

Getting Started With Smart DFM

For Users of ViewMate, ViewMate Deluxe and ViewMate Pro

Introduction

Smart DFM allows you to check your design files against a set of DFM (Design For Manufacturability) Rules. These DFM Rules ensure that your design can be fabricated without being placed on hold. If your design files pass the DFM Rule checks, then you will be presented with a no obligation quotation to purchase prototype or production quantities of your printed circuit board. If you like, you can purchase your boards online. The quoting and ordering capability is available 24/7/365.

The DFM checks are performed by one of the following programs:

ViewMate with Smart DFM

ViewMate Deluxe

ViewMate Professional

We will use “ViewMate with Smart DFM” in this application note. However, you can perform all of the same functions using either ViewMate Deluxe or ViewMate Pro.

Install Your Software First

Before running this tutorial, you should install your software and your software license. Please contact PentaLogix via email at support@pentalogix.com if you need help with the installation.

Start ViewMate

Start the file called “ViewMate”. By default, the program is installed in:

32 Bit Operating System “C:\Program Files\PentaLogix\ViewMate X.Y”

64 Bit Operating System “C:\Program Files (x86)\PentaLogix\ViewMate X.Y”

In both cases, X.Y refers to the major and minor revision of ViewMate. When you start the program, you should see the following screen:

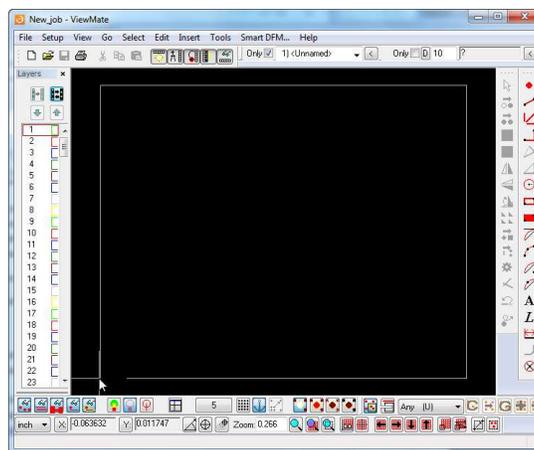


Figure 1 – ViewMate Startup Screen

Getting Started With Smart DFM – For Users of ViewMate, ViewMate Deluxe and ViewMate Pro

Loading Data into ViewMate, ViewMate Deluxe or ViewMate Pro

Smart DFM is integrated into the ViewMate family of products. You should load the sample file into ViewMate before you launch the Smart DFM process. If you have ViewMate Deluxe or ViewMate Pro, you can use “File->Import->Zip” if your data is contained in a zipped file. File->Import->Zip is not available in the free ViewMate program. With any of our ViewMate products, you can use “File->Import->Directory” (if all of your files are unzipped in a directory). Alternatively, you can load your Gerber and drill data by using one of the other import methods supported by ViewMate.

If you wish to follow along, you can download the file using the following link

[Get Sample File](#)

Download the sample file and save it to your computer. You can then use “File->Open” to load the file into ViewMate.

Taking a Look at the Sample File

The sample file is a very simple file. However, it contains all of the layer types that you will encounter when using Smart DFM. The file is shown below:

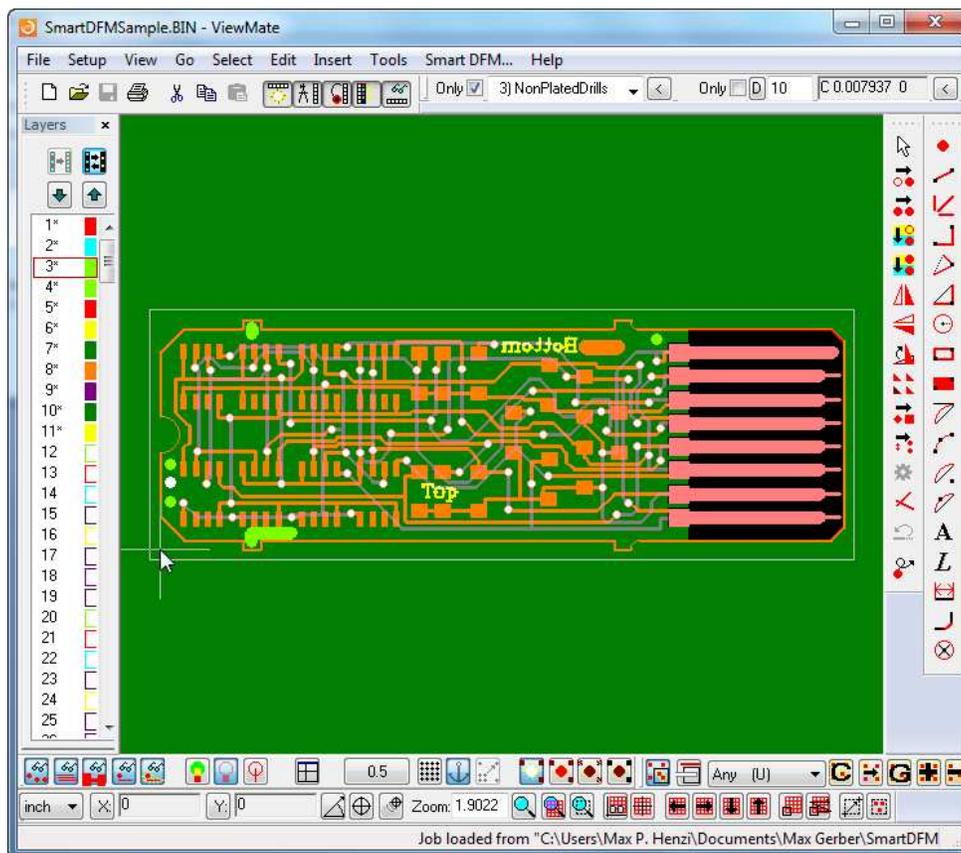


Figure 2 – SmartDFMSample.bin

Review Layer StackUp

Press the “F10” key to review the layer StackUp of the sample file:

L#	B Layer	Name	Type	Traces	Pads	Poly	Color	Vis	Neg	Scr	Fill
1	3	BoardOutline	BOL	36	0	0	Red	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	4	PlatedDrills	PTH	0	68	0	Cyan	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	5	NonPlatedDrills	NTH	0	4	0	Light Green	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	6	PlatedInternalRouts	RPI	3	0	0	Light Green	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	7	NonPlatedInternalRouts	RNI	1	0	0	Red	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6	1	TopSilkScreen	SKU	62	0	0	Yellow	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7	1	TopSolderMask	MSU	0	96	1	Green	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8	1	TopCopper	CPU	270	164	0	Orange	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9	2	BottomCopper	CPL	168	76	0	Purple	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10	2	BottomSolderMask	MSL	0	8	1	Green	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11	2	BottomSilkScreen	SKL	137	0	0	Yellow	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12	12		SIG	0	0	0	Light Green	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 3 – Sample File Layer StackUp

Not all of your files will have all of these layer types. However, the sample file is intended to demonstrate how you would handle each of these layer types.

