

**JEDEC types**

2N1809, 2N1816, 2N1823
2N1830, 2N2109, 2N2116
2N2123, 2N2130

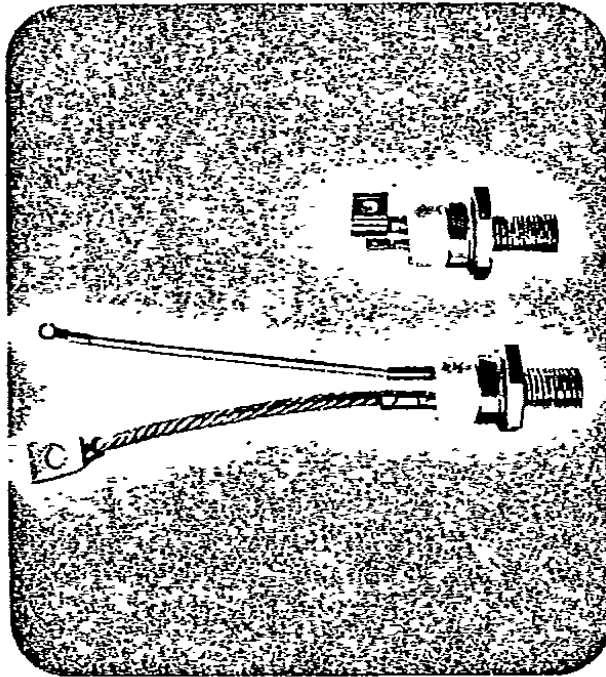
silicon power transistors
for switching, regulator and
amplifier applications

technical
data

54-662

30 amperes • 250 watts
collector-to-emitter voltage 50 to 300 volts

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**application**

These 30 ampere NPN fused silicon transistors are designed for high-power applications. Each transistor is power tested to the range of conditions under which the device can be operated in field applications. The transistors feature hard solder construction, extremely low saturation resistance, low thermal impedance and absence of secondary voltage breakdown. Westinghouse true voltage ratings allow operation at rated collector emitter voltage under any emitter-base biasing conditions. Westinghouse peak pulse power ratings up to 6,000 watts assure devices free from secondary breakdown within maximum voltage and current ratings for reliable operation in inverter and switching applications.

maximum ratings

$T_c = 25^\circ \pm 3^\circ\text{C}$ unless otherwise specified

JEDEC type flexible leads	JEDEC type flag-type terminals	voltage collector to emitter, V_{CEA} , volts
2N1809	2N2109	50
2N1816	2N2116	100
2N1823	2N2123	150
2N1817	2N2117	200
2N1824	2N2124	250
2N1831	2N2131	300
2N1825	2N2125	
2N1832	2N2126	
2N1818	2N2118	
2N1826	2N2119	
2N1833	2N2112	
2N1812	2N2113	
2N1813	2N2114	

Continuous collector dissipation, P_c , watts

Derating factor, $watts/^\circ\text{C}$ 250
 Junction temperature, T_j , $^\circ\text{C}$ —Operating 2.22
 Storage -65 to +175
 -65 to +175

The maximum rating (collector to emitter) of these transistors is well below the values of V_{CEA} , V_{CEB} , V_{CEC} , and V_{CEO} . This assures the user a safe operating level of voltage independent of bias conditions. Each transistor is power tested under full load to further identify a safe operating range of characteristics.

Emitter to base, V_{EB} , volts 15
 Collector to base, V_{CB} , volts equals V_{CE}
 Collector current, I_C , amps 30
 Base current, I_B , amps 10
 Max. collector current at $V_{CE} = V_{CE}$ (from max. ratings), $T_j = 175^\circ\text{C}$, $V_{BE} = -1.5$ Vdc, mAac 30
 Max. emitter current at $V_{EB} = 15$ Vdc, $T_j = 175^\circ\text{C}$, $I_C = 0$, mAac 25

electrical characteristics

characteristics and conditions ($T_c = 25^\circ \pm 3^\circ\text{C}$ unless otherwise specified.)

