

March 2021

Quarterly Reliability Report

Document Number DOC-104560, Revision 1

Table of Contents

Introduction	
• pSemi Reliability System	3
Failure Rate Calculation	
• Acceleration Factor	4
• Failure in Time Calculation	5
Technology Classification	
• UltraCMOS® 2 Process (U500E)	7
• UltraCMOS® 3.5 Process (U350E)	8
• UltraCMOS® 5 Process (U350B)	9
• UltraCMOS® 6 Process (U250E)	10
• UltraCMOS® 6.5 Process (U250E)	11
• UltraCMOS® 8 Process (U250B)	12
• UltraCMOS® 10 Process (U130S1)	13
• UltraCMOS® 11 Process (U130S2)	14
• UltraCMOS® 12 Process (U130S3)	15
• UltraCMOS® 12A Process (U130S4)	16
• UltraCMOS® 13 Process (U130S4)	17
• UltraCMOS® 13S Process (U130S4)	18
• BCD GEN II	19
• BCDLite	20
• 55LPx	21
Product Family Classification	
• Amplifiers (LNA & PA)	23
• Switches (ASW, HPSW, ATS & BSW)	24
• ASICs	25
• DC-DC	26
• Digital Step Attenuators (DSA)	27
• Digitally Tunable Capacitors (DTC)	28
• GaN Drivers (DRV)	29
• Power Limiters (LMTR)	30
• Monolithic Phase & Amplitude Controllers (MPAC)	31
• Mixers (MXR)	32
• PA Controller (PAC)	33
• Phase Locked-Loop Synthesizers (PLL)	34
• Phase Shifters (PSH)	35
• Prescalers (PSR)	36
Reliability Monitor Data (Periodic Testing - 8 QTRs)	
• High Temperature Operating Life (HTOL), and ELFR	38
• Temperature Cycle (TC)	39
• Highly Accelerated Stress Test (HAST)	40
• High Temperature Storage (HTS)	41
Appendix A	
• RF Switch Products List	43

pSemi Reliability System

The Quarterly Reliability Report is a compilation of reliability stress test results that crosses the entire product & technology family of pSemi products. Data is collected on a regular basis through the efforts of product and process qualifications, standard product monitoring and lot acceptance testing. To date, a total of **108,064 devices** have been tested in HTOL with a total of **7.87 billion equivalent device hours**. The overall failure rate for the pSemi family of products is **0.12 FIT**. (Using $E_{a} = 0.7\text{eV}$, $T_j = 55^\circ\text{C}$ at 60% UCL)

pSemi reliability testing standards conform to industry standard qualification procedures as detailed in the JEDEC guidelines. In addition, where clear guidelines have not been established yet, pSemi has developed stringent reliability requirements to ensure consistent high reliability performance.

pSemi makes use of accelerated life testing results, along with thermal acceleration factors in the prediction of failure rates. High Temperature Operating Life (HTOL) stress testing is performed at accelerated voltage and temperature conditions which are based on JEDEC-JESD22-A108 standards. Resulting data collected from HTOL tests is de-rated to a typical use operating junction temperature (T_j) of 55°C . Early Life Failure Rate (ELFR) is derived after 48-hr performance.

pSemi conducts an ongoing product reliability monitoring program to evaluate sample products from high volume, major product families on a quarterly basis. The reliability monitoring process is a continuously improving system within pSemi as we strive for superior product knowledge and performance.

pSemi performs the majority of Reliability testing using an ISO17025 certified test laboratories located in San Jose, CA. Regular auditing of the laboratory is performed to ensure compliance to ISO standards.

Failure Rate Calculation

Acceleration Factor (AF)

For a given failure mechanism, acceleration factor (AF), is the ratio of the time it takes for a certain fraction of the population to fail, following application of one stress or use condition, to the corresponding time at a more severe stress or use condition.

The industry uses the thermal acceleration model formula based on Arrhenius equation noted below:

$$AF(T_{use}, T_{stress}) := e^{\frac{E_{aa}}{k_B} \cdot \left(\frac{1}{T_{use}} - \frac{1}{T_{stress}} \right)}$$

where:

$E_{aa} := 0.7 \text{ eV}$, is the Apparent Activation Energy

$e = 2.718$, is the base of natural logarithm

$k_B := 8.62 \cdot 10^{-5} \frac{\text{eV}}{\text{K}}$, is the Boltzmann constant

T_{use} & T_{stress} , are the use and stress test temperatures, respectively, in Kelvin

Sample Calculation

Find the Acceleration Factor (AF) with the following conditions.

(a) $T_{use} := 55 \text{ }^\circ\text{C}$ and $T_{stress} := 125 \text{ }^\circ\text{C}$

$$AF(T_{use}, T_{stress}) = 77.5$$

(b) $T_{use} := 55 \text{ }^\circ\text{C}$ and $T_{stress} := 150 \text{ }^\circ\text{C}$

$$AF(T_{use}, T_{stress}) = 258.7$$

Failure Rate Calculation (continued)

Failure in Time Calculation

Mean time to failure (M.T.T.F.) is defined as the average time it takes for a failure to occur. Failure in Time (F.I.T.) is the number of units predicted to fail in a billion ($1e^9$) device hours at a specified temperature. After the life test is completed and accelerated device hour data is calculated, the failure rate is estimated using the Chi-Square approximation (χ^2) as follows:

$$FIT = \left(\frac{\chi^{2(2r+2)}}{2 * EDH} \right) * 1e^9$$

where:

χ^2 = chi square function

r = number of failures

EDH = equivalent device hours (units tested x test hours x AF)

Sample Calculation

Given: Units Tested (Sample Size) = 231 devices
 Test temperature = 150°C
 Test duration = 500 hours
 Failures = 0

$EDH = (231 \times 500 \times 259.2) = 2.99E+7$ equivalent device hours

χ^2 @ 60% confidence level and 0 failures = 1.83

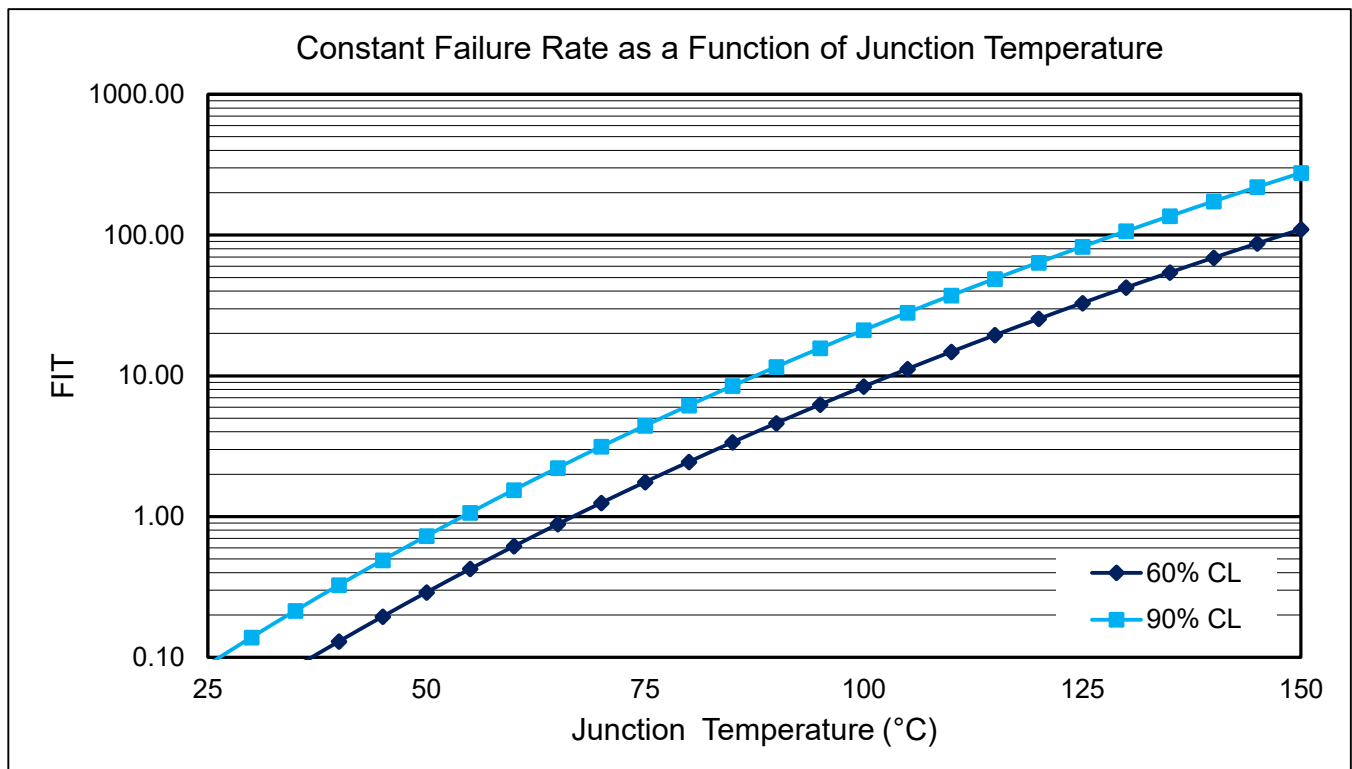
FIT (60% confidence level) = $[1.83 / (2 \times 2.99E+7)] \times 1.0E+9 = \underline{30.6 FIT}$

Technology Classification

UltraCMOS[®] 2 Process Technology

Generation : 500 nm CMOS Silicon Epi Process (U500E)
 Units Tested : 28,714
 Product Family : DC-DC, DSA, MXR, PLL, PSR, Switch

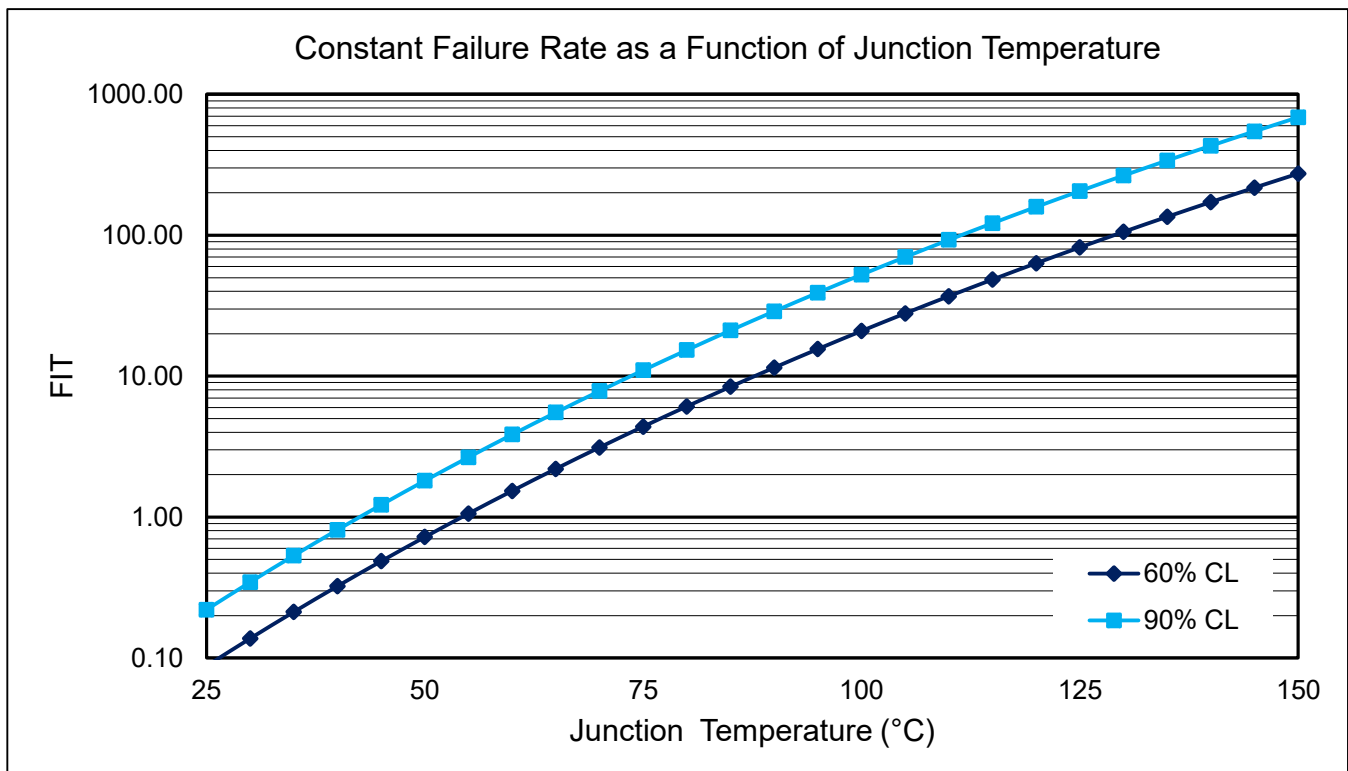
Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	2.53E+08	3.6	2.76E+08
Constant (Random)	2.16E+09	0.4	2.36E+09



UltraCMOS[®] 3.5 Process Technology

Generation : 350 nm CMOS Silicon Epi Process (U350E)
 Units Tested : 9,170
 Product Family : DSA, DTC, Switch

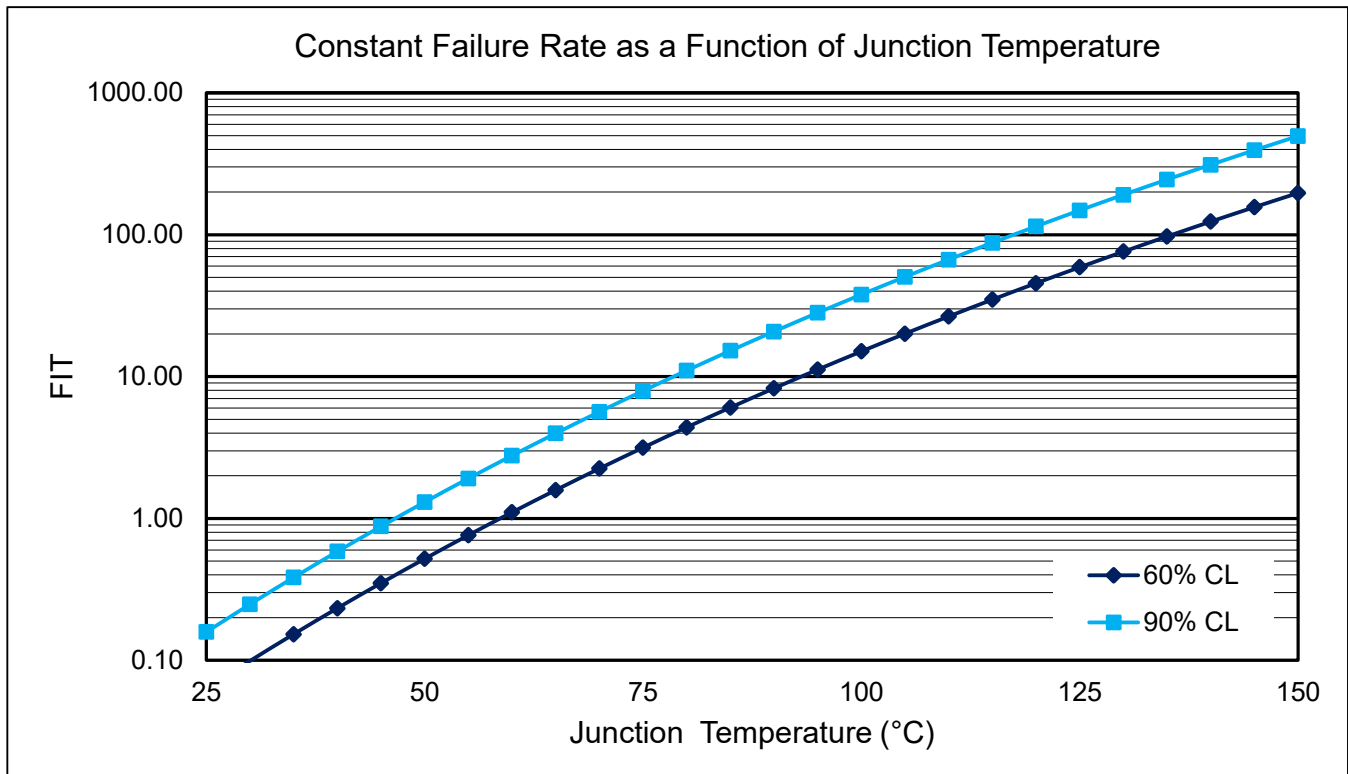
Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	1.12E+08	8.2	1.22E+08
Constant (Random)	8.65E+08	1.1	9.44E+08



