



Contents

Abstract.....	3
Audience	3
Scope.....	3
MTBF.....	3
MTBF Reference Documentation.....	4
Environmental Protection	4
Environmental Parameters	5
Conformal Coating.....	5
Parts Handling and Processing Steps.....	5
ESD Precautions	5
Soldering Through-hole Parts (FTT-10A, FT-X1, LPT-11, PLT-22).....	6
Soldering Surface Mount Parts (Free Topology (FT) and Power Line (PL) Smart Transceivers)	6
Washing	6
CPM 5000 FT 5000 Control Module.....	7
CRD 3000 Street Light Bridge	8
FT 3120 E4S40 Smart Transceiver.....	9
FT 3120 E4P40 Smart Transceiver.....	10
FT 3150 P20 Smart Transceiver	11
FT 5000 Smart Transceiver	12
FT X3 Communications Transformer.....	13
FTT-10A Free Topology Transceiver.....	14
i.LON 600 Internet Server, TP/FT-10	15
i.LON 600 Internet Server, TP/XF-1250.....	16
i.LON 600 Internet Server, TP/FT-10	17
i.LON 600 Internet Server, TP/XF-1250	18
LPR-10 Router Module	19
LPR-11 Router Module	20
LPR-12 Router Module	21
LPR-13 Router Module	22
LPR-14 Router Module	23
LPR-15 Router Module	24
LPT-11 Link Power Transceiver	25
PCC-10 PC Card Network Adapter	26
PCLTA-21 FT-10 PCI Interface	27
PCLTA-21 TP-78 PCI Interface	28
PL-3150 Power Line Smart Transceiver	29
PL-3170 Power Line Smart Transceiver	30

RTR-10 Router Core Module	31
SLTA-10/FT-10 Serial LonTalk Adapter	32
SmartServer FT	33
SmartServer FT with Modem	34
SmartServer PL	35
TP/XF-78 Twisted Pair Control Module	36
TP/XF-78F Flash Twisted Pair Control Module	37
TPT/XF-78 Twisted Pair Transceiver.....	38
TPT/XF-1250 Twisted Pair Transceiver.....	39
Appendix A (products no longer shipping)	40
AI-10 Analog Input Interface Module	41
AO-10 Analog Output Interface Module.....	42
DI-10 Digital Input Interface Module.....	43
DO-10 Digital Output Interface Module	44
DIO-10 Digital Input/Output Interface Module.....	45
DM-20/21 Device Manager Module.....	46
FTT-10 Free Topology Transceiver	47
<i>i</i> .LON 10 Internet Server, TP/FT-10	48
<i>i</i> .LON 10 Internet Server, TP/PL-20	49
<i>i</i> .LON 100 Internet Server, TP/FT-10	50
<i>i</i> .LON 100 Internet Server, TP/FT-10 with Modem.....	51
<i>i</i> .LON 100 Internet Server, PL-20	52
<i>i</i> .LON 100 Internet Server, PL-20 with Modem.....	53
<i>i</i> .LON 1000 Internet Server (FT-10).....	54
<i>i</i> .LON 1000 Internet Server (TP-1250).....	55
LonManager NSS-10 Module.....	56
LPI-10 Link Power Transceiver	57
LPT-10 Link Power Transceiver	58
LTM-10 LonTalk Module	59
LTS-10 SLTA Core Module.....	60
PL 3120-E4T10 Power Line Smart Transceiver.....	61
PLC-10 Power Line Control Module (Common Mode).....	62
PLM-22 Modular Transceiver	63
PLT-10 Power Line Transceiver.....	64
PLT-10A Power Line Transceiver.....	65
PLT-20 Power Line Transceiver.....	66
PLT-22 Power Line Transceiver.....	67
PLT-30 Power Line Transceiver.....	68
SLTA Motherboard.....	69
TP/FT-10 Free Topology Twisted Pair Control Module	70
TP/FT-10F Flash Control Module	71
TP-RS485 Twisted Pair Control Module.....	72
TP/XF-1250 Twisted Pair Control Module	73

Abstract

This guide provides a summary of the environmental specifications of Echelon's control products, including transceivers, control modules, and interface modules. In addition, mean time between failure (MTBF) predictions and safety agency file numbers are provided, together with parts handling and process guidelines.

Audience

This document is intended to assist an engineer in understanding the environmental and MTBF specifications of Echelon's control products.

Scope

Environmental specifications presented include temperature, strife, ESD, humidity, vibration, shock, altitude, and EMI. Where applicable, IEC tests and safety agency recognition, including file numbers, are included. MTBF predictions are also included.

MTBF

MTBF predictions are based on MIL HDBK 217F Notice 2 (February 1995). MIL 217 is designed to provide a fairly accurate prediction for military equipment where MIL SPEC components are used and production processes are controlled in accordance with various MIL Specifications. Under MIL 217 the failure rates for commercial parts are set purposefully high to discourage their use in military equipment.

Over the past ten years vendors have made great strides towards improving the reliability of their commercial parts. Component and equipment level qualification testing, accelerated testing, source control of components and vendors, ESD control programs, and failure reporting/analysis/corrective action systems all contribute to this increase in reliability.

Reliability predictions are particularly useful to compare one product against another, or to anticipate possible changes due to environmental factors such as temperature. Actual field reliability data from a large sample over a long time provides high quality prediction capability. Laboratory testing results also aid in the prediction process.

The MTBF predictions in this guide include realistic modifications to account for advancements in integrated circuits, discrete components, and electromechanical devices that have been realized since MIL 217 was first conceived. Field reliability data and laboratory test results have been analyzed to provide input into the prediction process. These realistic modifications also incorporate data from Telcordia SR-332 (formerly BellCore) calculations. All of this provides reasonable target reliability

for commercial equipment. MIL 217 predictions that are calculated "by-the-book" without realistic modifications predict worst case reliability, and given the bias against many types of components, are often so pessimistic as to be unusable. Even with these modifications, predictions are still conservative compared to what should be experienced in field service.

MTBF predictions were calculated using the parts stress method in a ground benign environment, and assume a 10% duty cycle on transmit.

MTBF Reference Documentation

MIL-HDBK 217F Notice 2, 28 February 1995.

Reliability Prediction Procedure for Electronic Equipment, SR-332, Issue 1, May 2001, Telcordia Technologies

Environmental Protection

Echelon supports environmentally sustainable development, and recognizes that every manufacturer has a role to play in promoting recycling and minimizing pollution. Many Echelon products, especially larger assemblies, bear recycling symbols. Most Echelon shipping containers are manufactured from recyclable cardboard.

With regard to environmental pollutants, none of the following substances are used in currently shipping Echelon products:

- Asbestos (excluding chrysotile)
- Dioxin
- Chlorofluorocarbons
- Polychlorobiphenyls
- Cadmium and its compounds
- Polybromobiphenyls (PBB)
- Polybromodiphenylethers (PBDB)
- Organic tin compounds
- Polychloronaphthalene
- Chlorinated paraffin
- Azo Compound

Effective 30 June 2006, the European Union's Restriction of Hazardous Substances (RoHS) Act bans shipment of the following additional substances beyond the specified thresholds into Europe (or other countries that adhere to this Act):

- Lead and lead compounds (1000 ppm maximum)
- Hexavalent chromium compounds (1000 ppm maximum)
- Mercury and mercury compounds (1000 ppm maximum)

Please refer to Echelon's Web site (<http://www.echelon.com/products/rohs.htm>) for a timetable listing on what dates given products will become RoHS compliant, if at all. Currently, Echelon believes that moving to RoHS compliance will yield no changes from our current MTBF results, therefore, the values in this guide cover both RoHS and non-RoHS parts. Where applicable, the

RoHS compliant product model numbers, denoted with an "R," are included alongside currently-shipping model numbers.

Environmental Parameters

The results for strife, humidity, vibration, shock, and altitude are derived from tests of typical units during engineering qualifications. These results are provided for reference only, and are not guaranteed for any production units. ESD specifications apply to discharges at the network connector (power mains connection for power line devices).

Conformal Coating

Some OEM customers have special needs for protecting the network nodes from harsh environments. There are several different types of available coating compounds, e.g., acrylic, polyurethane, epoxy, and silicone. Each coating is optimized for specific environmental hazards. Before deciding to conformally coat an Echelon OEM product, please consider the following issues:

1. The use of conformal coating on modules with sockets or edge connectors will void the Echelon warranty.
2. A comprehensive engineering qualification should be planned to verify that the coating compound does not adversely affect circuit operation or ESD protection, and that the compound, including any solvents or by-products, do not affect or damage any of the circuit components.
3. All connector pins on the transceivers must be properly masked, to prevent any infiltration of the coating compound. All adjacent connectors, sockets, and switches must be properly masked, to prevent any infiltration of the coating compound.
4. Due to shrinkage and exothermic reactions, some coating compounds may require that buffering material be used around fragile components.
5. Once the coating is applied to the product, rework and repair may not be possible.
6. This list does not include all the inherent process considerations, such as application, curing, inspection, repair, material storage, safety, and environmental regulations or concerns.
7. Echelon uses a "no clean" soldering process for certain assemblies. A suitable cleaning solvent and process should be used to remove any "no clean" flux prior to applying any conformal coating.

Parts Handling and Processing Steps

The handling and processing guidelines for Echelon's control products are listed below. Except where otherwise indicated, these specifications apply to all control products.

ESD Precautions

The same precautions should be observed for the control products as for any other CMOS devices with 1kV to 2kV sensitivity. Control products are shipped in ESD protective packaging.

Soldering Through-hole Parts (FTT-10A, FT-X1, LPT-11, PLT-22)

Please refer to individual User's Guides and Data Books for product-specific details. All through-hole parts should be soldered using a standard through-hole method with lead temperatures of 250 °C maximum for 5 seconds for both non-RoHS and RoHS parts.

Soldering Surface Mount (SMT) Parts (Free Topology (FT) and Power Line (PL) Smart Transceivers)

Please refer to the table below for guidance on the maximum reflow temperature for surface mount (SMT) parts. In all cases, consult the solder manufacturer's datasheet for recommendations on optimum reflow profile. The actual reflow profile chosen should consider the peak temperature limitations below.

Product	RoHS Compatible	Model Number	Peak Temperature (°C)
FT3120-E4S40	No	14210-500, 14211-500	220
FT3120-E4P40	No	14220-800, 14221-800	235
FT3150-P20	No	14230-450	235
PL3120-E4T10	No	15310-1000, 15311-1000	235
PL3150-L10	No	15320-960, 15321-960	235
FT3120-E4S40	Yes	14212R-500	245
FT3120-E4P40	Yes	14222R-800	260
FT3150-P20	Yes	14230R-450	260
PL3120-E4T10	Yes	15311R-1000	260
PL3150-L10	Yes	15321R-960	260

Other control products, e.g., SIMs and control modules, are not designed to be soldered in place: use only manual insertion techniques and suitable plug-in connectors with these devices.

Washing

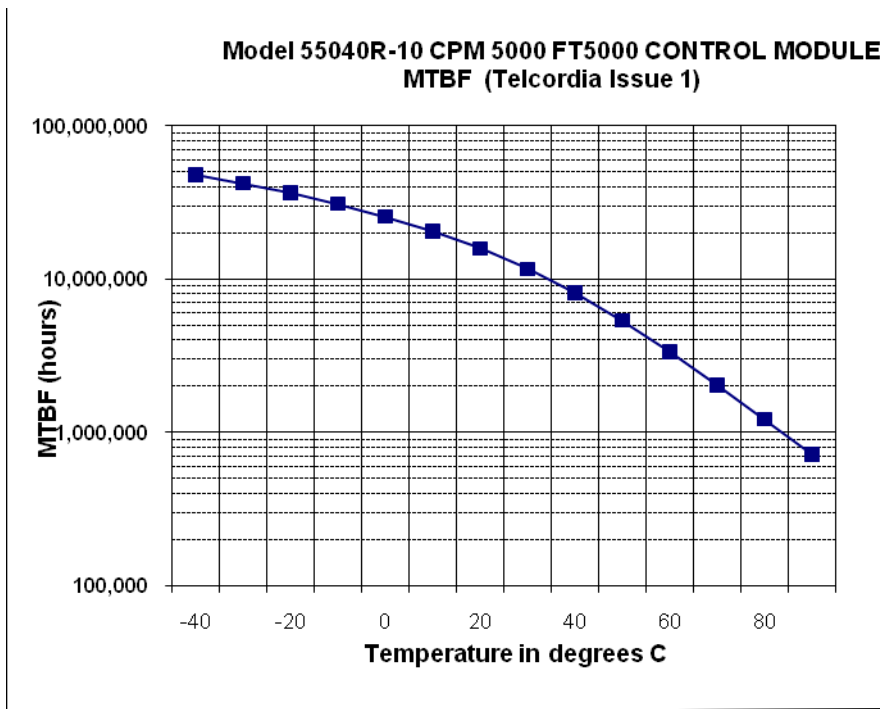
All through-hole parts should be washed using only standard through-hole, water wash processes, e.g., deionized water or water with saponifiers. Ultrasonic cleaning equipment is not recommended.

All SMT parts should be washed using processes approved/recommended by the solder paste manufacturer.

Other control products, e.g., SIMs and control modules, are not designed to be washed or cleaned.

CPM 5000 FT 5000 Control Module (55040R)

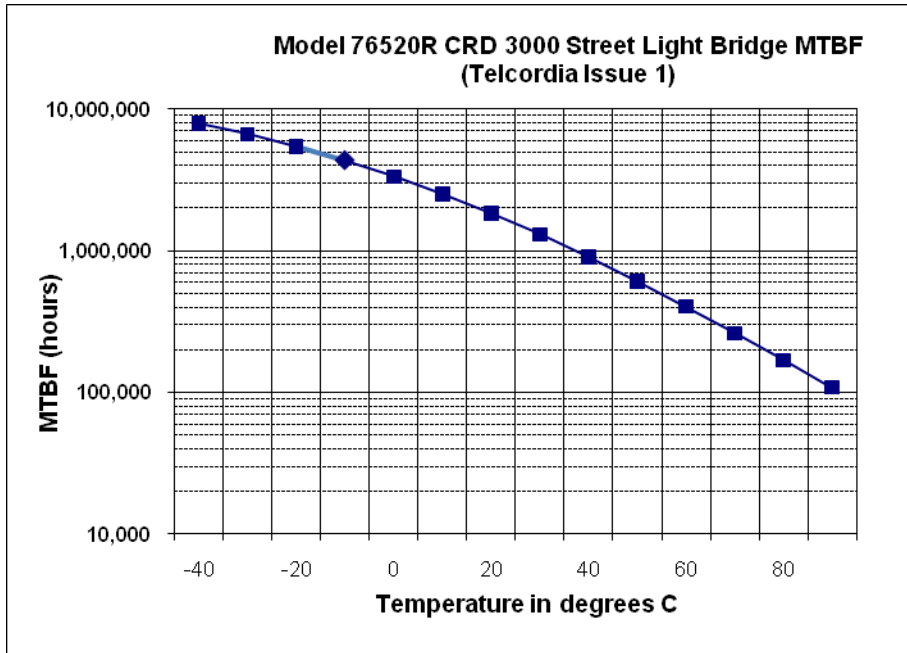
Parameter	Results
Operating Temperature	-40 to 85°C
Non-operating Temperature	-40 to 85°C
Operating Humidity	25-90% RH @50°C, non-condensing
Non-operating Humidity	95% RH @ 50°C, non-condensing
Vibration	1.5g peak-to-peak, 8Hz – 2kHz
Surge	IEC1000-4-5, Level 3
EMI	FCC Part 15, Subpart B and EN55022 Level B
ESD	EN 61000-4-2, Designed to comply with FCC Part 15, Level B



Temp (deg C)	MTBF (hours)	FITs
-40	47,873,791	21
-30	42,137,018	24
-20	36,417,093	27
-10	30,851,394	32
0	25,525,265	39
10	20,494,452	49
20	15,827,464	63
30	11,643,584	86
40	8,103,743	123
50	5,335,502	187
60	3,349,966	299
70	2,033,271	492
80	1,210,921	826
90	716,822	1,395

CRD 3000 Street Light Bridge (76520R)

Parameter	Results
Operating temperature	-40 to 85°C @ full load
Storage temperature	-40 to 85°C
Operating Humidity	0-90% RH @50°C, non-condensing FT-X3 Communications Transformer
Storage Humidity	0-95% RH @ 50°C, non-condensing FT-X3 Communications Transformer
Vibration	5Hz – 7.5Hz @ 0.5" D.A., 5.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sine)
EMC	FCC Part 15 Class B
Agency Listing	UL 60950, cUL C22.2 No 60950-00, CE

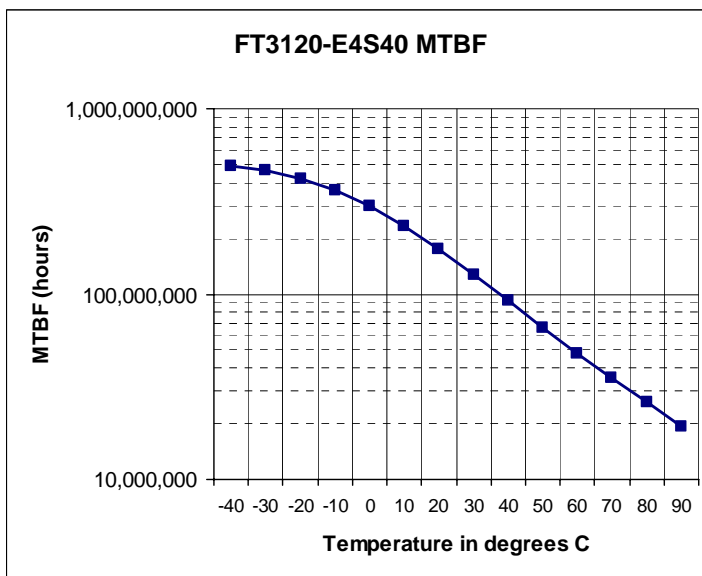


Temp (deg C)	MTBF (hours)	FITs
-40	7,924,388	126
-30	6,670,341	150
-20	5,457,182	183
-10	4,338,310	231
0	3,351,685	298
10	2,517,083	397
20	1,837,920	544
30	1,305,398	766
40	902,876	1,108
50	609,487	1,641
60	403,020	2,481
70	262,296	3,812
80	168,924	5,920
90	108,223	9,240

FT 3120 E4S40 Smart Transceiver (14210, 14212R)

Note: 14212R is the model number for the RoHS compliant FT 3120 E4S40.

Parameter	Results
Operating temperature	-40°C to +85°C
EMI	Designed to comply with FCC Part 15 Level B and EN55022 Level B

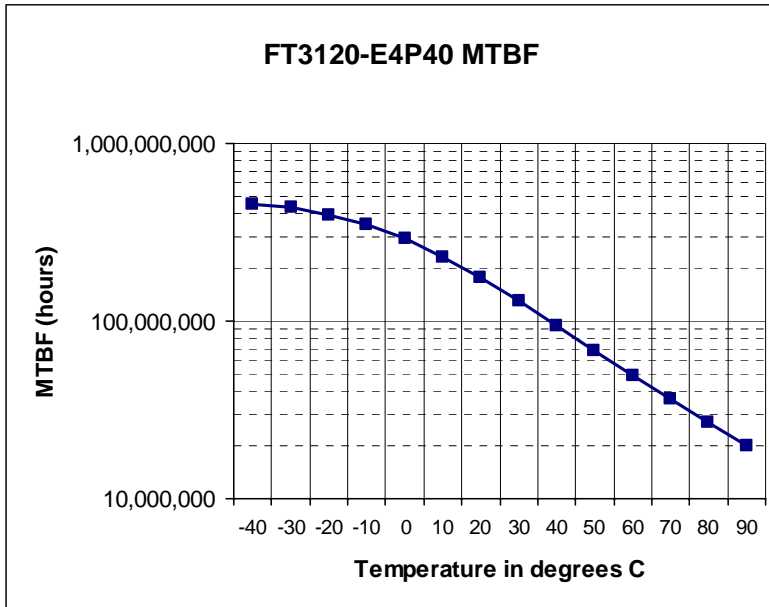


Temp (deg C)	MTBF (hours)	FITs
-40	492,610,837	2.0
-30	462,962,963	2.2
-20	420,168,067	2.4
-10	362,318,841	2.8
0	297,619,048	3.4
10	232,018,561	4.3
20	173,913,043	5.8
30	127,226,463	7.9
40	91,996,320	10.9
50	66,357,001	15.1
60	48,030,740	20.8
70	35,075,412	28.5
80	25,893,320	38.6
90	19,342,360	51.7

FT 3120 E4P40 Smart Transceiver (14220, 14222R)

Note: 14222R is the model number for the RoHS compliant FT 3120 E4P40.

Parameter	Results
Operating temperature	-40°C to +85°C
EMI	Designed to comply with FCC Part 15 Level B and EN55022 Level B

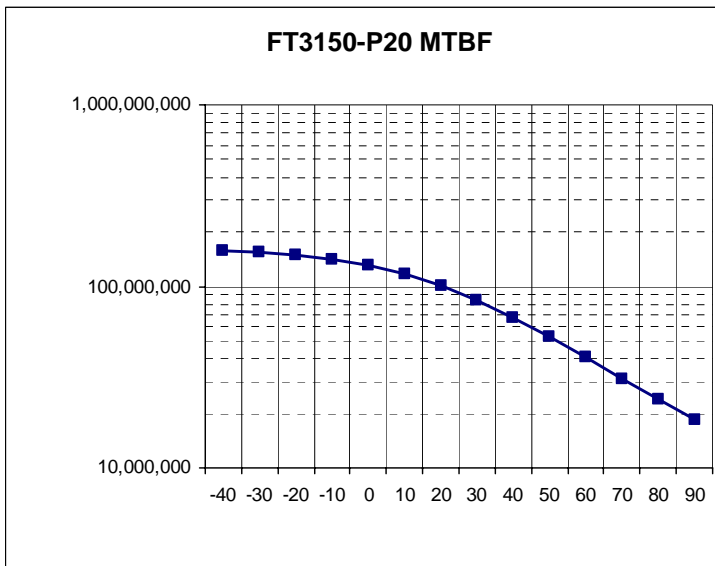


Temp (deg C)	MTBF (hours)	FITs
-40	458,715,596	2.2
-30	434,782,609	2.3
-20	398,406,375	2.5
-10	349,650,350	2.9
0	290,697,674	3.4
10	229,885,057	4.4
20	174,825,175	5.7
30	129,198,966	7.7
40	93,984,962	10.6
50	68,027,211	14.7
60	49,382,716	20.3
70	36,088,055	27.7
80	26,645,350	37.5
90	19,896,538	50.3

FT 3150 P20 Smart Transceiver (14230, 14230R)

Note: 14230R is the model number for the RoHS compliant FT 3150 P20.

