



DEMO STATION: <u>REDEXPERT – HOW MORE DATA HELPS</u> <u>YOU UNDERSTAND THE CAPACITORS</u>

Jon Izkue Rodriguez & Lukas Hölscher Capacitors and Resistors - Würth Elektronik eiSos GmbH & Co. KG

WURTH ELEKTRONIK MORE THAN YOU EXPECT

2023 PSMA MAGNETICS WORKSHOP

Use highly accurate component and circuit models with REDEXPERT[®] Data

Low entry access to electronics design with REDEXPERT[®] Data based on lab measurements with REDEXPERT[®]

Precise determination of inductor loss with **REDEXPERT**®

From lab to desk in seconds with REDEXPERT[®]



Capacitor and Resistor Modules

- Capacitors
 - X/Y EMI Suppression Capacitors
 - MLCCs: Multilayer Ceramic Chip Capacitors
 - Aluminum electrolytic + Polymer Capacitors
 - Supercapacitors
 - DC-Link Film Capacitors (High Power)
 - DC-Film Capacitors (General Purpose)
- Resistors
 - Current Sense Resistors

All capacitors and resistors released in the catalogue can be found in REDEXPERT !

2 2 2 2	Interference Suppression Capacitors (X-/Y-Capacitors)
2 2 2 2 2 2 2	Multilayer Ceramic Chip Capacitors (MLCCs)
-	Aluminum Electrolytic / Aluminum Polymer Capacitors
* *	DC-Film Capacitors
<u>z</u>	DC-Link Film Capacitors
1	Supercapacitors (EDLCs)
	Current Sense Resistors



Register and Log in / Or continue without logging in

- Registration is not mandatory
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Information sorted with focus on engineers

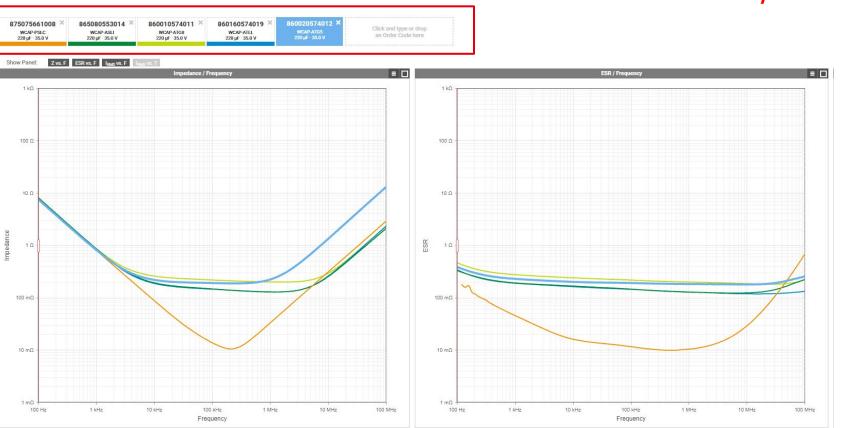
Y	Order Code	Series 🛛 🍸	Spec	Technology	Series Description \forall	C 7	To 🍸	V _R \heartsuit	DF 🍸	$MaximumI_R ~~\bigtriangledown$	Specified
	ି 86001027200 1	WCAP-ATG8	205	Alum. Electrolytic	Show parts where C	22.0 µF	±20%	10.0 V	< 19 %	89.8 mA	66.0
~	♦ 860010272002	WCAP-ATG8	207	Alum. Electrolytic	Technology is equal to:	33.0 µF	±20%	10.0 V	< 19 %	120 mA	88.0
	860010272003	WCAP-ATG8	207	Alum. Electrolytic		47.0 μF	±20%	10.0 V	< 19 %	143 mA	105
~	860010272004	WCAP-ATG8	1	Alum. Electrolytic	; Alum. Electrolytic	68.0 µF	±20%	10.0 V	< 19 %	180 mA	132
	860010272005	WCAP-ATG8	2027	Alum. Electrolytic	Alum. Polymer	100 µF	±20%	10.0 V	< 19 %	269 mA	198
\sim	860010272006	WCAP-ATG8	1	Alum. Electrolytic	Hybrid Polymer *C	120 µF	±20%	10.0 V	< 19 %	261 mA	209
	860010272007	WCAP-ATG8	207	Alum. Electrolytic	THT - General Purpose +85°C	150 µF	±20%	10.0 V	< 19 %	289 mA	231
\sim	◇860010273008	WCAP-ATG8	1	Alum. Electrolytic	THT - General Purpose +85°C	180 µF	±20%	10.0 V	< 19 %	316 mA	253
	860010273009	WCAP-ATG8	207	Alum. Electrolytic	THT - General Purpose +85°C	220 µF	±20%	10.0 V	< 19 %	367 mA	294
~	860010273010	WCAP-ATG8	1007	Alum. Electrolytic	THT - General Purpose +85°C	330 µF	±20%	10.0 V	< 19 %	454 mA	363
	860010273011	WCAP-ATG8	2027	Alum. Electrolytic	THT - General Purpose +85°C	470 µF	±20%	10.0 V	< 19 %	522 mA	418
~	◇860010274012	WCAP-ATG8	2	Alum. Electrolytic	THT - General Purpose +85°C	560 µF	±20%	10.0 V	< 19 %	633 mA	506 🗸
<					10 AGA	200 F		** ***	40.0		>

