BURR - BROWN®

3584

High Voltage, High Speed OPERATIONAL AMPLIFIER

FEATURES

- WIDE POWER SUPPLY VOLTAGE: ±70V to ±150V
- GAIN-BANDWIDTH PRODUCT: 50MHz
- SLEW RATE: 150V/µs
- FET INPUT: I_B = 20pA max
- THERMAL SHUT-DOWN PROTECTION
- HERMETIC TO-3 PACKAGE, ISOLATED CASE

APPLICATIONS

- PROGRAMABLE POWER SUPPLY
- PIEZO-ELECTRIC TRANSDUCER DRIVER
- ELECTROSTATIC TRANSDUCER DRIVER
- CRT DEFLECTION

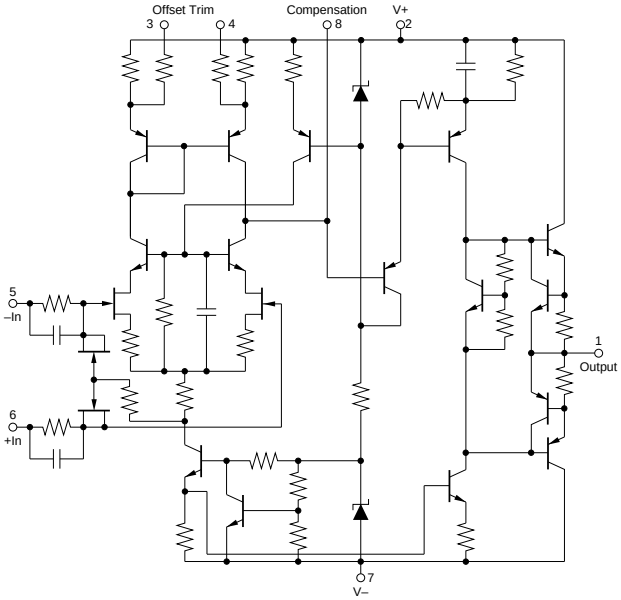
DESCRIPTION

The 3584 is a high voltage, high speed hybrid operational amplifier designed for a wide variety of programmable power supply and transducer driver applications.

The 3584 operates over a wide power supply range (±70V to ±150V) and provides outputs up to 15mA. 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.

The 3584 provides a gain-bandwidth product of 20MHz min (50MHz typical). External frequency compensation (series R/C) allows the user to optimize the bandwidth and slew rate for a particular application.

Specified temperature range is 0°C to +70°C. The 3584'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

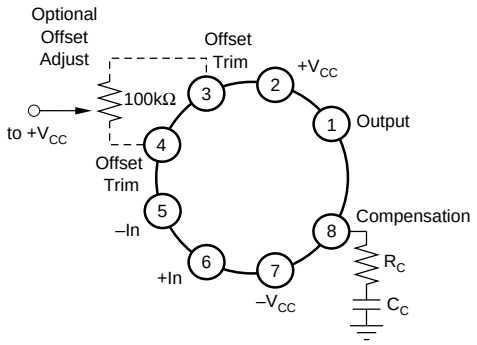
T_{CASE} = +25°C, V_S = ±150V, unless otherwise noted.

PARAMETER	CONDITIONS	3584JM			UNITS
		MIN	TYP	MAX	
OFFSET VOLTAGE					
Input Offset Voltage				±3	mV
vs Temperature	Specified Temperature Range			±25	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					
Maximum Safe Differential Input			(V+) + |V–|		
Maximum 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		120		dB
Open-Loop Voltage Gain	Rated Load, DC	100			dB
FREQUENCY RESPONSE					
Unity-Gain Bandwidth	Small-Signal		7		MHz
Gain-Bandwidth Product	f = 1kHz, G = 100	20			MHz
Full-Power Bandwidth	G = 100		135		kHz
Slew Rate	G = 100		150		V/µs
Settling Time: 0.1%	G = 100		12		µs
OUTPUT					
Voltage Output		V_S - 5			V
Current Output		±15			mA
Short Circuit Current			±25		mA
Load Capacitance (Maximum)			10		nF
POWER SUPPLY					
Operating Voltage Range		±70		±150	V
Quiescent Current	I_O = 0			±6.5	mA
TEMPERATURE RANGE					
Specification		0		+70	°C
Operating		–55		+125	°C
Storage		–55		+150	°C

