
Maximum Drain Current	I_D	Continuous $T_J = 100^\circ\text{C}$ Pulsed	310 mA 195 mA 1.2 A
Operating Junction Temperature Range	T_J	-55 to $+150$	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-55 to $+150$	$^\circ\text{C}$

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 CHARACTERISTICS

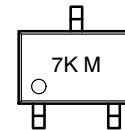
Parameter	Symbol	Value	Unit
Total Device Dissipation Derating above $T_A = 25^\circ\text{C}$	P_D	300 2.4	mW mW/ $^\circ\text{C}$
Thermal Resistance, Junction to Ambient*	$R_{\theta JA}$	410	$^\circ\text{C/W}$

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

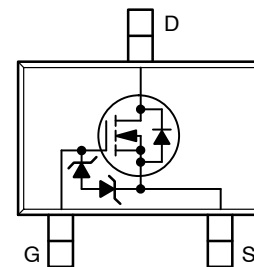


SC-70
3 LEAD
CASE 419AB

MARKING DIAGRAM



7K = Device Code
M = Date Code



ORDERING INFORMATION†

Device	Package	Shipping†
2N7002KW	SC-70	3000 / 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.

2N7002KW

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

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

OFF CHARACTERISTICS

BV_{DSS}	Drain-Source Breakdown Voltage	$V_{GS} = 0\text{ V}, I_D = 10\text{ }\mu\text{A}$	60	–	–	V
I_{DSS}	Zero Gate Voltage Drain Current	$V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}$ $V_{DS} = 60\text{ V}, V_{GS} = 0\text{ V}, T_J = 125^\circ\text{C}$	–	–	1.0 0.5	μA mA
I_{GSS}	Gate-Body Leakage	$V_{DS} = 0\text{ V}, V_{GS} = \pm 20\text{ V}$	–	–	± 10	μA

ON CHARACTERISTICS (Note 1)

$V_{GS(th)}$	Gate Threshold Voltage	$V_{DS} = V_{GS}, I_D = 250\text{ }\mu\text{A}$	1.1	–	2.1	V
$R_{DS(on)}$	Static Drain-Source On-Resistance	$V_{GS} = 10\text{ V}, I_D = 500\text{ mA}$ $V_{GS} = 10\text{ V}, I_D = 500\text{ mA}, T_J = 100^\circ\text{C}$ $V_{GS} = 5\text{ V}, I_D = 50\text{ mA}$ $V_{GS} = 5\text{ V}, I_D = 50\text{ mA}, T_J = 100^\circ\text{C}$	–	–	1.6 2.4 2 3	Ω
$V_{DS(on)}$	Drain-Source On-Voltage	$V_{GS} = 10\text{ V}, I_D = 500\text{ mA}$ $V_{GS} = 5\text{ V}, I_D = 50\text{ mA}$	–	–	3.75 1.5	V
$I_{D(on)}$	On-State Drain Current	$V_{GS} = 10\text{ V}, V_{DS} = 2\text{ V}$	500	–	–	mA
g_{FS}	Forward Transconductance	$V_{DS} = 2\text{ V}, I_D = 0.2\text{ A}$	80	–	–	mS

DYNAMIC CHARACTERISTICS

C_{iss}	Input Capacitance	$V_{DS} = 25\text{ V}, V_{GS} = 0\text{ V}, f = 1.0\text{ MHz}$	–	–	50	pF
C_{oss}	Output Capacitance		–	–	25	pF
C_{rss}	Reverse Transfer Capacitance		–	–	5	pF

SWITCHING CHARACTERISTICS

$t_{d(on)}$	Turn-On Delay Time	$V_{DD} = 30\text{ V}, R_L = 150\text{ }\Omega, V_{GS} = 10\text{ V},$ $I_D = 200\text{ mA}, R_{GEN} = 25\text{ }\Omega$	–	–	20	ns
$t_{d(off)}$	Turn-Off Delay Time		–	–	60	ns

DRAIN-SOURCE DIODE CHARACTERISTICS

I _S	Maximum Continuous Drain–Source Diode Forward Current		–	–	115	mA
I _{SM}	Maximum Pulsed Drain–Source Diode Forward Current		–	–	0.8	A
V _{SD}	Drain–Source Diode Forward Voltage	V _{GS} = 0 V, I _S = 115 mA	–	–	1.1	V

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.

