

NPN - MPS6601; PNP - MPS6651, MPS6652

MPS6652 is a Preferred Device

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 MPS6652 | V_{CEO} | 25 40 | Vdc |
| Collector-Base Voltage MPS6601/6651 MPS6652 | 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°C | P_D | 625 5.0 | W mW/ $^\circ\text{C}$ |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°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.

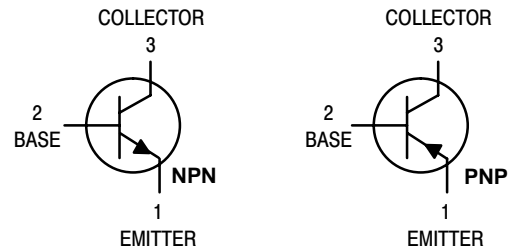
1. $R_{\theta JA}$ is measured with the device soldered into a typical printed circuit board.

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

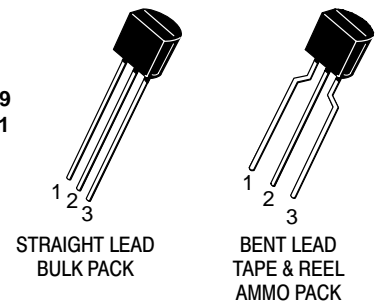


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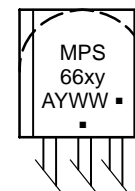
TO-92
CASE 29
STYLE 1



STRAIGHT LEAD
BULK PACK

BENT LEAD
TAPE & REEL
AMMO PACK

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 2 of this data sheet.

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

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ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

| Characteristic | | Symbol | Min | Max | Unit |
|--|-------------------------|----------------------|----------|------------|------------------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Emitter Breakdown Voltage (I _C = 1.0 mA _{dc} , I _B = 0) | MPS6601/6651 MPS6652 | V _{(BR)CEO} | 25 40 | – – | V _{dc} |
| Collector–Base Breakdown Voltage (I _C = 100 μA _{dc} , I _E = 0) | MPS6601/6651 MPS6652 | V _{(BR)CBO} | 25 40 | – – | V _{dc} |
| Emitter–Base Breakdown Voltage (I _E = 10 μA _{dc} , I _C = 0) | | V _{(BR)EBO} | 4.0 | – | V _{dc} |
| Collector Cutoff Current (V _{CE} = 25 V _{dc} , I _B = 0) (V _{CE} = 30 V _{dc} , I _B = 0) | MPS6601/6651 MPS6652 | I _{CES} | – – | 0.1 0.1 | μA _{dc} |
| Collector Cutoff Current (V _{CB} = 25 V _{dc} , I _E = 0) (V _{CB} = 30 V _{dc} , I _E = 0) | MPS6601/6651 MPS6652 | I _{CBO} | – – | 0.1 0.1 | μA _{dc} |

ON CHARACTERISTICS

| | | | | | |
|--|--|----------------------|----------------|-------------|-----------------|
| DC Current Gain (I _C = 100 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 500 mA _{dc} , V _{CE} = 1.0 V _{dc}) (I _C = 1000 mA _{dc} , V _{CE} = 1.0 V _{dc}) | | h _{FE} | 50 50 30 | – – – | – |
| Collector–Emitter Saturation Voltage (I _C = 1000 mA _{dc} , I _B = 100 mA _{dc}) | | V _{CE(sat)} | – | 0.6 | V _{dc} |
| Base–Emitter On Voltage (I _C = 500 mA _{dc} , V _{CE} = 1.0 V _{dc}) | | V _{BE(on)} | – | 1.2 | V _{dc} |

SMALL–SIGNAL CHARACTERISTICS

| | | | | | |
|---|--|------------------|-----|----|-----|
| Current–Gain — Bandwidth Product (I _C = 50 mA _{dc} , V _{CE} = 10 V _{dc} , f = 100 MHz) | | f _T | 100 | – | MHz |
| Output Capacitance (V _{CB} = 10 V _{dc} , I _E = 0, f = 1.0 MHz) | | C _{obo} | – | 30 | pF |

SWITCHING CHARACTERISTICS

| | | | | | |
|--------------|--|----------------|---|-----|----|
| Delay Time | (V _{CC} = 40 V _{dc} , I _C = 50 mA _{dc} , I _{B1} = 50 mA _{dc} , t _p ≥ 300 ns Duty Cycle) | t _d | – | 25 | ns |
| Rise Time | | t _r | – | 30 | ns |
| Storage Time | | t _s | – | 250 | ns |
| Fall Time | | t _f | – | 50 | ns |

