

## Features

- Epitaxial Planar Die Construction
- Complementary NPN Type Available MMST3904
- 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)

## Maximum Ratings @ 25°C Unless Otherwise Specified

- Operating Junction Temperature Range: -55°C to +150°C
- Storage Temperature Range: -55°C to +150°C

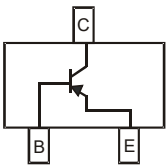
| Parameter                                  | Symbol    | Rating | Unit |
|--|-----------|--------|------|
| Collector-Base Voltage                     | $V_{CBO}$ | -10    | V    |
| Collector-Emitter Voltage                  | $V_{CEO}$ | -10    | V    |
| Emitter-Base Voltage                       | $V_{EBO}$ | -5     | V    |
| Collector Current <sup>(2)</sup>           | $I_C$     | -100   | mA   |
| Collector Power Dissipation <sup>(2)</sup> | $P_C$     | 200    | 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.

2. Valid provided that terminals are kept at ambient temperature.

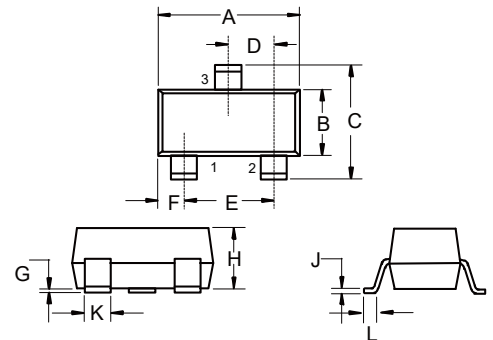
Marking: K5N

## Internal Structure



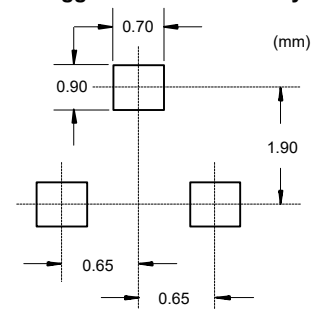
# PNP Small Signal Transistors

## SOT-323



| DIM | INCHES |       | MM   |      | NOTE |
|-----|--------|-------|------|------|------|
|     | MIN    | MAX   | MIN  | MAX  |      |
| A   | 0.071  | 0.087 | 1.80 | 2.20 |      |
| B   | 0.045  | 0.053 | 1.15 | 1.35 |      |
| C   | 0.083  | 0.096 | 2.10 | 2.45 |      |
| D   | 0.026  |       | 0.65 |      | TYP. |
| E   | 0.047  | 0.055 | 1.20 | 1.40 |      |
| F   | 0.012  | 0.016 | 0.30 | 0.40 |      |
| G   | 0.000  | 0.004 | 0.00 | 0.10 |      |
| H   | 0.035  | 0.044 | 0.90 | 1.10 |      |
| J   | 0.002  | 0.010 | 0.05 | 0.25 |      |
| K   | 0.006  | 0.016 | 0.15 | 0.40 |      |
| L   | 0.010  | 0.018 | 0.26 | 0.46 |      |

