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PRODUCT/PROCESS CHANGE NOTICE (PCN)

PCN Number: **04-10**
Date Issued: **June 18, 2004**
Product(s) Affected: **PI6CVF857**
Manufacturing Location Affected: **N/A**
Date Effective: **September 18, 2004 – standard 90 day waiting period (some customers may require longer timeframes)**

Means of Distinguishing Changed Devices:

- Product Mark:
- Back Mark
- Date Code:*
- Other

* X letter code in front of the year and week

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Attachment: Yes; No

See attached Characterization Comparison Data. Data confirms that the smaller die size has no significant performance differences than the previous version.

Samples: **Available upon request to Pericom Sales Representatives**

Description and Purpose of Change:
The change represents a die layout optimization that reduces chip size by 40%, while using the same 0.35- μ m wafer fab process and design rules. This product was part of an array design that featured multiple device types that were created by metal mask options. The other device type options were removed in order to decrease die size and increase die per wafer for this high volume product. No circuitry changes were made.

- Die Technology
- Wafer Fabrication
- Assembly Process
- Equipment
- Material
- Testing
- Manufacturing Site
- Data Sheet
- Other: **Die shrink**

Reliability/Qualification Summary: **N/A**

Customer Acknowledgement of Receipt:

Customer: _____

Name: _____

Title: _____

Date: _____

E-Mail: _____

Phone: _____

Fax: _____

Approval for shipments prior to effective date

Customer Comments (Optional): _____

Subject: DDR - PI6CVF857 Die Shrink and Production Version Comparison Report

Date: March 22, 2004

This characterization report covers a comparison between the current die version and a die layout optimization that reduces chip size by 40%, while using the same 0.35- μ m wafer fab process and design rules. This product was part of an array design that featured multiple device types that were created by metal mask options. The other device type options were removed in order to decrease die size and increase die per wafer for this high volume product. No circuitry changes were made.

Reference:

Die Shrink Version

Base: E85X

Process: CSM 0.35um 3.3V, 1P3M CMOS

Date Code: BXAA04100C

Lot #: EZ51278.1CP

Package: A48

Current Production Version:

Base: D85X

Process: CSM 0.35um 3.3V, 1P3M CMOS

Date Code: YK003180C

Lot #: EZ12205

Package: A48

Equipment Used:

1. TEK TDS694C Scope with P6249 probes and M1 system
2. HP8116A Function Generator
3. Rohde & Schwarz Signal Generator SMY01
4. HP8082A Pulse Generator
5. Agilent 81130A Pulse Generator
6. HP TIA
7. HP power supply & DMM
8. HP4145B
9. BK815 Capacitance meter
10. EV board: 120-ohm termination across CK & /CK, FBin & /FBin, and all Yx & /Yx output pairs; 15pF load to gnd for all Yx & /Yx output pairs, no capacitive load at FBout & /FBout; FBout to FBin PLL feedback path trace length is about 2.8 inches, 60-ohm trace; the trace length from Yx or /Yx output pin to Cload and test point is about 2.8 inches, and Cload to the 120-ohm termination resistor is about 0.4 inch, 60-ohm trace.

Summary of Results:

The overall performance between the reduced die size and the current production version is very close.

Results:

Table 1. PI6CVF857A DC Characteristics at 25C.

