



**THE DATASHEET OF  
MPS8098RLRA**



# (NPN) MPS8098, MPS8099\*, (PNP) MPS8598, MPS8599\*

\*Preferred Devices

## Amplifier Transistors

Voltage and Current are Negative  
for PNP Transistors

### Features

- Pb-Free Packages are Available\*

### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage MPS8098, MPS8598 MPS8099, MPS8599	$V_{CEO}$	60 80	Vdc
Collector-Base Voltage MPS8098, MPS8598 MPS8099, MPS8599	$V_{CBO}$	60 80	Vdc
Emitter-Base Voltage	$V_{EBO}$	4.0	Vdc
Collector Current - Continuous	$I_C$	500	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625 5.0	mW 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	$^\circ\text{C}/\text{W}$

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.

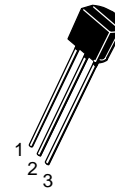
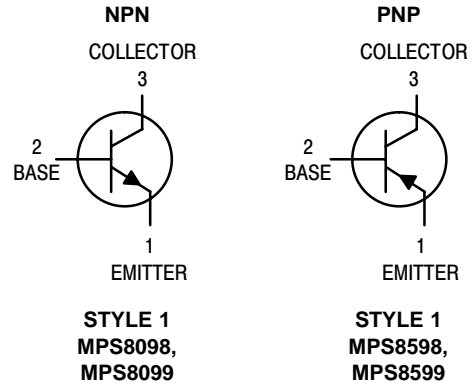
- $R_{\theta JA}$  is measured with the device soldered into a typical printed circuit board.

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



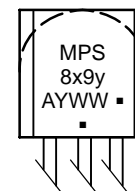
ON Semiconductor®

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**TO-92**  
**CASE 29-11**  
**STYLE 1**

### MARKING DIAGRAM



MPS8x9y = Device Code  
x = 0 or 5  
y = 8 or 9

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 6 of this data sheet.

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

# (NPN) MPS8098, MPS8099\*, (PNP) MPS8598, MPS8599\*

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

Characteristic	Symbol	Min	Max	Unit	
<b>OFF CHARACTERISTICS</b>					
Collector-Emitter Breakdown Voltage (Note 2) (I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 0)	MPS8098, MPS8598 MPS8099, MPS8599	V <sub>(BR)CEO</sub>	60 80	– –	V <sub>dc</sub>
Collector-Base Breakdown Voltage (I <sub>C</sub> = 100 μA <sub>dc</sub> , I <sub>E</sub> = 0)	MPS8098, MPS8598 MPS8099, MPS8599	V <sub>(BR)CBO</sub>	60 80	– –	V <sub>dc</sub>
Emitter-Base Breakdown Voltage (I <sub>E</sub> = 10 μA <sub>dc</sub> , I <sub>C</sub> = 0)	MPS8098, MPS8099 MPS8598, MPS8599	V <sub>(BR)EBO</sub>	6.0 5.0	– –	V <sub>dc</sub>
Collector Cutoff Current (V <sub>CE</sub> = 60 V <sub>dc</sub> , I <sub>B</sub> = 0)		I <sub>CES</sub>	–	0.1	μA <sub>dc</sub>
Collector Cutoff Current (V <sub>CB</sub> = 60 V <sub>dc</sub> , I <sub>E</sub> = 0) (V <sub>CB</sub> = 80 V <sub>dc</sub> , I <sub>E</sub> = 0)	MPS8098, MPS8598 MPS8099, MPS8599	I <sub>CBO</sub>	– –	0.1 0.1	μA <sub>dc</sub>
Emitter Cutoff Current (V <sub>EB</sub> = 6.0 V <sub>dc</sub> , I <sub>C</sub> = 0) (V <sub>EB</sub> = 4.0 V <sub>dc</sub> , I <sub>C</sub> = 0)	MPS8098, MPS8099 MPS8598, MPS8599	I <sub>EBO</sub>	– –	0.1 0.1	μA <sub>dc</sub>

