

# RC7352

## Parametric Measurement Unit

### Features

- Force voltage/measure current and force current measure voltage functions
- Forced voltage range (-5V to +15V)
- Four programmable measured current ranges:  
Range A =  $\pm 20\mu\text{A}$  max  
Range B =  $\pm 200\mu\text{A}$  max  
Range C =  $\pm 1.0\text{mA}$  max  
Range D =  $\pm 40\text{mA}$  max
- High resolution current force/measure  $\pm 0.05\% = 2$  bits
- Internal control circuitry for selecting ranges
- High accuracy: 12 bit linearity and 0.5% gain error
- High current range D current limit protection set externally by the value of resistor  $R_{DIL}$
- Measurement output voltage can be disabled
- Forced current ranges:  
Range A =  $\pm 20\mu\text{A}$  max  
Range B =  $\pm 200\mu\text{A}$  max  
Range C =  $\pm 1.0\text{mA}$  max  
Range D =  $\pm 40\text{mA}$  max
- Measured voltage range: -5V to +15V

- High resolution voltage measurement ( $\pm 0.05\%$ ) and accuracy: ( $\pm 10\text{mV}$  max. offset) and 0.5% gain error
- Internal current limit for ranges (A, B, & C)

### Applications

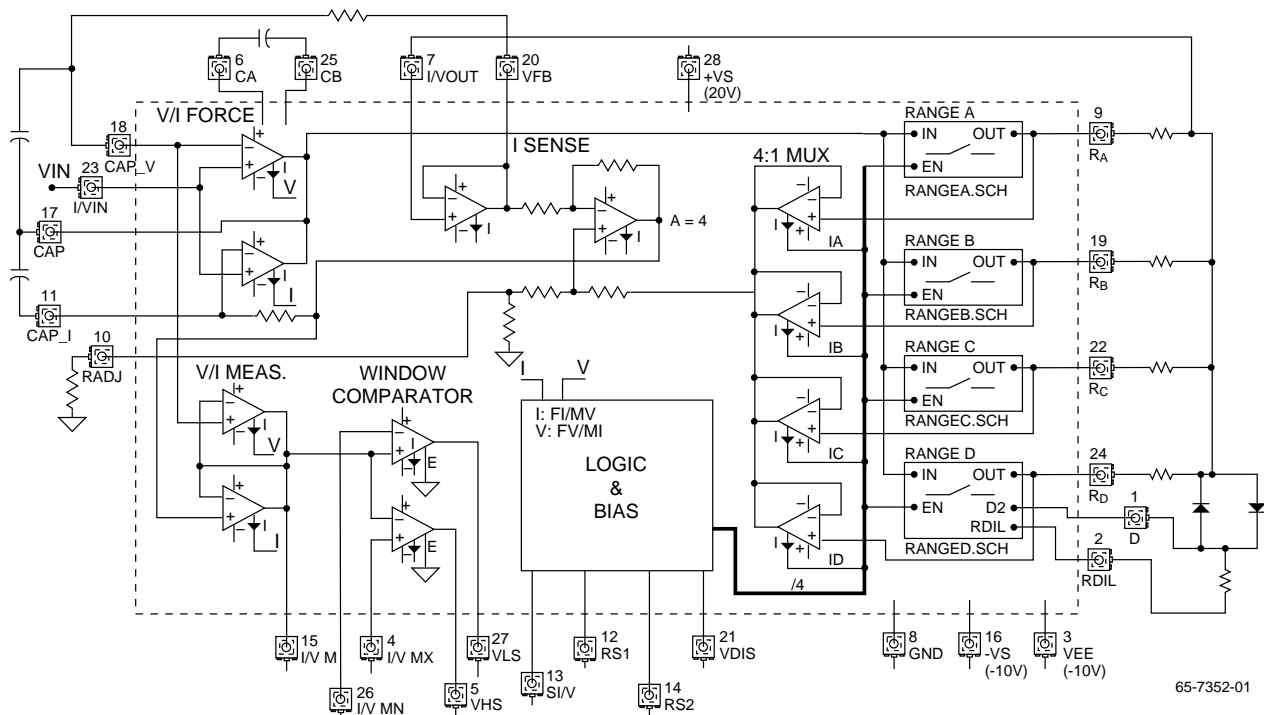
- ATE pin electronics measurements
- Instrumentation, meters
- Programmable voltage or current supply

### Description

The RC7352 is a "Per Pin" Parametric Measurement Unit (PMU) that can force voltage and measure current or force current and measure voltage. The RC7352 forces voltages from +15V to -5V when  $+V_S$  is 20V and  $-V_S$  is -10V, or currents up to  $\pm 40\text{mA}$ . All logic inputs for the RC7352 are TTL compatible, while the open collector logic outputs are TTL/CMOS compatible.

Setting the SI/V (Select I/V) pin low puts the RC7352 in the force voltage and measure current mode. The resulting output voltage at the DUT matches the input applied to the

### Block Diagram



I/VIN pin (please refer to block diagram). The I/VM pin provides a voltage proportional to the DUT current.  $V(I/VM) = (4 \times R \times I(DUT))$ , where R is the external range resistor (0.05% tolerance) and I(DUT) is the current supplied to the load. The resistors in the application circuit were chosen using this formula  $R \text{ range} = (2V/I_{max})$ , for Range A this is  $R_A = 2/20 \mu A$  or 100K.

