## Features

- Halogen Free. “Green” Device (Note 1)
- 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)

# NPN General Purpose Amplifier

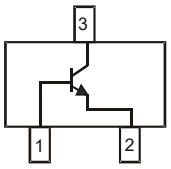
## Maximum Ratings @ 25°C Unless Otherwise Specified

- 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
- Thermal Resistance: 185°C/W Junction to Case

| Parameter | Symbol | Rating | Unit |
|---|---|---|---|
| Collector-Base Voltage | $V_{CBO}$ | 60 | V |
| Collector-Emitter Voltage | $V_{CEO}$ | 40 | V |
| Emitter-Base Voltage | $V_{EBO}$ | 6 | V |
| Collector Current | $I_C$ | 200 | mA |
| Collector Power Dissipation | $P_C$ | 350 | mW |

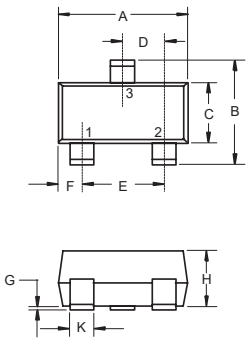
Note: 1. Halogen free "Green” products are defined as those which contain <900ppm bromine, <900ppm chlorine (<1500ppm total Br + Cl) and <1000ppm antimony compounds.

### Internal Structure



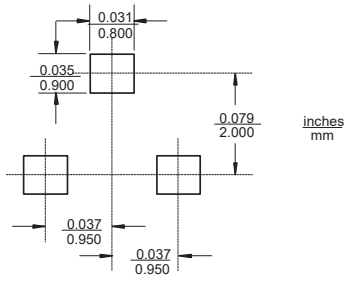

1.BASE
2.EMITTER
3.COLLECTOR

## 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**

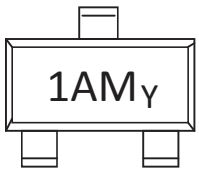


**Electrical Characteristics @ 25°C Unless Otherwise Specified**

| Parameter | Symbol | Min | Typ | Max | Units | Conditions |
|---|---|---|---|---|---|---|
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | 60 | | | V | $I_C$=10μA, $I_E$=0 |
| Collector-Emitter Breakdown Voltage* | $V_{(BR)CEO}$ | 40 | | | V | $I_C$=1mA, $I_B$=0 |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | 6 | | | V | $I_E$=10μA, $I_C$=0 |
| Collector-Base Cutoff Current | $I_{CBO}$ | | | 50 | nA | $V_{CB}$=30V, $I_E$=0 |
| Collector Cutoff Current | $I_{CEX}$ | | | 50 | nA | $V_{CE}$=30V, $V_{BE}$=3V |
| DC Current Gain* | $h_{FE(1)}$ | 40 | | | | $V_{CE}$=1V, $I_C$=0.1mA |
| | $h_{FE(2)}$ | 70 | | | | $V_{CE}$=1V, $I_C$=1mA |
| | $h_{FE(3)}$ | 100 | | 300 | | $V_{CE}$=1V, $I_C$=10mA |
| | $h_{FE(4)}$ | 60 | | | | $V_{CE}$=1V, $I_C$=50mA |
| | $h_{FE(5)}$ | 30 | | | | $V_{CE}$=1V, $I_C$=100mA |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | | | 0.2 | V | $I_C$=10mA, $I_B$=1mA |
| | | | | 0.3 | V | $I_C$=50mA, $I_B$=5mA |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | 0.65 | | 0.85 | V | $I_C$=10mA, $I_B$=1mA |
| | | | | 0.95 | V | $I_C$=50mA, $I_B$=5mA |
| Transition Frequency | $f_T$ | 300 | | | MHz | $V_{CE}$=20V, $I_C$=10mA, f=100MHz |
| Output Capacitance | $C_{cbo}$ | | | 4.0 | pF | $V_{CB}$=5V, $I_E$=0, f=1MHz, |
| Input Capacitance | $C_{ibo}$ | | | 8.0 | pF | $V_{BE}$=0.5V, $I_C$=0, f=1MHz, |
| Noise Figure | NF | | | 5 | dB | $V_{CE}$=5V, $I_C$=0.1mA<br>$R_S$=1KΩ, f=10Hz to 15.7KHz |
| Delay Time | $t_d$ | | | 35 | ns | $V_{CC}$=3V, $I_C$=10mA |
| Rise Time | $t_r$ | | | 35 | ns | $V_{BE}$=0.5V, $I_{B1}$=1mA |
| Storage Time | $t_s$ | | | 200 | ns | $V_{CC}$=3V, $I_C$=10mA |
| Fall Time | $t_f$ | | | 50 | ns | $I_{B1}$=$I_{B2}$=1mA |

