ESD Protection Diode Array, 5-Line

SMS05C, SMS12C, SMS15C, SMS24C

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 TSOP−6 package.

Features

- Protects up to 5 Lines in a Single TSOP−6 Package
- Peak Power Dissipation − 350 W (8 × 20 μs Waveform)
- ESD Rating of Class 3B (Exceeding 8.0 kV) per Human Body Model and Class C (Exceeding 400 V) per Machine Model
- Compliance with IEC 61000−4−2 (ESD) 15 kV (Air), 8.0 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
- These are Pb−Free Devices

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 × 20 μs Double Exponential Waveform (Note 1)	350	W
T_J	Operating Junction Temperature Range	−40 to 150	°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)	>8000 >400 >15000 >8000	V

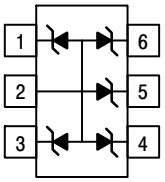
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. Non−repetitive current pulse per Figure 3.

TSOP−6 FIVE SURGE PROTECTION 350 W PEAK POWER

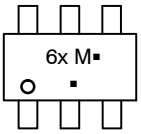
PIN ASSIGNMENT

TSOP−6
CASE 318G
SCALE 2:1



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

MARKING DIAGRAM



x = SMS05C:J
= SMS12C:K
= SMS15C:L
= SMS24C:M
M = Date Code
▪ = Pb−Free Package

(Note: Microdot may be in either location)

ORDERING INFORMATION

Device	Package	Shipping†
SMS05CT1G	TSOP−6 (Pb−Free)	3000 / Tape & Reel
SMS12CT1G		
SMS15CT1G		
SMS24CT1G SZSMS24CT1G		

†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.

SMS05C 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 = 1.0 mA (Note 3)	6.2		7.2	V
Reverse Leakage Current	I_R	V_{RWM} = 5.0 V			5.0	μA
Clamping Voltage	V_C	I_{PP} = 5.0 A (8 × 20 μs Waveform)			9.8	V
Clamping Voltage	V_C	I_{PP} = 24 A (8 × 20 μs Waveform)			14.5	V
Maximum Peak Pulse Current	I_{PP}	8 × 20 μs Waveform			24	A
Capacitance	C_J	V_R = 0 V, f = 1.0 MHz (Line to GND)		260	400	pF

SMS12C 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 = 1.0 mA (Note 3)	13.3		15	V
Reverse Leakage Current	I_R	V_{RWM} = 12 V		0.001	1.0	μA
Clamping Voltage	V_C	I_{PP} = 5.0 A (8 × 20 μs Waveform)			19	V
Clamping Voltage	V_C	I_{PP} = 15 A (8 × 20 μs Waveform)			23	V
Maximum Peak Pulse Current	I_{PP}	8 × 20 μs Waveform			15	A
Capacitance	C_J	V_R = 0 V, f = 1.0 MHz (Line to GND)		120	150	pF

SMS15C ELECTRICAL CHARACTERISTICS (T_J = 25°C, unless otherwise specified) (See Note 4)

Parameter	Symbol	Conditions	Min	Typ	Max	Unit
Reverse Working Voltage	V_{RWM}	(Note 2)			15	V
Breakdown Voltage	V_{BR}	I_T = 1.0 mA (Note 3)	17		19	V
Reverse Leakage Current	I_R	V_{RWM} = 15 V		0.05	1.0	μA
Clamping Voltage	V_C	I_{PP} = 5.0 A (8 × 20 μs Waveform)			24	V
Clamping Voltage	V_C	I_{PP} = 12 A (8 × 20 μs Waveform)			29	V
Maximum Peak Pulse Current	I_{PP}	8 × 20 μs Waveform			12	A
Capacitance	C_J	V_R = 0 V, f = 1.0 MHz (Line to GND)		95	125	pF

SZ/SMS24C 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 = 1.0 mA (Note 3)	26.7		32	V
Reverse Leakage Current	I_R	V_{RWM} = 24 V		0.001	1.0	μA
Clamping Voltage	V_C	I_{PP} = 5.0 A (8 × 20 μs Waveform)			40	V
Clamping Voltage	V_C	I_{PP} = 8 A (8 × 20 μs Waveform)			44	V
Maximum Peak Pulse Current	I_{PP}	8 × 20 μs Waveform			8.0	A
Capacitance	C_J	V_R = 0 V, f = 1.0 MHz (Line to GND)		60	75	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. Parametrics are the same for the Pb−Free packages, which are suffixed with a “G”.

