

# Sheet1

\PH\* PH ^ currInt<<2  
 \PL\* PL ^ currInt<<2

test Din == 011xxxxx  
 math Din != x11xxxxx  
 jump Din == 111x11xx  
 imm Din == 111xxxxx & !jump  
 k Din == xxx1xxxx  
 zs Din == xxxx11xx  
 zd Din == xxxxxx11  
 jop Din[4,1:0]  
 aluOp Imm ? Din[4:2] : Din[7:5]  
 cond Din[3:0]  
 \fetch TZ?fetcha:timer

\decodeSkip \decode

test	fetch	test	
Math & zs & zf	skip2	useK?\$zpa,mathzzb:\$zpa,mathzz	note:
Math & !zs & zd	skip1	useK?\$zpa,kmathrz:\$zpa,mathrz	
Math & zs & !zd	skip1	\$zpa,mathzr	
Math & !zs & !zd	fetch	mathrr	
Imm & zd	skip2	mathiz	
Imm & !zd	skip1	mathir	
Jump & jop == 0	skip2	jump	
Jump & jop == 1	skip2	call	
Jump & jop == 2	fetch	fetch	
Jump & jop == 3	fetch	return	
Jump & jop == 4	skip1	\$zpa,jumpz	
Jump & jop == 5	skip1	callz	
Jump & jop == 6	fetch	fetch	
Jump & jop == 7	skip1	\$zpa,table	

\mA SvAluOp[2]?00:SvAluOp[1:0]  
 \mL SvAluOp[2]?svAluOp[1:0]:11  
 \mCin !svAluOp[2]&svAluOp[0]  
 \S {00,svS}  
 \D {00,svD}  
 \kD prevK ? 0011 : {00,svD}  
 \kD2 useK ? 0011 : {00,svD}

label	aAd	bAd	wAd	wReg	dIn	rMem	dOut	wMem	aSel	bSel	logSel	Cin
reset	x	x	PL		1 ?		0 ?		0	0 B	^	0
resetb	x	x	PH		1 ?		0 ?		0	0 B	^	0
resetc	x	x	TL		1 ?		0 ?		0	0 B	^	0
resetd	x	x	TH		1 ?		0 ?		0	0 B	^	0
timer	x	TL	TL		1 ?		0 ?		0	-2 B	B	1
timerb	x	TH	TH		1 ?		0 ?		0	-2 B	B	1

