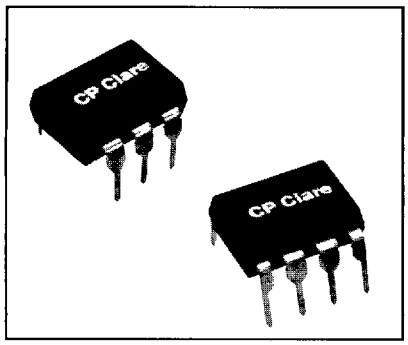
OptoMOS® Solid State Switches



DESCRIPTION

Single or dual output OptoMOS solid state switches are part of CP Clare's growing family of solid state switching devices (Loads up to 400 volts AC or DC and currents up to 1 Amp). As replacements for form "A"/"B"/"C" or dual form "A"/"B" electromechanical relays, these devices use a proprietary photovoltaic circuit and MOSFET switching elements for reliable bounce-free switching operation. Complimentary output devices require no auxillary supply current to maintain an on-state condition.

FEATURES

- Small 6 and 8 pin DIP Packages
- 2mW Drive Power (Logic Compatible)
- No Moving Parts
- Loads up to 400V AC/DC and 1 Amp (1P) or 170mA (2P)
- Expected Life > 15 Billion Operations
- Arc-Free with No Snubbing Circuits
- 3750V_{RMS} Input/Output Isolation
- FCC Compatible
- No EMI/RFI Generation
- Machine Insertable, Wave Solderable
- Surface Mount, Flatpack and Tape & Reel Version Available
- UL Recognized: File Number E76270
- CSA, VDE Compatible
- BABT: Certified to BS415:1990- Certificate Numbers 7023 and 7726
- BABT: Certified to BS EN60950: 1992 (BS7002: 1992) Certificate Numbers 7344 and 7727
- BABT: Complies with EN41003: 1993

APPLICATIONS

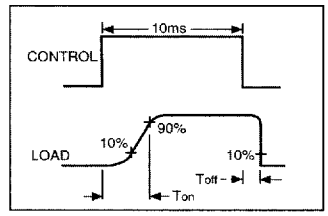
- Telecommunications
  - Telecom Switching
  - Tip/Ring Circuits
  - Modem Switching (Laptop, Notebook, Pocket Size)
  - Hookswitch
  - Dial Pulsing
  - Ground Start
  - Ringer Injection
- Instrumentation
  - Multiplexers
  - Data Acquisition
  - Electronic Switching
  - I/O Subsystems
  - Meters (Watt-Hour, Water, Gas)
  - Medical Equipment
- Security
- Aerospace
- Industrial Controls

RATINGS (@ 25°C)

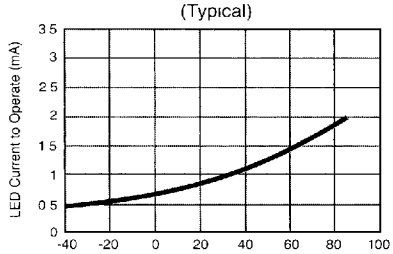
Parameter	Min	Typ	Max	Units
Input Power Dissipation	—	—	150[1]	mW
Input Control Current	—	—	100	mA
Peak (10msec)	—	—	1	A
Reverse Input Voltage	—	—	5	V
Total Power Dissipation	—	—	800[2]	mW
Capacitance				
Input to Output	—	3	—	pF
Isolation Voltage				
Input to Output	2500	—	—	V_{RMS}
"E" Suffix (Optional)	3750	—	—	V_{RMS}
Operating Temperature	– 40	—	85	°C
Storage Temperature	– 40	—	125	°C
Soldering Temperature (10 Seconds Max)	—	—	260	°C

[1] Derate Linearly 1 33 mW/°C
[2] Derate Linearly 6 67 mW/°C

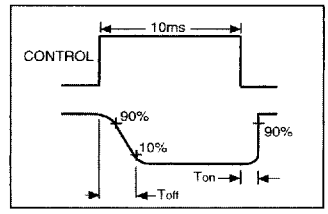
Switching Characteristics of Normally Open (Form A) Devices



LED Operate Current vs Ambient Temperature Characteristics (Typical)



Switching Characteristics of Normally Closed (Form B) Devices



OptoMOS® Solid State Switches

1 Form A Relays

Specifications **Output Characteristics @ 25°C**

Part Number		PLA110	PLA140	PLA150	LCA110	LCA120	LCA125	LCA127	LCA710	OMA160	Units
Contact Form		1 Form A	1 Form A	1 Form A	1 Form A	1 Form A	1 Form A	1 Form A	1 Form A	1 Form A	
Load Voltage (Peak)		400	400	250	350	250	300	250	60	250	V
Load Current (Continuous)											
X-Configuration		150	250	170	120	170	170	170	1000	50	mA
Y-Configuration		210	350	300	200	300	300	300	1800	80	
Peak Load Current											
(10ms Max.)		400	500	500	350	400	400	400	5000	100	mA
On-Resistance											
@ Rated Load Current											
X-Configuration	Typ	15	6	5	23	12	10	8	0.3	50	Ω
	Max	22	8	7	35	20	16	10	0.5	100	
Y-Configuration	Typ	5	2	1	7	4	4	2	0.1	15	
	Max	7	3	2	10	6	5	3	0.15	30	
Off State Leakage Current											
@ Rated Load Voltage	Max	1	1	1	1	1	1	1	1	0.025	µA
Switching Times											
Control Current		5	5	5	2/5	5	5	5	10	10	mA
T_{ON}	Typ	0.4	0.6	0.8	1.2/1	1.2	1.2	3	1	0.085	ms
	Max	1	1.5	2.5	5/3	5	5	5	2.5	0.125	
T_{OFF}	Typ	0.1	0.1	0.1	1/1	1	1	2	0.06	0.050	ms
	Max	0.25	0.25	0.25	3/3	5	5	5	0.25	0.125	
Output Capacitance											
@ 50V, f = 1MHz	Typ	35	110	110	25	50	50	110	220	5	pF