Notice that the sample file contains a standalone board outline on layer number 1. Plated and NonPlated drill data is found on layers 2 and 3 respectively. The sample file also contains two Gerber data layers that represent cutouts that the user would like to have made in the PCB. These are found in layers 4 and 5 respectively. Take a moment to review the layer StackUp. **Pay particular attention to the layer “Type” associated with each layer.** If you configure these layer types in ViewMate, it will make using the data in Smart DFM much easier. Press the “OK” button to dismiss the “Layers Table” dialog.

Smart DFM by pentalogix

Getting Started With Smart DFM – For Users of ViewMate, ViewMate Deluxe and ViewMate Pro

Starting Smart DFM

Now that you've loaded data into ViewMate, you're ready to start Smart DFM. You can either press "Alt+D" or click on the "Smart DFM..." menu item to start Smart DFM:



Figure 4 – Click on the "Smart DFM..." menu item.

In response, Smart DFM should start and display the main menu as shown below:

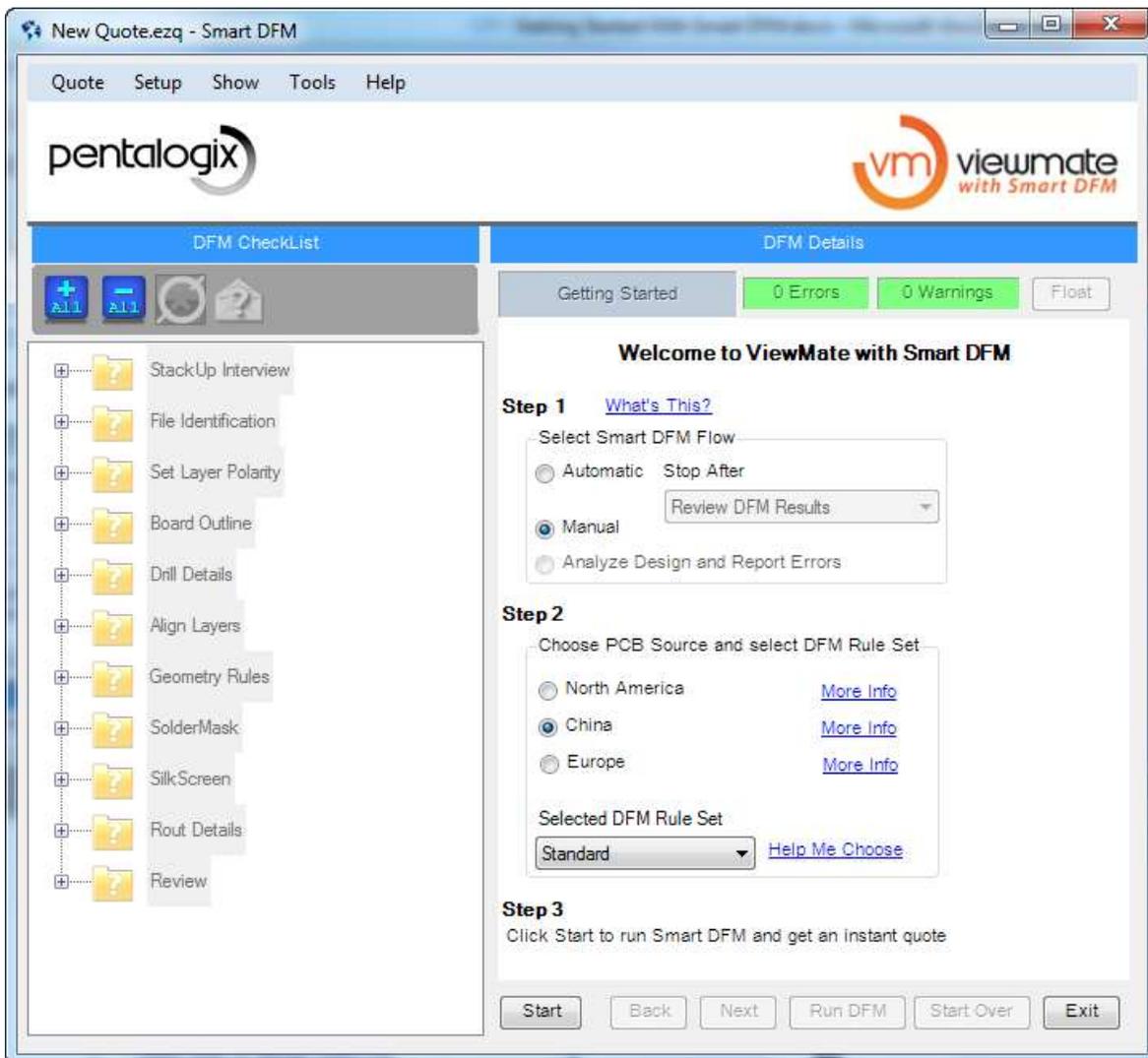


Figure 5 – Smart DFM Main Menu

Getting Started With Smart DFM – For Users of ViewMate, ViewMate Deluxe and ViewMate Pro

Positioning the ViewMate and Smart DFM Windows

If you have enough screen resolution, then it is best to position the ViewMate and the Smart DFM windows side by side as shown below:

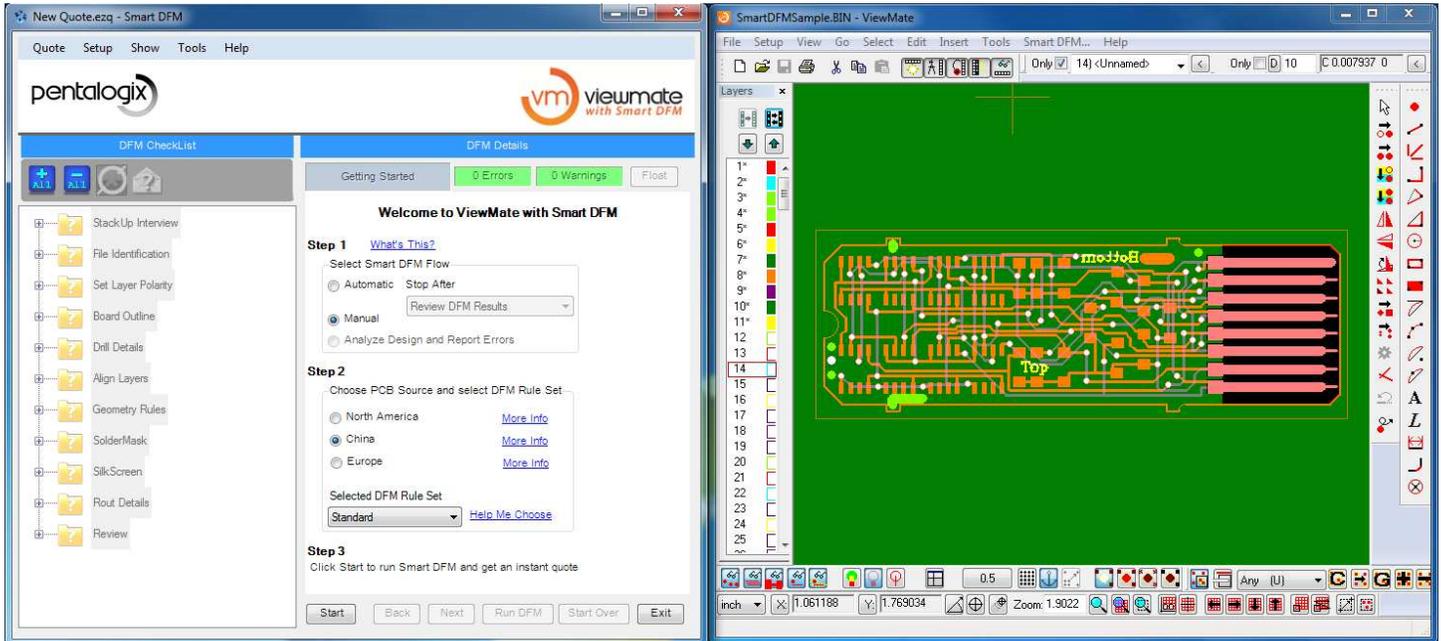


Figure 6 – ViewMate and Smart DFM Side by Side

You can also automatically position the two windows side by side by selecting “Setup->Split Screen View”. Smart DFM will be sized to take up the left side of the screen, using the minimum width required for Smart DFM. ViewMate will occupy the rest of the screen.

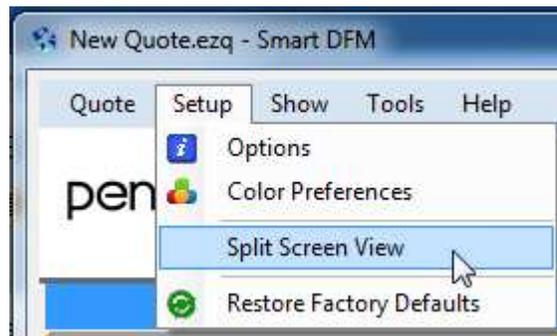


Figure 7 – Split Screen View

If you have insufficient screen resolution, then you will have to work with the windows overlapping one another.

Smart DFM “Flow”

Smart DFM “Flow” can proceed in one of three modes; “Manual”, “Auto” or “Analyze Design and Report Errors”. In “Manual” mode, each of your custom DFM Rules is checked one after another. Smart DFM stops after each check so you can review the results. In “Auto” mode, Smart DFM automatically advances from one DFM Rule to the next and only stops if a DFM Rule violation is found. If you use the “Analyze Design and Report Errors” method, then Smart DFM progresses through the first few DFM Rules in “Manual” mode. After you’ve identified a few basic things about the design (technology type, layer StackUp, etc.) Smart DFM takes over and quickly analyzes your design. The “Flow” mode you choose to use depends upon your personal preference and by what information you would like to extract from the data. For the purposes of this tutorial, please select the “Manual” option as shown below:

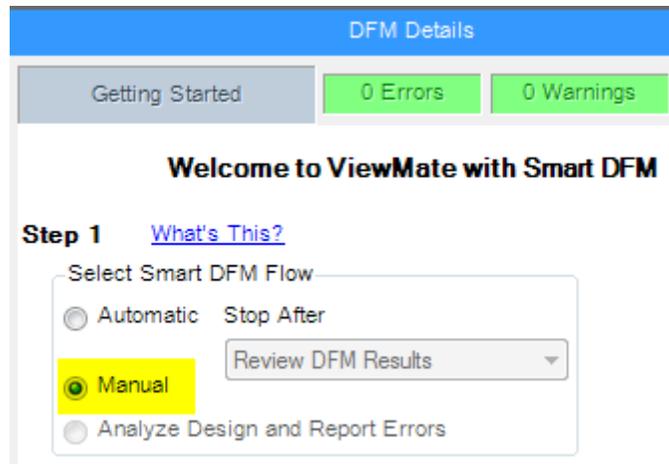


Figure 8 – Setting Up the Smart DFM “Flow”

Selecting the PCB Source and the DFM Rule Set

PentaLogix partners with PCB Manufacturers located in various parts of the world. Each PCB Manufacturer has their unique set of DFM Rules. All of our partners offer at least two DFM Rule Sets. You can choose a specific DFM Rule Set when checking your design.

Each PCB Manufacturer offers a "Standard" DFM Rule Set. The "Standard" DFM Rule Set is for designs that are not very complicated. The "Standard" DFM Rule Set also limits the available number of layers, the SilkScreen colors available, etc. The intent is to restrict the choices to a handful of parameters that are common among many other designs. If your design fits the "Standard" DFM Rule Set, then you are likely to receive your boards at a lower price, because your board can be built together with other customers boards that also fit the same "Standard" parameters.

If your board has special features that are not available in the "Standard" DFM Rule Set, then you should select the "Advanced" or "Extended" DFM Rule Set as applicable.

It is always safe to choose either the "Advanced" or the "Extended" DFM Rule Sets. If your design fits into the "Standard" category, you will automatically receive the pricing that applies to the "Standard" DFM Rule Set. For the purposes of this tutorial, please set the available options as shown in the figure below:

The screenshot shows the 'Getting Started' screen of the Smart DFM interface. At the top, there is a blue header 'DFM Details' and a status bar showing '0 Errors' and '0 Warnings'. Below this, the main heading is 'Welcome to ViewMate with Smart DFM'. The interface is divided into two steps:

- Step 1: What's This?** This step is titled 'Select Smart DFM Flow'. It contains three radio button options: 'Automatic Stop After', 'Manual', and 'Analyze Design and Report Errors'. The 'Manual' option is selected and highlighted in yellow. A dropdown menu labeled 'Review DFM Results' is also present.
- Step 2: Choose PCB Source and select DFM Rule Set** This step contains three radio button options for the PCB source: 'North America', 'China', and 'Europe'. The 'China' option is selected and highlighted in yellow. Each source option has a 'More Info' link next to it. Below the source options is a dropdown menu for the 'Selected DFM Rule Set', with 'Advanced' selected and highlighted in yellow. A 'Help Me Choose' link is located to the right of the dropdown menu.

Figure 9 – Please set "Getting Started" options as shown above

Working “Online” vs. Working “Offline”

At various times, Smart DFM will need to communicate with the PentaLogix web servers. The first time you start Smart DFM, you will be working in “Online” mode.

Online Mode:

When you work in “Online” mode, Smart DFM will establish a connection with our servers and download the latest available DFM Rule Sets. You will want to switch to “Online” mode whenever new DFM Rule Sets are available.

Offline Mode:

After you download the current DFM Rule Sets in “Online” mode, we suggest that you switch to “Offline” mode. In “Offline” mode, Smart DFM will use the DFM Rule Sets that are stored locally on your computer. In “Offline” mode, Smart DFM will start more quickly.

