

EM74HC595A 测试报告

一、样品测试要求、环境

测试项目	EM74HC595A 验证测试
测试标准	Datasheet
测试条件	EVB 板，环境温度：-40~125℃
样品状态	EM74HC595A
测试仪器	示波器 同轴电缆 信号发生器 直流电源 电子负载
测试时间	2024/5/22

二、测试内容（测试数据、结果）

1. 功能测试

Control				Input	Output		Function test result
SHCP	STCP	$\overline{OE}$	$\overline{MR}$	DS	Q7S	Qn	
X	X	L	L	X	L	NC	PASS
X	↑	L	L	X	L	L	PASS
X	X	H	L	X	L	Z	PASS
↑	X	L	H	H	Q6S	NC	PASS
X	↑	L	H	X	NC	QnS	PASS
↑	↑	L	H	X	Q6S	QnS	PASS

2. 静态参数测试规格及测试结果（-40 °C to +85 °C）

Symbol	Parameter	Conditions	-40 °C to +85 °C			Test Result 1#			Test Result 2#			Test Result 3#			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5	1.26			1.26	1.27		1.26	1.27		1.26	1.27	V
		V _{CC} = 4.5 V	3.15	2.48			2.48	2.52		2.48	2.53		2.48	2.52	V
		V _{CC} = 6.0 V	4.2	3.22			3.22	3.23		3.22	3.24		3.22	3.23	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V		0.84	0.5	0.83	0.84		0.83	0.84		0.83	0.84		V
		V _{CC} = 4.5 V		1.99	1.35	1.98	1.99		1.98	1.99		1.99	1.99		V
		V _{CC} = 6.0 V		2.65	1.8	2.64	2.65		2.64	2.65		2.64	2.65		V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}													
		all outputs													
		I _O = -20μA; V _{CC} = 2.0 V	1.9	2.0		2.0	2.0		2.0	2.0		2.0	2.0		V
		I _O = -20μA; V _{CC} = 4.5 V	4.4	4.5		4.5	4.5		4.5	4.5		4.5	4.5		V
		I _O = -20μA; V _{CC} = 6.0 V	5.9	6.0		6.0	6.0		6.0	6.0		6.0	6.0		V
		Q7S output													
		I _O = -4.0 mA; V _{CC} = 4.5 V	3.84	4.39		4.37	4.39		4.37	4.39		4.37	4.38		V
		I _O = -5.2 mA; V _{CC} = 6.0 V	5.34	5.88		5.86	5.88		5.86	5.87		5.87	5.88		V
		Qn bus driver outputs													
		I _O = -6.0 mA; V _{CC} = 4.5 V	3.84	4.34		4.31	4.34		4.30	4.34		4.31	4.34		V
		I _O = -7.8 mA; V _{CC} = 6.0 V	5.34	5.82		5.79	5.82		5.79	5.82		5.78	5.83		V

V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}													
		all outputs													
		I _O = -20μA; V _{CC} = 2.0 V			0.1		0.001	0.001		0.001	0.001		0.001	0.001	V
		I _O = -20μA; V _{CC} = 4.5 V			0.1		0.001	0.001		0.001	0.001		0.001	0.001	V
		I _O = -20μA; V _{CC} = 6.0 V			0.1		0.001	0.001		0.001	0.001		0.001	0.001	V
		Q7S output													
		I _O = -4.0 mA; V _{CC} = 4.5 V		0.08	0.33		0.08	0.09		0.09	0.10		0.08	0.09	V
		I _O = -5.2 mA; V _{CC} = 6.0 V		0.08	0.33		0.08	0.11		0.08	0.10		0.08	0.11	V
		Qn bus driver outputs													
		I _O = -6.0 mA; V _{CC} = 4.5 V		0.11	0.33		0.11	0.13		0.11	0.13		0.11	0.14	V
		I _O = -7.8 mA; V _{CC} = 6.0 V		0.13	0.33		0.13	0.15		0.13	0.15		0.13	0.15	V
I _I	Input leakage current	V _I = V _{CC} or GND ; V _{CC} = 6.0 V		0.0005	±1		0.0005	0.002		0.0006	0.003		0.0004	0.002	μA
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _{CC} = 6.0V ; V _O = V _{CC} or GND		0.002	±5		0.002	0.004		0.002	0.004		0.002	0.004	μA
I _{CC}	supply current	V _I = V _{CC} or GND ; I _O = 0A ; V _{CC} = 6.0 V		13.7	20		13.7	13.7		13.6	13.7		13.7	13.8	μA
C _I	input capacitance	V _{CC} = 5.0 ; V _I = GND to V _{CC}		1.2			1.19			1.25			1.23		pF

