

iC-BM FOUR-CHANNEL FOUR-QUADRANT ANALOG MULTIPLIER



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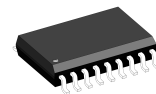
FEATURES

- ◆ MLT04 replacement
- ◆ Four independent channels
- ◆ Four-quadrant multiplication
- ◆ Voltage output: $W = 0.4 \times X \times Y$
- ◆ $\pm 2.5\text{ V}$ analog input range
- ◆ 3.5 MHz bandwidth
- ◆ Low power dissipation

APPLICATIONS

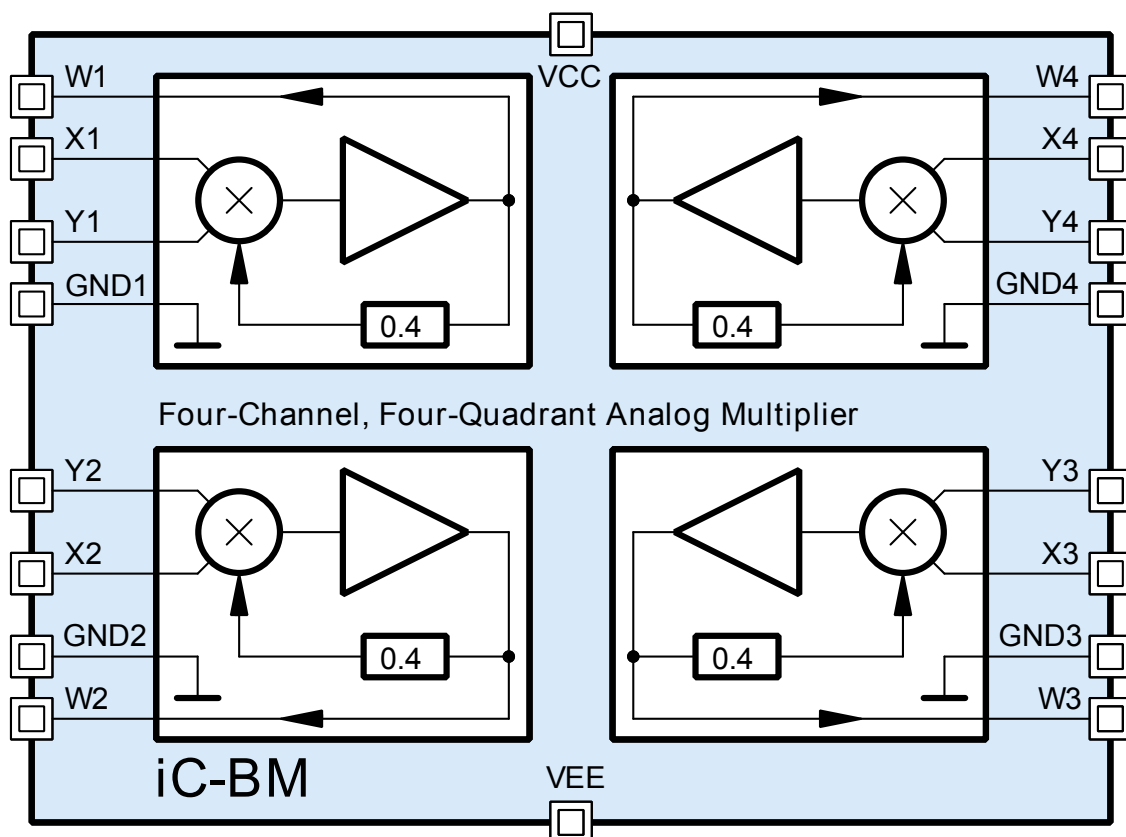
- ◆ Analog computation
- ◆ Squaring circuits
- ◆ Modulation and demodulation
- ◆ Voltage controlled amplifiers and filters

PACKAGES



SO18W
(RoHS compliant)