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timerc	x	TL	TL	1 ?	0 ?	0	-2 B	B	0
fetcha	PH*	PL*	PL*	1 ?	1 ?	0	0 B	B	1
fetchb	x	PH*	PH*	1 Inst	0 ?	0	0 B	B	1
fetchc	x	x	x	0 Inst	0 ?	0 x	x	x	x
skipf	PH*	PL*	PL*	1 ?	1 ?	0	0 B	B	1
skipfb	x	PH*	PH*	1 Inst	0 ?	0	0 B	B	1
skipfc	x	x	x	0 Inst	0 ?	0 x	x	x	x
skip2	PH*	PL*	PL*	1 ?	0 ?	0	0 B	B	1
skip2b	x	PH*	PH*	1 ?	0 ?	0	0 B	B	1
skip1	PH*	PL*	PL*	1 ?	0 ?	0	0 B	B	1
skip1b	x	PH*	PH*	1 ?	0 ?	0	0 B	B	1
test	x	x	K	1 ?	0 ?	0	0 B	^	tr
mathrr	S	kD	kD2	1 ?	0 ?	0 mA	B	mL	mCir
call	x	PL*	LL	1 ?	0 ?	0	0 B	B	0
callb	x	PH*	LH	1 ?	0 ?	0	0 B	B	0
jump	PH*	PL*	PL*	1 ?	1 ?	0	0 B	B	1
jumpb	x	x	ML	1 PCL	0 ?	0	0 mem	B	0
jumpc	x	x	ML	1 PCL	0 ?	0	0 mem	B	0
jumpd	x	PH*	PH*	1 ?	0 ?	0	0 B	B	1
jumpe	PH*	PL*	x	0 ?	1 ?	0 x	x	x	x
jumpf	x	x	PH*	1 PCH	0 ?	0	0 mem	B	0
jumpg	x	ML	PL*	1 ?	0 ?	0	0 B	B	0
return	x	LL	PL*	1 ?	0 ?	0	0 B	B	0
returnb	x	LH	PH*	1 ?	0 ?	0	0 B	B	0
mathir	PH*	PL*	PL*	1 ?	1 ?	0	0 B	B	1
mathirb	kD	x	D	1 #	0 ?	0 mA	mem	mL	mCir
mathirc	kD	x	D	1 #	0 ?	0 mA	mem	mL	mCir
mathird	x	PH*	PH*	1 ?	0 ?	0	0 B	B	1
zpa	PH*	PL*	PL*	1 ?	1 ?	0	0 B	B	1
zpab	x	x	ZL	1 zpa	0 ?	0	0 mem	B	0
zpac	x	x	ZL	1 zpa	0 ?	0	0 mem	B	0
zpad	x	PH*	PH*	1 ?	0 ?	0	0 B	B	1
zpaе	ZH	ZL	x	0 ?	1 ?	0 x	x	x	x
zpaф	ZH	ZL	x	0 ?	1 ?	0 x	x	x	x
zpag	x	x	ML	1 lowp	0 ?	0	0 mem	B	0
zpah	ZH	ZL	x	0 ?	1 ?	0 x	x	x	x
zpai	x	x	MH	1 highp	0 ?	0	0 mem	B	0
zpaј	x	ML	x	0 ?	0 ?	0	0 B	B	1
zpak	ZH	ZL	x	0 ?	0 ML+1	1 x	x	x	x
zpal	ZH	ZL	x	0 ?	0 ML+1	1 x	x	x	x
zpaм	x	MH	x	0 ?	0 ?	0	0 B	B	1
zpan	ZH	ZL	x	0 ?	0 MH+1	1 x	x	x	x
zpaо	MH	ML	x	0 ?	1 ?	0 x	x	x	x
mathiz	PH*	PL*	PL*	1 ?	1 ?	0	0 B	B	1

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mathizb	x	reg	K	1 #	0 ?	0	0 memz	B	0
mathizc	x	reg	K	1 #	0 ?	0	0 memz	B	0
mathizd	K	reg	K	1 #	0 ?	0 mA	memz	mL	mCir
mathize	K	reg	K	1 #	0 ?	0 mA	memz	mL	mCir
mathizf	x	PH*	PH*	1 ?	0 ?	0	0 B	B	1
mathizg	x	PH*	PH*	1 ?	0 ?	0	0 B	B	1
mathizo	K	reg	K	1 value	0 ?	0 mA	memz	mL	mCir
mathizp	x	K	x	0 ?	0 ?	0	0 B	B	0
mathizq	MH	ML	x	0 ?	0 K	1 x	x	x	x
mathizr	x	K	reg	1 ?	0 K	0	0 B	B	0
mathizs	x	K	reg	0 ?	0 K	0	0 B	B	0
callz	x	PL*	LL	1 ?	0 ?	0	0 B	B	0
callzb	x	PH*	LH	1 ?	0 ?	0	0 B	B	0
jumpz	x	ML	PL*	1 ?	0 ?	0	0 B	B	0
jumpzb	x	MH	PH*	1 ?	0 ?	0	0 B	B	0
table	LL	reg	PL*	1 ?	0 ?	0	0 memz	B	0
tableb	x	LH	PH*	1 ?	0 ?	0	0 B	B	1
tablec	x	LH	PH*	1 ?	0 ?	0	0 B	B	0
mathzr	kD	reg	kD2	1 value	0 ?	0 mA	memz	mL	mCir
mathrz	S	reg	K	1 value	0 ?	0 mA	memz	mL	mCir
mathrzb	MH	ML	x	0 ?	0 K	1 x	x	x	x
mathrzc	x	K	reg	1 ?	0 K	0	0 B	B	0
mathrzd	x	K	reg	0 ?	0 K	0	0 B	B	0
kmathrz	S	K	K	1 ?	0 ?	0 mA	B	mL	mCir
mathzz	x	reg	K	1 value	0 ?	0	0 memz	B	0
mathzzb	K	x	K	1 value	0 ?	0 mA	memz	mL	mCir
mathzzc	MH	ML	x	0 ?	0 K	1 x	x	x	x
mathzzd	x	K	reg	1 ?	0 K	0	0 B	B	0
mathzze	x	K	reg	0 ?	0 K	0	0 B	B	0

