Test Report: LRS-100-12

100W Single Output Switching Power Supply

■ DESIGN VERIFY TEST

Output Function Test
Input Function Test
Protection Function Test
Component Stress Test

■ SAFETY & E.M.C. TEST

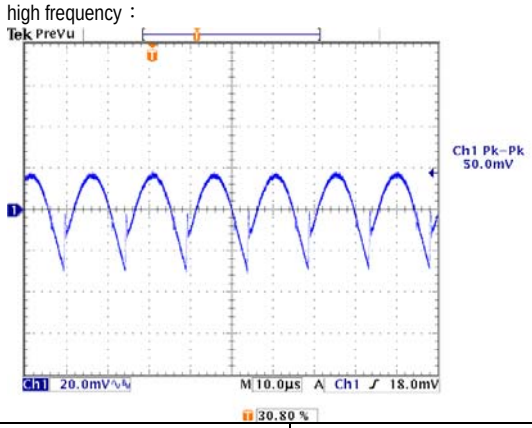
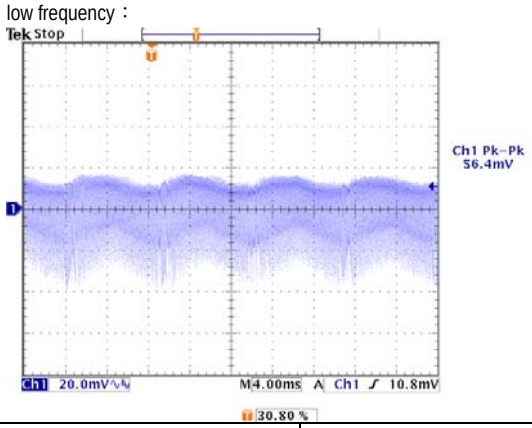
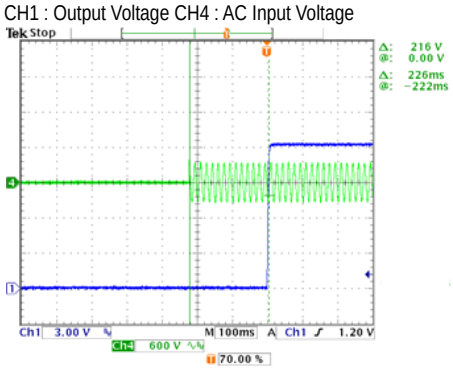
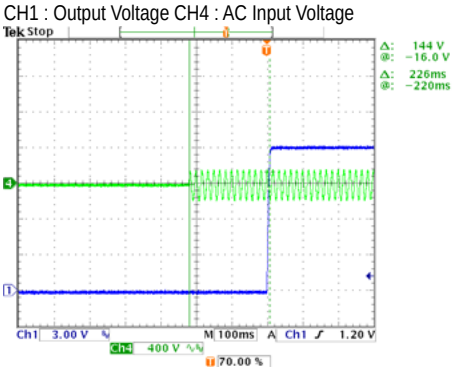
Safety Test
E.M.C. Test