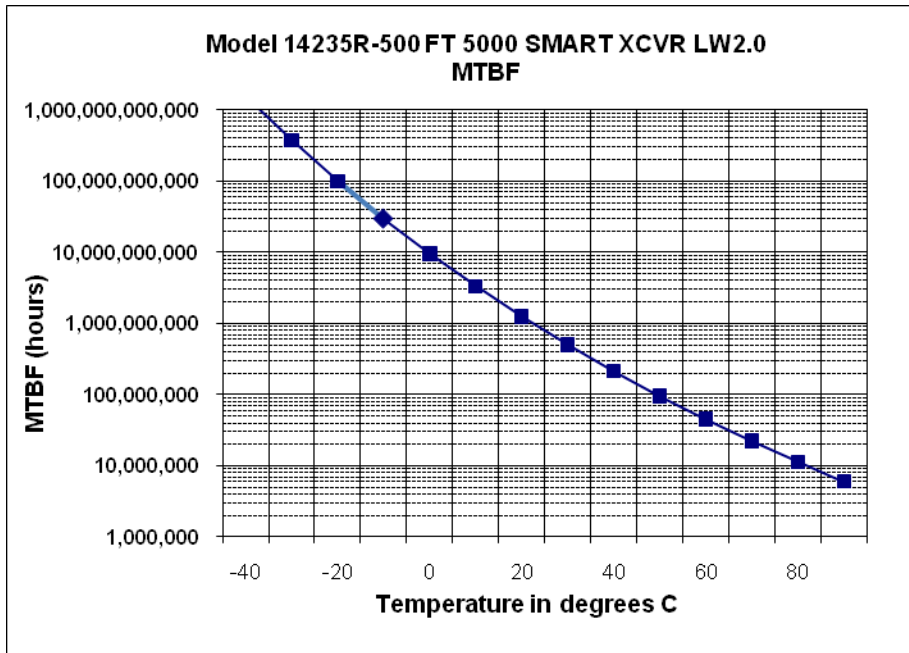
Parameter	Results
Operating temperature	-40°C to +85°C
EMI	Designed to comply with FCC Part 15 Level B and EN55022 Level B



Temp (deg C)	MTBF (hours)	FITs
-40	56,494,523	6.4
-30	153,609,831	6.5
-20	148,809,524	6.7
-10	141,242,938	7.1
0	130,548,303	7.7
10	116,550,117	8.6
20	100,401,606	10.0
30	83,333,333	12.0
40	67,024,129	14.9
50	52,631,579	19.0
60	40,666,938	24.6
70	31,162,356	32.1
80	23,832,221	42.0
90	18,264,840	54.8

FT 5000 Smart Transceiver (14235R)

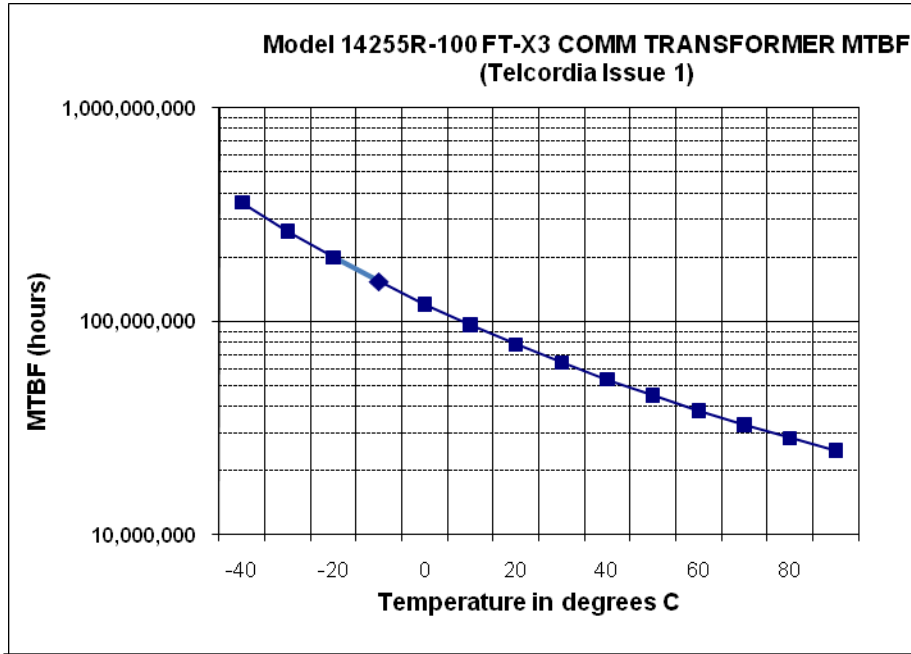
Parameter	Results
Operating temperature	-40 to 85°C
Operating Humidity	25-90% RH @50°C, non-condensing FT-X3 Communications Transformer
Non-operating Humidity	95% RH @ 50°C, non-condensing FT-X3 Communications Transformer
Vibration	1.5g peak-to-peak, 8Hz – 2kHz FT-X3 Communications Transformer
Surge	EN 61000-4-5, Level 3
EMI	FCC Part 15, Subpart B and EN55022 Level B
ESD	EN 61000-4-2, Level 4



Temp (deg C)	MTBF (hours)	FITs
-40	1,574,803,149,606	0.001
-30	375,798,571,965	0.003
-20	100,431,856,985	0.010
-10	29,668,308,313	0.034
0	9,583,950,015	0.104
10	3,352,475,971	0.3
20	1,259,945,696	0.8
30	505,101,015	2.0
40	214,663,537	4.7
50	96,191,823	10.4
60	45,232,102	22.1
70	22,225,646	45.0
80	11,396,427	88.0
90	6,034,698	165.7

FT-X3 Communications Transformer (14255R)

Parameter	Results
Operating temperature	-40 to 85°C
Operating Humidity	25-90% RH @50°C, non-condensing
Non-operating Humidity	95% RH @ 50°C, non-condensing
Vibration	1.5g peak-to-peak, 8Hz – 2kHz
Surge	EN 61000-4-5, Level 3
EMI	Designed to comply with FCC Part 15, Subpart B and EN55022 Level B
ESD	Designed to comply with EN 61000-4-2, Level 4

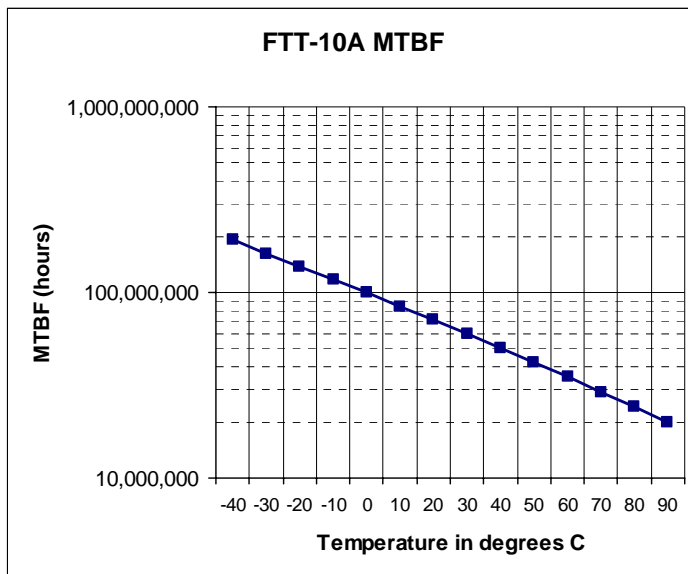


Temp (deg C)	MTBF (hours)	FITs
-40	360,424,652	2.8
-30	265,055,975	3.8
-20	199,715,685	5.0
-10	153,756,951	6.5
0	120,664,087	8.3
10	93,329,638	10.4
20	78,094,208	12.8
30	64,193,880	15.6
40	53,432,778	18.7
50	44,983,786	22.2
60	38,264,305	26.1
70	32,857,051	30.4
80	28,458,504	35.1
90	24,844,742	40.2

FTT-10A Free Topology Transceiver (50051, 50051R)

Note: 50051R is the model number for the RoHS compliant FTT-10A transceiver.

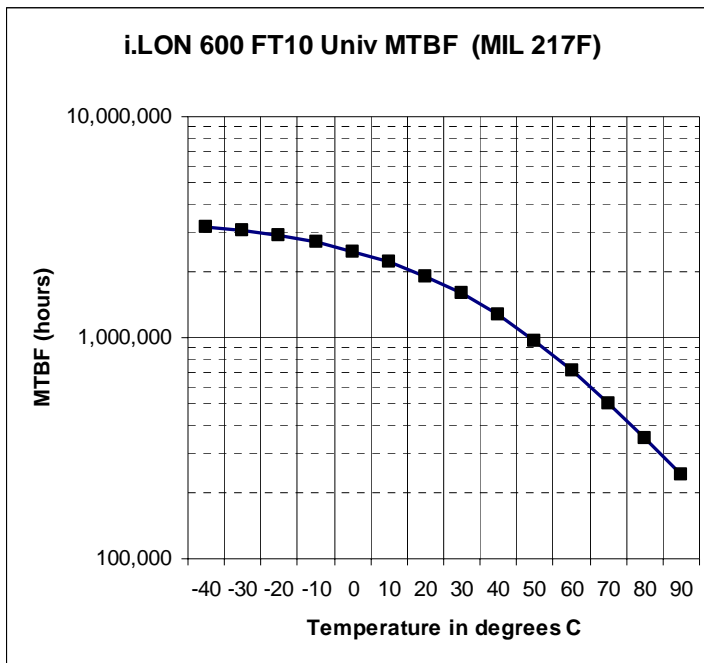
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10° C/minute
ESD	Designed to comply with IEC1000-4-2, Level 4
Radiated Susceptibility	Designed to comply with IEC1000-4-3, Level 3
Burst	Designed to comply with IEC1000-4-4, Level 4
Surge	Designed to comply with IEC1000-4-5, Level 3
Humidity (non-condensing)	25 to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR77376
TÜV EN 60950:1992	R9677385



Temp (deg C)	MTBF (hours)	FITs
-40	191,204,589	5.2
-30	162,601,626	6.2
-20	138,121,547	7.2
-10	117,370,892	8.5
0	99,601,594	10.0
10	84,459,459	11.8
20	71,428,571	14.0
30	60,204,696	16.6
40	50,530,571	19.8
50	42,211,904	23.7
60	35,124,693	28.5
70	29,112,082	34.4
80	24,050,024	41.6
90	19,821,606	50.5

i.LON 600 Internet Server, TP/FT-10 (72601)

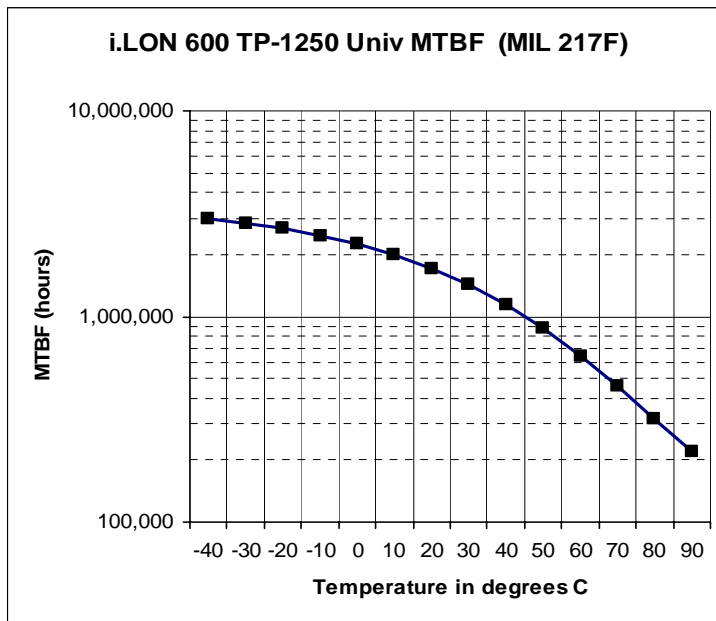
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH @ 65°C, non-operating
Altitude	4,545 meters operating (15,000 feet) 7,576 meters non-operating (25,000 feet)
EMI	FCC Part 15 Class B and EN55022 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	02272372-007



Temp (deg C)	MTBF (hours)	FITs
-40	3,153,579	317
-30	3,029,385	330
-20	2,877,201	348
-10	2,690,414	372
0	2,464,572	406
10	2,200,026	455
20	1,901,828	526
30	1,582,980	632
40	1,263,743	791
50	966,781	1034
60	710,985	1407
70	505,919	1977
80	351,272	2847
90	240,073	4165

i.LON 600 Internet Server, TP/XF-1250 (72602)

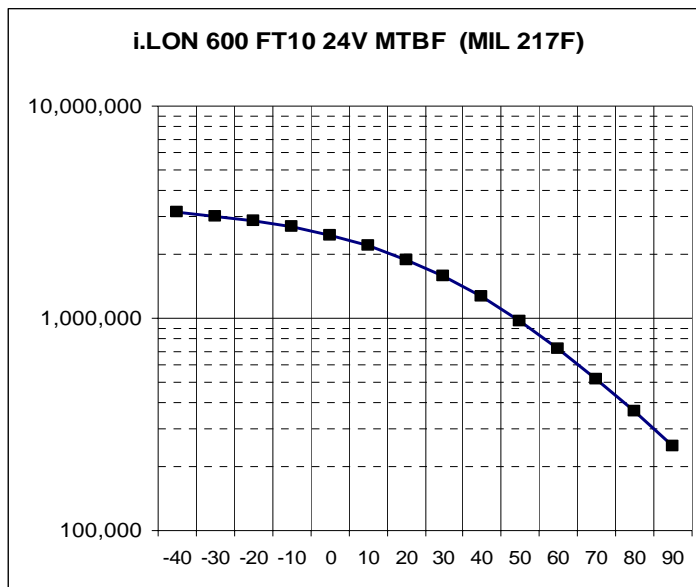
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH @ 65°C, non-operating
Altitude	4,545 meters operating (15,000 feet) 7,576 meters non-operating (25,000 feet)
EMI	FCC Part 15 Class B and EN55022 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	02272372-007



Temp (deg C)	MTBF (hours)	FITs
-40	2,992,220	334
-30	2,847,380	351
-20	2,676,230	374
-10	2,477,148	404
0	2,248,960	445
10	1,992,667	502
20	1,714,648	583
30	1,424,359	702
40	1,138,045	879
50	873,088	1145
60	644,288	1552
70	459,876	2175
80	319,959	3125
90	218,826	4570

i.LON 600 Internet Server, TP/FT-10 (72603)

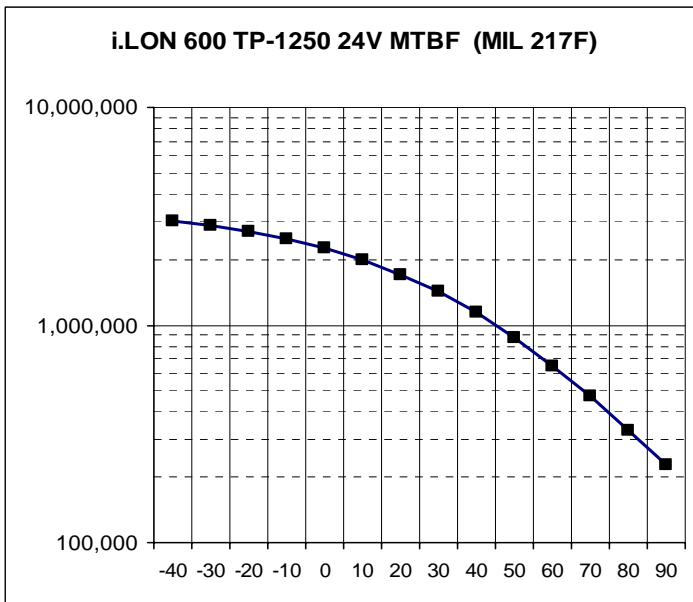
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH @ 65°C, non-operating
Altitude	4,545 meters operating (15,000 feet) 7,576 meters non-operating (25,000 feet)
EMI	FCC Part 15 Class B and EN55022 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E30382212-002



Temp (deg C)	MTBF (hours)	FITs
-40	3,158,560	317
-30	3,032,508	330
-20	2,876,787	348
-10	2,686,078	372
0	2,455,735	407
10	2,188,629	457
20	1,890,323	529
30	1,574,754	635
40	1,261,273	793
50	970,601	1030
60	719,792	1389
70	517,315	1933
80	363,016	2755
90	250,683	3989

i.LON 600 Internet Server, TP/XF-1250 (72604)

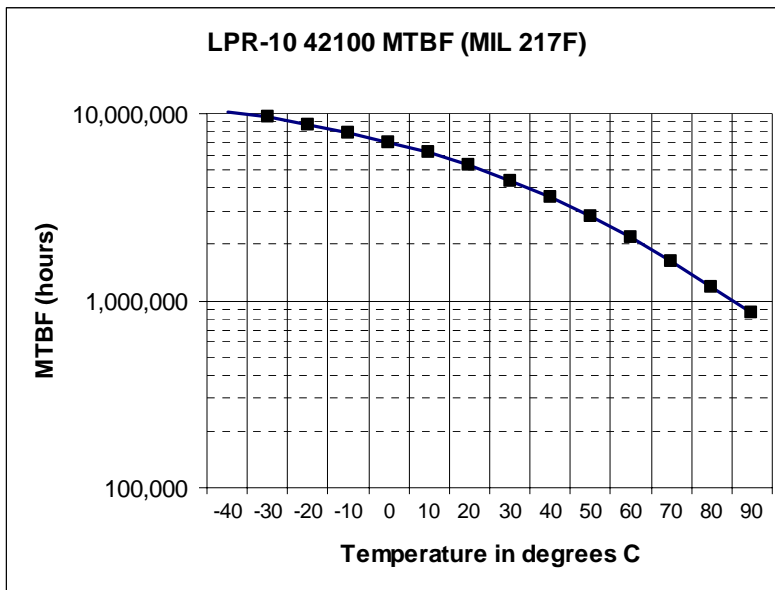
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH @ 65°C, non-operating
Altitude	4,545 meters operating (15,000 feet) 7,576 meters non-operating (25,000 feet)
EMI	FCC Part 15 Class B and EN55022 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E30382212-002



Temp (deg C)	MTBF (hours)	FITs
-40	2,996,704	334
-30	2,850,140	351
-20	2,675,872	374
-10	2,473,472	404
0	2,241,600	446
10	1,983,312	504
20	1,705,292	586
30	1,417,696	705
40	1,136,041	880
50	876,201	1141
60	651,512	1535
70	469,272	2131
80	329,674	3033
90	227,606	4394

LPR-10 Router Module (42100)

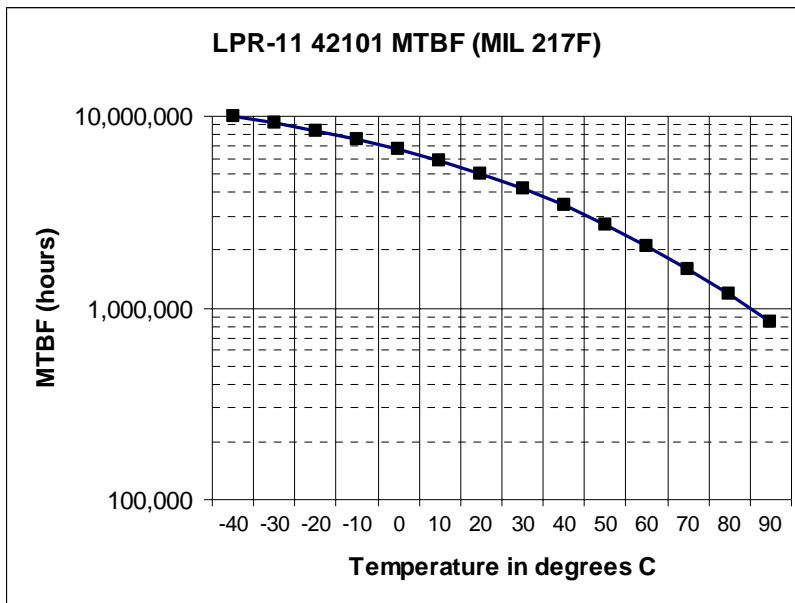
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD (per MIL-883)	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with En61000-4-5 Level 3
Humidity	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



Temp (deg C)	MTBF (hours)	FITs
-40	10,230,598	97.7
-30	9,536,161	104.9
-20	8,771,622	114.0
-10	7,938,146	126.0
0	7,073,937	141.4
10	6,174,212	162.0
20	5,270,926	189.7
30	4,392,091	227.7
40	3,566,156	280.4
50	2,818,251	354.8
60	2,167,984	461.3
70	1,625,282	615.3
80	1,190,507	840.0
90	855,303	1169.2

LPR-11 Router Module (42101)

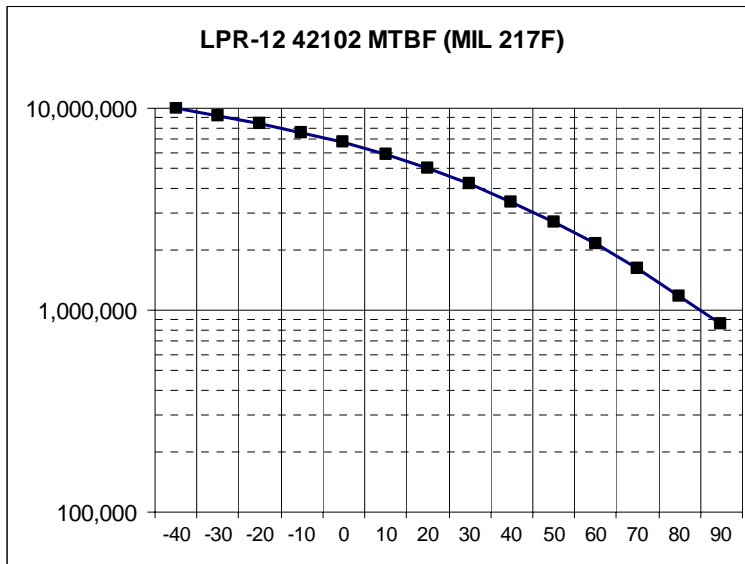
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD (per MIL-883)	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with En61000-4-5 Level 3
Humidity	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



