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PRODUCT/PROCESS CHANGE NOTICE (PCN)

PCN Number: **04-01**

Date Issued: **February 5, 2004**

Product(s) Affected: **PI5A3159; PI5A4624, 5A4625, 5A4626, 5A4629**

Manufacturing Location Affected: **Moving these CSMS Fab 1 products to already approved CSMS Fab 2.**

Date Effective: **May 5, 2004 (calendar week 19, 2004). All remaining Fab 1 inventory will ship until depleted.**

Means of Distinguishing Changed Devices:

- Product Mark:
- Back Mark
- Date Code: **Added dot symbol ***
- Other

*** SOT packages will have a dot symbol over the last two-digit date code characters, due to insufficient space for the usual "B" in front of the datecode to denote Fab 2**

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Attachment: Yes; No

See attached Characterization Comparison Data Report on a representative product. Data confirms CSM-S Fab 2 devices have no significant performance differences than those produced in Fab 1.

Samples: **Available upon request**

Description and Purpose of Change:

Products are transferring from approved wafer fab subcontractor Chartered Semiconductor Manufacturing Singapore's (CSMS) Fab 1, to the already approved Fab 2 facility. The listed devices use the same base array die, design and process, and will be manufactured in Fab 2 with essentially the same qualified CMOS 0.5- μ m SPTM process type as used in Fab 1. CSM will be closing the older 150-mm wafer Fab 1 facility in March 2004. Fab 2 will manufacture these Pericom products using 200-mm wafers. See CSMS website for more information:

<http://www.charteredsemi.com/media/corp/2003n/20030213.asp>

- Die Technology
- Wafer Fabrication
- Assembly Process
- Equipment
- Material
- Testing
- Manufacturing Site
- Data Sheet
- Other: **CSMS Fab 1 closure, porting to Fab 2**

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: PI5A3159 Full Characterization Comparison Report for CSM Fab 1 and Fab2

Introduction

PI5A3159 is a SOTiny™, 1-Ohm Low-Voltage SPDT Analog Switch. Characterization of the new CSM Fab 2 AS12 array was done side by side with the existing production array from CSM Fab 1 facility (ASW1). Other products using this same array will have the same basic electrical characteristics, and will include the SOTiny™ PI5A4624, 4625, 4626, and 4629.

Reference

Facility: CSM Fab 2 (AS12 Array)
Process: CSM 0.5um, 1P3M, 5V Process
Lot #: EZ29185.1A
Date Code: 0332
Package: SOT23 (T6)

Facility: CSM Fab 1 (ASW1 Array)
Process: CSM 0.5um, 1P3M, 5V Process
Lot #: EY93939.1A
Package: SOT23 (T6)

Equipment

HP power supply & DMM,
HP4145B DC Analyzer
BK810B Capacitance Meter
TDS8000 Oscilloscope, TX P6209 Active Probe
HP8082A Pulse generator
HP 4195A Network/Spectrum Analyzer, HP11667A Power Splitter
Thermostream TP041000-A

Tables

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Conclusion

1. Both Fab 2 and Fab 1 versions meet all data sheet requirements.
2. New CSM Fab 2 array has a lower Ron, Con and faster propagation delay than Fab 1.
3. New Fab 2 array has improved bandwidth over Fab 1 version.
4. Off Isolation and Crosstalk are similar for both.