After you log in the first time, you can switch to “Offline” mode by selecting “Quote->Work Offline” as shown below:

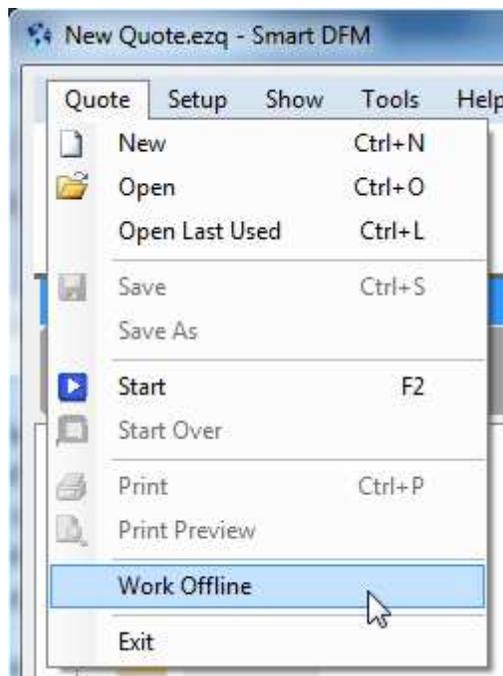


Figure 10 – Click on “Work Offline”

DFM Categories and Rules

The custom DFM Rules are displayed in the DFM CheckList tree view as shown below:

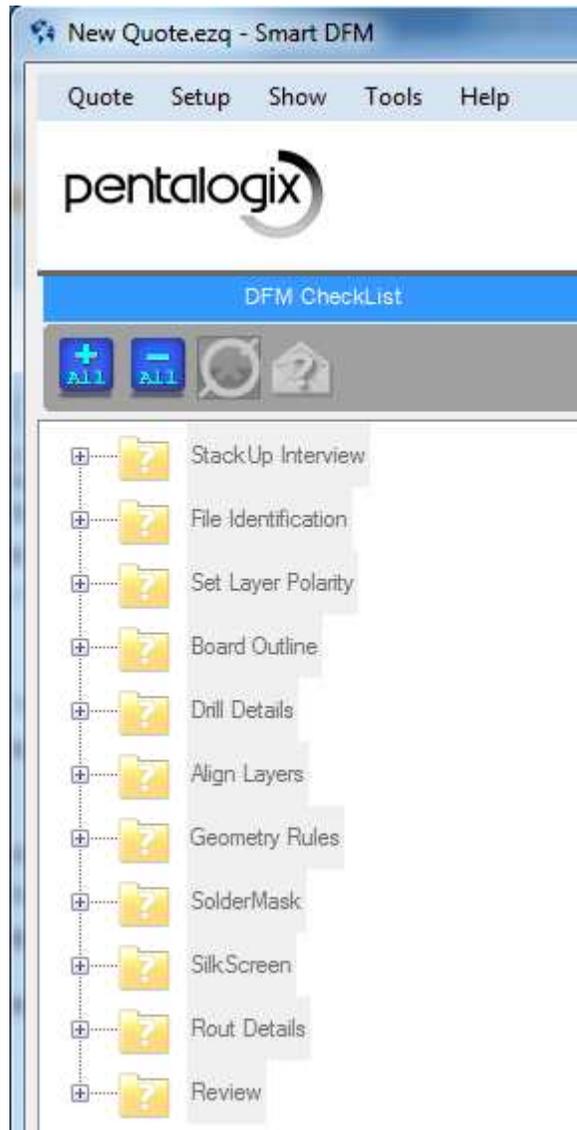


Figure 11 – DFM CheckList Tree View

Notice that DFM Rules are collected into a series of “Categories”. Each category is represented by a folder in the tree view. When you start a new DFM check, all of the category folders are closed as shown in the figure above. As you proceed through the checks, each subsequent folder will open and display the next set of DFM Rules to check. The DFM Rules in each folder are checked in the order that they appear in the tree view.

Starting the DFM Rule Checks

You can start the DFM checks by pressing “F2” or by doing one of the following:

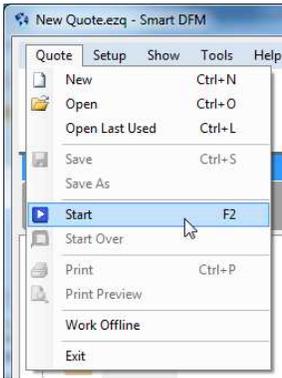


Figure 12a - Click on “Quote->Start” or

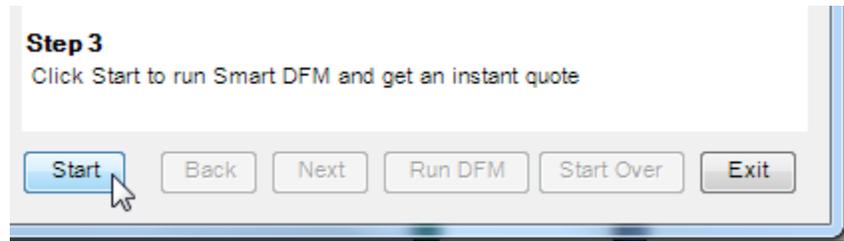


Figure 12b - Click on the “Start Quote” menu button

In response, Smart DFM will present the first DFM Rule as shown below (notice also that the first DFM Rule is shown in the tree view to the left of the menu):

