

7294621 POWEREX INC

40C 00578 D T-33-15



DATA SHEETS

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technical
data

54-662

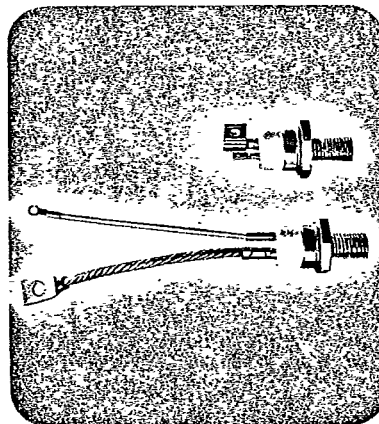
page 1

silicon power transistors
for switching, regulator and
amplifier applications

JEDEC types

2N1809, 2N1816, 2N1823
2N1830, 2N2109, 2N2116
2N2123, 2N213030 amperes • 250 watts
collector-to-emitter voltage 50 to 300 volts

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.

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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_{CE} , volts
2N1809 2N1816 2N1823 2N1830	2N2109 2N2116 2N2123 2N2130	50
2N1810 2N1817 2N1824 2N1831	2N2110 2N2117 2N2124 2N2131	100
2N1811 2N1818 2N1825 2N1832	2N2111 2N2118 2N2125 2N2132	150
2N1812 2N1819 2N1826 2N1833	2N2112 2N2119 2N2126 2N2133	200
2N1813	2N2113	250
2N1814	2N2114	300

Continuous collector dissipation, P_c , watts

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

At the maximum rating (collector to emitter) of these transistors is well below the values of V_{CE} , $V_{CE(sat)}$, and V_{BE} . This ensures 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), 30
 $T_j = 175^\circ\text{C}$, $V_{BE} = -1.5$ Vdc, mAdc 30
 Max. emitter current at $V_{BE} = 15$ Vdc, $T_j = 175^\circ\text{C}$, 25
 $I_C = 0$, mAdc

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	0.15
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, $I_B = 3$ 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	0.10
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, $I_B = 4.5$ 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	...

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electrical characteristics continued

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

2N1823 and 2N2123 series

	symbol	minimum	typical	maximum
d-c current transfer ratio at $V_{CE} = 4 \text{ Vdc}$, $I_C = 20 \text{ Adc}$	h_{FE}	10	12.5	0.075
saturation resistance at $I_C = 20 \text{ Adc}$, $I_B = 4 \text{ Adc}$, ohms	$V_{CE(sat)}$	..	0.037	2.5
base voltage at $I_C = 20 \text{ Adc}$, $I_B = 4 \text{ Adc}$, Vdc	$V_{BE(sat)}$	..	1.8	..
common emitter beta cut-off frequency at $V_{CE} = 12 \text{ Vdc}$, $I_C = 5 \text{ Adc}$, kilocycles	$f_{\beta e}$	..	16	..
turn on time at $I_C = 20 \text{ Adc}$, $I_B = 6 \text{ Adc}$, $V_{CE} = 12 \text{ Vdc}$, microseconds	t_{on}	..	20	..
turn off time at $V_{BE} = -6 \text{ Vdc}$, $V_{CE} = 12 \text{ Vdc}$, $I_{B2} = -6 \text{ Adc}$, microseconds	t_{off}	..	15	..

2N1830 and 2N2130 series

	symbol	minimum	typical	maximum
d-c current transfer ratio at $V_{CE} = 4 \text{ Vdc}$, $I_C = 25 \text{ Adc}$	h_{FE}	10	14	0.06
saturation resistance at $I_C = 25 \text{ Adc}$, $I_B = 5 \text{ Adc}$, ohms	$V_{CE(sat)}$	..	0.035	2.5
base voltage at $I_C = 25 \text{ Adc}$, $I_B = 5 \text{ Adc}$, Vdc	$V_{BE(sat)}$	..	1.9	..
common emitter beta cut-off frequency at $V_{CE} = 12 \text{ Vdc}$, $I_C = 5 \text{ Adc}$, kc	$f_{\beta e}$	..	14	..
turn on time at $I_C = 25 \text{ Adc}$, $I_B = 7.5 \text{ Adc}$, $V_{CE} = 12 \text{ Vdc}$, microseconds	t_{on}	..	15	..
turn off time at $V_{BE} = -6 \text{ Vdc}$, $V_{CE} = 12 \text{ Vdc}$, $I_{B2} = -7.5 \text{ Adc}$, microseconds	t_{off}	..	15	..

typical characteristics

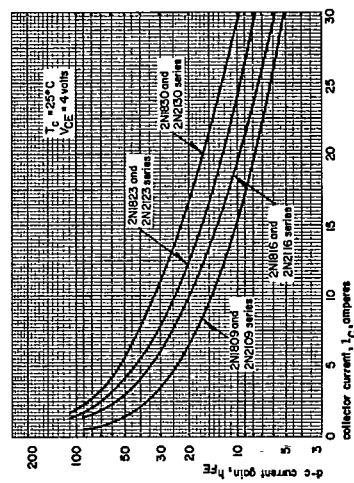


Figure 1. D-c current gain versus collector current.

