

# ON Semiconductor

## Is Now



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# NPN - MPS650, MPS651; PNP - MPS750, MPS751

## Amplifier Transistors

### Features

- These are Pb-Free Devices\*

### MAXIMUM RATINGS

| Rating                                                                                | Symbol         | Value       | Unit                       |
|---------------------------------------------------------------------------------------|----------------|-------------|----------------------------|
| Collector - Emitter Voltage<br>MPS650; MPS750<br>MPS651; MPS751                       | $V_{CE}$       | 40<br>60    | Vdc                        |
| Collector - Base Voltage<br>MPS650; MPS750<br>MPS651; MPS751                          | $V_{CB}$       | 60<br>80    | Vdc                        |
| Emitter - Base Voltage                                                                | $V_{EB}$       | 5.0         | Vdc                        |
| Collector Current - Continuous                                                        | $I_C$          | 2.0         | Adc                        |
| Total Power Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 625<br>5.0  | mW<br>mW/ $^\circ\text{C}$ |
| Total Power 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

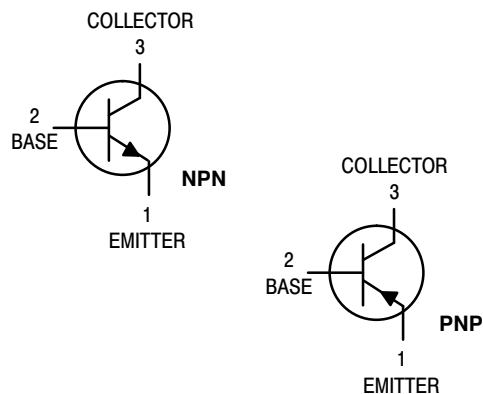
| Characteristic                          | Symbol   | Max  | Unit                      |
|-----------------------------------------|----------|------|---------------------------|
| Thermal Resistance, Junction-to-Ambient | $V_{CE}$ | 200  | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Case    | $V_{CB}$ | 83.3 | $^\circ\text{C}/\text{W}$ |

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.

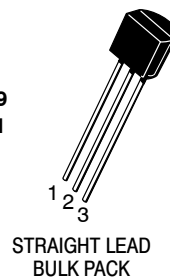


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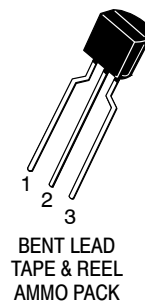
<http://onsemi.com>



**TO-92  
CASE 29  
STYLE 1**

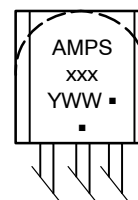


**STRAIGHT LEAD  
BULK PACK**



**BENT LEAD  
TAPE & REEL  
AMMO PACK**

### MARKING DIAGRAM



xxx = 650, 750, 651, or 751  
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 4 of this data sheet.

\*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 – MPS650, MPS651; PNP – MPS750, MPS751

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

| Characteristic                                                                                                   |                                  | Symbol        | Min      | Max        | Unit            |
|------------------------------------------------------------------------------------------------------------------|----------------------------------|---------------|----------|------------|-----------------|
| <b>OFF CHARACTERISTICS</b>                                                                                       |                                  |               |          |            |                 |
| Collector – Emitter Breakdown Voltage (Note 1)<br>( $I_C = 10\text{ mAdc}$ , $I_B = 0$ )                         | MPS650, MPS750<br>MPS651, MPS751 | $V_{(BR)CEO}$ | 40<br>60 | –<br>–     | Vdc             |
| Collector – Base Breakdown Voltage<br>( $I_C = 100\text{ }\mu\text{Adc}$ , $I_E = 0$ )                           | MPS650, MPS750<br>MPS651, MPS751 | $V_{(BR)CBO}$ | 60<br>80 | –<br>–     | Vdc             |
| Emitter – Base Breakdown Voltage<br>( $I_C = 0$ , $I_E = 10\text{ }\mu\text{Adc}$ )                              |                                  | $V_{(BR)EBO}$ | 5.0      | –          | Vdc             |
| Collector Cutoff Current<br>( $V_{CB} = 60\text{ Vdc}$ , $I_E = 0$ )<br>( $V_{CB} = 80\text{ Vdc}$ , $I_E = 0$ ) | MPS650, MPS750<br>MPS651, MPS751 | $I_{CBO}$     | –<br>–   | 0.1<br>0.1 | $\mu\text{Adc}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 4.0\text{ V}$ , $I_C = 0$ )                                                |                                  | $I_{EBO}$     | –        | 0.1        | $\mu\text{Adc}$ |