3. 静态参数测试规格及测试结果（-40 °C to +125 °C）

Symbol	Parameter	Conditions	-40 °C to +125 °C		Test Result 1#		Test Result 2#		Test Result 3#		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
V _{IH}	HIGH-level input voltage	V _{CC} = 2.0 V	1.5			1.27		1.27		1.27	V
		V _{CC} = 4.5 V	3.15			2.52		2.53		2.52	V
		V _{CC} = 6.0 V	4.2			3.23		3.24		3.23	V
V _{IL}	LOW-level input voltage	V _{CC} = 2.0 V		0.5	0.83		0.83		0.83		V
		V _{CC} = 4.5 V		1.35	1.98		1.98		1.99		V
		V _{CC} = 6.0 V		1.8	2.64		2.64		2.64		V
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}									
		all outputs									
		I _O = -20μA; V _{CC} = 2.0 V	1.9		2.0		2.0		2.0		V
		I _O = -20μA; V _{CC} = 4.5 V	4.4		4.5		4.5		4.5		V
		I _O = -20μA; V _{CC} = 6.0 V	5.9		6.0		6.0		6.0		V
		Q7S output									
		I _O = -4.0 mA; V _{CC} = 4.5 V	3.7		4.36		4.37		4.37		V
		I _O = -5.2 mA; V _{CC} = 6.0 V	5.2		5.85		5.86		5.85		V
		Qn bus driver outputs									
		I _O = -6.0 mA; V _{CC} = 4.5 V	3.7		4.29		4.31		4.31		V
		I _O = -7.8 mA; V _{CC} = 6.0 V	5.2		5.77		5.76		5.76		V

V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}									
		all outputs									
		I _O = -20μA; V _{CC} = 2.0 V		0.1		0.001		0.002		0.002	V
		I _O = -20μA; V _{CC} = 4.5 V		0.1		0.004		0.004		0.004	V
		I _O = -20μA; V _{CC} = 6.0 V		0.1		0.007		0.008		0.007	V
		Q7S output									
		I _O = -4.0 mA; V _{CC} = 4.5 V		0.4		0.10		0.11		0.10	V
		I _O = -5.2 mA; V _{CC} = 6.0 V		0.4		0.11		0.12		0.11	V
		Qn bus driver outputs									
		I _O = -6.0 mA; V _{CC} = 4.5 V		0.4		0.15		0.15		0.16	V
		I _O = -7.8 mA; V _{CC} = 6.0 V		0.4		0.17		0.17		0.17	V
I _I	Input leakage current	V _I = V _{CC} or GND ; V _{CC} = 6.0 V		±1		0.034		0.033		0.035	μA
I _{OZ}	OFF-state output current	V _I = V _{IH} or V _{IL} ; V _{CC} = 6.0V ; V _O = V _{CC} or GND		±10		0.031		0.031		0.032	μA
I _{CC}	supply current	V _I = V _{CC} or GND ; I _O = 0A ; V _{CC} = 6.0 V		40		14.1		14.1		14.2	μA

