

BD241C (NPN), BD242B (PNP), BD242C (PNP)

Complementary Silicon Plastic Power Transistors

Designed for use in general purpose amplifier and switching applications.

Features

- High Current Gain – Bandwidth Product
- Compact TO–220 AB Package
- Epoxy Meets UL94 V–0 @ 0.125 in
- These Devices are Pb–Free and are RoHS Compliant*

MAXIMUM RATINGS

| Rating | Symbol | BD242B | BD241C BD242C | Unit |
|---|----------------|-------------|------------------|-----------|
| Collector–Emitter Voltage | V_{CEO} | 80 | 100 | Vdc |
| Collector–Emitter Voltage | V_{CES} | 90 | 115 | Vdc |
| Emitter–Base Voltage | V_{EB} | 5.0 | | Vdc |
| Collector Current – Continuous | I_C | 3.0 | | Adc |
| Collector Current – Peak | I_{CM} | 5.0 | | Adc |
| Base Current | I_B | 1.0 | | Adc |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 40 0.32 | | W W/°C |
| Operating and Storage Junction Temperature Range | T_J, T_{stg} | –65 to +150 | | °C |
| ESD – Human Body Model | HBM | 3B | | V |
| ESD – Machine Model | MM | C | | 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.

THERMAL CHARACTERISTICS

| Characteristic | Symbol | Max | Unit |
|---|-----------------|-------|------|
| Thermal Resistance, Junction–to–Ambient | $R_{\theta JA}$ | 62.5 | °C/W |
| Thermal Resistance, Junction–to–Case | $R_{\theta JC}$ | 3.125 | °C/W |

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

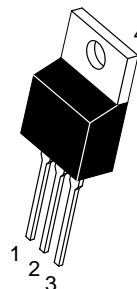
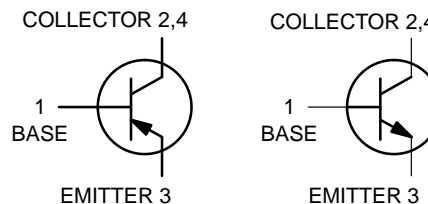


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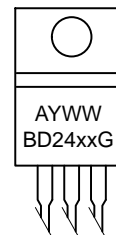
POWER TRANSISTORS COMPLEMENTARY SILICON 3 AMP 80–100 VOLTS 40 WATTS

COMPLEMENTARY



TO–220
CASE 221A
STYLE 1

MARKING DIAGRAM



BD24xx = Device Code
xx = 1C, 2B, or 2C
A = Assembly Location
Y = Year
WW = Work Week
G = Pb–Free Package

ORDERING INFORMATION

| Device | Package | Shipping† |
|---------|---------------------|---------------|
| BD241CG | TO–220 (Pb–Free) | 50 Units/Rail |
| BD242BG | TO–220 (Pb–Free) | 50 Units/Rail |
| BD242CG | TO–220 (Pb–Free) | 50 Units/Rail |

†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.

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

OFF CHARACTERISTICS

| | | | | |
|---|-----------|-----------|-----|---------------|
| Collector–Emitter Sustaining Voltage (Note 1) ($I_C = 30\text{ mA}$, $I_B = 0$) | V_{CEO} | 80 100 | | Vdc |
| BD242B BD241C, BD242C | | | | |
| Collector Cutoff Current ($V_{CE} = 50\text{ Vdc}$, $I_B = 0$) ($V_{CE} = 60\text{ Vdc}$, $I_B = 0$) | I_{CEO} | | 0.3 | mA |
| BD242B BD241C, BD242C | | | | |
| Collector Cutoff Current ($V_{CE} = 80\text{ Vdc}$, $V_{EB} = 0$) ($V_{CE} = 100\text{ Vdc}$, $V_{EB} = 0$) | I_{CES} | | 200 | μA |
| BD242B BD241C, BD242C | | | | |
| Emitter Cutoff Current ($V_{BE} = 5.0\text{ Vdc}$, $I_C = 0$) | I_{EBO} | | 1.0 | mA |

ON CHARACTERISTICS (Note 1)

| | | | | |
|---|---------------|----------|-----|-----|
| DC Current Gain ($I_C = 1.0\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) ($I_C = 3.0\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) | h_{FE} | 25 10 | | |
| Collector–Emitter Saturation Voltage ($I_C = 3.0\text{ A}$, $I_B = 0.6\text{ A}$) | $V_{CE(sat)}$ | | 1.2 | Vdc |
| Base–Emitter On Voltage ($I_C = 3.0\text{ A}$, $V_{CE} = 4.0\text{ Vdc}$) | $V_{BE(on)}$ | | 1.8 | Vdc |