Input Characteristics @ 25°C

Input Control Current											
I_{LED}	Min	5	5	5	2	5	5	5	10	10	mA
	Max	100	100	100	100	100	100	100	100	100	
Input Dropout Current											
I_{LED}	Min	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	mA
	Typ	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
Input Voltage Drop											
	Min	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	
V_F @ 5mA	Typ	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	V
	Max	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	
Reverse Input Voltage	Max	5	5	5	5	5	5	5	5	5	V
Reverse Input Current	Max	10	10	10	10	10	10	10	10	10	µA

Input to Output Capacitance	Typ	3	3	3	3	3	3	3	3	3	pF
Input to Output Isolation		2500	2500	2500	2500	2500	2500	2500	2500	2500	V_{RMS}
With "E" Suffix (optional)		3750	3750	3750	3750	3750	3750	3750	3750	3750	
Current Limiting[1] Version Available		Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	

[1] Current limiting typically adds 5 ohms to the total on-resistance of the device.

OptoMOS Solid State Switches

1 Form B Relays

Specifications

Output Characteristics @ 25°C

Part Number		LCB110	LCB120	LCB127	Units
Contact Form		1 Form B	1 Form B	1 Form B	
Load Voltage (Peak)		350	250	250	V
Load Current (Continuous)					
X-Configuration		120	170	170	mA
Y-Configuration		200	300	300	
Peak Load Current					
(10ms Max.)		350	400	400	mA
On-Resistance					
@ Rated Load Current					
X-Configuration	Typ	23	16	8	Ω
	Max	35	20	10	
Y-Configuration	Typ	7	5	2	
	Max	10	6	3	
Off State Leakage Current					
@ Rated Load Voltage	Max	1	1	1	µA
Switching Times					
Control Current		5	5	5	mA
T_{ON}	Typ	0.5	1	2	ms
	Max	3	5	5	
T_{OFF}	Typ	0.7	1.2	3	ms
	Max	3	5	5	
Output Capacitance					
@ 50V, f = 1MHz	Typ	25	50	100	pF

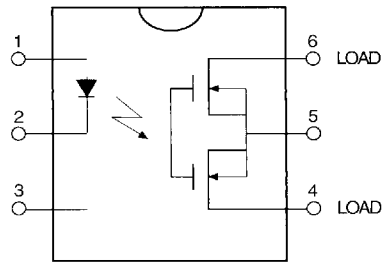
Input Characteristics @ 25°C

Input Control Current					
I_{LED}	Min	5	5	5	mA
	Max	100	100	100	
Input Dropout Current					
I_{LED}	Min	0.4	0.4	0.4	mA
	Typ	0.7	0.7	0.7	
Input Voltage Drop					
	Min	0.9	0.9	0.9	
V_F @ 5mA	Typ	1.2	1.2	1.2	V
	Max	1.4	1.4	1.4	
Reverse Input Voltage	Max	5	5	5	V
Reverse Input Current	Max	10	10	10	µA

Input to Output Capacitance					
	Typ	3	3	3	pF
Input to Output Isolation		2500	2500	2500	V_{RMS}
With "E" Suffix (optional)		3750	3750	3750	
Current Limiting[1]					
Version Available		No	No	No	

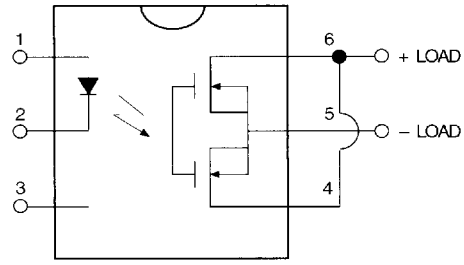
[1] Current limiting typically adds 5 ohms to the total on-resistance of the device

X-Configuration
(AC or DC Configuration)



Pin Connections
1 + Control
2 – Control
3 Do not use
6 Load
5 Do not use
4 Load

Y-Configuration
(DC Only Configuration)



Pin Connections
1 + Control
2 – Control
3 Do not use
4 and 6 + Load
5 – Load

► **NOTE:**
For Mechanical Dimensions refer to page 20.

OptoMOS® Solid State Switches

2 Form A Relays

Specifications

Output Characteristics @ 25°C

Part Number		PAA110[3]	PAA140[3]	PAA150[3]	LAA110[3]	LAA120[3]	LAA125[3]	LAA127[3]	OAA160[3]	Units
Contact Form		2 Form A	2 Form A	2 Form A	2 Form A	2 Form A	2 Form A	2 Form A	2 Form A	
Load Voltage (Peak)		400	400	250	350	250	300	250	250	V
Load Current[2] (Continuous)		150	250	170	120	170	170	170	50	mA
Peak Load Current (10ms Max.)		400	500	500	350	400	400	400	100	mA
On-Resistance @ Rated Load Current	Typ	15	6	5	23	12	10	8	50	Ω
	Max	22	8	7	35	20	16	10	100	
Off State Leakage Current @ Rated Load Voltage	Max	1	1	1	1	1	1	1	0.025	µA
Switching Times										
Control Current		5	5	5	5	5	5	5	10	mA
T_{ON}	Typ	0.4	0.6	0.8	0.7	1.2	1.2	3	0.085	ms
	Max	1	1.5	2.5	3	5	5	5	0.125	
T_{OFF}	Typ	0.1	0.1	0.1	0.5	1	1	2	0.050	ms
	Max	0.25	0.25	0.25	3	5	5	5	0.125	
Output Capacitance @ 50V, f = 1MHz	Typ	35	110	110	25	50	50	110	5	pF

