TOTAL IONIZING DOSE Test Report

BC817-25 - 500mA NPN Transistor from ON-Semiconductor

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1 INTRODUCTION

This report presents the total ionizing dose results of **BC817-25** a **500mA NPN Transistor from ON-Semiconductor**.

2 DOCUMENTS

APPLICABLE AND REFERENCE DOCUMENTS
BJTs COTS TID test plan
Datasheet **BC817** from ON-Semiconductor

3 PART REFERENCES

REFERENCES	
Type:	BC817-25LT1G and BC817-25LT3G
Manufacturer:	ON-Semiconductor
Function:	500 mA general-purpose transistors
Technology:	Bipolar NPN Silicon
PARTS PROCUREMENT	
Packaging:	SOT23 (TO-236AB)
Date Code:	batch no. 05: Jan. even years batch no. 06: Apr. even years batch no. 08: Jan. even years
Distributor:	batch no. 05: Farnell batch no. 06: RS Components batch no. 08: Mouser
Number of Parts:	3 x 10 irradiated and 3 x 1 ref

4 DOSIMETRY AND IRRADIATION FACILITY

IRRADIATION FACILITY	
Source:	Co60
Localization:	ESTEC, Netherlands
Dosimetry:	FARMER 2670 / 2571

IRRADIATION TIMING	
Total dose limit (krad(Si))	50
Level for measurement (krad(Si))	0, 5, 10, 21, 50
Dose rate (krad(Si)/h)	0.24

ANNEALING TIMING	
Annealing 22°C	24 h
Ageing 100°C	168h

5 TEST EQUIPMENT

PARAMETER	TEST EQUIPMENT
VCE0(BR), VCB0(BR), VCE(sat), hfe (Ic>50mA)	SZ UNIMET M300 Test adapter TA07B.1 SA 07.B.03/1
hfe (Ic<50mA)	Keysight B2912A Precision Source/Measure Unit

6 TEST PARAMETERS

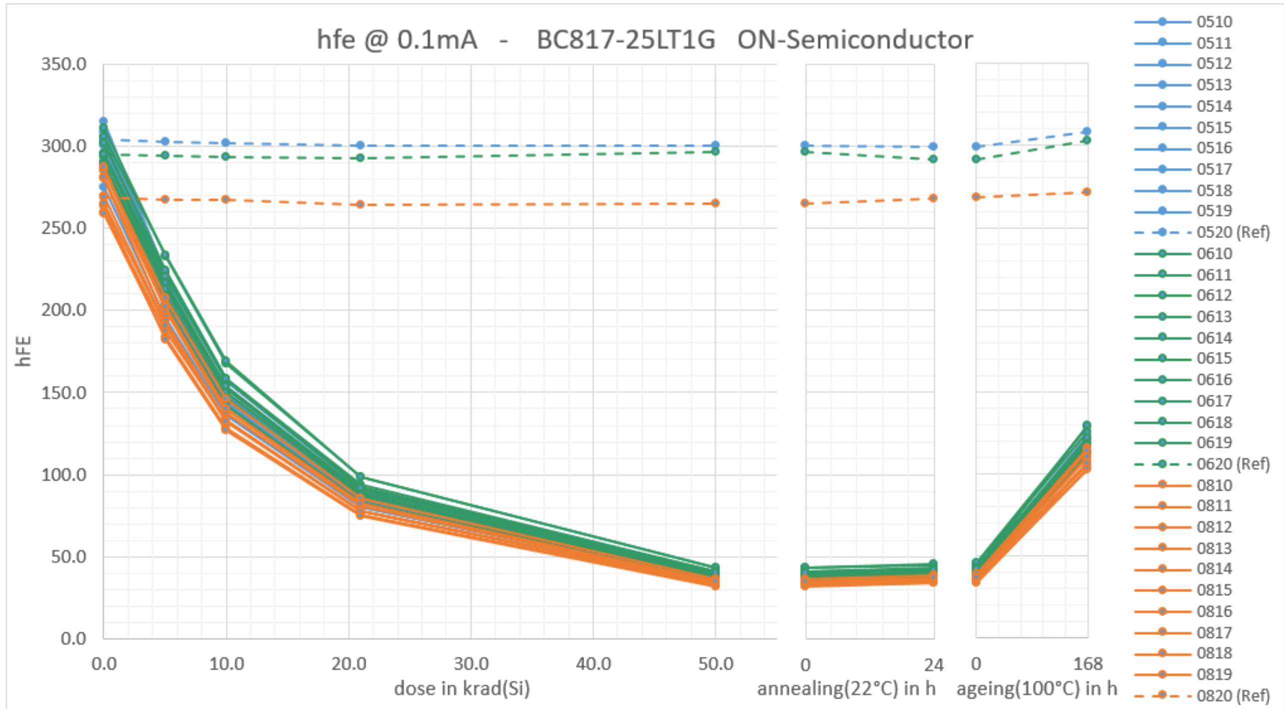
PARAMETERS	SYMBOLS	TEST CONDITIONS
Forward Current Transfer Ratio	hfe1	Ic= 0.1mA, Vce = 1V
	hfe2	Ic= 1mA, Vce = 1V
	hfe3	Ic= 10mA, Vce = 1V
	hfe4	Ic= 100mA, Vce = 1V
	hfe5	Ic= 500mA, Vce = 1V
Collector-Emitter Breakdown Voltage	VCE0 (BR)	Ic = 10mA
Collector-Base Breakdown Voltage	VCB0 (BR)	Ic = 10uA
Collector-Emitter Saturation Voltage	VCE (sat)	Ib = 50mA, Ic = 500mA

7 BIAS CONDITIONS

All samples were irradiated in unbiased condition. During the irradiation and during the annealing, a connection of all pins of the transistors was ensured by a conductive foam. During the aging at 100 °C aluminium foil was used to create a connection between all pins.

