

# High Current Surface Mount PNP Silicon Switching Transistor for Load Management in Portable Applications

## MBT35200MT1

### Features

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

### MAXIMUM RATINGS (T<sub>A</sub> = 25°C)

| Rating                         | Symbol           | Max                       | Unit |
|--------------------------------|------------------|---------------------------|------|
| Collector-Emitter Voltage      | V <sub>CEO</sub> | -35                       | Vdc  |
| Collector-Base Voltage         | V <sub>CBO</sub> | -55                       | Vdc  |
| Emitter-Base Voltage           | V <sub>EBO</sub> | -5.0                      | Vdc  |
| Collector Current - Continuous | I <sub>C</sub>   | -2.0                      | Adc  |
| Collector Current - Peak       | I <sub>CM</sub>  | -5.0                      | A    |
| Electrostatic Discharge        | ESD              | HBM Class 3<br>MM Class C |      |

### THERMAL CHARACTERISTICS

| Characteristic                                                         | Symbol                                | Max            | Unit        |
|------------------------------------------------------------------------|---------------------------------------|----------------|-------------|
| Total Device Dissipation<br>T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub> (Note 1)               | 625<br>5.0     | mW<br>mW/°C |
| Thermal Resistance,<br>Junction-to-Ambient                             | R <sub>θJA</sub> (Note 1)             | 200            | °C/W        |
| Total Device Dissipation<br>T <sub>A</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub> (Note 2)               | 1.0<br>8.0     | W<br>mW/°C  |
| Thermal Resistance,<br>Junction-to-Ambient                             | R <sub>θJA</sub> (Note 2)             | 120            | °C/W        |
| Thermal Resistance,<br>Junction-to-Lead #1                             | R <sub>θJL</sub>                      | 80             | °C/W        |
| Total Device Dissipation<br>(Single Pulse < 10 sec.)                   | P <sub>Dsingle</sub><br>(Notes 2 & 3) | 1.75           | W           |
| Junction and Storage<br>Temperature Range                              | T <sub>J</sub> , T <sub>stg</sub>     | -55 to<br>+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.

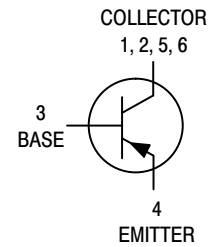
1. FR-4 @ Minimum Pad
2. FR-4 @ 1.0 X 1.0 inch Pad
3. ref: Figure 9

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

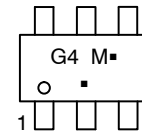
35 VOLTS  
2.0 AMPS  
PNP TRANSISTOR



CASE 318G  
TSOP-6  
STYLE 6



### MARKING DIAGRAM



G4 = Specific Device Code  
M = Date Code  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

| Device       | Package             | Shipping†              |
|--------------|---------------------|------------------------|
| MBT35200MT1G | TSOP-6<br>(Pb-Free) | 3,000 /<br>Tape & Reel |

### DISCONTINUED (Note 1)

|               |                     |                        |
|---------------|---------------------|------------------------|
| SMBT35200MT1G | TSOP-6<br>(Pb-Free) | 3,000 /<br>Tape & Reel |
|---------------|---------------------|------------------------|

†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.

1. **DISCONTINUED:** This device is not recommended for new design. Please contact your **onsemi** representative for information. The most current information on this device may be available on [www.onsemi.com](http://www.onsemi.com).

# MBT35200MT1

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

| Characteristic                                                                         | Symbol               | Min  | Typical | Max  | Unit             |
|----------------------------------------------------------------------------------------|----------------------|------|---------|------|------------------|
| <b>OFF CHARACTERISTICS</b>                                                             |                      |      |         |      |                  |
| Collector – Emitter Breakdown Voltage<br>(I <sub>C</sub> = -10 mA, I <sub>B</sub> = 0) | V <sub>(BR)CEO</sub> | -35  | -45     | -    | Vdc              |
| Collector – Base Breakdown Voltage<br>(I <sub>C</sub> = -0.1 mA, I <sub>E</sub> = 0)   | V <sub>(BR)CBO</sub> | -55  | -65     | -    | Vdc              |
| Emitter – Base Breakdown Voltage<br>(I <sub>E</sub> = -0.1 mA, I <sub>C</sub> = 0)     | V <sub>(BR)EBO</sub> | -5.0 | -7.0    | -    | Vdc              |
| Collector Cutoff Current<br>(V <sub>CB</sub> = -35 Vdc, I <sub>E</sub> = 0)            | I <sub>CBO</sub>     | -    | -0.03   | -0.1 | μA <sub>dc</sub> |
| Collector – Emitter Cutoff Current<br>(V <sub>CE</sub> = -35 Vdc)                      | I <sub>CES</sub>     | -    | -0.03   | -0.1 | μA <sub>dc</sub> |
| Emitter Cutoff Current<br>(V <sub>EB</sub> = -4.0 Vdc)                                 | I <sub>EBO</sub>     | -    | -0.01   | -0.1 | μA <sub>dc</sub> |