BLOCK DIAGRAM



iC-BM FOUR-CHANNEL FOUR-QUADRANT ANALOG MULTIPLIER



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DESCRIPTION

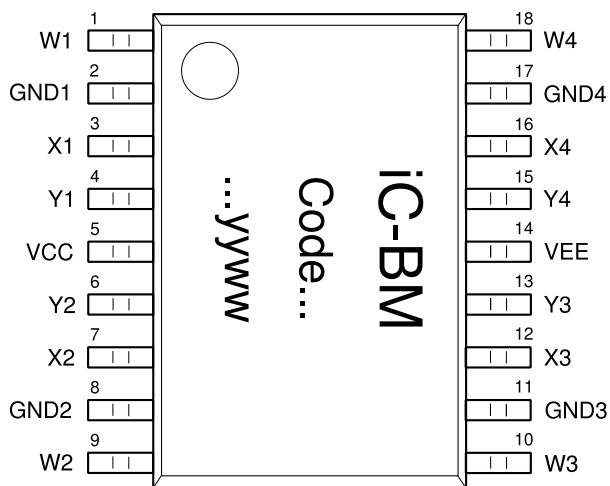
iC-BM features four analog multipliers. Each four-quadrant multiplier consists of a Gilbert cell multiplier with a 0.4 scale factor, a linearisation circuit and a unity gain output amplifier.

For higher precision all internal bias currents are derived from an internal band-gap reference.

All pins are ESD protected.

PACKAGING INFORMATION

PIN CONFIGURATION SO18W



PIN FUNCTIONS

No. Name Function

1	W1	Channel 1: Analog multiplier output
2	GND1	Channel 1: Ground
3	X1	Channel 1: First input of multiplier
4	Y1	Channel 1: Second input of multiplier
5	VCC	Positive power supply +5 V
6	Y2	Channel 2: Second input of multiplier
7	X2	Channel 2: First input of multiplier
8	GND2	Channel 2: Ground
9	W2	Channel 2: Analog multiplier output
10	W3	Channel 3: Analog multiplier output
11	GND3	Channel 3: Ground
12	X3	Channel 3: First input of multiplier
13	Y3	Channel 3: Second input of multiplier
14	VEE	Negative power supply -5 V
15	Y4	Channel 4: Second input of multiplier
16	X4	Channel 4: First input of multiplier
17	GND4	Channel 4: Ground
18	W4	Channel 4: Analog multiplier output

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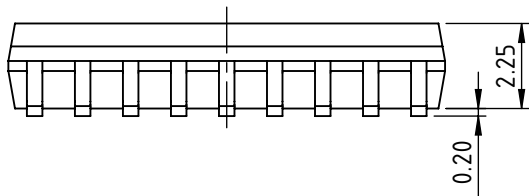


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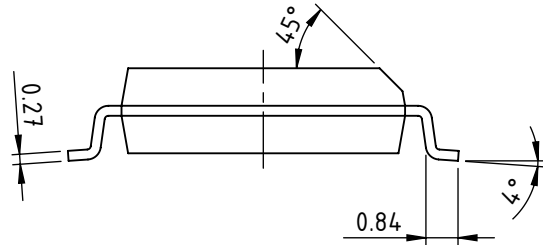
PACKAGE DIMENSIONS SO18W

All dimensions given in mm.

