HIGH POWER
NPN POWER DARLINGTON TRANSISTORS

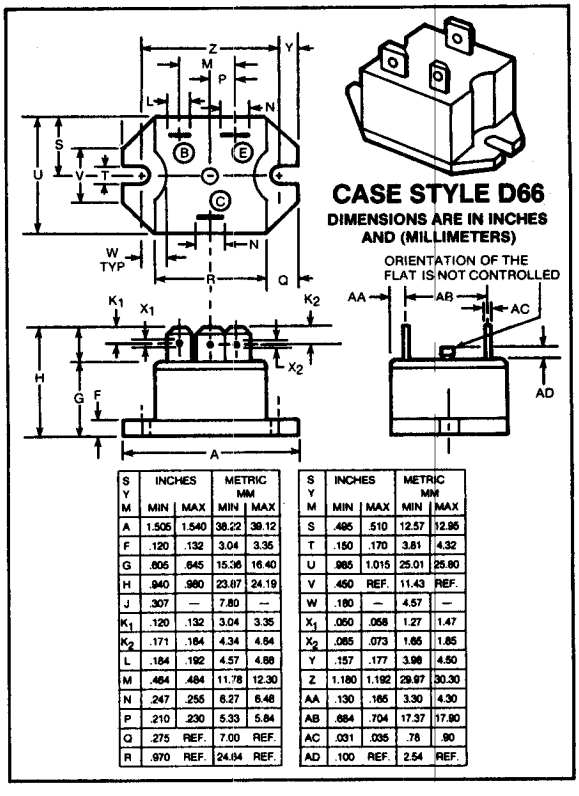
D66DS5,6,7
D66ES5,6,7

500-700 VOLTS
20 AMP, 62.5 WATTS

The General Electric D66DS/D66ES are high current power darlingtons. They feature collector isolation from the heat sink, an internal construction designed for stress-free operation at temperature extremes and quick connect electrical terminals. The devices are designed to meet UL creep, strike and isolation voltage. Major applications are for motor controls, switching power supplies, and UPS systems. The D66ES has a speed-up diode, the D66DS does not.

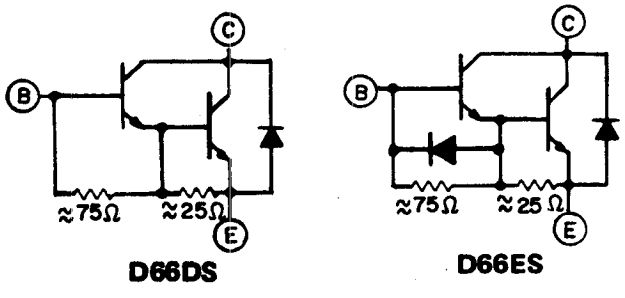
Features:

- High Voltage: 400-500 V_{CEO}
- High Current: 30 Amperes, I_C (Peak)
- High Gain: h_{FE} 40 Minimum @ 20 Amperes, I_C



SYM	INCHES MIN	INCHES MAX	METRIC MM MIN	METRIC MM MAX
A	1.505	1.540	38.22	39.12
F	.120	.132	3.04	3.35
G	.605	.645	15.36	16.40
H	.940	.980	23.87	24.19
J	.307	—	7.80	—
K_1	.120	.132	3.04	3.35
K_2	.171	.184	4.34	4.64
L	.184	.192	4.57	4.68
M	.464	.484	11.78	12.30
N	.247	.255	6.27	6.48
P	.210	.230	5.33	5.84
Q	.275	REF.	7.00	REF.
R	.970	REF.	24.64	REF.

SYM	INCHES MIN	INCHES MAX	METRIC MM MIN	METRIC MM MAX
S	.495	.510	12.57	12.95
T	.150	.170	3.81	4.32
U	.985	1.015	25.01	25.80
V	.450	REF.	11.43	REF.
W	.180	—	4.57	—
X_1	.050	.058	1.27	1.47
X_2	.085	.073	1.65	1.85
Y	.157	.177	3.98	4.50
Z	1.180	1.192	29.97	30.30
AA	.130	.165	3.30	4.30
AB	.684	.704	17.37	17.90
AC	.031	.035	.78	.90
AD	.100	REF.	2.54	REF.



DEVICE CIRCUIT

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

RATING	SYMBOL	D66DS5/ES5	D66DS6/ES6	D66DS7/ES7	UNITS
Collector-Emitter Voltage	V_{CEV}	500	600	700	Volts
Collector-Emitter Voltage	V_{CEO}	400	450	500	Volts
Emitter Base Voltage D66DS D66ES	V_{EBO}	8 5	8 5	8 5	Volts
Collector Current — Continuous Peak (Repetitive) Peak (Non-Repetitive)	I_C I_{CM} I_{CSM}	20 30 50	20 30 50	20 30 50	A
Base Current — Continuous Peak (Non-Repetitive)	I_B I_{BM}	5 10	5 10	5 10	A
Total Power Dissipation @ T_C = 25°C	P_D	62.5	62.5	62.5	Watts
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-40 to +150	-40 to +150	-40 to +150	°C
Isolation Voltage	V_{ISOL}	2500	2500	2500	$V_{(rms)}$

thermal characteristics

Thermal Resistance, Junction to Case	$R_{\theta JC}$	2	2	2	°C/W

See page 845 for mounting and handling considerations.

