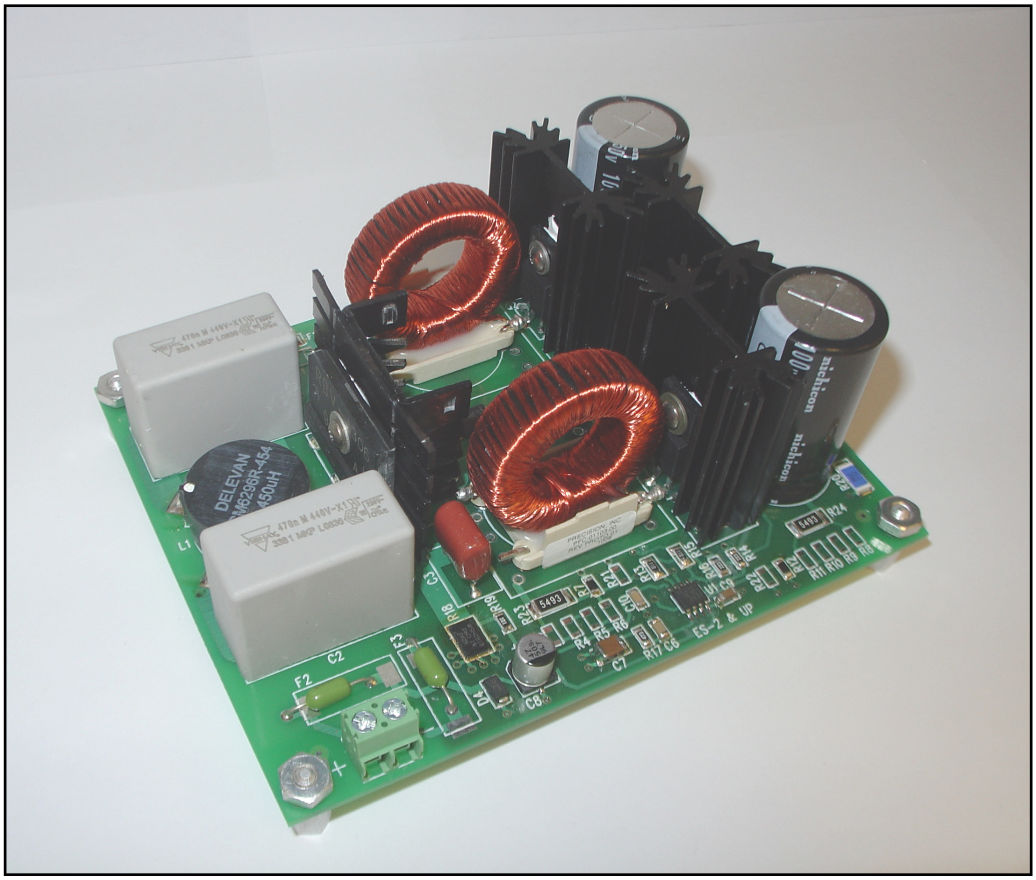
SSC2101-EB1
Evaluation Board
Users Guide



SSC2101 Power Factor Correction IC
- Schematics and Notes -

[This page intentionally left blank]

SSC2101 Evaluation Board Schematics and Notes

At Sanken's Polar Semiconductor design center we appreciate that our controller IC will not be the most costly item in your Bill of Materials. We have therefore designed our evaluation kit as a handy platform for evaluating and testing all those other critical pieces.

