



ACA2420

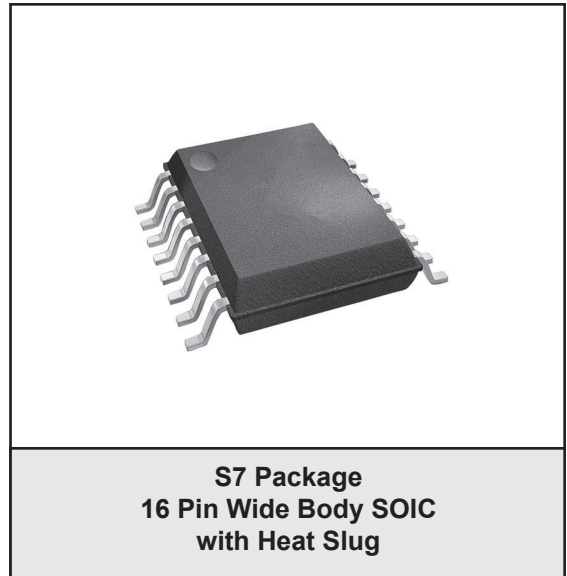
24V, 1000 MHz, 21.5dB Gain
High Output Power Doubler Line Amplifier
ADVANCED PRODUCT INFORMATION - Rev 0.1

FEATURES

- 21.5 dB Gain
- 75 Ω input and output match
- Characterized at +58dBmV output power
- Superior gain flatness (± 0.2 dB)
- Very Low Distortion
- Stable with High VSWR Load Conditions
- Monolithic GaAs Design for Consistent Performance Part-to-Part
- Surface Mount Package Compatible with Automatic Assembly
- RoHS Compliant Package

APPLICATIONS

- CATV Line Amplifiers, Deep Fiber Nodes



PRODUCT DESCRIPTION

The ACA2420 is a highly linear, monolithic GaAs RF amplifier that has been developed to replace, in new designs, standard CATV hybrid amplifiers. Offered in a convenient surface mount package, the MMIC consists of two pairs of parallel amplifiers that are optimized for exceptionally low

distortion. A hybrid equivalent that provides flat gain response and excellent input and output return loss over the 40 to 1000 MHz CATV downstream band is formed when one ACA2420 is cascaded between two appropriate transmission line baluns.

