

1920

"

" "

" "

"

	201	45	42	75	
	57				1683
687	355	22			

33

400

DSP

973 863

"

" "

" " CAD "

" "

" "

32 CPU

"

,

" 921

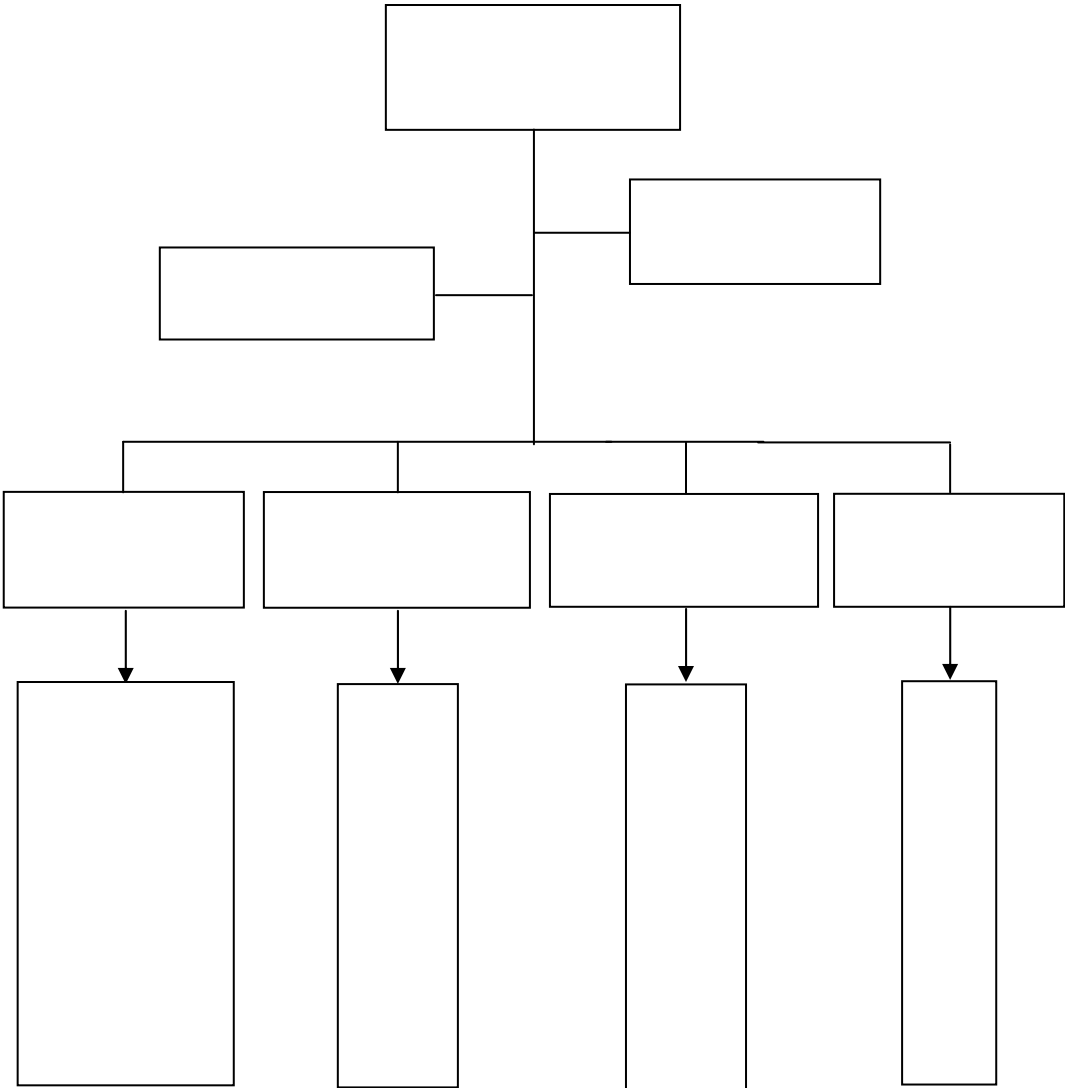
"