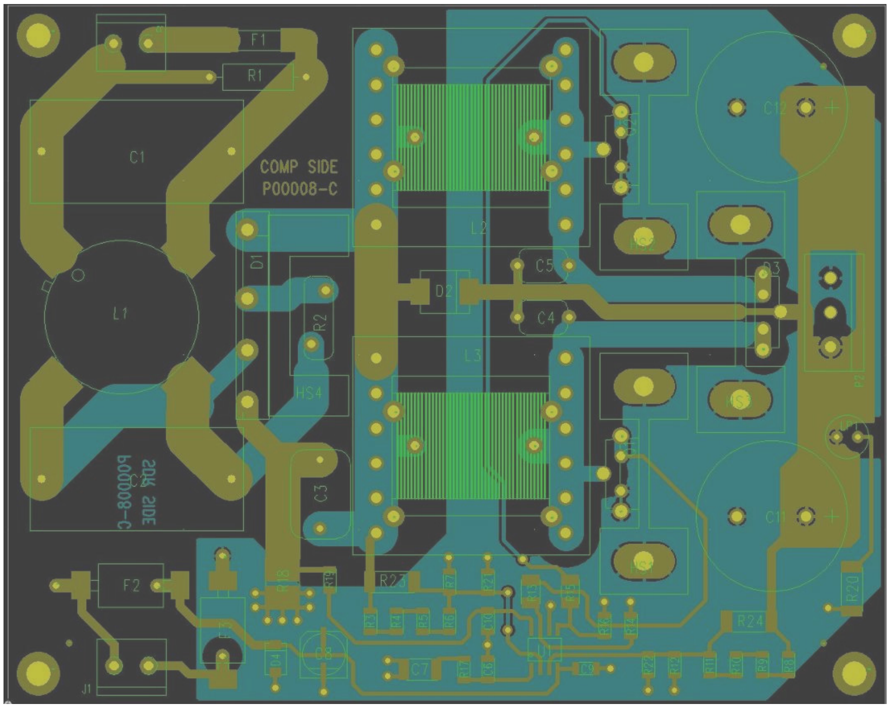


Figure 1: "X-Ray" Artwork View

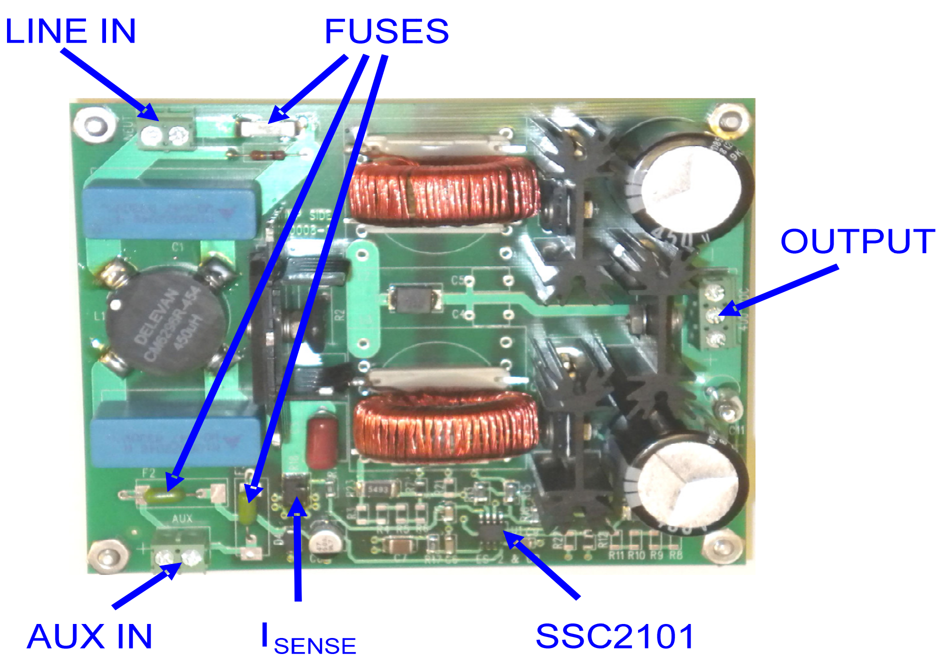


Figure 2: Top View

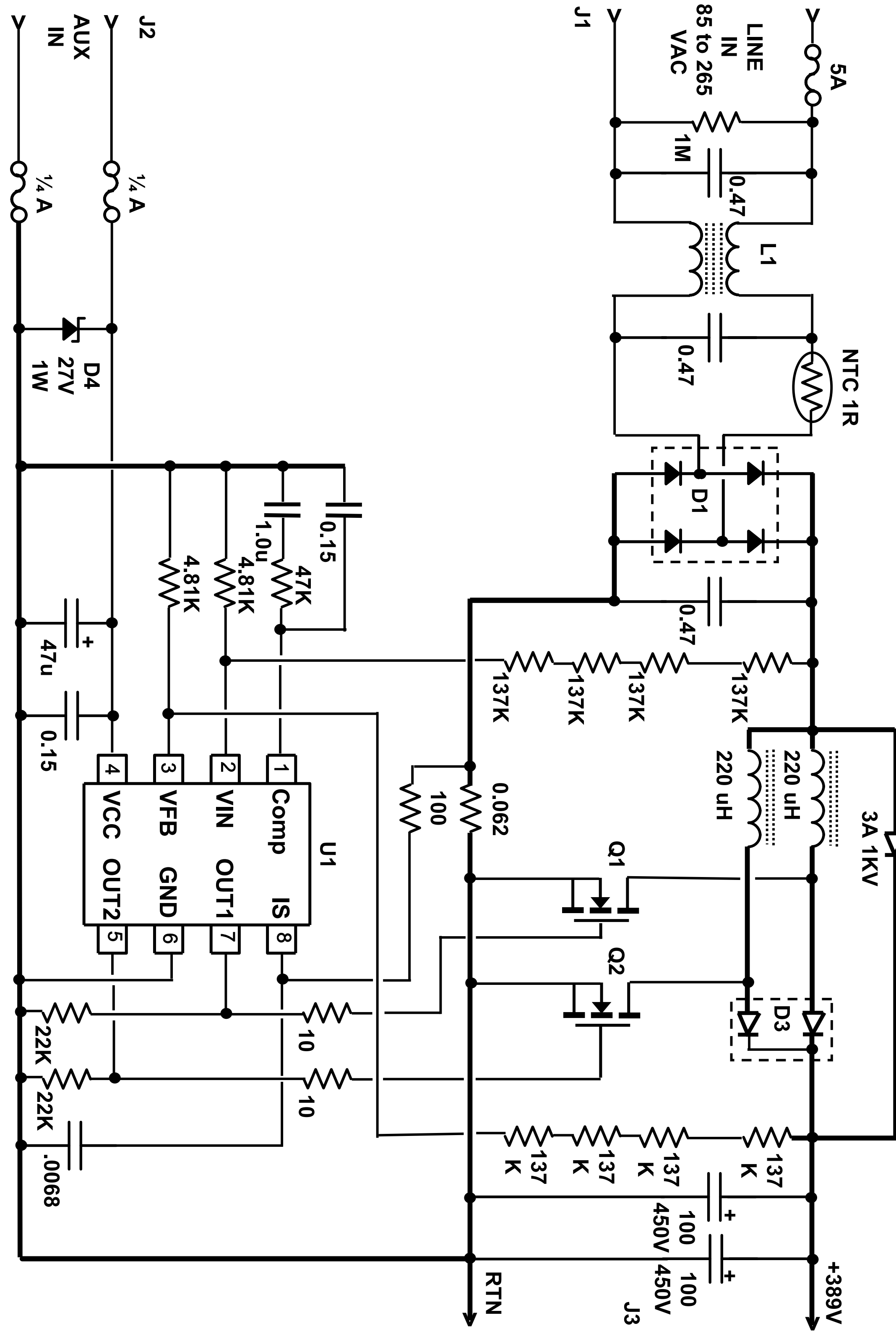


Figure 3: Functional Schematic

Bill of Materials

C1, C2;	0.47 µF Safety	Digi-Key BC1597-ND or 495-3253-ND
C3	0.47 µF 450V	Digi-Key P14202-ND
C4, C5	DNP or 220 pF 2KV with TK10A60D MOSFETs	(MOSFET plus inductor parasitics supply this capacitance)
C6,C9	0.15 µF	Digi-Key 478-1558-1-ND
C7	1.0 µF	Digi-Key 587-1403-1-ND
C8	47 µF 50V	Digi-Key PCE3929CT-ND
C10	6.8 nF	Digi-Key 478-3794-1-ND
C11, C12	100 µF 450V	Digi-Key 493-1462-ND
D1	Bridge Rectifier	Sanken RBV606 or Digi-Key GBJ610-FDI-ND
D2	3A 1KV	Digi-Key S3M-FDICT-ND
D3	Dual fast recovery	Sanken FSY2206
D4	27V 1W Zener Diode	Digi-Key SMAZ27-FDICT-ND
F1	5A 250V	Digi-Key F2913CT-ND
F2, F3	¼ A 250V Fuse	Digi-Key F2326-ND
