NPN/PNP Small Signal Surface Mount Transistors

Features

- Complementary Pari: 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℃ to +150℃
- Storage Temperature Range: -55℃ to +150℃

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

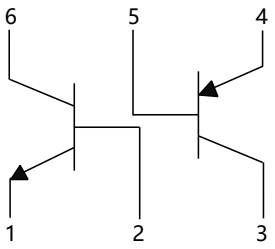
PNP Transistor

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



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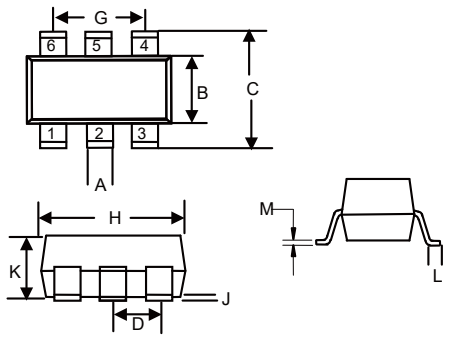
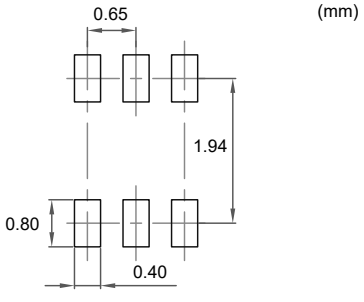


DIMENSIONS					
DIM	INCHES		MM		NOTE
	MIN	MAX	MIN	MAX	
A	0.006	0.014	0.15	0.35	
B	0.045	0.053	1.15	1.35	
C	0.079	0.096	2.00	2.45	
D	0.026		0.65		TYP.
G	0.047	0.055	1.20	1.40	
H	0.071	0.087	1.80	2.20	
J	-----	0.004	-----	0.10	
K	0.031	0.043	0.80	1.10	
L	0.010	0.018	0.26	0.46	
M	0.003	0.006	0.08	0.15	

Suggested Solder Pad Layout



Electrical Characteristics @ T_A=25°C Unless Otherwise Specified

NPN Transistor

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 Cutoff Current	I_{CBO}			50	nA	V_{CB}=30V, I_E=0
Collector Cutoff Current	I_{CEO}			500	nA	V_{CE}=30V, I_B=0
Emitter Cutoff Current	I_{EBO}			50	nA	V_{EB}=5V, I_C=0
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=20mA, f=100MHz
Delay Time	t_d			35	ns	V_{CC}=3V, I_C=10mA, V_{BE}=0.5V, I_{B1}=1mA
Rise Time	t_r			35	ns	
Storage Time	t_s			200	ns	V_{CC}=3V, I_C=10mA, I_{B1}=I_{B2}=1mA
Fall Time	t_f			50	ns	
Output Capacitance	C_{ob}			4	pF	V_{CB}=5V, I_E=0, f=1MHz
Noise Figure	N_F			5	dB	V_{CE}=5V,I_C=0.1mA,f=1KHz,Rs=1KΩ

Electrical Characteristics @ T_A=25°C Unless Otherwise Specified

PNP Transistor

Parameter	Symbol	Min	Typ	Max	Units	Conditions
Collector-Base Breakdown Voltage	$V_{(BR)CBO}$	-40			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	$V_{(BR)EBO}$	-5			V	I_E=-10μA, I_C=0
Collector Cutoff Current	I_{CBO}			-50	nA	V_{CB}=-30V, I_E=0
Emitter Cutoff Current	I_{EBO}			-50	nA	V_{EB}=-5V, I_C=0
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	$V_{CE(sat)}$			-0.25	V	I_C=-10mA, I_B=-1mA
				-0.4	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	250			MHz	V_{CE}=-20V, I_C=-10mA, f=100MHz
Delay Time	t_d			35	ns	V_{CC}=-3V, I_C=-10mA, V_{BE}=-0.5V, I_{B1}=-I_{B2}=-1mA
Rise Time	t_r			35	ns	
Storage Time	t_s			225	ns	V_{CC}=-3V, I_C=-10mA, I_{B1}=-I_{B2}=-1mA
Fall Time	t_f			75	ns	
Output Capacitance	C_{ob}			4.5	pF	V_{CB}=-5V, I_E=0, f=1MHz
Noise Figure	N_F			4	dB	V_{CE}=-5V,I_C=-0.1mA,f=1KHz,Rs=1KΩ

Curve Characteristics(NPN)

