

# SMF05

## ESD Protection Diode Array

### Quad, Low Clamping Voltage

This quad monolithic silicon overvoltage suppressor is designed for applications requiring transient voltage protection capability. It is intended for use in ESD sensitive equipment such as computers, printers, cell phones, medical equipment, and other applications. Its quad junction common anode design protects four separate lines using only one package. These devices are ideal for situations where board space is at a premium.

#### Specification Features

- SC-88A Package Allows Four Separate Unidirectional Configurations
- Low Leakage < 5  $\mu$ A @ 5 V
- Breakdown Voltage: 6.1 V – 7.2 V @ 1 mA
- Low Capacitance (90 pF TYP)
- Provides Protection for IEC61000-4-2
- Pb-Free Packages are Available\*

#### Mechanical Characteristics

- Void Free, Transfer-Molded, Thermosetting Plastic Case
- Corrosion Resistant Finish, Easily Solderable
- Package Designed for Optimal Automated Board Assembly
- Small Package Size for High Density Applications

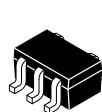
#### Applications

- Computers
- Printers
- Cell Phones
- Medical Equipment

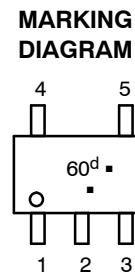


ON Semiconductor®

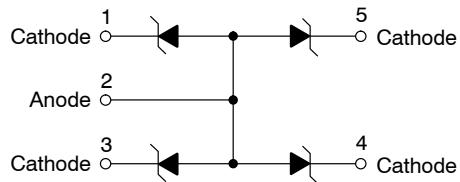
[www.onsemi.com](http://www.onsemi.com)



SC-88A/SOT-353  
CASE 419A-02  
STYLE 5  
SCALE 2:1



60 = Specific Device Code  
d = Date Code  
▪ = Pb-Free Package  
(Note: Microdot may be in either location)



#### ORDERING INFORMATION

Device	Package	Shipping <sup>†</sup>
SMF05T1	SC-88A	3000 Tape & Reel
SMF05T1G	SC-88A (Pb-Free)	3000 Tape & Reel
SMF05T2G	SC-88A (Pb-Free)	3000 Tape & Reel
SMF05CT1	SC-88A	3000 Tape & Reel
SMF05CT1G	SC-88A (Pb-Free)	3000 Tape & Reel
SMF05CT2	SC-88A	3000 Tape & Reel
SMF05CT2G	SC-88A (Pb-Free)	3000 Tape & Reel

<sup>†</sup>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.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

# SMF05

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

Characteristic	Symbol	Value	Unit
Peak Power Dissipation @ $8 \times 20 \mu\text{s}$ @ $T_A \leq 25^\circ\text{C}$ (Note 1)	$P_{pk}$	200	W
Maximum Junction Temperature	$T_{Jmax}$	150	$^\circ\text{C}$
Operating Junction and Storage Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$
ESD Discharge	$V_{PP}$	16 9	kV
Lead Solder Temperature (10 seconds duration)	$T_L$	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.

1. Non-repetitive current per Figure 2. Derate per Figure 3.

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

Device	Breakdown Voltage $V_{BR}$ @ 1 mA (Volts)		Leakage Current $I_R$ @ $V_{RWM} = 5 \text{ V}$ ( $\mu\text{A}$ )	Capacitance @ 0 V Bias (pF)	Max $V_F$ @ $I_F = 200 \text{ mA}$ (V)	Max Clamping Voltage ( $V_C$ ) @ $I_{PP}$		Max Clamping Voltage ( $V_C$ ) @ $I_{PP}$	
	Min	Max				$I_{PP}$ (A)	$V_C$ (V)	$I_{PP}$ (A)	$V_C$ (V)
SMF05	6.0	7.2	5.0	90	1.25	1.0	9.5	12	12.5