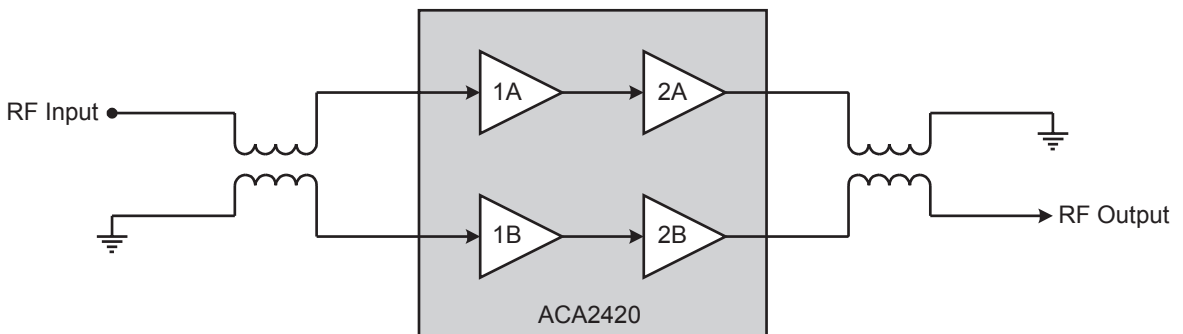


Figure 1: Hybrid Application Diagram

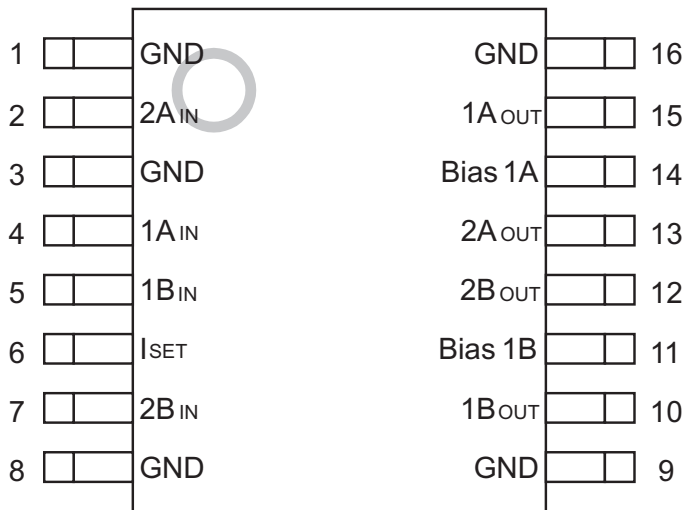


Figure 2: Pin Out

Table 1: Pin Description

| PIN | NAME | DESCRIPTION | PIN | NAME | DESCRIPTION |
|-----|------------------|--------------------|-----|-------------------|--------------------------------|
| 1 | GND | Ground | 9 | GND | Ground |
| 2 | 2A _{IN} | Amplifier 2A Input | 10 | 1B _{OUT} | Amplifier 1B Output |
| 3 | GND | Ground | 11 | Bias 1B | Bias for 1B Amplifier |
| 4 | 1A _{IN} | Amplifier 1A Input | 12 | 2B _{OUT} | Amplifier 2B Output and Supply |
| 5 | 1B _{IN} | Amplifier 1B Input | 13 | 2A _{OUT} | Amplifier 2A Output and Supply |
| 6 | I _{SET} | Current Adjust | 14 | Bias 1A | Bias for 1A Amplifier |
| 7 | 2B _{IN} | Amplifier 2B Input | 15 | 1A _{OUT} | Amplifier 1A Output |
| 8 | GND | Ground | 16 | GND | Ground |

ELECTRICAL CHARACTERISTICS

Table 2: Absolute Mimimum and Maximum Ratings

| PARAMETER | MIN | MAX | UNIT |
|--------------------------------|-----|------|-----------------|
| Supply (pins 12, 13) | 0 | +28 | V _{DC} |
| Current Adjust (pin 6) | 0 | +4 | V _{DC} |
| RF Power at Inputs (pins 4, 5) | - | +75 | 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 2, 4, 5 and 7 should be AC-coupled. No external DC bias should be applied.
2. Pin 6 should be AC-grounded and/or pulled to ground through a resistor for current control.
3. Pins 11 and 14 are bias feeds for input amplifiers 1A and 1B. No external DC bias should be applied.
4. Pins 10 and 15 receive DC bias directly from pins 11 and 14.

Table 3: Operating Ranges

| PARAMETER | MIN | TYP | MAX | UNIT |
|---------------------------------------|-----|------|------|-----------------|
| Supply: V _{DD} (pins 12, 13) | - | +24 | - | V _{DC} |
| Current Adjust (pin 6) | - | +1.5 | - | V _{DC} |
| RF Frequency | 40 | - | 1000 | MHz |
| Case Temperature | -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: AC and DC Electrical Specifications
(T_A = +25 °C, V_{DD} = +24 VDC)

| PARAMETER | MIN | TYP | MAX | UNIT | COMMENTS |
|--|-------------|-------------------|-----------------|------|-------------|
| Gain ⁽¹⁾ @ 870 MHz ⁽¹⁾ | - | 21.5 | - | dB | |
| Cable Equivalent Slope ⁽¹⁾ | - | 0 | - | dB | |
| Gain Flatness ⁽¹⁾ to 1000 MHz | - | ±0.2 | - | dB | |
| Noise Figure ⁽¹⁾ | - | 6.5 | - | dB | |
| CTB ⁽¹⁾ 77 Channels ⁽²⁾ 77 Channels ⁽³⁾ 110 Channels ⁽⁴⁾ | - - - | -78 -76 TBD | TBD -74 - | dBc | |
| CSO ⁽¹⁾ 77 Channels ⁽²⁾ 77 Channels ⁽³⁾ 110 Channels ⁽⁴⁾ | - - - | -71 -69 -64 | TBD -67 - | dBc | |
| XMOD ⁽¹⁾ 77 Channels ⁽²⁾ 77 Channels ⁽³⁾ 110 Channels ⁽⁴⁾ | - - - | -64 -63 TBD | - -61 - | dBc | |
| CIN ⁽¹⁾ 77 Channels ⁽³⁾ 110 channels ⁽⁴⁾ | - - | - - | -58 TBD | dBc | |
| Return Loss (Input) ⁽¹⁾ 40-1000 MHz | - | -22 | -20 | dB | 75 Ω system |
| Return Loss (Output) ⁽¹⁾ 40-900 MHz 901-1000 MHz | - - | -22 -22 | -20 -18 | dB | 75 Ω system |
| Supply Current | 495 | 520 | 545 | mA | |
| Thermal Resistance | - | 2.7 | 3.3 | °C/W | |

Notes:

(1) Measured with baluns on the input and output of the device.