1. Pulse Test: Pulse Width < 300 μs , Duty Cycle < 2.0%.



TYPICAL PERFORMANCE CHARACTERISTICS

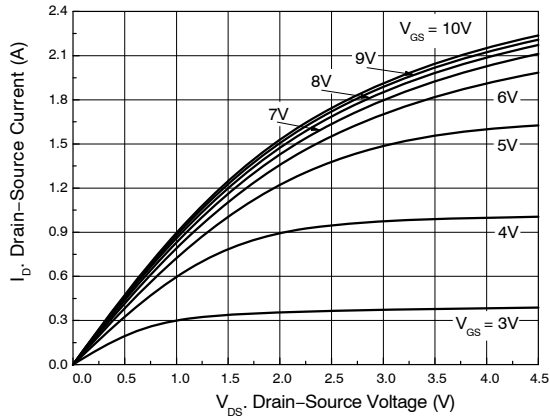


Figure 1. On-Region Characteristics

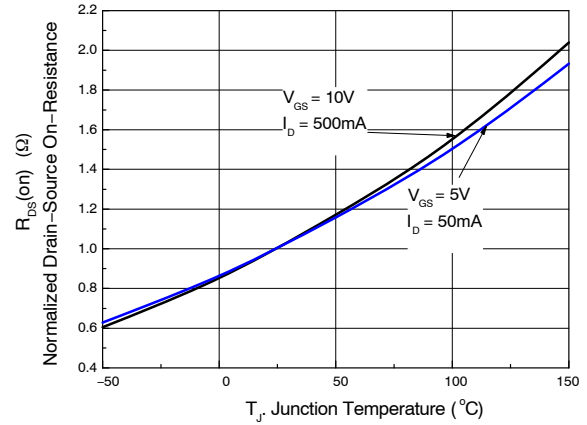


Figure 2. On-Resistance Variation with Temperature

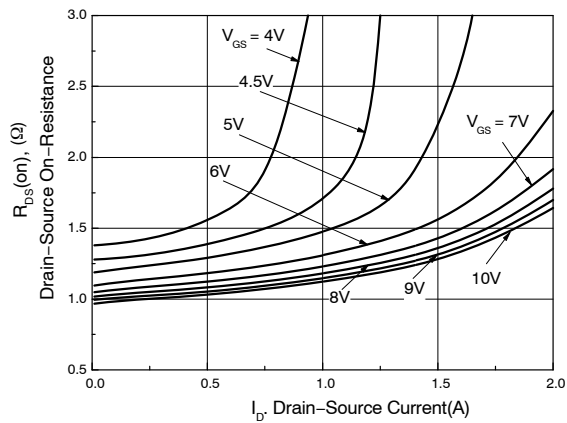


Figure 3. On-Resistance Variation with Gate Voltage and Drain Current

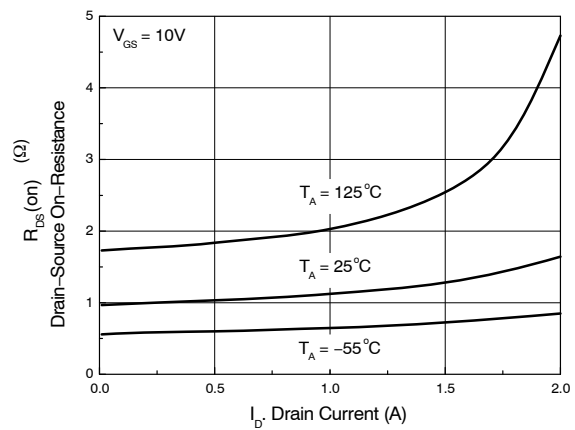


Figure 4. On-Resistance Variation with Drain Current and Temperature

