

NEC

2.5 GHz SILICON MMIC WIDE-BAND AMPLIFIER

UPC2709T UPC2712T

FEATURES

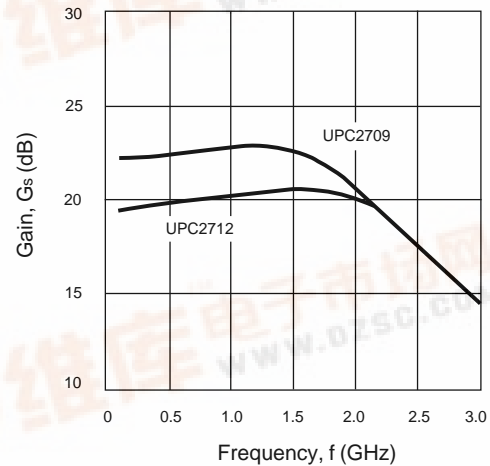
- **WIDE FREQUENCY RESPONSE:** 2.5 GHz
- **HIGH GAIN:** 23 dB (UPC2709T)
- **SATURATED OUTPUT POWER:** +11.5 dBm (UPC2709T)
- **INTERNAL CURRENT REGULATION MINIMIZES GAIN CHANGE OVER TEMPERATURE**
- **5 V SINGLE SUPPLY VOLTAGE**
- **SUPER SMALL PACKAGE**
- **TAPE AND REEL PACKAGING OPTION AVAILABLE**

DESCRIPTION

The UPC2709T and UPC2712T are Silicon Monolithic integrated circuits manufactured using the NESAT III process. These devices are suitable as buffer amplifiers for wide-band applications. They are designed for low cost gain stages in cellular radios, GPS receivers, DBS tuners, PCN, and test/measurement equipment.

NEC's stringent quality assurance and test procedures ensure the highest reliability and performance.

GAIN vs. FREQUENCY



ELECTRICAL CHARACTERISTICS (T_A = 25°C, f = 1 GHz, V_{CC} = 5 V)

PART NUMBER PACKAGE OUTLINE			UPC2709T T06			UPC2712T T06		
SYMBOLS	PARAMETERS AND CONDITIONS	UNITS	MIN	TYP	MAX	MIN	TYP	MAX
I _{CC}	Circuit Current (no signal)	mA	19	25	32	9	12	15
G _s	Small Signal Gain	dB	21	23	26.5	18	20	23.5
f _U	Upper Limit Operating Frequency (The gain at f _U is 3 dB down from the gain at 0.1 GHz)	GHz	2.0	2.3		2.2	2.6	
ΔG _s	Gain Flatness, f = 0.1 ~ 1.8 GHz f = 0.1 ~ 2.0 GHz	dB		±1.0			±0.8	
P _{SAT}	Saturated Output Power	dBm	9	11.5		0	3	
P _{1dB}	Output Power at 1 dB Compression Point	dBm		7.5			-2.5	
NF	Noise Figure	dB		5	6.5		4.5	6
RL _{IN}	Input Return Loss	dB	7	10		9	12	
RL _{OUT}	Output Return Loss	dB	7	10		10	13	
ISOL	Isolation	dB	26	31		28	33	
ΔG _T	Gain -Temperature Coefficient	dB/°C		-0.002			-0.003	
R _{θJA}	Thermal Resistance (Junction to Ambient)	°C/W			200			200



UPC2709T, UPC2712T

ABSOLUTE MAXIMUM RATINGS¹ (T_A = 25°C)

SYMBOLS	PARAMETERS	UNITS	RATINGS
V _{CC}	Supply Voltage	V	6
I _{CC}	Total Circuit Current UPC2709T UPC2712T	mA mA	60 30
P _{IN}	Input Power	dBm	+10
P _T	Power Dissipation ²	mW	280
T _{OP}	Operating Temperature	°C	-40 to +85
T _{STG}	Storage Temperature	°C	-55 to +150