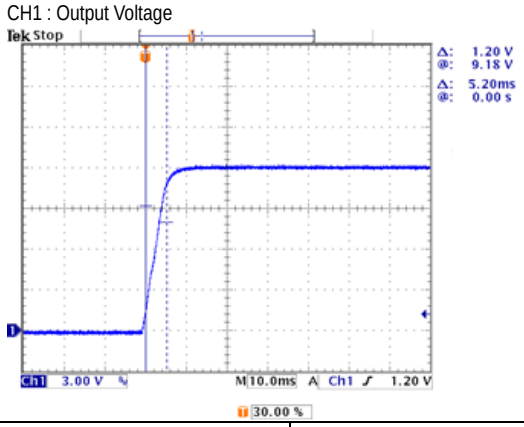
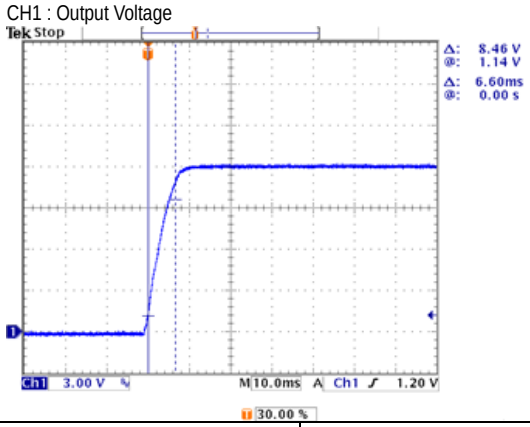
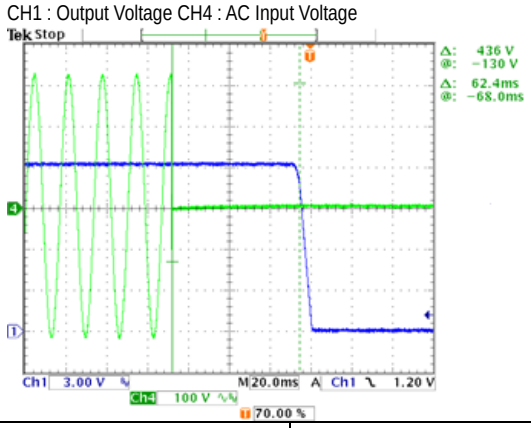
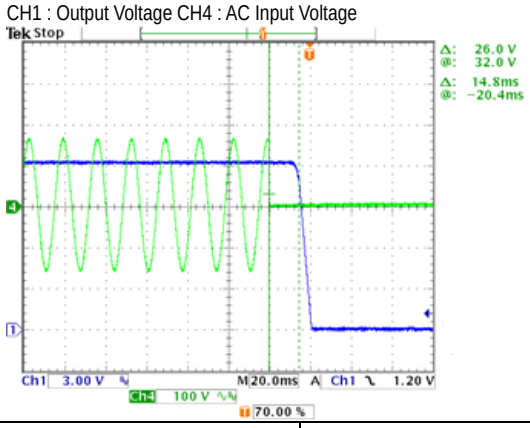
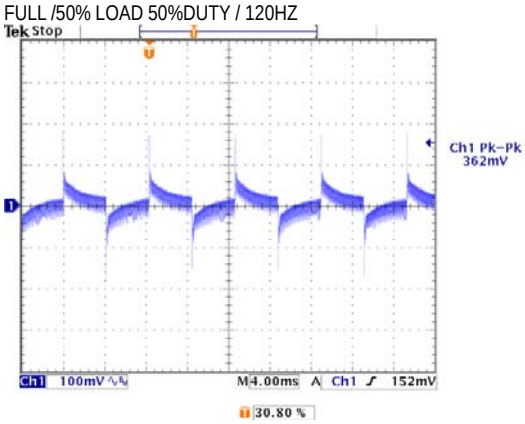
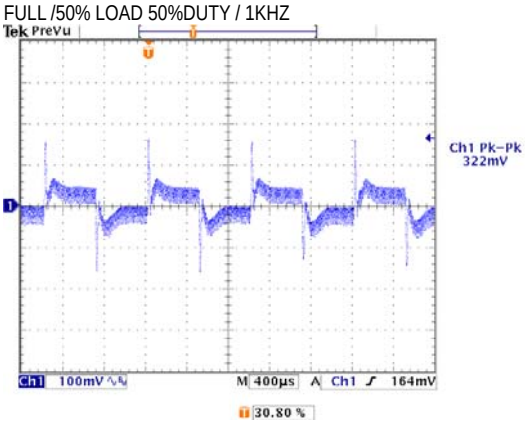
■ RELIABILITY TEST