When SI/V is high the RC7352 will force current and measure voltage. The range select pins RS1 and RS2 control the maximum output current (see Table 1), while magnitude of the forced current is given by the expression

$$I(DUT) = V(I/VIN)/(4 \times R)$$

where R is the range resistor. In the FI/MV mode the voltage at the I/VM pin equals the device voltage. The I/VM pin can be connected to an A/D convertor to monitor the current or voltage at the load device.

The RC7352 also has a window comparator that can provide upper or lower limit fail information. I/Vmx and I/Vmn are voltage inputs for the upper and lower limits respectively. You must use the formulas listed above to calculate current limits for each range while voltage limits are 1:1. Their corresponding outputs, VHF (V high fail) and VLF (V low fail) can be used individually or "Wire ORed" to obtain a

composite signal. Additionally the VDIS pin can be set high to disable the window comparator and its I/O lines. Although this reduces overall power consumption, it also disables the I/VM output.

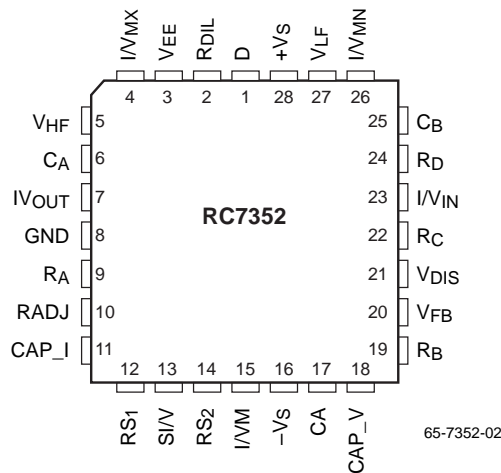
**Table 1. Maximum Output Current on Pin Select**

| SI/V | RS2 | RS1 | Mode  |
|------|-----|-----|---|
| 0    | 0   | 0   | FV/MI Range A, $I_{max} = \pm 20 \mu A$       |
| 0    | 0   | 1   | FV/MI Range B, $I_{max} = \pm 200 \mu A$      |
| 0    | 1   | 1   | FV/MI Range C, $I_{max} = \pm 1.0 \text{ mA}$ |
| 0    | 1   | 0   | FV/MI Range D, $I_{max} = \pm 40 \text{ mA}$  |
| 1    | 0   | 0   | FI/MV Range A, $I_{max} = \pm 20 \mu A$       |
| 1    | 0   | 1   | FI/MV Range B, $I_{max} = \pm 200 \mu A$      |
| 1    | 1   | 1   | FI/MV Range C, $I_{max} = \pm 1.0 \text{ mA}$ |
| 1    | 1   | 0   | FI/MV Range D, $I_{max} = \pm 40 \text{ mA}$  |

**Notes:**

1. FV/MI = Force Voltage Measure Current.
2. FI/MV = Force Current Measure Voltage.
3.  $+V_S - 5 \geq V_{OUT} \geq -V_S + 5$

## Pin Assignments



## Pin Description

| Pin Name                        | Pin Number | Pin Description  |
|---------------------------------|------------|--|
| +VS                             | 28         | +VS should be bypassed to ground with a 10.0 $\mu$ F tantalium capacitor placed as close to the pin as possible.   |
| -VS                             | 16         | -VS should be bypassed to ground with a 10.0 $\mu$ F tantalium capacitor placed as close to the pins as possible.  |
| V <sub>EE</sub>                 | 3          | V <sub>EE</sub> is the negative supply for range D. This pin should be bypassed with a 0.1 $\mu$ F ceramic capacitor to ground.  |
| GND                             | 8          | This pin should be connected to the printed circuit board's ground plane.  |
| I/V <sub>IN</sub>               | 23         | Input reference voltage for V <sub>OUT</sub> or I <sub>OUT</sub> . In the force voltage measure current mode (FV/MI)<br>$V(I/V_{OUT}) = V(I/V_{IN})$ and<br>$V(I/VM) = 4 \times I_{OUT} \times R$ Where I <sub>OUT</sub> is the device output current and R is the range resistor.<br>In the Force Current/Measure Voltage Mode<br>$I_{OUT} = \frac{V(I/V_{IN})}{4 \times R}$ $V(I/VM) = V(I/V_{OUT})$   |
| I/V <sub>OUT</sub>              | 7          | The Load or Device under test is connected to I/V <sub>OUT</sub> . The current to the load is supplied via the appropriate range resistor with I/V <sub>OUT</sub> serving as the voltage feedback point for the PMUs internal instrumentation amplifier.   |
| SI/V                            | 13         | A TTL/CMOS signal applied to this pin selects either Force Voltage/Measure Current or Force Current/Measure Voltage mode. A TTL/CMOS low level will select Force Voltage/Measure Current function. A TTL/CMOS high level selects Force Current/Measure Voltage mode.   |
| R <sub>A</sub>                  | 9          | Resistor R <sub>A</sub> should be placed between R <sub>A</sub> and I/V <sub>OUT</sub> . R <sub>A</sub> tolerance should be better than +0.05% to improve gain error. Maximum current for range A is shown in the equation below.<br>$I_A = \frac{\pm 2V}{R_A}$ The $\pm 2$ volts represents the maximum voltage V <sub>A</sub> across R <sub>A</sub> . For Range A, I <sub>A</sub> should not exceed $\pm 20 \mu$ A, i.e., R <sub>A</sub> should be higher than or equal to 100 k $\Omega$ . A metal film resistor should be used to reduce inherent resistor noise (schott and pop corn noise) and improve resolution. For maximum stability, a 300 pF capacitor should be connected across R <sub>A</sub> . |
| R <sub>B</sub>                  | 19         | For Range B, I <sub>B</sub> should not exceed $\pm 200 \mu$ A, i.e., R <sub>B</sub> should be higher than or equal to 10 k $\Omega$ with $\pm 0.05\%$ tolerance. For maximum stability a 1,000 pF capacitor should be connected across R <sub>B</sub> .  |
| R <sub>C</sub>                  | 22         | For Range C, I <sub>C</sub> should not exceed $\pm 1$ mA, i.e., R <sub>C</sub> should be higher than or equal to 2 k $\Omega$ with $\pm 0.05\%$ tolerance.   |
| R <sub>D</sub>                  | 24         | For Range D, I <sub>D</sub> should not exceed $\pm 40$ mA, i.e., R <sub>D</sub> should be higher than or equal to 50 $\Omega$ with $\pm 0.05\%$ tolerance.   |
| D                               | 1          | Two diodes must be connected between D & R <sub>D</sub> as shown in the block diagram.   |
| C <sub>A</sub> , C <sub>B</sub> | 6, 25      | A 30pF capacitor placed between these pins will improve stability.   |
| R <sub>DIL</sub>                | 2          | Range D output for current limiting. An external resistor is connected between R <sub>DIL</sub> and D to limit current to a value I <sub>LIM</sub> = 0.8V/R <sub>LM</sub> .  |

