



# ACA0861 - A, B, C, D

750/860 MHz CATV Line Amplifier MMIC

Data Sheet - Rev 2.1

## FEATURES

- Flat Gain
- Very Low Distortion
- Excellent Input/Output Match
- Low DC Power Consumption
- Good RF Stability with High VSWR Load Conditions
- Surface Mount Package Compatible with Automatic Assembly
- Low Cost
- Repeatability of Monolithic Fabrication
- Meets Cenelec Standard



## PRODUCT DESCRIPTION

The ACA0861 family of surface mount monolithic GaAs RF Linear Amplifiers has been developed to replace, in new designs, the standard CATV Hybrid amplifiers currently in use. The MMICs consist of two parallel amplifiers, each with 12 dB gain. The Amplifiers are optimized for exceptionally low distortion and noise figure while providing flat gain and excellent input and output return loss. There are four differently specified amplifiers available: two input stages and two output stages. The ACA0861A and the ACA0861C are input stages and are

specified at +34 dBmV flat output. The ACA0861B and ACA0861D are output stages and are specified at +44 dBmV flat output. A Hybrid equivalent is formed when one input stage ACA0861 is cascaded with an ACA0861 output stage between two transmission line baluns. For low gain applications a single ACA0861 can be used between baluns, for higher gain applications more than two ACA0861 can be cascaded between baluns. See ACA0861 application note for more information.

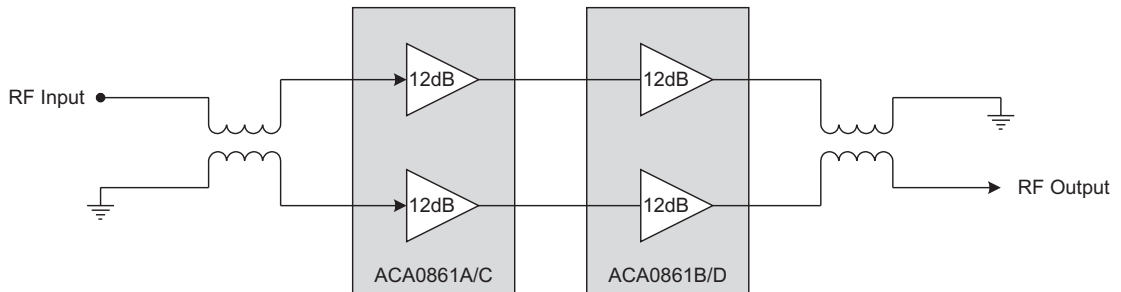


Figure 1: Hybrid Application Diagram

## ACA0861 - A, B, C, D

SUNSTAR微波光电 <http://www.rfoe.net/> TEL:0755-83396822 FAX:0755-83376182 E-MAIL:szss20@163.com

### Input Stages

The ACA0861A and the ACA0861C are designed as input stages and are specified at +34 dBmV flat output. These parts can be used alone for low gain, low output level applications or can be cascaded with one of the ACA0861 output stages for higher gain and output signal drive level. The ACA0861A is a low power dissipation part designed to drive the ACA0861B output stage. The ACA0861C is a slightly higher power dissipation part and provides the needed distortion parameters to drive the ACA0861D output stage.

### Output Stages

The ACA0861B and ACA0861D are designed as output stages and are specified at +44 dBmV flat output. These parts can be used alone for low gain, high output level applications or can be cascaded with one of the ACA0861 input stages for higher gain. The ACA0861B is a low power dissipation part designed as the output stage with an ACA0861A input stage. The ACA0861D is a higher power dissipation part designed as the output stage with an ACA0861C input stage. Cascaded, an ACA0861A and ACA0861B provide exceptional push-pull hybrid equivalent performance; an ACA0861C and an ACA0861D cascaded provide exceptional power doubling hybrid equivalent performance.

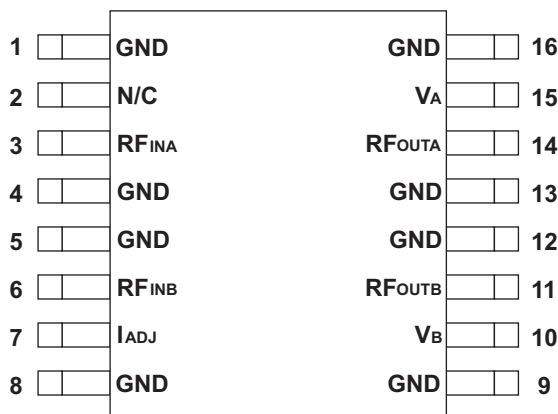


Figure 2: Pin Out

Table 1: Pin Description

PIN	NAME	DESCRIPTION	PIN	NAME	DESCRIPTION
1	GND	Ground	9	GND	Ground
2	N/C	No Connection	10	V <sub>B</sub>	Supply for Amplifier B
3	RF <sub>INA</sub>	Input to Amplifier A	11	RF <sub>OUTB</sub>	Output from Amplifier B
4	GND	Ground	12	GND	Ground
5	GND	Ground	13	GND	Ground
6	RF <sub>INB</sub>	Input to Amplifier B	14	RF <sub>OUTA</sub>	Output from Amplifier A
7	I <sub>ADJ</sub>	Current Adjust	15	V <sub>A</sub>	Supply for Amplifier A
8	GND	Ground	16	GND	Ground

SUNSTAR射频通信 <http://www.rfoe.net/> TEL:0755-83397033 FAX:0755-83376182 E-MAIL:szss20@163.com

**ELECTRICAL CHARACTERISTICS****Table 2: Absolute Minimum and Maximum Ratings**

PARAMETER	MIN	MAX	UNIT
Amplifier Supplies (pins 10, 11, 14, 15)	0	+15	VDC
RF Input Power (pins 3, 6)	-	+70	dBmV
Storage Temperature	-65	+150	°C
Soldering Temperature	-	+260	°C
Soldering Time	-	5.0	sec

**Stresses in excess of the absolute ratings may cause permanent damage. Functional operation is not implied under these conditions. Exposure to absolute ratings for extended periods of time may adversely affect reliability.**

Notes:

1. Pins 3 and 6 should be AC-coupled. No external DC bias should be applied.
2. Pin 7 should be pulled to ground through a resistor or left open-circuited. No external DC bias should be applied.

**Table 3: Operating Ranges**

PARAMETER	MIN	TYP	MAX	UNIT
RF Frequency	40	-	860	MHz
Supply: V <sub>D</sub> (pins 10, 11, 14, 15)	-	+12	-	VDC
Operating Temperature: T <sub>A</sub>	-40	-	+110	°C

The device may be operated safely over these conditions; however, parametric performance is guaranteed only over the conditions defined in the electrical specifications.

