

# 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 MPS750	MPS651 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 @ $T_A = 25^\circ\text{C}$ 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		$^\circ\text{C}$

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

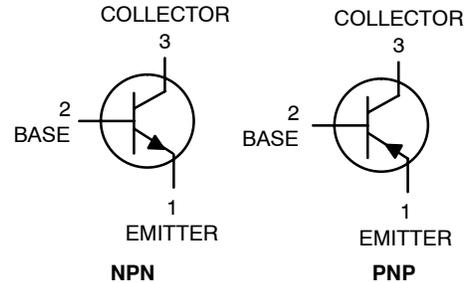
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{W}$

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



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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

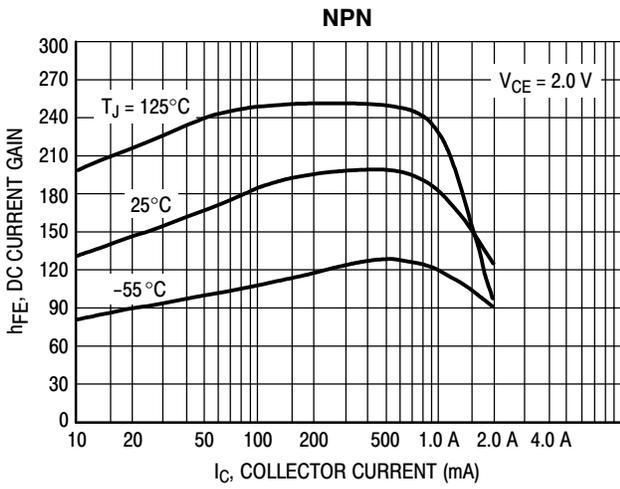
## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector – Emitter Breakdown Voltage (Note 1) (I <sub>C</sub> = 10 mA, I <sub>B</sub> = 0)	V <sub>(BR)CEO</sub>	40	–	Vdc
MPS650, MPS750 MPS651, MPS751		60	–	
Collector – Base Breakdown Voltage (I <sub>C</sub> = 100 μA, I <sub>E</sub> = 0)	V <sub>(BR)CBO</sub>	60	–	Vdc
MPS650, MPS750 MPS651, MPS751		80	–	
Emitter – Base Breakdown Voltage (I <sub>C</sub> = 0, I <sub>E</sub> = 10 μA)	V <sub>(BR)EBO</sub>	5.0	–	Vdc
Collector Cutoff Current (V <sub>CB</sub> = 60 Vdc, I <sub>E</sub> = 0) (V <sub>CB</sub> = 80 Vdc, I <sub>E</sub> = 0)	I <sub>CBO</sub>	–	0.1	μA
MPS650, MPS750 MPS651, MPS751		–	0.1	
Emitter Cutoff Current (V <sub>EB</sub> = 4.0 V, I <sub>C</sub> = 0)	I <sub>EBO</sub>	–	0.1	μA
<b>ON CHARACTERISTICS (Note 1)</b>				
DC Current Gain (I <sub>C</sub> = 50 mA, V <sub>CE</sub> = 2.0 V) (I <sub>C</sub> = 500 mA, V <sub>CE</sub> = 2.0 V) (I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 2.0 V) (I <sub>C</sub> = 2.0 A, V <sub>CE</sub> = 2.0 V)	h <sub>FE</sub>	75	–	–
		75	–	
		75	–	
		40	–	
Collector – Emitter Saturation Voltage (I <sub>C</sub> = 2.0 A, I <sub>B</sub> = 200 mA) (I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 100 mA)	V <sub>CE(sat)</sub>	–	0.5	Vdc
		–	0.3	
Base – Emitter On Voltage (I <sub>C</sub> = 1.0 A, V <sub>CE</sub> = 2.0 V)	V <sub>BE(on)</sub>	–	1.0	Vdc
Base – Emitter Saturation Voltage (I <sub>C</sub> = 1.0 A, I <sub>B</sub> = 100 mA)	V <sub>BE(sat)</sub>	–	1.2	Vdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>				
Current – Gain – Bandwidth Product (Note 2) (I <sub>C</sub> = 50 mA, V <sub>CE</sub> = 5.0 Vdc, f = 100 MHz)	f <sub>T</sub>	75	–	MHz