 Columns with information of interest for designers

100 / 2152 items 🏦

- Use columns for filtering the list
- Use columns for sorting the list
- Column order may be altered in the horizontal axis
- Columns can be hidden (use gear symbol in the right)

Select different parts and compare the curves

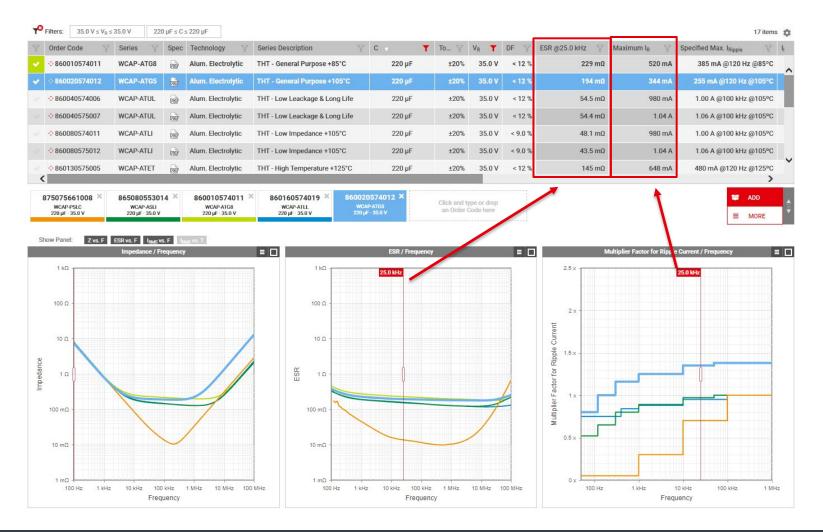


These are the selected components





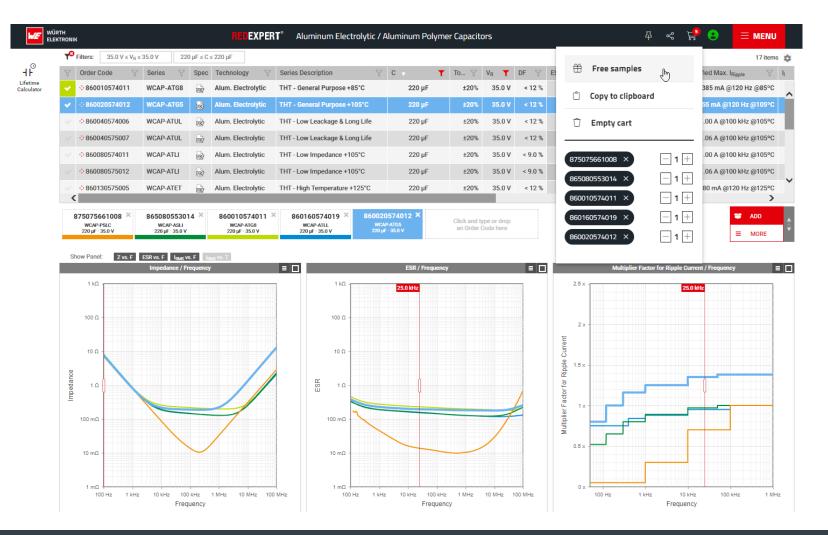
Use sliders to get the graph values in the main table (Only registered users)