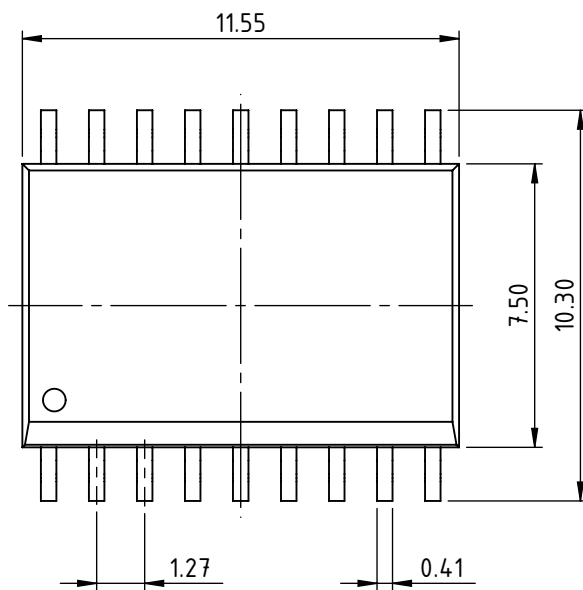
SIDE



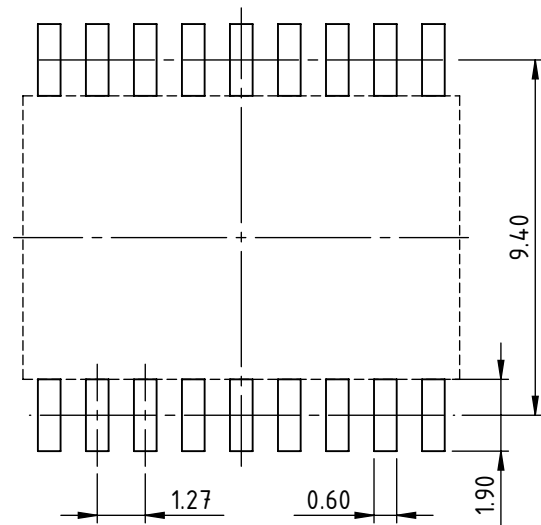
FRONT



TOP



RECOMMENDED PCB-FOOTPRINT



dra_so18w-1_pack_1, 5:1

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ABSOLUTE MAXIMUM RATINGS

Beyond these values damage may occur; device operation is not guaranteed.

Item No.	Symbol	Parameter	Conditions	Limits		Unit
				Min.	Max.	
G001	VCC	Positive Power Supply			7	V
G002	VEE	Negative Power Supply		-7		V
G003	V()	Voltage at Pins X _{1...4} , Y _{1...4} and W _{1...4}		-7	7	V
G004	T _j	Chip Temperature		-40	150	°C
G005	T _s	Storage Temperature		-40	150	°C

THERMAL DATA

Operating Conditions: VCC = 5 V ±0.25 V , VEE = -5 V ±0.25 V, T_j = -40...100 °C, R_L = 2 kΩ, if not other specified

Item No.	Symbol	Parameter	Conditions	Limits			Unit
				Min.	Typ.	Max.	
T01	T _a	Operating Ambient Temperature Range		-40		85	°C
T02	R _{thja}	Thermal Resistance Chip/Ambient			68		K/W

All voltages are referenced to ground unless otherwise stated.

All currents flowing into the device pins are positive; all currents flowing out of the device pins are negative.

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ELECTRICAL CHARACTERISTICS

Operating Conditions: VCC = 5 V ±0.25 V, VEE = -5 V ±0.25 V, Tj = -40...100 °C, RL = 2 kΩ, if not other specified