ENVIRONMENT TEST

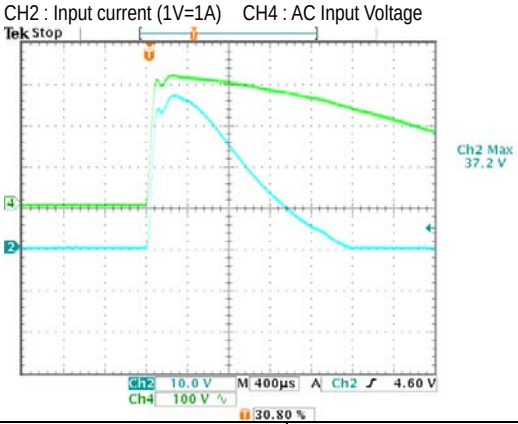
■ DESIGN VERIFY TEST

OUTPUT FUNCTION TEST

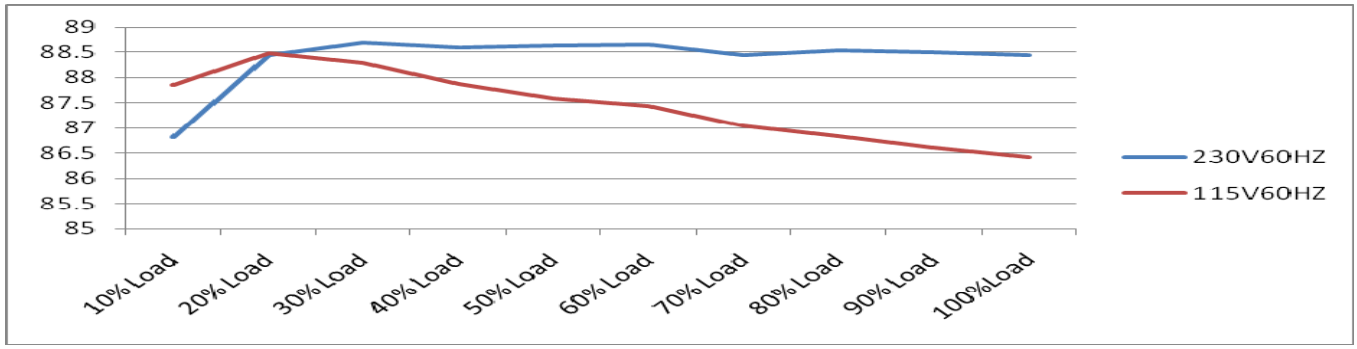
NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OUTPUT VOLTAGE ADJUST RANGE	CH1: 10.2 V~ 13.8V	I/P： 230 VAC I/P： 115 VAC O/P：MIN LOAD Ta：25℃	9.784V~14.565V/230VAC 9.783V~14.539V/115VAC
2	OUTPUT VOLTAGE(Max) TOLERANCE	V1: -1 %~1 %	I/P: 100VAC /264VAC O/P:FULL/ MIN. LOAD Ta:25℃	V1: -0.08%~ 0.08%
3	LINE REGULATION (Max)	V1:- 0.5 %~ 0.5 %	I/P: 100VAC~ 264VAC O/P:FULL LOAD Ta:25℃	V1: 0 %~0%
4	LOAD REGULATION(Max)	V1: -0.5 %~ 0.5%	I/P: 230VAC O/P:FULL ~MIN LOAD Ta:25℃	V1: 0%~ 0%
5	OVER/UNDERSHOOT TEST	< ±5%	I/P: 230VAC O/P:FULL LOAD Ta:25℃	<5%
6	RIPPLE & NOISE(Max)	V1: 120 mVp-p	I/P:230VAC O/P:FULL LOAD Ta:25℃	V1: 56.4mVp-p
	high frequency： 		low frequency： 	
7	SET UP TIME(Max)	230VAC/500ms 115VAC/ 500ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 226ms 115VAC/ 226ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 	