ORDERING INFORMATION

| Device | Package | Shipping [†] |
|--------------|-----------------------------|--------------------------|
| MPS6601RLRAG | TO–92 (TO–226) (Pb–Free) | 2000 Units / Tape & Reel |
| MPS6651G | TO–92 (TO–226) (Pb–Free) | 5000 Units / Bulk |
| MPS6652 | TO–92 (TO–226) | |
| MPS6652G | TO–92 (TO–226) (Pb–Free) | |
| MPS6652RLRAG | TO–92 (TO–226) (Pb–Free) | 2000 Units / Tape & Reel |

[†]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 – MPS6601; PNP – MPS6651, MPS6652

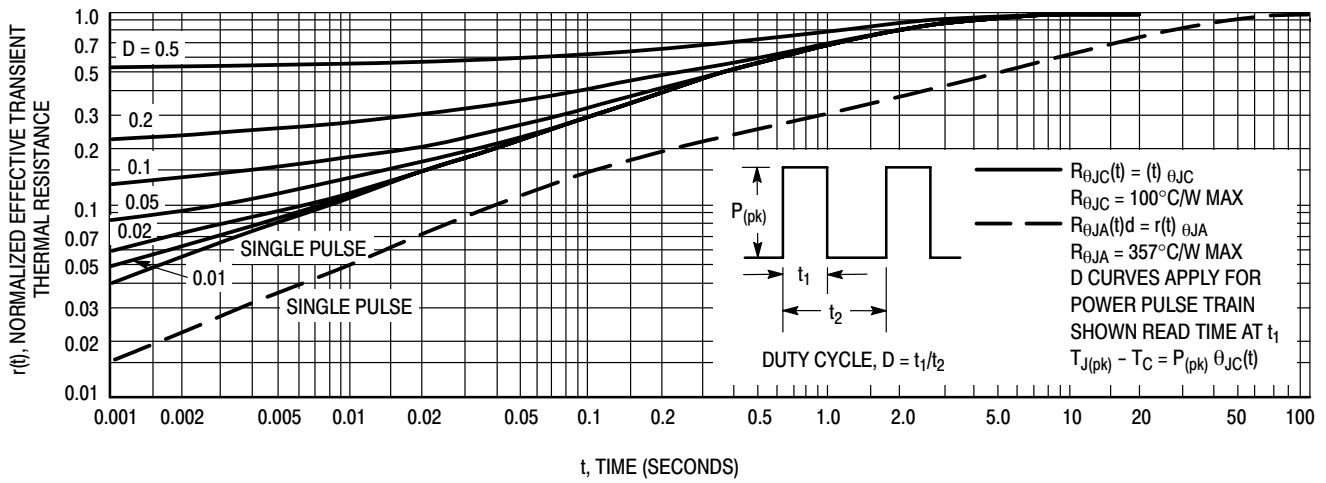
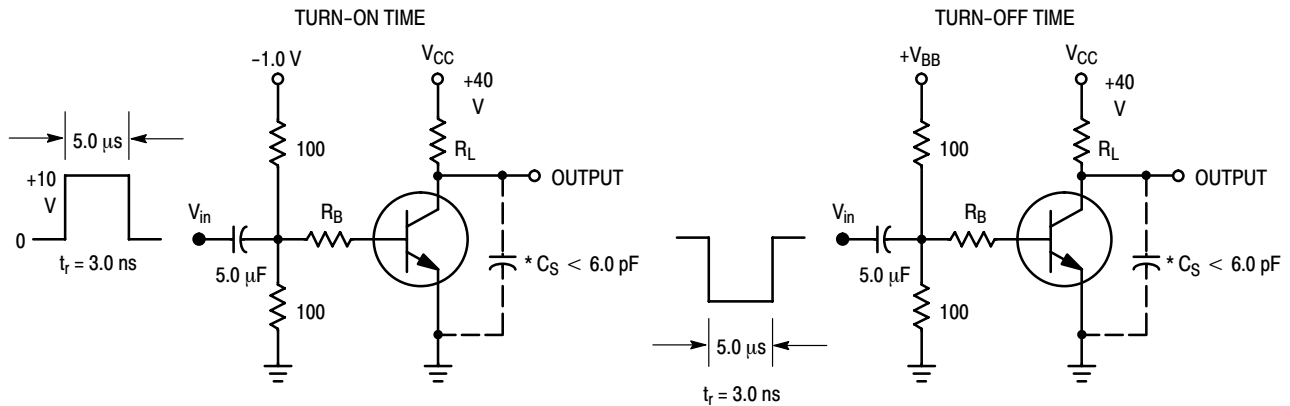


