Flex Max® 3xx Series RF Amplifiers

Flex Max321e 1GHz Line Extender Amplifier

Philips 9-LH Housing

ALC 42/54 MHz Specifications

	Forward		Return
Passband, MHz	54 to 1002		5-42
Housing, MHz	1002		—
AC current, Amp	15		15
Typical Operating Conditions			
Operational Gain, dB, (-0, +1.5 dB)[1,2]	33	35	20
Operating Levels, Recommended			
Frequency, MHz	1002/870/550/54	1002/870/550/54	42/5
Input, dBmV min.[3]	19/17.5/14.5/12	17/15.5/12.5/10	17/17
Output, dBmV [4,5]	52/49.5/44/35	52/49.5/44/35	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)			
Channels, Number of NTSC[6]		79	6
Carrier-to-Interference Ratio[7]			
Composite Triple Beat, –dBc	75	73	80
Cross Modulation (per NCTA standard), –dB[8]	67	67	70
Composite 2IM, –dBc	73	71	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	—
Composite Intermodulation Noise (CIN), dB[10]	76	76	—
Noise Figure (Without EQ)[11]			
Frequency, MHz	1002/870/550/54	1002/870/550/54	42
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	67/66/64.5/60	65/64/62.5/58	69.5
Factory Alignment, with ALC Reserve, without EQ			
Cable Loss, dB @ 1002 MHz	13	13	—
Flat Loss, dB	21	23	20
Gain Slope, dB[2]	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports	16	16	16
Level Control			
Range, dB @ 1002 MHz	±3.0	±3.0	—
Accuracy, dB (–40° C to 60° C)	±1.0	±1.0	—
Operating Level Range from recommended analog level at pilot freq. (dB)[5]	+6/–12	+6/–12	—
Powering Requirements, Max./Typ. (includes forward and return)[12]			
AC Voltage, 60 Hz	@60 V	@90 V	
AC Power, Watts	27/23	27/23	
AC Current, mA	610/520	375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800	865/800	

Technical Specification

ALC 42/54 MHz Specifications (Continued)

Testpoints		
Forward Input, dB (Resistive Type)[13]	–20 ± 1.25	—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (54 – 550 MHz) –20 ± 1.0 (550 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)	—	–20 ± 0.5
Return Output, dB (Resistive Type)	—	–20 ± 1.5
Gain Control		
Plug-in PAD[14]	10-A-WC	10-A-WC
Equalization to compensate for cable loss		
Plug-in Equalizers for additional equalization[14]	PEQ-1G-xx	10-A-WC
Chrominance/Luminance Delay, Max.		
Channel 2, ns/3.58 MHz	28	—
Channel 3, ns/3.58 MHz	12	—
Channel 4, ns/3.58 MHz	7	—
Channel 5, ns/3.58 MHz	4	—
Return Group Delay, Max.		
5.5 – 7 MHz, ns	—	52
10 – 11.5 MHz, ns	—	13
35 – 36.5 MHz, ns	—	10
38.5 – 40 MHz, ns	—	28
Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 42 MHz, –dBc	—	60
54 – 1002 MHz, –dBc	60	—

Specification Document Number 1503420 Rev H

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 42 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 42 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
12. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
13. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
14. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

42/54 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	42 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1503420 Rev H

ALC 42/54 MHz with High Output GaN Specifications

	Forward		Return
Passband, MHz	54 to 1002		5-42
Housing, MHz	1002		—
AC current, Amp	15		15
Typical Operating Conditions			
Operational Gain, dB, (-0, +1.5 dB)[1,2]	33	33	20
Operating Levels, Recommended			
Frequency, MHz	1002/870/550/54	1002/870/550/54	42/5
Input, dBmV min.[3]	19/17.5/14.5/12	23/21.5/18.5/16	17/17
Output, dBmV [4,5]	52/49.5/44/35	56/53.5/48/39	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)			
Channels, Number of NTSC[6]	79		6
Carrier-to-Interference Ratio[7]			
Composite Triple Beat, –dBc	76	68	80
Cross Modulation (per NCTA standard), –dB[8]	69	64	70
Composite 2IM, –dBc	73	69	78
Composite IM Distortion Noise (CIN), dB[9]	80	73	—
Composite Intermodulation Noise (CIN), dB[10]	77	70	—
Noise Figure (Without EQ)[11]			
Frequency, MHz	1002/870/550/54	1002/870/550/54	42
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	67/66/64.5/60	71/70/68.5/64	69.5
Factory Alignment, with ALC Reserve, without EQ			
Cable Loss, dB @ 1002 MHz	13		—
Flat Loss, dB	21		20
Gain Slope, dB[2]	± 1.0		—
Flatness, dB	± 0.8		± 0.9
Return Loss, dB minimum. All entry ports[12]	16		16
Level Control			
Range, dB @ 1002 MHz	±3.0		—
Accuracy, dB (–40° C to 60° C)	±1.0		—
Pilot Level Range, dBmV			
423.25 MHz	35 to 52		—
427.25 MHz	34 to 52		—
499.25 MHz	36 to 50		—
609 MHz	33 to 46		—
645 MHz	33 to 46		—
711 MHz	35 to 51		—
Powering Requirements, Max./Typ. (includes forward and return)[13]			
AC Voltage, 60 Hz	@60 V	@90 V	
AC Power, Watts	27/23	27/23	
AC Current, mA	610/520	375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800	865/800	

ALC 42/54 MHz with High Output GaN Specifications (Continued)

Testpoints		
Forward Input, dB (Resistive Type)[14]	–20 ± 1.25	—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (54 – 550 MHz) –20 ± 1.0 (550 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)	—	–20 ± 0.5
Return Output, dB (Resistive Type)	—	–20 ± 1.5
Gain Control		
Plug-in PAD[15]	10-A-WC	10-A-WC
Equalization to compensate for cable loss		
Plug-in Equalizers for additional equalization[15]	PEQ-1G-xx	10-A-WC
Chrominance/Luminance Delay, Max.		
Channel 2, ns/3.58 MHz	28	—
Channel 3, ns/3.58 MHz	12	—
Channel 4, ns/3.58 MHz	7	—
Channel 5, ns/3.58 MHz	4	—
Return Group Delay, Max.		
5.5 – 7 MHz, ns	—	52
10 – 11.5 MHz, ns	—	13
35 – 36.5 MHz, ns	—	10
38.5 – 40 MHz, ns	—	28
Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 42 MHz, –dBc	—	60
54 – 1002 MHz, –dBc	60	—

Specification Document Number 1507069 Rev A

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 42 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 42 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 59 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband.
12. Output return loss may be as low as 15 dB above 600 MHz.
13. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
14. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
15. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

42/54 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	42 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1507069 Rev A

