Silicon N-P-N Transistors

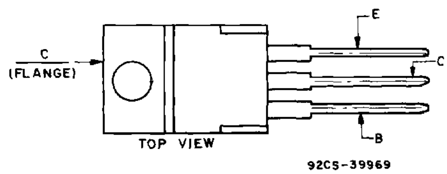
Complementary to the D45VH Series

Features:

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

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° 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 — Peak (1)	I_C I_{CM}	15 20				A
Base Current — Continuous — Peak (1)	I_B I_{BM}	5 10				A
Total Power Dissipation @ T_C = 25°C @ T_C = 100°C Derate above 25°C	P_D	83 33 0.67				Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to +150				°C

THERMAL CHARACTERISTICS

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

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

ELECTRICAL CHARACTERISTICS (T_C = 25°C) (unless otherwise specified)

CHARACTERISTICS	SYMBOL	MIN	MAX	UNIT
OFF CHARACTERISTICS[1]				
Collector-Emitter Sustaining Voltage[1] (I_C = 100mA, I_B = 0)	$V_{CEO(sus)}$			V
D44VH1		30	—	
D44VH4		45	—	
D44VH7		60	—	
D44VH10		80	—	
Collector-Emitter Voltage[2] (I_C = 1A, V_{CLAMP} = Rated V_{CEX}, T_C = 100°C)	V_{CEX}			V
D44VH1		40	—	
D44VH4		55	—	
D44VH7		65	—	
D44VH10		90	—	
Collector Cutoff Current	I_{CEV}			μA
(V_{CEV} = Rated Value, $V_{BE(off)}$ = -4.0V)		—	10	
(V_{CEV} = Rated Value, $V_{BE(off)}$ = -4.0V, T_C = 100°C)		—	100	
Collector Cutoff Current (V_{CE} = Rated V_{CEV}, R_{BE} = 50 Ω, T_C = 100°C)	I_{CER}	—	100	μA
Emitter Cutoff Current (V_{EB} = 7V, 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	h_{FE}			—
(I_C = 2 A, V_{CE} = 1V)		35	—	
(I_C = 4 A, V_{CE} = 1V)		20	—	
Collector-Emitter Saturation Voltage	$V_{CE(sat)}$			V
(I_C = 8A, I_B = 0.4A)		—	0.4	
(I_C = 8A, I_B = 0.4A, T_C = 100°C)		—	0.5	
(I_C = 15A, I_B = 3.0A, T_C = 100°C)		—	0.8	
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			V
(I_C = 8A, I_B = 0.4A)		—	1.2	
(I_C = 8A, I_B = 0.4A, T_C = 100°C)		—	1.1	

DYNAMIC CHARACTERISTICS

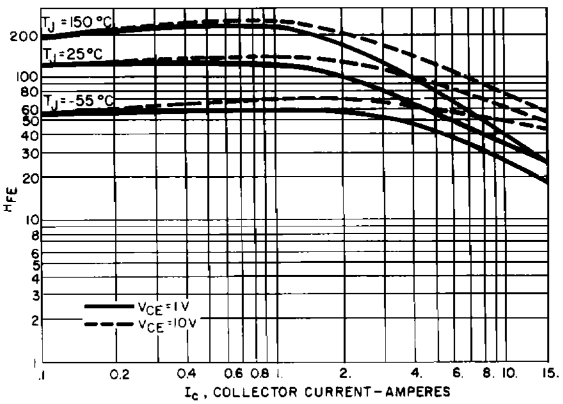
		Typical	
Current-Gain — Bandwidth Product (I_C = 0.1A, V_{CE} = 10V, f_{test} = 1 MHz)	f_T	50	MHz
Output Capacitance (V_{CB} = 10V, I_E = 0, f_{test} = 1 MHz)	C_{OB}	120	pF