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

CHARACTERISTIC		SYMBOL	MIN	TYP	MAX	UNIT
off characteristics						
Collector-Emitter Sustaining Voltage	D66DS5/ES5	$V_{CEO(sus)}$	400	—	—	Volts
(I_C = .5A)	D66DS6/ES6		450	—	—	
(V_{clamp} = V_{CEO} Rated)	D66DS7/ES7		500	—	—	
Collector Cutoff Current	T_J = 25°C	I_{CEV}	—	—	1.0	mA
(V_{CE} = Rated Value, V_{BE} = -1.5V)	T_J = 150°C		—	—	2.5	
Emitter Cutoff Current		I_{EBO}				
(V_{EB} = 4.5V, I_C = 0)	D66DS		—	—	200	mA
(V_{EB} = 1.5V, I_C = 0)	D66ES		—	—	200	
second breakdown						
Second Breakdown with Base Forward Biased		FBSOA	SEE FIGURE 26			
on characteristics						
DC Current Gain		h_{FE}				
(I_C = 30A, V_{CE} = 5V)			20	35	—	—
(I_C = 20A, V_{CE} = 5V)			40	85	—	
(I_C = 10A, V_{CE} = 5V)			100	160	—	
Collector-Emitter Saturation Voltage		$V_{CE(sat)}$				
(I_C = 30A, I_B = 3A)			—	2.1	3.5	V
(I_C = 20A, I_B = 2A)			—	1.6	2.5	
(I_C = 10A, I_B = 1A)			—	1.2	1.7	
Base-Emitter Saturation Voltage		$V_{BE(sat)}$				
(I_C = 30A, I_B = 3A)			—	2.65	4	V
(I_C = 20A, I_B = 2A)			—	2.30	3	
(I_C = 10A, I_B = 1A)			—	1.80	2.5	

switching characteristics

Resistive Load				TYP. DS	TYP. ES	MAX. DS	MAX. ES	
Delay Time	V_{CC} = 250V	t_d	—	.05	.05	0.5	0.5	μs
Rise Time	I_C = 20A	t_r	—	.4	.4	1	1	
Storage Time	I_{B1} = 1A, I_{B2} = 2A	t_s	—	2.2	1.8	5	3	
Fall Time	t_p = 50 μsec	t_f	—	1.6	.45	3	1	

emitter-collector diode characteristics

Power Dissipation	(I_{B1} = 0)	P_D	—	—	62.5	Watts
Forward Voltage	(I_F = 10A)	V_F	—	1.95	3.20	Volts
	(I_P = 25A)	V_F	—	2.80	4.00	Volts
	(I_F = 25A, T_J = 150°C)	V_F	—	2.75	4.00	Volts
Reverse Recovery Time (I_F = 25A, $di/_{dt}$ = 10A/μsec, R_{B1E} = .25Ω)		T_{rr}	—	3.85	10	μsec
Forward Turn-On Time (I_F = 25A, $di/_{dt}$ = 50A/μsec)		T_{ON}	—	0.42	1.0	μsec
Single Cycle Surge Current (60Hz)		I_{FSM}	—	—	50	Amps
Thermal Resistance		$R_{\theta JC}$	—	—	2.0	°C/Watt

TYPICAL CHARACTERISTICS

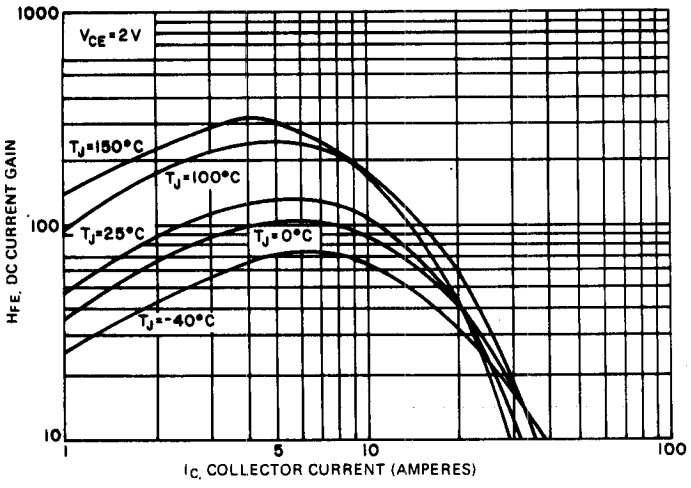


FIGURE 1. DC CURRENT GAIN (V_{CE} = 2V)

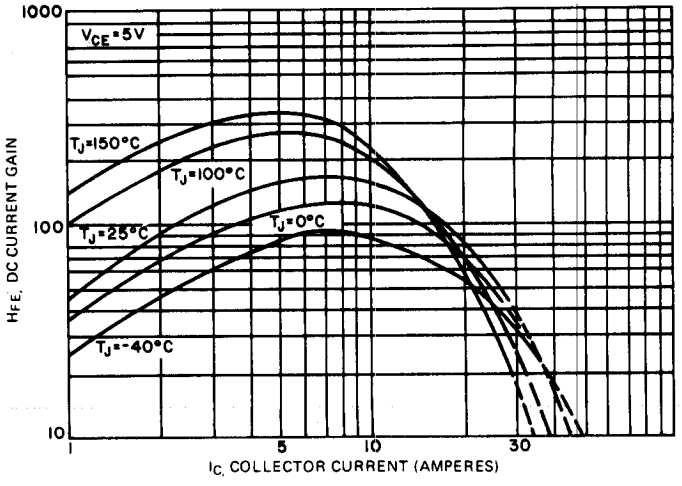


FIGURE 2. DC CURRENT GAIN (V_{CE} = 5V)

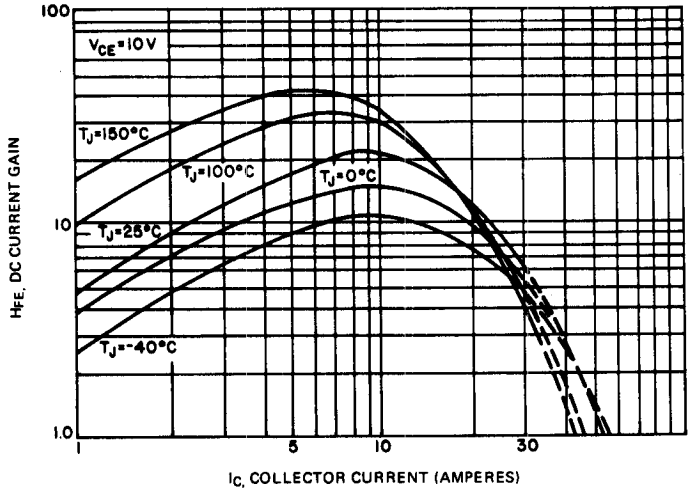


FIGURE 3. DC CURRENT GAIN (V_{CE} = 10V)

