

**SONY.****CXB1138Q/Q-Y****4-bit Arithmetic Logic Unit (ALU)**

T-49-11

**Description**

The CXB1138Q is an ultra high speed monolithic ECL IC, which contains an 8-bit Arithmetic Logic Unit capable of 16 arithmetic operations on two 4-bit words.

Arithmetic logic operations are selected by function Select (S0-S3) inputs as indicated in Function Table. This IC uses internal look-ahead carry to minimize delay to the Function (Fn) output and to the ripple Carry (CN+4) output.

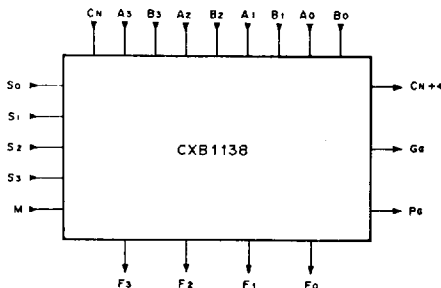
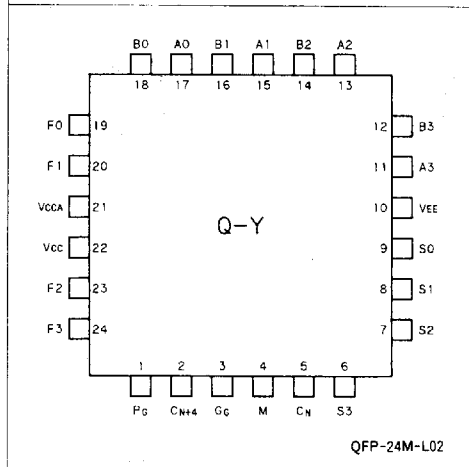
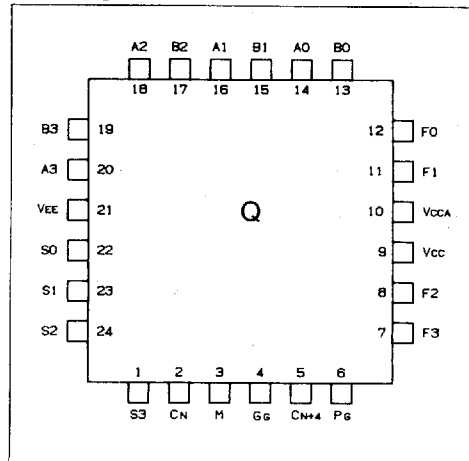
Group Carry Generate (Gg) and Group Carry Propagate (Pg) are provided to obtain fast operation on very long words in combination with the CXB1111Q Look-Ahead Carry Generator.

**Features**

- Typical propagation delay time 1.44ns (Bn to Fn)
- Internal pull down resistors on input pins to maintain logic LOW level with the pins left open
- ECL 100K compatible I/O levels

**Pin Names**

An-Bn	Word A and B operand inputs
CN	Carry input
M	Mode select input
Sn	Function Select inputs
Fn	Function outputs
CN+4	Carry output
Gg	Group carry Generate output
Pg	Group carry Propagate output
Vcc	Circuit ground
VCCA	Circuit ground for output
VEE	Negative voltage supply

**Logic Symbol****Pin Assignment**

QFP-24M-L02

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## DC Characteristics

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 $V_{EE} = -4.5 \pm 0.3V$ ,  $V_{CC} = V_{CCA} = GND$ ,  $V_{TT} = -2.0V$ ,  $T_c = 0^\circ C$  to  $+85^\circ C$ 

Item	Symbol	Test Condition	Min.	Typ.	Max.	Unit
Power supply current	I <sub>EE</sub>		-175	-129	-90	mA

Note: Other DC characteristics: See pages 3-3 and 3-4.

