

# MPS6601, MPS6602 (NPN) MPS6651, MPS6652 (PNP)

MPS6602 and MPS6652 are Preferred Devices

## Amplifier Transistors

### Features

- Voltage and Current are Negative for PNP Transistors
- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector–Emitter Voltage MPS6601/6651 MPS6602/6652	$V_{CEO}$	25 40	Vdc
Collector–Base Voltage MPS6601/6651 MPS6602/6652	$V_{CBO}$	25 30	Vdc
Emitter–Base Voltage	$V_{EBO}$	4.0	Vdc
Collector Current – Continuous	$I_C$	1000	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625 5.0	W mW/ $^\circ\text{C}$
Total Device 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 (Note 1)	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{W}$

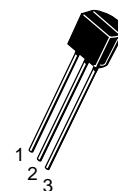
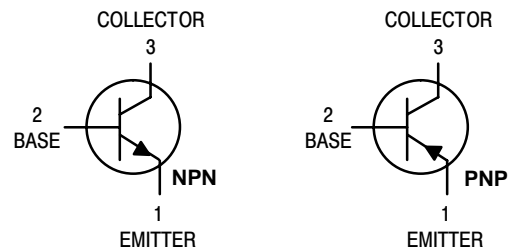
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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



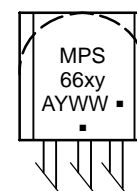
ON Semiconductor®

<http://onsemi.com>



TO-92  
CASE 29-11  
STYLE 1

### MARKING DIAGRAM



MPS66xy = Device Code

x = 0 or 5

y = 1 or 2

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 7 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.

# MPS6601, MPS6602 (NPN) MPS6651, MPS6652 (PNP)

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

Characteristic	Symbol	Min	Max	Unit
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### OFF CHARACTERISTICS

Collector–Emitter Breakdown Voltage (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , I <sub>B</sub> = 0)	MPS6601/6651 MPS6602/6652	V <sub>(BR)CEO</sub>	25 40	– –	V <sub>dc</sub>
Collector–Base Breakdown Voltage (I <sub>C</sub> = 100 μA <sub>dc</sub> , I <sub>E</sub> = 0)	MPS6601/6651 MPS6602/6652	V <sub>(BR)CBO</sub>	25 40	– –	V <sub>dc</sub>
Emitter–Base Breakdown Voltage (I <sub>E</sub> = 10 μA <sub>dc</sub> , I <sub>C</sub> = 0)		V <sub>(BR)EBO</sub>	4.0	–	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 25 V <sub>dc</sub> , I <sub>B</sub> = 0) (V <sub>CE</sub> = 30 V <sub>dc</sub> , I <sub>B</sub> = 0)	MPS6601/6651 MPS6602/6652	I <sub>CES</sub>	– –	0.1 0.1	μA <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = 25 V <sub>dc</sub> , I <sub>E</sub> = 0) (V <sub>CB</sub> = 30 V <sub>dc</sub> , I <sub>E</sub> = 0)	MPS6601/6651 MPS6602/6652	I <sub>CBO</sub>	– –	0.1 0.1	μA <sub>dc</sub>

### ON CHARACTERISTICS

DC Current Gain (I <sub>C</sub> = 100 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (I <sub>C</sub> = 500 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> ) (I <sub>C</sub> = 1000 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> )		h <sub>FE</sub>	50 50 30	– – –	–
Collector–Emitter Saturation Voltage (I <sub>C</sub> = 1000 mA <sub>dc</sub> , I <sub>B</sub> = 100 mA <sub>dc</sub> )		V <sub>CE(sat)</sub>	–	0.6	V <sub>dc</sub>
Base–Emitter On Voltage (I <sub>C</sub> = 500 mA <sub>dc</sub> , V <sub>CE</sub> = 1.0 V <sub>dc</sub> )		V <sub>BE(on)</sub>	–	1.2	V <sub>dc</sub>

