LTC4100
4A Smart Battery Charger

DESCRIPTION

Demonstration circuit DC512A is a single battery switching step-down charge controller featuring the LTC4100. The recommended input power is 15 to 20V at 3.5A. A two-position jumper allows choice of protected output voltage range suitable for 3- and 4-Cell Li-ion batteries. Removal of the jumper allows full output voltage range. The maximum charge current is 4A.

The demo board is initially configured for 12.6V at 3A for popular 3-cell Li-ion battery packs. LTC4100 will automatically charge a Smart Battery to termination as soon as input power is applied with a battery connected prior to power up. A VOUT pin automatically provides power to the system load from the wall adapter or battery. Status LEDs are provided for CHG, ACP, $\overline{\text{SMBALERT}}$ and SMBus activity.

The optional DC1223A-B SMBUS to USB adapter and associated software to control, monitor, and data log the system for demonstration purposes only. This software is not required to run the DC512. Contact your LT representative for ordering a DC1223A-B.

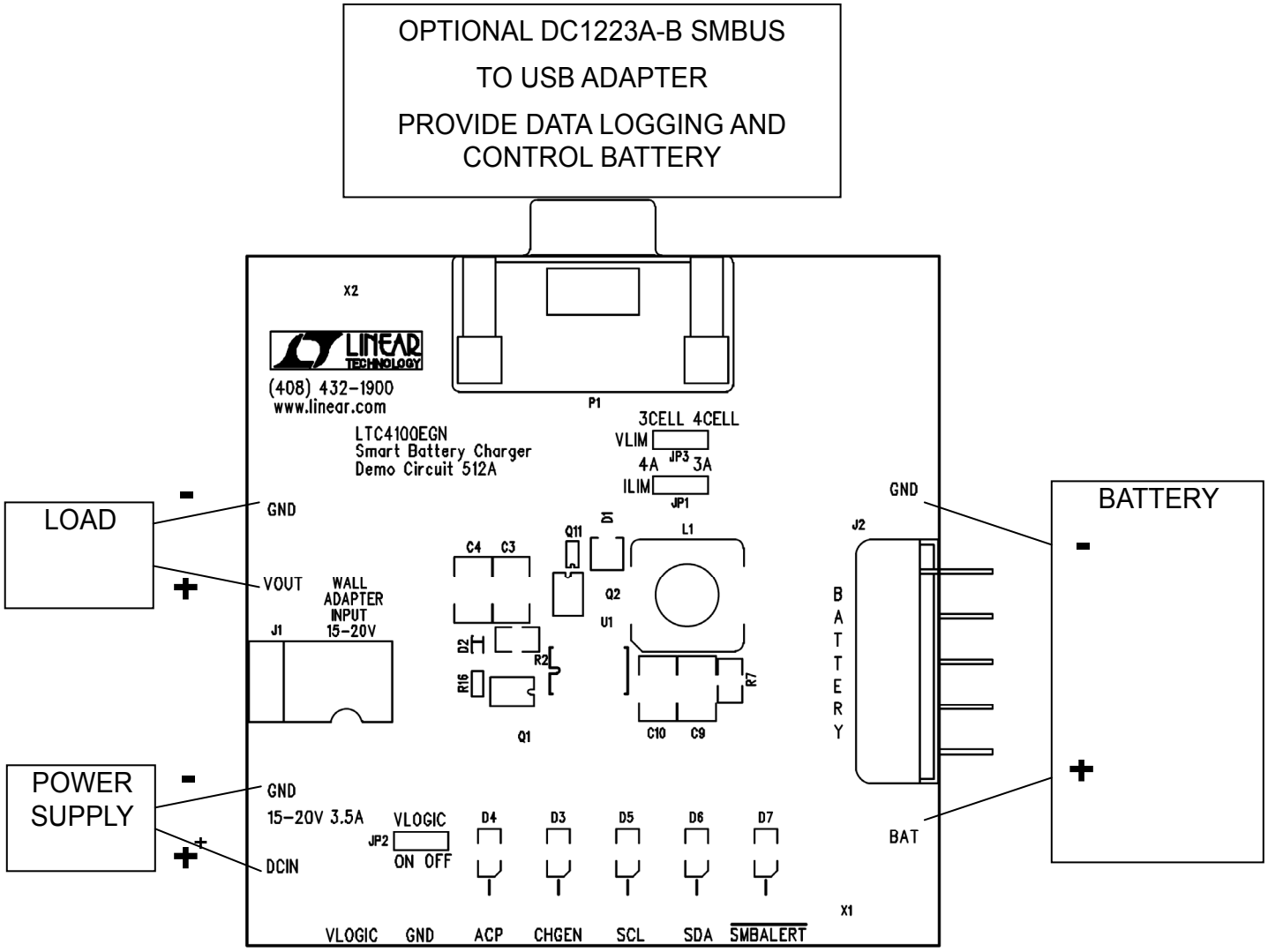
Design files for this circuit board are available at
http://www.linear.com/demo