4. 动态参数测试规格及测试结果（-40 °C to +85 °C）

Symbol	Parameter	Conditions	-40 °C to +85 °C			Test Result 1#			Test Result 2#			Test Result 3#			Unit
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
t _{pd}	propagation delay	SHCP to Q7S													
		V _{CC} = 2.0 V		18.4	30		18.4	19.8		18.4	19.9		18.3	19.8	ns
		V _{CC} = 4.5 V		7.6	15		7.6	9.1		7.6	9.0		7.5	9.1	ns
		V _{CC} = 6.0 V		6.2	10		6.2	7.2		6.3	7.2		6.2	7.3	ns
		STCP to Q7S													
		V _{CC} = 2.0 V		17.8	30		17.8	19.5		17.9	19.8		17.8	19.7	ns
		V _{CC} = 4.5 V		7.4	15		7.4	8.2		7.3	8.2		7.5	8.3	ns
		V _{CC} = 6.0 V		6.1	10		6.1	6.8		6.1	6.8		6.2	6.9	ns
t _{PHL}	HIGH to LOW propagation delay	$\overline{\text{MR}}$ to Q7S													
		V _{CC} = 2.0 V		19.2	30		19.2	21.3		19.2	21.3		19.3	21.4	ns
		V _{CC} = 4.5 V		7.9	15		7.9	9.2		8.0	9.1		7.9	9.2	ns
		V _{CC} = 6.0 V		6.5	10		6.5	7.9		6.5	7.8		6.6	7.8	ns
t _{en}	enable time	$\overline{\text{OE}}$ to Qn													
		V _{CC} = 2.0 V		15.5	25		15.5	16.7		15.6	16.8		15.5	16.8	ns
		V _{CC} = 4.5 V		5.8	14		5.8	6.9		5.8	7.0		5.7	7.0	ns
		V _{CC} = 6.0 V		4.9	13		4.9	6.2		5.0	6.2		4.9	6.1	ns
t _{dis}	disable time	$\overline{\text{OE}}$ to Qn													

		V _{CC} = 2.0 V		10.3	25		10.3	13.3		10.3	13.2		10.4	13.4	ns
		V _{CC} = 4.5 V		5.5	14		5.5	6.7		5.6	6.7		5.5	6.5	ns
		V _{CC} = 6.0 V		4.5	13		4.5	6.2		4.4	6.2		4.5	6.1	ns
t _w	pulse width	SHCP HIGH or LOW													
		V _{CC} = 2.0 V	25			5			5			5			ns
		V _{CC} = 4.5 V	19			5			5			5			ns
		V _{CC} = 6.0 V	16			5			5			5			ns
		STCP HIGH or LOW													
		V _{CC} = 2.0 V	25			5			5			5			ns
		V _{CC} = 4.5 V	19			5			5			5			ns
		V _{CC} = 6.0 V	16			5			5			5			ns
		$\overline{\text{MR}}$ LOW													
		V _{CC} = 2.0 V	25			5			5			5			ns
		V _{CC} = 4.5 V	19			5			5			5			ns
		V _{CC} = 6.0 V	16			5			5			5			ns
t _{su}	set up time	DS to SHCP													
		V _{CC} = 2.0 V	16			3			3			3			ns
		V _{CC} = 4.5 V	13			3			3			3			ns
		V _{CC} = 6.0 V	11			3			3			3			ns
		SHCP to STCP													

		$V_{CC} = 2.0\text{ V}$	25			3			3			3			ns
		$V_{CC} = 4.5\text{ V}$	19			3			3			3			ns
		$V_{CC} = 6.0\text{ V}$	16			3			3			3			ns
t_h	hold time	DS to SHCP													
		$V_{CC} = 2.0\text{ V}$	3			0.5			0.5			0.5			ns
		$V_{CC} = 4.5\text{ V}$	3			0.5			0.5			0.5			ns
		$V_{CC} = 6.0\text{ V}$	3			0.5			0.5			0.5			ns
t_{rec}	recovery time	$\overline{MR}$ to SHCP													
		$V_{CC} = 2.0\text{ V}$	16			3			3			3			ns
		$V_{CC} = 4.5\text{ V}$	13			3			3			3			ns
		$V_{CC} = 6.0\text{ V}$	11			3			3			3			ns
f_{max}	maximum frequency	SHCP or STCP;													
		$V_{CC} = 2.0\text{ V}$	20			30			30			30			MHz
		$V_{CC} = 4.5\text{ V}$	24			40			40			40			MHz
		$V_{CC} = 6.0\text{ V}$	28			40			40			40			MHz
C_{PD}	power dissipation capacitance	$f_i = 1\text{ MHz};$ $V_I = \text{GND to } V_{CC}$		55			55.1			55			55.1		pF