### SMALL–SIGNAL CHARACTERISTICS

Current–Gain — Bandwidth Product (I <sub>C</sub> = 50 mA <sub>dc</sub> , V <sub>CE</sub> = 10 V <sub>dc</sub> , f = 100 MHz)		f <sub>T</sub>	100	–	MHz
Output Capacitance (V <sub>CB</sub> = 10 V <sub>dc</sub> , I <sub>E</sub> = 0, f = 1.0 MHz)		C <sub>obo</sub>	–	30	pF

### SWITCHING CHARACTERISTICS

Delay Time	(V <sub>CC</sub> = 40 V <sub>dc</sub> , I <sub>C</sub> = 500 mA <sub>dc</sub> , I <sub>B1</sub> = 50 mA <sub>dc</sub> , t <sub>p</sub> ≥ 300 ns Duty Cycle)	t <sub>d</sub>	–	25	ns
Rise Time		t <sub>r</sub>	–	30	ns
Storage Time		t <sub>s</sub>	–	250	ns
Fall Time		t <sub>f</sub>	–	50	ns

MPS6601, MPS6602 (NPN) MPS6651, MPS6652 (PNP)

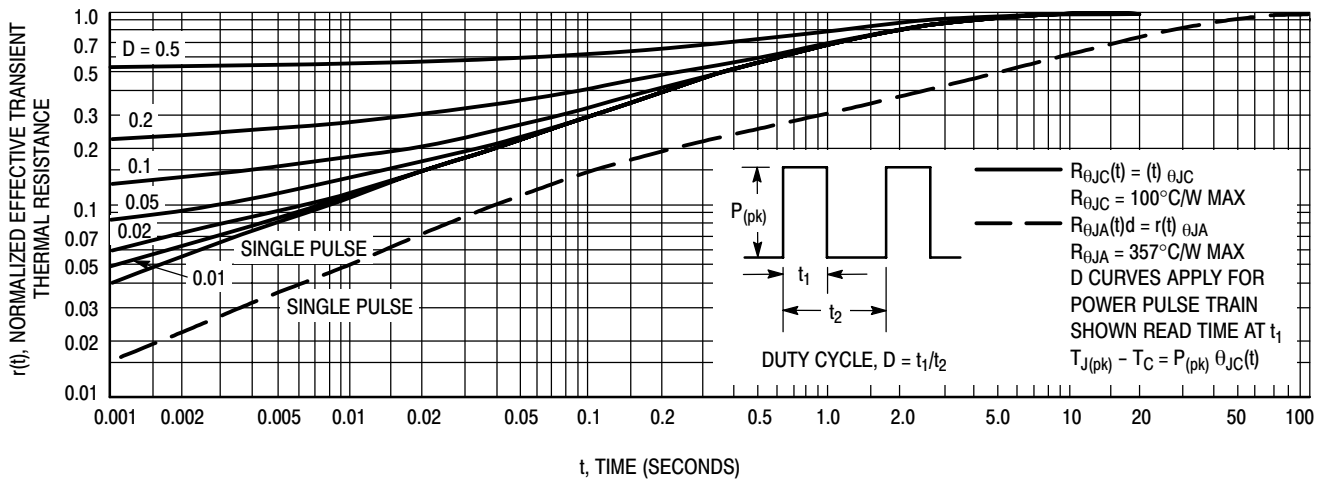
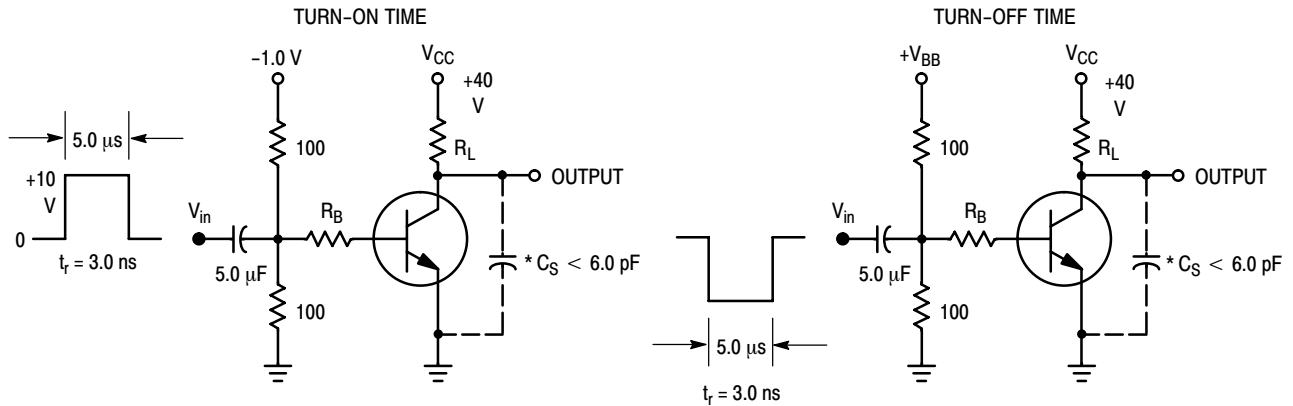


