

# D44VH10 (NPN), D45VH10 (PNP)

## Complementary Silicon Power Transistors

These complementary silicon power transistors are designed for high-speed switching applications, such as switching regulators and high frequency inverters. The devices are also well-suited for drivers for high power switching circuits.

### Features

- Fast Switching
- Key Parameters Specified @ 100°C
- Low Collector-Emitter Saturation Voltage
- Complementary Pairs Simplify Circuit Designs
- These Devices are Pb-Free and are RoHS Compliant\*

### MAXIMUM RATINGS

| Rating                                                                                   | Symbol         | Value      | Unit      |
|------------------------------------------------------------------------------------------|----------------|------------|-----------|
| Collector-Emitter Voltage                                                                | $V_{CEO}$      | 80         | Vdc       |
| Collector-Emitter Voltage                                                                | $V_{CEV}$      | 100        | Vdc       |
| Emitter Base Voltage                                                                     | $V_{EB}$       | 7.0        | Vdc       |
| Collector Current – Continuous                                                           | $I_C$          | 15         | Adc       |
| Collector Current – Peak (Note 1)                                                        | $I_{CM}$       | 20         | Adc       |
| Total Power Dissipation<br>@ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 83<br>0.67 | W<br>W/°C |
| Operating and Storage Junction<br>Temperature Range                                      | $T_J, T_{stg}$ | -55 to 150 | °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. Pulse Width  $\leq 6.0$  ms, Duty Cycle  $\leq 50\%$ .

### THERMAL CHARACTERISTICS

| Characteristic                                                                   | Symbol          | Max  | Unit |
|----------------------------------------------------------------------------------|-----------------|------|------|
| Thermal Resistance, Junction to Case                                             | $R_{\theta JC}$ | 1.5  | °C/W |
| Thermal Resistance, Junction to Ambient                                          | $R_{\theta JA}$ | 62.5 | °C/W |
| Maximum Lead Temperature for Soldering<br>Purposes: 1/8" from Case for 5 Seconds | $T_L$           | 275  | °C   |

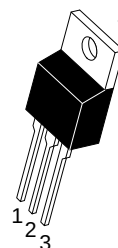
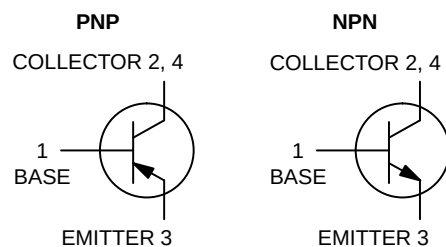
\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.



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## 15 A COMPLEMENTARY SILICON POWER TRANSISTORS 80 V, 83 W



TO-220  
CASE 221A  
STYLE 1

### MARKING DIAGRAM



x = 4 or 5  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

### ORDERING INFORMATION

| Device   | Package             | Shipping      |
|----------|---------------------|---------------|
| D44VH10G | TO-220<br>(Pb-Free) | 50 Units/Rail |
| D45VH10G | TO-220<br>(Pb-Free) | 50 Units/Rail |

# D44VH10 (NPN), D45VH10 (PNP)

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

| Characteristic                                                                                                                                                                                                         | Symbol                | Min    | Typ    | Max       | Unit |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|--------|--------|-----------|------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                                             |                       |        |        |           |      |
| Collector–Emitter Sustaining Voltage (Note 2)<br>(I <sub>C</sub> = 25 mAdc, I <sub>B</sub> = 0)                                                                                                                        | V <sub>CEO(sus)</sub> | 80     | –      | –         | Vdc  |
| Collector–Emitter Cutoff Current<br>(V <sub>CE</sub> = Rated V <sub>CEV</sub> , V <sub>BE(off)</sub> = 4.0 Vdc)<br>(V <sub>CE</sub> = Rated V <sub>CEV</sub> , V <sub>BE(off)</sub> = 4.0 Vdc, T <sub>C</sub> = 100°C) | I <sub>CEV</sub>      | –<br>– | –<br>– | 10<br>100 | μAdc |
| Emitter Base Cutoff Current<br>(V <sub>EB</sub> = 7.0 Vdc, I <sub>C</sub> = 0)                                                                                                                                         | I <sub>EBO</sub>      | –      | –      | 10        | μAdc |