Temp (deg C)	MTBF (hours)	FITs
-40	9,970,289	100.3
-30	9,235,572	108.3
-20	8,446,517	118.4
-10	7,609,076	131.4
0	6,761,691	147.9
10	5,895,114	169.6
20	5,038,291	198.5
30	4,211,218	237.5
40	3,435,576	291.1
50	2,732,091	366.0
60	2,116,384	472.5
70	1,597,702	625.9
80	1,177,518	849.2
90	850,446	1175.9

LPR-12 Router Module (42102)

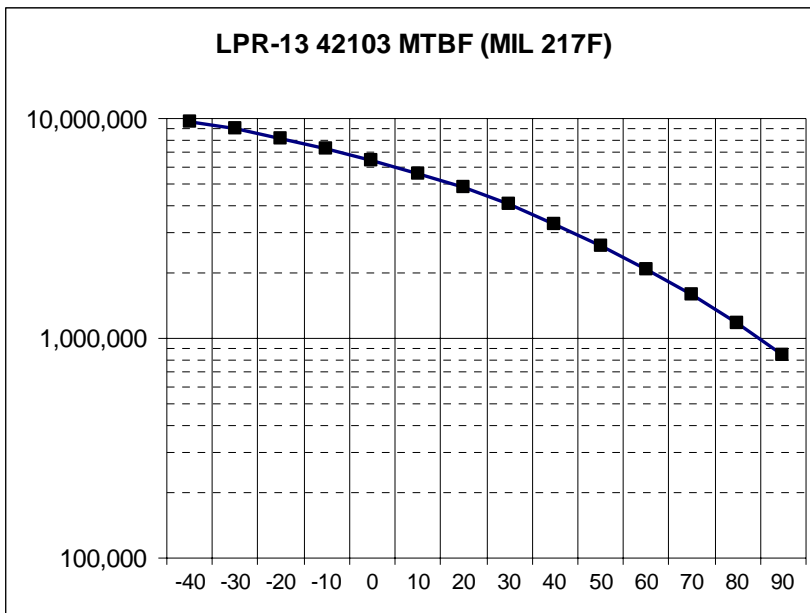
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD (per MIL-883)	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with En61000-4-5 Level 3
Humidity	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



Temp (deg C)	MTBF (hours)	FITs
-40	9,960,358	100.4
-30	9,218,544	108.5
-20	8,432,272	118.6
-10	7,591,746	131.7
0	6,743,452	148.3
10	5,877,789	170.1
20	5,023,106	199.1
30	4,198,840	238.2
40	3,427,334	291.8
50	2,726,133	366.8
60	2,112,361	473.4
70	1,595,153	626.9
80	1,176,133	850.2
90	849,652	1177.0

LPR-13 Router Module (42103)

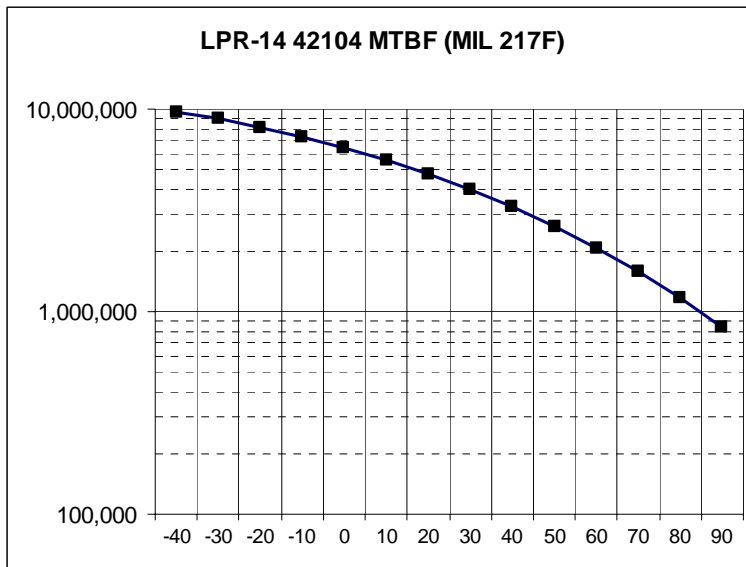
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD (per MIL-883)	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with En61000-4-5 Level 3
Humidity	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



Temp (deg C)	MTBF (hours)	FITs
-40	9,722,897	102.9
-30	8,953,353	111.7
-20	8,144,649	122.8
-10	7,306,203	136.9
0	6,475,845	154.4
10	5,640,158	177.3
20	4,825,323	207.2
30	4,044,653	247.2
40	3,314,221	301.7
50	2,651,043	377.2
60	2,067,183	483.8
70	1,571,043	636.5
80	1,164,809	858.5
90	845,645	1182.5

LPR-14 Router Module (42104)

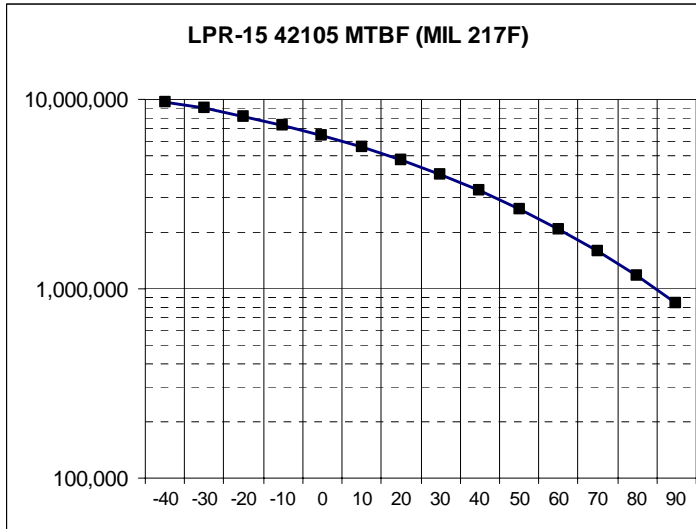
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD (per MIL-883)	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with En61000-4-5 Level 3
Humidity	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



Temp (deg C)	MTBF (hours)	FITs
-40	9,713,453	103.0
-30	8,937,349	111.9
-20	8,131,403	123.0
-10	7,290,224	137.2
0	6,459,114	154.8
10	5,624,297	177.8
20	4,811,393	207.8
30	4,033,234	247.9
40	3,306,550	302.4
50	2,645,433	378.0
60	2,063,345	484.7
70	1,568,578	637.5
80	1,163,454	859.5
90	844,859	1183.6

LPR-15 Router Module (42105)

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD (per MIL-883)	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with En61000-4-5 Level 3
Humidity	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747

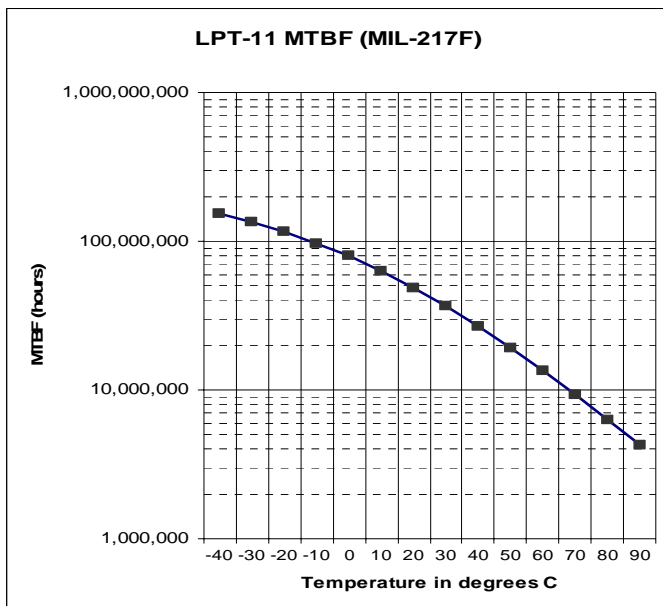


Temp (deg C)	MTBF (hours)	FITs
-40	9,704,027	103.0
-30	8,921,402	112.1
-20	8,118,201	123.2
-10	7,274,314	137.5
0	6,442,469	155.2
10	5,608,525	178.3
20	4,797,544	208.4
30	4,021,879	248.6
40	3,298,915	303.1
50	2,639,846	378.8
60	2,059,520	485.6
70	1,566,122	638.5
80	1,162,102	860.5
90	844,047	1184.7

LPT-11 Link Power Transceiver (50040, 50040R)

Note: 50040R is the model number for the RoHS compliant LPT-11 Link Power transceiver.

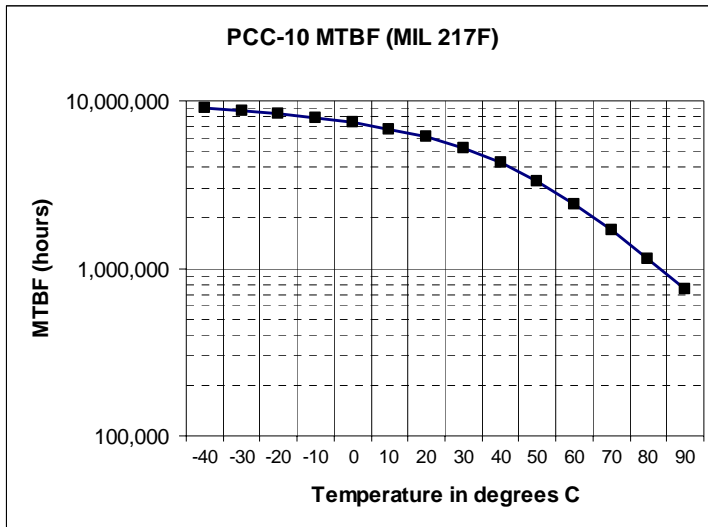
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN 61000-4-2, Level 4
Radiated Susceptibility	Designed to comply with EN 61000-4-3, Level 2
Burst	Designed to comply with EN 61000-4-4, Level 4 (network cable only)
Surge	Designed to comply with EN 61000-4-5, Level 3
Humidity (non-condensing)	25% to 90% RH @ 50°C, operating 95% RH @ 50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz – 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE demonstrated
UL 60950, 2000	E145541
CSA C22.2 No. 60950, 2000	E145541
TÜV EN 60950:1992	R2272463



Temp (deg C)	MTBF (hours)	FITs
-40	153,846,154	6.5
-30	134,408,602	7.4
-20	117,096,019	8.5
-10	97,181,730	10.3
0	79,491,256	12.6
10	63,171,194	15.8
20	48,780,488	20.5
30	36,630,037	27.3
40	26,809,651	37.3
50	19,193,858	52.1
60	13,477,089	74.2
70	9,302,326	107.5
80	6,337,136	157.8
90	4,277,160	233.8

PCC-10 PC Card Network Adapter (73200)

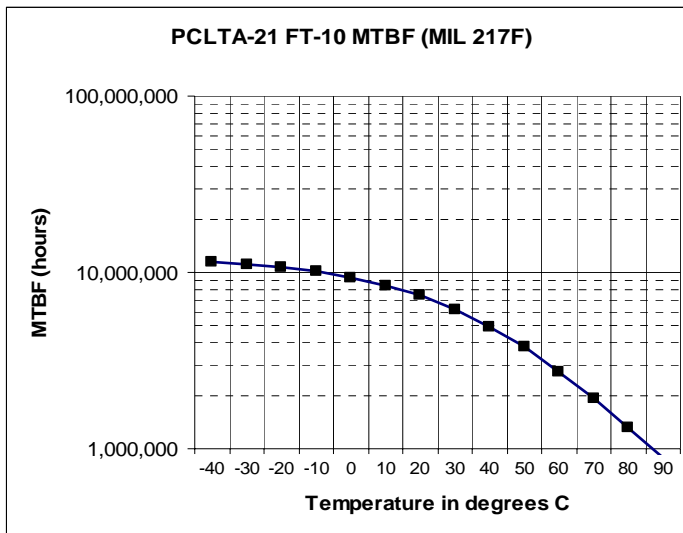
Parameter	Results
Operating temperature	0 to +55°C
Non-operating temperature	-20°C to +65°C
Strife	-15°C to +85°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 4
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 2
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 5.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60950	S9677441



Temp (deg C)	MTBF (hours)	FITs
-40	9,086,779	110.1
-30	8,724,481	114.6
-20	8,328,475	120.1
-10	7,887,679	126.8
0	7,383,888	135.4
10	6,789,788	147.3
20	6,078,288	164.5
30	5,236,699	191.0
40	4,291,845	233.0
50	3,320,494	301.2
60	2,426,360	412.1
70	1,689,532	591.9
80	1,136,958	879.5
90	750,289	1332.8

PCLTA-21 FT-10 PCI Interface (7450x)

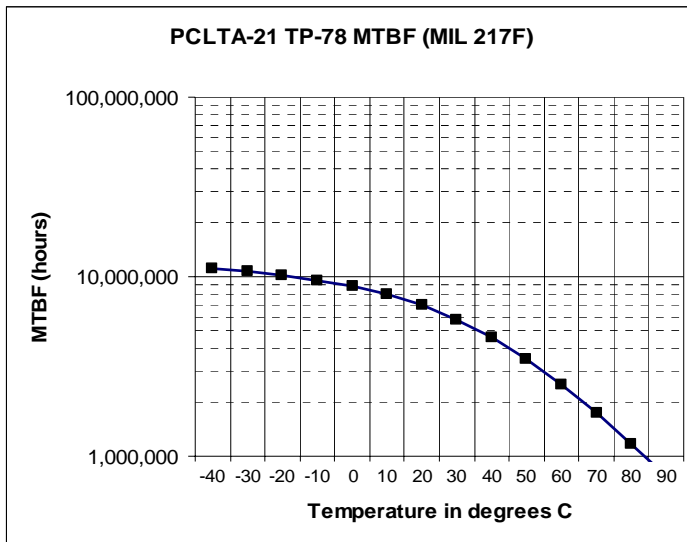
Parameter	Results
Operating temperature	0 to +70°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	25% to 90% RH @ 70°C, operating 95% RH @ 70°C, non-operating
Vibration	ETS1300 019-2-3 T3.2
Shock	ETS1300 019-2-3 T3.2
EMI	FCC Part 15 Level B and EN55022 Level B
UL 60950, 2000	E145541
CSA C22.2 No. 60950, 2000	E145541
TÜV EN 60950:2000	E30382588-001



Temp (deg C)	MTBF (hours)	FITs
-40	11,494,253	87
-30	11,135,857	90
-20	10,672,359	94
-10	10,090,817	99
0	9,363,296	107
10	8,460,237	118
20	7,390,983	135
30	6,195,787	161
40	4,952,947	202
50	3,772,161	265
60	2,746,498	364
70	1,927,897	519
80	1,317,870	759
90	886,446	1128

PCLTA-21 TP-78 PCI Interface (7450x)

Parameter	Results
Operating temperature	0 to +70°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	25% to 90% RH @ 70°C, operating 95% RH @ 70°C, non-operating
Vibration	ETS1300 019-2-3 T3.2
Shock	ETS1300 019-2-3 T3.2
EMI	FCC Part 15 Level B and EN55022 Level B
UL 60950, 2000	E145541
CSA C22.2 No. 60950, 2000	E145541
TÜV EN 60950:2000	E30382588-001

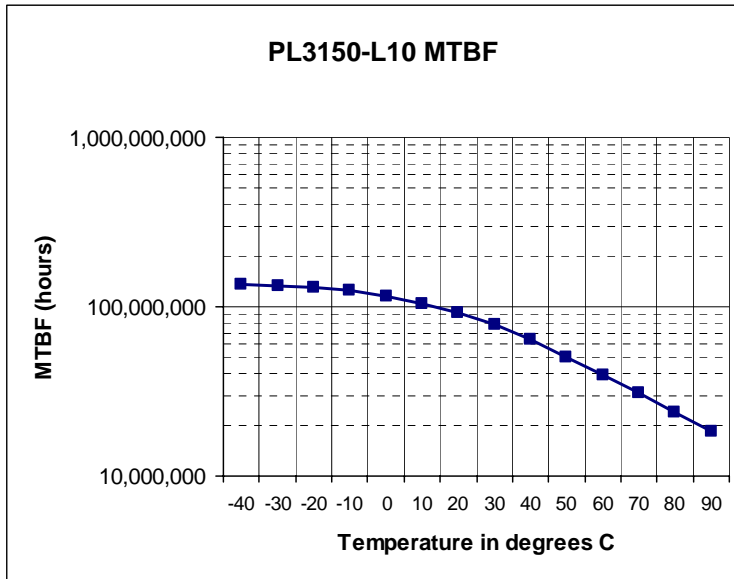


Temp (deg C)	MTBF (hours)	FITs
-40	11,160,714	90
-30	10,718,114	93
-20	10,193,680	98
-10	9,569,378	105
0	8,826,125	113
10	7,936,508	126
20	6,906,077	145
30	5,760,369	174
40	4,576,659	219
50	3,456,619	289
60	2,489,420	402
70	1,725,626	580
80	1,163,738	859
90	772,798	1294

PL 3150-L10 Power Line Smart Transceiver (15320, 15321R)

Note: 15321R is the model number for the RoHS compliant PL 3150-L10.

Parameter	Results
Operating temperature	-40°C to +85°C
EMI	Designed to comply with FCC, Industry Canada, Japan MPT, and CENELEC EN50065-1

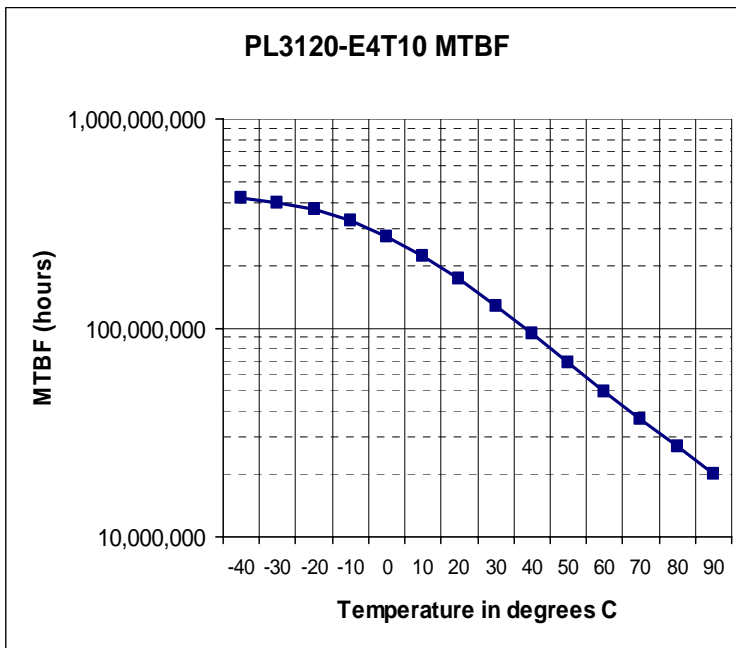


Temp (deg C)	MTBF (hours)	FITs
-40	135,501,355	7.4
-30	133,333,333	7.5
-20	129,870,130	7.7
-10	124,223,602	8.1
0	116,009,281	8.6
10	105,152,471	9.5
20	92,081,031	10.9
30	77,760,498	12.9
40	63,653,724	15.7
50	50,709,939	19.7
60	39,666,799	25.2
70	30,693,677	32.6
80	23,646,252	42.3
90	18,218,255	54.9

PL 3170 Power Line Smart Transceiver (15330R-0000, 15330R-2500)

The 3170 Power Line Smart Transceiver has the same MTBF characteristics as the PL 3120 Power Line Smart Transceiver.

