`define silence 32'd50000000

module lab08(

clk, // clock from crystal

rst, // active high reset: BTNC

\_play, // SW: Play/Pause

\_mute, // SW: Mute

\_repeat, // SW: Repeat

\_music, // SW: Music

\_volUP, // BTN: Vol up

\_volDOWN, // BTN: Vol down

\_led\_vol, // LED: volume

audio\_mclk, // master clock

audio\_lrck, // left-right clock

audio\_sck, // serial clock

audio\_sdin, // serial audio data input

DISPLAY, // 7-seg

DIGIT // 7-seg

);

// I/O declaration

input clk; // clock from the crystal

input rst; // active high reset

input \_play, \_mute, \_repeat, \_music, \_volUP, \_volDOWN;

output [4:0] \_led\_vol;

output audio\_mclk; // master clock

output audio\_lrck; // left-right clock

output audio\_sck; // serial clock

output audio\_sdin; // serial audio data input

output [6:0] DISPLAY;

output [3:0] DIGIT;

// Modify these

assign DIGIT = 4'b0001;

assign DISPLAY = 7'b111\_1111;

// Internal Signal

wire [15:0] audio\_in\_left, audio\_in\_right;

wire volup\_de;

wire voldown\_de;

wire volup\_pul;

wire voldown\_pul;

reg [2:0]level;

reg [2:0]nextlevel;

wire [2:0]tmplevel;

assign tmplevel=level;

debounce de1(.pb\_debounced(volup\_de),.pb(\_volUP),.clk(clk));

onepulse on1(.signal(volup\_de),.clk(clk),.op(volup\_pul));

debounce de2(.pb\_debounced(voldown\_de),.pb(\_volDOWN),.clk(clk));

onepulse on2(.signal(voldown\_de),.clk(clk),.op(voldown\_pul));

wire clkDiv22;

wire [11:0] ibeatNum; // Beat counter

wire [31:0] freqL, freqR; // Raw frequency, produced by music module

wire [21:0] freq\_outL, freq\_outR; // Processed Frequency, adapted to the clock rate of Basys3

assign freq\_outL = 50000000 / (\_mute ? `silence : freqL); // Note gen makes no sound, if freq\_out = 50000000 / `silence = 1

assign freq\_outR = 50000000 / (\_mute ? `silence : freqR);

assign \_led\_vol=(tmplevel==3'b000||\_mute)?5'b00000:(tmplevel==3'b001)?5'b00001:(tmplevel==3'b010)?5'b00010:(tmplevel==3'b011)?5'b00100:(tmplevel==3'b100)?5'b01000:(tmplevel==3'b101)?5'b10000:5'b00000;

clock\_divider #(.n(22)) clock\_22(

.clk(clk),

.clk\_div(clkDiv22)

);

// Player Control

player\_control #(.LEN(576)) playerCtrl\_00 (

.clk(clkDiv22),

.reset(rst),

.\_play(\_play),

.\_repeat(\_repeat),

.ibeat(ibeatNum),

.music(\_music)

);

// Music module

// [in] beat number and en

// [out] left & right raw frequency

music\_example music\_00 (

.ibeatNum(ibeatNum),

.en(\_play),

.toneL(freqL),

.toneR(freqR),

.music(\_music)

);

// Note generation

// [in] processed frequency

// [out] audio wave signal (using square wave here)

note\_gen noteGen\_00(

.clk(clk), // clock from crystal

.rst(rst), // active high reset

.note\_div\_left(freq\_outL),

.note\_div\_right(freq\_outR),

.audio\_left(audio\_in\_left), // left sound audio

.audio\_right(audio\_in\_right),

.volume(tmplevel) // 3 bits for 5 levels

);

// Speaker controller

speaker\_control sc(

.clk(clk), // clock from the crystal

.rst(rst), // active high reset

.audio\_in\_left(audio\_in\_left), // left channel audio data input

.audio\_in\_right(audio\_in\_right), // right channel audio data input

.audio\_mclk(audio\_mclk), // master clock

.audio\_lrck(audio\_lrck), // left-right clock

.audio\_sck(audio\_sck), // serial clock

.audio\_sdin(audio\_sdin) // serial audio data input

);

always@(\*)

begin

if(rst)

begin

nextlevel=3'b011;

end

else

begin

if(volup\_pul)

begin

if(level==3'b101) begin nextlevel=level; end

else begin nextlevel=level+1; end

end

else if(voldown\_pul)

begin

if(level==3'b001) begin nextlevel=level; end

else begin nextlevel=level-1; end

end

else

begin

nextlevel=level;

end

end

end

always@(posedge clk or posedge rst)

begin

if(rst)

begin

level<=3'b011;

end

else

begin

level<=nextlevel;

end

end

endmodule

`define hc 32'd524 // C5

`define hd 32'd588 // D5

`define he 32'd660 // E5

`define hf 32'd698 // F5

`define hg 32'd784 // G5

`define ha 32'd880 // A5

`define hb 32'd988 // B5

`define c 32'd262 // C4

`define d 32'd294 // D4

`define e 32'd330 // E4

`define f 32'd349 // F4

`define g 32'd392 // G4

`define a 32'd440 // A4

`define b 32'd494 // B4

`define l 32'd370 // sharp F4

`define k 32'd415 // sharp G4

`define m 32'd466 //sharp B4

`define n 32'd247 //sharp B3

`define sil 32'd50000000 // slience

module music\_example (

input [11:0] ibeatNum,

input en,

input music,

output reg [31:0] toneL,

output reg [31:0] toneR

);

always @\* begin

if(music==1'b0)

begin

if(en == 1)

begin

case(ibeatNum)

// --- Measure 1 ---

12'd0: toneR = `g; 12'd1: toneR = `g; 12'd2: toneR = `g; 12'd3: toneR = `g;

12'd4: toneR = `g; 12'd5: toneR = `g; 12'd6: toneR = `g; 12'd7: toneR = `g;

12'd8: toneR = `g; 12'd9: toneR = `g; 12'd10: toneR = `g; 12'd11: toneR = `g;

12'd12: toneR = `g; 12'd13: toneR = `g; 12'd14: toneR = `g; 12'd15: toneR = `g;

12'd16: toneR = `sil; 12'd17: toneR = `sil; 12'd18: toneR = `sil; 12'd19: toneR = `sil;

12'd20: toneR = `sil; 12'd21: toneR = `sil; 12'd22: toneR = `sil; 12'd23: toneR = `sil;

12'd24: toneR = `c; 12'd25: toneR = `c; 12'd26: toneR = `c; 12'd27: toneR = `c;

12'd28: toneR = `c; 12'd29: toneR = `c; 12'd30: toneR = `c; 12'd31: toneR = `c;

12'd32: toneR = `c; 12'd33: toneR = `c; 12'd34: toneR = `c; 12'd35: toneR = `c;

12'd36: toneR = `c; 12'd37: toneR = `c; 12'd38: toneR = `c; 12'd39: toneR = `c;

12'd40: toneR = `m; 12'd41: toneR = `m; 12'd42: toneR = `m; 12'd43: toneR = `m;

12'd44: toneR = `m; 12'd45: toneR = `m; 12'd46: toneR = `m; 12'd47: toneR = `m;

12'd48: toneR = `m; 12'd49: toneR = `m; 12'd50: toneR = `m; 12'd51: toneR = `m;

12'd52: toneR = `m; 12'd53: toneR = `m; 12'd54: toneR = `m; 12'd55: toneR = `m;

12'd56: toneR = `g; 12'd57: toneR = `g; 12'd58: toneR = `g; 12'd59: toneR = `g;

12'd60: toneR = `g; 12'd61: toneR = `g; 12'd62: toneR = `g; 12'd63: toneR = `g;

12'd64: toneR = `a; 12'd65: toneR = `a; 12'd66: toneR = `a; 12'd67: toneR = `a;

12'd68: toneR = `a; 12'd69: toneR = `a; 12'd70: toneR = `a; 12'd71: toneR = `a;

12'd72: toneR = `sil; 12'd73: toneR = `sil; 12'd74: toneR = `sil; 12'd75: toneR = `sil;

12'd76: toneR = `sil; 12'd77: toneR = `sil; 12'd78: toneR = `sil; 12'd79: toneR = `sil;

12'd80: toneR = `sil; 12'd81: toneR = `sil; 12'd82: toneR = `sil; 12'd83: toneR = `sil;

12'd84: toneR = `sil; 12'd85: toneR = `sil; 12'd86: toneR = `sil; 12'd87: toneR = `sil;

12'd88: toneR = `c; 12'd89: toneR = `c; 12'd90: toneR = `c; 12'd91: toneR = `c;

