

# Single Rail-to-Rail Operational Amplifiers

## Features

- Wide Supply Operation Range +4.5V to +20V
- Beyond the Rails Input Capability
- Rail-to-Rail Output Swing
- Low Supply Current, 3mA (Typical)
- Low Input Offset Voltage 2mV (Typical)
- Internal Frequency Compensated for Unit Gain Stable
- Wide Bandwidth (unit gain) 30MHz
- High Slew Rate  $\approx 150V/\mu s$
- Large DC Voltage Gain 80dB (Typical)
- $\pm 180mA$  Output Short Current
- Embedded Over-Temperature Protection
- Short-Circuit Current Limit Protection
- TSOT-23-5 and SC-70-5 (SOT-353) Package Available

## Applications

- Portable Equipment
- TFT Vcom/Gamma buffers
- Battery-Powered Equipment
- ASIC Input or Output Amplifier
- Low Power/Low Voltage Applications

## General Description

The G1562 is a single rail-to-rail input/output operation amplifier with the low power, high voltage swing. Operating on supplies ranging from 4.5V to 20V, while current consuming only 3mA, the G1562 is with high unit-gain bandwidth of 30MHz. The G1562 also provides common mode input ability beyond the supply rails, as well as rail-to-rail output capability. This enables this amplifier to offer maximum dynamic range at any supply voltage.

The G1562 also features fast slewing and settling times, as well as a high output drive capability of 65mA (sink and source). These features make these amplifiers ideal for high speed filtering and signal conditioning application. Other applications include battery power, TFT Vcom /Gamma buffers, portable devices, and anywhere low power consumption is important.

There are over temperature and short-circuit current limit protection embedded to avoid the unexpected damages. The G1562 is available in TSOT-23-5 and SC-70-5 (SOT-353) package.

## Ordering Information

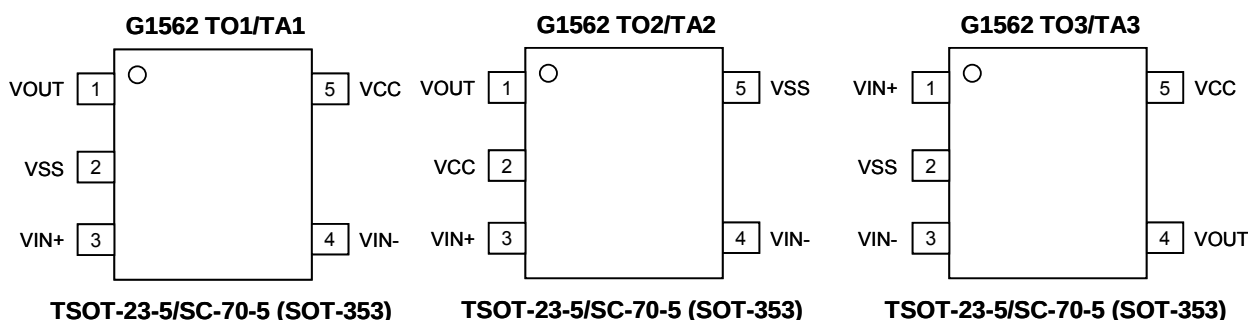
| ORDER NUMBER | MARKING | TEMP. RANGE  | PACKAGE (Green)   |
|--------------|---------|--------------|-------------------|
| G1562TO1U    | 1562x   | -40°C~ +85°C | TSOT-23-5         |
| G1562TO2U    | 152Ax   | -40°C~ +85°C | TSOT-23-5         |
| G1562TO3U    | 152Bx   | -40°C~ +85°C | TSOT-23-5         |
| G1562TA1U    | 15Ax    | -40°C~ +85°C | SC-70-5 (SOT-353) |
| G1562TA2U    | 15Bx    | -40°C~ +85°C | SC-70-5 (SOT-353) |
| G1562TA3U    | 15Cx    | -40°C~ +85°C | SC-70-5 (SOT-353) |

Note: TO: TSOT-23-5 TA: SC-70-5 (SOT-353)

