Silicon P-N-P Transistors

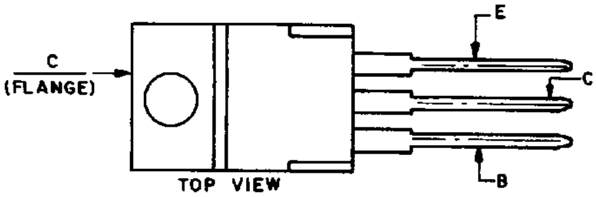
Complementary to the D44VH Series

Features:

- *Fast Switching $t_s \le 500$ ns resistive*
  $t_f \le 100$ ns
- *Low $V_{CE(sat)} \le 1.0V$ @ $I_C = 8A$*

The D45VH-series of silicon p-n-p 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	D45VH1	D45VH4	D45VH7	D45VH10	UNITS
Collector-Emitter Voltage	$V_{CEO(sus)}$	-30	-45	-60	-80	Volts
Collector-Emitter Voltage	V_{CEX}	-40	-55	-70	-90	Volts
Collector-Emitter Voltage	V_{CEV}	-50	-70	-80	-100	Volts
Emitter Base Voltage	V_{EBO}	-7	-7	-7	-7	Volts
Collector Current — Continuous Peak[1]	I_C I_{CM}	-15 -20	-15 -20	-15 -20	-15 -20	A
Base Current — Continuous Peak[1]	I_B I_{BM}	-5 -10	-5 -10	-5 -10	-5 -10	A
Total Power Dissipation @ Tc = 25°C @ Tc = 100°C Derate above 25°C	P_D	83 33 0.67	83 33 0.67	83 33 0.67	83 33 0.67	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-55 to +150	-55 to +150	-55 to +150	-55 to +150	°C

THERMAL CHARACTERISTICS

Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.5	1.5	1.5	1.5	°C/W
Thermal Resistance, Junction to Ambient	$R_{\theta JA}$	75	75	75	75	°C/W
Maximum Lead Temperature for Soldering Purpose: ⅛" from Case for 5 Seconds	T_L	235	235	235	235	°C

(1) Pulse measurement condition PW ≤ 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
D45VH1		-30	—	
D45VH4		-45	—	
D45VH7		-60	—	
D45VH10		-80	—	
Collector-Emitter Voltage[2] (I_C = -10A, V_{CLAMP} = Rated V_{CEX}, T_C = 100°C)	V_{CEX}			V
D45VH1		-40	—	
D45VH4		-55	—	
D45VH7		-70	—	
D45VH10		-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 = -0.8A)		—	-1.0	
(I_C = -8A, I_B = -0.8A, T_C = 100°C)		—	-1.1	
(I_C = -15A, I_B = -3.0A, T_C = 100°C)		—	-1.5	
Base-Emitter Saturation Voltage	$V_{BE(sat)}$			V
(I_C = -8A, I_B = -0.8A)		—	-1.4	
(I_C = -8A, I_B = -0.8A, T_C = 100°C)		—	-1.4	

