

ENGINEERING PRACTICES STUDY

TITLE: ENGINEERING PRACTICE STUDY TO REVIEW THE BURN-IN, LIFE TEST,
AND SOA SPECIFICATION SHEET FORMAT OF POWER TRANSISTORS

24 June 2019

STUDY PROJECT (SEE ATTACHMENT 1)

FINAL REPORT

Study Conducted by DLA LAND AND MARITIME

Project Number: 5961-2018-114

Prepared by:

Jason Hochstetler

I. **OBJECTIVES:** An engineering practice study was conducted to review MIL-PRF-19500 power transistor specification sheets. The purpose of this study was to review the existing variations in the burn-in, life test, and safe operating area (SOA) requirements across these power transistor specifications and standardize each section as needed.

II. **BACKGROUND:** Recent comments received by DLA requested clarification of a sample size requirement for an SOA test that is specified in Group B. After review, it was found that the Group B SOA test was only listed in this location on three specification sheets and none of those Group B listings included the sample size. The typical location for the SOA test is located in Group A subgroup 5, however there are variations in the specified conditions and methods for these power transistors.

During the SOA review of all of the power transistor specification sheets, it was also determined that variation also existed in the burn-in and life test requirements. Multiple test methods, and conditions are used. Some examples of the differences are listed below:

- Temperature (T_j vs T_a), (Fixed temp vs delta temp).
- Some specification sheets include specific testing options for solder die attach and eutectic die attach.
- Some specification sheets state "No heat sink or forced-air cooling on device shall be permitted".

To streamline the MIL-PRF-19500 power transistor specification sheets flow, DLA Land and Maritime VAC requests that the burn-in, life test, and SOA requirements be reviewed and provide feedback to DLA to either confirm this format variation is needed, or to determine if a more standardized format should be used.

See **Attachment 1** for a comparison of the burn-in, life test, and SOA requirements of the power transistor specification sheets. The format at the time of the study is represented in black.

III. **RESULTS:** The initial comments submitted to DLA Land and Maritime have been reviewed and indicate that the recommendations DLA received should be used as the basis for the future effort to standardize the applicable specification sheets. **Attachment 1** incorporates those proposed recommendations in red.

Below is a summary of the initial comments received:

- For screening burn-in it was suggested to specify a range for the collector to base voltage in lieu of a single voltage.
- For Group B case or stud mount device, list both a solder and eutectic test option. (Currently this option is only listed for some of the specification sheets.)
- For Group B TO-5/39, no change, keep the tests listed in the small die flow 1026, 1048, and 1032
- For Group C, propose same as suggested for group B (solder and eutectic option) and then test 1026 for TO-5/39 devices.
- For Group E, propose test 1048 for all devices.
- For SOA, the 3053 test be consolidated/added to the group A subgroup 5 location for at least an unclamped condition C test.

IV. **CONCLUSIONS:** Based on feedback DLA received from the initial comments in Attachment 1, DLA will initiate an additional coordination to review the items listed below that were submitted in the final comments:

- Verify the proposed burn-in temperature of 162.5 °C for devices with a maximum rating of 200 °C, and additionally what an appropriate T_j is achieved during the test for the methods that require it.
- Verify the correct conditions are specified for the voltage ranges (VCB or VCE).
- Review 1037 conditions, will need to specify power or current.
- Review A5 3053 conditions:
 - 1) Per 3053 (Condition C), what are the values for I_C , V_{CC} , & inductor characteristics (L , Q , R_{dc} , F_r)?
 - 2) Since only Condition C is being proposed for Group A5, Should condition B also be considered for A5? For the slash sheets that currently have Condition B in B7, should it stay or be removed?

V. **RECOMMENDATIONS:** DLA Land and Maritime proposes that further evaluation be coordinated by DLA with the manufacturers, military, and industry to review the comments DLA received and the results added to this final report once the comments are resolved. In addition, it is recommended that the power transistor specification sheets listed in this study be updated based on the final results of the coordination.

