

MPS2222, MPS2222A

MPS2222A is a Preferred Device

General Purpose Transistors

NPN Silicon

Features

- Pb-Free Packages are Available*

MAXIMUM RATINGS

| Rating | Symbol | Value | Unit |
|---|----------------|-------------|----------------------------|
| Collector – Emitter Voltage MPS2222 MPS2222A | V_{CEO} | 30 40 | Vdc |
| Collector – Base Voltage MPS2222 MPS2222A | V_{CBO} | 60 75 | Vdc |
| Emitter – Base Voltage MPS2222 MPS2222A | V_{EBO} | 5.0 6.0 | Vdc |
| Collector Current – Continuous | I_C | 600 | mAdc |
| Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C | P_D | 625 5.0 | mW 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 | $R_{\theta JA}$ | 200 | $^\circ\text{C}/\text{W}$ |
| Thermal Resistance, Junction-to-Case | $R_{\theta JC}$ | 83.3 | $^\circ\text{C}/\text{W}$ |

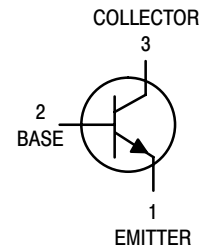
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

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

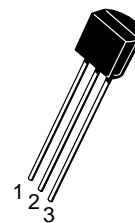


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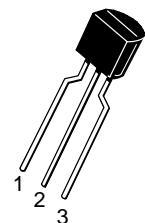
<http://onsemi.com>



TO-92
CASE 29
STYLE 1

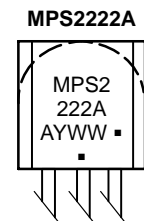
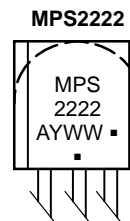


STRAIGHT LEAD
BULK PACK



BENT LEAD
TAPE & REEL
AMMO PACK

MARKING DIAGRAMS



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 5 of this data sheet.

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

MPS2222, MPS2222A

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

| Characteristic | | Symbol | Min | Max | Unit |
|--|--|----------------------|------------------|--------------------------|------|
| OFF CHARACTERISTICS | | | | | |
| Collector–Emitter Breakdown Voltage (I _C = 10 mAdc, I _B = 0) | MPS2222 MPS2222A | V _{(BR)CEO} | 30 40 | – – | Vdc |
| Collector–Base Breakdown Voltage (I _C = 10 μAdc, I _E = 0) | MPS2222 MPS2222A | V _{(BR)CBO} | 60 75 | – – | Vdc |
| Emitter–Base Breakdown Voltage (I _E = 10 μAdc, I _C = 0) | MPS2222 MPS2222A | V _{(BR)EBO} | 5.0 6.0 | – – | Vdc |
| Collector Cutoff Current (V _{CE} = 60 Vdc, V _{EB(off)} = 3.0 Vdc) | MPS2222A | I _{CEX} | – | 10 | nAdc |
| Collector Cutoff Current (V _{CB} = 50 Vdc, I _E = 0) (V _{CB} = 60 Vdc, I _E = 0) (V _{CB} = 50 Vdc, I _E = 0, T _A = 125°C) (V _{CB} = 50 Vdc, I _E = 0, T _A = 125°C) | MPS2222 MPS2222A MPS2222 MPS2222A | I _{CBO} | – – – – | 0.01 0.01 10 10 | μAdc |
| Emitter Cutoff Current (V _{EB} = 3.0 Vdc, I _C = 0) | MPS2222A | I _{EBO} | – | 100 | nAdc |
| Base Cutoff Current (V _{CE} = 60 Vdc, V _{EB(off)} = 3.0 Vdc) | MPS2222A | I _{BL} | – | 20 | nAdc |

