

## 3MHz, BiMOS Microprocessor Operational Amplifiers with MOSFET Input/CMOS Output

The CA5260A and CA5260 are integrated-circuit operational amplifiers that combine the advantage of both CMOS and bipolar transistors on a monolithic chip. The CA5260 series circuits are dual versions of the popular CA5160 series. They are designed and guaranteed to operate in microprocessor or logic systems that use +5V supplies.

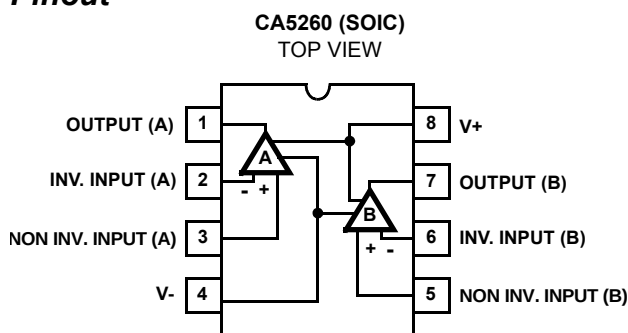
Gate-protected P-Channel MOSFET (PMOS) transistors are used in the input circuit to provide very-high-input impedance, very-low-input current, and exceptional speed performance. The use of PMOS field-effect transistors in the input stage results in common-mode input-voltage capability down to 0.5V below the negative-supply terminal, an important attribute in single-supply applications.

A complementary-symmetry MOS (CMOS) transistor-pair, capable of swinging the output voltage to within 10mV of either supply-voltage terminal (at very high values of load impedance), is employed as the output circuit.

The CA5260 Series circuits operate at supply voltages ranging from 4.5V to 16V, or  $\pm 2.25V$  to  $\pm 8V$  when using split supplies.

The CA5260, CA5260A have guaranteed specifications for 5V operation over the full military temperature range of -55°C to 125°C.

## Pinout



## Ordering Information

| PART NUMBER       | PART MARKING | TEMP. RANGE (°C) | PACKAGE                 | PKG. DWG. # |
|-------------------|--------------|------------------|-------------------------|-------------|
| CA5260AM96        | 5260A        | -55 to 125       | 8 Ld SOIC Tape and Reel | M8.15       |
| CA5260M           | 5260         | -55 to 125       | 8 Ld SOIC               | M8.15       |
| CA5260MZ (Note)   | CA5260MZ     | -55 to 125       | 8 Ld SOIC (Pb-free)     | M8.15       |
| CA5260MZ96 (Note) | CA5260MZ     | -55 to 125       | 8 Ld SOIC (Pb-free)     | M8.15       |

NOTE: Intersil Pb-free plus anneal products employ special Pb-free material sets; molding compounds/die attach materials and 100% matte tin plate termination finish, which are RoHS compliant and compatible with both SnPb and Pb-free soldering operations. Intersil Pb-free products are MSL classified at Pb-free peak reflow temperatures that meet or exceed the Pb-free requirements of IPC/JEDEC J STD-020.

## Features

- MOSFET Input Stage provides
  - Very High  $Z_i$  .....  $1.5T\Omega$  ( $1.5 \times 10^{12}\Omega$ ) (Typ)
  - Very Low  $I_i$  ..... 5pA (Typ) at 15V Operation  
2pA (Typ) at 5V Operation
- Ideal for Single Supply Applications
- Common Mode Input Voltage Range Includes Negative Supply Rail; Input Terminals Can be Swung 0.5V Below Negative Supply Rail
- CMOS Output Stage Permits Signal Swing to Either (or Both) Supply Rails
- CA5260A, CA5260 Have Full Military Temperature Range Guaranteed Specifications for  $V+ = 5V$
- CA5260A, CA5260 are Guaranteed to Operate Down to 4.5V for  $A_{OL}$
- Fully Guaranteed to Operate from -55°C to 125°C at  $V+ = 5V$ ,  $V- = GND$
- Pb-Free Plus Anneal Available (RoHS Compliant)

## Applications

- Ground Referenced Single Supply Amplifiers
- Fast Sample-Hold Amplifiers
- Long Duration Timers/Monostables
- Ideal Interface with Digital CMOS
- High Input Impedance Wideband Amplifiers
- Voltage Followers (e.g., Follower for Single Supply D/A Converter)
- Voltage Regulators (Permits Control of Output Voltage Down to 0V)
- Wien Bridge Oscillators
- Voltage Controlled Oscillators
- Photo Diode Sensor Amplifiers
- 5V Logic Systems
- Microprocessor Interface