DYNAMIC CHARACTERISTICS

| | | | | |
|---|----------|-----|--|-----|
| Current Gain – Bandwidth Product (Note 2) ($I_C = 500\text{ mA}$, $V_{CE} = 10\text{ Vdc}$, $f_{test} = 1.0\text{ MHz}$) | f_T | 3.0 | | MHz |
| Small–Signal Current Gain ($I_C = 0.5\text{ A}$, $V_{CE} = 10\text{ Vdc}$, $f = 1.0\text{ kHz}$) | h_{fe} | 20 | | |

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.

1. Pulse Test: Pulse Width $\leq 300\ \mu\text{s}$, Duty Cycle $\leq 2.0\%$.
2. $f_T = |h_{fe}| \cdot f_{test}$.

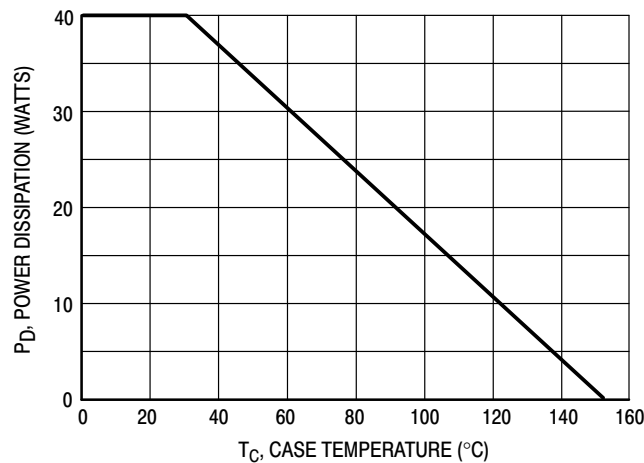


Figure 1. Power Derating

BD241C (NPN), BD242B (PNP), BD242C (PNP)