Modification	Part	Cust	Is	Power	Vcb	Vst	Hfe	Ust	Screening (Current)	Screening (Updated)	GRP B, Tx (Current)	GRP B, Tx (Updated)	GRP C (Current)	GRP C (Updated)	GRP E (Current)	GRP E (Updated)	3053 location (Current)	3053 location (Updated)	
MIL-PRF-19500/311	2N2880	TO-111	5	30	110	80	40/120	0.25	a. Tj = +187.5 ±12.5 °C. b. TA ≤ +100 °C. c. VCE = +25 ±5 V dc.	Tj = +162.5 °C ±12.5 °C; TA = ambient; VCB = 10 - 40 V dc.	1027 Tj = 187.5 ±12.5 °C; TA ≤ 35 °C; VCE = 25 ±5 V dc.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 Tj = 187.5 ±12.5 °C; TA ≤ 35 °C; VCE = 25 ±5 V dc.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 1,000 hours minimum; TA = 150 °C; VCB = 80 percent of rated.	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	None	A5, unclamped condition C	
MIL-PRF-19500/344 MIL-PRF-19500/369	2N3749	TO-59	5	30	110	80	40/120	0.25				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 Tj = +187.5 °C ±12.5 °C; TA = +25 °C ±5 °C; VCB ≥ 24 V dc.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	B7 condition B and C	A5, unclamped condition C	
MIL-PRF-19500/370	2N3442	TO-3	10	117	160	140	20/70	1	Tj = +187.5 °C ±12.5 °C; VCB = 10 to 30 V dc; TA + 35 °C	Tj = +162.5 °C ±12.5 °C; TA = ambient; VCB = 10 - 40 V dc	1037 For solder die attach: 2,000 cycles; VCB = 10 - 30 V dc; TA ≤ +35 °C. 1026 For eutectic die attach: VCB = 10 to 30 V dc; TA ≤ +35 °C, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 10 to 30 V dc; TA ≤ +35 °C, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 80 percent of rated voltage; T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	None	A5, unclamped condition C	
MIL-PRF-19500/371	2N5157	TO-3	3.5	125	700	500	30/90	0.8	TA = ambient; VCB = 10-30 V dc; Tj = +175 °C minimum	Tj = +162.5 °C ±12.5 °C; TA = ambient; VCB = 10 - 40 V dc	1037 VCB = 10-30 V dc; ton = toff = 3 minutes; 2,000 cycles	1037 VCB = 10-30 V dc; ton = toff = 3 minutes; 2,000 cycles	1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 80 percent of rated; T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	A5, Unclamped cond C, and clamped	A5, unclamped condition C	
MIL-PRF-19500/372	2N3902	TO-3	3.5	125	700	400	30/90	0.8											
MIL-PRF-19500/372	2N5171	TO-254	3.5	175	700	500	30/90	0.8											
MIL-PRF-19500/372	2N5173	TO-257	3.5	125	700	500	30/90	0.8											
MIL-PRF-19500/372	2N39021	TO-254	3.5	175	700	400	30/90	0.8											
MIL-PRF-19500/372	2N390219	TO-257	3.5	125	700	400	30/90	0.8											
MIL-PRF-19500/372	2N3996	STUD	5	30	100	80	40/120	2	VCE = ±5 V dc, ±5 V dc; PT = 187.5 °C; TA = 35 °C; max	Tj = +162.5 °C ±12.5 °C; TA = ambient; VCB = 10 - 40 V dc	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1027 For eutectic die attach: TA = +35 °C max; PT adjusted to achieve Tj = +175 °C min, VCB ≥ 10 V dc.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	A5 clamped, and B7 Unclamped cond C	A5, unclamped condition C	
MIL-PRF-19500/374	2N3998	STUD	5	30	100	80	40/120	2				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min, VCE = 10 V dc.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours		
MIL-PRF-19500/374	2N3997	STUD	5	30	100	80	80/240	2				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min, VCE = 10 V dc.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours		
MIL-PRF-19500/374	2N3999	STUD	5	30	100	80	80/240	2				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min, VCE = 10 V dc.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours		
MIL-PRF-19500/384	2N3584	TO-66	2	35	375	250	25/100	0.75	PT = ±2.5 W; VCB = 150 V dc; TA = +25 °C minimum. NOTE: No heat sink or forced air cooling on the devices shall be permitted.	Tj = +162.5 °C ±12.5 °C; TA = ambient; VCB = 10 - 40 V dc	1037 ATj = +100 °C, test condition D. The heating cycle shall be 1 minute minimum	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 ATj = +100 °C, test condition D. The heating cycle shall be 1 minute minimum	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 30 V dc; T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	None	A5, unclamped condition C	
MIL-PRF-19500/384 MIL-PRF-19500/402	2N3739	TO-66	2	35	300	300	25/100	0.75				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1039 Condition A, 1,000 hrs.	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	A5, Unclamped cond C, and clamped but no condition	A5, unclamped condition C
