BURR - BROWN®

**3583**

# High Voltage, High Current OPERATIONAL AMPLIFIER

## FEATURES

- WIDE POWER SUPPLY VOLTAGE: ±70V to ±150V
- OUTPUT CURRENT TO 75mA
- SLEW RATE: 30V/μs
- FET INPUT: $I_B$ = 20pA max
- THERMAL SHUT-DOWN PROTECTION
- HERMETIC TO-3 PACKAGE, ISOLATED CASE

## APPLICATIONS

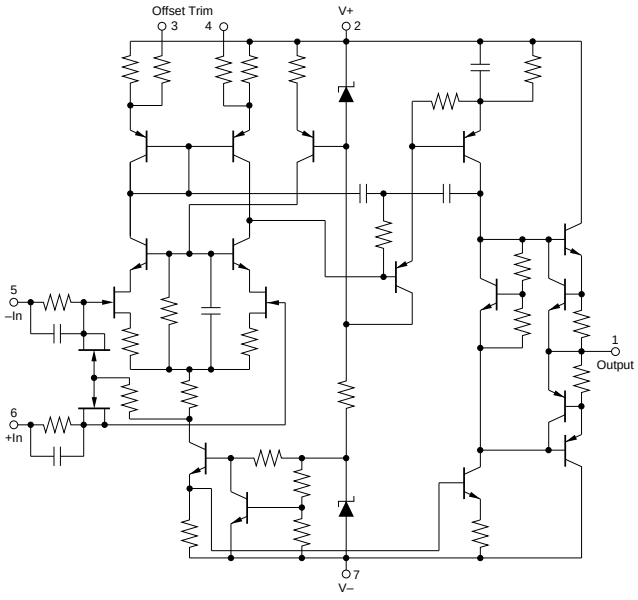
- PROGRAMMABLE POWER SUPPLY
- PIEZO-ELECTRIC TRANSDUCER DRIVER
- HIGH VOLTAGE CURRENT SOURCE

## DESCRIPTION

The 3583 is a high voltage, high speed hybrid operational amplifier designed for a wide variety of programmable power supply and transducer driver applications.

The 3583 operates over a wide power supply range (±50V to ±150V) and provides outputs up to 75mA. Laser-trimmed FET input circuitry provides low offset voltage (3mV max) and low input bias current (20pA max). Thermal shut-down circuitry protects internal circuitry from excessive power dissipation.

Commercial and industrial temperature range models are available. The 3583's hermetic 8-pin TO-3 package is electrically isolated from all internal circuitry.




International Airport Industrial Park • Mailing Address: PO Box 11400 • Tucson, AZ 85734 • Street Address: 6730 S. Tucson Blvd. • Tucson, AZ 85706
Tel: (520) 746-1111 • Twx: 910-952-1111 • Cable: BBRCORP • Telex: 066-6491 • FAX: (520) 889-1510 • Immediate Product Info: (800) 548-6132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# SPECIFICATIONS

## ELECTRICAL

$T_{CASE}$ = +25°C, $V_S$ = ±150V, unless otherwise noted.