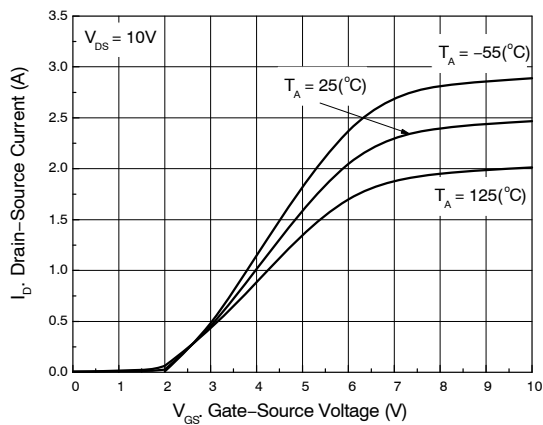


Figure 5. Transfer Characteristics

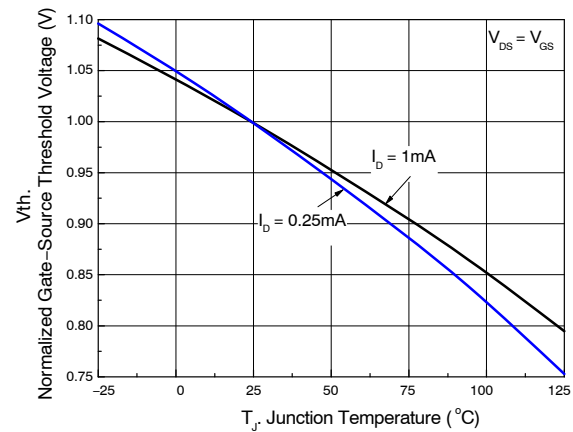


Figure 6. Gate Threshold Variation with Temperature

TYPICAL PERFORMANCE CHARACTERISTICS

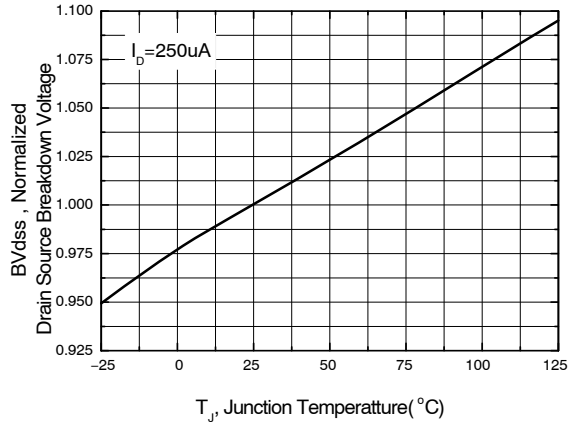


Figure 7. Breakdown Voltage Variation with Temperature

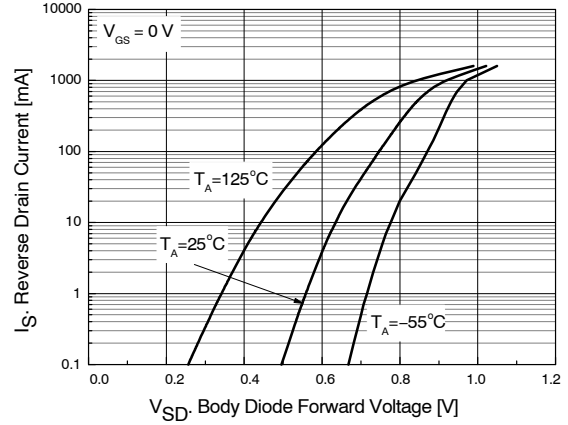


Figure 8. Body Diode Forward Voltage Variation with Source Current and Temperature