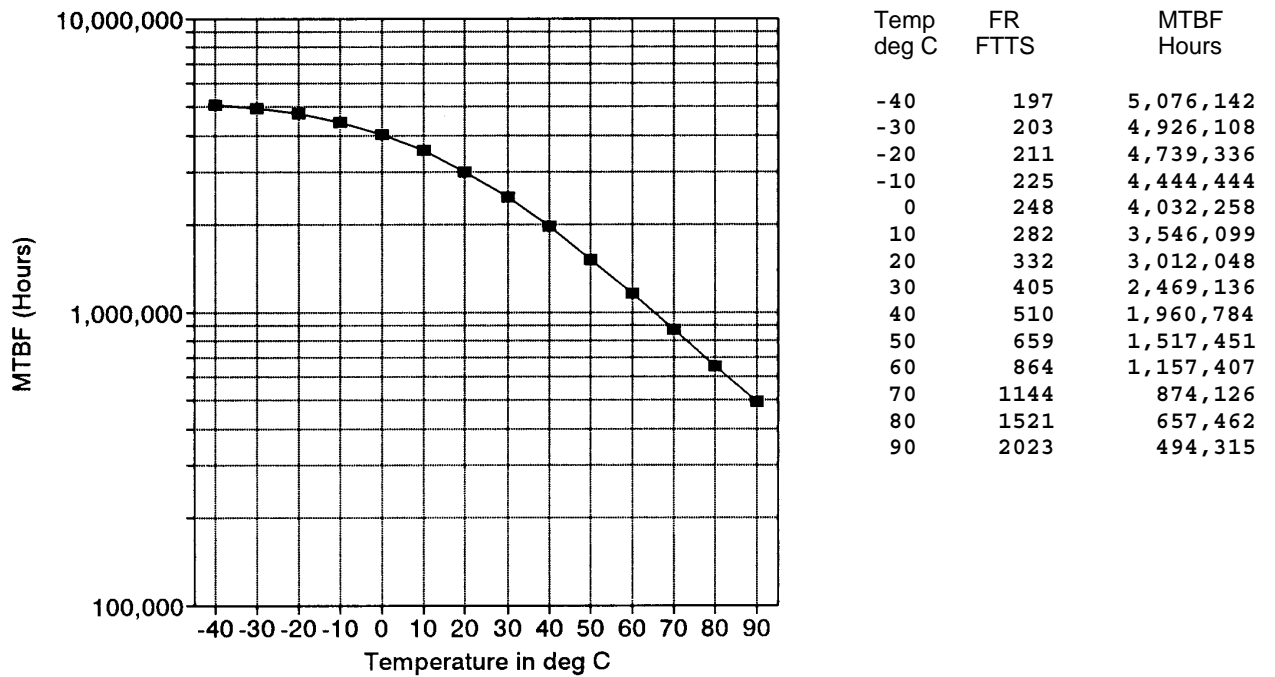
Parameter	Results
Operating temperature	-40°C to +85°C
EMI	Designed to comply with FCC, Industry Canada, Japan MPT, and CENELEC EN50065-1



Temp (deg C)	MTBF (hours)	FITs
-40	416,666,667	2.4
-30	396,825,397	2.5
-20	367,647,059	2.7
-10	325,732,899	3.1
0	275,482,094	3.6
10	221,729,490	4.5
20	170,940,171	5.9
30	127,713,921	7.8
40	93,720,712	10.7
50	68,259,386	14.7
60	49,751,244	20.1
70	36,456,435	27.4
80	26,961,445	37.1
90	20,149,103	49.6

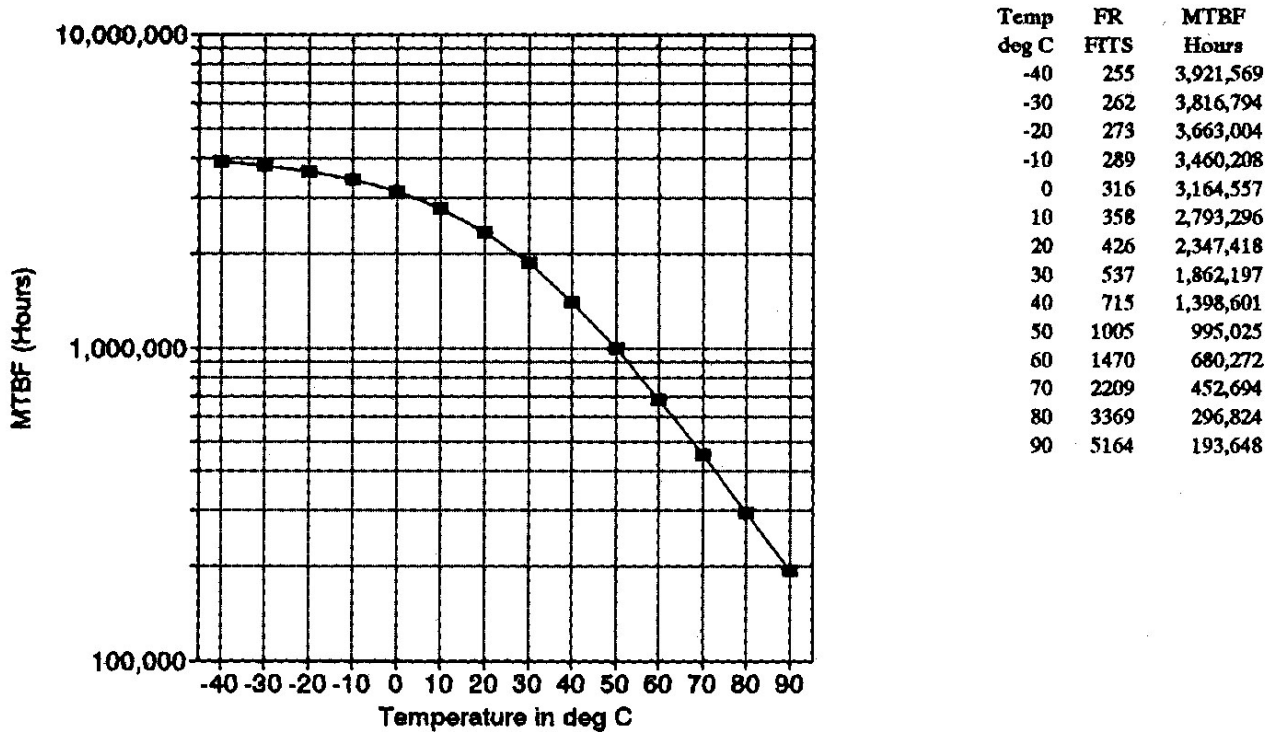
RTR-10 Router Core Module (61000)

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 95% RH @ 40°C, operating 95% RH @ 85°C, non-operating
EMI	FCC/VDE B demonstrated



SLTA-10/FT-10 Serial LonTalk Adapter (73351)

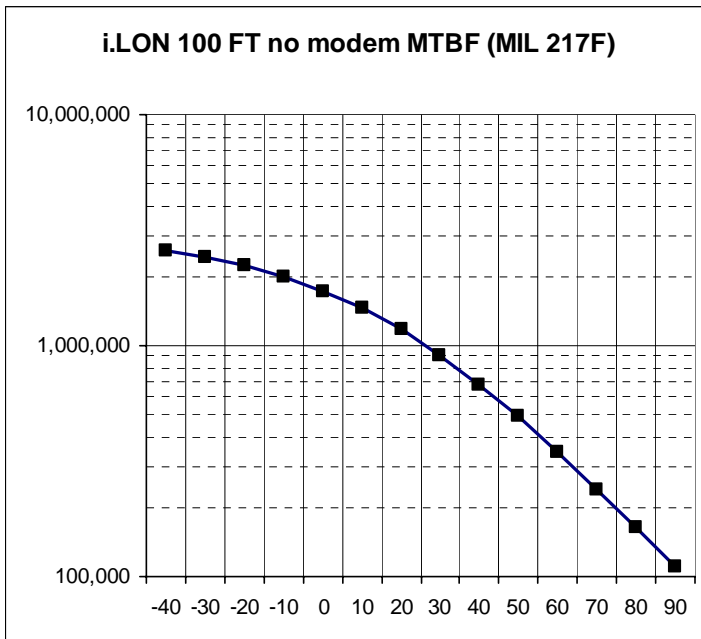
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 4
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 2
Burst	Designed to comply with EN61000-4-4 Level 3
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE B demonstrated
UL 1950	E145541
cUL per CSA C22.2 No. 950	E145541
TÜV EN 60950	T9677495



SmartServer FT (72101R-4xx)

The SmartServer has the same MTBF characteristics as the *i.LON 100*.

Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH @ 65°C, non-operating
Altitude	4,545 meters operating (15,000 feet) 7,576 meters non-operating (25,000 feet)
EMI	FCC Part 15 Class , EN55024, CISPR 22 Class B, VCC1 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E2272372.01

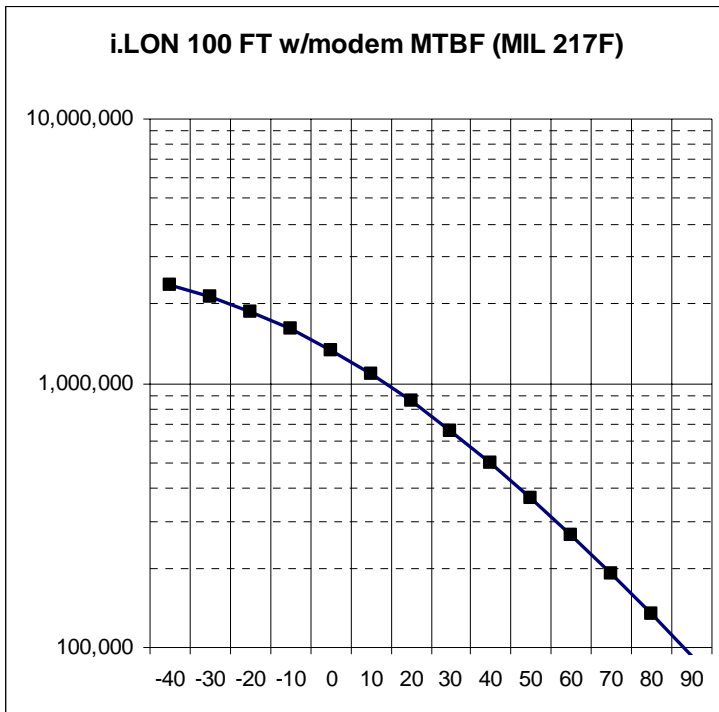


Temp (deg C)	MTBF (hours)	FITs
-40	2,586,653	387
-30	2,412,545	415
-20	2,209,456	453
-10	1,977,457	506
0	1,719,395	582
10	1,445,504	692
20	1,170,275	855
30	910,084	1099
40	680,805	1469
50	492,053	2032
60	346,009	2890
70	238,641	4190
80	162,700	6146
90	110,392	9059

SmartServer FT with Modem (72102R-4xx)

The SmartServer has the same MTBF characteristics as the *i.LON 100*.

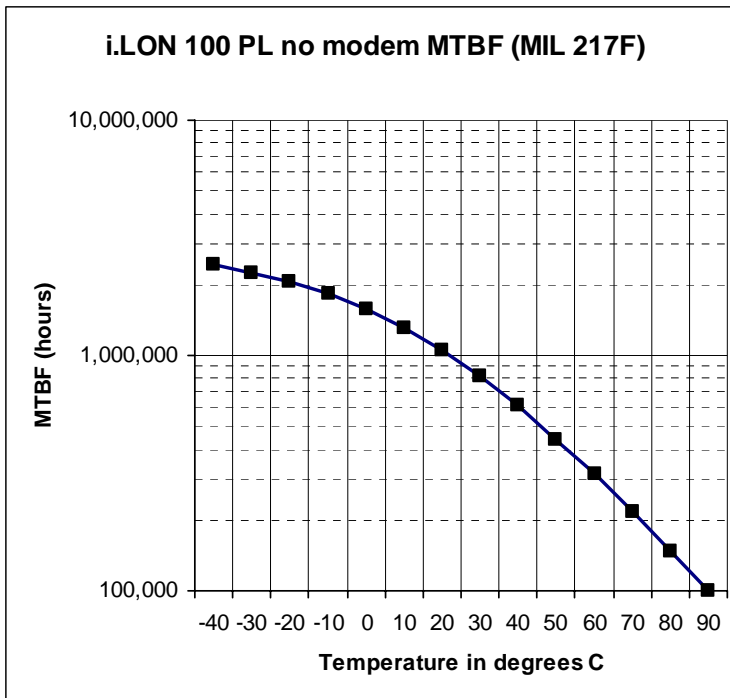
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH @ 65°C, non-operating
Altitude	4,545 meters operating (15,000 feet) 7,576 meters non-operating (25,000 feet)
EMI	FCC Part 15 Class , EN55024, CISPR 22 Class B, VCC1 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E2272372.01



Temp (deg C)	MTBF (hours)	FITs
-40	2,365,184	423
-30	2,128,112	470
-20	1,870,208	535
-10	1,601,794	624
0	1,335,827	749
10	1,084,834	922
20	858,516	1165
30	662,252	1510
40	498,840	2005
50	367,688	2720
60	265,957	3760
70	189,502	5277
80	133,552	7488
90	93,489	10697

SmartServer PL (72103R-4xx)

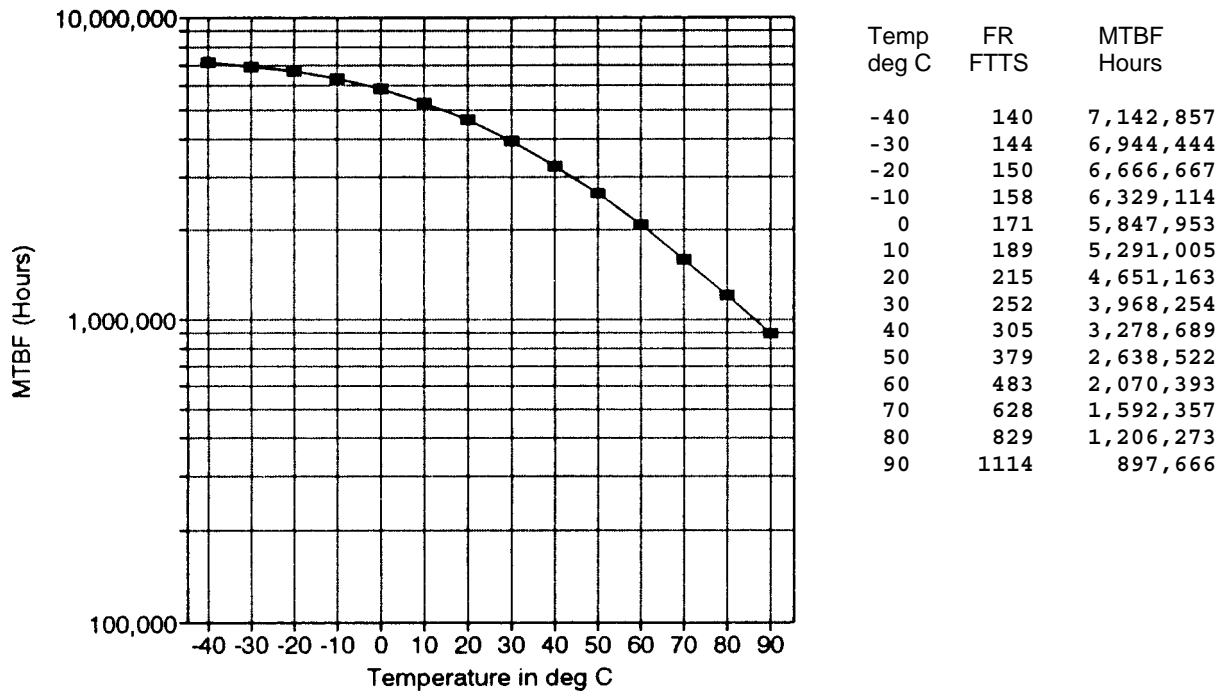
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH max @ 50°C, non-operating
EMI	FCC Part 15 Class B, EN55022 Class B, EN55024, CISPR 22 Class B, VCC1 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E2272372.01



Temp (deg C)	MTBF (hours)	FITs
-40	2,420,721	413
-30	2,250,731	444
-20	2,051,703	487
-10	1,825,817	548
0	1,578,034	634
10	1,317,870	759
20	1,060,221	943
30	820,681	1219
40	612,257	1633
50	442,302	2261
60	311,488	3210
70	215,420	4642
80	147,375	6785
90	100,359	9964

TP/XF-78 Twisted Pair Control Module (55010)

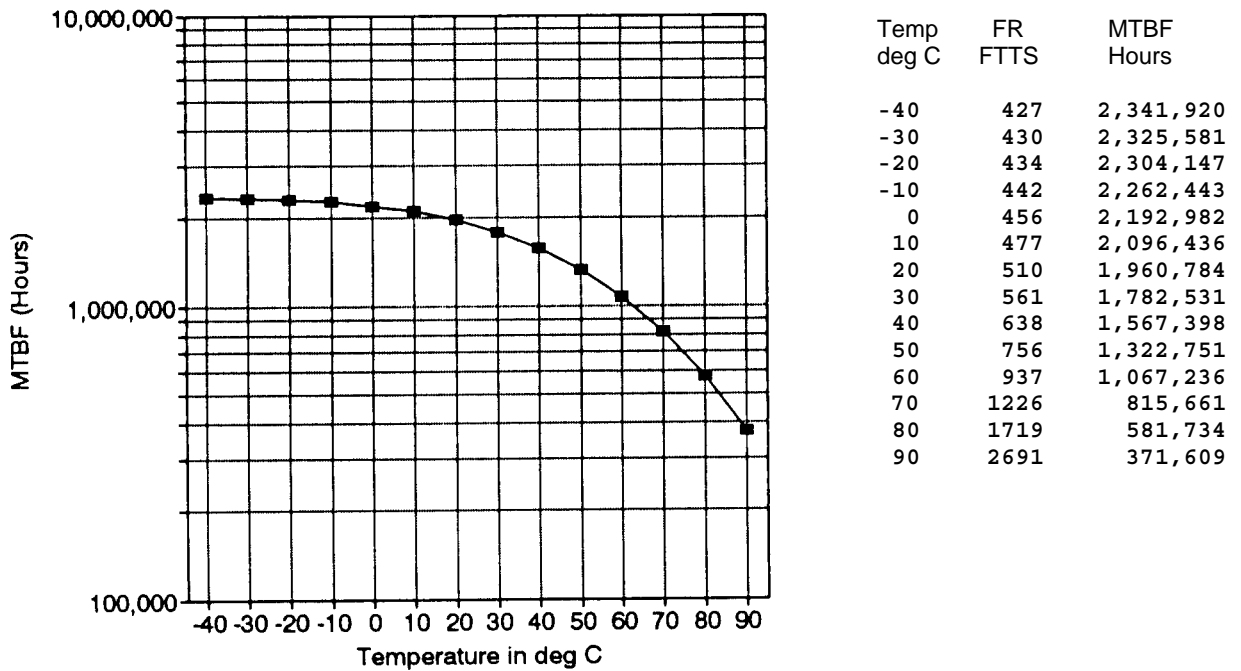
Parameter	Results
Operating temperature	-40°C to +85°C: see data sheet for effects on performance caused by temperature extremes
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +100°C, ramp rate 10°C/minute
ESD (per MIL-883)	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/VDE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60950:1992	R9371502.02



TP/XF-78F Flash Twisted Pair Control Module (55010-10, 55010R-10)

Note: 55010R-10 is the model number for the RoHS compliant TP/XF-78F twisted pair control module.

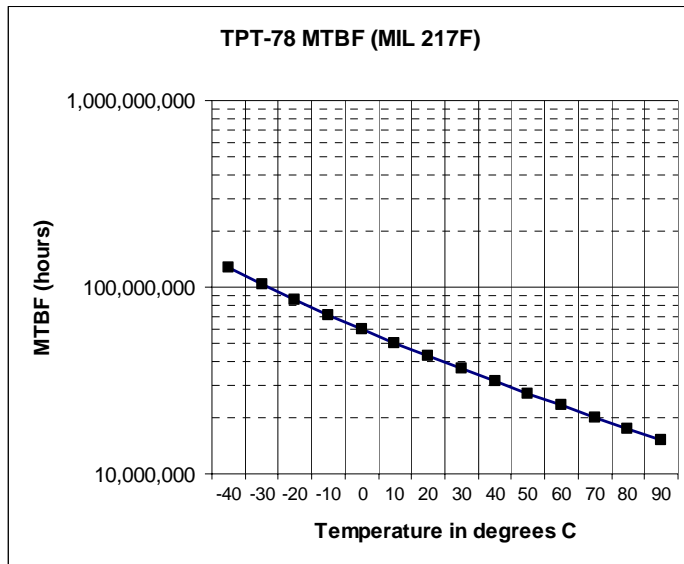
Parameter	Results
Operating temperature	-40°C to +85°C excluding flash memory: see data sheet for effects on performance caused by temperature extremes
Non-operating temperature	-40°C to +85°C excluding flash memory
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 4
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.Hz @ 0.5" D.A., 7.5Hz to 200 Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/VDE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60950:1992	R9371502.05



TPT/XF-78 Twisted Pair Transceiver (50010, 50010R)

Note: 50010R is the model number for the RoHS compliant TPT/XF-78 transceiver.

Parameter	Results
Operating temperature	-40°C to +85°C: see data sheet for effects on performance caused by temperature extremes
Non-operating temperature	-40°C to +85°C
Strife	-55°C to +100°C, ramp rate 10°C/minute
ESD	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60 950:1992	R9371502.02

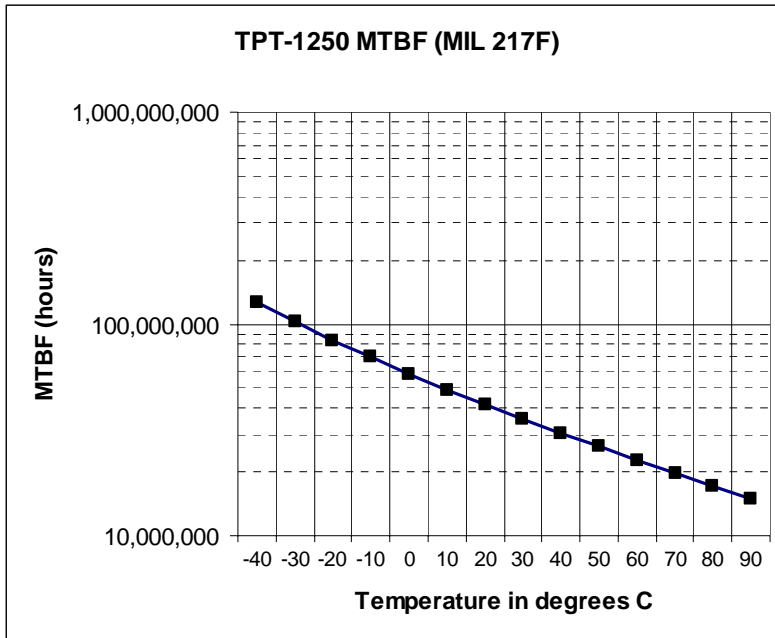


Temp (deg C)	MTBF (hours)	FITs
-40	128,205,128	7.8
-30	104,166,667	9.6
-20	85,470,085	11.7
-10	70,921,986	14.1
0	59,523,810	16.8
10	50,251,256	19.9
20	42,735,043	23.4
30	36,496,350	27.4
40	31,250,000	32.0
50	26,881,720	37.2
60	23,201,856	43.1
70	20,080,321	49.8
80	17,361,111	57.6
90	15,060,241	66.4

TPT/XF-1250 Twisted Pair Transceiver (50020, 50020R)

Note: 50020R is the model number for the RoHS compliant TPT/XF-1250 transceiver.

