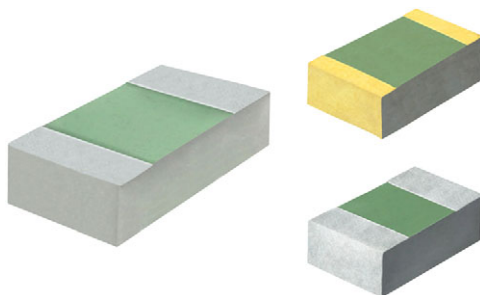


# High Frequency and High Power Thin Film Chip Resistor



## FEATURES

- Operating frequency up to 50 GHz
- Thin film microwave resistors
- Flip chip or wraparound terminals available
- Ohmic range: 20  $\Omega$  to 120  $\Omega$
- High power (up to 2.8 W for 0603 size) - no active cooling required (see specification)
- Small internal reactance (LC down to  $1 \times 10^{-24}$ )
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS\***

Available

**HALOGEN**
**FREE**

Available

**GREEN**

(5-2008)

Available

## LINKS TO ADDITIONAL RESOURCES



3D Models



S-Parameters



Capabilities and Custom Options

## Note

\* This datasheet provides information about parts that are RoHS-compliant and / or parts that are non RoHS-compliant. For example, parts with lead (Pb) terminations are not RoHS-compliant. Please see the information / tables in this datasheet for details

These miniaturized components are designed to minimize internal reactance. When correctly mounted, they function across a wide frequency band, up to 50 GHz for CHEP0402 and 40 GHz for CHEP0603 from 20  $\Omega$  to 120  $\Omega$ . Aluminum nitride substrate combined with PCB dissipation ensures high power capability. The resistive thin film layer can withstand an established temperature as high as 250 °C.

## STANDARD ELECTRICAL SPECIFICATIONS

MODEL	SIZE	RESISTANCE RANGE $\Omega$	RATED POWER <sup>(1)</sup> $P_n$ W	LIMITING ELEMENT VOLTAGE V	TOLERANCE $\pm$ %	TEMPERATURE COEFFICIENT $\pm$ ppm/°C
CHEP0402	0402	20 to < 50	1.2 (1.8)	37	2, 5	100 (50 upon request)
	0402	50 to $\leq$ 120	1.2 (1.8)	37	1, 2, 5	100 (50 upon request)
CHEP0603	0603	20 to < 50	2.0 (2.8)	50	2, 5	100 (50 upon request)
	0603	50 to $\leq$ 120	2.0 (2.8)	50	1, 2, 5	100 (50 upon request)

## Note

<sup>(1)</sup> Higher power in parenthesis achievable under additional conditions - see High Power Capability

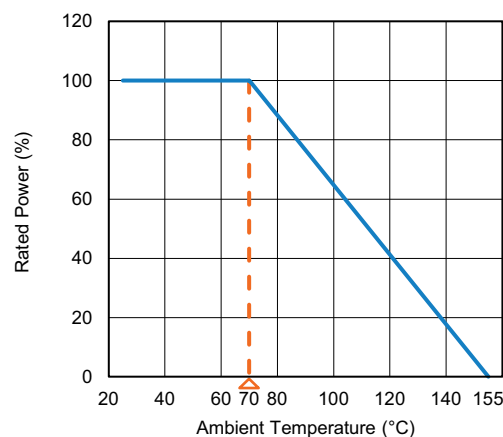
## MECHANICAL SPECIFICATIONS

Substrate	Aluminum nitride
Technology	Thin film
Film	<b>Nickel chromium-based alloy</b> with mineral passivation
Protection	Epoxy + silicone
Terminations	<b>F, N type:</b> tin silver over nickel barrier <b>G type:</b> gold over nickel barrier

