

# NPN - MPS8099; PNP - MPS8599

Preferred Device

## 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                                                            | $V_{CEO}$      | 80          | Vdc                        |
| Collector - Base Voltage                                                               | $V_{CBO}$      | 80          | Vdc                        |
| Emitter - Base Voltage                                                                 | $V_{EBO}$      | 5.0         | Vdc                        |
| Collector Current - Continuous                                                         | $I_C$          | 500         | mAdc                       |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 625<br>5.0  | mW<br>mW/ $^\circ\text{C}$ |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$          | 1.5<br>12   | W<br>mW/ $^\circ\text{C}$  |
| Operating and Storage Junction Temperature Range                                       | $T_J, T_{stg}$ | -55 to +150 | $^\circ\text{C}$           |

### THERMAL CHARACTERISTICS

| Characteristic                                      | Symbol          | Max  | Unit               |
|-----------------------------------------------------|-----------------|------|--------------------|
| Thermal Resistance, Junction-to-Ambient<br>(Note 1) | $R_{\theta JA}$ | 200  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction-to-Case                | $R_{\theta JC}$ | 83.3 | $^\circ\text{C/W}$ |

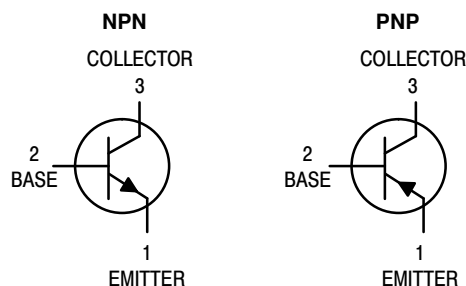
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

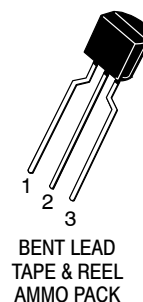
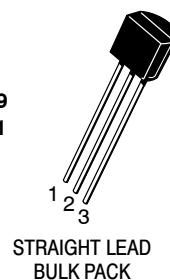


ON Semiconductor®

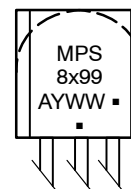
<http://onsemi.com>



TO-92  
CASE 29  
STYLE 1



### MARKING DIAGRAM



x = 0 or 5  
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 3 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.

# NPN – MPS8099; PNP – MPS8599

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

| Characteristic | Symbol | Min | Max | Unit |
|----------------|--------|-----|-----|------|
|----------------|--------|-----|-----|------|

### OFF CHARACTERISTICS

|                                                                                                               |                      |     |     |                  |
|---------------------------------------------------------------------------------------------------------------|----------------------|-----|-----|------------------|
| Collector – Emitter Breakdown Voltage (Note 2)<br>(I <sub>C</sub> = 10 mA <sub>dc</sub> , I <sub>B</sub> = 0) | V <sub>(BR)CEO</sub> | 80  | –   | V <sub>dc</sub>  |
| Collector – Base Breakdown Voltage<br>(I <sub>C</sub> = 100 μA <sub>dc</sub> , I <sub>E</sub> = 0)            | V <sub>(BR)CBO</sub> | 80  | –   | V <sub>dc</sub>  |
| Emitter – Base Breakdown Voltage<br>(I <sub>E</sub> = 10 μA <sub>dc</sub> , I <sub>C</sub> = 0)               | V <sub>(BR)EBO</sub> | 5.0 | –   | V <sub>dc</sub>  |
| Collector Cutoff Current<br>(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<br>(V <sub>CB</sub> = 80 V <sub>dc</sub> , I <sub>E</sub> = 0)                       | I <sub>CBO</sub>     | –   | 0.1 | μA <sub>dc</sub> |
| Emitter Cutoff Current<br>(V <sub>EB</sub> = 4.0 V <sub>dc</sub> , I <sub>C</sub> = 0)                        | I <sub>EBO</sub>     | –   | 0.1 | μA <sub>dc</sub> |

