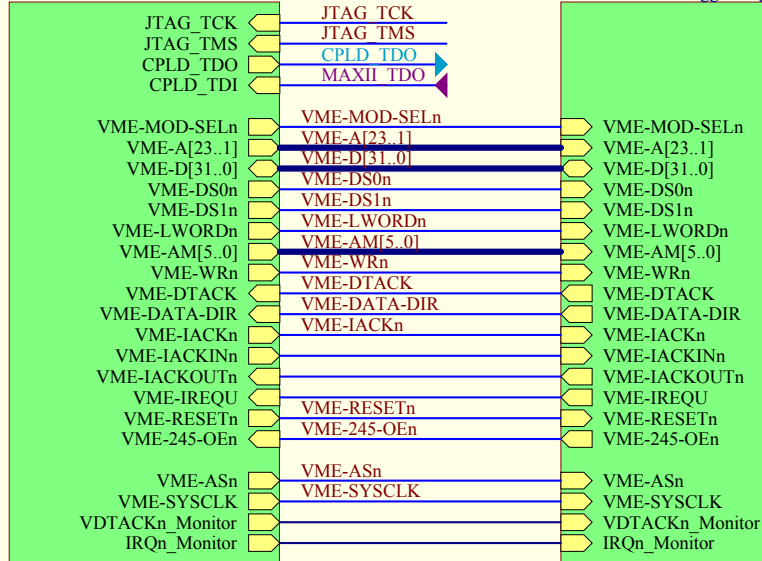


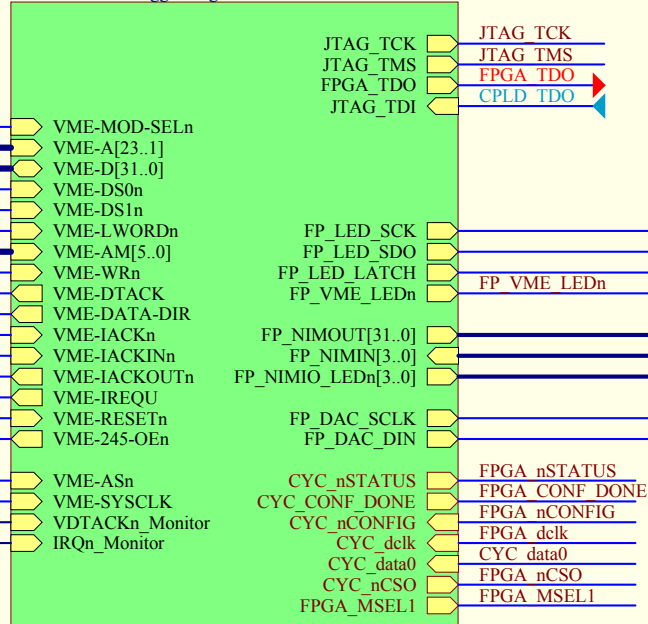
## VME

VME-PPG32 - VME Interface - Rev2.SchDoc



## FPGA

VME-PPG32 - Trigger Logic - Rev2.SCHDOC



## REG

VME-PPG32 - Voltage Regulators - Rev2.SCHDOC



## FP

VME-PPG32 - Front Panel - Rev2.SCHDOC

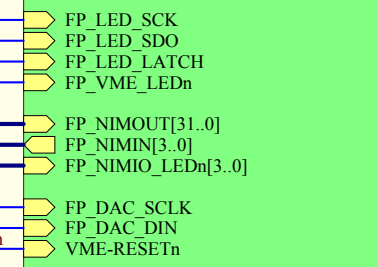
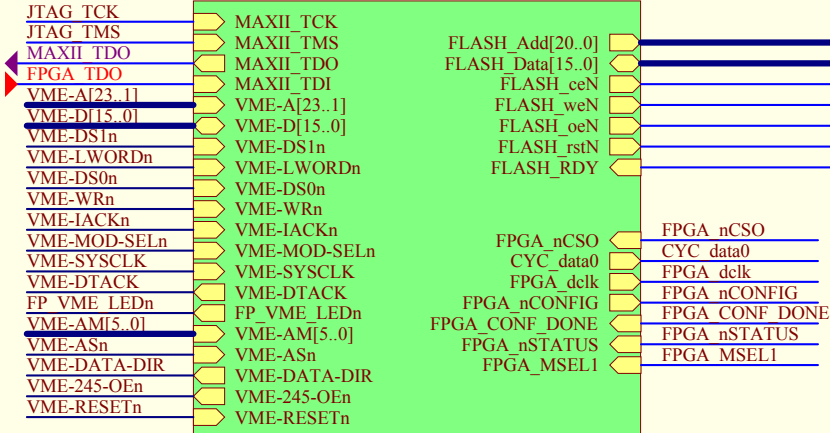


Table 9-7. Cyclone III Device Family Configuration Schemes (Note 1) (Part 1 of 2)

Configuration Scheme	MSEL				Configuration Voltage Standard (V) (2),(3)
	3	2	1	0	
Fast Active Serial Standard (AS Standard POR)	0	0	1	0	3.3
Fast Active Serial Standard (AS Standard POR)	0	0	1	1	3.0/2.5
Fast Active Serial Fast (AS Fast POR)	1	1	0	1	3.3
Fast Active Serial Fast (AS Fast POR)	0	1	0	0	3.0/2.5
Active Parallel x16 Standard (AP Standard POR, for Cyclone III devices only)	0	1	1	1	3.3
Active Parallel x16 Standard (AP Standard POR, for Cyclone III devices only)	1	0	1	1	3.0/2.5
Active Parallel x16 Standard (AP Standard POR, for Cyclone III devices only)	1	0	0	0	1.8
Active Parallel x16 Fast (AP Fast POR, for Cyclone III devices only)	0	1	0	1	3.3
Active Parallel x16 Fast (AP Fast POR, for Cyclone III devices only)	0	1	1	0	1.8
Passive Serial Standard (PS Standard POR)	0	0	0	0	3.3/3.0/2.5
Passive Serial Fast (PS Fast POR)	1	1	0	0	3.3/3.0/2.5
Fast Passive Parallel Fast (FPP Fast POR) (4)	1	1	1	0	3.3/3.0/2.5

## MAXII

VME-PPG32 - MAXII Flash Interface Rev2.SchDoc



## FLASH

VME-PPG32 - Flash Memory - Rev2.SchDoc

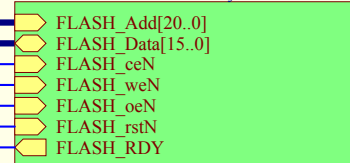


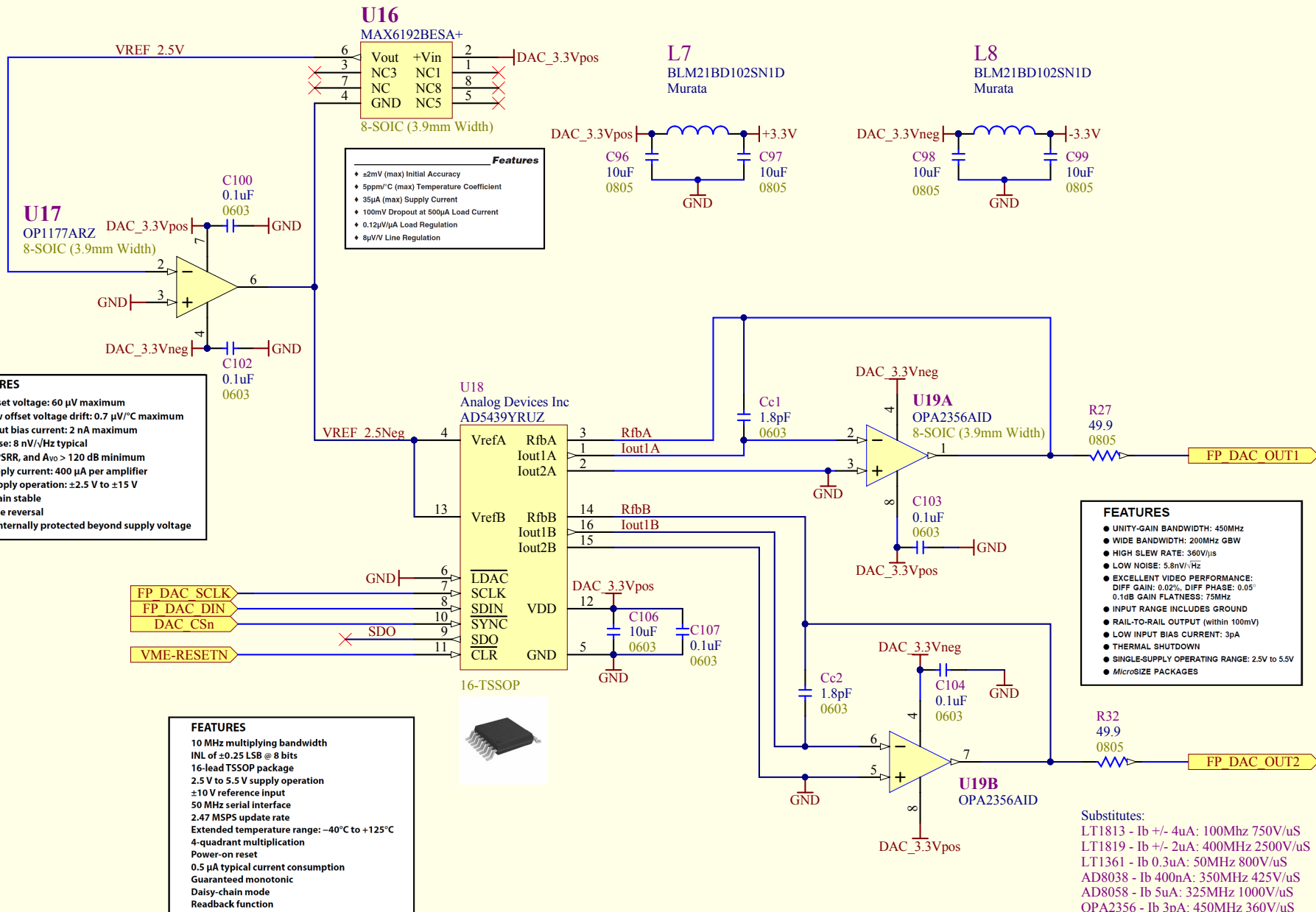
Table 9-4. Cyclone III Device Family Configuration Features

