

Features

- 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	600	mA
Power Dissipation	P_D	200	mW
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	625	°C/W

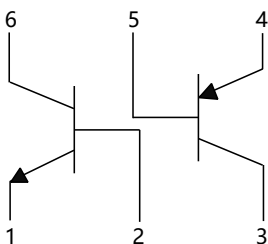
PNP Transistor

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	-600	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.

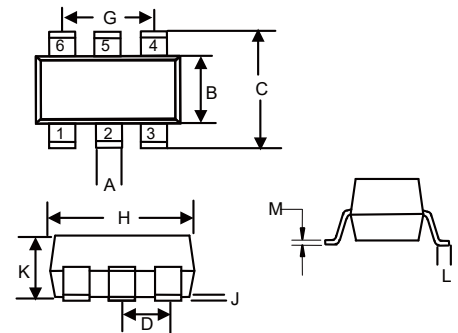
Marking: K13

Internal Structure



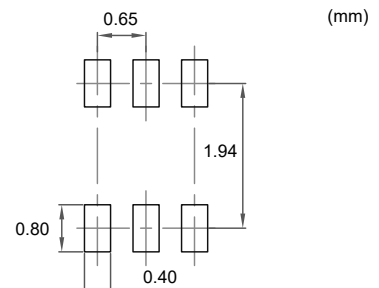
**NPN/PNP
Plastic-Encapsulate
Transistors**

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	$I_C=100\mu\text{A}$, $I_E=0$
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	$I_E=100\mu\text{A}$, $I_C=0$
Collector Cutoff Current	I_{CBO}			100	nA	$V_{CB}=50\text{V}$, $I_E=0$
Emitter Cutoff Current	I_{EBO}			100	nA	$V_{EB}=5\text{V}$, $I_C=0$
DC Current Gain	$h_{FE(1)}$	20				$V_{CE}=1\text{V}$, $I_C=0.1\text{mA}$
	$h_{FE(2)}$	40				$V_{CE}=1\text{V}$, $I_C=1\text{mA}$
	$h_{FE(3)}$	80				$V_{CE}=1\text{V}$, $I_C=10\text{mA}$
	$h_{FE(4)}$	100		300		$V_{CE}=1\text{V}$, $I_C=150\text{mA}$
	$h_{FE(5)}$	40				$V_{CE}=2\text{V}$, $I_C=500\text{mA}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			0.4	V	$I_C=150\text{mA}$, $I_B=15\text{mA}$
				0.75	V	$I_C=500\text{mA}$, $I_B=50\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	0.75		0.95	V	$I_C=150\text{mA}$, $I_B=15\text{mA}$
				1.20	V	$I_C=500\text{mA}$, $I_B=50\text{mA}$
Transition Frequency	f_T	250			MHz	$V_{CE}=10\text{V}$, $I_C=20\text{mA}$, $f=100\text{MHz}$
Delay Time	t_d			15	ns	$V_{CC}=30\text{V}$, $I_C=150\text{mA}$, $V_{BE}=2\text{V}$, $I_{B1}=15\text{mA}$
Rise Time	t_r			20	ns	
Storage Time	t_s			225	ns	$V_{CC}=30\text{V}$, $I_C=150\text{mA}$, $I_{B1}=-I_{B2}=15\text{mA}$
Fall Time	t_f			30	ns	
Output Capacitance	C_{ob}			6.5	pF	$V_{CB}=5\text{V}$, $I_E=0$, $f=1\text{MHz}$