1& 2 & 3: Bonding Code

U: Tape & Reel

## Pin Configuration



## Absolute Maximum Ratings

Supply Voltage ( $V_{CC}$  to  $V_{SS}$ ) . . . . . +24V  
 Input Voltage. . . . .  $V_{SS}-0.3V$  to  $V_{CC}+0.3V$   
 Storage Temperature Range. . . . .  $-65^{\circ}C$  to  $150^{\circ}C$   
 Junction Temperature. . . . .  $150^{\circ}C$   
 Reflow Temperature (soldering, 10sec) . . . . .  $260^{\circ}C$   
 Thermal Resistance Junction to Ambient, ( $\theta_{JA}$ )\*  
 TSOT-23-5 . . . . .  $250^{\circ}C/W$   
 SC-70-5 (SOT-353) . . . . .  $450^{\circ}C/W$   
 Continuous Power Dissipation ( $T_A=25^{\circ}C$ )\*  
 TSOT-23-5 . . . . . 0.5W  
 SC-70-5 (SOT-353) . . . . . 0.28W

Thermal Resistance Junction to Case, ( $\theta_{JC}$ )  
 TSOT-23-5 . . . . .  $60^{\circ}C/W$   
 SC-70-5 (SOT-353) . . . . .  $180^{\circ}C/W$

## Recommend Operating Range

Operating Supply Voltage Range. .  $6.5V \leq V_{DD} \leq 19.5V$   
 Operating Temperature Range . . . . .  $-40^{\circ}C$  to  $85^{\circ}C$   
 ESD Susceptibility . . . . . 2000V

\*Please refer to Minimum Footprint PCB Layout Section.

## Electrical Characteristics

$V_{CC} = 10V$ ;  $V_{SS} = 0V$ ;  $T_{AMB} = 25^{\circ}C$ ;  $R_L = 1K\Omega$  to  $V_{CC}/2$ .

The device is not guaranteed to function outside its operating conditions. Parameters with MIN and/or MAX limits are 100% tested at  $+25^{\circ}C$ , unless otherwise specified.

| PARAMETER                    | SYMBOL          | CONDITION                                   | MIN  | TYP       | MAX          | UNIT       |
|------------------------------|-----------------|---------------------------------------------|------|-----------|--------------|------------|
| <b>Supplies</b>              |                 |                                             |      |           |              |            |
| Supply Voltage Range         | $V_{CC}$        | Note1                                       | 4.5  | ---       | 20           | V          |
| Supply Current               | $I_{CC}$        | $V_O=5V$ no load                            | ---  | 3         | 5            | mA         |
| <b>DC Characteristics</b>    |                 |                                             |      |           |              |            |
| Input Offset Voltage         | $V_{I(OS)}$     |                                             | ---  | 2         | 12           | mV         |
| Common Mode Voltage          | $V_{CM}$        | Inferred from CMRR test                     | -0.5 | ---       | $V_{CC}+0.5$ | V          |
| Input Bias Current           | $I_B$           | $V_O=5V$                                    | ---  | 20        | 100          | nA         |
| Input Bias Current Offset    | $I_{OS}$        | $V_O=5V$                                    | ---  | 2         | 50           | nA         |
| Open Loop Gain               | $A_V$           | $0.5V \leq V_{OUT} \leq 9.5V$ (no load)     | 70   | 80        | ---          | dB         |
| Output Voltage Swing High    | $V_{OH}$        | $I_L=5mA$                                   | 9.86 | 9.92      | ---          | V          |
| Output Voltage Swing Low     | $V_{OL}$        | $I_L=-5mA$                                  | ---  | 0.08      | 0.14         | V          |
| Power Supply Rejection Ratio | PSRR            | $7V \leq V_{CC} \leq 18V$                   | 65   | 80        | ---          | dB         |
| Common-Mode Rejection Ratio  | CMRR            | $V_{SS} \leq V_{CM} \leq V_{CC}$            | 50   | 65        | ---          | dB         |
| Channel Separation           | $\alpha$        | $f=1kHz$                                    | ---  | 90        | ---          | dB         |
| Output Current               | $I_{O(Source)}$ |                                             | ---  | 65        | ---          | mA         |
|                              | $I_{O(Sink)}$   |                                             | ---  | 65        | ---          | mA         |
| Short Circuit Current        | $I_{SC}$        |                                             | ---  | $\pm 180$ | ---          | mA         |
| Slew-Rate                    | SR              | $1V \leq V_{CC} \leq 9V$ ; 20% to 80%       | ---  | 150       | ---          | V/ $\mu S$ |
| Unit-Gain Bandwidth          | BW              | No load                                     | ---  | 30        | ---          | MHz        |
| Phase Margin                 | PH              | No load                                     | ---  | 50        | ---          | degree     |
| Settling Time                | $t_s$           | $A_V=+1$ , $V_O=2V$ step (Settling to 0.1%) | ---  | 130       | ---          | nS         |