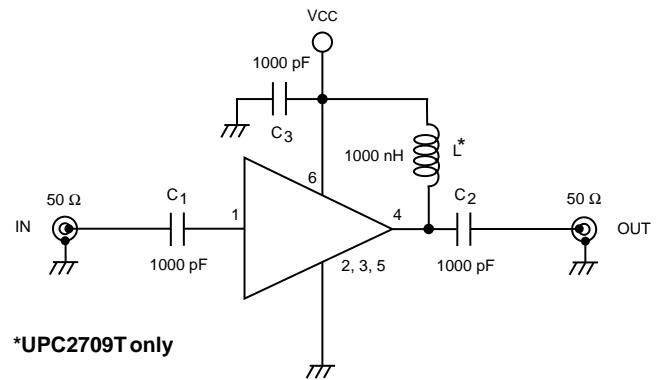
Notes:

- Operation in excess of any one of these parameters may result in permanent damage.
- Mounted on 50 x 50 x 1.6 mm epoxy glass PWB (T_A = +85°C).

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	UNITS	MIN	TYP	MAX
V _{CC}	Supply Voltage	V	4.5	5.0	5.5

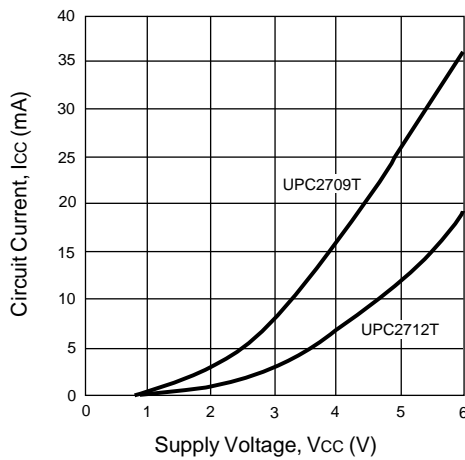
TEST CIRCUIT



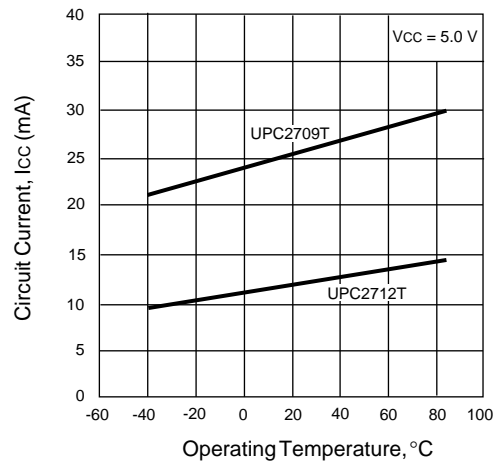
*UPC2709T only

TYPICAL PERFORMANCE CURVES (T_A = 25°C)

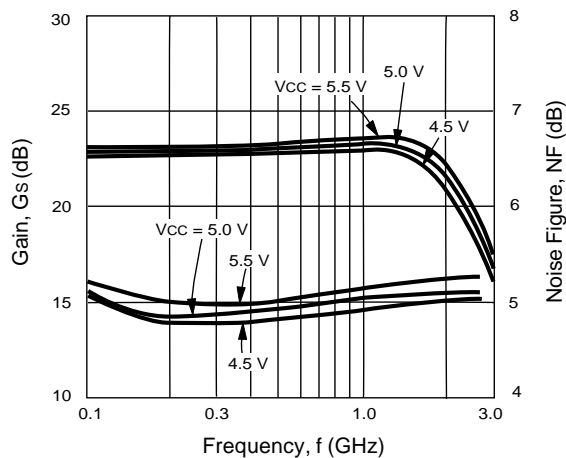
CIRCUIT CURRENT vs. VOLTAGE



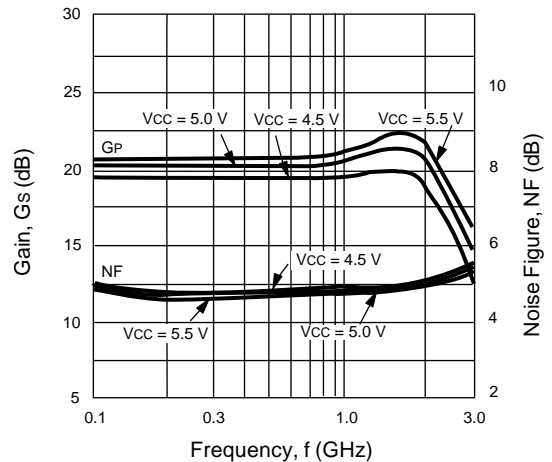
CIRCUIT CURRENT vs. OPERATING TEMPERATURE



