

Medium-Power Plastic NPN Silicon Transistors

... designed for driver circuits, switching, and amplifier applications. These high-performance plastic devices feature:

- Low Saturation Voltage —
 $V_{CE(sat)} = 0.6 \text{ Vdc (Max) @ } I_C = 1.0 \text{ Amp}$
- Excellent Power Dissipation Due to Thermopad Construction —
 $P_D = 30 \text{ W @ } T_C = 25^\circ\text{C}$
- Excellent Safe Operating Area
- Gain Specified to $I_C = 1.0 \text{ Amp}$
- Complement to PNP 2N4918, 2N4919, 2N4920

*MAXIMUM RATINGS

| Rating | Symbol | 2N4921 | 2N4922 | 2N4923 | Unit |
|---|----------------|-------------|--------|--------|------------------------------|
| Collector-Emitter Voltage | V_{CEO} | 40 | 60 | 80 | Vdc |
| Collector-Base Voltage | V_{CB} | 40 | 60 | 80 | Vdc |
| Emitter-Base Voltage | V_{EB} | 5.0 | | | Vdc |
| Collector Current — Continuous (1) | I_C | 1.0 3.0 | | | A dc |
| Base Current — Continuous | I_B | 1.0 | | | A dc |
| Total Power Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C | P_D | 30 0.24 | | | Watts W/ $^\circ\text{C}$ |
| Operating & Storage Junction Temperature Range | T_J, T_{stg} | -65 to +150 | | | $^\circ\text{C}$ |

THERMAL CHARACTERISTICS (2)

| Characteristic | Symbol | Max | Unit |
|--------------------------------------|---------------|------|--------------------|
| Thermal Resistance, Junction to Case | θ_{JC} | 4.16 | $^\circ\text{C/W}$ |

(1) The 1.0 Amp maximum I_C value is based upon JEDEC current gain requirements. The 3.0 Amp maximum value is based upon actual current handling capability of the device (see Figures 5 and 6).

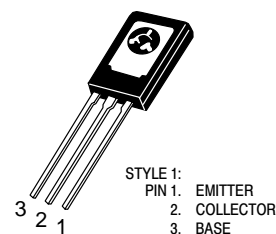
(2) Recommend use of thermal compound for lowest thermal resistance.

*Indicates JEDEC Registered Data.

**2N4921
thru
2N4923 ***

*ON Semiconductor Preferred Device

**1 AMPERE
GENERAL-PURPOSE
POWER TRANSISTORS
40-80 VOLTS
30 WATTS**



**CASE 77-09
TO-225AA TYPE**

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

2N4921 thru 2N4923

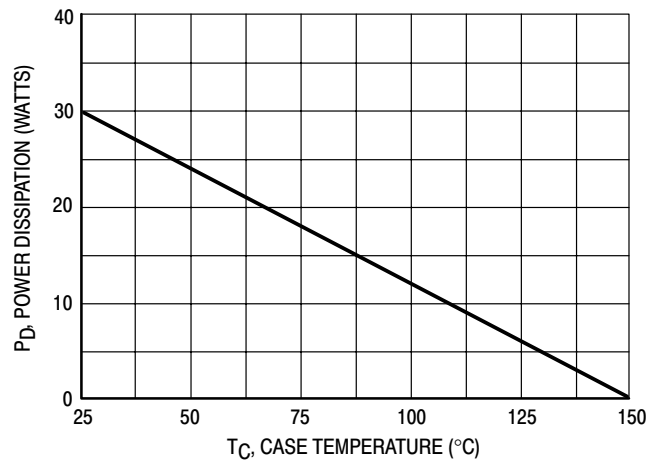


Figure 1. Power Derating

Safe Area Curves are indicated by Figure 5. All limits are applicable and must be observed.

