

Features

- Complementary Pair: NPN(3904), PNP(3906)
- Ideal for Low Power Amplification and Switching
- Epitaxial Planar Die Construction
- 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

NPN Transistor

| 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 |
| Continuous Collector Current | I_C | 200 | mA |
| Power Dissipation | P_D | 200 | mW |
| Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 625 | °C/W |

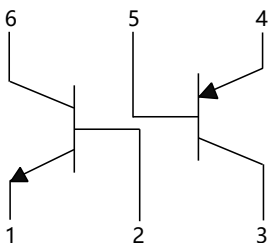
PNP Transistor

| Parameter | Symbol | Rating | Unit |
|--|-----------------|--------|------|
| Collector-Base Voltage | V_{CBO} | -40 | V |
| Collector-Emitter Voltage | V_{CEO} | -40 | V |
| Emitter-Base Voltage | V_{EBO} | -5 | V |
| Continuous Collector Current | I_C | -200 | mA |
| Power Dissipation | P_D | 200 | mW |
| Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 625 | °C/W |

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

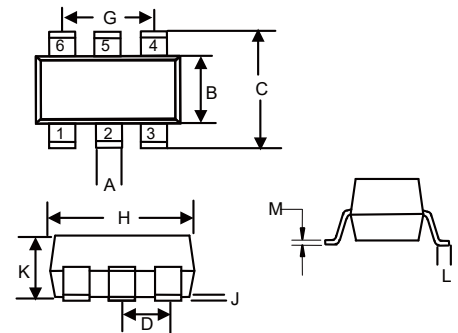
Marking: K46

Internal Structure



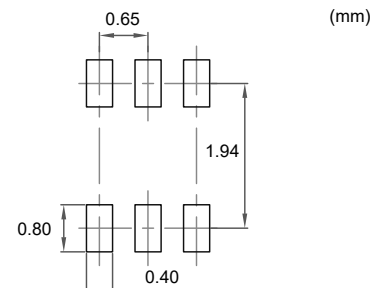
**NPN/PNP
Small Signal Surface
Mount Transistors**

SOT-363



| DIM | DIMENSIONS | | | | NOTE |
|-----|------------|-------|------|------|------|
| | INCHES | | MM | | |
| | MIN | MAX | MIN | MAX | |
| A | 0.006 | 0.014 | 0.15 | 0.35 | |
| B | 0.045 | 0.053 | 1.15 | 1.35 | |
| C | 0.079 | 0.096 | 2.00 | 2.45 | |
| D | 0.026 | | 0.65 | | TYP. |
| G | 0.047 | 0.055 | 1.20 | 1.40 | |
| H | 0.071 | 0.087 | 1.80 | 2.20 | |
| J | ---- | 0.004 | ---- | 0.10 | |
| K | 0.031 | 0.043 | 0.80 | 1.10 | |
| L | 0.010 | 0.018 | 0.26 | 0.46 | |
| M | 0.003 | 0.006 | 0.08 | 0.15 | |

Suggested Solder Pad Layout



Electrical Characteristics @ $T_A=25^\circ\text{C}$ Unless Otherwise Specified
NPN Transistor