*Pulse Width ≤ 300μs, Duty Cycle≤2.0%

## Marking Information




1AM=Product Type Marking Code
Y=Date Code Marking

Date code Key（2 years a cycle）

| Year | 2011 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Code | J | O | L | C | K | B | P | D | M | E | G | F |

| Year | 2012 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
| Code | W | N | Y | T | R | H | A | I | U | X | Z | S |

## Curve Characteristics

Fig. 1 - Static Characteristics

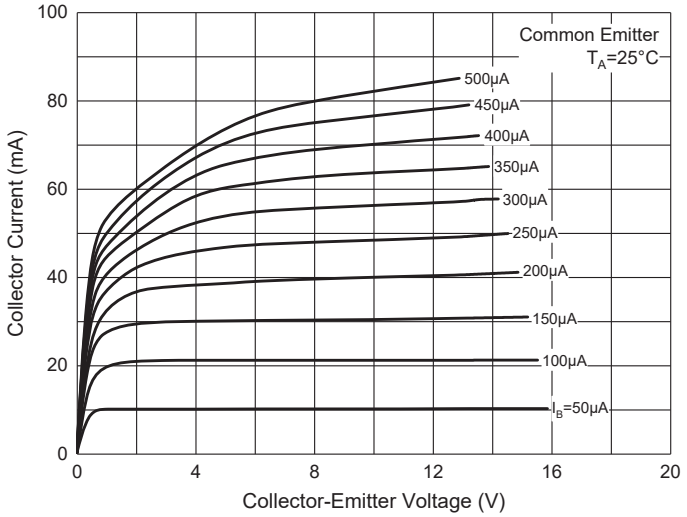



Fig. 2 - DC Current Gain Characteristics

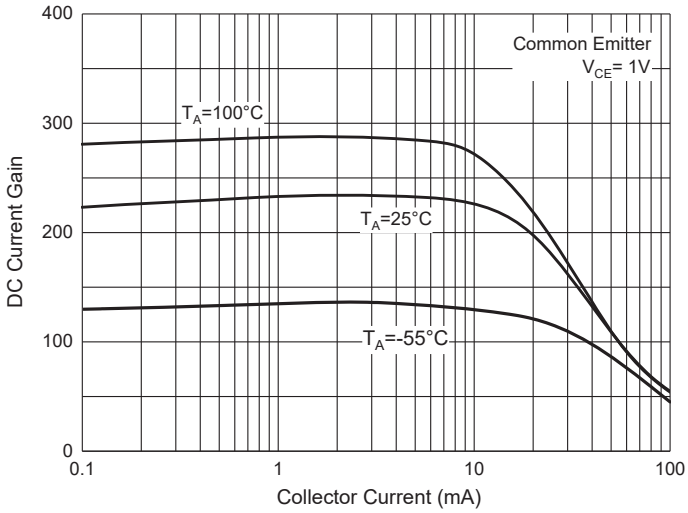



