


MICROELECTRONIC RELAY

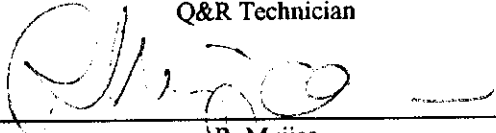
RELIABILITY REPORT

March 1997

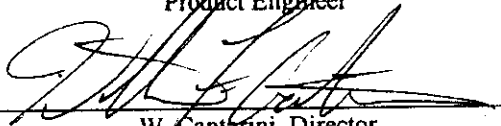
This report has been reviewed and approved by the following:


S. Brown
Q&R Technician


4/4/97
Date


R. Mujica
Product Engineer

4/4/97
Date


W. Cantarini, Director
MER Engineering

4/7/97
Date


A. Serkuzewski, Director
MER Business Management & Marketing

4/7/97
Date

TABLE OF CONTENTS

1.0	Product Description	3
2.0	Reliability and Quality Assurance Program	4
3.0	Product Test Results	
3.1	CS60 Series	5
3.2	DPA Series	6
3.3	PVG612 Series	7
3.4	PVI5013R Series	8
3.5	PVI5100 Series	9
3.6	PVN Series	10
3.7	PVO402P Series	11
3.8	PVT322 Series	12
3.9	PVT412L Series	13
3.10	PVT422 Series	14
3.11	PVT422P Series	15
3.12	PVU Series	16
3.13	SPA Series	17
Appendix A	Failure Definitions	18
Appendix B	Environmental Stress Test Conditions	19
Appendix C	Typical SRS Chart	22

1.0 PRODUCT DESCRIPTION

The International Rectifier Microelectronic (MER) Relay product line consists of two types of relays. The ChipSwitch® relays have a thyristor type output and switch AC power loads. The PhotoVoltaic Relays (PVR) have a MOSFET transistor type output and switch a broad range of signals from DC to RF, but are restricted to a lower power level than the ChipSwitch products. The MERs all use photo-isolation by means of radiation from a light emitting diode (LED) actuating an electrically isolated, photo-sensitive semiconductor. Isolation voltages are rated from 2500 V_{RMS} to 4000 V_{RMS}. The products are all constructed in dual-in-line (DIP) or single-in-line (SIP) semiconductor-style packages.

The ChipSwitch relays use a unique pair of photo-sensitive Power IC has the output devices to control power from 47 to 63 Hz and 20 to 280 VAC. The two chips are connected in inverse parallel (analogous to anti-parallel SCRs), each controlling one polarity of the AC power line. These Power ICs also include supplementary circuit functions such as zero voltage turn-on and dv/dt protection.

The PhotoVoltaic Relays feature two internal topologies. The PVA/D10, PVA/D13, PVA/D30, PVA/D33 and PVR Series use a unique single chip Power IC termed a BOSFET® as an output device. The BOSFET contains two coplanar MOSFETs in inverse series connection plus fast turn-off and transient protection circuitry. The BOSFET is driven by a unique multicell photovoltaic generator of alloy construction which is energized by the LED.

The PVA/DZ172, PVN, PVT and PVU Series use International Rectifier's HEXFET® power MOSFET transistors as output devices. The output transistors are driven by an IC-type photovoltaic generator which also incorporates supplementary turn-off and dv/dt protection circuitry. Radiation from an input LED actuates the photovoltaic generator which controls the output transistors.

*ChipSwitch is a registered trademark for International Rectifier's AC switching relays.
BOSFET is a registered trademark of International Rectifier.
HEXFET is a registered trademark of International Rectifier's power MOSFETs.*

2.0 RELIABILITY AND QUALITY ASSURANCE PROGRAM

The MER Reliability and Quality Assurance Program consists of three basic parts. All parts receive 100% automated testing of typically 14 to 20 parameters. A Statistical Reliability Sampling (SRS) program submits each process lot to short-term environmental stress tests before production release. A Statistical Reliability Evaluation (SRE) program submits samples to more extensive and long term environmental stress tests to verify application reliability.

SRS, in conjunction with 100% testing, is the MER basic Quality Assurance technique. A sample of 10 to 20 parts from each process lot are numbered and the electrical parameters are tested and their values are recorded. These units are environmentally stressed with High Temperature Reverse Bias (HTRB) and temperature cycling. Test times typically extend from 16 hours to 72 hours. See Appendix B for test descriptions.

At the completion of the environmental stress tests, the units are again tested and parametric values recorded. This data is plotted on an Statistical Process Control (SPC) chart as shown in Appendix C. The pre-stress average (\bar{x}) and standard deviation for various lots are shown in Fig. 1 and Fig. 2 in Appendix C. The post-stress (\bar{x}) minus the pre-stress (\bar{x}) is then plotted in Fig. 3 to determine if the lot is in control. Upper and lower control limits have been calculated using standard SPC techniques. The pre-stress (\bar{x}) values always start within the specification limits. This method allows identification of an out of control lot well before it has failed the specified limits and allows early initiation of corrective action. The SPC charts are available for all products and are continually updated.

Production samples are also regularly placed on long term SRE. These parts are numbered, tested, datalogged and submitted to a larger group of environmental stress tests. The program typically includes tests for HTRB, High Temperature Humidity (85°C, 85% RH), Temperature Cycling, Operational Power Cycling and Autoclave. See Appendix B for test descriptions. Test times typically extend to 1000 hours.

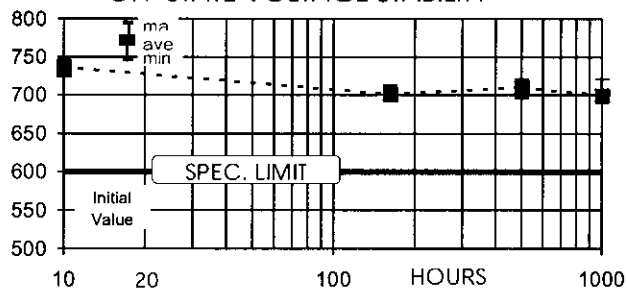
SRE results are documented on the following pages. The mean values for each sample lot are plotted as a function of time for HTRB and High Temperature Humidity. For each parameter, the highest and lowest individual value from each lot is also shown. The other tests are reported in pass/fail basis in tabular form. This data allows the end user to choose and evaluate the performance of the specific parameters that are critical for the performance of their system.

This year, we have performed temperature cycle conditioning changing the limits to -55°C and +150°C (from -40°C and +110°C). We have seen no increase on the failure rate for most of our products. Exceptions are noted on the data as applicable. Our published temperature ratings continue to be -40°C to +100°C (storage) and -40°C to +85°C (operational).

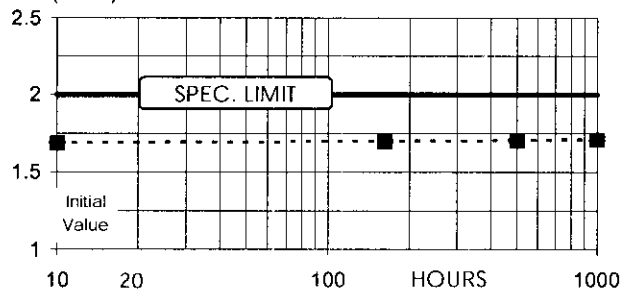
3.1 CS60 SERIES RELIABILITY DATA

HTRB (110°C, 240V) Test Results

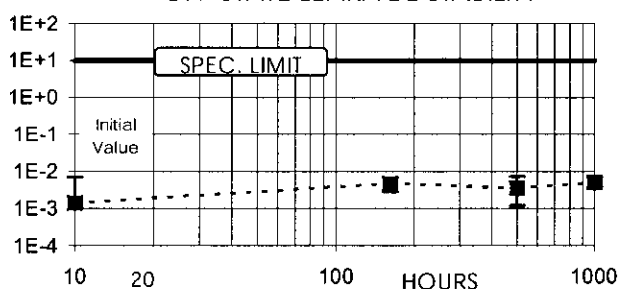
BV (Volts) OFF-STATE VOLTAGE STABILITY



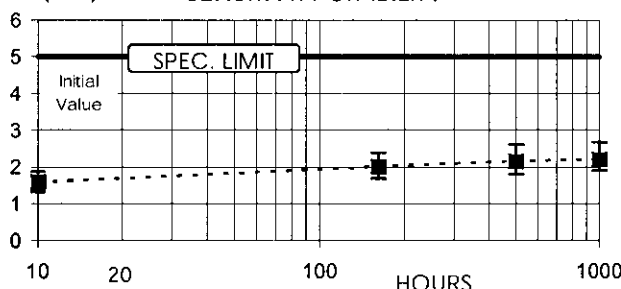
VON (Volts) ON-VOLTAGE STABILITY



IROUT (uA) OFF-STATE LEAKAGE STABILITY

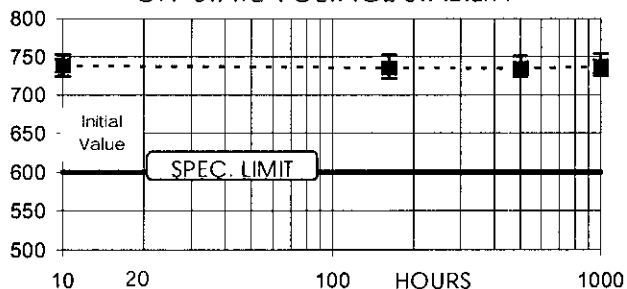


IPU (mA) SENSITIVITY STABILITY

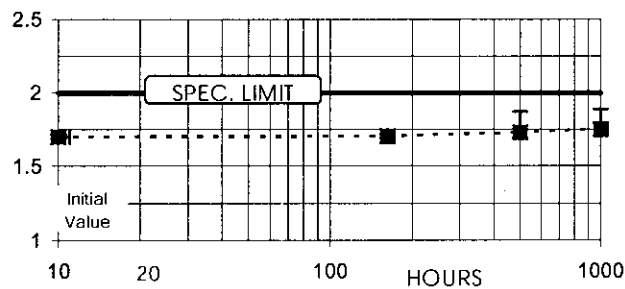


(85°C/85% RH) Test Results

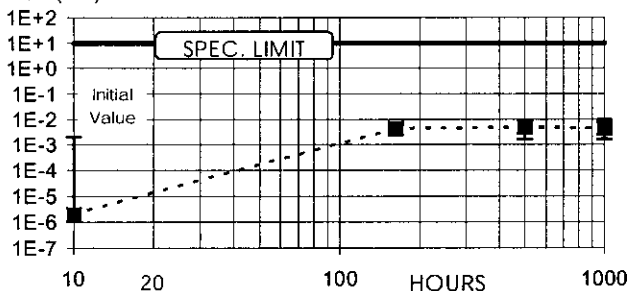
BV (Volts) OFF-STATE VOLTAGE STABILITY



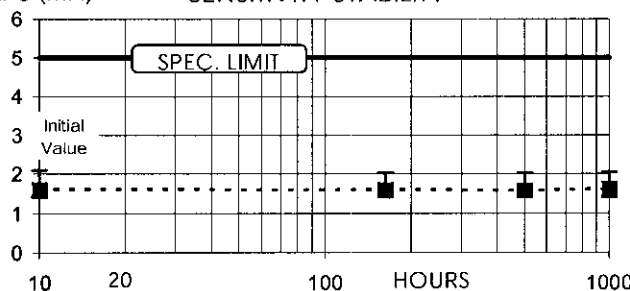
VON (Volts) ON-VOLTAGE STABILITY



IROUT (uA) OFF-STATE LEAKAGE STABILITY



IPU (mA) SENSITIVITY STABILITY



Summary of Test Results

Test	# Devices	0 Hrs	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	See Appendix B
85°C/85% RH	10	0		0	0	0	
Autoclave	10	0	0				
Temp Cycle	10	0 cycles	250 cycles	500 cycles	750 cycles	1000 cycles	-55°C to +150°C
Operating Lif	10	0 cycles	2.5x10 ³	5.0x10 ³	7.5x10 ³	1.5x10 ⁴	100 mA, two minutes on, two minutes off

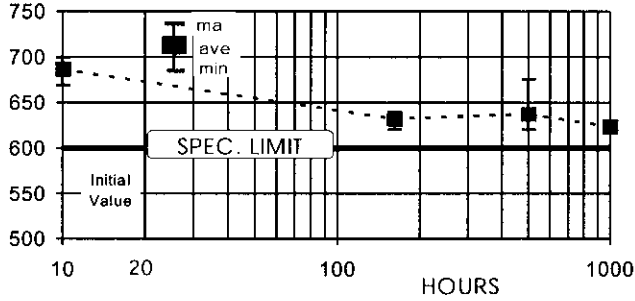
Device Failures: p = parametric drift; c = catastrophic failure. See Appendix A for definitions.

