ASSR-4110

Form A, Solid State Relay (400V, 0.12A, 25Ω)

Reliability Data Sheet

Description

The reliability data shown includes Broadcom® reliability test data from the reliability qualification done on this product family. All of these products use the same LEDs, similar IC, and the same packaging materials, processes, stress conditions, and testing. The data in Table 1 and Table 2 reflects actual test data for devices on a per-channel basis. Before stress, all devices are preconditioned using a solder reflow process (260°C peak temp) and 20 temperature cycles (–55°C to +125°C, 15 mins dwell, 1 min transfer). This data is taken from testing on Broadcom devices using internal Broadcom processes, material specifications, design standards, and statistical process controls. **It is not transferable to other manufacturers' similar part types.**

Operating Life Test

For valid system reliability calculations, it is necessary to adjust for the time when the system is not in operation. Note that if you are using MIL-HDBK-217 for predicting component reliability, the results may not be comparable to those given in Table 2 due to different conditions and factors that have been accounted for in MIL-HDBK-217. For example, it is unlikely that your application will exercise all available channels at full rated power with the LED(s) always ON as Broadcom testing does. Thus, your application total power and duty cycle must be carefully considered when comparing Table 2 to predictions using MIL-HDBK-217.

Definition of Failure

Inability to switch (functional failure), is the definition of failure in this data sheet. Specifically, failure occurs when the device fails to switch ON with 2 times the minimum recommended drive current (but not exceeding the max rating) or fails to switch off when there is no input current.

Failure Rate Projections

The demonstrated point mean time to failure (MTTF) is measured at the absolute maximum stress condition. The failure rate projections in Table 2 uses the Arrhenius acceleration relationship, where a 0.43 eV activation energy is used as in the hybrid section of MIL-HDBK-217.

Application Information

The data of Table 1 and Table 2 was obtained on devices with high temperature operating life duration. An exponential (random) failure distribution is assumed, expressed in units of FIT (failures per billion device hours) are only defined in the random failure portion of the reliability curve.

Test Results

Table 1 Demonstrated Operating Life Test Performance

Stress Test Condition	Total Device Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF(hr) at Ta = +105°C	Demonstrated FITs at Ta = +105°C
Ta = 105°C If = 30 mA Io = 70 mA	60	60,000	0	> 60,000	< 16,667

Table 2 Reliability Projection for Device Listed in Title

Ambient Temperature (°C)	Junction Temperature (°C)	Typical (60% Confidence)		90% Confidence	
		MTTF (Hr/Fail)	FITs (Fail/10^9h)	MTTF (Hr/Fail)	FITs (Fail/10^9h)
105	150	65,481	15,272	26,058	38,376
100	145	75,389	13,264	30,000	33,333
90	135	100,970	9,904	40,180	24,888
80	125	137,231	7,287	54,610	18,312
70	115	189,488	5,277	75,405	13,262
60	105	266,149	3,757	105,911	9,442
50	95	380,791	2,626	151,532	6,599
40	85	555,826	1,799	221,185	4,521
30	75	829,145	1,206	329,950	3,031
25	70	1,021,585	979	406,530	2,460

Mechanical Tests

Testing done on a constructional basis.

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JA104	–55 to +125°C, Transfer = 1 min, Dwell = 15 mins, 500 cycles	80	0
Solderability (Pb-free condition)	—	8 hrs steam aging (93°C), followed by solder dip (260°C, 5 sec)	10	0
Solderability (SnPb condition)	—	8 hrs steam aging (93°C), followed by solder dip (245°C, 5 sec)	10	0
Preconditioning	J-STD-020, JA113	As per reference standard (MSL 1 condition)	80	0

Environmental Testing

Testing on a constructional basis.

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
High Temperature Reverse Bias	JA108	Ta = 150°C, Vf = –5V, Vo = 320V, Time = 500 hrs	78	0
Unbiased Autoclave	JA102	Ta = 121°C, RH = 100%, 15 psig, Time = 168 hours	80	0

For product information and a complete list of distributors, please go to our web site: www.broadcom.com.

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