## CLIMATIC SPECIFICATIONS

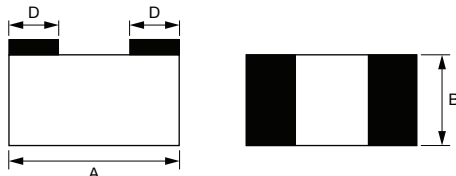
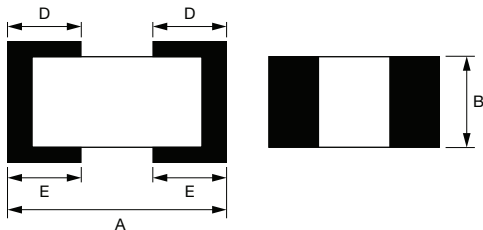
Operating temperature range	-55 °C to +155 °C
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## POWER DERATING CURVE <sup>(1)</sup>



## Note

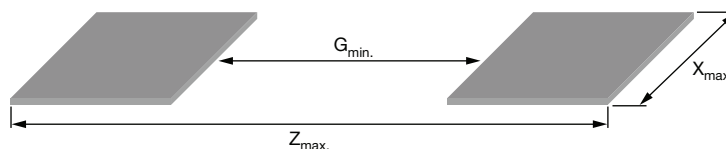
<sup>(1)</sup> FR4 PCB with one side 70  $\mu$ m thick copper, width 1 cm for 0402 and 2 cm for 0603 SnAgCu solder paste

DIMENSIONS in millimeters (inches)					
CHEP0402F / CHEP0603F			CHEP0402N / CHEP0402G / CHEP0603N / CHEP0603EPG		
					
CASE SIZE  MODEL	DIMENSIONS				
	A ± 0.10 (± 0.004)	B ± 0.10 (± 0.004)	C ± 0.127 (± 0.005)	D E (WHEN APPLICABLE)	
				MIN.	MAX.
CHEP0402F CHEP0402N CHEP0402G	1.000 (0.040)	0.600 (0.023)	0.500 (0.020)	0.150 (0.006)	0.350 (0.014)
CHEP0603F CHEP0603N CHEP0603G	1.520 (0.060)	0.850 (0.033)	0.500 (0.020)	0.250 (0.010)	0.510 (0.020)

PERFORMANCES			
TEST <sup>(1)</sup>	CONDITIONS	GLOBAL PERFORMANCES	TYPICAL PERFORMANCES
Temperature cycling	JESD22-A104 1000 cycles (-55 °C to +155 °C)	± 0.2 %	± 0.08 %
Storage	MIL-STD-202 method 108 +155 °C unpowered	± 0.2 %	± 0.08 %
Operational life	MIL-STD-202 method 108 condition D Steady state T = 70 °C at rated power 90' on / 30' off / 1000 h	± 0.2 %	± 0.06 %
Biased humidity	MIL-STD-202 method 103 1000 h 85 °C / 85 % RH 10 % of operating power	± 1.0 %	± 0.6 %
Terminal strength	AEC-Q200-006	± 0.1 %	± 0.05 %
Solderability	J-STD-002 Method B1 245 °C SnAg 5 s Method D 260 °C SnAg 30 s	Good tinning (≥ 95 % covered) No visible damage	

ASSEMBLY SPECIFICATION			
FOR THE ASSEMBLY ON BOARD, WE RECOMMEND THE LEAD (Pb)-FREE THERMAL PROFILE AS PER J-STD-020C			
TEST <sup>(1)</sup>	CONDITIONS	GLOBAL PERFORMANCES	TYPICAL PERFORMANCES
Resistance to soldering heat	MIL-STD-202 method 210 condition K Flux above 217 °C 60 s to 150 s	± 0.03 %	± 0.02 %
Boardflex	AEC-Q200-005	± 0.1 %	± 0.06 %