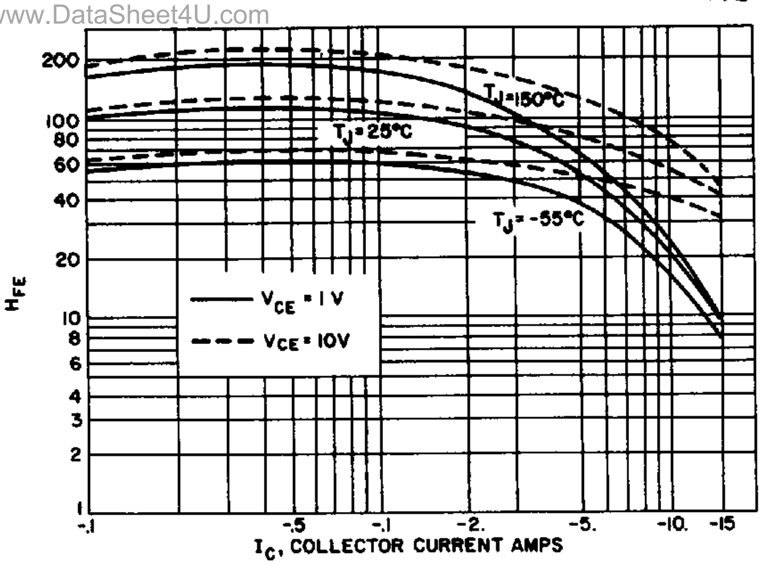
DYNAMIC CHARACTERISTICS

		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}	275	pF

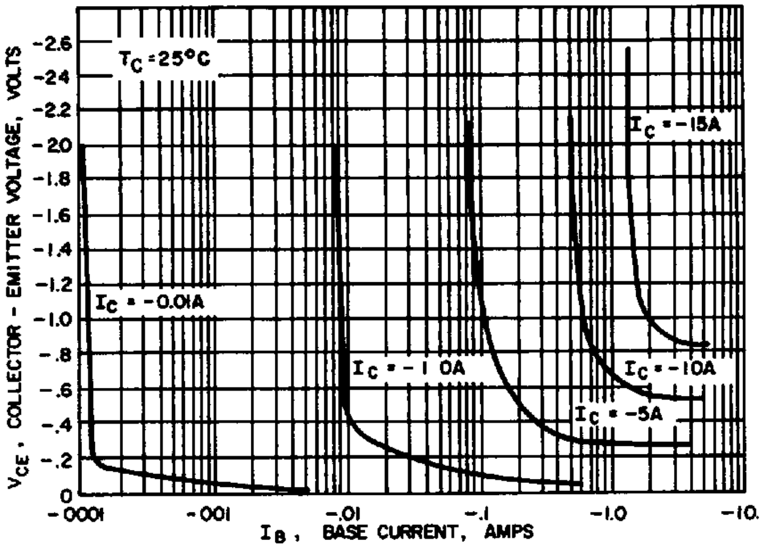
SWITCHING CHARACTERISTICS

			Maximum		
Resistive Load (See Figure 16 for Test Circuit)		T_C	25°C	100°C	
Delay Time	V_{CC} = -20V, I_C = -8A	t_d	50	—	nsec
Rise Time	I_{B1} = I_{B2} = 0.8A	t_r	250	—	nsec
Storage Time	t_p = 25 μsec	t_s	500	—	nsec
Fall Time		t_f	100	—	nsec
Inductive Load, Clamped (See Figure 15 for Test Circuit)					
Storage Time	V_{CC} = -20V, I_C = -8A	t_s	500	600	nsec
Fall Time	V_{CLAMP} = Rated V_{CEX}	t_f	300	400	nsec
	I_{B1} = - 0.8A, $V_{BE(off)}$ = 5V		Typical		
Storage Time	L = 200 μh	t_s	200	320	nsec
Fall Time		t_f	160	180	nsec

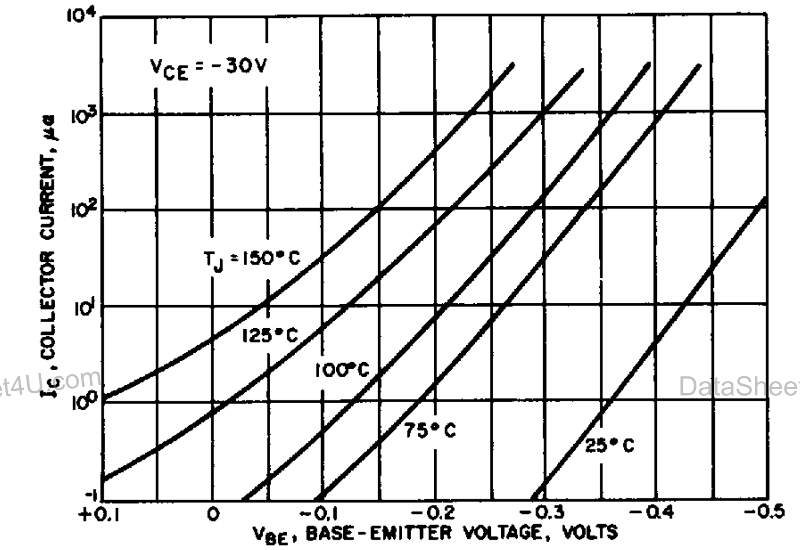
(1) Pulse Duration = 300 μsec, Duty Factor ≤ 2%.
(2) See Figure 15 for Test Circuit.



