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# 2N4123, 2N4124

## General Purpose Transistors

### NPN Silicon

#### Features

- Pb-Free Packages are Available\*

#### MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector-Emitter Voltage 2N4123 2N4124	$V_{CEO}$	30 25	Vdc
Collector-Base Voltage 2N4123 2N4124	$V_{CBO}$	40 30	Vdc
Emitter-Base Voltage	$V_{EBO}$	5.0	Vdc
Collector Current - Continuous	$I_C$	200	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	625 5.0	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	1.5 12	W mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	$T_J, T_{stg}$	-55 to +150	$^\circ\text{C}$

#### THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Ambient	$R_{\theta JA}$	200	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	83.3	$^\circ\text{C}/\text{W}$

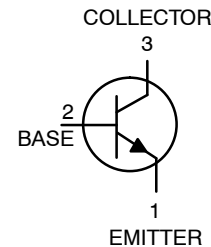
Stresses exceeding Maximum Ratings may damage the device. Maximum Ratings are stress ratings only. Functional operation above the Recommended Operating Conditions is not implied. Extended exposure to stresses above the Recommended Operating Conditions may affect device reliability.

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

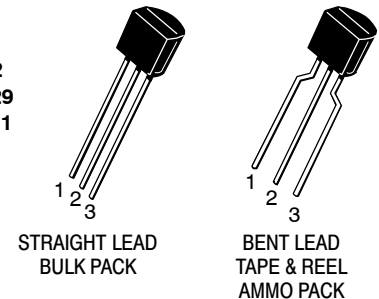


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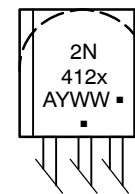
<http://onsemi.com>



TO-92  
CASE 29  
STYLE 1



#### MARKING DIAGRAM



x = 3 or 4

A = Assembly Location

Y = Year

WW = Work Week

■ = Pb-Free Package

(Note: Microdot may be in either location)

#### ORDERING INFORMATION

Device	Package	Shipping†
2N4123RLRM	TO-92	2000 / Tape & Ammo
2N4124G	TO-92 (Pb-Free)	5000 Units / Bulk

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.