UltraCMOS[®] 5 Process Technology

Generation : 350 nm CMOS Bonded Silicon Process (U350B)
 Units Tested : 9,338
 Product Family : DSA, DTC, LMTR, MPAC, PLL, PSH, Switch

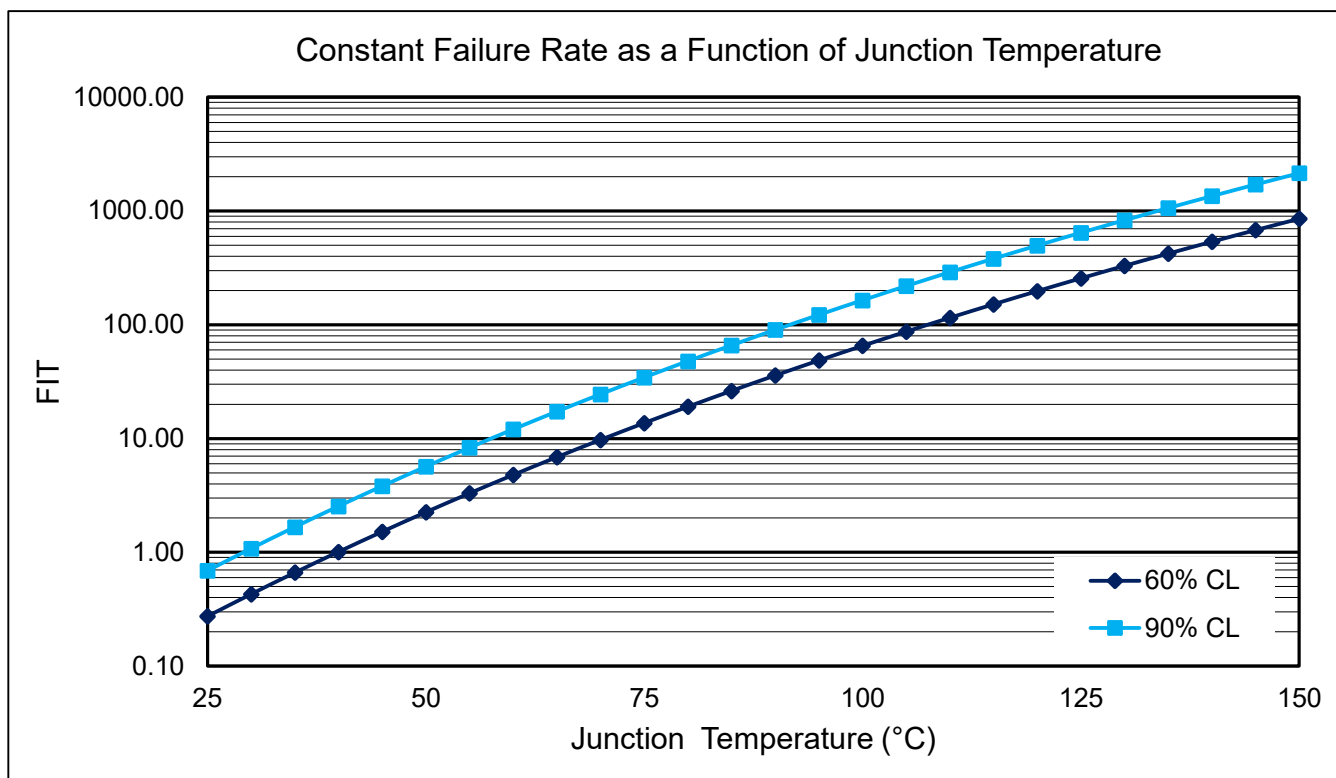
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		1.15E+08	8.0	1.25E+08
Constant (Random)		1.20E+09	0.8	1.31E+09



UltraCMOS[®] 6 Process Technology

Generation : 250 nm CMOS Silicon Epi Process (U250E2)
 Units Tested : 2,198
 Product Family : Switch

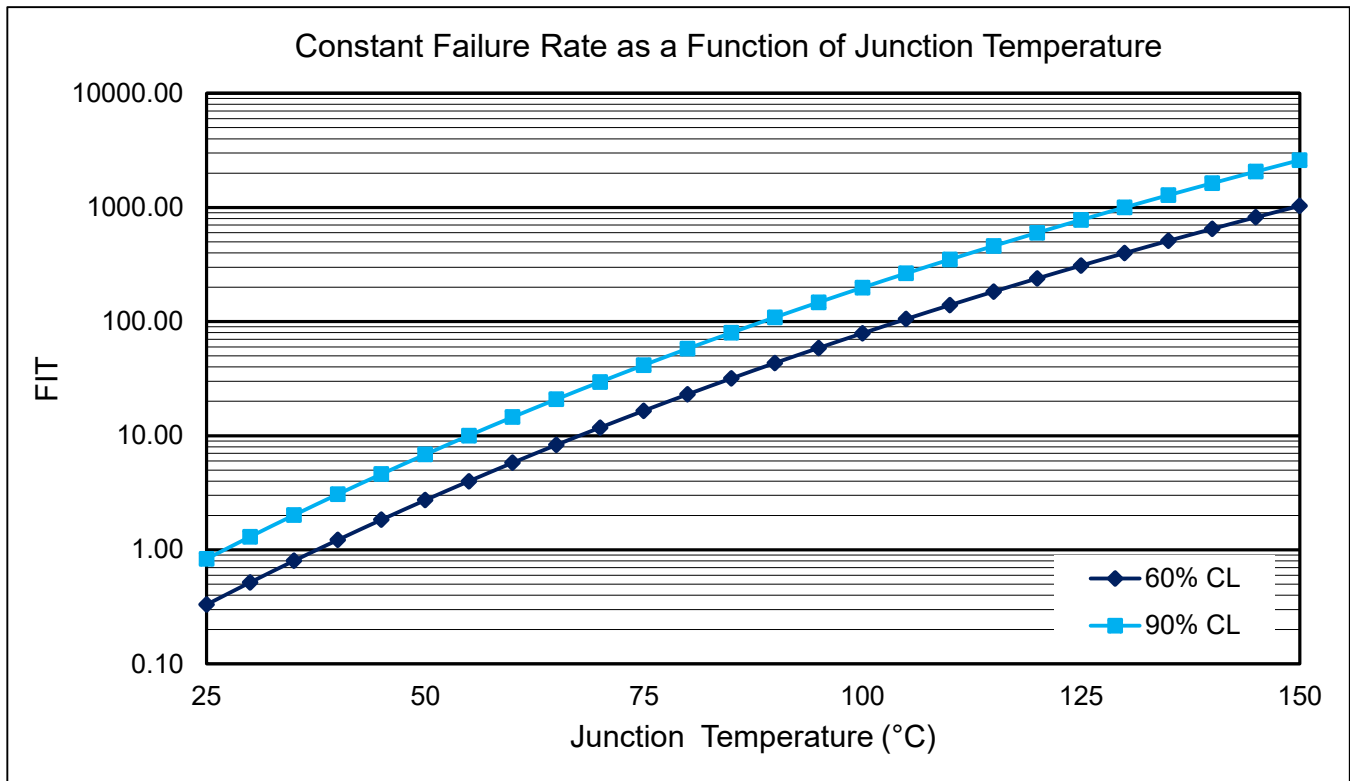
Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	2.70E+07	33.9	2.95E+07
Constant (Random)	2.78E+08	3.3	3.03E+08



UltraCMOS[®] 6.5 Process Technology

Generation : 250 nm CMOS Silicon Epi Process (U250E4)
 Units Tested : 1,831
 Product Family : Driver, DSA, Switch

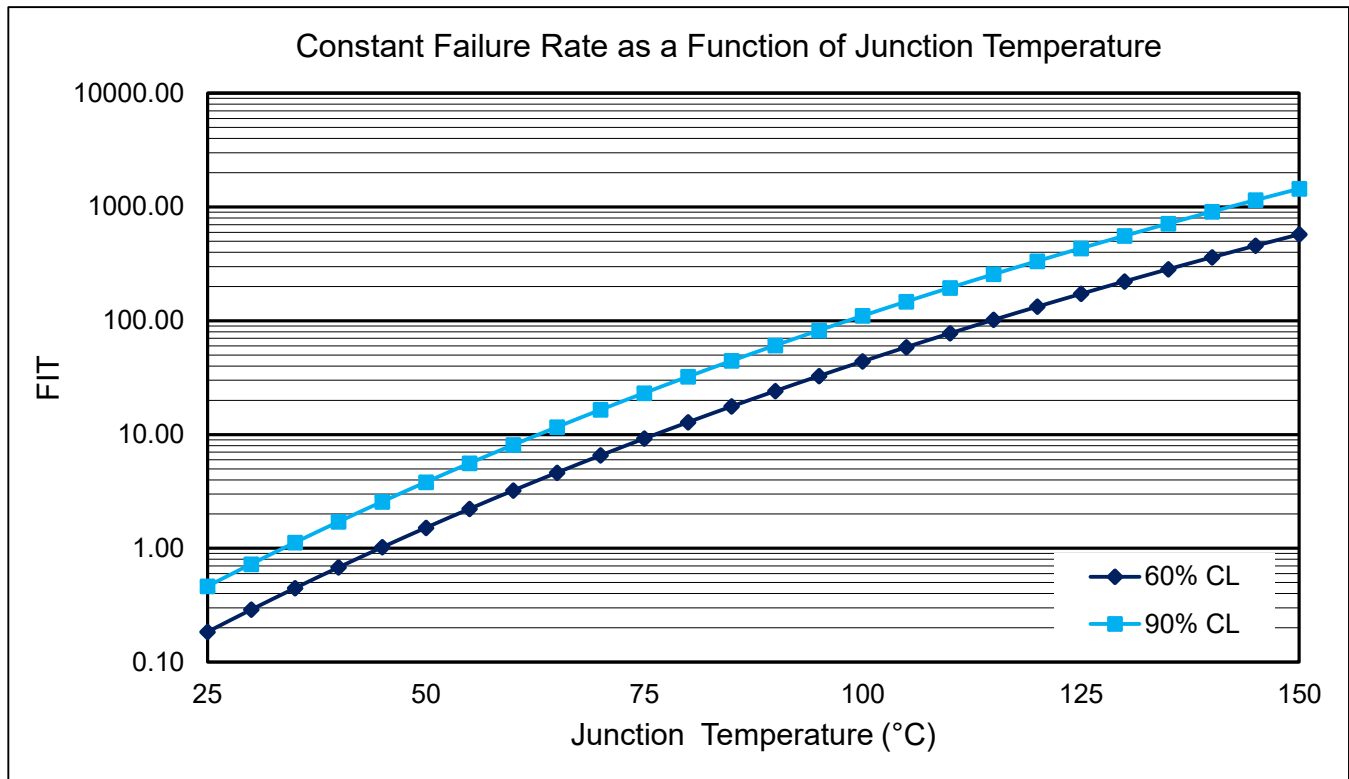
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		1.83E+07	49.9	2.00E+07
Constant (Random)		2.29E+08	4.0	2.50E+08



UltraCMOS[®] 8 Process Technology

Generation : 250 nm CMOS Bonded Silicon Process (U250B)
 Units Tested : 3,215
 Product Family : Driver, DSA, DTC, LMTR, MPAC, MXR, PSR, Switch

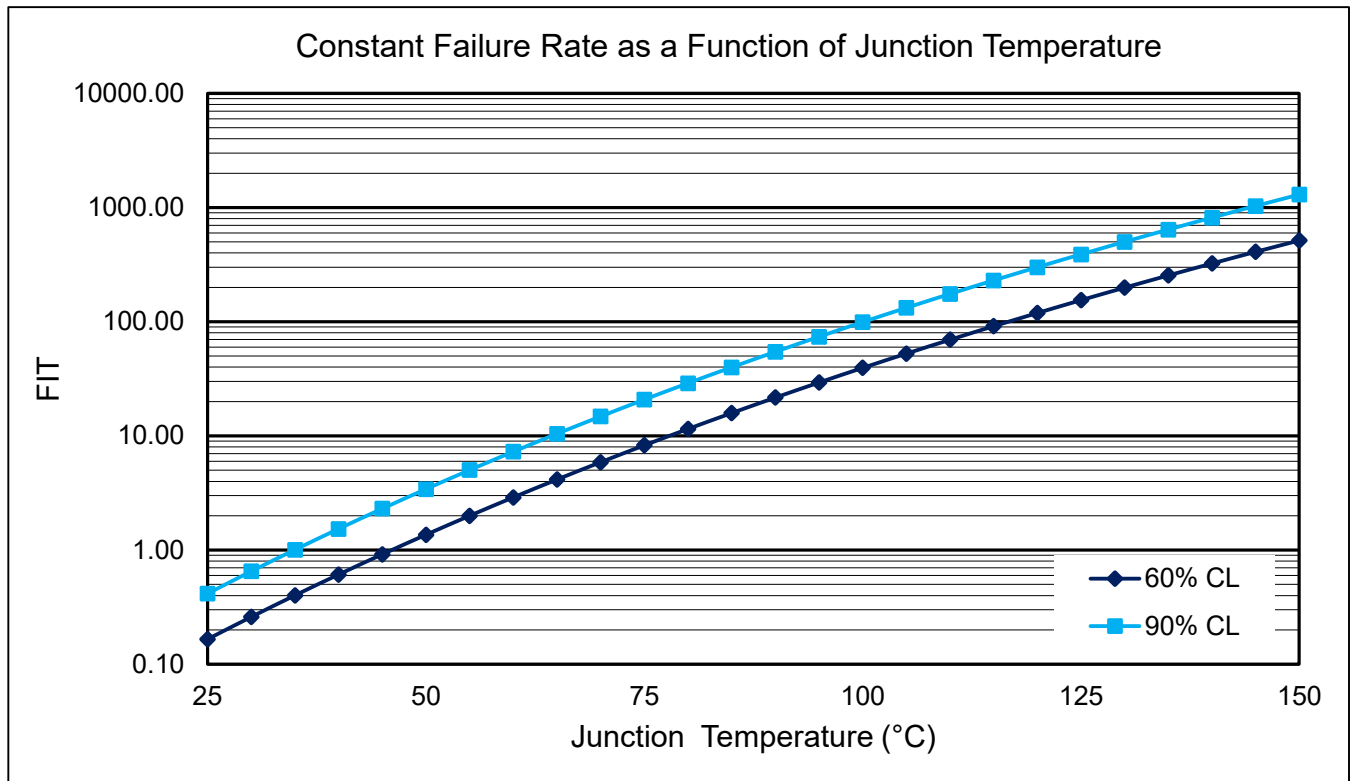
	Standard Failure Rate Calculations at 55°C and 60% CL		
	EDH (hours)	FITs	MTTF (hours)
Early Life	3.80E+07	24.1	4.15E+07
Constant (Random)	4.12E+08	2.2	4.50E+08



UltraCMOS[®] 10 Process Technology

Generation : 130nm CMOS Silicon-On-Insulator in 200mm wafer(U130S1)
 Units Tested : 3,806
 Product Family : Switch

