TIP110, TIP111, TIP112

File Number **1336**

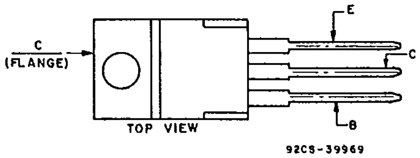
2-Ampere N-P-N Darlington Power Transistors

For Low and Medium Frequency Power Switching, Hammer Driver, Audio Amplifier, and Series and Shunt Regulator Applications

Features:

- *Operates from IC without predriver*
- *Gain of 1000 at 1A*
- *Low leakage at high temperatures*
- *Designed for complementary use with TIP-115, 116, and 117*
- *Hard glass passivation*
- *Wire-bonded construction*

TERMINAL DESIGNATIONS



JEDEC TO-220AB

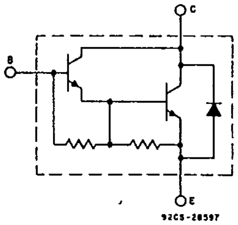


Fig. 1 - Schematic diagram for all types.

The RCA-TIP110, TIP111 and TIP112 series monolithic n-p-n silicon Darlington transistors are designed for low and medium frequency power applications. The construction of these devices provides good forward-bias second-breakdown capability; their high gain makes it possible for them to be driven directly from integrated circuits.

These devices are supplied in the JEDEC TO-220AB (VERSAWATT) plastic package.

MAXIMUM RATINGS, *Absolute Maximum Values:*

	TIP110	TIP111	TIP112	UNITS
V_{CBO}	60	80	100	V
$V_{CEO}(sus)$	60	80	100	V
V_{EBO}		5		V
I_C		2		A
I_{CM}		4		A
I_B		0.05		A
P_T:				
T_C up to 25°C		50		W
T_C above 25°C ... Derate linearly at		0.4		W/°C
T_{stg}, T_J		-65 to 150		°C
T_L				
At distance 1/8 in. (3.17 mm) from case for 10 s max.		260		°C

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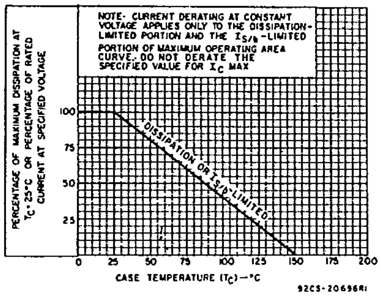
ELECTRICAL CHARACTERISTICS, *At Case Temperature (T_C) =25° C*

CHARACTERISTIC	TEST CONDITIONS				LIMITS						UNITS
	Voltage V dc		Current A dc		TIP110		TIP111		TIP112		
	V_{CE}	V_{BE}	I_C	I_B	MIN.	MAX.	MIN.	MAX.	MIN.	MAX.	
I_{CBO} $I_E = 0$	60[a]	—	—	—	—	1	—	—	—	—	mA
	80[a]	—	—	—	—	—	—	1	—	—	
	100[a]	—	—	—	—	—	—	—	—	1	
I_{CEO}	30	—	—	0	—	2	—	—	—	—	
	40	—	—	0	—	—	—	2	—	—	
	50	—	—	0	—	—	—	—	—	2	
I_{EBO}	—	-5	0	—	—	2	—	2	—	2	mA
V_{CEO}(sus)	—	—	0.03[b]	0	60	—	80	—	100	—	V
h_{FE}	4	—	1[b]	—	1000	—	1000	—	1000	—	—
	4	—	2[b]	—	500	—	500	—	500	—	
V_{BE}	4	—	2[b]	—	—	2.8	—	2.8	—	2.8	V
V_{CE}(sat)	—	—	2[b]	0.008	—	2.5	—	2.5	—	2.5	
C_{obo}	10[a]	—	—	—	—	100	—	100	—	100	pf
$\lvert h_{fe} \rvert$ f = 1.0 mHz	10	—	0.75	—	25 TYP.		25 TYP.		25 TYP.		—
$I_{S/b}$ t = 0. 5 s non-rep. pulse	40	—	—	—	1.25	—	1.25	—	1.25	—	A
$R_{\theta JC}$	—	—	—	—	—	2.5	—	2.5	—	2.5	°C/W
$R_{\theta JA}$	—	—	—	—	—	62.5	—	62.5	—	62.5	

[a] V_{CB} value. [b] Pulsed: Pulsed duration = 300 μs, duty factor ≤2%.



NOTE- CURRENT DERATING AT CONSTANT VOLTAGE APPLIES ONLY TO THE DISSIPATION-LIMITED PORTION AND THE $I_{S/b}$-LIMITED PORTION OF MAXIMUM OPERATING AREA CURVE. DO NOT DERATE THE SPECIFIED VALUE FOR I_C MAX

Fig. 2 - Derating curve for all types.

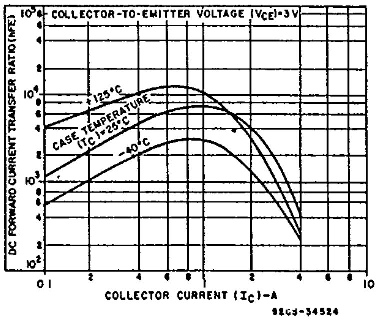


Fig. 3 - Typical dc-beta characteristics for all types.