Input Characteristics @ 25°C

Input Control Current I_{LED}	Min	5	5	5	5	5	5	5	10	mA
	Max	100	100	100	100	100	100	100	100	
Input Dropout Current I_{LED}	Min	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	mA
	Typ	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
Input Voltage Drop	Min	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	
V_F @ 5mA	Typ	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	V
	Max	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	
Reverse Input Voltage	Max	5	5	5	5	5	5	5	5	V
Reverse Input Current	Max	10	10	10	10	10	10	10	10	µA

Input to Output Capacitance	Typ	3	3	3	3	3	3	3	3	pF
Input to Output Isolation		2500	2500	2500	2500	2500	2500	2500	2500	V_{RMS}
With "E" Suffix (optional)		3750	3750	3750	3750	3750	3750	3750	3750	
Current Limiting[1] Version Available		Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	

[1] Current limiting typically adds 5 ohms to the total on-resistance of the device
[2] If both poles operate simultaneously load current derates so as not to exceed the package power dissipation value
[3] Available in low profile flatpack

► **NOTE: For Mechanical Dimensions refer to page 20.**

OptoMOS Solid State Switches

2 Form B / 1 Form B - 1 Form A / 1 Form C Relays

Specifications

Output Characteristics @ 25°C

Part Number		LBB110[2]	LBB120[2]	LBB127[2]	LBA110[2]	LBA120[2]	LBA127	LCC110	LCC120	Units
Contact Form		2 Form B	2 Form B	2 Form B	1 Form B 1 Form A	1 Form B 1 Form A	1 Form B 1 Form A	1 Form C	1 Form C	
Load Voltage (Peak)		350	250	250	350	250	250	350	250	V
Load Current (Continuous)		120	170	170	120	170	170	120	170	mA
Peak Load Current (10ms Max.)		350	400	400	350	400	400	350	400	mA
On-Resistance @ Rated Load Current	Typ	23	16	8	23	16	8	23	16	Ω
	Max	35	20	10	35	20	10	35	20	
Off State Leakage Current @ Rated Load Voltage	Max	1	1	1	1	1	1	1	1	µA
Switching Times										
Control Current		5	5	5	5	5	5	8	10	mA
T_{ON}	Typ	0.5	1	2	—	—	—	—	—	ms
	Max	3	5	5	3	5	5	4	5	
T_{OFF}	Typ	0.7	1.2	3	—	—	—	—	—	ms
	Max	3	5	5	3	5	5	4	5	
Output Capacitance @ 50V, f = 1MHz	Typ	25	50	110	25	50	110	25	50	pF

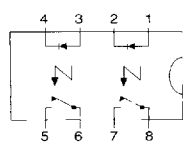
Input Characteristics @ 25°C

Input Control Current I_{LED}	Min	5	5	5	5	5	5	8	10	mA
	Max	100	100	100	100	100	100	100	100	
Input Dropout Current I_{LED}	Min	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	mA
	Typ	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	
Input Voltage Drop	Min	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	
V_F @ 5mA	Typ	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	V
	Max	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	
Reverse Input Voltage	Max	5	5	5	5	5	5	5	5	V
Reverse Input Current	Max	10	10	10	10	10	10	10	10	µA

Input to Output Capacitance	Typ	3	3	3	3	3	3	3	3	pF
Input to Output Isolation		2500	2500	2500	2500	2500	2500	2500	2500	V_{RMS}
With "E" Suffix (optional)		3750	3750	3750	3750	3750	3750	3750	3750	
Current Limiting[1] Version Available		No	No	No	No Yes	No Yes	No Yes	No	No	

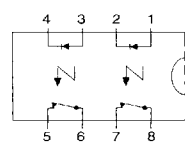
[1] See page 6
[2] Available in low profile flatpack

PAA/LAA/OAA



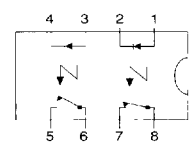
CONNECTIONS
1,2 Control, Pole 1
3,4 Control Pole 2
5,6 Normally-Open Pole 2
7,8 Normally-Open Pole 1

LBB



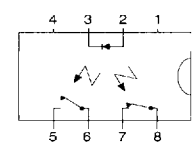
CONNECTIONS
1,2 Control, Pole 1
3,4 Control Pole 2
5,6 Normally-Closed Pole 2
7,8 Normally Closed Pole 1

LBA



CONNECTIONS
1,2 Normally-Closed Control
3,4 Normally-Open Control
5,6 Normally-Open Pole
7,8 Normally-Closed Pole

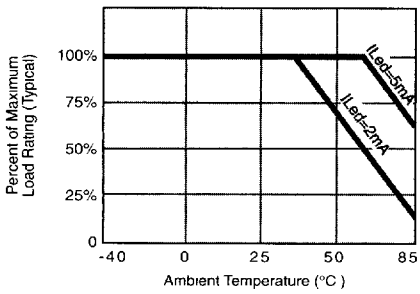
LCC



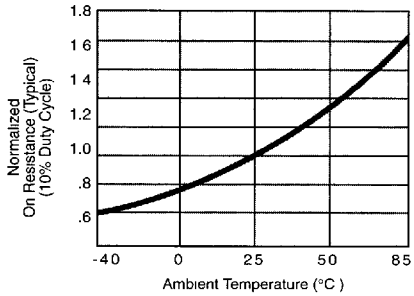
CONNECTIONS
1 Do not Use
2+ + Control
3 - Control
4 Do not Use
5,6 Normally-Open Pole
7,8 Normally Closed Pole

