BROADCOM®

Reliability Data Sheet

ASSR-1611

High Current, 1 Form A, Solid State Relay (MOSFET) (60V/2.5A/0.1Ω)

Description

The reliability data shown includes Broadcom® reliability test data from the reliability tests done on this product family. All of these products use similar wafer technology. 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 at MSL 1 using a solder reflow process (260°C peak temp) and 20 temperature cycles (–55°C to +125°C, 15-minutes dwell, 1-minute transfer). This data is taken from testing on the 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 might 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 IC always ON as Broadcom testing does. Thus, your application's 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), and are only defined in the random failure portion of the reliability curve.

Table 1: Demonstrated Operating Life Test Performance

Stress Test Condition	Total Device Tested	Total Device Hours	Number of Failed Units	Demonstrated MTTF (hr) at T_a = +105°C	Demonstrated FITs at T_a = +105°C
T_a = 105°C Iled = 30 mA Iload = 2.5A per unit	231	231,000	0	>231,000	<4329

Table 2: Reliability Projection for Device Listed in the 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	252,103	3967	100,322	9968
100	145	290,249	3445	115,502	8658
90	135	388,736	2572	154,693	6464
80	125	528,341	1893	210,248	4756
70	115	729,529	1371	290,309	3445
60	105	1,024,674	976	407,759	2452
50	95	1,466,045	682	583,398	1714
40	85	2,139,930	467	851,564	1174
30	75	3,192,210	313	1,270,308	787
25	70	3,933,103	254	1,565,139	639

Table 3: Mechanical Tests, Done on a Constructional Basis

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temperature Cycling	JA104	–55°C to 125°C, transfer = 1 minute, dwell = 15 minutes, 1000 cycles	229	0
Solderability (Pb-free Condition)	JB102	8 hours steam aging (93°C), followed by solder dip (260°C, 5 seconds)	10	0
Solderability (SnPb Condition)	JB102	8 hours steam aging (93°C), followed by solder dip (245°C, 5 seconds)	10	0
Pre-conditioning	J-STD-020 JA113	As per reference standard (MSL 1 condition)	1290	0

Table 4: Environmental Testing

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
High Temperature Reverse Bias	JA108	T_a = 105°C, biased, time = 1000 hours	230	0
Unbiased HAST	JA118	T_a = 130°C, RH = 85%, unbiased, time = 96 hours	231	0
Highly Accelerated Stress Test	JA110	T_a = 130°C, RH = 85%, biased, time = 96 hours	135	0
High Temperature Storage	JA103	T_a = 150°C, unbiased, time = 1000 hours	231	0

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