Figure 1. Thermal Response



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

Figure 2. Switching Time Test Circuits

NPN – MPS6601; PNP – MPS6651, MPS6652

NPN

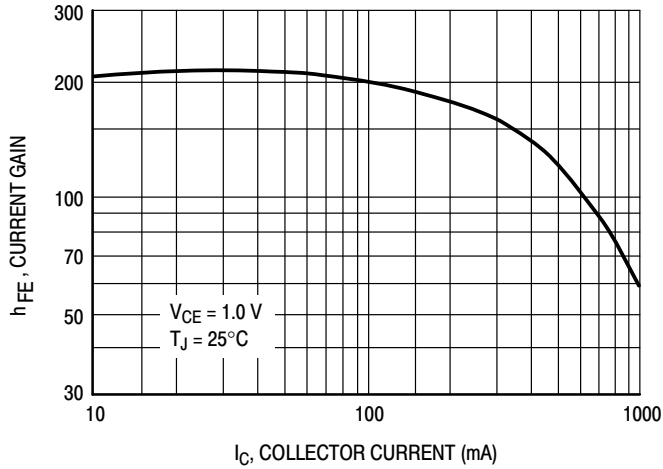


Figure 3. MPS6601/6602 DC Current Gain

PNP

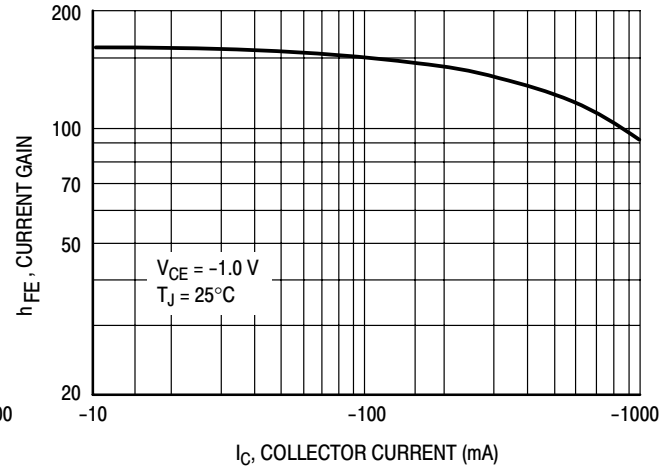


Figure 4. MPS6651/6652 DC Current Gain

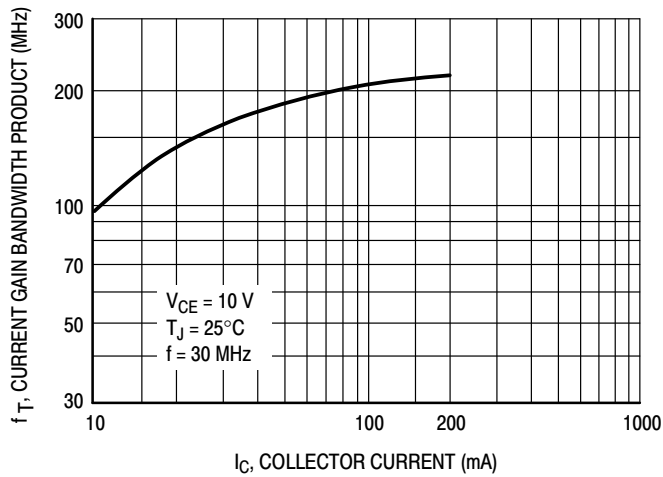


Figure 5. Current Gain Bandwidth Product