## Suggested Solder Pad Layout



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

| Parameter   | Symbol        | Min   | Typ | Max   | Units         | Conditions   |
|---|---------------|-------|-----|-------|---------------|--|
| Collector-Base Breakdown Voltage <sup>(3)</sup>     | $V_{(BR)CBO}$ | -40   |     |       | V             | $I_C=-10\mu A, I_E=0$                              |
| Collector-Emitter Breakdown Voltage <sup>(3)</sup>  | $V_{(BR)CEO}$ | -40   |     |       | V             | $I_C=-1mA, I_B=0$                                  |
| Emitter-Base Breakdown Voltage <sup>(3)</sup>       | $V_{(BR)EBO}$ | -5    |     |       | V             | $I_E=-10\mu A, I_C=0$                              |
| Collector Cutoff Current <sup>(3)</sup>             | $I_{CEX}$     |       |     | -50   | nA            | $V_{CE}=-30V, V_{EB(OFF)}=-3V$                     |
| Base Cutoff Current <sup>(3)</sup>                  | $I_{BL}$      |       |     | -50   | nA            | $V_{CE}=-30V, V_{EB(OFF)}=-3V$                     |
| DC Current Gain <sup>(3)</sup>                      | $h_{FE(1)}$   | 60    |     |       |               | $V_{CE}=-1V, I_C=-0.1mA$                           |
|   | $h_{FE(2)}$   | 80    |     |       |               | $V_{CE}=-1V, I_C=-1mA$                             |
|   | $h_{FE(3)}$   | 100   |     | 300   |               | $V_{CE}=-1V, I_C=-10mA$                            |
|   | $h_{FE(4)}$   | 60    |     |       |               | $V_{CE}=-1V, I_C=-50mA$                            |
|   | $h_{FE(5)}$   | 30    |     |       |               | $V_{CE}=-1V, I_C=-500mA$                           |
| Collector-Emitter Saturation Voltage <sup>(3)</sup> | $V_{CE(sat)}$ |       |     | -0.2  | V             | $I_C=-10mA, I_B=-1mA$                              |
|   |               |       |     | -0.3  | V             | $I_C=-50mA, I_B=-5mA$                              |
| Base-Emitter Saturation Voltage <sup>(3)</sup>      | $V_{BE(sat)}$ | -0.65 |     | -0.85 | V             | $I_C=-10mA, I_B=-1mA$                              |
|   |               |       |     | -0.95 | V             | $I_C=-50mA, I_B=-5mA$                              |
| Output Capacitance                                  | $C_{cbo}$     |       |     | 4.5   | pF            | $V_{CB}=-5V, I_E=0, f=1MHz$                        |
| Input Capacitance                                   | $C_{ibo}$     |       |     | 10    | pF            | $V_{EB}=-0.5V, I_C=0, f=1MHz$                      |
| Input Impedance                                     | $h_{ie}$      | 2     |     | 12    | K $\Omega$    | $V_{CE}=-10V, I_C=-1mA, f=1KHz$                    |
| Voltage Feedback Ratio                              | $h_{re}$      | 0.1   |     | 10    | $\times 10^4$ |  |
| Small Signal Current Gain                           | $h_{fe}$      | 100   |     | 400   |               |  |
| Output Admittance                                   | $h_{oe}$      | 3     |     | 60    | $\mu S$       |  |
| Transition Frequency                                | $f_T$         | 300   |     |       | MHz           |  |
| Noise Figure  | NF            |       |     | 4     | dB            | $V_{CE}=-5V, I_C=-0.1mA$<br>$R_S=1K\Omega, f=1KHz$ |
| Delay Time  | $t_d$         |       |     | 35    | ns            | $V_{CC}=-3V, I_C=-10mA$                            |
| Rise Time   | $t_r$         |       |     | 35    | ns            | $V_{BE(OFF)}=-0.5V, I_{B1}=-1mA$                   |
| Storage Time  | $t_s$         |       |     | 225   | ns            | $V_{CC}=-3V, I_C=-10mA$                            |
| Fall Time   | $t_f$         |       |     | 75    | ns            | $I_{B1}=I_{B2}=-1mA$                               |