Fig. 1 - Static Characteristics

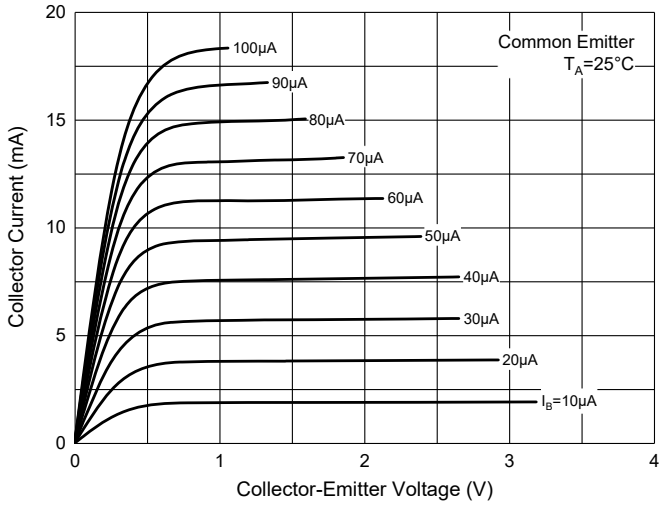


Fig. 2 - DC Current Gain Characteristics

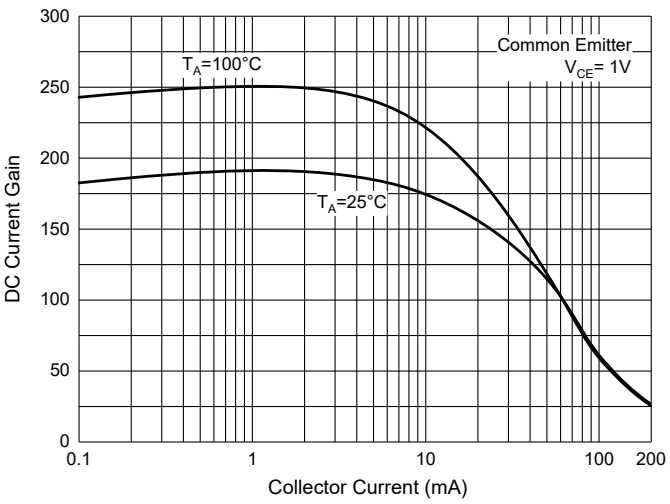


Fig. 3 - Collector-Emitter Saturation Voltage Characteristics

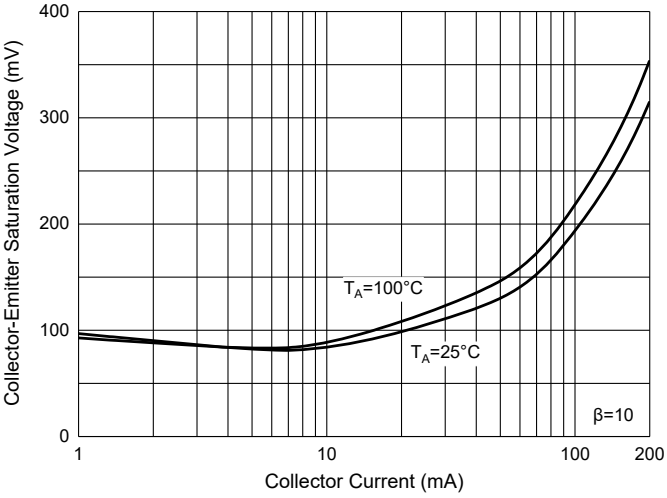


Fig. 4 - Base-Emitter Saturation Voltage Characteristics

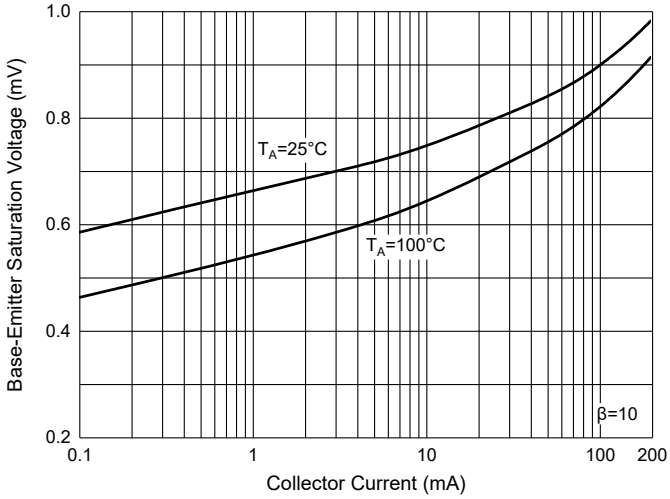


Fig. 5 - Base-Emitter Voltage Characteristics

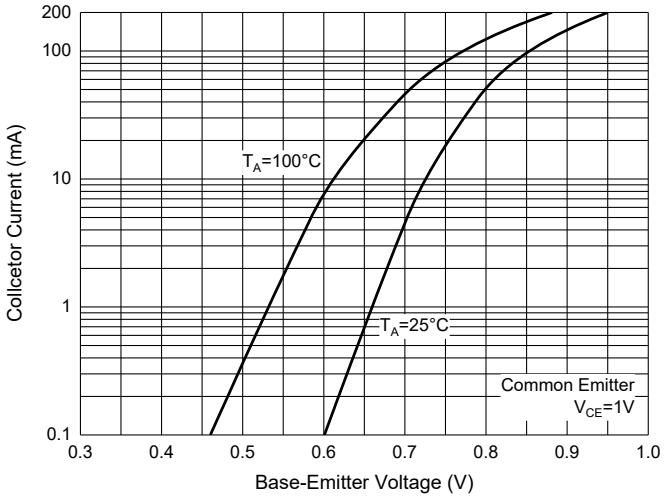
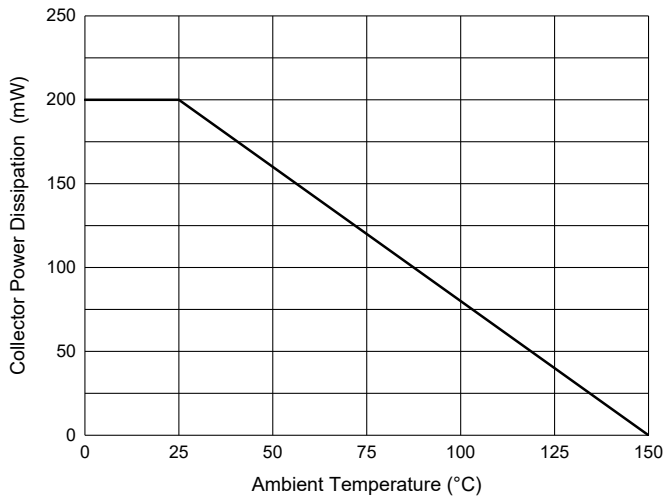


Fig. 6 - Collector Power Derating Curve



Curve Characteristics(PNP)