## ON CHARACTERISTICS (Note 2)

DC Current Gain (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> ) (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> ) (I <sub>C</sub> = 100 mA <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> )		h <sub>FE</sub>	100 100 75	300 – –	–
Collector-Emitter Saturation Voltage (I <sub>C</sub> = 100 mA <sub>dc</sub> , I <sub>B</sub> = 5.0 mA <sub>dc</sub> ) (I <sub>C</sub> = 100 mA <sub>dc</sub> , I <sub>B</sub> = 10 mA <sub>dc</sub> )		V <sub>CE(sat)</sub>	– –	0.4 0.3	V <sub>dc</sub>
Base-Emitter On Voltage (I <sub>C</sub> = 1.0 mA <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> ) (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> )	MPS8098, MPS8598 MPS8099, MPS8599	V <sub>BE(on)</sub>	0.5 0.6	0.7 0.8	V <sub>dc</sub>

## SMALL-SIGNAL CHARACTERISTICS

Current-Gain-Bandwidth Product (I <sub>C</sub> = 10 mA <sub>dc</sub> , V <sub>CE</sub> = 5.0 V <sub>dc</sub> , f = 100 MHz)		f <sub>T</sub>	150	–	MHz
Output Capacitance (V <sub>CB</sub> = 5.0 V <sub>dc</sub> , I <sub>E</sub> = 0, f = 1.0 MHz)	MPS8098, MPS8099 MPS8598, MPS8599	C <sub>obo</sub>	– –	6.0 8.0	pF
Input Capacitance (V <sub>EB</sub> = 0.5 V <sub>dc</sub> , I <sub>C</sub> = 0, f = 1.0 MHz)	MPS8098, MPS8099 MPS8598, MPS8599	C <sub>ibo</sub>	– –	25 30	pF

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

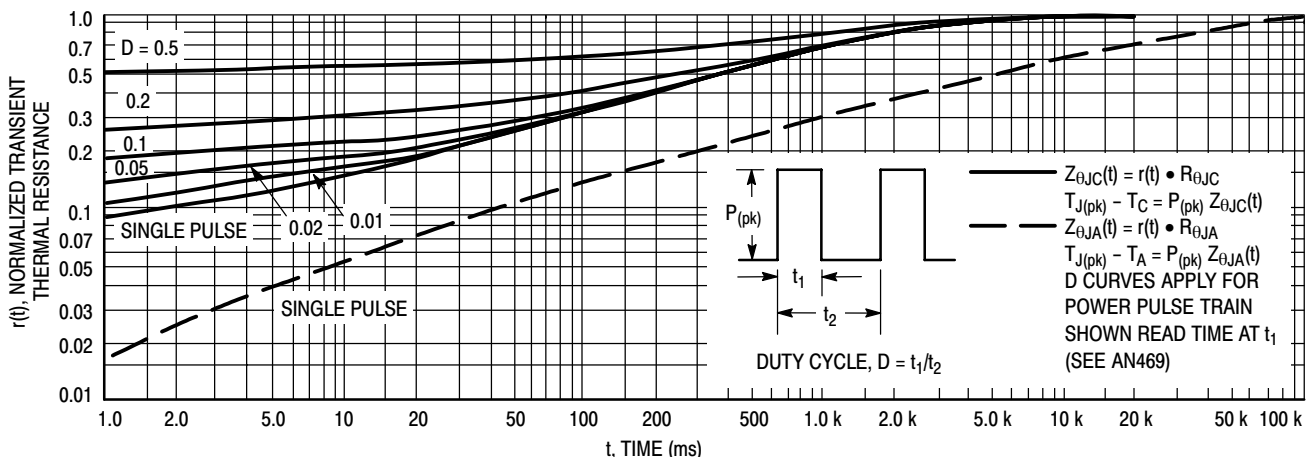
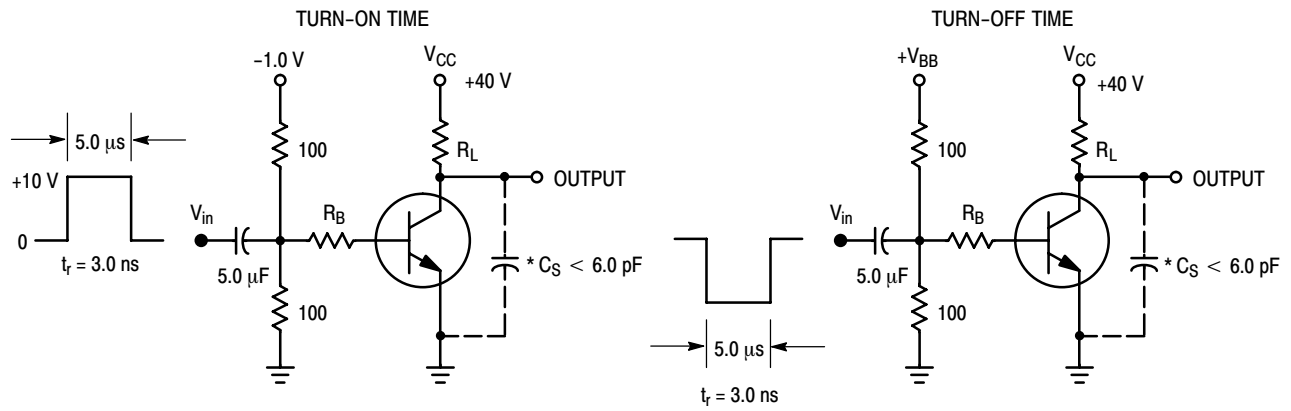