## AC Characteristics

 $V_{EE} = -4.5 \pm 0.3V$ ,  $V_{CC} = V_{CCA} = GND$ ,  $V_{TT} = -2.0V$ ,  $T_c = 0^\circ C$  to  $+85^\circ C$ ,  $R_T = 50\Omega$  to  $V_{TT}$ 

Item	Symbol	Input	Output	Test Condition	Min.	Typ.	Max.	Unit
Propagation delay time	T <sub>PLH</sub>	B <sub>n</sub>	F <sub>n</sub>		700	1440	1830	ps
	T <sub>PHL</sub>				820	1370	1740	
	T <sub>PLH</sub>		P <sub>G</sub>		750	1000	1270	
	T <sub>PHL</sub>				910	1210	1540	
	T <sub>PLH</sub>	B <sub>o</sub>	G <sub>G</sub>		790	1050	1330	
	T <sub>PHL</sub>				980	1310	1660	
	T <sub>PLH</sub>		C <sub>N+4</sub>		890	1180	1500	
	T <sub>PHL</sub>				990	1320	1680	
Rise time	T <sub>TLH</sub>	All Inputs	All Outputs	20% to 80%		500	630	
Fall time	T <sub>THL</sub>					400	510	

Note: AC test circuit; See page 4-3.

All output pins are left open except measured output pins.

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## Function Table

## 1. Positive Logic

Function select				Logic function (M= "H") F	Arithmetic operation (M= "L", C <sub>N</sub> = "L") F
S3	S2	S1	S0		
L	L	L	L	$F=\bar{A}$	$F=A+0$
L	L	L	H	$F=\bar{A}+\bar{B}$	$F=A+(A\cdot\bar{B})$
L	L	H	L	$F=\bar{A}+B$	$F=A+(A\cdot B)$
L	L	H	H	$F="H"$	$F=A\times 2$
L	H	L	L	$F=\bar{A}\cdot\bar{B}$	$F=(A+B)+0$
L	H	L	H	$F=\bar{B}$	$F=(A+B)+(A\cdot\bar{B})$
L	H	H	L	$F=A\oplus B$	$F=A+B$
L	H	H	H	$F=A+\bar{B}$	$F=A+(A+B)$
H	L	L	L	$F=\bar{A}\cdot B$	$F=(A+\bar{B})+0$
H	L	L	H	$F=A\oplus B$	$F=A-B-1$
H	L	H	L	$F=B$	$F=(A+\bar{B})+(A\cdot B)$
H	L	H	H	$F=A+B$	$F=(A+\bar{B})+A$
H	H	L	L	$F="L"$	$F=-1$ (two's complement)
H	H	L	H	$F=A\cdot\bar{B}$	$F=(A\cdot\bar{B})-1$
H	H	H	L	$F=A\cdot B$	$F=(A\cdot B)-1$
H	H	H	H	$F=A$	$F=A-1$