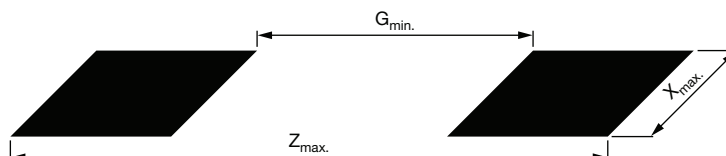
**Note**
<sup>(1)</sup> According to AEC-Q200 rev. E

**LAND PATTERN FOR F “FLIP CHIP” TERMINATIONS** in millimeters (inches)


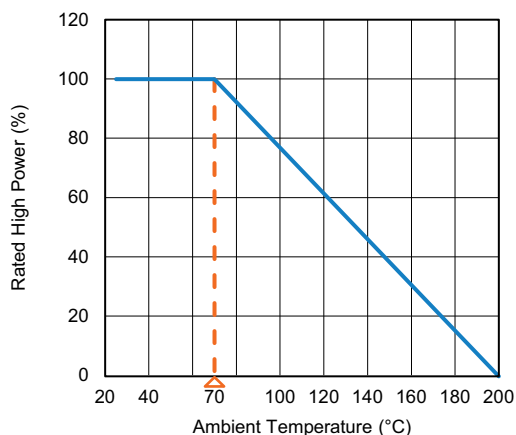
CHIP SIZE	$Z_{max.}$	$X_{max.}$	$G_{min.}$
0402	1.40 (0.055)	0.65 (0.026)	0.40 (0.016)
0603	1.71 (0.067)	0.90 (0.035)	0.76 (0.030)

**Note**

- Suggested land pattern: according to IPC-7351

**LAND PATTERN FOR N AND G WRAPAROUND TERMINATIONS** in millimeters (inches)


CHIP SIZE	$Z_{max.}$	$X_{max.}$	$G_{min.}$
0402	1.55 (0.061)	0.73 (0.029)	0.15 (0.006)
0603	2.37 (0.093)	0.98 (0.039)	0.35 (0.014)

**HIGH POWER CAPABILITY <sup>(1)</sup>**


SIZE	RATED HIGH POWER W $P_{hp}$
0402	1.8
0603	2.8

**Note**

- <sup>(1)</sup> Polyimide PCB with one side 70  $\mu$ m thick copper, width 1 cm for 0402 and 2 cm for 0603 solder paste PbSnAg

**PERFORMANCES WITH HIGH POWER RATING  $P_{hp}$** 

TESTS	CONDITIONS	GLOBAL PERFORMANCES	TYPICAL PERFORMANCES
Operational life	MIL-STD-202 method 108 condition D Steady state $T = 70^{\circ}\text{C}$ at rated power 90' on / 30' off / 1000 h	$\pm 0.2 \%$	$\pm 0.1 \%$

**PACKAGING**

SIZE	MOQ <sup>(1)</sup>	NUMBER OF PIECES PER PACKAGE			TAPE WIDTH
		WAFFLE PACK 2" x 2"	TAPE AND REEL (CODE DEPENDENT)		
			MIN.	MAX.	
0402	100 for waffle pack	100	100	5000	8 mm
0603					

**Notes**

- Standard packaging is plastic tape and reel for all sizes
- Waffle pack is available for all sizes
- <sup>(1)</sup> See "Codification of Packaging" table for tape and reel mins

**GLOBAL PART NUMBER INFORMATION**

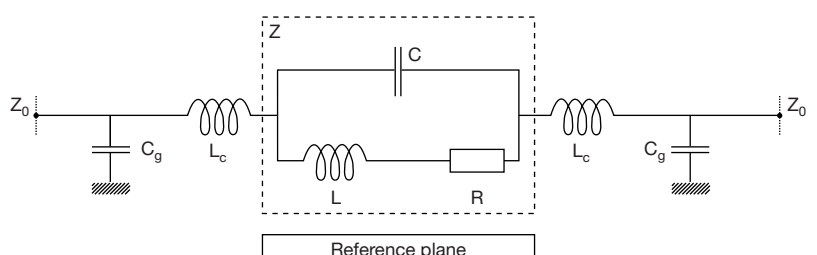
Global Part Numbering: **CHEP0402-100RJF**