Configuration Scheme	Configuration Method	Decompression	Remote System Upgrade (1)	Design Security (Cyclone III LS Devices Only)
Fast Active Serial Standard (AS Standard POR)	Serial Configuration Device	✓	✓	✓
Fast Active Serial Fast (AS Fast POR)	Serial Configuration Device	✓	✓	✓
Active Parallel x16 Standard (AP Standard POR, for Cyclone III devices only)	Supported Flash Memory (2)	—	✓	—
Active Parallel x16 Fast (AP Fast POR, for Cyclone III devices only)	Supported Flash Memory (2)	—	✓	—
Passive Serial Standard (PS Standard POR)	External Host with Flash Memory	✓	—	—
Passive Serial Fast (PS Fast POR)	Download Cable	✓	—	✓ (3)
Fast Passive Parallel Fast (FPP Fast POR)	External Host with Flash Memory	✓	—	✓ (3)
JTAG based configuration	Download Cable	—	—	—

Notes to Table 9-4:  
 (1) Remote update mode is supported when using the remote system upgrade feature. You can enable or disable remote update mode with a option setting in the Quartus® II software. For more information about the remote system upgrade feature, refer to "Remote System Upgrade" on page 9-7.  
 (2) For more information about the supported flash devices for the hardware community parallel flash, refer to Table 9-11 on page 9-24.  
 (3) The design security feature is not supported using a SRAM-based flash.

## VME - PPG32 - Top Level

Revision	Drawing #: 1	<b>TRIUMF</b> 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3		
2	Sheet #: 1 of 13			Size: A
	Drawn by: D.Bishop			Date: 20/05/2012
File: C:\Altium\VME - PPG Rev2\VME-PPG32 - Top Level - Rev2.SCHDOC			2:48:40 PM	



**U16**  
MAX6192BESA+  
8-SOIC (3.9mm Width)

**Features**

- ±2mV (max) Initial Accuracy
- 5ppm/°C (max) Temperature Coefficient
- 35µA (max) Supply Current
- 100mV Dropout at 500µA Load Current
- 0.12µV/µA Load Regulation
- 8µV/V Line Regulation

**FEATURES**

- Low offset voltage: 60 µV maximum
- Very low offset voltage drift: 0.7 µV/°C maximum
- Low input bias current: 2 nA maximum
- Low noise: 8 nV/√Hz typical
- CMRR, PSRR, and Avo > 120 dB minimum
- Low supply current: 400 µA per amplifier
- Dual supply operation: ±2.5 V to ±15 V
- Unity-gain stable
- No phase reversal
- Inputs internally protected beyond supply voltage

**FEATURES**

- 10 MHz multiplying bandwidth
- INL of ±0.25 LSB @ 8 bits
- 16-lead TSSOP package
- 2.5 V to 5.5 V supply operation
- ±10 V reference input
- 50 MHz serial interface
- 2.47 MSPS update rate
- Extended temperature range: -40°C to +125°C
- 4-quadrant multiplication
- Power-on reset
- 0.5 µA typical current consumption
- Guaranteed monotonic
- Daisy-chain mode
- Readback function

**FEATURES**

- UNITY-GAIN BANDWIDTH: 450MHz
- WIDE BANDWIDTH: 200MHz GBW
- HIGH SLEW RATE: 360V/µs
- LOW NOISE: 5.8nV/√Hz
- EXCELLENT VIDEO PERFORMANCE: DIFF GAIN: 0.02%, DIFF PHASE: 0.05° 0.1dB GAIN FLATNESS: 75MHz
- INPUT RANGE INCLUDES GROUND
- RAIL-TO-RAIL OUTPUT (within 100mV)
- LOW INPUT BIAS CURRENT: 3pA
- THERMAL SHUTDOWN
- SINGLE-SUPPLY OPERATING RANGE: 2.5V to 5.5V
- MICROSIZE PACKAGES

Substitutes:

- LT1813 - Ib +/- 4uA: 100MHz 750V/uS
- LT1819 - Ib +/- 2uA: 400MHz 2500V/uS
- LT1361 - Ib 0.3uA: 50MHz 800V/uS
- AD8038 - Ib 400nA: 350MHz 425V/uS
- AD8058 - Ib 5uA: 325MHz 1000V/uS
- OPA2356 - Ib 3pA: 450MHz 360V/uS

**VME - PPG32 - Dual DAC**

Revision	Drawing #: 2		<b>TRIUMF</b> 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
<b>2</b>	Sheet #: 2 of 13	Size: A		
	Drawn by: D.Bishop	Date: 20/05/2012		
File: C:\Altium\VME - PPG Rev2\VME - PPG32 - Dual DAC - Rev2.SchDoc				

Iset = 5ma

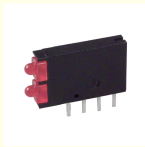
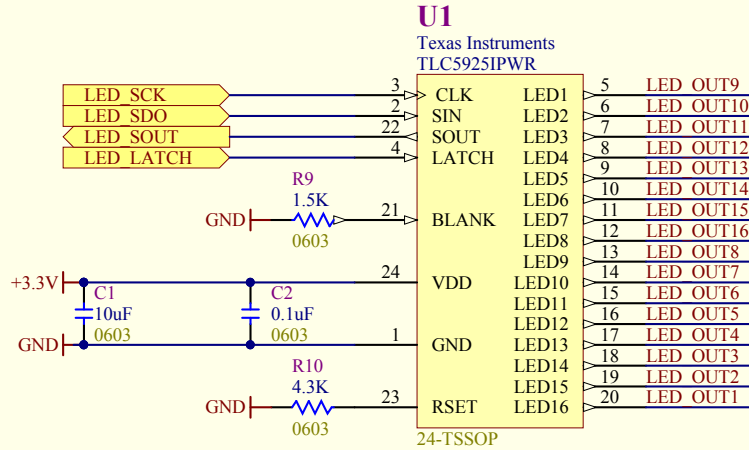
TLC5925: R10 = 4.3K

STP16CP05TTR: R10 = 4.3K

A6282ELP-T: R10 = 4.3K

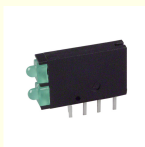
CAT4016Y-T2: R10 = 12K

Alternate Part Numbers:  
 ST Microelectronics - STP16CP05TTR  
 Catalyst Semiconductor - CAT4016Y-T2  
 Allegro - A6282ELP-T



### OUTPUTS

Red LEDs: 571-0111F



### INPUTS

Green LEDs: 571-0122F

#### Adjusting Output Current

TLC5925 sets I<sub>OUT</sub> based on the external resistor R<sub>ext</sub>. Users can follow the below formulas to calculate the target output current I<sub>OUT,target</sub> in the saturation region:

$$I_{OUT,target} = (1.21 \text{ V} / R_{ext}) \times 18, \text{ where } R_{ext} \text{ is the external resistance connected between R-EXT and GND.}$$

Therefore, the default current is approximately 26 mA at 840 Ω and 13 mA at 1680 Ω. The default relationship after power on between I<sub>OUT,target</sub> and R<sub>ext</sub> is shown in Figure 5.

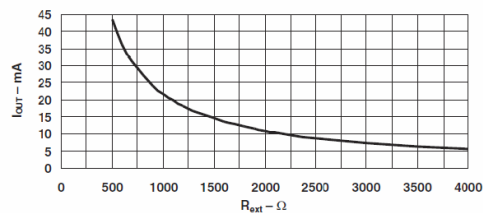
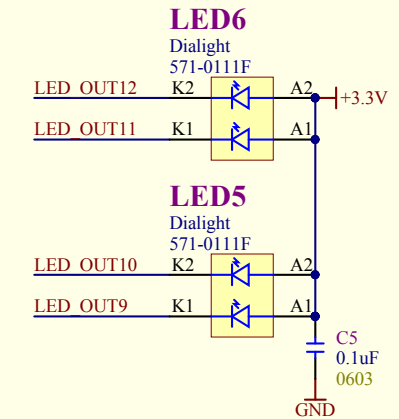
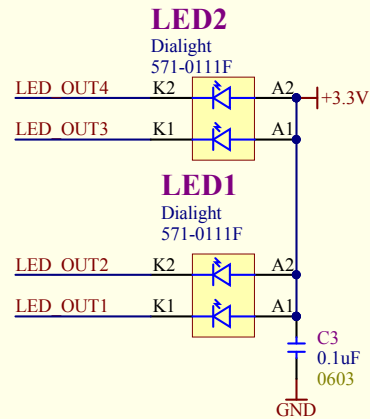
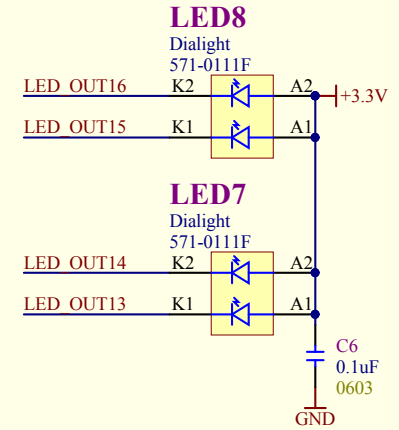
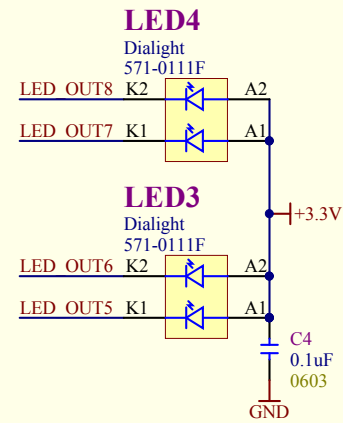