HS-1	D1 Heatsink	Digi-Key HS352-ND or Equivalent
HS-2, HS-3	Q1, Q2 Heatsink	Aavid 531102B02500G (Use 531302B02500G for TK10A60D)
HS-4	D3 heat sink	Aavid 531102B02500G
J1	Eurostyle Terminal Block	Digi-Key 277-1667-ND
J2	Eurostyle Terminal Block	Digi-Key 277-1667-ND
J3	Eurostyle Terminal Block	Digi-Key 277-1578-ND
L1	Common mode choke	Digi-Key DN4727-ND
L2, L3	220 µH Inductor	Precision PFC-01130-00 Rev 01
LP1	Neon Lamp	NE-2H
Q1, Q2	Layout for TO-220 & TO-247	TK10A60D, FKS6010, or FKS5012
R1	1 Meg Ohm 1 Watt MF	Digi-Key PPC1.0MW-1CT-ND
R2	1 Ohm NTC Thermistor	Digi-Key SL121R010-ND
R3,R4, R5,R6, R8, R9, R10, R11	137 K Ohms 0.1 %	Digi-Key RG3216P-1373-B-T1-ND
R7,R12	4.81 K Ohms 0.1 %	Digi-Key RNCF32T94.81KBICT-ND
R13, R15	10 Ohms 1/4W 5%	Digi-Key P10ECT-ND
R14, R16	22 K Ohms 5%	Digi-Key P22KECT-ND
R17	47 K Ohms 5%	Digi-Key P47KECT-ND
R18	0.06 Ohms 5W 1%	Digi-Key WSHA-.06CT-ND
R19	100 Ohms 5%	Digi-Key P100ALCT-ND
R20	2 Meg Ohm 1 Watt	Digi-Key HVF2512T2004FEBK-ND
R21, R22	Trim shunts if required. [1]	5% tolerance is adequate
R23,R24	549K Ohm .1% 1W	Alternate to R3-R6 and R8-R11
U1	SSC2101	Sanken SSC2101

[1] To properly utilize 1% or 2% resistors in the divider chains, especially with output voltages set very near the peak AC input, the VIN and VFB dividers should be carefully matched. Apply 110V or greater DC at the input without powering the SSC2101 VCC, then add a large value shunt as required at either R21 or R22 such that $V_{PIN2}=V_{PIN3} \pm 1/2\%$ (Or whatever precision is desired). This shunt will comprise a small percentage of the total divider ratio and can therefore be 5% tolerance. Use of 5% or 10% resistors anywhere else in the dividers is not recommended.