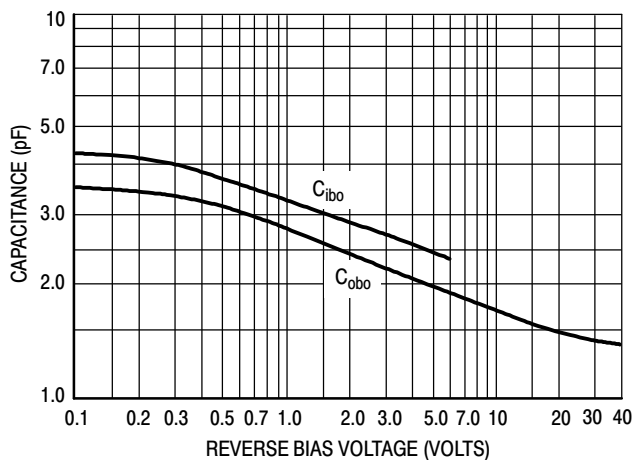
## 2N4123, 2N4124

### ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

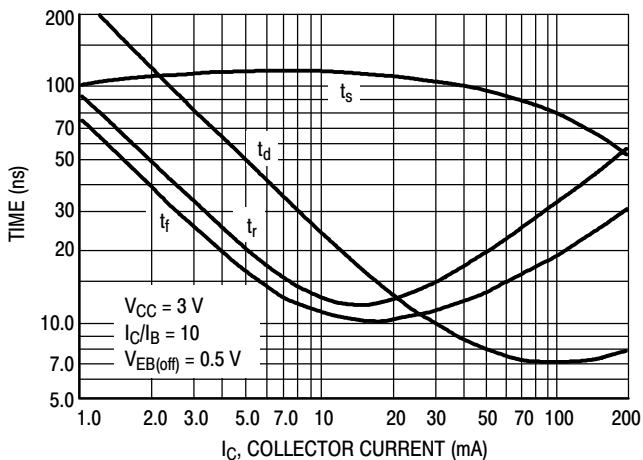
Characteristic	Symbol	Min	Max	Unit
<b>OFF CHARACTERISTICS</b>				
Collector–Emitter Breakdown Voltage (Note 1) ( $I_C = 1.0\text{ mAdc}$ , $I_E = 0$ )	2N4123 2N4124	$V_{(BR)CEO}$ 30 25	– –	Vdc
Collector–Base Breakdown Voltage ( $I_C = 10\text{ }\mu\text{Adc}$ , $I_E = 0$ )	2N4123 2N4124	$V_{(BR)CBO}$ 40 30	– –	Vdc
Emitter–Base Breakdown Voltage ( $I_E = 10\text{ }\mu\text{Adc}$ , $I_C = 0$ )		$V_{(BR)EBO}$ 5.0	–	Vdc
Collector Cutoff Current ( $V_{CB} = 20\text{ Vdc}$ , $I_E = 0$ )		$I_{CBO}$ –	50	nAdc
Emitter Cutoff Current ( $V_{EB} = 3.0\text{ Vdc}$ , $I_C = 0$ )		$I_{EBO}$ –	50	nAdc
<b>ON CHARACTERISTICS</b>				
DC Current Gain (Note 1) ( $I_C = 2.0\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )	2N4123 2N4124	$h_{FE}$ 50 120	150 360	–
( $I_C = 50\text{ mAdc}$ , $V_{CE} = 1.0\text{ Vdc}$ )	2N4123 2N4124	25 60	– –	
Collector–Emitter Saturation Voltage (Note 1) ( $I_C = 50\text{ mAdc}$ , $I_B = 5.0\text{ mAdc}$ )		$V_{CE(sat)}$ –	0.3	Vdc
Base–Emitter Saturation Voltage (Note 1) ( $I_C = 50\text{ mAdc}$ , $I_B = 5.0\text{ mAdc}$ )		$V_{BE(sat)}$ –	0.95	Vdc
<b>SMALL–SIGNAL CHARACTERISTICS</b>				
Current–Gain – Bandwidth Product ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ )	2N4123 2N4124	$f_T$ 250 300	– –	MHz
Input Capacitance ( $V_{EB} = 0.5\text{ Vdc}$ , $I_C = 0$ , $f = 1.0\text{ MHz}$ )		$C_{ibo}$ –	8.0	pF
Collector–Base Capacitance ( $I_E = 0$ , $V_{CB} = 5.0\text{ V}$ , $f = 1.0\text{ MHz}$ )		$C_{cb}$ –	4.0	pF
Small–Signal Current Gain ( $I_C = 2.0\text{ mAdc}$ , $V_{CE} = 10\text{ Vdc}$ , $R_S = 10\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ )	2N4123 2N4124	$h_{fe}$ 50 120	200 480	–
Current Gain – High Frequency ( $I_C = 10\text{ mAdc}$ , $V_{CE} = 20\text{ Vdc}$ , $f = 100\text{ MHz}$ )	2N4123 2N4124	$ h_{fe} $ 2.5 3.0	– –	–
( $I_C = 2.0\text{ mAdc}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$ )	2N4123	50	200	
( $I_C = 2.0\text{ mAdc}$ , $V_{CE} = 10\text{ V}$ , $f = 1.0\text{ kHz}$ )	2N4124	120	480	
Noise Figure ( $I_C = 100\text{ }\mu\text{Adc}$ , $V_{CE} = 5.0\text{ Vdc}$ , $R_S = 1.0\text{ k}\Omega$ , $f = 1.0\text{ kHz}$ )	2N4123 2N4124	NF – –	6.0 5.0	dB

1. Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle = 2.0%.