Fig. 4 - Collector-Emitter Saturation Voltage Characteristics

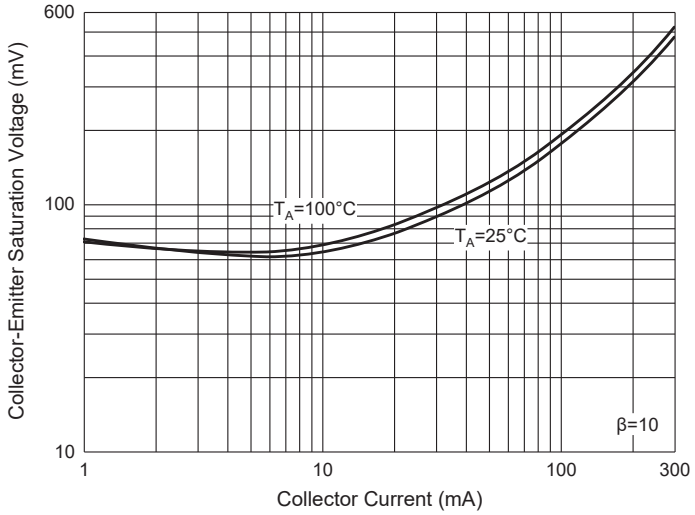



Fig. 4 - Base-Emitter Saturation Voltage Characteristics

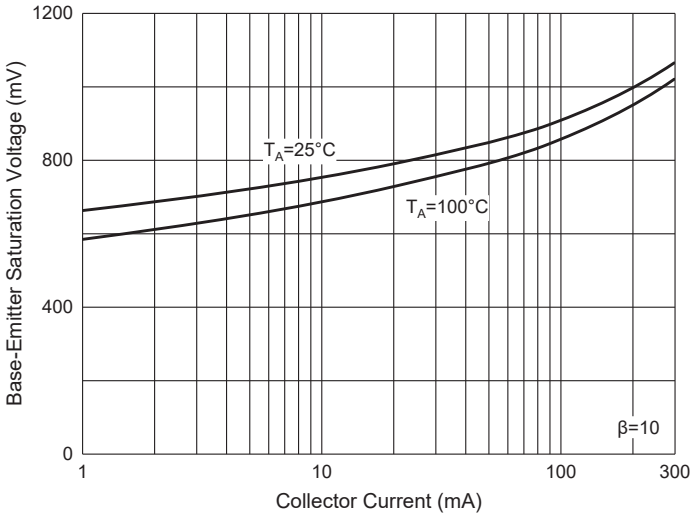



Fig. 5 - Base-Emitter Voltage Characteristics

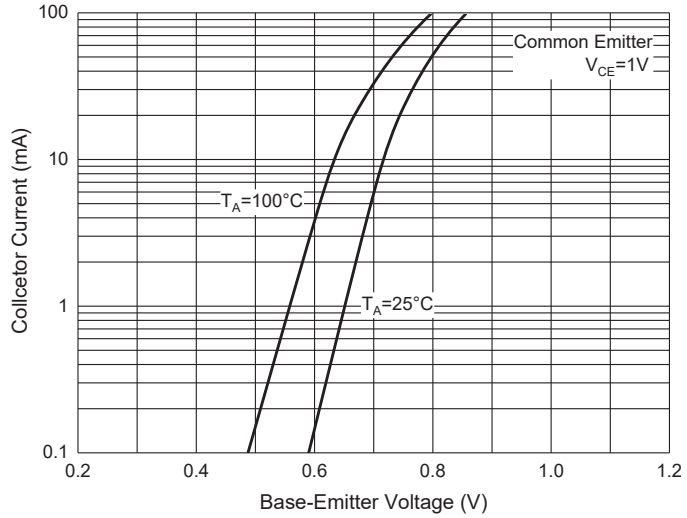
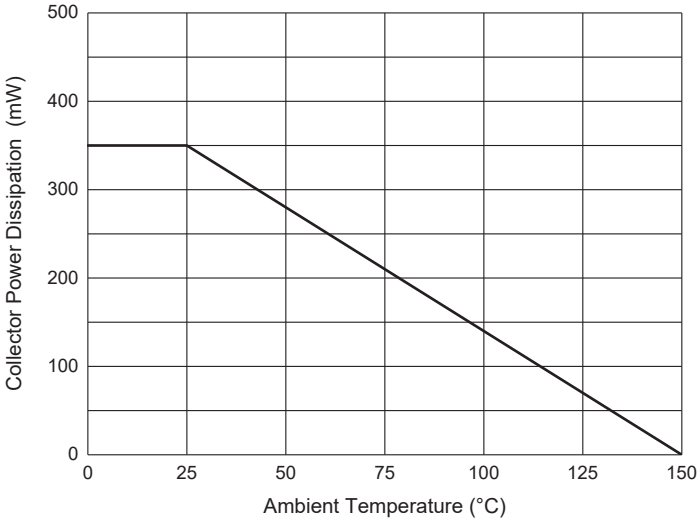



Fig. 6 - Collector Power Derating Curve



## Ordering Information

| Device | Packing |
|---|---|
| Part Number-TP | Tape&Reel: 3Kpcs/Reel |
| Part Number-13P | Tape&Reel: 10Kpcs/Reel |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