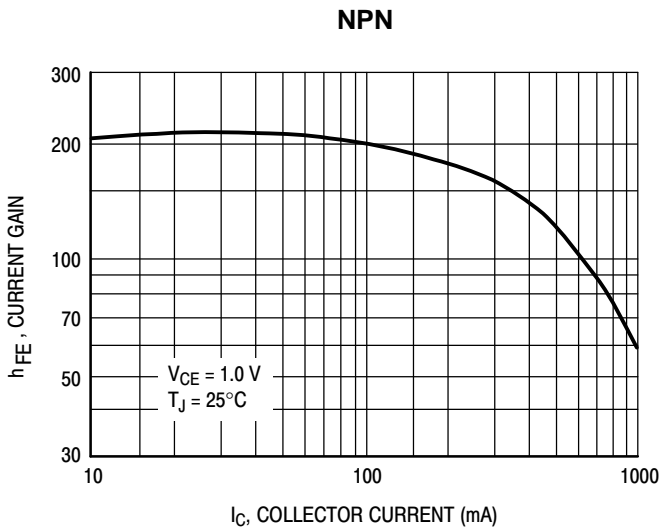
Figure 1. Thermal Response



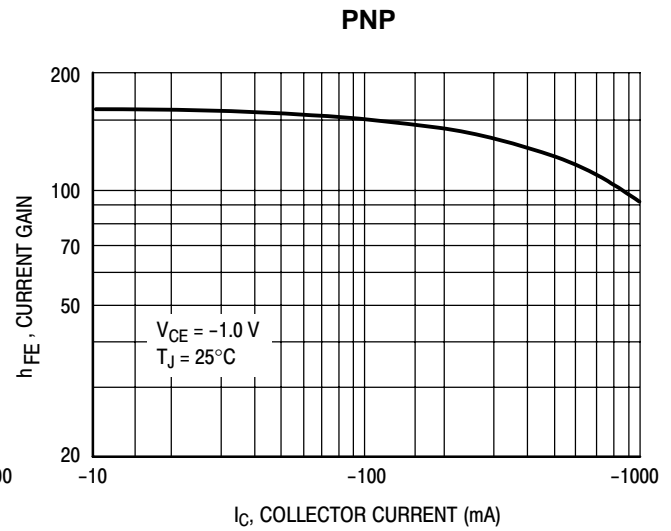
\*Total Shunt Capacitance of Test Jig and Connectors  
For PNP Test Circuits, Reverse All Voltage Polarities