OptoMOS® Performance Data

1) Load Current vs Ambient Temperature Characteristics

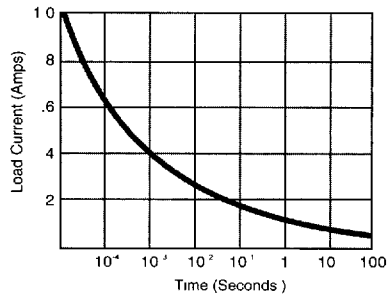


2) Normalized On-Resistance vs. Ambient Temperature

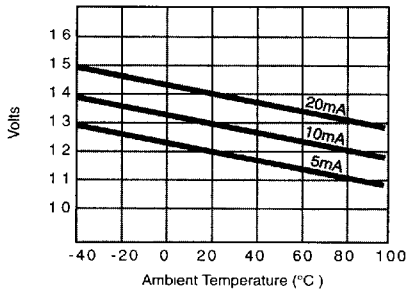


3) Energy Rating Curve

Load Current vs Time

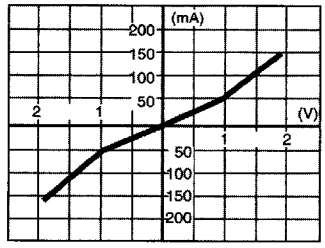


4) Typical Forward Voltage vs Temperature (VF)



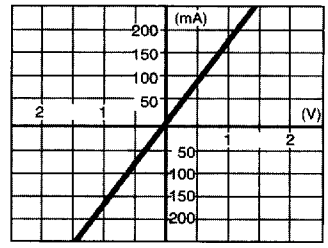
5) PLA110, PAA110

Load Voltage vs. Load Current Characteristics (Typical)



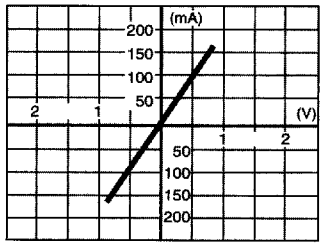
6) PLA140, PAA140

Load Voltage vs. Load Current Characteristics (Typical)



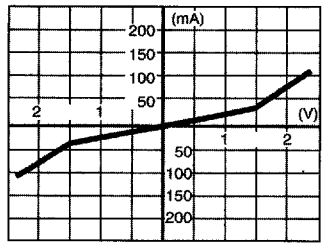
7) PLA150, PAA150

Load Voltage vs. Load Current Characteristics (Typical)



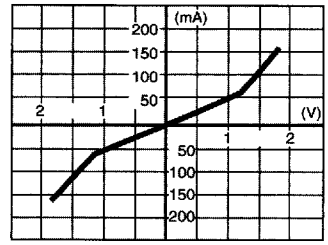
8) LCA110, LAA110, LCB110 LBB110, LBA110, LCC110

Load Voltage vs. Load Current Characteristics (Typical)



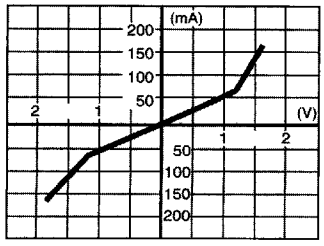
9) LCA120, LAA120, LCB120 LBB120, LBA120, LCC120

Load Voltage vs. Load Current Characteristics (Typical)



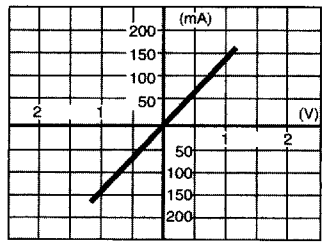
10) LCA125, LAA125

Load Voltage vs Load Current Characteristics (Typical)



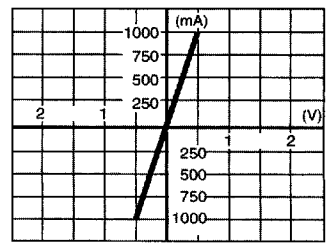
11) LCA127, LAA127, LCB127 LBB127, LBA127

Load Voltage vs. Load Current Characteristics (Typical)



12) LCA710

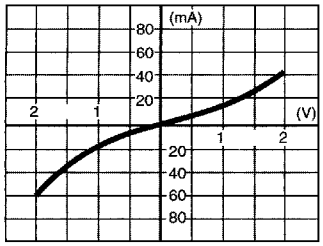
Load Voltage vs. Load Current Characteristics (Typical)



OptoMOS Performance Data

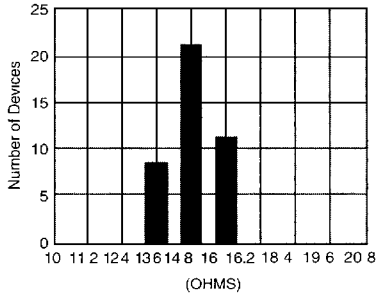
13) OMA160, OAA160

Load Voltage vs. Load Current Characteristics (Typical)



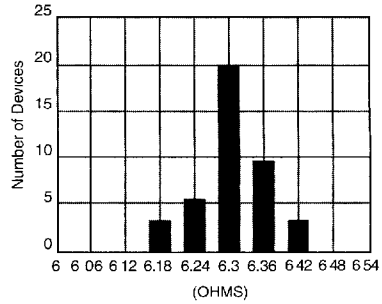
14) PLA110, PAA110

On-Resistance Distribution (N=40: Ambient Temp = 25 Deg C)



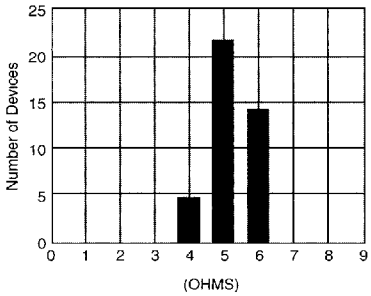
15) PLA140, PAA140

On-Reistsance Distribution (N=40. Ambient Temp = 25 Deg C)



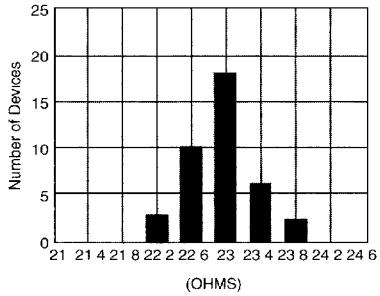
16) PLA150, PAA150

On-Resistance Distribution (N=40. Ambient Temp = 25 Deg C)