MIL-PRF-19500/407	2N3055	TO-3	15	117	100	70	20/60	0.75	Tj = +187.5 °C ±12.5 °C; VCB = 10 to 30 V dc. NOTE: No heat sink or forced air cooling on the devices shall be permitted	Tj = +162.5 °C ±12.5 °C; TA = ambient; VCB = 10 - 40 V dc	1027 Tj = +187.5 °C ±12.5 °C; VCB = 10 to 30 V dc.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 VCB = 10 to 30 V dc; Tj = +187.5 °C ±12.5 °C.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	A6 Unclamped cond C, and A7 clamped but no condition.	A5, unclamped condition C	
MIL-PRF-19500/408	2N3715	TO-3	10	117	80	60	30/120	1	Tj = +187.5 ±12.5 °C; VCE = 25 ±5 V dc; TA = room ambient	Tj = +162.5 °C ±12.5 °C; TA = ambient; VCB = 10 - 40 V dc	1037 VCB = 10 V dc; ATj between cycles ≥ 100 °C; ton = toff ≥ 1 minute for 2,000 cycles. No heat sink or forced air cooling on the device shall be permitted.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 VCB = 10 V dc; ATj between cycles ≥ 100 °C; ton = toff ≥ 1 minute for 6,000 cycles. No heat sink or forced air cooling on the device shall be permitted	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 Test temperature = +125 °C; VCB = 80 percent of rated voltage; T = 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	A5 clamped	A5, unclamped condition C	
MIL-PRF-19500/408 MIL-PRF-19500/412	2N3716	TO-3	10	117	100	80	30/120	1				1037 For solder die attach: 2,000 cycles; VCB = 10 - 30 V dc; power shall be applied to the device to achieve a junction temperature, Tj = +175 °C minimum	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 20 V dc; adjust PT or TA to achieve Tj = 175 °C min, TA ≤ +15 °C.	1026 For eutectic die attach: VCB = 20 V dc; adjust PT or TA to achieve Tj = +175 °C min, TA ≤ +15 °C.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1039 or 1048 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	None	A5, unclamped condition C
MIL-PRF-19500/412	2N3846	TO-63	20	150	300	200	12/60	0.75	VCB = 10 - 30 V dc, power shall be applied to the device to achieve a junction temperature, Tj = +175 °C minimum	Tj = +162.5 °C ±12.5 °C; TA = ambient; VCB = 10 - 40 V dc	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 20 V dc; adjust PT or TA to achieve Tj = 175 °C min, TA ≤ +15 °C.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 20 V dc; adjust PT or TA to achieve Tj = +175 °C min, TA ≤ +15 °C.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1039 or 1048 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours			
MIL-PRF-19500/412	2N3847	TO-63	20	150	400	300	12/60	0.75				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1039 or 1048 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours		
MIL-PRF-19500/412	2N3846T1	TO-254	20	150	300	200	12/60	0.75				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1039 or 1048 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours		
MIL-PRF-19500/412	2N3846T3	TO-257	20	125	400	200	12/60	0.75				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1039 or 1048 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours		
MIL-PRF-19500/412	2N3847T1	TO-254	20	150	400	300	12/60	0.75				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1039 or 1048 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours		
MIL-PRF-19500/412	2N3847T3	TO-257	20	125	400	300	12/60	0.75				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C min.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1039 or 1048 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours		
MIL-PRF-19500/413	2N3771	TO-3	30	150	50	40	15/60	1.5	1037 For solder die attach: 2,000 cycles; VCB ≥ 10 V dc; TA ≤ +35 °C. B3 1026 For eutectic die attach: TA ≤ +35 °C; VCB ≥ 10 V dc; adjust PT to achieve Tj = +175 °C minimum.	Tj = +162.5 °C ±12.5 °C; TA = ambient; VCB = 10 - 40 V dc	1037 For solder die attach: 2,000 cycles; VCB ≥ 10 V dc; TA ≤ +35 °C. 1048 HTBB: Test condition A, 48 hours minimum	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1048 1,000 hours minimum; TA = +150 °C; VCB = 80 percent of rated	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	A5 clamped cond B A6 unclamped cond C, and clamped	A5, unclamped condition C	
MIL-PRF-19500/441 MIL-PRF-19500/430	2N3772	TO-3	20	150	100	60	15/60	1.2				1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175 °C minimum.	1039 Condition A, 1,000 hours	1048 Test temperature = +125 °C; VCB = 80 percent of rated, T = 1,000 hours	B7 cond C, A	