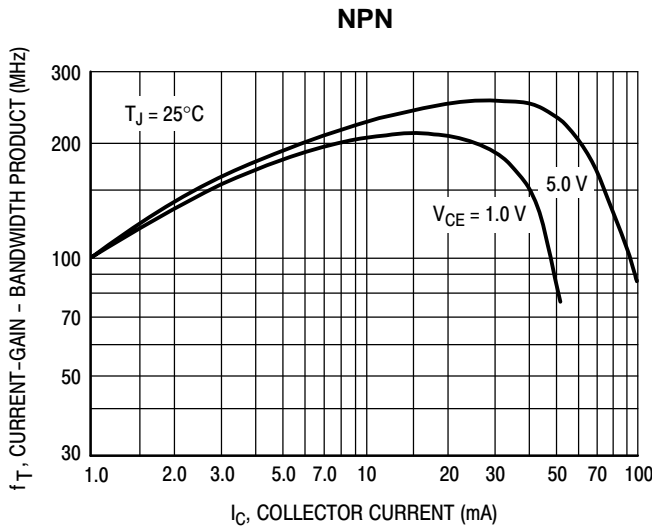
Figure 1. MPS8098, MPS8099, MPS8598 and MPS8599 Thermal Response

**(NPN) MPS8098, MPS8099\*, (PNP) MPS8598, MPS8599\***

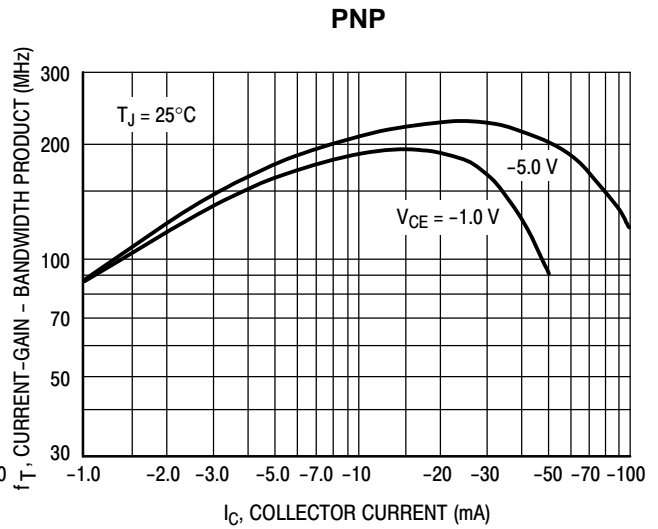


\*Total Shunt Capacitance of Test Jig and Connectors For PNP Test Circuits, Reverse All Voltage Polarities

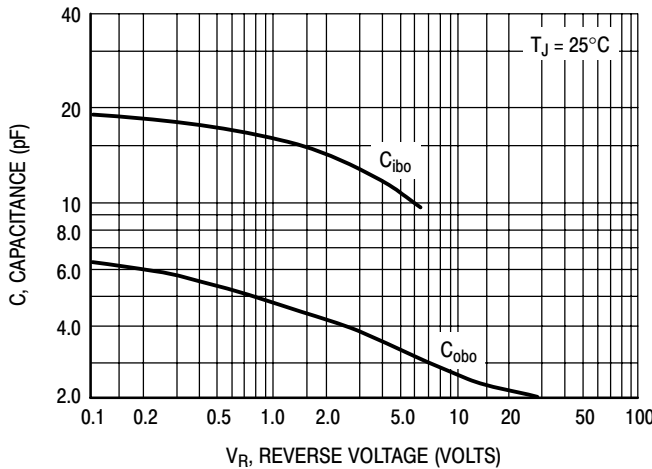
**Figure 2. Switching Time Test Circuits**