## ON CHARACTERISTICS (Note 2)

|                                                                                                                                                                                                                                                                                                                                                             |                      |                  |                  |                          |     |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------------|------------------|--------------------------|-----|
| DC Current Gain<br>(I <sub>C</sub> = 2.0 Adc, V <sub>CE</sub> = 1.0 Vdc)<br>(I <sub>C</sub> = 4.0 Adc, V <sub>CE</sub> = 1.0 Vdc)                                                                                                                                                                                                                           | h <sub>FE</sub>      | 35<br>20         | –<br>–           | –<br>–                   | –   |
| Collector–Emitter Saturation Voltage<br>(I <sub>C</sub> = 8.0 Adc, I <sub>B</sub> = 0.4 Adc)<br>D44VH10<br>(I <sub>C</sub> = 8.0 Adc, I <sub>B</sub> = 0.8 Adc)<br>D45VH10<br>(I <sub>C</sub> = 15 Adc, I <sub>B</sub> = 3.0 Adc, T <sub>C</sub> = 100°C)<br>D44VH10<br>D45VH10                                                                             | V <sub>CE(sat)</sub> | –<br>–<br>–<br>– | –<br>–<br>–<br>– | 0.4<br>1.0<br>0.8<br>1.5 | Vdc |
| Base–Emitter Saturation Voltage<br>(I <sub>C</sub> = 8.0 Adc, I <sub>B</sub> = 0.4 Adc)<br>D44VH10<br>(I <sub>C</sub> = 8.0 Adc, I <sub>B</sub> = 0.8 Adc)<br>D45VH10<br>(I <sub>C</sub> = 8.0 Adc, I <sub>B</sub> = 0.4 Adc, T <sub>C</sub> = 100°C)<br>D44VH10<br>(I <sub>C</sub> = 8.0 Adc, I <sub>B</sub> = 0.8 Adc, T <sub>C</sub> = 100°C)<br>D45VH10 | V <sub>BE(sat)</sub> | –<br>–<br>–<br>– | –<br>–<br>–<br>– | 1.2<br>1.0<br>1.1<br>1.5 | Vdc |

## DYNAMIC CHARACTERISTICS

|                                                                                                                         |                 |        |            |        |     |
|-------------------------------------------------------------------------------------------------------------------------|-----------------|--------|------------|--------|-----|
| Current Gain Bandwidth Product<br>(I <sub>C</sub> = 0.1 Adc, V <sub>CE</sub> = 10 Vdc, f = 20 MHz)                      | f <sub>T</sub>  | –      | 50         | –      | MHz |
| Output Capacitance<br>(V <sub>CB</sub> = 10 Vdc, I <sub>C</sub> = 0, f <sub>test</sub> = 1.0 MHz)<br>D44VH10<br>D45VH10 | C <sub>ob</sub> | –<br>– | 120<br>275 | –<br>– | pF  |

## SWITCHING CHARACTERISTICS

|              |                                                                                                   |                |   |   |     |    |
|--------------|---------------------------------------------------------------------------------------------------|----------------|---|---|-----|----|
| Delay Time   | (V <sub>CC</sub> = 20 Vdc, I <sub>C</sub> = 8.0 Adc, I <sub>B1</sub> = I <sub>B2</sub> = 0.8 Adc) | t <sub>d</sub> | – | – | 50  | ns |
| Rise Time    |                                                                                                   | t <sub>r</sub> | – | – | 250 |    |
| Storage Time |                                                                                                   | t <sub>s</sub> | – | – | 700 |    |
| Fall Time    |                                                                                                   | t <sub>f</sub> | – | – | 90  |    |

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.

2. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.