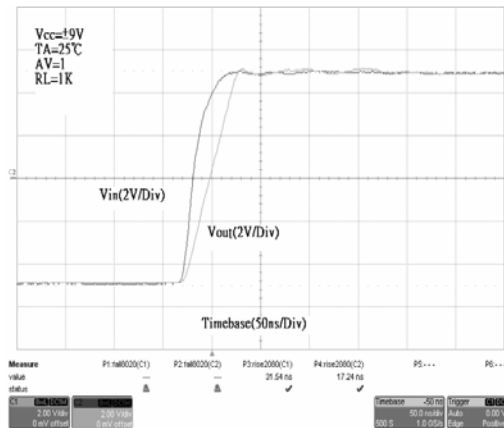
**Note1:** Guaranteed by the Power-Supply Rejection Ratio (PSRR) test



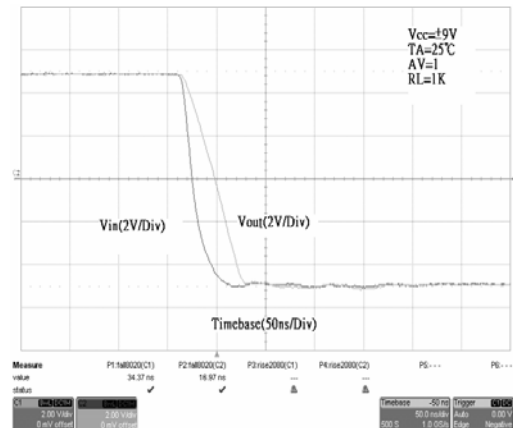
## Typical Performance Characteristics

 $(V_{IN} = \pm 9V, V_{OUT} = 0V, T_A = 25^\circ C)$ 

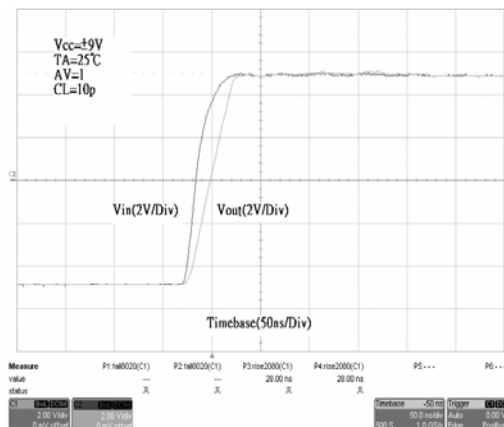
Large Signal Transient Response



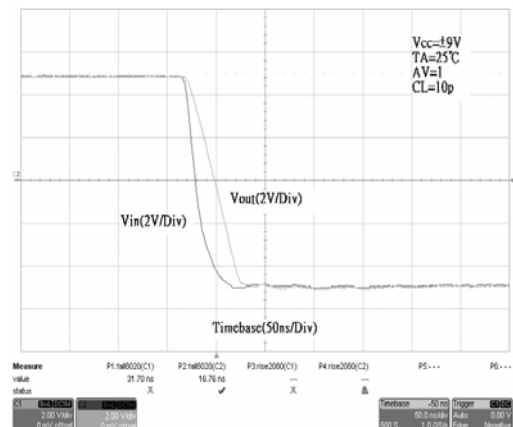
Large Signal Transient Response