TYPICAL PERFORMANCE CURVES (T_J = 25°C unless otherwise specified)

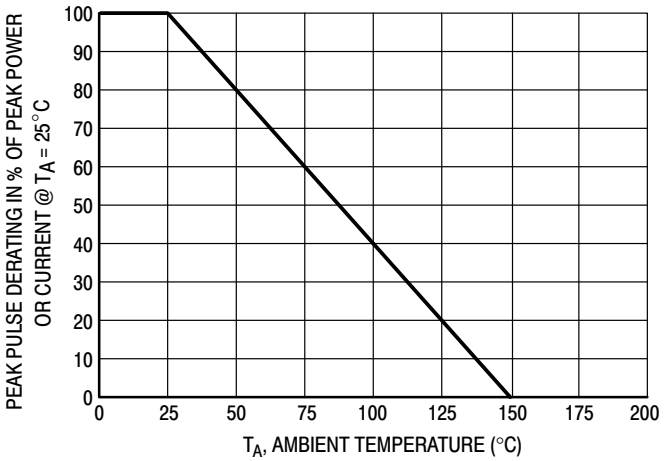


Figure 1. Pulse Derating Curve

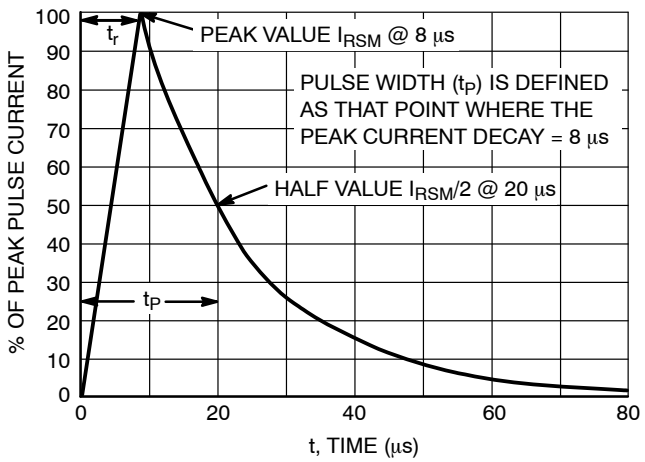


Figure 2. 8 × 20 μs Pulse Waveform

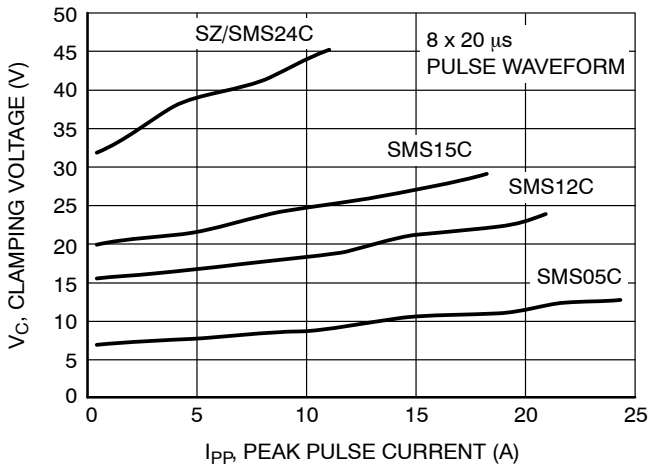


Figure 3. Clamping Voltage vs. Peak Pulse Current

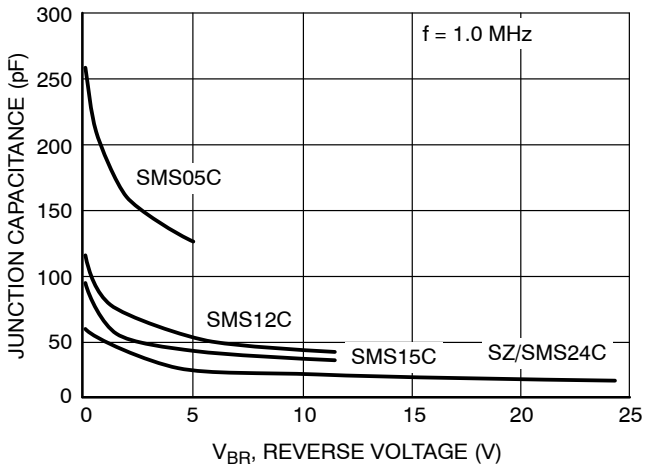


Figure 4. Junction Capacitance vs. Reverse Voltage

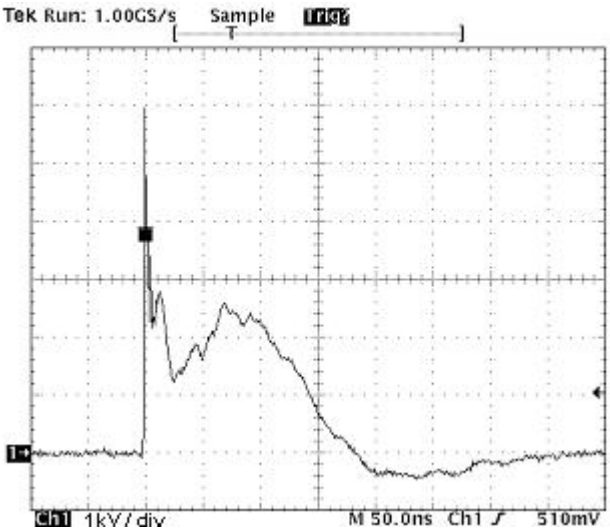