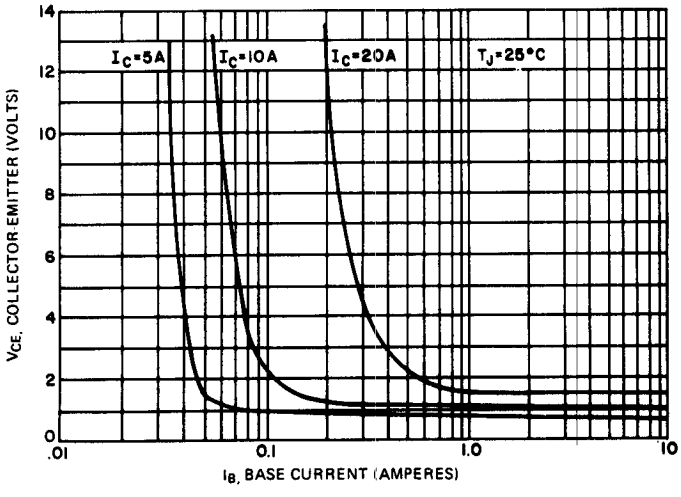


FIGURE 4. COLLECTOR SATURATION REGION

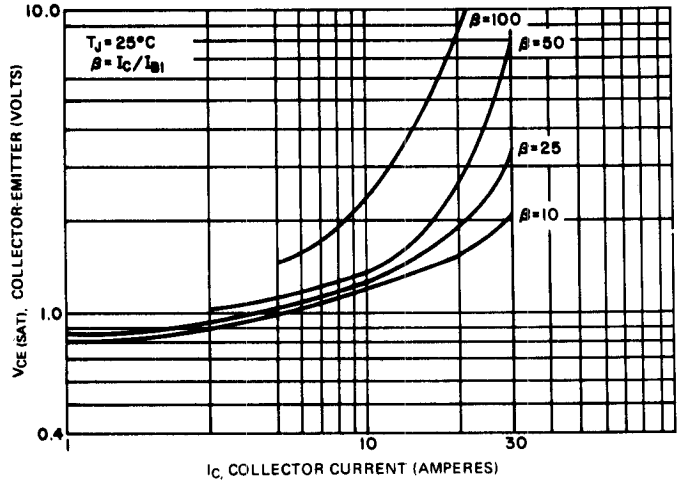


FIGURE 5. $V_{CE(SAT)}$ VS. I_C, T_J = 25°C

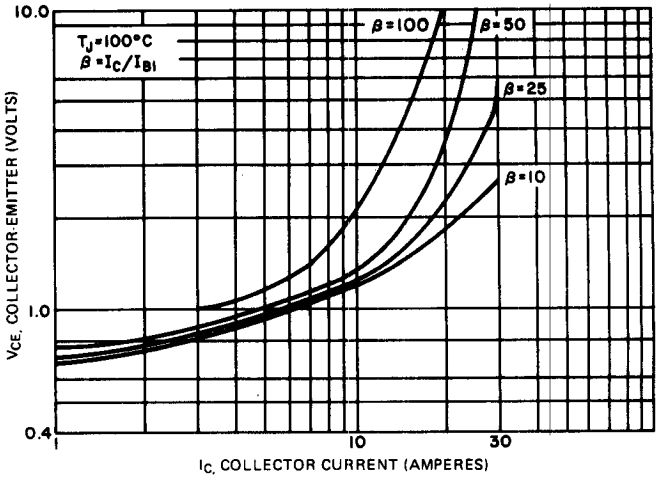


FIGURE 6. $V_{CE(SAT)}$ VS. I_C, T_J = 100°C

TYPICAL CHARACTERISTICS

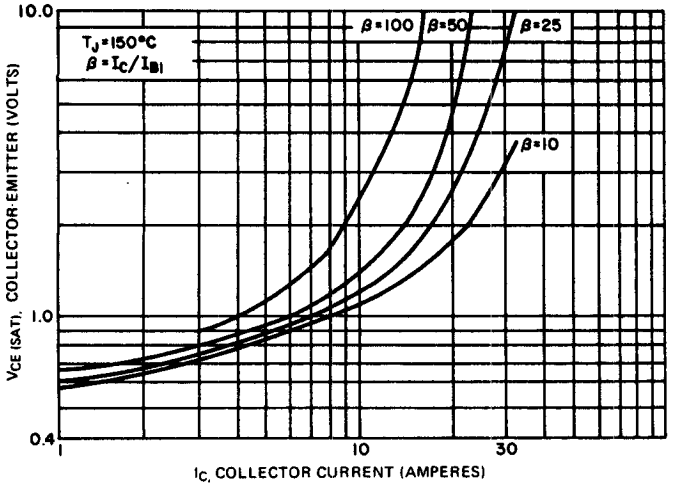


FIGURE 7. $V_{CE(SAT)}$ VS. I_C, T_J = 150°C

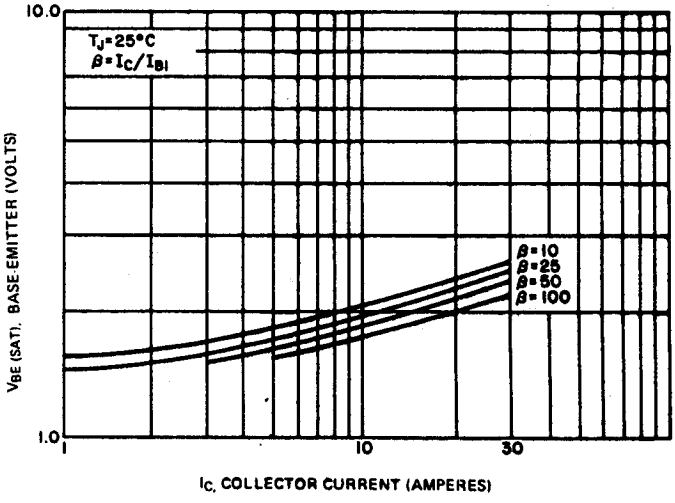


FIGURE 8. $V_{BE(SAT)}$ VS. I_C, T_J = 25°C