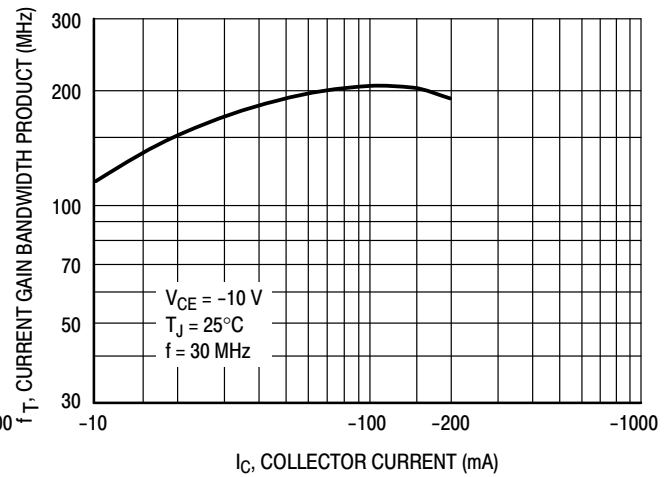


Figure 6. Current Gain Bandwidth Product

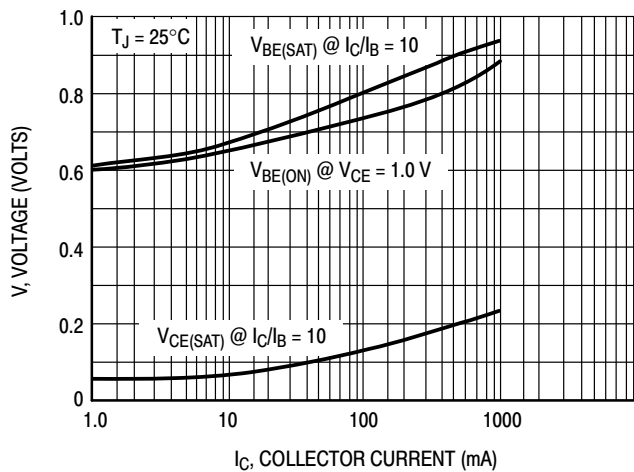


Figure 7. On Voltages

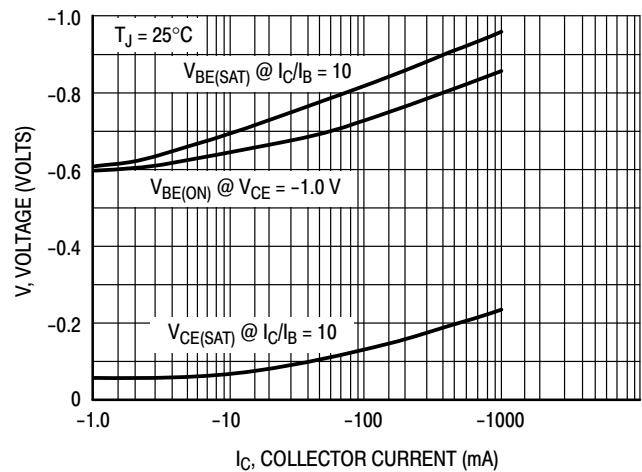


Figure 8. On Voltages

NPN – MPS6601; PNP – MPS6651, MPS6652

NPN

PNP

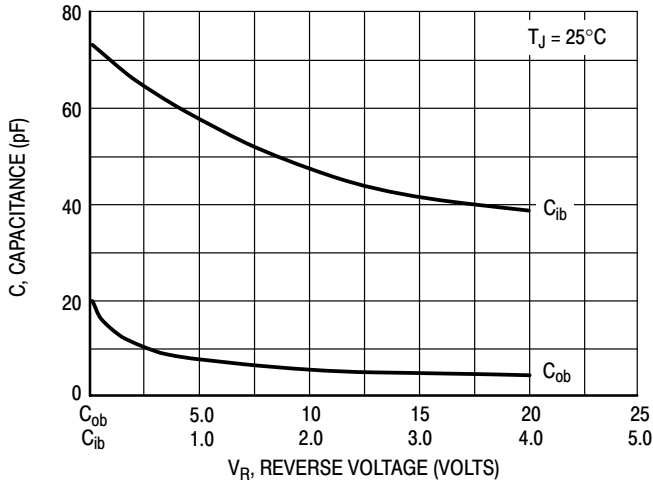


Figure 9. Capacitance

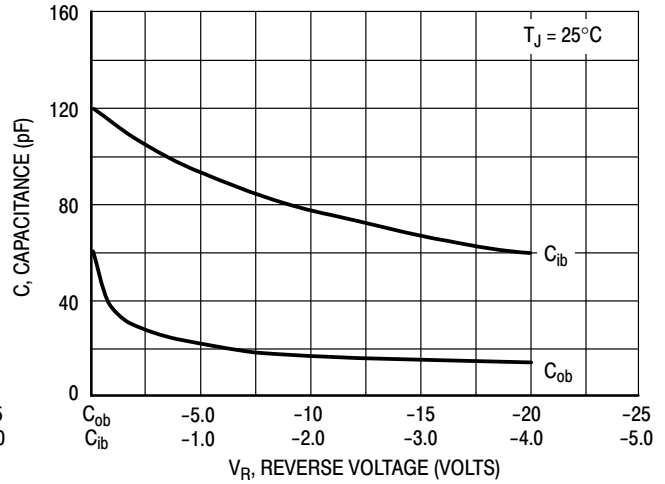


Figure 10. Capacitance

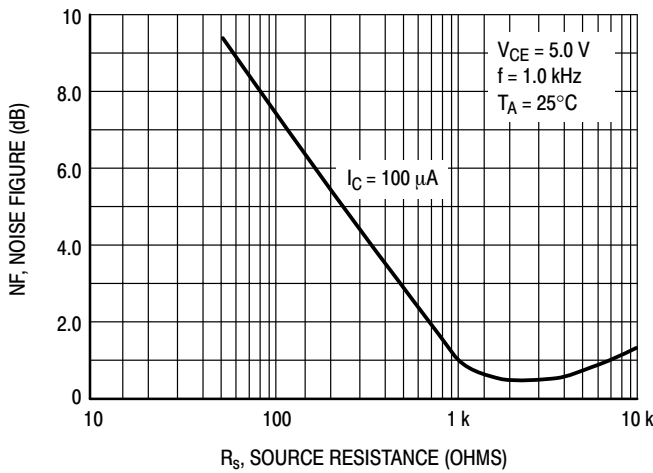