### ON CHARACTERISTICS (Note 2)

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

### SMALL–SIGNAL CHARACTERISTICS

|                                                                                                                                    |                  |     |     |     |
|------------------------------------------------------------------------------------------------------------------------------------|------------------|-----|-----|-----|
| Current – Gain – Bandwidth Product<br>(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<br>(V <sub>CB</sub> = 5.0 V <sub>dc</sub> , I <sub>E</sub> = 0, f = 1.0 MHz)                                    | C <sub>obo</sub> | –   | 8.0 | pF  |
| Input Capacitance<br>(V <sub>EB</sub> = 0.5 V <sub>dc</sub> , I <sub>C</sub> = 0, f = 1.0 MHz)                                     | C <sub>ibo</sub> | –   | 30  | pF  |

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

# NPN – MPS8099; PNP – MPS8599

## ORDERING INFORMATION

| Device       | Package            | Shipping†          |
|--------------|--------------------|--------------------|
| MPS8099G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk  |
| MPS8099RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| MPS8099RLRP  | TO-92              | 2000 / Ammo Pack   |
| MPS8099RLRPG | TO-92<br>(Pb-Free) | 2000 / Ammo Pack   |
| MPS8599RLRAG | TO-92<br>(Pb-Free) | 2000 / Tape & Reel |
| MPS8599RLRMG | TO-92<br>(Pb-Free) | 2000 / 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.

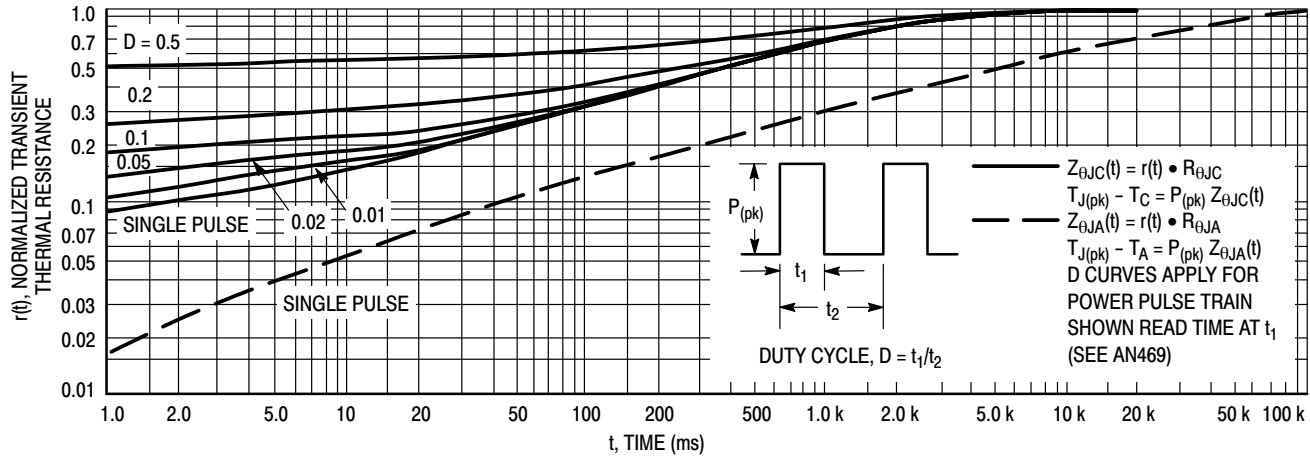
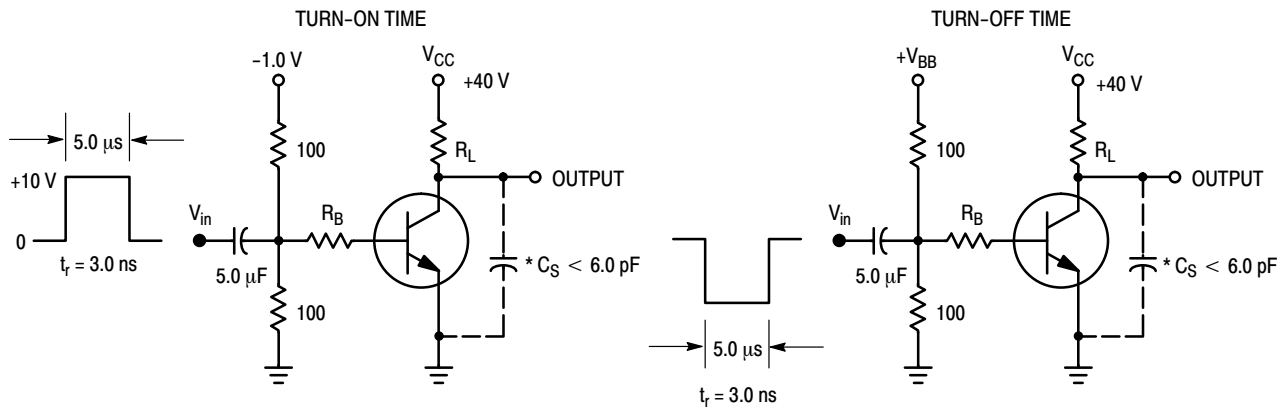