310027

0571-87952706

0571-87951625

E-mail keyanke@zju.edu.cn



1

2

3

4

5

6

7

DC/DC

UPS

DSP

8

(EDA)

CPU

/

IP

(SOC)

/

9

1	.....	1
1 1	.....	1
1 2	.....	1
1 3	.....	1
1 4	.....	1
1 5	.....	2
1 6	.....	2
1 7	.....	2
1 8	Visual EMCAD	3
1 9	.....	3
1 10	.....	3
1 11	.....	3
1 12	.....	4
1 13	.....	4
1 14	.....	4
1 15	.....	4
1 16	.....	5
1 17	.....	5
1 18	——	5
1 19	.....	6
1 20	.....	6
1 21	.....	6
1 22	.....	6
1 23	.....	7
1 24	.....	7
1 25	.....	7
1 26	.....	7
1 27	.....	8
1 28	.....	8
1 29	.....	8
1 30	.....	9
1 31	.....	9
1 32	.....	9
1 33	.....	9
1 34	.....	10
1 35	.....	10
1 36	.....	10
1 37	.....	10
1 38	.....	11
1 39	.....	11
1 40	.....	11

1	41		.....	11
1	42		.....	12
1	43		.....	12
1	44		.....	12
1	45		.....	12
1	46	MC33092	.....	13
1	47		.....	13
1	48		.....	13
.....				16
2	1		.....	16
2	2		.....	16
2	3		.....	16
2	4		.....	16
2	5	PMU	.....	17
2	6	FTU	.....	17
2	7	SSFCL	.....	17
2	8		.....	18
2	9		.....	18
2	10		.....	18
2	11	1000	.....	19
2	12		.....	19
2	13		.....	19
2	14		.....	19
2	15		.....	20
2	16		.....	20
2	17		.....	20
2	18		.....	20
2	19		.....	21
.....				22
3	1		.....	22
3	2	IC	.....	22
3	3		.....	22
3	4		.....	22
3	5		.....	23
3	6		.....	23
3	7		.....	23
3	8		.....	23
3	9		.....	24
3	10	IC	.....	24
3	11	DCS	.....	24
3	12	CAD	.....	24
3	13	2000	.....	25
3	14		.....	25
3	15		.....	25

3	16		.....	26
3	17		.....	26
3	18	IC	TM	.....26
3	19		PLC	.....27
3	20		.....	27
3	21		.....	27
3	22		.....	28
3	23		.....	28
3	24	“	”	MIS28
3	25		.....	29
3	26		.....	29
3	27		.....	29
3	28		GPRS	.....30
3	29		.....	30
3	30		.....	30
3	31		.....	30
3	32		.....	31
3	33		.....	31
3	34		DSP	.....31
3	35		.....	31
3	36		.....	32
3	37		.....	32
3	38		.....	32
3	39		.....	32
4			.....	33
		400Hz-8KHz	.....	33
4	2	10KHz~100KHz	IGBT	.....33
4	3		.....	33
4	4		.....	33
4	5		.....	34
4	6		.....	34
4	7		IGBT	.....34
4	8		.....	35
4	9	20kVA	DSP	.....35
4	10		.....	35
4	11		DSP	.....35
4	12		.....	35
4	13		APF	.....36
4	14		.....	36
4	15		DC/DC	.....36
4	16		.....	37
4	17		.....	37
4	18		.....	37
4	19	6kVA---9kVA	.....	37

4	20	:	.....	38
4	21		HID	38
4	22		.....	39
4	23		.....	39
4	24		.....	39
4.25			.....	40
4.26			.....	40
4.27			.....	40
4.28			.....	41
4.29			.....	41
4.30			.....	41
4.31			.....	42
4.32			.....	42
4.33			.....	42
4.34			.....	43
4.35			.....	43
4.36	LLC	DC_DC	.....	43
4.37			.....	44
4.38			.....	44
4.39			.....	44
4.40			.....	45
4.41			.....	45
5			.....	46
5	1		.....	46
5	2	/	EDA	46
5	3	usb	.....	46
5	4		.....	46
5	5		.....	47
5	6		.....	47
5	7		.....	47
5	8		.....	48
6			.....	49

