BROADCOM®

Reliability Data Sheet

Automotive R^{2}Coupler™

Mechanical and Environmental Reliability Data

Description

The reliability data shown includes Broadcom® reliability test data from the reliability qualification done across all product family. Broadcom performed reliability stress in accordance to AEC-Q100/Q101 guidelines.

The data in Table 2 through Table 15 reflects actual test data for devices. Devices are classified according to package family. This data is taken from testing on Broadcom devices using internal Broadcom process, material specifications, design standards, and statistical process controls. **It is not transferable to other manufacturers' similar part types.**

Definition of Failure

Inability of the optocoupler to switch, that is, *functional failure*, is the definition of failure in this data sheet.

Reliability Testing

Broadcom subjects the devices to a series of reliability tests, including environmental, mechanical, and electrical tests, to ensure the product meets the intended reliability expectation. The tables show the results of reliability testing conducted by Broadcom over a period of time as shown in the test conditions.

NOTE: If more information is required on a specific product, contact the respective sales representative in the region.

Table 1: List of Automotive R^{2}Couplers™[a]

SO-5	SSO-8	SSO-12	SO-16	SO-24	SO-32	300-mil 8-pin
ACPL-M43T	ACPL-K30T	ACFL-3161T	ACPL-31JT	ACFJ-3262T	ACFH-3548T	ACPL-312T
ACPL-M46T	ACPL-K33T	ACFL-5211T	ACPL-32JT	ACFJ-332BT		ACPL-782T
ACPL-M49T	ACPL-K34T	ACFL-5212T	ACPL-33JT	ACFJ-3439T		
ACPL-M61T	ACPL-K43CT	ACFL-6211T	ACPL-34JT	ACFJ-3530T		
ACPL-M71T	ACPL-K43T	ACFL-6212T	ACPL-344JT	ACFJ-3531T		
ACPL-M72T	ACPL-K44CT		ACPL-36JT	ACFJ-3540T		
	ACPL-K44T		ACPL-38JT			
	ACPL-K49CT		ACPL-36JV			
	ACPL-K49T		ASSR-601JV			
	ACPL-K71T		ASSR-601JT			
	ACPL-K72T					
	ACPL-K74T					
	ACPL-K75T					
	ACPL-C797T					
	ACPL-C799T					
	ACPL-C87AT					
	ACPL-C87BT					

a. All associated options and specials apply.

Package Family: Small Outline 5-Pin Surface-Mount Plastic Package (SO-5)

Table 2: Mechanical Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JESD-A104	–65°C to 150°C, Transfer = 1 minute, Dwell = 15 minutes, 500 cycles	7338	0
Physical Dimensions	JESD-B100	Conformance to data sheet package drawings	240	0
Solderability (Non RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip, (245°C, 5 seconds)	40	0
Solderability (RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip, (260°C, 5 seconds)	115	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	25048	0
Mechanical Vibration	Mil Std 883, Method 2007	20G, 20 Hz to 2000 Hz, 10 minutes/cycle, 4 times/direction	80	0

Table 3: Environmental Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Highly Accelerated Stress Test	JESD-A110	T_A = 130°C, RH = 85%, Biased, Time = 96 hours	7191	0
Unbiased Autoclave	JESD-A102	T_A = 121°C, RH = 100%, 15 psig, Unbiased, Time = 96 hours	993	0
High Temperature Bake	JESD-A103	T_A = 175°C, Unbiased, Time = 500 hours	4664	0

Package Family: Stretched 8-Pin Surface-Mount Plastic Package (SSO-8)

Table 4: Mechanical Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JESD-A104	–65°C to 150°C, Transfer = 1 minute, Dwell = 15 minutes, 500 cycles	3254	0
Physical Dimensions	JESD-B100	Conformance to data sheet package drawings	330	0
Solderability (RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip, (260°C, 5 seconds)	180	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	11825	0
Mechanical Vibration	Mil Std 883, Method 2007	20G, 20 Hz to 2000 Hz, 10 minutes/cycle, 4 times/direction	120	0

Table 5: Environmental Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Highly Accelerated Stress Test	JESD-A110	T_A = 130°C, RH = 85%, Biased, Time = 96 hours	3342	0
Unbiased Highly Accelerated Stress Test	JESD-A118	T_A = 130°C, RH = 85%, Unbiased, Time = 96 hours	2387	0
Unbiased Autoclave	JESD-A102	T_A = 121°C, RH = 100%, 15 psig, Unbiased, Time = 96 hours	230	0
High Temperature Bake	JESD-A103	T_A = 150°C, Unbiased, Time = 1000 hours	662	0
High Temperature Bake	JESD-A103	T_A = 175°C, Unbiased, Time = 500 hours	636	0

Package Family: Stretched 12-Pin Surface-Mount Plastic Package (SSO-12)

Table 6: Mechanical Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JESD-A104	–65°C to 150°C, Transfer = 1 minute, Dwell = 15 minutes, 500 cycles	702	0
Physical Dimensions	JESD-B100	Conformance to data sheet package drawings	90	0
Solderability (RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip, (260°C, 5 seconds)	50	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	3558	0

Table 7: Environmental Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Highly Accelerated Stress Test	JESD-A110	T_A = 130°C, RH = 85%, Biased, Time = 96 hours	702	0
Unbiased Highly Accelerated Stress Test	JESD-A118	T_A = 130°C, RH = 85%, Unbiased, Time = 96 hours	702	0
High Temperature Bake	JESD-A103	T_A = 175°C, Unbiased, Time = 500 hours	510	0