(2) Parts measured with 77 channels, +58 dBmV power, 15.5 dB tilt at 1000 MHz.

(3) Parts measured with 77 channels, +58 dBmV power, 15.5 dB tilt at 1000 MHz, plus Q_{AM} to 1GHz.

(4) Parts measured with 110 channels, +56 dBmV power, 15.5 dB tilt at 1000 MHz, plus Q_{AM} to 1GHz.

(5) All specifications as measured on Evaluation Board (see Figures 13 & 14).

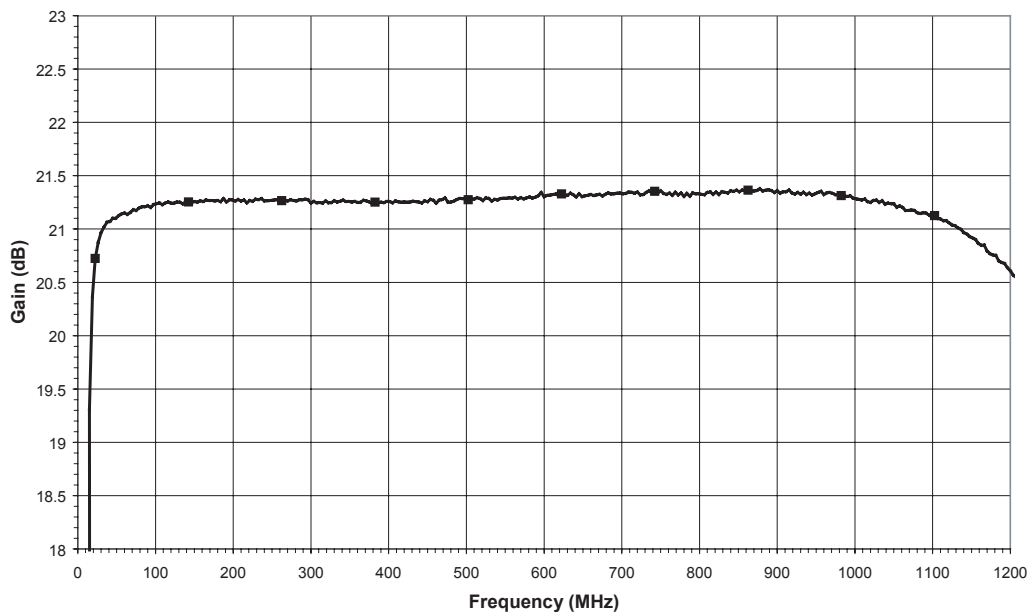


Figure 3: Gain (S21) vs Frequency
 ($T_A=+25\text{ }^\circ\text{C}$, $V_{DD}=+24\text{ V}$, 75 ohm system)

