

# High Current Surface Mount NPN Silicon Low $V_{CE(sat)}$ Switching Transistor for Load Management in Portable Applications

## NST489AMT1G, NSVT489AMT1G

### Features

- NSV Prefix for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### MAXIMUM RATINGS ( $T_A = 25^\circ\text{C}$ )

| Rating                         | Symbol    | Max | Unit |
|--------------------------------|-----------|-----|------|
| Collector-Emitter Voltage      | $V_{CEO}$ | 30  | V    |
| Collector-Base Voltage         | $V_{CBO}$ | 50  | V    |
| Emitter-Base Voltage           | $V_{EBO}$ | 5.0 | V    |
| Collector Current – Continuous | $I_C$     | 2.0 | A    |
| Collector Current – Peak       | $I_{CM}$  | 3.0 | A    |

### THERMAL CHARACTERISTICS

| Characteristic                                                                          | Symbol                                               | Max          | Unit                                                   |
|-----------------------------------------------------------------------------------------|------------------------------------------------------|--------------|--------------------------------------------------------|
| Total Device Dissipation<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$ (Note 1)                                       | 535<br>4.3   | mW<br>mW/ $^\circ\text{C}$                             |
| Thermal Resistance,<br>Junction-to-Ambient                                              | $R_{\theta JA}$ (Note 1)                             | 234          | $^\circ\text{C}/\text{W}$                              |
| Total Device Dissipation<br>$T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$ (Note 2)                                       | 1.180<br>9.4 | W<br>mW/ $^\circ\text{C}$                              |
| Thermal Resistance,<br>Junction-to-Ambient                                              | $R_{\theta JA}$ (Note 2)                             | 106          | $^\circ\text{C}/\text{W}$                              |
| Thermal Resistance,<br>Junction-to-Lead #1                                              | $R_{\theta JL}$ (Note 1)<br>$R_{\theta JL}$ (Note 2) | 110<br>50    | $^\circ\text{C}/\text{W}$<br>$^\circ\text{C}/\text{W}$ |
| Total Device Dissipation<br>(Single Pulse < 10 s)                                       | $P_{D\text{single}}$<br>(Notes 2 and 3)              | 1.75         | W                                                      |
| Junction and Storage<br>Temperature Range                                               | $T_J, T_{stg}$                                       | -55 to +150  | $^\circ\text{C}$                                       |

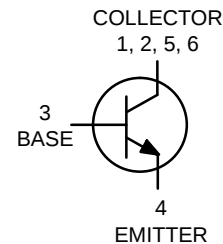
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR-4 with 1 oz and 3.9 mm<sup>2</sup> of copper area.
2. FR-4 with 1 oz and 645 mm<sup>2</sup> of copper area.
3. Refer to Figure 8.

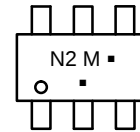
30 VOLTS, 3.0 AMPS  
NPN TRANSISTOR



TSOP-6  
CASE 318G  
STYLE 6



### DEVICE MARKING



N2 = Specific Device Code  
M = Date Code\*  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

\* Date Code orientation may vary depending upon manufacturing location.

### ORDERING INFORMATION

| Device       | Package             | Shipping <sup>†</sup>  |
|--------------|---------------------|------------------------|
| NST489AMT1G  | TSOP-6<br>(Pb-Free) | 3,000 /<br>Tape & Reel |
| NSVT489AMT1G | TSOP-6<br>(Pb-Free) | 3,000 /<br>Tape & Reel |

<sup>†</sup> 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](http://www.onsemi.com/BRD8011/D).

