



HIGH SPEED NPN POWER DARLINGTON TRANSISTORS

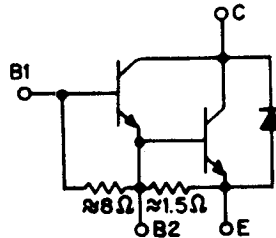
D67DE5,6,7

500-700 VOLTS
100 AMP, 312.5 WATTS

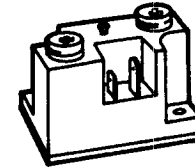
The General Electric D67DE is a high current power darlington. It features collector isolation from the heat sink, an internal construction designed for stress-free operation at temperature extremes, hefty screw terminals for emitter and collector connection and quick electrical terminals for B1 and B2. The device is designed to meet UL creep, strike and isolation voltage. Major applications are for motor controls, switching power supplies and UPS systems.

Features:

- High Voltage: 400-500 $V_{CEO(sus)}$; 500-700 V_{CEV}
- High Current: 150 Amperes, I_C (Peak)
- High Gain: h_{FE} 50 Minimum @ 100 Amperes I_C (h_{FE} 200 typical)
- Both Base 1 and Base 2 connections are available
- UL recognized industrial package

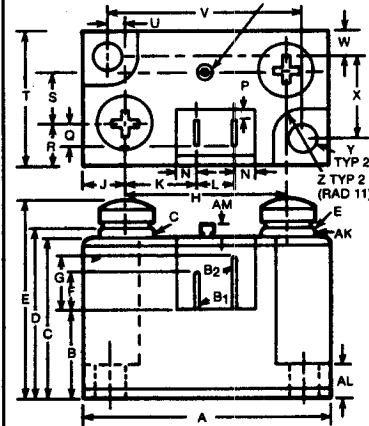


DEVICE CIRCUIT



CASE STYLE D67
DIMENSIONS ARE IN INCHES AND
(MILLIMETERS)

ORIENTATION OF THE FLAT IS NOT CONTROLLED



S	Y	MIN	MAX	MIN	MAX
A	1.785	1.815	46.33	46.10	
B	.815	.885	18.82	17.40	
C	11.48	11.98	28.15	30.43	
D	1.215	1.270	30.88	32.26	
E	—	1.470	—	37.34	
F	.245	—	6.20	—	
G	.335	—	8.50	—	
H	1.170	1.190	29.71	30.23	
J	.295	.325	7.50	8.26	
K	.518	REF.	13.16	REF.	
L	.280	.290	6.80	7.37	
N	.190	REF.	3.81	REF.	
P	.070	REF.	1.80	REF.	
Q	.170	REF.	4.30	REF.	
R	.300	.320	7.60	8.13	
S	.370	.390	9.40	9.90	
T	.885	1.016	25.00	25.80	
U	.110	.130	2.80	3.30	
V	1.418	1.430	36.00	36.32	
W	.175	.205	4.44	5.20	
X	.610	.630	15.50	16.00	
Y	.188	.221	5.05	5.61	
Z	.180	.230	4.62	5.84	
AA	.047	REF.	1.30	REF.	
AB	.312	REF.	7.90	REF.	
AC	.184	.192	4.67	4.90	
AD	.051	.054	.78	.86	
AE	.118	.122	3.02	3.25	
AF	.050	.060	1.27	1.52	
AG	.065	.075	1.65	1.90	
AH	.204	.211	5.18	5.36	
AI	.385	.395	9.77	9.90	
AL	.235	.285	5.96	6.73	
AM	—	.125	—	3.20	

maximum ratings ($T_C = 25^\circ\text{C}$) (unless otherwise noted)