Notes:

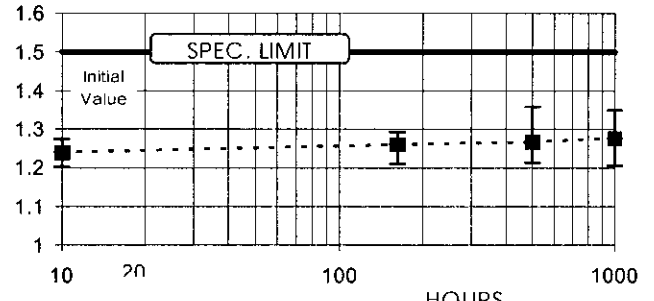
3.2 DPA SERIES RELIABILITY DATA

HTRB (110°C, 240V) Test Results

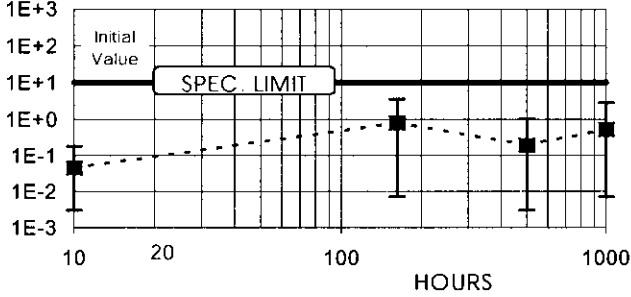
BV (Volts) OFF-STATE VOLTAGE STABILITY



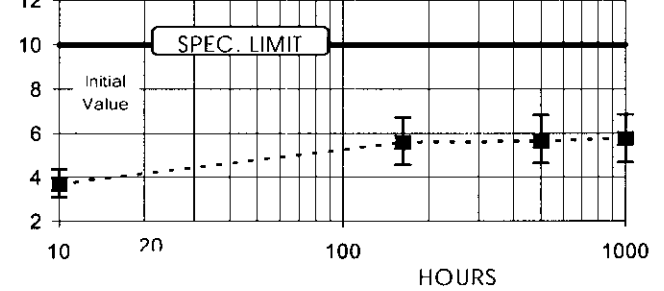
VON (Volts) ON-VOLTAGE STABILITY



IROUT (uA) OFF-STATE LEAKAGE STABILITY

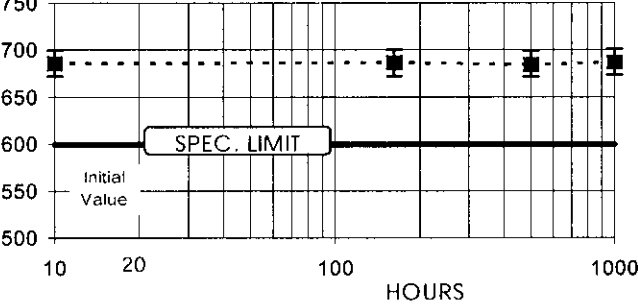


IPU (mA) SENSITIVITY STABILITY

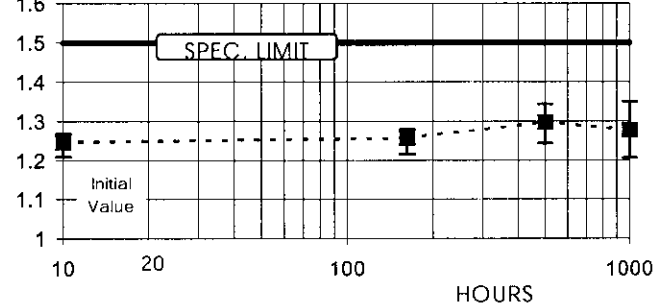


(85°C/85% RH) Test Results

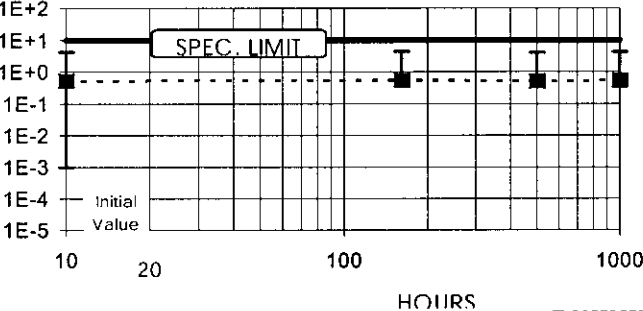
BV (Volts) OFF-STATE VOLTAGE STABILITY



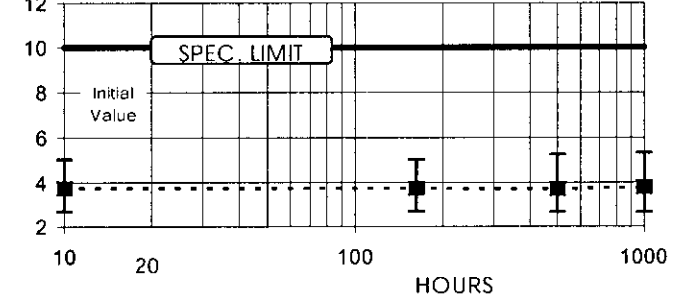
VON (Volts) ON-VOLTAGE STABILITY



IROUT (uA) OFF-STATE LEAKAGE STABILITY



IPU (mA) SENSITIVITY STABILITY



Hel# 1539

Summary of Test Results

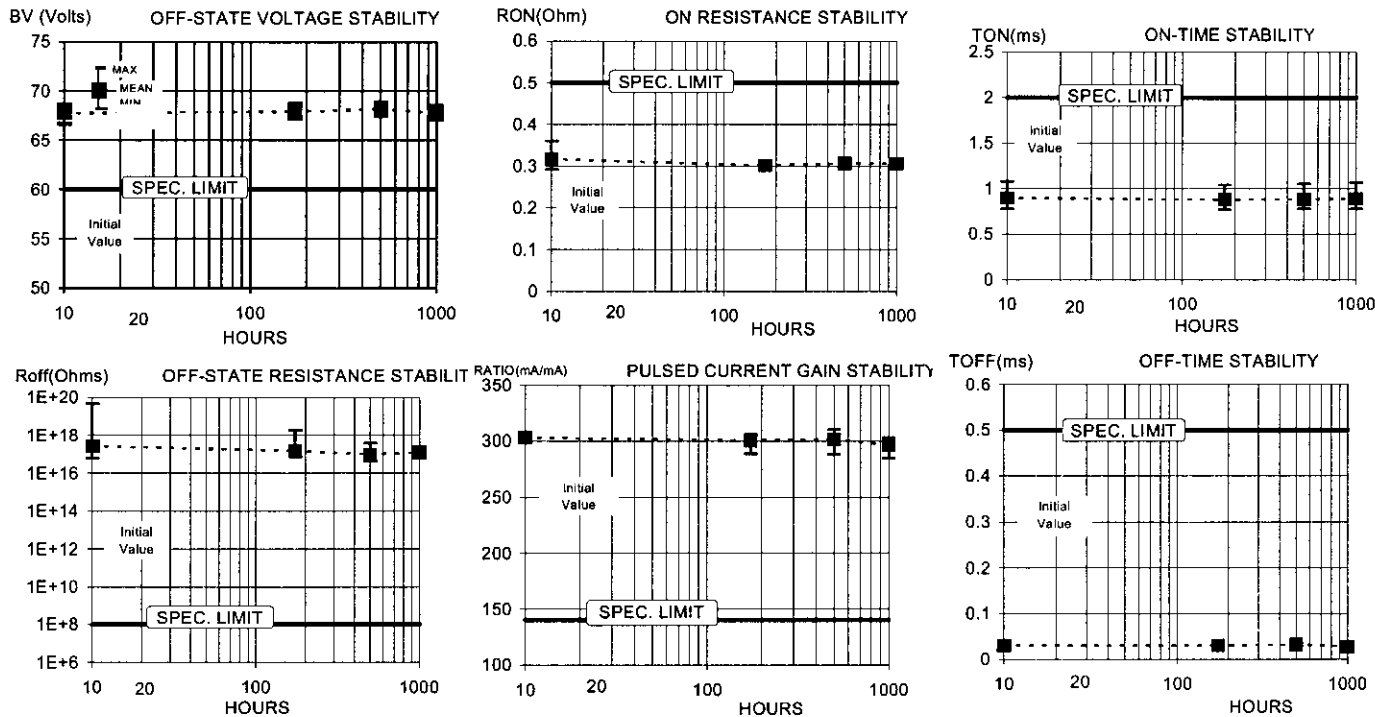
Test	# Devices	0 Hrs	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	See Appendix B
85°C/85% RH	10	0		0	0	0	
Autoclave	10	0	0				
		100 cycles	200 cycles	500 cycles	1000 cycles		-55°C to +150°C
Temp Cycle	10	0	0	0	0		
		0 Cycles	5x10 ³ Cycles	1.5x10 ⁴	3x10 ⁴ Cycles		1 Amp, 120V _{RMS} 1 minute on, 1 minute off
Operating Life	10	0	0	0	0		

Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

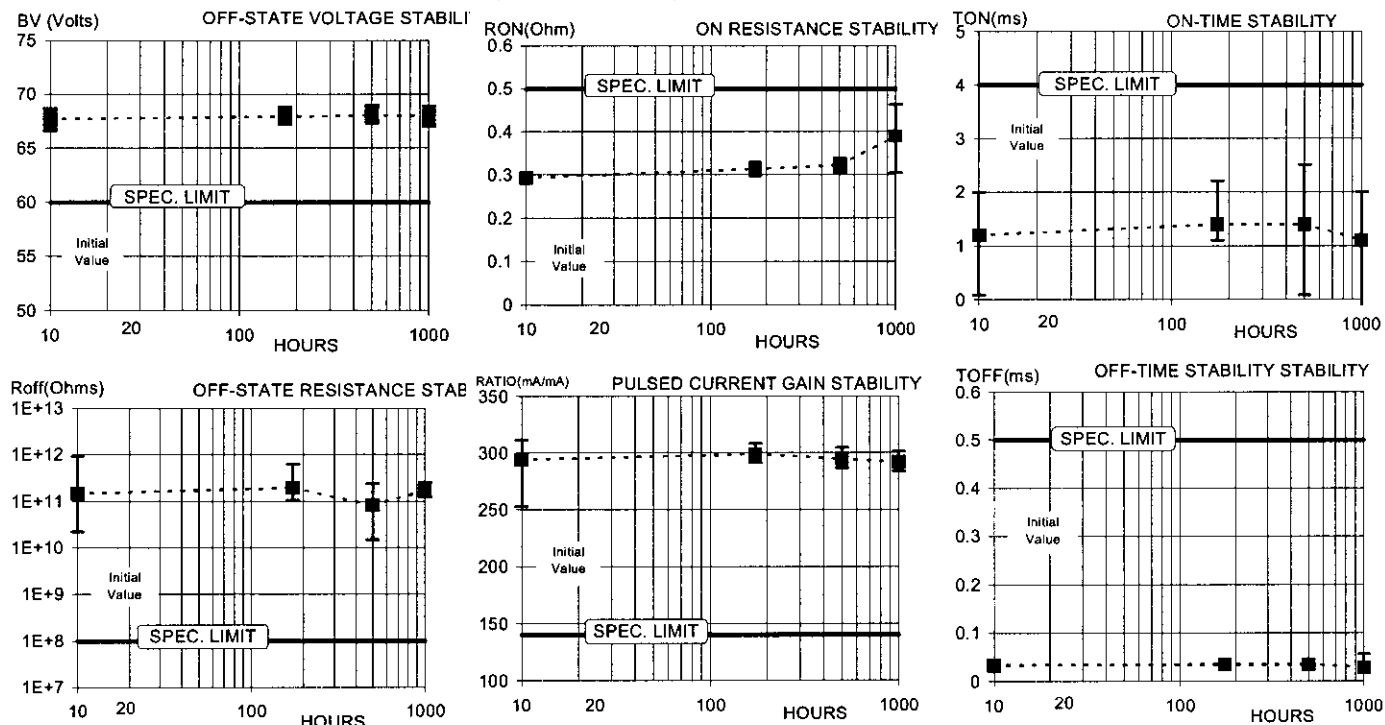
Notes:

3.3 PVG612 SERIES RELIABILITY DATA

HTRB (110°C, 60V) Test Results



(85°C/85%RH) Test Results



Rel#1547

Summary of Test Results

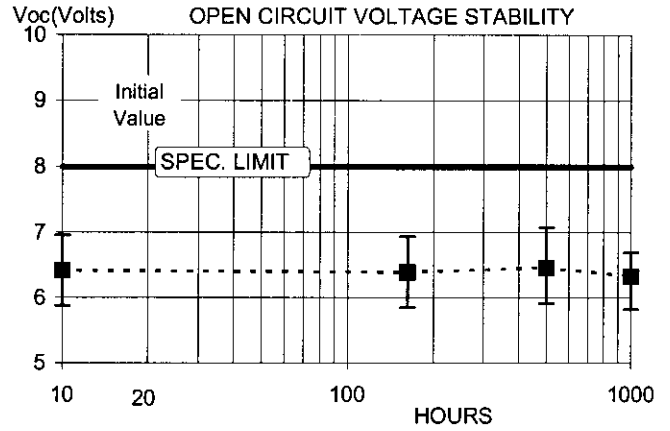
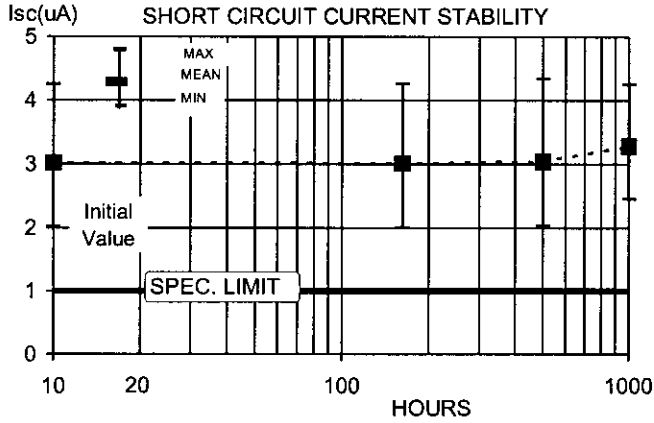
Test	# Devices	0 Hrs	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	"C" Connection 60V
85°C/85% RH	10	0		0	0	0	"C" Connection 60V
Autoclave	10	0	0				See Appendix B
		0 Cycles	250 Cycles	500 Cycles	1000 Cycles		-55°C to +150°C
Temp Cycle	10	0	0	0	0		
		0 Cycles	10 ⁴ Cycles	3x10 ⁴ Cycles	6x10 ⁴ Cycles		A connection, 1Amp, 8V
Operating Life	10	0	0	0	0		2 minutes on, 2 minutes off

Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

Notes:

3.4 PVI5013R RELIABILITY DATA

HTRB (110°C, 10V) Test Results



Rel# 1535

Summary of Test Results

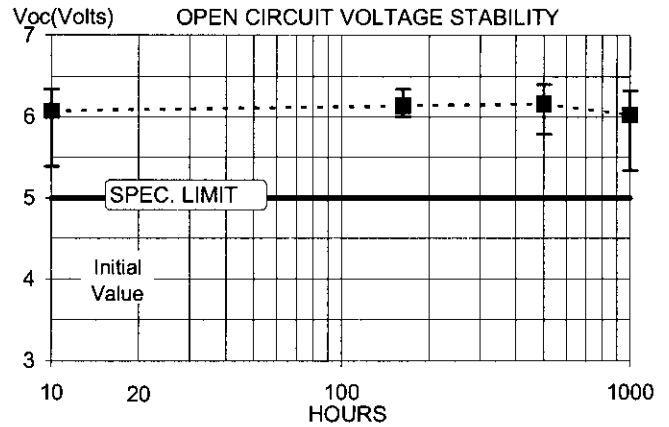
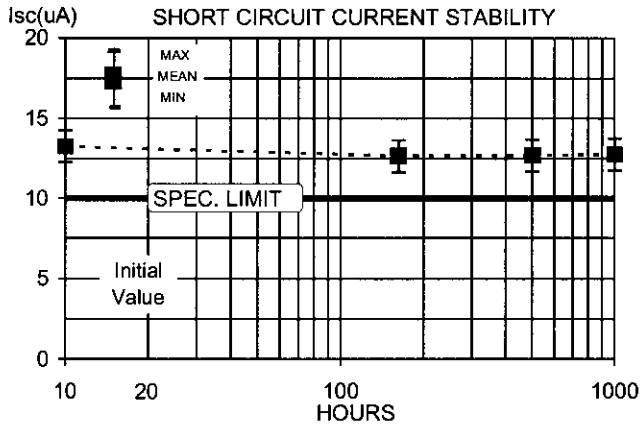
Test	# Devices	0	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	6V
85°C/85% RH	-						See Appendix B
Autoclave	10	0	0				
		0 Cycles	200 Cycles	500 Cycles	1000 Cycles		-55°C to +150°C
Temp Cycle	10	0	0	0	0		
		10 ³ Cycles	10 ⁴ Cycles	10 ⁵ Cycles	10 ⁶ Cycles	10 ⁷ Cycles	
Operating Life	-						

Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

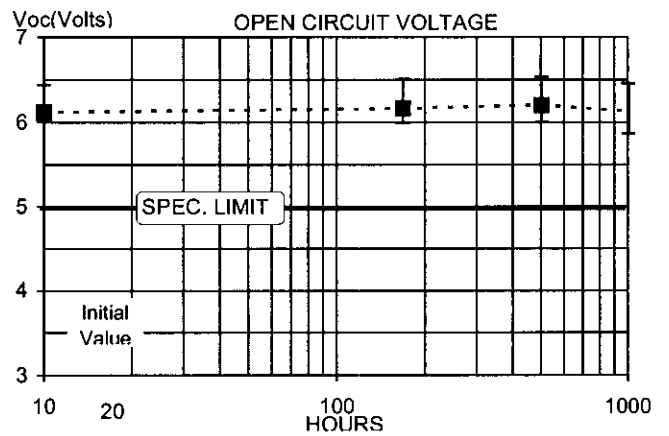
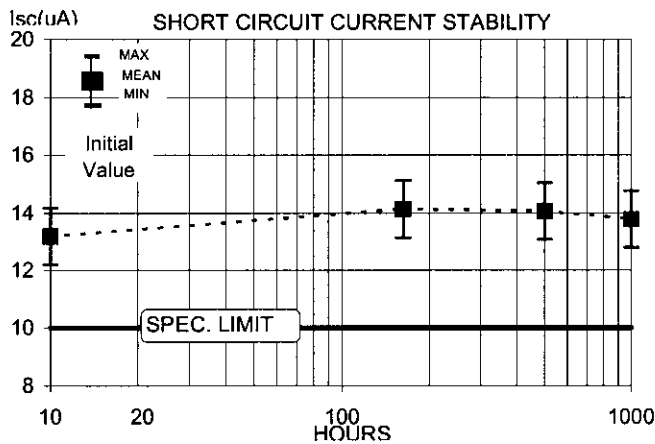
Notes:

3.5 PVI5100 SERIES RELIABILITY DATA

HTRB (110°C, 10V) Test Results



(85°C/85% RH) Test Results



Rel# 1534

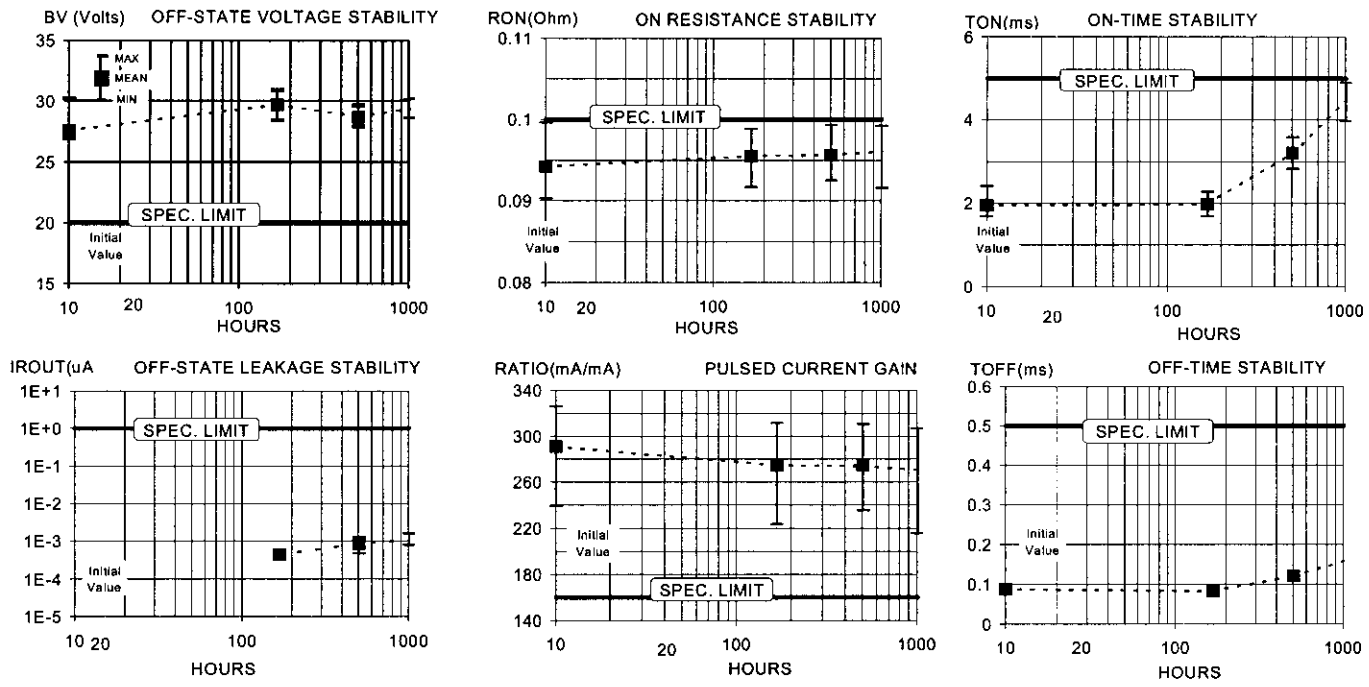
Summary of Test Results

Test	# Devices	0	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	6V
85°C/85% RH	10	0		0	0	0	
Autoclave	10	0	0				See Appendix B
		0 Cycles	200 Cycles	500 Cycles	1000 Cycles		-55°C to +150°C
Temp Cycle	10	0	0	0	0		
		10 ³ Cycles	10 ⁴ Cycles	10 ⁵ Cycles	10 ⁶ Cycles	10 ⁷ Cycles	
Operating Life	-						