## D44VH10 (NPN), D45VH10 (PNP)

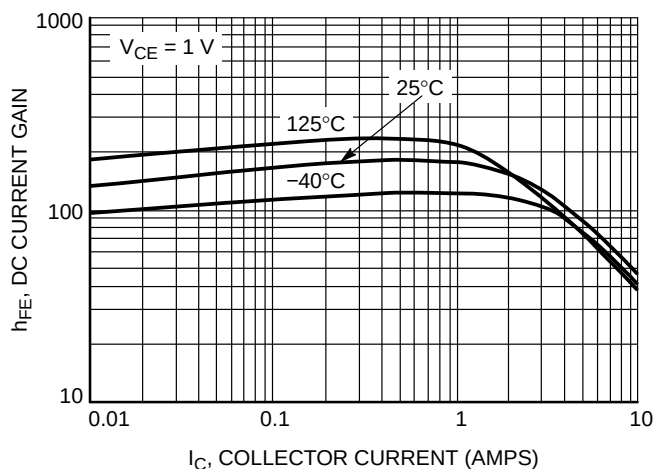


Figure 1. D44VH10 DC Current Gain

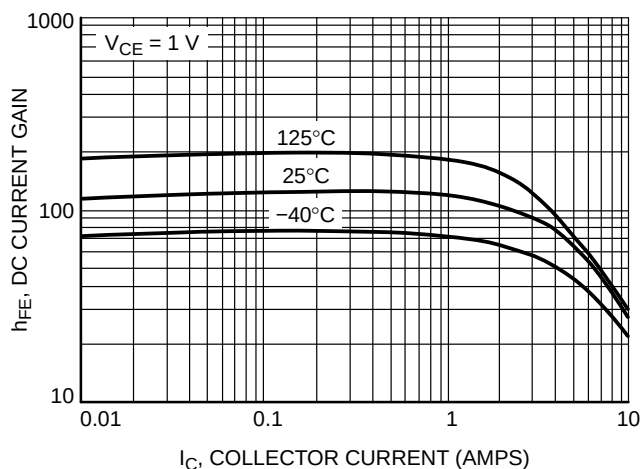


Figure 2. D45VH10 DC Current Gain

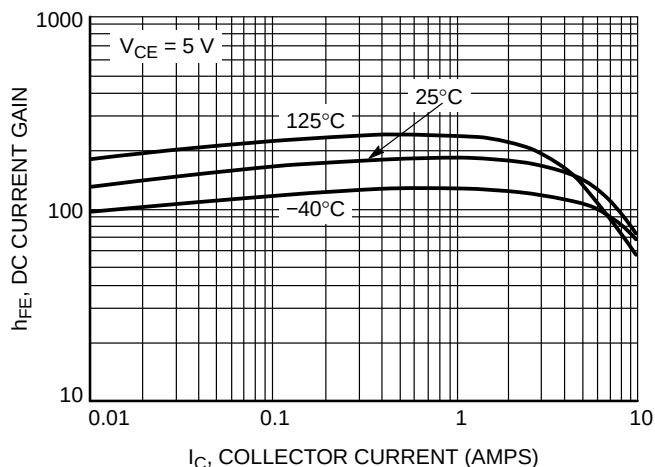


Figure 3. D44VH10 DC Current Gain