Parameter	Test Condition	Die Shrink Version Data	Production Version Data
I _{in} (CLK, /CLK, FBin, /FBin, /PWRDWN)	V _{in} = 0V, V _{dd} =2.7V, V _{in} = 2.7V, V _{dd} =2.7V, V _{in} = 5.5V (5V tolerant), V _{dd} =2.7V	-31pA 105pA 224pA	210pA 140pA 860pA
I _{off} (CLK, /CLK, FBin, /FBin, /PWRDWN)	V _{in} = 2.7V, V _{dd} =0V, V _{in} = 5.5V (5V tolerant), V _{dd} =0V	123pA 242pA	125pA 376pA
V _{ik} (CLK, /CLK, FBin, /FBin, /PWRDWN)	V _{dd} = 2.3V, I _{ik} = -18mA	-0.892V	-0.902V
V _{il max} (/PWRDWN)	Max V _{il} at /PWRDWN for outputs to stay tristated, V _{dd} =2.3V Max V _{il} at /PWRDWN for outputs to stay tristated, V _{dd} =2.5V Max V _{il} at /PWRDWN for outputs to stay tristated, V _{dd} =2.7V	1.00V 1.07V 1.15V	0.93V 1.00V 1.08V
V _{il max} (/PWRDWN)	Max V _{il} at /PWRDWN for outputs to switch from high to tristate, V _{dd} =2.3V Max V _{il} at /PWRDWN for outputs to switch from high to tristate, V _{dd} =2.5V Max V _{il} at /PWRDWN for outputs to switch from high to tristate, V _{dd} =2.7V	0.67V 0.72V 0.76V	0.65V 0.68V 0.72V
V _{ih min} (/PWRDWN)	Min V _{ih} at /PWRDWN for outputs to stay high, V _{dd} =2.3V Min V _{ih} at /PWRDWN for outputs to stay high, V _{dd} =2.5V Min V _{ih} at /PWRDWN for outputs to stay high, V _{dd} =2.7V	1.02V 1.10V 1.18V	0.96V 1.03V 1.11V
V _{ih min} (/PWRDWN)	Min V _{ih} at /PWRDWN for outputs to switch from tristate to high, V _{dd} =2.3V Min V _{ih} at /PWRDWN for outputs to switch from tristate to high, V _{dd} =2.5V Min V _{ih} at /PWRDWN for outputs to switch from tristate to high, V _{dd} =2.7V	1.23V 1.34V 1.44V	1.10V 1.19V 1.29V
I _{oz}	/PWRDWN, CK & /CK = 0V or 2.7V, V _{dd} =2.7V, V _{out} =0V /PWRDWN, CK & /CK = 0V or 2.7V, V _{dd} =2.7V, V _{out} =2.7V	-70pA 158pA	-507pA 142pA
V _{ol}	V _{dd} = 2.3V, I _{ol} = 100uA V _{dd} = 2.3V, I _{ol} = 12mA	0.002V 0.314V	0.001V 0.312V
V _{oh}	V _{dd} = 2.3V, I _{oh} = -100uA V _{dd} = 2.3V, I _{oh} = -12mA	2.296V 1.936V	2.296V 1.934V
I _{ddq} (V _{ddq} only)	CK & /CK, FBin & /FBin, / PWRDWN = 0V or 2.7V, V _{ddq} =AV _{dd} =2.7V, outputs open	3.835nA	4.918uA
I _{dda} (AV _{dd} only)	CK & /CK, FBin & /FBin, / PWRDWN = 0V or 2.7V, V _{ddq} =AV _{dd} =2.7V, outputs open	553pA	324pA

Equipment used: HP4145B, HP Power Supply & DMM, TEK TDS694C scope.

Table 2. PI6CVF857A DC Output Pullup & Pulldown at V_{dd} = 2.3V, 25C.

Vol / Voh V	Shrink Version I _{ol} , mA	Production Version I _{ol} , mA	Shrink Version I _{oh} , mA	Production Version I _{oh} , mA
0	0	0	-62.03	-59.49
0.5	18.18	18.59	-52.01	-50.76
1.0	35.31	35.84	-39.41	-38.93
1.5	50.73	50.88	-25.18	-25.08
2.0	63.68	62.74	-9.746	-9.763
2.3	69.46	67.46	0	0

Equipment used: HP4145B.

Table 3. PI6CVF857A pin capacitance, V_{dd} = 2.5V, 25C.

Pin	C _{pin} , pF Shrink Version	C _{pin} , pF Production Version
CK, /CK, FBin, /FBin	2.4pF	2.5pF
/PWRDWN	2.1pF	2.2pF
Y _x , /Y _x	7.3pF	7.4pF

Equipment used: HP Power Supply, BK815 capacitance meter.

Table 4. PI6CVF857A Dynamic Supply Currents for all Yx & /Yx outputs switching with 15pF load to Gnd and 120 ohms across output pairs, FBout & /FBout do not have 15pF Cloud, Vddq = AVdd = 2.7V, 25C.

