

# ESD Protection Diode Array, 5-Line

## SMS05C, 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 ( $8 \times 20 \mu\text{s}$  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 ( $T_J = 25^\circ\text{C}$ unless otherwise specified)

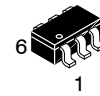
| Symbol     | Rating                                                                                                 | Value                            | Unit             |
|------------|--------------------------------------------------------------------------------------------------------|----------------------------------|------------------|
| $P_{PK} 1$ | Peak Power Dissipation<br>$8 \times 20 \mu\text{s}$ Double Exponential Waveform<br>(Note 1)            | 350                              | W                |
| $T_J$      | Operating Junction Temperature Range                                                                   | -40 to 150                       | $^\circ\text{C}$ |
| $T_{STG}$  | Storage Temperature Range                                                                              | -55 to 150                       | $^\circ\text{C}$ |
| $T_L$      | Lead Solder Temperature (10 s)                                                                         | 260                              | $^\circ\text{C}$ |
| ESD        | Human Body Model (HBM)<br>Machine Model (MM)<br>IEC 61000-4-2 Air (ESD)<br>IEC 61000-4-2 Contact (ESD) | >8000<br>>400<br>>15000<br>>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.

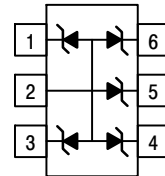
1. Non-repetitive current pulse per Figure 3.

## TSOP-6 FIVE SURGE PROTECTION 350 W PEAK POWER

### PIN ASSIGNMENT

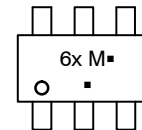


TSOP-6  
CASE 318G  
SCALE 2:1



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

See detailed ordering and shipping information on page 5 of this data sheet.

## SMS05C, SMS15C, SMS24C

### SMS05C ELECTRICAL CHARACTERISTICS ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

| Symbol    | Parameter                  | Conditions                                                           | Min | Typ | Max  | Unit          |
|-----------|----------------------------|----------------------------------------------------------------------|-----|-----|------|---------------|
| $V_{RWM}$ | Reverse Working Voltage    | (Note 2)                                                             |     |     | 5.0  | V             |
| $V_{BR}$  | Breakdown Voltage          | $I_T = 1.0\text{ mA}$ (Note 3)                                       | 6.2 |     | 7.2  | V             |
| $I_R$     | Reverse Leakage Current    | $V_{RWM} = 5.0\text{ V}$                                             |     |     | 5.0  | $\mu\text{A}$ |
| $V_C$     | Clamping Voltage           | $I_{PP} = 5.0\text{ A}$ ( $8 \times 20\text{ }\mu\text{s}$ Waveform) |     |     | 9.8  | V             |
| $V_C$     | Clamping Voltage           | $I_{PP} = 24\text{ A}$ ( $8 \times 20\text{ }\mu\text{s}$ Waveform)  |     |     | 14.5 | V             |
| $I_{PP}$  | Maximum Peak Pulse Current | $8 \times 20\text{ }\mu\text{s}$ Waveform                            |     |     | 24   | A             |
| $C_J$     | Capacitance                | $V_R = 0\text{ V}$ , $f = 1.0\text{ MHz}$ (Line to GND)              |     | 260 | 400  | pF            |

### SMS12C ELECTRICAL CHARACTERISTICS ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

| Symbol    | Parameter                  | Conditions                                                           | Min  | Typ   | Max | Unit          |
|-----------|----------------------------|----------------------------------------------------------------------|------|-------|-----|---------------|
| $V_{RWM}$ | Reverse Working Voltage    | (Note 2)                                                             |      |       | 12  | V             |
| $V_{BR}$  | Breakdown Voltage          | $I_T = 1.0\text{ mA}$ (Note 3)                                       | 13.3 |       | 15  | V             |
| $I_R$     | Reverse Leakage Current    | $V_{RWM} = 12\text{ V}$                                              |      | 0.001 | 1.0 | $\mu\text{A}$ |
| $V_C$     | Clamping Voltage           | $I_{PP} = 5.0\text{ A}$ ( $8 \times 20\text{ }\mu\text{s}$ Waveform) |      |       | 19  | V             |
| $V_C$     | Clamping Voltage           | $I_{PP} = 15\text{ A}$ ( $8 \times 20\text{ }\mu\text{s}$ Waveform)  |      |       | 23  | V             |
| $I_{PP}$  | Maximum Peak Pulse Current | $8 \times 20\text{ }\mu\text{s}$ Waveform                            |      |       | 15  | A             |
| $C_J$     | Capacitance                | $V_R = 0\text{ V}$ , $f = 1.0\text{ MHz}$ (Line to GND)              |      | 120   | 150 | pF            |