RATING	SYMBOL	D67DE5	D67DE6	D67DE7	UNITS
Collector-Base Voltage	V_{CBO}	500	600	700	Volts
Collector-Emitter Voltage	V_{CEO}	400	450	500	Volts
Emitter Base Voltage	V_{EBO}	8	8	8	Volts
Collector Current — Continuous	I_C	100	100	100	A
Peak (Repetitive)	I_{CM}	150	150	150	
Peak (Non-Repetitive)	I_{CSM}	250	250	250	
Base Current — Continuous	I_B	10	10	10	A
Peak (Non-Repetitive)	I_{BM}	20	20	20	
Total Power Dissipation @ $T_C = 25^\circ\text{C}$	P_D	312.5	312.5	312.5	Watts
Operating and Storage Junction Temperature Range	T_J, T_{STG}	-40 to +150	-40 to +150	-40 to +150	$^\circ\text{C}$
Isolation Voltage	V_{ISOL}	2500	2500	2500	$V_{(rms)}$

thermal characteristics

Thermal Resistance, Junction to Case	$R_{\theta JC}$	4	4	4	$^\circ\text{C/W}$
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See page 845 for mounting and handling considerations.

electrical characteristics ($T_C = 25^\circ\text{C}$) (unless otherwise specified)

CHARACTERISTIC	SYMBOL	MIN	TYP	MAX	UNIT
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off characteristics

Collector-Emitter Sustaining Voltage ($I_C = 1\text{A}$) ($V_{\text{clamp}} = V_{\text{CEO}}$, $R_{\text{BE}} = 10\Omega$)	D67DE5 D67DE6 D67DE7	$V_{\text{CEO(sus)}}$	400 450 500	— — —	— — —	Volts
Collector Cutoff Current ($V_{\text{CEV}} = \text{Rated Value}$, $V_{\text{BE(off)}} = 1.5\text{V}$)	$T_J = 25^\circ\text{C}$ $T_J = 150^\circ\text{C}$	I_{CEV}	— —	— —	1.0 2.5	mA
Emitter Cutoff Current ($V_{\text{EB}} = 3.5\text{V}$, $I_C = 0$)		I_{EBO}	—	—	500	mA

second breakdown

Second Breakdown with Base Forward Biased	FBSOA	SEE FIGURE 16
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on characteristics

DC Current Gain ($I_C = 150\text{A}$, $V_{\text{CE}} = 5\text{V}$) ($I_C = 100\text{A}$, $V_{\text{CE}} = 5\text{V}$) ($I_C = 40\text{A}$, $V_{\text{CE}} = 5\text{V}$)	h_{FE}	25 50 100	90 200 275	— — —	—
Collector-Emitter Saturation Voltage ($I_C = 150\text{A}$, $I_B = 10\text{A}$) ($I_C = 100\text{A}$, $I_B = 8\text{A}$) ($I_C = 40\text{A}$, $I_B = 4\text{A}$)	$V_{\text{CE(sat)}}$	— — —	1.9 1.4 1.0	3.0 2.0 1.5	V
Base-Emitter Saturation Voltage ($I_C = 150\text{A}$, $I_B = 10\text{A}$) ($I_C = 100\text{A}$, $I_B = 8\text{A}$)	$V_{\text{BE(sat)}}$	— —	2.75 2.3	3.5 3.0	V

switching characteristics

Resistive Load						
Delay Time	V _{CC} = 250V I _C = 100A I _{B1} = 5A, I _{B2} = 10A	t _d	—	.105	0.5	μs
Rise Time		t _r	—	.45	1.0	
Storage Time		t _s	—	3.2	5.0	
Fall Time		t _f	—	1.1	3.0	

emitter-collector diode characteristics

Forward Voltage ($I_F = 100\text{A}$) ($T_J = 25^\circ\text{C}$) ($T_J = 150^\circ\text{C}$)	V_F V_F	— —	1.9 1.75	3.25 3.00	Volts Volts
Reverse Recovery Time ($I_F = 100\text{A}$, $di/dt = 25\text{A}/\mu\text{sec}$, $R_{\text{B1E}} = .25\Omega$) ($T_J = 25^\circ\text{C}$)	T_{rr}	—	4.5	10.0	μsec
Forward Turn-On Time ($I_F = 100\text{A}$, $di/dt = 100\text{A}/\mu\text{sec}$) ($T_J = 25^\circ\text{C}$)	T_{ON}	—	1.7	2.5	μsec
Thermal Resistance	$R_{\theta\text{JC}}$	—	—	0.4	$^\circ\text{C}/\text{Watt}$