**Pin Description** (continued)

| Pin Name                                 | Pin Number     | Pin Description   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
|--|----------------|---|-----|-----|----------------|---|---|---|---|---|---|---|---|---|---|---|---|
| RS1,<br>RS2                              | 12<br>14       | RS1 and RS2 are TTL or CMOS compatible. The truth table below shows the range selection table.<br><br><table border="1"> <thead> <tr> <th>RS1</th> <th>RS2</th> <th>Range Selected</th> </tr> </thead> <tbody> <tr> <td>L</td> <td>L</td> <td>A</td> </tr> <tr> <td>L</td> <td>H</td> <td>B</td> </tr> <tr> <td>H</td> <td>H</td> <td>C</td> </tr> <tr> <td>H</td> <td>L</td> <td>D</td> </tr> </tbody> </table>                    | RS1 | RS2 | Range Selected | L | L | A | L | H | B | H | H | C | H | L | D |
| RS1                                      | RS2            | Range Selected  |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| L  | L              | A   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| L  | H              | B   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| H  | H              | C   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| H  | L              | D   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| I/V <sub>MX</sub> ,<br>I/V <sub>MN</sub> | 4<br>26        | The voltage applied to pin 4 sets the upper current or voltage limit for the measurement at pin 15 I/VM. To set the desired limit for current measurement a voltage equaling ( $4 \times I_L \times R$ ) must be applied on this pin. R is the external resistor of the selected range (A, B, C, or D). For voltage measurement the voltage applied to this pin is the limit.   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| V <sub>HF</sub>                          | 5              | V <sub>HF</sub> , High Fail, is an open collector output that requires a pull-up to the logic supply. If the voltage at pin 15, I/VM, is greater than the threshold voltage at pin 4, I/V <sub>MX</sub> , V <sub>HF</sub> will become a logic low. The open collector structure makes wire-ORing of multiple PMU's possible. Connect a 3,000 pF capacitor to GND to minimize oscillation at the cross-over point.                   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| V <sub>LF</sub>                          | 29             | V <sub>LF</sub> mirror V <sub>HF</sub> for the lower threshold I/V <sub>MN</sub> . Connect a 3,000 pF capacitor to GND to minimize oscillation at the cross over point.   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| V <sub>DIS</sub>                         | 21             | When V <sub>DIS</sub> is tied to ground output I/VM, V <sub>HF</sub> and V <sub>LF</sub> are enabled. If V <sub>DIS</sub> is open V <sub>HF</sub> and V <sub>LF</sub> will require external pullups to maintain a logic high. And I/VM will be in a high impedance state.   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| I/VM                                     | 15             | In the Force Voltage/Measure Current mode this output voltage is equal to four times the voltage across external resistor R of selected range A, B, C, or D through which the measured current is flowing ( $(I/V)_M = 4.0 \times I_M \times R$ ). In the Force Current/Measure Voltage mode this output is equal to the voltage at I/V out. This output can be disabled by applying a TTL HI on the V <sub>DIS</sub> pin. (Pin 21) |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| V <sub>FB</sub>                          | 20             | V <sub>FB</sub> , voltage feedback, is the buffered output voltage, I/V <sub>OUT</sub> . This pin should not be loaded. Connect a 50K 1% resistor from V <sub>FB</sub> to CAP_V.  |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| RADJ                                     | 10             | The RADJ pin is provided to adjust the offset for the ISENSE function. The best accuracy for V/IM is obtained when RADJ is shorted to analog ground. The point is terminated with a 100 $\Omega$ resistor in the block diagram.   |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |
| CAP_I<br>CAP_V<br>CA                     | 11<br>18<br>17 | CA is the common point for two 50 pF compensation capacitors that improve the stability of the PMU. These components are optional and can be omitted for some loads.  |     |     |                |   |   |   |   |   |   |   |   |   |   |   |   |