1

1 1

5-10
600

1			80mm	11.6Nm
13r/min	0.025		4μs	2
45mm	0.32Nm	100r/min	30 60 80	100 mm

1 2

			VKDC-A	VKDC-B
1				
2	3			
	4			
	(

1 3

	()
T-n		
1	<10s/	
		2
		3
	(
)	

1 4

()

1 <10s/ () 2
3

(
)

1 5

270-540V

110V

1 50Hz 380V 2 TI
TM320F240 3

1 6

2000 8

CI DS

1 CI DS CI MS
CAD CAT MIS ,
2 CAD

3 CAT

4 MIS

1 7

1 10° 30M
2 0.5m
2-3 3

1 8

Visual EMCAD

Vi sua l EMCAD

CAD

CAD

CAD

CAD

1

2

3

4

1 9

50-4000rpm

20000.:1

2000rpm

10~30kw()

>80~85%()

~220v;

()

1 10

4~5

3600 /

1

24

36

120

>75%

70

5° 2

24

36

750

3600 /

75%

1 11

220 12 24 36 1W~30KW
100r/min~100000r/min 50~85%

1 12

1 220V/50Hz 2 400W 3
400W 4 4~170Hz

1 13

1 220V/50Hz 155V~250V 2
30Hz~100Hz. 3
4 16 ~30 1

1 14

380 1~100 10~2003 Hz

1 15

185mm

70mm

50r/min,12N.m
1.0

5kg

220V/

380

5r/min~300r/min

~

1 16

1

DOS

Windows

2

3

4

1 17

TM320F241

IPM

TI

DSP
CPU

380 VAC 1.5KW 8~180Hz 3

220VAC 50HZ 2

220/
4

5

6

7

1 18

1 1~50KN 20~300 /



	1			2
220V				
1 23				
		1000~3000N	10~30kg	3~30m/s
1 24				
	1	380V	220V	1000Kg~100000Kg
	2			50m
1 25				
	1	380V	220V	10mm~500mm
				50g~100000g
1 26				
				CAD

80%

1100V

39A

86.42%

64.2kW

0.835

3000r/min

2.68

1 27

CAD

68× 71.5mm

30A

7Ah 12V

8000V/min

5 v

Y30

0.4KW

250A

11.5V

2Nm

1 28

2.2KW

1.5KW

415V

S1

FS4T

5.4 5.5 5.6A

F

2800

2820

2.2KW

2840r/min,

3

380 400

50Hz

1 29

u=380V

v=220V,

F=100-1000N

10-100m

V=0.5-3m/s

S=1-20m

1 30

G=450-1500kg

H=10-300m

V=4.5-12m/s

1 31

30

F=3000Kg

6 12 /min

1 32

P 1kw-100kw
F=3500kg

U=380V 660V

n=1-1500r/min

.....

1 33

90

15 25

1/3

10

1 34

1 35

1.2m/s 5000 1000
0.8 3m/s

1 36

, <500mm >1500Nm <12A <100Kg

1 37

500kg

1000kg

1 38

863

3

1 39

" " 863

1 40

Ä t

1 42

10 200 800~5000 / 12~300Vdc

1 43

1 10,000-200,000 r/min, 2
50 300mm 3 1-200 kg.

1 44

1 10,000-200,000 r/min, 2
50 300mm 3 1-200 kg.

1 45

Freescal e DSP MC56F8357
150W
SVPWM

PI

1 , 1024

1 46

MC33092

()

N

MOSFET

14 85V

$\pm 0.1V$ (25)

1 0A

()

(25)

2 0mA

3 0mA

f=280kHz

2 5s 10s

(LRC)

MOSFET

1 47

12 36V

>200W

200 3000 /



1 1. 1Kw 100kW 2 2 8 3
Y2 4
1 Y2 5 8%
Y Y2

1.53

180
3 1 100w 1000W 2 300 2000r/min

1.54

1 300 r/min, 2 1kW 3 6m/s.