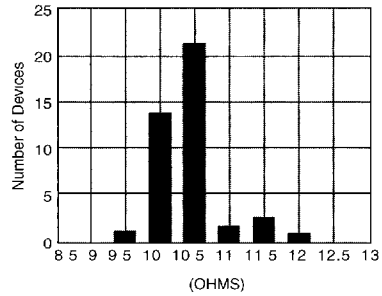
17) LCA110, LAA110, LCB110, LBB110, LCC110

On-Resistance Distribution (N=40 Ambient Temp = 25 Deg C)



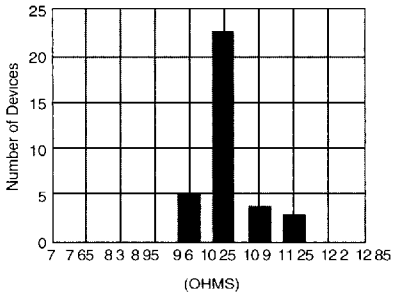
18) LCA120, LAA120, LCB120, LBB120, LCC120

On-Resistance Distribution (N=40 Ambient Temp = 25 Deg C)



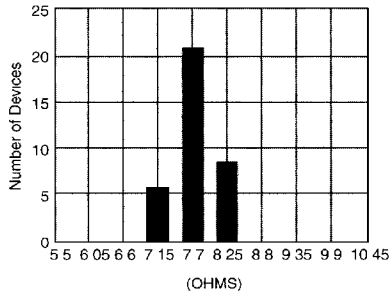
19) LCA125, LAA125

On-Resistance Distribution (N=40: Ambient Temp = 25 Deg C)



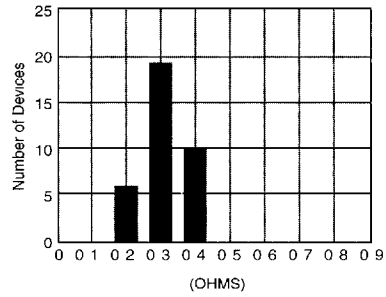
20) LCA127, LAA127, LCB127, LBB127, LBA127

On-Resistance Distribution (N=40: Ambient Temp = 25 Deg C)



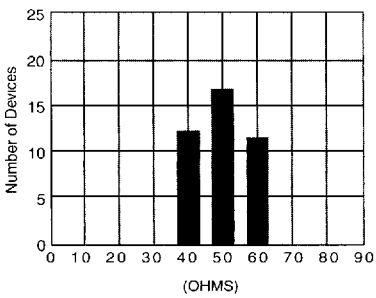
21) LCA710

On-Resistance Distribution (N=40: Ambient Temp = 25 Deg C)



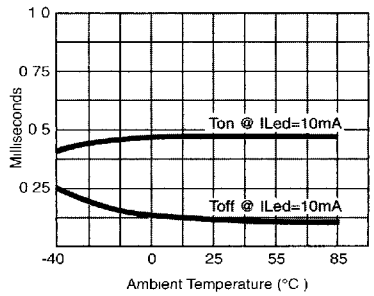
22) OMA160, OAA160

On-Resistance Distribution (N=40 Ambient Temp = 25 Deg C)



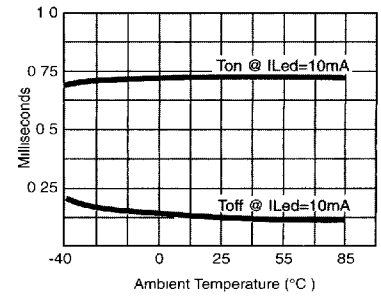
23) PLA110, PAA110

Switching Speed vs Temperature (Typical)



24) PLA140, PAA140

Switching Speed vs Temperature (Typical)



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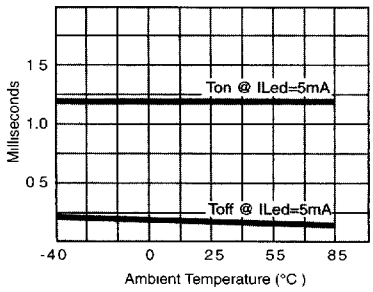
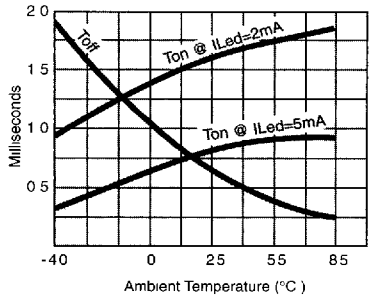
25) PLA150, PAA150

Switching Speed vs Temperature
(Typical)



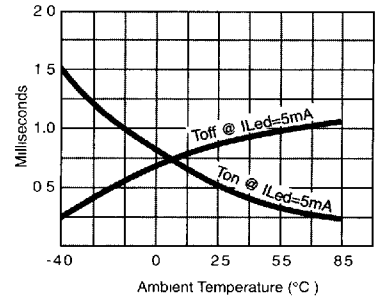
26) LCA110, LAA110

Switching Speed vs Temperature
(Typical)



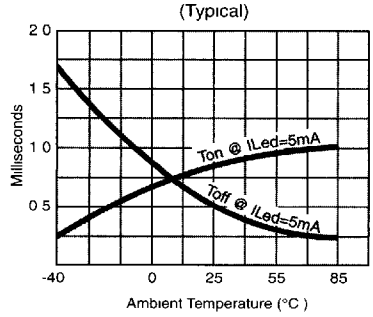
27) LCB110, LBB110

Switching Speed vs Temperature
(Typical)



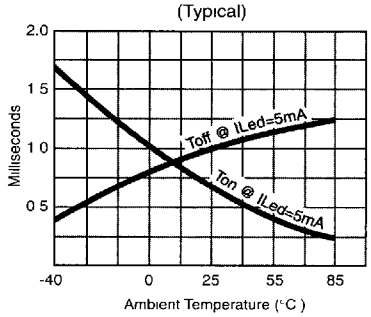
28) LCA120, LCA125, LCA127
LAA120, LAA125, LAA127

