

ACPL-C799

Optically Isolated Sigma-Delta Modulator

Description

The reliability data shown includes Broadcom[®] reliability test data from the reliability tests done on this product family. All of these products use the 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 (260°C peak temperature) and 20 temperature cycles (–55°C to +125°C, 15 minutes dwell, 1 minute 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 IC 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, that is, "functional failure" is the definition of failure in this data sheet. Specifically, failure occurs when the device fails to switch ON with twice 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](#) use 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 in [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 is only defined in the random failure portion of the reliability curve.

Test Results

Table 1: Demonstrated Operating Life Test Performance

Stress Test Condition	Total Devices Tested	Total Device Hours	Number of Failed Units	Demonstrated MTF (hour) @ $T_A = +125^\circ\text{C}$	Demonstrated FITs @ $T_A = +125^\circ\text{C}$
$T_A = 125^\circ\text{C}$, $V_{dd1} = V_{dd2} = 5.5\text{V}$, $V_{in+} = 0.1\text{V}$, $V_{in-} = \text{GND1}$, $V_{o1} = V_{o2} = \text{GND2}$	231	231,000	0	> 231,000	<4,329

Table 2: Reliability Projection for Device Listed in Title

Ambient Temperature ($^\circ\text{C}$)	Junction Temperature ($^\circ\text{C}$)	Typical (60% Confidence)		90% Confidence	
		MTTF (Hour/fail)	FITs (Fail/ 10^9 hour)	MTTF (Hour/fail)	FITs (Fail/ 10^9 hour)
125	140	252,103	3,967	100,322	9,968
120	135	292,273	3,421	116,307	8,598
110	125	397,236	2,517	158,076	6,326
100	115	548,500	1,823	218,270	4,581
90	105	770,406	1,298	306,576	3,262
80	95	1,102,253	907	438,631	2,280
70	85	1,608,917	622	640,252	1,562
60	75	2,400,079	417	955,088	1,047
50	65	3,666,023	273	1,458,857	685
40	55	5,746,222	174	2,286,652	437
30	45	9,265,004	108	3,686,916	271
25	40	11,900,038	84	4,735,501	211

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

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JESD-A104	-55°C to 125°C , Transfer = 1 minute, Dwell = 15 minutes, 1000 cycles	134	0
Physical Dimensions	JESD-B100	Conformance to data sheet package drawings	30	0
Preconditioning	J-STD-20 JA113	As per reference standard (to conform to MSL 1)	771	0

Table 4: Environmental Testing

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
HAST	JESD-A110	$T_A = 130^\circ\text{C}$, RH = 85%, Biased, Time = 1000 hours	135	0
Unbiased HAST	JESD-A118	$T_A = 130^\circ\text{C}$, RH = 85%, Unbiased, Time = 96 hours	135	0
High Temperature Bake	JESD-A103	$T_A = 150^\circ\text{C}$, Unbiased, Time = 1000 hours	135	0

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