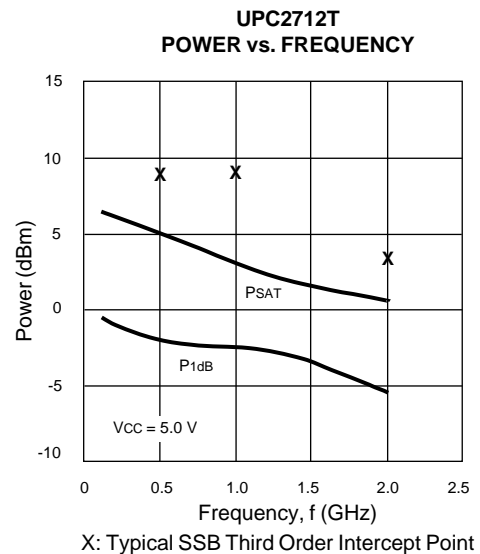
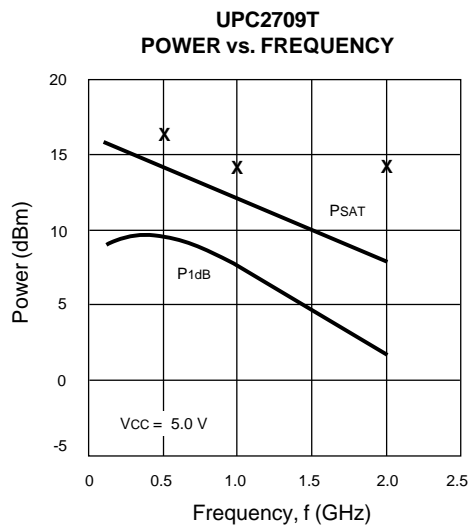
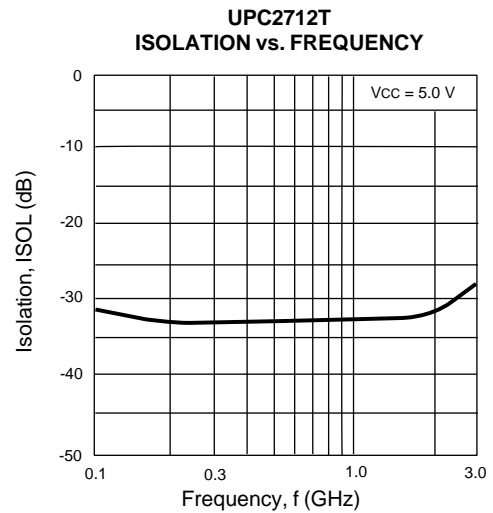
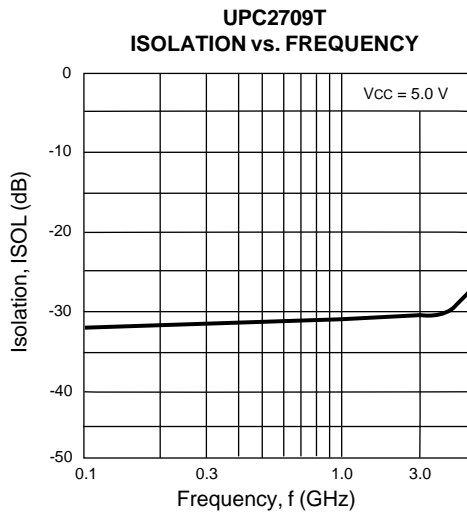
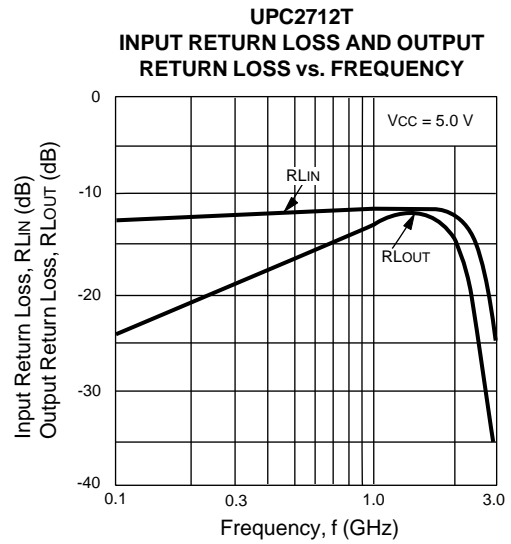
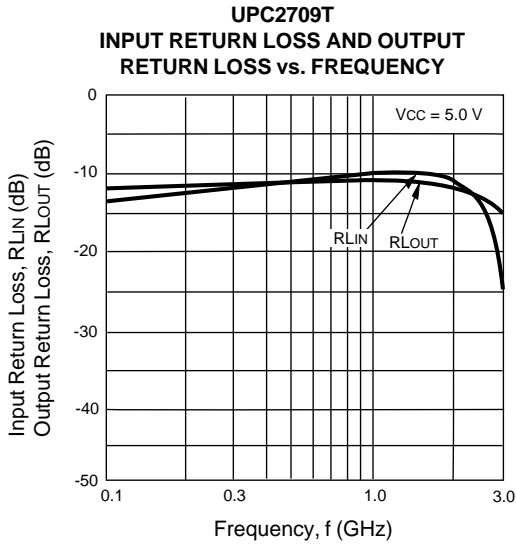
UPC2709T
GAIN AND NOISE FIGURE
vs. FREQUENCY AND VOLTAGE



