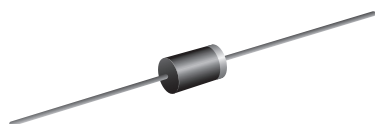


# TRANSZORB® Transient Voltage Suppressors



DO-15 (DO-204AC)



**RoHS**  
COMPLIANT

## FEATURES

- Glass passivated chip junction
- Available in unidirectional and bidirectional
- 500 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Solder dip 275 °C max. 10 s, per JESD 22-B106
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

## TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, and telecommunication.

## MECHANICAL DATA

**Case:** DO-15 (DO-204AC)

Molded epoxy over passivated chip

Molding compound meets UL 94 V-0 flammability rating  
Base P/N-E3 - RoHS compliant, commercial grade  
Base P/NHE3 - RoHS compliant, AEC-Q101 qualified

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

E3 suffix meets JESD 201 class 1A whisker test, HE3 suffix meets JESD 201 class 2 whisker test

**Polarity:** for unidirectional types the color band denotes cathode end, no marking on bidirectional types

## PRIMARY CHARACTERISTICS

|                                 |                               |
|---------------------------------|-------------------------------|
| $V_{WM}$                        | 5.0 V to 170 V                |
| $V_{BR}$ (unidirectional)       | 6.4 V to 209 V                |
| $V_{BR}$ (bidirectional)        | 6.4 V to 209 V                |
| $P_{PPM}$                       | 500 W                         |
| $P_D$                           | 3.0 W                         |
| $I_{FSM}$ (unidirectional only) | 70 A                          |
| $T_J$ max.                      | 175 °C                        |
| Polarity                        | Unidirectional, bidirectional |
| Package                         | DO-15 (DO-204AC)              |

## DEVICES FOR BIDIRECTION APPLICATIONS

For bidirectional types, use CA suffix (e.g. SA5.0CA, SA170CA).

Electrical characteristics apply in both directions.

## MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)

| PARAMETER                                                                             | SYMBOL         | VALUE          | UNIT |
|---------------------------------------------------------------------------------------|----------------|----------------|------|
| Peak pulse power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)</sup> (fig. 1)  | $P_{PPM}$      | 500            | W    |
| Peak pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup>                     | $I_{PPM}$      | See next table | A    |
| Power dissipation on infinite heatsink at $T_L = 75$ °C (fig. 5)                      | $P_D$          | 3.0            | W    |
| Peak forward surge current 10 ms single half sine-wave unidirectional only            | $I_{FSM}$      | 70             | A    |
| Maximum instantaneous forward voltage at 100 A for unidirectional only <sup>(3)</sup> | $V_F$          | 3.5            | V    |
| Operating junction and storage temperature range                                      | $T_J, T_{STG}$ | -55 to +175    | °C   |

### Notes

<sup>(1)</sup> Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25$  °C per fig. 2