Switching Speed vs Temperature
(Typical)



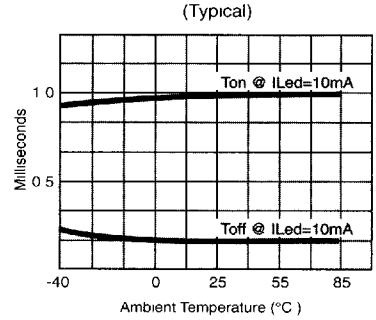
29) LCB120, LCB127, LBB120, LBB127

Switching Speed vs Temperature
(Typical)



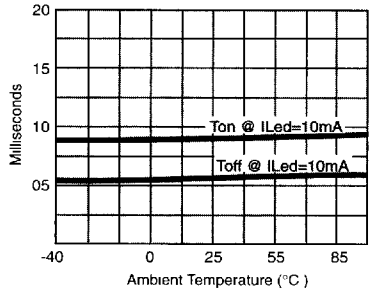
30) LCA710

Switching Speed vs Temperature
(Typical)



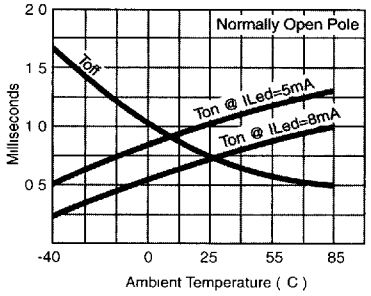
31) OMA160, OAA160

Switching Speed vs Temperature
(Typical)



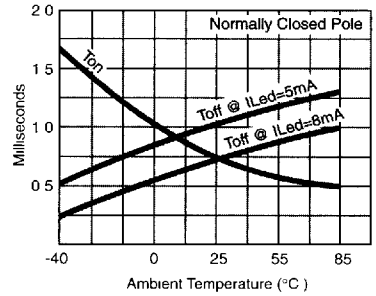
32) LBA110, LBA120, LBA127

Switching Speed vs Temperature
(Typical)



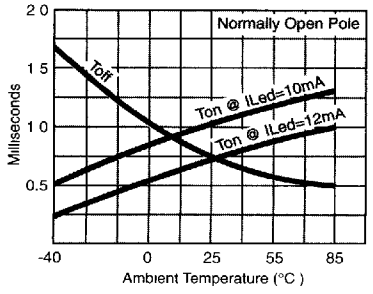
33) LBA110, LBA120, LBA127

Switching Speed vs Temperature
(Typical)



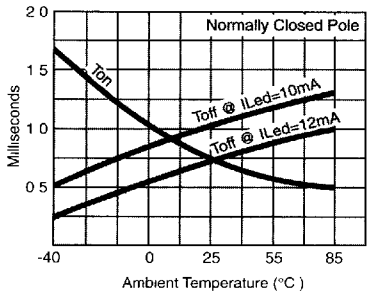
34) LCC110, LCC120

Switching Speed vs Temperature
(Typical)



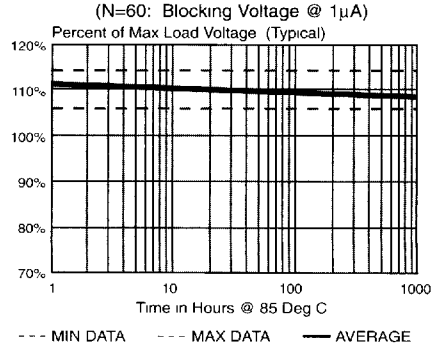
35) LCC110, LCC120

Switching Speed vs Temperature
(Typical)



36) Blocking Voltage Stability

Test: HTRB
(N=60: Blocking Voltage @ 1μA)



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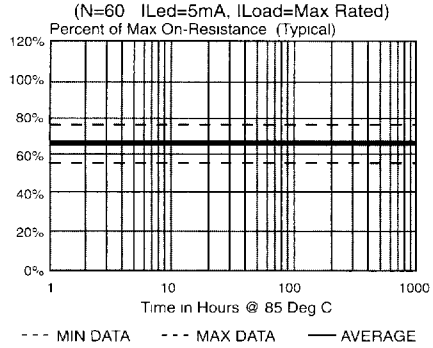
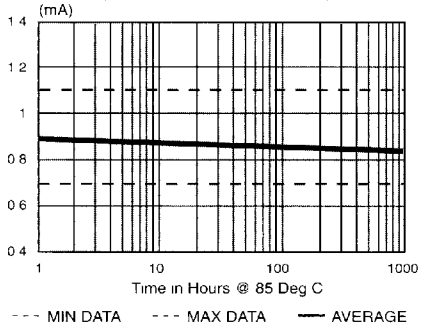
37) On-Resistance Stability

Test: HTRB
(N=60 ILed=5mA, ILoad=Max Rated)



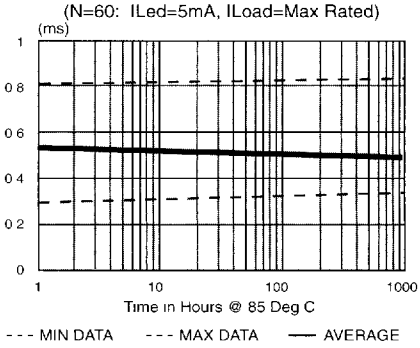
38) ILED Stability

Test: HTRB
(N=60 ILoad = Max Rated)



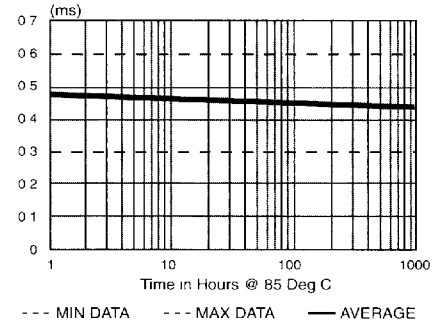
39) Ton Stability

Test: HTRB
(N=60: ILed=5mA, ILoad=Max Rated)



