

# MCC1536 MCC1436

## OPERATIONAL AMPLIFIERS

### Advance Information

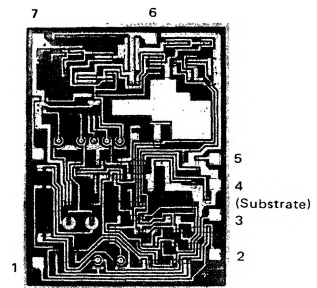
#### HIGH VOLTAGE, INTERNALLY COMPENSATED MONOLITHIC OPERATIONAL AMPLIFIER CHIP

... designed for use as a summing amplifier, integrator, or amplifier with operating characteristics as a function of the external feedback components.

The MCC1536 and MCC1436 employ phosphosilicate passivation that protects the entire die surface area, including metalization interconnects. All dice have a minimum gold-backed thickness of 4000 Angstroms. The interconnecting metalization and bonding pads are of evaporated aluminum.

- Maximum Supply Voltage –  $\pm 40$  Vdc
- Output Voltage Swing –  
 $\pm 30$  V<sub>pk(min)</sub> ( $V^+ = +36$  V,  $V^- = -36$  V)  
 $\pm 22$  V<sub>pk(min)</sub> ( $V^+ = +28$  V,  $V^- = -28$  V)
- Input Bias Current – 20 nA max
- Input Offset Current – 3.0 nA max
- Input Offset Voltage Null Capability
- Fast Slew Rate – 2.0 V/ $\mu$ s typ
- Input Over-Voltage Protection
- Internally Compensated
- $AVOL$  – 500,000 typ
- Characteristics Independent of Power Supply Voltages –  
 $(\pm 5.0$  Vdc to  $\pm 36$  Vdc)

#### OPERATIONAL AMPLIFIER CHIP MONOLITHIC SILICON INTEGRATED CIRCUIT EPITAXIAL PASSIVATED



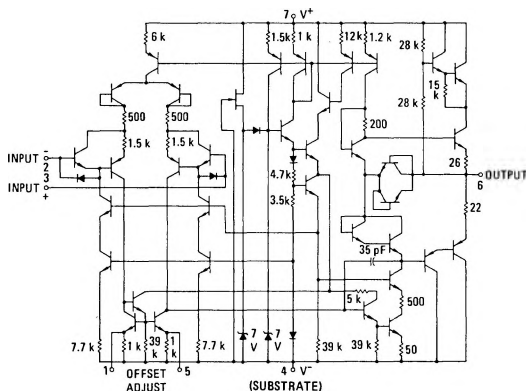
MCC1536/MCC1436

#### MAXIMUM RATINGS ( $T_A = +25^\circ\text{C}$ unless otherwise noted)

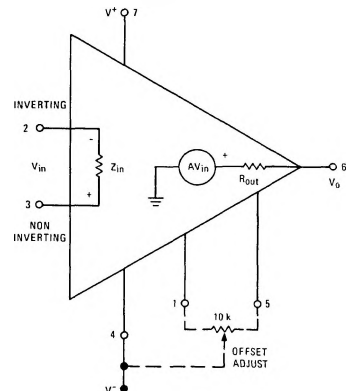
Rating	Symbol	MCC1536	MCC1436	Unit
Power Supply Voltage	$V^+$ $V^-$	+40 -40	+34 -34	Vdc
Differential Input Signal (1)	$V_{in}$	$\pm (V^+ +  V^-  - 3)$		Volts
Common-Mode Input Swing	$CMV_{in}$	$+V^+, -( V^-  - 3)$		Volts
Output Short Circuit Duration ( $V^+ =  V^-  = 28$ Vdc, $V_O = 0$ )	$T_{SC}$	5.0		s
Operating Temperature Range	$T_A$	-55 to +125		$^\circ\text{C}$
Junction Temperature Range	$T_{stg}$	-65 to +150		$^\circ\text{C}$

(1) The absolute voltage applied to either input terminal must not exceed  $+V^+, -(|V^-| - 3)$

#### CIRCUIT SCHEMATIC



#### EQUIVALENT CIRCUIT



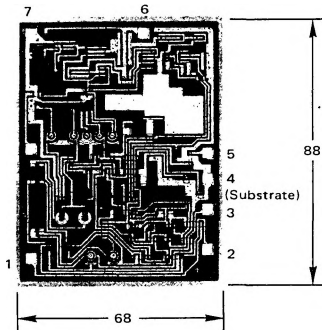
MCC1536, MCC1436 (continued)