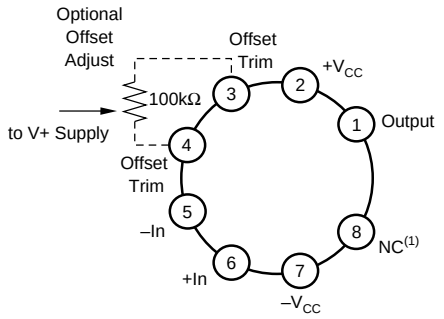
| PARAMETER | CONDITIONS | 3583AM | | | 3583JM | | | UNITS |
|---|---|---|---|---|---|---|---|---|
| | | MIN | TYP | MAX | MIN | TYP | MAX | |
| **OFFSET VOLTAGE** | | | | | | | | |
| Input Offset Voltage | | | | ±3 | | | * | mV |
| vs Temperature | Specified Temp. Range | | | ±23 | | | * | µV/°C |
| vs Power Supply | | | 20 | | | * | | µV/V |
| vs Time | | | 50 | | | • | | µV/month |
| **INPUT BIAS CURRENT**(1) | | | | | | | | |
| Input Bias Current | $V_{CM}$ = 0V | | | –20 | | | * | pA |
| vs Temperature | | | Doubles Every 10°C | | | * | | |
| vs Power Supply | | | 0.2 | | | * | | pA/V |
| Input Offset Current | $V_{CM}$ = 0V | | | ±20 | | | * | pA |
| vs Temperature | | | Doubles Every 10°C | | | * | | |
| vs Power Supply | | | 0.2 | | | * | | pA/V |
| **NOISE** | | | | | | | | |
| Voltage, 0.01Hz to 10Hz | | | 5 | | | * | | µVp-p |
| 10Hz to 1kHz | | | 1.7 | | | * | | µVrms |
| Current, 0.01Hz to 10Hz | | | 0.3 | | | * | | pAp-p |
| **INPUT VOLTAGE RANGE** | | | | | | | | |
| Max Safe Differential Input | | | (V+) + \|V–\| | | | * | | |
| Max Safe Common-Mode Input | | | V– to V+ | | | * | | |
| Common-Mode Input Range | Linear Operation | | $V_S$ –10 | | | * | | V |
| Common-Mode Rejection | | | 110 | | | * | | dB |
| **INPUT IMPEDANCE** | | | | | | | | |
| Differential | | | $10^{11}$ \|\| 10 | | | * | | Ω \|\| pF |
| Common-Mode | | | $10^{11}$ | | | * | | Ω \|\| pF |
| **OPEN-LOOP GAIN** | | | | | | | | |
| Open-Loop Voltage Gain | No Load, DC | | 118 | | | * | | dB |
| Open-Loop Voltage Gain | Rated Load, DC | 94 | 105 | | * | * | | dB |
| **FREQUENCY RESPONSE** | | | | | | | | |
| Unity-Gain Bandwidth | Small-Signal | | 5 | | | * | | MHz |
| Full-Power Bandwidth | $R_L$ = 10kΩ | | 60 | | | * | | kHz |
| Slew Rate | | | 30 | | | * | | V/µs |
| Settling Time: 0.1% | | | 12 | | | * | | µs |
| **OUTPUT** | | | | | | | | |
| Voltage Output | | $V_S$ –10 | | | * | | | V |
| Current Output | | ±75 | | | * | | | mA |
| Short Circuit Current | | | ±100 | | | * | | mA |
| Load Capacitance | | | | 10 | | | * | nF |
| **POWER SUPPLY** | | | | | | | | |
| Operating Voltage Range | | ±50 | | ±150 | * | | * | V |
| Quiescent Current | $I_O$ = 0 | | | ±8.5 | | | * | mA |
| **TEMPERATURE RANGE (CASE)** | | | | | | | | |
| Specification | | –25 | | +85 | 0 | | +70 | °C |
| Operating | | –55 | | +125 | * | | * | °C |
| Storage $\theta_{JC}$ = 4°C/W | | –55 | | +125 | * | | * | °C |

* Specification same as 3583AM.

NOTE: (1) Inputs may be damaged by input slew rates exceeding 1000V/µs. Inputs can be protected from signals exceeding 1000V/µs by limiting input current to 150mA with external series resistors (pins 5 and 6).

## CONNECTION DIAGRAM

**Top View** **TO-3**




NOTE: (1) No internal connection.

Optional socket available: 804MC

## PACKAGING INFORMATION

| MODEL | PACKAGE | PACKAGE DRAWING NUMBER(1) |
|---|---|---|
| 3583AM | 8-Pin TO 3 | 030 |
| 3583JM | 8-Pin TO 3 | 030 |

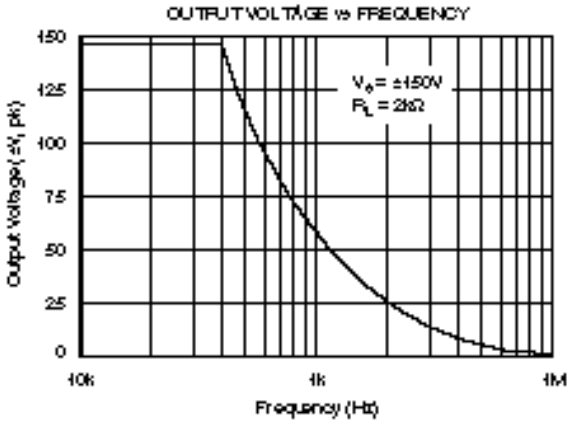
NOTE: (1) For detailed drawing and dimension table, please see end of data sheet, or Appendix D of Burr-Brown IC Data Book.