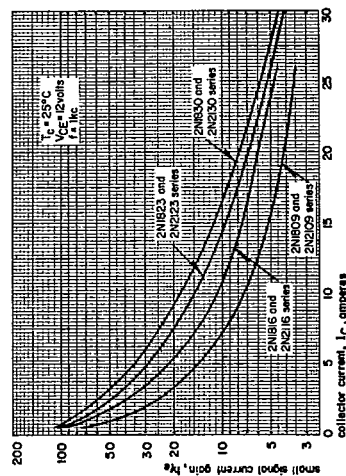


Figure 2. Small signal gain versus collector current.

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typical characteristics continued

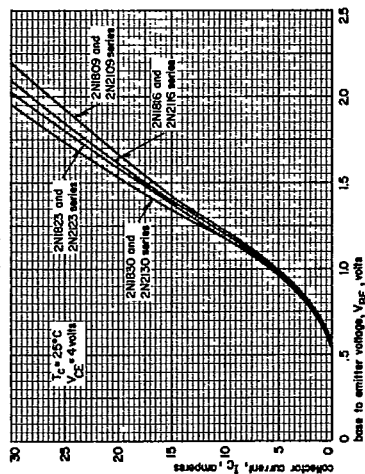


Figure 3. Transconductance characteristics.

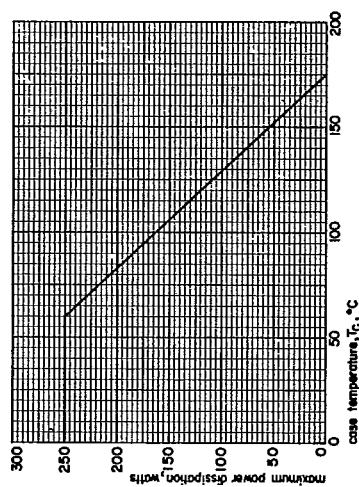


Figure 5. Derating curve.

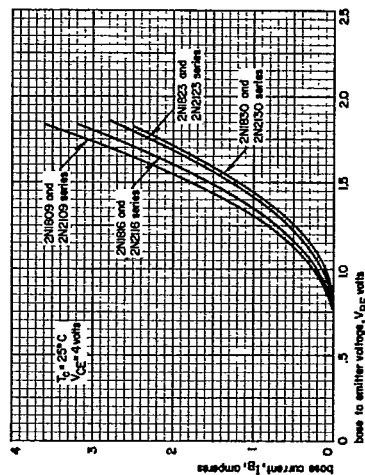


Figure 4. Input characteristics.

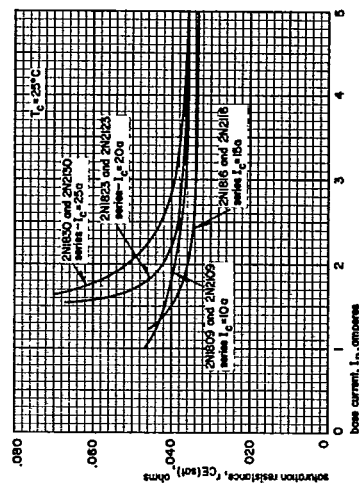


Figure 6. Saturation characteristics versus base current.

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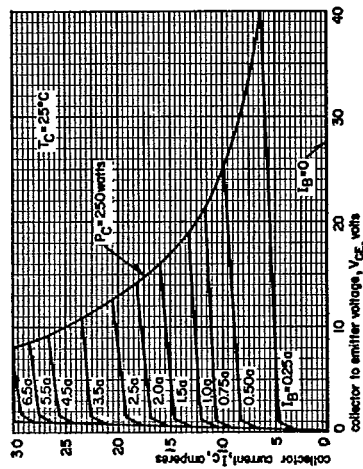


Figure 8. Output characteristics, 2N1809-2N2109 series.

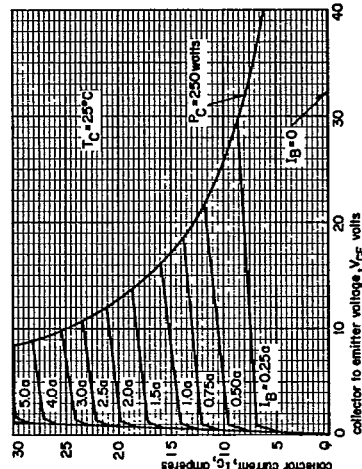


Figure 10. Output characteristics, 2N1816-2N2116 series.

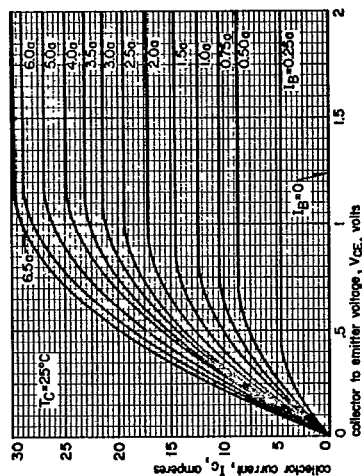


Figure 7. Output characteristics—saturation region, 2N1809-2N2109 series.

