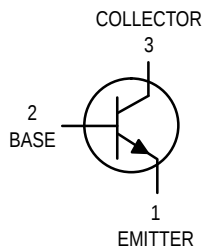
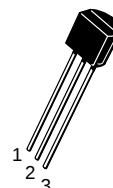


# Amplifier Transistor

## NPN Silicon



**MPSL01**



CASE 29-04, STYLE 1  
TO-92 (TO-226AA)

### MAXIMUM RATINGS

| Rating                                                                                 | Symbol         | Value       | Unit                          |
|----------------------------------------------------------------------------------------|----------------|-------------|-------------------------------|
| Collector–Emitter Voltage                                                              | $V_{CEO}$      | 120         | Vdc                           |
| Collector–Base Voltage                                                                 | $V_{CBO}$      | 140         | Vdc                           |
| Emitter–Base Voltage                                                                   | $V_{EBO}$      | 5.0         | Vdc                           |
| Collector Current — Continuous                                                         | $I_C$          | 150         | 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   | Watts<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 | $R_{\theta JA}$ | 200  | $^\circ\text{C/W}$ |
| Thermal Resistance, Junction to Case    | $R_{\theta JC}$ | 83.3 | $^\circ\text{C/W}$ |

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

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

### OFF CHARACTERISTICS

|                                                                                                |               |     |     |                 |
|------------------------------------------------------------------------------------------------|---------------|-----|-----|-----------------|
| Collector–Emitter Breakdown Voltage <sup>(1)</sup><br>( $I_C = 1.0 \text{ mAdc}$ , $I_E = 0$ ) | $V_{(BR)CEO}$ | 120 | —   | Vdc             |
| Collector–Base Breakdown Voltage<br>( $I_C = 100 \mu\text{Adc}$ , $I_E = 0$ )                  | $V_{(BR)CBO}$ | 140 | —   | Vdc             |
| Emitter–Base Breakdown Voltage<br>( $I_E = 10 \mu\text{Adc}$ , $I_C = 0$ )                     | $V_{(BR)EBO}$ | 5.0 | —   | Vdc             |
| Collector Cutoff Current<br>( $V_{CB} = 75 \text{ Vdc}$ , $I_E = 0$ )                          | $I_{CBO}$     | —   | 1.0 | $\mu\text{Adc}$ |
| Emitter Cutoff Current<br>( $V_{EB} = 4.0 \text{ Vdc}$ , $I_C = 0$ )                           | $I_{EBO}$     | —   | 100 | nAdc            |

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

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

| Characteristic                                                                                                                                         | Symbol        | Min    | Max          | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|--------|--------------|------|
| <b>ON CHARACTERISTICS</b>                                                                                                                              |               |        |              |      |
| DC Current Gain <sup>(1)</sup><br>( $I_C = 10\text{ mA}$ , $V_{CE} = 5.0\text{ Vdc}$ )                                                                 | $h_{FE}$      | 50     | 300          | —    |
| Collector–Emitter Saturation Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ )<br>( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ )           | $V_{CE(sat)}$ | —<br>— | 0.20<br>0.30 | Vdc  |
| Base–Emitter Saturation Voltage<br>( $I_C = 10\text{ mA}$ , $I_B = 1.0\text{ mA}$ )<br>( $I_C = 50\text{ mA}$ , $I_B = 5.0\text{ mA}$ ) <sup>(1)</sup> | $V_{BE(sat)}$ | —<br>— | 1.2<br>1.4   | Vdc  |
| <b>SMALL–SIGNAL CHARACTERISTICS</b>                                                                                                                    |               |        |              |      |
| Current–Gain — Bandwidth Product <sup>(1)</sup><br>( $I_C = 10\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 20\text{ MHz}$ )                           | $f_T$         | 60     | —            | MHz  |
| Collector–Base Capacitance<br>( $V_{CB} = 10\text{ Vdc}$ , $I_E = 0$ , $f = 1.0\text{ MHz}$ )                                                          | $C_{cb}$      | —      | 8.0          | pF   |
| Small–Signal Current Gain<br>( $I_C = 1.0\text{ mA}$ , $V_{CE} = 10\text{ Vdc}$ , $f = 1.0\text{ kHz}$ )                                               | $h_{fe}$      | 30     | —            | —    |