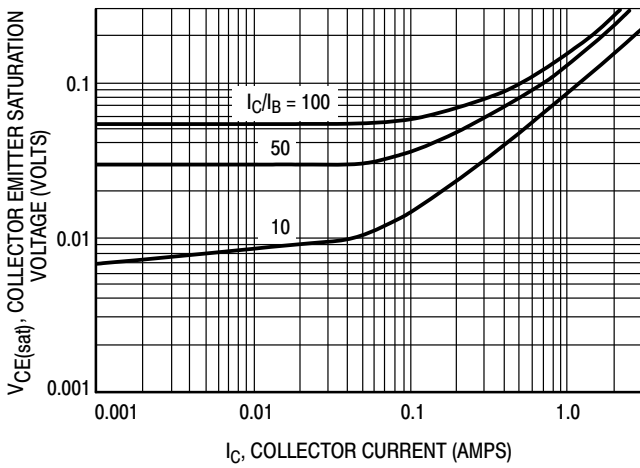
## ON CHARACTERISTICS

|                                                                                                                                                                                                                        |                      |                   |                            |                         |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-------------------|----------------------------|-------------------------|-----|
| DC Current Gain (Note 1)<br>(I <sub>C</sub> = -1.0 A, V <sub>CE</sub> = -1.5 V)<br>(I <sub>C</sub> = -1.5 A, V <sub>CE</sub> = -1.5 V)<br>(I <sub>C</sub> = -2.0 A, V <sub>CE</sub> = -3.0 V)                          | h <sub>FE</sub>      | 100<br>100<br>100 | 200<br>200<br>200          | -<br>400<br>-           |     |
| Collector – Emitter Saturation Voltage (Note 1)<br>(I <sub>C</sub> = -0.8 A, I <sub>B</sub> = -0.008 A)<br>(I <sub>C</sub> = -1.2 A, I <sub>B</sub> = -0.012 A)<br>(I <sub>C</sub> = -2.0 A, I <sub>B</sub> = -0.02 A) | V <sub>CE(sat)</sub> | -<br>-<br>-       | -0.125<br>-0.175<br>-0.260 | -0.15<br>-0.20<br>-0.31 | V   |
| Base – Emitter Saturation Voltage (Note 1)<br>(I <sub>C</sub> = -1.2 A, I <sub>B</sub> = -0.012 A)                                                                                                                     | V <sub>BE(sat)</sub> | -                 | -0.68                      | -0.85                   | V   |
| Base – Emitter Turn-on Voltage (Note 1)<br>(I <sub>C</sub> = -2.0 A, V <sub>CE</sub> = -3.0 V)                                                                                                                         | V <sub>BE(on)</sub>  | -                 | -0.81                      | -0.875                  | V   |
| Cutoff Frequency<br>(I <sub>C</sub> = -100 mA, V <sub>CE</sub> = -5.0 V, f = 100 MHz)                                                                                                                                  | f <sub>T</sub>       | 100               | -                          | -                       | MHz |
| Input Capacitance (V <sub>EB</sub> = -0.5 V, f = 1.0 MHz)                                                                                                                                                              | C <sub>ibo</sub>     | -                 | 600                        | 650                     | pF  |
| Output Capacitance (V <sub>CB</sub> = -3.0 V, f = 1.0 MHz)                                                                                                                                                             | C <sub>obo</sub>     | -                 | 85                         | 100                     | pF  |
| Turn-on Time (V <sub>CC</sub> = -10 V, I <sub>B1</sub> = -100 mA, I <sub>C</sub> = -1 A, R <sub>L</sub> = 3 Ω)                                                                                                         | t <sub>on</sub>      | -                 | 35                         | -                       | nS  |
| Turn-off Time (V <sub>CC</sub> = -10 V, I <sub>B1</sub> = I <sub>B2</sub> = -100 mA, I <sub>C</sub> = 1 A, R <sub>L</sub> = 3 Ω)                                                                                       | t <sub>off</sub>     | -                 | 225                        | -                       | nS  |