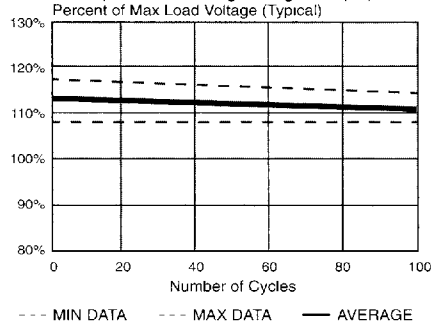
40) Toff Stability

Test: HTRB
(N=60· ILed=5mA, ILoad=Max Rated)



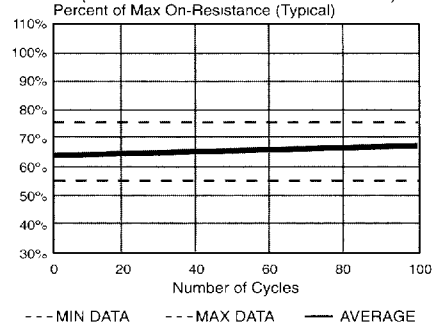
41) Blocking Voltage Stability

Test: Temp. Cycle -40 to +125 DEG C
(N=60 Blocking Voltage @ 1µA)



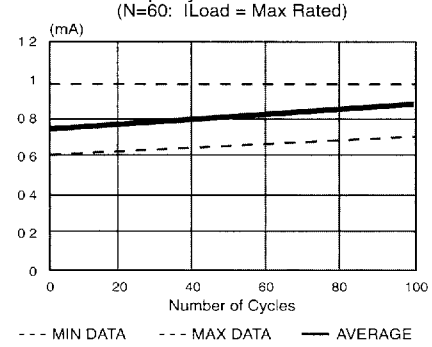
42) On-Resistance Stability

Test: Temp. Cycle -40 to +125 DEG C
(N=60. ILed=5mA. ILoad=Max Rated)



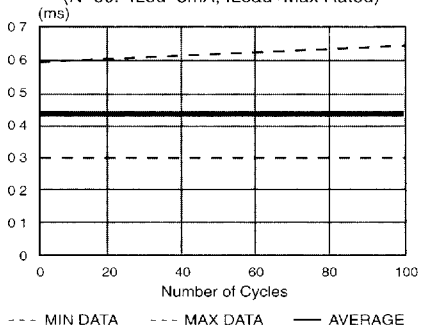
43) ILED Stability

Test: Temp. Cycle -40 to +125 DEG C
(N=60: ILoad = Max Rated)



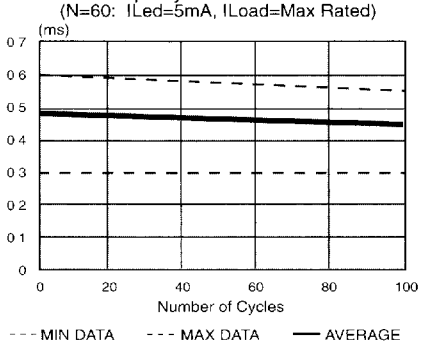
44) Ton Stability

Test: Temp. Cycle -40 to +125 DEG C
(N=60: ILed=5mA, ILoad=Max Rated)



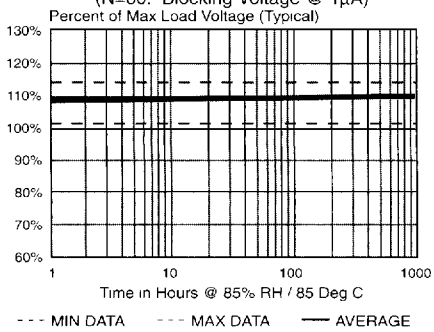
45) Toff Stability

Test: Temp. Cycle -40 to +125 DEG C
(N=60: ILed=5mA, ILoad=Max Rated)



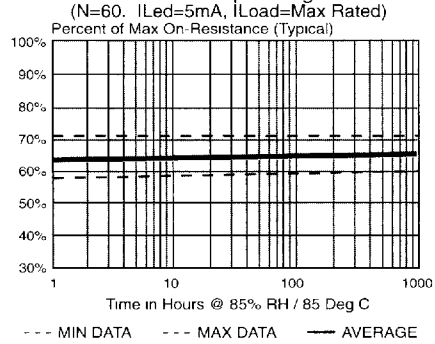
46) Blocking Voltage Stability

Test: Damp Storage
(N=60: Blocking Voltage @ 1µA)



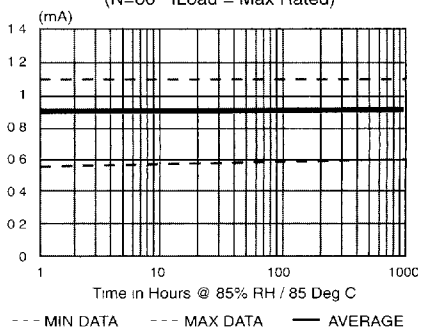
47) On-Resistance Stability

Test: Damp Storage
(N=60. ILed=5mA, ILoad=Max Rated)



48) ILED Stability

Test: Damp Storage
(N=60 ILoad = Max Rated)



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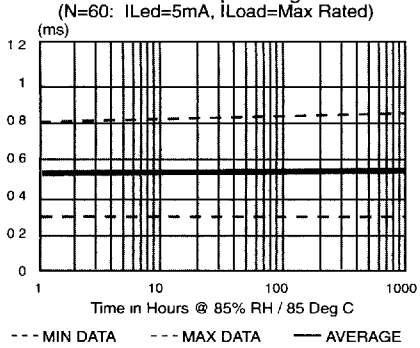
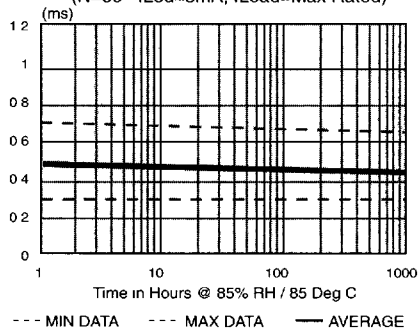
49) Ton Stability