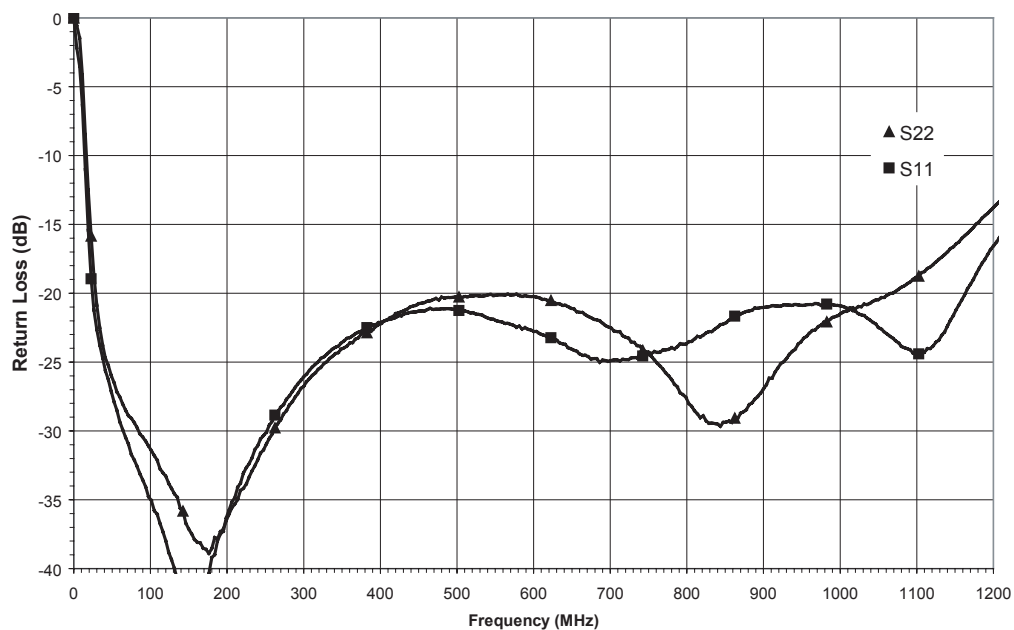


Figure 4: Input and Output Return Loss (S11 and S12) vs. Frequency
 ($T_A=+25\text{ }^\circ\text{C}$, $V_{DD}=+24\text{ V}$, 75 ohm system)

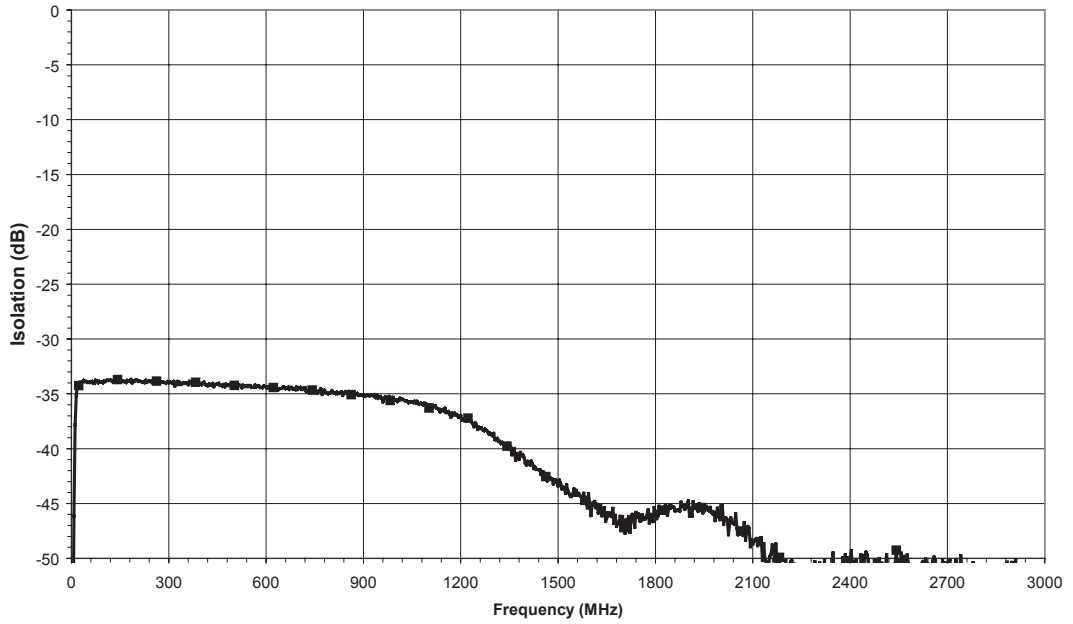


Figure 5: Isolation (S12) vs. Frequency
(T_A=+25 °C, V_{DD}=+24 V, 75 ohm system)