Parameter	Results
Operating temperature	-40°C to +85°C: see data sheet for effects on performance caused by temperature extremes
Non-operating temperature	-40°C to +85°C
Strife	-55°C to +100°C, ramp rate 10°C/minute
ESD	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60 950:1992	S9371373.01



Temp (deg C)	MTBF (hours)	FITs
-40	126,582,278	7.9
-30	102,040,816	9.8
-20	84,033,613	11.9
-10	69,444,444	14.4
0	58,139,535	17.2
10	49,019,608	20.4
20	41,666,667	24.0
30	35,587,189	28.1
40	30,581,040	32.7
50	26,315,789	38.0
60	22,727,273	44.0
70	19,685,039	50.8
80	17,064,846	58.6
90	14,814,815	67.5

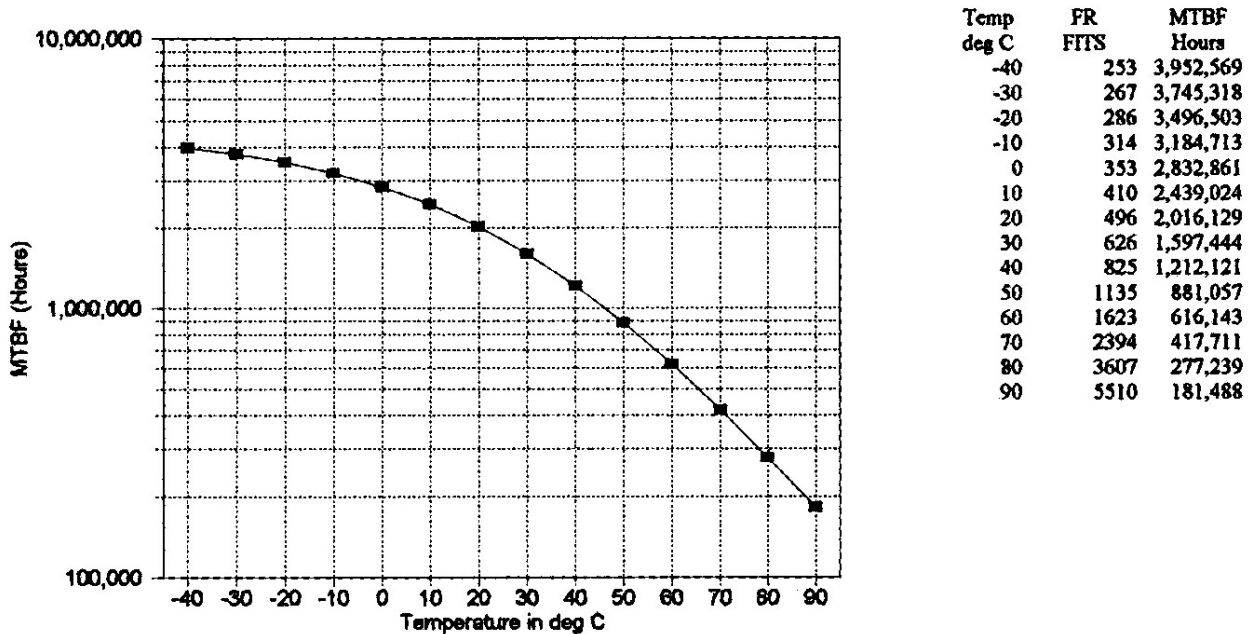
Appendix A

The LONWORKS Control Products Environmental Specifications and MTBF Guide provides information for products currently available from the LONWORKS Products Price List. Specifications and MTBF information for older products no longer shipped by Echelon are available in this appendix.

AI-10 Analog Input Interface Module
AO-10 Analog Output Interface Module
DI-10 Digital Input Interface Module
DO-10 Digital Input Interface Module
DIO-10 Digital Input/Output Interface Module
DM-20/21 Device Manager Module
FTT-10 Free Topology Transceiver
i.LON 10 Internet Server, TP/FT-10
i.LON 10 Internet Server, TP/PL-20
i.LON 100 Internet Server, TP/FT-10
i.LON 100 Internet Server, TP/FT with Modem
i.LON 100 Internet Server, PL-20
i.LON 100 Internet Server PL-20 with Modem
i.LON 1000 Internet Server 72001
i.LON 1000 Internet Server 72002
LonManager NSS-10 Module
LPI-10 Link Power Transceiver
LPT-10 Link Power Transceiver
LTM-10 LonTalk Module
LTS-10 SLTA Core Module
PL 3120-E4T10 Power Line Smart Transceiver
PLC-10 Power Line Control Module (Common Mode)
PLM-22 Modular Transceiver
PLT-10 Power Line Transceiver
PLT-10A Power Line Transceiver
PLT-20 Power Line Transceiver
PLT-22 Power Line Transceiver
PLT-30 Power Line Transceiver
SLTA Motherboard
TP/FT-10 Free Topology Twister Pair Control Module
TP/FT-10F Flash Control Module
TP-RS485 Twisted Pair Control Module
TP/XF-1250 Twisted Pair Control Module

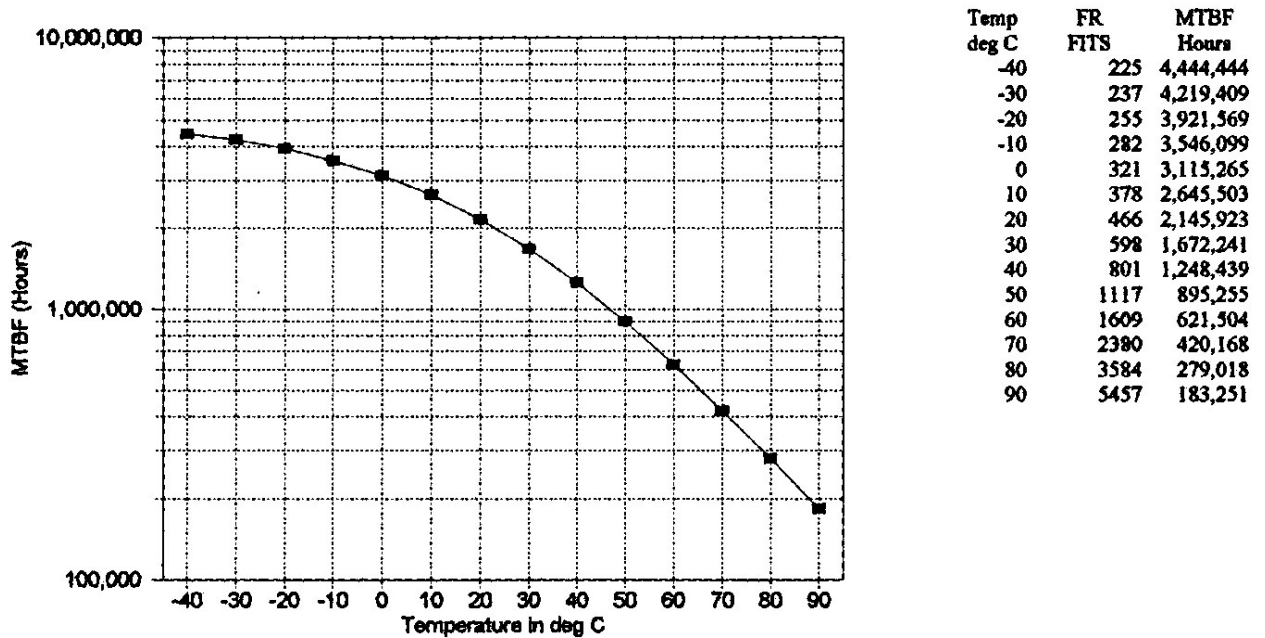
AI-10 Analog Input Interface Module (41300)

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



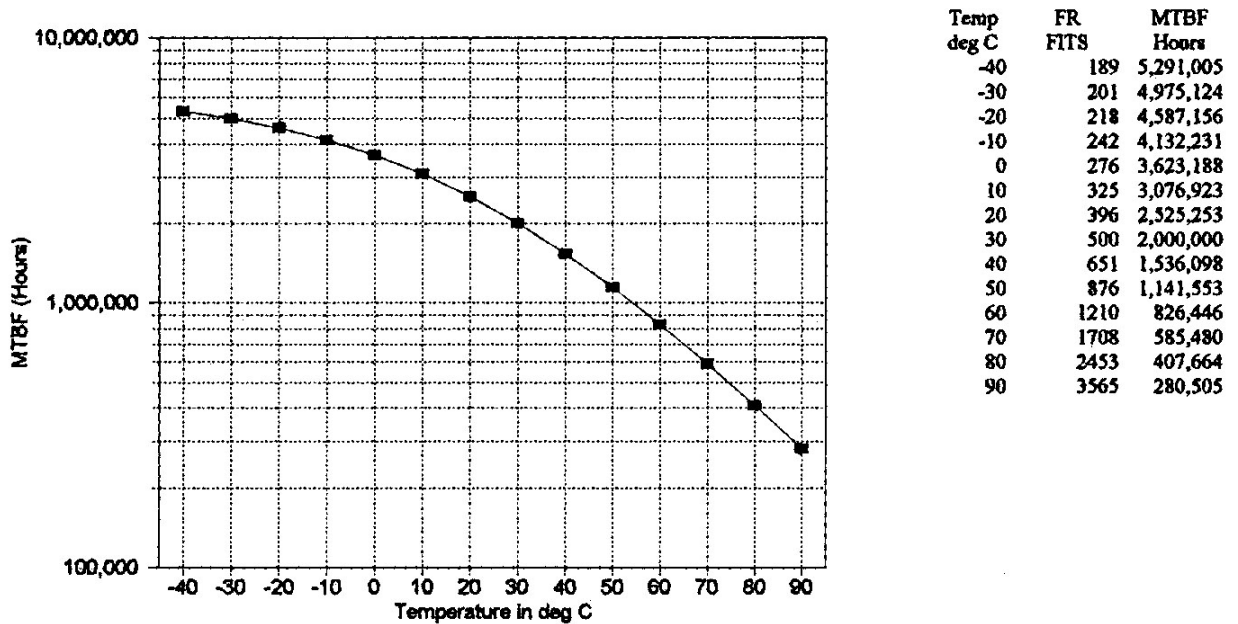
AO-10 Analog Output Interface Module (41400)

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



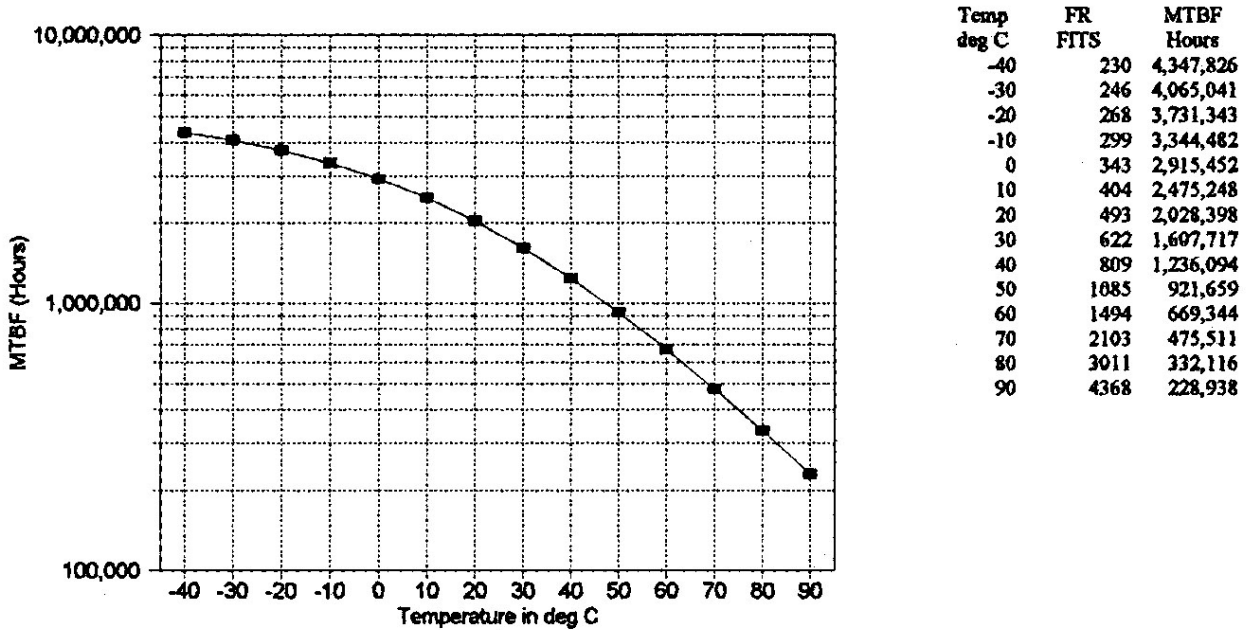
DI-10 Digital Input Interface Module (41100)

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



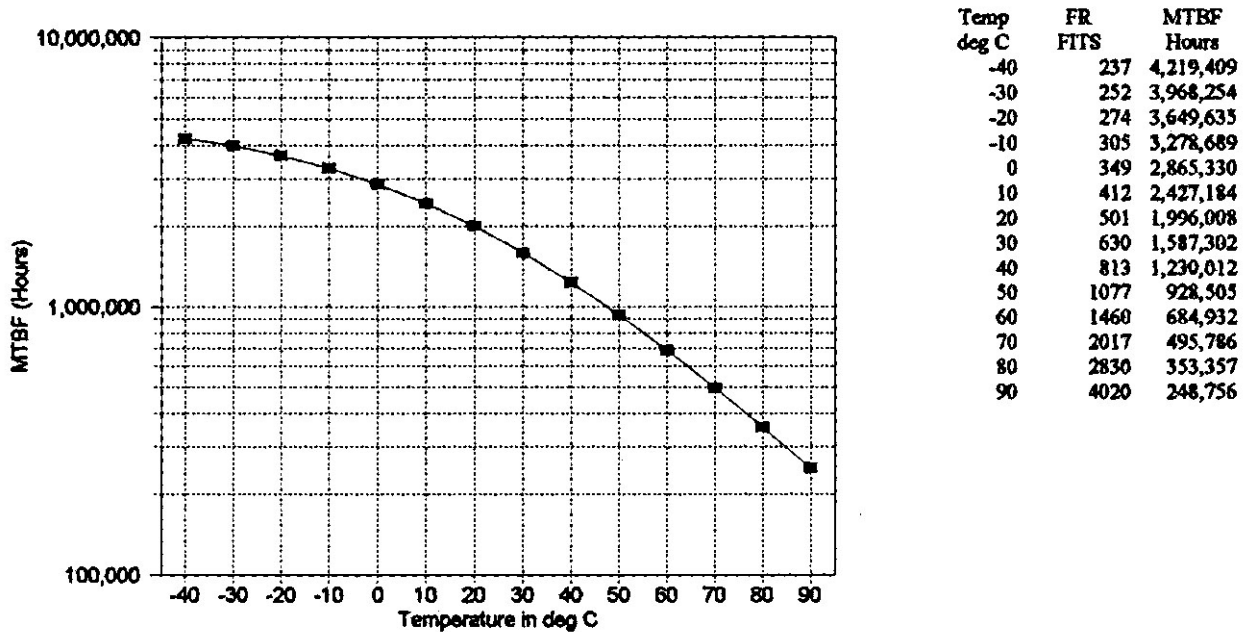
DO-10 Digital Output Interface Module (41200)

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



DIO-10 Digital Input/Output Interface Module (41500)

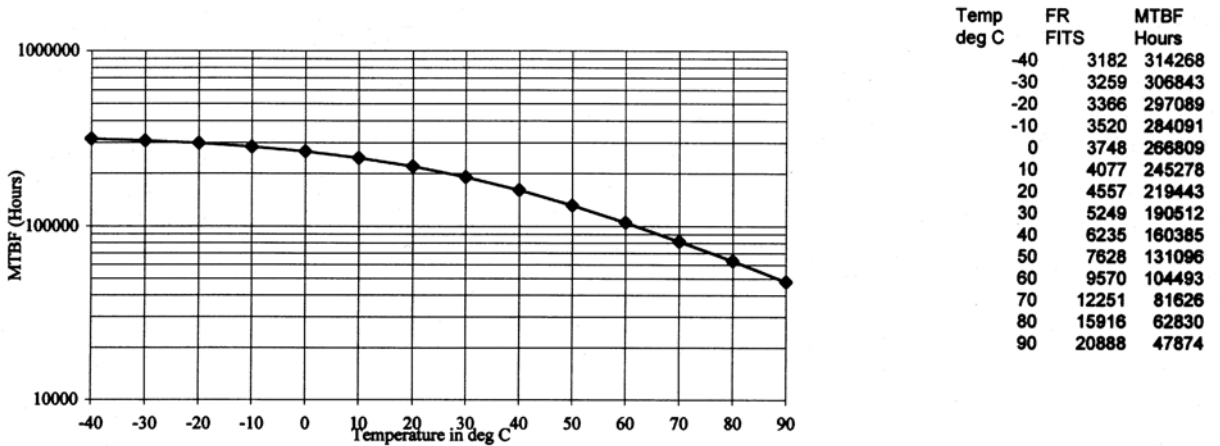
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747



DM-20/21 Device Manager Module (43201, 43202)

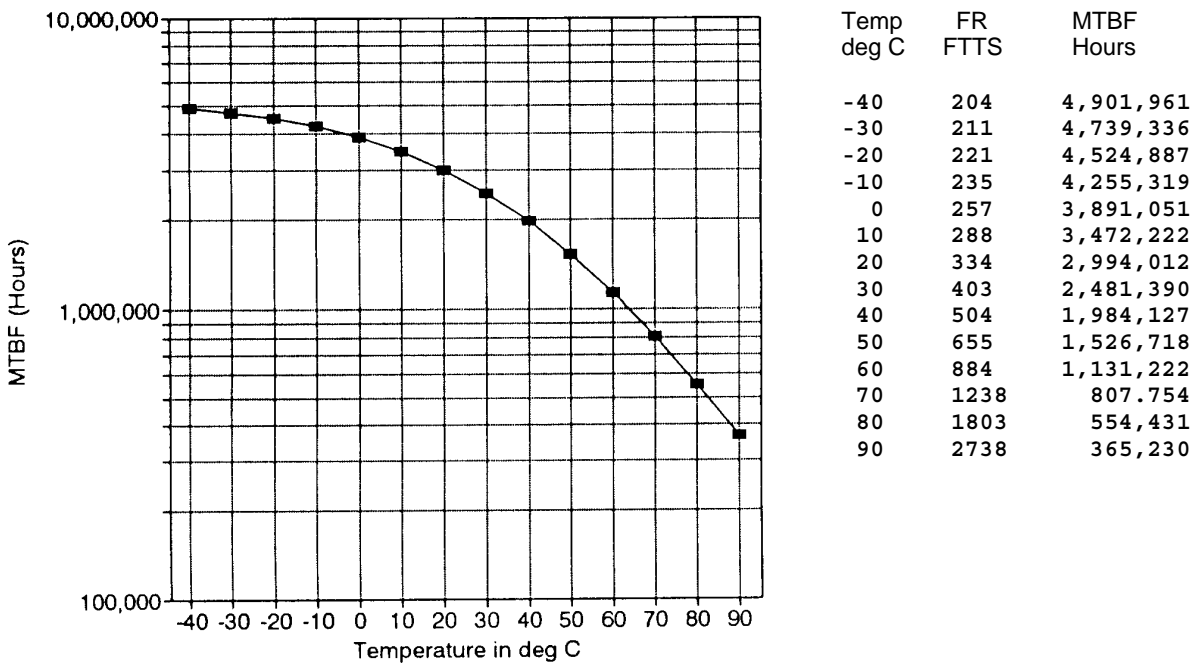
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 3
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 3
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C operating 95% RH @ +50°C non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE A demonstrated
UL 916	E146747
cUL per CSA C22.2 No. 205	E146747

MTBF calculation assumes a ground mobile environment



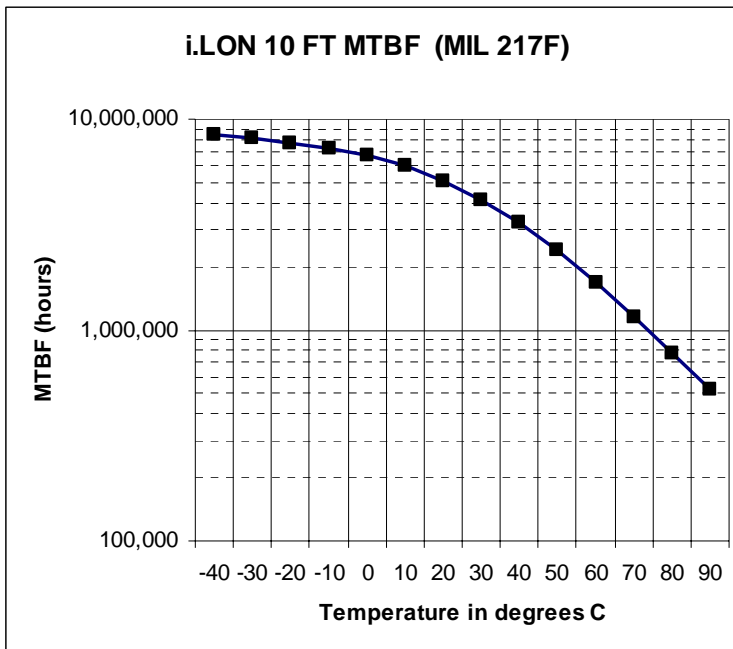
FTT-10 Free Topology Transceiver

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with IEC801-2 Level 4
Radiated Susceptibility	Designed to comply with IEC801-3 Level 3
Burst	Designed to comply with IEC801-4 Level 4
Surge	Designed to comply with IEC801-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ 50°C, operating 95% RH @ 50°C, non-operating
Vibration	3g (5Hz to 200Hz)
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/VDE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60950:1992	R9577050



i.LON 10 Internet Server, TP/FT-10 (72010-X)

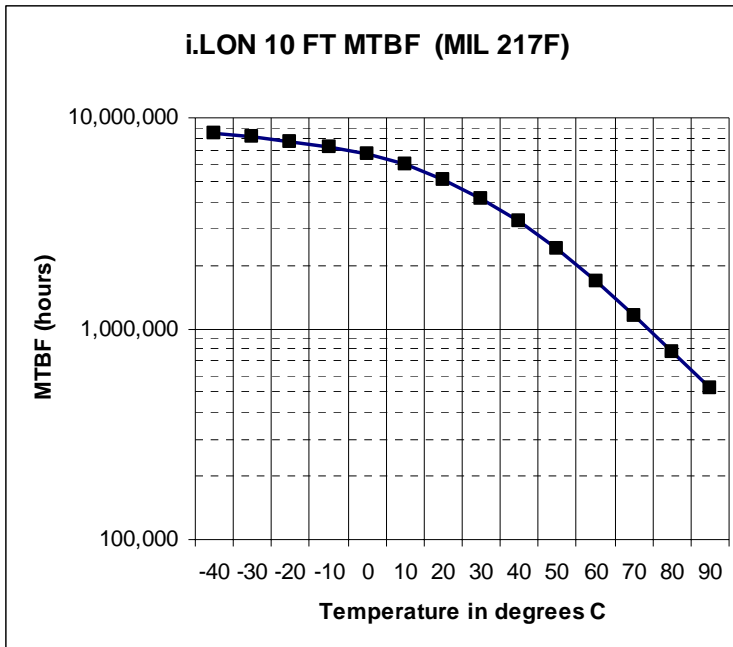
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	0 to +50°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	25% to 90% RH @ 50°C, operating 95% RH @ 50°C, non-operating
EMI	FCC Part 15 Class B and EN55022B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E2272210.01