8 TEST RESULTS

8.1 hfe @ 0.1 mA

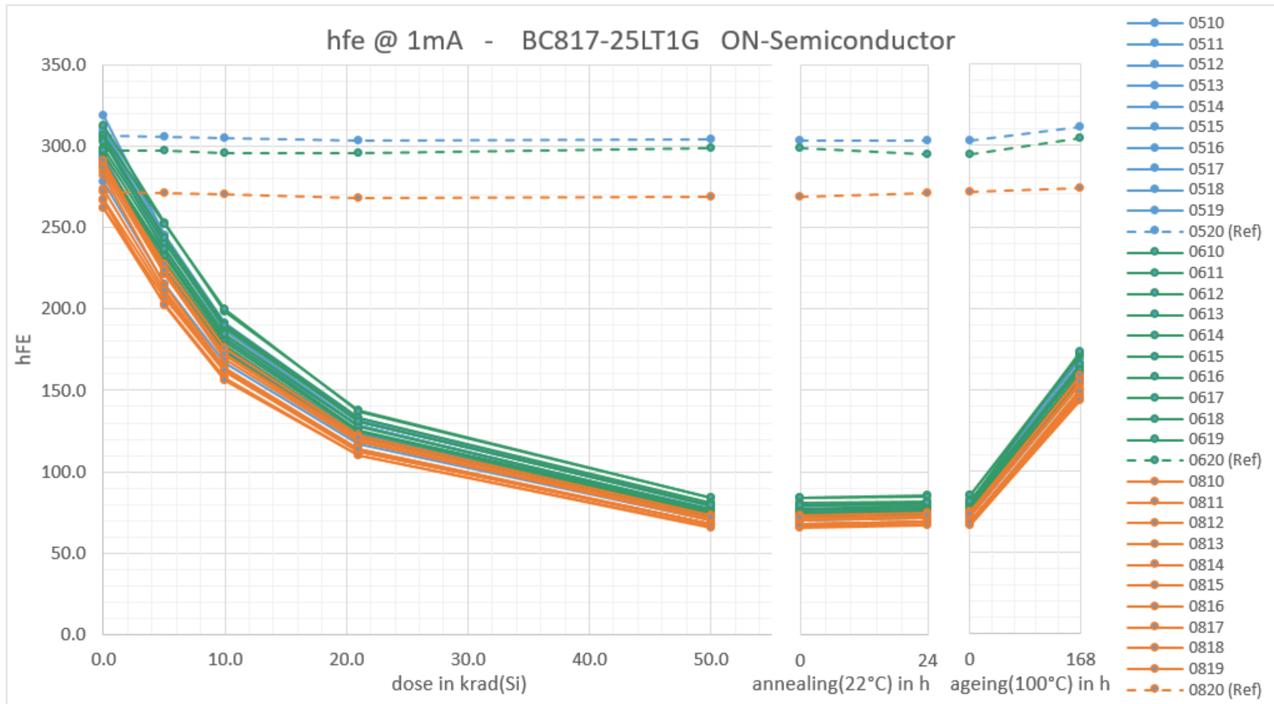


hfe @ 0.1mA	BC817-25LT1G ON-Semiconductor Farnell Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0510	300.3	210.8	147.9	88.3	37.2	38.9	117.5
0511	303.5	213.9	150.0	88.3	37.7	39.4	118.5
0512	314.7	221.8	157.1	91.8	39.0	41.0	122.0
0513	305.6	218.5	153.4	88.8	38.3	40.2	120.3
0514	290.5	202.3	142.6	83.0	35.0	36.9	112.5
0515	287.0	213.7	149.3	86.7	37.7	39.6	117.1
0516	275.1	194.8	136.4	80.4	34.9	36.7	111.5
0517	289.3	207.6	145.7	85.0	36.9	38.5	116.7
0518	308.8	223.0	157.4	91.4	39.4	41.2	123.1
0519	289.0	205.8	144.2	84.8	36.6	38.4	114.7
0520 (Ref)	303.7	302.2	301.4	300.2	300.2	299.5	308.1
Average	296.37	211.22	148.39	86.84	37.27	39.08	117.38
s	12.105	8.897	6.550	3.595	1.503	1.545	3.802
Average+3s	332.69	237.91	168.04	97.63	41.77	43.72	128.79
Average-3s	260.06	184.53	128.74	76.06	32.76	34.45	105.98

hfe @ 0.1mA	BC817-25LT3G ON-Semiconductor RS April even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0610	289.6	214.3	152.1	88.6	38.7	40.5	118.1
0611	311.0	233.0	167.4	98.5	43.6	45.3	126.2
0612	293.1	216.6	153.7	90.1	39.5	41.3	119.9
0613	289.6	213.0	150.0	87.2	38.0	39.8	117.4
0614	305.4	233.5	169.3	98.5	43.6	45.7	129.0
0615	302.1	222.9	158.7	94.3	41.2	43.1	118.7
0616	295.3	220.3	157.7	92.8	40.9	42.7	122.0
0617	287.7	209.2	146.7	85.3	36.9	38.7	116.9
0618	285.3	203.6	142.4	83.3	36.4	38.0	112.8
0619	301.4	224.0	158.4	91.9	40.3	42.0	129.4
0620 (Ref)	294.5	294.3	293.1	292.8	296.1	291.9	302.6
Average	296.05	219.04	155.63	91.03	39.90	41.70	121.03
s	8.517	9.687	8.487	5.174	2.502	2.574	5.501
Average+3s	321.60	248.11	181.09	106.56	47.40	49.43	137.53
Average-3s	270.50	189.98	130.17	75.51	32.39	33.98	104.53

hfe @ 0.1mA	BC817-25LT1G ON-Semiconductor Mouser Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.0	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0810	259.3	187.7	133.2	78.0	34.1	35.7	105.9
0811	258.5	183.6	128.5	75.9	32.9	34.5	103.1
0812	280.0	193.4	132.9	77.6	33.1	35.0	107.7
0813	263.5	182.1	127.2	75.0	31.9	33.9	103.2
0814	265.2	190.4	132.5	77.5	33.8	35.6	106.8
0815	269.9	190.9	132.5	77.6	33.1	34.9	106.9
0816	281.2	200.2	140.3	82.4	35.1	37.1	110.3
0817	284.5	207.4	145.7	85.2	36.8	38.8	115.5
0818	287.1	199.8	137.7	81.1	34.4	36.4	110.8
0819	287.5	201.8	140.2	82.9	35.1	37.1	114.0
0820 (Ref)	268.7	267.6	267.3	264.3	265.2	268.2	271.2
Average	273.68	193.73	135.07	79.32	34.02	35.90	108.40
s	11.595	8.310	5.780	3.345	1.403	1.457	4.190
Average+3s	308.46	218.66	152.41	89.35	38.23	40.27	120.98
Average-3s	238.89	168.81	117.73	69.28	29.82	31.53	95.83