TLC 42/54 MHz Specifications

		Forward		Return
Passband, MHz		54 to 1002		5-42
Housing, MHz		1002		—
AC current, Amp		15		15
Typical Operating Conditions				
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	33	37	39	20
Full Gain, dB (without Thermal Attenuator and without EQ)	37	41	43	20
Operating Levels, Recommended				
Frequency, MHz	1002/870/550/54	1002/870/550/54	1002/870/550/54	42/5
Input, dBmV min.[3]	19/17.5/14.5/12	15/13.5/10.5/8	13/11.5/8.5/6	17/17
Output, dBmV [4,5]	52/49.5/44/35	52/49.5/44/35	52/49.5/44/35	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)				
Channels, Number of NTSC[6]		79		6
Carrier-to-Interference Ratio[7]				
Composite Triple Beat, –dBc	75	79	76	80
Cross Modulation (per NCTA standard), –dB[8]	67	72	72	70
Composite 2IM, –dBc	73	75	72	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	79	—
Composite Intermodulation Noise (CIN), dB[10]	76	76	76	—
Noise Figure (Without EQ)[11]				
Frequency, MHz	1002/870/550/54	1002/870/550/54	1002/870/550/54	42
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	67/66/64.5/60	63/62/60.5/56	61/60/58.5/54	69.5
Factory Alignment, with ALC Reserve, without EQ				
Cable Loss, dB @ 1002 MHz	13	13	13	—
Flat Loss, dB	21	25	27	20
Gain Slope, dB[2]	± 1.0	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports	16	16	16	16
Powering Requirements, Max./Typ. (includes forward and return)[12]				
AC Voltage, 60 Hz	@60 V		@90 V	
AC Power, Watts	27/23		27/23	
AC Current, mA	610/520		375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800		865/800	
Testpoints				
Forward Input, dB (Resistive Type)[13]		–20 ± 1.25		—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (54 – 550 MHz)	–20 ± 1.0 (550 – 1002 MHz)		—
Return Input, dB (Directional Coupler Type)		—		–20 ± 0.5
Return Output, dB (Resistive Type)		—		–20 ± 1.5

TLC 42/54 MHz Specifications (Continued)

Gain Control		
Plug-in PAD[14]	10-A-WC	10-A-WC
Equalization to compensate for cable loss		
Plug-in Equalizers for additional equalization[14]	PEQ-1G-xx	10-A-WC
Chrominance/Luminance Delay, Max.		
Channel 2, ns/3.58 MHz	28	—
Channel 3, ns/3.58 MHz	12	—
Channel 4, ns/3.58 MHz	7	—
Channel 5, ns/3.58 MHz	4	—
Return Group Delay, Max.		
5.5 – 7 MHz, ns	—	52
10 – 11.5 MHz, ns	—	13
35 – 36.5 MHz, ns	—	10
38.5 – 40 MHz, ns	—	28
Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 42 MHz, –dBc	—	60
54 – 1002 MHz, –dBc	60	—

Specification Document Number 1505305 Rev D

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 42 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 42 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
12. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
13. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
14. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

42/54 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	42 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1505305 Rev D

NLC 42/54 MHz Specifications (Includes 110/230 VAC Local Powering)

		Forward	Return
Passband, MHz		54 to 1002	5-42
Housing, MHz		1002	—
AC current, Amp		15	15
Typical Operating Conditions			
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	40	42	20
Full Gain, dB (without Thermal Attenuator and without EQ)	41	43	20
Operating Levels, Recommended			
Fr equency, MHz	1002/870/550/54	1002/870/550/54	42/5
Input, dBmV min.[3]	12/10.5/7.5/5	10/8.5/5.5/3	17/17
Output, dBmV [4,5]	52/49.5/44/35	52/49.5/44/35	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)			
Channels, Number of NTSC[6]		79	6
Carrier-to-Interference Ratio[7]			
Composite Triple Beat, –dBc	80	76	80
Cross Modulation (per NCTA standard), –dB[8]	74	72	70
Composite 2IM, –dBc	75	72	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	—
Composite IM Noise (CIN), dB[10]	73	73	—
Noise Figure (Without EQ)[11]			
Frequency, MHz	1002/870/550/54	1002/870/550/54	42
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	60/59/56.5/53	58/57/54.5/51	69.5
Factory Alignment, without EQ			
Cable Loss, dB @ 1002 MHz	13	13	—
Flat Loss, dB	28	30	20
Gain Slope, dB[2]	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports	16	16	16
Powering Requirements, Max./Typ. (includes forward and return)[12]			
90 Volt AC Power Supply (Remote)			
AC Voltage, 60 Hz	@60 V	@90 V	
AC Power, Watts	27/23	27/23	
AC Current, mA	610/520	375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800	865/800	
110/230 Volt AC Power Supply (Local)			
AC Voltage, 60 Hz	@110 V	@230 V	
AC Power, Watts, Typ.	25.6	24.5	
AC Current, mA, Typ.	337	190	
DC Current, mA @ 24 V ± 0.5 V, Typ.	800	800	
Testpoints			
Forward Input, dB (Resistive Type)[13]		–20 ± 1.25	—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (54 – 550 MHz)	–20 ± 1.0 (550 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)		—	–20 ± 0.5
Return Output, dB (Resistive Type)		—	–20 ± 1.5
Gain Control			
Plug-in PAD[14]		10-A-WC	10-A-WC
Equalization to compensate for cable loss			
Plug-in Equalizers for additional equalization[14]		PEQ-1G-xx	10-A-WC
Chrominance/Luminance Delay, Max.			
Channel 2, ns/3.58 MHz		28	—
Channel 3, ns/3.58 MHz		12	—
Channel 4, ns/3.58 MHz		7	—
Channel 5, ns/3.58 MHz		4	—

NLC 42/54 MHz Specifications (Includes 110/230 VAC Local Powering) (Continued)

Return Group Delay, Max.		
5.5 – 7 MHz, ns	—	52
10 – 11.5 MHz, ns	—	13
35 – 36.5 MHz, ns	—	10
38.5 – 40 MHz, ns	—	28
Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 42 MHz, –dBc	—	60
54 – 1002 MHz, –dBc	60	—

Specification Document Number 1505416 Rev B (90 VAC), 1506948 Rev A (110/230 VAC)

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 42 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 42 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 54 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
12. The power supply is internal to the RF module. Refer to drawing #333995-32 for the 90 VAC power supply and refer to drawing #333995-33 for the 110/230 VAC power supply. For the 90 VAC power supply with 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
13. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
14. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

42/54 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	42 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1505416 Rev B (90 VAC), 1506948 Rev A (110/230 VAC)

ALC 55/70 MHz Specifications

		Forward	Return
Passband, MHz		70 to 1002	5-55
Housing, MHz		1002	—
AC current, Amp		15	15
Typical Operating Conditions			
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	33	35	20
Full Gain, dB (without EQ and Thermal Attenuator)	41	43	20
Operating Levels, Recommended			
Frequency, MHz	1002/870/550/70	1002/870/550/70	55/5
Input, dBmV min.[3]	19/17.5/14.5/12	17/15.5/12.5/10	17/17
Output, dBmV [4,5]	52/49.5/44/35	52/49.5/44/35	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)			
Channels, Number of NTSC[6]		77	6
Carrier-to-Interference Ratio[7]			
Composite Triple Beat, –dBc	75	73	80
Cross Modulation (per NCTA std), –dB[8]	67	67	70
Composite 2IM, –dBc	73	71	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	—
Composite IM Noise (CIN), dB[10]	76	76	—
Noise Figure (Without EQ)[11]			
Frequency, MHz	1002/870/550/70	1002/870/550/70	55
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	67/66/64.5/60	65/64/62.5/58	69.5
Factory Alignment, with ALC Reserve, without EQ			
Cable Loss, dB @ 1002 MHz	13	13	—
Flat Loss, dB	21	23	20
Gain Slope, dB[2]	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports	16	16	16
Level Control			
Range, dB @ 1002 MHz	±3.0	±3.0	—
Accuracy, dB (–40° C to 60° C)	±1.0	±1.0	—
Operating Level Range from recommended analog level at pilot freq. (dB)[5]	+6/–12	+6/–12	—
Powering Requirements, Max./Typ. (includes forward and return)[12]			
AC Voltage, 60 Hz	@60 V	@90 V	
AC Power, Watts	27/23	27/23	
AC Current, mA	610/520	375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800	865/800	
Testpoints			
Forward Input, dB (Resistive Type)[13]		–20 ± 1.25	—
Forward Output, dB (Directional Coupler Type)		–20 ± 0.5 (70 – 550 MHz) –20 ± 1.0 (550 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)		—	–20 ± 0.5
Return Output, dB (Resistive Type)		—	–20 ± 1.5
Gain Control			
Plug-in PAD[14]		10-A-WC	10-A-WC
Equalization to compensate for cable loss			
Plug-in Equalizers for additional equalization[14]		PEQ-1G-xx	10-A-WC
Chrominance/Luminance Delay, Max.			
Channel 5, ns/3.58 MHz		28	—
Channel 6, ns/3.58 MHz		12	—
Channel 7, ns/3.58 MHz		7	—
Channel 8, ns/3.58 MHz		4	—