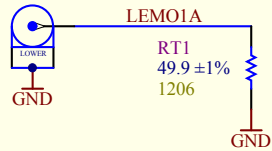
Figure 5. Default Relationship Curve Between I<sub>OUT,target</sub> and R<sub>ext</sub> After Power Up



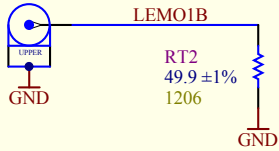
### VME - PPG32 - Front Panel LEDs and driver

Revision	Drawing #: 3	TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
2	Sheet #: 3 of 13		
	Drawn by: D.Bishop	Date: 20/05/2012	

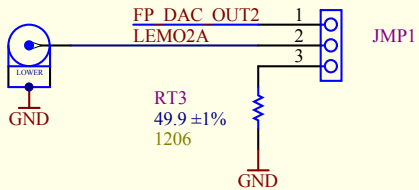
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NIM Input 1



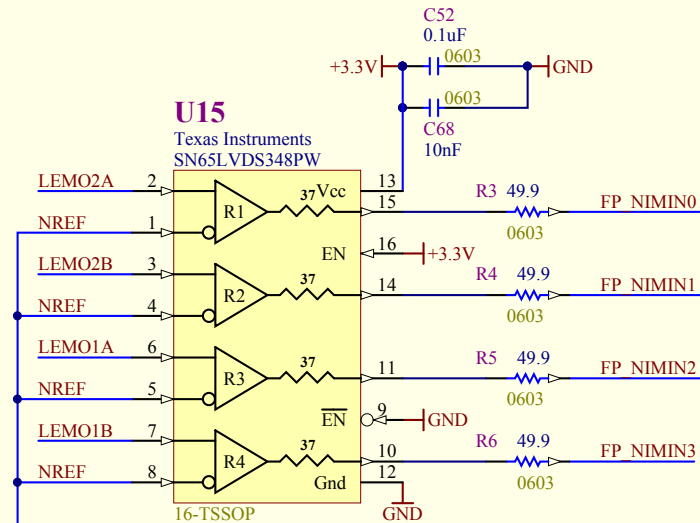
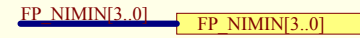
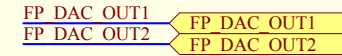
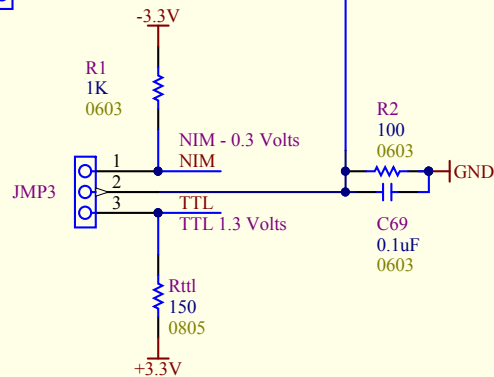
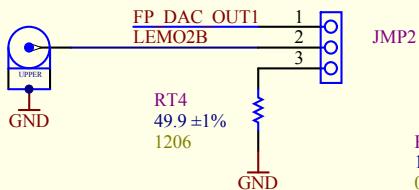
LEMO1B  
NIM Input 2




LEMO2A  
NIM Input 3

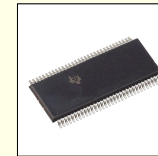
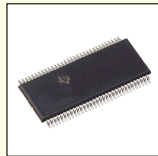
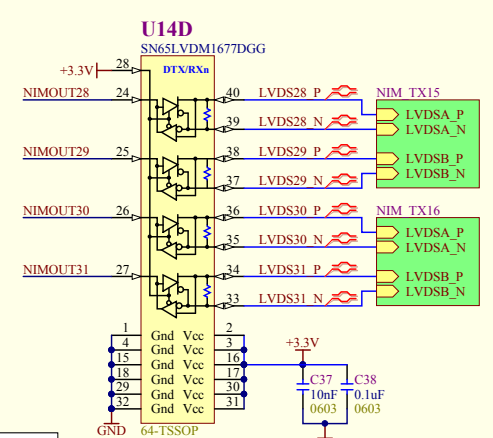
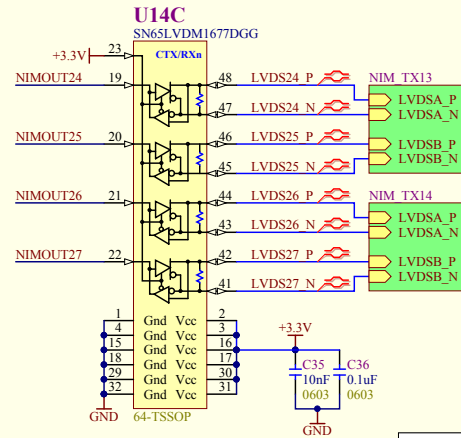
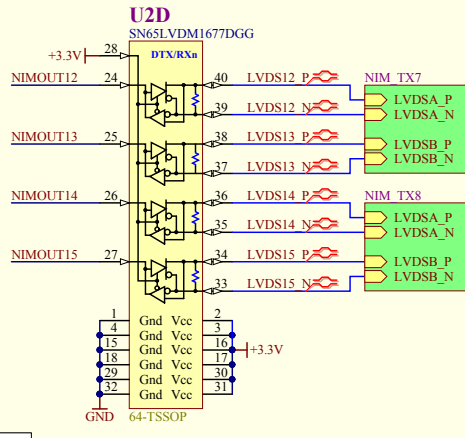
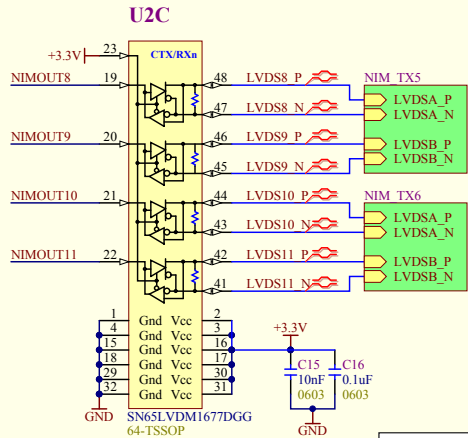
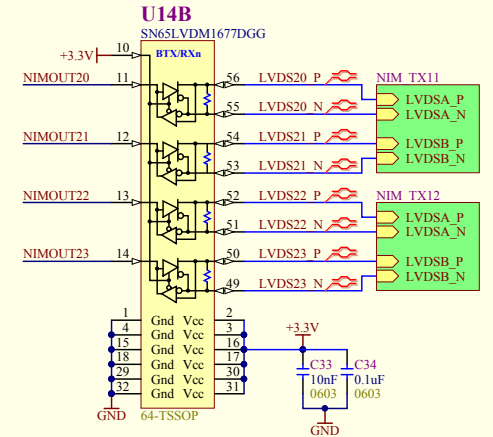
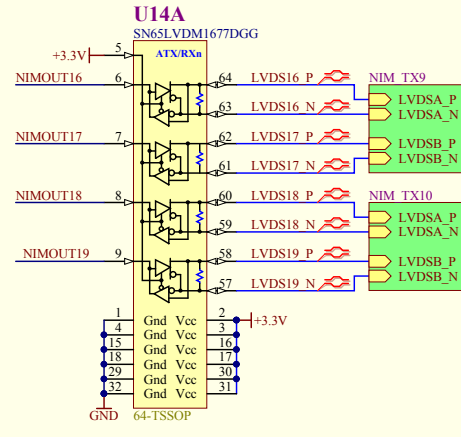
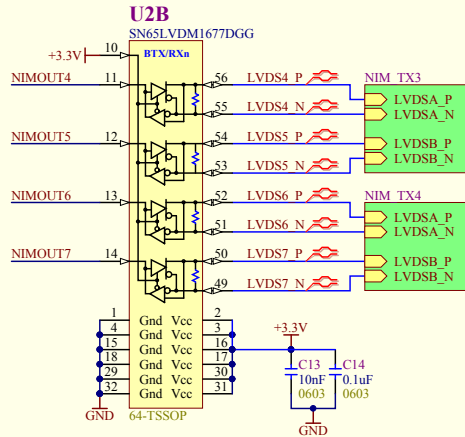
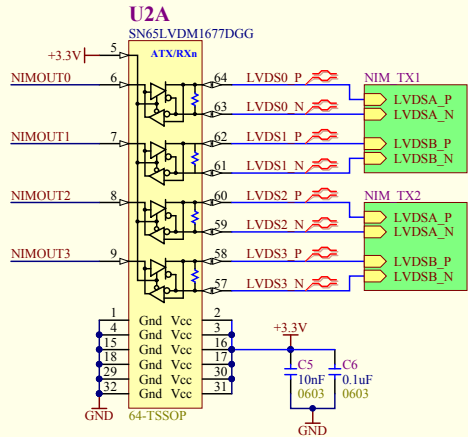