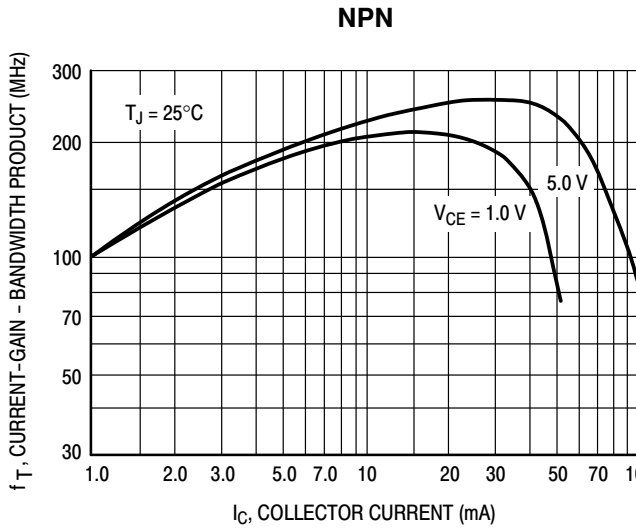
Figure 1. Thermal Response



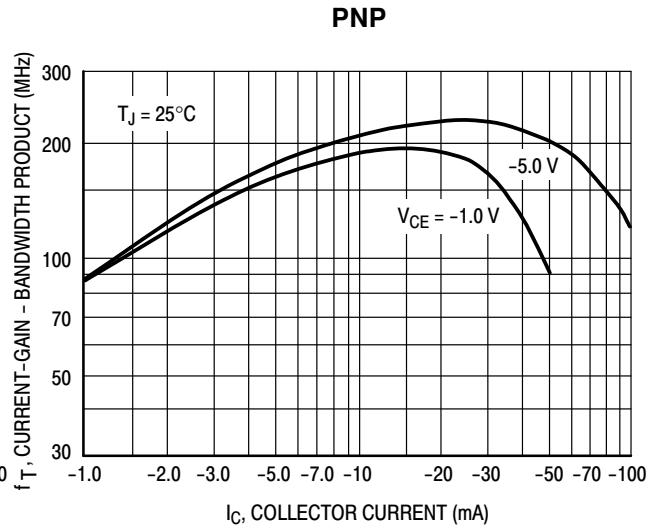
\*Total Shunt Capacitance of Test Jig and Connectors For PNP Test Circuits, Reverse All Voltage Polarities