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

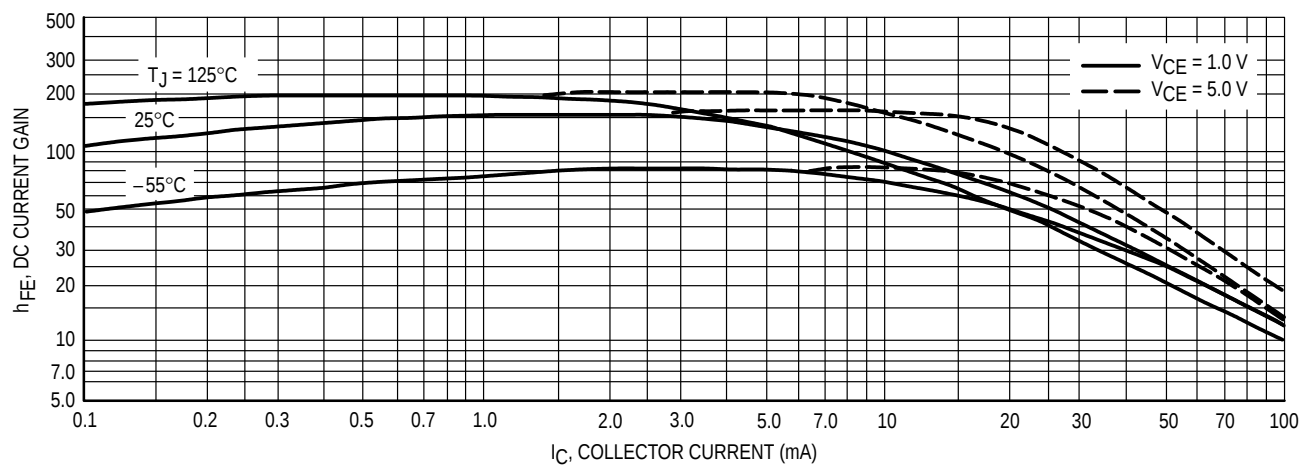


Figure 1. DC Current Gain

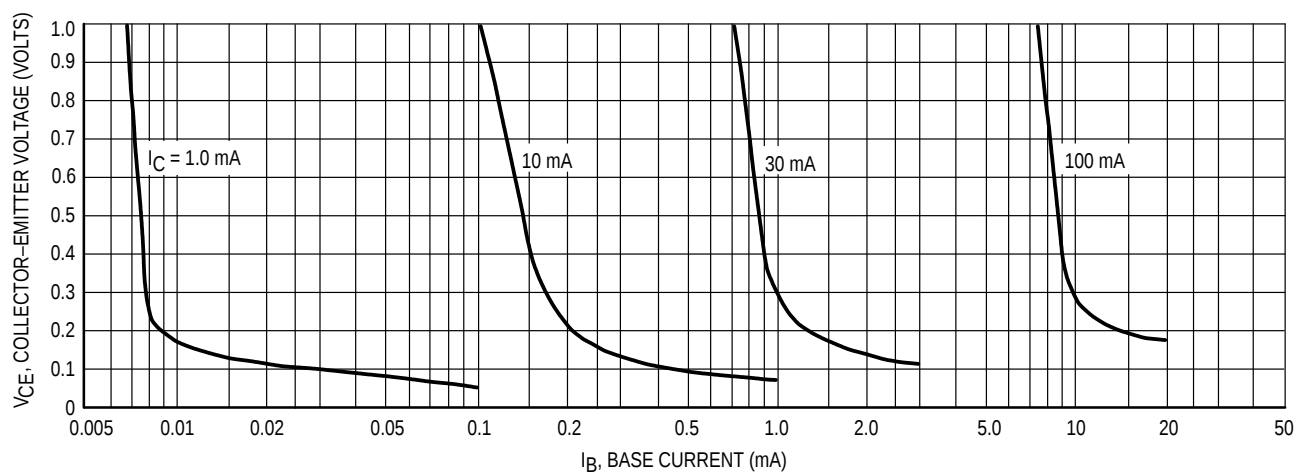


Figure 2. Collector Saturation Region