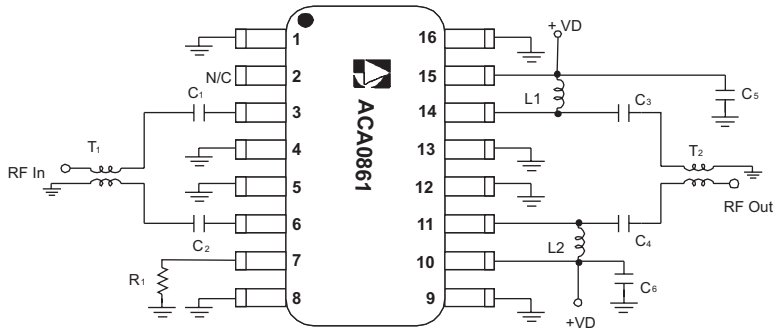
Table 4: Electrical Specifications

(T<sub>A</sub> = +25 °C, V<sub>D</sub> = +12 VDC)

PARAMETER	ACA0861A			ACA0861B			ACA0861C			ACA0861D			UNIT
	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	
Gain <sup>(1)</sup>	11.4	11.9	12.4	11.5	12	12.5	11.5	12	12.5	11.6	12.1	12.6	dB
Gain Flatness <sup>(1)</sup>	-	-	±0.3	-	-	±0.3	-	-	±0.3	-	-	±0.3	dB
Noise Figure <sup>(2)</sup>	-	3	5	-	3	5	-	3	5	-	3	6	dB
CTB <sup>(2),(3)</sup>													
77 Channels	-	-70	-	-	-62	-	-	-77	-	-	-70	-	dBc
110 Channels	-	-68	-64	-	-60	-57	-	-75	-68	-	-68	-66	
128 Channels	-	-65	-	-	-58	-	-	-71	-	-	-67	-	
CSO <sup>(2),(3)</sup>													
77 Channels	-	-71	-	-	-66	-	-	-75	-	-	-72	-	dBc
110 Channels	-	-71	-66	-	-66	-60	-	-75	-68	-	-72	-68	
128 Channels	-	-70	-	-	-64	-	-	-73	-	-	-70	-	
XMOD <sup>(2),(3)</sup>													
77 Channels	-	-67	-	-	-62	-	-	-74	-	-	-71	-	dBc
110 Channels	-	-63	-56	-	-56	-50	-	-71	-62	-	-68	-61	
128 Channels	-	-59	-	-	-55	-	-	-67	-	-	-66	-	
Supply Current <sup>(4)</sup>	-	180	200	-	310	330	-	260	275	-	450	490	mA
Cable Equivalent Slope <sup>(1)</sup>	-0.5	-	1.0	-0.5	-	1.0	-0.5	-	1.0	-0.5	-	1.0	dB
Return Loss (Input/Output) <sup>(1)</sup>	18	22	-	18	22	-	18	22	-	18	22	-	dB
Thermal Resistance (θ <sub>JC</sub> )	-	-	6.0	-	-	6.0	-	-	6.0	-	-	6.0	°C/W

## Notes:

- (1) Measured performance of MMIC alone. Balun effects de-embedded from measurement.
- (2) Measured with a balun on input and output of the device. See Figure 3 for test setup.
- (3) All parts measured with 110 channel flat input. Parts A and C measured at +34 dBmV output (per channel). Parts B and D measured at +44 dBmV output (per channel).
- (4) A fixed resistor is needed for parts A through C; part D does not need an external resistor (see Table 6.) These resistors set the devices' current draw. Bias voltage is +12 VDC.



Note: Apply voltage to both  $V_D$  lines simultaneously.

Figure 3: Test Circuit

Table 5: Parts List for Test Circuit

REF	DESCRIPTION	QTY	VENDOR	VENDOR PART NO.
C1, C2, C5, C6	0.01uF chip capacitor	4	Murata	GRM39X7R1103K25V
C3, C4	300pF chip capacitor	2	Murata	GRM39X7R301K25V
L1, L2	390nH air-wound chip inductor	2	Coilcraft	1008CS-391
R1	(see Table 6)	1		
T1, T2 <sup>(1)</sup>	ferrite core	2	Philips	TC3.4/1.8/1.3-3D3
	wire		MWS Wire industries	B238611

Notes:

(1) T1, T2 (balun) wind 4 turns thru core, as shown in Figure 4.

DO NOT SEPARATE BIFILAR WIRES.

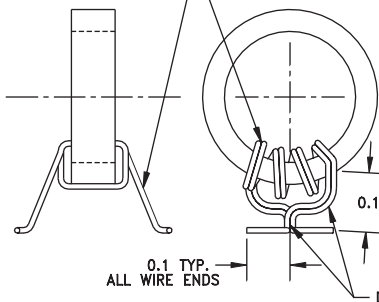


Table 6: R1 Resistor Value

PART NUMBER	R1 VALUE
ACA0861A	21.5 Ohms
ACA0861B	274 Ohms
ACA0861C	121 Ohms
ACA0861D	(open)

NOTES: 1. MATERIAL:

CORE: PHILLIPS (135 CT 050-3D3)

WIRE: MWS WIRE IND.  
B238611(66256-01)  
4 TIMES THRU CENTER  
AS SHOWN IN FIGURE.

Figure 4: Balun Drawing (4 Turns)

PERFORMANCE DATA

ACA0861A and ACA0861B Cascade Typical Data (see Figure 42)