2N4921 thru 2N4923

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

| Characteristic | Symbol | Min | Max | Unit |
|--|-----------------------|----------------|-------------------|------|
| OFF CHARACTERISTICS | | | | |
| Collector–Emitter Sustaining Voltage (3) (I _C = 0.1 Adc, I _B = 0) | V _{CEO(sus)} | 40 60 80 | — | Vdc |
| Collector Cutoff Current (V _{CE} = 20 Vdc, I _B = 0) (V _{CE} = 30 Vdc, I _B = 0) (V _{CE} = 40 Vdc, I _B = 0) | I _{CEO} | — — — | 0.5 0.5 0.5 | mAdc |
| Collector Cutoff Current (V _{CE} = Rated V _{CEO} , V _{EB(off)} = 1.5 Vdc) (V _{CE} = Rated V _{CEO} , V _{EB(off)} = 1.5 Vdc, T _C = 125°C) | I _{CEX} | — — | 0.1 0.5 | mAdc |
| Collector Cutoff Current (V _{CB} = Rated V _{CB} , I _E = 0) | I _{CBO} | — | 0.1 | mAdc |
| Emitter Cutoff Current (V _{EB} = 5.0 Vdc, I _C = 0) | I _{EBO} | — | 1.0 | mAdc |

ON CHARACTERISTICS

| | | | | |
|---|----------------------|----------------|---------------|-----|
| DC Current Gain (3) (I _C = 50 mAdc, V _{CE} = 1.0 Vdc) (I _C = 500 mAdc, V _{CE} = 1.0 Vdc) (I _C = 1.0 Adc, V _{CE} = 1.0 Vdc) | h _{FE} | 40 30 10 | — 150 — | — |
| Collector–Emitter Saturation Voltage (3) (I _C = 1.0 Adc, I _B = 0.1 Adc) | V _{CE(sat)} | — | 0.6 | Vdc |
| Base–Emitter Saturation Voltage (3) (I _C = 1.0 Adc, I _B = 0.1 Adc) | V _{BE(sat)} | — | 1.3 | Vdc |
| Base–Emitter On Voltage (3) (I _C = 1.0 Adc, V _{CE} = 1.0 Vdc) | V _{BE(on)} | — | 1.3 | Vdc |

SMALL–SIGNAL CHARACTERISTICS

| | | | | |
|---|-----------------|-----|-----|-----|
| Current–Gain — Bandwidth Product (I _C = 250 mAdc, V _{CE} = 10 Vdc, f = 1.0 MHz) | f _T | 3.0 | — | MHz |
| Output Capacitance (V _{CB} = 10 Vdc, I _E = 0, f = 100 kHz) | C _{ob} | — | 100 | pF |
| Small–Signal Current Gain (I _C = 250 mAdc, V _{CE} = 10 Vdc, f = 1.0 kHz) | h _{fe} | 25 | — | — |

(3) Pulse Test: PW ≈ 300 μs, Duty Cycle ≈ 2.0%.

*Indicates JEDEC Registered Data.