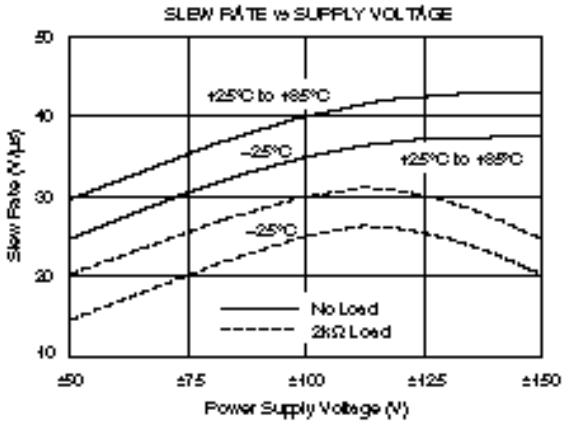
## ORDERING INFORMATION

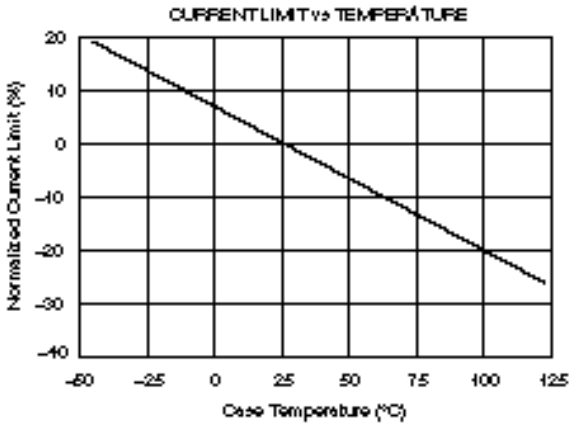
| MODEL | PACKAGE | TEMPERATURE RANGE |
|---|---|---|
| 3583AM | 8-Pin TO-3 | –25°C to +85°C |
| 3583JM | 8-Pin TO-3 | 0°C to +70°C |

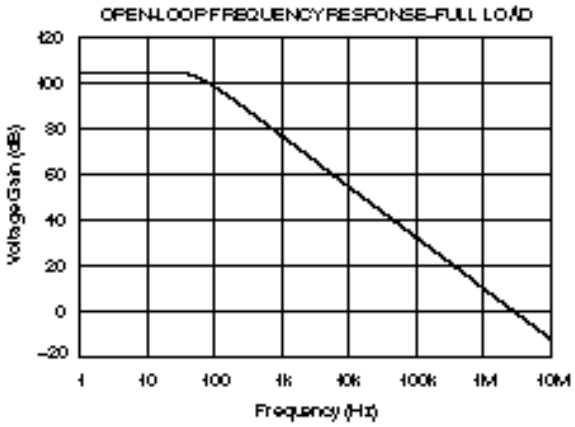
# TYPICAL PERFORMANCE CURVES

$T_{CASE}$ = +25°C, $\pm V_{CC}$ = 150VDC, unless otherwise noted.