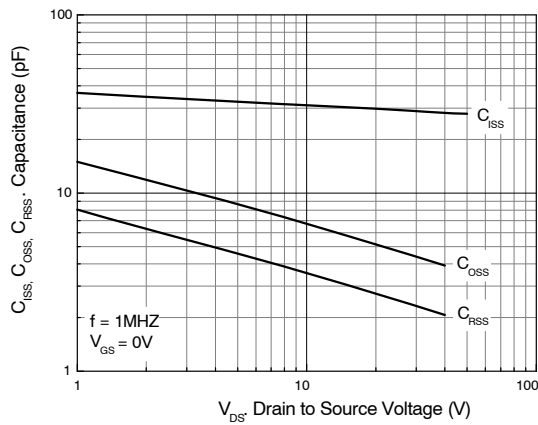


Figure 9. Capacitance Variation

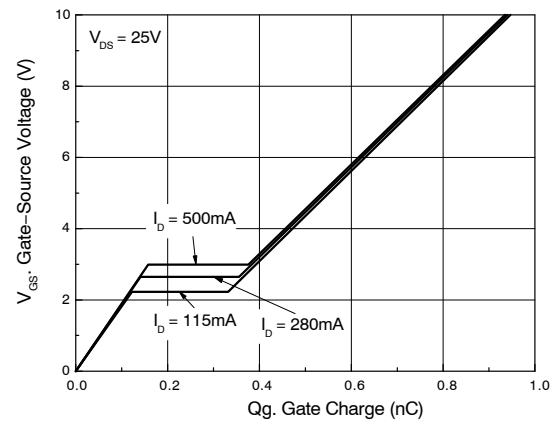


Figure 10. Gate Charge Characteristics

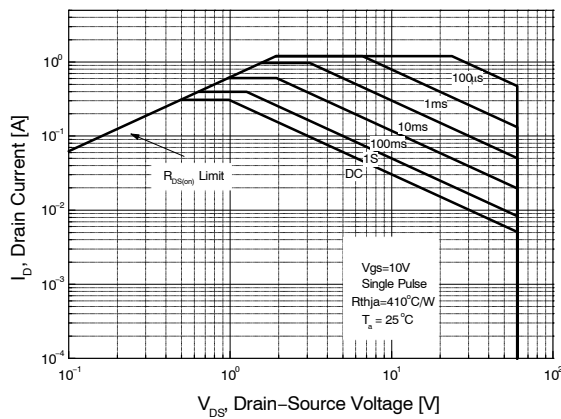


Figure 11. Maximum Safe Operating Area

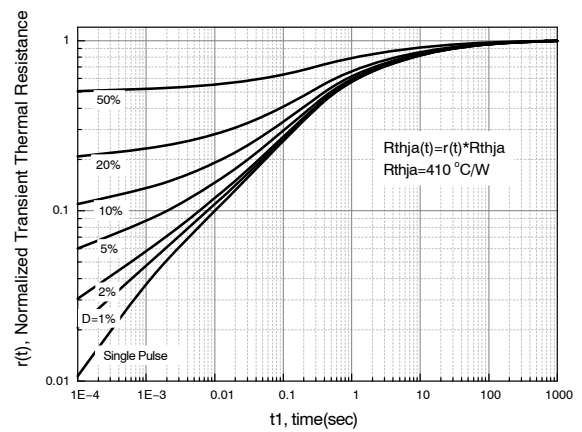
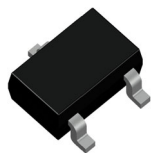
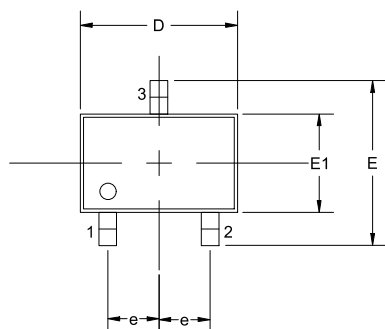


Figure 12. Transient Thermal Response Curve

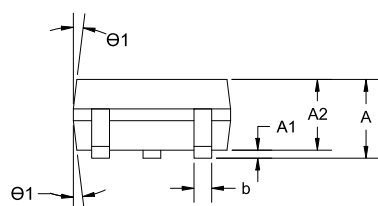


SC-70, 3 Lead, 1.25x2
CASE 419AB
ISSUE A

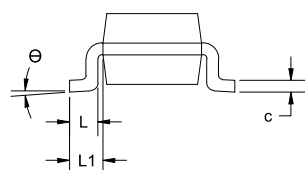
DATE 13 FEB 2023



TOP VIEW



SIDE VIEW

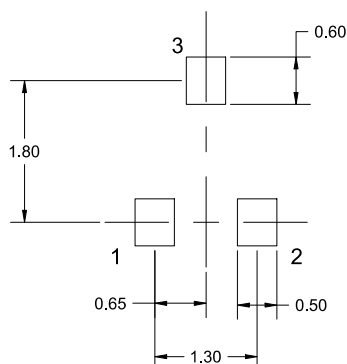


END VIEW

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETERS. ANGLES IN DEGREES.
2. COMPLIES WITH JEDEC MO-203

DIM	MILLIMETERS		
	MIN.	NOM.	MAX.
A	0.80		1.10
A1	0.00		0.10
A2	0.80	0.90	1.00
b	0.15		0.30
c	0.08		0.22
D	1.80	2.00	2.20
E	1.80	2.10	2.40
E1	1.15	1.25	1.35
e	0.65 BSC		
L	0.26	0.36	0.46
L1	0.42 REF		
Θ	0°		8°
Θ1	4°		10°



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.

DOCUMENT NUMBER:	98AON34256E	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	SC-70, 3 LEAD, 1.25X2	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

