

# MPS650, MPS651, NPN MPS750, MPS751, PNP

MPS651 and MPS751 are Preferred Devices

## Amplifier Transistors

### Features

- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

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

Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

### THERMAL CHARACTERISTICS

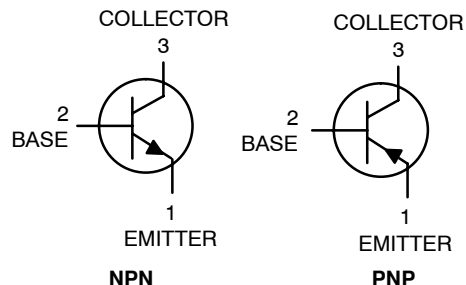
| Characteristic                             | Symbol          | Max  | Unit                      |
|--------------------------------------------|-----------------|------|---------------------------|
| Thermal Resistance,<br>Junction-to-Ambient | $R_{\theta JA}$ | 200  | $^\circ\text{C}/\text{W}$ |
|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

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



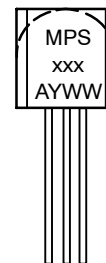
ON Semiconductor®

<http://onsemi.com>



TO-92  
CASE 29-11

### MARKING DIAGRAM



xxx = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 5 of this data sheet.

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

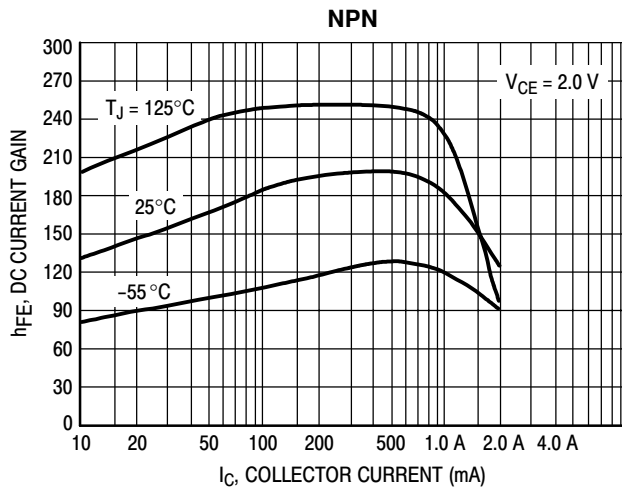
# MPS650, MPS651, NPN MPS750, MPS751, PNP

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

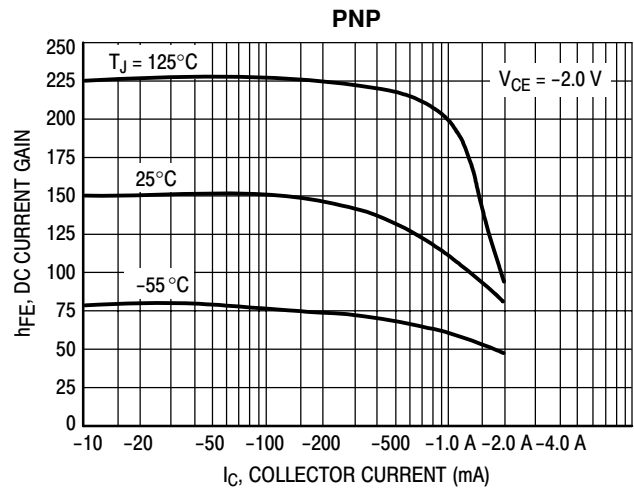
| Characteristic                                                                                                                                                                                                                                   | Symbol        | Min                  | Max              | Unit            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------|------------------|-----------------|
| <b>OFF CHARACTERISTICS</b>                                                                                                                                                                                                                       |               |                      |                  |                 |
| Collector – Emitter Breakdown Voltage (Note 1)<br>( $I_C = 10 \text{ mAdc}$ , $I_B = 0$ )                                                                                                                                                        | $V_{(BR)CEO}$ | 40<br>60             | –<br>–           | Vdc             |
| Collector – Base Breakdown Voltage<br>( $I_C = 100 \text{ } \mu\text{Adc}$ , $I_E = 0$ )                                                                                                                                                         | $V_{(BR)CBO}$ | 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>( $V_{CB} = 80 \text{ Vdc}$ , $I_E = 0$ )                                                                                                                               | $I_{CBO}$     | –<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              | $\mu\text{Adc}$ |
| <b>ON CHARACTERISTICS</b> (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 ( $I_C = 1.0 \text{ A}$ , $V_{CE} = 2.0 \text{ V}$ )                                                                                                                                                                   | $V_{BE(on)}$  | –                    | 1.0              | Vdc             |
| Base – Emitter Saturation Voltage ( $I_C = 1.0 \text{ A}$ , $I_B = 100 \text{ mA}$ )                                                                                                                                                             | $V_{BE(sat)}$ | –                    | 1.2              | Vdc             |
| <b>SMALL – SIGNAL CHARACTERISTICS</b>                                                                                                                                                                                                            |               |                      |                  |                 |
| 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.