TYPICAL CHARACTERISTICS

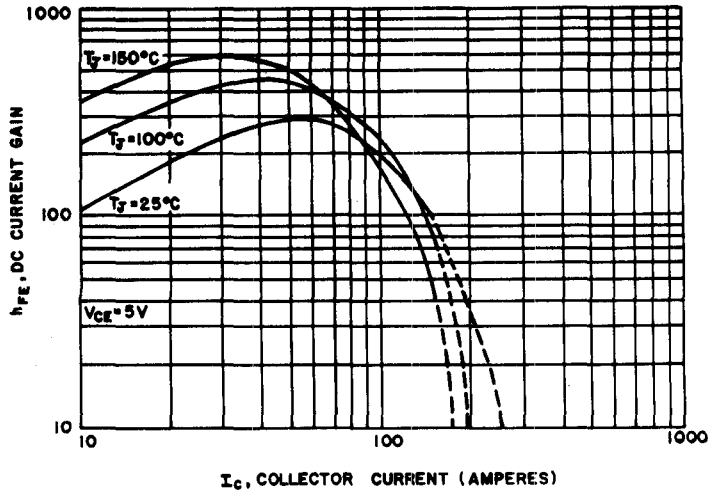


FIGURE 1: DC CURRENT GAIN ($V_{CE} = 5V$)

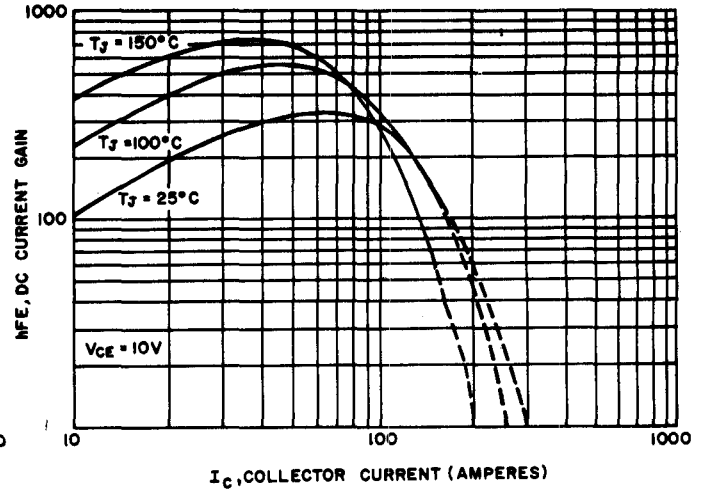


FIGURE 2: DC CURRENT GAIN ($V_{CE} = 10V$)