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	$I_C=-100\mu\text{A}$, $I_E=0$
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	$I_E=-100\mu\text{A}$, $I_C=0$
Collector Cutoff Current	I_{CBO}			-100	nA	$V_{CB}=-50\text{V}$, $I_E=0$
Emitter Cutoff Current	I_{EBO}			-100	nA	$V_{EB}=-5\text{V}$, $I_C=0$
DC Current Gain	$h_{FE(1)}$	30				$V_{CE}=-1\text{V}$, $I_C=-0.1\text{mA}$
	$h_{FE(2)}$	60				$V_{CE}=-1\text{V}$, $I_C=-1\text{mA}$
	$h_{FE(3)}$	100				$V_{CE}=-1\text{V}$, $I_C=-10\text{mA}$
	$h_{FE(4)}$	100		300		$V_{CE}=-2\text{V}$, $I_C=-150\text{mA}$
	$h_{FE(5)}$	20				$V_{CE}=-2\text{V}$, $I_C=-500\text{mA}$
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			-0.40	V	$I_C=-150\text{mA}$, $I_B=-15\text{mA}$
				-0.75	V	$I_C=-500\text{mA}$, $I_B=-50\text{mA}$
Base-Emitter Saturation Voltage	$V_{BE(sat)}$	-0.75		-0.95	V	$I_C=-150\text{mA}$, $I_B=-15\text{mA}$
				-1.30	V	$I_C=-500\text{mA}$, $I_B=-50\text{mA}$
Transition Frequency	f_T	200			MHz	$V_{CE}=-10\text{V}$, $I_C=-20\text{mA}$, $f=100\text{MHz}$
Delay Time	t_d			15	ns	$V_{CC}=-30\text{V}$, $I_C=-150\text{mA}$, $V_{BE}=-2\text{V}$, $I_{B1}=-15\text{mA}$
Rise Time	t_r			20	ns	
Storage Time	t_s			225	ns	$V_{CC}=-30\text{V}$, $I_C=-150\text{mA}$, $I_{B1}=-I_{B2}=-15\text{mA}$
Fall Time	t_f			30	ns	
Output Capacitance	C_{ob}			8.5	pF	$V_{CB}=-10\text{V}$, $I_E=0$, $f=1\text{MHz}$

Curve Characteristics(NPN)