Table 1. DC Characteristics

Symbol	Test Conditions	Vcc	CSM Fab 2			CSM Fab 1			Spec		
			-10°C	25°C	90°C	-40°C	25°C	90°C	Min	Max	unit
VIH	Input High Voltage	1.80 V	0.775	0.770	0.755	0.755	0.750	0.745	1.24		V
VIH	Input High Voltage	2.50 V	0.995	0.985	0.975	1.000	0.990	0.985	1.75		V
VIH	Input High Voltage	3.00 V	1.135	1.135	1.115	1.160	1.150	1.150	2.10		V
VIH	Input High Voltage	5.00 V	1.655	1.655	1.650	1.750	1.755	1.765	3.50		V
VIL	Input Low Voltage	1.80 V	0.775	0.770	0.755	0.755	0.750	0.745		0.49	V
VIL	Input Low Voltage	2.50 V	0.995	0.985	0.975	1.000	0.990	0.985		0.63	V
VIL	Input Low Voltage	3.00 V	1.135	1.135	1.115	1.160	1.150	1.150		0.75	V
VIL	Input Low Voltage	5.00 V	1.655	1.655	1.650	1.750	1.755	1.765		1.25	V
IIL	Vin= 0.8 V	5.5 V	-70 p	202 p	349 p	40 p	13 p	409 p		-1u	A
IIH	Vin= 2.4 V	5.5 V	-51 p	-309 p	1.1 n	189 p	45 p	46 p		1u	A
Ioff	1B0 Off, Vout=4.5V	5.5 V	243 p	218 p	570 p	29.5 p	105 p	8.6 n		20n	A
Ioff	1B1 Off, Vout=4.5V	5.5 V	-51 p	-309 p	1.1 n	28 p	101 p	10.8 n		20n	A
IA	IA On, Vin=4.5V	5.5 V	-110 p	403 p	1.6 n	26.7 p	31 p	1.4 n		40 n	A
ICCL	Vin=0 V	5.5 V	178 p	845 p	2.2 n	428 p	1.4 n	11.2 n		0.1 u	A
ICCH	Vin=5.5V	5.5 V	-171 p	-377 p	2.8 n	382 p	2.3 n	19.8 n		0.1 u	A

Table 2. 5A3159 Ron Measurements

Symbol	Test Conditions	Vcc	Path	CSM Fab 2			CSM Fab 1			Spec	
				-10°C	25°C	90°C	-40°C	25°C	90°C	Max	unit
Ron	Io=-30mA, Vin=2.5V	4.5 V	A to B0	0.60	0.68	0.80	0.60	0.73	0.83	1.1	Ω
Ron	Io=-30mA, Vin=2.5V	4.5 V	A to B1	0.60	0.68	0.80	0.60	0.70	0.80	1.1	Ω
ΔRon	Io=-30mA, Vin=2.5V	4.5 V	B0 & B1	0	0	0	0	0.03	0.03	0.05	Ω
Ron	Io=-24mA, Vin=2.0V	3.0 V	A to B0	1.07	1.15	1.30	1.23	1.40	1.61	2.2	Ω
Ron	Io=-24mA, Vin=2.0V	3.0 V	A to B1	1.08	1.17	1.32	1.19	1.40	1.52	2.2	Ω
ΔRon	Io=-24mA, Vin=2.0V	3.0 V	B0 & B1	0.01	0.02	0.02	0.04	0	0.09	0.11	Ω
Ron	Io=-8mA, Vin=1.8V	2.3 V	A to B0	1.23	1.38	1.58	1.60	1.60	1.99	2.7	Ω
Ron	Io=-8mA, Vin=1.8V	2.3 V	A to B1	1.23	1.38	1.60	1.36	1.60	1.86	2.7	Ω
ΔRon	Io=-8mA, Vin=2.3V	2.3 V	B0 & B1	0	0	0.02	0.24	0	0.13	0.16	Ω
Ron	Io=-2mA, Vin=1.5V	1.8 V	A to B0	2.02	2.32	2.81	2.29	2.78	3.27	5.0	Ω
Ron	Io=-2mA, Vin=1.5V	1.8 V	A to B1	2.02	2.32	2.81	2.29	2.78	2.78	5.0	Ω
ΔRon	Io=-2mA, Vin=1.5V	1.8 V	B0 & B1	0	0	0	0	0	0.49	0.60	Ω

