

NTHS4101P

MOSFET – Power, P-Channel, ChipFET -20 V, 6.7 A

Features

- Offers an Ultra Low $R_{DS(on)}$ Solution in the ChipFET Package
- Miniature ChipFET Package 40% Smaller Footprint than TSOP-6 making it an Ideal Device for Applications where Board Space is at a Premium
- Low Profile (<1.1 mm) Allows it to Fit Easily into Extremely Thin Environments such as Portable Electronics
- Designed to Provide Low $R_{DS(on)}$ at Gate Voltage as Low as 1.8 V, the Operating Voltage used in many Logic ICs in Portable Electronics
- Simplifies Circuit Design since Additional Boost Circuits for Gate Voltages are not Required
- Operated at Standard Logic Level Gate Drive, Facilitating Future Migration to Lower Levels using the same Basic Topology
- Pb-Free Package is Available

Applications

- Optimized for Battery and Load Management Applications in Portable Equipment such as MP3 Players, Cell Phones, Digital Cameras, Personal Digital Assistant and other Portable Applications
- Charge Control in Battery Chargers
- Buck and Boost Converters

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

Rating	Symbol	Value	Unit
Drain-to-Source Voltage	V_{DS}	-20	V_{dc}
Gate-to-Source Voltage – Continuous	V_{GS}	± 8.0	V_{dc}
Drain Current – Continuous – 5 seconds	I_D I_D	-4.8 -6.7	A
Total Power Dissipation Continuous @ $T_A = 25^\circ\text{C}$ (5 sec) @ $T_A = 25^\circ\text{C}$ Continuous @ 85°C (5 sec) @ 85°C	P_D	1.3 2.5 0.7 1.3	W
Pulsed Drain Current – $t_p = 10 \mu\text{s}$	I_{DM}	-190	A
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-55 to +150	$^\circ\text{C}$
Continuous Source Current	I_S	-4.8	A
Thermal Resistance (Note 1) Junction-to-Ambient, 5 sec Junction-to-Ambient, Continuous	$R_{\theta JA}$ $R_{\theta JA}$	50 95	$^\circ\text{C/W}$
Maximum Lead Temperature for Soldering Purposes, 1/8" from case for 10 seconds	T_L	260	$^\circ\text{C}$

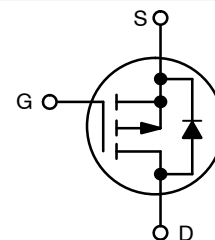
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.



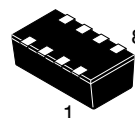
ON Semiconductor®

<http://onsemi.com>

$V_{(BR)DS}$	$R_{DS(on)}$ TYP	I_D MAX
-20 V	21 m Ω @ -4.5 V	-6.7 A
	30 m Ω @ -2.5 V	
	42 m Ω @ -1.8 V	

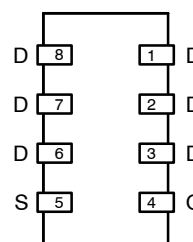


P-Channel MOSFET

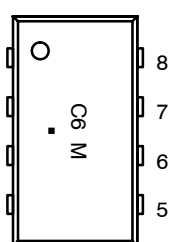


ChipFET
CASE 1206A
STYLE 1

PIN CONNECTIONS



MARKING DIAGRAM



C6 = Specific Device Code
M = Month Code
■ = Pb-Free Package

ORDERING INFORMATION

Device	Package	Shipping†
NTHS4101PT1	ChipFET	3000 Tape / Reel
NTHS4101PT1G	ChipFET (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.