## 2. Negative Logic

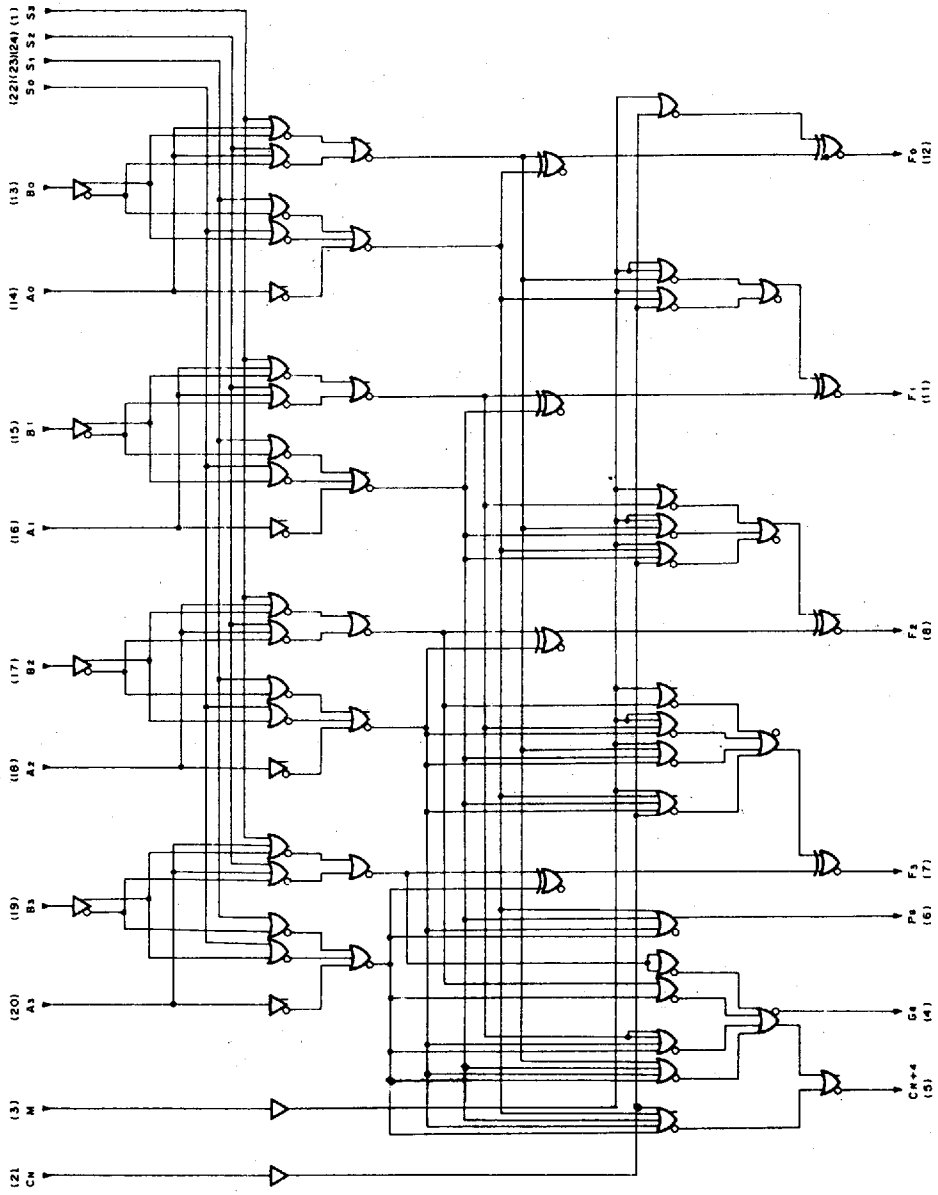
Function select				Logic function (M= "H") F	Arithmetic operation (M= "L", C <sub>N</sub> = "H") F
S3	S2	S1	S0		
L	L	L	L	$F=\bar{A}$	$F=A-1$
L	L	L	H	$F=A+\bar{B}$	$F=A+(A+\bar{B})$
L	L	H	L	$F=\bar{A}\cdot B$	$F=A+(A+B)$
L	L	H	H	$F="L"$	$F=A\times 2$
L	H	L	L	$F=\bar{A}\cdot\bar{B}$	$F=(A\cdot B)-1$
L	H	L	H	$F=\bar{B}$	$F=(A\cdot B)+(A+\bar{B})$
L	H	H	L	$F=A\oplus B$	$F=A+B$
L	H	H	H	$F=A\cdot\bar{B}$	$F=A+(A\cdot B)$
H	L	L	L	$F=\bar{A}+B$	$F=(A\cdot\bar{B})-0$
H	L	L	H	$F=A\oplus B$	$F=A-B-1$
H	L	H	L	$F=B$	$F=(A\cdot\bar{B})+(A+B)$
H	L	H	H	$F=A\cdot B$	$F=(A\cdot\bar{B})+A$
H	H	L	L	$F="H"$	$F=-1$ (two's complement)
H	H	L	H	$F=A+\bar{B}$	$F=(A+\bar{B})+0$
H	H	H	L	$F=A+B$	$F=(A+B)+0$
H	H	H	H	$F=A$	$F=A+0$

