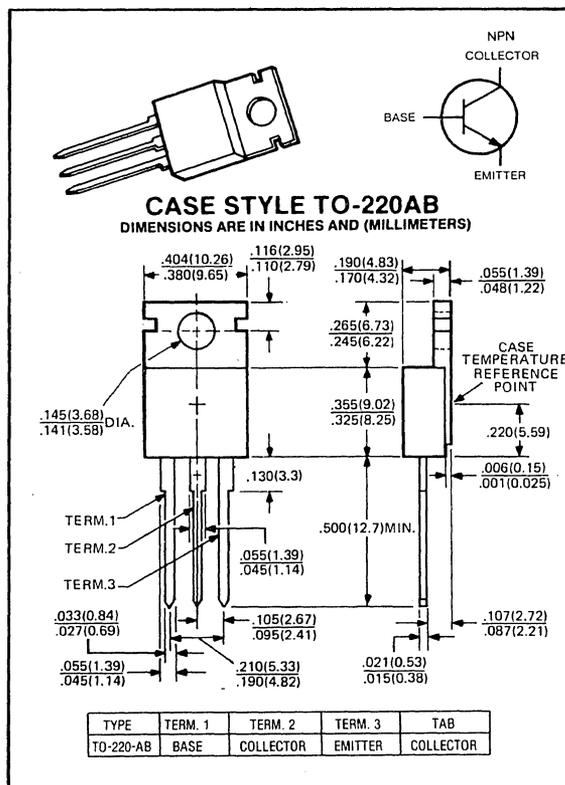# HIGH SPEED
NPN POWER TRANSISTORS

D44TQ1
D44TQ2

400-450 VOLTS
12 AMP, 100 WATTS

The D44TQ1 and D44TQ2 are designed for high-voltage, high-speed power switching inductive circuits where fall time is critical. They are particularly suited for 115 and 220V switch-mode applications such as switching regulators, inverters, motor controls, solenoid/relay drivers and deflection circuits.

Features:

* $V_{CEO(sus)}$ 400V and 450 V
* Reverse Bias SOA with inductive loads @ T_C = 100°C
* 700 V blocking capability
* SOA and switching information.

NPN
COLLECTOR

BASE

EMITTER

CASE STYLE TO-220AB
DIMENSIONS ARE IN INCHES AND (MILLIMETERS)

TYPE	TERM. 1	TERM. 2	TERM. 3	TAB
TO-220-AB	BASE	COLLECTOR	EMITTER	COLLECTOR

maximum ratings (T_A = 25°C) (unless otherwise noted)

RATING	SYMBOL	D44TQ1	D44TQ2	UNITS
Collector-Emitter Voltage	V_{CEO}	400	450	Volts
Collector-Emitter Voltage	V_{CEV}	650	750	Volts
Emitter Base Voltage	V_{EBO}	6	6	Volts
Collector Current — Continuous / Peak (Repetitive)[1]	I_C / I_{CM}	12 / 24	12 / 24	A
Base Current — Continuous / Peak (Non-Repetitive)[1]	I_B / I_{BM}	6 / 12	6 / 12	A
Total Power Dissipation @ Tc = 25°C / Derate above 25°C	P_D	100 / 0.8	100 / 0.8	Watts W/°C
Operating and Storage Junction Temperature Range	T_J, T_{STG}	–65 to +150	–65 to +150	°C

thermal characteristics

Thermal Resistance, Junction to Case	$R_{\theta JC}$	1.25	1.25	°C/W
Maximum Lead Temperature for Soldering Purpose: ⅛" from Case for 5 Seconds	T_L	260	260	°C

(1) Pulse Test: Pulse Width = 5ms. Duty Cycle ≤ 10%.

electrical characteristics ($T_C = 25°C$) (unless otherwise specified)

CHARACTERISTIC		SYMBOL	MIN	TYP	MAX	UNIT

off characteristics[1]

