Engineering Test Report

Design of 5V*2.4A Charger with SC1225K (InnoSwitch)

Features :

- Build in Secondary Sync-Rectification. Efficiency Ratings exceeded DoE & CoC_v5.0;
- Integrated-Secondary Side Regulation with Fast DLR;
- Complete System and Output Protections (SCP, OPP, OCP, OVP, OTP).
- Simple Transformer Design

2-Sep-2014, Rev-1

RL (PI-Shenzhen)

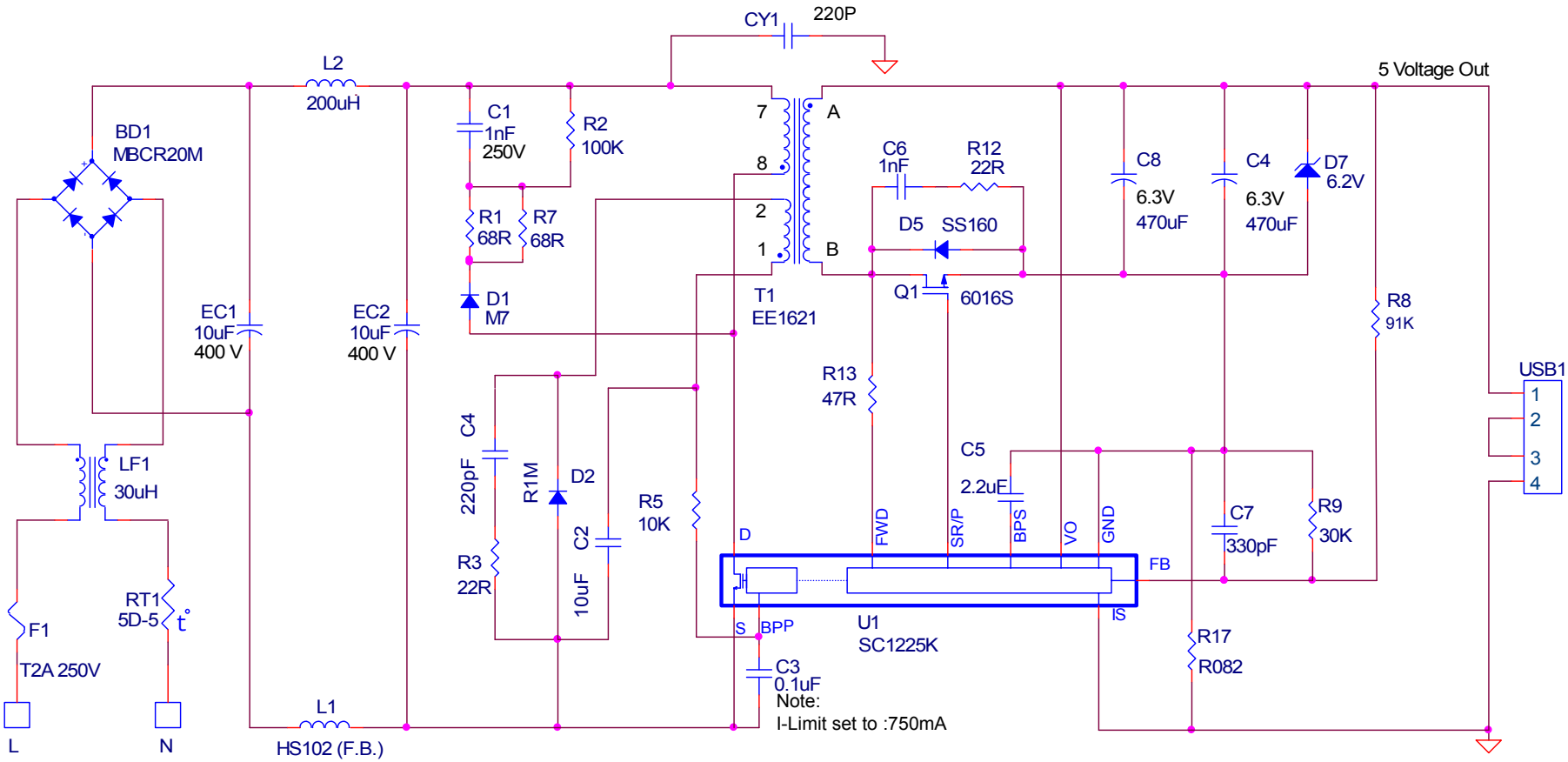
Demo Design # PI-C-USB-50 (Rev-1)

