

# NPN - MPSA05, MPSA06\*; PNP - MPSA55, MPSA56\*

\*Preferred Devices

## Amplifier Transistors

Voltage and Current are Negative  
for PNP Transistors

### Features

- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

| Rating                                                                                 | Symbol         | Value       | Unit                      |
|----------------------------------------------------------------------------------------|----------------|-------------|---------------------------|
| Collector - Emitter Voltage<br>MPSA05, MPSA55<br>MPSA06, MPSA56                        | $V_{CEO}$      | 60<br>80    | Vdc                       |
| Collector - Base Voltage<br>MPSA05, MPSA55<br>MPSA06, MPSA56                           | $V_{CBO}$      | 60<br>80    | Vdc                       |
| Emitter - Base Voltage                                                                 | $V_{EBO}$      | 4.0         | Vdc                       |
| Collector Current - Continuous                                                         | $I_C$          | 500         | mA                        |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 625<br>5.0  | W<br>mW/ $^\circ\text{C}$ |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.5<br>12   | W<br>mW/ $^\circ\text{C}$ |
| Operating and Storage Junction<br>Temperature Range                                    | $T_J, T_{stg}$ | -55 to +150 | $^\circ\text{C}$          |

### THERMAL CHARACTERISTICS

| Characteristic                                      | Symbol          | Max  | Unit               |
|-----------------------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Ambient<br>(Note 1) | $R_{\theta JA}$ | 200  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Case                | $R_{\theta JC}$ | 83.3 | $^\circ\text{C/W}$ |

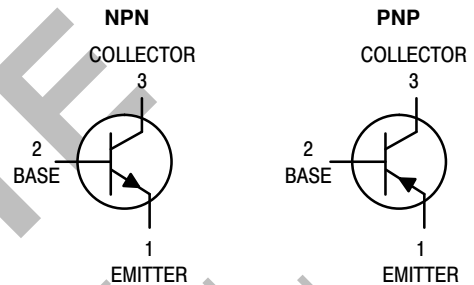
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

1.  $R_{\theta JA}$  is measured with the device soldered into a typical printed circuit board.

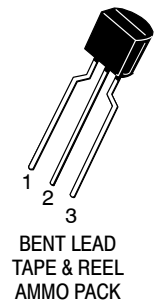
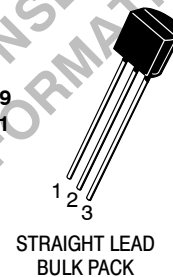


ON Semiconductor®

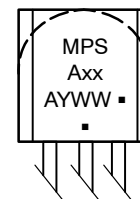
<http://onsemi.com>



TO-92  
CASE 29  
STYLE 1



### MARKING DIAGRAM



xx = 05, 06, 55, or 56  
A = Assembly Location  
Y = Year  
WW = Work Week  
▪ = Pb-Free Package

(Note: Microdot may be in either location)

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 6 of this data sheet.

Preferred devices are recommended choices for future use and best overall value.

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

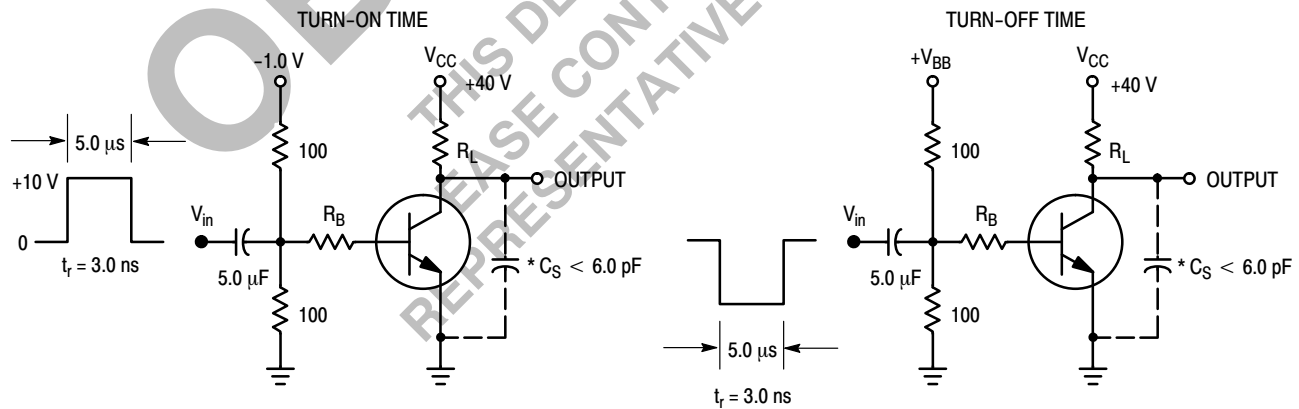
# NPN – MPSA05, MPSA06\*; PNP – MPSA55, MPSA56\*