| Parameter | Symbol | Min | Typ | Max | Units | Conditions |
|--------------------------------------|---------------|------|-----|------|-------|--|
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | 60 | | | V | $I_C=10\mu\text{A}, I_E=0$ |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | 40 | | | V | $I_C=1\text{mA}, I_B=0$ |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | 6 | | | V | $I_E=10\mu\text{A}, I_C=0$ |
| Collector Cutoff Current | I_{CBO} | | | 50 | nA | $V_{CB}=30\text{V}, I_E=0$ |
| Collector Cutoff Current | I_{CEO} | | | 500 | nA | $V_{CE}=30\text{V}, I_B=0$ |
| Emitter Cutoff Current | I_{EBO} | | | 50 | nA | $V_{EB}=5\text{V}, I_C=0$ |
| DC Current Gain | $h_{FE(1)}$ | 40 | | | | $V_{CE}=1\text{V}, I_C=0.1\text{mA}$ |
| | $h_{FE(2)}$ | 70 | | | | $V_{CE}=1\text{V}, I_C=1\text{mA}$ |
| | $h_{FE(3)}$ | 100 | | 300 | | $V_{CE}=1\text{V}, I_C=10\text{mA}$ |
| | $h_{FE(4)}$ | 60 | | | | $V_{CE}=1\text{V}, I_C=50\text{mA}$ |
| | $h_{FE(5)}$ | 30 | | | | $V_{CE}=1\text{V}, I_C=100\text{mA}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | | | 0.2 | V | $I_C=10\text{mA}, I_B=1\text{mA}$ |
| | | | | 0.3 | V | $I_C=50\text{mA}, I_B=5\text{mA}$ |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | 0.65 | | 0.85 | V | $I_C=10\text{mA}, I_B=1\text{mA}$ |
| | | | | 0.95 | V | $I_C=50\text{mA}, I_B=5\text{mA}$ |
| Transition Frequency | f_T | 300 | | | MHz | $V_{CE}=20\text{V}, I_C=20\text{mA}, f=100\text{MHz}$ |
| Delay Time | t_d | | | 35 | ns | $V_{CC}=3\text{V}, I_C=10\text{mA}, V_{BE}=0.5\text{V}, I_{B1}=1\text{mA}$ |
| Rise Time | t_r | | | 35 | ns | |
| Storage Time | t_s | | | 200 | ns | $V_{CC}=3\text{V}, I_C=10\text{mA}, I_{B1}=I_{B2}=1\text{mA}$ |
| Fall Time | t_f | | | 50 | ns | |
| Output Capacitance | C_{ob} | | | 4 | pF | $V_{CB}=5\text{V}, I_E=0, f=1\text{MHz}$ |
| Noise Figure | N_F | | | 5 | dB | $V_{CE}=5\text{V}, I_C=0.1\text{mA}, f=1\text{KHz}, R_s=1\text{K}\Omega$ |

Electrical Characteristics @ $T_A=25^\circ\text{C}$ Unless Otherwise Specified
PNP Transistor

| Parameter | Symbol | Min | Typ | Max | Units | Conditions |
|--------------------------------------|---------------|-------|-----|-------|-------|--|
| Collector-Base Breakdown Voltage | $V_{(BR)CBO}$ | -40 | | | V | $I_C=-10\mu\text{A}, I_E=0$ |
| Collector-Emitter Breakdown Voltage | $V_{(BR)CEO}$ | -40 | | | V | $I_C=-1\text{mA}, I_B=0$ |
| Emitter-Base Breakdown Voltage | $V_{(BR)EBO}$ | -5 | | | V | $I_E=-10\mu\text{A}, I_C=0$ |
| Collector Cutoff Current | I_{CBO} | | | -50 | nA | $V_{CB}=-30\text{V}, I_E=0$ |
| Emitter Cutoff Current | I_{EBO} | | | -50 | nA | $V_{EB}=-5\text{V}, I_C=0$ |
| DC Current Gain | $h_{FE(1)}$ | 40 | | | | $V_{CE}=-1\text{V}, I_C=-0.1\text{mA}$ |
| | $h_{FE(2)}$ | 70 | | | | $V_{CE}=-1\text{V}, I_C=-1\text{mA}$ |
| | $h_{FE(3)}$ | 100 | | 300 | | $V_{CE}=-1\text{V}, I_C=-10\text{mA}$ |
| | $h_{FE(4)}$ | 60 | | | | $V_{CE}=-1\text{V}, I_C=-50\text{mA}$ |
| | $h_{FE(5)}$ | 30 | | | | $V_{CE}=-1\text{V}, I_C=-100\text{mA}$ |
| Collector-Emitter Saturation Voltage | $V_{CE(sat)}$ | | | -0.25 | V | $I_C=-10\text{mA}, I_B=-1\text{mA}$ |
| | | | | -0.4 | V | $I_C=-50\text{mA}, I_B=-5\text{mA}$ |
| Base-Emitter Saturation Voltage | $V_{BE(sat)}$ | -0.65 | | -0.85 | V | $I_C=-10\text{mA}, I_B=-1\text{mA}$ |
| | | | | -0.95 | V | $I_C=-50\text{mA}, I_B=-5\text{mA}$ |
| Transition Frequency | f_T | 250 | | | MHz | $V_{CE}=-20\text{V}, I_C=-10\text{mA}, f=100\text{MHz}$ |
| Delay Time | t_d | | | 35 | ns | $V_{CC}=-3\text{V}, I_C=-10\text{mA}, V_{BE}=-0.5\text{V}, I_{B1}=-I_{B2}=-1\text{mA}$ |
| Rise Time | t_r | | | 35 | ns | |
| Storage Time | t_s | | | 225 | ns | $V_{CC}=-3\text{V}, I_C=-10\text{mA}, I_{B1}=-I_{B2}=-1\text{mA}$ |
| Fall Time | t_f | | | 75 | ns | |
| Output Capacitance | C_{ob} | | | 4.5 | pF | $V_{CB}=-5\text{V}, I_E=0, f=1\text{MHz}$ |
| Noise Figure | N_F | | | 4 | dB | $V_{CE}=-5\text{V}, I_C=-0.1\text{mA}, f=1\text{KHz}, R_s=1\text{K}\Omega$ |