2N1809 and 2N2109 series

	symbol	minimum	typical	maximum
d-c current transfer ratio at $V_{CE} = 4$ Vdc, $I_C = 10$ Adc	h_{FE}	10	14	...
saturation resistance at $I_C = 10$ Adc, $I_B = 2$ Adc, ohms	$r_{CE(sat)}$	...	0.040	0.15
base voltage at $I_C = 10$ Adc, $I_B = 2$ Adc, Vdc	$V_{BE(sat)}$	...	1.35	2.5
common emitter beta cut-off frequency at $V_{CE} = 12$ Vdc, $I_C = 2.5$ Adc, kilocycles	f_{β}	...	14	...
turn on time at $I_C = 10$ Adc, $I_{B1} = 3$ Adc, $V_{CE} = 12$ Vdc, microseconds	$t_d + t_r$	...	12	...
turn off time at $V_{BE} = -6$ Vdc, $V_{CE} = 12$ Vdc, $I_{B2} = -3$ Adc, microseconds	$t_s + t_f$	...	14	...

2N1816 and 2N2116 series

	symbol	minimum	typical	maximum
d-c current transfer ratio at $V_{CE} = 4$ Vdc, $I_C = 15$ Adc	h_{FE}	10	13.5	...
saturation resistance at $I_C = 15$ Adc, $I_B = 3$ Adc, ohms	$r_{CE(sat)}$	...	0.042	0.10
base voltage at $I_C = 15$ Adc, $I_B = 3$ Adc, Vdc	$V_{BE(sat)}$	...	1.50	2.5
common emitter beta cut-off frequency at $V_{CE} = 12$ Vdc, $I_C = 3.75$ Adc, kilocycles	f_{β}	...	14.5	...
turn on time at $I_C = 15$ Adc, $I_{B1} = 4.5$ Adc, $V_{CE} = 12$ Vdc, microseconds	$t_d + t_r$	...	17	...
turn off time at $V_{BE} = -6$ Vdc, $V_{CE} = 12$ Vdc, $I_{B2} = -4.5$ Adc, microseconds	$t_s + t_f$	...	13	...

electrical characteristics

continued

characteristics and conditions ($T_c = 25^\circ \pm 3^\circ\text{C}$ unless otherwise specified)

symbol	minimum	typical	maximum
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2N1823 and 2N2123 series

d-c current transfer ratio at $V_{CE} = 4 \text{ Vdc}$, $I_C = 20 \text{ Adc}$.
 saturation resistance at $I_C = 20 \text{ Adc}$, $I_B = 4 \text{ Adc}$, ohms.
 base voltage at $I_C = 20 \text{ Adc}$, $I_B = 4 \text{ Adc}$, Vdc.
 common emitter beta cut-off frequency at $V_{CE} = 12 \text{ Vdc}$, $I_C = 5 \text{ Adc}$, kilocycles.
 turn on time at $I_C = 20 \text{ Adc}$, $I_{B1} = 6 \text{ Adc}$, $V_{CE} = 12 \text{ Vdc}$, microseconds.
 turn off time at $V_{BE} = -6 \text{ Vdc}$, $V_{CE} = 12 \text{ Vdc}$, $I_{B2} = -6 \text{ Adc}$, microseconds.

hFE	10	12.5	0.075
$r_{CE(sat)}$..	0.037	0.075
$V_{BE(sat)}$..	1.8	2.5
f_{β}	..	16	..
$t_d + t_r$..	20	..
$t_s + t_f$..	15	..

2N1830 and 2N2130 series

d-c current transfer ratio at $V_{CE} = 4 \text{ Vdc}$, $I_C = 25 \text{ Adc}$.
 saturation resistance at $I_C = 25 \text{ Adc}$, $I_B = 5 \text{ Adc}$, ohms.
 base voltage at $I_C = 25 \text{ Adc}$, $I_B = 5 \text{ Adc}$, Vdc.
 common emitter beta cut-off frequency at $V_{CE} = 12 \text{ Vdc}$, $I_C = 5 \text{ Adc}$, kc.
 turn on time at $I_C = 25 \text{ Adc}$, $I_{B1} = 7.5 \text{ Adc}$, $V_{CE} = 12 \text{ Vdc}$, microseconds.
 turn off time at $V_{BE} = -6 \text{ Vdc}$, $V_{CE} = 12 \text{ Vdc}$, $I_{B2} = -7.5 \text{ Adc}$, microseconds.

hFE	10	14	0.06
$r_{CE(sat)}$..	0.035	0.06
$V_{BE(sat)}$..	1.9	2.5
f_{β}	..	14	..
$t_d + t_r$..	15	..
$t_s + t_f$..	15	..