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



Optional Socket: Burr-Brown Model 0804MC

ORDERING INFORMATION

MODEL	PACKAGE	TEMPERATURE RANGE
3584JM	8-Pin TO-3	0°C to +70°C

PACKAGE INFORMATION

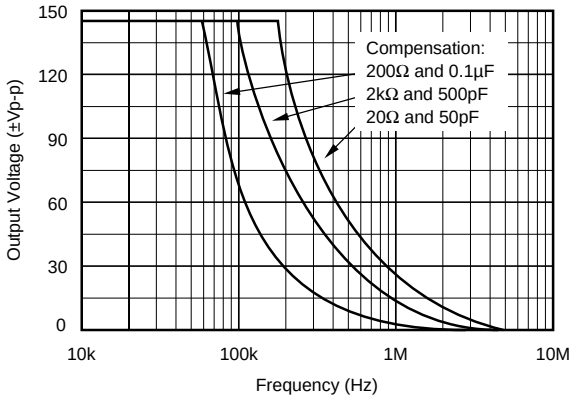
MODEL	PACKAGE	PACKAGE DRAWING NUMBER(1)
3584JM	8-Pin TO-3	030

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

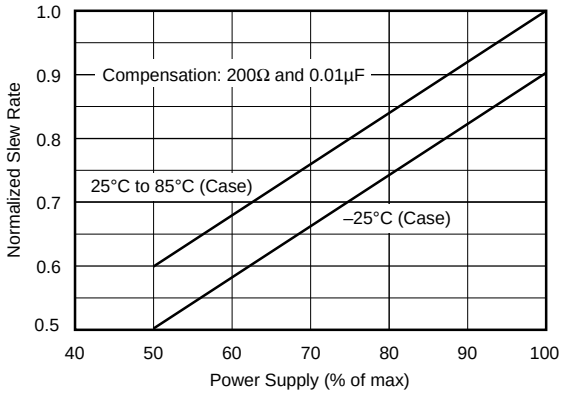
TYPICAL PERFORMANCE CURVES

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

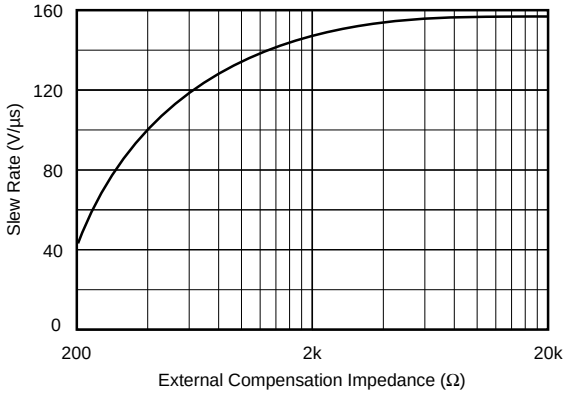
OUTPUT VOLTAGE vs FREQUENCY



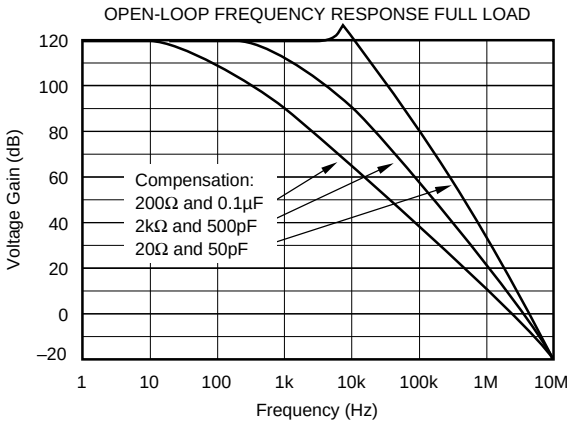
SLEW RATE vs SUPPLY VOLTAGE AT FULL LOAD