Curve Characteristics(NPN)

Fig. 1 - Static Characteristics

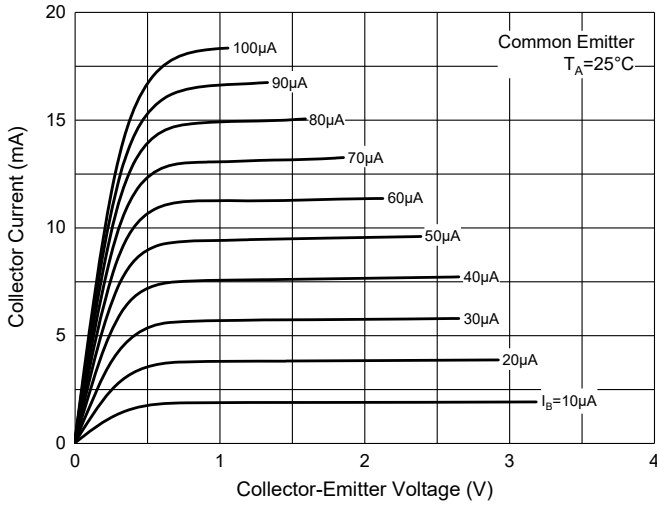


Fig. 2 - DC Current Gain Characteristics

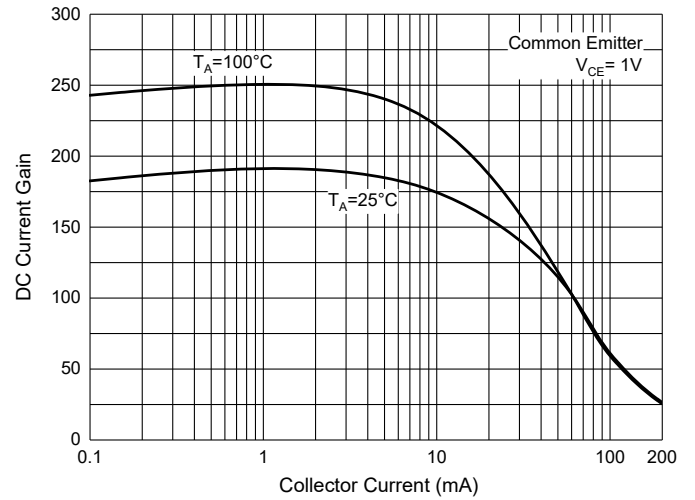


Fig. 3 - Collector-Emitter Saturation Voltage Characteristics