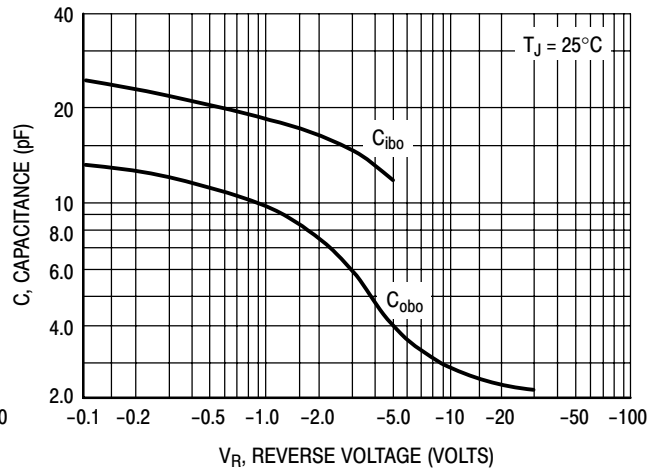
**Figure 3. MPS8098/99 Current-Gain - Bandwidth Product**



**Figure 4. MPS8598/99 Current-Gain - Bandwidth Product**



**Figure 5. MPS8098/99 Capacitance**



**Figure 6. MPS8598/99 Capacitance**

(NPN) MPS8098, MPS8099\*, (PNP) MPS8598, MPS8599\*

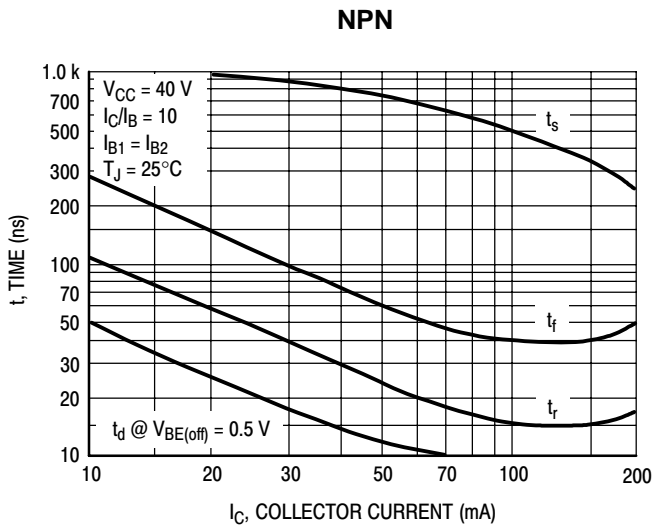


Figure 7. MPS8098/99 Switching Times

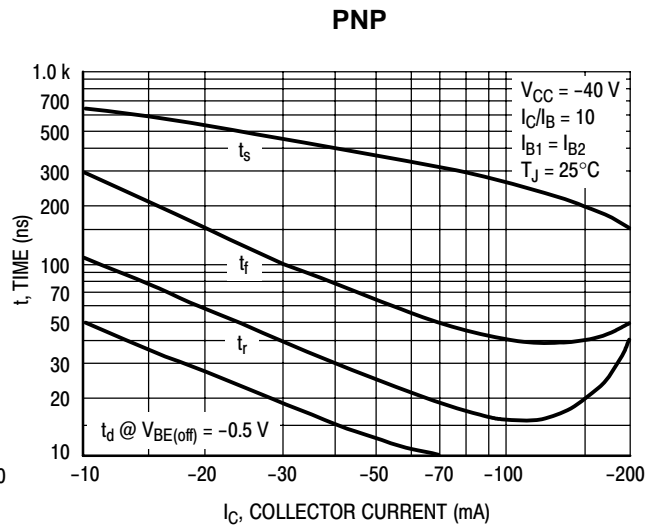


Figure 8. MPS8598/99 Switching Times

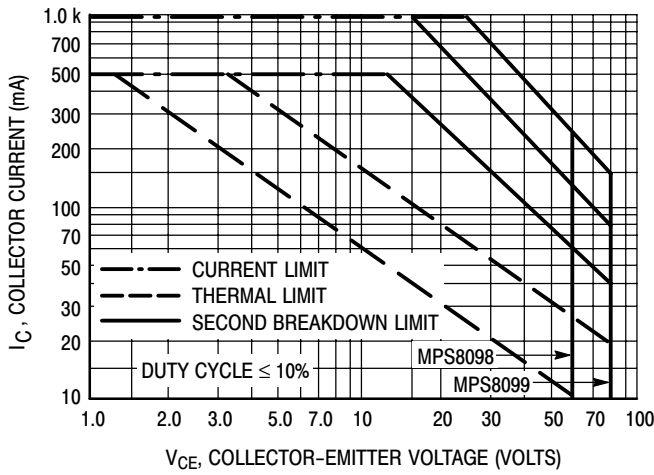


Figure 9. MPS8098/99 Active-Region Safe Operating Area

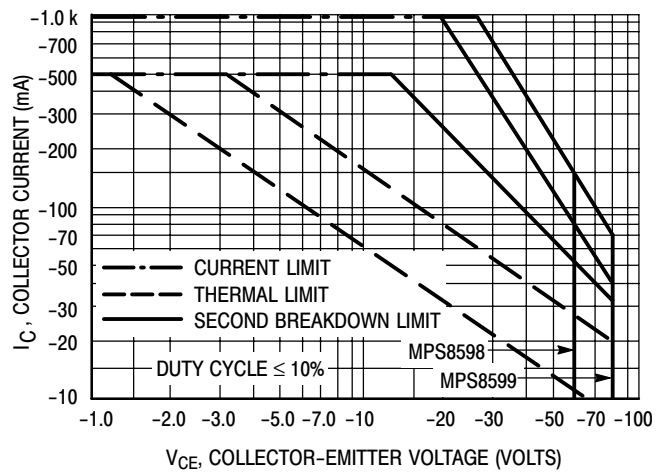


Figure 10. MPS8598/99 Active-Region Safe Operating Area

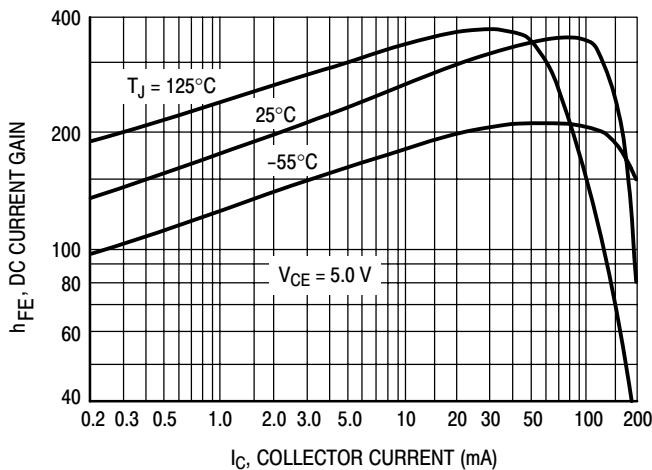


