ESD Protection Diode Array, 5-Line

SMF05CT1G, SMF12CT1G, SMF15CT1G, SMF24CT1G, SZSMF12CT1G

This 5-line surge protection array is designed for application requiring transient voltage protection capability. It is intended for use in over-transient voltage and ESD sensitive equipment such as computers, printers, automotive electronics, networking communication and other applications. This device features a monolithic common anode design which protects five independent lines in a single SC-88 package.

Features

- Protects up to 5-Line in a Single SC-88 Package
- Peak Power Dissipation - 100 W (8 x 20 μs Waveform)
- ESD Rating of Class 3B (Exceeding 8 kV) per Human Body Model and Class C (Exceeding 400 V) per Machine Model.
- Compliance with IEC 61000-4-2 (ESD) 15 kV (Air), 8 kV (Contact)
- Flammability Rating of UL 94 V-0
- SZ Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- Pb-Free Packages are Available*

Applications

- Hand-Held Portable Applications
- Networking and Telecom
- Automotive Electronics
- Serial and Parallel Ports
- Notebooks, Desktops, Servers

MAXIMUM RATINGS (T_J = 25 °C unless otherwise specified)

Symbol	Rating	Value	Unit
P_{PK} 1	Peak Power Dissipation 8 x 20 μs Double Exponential Waveform (Note 1)	100	W
T_J	Operating Junction Temperature Range	−40 to 125	°C
T_{STG}	Storage Temperature Range	−55 to 150	°C
T_L	Lead Solder Temperature (10 s)	260	°C
ESD	Human Body Model (HBM) Machine Model (MM) IEC 61000-4-2 Air (ESD) IEC 61000-4-2 Contact (ESD)	16000 400 15000 15000	V

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. Nonrepetitive current pulse per Figure 3.

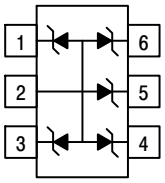
*For additional information on our Pb−Free strategy and soldering details, please download the **onsemi** Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

SC-88 FIVE SURGE PROTECTION 100 W PEAK POWER



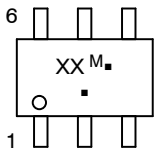
SC-88
CASE 419B
STYLE 24

PIN ASSIGNMENT



PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

MARKING DIAGRAM



XX = Specific Device Code
6J = SMF05C
6K = SZSMF12C/SMF12C
6L = SMF15C
6M = SMF24C
M = Date Code
▪ = Pb-Free Package

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 3 of this data sheet.

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SMF05CT1G ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	V_{RWM}	(Note 2)			5.0	V
Breakdown Voltage	V_{BR}	I_T = 1 mA, (Note 3)	6.2		7.2	V
Reverse Leakage Current	I_R	V_{RWM} = 5 V		0.07	5.0	μA
Clamping Voltage	V_C	I_{PP} = 5 A (8 x 20 μs Waveform)			9.8	V
Clamping Voltage	V_C	I_{PP} = 8 A (8 x 20 μs Waveform)			12.5	V
Maximum Peak Pulse Current	I_{PP}	8 x 20 μs Waveform			8.0	A
Capacitance	C_J	V_R = 0 V, f = 1 MHz (Line to GND)		80	130	pF

SMF12CT1G ELECTRICAL CHARACTERISTICS (T_J = 25 °C unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	V_{RWM}	(Note 2)			12	V
Breakdown Voltage	V_{BR}	I_T = 1 mA, (Note 3)	13.3		15	V
Reverse Leakage Current	I_R	V_{RWM} = 12 V		0.01	0.1	μA
Clamping Voltage	V_C	I_{PP} = 3 A (8 x 20 μs Waveform)			21	V
Clamping Voltage	V_C	I_{PP} = 6 A (8 x 20 μs Waveform)			23	V
Maximum Peak Pulse Current	I_{PP}	8 x 20 μs Waveform			6.0	A
Capacitance	C_J	V_R = 0 V, f = 1 MHz (Line to GND)		40	60	pF

SMF15CT1G ELECTRICAL CHARACTERISTICS (T_J = 25 °C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	V_{RWM}	(Note 2)			15	V
Breakdown Voltage	V_{BR}	I_T = 1 mA, (Note 3)	17		19	V
Reverse Leakage Current	I_R	V_{RWM} = 15 V		0.01	1.0	μA
Clamping Voltage	V_C	I_{PP} = 1 A (8 x 20 μs Waveform)			23	V
Clamping Voltage	V_C	I_{PP} = 5 A (8 x 20 μs Waveform)			29	V
Maximum Peak Pulse Current	I_{PP}	8 x 20 μs Waveform			5.0	A
Capacitance	C_J	V_R = 0 V, f = 1 MHz (Line to GND)		33	45	pF