CK & /CK Input Freq. MHz	Iddq, mA Vddq pins	Iddq, mA Vddq pins	Iadd, mA AVdd pin	Iadd, mA AVdd pin	Total Idd mA	Total Idd mA
	Shrink Version	Production Version	Shrink Version	Production Version	Shrink Version	Production Version
1 (powerdown)	0.07	0.02	0.18	0.16	0.25	0.18
170 (outputs open)	--	--	--	--	179	173
60	217	218	4.23	4.07	221	222
100	251	252	5.35	5.24	256	257
133	281	283	6.37	6.30	287	289
170	309	309	7.63	7.65	317	317
200	317	316	8.76	8.86	326	325
220	315	314	9.56	9.73	325	324

Equipment used: HP power supply & DMM, HP8082A Pulse Gen., TDS694C scope.

Table 5. PI6CVF857A max input freq. to enter automatic power-down mode at different Vdd.

Vdd V	Max Input Freq., MHz Shrink Version	Max Input Freq., MHz Production Version
2.3	1.4	1.4
2.5	1.5	1.6
2.7	1.6	1.7

Equipment used: HP power supply, HP8082A Pulse Gen., TDS694C scope.

Table 6. PI6CVF857A min Vdd for PLL to lock at different freq.

CK & CK/ Input Freq. MHz	Min Vdd for PLL to lock V	Min Vdd for PLL to lock V
	Shrink Version	Production Version
100	1.59	1.64
133	1.60	1.66
170	1.63	1.67
200	1.63	1.71
220	1.70	1.78

Equipment used: HP power supply, HP8082A Pulse Gen., TDS694C scope.

Note: Part may have large phase error and/or jitters at these low Vdd conditions, but the outputs still track input.

Table 7. PI6CVF857A Min & Max input freq. at different Vdd for PLL to lock.

Vdd V	Min CK Freq. MHz	Min CK Freq. MHz	Max CK Freq. MHz	Max CK Freq. MHz
	Shrink Version	Production Version	Shrink Version	Production Version
2.3	1.7	2.7	368	340
2.5	2.0	3.1	394	383
2.7	2.3	3.5	413	414

Equipment used: HP power supply, Agilent 81130A Pulse Generator, TDS694C scope.

Note: Part may have large phase error and/or jitters at these freq. conditions, but the outputs still track input.

Table 8. PI6CVF857A Output-to-output skew measured between the crossings of Yx rising & /Yx falling, 25C.

CK Freq. MHz	Vdd V	Output-to-output Skew - ps	Output-to-output Skew - ps
		Shrink Version	Production Version
133	2.3	40	36
	2.5	44	34
	2.7	40	38
170	2.3	33	29
	2.5	34	28
	2.7	33	27
220	2.5	10	14
	2.6	12	10
	2.7	14	10

Equipment used: HP power supply, HP8082A Pulse Gen., TDS694C scope.

Table 9. PI6CVF857A Input CK Vil, Vih, and Vcm range measured at 170MHz, 25C.

Vdd V	Input CK Vil V Shrink	Input CK Vil V Production	Input CK Vih V Shrink	Input CK Vih V Production	Input CK min Vix V Shrink	Input CK min Vix V Production	Input CK max Vix V Shrink	Input CK max Vix V Production
2.3	0.87	0.83	1.20	0.99	-0.18	+0.05	2.26	2.30
2.5	0.97	0.90	1.32	1.08	-0.10	+0.02	2.32	2.38
2.7	1.07	0.97	1.41	1.17	-0.04	+0.01	2.44	2.44

Equipment used: HP power supply, Agilent 81130A Pulse Generator, TDS694C scope.

Table 10. PI6CVF857A Y0 Output Vmax, Vmin, rise & fall times measured between 20% & 80% of output swing, 25C.