### SMS15C ELECTRICAL CHARACTERISTICS ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified) (See Note 4)

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

### SZ/SMS24C ELECTRICAL CHARACTERISTICS ( $T_J = 25\text{ }^{\circ}\text{C}$ , unless otherwise specified)

| Symbol    | Parameter                  | Conditions                                                           | Min  | Typ   | Max | Unit          |
|-----------|----------------------------|----------------------------------------------------------------------|------|-------|-----|---------------|
| $V_{RWM}$ | Reverse Working Voltage    | (Note 2)                                                             |      |       | 24  | V             |
| $V_{BR}$  | Breakdown Voltage          | $I_T = 1.0\text{ mA}$ (Note 3)                                       | 26.7 |       | 32  | V             |
| $I_R$     | Reverse Leakage Current    | $V_{RWM} = 24\text{ V}$                                              |      | 0.001 | 1.0 | $\mu\text{A}$ |
| $V_C$     | Clamping Voltage           | $I_{PP} = 5.0\text{ A}$ ( $8 \times 20\text{ }\mu\text{s}$ Waveform) |      |       | 40  | V             |
| $V_C$     | Clamping Voltage           | $I_{PP} = 8\text{ A}$ ( $8 \times 20\text{ }\mu\text{s}$ Waveform)   |      |       | 44  | V             |
| $I_{PP}$  | Maximum Peak Pulse Current | $8 \times 20\text{ }\mu\text{s}$ Waveform                            |      |       | 8.0 | A             |
| $C_J$     | Capacitance                | $V_R = 0\text{ V}$ , $f = 1.0\text{ MHz}$ (Line to GND)              |      | 60    | 75  | pF            |

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.

- 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.
- $V_{BR}$  is measured at pulse test current  $I_T$ .
- Parametrics are the same for the Pb-Free packages, which are suffixed with a "G".