Table 3. Ron Distribution Vcc=4.5V, Ion=-30mA, 25C

Vin, V	CSM Fab 2		CSM Fab 1		
	A to B0	A to B1	A to B0	A to B1	
0	0.70	0.70	0.70	0.66	Ω
0.50	0.75	0.75	0.76	0.73	Ω
0.80	0.77	0.77	0.80	0.76	Ω
1.00	0.75	0.75	0.80	0.76	Ω
1.50	0.68	0.68	0.73	0.70	Ω
2.00	0.67	0.67	0.70	0.66	Ω
2.50	0.68	0.68	0.73	0.70	Ω
3.00	0.73	0.73	0.83	0.80	Ω
3.50	0.87	0.85	0.90	0.90	Ω
4.00	0.82	0.80	0.83	0.80	Ω
4.50	0.77	0.79	0.80	0.77	Ω
Rflat	0.07	0.07	0.07	0.06	

Table 4. Ron Distribution Vcc=3.0V, Ion=-24mA, 25C

Vin, V	CSM Fab 2		CSM Fab 1		
	A to B0	A to B1	A to B0	A to B1	
0	0.77	0.77	0.81	0.81	Ω
0.50	0.87	0.87	0.98	0.94	Ω
0.80	0.93	0.93	1.06	1.06	Ω
1.00	0.92	0.93	1.11	1.06	Ω
1.50	0.92	0.92	1.11	1.11	Ω
2.00	1.15	1.17	1.40	1.40	Ω
2.50	1.02	1.03	1.15	1.15	Ω
3.00	0.92	0.92	1.03	0.98	Ω
Rflat	0.22	0.24	0.34	0.34	

Table 5. Ron Distribution Vcc=2.3V, Ion=-8mA, 25C

Vin, V	CSM Fab 2		CSM Fab 1		
	A to B0	A to B1	A to B0	A to B1	
0	0.88	0.90	0.86	0.86	Ω
0.50	1.10	1.10	1.23	1.23	Ω
0.80	1.28	1.28	1.61	1.73	Ω
1.00	1.43	1.40	1.86	1.98	Ω
1.50	1.75	1.77	2.11	2.11	Ω
1.80	1.43	1.43	1.60	1.60	Ω
2.00	1.23	1.25	1.36	1.48	Ω
2.30	1.10	1.10	1.24	1.24	Ω
Rflat	0.15	0.15	0.01	0.13	

Table 6. Ron Distribution Vcc=1.8V, Ion=-2mA, 25C

Vin, V	CSM Fab 2		CSM Fab 1		
	A to B0	A to B1	A to B0	A to B1	
0	1.30	1.30	1.27	1.27	Ω
0.5	1.80	1.80	2.77	2.77	Ω
0.6	2.81	2.81	3.28	2.78	Ω
0.8	4.31	4.31	6.77	7.27	Ω
0.9	6.31	6.31	12.3	13.3	Ω
1.0	5.31	5.31	8.78	8.78	Ω
1.2	3.32	3.32	4.27	4.27	Ω
1.5	2.32	2.32	2.78	2.78	Ω
1.8	1.81	1.81	2.27	2.27	Ω
Rflat	0.49	0.49	0.5	0	