Figure 2. Switching Time Test Circuits

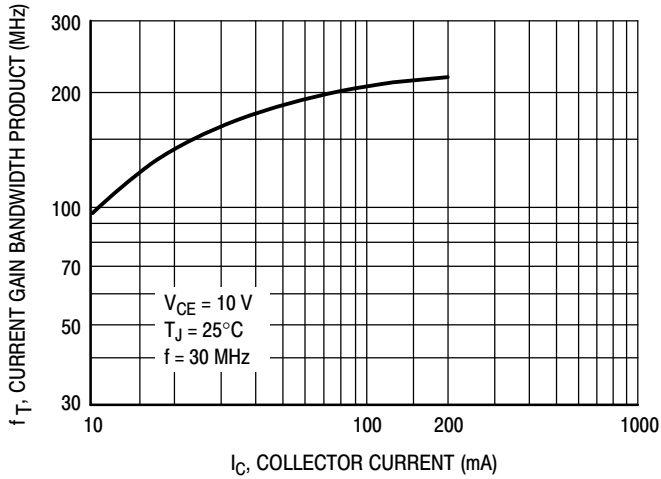
# MPS6601, MPS6602 (NPN) MPS6651, MPS6652 (PNP)



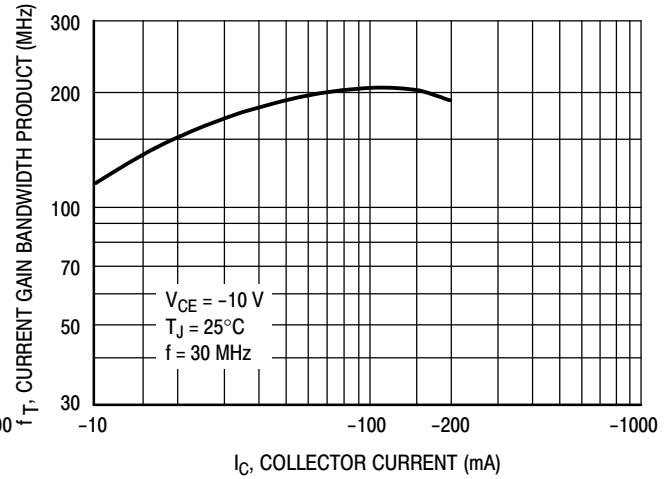
**Figure 3. MPS6601/6602 DC Current Gain**



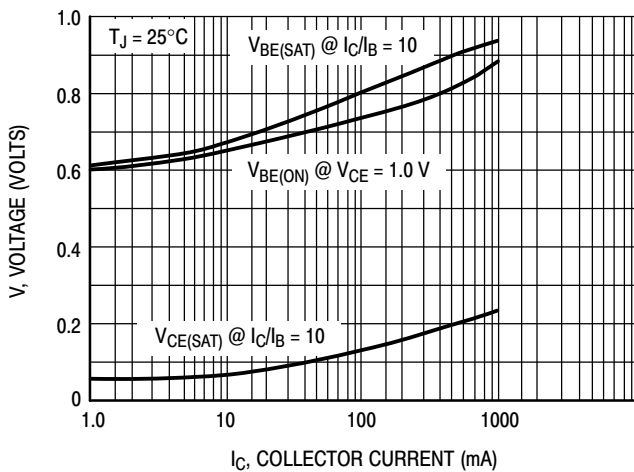
**Figure 4. MPS6651/6652 DC Current Gain**



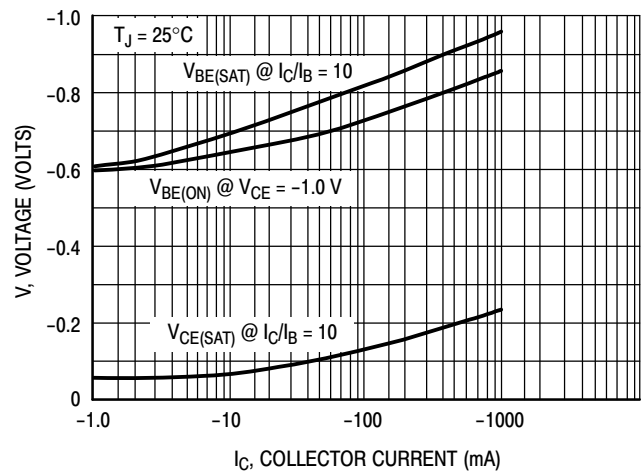
**Figure 5. Current Gain Bandwidth Product**