# NST489AMT1G, NSVT489AMT1G

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

| Characteristic                                                                              | Symbol               | Min                                                                                                                                                          | Typ               | Max                  | Unit                    |
|---------------------------------------------------------------------------------------------|----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|----------------------|-------------------------|
| <b>OFF CHARACTERISTICS</b>                                                                  |                      |                                                                                                                                                              |                   |                      |                         |
| Collector - Emitter Breakdown Voltage (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0)          | V <sub>(BR)CEO</sub> | 30                                                                                                                                                           | –                 | –                    | V                       |
| Collector - Base Breakdown Voltage (I <sub>C</sub> = 0.1 mA, I <sub>E</sub> = 0)            | V <sub>(BR)CBO</sub> | 50                                                                                                                                                           | –                 | –                    | V                       |
| Emitter - Base Breakdown Voltage (I <sub>E</sub> = 0.1 mA, I <sub>C</sub> = 0)              | V <sub>(BR)EBO</sub> | 5.0                                                                                                                                                          | –                 | –                    | V                       |
| Collector Cutoff Current (V <sub>CB</sub> = 30 V, I <sub>E</sub> = 0)                       | I <sub>CBO</sub>     | –                                                                                                                                                            | –                 | 0.1                  | μA                      |
| Collector-Emitter Cutoff Current (V <sub>CE</sub> = 30 V)                                   | I <sub>CES</sub>     | –                                                                                                                                                            | –                 | 0.1                  | μA                      |
| Emitter Cutoff Current (V <sub>EB</sub> = 4.0 V)                                            | I <sub>EBO</sub>     | –                                                                                                                                                            | –                 | 0.1                  | μA                      |
| <b>ON CHARACTERISTICS</b>                                                                   |                      |                                                                                                                                                              |                   |                      |                         |
| DC Current Gain (Note 4)                                                                    | h <sub>FE</sub>      | (I <sub>C</sub> = 1.0 mA, V <sub>CE</sub> = 5.0 V)<br>(I <sub>C</sub> = 0.5 A, V <sub>CE</sub> = 5.0 V)<br>(I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 5.0 V) | 300<br>300<br>200 | –<br>500<br>–        | –<br>900<br>–           |
| Collector - Emitter Saturation Voltage (Note 4)                                             | V <sub>CE(sat)</sub> | (I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 100 mA)<br>(I <sub>C</sub> = 0.5 A, I <sub>B</sub> = 50 mA)<br>(I <sub>C</sub> = 0.1 A, I <sub>B</sub> = 1.0 mA)   | –<br>–<br>–       | 0.10<br>0.06<br>0.05 | 0.200<br>0.125<br>0.075 |
| Base - Emitter Saturation Voltage (Note 4) (I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 0.1 A) | V <sub>BE(sat)</sub> |                                                                                                                                                              | –                 | –                    | 1.1                     |
| Base - Emitter Turn-on Voltage (Note 4) (I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 2.0 V)   | V <sub>BE(on)</sub>  |                                                                                                                                                              | –                 | –                    | 1.1                     |
| Cutoff Frequency (I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 5.0 V, f = 100 MHz)            | f <sub>T</sub>       |                                                                                                                                                              | 200               | 300                  | –                       |
| Output Capacitance (f = 1.0 MHz)                                                            | C <sub>obo</sub>     |                                                                                                                                                              | –                 | –                    | 15                      |

