

D44VH Series

File Number **15.23**

Silicon N-P-N Transistors

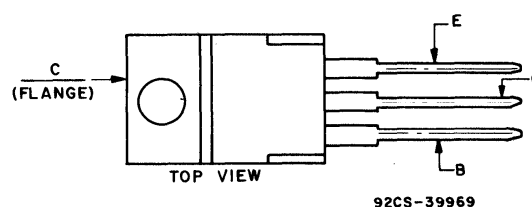
Complementary to the D45VH Series

Features:

- Fast Switching $t_s \leq 700 \text{ ns}$ resistive
 $t_f \leq 200 \text{ ns}$
- Low $V_{CE(sat)} \leq 0.4 \text{ V}$ @ $I_C = 8 \text{ A}$

The D44VH series of silicon n-p-n power transistors are especially designed for use in switching circuits such as switching regulators, high-frequency inverters/converters, and other applications where very fast switching times and low-saturation voltages are necessary. These devices are tested for parameters that relate directly to the design of high-power switching circuits. Switching times, saturation voltages, and leakage currents are specified at 100°C to provide information necessary for worst-case design.

TERMINAL DESIGNATIONS



JEDEC TO-220AB

MAXIMUM RATINGS ($T_A = 25^\circ\text{C}$) (unless otherwise specified)

RATING	SYMBOL	D44VH1	D44VH4	D44VH7	D44VH10	UNIT
Collector-Emitter Voltage	$V_{CEO(sus)}$	30	45	60	80	V
Collector-Emitter Voltage	V_{CEX}	40	55	70	90	V
Collector-Emitter Voltage	V_{CEV}	50	65	80	100	V
Emitter Base Voltage	V_{EBO}	7				V
Collector Current — Continuous	I_C	15				A
— Peak (1)	I_{CM}	20				
Base Current — Continuous	I_B	5				A
— Peak (1)	I_{BM}	10				
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	83				Watts
Derate above 25°C		33				$\text{W}/^\circ\text{C}$
		0.67				
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to +150				$^\circ\text{C}$

THERMAL CHARACTERISTICS

CHARACTERISTICS	SYMBOL	MAX	UNIT
Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.5	$^\circ\text{C}/\text{W}$
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	74	$^\circ\text{C}/\text{W}$
Maximum Lead Temperature for Soldering Purposes: 1/8" from Case for 5 Seconds	T_L	235	$^\circ\text{C}$

(1) Pulse measurement condition $PW \leq 6.0 \text{ ms}$, See Figure 14.

D44VH Series**ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$) (unless otherwise specified)**

CHARACTERISTICS	SYMBOL	MIN	MAX	UNIT
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OFF CHARACTERISTICS⁽¹⁾

Collector-Emitter Sustaining Voltage ⁽¹⁾ ($I_C = 100\text{mA}$, $I_B = 0$) D44VH1 D44VH4 D44VH7 D44VH10	$V_{CEO(sus)}$	30 45 60 80	— — — —	V
Collector-Emitter Voltage ⁽²⁾ ($I_C = 1\text{A}$, $V_{CLAMP} = \text{Rated } V_{CEX}$, $T_C = 100^\circ\text{C}$) D44VH1 D44VH4 D44VH7 D44VH10	V_{CEX}	40 55 65 90	— — — —	V
Collector Cutoff Current ($V_{CEV} = \text{Rated Value}$, $V_{BE(off)} = -4.0\text{V}$) ($V_{CEV} = \text{Rated Value}$, $V_{BE(off)} = -4.0\text{V}$, $T_C = 100^\circ\text{C}$)	I_{CEV}	— —	10 100	μA
Collector Cutoff Current ($V_{CE} = \text{Rated } V_{CEV}$, $R_{BE} = 50\ \Omega$, $T_C = 100^\circ\text{C}$)	I_{CER}	—	100	μA
Emitter Cutoff Current ($V_{EB} = 7\text{V}$, $I_C = 0$)	I_{EBO}	—	10	μA

SECOND BREAKDOWN

Second Breakdown with Base Forward Biased	F_{BSOA}	SEE FIGURE 7
Second Breakdown with Base Reverse Biased	R_{BSOA}	SEE FIGURE 8