1. Power Supply Specification

Description	Symbol	Min	Typ	Max	Units	Comment/Conditions
INPUT						
Voltage	V_{IN}	90		264	V_{AC}	2 Wire no P.E
Frequency	f_{LINE}	47	50/60	63	Hz	
No-load Input Power	P_{IN}			30	mW	Input 230 V_{AC}
OUTPUT						
Output Voltage	V_{OUT}	4.85	5.00	5.25	V	Measured at the End of Cable,
Output Current	I_{OUT}	2.4			A	
Output Ripple Voltage	V_{RIPPLE}			150	mV_{P-P}	Measured at the End of PCB
Total Output Power						
Continuous Output Power	P_{OUT}	12			W	
Peak Output Power	P_{OUT_PK}				W	
Conducted EMI Margin		6			dB	CISPR22B/EN55022 class B
Average Efficiency	h				%	115 and 230V_{AC}
Ambient Temprature	T_{AMB}			40	°C	Free convection, sea level
Surge Test			TBD		kV	
Safety		Designed to meet IEC950, UL1950 Class II				

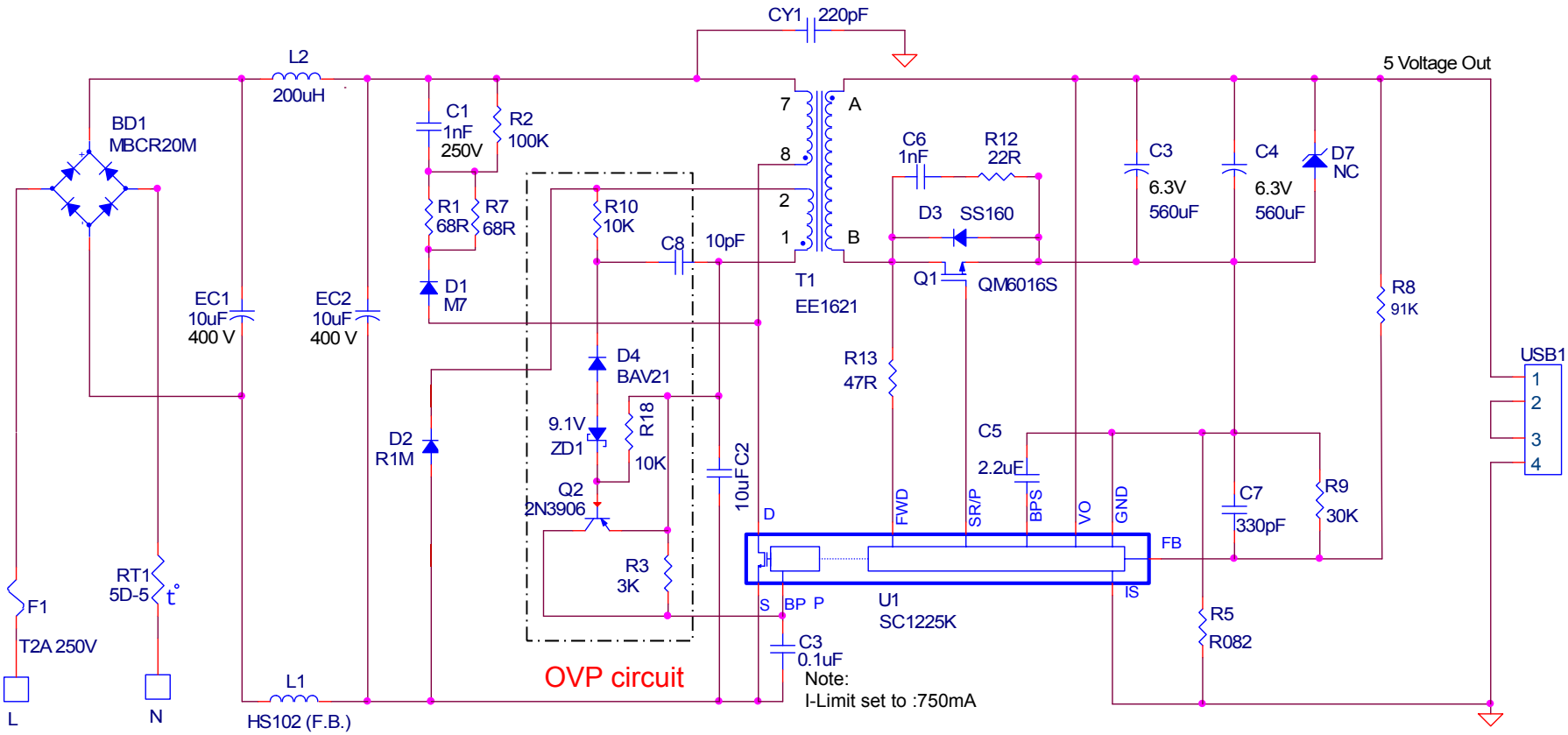
Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