NTHS4101P

1. Surface Mounted on FR4 Board using 1 in sq pad size (Cu area = 1.27 in sq [1 oz] including traces).

NTHS4101P

ELECTRICAL CHARACTERISTICS (T_J = 25°C unless otherwise noted)

Characteristic	Symbol	Test Condition	Min	Typ	Max	Unit
----------------	--------	----------------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-to-Source Breakdown Voltage (Note 2) Temperature Coefficient (Positive)	V _{(Br)DSS}	V _{GS} = 0 V _{dc} , I _D = -250 μA _{dc}	-20			V _{dc}
Gate-Body Leakage Current Zero	I _{GSS}	V _{DS} = 0 V _{dc} , V _{GS} = ±8.0 V _{dc}			±100	nA _{dc}
Zero Gate Voltage Drain Current	I _{DSS}	V _{DS} = -16 V _{dc} , V _{GS} = 0 V _{dc} V _{DS} = -16 V _{dc} , V _{GS} = 0 V _{dc} , T _J = 85°C			-1.0 -5.0	μA _{dc}

ON CHARACTERISTICS (Note 2)

Gate Threshold Voltage	V _{GS(th)}	V _{DS} = V _{GS} , I _D = -250 μA _{dc}	-0.45		-1.5	V _{dc}
Static Drain-to-Source On-Resistance	R _{DS(on)}	V _{GS} = -4.5 V _{dc} , I _D = -4.8 A _{dc} V _{GS} = -2.5 V _{dc} , I _D = -4.2 A _{dc} V _{GS} = -1.8 V _{dc} , I _D = -1.0 A _{dc}		21 30 42	34 40 52	mΩ
Forward Transconductance	g _{FS}	V _{DS} = -5.0 V _{dc} , I _D = -4.8 A _{dc}		15		S
Diode Forward Voltage	V _{SD}	I _S = -4.8 A _{dc} , V _{GS} = 0 V _{dc}		-0.8	-1.2	V

DYNAMIC CHARACTERISTICS

Input Capacitance	C _{iss}	V _{DS} = -16 V _{dc} V _{GS} = 0 V f = 1.0 MHz		2100		pF
Output Capacitance	C _{oss}			290		
Transfer Capacitance	C _{rss}			200		

SWITCHING CHARACTERISTICS (Note 3)

Turn-On Delay Time	t _{d(on)}	V _{DD} = -16 V _{dc} V _{GS} = -4.5 V _{dc} I _D = -4.5 A _{dc} R _G = 2.5 Ω		8.0		ns
Rise Time	t _r			28		
Turn-Off Delay Time	t _{d(off)}			75		
Fall Time	t _f			60		
Gate Charge	Q _g	V _{GS} = -4.5 V _{dc} I _D = -4.5 A _{dc} V _{DS} = -16 V _{dc} (Note 3)		25	35	nC
	Q _{gs}			4.0		
	Q _{gd}			7.0		

