

## Features

- Halogen Free Available Upon Request By Adding Suffix "-HF"
- Moisture Sensitivity Level 1
- Epoxy Meets UL 94 V-0 Flammability Rating
- Lead Free Finish/RoHS Compliant ("P" Suffix Designates RoHS Compliant. See Ordering Information)

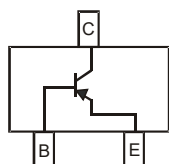
## Maximum Ratings @ 25°C Unless Otherwise Specified

- Operating Junction Temperature Range: -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C
- Thermal Resistance: 357°C/W Junction to Ambient

| Parameter                 | Symbol    | Rating | Unit |
|---------------------------|-----------|--------|------|
| Collector-Base Voltage    | $V_{CBO}$ | -60    | V    |
| Collector-Emitter Voltage | $V_{CEO}$ | -60    | V    |
| Emitter-Base Voltage      | $V_{EBO}$ | -5     | V    |
| Collector Current         | $I_C$     | -600   | mA   |
| Peak Collector Current    | $I_{CM}$  | -800   | mA   |
| Power Dissipation         | $P_D$     | 350    | mW   |

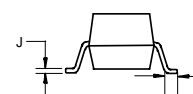
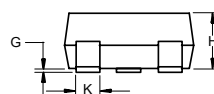
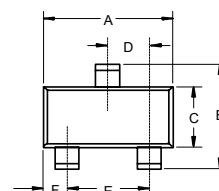
**Marking: 2F**

## Internal Structure



# PNP General Purpose Amplifier

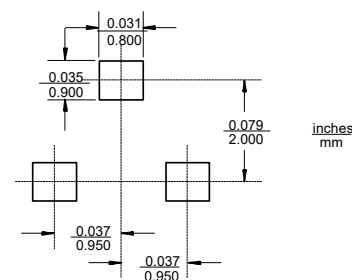
## SOT-23



### DIMENSIONS

| DIM | INCHES |       | MM   |      | NOTE |
|-----|--------|-------|------|------|------|
|     | MIN    | MAX   | MIN  | MAX  |      |
| A   | 0.110  | 0.120 | 2.80 | 3.04 |      |
| B   | 0.083  | 0.104 | 2.10 | 2.64 |      |
| C   | 0.047  | 0.055 | 1.20 | 1.40 |      |
| D   | 0.034  | 0.041 | 0.85 | 1.05 |      |
| E   | 0.067  | 0.083 | 1.70 | 2.10 |      |
| F   | 0.018  | 0.024 | 0.45 | 0.60 |      |
| G   | 0.0004 | 0.006 | 0.01 | 0.15 |      |
| H   | 0.035  | 0.043 | 0.90 | 1.10 |      |
| J   | 0.003  | 0.007 | 0.08 | 0.18 |      |
| K   | 0.014  | 0.020 | 0.35 | 0.51 |      |
| L   | 0.007  | 0.020 | 0.20 | 0.50 |      |

### Suggested Solder Pad Layout



## Electrical Characteristics @ 25°C Unless Otherwise Specified

| Parameter                            | Symbol        | Min | Typ | Max  | Units   | Conditions                                                |
|--------------------------------------|---------------|-----|-----|------|---------|-----------------------------------------------------------|
| Collector-Base Breakdown Voltage*    | $V_{(BR)CBO}$ | -60 |     |      | V       | $I_C = -10\mu A, I_E = 0$                                 |
| Collector-Emitter Breakdown Voltage  | $V_{(BR)CEO}$ | -60 |     |      | V       | $I_C = -10mA, I_B = 0$                                    |
| Emitter-Base Breakdown Voltage       | $V_{(BR)EBO}$ | -5  |     |      | V       | $I_E = -10\mu A, I_C = 0$                                 |
| Collector-Base Cutoff Current        | $I_{CBO}$     |     |     | -20  | nA      | $V_{CB} = -50V, I_E = 0$                                  |
|                                      |               |     |     | -10  | $\mu A$ | $V_{CB} = -50V, I_E = 0, T_A = 150^\circ C$               |
| Base Cutoff Current                  | $I_{BL}$      |     |     | -50  | nA      | $V_{CE} = -30V, V_{BE} = -0.5V$                           |
| Collector Cutoff Current             | $I_{CEX}$     |     |     | -50  | nA      | $V_{CE} = -30V, V_{BE} = -0.5V$                           |
| DC Current Gain*                     | $h_{FE(1)}$   | 75  |     |      |         | $V_{CE} = -10V, I_C = -0.1mA$                             |
|                                      | $h_{FE(2)}$   | 100 |     |      |         | $V_{CE} = -10V, I_C = -1mA$                               |
|                                      | $h_{FE(3)}$   | 100 |     |      |         | $V_{CE} = -10V, I_C = -10mA$                              |
|                                      | $h_{FE(4)}$   | 100 |     | 300  |         | $V_{CE} = -10V, I_C = -150mA$                             |
|                                      | $h_{FE(5)}$   | 50  |     |      |         | $V_{CE} = -10V, I_C = -500mA$                             |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ |     |     | -0.4 | V       | $I_C = -150mA, I_B = -15mA$                               |
|                                      |               |     |     | -1.6 | V       | $I_C = -500mA, I_B = -50mA$                               |
| Base-Emitter Saturation Voltage      | $V_{BE(sat)}$ |     |     | -1.3 | V       | $I_C = -150mA, I_B = -15mA$                               |
|                                      |               |     |     | -2.6 | V       | $I_C = -500mA, I_B = -50mA$                               |
| Transition Frequency                 | $f_T$         | 200 |     |      | MHz     | $V_{CE} = -20V, I_C = -50mA, f = 100MHz$                  |
| Output Capacitance                   | $C_{cbo}$     |     |     | 8    | pF      | $V_{CB} = -10V, I_E = 0, f = 1MHz,$                       |
| Input Capacitance                    | $C_{ibo}$     |     |     | 30   | pF      | $V_{EB} = -2V, I_C = 0, f = 1MHz,$                        |
| Turn on Time                         | $t_{on}$      |     |     | 45   | ns      | $V_{CC} = -30V, I_C = -150mA$<br>$I_{B1} = -15mA$         |
| Delay Time                           | $t_d$         |     |     | 10   | ns      |                                                           |
| Rise Time                            | $t_r$         |     |     | 40   | ns      |                                                           |
| Turn off Time                        | $t_{off}$     |     |     | 100  | ns      | $V_{CC} = -6V, I_C = -150mA$<br>$I_{B1} = I_{B2} = -15mA$ |
| Storage Time                         | $t_s$         |     |     | 80   | ns      |                                                           |
| Fall Time                            | $t_f$         |     |     | 30   | ns      |                                                           |