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

| Characteristic                                                                                                                                                                         | Symbol               | Min        | Max        | Unit |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|------------|------------|------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                             |                      |            |            |      |
| Collector – Emitter Breakdown Voltage (Note 2)<br>(I <sub>C</sub> = 1.0 mA, I <sub>B</sub> = 0)                                                                                        | V <sub>(BR)CEO</sub> | 60<br>80   | –<br>–     | Vdc  |
| Emitter – Base Breakdown Voltage<br>(I <sub>E</sub> = 100 μA, I <sub>C</sub> = 0)                                                                                                      | V <sub>(BR)EBO</sub> | 4.0        | –          | Vdc  |
| Collector Cutoff Current<br>(V <sub>CE</sub> = 60 Vdc, I <sub>B</sub> = 0)                                                                                                             | I <sub>CES</sub>     | –          | 0.1        | μAdc |
| Collector Cutoff Current<br>(V <sub>CB</sub> = 60 Vdc, I <sub>E</sub> = 0)<br>(V <sub>CB</sub> = 80 Vdc, I <sub>E</sub> = 0)                                                           | I <sub>CBO</sub>     | –<br>–     | 0.1<br>0.1 | μAdc |
| <b>ON CHARACTERISTICS</b>                                                                                                                                                              |                      |            |            |      |
| DC Current Gain<br>(I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 1.0 Vdc)<br>(I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 1.0 Vdc)                                                         | h <sub>FE</sub>      | 100<br>100 | –<br>–     | –    |
| Collector – Emitter Saturation Voltage<br>(I <sub>C</sub> = 100 mA, I <sub>B</sub> = 10 mA)                                                                                            | V <sub>CE(sat)</sub> | –          | 0.25       | Vdc  |
| Base – Emitter On Voltage<br>(I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 1.0 Vdc)                                                                                                      | V <sub>BE(on)</sub>  | –          | 1.2        | Vdc  |
| <b>SMALL – SIGNAL CHARACTERISTICS</b>                                                                                                                                                  |                      |            |            |      |
| Current – Gain – Bandwidth Product (Note 3)<br>(I <sub>C</sub> = 10 mA, V <sub>CE</sub> = 2.0 V, f = 100 MHz)<br><br>(I <sub>C</sub> = 100 mA, V <sub>CE</sub> = 1.0 Vdc, f = 100 MHz) | f <sub>T</sub>       | 100<br>50  | –<br>–     | MHz  |

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

3. f<sub>T</sub> is defined as the frequency at which |h<sub>fe</sub>| extrapolates to unity.



\*Total Shunt Capacitance of Test Jig and Connectors For PNP Test Circuits, Reverse All Voltage Polarities