Fig. 7 - Static Characteristics

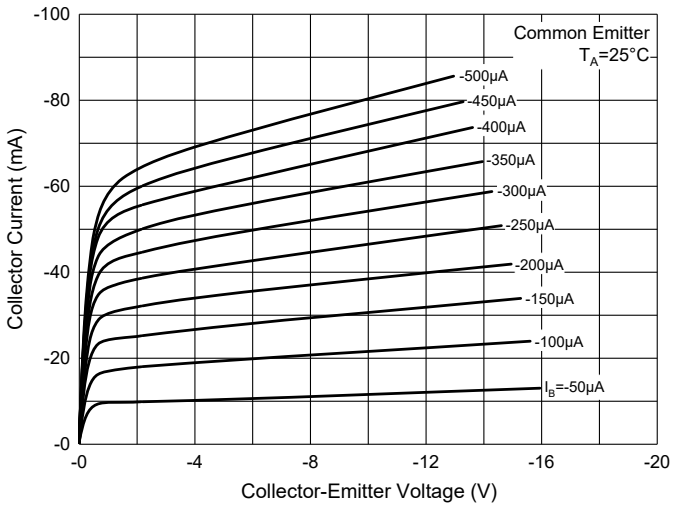


Fig. 8 - DC Current Gain Characteristics

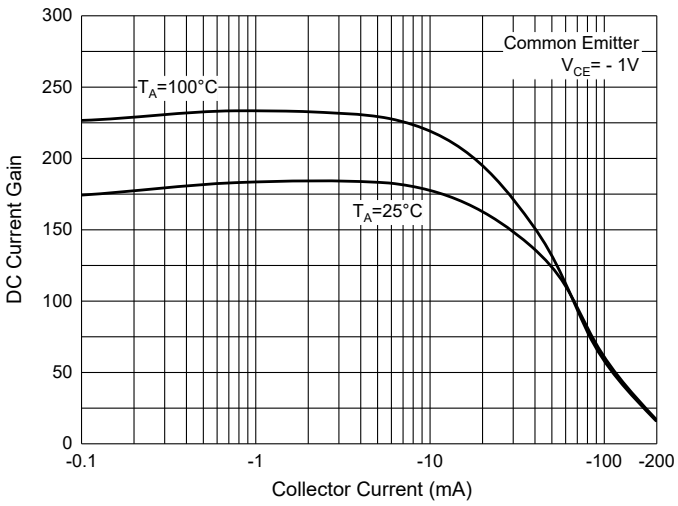


Fig. 9 - Collector-Emitter Saturation Voltage Characteristics

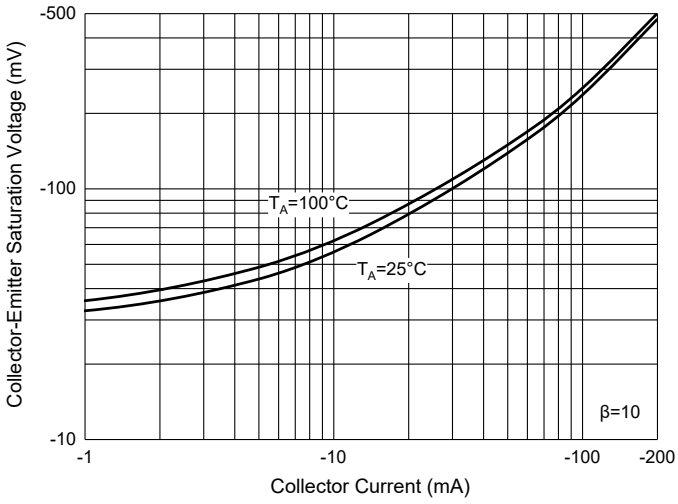


Fig. 10 - Base-Emitter Saturation Voltage Characteristics