1.55

1 250 nW

2 1

1 9V 2 RS 232

2 2

1 9V 2 5000 RS 232
3 40 85

2 3

1 20 5
2 RS485 48 5
3 3
* 4 ± 2kVh

2 4

1 -- 4 2 0
2 3 5

1.0 6 " " 7
1.0

2 5

PMU

GPS 16 DSP
1 () 0.5% 1.0%
0.5° 0.01Hz ± 1us 2
RS232/485 3 64*128 4)
(0 70 95%) 5

2 6

FTU

FTU 3 V I P Q f
FTU CPU GPS
1 / /
2 RS232/485 3
4 5 SCE
5 -10 85
95%

2 7

SSFCL

DSP
()
1 2
3
4 20ms
5
6 7 RS232/485

IEC-61850

2 8

24

1 2 4 15
35 3 RS232 2 8
5
2 8

2 11

1000

1000 kW

2 12

8 18 700MW 12600MW
750MW
10 6

2 13

10kV 90

2 14

1 220KV 110KV 35KV
4 9 3 2 16 32
Windows NT

2.15

3 1 2

2.16

2.17

220kV

PSEE

220kV

2.18

110kV

110kV

220kV

35kV

T

110kV

2. 19

4

16

HD-201 HD-202

63

95%

1

2

3 16

A/D

4

3

3 1

2 1 20 2000
 3 10uA
 4

3 2

IC
" "

IC

1 IC 2 LCD 3

()

3 3

" "

1 24 2 RS485

3 4

1 30m 2
3

3 5

1 2
3
4

3 6

1 2 3V
0.2mA 8.0m 15° 10⁴
+40 45% 80%

3 7

1 380V
2 40 KWM³
15db
3

3 8

8 60 6 9 10 7 5

3 9

1 2

3 10

IC
IC IC

PC

1

2

3

4 PC

3 11

DCS

PC I PC DCS

32 Intel 16 80C196KC RS-485 CPU

CPU CPU RAM CPU

1

2

6

PWM 16

16 8

2

3 CPU VDT

3 12

CAD

3 1 2 5
4 6
7 8 1 32
9 10

3 13 2000
2000

PSII Xquark 1 RIP
Photoshp Corel Draw FreeHand Pagenaker Illustrator
Windows 2000 Mac PC
6 CMYK 16
7 8

3 14

1 2 3
4 5 6
100-150 / 0.5mm

3 15

CAD IC CAD
IC



3 19

PLC

:

Rapyd-D-1250

1

" "