# CA5260, CA5260A

## Absolute Maximum Ratings

Supply Voltage (Between V+ and V- Terminals) . . . . . 16V  
 Differential Input Voltage . . . . . 8V  
 Input Voltage . . . . . (V+ +8V) to (V- -0.5V)  
 Input Current . . . . . 1mA  
 Output Short Circuit Duration (Note 1). . . . . Indefinite

### Operating Conditions

Temperature Range . . . . . -55°C to 125°C

**CAUTION:** Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### NOTES:

1. Short circuit may be applied to ground or to either supply.
2.  $\theta_{JA}$  is measured with the component mounted on an evaluation PC board in free air.

## Thermal Information

Thermal Resistance (Typical, Note 2)  $\theta_{JA}$  (°C/W)  
 SOIC Package . . . . . 157  
 Maximum Junction Temperature (Die). . . . . 175°C  
 Maximum Junction Temperature (Plastic Package) . . . . . 150°C  
 Maximum Storage Temperature Range . . . . . -65°C to 150°C  
 Maximum Lead Temperature (Soldering 10s) . . . . . 300°C  
 (Lead Tips Only)

## Electrical Specifications

Typical Values Intended Only for Design Guidance, V+ = 5V, V- = 0V, T<sub>A</sub> = 25°C,  
 Unless Otherwise Specified

| PARAMETER                                                      | SYMBOL         | TEST CONDITIONS                                                   | TYPICAL VALUES |         | UNITS |
|----------------------------------------------------------------|----------------|-------------------------------------------------------------------|----------------|---------|-------|
|                                                                |                |                                                                   | CA5260         | CA5260A |       |
| Input Resistance                                               | R <sub>I</sub> |                                                                   | 1.5            | 1.5     | TΩ    |
| Input Capacitance                                              | C <sub>I</sub> | f = 1MHz                                                          | 4.3            | 4.3     | pF    |
| Unity Gain Crossover Frequency                                 | f <sub>T</sub> |                                                                   | 3              | 3       | MHz   |
| Slew Rate                                                      | SR             | V <sub>OUT</sub> = 2.5V <sub>P-P</sub>                            | 5              | 5       | V/μs  |
| Transient Response                                             |                | C <sub>L</sub> = 25pF, R <sub>L</sub> = 2kΩ<br>(Voltage Follower) |                |         |       |
| Rise Time                                                      | t <sub>r</sub> |                                                                   | 0.09           | 0.09    | μs    |
| Overshoot                                                      | OS             |                                                                   | 10             | 10      | %     |
| Settling Time (To <0.1%, V <sub>IN</sub> = 4V <sub>P-P</sub> ) | t <sub>S</sub> | C <sub>L</sub> = 25pF, R <sub>L</sub> = 2kΩ<br>(Voltage Follower) | 1.8            | 1.8     | μs    |

## Electrical Specifications

T<sub>A</sub> = 25°C, V+ = 5V, V- = 0V

| PARAMETER                          | SYMBOL              | TEST CONDITIONS                                     | CA5260 |      |     | CA5260A |      |     | UNITS |
|------------------------------------|---------------------|-----------------------------------------------------|--------|------|-----|---------|------|-----|-------|
|                                    |                     |                                                     | MIN    | TYP  | MAX | MIN     | TYP  | MAX |       |
| Input Offset Voltage               | V <sub>IO</sub>     | V <sub>O</sub> = 2.5V                               | -      | 2    | 15  | -       | 1.5  | 4   | mV    |
| Input Offset Current               | I <sub>IO</sub>     | V <sub>O</sub> = 2.5V                               | -      | 1    | 10  | -       | 1    | 10  | pA    |
| Input Current                      | I <sub>I</sub>      | V <sub>O</sub> = 2.5V                               | -      | 2    | 15  | -       | 2    | 15  | pA    |
| Common Mode Rejection Ratio        | CMRR                | V <sub>CM</sub> = 0 to 1V                           | 70     | 85   | -   | 80      | 85   | -   | dB    |
|                                    |                     | V <sub>CM</sub> = 0 to 2.5V                         | 50     | 55   | -   | 50      | 55   | -   | dB    |
| Common Mode Input Voltage Range    | V <sub>ICR+</sub>   |                                                     | 2.5    | 3    | -   | 2.5     | 3    | -   | V     |
|                                    | V <sub>ICR-</sub>   |                                                     | -      | -0.5 | 0   | -       | -0.5 | 0   | V     |
| Power Supply Rejection Ratio       | PSRR                | ΔV+ = 1V; ΔV- = 1V                                  | 70     | 84   | -   | 75      | 84   | -   | dB    |
| Large Signal Voltage Gain (Note 3) | A <sub>OL</sub>     | R <sub>L</sub> = ∞, V <sub>O</sub> = 0.5 to 4V      | 105    | 111  | -   | 107     | 113  | -   | dB    |
|                                    |                     | R <sub>L</sub> = 10kΩ, V <sub>O</sub> = 0.5 to 3.6V | 80     | 86   | -   | 83      | 86   | -   | dB    |
| Source Current                     | I <sub>SOURCE</sub> | V <sub>O</sub> = 0V                                 | 1.75   | 2.2  | -   | 1.75    | 2.2  | -   | mA    |
| Sink Current                       | I <sub>SINK</sub>   | V <sub>O</sub> = 5V                                 | 1.70   | 2    | -   | 1.70    | 2    | -   | mA    |