Figure 5. ESD Pulse IEC 61000−4−2 (8.0 kV Contact)

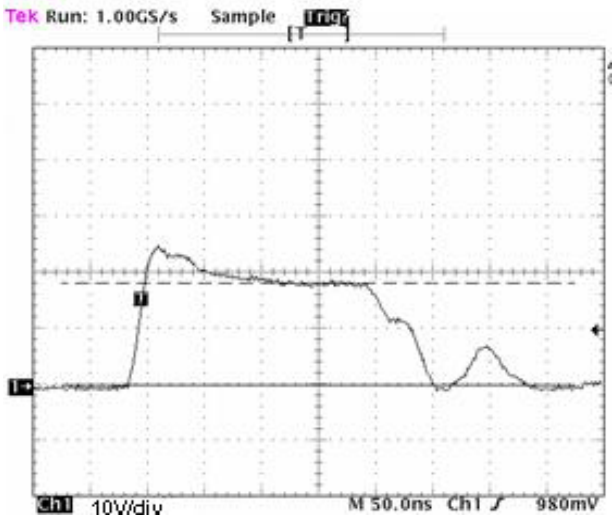


Figure 6. SMS15CT1 ESD Response for IEC 61000−4−2 (+8.0 kV Contact)

TYPICAL COMMON ANODE APPLICATIONS

A 5 surge protection junction common anode design in a TSOP−6 package protects four separate lines using only one package. This adds flexibility and creativity to PCB design especially when board space is at a premium. A simplified example of SMS05C Series Device applications is illustrated below.