4. Pulsed Condition: Pulse Width ≤ 300 μsec, Duty Cycle ≤ 2%.

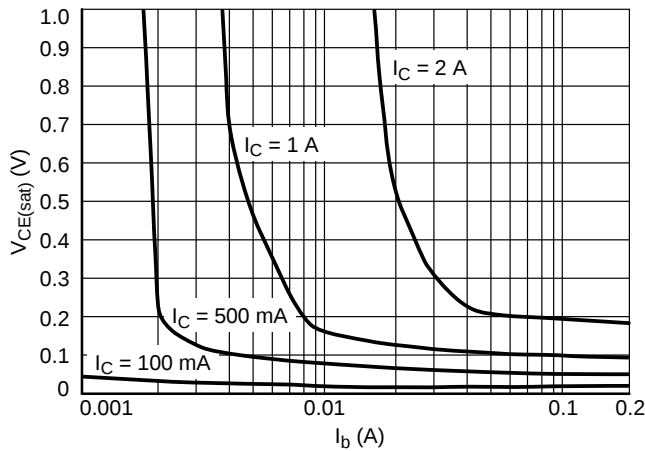


Figure 1. V<sub>CE(sat)</sub> versus I<sub>B</sub>

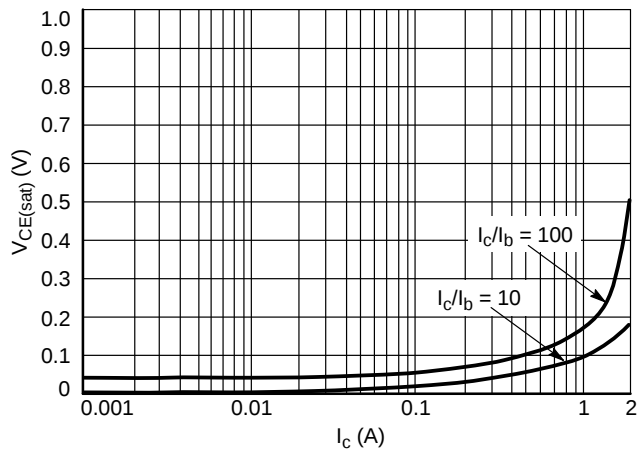


Figure 2. V<sub>CE(sat)</sub> versus I<sub>C</sub>

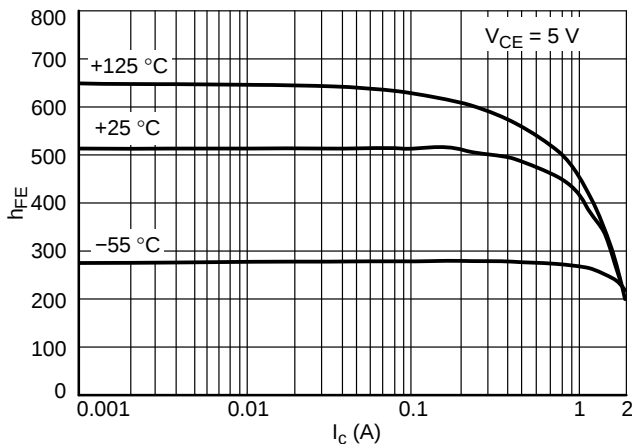


Figure 3. h<sub>FE</sub> versus I<sub>C</sub>

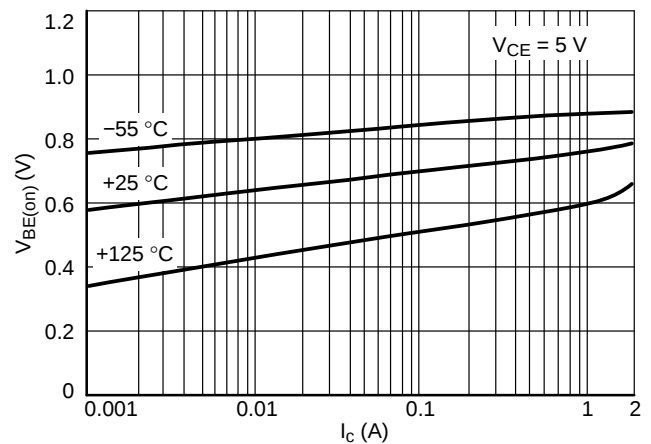


Figure 4. V<sub>BE(on)</sub> versus I<sub>C</sub>

# NST489AMT1G, NSVT489AMT1G

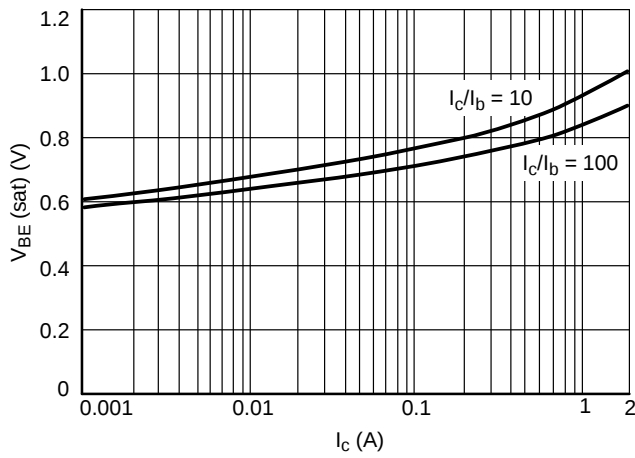