Figure 5: Gain / S21

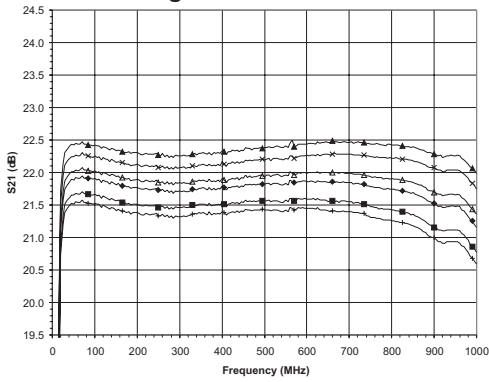


Figure 6: Reverse Isolation / S12

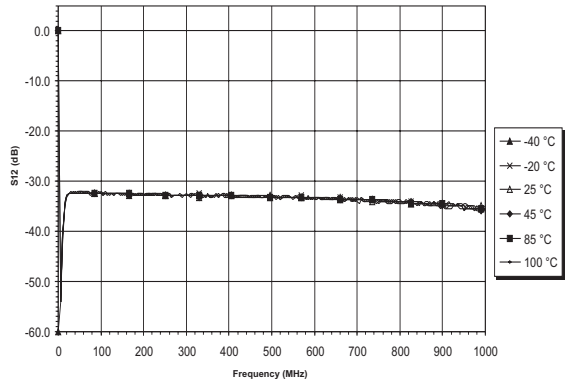


Figure 7: Input Return Loss / S11

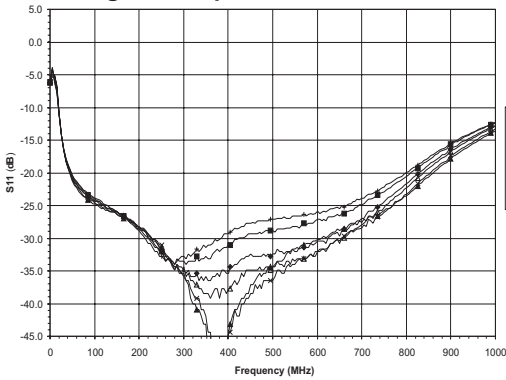


Figure 8: Noise Figure vs. Frequency

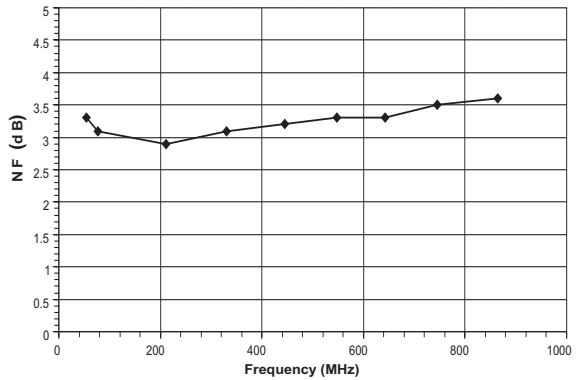
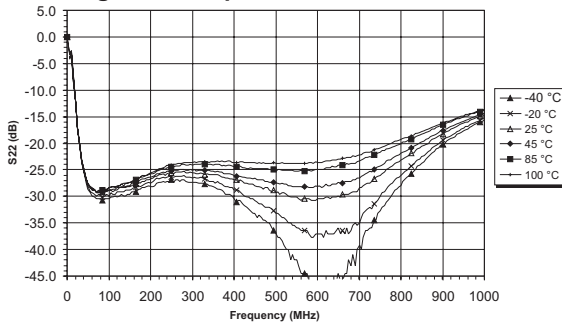
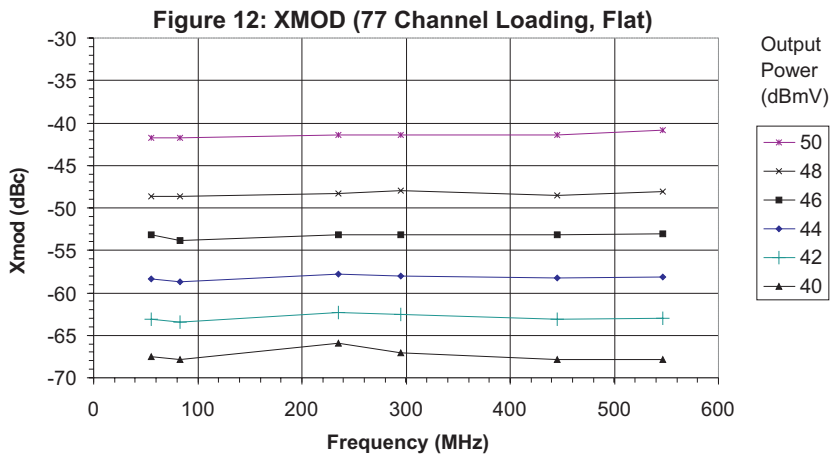
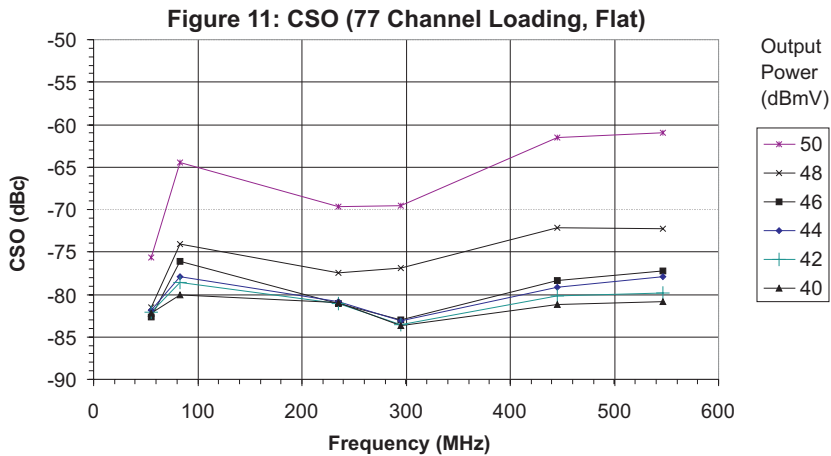
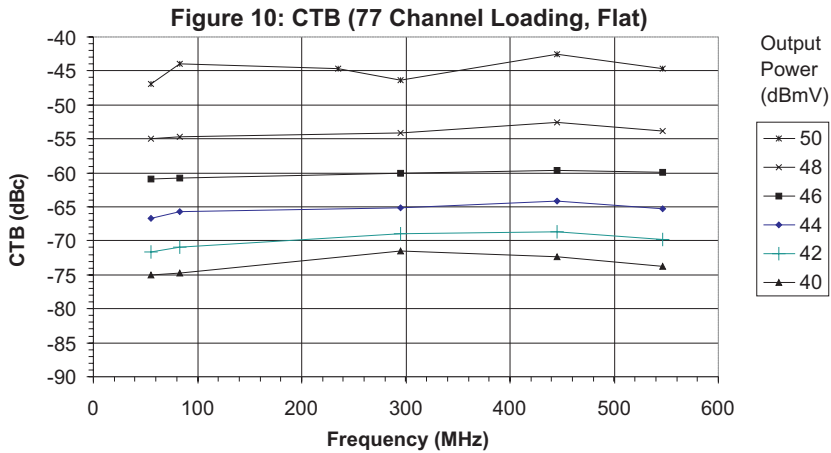


Figure 9: Output Return Loss / S22



ACA0861A and ACA0861B Cascade Typical Data (see Figure 42)



ACA0861A and ACA0861B Cascade Typical Data (see Figure 42)

Figure 13: CTB (110 Channel Loading, Flat)

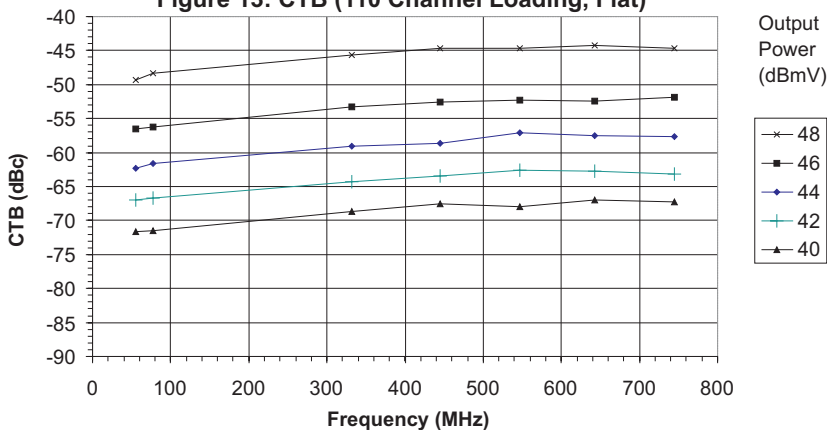


Figure 14: CSO (110 Channel Loading, Flat)