Figure 2. Switching Time Test Circuits

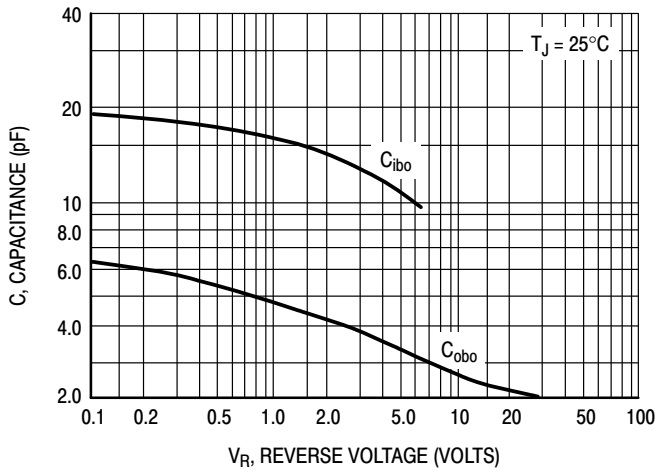
# NPN – MPS8099; PNP – MPS8599



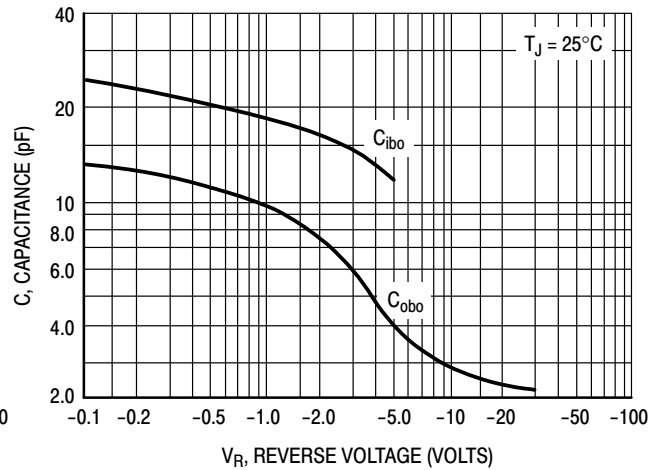
**Figure 3. Current-Gain – Bandwidth Product**



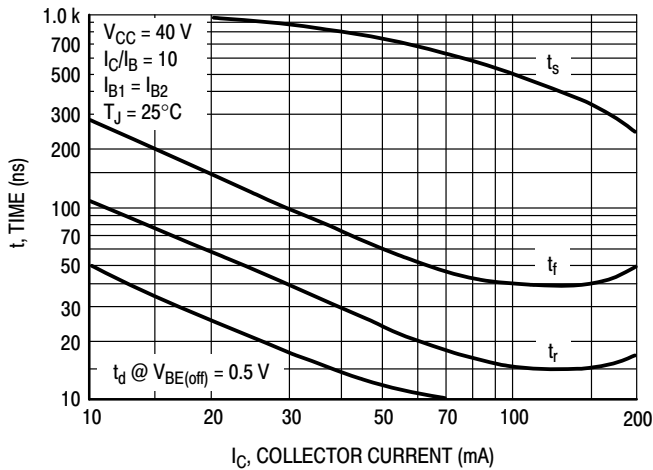
**Figure 4. Current-Gain – Bandwidth Product**