**Figure 1. Switching Time Test Circuits**

# NPN – MPSA05, MPSA06\*; PNP – MPSA55, MPSA56\*

NPN

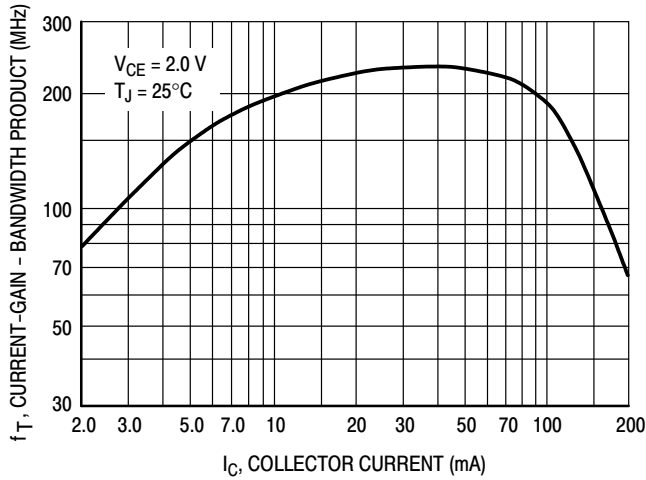


Figure 2. MPSA05/06 Current-Gain — Bandwidth Product

PNP

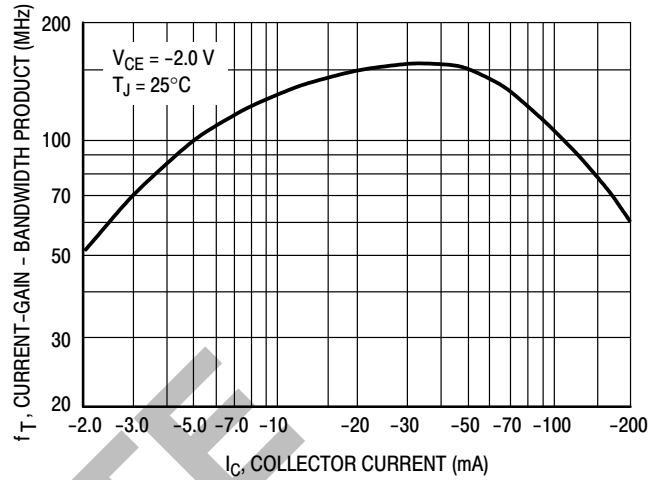


Figure 3. MPSA55/56 Current-Gain — Bandwidth Product

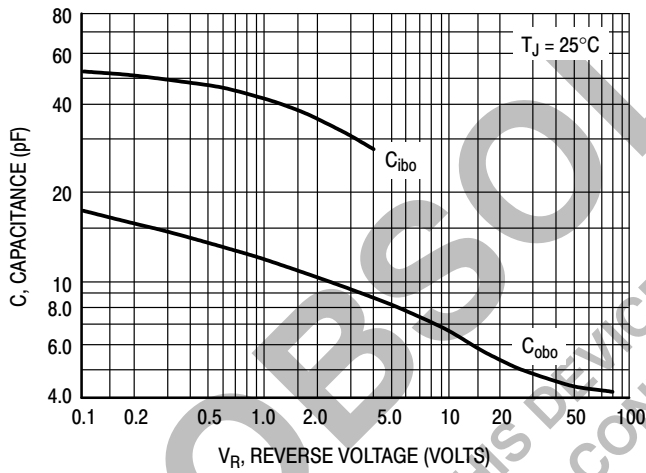