Figure 11. MPS6601/6602 Noise Figure

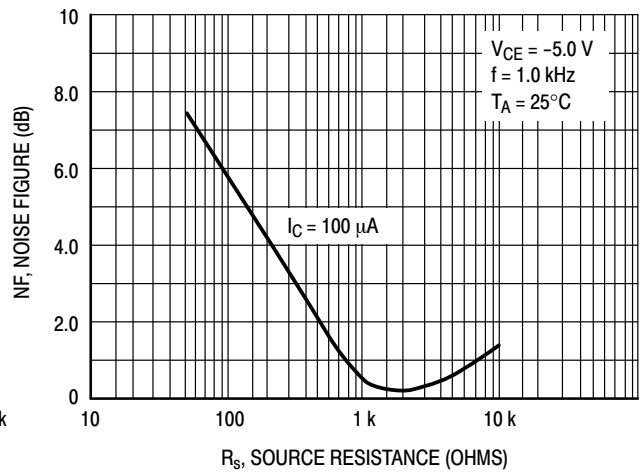


Figure 12. MPS6651/6652 Noise Figure

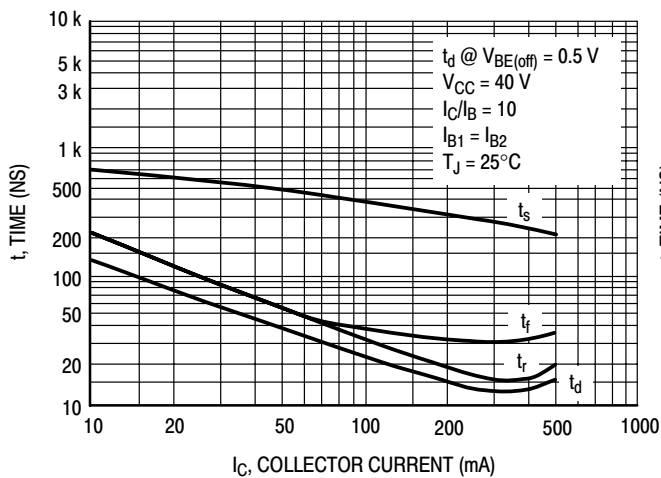


Figure 13. MPS6601/6602 Switching Times

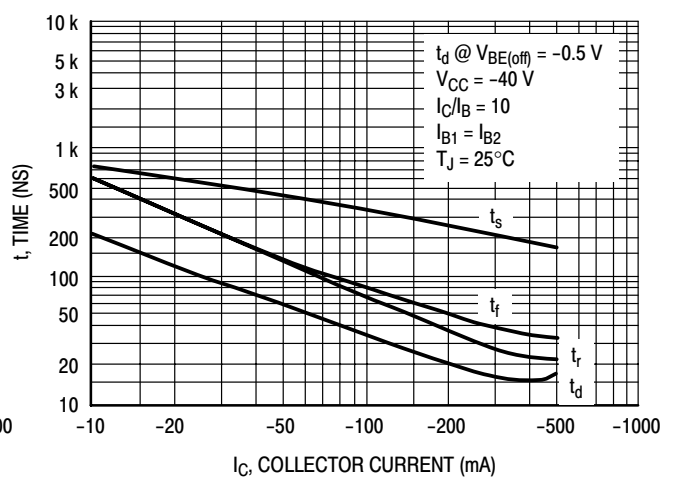


Figure 14. MPS6651/6652 Switching Times

NPN – MPS6601; PNP – MPS6651, MPS6652

NPN

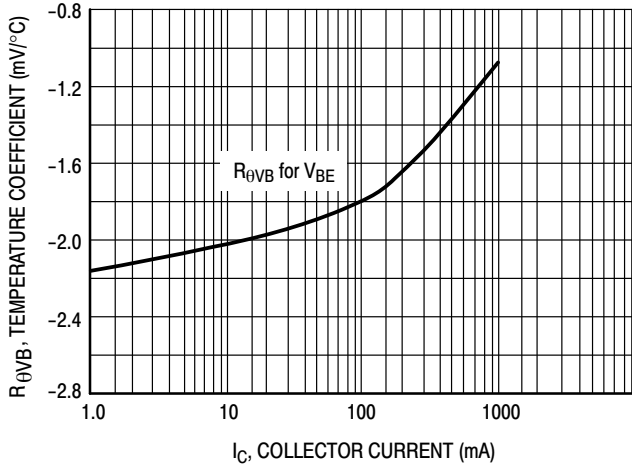


Figure 15. Base-Emitter Temperature Coefficient

PNP