2

2

1 29% 30% 15kW,
 5000~7000 /min 2 488m/min
 D=15 Rapyd-D-125

3 20

1400~1500

1 2 3
 1-4 4 5 CRT
 1% <±1.5%

3 21

1 0.3 m/s 1.0 m/s
 2 3° 45°
 3 45° 90° 0° 4

3 22

A/D I/O

1 2
A/D I/O 3
4

3 23

1 2
3 4 5

3 24

" " **MIS**
MRPI /ERP

1 ISO9000 2

12

3 25

4 1 3 2

3 26

MES

TOUCH PANEL

2 1 DCS ERP DCS ERP 3
485/GSM/MODBUS 4

3 27

ABS

32

16

RF

3 1 2

3 28

GPRS

GPRS

GSM GPRS

GSM

1	2	3	4	5
6	7	8	9	10
11		3		

3 29

MC68HC908GR16 908E625

LIN

1

2

3

4

5

3 30

DVD

G S

GPS

G S

1		DVD	CD	VCD	MP3
2	GPS	<10M	1-3M	3	500
		4 10	1	50	5
				<0.01%	

CF/SIMMS/SD/MMC/MICRODRIVE

3 31

5

1

2
3

5

9999999999J

0.001J

3 32

GPRS CDMA

ARM
GPRS/CDMA

GPRS CDMA

1

GPRS

JPEG

2

CDMA

3

4

3 33

CCD

PC

1

2

3 34

DSP

DSP—TI
CDMA

TMS320DM642

internet

DSP

1

4

CIF

352× 288

25fps

MPEG-4 SP

2

Internet

CDMA

3

4

3 35

MOOG

9

USB

9 1 48 64 2 6 4
 10 3 10 LCD 4

3 36

CPU

 1 LCD 2 100 20
3 80 4 24 32 3

3 37

4

400Hz-8KHz

1 50KW-3000KW 400Hz~8000Hz 2

4 2

10KHz~100KHz IGBT

IGBT 97 50% 8 90 90% 1 30KW-350KW 10KHz~100KHz 2

4 3

220V/110V 1 30A/10A 380V 220V

4 4

1 220 380V 50Hz 2
3 5% 0.04s 0.08s
0.5% 150A

4 5

97 97 12
1 3 0.5% 1% 2
UPS

4 6

2 1 0.5% 1%
3 60 28 32
PID 1 1% °%

4 8

N+1

180V 275V 1 220V± 10% 220V 99%
90% 15A- 25A 1%

220V (110V)

4 9

20kVA DSP
DSP

>96% 500W-5kW 220Vrms <5%

4 10

1 20KW <5% 95% 2
3 SPWM

4 11

DSP

DSP

1- 3KW 220 Vrms <3% 50Vrms- 265Vrms 40- 1000Hz
90%

4 12

1 7-12mm 950 425 ,
 50-60r/min, 300 / 2 PLC
 3 20
 4 /

4 13

APF

APF

1 2
 3 4

4 14

DSP MPU

1 / 2
 3 0-100A 4 500W100kVA 0-250V
 20-400Hz 0.4% 0.1% THD<1%

UPS

4 15

DC/DC

DC/DC

DC/DC

DC/DC

42V

380V

5kw

DC/AC 24 32 220 /50
 110 /200 /400 DC/DC
 DC/AC DC/DC
 220 /50 DC/AC /400
 115 /200 /400
 24 32 220± 2 /50± 0.1
 115± 2 /400± 0.5 6kVA 9kVA
 80

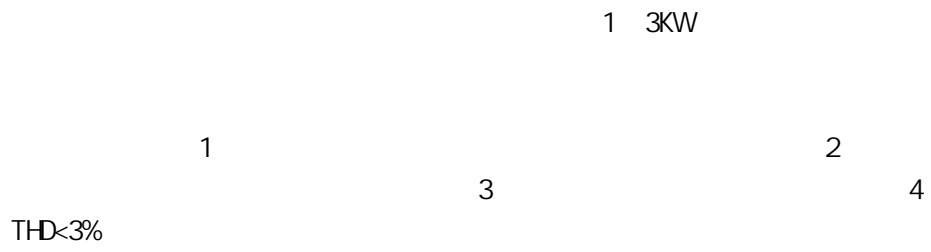
4 20 :
:

Labvi ew

: 1.
 2 100V 1000V 10A 150A
 25 125 3 PC
 :

4 21 **HID** H D H D
 50Hz H D N
 1 H D 50Hz 400Hz
 2 DC/AC H D (2) (3)
 (1) 1 8 (2) (3)
 4 5

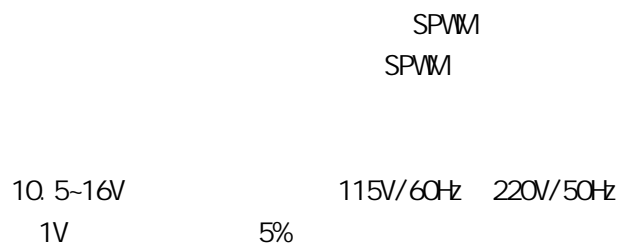
4 22



4 23

1998

4 24



4.25

ZL2001145559.4

4.28

ZL200410025285.0

20%

50%.