Test: Damp Storage
(N=60: ILed=5mA, ILoad=Max Rated)



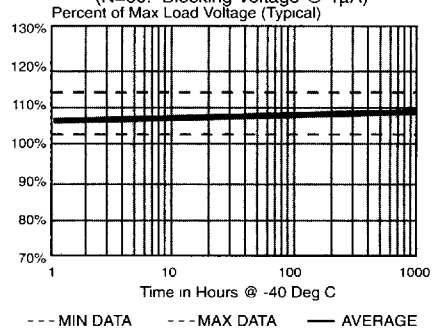
50) Toff Stability

Test: Damp Storage
(N=60· ILed=5mA, ILoad=Max Rated)



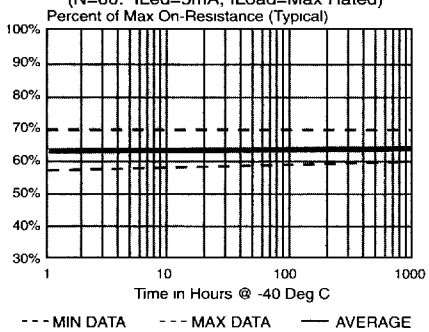
51) Blocking Voltage Stability

Test: Cold Storage
(N=60: Blocking Voltage @ 1µA)



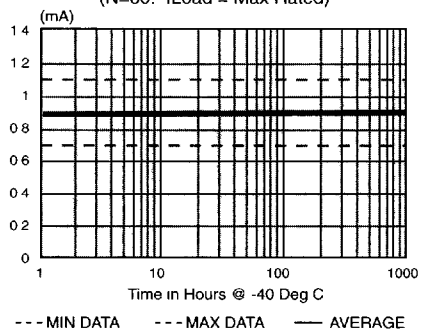
52) On-Resistance Stability

Test: Cold Storage
(N=60: ILed=5mA, ILoad=Max Rated)



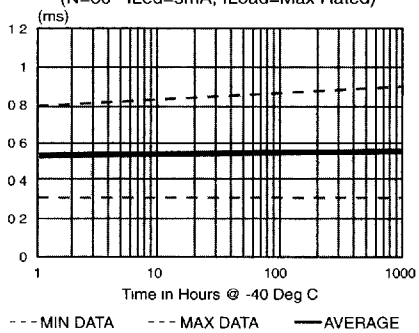
53) ILED Stability

Test: Cold Storage
(N=60: ILoad = Max Rated)



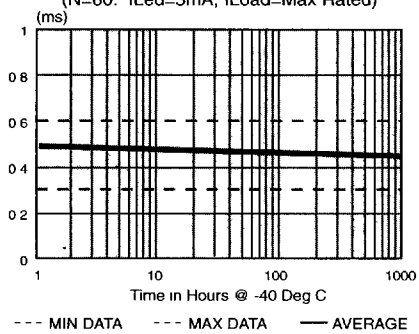
54) Ton Stability

Test: Cold Storage
(N=60· ILed=5mA, ILoad=Max Rated)



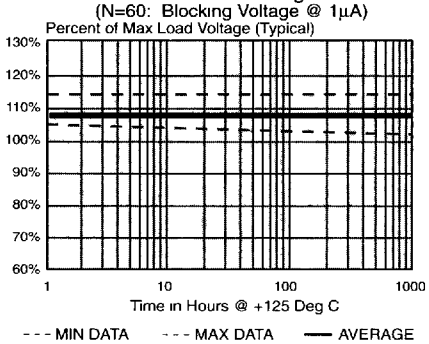
55) Toff Stability

Test: Cold Storage
(N=60: ILed=5mA, ILoad=Max Rated)



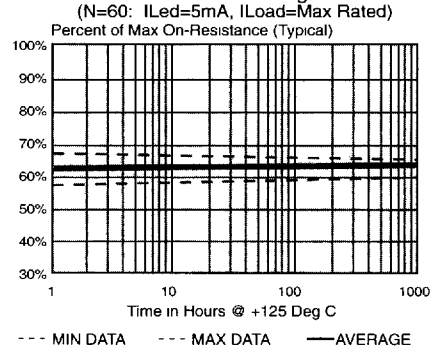
56) Blocking Voltage Stability

Test: Hot Storage
(N=60: Blocking Voltage @ 1µA)



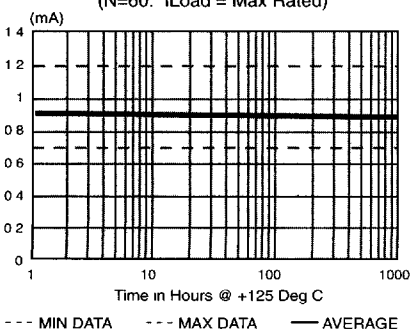
57) On-Resistance Stability

Test: Hot Storage
(N=60: ILed=5mA, ILoad=Max Rated)



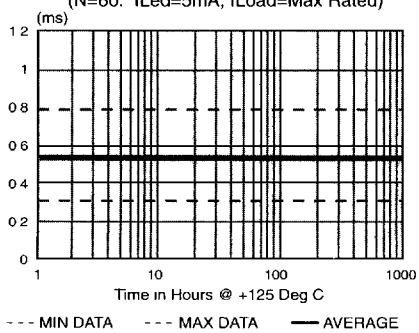
58) ILed Stability

Test: Hot Storage
(N=60. ILoad = Max Rated)



59) Ton Stability

Test: Hot Storage
(N=60: ILed=5mA, ILoad=Max Rated)



60) Toff Stability

Test: Hot Storage
(N=60: ILed=5mA, ILoad=Max Rated)