MIL-PRF-19500/244	2N5154	TO-39	2	10	100	80	70/200	1.5	VCB = 10 - 30 V dc. Power shall be applied to the device to achieve Tj = +175°C minimum using a minimum PD = 75 percent of PT maximum, TA ambient rated	VCB = 10 - 40 V dc. Power shall be applied to achieve Tj = +135°C minimum using a minimum PD = 75 percent of PT maximum, TA = ambient rated	1 1026 Steady-state life: 1,000 hours minimum, VCB = 10 V dc, power shall be applied to achieve Tj = +150°C minimum using a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life, TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum. n = 45 devices, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C. n = 22, c = 0.	1 1026 Steady-state life: 1,000 hours minimum, VCB = 10-40V dc, power shall be applied to achieve Tj = +150°C minimum using a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life, TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum. n = 45 devices, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C. n = 22, c = 0.	1026 1,000 hours, VCB = 10 V dc, power and ambient temperature shall be applied to the device to achieve Tj = +150°C minimum, and minimum power dissipation of 75 percent of max rated PT (see 1.3 herein); n = 45, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours.	1026 JANS Only, 1,000 hours at VCB = 10 - 40 V dc; power shall be applied to achieve Tj = +150°C minimum and a minimum of PD = 75 percent of maximum rated PT as defined in 1.3 n = 45, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours.	1037 VCB = 10 V dc, 6,000 cycles	1048 Test temperature = +125°C, VCB = 80 percent of rated, T = 1,000 hours	A5, SOA uncamped no condition	A5, uncamped condition C	
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152L	TO-5	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152	TO-39	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154L	TO-5	2	10	100	80	70/200	1.5											
MIL-PRF-19500/244	2N5152UB	UB	2	10	100	80	50/90	1.5											
MIL-PRF-19500/244	2N5154UB	UB	2	10	100	80	70/20												