# SMS05C, SMS15C, SMS24C

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

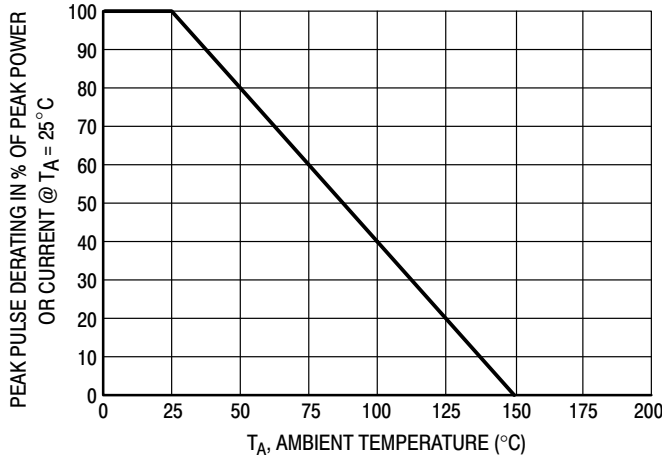


Figure 1. Pulse Derating Curve

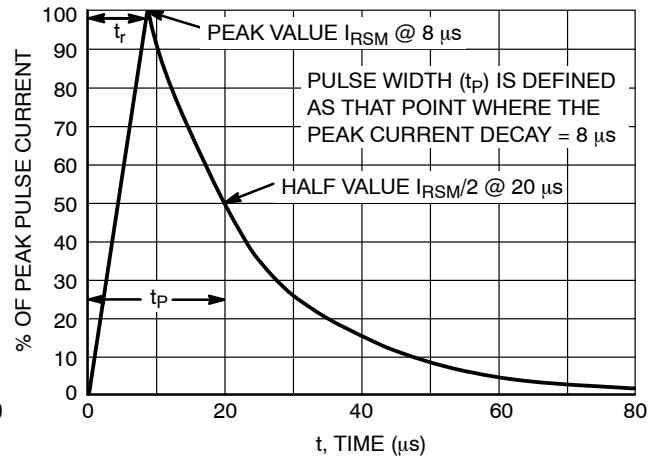


Figure 2.  $8 \times 20 \mu\text{s}$  Pulse Waveform

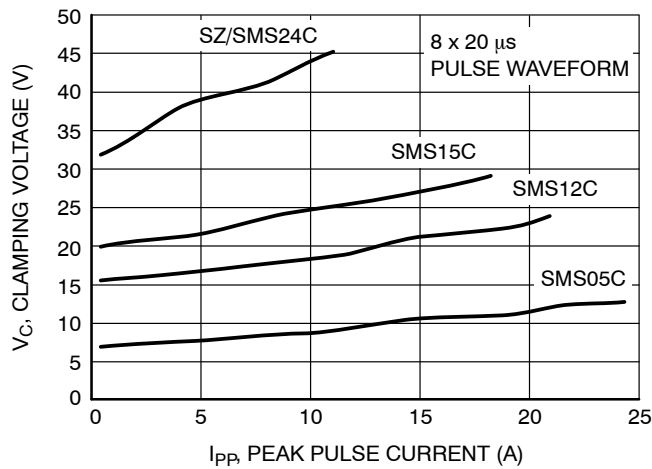


Figure 3. Clamping Voltage vs. Peak Pulse Current

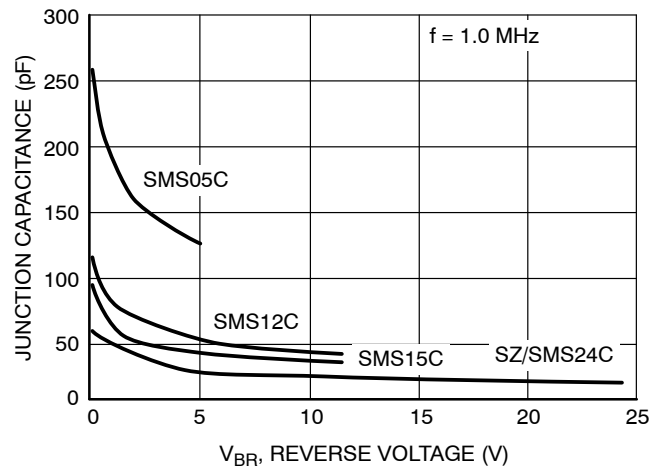


Figure 4. Junction Capacitance vs. Reverse Voltage

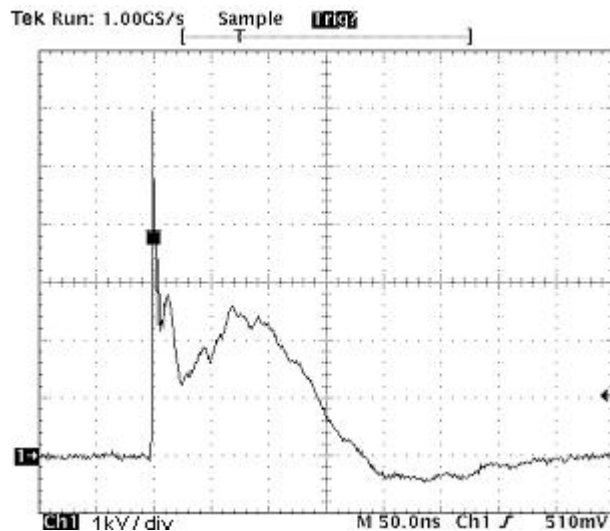


Figure 5. ESD Pulse IEC 61000-4-2 (8.0 kV Contact)