## Absolute Maximum Ratings<sup>1</sup>

| Parameter                          | Min.              | Max.                        | Units |
|------------------------------------|-------------------|-----------------------------|-------|
| Absolute Difference, $+V_S+ -V_S $ |                   | 32                          | V     |
| <b>Digital Control Inputs</b>      |                   |                             |       |
| SI/V, RS1, RS2, VDIS               | -2                | +6                          | V     |
| <b>Comparator Inputs</b>           |                   |                             |       |
| I/VMN, I/VMX                       | $I/VMN \leq +V_S$ | $-V_S \leq I/VMX$           | V     |
| I/VIN                              |                   | $-V_S \leq I/VIN \leq +V_S$ | V     |

### Notes:

1. Absolute maximum ratings are limiting values applied individually while all other parameters are within specified operating conditions. Functional operation under any of these conditions is NOT implied.
2. Applied voltage must be current limited to specified range, and measured with respect to GND.
3. Forcing voltage must be limited to specified range.
4. Current is specified as conventional current flowing into the device.

## Recommended Operating Conditions

| Symbol | Parameters                                       | Min.   | Typ.  | Max. | Units |
|--------|--|--------|-------|------|-------|
| TC     | Case operating temperature                       | 0      |       | 70   | °C    |
| +VS    | Positive supply voltage <sup>1</sup>             | 10.4   | 20.0  | 20.6 | V     |
| -VS    | Negative supply voltage <sup>1</sup>             | -15.75 | -10.0 | -9.5 | V     |
| VEE    | Negative supply voltage for range D <sup>2</sup> |        | -VS   |      | V     |
| RA     | Resistor for IA current range                    | 100    |       | 2000 | KΩ    |
| RB     | Resistor for IB current range                    | 10     |       | 200  | KΩ    |
| RC     | Resistor for IC current range                    | 2      |       | 40   | KΩ    |
| RD     | Resistor for ID current range                    | 50     |       | 1000 | Ω     |

### Notes:

1.  $+V_S + |-V_S| \leq 30V$   $+V_S + |-V_S| \geq 24$
2. -VS & VEE are always at the same voltage.

## DC Electrical Characteristics

+V<sub>S</sub> = 20V ±3%, -V<sub>S</sub> = -10V ±5% T<sub>A</sub> = 25°C, and external ±0.05% tolerance resistors R<sub>A</sub> = 1000kΩ, R<sub>B</sub> = 10kΩ, R<sub>C</sub> = 2kΩ, and R<sub>D</sub> = 50Ω unless otherwise specified.