Figure 4. MPSA05/06 Capacitance

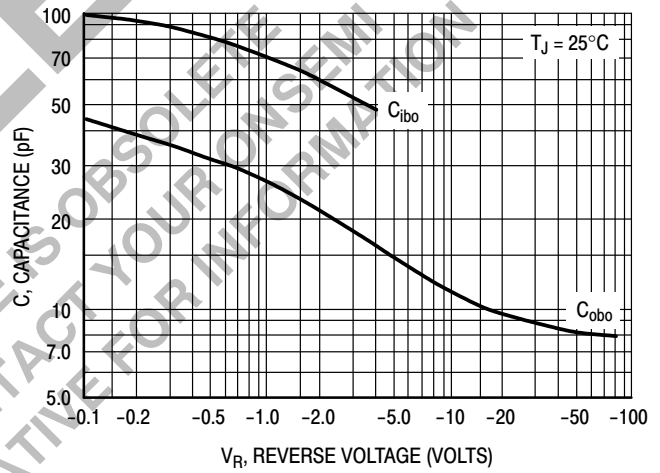


Figure 5. MPSA55/56 Capacitance

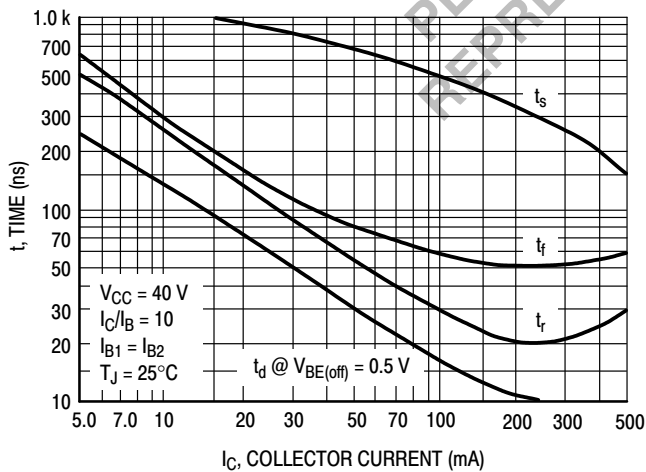


Figure 6. MPSA05/06 Switching Time

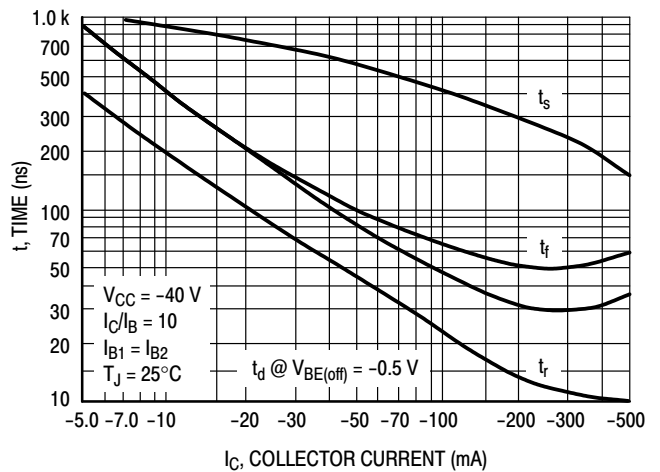
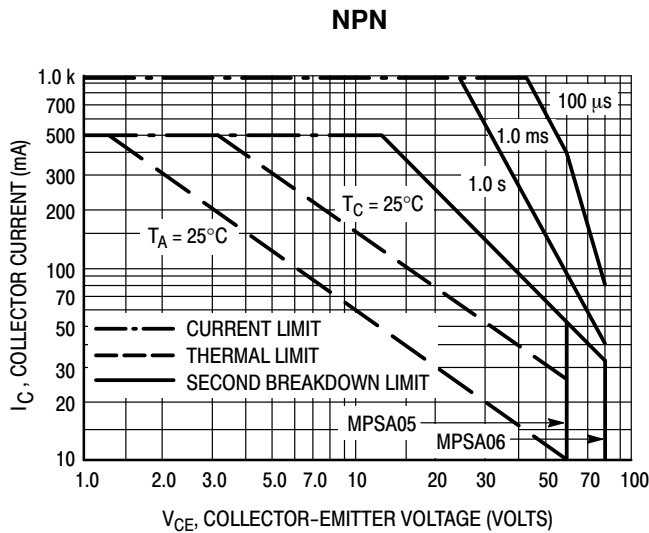
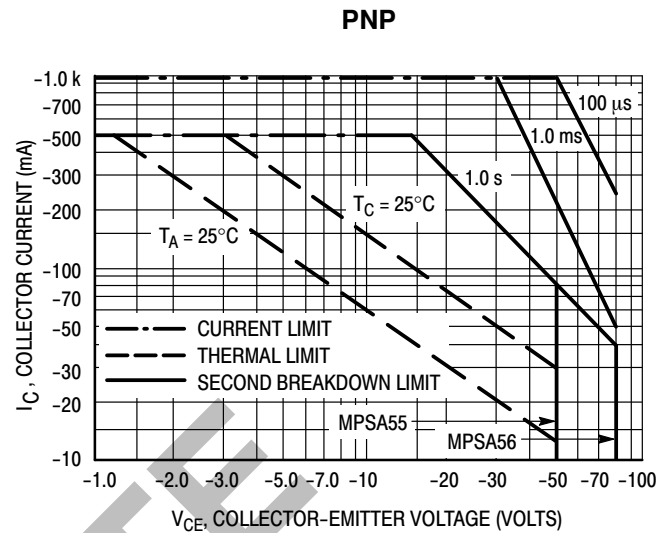