SMF24CT1G ELECTRICAL CHARACTERISTICS (T_J = 25 °C, unless otherwise specified)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	V_{RWM}	(Note 2)			24	V
Breakdown Voltage	V_{BR}	I_T = 1 mA, (Note 3)	26.7		32	V
Reverse Leakage Current	I_R	V_{RWM} = 24 V		0.01	1.0	μA
Clamping Voltage	V_C	I_{PP} = 1 A (8 x 20 μs Waveform)			40	V
Clamping Voltage	V_C	I_{PP} = 2.5 A (8 x 20 μs Waveform)			44	V
Maximum Peak Pulse Current	I_{PP}	8 x 20 μs Waveform			2.5	A
Capacitance	C_J	V_R = 0 V, f = 1 MHz (Line to GND)		21	25	pF

2. Surge protection devices are normally selected according to the working peak reverse voltage (V_{RWM}), which should be equal or greater than the DC or continuous peak operating voltage level.
3. V_{BR} is measured at pulse test current I_T.
4. Include SZ-prefix devices where applicable.

TYPICAL PERFORMANCE CURVES

(T_J = 25 °C unless otherwise specified)

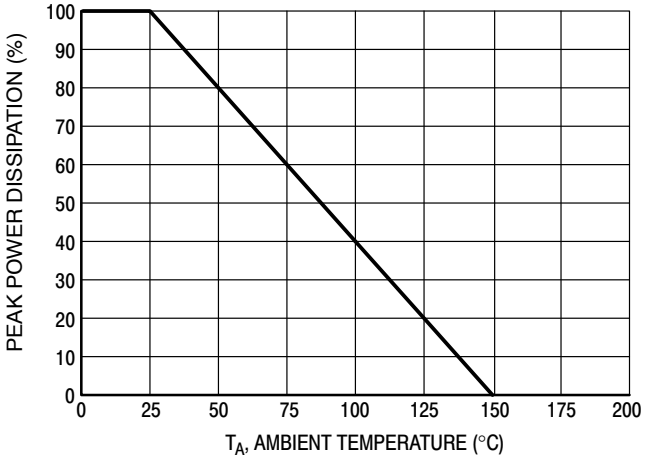


Figure 1. Pulse Derating Curve

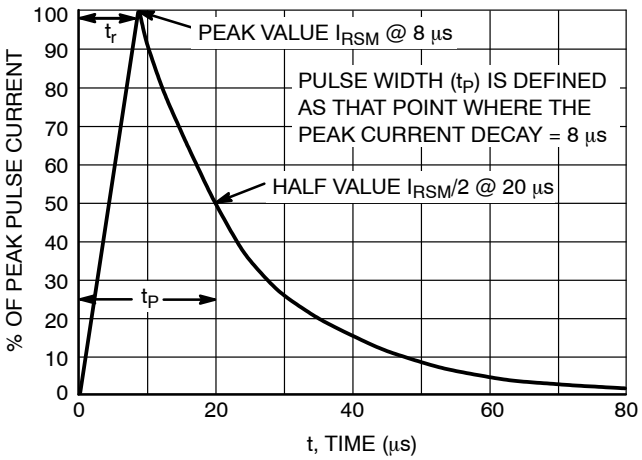


Figure 2. 8 × 20 μs Pulse Waveform

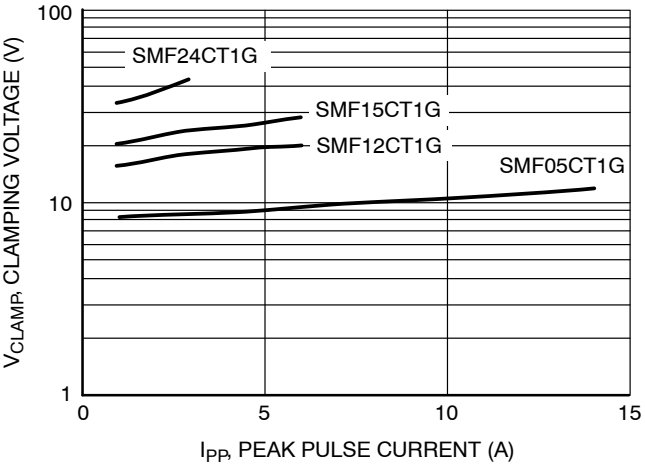


Figure 3. Clamping Voltage vs Peak Pulse Current

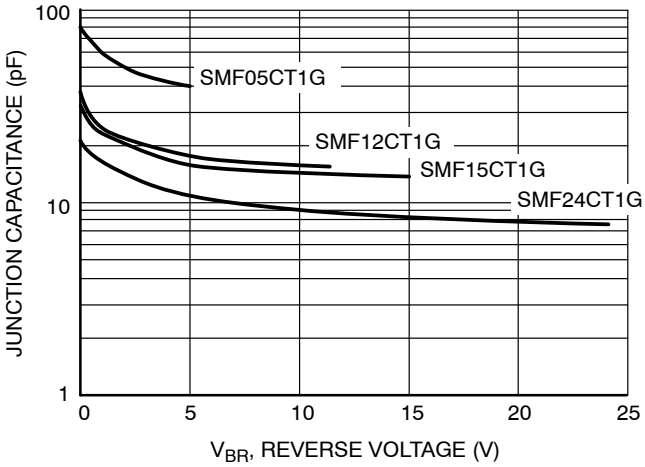


Figure 4. Junction Capacitance vs Reverse Voltage

ORDERING INFORMATION

Device	Package	Shipping†
SMF05CT1G	SC-88 (Pb-Free)	3,000 / Tape & Reel