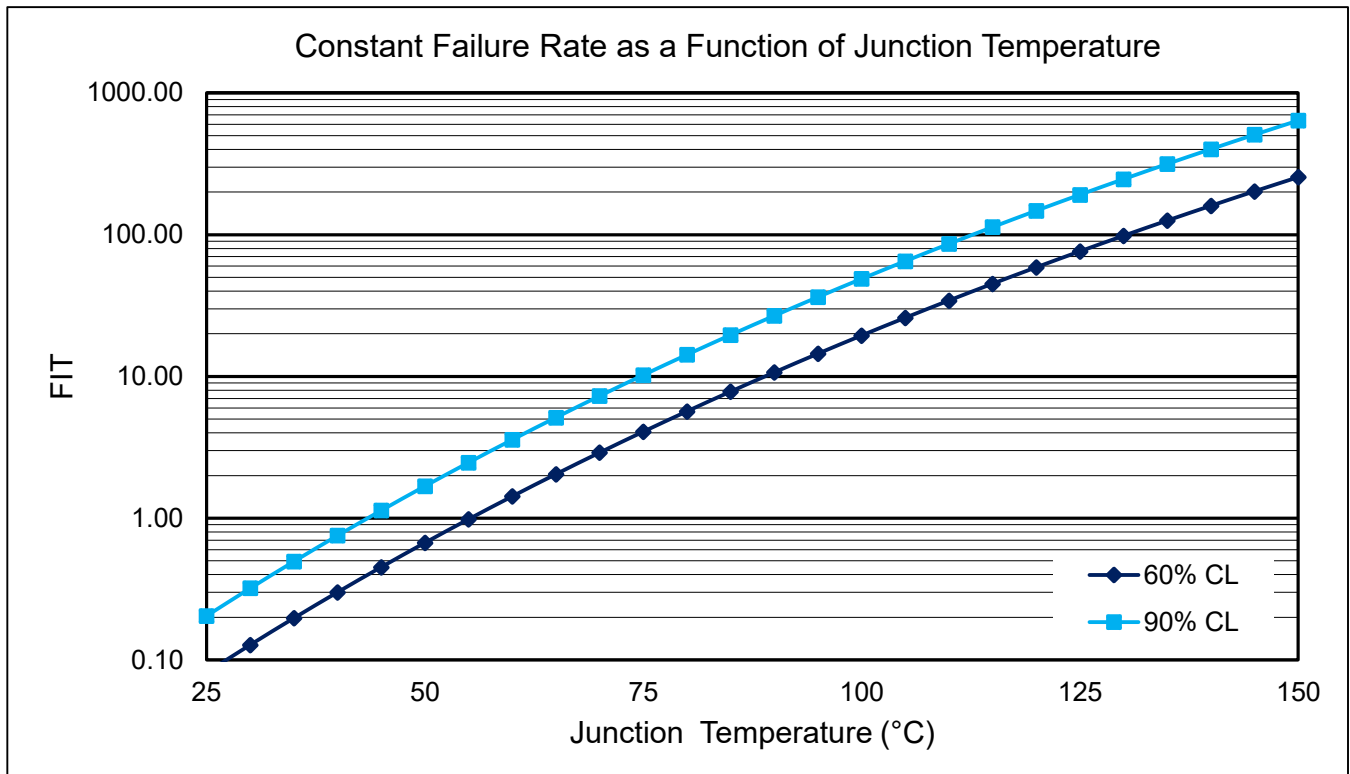
Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	4.06E+07	22.5	4.44E+07
Constant (Random)	4.59E+08	2.0	5.01E+08



UltraCMOS[®] 11 Process Technology

Generation : 130nm CMOS Silicon-On-Insulator in 300mm wafer (U130S2)
 Units Tested : 12,888
 Product Family : Amplifier, DC-DC, Switch

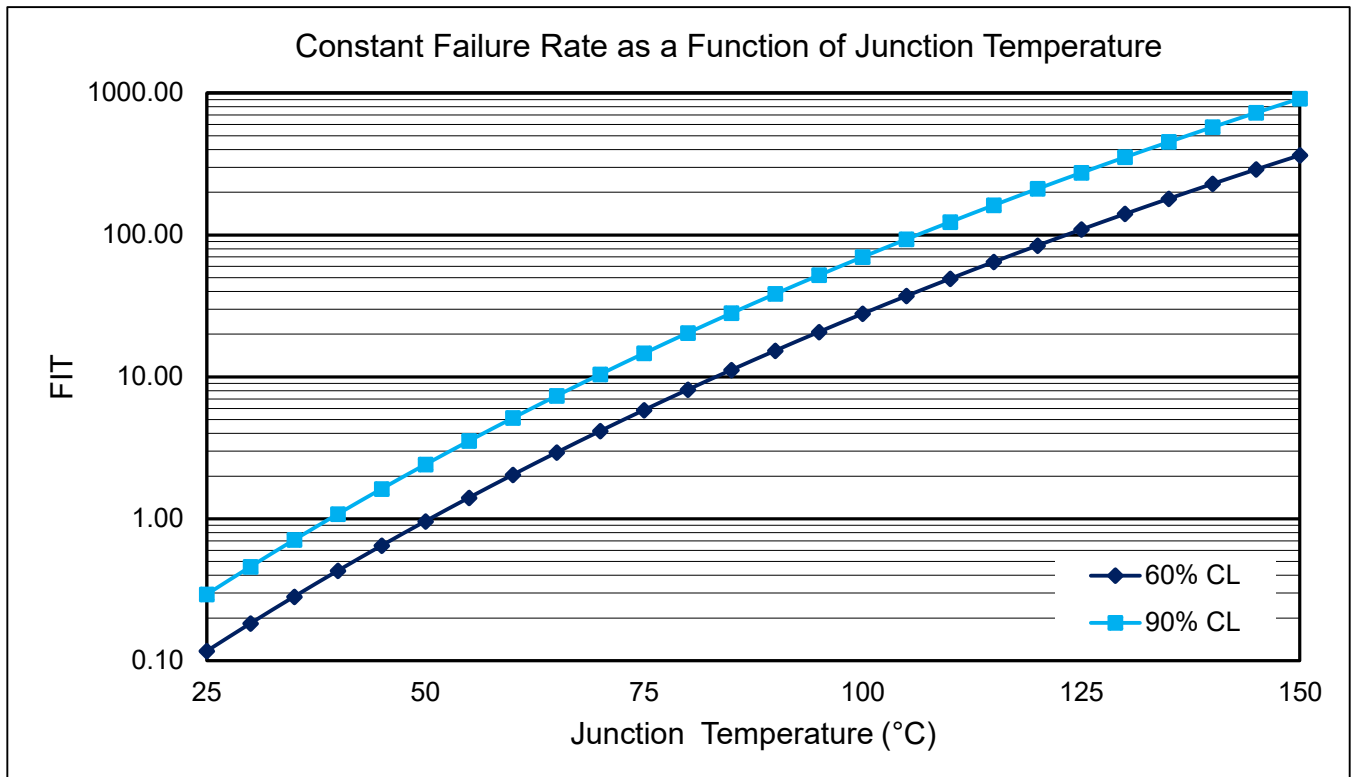
Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	7.42E+07	12.3	8.10E+07
Constant (Random)	9.33E+08	1.0	1.02E+09



UltraCMOS[®] 12 Process Technology

Generation : 65nm CMOS Silicon-On-Insulator in 300mm wafer (U130S3)
 Units Tested : 16,050
 Product Family : Amplifier, DSA, PAC, Switch

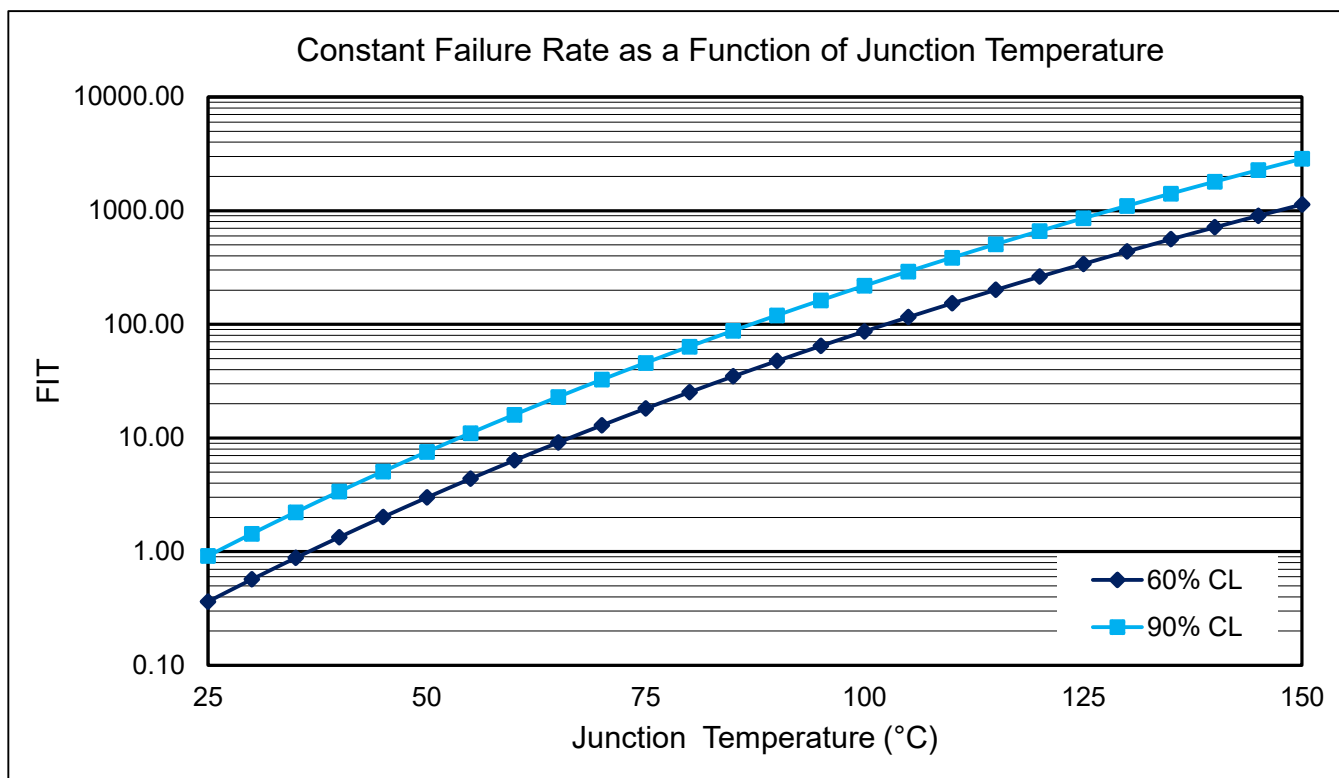
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		8.23E+07	11.1	8.98E+07
Constant (Random)		6.50E+08	1.4	7.10E+08



UltraCMOS[®] 12A Process Technology

Generation : 65nm CMOS Silicon-On-Insulator in 300mm wafer (U130S4)
 Units Tested : 4,611
 Product Family : Amplifier

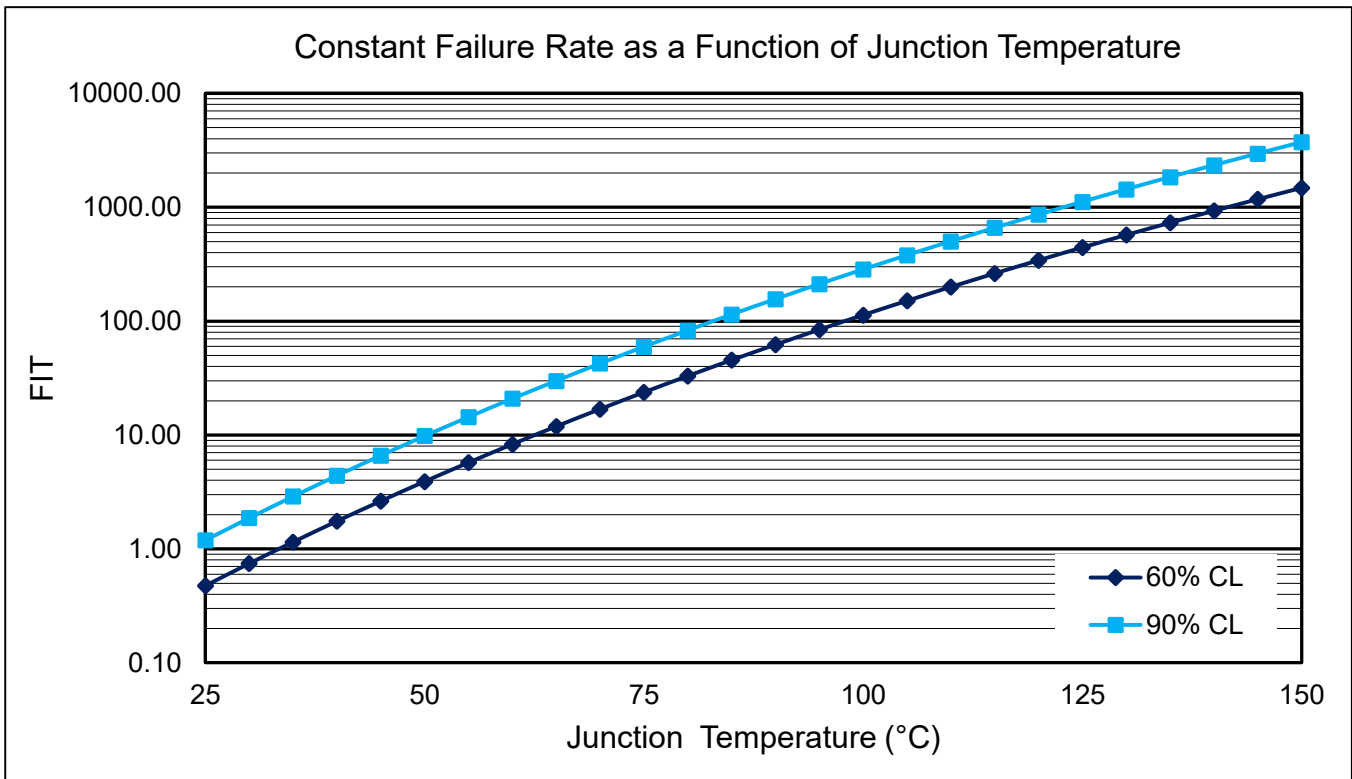
Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	1.72E+07	53.4	1.87E+07
Constant (Random)	2.09E+08	4.4	2.28E+08



UltraCMOS[®] 13 Process Technology

Generation : 65nm CMOS Silicon-On-Insulator in 300mm wafer (U130S4)
 Units Tested : 5,034
 Product Family : Amplifier, Switch

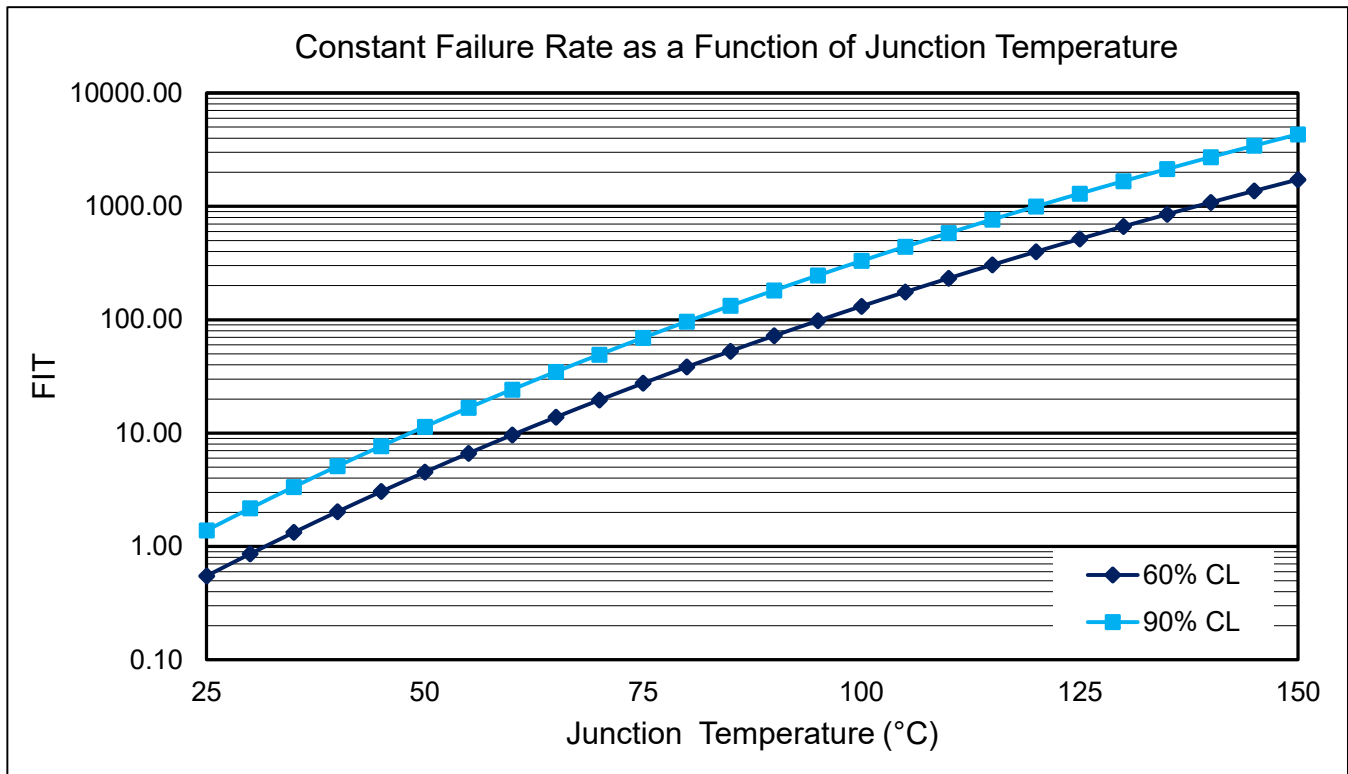
	Standard Failure Rate Calculations at 55°C and 60% CL		
	EDH (hours)	FITs	MTTF (hours)
Early Life	1.87E+07	48.9	2.04E+07
Constant (Random)	1.60E+08	5.7	1.75E+08