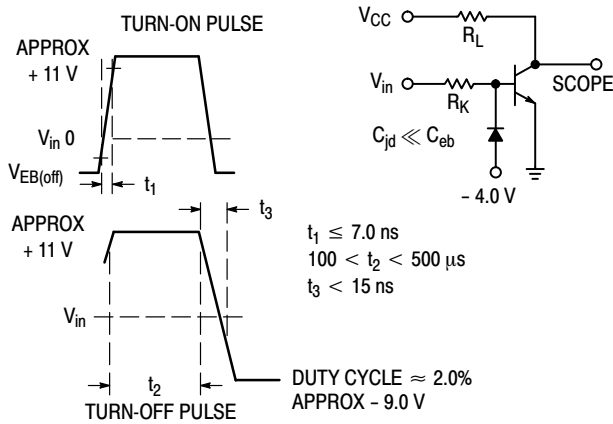


Figure 2. Switching Time Equivalent Circuit

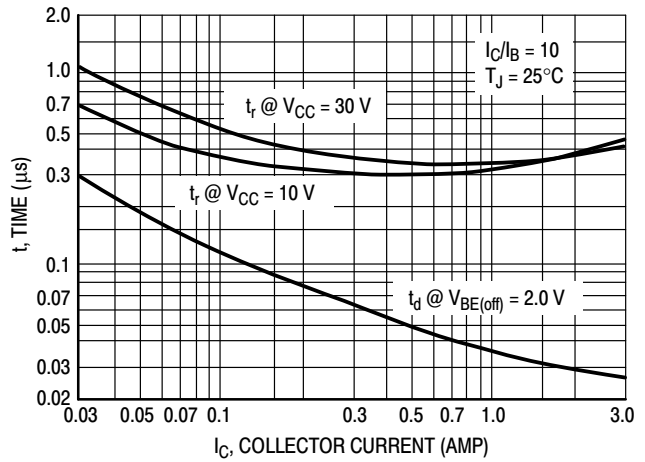


Figure 3. Turn-On Time

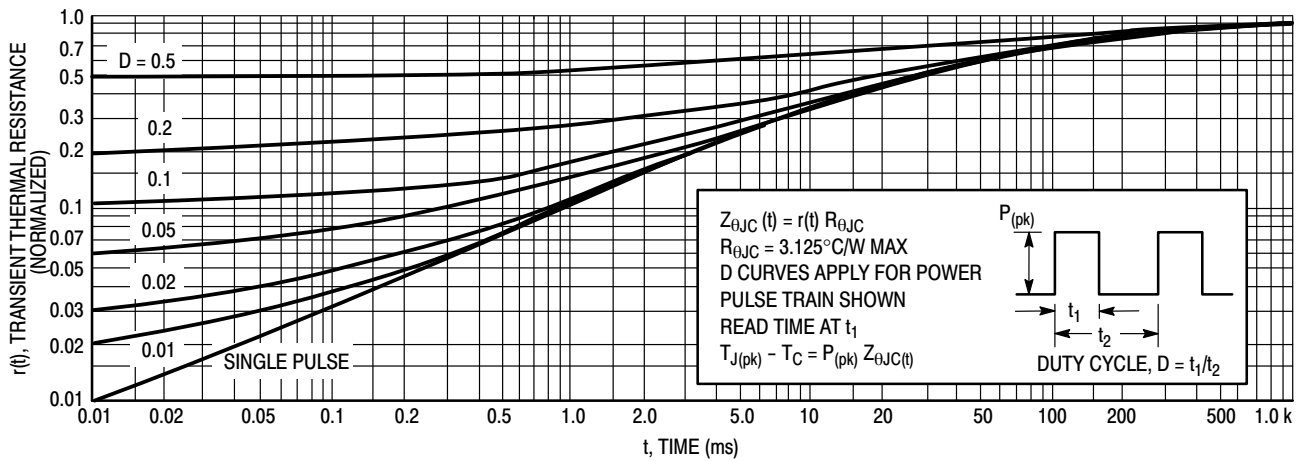


Figure 4. Thermal Response

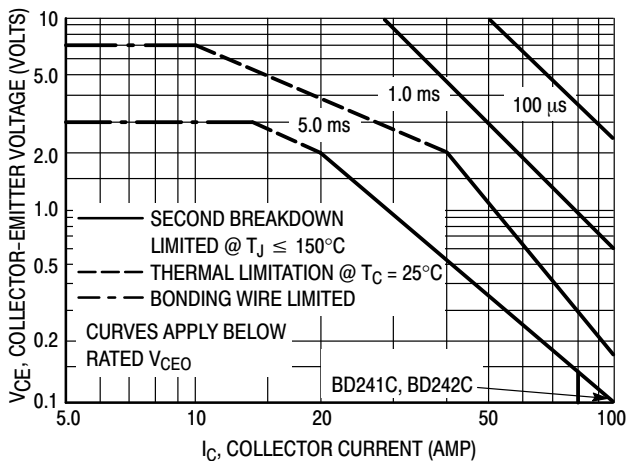


Figure 5. Active Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ limits of the transistor that must be observed for reliable operation, i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on $T_{J(pk)} = 150^\circ\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150^\circ\text{C}$, $T_{J(pk)}$ may be calculated from the data in Figure 4. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

BD241C (NPN), BD242B (PNP), BD242C (PNP)