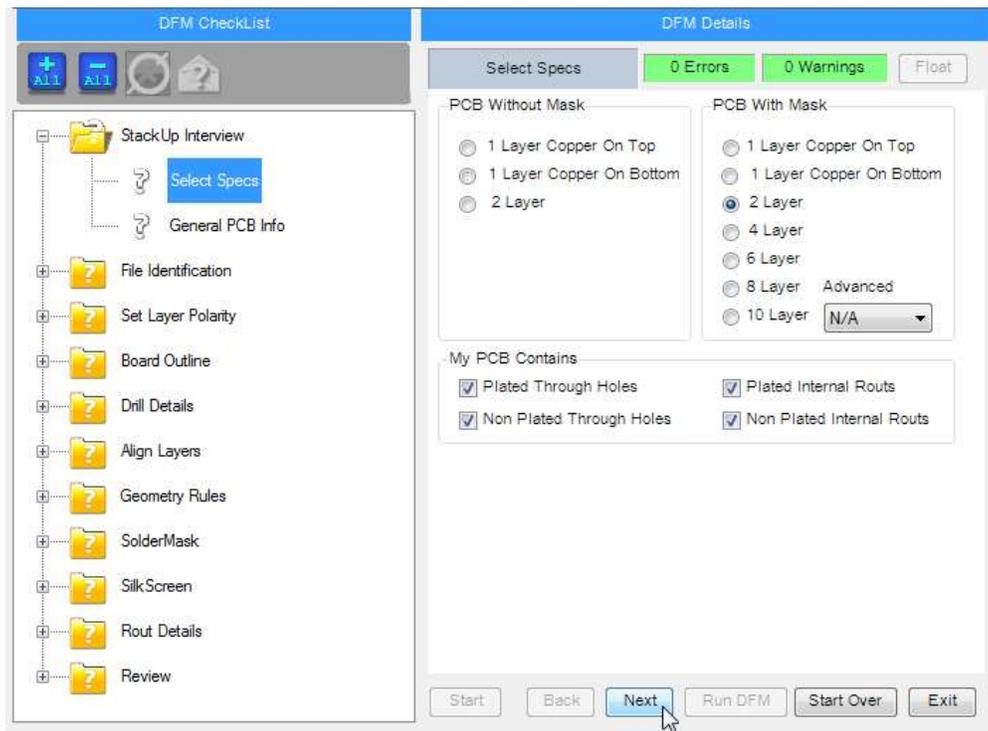


Figure 13 – Smart DFM displays the “Select Specs” DFM Rule

By default, a “4 Layer” board will be selected and only the “Plated Through Holes” check box will be checked. Ensure that the options are set as shown above before you continue. You can then press the “F5” key or click on the “Next” button as shown to continue to the next DFM Rule.

Specifying “General PCB Info”

In this DFM Rule you make various selections about the PCB. If the board has top and/or bottom SilkScreen, then select the appropriate color from the combo boxes. You can also select board thickness, copper thickness, and surface finish.

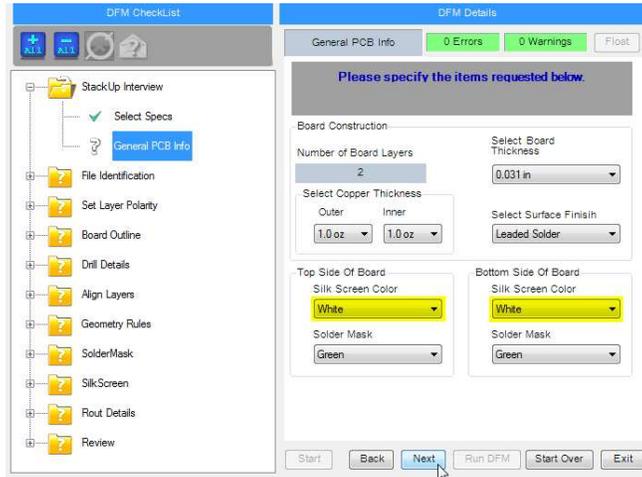


Figure 14 – “General PCB Info”

Before you proceed, ensure that both top and bottom SilkScreen colors are set to “White”.

Identify Layers

Smart DFM will present a “StackUp” of the data. The “Board Outline” will always be shown first. Which of the remaining layers you see depends upon the selections you made in the previous menus. For example, if you did not select top and bottom SilkScreen, then these layers would not appear in the StackUp. Click on the “AutoLoad Using Layer Type” button to identify the layers. Notice that this works because we previously set the layer “Type” in ViewMate. If the layer types are not set in ViewMate, then you would have to click on the individual combo boxes and select the appropriate layer.

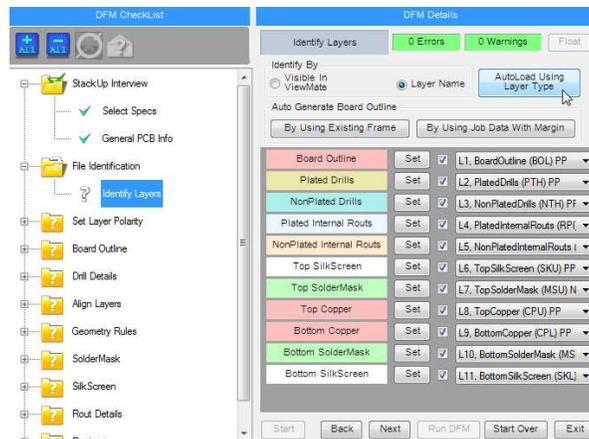


Figure 15 – “Identify Layers”

Set Layer Polarity

Assign the appropriate layer polarity. If you set the “SolderMask” layers to negative, then the screen display will look more like the finished board.

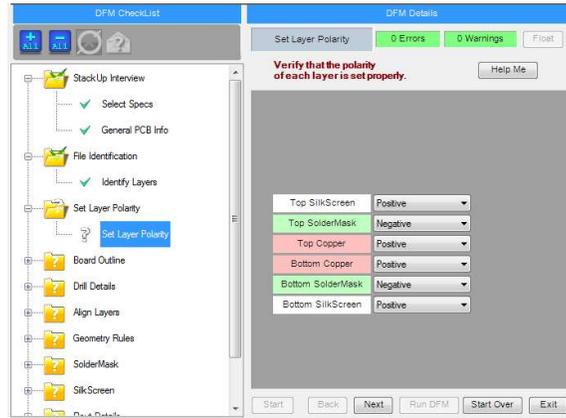


Figure 16 – “Set Layer Polarity”

Outline Is Unbroken Path

Your design must contain a valid description of the physical size and shape of your board. The board outline is used in many of the subsequent tests. For this DFM Rule to pass, the board outline must be a continuous unbroken path and must appear on a separate layer without any other elements.

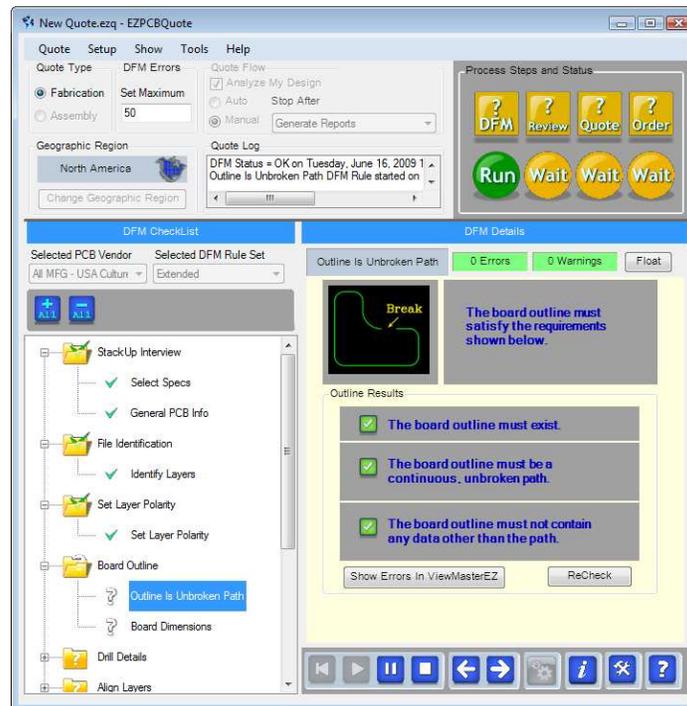


Figure 17 – “Outline Is Unbroken Path”

Saving Smart DFM Files

To avoid losing your work, you should periodically save your progress. Smart DFM saves a file with an “.ezq” extension. You must proceed past the “Set Layer Polarity” DFM Rule before you can save a file.