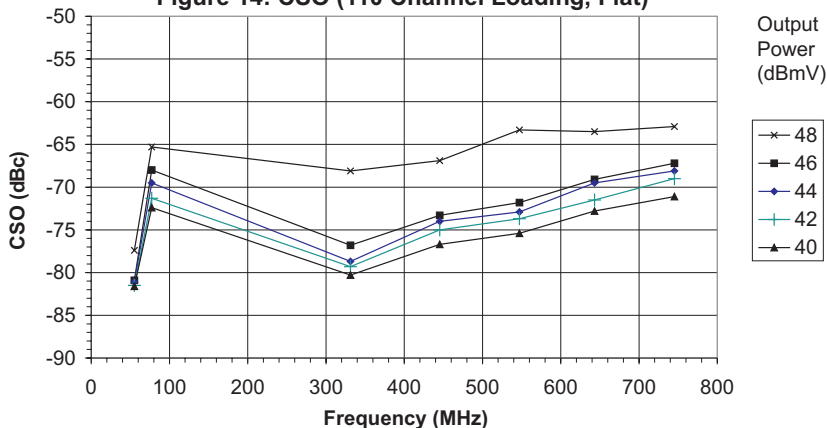
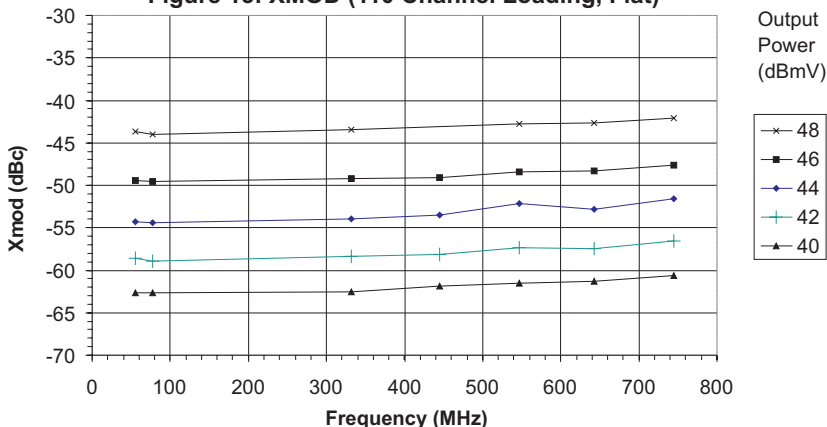


Figure 15: XMOD (110 Channel Loading, Flat)





ACA0861A and ACA0861B Cascade Typical Data (see Figure 42)

Figure 16: CTB (128 Channel Loading, Flat)

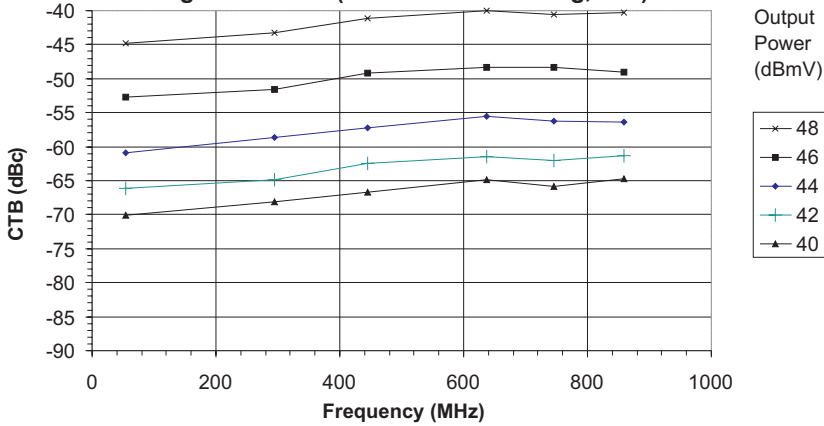


Figure 17: CSO (128 Channel Loading, Flat)

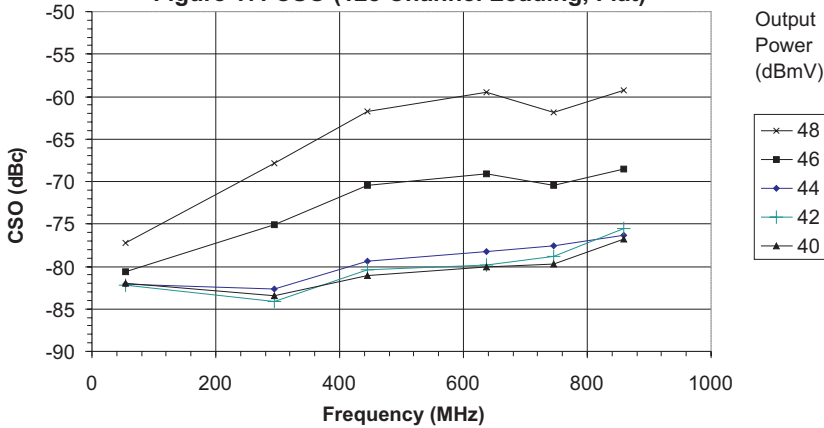
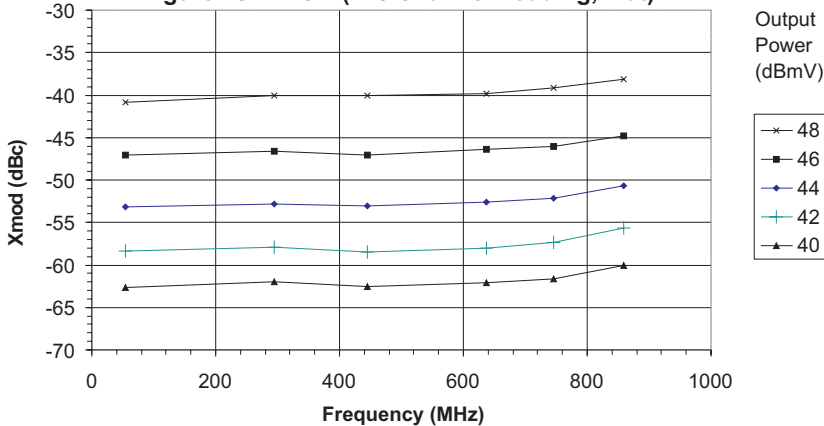


Figure 18: XMOD (128 Channel Loading, Flat)



ACA0861C and ACA0861D Cascade Typical Data (see Figure 42)