UltraCMOS[®] 13S Process Technology

Generation : 65nm CMOS Silicon-On-Insulator in 300mm wafer (U130S4)
 Units Tested : 9,069
 Product Family : Switch

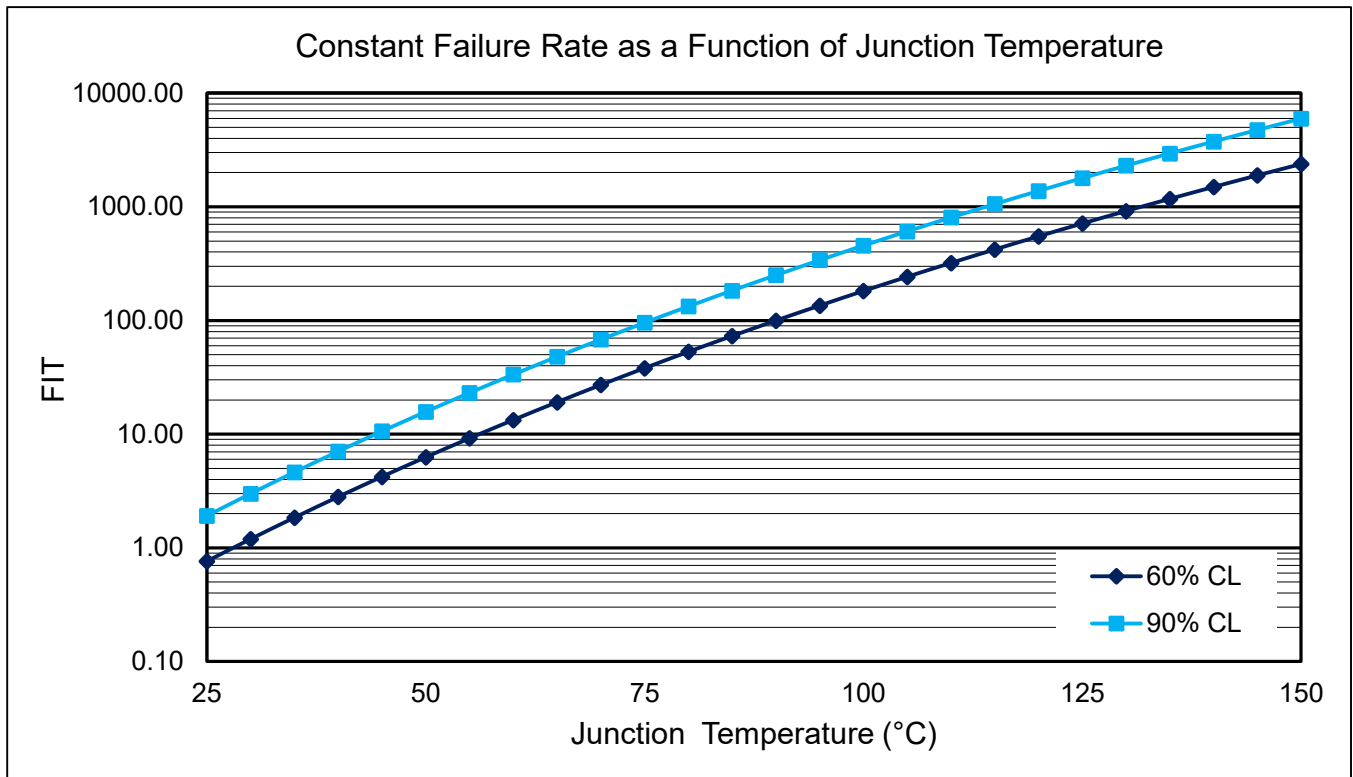
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		3.27E+07	28.1	3.56E+07
Constant (Random)		1.38E+08	6.7	1.50E+08



BCD GEN II Process Technology

Generation : 180nm BCD Gen 2 Process
 Units Tested : 1,287
 Product Family : DC-DC

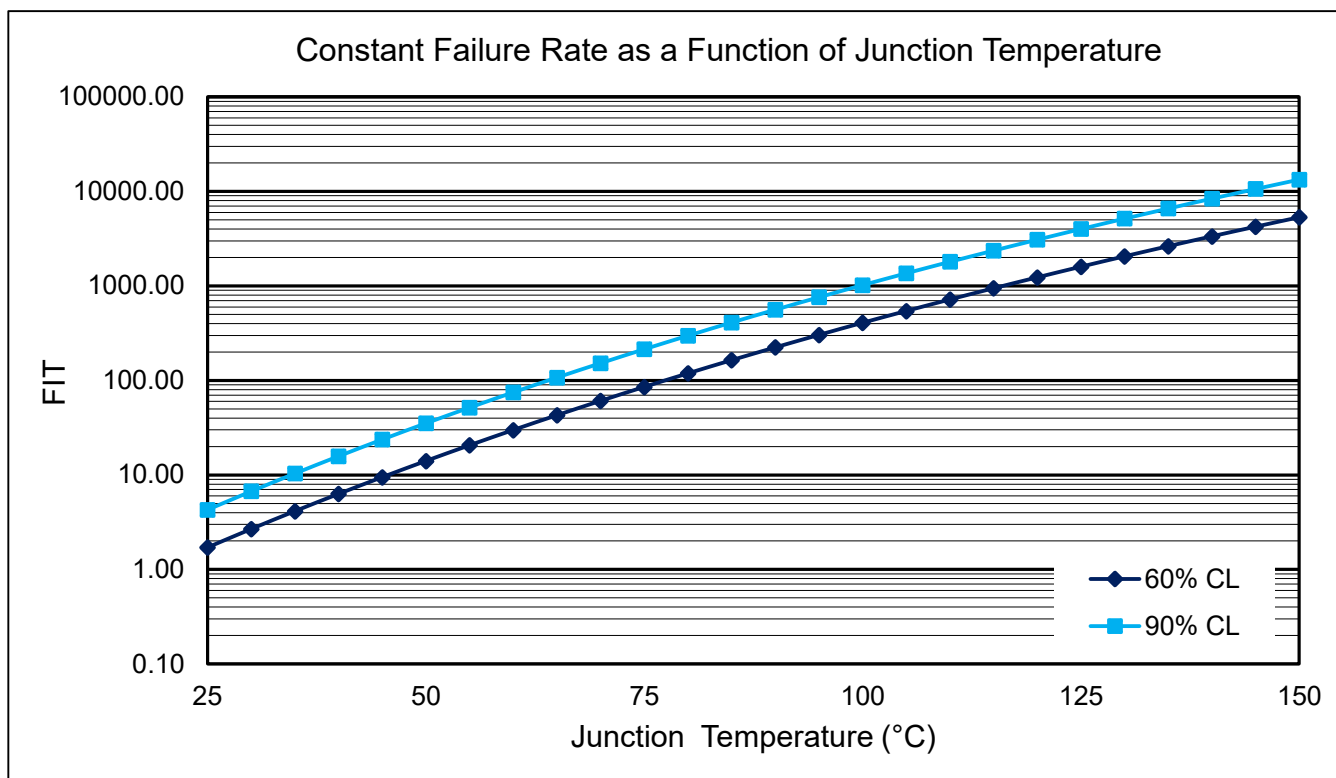
Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	4.79E+06	191.3	5.23E+06
Constant (Random)	9.98E+07	9.2	1.09E+08



BCDLite Process Technology

Generation : 130nm BCDLite Process
 Units Tested : 510
 Product Family : DC-DC

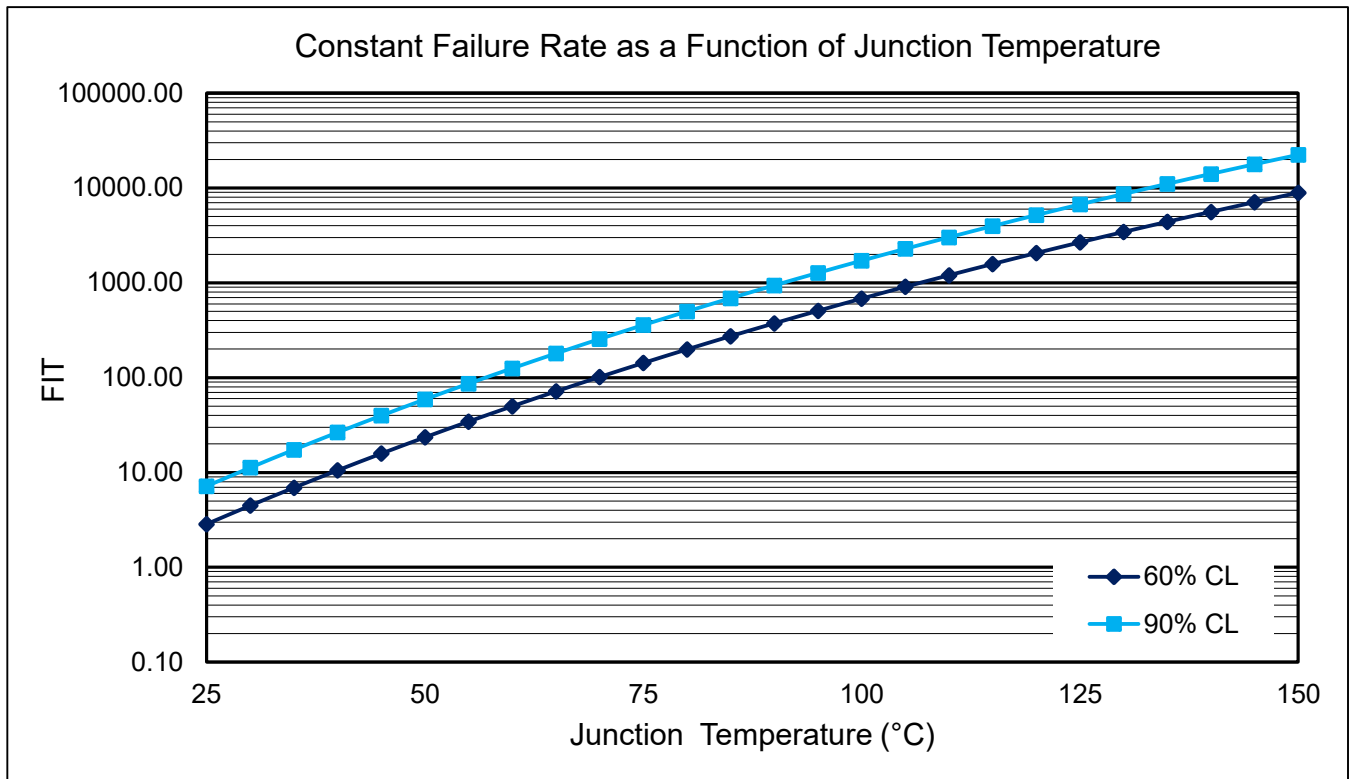
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		3.80E+06	241.4	4.14E+06
Constant (Random)		4.45E+07	20.6	4.86E+07



55LPx Process Technology

Generation : 55nm 300mm wafer (C055C1E6)
 Units Tested : 343
 Product Family : ASIC

Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	3.80E+06	241.4	4.14E+06
Constant (Random)	4.45E+07	20.6	4.86E+07



Product Family Classification

Amplifiers (LNA & PA)

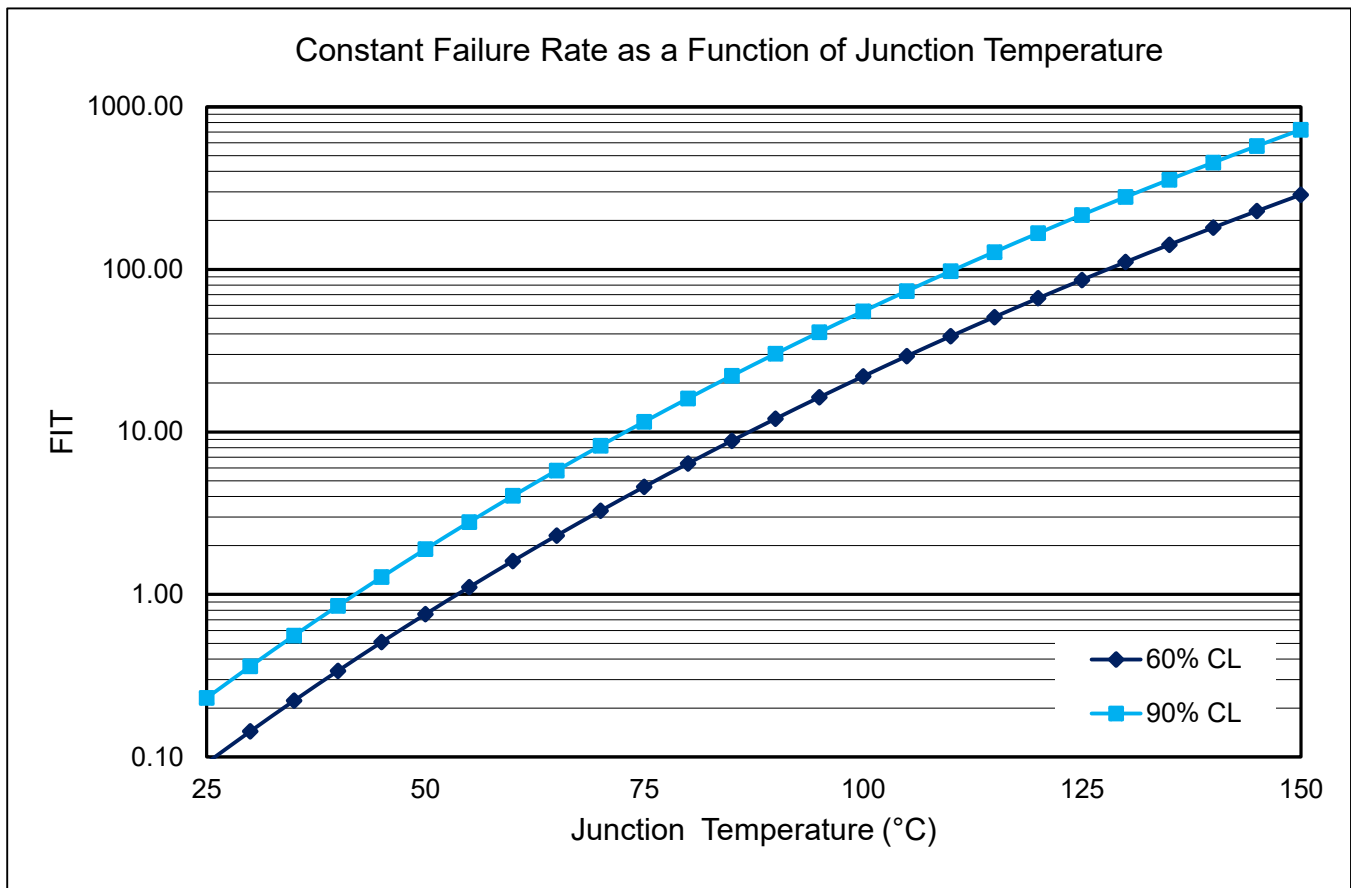
Description : UltraCMOS Low-Noise Amplifiers (LNA) and Power Amplifiers (PA)

Products in Family : PE47002x, PE47004x, PE47066x, PE470681, PE471110, PE471112, PE471741, PE472110, PE477180, PE477181, PE478021, PE478031, PE478051, PE478070, PE478090, PE478091, PE478100, PE478110, PE478130, PE47814x, PE47901x, PE47902x, PE479050, PE479070, PE479081, PE479091, PE479381, PE521200, PE521221, PE52321x, PE53210