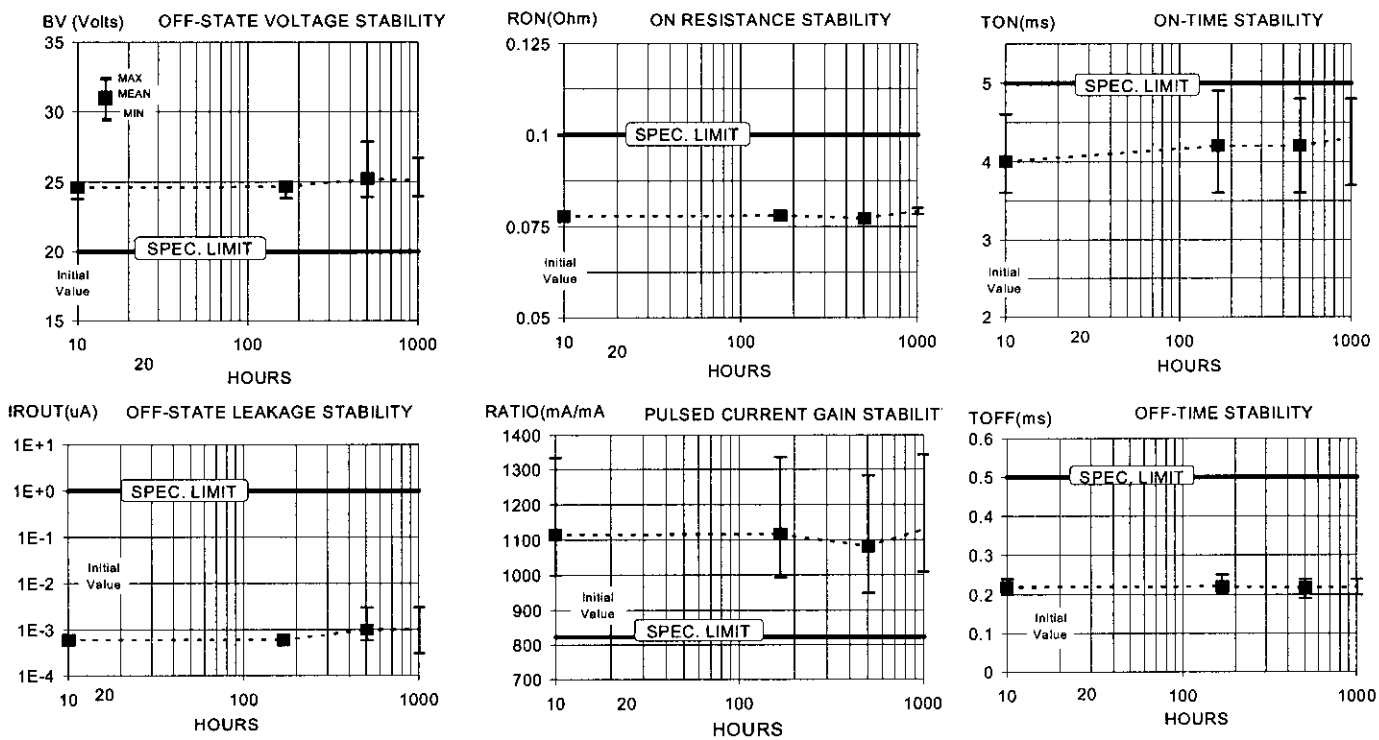
Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

3.6 PVN SERIES RELIABILITY DATA

HTRB (110°C, 20V) Test Results



(85°C/85% RH) Test Results



Rel# 1546

Summary of Test Results

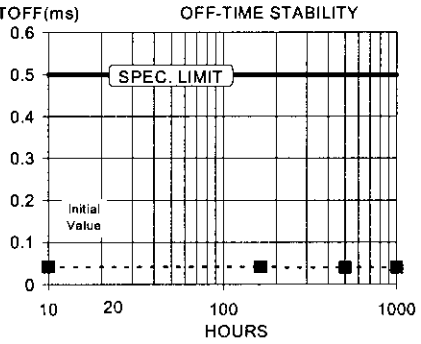
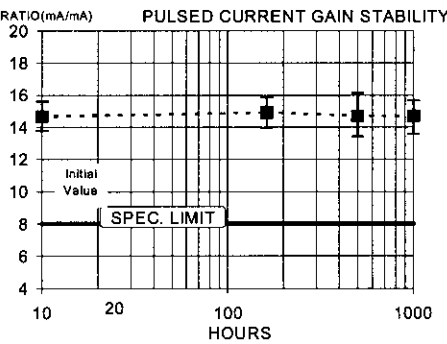
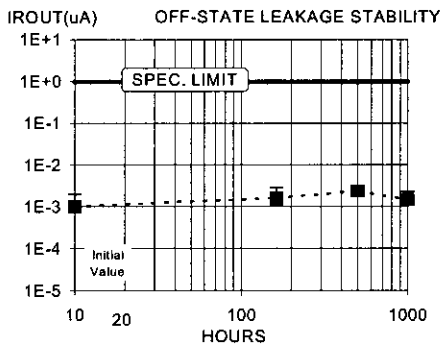
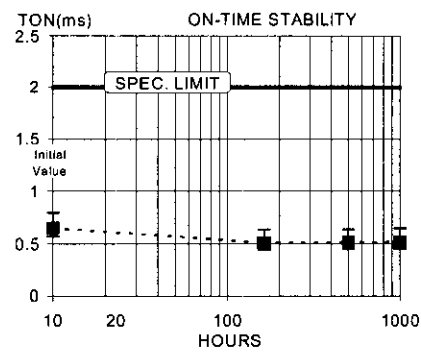
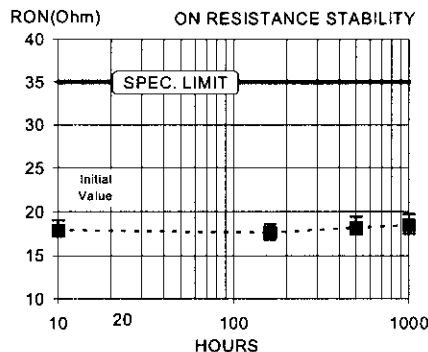
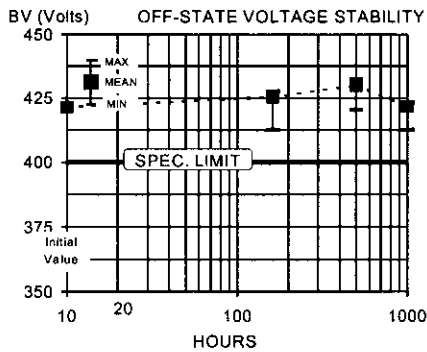
Test	# Devices	0 Hrs	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	"C" Connection 20V
85oC/85% RH	10	0		0	0	0	"C" Connection 20V
Autoclave	10	0					See Appendix B
		0 Cycles	250 Cycles	500 Cycles	1000 Cycles		-55°C to +150°C
Temp Cycle	10	0	0	0	1-c *		
		0 Cycles	2x10 ³ Cycles	5x10 ³ Cycles	1x10 ⁴ Cycles	10 ⁴ Cycles	2 Amp, 16V
Operating Life	10	0	0	0	0		2 minutes on, 2 minutes off

Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

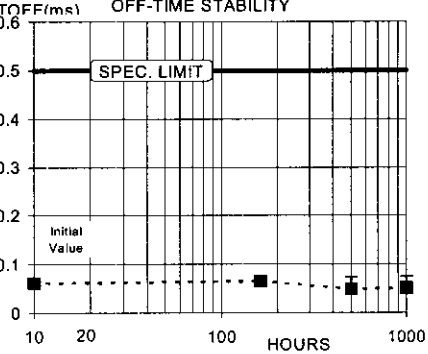
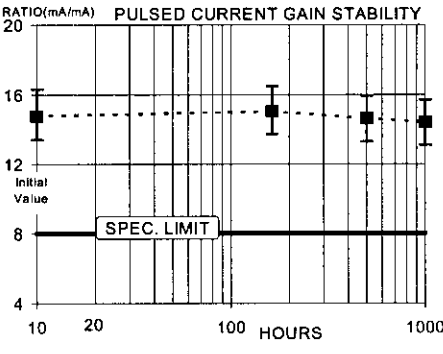
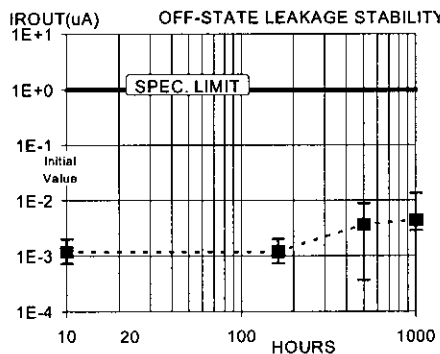
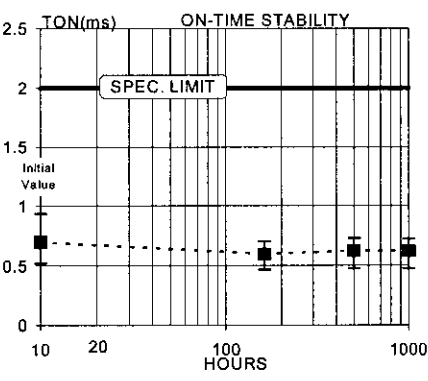
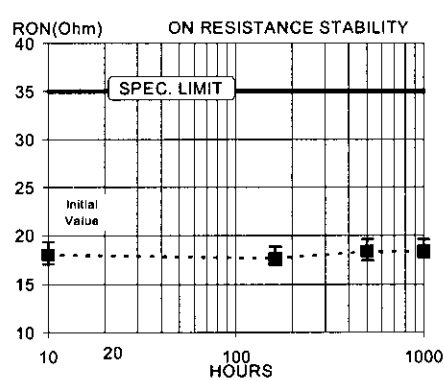
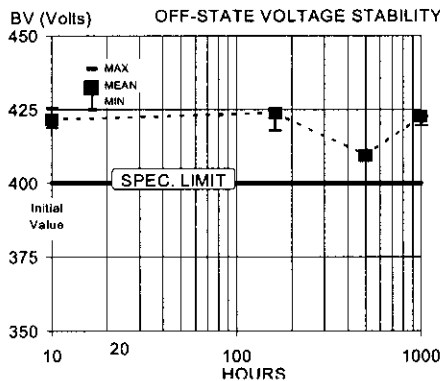
Notes: * Previously done at -40°C to +110°C.