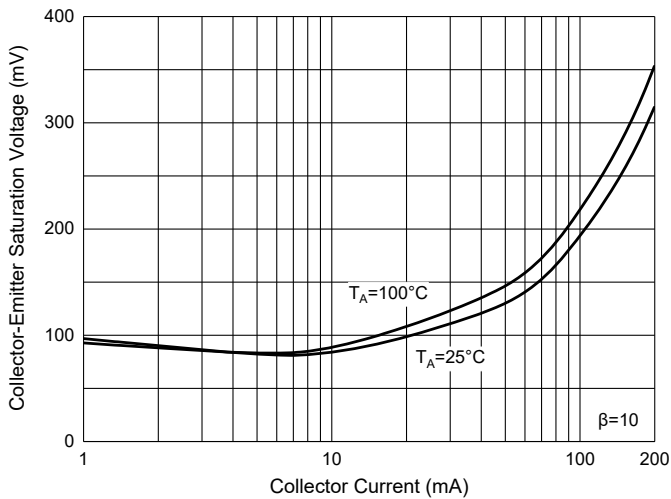


Fig. 4 - Base-Emitter Saturation Voltage Characteristics

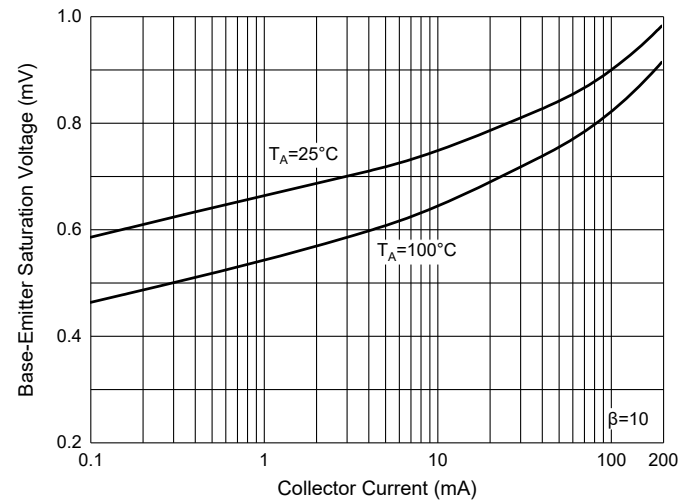


Fig. 5 - Base-Emitter Voltage Characteristics

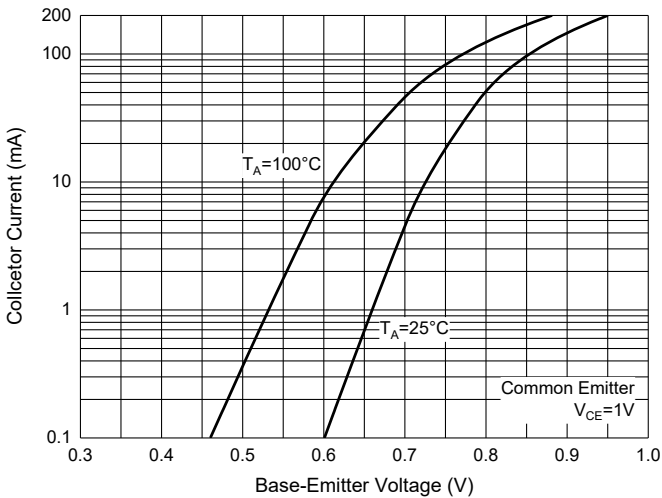
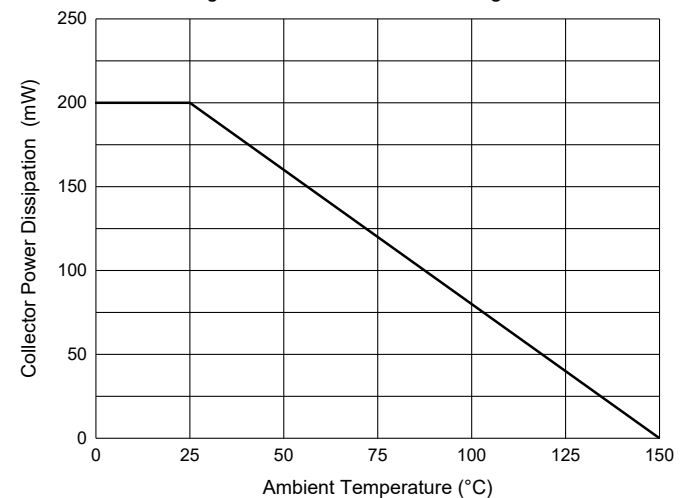