Temp (deg C)	MTBF (hours)	FITs
-40	8,389,262	119
-30	8,116,883	123
-20	7,751,938	129
-10	7,288,630	137
0	6,702,413	149
10	5,970,149	168
20	5,109,862	196
30	4,164,931	240
40	3,223,727	310
50	2,374,733	421
60	1,679,543	595
70	1,153,137	867
80	777,726	1286
90	520,346	1922

i.LON 10 Internet Server, TP/PL-20 (72011-X)

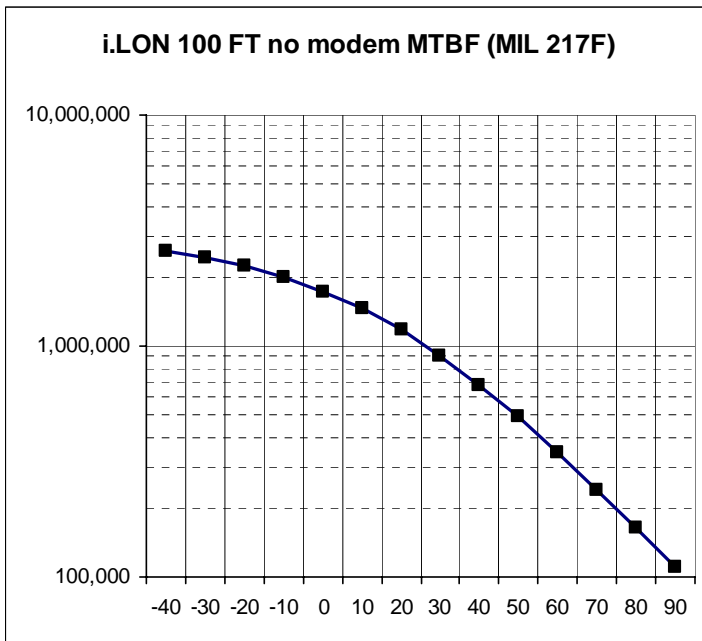
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	0 to +50°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	25% to 90% RH @ 50°C, operating 95% RH @ 50°C, non-operating
EMI	FCC Part 15 Class B and EN55022B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E2272210.01



Temp (deg C)	MTBF (hours)	FITs
-40	8,389,262	119
-30	8,116,883	123
-20	7,751,938	129
-10	7,288,630	137
0	6,702,413	149
10	5,970,149	168
20	5,109,862	196
30	4,164,931	240
40	3,223,727	310
50	2,374,733	421
60	1,679,543	595
70	1,153,137	867
80	777,726	1286
90	520,346	1922

i.LON 100 Internet Server, TP/FT-10 (72101)

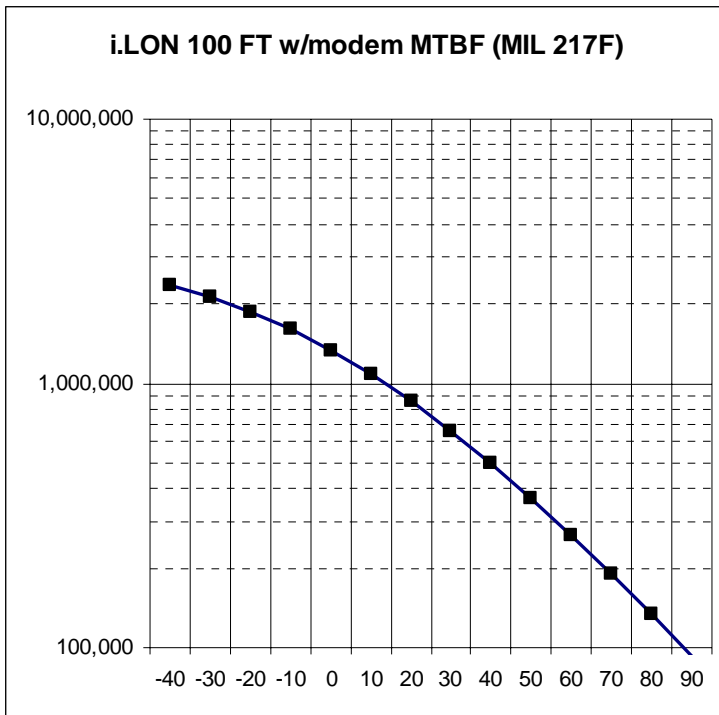
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH @ 65°C, non-operating
Altitude	4,545 meters operating (15,000 feet) 7,576 meters non-operating (25,000 feet)
EMI	FCC Part 15 Class , EN55024, CISPR 22 Class B, VCC1 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E2272372.01



Temp (deg C)	MTBF (hours)	FITs
-40	2,586,653	387
-30	2,412,545	415
-20	2,209,456	453
-10	1,977,457	506
0	1,719,395	582
10	1,445,504	692
20	1,170,275	855
30	910,084	1099
40	680,805	1469
50	492,053	2032
60	346,009	2890
70	238,641	4190
80	162,700	6146
90	110,392	9059

i.LON 100 Internet Server, TP/FT-10 with Modem (72102)

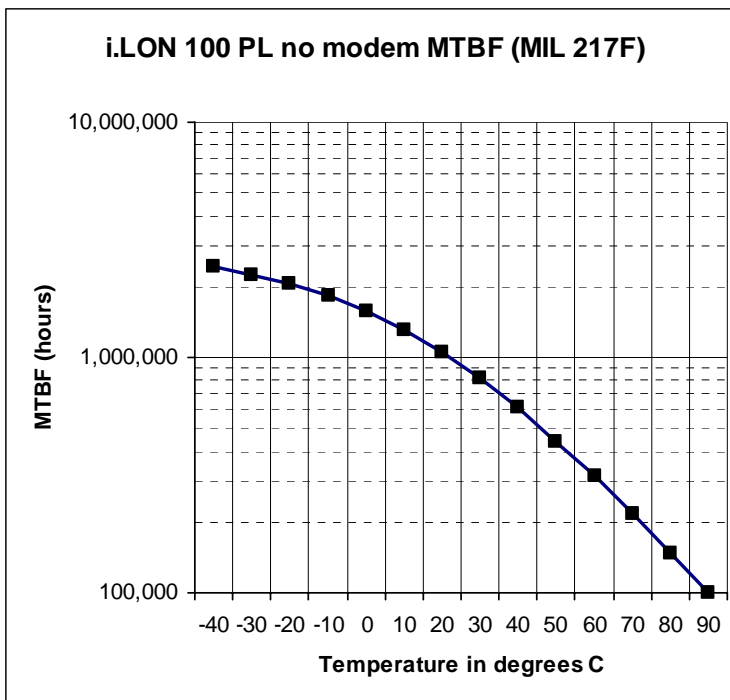
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
ESD	±4kv contact, ±8kv air
Radiated Susceptibility	3 v/m
EFT	1kv (AC), 0.5kv (I/O)
Surge	2kv common mode, 1kv differential mode
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH @ 65°C, non-operating
Altitude	4,545 meters operating (15,000 feet) 7,576 meters non-operating (25,000 feet)
EMI	FCC Part 15 Class , EN55024, CISPR 22 Class B, VCC1 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E2272372.01



Temp (deg C)	MTBF (hours)	FITs
-40	2,365,184	423
-30	2,128,112	470
-20	1,870,208	535
-10	1,601,794	624
0	1,335,827	749
10	1,084,834	922
20	858,516	1165
30	662,252	1510
40	498,840	2005
50	367,688	2720
60	265,957	3760
70	189,502	5277
80	133,552	7488
90	93,489	10697

i.LON 100 Internet Server, PL-20 (72103)

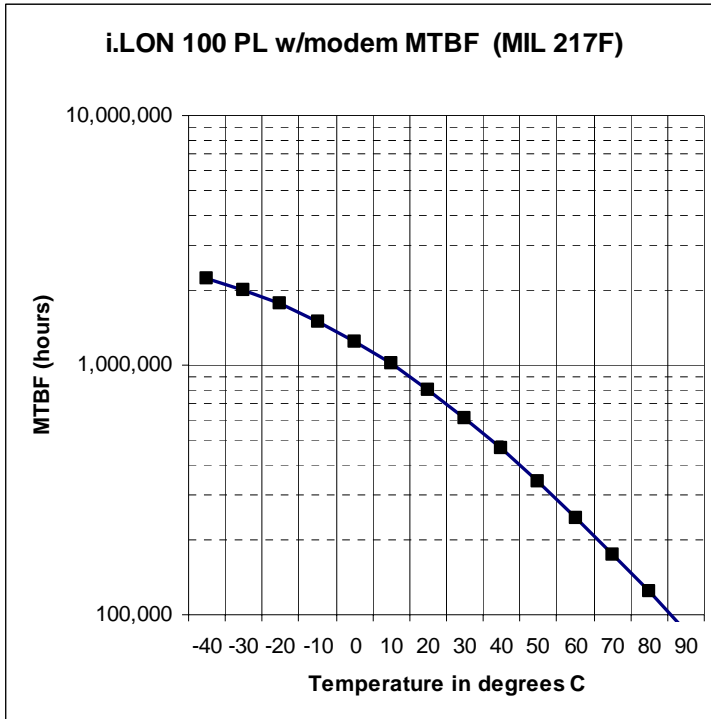
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH max @ 50°C, non-operating
EMI	FCC Part 15 Class B, EN55022 Class B, EN55024, CISPR 22 Class B, VCC1 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E2272372.01



Temp (deg C)	MTBF (hours)	FITs
-40	2,420,721	413
-30	2,250,731	444
-20	2,051,703	487
-10	1,825,817	548
0	1,578,034	634
10	1,317,870	759
20	1,060,221	943
30	820,681	1219
40	612,257	1633
50	442,302	2261
60	311,488	3210
70	215,420	4642
80	147,375	6785
90	100,359	9964

i.LON 100 Internet Server, PL-20 with Modem (72104)

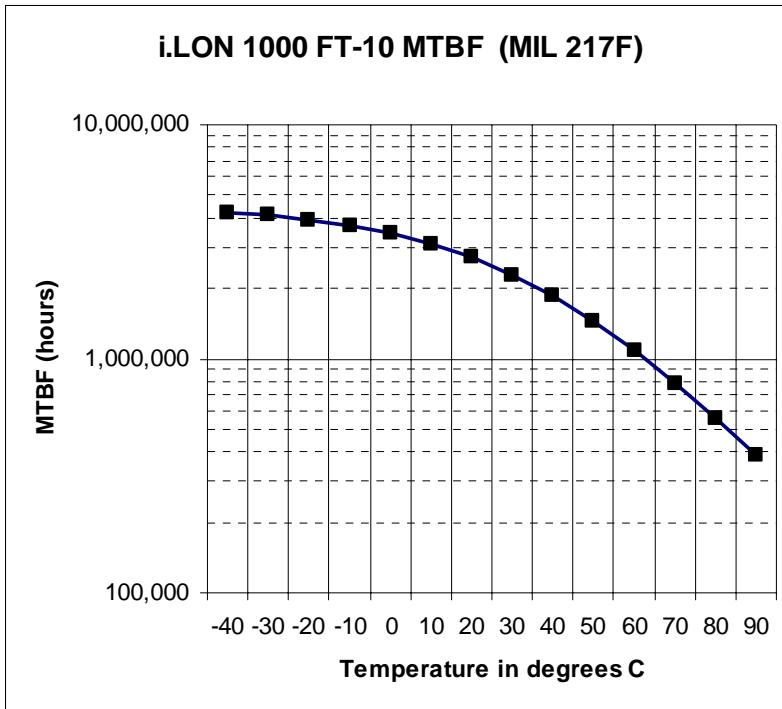
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
Humidity (non-condensing)	10% to 90% RH @ 50°C, operating 5% to 90% RH @ 65°C, non-operating
EMI	FCC Part 15 Class B, EN55022 Class B, EN55024, CISPR 22 Class B, VCC1 Class B
UL 60950, 2000	E145541
CSA C22.2 No. 60950-00	E145541
TÜV EN 60950:2000	E2272372.01



Temp (deg C)	MTBF (hours)	FITs
-40	2,225,684	449
-30	2,001,201	500
-20	1,755,926	570
-10	1,500,825	666
0	1,248,907	801
10	1,011,327	989
20	797,766	1254
30	613,610	1630
40	461,021	2169
50	339,179	2948
60	245,080	4080
70	174,560	5729
80	123,050	8127
90	86,191	11602

i.LON 1000 Internet Server (72001)

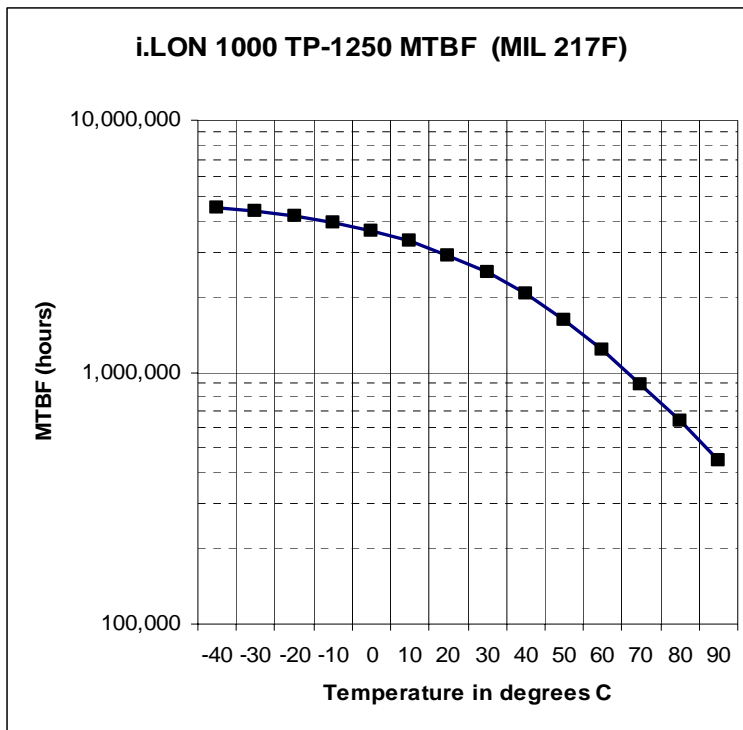
Parameter	Results
Operating temperature	0°C to +50°C
Non-operating temperature	-10°C to +85°C
Strife	-10°C to +80°C, ramp rate 10°C/minute
EMI	FCC Part 15 Class A and EN550022 Class A



Temp (deg C)	MTBF (hours)	FITs
-40	4,227,794	237
-30	4,099,369	244
-20	3,932,054	254
-10	3,717,058	269
0	3,443,526	290
10	3,108,776	322
20	2,719,534	368
30	2,291,476	436
40	1,854,943	539
50	1,441,878	694
60	1,079,704	926
70	783,349	1277
80	554,656	1803
90	386,160	2590

i.LON 1000 Internet Server (72002)

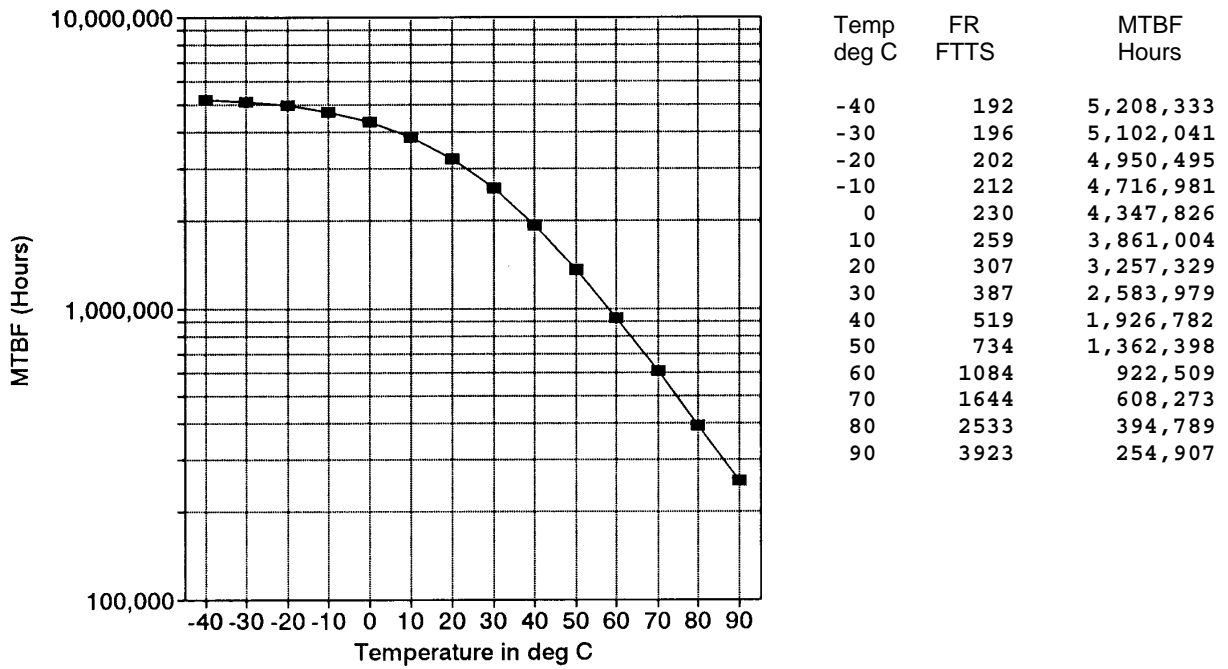
Parameter	Results
Operating temperature	0°C to +50°C
Non-operating temperature	-10°C to +85°C
Strife	-10°C to +80°C, ramp rate 10°C/minute
EMI	FCC Part 15 Class A and EN550022 Class A



Temp (deg C)	MTBF (hours)	FITs
-40	4,483,702	223
-30	4,333,882	231
-20	4,149,033	241
-10	3,918,035	255
0	3,636,364	275
10	3,299,568	303
20	2,911,123	344
30	2,483,238	403
40	2,039,568	490
50	1,609,425	621
60	1,221,777	818
70	896,242	1116
80	639,542	1564
90	447,407	2235

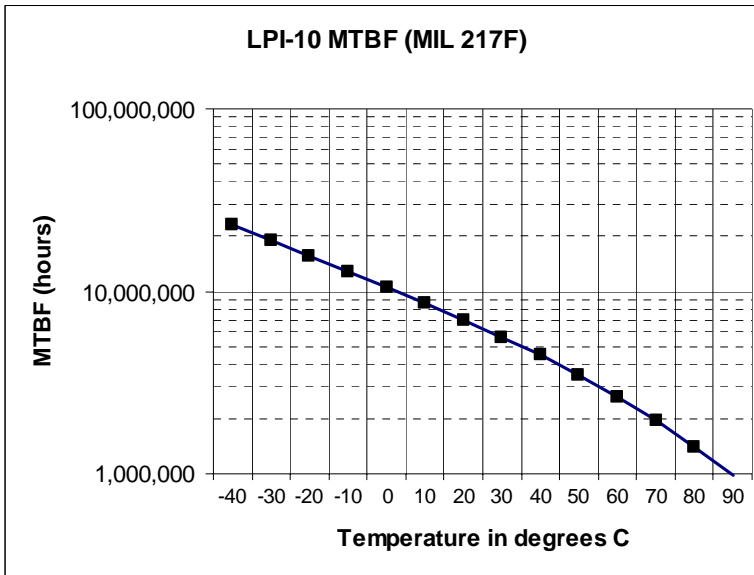
LonManager NSS-10 Module (34000)

Parameter	Results
Operating temperature	0°C to +70°C
Non-operating temperature	-40°C to +85°C
Operating Humidity	10% to 90% RH @ 50°C
Non-operating Humidity	95% RH @ 50°C
EMI	FCC/VDE B demonstrated



LPI-10 Link Power Interface Module (56210)

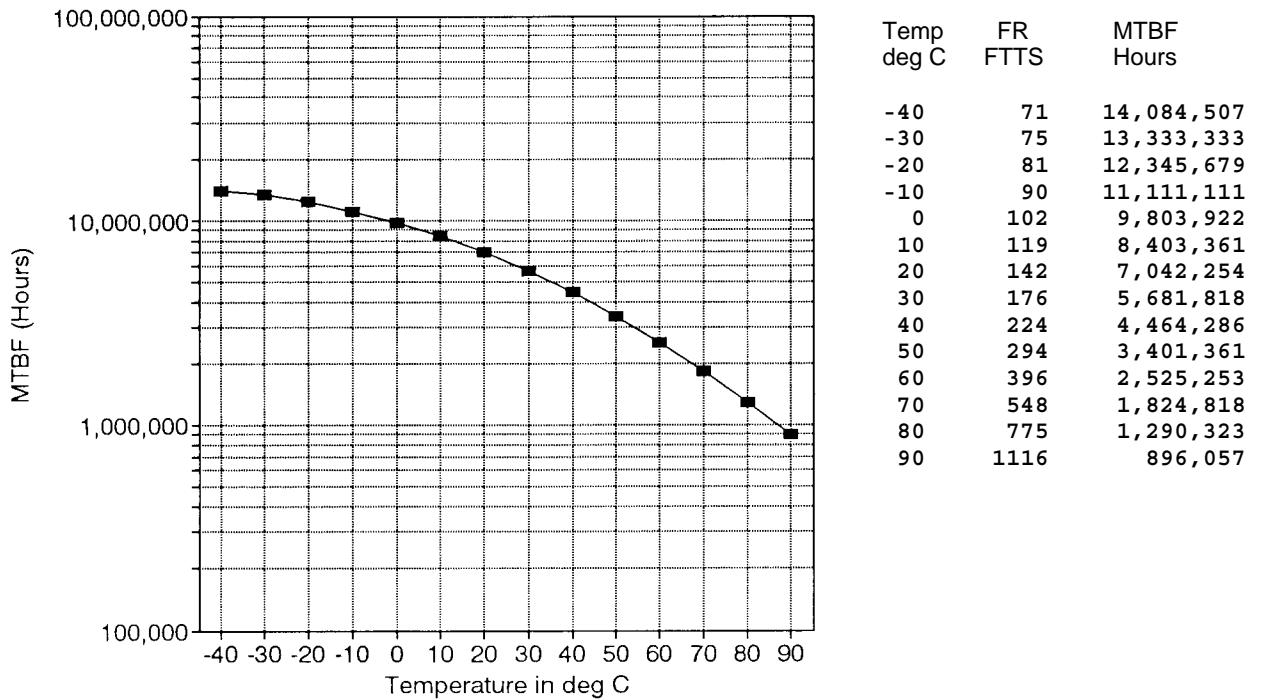
Parameter	Results
Operating temperature	0 to +50°C
Non-operating temperature	-40°C to +85°C
Strife	-20°C to +70°C, ramp rate 10°C/minute
Humidity (non-condensing)	25% to 90% RH @ 50°C, operating 95% RH @ 50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC Part 15, Level B and VDE 0871, Level B
UL 1950	E145541
CSA C22.2 No. 950-M89	LR77376
TÜV EN 60950:1992	R9371750.1



