

# 9013-HAF

## NPN Silicon Epitaxial Planar Transistor

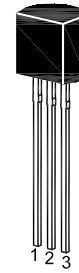
The transistor is subdivided into three groups, G, H and I, according to its DC current gain. As complementary type the PNP transistor 9012 is recommended.

### Features

- Halogen and Antimony Free(HAF), RoHS compliant

### Applications

- For switching and amplifier
- Especially suitable for AF-driver stages and low power output stages



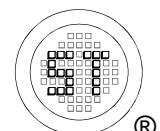
1. Emitter 2. Base 3. Collector  
TO-92 Plastic Package

### Absolute Maximum Ratings ( $T_a = 25\text{ }^\circ\text{C}$ )

Parameter	Symbol	Value	Unit
Collector Base Voltage	$V_{CBO}$	40	V
Collector Emitter Voltage	$V_{CEO}$	30	V
Emitter Base Voltage	$V_{EBO}$	5	V
Collector Current	$I_C$	500	mA
Power Dissipation	$P_{tot}$	625	mW
Junction Temperature	$T_j$	150	$^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	- 55 to + 150	$^\circ\text{C}$

### Thermal Resistance Ratings

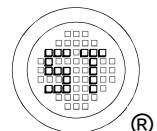
Parameter	Symbol	Max.	Unit
Thermal Resistance Junction to Ambient	$R_{\theta JA}$	200	$^\circ\text{C/W}$



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## Characteristics at $T_a = 25\text{ }^\circ\text{C}$

Parameter	Symbol	Min.	Max.	Unit	
DC Current Gain at $V_{CE} = 1\text{ V}$ , $I_C = 50\text{ mA}$  at $V_{CE} = 1\text{ V}$ , $I_C = 500\text{ mA}$	Current Gain Group G H I	$h_{FE}$	110	183	-
		$h_{FE}$	177	250	-
		$h_{FE}$	250	380	-
		$h_{FE}$	40	-	-
Collector Base Cutoff Current at $V_{CB} = 35\text{ V}$	$I_{CBO}$	-	100	nA	
Emitter Base Cutoff Current at $V_{EB} = 5\text{ V}$	$I_{EBO}$	-	100	nA	
Collector Base Breakdown Voltage at $I_C = 100\text{ }\mu\text{A}$	$V_{(BR)CBO}$	40	-	V	
Collector Emitter Breakdown Voltage at $I_C = 1\text{ mA}$	$V_{(BR)CEO}$	30	-	V	
Emitter Base Breakdown Voltage at $I_E = 100\text{ }\mu\text{A}$	$V_{(BR)EBO}$	5	-	V	
Collector Emitter Saturation Voltage at $I_C = 500\text{ mA}$ , $I_B = 50\text{ mA}$	$V_{CE(sat)}$	-	0.6	V	
Base Emitter Saturation Voltage at $I_C = 500\text{ mA}$ , $I_B = 50\text{ mA}$	$V_{BE(sat)}$	-	1.2	V	
Base Emitter Voltage at $V_{CE} = 1\text{ V}$ , $I_C = 100\text{ mA}$	$V_{BE}$	-	1	V	
Gain Bandwidth Product at $V_{CE} = 6\text{ V}$ , $I_C = 20\text{ mA}$	$f_T$	100	-	MHz	