Figure 7. MPSA55/56 Switching Time

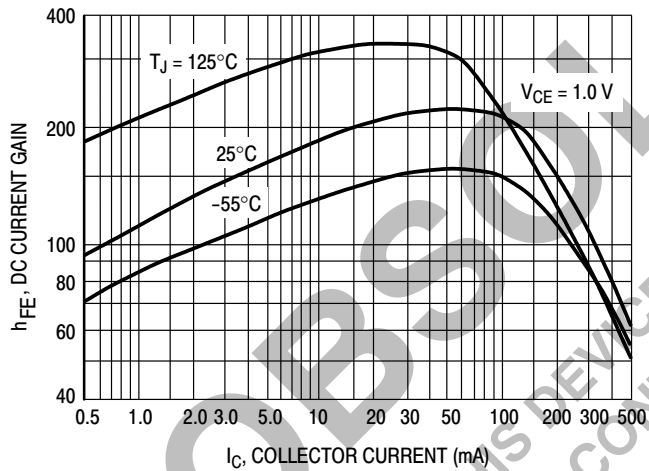
# NPN – MPSA05, MPSA06\*; PNP – MPSA55, MPSA56\*



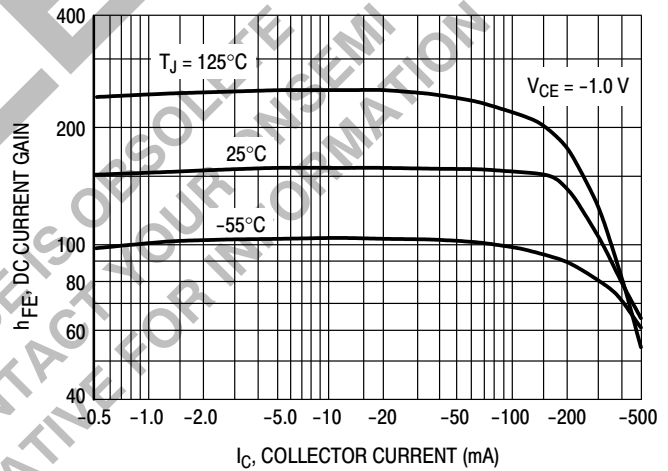
**Figure 8. MPSA05/06 Active-Region Safe Operating Area**



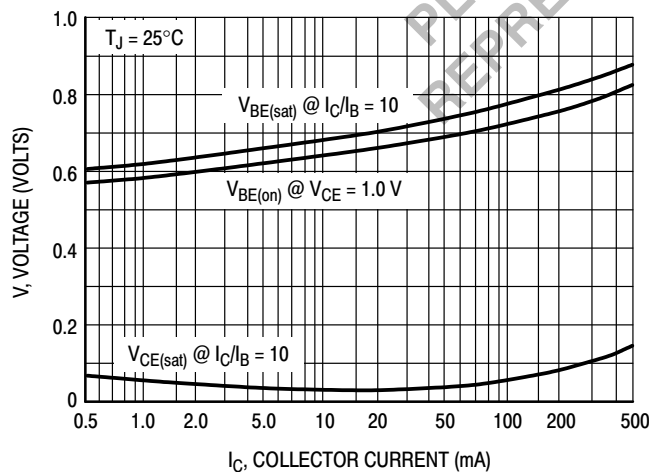
**Figure 9. MPSA55/56 Active-Region Safe Operating Area**



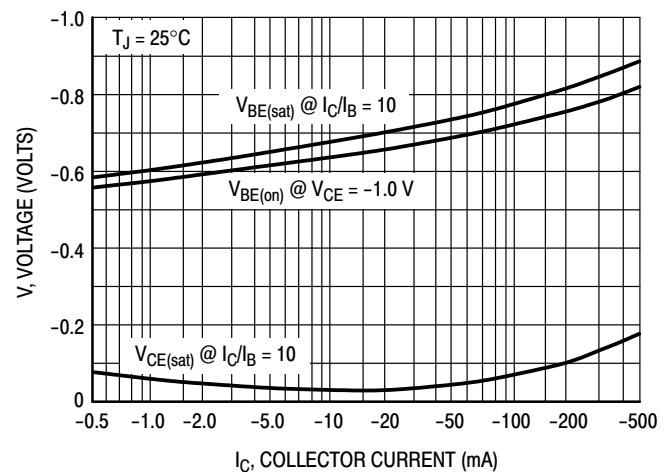
**Figure 10. MPSA05/06 DC Current Gain**