Table 7. AC Characteristics

Symbol	Conditions	Vcc	CSM Fab 2			CSM Fab 1			Spec	
			-10°C	25°C	90°C	-10°C	25°C	90°C	Max	units
tON	S to B0, A=1.5V	1.65V	56.00	58.94	63.87	79.66	83.93	91.10	95	ns
tON	S to B0, A=1.8V	2.30V	31.53	34.39	39.68	42.65	46.81	53.51	70	ns
tON	S to B0, A=2.0V	3.00V	22.35	24.75	28.82	29.92	33.55	39.55	55	ns
tON	S to B0, A=3.0V	4.50V	16.26	17.65	20.68	20.75	22.80	26.52	40	ns
tON	S to B1, A=1.5V	1.65V	55.83	58.87	63.71	78.82	83.43	90.71	95	ns
tON	S to B1, A=1.8V	2.30V	31.53	34.23	39.43	42.40	46.30	53.24	70	ns
tON	S to B1, A=2.0V	3.00V	22.23	24.36	28.66	29.16	33.37	38.95	55	ns
tON	S to B1, A=3.0V	4.50V	16.08	17.58	20.59	20.03	22.21	26.00	40	ns
tOFF	S to B0, A=1.5V	1.65V	7.35	7.82	8.66	10.58	11.38	12.67	70	ns
tOFF	S to B0, A=1.8V	2.30V	5.22	5.62	6.35	6.83	7.40	8.33	55	ns
tOFF	S to B0, A=2.0V	3.00V	4.12	4.41	4.96	5.30	5.64	6.35	40	ns
tOFF	S to B0, A=3.0V	4.50V	4.17	4.39	4.84	5.29	5.65	6.24	35	ns
tOFF	S to B1, A=1.5V	1.65V	8.09	8.53	9.45	11.49	12.31	13.77	70	ns
tOFF	S to B1, A=1.8V	2.30V	5.77	6.16	6.90	7.51	8.05	9.02	55	ns
tOFF	S to B1, A=2.0V	3.00V	4.66	4.93	5.51	5.79	6.20	7.00	40	ns
tOFF	S to B1, A=3.0V	4.50V	4.71	4.97	5.52	5.87	6.23	6.93	35	ns
T_{BM}	S =Low to High	1.65V	48.11	50.35	53.75	68.18	71.30	76.07	72	ns
T_{BM}	S =Low to High	2.30V	23.53	25.49	29.04	30.92	33.65	38.52	39	ns
T_{BM}	S =Low to High	3.00V	15.36	16.77	19.62	19.36	21.24	24.89	29	ns
T_{BM}	S =Low to High	4.50V	8.93	9.90	11.70	10.46	11.78	14.28	17.5	ns
T_{BM}	S =High to Low	1.65V	47.19	49.49	52.83	67.82	70.87	75.57	72	ns
T_{BM}	S =High to Low	2.30V	23.02	24.82	28.25	30.80	33.26	38.14	39	ns
T_{BM}	S =High to Low	3.00V	14.64	16.01	18.53	18.90	20.74	24.35	29	ns
T_{BM}	S =High to Low	4.50V	7.91	8.70	10.46	9.69	10.93	13.18	17.5	ns

Load: 33pF//50Ω

Table 8. Capacitance at 25C

Symbol	Description	Vcc	CSM Fab 2	CSM Fab 1	typ	Units
Cin	S Pin Capacitance	5 V	4.0	4.1	--	pF
Coff	B0, Switch Off	5 V	35.9	38.4	42	pF
Coff	B1, Switch Off	5 V	35.9	38.3	42	pF
Con	A-B0, Switch On	5 V	98.2	117.5	130	pF
Con	A-B1, Switch On	5 V	98.2	118.2	130	pF

Charge Injection Setup Procedure:

1. Vgen is applied to the input pin, decoupled with a 4.7uF to Gnd.
2. Used 1 nF Capacitor load at the intended Output Pin.
3. Apply square wave, 0 to Vcc swing, and 1MHz to the control pin.
4. Measure the change in output voltage.

Equipment Used:

HP54540A
HP8110 Signal Generator

Table 9: Charge Injection Distribution @ 25C, CL=1nF, Vcc=5V

			CSM Fab 2		CSM Fab 1	
Vgen, V	Vcc	Load	ΔV_{out} , mV	Charge Injection (Q)	ΔV_{out}	Charge Injection (Q)
0	5V	1nF	120 mV	120 pC	125 mV	125 pC
0.5	5V	1nF	123 mV	123 pC	121 mV	121 pC
1.0	5V	1nF	110 mV	110 pC	114 mV	114 pC
1.5	5V	1nF	92 mV	92 pC	90 mV	90 pC
2.0	5V	1nF	75 mV	75 pC	73 mV	73 pC
2.5	5V	1nF	56 mV	56 pC	50 mV	50 pC
3.0	5V	1nF	34 mV	34 pC	25 mV	25 pC
3.5	5V	1nF	10 mV	10 pC	11 mV	11 pC
4.0	5V	1nF	25 mV	25 pC	44 mV	44 pC
4.5	5V	1nF	47 mV	47 pC	86 mV	86 pC
5.0	5V	1nF	82 mV	82 pC	145 mV	145 pC

Vout measured at pin A.