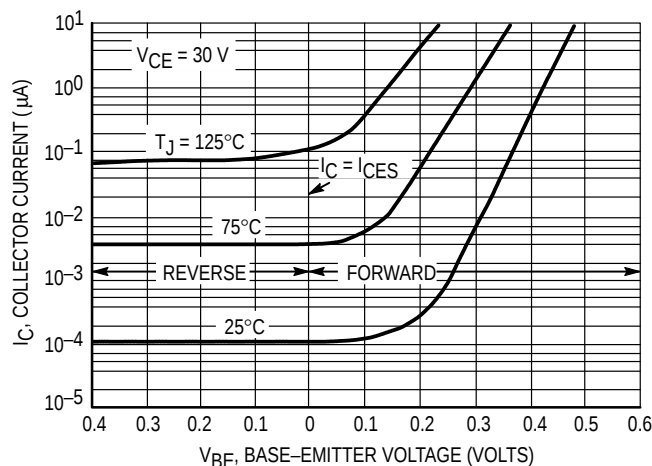


Figure 3. Collector Cut-Off Region

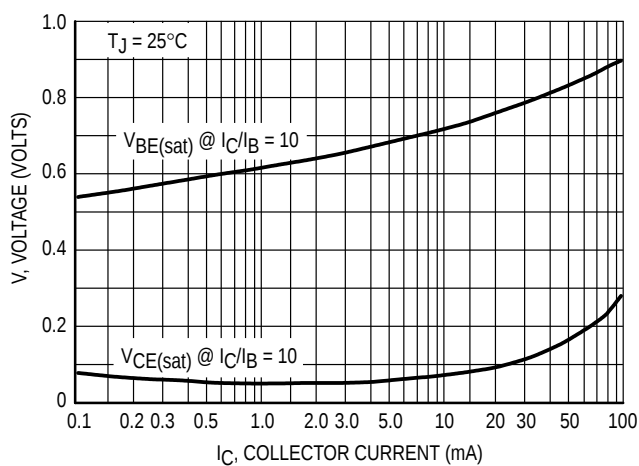


Figure 4. "On" Voltages

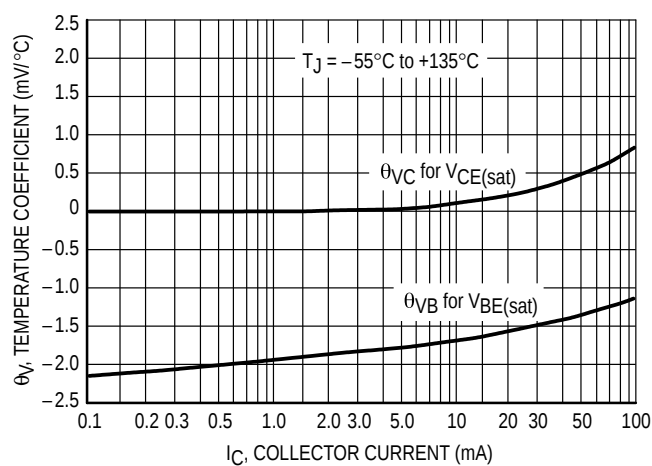
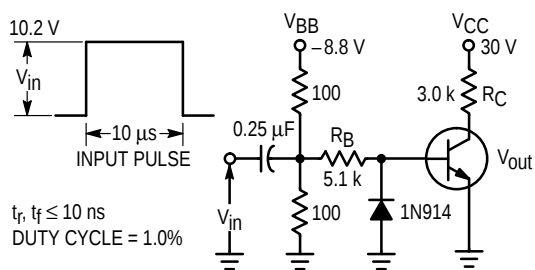