3.7 PVO402P SERIES RELIABILITY DATA

HTRB (110°C, 400V) Test Results



(85°C/85%RH) Test Results



Rel#1545

Summary of Test Results

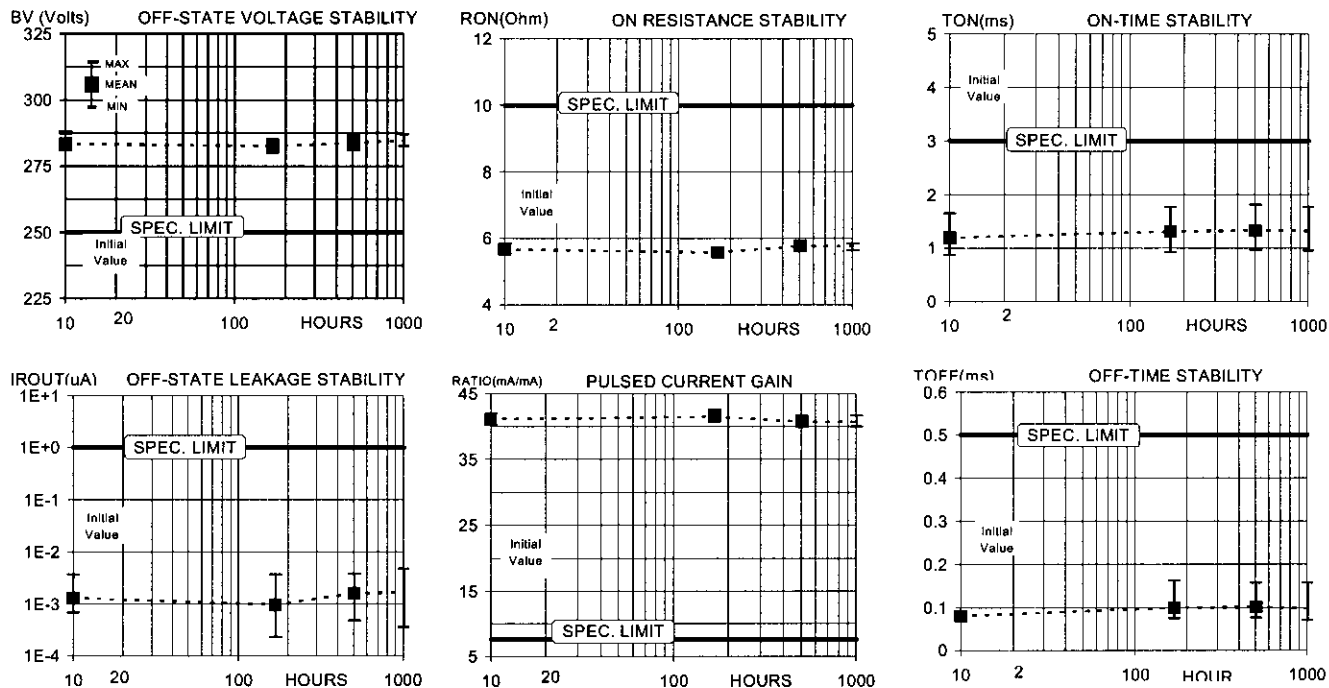
Test	# Devices	0 Hrs	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0	0	0	0	0	"C" Connection 400V
85°C/85% RH	10	0	0	0	0	0	"C" Connection 300V
Autoclave	10	0	0				See Appendix B
Temp Cycle	10	0 Cycles	250 Cycles	500 Cycles	1000 Cycles		-55°C to +150°C
Operating Life	10	0 Cycles	10 ⁴ Cycles	3x10 ⁴ Cycles	6x10 ⁴ Cycles		"C" Connection 50V, 170mA, 30 seconds on, 30 seconds off

Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

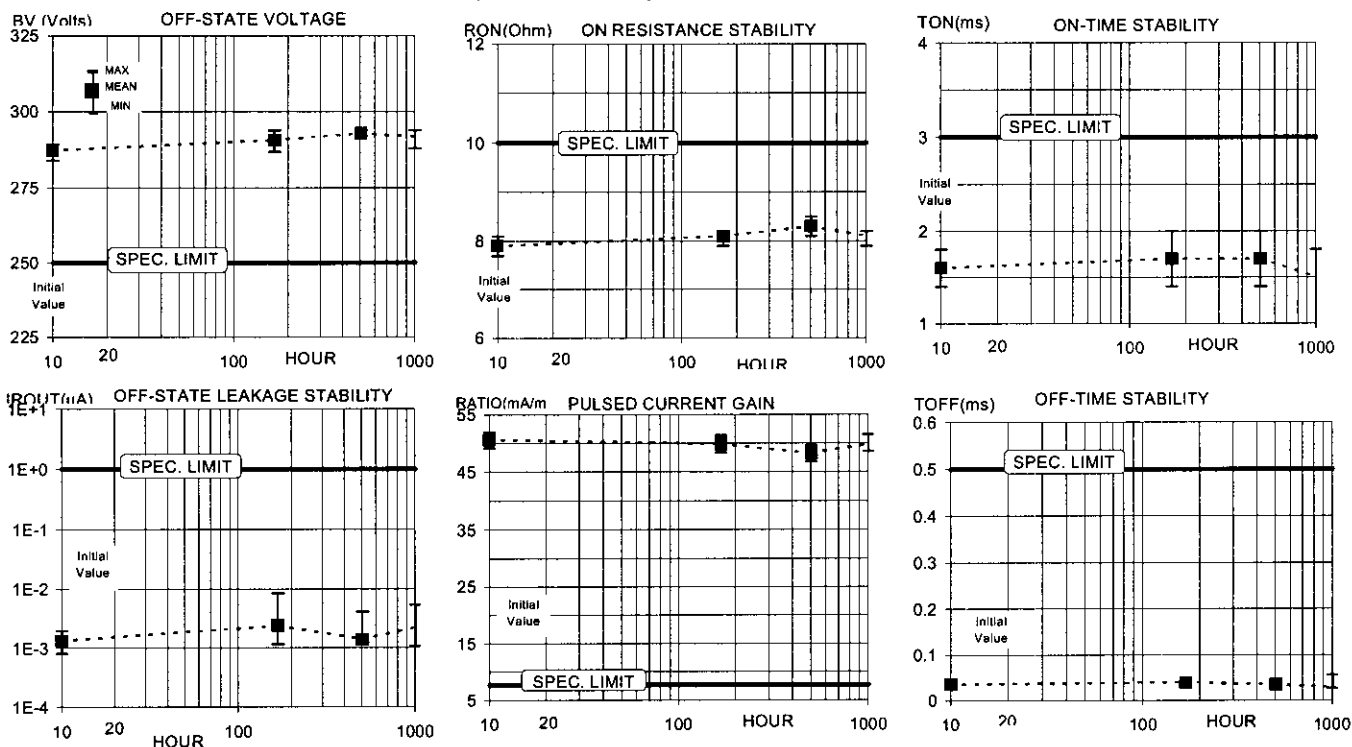
Notes:

3.8 PVT322 SERIES RELIABILITY DATA

HTRB (110°C, 400V) Test Results



(85°C/85%RH) Test Results



Rel#1541

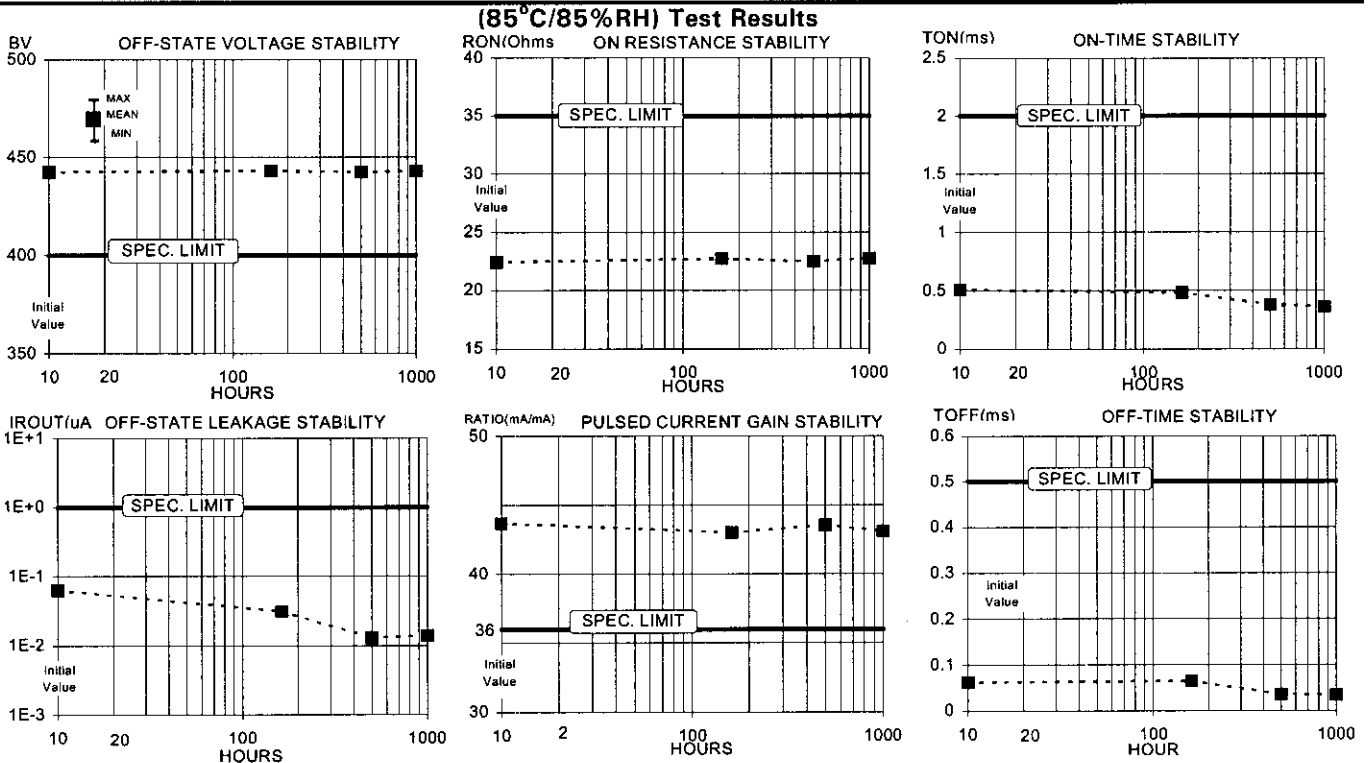
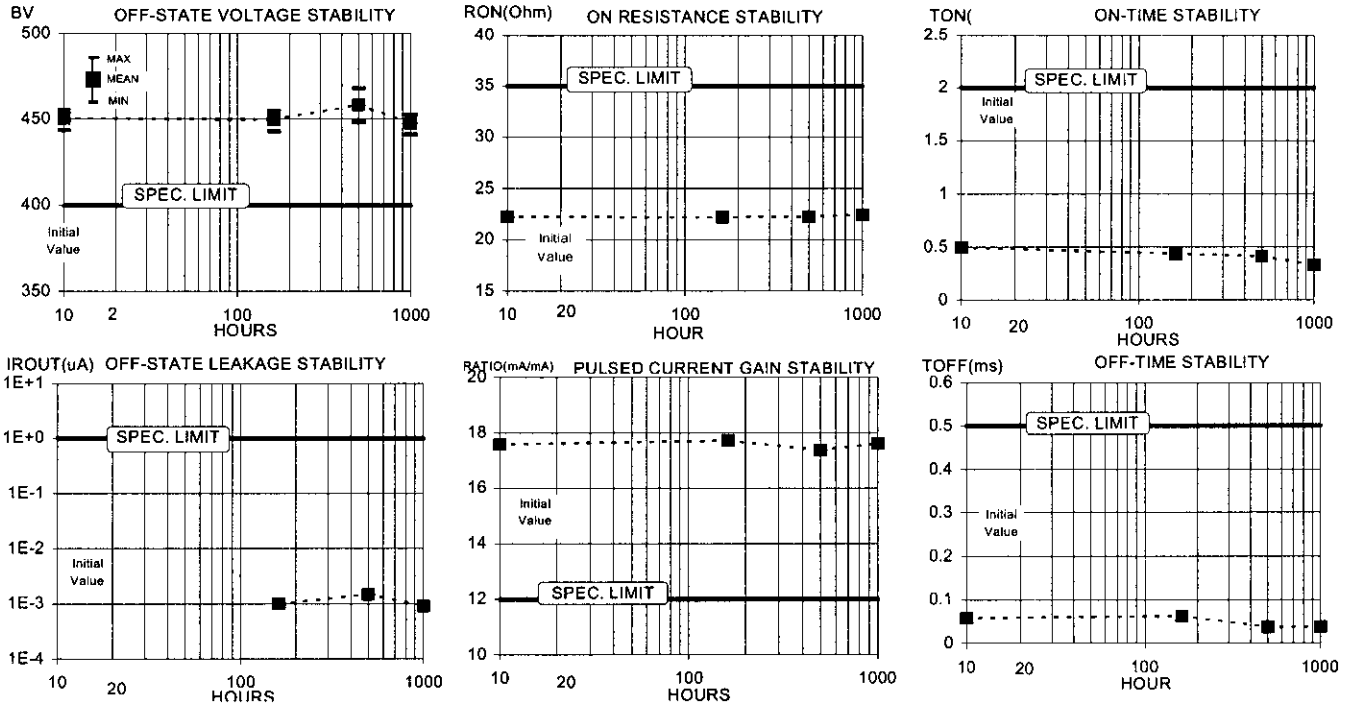
Summary of Test Results