CHARACTERISTIC		SYMBOL	MIN	TYP	MAX	UNIT
Collector-Emitter Sustaining Voltage ($I_C = 10mA$, $I_B = 0$)	D44TQ1 D44TQ2	$V_{CEO(sus)}$	400 450	— —	— —	Volts
Collector Cutoff Current (V_{CE} = Rated Value, $V_{BE(OFF)} = 1.5V$)		I_{CEV}	—	—	1	mA
Emitter Cutoff Current ($V_{EB} = 6V$, $I_C = 0$)		I_{EBO}	—	—	1	mA

second breakdown

Second Breakdown with Base Forward Biased	FBSOA	SEE FIGURE 1
Clamped Inductive SOA with Base Reversed Bias	RBSOA	SEE FIGURE 2

on characteristics[1]

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
DC Current Gain ($I_C = 5A$, $V_{CE} = 5V$) ($I_C = 8A$, $V_{CE} = 5V$)	h_{FE}	8 6	— —	40 30	—
Collector-Emitter Saturation Voltage ($I_C = 5A$, $I_B = 1A$) ($I_C = 8A$, $I_B = 1.8A$) ($I_C = 12A$, $I_B = 3A$)	$V_{CE(sat)}$	— — —	— — —	1 1.5 3	V
Base-Emitter Saturation Voltage ($I_C = 5A$, $I_B = 1A$) ($I_C = 8A$, $I_B = 1.6A$)	$V_{BE(sat)}$	— —	— —	1.2 1.6	V

switching characteristics

Resistive Load (Table 1)						
Delay Time	$V_{CC} = 125V$, $I_C = 8A$	t_d	—	0.06	0.1	μs
Rise Time	$I_{B1} = I_{B2} = 1.6A$, $t_p = 25 \mu s$	t_r	—	0.45	1	
Storage Time	Duty Cycle < 1%	t_s	—	1.3	3	
Fall Time		t_f	—	0.2	0.7	
Inductive Load, Clamped (Table 1, Figure 13)						
Storage Time	($I_C = 8A$, $V_{CLAMP} = 300V$)	t_{sv}	—	0.92	2.3	μs
Crossover Time	($I_{B1} = 1.6A$, $V_{BE(OFF)} = 5V$, $T_C = 100°C$)	t_c	—	0.12	0.7	

(1) Pulse Test: Pulse Width - 300μs Duty Cycle $\leq$ 2%.
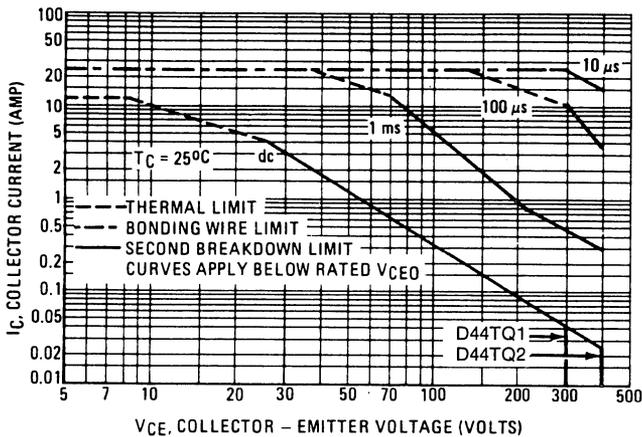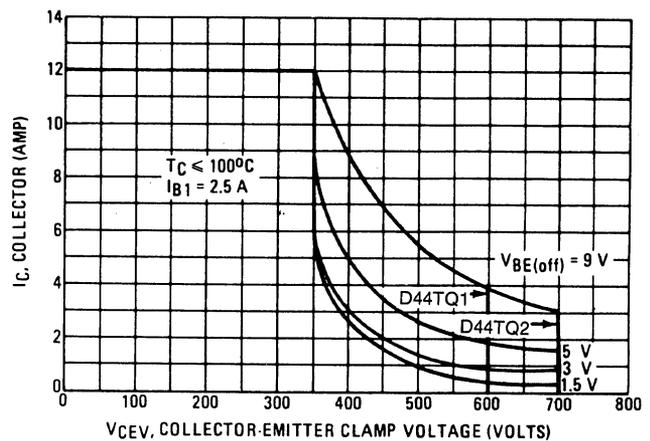