To save a file, you can press “Ctrl+S” or select “Quote->Save” or “Quote->Save As” as shown below:

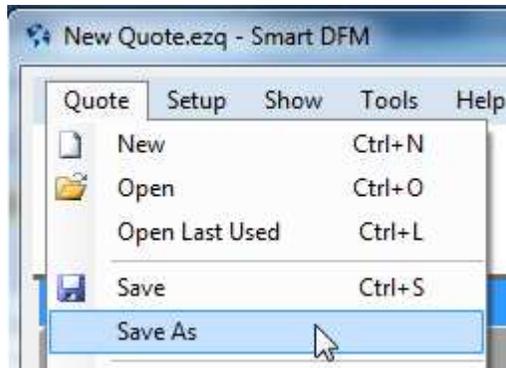


Figure18 – Choose “Quote->Save As”

By default, Smart DFM saves your quote files in the “MyQuoteFiles” folder. This folder is located in:

“My Documents\PentaLogix\SmartDFM\”

Choose “Quote->Save As” and save the file with any file name you choose. By default, Smart DFM will choose a file name that is of the form “SmartDFM_YYYY_MM_DD_hhmm” as shown below:

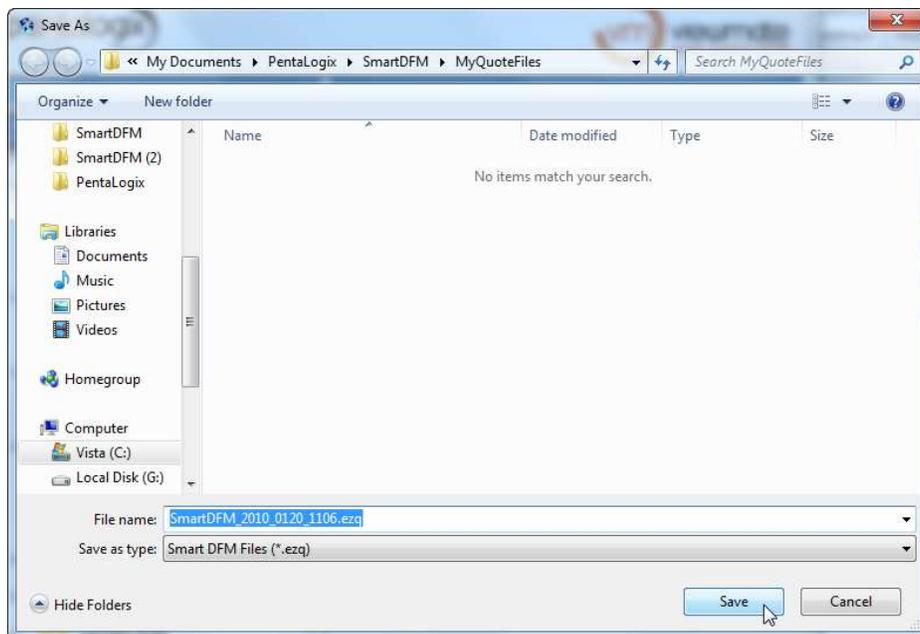


Figure 19 – Save your .ezq file

Switching to “Auto” mode

You could now continue to execute each DFM Rule one step at a time by continuing to click the “Next” button. This may be useful the first time you run Smart DFM so that you can become familiar with all of the checks that are performed by Smart DFM. However, this would be tedious to do on an ongoing basis. It is easier to switch to “Auto” mode. This way, Smart DFM will automatically move to the next DFM Rule after the current DFM Rule is checked. Smart DFM will only stop if an error is encountered.

To switch the “Flow” to “Auto”, select “Setup->Options” as shown below:

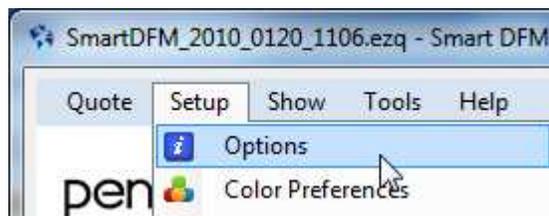


Figure 20 – Choose “Setup->Options”

Select the “Auto” option and then click on “Next”.

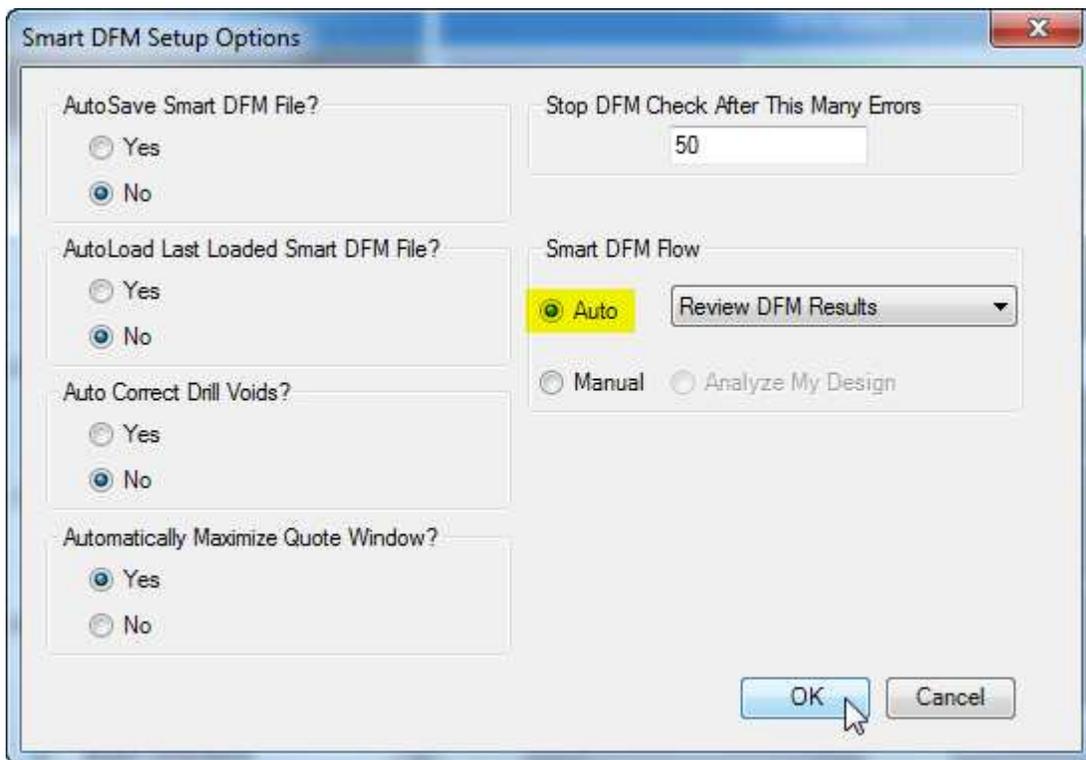


Figure 21 – Select the “Auto” option and then click on “OK”

Run in “Auto” Mode

Smart DFM will run in “Auto” mode until an error is encountered. For the sample file, Smart DFM stops at the “Format Rout Data” DFM Rule. The default rout tool used by the PCB Manufacturer is too large to create the cutouts that we want. Notice the error markers shown in ViewMate. The “blue” features show our desired rout shapes. ViewMate shows how these shapes would be cut out if the default tool were utilized.