<sup>(2)</sup> 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum

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

| DEVICE TYPE           | BREAKDOWN VOLTAGE $V_{BR}$ AT $I_T$ <sup>(1)</sup> (V) |      | TEST CURRENT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ <sup>(3)</sup> $I_D$ ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE CURRENT $I_{PPM}$ <sup>(2)</sup> (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | MAXIMUM TEMPERATURE COEFFICIENT AT $V_{BR}$ ( $\text{mV}/^{\circ}\text{C}$ ) |
|-----------------------|--------------------------------------------------------|------|-------------------------|--------------------------------|----------------------------------------------------------------------------|---------------------------------------------------------|-------------------------------------------------|------------------------------------------------------------------------------|
|                       | MIN.                                                   | MAX. |                         |                                |                                                                            |                                                         |                                                 |                                                                              |
| SA5.0A <sup>(4)</sup> | 6.40                                                   | 7.07 | 10                      | 5.0                            | 600                                                                        | 54.3                                                    | 9.2                                             | 5                                                                            |
| SA6.0A                | 6.67                                                   | 7.37 | 10                      | 6.0                            | 600                                                                        | 48.5                                                    | 10.3                                            | 5                                                                            |
| SA6.5A                | 7.22                                                   | 7.98 | 10                      | 6.5                            | 400                                                                        | 44.7                                                    | 11.2                                            | 5                                                                            |
| SA7.0A                | 7.78                                                   | 8.60 | 10                      | 7.0                            | 150                                                                        | 41.7                                                    | 12.0                                            | 6                                                                            |
| SA7.5A                | 8.33                                                   | 9.21 | 1.0                     | 7.5                            | 50                                                                         | 38.8                                                    | 12.9                                            | 7                                                                            |
| SA8.0A                | 8.89                                                   | 9.83 | 1.0                     | 8.0                            | 25                                                                         | 36.8                                                    | 13.6                                            | 7                                                                            |
| SA8.5A                | 9.44                                                   | 10.4 | 1.0                     | 8.5                            | 10                                                                         | 34.7                                                    | 14.4                                            | 8                                                                            |
| SA9.0A                | 10.0                                                   | 11.1 | 1.0                     | 9.0                            | 5.0                                                                        | 32.5                                                    | 15.4                                            | 9                                                                            |
| SA10A                 | 11.1                                                   | 12.3 | 1.0                     | 10                             | 1.0                                                                        | 29.4                                                    | 17.0                                            | 10                                                                           |
| SA11A                 | 12.2                                                   | 13.5 | 1.0                     | 11                             | 1.0                                                                        | 27.5                                                    | 18.2                                            | 11                                                                           |
| SA12A                 | 13.3                                                   | 14.7 | 1.0                     | 12                             | 1.0                                                                        | 25.1                                                    | 19.9                                            | 12                                                                           |
| SA13A                 | 14.4                                                   | 15.9 | 1.0                     | 13                             | 1.0                                                                        | 23.3                                                    | 21.5                                            | 13                                                                           |
| SA14A                 | 15.6                                                   | 17.2 | 1.0                     | 14                             | 1.0                                                                        | 21.6                                                    | 23.2                                            | 14                                                                           |
| SA15A                 | 16.7                                                   | 18.5 | 1.0                     | 15                             | 1.0                                                                        | 20.5                                                    | 24.4                                            | 16                                                                           |
| SA16A                 | 17.8                                                   | 19.7 | 1.0                     | 16                             | 1.0                                                                        | 19.2                                                    | 26.0                                            | 17                                                                           |
| SA17A                 | 18.9                                                   | 20.9 | 1.0                     | 17                             | 1.0                                                                        | 18.1                                                    | 27.6                                            | 19                                                                           |
| SA18A                 | 20.0                                                   | 22.1 | 1.0                     | 18                             | 1.0                                                                        | 17.1                                                    | 29.2                                            | 20                                                                           |
| SA20A                 | 22.2                                                   | 24.5 | 1.0                     | 20                             | 1.0                                                                        | 15.4                                                    | 32.4                                            | 23                                                                           |
| SA22A                 | 24.4                                                   | 26.9 | 1.0                     | 22                             | 1.0                                                                        | 14.1                                                    | 35.5                                            | 25                                                                           |
| SA24A                 | 26.7                                                   | 29.5 | 1.0                     | 24                             | 1.0                                                                        | 12.9                                                    | 38.9                                            | 28                                                                           |
| SA26A                 | 28.9                                                   | 31.9 | 1.0                     | 26                             | 1.0                                                                        | 11.9                                                    | 42.1                                            | 30                                                                           |