# TYPICAL PERFORMANCE CURVES

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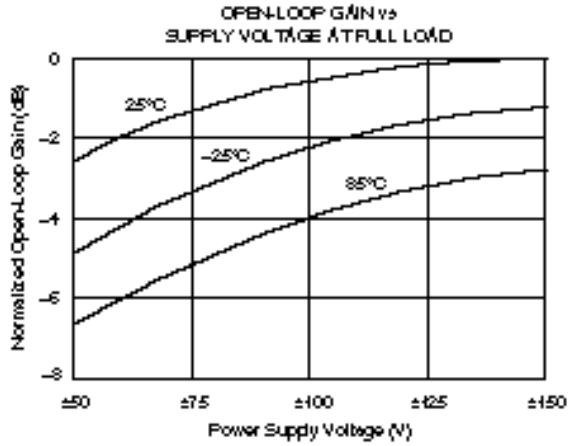
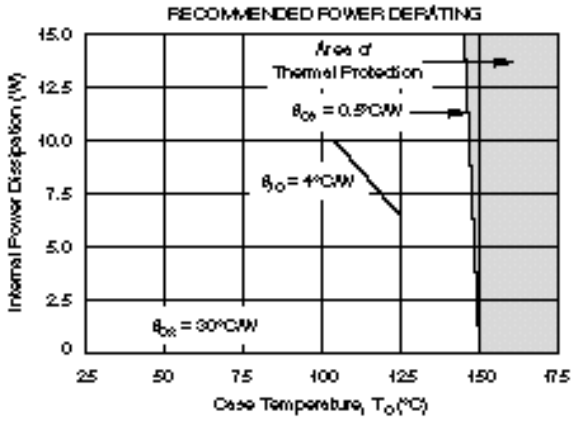
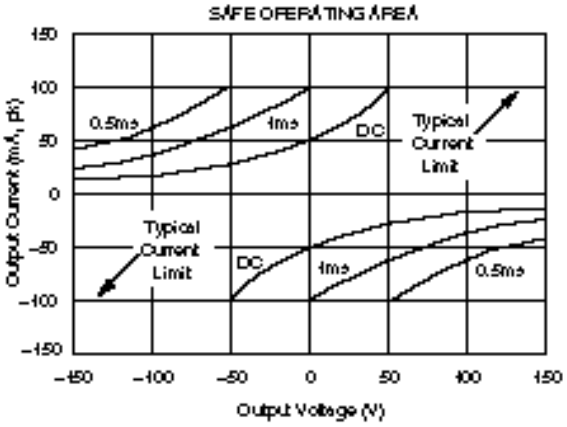
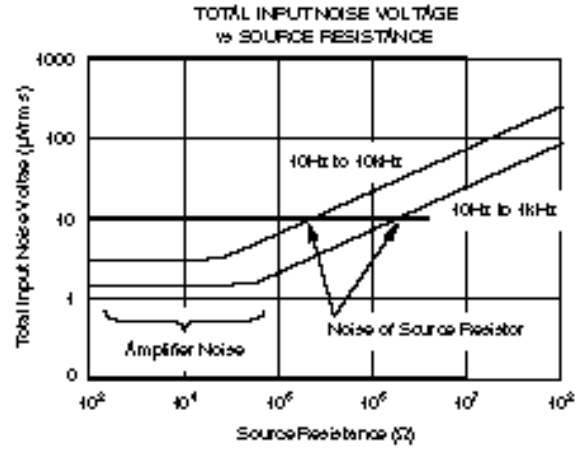
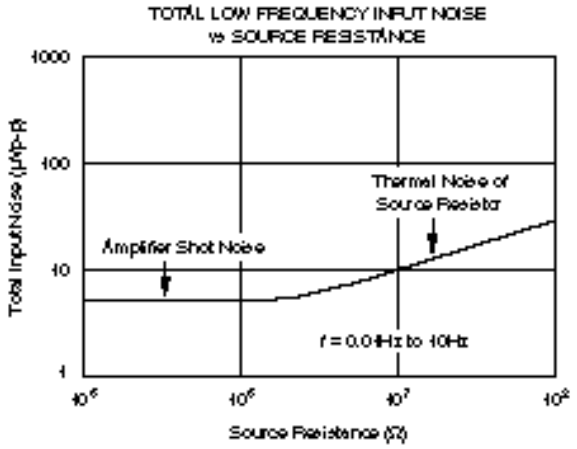
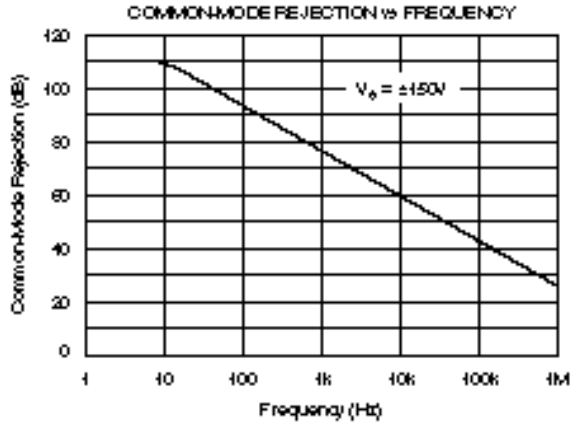


