

ADVISORY ON THE USE OF THIS DOCUMENT

The information contained in this document has been developed solely for the purpose of providing general guidance to employees of the Goddard Space Flight Center (GSFC). This document may be distributed outside GSFC only as a courtesy to other government agencies and contractors. Any distribution of this document, or application or use of the information contained herein, is expressly conditioned upon, and is subject to, the following understandings and limitations:

- (a) The information was developed for general guidance only and is subject to change at any time;
- (b) The information was developed under unique GSFC laboratory conditions which may differ substantially from outside conditions;
- (c) GSFC does not warrant the accuracy of the information when applied or used under other than unique GSFC laboratory conditions;
- (d) The information should not be construed as a representation of product performance by either GSFC or the manufacturer;
- (e) Neither the United States government nor any person acting on behalf of the United States government assumes any liability resulting from the application or use of the information.

UNISYS

48

Interoffice Memorandum

PPM-91-406

Date June 14, 1991

Location Lanham

Telephone 731-8954

Location Lanham

cc

G. Krishnan/311
V. Edson
S. Esmacher
D. Krus
R. Woodward
B. Fridovich/661
T. Rosenvinge/661

To
W. Beyah
Department
Code 300.1
From
K. Sahu K.S.
Department
7809
Subject
Radiation Report on ISTP
Non-Common Buy Part No. CA3127F

A radiation evaluation was performed on CA3127F to determine the total dose tolerance of these parts. A brief summary of the test results is provided below. For detailed information, refer to Tables I through IV and Figure 1.

The total dose testing was performed using a cobalt-60 gamma ray source. During the radiation testing, eight parts were irradiated under bias (see Figure 1 for bias configuration), and two parts were used as control samples. The total dose radiation steps were 10, 20, 30, 50 and 100 krads. After 100 krads, parts were annealed at 25°C for 24 and 168 hours. The dose rate was between 0.6 - 2.7 krads/hour, depending on the total dose level (see Table II for radiation schedule). After each radiation exposure and annealing treatment, parts were electrically tested according to the test conditions and the specification limits listed in Table III.

All (8) parts passed all tests on irradiation to 100 krads and subsequent annealing for 24 and 168 hours. Table IV provides the mean and standard deviation values for each parameter after different radiation exposures and annealing treatments.

Any further details about this evaluation can be obtained upon request. If you have any questions, please call me at 301-731-8954.

TABLE I. Part Information

Generic Part Number:	CA3127F
ISTP Non-Common Buy Part Number:	CA3127F
ISTP Non-Common Buy Control Number:	1996
Charge No.:	C13905
Manufacturer:	Harris Corp.
Quantity Procured:	140
Lot Date Code:	9101
Quantity Tested:	10
Serial Numbers of Radiation Samples:	292, 293, 294, 295, 296, 297, 298, 299
Serial Numbers of Control Samples:	290, 291
Part Function:	NPN Transistor Array
Part Technology:	Bipolar
Package Style:	16 Pin DIP

TABLE II. Radiation Schedule

EVENTS	DATE
1) Initial Electrical Measurements	05/16/91
2) 10 krads irradiation @ 556 rads/hr	05/17/91
Post 10 krads Electrical Measurements	05/18/91
3) 20 krads irradiation @ 500 rads/hr	05/18/91
Post 20 krads Electrical Measurements	05/19/91
4) 30 krads irradiation @ 526 rads/hr	05/19/91
Post 30 krads Electrical Measurements	05/20/91
5) 50 krads irradiation @ 1081 rads/hr	05/20/91
Post 50 krads Electrical Measurements	05/21/91
6) 100 krads irradiation @ 2703 rads/hr	05/21/91
Post 100 krads Electrical Measurements	05/22/91
7) 24 hrs annealing	05/22/91
Post 24 hr Electrical Measurements	05/23/91
8) 168 hrs annealing	05/22/91
Post 168 hr Electrical Measurements	05/29/91

Notes:

- All parts were radiated under bias at the cobalt-60 gamma ray facility at GSFC.
- All electrical measurements were performed off-site at 25°C.
- Annealing performed at 25°C under bias.

Table III. Electrical Characteristics of CA3127F

Test	Condition	Limits		Units
		Min	Max	
VBRCEO	$I_C = 10\mu A, I_E = 0$	20	-	V
VBRCEO	$I_C = 1mA, I_B = 0$	15	-	V
VBREBO	$I_E = 10\mu A, I_C = 0$	4	-	V
ICBO	$V_{CB} = 10V, I_E = 0$	-	40	nA
ICEO	$V_{CE} = 10V, I_B = 0$	-	500	nA
HFE 1 2 3	$V_{CE} = 6V, I_C = 5mA$	35	-	
	$V_{CE} = 6V, I_C = 1mA$	40	-	
	$V_{CE} = 6V, I_C = 0.1mA$	35	-	
dHFE	$V_{CE} = 6V, I_C = 5mA$	-5	5	
VCEsat	$I_C = 10mA, I_B = 1mA$	-	0.5	V
VBRCSO	$I_C = 10\mu A, I_B = I_E = 0$	20	-	V
VBE 1 2 3	$V_{CE} = 6V, I_C = 5mA$	0.71	0.91	V
	$V_{CE} = 6V, I_C = 1mA$	0.66	0.86	V
	$V_{CE} = 6V, I_C = 0.1mA$	0.60	0.80	V
dVBE	$V_{CE} = 6V, I_C = 5mA$	-5	5	mV

TABLE IV: Summary of Electrical Measurements after
Total Dose Exposures and Annealing for CA3127F