| SA28A                 | 31.1                                                   | 34.4 | 1.0                     | 28                             | 1.0                                                                        | 11                                                      | 45.4                                            | 31                                                                           |
| SA30A                 | 33.3                                                   | 36.8 | 1.0                     | 30                             | 1.0                                                                        | 10                                                      | 48.4                                            | 36                                                                           |
| SA33A                 | 36.7                                                   | 40.6 | 1.0                     | 33                             | 1.0                                                                        | 9.4                                                     | 53.3                                            | 39                                                                           |
| SA36A                 | 40.0                                                   | 44.2 | 1.0                     | 36                             | 1.0                                                                        | 8.6                                                     | 58.1                                            | 41                                                                           |
| SA40A                 | 44.4                                                   | 49.1 | 1.0                     | 40                             | 1.0                                                                        | 7.8                                                     | 64.5                                            | 46                                                                           |
| SA43A                 | 47.8                                                   | 52.8 | 1.0                     | 43                             | 1.0                                                                        | 7.2                                                     | 69.4                                            | 50                                                                           |
| SA45A                 | 50.0                                                   | 55.3 | 1.0                     | 45                             | 1.0                                                                        | 6.9                                                     | 72.7                                            | 52                                                                           |
| SA48A                 | 53.3                                                   | 58.9 | 1.0                     | 48                             | 1.0                                                                        | 6.5                                                     | 77.4                                            | 56                                                                           |
| SA51A                 | 56.7                                                   | 62.7 | 1.0                     | 51                             | 1.0                                                                        | 6.1                                                     | 82.4                                            | 61                                                                           |
| SA54A                 | 60.0                                                   | 66.3 | 1.0                     | 54                             | 1.0                                                                        | 5.7                                                     | 87.1                                            | 65                                                                           |
| SA58A                 | 64.4                                                   | 71.2 | 1.0                     | 58                             | 1.0                                                                        | 5.3                                                     | 93.6                                            | 70                                                                           |
| SA60A                 | 66.7                                                   | 73.7 | 1.0                     | 60                             | 1.0                                                                        | 5.2                                                     | 96.8                                            | 71                                                                           |
| SA64A                 | 71.1                                                   | 78.6 | 1.0                     | 64                             | 1.0                                                                        | 4.9                                                     | 103                                             | 76                                                                           |
| SA70A                 | 77.8                                                   | 86.0 | 1.0                     | 70                             | 1.0                                                                        | 4.4                                                     | 113                                             | 85                                                                           |
| SA75A                 | 83.3                                                   | 92.1 | 1.0                     | 75                             | 1.0                                                                        | 4.1                                                     | 121                                             | 91                                                                           |
| SA78A                 | 86.7                                                   | 95.8 | 1.0                     | 78                             | 1.0                                                                        | 4                                                       | 126                                             | 95                                                                           |
| SA85A                 | 94.4                                                   | 104  | 1.0                     | 85                             | 1.0                                                                        | 3.6                                                     | 137                                             | 103                                                                          |
| SA90A                 | 100                                                    | 111  | 1.0                     | 90                             | 1.0                                                                        | 3.4                                                     | 146                                             | 110                                                                          |
| SA100A                | 111                                                    | 123  | 1.0                     | 100                            | 1.0                                                                        | 3.1                                                     | 162                                             | 123                                                                          |
| SA110A                | 122                                                    | 135  | 1.0                     | 110                            | 1.0                                                                        | 2.8                                                     | 177                                             | 133                                                                          |
| SA120A                | 133                                                    | 147  | 1.0                     | 120                            | 1.0                                                                        | 2.6                                                     | 193                                             | 146                                                                          |
| SA130A                | 144                                                    | 159  | 1.0                     | 130                            | 1.0                                                                        | 2.4                                                     | 209                                             | 158                                                                          |
| SA150A                | 167                                                    | 185  | 1.0                     | 150                            | 1.0                                                                        | 2.1                                                     | 243                                             | 184                                                                          |
| SA160A                | 178                                                    | 197  | 1.0                     | 160                            | 1.0                                                                        | 1.9                                                     | 259                                             | 196                                                                          |
| SA170A                | 189                                                    | 209  | 1.0                     | 170                            | 1.0                                                                        | 1.8                                                     | 275                                             | 208                                                                          |