8.2 hfe @ 1 mA

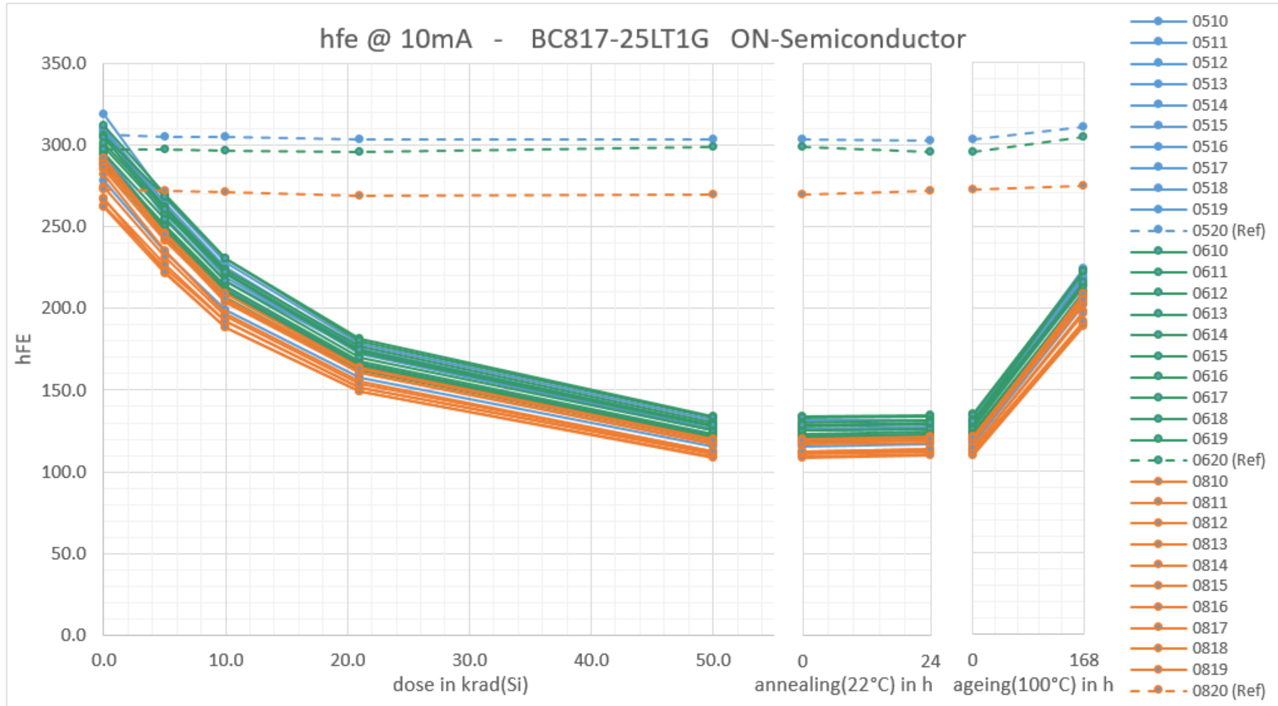


hfe @ 1mA	BC817-25LT1G ON-Semiconductor Farnell Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0510	304.5	233.9	181.1	128.8	75.6	77.2	164.2
0511	307.7	237.0	183.4	128.8	76.6	78.2	165.5
0512	318.4	245.3	191.5	133.0	79.4	80.7	169.8
0513	309.0	240.9	186.4	128.4	76.6	78.2	165.9
0514	293.7	224.2	174.7	121.5	71.9	73.3	157.3
0515	289.7	233.4	180.2	124.3	75.3	76.6	160.7
0516	277.9	215.4	166.8	116.8	70.3	72.0	153.7
0517	291.9	228.3	176.9	122.8	73.9	75.2	160.0
0518	311.0	244.7	190.5	131.3	78.6	80.3	168.7
0519	293.5	227.9	176.2	123.3	73.8	75.3	159.3
0520 (Ref)	306.5	305.4	304.7	303.6	303.6	303.0	311.0
Average	299.73	233.11	180.77	125.89	75.21	76.69	162.48
s	12.273	9.445	7.581	4.984	2.838	2.822	5.161
Average+3s	336.55	261.44	203.52	140.84	83.73	85.16	177.96
Average-3s	262.91	204.77	158.03	110.94	66.70	68.22	147.00

hfe @ 1mA	BC817-25LT3G ON-Semiconductor RS April even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0610	291.4	233.3	182.3	125.6	76.3	77.6	160.4
0611	312.6	252.5	198.5	137.7	84.0	85.4	171.1
0612	295.3	236.2	184.2	127.9	77.5	79.1	163.4
0613	291.0	232.1	180.2	124.3	75.0	76.5	159.4
0614	306.7	252.0	199.7	137.1	83.8	85.2	172.6
0615	304.2	243.2	190.3	133.1	80.6	82.1	162.5
0616	298.3	240.3	188.5	130.7	79.5	80.8	165.5
0617	289.6	229.0	177.3	122.5	73.9	75.3	159.9
0618	287.2	224.1	173.6	120.4	72.9	74.0	156.4
0619	302.4	243.4	190.0	131.1	79.3	81.0	173.1
0620 (Ref)	297.1	297.1	296.0	295.7	298.9	294.7	304.7
Average	297.86	238.61	186.45	129.04	78.27	79.70	164.43
s	8.407	9.426	8.584	5.923	3.864	3.920	5.962
Average+3s	323.08	266.88	212.20	146.81	89.86	91.46	182.31
Average-3s	272.63	210.33	160.69	111.28	66.68	67.94	146.55

hfe @ 1mA	BC817-25LT1G ON-Semiconductor Mouser Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.0	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0810	262.1	206.6	161.7	112.5	68.1	69.3	145.7
0811	261.6	203.1	157.3	110.2	66.5	67.7	143.3
0812	282.1	214.4	163.5	114.3	68.0	69.3	150.2
0813	266.6	202.1	156.3	110.1	65.4	66.9	143.9
0814	266.9	209.1	161.2	112.3	67.8	69.3	147.0
0815	273.1	211.5	162.5	113.8	67.5	69.2	148.8
0816	284.2	221.0	171.2	119.6	71.3	72.8	153.6
0817	286.6	227.1	176.2	122.1	73.4	75.0	158.2
0818	289.7	221.5	169.3	118.7	70.4	71.9	155.0
0819	291.1	223.7	171.8	120.8	71.7	73.3	158.4
0820 (Ref)	271.8	270.9	270.7	267.7	268.6	271.4	274.1
Average	276.40	214.00	165.10	115.45	69.01	70.49	150.39
s	11.597	8.942	6.658	4.446	2.556	2.616	5.638
Average+3s	311.19	240.83	185.07	128.79	76.68	78.34	167.31
Average-3s	241.61	187.17	145.13	102.11	61.34	62.64	133.48

8.3 hfe @ 10 mA

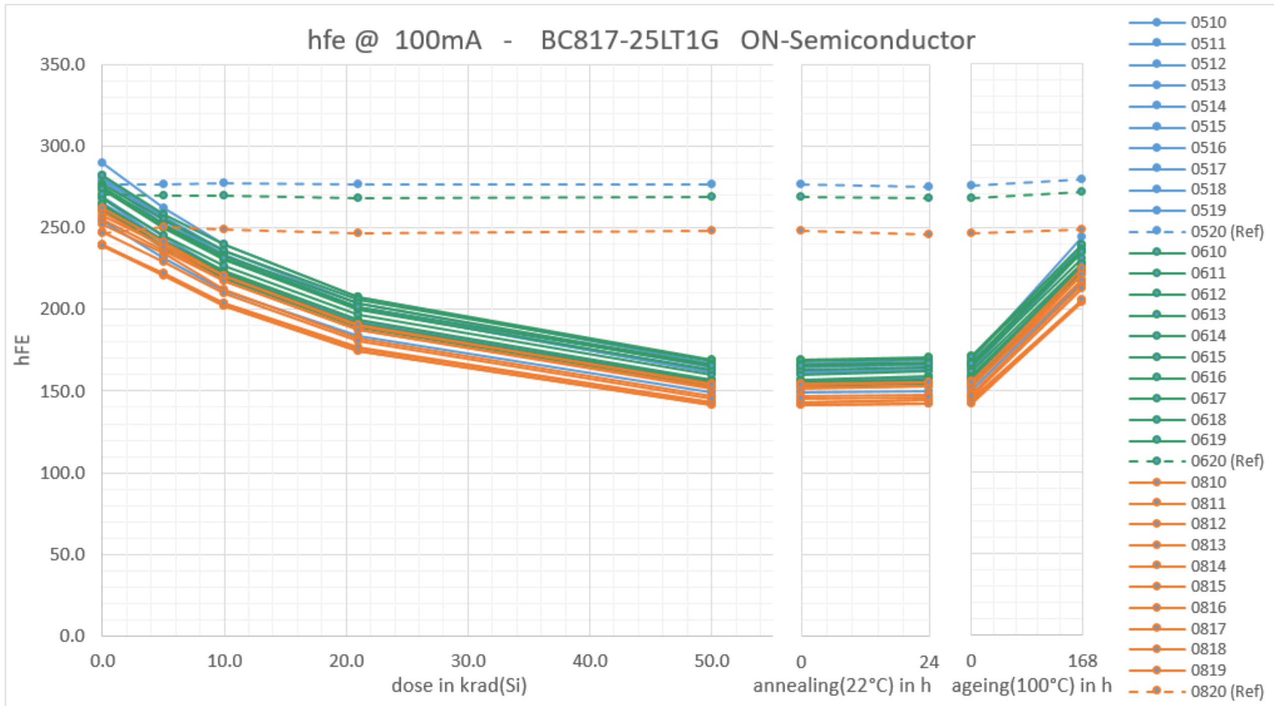


hfe @ 10mA	BC817-25LT1G ON-Semiconductor Farnell Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0510	305.3	255.9	216.7	173.4	125.2	126.4	216.9
0511	308.4	258.8	219.1	173.4	126.5	127.6	218.5
0512	318.5	267.2	227.9	178.7	131.6	131.8	223.9
0513	309.0	261.5	221.6	172.5	125.6	126.8	218.1
0514	293.8	245.1	209.4	164.1	119.1	120.3	207.8
0515	289.5	250.4	212.8	166.3	122.1	123.4	209.7
0516	278.3	234.3	198.9	157.8	115.6	116.8	201.4
0517	291.8	247.4	209.9	165.3	120.9	122.3	208.9
0518	310.0	264.0	224.9	175.6	128.4	129.6	219.8
0519	294.5	248.4	210.2	165.9	121.1	122.2	209.8
0520 (Ref)	306.1	305.1	304.5	303.5	303.5	302.8	310.7
Average	299.90	253.30	215.12	169.29	123.61	124.72	213.48
s	12.186	10.032	8.650	6.372	4.754	4.536	6.940
Average+3s	336.46	283.40	241.07	188.41	137.87	138.33	234.30
Average-3s	263.34	223.20	189.17	150.17	109.35	111.11	192.66