1/, 2/, 3/, 4/

Parameters	Spec. Limits min max	Initials mean sd	Total Dose Exposure (krads)										Annealing						
			10		20		30		50		100		24 hrs.		168 hrs.				
			mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd			
VBRCEO	V 20 -	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
VBRCEO	V 15 -	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
VBREBO	V 4 -	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
ICBO	nA - 40	0.1	0.1	0.1	0.1	0.3	0.1	0.3	0.2	0.2	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.2	0.1
ICEC	nA - 500	0.1	0.1	0.1	0.1	0.3	0.1	0.3	0.2	0.2	0.1	0.3	0.1	0.3	0.1	0.3	0.1	0.2	0.1
HFE1	35 -	49	1	49	1	50	2	50	2	50	2	50	2	50	2	50	2	52	2
HFE2	40 -	62	5	60	4	63	4	65	4	68	4	64	3	66	3	66	3	66	3
HFE3	35 -	77	6	75	8	74	8	75	8	72	7	68	5	67	5	67	5	67	4
dhFE	-5 5	1.1	.03	1.1	.03	1.0	.03	1.0	.03	1.1	.03	1.1	0	1.0	.05	1.1	.07	1.1	.07
VCEsat	V - 0.5	0.23	.01	0.23	.01	0.22	.01	0.22	0	0.22	0	0.23	0	0.23	0	0.22	0	0.22	0
VBRCSO	V 20 -	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass
VBE1	V 0.71 0.91	0.82	0	0.82	0	0.82	0	-	-	0.82	0	0.82	0	0.82	0	0.82	0	0.82	0
VBE2	V 0.66 0.86	0.76	0	0.76	0	0.76	0	-	-	0.76	0	0.76	0	0.76	0	0.76	0	0.76	0
VBE3	V 0.60 0.80	0.69	0	0.70	0	0.70	0	-	-	0.69	0	0.69	0	0.69	0	0.69	0	0.69	0
dVBE	mV -5 5	0	0	-0.5	0.2	-0.8	0.3	-	-	-0.5	0.2	-1.3	0.4	-0.8	0.3	-1.0	0.3	-1.0	0.3

Notes:

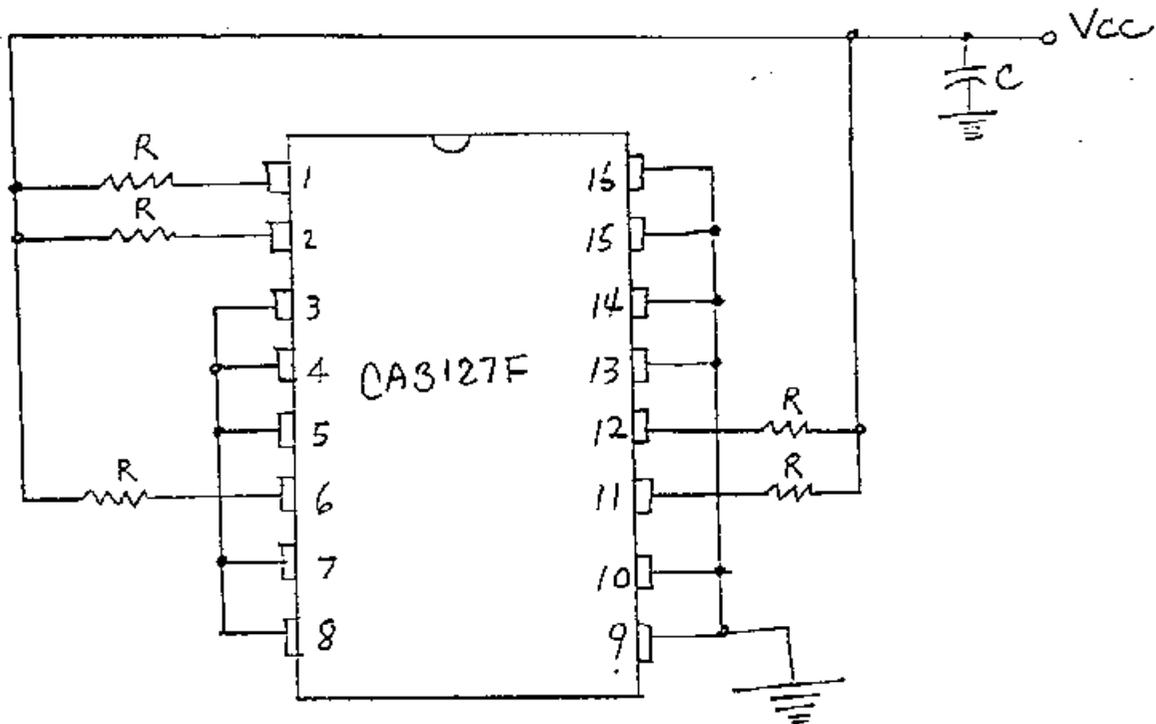
1/ The mean and standard deviation values were calculated over the eight parts irradiated in this testing. The control samples remained constant throughout the testing and are not included in this table.

2/ The test equipment used to test VBRCSO, VBE, and dVBE was not available for post 30 krad electrical measurements, and hence no data for these parameters was obtained at this radiation step.

3/ A lead on SN 298 was broken upon removing the part from its test socket after post 20 krad electrical measurement; thus, Table IV provides data on the remaining seven parts at the following radiation steps.

4/ Test data from one of the five transistors in each part was used for analysis in Table IV. However, this data characterizes the data for all the transistors in the parts.

Figure 1. Radiation Bias Circuit for CA3127F



$$V_{cc} = +10V \pm 0.5V$$

$$C = 0.01\mu F, 50V$$

$$R = 100k\Omega, \frac{1}{4}W$$
$$\pm 5\%$$