

# MPSA18

Preferred Device

## Low Noise Transistor

### NPN Silicon

#### Features

- These are Pb-Free Devices\*

#### MAXIMUM RATINGS

| Rating                                                                                 | Symbol         | Value       | Unit                       |
|----------------------------------------------------------------------------------------|----------------|-------------|----------------------------|
| Collector – Emitter Voltage                                                            | $V_{CEO}$      | 45          | Vdc                        |
| Collector – Base Voltage                                                               | $V_{CBO}$      | 45          | Vdc                        |
| Emitter – Base Voltage                                                                 | $V_{EBO}$      | 6.5         | Vdc                        |
| Collector Current – Continuous                                                         | $I_C$          | 200         | mA dc                      |
| 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<br>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 | $^\circ\text{C/W}$ |

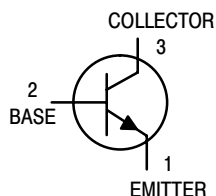
Maximum ratings are those values beyond which device damage can occur. Maximum ratings applied to the device are individual stress limit values (not normal operating conditions) and are not valid simultaneously. If these limits are exceeded, device functional operation is not implied, damage may occur and reliability may be affected.

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

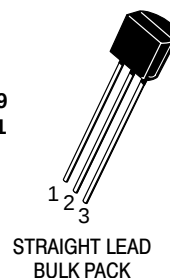


ON Semiconductor®

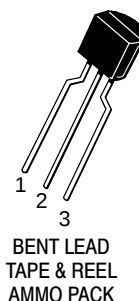
<http://onsemi.com>



TO-92  
CASE 29  
STYLE 1

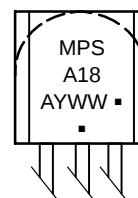


STRAIGHT LEAD  
BULK PACK



BENT LEAD  
TAPE & REEL  
AMMO PACK

#### MARKING DIAGRAM



A = Assembly Location  
Y = Year  
WW = Work Week  
■ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

| Device      | Package            | Shipping†         |
|-------------|--------------------|-------------------|
| MPSA18G     | TO-92<br>(Pb-Free) | 5000 Units / Bulk |
| MPSA18RLRAG | TO-92<br>(Pb-Free) | 2000/Tape & Reel  |
| MPSA18RLRMG | 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 Specifications Brochure, BRD8011/D.

**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.

# MPSA18

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

| Characteristic                                                                         | Symbol        | Min | Typ | Max | Unit |
|----------------------------------------------------------------------------------------|---------------|-----|-----|-----|------|
| <b>OFF CHARACTERISTICS</b>                                                             |               |     |     |     |      |
| Collector–Emitter Breakdown Voltage (Note 2)<br>( $I_C = 10\text{ mAdc}$ , $I_B = 0$ ) | $V_{(BR)CEO}$ | 45  | –   | –   | Vdc  |
| Collector–Base Breakdown Voltage<br>( $I_C = 100\text{ }\mu\text{Adc}$ , $I_E = 0$ )   | $V_{(BR)CBO}$ | 45  | –   | –   | Vdc  |
| Emitter–Base Breakdown Voltage<br>( $I_E = 10\text{ }\mu\text{Adc}$ , $I_C = 0$ )      | $V_{(BR)EBO}$ | 6.5 | –   | –   | Vdc  |
| Collector Cutoff Current<br>( $V_{CB} = 30\text{ Vdc}$ , $I_E = 0$ )                   | $I_{CBO}$     | –   | 1.0 | 50  | nAdc |

## ON CHARACTERISTICS (Note 2)

|                                                                                                                                                                                                                                                                             |               |                          |                            |                     |     |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------------------------|----------------------------|---------------------|-----|
| DC Current Gain<br>( $I_C = 10\text{ }\mu\text{Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ )<br>( $I_C = 100\text{ }\mu\text{Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ )<br>( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ )<br>( $I_C = 10\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ ) | $h_{FE}$      | 400<br>500<br>500<br>500 | 580<br>850<br>1100<br>1150 | –<br>–<br>–<br>1500 | –   |
| Collector–Emitter Saturation Voltage<br>( $I_C = 10\text{ mAdc}$ , $I_B = 0.5\text{ mAdc}$ )<br>( $I_C = 50\text{ mAdc}$ , $I_B = 5.0\text{ mAdc}$ )                                                                                                                        | $V_{CE(sat)}$ | –<br>–                   | –<br>0.08                  | 0.2<br>0.3          | Vdc |
| Base–Emitter On Voltage<br>( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ )                                                                                                                                                                                          | $V_{BE(on)}$  | –                        | 0.6                        | 0.7                 | Vdc |