Process Technology : UltraCMOS[®] 11, UltraCMOS[®] 12, UltraCMOS[®] 12A, UltraCMOS[®] 13

Units Tested : 21,193

		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		8.40E+07	10.9	9.17E+07
Constant (Random)		8.26E+08	1.1	9.01E+08



Switches (ASW, HPSW, ATS & BSW)

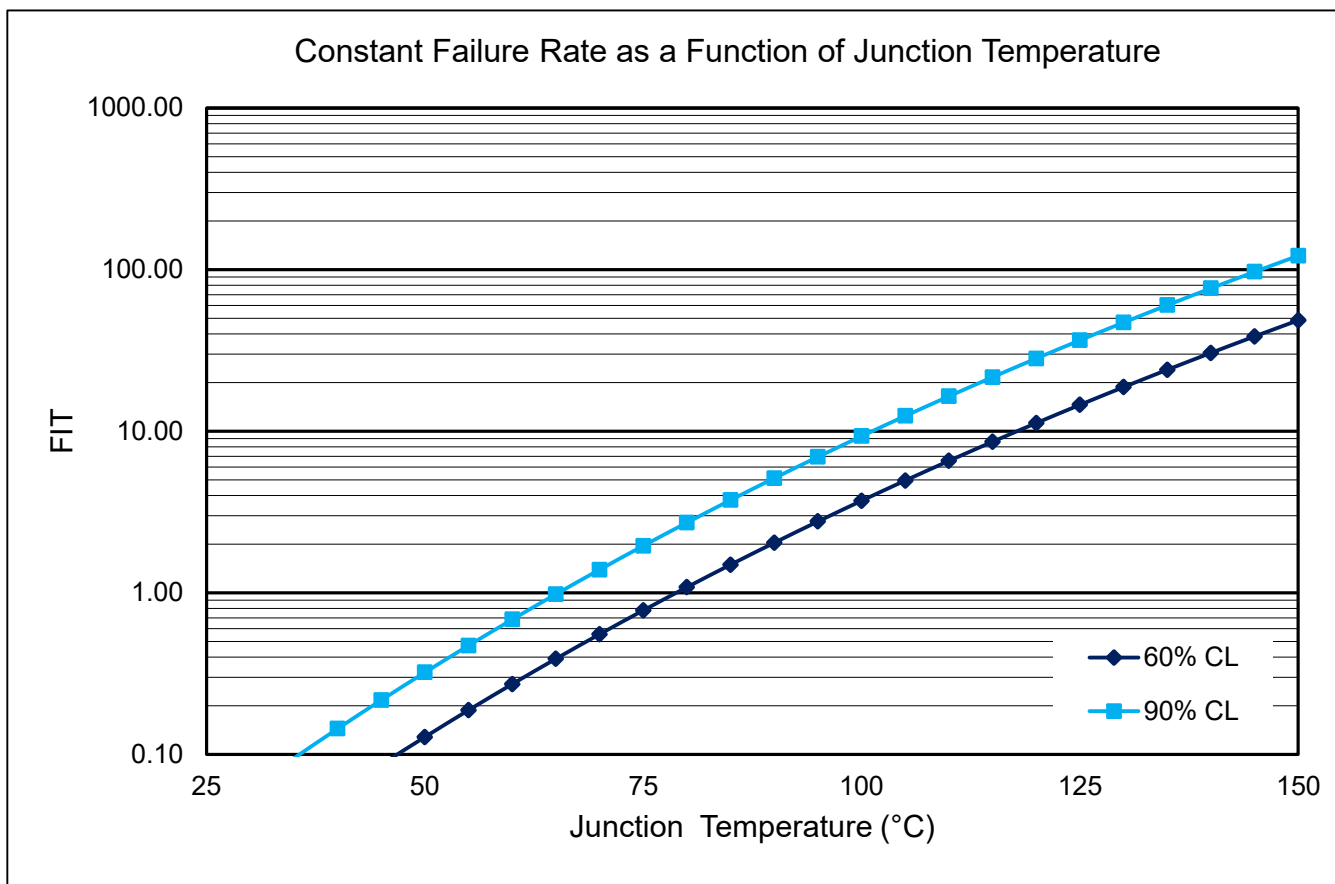
Description : Multi-pole & multi-throw high power handling antenna switch products for Mobile Wireless RF, broadband infrastructure, and Test Equipment /ATE applications.

Products in Family : See Appendix A (page 43)

Process Technology : UltraCMOS[®] 2, UltraCMOS[®] 3.5, UltraCMOS[®] 5, UltraCMOS[®] 6, UltraCMOS[®] 6.5, UltraCMOS[®] 8, UltraCMOS[®] 10, UltraCMOS[®] 11, UltraCMOS[®] 12, UltraCMOS[®] 13, UltraCMOS[®] 13S

Units Tested : 57,842

		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		5.66E+08	1.6	6.18E+08
Constant (Random)		4.88E+09	0.2	5.33E+09



ASIC

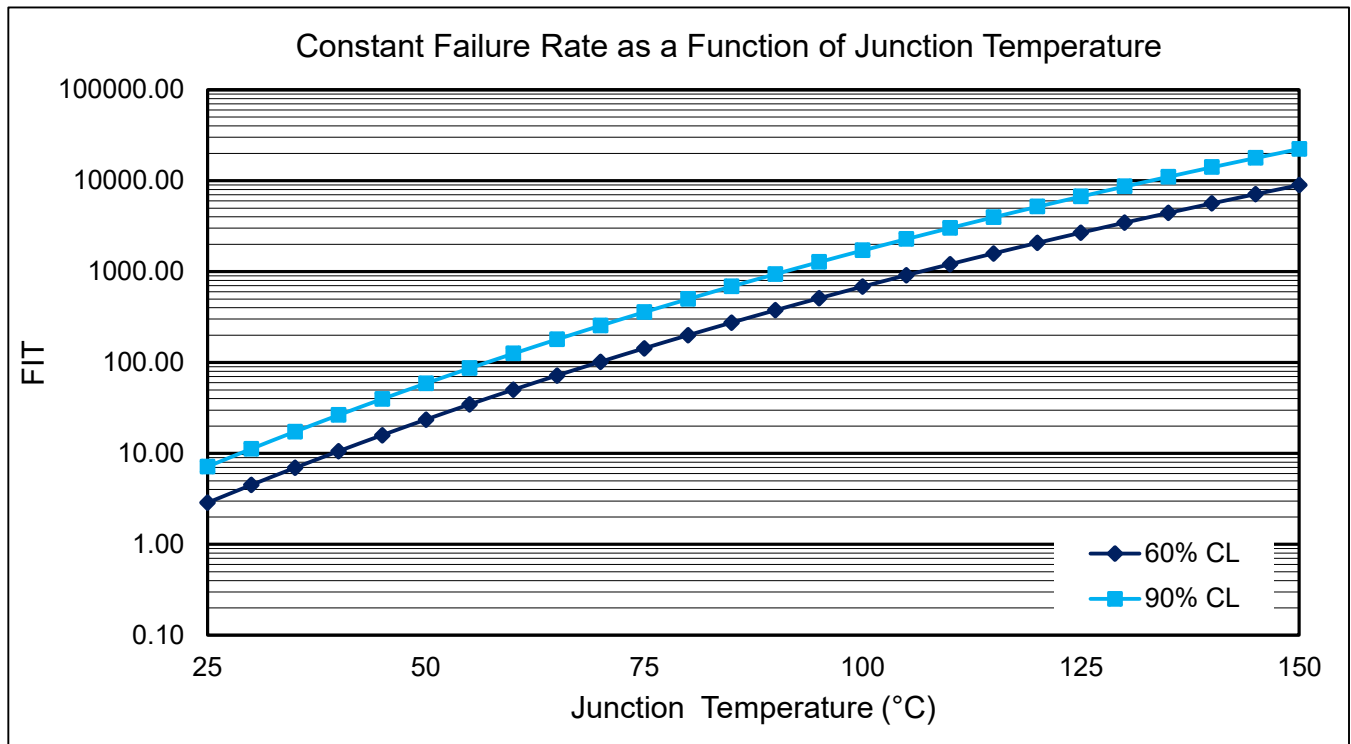
Description : These ICs have high precision ADCs for sensing MEMS capacitance and high accuracy temperature sensors to support high conversion rates and low latency.

Products in Family : WP71900, WP71901

Process Technology : 55LPx

Units Tested : 343

Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	1.28E+06	717.7	1.39E+06
Constant (Random)	2.66E+07	34.5	2.90E+07



DC-DC

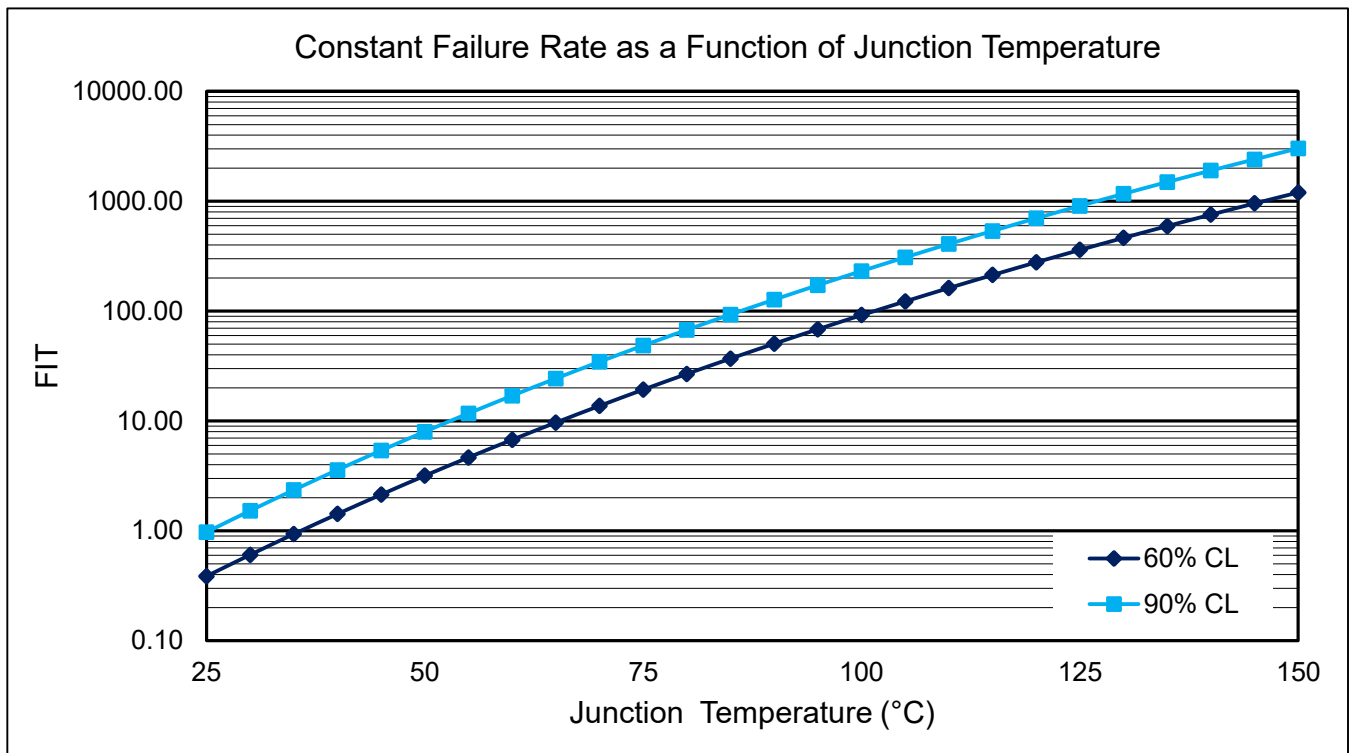
Description : These devices are ultra-high efficiency DC/DC converter solution with integrated programmable current sinks that drive strings of LEDs.

Products in Family : PE22100, PE23100, PE23102, PE23261, PE23363, PE24101, PE24102, PE25200, PE99151, PE99153, PE99153-11, PE99155, PE99155-11

Process Technology : BCD GEN II, BCDLite, UltraCMOS[®] 2, UltraCMOS[®] 11

Units Tested : 2,672

Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	1.23E+07	74.7	1.34E+07
Constant (Random)	1.96E+08	4.7	2.14E+08



Digital Step Attenuators (DSA)

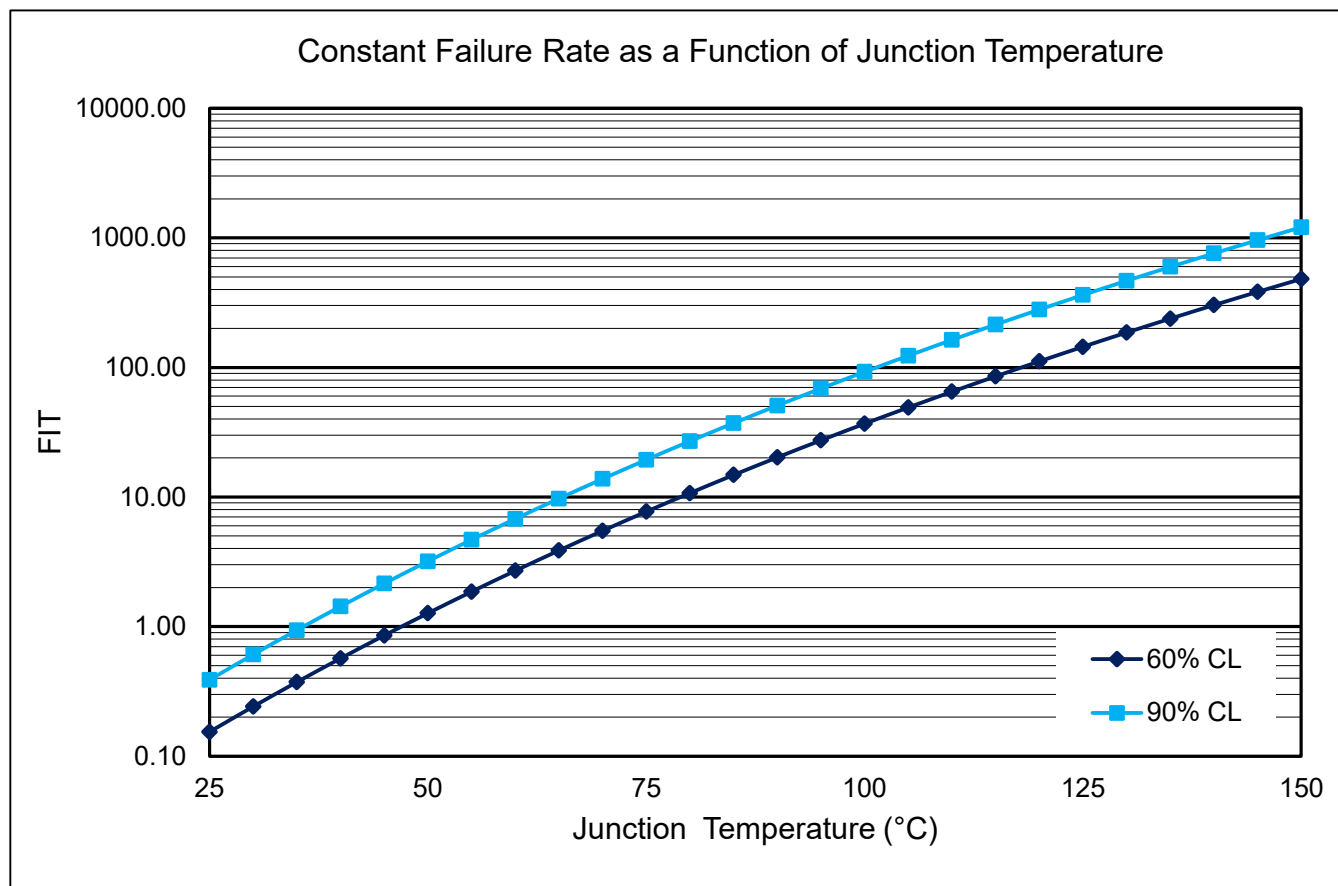
Description : 50Ω and 75Ω Digital Step Attenuators for wireless infrastructure, microwave, test equipment and high reliability space applications.