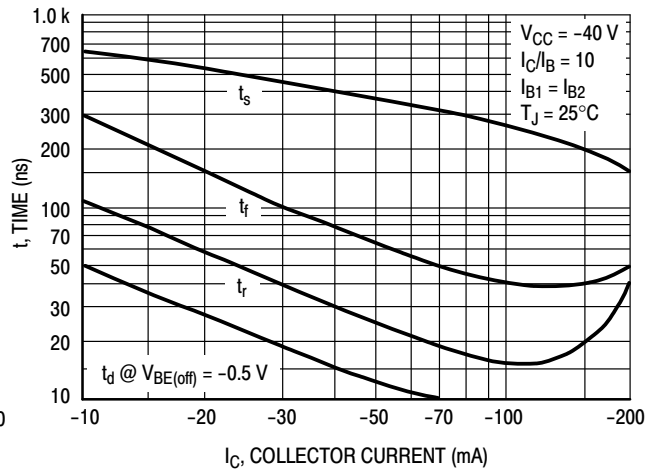
**Figure 5. Capacitance**



**Figure 6. Capacitance**



**Figure 7. Switching Times**



**Figure 8. Switching Times**

# NPN – MPS8099; PNP – MPS8599

## NPN

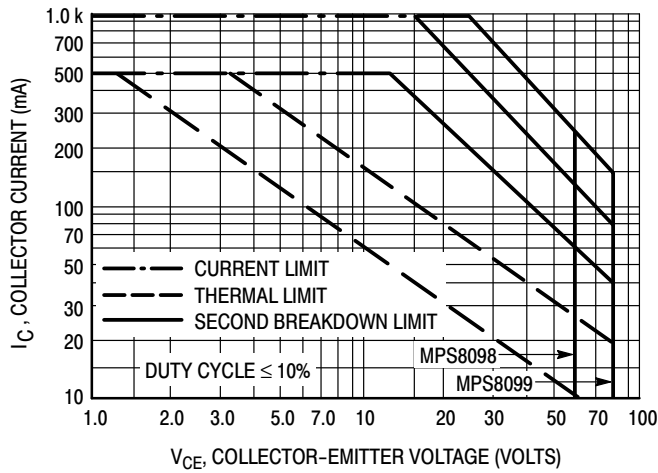


Figure 9. Active-Region Safe Operating Area

## PNP

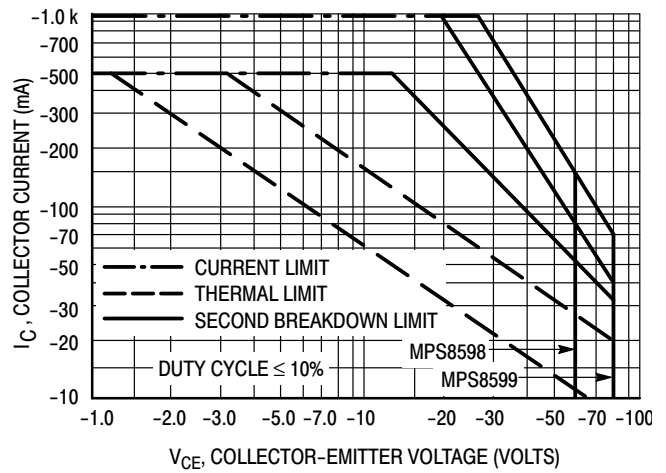