ON CHARACTERISTICS

| | | | | | |
|--|--|----------------------|---|--|-----|
| DC Current Gain (I _C = 0.1 mAdc, V _{CE} = 10 Vdc) (I _C = 1.0 mAdc, V _{CE} = 10 Vdc) (I _C = 10 mAdc, V _{CE} = 10 Vdc) (I _C = 10 mAdc, V _{CE} = 10 Vdc, T _A = –55°C) (I _C = 150 mAdc, V _{CE} = 10 Vdc) (Note 1) (I _C = 150 mAdc, V _{CE} = 1.0 Vdc) (Note 1) (I _C = 500 mAdc, V _{CE} = 10 Vdc) (Note 1) | MPS2222A only MPS2222 MPS2222A | h _{FE} | 35 50 75 35 100 50 30 40 | – – – – 300 – – – | – |
| Collector–Emitter Saturation Voltage (Note 1) (I _C = 150 mAdc, I _B = 15 mAdc) (I _C = 500 mAdc, I _B = 50 mAdc) | MPS2222 MPS2222A MPS2222 MPS2222A | V _{CE(sat)} | – – – – | 0.4 0.3 1.6 1.0 | Vdc |
| Base–Emitter Saturation Voltage (Note 1) (I _C = 150 mAdc, I _B = 15 mAdc) (I _C = 500 mAdc, I _B = 50 mAdc) | MPS2222 MPS2222A MPS2222 MPS2222A | V _{BE(sat)} | – 0.6 – – | 1.3 1.2 2.6 2.0 | Vdc |

SMALL–SIGNAL CHARACTERISTICS

| | | | | | |
|--|----------------------|-------------------|-------------|-------------|--------------------|
| Current–Gain – Bandwidth Product (Note 2) (I _C = 20 mAdc, V _{CE} = 20 Vdc, f = 100 MHz) | MPS2222 MPS2222A | f _T | 250 300 | – – | MHz |
| Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 1.0 MHz) | | C _{obo} | – | 8.0 | pF |
| Input Capacitance (V _{EB} = 0.5 Vdc, I _C = 0, f = 1.0 MHz) | MPS2222 MPS2222A | C _{ibo} | – – | 30 25 | pF |
| Input Impedance (I _C = 1.0 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) | MPS2222A MPS2222A | h _{ie} | 2.0 0.25 | 8.0 1.25 | kΩ |
| Voltage Feedback Ratio (I _C = 1.0 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) | MPS2222A MPS2222A | h _{re} | – – | 8.0 4.0 | X 10 ^{–4} |
| Small–Signal Current Gain (I _C = 1.0 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) | MPS2222A MPS2222A | h _{fe} | 50 75 | 300 375 | – |
| Output Admittance (I _C = 1.0 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) (I _C = 10 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) | MPS2222A MPS2222A | h _{oe} | 5.0 25 | 35 200 | μmhos |
| Collector Base Time Constant (I _E = 20 mAdc, V _{CB} = 20 Vdc, f = 31.8 MHz) | MPS2222A | rb'C _C | – | 150 | ps |
| Noise Figure (I _C = 100 μAdc, V _{CE} = 10 Vdc, R _S = 1.0 kΩ, f = 1.0 kHz) | MPS2222A | NF | – | 4.0 | dB |

1. Pulse Test: Pulse Width ≤ 300 μs, Duty Cycle ≤ 2%.
2. f_T is defined as the frequency at which |h_{fe}| extrapolates to unity.

MPS2222, MPS2222A

ELECTRICAL CHARACTERISTICS ($T_A = 25^\circ\text{C}$ unless otherwise noted) (Continued)

| Characteristic | Symbol | Min | Max | Unit |
|--|--------|-----|-----|------|
| SWITCHING CHARACTERISTICS MPS2222A only | | | | |
| Delay Time | t_d | – | 10 | ns |
| Rise Time | t_r | – | 25 | ns |
| Storage Time | t_s | – | 225 | ns |
| Fall Time | t_f | – | 60 | ns |