Figure 19: Gain / S21

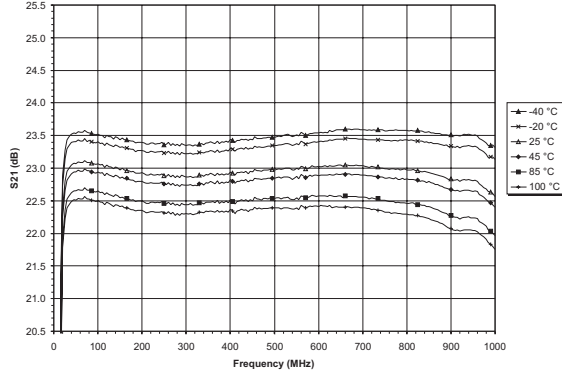


Figure 20: Reverse Isolation / S12

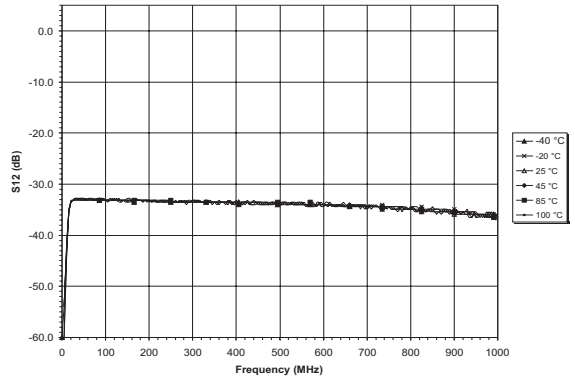


Figure 21: Input Return Loss / S11

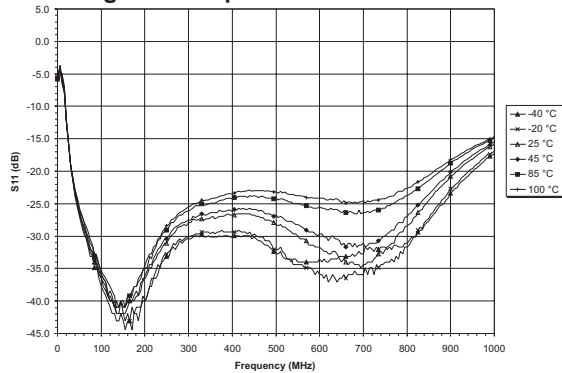


Figure 22: Noise Figure vs. Frequency

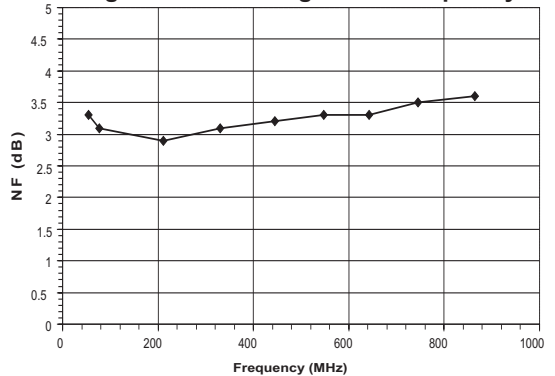
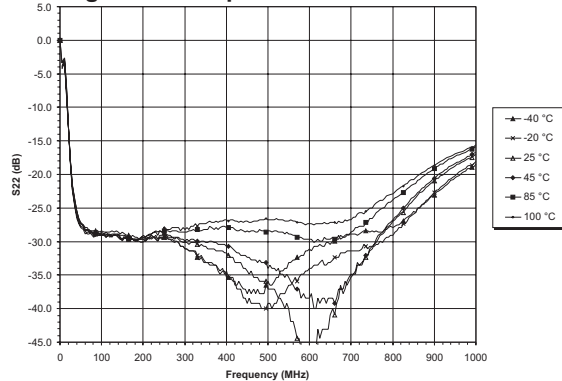


Figure 23: Output Return Loss / S22



ACA0861C and ACA0861D Cascade Typical Data (see Figure 42)

Figure 24: CTB (77 Channel Loading, Flat)

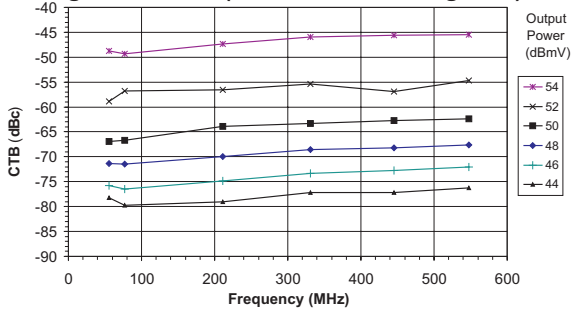


Figure 25: CTB (110 Channel Loading, Flat)

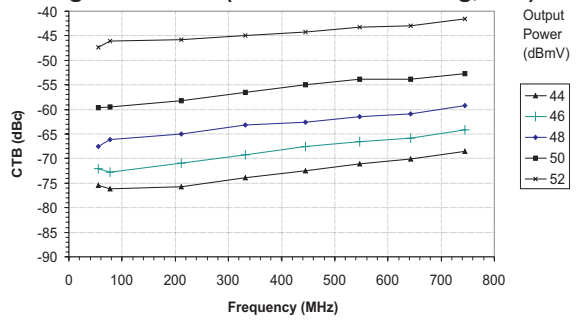


Figure 26: CSO (77 Channel Loading, Flat)

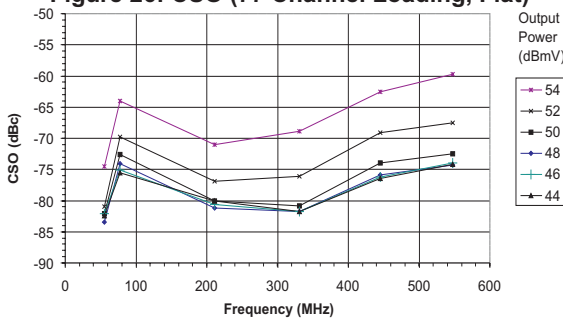


Figure 27: CSO (110 Channel Loading, Flat)

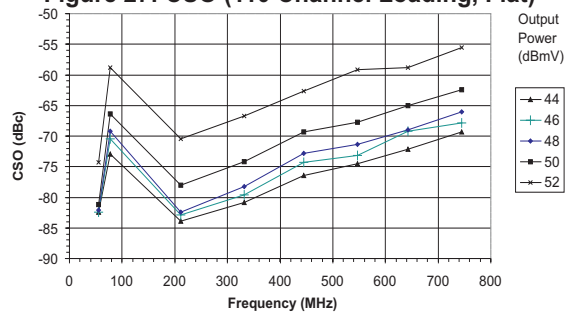


Figure 28: XMOD (77 Channel Loading, Flat)