UPC2712T
GAIN AND NOISE FIGURE
vs. FREQUENCY AND VOLTAGE

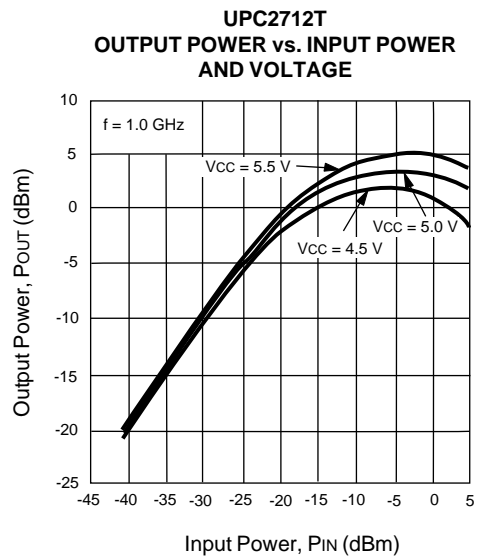
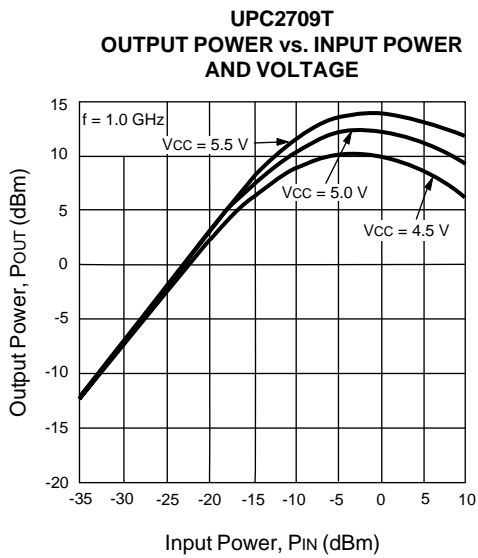
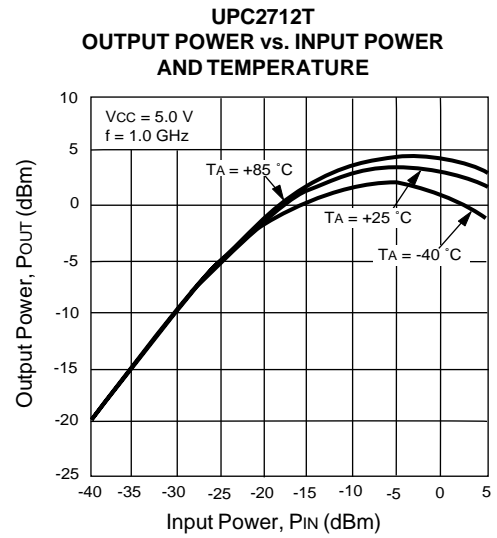
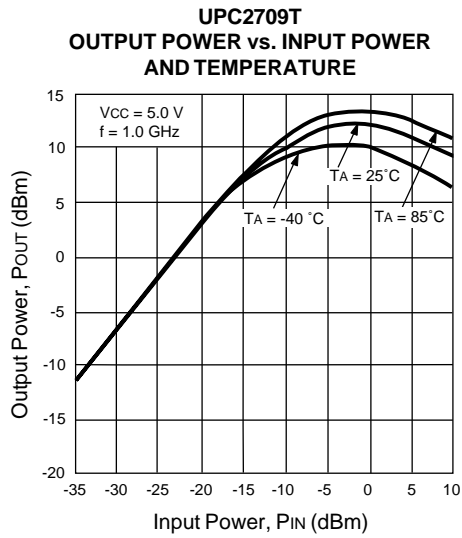