ALC 55/70 MHz Specifications (Continued)

Return Group Delay, Max.		
5.5 – 7 MHz, ns	—	52
10 – 11.5 MHz, ns	—	13
35 – 36.5 MHz, ns	—	10
38.5 – 40 MHz, ns	—	28
Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 55 MHz, –dBc	—	60
70 – 1002 MHz, –dBc	60	—

Specification Document Number 1505419 Rev B

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 55 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 55 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 70 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 70 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
12. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
13. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
14. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

55/70 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	55 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1505419 Rev B

TLC 55/70 MHz Specifications

		Forward		Return
Passband, MHz		70 to 1002		5-55
Housing, MHz		1002		—
AC current, Amp		15		15
Typical Operating Conditions				
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	33	37	39	20
Full Gain, dB (without Thermal Attenuator and without EQ)	37	41	43	20
Operating Levels, Recommended				
Frequency, MHz	1002/870/550/70	1002/870/550/70	1002/870/550/70	55/5
Input, dBmV min.[3]	19/17.5/14.5/12	15/13.5/10.5/8	13/11.5/8.5/6	17/17
Output, dBmV [4,5]	52/49.5/44/35	52/49.5/44/35	52/49.5/44/35	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)				
Channels, Number of NTSC[6]		77		6
Carrier-to-Interference Ratio[7]				
Composite Triple Beat, –dBc	75	79	76	80
Cross Modulation (per NCTA standard), –dB[8]	67	72	72	70
Composite 2IM, –dBc	73	75	72	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	79	—
Composite Intermodulation Noise (CIN), dB[10]	76	76	76	—
Noise Figure (Without EQ)[11]				
Frequency, MHz	1002/870/550/70	1002/870/550/70	1002/870/550/70	55
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	67/66/64.5/60	63/62/60.5/56	61/60/58.5/54	69.5
Factory Alignment, with ALC Reserve, without EQ				
Cable Loss, dB @ 1002 MHz	13	13	13	—
Flat Loss, dB	21	25	27	20
Gain Slope, dB[2]	± 1.0	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports	16	16	16	16
Powering Requirements, Max./Typ. (includes forward and return)[12]				
AC Voltage, 60 Hz	@60 V		@90 V	
AC Power, Watts	27/23		27/23	
AC Current, mA	610/520		375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800		865/800	
Testpoints				
Forward Input, dB (Resistive Type)[13]		–20 ± 1.25		—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (54 – 550 MHz)	–20 ± 1.0 (550 – 1002 MHz)		—
Return Input, dB (Directional Coupler Type)		—		–20 ± 0.5
Return Output, dB (Resistive Type)		—		–20 ± 1.5
Gain Control				
Plug-in PAD[14]		10-A-WC		10-A-WC
Equalization to compensate for cable loss				
Plug-in Equalizers for additional equalization[14]		PEQ-1G-xx		10-A-WC
Chrominance/Luminance Delay, Max.				
Channel 5, ns/3.58 MHz		28		—
Channel 6, ns/3.58 MHz		12		—
Channel 7, ns/3.58 MHz		7		—
Channel 8, ns/3.58 MHz		4		—
Return Group Delay, Max.				
5.5 – 7 MHz, ns		—		52
10 – 11.5 MHz, ns		—		13
35 – 36.5 MHz, ns		—		10
38.5 – 40 MHz, ns		—		28

TLC 55/70 MHz Specifications (Continued)

Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 55 MHz, –dBc	—	60
70 – 1002 MHz, –dBc	60	—

Specification Document Number 1505420 Rev A

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 55 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 55 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 70 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 70 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
12. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
13. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
14. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

55/70 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	55 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1505420 Rev A

NLC 55/70 MHz Specifications

		Forward		Return
Passband, MHz		70 to 1002		5-55
Housing, MHz		1002		—
AC current, Amp		15		15
Typical Operating Conditions				
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	40		42	20
Full Gain, dB (without Thermal Attenuator and without EQ)	41		43	20
Operating Levels, Recommended				
Fr equency, MHz	1002/870/550/70		1002/870/550/70	55/5
Input, dBmV min.[3]	12/10.5/7.5/5		10/8.5/5.5/3	17/17
Output, dBmV [4,5]	52/49.5/44/35		52/49.5/44/35	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)				
Channels, Number of NTSC[6]		77		6
Carrier-to-Interference Ratio[7]				
Composite Triple Beat, –dBc	80		76	80
Cross Modulation (per NCTA standard), –dB[8]	74		72	70
Composite 2IM, –dBc	75		72	78
Composite IM Distortion Noise (CIN), dB[9]	79		79	—
Composite IM Noise (CIN), dB[10]	73		73	—
Noise Figure (Without EQ)[11]				
Frequency, MHz	1002/870/550/70		1002/870/550/70	55
Noise Figure, dB	10/9.5/9/10		10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	60/59/56.5/53		58/57/54.5/51	69.5
Factory Alignment, without EQ				
Cable Loss, dB @ 1002 MHz	13		13	—
Flat Loss, dB	28		30	20
Gain Slope, dB[2]	± 1.0		± 1.0	—
Flatness, dB	± 0.8		± 0.8	± 0.9
Return Loss, dB minimum. All entry ports	16		16	16
Powering Requirements, Max./Typ. (includes forward and return)[12]				
AC Voltage, 60 Hz	@60 V		@90 V	
AC Power, Watts	27/23		27/23	
AC Current, mA	610/520		375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800		865/800	
Testpoints				
Forward Input, dB (Resistive Type)[13]		–20 ± 1.25		—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (70 – 550 MHz)		–20 ± 1.0 (550 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)		—		–20 ± 0.5
Return Output, dB (Resistive Type)		—		–20 ± 1.5
Gain Control				
Plug-in PAD[14]		10-A-WC		10-A-WC
Equalization to compensate for cable loss				
Plug-in Equalizers for additional equalization[14]		PEQ-1G-xx		10-A-WC
Chrominance/Luminance Delay, Max.				
Channel 5, ns/3.58 MHz		28		—
Channel 6, ns/3.58 MHz		12		—
Channel 7, ns/3.58 MHz		7		—
Channel 8, ns/3.58 MHz		4		—
Return Group Delay, Max.				
5.5 – 7 MHz, ns		—		52
10 – 11.5 MHz, ns		—		13
35 – 36.5 MHz, ns		—		10
38.5 – 40 MHz, ns		—		28

NLC 55/70 MHz Specifications (Continued)

Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 65 MHz, –dBc	—	60
70 – 1002 MHz, –dBc	60	—

Specification Document Number 1505421 Rev B

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 55 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 55 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 70 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 70 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
12. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
13. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
14. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

55/70 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	55 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1505421 Rev B