Figure 5.  $V_{BE(sat)}$  versus  $I_C$

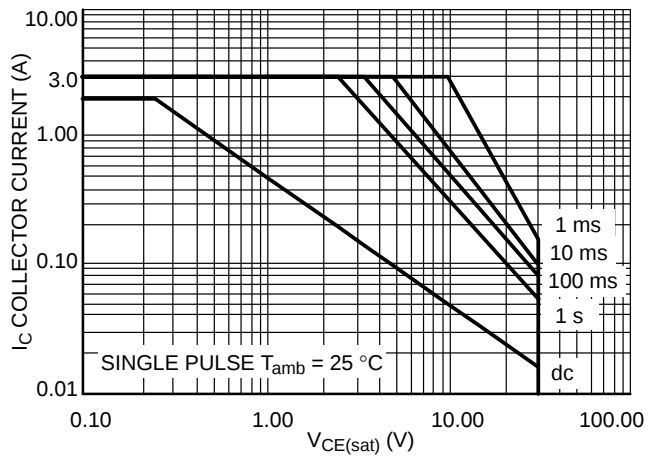


Figure 6. Safe Operating Area

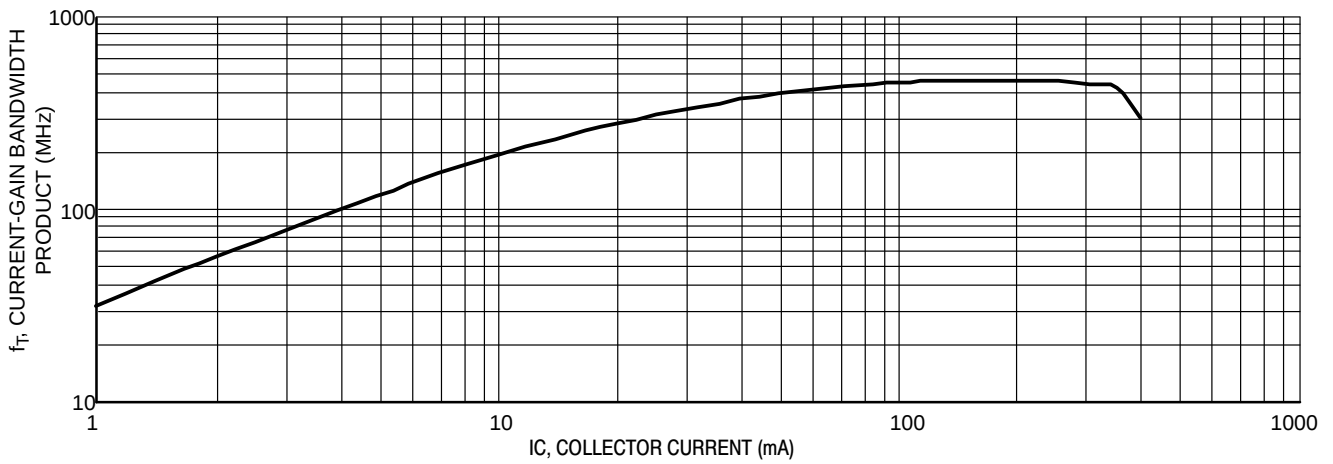


Figure 7.  $f_T$  (MHz) versus  $I_C$  (mA)  $V_{CE} = 5.0$  V

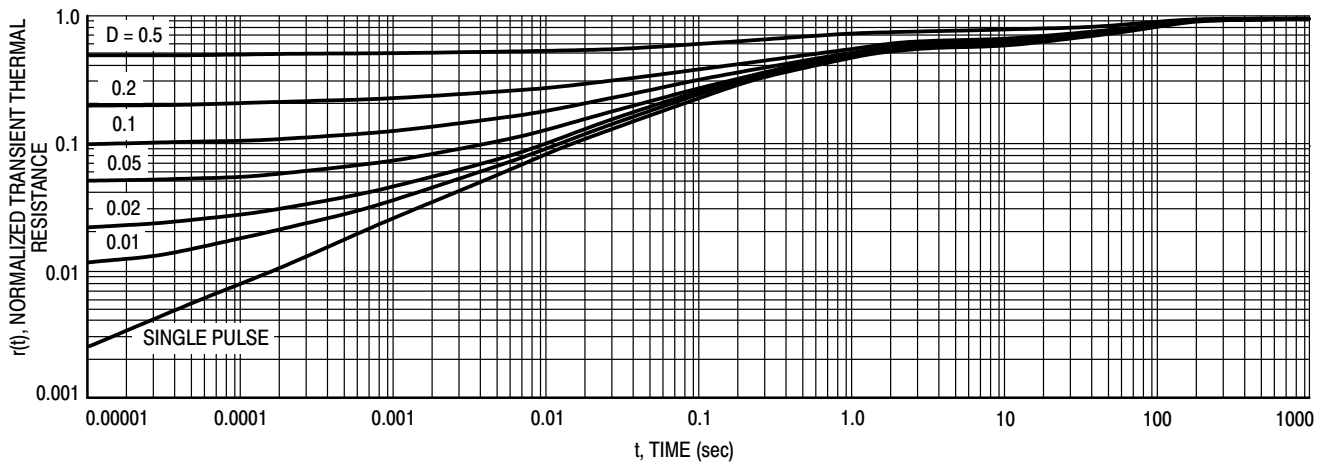


Figure 8. Normalized Thermal Response

## NST489AMT1G, NSVT489AMT1G

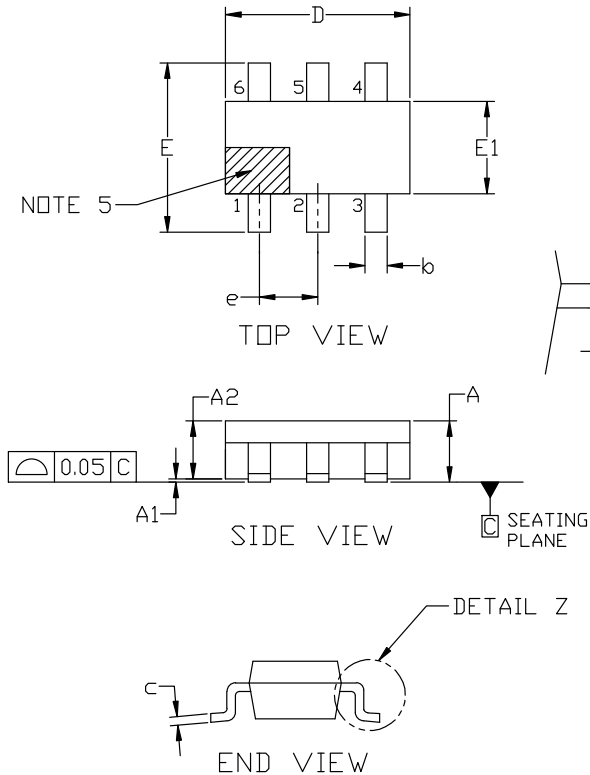
### REVISION HISTORY

| Revision | Description of Changes                            | Date      |
|----------|---------------------------------------------------|-----------|