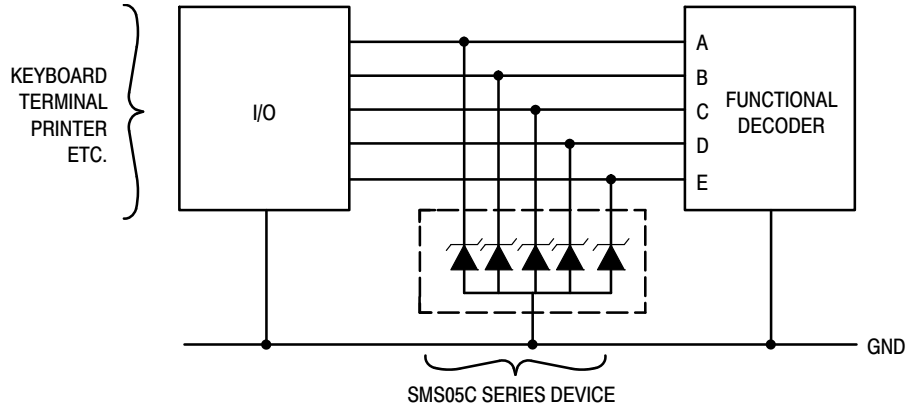


Figure 7. Computer Interface Protection

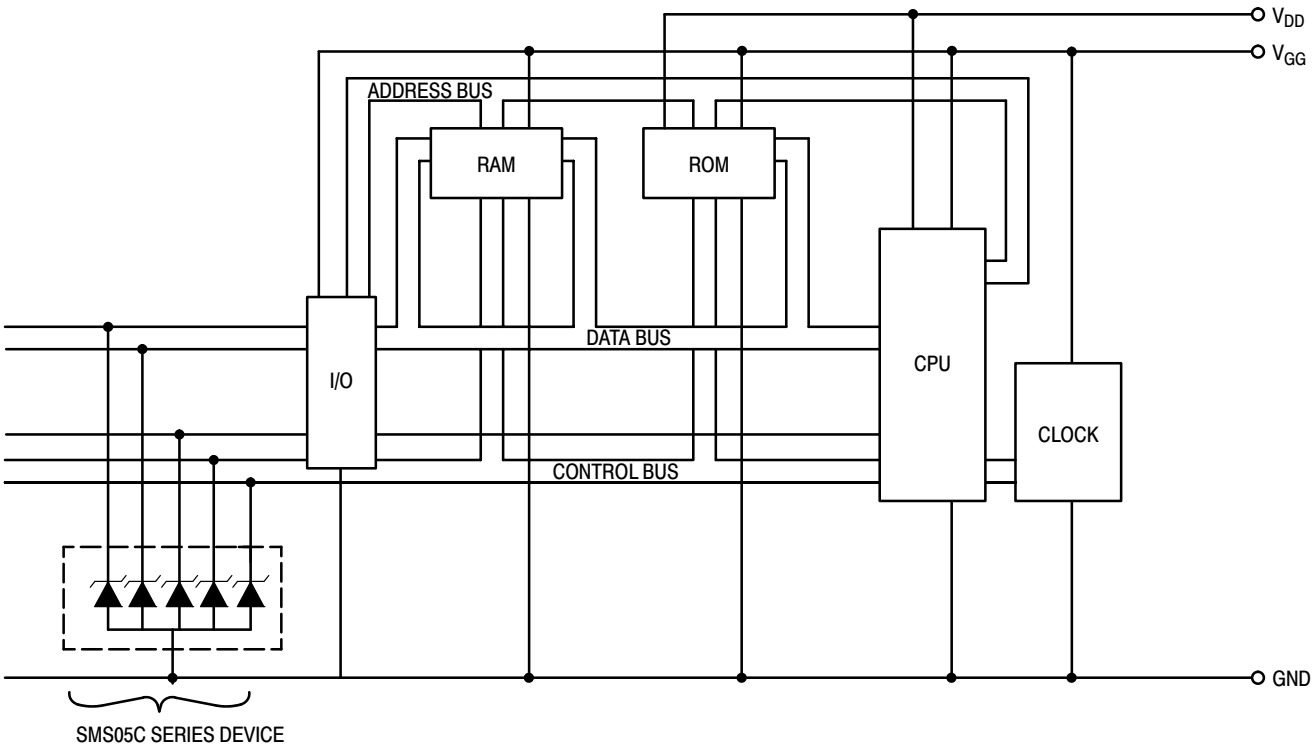


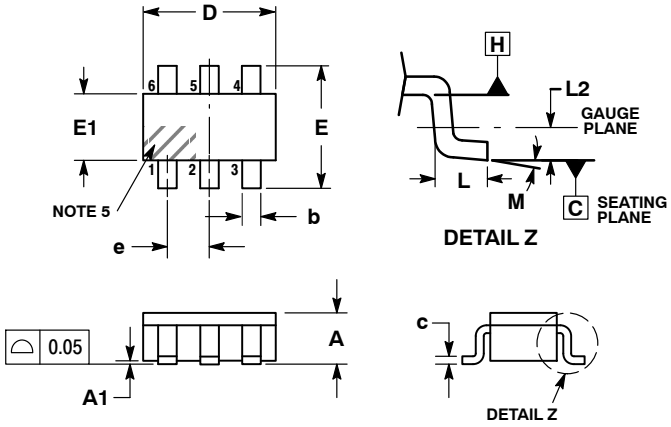
Figure 8. Microprocessor Protection

MECHANICAL CASE OUTLINE
PACKAGE DIMENSIONS

SCALE 2:1

TSOP−6
CASE 318G−02
ISSUE V

DATE 12 JUN 2012



NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. MAXIMUM LEAD THICKNESS INCLUDES LEAD FINISH. MINIMUM LEAD THICKNESS IS THE MINIMUM THICKNESS OF BASE MATERIAL.
4. DIMENSIONS D AND E1 DO NOT INCLUDE MOLD FLASH, PROTRUSIONS, OR GATE BURRS. MOLD FLASH, PROTRUSIONS, OR GATE BURRS SHALL NOT EXCEED 0.15 PER SIDE. DIMENSIONS D AND E1 ARE DETERMINED AT DATUM H.
5. PIN ONE INDICATOR MUST BE LOCATED IN THE INDICATED ZONE.

	MILLIMETERS		
DIM	MIN	NOM	MAX
A	0.90	1.00	1.10
A1	0.01	0.06	0.10
b	0.25	0.38	0.50
c	0.10	0.18	0.26
D	2.90	3.00	3.10
E	2.50	2.75	3.00
E1	1.30	1.50	1.70
e	0.85	0.95	1.05
L	0.20	0.40	0.60
L2	0.25 BSC		
M	0°	–	10°

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

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

STYLE 3:
PIN 1. ENABLE
2. N/C
3. R BOOST
4. Vz
5. V in
6. V out

STYLE 4:
PIN 1. N/C
2. V in
3. NOT USED
4. GROUND
5. ENABLE
6. LOAD

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

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

STYLE 7:
PIN 1. COLLECTOR
2. COLLECTOR
3. BASE
4. N/C
5. COLLECTOR
6. EMITTER

STYLE 8:
PIN 1. Vbus
2. D(in)
3. D(in)+
4. D(out)+
5. D(out)
6. GND

STYLE 9:
PIN 1. LOW VOLTAGE GATE
2. DRAIN
3. SOURCE
4. DRAIN
5. DRAIN
6. HIGH VOLTAGE GATE

STYLE 10:
PIN 1. D(OUT)+
2. GND
3. D(OUT)−
4. D(IN)−
5. VBUS
6. D(IN)+

STYLE 11:
PIN 1. SOURCE 1
2. DRAIN 2
3. DRAIN 2
4. SOURCE 2
5. GATE 1
6. DRAIN 1/GATE 2

STYLE 12:
PIN 1. I/O
2. GROUND
3. I/O
4. I/O
5. VCC
6. I/O

STYLE 13:
PIN 1. GATE 1
2. SOURCE 2
3. GATE 2
4. DRAIN 2
5. SOURCE 1
6. DRAIN 1

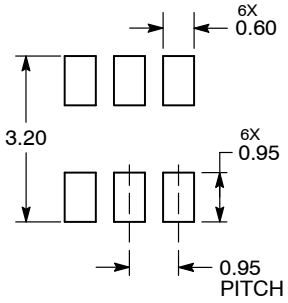
STYLE 14:
PIN 1. ANODE
2. SOURCE
3. GATE
4. CATHODE/DRAIN
5. CATHODE/DRAIN
6. CATHODE/DRAIN

STYLE 15:
PIN 1. ANODE
2. SOURCE
3. GATE
4. DRAIN
5. N/C
6. CATHODE

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

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

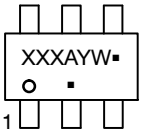
RECOMMENDED SOLDERING FOOTPRINT*



DIMENSIONS: MILLIMETERS

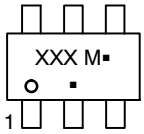
*For additional information on our Pb−Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

GENERIC MARKING DIAGRAM*



IC

XXX = Specific Device Code
A = Assembly Location
Y = Year
W = Work Week
▪ = Pb−Free Package



STANDARD

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

*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.

DOCUMENT NUMBER:	98ASB14888C	Electronic versions are uncontrolled except when accessed directly from the Document Repository. Printed versions are uncontrolled except when stamped “CONTROLLED COPY” in red.
DESCRIPTION:	TSOP−6	PAGE 1 OF 1

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

◊