APPLICATION INFORMATION

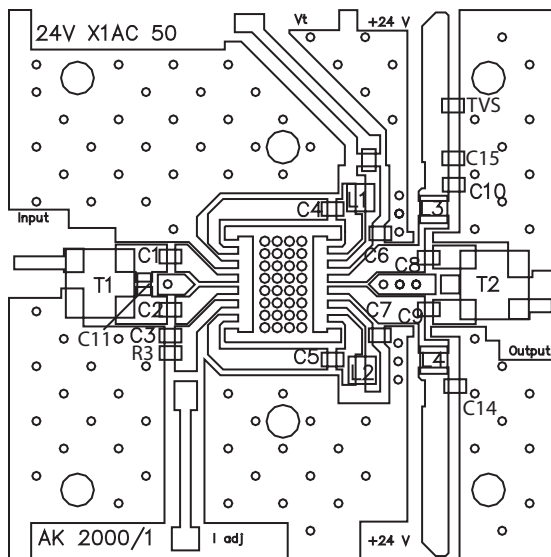


Figure 6: Evaluation Board Layout

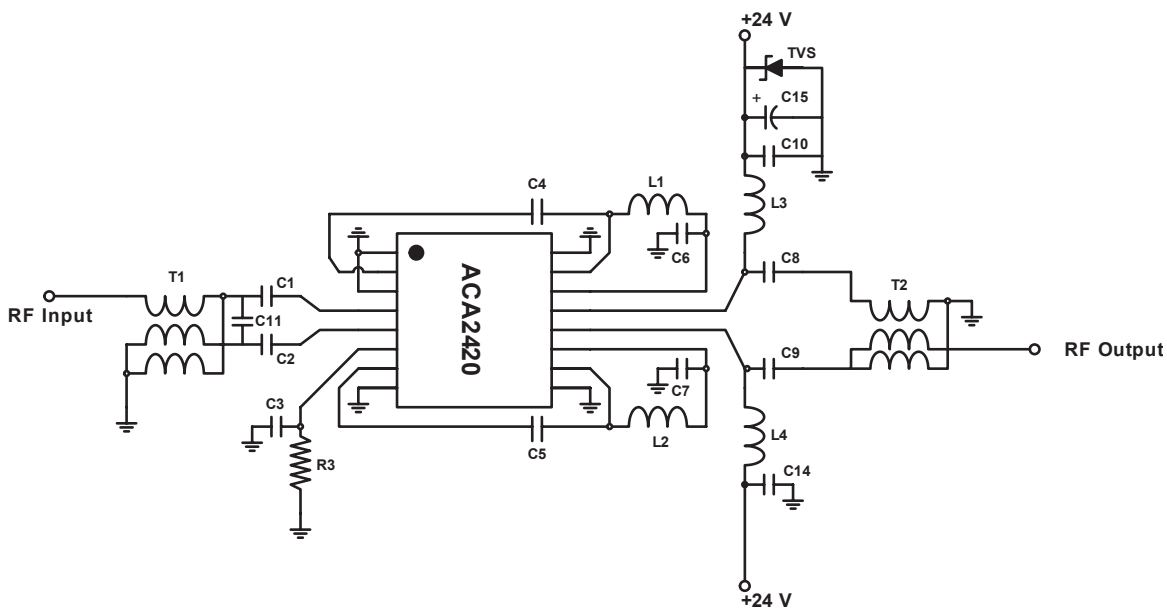


Figure 7: Evaluation Board Schematic

Table 5: Evaluation Board Parts List

| REF | DESCRIPTION | QTY | VENDOR | VENDOR P/N |
|------------------------------|--------------------------------------|-----|-----------------------------|----------------------|
| C1, C2, C3, C6, C7, C10, C14 | 0.01 μ F CHIP CAP | 7 | MURATA | GRM39X7R103K50V |
| C4, C5, C8, C9 | 270 pF CHIP CAP | 4 | MURATA | GRM39X7R271K50V |
| C11 | 1.0 pF CHIP CAP | 1 | MURATA | GRM36COG0R5C50 |
| C15 | 47 μ F ELECT CAP | 1 | DIGKEY CORP | P5275-ND |
| C12, C13, R2, R3 | NOT USED | | | |
| TVS | TVS 24 VOLT 600 WATT | 1 | DIGKEY CORP | SMBJ24ACCCT-ND |
| L1, L2, L3, L4 | 470 nH INDUCTOR | 4 | MURATA | LQH1WA47KONO003-4052 |
| R3 | 15 K Ω | - | - | - |
| CONNECTOR ⁽¹⁾ | 75 Ω N MALE PANEL MOUNT | 2 | PASTERNAK ENTERPRISES | PE4504 |
| T1, T2 | Balun | 2 | M/A-COM | MABA-009210-CT1760 |
| | Printed Circuit Board ⁽³⁾ | 1 | STANDARD PRINTED CIRC. INC. | 24VX1AC50 |
| INDIUM | 300 X 160 MILS | 1 | INDIUM CORP OF AMERICA | 14996Y |

Notes:

(1) N connector center pin should be approximately 80 mils in length.

(2) T1, T2, balun: 5.5 turns thru, as shown in Figure 15.

(3) Due to the power dissipation of this device, the printed circuit board should be mounted / attached to a heat sink.