SLEW RATE vs COMPENSATION



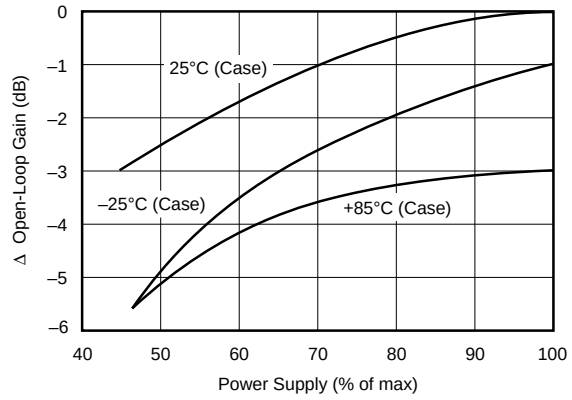
OPEN-LOOP FREQUENCY RESPONSE FULL LOAD



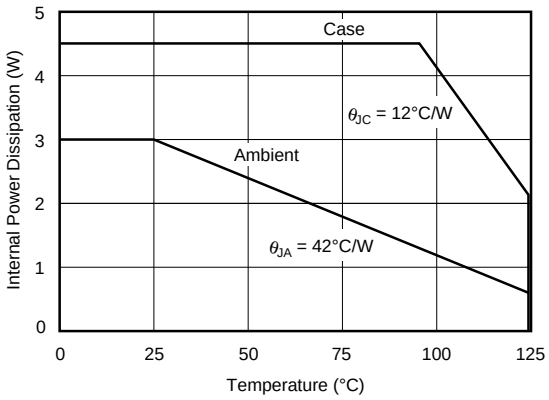
TYPICAL PERFORMANCE CURVES (CONT)

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

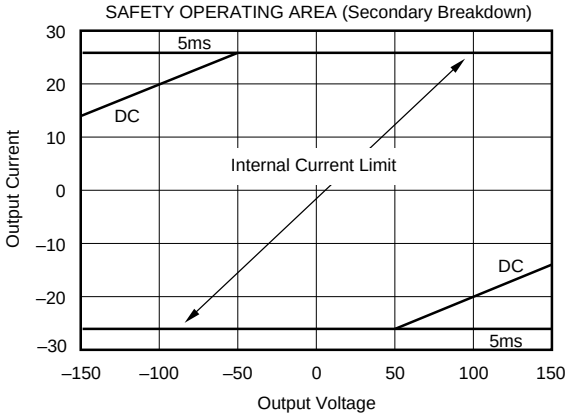
OPEN-LOOP GAIN
vs SUPPLY VOLTAGE AT MAX LOAD



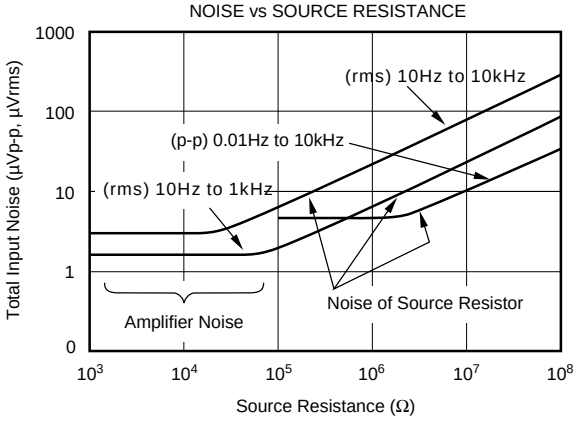
POWER DISSIPATION



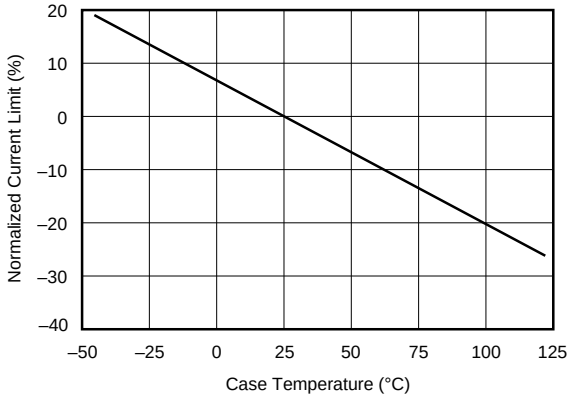
SAFETY OPERATING AREA (Secondary Breakdown)