H: HIGH voltage level

L: LOW voltage level

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Block Diagram



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Typical Application

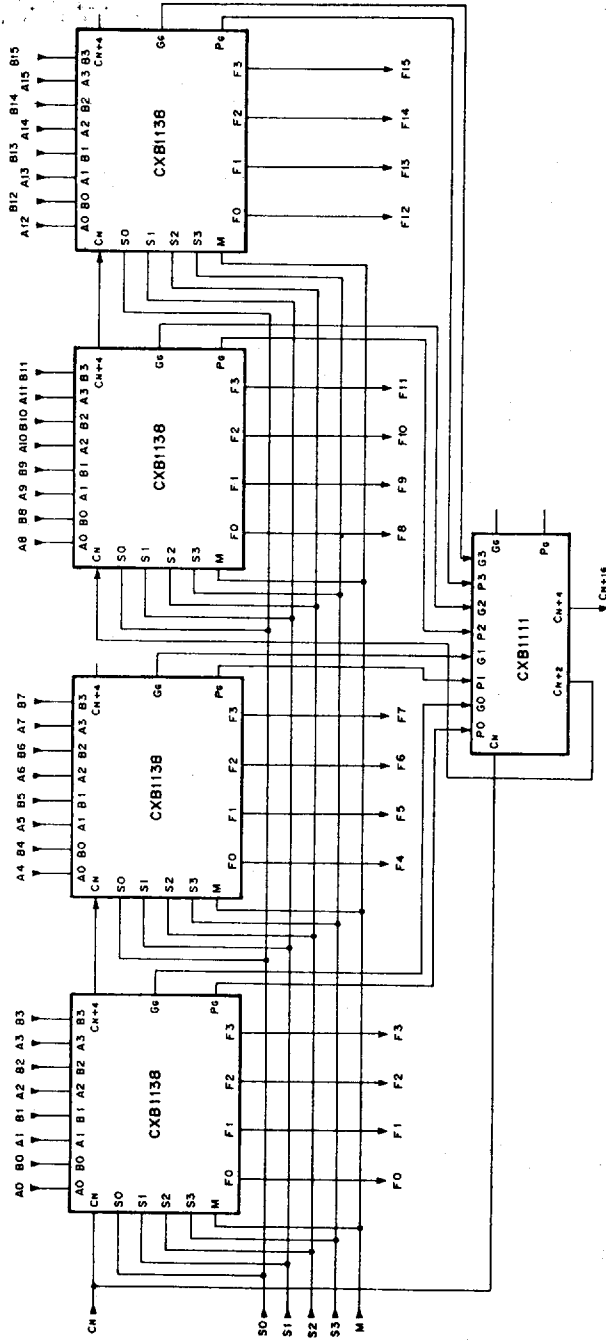


Figure 1. 16-bit ALU with Carry Look Ahead

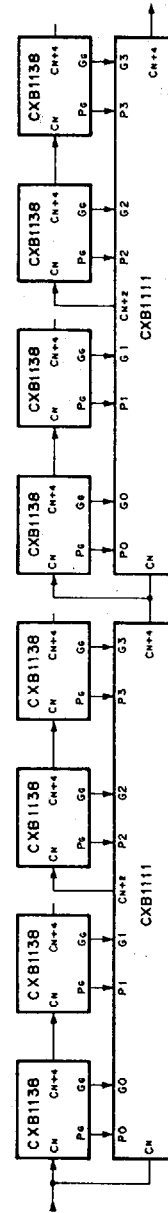


Figure 2. 32-bit ALU with Carry Look Ahead

# Package Data

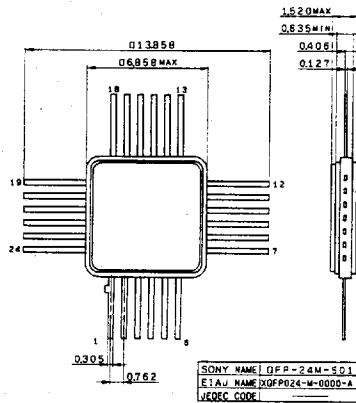
T-90-20

Package Outline

Unit: mm

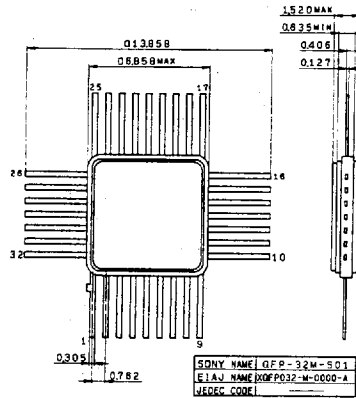
