BROADCOM®

Reliability Data Sheet

ASSR-1410/ASSR-1411/ASSR-1420

General Purpose, Form A, Solid State Relay (Photo MOSFET) (60V/0.6A/1Ω)

Description

The reliability data shown includes Avago Technologies reliability test data from the reliability qualification done on this product family. All of these products use a 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 at MSL 1 using a solder reflow process (250°C peak temp) and 20 temperature cycles (–55°C to +125°C, 15-minute dwell, 1-minute transfer). This data is taken from testing on Avago Technologies devices using internal Avago Technologies processes, material specifications, design standards, and statistical process controls. They are not transferrable 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 exercises all available channels at full-rated power with the IC always ON (as is standard during Avago Technologies testing). 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, meaning functional failure, is the definition of failure in this data sheet. Specifically, failure occurs when the device fails to switch ON with two times the minimum recommended drive current (but not exceeding the maximum 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 from Table 1 and Table 2 is 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 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	Units Failed	Demonstrated MTTF (hr) at T_a = +105°C	Demonstrated FITs at T_a = +105°C
T_a = 105°C I_f = 30 mA I_o = 125 mA	80	80,000	0	>80,000	<12,500

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/109h)	MTTF (hr/fail)	FITs (fail/109h)
105	150	87,309	11,454	34,744	28,782
100	145	100,519	9,948	40,001	25,000
90	135	134,627	7,428	53,573	18,666
80	125	182,975	5,465	72,813	13,734
70	115	252,651	3,958	100,540	9,946
60	105	354,865	2,818	141,215	7,081
50	95	507,721	1,970	202,043	4,949
40	85	741,101	1,349	294,914	3,391
30	75	1,105,527	905	439,934	2,273
25	70	1,362,114	734	542,040	1,845

Table 3: Mechanical Tests (Testing on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JA104	–55°C to +125°C Transfer = 1 minute, Dwell = 15 minutes 1000 cycles	80	0
Physical Dimensions	JB100	Conformance to data sheet package drawings	20	0
Solderability (Pb-free condition)	–	8 hours steam aging (93°C), followed by solder dip (260°C, 5s)	10	0
Solderability (SnPb condition)	JB102	8 hours steam aging (93°C), followed by solder dip (245°C, 5s)	10	0
Preconditioning	J-STD-020 JA113	As per reference standard (MSL 1 condition)	40	0

Table 4: Environmental Testing

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
High Temperature Reverse Bias	JA108	T_a = 150°C V_f = –5V, V_o = 48V, Time = 500 hours	77	0
Unbiased Autoclave	JA102	T_a = 121°C, RH = 100%, 15 psig Time = 168 hours	60	0

BROADCOM®