C	H	E	P	0	4	0	2	-	1	0	0	R	J	F	T	F	X
GLOBAL MODEL			SIZE		OHMIC VALUE			TOLERANCE		TERMINATION				PACKAGING			
CHEP			0402 0603		20R to 120R			F = 1 % G = 2 % J = 5 %		F (flip chip): SnAg over nickel barrier N (W/A): SnAg over nickel barrier G (W/A): gold over nickel barrier				For more information see Codification of Packaging table			

**CODIFICATION OF PACKAGING**

WAFFLE PACK (available for all sizes)	
W	100 min., 1 mult.; 100 pcs max.
PLASTIC TAPE (standard packaging for all sizes)	
T	100 min., 100 mult.; delivered in reels of 1000 pcs max.
TD	1000 min., 1000 mult.; delivered in reels of 1000 pcs
TF	5000 min., 5000 mult.; delivered in reels of 5000 pcs

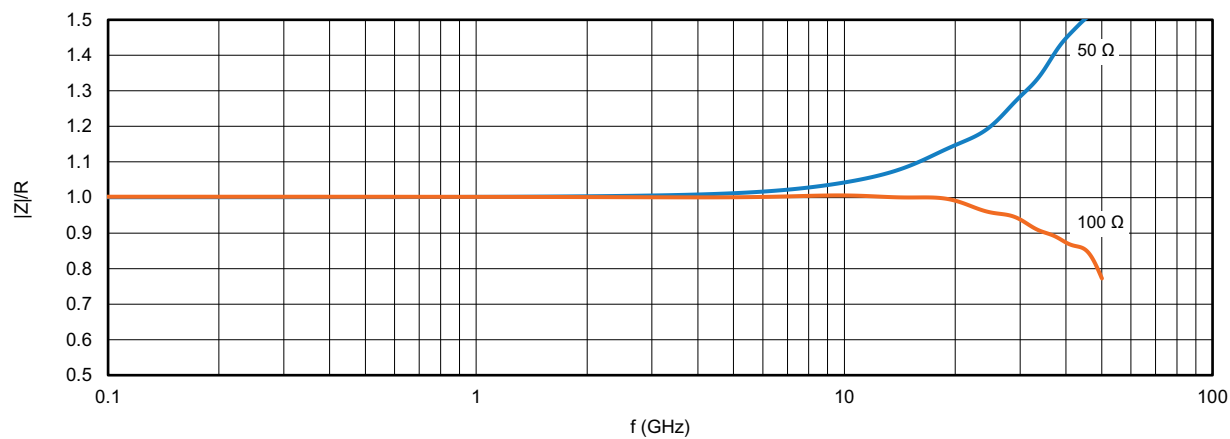
**TYPICAL HIGH FREQUENCY PERFORMANCE ELECTRICAL MODEL**

	
C	Internal shunt capacitance
L	Internal inductance
R	Resistance
Z	Internal impedance (R, L, C)
L <sub>c</sub>	External connection inductance
C <sub>g</sub>	External capacitance to ground