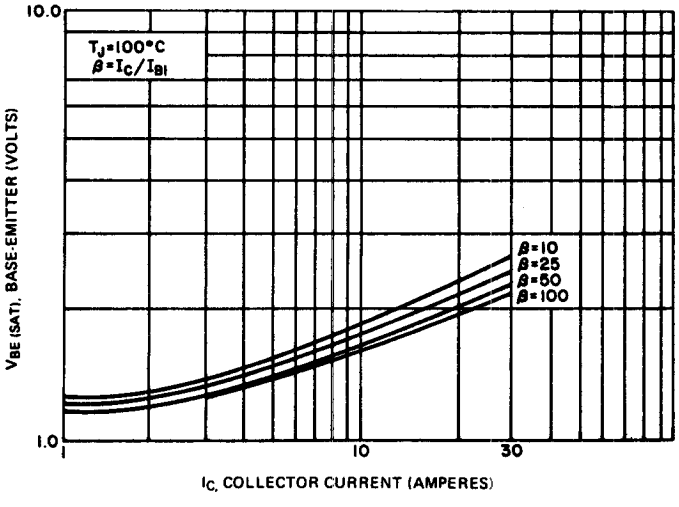


FIGURE 9. $V_{BE(SAT)}$ VS. I_C, T_J = 100°C

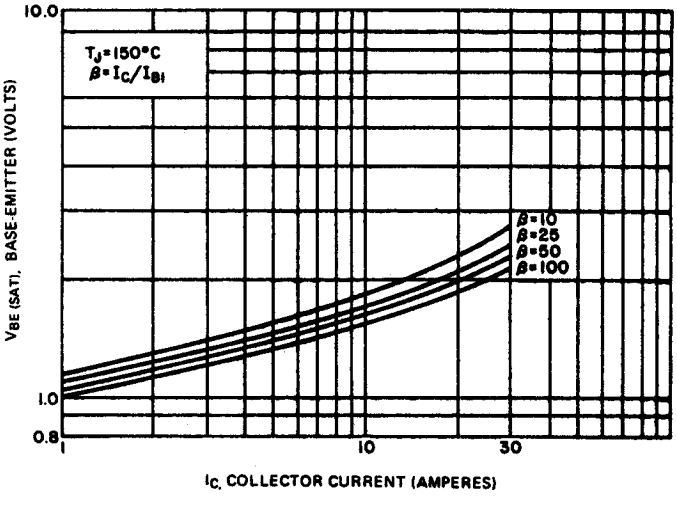


FIGURE 10. $V_{BE(SAT)}$ VS. I_C, T_J = 150°C

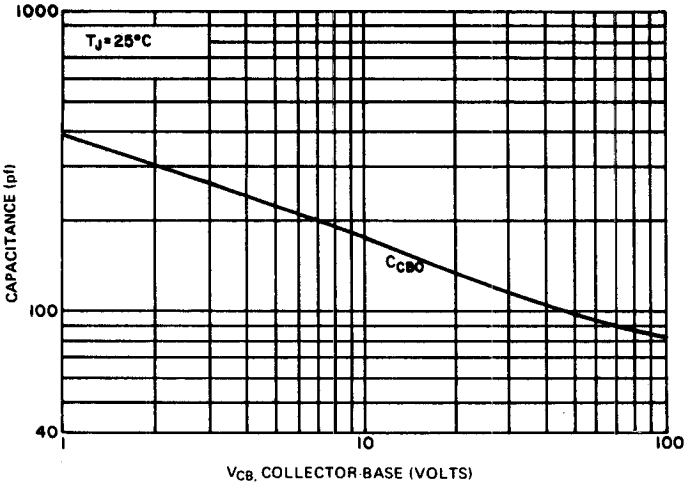


FIGURE 11. CAPACITANCE (C_{CBO})

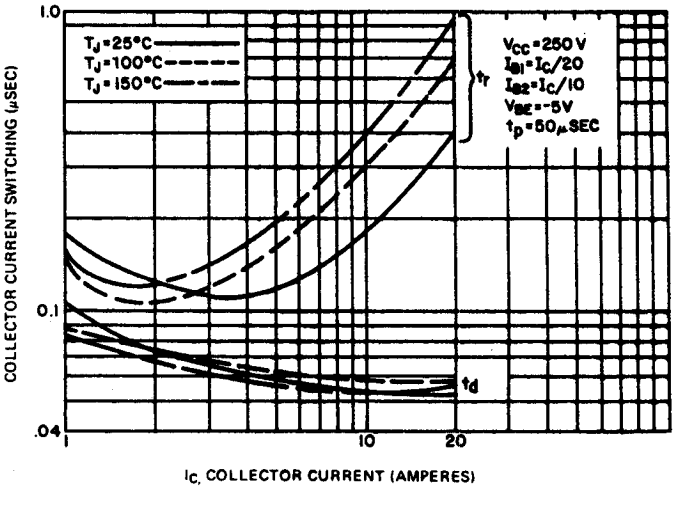


FIGURE 12. TURN-ON TIME (RESISTIVE LOAD) (D66DS ONLY)

TYPICAL CHARACTERISTICS

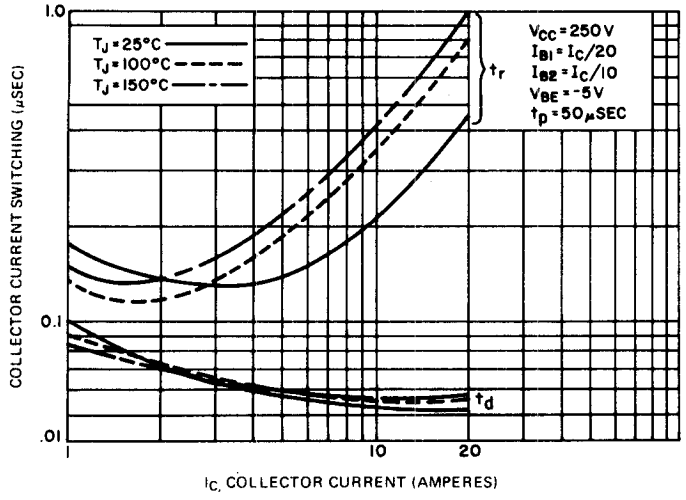


FIGURE 13. TURN-ON TIME (RESISTIVE) (D66ES ONLY)