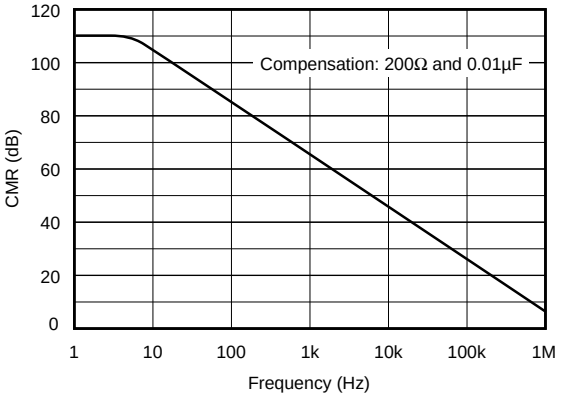
NOISE vs SOURCE RESISTANCE



CURRENT LIMIT vs TEMPERATURE

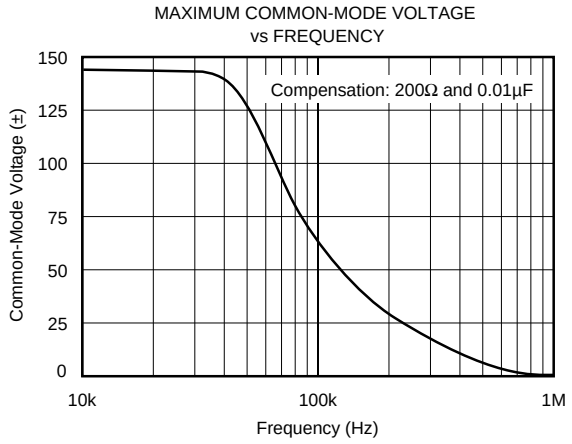


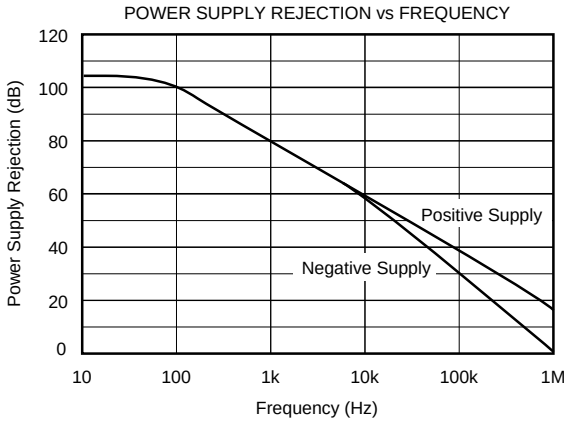
COMMON-MODE REJECTION



TYPICAL PERFORMANCE CURVES (CONT)

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





APPLICATION INFORMATION

Figure 1 shows the basic connections required to operate the 3584. Bypass capacitors should be connected close to the device pins. Be sure that these capacitors have an adequate voltage rating.

Frequency compensation components must be connected to pin 8 for closed-loop gains of 100 or less. Recommended values are shown in Figure 1. Some adjustment in these values may be required depending on exact circuit configuration and load conditions. Be sure the compensation capacitor has a voltage rating equal to or greater than the positive power supply voltage, V+. Standard 0.25W resistors can be used for R_C.

Input offset voltage and drift of the 3584 are laser-trimmed. Many applications require no external offset trimming. Figure 1 shows connection of an optional offset trim potentiometer which connects to pins 3 and 4.

FET input circuitry reduces the input bias current of the 3584 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.

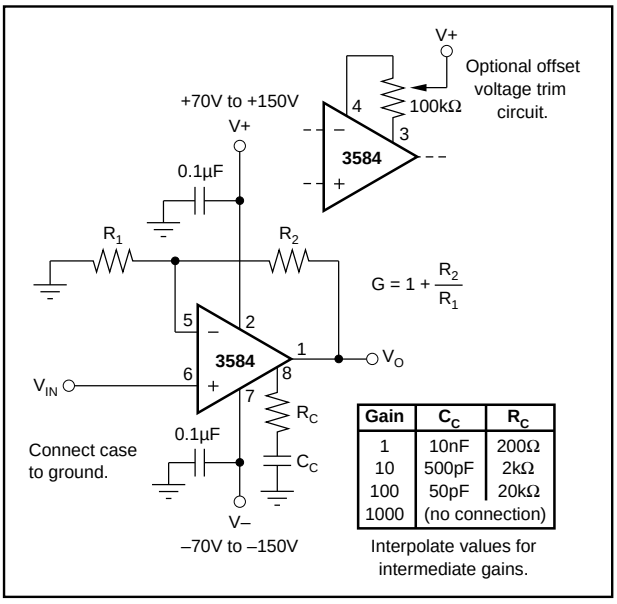
Input circuitry of the 3584 is protected with series limiting resistors and input clamp diodes. The inputs can withstand the full rated supply voltage of ±150V (common-mode or differential).

THERMAL PROTECTION

The 3584 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.

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 3584 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.



Gain	C_C	R_C
1	10nF	200Ω
10	500pF	2kΩ
100	50pF	20kΩ
1000	(no connection)	

FIGURE 1. Basic Circuit Connections.