TYPICAL PERFORMANCE CURVES ($T_A = 25^\circ\text{C}$)



UPC2709T, UPC2712T

TYPICAL PERFORMANCE CURVES (TA = 25°C)



UPC2709T, UPC2712T

TYPICAL SCATTERING PARAMETERS (T_A = 25°C)

UPC2709T

V_{CC} = 5 V, I_{CC} = 25 mA

FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K ¹	S ₂₁ (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		
0.10	0.258	-4.1	12.7	-3.7	0.022	7.5	0.234	-4.6	1.66	22.1
0.20	0.261	-2.9	12.8	-12.2	0.024	3.1	0.240	-6.9	1.52	22.1
0.30	0.266	-3.4	12.9	-19.6	0.025	6.3	0.251	-9.6	1.45	22.2
0.40	0.271	-4.6	13.0	-27.0	0.025	6.5	0.260	-13.5	1.42	22.3
0.50	0.272	-6.8	13.1	-34.2	0.026	5.6	0.272	-17.9	1.36	22.3
0.60	0.275	-8.1	13.3	-41.3	0.026	10.5	0.288	-22.1	1.32	22.5
0.70	0.277	-10.4	13.5	-49.2	0.026	9.9	0.303	-28.6	1.29	22.6
0.80	0.278	-12.7	13.6	-57.4	0.026	11.0	0.312	-33.5	1.27	22.7
0.90	0.279	-14.0	13.7	-65.7	0.026	11.8	0.319	-38.4	1.25	22.7
1.00	0.279	-15.2	13.8	-72.3	0.027	15.6	0.324	-43.4	1.20	22.8
1.10	0.279	-18.1	13.9	-81.1	0.027	15.8	0.328	-51.2	1.19	22.9
1.20	0.276	-20.7	14.0	-90.3	0.027	17.7	0.332	-59.0	1.19	22.9
1.30	0.271	-23.3	13.9	-99.8	0.027	16.7	0.332	-67.1	1.20	22.9
1.40	0.263	-25.6	13.8	-109.3	0.027	19.2	0.326	-75.1	1.22	22.8
1.50	0.255	-26.9	13.6	-118.5	0.027	20.4	0.314	-82.5	1.25	22.7
1.60	0.246	-28.6	13.2	-128.3	0.028	20.6	0.302	-90.6	1.27	22.4
1.70	0.238	-30.2	12.7	-138.0	0.029	21.6	0.282	-98.9	1.30	22.1
1.80	0.237	-31.7	12.3	-147.5	0.030	27.9	0.254	-106.8	1.33	21.8
1.90	0.232	-33.1	11.7	-157.2	0.030	31.0	0.226	-113.6	1.40	21.4
2.00	0.222	-33.6	11.0	-166.1	0.031	33.2	0.198	-120.8	1.47	20.8
2.10	0.209	-34.4	10.3	-174.3	0.032	34.6	0.168	-126.7	1.54	20.3
2.20	0.194	-33.1	9.7	-177.5	0.033	35.8	0.143	-132.5	1.61	19.7
2.30	0.184	-30.3	9.0	-169.5	0.034	36.1	0.114	-137.7	1.69	19.1
2.40	0.176	-26.8	8.4	-162.0	0.034	38.5	0.089	-144.4	1.81	18.5
2.50	0.173	-23.2	7.8	-154.8	0.035	39.2	0.065	-150.6	1.90	17.8