Fig. 6 - Collector Power Derating Curve



Curve Characteristics(PNP)

Fig. 7 - Static Characteristics

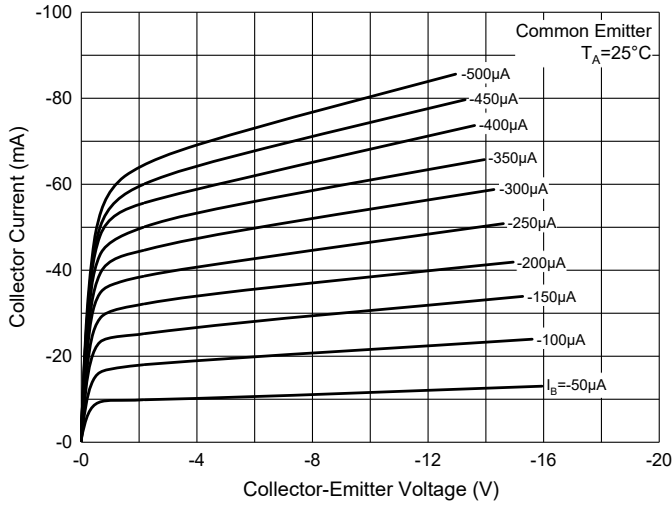


Fig. 8 - DC Current Gain Characteristics

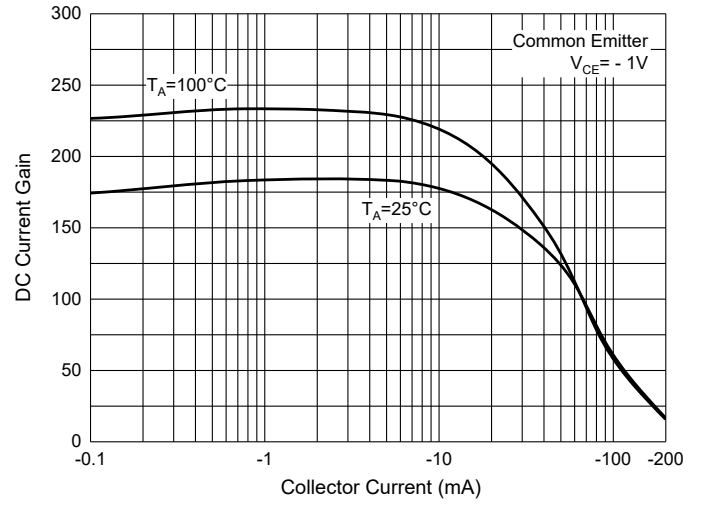


Fig. 9 - Collector-Emitter Saturation Voltage Characteristics

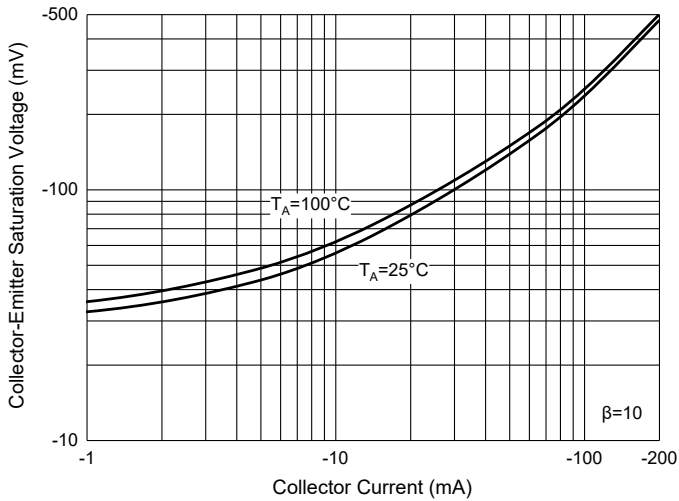


Fig. 10 - Base-Emitter Saturation Voltage Characteristics