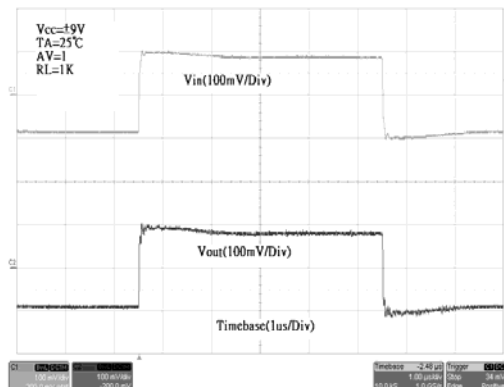
Large Signal Transient Response



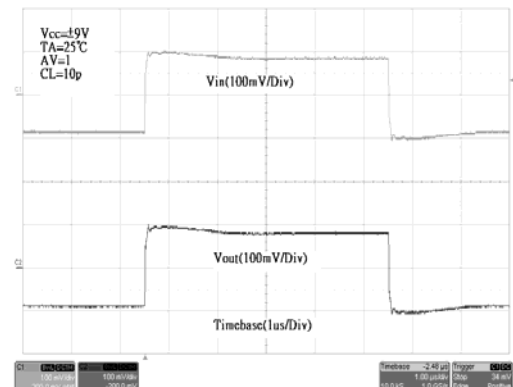
Large Signal Transient Response



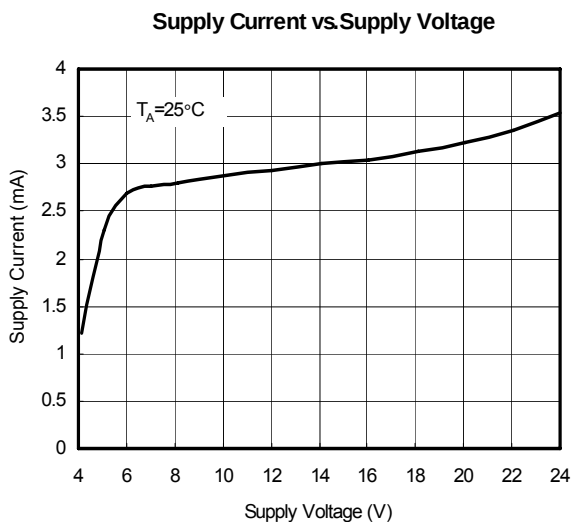
Small Signal Transient Response



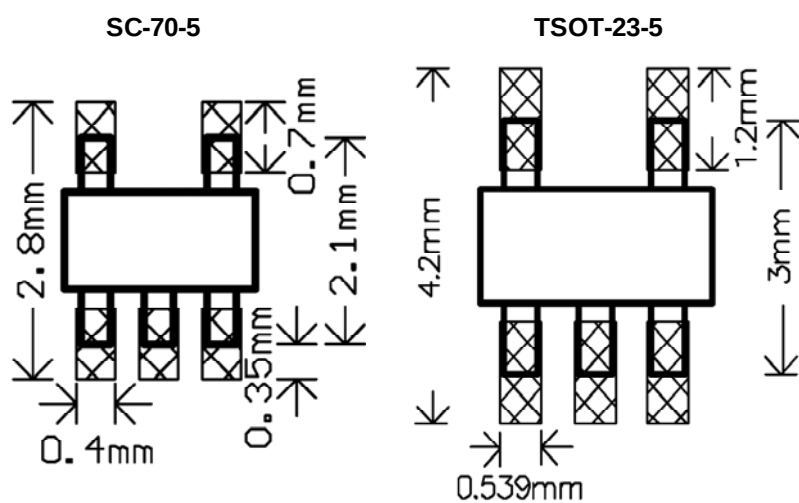
Small Signal Transient Response



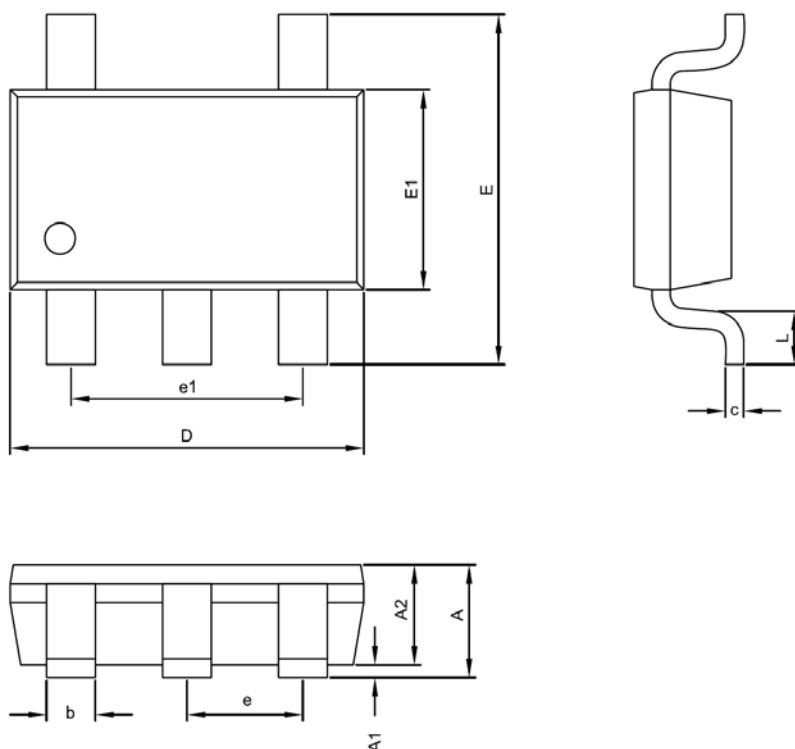
Typical Performance Characteristics (continued)