ON CHARACTERISTICS⁽¹⁾

DC Current Gain ($I_C = 2\text{A}$, $V_{CE} = 1\text{V}$) ($I_C = 4\text{A}$, $V_{CE} = 1\text{V}$)	h_{FE}	35 20	— —	—
Collector-Emitter Saturation Voltage ($I_C = 8\text{A}$, $I_B = 0.4\text{A}$) ($I_C = 8\text{A}$, $I_B = 0.4\text{A}$, $T_C = 100^\circ\text{C}$) ($I_C = 15\text{A}$, $I_B = 3.0\text{A}$, $T_C = 100^\circ\text{C}$)	$V_{CE(sat)}$	— — —	0.4 0.5 0.8	V
Base-Emitter Saturation Voltage ($I_C = 8\text{A}$, $I_B = 0.4\text{A}$) ($I_C = 8\text{A}$, $I_B = 0.4\text{A}$, $T_C = 100^\circ\text{C}$)	$V_{BE(sat)}$	— —	1.2 1.1	V

DYNAMIC CHARACTERISTICS

Typical

Current-Gain — Bandwidth Product ($I_C = 0.1\text{A}$, $V_{CE} = 10\text{V}$, $f_{test} = 1\text{MHz}$)	f_T	50	MHz
Output Capacitance ($V_{CB} = 10\text{V}$, $I_E = 0$, $f_{test} = 1\text{MHz}$)	C_{OB}	120	pF

SWITCHING CHARACTERISTICS

Maximum

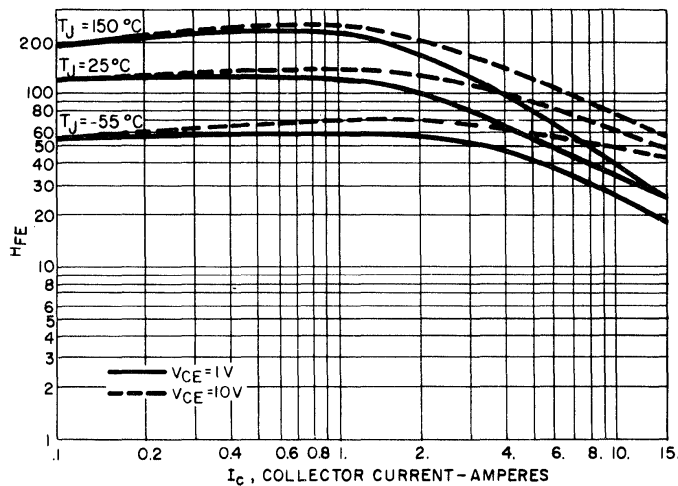
Resistive Load (See Figure 16 for Test Circuit)		T _C	25°C	100°C	
Delay Time	V _{CC} = 20V, I _C = 8A I _{B1} = I _{B2} = 0.8A t _p = 25 μsec	t _d	50	—	nsec
Rise Time		t _r	250	—	nsec
Storage Time		t _s	700	—	nsec
Fall Time		t _f	200	—	nsec
Inductive Load, Clamped (See Figure 15 for Test Circuit)					
Storage Time	V _{CC} = 20V, I _C = 8A V _{CLAMP} = Rated V _{CEX} I _{B1} = 0.8A, V _{BE(off)} = -5V L = 200 μh	t _s	800	—	nsec
Fall Time		t _f	180	400	nsec
		Typical			
Storage Time		t _s	280	370	nsec
Fall Time		t _f	130	150	nsec

(1) Pulse Duration = 300 μsec , Duty Factor $\leq 2\%$.