typical characteristics

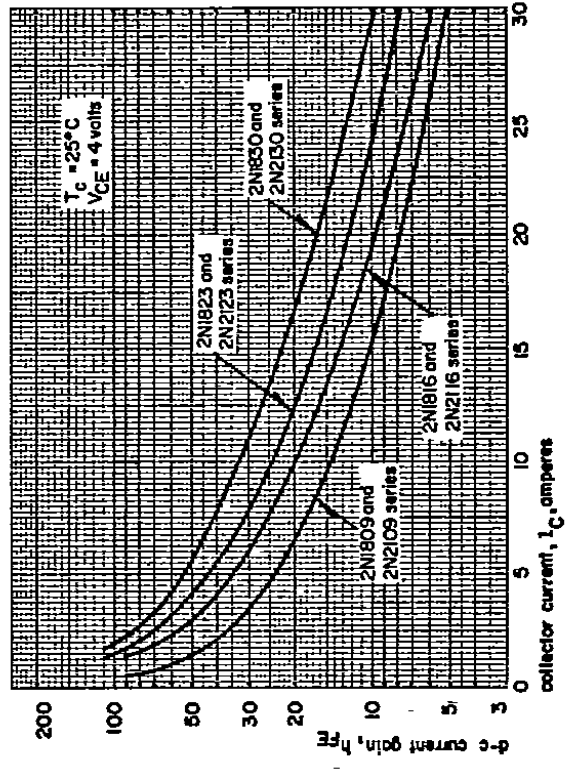


figure 1. D-c current gain versus collector current.

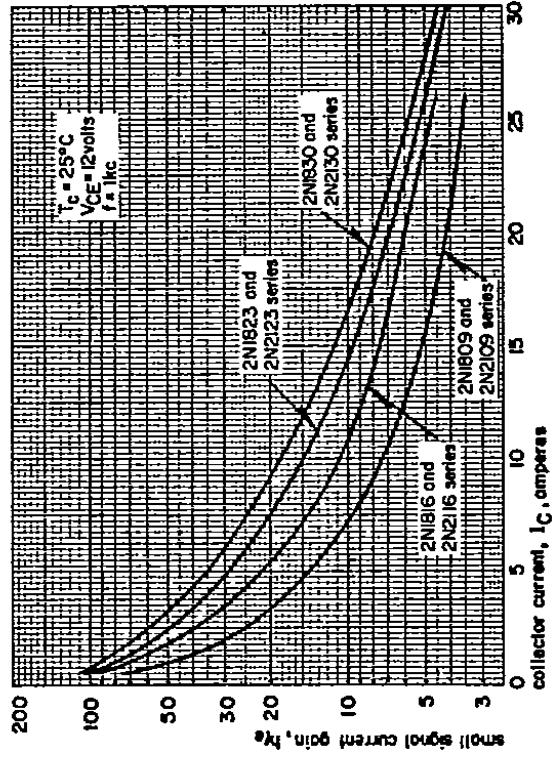


figure 2. Small signal gain versus collector current.

typical characteristics

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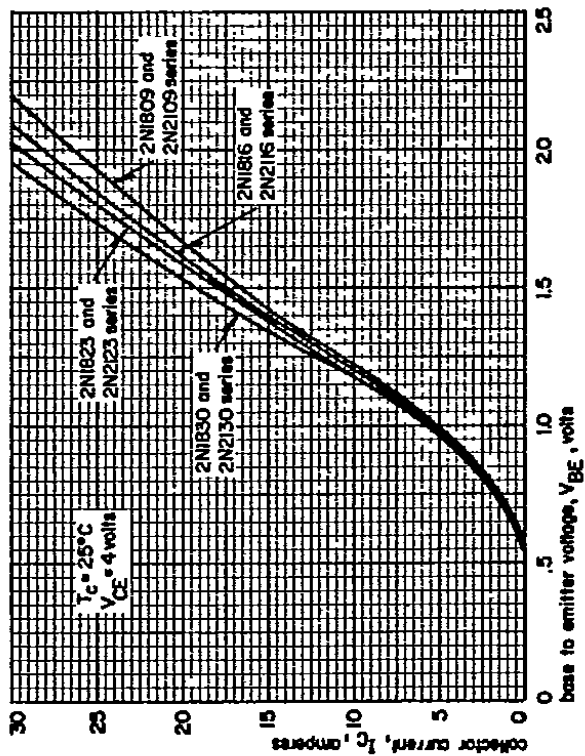


figure 3. Transconductance characteristics.