2023 PSMA MAGNETICS WORKSHOP
DEMO STATION | JIR | 18.03.2023



Add selected components and order free samples (Only registered users)





Comparison of MLCCs' characteristic curves

https://we-online.com/re/5jBR7DSLa6

Order Code 🛛 💎	Spec	Series 💎	Description	7 Size	Ce 🖓 🕻	÷ 🚺	Tole V	V _R	Riso Y	DF Y T	min 🝸 T	max V	TCC 7	Length T	Width V	Height	Technical Part Number	Assemb 🕅	
♦ 885012206071R	1	WCAP-CSGP	General Purpose	0603	X7R	100 nF	±10 %	25.0 V	> 5.00 GΩ	3.5 %	-55.0°C	125°C	±15%	1.60 mm	0.800 mm	0.800 mm	X7R0603104K025DFCT10000	SMT	
🔆 885012205085R	1	WCAP-CSGP	General Purpose	0402	X7R	100 nF	±10 %	25.0 V	> 5.00 GΩ	10 %	-55.0°C	125°C	±15%	1.00 mm	0.500 mm	0.500 mm	X7R0402104K025DFCT10000	SMT	
◇885012205037R	207	WCAP-CSGP	General Purpose	0402	X7R	100 nF	±10 %	16.0 V	> 5.00 GΩ	5.0 %	-55.0°C	125°C	±15%	1.00 mm	0.500 mm	0.500 mm	X7R0402104K016DFCT10000	SMT	
885012206071	1	WCAP-CSGP	General Purpose	0603	X7R	100 nF	±10 %	25.0 V	> 5.00 GΩ	3.5 %	-55.0°C	125°C	±15%	1.60 mm	0.800 mm	0.800 mm	X7R0603104K025DFCT20000	SMT	
ං 885012206046	201	WCAP-CSGP	General Purpose	0603	X7R	100 nF	±10 %	16.0 V	> 5.00 GΩ	3.5 %	-55.0°C	125°C	±15%	1.60 mm	0.800 mm	0.800 mm	X7R0603104K016DFCT10000	SMT	
885012205085	1	WCAP-CSGP	General Purpose	0402	X7R	100 nF	±10 %	25.0 V	> 5.00 GΩ	10 %	-55.0°C	125°C	±15%	1.00 mm	0.500 mm	0.500 mm	X7R0402104K025DFCT10000	SMT	
885010005007	D.	WCVD-C60D	General Purnnee	0402	¥7D	100 nE	+10 %	16 O V	> 5 00 CO	50%	-55 000	12500	+15%	1 00 mm	0 500 mm	0 500 mm	¥700402104K016DECT10000	SWL	
P-CSGP · X5R · 0402 V 100 nF · 25.0 V	885012: WCAP-CSGP 100 nF -	· X7R · 0402 · 16.0 V	885012206046 × WCAP-CSGP · X7R · 0603 100 nF · 16.0 V	an Or	nd type or drop Ier Code here														ADD MORE
P-CSGP · X5R · 0402 V 100 nF · 25.0 V	WCAP-CSGP 100 nF	· X7R · 0402 · 16.0 V	WCAP-CSGP - X7R - 0603 100 nF - 16.0 V		ler Code here					= 🗆						Сар	acitance / DC-Bias Voltage		and the second
2CSGP - XSR - 0402 00 nF - 25.0 V V Panel: Z vs. F Ε 10 kΩ -	WCAP-CSGP 100 nF	· X7R · 0402 · 16.0 V	WCAP-CSGP - X7R - 0603 100 nF - 16.0 V	an Or	ler Code here						120 r 100 r 80 r	nF -				Cap	acitance / DC-Bias Voltage		and the second
CSGP X5R 0402 V OD F - 25.0 V Panel: Z vs. F 10 kΩ 1 kΩ 10 Ω 10 Ω 1 Ω	WCAP-CSGP 100 nF	· X7R · 0402 · 16.0 V	WCAP-CSGP - X7R - 0603 100 nF - 16.0 V	an Or	ler Code here						120 r 100 r 80 r	nF -				Cap	acitance / DC-Bias Voltage		and the second
2-CSGP · XSR · 0402 V 100 nF · 25.0 V V v Panel: Z vs. F E 10 kΩ - - 1 kΩ - - 100 Ω - - 10 Ω - -	WCAP-CSGP 100 nF	· X7R · 0402 · 16.0 V	WCAP-CSGP - X7R - 0603 100 nF - 16.0 V	an Or	ler Code here						120 r 100 r 100 r 100 r 100 r 100 r 100 r 20 r 20 r 20 r	nF -				Cap	acitance / DC-Bias Voltage		- and -