4.29

ZL2002112007.2

20kVA

4.30

ZL2002265208.6

PYC

10kV

10

1

220kV

4.31

ZL2002112006.4

50kVA

4.32

ZL2000127456.2

PWM A/D 2 5

4.33

ZL200410015754.0

10kV dq dq 10 220kV 1

4.34

200410016336.3

50

50%

3%

1kVA

DC/DC

4.35

200510060357.X

50%

50%

97%

1kVA

DC/DC

4.36

LLC

DC_DC

03150858.8

LLC

DC DC

LLC

ZVS

ZCS

50%

97%

1kVA

DC/DC

4.37

200510050642.3

4.38

200510050641.9

PWM

PWM

-
-
-
-
-
-

UPFC

— —

1

— 1/2

IGBT

4.39



4.40

,

4.41

"

"

4.42

5

5 1

RS-485

16

16

64

5 5

1

$\Phi 3$ 60mm
2

/

1 3

5 6

0 3000V

0 1000A

5 8

V_F I_F

V_W

t_{rr}

50KV

30KV

I_R

V_F I_F

t_{rr}

20ns 50KV

30KV

1%

6

1	
2	
3	
4	100kW ZJY440
5	TRW
6	24V
7	
8	
9	
10	
11	
12	
13	
14	
15	IPM
16	
17	
18	
19	
20	--
21	
22	
23	
24	
25	
26	“ ”
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	
38	-

39	
40	
41	
42	
43	
44	
45	
46	--
47	
48	1kW
49	
50	
51	
52	1780
53	950
54	E2R2
55	
56	
57	
58	
59	
60	
61	
62	
63	
64	
65	
66	
67	
68	
69	BD
70	BD
71	BD
72	
73	
74	YN
75	
76	
77	20kW
78	8MW
79	GAM1010
80	
81	

82	
83	
84	halbach
85	
86	
87	
88	
89	
90	
91	
92	
93	
94	
95	
96	
97	
98	
99	
100	
101	
102	
103	
104	
105	
106	
107	
108	
109	
110	
111	
112	
113	
114	
115	
116	
117	0.75KW
118	1.5KW
119	1.5W
120	10W
121	14kw80v
122	1kW
123	350W
124	3kW

125	550W
126	8kc
127	YC7114
128	YD132M-4/2
129	YSK-140
130	
131	
132	
133	
134	
135	
136	
137	
138	
139	
140	
141	
142	
143	
144	
145	CAD
146	CAD
147	
148	
149	
150	
151	
152	
153	
154	
155	
156	
157	
158	3KW
159	k

168	
169	
170	
171	
172	
173	
174	
175	
176	
177	
178	
179	
180	
181	1.2-6.0kw
182	PSOC
183	Crowbar
184	
185	DSP
186	
187	
188	1KW
189	
190	
191	
192	
193	
194	
195	
196	
197	
198	
199	
200	
201	
202	
203	
204	
205	
206	
207	
208	-
209	

1	
2	DMS
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	EMS
16	SCED
17	PJM
18	
19	
20	
21	110kV
22	PDAS100
23	agent
24	CIM SOA
25	E3CS
26	
27	()
28	
29	-
30	
31	
32	DMS
33	
34	IEC61850
35	
36	
37	
38	()
39	
40	VR
41	220kV
42	

43	
44	AVC
45	AVC
46	
47	CIM
48	PI
49	SVG
50	
51	AVC
52	
53	VK
54	
55	AVQC
56	(AVC)
57	
58	
59	
60	
61	
62	
63	
64	
65	1000kV
66	10
67	110kV
68	110kV
69	PSSE
70	
71	GCB
72	
73	2030
74	110
75	
76	
77	“ ”
78	“ ”
79	
80	
81	“ ”
82	2030
83	
84	
85	“ ”

86	2030
87	SVC
88	
89	
90	
91	
92	
93	
94	
95	
96	
97	WAMS
98	1000kV
99	2008
100	
101	
102	
103	
104	
105	
106	
107	
108	
109	
110	
111	EMS
112	
113	
114	CIM
115	
116	
117	
118	
119	
120	
121	EMS IEC61970 SVG
122	
123	IEC61970
124	GDA
125	
126	
127	
128	