hfe @ 10mA	BC817-25LT3G ON-Semiconductor RS April even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0610	290.8	250.5	213.4	167.3	123.0	124.3	208.6
0611	311.7	269.8	230.7	181.1	133.7	134.8	222.3
0612	295.0	254.2	216.4	170.0	125.1	126.4	213.5
0613	290.3	249.4	211.5	165.7	121.7	122.8	207.7
0614	305.5	267.9	230.8	179.9	133.4	134.1	222.7
0615	303.8	261.7	223.3	176.9	129.9	131.5	213.6
0616	298.4	258.3	220.9	173.3	127.5	129.0	215.8
0617	289.0	247.0	209.4	164.5	120.5	122.0	209.4
0618	286.9	243.4	206.3	162.5	119.0	120.3	206.1
0619	301.0	260.5	222.2	174.5	128.4	130.1	222.7
0620 (Ref)	297.1	297.1	296.1	295.9	298.9	295.3	304.6
Average	297.23	256.27	218.48	171.58	126.21	127.54	214.25
s	8.190	8.857	8.503	6.561	5.219	5.136	6.463
Average+3s	321.80	282.84	243.99	191.26	141.87	142.95	233.64
Average-3s	272.66	229.69	192.97	151.89	110.56	112.13	194.86

hfe @ 10mA	BC817-25LT1G ON-Semiconductor Mouser Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.0	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0810	262.6	224.3	192.3	151.4	111.4	112.4	190.3
0811	262.2	221.6	188.0	149.0	109.6	110.6	188.4
0812	281.7	234.8	196.8	155.3	112.7	114.1	198.0
0813	267.2	221.6	188.2	149.2	108.4	109.8	189.7
0814	266.5	226.8	192.0	151.3	110.8	112.3	191.7
0815	273.7	231.4	195.3	154.0	112.0	113.9	196.0
0816	284.6	241.3	204.9	160.9	117.8	119.0	202.6
0817	286.2	245.4	208.6	163.4	119.9	121.3	206.0
0818	289.6	242.8	203.8	160.7	117.0	118.2	205.0
0819	291.8	244.8	206.2	163.2	119.0	120.3	208.7
0820 (Ref)	272.3	271.6	271.3	268.6	269.4	272.1	274.7
Average	276.61	233.49	197.61	155.83	113.86	115.18	197.65
s	11.474	9.635	7.692	5.716	4.169	4.163	7.523
Average+3s	311.03	262.40	220.68	172.98	126.37	127.67	220.22
Average-3s	242.19	204.59	174.53	138.68	101.35	102.69	175.08

8.4 hfe @ 100 mA

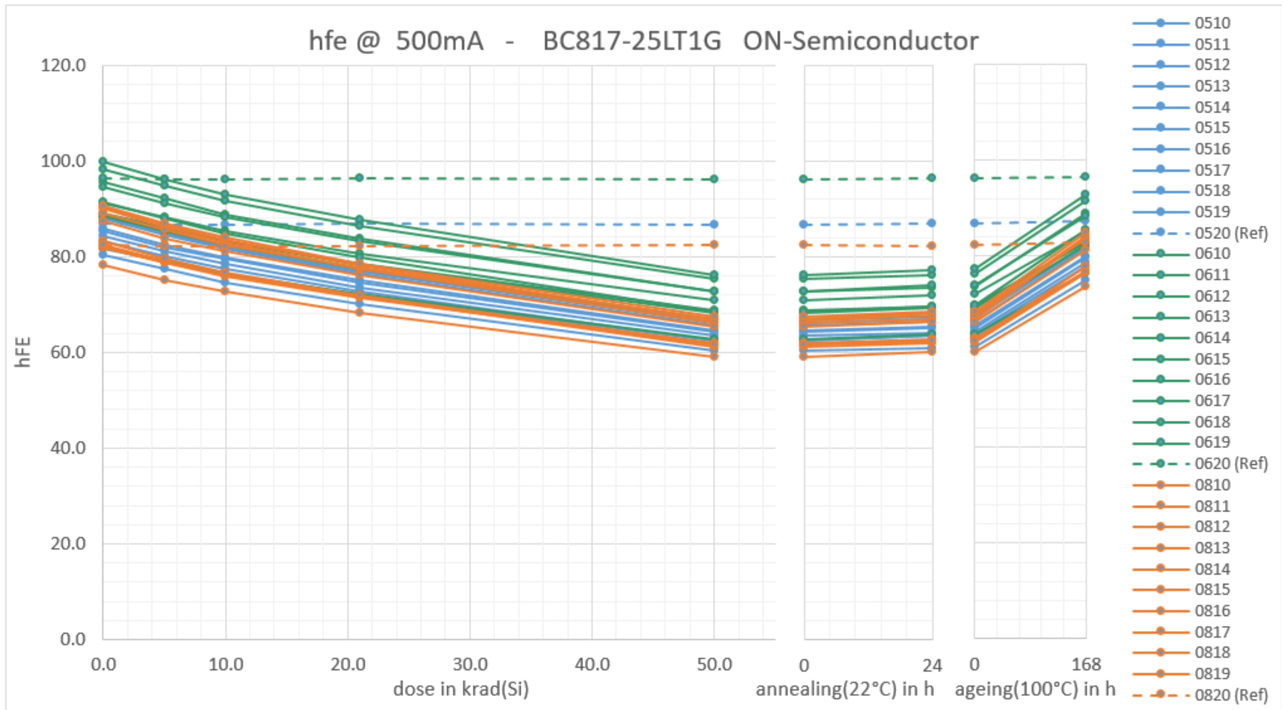


hfe @ 100mA	BC817-25LT1G ON-Semiconductor Farnell Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0510	278.6	252.0	230.4	200.3	161.1	162.9	235.6
0511	280.4	254.2	232.6	201.5	162.3	164.3	237.3
0512	289.2	262.1	239.7	207.3	166.9	168.7	243.6
0513	281.7	254.9	233.5	200.5	161.5	163.1	235.8
0514	268.2	241.1	220.6	190.8	153.8	155.0	225.6
0515	264.0	241.0	221.8	192.7	156.2	158.0	225.6
0516	254.6	230.9	211.5	183.8	148.8	150.1	216.6
0517	264.6	242.2	222.1	191.9	155.5	157.2	226.1
0518	282.0	256.3	235.6	203.3	164.6	165.9	238.4
0519	268.9	243.9	223.0	192.8	155.3	156.8	227.7
0520 (Ref)	276.7	276.1	276.9	276.4	276.2	275.2	279.6
Average	273.21	247.85	227.06	196.49	158.59	160.20	231.24
s	10.703	9.477	8.632	7.164	5.563	5.707	8.163
Average+3s	305.32	276.28	252.96	217.99	175.28	177.32	255.73
Average-3s	241.10	219.42	201.17	175.00	141.90	143.08	206.75

hfe @ 100mA	BC817-25LT3G ON-Semiconductor RS April even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0610	263.3	242.1	223.2	193.6	157.1	159.4	225.2
0611	281.7	258.3	239.5	207.7	169.0	170.9	239.3
0612	268.3	245.0	226.6	196.6	159.9	162.0	227.7
0613	264.0	241.0	221.9	191.7	155.4	157.1	223.1
0614	276.5	255.0	236.1	205.6	168.3	170.0	236.2
0615	274.9	252.0	232.7	203.3	166.2	167.6	235.0
0616	273.2	249.2	230.2	200.1	163.0	164.6	230.9
0617	262.0	238.8	219.8	191.0	155.4	156.5	223.2
0618	260.8	237.2	219.0	189.1	153.2	154.4	222.1
0619	273.3	250.3	231.1	201.6	165.1	166.8	234.7
0620 (Ref)	270.2	269.6	269.7	268.2	268.7	268.0	271.3
Average	269.81	246.90	227.99	198.03	161.25	162.92	229.73
s	7.123	7.145	7.020	6.546	5.804	5.909	6.293
Average+3s	291.18	268.33	249.05	217.67	178.67	180.65	248.61
Average-3s	248.44	225.46	206.93	178.39	143.84	145.19	210.86