| Symbol                                | Parameters  | Test Conditions  | Min.       | Typ.   | Max.        | Units   |
|---------------------------------------|---|--|------------|--------|-------------|---------|
| <b>Forced Current/Measure Voltage</b> |   |  |            |        |             |         |
| I/V <sub>IN</sub>                     | Input Voltage Range For Setting Forced Current (I <sub>F</sub> )                              | I/V <sub>FIN</sub> = 4 x I <sub>F</sub> x R                            | -8         |        | +8          | V       |
| I/V <sub>M</sub>                      | Measured Voltage Output @ (I/V) <sub>M</sub><br>Output Sink/Source Current                    | All ranges, full scale current<br>(I/V) <sub>M</sub> = -5V, +15V       | -5<br>-200 |        | +15<br>+200 | V<br>μA |
| V <sub>MR</sub>                       | Voltage Measured Resolution   |  | -0.05      | ±0.025 | +0.05       | %FSR    |
| V <sub>OR</sub>                       | Voltage Measurement Offset  | I/V <sub>IN</sub> = 0V; Measured @ I/V <sub>M</sub>                    | -6.0       | ±2     | +6.0        | mV      |
| V <sub>GE</sub>                       | Voltage Gain Error  | Gain of 4  | -2.0       | +0.5   | +2.0        | %       |
| CMRR <sup>1</sup><br>IOER             | I <sub>OUT</sub> Error Due to Common Mode Load Voltage  | -5V ≤ I/V <sub>OUT</sub> ≤ +15V; Measured @ (I/V) <sub>M</sub>         | 45         | 60     |             | dB      |
| <b>Forced Voltage/Measure Current</b> |   |  |            |        |             |         |
| I/V <sub>IN</sub>                     | Force Input Voltage Range   | All ranges, full scale current   | -5         |        | +15         | V       |
| I/V <sub>FVOS</sub>                   | Forced Voltage Offset   | I/V <sub>IN</sub> = 0V, measure I/V <sub>OUT</sub> and V <sub>FB</sub> | -6.0       | ±2     | +6.0        | mV      |
|                                       | Forced Voltage Linearity Error  |  |            | ±0.025 | ±0.05       | FSR%    |
| CMRR <sup>2</sup><br>VLER             | I <sub>OUT</sub> Measure Error Due to I/V <sub>M</sub> Common Mode Voltage                    | -FSR ≤ I <sub>OUT</sub> ≤ +FSR; Measured @ (I/V) <sub>M</sub>          | 45         | 60     |             | dB      |
| I/V <sub>OUT</sub>                    | Forced Output Voltage Range   | All ranges, full scale current   | -5         |        | +15         | V       |
| I/V <sub>M</sub>                      | Voltage Output Equivalent to Measured Current:<br>(I/V) <sub>M</sub> = 4 x I <sub>F</sub> x R | All ranges, full scale voltage   | -8         |        | +8          | V       |
| I                                     | I measured; I = (I/V <sub>M</sub> )/(4R)  | I/V <sub>M</sub> = -8.0V, +8.0V; full scale                            | -200       |        | +200        | μA      |
| <b>Current Ranges</b>                 |   |  |            |        |             |         |
| Range A                               |   |  |            |        |             |         |
| I <sub>A</sub>                        | Maximum Full Scale Current  | R <sub>A</sub> = 100kΩ (0.05%)   |            |        | ±20         | μA      |
| I <sub>AMR</sub>                      | Current Measurement Resolution  | guaranteed by design   |            | ±0.025 |             | %       |
| I <sub>LIN</sub>                      | Linearity <sup>3</sup>  |  | -0.05      | ±0.025 | +0.05       |         |
| I <sub>GE</sub>                       | Current Gain Error <sup>4</sup>   |  | -2.0       | 0.5    | +2.0        | %       |
| I <sub>FIOS</sub>                     | Force Current Offset <sup>5</sup>   | I/V <sub>IN</sub> = 0V   | -25        | ±10    | +25         | nA      |
| I <sub>MIOS</sub>                     | Measure Current Offset <sup>6</sup>   | I/V <sub>IN</sub> = 0V   | -25        | ±10    | +25         | nA      |
| Range B                               |   |  |            |        |             |         |
| I <sub>B</sub>                        | Maximum Full Scale Current  | R <sub>B</sub> = 10kΩ (0.05%)  |            |        | ±200        | μA      |
| I <sub>BMR</sub>                      | Current Measurement Resolution  | guaranteed by design   |            | ±0.025 |             | %       |
| I <sub>LIN</sub>                      | Linearity <sup>3</sup>  |  | -0.05      | ±0.025 | +0.05       |         |
| I <sub>GE</sub>                       | Current Gain Error <sup>4</sup>   |  | -2.0       | ±0.5   | +2.0        | %       |
| I <sub>FIOS</sub>                     | Force Current Offset <sup>5</sup>   |  | -250       | ±100   | +250        | nA      |
| I <sub>MIOS</sub>                     | Measure Current Offset <sup>6</sup>   |  | -250       | ±100   | +250        | nA      |

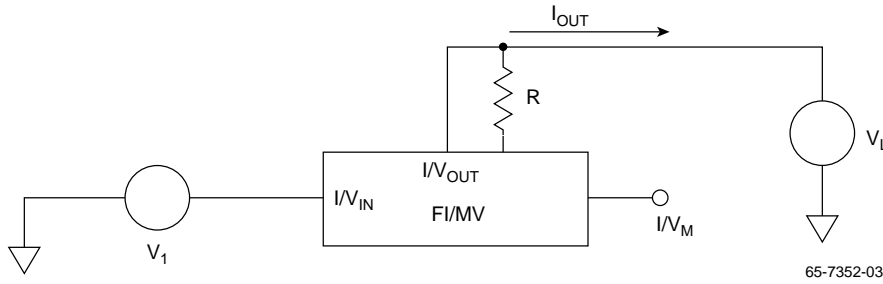
**DC Electrical Characteristics** (continued)