Minimum Footprint PCB Layout Section



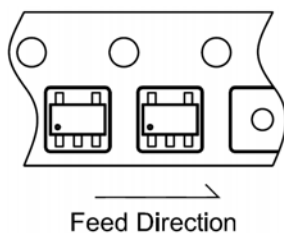
## Package Information



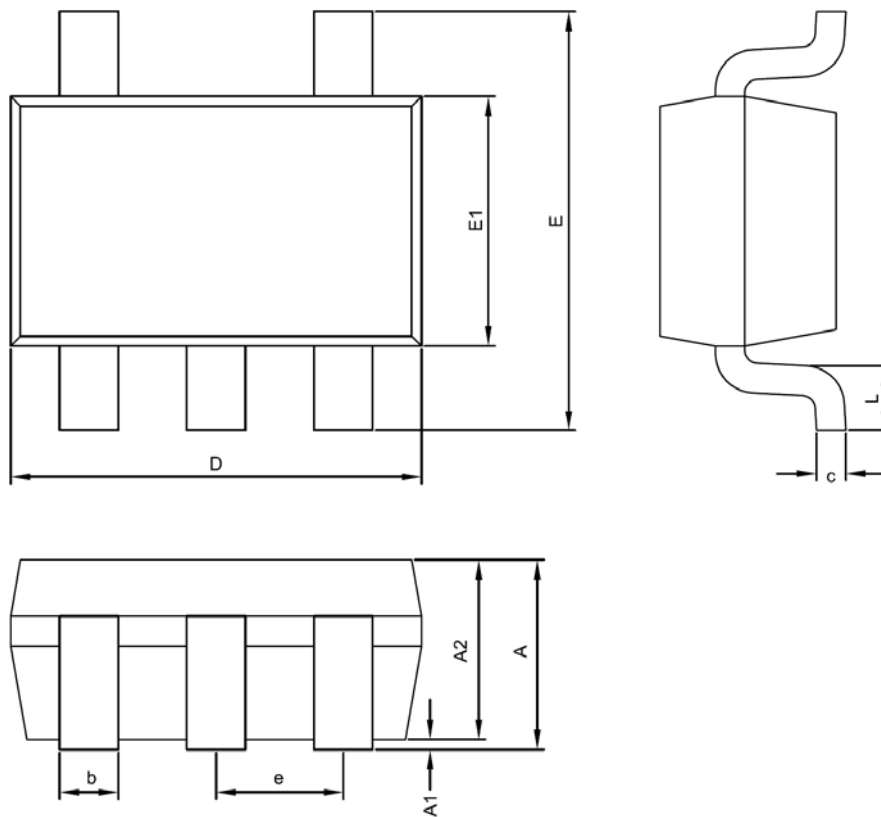
**TSOT-23-5 Package**

| Symble | DIMENSION IN MM |      |      | DIMENSION IN INCH |       |       |
|--------|-----------------|------|------|-------------------|-------|-------|
|        | MIN.            | NOM. | MAX. | MIN.              | NOM.  | MAX.  |
| A      | ---             | ---  | 1.00 | ---               | ---   | 0.039 |
| A1     | 0.00            | 0.05 | 0.10 | 0.000             | 0.002 | 0.004 |
| A2     | 0.70            | 0.80 | 0.90 | 0.028             | 0.031 | 0.035 |
| D      | 2.70            | 2.90 | 3.10 | 0.106             | 0.114 | 0.122 |
| E      | 2.60            | 2.80 | 3.00 | 0.102             | 0.110 | 0.118 |
| E1     | 1.50            | 1.60 | 1.70 | 0.059             | 0.063 | 0.067 |
| c      | 0.08            | 0.15 | 0.25 | 0.003             | 0.006 | 0.010 |
| b      | 0.30            | 0.40 | 0.50 | 0.012             | 0.016 | 0.020 |
| e      | 0.95 BSC        |      |      | 0.037 BSC         |       |       |
| e1     | 1.90 BSC        |      |      | 0.075 BSC         |       |       |
| L      | 0.30            | 0.45 | 0.60 | 0.012             | 0.018 | 0.024 |