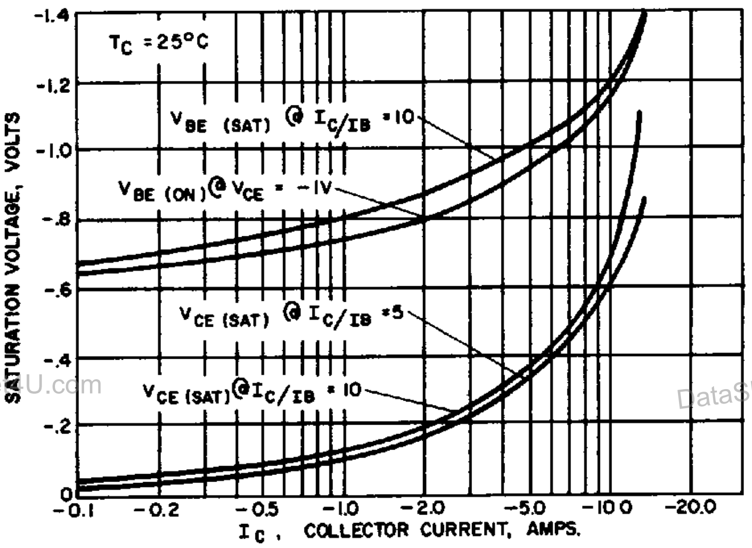
1. DC CURRENT GAIN



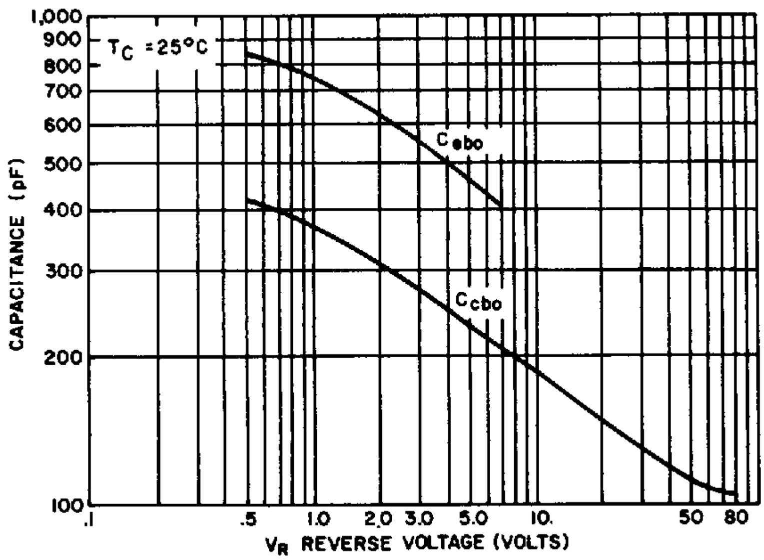
2. COLLECTOR SATURATION REGION



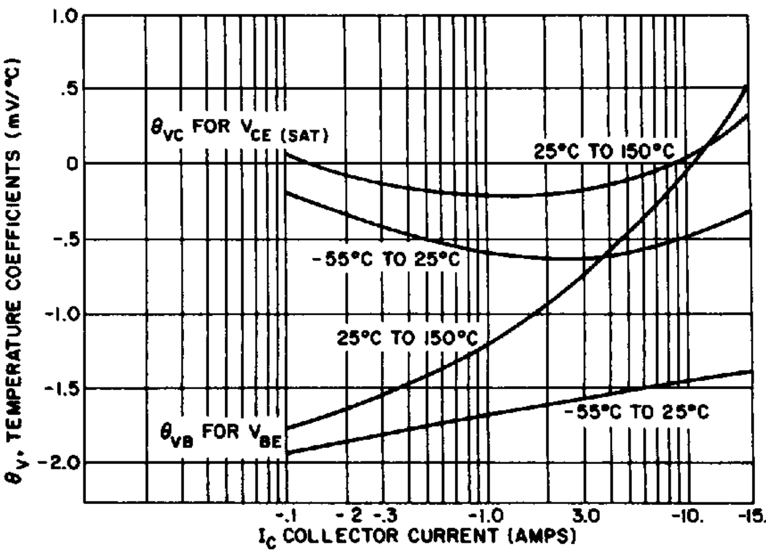
3. COLLECTOR CUTOFF REGION



4. SATURATION VOLTAGE

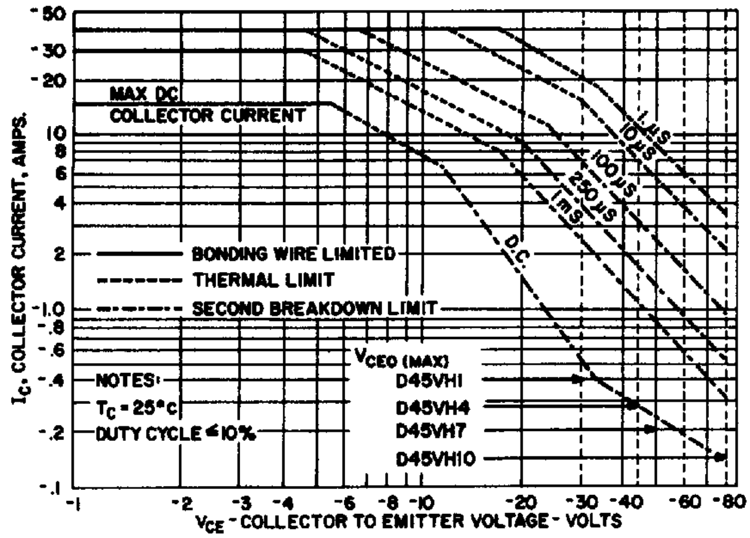