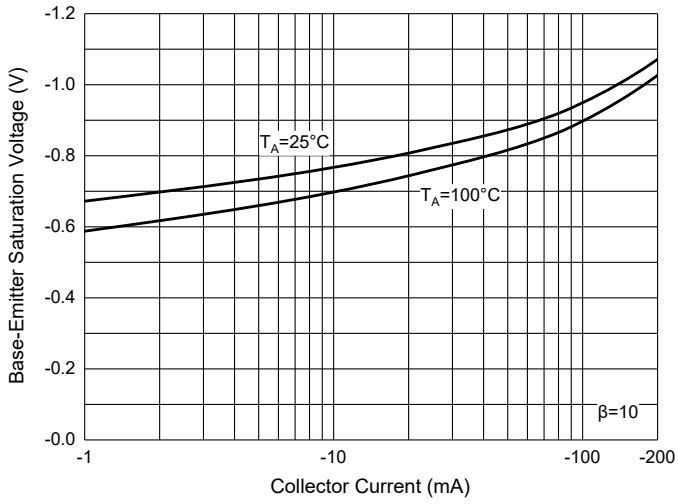


Fig. 11 - Base-Emitter Voltage Characteristics

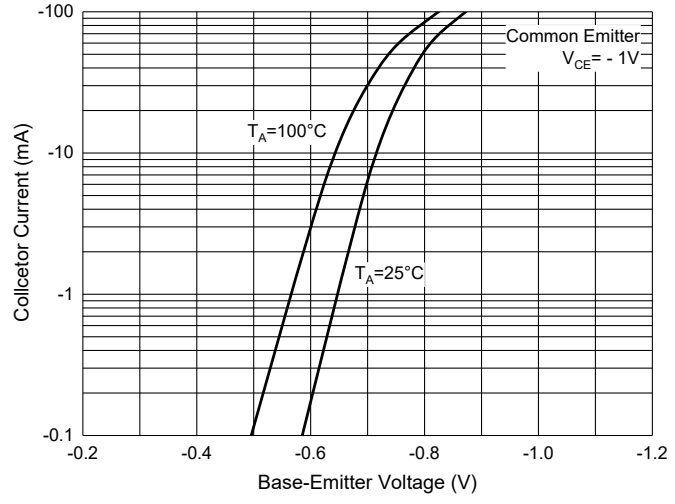
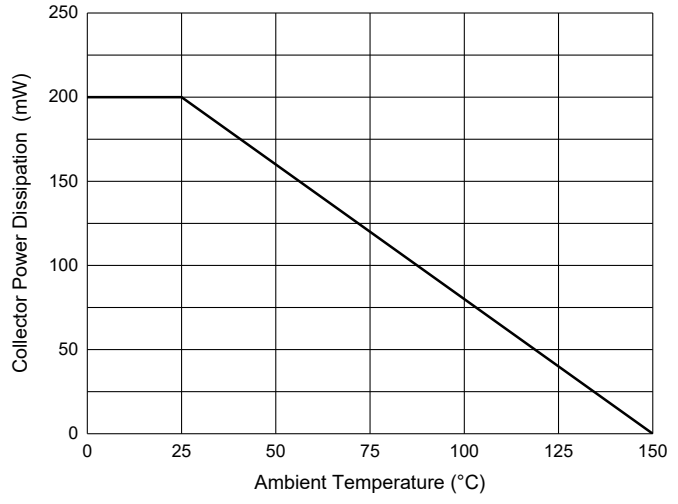


Fig. 12 - Collector Power Derating Curve



Ordering Information

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