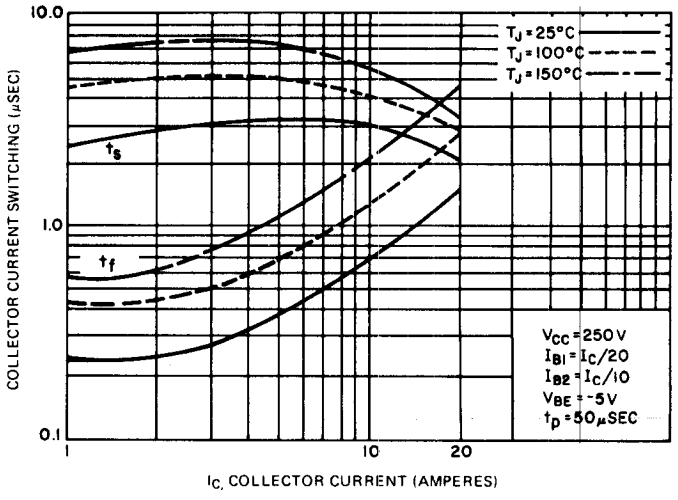


FIGURE 14. TURN-OFF TIME (RESISTIVE) (D66DS ONLY)

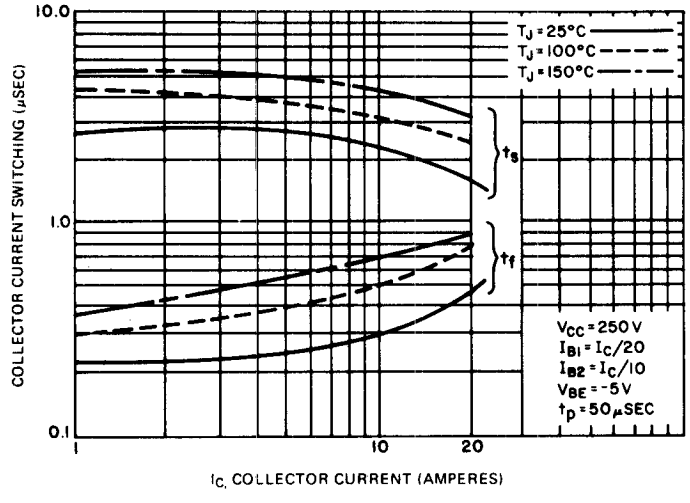


FIGURE 15. TURN-OFF TIME (RESISTIVE) (D66ES ONLY)

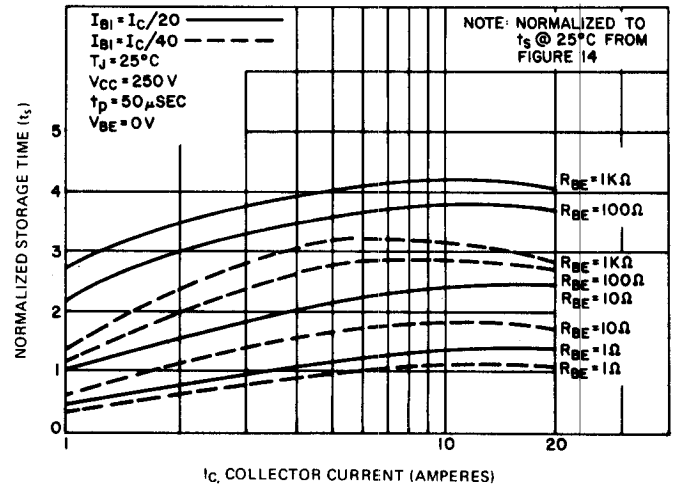


FIGURE 16. NORMALIZED RESISTIVE SWITCHING STORAGE TIME (R_{BE} VARIATIONS) VS. COLLECTOR CURRENT (D66DS ONLY)

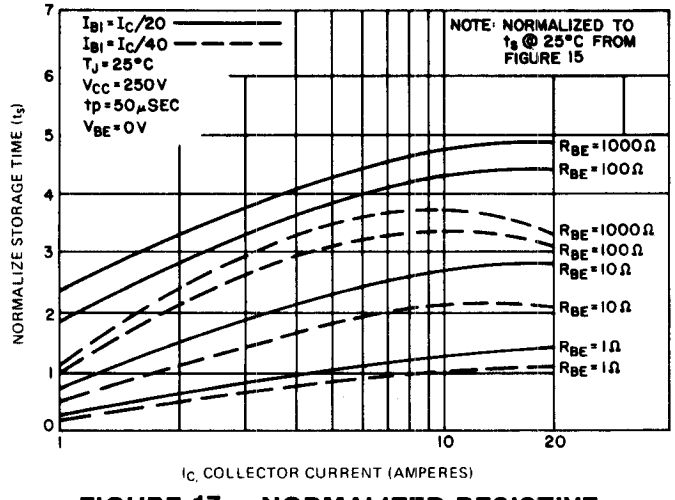


FIGURE 17. NORMALIZED RESISTIVE SWITCHING STORAGE TIME (R_{BE} VARIATIONS) VS. COLLECTOR CURRENT (D66ES ONLY)