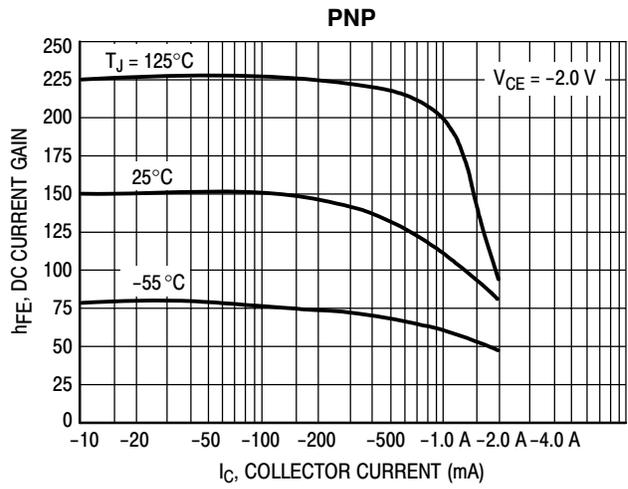
1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle = 2.0%.

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

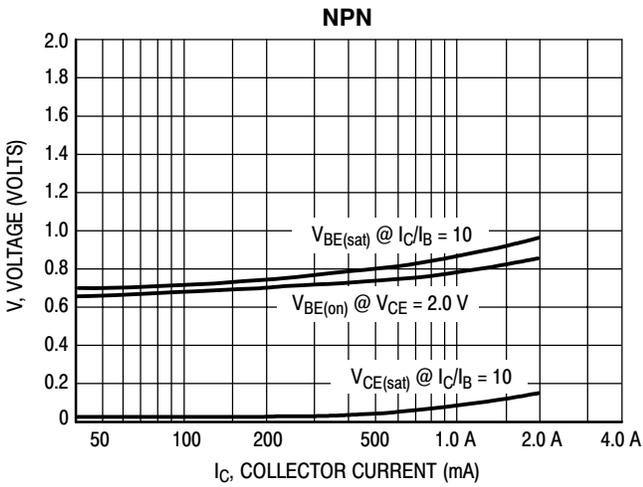
# MPS650, MPS651, NPN MPS750, MPS751, PNP



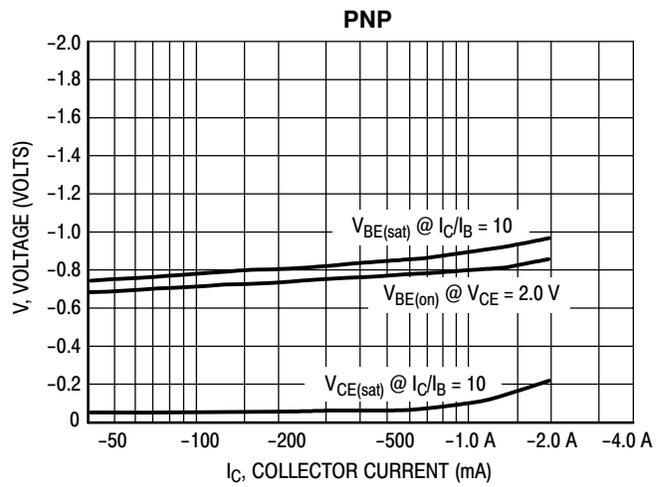
**Figure 1. MPS650, MPS651  
Typical DC Current Gain**