Products in Family : PE4302, PE4306, PE4308, PE4309, PE4312, PE43204, PE43205, PE43610, PE23614, PE43703, PE43704, PE43713, PE43713, PE94302

Process Technology : UltraCMOS[®] 2, UltraCMOS[®] 3.5, UltraCMOS[®] 5, UltraCMOS[®] 6.5, UltraCMOS[®] 8, UltraCMOS[®] 12

Units Tested : 4,471

		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		4.36E+07	21.0	4.76E+07
Constant (Random)		4.92E+08	1.9	5.37E+08



Digitally Tunable Capacitors (DTC)

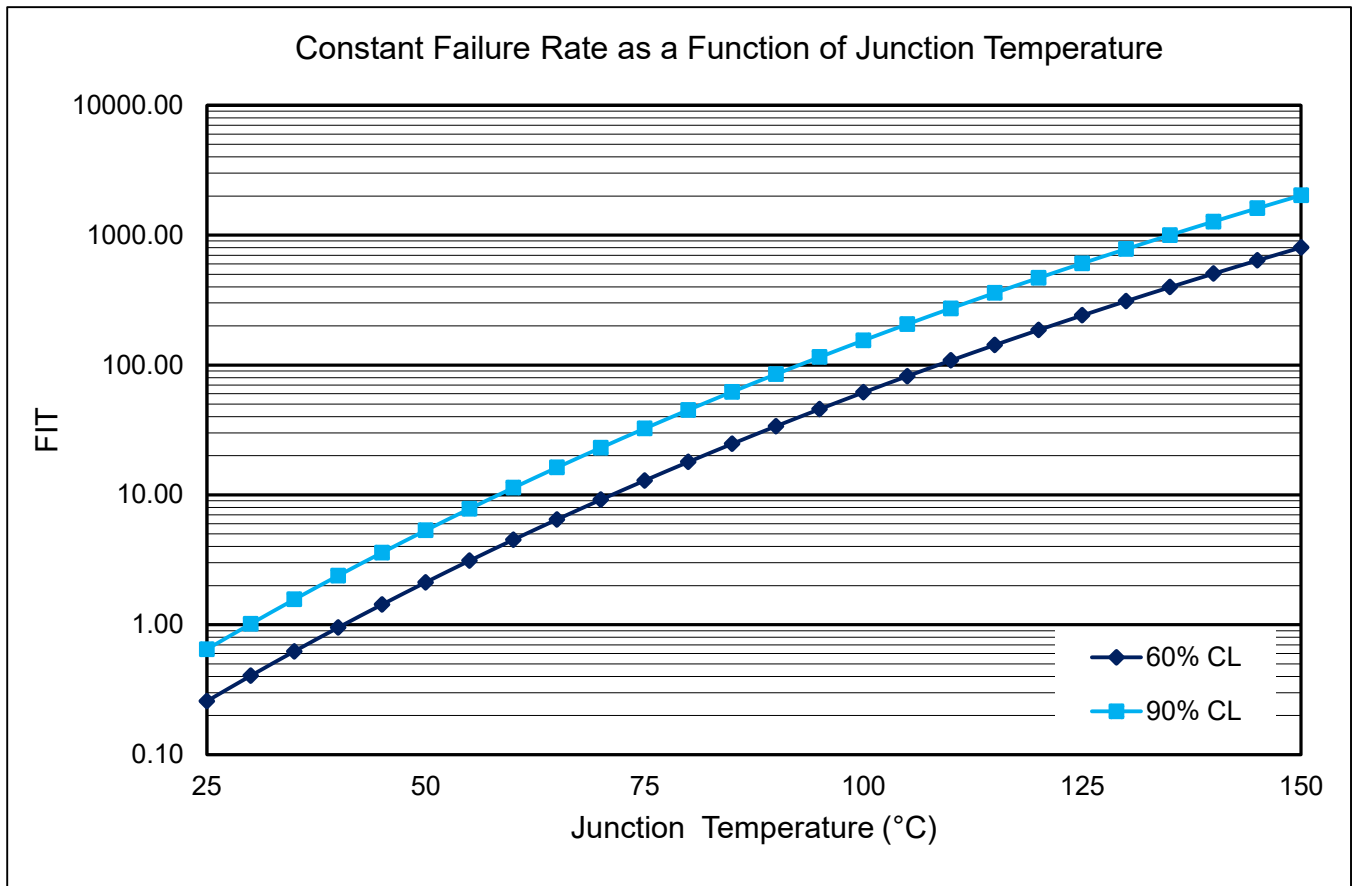
Description : Supports a wide range of tuning applications, from tuning the center frequency of mobile-TV and antennas, to tunable impedance matching and filters.

Products in Family : PE623060, PE623090, PE64102, PE64906, PE62304, PE62305, PE64904, PE613040, PE613050

Process Technology : UltraCMOS® 3.5, UltraCMOS® 5, UltraCMOS® 8

Units Tested : 2,379

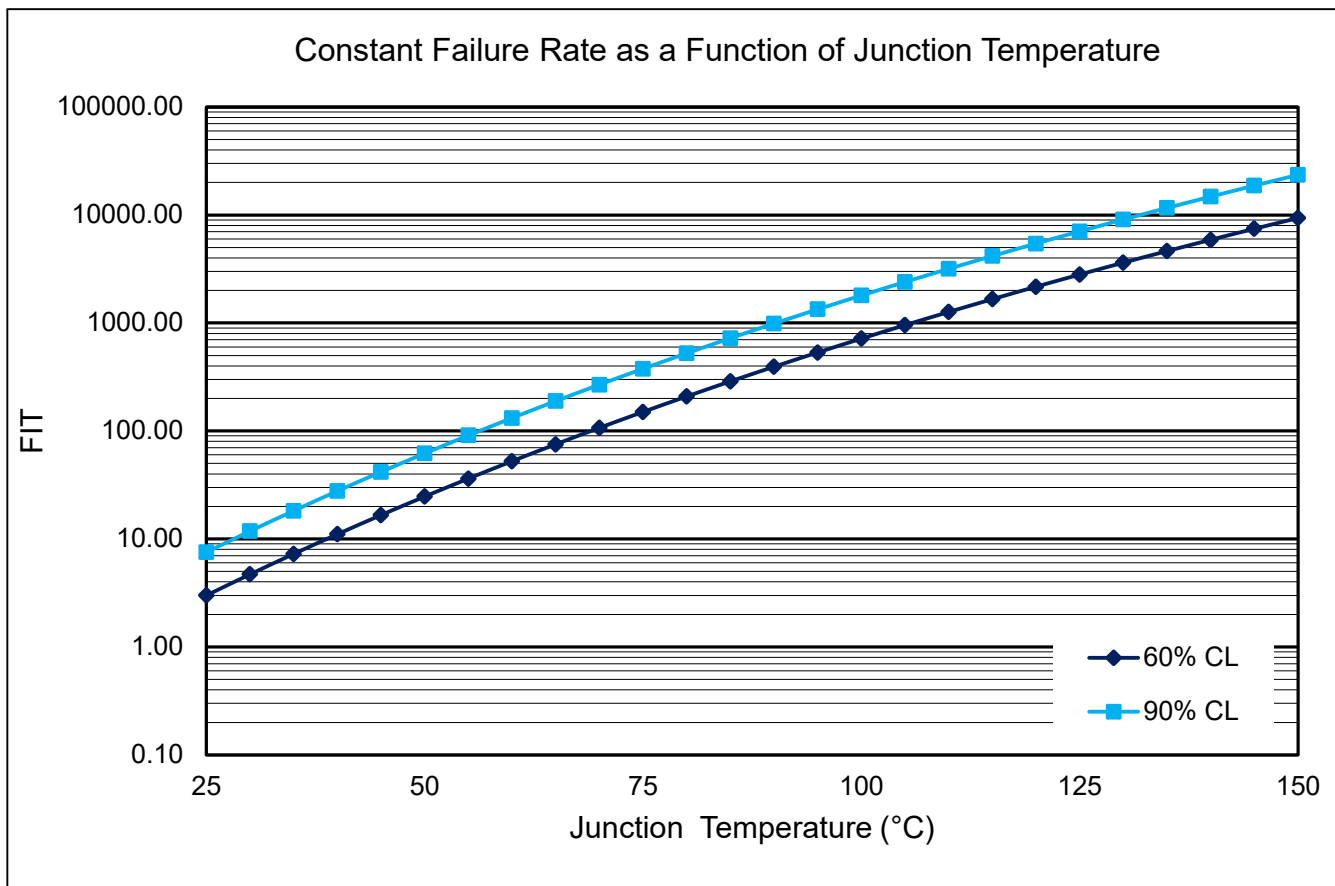
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		2.82E+07	32.5	3.07E+07
Constant (Random)		2.95E+08	3.1	3.22E+08



GaN Driver Product Family

Description : High-speed FET Driver
 Products in Family : PE29100, PE29101, PE29102
 Process Technology : UltraCMOS® 6.5, UltraCMOS® 8
 Units Tested : 327

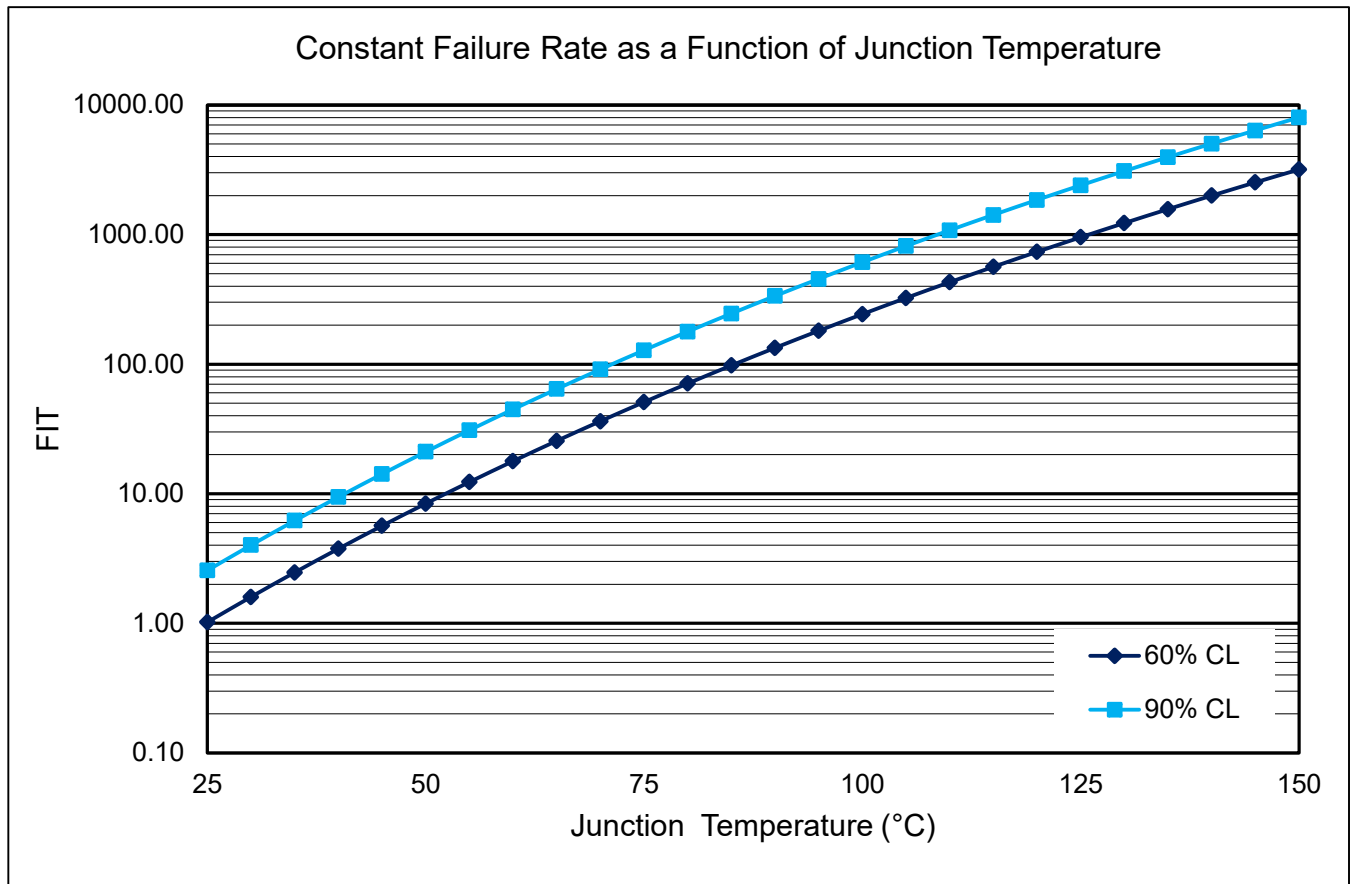
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		1.22E+06	752.9	1.33E+06
Constant (Random)		2.54E+07	36.1	2.77E+07



Power Limiters (LMTR)

Description : UltraCMOS Power Limiters.
 Products in Family : PE45140, PE45361, PE45450
 Process Technology : UltraCMOS[®] 5, UltraCMOS[®] 8
 Units Tested : 589

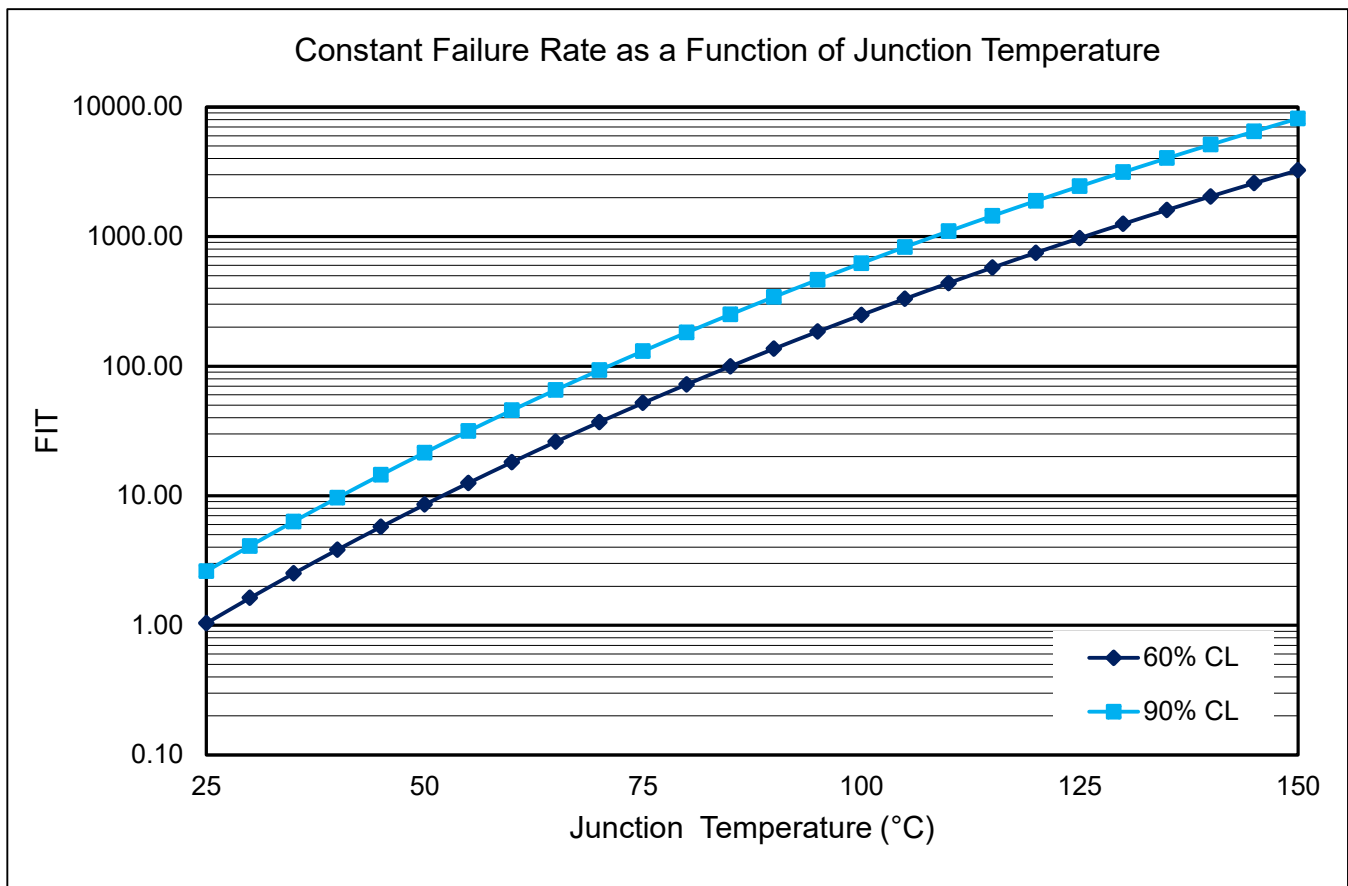
Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	7.04E+06	130.2	7.68E+06
Constant (Random)	7.45E+07	12.3	8.13E+07