SMF05CT2G*	SC-88 (Pb-Free)	3,000 / Tape & Reel
SMF12CT1G	SC-88 (Pb-Free)	3,000 / Tape & Reel
SMF15CT1G	SC-88 (Pb-Free)	3,000 / Tape & Reel
SZSMF12CT1G	SC-88 (Pb-Free)	3,000 / 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.

*The “T2” suffix refers to an alternate tape & reel orientation.

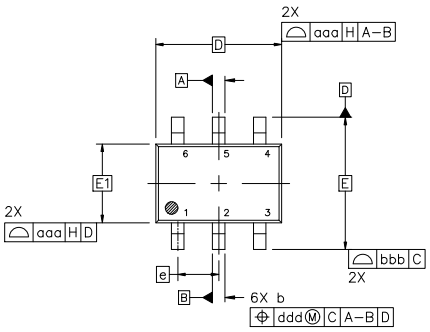
REVISION HISTORY

Revision	Description of Changes	Date
6	Rebranded the Data Sheet to **onsemi** format.	6/6/2025

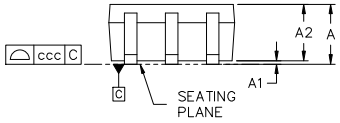


SC−88 2.00x1.25x0.90, 0.65P
CASE 419B−02
ISSUE Z

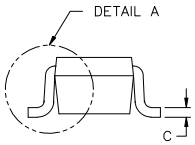
DATE 18 APR 2024



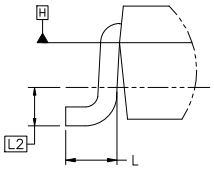
TOP VIEW



SIDE VIEW



END VIEW

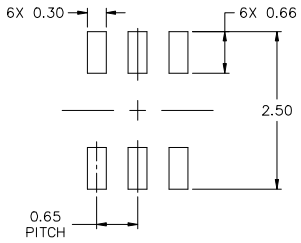


DETAIL A
SCALE 2:1

NOTES:

1. DIMENSIONING AND TOLERANCING CONFORM TO ASME Y14.5−2018.
2. ALL DIMENSION ARE IN MILLIMETERS.
3. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.20 PER END.
4. DIMENSIONS D AND E1 AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AND DATUM H.
5. DATUMS A AND B ARE DETERMINED AT DATUM H.
6. DIMENSIONS b AND c APPLY TO THE FLAT SECTION OF THE LEAD BETWEEN 0.08 AND 0.15 FROM THE TIP.
7. DIMENSION b DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 TOTAL IN EXCESS OF DIMENSION b AT MAXIMUM MATERIAL CONDITION. THE DAMBAR CANNOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.