8	RISE TIME (Max)	230VAC/ 30ms 115VAC/ 30ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 5.20ms 115VAC/6.60ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage 	
9	HOLD UP TIME(Typ)	230VAC/ 55ms 115VAC/ 10ms	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	230VAC/ 62.4ms 115VAC/ 14.8ms
	INPUT=230VAC/50HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 		INPUT=115VAC/60HZ @ FULL LOAD CH1 : Output Voltage CH4 : AC Input Voltage 	
10	DYNAMIC LOAD	V1: 1000 mVp-p	I/P: 230VAC O/P: (1)FULL /50% LOAD 50%DUTY / 120HZ (2)FULL /50% LOAD 50%DUTY / 1KHZ Ta:25℃	 362mVp-p 322mVp-p
	FULL /50% LOAD 50%DUTY / 120HZ 		FULL /50% LOAD 50%DUTY / 1KHZ 	

INPUT FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	INPUT VOLTAGE RANGE	85VAC~264VAC	I/P:TESTING O/P:FULL LOAD Ta:25℃	76V~264V
			I/P: (1)LOW-LINE-3V=167 V HIGH-LINE+15%=300 V O/P:FULL/MIN LOAD ON: 30 Sec OFF: 30 Sec 10MIN (2)230Vac ON: 0.5 Sec OFF: 0.5 Sec 20MIN (3)230Vac ON:3Sec OFF:3Sec 12HOURS (POWER ON/OFF NO DAMAGE)	TEST:OK
2	INPUT FREQUENCY RANGE	47HZ ~63 HZ NO DAMAGE	I/P:170 VAC ~264 VAC O/P:FULL~MIN LOAD Ta:25℃	TEST: OK
3	INPUT CURRENT (Typ)	230V/ 1.2A 115V/ 1.9A	I/P： 230 VAC I/P： 115 VAC O/P：FULL LOAD Ta：25℃	I =1.06A/ 230VAC I =1.77A/ 115VAC
4	LEAKAGE CURRENT	< 0.75 mA / 240 VAC	I/P： 240 VAC O/P：Min LOAD Ta：25℃	L-FG： 0.327 mA N-FG： 0.327 mA
5	NO LOAD CONSUMPTION	< 0.3 W	I/P：115VAC I/P：230VAC O/P：NO LOAD Ta：25℃	< 0.13 W < 0.23 W
6	INRUSH CURRENT(Typ)	230V/50A COLD START	I/P： 230 VAC O/P：FULL LOAD Ta：25℃	I =37.2A/ 230VAC
	INPUT=230VAC/50HZ @ FULL LOAD CH2 : Input current (1V=1A) CH4 : AC Input Voltage 			
7	EFFICIENCY(Typ)	88%	I/P:230 VAC O/P:FULL LOAD Ta:25℃	88.43%

EFFICIENCY vs LOAD



PROTECTION FUNCTION TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	OVER LOAD PROTECTION	110%~ 150%	I/P: 230VAC I/P: 115VAC O/P:TESTING Ta:25℃	129.5%/ 230VAC 129.1%/115VAC Hiccup Mode
2	OVER VOLTAGE PROTECTION	CH:13.8V~16.2V	I/P: 230VAC I/P: 115VAC O/P:MIN LOAD Ta:25℃	15.6V/ 230VAC 15.6V/115VAC Shut down Re- power ON
3	SHORT PROTECTION	SHORT EVERY OUTPUT 1 HOUR NO DAMAGE	I/P: 264VAC O/P: FULL LOAD Ta:25℃	NO DAMAGE Hiccup Mode

COMPONENT STRESS TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	PWM Transistor (D to S) or (C to E) **Peak Voltage**	Q1 Rated 600 V/11A	I/P:High-Line +3V =267V AC ON/OFF VDS: O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. Ta:25℃	(1)524V (2)500V (3)516V (4)504V (5)508V (6)536V (7)510V
2	Diode Peak **Voltage**	Q101 Rated 20A/100 V	I/P:High-Line +3V =267 V AC ON/OFF	Q101: (1) 88.8V