## SMALL–SIGNAL CHARACTERISTICS

|                                                                                                                                                                                                                                                            |          |        |            |          |                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|--------|------------|----------|------------------------|
| Current–Gain – Bandwidth Product<br>( $I_C = 1.0\text{ mAdc}$ , $V_{CE} = 5.0\text{ Vdc}$ , $f = 100\text{ MHz}$ )                                                                                                                                         | $f_T$    | 100    | 160        | –        | MHz                    |
| Collector–Base Capacitance<br>( $V_{CB} = 5.0\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                                                                                                                                                             | $C_{cb}$ | –      | 1.7        | 3.0      | pF                     |
| Emitter–Base Capacitance<br>( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )                                                                                                                                                               | $C_{eb}$ | –      | 5.6        | 6.5      | pF                     |
| Noise Figure<br>( $I_C = 100\text{ }\mu\text{Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 10\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ )<br>( $I_C = 100\text{ }\mu\text{Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 1.0\text{ k}\Omega$ , $f = 100\text{ Hz}$ ) | NF       | –<br>– | 0.5<br>4.0 | 1.5<br>– | dB                     |
| Equivalent Short Circuit Noise Voltage<br>( $I_C = 100\text{ }\mu\text{Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 1.0\text{ k}\Omega$ , $f = 100\text{ Hz}$ )                                                                                              | $V_T$    | –      | 6.5        | –        | nV/ $\sqrt{\text{Hz}}$ |

2. Pulse Test: Pulse Width  $\leq 300\text{ }\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

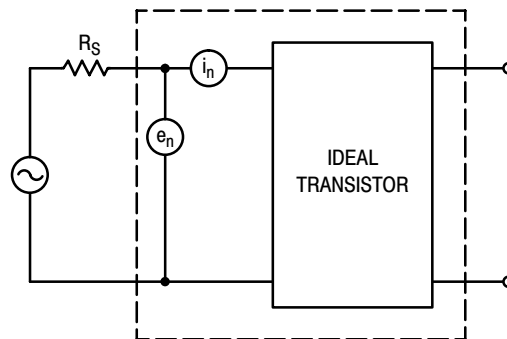


Figure 1. Transistor Noise Model

# NOISE CHARACTERISTICS

( $V_{CE} = 5.0 \text{ Vdc}$ ,  $T_A = 25^\circ\text{C}$ )