129	
130	
131	
132	
133	
134	
135	
136	
137	ARM
138	
139	
140	
141	
142	
143	
144	
145	
146	SPSSN
147	
148	
149	
150	
151	
152	NSR890
153	
154	
155	(200410084764.X)
156	
157	
158	
159	ZL200410016284.X
160	
161	
162	
163	-
164	
165	/ 660kV
166	2009 800KV
167	800kV
168	800kV
169	MMC
170	
171	

172	
173	
174	
175	
176	
177	
178	
179	
180	SVC
181	SVC SSR
182	PSCAD/EMTDC
183	
184	“ ”
185	
186	
187	
188	
189	
190	
191	
192	
193	
194	
195	
196	
197	
198	
199	
200	
201	
202	“ ”
203	
204	SVG
205	
206	DlgSILENT
207	
208	
209	
210	
211	
212	10kv
213	PLC
214	

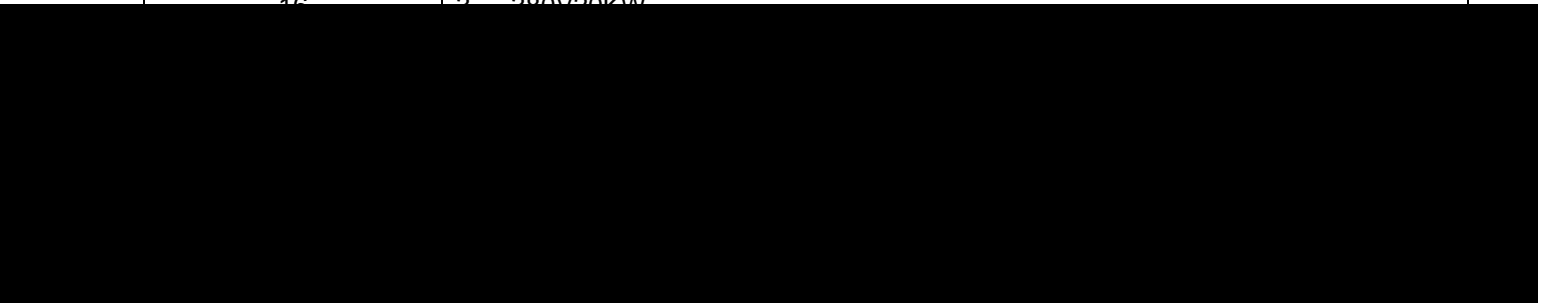
215	
216	
217	
218	±500kV 27DCL)
219	1000kV
220	10kV
221	20kV
222	20
223	220kV
224	220kV
225	500/220kV 4
226	500/220kV 4
227	500kV
228	500kV VFTO
229	500kV
230	1679
231	
232	
233	
234	
235	
236	
237	CDEGS
238	
239	
240	1000KV
241	
242	4
243	20kV
244	220/110kV
245	
246	“ ” LCC
247	
1	
2	CAD
3	
4	16 DTM2830-1
5	10KV
6	MIS
7	
8	
9	

10	
11	
12	
13	
14	
15	
16	GG705
17	
18	
19	
20	
21	
22	
23	
24	
25	ICA PWV
26	
27	SVM
28	
29	
30	
31	
32	SOE
33	
34	
35	
36	
37	BGA
38	()
39	
40	GPRS
41	
42	
43	
44	
45	
46	LED
47	
48	
49	ERP
50	
51	
52	