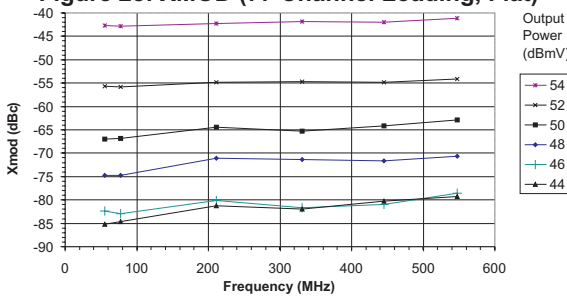
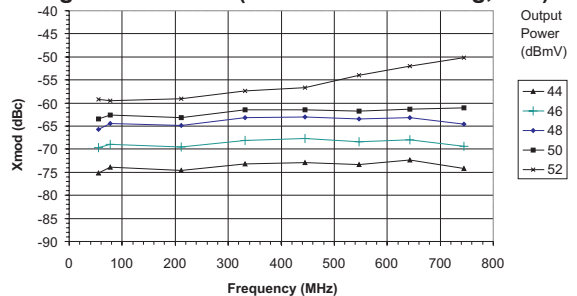


Figure 29: XMOD (110 Channel Loading, Flat)



ACA0861C and ACA0861D Cascade Typical Data (see Figure 42)

Figure 30: CTB (128 Channel Loading, Flat)

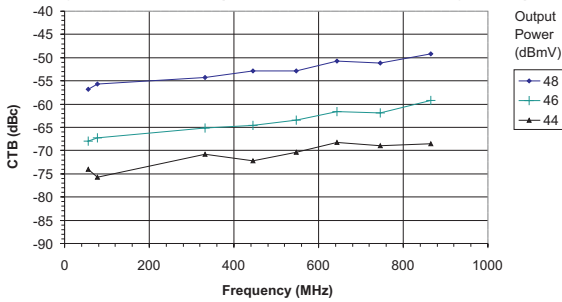


Figure 31: CTB (77 Channel Loading, 8 dB Tilt)

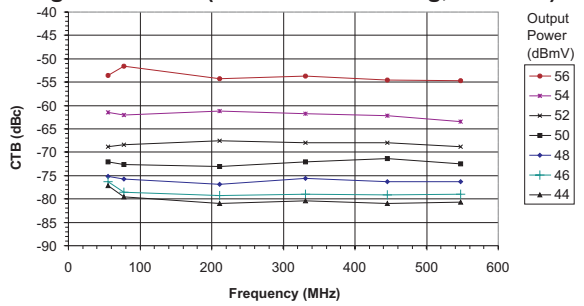


Figure 32: CSO (128 Channel Loading, Flat)

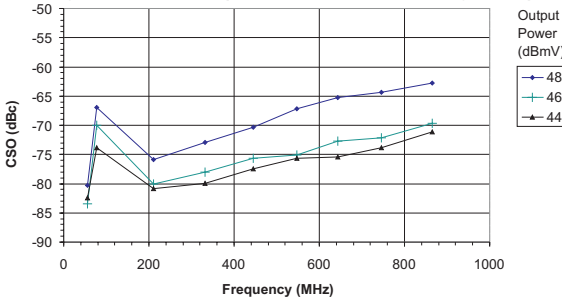


Figure 33: CSO (77 Channel Loading, 8 dB Tilt)

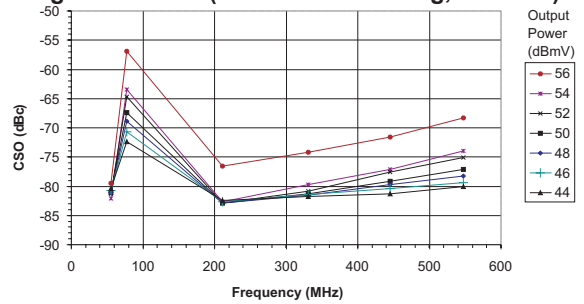


Figure 34: XMOD (128 Channel Loading, Flat)

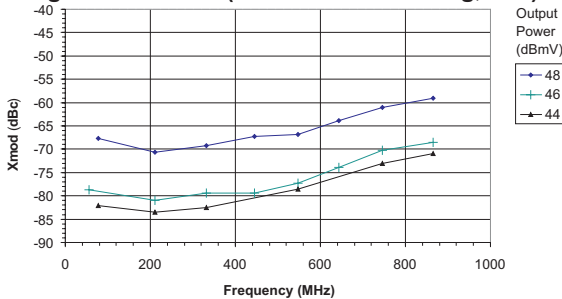
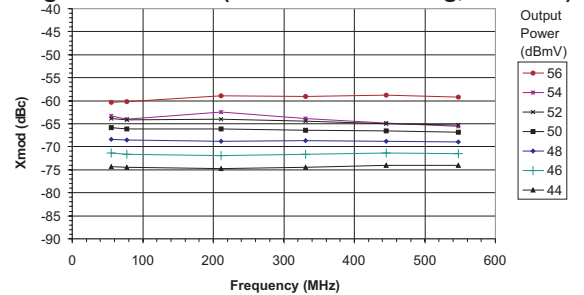


Figure 35: XMOD (77 Channel Loading, 8 dB Tilt)



ACA0861C and ACA0861D Cascade Typical Data (see Figure 42)

Figure 36: CTB (110 Channel Loading, 10 dB Tilt)

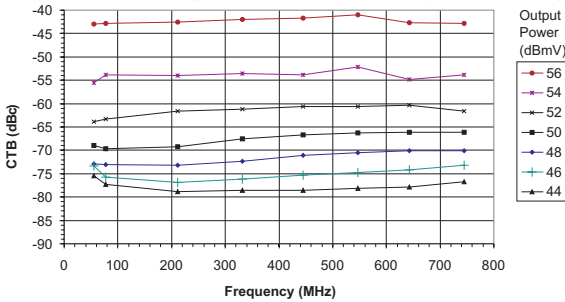


Figure 37: CTB (128 Channel Loading, 12 dB Tilt)

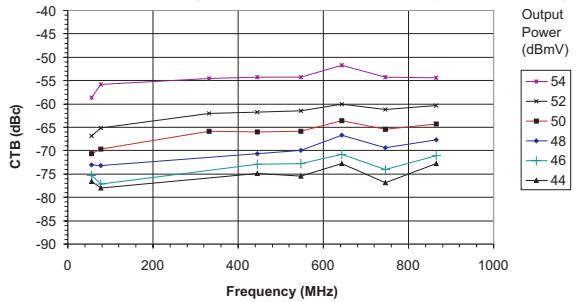


Figure 38: CSO (110 Channel Loading, 10 dB Tilt)

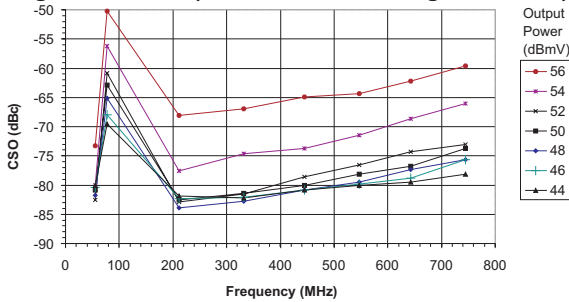


Figure 39: CSO (128 Channel Loading, 12 dB Tilt)