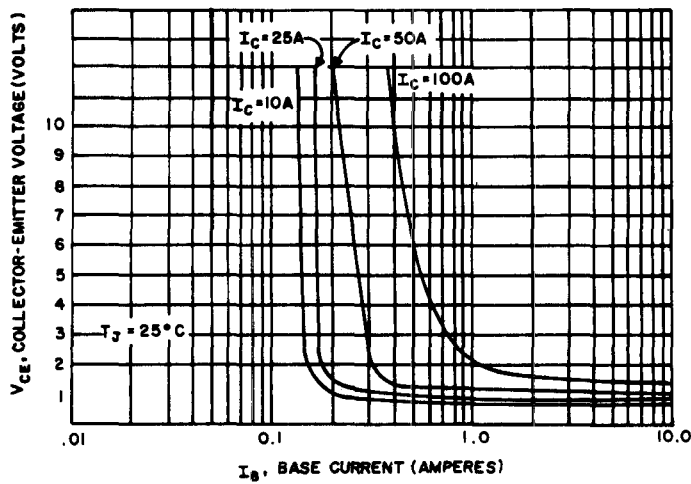


FIGURE 3: COLLECTOR SATURATION REGION

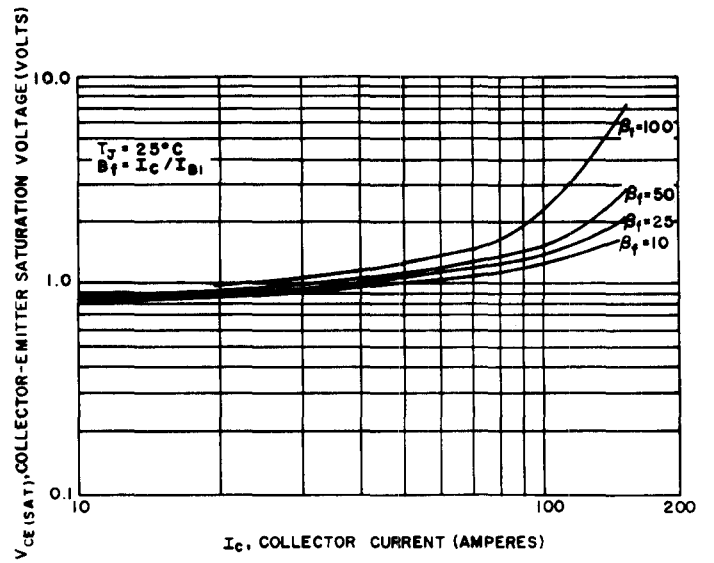


FIGURE 4: $V_{CE(SAT)}$ VS I_C , $T_J = 25^\circ C$

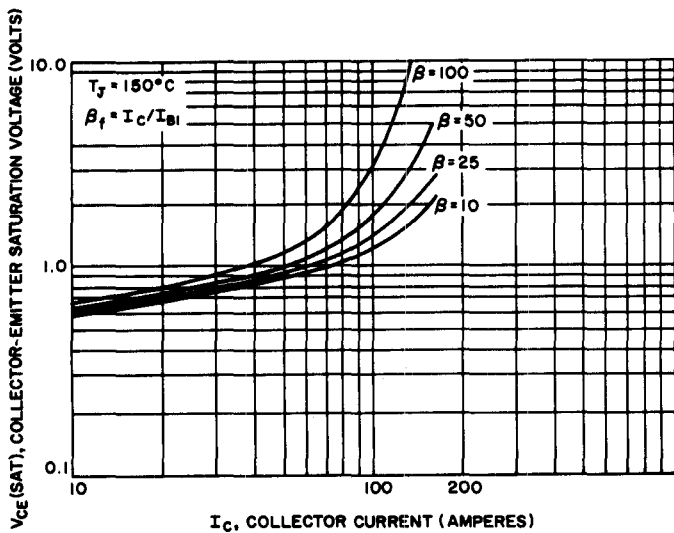


FIGURE 5: $V_{CE(SAT)}$ VS I_C , $T_J = 150^\circ C$

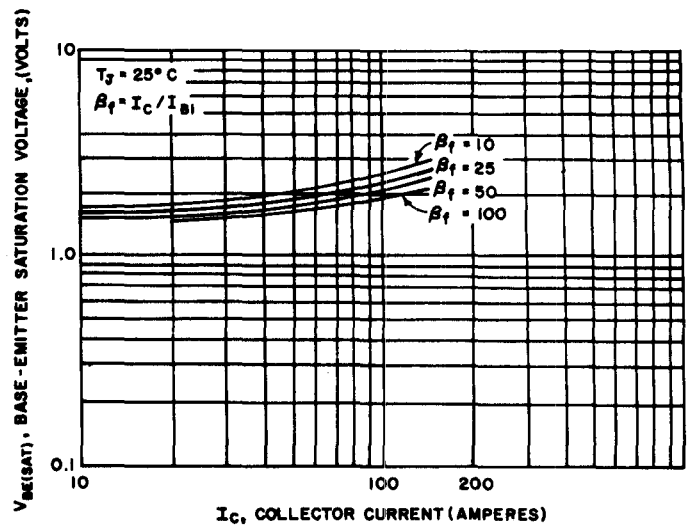


FIGURE 6: $V_{BE(SAT)}$ VS I_C , $T_J = 25^\circ C$