SWITCHING CHARACTERISTICS

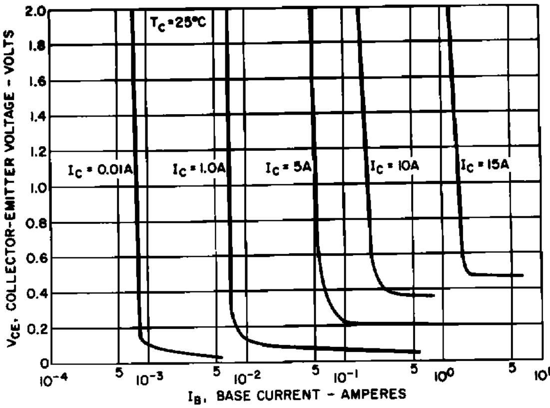
			Maximum		
Resistive Load (See Figure 16 for Test Circuit)		T_C	25°C	100°C	
Delay Time	V_{CC} = 20V, I_C = 8A I_{B1} = I_{B2} = 0.8A t_p = 25 μsec	t_d	50	—	nsec
Rise Time		t_r	250	—	nsec
Storage Time		t_s	700	—	nsec
Fall Time		t_f	200	—	nsec
Inductive Load, Clamped (See Figure 15 for Test Circuit)					
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 ≤ 2%.
(2) See Figure 15 for Test Circuit.