## 2N4123, 2N4124



**Figure 1. Capacitance**



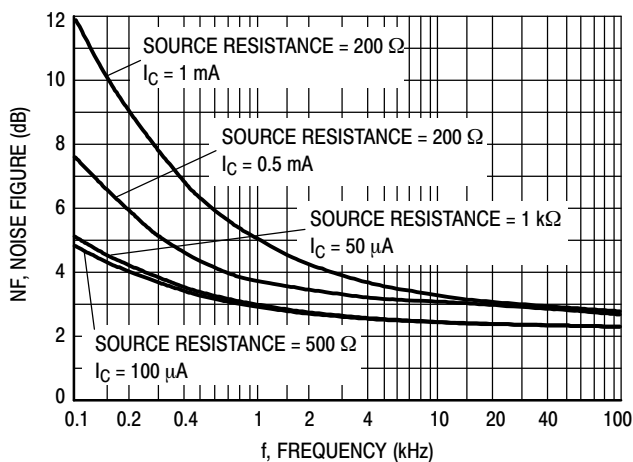
**Figure 2. Switching Times**

### AUDIO SMALL-SIGNAL CHARACTERISTICS

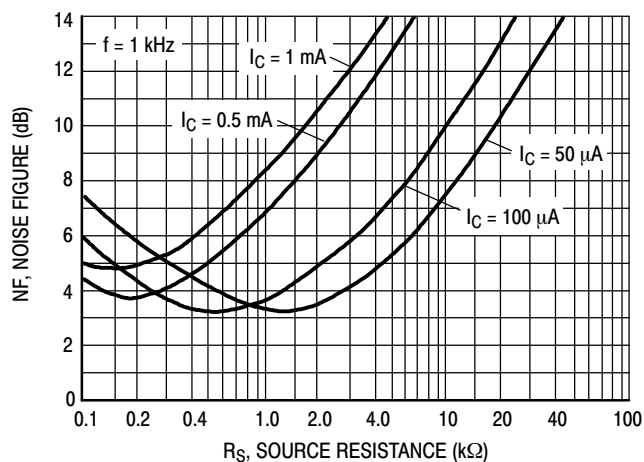
#### NOISE FIGURE

( $V_{CE} = 5V_{dc}$ ,  $T_A = 25^\circ C$ )

Bandwidth = 1.0 Hz



**Figure 3. Frequency Variations**



**Figure 4. Source Resistance**

# 2N4123, 2N4124

## h PARAMETERS

( $V_{CE} = 10\text{ V}$ ,  $f = 1\text{ kHz}$ ,  $T_A = 25^\circ\text{C}$ )