MH,K,S,kD,LL,PH\*,ZH

ML,K,LH,MH,PH\*,PL\*,ZL,LL,kD,TL,TH,reg

K,kD2,PH\*,PL\*,LH,LL,MH,ML,ZL,D,TL,TH,reg

0,-2,mA

B,mem,memz

B,mL,^

0,1,n

: useK will become prevK at the end of this clock cycle

sA7 sA0 A0 wIR wFL next

x	x	x	0	0 resetb	PH,PL = 0
x	x	x	0	0 resetc	
x	x	x	0	0 resetd	TH,TL = 0
x	x	x	0	0 fetch	
x	x	x	0	0 Z?(TZ?fetcha:timerb):timer	TL -= 1
x	x	x	0	0 timerc	TH -= 1

x	x	x	0	0 timer
	0	0 x	0	0 C?fetchb:fetchc
x	x	x	1	0 decode
x	x	x	1	0 decode
	0	0 x	0	0 C?skipfb:skipfc
x	x	x	0	0 decodeSkip
x	x	x	0	0 decodeSkip
x	x	x	0	0 C?skip2b:skip1
x	x	x	0	0 skip1
x	x	x	0	0 C?skip1b:fetch
x	x	x	0	0 fetch
x	x	x	0	0 useK ltr?fetch:skipf
x	x	x	0	1 fetch
x	x	x	0	0 callb
x	x	x	0	0 jump
	0	0 x	0	0 C?jumpb:jumpc
x	x	x	0	0 jumpd
x	x	x	0	0 jumpe
x	x	x	0	0 jumpe
	0	0 x	0	0 jumpf
x	x	x	0	0 jumpg
x	x	x	0	0 fetch
x	x	x	0	0 returnb
x	x	x	0	0 fetch
	0	0 x	0	0 C?mathirb:mathirc
x	x	x	0	1 mathird
x	x	x	0	1 fetch
x	x	x	0	0 fetch
	0	0 x	0	0 C?zpab:zpac
x	x	x	0	0 zpad
x	x	x	0	0 svlnd?zpa:zpa
x	x	x	0	0 svlnd?zpa:zpa
	0	0 x	0	0 rtn
	1	1 0	0	0 zpag
x	x	x	0	0 zpah
	1	1 1	0	0 zpai
x	x	x	0	0 svlnc?zpa:zpa
x	x	x	0	0 C?zpak:zpal
	1	1 0	0	0 zpam
	1	1 0	0	0 zpao
x	x	x	0	0 zpan
	1	1 1	0	0 zpao
x	x	x	0	0 rtn
	0	0 x	0	0 prevK?(C?mathizd:mathize):(C?mathizb:mathizc)

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0	0	x	0	0 \$zpa,mathizo
0	0	x	0	0 mathizf
x	x	x	0	1 \$zpa,mathizp
x	x	x	0	1 mathizg
x	x	x	0	0 \$zpa,mathizo
x	x	x	0	0 \$zpa,mathizp
x	x	x	0	1 mathizp
x	x	x	0	0 svZReg?(svZIO?mathizs:mathizr):mathizq
x	x	x	0	0 fetch
x	x	x	0	0 fetch
x	x	x	0	0 fetch
x	x	x	0	0 callzb
x	x	x	0	0 \$zpa,jumpz
x	x	x	0	0 jumpzb
x	x	x	0	0 fetch
x	x	x	0	0 C?tableb:tablec
x	x	x	0	0 fetch
x	x	x	0	0 fetch
x	x	x	0	1 fetch
x	x	x	0	1 svZReg?(svZIO?mathrzd:mathrzc):mathrzb
x	x	x	0	0 fetch
x	x	x	0	0 fetch
x	x	x	0	0 fetch
x	x	x	0	1 svZReg?(svZIO?mathrzd:mathrzc):mathrzb
x	x	x	0	0 \$zpa,mathzzb
x	x	x	0	1 svZReg?(svZIO?mathzze:mathzzd):mathzzc
x	x	x	0	0 fetch
x	x	x	0	0 fetch
x	x	x	0	0 fetch

1Cin