

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

## Amplifier Transistors

### Features

- These are Pb-Free Devices\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector – Emitter Voltage MPS650; MPS750 MPS651; MPS751	$V_{CE}$	40 60	Vdc
Collector – Base Voltage MPS650; MPS750 MPS651; MPS751	$V_{CB}$	60 80	Vdc
Emitter – Base Voltage	$V_{EB}$	5.0	Vdc
Collector Current – Continuous	$I_C$	2.0	Adc
Total Power Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625 5.0	mW mW/ $^\circ\text{C}$
Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.5 12	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

### THERMAL CHARACTERISTICS

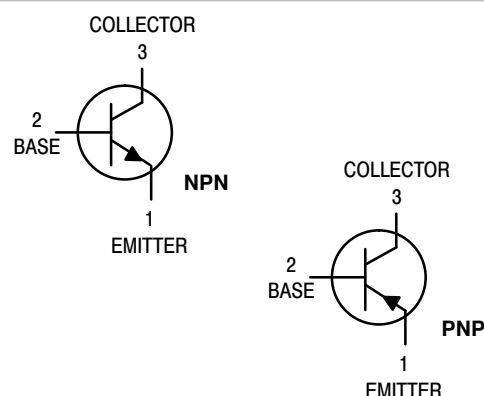
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$V_{CE}$	200	$^\circ\text{C/W}$
Thermal Resistance, Junction-to-Case	$V_{CB}$	83.3	$^\circ\text{C/W}$

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.

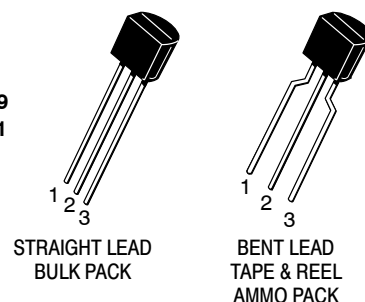


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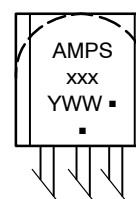
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**TO-92  
CASE 29  
STYLE 1**



### 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) ( $I_C = 10\text{ mAdc}$ , $I_B = 0$ )	$V_{(BR)CEO}$	40 60	– –	Vdc
Collector – Base Breakdown Voltage ( $I_C = 100\text{ }\mu\text{Adc}$ , $I_E = 0$ )	$V_{(BR)CBO}$	60 80	– –	Vdc
Emitter – Base Breakdown Voltage ( $I_C = 0$ , $I_E = 10\text{ }\mu\text{Adc}$ )	$V_{(BR)EBO}$	5.0	–	Vdc
Collector Cutoff Current ( $V_{CB} = 60\text{ Vdc}$ , $I_E = 0$ ) ( $V_{CB} = 80\text{ Vdc}$ , $I_E = 0$ )	$I_{CBO}$	– –	0.1 0.1	$\mu\text{Adc}$
Emitter Cutoff Current ( $V_{EB} = 4.0\text{ V}$ , $I_C = 0$ )	$I_{EBO}$	–	0.1	$\mu\text{Adc}$

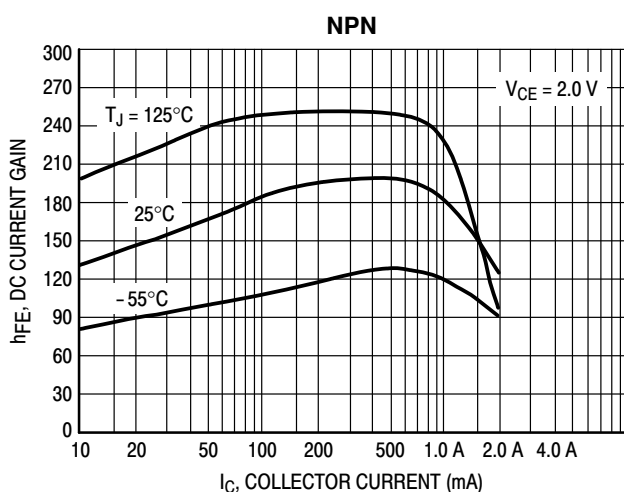
## ON CHARACTERISTICS (Note 1)

DC Current Gain ( $I_C = 50\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ ) ( $I_C = 500\text{ mA}$ , $V_{CE} = 2.0\text{ V}$ ) ( $I_C = 1.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ ) ( $I_C = 2.0\text{ A}$ , $V_{CE} = 2.0\text{ V}$ )	$h_{FE}$	75 75 75 40	– – – –	–
Collector – Emitter Saturation Voltage ( $I_C = 2.0\text{ A}$ , $I_B = 200\text{ mA}$ ) ( $I_C = 1.0\text{ A}$ , $I_B = 100\text{ mA}$ )	$V_{CE(sat)}$	– –	0.5 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