Temp (deg C)	MTBF (hours)	FITs
-40	23,364,486	42.8
-30	19,083,969	52.4
-20	15,612,802	64.1
-10	12,790,995	78.2
0	10,481,082	95.4
10	8,573,388	116.6
20	6,976,906	143.3
30	5,624,613	177.8
40	4,468,475	223.8
50	3,479,108	287.4
60	2,642,636	378.4
70	1,953,392	511.9
80	1,406,153	711.2
90	989,374	1010.7

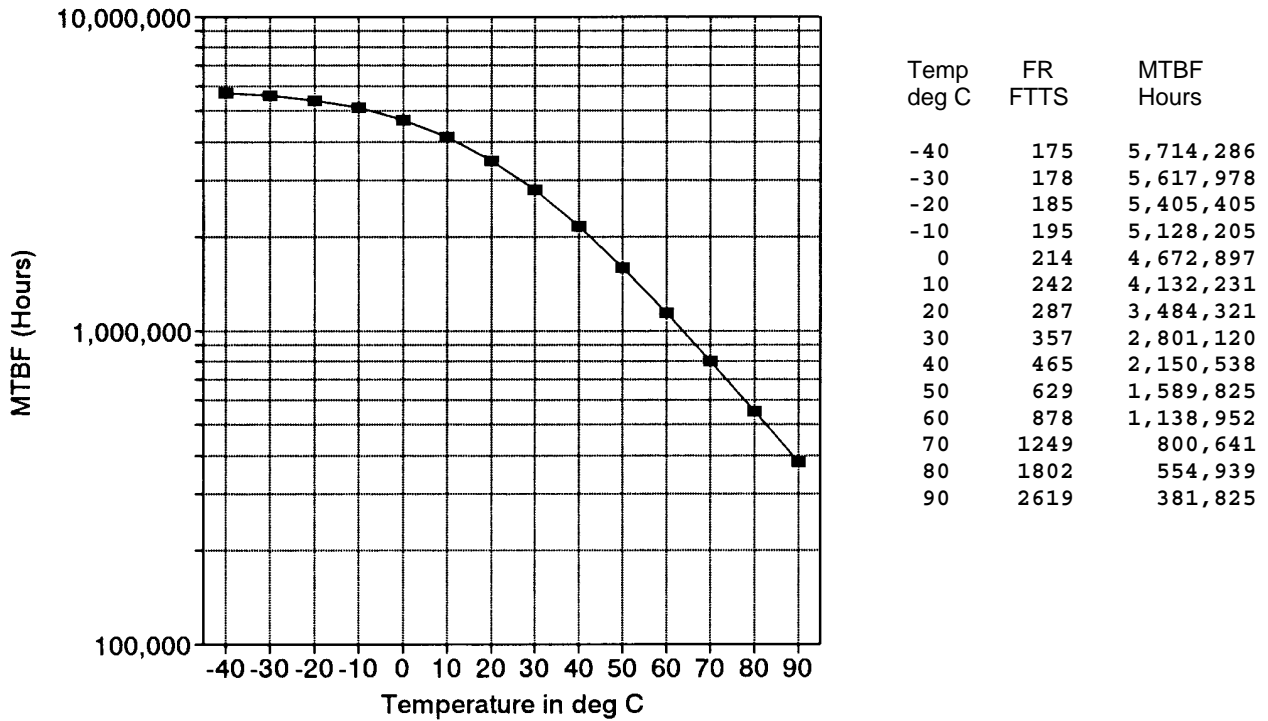
LPT-10 Link Power Transceiver

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with IEC801-2 Level 4
Radiated Susceptibility	Designed to comply with IEC801-3 Level 2
Burst	Designed to comply with IEC801-4 Level 4
Surge	Designed to comply with IEC801-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ 70°C, operating 95% RH @ 70°C, non-operating
Vibration	1.5g (8Hz to 2kHz)
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/VDE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60950:1992	R9373076



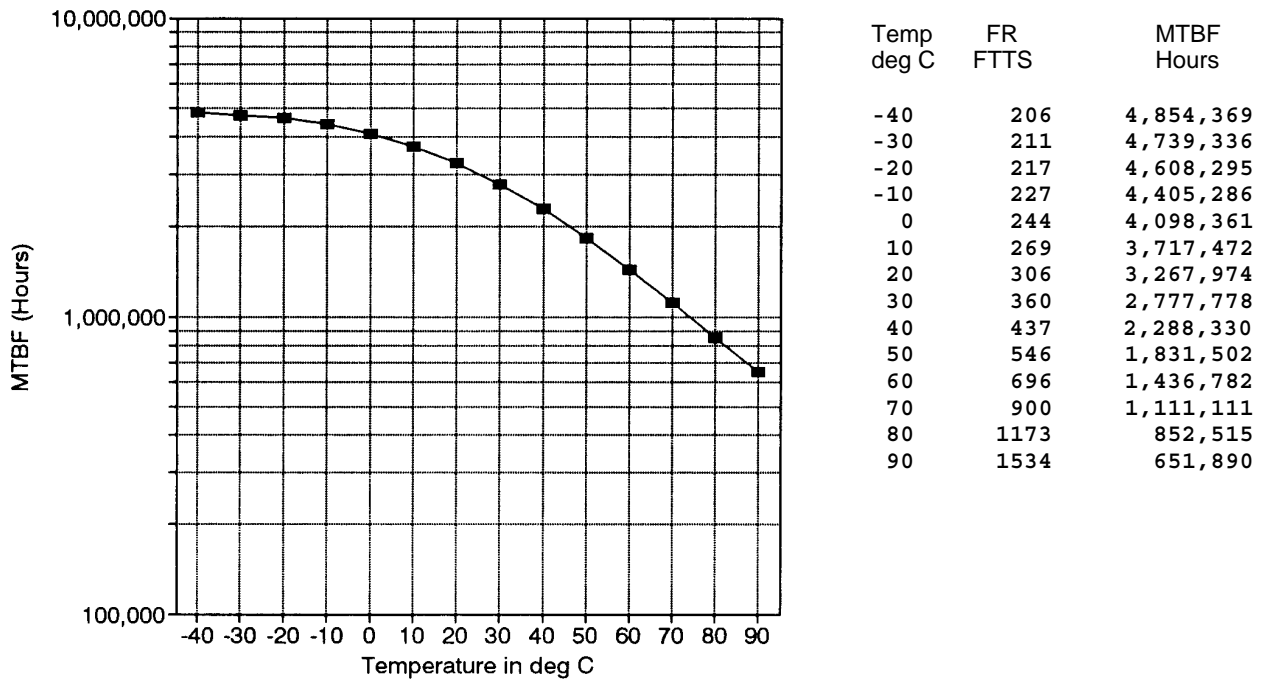
LTM-10 LonTalk Module

Parameter	Results
Operating temperature	0°C to +70°C
Non-operating temperature	-40°C to +85°C
Strife	-10°C to +80°C, ramp rate 10°C/minute
ESD	Designed to comply with IEC801-2 Level 4
Humidity (non-condensing)	10% to 95% RH @ 70°C, operating 95% RH @ 85°C, non-operating
Altitude	7620 meters (25,000 feet)
EMI	FCC/VDE B demonstrated



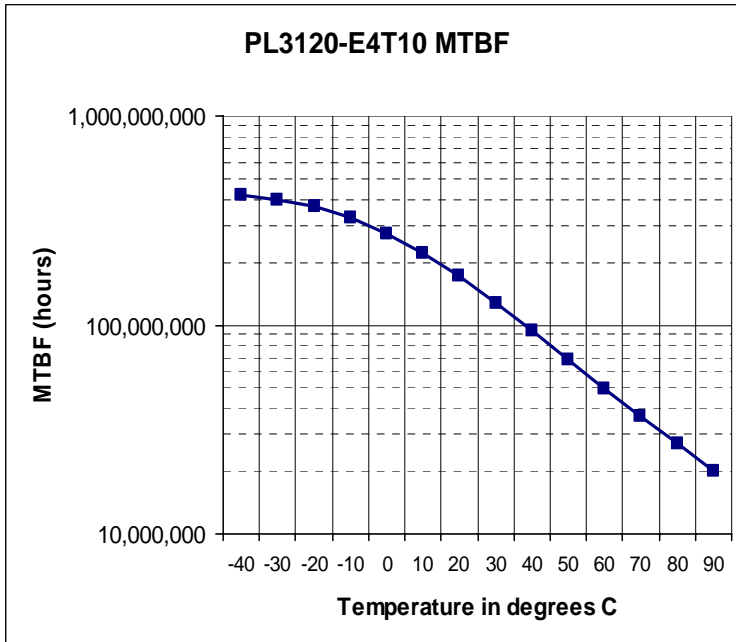
LTS-10 SLTA Core Module

Parameter	Results
Operating temperature	0°C to +70°C or <i>depending on date of manufacture</i> -40 to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 95% RH @ 40°C, operating 95% RH @ 85°C, non-operating
EMI	FCC/VDE B demonstrated



PL 3120-E4T10 Power Line Smart Transceiver (15310, 15311R)

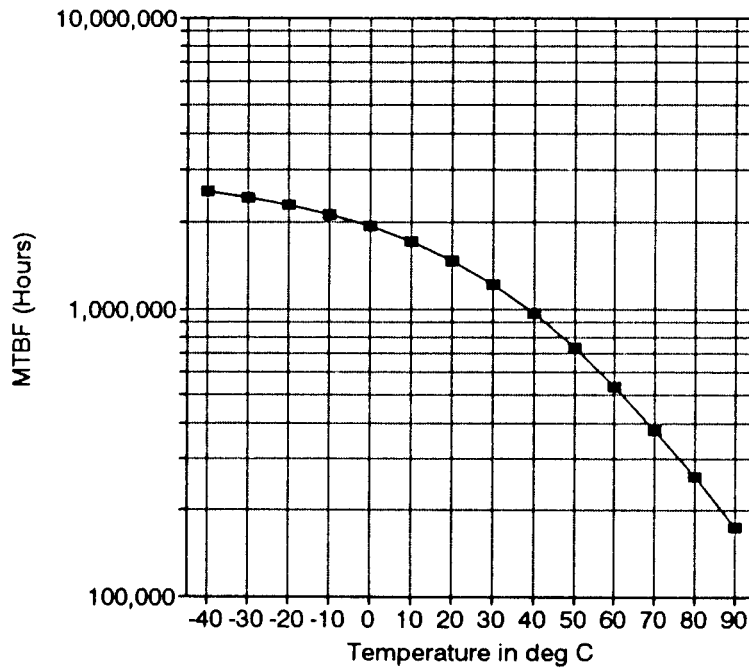
Parameter	Results
Operating temperature	-40°C to +85°C
EMI	Designed to comply with FCC, Industry Canada, Japan MPT, and CENELEC EN50065-1



Temp (deg C)	MTBF (hours)	FITs
-40	416,666,667	2.4
-30	396,825,397	2.5
-20	367,647,059	2.7
-10	325,732,899	3.1
0	275,482,094	3.6
10	221,729,490	4.5
20	170,940,171	5.9
30	127,713,921	7.8
40	93,720,712	10.7
50	68,259,386	14.7
60	49,751,244	20.1
70	36,456,435	27.4
80	26,961,445	37.1
90	20,149,103	49.6

PLC-10 Power Line Control Module (Common Mode)

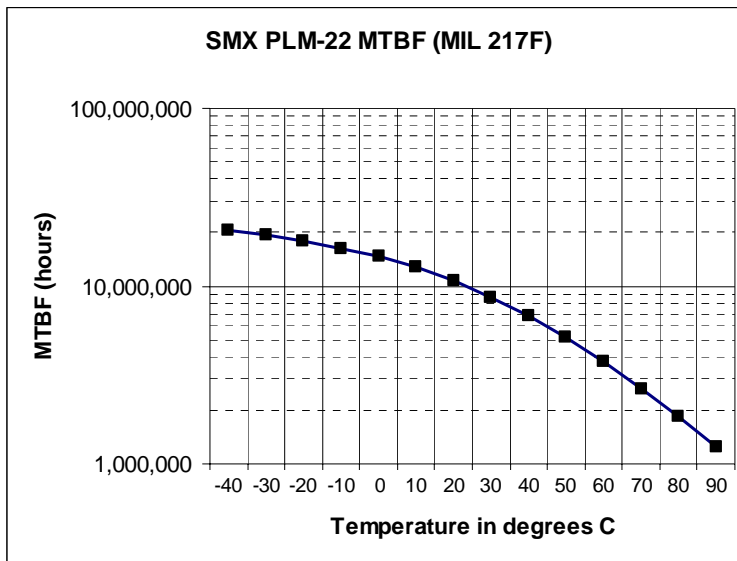
Parameter	Results
Operating temperature	0°C to +70°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +80°C, ramp rate 10°C/minute
ESD (per MIL-883)	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	10% to 95% RH @ 70°C, operating 95% @ 85°C, non-operating
Vibration	3g (5Hz to 200Hz)
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
UL 1950	E145541, E146747
CSA C22.2 No. 950-M89	LR 77376



Temp deg C	FR FTTS	MTBF Hours
-40	394	2,538,071
-30	413	2,421,308
-20	437	2,288,330
-10	471	2,123,142
0	518	1,930,502
10	584	1,712,329
20	680	1,470,588
30	822	1,216,545
40	1036	965,251
50	1362	734,214
60	1863	536,769
70	2639	378,931
80	3850	259,740
90	5758	173,671

PLM-22 Modular Transceiver (77162)

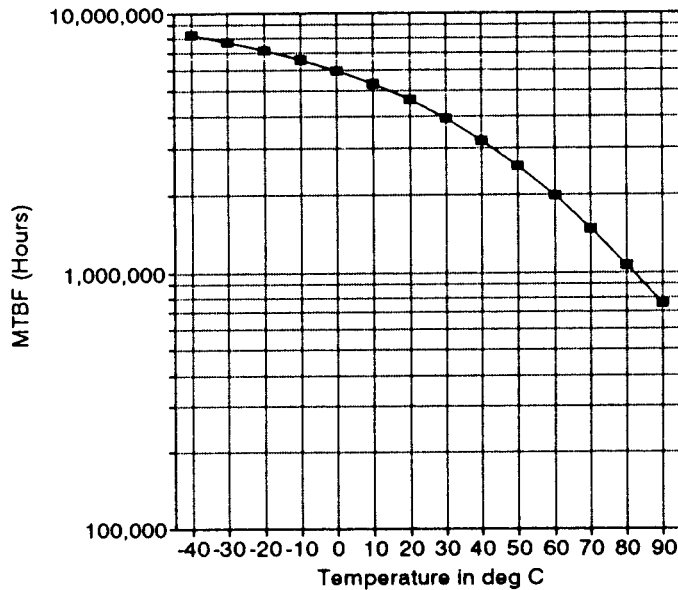
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-10°C to +50°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 4
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 2
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +40°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz-200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE B demonstrated
UL 1950	E145541
cUL per CSA C22.2 No. 950	E145541



Temp (deg C)	MTBF (hours)	FITs
-40	20,395,676	49.0
-30	19,245,574	52.0
-20	17,898,693	55.9
-10	16,369,291	61.1
0	14,613,474	68.4
10	12,688,745	78.8
20	10,682,619	93.6
30	8,665,511	115.4
40	6,778,282	147.5
50	5,110,123	195.7
60	3,727,449	268.3
70	2,643,475	378.3
80	1,833,819	545.3
90	1,252,458	798.4

PLT-10 Power Line Transceiver

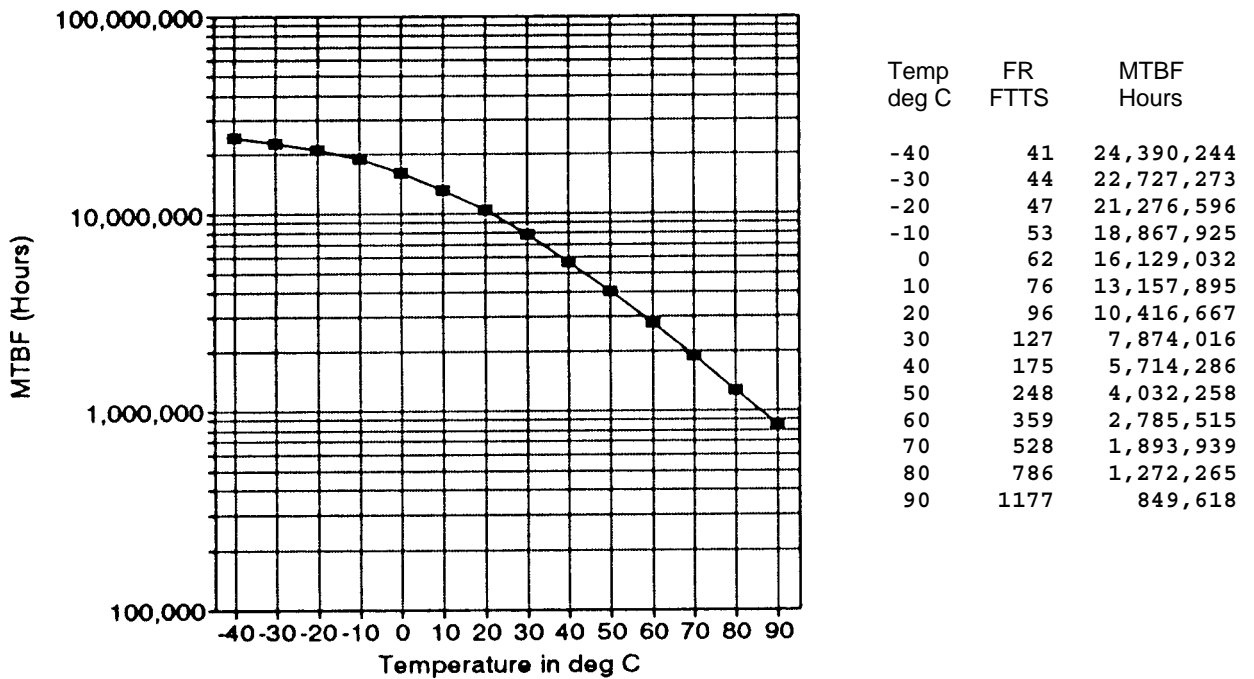
Parameter	Results
Operating temperature	-20°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-55°C to +100°C, ramp rate 10°C/minute
ESD (per MIL-883)	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	10% to 95% RH @ 85°C, operating 95% RH @ 85°C, non-operating
Vibration	3g (5Hz to 200Hz)
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
EMI	FCC B demonstrated
UL 1950	E145541, E146747
CSA C22.2 No. 950-M89	LR 77376
TÜV EB 60950:1992	S9371372.01



Temp deg C	FR FTTS	MTBF Hours
-40	111	8,264,463
-30	111	7,751,938
-20	111	7,194,245
-10	111	6,622,517
0	111	5,988,024
10	111	5,347,594
20	111	4,651,163
30	111	3,921,569
40	111	3,225,806
50	111	2,564,103
60	111	1,972,387
70	111	1,470,588
80	145	1,066,098
90	1891	755,287

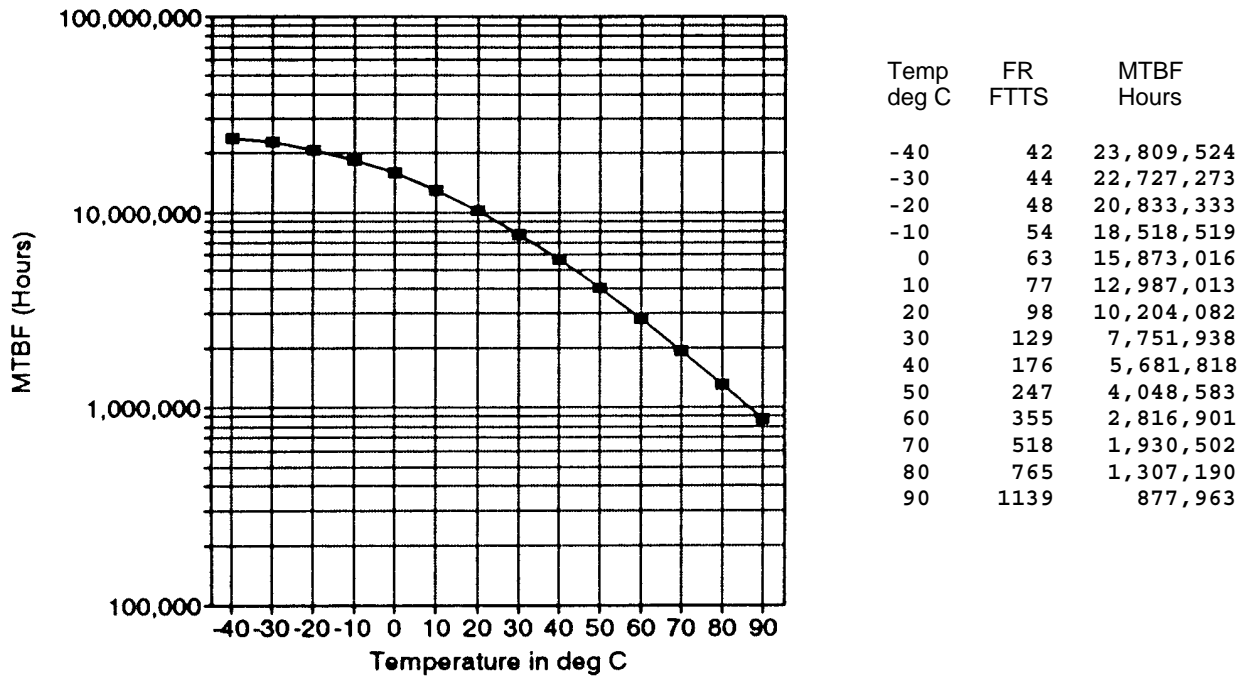
PLT-10A Power Line Transceiver

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-55°C to +100°C, ramp rate 10°C/minute
ESD (per MIL-883)	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 90% RH @ 70°C, operating 95% RH @ 70°C, non-operating
Vibration	1.5g (8Hz to 2kHz)
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
VDE EN 60 950	1763ÜG