**Figure 11. MPSA55/56 DC Current Gain**



**Figure 12. MPSA05/06 "ON" Voltages**



**Figure 13. MPSA55/56 "ON" Voltages**

# NPN – MPSA05, MPSA06\*; PNP – MPSA55, MPSA56\*

NPN

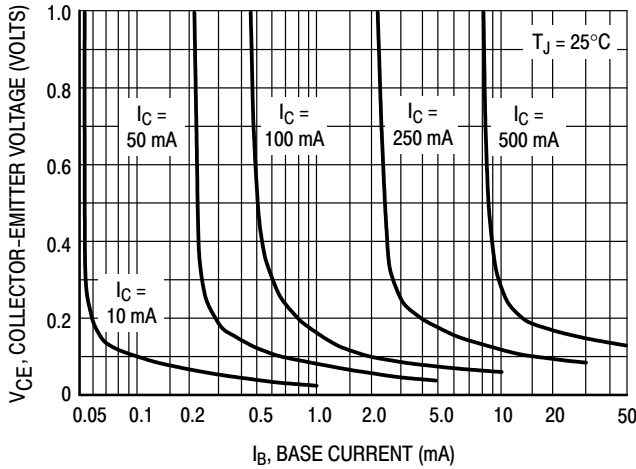


Figure 14. MPSA05/06 Collector Saturation Region

PNP

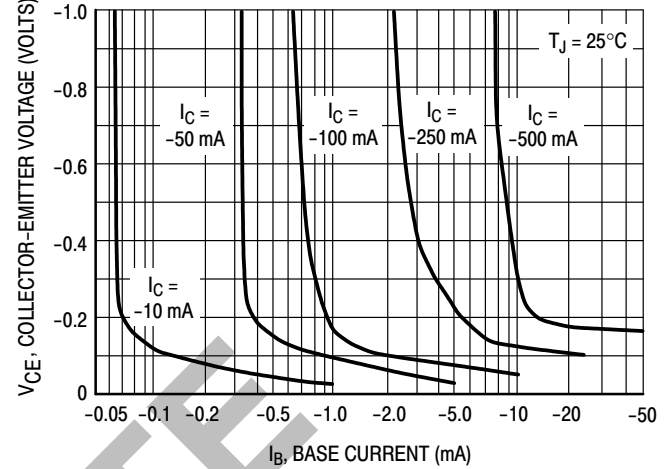


Figure 15. MPSA55/56 Collector Saturation Region

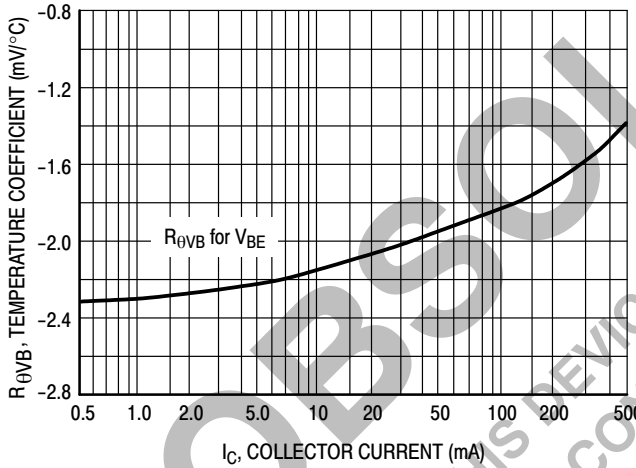


Figure 16. MPSA05/06 Base-Emitter Temperature Coefficient

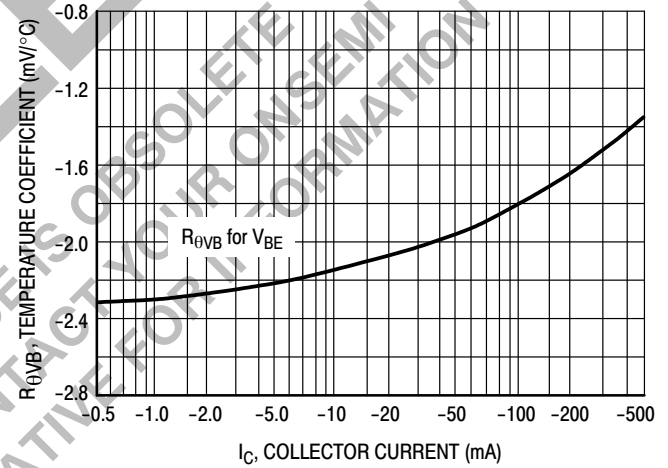


Figure 17. MPSA55/56 Base-Emitter Temperature Coefficient

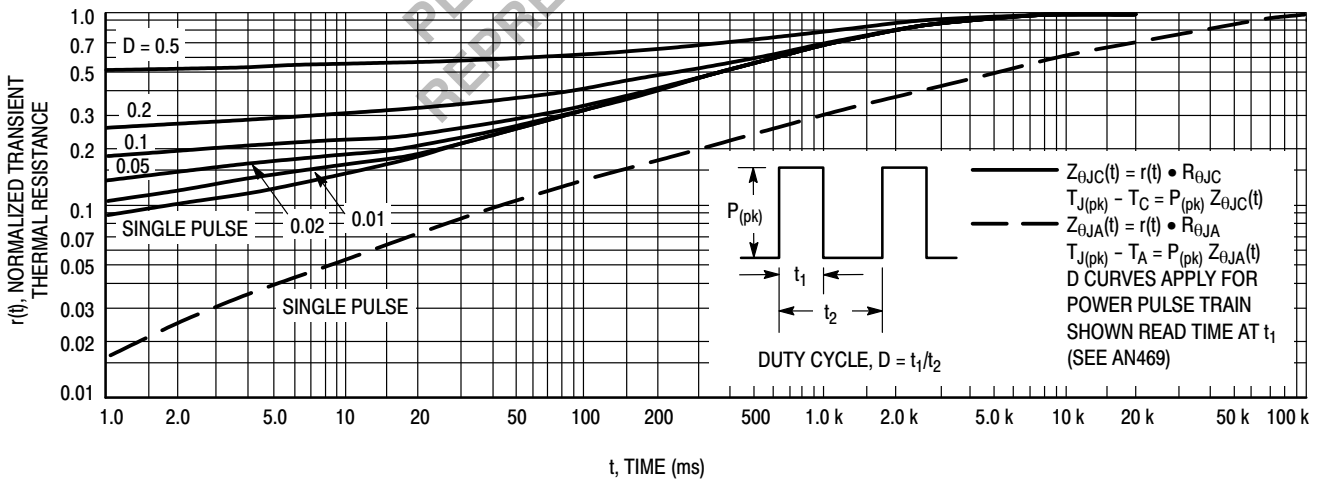


Figure 18. MPSA05, MPSA06, MPSA55 and MPSA56 Thermal Response

# NPN – MPSA05, MPSA06\*; PNP – MPSA55, MPSA56\*

## ORDERING INFORMATION

| Device      | Package            | Shipping†          |
|-------------|--------------------|--------------------|
| MPSA05      | TO-92              | 5000 Units / Bulk  |
| MPSA05G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk  |
| MPSA05RLRA  | TO-92              | 2000 / Tape & Reel |
| MPSA05RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| MPSA05RLRM  | TO-92              | 2000 / Ammo Pack   |
| MPSA05RLRMG | TO-92<br>(Pb-Free) | 2000 / Ammo Pack   |
| MPSA06      | TO-92              | 5000 Units / Bulk  |