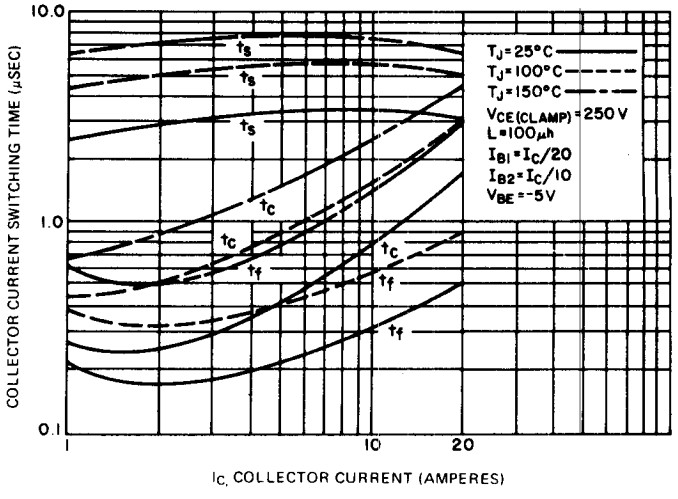


FIGURE 18. CLAMPED INDUCTIVE TURN-OFF TIME (D66DS ONLY)

TYPICAL CHARACTERISTICS

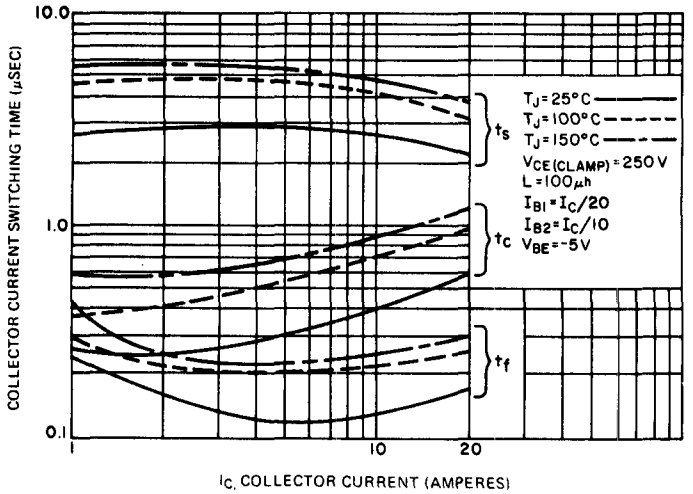


FIGURE 19. CLAMPED INDUCTIVE TURN-OFF TIME (D66ES ONLY)

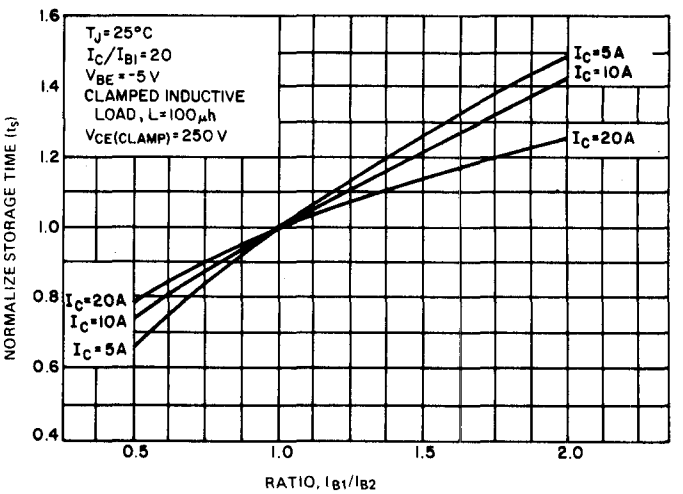


FIGURE 20. STORAGE TIME VARIATION WITH I_{B2} (D66DS ONLY)

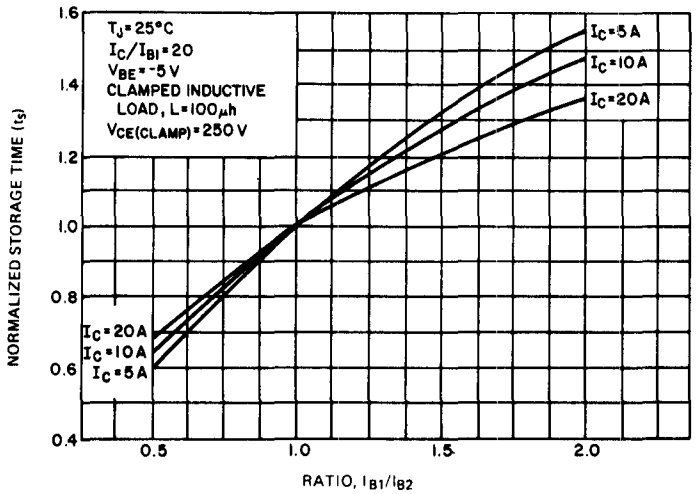


FIGURE 21. STORAGE TIME VARIATION WITH I_{B2} (D66ES ONLY)

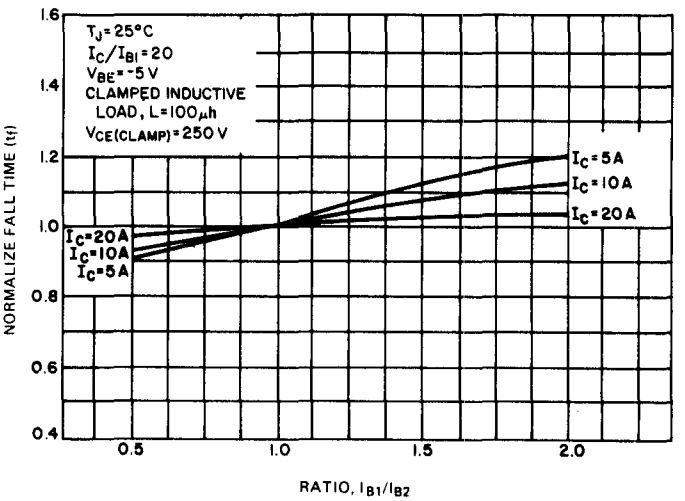


FIGURE 22. FALL TIME VARIATION WITH I_{B2} (D66DS ONLY)