## Electrical Characteristics Curves

Fig. 1 Output Characteristics Curve

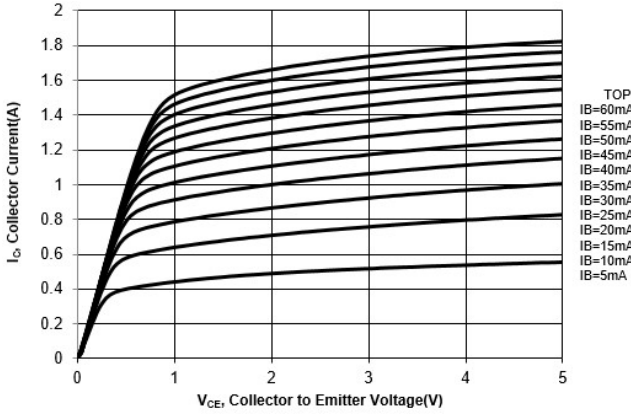


Fig. 2 Collector Current vs. Base to Emitter Voltage

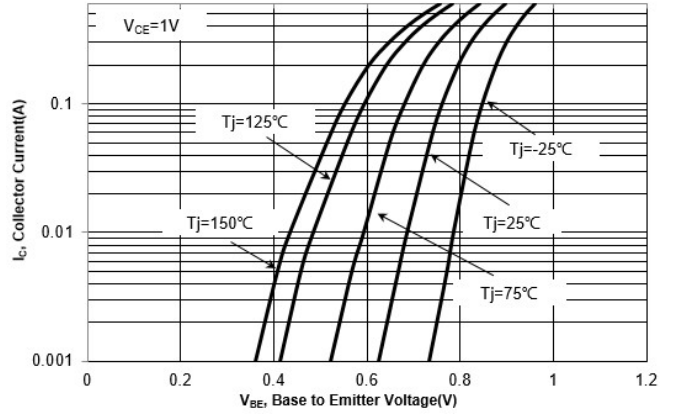


Fig. 3 DC Current Gain vs. Collector Current

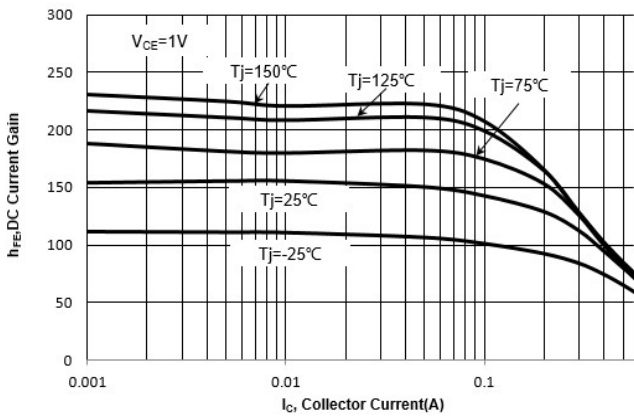
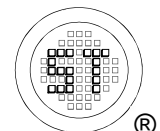
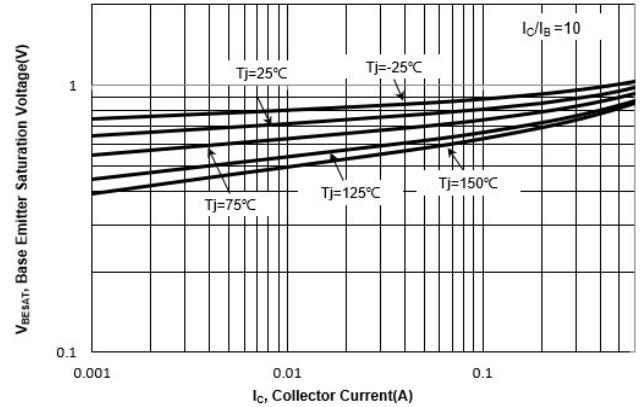


Fig. 4  $V_{BESAT}$  vs. Collector Current



## Electrical Characteristics Curves

Fig. 5  $V_{CESAT}$  vs. Collector Current

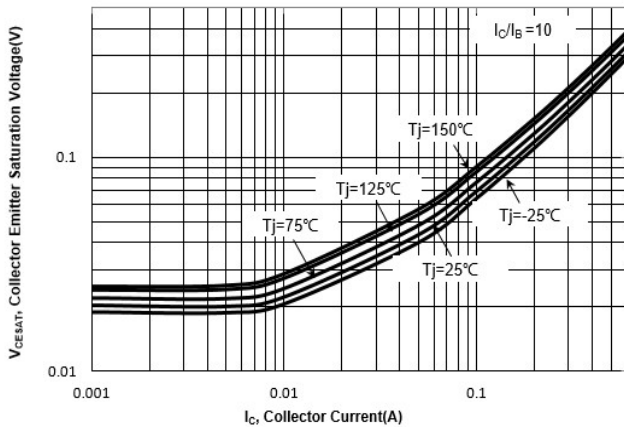


Fig. 6 Output Capacitance

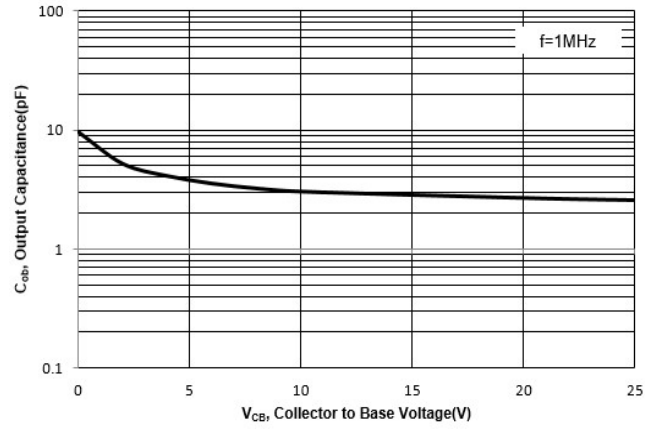


Fig. 7 Power Derating Curve