**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

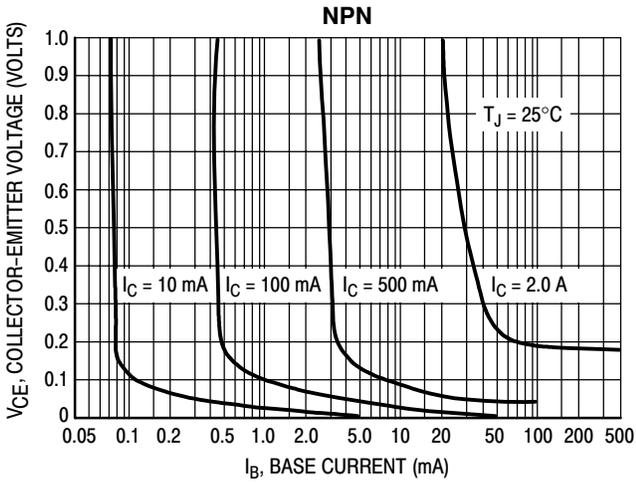


Figure 5. MPS650, MPS651  
Collector Saturation Region

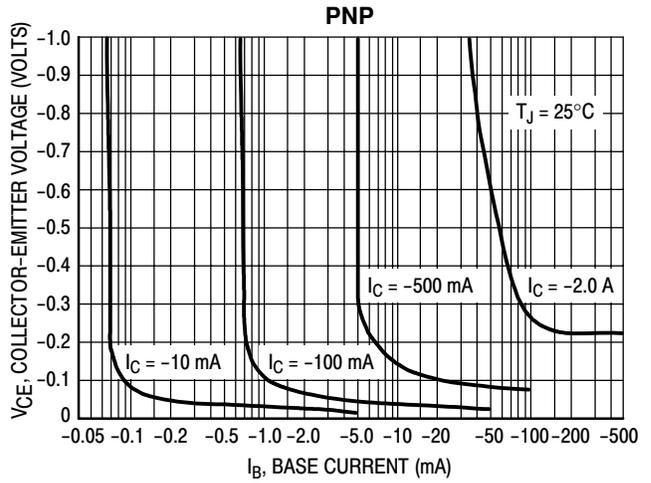


Figure 6. MPS750, MPS751  
Collector Saturation Region

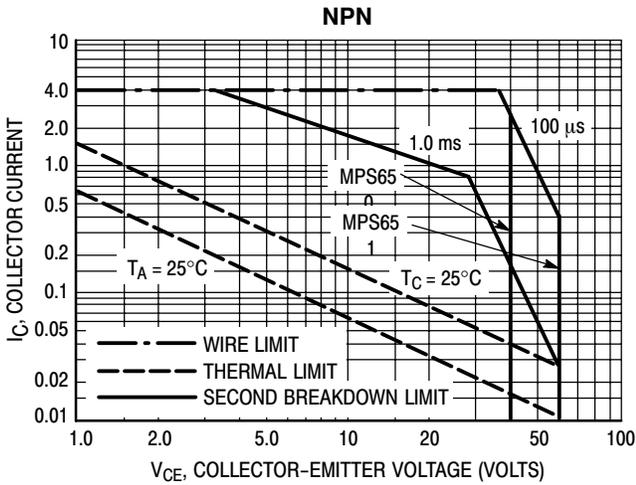


Figure 7. MPS650, MPS651 SOA,  
Safe Operating Area

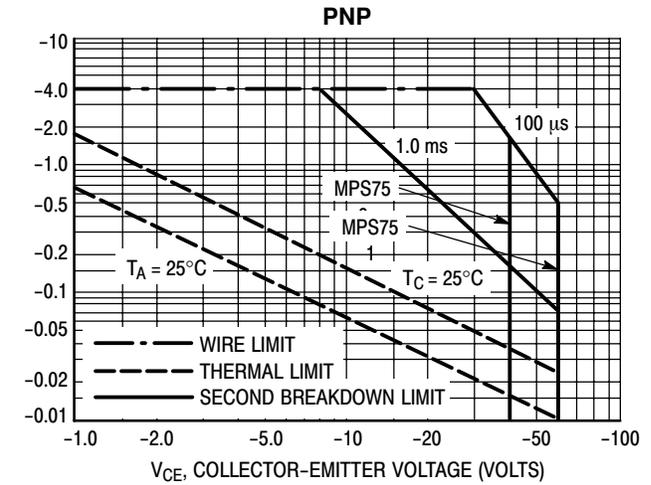


Figure 8. MPS750, MPS751 SOA,  
Safe Operating Area

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

### ORDERING INFORMATION

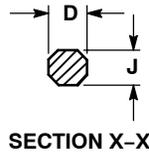
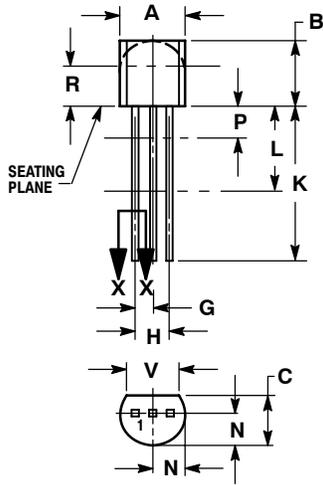
Device	Package	Shipping†
MPS650	TO-92	5000 Units / Bulk
MPS650G	TO-92 (Pb-Free)	5000 Units / Bulk
MPS650RLRA	TO-92	2000 / Tape & Reel
MPS650RLRAG	TO-92 (Pb-Free)	2000 / Tape & Reel
MPS650ZL1	TO-92	2000 / Tape & Ammunition
MPS650ZL1G	TO-92 (Pb-Free)	2000 / Tape & Ammunition
MPS651	TO-92	5000 Units / Bulk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

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## 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
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	---

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