TYPICAL CHARACTERISTICS

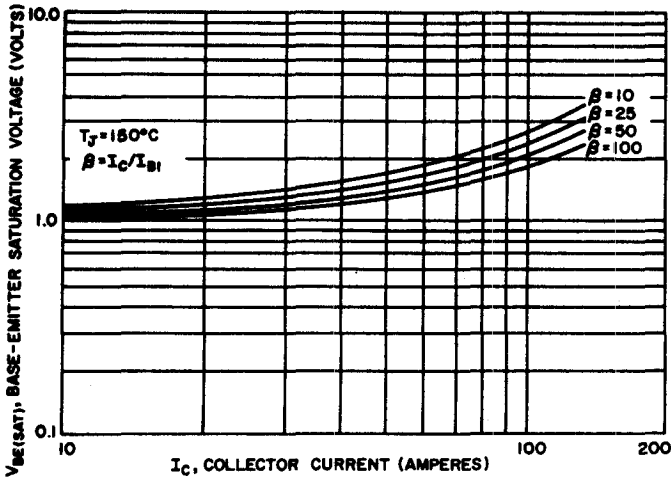


FIGURE 7: $V_{BE(SAT)}$ VS I_C , $T_J=150^\circ\text{C}$

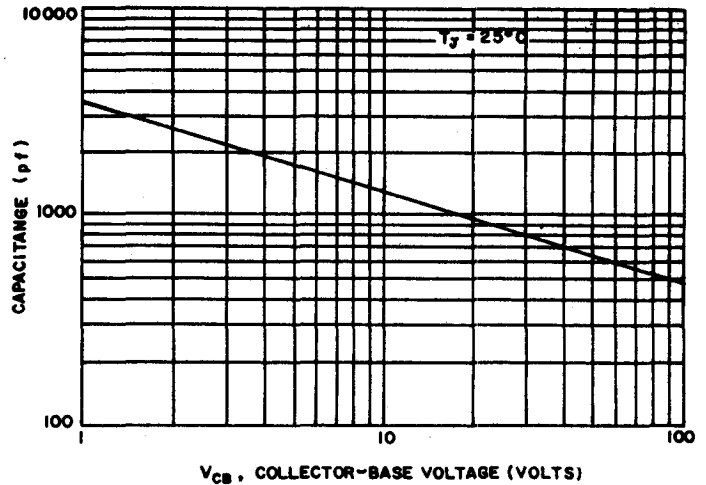


FIGURE 8: CAPACITANCE (C_{CBO})

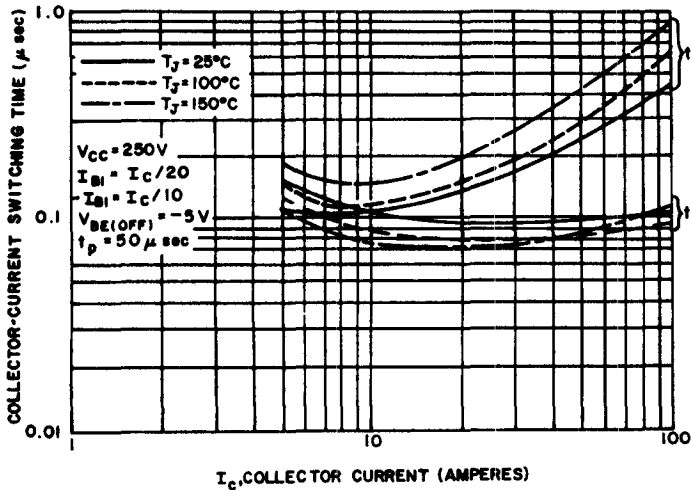


FIGURE 9: TURN-ON TIME (RESISTIVE LOAD)

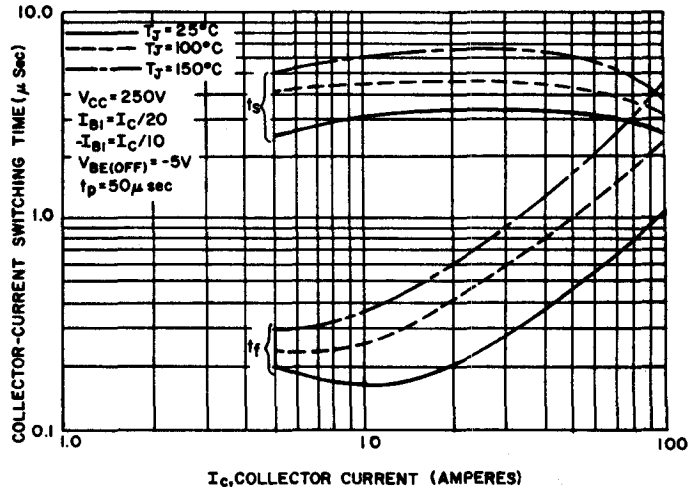


FIGURE 10: TURN-OFF TIME (RESISTIVE LOAD)