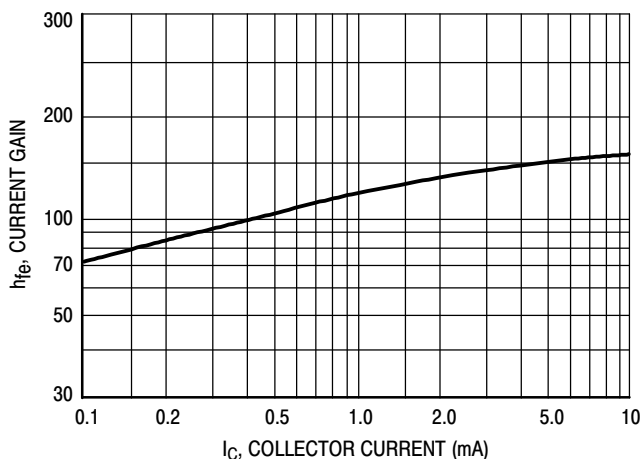


Figure 5. Current Gain

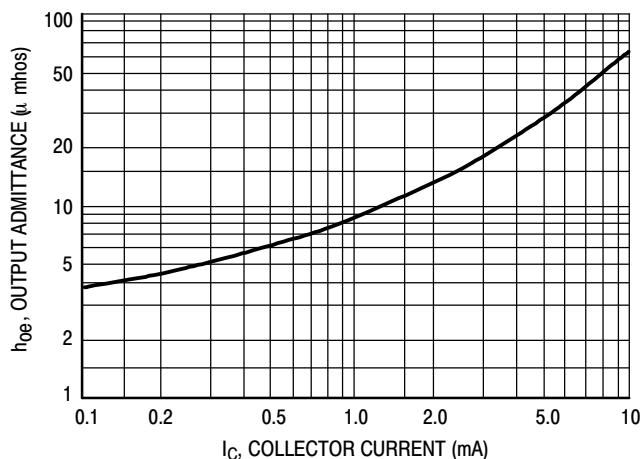


Figure 6. Output Admittance

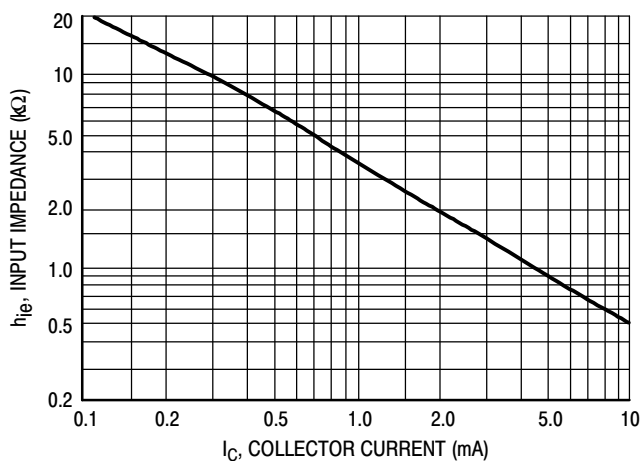


Figure 7. Input Impedance