ELECTRICAL CHARACTERISTICS ( $V^+ = +28$  Vdc,  $V^- = -28$  Vdc,  $T_A = +25^\circ\text{C}$  unless otherwise noted)

Characteristics	Symbol	MCC1536			MCC1436			Unit
		Min	Typ	Max	Min	Typ	Max	
Input Bias Current	$I_b$	-	8.0	20	-	15	40	nAdc
Input Offset Current	$ I_{io} $	-	1.0	3.0	-	5.0	10	nAdc
Input Offset Voltage	$ V_{io} $	-	2.0	5.0	-	5.0	10	mVdc
Differential Input Impedance (Open-Loop, $f \leq 5.0$ Hz)								
Parallel Input Resistance	$R_D$	-	10	-	-	10	-	Meg ohms
Parallel Input Capacitance	$C_D$	-	2.0	-	-	2.0	-	pF
Common-Mode Input Impedance ( $f \leq 5.0$ Hz)	$Z_{(in)}$	-	250	-	-	250	-	Meg ohms
Common-Mode Input Voltage Swing	CMV <sub>in</sub>	-	$\pm 25$	-	-	$\pm 25$	-	V <sub>pk</sub>
Common-Mode Rejection Ratio (dc)	CM <sub>rej</sub>	-	110	-	-	110	-	dB
Large Signal dc Open Loop Voltage Gain	AVOL							V/V
( $V_O = \pm 10$ V, $R_L = 100$ k ohms)		100,000	500,000	-	70,000	500,000	-	
( $V_O = \pm 10$ V, $R_L = 10$ k ohms)		-	200,000	-	-	200,000	-	
Power Bandwidth (Voltage Follower)	P <sub>BW</sub>	-	23	-	-	23	-	kHz
( $A_V = 1$ , $R_L = 5.0$ k ohms, THD $\leq 5\%$ , $V_O = 40$ Vp-p)								
Unity Gain Crossover Frequency (open-loop)		-	1.0	-	-	1.0	-	MHz
Phase Margin (open-loop, unity gain)		-	50	-	-	50	-	degrees
Gain Margin		-	18	-	-	18	-	dB
Slew Rate (Unity Gain)	dV <sub>out</sub> /dt	-	2.0	-	-	2.0	-	V/ $\mu$ s
Output Impedance ( $f \leq 5.0$ Hz)	Z <sub>out</sub>	-	1.0	-	-	1.0	-	k ohms
Short-Circuit Output Current	I <sub>SC</sub>	-	$\pm 17$	-	-	$\pm 17$	-	mAdc
Output Voltage Swing ( $R_L = 5.0$ k ohms)	V <sub>O</sub>							V <sub>pk</sub>
$V^+ = +28$ Vdc, $V^- = -28$ Vdc		$\pm 22$	$\pm 23$	-	$\pm 20$	$\pm 22$	-	
$V^+ = +36$ Vdc, $V^- = -36$ Vdc		$\pm 30$	$\pm 32$	-	-	-	-	
Power Supply Sensitivity (dc)								$\mu$ V/V
$V^- = \text{constant}$ , $R_L \leq 10$ k ohms	S+	-	15	100	-	35	200	
$V^+ = \text{constant}$ , $R_S \leq 10$ k ohms	S-	-	15	100	-	35	200	
Power Supply Current	I <sub>D+</sub>	-	2.2	4.0	-	2.6	5.0	mAdc
	I <sub>D-</sub>	-	2.2	4.0	-	2.6	5.0	
DC Quiescent Power Dissipation	P <sub>D</sub>	-	124	224	-	146	280	mW
( $V_O = 0$ )								

See current MCC1536/1436 data sheet for additional information.

MCC1536/MCC1436 BONDING DIAGRAM



PACKAGING AND HANDLING

The MCC1536/MCC1436 operational amplifier is now available in die (chip) form. The phosphorsilicate passivation protects the metalization and active area of the die but care must be exercised when removing the dice from the shipping carrier to avoid scratching the bonding pads. A vacuum pickup is useful for the handling of dice. Tweezers are not recommended for this purpose.

The non-spill type shipping carrier consists of a compartmentalized tray and fitted cover. Die are placed in the carrier with geometry side up.

All dimensions are nominal and in mils ( $10^{-3}$  inches).  
 Die Dimensions  
 Thickness = 8.0  
 Bonding Pads = 4.0 x 4.0