2. Pulse Test: Pulse Width = 250 μs, Duty Cycle = 2%.

3. Switching characteristics are independent of operating junction temperatures.

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

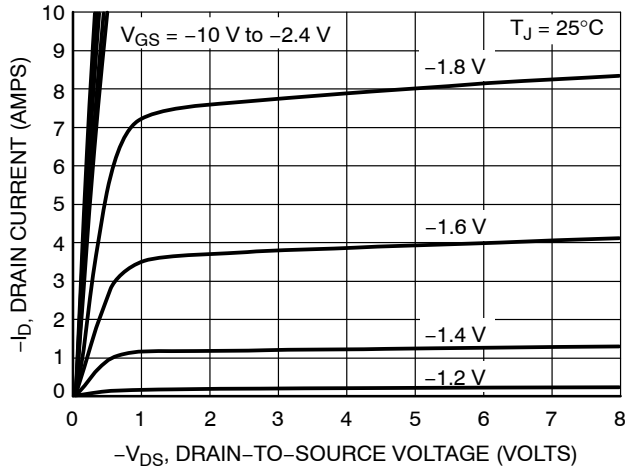


Figure 1. On-Region Characteristics

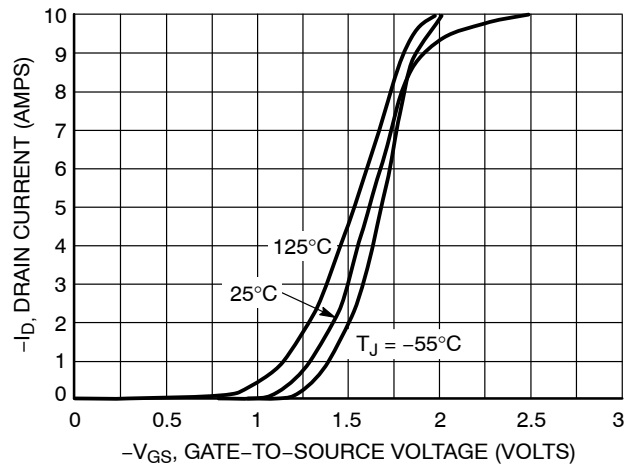


Figure 2. Transfer Characteristics

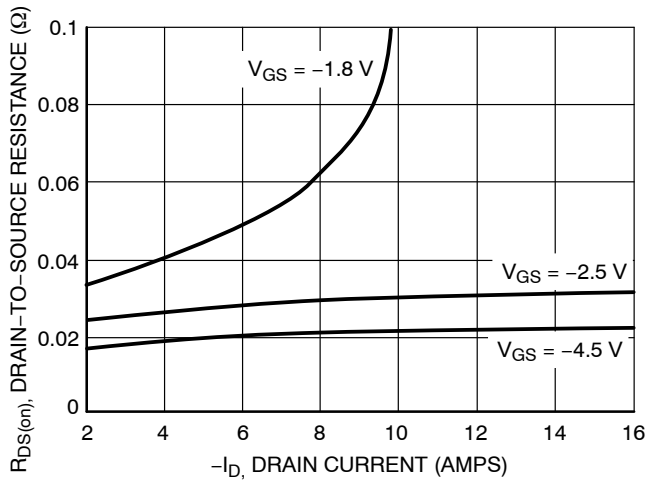


Figure 3. On-Resistance vs. Drain Current and Gate Voltage

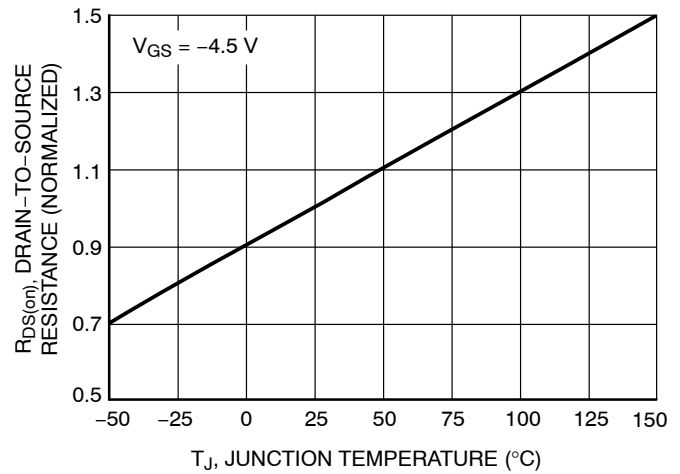


Figure 4. On-Resistance Variation with Temperature

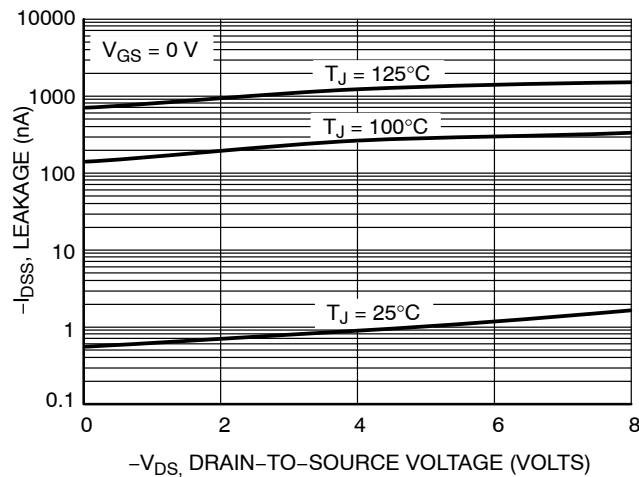


Figure 5. Drain-to-Source Leakage Current vs. Voltage

TYPICAL PERFORMANCE CURVES ($T_J = 25^\circ\text{C}$ unless otherwise noted)