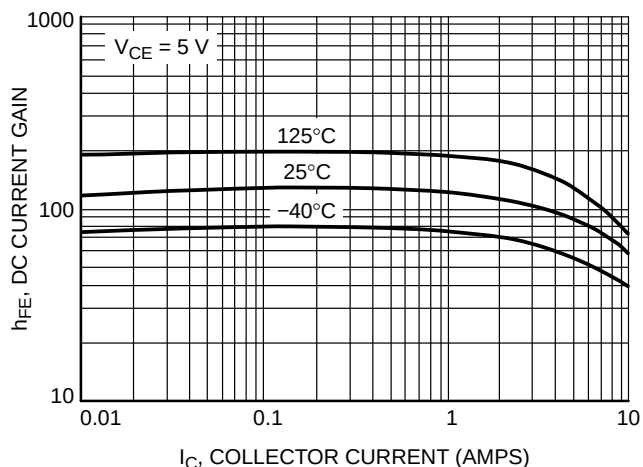


Figure 4. D45VH10 DC Current Gain

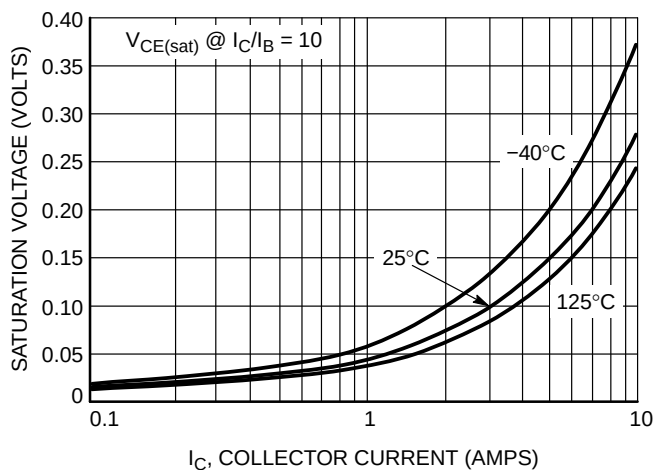


Figure 5. D44VH10 ON-Voltage

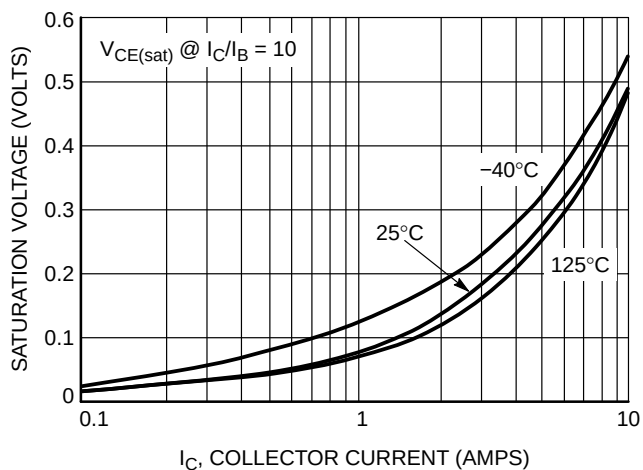
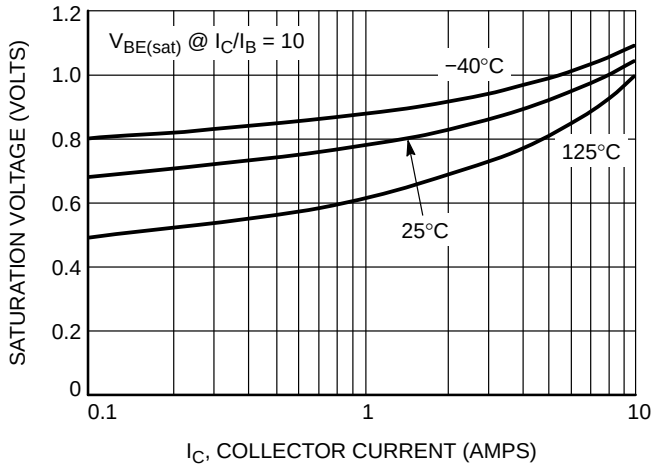
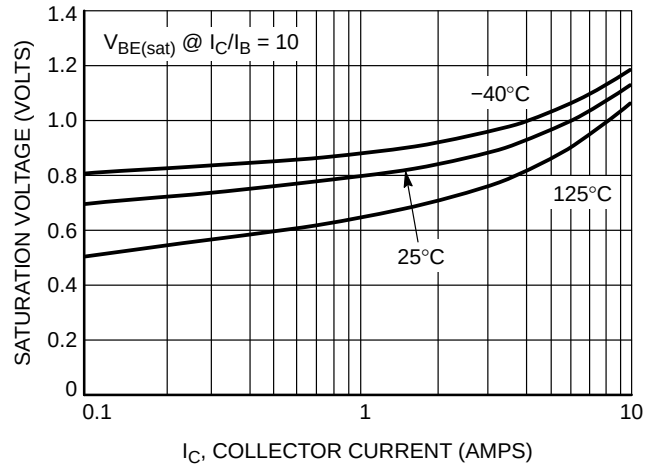