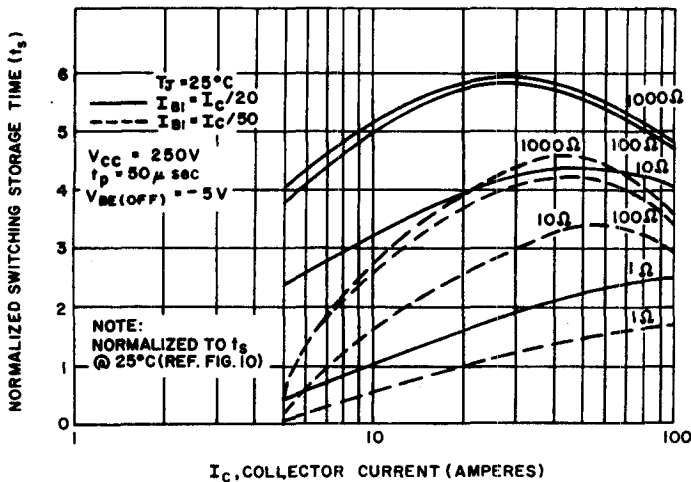


FIGURE 11: NORMALIZED RESISTIVE SWITCHING STORAGE TIME (R_{BE} VARIATIONS) VS COLLECTOR CURRENT

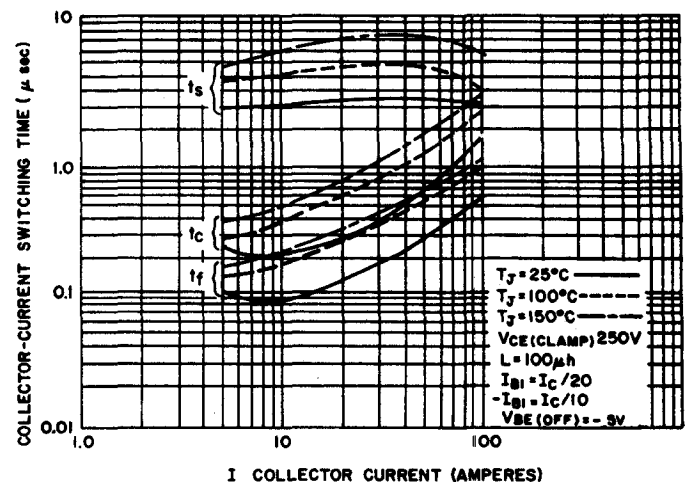


FIGURE 12: CLAMPED INDUCTIVE TURN-OFF TIME

TYPICAL CHARACTERISTICS

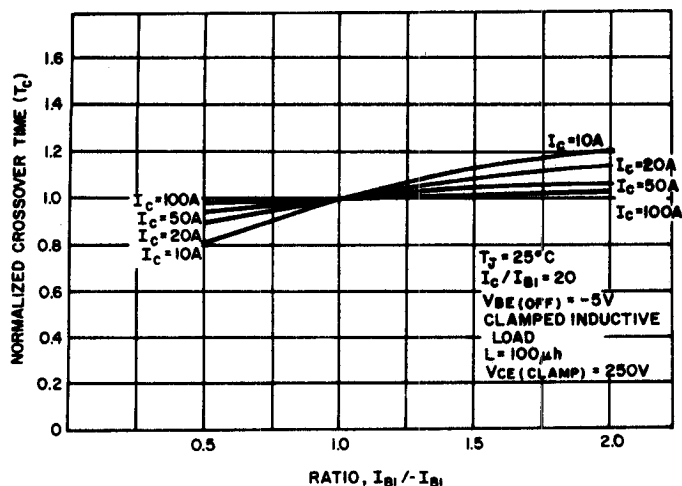


FIGURE 13: CROSSOVER TIME VARIATION WITH $-I_{B1}$