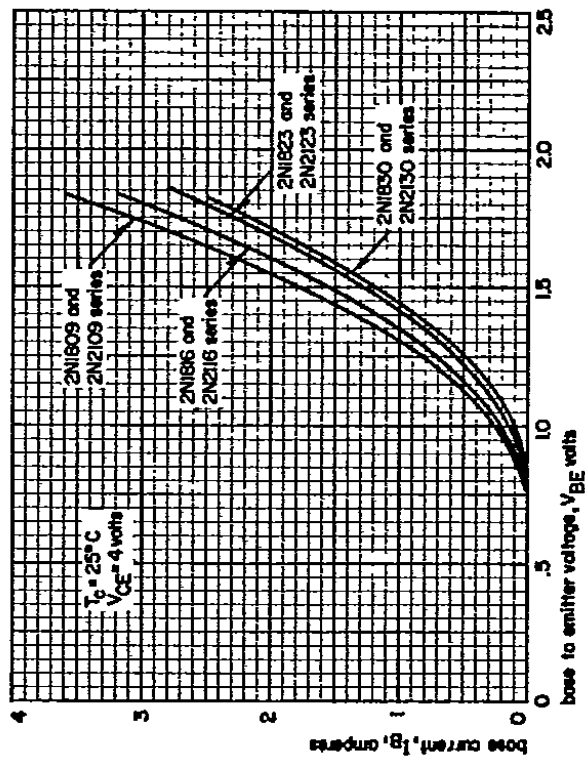


figure 4. Input characteristics.

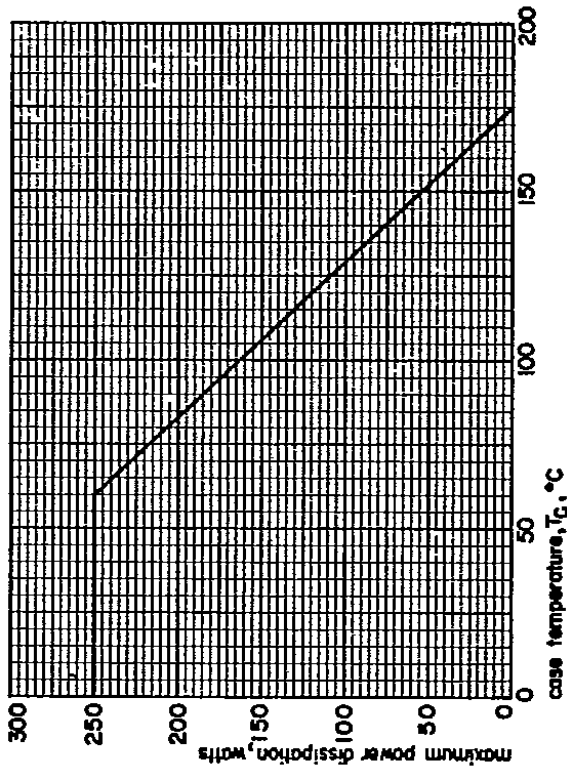


figure 5. Derating curve.

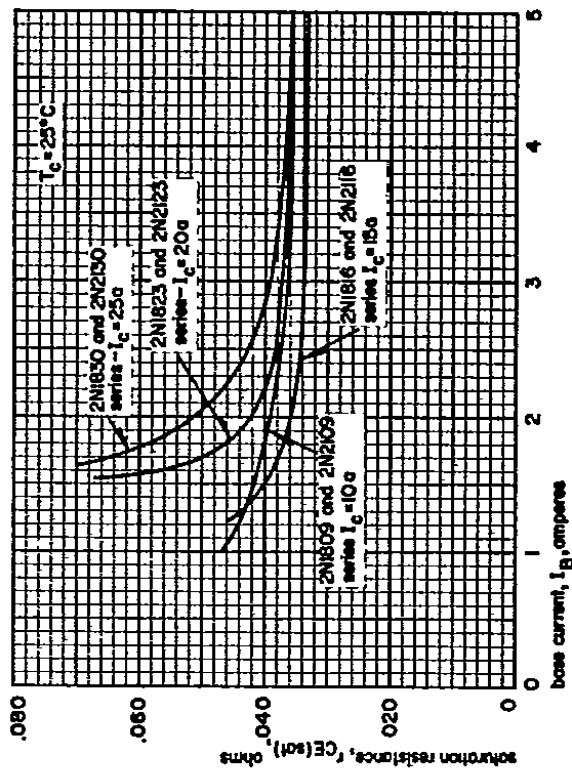


figure 6. Saturation characteristics versus base current.