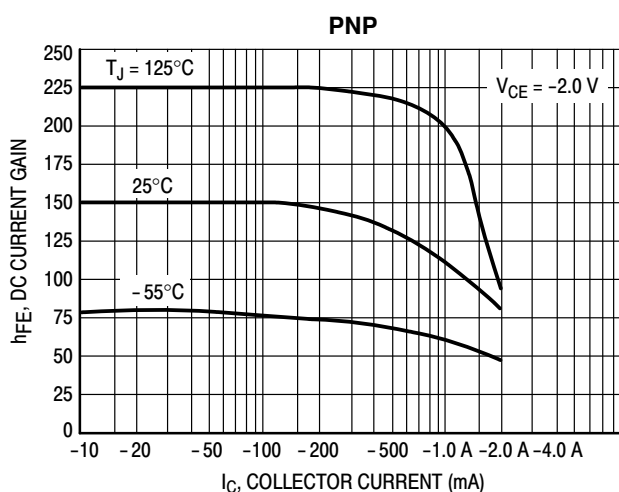
## SMALL – SIGNAL CHARACTERISTICS

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

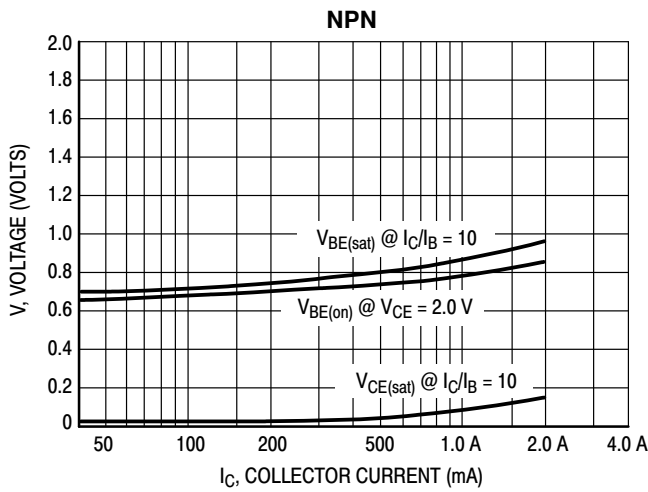


**Figure 1. MPS650, MPS651**  
Typical DC Current Gain

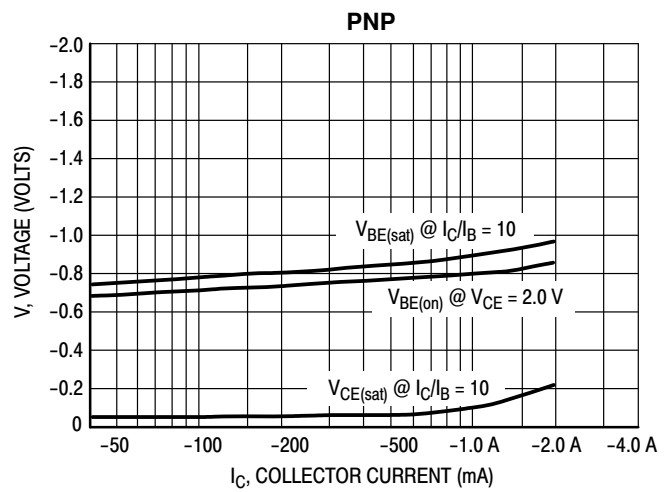


**Figure 2. MPS750, MPS751**  
Typical DC Current Gain

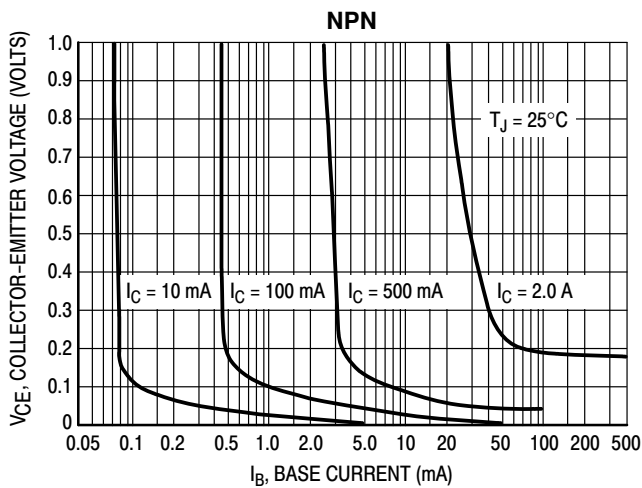
## NPN – MPS650, MPS651; PNP – MPS750, MPS751