ALC 65/85 MHz Specifications

		Forward		Return
Passband, MHz		85 to 1002		5-65
Housing, MHz		1002		—
AC current, Amp		15		15
Typical Operating Conditions				
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	33		35	20
Full Gain, dB (without EQ and Thermal Attenuator)	41		43	20
Operating Levels, Recommended				
Frequency, MHz	1002/870/550/85		1002/870/550/85	65/5
Input, dBmV min.[3]	19/17.5/14.5/12		17/15.5/12.5/10	17/17
Output, dBmV [4,5]	52/49.5/44/35		52/49.5/44/35	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)				
Channels, Number PAL[6]		60		6
Carrier-to-Interference Ratio[7]				
Composite Triple Beat, –dBc	75		73	80
Cross Modulation (per NCTA std), –dB[8]	67		67	70
Composite 2IM, –dBc	73		71	78
Composite IM Distortion Noise (CIN), dB[9]	79		79	—
Composite IM Noise (CIN), dB[10]	73		73	—
42 CENELEC Performance Specifications				
Channel Loading, Number of Channels[11]		42		—
Reference Frequency, MHz		870/47		—
Output Level, dBmV		55		—
Carrier to Noise Ratio, dB, 5 MHz		67		—
Composite Triple Beat, –dBc		65		—
Composite 2IM, –dBc		70		—
Noise Figure (Without EQ)[12]				
Frequency, MHz	1002/870/550/85		1002/870/550/85	65
Noise Figure, dB	10/9.5/9/10		10/9.5/9/10	6.5
Noise, 5 MHz, 75Ω, dB	66/65/63.5/59		64/63/61.5/57	68.5
Factory Alignment, with ALC Reserve, without EQ				
Cable Loss, dB @ 1002 MHz	13		13	—
Flat Loss, dB	21		23	20
Gain Slope, dB[2]	± 1.0		± 1.0	—
Flatness, dB	± 0.8		± 0.8	± 0.9
Return Loss, dB minimum. All entry ports	16		16	16
Level Control				
Range, dB @ 1002 MHz	±3.0		±3.0	—
Accuracy, dB (–40° C to 60° C)	±1.0		±1.0	—
Operating Level Range from recommended analog level at pilot freq. (dB)[5]	+6/–12		+6/–12	—
Powering Requirements, Max./Typ. (includes forward and return)[13]				
AC Voltage, 60 Hz	@60 V		@90 V	
AC Power, Watts	27/23		27/23	
AC Current, mA	610/520		375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800		865/800	
Testpoints				
Forward Input, dB (Resistive Type)[14]		–20 ± 1.25		—
Forward Output, dB (Directional Coupler Type)		–20 ± 0.5 (85 – 550 MHz) –20 ± 1.0 (550 – 1002 MHz)		—
Return Input, dB (Directional Coupler Type)		—		–20 ± 0.5
Return Output, dB (Resistive Type)		—		–20 ± 1.5
Gain Control				
Plug-in PAD[15]		10-A-WC		10-A-WC
Equalization to compensate for cable loss				
Plug-in Equalizers for additional equalization[15]		PEQ-1G-xx		10-A-WC

ALC 65/85 MHz Specifications (Continued)

Chrominance/Luminance Delay, Max./Typ.			
85 + 4.43 MHz, ns		33/25	—
91.25 + 4.43 MHz, ns		17/10	—
97.25 + 4.43 MHz, ns		10/5	—
Return Group Delay, Max./Typ.			
5 + 4.43 MHz, ns	—	52	
10 + 4.43 MHz, ns	—	13	
65 – 4.43 MHz, ns	—	10	
	—	28	
Hum Modulation (Time Domain @ 15 A)			
5 – 10 MHz, –dBc	—	55	
11 – 65 MHz, –dBc	—	60	
85 – 1002 MHz, –dBc	60	—	

Specification Document Number 1505129 Rev B

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 65 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 65 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. PAL video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 85 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 85 – 550 MHz frequency spectrum.
11. According to EN50083-3, CENELEC42 channel loading, with 8 dB of tilt from 47 to 870 MHz.
12. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
13. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
14. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
15. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

65/85 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	65 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1505129 Rev B

TLC 65/85 MHz Specifications

		Forward		Return
Passband, MHz		85 to 1002		5-65
Housing, MHz		1002		—
AC current, Amp		15		15
Typical Operating Conditions				
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	33	37	39	20
Full Gain, dB (without Thermal Attenuator and without EQ)	37	41	43	20
Operating Levels, Recommended				
Frequency, MHz	1002/870/550/85	1002/870/550/85	1002/870/550/85	65/5
Input, dBmV min.[3]	19/17.5/14.5/12	15/13.5/10.5/8	13/11.5/8.5/6	17/17
Output, dBmV [4,5]	52/49.5/44/35	52/49.5/44/35	52/49.5/44/35	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)				
Channels, Number of PAL[6]		60		6
Carrier-to-Interference Ratio[7]				
Composite Triple Beat, –dBc	75	79	76	80
Cross Modulation (per NCTA standard), –dB[8]	67	72	72	70
Composite 2IM, –dBc	73	75	72	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	79	—
Composite Intermodulation Noise (CIN), dB[10]	73	73	73	—
42 CENELEC Performance Specifications				
Channel Loading, Number of Channels[11]		42		—
Reference Frequency, MHz		870/47		—
Output Level, dBmV		55		—
Carrier to Noise Ratio, dB, 5 MHz		67		—
Composite Triple Beat, –dBc		65		—
Composite 2IM, –dBc		70		—
Noise Figure (Without EQ)[12]				
Frequency, MHz	1002/870/550/85	1002/870/550/85	1002/870/550/85	65
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 5 MHz, 75Ω, dB	66/65/63.5/59	62/61/59.5/55	60/59/57.5/53	68.5
Factory Alignment, with ALC Reserve, without EQ				
Cable Loss, dB @ 1002 MHz	13	13	13	—
Flat Loss, dB	21	25	27	20
Gain Slope, dB[2]	± 1.0	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports	16	16	16	16
Powering Requirements, Max./Typ. (includes forward and return)[13]				
AC Voltage, 60 Hz	@60 V		@90 V	
AC Power, Watts	27/23		27/23	
AC Current, mA	610/520		375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800		865/800	
Testpoints				
Forward Input, dB (Resistive Type)[14]		–20 ± 1.25		—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (85 – 550 MHz)	–20 ± 1.0 (550 – 1002 MHz)		—
Return Input, dB (Directional Coupler Type)		—		–20 ± 0.5
Return Output, dB (Resistive Type)		—		–20 ± 1.5
Gain Control				
Plug-in PAD[15]		10-A-WC		10-A-WC
Equalization to compensate for cable loss				
Plug-in Equalizers for additional equalization[15]		PEQ-1G-xx		10-A-WC
Chrominance/Luminance Delay, Max./Typ.				
85 + 4.43 MHz, ns		33/25		—
91.25 + 4.43 MHz, ns		17/10		—
97.25 + 4.43 MHz, ns		10/5		—
Return Group Delay, Max./Typ.				
5 + 4.43 MHz, ns		—		60/50
10 + 4.43 MHz, ns		—		20/12
65 – 4.43 MHz, ns		—		50/40

TLC 65/85 MHz Specifications (Continued)

Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 65 MHz, –dBc	—	60
85 – 1002 MHz, –dBc	60	—

Specification Document Number 1505417 Rev B

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 65 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 65 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. PAL video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 85 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 85 – 550 MHz frequency spectrum.
11. According to EN50083-3, CENELEC42 channel loading, with 8 dB of tilt from 47 to 870 MHz.
12. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
13. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
14. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
15. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

65/85 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	65 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1505417 Rev B

NLC 65/85 MHz Specifications (Includes 110/230 VAC Local Powering)

