

2.5Gbps, 850nm VCSEL Transmitters



Application Bulletin 224 OPV300 Series VCSEL Reliability Data



The Optek Quality Assurance System provides a means to monitor, control and correct product quality on a real-time basis. Each product family that Optek produces is tested extensively prior to manufacturing release for quality and reliability. Optek's ongoing commitment to quality and product improvement ensures that reliability will be maintained throughout the product's life cycle.

The OPV300 series VCSEL transmitters were designed to provide a high degree of performance and reliability. The data contained in this report serves to validate the reliability of these components and stands as Optek's commitment to continuous product improvement.

OPV300 Series Demonstrated Performance

Test Name	Conditions	Total Units Tested	Total Device Hours	Failures ¹
High Temperature Operating Life	$T_A = 85\text{ }^\circ\text{C}$, $I_F = 12.6\text{ mA}$ $V_{F(AVG)} = 1.92\text{ V}$	185	572,913	10

Predicted Failure Rate at $I_F = 7.0\text{ mA}$ (typical)

Ambient Temp. (°C)	Predicted Performance 60% Confidence				Predicted Performance 90% Confidence	
	MTTF ² (Hours)	FIT ³ (10 ⁹ Hours)	MTTF (Hours)	FIT (10 ⁹ Hours)	MTTF (Hours)	FIT (10 ⁹ Hours)
70	469,180	2,131	407,451	2,454	304,563	3,283
60	910,459	1,098	790,672	1,265	591,015	1,692
50	1,838,090	544	1,596,257	626	1,193,178	838
40	3,874,759	258	3,364,967	297	2,515,261	398
30	8,564,092	117	7,437,336	134	5,559,294	180
25	12,978,687	77	11,271,113	89	8,424,983	119

Notes:

- End point failure criteria is a catastrophic failure or when the product demonstrates a drop in optical power of greater than 2 dBm at $I_F = 12\text{ mA}$.
- MTTF is the total devices hours divided by either the number of failures or unity if there are no failures.
- Failure in time (FIT) is equal to the number of failures expected in one billion device hours. For example, 1 FIT = 1 failure per 1,000,000,000 devices hours.

Optek reserves the right to make changes at any time in order to improve design and to supply the best product possible.



OPV300 Series VCSEL Reliability Data

OPV300 Series Mechanical and Environmental Tests

Examination or Test	MIL-STD-883 (Unless otherwise stated)		Results		
	Method	Details	LTPD	Reject	Pass
Group 1		11 Parts	20		
Mechanical Shock	2002	1,500 G at 0.5ms, 5 times per axis			
Vibration	2007	Condition A 20-2,000 Hz, 4 min/cycle, 4 cycles/axis			
End point testing for Group 1				0	11
Group 2		11 Parts	20		
Thermal Shock	1011	0-100 °C			
Solderability	2003	Steam aging not required			
End point testing for Group 2				0	11
Group 3		10 parts			
Accelerated Aging Life Test (Central Office Rating)		Output power maintained at 1.1mW. $T_C = 70^\circ\text{C}$ (T_A may be adjusted to obtain T_C value.)			
End point testing for Group 3		5,000 Hour read point		0	10
Group 4		25 parts			
Accelerated Aging Life Test (Uncontrolled Env. Rating)		Biased at rated power. $T_C = 85^\circ\text{C}$, 0.8mW			
End point testing for Group 4		5,000 Hour read point		0	25
Group 5		11 Parts	20		
High Temp Storage	1008	$T_A = 125^\circ\text{C}$ (2,000 hours total)			
Mid point testing for Group 5		1,000 Hours		0	11
End point testing for Group 5		2,000 Hours		0	11
Group 6		11 Parts	20		
Low Temp Storage		$T_A = -40^\circ\text{C}$ (2,000 hours total)			
Mid point testing for Group 6		1,000 hour mid point		0	11
End point testing for Group 6		2,000 hour end point		0	11

Application Bulletin 224



OPV300 Series VCSEL Reliability Data

Examination or Test	MIL-STD-883 (Unless otherwise stated)		Results		
	Method	Details	LTPD	Reject	Pass
Group 7		11 Parts	20		
Temperature Cycling (Central office rating)	1011	-40 - 70 °C, 500 cycles			
End point testing for Group 7				0	11
Group 8		11 Parts	20		
Temperature Cycling (Uncontrolled Env. Rating)	1010	-40 - 85 °C, 500 cycles			
End point testing for Group 8		5,000 Hour read point		0	11
Group 9		11 Parts	20		
Damp Heat	103	MIL-STD-202 85°C/85% Relative Humidity; 1,000 hours			
End point testing for Group 9				0	11
Group 10		11 Parts	20		
Moisture Resistance		20 cycles with 10 sub-cycles			
End point testing for Group 10				0	11
Group 11		5 Parts	-		
Water Vapor Content	1004	5,000 PPM Max H ₂ O			
End point testing for Group 11				0	5