| Symbol   | Parameters   | Test Conditions              | Min.  | Typ.  | Max.  | Units |
|--|--|------------------------------|-------|-------|-------|-------|
| <b>Range C</b>   |  |                              |       |       |       |       |
| I <sub>C</sub>   | Maximum Full Scale Current                                     | R <sub>C</sub> = 2kΩ (0.05%) |       |       | ±1    | mA    |
| I <sub>CMR</sub>   | Current Measurement Resolution                                 | guaranteed by design         |       | ±.025 |       | %     |
| I <sub>LIN</sub>   | Linearity <sup>3</sup>   |                              | -0.05 | ±.025 | +0.05 | %     |
| I <sub>GE</sub>  | Current Gain Error <sup>4</sup>                                |                              | -2.0  | ±0.5  | +2.0  | %     |
| I <sub>FIOS</sub>  | Force Current Offset <sup>5</sup>                              |                              | -1.5  | ±0.5  | +1.5  | μA    |
| I <sub>MIOS</sub>  | Measure Current Offset <sup>6</sup>                            |                              | -1.5  | ±0.5  | +1.5  | μA    |
| <b>Range D</b>   |  |                              |       |       |       |       |
| I <sub>C</sub>   | Maximum Full Scale Current                                     | R <sub>D</sub> = 50Ω (0.05%) |       |       | ±40   | mA    |
| I <sub>DMR</sub>   | Current Measurement Resolution<br>Current Measurement Accuracy | guaranteed by design         |       | ±.025 |       | %     |
| I <sub>LIN</sub>   | Linearity <sup>3</sup>   |                              | -0.05 | ±.025 | +0.05 | %     |
| I <sub>GE</sub>  | Current Gain Error <sup>4</sup>                                |                              | -2.0  | ±0.5  | +2.0  | %     |
| I <sub>FIOS</sub>  | Force Current Offset <sup>5</sup>                              |                              | -50   | ±20   | +50   | μA    |
| I <sub>MIOS</sub>  | Measure Current Offset <sup>6</sup>                            |                              | -50   | ±20   | +50   | μA    |
| <b>Digital Control Inputs (SI/V, RS<sub>1</sub>, RS<sub>2</sub>)</b> |  |                              |       |       |       |       |
| V <sub>IH</sub>  | Internal Threshold Voltage                                     |                              | 0.8   | 1.4   | 2.0   | V     |
| I <sub>LH</sub>  | Logic High Bias Current  | V <sub>H</sub> = 2.0V        |       | 200   |       | nA    |
| I <sub>LL</sub>  | Logic Low Bias Current   | V <sub>L</sub> = 0.8V        |       | 2.0   |       | nA    |
| <b>Digital Control Input V<sub>DIS</sub></b>                         |  |                              |       |       |       |       |
| V <sub>IH</sub>  | Internal Threshold Voltage                                     |                              | 0.8   | 1.4   | 2.0   | V     |
| I <sub>LH</sub>  | Logic High Bias Current  | V <sub>H</sub> = 2.0V        |       | 1.0   |       | μA    |
| I <sub>LL</sub>  | Logic Low Bias Current   | V <sub>L</sub> = 0.8V        |       | 2.0   |       | nA    |
| <b>Comparator Input; I/V<sub>MAX</sub>, I/V<sub>MIN</sub></b>        |  |                              |       |       |       |       |
| I/V <sub>MX,MN</sub>   | Input Voltage Range  |                              | -8.0  |       | +15   | V     |
| I <sub>H</sub>   | Input Bias Current (Logic High)                                | V <sub>H</sub> = +15V        |       | 0.4   |       | μA    |
| I <sub>L</sub>   | Input Bias Current (Logic Low)                                 | V <sub>L</sub> = 0.8V        |       | 0.4   |       | μA    |
| <b>Comparator Status Outputs; V<sub>HF</sub>, V<sub>LF</sub></b>     |  |                              |       |       |       |       |
| V <sub>OH</sub>  | Output Voltage (Logic High)                                    | R <sub>PULLUP</sub> = 10kΩ   | 3.5   |       |       | V     |
| V <sub>OL</sub>  | Output Voltage (Logic Low)                                     | R <sub>PULLUP</sub> = 10kΩ   |       |       | 0.8   | V     |
| I <sub>OH</sub>  | Output Current High  | V <sub>OUT</sub> = 5.0V      |       | 0.1   |       | μA    |
| I <sub>OL</sub>  | Output Current Low   |                              |       |       | 1.0   | mA    |
| I <sub>Z</sub>   | Output Leakage Current Disable State                           | V <sub>OUT</sub> = 5.0V      |       | 0.1   |       | μA    |
| <b>Other</b>   |  |                              |       |       |       |       |
| I+ (1.0)   | Positive Supply Current  | No load Range A              |       | 4.0   | 11.0  | mA    |
| I- (2.0)   | Positive Supply Current  | No load Range A              |       | 4.0   | 11.0  | mA    |

**Notes:**

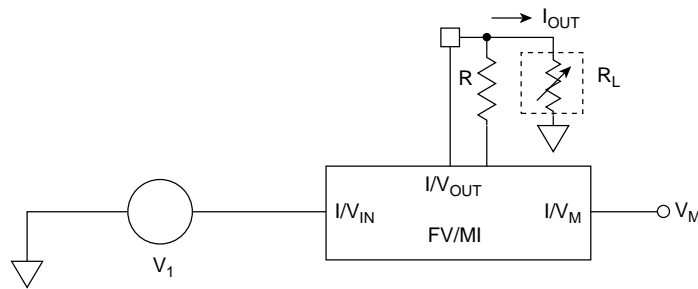
- CMRR is measured with V<sub>L</sub>=15V/-5V; R is R<sub>A</sub>, R<sub>B</sub>, R<sub>C</sub> or R<sub>D</sub>; V<sub>1</sub> = constant; This parameter is to define the I<sub>OUT</sub> current error due to the V<sub>L</sub> common mode voltage for a constant V<sub>1</sub>. This parameter is guaranteed to full V<sub>1</sub> range. (±8V)

$$CMRR = 20 \log \left( \frac{\Delta I_{OUT} \times 4 \times R}{\Delta V_L} \right)$$



2. CMRR is measured with  $V_1 = +15V/-5V$ ; R is  $R_A, R_B, R_C$  or  $R_D$ ;  $I_{OUT} = \text{constant}$ . This parameter is to define the current measurement error due to the input voltage  $V_1$ . It guarantees all ranges and  $\pm$  full scale  $I_{OUT}$ .

$$CMRR = 20 \log \left( \frac{\Delta V_M}{\Delta V_1} \right)$$



3. Linearity is measured against two point straight line calibration with five measurement points.  
 4. Current Gain Error is measured with  $-$ full scale current to  $+$ full scale current. The ideal gain is 4.

$$\text{Current Gain Error} = \left| \frac{VM_2 - VM_1}{R(I_{OUT2} - I_{OUT1})} \right|$$

5. Force current is measured with  $I/V_{OUT}$  to ground with  $I/V_{IN} = 0V$ .  
 6. Measured current offset is measured with  $I/V_{IN} = 0V$ ,  $\text{Offset} = (I/V_M)/4R$  where R is  $R_A, R_B, R_C$ , and  $R_D$ .