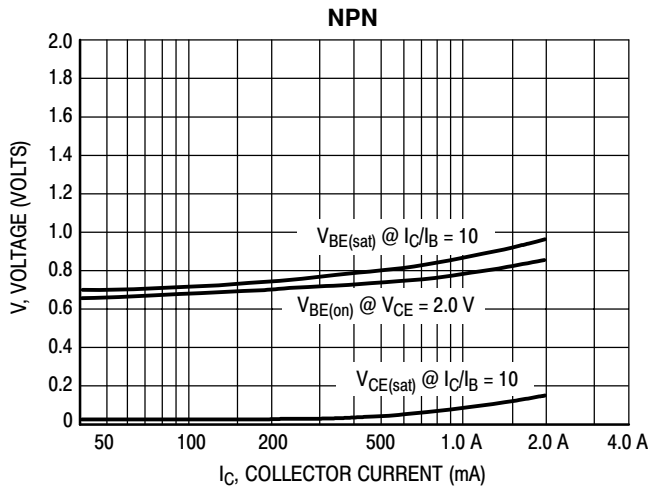
# MPS650, MPS651, NPN MPS750, MPS751, PNP



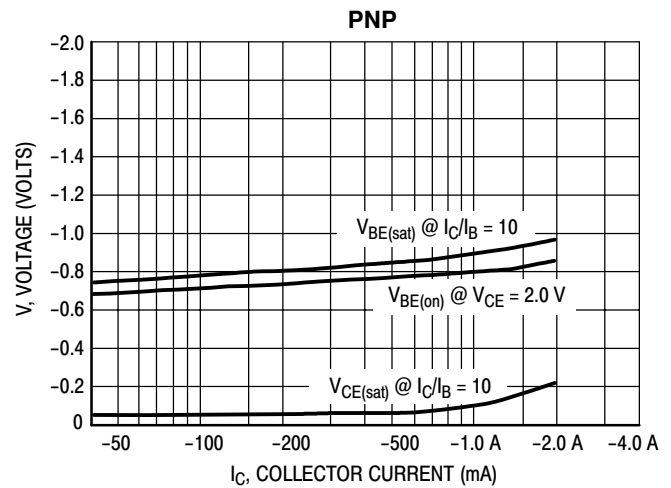
**Figure 1. MPS650, MPS651  
Typical DC Current Gain**



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

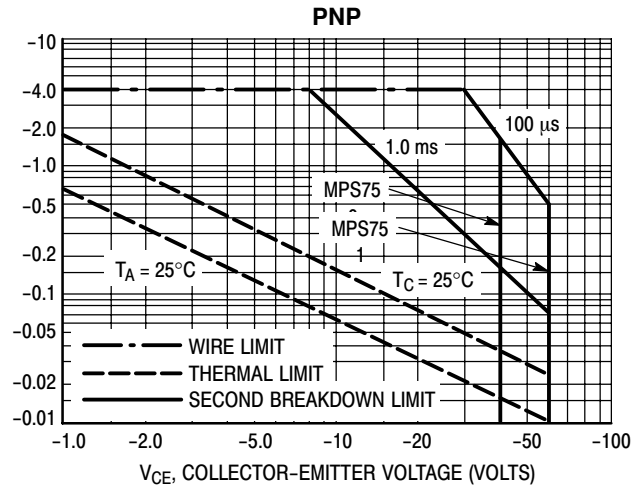
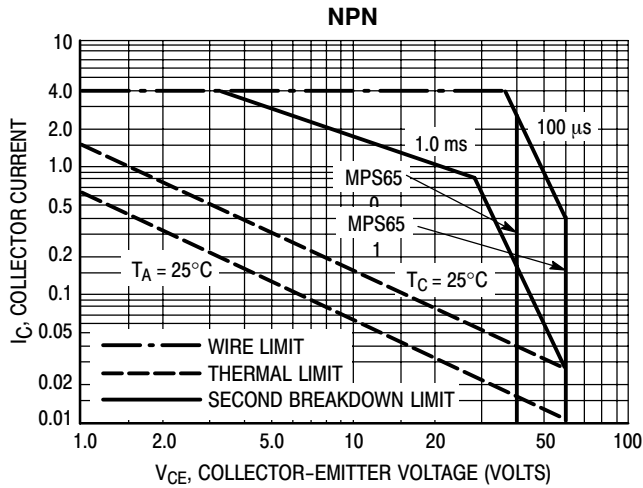
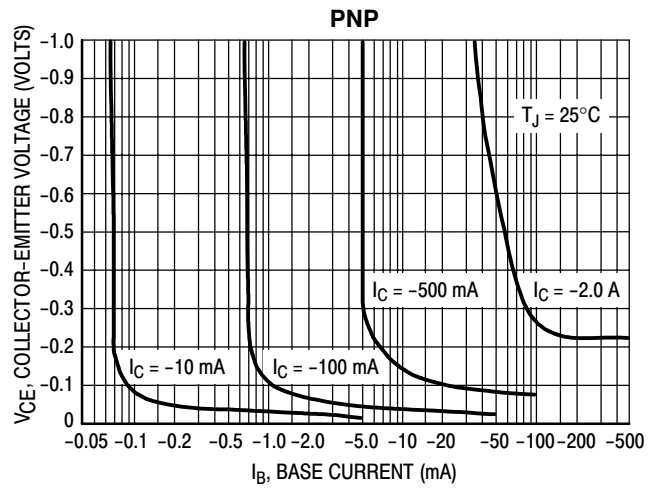
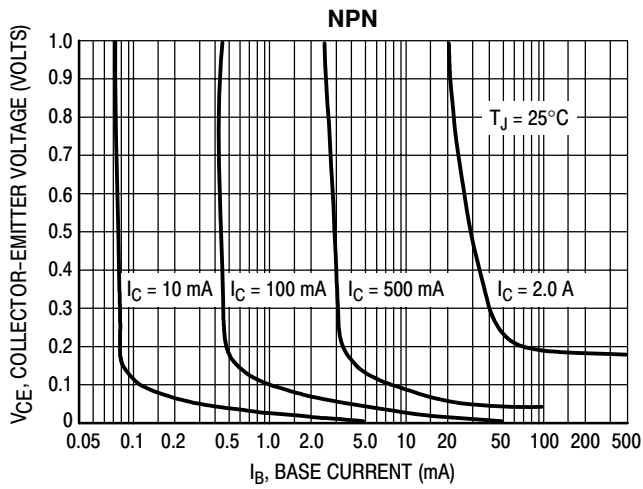