Figure 10. Active-Region Safe Operating Area

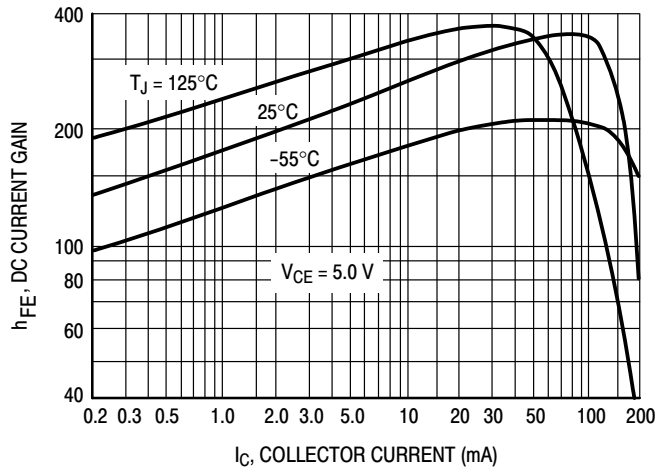


Figure 11. DC Current Gain

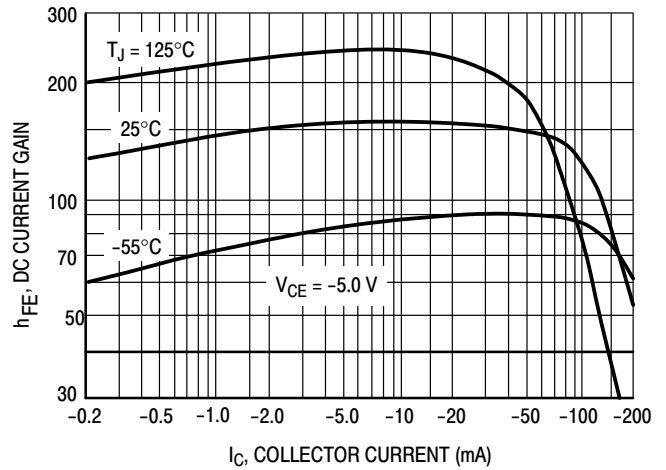


Figure 12. DC Current Gain

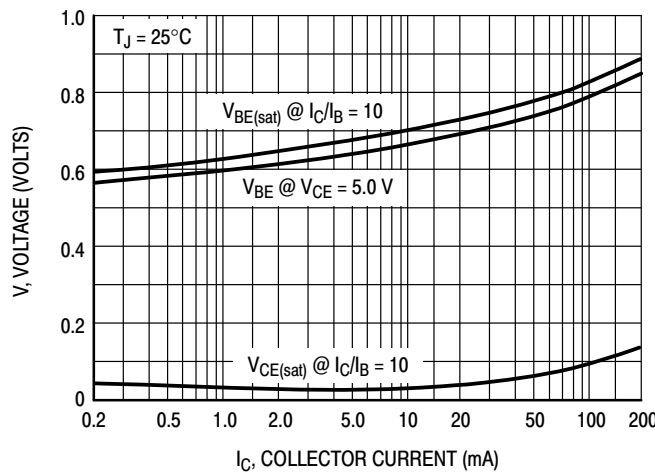


Figure 13. "ON" Voltages

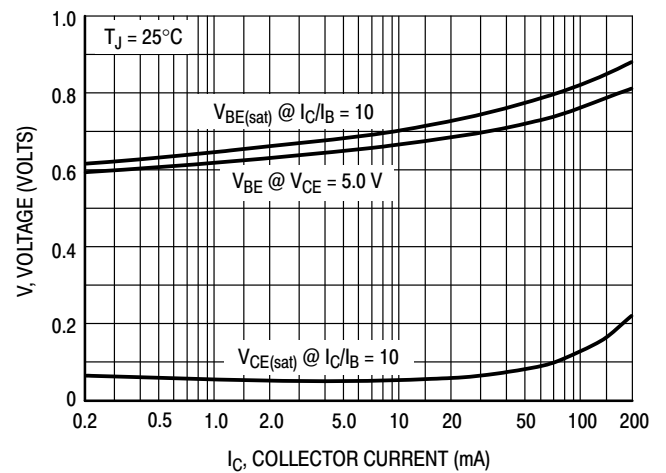


Figure 14. "ON" Voltages