UPC2712T

V_{CC} = 5 V, I_{CC} = 12 mA

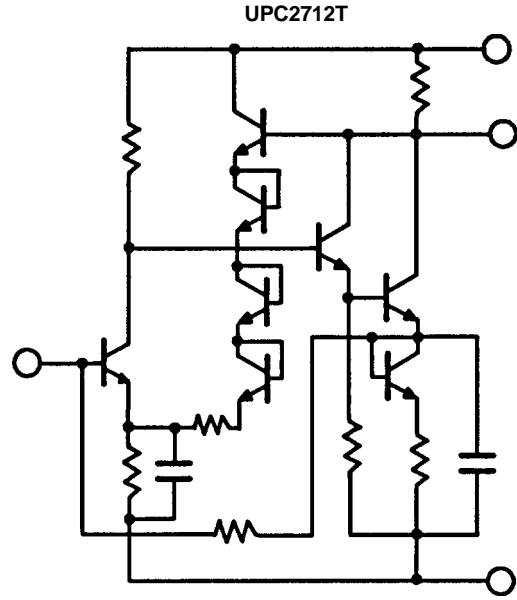
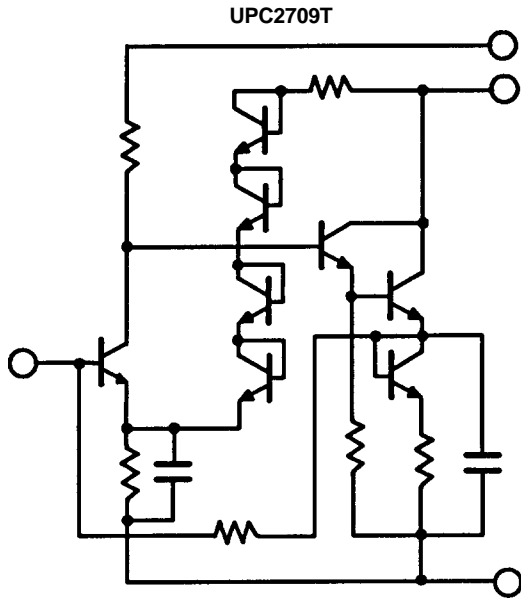
FREQUENCY (GHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂		K ¹	S ₂₁ (dB)
	MAG	ANG	MAG	ANG	MAG	ANG	MAG	ANG		
0.10	0.262	-9.3	9.3	-6.4	0.021	-1.6	0.071	7.8	2.46	19.3
0.20	0.261	-12.3	9.4	-17.4	0.022	-3.3	0.078	7.2	2.33	19.5
0.30	0.260	-17.0	9.5	-27.7	0.022	-5.1	0.091	6.4	2.29	19.6
0.40	0.258	-21.9	9.6	-37.5	0.023	-6.8	0.110	4.3	2.16	19.7
0.50	0.257	-27.1	9.8	-46.9	0.024	-8.5	0.128	-1.1	2.05	19.8
0.60	0.255	-32.0	9.9	-56.4	0.024	-10.2	0.146	-6.8	2.01	19.9
0.70	0.254	-38.1	10.0	-65.7	0.025	-12.0	0.166	-14.9	1.90	20.0
0.80	0.252	-41.9	10.2	-75.9	0.026	-13.7	0.181	-22.9	1.80	20.1
0.90	0.250	-46.5	10.3	-86.0	0.026	-15.4	0.194	-32.7	1.77	20.3
1.00	0.248	-51.0	10.4	-96.4	0.027	-17.2	0.204	-40.5	1.69	20.4
1.10	0.246	-57.5	10.6	-106.4	0.028	-18.9	0.212	-50.9	1.62	20.5
1.20	0.240	-62.5	10.6	-117.7	0.028	-20.6	0.221	-59.7	1.60	20.5
1.30	0.236	-67.8	10.7	-128.9	0.029	-22.3	0.235	-70.9	1.54	20.6
1.40	0.232	-72.4	10.8	-140.6	0.030	-24.1	0.244	-81.3	1.48	20.6
1.50	0.224	-77.7	10.8	-152.7	0.031	-25.8	0.247	-94.4	1.44	20.7
1.60	0.218	-82.1	10.9	-164.9	0.031	-27.5	0.246	-106.3	1.44	20.7
1.70	0.210	-86.2	10.9	-177.6	0.032	-29.3	0.240	-119.4	1.42	20.7
1.80	0.201	-89.3	10.7	-169.5	0.033	-31.0	0.234	-131.5	1.42	20.6
1.90	0.190	-93.5	10.5	-156.4	0.033	-32.7	0.221	-143.3	1.46	20.4
2.00	0.180	-96.9	10.3	-143.7	0.034	-34.4	0.210	-159.0	1.46	20.3
2.10	0.173	-98.4	10.0	-129.8	0.035	-36.2	0.187	-173.4	1.48	20.0
2.20	0.169	-101.3	9.7	-119.3	0.035	-37.9	0.169	-167.5	1.54	19.7
2.30	0.161	-100.3	8.8	-107.2	0.036	-39.6	0.156	-151.8	1.63	18.9
2.40	0.157	-100.0	8.4	-95.8	0.037	-41.3	0.134	-132.8	1.69	18.4
2.50	0.156	-99.4	7.7	-84.9	0.037	-43.1	0.125	-114.0	1.80	17.8
2.60	0.156	-100.0	7.3	-75.4	0.038	-44.8	0.118	-99.8	1.85	17.3
2.70	0.159	-98.4	6.8	-64.5	0.038	-46.5	0.108	-85.4	2.00	16.6
2.80	0.164	-101.7	6.5	-56.1	0.039	-48.3	0.110	-75.2	2.02	16.2
2.90	0.168	-100.1	5.8	-47.0	0.039	-50.0	0.122	-62.2	2.21	15.3
3.00	0.172	-101.1	5.5	-36.2	0.040	-51.7	0.136	-51.6	2.28	14.8