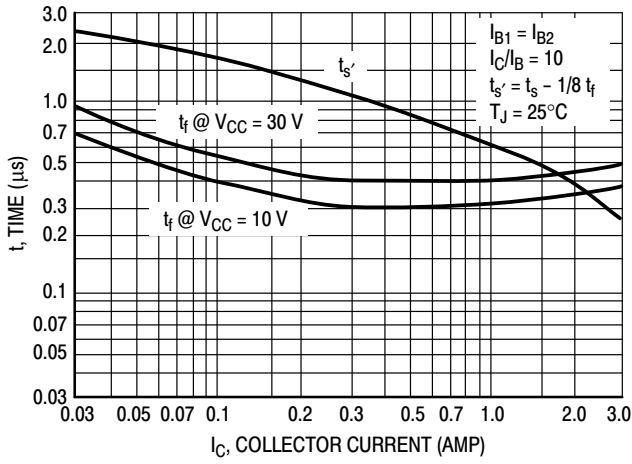


Figure 6. Turn-Off Time

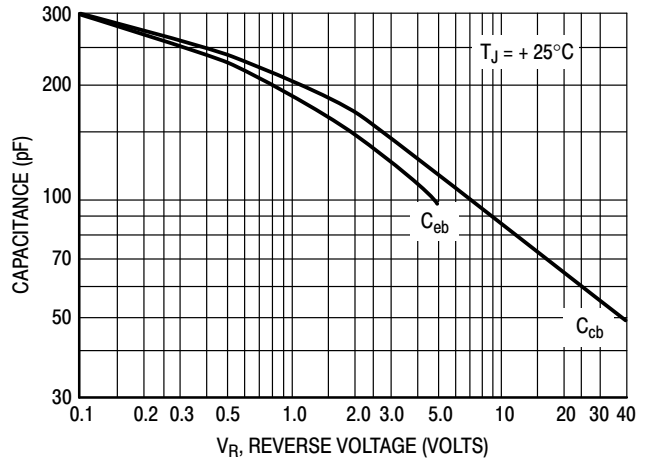


Figure 7. Capacitance

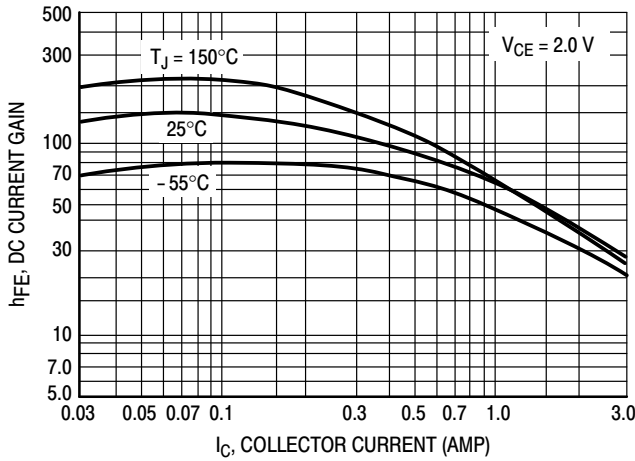


Figure 8. DC Current Gain

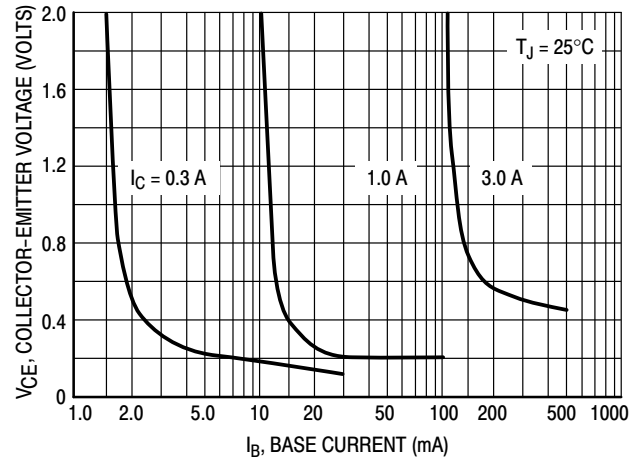


Figure 9. Collector Saturation Region

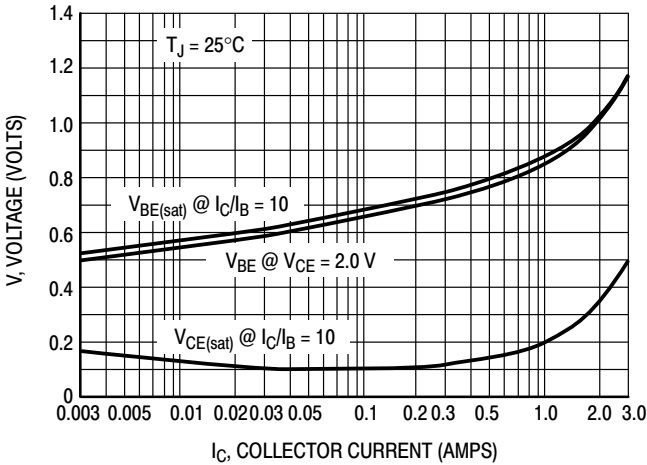


Figure 10. "On" Voltages

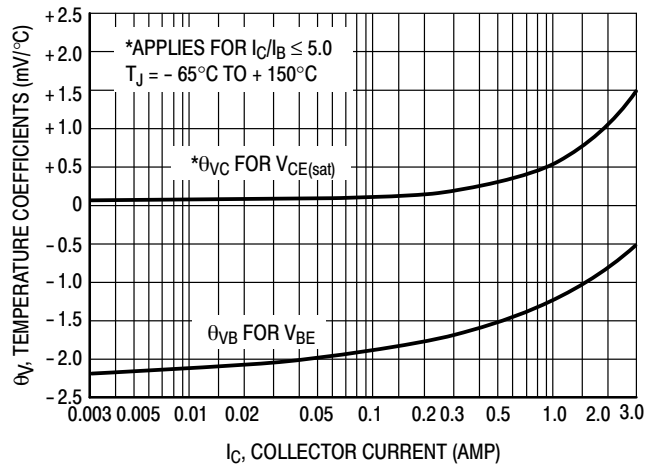


Figure 11. Temperature Coefficients

BD241C (NPN), BD242B (PNP), BD242C (PNP)