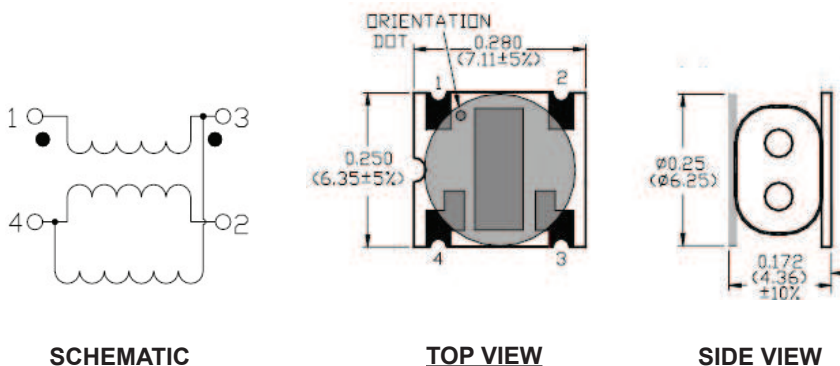
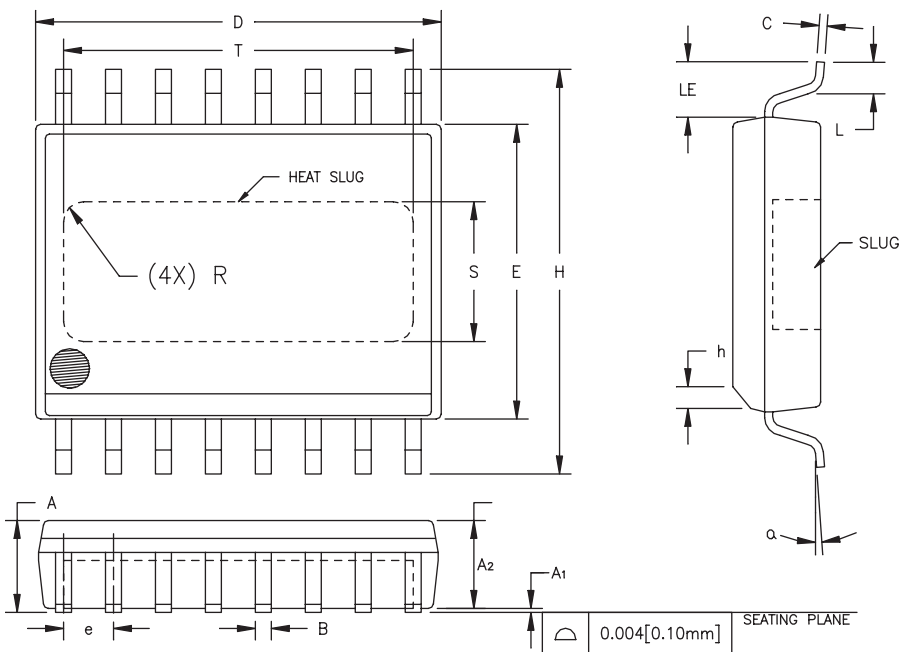


Figure 4: Balun Drawing

Note:

See M/A-COM's data sheet for more details.

PACKAGE OUTLINE



| S _v M _{Bo} | INCHES | | MILLIMETERS | | NOTE |
|--------------------------------|------------|-------|-------------|-------|------|
| | MIN. | MAX. | MIN. | MAX. | |
| A | 0.087 | 0.098 | 2.21 | 2.49 | |
| A ₁ | 0.000 | 0.004 | 0.00 | 0.10 | 6 |
| A ₂ | 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 | — | |
| α | 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 ±0.005 [0.13mm].
5. DIMENSIONS "S", "T" AND "R" INDICATE EXPOSED SLUG AREA.
6. STANDOFF HEIGHT (A₁) MEASURED FROM BOTTOM OF SLUG.

Figure 5: S7 Package Outline - 16 Pin Wide Body SOIC with Heat Slug

ORDERING INFORMATION

| ORDER NUMBER | TEMPERATURE RANGE | PACKAGE DESCRIPTION | COMPONENT PACKAGING |
|--------------|-------------------|--------------------------------------|-------------------------------------|
| ACA2420RS7P2 | -40 °C to +110 °C | 16 Pin Wide Body SOIC with Heat Slug | Tape and Reel, 1500 pieces per Reel |
| ACA2420RS7P0 | -40 °C to +110 °C | 16 Pin Wide Body SOIC with Heat Slug | Plastic Tubes, 25 pieces per Tube |

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