hfe @ 100mA	BC817-25LT1G ON-Semiconductor Mouser Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.0	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0810	239.2	221.3	203.8	176.3	143.2	144.8	204.7
0811	238.7	220.1	202.3	174.7	141.5	142.5	203.7
0812	251.8	234.0	211.8	182.5	146.7	147.7	214.5
0813	239.6	220.9	202.4	174.7	141.2	142.2	204.7
0814	238.6	222.1	203.9	176.5	143.1	144.4	205.9
0815	247.5	228.7	209.9	180.3	145.5	146.2	212.2
0816	254.8	235.9	217.2	187.6	152.3	153.0	218.1
0817	257.5	238.6	220.8	189.7	154.4	155.5	221.7
0818	259.6	238.5	217.7	187.9	151.7	152.8	221.0
0819	262.0	241.3	220.8	190.7	153.9	155.0	224.4
0820 (Ref)	246.3	250.3	248.7	246.5	247.9	246.1	248.8
Average	248.93	230.15	211.07	182.08	147.36	148.41	213.09
s	9.405	8.458	7.669	6.439	5.248	5.190	7.972
Average+3s	277.14	255.52	234.08	201.40	163.10	163.98	237.00
Average-3s	220.71	204.78	188.06	162.77	131.61	132.84	189.17

8.5 hfe @ 500 mA

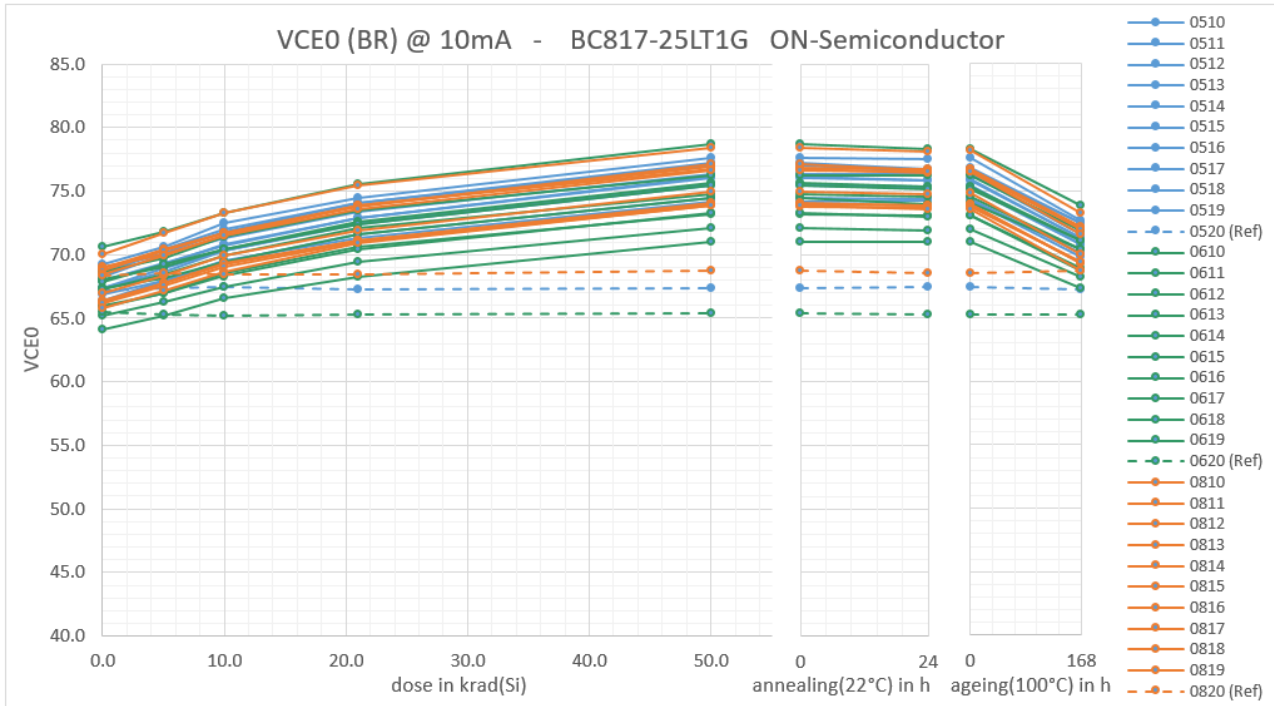


hfe @ 500mA	BC817-25LT1G ON-Semiconductor Farnell Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0510	84.2	81.2	78.4	73.6	63.4	64.1	78.7
0511	85.4	82.0	79.4	74.6	64.3	65.0	79.7
0512	88.3	84.9	82.0	76.8	66.2	67.0	82.3
0513	87.9	84.5	81.6	76.4	65.5	66.3	81.7
0514	80.4	77.3	74.7	70.2	60.3	61.0	75.0
0515	81.7	78.9	76.3	71.9	62.5	63.4	76.6
0516	83.3	80.0	77.4	72.6	62.5	63.5	77.8
0517	85.7	82.4	79.7	75.0	64.5	65.4	80.0
0518	88.2	84.9	82.0	77.0	66.7	67.4	82.2
0519	82.2	79.0	76.3	71.5	61.6	62.4	76.6
0520 (Ref)	86.8	86.7	86.7	86.8	86.7	86.9	87.4
Average	84.74	81.52	78.78	73.96	63.75	64.55	79.07
s	2.845	2.727	2.594	2.391	2.067	2.063	2.553
Average+3s	93.27	89.70	86.56	81.13	69.95	70.74	86.73
Average-3s	76.20	73.34	71.00	66.79	57.55	58.36	71.41

hfe @ 500mA	BC817-25LT3G ON-Semiconductor RS April even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0610	95.5	92.1	88.9	83.6	72.8	73.6	89.0
0611	98.1	94.9	91.6	86.4	75.4	76.2	91.6
0612	89.1	86.0	83.1	78.3	68.3	69.3	83.1
0613	88.5	85.3	82.3	77.5	67.0	68.1	82.3
0614	91.1	88.1	85.3	80.7	70.9	71.9	85.2
0615	88.8	85.9	83.2	78.6	68.7	69.6	82.8
0616	99.9	96.2	92.9	87.6	76.2	77.3	93.0
0617	82.0	79.1	76.5	72.0	62.7	63.7	76.5
0618	91.5	88.0	84.9	79.7	68.6	69.6	85.4
0619	94.5	91.1	88.2	83.1	72.8	73.9	88.5
0620 (Ref)	96.3	96.2	96.2	96.3	96.2	96.4	96.6
Average	91.89	88.68	85.69	80.74	70.33	71.32	85.73
s	5.275	5.068	4.862	4.596	4.099	4.087	4.921
Average+3s	107.72	103.88	100.28	94.53	82.63	83.58	100.50
Average-3s	76.07	73.47	71.11	66.96	58.04	59.06	70.97

hfe @ 500mA	BC817-25LT1G ON-Semiconductor Mouser Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.0	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0810	81.9	78.8	76.2	71.5	62.0	62.8	76.7
0811	82.0	78.6	75.9	71.4	61.6	62.2	76.5
0812	90.0	86.1	82.9	77.5	66.0	66.9	83.8
0813	82.3	79.0	76.2	71.5	61.2	62.0	76.7
0814	78.1	75.2	72.6	68.3	59.1	60.0	73.6
0815	83.1	79.5	76.7	71.9	61.6	62.4	77.7
0816	87.3	83.8	81.0	76.1	65.5	66.4	81.4
0817	89.0	85.5	82.3	77.6	67.0	68.1	83.6
0818	90.3	86.5	83.5	78.1	66.7	67.6	84.2
0819	90.7	87.0	84.0	78.5	67.4	68.4	84.9
0820 (Ref)	82.4	82.2	82.3	82.3	82.3	82.3	82.9
Average	85.47	82.01	79.14	74.26	63.80	64.67	79.91
s	4.484	4.227	4.044	3.691	3.026	3.093	4.076
Average+3s	98.92	94.69	91.27	85.33	72.88	73.95	92.14
Average-3s	72.02	69.33	67.01	63.18	54.72	55.40	67.69