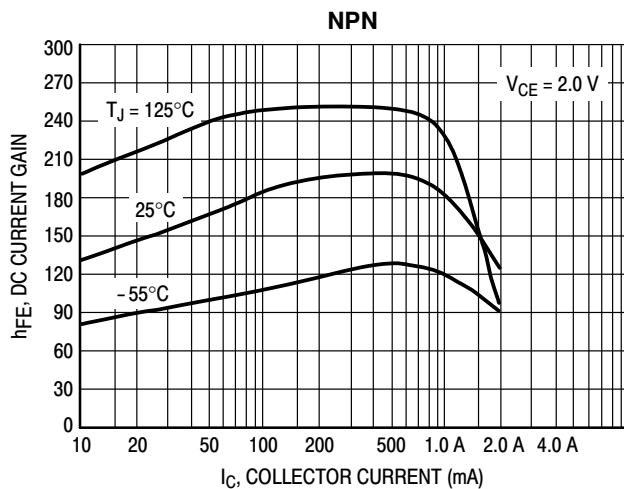
## ON CHARACTERISTICS (Note 1)

|                                                                                                                                                                                                                                          |  |               |                      |                  |     |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|---------------|----------------------|------------------|-----|
| DC Current Gain<br>( $I_C = 50\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ )<br>( $I_C = 500\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ )<br>( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )<br>( $I_C = 2.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ ) |  | $h_{FE}$      | 75<br>75<br>75<br>40 | –<br>–<br>–<br>– | –   |
| Collector – Emitter Saturation Voltage<br>( $I_C = 2.0\text{ A}$ , $I_B = 200\text{ mA}$ )<br>( $I_C = 1.0\text{ A}$ , $I_B = 100\text{ mA}$ )                                                                                           |  | $V_{CE(sat)}$ | –<br>–               | 0.5<br>0.3       | Vdc |
| Base – Emitter On Voltage<br>( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )                                                                                                                                                          |  | $V_{BE(on)}$  | –                    | 1.0              | Vdc |
| Base – Emitter Saturation Voltage<br>( $I_C = 1.0\text{ A}$ , $I_B = 100\text{ mA}$ )                                                                                                                                                    |  | $V_{BE(sat)}$ | –                    | 1.2              | Vdc |

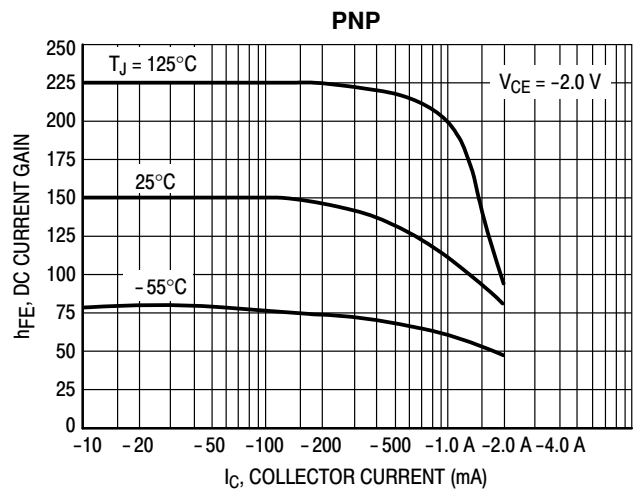
## SMALL – SIGNAL CHARACTERISTICS

|                                                                                                                              |  |       |    |   |     |
|------------------------------------------------------------------------------------------------------------------------------|--|-------|----|---|-----|
| Current – Gain – Bandwidth Product (Note 2)<br>( $I_C = 50\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ ) |  | $f_T$ | 75 | – | MHz |
|------------------------------------------------------------------------------------------------------------------------------|--|-------|----|---|-----|

1. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle = 2.0%.
2.  $f_T$  is defined as the frequency at which  $|h_{fe}|$  extrapolates to unity.