# CA5260, CA5260A

## Electrical Specifications $T_A = 25^\circ\text{C}$ , $V_+ = 5\text{V}$ , $V_- = 0\text{V}$ (Continued)

| PARAMETER      | SYMBOL       | TEST CONDITIONS          | CA5260 |      |      | CA5260A |      |      | UNITS |
|----------------|--------------|--------------------------|--------|------|------|---------|------|------|-------|
|                |              |                          | MIN    | TYP  | MAX  | MIN     | TYP  | MAX  |       |
| Output Voltage | $V_{OM+}$    | $R_L = \infty$           | 4.99   | 5    | -    | 4.99    | 5    | -    | V     |
|                | $V_{OM-}$    |                          | -      | 0    | 0.01 | -       | 0    | 0.01 | V     |
|                | $V_{OM+}$    | $R_L = 10\text{k}\Omega$ | 4.4    | 4.7  | -    | 4.4     | 4.7  | -    | V     |
|                | $V_{OM-}$    |                          | -      | 0    | 0.01 | -       | 0    | 0.01 | V     |
|                | $V_{OM+}$    | $R_L = 2\text{k}\Omega$  | 3      | 3.4  | -    | 3       | 3.4  | -    | V     |
|                | $V_{OM-}$    |                          | -      | 0    | 0.01 | -       | 0    | 0.01 | V     |
| Supply Current | $I_{SUPPLY}$ | $V_O = 0\text{V}$        | -      | 1.60 | 2.0  | -       | 1.60 | 2.0  | mA    |
|                |              | $V_O = 2.5\text{V}$      | -      | 1.80 | 2.25 | -       | 1.80 | 2.25 | mA    |

NOTE:

3. For  $V_+ = 4.5\text{V}$  and  $V_- = \text{GND}$ ;  $V_{OUT} = 0.5\text{V}$  to  $3.2\text{V}$  at  $R_L = 10\text{k}\Omega$ .

