

Device	Manufacturer	Part Description	Test Conditions	Effect of Co60 Photons	Effect of Reactor Neutrons and Photons
LT1129-5	Linear Technology	Fixed 5 V Regulator, 700 mA	5 V , 125 mA	Voltage increased slowly from 5 to 6 V over exposure to 100 kRads	Voltage increased from 5 to 5.4 V up to $8 \times 10^{11}$ N/cm <sup>2</sup> (just as with photons alone) then died (0V output) at $8.6 \times 10^{11}$ N/cm <sup>2</sup> .
LM1085-3.3	National	Fixed 3.3 V Regulator, 3A	3.3 V, 100 mA	No changes observed up to 100 kRads	First test saw a slight increase in voltage up to $1.4 \times 10^{12}$ N/cm <sup>2</sup> then a rapid increase to 3.8-3.9 V. The second test (new part) only showed a mild increase over the test range of $2.8 \times 10^{12}$ N/cm <sup>2</sup> .
LM1086-5	National	Fixed 5 V Regulator, 1.5A	5V, 100 mA	Voltage showed slight increase over exposure to 100 kRads	Voltage increase from 5 to 5.4 V over $2.8 \times 10^{12}$ N/cm <sup>2</sup>
LM1117-ADJ	National	Adjustable Voltage Regulator	2.5 V, 5 mA	N/A	No change observed after $2.8 \times 10^{12}$ N/cm <sup>2</sup>
LM4130	National	Voltage Reference, 20 mA	Not available for testing	N/A	N/A
LM4120-3.3	National	Voltage Reference 3.3 V 5mA	3.3 V, 100 mA , with pass transistor	Input voltage dropped due to changing threshold of pass transistor. When < dropout voltage, the output tracked the input.	Same behavior as with photons alone.
IRFU9110	International Rectifier	PMOS Pass Transistor for LM4120-3.3, 3.1A	Gate set to 4V below Vdd	Threshold started changing immediately and steadily increased.	Same behavior as with photons alone.
LM4120-1.8	National	Voltage Reference , 1.8 V, 5 mA	1.8 V, 0.5 mA, with DMOS FET pass transistor	N/A	No change observed after $2.8 \times 10^{12}$ N/cm <sup>2</sup>
LM4041	National	Shunt Voltage Reference	1.5V, 0.5 mA	N/A	Slight increase in voltage after $2.5 \times 10^{12}$ N/cm <sup>2</sup> .
SDA321	Zetex	Schottky Diode Array reversed biased	Reversed biased at 4V	No significant change in the leakage current was observed.	No significant change in the leakage current was observed. (Forward biasing conducts after exposure)
Red LED	N/A	red LED	in series with 2k resistor to power	N/A	No change in current or voltage observed.
OM7611ST	Omnirel	Adjustable Negative Voltage Regulator, 3 A	Wired "upside down" with input grounded and trim-pot at +7V. Adjusted for +1.6V output (i.e.. 5.4 V below	N/A	No indication of problems up to $1.1 \times 10^{12}$ N/cm <sup>2</sup> (i.e.. The output tracked the supply voltage); Possibly OK beyond $1.1 \times 10^{12}$ N/cm <sup>2</sup> but data is unreliable.
OM3914ST	Omnirel	Adjustable Negative Voltage Regulator, 3 A	Not available for testing	N/A	N/A

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PQ7DV10	Sharp	Adjustable Voltage Regulator 10A	5 V, 750 mA	No indication of problems up to 100 kRads	No problems observed up to $1.1 \times 10^{12}$ . Good indication that it is OK up to $2.8 \times 10^{12}$ N/cm <sup>2</sup> .
PQ7DV5	Sharp	Adjustable Voltage Regulator 5A	6 V, 900 mA	No indication of problems up to 100 kRads	No problems observed up to $1.1 \times 10^{12}$ . Good indication that it is OK up to $2.8 \times 10^{12}$ N/cm <sup>2</sup> .
LP3964-5	National	5 V Regulator 800mA	5 V, 250 mA	Drop in voltage starts at 18kRad then sudden rise at 27kRad then dead at 31kRad	Same behavior as with photons alone starting at $3 \times 10^{11}$ N/cm <sup>2</sup> . Dead at $8 \times 10^{11}$ N/cm <sup>2</sup> . Behavior with neutrons alone ???
LP3966	National	Adjustable Voltage Regulator 3A	3.3 V, 660 mA	Rapid rise in voltage as 31kRads then dead at 35kRads	Same behavior as with photons alone starting at $6 \times 10^{11}$ N/cm <sup>2</sup> . Dead at $8 \times 10^{11}$ N/cm <sup>2</sup> . Behavior with neutrons alone ???
LM2991	National	Adjustable Negative Voltage Regulator 1A	Wired "upside down" with input grounded and trim-pot at +7V. Adjusted for +4.4V output (i.e.. 3.6V below supply)	No indication of problems up to 100 kRads	Tracking the positive supply up to $8.5 \times 10^{11}$ N/cm <sup>2</sup> at which point the ADC becomes saturated.
AD8011	Analog Devices	300MHz Current Feedback OpAmp	input was LM4120-3.3 with gain of 1	No indication of problems up to 100 kRads	No problems observed up to $2.8 \times 10^{12}$ N/cm <sup>2</sup> .
TPS2012	Texas Instruments	Power Distribution Switches	Not yet tested		
TPS2013	Texas Instruments	Power Distribution Switches	Not yet tested		
TPS2015	Texas Instruments	Power Distribution Switches	Not yet tested		