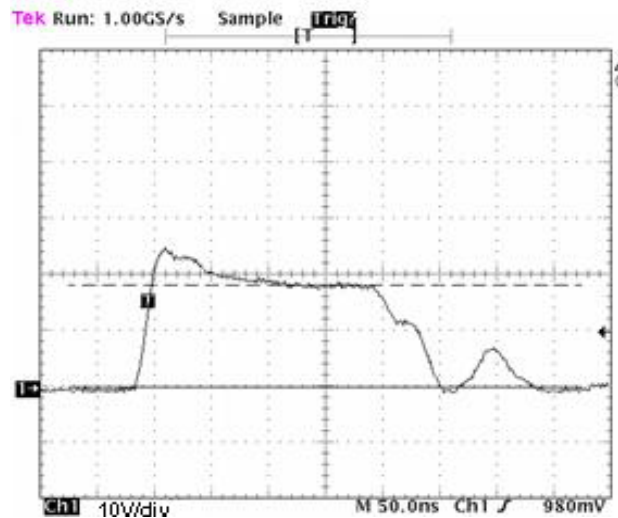
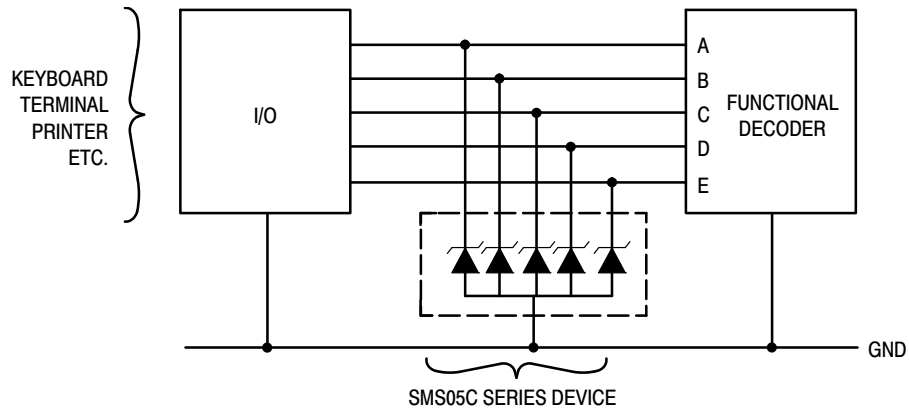


Figure 6. SMS15CT1 ESD Response for IEC 61000-4-2 (+8.0 kV Contact)