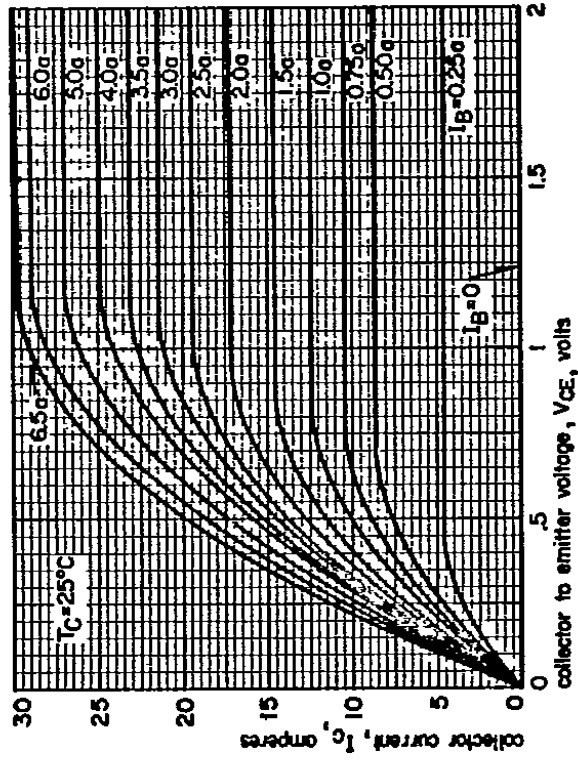


Figure 7. Output characteristics—saturation region, 2N1809—2N2109 series.

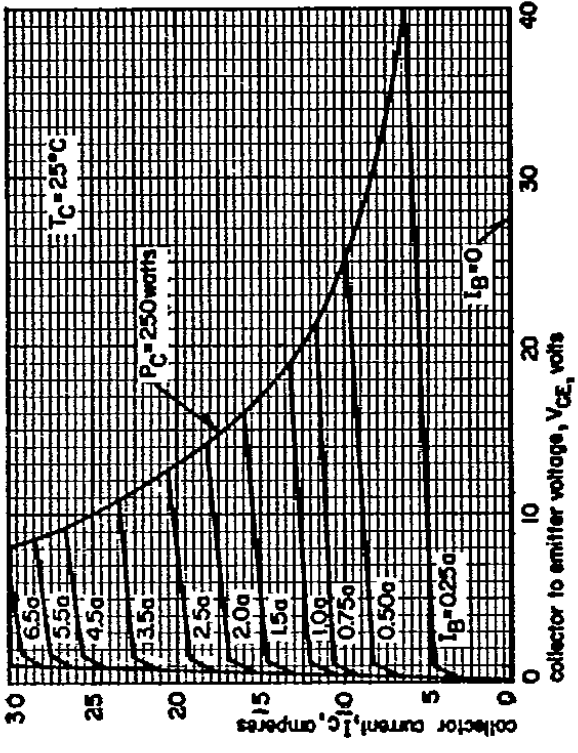


Figure 8. Output characteristics, 2N1809—2N2109 series.