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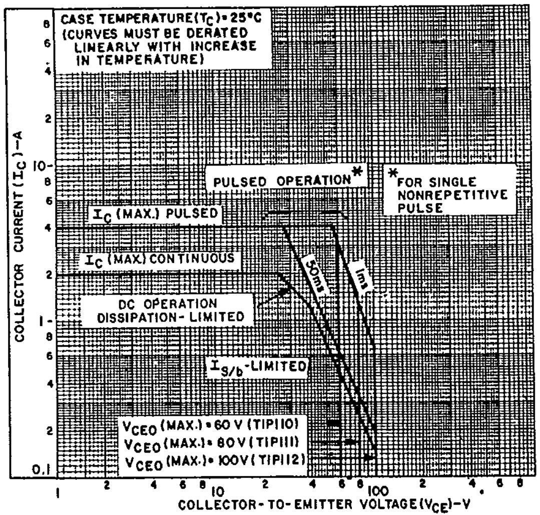


Fig. 4 - Maximum operating areas for all types (T_C = 25° C).

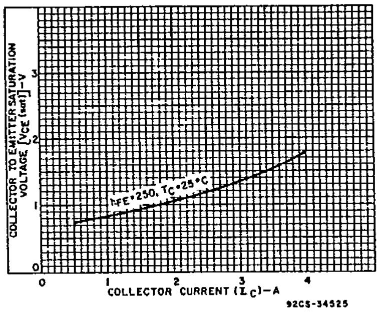


Fig. 5 - Typical saturation characteristics for all types.

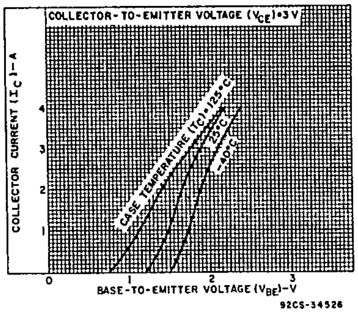


Fig. 6 - Typical transfer characteristics for all types.

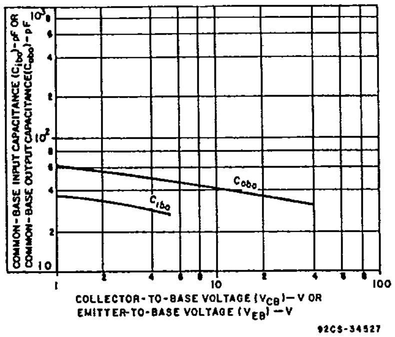


Fig. 7 - Typical common-base input (C_{ibo}) or output (C_{obo}) capacitance characteristic (all types).

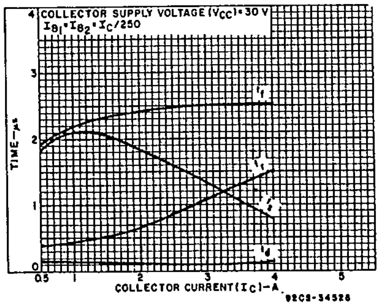
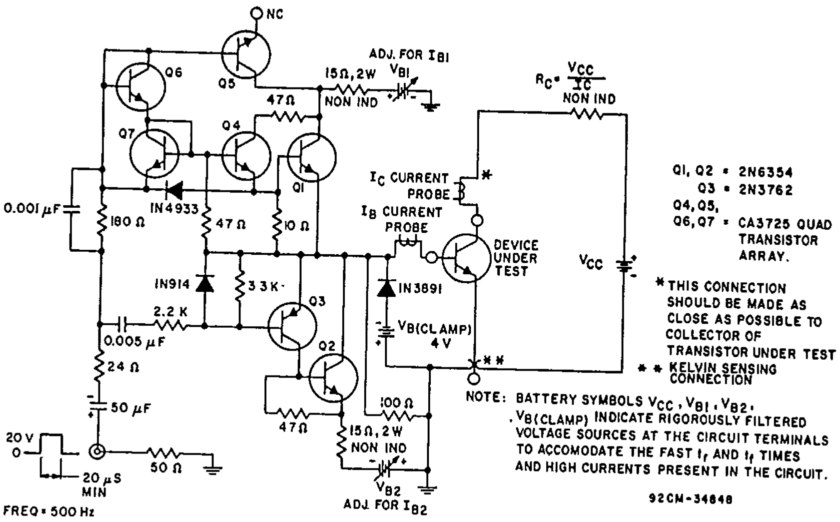


Fig. 8 - Typical saturated switching characteristics (all types).



Q1, Q2 = 2N6354
Q3 = 2N3762
Q4, Q5,
Q6, Q7 = CA3725 QUAD TRANSISTOR ARRAY.

* THIS CONNECTION SHOULD BE MADE AS CLOSE AS POSSIBLE TO COLLECTOR OF TRANSISTOR UNDER TEST

** KELVIN SENSING CONNECTION

NOTE: BATTERY SYMBOLS V_{CC}, V_{B1}, V_{B2}, $V_{B(CLAMP)}$ INDICATE RIGOROUSLY FILTERED VOLTAGE SOURCES AT THE CIRCUIT TERMINALS TO ACCOMODATE THE FAST t_r AND t_f TIMES AND HIGH CURRENTS PRESENT IN THE CIRCUIT.

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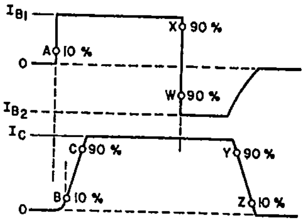
Fig. 9 - Circuit for measuring switching times.



92CS-30381R2

t_d = A–B
t_s = X–Y
t_r = B–C
t_f = Y–Z
$t_{transition}$ = X–W

NOTE: TRANSITION TIME FROM 90% I_{B_1} TO 90% I_{B_2} MUST BE LESS THAN 0.5 μs.

Fig. 10 - Phase relationship between input and output currents showing reference points for specification of switching times.