2. Schematic – General



Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

3. Schematic – Added Primary OVP



Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

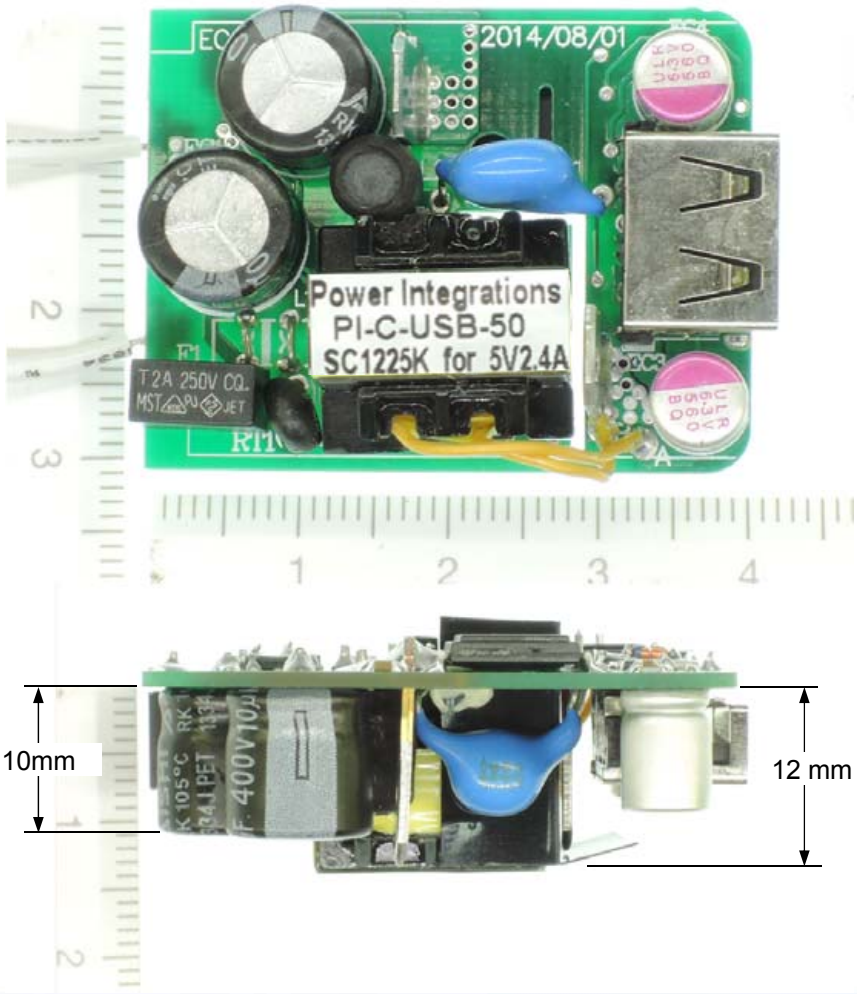
4. BOM

Number	Quantity	Reference	Value	Description
1	2	EC1,EC2	10uF	10uF, 400 V, Electrolytic, 10 x 10
2	2	C3,C4	560uF	560uF,6.3V, Solid cap ,(8 x 9)
3	1	C1	1nF	1nF, 250V, Ceramic, X7R,0805
4	1	C2	10uF	10uF, 50 V, Ceramic, X7R, 1206, part number :GJ831CR61E106KE83
5	1	C4	220pF	220pF, 100V, Ceramic, X7R,0805
6	1	C6	1nF	1nF, 100V, Ceramic, X7R,0805
7	1	C3	0.1uF	100 nF, 50 V, Ceramic, 0805
8	1	C5	2.2uF	2.2uF, 25 V, Ceramic, X7R, 0805
9	1	C7	330pF	330pF, 25 V, Ceramic, X7R, 0603
10	1	C8	10pF	10pF, 100V, Ceramic,X7R,0603
11	1	Q1	QM6016S	60V,6A, N-Channel Mosfet, SO-8
12	1	Q2	2N3906	2N3906,PNP transistor.
13	1	CY1	220pF	100pF, 250VAC, Y1
14	1	BD1	MBCR20M	1000V, 2 A, Rectifier
15	1	D1	M7	1000V, 1 A, Rectifier SMA
16	1	D2	RIM	1000V, 0.8 A, Fast Rectifier, Sub SMA