24pin QFP (QFP-24M-S01)

24pin QFP (Metal) 0.3g



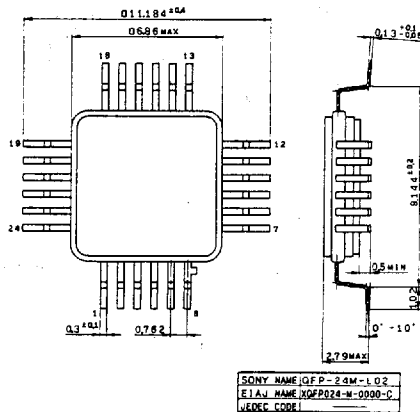
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24pin QFP (QFP-24M-L02)

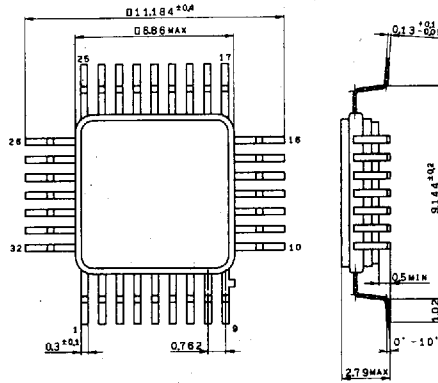
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32pin QFP (QFP-32M-L02)

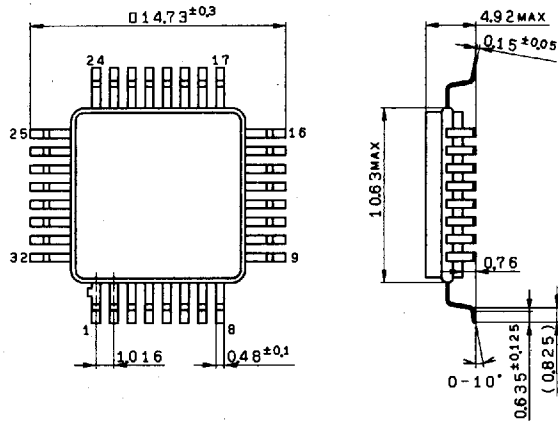
32pin QFP (Metal) 0.2g



SONY NAME	QFP-32M-L02
EIAJ NAME	XQFP032-M-0000-C
JEDEC CODE	

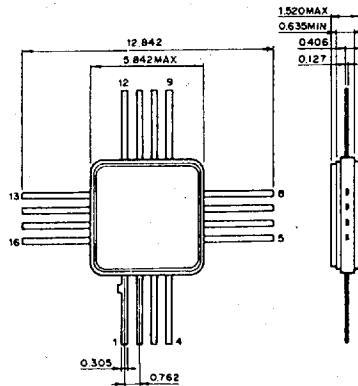
32pin QFP (QFP-32C-L01)

32pin QFP (Ceramic)