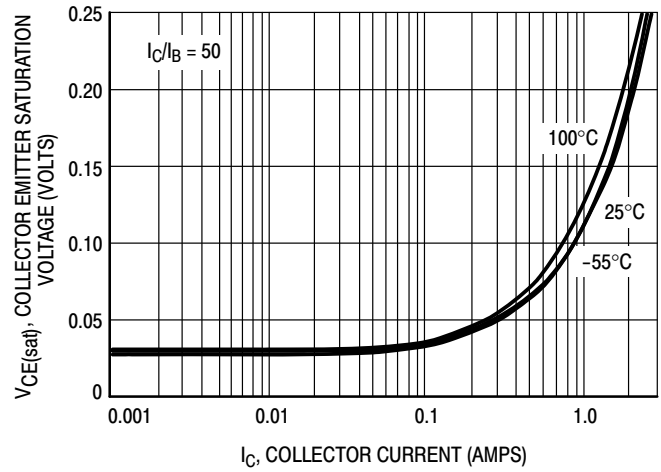
Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

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

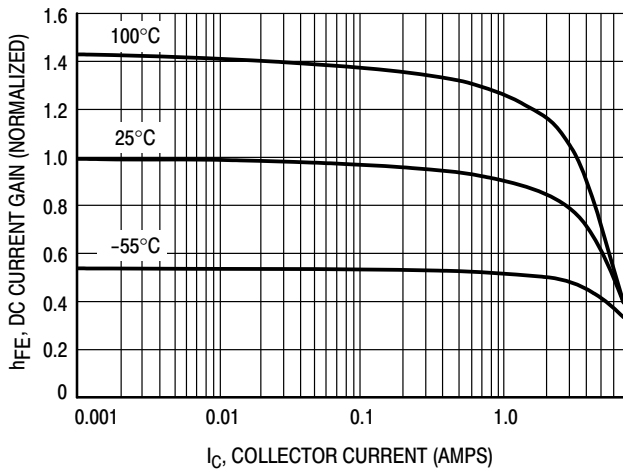
# MBT35200MT1



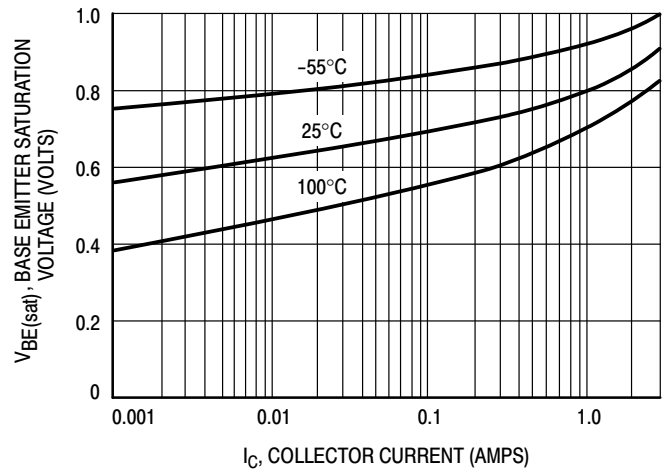
**Figure 1. Collector Emitter Saturation Voltage versus Collector Current**



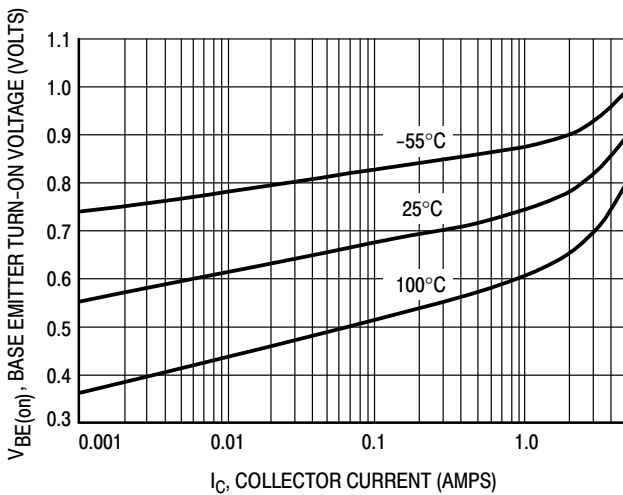
**Figure 2. Collector Emitter Saturation Voltage versus Collector Current**