Fig. 1 - Static Characteristics

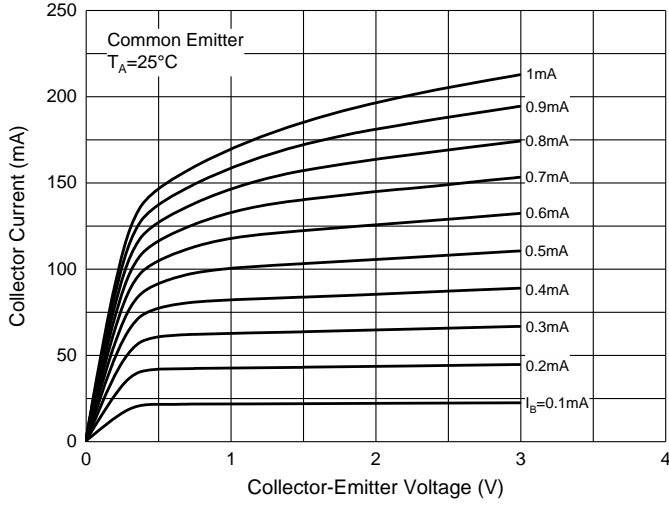


Fig. 2 - DC Current Gain Characteristics

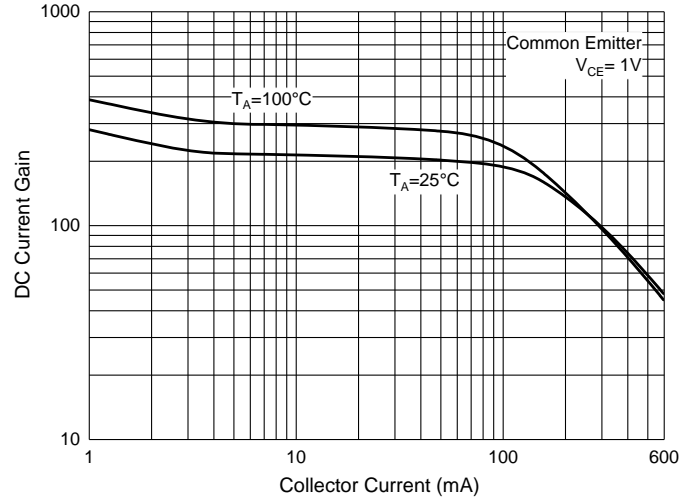


Fig. 3 - Base-Emitter Saturation Voltage Characteristics

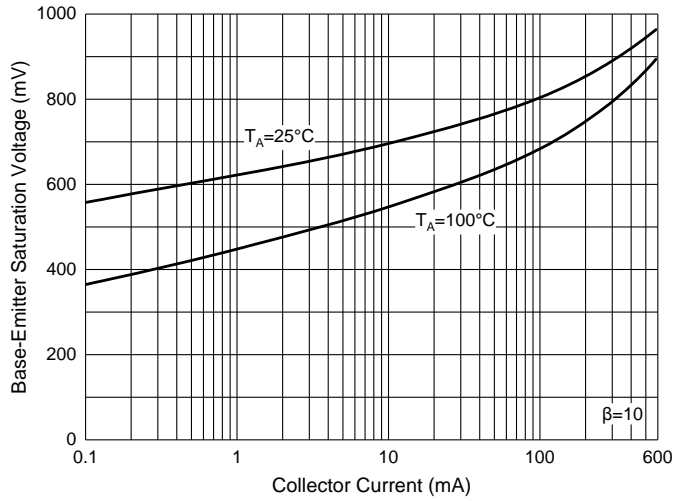


Fig. 4 - Collector-Emitter Saturation Voltage Characteristics

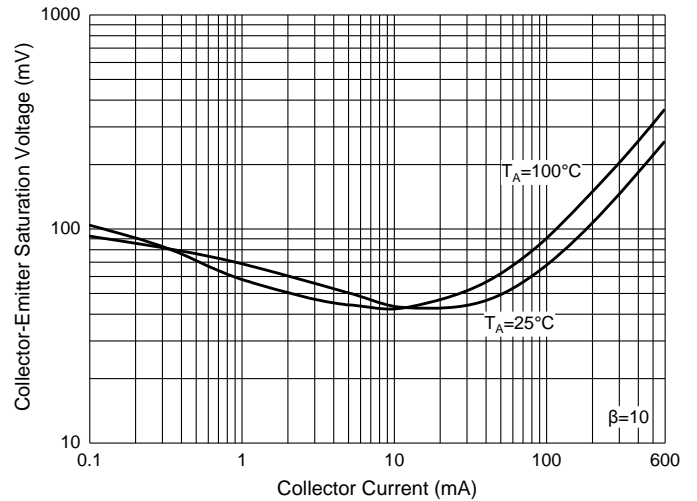


Fig. 5 - Base-Emitter Voltage Characteristics

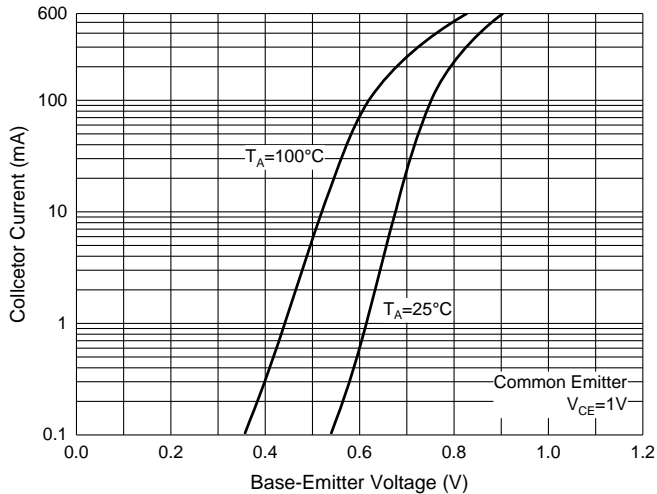
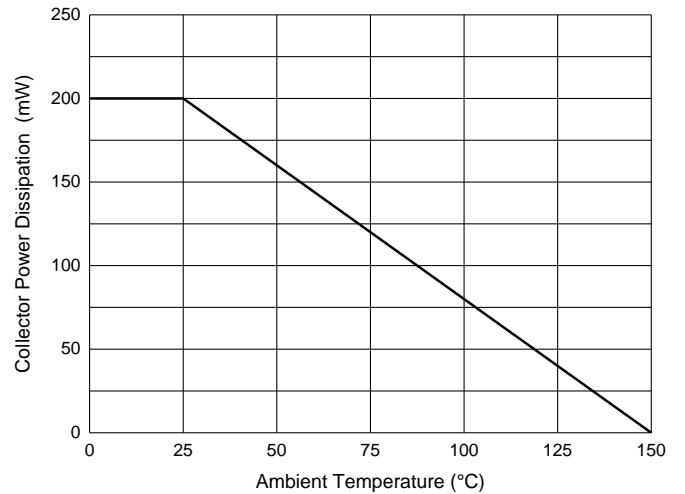