Pulse Width  $\leq 300\mu s$ , Duty Cycle  $\leq 2.0\%$

## Curve Characteristics

Fig. 1 - Static Characteristics

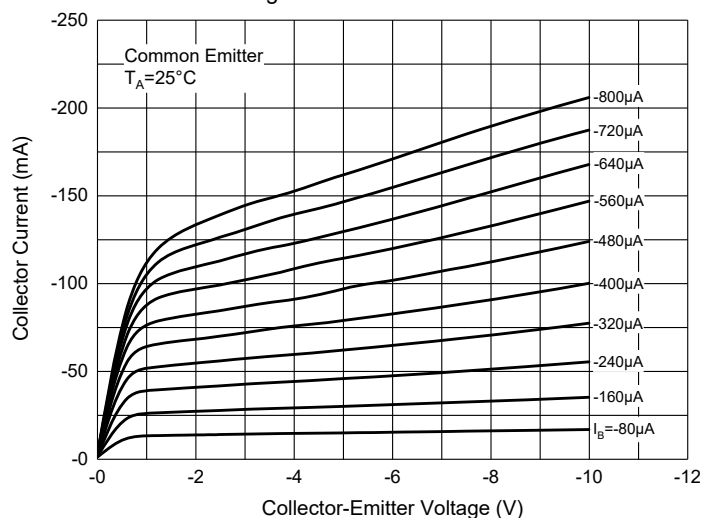


Fig. 2 - DC Current Gain Characteristics

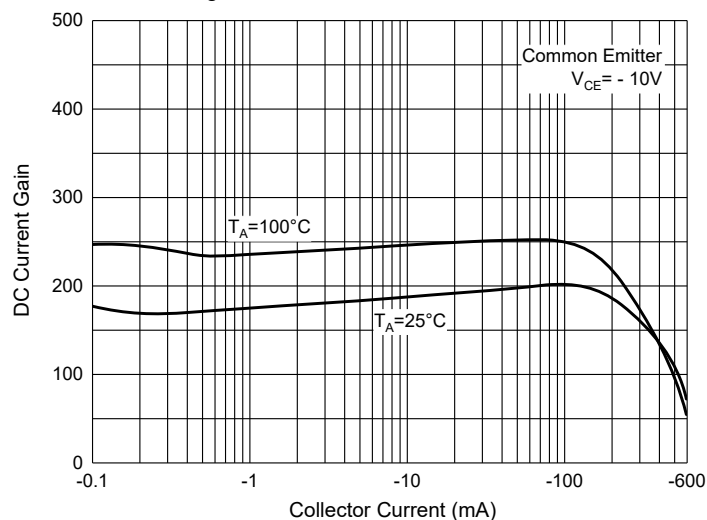


Fig. 3 - Collector-Emitter Saturation Voltage Characteristics

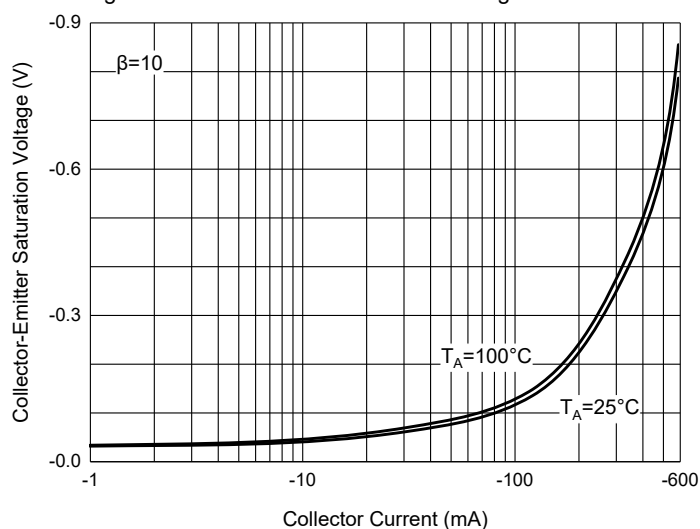


Fig. 4 - Base-Emitter Saturation Voltage Characteristics

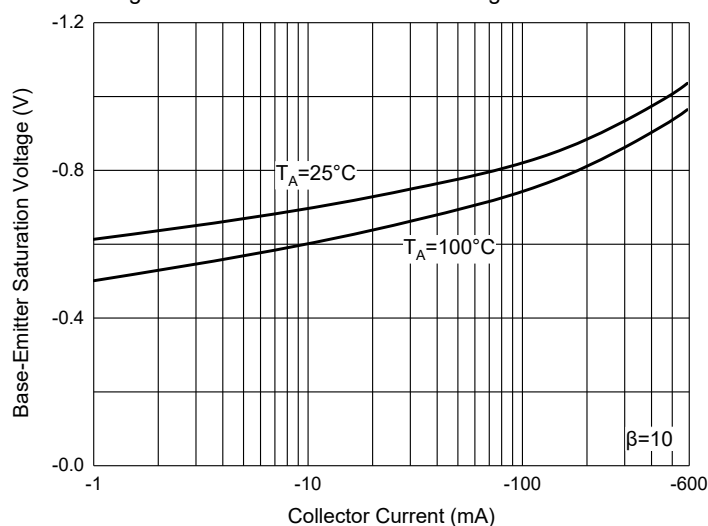