12'd92: toneR = `c; 12'd93: toneR = `c; 12'd94: toneR = `c; 12'd95: toneR = `c;

12'd96: toneR = `c; 12'd97: toneR = `c; 12'd98: toneR = `c; 12'd99: toneR = `c;

12'd100: toneR = `c; 12'd101: toneR = `c; 12'd102: toneR = `c; 12'd103: toneR = `c;

12'd104: toneR = `a; 12'd105: toneR = `a; 12'd106: toneR = `a; 12'd107: toneR = `a;

12'd108: toneR = `a; 12'd109: toneR = `a; 12'd110: toneR = `a; 12'd111: toneR = `a;

12'd112: toneR = `a; 12'd113: toneR = `a; 12'd114: toneR = `a; 12'd115: toneR = `a;

12'd116: toneR = `a; 12'd117: toneR = `a; 12'd118: toneR = `a; 12'd119: toneR = `a;

12'd120: toneR = `g; 12'd121: toneR = `g; 12'd122: toneR = `g; 12'd123: toneR = `g;

12'd124: toneR = `g; 12'd125: toneR = `g; 12'd126: toneR = `g; 12'd127: toneR = `g;

12'd128: toneR = `g; 12'd129: toneR = `g; 12'd130: toneR = `g; 12'd131: toneR = `g;

12'd132: toneR = `g; 12'd133: toneR = `g; 12'd134: toneR = `g; 12'd135: toneR = `g;

12'd136: toneR = `sil; 12'd137: toneR = `sil; 12'd138: toneR = `sil; 12'd139: toneR = `sil;

12'd140: toneR = `sil; 12'd141: toneR = `sil; 12'd142: toneR = `sil; 12'd143: toneR = `sil;

12'd144: toneR = `sil; 12'd145: toneR = `sil; 12'd146: toneR = `sil; 12'd147: toneR = `sil;

12'd148: toneR = `sil; 12'd149: toneR = `sil; 12'd150: toneR = `sil; 12'd151: toneR = `sil;

12'd152: toneR = `g; 12'd153: toneR = `g; 12'd154: toneR = `g; 12'd155: toneR = `g;

12'd156: toneR = `g; 12'd157: toneR = `g; 12'd158: toneR = `g; 12'd159: toneR = `g;

12'd160: toneR = `g; 12'd161: toneR = `g; 12'd162: toneR = `g; 12'd163: toneR = `g;

12'd164: toneR = `g; 12'd165: toneR = `g; 12'd166: toneR = `g; 12'd167: toneR = `g;

12'd168: toneR = `a; 12'd169: toneR = `a; 12'd170: toneR = `a; 12'd171: toneR = `a;

12'd172: toneR = `a; 12'd173: toneR = `a; 12'd174: toneR = `a; 12'd175: toneR = `a;

12'd176: toneR = `m; 12'd177: toneR = `m; 12'd178: toneR = `m; 12'd179: toneR = `m;

12'd180: toneR = `m; 12'd181: toneR = `m; 12'd182: toneR = `m; 12'd183: toneR = `m;

12'd184: toneR = `hc; 12'd185: toneR = `hc; 12'd186: toneR = `hc; 12'd187: toneR = `hc;

12'd188: toneR = `hc; 12'd189: toneR = `hc; 12'd190: toneR = `hc; 12'd191: toneR = `hc;

12'd192: toneR = `f; 12'd193: toneR = `f; 12'd194: toneR = `f; 12'd195: toneR = `f;

12'd196: toneR = `f; 12'd197: toneR = `f; 12'd198: toneR = `f; 12'd199: toneR = `f;

12'd200: toneR = `f; 12'd201: toneR = `f; 12'd202: toneR = `f; 12'd203: toneR = `f;

12'd204: toneR = `f; 12'd205: toneR = `f; 12'd206: toneR = `f; 12'd207: toneR = `f;

12'd208: toneR = `e; 12'd209: toneR = `e; 12'd210: toneR = `e; 12'd211: toneR = `e;

12'd212: toneR = `e; 12'd213: toneR = `e; 12'd214: toneR = `e; 12'd215: toneR = `e;

12'd216: toneR = `e; 12'd217: toneR = `e; 12'd218: toneR = `e; 12'd219: toneR = `e;

12'd220: toneR = `f; 12'd221: toneR = `f; 12'd222: toneR = `f; 12'd223: toneR = `f;

12'd224: toneR = `f; 12'd225: toneR = `f; 12'd226: toneR = `f; 12'd227: toneR = `f;

12'd228: toneR = `f; 12'd229: toneR = `f; 12'd230: toneR = `f; 12'd231: toneR = `f;

12'd232: toneR = `f; 12'd233: toneR = `f; 12'd234: toneR = `f; 12'd235: toneR = `f;

12'd236: toneR = `sil; 12'd237: toneR = `sil; 12'd238: toneR = `sil; 12'd239: toneR = `sil;

12'd240: toneR = `hc; 12'd241: toneR = `hc; 12'd242: toneR = `hc; 12'd243: toneR = `hc;

12'd244: toneR = `hc; 12'd245: toneR = `hc; 12'd246: toneR = `hc; 12'd247: toneR = `hc;

12'd248: toneR = `hc; 12'd249: toneR = `hc; 12'd250: toneR = `hc; 12'd251: toneR = `hc;

12'd252: toneR = `hc; 12'd253: toneR = `hc; 12'd254: toneR = `hc; 12'd255: toneR = `hc;

12'd256: toneR = `c; 12'd257: toneR = `c; 12'd258: toneR = `c; 12'd259: toneR = `c;

12'd260: toneR = `c; 12'd261: toneR = `c; 12'd262: toneR = `c; 12'd263: toneR = `c;

12'd264: toneR = `c; 12'd265: toneR = `c; 12'd266: toneR = `c; 12'd267: toneR = `c;

12'd268: toneR = `c; 12'd269: toneR = `c; 12'd270: toneR = `c; 12'd271: toneR = `c;

12'd272: toneR = `sil; 12'd273: toneR = `sil; 12'd274: toneR = `sil; 12'd275: toneR = `sil;

12'd276: toneR = `sil; 12'd277: toneR = `sil; 12'd278: toneR = `sil; 12'd279: toneR = `sil;

12'd280: toneR = `a; 12'd281: toneR = `a; 12'd282: toneR = `a; 12'd283: toneR = `a;

12'd284: toneR = `a; 12'd285: toneR = `a; 12'd286: toneR = `a; 12'd287: toneR = `a;

12'd288: toneR = `a; 12'd289: toneR = `a; 12'd290: toneR = `a; 12'd291: toneR = `a;

12'd292: toneR = `a; 12'd293: toneR = `a; 12'd294: toneR = `a; 12'd295: toneR = `a;

12'd296: toneR = `m; 12'd297: toneR = `m; 12'd298: toneR = `m; 12'd299: toneR = `m;

12'd300: toneR = `m; 12'd301: toneR = `m; 12'd302: toneR = `m; 12'd303: toneR = `m;

12'd304: toneR = `hc; 12'd305: toneR = `hc; 12'd306: toneR = `hc; 12'd307: toneR = `hc;

12'd308: toneR = `hc; 12'd309: toneR = `hc; 12'd310: toneR = `hc; 12'd311: toneR = `hc;

12'd312: toneR = `hd; 12'd313: toneR = `hd; 12'd314: toneR = `hd; 12'd315: toneR = `hd;

12'd316: toneR = `hd; 12'd317: toneR = `hd; 12'd318: toneR = `hd; 12'd319: toneR = `hd;

12'd320: toneR = `f; 12'd321: toneR = `f; 12'd322: toneR = `f; 12'd323: toneR = `f;

12'd324: toneR = `f; 12'd325: toneR = `f; 12'd326: toneR = `f; 12'd327: toneR = `f;

12'd328: toneR = `sil; 12'd329: toneR = `sil; 12'd330: toneR = `sil; 12'd331: toneR = `sil;

12'd332: toneR = `sil; 12'd333: toneR = `sil; 12'd334: toneR = `sil; 12'd335: toneR = `sil;

12'd336: toneR = `sil; 12'd337: toneR = `sil; 12'd338: toneR = `sil; 12'd339: toneR = `sil;

12'd340: toneR = `sil; 12'd341: toneR = `sil; 12'd342: toneR = `sil; 12'd343: toneR = `sil;

12'd344: toneR = `e; 12'd345: toneR = `e; 12'd346: toneR = `e; 12'd347: toneR = `e;

12'd348: toneR = `e; 12'd349: toneR = `e; 12'd350: toneR = `e; 12'd351: toneR = `e;