LEMO2B  
NIM Input 4



**VME - PPG32 NIM INPUT**

Revision <b>2</b>	Drawing #: 4		<b>TRIUMF</b> 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
	Sheet #: 4 of 13	Size: A		
	Drawn by: D.Bishop	Date: 20/05/2012		
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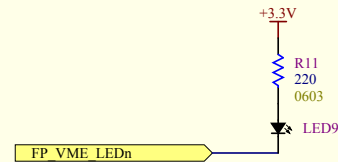
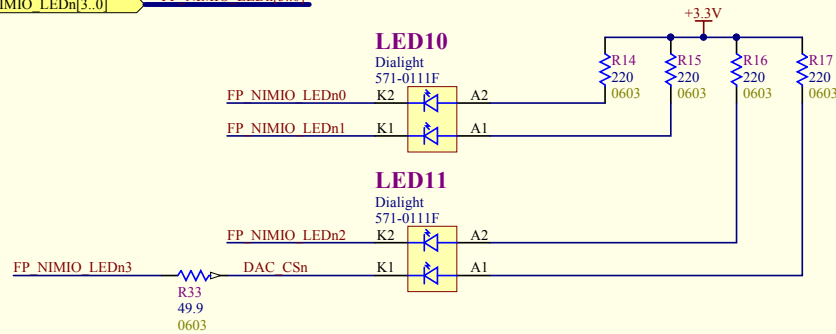
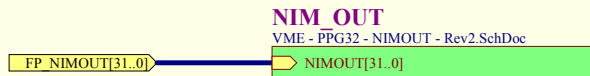
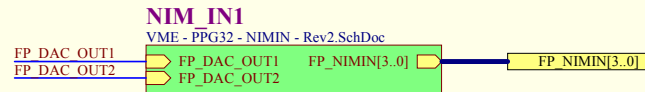
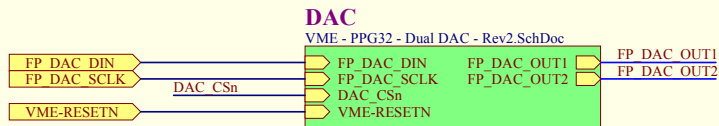
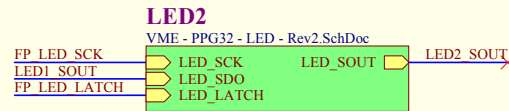
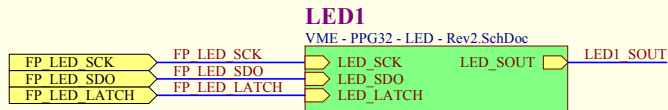


NIMOUT[31..0] → NIMOUT[31..0]

**VME - PPG32 - NIMOUT**

Revision	Drawing #: 5	TRUMF
<b>2</b>	Sheet #: 5 of 13	4004 Wesbrook Mall
	Size: B	Vancouver, B.C.
	Drawn by: D.Bishop	Canada
	Date: 20/05/2012	V6T 2A3




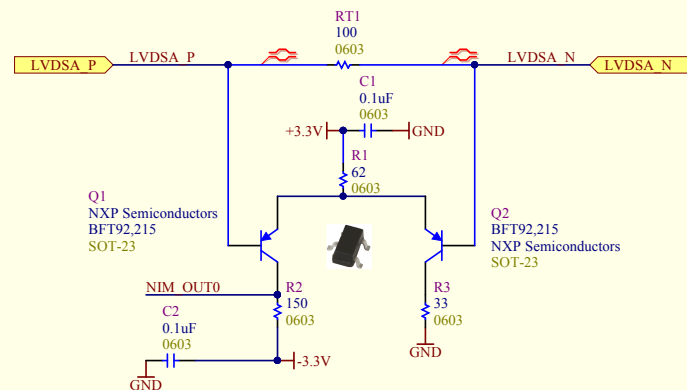


CHICAGO MINIATURE LIGHTING, LLC  
5350TSLC  
Round, 2mm, T-3/4



**VME - PPG32 - Front Panel**

Revision <b>2</b>	Drawing #: 6		TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
	Sheet #: 6 of 13	Size: A		
Drawn by: D.Bishop		Date: 20/05/2012		



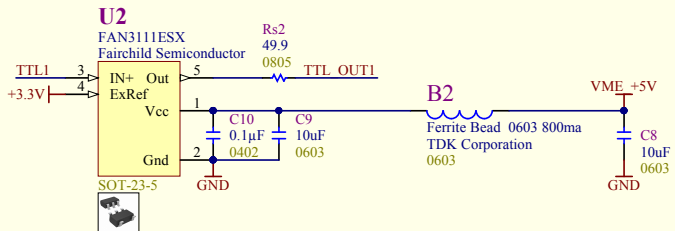
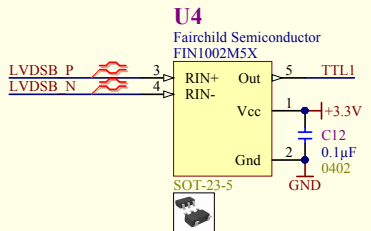
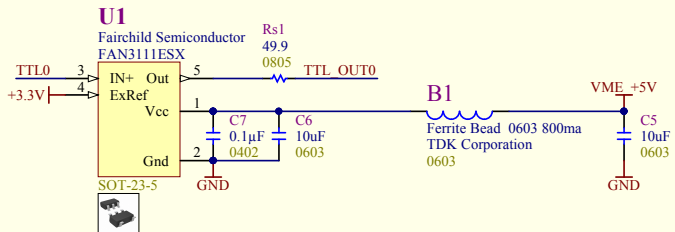
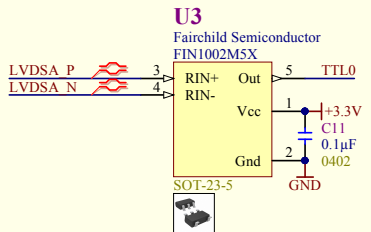
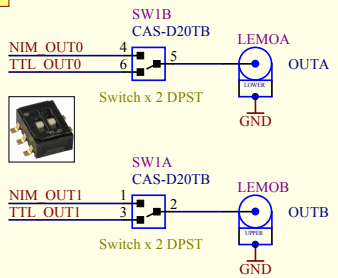
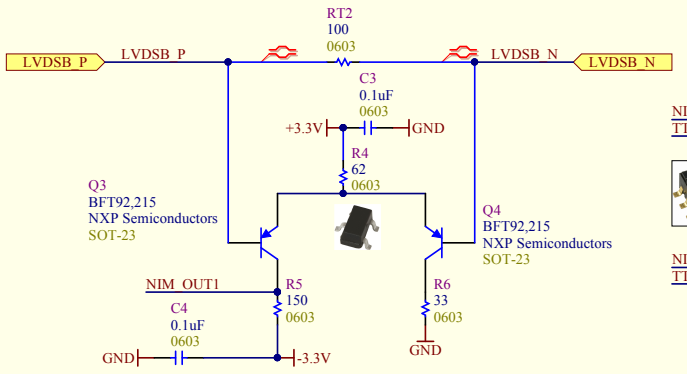
**Cyclone - LVDS**

Output Offset Voltage

Vos Max: 1.375  
 Vos Typ: 1.25  
 Vos Min: 1.125

Diff Output Voltage

Vod Min: 250mv  
 Vod Max: 600mv



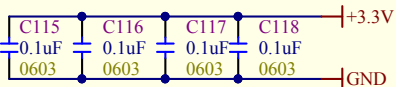
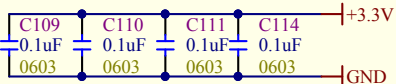
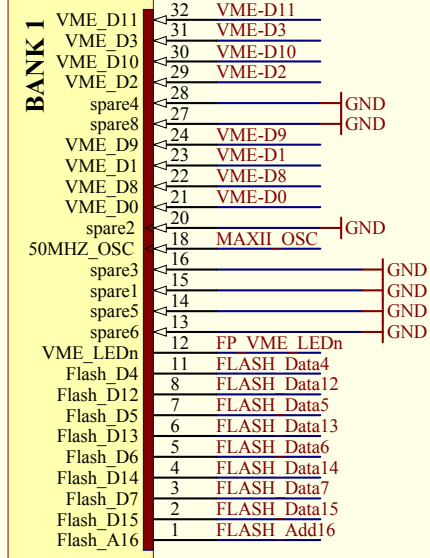
**VME - PPG32 - LVDS to NIM/TTL Converter**

Revision	Drawing #: 7	TRUMF 4004 Westbrook Mall Vancouver, B.C. Canada V6T 2A3	
<b>2</b>	Sheet #: 7 of 13		
Drawn by: D.Bishop		Date: 20/05/2012	

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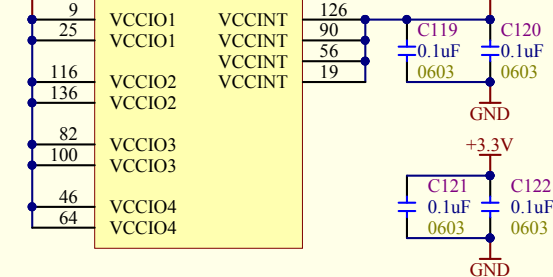
**U20A**