5. CAPACITANCE

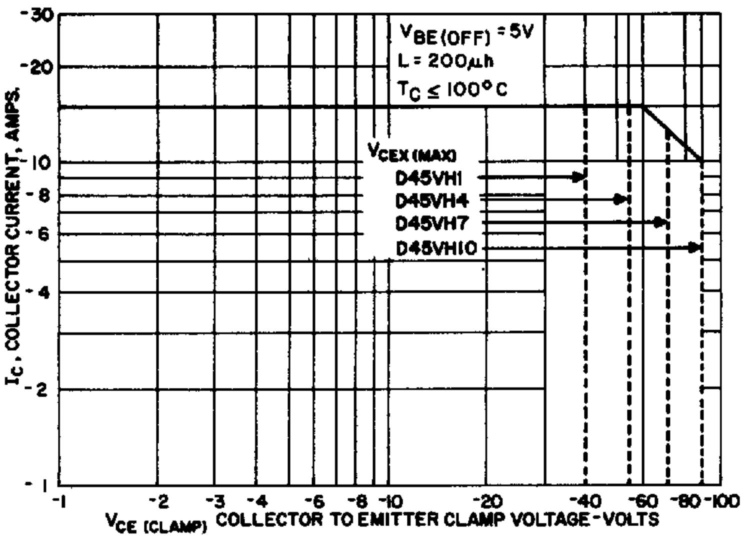


6. SATURATION VOLTAGE TEMPERATURE COEFFICIENTS

SAFE OPERATING AREA

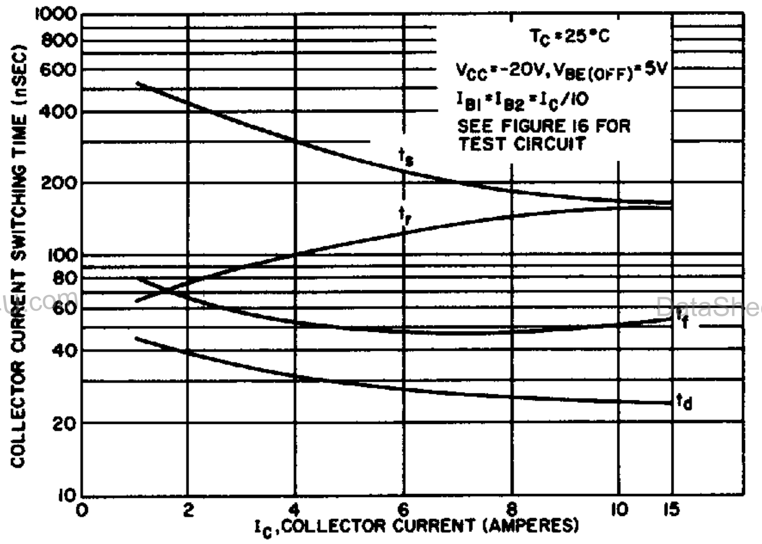


7. FORWARD BIAS SOA

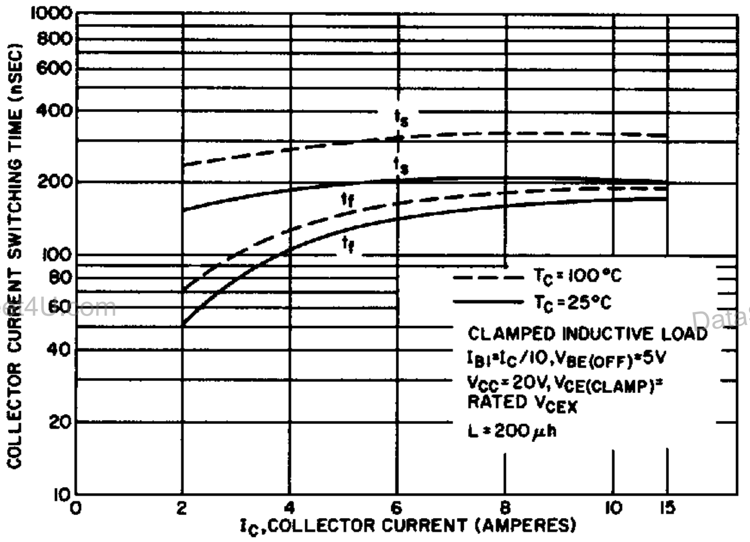


8. REVERSE BIAS SOA

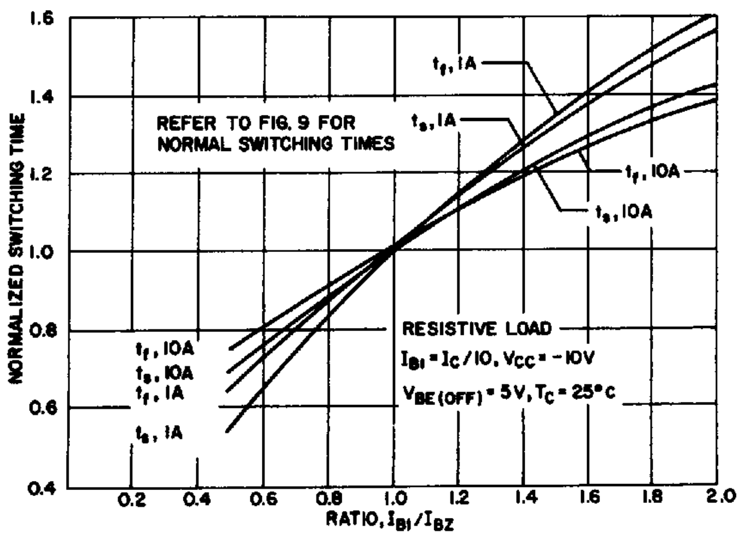