12'd352: toneR = `e; 12'd353: toneR = `e; 12'd354: toneR = `e; 12'd355: toneR = `e;

12'd356: toneR = `e; 12'd357: toneR = `e; 12'd358: toneR = `e; 12'd359: toneR = `e;

12'd360: toneR = `f; 12'd361: toneR = `f; 12'd362: toneR = `f; 12'd363: toneR = `f;

12'd364: toneR = `f; 12'd365: toneR = `f; 12'd366: toneR = `f; 12'd367: toneR = `f;

12'd368: toneR = `a; 12'd369: toneR = `a; 12'd370: toneR = `a; 12'd371: toneR = `a;

12'd372: toneR = `a; 12'd373: toneR = `a; 12'd374: toneR = `a; 12'd375: toneR = `a;

12'd376: toneR = `hd; 12'd377: toneR = `hd; 12'd378: toneR = `hd; 12'd379: toneR = `hd;

12'd380: toneR = `hd; 12'd381: toneR = `hd; 12'd382: toneR = `hd; 12'd383: toneR = `hd;

12'd384: toneR = `hc; 12'd385: toneR = `hc; 12'd386: toneR = `hc; 12'd387: toneR = `hc;

12'd388: toneR = `hc; 12'd389: toneR = `hc; 12'd390: toneR = `hc; 12'd391: toneR = `hc;

12'd392: toneR = `hc; 12'd393: toneR = `hc; 12'd394: toneR = `hc; 12'd395: toneR = `hc;

12'd396: toneR = `hc; 12'd397: toneR = `hc; 12'd398: toneR = `hc; 12'd399: toneR = `hc;

12'd400: toneR = `g; 12'd401: toneR = `g; 12'd402: toneR = `g; 12'd403: toneR = `g;

12'd404: toneR = `g; 12'd405: toneR = `g; 12'd406: toneR = `g; 12'd407: toneR = `g;

12'd408: toneR = `g; 12'd409: toneR = `g; 12'd410: toneR = `g; 12'd411: toneR = `g;

12'd412: toneR = `g; 12'd413: toneR = `g; 12'd414: toneR = `g; 12'd415: toneR = `g;

12'd416: toneR = `a; 12'd417: toneR = `a; 12'd418: toneR = `a; 12'd419: toneR = `a;

12'd420: toneR = `a; 12'd421: toneR = `a; 12'd422: toneR = `a; 12'd423: toneR = `a;

12'd424: toneR = `a; 12'd425: toneR = `a; 12'd426: toneR = `a; 12'd427: toneR = `a;

12'd428: toneR = `a; 12'd429: toneR = `a; 12'd430: toneR = `a; 12'd431: toneR = `a;

12'd432: toneR = `sil; 12'd433: toneR = `sil; 12'd434: toneR = `sil; 12'd435: toneR = `sil;

12'd436: toneR = `sil; 12'd437: toneR = `sil; 12'd438: toneR = `sil; 12'd439: toneR = `sil;

12'd440: toneR = `a; 12'd441: toneR = `a; 12'd442: toneR = `a; 12'd443: toneR = `a;

12'd444: toneR = `a; 12'd445: toneR = `a; 12'd446: toneR = `a; 12'd447: toneR = `a;

12'd448: toneR = `hc; 12'd449: toneR = `hc; 12'd450: toneR = `hc; 12'd451: toneR = `hc;

12'd452: toneR = `hc; 12'd453: toneR = `hc; 12'd454: toneR = `hc; 12'd455: toneR = `hc;

12'd456: toneR = `m; 12'd457: toneR = `m; 12'd458: toneR = `m; 12'd459: toneR = `m;

12'd460: toneR = `m; 12'd461: toneR = `m; 12'd462: toneR = `m; 12'd463: toneR = `m;

12'd464: toneR = `a; 12'd465: toneR = `a; 12'd466: toneR = `a; 12'd467: toneR = `a;

12'd468: toneR = `a; 12'd469: toneR = `a; 12'd470: toneR = `a; 12'd471: toneR = `a;

12'd472: toneR = `m; 12'd473: toneR = `m; 12'd474: toneR = `m; 12'd475: toneR = `m;

12'd476: toneR = `m; 12'd477: toneR = `m; 12'd478: toneR = `m; 12'd479: toneR = `m;

12'd480: toneR = `a; 12'd481: toneR = `a; 12'd482: toneR = `a; 12'd483: toneR = `a;

12'd484: toneR = `a; 12'd485: toneR = `a; 12'd486: toneR = `a; 12'd487: toneR = `a;

12'd488: toneR = `a; 12'd489: toneR = `a; 12'd490: toneR = `a; 12'd491: toneR = `a;

12'd492: toneR = `a; 12'd493: toneR = `a; 12'd494: toneR = `a; 12'd495: toneR = `a;

12'd496: toneR = `f; 12'd497: toneR = `f; 12'd498: toneR = `f; 12'd499: toneR = `f;

12'd500: toneR = `f; 12'd501: toneR = `f; 12'd502: toneR = `f; 12'd503: toneR = `f;

12'd504: toneR = `f; 12'd505: toneR = `f; 12'd506: toneR = `f; 12'd507: toneR = `f;

12'd508: toneR = `f; 12'd509: toneR = `f; 12'd510: toneR = `f; 12'd511: toneR = `f;

12'd512: toneR = `g; 12'd513: toneR = `g; 12'd514: toneR = `g; 12'd515: toneR = `g;

12'd516: toneR = `g; 12'd517: toneR = `g; 12'd518: toneR = `g; 12'd519: toneR = `g;

12'd520: toneR = `g; 12'd521: toneR = `g; 12'd522: toneR = `g; 12'd523: toneR = `g;

12'd524: toneR = `g; 12'd525: toneR = `g; 12'd526: toneR = `g; 12'd527: toneR = `g;

12'd528: toneR = `f; 12'd529: toneR = `f; 12'd530: toneR = `f; 12'd531: toneR = `f;

12'd532: toneR = `f; 12'd533: toneR = `f; 12'd534: toneR = `f; 12'd535: toneR = `f;

12'd536: toneR = `c; 12'd537: toneR = `c; 12'd538: toneR = `c; 12'd539: toneR = `c;

12'd540: toneR = `c; 12'd541: toneR = `c; 12'd542: toneR = `c; 12'd543: toneR = `c;

12'd544: toneR = `c; 12'd545: toneR = `c; 12'd546: toneR = `c; 12'd547: toneR = `c;

12'd548: toneR = `c; 12'd549: toneR = `c; 12'd550: toneR = `c; 12'd551: toneR = `c;

12'd552: toneR = `m; 12'd553: toneR = `m; 12'd554: toneR = `m; 12'd555: toneR = `m;

12'd556: toneR = `m; 12'd557: toneR = `m; 12'd558: toneR = `m; 12'd559: toneR = `m;

12'd560: toneR = `m; 12'd561: toneR = `m; 12'd562: toneR = `m; 12'd563: toneR = `m;

12'd564: toneR = `m; 12'd565: toneR = `m; 12'd566: toneR = `m; 12'd567: toneR = `m;

12'd568: toneR = `g; 12'd569: toneR = `g; 12'd570: toneR = `g; 12'd571: toneR = `g;

12'd572: toneR = `g; 12'd573: toneR = `g; 12'd574: toneR = `g; 12'd575: toneR = `g;

default: toneR = `sil;

endcase

end

else

begin

toneR = `sil;

end

end

else

begin

if(en == 1)

begin

case(ibeatNum)

12'd0: toneR = `sil; 12'd1: toneR = `sil; 12'd2: toneR = `sil; 12'd3: toneR = `sil;

12'd4: toneR = `sil; 12'd5: toneR = `sil; 12'd6: toneR = `sil; 12'd7: toneR = `sil;

12'd8: toneR = `sil; 12'd9: toneR = `sil; 12'd10: toneR = `sil; 12'd11: toneR = `sil;

12'd12: toneR = `sil; 12'd13: toneR = `sil; 12'd14: toneR = `sil; 12'd15: toneR = `sil;

12'd16: toneR = `sil; 12'd17: toneR = `sil; 12'd18: toneR = `sil; 12'd19: toneR = `sil;

12'd20: toneR = `sil; 12'd21: toneR = `sil; 12'd22: toneR = `sil; 12'd23: toneR = `sil;

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12'd344: toneR = `he; 12'd345: toneR = `he; 12'd346: toneR = `he; 12'd347: toneR = `he;

12'd348: toneR = `he; 12'd349: toneR = `he; 12'd350: toneR = `he; 12'd351: toneR = `he;

12'd352: toneR = `he; 12'd353: toneR = `he; 12'd354: toneR = `he; 12'd355: toneR = `he;