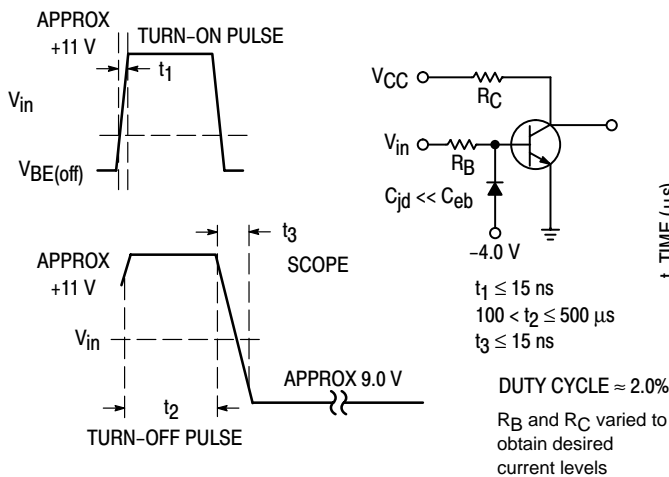


Figure 2. Switching Time Equivalent Circuit

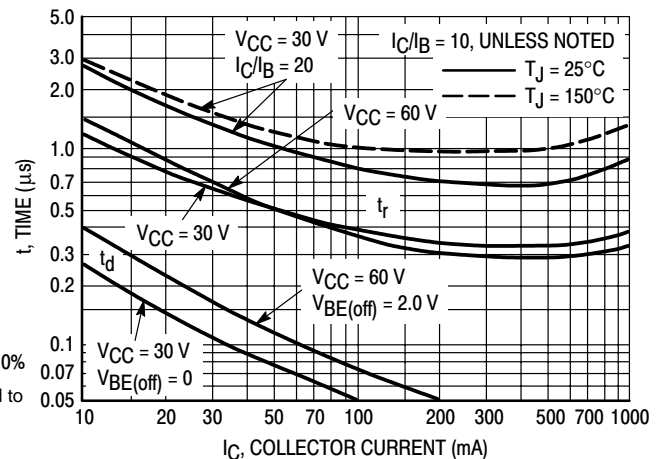


Figure 3. Turn-On Time

2N4921 thru 2N4923

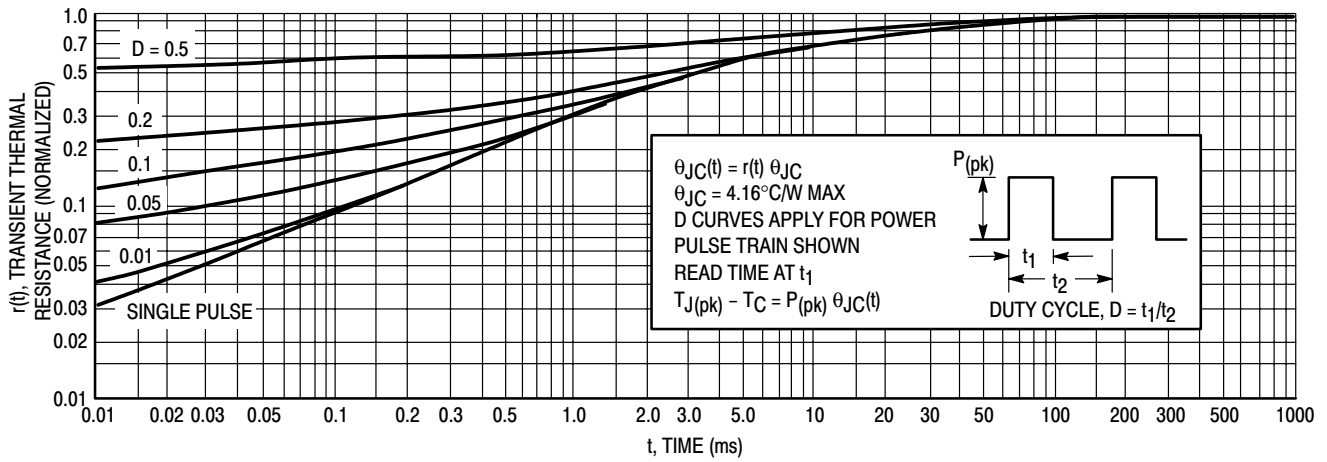


Figure 4. Thermal Response

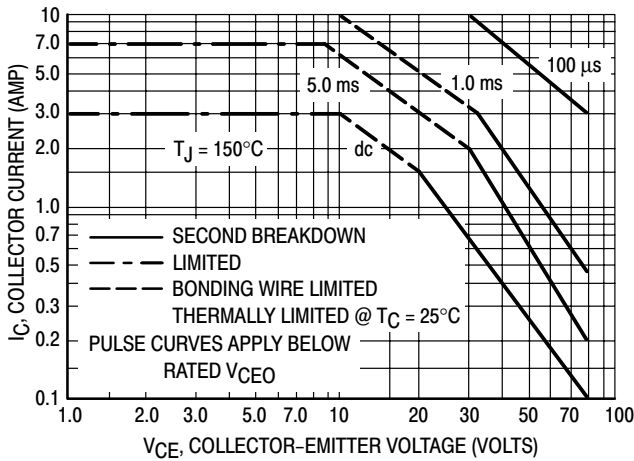


Figure 5. Active-Region Safe Operating Area

There are two limitations on the power handling ability of a transistor: average junction temperature and second breakdown. Safe operating area curves indicate $I_C - V_{CE}$ operation i.e., the transistor must not be subjected to greater dissipation than the curves indicate.