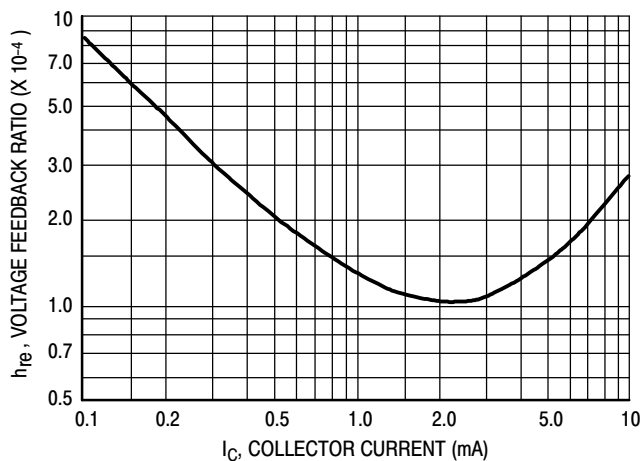


Figure 8. Voltage Feedback Ratio

## STATIC CHARACTERISTICS

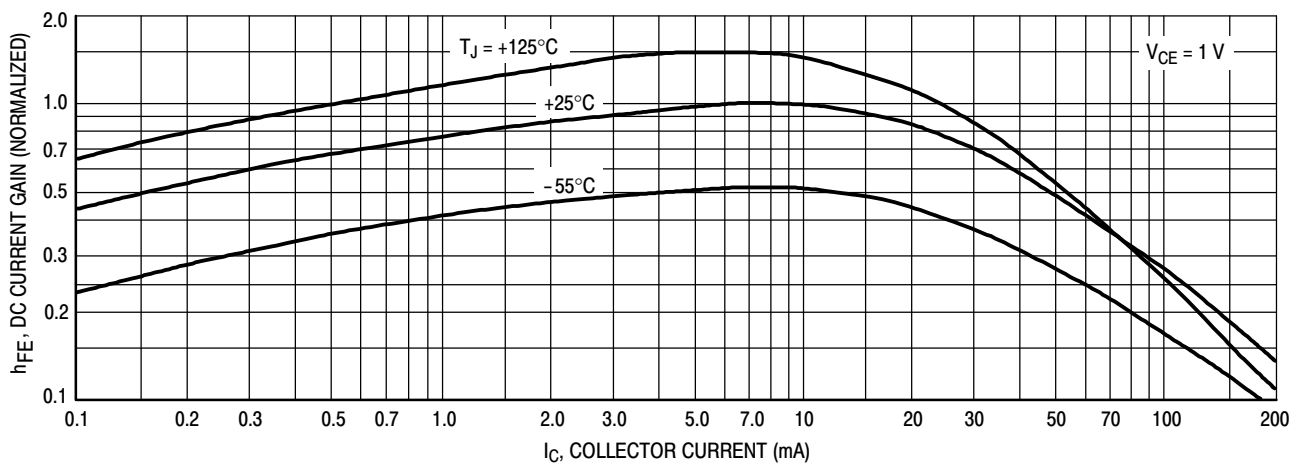
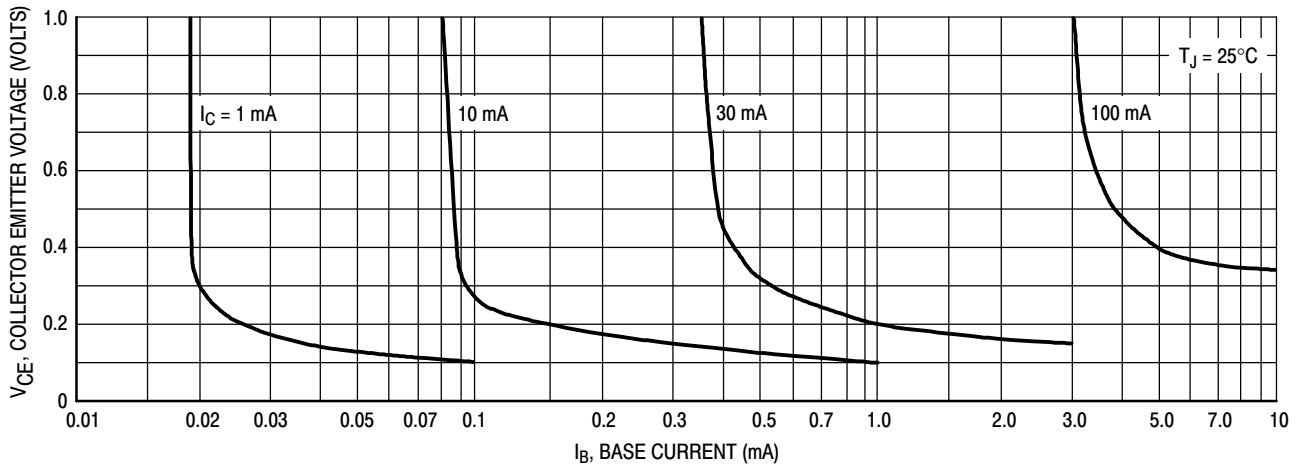
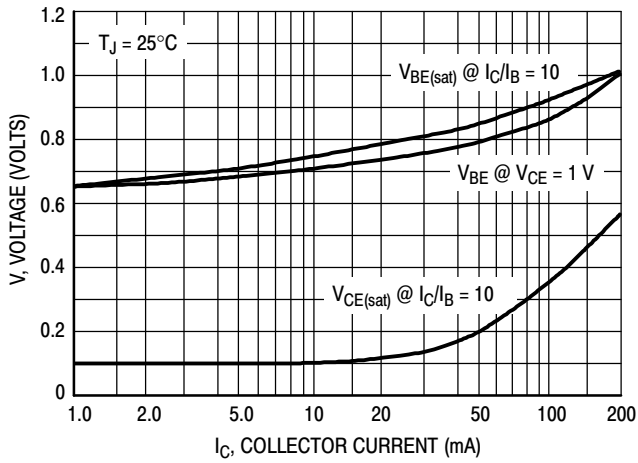