## TYPICAL PERFORMANCE CURVES

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

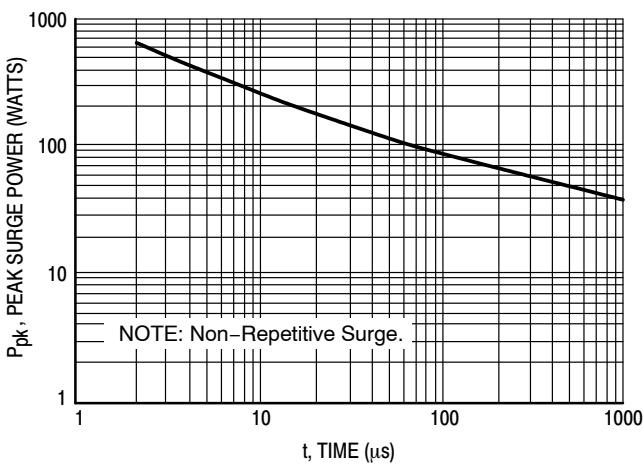


Figure 1. Peak Power Dissipation versus Pulse Width

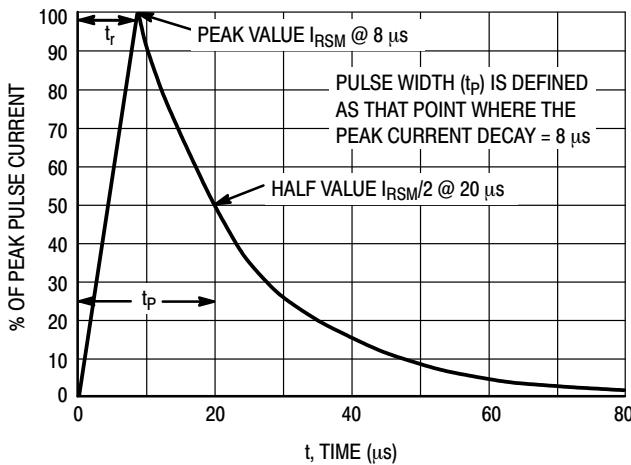
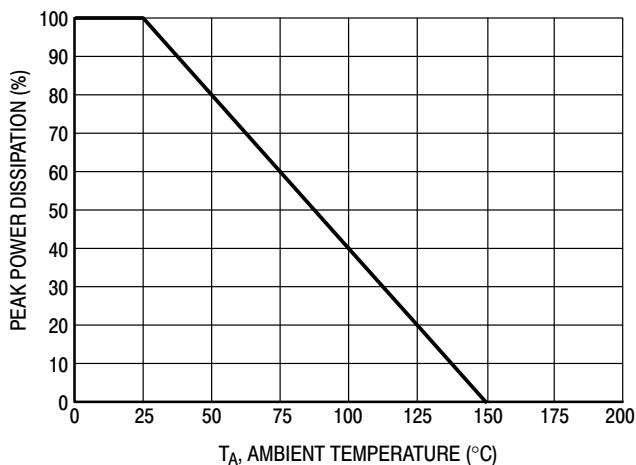
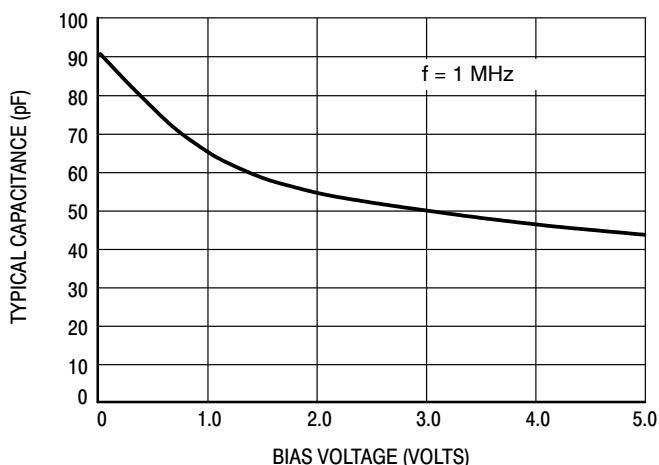
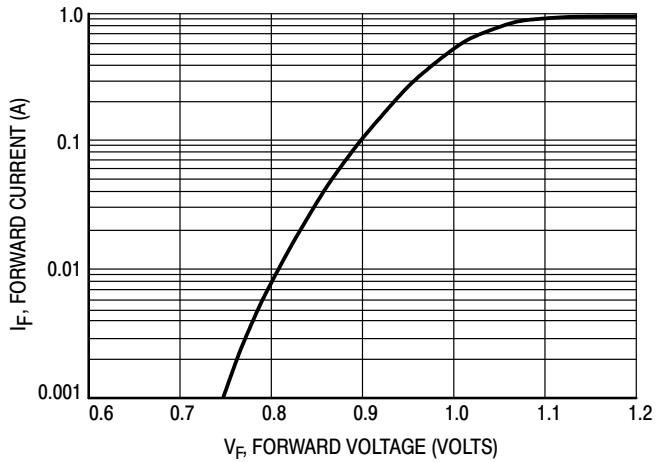
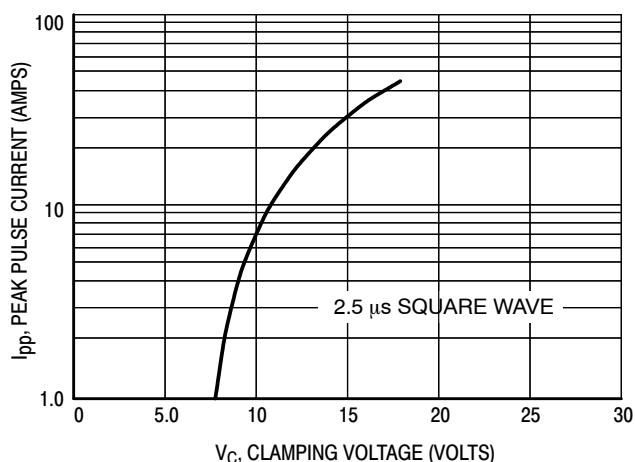
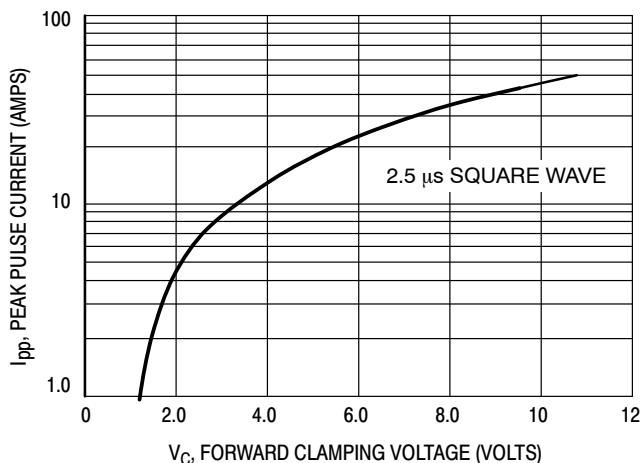