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12'd396: toneR = `hc; 12'd397: toneR = `hc; 12'd398: toneR = `hc; 12'd399: toneR = `hc;

12'd400: toneR = `hd; 12'd401: toneR = `hd; 12'd402: toneR = `hd; 12'd403: toneR = `hd;

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12'd468: toneR = `a; 12'd469: toneR = `a; 12'd470: toneR = `a; 12'd471: toneR = `a;

12'd472: toneR = `hc; 12'd473: toneR = `hc; 12'd474: toneR = `hc; 12'd475: toneR = `hc;

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12'd500: toneR = `hd; 12'd501: toneR = `hd; 12'd502: toneR = `hd; 12'd503: toneR = `hd;

12'd504: toneR = `hc; 12'd505: toneR = `hc; 12'd506: toneR = `hc; 12'd507: toneR = `hc;

12'd508: toneR = `hc; 12'd509: toneR = `hc; 12'd510: toneR = `hc; 12'd511: toneR = `hc;

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12'd516: toneR = `hc; 12'd517: toneR = `hc; 12'd518: toneR = `hc; 12'd519: toneR = `hc;

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12'd536: toneR = `hc; 12'd537: toneR = `hc; 12'd538: toneR = `hc; 12'd539: toneR = `hc;

12'd540: toneR = `hc; 12'd541: toneR = `hc; 12'd542: toneR = `hc; 12'd543: toneR = `hc;

12'd544: toneR = `sil; 12'd545: toneR = `sil; 12'd546: toneR = `sil; 12'd547: toneR = `sil;

12'd548: toneR = `sil; 12'd549: toneR = `sil; 12'd550: toneR = `sil; 12'd551: toneR = `sil;

12'd552: toneR = `sil; 12'd553: toneR = `sil; 12'd554: toneR = `sil; 12'd555: toneR = `sil;

12'd556: toneR = `sil; 12'd557: toneR = `sil; 12'd558: toneR = `sil; 12'd559: toneR = `sil;

12'd560: toneR = `sil; 12'd561: toneR = `sil; 12'd562: toneR = `sil; 12'd563: toneR = `sil;

12'd564: toneR = `sil; 12'd565: toneR = `sil; 12'd566: toneR = `sil; 12'd567: toneR = `sil;

12'd568: toneR = `sil; 12'd569: toneR = `sil; 12'd570: toneR = `sil; 12'd571: toneR = `sil;

12'd572: toneR = `sil; 12'd573: toneR = `sil; 12'd574: toneR = `sil; 12'd575: toneR = `sil;

default: toneR = `sil;

endcase

end

else

begin

toneR=`sil;

end

end

end

always @(\*) begin

if(music==1'b0)

begin

if(en==1)

begin

case(ibeatNum)

12'd0: toneL = `sil; 12'd1: toneL = `sil; 12'd2: toneL = `sil; 12'd3: toneL = `sil;

12'd4: toneL = `sil; 12'd5: toneL = `sil; 12'd6: toneL = `sil; 12'd7: toneL = `sil;

12'd8: toneL = `b; 12'd9: toneL = `b; 12'd10: toneL = `b; 12'd11: toneL = `b;

12'd12: toneL = `b; 12'd13: toneL = `b; 12'd14: toneL = `b; 12'd15: toneL = `b;

12'd16: toneL = `b; 12'd17: toneL = `b; 12'd18: toneL = `b; 12'd19: toneL = `b;

12'd20: toneL = `b; 12'd21: toneL = `b; 12'd22: toneL = `b; 12'd23: toneL = `b;

12'd24: toneL = `b; 12'd25: toneL = `b; 12'd26: toneL = `b; 12'd27: toneL = `b;

12'd28: toneL = `b; 12'd29: toneL = `b; 12'd30: toneL = `b; 12'd31: toneL = `b;

12'd32: toneL = `b; 12'd33: toneL = `b; 12'd34: toneL = `b; 12'd35: toneL = `b;

12'd36: toneL = `b; 12'd37: toneL = `b; 12'd38: toneL = `b; 12'd39: toneL = `b;

12'd40: toneL = `sil; 12'd41: toneL = `sil; 12'd42: toneL = `sil; 12'd43: toneL = `sil;

12'd44: toneL = `sil; 12'd45: toneL = `sil; 12'd46: toneL = `sil; 12'd47: toneL = `sil;

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12'd60: toneL = `sil; 12'd61: toneL = `sil; 12'd62: toneL = `sil; 12'd63: toneL = `sil;

12'd64: toneL = `f; 12'd65: toneL = `f; 12'd66: toneL = `f; 12'd67: toneL = `f;

12'd68: toneL = `f; 12'd69: toneL = `f; 12'd70: toneL = `f; 12'd71: toneL = `f;

12'd72: toneL = `hc; 12'd73: toneL = `hc; 12'd74: toneL = `hc; 12'd75: toneL = `hc;

12'd76: toneL = `hc; 12'd77: toneL = `hc; 12'd78: toneL = `hc; 12'd79: toneL = `hc;

12'd80: toneL = `hg; 12'd81: toneL = `hg; 12'd82: toneL = `hg; 12'd83: toneL = `hg;

12'd84: toneL = `hg; 12'd85: toneL = `hg; 12'd86: toneL = `hg; 12'd87: toneL = `hg;

12'd88: toneL = `hc; 12'd89: toneL = `hc; 12'd90: toneL = `hc; 12'd91: toneL = `hc;

12'd92: toneL = `hc; 12'd93: toneL = `hc; 12'd94: toneL = `hc; 12'd95: toneL = `hc;

12'd96: toneL = `f; 12'd97: toneL = `f; 12'd98: toneL = `f; 12'd99: toneL = `f;

12'd100: toneL = `f; 12'd101: toneL = `f; 12'd102: toneL = `f; 12'd103: toneL = `f;

12'd104: toneL = `hc; 12'd105: toneL = `hc; 12'd106: toneL = `hc; 12'd107: toneL = `hc;

12'd108: toneL = `hc; 12'd109: toneL = `hc; 12'd110: toneL = `hc; 12'd111: toneL = `hc;

12'd112: toneL = `hg; 12'd113: toneL = `hg; 12'd114: toneL = `hg; 12'd115: toneL = `hg;

12'd116: toneL = `hg; 12'd117: toneL = `hg; 12'd118: toneL = `hg; 12'd119: toneL = `hg;

12'd120: toneL = `c; 12'd121: toneL = `c; 12'd122: toneL = `c; 12'd123: toneL = `c;

12'd124: toneL = `c; 12'd125: toneL = `c; 12'd126: toneL = `c; 12'd127: toneL = `c;

12'd128: toneL = `e; 12'd129: toneL = `e; 12'd130: toneL = `e; 12'd131: toneL = `e;

12'd132: toneL = `e; 12'd133: toneL = `e; 12'd134: toneL = `e; 12'd135: toneL = `e;

12'd136: toneL = `hc; 12'd137: toneL = `hc; 12'd138: toneL = `hc; 12'd139: toneL = `hc;

12'd140: toneL = `hc; 12'd141: toneL = `hc; 12'd142: toneL = `hc; 12'd143: toneL = `hc;

12'd144: toneL = `he; 12'd145: toneL = `he; 12'd146: toneL = `he; 12'd147: toneL = `he;

12'd148: toneL = `he; 12'd149: toneL = `he; 12'd150: toneL = `he; 12'd151: toneL = `he;

12'd152: toneL = `hc; 12'd153: toneL = `hc; 12'd154: toneL = `hc; 12'd155: toneL = `hc;

12'd156: toneL = `hc; 12'd157: toneL = `hc; 12'd158: toneL = `hc; 12'd159: toneL = `hc;

12'd160: toneL = `e; 12'd161: toneL = `e; 12'd162: toneL = `e; 12'd163: toneL = `e;

12'd164: toneL = `e; 12'd165: toneL = `e; 12'd166: toneL = `e; 12'd167: toneL = `e;

12'd168: toneL = `hc; 12'd169: toneL = `hc; 12'd170: toneL = `hc; 12'd171: toneL = `hc;

12'd172: toneL = `hc; 12'd173: toneL = `hc; 12'd174: toneL = `hc; 12'd175: toneL = `hc;

12'd176: toneL = `he; 12'd177: toneL = `he; 12'd178: toneL = `he; 12'd179: toneL = `he;

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12'd184: toneL = `hc; 12'd185: toneL = `hc; 12'd186: toneL = `hc; 12'd187: toneL = `hc;

12'd188: toneL = `hc; 12'd189: toneL = `hc; 12'd190: toneL = `hc; 12'd191: toneL = `hc;