SWITCHING TIME EQUIVALENT TEST CIRCUITS

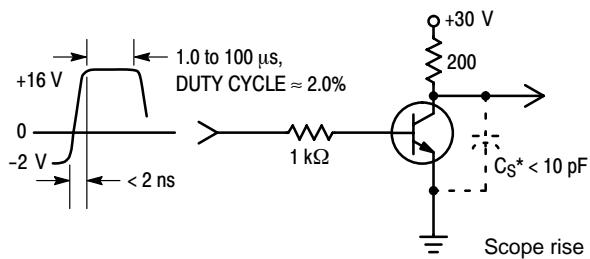


Figure 1. Turn-On Time

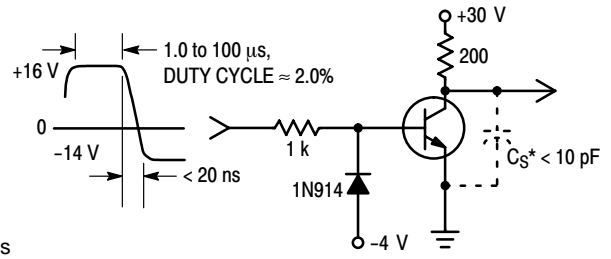


Figure 2. Turn-Off Time

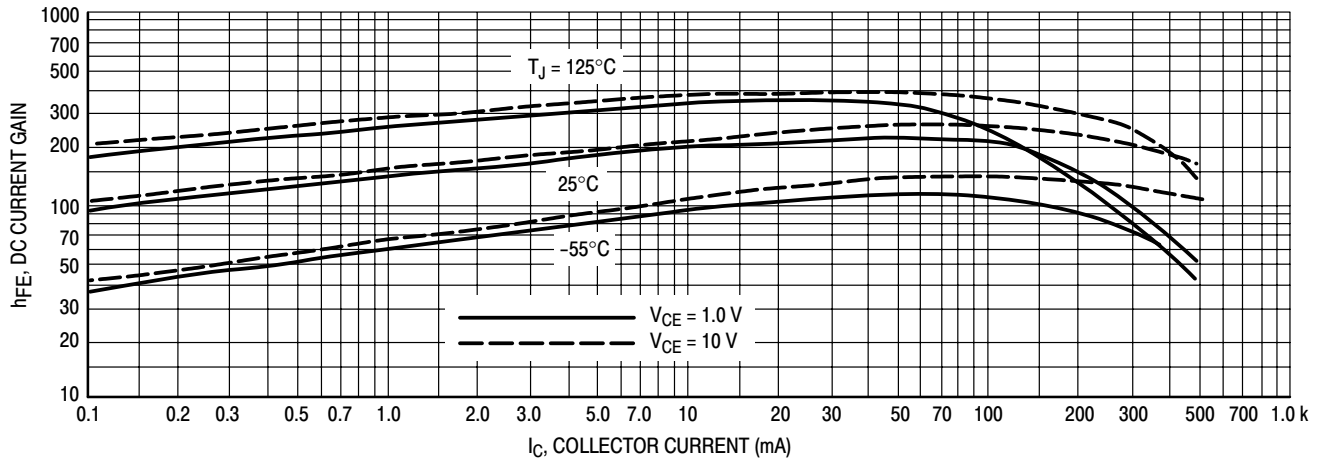


Figure 3. DC Current Gain

MPS2222, MPS2222A

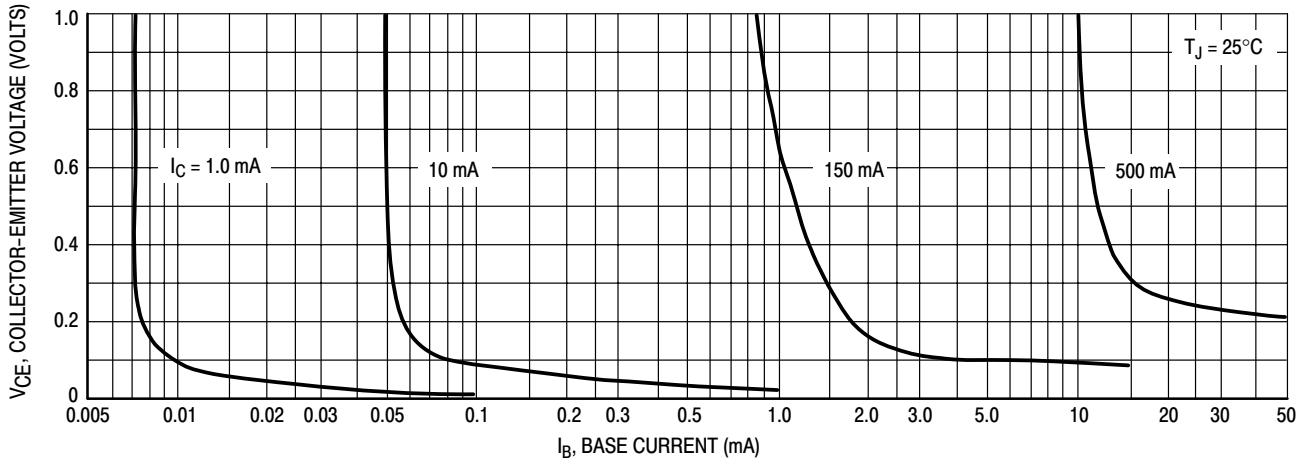


Figure 4. Collector Saturation Region

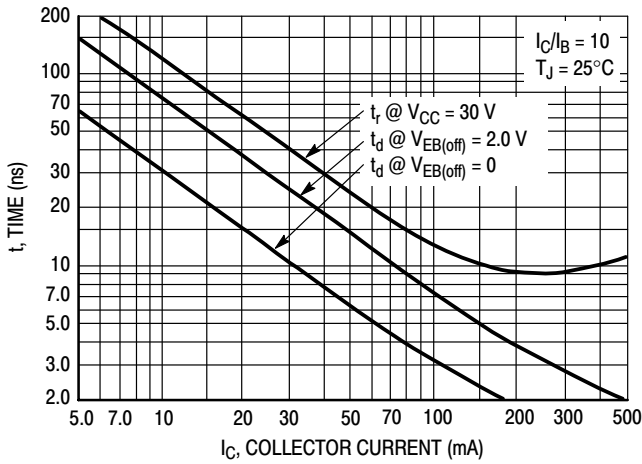


Figure 5. Turn-On Time

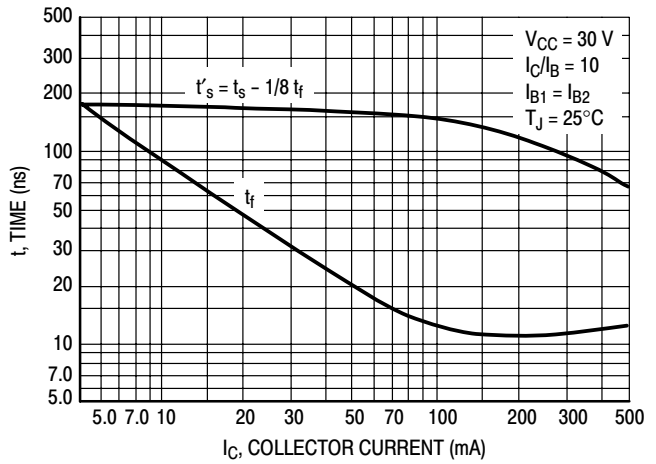


Figure 6. Turn-Off Time

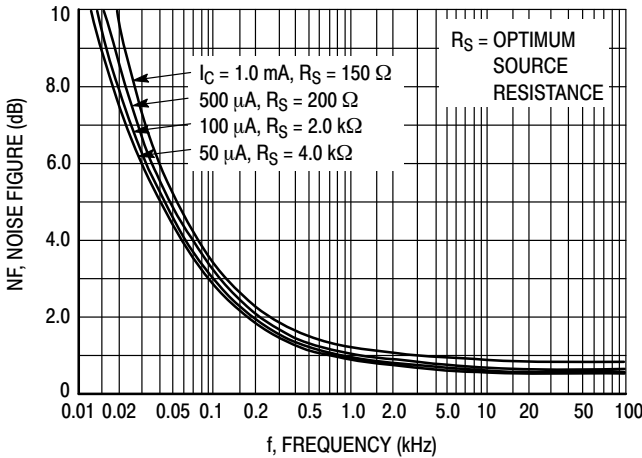