**Figure 6. Current Gain Bandwidth Product**

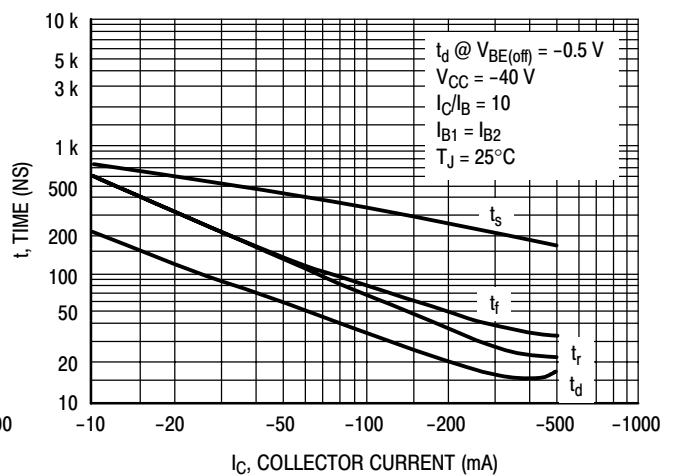
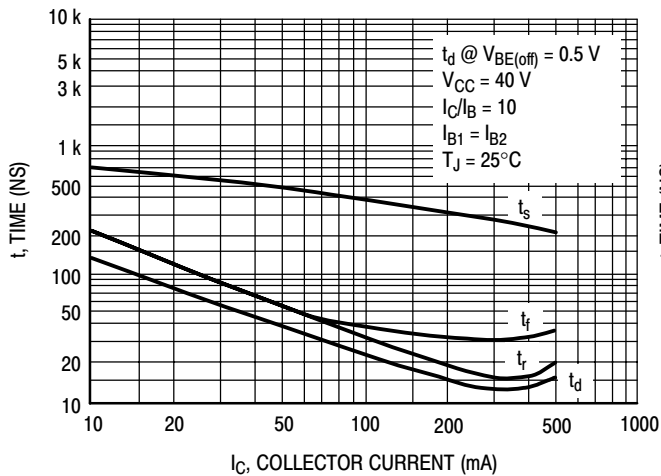