## Electrical Specifications $T_A = -55^\circ\text{C}$ to $125^\circ\text{C}$ , $V_+ = 5\text{V}$ , $V_- = 0\text{V}$

| PARAMETER                          | SYMBOL       | TEST CONDITIONS                                            | CA5260 |      |      | CA5260A |      |      | UNITS |
|------------------------------------|--------------|------------------------------------------------------------|--------|------|------|---------|------|------|-------|
|                                    |              |                                                            | MIN    | TYP  | MAX  | MIN     | TYP  | MAX  |       |
| Input Offset Voltage               | $V_{IO}$     | $V_O = 2.5\text{V}$                                        | -      | 3    | 20   | -       | 2    | 15   | mV    |
| Input Offset Current               | $I_{IO}$     | $V_O = 2.5\text{V}$                                        | -      | 1    | 10   | -       | 1    | 10   | nA    |
| Input Current                      | $I_I$        | $V_O = 2.5\text{V}$                                        | -      | 2    | 15   | -       | 2    | 15   | nA    |
| Common Mode Rejection Ratio        | CMRR         | $V_{CM} = 0$ to $1\text{V}$                                | 60     | 78   | -    | 65      | 78   | -    | dB    |
|                                    |              | $V_{CM} = 0$ to $2.5\text{V}$                              | 50     | 60   | -    | 50      | 60   | -    | dB    |
| Common Mode Input Voltage Range    | $V_{ICR+}$   |                                                            | 2.5    | 3    | -    | 2.5     | 3    | -    | V     |
|                                    | $V_{ICR-}$   |                                                            | -      | -0.5 | 0    | -       | -0.5 | 0    | V     |
| Power Supply Rejection Ratio       | PSRR         | $\Delta V_+ = 1\text{V}$ ;<br>$\Delta V_- = 1\text{V}$     | 60     | 65   | -    | 62      | 65   | -    | dB    |
| Large Signal Voltage Gain (Note 4) | $A_{OL}$     | $R_L = \infty$ ,<br>$V_O = 0.5$ to $4\text{V}$             | 70     | 78   | -    | 70      | 78   | -    | dB    |
|                                    |              | $R_L = 10\text{k}\Omega$ ,<br>$V_O = 0.5$ to $3.6\text{V}$ | 60     | 65   | -    | 60      | 65   | -    | dB    |
| Source Current                     | $I_{SOURCE}$ | $V_O = 0\text{V}$                                          | 1.3    | 1.6  | -    | 1.3     | 1.6  | -    | mA    |
| Sink Current                       | $I_{SINK}$   | $V_O = 5\text{V}$                                          | 1.2    | 1.4  | -    | 1.2     | 1.4  | -    | mA    |
| Output Voltage                     | $V_{OM+}$    | $R_L = \infty$                                             | 4.99   | 5    | -    | 4.99    | 5    | -    | V     |
|                                    | $V_{OM-}$    |                                                            | -      | 0    | 0.01 | -       | 0    | 0.01 | V     |
|                                    | $V_{OM+}$    | $R_L = 10\text{k}\Omega$                                   | 4.2    | 4.4  | -    | 4.2     | 4.4  | -    | V     |
|                                    | $V_{OM-}$    |                                                            | -      | 0    | 0.01 | -       | 0    | 0.01 | V     |
|                                    | $V_{OM+}$    | $R_L = 2\text{k}\Omega$                                    | 2.5    | 2.7  | -    | 2.5     | 2.7  | -    | V     |
|                                    | $V_{OM-}$    |                                                            | -      | 0    | 0.01 | -       | 0    | 0.01 | V     |
| Supply Current                     | $I_{SUPPLY}$ | $V_O = 0\text{V}$                                          | -      | 1.65 | 2.2  | -       | 1.65 | 2.2  | mA    |
|                                    |              | $V_O = 2.5\text{V}$                                        | -      | 1.95 | 2.35 | -       | 1.95 | 2.35 | mA    |

NOTE:

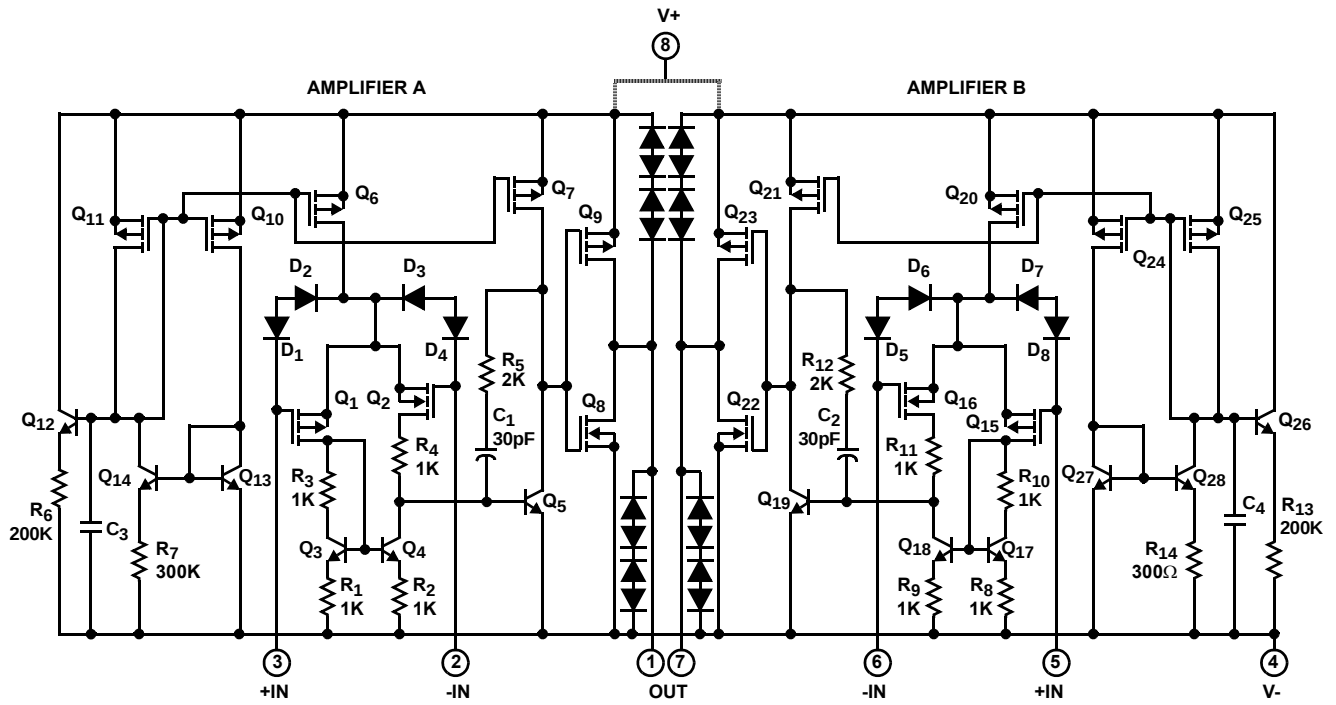
4. For  $V_+ = 4.5\text{V}$  and  $V_- = \text{GND}$ ;  $V_{OUT} = 0.5\text{V}$  to  $3.2\text{V}$  at  $R_L = 10\text{k}\Omega$ .