Figure 7. Frequency Effects

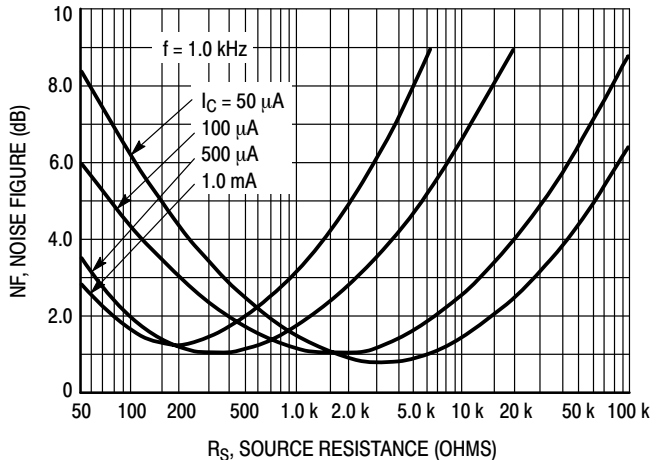


Figure 8. Source Resistance Effects

MPS2222, MPS2222A

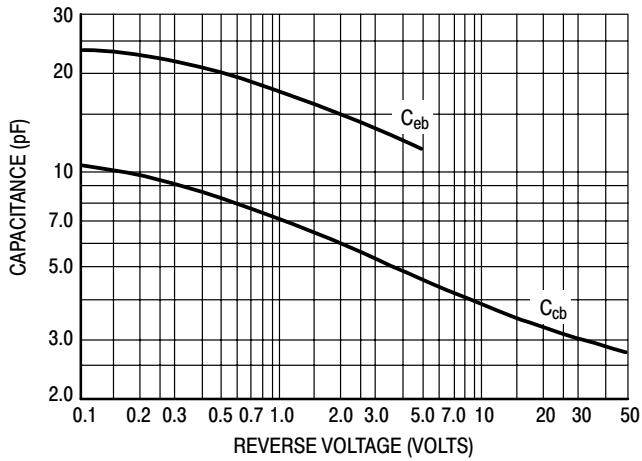


Figure 9. Capacitances

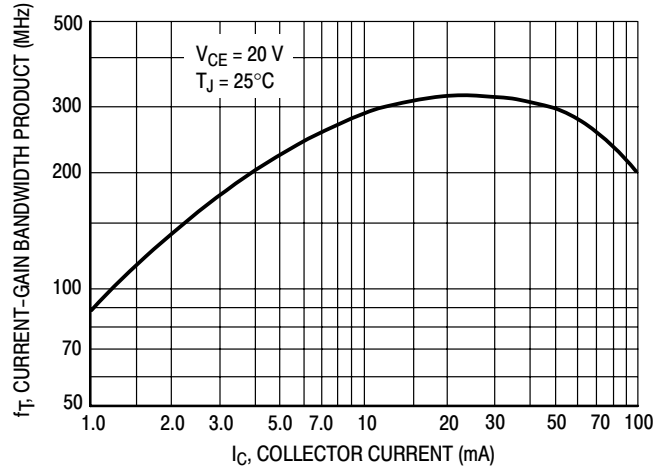


Figure 10. Current-Gain Bandwidth Product

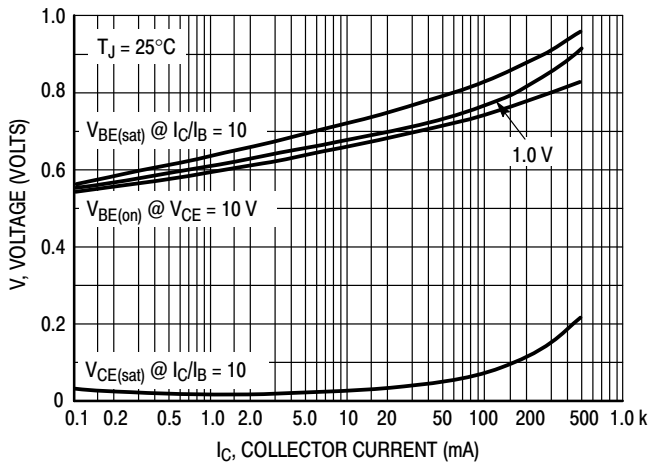


Figure 11. "On" Voltages

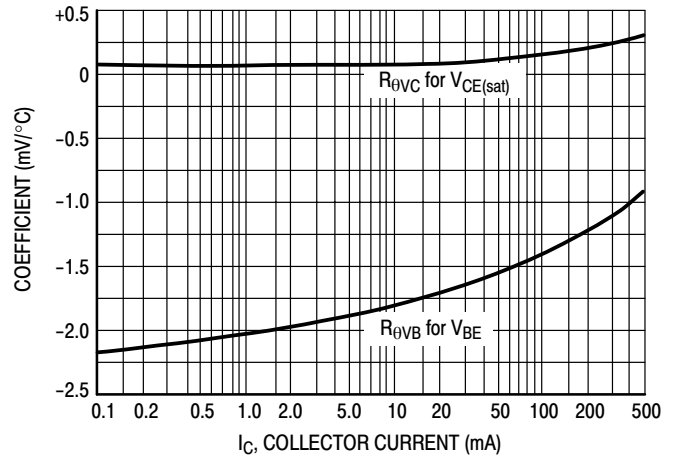


Figure 12. Temperature Coefficients

ORDERING INFORMATION

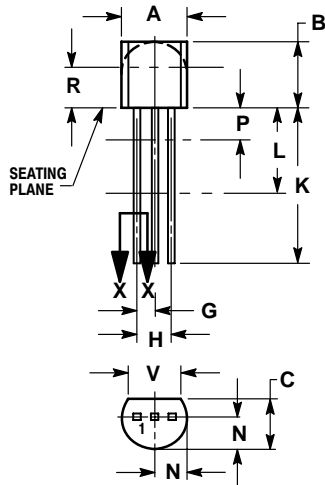
| Device | Package | Shipping† |