**Figure 3. MPS650, MPS651  
On Voltages**



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

# MPS650, MPS651, NPN MPS750, MPS751, PNP



# MPS650, MPS651, NPN MPS750, MPS751, PNP

## ORDERING INFORMATION

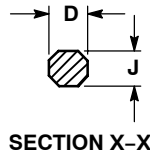
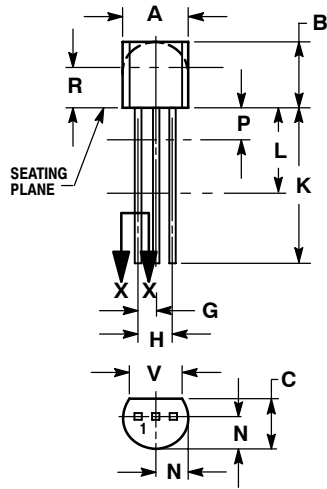
| Device      | Package            | Shipping <sup>†</sup>    |
|-------------|--------------------|--------------------------|
| MPS650      | TO-92              | 5000 Units / Bulk        |
| MPS650G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk        |
| MPS650RLRA  | TO-92              | 2000 / Tape & Reel       |
| MPS650RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel       |
| MPS650ZL1   | TO-92              | 2000 / Tape & Ammunition |
| MPS650ZL1G  | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |
| MPS651      | TO-92              | 5000 Units / Bulk        |
| MPS651G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk        |
| MPS651RLRA  | TO-92              | 2000 / Tape & Reel       |
| MPS651RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel       |
| MPS651RLRBG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel       |
| MPS651RLRM  | TO-92              | 2000 / Tape & Ammunition |
| MPS651RLRMG | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |
| MPS750      | TO-92              | 5000 Units / Bulk        |
| MPS750G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk        |
| MPS750RLRA  | TO-92              | 2000 / Tape & Reel       |
| MPS750RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel       |
| MPS750RLRP  | TO-92              | 2000 / Tape & Ammunition |
| MPS750RLRPG | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |
| MPS751      | TO-92              | 5000 Units / Bulk        |
| MPS751G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk        |
| MPS751RLRA  | TO-92              | 2000 / Tape & Reel       |
| MPS751RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel       |
| MPS751RLRP  | TO-92              | 2000 / Tape & Ammunition |
| MPS751RLRPG | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |
| MPS751ZL1   | TO-92              | 2000 / Tape & Ammunition |
| MPS751ZL1G  | TO-92<br>(Pb-Free) | 2000 / Tape & Ammunition |

<sup>†</sup>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.

# MPS650, MPS651, NPN MPS750, MPS751, PNP

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
CASE 29-11  
ISSUE AL



### 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 |
| E   | 0.045  | 0.055 | 1.15        | 1.39  |
| F   | 0.095  | 0.105 | 2.42        | 2.66  |
| G   | 0.015  | 0.020 | 0.39        | 0.50  |
| H   | 0.500  | ---   | 12.70       | ---   |
| I   | 0.250  | ---   | 6.35        | ---   |
| J   | 0.080  | 0.105 | 2.04        | 2.66  |
| K   | ---    | 0.100 | ---         | 2.54  |
| L   | 0.115  | ---   | 2.93        | ---   |
| M   | 0.135  | ---   | 3.43        | ---   |

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