12'd192: toneL = `d; 12'd193: toneL = `d; 12'd194: toneL = `d; 12'd195: toneL = `d;

12'd196: toneL = `d; 12'd197: toneL = `d; 12'd198: toneL = `d; 12'd199: toneL = `d;

12'd200: toneL = `a; 12'd201: toneL = `a; 12'd202: toneL = `a; 12'd203: toneL = `a;

12'd204: toneL = `a; 12'd205: toneL = `a; 12'd206: toneL = `a; 12'd207: toneL = `a;

12'd208: toneL = `hd; 12'd209: toneL = `hd; 12'd210: toneL = `hd; 12'd211: toneL = `hd;

12'd212: toneL = `hd; 12'd213: toneL = `hd; 12'd214: toneL = `hd; 12'd215: toneL = `hd;

12'd216: toneL = `a; 12'd217: toneL = `a; 12'd218: toneL = `a; 12'd219: toneL = `a;

12'd220: toneL = `a; 12'd221: toneL = `a; 12'd222: toneL = `a; 12'd223: toneL = `a;

12'd224: toneL = `d; 12'd225: toneL = `d; 12'd226: toneL = `d; 12'd227: toneL = `d;

12'd228: toneL = `d; 12'd229: toneL = `d; 12'd230: toneL = `d; 12'd231: toneL = `d;

12'd232: toneL = `a; 12'd233: toneL = `a; 12'd234: toneL = `a; 12'd235: toneL = `a;

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12'd240: toneL = `hd; 12'd241: toneL = `hd; 12'd242: toneL = `hd; 12'd243: toneL = `hd;

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12'd268: toneL = `a; 12'd269: toneL = `a; 12'd270: toneL = `a; 12'd271: toneL = `a;

12'd272: toneL = `hc; 12'd273: toneL = `hc; 12'd274: toneL = `hc; 12'd275: toneL = `hc;

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12'd328: toneL = `f; 12'd329: toneL = `f; 12'd330: toneL = `f; 12'd331: toneL = `f;

12'd332: toneL = `f; 12'd333: toneL = `f; 12'd334: toneL = `f; 12'd335: toneL = `f;

12'd336: toneL = `b; 12'd337: toneL = `b; 12'd338: toneL = `b; 12'd339: toneL = `b;

12'd340: toneL = `b; 12'd341: toneL = `b; 12'd342: toneL = `b; 12'd343: toneL = `b;

12'd344: toneL = `f; 12'd345: toneL = `f; 12'd346: toneL = `f; 12'd347: toneL = `f;

12'd348: toneL = `f; 12'd349: toneL = `f; 12'd350: toneL = `f; 12'd351: toneL = `f;

12'd352: toneL = `n; 12'd353: toneL = `n; 12'd354: toneL = `n; 12'd355: toneL = `n;

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12'd368: toneL = `b; 12'd369: toneL = `b; 12'd370: toneL = `b; 12'd371: toneL = `b;

12'd372: toneL = `b; 12'd373: toneL = `b; 12'd374: toneL = `b; 12'd375: toneL = `b;

12'd376: toneL = `f; 12'd377: toneL = `f; 12'd378: toneL = `f; 12'd379: toneL = `f;

12'd380: toneL = `f; 12'd381: toneL = `f; 12'd382: toneL = `f; 12'd383: toneL = `f;

12'd384: toneL = `n; 12'd385: toneL = `n; 12'd386: toneL = `n; 12'd387: toneL = `n;

12'd388: toneL = `n; 12'd389: toneL = `n; 12'd390: toneL = `n; 12'd391: toneL = `n;

12'd392: toneL = `e; 12'd393: toneL = `e; 12'd394: toneL = `e; 12'd395: toneL = `e;

12'd396: toneL = `e; 12'd397: toneL = `e; 12'd398: toneL = `e; 12'd399: toneL = `e;

12'd400: toneL = `g; 12'd401: toneL = `g; 12'd402: toneL = `g; 12'd403: toneL = `g;

12'd404: toneL = `g; 12'd405: toneL = `g; 12'd406: toneL = `g; 12'd407: toneL = `g;

12'd408: toneL = `e; 12'd409: toneL = `e; 12'd410: toneL = `e; 12'd411: toneL = `e;

12'd412: toneL = `e; 12'd413: toneL = `e; 12'd414: toneL = `e; 12'd415: toneL = `e;

12'd416: toneL = `d; 12'd417: toneL = `d; 12'd418: toneL = `d; 12'd419: toneL = `d;

12'd420: toneL = `d; 12'd421: toneL = `d; 12'd422: toneL = `d; 12'd423: toneL = `d;

12'd424: toneL = `a; 12'd425: toneL = `a; 12'd426: toneL = `a; 12'd427: toneL = `a;

12'd428: toneL = `a; 12'd429: toneL = `a; 12'd430: toneL = `a; 12'd431: toneL = `a;

12'd432: toneL = `ha; 12'd433: toneL = `ha; 12'd434: toneL = `ha; 12'd435: toneL = `ha;

12'd436: toneL = `ha; 12'd437: toneL = `ha; 12'd438: toneL = `ha; 12'd439: toneL = `ha;

12'd440: toneL = `a; 12'd441: toneL = `a; 12'd442: toneL = `a; 12'd443: toneL = `a;

12'd444: toneL = `a; 12'd445: toneL = `a; 12'd446: toneL = `a; 12'd447: toneL = `a;

12'd448: toneL = `n; 12'd449: toneL = `n; 12'd450: toneL = `n; 12'd451: toneL = `n;

12'd452: toneL = `n; 12'd453: toneL = `n; 12'd454: toneL = `n; 12'd455: toneL = `n;

12'd456: toneL = `f; 12'd457: toneL = `f; 12'd458: toneL = `f; 12'd459: toneL = `f;

12'd460: toneL = `f; 12'd461: toneL = `f; 12'd462: toneL = `f; 12'd463: toneL = `f;

12'd464: toneL = `b; 12'd465: toneL = `b; 12'd466: toneL = `b; 12'd467: toneL = `b;

12'd468: toneL = `b; 12'd469: toneL = `b; 12'd470: toneL = `b; 12'd471: toneL = `b;

12'd472: toneL = `f; 12'd473: toneL = `f; 12'd474: toneL = `f; 12'd475: toneL = `f;

12'd476: toneL = `f; 12'd477: toneL = `f; 12'd478: toneL = `f; 12'd479: toneL = `f;

12'd480: toneL = `n; 12'd481: toneL = `n; 12'd482: toneL = `n; 12'd483: toneL = `n;

12'd484: toneL = `n; 12'd485: toneL = `n; 12'd486: toneL = `n; 12'd487: toneL = `n;

12'd488: toneL = `f; 12'd489: toneL = `f; 12'd490: toneL = `f; 12'd491: toneL = `f;

12'd492: toneL = `f; 12'd493: toneL = `f; 12'd494: toneL = `f; 12'd495: toneL = `f;

12'd496: toneL = `b; 12'd497: toneL = `b; 12'd498: toneL = `b; 12'd499: toneL = `b;

12'd500: toneL = `b; 12'd501: toneL = `b; 12'd502: toneL = `b; 12'd503: toneL = `b;

12'd504: toneL = `f; 12'd505: toneL = `f; 12'd506: toneL = `f; 12'd507: toneL = `f;

12'd508: toneL = `f; 12'd509: toneL = `f; 12'd510: toneL = `f; 12'd511: toneL = `f;

12'd512: toneL = `c; 12'd513: toneL = `c; 12'd514: toneL = `c; 12'd515: toneL = `c;

12'd516: toneL = `c; 12'd517: toneL = `c; 12'd518: toneL = `c; 12'd519: toneL = `c;

12'd520: toneL = `g; 12'd521: toneL = `g; 12'd522: toneL = `g; 12'd523: toneL = `g;

12'd524: toneL = `g; 12'd525: toneL = `g; 12'd526: toneL = `g; 12'd527: toneL = `g;

12'd528: toneL = `hd; 12'd529: toneL = `hd; 12'd530: toneL = `hd; 12'd531: toneL = `hd;

12'd532: toneL = `hd; 12'd533: toneL = `hd; 12'd534: toneL = `hd; 12'd535: toneL = `hd;

12'd536: toneL = `hf; 12'd537: toneL = `hf; 12'd538: toneL = `hf; 12'd539: toneL = `hf;

12'd540: toneL = `hf; 12'd541: toneL = `hf; 12'd542: toneL = `hf; 12'd543: toneL = `hf;

12'd544: toneL = `g; 12'd545: toneL = `g; 12'd546: toneL = `g; 12'd547: toneL = `g;

