MCC1595
MCC1495

Advance Information

MONOLITHIC FOUR-QUADRANT MULTIPLIER CHIP

. . . designed for uses where the output voltage is a linear product of two input voltages. Typical applications include: multiply, divide*, square root*, mean square*, phase detector, frequency doubler, balanced modulator/demodulator, electronic gain control.

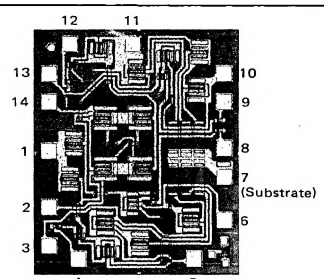
The MCC1595 and MCC1495 employ phosphorsilicate passivation that protects the entire die surface area, including metalization interconnects. All dice have a minimum gold-backed thickness of 4000 Angstroms. The interconnecting metalization and bonding pads are of evaporated aluminum.

*When used with an operational amplifier.

- Excellent Linearity – 0.5% typ Error on X-Input, 1% typ Error on Y-Input – MCC1595
- Excellent Linearity – 1% typ Error on X-Input, 2% typ Error on Y-Input – MCC1495
- Adjustable Scale Factor, K
- Excellent Temperature Stability
- Wide Input Voltage Range – ± 10 Volts

LINEAR FOUR-QUADRANT MULTIPLIER CHIP INTEGRATED CIRCUIT

MONOLITHIC SILICON
EPITAXIAL PASSIVATED

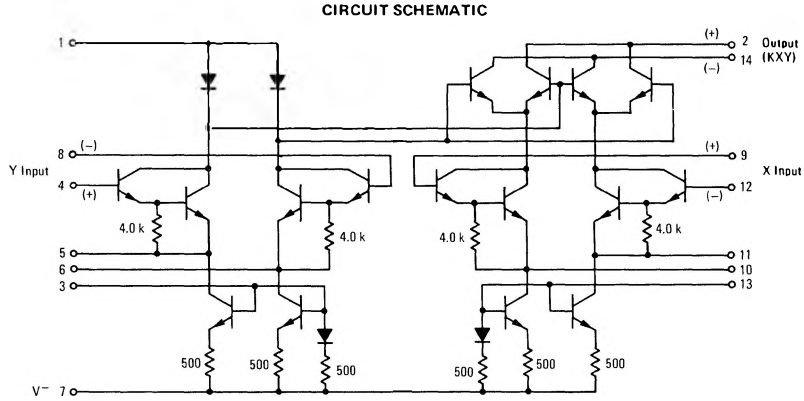


MCC1595/MCC1495 Die

MAXIMUM RATINGS (T_A = 25°C unless otherwise noted)

Rating	Symbol	Value	Unit
Applied Voltage (V_2-V_1, $V_{14}-V_1$, V_1-V_9, V_1-V_{12}, V_1-V_4, V_1-V_8, $V_{12}-V_7$, V_9-V_7, V_8-V_7, V_4-V_7)	±V	30	Vdc
Differential Input Signal	$V_{12}-V_9$ V_4-V_8	±(6+$I_{13}R_X$) ±(6+$I_{13}R_Y$)	Vdc Vdc
Maximum Bias Current	I_3 I_{13}	10 10	mA
Operating Temperature Range	T_A	-55 to +125	°C
Junction Temperature Range	T_J	-65 to +150	°C

CIRCUIT SCHEMATIC



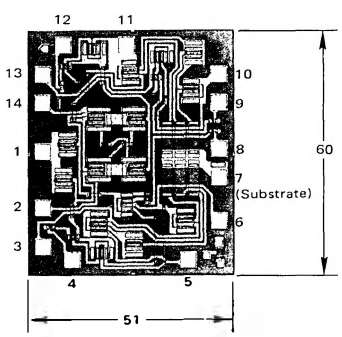
This is advance information on a new introduction and specifications are subject to change without notice.

ELECTRICAL CHARACTERISTICS (V^+ = +32 V, V^- = -15 V, T_A = 25°C, $I_3 = I_{13}$ = 1 mA, $R_X = R_Y$ = 15 kΩ, R_L = 11 kΩ unless otherwise noted)

Characteristic		Symbol	Min	Typ	Max	Unit
Linearity:						
Output Error in Percent of Full Scale:						%
$-10 < V_X < +10$ (V_Y = ±10 V)	MCC1495	E_{RX}	–	1.0	–	
	MCC1595		–	0.5	–	
$-10 < V_Y < +10$ (V_X = ±10 V)	MCC1495	E_{RY}	–	2.0	–	
	MCC1595		–	1.0	–	
Squaring Mode Error:						
Accuracy in Percent of Full Scale After Offset and Scale Factor Adjustment		E_{SQ}				%
	MCC1495		–	0.75	–	
	MCC1595		–	0.5	–	
Scale Factor (Adjustable)						
$(K = \frac{2R_L}{I_3 R_X R_Y})$		K	–	0.1	–	–
Input Resistance	MCC1495	R_{INX}	–	20	–	Megohms
(f = 20 Hz)	MCC1595		–	35	–	
	MCC1495	R_{INY}	–	20	–	
	MCC1595		–	35	–	
Differential Output Resistance (f = 20 Hz)		R_o	–	300	–	k Ohms
Input Bias Current						
$I_{bx} = \frac{(I_9 + I_{12})}{2}$, $I_{by} = \frac{(I_4 + I_8)}{2}$	MCC1495	I_{bx}	–	2.0	12	μA
	MCC1595		–	2.0	8.0	
	MCC1495	I_{by}	–	2.0	12	
	MCC1595		–	2.0	8.0	
Input Offset Current						
$\lvert I_9 - I_{12}\rvert$	MCC1495	$\lvert I_{iox}\rvert$	–	0.4	2.0	μA
	MCC1595		–	0.2	1.0	
$\lvert I_4 - I_8\rvert$	MCC1495	$\lvert I_{ioy}\rvert$	–	0.4	2.0	
	MCC1595		–	0.2	1.0	
Output Offset Current		$\lvert I_{oo}\rvert$				μA
$\lvert I_{14} - I_2\rvert$	MCC1495		–	20	100	
	MCC1595		–	10	50	
Frequency Response						
3.0 dB Bandwidth		BW_{3dB}	–	3.0	–	MHz
3° Relative Phase Shift Between V_X and V_Y		f_ϕ	–	750	–	kHz
1% Absolute Error Due to Input-Output Phase Shift		f_θ	–	30	–	kHz
Common Mode Input Swing		CMV				Vdc
(Either input)	MCC1495		–	±12	–	
	MCC1595		–	±13	–	
Common Mode Quiescent Output Voltage		V_{o1}	–	21	–	Vdc
		V_{o2}	–	21	–	
Differential Output Voltage Swing Capability		V_{out}	–	±14	–	V_{peak}
Power Supply Sensitivity		S^+	–	5.0	–	mV/V
		S^-	–	10	–	
Power Supply Current		I_7	–	6.0	7.0	mA
DC Power Dissipation		P_D	–	135	170	mW

See current MC1595/1495 data sheet for additional information.

MCC1595/MCC1495 BONDING DIAGRAM



PACKAGING AND HANDLING

The MCC1595/MCC1495 is the Four-Quadrant Multiplier now available in die (chip) form. The phosphorsilicate passivation protects the metalization and active area of the die but care must be exercized when removing the dice from the shopping 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