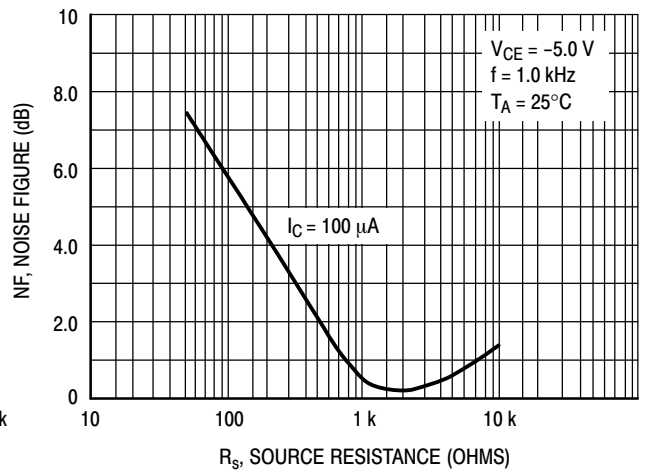
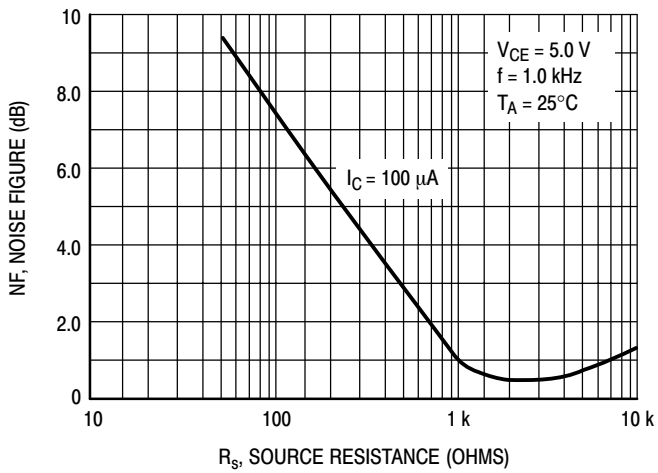
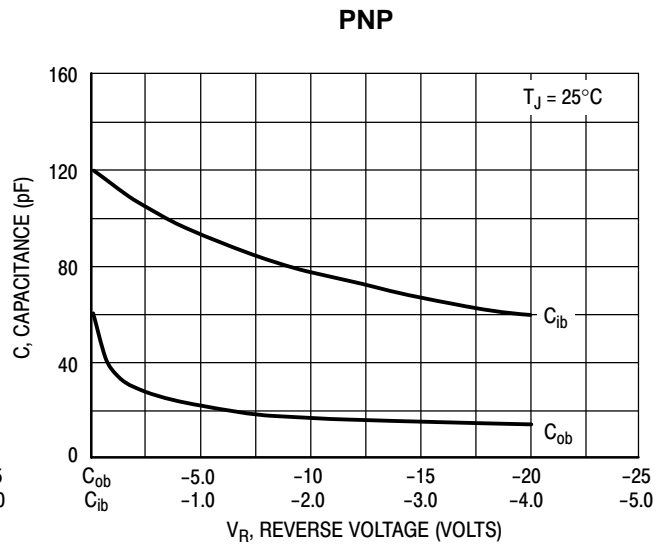
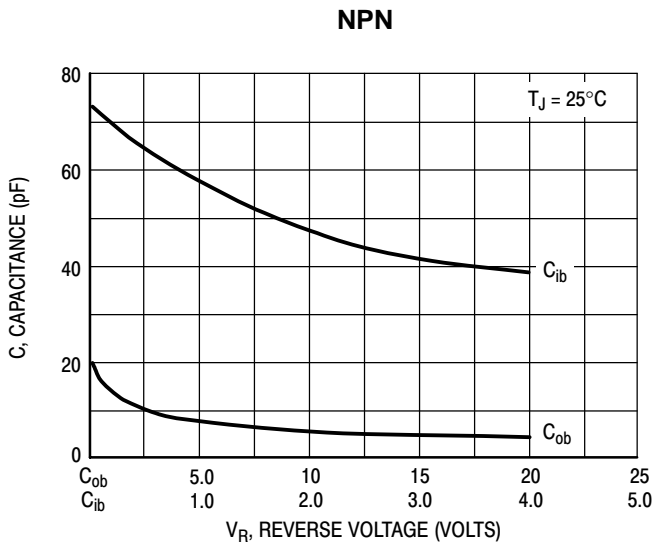