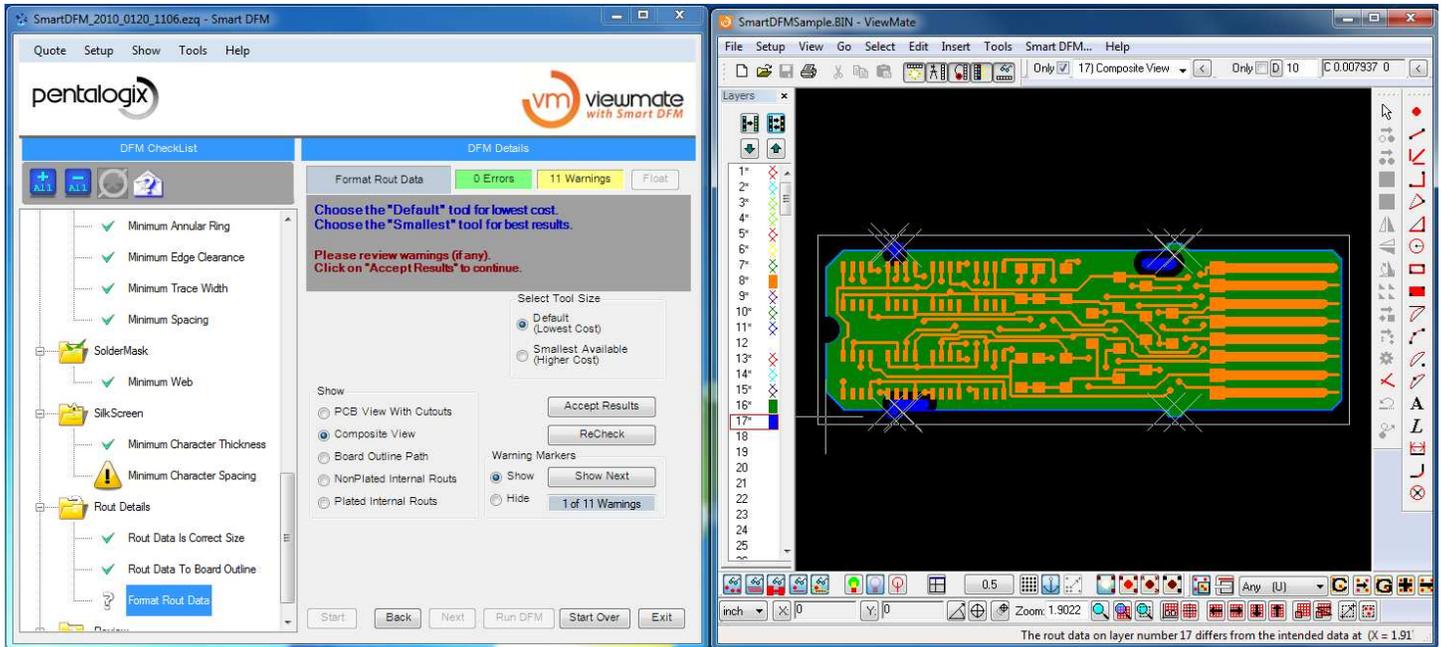


Figure 22 – “Format Rout Data” needs your attention

Click on the “Smallest Available” option in the Smart DFM screen. Notice the results in ViewMate. There are still some problems where shown, but these are most likely acceptable.

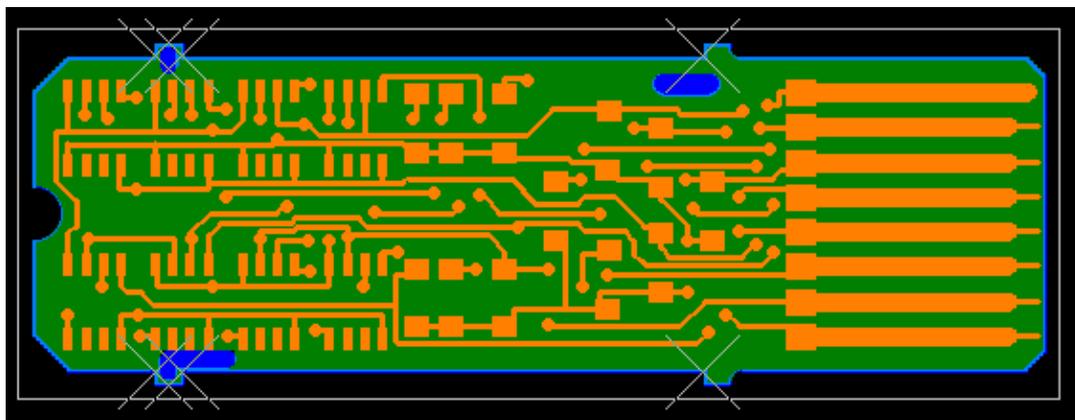


Figure 23 – Note improved results on internal cuts

Click on “Accept Results” and then click on the “Next” button.

Run DFM Review

It is possible that you may have made a correction in a subsequent DFM Rule that ends up causing a new problem in a DFM Rule that was already checked earlier in the flow.

Smart DFM will automatically run a final DFM Review after each of the DFM Rules has been completed in the “Auto” or “Manual” mode. This is to ensure that all DFM Rules still pass and that there are no errors in your design. During this phase, you will see the following screen:

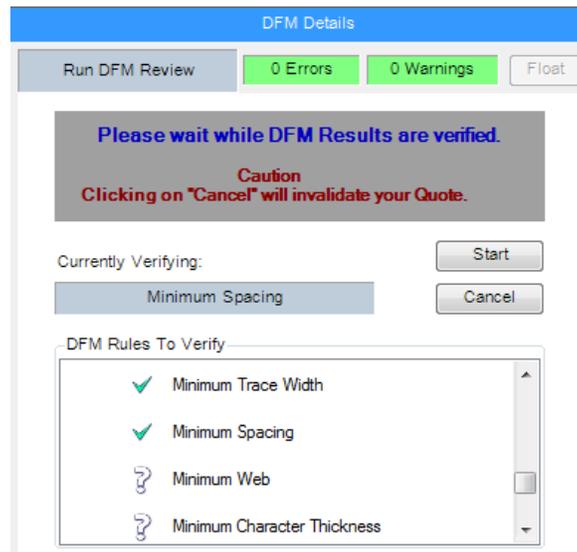


Figure24 – “Run DFM Review”

At the end of the DFM Review process, you’ll be presented with the following dialog. We recommend that you leave the “OK To Upload Files To PentaLogix” check box checked. If you wish to upload your files manually when you place an order, then uncheck this check box. You can also click on the “Why is this important?” for more info.