## AC Electrical Characteristics

+V<sub>S</sub> = 20V ±3%, -V<sub>S</sub> = -10V ±5%, T<sub>A</sub> = 25°C, and external ±0.05% tolerance resistors R<sub>A</sub> = 100kΩ, R<sub>B</sub> = 10kΩ, R<sub>C</sub> = 2kΩ, and R<sub>D</sub> = 50Ω unless otherwise specified.

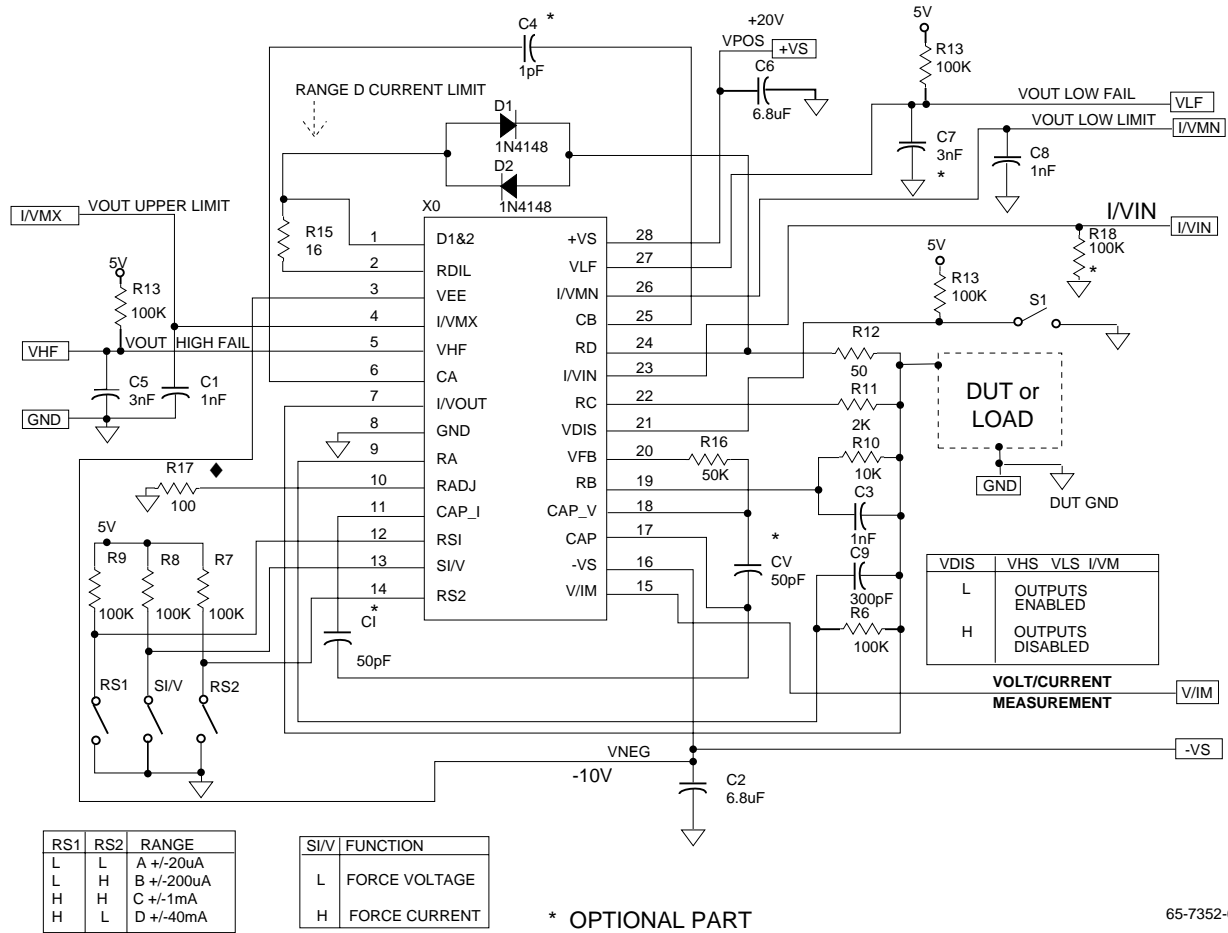
| Symbol                        | Parameters  | Test Conditions   | Min. | Typ.                     | Max. | Units |
|-------------------------------|---|---|------|--------------------------|------|-------|
| <b>Comparator</b>             |   |   |      |                          |      |       |
| t <sub>HL</sub>               | Response Time High to Low   | R <sub>LOAD</sub> = 10k, 5mV Overdrive  |      | 1.1                      |      | μs    |
| t <sub>LH</sub>               | Response Time Low to High   | R <sub>LOAD</sub> = 10k, 5mV Overdrive  |      | 450                      |      | ns    |
| <b>Differential Amplifier</b> |   |   |      |                          |      |       |
| t <sub>MZF</sub>              | Response Time (setting time) <sup>1</sup><br>Force Current/Measure Voltage  | Range A<br>Range B<br>Range C<br>Range D<br>Voltage @ I/V <sub>M</sub> = -5.0V to +15V<br>I <sub>F</sub> = Max      |      | 2.4<br>2.3<br>2.6<br>2.6 |      | ms    |
| t <sub>MZF</sub>              | Response Time (settling time) <sup>1</sup><br>Force Voltage/Measure Current | Ranges A<br>Ranges B<br>Ranges C<br>Ranges D<br>Voltage @ I/V <sub>OUT</sub> = 5.0V to +15V<br>I <sub>M</sub> = Max |      | 2.4<br>2.5<br>2.6<br>2.7 |      | ms    |
| t <sub>MZF</sub>              | Response Time (Settling time) <sup>1</sup>                                  | Ranges A, B, C, & D<br>Voltage @ I/V <sub>OUT</sub> = -2.0V to +6.0V<br>30pF from CA to CB<br>No Load               |      | 1.0                      | 3    | ms    |
| t <sub>DS</sub>               | Output Disable to Enable Time   |   |      | 20                       |      | μs    |