FIGURE 1 – FORWARD BIAS SAFE
OPERATING AREA

FIGURE 2 – REVERSE BIAS SWITCHING SAFE
OPERATING AREA

The Safe Operating Area figures shown in Figures 1 and 2 are specified ratings for these devices under the test conditions shown.
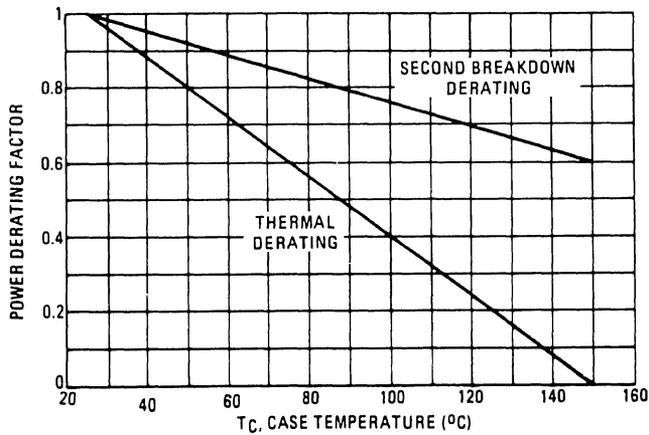
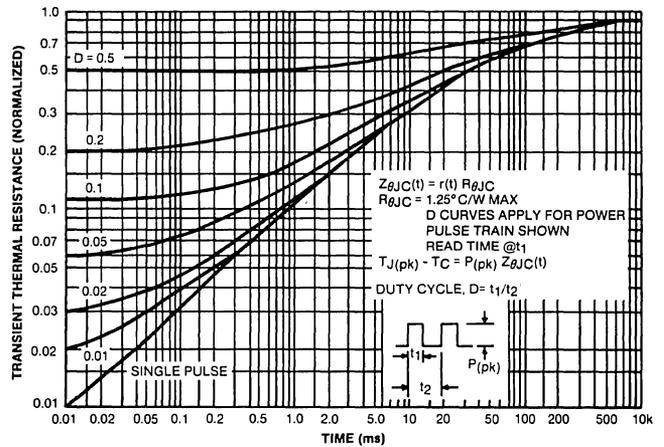**FIGURE 3 – FORWARD BIAS POWER DERATING**

POWER DERATING FACTOR

SECOND BREAKDOWN DERATING

THERMAL DERATING

T_C, CASE TEMPERATURE (°C)

FIGURE 4 TYPICAL THERMAL RESPONSE [($Z_{\theta JC}(t)$)]

TRANSIENT THERMAL RESISTANCE (NORMALIZED)

D = 0.5
0.2
0.1
0.05
0.02
0.01

SINGLE PULSE

$Z_{\theta JC}(t) = r(t) R_{\theta JC}$
$R_{\theta JC} = 1.25°C/W$ MAX
D CURVES APPLY FOR POWER PULSE TRAIN SHOWN
READ TIME @t_1
$T_{J(pk)} - T_C = P_{(pk)} Z_{\theta JC}(t)$

DUTY CYCLE, D= t_1/t_2

t_1 $P_{(pk)}$
t_2

TIME (ms)

FIGURE 5 –DC CURRENT GAIN

h_{FE}, DC CURRENT GAIN

$T_J = 150°C$
25°C
–55°C
$V_{CE} = 5V$
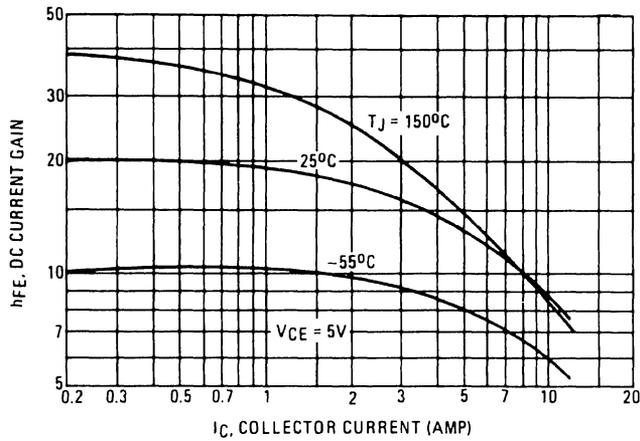
I_C, COLLECTOR CURRENT (AMP)
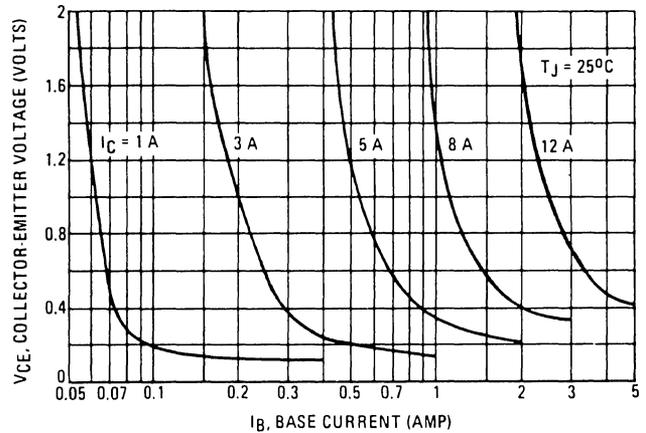
FIGURE 6 – COLLECTOR SATURATION REGION