CK Freq. MHz	Vdd V	Vmax V Shrink	Vmax V Production	Vmin V Shrink	Vmin V Production	trise ns Shrink	trise ns Production	tfall ns Shrink	tfall ns Production
100	2.3	1.880	1.879	0.285	0.280	0.915	0.907	0.924	0.944
	2.5	2.058	2.068	0.290	0.285	0.929	0.928	0.903	0.938
	2.7	2.234	2.241	0.305	0.295	0.947	0.936	0.896	0.916
133	2.3	1.855	1.859	0.335	0.340	0.831	0.829	0.913	0.931
	2.5	2.046	2.053	0.360	0.354	0.824	0.827	0.897	0.918
	2.7	2.220	2.244	0.385	0.377	0.820	0.820	0.888	0.905
170	2.3	1.846	1.846	0.363	0.363	0.809	0.823	0.859	0.887
	2.5	2.027	2.037	0.382	0.378	0.809	0.826	0.853	0.883
	2.7	2.202	2.218	0.405	0.391	0.806	0.826	0.850	0.879
200	2.5	2.041	2.069	0.377	0.361	0.730	0.735	0.788	0.793
	2.6	2.130	2.160	0.391	0.370	0.727	0.768	0.792	0.819
	2.7	2.219	2.251	0.400	0.374	0.722	0.733	0.786	0.784
220	2.5	2.033	2.043	0.400	0.385	0.771	0.795	0.798	0.822
	2.6	2.122	2.134	0.409	0.395	0.780	0.802	0.804	0.822
	2.7	2.213	2.231	0.419	0.405	0.767	0.796	0.797	0.820

Equipment used: HP power supply, HP8082A Pulse Gen., TDS694C scope.

Table 11. PI6CVF857A Y0 & /Y0 Output crossing voltages, Vox+ measured at the crossing of Y0 rising & /Y0 falling, Vox- measured at the crossing of /Y0 rising & Y0 falling, 25C.

CK Freq. MHz	Vdd V	Vox+ V Shrink Version	Vox+ V Production version	Vox- V Shrink Version	Vox- V Production version
100	2.3	1.190	1.210	1.190	1.200
	2.5	1.300	1.320	1.300	1.310
	2.7	1.395	1.425	1.400	1.415
133	2.3	1.125	1.150	1.130	1.145
	2.5	1.233	1.245	1.237	1.255
	2.7	1.334	1.350	1.339	1.355
170	2.3	1.132	1.150	1.136	1.145
	2.5	1.228	1.255	1.233	1.250
	2.7	1.329	1.355	1.339	1.355
200	2.5	1.224	1.205	1.270	1.290
	2.6	1.279	1.260	1.316	1.340
	2.7	1.325	1.310	1.366	1.385
220	2.5	1.214	1.220	1.260	1.265
	2.6	1.265	1.275	1.311	1.315
	2.7	1.311	1.325	1.357	1.360

Equipment used: HP power supply, HP8082A Pulse Gen., TDS694C scope.

Table 12a. PI6CVF857A Static & Dynamic Phase Errors measured from the crossing of CK rising & /CK falling to the crossing of FBIN rising & /FBIN falling, input CK slew rate ~ 1.5V/ns, input Vid > 1V, input Vix ~ Vdd/2, SSC off, 25C.

Input CK Freq. MHz	Vdd V	Static Phase Error ps	Static Phase Error ps	Dynamic Phase Error ps	Dynamic Phase Error ps
		Shrink Version	Production Version	Shrink Version	Production Version
60	2.3	+88	+62	137	206
	2.5	+107	+87	164	198
	2.7	+109	+105	158	163
100	2.3	+69	+43	97	120
	2.5	+94	+67	106	110
	2.7	+88	+83	105	104
133	2.3	+68	+68	76	93
	2.5	+93	+90	84	78
	2.7	+86	+95	98	85
170	2.3	+50	+27	63	77
	2.5	+76	+52	72	67
	2.7	+69	+74	76	70
200	2.5	+129	+94	78	50
	2.6	+119	+100	84	56
	2.7	+112	+102	79	60
220	2.5	+134	+119	69	48
	2.6	+123	+122	79	56
	2.7	+125	+125	80	57

Equipment used: HP power supply, HP8082A Pulse Gen., TDS694C scope and M1.

Table 12b. PI6CVF857A Static & Dynamic Phase Errors measured from the crossing of CK rising & /CK falling to the crossing of FBIN rising & /FBIN falling, input CK slew rate ~ 1.5V/ns, input Vid > 1V, input Vix ~ Vdd/2, SSC on with 50KHz triangular modulation and +/-0.5% freq. spread, 25C.