17	1	D4	BAV21	250V,small signal diode, SOD123
18	1	D5	SS160	60 V, 1A, Schottky, Sub SMA
19	1	ZD1	9.1V	15V, Zenner, DL-35
20	1	F1	2A	2A, 250V, Time-lag fuse,
21	1	RT1	5R	5D-5, 5R, 2A, Thermistor
22	1	LF1	30uH	30uH, NiZn toroild CM Choke
23	1	L2	200uH	200uH,Drum inductor ,5X7
24	1	L1	1K	Bead , 1K @ 100Mhz
25	2	R1,R7	68 R	68R, 5%,Thick Film, 1206
26	1	R2	100 K	100 K,5%,Thick Film, 0805
27	1	R3	3K	3K, 5%,Thick Film, 0603
28	2	R4	22 R	22 R, 5%,Thick Film, 0603
29	1	R10	10K	10K, 5%,Thick Film, 0603
30	1	R12	22R	22 R, 5%,Thick Film, 0805
31	1	R13	47R	47R, 5%,Thick Film, 0805
32	1	R8	91 K	91 K, 1%,Thick Film, 0603
33	1	R9	30 K	30 K, 1%,Thick Film, 0603
34	1	R17	R082	82m, 1%,Thick Film, 2516
35	1	R18	10K	10K, 5%,Thick Film, 0603
36	1	T1	EE1621	Extended Bobbin, EE1621, wide core, Vertical
37	1	U1	SC1225k	Innoswitch, SC1225K, 100kHz, 4D-FET, A/R=65%, CDC=6%, CC 2A (Current Limit set to 750mA by C3, 100nF)
38	2	HS	HS	Heatsink
Total :	43			