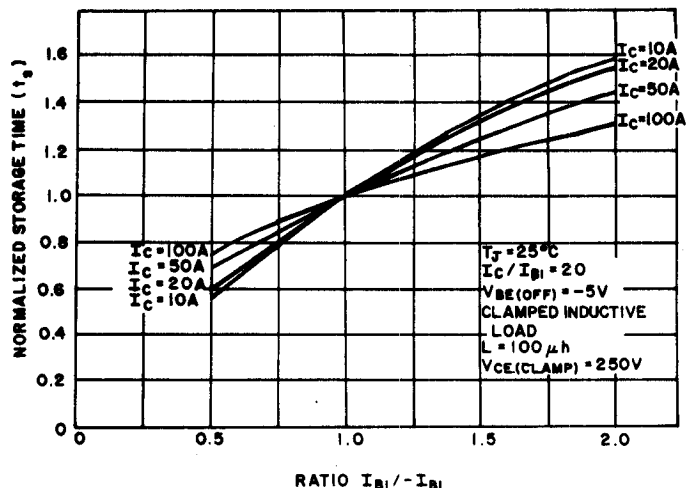


FIGURE 14: STORAGE TIME VARIATION WITH $-I_{B1}$

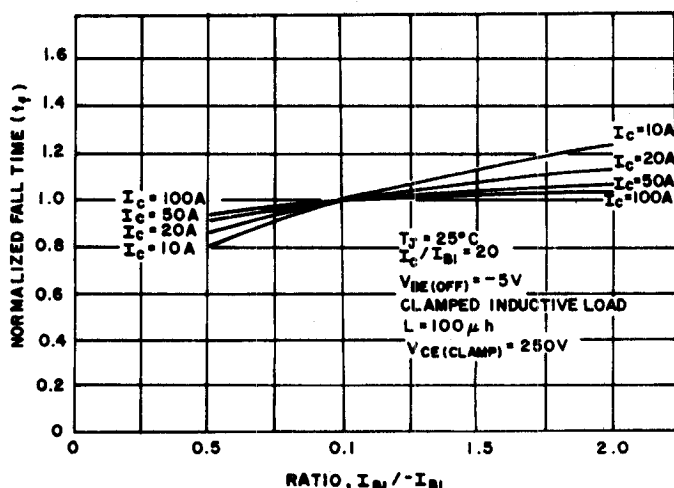


FIGURE 15: FALL TIME VARIATION WITH $-I_{B1}$

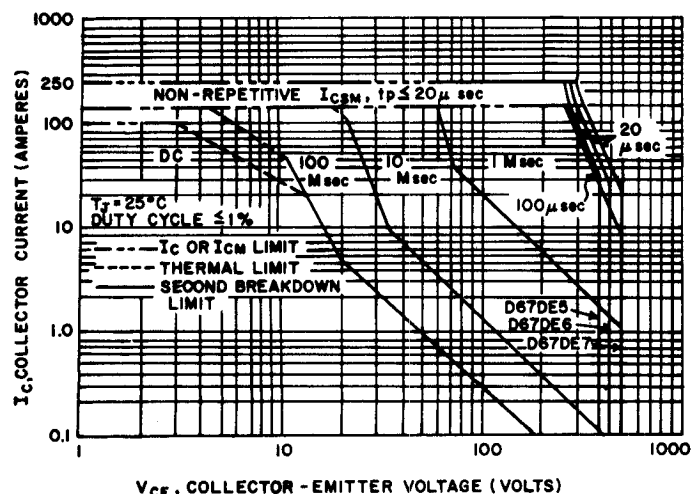


FIGURE 16: FORWARD BIAS SAFE OPERATING AREA

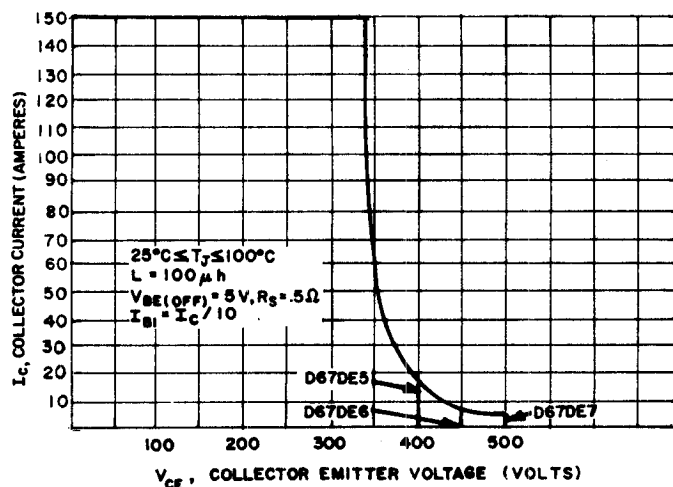


FIGURE 17: REVERSE BIAS SAFE OPERATING AREA (CLAMPED)