12'd548: toneL = `g; 12'd549: toneL = `g; 12'd550: toneL = `g; 12'd551: toneL = `g;

12'd552: toneL = `g; 12'd553: toneL = `g; 12'd554: toneL = `g; 12'd555: toneL = `g;

12'd556: toneL = `g; 12'd557: toneL = `g; 12'd558: toneL = `g; 12'd559: toneL = `g;

12'd560: toneL = `g; 12'd561: toneL = `g; 12'd562: toneL = `g; 12'd563: toneL = `g;

12'd564: toneL = `g; 12'd565: toneL = `g; 12'd566: toneL = `g; 12'd567: toneL = `g;

12'd568: toneL = `g; 12'd569: toneL = `g; 12'd570: toneL = `g; 12'd571: toneL = `g;

12'd572: toneL = `g; 12'd573: toneL = `g; 12'd574: toneL = `g; 12'd575: toneL = `g;

default: toneL = `sil;

endcase

end

else

begin

toneL = `sil;

end

end

else

begin

if(en==1)

begin

case(ibeatNum)

12'd0: toneL = `sil; 12'd1: toneL = `sil; 12'd2: toneL = `sil; 12'd3: toneL = `sil;

12'd4: toneL = `sil; 12'd5: toneL = `sil; 12'd6: toneL = `sil; 12'd7: toneL = `sil;

12'd8: toneL = `sil; 12'd9: toneL = `sil; 12'd10: toneL = `sil; 12'd11: toneL = `sil;

12'd12: toneL = `sil; 12'd13: toneL = `sil; 12'd14: toneL = `sil; 12'd15: toneL = `sil;

12'd16: toneL = `sil; 12'd17: toneL = `sil; 12'd18: toneL = `sil; 12'd19: toneL = `sil;

12'd20: toneL = `sil; 12'd21: toneL = `sil; 12'd22: toneL = `sil; 12'd23: toneL = `sil;

12'd24: toneL = `sil; 12'd25: toneL = `sil; 12'd26: toneL = `sil; 12'd27: toneL = `sil;

12'd28: toneL = `sil; 12'd29: toneL = `sil; 12'd30: toneL = `sil; 12'd31: toneL = `sil;

12'd32: toneL = `sil; 12'd33: toneL = `sil; 12'd34: toneL = `sil; 12'd35: toneL = `sil;

12'd36: toneL = `sil; 12'd37: toneL = `sil; 12'd38: toneL = `sil; 12'd39: toneL = `sil;

12'd40: toneL = `sil; 12'd41: toneL = `sil; 12'd42: toneL = `sil; 12'd43: toneL = `sil;

12'd44: toneL = `sil; 12'd45: toneL = `sil; 12'd46: toneL = `sil; 12'd47: toneL = `sil;

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12'd56: toneL = `sil; 12'd57: toneL = `sil; 12'd58: toneL = `sil; 12'd59: toneL = `sil;

12'd60: toneL = `sil; 12'd61: toneL = `sil; 12'd62: toneL = `sil; 12'd63: toneL = `sil;

12'd64: toneL = `c; 12'd65: toneL = `c; 12'd66: toneL = `c; 12'd67: toneL = `c;

12'd68: toneL = `c; 12'd69: toneL = `c; 12'd70: toneL = `c; 12'd71: toneL = `c;

12'd72: toneL = `e; 12'd73: toneL = `e; 12'd74: toneL = `e; 12'd75: toneL = `e;

12'd76: toneL = `e; 12'd77: toneL = `e; 12'd78: toneL = `e; 12'd79: toneL = `e;

12'd80: toneL = `g; 12'd81: toneL = `g; 12'd82: toneL = `g; 12'd83: toneL = `g;

12'd84: toneL = `g; 12'd85: toneL = `g; 12'd86: toneL = `g; 12'd87: toneL = `g;

12'd88: toneL = `g; 12'd89: toneL = `g; 12'd90: toneL = `g; 12'd91: toneL = `g;

12'd92: toneL = `g; 12'd93: toneL = `g; 12'd94: toneL = `g; 12'd95: toneL = `g;

12'd96: toneL = `e; 12'd97: toneL = `e; 12'd98: toneL = `e; 12'd99: toneL = `e;

12'd100: toneL = `e; 12'd101: toneL = `e; 12'd102: toneL = `e; 12'd103: toneL = `e;

12'd104: toneL = `l; 12'd105: toneL = `l; 12'd106: toneL = `l; 12'd107: toneL = `l;

12'd108: toneL = `l; 12'd109: toneL = `l; 12'd110: toneL = `l; 12'd111: toneL = `l;

12'd112: toneL = `b; 12'd113: toneL = `b; 12'd114: toneL = `b; 12'd115: toneL = `b;

12'd116: toneL = `b; 12'd117: toneL = `b; 12'd118: toneL = `b; 12'd119: toneL = `b;

12'd120: toneL = `a; 12'd121: toneL = `a; 12'd122: toneL = `a; 12'd123: toneL = `a;

12'd124: toneL = `a; 12'd125: toneL = `a; 12'd126: toneL = `a; 12'd127: toneL = `a;

12'd128: toneL = `a; 12'd129: toneL = `a; 12'd130: toneL = `a; 12'd131: toneL = `a;

12'd132: toneL = `a; 12'd133: toneL = `a; 12'd134: toneL = `a; 12'd135: toneL = `a;

12'd136: toneL = `e; 12'd137: toneL = `e; 12'd138: toneL = `e; 12'd139: toneL = `e;

12'd140: toneL = `e; 12'd141: toneL = `e; 12'd142: toneL = `e; 12'd143: toneL = `e;

12'd144: toneL = `a; 12'd145: toneL = `a; 12'd146: toneL = `a; 12'd147: toneL = `a;

12'd148: toneL = `a; 12'd149: toneL = `a; 12'd150: toneL = `a; 12'd151: toneL = `a;

12'd152: toneL = `a; 12'd153: toneL = `a; 12'd154: toneL = `a; 12'd155: toneL = `a;

12'd156: toneL = `a; 12'd157: toneL = `a; 12'd158: toneL = `a; 12'd159: toneL = `a;

12'd160: toneL = `a; 12'd161: toneL = `a; 12'd162: toneL = `a; 12'd163: toneL = `a;

12'd164: toneL = `a; 12'd165: toneL = `a; 12'd166: toneL = `a; 12'd167: toneL = `a;

12'd168: toneL = `hc; 12'd169: toneL = `hc; 12'd170: toneL = `hc; 12'd171: toneL = `hc;

12'd172: toneL = `hc; 12'd173: toneL = `hc; 12'd174: toneL = `hc; 12'd175: toneL = `hc;

12'd176: toneL = `g; 12'd177: toneL = `g; 12'd178: toneL = `g; 12'd179: toneL = `g;

12'd180: toneL = `g; 12'd181: toneL = `g; 12'd182: toneL = `g; 12'd183: toneL = `g;

12'd184: toneL = `e; 12'd185: toneL = `e; 12'd186: toneL = `e; 12'd187: toneL = `e;

12'd188: toneL = `e; 12'd189: toneL = `e; 12'd190: toneL = `e; 12'd191: toneL = `e;

12'd192: toneL = `f; 12'd193: toneL = `f; 12'd194: toneL = `f; 12'd195: toneL = `f;

12'd196: toneL = `f; 12'd197: toneL = `f; 12'd198: toneL = `f; 12'd199: toneL = `f;

12'd200: toneL = `a; 12'd201: toneL = `a; 12'd202: toneL = `a; 12'd203: toneL = `a;

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12'd224: toneL = `g; 12'd225: toneL = `g; 12'd226: toneL = `g; 12'd227: toneL = `g;

12'd228: toneL = `g; 12'd229: toneL = `g; 12'd230: toneL = `g; 12'd231: toneL = `g;

12'd232: toneL = `g; 12'd233: toneL = `g; 12'd234: toneL = `g; 12'd235: toneL = `g;

12'd236: toneL = `g; 12'd237: toneL = `g; 12'd238: toneL = `g; 12'd239: toneL = `g;

12'd240: toneL = `g; 12'd241: toneL = `g; 12'd242: toneL = `g; 12'd243: toneL = `g;

12'd244: toneL = `g; 12'd245: toneL = `g; 12'd246: toneL = `g; 12'd247: toneL = `g;

12'd248: toneL = `g; 12'd249: toneL = `g; 12'd250: toneL = `g; 12'd251: toneL = `g;

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12'd272: toneL = `e; 12'd273: toneL = `e; 12'd274: toneL = `e; 12'd275: toneL = `e;