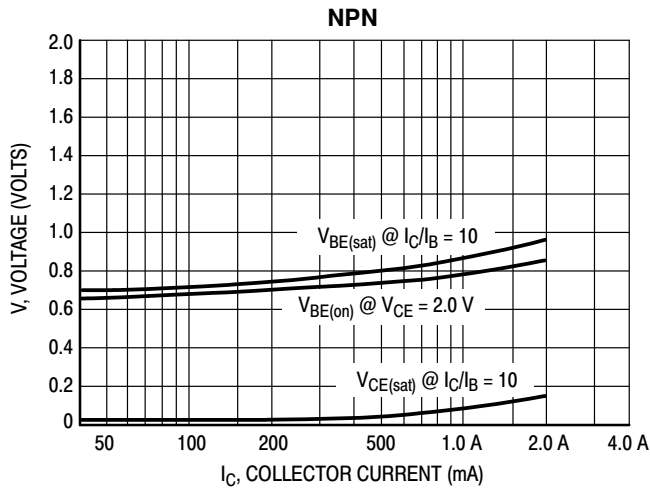


**Figure 1. MPS650, MPS651**  
Typical DC Current Gain

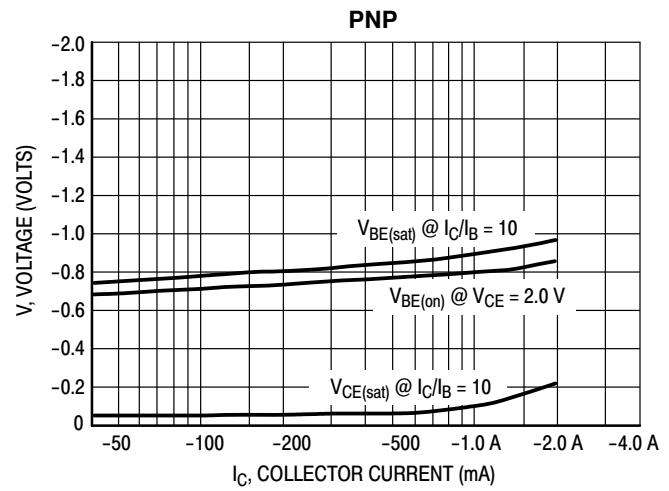


**Figure 2. MPS750, MPS751**  
Typical DC Current Gain

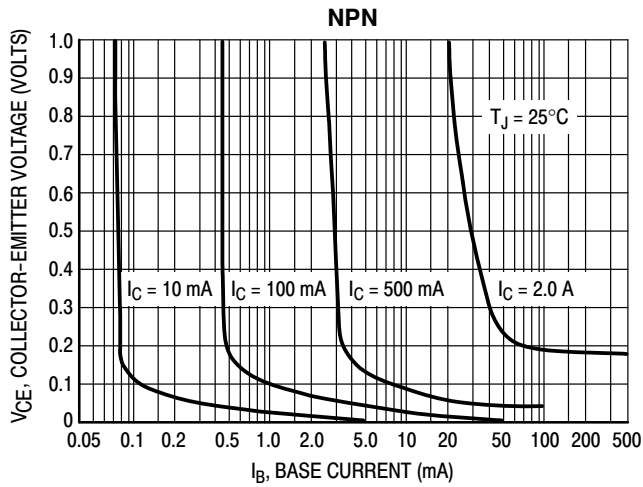
# NPN – MPS650, MPS651; PNP – MPS750, MPS751



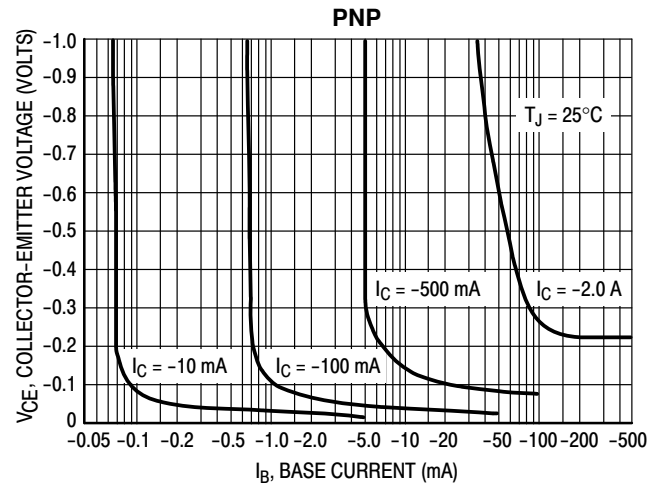
**Figure 3. MPS650, MPS651  
On Voltages**