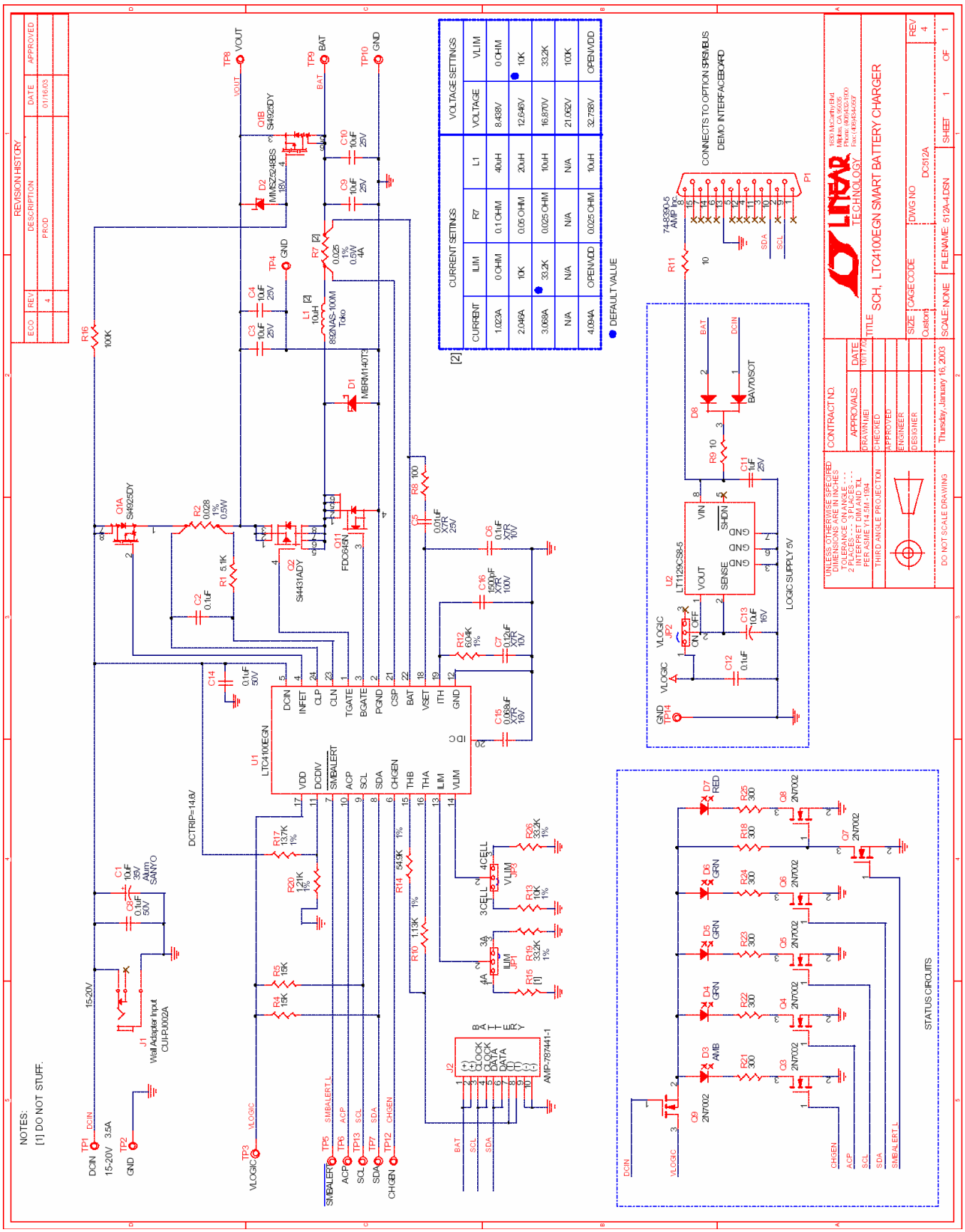
Performance Summary

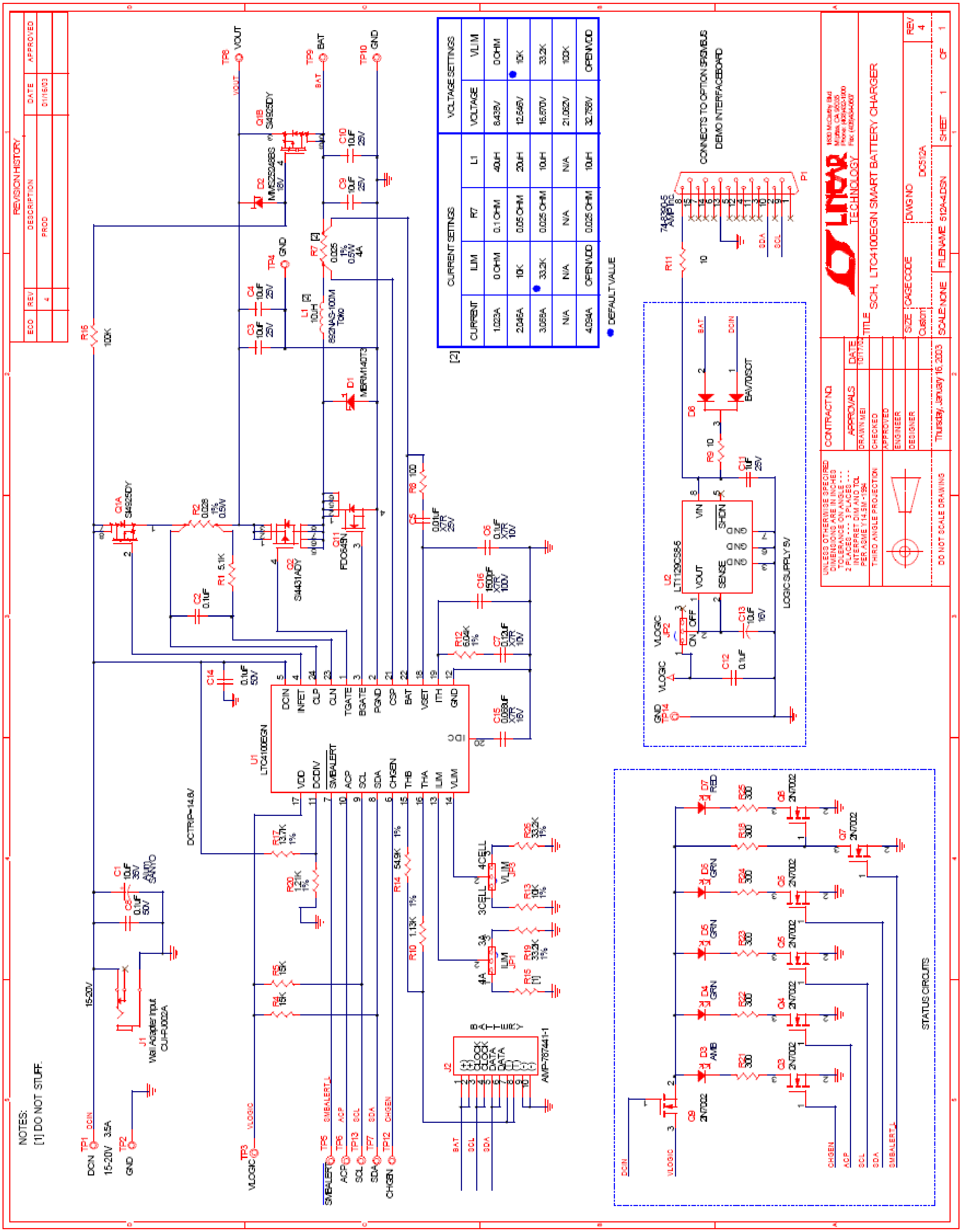
Parameter	Value	Conditions/Notes
Input Voltage Range	15 – 25V	VIN must exceed VBAT to charge. Max Input voltage is input cap limited.
ACP Trip voltage	14.6V+/-3%	
Recommended Wall Adapter Voltage	15 – 20V	See Note
Recommended Wall Adapter Current	≥3.5A	See Note
Input Current Limit from Wall Adapter	3.5A+/-7%	5% Typical. See Note
Programmable Output Voltage Range	6V to VLIMIT	Preset 3 and 4 Cell jumper settings
Absolute maximum Output Voltage	25V	Max output voltage is output cap limited. VLIMIT = open
Program Voltage Accuracy	±0.8%	Typical
Minimum Voltage Step	16mV	All VLIMIT scales.
# of Voltage Steps	2048 Steps	11 Bit range
Programmable Output Current Range	0 – ILIMIT	Preset jumper for 3 and 4 Amp range
Absolute maximum Output Current	4.092A	ILIMIT = Open (4 Amp jumper setting)
Program Current Accuracy	±5%	3% is typical
Minimum Current Step	4mA	For 3 & 4 amp scale
# of Current Steps	1024 Steps	10 Bit range
Efficiency	85–96%	See Datasheet
Dropout voltage.	<1V	At 4A charge rate