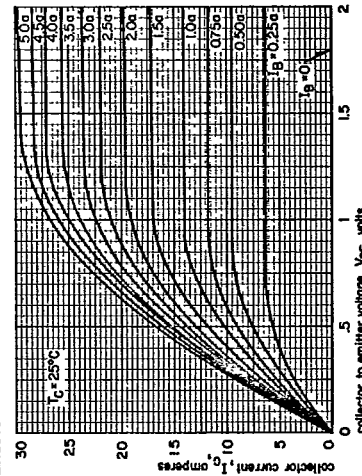


Figure 9. Output characteristics—saturation region, 2N1816-2N2116 series.

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typical characteristics continued

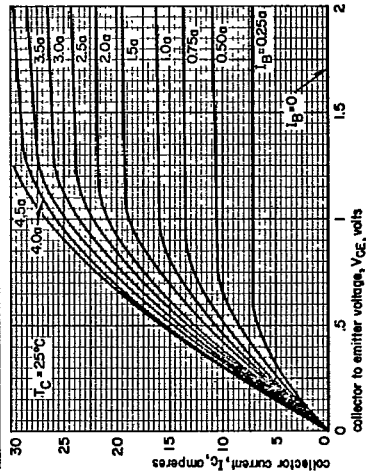


Figure 11. Output characteristics—saturation region, 2N1823-2N2123 series.

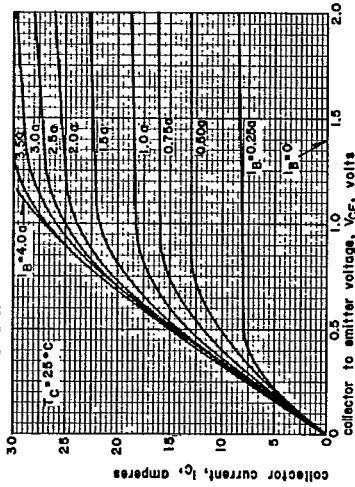


Figure 13. Output characteristics—saturation region, 2N1830-2N2130 series.

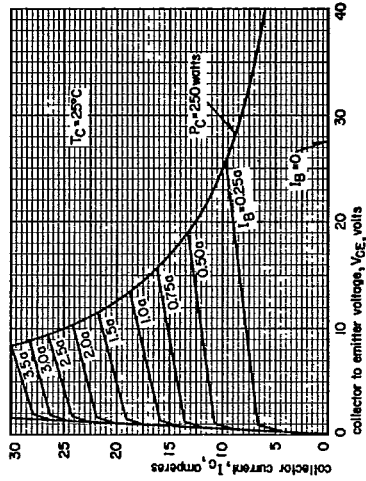


Figure 12. Output characteristics, 2N1823-2N2123 series.

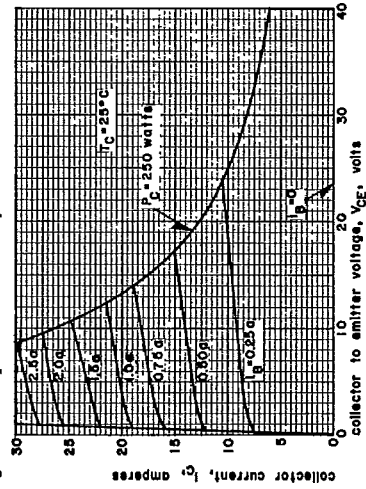


Figure 14. Output characteristics, 2N1830-2N2130 series.

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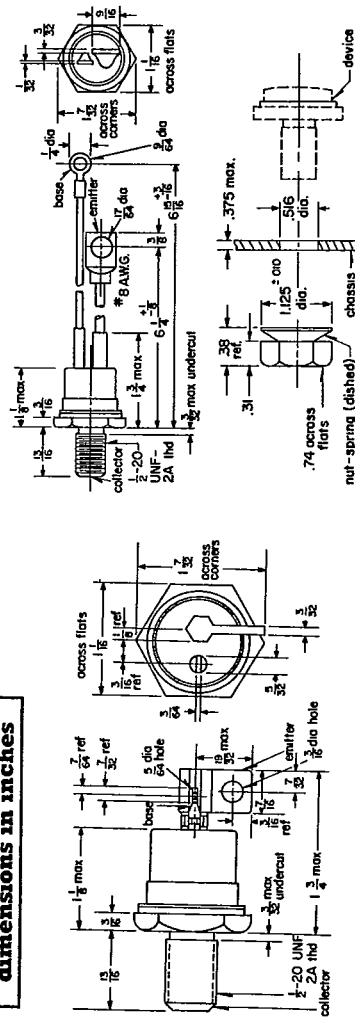
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DT-33-15

DATA SHEETS

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dimensions in inches



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