| 10       | Rebranded the Data Sheet to <b>onsemi</b> format. | 6/19/2025 |



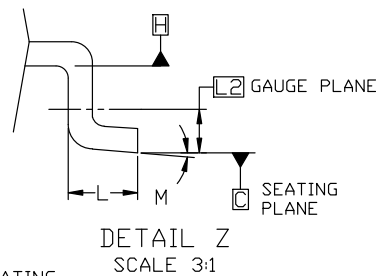
**TSOP-6 3.00x1.50x0.90, 0.95P**  
**CASE 318G**  
**ISSUE W**

DATE 26 FEB 2024

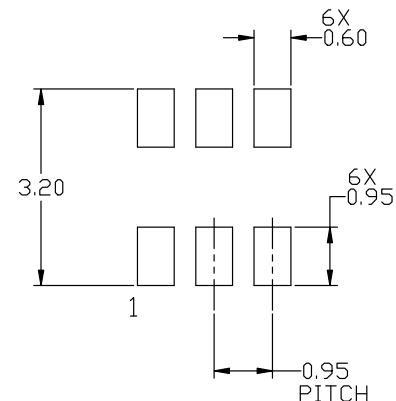


**NOTES:**

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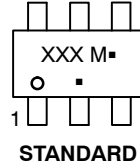
TSOP-6 3.00x1.50x0.90, 0.95P  
CASE 318G  
ISSUE W

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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