Fig. 5 - Base-Emitter Voltage Characteristics

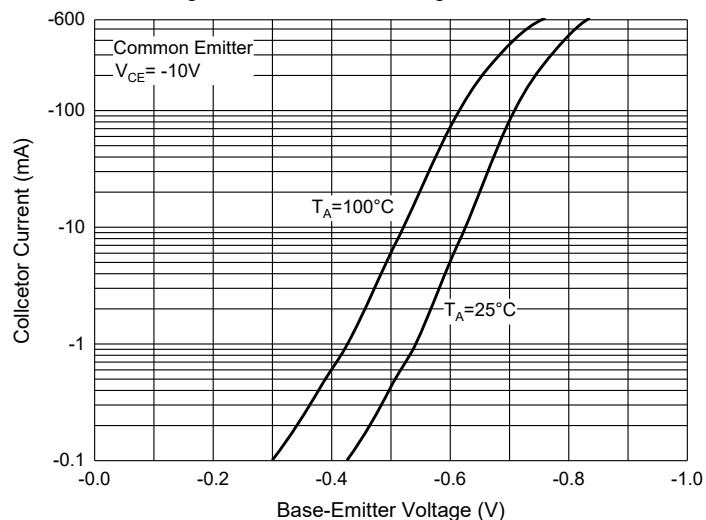
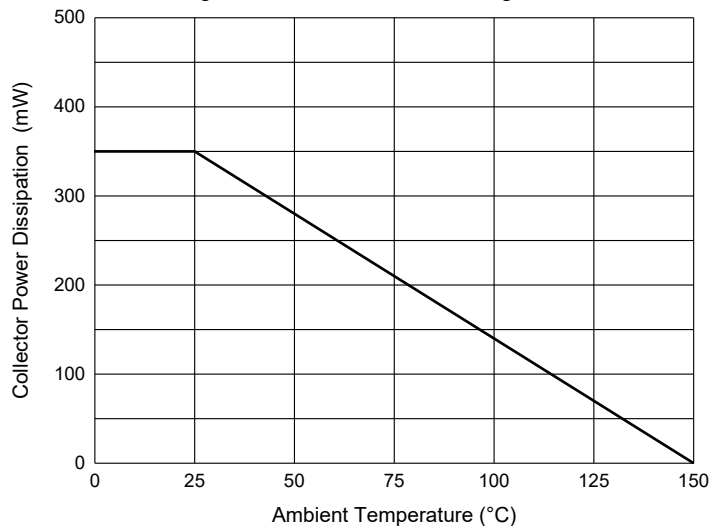


Fig. 6 - Collector Power Derating Curve



## Ordering Information

| Device         | Packing               |
|----------------|-----------------------|
| Part Number-TP | Tape&Reel: 3Kpcs/Reel |

Note : Adding "-HF" Suffix For Halogen Free, eg. Part Number-TP-HF

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