## NOISE VOLTAGE

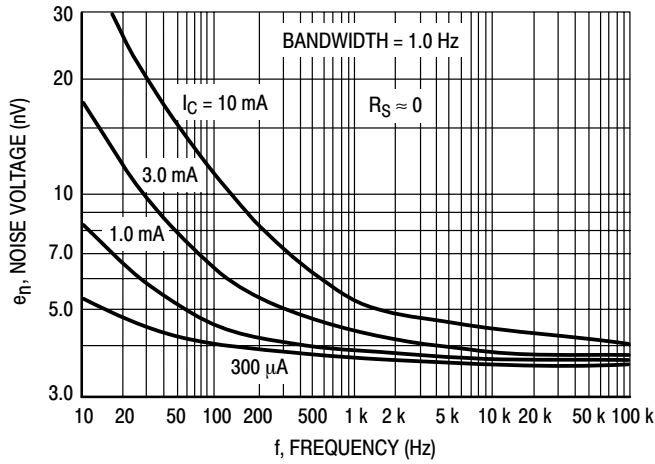


Figure 2. Effects of Frequency

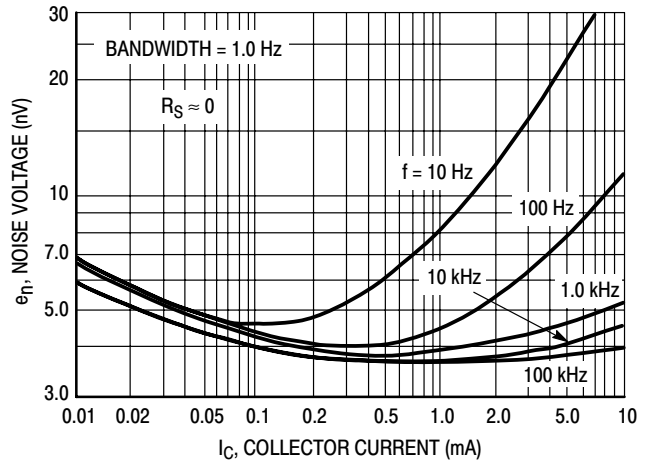


Figure 3. Effects of Collector Current

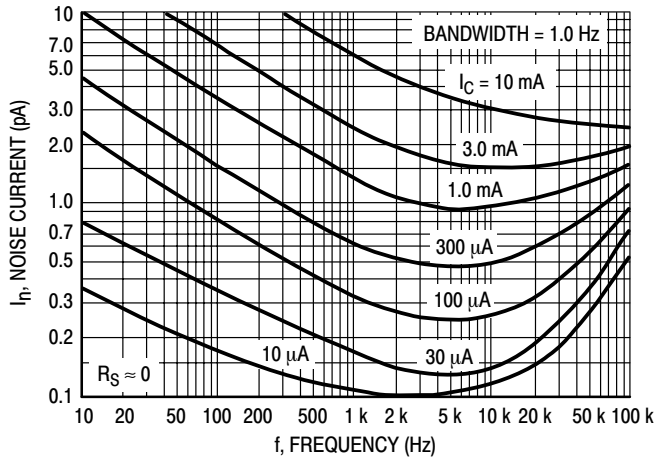


Figure 4. Noise Current

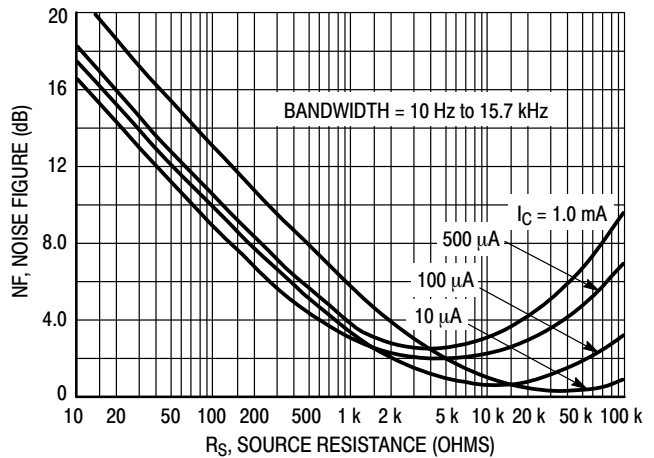


Figure 5. Wideband Noise Figure

## 100 Hz NOISE DATA

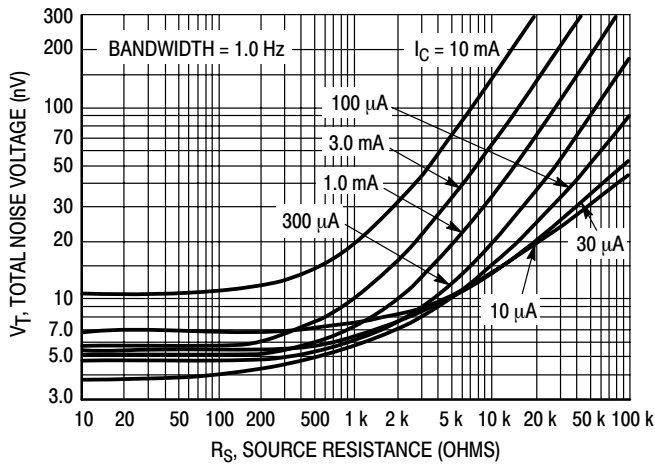


Figure 6. Total Noise Voltage