**Figure 7. On Voltages**

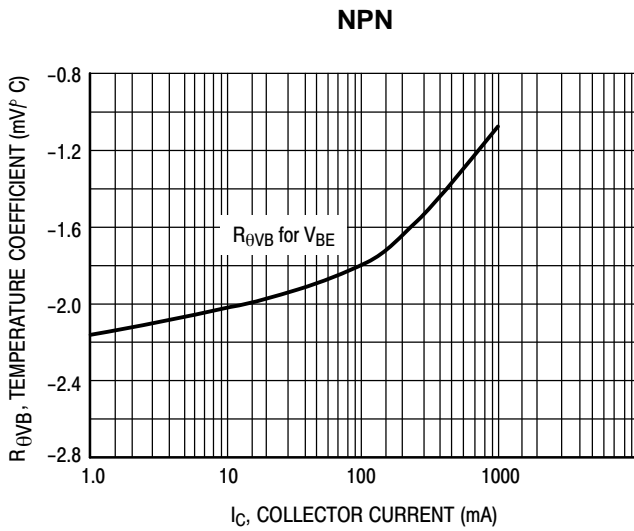


**Figure 8. On Voltages**

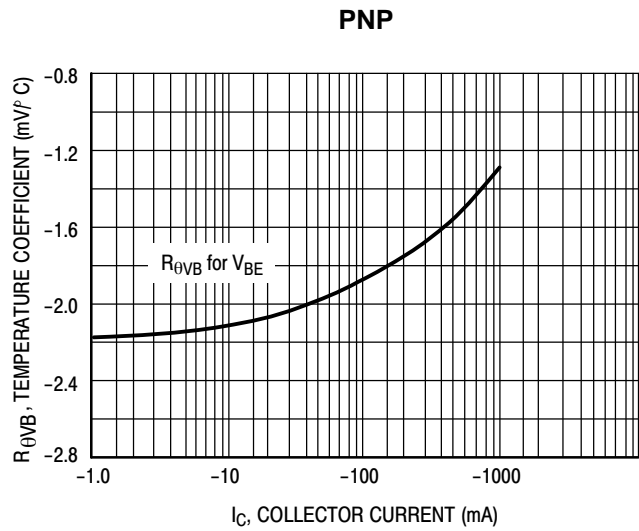
# MPS6601, MPS6602 (NPN) MPS6651, MPS6652 (PNP)



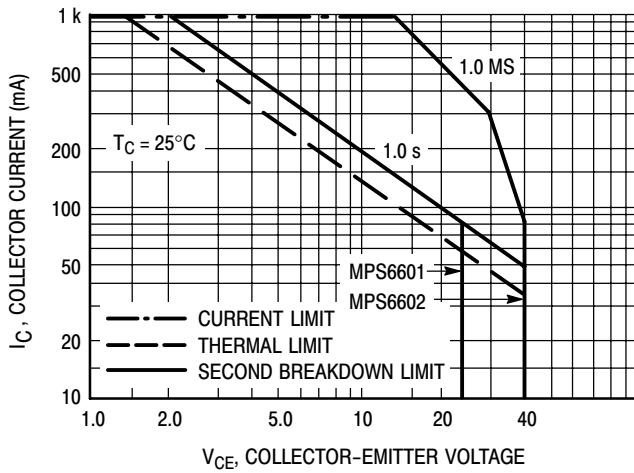
MPS6601, MPS6602 (NPN) MPS6651, MPS6652 (PNP)



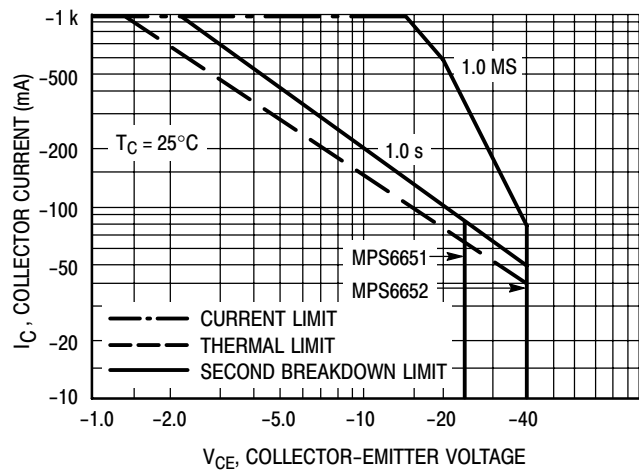
**Figure 15. Base-Emitter Temperature Coefficient**



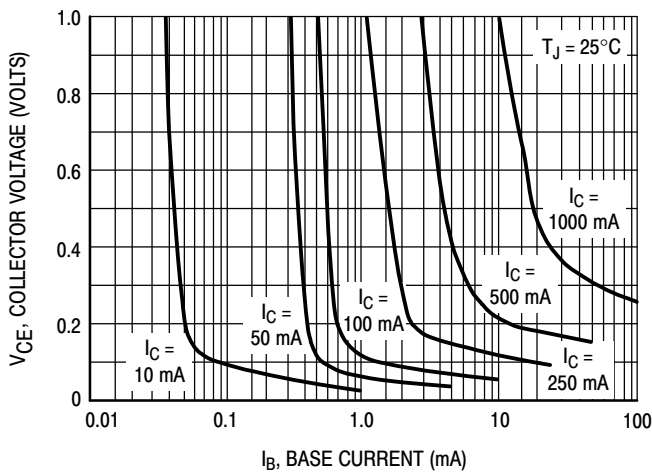
**Figure 16. Base-Emitter Temperature Coefficient**