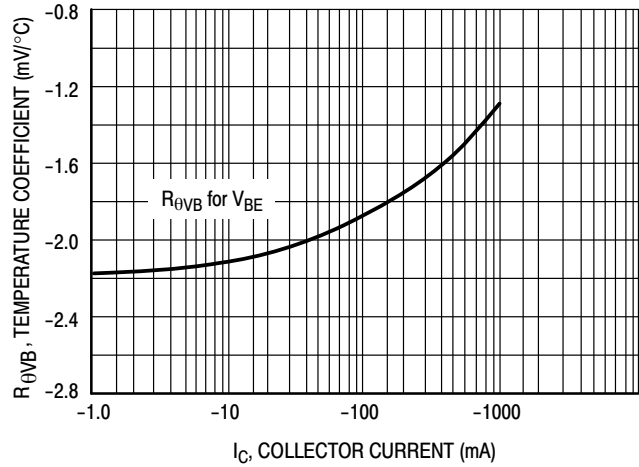


Figure 16. Base-Emitter Temperature Coefficient

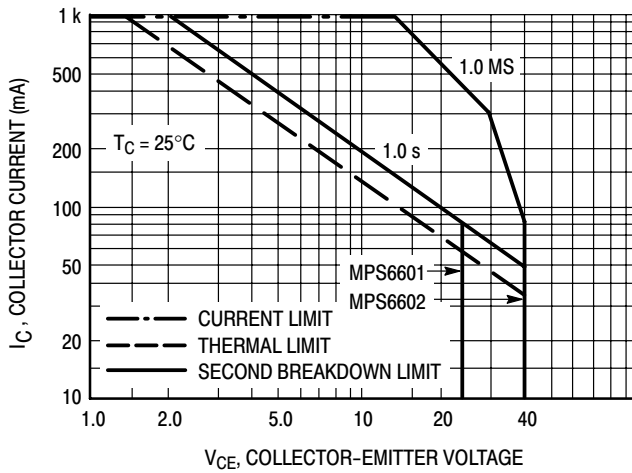


Figure 17. Safe Operating Area

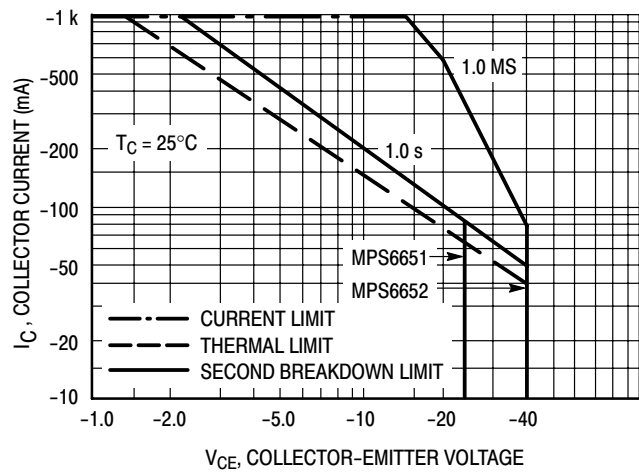


Figure 18. Safe Operating Area

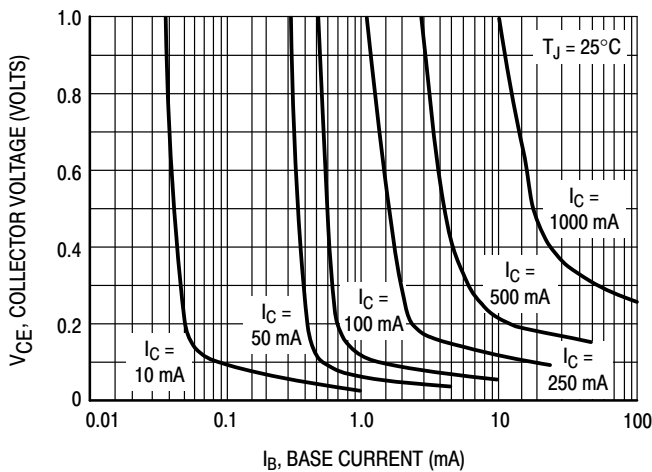


Figure 19. MPS6601/6602 Saturation Region

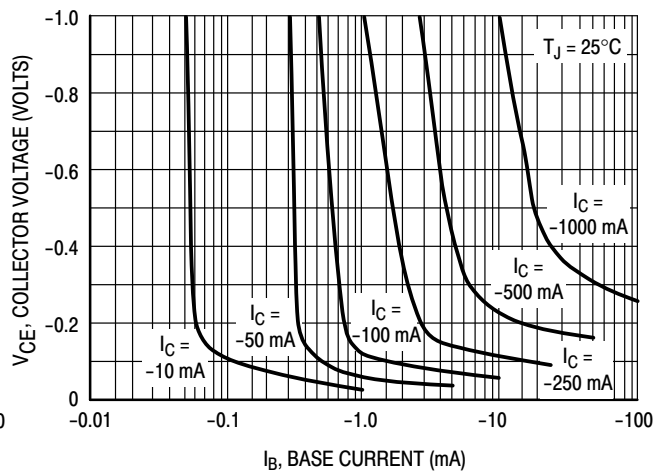
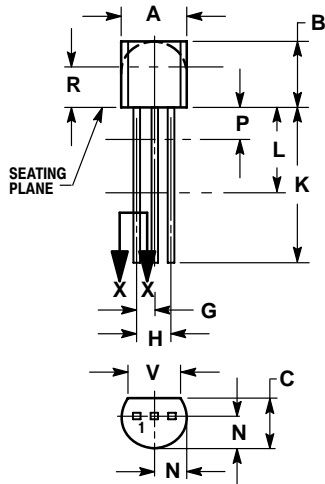


Figure 20. MPS6651/6652 Saturation Region

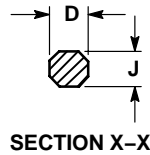
NPN – MPS6601; PNP – MPS6651, MPS6652

PACKAGE DIMENSIONS

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



STRAIGHT LEAD
BULK PACK

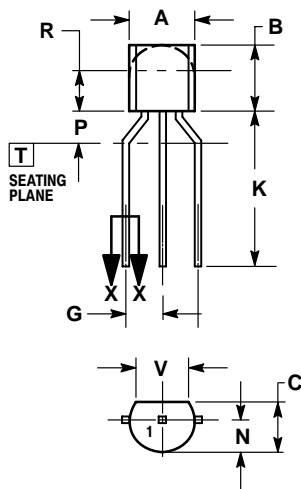


SECTION X-X

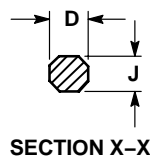
NOTES:

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:

1. EMITTER
2. BASE
3. COLLECTOR

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