8.6 VCEo (BR) @ 10mA

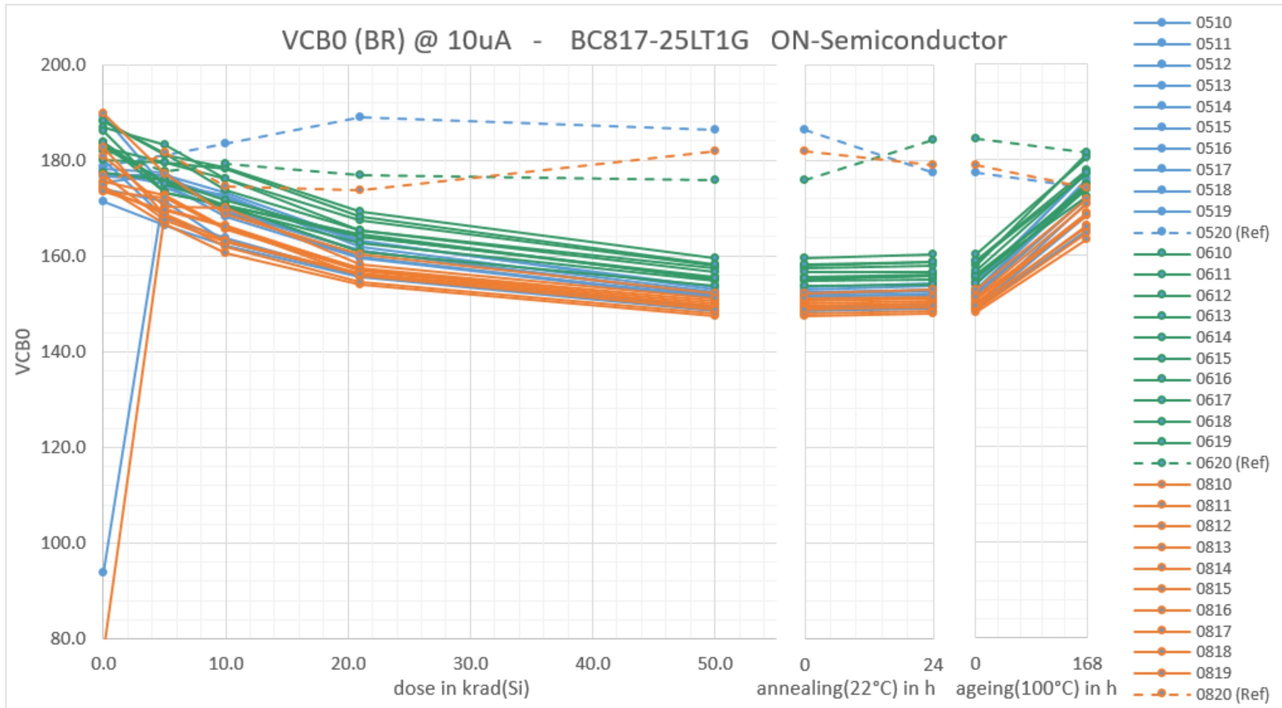


VCE0 (BR) @ 10mA BC817-25LT1G ON-Semiconductor Farnell Jan. even years							
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0510	67.9	69.4	70.7	72.9	76.1	75.8	71.2
0511	67.4	68.6	70.4	72.4	75.4	75.2	70.7
0512	66.4	67.9	69.5	71.3	74.2	74.2	69.8
0513	67.4	68.9	70.4	72.4	75.6	75.4	70.8
0514	69.2	70.6	72.5	74.5	77.6	77.5	72.7
0515	68.7	70.2	71.8	74.1	77.0	76.6	72.4
0516	68.3	70.0	71.3	73.3	76.3	76.3	71.5
0517	67.9	69.2	70.8	72.9	76.1	75.9	71.2
0518	66.9	67.9	69.4	71.6	74.4	74.3	70.0
0519	68.5	70.4	72.0	74.1	77.2	76.8	72.4
0520 (Ref)	67.1	67.3	67.4	67.3	67.3	67.5	67.3
Average	67.86	69.32	70.87	72.94	75.99	75.80	71.28
s	0.868	0.974	1.019	1.057	1.128	1.051	0.989
Average+3s	70.46	72.24	73.93	76.11	79.38	78.95	74.25
Average-3s	65.26	66.39	67.81	69.77	72.61	72.65	68.31

VCE0 (BR) @ 10mA	BC817-25LT3G ON-Semiconductor RS April even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0610	66.0	67.0	68.5	70.6	73.2	73.0	68.9
0611	65.2	66.3	67.5	69.5	72.1	71.9	68.2
0612	68.1	69.0	70.4	72.6	75.7	75.3	71.1
0613	68.6	69.7	71.4	73.4	76.3	76.2	71.9
0614	67.3	68.1	69.4	71.6	74.4	74.0	70.4
0615	67.8	69.2	70.4	72.4	75.4	75.1	71.1
0616	64.1	65.2	66.6	68.3	71.0	71.0	67.4
0617	70.6	71.8	73.2	75.5	78.7	78.3	73.8
0618	67.2	68.4	70.0	72.1	74.8	74.6	70.4
0619	65.9	67.0	68.3	70.4	73.2	73.0	68.7
0620 (Ref)	65.4	65.3	65.2	65.2	65.4	65.3	65.2
Average	67.08	68.17	69.58	71.64	74.48	74.24	70.18
s	1.872	1.900	1.963	2.072	2.209	2.149	1.921
Average+3s	72.70	73.87	75.47	77.86	81.11	80.69	75.95
Average-3s	61.47	62.47	63.69	65.42	67.85	67.79	64.42

VCE0 (BR) @ 10mA	BC817-25LT1G ON-Semiconductor Mouser Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.0	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0810	69.0	70.0	71.5	73.8	76.7	76.5	72.0
0811	68.9	70.4	71.7	73.9	76.9	76.7	72.1
0812	66.2	67.8	69.3	71.1	74.1	73.9	69.3
0813	68.7	70.3	71.7	73.8	77.1	76.7	72.0
0814	70.0	71.7	73.3	75.4	78.4	78.1	73.2
0815	68.4	69.9	71.5	73.6	76.6	76.5	71.6
0816	66.9	68.4	69.9	71.9	75.0	74.8	70.0
0817	66.4	67.8	69.3	71.1	74.0	73.9	69.3
0818	66.2	67.6	69.1	71.0	73.8	73.7	69.4
0819	65.8	67.1	68.7	70.9	73.8	73.5	68.7
0820 (Ref)	68.4	68.6	68.5	68.4	68.8	68.5	68.7
Average	67.66	69.09	70.58	72.65	75.64	75.42	70.77
s	1.519	1.545	1.531	1.641	1.673	1.634	1.576
Average+3s	72.22	73.72	75.18	77.57	80.65	80.33	75.50
Average-3s	63.10	64.45	65.99	67.73	70.62	70.52	66.05