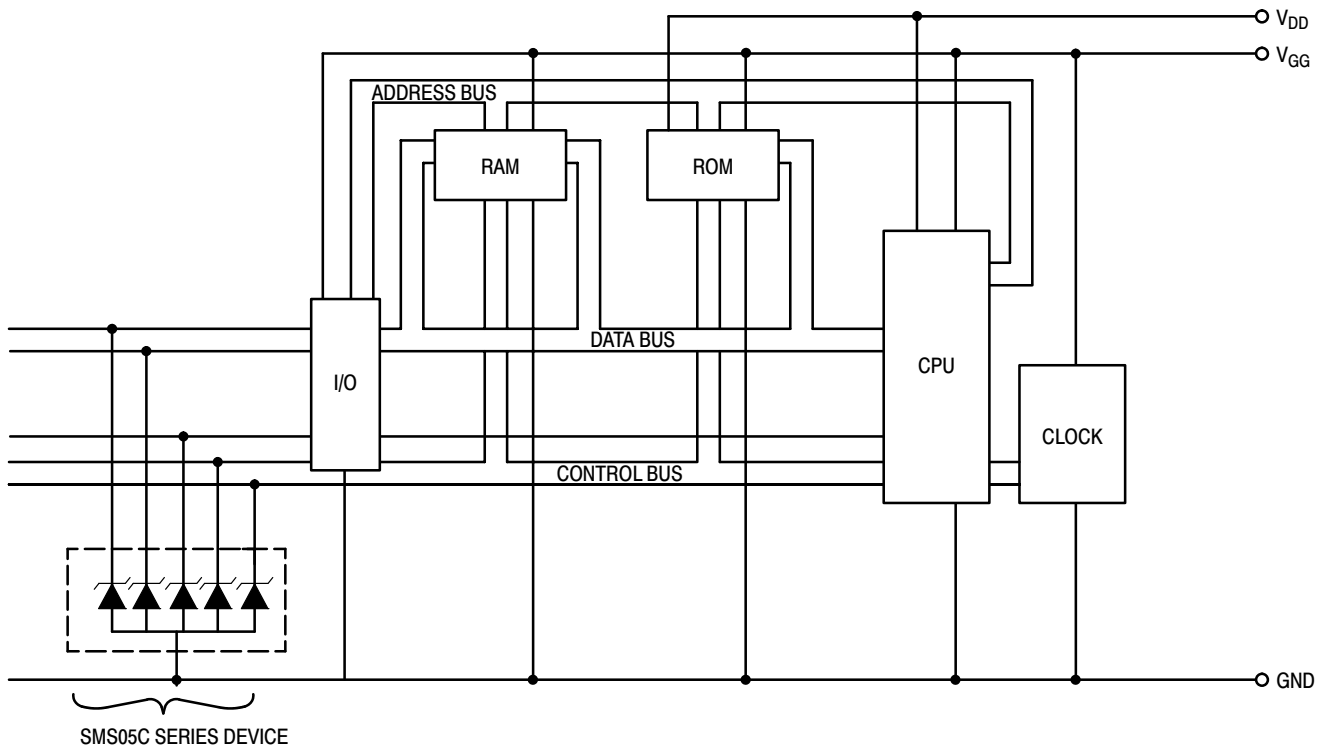
## TYPICAL COMMON ANODE APPLICATIONS

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**

## SMS05C, SMS15C, SMS24C

### ORDERING INFORMATION

| Device      | Part Orientation    | Package             | Shipping <sup>†</sup> |
|-------------|---------------------|---------------------|-----------------------|
| SMS05CT1G   | Pin 1 – Lower Left  | TSOP-6<br>(Pb-Free) | 3000/ Tape & Reel     |
| SMS15CT1G   | Pin 1 – Lower Left  |                     |                       |
| SMS24CT1G   | Pin 1 – Lower Left  |                     |                       |
| SZSMS24CT1G | Pin 1 – Lower Left  |                     |                       |
| SMS24CT2G   | Pin 1 – Upper Right |                     |                       |
| SZSMS24CT2G | Pin 1 – Upper Right |                     |                       |

<sup>†</sup> 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](#).



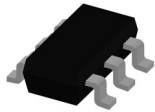
## SMS05C, SMS15C, SMS24C

### REVISION HISTORY

| Revision | Description of Changes                                      | Date      |
|----------|-------------------------------------------------------------|-----------|
| 11       | Added Optional Part Orientation.                            | 6/8/2026  |
| 12       | Corrected ordering suffixes for two OPNs in ordering table. | 6/25/2026 |

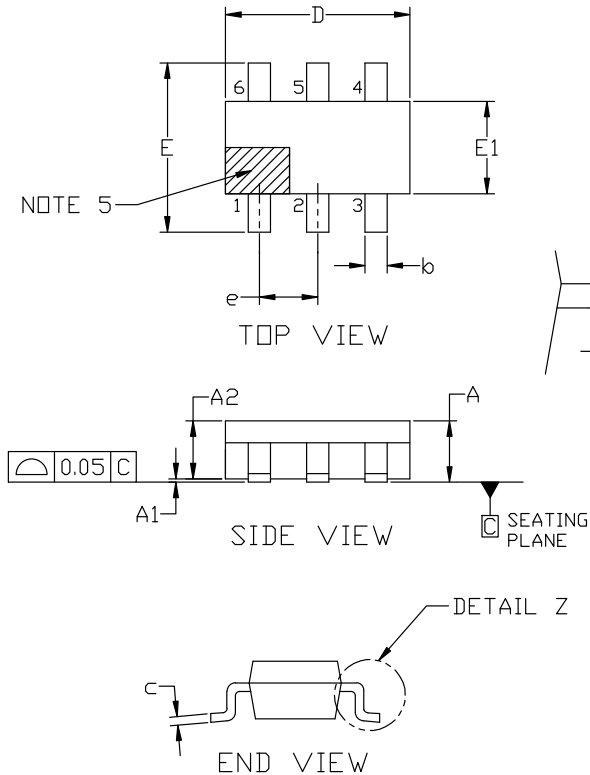
This document has undergone updates prior to the inclusion of this revision history table. The changes tracked here only reflect updates made on the noted approval dates.





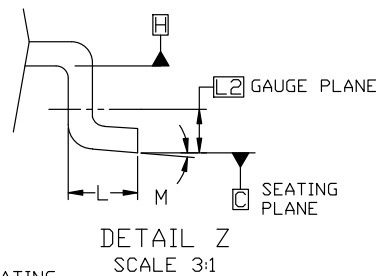
**TSOP-6 3.00x1.50x0.90, 0.95P**  
**CASE 318G**  
**ISSUE W**