TYPICAL SWITCHING CHARACTERISTICS



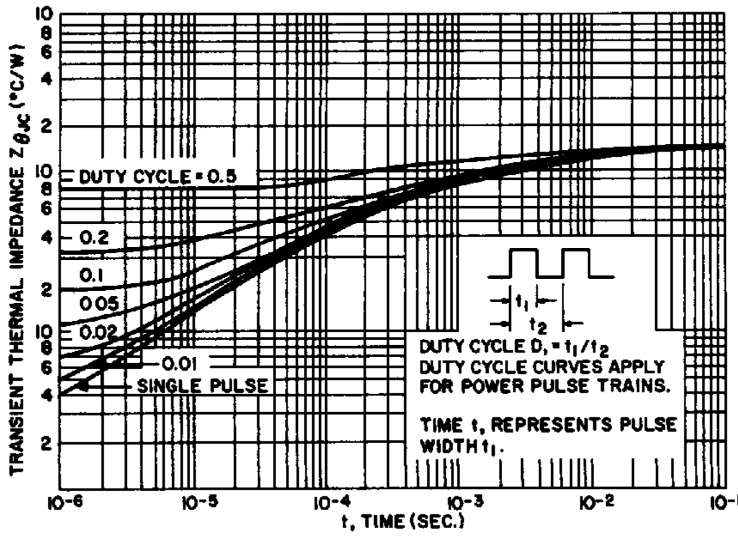
9. RESISTIVE SWITCHING TIME



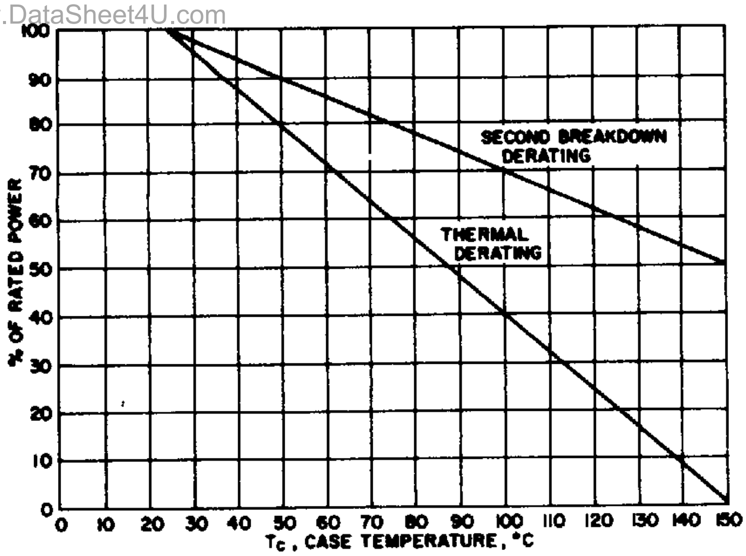
10. CLAMPED INDUCTIVE SWITCHING TIME



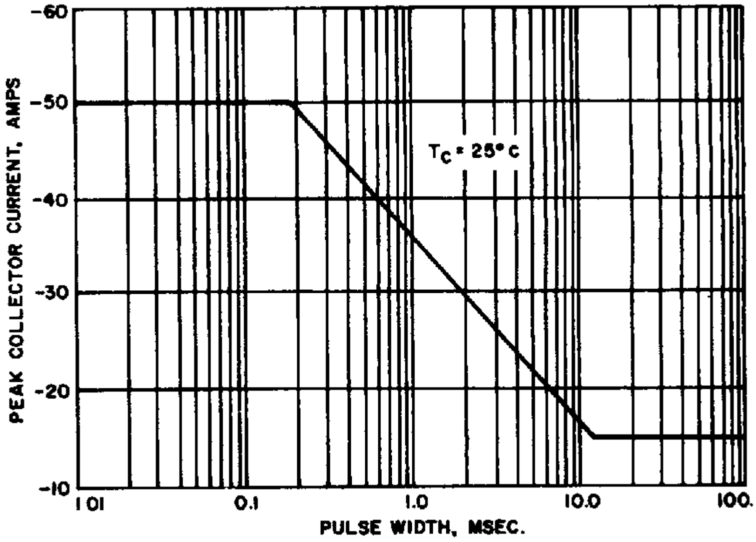
11. SWITCHING TIME VARIATION WITH I_{B2}