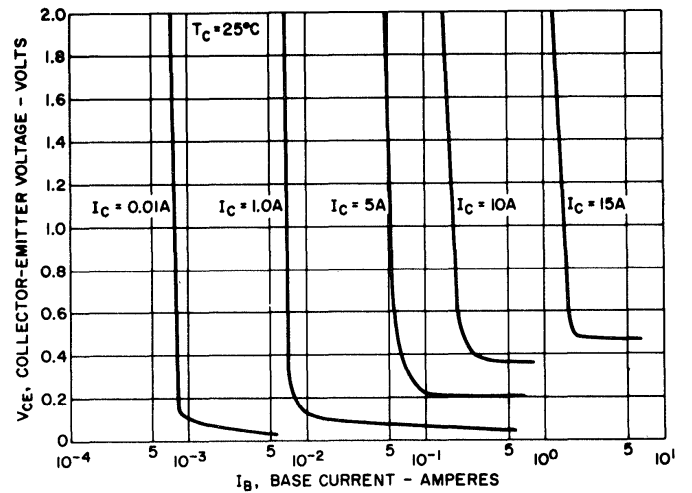
(2) See Figure 15 for Test Circuit.

D44VH Series

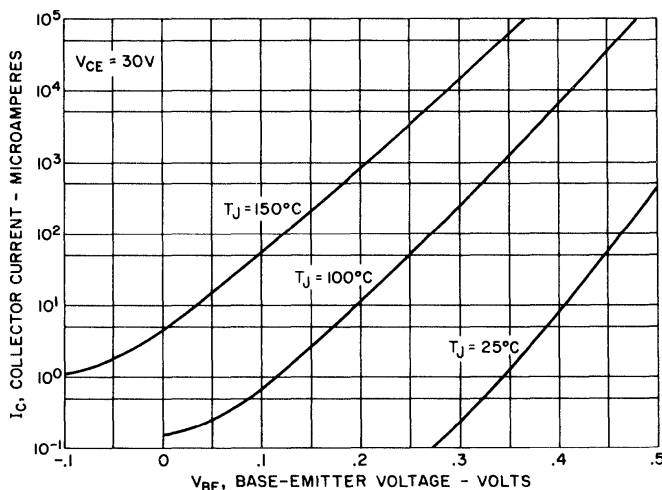
SAFE OPERATING AREA



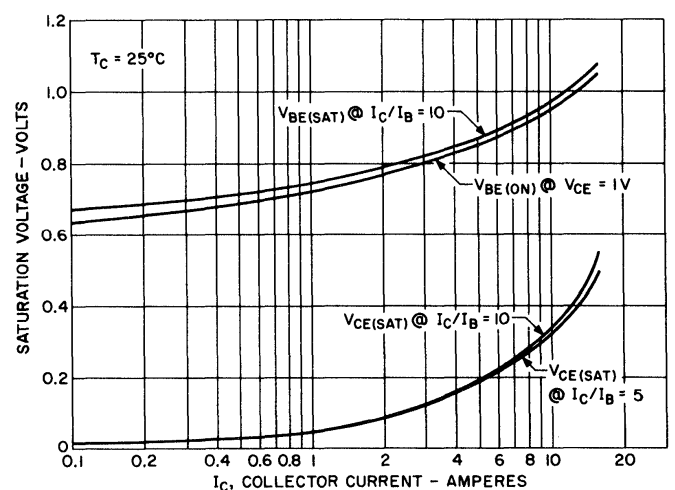
1. DC CURRENT GAIN