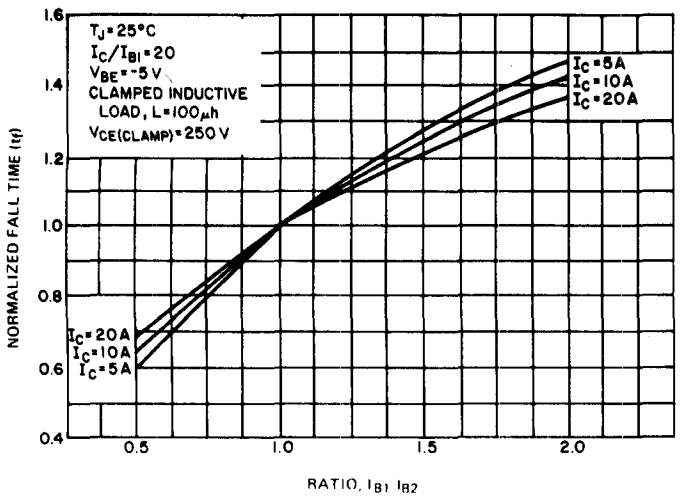


FIGURE 23. FALL TIME VARIATION WITH I_{B2} (D66ES ONLY)

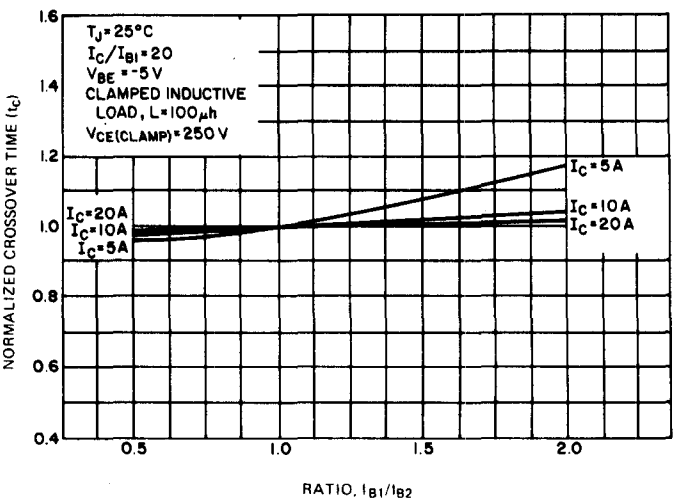


FIGURE 24. CROSS-OVER TIME VARIATION WITH I_{B2} (D66DS ONLY)

TYPICAL CHARACTERISTICS

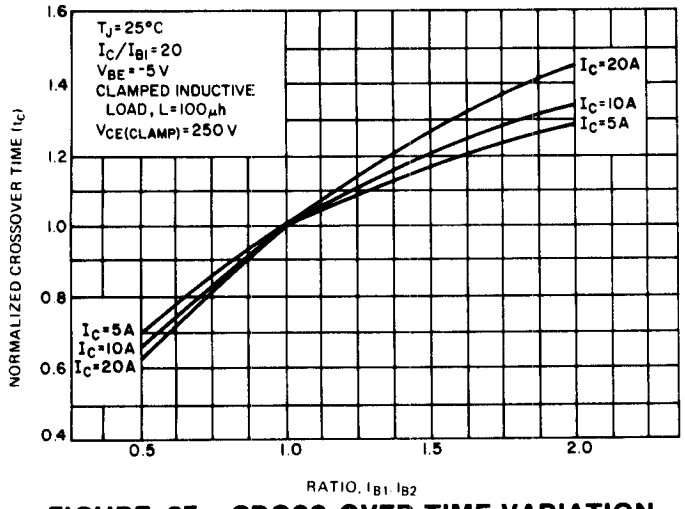


FIGURE 25. CROSS-OVER TIME VARIATION WITH I_{B2} (D66ES ONLY)