Monolithic Phase & Amplitude Controller (MPAC)

Description : UltraCMOS RF MPACs.
 Products in Family : PE19601, PE46120, PE46130, PE46140
 Process Technology : UltraCMOS® 5, UltraCMOS® 8
 Units Tested : 565

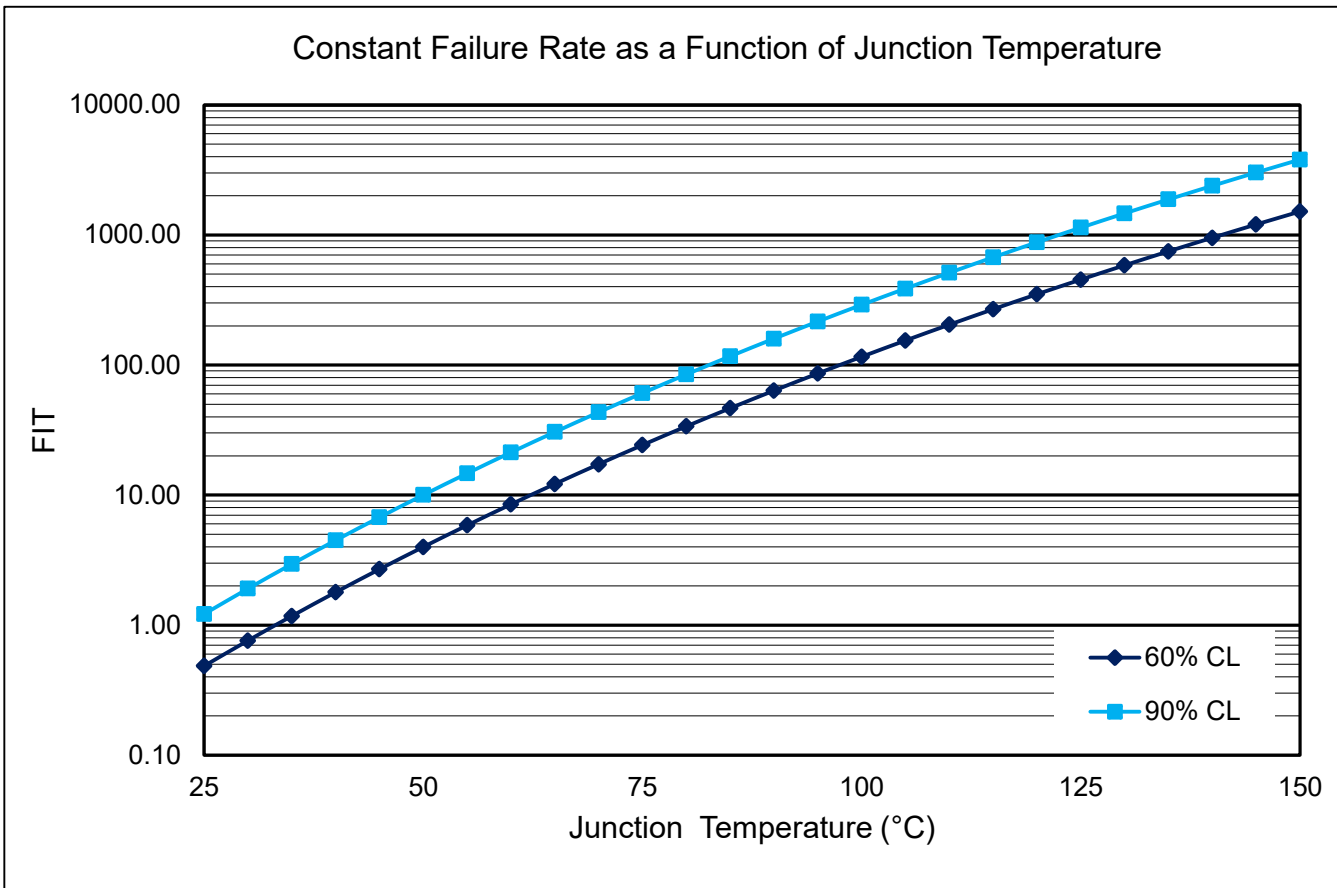
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		7.02E+06	130.6	7.66E+06
Constant (Random)		7.31E+07	12.5	7.98E+07



Mixers (MXR)

Description : UltraCMOS MOSFET quad array broadband and tuned mixers.
 Products in Family : PE4120, PE4122, PE4126, PE4134, PE4140, PE4150, PE4151, PE4152, PE41901
 Process Technology : UltraCMOS[®] 2, UltraCMOS[®] 8
 Units Tested : 1,136

Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	9.15E+06	100.1	9.99E+06
Constant (Random)	1.57E+08	5.9	1.71E+08



PA Controller (PAC)

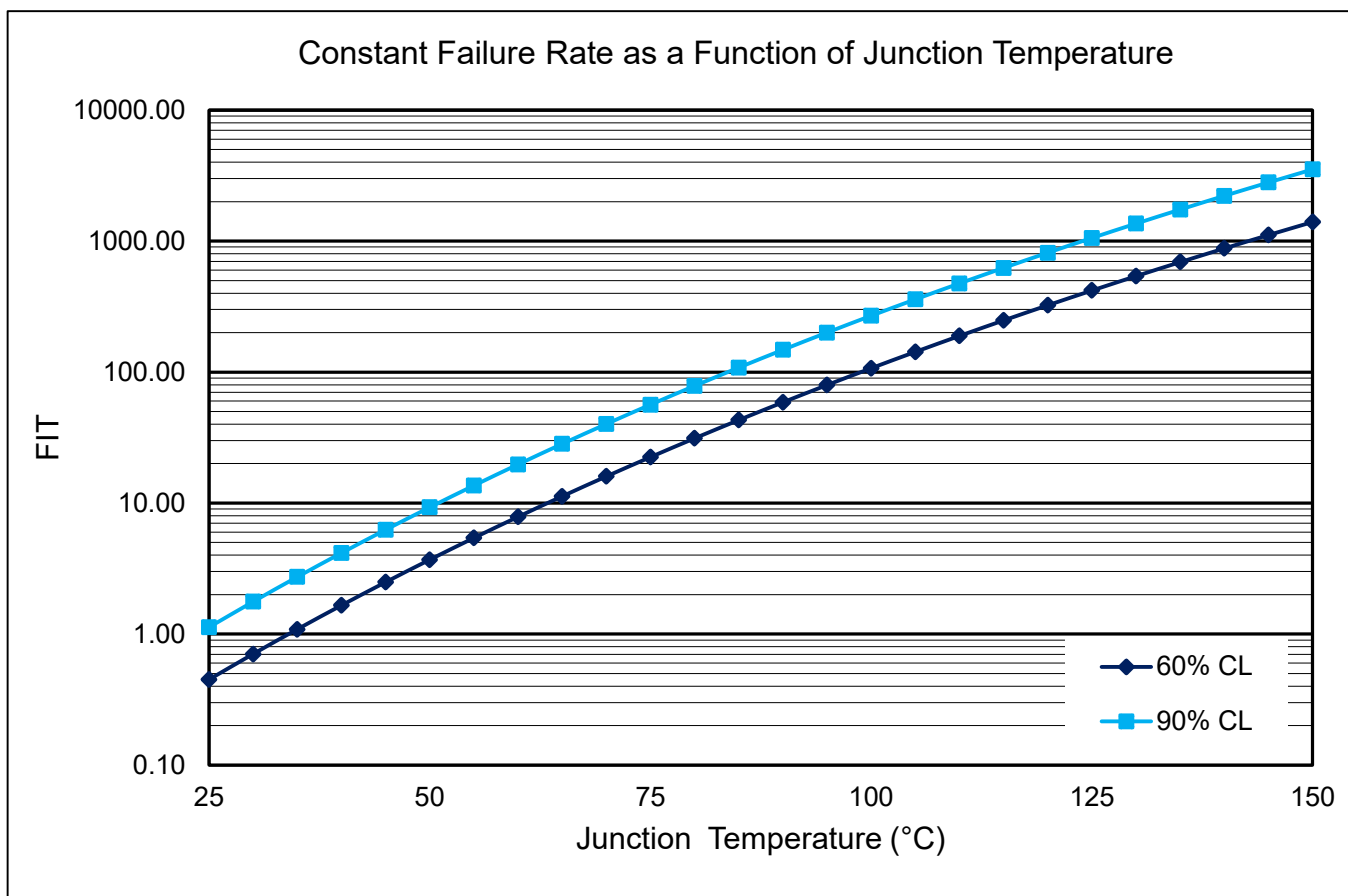
Description : PA Controller controls the PA bias current in PAD modules for RF Front Ends

Products in Family : PE515131, PE515170, PE515190, PE519011

Process Technology : UltraCMOS® 12

Units Tested : 7,837

Standard Failure Rate Calculations at 55°C and 60% CL			
	EDH (hours)	FITs	MTTF (hours)
Early Life	3.14E+07	29.2	3.43E+07
Constant (Random)	1.69E+08	5.4	1.85E+08



Phase Locked-Loop Synthesizers (PLL)

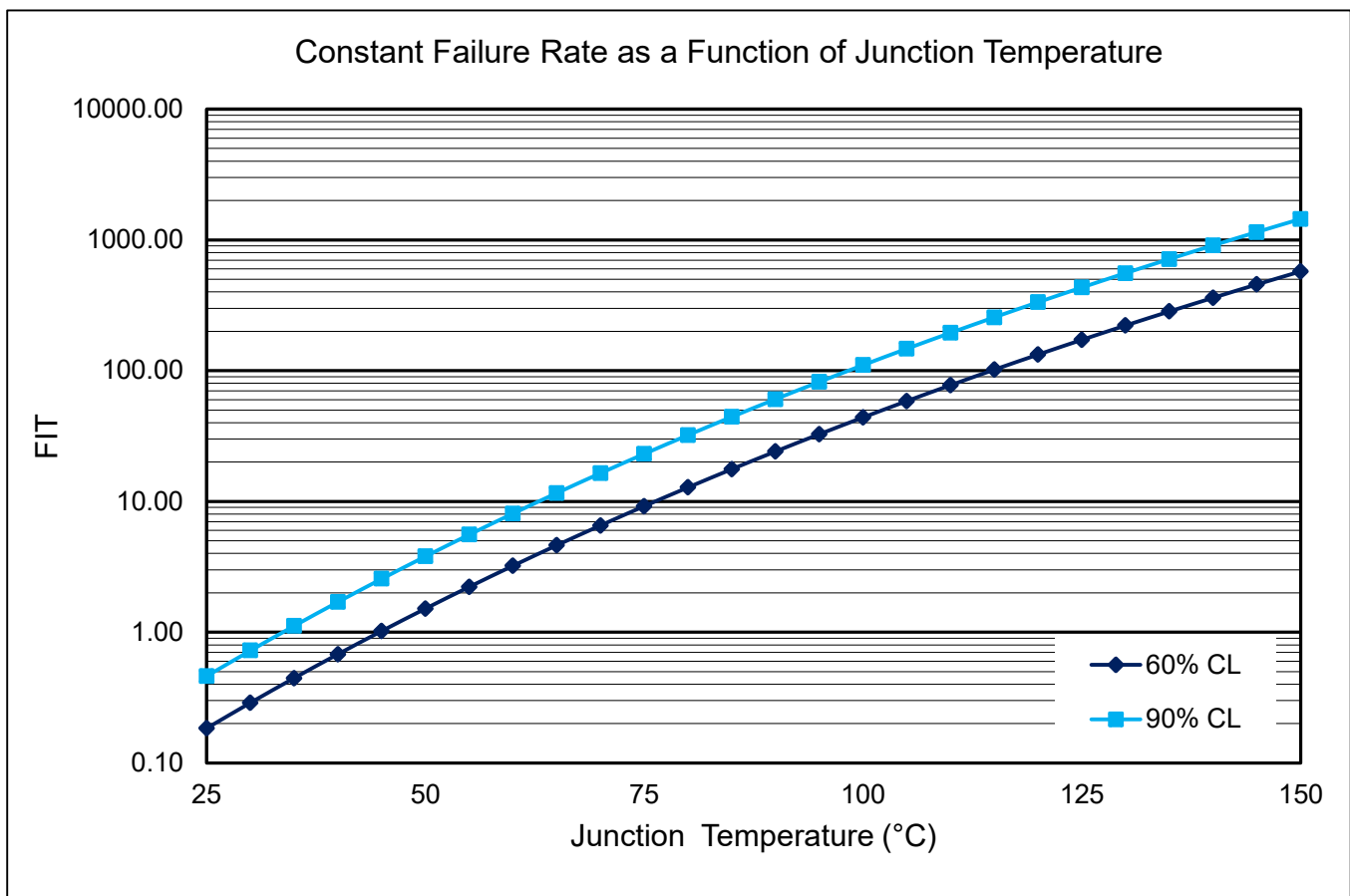
Description : Integer-N, Fractional-N and Delta Sigma Modulated frequency synthesizers for base station, mobile wireless and high reliability space applications.

Products in Family : PE3236, PE33241, PE3335, PE3336, PE33361, PE3341, PE3342, PE83336-21, PE9601, PE9701, PE9702, PE97022, PE9704, PE97042, PE97240, PE9763, PE9763-14, PE97632, PE97640

Process Technology : UltraCMOS® 2, UltraCMOS® 5

Units Tested : 5,846

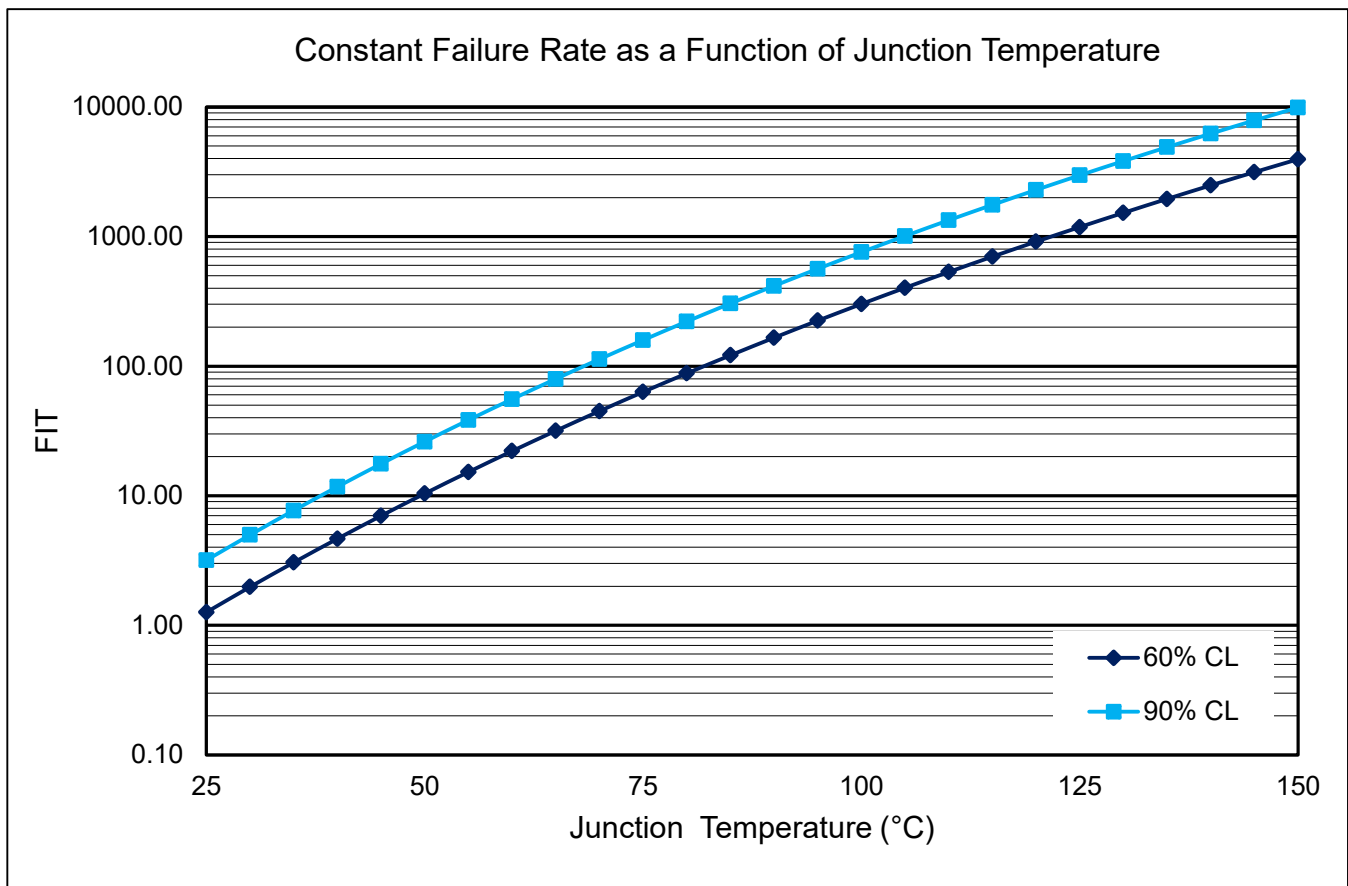
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		2.95E+07	31.0	3.22E+07
Constant (Random)		4.13E+08	2.2	4.51E+08