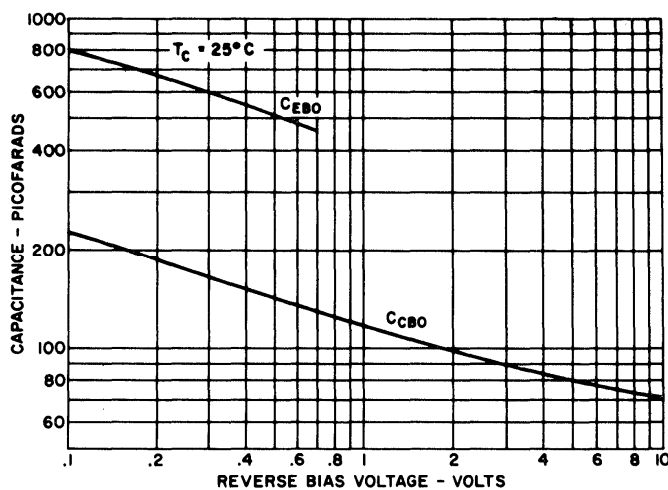
2. COLLECTOR SATURATION REGION



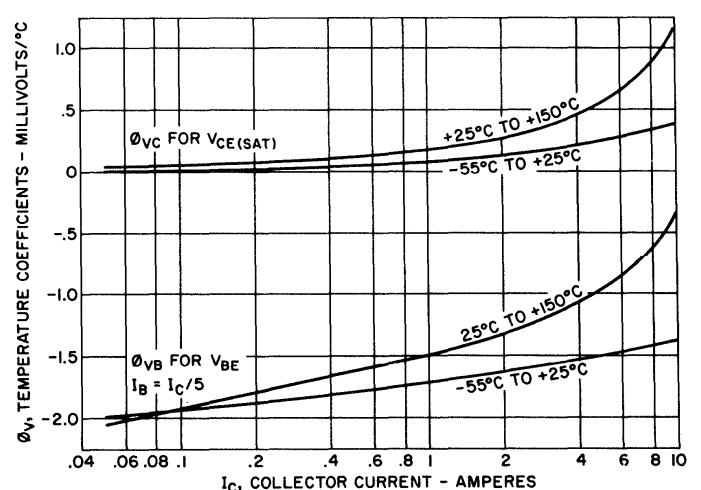
3. COLLECTOR CUTOFF REGION



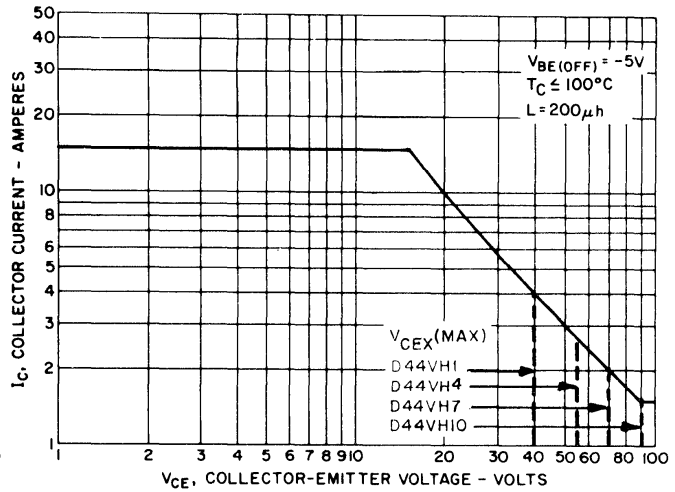
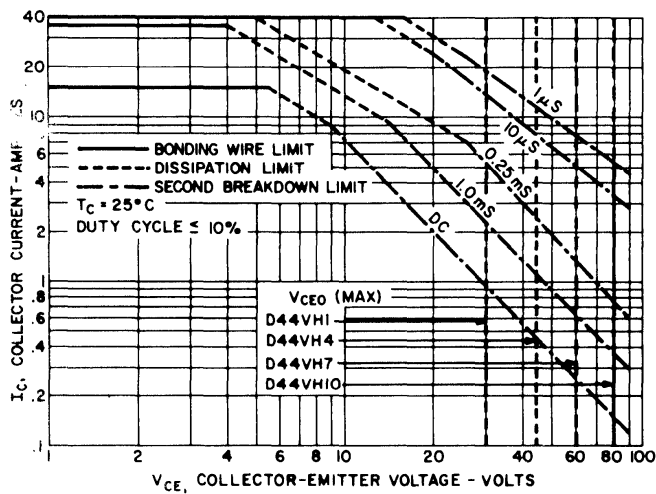
4. SATURATION VOLTAGE