Item No.	Symbol	Parameter	Conditions	Min.	Typ.	Max.	Unit
General							
101	V(VCC)	Positive Supply Voltage Range		4.75	5	5.25	V
102	V(VEE)	Negative Supply Voltage Range		-5.25	-5	-4.75	V
103	I(VCC)	Positive Supply Current	W _{1...4} without load resistors		15	20	mA
104	I(VEE)	Negative Supply Current	W _{1...4} without load resistors	-20	-15		mA
105	P _{DISS}	Power Dissipation	P _{DISS} = 5 V × I _{CC} + 5 V × I _{EE}		150	200	mW
Multiplier Performance							
201	V(X _{1...4}) _{os}	Offset Voltage X _{1...4}	V(X _{1...4}) = 0 V, V(Y _{1...4}) = ±2.5 V	-50		50	mV
202	V(Y _{1...4}) _{os}	Offset Voltage Y _{1...4}	V(Y _{1...4}) = 0 V, V(X _{1...4}) = ±2.5 V	-50		50	mV
203	V(W _{1...4}) _{os}	Output Offset Voltage W _{1...4}	V(X _{1...4}) = 0 V, V(Y _{1...4}) = 0 V	-50		50	mV
204	TCV() _{os}	Output Offset Drift W _{1...4}	V(X _{1...4}) = 0 V, V(Y _{1...4}) = 0 V		50		μV/°C
205	K	Fix Scale Factor	V(X _{1...4}) = ±2.5 V, V(Y _{1...4}) = ±2.5 V	0.38	0.4	0.42	1/V
206	TE(X _{1...4})	Total Error X _{1...4}	-2.5 V ≤ X ≤ 2.5 V, Y = 2.5 V, measured as % of the ±2.5 V full scale	-5	±2	5	%
207	TE(Y _{1...4})	Total Error Y _{1...4}	-2.5 V ≤ Y ≤ 2.5 V, X = 2.5 V, measured as % of the ±2.5 V full scale	-5	±2	5	%
208	TCE(X _{1...4})	Total Error Drift X _{1...4}	V(X _{1...4}) = -2.5 V, V(Y _{1...4}) = 2.5 V		0.005		%/°C
209	TCE(Y _{1...4})	Total Error Drift Y _{1...4}	V(Y _{1...4}) = -2.5 V, V(X _{1...4}) = 2.5 V		0.005		%/°C
210	SE()	Total Square Error X _{1...4} , Y _{1...4}	V(X ₁) = V(Y ₁), V(X ₂) = V(Y ₂), V(X ₃) = V(Y ₃) and V(X ₄) = V(Y ₄)		5		%
211	LE(X _{1...4})	Linearity Error X _{1...4}	-2.5 V ≤ X ≤ 2.5 V, Y = 2.5 V	-1	±0.2	1	%
212	LE(Y _{1...4})	Linearity Error Y _{1...4}	-2.5 V ≤ Y ≤ 2.5 V, X = 2.5 V	-1	±0.2	1	%
Dynamic Performance							
301	BW	Small Signal Bandwidth	V(W _{1...4}) = 0.1 V _{rms}		3.5		MHz
302	SR	Slew Rate	V(W _{1...4}) = ±2.5 V		30		V/μs
303	t _S	Settling Time	V(W _{1...4}) = Δ2.5 V and 1% error band		1		μs
304	FT _{AC}	AC Feedthrough	V(X _{1...4}) = 0 V, V(Y _{1...4}) = 1 V _{rms} and f = 1 kHz	-65			dB
305	CT _{AC}	Crosstalk	V(X _{1...4}) = V(Y _{1...4}) = 1 V _{rms} , f = 100 kHz, applied to adjacent channel	-90			dB
Outputs: W_{1...4}							
401	I _{sc} ()	Short Circuit Current			±30		mA
402	THD(X _{1...4})	Total Harmonic Distortion X _{1...4}	f = 1 kHz, V(Y _{1...4}) = 2.5 V		0.1		%
403	THD(Y _{1...4})	Total Harmonic Distortion Y _{1...4}	f = 1 kHz, V(X _{1...4}) = 2.5 V		0.02		%
404	PSSR()	Power Supply Sensitivity Ratio	V(X _{1...4}) = V(Y _{1...4}) = 0 V, VCC = Δ5% or VEE = Δ5%			10	mV/V
405	EN _A	Audio Band Noise	BW = 10 Hz to 50 kHz		70		μV _{rms}
406	EN _W	Wide Band Noise	BW = 1.9 MHz		590		μV _{rms}
407	en	Spot Noise Voltage	Noise at f = 1 kHz		0.3		μV/√Hz
408	V _{max} ()	Voltage Swing	VCC = +5 V, VEE = -5 V	3.0	3.3		V
409	ROUT()	Open Loop Output Resistance	VCC = +5 V, VEE = -5 V, T = +25 °C		60		Ω
Inputs: X_{1...4}, Y_{1...4}							
501	VR() _{in}	Analog Input Range	V(GND _{1...4}) = 0 V	-2.5		2.5*	V
502	I() _{in}	Input Current	V(X _{1...4}) = V(Y _{1...4}) = 0 V		2.3	10	μA
503	R() _{in}	Input Resistance			1		MΩ
504	C() _{in}	Input Capacitance			3		pF

* For input voltages > 3 V the output is undefined.

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iC-BM FOUR-CHANNEL
FOUR-QUADRANT ANALOG MULTIPLIER



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ORDERING INFORMATION

Type	Package	Order Designation
iC-BM	SO18W	iC-BM SO18W

Please send your purchase orders to our order handling team:

Fax: +49 (0) 61 35 - 92 92 - 692
E-Mail: dispo@ichaus.com

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