The data of Figure 5 is based on $T_{J(pk)} = 150^{\circ}\text{C}$; T_C is variable depending on conditions. Second breakdown pulse limits are valid for duty cycles to 10% provided $T_{J(pk)} \leq 150^{\circ}\text{C}$. At high case temperatures, thermal limitations will reduce the power that can be handled to values less than the limitations imposed by second breakdown.

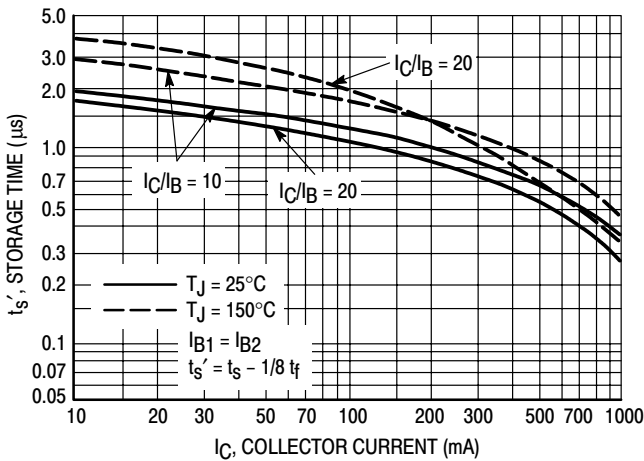


Figure 6. Storage Time

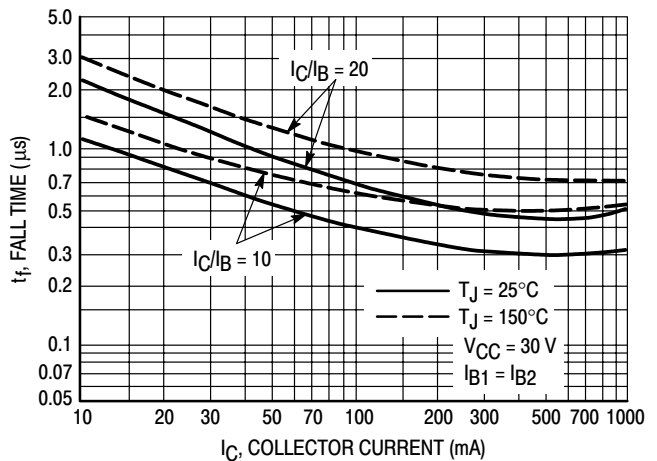


Figure 7. Fall Time

2N4921 thru 2N4923

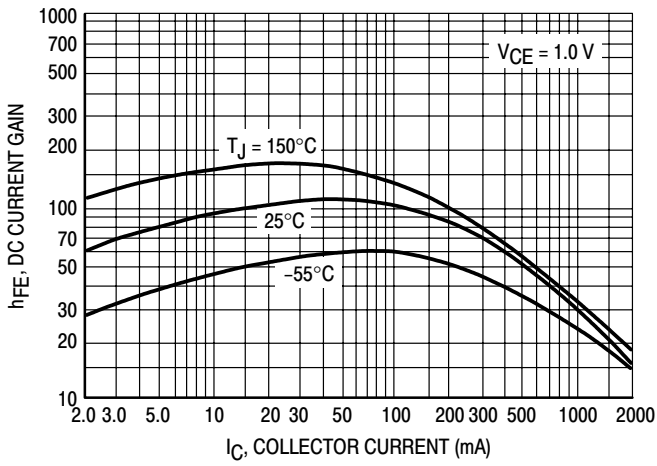


Figure 8. Current Gain

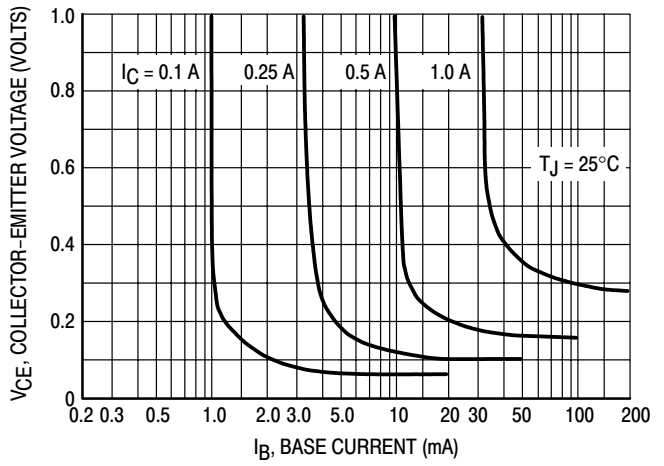