**Notes**(1) Pulse test:  $t_p \leq 50\text{ ms}$ 

(2) Surge current waveform per fig. 3 and derate per fig. 2

(3) For bidirectional types with  $V_{WM}$  of 10 V and less the  $I_D$  limit is doubled(4) For the bidirectional SA5.0CA, the maximum  $V_{BR}$  is 7.25 V

(5) All terms and symbols are consistent with ANSI/IEEE CA62.35



**ORDERING INFORMATION** (Example)

| PREFERRED PIN               | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                    |
|-----------------------------|-----------------|------------------------|---------------|----------------------------------|
| SA5.0A-E3/54                | 0.432           | 54                     | 4000          | 13" diameter paper tape and reel |
| SA5.0AHE3/54 <sup>(1)</sup> | 0.432           | 54                     | 4000          | 13" diameter paper tape and reel |

**Note**

<sup>(1)</sup> AEC-Q101 qualified

**RATINGS AND CHARACTERISTICS CURVES** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

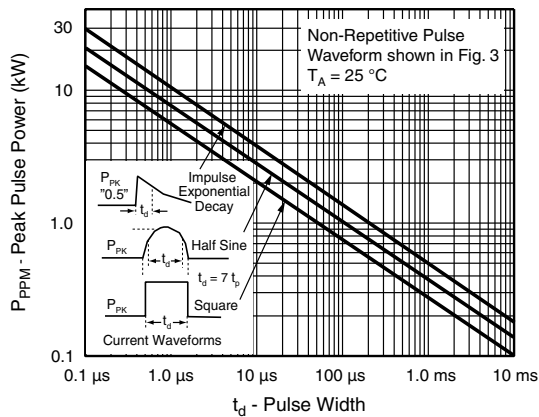


Fig. 1 - Peak Pulse Power Rating Curve

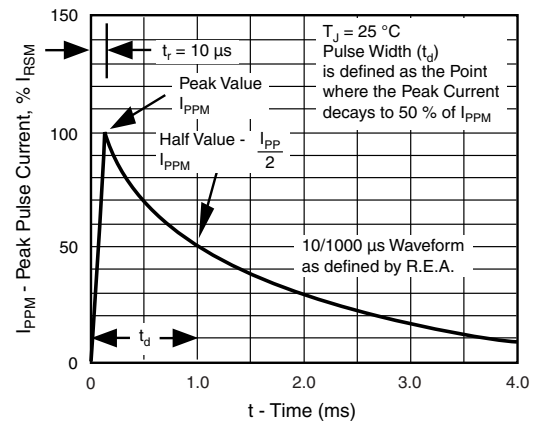


Fig. 3 - Pulse Waveform

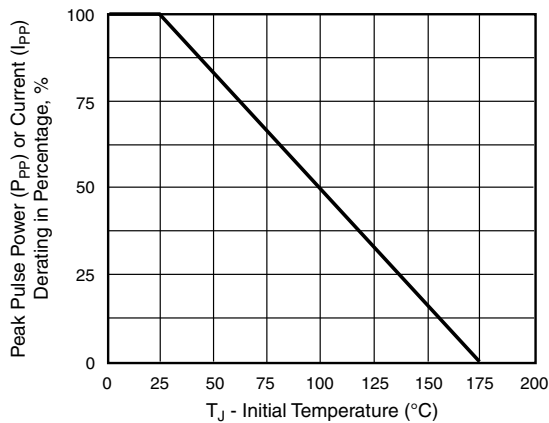


Fig. 2 - Pulse Derating Curve

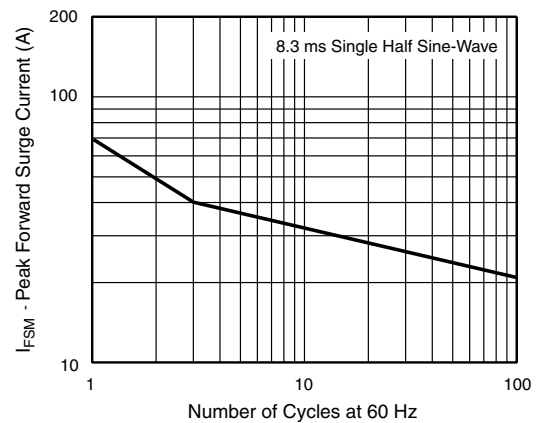


Fig. 4 - Maximum Non-Repetitive Forward Surge Current Unidirectional Only

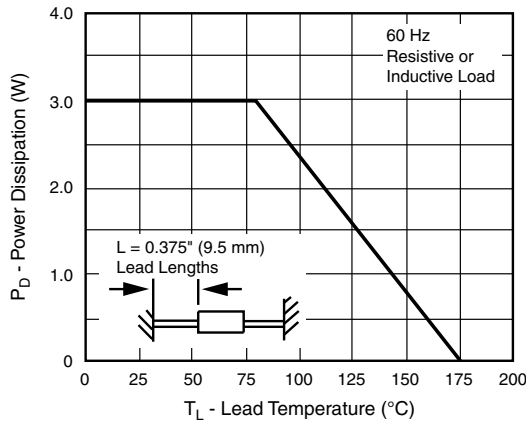


Fig. 5 - Steady State Power Derating Curve

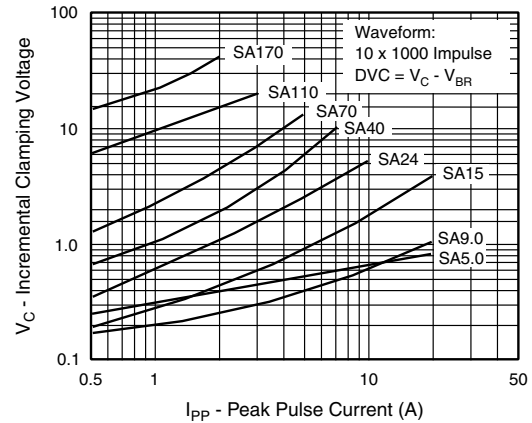


Fig. 8 - Incremental Clamping Voltage Curve Uni-Directional

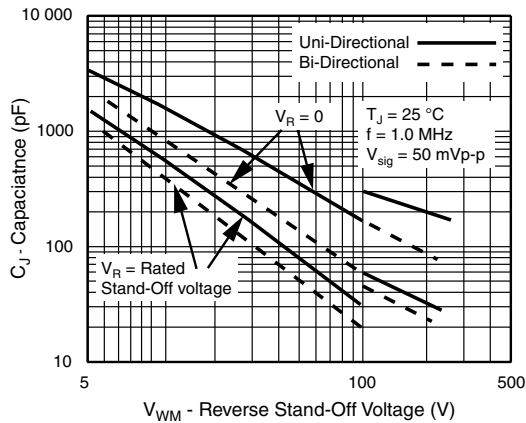


Fig. 6 - Capacitance

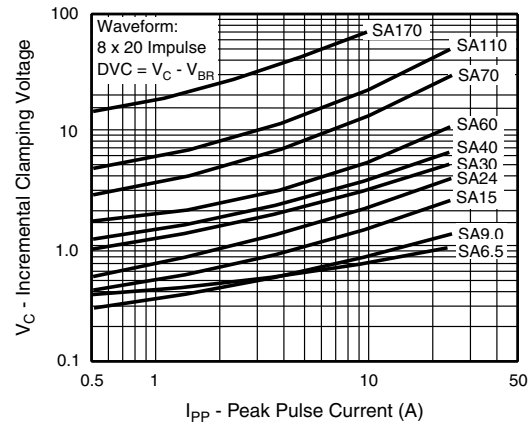