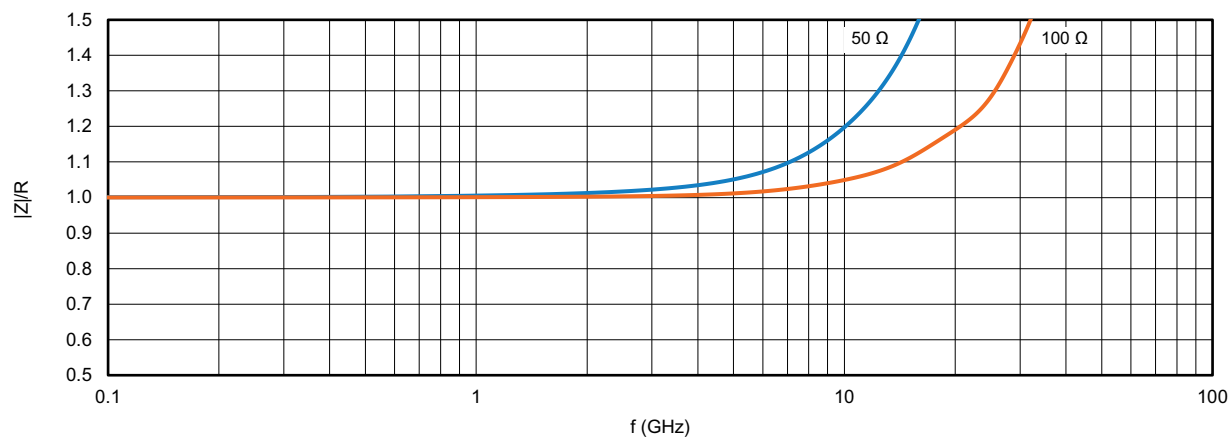
The test board used to collect data respect the electrical model. Test board was designed to reduce reflection and measurement noise at high frequency. The reference plane is at the pad of the component.



## INTERNAL IMPEDANCE CURVES



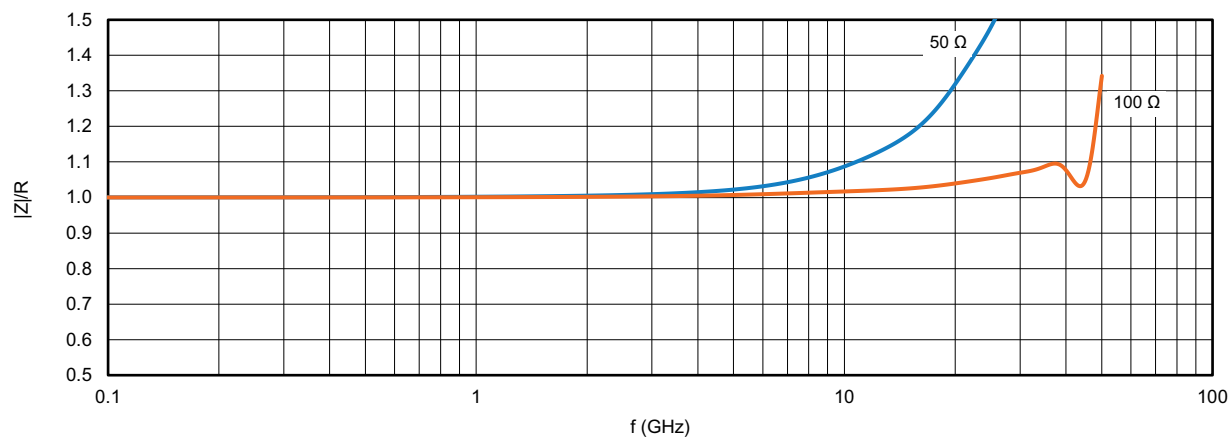
Internal impedance curve for 0402 size (F termination)