Fig. 6 - Collector Power Derating Curve



Curve Characteristics(PNP)

Fig. 7 - Static Characteristics

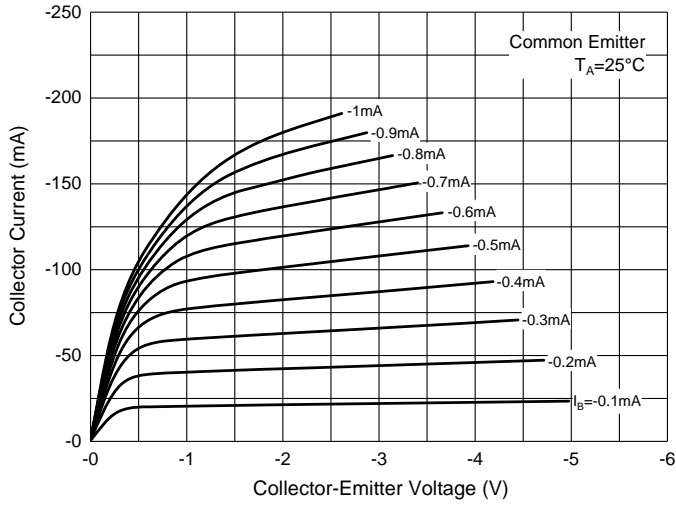


Fig. 8 - DC Current Gain Characteristics

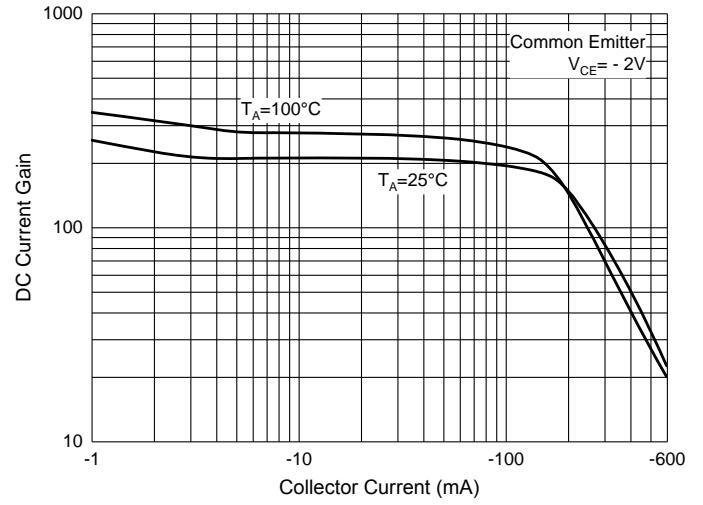


Fig. 9 - Collector-Emitter Saturation Voltage Characteristics

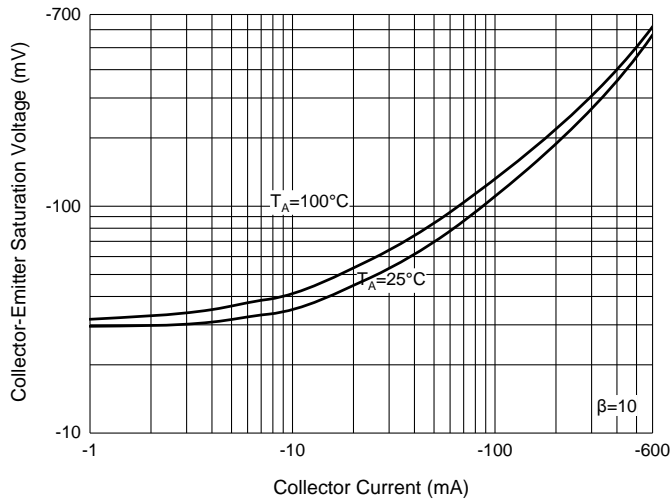


Fig. 10 - Base-Emitter Saturation Voltage Characteristics