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12'd284: toneL = `g; 12'd285: toneL = `g; 12'd286: toneL = `g; 12'd287: toneL = `g;

12'd288: toneL = `b; 12'd289: toneL = `b; 12'd290: toneL = `b; 12'd291: toneL = `b;

12'd292: toneL = `b; 12'd293: toneL = `b; 12'd294: toneL = `b; 12'd295: toneL = `b;

12'd296: toneL = `b; 12'd297: toneL = `b; 12'd298: toneL = `b; 12'd299: toneL = `b;

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12'd304: toneL = `b; 12'd305: toneL = `b; 12'd306: toneL = `b; 12'd307: toneL = `b;

12'd308: toneL = `b; 12'd309: toneL = `b; 12'd310: toneL = `b; 12'd311: toneL = `b;

12'd312: toneL = `b; 12'd313: toneL = `b; 12'd314: toneL = `b; 12'd315: toneL = `b;

12'd316: toneL = `b; 12'd317: toneL = `b; 12'd318: toneL = `b; 12'd319: toneL = `b;

12'd320: toneL = `c; 12'd321: toneL = `c; 12'd322: toneL = `c; 12'd323: toneL = `c;

12'd324: toneL = `c; 12'd325: toneL = `c; 12'd326: toneL = `c; 12'd327: toneL = `c;

12'd328: toneL = `e; 12'd329: toneL = `e; 12'd330: toneL = `e; 12'd331: toneL = `e;

12'd332: toneL = `e; 12'd333: toneL = `e; 12'd334: toneL = `e; 12'd335: toneL = `e;

12'd336: toneL = `g; 12'd337: toneL = `g; 12'd338: toneL = `g; 12'd339: toneL = `g;

12'd340: toneL = `g; 12'd341: toneL = `g; 12'd342: toneL = `g; 12'd343: toneL = `g;

12'd344: toneL = `g; 12'd345: toneL = `g; 12'd346: toneL = `g; 12'd347: toneL = `g;

12'd348: toneL = `g; 12'd349: toneL = `g; 12'd350: toneL = `g; 12'd351: toneL = `g;

12'd352: toneL = `e; 12'd353: toneL = `e; 12'd354: toneL = `e; 12'd355: toneL = `e;

12'd356: toneL = `e; 12'd357: toneL = `e; 12'd358: toneL = `e; 12'd359: toneL = `e;

12'd360: toneL = `k; 12'd361: toneL = `k; 12'd362: toneL = `k; 12'd363: toneL = `k;

12'd364: toneL = `k; 12'd365: toneL = `k; 12'd366: toneL = `k; 12'd367: toneL = `k;

12'd368: toneL = `b; 12'd369: toneL = `b; 12'd370: toneL = `b; 12'd371: toneL = `b;

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12'd388: toneL = `a; 12'd389: toneL = `a; 12'd390: toneL = `a; 12'd391: toneL = `a;

12'd392: toneL = `e; 12'd393: toneL = `e; 12'd394: toneL = `e; 12'd395: toneL = `e;

12'd396: toneL = `e; 12'd397: toneL = `e; 12'd398: toneL = `e; 12'd399: toneL = `e;

12'd400: toneL = `a; 12'd401: toneL = `a; 12'd402: toneL = `a; 12'd403: toneL = `a;

12'd404: toneL = `a; 12'd405: toneL = `a; 12'd406: toneL = `a; 12'd407: toneL = `a;

12'd408: toneL = `a; 12'd409: toneL = `a; 12'd410: toneL = `a; 12'd411: toneL = `a;

12'd412: toneL = `a; 12'd413: toneL = `a; 12'd414: toneL = `a; 12'd415: toneL = `a;

12'd416: toneL = `a; 12'd417: toneL = `a; 12'd418: toneL = `a; 12'd419: toneL = `a;

12'd420: toneL = `a; 12'd421: toneL = `a; 12'd422: toneL = `a; 12'd423: toneL = `a;

12'd424: toneL = `he; 12'd425: toneL = `he; 12'd426: toneL = `he; 12'd427: toneL = `he;

12'd428: toneL = `he; 12'd429: toneL = `he; 12'd430: toneL = `he; 12'd431: toneL = `he;

12'd432: toneL = `hc; 12'd433: toneL = `hc; 12'd434: toneL = `hc; 12'd435: toneL = `hc;

12'd436: toneL = `hc; 12'd437: toneL = `hc; 12'd438: toneL = `hc; 12'd439: toneL = `hc;

12'd440: toneL = `a; 12'd441: toneL = `a; 12'd442: toneL = `a; 12'd443: toneL = `a;

12'd444: toneL = `a; 12'd445: toneL = `a; 12'd446: toneL = `a; 12'd447: toneL = `a;

12'd448: toneL = `c; 12'd449: toneL = `c; 12'd450: toneL = `c; 12'd451: toneL = `c;

12'd452: toneL = `c; 12'd453: toneL = `c; 12'd454: toneL = `c; 12'd455: toneL = `c;

12'd456: toneL = `e; 12'd457: toneL = `e; 12'd458: toneL = `e; 12'd459: toneL = `e;

12'd460: toneL = `e; 12'd461: toneL = `e; 12'd462: toneL = `e; 12'd463: toneL = `e;

12'd464: toneL = `g; 12'd465: toneL = `g; 12'd466: toneL = `g; 12'd467: toneL = `g;

12'd468: toneL = `g; 12'd469: toneL = `g; 12'd470: toneL = `g; 12'd471: toneL = `g;

12'd472: toneL = `hc; 12'd473: toneL = `hc; 12'd474: toneL = `hc; 12'd475: toneL = `hc;

12'd476: toneL = `hc; 12'd477: toneL = `hc; 12'd478: toneL = `hc; 12'd479: toneL = `hc;

12'd480: toneL = `hd; 12'd481: toneL = `hd; 12'd482: toneL = `hd; 12'd483: toneL = `hd;

12'd484: toneL = `hd; 12'd485: toneL = `hd; 12'd486: toneL = `hd; 12'd487: toneL = `hd;

12'd488: toneL = `g; 12'd489: toneL = `g; 12'd490: toneL = `g; 12'd491: toneL = `g;

12'd492: toneL = `g; 12'd493: toneL = `g; 12'd494: toneL = `g; 12'd495: toneL = `g;

12'd496: toneL = `b; 12'd497: toneL = `b; 12'd498: toneL = `b; 12'd499: toneL = `b;

12'd500: toneL = `b; 12'd501: toneL = `b; 12'd502: toneL = `b; 12'd503: toneL = `b;

12'd504: toneL = `sil; 12'd505: toneL = `sil; 12'd506: toneL = `sil; 12'd507: toneL = `sil;

12'd508: toneL = `sil; 12'd509: toneL = `sil; 12'd510: toneL = `sil; 12'd511: toneL = `sil;

12'd512: toneL = `hc; 12'd513: toneL = `hc; 12'd514: toneL = `hc; 12'd515: toneL = `hc;

12'd516: toneL = `hc; 12'd517: toneL = `hc; 12'd518: toneL = `hc; 12'd519: toneL = `hc;

12'd520: toneL = `hc; 12'd521: toneL = `hc; 12'd522: toneL = `hc; 12'd523: toneL = `hc;

12'd524: toneL = `hc; 12'd525: toneL = `hc; 12'd526: toneL = `hc; 12'd527: toneL = `hc;

12'd528: toneL = `hc; 12'd529: toneL = `hc; 12'd530: toneL = `hc; 12'd531: toneL = `hc;

12'd532: toneL = `hc; 12'd533: toneL = `hc; 12'd534: toneL = `hc; 12'd535: toneL = `hc;

12'd536: toneL = `hc; 12'd537: toneL = `hc; 12'd538: toneL = `hc; 12'd539: toneL = `hc;

12'd540: toneL = `hc; 12'd541: toneL = `hc; 12'd542: toneL = `hc; 12'd543: toneL = `hc;

12'd544: toneL = `sil; 12'd545: toneL = `sil; 12'd546: toneL = `sil; 12'd547: toneL = `sil;

12'd548: toneL = `sil; 12'd549: toneL = `sil; 12'd550: toneL = `sil; 12'd551: toneL = `sil;

12'd552: toneL = `sil; 12'd553: toneL = `sil; 12'd554: toneL = `sil; 12'd555: toneL = `sil;

12'd556: toneL = `sil; 12'd557: toneL = `sil; 12'd558: toneL = `sil; 12'd559: toneL = `sil;

12'd560: toneL = `sil; 12'd561: toneL = `sil; 12'd562: toneL = `sil; 12'd563: toneL = `sil;