Comparison of MLCCs' characteristic curves

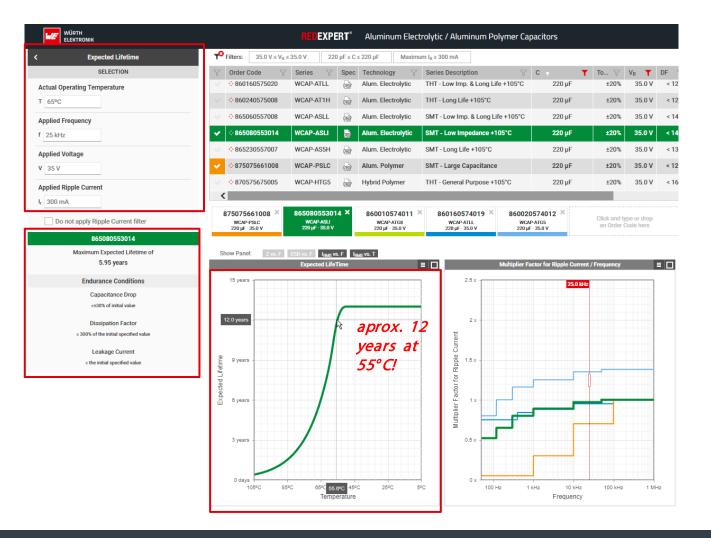
https://we-online.com/re/5jBT9WG4

Order Code	Spec Series	Description	V Size	Ce. T	C Y	Tole V		Rice 87	DE Y	T _{min} V	Town V	TCC Y	Length 7	Width Y	Height V	Technical Part Number	Assemb 7		
	1 oper conce	[3] 10.003 (0.0100) [100].	0000			-10.0		1010 011	2.0.0		· IIIdX	-10.0	2.00 1101		0.000		5		
885012207085	WCAP-CS	P General Purpose	0805	X7R	680 pF	±10 %	50.0 V	> 10.0 GΩ	2.5 %	-55.0°C	125°C	±15%	2.00 mm	1.25 mm	0.800 mm	X7R0805681K050DFCT10000	SMT		
885012207084	WCAP-CS	P General Purpose	0805	X7R	470 pF	±10 %	50.0 V	> 10.0 GΩ	2.5 %	-55.0°C	125ºC	±15%	2.00 mm	1.25 mm	0.800 mm	X7R0805471K050DFCT10000	SMT		
885012207083	WCAP-CS	P General Purpose	0805	X7R	330 pF	±10 %	50.0 V	> 10.0 GΩ	2.5 %	-55.0°C	125°C	±15%	2.00 mm	1.25 mm	0.800 mm	X7R0805331K050DFCT10000	SMT		
885012207082	WCAP-CS	P General Purpose	0805	X7R	220 pF	±10 %	50.0 V	> 10.0 GΩ	2.5 %	-55.0°C	125°C	±15%	2.00 mm	1.25 mm	0.800 mm	X7R0805221K050DFCT10000	SMT		
885012207081	WCAP-CS	P General Purpose	0805	X7R	150 pF	±10 %	50.0 V	> 10.0 GΩ	2.5 %	-55.0°C	125°C	±15%	2.00 mm	1.25 mm	0.800 mm	X7R0805151K050DFCT10000	SMT		
ି 885012207080	WCAP-CS	P General Purpose	0805	X7R	100 pF	±10 %	50.0 V	> 10.0 GΩ	2.5 %	-55.0°C	125°C	±15%	2.00 mm	1.25 mm	0.800 mm	X7R0805101K050DFCT10000	SMT		
5012207103 ×	885382207007	885382207006	88538220	7004 ×	Oliok and the		-1												ADD
P-CSGP - X7R - 0805 .00 µF - 50.0 V	WCAP-CSST · X7R · 0805 100 nF · 50.0 V ESR vs. F ΔC vs. V _{DC}	WCAP-CSST · X7R · 0805 10.0 nF · 50.0 V	WCAP-CSST · X7 1.00 nF · 50 Vac C vs. T Impedance / Free	.0 V	Click and typ an Order Co					1					Cap	acitance / DC-Bias Voltage		=	MOR
AP-CSGP · X7R · 0805 1.00 μF · 50.0 V	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50															=	MORE
AP-CSGP · X7R · 0805 1.00 μF · 50.0 V	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V					= 🗖	1924	2 µF				Сар	acitance / DC-Bias Voltage		=	MORE
P-CSGP • X7R • 0805 1.00 μF • 50.0 V v Panel: <u>z va. F</u> 100 kΩ	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V						1924	2 µF				Сар	acitance / DC-Bias Voltage		=	: MORI