5. 动态参数测试规格及测试结果（-40 °C to +125 °C）

Symbol	Parameter	Conditions	-40 °C to +125 °C		Test Result 1#		Test Result 2#		Test Result 3#		Unit
			Min	Max	Min	Max	Min	Max	Min	Max	
t _{pd}	propagation delay	SHCP to Q7S									
		V _{CC} = 2.0 V		35		21.5		21.7		21.7	ns
		V _{CC} = 4.5 V		20		9.2		9.3		9.3	ns
		V _{CC} = 6.0 V		15		7.9		7.9		7.8	ns
		STCP to Q7S									
		V _{CC} = 2.0 V		35		21.4		21.5		21.4	ns
		V _{CC} = 4.5 V		20		8.9		8.8		8.8	ns
		V _{CC} = 6.0 V		15		7.3		7.3		7.4	ns
t _{PHL}	HIGH to LOW propagation delay	$\overline{\text{MR}}$ to Q7S									
		V _{CC} = 2.0 V		35		22.1		22.2		22.2	ns
		V _{CC} = 4.5 V		20		9.5		9.6		9.5	ns
		V _{CC} = 6.0 V		15		8.2		8.2		8.3	ns
t _{en}	enable time	$\overline{\text{OE}}$ to Qn									
		V _{CC} = 2.0 V		30		17.6		17.7		17.9	ns
		V _{CC} = 4.5 V		17		7.5		7.4		7.9	ns
		V _{CC} = 6.0 V		16		6.4		6.3		6.7	ns
t _{dis}	disable time	$\overline{\text{OE}}$ to Qn									

		V _{CC} = 2.0 V		30		13.9		13.7		14.1	ns
		V _{CC} = 4.5 V		17		7.4		7.2		7.5	ns
		V _{CC} = 6.0 V		16		6.1		6.1		6.5	ns
t _w	pulse width	SHCP HIGH or LOW									
		V _{CC} = 2.0 V	30		5		5		5		ns
		V _{CC} = 4.5 V	22		5		5		5		ns
		V _{CC} = 6.0 V	19		5		5		5		ns
		STCP HIGH or LOW									
		V _{CC} = 2.0 V	30		5		5		5		ns
		V _{CC} = 4.5 V	22		5		5		5		ns
		V _{CC} = 6.0 V	19		5		5		5		ns
		$\overline{\text{MR}}$ LOW									
		V _{CC} = 2.0 V	30		5		5		5		ns
		V _{CC} = 4.5 V	22		5		5		5		ns
		V _{CC} = 6.0 V	19		5		5		5		ns
		DS to SHCP									
t _{su}	set up time	V _{CC} = 2.0 V	20		3		3		3		ns
		V _{CC} = 4.5 V	15		3		3		3		ns
		V _{CC} = 6.0 V	13		3		3		3		ns
		SHCP to STCP									

		$V_{CC} = 2.0\text{ V}$	30		3		3		3		ns
		$V_{CC} = 4.5\text{ V}$	22		3		3		3		ns
		$V_{CC} = 6.0\text{ V}$	19		3		3		3		ns
t_h	hold time	DS to SHCP									
		$V_{CC} = 2.0\text{ V}$	3		0.5		0.5		0.5		ns
		$V_{CC} = 4.5\text{ V}$	3		0.5		0.5		0.5		ns
		$V_{CC} = 6.0\text{ V}$	3		0.5		0.5		0.5		ns
t_{rec}	recovery time	$\overline{MR}$ to SHCP									
		$V_{CC} = 2.0\text{ V}$	20		3		3		3		ns
		$V_{CC} = 4.5\text{ V}$	15		3		3		3		ns
		$V_{CC} = 6.0\text{ V}$	13		3		3		3		ns
f_{max}	maximum frequency	SHCP or STCP;									
		$V_{CC} = 2.0\text{ V}$	16		30		30		30		MHz
		$V_{CC} = 4.5\text{ V}$	20		40		40		40		MHz
		$V_{CC} = 6.0\text{ V}$	24		40		40		40		MHz

6. AMR 测试规格(Ta=25℃)

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CC}	supply voltage		-0.5	7	V
V _I	input voltage		-0.5	7	V

测试结果

Symbol	Parameter	Conditions	I _{Leakage}	Unit
V _{CC}	supply voltage	V _{CC} = 7 V	17.3231562	μA
V _I	input voltage	V _I = 7 V	0.00035783	μA

三、测试结论

1. 功能测试 PASS;
2. 静态参数测试 PASS;
3. 动态参数测试 PASS.
4. AMR 测试 PASS.