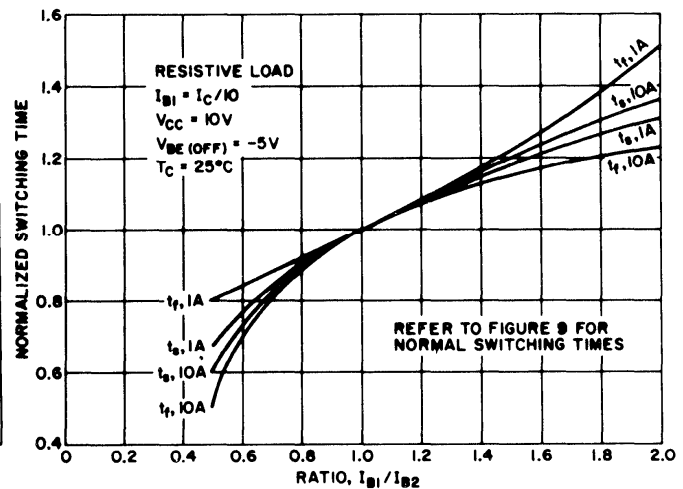
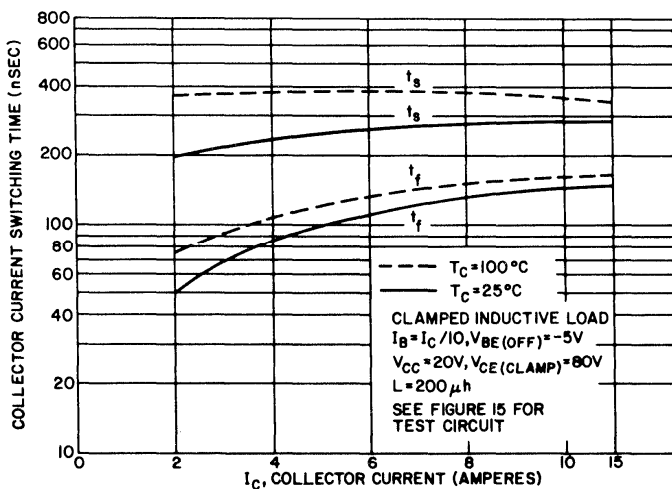
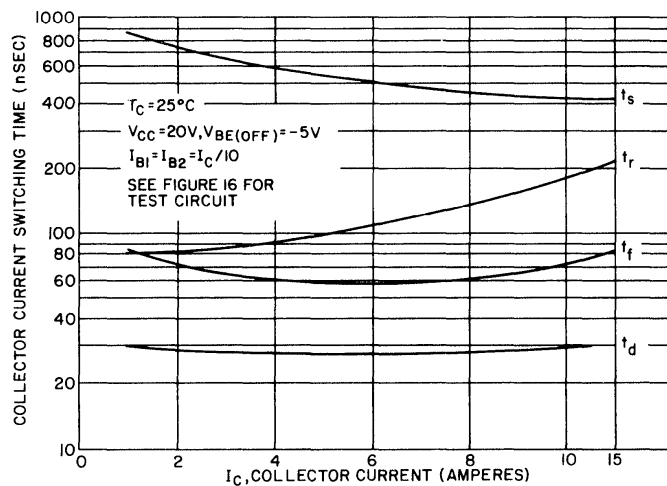
5. CAPACITANCE

6. SATURATION VOLTAGE
TEMPERATURE COEFFICIENTS

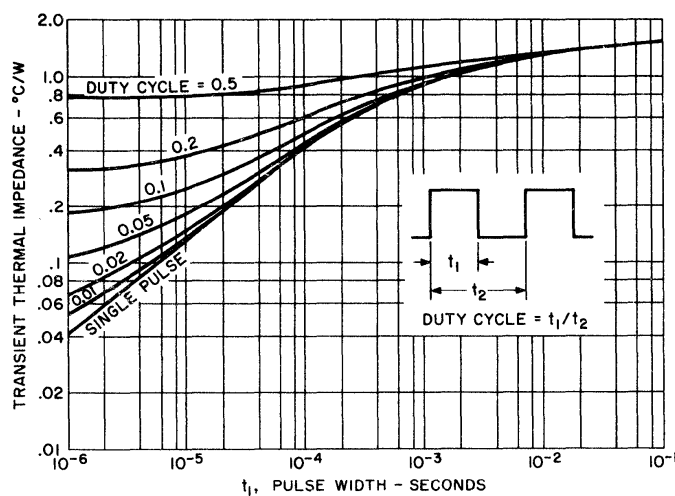
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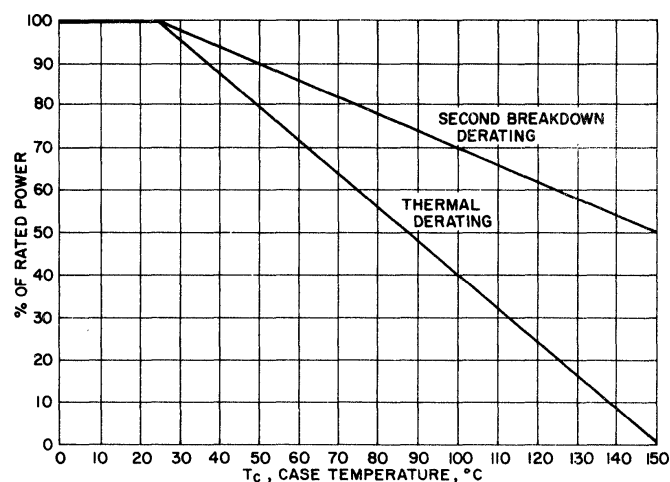
TYPICAL SWITCHING CHARACTERISTICS