 Note: 3.Pulse Width  $\leq 300\mu s$ , Duty Cycle $\leq 2.0\%$

**Curve Characteristics**

Fig. 1 - Static Characteristics

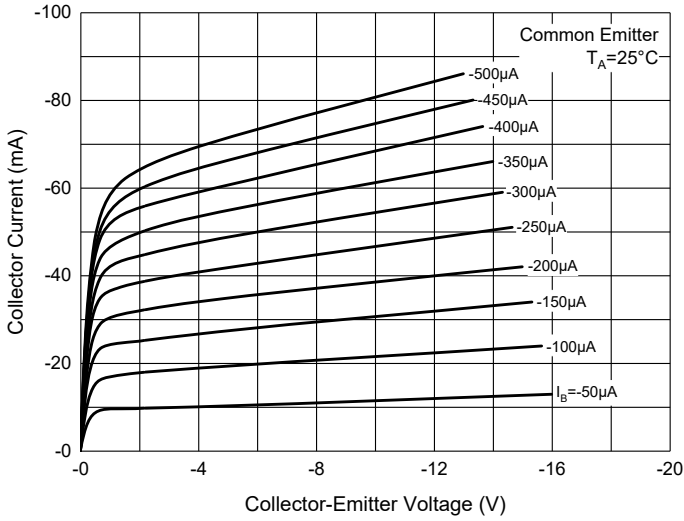


Fig. 2 - DC Current Gain Characteristics

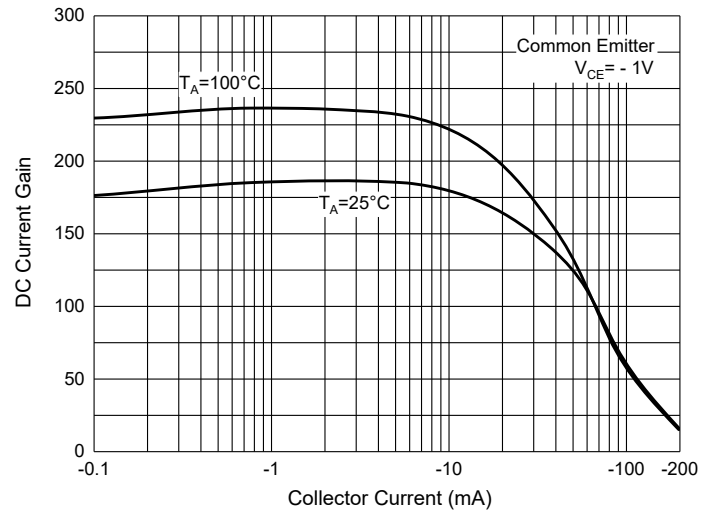


Fig. 3 - Collector-Emitter Saturation Voltage Characteristics

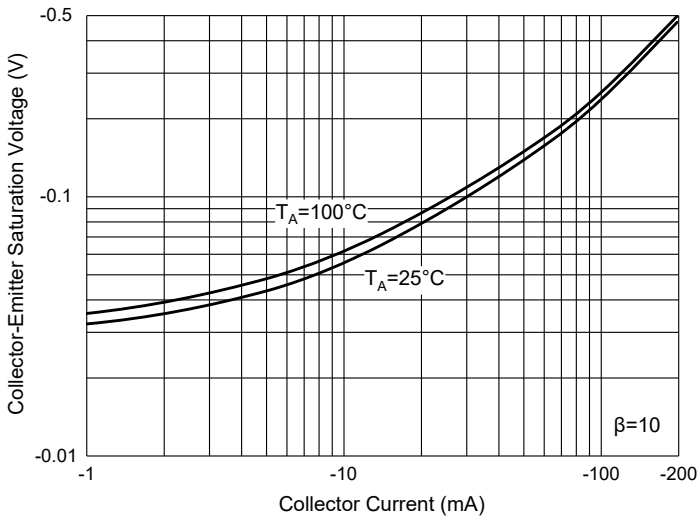


Fig. 4 - Base-Emitter Saturation Voltage Characteristics

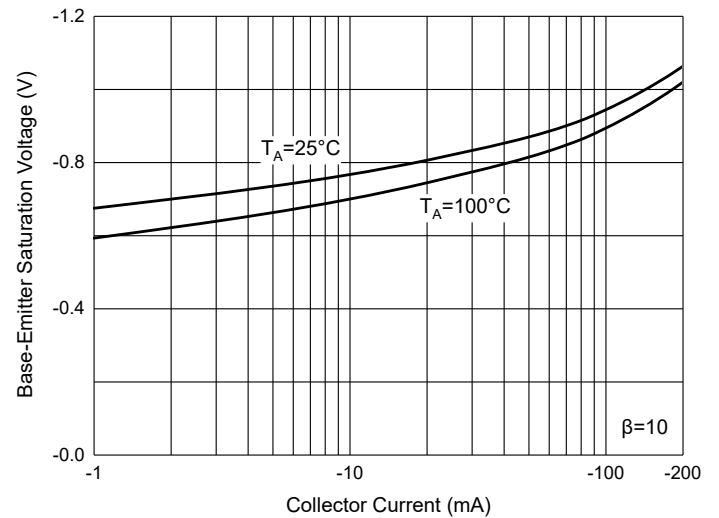


Fig. 5 - Base-Emitter Voltage Characteristics

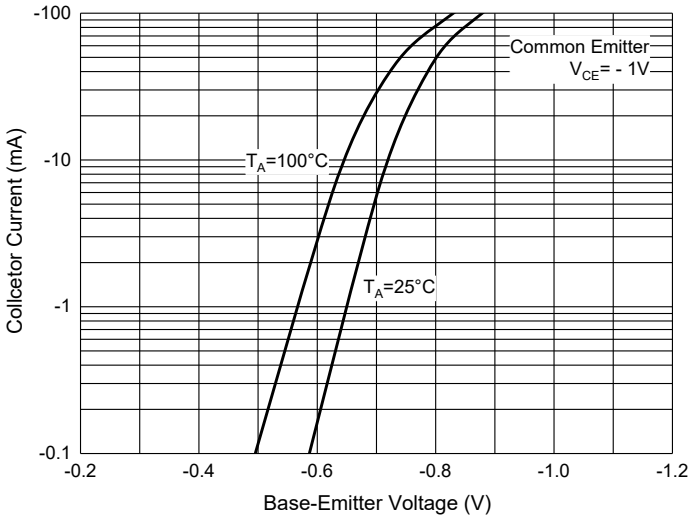
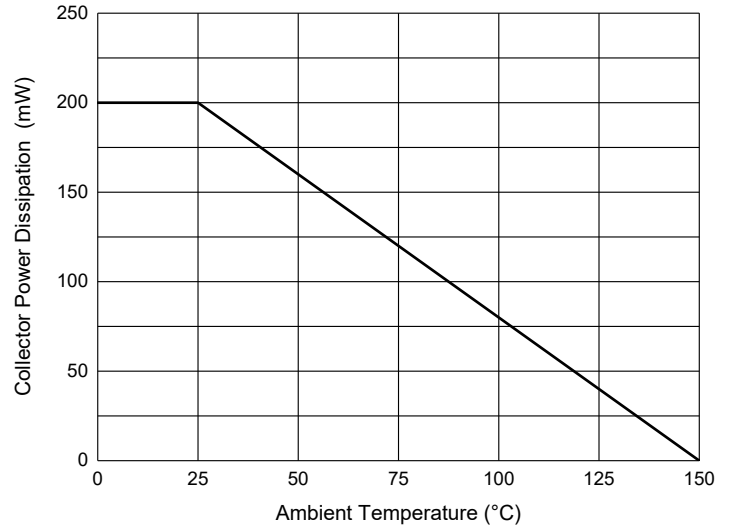


Fig. 6 - Collector Power Derating Curve



## Ordering Information

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

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