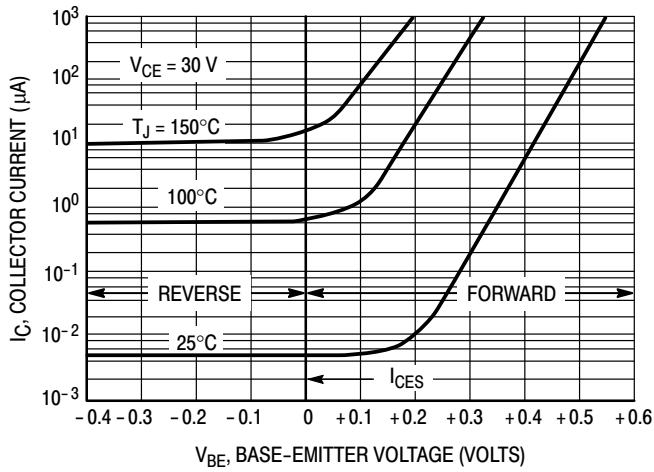


Figure 12. Collector Cut-Off Region

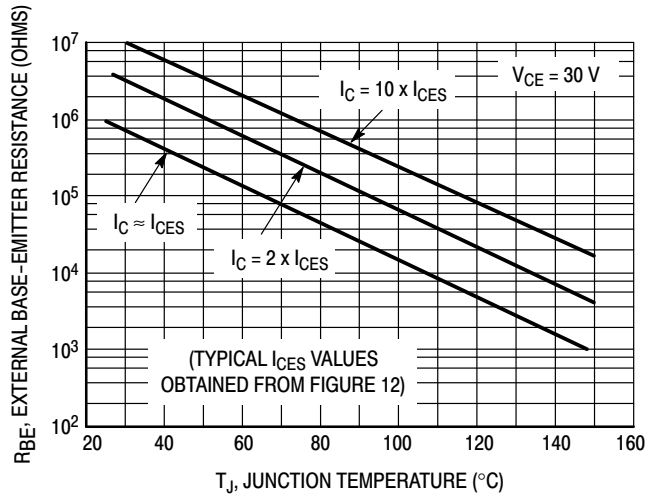
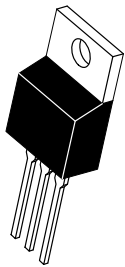


Figure 13. Effects of Base-Emitter Resistance

MECHANICAL CASE OUTLINE

PACKAGE DIMENSIONS

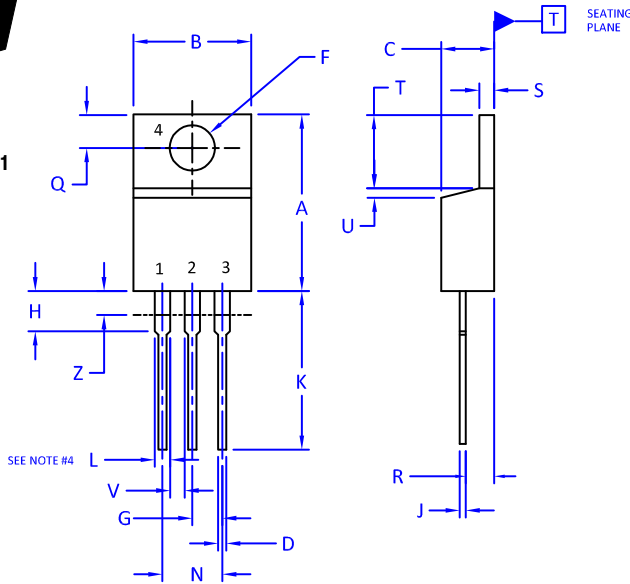
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SCALE 1:1

TO-220 CASE 221A-09 ISSUE AJ

DATE 05 NOV 2019



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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