Part	Case	Power	Vce	Vbe	Is	Vcb	Usst	Screening (Current)	Screening (Updated)	GPB B_TY (Current)	GPB B_TY (Updated)	GPB C (Current)	GPB C (Updated)	GPB E (Current)	GPB E (Updated)	8053 location (Current)	8053 location (Updated)
ML-PHF-19500/379	2N63791	TO-3	85.7	60	30/120	10	60	1	Tj = +187.5°C ±12.5°C; VCB = +35 V dc; TA = room ambient	Tj = +162.5°C ±12.5°C; TA = ambient; VCB = 10 - 40 V dc	1037 Tj = +187.5°C ±12.5°C; VCB = -35 V dc ±5 V dc; TA = +100°C	1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1026 Tj = +187.5°C ±12.5°C; VCB = -35 V dc; TA = +100°C	1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1048 +125°C; VCB = 80 percent rated (see 1.3); 1,000 hours	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, Clamped cond C
ML-PHF-19500/432	2N4399	TO-3	115	60	15/60	30	60	0.75	Tj = +187.5 ± 12.5°C; VCE = -30 V dc; ±10 V dc; TA = room ambient	Tj = +162.5°C ±12.5°C; TA = ambient; VCB = 10 - 40 V dc	1037 VCB = -20 V dc; adjust device current or power between cycles to achieve a minimum ΔTj of +100°C; ton = toff = 3 minutes minimum No heat sink or forced air cooling on the devices shall be permitted	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1037 VCB = -20 V dc; Adjust device current or power between cycles to achieve a minimum ΔTj of +100°C; ton = toff = 3 minutes minimum. No heat sink or forced air cooling on device shall be permitted	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1048 Test temperature = +125°C; T = 1,000 hrs, VCB = 80 percent rated voltage (see 1.3).	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, unclamped cond C
ML-PHF-19500/441	2N63740	TO-66	25	60	30/100	4	60	0.6	VCB = -10 to -30 V dc. Power shall be applied to the device to achieve a junction temperature, Tj = +175°C minimum and a minimum PD = 75 percent of PT maximum rated as defined in 1.3.	Tj = +162.5°C ±12.5°C; TA = ambient; VCB = 10 - 40 V dc	1 1037 6,000 cycles, tON = tOFF = 3 minutes, PD(ON) = PD max rated per 1.3; PD(OFF) = 0, n = 45, c = 0. 2 1048 Blocking life: TA = +150°C, VCB = 80 percent of rated voltage, 48 hours min. n = 45, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C, n = 22, c = 0.	1 1026 Steady-state life: 1,000 hours minimum, VCB = 10-40V dc; power shall be applied to achieve Tj = +150°C minimum using a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life: TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum n = 45 devices, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C, n = 22, c = 0.	1037 6,000 cycles, tON = tOFF = 3 minutes, PD(ON) = PD max rated in accordance with 1.3; PD(OFF) = 0.	1026 JANS Only, 1,000 hours at VCB = 10 - 40 V dc; power shall be applied to achieve Tj = +150°C minimum and a minimum of PD = 75 percent of maximum rated PT as defined in 1.3 n = 45, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours.	1048 TA = +150°C, VCB = 80 percent of rated voltage, T = 1,000 hours.	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, Unclamped cond C, Clamped cond B
ML-PHF-19500/461	2N6211	TO-66	35	225	30/175	2	275	1.4	1039 OF MIL-STD-750, MIL condition B. TA = room ambient as defined in the general requirements n=4.5 of MIL-STD-750; VCB ≥ -20 V dc. PT = 3.0 W. NOTE: No heat sink or forced air cooling on the devices shall be permitted.	Tj = +162.5°C ±12.5°C; TA = ambient; VCB = 10 - 40 V dc	1037 VCB ≥ -10 V dc, forced air cooling on the devices shall be permitted only during the toff time.	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1037 VCB ≥ -10 V dc; forced air cooling on the devices shall be permitted only during the toff time.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1037 Intermittent operation life: VCB = -10 V dc, 6,000 cycles	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, Unclamped cond C, Clamped cond B
ML-PHF-19500/466	2N5683	TO-3	300	60	15/60	50	60	1	Adjust PT to achieve Tj = +187.5°C ±12.5°C, VCB ≥ -10 V dc.	Tj = +162.5°C ±12.5°C; TA = ambient; VCB = 10 - 40 V dc	1037 For solder die attach: VCB ≥ -10 V dc. No heat sink shall be permitted. 1026 For eutectic die attach: adjust PT to achieve Tj = +175°C minimum. VCB ≥ -10 V dc, TA = +35°C	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1026 For eutectic die attach: adjust PT to achieve +175°C minimum. VCB = -10 V dc; TA = +35°C. 1037 For solder die attach: VCB ≥ -10 V dc. No heat sink shall be permitted. TA ≤ +35°C.	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1048 Test temperature = +125°C; VCB = 80 percent of rated; T = 1,000 hours.	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, Unclamped cond C, Clamped cond B
ML-PHF-19500/508	2N6437	TO-3	200	100	30/120	25	120	1	Tj = +187.5°C ±12.5°C; VCB ≥ 20 V dc; TA ≤ +35°C. NOTE: No heat sink or forced air cooling on the devices shall be permitted	Tj = +162.5°C ±12.5°C; TA = ambient; VCB = 10 - 40 V dc	1037 For solder die attach: VCB ≥ 20 V dc; 2,000 cycles; TA ≤ +35°C. 1027 For eutectic die attach: TA ≤ +35°C, VCB ≥ 20 V dc adjust PT to achieve Tj = +175°C minimum	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1037 For solder die attach: VCB ≥ 20 V dc; 2,000 cycles; TA ≤ +35°C. 1027 For eutectic die attach: TA ≤ +35°C, VCB ≥ 20 V dc adjust PT to achieve Tj = +175°C minimum	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1048 Test temperature = +125°C; VCB = 80 percent of rated; T = 1,000 hours.	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, Unclamped cond C, Clamped cond B
ML-PHF-19500/514	2N6378	TO-3	250	100	30/120	50	120	1	Tj = +187.5 °C, ± 12.5 °C; VCB ≥ -20 V dc; TA ≤ +35°C. Tj measurement shall be in accordance with method 3100 of MIL-STD-750	Tj = +162.5°C ±12.5°C; TA = ambient; VCB = 10 - 40 V dc	1037 For solder die attach: VCB ≥ -20 V dc 1027 For eutectic die attach: VCB ≥ -20 V dc adjust PT to achieve Tj = +175°C minimum	1037 For solder die attach: 2,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 - 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1037 For solder die attach: VCB ≥ -20 V dc 1026 For eutectic die attach: VCB ≥ -20 V dc adjust PT to achieve Tj = +175°C minimum	1037 For solder die attach: 6,000 cycles; VCB = 10 - 40 V dc; TA = room ambient. 1026 For eutectic die attach: VCB = 10 to 40 V dc; TA = room ambient, adjust PT to achieve Tj = +175°C minimum.	1048 Test temperature = +125°C; VCB = 80 percent of rated; T = 1,000 hours.	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, Unclamped cond C, Clamped cond B