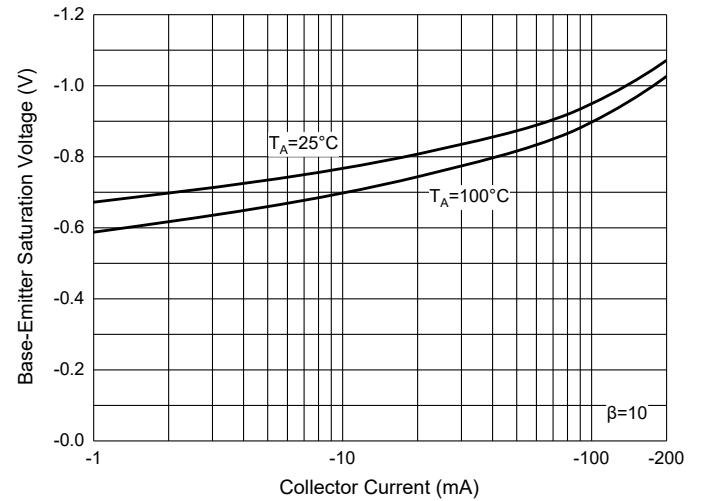


Fig. 11 - Base-Emitter Voltage Characteristics

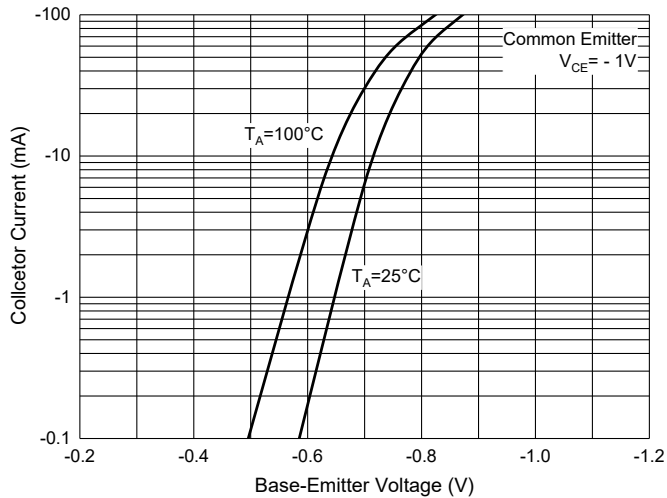
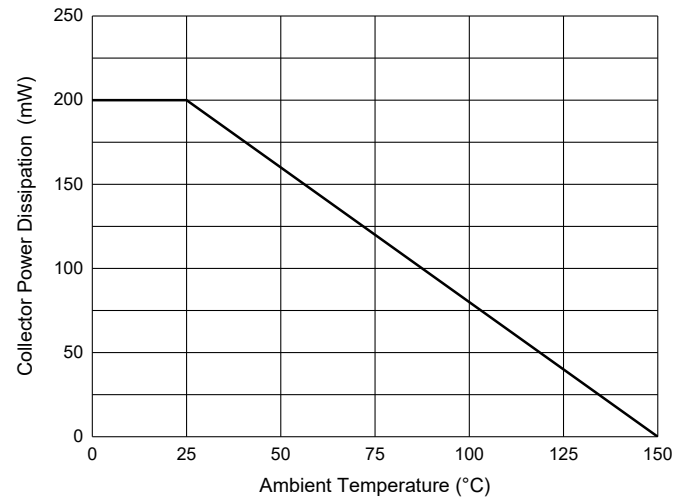


Fig. 12 - Collector Power Derating Curve



Ordering Information

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

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