Input CK Freq. MHz	Vdd V	Static Phase Error ps	Static Phase Error ps	Dynamic Phase Error ps	Dynamic Phase Error ps
		Shrink Version	Production Version	Shrink Version	Production Version
60	2.3	+86	+62	172	217
	2.5	+108	+85	176	204
	2.7	+113	+105	188	230
100	2.3	+74	+44	134	138
	2.5	+95	+70	153	134
	2.7	+87	+82	149	135
133	2.3	+70	+68	118	108
	2.5	+93	+90	115	104
	2.7	+86	+94	127	113
170	2.3	+52	+28	95	86
	2.5	+75	+51	100	91
	2.7	+68	+76	116	96
200	2.5	+127	+96	115	79
	2.6	+117	+104	130	87
	2.7	+115	+101	117	95
220	2.5	+133	+121	110	78
	2.6	+118	+124	117	93
	2.7	+123	+131	121	96

Equipment used: HP power supply, R&S Signal Gen., HP8116A Fun. Gen., HP8082A Pulse Gen., TDS694C scope and M1.

Table 13a. PI6CVF857A Cycle-to-cycle & peak-to-peak jitters measured at the crossing of Y0 rising & /Y0 falling, SSC off, 25C.

CK Freq. MHz	Vdd V	Max Cycle Jitter, ps Shrink Version	Max Cycle Jitter, ps Production Version	Peak-to-peak Jitter, ps Shrink Version	Peak-to-peak Jitter, ps Production Version
60	2.3	69	92	128	149
	2.5	91	86	119	145
	2.7	73	73	118	147
100	2.3	42	56	66	77
	2.5	39	53	57	71
	2.7	39	41	55	68
133	2.3	31	36	47	59
	2.5	34	37	48	49
	2.7	30	34	42	49
170	2.3	34	35	43	40
	2.5	31	34	40	44
	2.7	30	34	40	40
200	2.5	31	33	34	40
	2.6	27	29	32	37
	2.7	30	29	32	36
220	2.5	27	34	31	38
	2.6	29	29	32	35
	2.7	30	26	33	33

Equipment used: HP power supply, HP8082A Pulse Gen., TDS694C scope and M1.

Table 13b. PI6CVF857A Cycle-to-cycle & peak-to-peak jitters measured at the crossing of Y0 rising & /Y0 falling, SSC on with 50KHz triangular modulation and +/-0.5% freq. spread, 25C.

CK Freq. MHz	Vdd V	Max Cycle Jitter, ps Shrink Version	Max Cycle Jitter, ps Production Version	Peak-to-peak Jitter, ps Shrink Version	Peak-to-peak Jitter, ps Production Version
60	2.3	75	97	241	289
	2.5	76	90	242	266
	2.7	85	82	264	268
100	2.3	44	49	148	158
	2.5	40	43	143	149
	2.7	44	40	152	149
133	2.3	36	35	113	114
	2.5	31	37	109	113
	2.7	30	33	104	110
170	2.3	33	29	86	89
	2.5	32	30	85	87
	2.7	31	27	89	89
200	2.5	28	31	80	79
	2.6	29	33	73	78
	2.7	31	27	75	76
220	2.5	28	27	71	72
	2.6	27	29	68	70
	2.7	30	26	68	67

Equipment used: HP power supply, R&S Signal Gen., HP8116A Fun. Gen., HP8082A Pulse Gen., TDS694C scope and M1.

Table 14. PI6CVF857A Period jitters measured at the crossing of Y0 rising & /Y0 falling, SSC off and on with 50KHz triangular modulation and +/-0.5% freq. spread, 25C.

CK Freq. MHz	Vdd V	Period Jitter, ps	Period Jitter, ps	Period Jitter, ps	Period Jitter, ps
		SSC off Shrink Version	SSC off Production Version	SSC on Shrink Version	SSC on Production Version
60	2.3	52	66	124	139
	2.5	45	67	123	124
	2.7	53	66	130	135
100	2.3	25	35	74	76
	2.5	29	31	74	74
	2.7	24	32	72	75
133	2.3	20	25	54	55
	2.5	19	24	53	55
	2.7	19	22	54	53
170	2.3	19	20	44	44
	2.5	17	19	42	45
	2.7	16	19	44	42
200	2.5	17	17	37	37
	2.6	14	17	38	37
	2.7	15	16	37	38
220	2.5	15	16	31	34
	2.6	14	17	34	33
	2.7	15	14	35	34

Equipment used: HP power supply, R&S Signal Gen., HP8116A Fun. Gen., HP8082A Pulse Gen., TDS694C scope and M1.