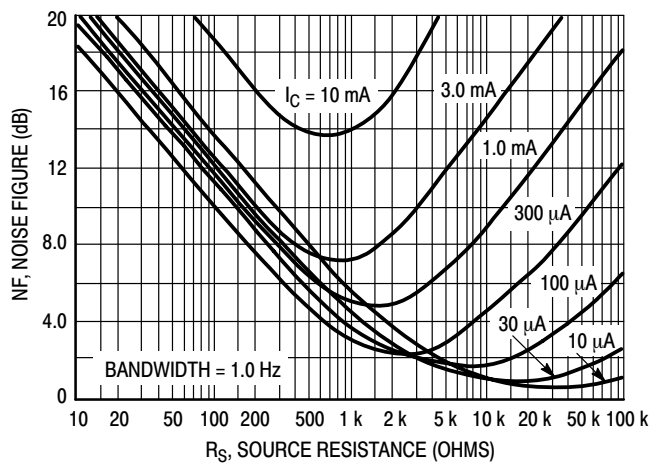


Figure 7. Noise Figure

# MPSA18

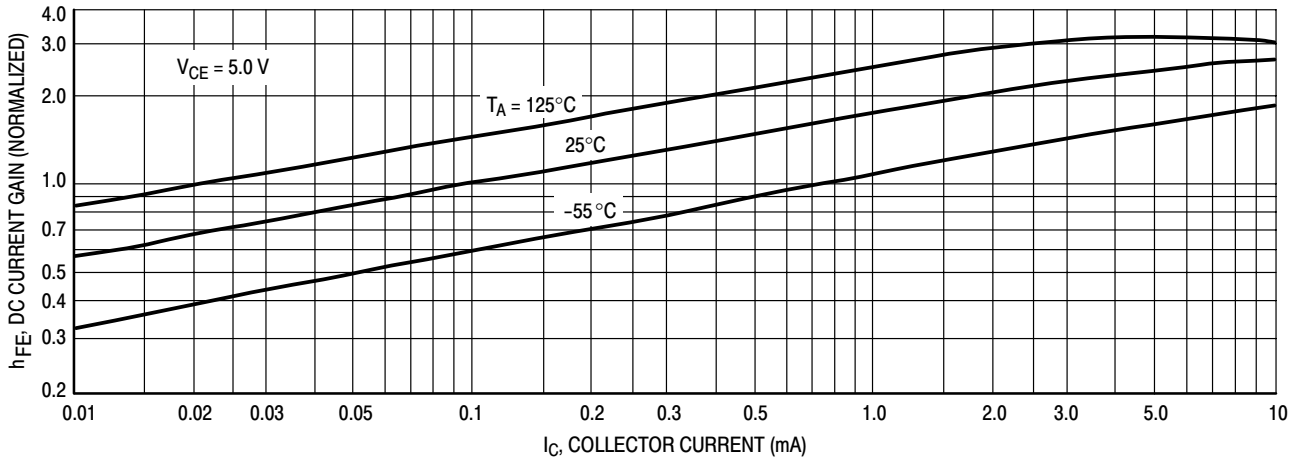


Figure 8. DC Current Gain

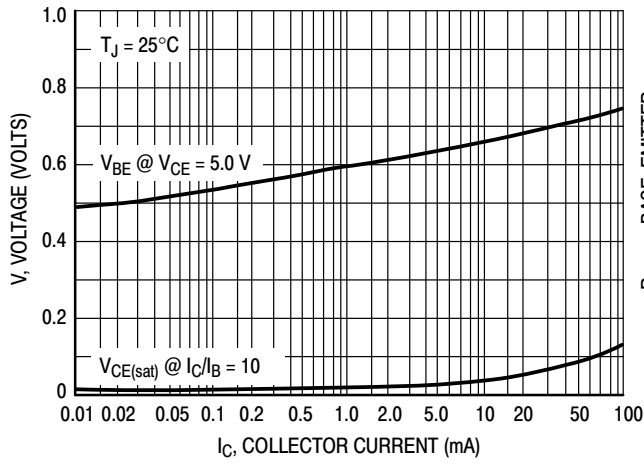


Figure 9. "On" Voltages

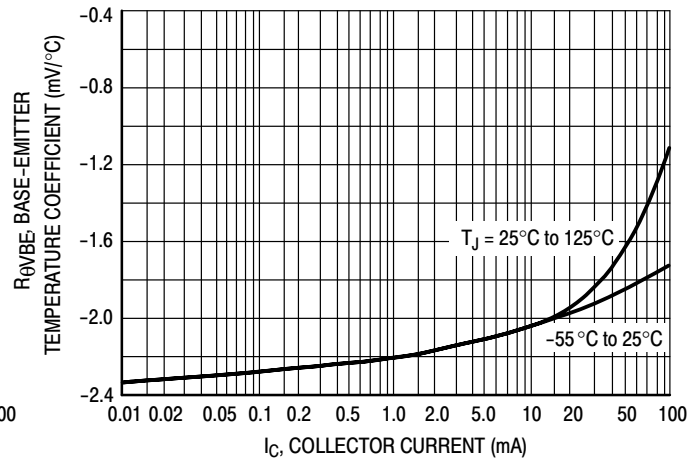


Figure 10. Temperature Coefficients

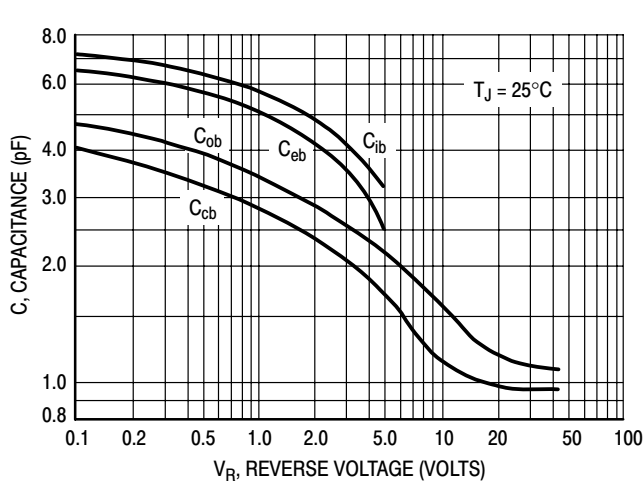


Figure 11. Capacitance

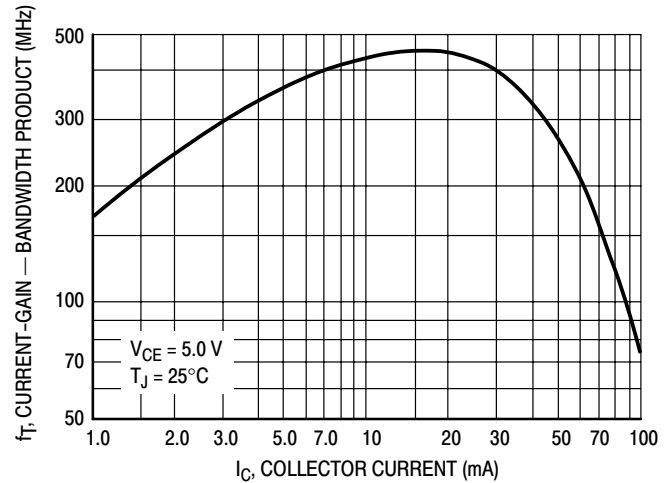
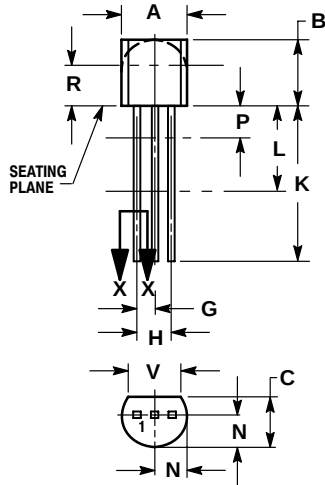


Figure 12. Current-Gain - Bandwidth Product

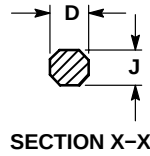
# MPSA18

## PACKAGE DIMENSIONS

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



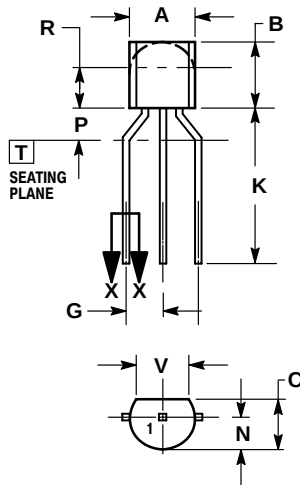
STRAIGHT LEAD  
BULK PACK



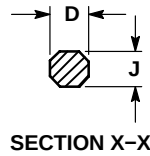
#### NOTES:

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. PIN 1. EMITTER
2. BASE
3. COLLECTOR

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