Figure 9. DC Current Gain

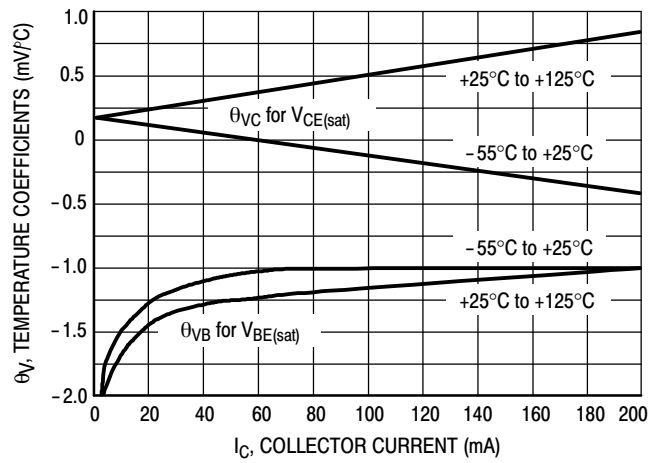
## 2N4123, 2N4124



**Figure 10. Collector Saturation Region**



**Figure 11. "On" Voltages**

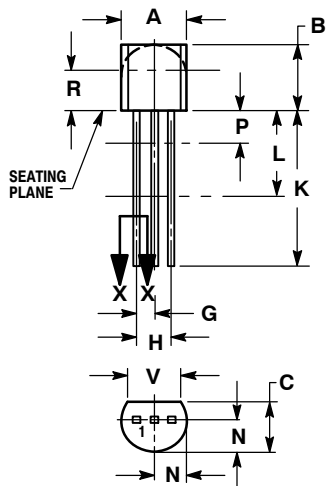


**Figure 12. Temperature Coefficients**

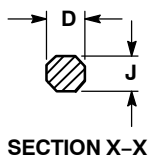
# 2N4123, 2N4124

## PACKAGE DIMENSIONS

TO-92 (TO-226)  
CASE 29-11  
ISSUE AM



STRAIGHT LEAD  
BULK PACK

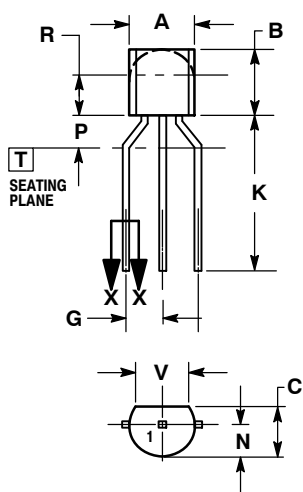


SECTION X-X

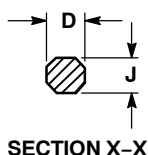
NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.175	0.205	4.45	5.20
B	0.170	0.210	4.32	5.33
C	0.125	0.165	3.18	4.19
D	0.016	0.021	0.407	0.533
G	0.045	0.055	1.15	1.39
H	0.095	0.105	2.42	2.66
J	0.015	0.020	0.39	0.50
K	0.500	---	12.70	---
L	0.250	---	6.35	---
N	0.080	0.105	2.04	2.66
P	---	0.100	---	2.54
R	0.115	---	2.93	---
V	0.135	---	3.43	---



BENT LEAD  
TAPE & REEL  
AMMO PACK



SECTION X-X

NOTES:

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: MILLIMETERS.
3. CONTOUR OF PACKAGE BEYOND DIMENSION R IS UNCONTROLLED.
4. LEAD DIMENSION IS UNCONTROLLED IN P AND BEYOND DIMENSION K MINIMUM.

DIM	MILLIMETERS	
	MIN	MAX
A	4.45	5.20
B	4.32	5.33
C	3.18	4.19
D	0.40	0.54
G	2.40	2.80
J	0.39	0.50
K	12.70	---
N	2.04	2.66
P	1.50	4.00
R	2.93	---
V	3.43	---

STYLE 1:

1. EMITTER
2. BASE
3. COLLECTOR

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