## Taping Specification



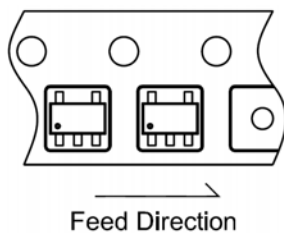
| PACKAGE   | Q'TY/REEL |
|-----------|-----------|
| TSOT-23-5 | 3,000 ea  |



**SC-70-5 (SOT-353) Package**

| Symble | DIMENSION IN MM |      |      | DIMENSION IN INCH |       |       |
|--------|-----------------|------|------|-------------------|-------|-------|
|        | MIN.            | NOM. | MAX. | MIN.              | NOM.  | MAX.  |
| A      | 0.80            | 0.95 | 1.10 | 0.031             | 0.037 | 0.043 |
| A1     | 0.00            | ---  | 0.10 | 0.000             | ---   | 0.004 |
| A2     | 0.70            | 0.90 | 1.00 | 0.028             | 0.035 | 0.039 |
| D      | 1.80            | 2.00 | 2.20 | 0.071             | 0.079 | 0.087 |
| E      | 1.80            | 2.10 | 2.40 | 0.071             | 0.083 | 0.094 |
| E1     | 1.15            | 1.25 | 1.35 | 0.045             | 0.049 | 0.053 |
| c      | 0.08            | 0.15 | 0.25 | 0.003             | 0.006 | 0.010 |
| b      | 0.15            | 0.25 | 0.30 | 0.006             | 0.010 | 0.012 |
| e      | 0.65 BSC        |      |      | 0.026 BSC         |       |       |
| L      | 0.26            | 0.36 | 0.46 | 0.010             | 0.014 | 0.018 |

## Taping Specification



| PACKAGE           | Q'TY/REEL |
|-------------------|-----------|
| SC-70-5 (SOT-353) | 3,000 ea  |