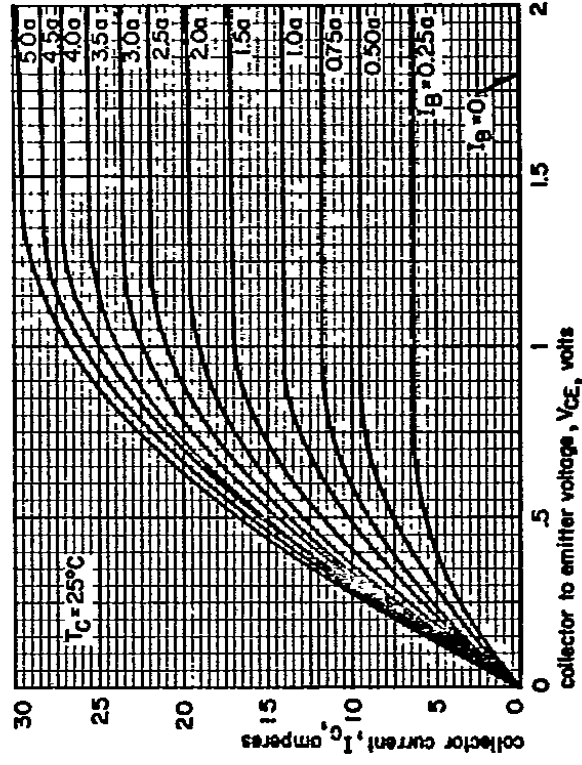


Figure 9. Output characteristics—saturation region, 2N1816—2N2116 series.

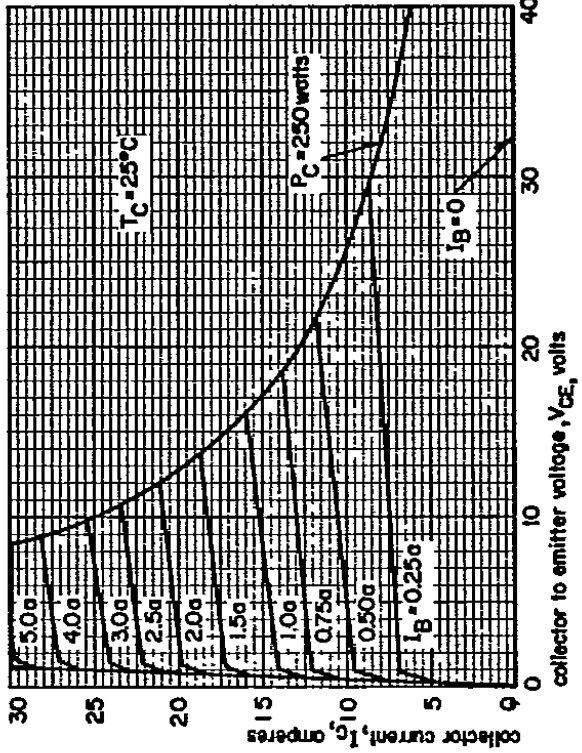


Figure 10. Output characteristics, 2N1816—2N2116 series.

typical characteristics

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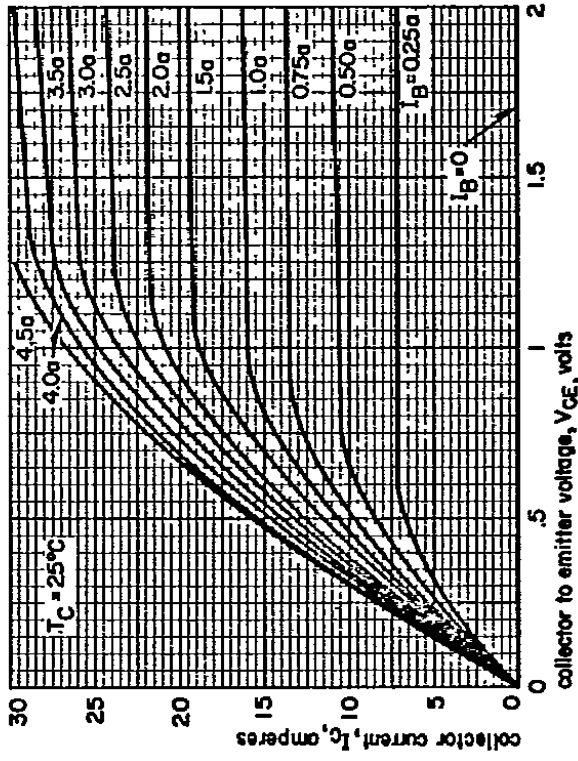


figure 11. Output characteristics—saturation region, 2N1823—2N2123 series.