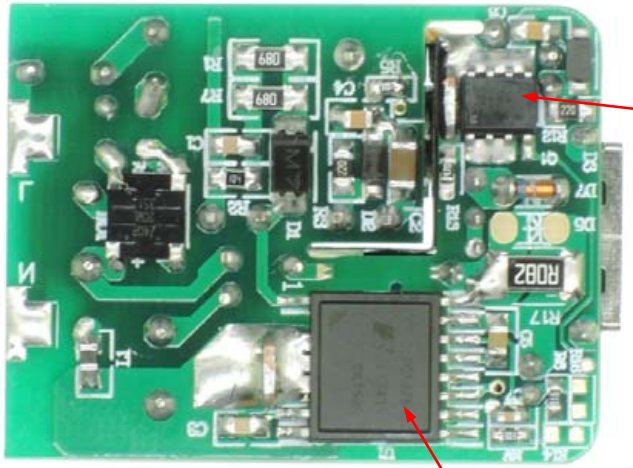
Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

5 Circuit Board

Component side

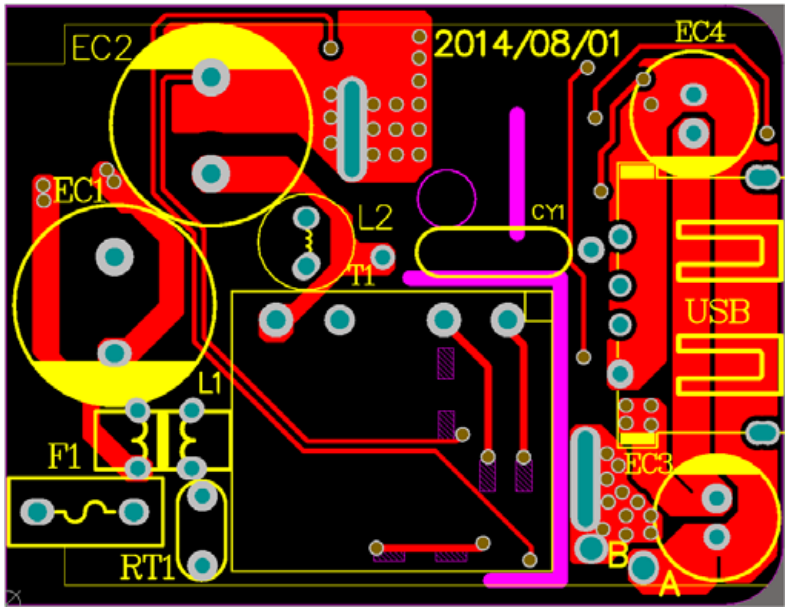


Solder side



Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

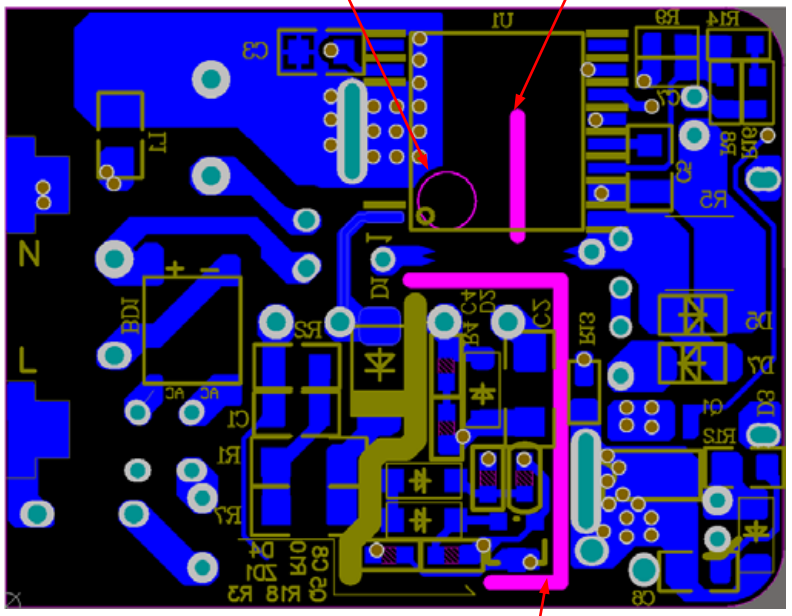
6. Circuit board



Component side

Safety hole (Φ2mm), adjacent to stand-off, underneath the InnoSwitch)

Safety Slot (to be opened underneath the InnoSwitch)