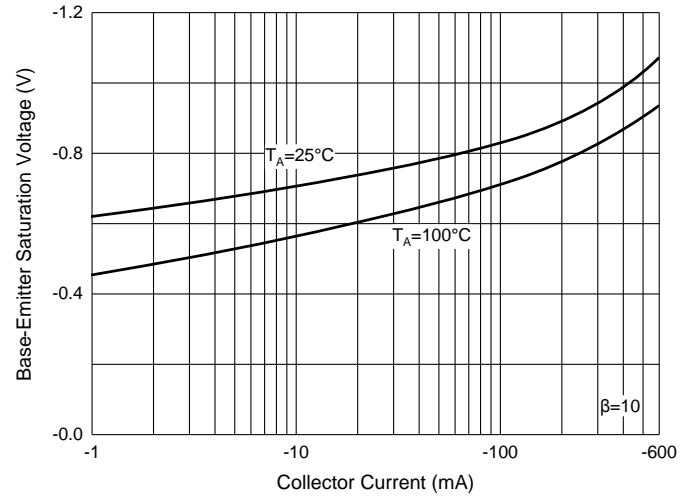


Fig. 11 - Base-Emitter Voltage Characteristics

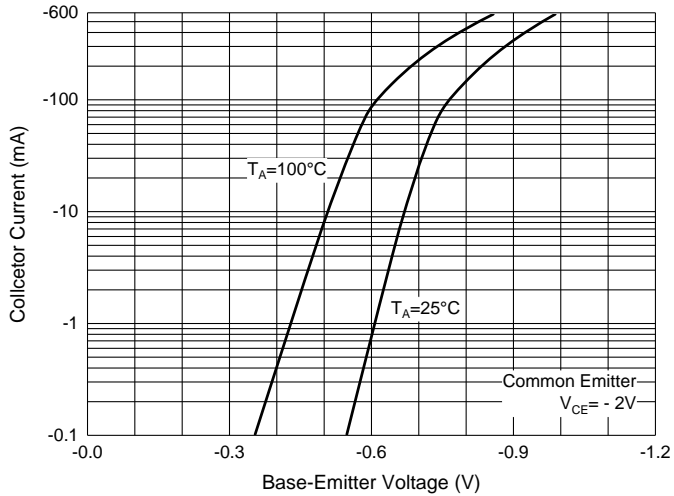
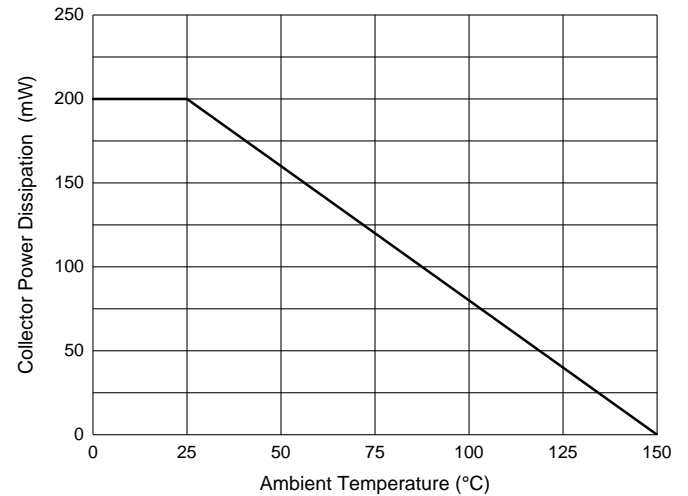


Fig. 12 - Collector Power Derating Curve



Ordering Information

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

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