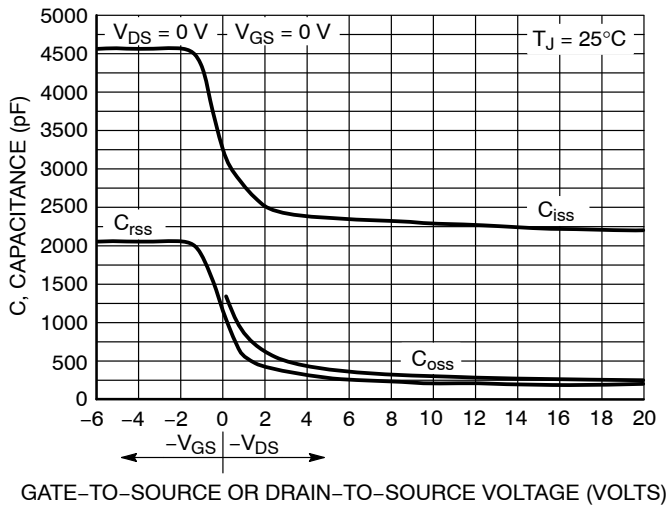


Figure 6. Capacitance Variation

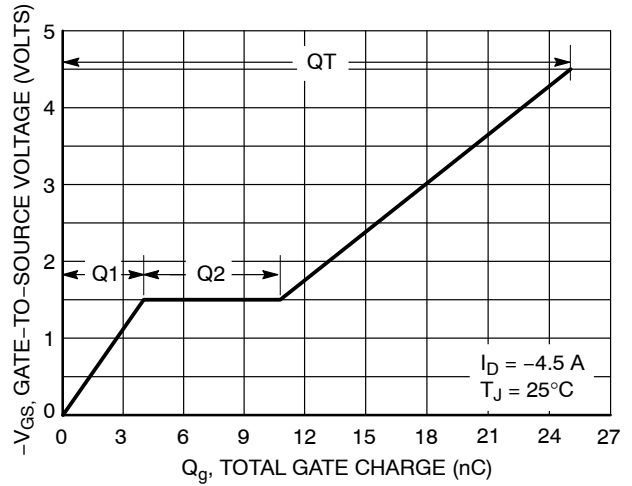


Figure 7. Gate-to-Source and Drain-to-Source Voltage vs. Total Gate Charge

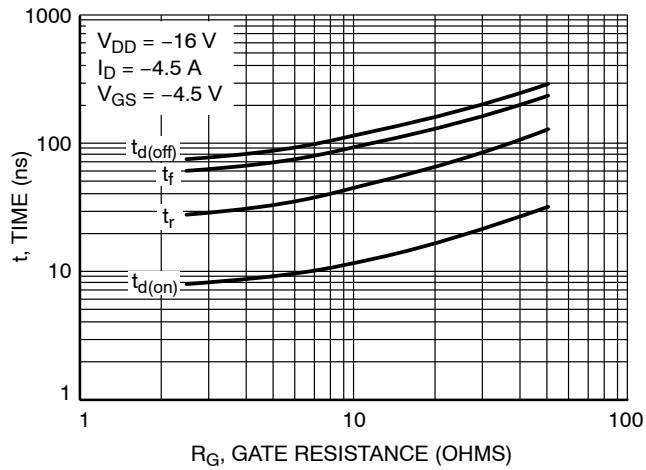


Figure 8. Resistive Switching Time Variation vs. Gate Resistance

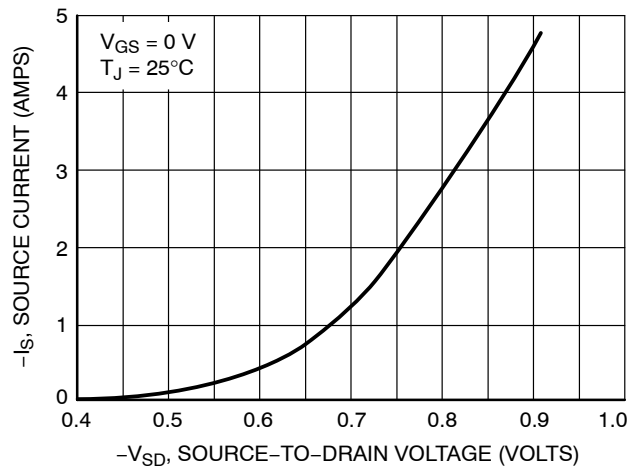


Figure 9. Diode Forward Voltage vs. Current

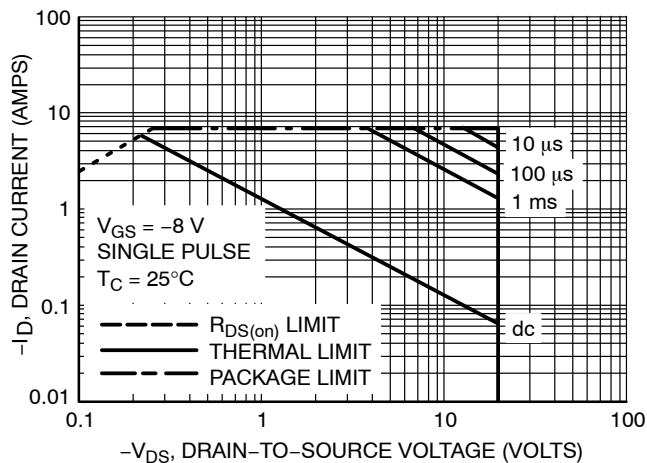


Figure 10. Maximum Rated Forward Biased Safe Operating Area