ML-PHF-19500/533	2N5003	TO-59	58	80	30/90	5	100	1.5	VCB = -10 - 30 V dc. Power shall be applied to achieve Tj = +135°C minimum using a minimum PD = 75 percent of PT maximum. TA ambient rated as defined in 1.3. NOTE: No heat sink or forced air cooling on the device shall be permitted. With approval of the qualifying activity and preparing activity, alternate burn-in criteria (hours, bias conditions, Tj, and mounting conditions) may be used for JANTX and JANTXV quality levels. A justification demonstrating equivalence is required. In addition, the manufacturing site's burn-in data and performance history will be essential criteria for burn-in modification approval.	Tj = +162.5°C ±12.5°C; TA = ambient; VCB = 10 - 40 V dc	1 1026 Steady-state life: Test condition B, 1,000 hours minimum, VCB = -10 V dc; power shall be applied to achieve Tj = +150°C minimum using a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life: TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum n = 45 devices, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C, n = 22, c = 0.	1 1026 Steady-state life: 1,000 hours minimum, VCB = 10-40V dc; power shall be applied to achieve Tj = +150°C minimum using a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life: TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum n = 45 devices, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C, n = 22, c = 0.	1026 1,000 hours at VCB = -10 V dc; power shall be applied to achieve Tj = +150°C minimum and a minimum of PD = 75 percent of maximum rated PT as defined in 1.3 n = 45, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours.	1026 JANS Only, 1,000 hours at VCB = 10 - 40 V dc; power shall be applied to achieve Tj = +150°C minimum and a minimum of PD = 75 percent of maximum rated PT as defined in 1.3 n = 45, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours.	1037 Intermittent operation life: VCB = -10 V dc, 6,000 cycles. Adjust device current, or power, to achieve a minimum ΔTj of +100°C.	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, unclamped cond C
ML-PHF-19500/545	2N5151UB	U3	100	80	30/90	2	100	1.5	VCB = -10 - 30 V dc. TA = room ambient as defined in the general requirements of 4.5 of MIL-STD-750. Power shall be applied to the device to achieve a junction temperature, Tj = +175°C minimum and a minimum PD = 75 percent of PT maximum rated as defined in 1.3 herein.	VCB = 10 - 40 V dc. Power shall be applied to achieve Tj = +135°C minimum using a minimum PD = 75 percent of PT maximum, TA = ambient rated	1 1026 Steady-state life: 1,000 hours minimum, VCB = -10 V dc; power shall be applied to achieve Tj = +150°C minimum using a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life: TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum n = 45 devices, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C, n = 22, c = 0.	1 1026 Steady-state life: 1,000 hours minimum, VCB = 10-40V dc; power shall be applied to achieve Tj = +150°C minimum using a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life: TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum n = 45 devices, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C, n = 22, c = 0.	1026 1,000 hours at VCB = -10 V dc; power shall be applied to achieve Tj = +150°C minimum and a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. n = 45, c = 0.	1026 JANS Only, 1,000 hours at VCB = 10 - 40 V dc; power shall be applied to achieve Tj = +150°C minimum and a minimum of PD = 75 percent of maximum rated PT as defined in 1.3 n = 45, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours.	1037 VCB = -10 V dc, 6,000 cycles. Adjust device current, or power, to achieve a minimum ΔTj of +100°C.	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, unclamped cond C
ML-PHF-19500/580	2N4234	TO-39	6	40	30/150	1	40	0.6	VCB = -10 - 30 V dc. Power shall be applied to achieve Tj = +135°C minimum and minimum power dissipation of PD = 75 percent of maximum rated PT as defined in 1.3. With approval of the qualifying activity and preparing activity, alternate burn-in criteria (hours, bias conditions, Tj, and mounting conditions) may be used. A justification demonstrating equivalence is required. In addition, the manufacturing site's burn-in data and performance history will be essential criteria for burn-in modification approval. This option is limited to plants who are at least transitional (QAL) approved or have an approved technical review board (TRB).	VCB = 10 - 40 V dc. Power shall be applied to achieve Tj = +135°C minimum using a minimum PD = 75 percent of PT maximum, TA = ambient rated	1 1026 Steady-state life: 1,000 hours minimum, VCB = -10 V dc; power shall be applied to achieve Tj = +150°C minimum using a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life: TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum n = 45 devices, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C, n = 22, c = 0.	1 1026 Steady-state life: 1,000 hours minimum, VCB = 10-40V dc; power shall be applied to achieve Tj = +150°C minimum using a minimum of PD = 75 percent of maximum rated PT as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life: TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum n = 45 devices, c = 0. 3 1032 High-temperature life (non-operating), t = 340 hours, TA = +200°C, n = 22, c = 0.	Not applicable. (No JANS in slash sheet)	CS Not applicable (No JANS level on slash sheet)	1039 Test condition A, 1,000 hours	1048 Test temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	None