Test	# Devices	0 Hrs	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	"C" Connection 400V
85°C/85% RH	10	0		0	0	0	"C" Connection 300V
Autoclave	10	0	0				See Appendix B
		0 Cycles	250 Cycles	500 Cycles	1000 Cycles		-55°C to +150°C
Temp Cycle	10	0	0	0	0		
		0 Cycles	10 ⁴ Cycles	3x10 ⁴ Cycles	6x10 ⁴ Cycles		"C" Connection 50V, 170mA, 30 seconds on, 30 seconds off
Operating Life	10	0	0	0	0		

Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

Notes:

3.9 PVT412L SERIES RELIABILITY DATA HTRB (110°C, 400V) Test Results



Rel#1548

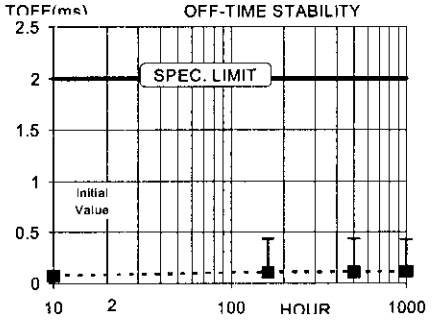
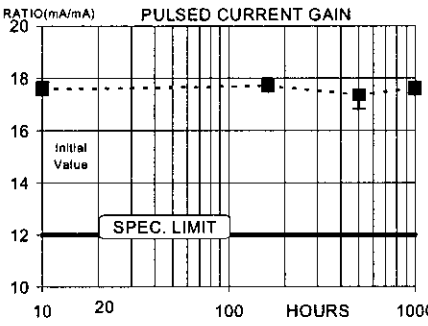
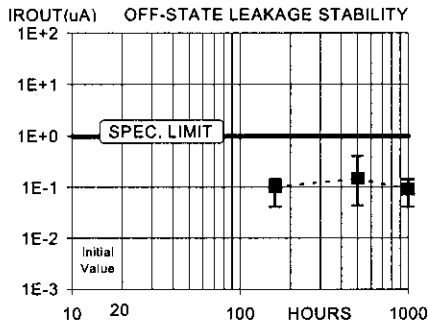
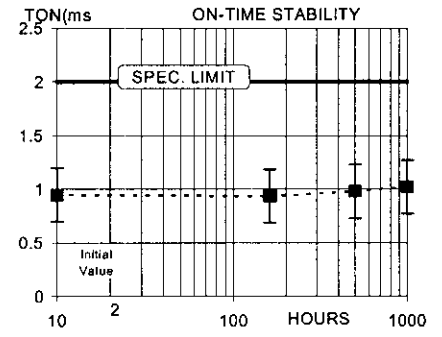
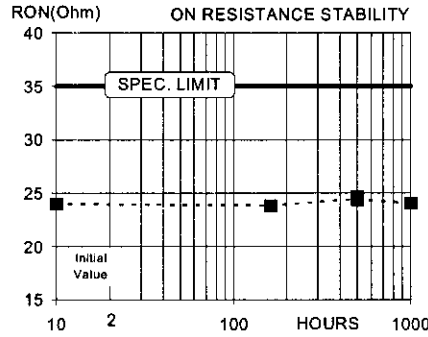
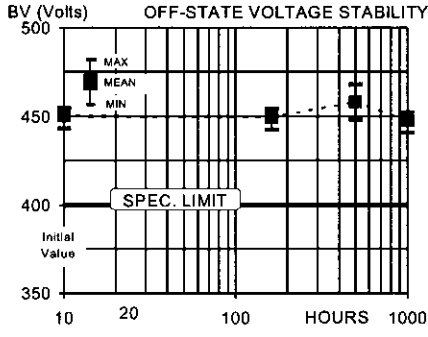
Summary of Test Results

Test	# Devices	0 Hrs	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	"C" Connection 400V
85°C/85% RH	10	0		0	0	0	"C" Connection 300V
Autoclave	10	0	0				See Appendix B
Temp Cycle	10	0 Cycles	250 Cycles	500 Cycles	1000 Cycles		-55°C to +150°C
Operating Life	10	0	10 ⁶ Cycles	3x10 ⁶ Cycles	6x10 ⁶ Cycles		"C" Connection 50V, 170mA, 30 seconds on, 30 seconds off

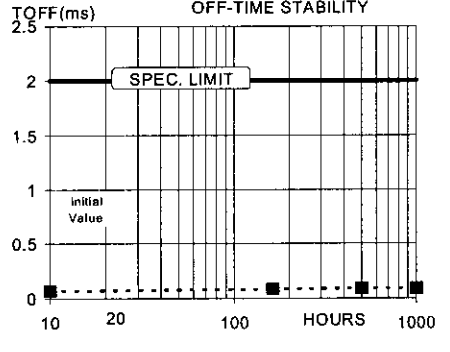
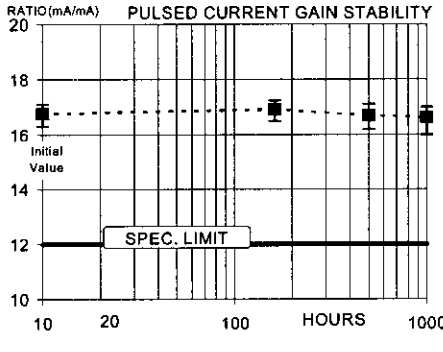
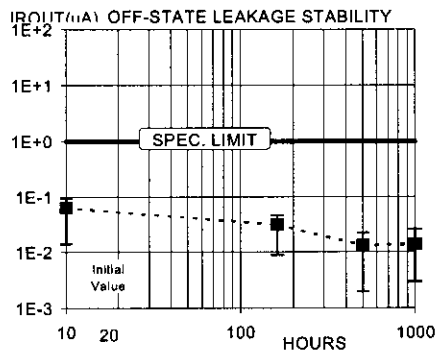
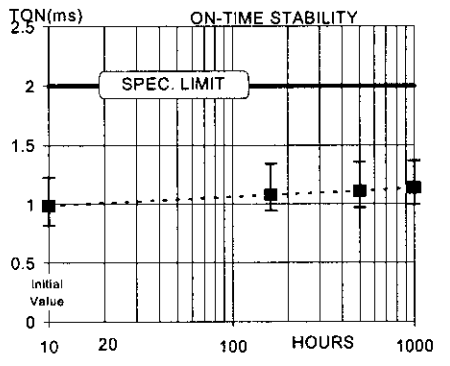
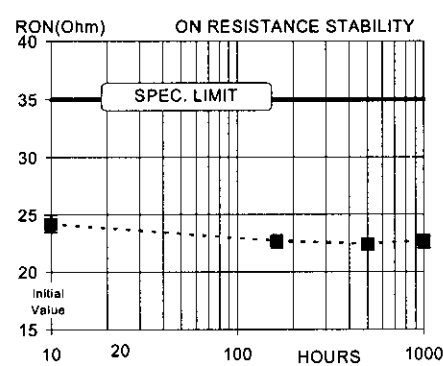
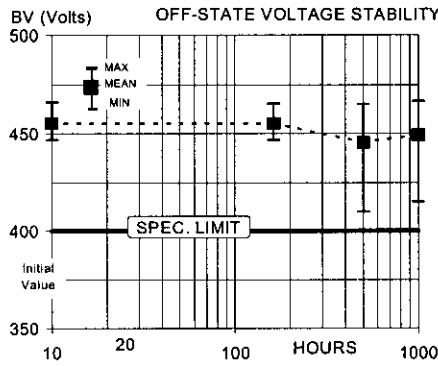
Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

Notes:

3.10 PVT422 SERIES RELIABILITY DATA
HTRB (110°C, 400V) Test Results



(85°C/85%RH) Test Results



Rel #1543

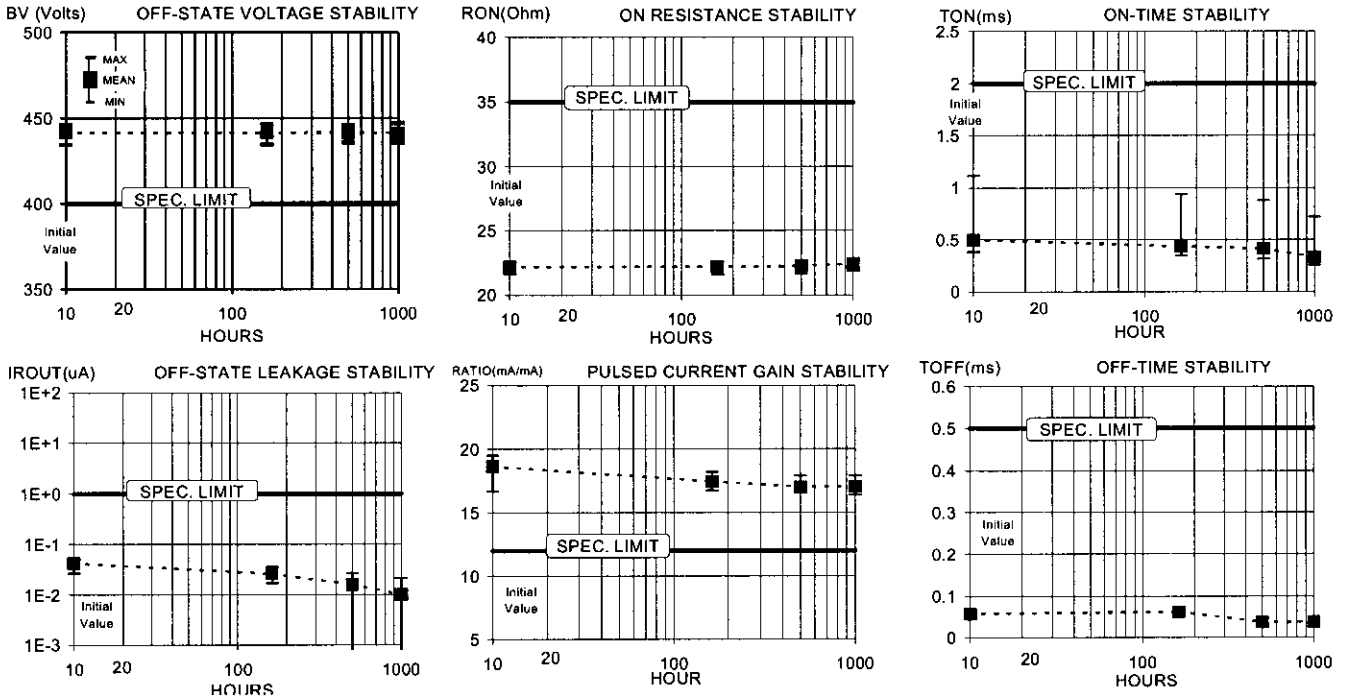
Summary of Test Results

Test	# Devices	0 Hrs	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	"C" Connection 400V
85°C/85% RH	10	0		0	0	0	"C" Connection 300V
Autoclave	10	0	0				See Appendix B
		0 Cycles	250 Cycles	500 Cycles	1000 Cycles		-55°C to +150°C
Temp Cycle	10	0	0	0	0		
		0 Cycles	10 ⁴ Cycles	3x10 ⁴ Cycles	6x10 ⁴ Cycles		"C" Connection 50V, 170mA,
Operating Life	10	0	0	0	0		30 seconds on, 30 seconds off