# NPN – MPS8099; PNP – MPS8599

## NPN

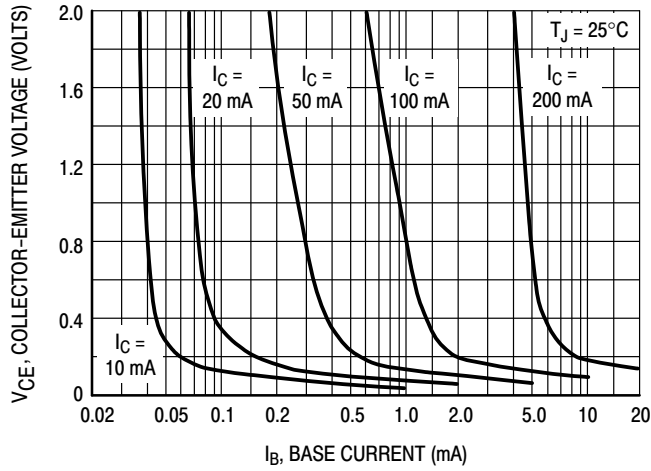


Figure 15. Collector Saturation Region

## PNP

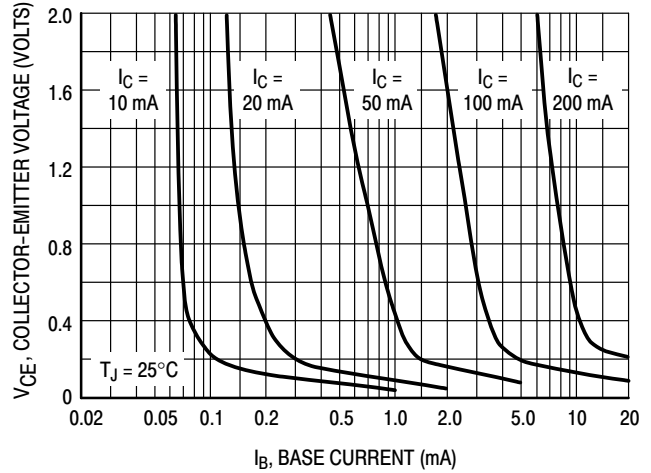


Figure 16. Collector Saturation Region

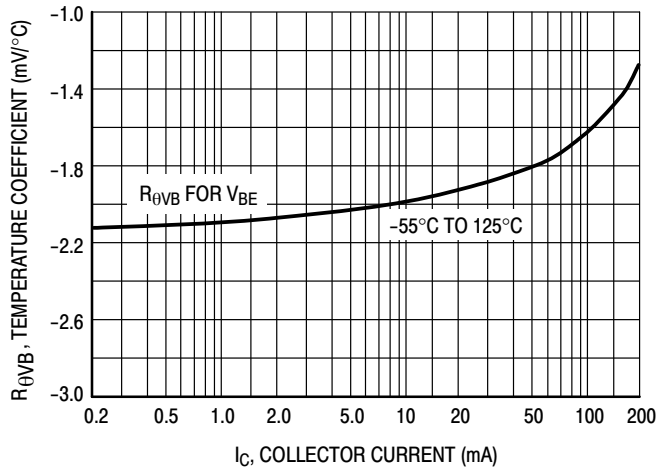


Figure 17. Base-Emitter Temperature Coefficient

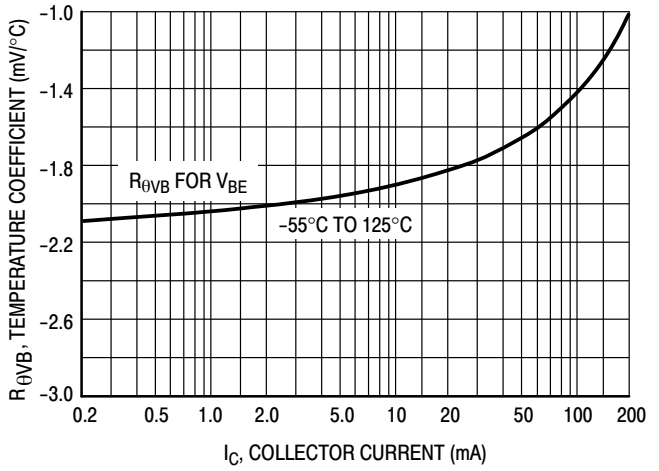
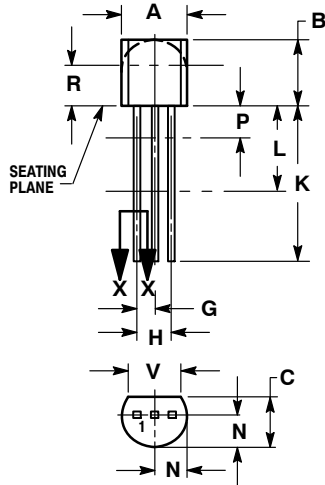