EPM1270T144C5



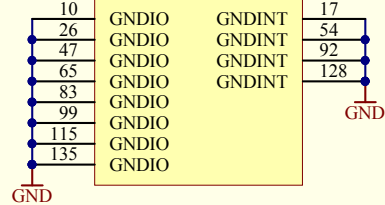
**U20F**

EPM1270T144C5



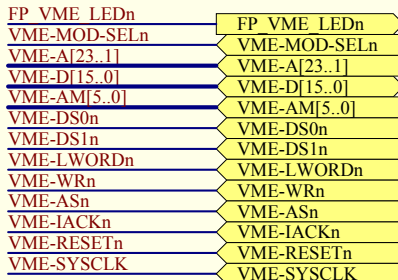
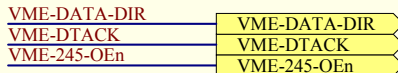
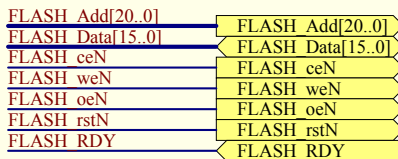
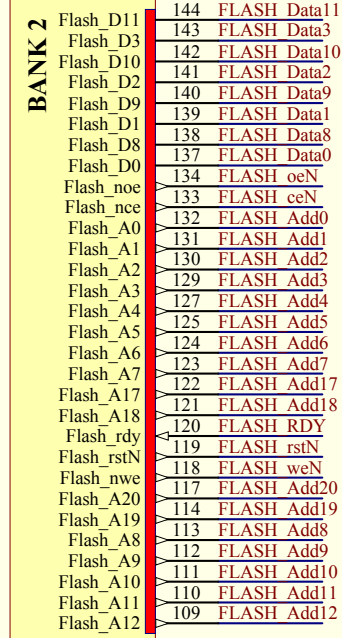
**U20G**

EPM1270T144C5



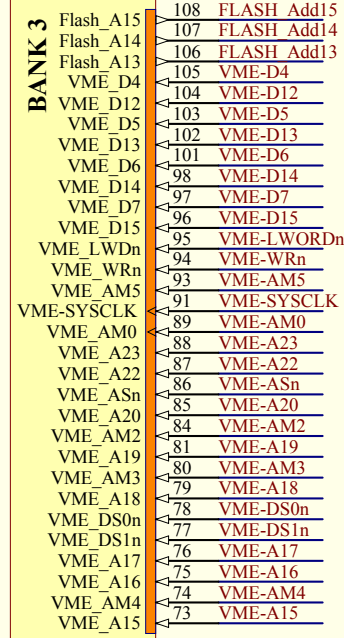
**U20B**

EPM1270T144C5



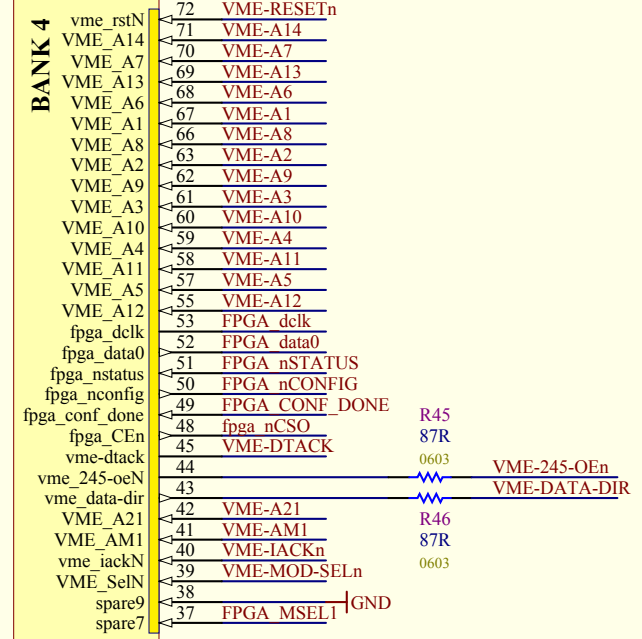
**U20C**

EPM1270T144C5



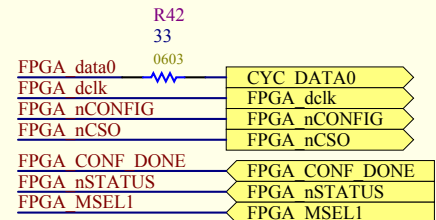
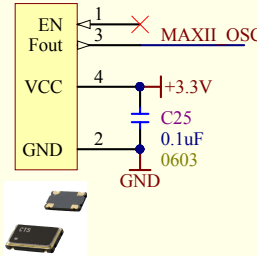
**U20D**

EPM1270T144C5

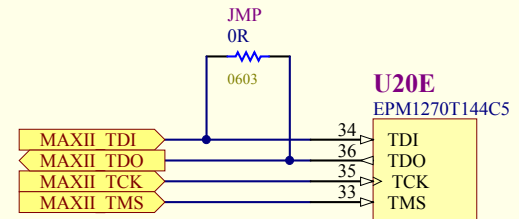



**OSC2**

CTS-Frequency Controls  
CB31V-3C-50M0000  
50MHz  
SMD 7.5mm x 5mm



Install only if U20 (MAXII) not used



VME - PPG32 - MAXII Flash Interface			
Revision	Drawing #: 8		TRIUMF
2	Sheet #: 8 of 13	Size: A	4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3
	Drawn by: D.Bishop	Date: 20/05/2012	
File: C:\Altium\VME - PPG Rev2\VME-PPG32 - MAXII Flash Interface Rev2.SchDoc			2:48:40 PM



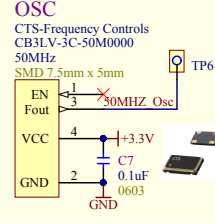
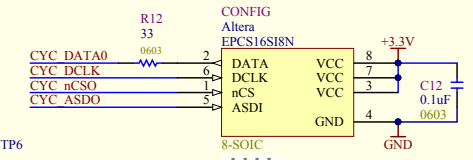
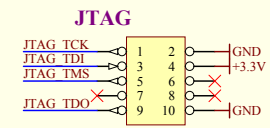
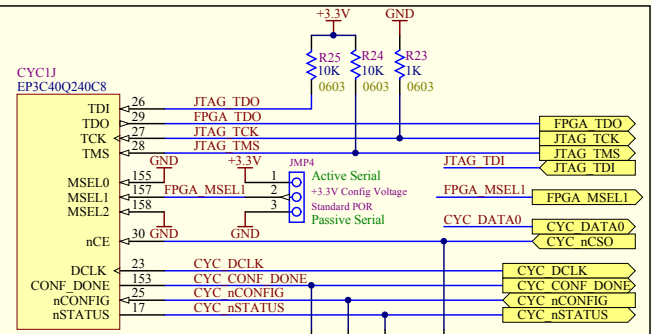
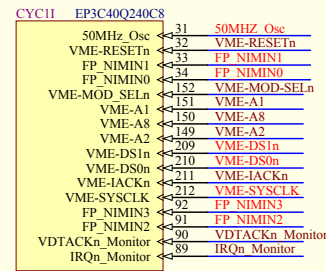
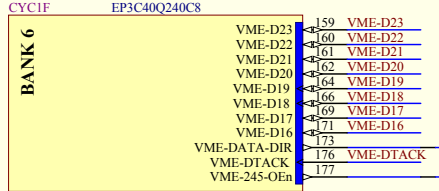
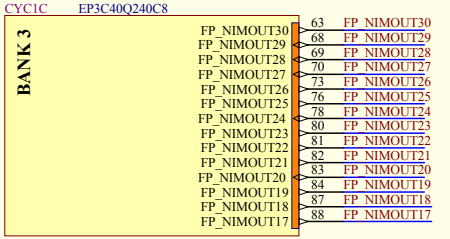
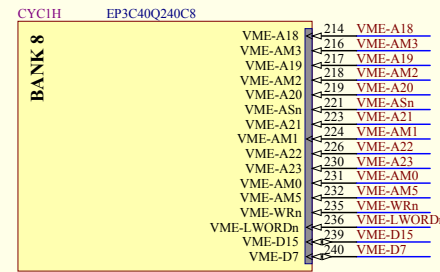
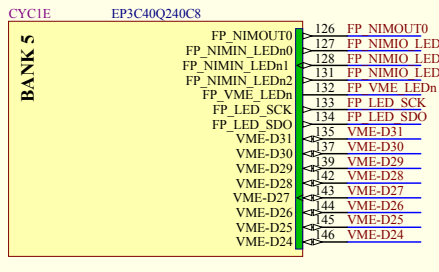
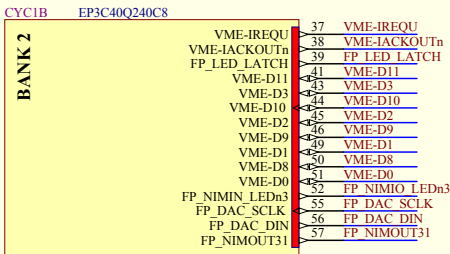
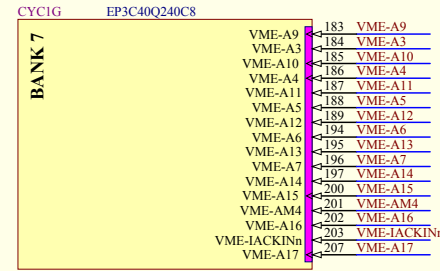
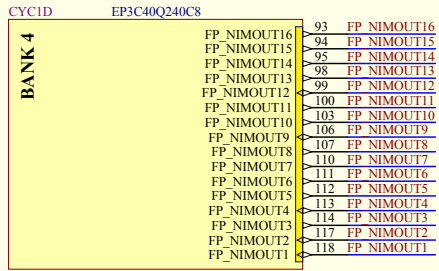
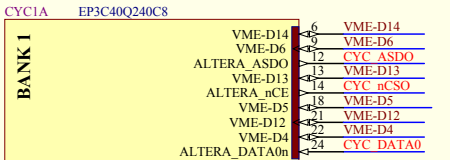
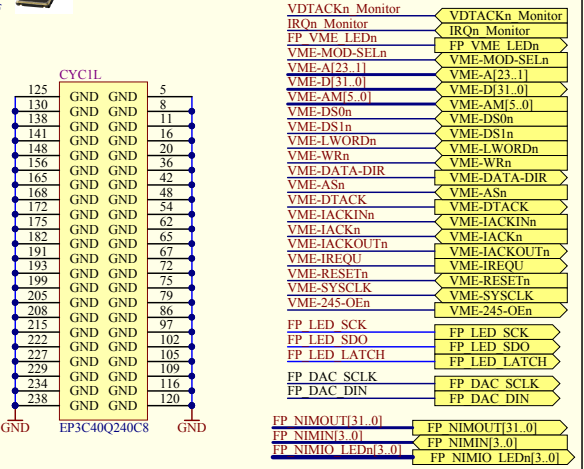
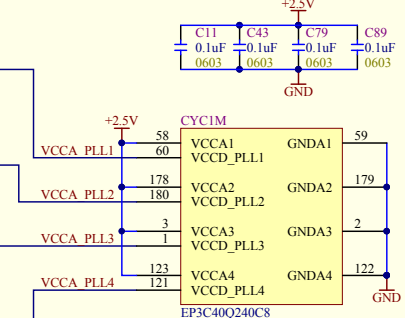
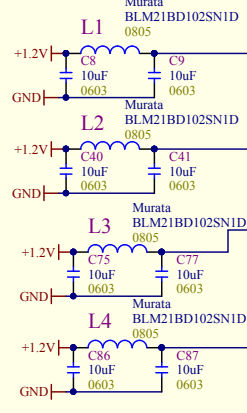
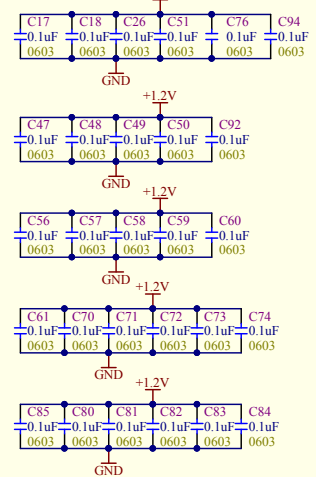
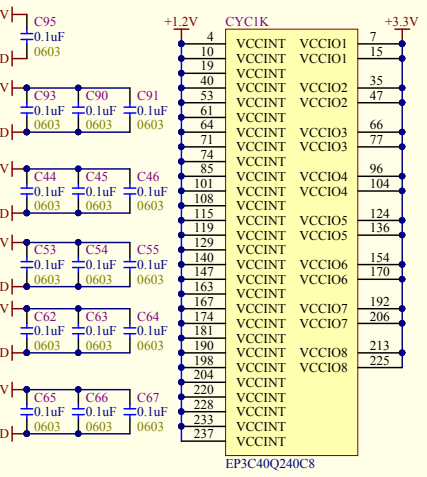