12'd564: toneL = `sil; 12'd565: toneL = `sil; 12'd566: toneL = `sil; 12'd567: toneL = `sil;

12'd568: toneL = `sil; 12'd569: toneL = `sil; 12'd570: toneL = `sil; 12'd571: toneL = `sil;

12'd572: toneL = `sil; 12'd573: toneL = `sil; 12'd574: toneL = `sil; 12'd575: toneL = `sil;

default: toneL = `sil;

endcase

end

else

begin

toneL = `sil;

end

end

end

endmodule

module clock\_divider(clk, clk\_div);

parameter n = 26;

input clk;

output clk\_div;

reg [n-1:0] num;

wire [n-1:0] next\_num;

always@(posedge clk)begin

num<=next\_num;

end

assign next\_num = num +1;

assign clk\_div = num[n-1];

endmodule

module note\_gen(

clk, // clock from crystal

rst, // active high reset

note\_div\_left, // div for note generation

note\_div\_right,

audio\_left,

audio\_right,

volume

);

// I/O declaration

input clk; // clock from crystal

input rst; // active low reset

input [21:0] note\_div\_left, note\_div\_right; // div for note generation

output [15:0] audio\_left, audio\_right;

input [2:0] volume;

// Declare internal signals

reg [21:0] clk\_cnt\_next, clk\_cnt;

reg [21:0] clk\_cnt\_next\_2, clk\_cnt\_2;

reg b\_clk, b\_clk\_next;

reg c\_clk, c\_clk\_next;

// Note frequency generation

always @(posedge clk or posedge rst)

if (rst == 1'b1)

begin

clk\_cnt <= 22'd0;

clk\_cnt\_2 <= 22'd0;

b\_clk <= 1'b0;

c\_clk <= 1'b0;

end

else

begin

clk\_cnt <= clk\_cnt\_next;

clk\_cnt\_2 <= clk\_cnt\_next\_2;

b\_clk <= b\_clk\_next;

c\_clk <= c\_clk\_next;

end

always @\*

if (clk\_cnt == note\_div\_left)

begin

clk\_cnt\_next = 22'd0;

b\_clk\_next = ~b\_clk;

end

else

begin

clk\_cnt\_next = clk\_cnt + 1'b1;

b\_clk\_next = b\_clk;

end

always @\*

if (clk\_cnt\_2 == note\_div\_right)

begin

clk\_cnt\_next\_2 = 22'd0;

c\_clk\_next = ~c\_clk;

end

else

begin

clk\_cnt\_next\_2 = clk\_cnt\_2 + 1'b1;

c\_clk\_next = c\_clk;

end

// Assign the amplitude of the note

// Volume is controlled here

wire [15:0]posnum;

wire [15:0]negnum;

assign posnum=(volume==3'b000)?16'h0000:(volume==3'b001)?16'h0100:(volume==3'b010)?16'h0220:(volume==3'b011)?16'h0620:

(volume==3'b100)?16'h0920:(volume==3'b101)?16'h0C20:16'h0620;

assign negnum=(volume==3'b000)?16'h0000:(volume==3'b001)?16'hFFE0:(volume==3'b010)?16'hFDE0:(volume==3'b011)?16'hF9E0:

(volume==3'b100)?16'hF6E0:(volume==3'b101)?16'hF3E0:16'hF9E0;

assign audio\_left = (note\_div\_left == 22'd1) ? 16'h0000 : (b\_clk == 1'b0) ? negnum : posnum;

assign audio\_right = (note\_div\_right == 22'd1) ? 16'h0000 : (c\_clk == 1'b0) ? negnum : posnum;

endmodule

module onepulse(signal, clk, op);

input signal, clk;

output op;

reg op;

reg delay;

always @(posedge clk) begin

if((signal == 1) & (delay == 0)) op <= 1;

else op <= 0;

delay = signal;

end

endmodule

module player\_control (

input clk,

input reset,

input \_play,

input \_repeat,

input music,

output reg [11:0] ibeat

);

parameter LEN = 4095;

reg [11:0] next\_ibeat;

reg nowmusic;

always @(\*) begin

if(reset) begin next\_ibeat=0; end

else if(\_play==1'b0) begin next\_ibeat=ibeat; end

else

begin

next\_ibeat = (music!=nowmusic)?12'd0:(ibeat+1<LEN)?(ibeat + 1):((ibeat+1>=LEN)&&\_repeat==1'b1)?12'd0:((ibeat+1==LEN)&&\_repeat==1'b0)?(ibeat+1):ibeat;

end

end

always @(posedge clk, posedge reset) begin

if (reset)

begin

ibeat <= 0;

nowmusic<=0;

end

else begin

ibeat <= next\_ibeat;

nowmusic<=music;

end

end

endmodule

module debounce(pb\_debounced, pb ,clk);

output pb\_debounced;

input pb;

input clk;

reg [6:0] shift\_reg;

always @(posedge clk) begin

shift\_reg[6:1] <= shift\_reg[5:0];

shift\_reg[0] <= pb;

end

assign pb\_debounced = shift\_reg == 7'b111\_1111 ? 1'b1 : 1'b0;

endmodule

module speaker\_control(

clk, // clock from the crystal

rst, // active high reset

audio\_in\_left, // left channel audio data input

audio\_in\_right, // right channel audio data input

audio\_mclk, // master clock

audio\_lrck, // left-right clock, Word Select clock, or sample rate clock

audio\_sck, // serial clock

audio\_sdin // serial audio data input

);

// I/O declaration

input clk; // clock from the crystal

input rst; // active high reset

input [15:0] audio\_in\_left; // left channel audio data input

input [15:0] audio\_in\_right; // right channel audio data input

output audio\_mclk; // master clock

output audio\_lrck; // left-right clock

output audio\_sck; // serial clock

output audio\_sdin; // serial audio data input

reg audio\_sdin;

// Declare internal signal nodes

wire [8:0] clk\_cnt\_next;

reg [8:0] clk\_cnt;

reg [15:0] audio\_left, audio\_right;

// Counter for the clock divider

assign clk\_cnt\_next = clk\_cnt + 1'b1;

always @(posedge clk or posedge rst)

if (rst == 1'b1)

clk\_cnt <= 9'd0;

else

clk\_cnt <= clk\_cnt\_next;

// Assign divided clock output

assign audio\_mclk = clk\_cnt[1];

assign audio\_lrck = clk\_cnt[8];

assign audio\_sck = 1'b1; // use internal serial clock mode

// audio input data buffer

always @(posedge clk\_cnt[8] or posedge rst)

if (rst == 1'b1)

begin

audio\_left <= 16'd0;

audio\_right <= 16'd0;

end

else

begin

audio\_left <= audio\_in\_left;

audio\_right <= audio\_in\_right;

end

always @\*

case (clk\_cnt[8:4])

5'b00000: audio\_sdin = audio\_right[0];

5'b00001: audio\_sdin = audio\_left[15];

5'b00010: audio\_sdin = audio\_left[14];

5'b00011: audio\_sdin = audio\_left[13];

5'b00100: audio\_sdin = audio\_left[12];

5'b00101: audio\_sdin = audio\_left[11];

5'b00110: audio\_sdin = audio\_left[10];

5'b00111: audio\_sdin = audio\_left[9];

5'b01000: audio\_sdin = audio\_left[8];

5'b01001: audio\_sdin = audio\_left[7];

5'b01010: audio\_sdin = audio\_left[6];

5'b01011: audio\_sdin = audio\_left[5];

5'b01100: audio\_sdin = audio\_left[4];

5'b01101: audio\_sdin = audio\_left[3];

5'b01110: audio\_sdin = audio\_left[2];

5'b01111: audio\_sdin = audio\_left[1];

5'b10000: audio\_sdin = audio\_left[0];

5'b10001: audio\_sdin = audio\_right[15];

5'b10010: audio\_sdin = audio\_right[14];

5'b10011: audio\_sdin = audio\_right[13];

5'b10100: audio\_sdin = audio\_right[12];

5'b10101: audio\_sdin = audio\_right[11];

5'b10110: audio\_sdin = audio\_right[10];

5'b10111: audio\_sdin = audio\_right[9];

5'b11000: audio\_sdin = audio\_right[8];

5'b11001: audio\_sdin = audio\_right[7];

5'b11010: audio\_sdin = audio\_right[6];

5'b11011: audio\_sdin = audio\_right[5];

5'b11100: audio\_sdin = audio\_right[4];

5'b11101: audio\_sdin = audio\_right[3];

5'b11110: audio\_sdin = audio\_right[2];

5'b11111: audio\_sdin = audio\_right[1];

default: audio\_sdin = 1'b0;

endcase

endmodule