**Notes:**

1. Response Time (settling time) for Force Current/Measure Voltage mode is measured with 30pF from CA to CB and I/V<sub>IN</sub> Voltage Swings from -8.0V to +8.0V, and R<sub>L</sub> value for Range placed between I/V<sub>OUT</sub> and 5V.

500KΩ     A  
 50KΩ     B  
 10KΩ     C  
 250Ω     D

# Application Example



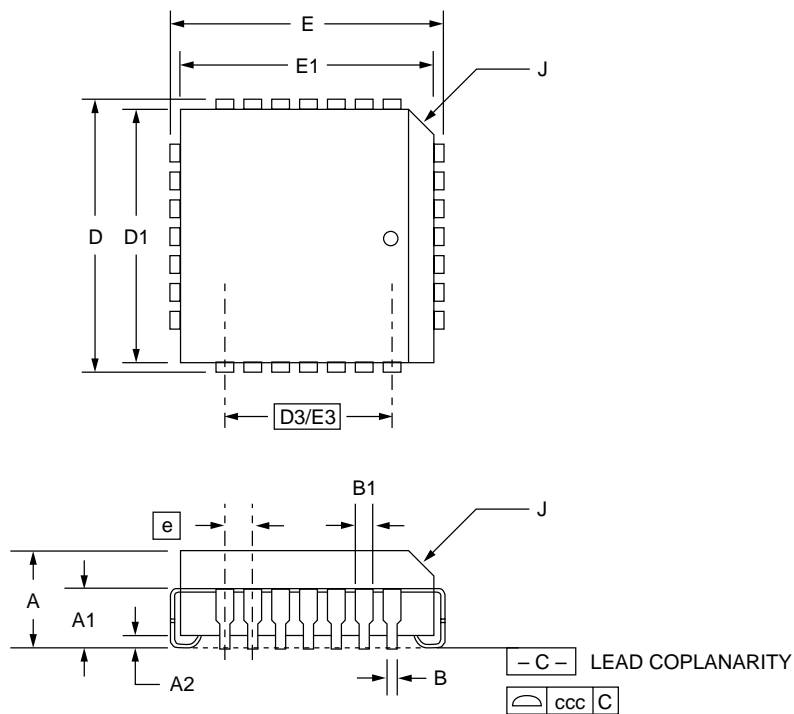
65-7352-05

# Mechanical Dimensions

| Symbol | Inches   |      | Millimeters |       | Notes |
|--------|----------|------|-------------|-------|-------|
|        | Min.     | Max. | Min.        | Max.  |       |
| A      | .165     | .180 | 4.19        | 4.57  |       |
| A1     | .090     | .120 | 2.29        | 3.05  |       |
| A2     | .020     | —    | .51         | —     |       |
| B      | .013     | .021 | .33         | .53   |       |
| B1     | .026     | .032 | .66         | .81   |       |
| D/E    | .485     | .495 | 12.32       | 12.57 |       |
| D1/E1  | .450     | .456 | 11.43       | 11.58 | 3     |
| D3/E3  | .300 BSC |      | 7.62 BSC    |       |       |
| e      | .050 BSC |      | 1.27 BSC    |       |       |
| J      | .042     | .048 | 1.07        | 1.22  | 2     |
| ND/NE  | 7        |      | 7           |       |       |
| N      | 28       |      | 28          |       |       |
| ccc    | —        | .004 | —           | 0.10  |       |

**Notes:**

1. All dimensions and tolerances conform to ANSI Y14.5M-1982.
2. Corner and edge chamfer (J) = 45°.
3. Dimension D1 and E1 do not include mold protrusion. Allowable protrusion is .101" (.25mm).



## Ordering Information

| Part Number | Package     |
|-------------|-------------|
| RC7352QA    | 28-pin PLCC |

### LIFE SUPPORT POLICY

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2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.