# CA5260, CA5260A

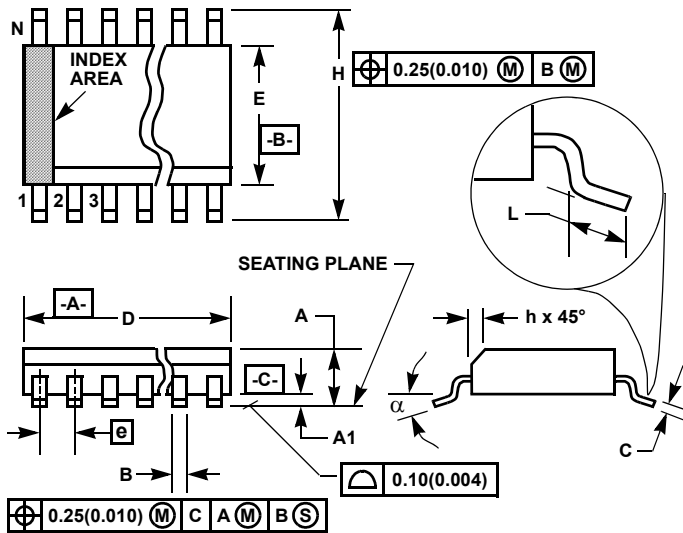
## Electrical Specifications Each Amplifier at $T_A = 25^\circ\text{C}$ , $V_+ = 15\text{V}$ , $V_- = 0\text{V}$ , Unless Otherwise Specified