			O/P: (1)Full Load (2)Output Short (3)Dynamic Load Full Load/ Min. Load 90%Duty/1KHz (4)Dynamic Load Full Load/ Min. Load 90%Duty/3KHz (5)Dynamic Load Full Load/ Min. Load 90%Duty/5KHz (6)Dynamic Load 100% Load/ Min. Load 50%Duty/120Hz (7)0%→400% Load. (8).NO LOAD Ta:25℃	(2) 76.0V (3) 89.6V (4) 90.4V (5) 90.4V (6) 94.0V (7) 88.8V (8) 79.2V
3	**Input Capacitor Voltage**	C5 Rated: 150 μ/400V 105℃	I/P:High-Line +3V =267 V O/P: (1)Full Load input on/off (2) Min load input on /Off (3)Full Load /Min load Change Ta:25℃	(1)352V (2)356V (3)356V
4	**Control IC Voltage Test**	PWM IC U1 Rated 28 V(MAX) 9.5V(MIN.	I/P:High-Line +3V =267 V AC ON/OFF O/P(1)FULL LOAD (2) Output Short (3)O.L.P (4)O.V.P. (5)NO LOAD VR Min. LOW LINE Ta:25℃	(1) 19.4V (2) 12.1V (3) 20.3V (4) 22.3V (5) 14.1V
5	Clamp Diode Peak Voltage	D 5 Rated： GP20K 800 V 2 A	I/P：High-Line +3V = 267 V AC ON/OFF O/P： (1) Dynamic Load 90%Duty/1KHz (2)Full load continue Ta：25℃	(1)448V (2)440V

SAFETY TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	WITHSTAND VOLTAGE	I/P-O/P: 4KVAC/min I/P-FG :2KVAC/min O/P-FG:1.25KVAC/min	I/P-O/P: 4.4 KVAC/min I/P-FG: 2.4 KVAC/min O/P-FG:1.5 KVAC/min Ta:25℃	I/P-O/P:2.1mA I/P-FG:1.9mA O/P-FG:1.02m A NO DAMAGE
2	ISOLATION RESISTANCE	I/P-O/P:500VDC>100MΩ I/P-FG: 500VDC>100MΩ O/P-FG:500VDC>100MΩ	I/P-O/P: 500 VDC I/P-FG: 500 VDC O/P-FG: 500 VDC Ta:25℃	I/P-O/P:999 MΩ I/P-FG: 999MΩ O/P-FG:999 MΩ NO DAMAGE
3	GROUNDING CONTINUITY	FG(PE) TO CHASSIS OR TRACE < 100 mΩ	40A / 2min Ta:25℃	7mΩ

E.M.C TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	HARMONIC	EN61000-3-2 CLASS A	I/P:230VAC/50HZ O/P: FULL LOAD Ta:25℃	PASS

2	CONDUCTION	EN55022 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL/50% LOAD Ta：25℃	PASS Test by certified Lab
3	RADIATION	EN55022 CLASS B	I/P： 230 VAC (50HZ) O/P：FULL LOAD Ta：25℃	PASS Test by certified Lab
4	E.S.D	EN61000-4-2 INDUSTRY AIR：8KV / Contact：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
5	E.F.T	EN61000-4-4 INDUSTRY INPUT： 2KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
6	SURGE	IEC61000-4-5 INDUSTRY L-N ： 2KV L,N-PE：4KV	I/P： 230 VAC/50HZ O/P：FULL LOAD Ta：25℃	CRITERIA A
7	Test by certified Lab ＆ Test Report Prepare			

RELIABILITY TEST

ENVIRONMENT TEST

NO	TEST ITEM	SPECIFICATION	TEST CONDITION	RESULT
1	TEMPERATURE RISE TEST	MODEL： LRS-100-5 1. ROOM AMBIENT BURN-IN：2 HRS I/P： 230VAC O/P： FULL LOAD Ta=18.6℃ 2. HIGH AMBIENT BURN-IN： 2 HRS I/P： 230VAC O/P： FULL LOAD Ta=42.1℃		