Figure 6. D45VH10 ON-Voltage

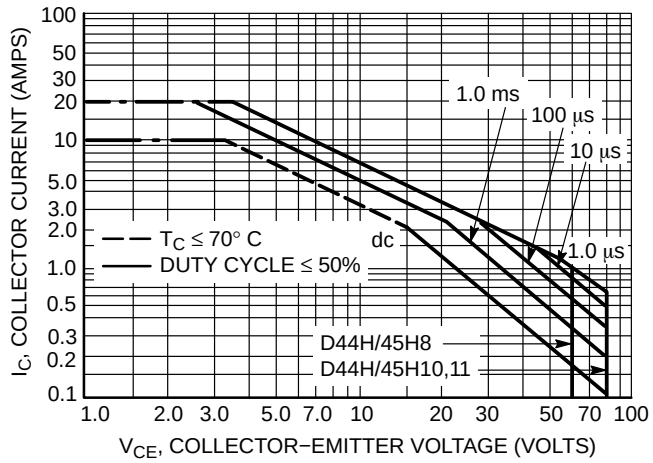
## D44VH10 (NPN), D45VH10 (PNP)



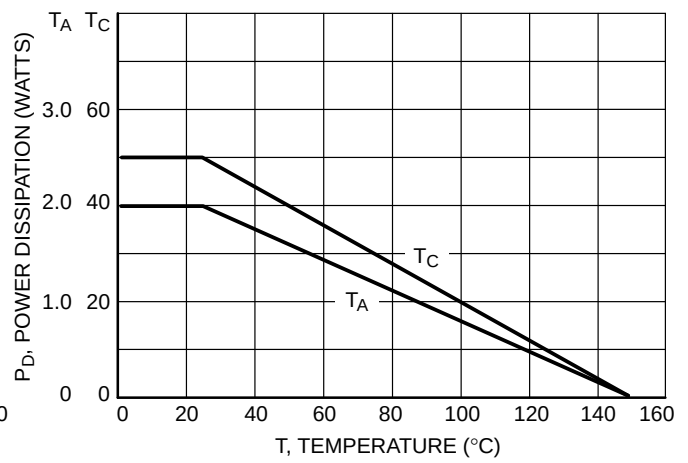
**Figure 7. D44VH10 ON-Voltage**



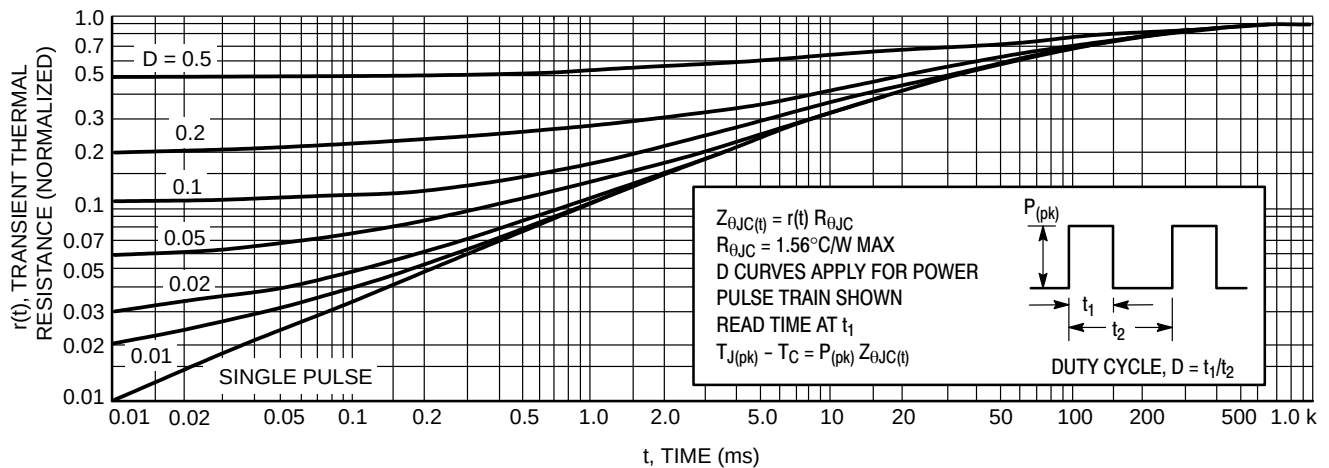
**Figure 8. D45VH10 ON-Voltage**



**Figure 9. Maximum Rated Forward Bias Safe Operating Area**

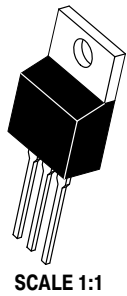


**Figure 10. Power Derating**



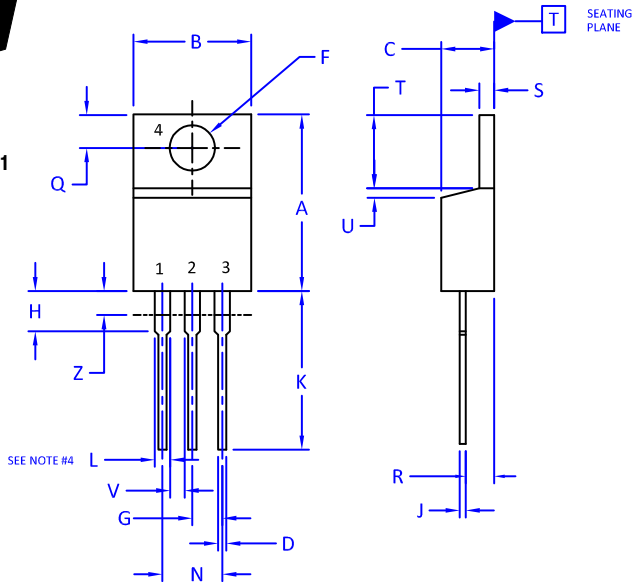
**Figure 11. Thermal Response**

# MECHANICAL CASE OUTLINE PACKAGE DIMENSIONS



## TO-220 CASE 221A ISSUE AK

DATE 13 JAN 2022



### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 2009.
2. CONTROLLING DIMENSION: INCHES
3. DIMENSION Z DEFINES A ZONE WHERE ALL BODY AND LEAD IRREGULARITIES ARE ALLOWED.
4. MAX WIDTH FOR F102 DEVICE = 1.35MM

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN.   | MAX.  | MIN.        | MAX.  |
| A   | 0.570  | 0.620 | 14.48       | 15.75 |
| B   | 0.380  | 0.415 | 9.66        | 10.53 |
| C   | 0.160  | 0.190 | 4.07        | 4.83  |
| D   | 0.025  | 0.038 | 0.64        | 0.96  |
| F   | 0.142  | 0.161 | 3.60        | 4.09  |
| G   | 0.095  | 0.105 | 2.42        | 2.66  |
| H   | 0.110  | 0.161 | 2.80        | 4.10  |
| J   | 0.014  | 0.024 | 0.36        | 0.61  |
| K   | 0.500  | 0.562 | 12.70       | 14.27 |
| L   | 0.045  | 0.060 | 1.15        | 1.52  |
| N   | 0.190  | 0.210 | 4.83        | 5.33  |