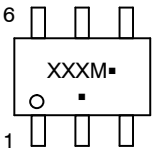
	MILLIMETERS		
DIM	MIN.	NOM.	MAX.
A	−−−	−−−	1.10
A1	0.00	−−−	0.10
A2	0.70	0.90	1.00
b	0.15	0.20	0.25
c	0.08	0.15	0.22
D	2.00 BSC		
E	2.10 BSC		
E1	1.25 BSC		
e	0.65 BSC		
L	0.26	0.36	0.46
L2	0.15 BSC		
aaa	0.15		
bbb	0.30		
ccc	0.10		
ddd	0.10		



RECOMMENDED MOUNTING FOOTPRINT*

* FOR ADDITIONAL INFORMATION ON OUR Pb−FREE STRATEGY AND SOLDERING DETAILS, PLEASE DOWNLOAD THE ONSEMI SOLDERING AND MOUNTING TECHNIQUES REFERENCE MANUAL, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



XXX = Specific Device Code
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or position may vary depending upon manufacturing 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. Some products may not follow the Generic Marking.

STYLES ON PAGE 2

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SC−88 2.00x1.25x0.90, 0.65P
CASE 419B−02
ISSUE Z

DATE 18 APR 2024

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

STYLE 2:
CANCELLED

STYLE 3:
CANCELLED

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

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

STYLE 6:
PIN 1. ANODE 2
2. N/C
3. CATHODE 1
4. ANODE 1
5. N/C
6. CATHODE 2

STYLE 7:
PIN 1. SOURCE 2
2. DRAIN 2
3. GATE 1
4. SOURCE 1
5. DRAIN 1
6. GATE 2

STYLE 8:
CANCELLED

STYLE 9:
PIN 1. EMITTER 2
2. EMITTER 1
3. COLLECTOR 1
4. BASE 1
5. BASE 2
6. COLLECTOR 2

STYLE 10:
PIN 1. SOURCE 2
2. SOURCE 1
3. GATE 1
4. DRAIN 1
5. DRAIN 2
6. GATE 2

STYLE 11:
PIN 1. CATHODE 2
2. CATHODE 2
3. ANODE 1
4. CATHODE 1
5. CATHODE 1
6. ANODE 2

STYLE 12:
PIN 1. ANODE 2
2. ANODE 2
3. CATHODE 1
4. ANODE 1
5. ANODE 1
6. CATHODE 2

STYLE 13:
PIN 1. ANODE
2. N/C
3. COLLECTOR
4. EMITTER
5. BASE
6. CATHODE

STYLE 14:
PIN 1. VREF
2. GND
3. GND
4. IOUT
5. VEN
6. VCC

STYLE 15:
PIN 1. ANODE 1
2. ANODE 2
3. ANODE 3
4. CATHODE 3
5. CATHODE 2
6. CATHODE 1

STYLE 16:
PIN 1. BASE 1
2. EMITTER 2
3. COLLECTOR 2
4. BASE 2
5. EMITTER 1
6. COLLECTOR 1

STYLE 17:
PIN 1. BASE 1
2. EMITTER 1
3. COLLECTOR 2
4. BASE 2
5. EMITTER 2
6. COLLECTOR 1

STYLE 18:
PIN 1. VIN1
2. VCC
3. VOUT2
4. VIN2
5. GND
6. VOUT1

STYLE 19:
PIN 1. I OUT
2. GND
3. GND
4. V CC
5. V EN
6. V REF

STYLE 20:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. EMITTER
5. COLLECTOR
6. COLLECTOR

STYLE 21:
PIN 1. ANODE 1
2. N/C
3. ANODE 2
4. CATHODE 2
5. N/C
6. CATHODE 1

STYLE 22:
PIN 1. D1 (i)
2. GND
3. D2 (i)
4. D2 (c)
5. VBUS
6. D1 (c)

STYLE 23:
PIN 1. Vn
2. CH1
3. Vp
4. N/C
5. CH2
6. N/C

STYLE 24:
PIN 1. CATHODE
2. ANODE
3. CATHODE
4. CATHODE
5. CATHODE
6. CATHODE

STYLE 25:
PIN 1. BASE 1
2. CATHODE
3. COLLECTOR 2
4. BASE 2
5. EMITTER
6. COLLECTOR 1

STYLE 26:
PIN 1. SOURCE 1
2. GATE 1
3. DRAIN 2
4. SOURCE 2
5. GATE 2
6. DRAIN 1

STYLE 27:
PIN 1. BASE 2
2. BASE 1
3. COLLECTOR 1
4. EMITTER 1
5. EMITTER 2
6. COLLECTOR 2

STYLE 28:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. SOURCE
5. DRAIN
6. DRAIN

STYLE 29:
PIN 1. ANODE
2. ANODE
3. COLLECTOR
4. EMITTER
5. BASE/ANODE
6. CATHODE

STYLE 30:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
6. DRAIN 1

Note: Please refer to datasheet for style callout. If style type is not called out in the datasheet refer to the device datasheet pinout or pin assignment.

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