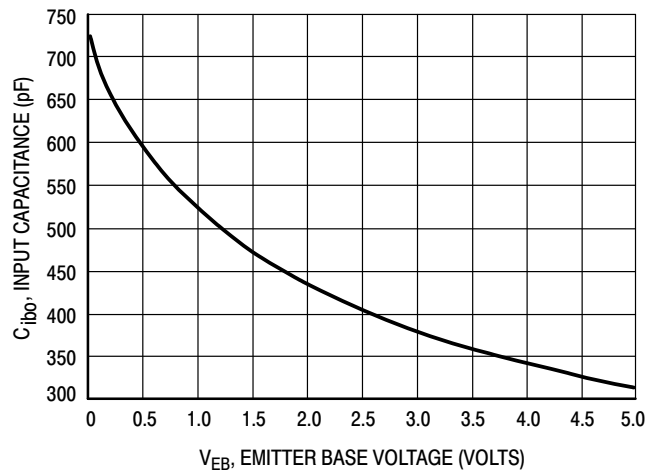
**Figure 3. DC Current Gain versus Collector Current**



**Figure 4. Base Emitter Saturation Voltage versus Collector Current**



**Figure 5. Base Emitter Turn-On Voltage versus Collector Current**



**Figure 6. Input Capacitance**

# MBT35200MT1

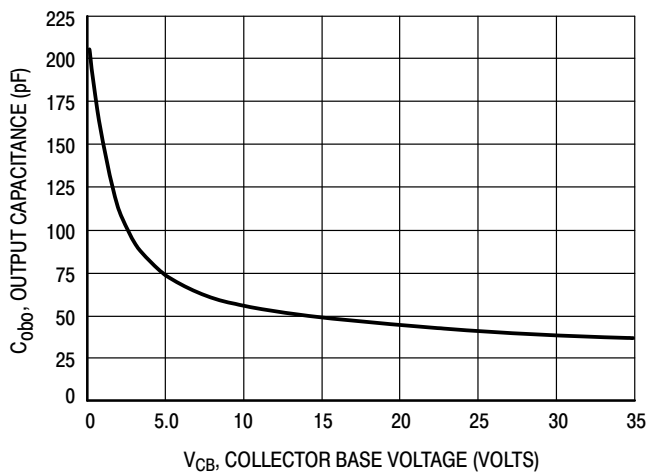


Figure 7. Output Capacitance

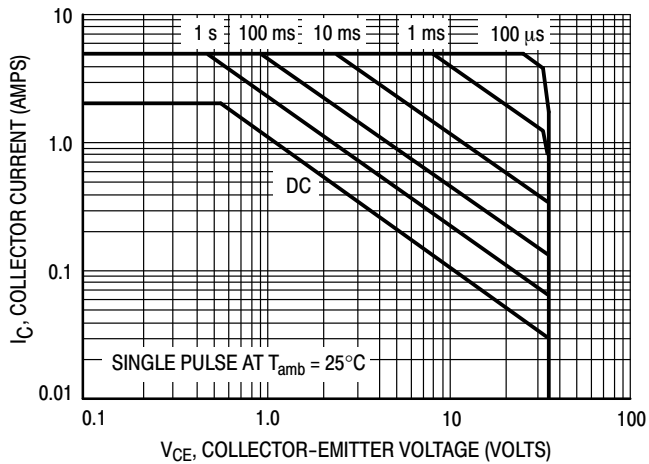


Figure 8. Safe Operating Area

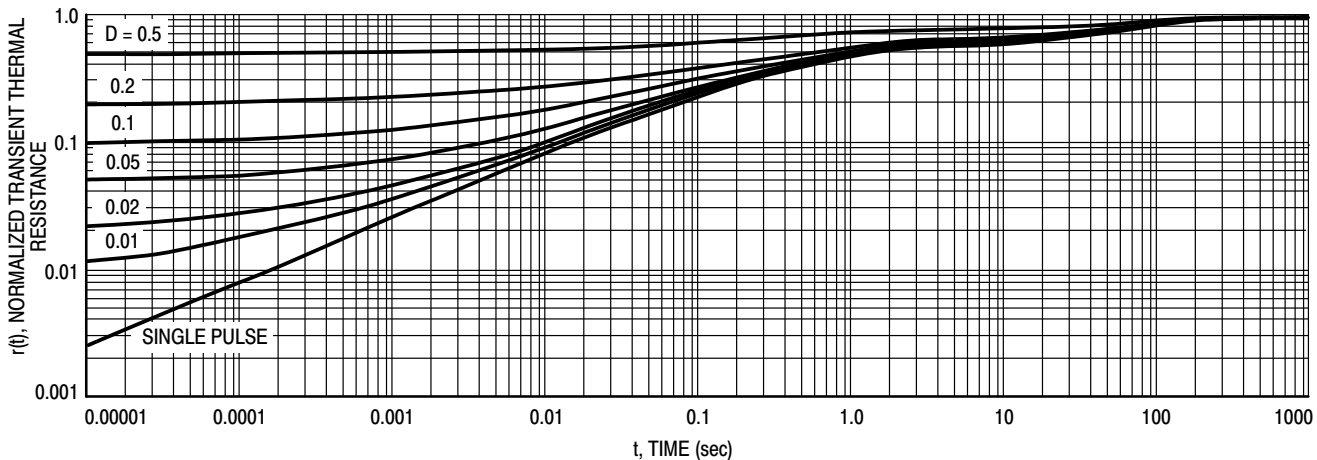
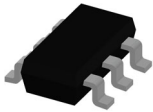
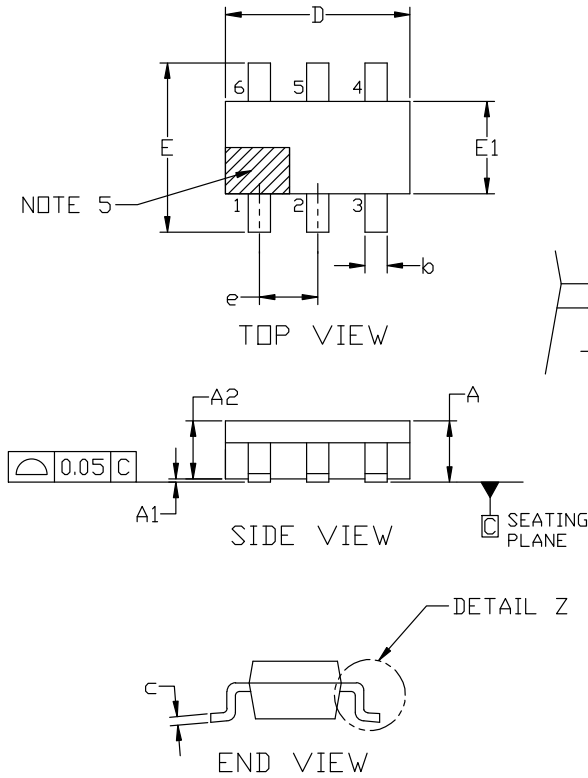


Figure 9. Normalized Thermal Response



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

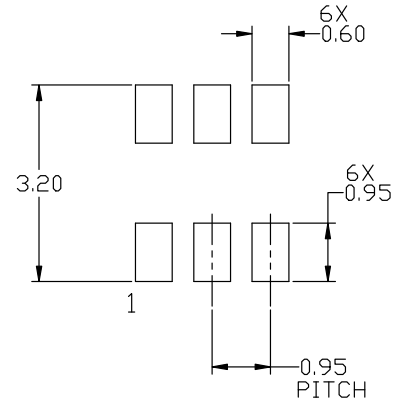
DATE 26 FEB 2024



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.

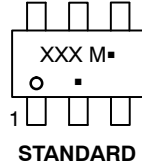
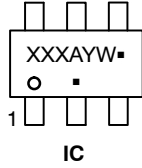
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| <b>DESCRIPTION:</b>     | <b>TSOP-6 3.00x1.50x0.90, 0.95P</b> | <b>PAGE 1 OF 2</b>                                                                                                                                                               |

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

DATE 26 FEB 2024

**GENERIC  
MARKING DIAGRAM\***



|                            |                            |
|----------------------------|----------------------------|
| XXX = Specific Device Code | XXX = Specific Device Code |
| A = Assembly Location      | M = Date Code              |
| Y = Year                   | ■ = Pb-Free Package        |
| W = Work Week              |                            |
| ■ = 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.

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

|                         |                                     |                                                                                                                                                                                     |
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| <b>DESCRIPTION:</b>     | <b>TSOP-6 3.00x1.50x0.90, 0.95P</b> | <b>PAGE 2 OF 2</b>                                                                                                                                                                  |

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