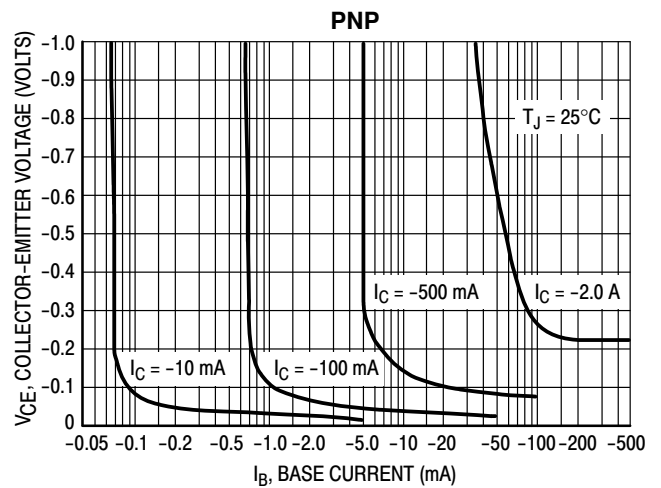
**Figure 3. MPS650, MPS651  
On Voltages**



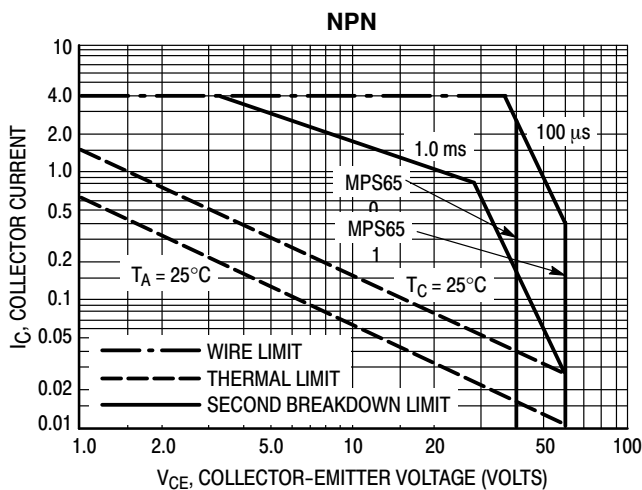
**Figure 4. MPS750, MPS751  
On Voltages**



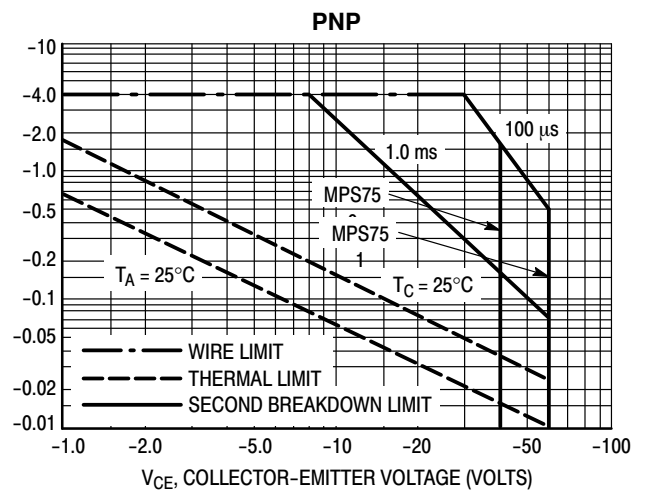
**Figure 5. MPS650, MPS651  
Collector Saturation Region**



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

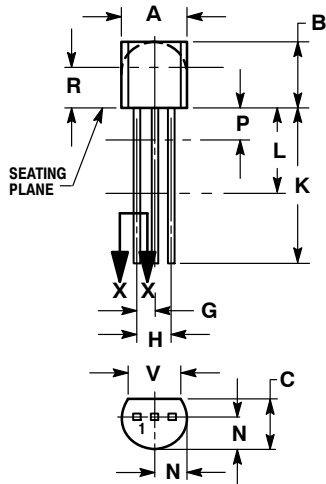
# NPN – MPS650, MPS651; PNP – MPS750, MPS751

## PACKAGE DIMENSIONS

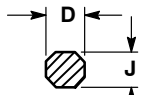
### TO-92 (TO-226)

CASE 29-11

ISSUE AM



STRAIGHT LEAD  
BULK PACK

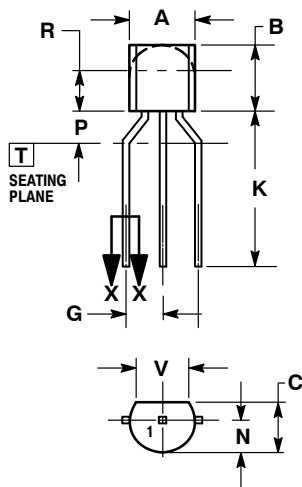


SECTION X-X

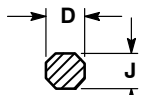
#### NOTES:

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.
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:

- PIN 1. EMITTER
- BASE
- COLLECTOR

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