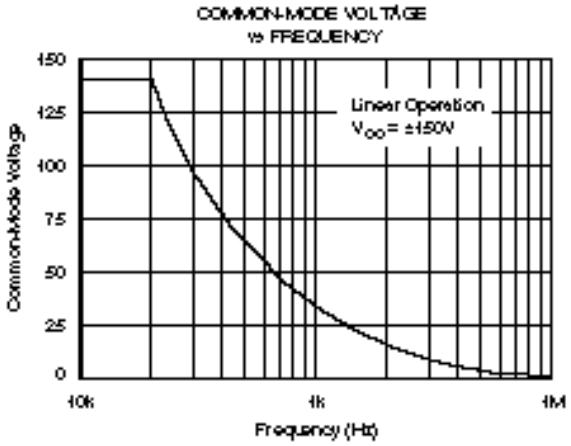



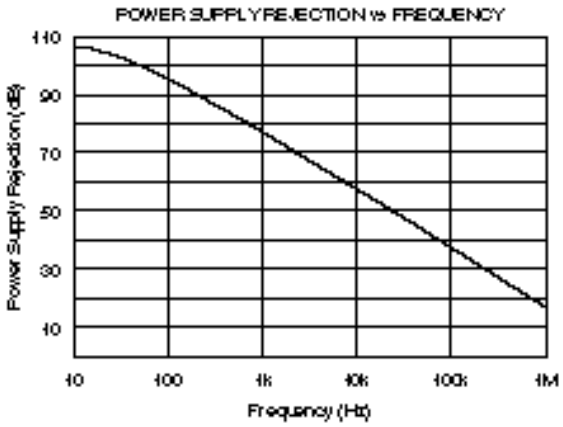



# TYPICAL PERFORMANCE CURVES (CONT)

$T_{CASE}$ = +25°C, $\pm V_{CC}$ = 150VDC, unless otherwise noted.




# APPLICATION INFORMATION

Figure 1 shows the basic connections required to operate the 3583. Power supply bypass capacitors should be connected close to the device pins. Be sure that these capacitors have an adequate voltage rating.

Input offset voltage and drift of the 3583 are laser-trimmed. Many applications require no external offset trimming. Figure 1 also shows connection of an optional offset trim potentiometer connected to pins 3 and 4.

FET input circuitry reduces the input bias current of the 3583 to less than 20pA at room temperature. Input bias current remains nearly constant throughout the full common-mode range. Input bias current approximately doubles for each 10°C increase in case temperature above 25°C. Heat sinking can help minimize this effect by reducing the case temperature.

Input circuitry of the 3583 is protected with series limiting resistors and input clamp diodes. The inputs can withstand the full rated supply voltage of ±150V (common-mode or differential).

### THERMAL PROTECTION

The 3583 has internal thermal shut-down circuitry that activates at a case temperature of approximately 150°C or higher. As this circuitry is activated, the output current drive is reduced. As the case temperature returns to less than the activation temperature, operation will return to normal. A heat sink may be required depending on load and signal conditions.

Note that a 75mA output may not be safe for all output voltages—see typical performance curve “Safe Operating Area”. Applications such as current sources where output voltage may be low (or the opposite polarity of the output current) can overstress the output stage.

The thermal shut-down circuit will normally protect the amplifier during a short-circuit to ground. It will not protect against short-circuit to one of the power supplies. The typical performance curve “Safe Operating Area” shows that the large stress occurring during this high voltage condition may cause damage if it exceeds 5ms duration. The thermal protection circuitry will not activate fast enough to protect the device from short-circuits to one of the power supplies.

The package case of the 3583 is electrically isolated from all circuitry. No special insulating hardware is required. Although not absolutely required, it is recommended that the case be connected to ground.

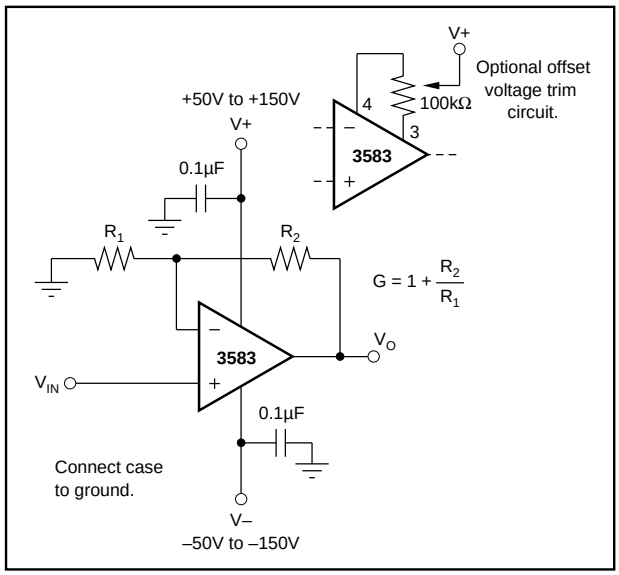



FIGURE 1. Basic Circuit Connections.

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