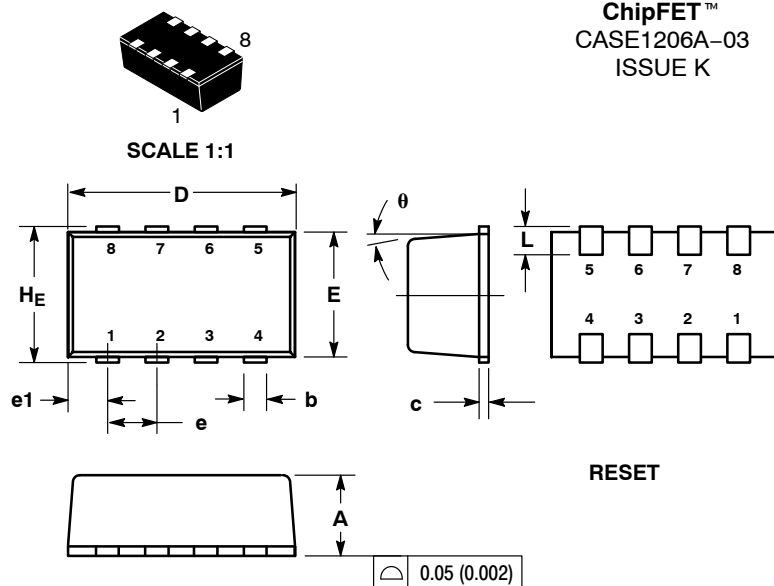
MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS

ON Semiconductor®



ChipFET™
CASE1206A-03
ISSUE K

DATE 19 MAY 2009



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. MOLD GATE BURRS SHALL NOT EXCEED 0.13 MM PER SIDE.
4. LEADFRAME TO MOLDED BODY OFFSET IN HORIZONTAL AND VERTICAL SHALL NOT EXCEED 0.08 MM.
5. DIMENSIONS A AND B EXCLUSIVE OF MOLD GATE BURRS.
6. NO MOLD FLASH ALLOWED ON THE TOP AND BOTTOM LEAD SURFACE.