Click on “OK” to get your instant quote.



Figure 25 – Click on “OK” to continue

Reviewing Your Quote

Smart DFM will display a real time quote for your review:

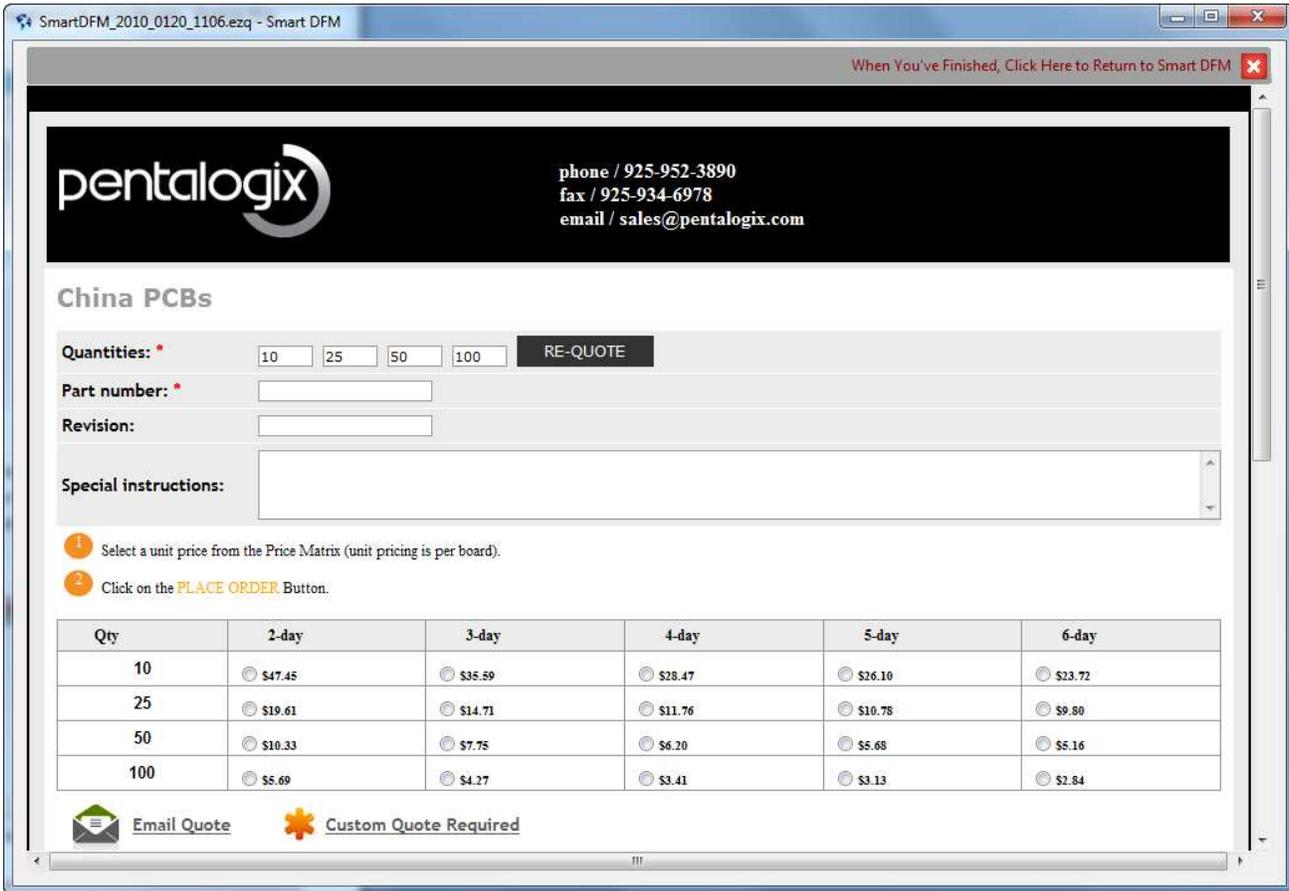


Figure 26 – Review Your Quote

The prices shown here are unit prices (price per board). If you wish, you can make a selection for lead time and quantity and then follow the on screen prompts to place your order.

When you are finished reviewing your quote and or placing your order, you can click on the icon shown below to return to Smart DFM.

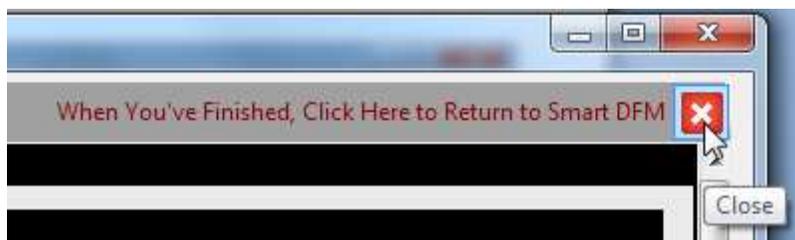


Figure 27 – Click where shown to return to Smart DFM

Next Steps

When you are returned to Smart DFM, you will see the following screen:

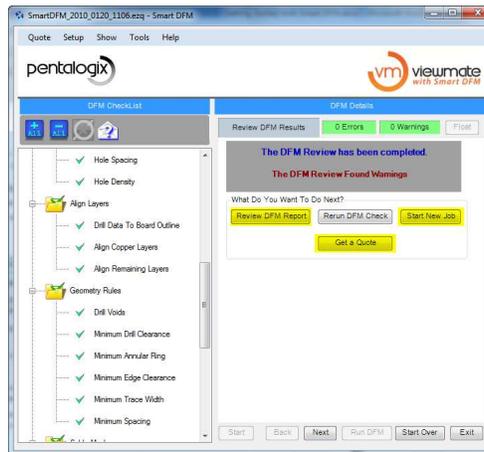


Figure 28 – Next Steps

You can click on “Review DFM Report” to see a summary of your design and the DFM Results.

You can also click on “Get a Quote” if you want to again display the quote results.

When you’ve finished with this screen, we suggest that you save your file. When ready, click on “Start New Job” to begin working with a new set of Gerber and drill data.

Summary – Additional Resources

We have presented a short tutorial to describe the overall functionality of Smart DFM. The information in this tutorial is very brief. Smart DFM has many more features that can help you identify and correct errors with your design.

We have added a “Forum” to our main web site (www.pentalogix.com). This forum is available to all users of PentaLogix software. We welcome you to join the forum, where you can exchange ideas with other PentaLogix users and with PentaLogix software experts. You can also use the forum to request technical support.

You can also request technical support by sending an email to support@pentalogix.com. We attempt to answer your questions as quickly as possible.

When you have some free time, please take a moment to visit <http://shop.pentalogix.com/>. We now provide a wide variety of products that you may find useful for your assembly and PCB projects.

We welcome your feedback. Please address all comments to support@pentalogix.com.

Wishing you every success,

The team at PentaLogix