V_{CE}, COLLECTOR-EMITTER VOLTAGE (VOLTS)

$T_J = 25°C$

$I_C = 1 A$ 3 A   5 A   8 A   12 A

I_B, BASE CURRENT (AMP)
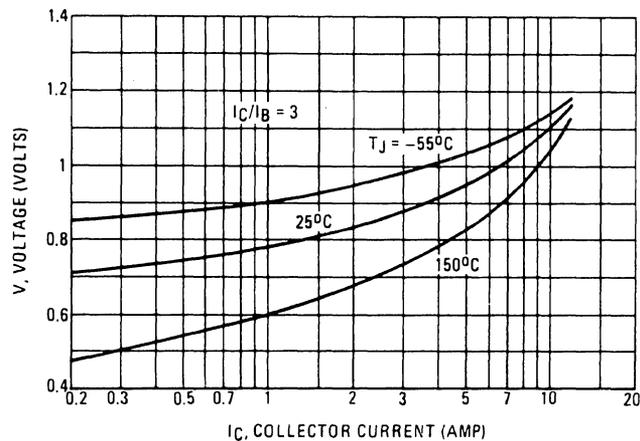
FIGURE 7 – BASE-EMITTER SATURATION VOLTAGE

V, VOLTAGE (VOLTS)

$I_C/I_B = 3$
$T_J = -55°C$
25°C
150°C

I_C, COLLECTOR CURRENT (AMP)
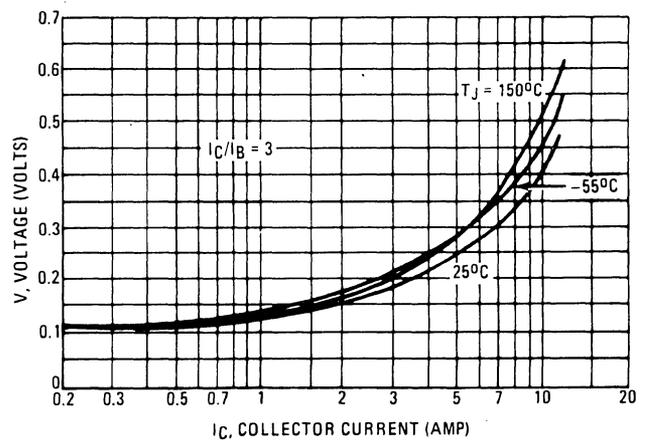
FIGURE 8 – COLLECTOR-EMITTER SATURATION VOLTAGE

V, VOLTAGE (VOLTS)

$T_J = 150°C$
$I_C/I_B = 3$
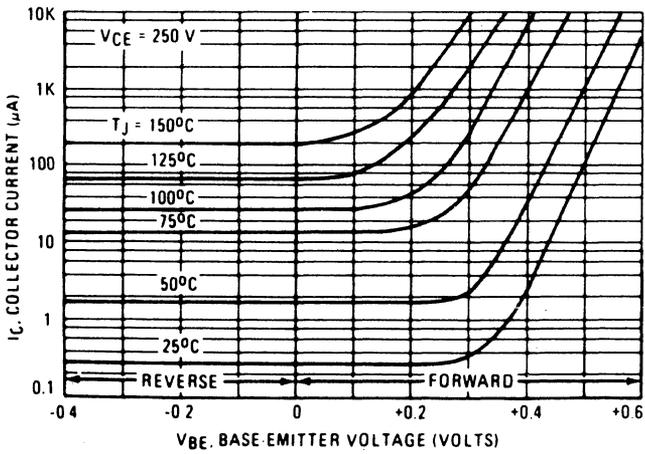–55°C
25°C

I_C, COLLECTOR CURRENT (AMP)