8.7 VCBO (BR) @ 10uA



VCB0 (BR) @ 10uA BC817-25LT1G ON-Semiconductor Farnell Jan. even years							
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0510	189.2	174.4	169.8	161.2	152.0	152.7	174.1
0511	175.3	177.3	169.2	161.0	151.6	152.0	171.9
0512	177.4	175.0	168.2	159.5	151.1	151.4	172.0
0513	171.4	166.5	162.1	155.5	148.6	149.0	165.3
0514	93.9*	175.0	172.8	161.9	152.4	152.9	175.3
0515	177.0	176.8	173.3	163.1	153.0	153.8	177.6
0516	174.0	171.3	163.0	156.0	149.2	149.5	171.1
0517	176.7	176.0	172.2	162.9	153.6	154.3	177.4
0518	180.1	168.0	163.6	155.9	148.7	149.2	168.3
0519	178.1	177.4	168.9	159.8	151.5	152.1	176.0
0520 (Ref)	178.8	181.2	183.4	188.9	186.5	177.4	174.1
Average	169.31	173.75	168.31	159.67	151.18	151.69	172.88
s	26.924	3.883	4.104	2.920	1.776	1.905	3.989
Average+3s	250.08	185.40	180.63	168.43	156.50	157.40	184.84
Average-3s	88.54	162.10	156.00	150.91	145.85	145.97	160.91

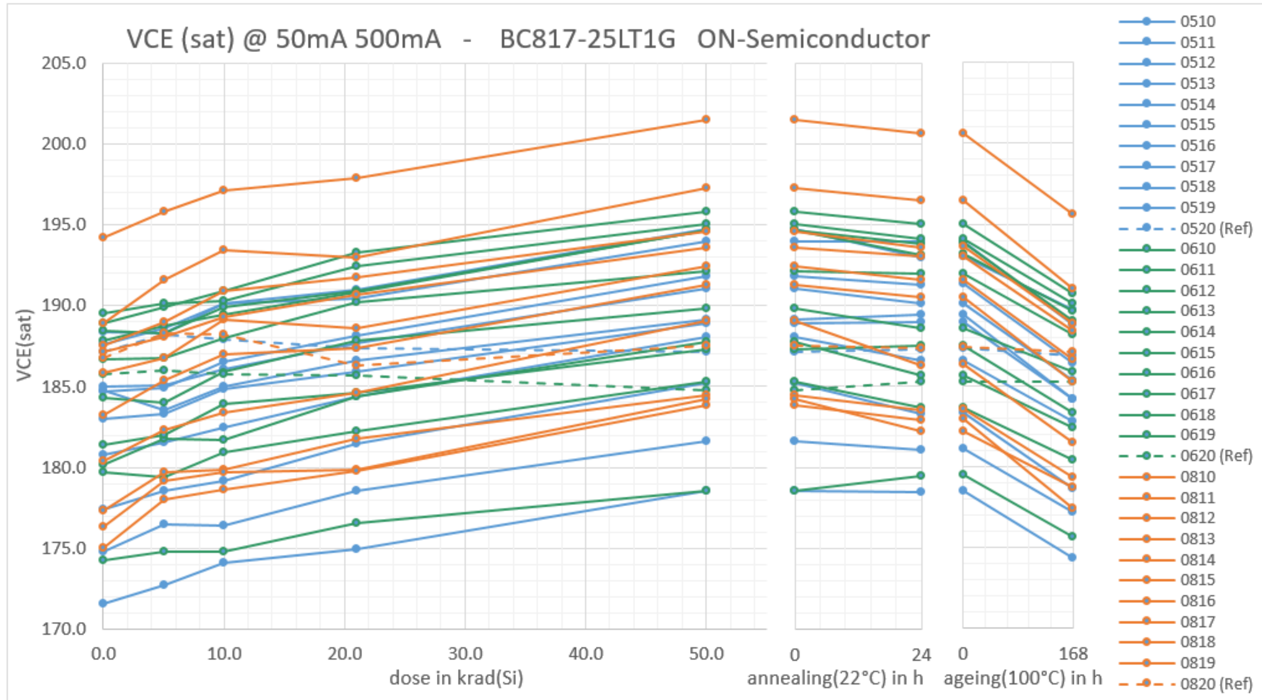
* Obviously incorrect measurement result, due to the UNIMET M3000

VCB0 (BR) @ 10uA BC817-25LT3G ON-Semiconductor RS April even years							
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0610	186.9	183.2	176.1	165.4	157.5	158.0	181.4
0611	183.7	173.1	170.7	164.6	155.2	155.9	172.3
0612	179.9	179.5	176.0	167.5	158.0	158.7	177.1
0613	182.6	179.6	178.2	168.2	158.3	158.9	177.7
0614	182.6	175.5	170.2	162.7	154.8	155.2	175.0
0615	177.3	175.9	171.5	164.0	155.5	156.1	174.0
0616	183.8	175.0	170.7	163.9	155.3	155.8	174.4
0617	188.2	181.2	178.3	169.4	159.6	160.2	180.6
0618	188.2	181.2	173.6	165.3	156.6	156.7	177.2
0619	186.1	173.3	170.5	161.0	153.7	154.1	173.9
0620 (Ref)	181.9	177.8	179.3	176.9	175.8	184.3	181.6
Average	183.94	177.75	173.58	165.19	156.46	156.94	176.37
s	3.542	3.619	3.323	2.570	1.849	1.927	2.983
Average+3s	194.56	188.61	183.55	172.90	162.00	162.72	185.32
Average-3s	173.32	166.89	163.61	157.48	150.91	151.16	167.42

VCB0 (BR) @ 10uA BC817-25LT1G ON-Semiconductor Mouser Jan. even years							
	krad(Si)					annealing	ageing
DUT	0.0	5.0	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0810	175.5	172.6	165.9	157.3	150.6	151.1	168.5
0811	77.2*	169.7	166.5	157.0	150.1	150.7	168.9
0812	174.5	166.7	160.7	154.1	147.4	148.1	163.2
0813	174.2	168.8	163.2	156.3	149.6	150.0	168.6
0814	189.8	177.2	168.8	160.2	152.2	153.0	171.9
0815	173.5	172.1	165.5	156.8	149.6	150.0	168.7
0816	180.8	170.4	169.9	158.3	151.1	151.3	170.8
0817	182.6	168.4	162.0	154.6	148.1	148.5	164.6
0818	173.4	169.6	166.1	155.9	148.9	149.3	166.2
0819	176.8	167.5	163.0	156.1	148.8	149.4	165.9
0820 (Ref)	174.8	181.5	174.4	173.8	181.8	178.9	174.0
Average	167.82	170.29	165.17	156.66	149.64	150.14	167.72
s	32.276	3.029	2.945	1.751	1.440	1.442	2.707
Average+3s	264.65	179.38	174.00	161.91	153.96	154.46	175.84
Average-3s	70.99	161.21	156.33	151.41	145.32	145.81	159.59

* Obviously incorrect measurement result, due to the UNIMET M3000

8.8 VCE (sat) @ 50mA 500mA



VCE (sat) @ 50mA 500mA	BC817-25LT1G ON-Semiconductor Farnell Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0510	184.8	183.5	185.0	186.6	189.2	189.4	184.2
0511	185.0	185.1	186.1	187.7	191.1	190.1	185.4
0512	183.0	183.3	184.9	185.9	188.9	189.0	184.2
0513	171.6	172.7	174.1	175.0	178.5	178.5	174.4
0514	184.7	185.0	186.6	188.1	191.8	191.3	186.4
0515	188.4	188.3	190.1	190.4	194.0	193.9	188.8
0516	180.8	181.6	182.5	184.4	188.0	186.6	182.8
0517	174.8	176.5	176.4	178.6	181.6	181.1	177.2
0518	187.6	188.6	190.1	191.0	194.7	193.0	189.7
0519	177.4	178.6	179.2	181.5	185.3	183.3	178.7
0520 (Ref)	187.2	188.2	187.9	187.4	187.1	187.3	186.9
Average	181.80	182.31	183.48	184.92	188.30	187.63	183.17
s	5.576	5.090	5.444	5.167	5.199	5.150	4.982
Average+3s	198.53	197.58	199.82	200.42	203.90	203.08	198.12
Average-3s	165.07	167.04	167.15	169.41	172.71	172.18	168.23