	Forward		Return
Passband, MHz	85 to 1002		5-65
Housing, MHz	1002		—
AC current, Amp	15		15
Typical Operating Conditions			
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	40	42	20
Full Gain, dB (without Thermal Attenuator and without EQ)	41	43	20
Operating Levels, Recommended			
Fr equency, MHz	1002/870/600/85	1002/870/600/85	65/5
Input, dBmV min.[3]	12/10.5/8/5	10/8.5/6/3	17/17
Output, dBmV [4,5]	52/49.5/44.5/35	52/49.5/44.5/35	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)			
Channels, Number of PAL[6]	60		6
Carrier-to-Interference Ratio[7]			
Composite Triple Beat, –dBc	80	76	80
Cross Modulation (per NCTA standard), –dB[8]	74	72	70
Composite 2IM, –dBc	75	72	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	—
Composite IM Noise (CIN), dB[10]	73	73	—
42 CENELEC Performance Specifications			
Channel Loading, Number of Channels[11]	42		—
Reference Frequency, MHz	870/47		—
Output Level, dBmV	55		—
Carrier to Noise Ratio, dB, 5 MHz	67		—
Composite Triple Beat, –dBc	65		—
Composite 2IM, –dBc	70		—
Noise Figure (Without EQ)[12]			
Frequency, MHz	1002/870/600/85	1002/870/600/85	65
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 5 MHz, 75Ω, dB	59/58/55.5/52	57/56/53.5/50	68.5
Factory Alignment, without EQ			
Cable Loss, dB @ 1002 MHz	13	13	—
Flat Loss, dB	28	30	20
Gain Slope, dB[2]	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports	16	16	16
Powering Requirements, Max./Typ. (includes forward and return)[13]			
90 Volt AC Power Supply (Remote)			
AC Voltage, 60 Hz	@60 V	@90 V	
AC Power, Watts	27/23	27/23	
AC Current, mA	610/520	375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800	865/800	
110/230 Volt AC Power Supply (Local)			
AC Voltage, 60 Hz	@110 V	@230 V	
AC Power, Watts, Typ.	25.6	24.5	
AC Current, mA, Typ.	337	190	
DC Current, mA @ 24 V ± 0.5 V, Typ.	800	800	
Testpoints			
Forward Input, dB (Resistive Type)[14]	–20 ± 1.25		—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (85 – 600 MHz)	–20 ± 1.0 (600 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)	—		–20 ± 0.5
Return Output, dB (Resistive Type)	—		–20 ± 1.5
Gain Control			
Plug-in PAD[15]	10-A-WC		10-A-WC
Equalization to compensate for cable loss			
Plug-in Equalizers for additional equalization[15]	PEQ-1G-xx		10-A-WC

NLC 65/85 MHz Specifications (Includes 110/230 VAC Local Powering) (Continued)

Chrominance/Luminance Delay, Max.		
85 + 4.43 MHz, ns	33/25	—
91.25 + 4.43 MHz, ns	17/10	—
97.25 + 4.43 MHz, ns	10/5	—
Return Group Delay, Max.		
5 + 4.43 MHz, ns	—	60/50
10 + 4.43 MHz, ns	—	20/12
65 – 4.43 MHz, ns	—	50/40
Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 65 MHz, –dBc	—	60
85 – 1002 MHz, –dBc	60	—

Specification Document Number 1505418 Rev B (90 VAC), 1506947 Rev A (110/230 VAC)

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 65 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 65 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. PAL video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 600 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 85 – 600 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 600 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 85 – 600 MHz frequency spectrum.
11. According to EN50083-3, CENELEC42 channel loading, with 8 dB of tilt from 47 to 870 MHz.
12. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
13. The power supply is internal to the RF module. Refer to drawing #333995-32 for the 90 VAC power supply and refer to drawing #333995-33 for the 110/230 VAC power supply. For the 90 VAC power supply with 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
14. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
15. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

65/85 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	65 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1505418 Rev B (90 VAC), 1506947 Rev A (110/230 VAC)

NLC 65/85 MHz with High Output GaN Specifications (Includes 110/230 VAC Local Powering)

		Forward	Return
Passband, MHz		85 to 1002	5-65
Housing, MHz		1002	—
AC current, Amp		15	15
Typical Operating Conditions			
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	40	40	20
Full Gain, dB (without Thermal Attenuator and without EQ)	41	41	20
Operating Levels, Recommended			
Fr equency, MHz	1002/870/600/85	1002/870/600/85	65/5
Input, dBmV min.[3]	12/10.5/8/5	16/14.5/12/9	17/17
Output, dBmV [4,5]	52/49.5/44.5/35	56/53.5/48.5/39	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)			
Channels, Number of NTSC[6]		60	6
Carrier-to-Interference Ratio[7]			
Composite Triple Beat, –dBc	82	74	80
Cross Modulation (per NCTA standard), –dB[8]	75	70	70
Composite 2IM, –dBc	75	71	78
Composite IM Distortion Noise (CIN), dB[9]	80	73	—
Composite IM Noise (CIN), dB[10]	77	70	—
42 CENELEC Performance Specifications			
Channel Loading, Number of Channels[11]		42	—
Reference Frequency, MHz		870/47	—
Output Level, dBmV		55	—
Carrier to Noise Ratio, dB, 5 MHz		67	—
Composite Triple Beat, –dBc		65	—
Composite 2IM, –dBc		70	—
Noise Figure (Without EQ)[12]			
Frequency, MHz	1002/870/600/85	1002/870/600/85	65
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 5 MHz, 75Ω, dB	59/58/55.5/52	63/62/59.5/56	68.5
Factory Alignment, without EQ			
Cable Loss, dB @ 1002 MHz		13	—
Flat Loss, dB		28	20
Gain Slope, dB[2]		± 1.0	—
Flatness, dB		± 0.8	± 0.9
Return Loss, dB minimum. All entry ports		16	16
Powering Requirements, Max./Typ. (includes forward and return)[13]			
90 Volt AC Power Supply (Remote)			
AC Voltage, 60 Hz	@60 V	@90 V	
AC Power, Watts	27/23	27/23	
AC Current, mA	610/520	375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800	865/800	
110/230 Volt AC Power Supply (Local)			
AC Voltage, 60 Hz	@110 V	@230 V	
AC Power, Watts, Typ.	25.6	24.5	
AC Current, mA, Typ.	337	190	
DC Current, mA @ 24 V ± 0.5 V, Typ.	800	800	
Testpoints			
Forward Input, dB (Resistive Type)[14]		–20 ± 1.25	—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (85 – 600 MHz)	–20 ± 1.0 (600 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)		—	–20 ± 0.5
Return Output, dB (Resistive Type)		—	–20 ± 1.5
Gain Control			
Plug-in PAD[15]		10-A-WC	10-A-WC
Equalization to compensate for cable loss			
Plug-in Equalizers for additional equalization[15]		PEQ-1G-xx	10-A-WC

NLC 65/85 MHz with High Output GaN Specifications (Includes 110/230 VAC Local Powering) (Continued)

Chrominance/Luminance Delay, Max.		
85 + 4.43 MHz, ns	33/25	—
91.25 + 4.43 MHz, ns	17/10	—
97.25 + 4.43 MHz, ns	10/5	—
Return Group Delay, Max.		
5 + 4.43 MHz, ns	—	60/50
10 + 4.43 MHz, ns	—	20/12
65 – 4.43 MHz, ns	—	50/40
Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 65 MHz, –dBc	—	60
85 – 1002 MHz, –dBc	60	—

Specification Document Number 1506951 Rev B

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 65 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 65 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 600 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 85 – 60 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 600 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 85 – 600 MHz frequency spectrum.
11. According to EN50083-3, CENELEC42 channel loading, with 8 dB of tilt from 47 to 870 MHz.
12. The Noise Figure and CNR specifications are "Typical" within specified passband where CNR=Input Level (dBmV) +59 – NF.
13. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
14. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
15. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

65/85 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	10 MHz	30 MHz	65 MHz
0	1.00	0.80	0.40	0
1	2.00	1.70	0.70	0.20
2	3.00	2.50	1.00	0.30
3	4.00	3.30	1.30	0.40
4	5.00	4.10	1.60	0.60
5	5.90	5.00	1.95	0.70
6	6.80	5.80	2.20	0.90
7	7.80	6.60	2.50	1.00
8	8.70	7.30	2.70	1.20
9	9.70	8.10	3.00	1.30
10	10.70	8.80	3.30	1.40