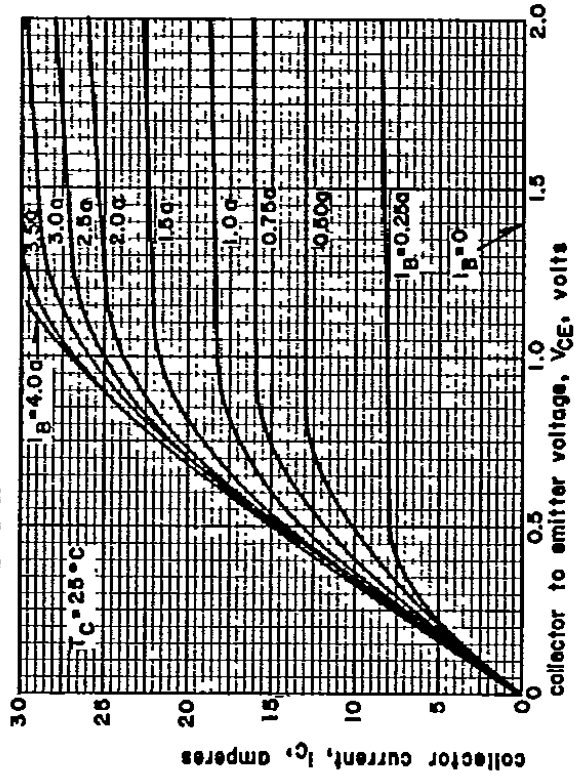


figure 13. Output characteristics—saturation region, 2N1830—2N2130 series.

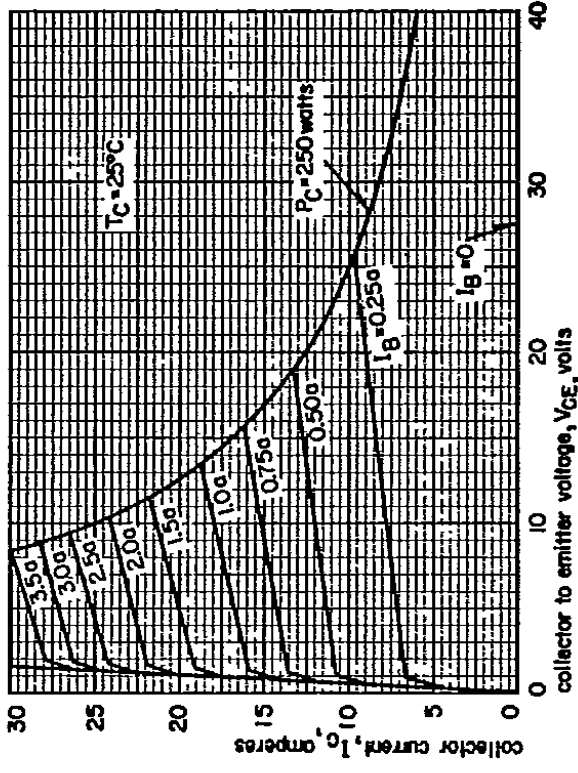


figure 12. Output characteristics, 2N1823—2N2123 series

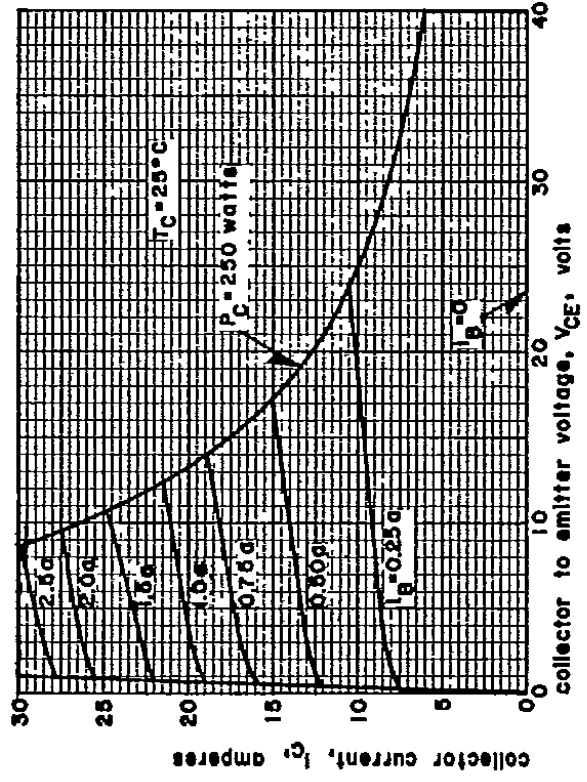


figure 14. Output characteristics, 2N1830—2N2130 series.