Table 10: Charge Injection Distribution @ 25C, CL=1nF, Vcc=3.3V, Output at A

			CSM Fab 2		CSM Fab 1	
Vgen, V	Vcc	Load	ΔV_{out}	Charge Injection (Q)	ΔV_{out}	Charge Injection (Q)
0	3V	1nF	74 mV	74 pC	71 mV	71 pC
0.5	3V	1nF	75 mV	75 pC	69 mV	69 pC
1.0	3V	1nF	65 mV	65 pC	59 mV	59 pC
1.5	3V	1nF	44 mV	44 pC	40 mV	40 pC
2.0	3V	1nF	24 mV	24 pC	16 mV	16 pC
2.5	3V	1nF	5 mV	5 pC	18 mV	18 pC
3.0	3V	1nF	27 mV	27 pC	48 mV	48 pC
3.3	3V	1nF	46 mV	46 pC	75 mV	75 pC

Vout measured at pin A.

Table 11: Charge Injection Distribution @ 25C, CL=1nF, Vcc=2.5V, Output at A

			CSM Fab 2		CSM Fab 1	
Vgen, V	Vcc	Load	ΔV_{out}	Charge Injection (Q)	ΔV_{out}	Charge Injection (Q)
0	2.5V	1nF	49 mV	49 pC	43 mV	43 pC
0.5	2.5V	1nF	45 mV	45 pC	41 mV	41 pC
1.0	2.5V	1nF	39 mV	39 pC	33 mV	33 pC
1.5	2.5V	1nF	16 mV	16 pC	12 mV	12 pC
2.0	2.5V	1nF	8 mV	8 pC	15 mV	15 pC
2.5	2.5V	1nF	30 mV	30 pC	48 mV	48 pC

Vout measured at pin A.

Table 12: Charge Injection Distribution @ 25C, CL=1nF, Vcc=1.8V, Output at A

Vgen, V	Vcc	Load	CSM Fab 2		CSM Fab 1	
			ΔV_{out}	Charge Injection (Q)	ΔV_{out}	Charge Injection (Q)
0	1.8V	1nF	21 mV	21 pC	20 mV	20 pC
0.5	1.8V	1nF	21 mV	21 pC	17 mV	17 pC
1.0	1.8V	1nF	13 mV	13 pC	10 mV	10 pC
1.5	1.8V	1nF	5 mV	5 pC	11 mV	11 pC
1.8	1.8V	1nF	16 mV	16 pC	28 mV	28 pC

Vout measured at pin A.

Table 13. Bandwidth, Off Isolation and Crosstalk, 25C

Symbol	Conditions	CSM Fab 2	CSM Fab 1	typ	Units
BW	Vcc=5V, -3dB	65	61	--	MHz
Xtalk	Vcc=5V, Freq=1Mhz	-52	-52	-57	dB
OIRR	Vcc=5V, Freq=1Mhz	-36	-37	-57	dB

Table 14. Crosstalk vs. Frequency, Vcc=5V, 25C

Frequency	CSM Fab 2	CSM Fab 1
1 MHz	-52 dB	-52 dB
5 MHz	-36 dB	-36 dB
10 MHz	-30 dB	-30 dB

Table 15. Off Isolation vs. Frequency, Vcc=5V, 25C

Frequency	CSM Fab 2	CSM Fab 1
1 MHz	-26 dB	-37 dB
5 MHz	-29 dB	-29 dB
10 MHz	-24 dB	-24 dB