QUICK START PROCEDURE

1. Connect a properly rated power source to DCIN terminals J1 or terminals labeled DCIN and GND.
2. Optionally connect a load to DCOUT and GND terminals.
3. Configure the jumpers for your specific battery.
4. Plug in the battery. Industry standard 5 Pin AMP Smart Battery connector is provided as well as generic soldering Test Points for hardwire connections.
5. Turn on the input power supply.
6. Optionally use the provided DC1223A-B demonstration software to control and configure the DC512A.
7. NOTE: If the board is allowed to get to warm, the onboard NTC thermistor may trip and momentarily suspend the charge process. This can be confirmed by the fault LED turning on. When the board cools down, charging will resume.


OPTIONAL DC1223A-B SMBUS
TO USB ADAPTER
PROVIDE DATA LOGGING AND
CONTROL BATTERY
LOAD
POWER
SUPPLY
BATTERY
(408) 432-1900
www.linear.com
LTC4100EGN
Smart Battery Charger
Demo Circuit 512A
GND
VOUT
WALL
ADAPTER
INPUT
15-20V
J1
15-20V 3.5A
DCIN
VLOGIC
JP2
ON OFF
3CELL 4CELL
VLIM
JP3
4A
3A
ILIM
JP1
P1
X2
X1
J2
BAT
VLOGIC GND ACP CHGEN SCL SDA SMBALERT


NOTES:
[1] DO NOT STUFF.
REVISION HISTORY
ECO
REV
DESCRIPTION
DATE
APPROVED
4
PROD
01/16/03
CURRENT SETTINGS
VOLTAGE SETTINGS
[2]
DEFAULT VALUE
CONNECTS TO OPTION SMBUS
DEMO INTERFACE BOARD
LINEAR TECHNOLOGY
SCH, LTC4100EGN SMART BATTERY CHARGER
CONTRACT NO.
APPROVALS
DRAWN/MEI
CHECKED
APPROVED
ENGINEER
DESIGNER
DATE
10/17/02
TITLE
SIZE
CAGECODE
DWG NO
DC512A
REV
4
SCALE=NONE
FILENAME: 512A-EDSN
SHEET 1 OF 1
Thursday, January 16, 2003
DO NOT SCALE DRAWING
STATUS CIRCUITS
LOGIC SUPPLY 5V
DCTRIP=14.0V
15-20V 3.5A
Wall Adapter Input
CUI-PJ002A
LTC4100EGN
LT1129CS8-5
MBRM140T3
MMSZ5248BS
Si4925DY
Si4431ADY
FDC645N
892NAS-100M
Toko
AMP-787441-1
74-8390-5
AMP Inc
BATTERY


SCH, LTC4100EGN SMART BATTERY CHARGER
DC512A
512A-4.DSN
Thursday, January 16, 2003
REVISION HISTORY
CURRENT SETTINGS
CURRENT ILIM R7 L1
1.023A 0 OHM 0.1 OHM 40uH
2.046A 10K 0.05 OHM 20uH
3.068A 33.2K 0.025 OHM 10uH
N/A N/A N/A N/A
4.094A OPEN/VDD 0.025 OHM 10uH
VOLTAGE SETTINGS
VOLTAGE VLIM
8.439V 0 OHM
12.66V 10K
16.57V 33.2K
21.062V 100K
32.758V OPEN/VDD
DEFAULT VALUE
NOTES:
[1] DO NOT STUFF.
CONNECTS TO OPTION SPS/MBUS DEMO INTERFACEBOARD
LOGIC SUPPLY 5V
STATUS CIRCUITS