Table 9-3. Cyclone III Device Family Uncompressed Raw Binary File (.rbf) Sizes (Part 1 of 2)

Device	Data Size (Mbits)
EP3C5	3,000,000
EP3C10	3,000,000
EP3C16	4,100,000
EP3C25	5,800,000
EP3C40	9,600,000
EP3C55	14,900,000
EP3C80	20,000,000
EP3C120	28,600,000

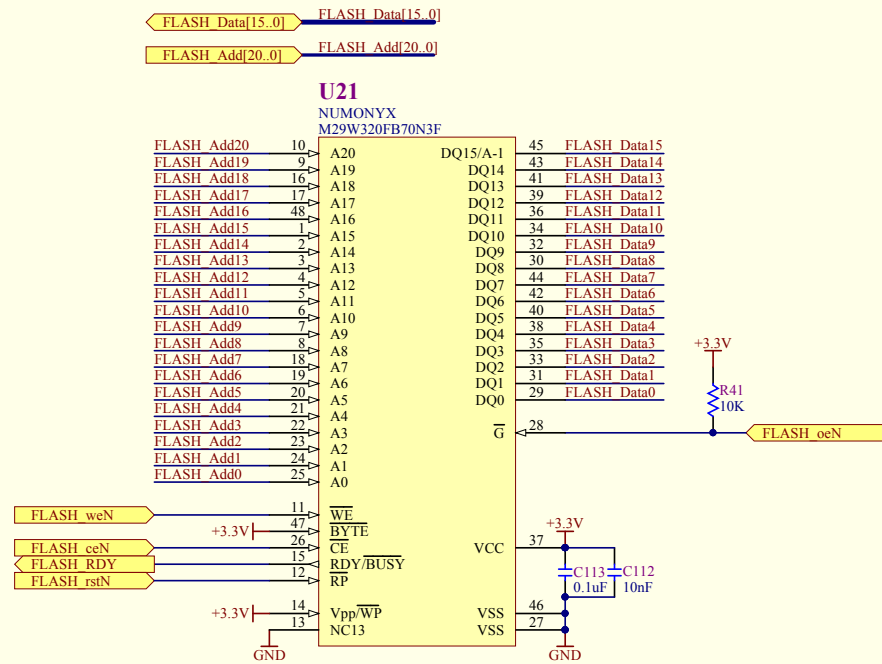


**VME - PPG32 - Trigger Logic & VME Interface**

Revision	Drawing #: 9	TRIUMF
2	Sheet # 9 of 13	4004 Westbrook Mall
	Size: B	Vancouver, B.C.
	Date: 20/05/2012	Canada
	Drawn by: D.Bishop	V6T 2A3

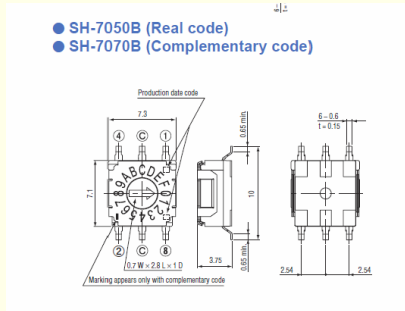
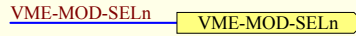
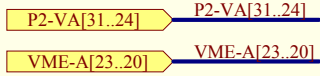
File: C:\Altium\VME - PPG Rev2\VME-PPG32 - Trigger Logic - Rev2.SCHDOC

2:48:41 PM



**VME - PPG32 - Flash Memory**

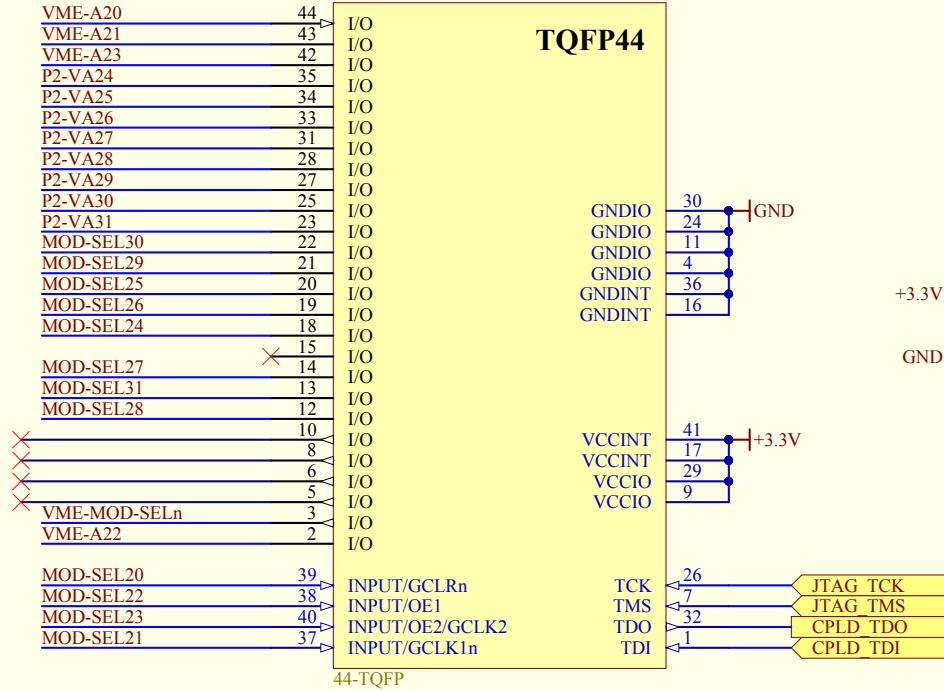
Revision	Drawing #: 10	TRIUMF	
<b>2</b>	Sheet #: 10 of 13	Size: A	4004 Wesbrook Mall
Drawn by: D.Bishop	Date: 20/05/2012	Vancouver, B.C.	
		Canada	
		V6T 2A3	