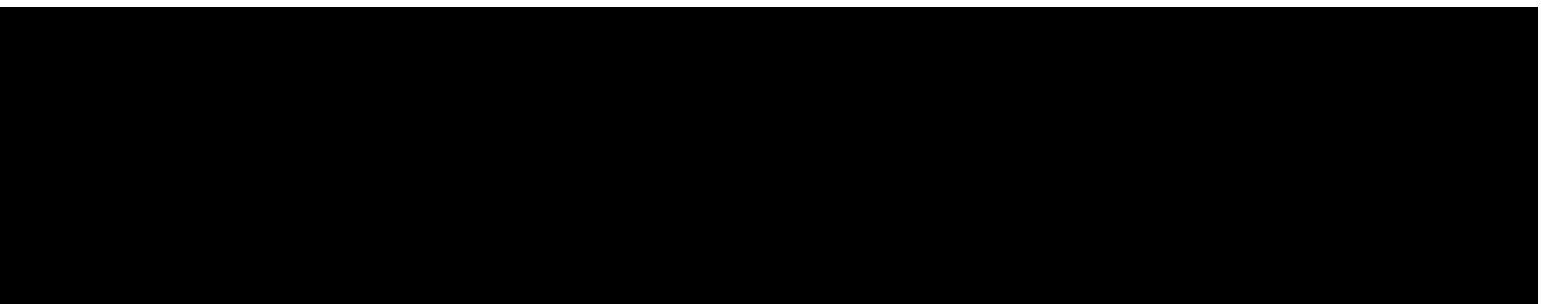
53	TTCN GFT
54	
55	
56	
57	
58	
59	
60	
61	
62	
63	
64	537-Y
65	LD-801
66	
67	
68	
69	B/S
70	
71	
72	—
73	
74	
75	
76	GG705
77	LMI
78	
79	
80	1.5MW
81	
82	
83	
84	
85	
86	
87	
88	
89	
90	
91	
92	
93	
94	
95	

96	
97	
98	
99	
100	
101	
102	
103	
104	
105	
106	
107	650KVA
108	1-SVM
109	
110	
111	
112	
113	
114	"
115	MRI
116	PLC
117	
118	
119	
120	
121	
122	
123	
124	
125	
126	
127	
128	
1	380V 6kV
2	6 10kV/MVA DSTATCOM
3	
4	
5	
6	
7	
8	
9	

10	ZL200710068347.X
11	
12	AC-DC
13	
14	
15	
16	2 280V/20KW



23	UPS
24	
25	
26	
27	
28	
29	
30	16 Microchip
31	(LED)
32	
33	LED
34	
35	
36	/ /
37	
38	
39	
40	ı k . k



53	
54	
55	
56	
57	
58	
59	HID
60	
61	
62	
63	PWM
64	Wind Energy Power Conversion Control Platform
65	
66	2 5KW
67	50kW
68	5kVA
69	
70	
71	APF
72	HID DSP
73	
74	
75	
76	
77	
78	
79	AC/DC
80	AC/DC BMP
81	
82	
83	
84	HID
85	
86	TZQ-50
87	
88	
89	
90	19V90W PFC
91	CM80A
92	35W HID
93	220v/300w
94	
95	HID

96	
97	
98	30
99	
100	UPS
101	
102	
103	
104	70W
105	
106	
107	EMI
108	
109	
110	
111	
112	
113	
114	
115	
116	DSP
117	
118	
119	IGBT
120	LED
121	
122	
123	
124	
125	
126	30KVA
127	LED
128	
129	
130	
131	
132	/
133	
134	
135	
136	
137	PSMS
138	

139	
140	
141	
142	
143	
144	
145	AC/DCLED
146	LED
147	150W AC/DC LED
148	100kW
149	2MW
150	40KW PFC
151	PV
152	UPS
153	UPS
154	
155	EMI
156	SFC
157	
158	
159	
160	DC-DC
161	PFC
162	
163	DC/DC
164	

2	LDO DC DC
3	li
4	sigma-delta
5	USB2 0
6	
7	
8	
9	
10	
11	Li
12	
13	
14	IP
15	SoC
16	CPU-DSP SOC
17	
18	/IP
19	
20	45
21	65 SOC
22	OPC
23	EDA
24	
25	SoC
26	SOC
27	
28	Verilog
29	SOC
30	
31	
32	
33	0.09
34	Hifn
35	SoC
36	SoC
37	SOC EDA
38	CPU
39	CMOS
40	
41	cpu vlx
42	CMOS
43	
44	

45	SoC
46	
1	PM
2	
3	VF IF
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	PWM
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
37	NI
38	PWM
39	
40	