Item	Qty	Ref	Desc	Part Number
1	1	C1	CAP, ALUM 10uF 35V 10%	SANYO 35CV10AX
2	1	C2	CAP, Y5V 0.1uF 25V +80-20% 0603	AVX 06033G104ZAT2TA
3	4	C3,C4,C9,C10	CAP, X5R 10uF 25V 20% 1812	TAIYO YUDEN TMK432BJ106MM
4	1	C5	CAP, X7R 0.01uF 25V 10% 0603	AVX 06033C103KAT
5	1	C6	CAP, X7R 0.1uF 10V 20% 0603	AVX 0603ZC104MAT
6	1	C7	CAP, X7R 0.12uF 10V 20% 0603	AVX 0603ZC124MAT
7	2	C8,C14	CAP, X7R 0.1uF 10V 10% 0805	AVX 08055C104KAT
8	1	C11	CAP, Y5V 1uF 25V +80-20% 1206	AVX 12063G105ZATMA
9	1	C12	CAP, X7R 0.1uF 16V 10% 0603	AVX 0603YC104KAT
10	1	C13	CAP, TANT 10uF 16V 20% 3828	AVX TAJB106M016
11	1	C15	CAP, X7R 0.068uF 16V 10% 0603	TAIYO YUDEN EMK107BJ683KA
12	1	C16	CAP, X7R 1500pF 100V 10% 0603	AVX 06031C152KAT2A
13	1	D1	DIODE, MBRM140T3	MOTOROLA MBRM140T3
14	1	D2	DIODE, ZENER MMSZ5248BS 18V SOT323	DIODES INC. MMSZ5248BS
15	1	D3	LED, AMBER	PANASONIC LN1451C-(TR)
16	3	D4,D5,D6	LED, GREEN	PANASONIC LN1351C-(TR)
17	1	D7	LED, RED	PANASONIC LN1251C-(TR)
18	1	D8	DIODE, BAV70 SWITCHING 350mW SOT-23	DIODES INC. BAV70
19	3	JP1,JP2,JP3	JUMPER, 1X3 PINS, 2MM	COMM CON 2802S-03-G1
20	1	J1	CONN, 2 PIN	CUI-STACK CUI-PJ002A
21	1	J2	CONN, 10 PIN	AMP INC. 787441-1
22	1	L1	IND, 10uH	TOKO 892NAS-100M
23	1	P1	CONN, DSUB 15 PIN	AMP INC. 74-8390-5
24	1	Q1	XSTR, Si4925DY DUAL P-CHANNEL MOSFET SO8	VISHAY SILICONIX Si4925DY
25	1	Q2	XSTR, Si4431ADY P-CHANNEL MOSFET SO8	VISHAY SILICONIX Si4431ADY
26	7	Q3,Q4,Q5,Q6,Q7,Q8,Q9	XSTR, 2N7002 N-CHANNEL MOSFET	ZETEX 2N7002
27	1	Q11	XSTR, FDC645N N-CHANNEL MOSFET SUPERSOT	FAIRCHILD FDC645N
28	1	R1	RES, 5.1K OHMS 5% 1/16W 0603	AAC CR16-512JM
29	1	R2	RES, 0.028 OHM 1% 0.5W 1206	IRC LR1206-01-R028-F
30	2	R5,R4	RES, 15K OHMS 5% 1/16W 0603	AAC CR16-153JM
31	1	R7	RES, 1206 0.025 OHMS 1% 0.5W	IRC LRF1206-01-R025-F
32	1	R8	RES, 100 OHMS 5% 1/16W 0603	AAC CR16-101JM
33	2	R9,R11	RES, 10 OHMS 5% 1/16W 0603	AAC CR16-100JM
34	1	R10	RES, 1.13K OHMS 1% 1/16W 0603	AAC CR16-1131FM
35	1	R12	RES, 6.04K OHMS 1% 1/16W0603	AAC CR16-6041FM
36	1	R13	RES, 10K OHMS 1% 1/16W 0603	AAC CR16-1002FM

37	1	R14	RES, 54.9K OHMS 1% 1/16W 0603	AAC CR16-5492FM
38	0	R15	DO NOT STUFF	NONE
39	1	R16	RES, 100K OHMS 5% 1/16W 0603	AAC CR16-104JM
40	1	R17	RES, 13.7K OHMS 1% 1/16W 0603	AAC CR16-1372FM
41	6	R18,R21,R22,R23,R24,R25	RES, 300 OHMS 5% 1/16W 0603	AAC CR16-301JM
42	2	R26,R19	RES, 33.2K OHMS 1% 1/16W 0603	AAC CR16-3322FM
43	1	R20	RES, 1.21K OHMS 1% 1/16W 0603	AAC CR16-1211FM
44	13	TP1-TP10,TP12-TP14	TURRET	MILL-MAX 2308-2
45	1	U1	IC, LTC4100EGN SMART BATTERY CONTROLLER	LINEAR TECH LTC 4100EGN
46	1	U2	IC, LT1129CS8-5 SO8	LINEAR TECH. LT1129CS8-5
	4		SCREW, 4-40, 0.25" LONG	ANY
	4		STANDOFF, NYLON HEX 4-40 0.5" LONG	MICROPLASTICS 14HTSP003
	3	JP1,JP2,JP3	SHUNT, 2PIN 2mm	COMM CON CCIJ2mm-138G