-CSGP - X7R - 0805 .00 μF - 50.0 V v Panel: Z vs. F 100 kΩ 10 kΩ	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V						1.2	2 µF				Car	acitance / DC-Bias Voltage			MORE
-CSGP · X7R · 0805 .00 μF · 50.0 V V Panel: Z vs. F 100 kΩ 10 kΩ 1 kΩ	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V			+			1.2	1 µF				Cap	acitance / DC-Bias Voltage			MORE
P-CSGP - X7R - 0805 1.00 μF - 50.0 V w Panel: Z vs. F 100 kΩ 10 kΩ	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V						1.2 1 800					Cap	acitance / DC-Bias Voltage			MORE
P-CSGP · X7R · 0805 1.00 μF · 50.0 V w Panel: Z vs. F 100 kΩ 10 kΩ 1 kΩ	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V						1.2 1 800 800 800 800	1 µF				Cap	acitance / DC-Bias Voltage			MORE
P.CSGP : X7R · 0805 1.00 μF · 50.0 V w Panel: Z vs. F 100 kΩ 10 kΩ 1 kΩ 100 Ω	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V						1.2 1 008 009 009 009 009 009	1 µF				Cap	acitance / DC-Bias Voltage			MORE
P-CSGP - X7R - 0805 1.00 μF - 50.0 V W Panel: Z vs. F 100 kΩ 10 kΩ 1 kΩ 100 Ω 10 Ω 10 Ω	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V				/		1.2 1 008 009 009 009 009 009	1 μF				Cap	acitance / DC-Bias Voltage			MORE
P.CSGP - X7R - 0805 1.00 μF - 50.0 V w Panel: Z vs. F 100 kΩ 10 kΩ 10 kΩ 10 μΩ 1 μΩ 10 Ω 10 Ω	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V						1.2 1 008 009 009 009 009 009	1 µF -				Car	acitance / DC-Bias Voltage			MORE
XP-CSGP - X7R - 0805 1.00 μF - 50.0 V ww Panel: Z vs. F 100 kΩ 10 kΩ 10 kΩ 10 kΩ 10 kΩ 10 kΩ	100 nF · 50.0 V	10.0 nF · 50.0 V	1.00 nF · 50	.0 V						1.2 1000 1000 1000 1000 1000	1 µF -				Cap	acitance / DC-Bias Voltage			MORE

10



Lifetime calculator for Aluminum Electrolytic + Aluminum Polymer Capacitors (Only registered users)



- Select a component in the list
- Input Operating conditions in the module on the left
- Get the endurance calculation at that point
 - Endurance conditions are the expected limits when the calculated lifetime had passed
- Look at the table to have an overview of the lifetime at different temperatures
 - In this example, 12 years is double lifetime only 10 degrees colder at temperature of 55° C