Note:

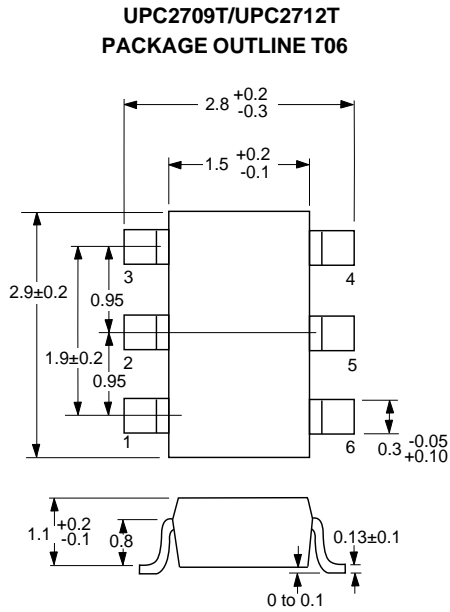
1. K factor calculations: $K = \frac{1 + |\Delta|^2 - |S_{11}|^2 - |S_{22}|^2}{4|\Delta|}$, $\Delta = S_{11} S_{22} - S_{21} S_{12}$

UPC2709T, UPC2712T

EQUIVALENT CIRCUIT



OUTLINE DIMENSIONS (Units in mm)



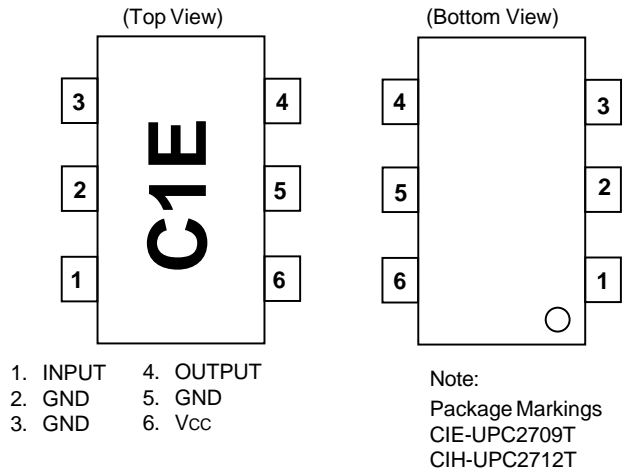
Note:
All dimensions are typical unless otherwise specified.

ORDERING INFORMATION

PART NUMBER	QTY
UPC2709T-E3	3K/Reel
UPC2712T-E3	3K/Reel

Embossed Tape, 8 mm wide.

LEAD CONNECTIONS



RECOMMENDED P.C.B. LAYOUT (Units in mm)