12. TRANSIENT THERMAL RESPONSE

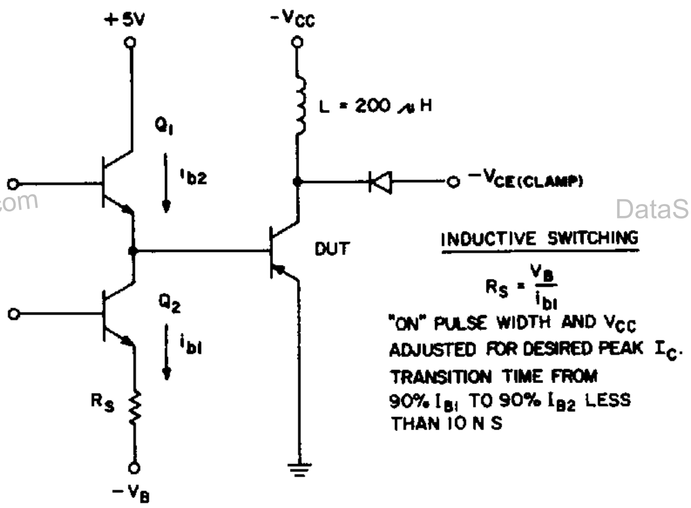


13. POWER DERATING FACTOR

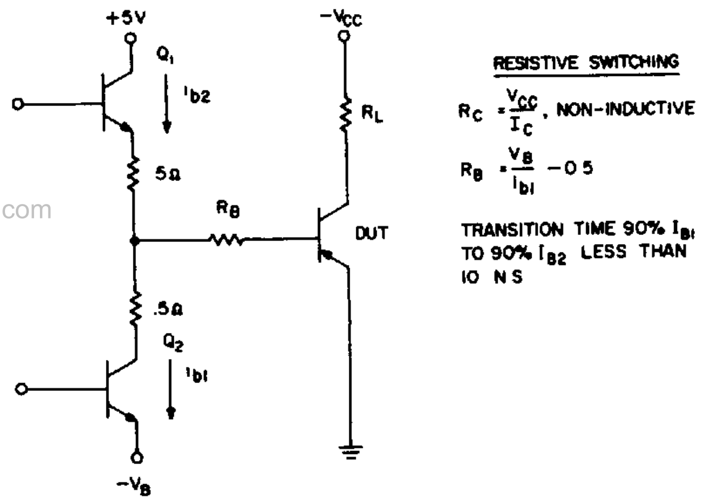


14. MAXIMUM SINGLE PULSE COLLECTOR CURRENT

TEST CIRCUITS



15. INDUCTIVE SWITCHING AND V_{CEX}



16. RESISTIVE SWITCHING