Find the parameters that you need for your simulation

									 ↓⊂	(Cs)		SR (s)	 ES (L	↓↓ 5L s) ᢏ	_							circ extr	uit mo ractec asure
										(R _p												15	
V	Order Code • 885012206095R	Spec	Series V WCAP-CSGP	Description General Purpose	Size 50603	7 I V	Ce 🝸	C	Tole 🝸		R ₁₂	DF 🍸	Q 🍸	T _{min}	F _{max} ∀ 125°C	TCC 7	Length T	0.800 mm	Height V	Rs Υ Ι 15.8 mΩ	-s V 310 pH		
	◇885012206089R		WCAP-CSGP	General Purpose	0603		X7R	10.0 nF			> 10.0 GΩ	2.5 %		-55.0°C	125°C		1.60 mm	0.800 mm	0.800 mm	35.9 mΩ	341 pH	10	
~	◇885012206083R		WCAP-CSGP	General Purpose	0603		X7R	1.00 nF			> 10.0 GΩ	2.5 %		-55.0°C		±15%		0.800 mm	0.800 mm	258 mΩ	410 pH	10	Ω -
	♦ 885012206075R		WCAP-CSGP	General Purpose	0603		X7R	470 nF	±10 %	25.0 V	> 1.10 GΩ	10 %		-55.0°C	125°C	±15%	1.60 mm	0.800 mm	0.800 mm	10.1 mΩ	414 pH	ance	
	♦ 885012206071R	ind the	WCAP-CSGP	General Purpose	0603		X7R	100 nF	±10 %	25.0 V	> 5.00 GΩ	3.5 %		-55.0°C	125°C	±15%	1.60 mm	0.800 mm	0.800 mm	18.9 mΩ	443 pH	1 Impedance	Ω -
	♦ 885012205085R		WCAP-CSGP	General Purpose	0402		X7R	100 nF	±10 %	25.0 V	> 5.00 GΩ	10 %		-55.0°C	125°C	±15%	1.00 mm	0.500 mm	0.500 mm	35.0 mΩ	766 pH		
	♦ 885012205037R	1	WCAP-CSGP	General Purpose	0402		X7R	100 nF	±10 %	16.0 V	> 5.00 GΩ	5.0 %		-55.0°C	125°C	±15%	1.00 mm	0.500 mm	0.500 mm	16.9 mΩ	332 pH		
	885012204006		WCAP-CSGP	General Purpose	0201		X7R	1.00 nF	±10 %	25.0 V	> 10.0 GΩ	3.5 %		-55.0°C	125°C	±15%	0.600 mm	0.300 mm	0.300 mm	237 mΩ	173 pH	100 m	nΩ -
	885012204005		WCAP-CSGP	General Purpose	0201		X7R	10.0 nF	±10 %	10.0 V	> 10.0 GΩ	5.0 %		-55.0°C	125°C	±15%	0.600 mm	0.300 mm	0.300 mm	63.1 mΩ	217 pH		
	885012204004	1	WCAP-CSGP	General Purpose	0201		X7R	10.0 nF	±10 %	25.0 V	> 10.0 GΩ	10 %		-55.0°C	125°C	±15%	0.600 mm	0.300 mm	0.300 mm	70.9 mΩ	180 pH		
	885012204003	jan ka	WCAP-CSGP	General Purpose	0201		X7R	1.00 nF	±10 %	50.0 V	> 10.0 GΩ	3.0 %		-55.0°C	125°C	±15%	0.600 mm	0.300 mm	0.300 mm	251 mΩ	210 pH	10 m	n1.2 -
	885012204002		WCAP-CSGP	General Purpose	0201		X7R	680 pF	±10 %	50.0 V	> 10.0 GΩ	3.0 %		-55.0°C	125°C	±15%	0.600 mm	0.300 mm	0.300 mm	319 mΩ	220 pH		
~			WCAP-CSGP	General Purpose	0201		NP0	100 pF	+5%	50 0 V	> 10 0 GO		1000	-55 0°C	125°C	+30ppm/°C	0.600 mm	0.300 mm	0.300 mm	179 m0	200 pH	1 m	100 Hz 1 kHz

Parameters of the equivalent circuit model / Parasisitcs extracted from the impedance measurement