| MPSA06G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk  |
| MPSA06RL1G  | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| MPSA06RLG   | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| MPSA06RLRA  | TO-92              | 2000 / Tape & Reel |
| MPSA06RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| MPSA06RLRM  | TO-92              | 2000 / Ammo Pack   |
| MPSA06RLRMG | TO-92<br>(Pb-Free) | 2000 / Ammo Pack   |
| MPSA06RLRP  | TO-92              | 2000 / Ammo Pack   |
| MPSA06RLRPG | TO-92<br>(Pb-Free) | 2000 / Ammo Pack   |
| MPSA55G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk  |
| MPSA55RLRA  | TO-92              | 2000 / Tape & Reel |
| MPSA55RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| MPSA56      | TO-92              | 5000 Units / Bulk  |
| MPSA56G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk  |
| MPSA56RLRA  | TO-92              | 2000 / Tape & Reel |
| MPSA56RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| MPSA56RLRM  | TO-92              | 2000 / Ammo Pack   |
| MPSA56RLRMG | TO-92<br>(Pb-Free) | 2000 / Ammo Pack   |
| MPSA56RLRP  | TO-92              | 2000 / Ammo Pack   |
| MPSA56RLRPG | TO-92<br>(Pb-Free) | 2000 / Ammo Pack   |
| MPSA56ZL1   | TO-92              | 2000 / Ammo Pack   |
| MPSA56ZL1G  | TO-92<br>(Pb-Free) | 2000 / Ammo Pack   |