Figure 18. Base-Emitter Temperature Coefficient

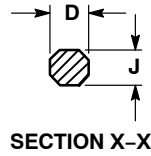
# NPN – MPS8099; PNP – MPS8599

## PACKAGE DIMENSIONS

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



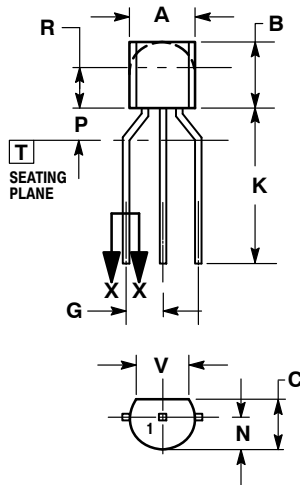
STRAIGHT LEAD  
BULK PACK



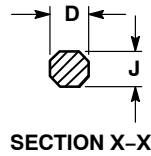
### NOTES:

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



### 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

ON Semiconductor and  are registered trademarks of Semiconductor Components Industries, LLC (SCILLC). SCILLC reserves the right to make changes without further notice to any products herein. SCILLC makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does SCILLC assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation special, consequential or incidental damages. "Typical" parameters which may be provided in SCILLC data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals" must be validated for each customer application by customer's technical experts. SCILLC does not convey any license under its patent rights nor the rights of others. SCILLC products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the SCILLC product could create a situation where personal injury or death may occur. Should Buyer purchase or use SCILLC products for any such unintended or unauthorized application, Buyer shall indemnify and hold SCILLC and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that SCILLC was negligent regarding the design or manufacture of the part. SCILLC is an Equal Opportunity/Affirmative Action Employer. This literature is subject to all applicable copyright laws and is not for resale in any manner.

## PUBLICATION ORDERING INFORMATION

### LITERATURE FULFILLMENT:

Literature Distribution Center for ON Semiconductor  
P.O. Box 5163, Denver, Colorado 80217 USA  
Phone: 303-675-2175 or 800-344-3860 Toll Free USA/Canada  
Fax: 303-675-2176 or 800-344-3867 Toll Free USA/Canada  
Email: [orderlit@onsemi.com](mailto:orderlit@onsemi.com)

N. American Technical Support: 800-282-9855 Toll Free  
USA/Canada  
Europe, Middle East and Africa Technical Support:  
Phone: 421 33 790 2910  
Japan Customer Focus Center  
Phone: 81-3-5773-3850

ON Semiconductor Website: [www.onsemi.com](http://www.onsemi.com)

Order Literature: <http://www.onsemi.com/orderlit>

For additional information, please contact your local Sales Representative



Компания «ЭлектроПласт» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Оперативные поставки широкого спектра электронных компонентов отечественного и импортного производства напрямую от производителей и с крупнейших мировых складов;
- Поставка более 17-ти миллионов наименований электронных компонентов;
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- Лицензия ФСБ на осуществление работ с использованием сведений, составляющих государственную тайну;
- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Помимо этого, одним из направлений компании «ЭлектроПласт» является направление «Источники питания». Мы предлагаем Вам помощь Конструкторского отдела:

- Подбор оптимального решения, техническое обоснование при выборе компонента;
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.



#### Как с нами связаться

**Телефон:** 8 (812) 309 58 32 (многоканальный)

**Факс:** 8 (812) 320-02-42

**Электронная почта:** [org@eplast1.ru](mailto:org@eplast1.ru)

**Адрес:** 198099, г. Санкт-Петербург, ул. Калинина, дом 2, корпус 4, литера А.