|---------------|--------------------|------------------------|
| MPS2222G | TO-92 (Pb-Free) | 5000 Units / Bulk |
| MPS2222RLRP | TO-92 | 2000 / Tape & Ammo Box |
| MPS2222RLRPG | TO-92 (Pb-Free) | 2000 / Tape & Ammo Box |
| MPS2222A | TO-92 | 5000 Units / Bulk |
| MPS2222AG | TO-92 (Pb-Free) | 5000 Units / Bulk |
| MPS2222ARLG | TO-92 (Pb-Free) | 2000 / Tape & Reel |
| MPS2222ARLRA | TO-92 | 2000 / Tape & Reel |
| MPS2222ARLRAG | TO-92 (Pb-Free) | 2000 / Tape & Reel |
| MPS2222ARLRMG | TO-92 (Pb-Free) | 2000 / Tape & Reel |
| MPS2222ARLRPG | TO-92 (Pb-Free) | 2000 / Tape & Ammo Box |

†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.

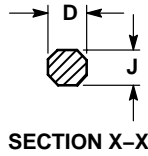
MPS2222, MPS2222A

PACKAGE DIMENSIONS

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



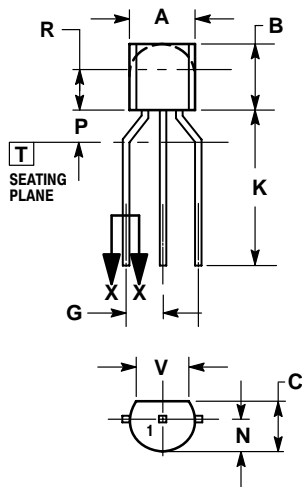
STRAIGHT LEAD
BULK PACK



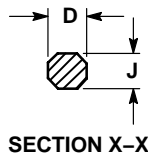
NOTES:

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:

1. EMITTER
2. BASE
3. COLLECTOR

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