†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.

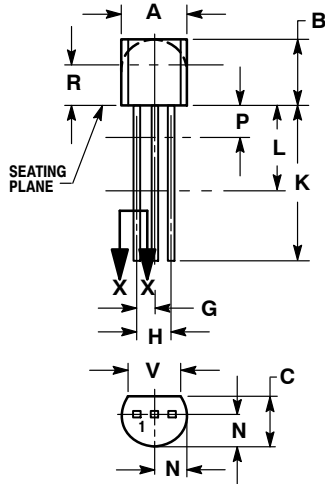
# NPN – MPSA05, MPSA06\*; PNP – MPSA55, MPSA56\*

## PACKAGE DIMENSIONS

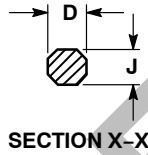
TO-92 (TO-226)

CASE 29-11

ISSUE AM



STRAIGHT LEAD  
BULK PACK

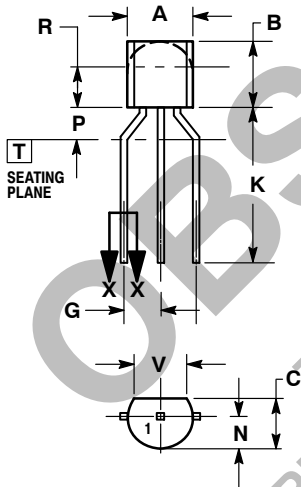


SECTION X-X

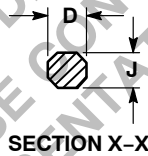
### NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | INCHES |       | MILLIMETERS |       |
|-----|--------|-------|-------------|-------|
|     | MIN    | MAX   | MIN         | MAX   |
| A   | 0.175  | 0.205 | 4.45        | 5.20  |
| B   | 0.170  | 0.210 | 4.32        | 5.33  |
| C   | 0.125  | 0.165 | 3.18        | 4.19  |
| D   | 0.016  | 0.021 | 0.407       | 0.533 |
| G   | 0.045  | 0.055 | 1.15        | 1.39  |
| H   | 0.095  | 0.105 | 2.42        | 2.66  |
| J   | 0.015  | 0.020 | 0.39        | 0.50  |
| K   | 0.500  | ---   | 12.70       | ---   |
| L   | 0.250  | ---   | 6.35        | ---   |
| N   | 0.080  | 0.105 | 2.04        | 2.66  |
| P   | ---    | 0.100 | ---         | 2.54  |
| R   | 0.115  | ---   | 2.93        | ---   |
| V   | 0.135  | ---   | 3.43        | ---   |



BENT LEAD  
TAPE & REEL  
AMMO PACK



SECTION X-X

### NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

| DIM | MILLIMETERS |      |
|-----|-------------|------|
|     | MIN         | MAX  |
| A   | 4.45        | 5.20 |
| B   | 4.32        | 5.33 |
| C   | 3.18        | 4.19 |
| D   | 0.40        | 0.54 |
| G   | 2.40        | 2.80 |
| J   | 0.39        | 0.50 |
| K   | 12.70       | ---  |
| N   | 2.04        | 2.66 |
| P   | 1.50        | 4.00 |
| R   | 2.93        | ---  |
| V   | 3.43        | ---  |

### STYLE 1:

1. PIN 1. EMITTER
2. BASE
3. COLLECTOR

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