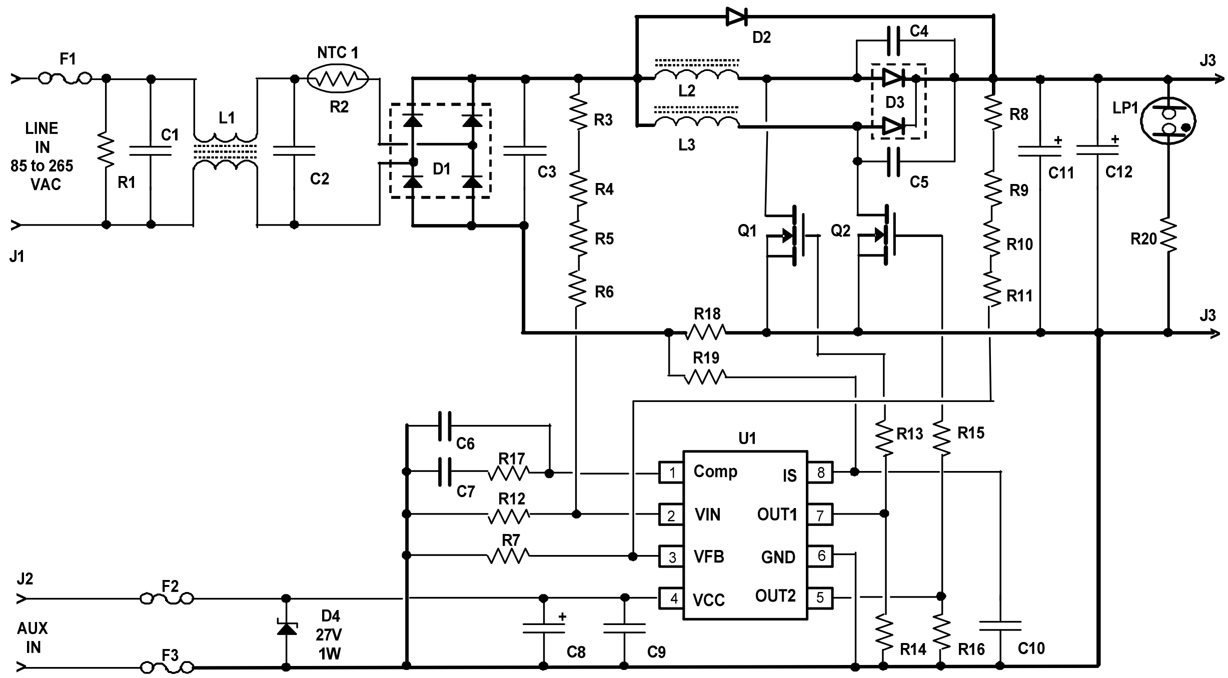


Figure 4: .Bill of Materials Schematic

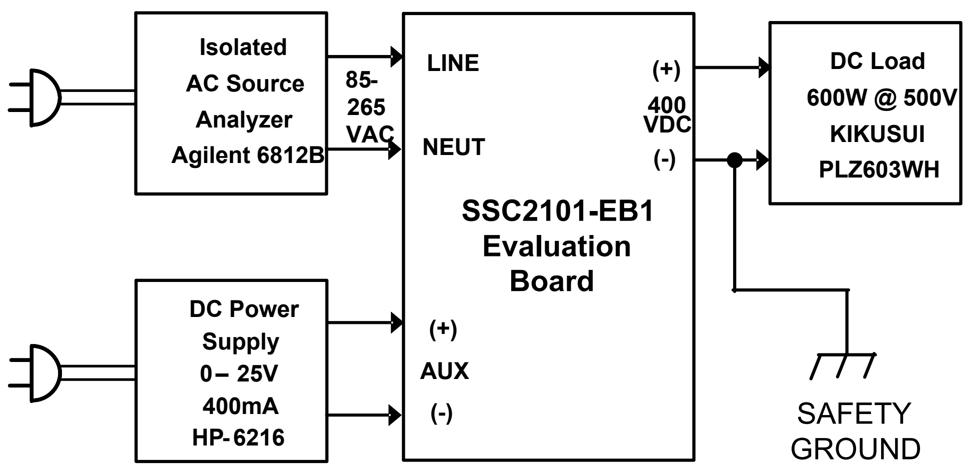


Figure 5: Top View

Set up is quite straightforward: Six connections, shown above, must be made to the board utilizing a properly isolated AC source and safety ground. "Hot" circuit elements are accessible to probes, but mounted out of the way of accidental contact as much as is practicable The DC supply for the IC (AUX) is left uncommitted for the sake of simplicity and is fused so mistakes with line isolation are a little less likely to take an expensive (or dangerous) turn. This VCC supply may be applied before, concurrently with, or after the mains supply as desired. A neon lamp between C11 and the output connector will indicate the presence of high voltage at the output. Source, load, and DC may now be varied at will to evaluate circuit operation.

The initial selection of components was intentionally done in a very conservative manner. The goal is to minimize downtime in the lab. The MOSFETs and rectifier diodes are all mounted on separate heat-sinks to facilitate temperature measurements. The controller and its associated passives are located to one side for easy access and modification and three typical inductor patterns are provided to facilitate experimentation. Twelve Amp MOSFETs will be supplied with Aavid 531102B02500G heat sinks while lower current devices with their greater R_{DSON} losses would be equipped with the larger Aavid 531302B02500G heat sinks.