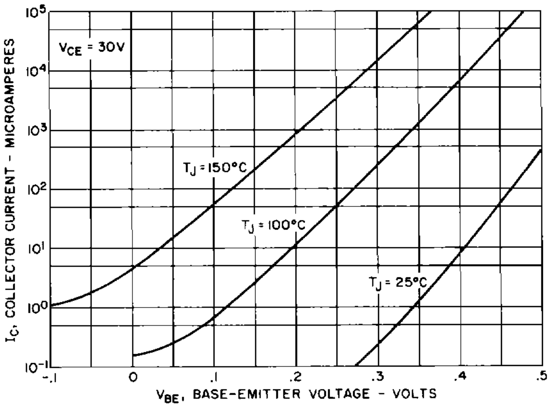
SAFE OPERATING AREA



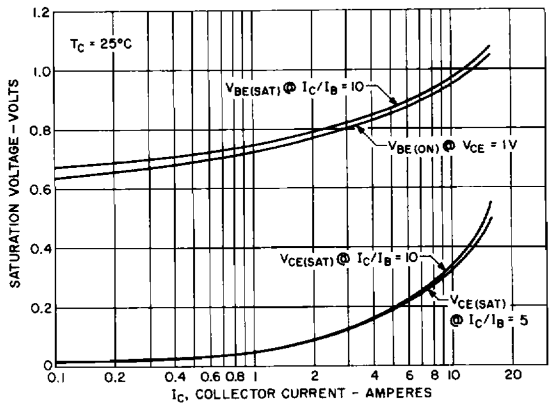
1. DC CURRENT GAIN



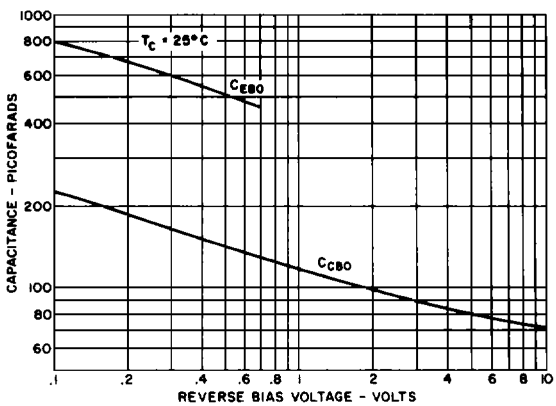
2. COLLECTOR SATURATION REGION



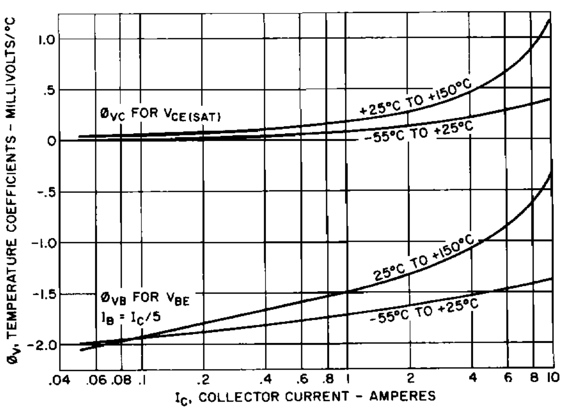
3. COLLECTOR CUTOFF REGION



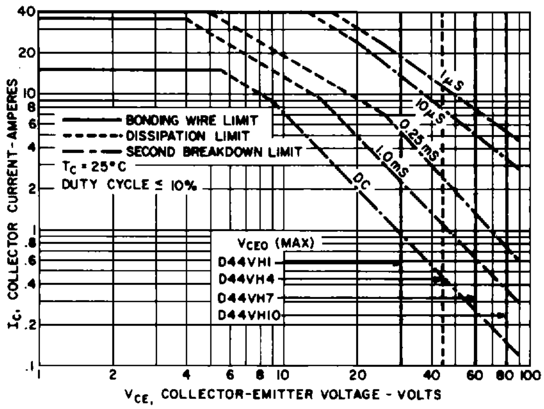
4. SATURATION VOLTAGE



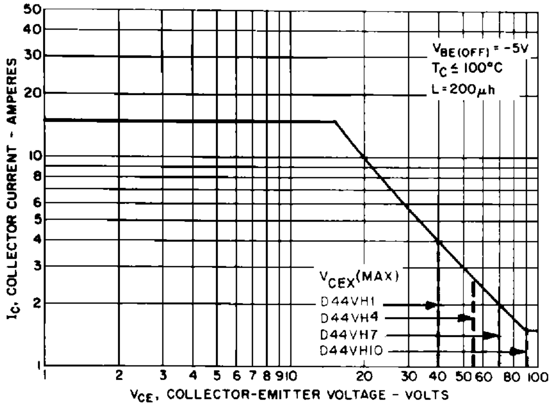
5. CAPACITANCE



6. SATURATION VOLTAGE TEMPERATURE COEFFICIENTS

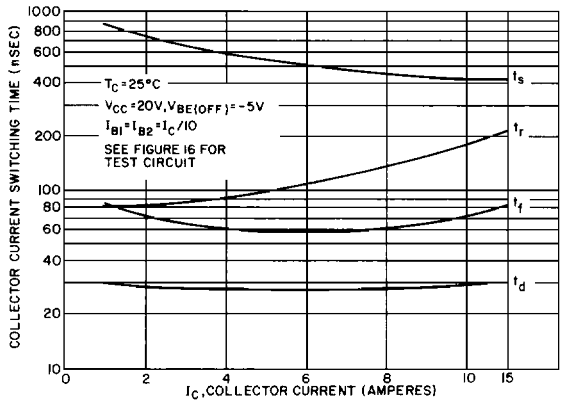


7. FORWARD BIAS SOA

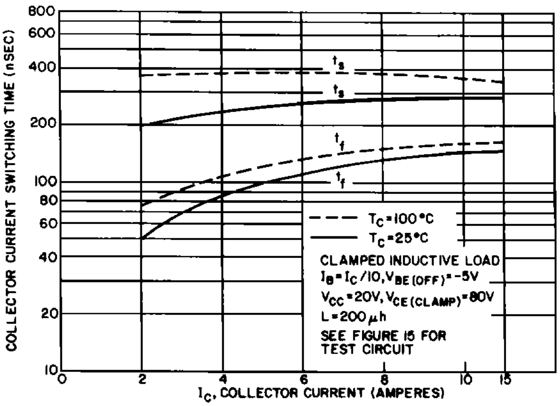


8. REVERSE BIAS SOA