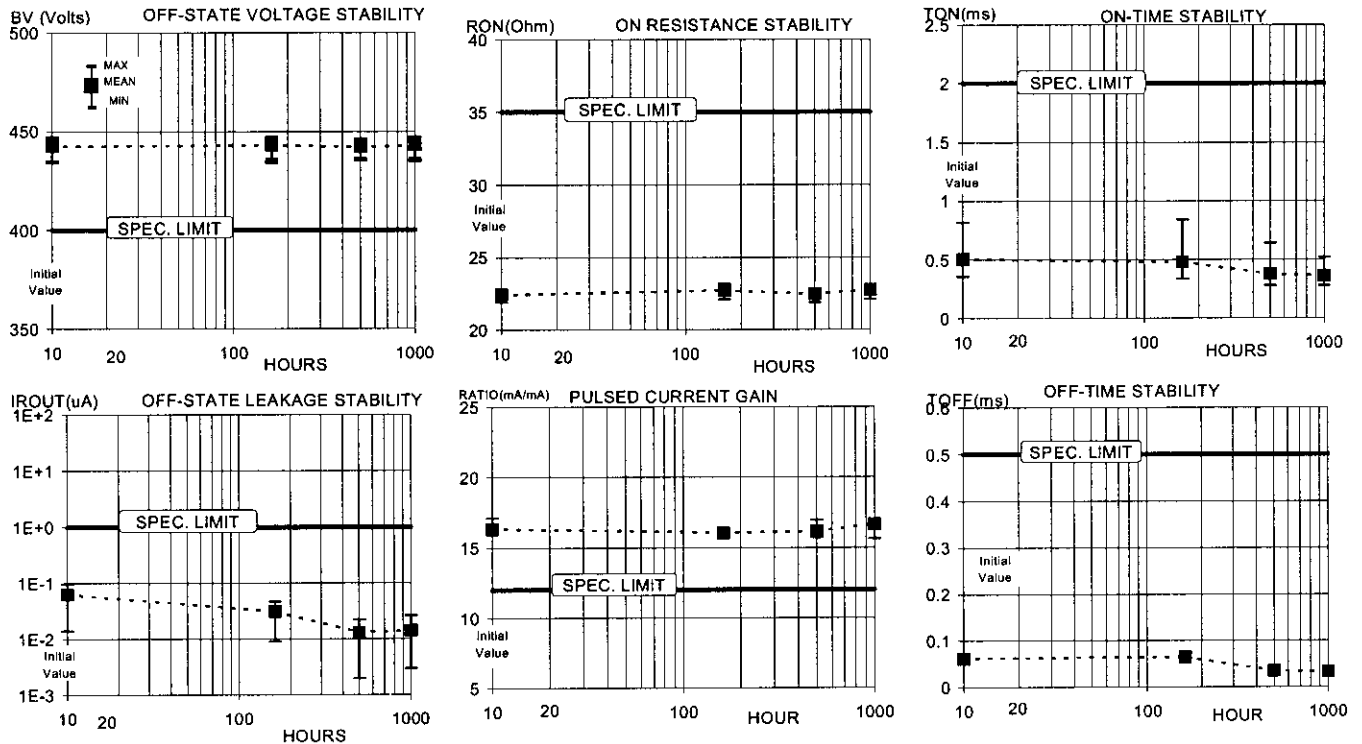
Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

Notes:

3.11 PVT422P SERIES RELIABILITY DATA HTRB (110°C, 400V) Test Results



(85°C/85%RH) Test Results



Rel#1544

Summary of Test Results

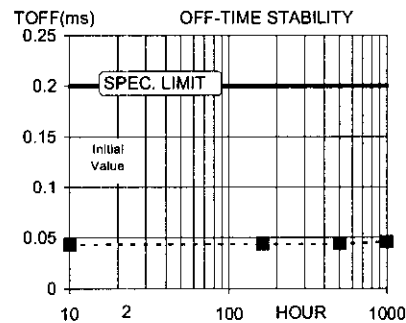
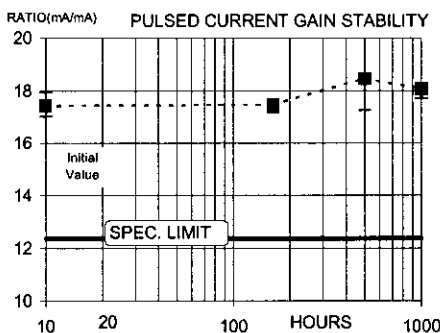
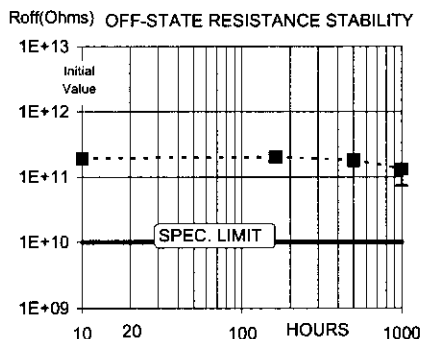
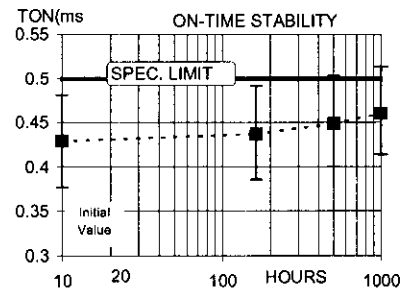
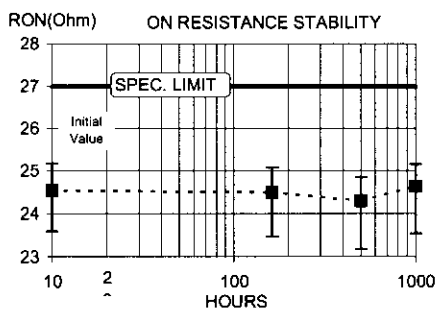
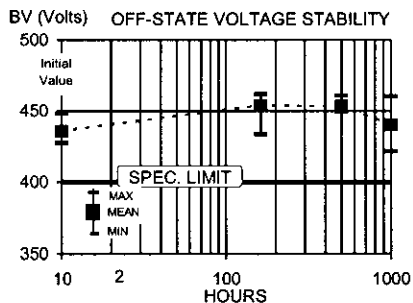
Test	# Devices	0 Hrs	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		0	0	0	"C" Connection 400V
85°C/85% RH	10	0		0	0	0	"C" Connection 300V
Autoclave	10	0	0				See Appendix B
		0 Cycles	250 Cycles	500 Cycles	1000 Cycles		-55°C to +150°C
Temp Cycle	10	0	0	0	0		
		0 Cycles	10 ⁴ Cycles	3x10 ⁴ Cycles	6x10 ⁴ Cycles		"C" Connection 50V, 170mA,
Operating Life	10	0	0	0	0		30 seconds on, 30 seconds off

Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

Notes:

3.12 PVU SERIES RELIABILITY DATA

HTRB (110°C, 400V) Test Results



(85°C/85%RH) 300V Test Results

Refer to PVT412 Graphs.

PVU series is mechanically identical and will yield similar performance results.

Rel# 1542

Summary of Test Results

Test	# Devices	0	16 Hrs	168 Hrs	504 Hrs	1008 Hrs	Remarks
HTRB	10	0		1-p (Ton)	1-p (Ton)	2-p (Ton)	"C" Connection 400V
85°C/85% RH	-						See Appendix B
Autoclave	10	0	0				
Temp Cycle	10	0 Cycles	250 Cycles	500 Cycles	750 Cycles	1000 Cycles	-55°C to +150°C
		0	4-p (Ton)	0	5-p (Ton)	3-p (Ton)	
Operating Life	-	0 Cycles	1x10 ⁴ Cycles	3X10 ⁴ Cycles	6x10 ⁴ Cycles		"C" Connection 170mA 50V 30sec on, 30sec off

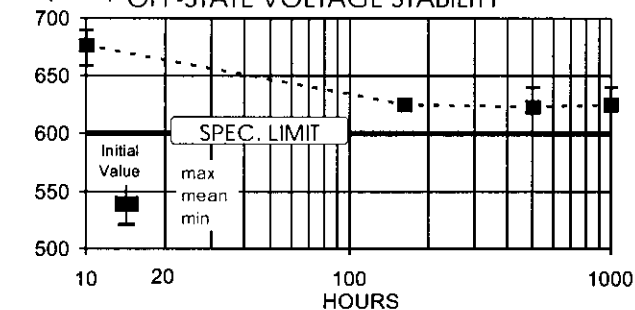
Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

Notes:

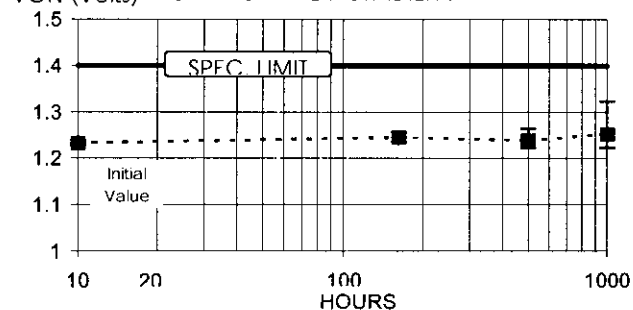
3.13 SPA SERIES RELIABILITY DATA

HTRB (110°C, 240V) Test Results

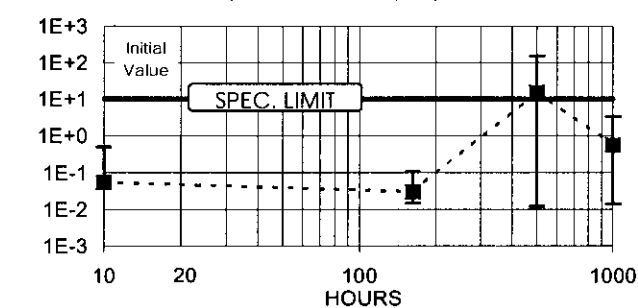
BV (Volts) OFF-STATE VOLTAGE STABILITY



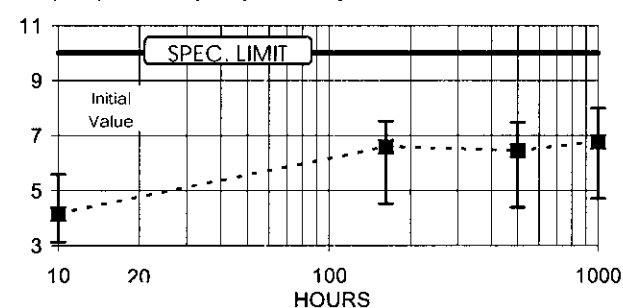
VON (Volts) ON-VOLTAGE STABILITY



IROUT (uA) OFF-STATE LEAKAGE STABILITY

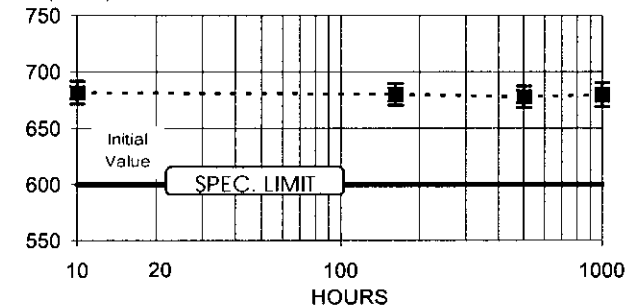


IPU (mA) SENSITIVITY STABILITY

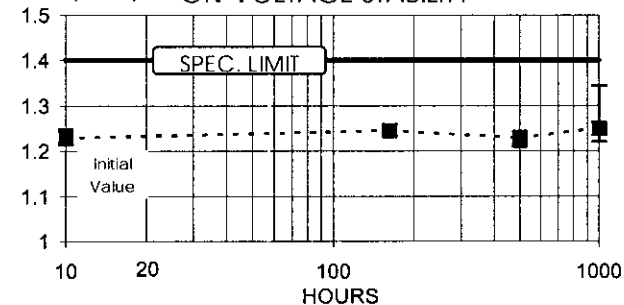


(85°C/85% RH) Test Results

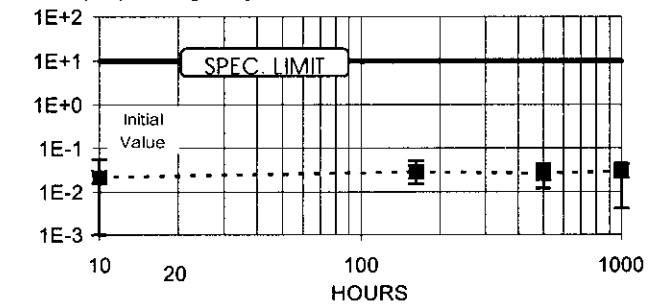
BV (Volts) OFF-STATE VOLTAGE STABILITY



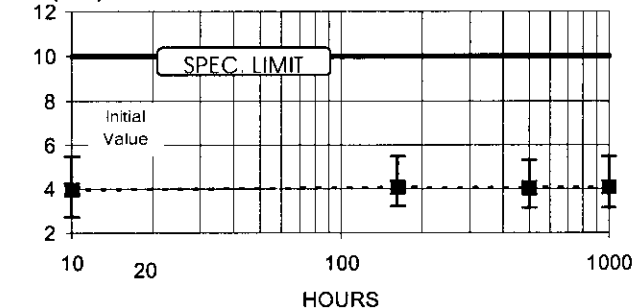
VON (Volts) ON-VOLTAGE STABILITY



IROUT (uA) OFF-STATE LEAKAGE STABILITY



IPU (mA) SENSITIVITY STABILITY



Rel# 1538

Summary of Test Results

Test	# Devices	0	16 hrs	168 hrs	504 hrs	1008 hrs	Remarks
HTRB	10	0		0	0	0	See Appendix B
85°C/85% RH	10	0		0	0	0	
Autoclave	10	0	0				
Temp Cycle	10	0 cycles	250 cycles	500 cycles	1000 cycles		-55°C to +150°C
		0 Cycles	5x10 ³ Cycles	1.5x10 ⁴	3x10 ⁴ Cycles		1 Amp, 120V _{RMS}
Operating Life	10	0	0	0	0		1 minute on, 1 minute off

Device Failures: p = parametric drift; c = catastrophic failure See Appendix A for definitions.

Notes:

APPENDIX A
PARAMETRIC/CATASTROPHIC FAILURE DEFINITIONS

1. **PARAMETRIC (p) FAILURES:** A “p” failure is a parametric drift which is between the specification limit and the Catastrophic Failure definition. A “p” failure is small enough not to cause system failure in a normal application.

2. **CATASTROPHIC (c) FAILURES:** A “c” failure is a parameter sufficiently beyond specification that a system malfunction would commonly occur.

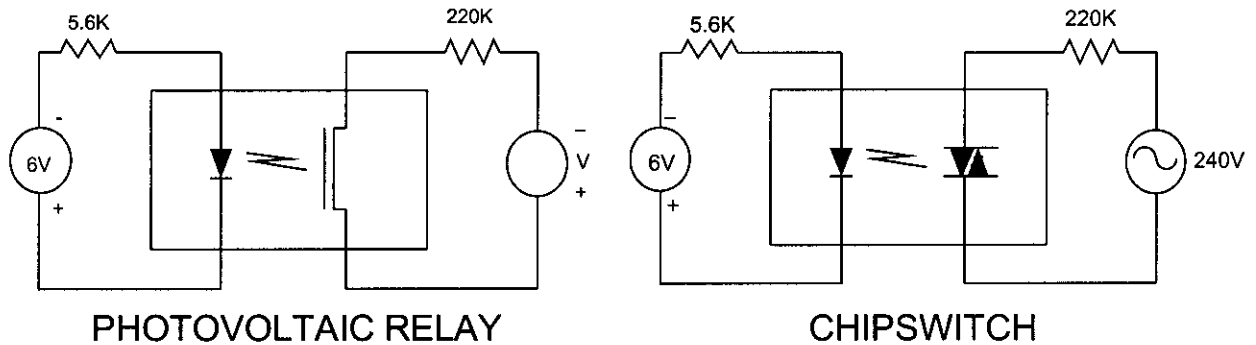
CATASTROPHIC FAILURE LIMITS

Relay Type	Off-State Blocking Voltage	Off-State Leakage or Resistance	On-State Voltage Drop or Resistance	Turn-On Pick-Up or Sensitivity	On and Off Response Times
ChipSwitch	-20%	100 Times Spec	+20%	+20%	Beyond 1/2 cycle
PhotoVoltaic	-20%	100 Times Spec	+20%	+20%	+40%

APPENDIX B ENVIRONMENTAL STRESS TEST CONDITIONS

HIGH TEMPERATURE REVERSE BIAS

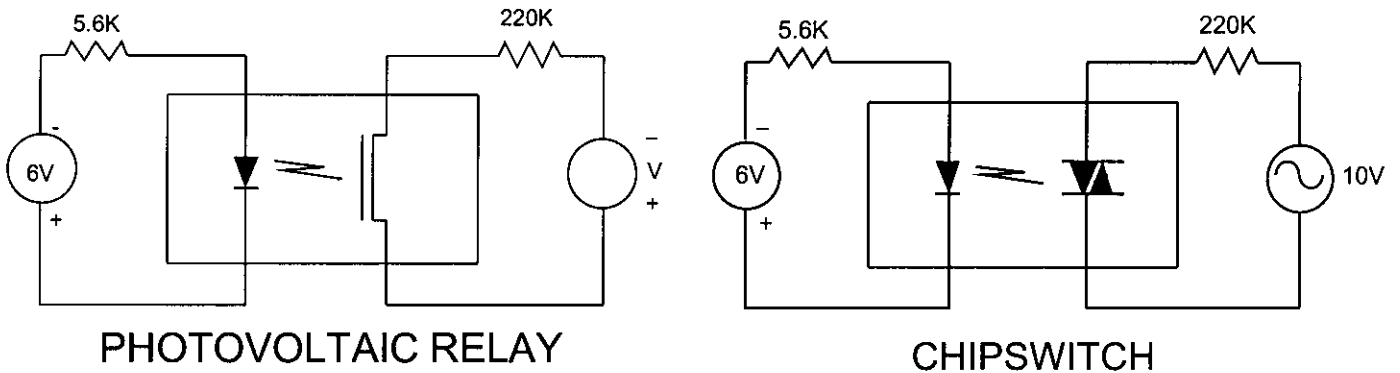
Temperature	$T_A = +150^{\circ}\text{C}$
Duration	1008 Hours
Bias	$V_A = 80\% - 100\%$ of Rated Voltage
	$V_B = 6$ Volts



PURPOSE: The purpose of high temperature bias testing is to stress the devices with an applied bias in the blocking mode while at elevated junction temperatures. This will accelerate any blocking voltage degradation process.

2. TEMPERATURE/HUMIDITY 85°C/85% RH

Temperature	$T_A = +85^\circ\text{C}$
Relative Humidity	85%
Duration	1008 Hours
Bias	Varies with Model



Purpose: The purpose of 85/85 (temperature-humidity-bias) testing is to subject non-hermetic encapsulated devices to temperature and humidity extremes with bias on both logic and power sections of the die. This test is a method of examining the ability of a non-hermetic package to withstand the deleterious effect of a humid environment. The devices are placed in a temperature and humidity chamber at ambient pressure and are biased in the blocking mode.

AUTOCLAVE

Temperature	$T_A = +121^\circ\text{C}$
Relative Humidity	100%
Pressure	$P_A = 15 \text{ psig}$
Duration	16 Hours
Bias	No bias applied during testing.

PURPOSE: The purpose of autoclave (HAST, Highly Accelerated Stress Testing) testing is to subject non-hermetic encapsulated devices at temperature-humidity-pressure conditions accelerated above "standard" 85°C/85% RH tests. This test is being evaluated as a potential accelerated temperature/humidity test that would provide a more effective process control monitor. The devices are placed unbiased in a pressure cooker chamber for the specified time, removed and examined for physical and electrical degradations.

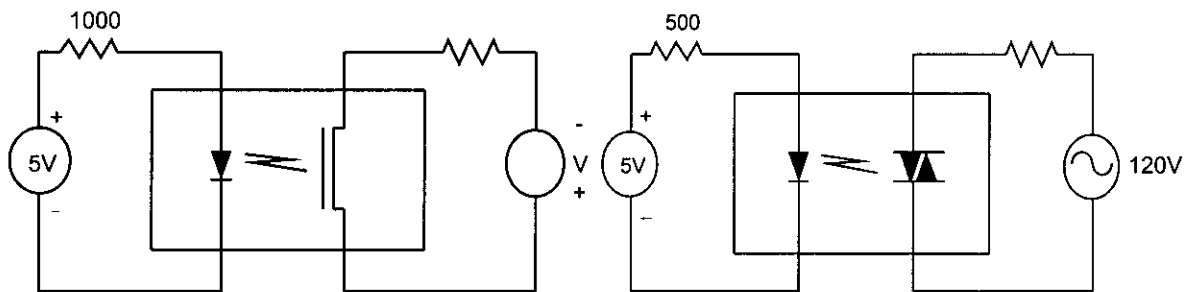
TEMPERATURE CYCLING

Temperature	$T_{A(min.)} = -55^{\circ}\text{C}$ $T_{A(max.)} = +150^{\circ}\text{C}$
Duration	1000 Cycles
Bias	No bias applied during testing.

PURPOSE: The purpose of temperature cycling is to simulate thermal stresses which devices will encounter in the actual circuit applications (as with operational life testing) in combination with potentially extreme operating ambient temperature. Some equipment is destined to be used in extreme conditions, subject to daily temperature cycles.

POWER CYCLING

Temperature	$T_A = +25^{\circ}\text{C}$
Duration	Varies with Model
Input On-Current	6 mA
Output On-Current	Varies with Model
Off Bias	Varies with Model
Frequency	50% Duty Cycle



PHOTOVOLTAIC RELAY

CHIPSWITCH

PURPOSE: The purpose of Power Cycling is to simulate the thermal and current pulsing stresses which the devices will encounter in the actual circuit applications when either the equipment is turned on and off or the power is applied to the device in short bursts interspersed with quiescent, low power periods. The simulation is achieved by the on/off application of power to each device.

CS60 Ipu2R HTRB

APPENDIX C

S. Brown

Date	5/20/93	5/20/93	6/23/93	10/22/93	10/22/93	10/28/93	10/28/93	11/30/93	11/30/93	2/25/94	3/23/94	3/23/94	10/26/94	4/24/95	8/7/95	8/28/95	11/13/95	3/18/96	6/13/96
Lot #	4697A-1	4744A-1	4798A	4793B-1	6536-1	6312A-1	6670-1	6420A-1	6224-1	6643A-1	6926-1	7036-1	7450-1	7368-1	7652A-1	7109-1	7246-3	G6820-2	G7806-1
avg. pcf/inh	1.36	1.82	1.46	1.3	1.53	1.75	1.94	1.73	1.76	2.01	2	1.96	1.76	1.6	1.53	1.57	1.82	1.57	1.55
1 day pcf/inh	0.35	0.25	0.21	0.07	0.26	0.34	0.28	0.21	0.12	0.22	0.16	0.19	0.11	0.27	0.17	0.19	0.25	0.11	0.15
4 day avg pcf/inh	0.06	0.09	0.12	-0.01	0.02	0.27	0.25	1.16	0.93	-0.06	0.05	0.07	0.13	0.36	0.38	0.5	0.82	0.1	0.23
del 1 sig fig	0.15	0.09	0.03	0	0	0.22	0.01	0.76	0.26	-0.01	0.02	0.03	0.04	0.16	0.47	0.26	0.18	0.04	-0.01

MHO-83553