DATE 26 FEB 2024

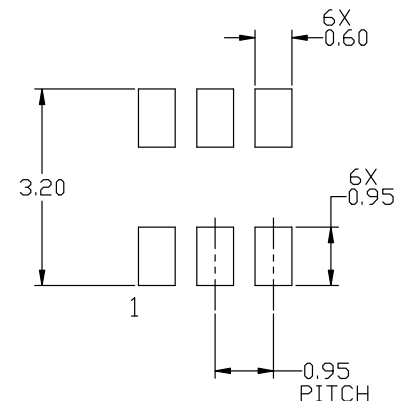


**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2018.
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 1 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 |
| A2          | 0.80     | 0.90 | 1.00 |
| 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°  |



**RECOMMENDED MOUNTING 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.

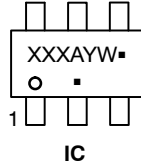
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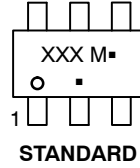
TSOP-6 3.00x1.50x0.90, 0.95P  
CASE 318G  
ISSUE W

DATE 26 FEB 2024

GENERIC  
MARKING DIAGRAM\*



IC



STANDARD

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

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.

|                                                                                                   |                                                                                                               |                                                                                                              |                                                                                                      |                                                                                                            |                                                                                                       |
|---------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|
| STYLE 1:<br>PIN 1. DRAIN<br>2. DRAIN<br>3. GATE<br>4. SOURCE<br>5. DRAIN<br>6. DRAIN              | STYLE 2:<br>PIN 1. EMITTER 2<br>2. BASE 1<br>3. COLLECTOR 1<br>4. EMITTER 1<br>5. BASE 2<br>6. COLLECTOR 2    | STYLE 3:<br>PIN 1. ENABLE<br>2. N/C<br>3. R BOOST<br>4. Vz<br>5. V in<br>6. V out                            | STYLE 4:<br>PIN 1. N/C<br>2. V in<br>3. NOT USED<br>4. GROUND<br>5. ENABLE<br>6. LOAD                | STYLE 5:<br>PIN 1. EMITTER 2<br>2. BASE 2<br>3. COLLECTOR 1<br>4. EMITTER 1<br>5. BASE 1<br>6. COLLECTOR 2 | STYLE 6:<br>PIN 1. COLLECTOR<br>2. COLLECTOR<br>3. BASE<br>4. EMITTER<br>5. COLLECTOR<br>6. COLLECTOR |
| STYLE 7:<br>PIN 1. COLLECTOR<br>2. COLLECTOR<br>3. BASE<br>4. N/C<br>5. COLLECTOR<br>6. EMITTER   | STYLE 8:<br>PIN 1. Vbus<br>2. D(in)<br>3. D(in)+<br>4. D(out)+<br>5. D(out)<br>6. GND                         | STYLE 9:<br>PIN 1. LOW VOLTAGE GATE<br>2. DRAIN<br>3. SOURCE<br>4. DRAIN<br>5. DRAIN<br>6. HIGH VOLTAGE GATE | STYLE 10:<br>PIN 1. D(OUT)+<br>2. GND<br>3. D(OUT)-<br>4. D(IN)-<br>5. VBUS<br>6. D(IN)+             | STYLE 11:<br>PIN 1. SOURCE 1<br>2. DRAIN 2<br>3. DRAIN 2<br>4. SOURCE 2<br>5. GATE 1<br>6. DRAIN 1/GATE 2  | STYLE 12:<br>PIN 1. I/O<br>2. GROUND<br>3. I/O<br>4. I/O<br>5. VCC<br>6. I/O                          |
| STYLE 13:<br>PIN 1. GATE 1<br>2. SOURCE 2<br>3. GATE 2<br>4. DRAIN 2<br>5. SOURCE 1<br>6. DRAIN 1 | STYLE 14:<br>PIN 1. ANODE<br>2. SOURCE<br>3. GATE<br>4. CATHODE/DRAIN<br>5. CATHODE/DRAIN<br>6. CATHODE/DRAIN | STYLE 15:<br>PIN 1. ANODE<br>2. SOURCE<br>3. GATE<br>4. DRAIN<br>5. N/C<br>6. CATHODE                        | STYLE 16:<br>PIN 1. ANODE/CATHODE<br>2. BASE<br>3. EMITTER<br>4. COLLECTOR<br>5. ANODE<br>6. CATHODE | STYLE 17:<br>PIN 1. EMITTER<br>2. BASE<br>3. ANODE/CATHODE<br>4. ANODE<br>5. CATHODE<br>6. COLLECTOR       |                                                                                                       |

|                  |                              |                                                                                                                                                                                     |
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