Table 15. PI6CVF857A Half-Period jitters measured at the crossing of Y0 rising & /Y0 falling, SSC off and on with 50KHz triangular modulation and +/-0.5% freq. spread, 25C.

CK Freq. MHz	Vdd V	Half-Period Jitter, ps	Half-Period Jitter, ps	Half-Period Jitter, ps	Half-Period Jitter, ps
		SSC off Shrink Version	SSC off Production Version	SSC on Shrink Version	SSC on Production Version
60	2.3	34	40	72	73
	2.5	37	42	67	72
	2.7	35	38	69	83
100	2.3	25	38	44	56
	2.5	29	29	52	47
	2.7	37	23	61	45
133	2.3	56	61	69	80
	2.5	56	58	74	72
	2.7	53	59	69	74
170	2.3	26	32	34	45
	2.5	15	24	28	31
	2.7	23	31	34	41
200	2.5	66	55	82	69
	2.6	57	54	68	64
	2.7	40	45	52	57
220	2.5	80	70	90	78
	2.6	67	60	77	72
	2.7	59	50	67	60

Equipment used: HP power supply, R&S Signal Gen., HP8116A Fun. Gen., HP8082A Pulse Gen., TDS694C scope and M1.

Table 16. PI6CVF857A Input-to-output mean delay measured from the crossing of CK rising & /CK falling to the crossing of Yx rising & /Yx falling, 170MHz, SSC off, 25C.

Vdd V	Output Pair	Mean Delay, ps	Mean Delay, ps	Mean Delay, ps	Mean Delay, ps
		Vddq = AVdd Shrink Version	Vddq = AVdd Production Version	AVdd=0 Shrink Version	AVdd=0 Production Version
2.3	Y0 & /Y0	-81	-88	3606	3695
	Y1 & /Y1	-98	-106	3588	3685
	Y2 & /Y2	-110	-111	3565	3675
	Y3 & /Y3	-97	-112	3590	3687
	Y4 & /Y4	-82	-92	3600	3694
	Y5 & /Y5	-86	-83	3616	3722
	Y6 & /Y6	-100	-104	3605	3705
	Y7 & /Y7	-114	-103	3593	3706
	Y8 & /Y8	-96	-111	3599	3694
	Y9 & /Y9	-89	-91	3611	3713
	Mean Delay	-95.3	-100.1	3597.3	3697.6
	Min Delay	-114	-112	3565	3675
	Max Delay	-81	-83	3616	3722
2.5	Y0 & /Y0	-62	-68	3612	3626
	Y1 & /Y1	-78	-84	3593	3617
	Y2 & /Y2	-92	-89	3574	3610
	Y3 & /Y3	-79	-89	3598	3621
	Y4 & /Y4	-62	-71	3602	3625
	Y5 & /Y5	-67	-62	3611	3648
	Y6 & /Y6	-80	-82	3602	3633
	Y7 & /Y7	-96	-82	3596	3638
	Y8 & /Y8	-76	-90	3599	3624
	Y9 & /Y9	-69	-69	3609	3642
	Mean Delay	-76.1	-78.6	3599.6	3628.4
	Min Delay	-96	-90	3574	3610
	Max Delay	-62	-62	3612	3648
2.7	Y0 & /Y0	-50	-47	3762	3672
	Y1 & /Y1	-60	-62	3748	3667
	Y2 & /Y2	-77	-68	3737	3665
	Y3 & /Y3	-68	-68	3751	3668
	Y4 & /Y4	-50	-50	3757	3673
	Y5 & /Y5	-56	-41	3750	3686
	Y6 & /Y6	-65	-61	3748	3674
	Y7 & /Y7	-83	-61	3744	3684
	Y8 & /Y8	-65	-68	3745	3669
	Y9 & /Y9	-56	-48	3750	3684
	Mean Delay	-63	-57.4	3749.2	3674.2
	Min Delay	-83	-68	3737	3665
	Max Delay	-50	-41	3762	3686

Equipment used: HP power supply, HP8082A Pulse Gen., TDS694C scope and M1.