SONY NAME	QFP-32C-L01
EIAJ NAME	XQFP032-G-0000-A
JEDEC CODE	

16pin QFP



**Package Data**

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1. 16 pin QFP	6-3
2. 24 pin QFP	6-3
3. 32 pin QFP	6-3
4. 24 pin QFP with formed lead	6-4
5. 32 pin QFP with formed lead	6-4

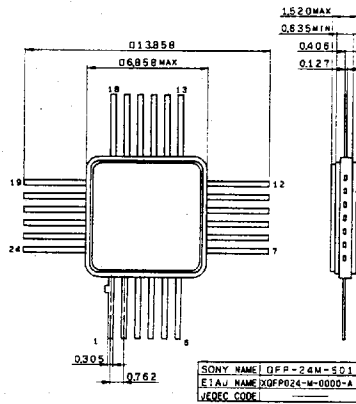
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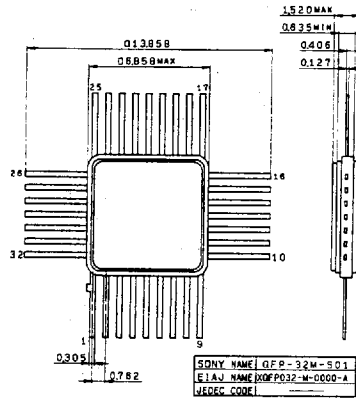
Package Outline

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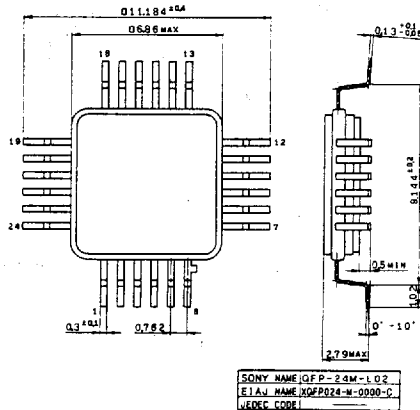
24pin QFP (QFP-24M-S01)  
24pin QFP (Metal) 0.3g



32pin QFP (QFP-32M-S01)  
32pin QFP (Metal) 0.2g



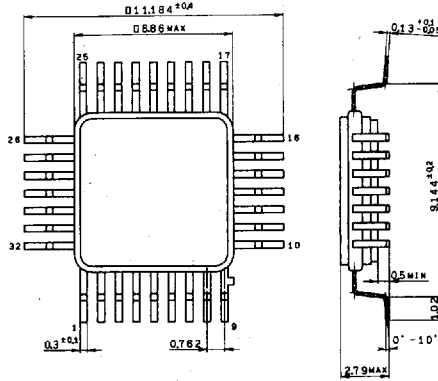
24pin QFP (QFP-24M-L02)  
24pin QFP (Metal) 0.3g



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32pin QFP (QFP-32M-L02)

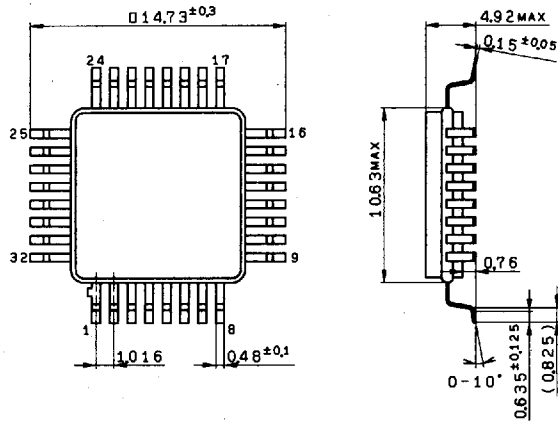
32pin QFP (Metal) 0.2g



SONY NAME	QFP-32M-L02
EIAJ NAME	XQFP032-M-0000-C
JEDEC CODE	

32pin QFP (QFP-32C-L01)

32pin QFP (Ceramic)



SONY NAME	QFP-32C-L01
EIAJ NAME	XQFP032-G-0000-A
JEDEC CODE	

16pin QFP