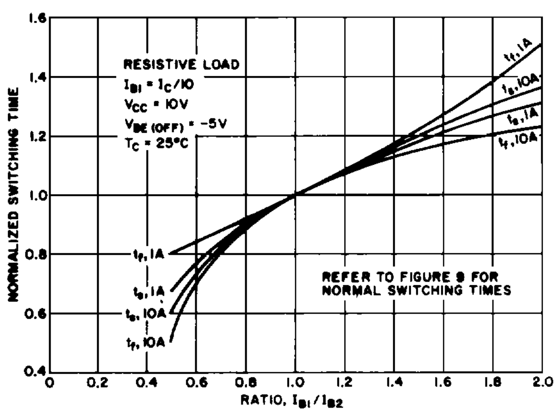
TYPICAL SWITCHING CHARACTERISTICS



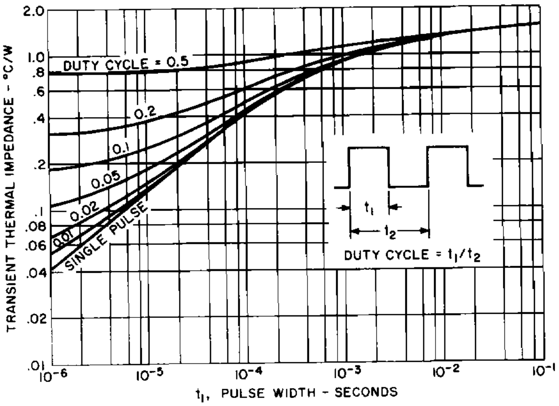
9. RESISTIVE SWITCHING TIME



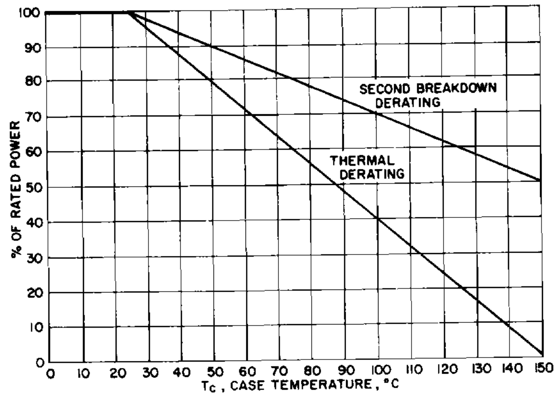
10. CLAMPED INDUCTIVE SWITCHING TIME



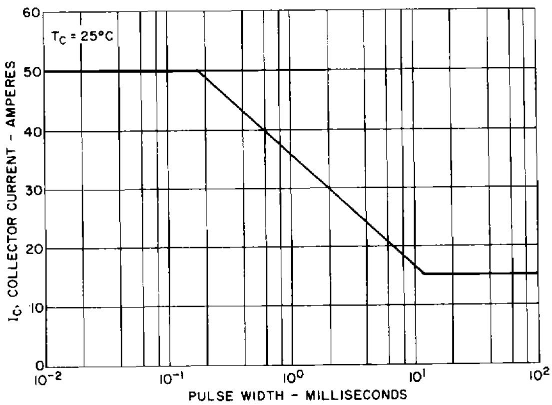
11. SWITCHING TIME VARIATION WITH I_{B2}



12. TRANSIENT THERMAL RESPONSE

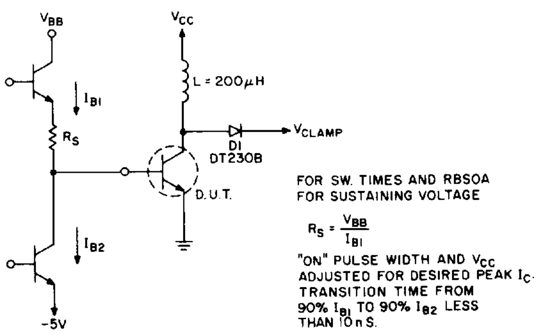


13. POWER DERATING FACTOR

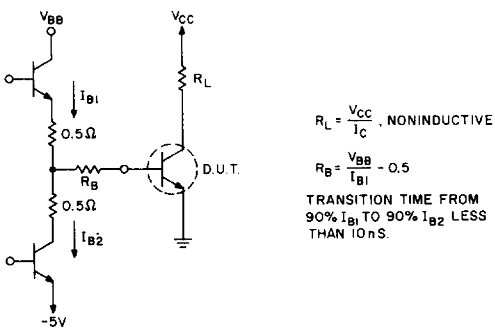


14. MAXIMUM SINGLE PULSE COLLECTOR CURRENT

TEST CIRCUITS



15. INDUCTIVE SWITCHING AND V_{CEX}



16. RESISTIVE SWITCHING