Specification Document Number 1506951 Rev B

ALC 85/105 MHz Specifications

		Forward	Return
Passband, MHz		105 to 1002	5-85
Housing, MHz		1002	—
AC current, Amp		15	15
Typical Operating Conditions			
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	33	35	20
Full Gain, dB (without EQ and Thermal Attenuator)	41	43	20
Operating Levels, Recommended			
Frequency, MHz	1002/870/550/105	1002/870/550/105	85/5
Input, dBmV min.[3]	19/17.5/14.5/12.4	17/15.5/12.5/10.4	17/17
Output, dBmV [4,5]	52/49.5/44/35.5	52/49.5/44/35.5	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)			
Channels, Number of NTSC[6]		71	6
Carrier-to-Interference Ratio[7]			
Composite Triple Beat, –dBc	75	73	80
Cross Modulation (per NCTA std), –dB[8]	67	67	70
Composite 2IM, –dBc	73	71	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	—
Composite IM Noise (CIN), dB[10]	76	76	—
Noise Figure (Without EQ)[11]			
Frequency, MHz	1002/870/550/105	1002/870/550/105	85
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	67/66/64.5/60	65/64/62.5/58	69.5
Factory Alignment, with ALC Reserve, without EQ			
Cable Loss, dB @ 1002 MHz	13	13	—
Flat Loss, dB	21	25	20
Gain Slope, dB[2]	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports[12]	16	16	16
Level Control			
Range, dB @ 1002 MHz	±3.0	±3.0	—
Accuracy, dB (–40° C to 60° C)	±1.0	±1.0	—
Operating Level Range from recommended analog level at pilot freq. (dB)[5]	+6/–12	+6/–12	—
Powering Requirements, Max./Typ. (includes forward and return)[13]			
AC Voltage, 60 Hz	@60 V	@90 V	
AC Power, Watts	27/23	27/23	
AC Current, mA	610/520	375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800	865/800	
Testpoints			
Forward Input, dB (Resistive Type)[14]		–20 ± 1.25	—
Forward Output, dB (Directional Coupler Type)		–20 ± 0.5 (105 – 550 MHz) –20 ± 1.0 (550 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)		—	–20 ± 0.5
Return Output, dB (Resistive Type)		—	–20 ± 1.5
Gain Control			
Plug-in PAD[15]		10-A-WC	10-A-WC
Equalization to compensate for cable loss			
Plug-in Equalizers for additional equalization[15]		PEQ-1G-xx	10-A-WC
Chrominance/Luminance Delay, Max.			
Channel 98, ns/3.58 MHz		15	—
Channel 99, ns/3.58 MHz		9	—

ALC 85/105 MHz Specifications (Continued)

Return Group Delay, Max.		
5.5 – 7 MHz, ns	—	52
10 – 11.5 MHz, ns	—	13
82 – 83.5 MHz, ns	—	16
83.5 – 85 MHz, ns	—	20
Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 85 MHz, –dBc	—	60
105 – 1002 MHz, –dBc	60	—

Specification Document Number 1505422 Rev B

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 85 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 85 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 105 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 105 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
12. Return loss from 5 to 7 MHz may be as low as 15 dB.
13. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
14. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
15. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

85/105 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	25 MHz	50 MHz	85 MHz
1	1.00	0.60	0.20	0.00
2	2.00	1.20	0.40	0.00
3	3.00	1.80	0.60	0.10
4	4.00	2.20	0.80	0.10
5	5.00	3.00	1.00	0.10
6	6.00	3.50	1.20	0.10
7	7.00	4.00	1.40	0.20
8	8.00	4.50	1.60	0.20
9	9.00	5.00	1.80	0.20
10	10.0	5.50	2.00	0.30

Specification Document Number 1505422 Rev B

TLC 85/105 MHz Specifications

		Forward		Return
Passband, MHz		105 to 1002		5-85
Housing, MHz		1002		—
AC current, Amp		15		15
Typical Operating Conditions				
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	33	37	39	20
Full Gain, dB (without Thermal Attenuator and without EQ)	37	41	43	20
Operating Levels, Recommended				
Frequency, MHz	1002/870/550/105	1002/870/550/105	1002/870/550/105	85/5
Input, dBmV min.[3]	19/17.5/14.5/12.4	15/13.5/10.5/8.4	13/11.5/8.5/6.4	17/17
Output, dBmV [4,5]	52/49.5/44/35.5	52/49.5/44/35.5	52/49.5/44/35.5	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)				
Channels, Number of NTSC[6]		71		6
Carrier-to-Interference Ratio[7]				
Composite Triple Beat, –dBc	75	79	76	80
Cross Modulation (per NCTA standard), –dB[8]	67	72	72	70
Composite 2IM, –dBc	73	75	72	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	79	—
Composite Intermodulation Noise (CIN), dB[10]	76	76	76	—
Noise Figure (Without EQ)[11]				
Frequency, MHz	1002/870/550/105	1002/870/550/105	1002/870/550/105	85
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	67/66/64.5/60	63/62/60.5/56	61/60/58.5/54	69.5
Factory Alignment, with ALC Reserve, without EQ				
Cable Loss, dB @ 1002 MHz	13	13	13	—
Flat Loss, dB	21	25	27	20
Gain Slope, dB[2]	± 1.0	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports[12]	16	16	16	16
Powering Requirements, Max./Typ. (includes forward and return)[13]				
AC Voltage, 60 Hz	@60 V		@90 V	
AC Power, Watts	27/23		27/23	
AC Current, mA	610/520		375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800		865/800	
Testpoints				
Forward Input, dB (Resistive Type)[14]		–20 ± 1.25		—
Forward Output, dB (Directional Coupler Type)	–20 ± 0.5 (105 – 550 MHz)		–20 ± 1.0 (550 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)		—		–20 ± 1.0
Return Output, dB (Resistive Type)		—		–20 ± 1.5
Gain Control				
Plug-in PAD[15]		10-A-WC		10-A-WC
Equalization to compensate for cable loss				
Plug-in Equalizers for additional equalization[15]		PEQ-1G-xx		10-A-WC
Chrominance/Luminance Delay, Max.				
Channel 98, ns/3.58 MHz		15		—
Channel 99, ns/3.58 MHz		9		—
Return Group Delay, Max.				
5.5 – 7 MHz, ns		—		52
10 – 11.5 MHz, ns		—		13
82 – 83.5 MHz, ns		—		16
83.5 – 85 MHz, ns		—		20

TLC 85/105 MHz Specifications (Continued)

Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 85 MHz, –dBc	—	60
105 – 1002 MHz, –dBc	60	—

Specification Document Number 1505423 Rev C

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 85 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 85 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 105 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 105 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
12. Return loss from 5 to 7 MHz may be as low as 14 dB.
13. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
14. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
15. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

85/105 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	25 MHz	50 MHz	85 MHz
1	1.00	0.60	0.20	0.00
2	2.00	1.20	0.40	0.00
3	3.00	1.80	0.60	0.10
4	4.00	2.20	0.80	0.10
5	5.00	3.00	1.00	0.10
6	6.00	3.50	1.20	0.10
7	7.00	4.00	1.40	0.20
8	8.00	4.50	1.60	0.20
9	9.00	5.00	1.80	0.20
10	10.0	5.50	2.00	0.30