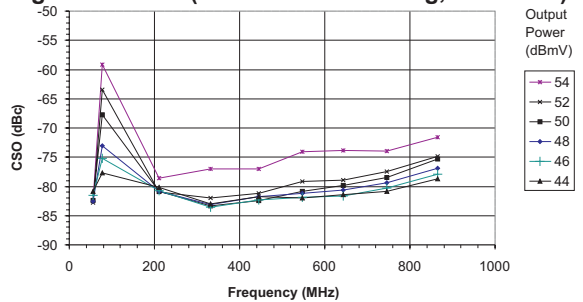


Figure 40: XMOD (110 Channel Loading, 10 dB Tilt)

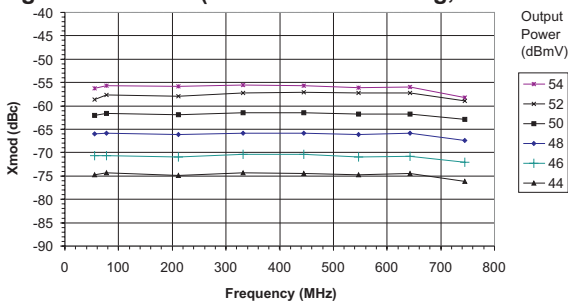
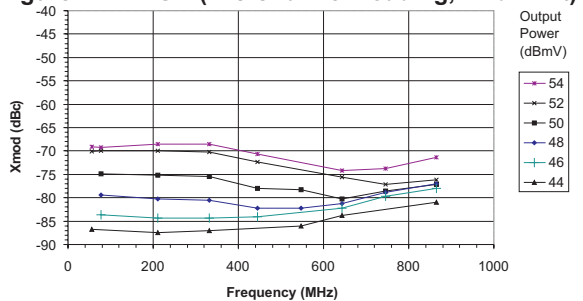
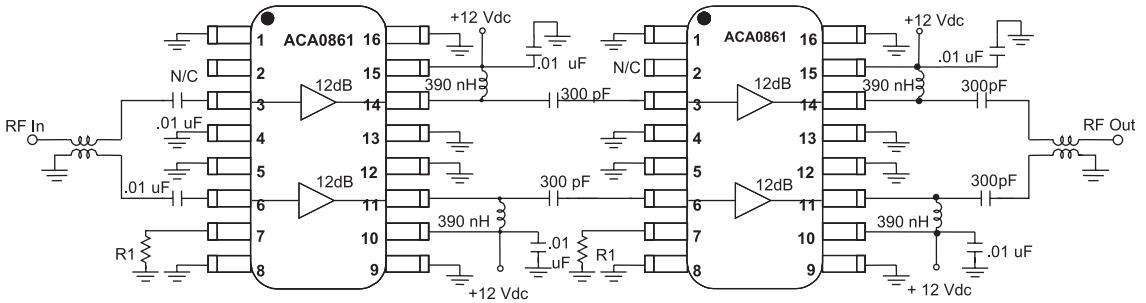


Figure 41: XMOD (128 Channel Loading, 12 dB Tilt)



APPLICATION INFORMATION



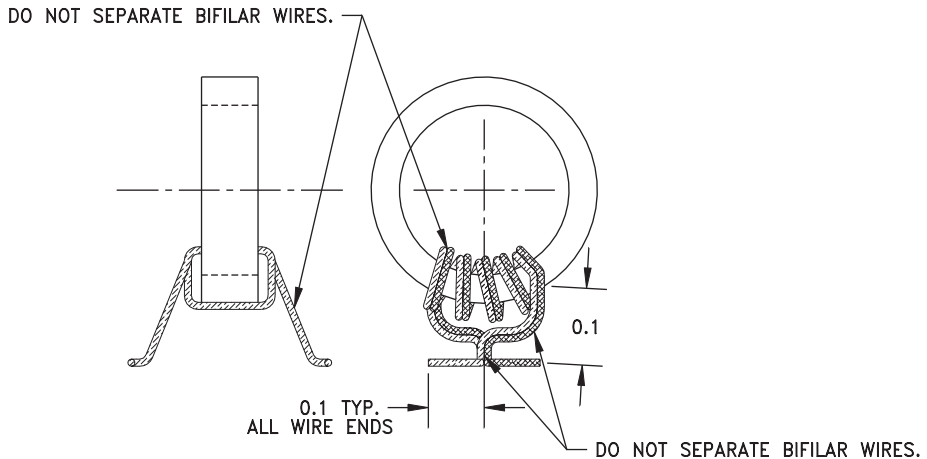
Notes:

1. Apply voltage to all +12 Vdc lines simultaneously.
2. See Table 6 for R1 values.
3. Input and output baluns: wind 5 turns thru core (see Table 7), as shown in Figure 43.

Figure 42: Hybrid Equivalent Test Circuit

Table 7: Parts List for Balun (5 Turns)

PART	VENDOR	VENDOR PART NO.
ferrite core	Philips	TC3.4/1.8/1.3-3D3
wire	MWS Wire industries	B238611



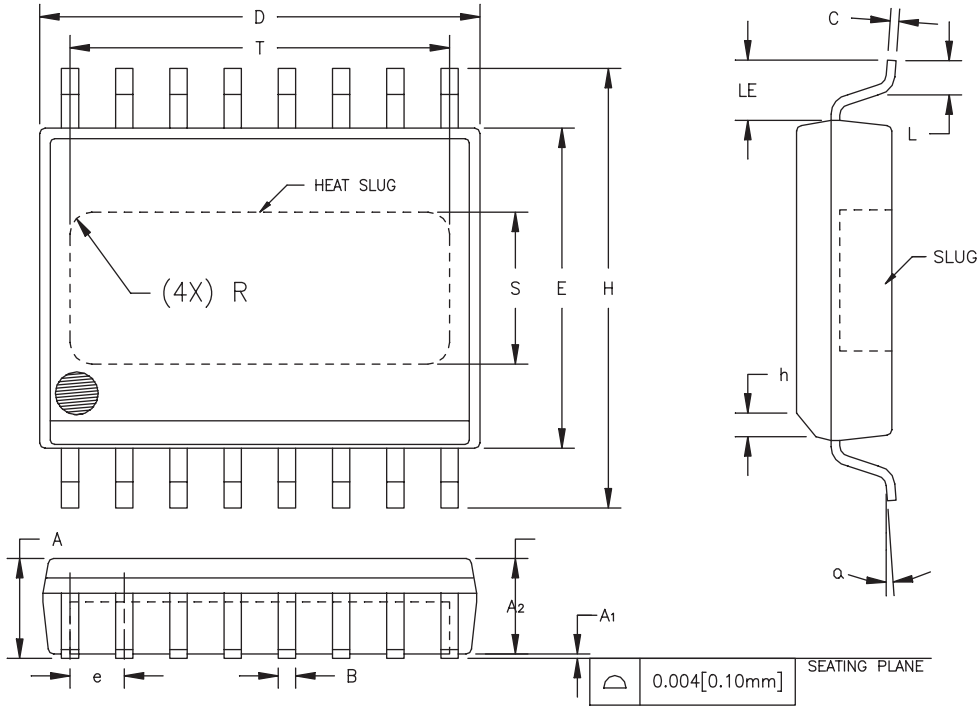
NOTES: 1. MATERIAL:

CORE: PHILLIPS (135 CT 050-3D3)

WIRE: MWS WIRE IND.  
B2383611(66256-01)  
5 TIMES THRU CENTER  
AS SHOWN IN FIGURE.