Figure 11. MPS8098/99 DC Current Gain

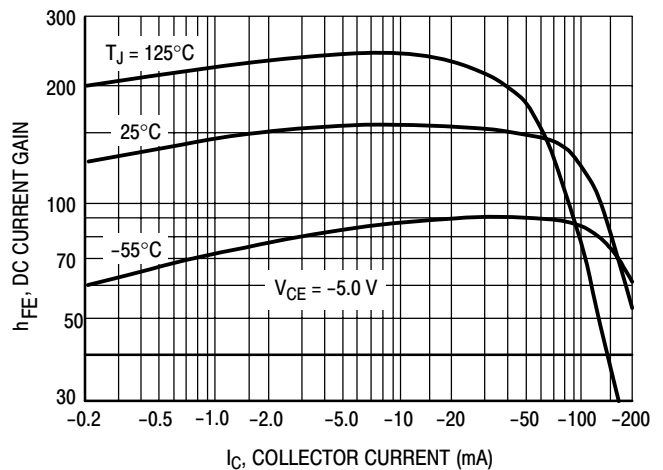


Figure 12. MPS8598/99 DC Current Gain

(NPN) MPS8098, MPS8099\*, (PNP) MPS8598, MPS8599\*

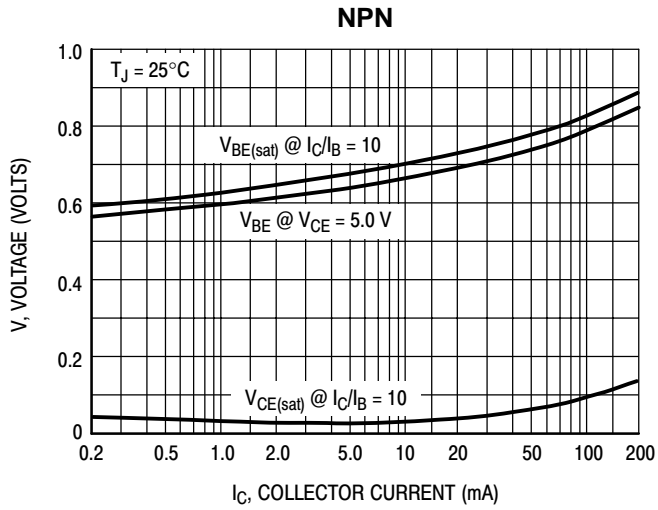


Figure 13. MPS8098/99 "ON" Voltages

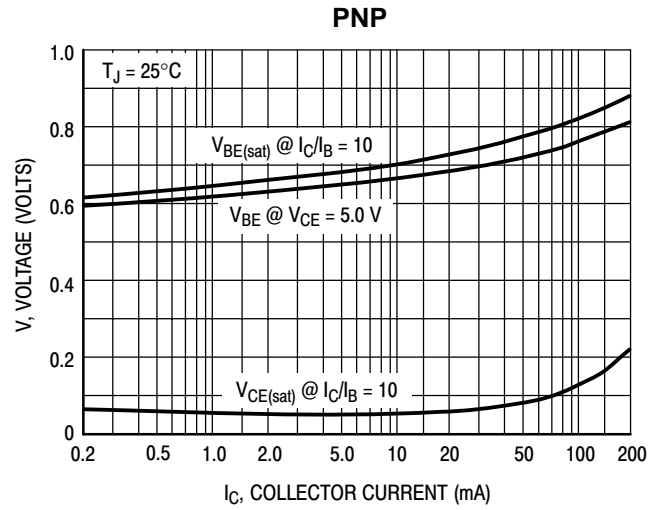


Figure 14. MPS8598/99 "ON" Voltages

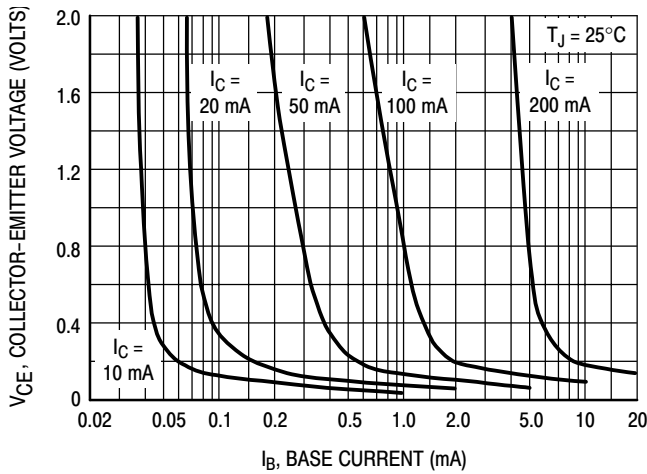


Figure 15. MPS8098/99 Collector Saturation Region

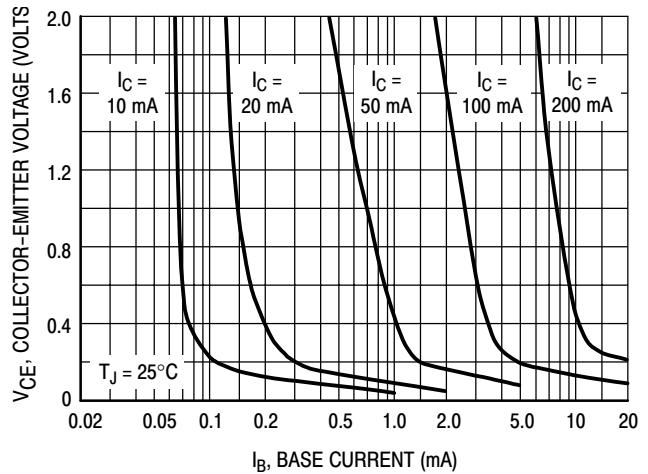


Figure 16. MPS8598/99 Collector Saturation Region

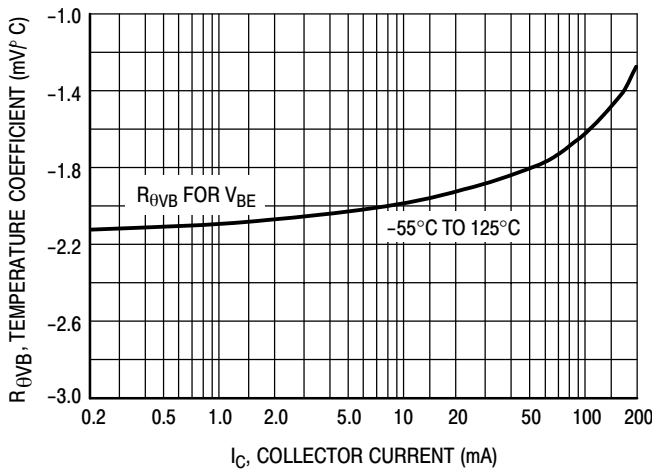


Figure 17. MPS8098/99 Base-Emitter Temperature Coefficient

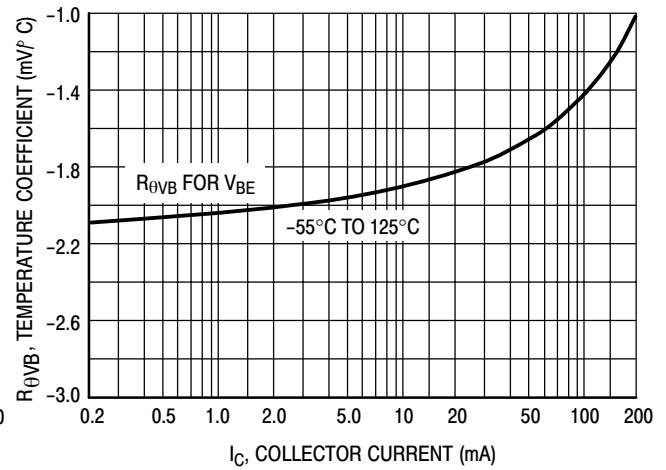


Figure 18. MPS8598/99 Base-Emitter Temperature Coefficient