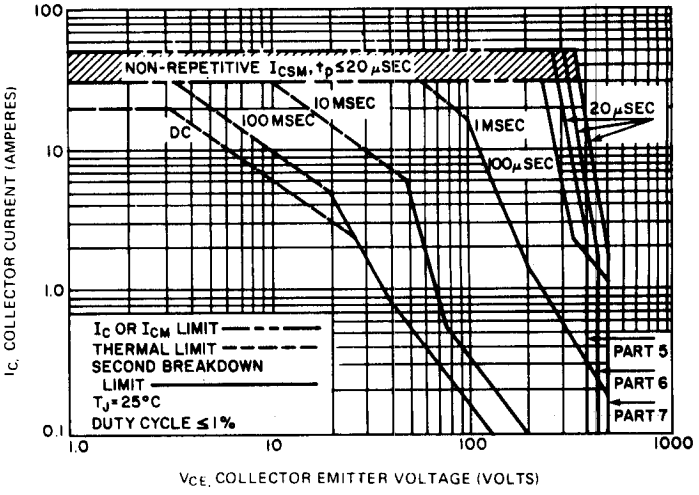


FIGURE 26. FORWARD BIAS SAFE OPERATING AREA

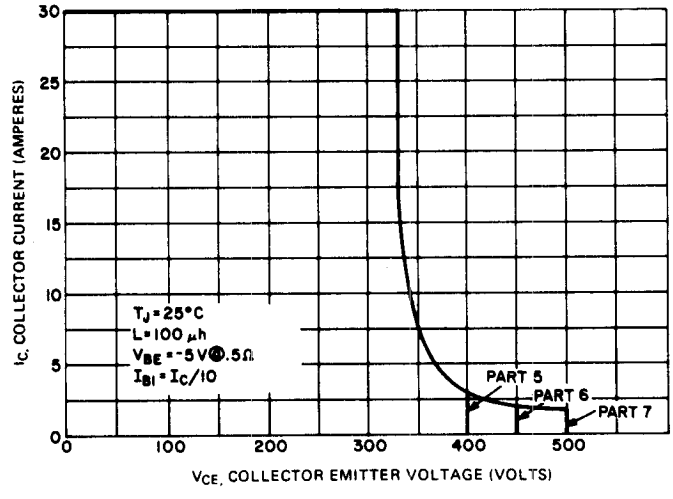


FIGURE 27. REVERSE BIAS SAFE OPERATING AREA

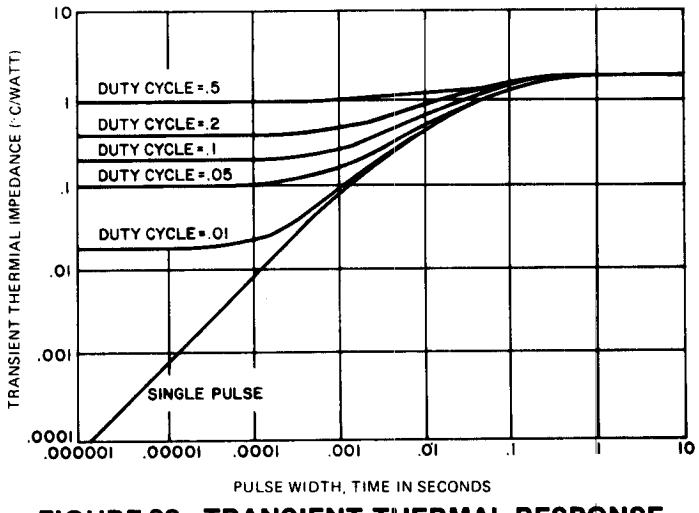


FIGURE 28. TRANSIENT THERMAL RESPONSE

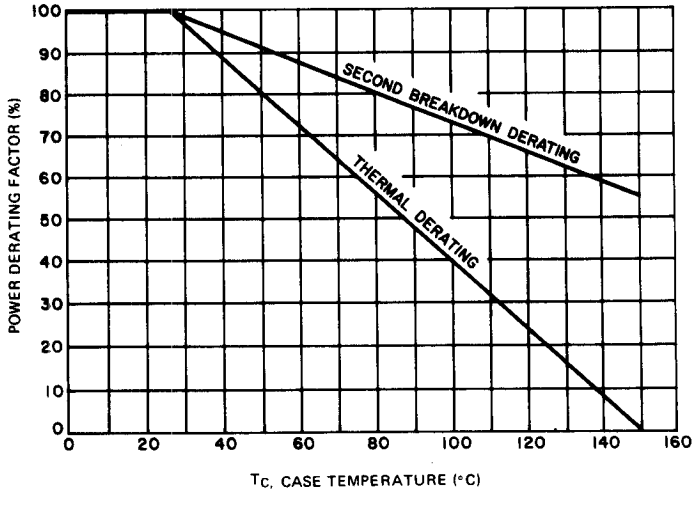


FIGURE 29. POWER DERATING

TYPICAL CHARACTERISTICS

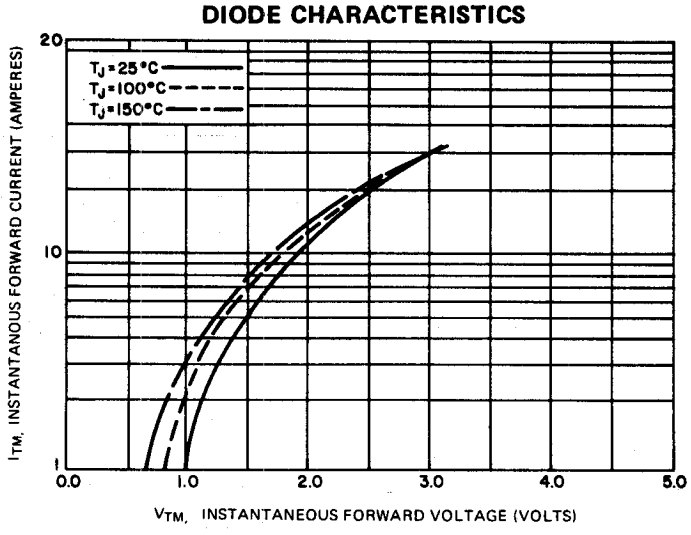


FIGURE 30. FORWARD CHARACTERISTICS

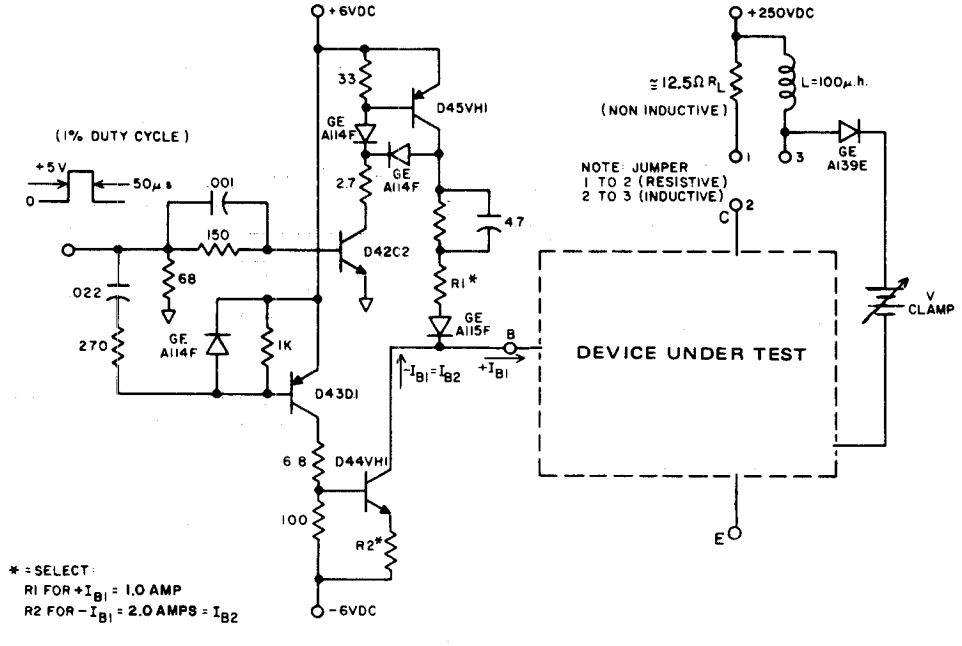


FIGURE 31. SWITCHING TIME TEST CIRCUIT