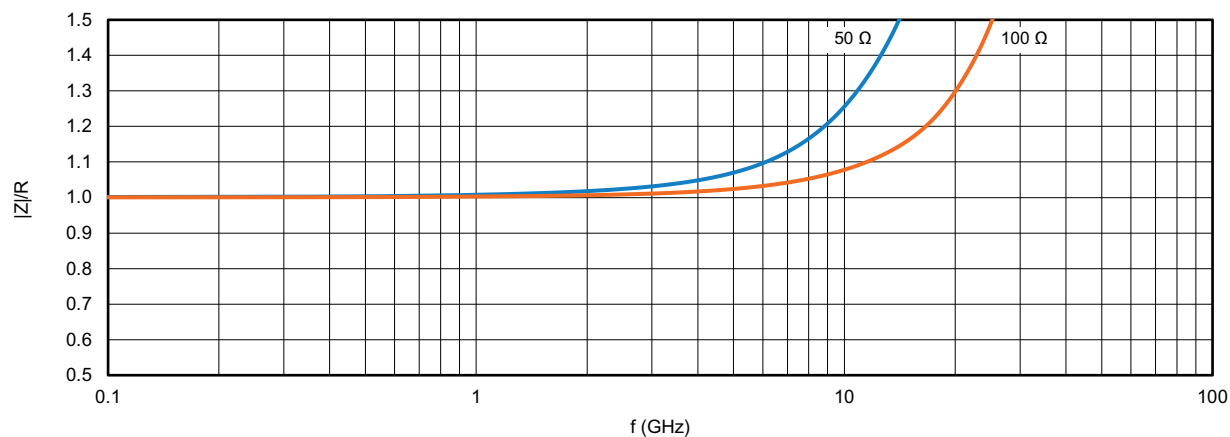
Internal impedance curve for 0402 size (N and G terminations)



## INTERNAL IMPEDANCE CURVES



Internal impedance curve for 0603 size (F termination)

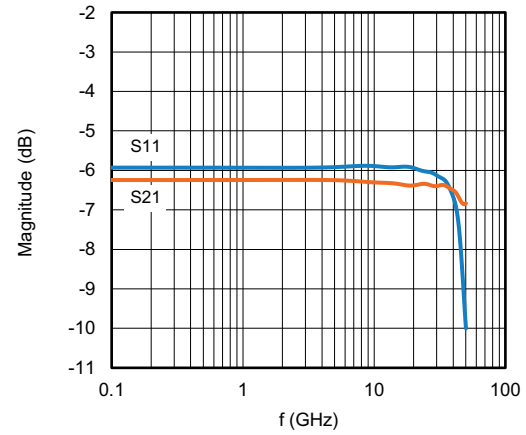
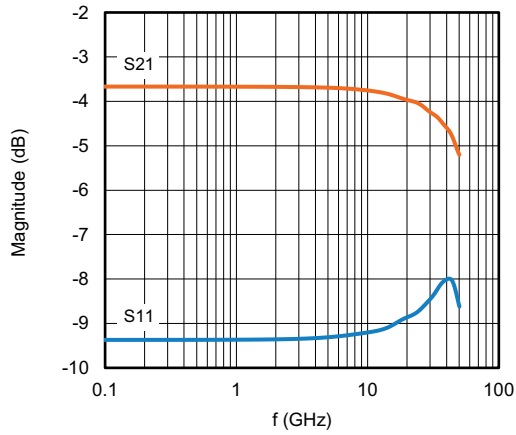


Internal impedance curve for 0603 size (N and G terminations)

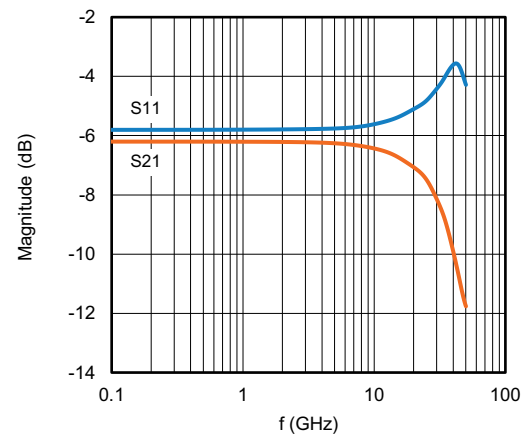
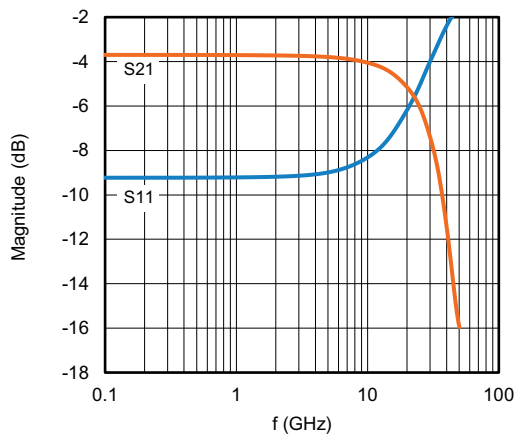