| Q   | 0.100  | 0.120 | 2.54        | 3.04  |
| R   | 0.080  | 0.110 | 2.04        | 2.79  |
| S   | 0.045  | 0.055 | 1.15        | 1.41  |
| T   | 0.235  | 0.255 | 5.97        | 6.47  |
| U   | 0.000  | 0.050 | 0.00        | 1.27  |
| V   | 0.045  | ----  | 1.15        | ---   |
| Z   | ----   | 0.080 | ---         | 2.04  |

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

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

STYLE 3:  
PIN 1. CATHODE  
2. ANODE  
3. GATE  
4. ANODE

STYLE 4:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. MAIN TERMINAL 2

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

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

STYLE 7:  
PIN 1. CATHODE  
2. ANODE  
3. CATHODE  
4. ANODE

STYLE 8:  
PIN 1. CATHODE  
2. ANODE  
3. EXTERNAL TRIP/DELAY  
4. ANODE

STYLE 9:  
PIN 1. GATE  
2. COLLECTOR  
3. EMITTER  
4. COLLECTOR

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

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

STYLE 12:  
PIN 1. MAIN TERMINAL 1  
2. MAIN TERMINAL 2  
3. GATE  
4. NOT CONNECTED

|                  |             |                                                                                                                                                                                     |
|------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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