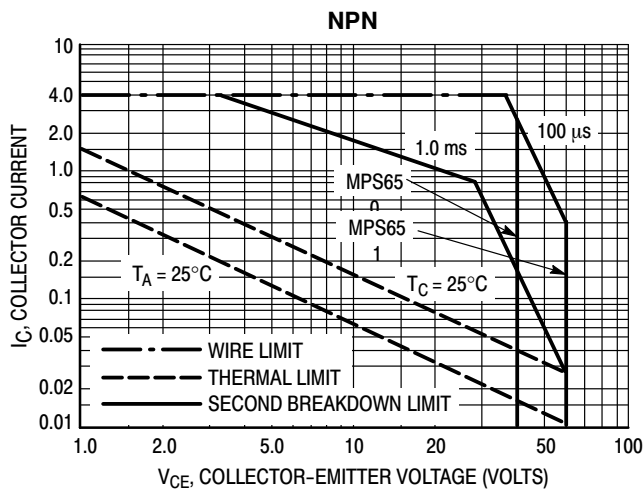
**Figure 4. MPS750, MPS751  
On Voltages**



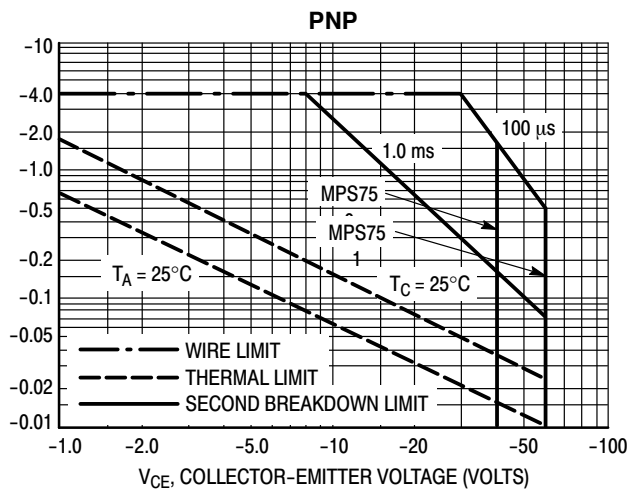
**Figure 5. MPS650, MPS651  
Collector Saturation Region**



**Figure 6. MPS750, MPS751  
Collector Saturation Region**



**Figure 7. MPS650, MPS651 SOA,  
Safe Operating Area**



**Figure 8. MPS750, MPS751 SOA,  
Safe Operating Area**

## NPN – MPS650, MPS651; PNP – MPS750, MPS751

### ORDERING INFORMATION

| Device      | Package            | Shipping†                |
|-------------|--------------------|--------------------------|
| MPS650G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk        |
| MPS650RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel       |
| MPS650ZL1G  | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |
| MPS651G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk        |
| MPS651RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel       |
| MPS651RLRMG | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |
| MPS750G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk        |
| MPS750RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel       |
| MPS750RLRPG | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |
| MPS751G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk        |
| MPS751RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel       |
| MPS751RLRPG | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |
| MPS751ZL1G  | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |

†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.

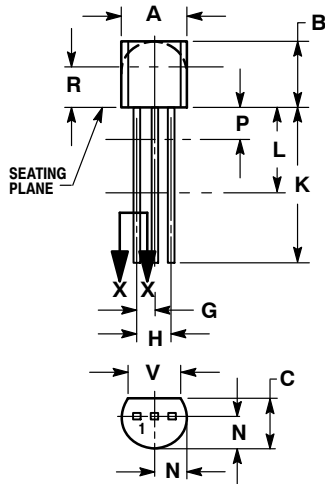
# NPN – MPS650, MPS651; PNP – MPS750, MPS751

## PACKAGE DIMENSIONS

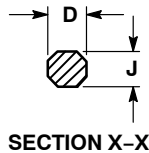
### TO-92 (TO-226)

CASE 29-11

ISSUE AM



STRAIGHT LEAD  
BULK PACK

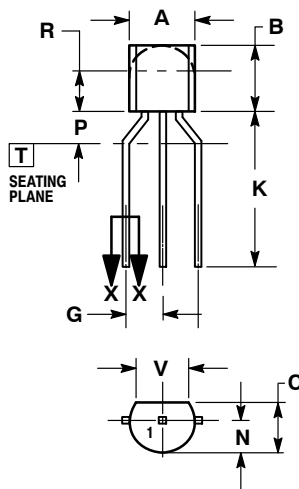


SECTION X-X

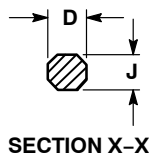
#### NOTES:

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.
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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:

- PIN 1. EMITTER
- BASE
- COLLECTOR

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