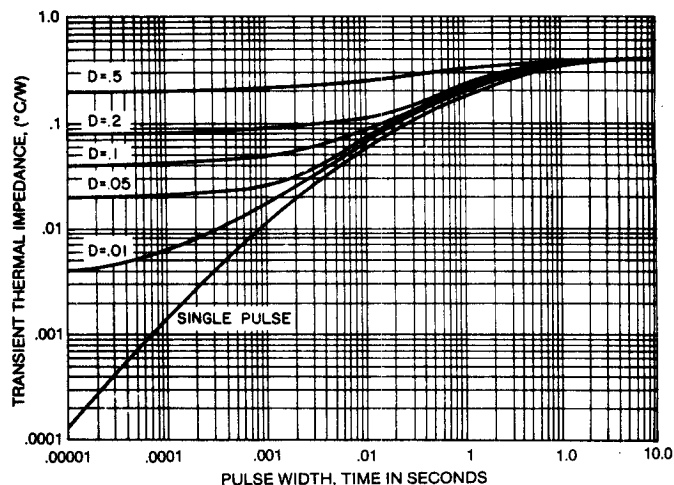


FIGURE 18: TRANSIENT THERMAL RESPONSE

The graph shows the power derating factor (%) on the y-axis (0 to 100) versus case temperature (T_c) in $^{\circ}\text{C}$ on the x-axis (0 to 160). Two curves are plotted:

- THERMAL DERATING:** A straight line starting at 100% at 25°C and reaching 0% at 150°C .
- SECOND BREAKDOWN DERATING:** A straight line starting at 100% at 25°C and reaching approximately 55% at 150°C .

T_c ($^{\circ}\text{C}$)	Thermal Derating (%)	Second Breakdown Derating (%)
25	100	100
40	86.7	93.3
60	66.7	83.3
80	46.7	73.3
100	26.7	63.3
120	6.7	53.3
140	-13.3	43.3
150	-33.3	33.3

A graph showing the relationship between instantaneous forward current (I_{TM}) and instantaneous on-state voltage (V_{TM}) for a 2N3867 JFET at three different temperatures: $T_J = 25^\circ\text{C}$ (solid line), $T_J = 100^\circ\text{C}$ (dashed line), and $T_J = 150^\circ\text{C}$ (dash-dot line). The y-axis is logarithmic, ranging from 10 to 150 amperes. The x-axis is linear, ranging from 0 to 3.0 volts. The curves show that the device can handle higher currents at lower voltages as temperature increases.

V_{TM} (Volts)	I_{TM} (A) at 25°C	I_{TM} (A) at 100°C	I_{TM} (A) at 150°C
1.0	10	15	20
1.5	40	50	60
2.0	100	110	120
2.5	140	150	160
3.0	150	150	150

FIGURE 20: DIODE FORWARD CHARACTERISTICS

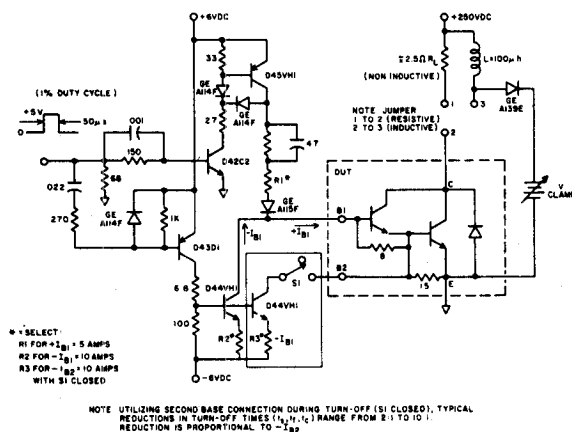


FIGURE 21: SWITCHING TIME TEST CIRCUITS FOR:

- RESISTIVE & INDUCTIVE SWITCHING
- USING BASE 1 ONLY
- USING BASE 1 AND BASE 2