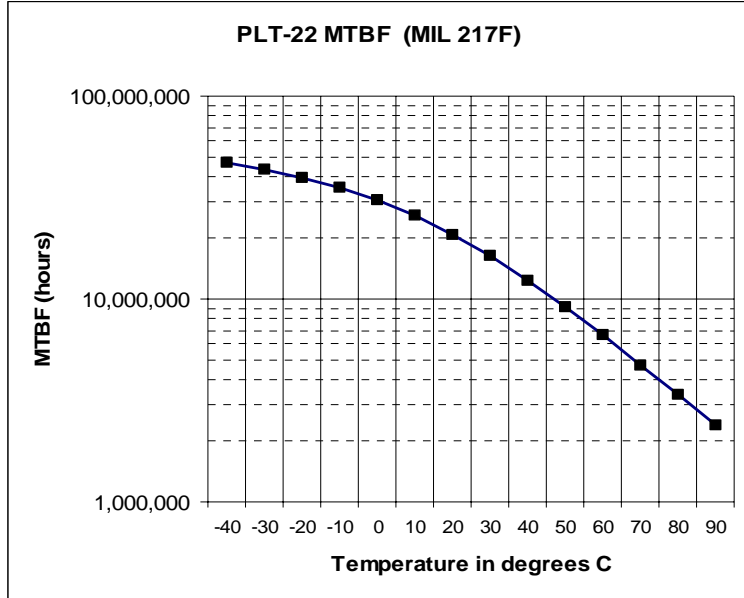
PLT-20 Power Line Transceiver

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-55°C to +100°C, ramp rate 10°C/minute
ESD (per MIL-883)	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 90% RH @ 70°C, operating 95% RH @ 70°C, non-operating
Vibration	1.5g (8Hz to 2kHz)
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
EMI	EN 50065-1, VDE B, EN55022B
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
VDE EN 60950/08.92	1763 ÜG



PLT-22 Power Line Transceiver

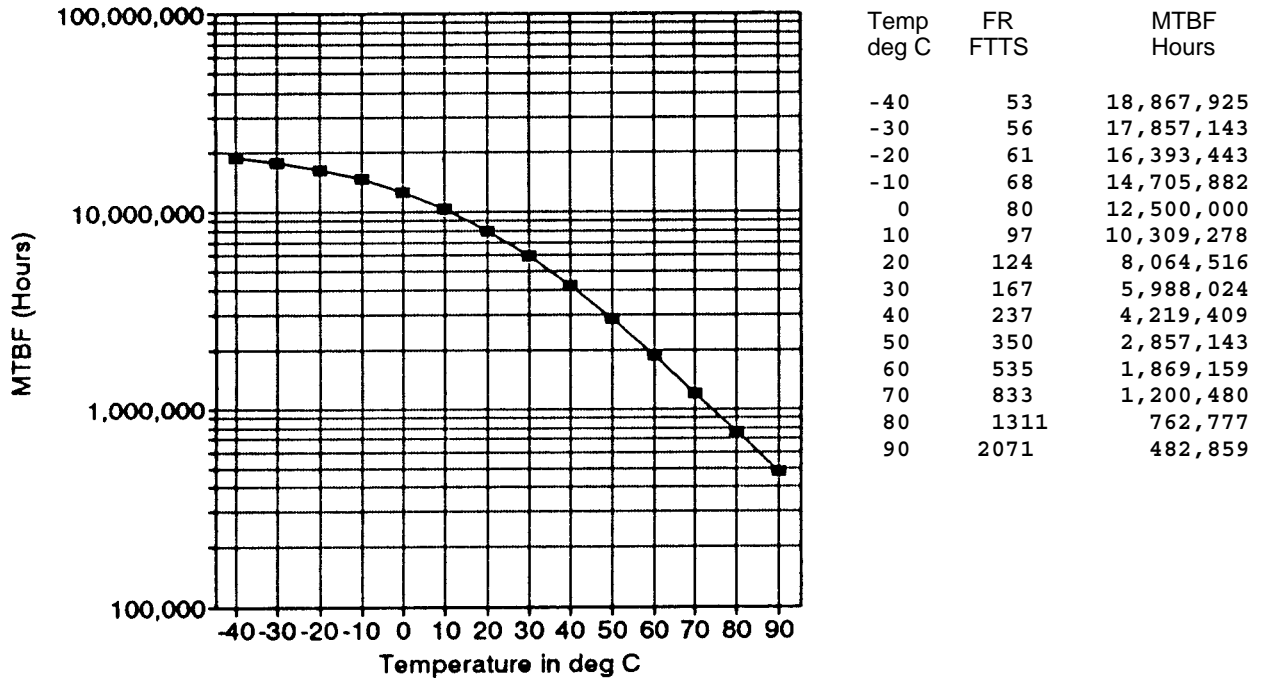
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 4
Radiated Susceptibility	Designed to comply with EN61000-4-3 Level 2
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% - 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR77376
TÜV EN 60950:1992	R9972199



Temp (deg C)	MTBF (hours)	FITs
-40	23,364,486	42.8
-30	19,083,969	52.4
-20	15,612,802	64.1
-10	12,790,995	78.2
0	10,481,082	95.4
10	8,573,388	116.6
20	6,976,906	143.3
30	5,624,613	177.8
40	4,468,475	223.8
50	3,479,108	287.4
60	2,642,636	378.4
70	1,953,392	511.9
80	1,406,153	711.2
90	989,374	1010.7

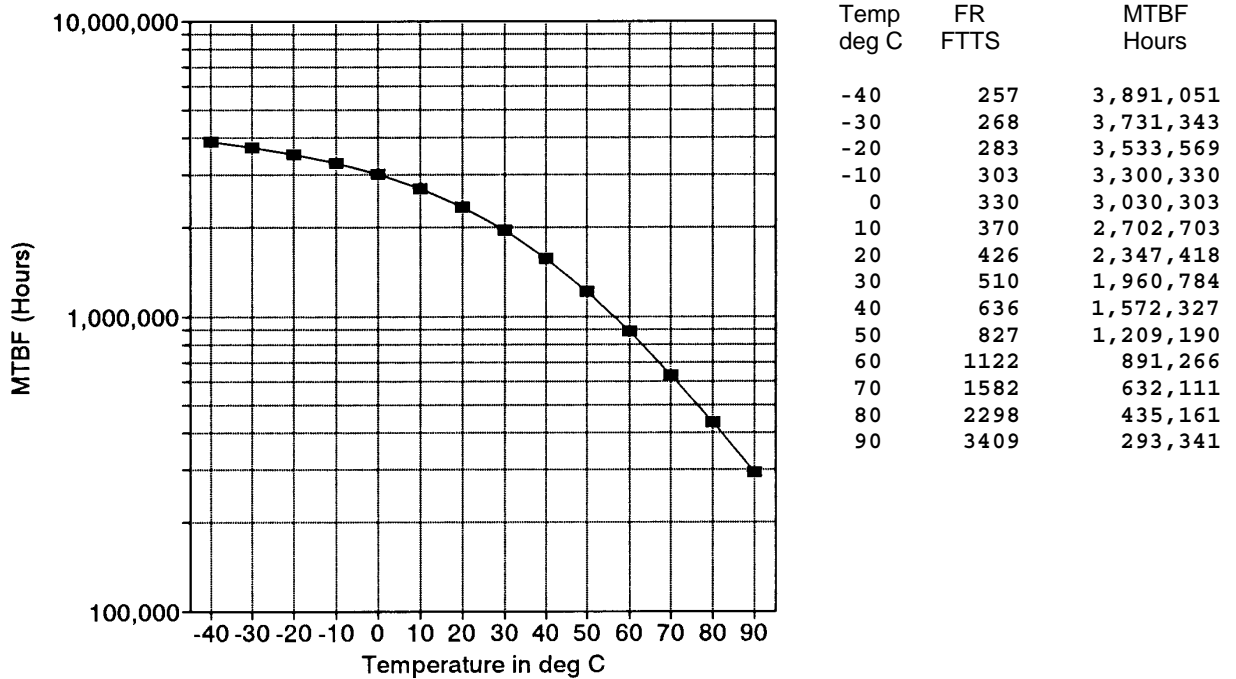
PLT-30 Power Line Transceiver

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-55°C to +100°C, ramp rate 10°C/minute
ESD (per MIL-883)	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 90% RH @ 70°C, operating 95% RH @ 70°C, non-operating
Vibration	1.5g (8Hz to 2kHz)
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
EMI	EN 50065-1, VDE B, EN55022B
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
VDE EN 60950/08.92	1763 ÜG



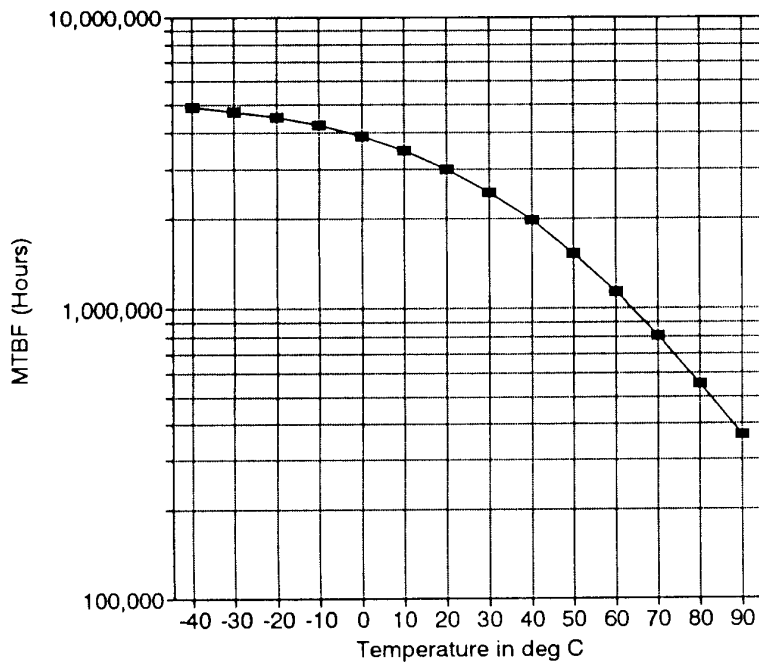
SLTA Motherboard

Parameter	Results
Operating temperature	0°C to +70°C or -40C to +85°C <i>depending on date of manufacture and excluding battery</i>
Non-operating temperature	-40°C to +85°C
Strife	-10°C to +80°C, ramp rate 10°C/minute
ESD (per MIL-883)	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 95% RH @ 40°C, operating 90% RH @ 65°C, non-operating
Vibration	3g (5Hz to 200Hz)
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/VDE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60950:1992	S9371501.02



TP/FT-10 Free Topology Twisted Pair Control Module (55020)

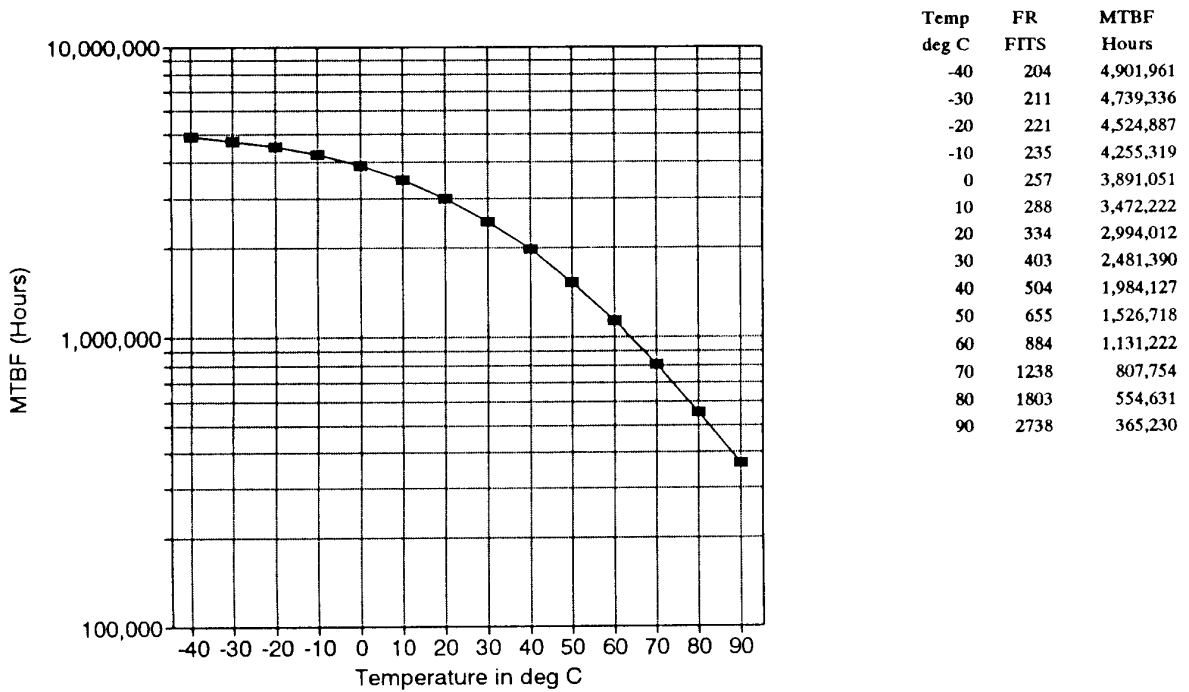
Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 4
Radiated susceptibility	Designed to comply with EN61000-4-3 Level 2
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/VDE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60950:1992	R9577050



Temp deg C	FR FTTS	MTBF Hours
-40	204	4,901,961
-30	211	4,739,336
-20	221	4,524,887
-10	235	4,255,319
0	257	3,891,051
10	288	3,472,222
20	334	2,994,012
30	403	2,481,390
40	504	1,984,127
50	655	1,526,718
60	884	1,131,222
70	1238	807,754
80	1803	554,431
90	2738	365,230

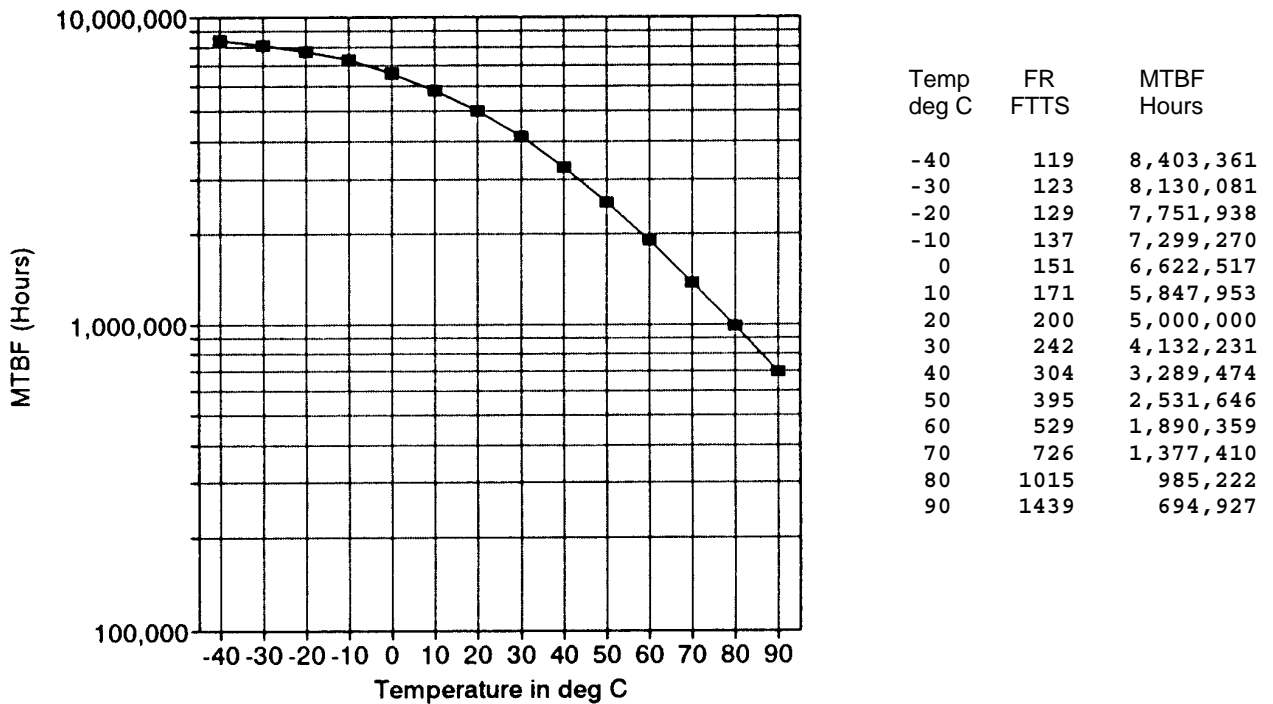
TP/FT-10F Flash Control Module (55020-10)

Parameter	Results
Operating temperature	-40°C to +85°C
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD	Designed to comply with EN61000-4-2 Level 4
Radiated susceptibility	Designed to comply with EN61000-4-3 Level 2
Burst	Designed to comply with EN61000-4-4 Level 4
Surge	Designed to comply with EN61000-4-5 Level 3
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/CE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376



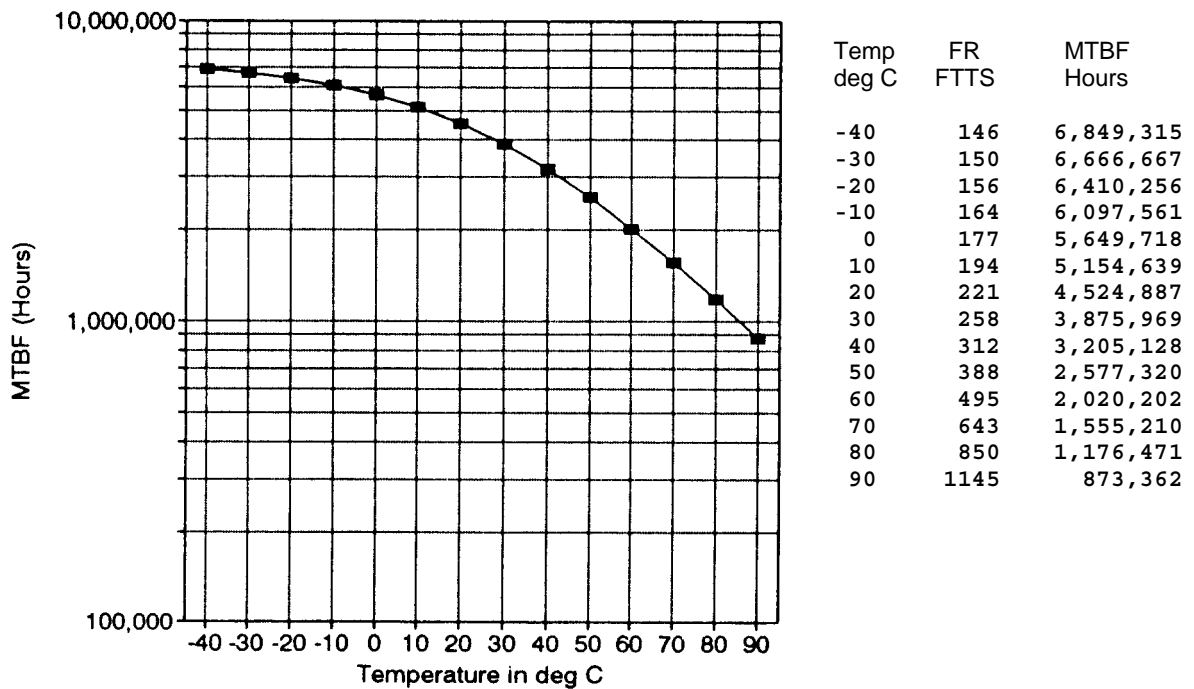
TP-RS485 Twisted Pair Control Module

Parameter	Results
Operating temperature	0°C to +70°C
Non-operating temperature	-40°C to +85°C
Strife	-55°C to +85°C, ramp rate 10°C/minute
ESD (per MIL-883)	15kV no soft/hard failures
	20kV no hard failures
Humidity (non-condensing)	25% to 90% RH @ +70°C, operating
	95% RH @ +70°C, non-operating
Vibration	3g (5Hz to 200Hz)
Shock	100g (3ms half sine wave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/VDE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60950:1992	R9371502.02



TP/XF-1250 Twisted Pair Control Module (55030)

Parameter	Results
Operating temperature	-40°C to +85°C: see data sheet for effects on performance caused by temperature extremes
Non-operating temperature	-40°C to +85°C
Strife	-50°C to +95°C, ramp rate 10°C/minute
ESD (per MIL-883)	15kV no soft/hard failures 20kV no hard failures
Humidity (non-condensing)	25% to 90% RH @ +50°C, operating 95% RH @ +50°C, non-operating
Vibration	5Hz to 7.5Hz @ 0.5" D.A., 7.5Hz to 200Hz @ 1.5G
Shock	30g @ 11ms; 100g @ 3ms (half sinewave)
Altitude	7620 meters (25,000 feet)
EMI	FCC/VDE B demonstrated
UL 1950	E145541
CSA C22.2 No. 950-M89	LR 77376
TÜV EN 60950:1992	R9371502.02



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