Another trade off will of course be input voltage range vs. power output. As supplied, this eval board will supply 200W from 75 to 265VAC, 250W from 85 to 265VAC, and 600W between 165 and 256VAC. DC losses in L2 and L3 might easily necessitate some extra cooling for continuous duty at 600W current levels.

Example Lab Results:

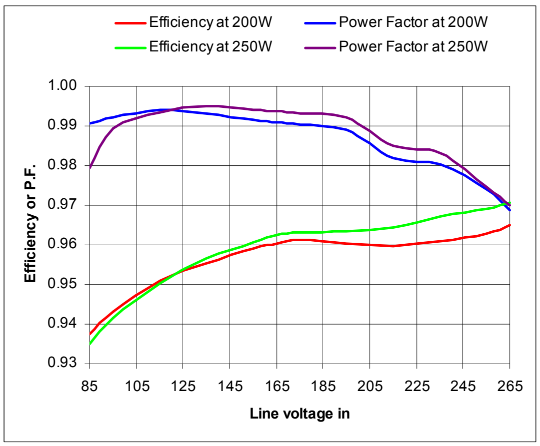


Figure 6: Efficiency and Power Factor Vs. Line In

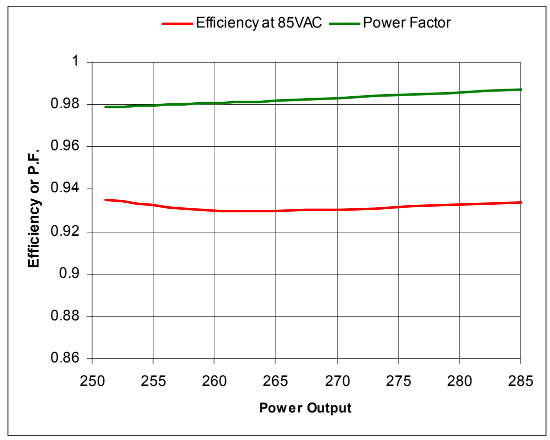


Figure 7: Efficiency and Power Factor at 85 VAC In

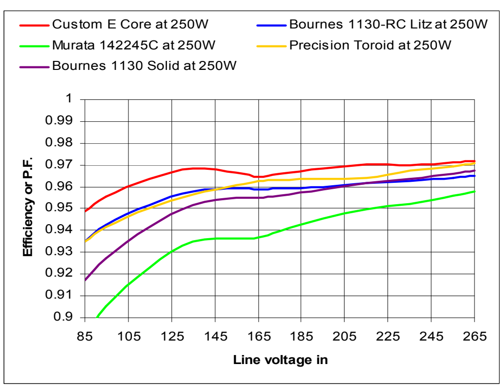


Figure 8: Effect Of Various Inductors

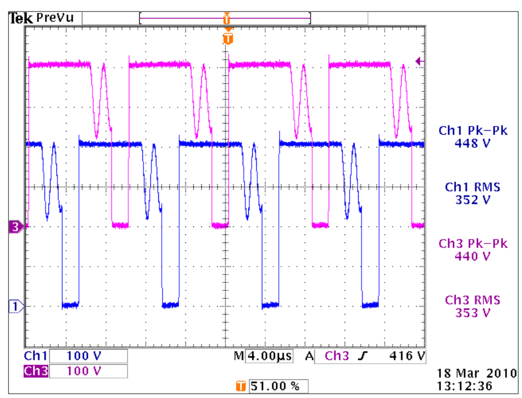


Figure 9: Q1 and Q2 Drain Waveforms

Contacts:

Europe

Sanken Power Systems (UK) Limited
Pencoed Technology Park
Pencoed Bridgend
CF35 5HY. UK
Tel: 44-1656-869-100
sales@sankenpower.co.uk

North America

Allegro MicroSystems, Inc.
115 Northeast Cutoff
Worcester, Massachusetts 01606, U.S.A.
Tel: 1-508-853-5000
sales@allegromicro.com

Polar Semiconductor, Inc.
(IC and Board Design)
2800 Old Shakopee Road
Bloomington, Minnesota 55425
techsupport@Polarfab.com