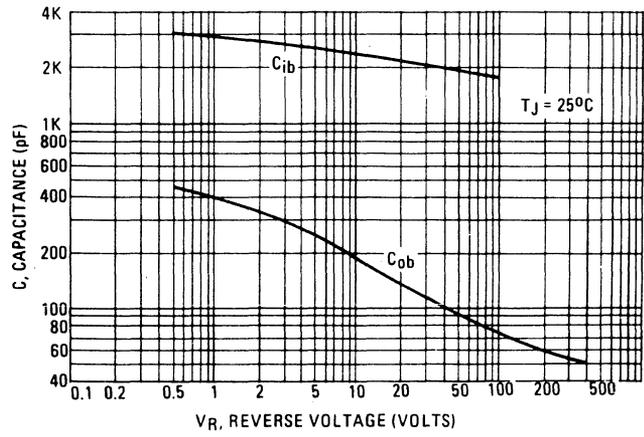FIGURE 9 – COLLECTOR CUTOFF REGION

FIGURE 10 – CAPACITANCE

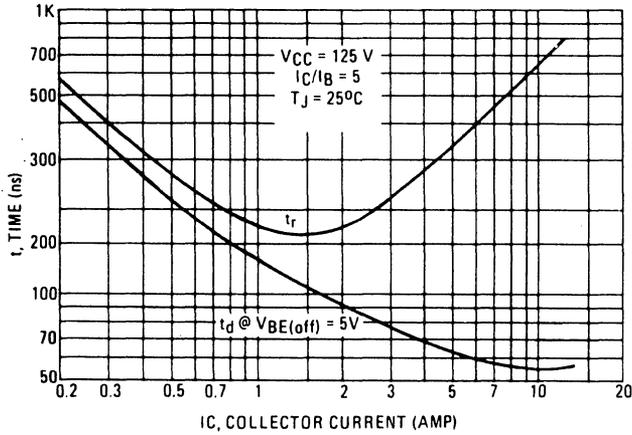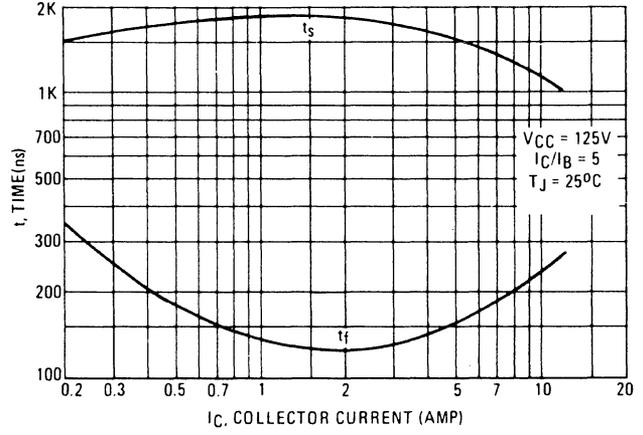## RESISTIVE SWITCHING PERFORMANCE
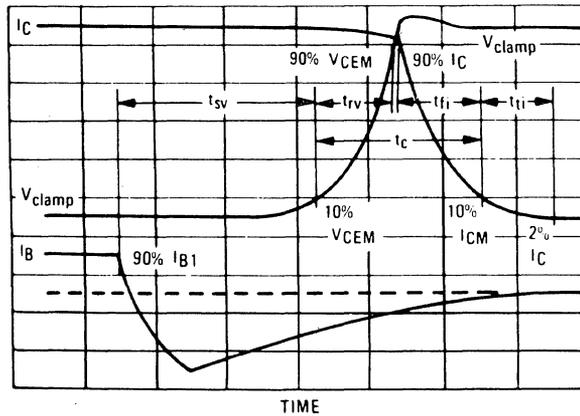

FIGURE 11 – TURN-ON TIME

FIGURE 12 – TURN-OFF TIME

FIGURE 13 – INDUCTIVE SWITCHING MEASUREMENTS