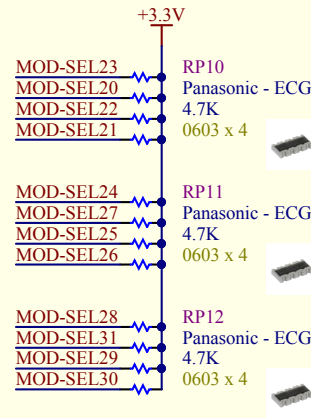
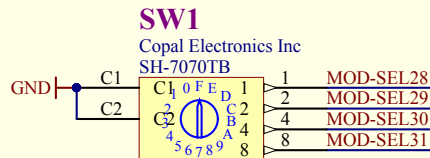
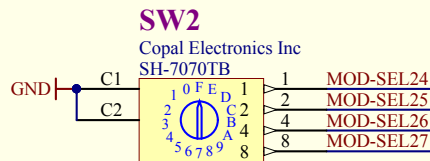
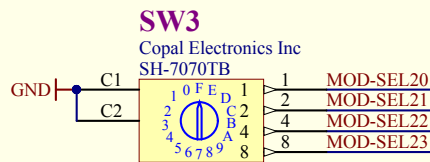
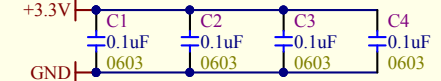
- SH-7050B (Real code)
- SH-7070B (Complementary code)




**U1**  
 ALTERA  
 EPM3032ATC44-7

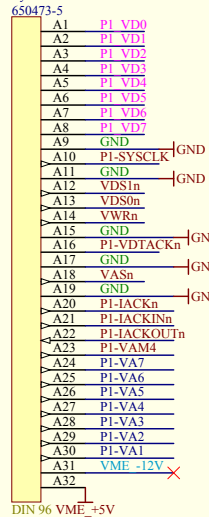


**TQFP44**

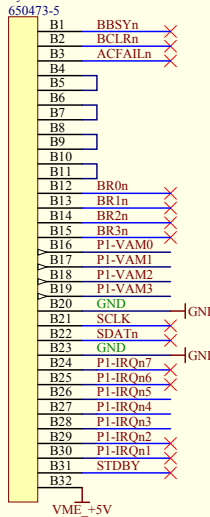


VME - PPG32 - VME Address Decode			
Revision	Drawing #: 11		<b>TRIUMF</b> 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3
<b>2</b>	Sheet #: 11 of 13	Size: A	
	Drawn by: D.Bishop	Date: 20/05/2012	
File: C:\Altium\VME - PPG Rev2\VME-PPG32 - VME Address Decode - Rev2.SCHDOC			
			2:48:41 PM

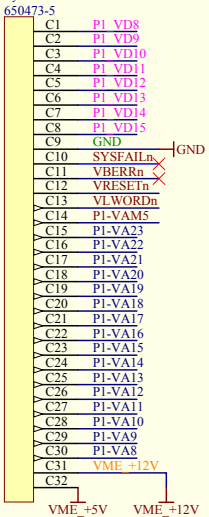
**P1A**  
Tyco Electronics  
650473-5



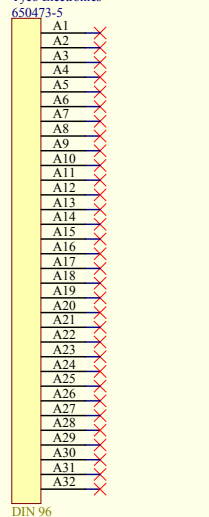
**P1B**  
Tyco Electronics  
650473-5



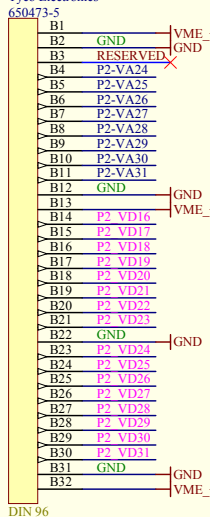
**P1C**  
Tyco Electronics  
650473-5



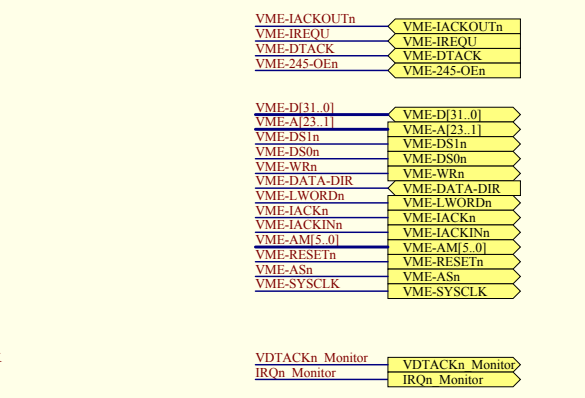
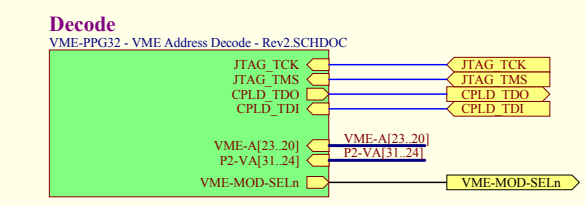
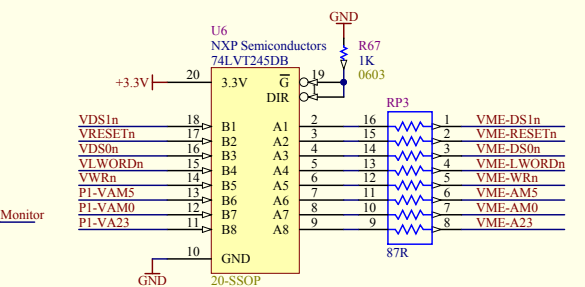
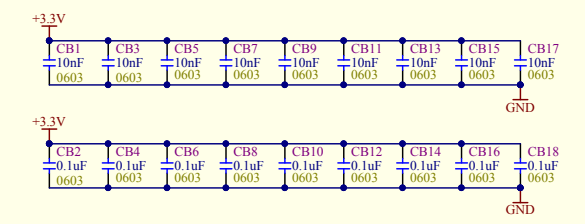
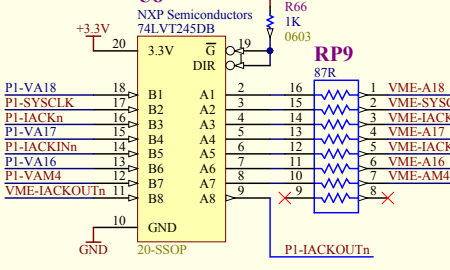
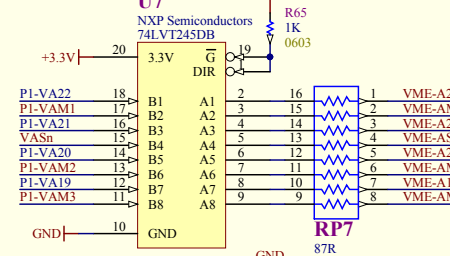
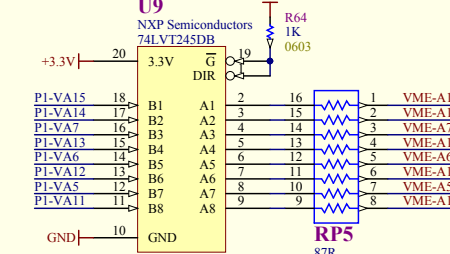
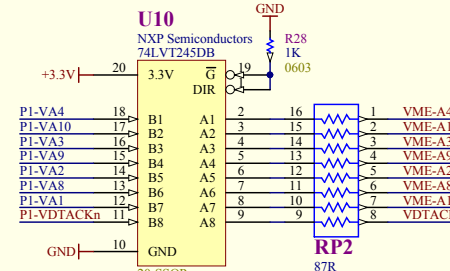
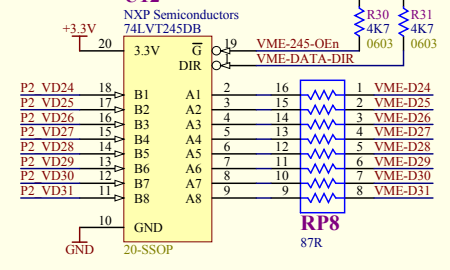
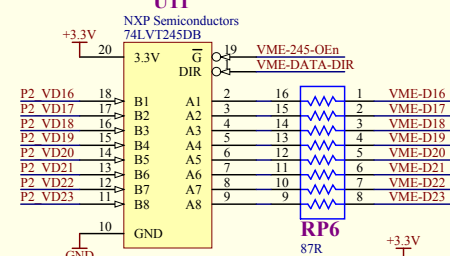
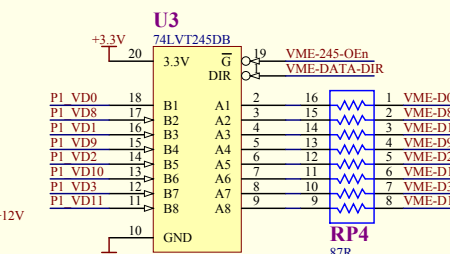
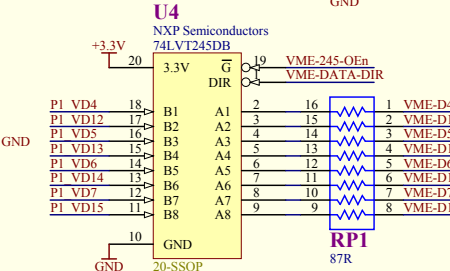
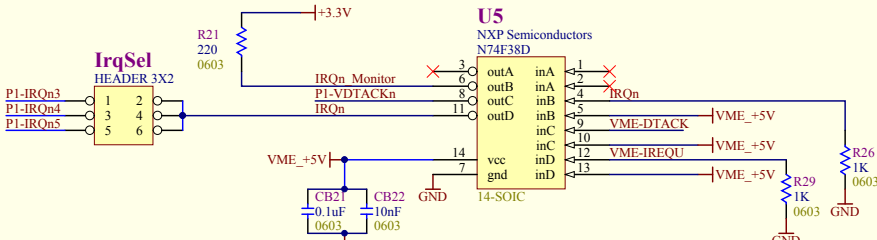
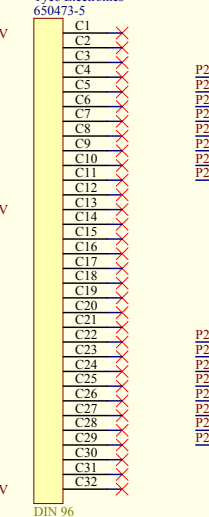
**P2A**  
Tyco Electronics  
650473-5