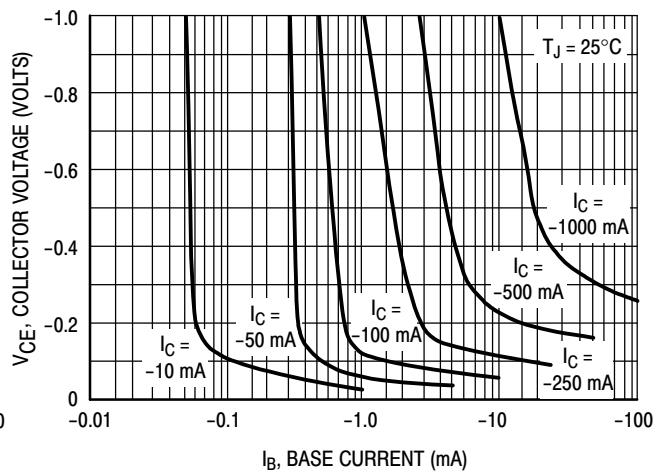
**Figure 17. Safe Operating Area**



**Figure 18. Safe Operating Area**



**Figure 19. MPS6601/6602 Saturation Region**



**Figure 20. MPS6651/6652 Saturation Region**

## MPS6601, MPS6602 (NPN) MPS6651, MPS6652 (PNP)

### ORDERING INFORMATION

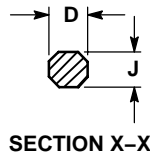
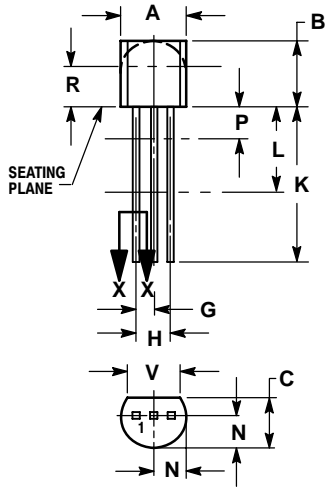
Device	Package	Shipping†
MPS6601	TO-92 (TO-226)	5000 Units / Box
MPS6601G	TO-92 (TO-226) (Pb-Free)	
MPS6601RLRA	TO-92 (TO-226)	2000 Units / Tape & Reel
MPS6601RLRAG	TO-92 (TO-226) (Pb-Free)	
MPS6602	TO-92 (TO-226)	5000 Units / Box
MPS6602G	TO-92 (TO-226) (Pb-Free)	
MPS6602RLRA	TO-92 (TO-226)	2000 Units / Tape & Reel
MPS6602RLRAG	TO-92 (TO-226) (Pb-Free)	
MPS6651	TO-92 (TO-226)	5000 Units / Box
MPS6651G	TO-92 (TO-226) (Pb-Free)	
MPS6652	TO-92 (TO-226)	5000 Units / Box
MPS6652G	TO-92 (TO-226) (Pb-Free)	
MPS6652RLRA	TO-92 (TO-226)	2000 Units / Tape & Reel
MPS6652RLRAG	TO-92 (TO-226) (Pb-Free)	
MPS6652RLRP	TO-92 (TO-226)	2000 Units / Tape & Ammo Box
MPS6652RLRPG	TO-92 (TO-226) (Pb-Free)	

†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.

# MPS6601, MPS6602 (NPN) MPS6651, MPS6652 (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
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	---

### STYLE 1:

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

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