| PARAMETER                                                    | SYMBOL                   | TEST CONDITIONS                              | CA5260 |            |      | CA5260A |            |      | UNITS                        |
|--------------------------------------------------------------|--------------------------|----------------------------------------------|--------|------------|------|---------|------------|------|------------------------------|
|                                                              |                          |                                              | MIN    | TYP        | MAX  | MIN     | TYP        | MAX  |                              |
| Input Offset Voltage                                         | $V_{IO}$                 | $V_S = \pm 7.5$                              | -      | 6          | 15   | -       | 2          | 5    | mV                           |
| Input Offset Current                                         | $I_{IO}$                 | $V_S = \pm 7.5$                              | -      | 0.5        | 30   | -       | 0.5        | 20   | pA                           |
| Input Current                                                | $I_I$                    | $V_S = \pm 7.5$                              | -      | 5          | 50   | -       | 5          | 30   | pA                           |
| Large Signal Voltage Gain                                    | $A_{OL}$                 | $V_O = 10V_{P-P}$<br>$R_L = 10k\Omega$       | 50     | 320        | -    | 50      | 320        | -    | kV/V                         |
|                                                              |                          |                                              | 94     | 110        | -    | 94      | 110        | -    | dB                           |
| Common Mode Rejection Ratio                                  | CMRR                     |                                              | 70     | 90         | -    | 80      | 95         | -    | dB                           |
| Common Mode Input Voltage Range                              | $V_{ICR}$                |                                              | 10     | -0.5 to 12 | 0    | 10      | -0.5 to 12 | 0    | V                            |
| Power Supply Rejection Ratio, $\Delta V_{IO}/\Delta V_{\pm}$ | PSRR                     | $V_S = \pm 7.5$                              | -      | 32         | 320  | -       | 32         | 150  | $\mu\text{V/V}$              |
| Maximum Output Voltage                                       | $V_{OM+}$                | $R_L = 10k\Omega$                            | 11     | 13.3       | -    | 11      | 13.3       | -    | V                            |
|                                                              | $V_{OM-}$                |                                              | -      | 0.002      | 0.01 | -       | 0.002      | 0.01 | V                            |
|                                                              | $V_{OM+}$                | $R_L = \infty$                               | 14.99  | 15         | -    | 14.99   | 15         | -    | V                            |
|                                                              | $V_{OM-}$                |                                              | -      | 0          | 0.01 | -       | 0          | 0.01 | V                            |
| Maximum Output Current                                       | $I_{OM+}$ (Source)       | $V_O = 7.5\text{V}$                          | 12     | 22         | 45   | 12      | 22         | 45   | mA                           |
|                                                              | $I_{OM-}$ (Sink)         |                                              | 12     | 20         | 45   | 12      | 20         | 45   | mA                           |
| Total Supply Current, $R_L = \infty$                         | I+                       | $V_O$ (Amp A) = 7.5V<br>$V_O$ (Amp B) = 7.5V | -      | 9          | 16.5 | -       | 9          | 16.5 | mA                           |
|                                                              |                          | $V_O$ (Amp A) = 0V<br>$V_O$ (Amp B) = 0V     | -      | 1.2        | 4    | -       | 1.2        | 4    | mA                           |
|                                                              |                          | $V_O$ (Amp A) = 0V $V_O$ (Amp B) = 7.5V      | -      | 5          | 9.5  | -       | 5          | 9.5  | mA                           |
| Input Offset Voltage Temperature Drift                       | $\Delta V_{IO}/\Delta T$ |                                              | -      | 8          | -    | -       | 6          | -    | $\mu\text{V}/^\circ\text{C}$ |
| Crosstalk                                                    |                          | f = 1kHz                                     | -      | 120        | -    | -       | 120        | -    | dB                           |

## Schematic Diagram



## Small Outline Plastic Packages (SOIC)



### NOTES:

1. Symbols are defined in the "MO Series Symbol List" in Section 2.2 of Publication Number 95.
2. Dimensioning and tolerancing per ANSI Y14.5M-1982.
3. Dimension "D" does not include mold flash, protrusions or gate burrs. Mold flash, protrusion and gate burrs shall not exceed 0.15mm (0.006 inch) per side.
4. Dimension "E" does not include interlead flash or protrusions. Interlead flash and protrusions shall not exceed 0.25mm (0.010 inch) per side.
5. The chamfer on the body is optional. If it is not present, a visual index feature must be located within the crosshatched area.
6. "L" is the length of terminal for soldering to a substrate.
7. "N" is the number of terminal positions.
8. Terminal numbers are shown for reference only.
9. The lead width "B", as measured 0.36mm (0.014 inch) or greater above the seating plane, shall not exceed a maximum value of 0.61mm (0.024 inch).
10. Controlling dimension: MILLIMETER. Converted inch dimensions are not necessarily exact.

### M8.15 (JEDEC MS-012-AA ISSUE C)

#### 8 LEAD NARROW BODY SMALL OUTLINE PLASTIC PACKAGE

| SYMBOL   | INCHES    |        | MILLIMETERS |      | NOTES |
|----------|-----------|--------|-------------|------|-------|
|          | MIN       | MAX    | MIN         | MAX  |       |
| A        | 0.0532    | 0.0688 | 1.35        | 1.75 | -     |
| A1       | 0.0040    | 0.0098 | 0.10        | 0.25 | -     |
| B        | 0.013     | 0.020  | 0.33        | 0.51 | 9     |
| C        | 0.0075    | 0.0098 | 0.19        | 0.25 | -     |
| D        | 0.1890    | 0.1968 | 4.80        | 5.00 | 3     |
| E        | 0.1497    | 0.1574 | 3.80        | 4.00 | 4     |
| e        | 0.050 BSC |        | 1.27 BSC    |      | -     |
| H        | 0.2284    | 0.2440 | 5.80        | 6.20 | -     |
| h        | 0.0099    | 0.0196 | 0.25        | 0.50 | 5     |
| L        | 0.016     | 0.050  | 0.40        | 1.27 | 6     |
| N        | 8         |        | 8           |      | 7     |
| $\alpha$ | 0°        | 8°     | 0°          | 8°   | -     |

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