Figure 9. Collector Saturation Region

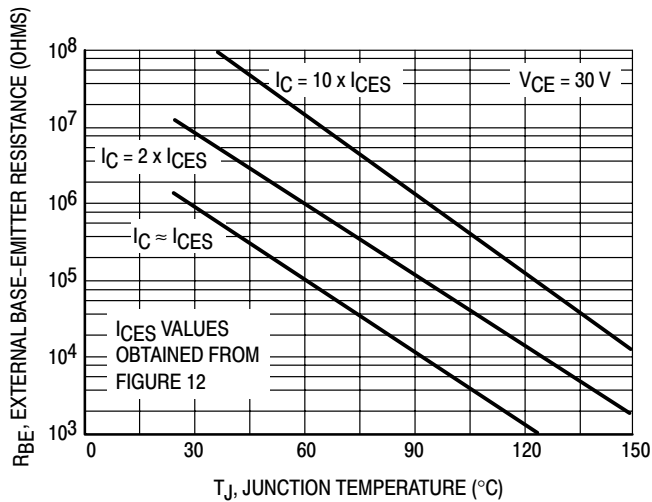


Figure 10. Effects of Base-Emitter Resistance

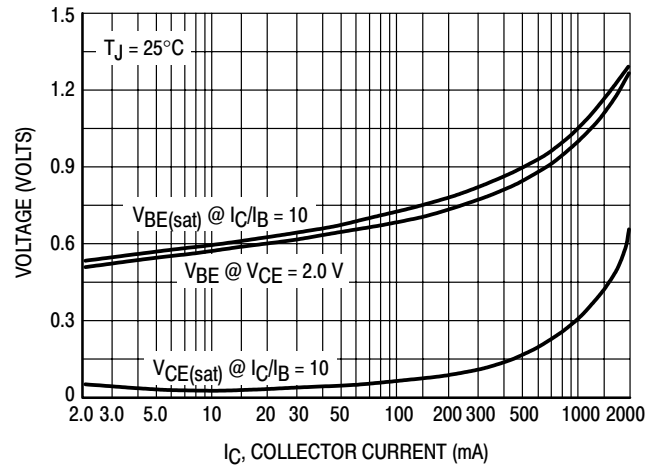


Figure 11. "On" Voltage

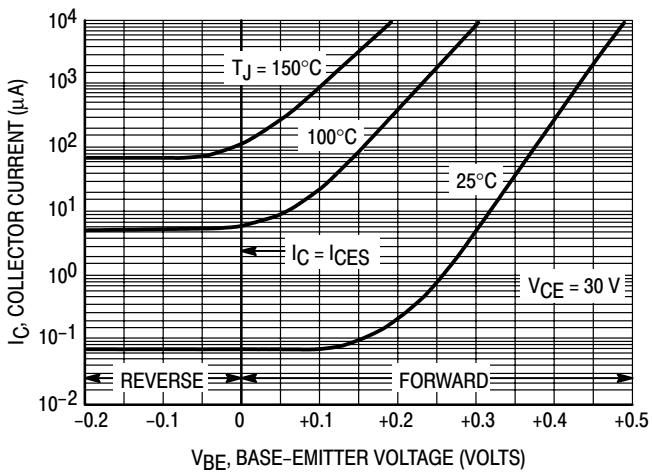


Figure 12. Collector Cut-Off Region

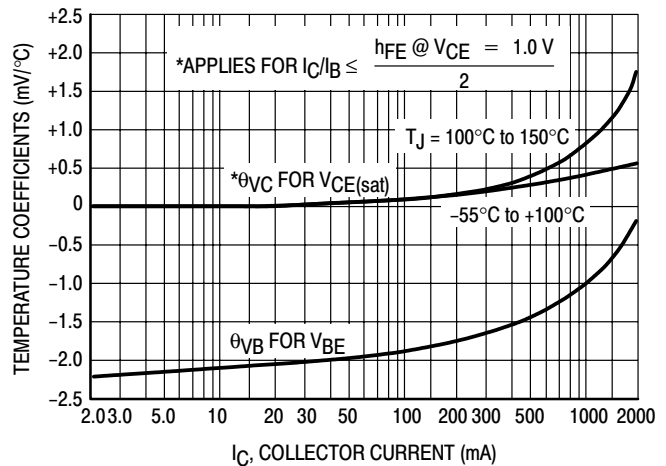
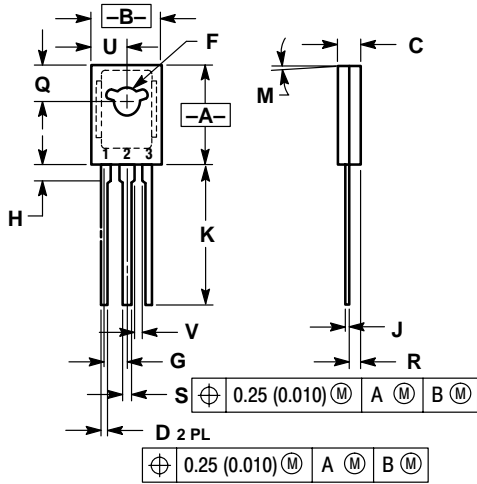


Figure 13. Temperature Coefficients

2N4921 thru 2N4923

PACKAGE DIMENSIONS

CASE 77-08 TO-225AA TYPE ISSUE V



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES | | MILLIMETERS | |
|-----|-----------|-------|-------------|-------|
| | MIN | MAX | MIN | MAX |
| A | 0.425 | 0.435 | 10.80 | 11.04 |
| B | 0.295 | 0.305 | 7.50 | 7.74 |
| C | 0.095 | 0.105 | 2.42 | 2.66 |
| D | 0.020 | 0.026 | 0.51 | 0.66 |
| F | 0.115 | 0.130 | 2.93 | 3.30 |
| G | 0.094 BSC | | 2.39 BSC | |
| H | 0.050 | 0.095 | 1.27 | 2.41 |
| J | 0.015 | 0.025 | 0.39 | 0.63 |
| K | 0.575 | 0.655 | 14.61 | 16.63 |
| M | 5° TYP | | 5° TYP | |
| Q | 0.148 | 0.158 | 3.76 | 4.01 |
| R | 0.045 | 0.055 | 1.15 | 1.39 |
| S | 0.025 | 0.035 | 0.64 | 0.88 |
| U | 0.145 | 0.155 | 3.69 | 3.93 |
| V | 0.040 | --- | 1.02 | --- |

STYLE 1:

- PIN 1. EMITTER
- COLLECTOR
- BASE

Notes

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