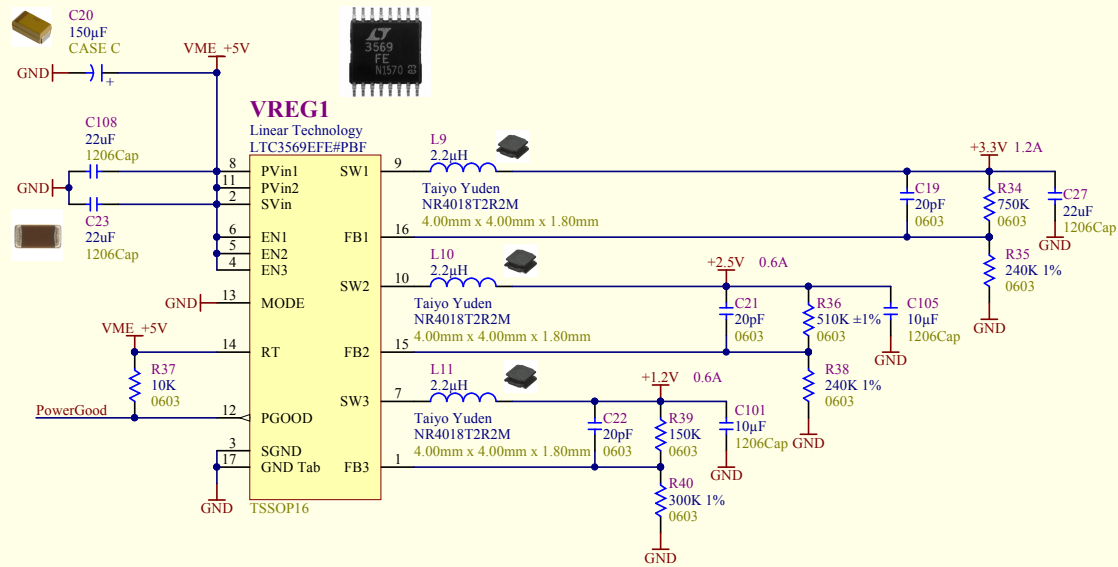
**P2B**  
Tyco Electronics  
650473-5



**P2C**  
Tyco Electronics  
650473-5

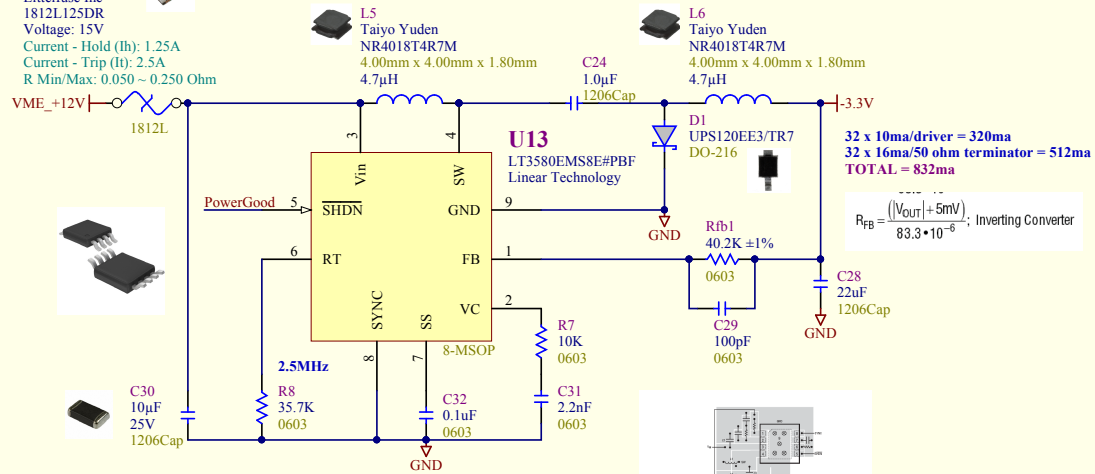


VME - PPG32 - VME Interface			
Revision	Drawing #:	TRIUMF	
<b>2</b>	12	4004 Wesbrook Mall	
	Sheet #:	Vancouver, B.C.	
	12 of 13	Canada	
	Size:	V6T 2A3	
	B		
	Drawn by:	Date: 20/05/2012	
	D.Bishop		



**F1**

Littelfuse Inc  
1812L125DR  
Voltage: 15V  
Current - Hold (Ih): 1.25A  
Current - Trip (It): 2.5A  
R Min/Max: 0.050 - 0.250 Ohm




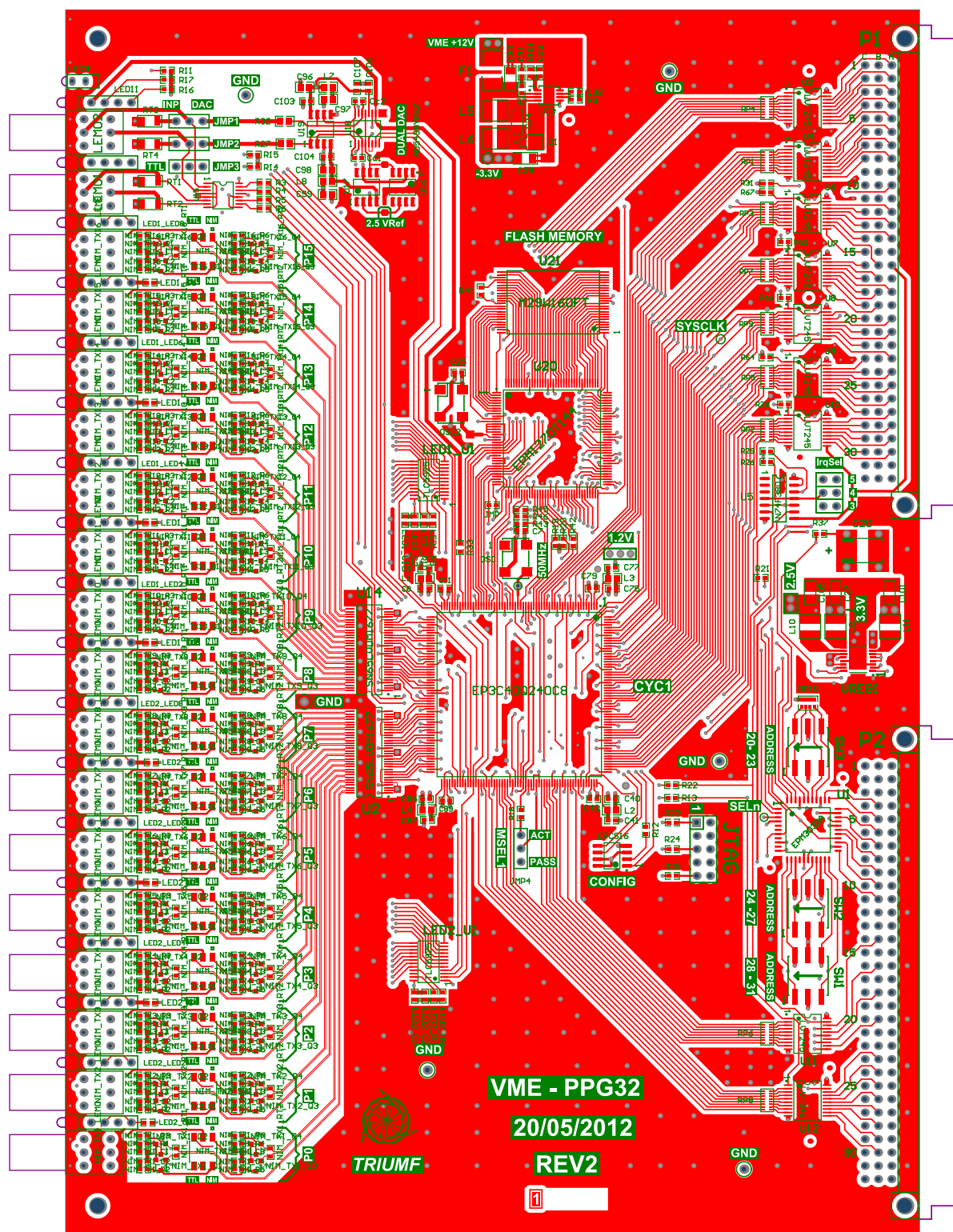
32 x 10ma/driver = 320ma  
32 x 16ma/50 ohm terminator = 512ma  
TOTAL = 832ma

$$R_{FB} = \frac{(|V_{OUT}| + 5mV)}{83.3 \cdot 10^{-6}}; \text{ Inverting Converter}$$

Figure 11. Suggested Component Placement for Switching Regulator (Both 500 and 800K Production). Not to Scale.  
Note each a general representation of device location. The LT3580EMSE#PBF must be oriented identically to your printed board.  
The suggested component placement should be used to minimize ground planes and improve board performance.

**VME - PPG32 - Voltage Regulators**

Revision <b>2</b>	Drawing #: 13	TRIUMF 4004 Wesbrook Mall Vancouver, B.C. Canada V6T 2A3	
	Sheet #: 13 of 13		
	Drawn by: D.Bishop	Date: 20/05/2012	



VME - PPG32

20/05/2012

REV2

TRIUMF