Figure 2. Pulse Waveform  $8 \times 20 \mu\text{s}$

**TYPICAL PERFORMANCE CURVES** $(T_A = 25^\circ\text{C} \text{ unless otherwise noted})$ **Figure 3. Power Derating Curve****Figure 4. Junction Capacitance versus Reverse Voltage****Figure 5. Forward Voltage Curve****Figure 6. Clamping Voltage versus Peak Pulse Current (Reverse Direction)****Figure 7. Clamping Voltage versus Peak Pulse Current (Forward Direction)**

# MECHANICAL CASE OUTLINE

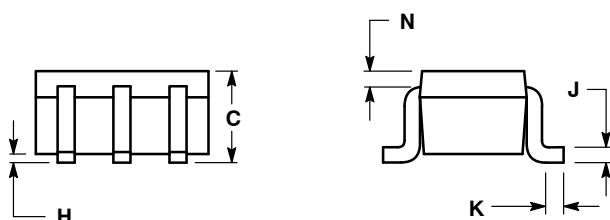
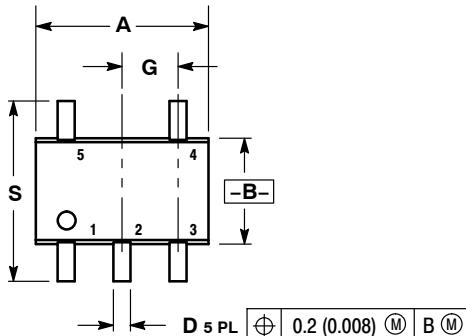
## PACKAGE DIMENSIONS