Package Family: Small Outline 16-Pin Surface-Mount Plastic Package (SO-16)

Table 8: Mechanical Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JESD-A104	–65°C to 150°C, Transfer = 1 minute, Dwell = 15 minutes, 500 cycles	2447	0
Temp Cycling	JESD-A104	–50°C to 150°C, Transfer = 1 minute, Dwell = 15 minutes, 1000 cycles	4273	0
Physical Dimensions	JESD-B100	Conformance to data sheet package drawings	260	0
Solderability (Non RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip, (245°C, 5 seconds)	70	0
Solderability (RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip, (260°C, 5 seconds)	117	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	42,841	0
Mechanical Vibration	Mil Std 883, Method 2007	20G, 20 Hz to 2000 Hz, 10 minutes/cycle, 4 times/direction	40	0

Table 9: Environmental Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Highly Accelerated Stress Test	JESD-A110	T_A = 130°C, RH = 85%, Biased, Time = 96 hours	3589	0
Unbiased Highly Accelerated Stress Test	JESD-A118	T_A = 130°C, RH = 85%, Unbiased, Time = 96 hours	1001	0
High Temperature Reverse Bias	JESD-A108	T_A = 150°C, Biased, Vout = 1.2 kV, Time = 1000 hours	546	0
High Temperature High Humidity Bias	JESD-A101	T_A = 85°C, RH = 85%, Biased, Iled = 30 mA, Time = 1000 hours	231	0
Unbiased Autoclave	JESD-A102	T_A = 121°C, RH = 100%, 15 psig, Unbiased, Time = 96 hours	704	0
Temperature Humidity Bias	JESD-A101	T_A = 85°C, RH = 85%, Biased, Time = 1000 hours	1907	0
High Temperature Bake	JESD-A103	T_A = 175°C, Unbiased, Time = 500 hours	3196	0

Package Family: Small Outline 24-Pin Surface-Mount Plastic Package (SO-24)

Table 10: Mechanical Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JESD-A104	–65°C to 150°C, Transfer = 1 minute, Dwell = 15 minutes, 500 cycles	1440	0
Physical Dimensions	JESD-B100	Conformance to data sheet package drawings	150	0
Solderability (RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip, (260°C, 5 seconds)	100	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	8640	0

Table 11: Environmental Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Unbiased Highly Accelerated Stress Test	JESD-A118	T_A = 130°C, RH = 85%, Unbiased, Time = 96 hours	1440	0
Temperature Humidity Bias	JESD-A101	T_A = 85°C, RH = 85%, Biased, Time = 1000 hours	960	0
Highly Accelerated Stress Test	JESD-A110	T_A = 130°C, RH = 85%, Biased, Time = 96 hours	240	0
High Temperature Bake	JESD-A103	T_A = 175°C, Unbiased, Time = 500 hours	1440	0

Package Family: Small Outline 32-Pin Surface-Mount Plastic Package (SO-32)

Table 12: Mechanical Tests (Testing done on a constructional basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temp Cycling	JESD-A104	–65°C to 150°C, Transfer = 1 minute, Dwell = 15 minutes, 500 cycles	240	0
Physical Dimensions	JESD-B100	Conformance to data sheet package drawings	30	0
Solderability (RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip (260°C,5 seconds)	20	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	1440	0

Table 13: Environmental Tests (Testing done on a constructional basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Unbiased Highly Accelerated Stress Test	JESD-A118	T_A = 130°C, RH = 85% Unbiased, Time = 96 hours	240	0
Temperature Humidity Bias	JESD-A101	T_A = 85°C, RH = 85%, Biased, Time = 1000 hours	240	0
High Temperature Bake	JESD-A103	T_A = 175°C, Unbiased, Time = 500 hours	240	0

Package Family: 300-mil 8-Pin Package (300-mil 8-Pin)

Table 14: Mechanical Tests (Testing Performed on a Constructional Basis)

Test Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Temperature Cycling	JESD-A104	–50°C to 150°C, Transfer = 1 minute, Dwell = 15 minutes, 1000 cycles	3066	0
Physical Dimensions	JESD-B100	Conformance to data sheet package drawings	100	0
Solderability (Non-RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip, (245°C, 5 seconds)	55	0
Solderability (RoHS condition)	JESD-B102	8 hours steam aging (93°C), followed by solder dip, (260°C, 5 seconds)	85	0
Preconditioning	J-STD-020 JA113	As per reference standard (to conform to MSL 1)	9583	0
Mechanical Vibration	Mil Std 883, Method 2007	20G, 20 Hz to 2000 Hz,10 minutes/cycle, 4 times/direction	20	0

Table 15: Environmental Tests (Testing Performed on a Constructional Basis)

est Name	Reference Standard	Test Conditions	Units Tested	Units Failed
Highly Accelerated Stress Test	JESD-A110	T_A = 130°C, RH = 85%, Biased, Time = 96 hours	2276	0
Unbiased Highly Accelerated Stress Test	JESD-A118	T_A = 130°C, RH = 85%, Unbiased, Time = 96 hours	1032	0
Unbiased Autoclave	JESD-A102	T_A = 121°C, RH = 100%, 15 psig, Unbiased, Time = 96 hours	651	0
High Temperature Bake	JESD-A103	T_A = 175°C, Unbiased, Time = 500 hours	2024	0