Fig. 9 - Incremental Clamping Voltage Curve Bidirectional

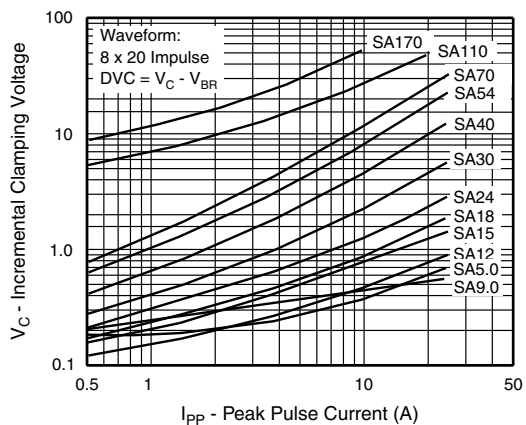


Fig. 7 - Incremental Clamping Voltage Curve Unidirectional

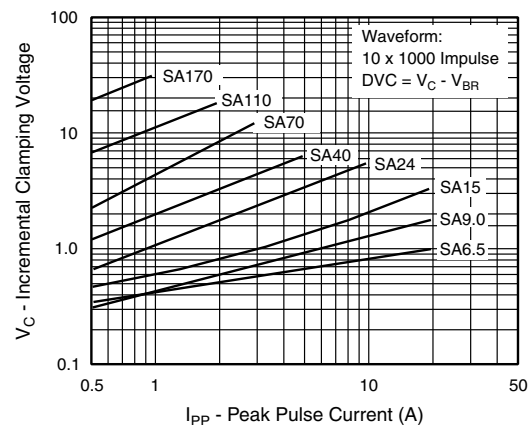


Fig. 10 - Incremental Clamping Voltage Curve Bidirectional

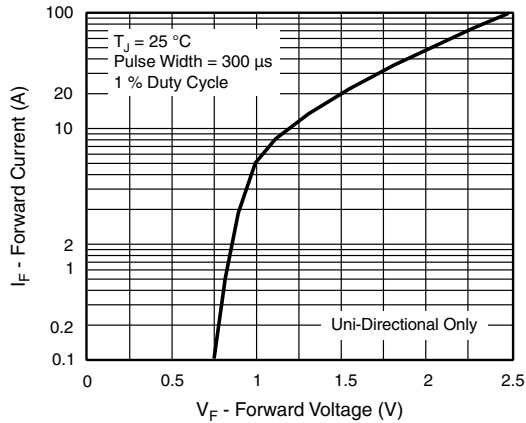


Fig. 11 - Typical Instantaneous Forward Voltage

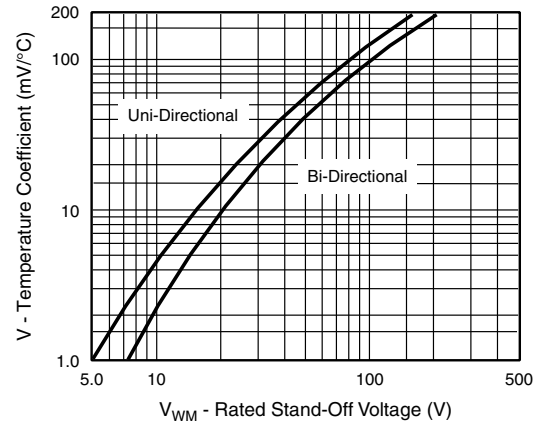
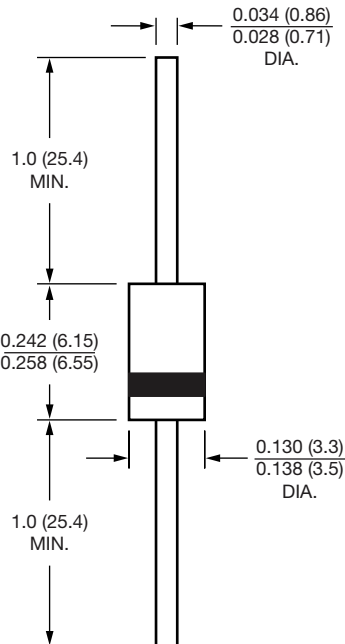


Fig. 12 - Breakdown Voltage Temperature Coefficient Curve

**PACKAGE OUTLINE DIMENSIONS** in inches (millimeters)

**DO-15 (DO-204AC)**

**Note**

- Dimensions of mold length and diameter do not include mold flash and gate burr, mold flash shall not exceed 0.015 inch per side. These dimensions are measured at the outermost extreme of the plastic body



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