Phase Shifters (PSH)

Description : UltraCMOS RF Phase Shifters.
 Products in Family : PE44820
 Process Technology : UltraCMOS® 5
 Units Tested : 432

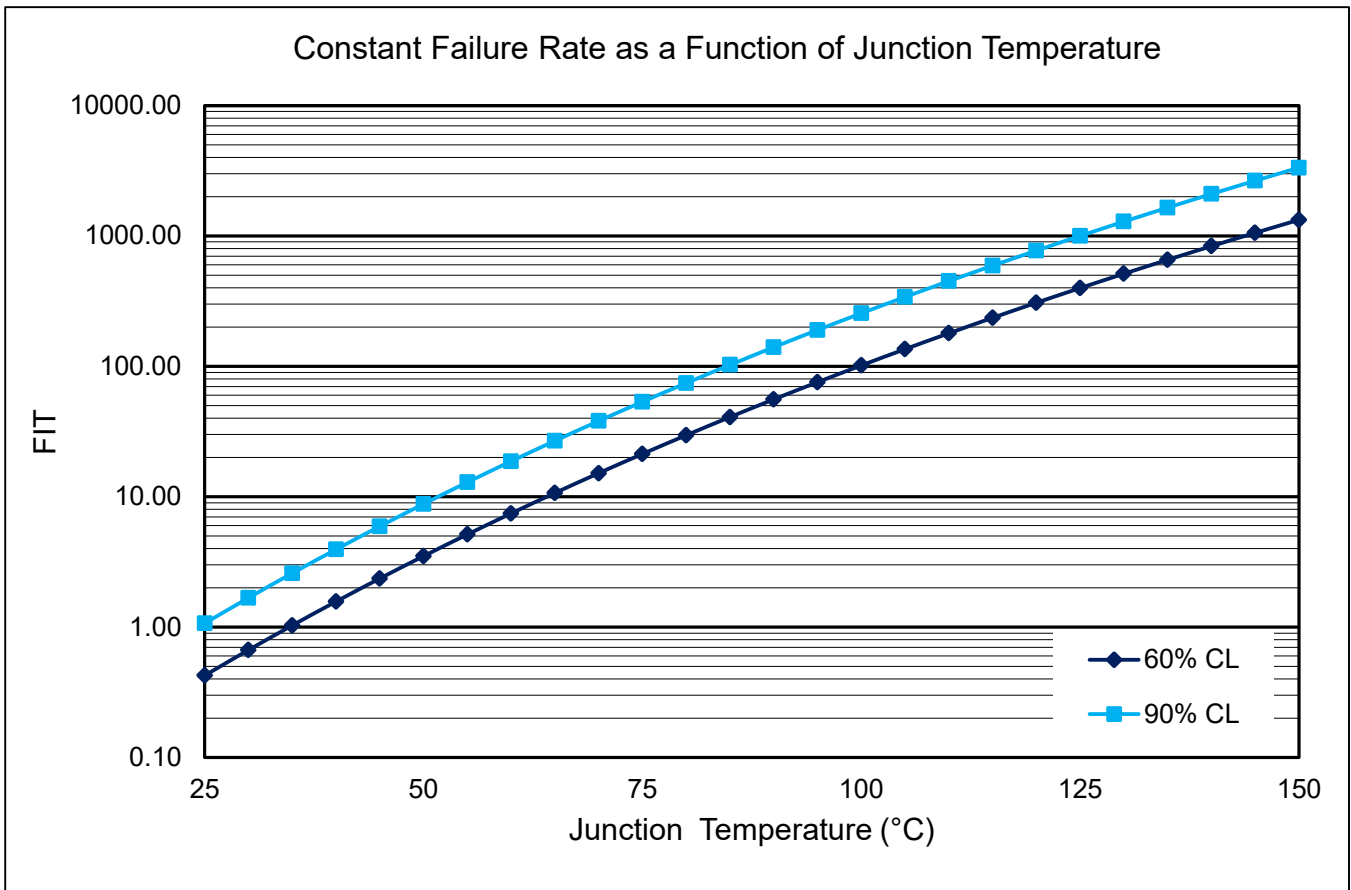
		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		5.37E+06	170.8	5.86E+06
Constant (Random)		6.00E+07	15.3	6.55E+07



Prescalers (PSR)

Description : UltraCMOS RF Prescalers.
 Products in Family : PE3501, PE3503, PE3511, PE3512, PE35400, PE83512, PE9301, PE9303, PE9304, PE9308, PE9309, PE9311, PE9312, PE9313
 Process Technology : UltraCMOS® 2, UltraCMOS® 8
 Units Tested : 2,432

		Standard Failure Rate Calculations at 55°C and 60% CL		
		EDH (hours)	FITs	MTTF (hours)
Early Life		1.25E+07	73.5	1.36E+07
Constant (Random)		1.78E+08	5.1	1.94E+08



Reliability Data

(Periodic Testing for the last 8 Quarters)

High Temperature Operating Life (HTOL)

Reference Standards : JESD22-A108
 Test Conditions : $T_A = 125^{\circ}\text{C}$ (A) or 150°C (B)
 : $V_{\text{bias}} = \text{max operating voltage}$
 Test Duration (typical) : HTOL: 1,000 hrs. at (A) or 500 hrs. at (B)
 ELFR: 48 hrs. at (A) or 24 hrs. at (B)

HTOL & ELFR	2019	2019	2019	2020	2020	2020	2020	2021
Process Technology	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
55LPx	-	-	0/255	0/88	-	-	-	-
BCD Gen II	-	0/954	-	-	-	-	-	0/80
BCD Lite	-	0/510	-	-	-	-	-	-
UltraCMOS® 10	-	-	-	-	-	-	-	-
UltraCMOS® 11	0/247	0/85	-	-	-	0/25	-	-
UltraCMOS® 12	0/4,081	0/90	0/162	0/824	0/3,817	-	0/85	0/90
UltraCMOS® 12A	0/96	-	-	0/2,525	0/670	0/337	-	0/983
UltraCMOS® 13	-	-	-	0/270	0/4,062	0/255	0/90	0/261
UltraCMOS® 13S	0/3,613	-	0/2,217	-	0/2,571	0/340	-	-
UltraCMOS® 2	0/85	0/85	0/85	0/85	0/90	0/175	0/90	-
UltraCMOS® 3.5	0/85	0/85	-	0/85	0/170	0/170	0/85	-
UltraCMOS® 5	0/85	-	-	-	-	-	-	-
UltraCMOS® 6	-	-	-	-	-	-	-	-
UltraCMOS® 6.5	-	-	-	-	-	-	-	-
UltraCMOS® 8	-	-	-	-	-	-	-	-

HTOL & ELFR	2019	2019	2019	2020	2020	2020	2020	2021
Product Group	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
Amplifier	0/4,328	0/175	-	0/2,609	0/4,315	0/337	0/90	0/1,064
ASIC	-	-	0/255	0/88	-	-	-	-
DC-DC	-	0/1,464	-	-	-	0/25	-	0/80
Driver	-	-	-	-	-	-	-	-
DSA	-	-	-	-	0/255	-	-	-
DTC	-	-	-	-	-	-	-	-
LMTR	-	-	-	-	-	-	-	-
MPAC	-	-	-	-	-	-	-	-
MXR	-	-	-	-	-	-	-	-
PAC	0/96	-	0/77	0/170	0/3,478	-	0/85	0/270
PLL	-	-	-	-	-	-	-	-
PSH	-	-	-	-	-	-	-	-
PSR	-	-	-	-	-	-	-	-
Switch	0/3,868	0/170	0/2,387	0/1,010	0/3,332	0/940	0/175	-

Temperature Cycle (TC)

Reference Standards : JESD22-A104

Test Conditions : -55°C to +125°C (B)

: -65°C to +150°C (C)

Test Duration (typical) : 1,000 cyc. at (B) or 500 cyc. at (C)

TC	2019	2019	2019	2020	2020	2020	2020	2021
Package Family	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
32L 5x5 QFN	-	-	-	0/150	-	-	-	-
WLCSP	0/310	0/540	-	-	0/1,626	0/400	0/770	0/380
20L 4x4 QFN	0/165	-	-	-	-	-	-	-
12L 2x2 QFN	0/55	0/50	-	0/50	0/100	0/100	0/50	-
32L 5x5 FCLGA	0/165	0/205	-	0/205	-	-	-	-
Flip Chip Die	-	0/270	-	0/90	-	-	0/300	-
6L SC70	0/55	0/50	0/50	0/50	0/55	0/105	0/55	-
16L 3x3 QFN	-	-	-	-	-	-	-	-
24L 4x4 QFN	-	-	-	-	-	-	-	-
12L 3x3 QFN	-	-	-	-	-	-	-	-
29L 4x4 FCLGA	0/165	-	-	0/150	-	-	-	-
30L 3x3.8 QFN	-	-	-	-	-	-	-	-
10L 2x2 FCETSLP	-	-	-	-	-	-	-	-
20L 4x4 FCLGA	0/50	0/150	0/135	0/150	-	-	-	-
6L 3x3 DFN	-	-	-	-	-	-	-	-

Note

n/a - Reliability data not available. Package (family) not yet qualified at the specified period.

dash (-) - Test not performed at the specified period.

* Plastic encapsulated packages had undergone MSL Preconditioning prior to test.

Highly Accelerated Stress Test (HAST)

Reference Standards : JESD22-A110
 Test Conditions : 130°C, 85% RH, 2.27 atm. (A)
 : 110°C, 85% RH, 1.20 atm. (B)
 Test Duration (typical) : 96 hrs. at (A) or 264 hrs. at (B)

HAST	2019	2019	2019	2020	2020	2020	2020	2021
Package Family	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
32L 5x5 QFN	-	-	-	0/150	-	-	-	-
WLCSP	0/580	0/394	-	-	0/947	-	-	-
20L 4x4 QFN	0/165	-	-	-	-	-	-	-
12L 2x2 QFN	0/55	0/50	-	0/50	0/100	0/100	0/50	-
32L 5x5 FCLGA	0/165	0/150	-	0/150	-	-	-	-
Flip Chip Die	-	-	-	0/144	0/444	0/144	-	0/294
6L SC70	0/55	0/50	0/50	0/50	0/55	0/105	0/55	-
16L 3x3 QFN	-	-	-	-	-	-	-	-
24L 4x4 QFN	-	-	-	-	-	-	-	-
12L 3x3 QFN	-	-	-	-	-	-	-	-
29L 4x4 FCLGA	-	-	-	0/150	-	-	-	-
30L 3x3.8 QFN	-	-	-	-	-	-	-	-
10L 2x2 FCETSLP	-	-	-	-	-	-	-	-
20L 4x4 FCLGA	-	0/150	-	0/150	-	-	-	-
6L 3x3 DFN	-	-	-	-	-	-	-	-

Note

- n/a - Reliability data not available. Package (family) not yet qualified at the specified period.
- dash (-) - Test not performed at the specified period. HAST may not apply to hermetic packages.
- * Plastic encapsulated packages had undergone MSL Preconditioning prior to test.

High Temperature Storage (HTS)

Reference Standards : JESD22-A103

Test Conditions : Ta = 150°C

Test Duration (typical) : 1,000 hrs.

HTS	2019	2019	2019	2020	2020	2020	2020	2021
Package Family	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1
32L 5x5 QFN	-	-	-	0/150	-	-	-	-
WLCSP	0/600	0/540	-	-	0/480	-	-	-
20L 4x4 QFN	-	-	-	-	-	-	-	-
12L 2x2 QFN	0/85	0/85	-	0/85	0/170	0/162	0/85	-
32L 5x5 FCLGA	-	0/205	-	0/205	-	-	-	-
Flip Chip Die	-	0/270	-	0/90	0/90	-	0/300	-
6L SC70	0/85	0/85	0/50	0/50	0/55	0/105	0/55	-
16L 3x3 QFN	-	-	-	-	-	-	-	-
24L 4x4 QFN	-	-	-	-	-	-	-	-
12L 3x3 QFN	-	-	-	-	-	-	-	-
29L 4x4 FCLGA	-	-	-	0/150	-	-	-	-
30L 3x3.8 QFN	-	-	-	-	-	-	-	-
10L 2x2 FCETSLP	-	-	-	-	-	-	-	-
20L 4x4 FCLGA	0/85	0/150	0/90	0/150	-	-	-	-
6L 3x3 DFN	-	-	-	-	-	-	-	-

Note

n/a - Reliability data not available. Package (family) not yet qualified at the specified period.

dash (-) - Test not performed at the specified period.

Appendix A

(RF Switch Products List)

Switches (ASW, HPSW, ATS & BSW)

Description	: Multi-pole & multi-throw high power handling antenna switch products for Mobile Wireless RF, broadband infrastructure, and Test Equipment /ATE applications.
Products in Family	: PE420021, PE42020, PE420540, PE420560, PE4210, PE421080, PE421130, PE421141, PE421160, PE421230, PE421240, PE421261, PE421281, PE421292, PE421293, PE421294, PE421321, PE421422, PE42145x, PE421460, PE421510, PE421550, PE421592, PE421603, PE421628, PE421690, PE421711, PE421729, PE421752, PE421812, PE421821, PE421880, PE421941, PE421951, PE421979, PE422020, PE422050, PE4230, PE4231, PE4232, PE423422, PE4235, PE42359, PE423641, PE4237, PE4239, PE42412, PE42420, PE42421, PE42422, PE42424, PE42430, PE4244, PE42441, PE42450, PE42452, PE4251, PE42510, PE42520, PE42522, PE42524, PE42525, PE42540, PE42542, PE42543, PE42552, PE42556, PE4256, PE4257, PE4259, PE4261, PE426140, PE42615, PE4263, PE42633, PE426331, PE42641, PE426412, PE426482, PE42650, PE42660, PE42672, PE426810, PE42682, PE426823, PE426850, PE426860, PE426880, PE426882, PE42691, PE426911, PE42695, PE42696, PE426960, PE426970, PE4270, PE42721, PE42723, PE42742, PE42750, PE42823, PE42850, PE429002, PE429011, PE42956x, PE4314, PE43701, PE43711, PE613010, PE614910, PE614912, PE636030, PE636040, PE84140, PE84244, PE926C31, PE926C32, PE9354, PE94257, PE95420, PE95421
Process Technology	: UltraCMOS [®] 2, UltraCMOS [®] 3.5, UltraCMOS [®] 5, UltraCMOS [®] 6, UltraCMOS [®] 6.5, UltraCMOS [®] 8, UltraCMOS [®] 10, UltraCMOS [®] 11, UltraCMOS [®] 12, UltraCMOS [®] 13, UltraCMOS [®] 13S
Units Tested	: 57,842