Specification Document Number 1505423 Rev C

NLC 85/105 MHz Specifications

		Forward	Return
Passband, MHz		105 to 1002	5-85
Housing, MHz		1002	—
AC current, Amp		15	15
Typical Operating Conditions			
Operational Gain, dB, (-0, +1.5 dB)[1, 2]	40	42	20
Full Gain, dB (without Thermal Attenuator and without EQ)	41	43	20
Operating Levels, Recommended			
Fr equency, MHz	1002/870/550/105	1002/870/550/105	85/5
Input, dBmV min.[3]	12/10.5/7.5/5.4	10/8.5/5.5/3.4	17/17
Output, dBmV [4,5]	52/49.5/44/35.5	52/49.5/44/35.5	37/37
Performance Characteristics @ Recommended Levels (Temperature Range: –40 to 60° C)			
Channels, Number of NTSC[6]		71	6
Carrier-to-Interference Ratio[7]			
Composite Triple Beat, –dBc	80	76	80
Cross Modulation (per NCTA standard), –dB[8]	74	72	70
Composite 2IM, –dBc	75	72	78
Composite IM Distortion Noise (CIN), dB[9]	79	79	—
Composite IM Noise (CIN), dB[10]	73	73	—
Noise Figure (Without EQ)[11]			
Frequency, MHz	1002/870/550/105	1002/870/550/105	85
Noise Figure, dB	10/9.5/9/10	10/9.5/9/10	6.5
Noise, 4 MHz, 75Ω, dB	60/59/56.5/53	58/57/54.5/51	69.5
Factory Alignment, without EQ			
Cable Loss, dB @ 1002 MHz	13	13	—
Flat Loss, dB	28	30	20
Gain Slope, dB[2]	± 1.0	± 1.0	—
Flatness, dB	± 0.8	± 0.8	± 0.9
Return Loss, dB minimum. All entry ports[12]	16	16	16
Powering Requirements, Max./Typ. (includes forward and return)[13]			
AC Voltage, 60 Hz	@60 V	@90 V	
AC Power, Watts	27/23	27/23	
AC Current, mA	610/520	375/320	
DC Current, mA @ 24 V ± 0.5 V	865/800	865/800	
Testpoints			
Forward Input, dB (Resistive Type)[14]		–20 ± 1.25	—
Forward Output, dB (Directional Coupler Type)		–20 ± 0.5 (105 – 550 MHz) –20 ± 1.0 (550 – 1002 MHz)	—
Return Input, dB (Directional Coupler Type)		—	–20 ± 1.0
Return Output, dB (Resistive Type)		—	–20 ± 1.5
Gain Control			
Plug-in PAD[15]		10-A-WC	10-A-WC
Equalization to compensate for cable loss			
Plug-in Equalizers for additional equalization[15]		PEQ-1G-xx	10-A-WC
Chrominance/Luminance Delay, Max.			
Channel 98, ns/3.58 MHz		15	—
Channel 99, ns/3.58 MHz		9	—
Return Group Delay, Max.			
5.5 – 7 MHz, ns		—	52
10 – 11.5 MHz, ns		—	13
82 – 83.5 MHz, ns		—	16
83.5 – 85 MHz, ns		—	20

NLC 85/105 MHz Specifications (Continued)

Hum Modulation (Time Domain @ 15 A)		
5 – 10 MHz, –dBc	—	55
11 – 85 MHz, –dBc	—	60
105 – 1002 MHz, –dBc	60	—

Specification Document Number 1505424 Rev C

1. Forward spacing at highest frequency with PEQ-1G-xx equalizer installed.
2. Return spacing is with a 0 dB attenuator installed in the return EQ location. Return EQ circuitry is built into main PCB. As the attenuator value increases, the return equalization insertion loss at 85 MHz also increases. See the Return Equalization Losses chart in the following table for the insertion loss values with different attenuator values installed.
3. Recommended minimum forward input level includes loss due to equalizer.
4. Recommended maximum return output level at 85 MHz.
5. At specified operational tilt, maximum output level for 1 GHz or 870 MHz loading is 56.5 dBmV @ HF.
6. NTSC video channels occupying the appropriate frequency spectrum per specified number of channels.
7. Distortion performance is derated accordingly to take into account the influence of the digitally compressed channels operating at levels 6 dB below equivalent video channels.
8. Cross Modulation specification number indicates typical cascade performance.
9. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 862 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 105 – 550 MHz frequency spectrum.
10. Systems operating with digitally compressed channels or equivalent broadband noise from 550 – 1002 MHz at levels 6 dB below equivalent video channels will experience a composite intermodulation distortion (CIN) appearing as noise in the 105 – 550 MHz frequency spectrum.
11. The Noise Figure and CNR specification are "Typical" within specified passband where CNR = Input Level (dBmV)+59 – Noise Figure.
12. Return loss from 5 to 7 MHz may be as low as 14 dB.
13. The power supply is internal to the RF module. Refer to drawing #333995-32. For 60 VAC powering: AC power consumption in watts divided by a factor of 43 = Amps required. For 90 VAC: ≤ 67 VAC, 1.03 x (AC power consumption in watts divided by voltage) = Amps required. For 67 to 90 VAC, AC power consumption in watts divided by 65 = Amps required.
14. Testpoint tolerance is with input attenuator position terminated into 75 ohms.
15. ARRIS accessories should be used for guaranteed performance; using third party accessories may result in degraded and/or intermittent performance. The 9-A-WC PADs may be still be used in the Flex Max321e, but are no longer available.

85/105 MHz Return Equalization Insertion Loss Specifications

Attenuator Values (dB)	Return Equalization Insertion Loss (Attenuation) in dB			
	5 MHz	25 MHz	50 MHz	85 MHz
1	1.00	0.60	0.20	0.00
2	2.00	1.20	0.40	0.00
3	3.00	1.80	0.60	0.10
4	4.00	2.20	0.80	0.10
5	5.00	3.00	1.00	0.10
6	6.00	3.50	1.20	0.10
7	7.00	4.00	1.40	0.20
8	8.00	4.50	1.60	0.20
9	9.00	5.00	1.80	0.20
10	10.0	5.50	2.00	0.30