DIM	MILLIMETERS			INCHES		
	MIN	NOM	MAX	MIN	NOM	MAX
A	1.00	1.05	1.10	0.039	0.041	0.043
b	0.25	0.30	0.35	0.010	0.012	0.014
c	0.10	0.15	0.20	0.004	0.006	0.008
D	2.95	3.05	3.10	0.116	0.120	0.122
E	1.55	1.65	1.70	0.061	0.065	0.067
e	0.65 BSC			0.025 BSC		
e1	0.55 BSC			0.022 BSC		
L	0.28	0.35	0.42	0.011	0.014	0.017
He	1.80	1.90	2.00	0.071	0.075	0.079
theta	5° NOM			5° NOM		

STYLE 1:

- PIN 1. DRAIN
2. DRAIN
3. DRAIN
4. GATE
5. SOURCE
6. DRAIN
7. DRAIN
8. DRAIN

STYLE 2:

- PIN 1. SOURCE 1
2. GATE 1
3. SOURCE 2
4. GATE 2
5. DRAIN 2
6. DRAIN 2
7. DRAIN 1
8. DRAIN 1

STYLE 3:

- PIN 1. ANODE
2. ANODE
3. SOURCE
4. GATE
5. DRAIN
6. DRAIN
7. CATHODE
8. CATHODE

STYLE 4:

- PIN 1. COLLECTOR
2. COLLECTOR
3. COLLECTOR
4. BASE
5. EMITTER
6. COLLECTOR
7. COLLECTOR
8. COLLECTOR

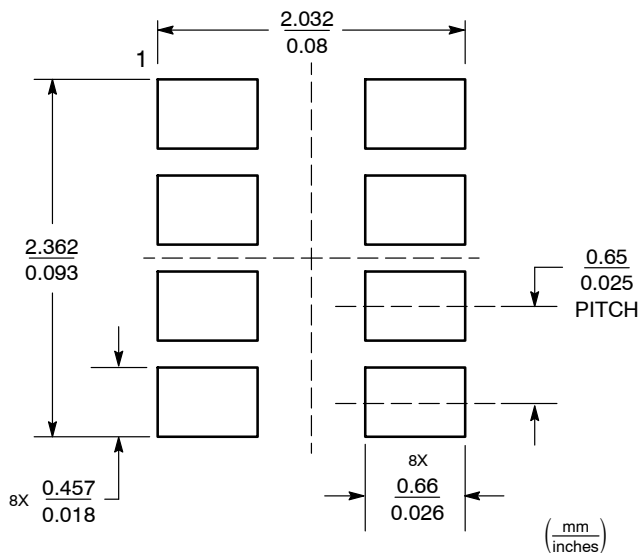
STYLE 5:

- PIN 1. ANODE
2. ANODE
3. DRAIN
4. DRAIN
5. SOURCE
6. GATE
7. CATHODE
8. CATHODE

STYLE 6:

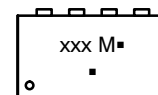
- PIN 1. ANODE
2. DRAIN
3. DRAIN
4. GATE
5. SOURCE
6. DRAIN
7. DRAIN
8. CATHODE / DRAIN

SOLDERING FOOTPRINT



Basic Style

GENERIC MARKING DIAGRAM*



- xxx = Specific Device Code
M = Month Code
▪ = Pb-Free Package
(Note: Microdot may be in either location)

*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.

OPTIONAL SOLDERING FOOTPRINTS ON PAGE 2

DOCUMENT NUMBER:	98AON03078D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	ChipFET	PAGE 1 OF 2

ON Semiconductor and ON are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others.

Technical drawing of a mechanical part with dimensions in inches and millimeters.