**(NPN) MPS8098, MPS8099\*, (PNP) MPS8598, MPS8599\*****ORDERING INFORMATION**

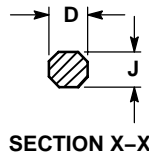
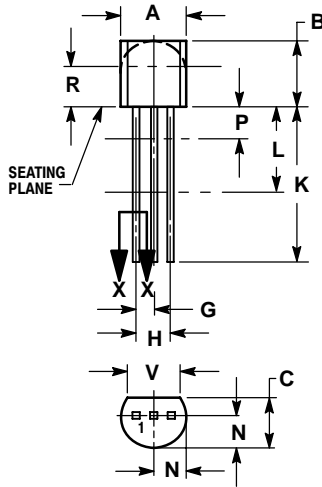
<b>Device</b>	<b>Package</b>	<b>Shipping†</b>
MPS8098	TO-92	5,000 Units / Box
MPS8098G	TO-92 (Pb-Free)	5,000 Units / Box
MPS8098RLRA	TO-92	2,000 / Tape & Reel
MPS8098RLRAG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPS8099	TO-92	5,000 Units / Box
MPS8099G	TO-92 (Pb-Free)	5,000 Units / Box
MPS8099RLRA	TO-92	2,000 / Tape & Reel
MPS8099RLRAG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPS8099RLRM	TO-92	2,000 / Ammo Pack
MPS8099RLRMG	TO-92 (Pb-Free)	2,000 / Ammo Pack
MPS8099RLRP	TO-92	2,000 / Ammo Pack
MPS8099RLRPG	TO-92 (Pb-Free)	2,000 / Ammo Pack
MPS8598	TO-92	5,000 Units / Box
MPS8598G	TO-92 (Pb-Free)	5,000 Units / Box
MPS8598RLRA	TO-92	2,000 / Tape & Reel
MPS8598RLRAG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPS8599	TO-92	5,000 Units / Box
MPS8599G	TO-92 (Pb-Free)	5,000 Units / Box
MPS8599RLRA	TO-92	2,000 / Tape & Reel
MPS8599RLRAG	TO-92 (Pb-Free)	2,000 / Tape & Reel
MPS8599RLRM	TO-92	2,000 / Ammo Pack
MPS8599RLRMG	TO-92 (Pb-Free)	2,000 / Ammo Pack

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specification Brochure, BRD8011/D.

# (NPN) MPS8098, MPS8099\*, (PNP) MPS8598, MPS8599\*

## 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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