Specification Document Number 1505424 Rev C

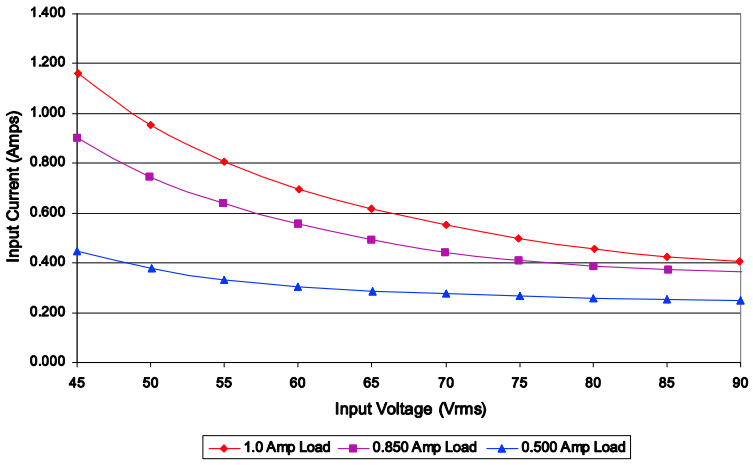
90 VAC Power Supply Specifications

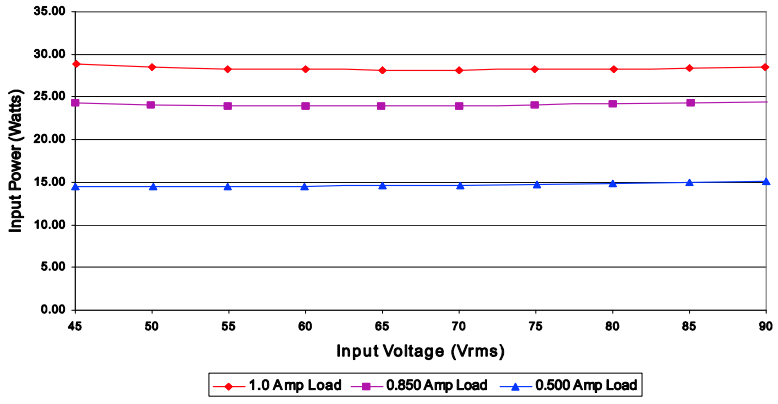
Characteristic	Specification
Input Voltage Range, 50/60 Hz, @ 1 A load Quasi-square wave	45 to 90 V RMS
Input Frequency	50/60 Hz
Output Voltage, Vdc	24 ± 0.5
DC Output Current, max., A	1.00
Output Voltage Ripple, mVrms, 0 to 100 kHz	8
Output Voltage Ripple, mVp-p, 100MHz	64
Output Voltage Protection, max., Vdc	33
Efficiency, typ.	85%
Short Circuit Current, max., Adc	1.6
Hold up Time @ 1.0 Adc 44 V, min., msec	8
Hold up Time @ 1.0 Adc 60 V, min., msec	25
Continuous Operation Input Voltage, min., Vrms	44
Re-start Voltage, min., Vrms	43
Low Voltage Turn Off, Vrms	20
Operating Temperature, ° C[1]	–40 to 60 (–40 to 140° F)

Specification Document Number 601286 Rev B

1. Reflects an external ambient temperature range.
2. See Power Curve 333995-32 for typical performance under various operating conditions.

90 VAC Power Supply Curves (#333995-32 Rev C)





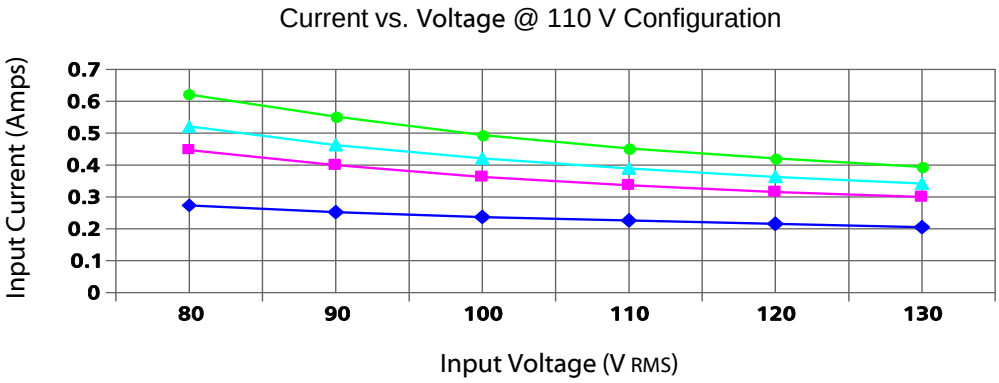
110/230 VAC Power Supply Specifications[1]

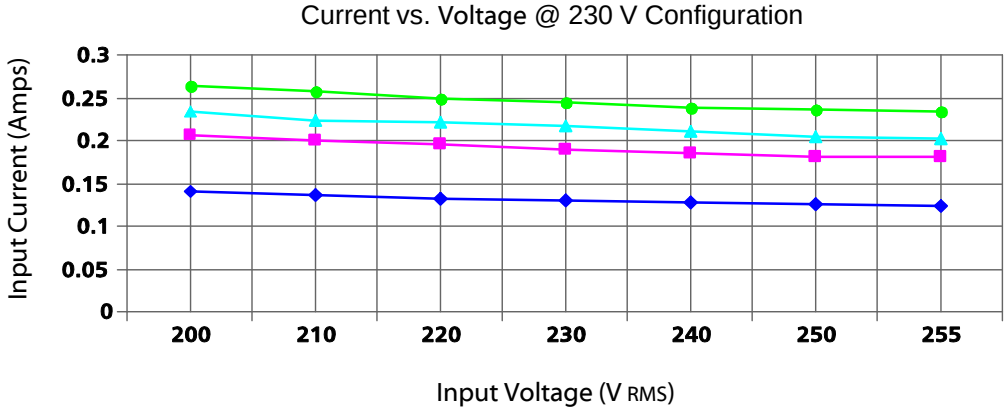
Characteristic	Specification
Input Voltage Range	90 to 130 VAC or 205 to 253 VAC
Input Frequency	50/60 Hz
Output Voltage	24.0 VDC ± 0.5 V
Output Voltage Ripple	8 mVrms
Output Currents	
Nominal DC Loading	24.0 VDC, 1.0 A
Maximum DC Loading	24.0 VDC, 1.2 A
Efficiency, typ.	78%
Short Circuit Current, typ.	24.0 VDC, 8.0 A
Output Voltage Protection, max.	24.0 VDC, 31.5 VDC
Input Voltage Protection[2]	Firing Voltage 275 VAC
Switching Frequency	60 kHz
Operating Temperature[3]	–40 to 60° C
Hold-up Time @ max DC loading, min.	20 ms
Start-up Voltage, typ.	
90 to 130 VAC	85 VRMS
205 TO 253 VAC	200 VRMS

Specification Document Number 601280 Rev B

1. See following power curves for input current vs. input voltage curves (from 333995-33).
2. The operating temperature represents the outside ambient temperature of the die-cast housing in which power supply is installed. (Housing Ambient Temp.)
3. As tested in accordance with IEEE C62.41-1991.

110 and 230 VAC Power Supply Curves (#333995-33 Rev A)

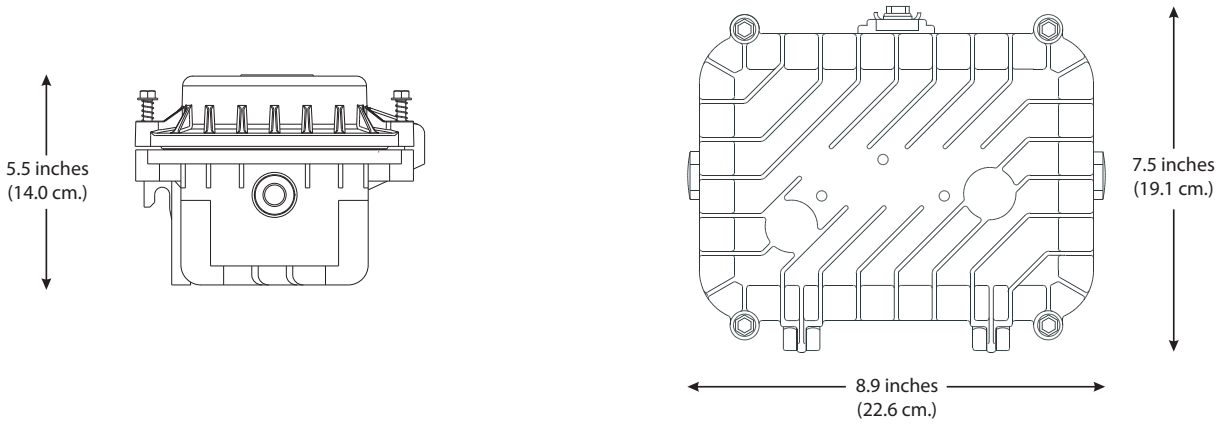




Flex Max321e Physical Specifications (9-LH Series Housing)

Characteristic	Uncrated Measurements	Crated Measurements
Width	8.9 inches (22.6 cm)	11.75 inches (29.9 cm)
Height	5.5 inches (14.0 cm)	6.0 inches (16.8 cm)
Depth	7.5 inches (19.1 cm)	8.5 inches (21.6 cm)
Weight[1]	7.4 pounds (3.35 kg)	8.5 pounds (3.9 kg)

1. Weight includes the housing and RF module.



Specifications are subject to change without notice.

ARRIS

www.arrisi.com