ON Semiconductor®

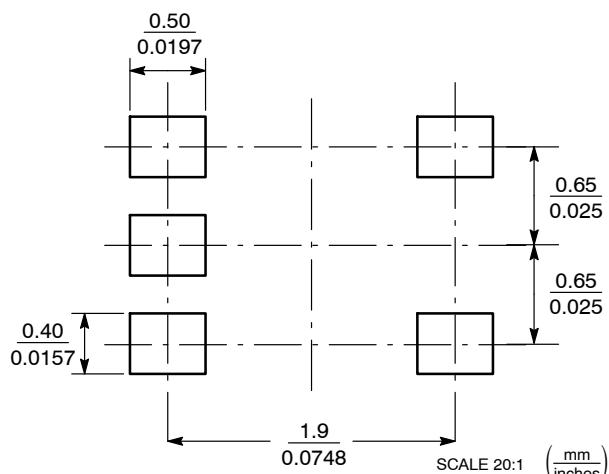


### SC-88A (SC-70-5/SOT-353) CASE 419A-02 ISSUE L

SCALE 2:1



#### SOLDER FOOTPRINT



STYLE 1:  
PIN 1. BASE  
2. Emitter  
3. BASE  
4. COLLECTOR  
5. COLLECTOR

STYLE 6:  
PIN 1. Emitter 2  
2. BASE 2  
3. Emitter 1  
4. COLLECTOR  
5. COLLECTOR 2/BASE 1

STYLE 2:  
PIN 1. ANODE  
2. Emitter  
3. BASE  
4. COLLECTOR  
5. CATHODE

STYLE 7:  
PIN 1. BASE  
2. Emitter  
3. BASE  
4. COLLECTOR  
5. COLLECTOR

STYLE 3:  
PIN 1. ANODE 1  
2. N/C  
3. ANODE 2  
4. CATHODE 2  
5. CATHODE 1

STYLE 8:  
PIN 1. CATHODE  
2. COLLECTOR  
3. N/C  
4. BASE  
5. Emitter

STYLE 4:  
PIN 1. SOURCE 1  
2. DRAIN 1/2  
3. SOURCE 1  
4. GATE 1  
5. GATE 2

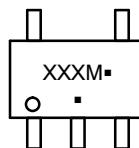
STYLE 9:  
PIN 1. ANODE  
2. CATHODE  
3. ANODE  
4. ANODE  
5. ANODE

NOTES:  
1. DIMENSIONING AND TOLERANCING  
PER ANSI Y14.5M, 1982.  
2. CONTROLLING DIMENSION: INCH.  
3. 419A-01 OBSOLETE. NEW STANDARD  
419A-02.  
4. DIMENSIONS A AND B DO NOT INCLUDE  
MOLD FLASH, PROTRUSIONS, OR GATE  
BURRS.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.071	0.087	1.80	2.20
B	0.045	0.053	1.15	1.35
C	0.031	0.043	0.80	1.10
D	0.004	0.012	0.10	0.30
G	0.026 BSC		0.65 BSC	
H	---	0.004	---	0.10
J	0.004	0.010	0.10	0.25
K	0.004	0.012	0.10	0.30
N	0.008 REF		0.20 REF	
S	0.079	0.087	2.00	2.20

DATE 17 JAN 2013

#### GENERIC MARKING DIAGRAM\*



XXX = Specific Device Code

M = Date 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.

DOCUMENT NUMBER:	98ASB42984B	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped "CONTROLLED COPY" in red.
STATUS:	ON SEMICONDUCTOR STANDARD	
NEW STANDARD:		
DESCRIPTION:	SC-88A (SC-70-5/SOT-353)	PAGE 1 OF 2



ON Semiconductor®

**DOCUMENT NUMBER:**  
**98ASB42984B**

PAGE 2 OF 2

**ON Semiconductor** and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC 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. "Typical" parameters which may be provided in SCILLC 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. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC 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 SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

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 owns the rights to a number of patents, trademarks, copyrights, trade secrets, and other intellectual property. A listing of ON Semiconductor'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). 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. Buyer is responsible for its products and applications using ON Semiconductor products, including compliance with all laws, regulations and safety requirements or standards, regardless of any support or applications information provided by ON Semiconductor. "Typical" parameters which may be provided in ON Semiconductor 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. ON Semiconductor does not convey any license under its patent rights nor the rights of others. ON Semiconductor 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 ON Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold ON Semiconductor 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 ON Semiconductor was negligent regarding the design or manufacture of the part. ON Semiconductor 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)

ON Semiconductor 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