NO	Position	ROOM AMBIENT Ta= 18.6 ℃	HIGH AMBIENT Ta=42.1 ℃
1	**U100**	79.3℃	105.1℃
2	**U1**	52.7℃	77.6℃
3	**LF1**	47.5℃	73.3℃
4	**BD1**	54.3℃	78.8℃
5	**C5**	46.7℃	69.7℃
6	**D5**	62.0℃	89.9℃
7	**Q1**	55.5℃	83.9℃
8	**C35**	59.5℃	85.4℃
9	**D31**	61.9℃	90.1℃
10	**T1coil**	73.7℃	101.9℃
11	**C105**	67.3℃	95.3℃
12	**Q100**	70.3℃	98.6℃
13	**Q101**	70.5℃	98.6℃
14	**L100**	63.4℃	90.9℃
15	**RTH1**	83.0℃	96.0℃
16	**C107**	64.9℃	93.0℃
17	**R7**	74.7℃	101.0℃
18	**R15**	59.2℃	88.4℃

2	OVER LOAD BURN-IN TEST	NO DAMAGE 1 HOUR (MIN)	I/P： 230 VAC O/P：125％LOAD Ta：25℃	TEST：OK
3	LOW TEMPERATURE TURN ON TEST	TURN ON AFTER 2 HOUR	I/P： 264VAC/100VAC O/P：100 ％LOAD Ta= -20 ℃	TEST：OK
4	HIGH HUMIDITY HIGH TEMPERATURE HIGH VOLTAGE TURN ON TEST	AFTER 12 HOURS IN CHAMBER ON CONTROL 45 ℃ NO DAMAGE	I/P： 272 VAC O/P：FULL LOAD Ta= 45℃ HUMIDITY= 95 %R.H	TEST：OK
5	TEMPERATURE COEFFICIENT	± 0.03 %/℃(0~50℃)	I/P： 230 VAC O/P：FULL LOAD	±0.009%/℃(0~40℃)
6	STORAGE TEMPERATURE TEST	1. Thermal shock Temperature： -45℃~ +85℃ 2. Temperature change rate ：25℃ / MIN 3. Dwell time low and high temperature ： 30 MIN/EACH 4. Total test cycle：5 CYCLE 5. Input/Output condition： STATIC		OK
7	THERMAL SHOCK TEST	1. Thermal shock Temperature： -30℃~ 70℃ 2. Temperature change rate ：25℃ / MIN 3. Dwell time low and high temperature ： 30 MIN/EACH 4. Total test cycle：10 CYCLE 5. Input/Output condition： 230VAC/Full Load AC ON/OFF TEST turn on 58sec；turn off 2sec		OK
8	VIBRATION TEST	1 Carton & 1 Set (1) Waveform： Sine Wave (2) Frequency：10~500Hz (3) Sweep Time：10min/sweep cycle (4) Acceleration：5G (5) Test Time：60min in each axis (X.Y.Z) (6) Ta：25℃		TEST：OK
9	CAPACITOR LIFE CYCLE	SUPPOSE C105 IS THE MOST CRITICAL COMPONENT (1) I/P： 230VAC O/P：FULL LOAD Ta= 25 ℃ LIFE TIME (2) I/P： 230VAC O/P：FULL LOAD Ta=45 ℃ LIFE TIME (3) I/P： 230VAC O/P：75% LOAD Ta= 45 ℃ LIFE TIME (4) I/P： 230VAC O/P：50% LOAD Ta= 45 ℃ LIFE TIME		(1) 157680HRS (2) 39885HRS (3) 99776HRS (4) 175200HRS
10	MTBF	MIL-HDBK-217F TOTAL FAILURE RATE：720.6 KHRS		
11	DMTBF/Accelerated Life Test	Demonstration Mean Time Between Failure (Expected Life): Above 30,000 hours @ TA 50℃		

TEST RESULT	TESTER	APPROVAL
PASS	FRANK	WANGDZ

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