Figure 43: Balun Drawing (5 Turns)

PACKAGE OUTLINE



SYMBOL	INCHES		MILLIMETERS		NOTE
	MIN.	MAX.	MIN.	MAX.	
A	0.087	0.098	2.21	2.49	
A1	0.000	0.004	0.00	0.10	6
A2	0.087	0.094	2.21	2.39	
B	0.013	0.019	0.33	0.48	
C	0.007	0.009	0.18	0.23	
D	0.398	0.412	10.11	10.46	2
E	0.290	0.300	7.37	7.62	3
e	0.050 BSC		1.27 BSC		4
H	0.394	0.418	10.01	10.62	
h	0.010	0.028	0.25	0.71	
L	0.024	0.040	0.61	1.02	
LE	0.052	—	1.32	—	
alpha	0°	8°	0°	8°	
S	0.120	0.140	3.05	3.56	5
T	0.330	0.350	8.38	8.89	5
R	REF. 0.015		REF. 0.38		5

NOTES:

1. CONTROLLING DIMENSION: INCHES
2. DIMENSION "D" DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH, PROTRUSIONS AND GATE BURRS SHALL NOT EXCEED 0.006 [0.15mm] PER SIDE.
3. DIMENSION "E" DOES NOT INCLUDE INTER-LEAD FLASH OR PROTRUSIONS. INTER-LEAD FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.010 [0.25mm] PER SIDE.
4. MAXIMUM LEAD TWIST/SKEW TO BE  $\pm 0.005$  [0.13mm].
5. DIMENSIONS "S", "T" AND "R" INDICATE EXPOSED SLUG AREA.
6. STANDOFF HEIGHT (A<sub>1</sub>) MEASURED FROM BOTTOM OF SLUG.

Figure 44: S7 Package Outline - 16 Pin Wide Body SOIC with Heat Slug

**ORDERING INFORMATION**

ORDER NUMBER	TEMPERATURE RANGE	PACKAGE DESCRIPTION	COMPONENT PACKAGING
ACA0861AS7CTR	-40 to 110 °C	16 Pin wide Body SOIC with Heat Slug	1,500 piece tape and reel
ACA0861AS7C	-40 to 110 °C	16 Pin wide Body SOIC with Heat Slug	Plastic Tubes (25 pcs. per tube)
ACA0861BS7CTR	-40 to 110 °C	16 Pin wide Body SOIC with Heat Slug	1,500 piece tape and reel
ACA0861BS7C	-40 to 110 °C	16 Pin wide Body SOIC with Heat Slug	Plastic Tubes (25 pcs. per tube)
ACA0861CS7CTR	-40 to 110 °C	16 Pin wide Body SOIC with Heat Slug	1,500 piece tape and reel
ACA0861CS7C	-40 to 110 °C	16 Pin wide Body SOIC with Heat Slug	Plastic Tubes (25 pcs. per tube)
ACA0861DS7CTR	-40 to 110 °C	16 Pin wide Body SOIC with Heat Slug	1,500 piece tape and reel
ACA0861DS7C	-40 to 110 °C	16 Pin wide Body SOIC with Heat Slug	Plastic Tubes (25 pcs. per tube)

**ANADIGICS, Inc.**

141 Mount Bethel Road  
Warren, New Jersey 07059, U.S.A.

Tel: +1 (908) 668-5000

Fax: +1 (908) 668-5132

URL: <http://www.anadigics.com>

E-mail: [Mktg@anadigics.com](mailto:Mktg@anadigics.com)

**IMPORTANT NOTICE**

ANADIGICS, Inc. reserves the right to make changes to its products or to discontinue any product at any time without notice. The product specifications contained in Advanced Product Information sheets and Preliminary Data Sheets are subject to change prior to a product's formal introduction. Information in Data Sheets have been carefully checked and are assumed to be reliable; however, ANADIGICS assumes no responsibilities for inaccuracies. ANADIGICS strongly urges customers to verify that the information they are using is current before placing orders.

**WARNING**

ANADIGICS products are not intended for use in life support appliances, devices or systems. Use of an ANADIGICS product in any such application without written consent is prohibited.



SUNSTAR 商斯达实业集团是集研发、生产、工程、销售、代理经销、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有 10 多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一，是一家专业代理和分销世界各大品牌 IC 芯片和电子元器件的连锁经营综合性国际公司，专业经营进口、国产名厂名牌电子元件，型号、种类齐全。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商，已在全国范围内建成强大统一的供货和代理分销网络。我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM 电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA 软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。商斯达实业公司拥有庞大的资料库，有数位毕业于著名高校——有中国电子工业摇篮之称的西安电子科技大学（西军电）并长期从事国防尖端科技研究的高级工程师为您精挑细选、量身订做各种高科技电子元器件，并解决各种技术问题。

微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件：晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子器件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

更多产品请看本公司产品专用销售网站：

商斯达中国传感器科技信息网：<http://www.sensor-ic.com/>

商斯达工控安防网：<http://www.pc-ps.net/>

商斯达电子元器件网：<http://www.sunstare.com/>

商斯达微波光电产品网：[HTTP://www.rfoe.net/](http://www.rfoe.net/)

商斯达消费电子产品网：<http://www.icasic.com/>

商斯达实业科技产品网：<http://www.sunstars.cn/> 微波元器件销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室

电话：0755-82884100 83397033 83396822 83398585

传真：0755-83376182 (0) 13823648918 MSN: SUNS8888@hotmail.com

邮编：518033 E-mail:szss20@163.com QQ: 195847376

深圳赛格展销部：深圳华强北路赛格电子市场 2583 号 电话：0755-83665529 25059422

技术支持：0755-83394033 13501568376

欢迎索取免费详细资料、设计指南和光盘；产品凡多，未能尽录，欢迎来电查询。

北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号

TEL: 010-81159046 82615020 13501189838 FAX: 010-62543996

上海分公司：上海市北京东路 668 号上海赛格电子市场 D125 号

TEL: 021-28311762 56703037 13701955389 FAX: 021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

TEL: 029-81022619 13072977981 FAX:029-88789382