VCE (sat) @ 50mA 500mA	BC817-25LT3G ON-Semiconductor RS April even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.1	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0610	174.3	174.8	174.8	176.5	178.6	179.5	175.7
0611	184.3	184.0	185.9	187.8	189.8	188.6	185.9
0612	186.7	186.7	188.0	190.2	192.1	192.0	188.2
0613	180.2	181.8	181.7	184.3	187.8	185.7	182.4
0614	181.4	182.0	183.9	184.6	187.3	187.5	183.3
0615	188.4	188.3	189.9	190.9	194.7	193.1	189.6
0616	179.7	179.4	180.9	182.2	185.3	183.7	180.4
0617	188.9	189.9	190.9	193.3	195.8	195.0	190.7
0618	187.8	188.7	189.4	190.9	194.7	193.8	189.1
0619	189.5	190.1	190.3	192.4	195.0	194.1	190.1
0620 (Ref)	185.8	186.0	185.7	185.7	184.8	185.3	185.3
Average	184.12	184.57	185.56	187.32	190.11	189.30	185.54
s	5.048	5.088	5.225	5.312	5.506	5.200	4.965
Average+3s	199.26	199.83	201.23	203.25	206.63	204.90	200.43
Average-3s	168.97	169.31	169.88	171.38	173.59	173.70	170.64

VCE (sat) @ 50mA 500mA	BC817-25LT1G ON-Semiconductor Mouser Jan. even years						
	krad(Si)					annealing	ageing
DUT	0.0	5.0	10.0	21.0	50.0	(22°C, 24h)	(100°C, 168h)
0810	194.2	195.8	197.1	197.8	201.4	200.6	195.6
0811	187.5	189.0	190.9	191.7	194.6	193.6	188.9
0812	177.3	179.7	179.9	181.8	184.5	183.5	179.4
0813	183.2	185.4	187.0	187.4	191.3	190.5	185.3
0814	188.9	191.6	193.4	193.0	197.3	196.5	191.0
0815	180.4	182.3	183.4	184.6	189.0	186.3	181.5
0816	176.3	179.1	179.7	179.9	184.3	182.2	178.7
0817	185.8	186.8	189.1	188.6	192.4	191.6	186.7
0818	175.0	178.0	178.6	179.8	183.8	182.9	177.4
0819	187.2	188.1	189.3	190.7	193.6	193.0	188.4
0820 (Ref)	186.8	188.3	188.2	186.3	187.5	187.4	187.1
Average	183.59	185.57	186.84	187.52	191.22	190.08	185.29
s	6.248	5.815	6.289	6.012	5.898	6.195	5.944
Average+3s	202.33	203.01	205.70	205.55	208.91	208.67	203.12
Average-3s	164.84	168.13	167.97	169.48	173.52	171.50	167.45

9 CONCLUSION

The test results of the BC817-25 from ON-Semi indicate very similar behaviour for all the 3 different tested date codes, especially if you put the different initial gain value into consideration.

The gain of the transistors decreases continuously with increasing dose. This effect is particularly stronger at the lower collector currents. Whether the transistor can still be used at the maximum tested dose must be carefully considered for the respective application.

A change in the breakdown voltage between the Collector-Emitter and Collector-Base can be determined at the measured operating points, but it is still within the tolerances specified in the data sheet.

The CE saturation voltage increases slightly over the radiation dose but still stays inside the specification.

10 APPENDIX - EXTRACT FROM THE DATA SHEET

BC817-16L, SBC817-16L, BC817-25L, SBC817-25L, BC817-40L, SBC817-40L

General Purpose Transistors

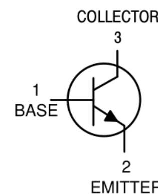
NPN Silicon

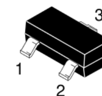
ON Semiconductor®

http://onsemi.com

Features

- S and NSV Prefixes for Automotive and Other Applications Requiring Unique Site and Control Change Requirements; AEC−Q101 Qualified and PPAP Capable
- These Devices are Pb−Free, Halogen Free/BFR Free and are RoHS Compliant





SOT−23
CASE 318
STYLE 6

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Collector − Emitter Voltage	V_{CEO}	45	V
Collector − Base Voltage	V_{CBO}	50	V
Emitter − Base Voltage	V_{EBO}	5.0	V
Collector Current − Continuous	I_C	500	mAdc

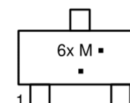
THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Total Device Dissipation FR−5 Board, (Note 1) T_A = 25°C Derate above 25°C	P_D	225 1.8	mW mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	556	°C/W
Total Device Dissipation Alumina Substrate, (Note 2) T_A = 25°C Derate above 25°C	P_D	300 2.4	mW mW/°C
Thermal Resistance, Junction−to−Ambient	$R_{\theta JA}$	417	°C/W
Junction and Storage Temperature	T_J, T_{stg}	−65 to +150	°C

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. FR−5 = 1.0 x 0.75 x 0.062 in.
2. Alumina = 0.4 x 0.3 x 0.024 in 99.5% alumina.

MARKING DIAGRAM



6x = Device Code
x = A, B, or C
M = Date Code*
▪ = Pb−Free Package

(Note: Microdot may be in either location)

*Date Code orientation and/or overbar may vary depending upon manufacturing location.

ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

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July, 2014 − Rev. 14 1 Publication Order Number: **BC817−16LT1/D**

BC817−16L, SBC817−16L, BC817−25L, SBC817−25L, BC817−40L, SBC817−40L

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Collector−Emitter Breakdown Voltage (I_C = 10 mA)	$V_{(BR)CEO}$	45	–	–	V
Collector−Emitter Breakdown Voltage (V_{EB} = 0, I_C = 10 μA)	$V_{(BR)CES}$	50	–	–	V
Emitter−Base Breakdown Voltage (I_E = 1.0 μA)	$V_{(BR)EBO}$	5.0	–	–	V
Collector Cutoff Current (V_{CB} = 20 V) (V_{CB} = 20 V, T_A = 150°C)	I_{CBO}	 – –	 – –	 100 5.0	 nA μA
ON CHARACTERISTICS					
DC Current Gain (I_C = 100 mA, V_{CE} = 1.0 V) BC817−16, SBC817−16 BC817−25, SBC817−25 BC817−40, SBC817−40 (I_C = 500 mA, V_{CE} = 1.0 V)	h_{FE}	 100 160 250 40	 – – – –	 250 400 600 –	–
Collector−Emitter Saturation Voltage (I_C = 500 mA, I_B = 50 mA)	$V_{CE(sat)}$	–	–	0.7	V
Base−Emitter On Voltage (I_C = 500 mA, V_{CE} = 1.0 V)	$V_{BE(on)}$	–	–	1.2	V
SMALL−SIGNAL CHARACTERISTICS					
Current−Gain − Bandwidth Product (I_C = 10 mA, V_{CE} = 5.0 Vdc, f = 100 MHz)	f_T	100	–	–	MHz
Output Capacitance (V_{CB} = 10 V, f = 1.0 MHz)	C_{obo}	–	10	–	pF

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

ORDERING INFORMATION

Device	Specific Marking	Package	Shipping†
BC817−16LT1G	6A	SOT−23 (Pb−Free)	3000 / Tape & Reel
NSVBC817−16LT1G			
BC817−16LT3G			10,000 / Tape & Reel
SBC817−16LT3			
BC817−25LT1G	6B	SOT−23 (Pb−Free)	3000 / Tape & Reel
SBC817−25LT1G			
BC817−25LT3G			10,000 / Tape & Reel
SBC817−25LT3G			
BC817−40LT1G	6C	SOT−23 (Pb−Free)	3000 / Tape & Reel
SBC817−40LT1G			
BC817−40LT3G			10,000 / Tape & Reel
SBC817−40LT3G			

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.