## S-PARAMETER

### CHEP0402 (F Termination) 50 $\Omega$ and 100 $\Omega$



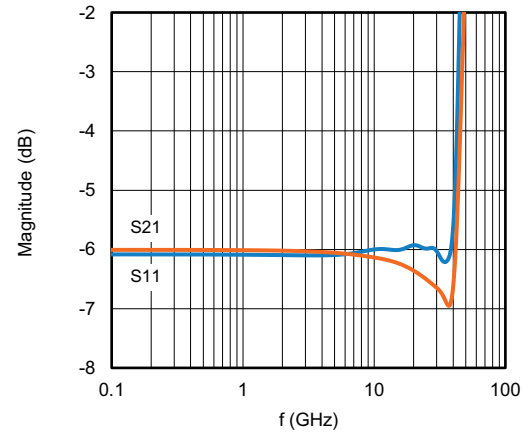
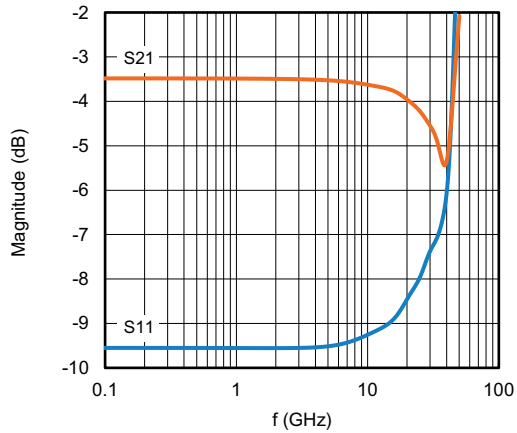
### CHEP0402 (N and G Terminations) 50 $\Omega$ and 100 $\Omega$



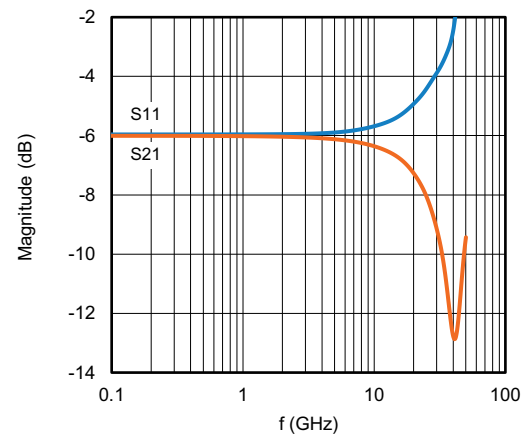
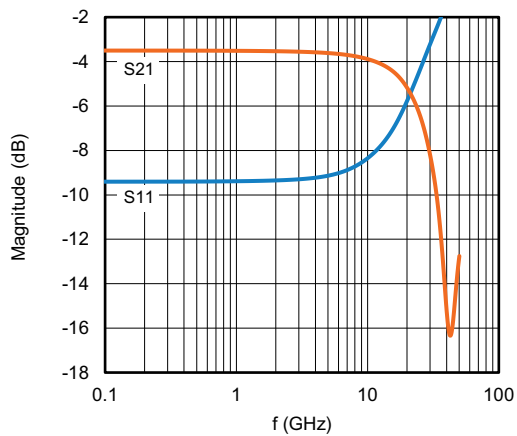


## S-PARAMETER

### CHEP0603 (F Termination) 50 $\Omega$ and 100 $\Omega$



### CHEP0603 (N and G Terminations) 50 $\Omega$ and 100 $\Omega$





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