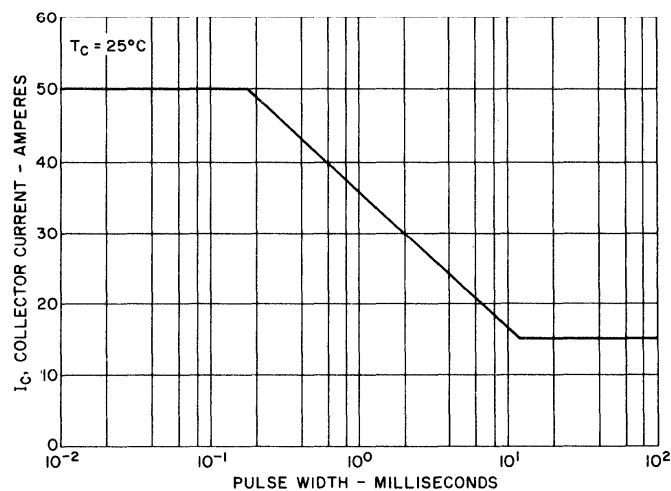
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12. TRANSIENT THERMAL RESPONSE

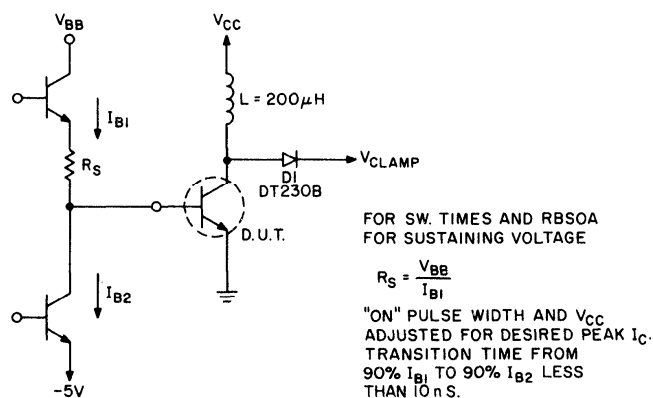
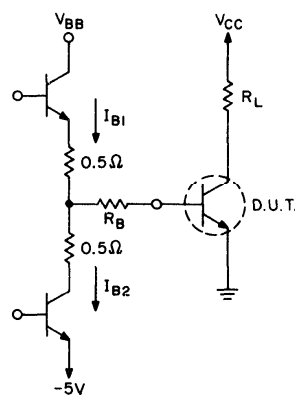


13. POWER DERATING FACTOR



14. MAXIMUM SINGLE PULSE COLLECTOR CURRENT

TEST CIRCUITS

15. INDUCTIVE SWITCHING AND V_{CEX} 

$$R_L = \frac{V_{CC}}{I_C}, \text{ NONINDUCTIVE}$$

$$R_B = \frac{V_{BB}}{I_{B1}} - 0.5$$

TRANSITION TIME FROM 90% I_{B1} TO 90% I_{B2} LESS THAN 10 nS.

16. RESISTIVE SWITCHING