Dimensions (inches):

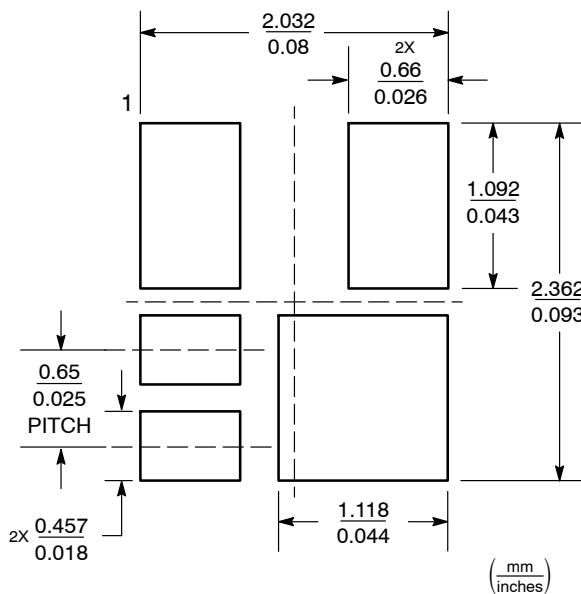
- Overall width: 2.032
- Overall height: 1.727
- Top flange width: 0.08
- Top flange height: 0.068
- Bottom flange width: 0.66
- Bottom flange height: 0.026
- Bottom flange offset: 2X
- Bottom flange hole diameter: 0.457
- Bottom flange hole offset: 0.018
- Bottom flange hole diameter (mm): 11.71
- Bottom flange hole offset (mm): 4.57

Dimensions (millimeters):

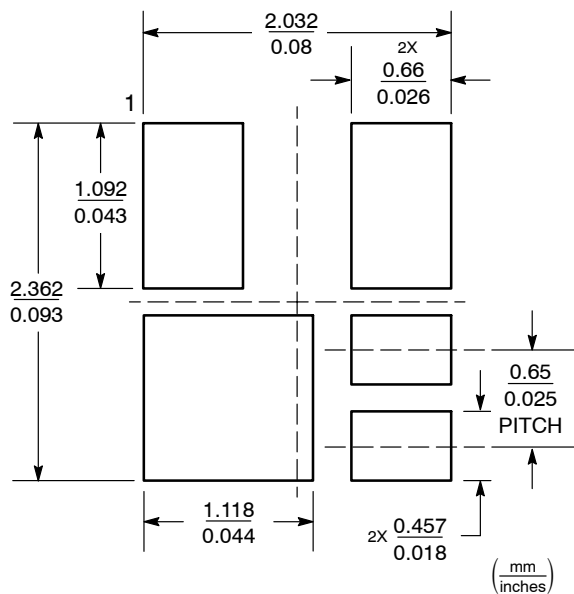
- Overall width: 51.68
- Overall height: 43.97
- Top flange width: 2.032
- Top flange height: 1.727
- Bottom flange width: 16.76
- Bottom flange height: 0.66
- Bottom flange offset: 2X
- Bottom flange hole diameter: 11.71
- Bottom flange hole offset: 4.57

Figure 1: Dimensions of the test specimens. The diagram shows two types of specimens: 1X and 2X. The 1X specimen is a small square with dimensions 0.457 (width) and 0.018 (height). The 2X specimen is a larger square with dimensions 1.092 (width) and 0.043 (height). The 1X specimen is shown in a 4X arrangement, and the 2X specimen is shown in a 2X arrangement. The overall dimensions of the test area are 2.032 (width) and 2.362 (height). The pitch between the specimens is 0.025. The dimensions are given in inches, with a note indicating (mm/inches).

Style 2



Style 3



Style 5

DOCUMENT NUMBER:	98AON03078D	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
DESCRIPTION:	ChipFET	PAGE 2 OF 2

ON Semiconductor and  are trademarks of Semiconductor Components Industries, LLC dba ON Semiconductor or its subsidiaries in the United States and/or other countries. ON Semiconductor reserves the right to make changes without further notice to any products herein. ON Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does ON Semiconductor 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. ON Semiconductor 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.

PUBLICATION ORDERING INFORMATION

LITERATURE FULFILLMENT:

Email Requests to: orderlit@onsemi.com

onsemi Website: 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