MIL-PRF-19500/582	2N5679	TO-39	10	100	40/150	1	100	0.6	VCB ≥ -20 V dc; PT 1.0 W at TA = 30°C ±5°C. NOTE: No heat sink or forced air cooling on the devices shall be permitted	VCB = 10 - 40 V dc. Power shall be applied to achieve TJ = +150°C minimum using a minimum PD = 75 percent of PT maximum, TA = ambient rated	1 1037 Steady-state life: 340 hours, VCB ≥ -20 V dc, TJ = 150°C minimum. External heating of the device under test to achieve TJ = 150°C minimum is allowed provided that a minimum of 75 percent of rated power is dissipated. No heat sink or forced-air cooling on the devices shall be permitted. n = 45 devices, c = 0. 2 1026 The steady-state life test of step 1 shall be extended to 1,000 hours for each die design. Samples shall be selected from a wafer lot every twelve months of wafer production, however, step 2 shall not be required more than once for any single wafer lot. n = 45, c = 0. 3 10312 High-temperature life (non-operating), TA = +200°C, n = 22, c = 0.	1 1026 Steady-state life: 1,000 hours minimum, VCB = 10-40V dc, power shall be applied to achieve TJ = +150°C minimum using a minimum of PD = 75 percent of maximum rated PF as defined in 1.3. n = 45 devices, c = 0. The sample size may be increased and the test time decreased as long as the devices are stressed for a total of 45,000 device hours minimum, and the actual time of test is at least 340 hours. 2 1048 Blocking life, TA = +150°C, VCB = 80 percent of rated voltage, 48 hours minimum. n = 45 devices, c = 0. 3 10312 High-temperature life (non-operating), t = 340 hours, TA = +200°C. n = 22, c = 0.	Not applicable. (No JANS in slash sheet)	C6 Not applicable (No JANS level on slash sheet)	1048 Condition A, 1,000 hours	1048 Test temperature = +125°C, VCB = 80 percent of rated, T = 1,000 hours	None
MIL-PRF-19500/512	2N7372	TO-254	58	80	70/200	5	100	1.5	TJ = 187.5 ±12.5°C, VCE = 30 V dc ±10 V dc, TA = room ambient as defined in the general requirements, A.5 of MIL-STD-750	TJ = +162.5°C ±12.5°C TA = ambient; VCB = 10 - 40 V dc	1037 VCB = -10 V dc minimum	VCB = -10 V dc minimum	11037 For solder die attach: 1,340 cycles, VCB = 10 - 40 V dc, TA = room ambient. or 1026 For eutectic die attach: VCB = 10 to 40 V dc, TA = room ambient, adjust PT to achieve TJ = +175°C minimum.	1048 Test Temperature = +125°C; VCB = -30 V dc; t = 1000 hours.	1048 Test Temperature = +125°C; VCB = 80 percent of rated, T = 1,000 hours	A5, unclamped, no condition letter	