Figure 5. Temperature Coefficients



Values Shown are for  $I_C$  @ 10 mA

Figure 6. Switching Time Test Circuit

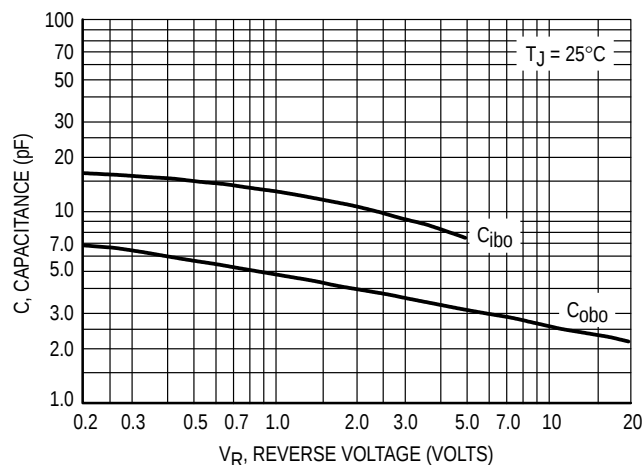


Figure 7. Capacitances

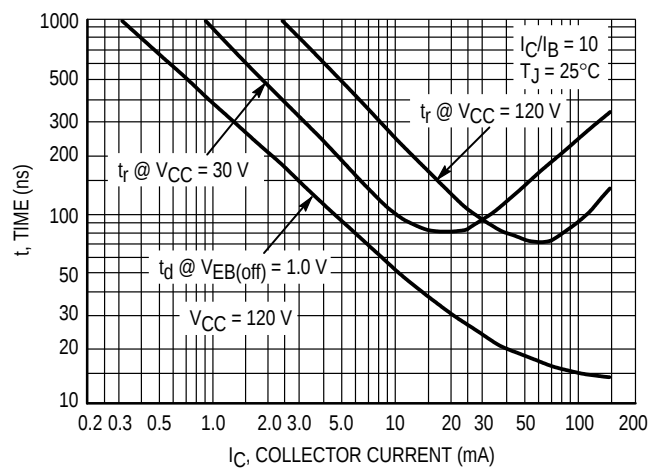


Figure 8. Turn-On Time

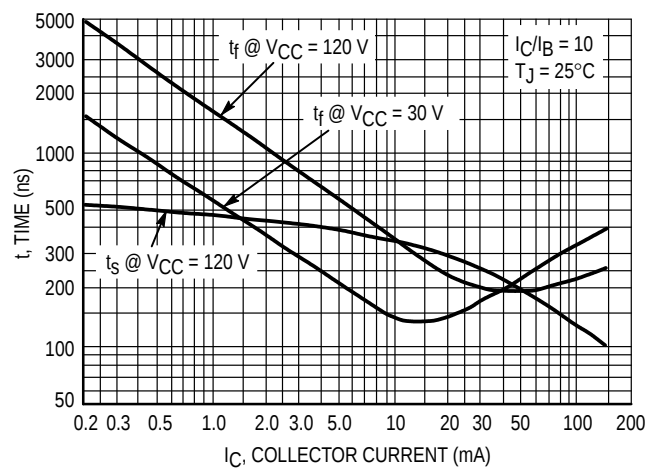
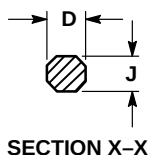
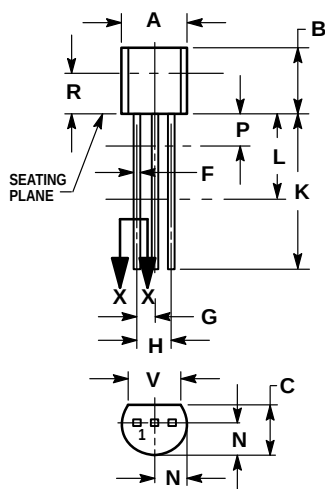


Figure 9. Turn-Off Time

## PACKAGE DIMENSIONS



**CASE 029-04  
(TO-226AA)  
ISSUE AD**

## NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. DIMENSION F APPLIES BETWEEN P AND L. DIMENSION D AND J APPLY BETWEEN L AND K. MINIMUM 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  | 0.022 | 0.41        | 0.55 |
| F   | 0.016  | 0.019 | 0.41        | 0.48 |
| 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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