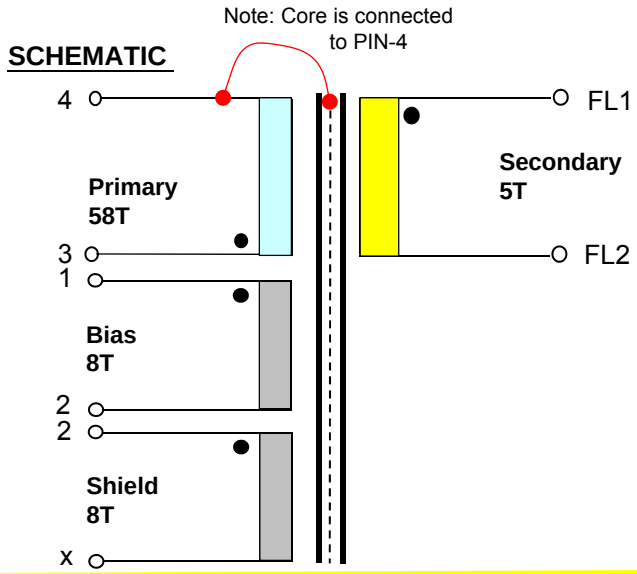


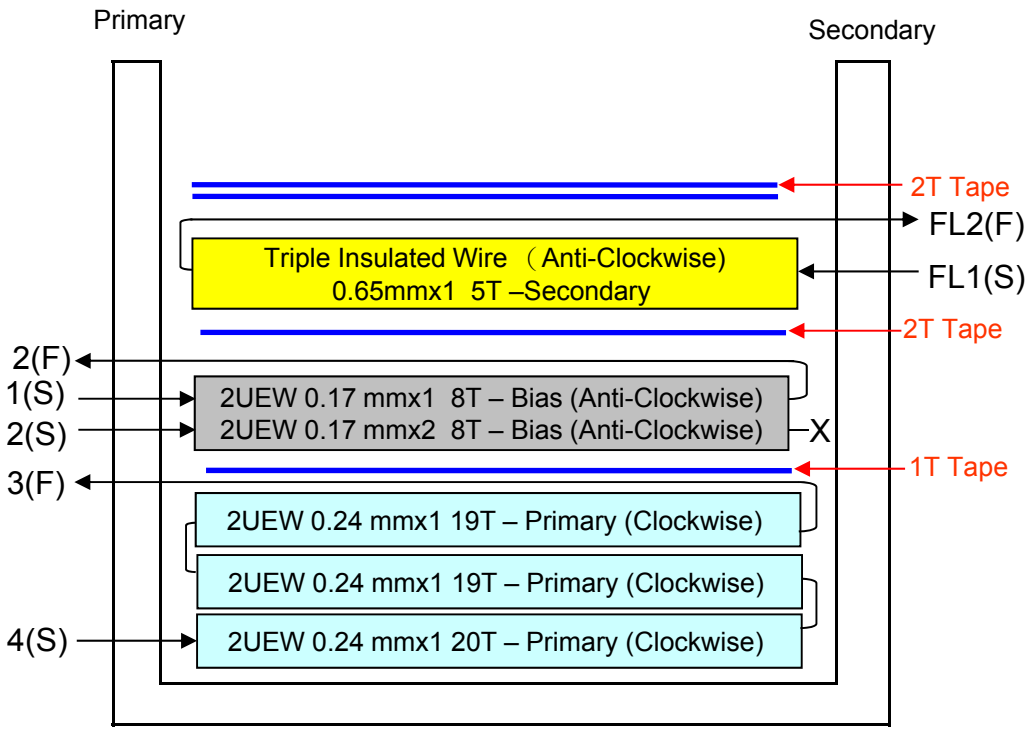
Solder side

Safety Slots (to be inserted with Mylar Insulation Sheet)

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

7. Transformer Information





ELECTRICAL SPECIFICATIONS:

1. Primary Inductance (Lp) = 640uH± 7% @100KHz
2. Primary Leakage Inductance 50uH
3. Electrical Strength = 3KV, 50/60Hz,1Min

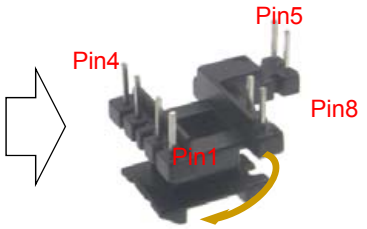
MATERIALS:

1. Core : EE1621 (Ferrite Material TDK PC40 or equivalent, Ae=33mm^2, Bw=5.4mm)
2. Bobbin : ELPD16 (4pin+2pin).
3. Magnet Wires (Pri) : Type 2-UEW
4. Magnet Wire (Sec) : Triple Insulated Wires

FINISHED :

1. Varnish the complete assembly

Wire started in clockwise direction from pin-3 and ended at pin-4 when looking from the bottom side of the bobbin(right photo)



Wire dressing direction

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

8. Regulation, Ripple & Efficiency Measurement

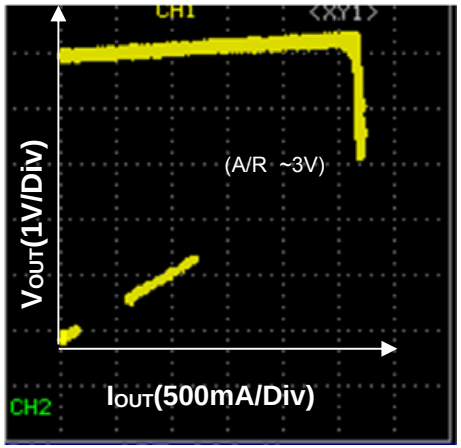
*** Note: Output voltage & Ripple is measured at PCB End.**

V_{IN} (V_{AC})	P_{IN} (W)	V_{OUT} (V)	I_{OUT} (mA)	V_{RIPPLE} (mV_{P-P})	P_{OUT} (W)	η (%)	Average η(%)	DOE η (%)
90	0.008	5.05	0	30			84.53	79.94
	3.59	5.13	600	35	3.08	85.67		
	7.40	5.21	1200	65	6.26	84.54		
	11.30	5.28	1800	60	9.51	84.17		
	15.34	5.35	2400	55	12.84	83.73		
115	0.080	5.05	0	30	0	0	84.86	
	3.64	5.13	600	35	3.08	84.52		
	7.34	5.21	1200	65	6.25	85.18		
	11.18	5.28	1800	65	9.50	85.01		
	15.15	5.35	2400	55	12.84	84.75		
230	0.010	5.05	0	35	0	0	84.26	
	3.75	5.13	600	40	3.08	82.08		
	7.42	5.21	1200	50	6.25	84.32		
	11.15	5.28	1800	75	9.50	85.24		
	15.06	5.36	2400	70	12.86	85.42		
264	0.012	5.05	0	35	0	0	83.88	
	3.77	5.13	600	40	3.08	81.64		
	7.49	5.21	1200	50	6.25	83.47		
	11.19	5.29	1800	75	9.52	85.09		
	15.08	5.36	2400	70	12.86	85.31		

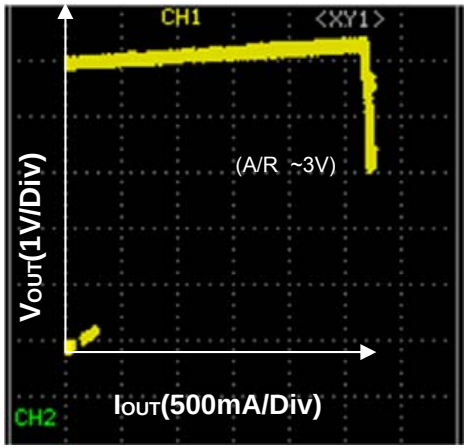
Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

9. Output VI Characteristic

(Measured at PCB end)



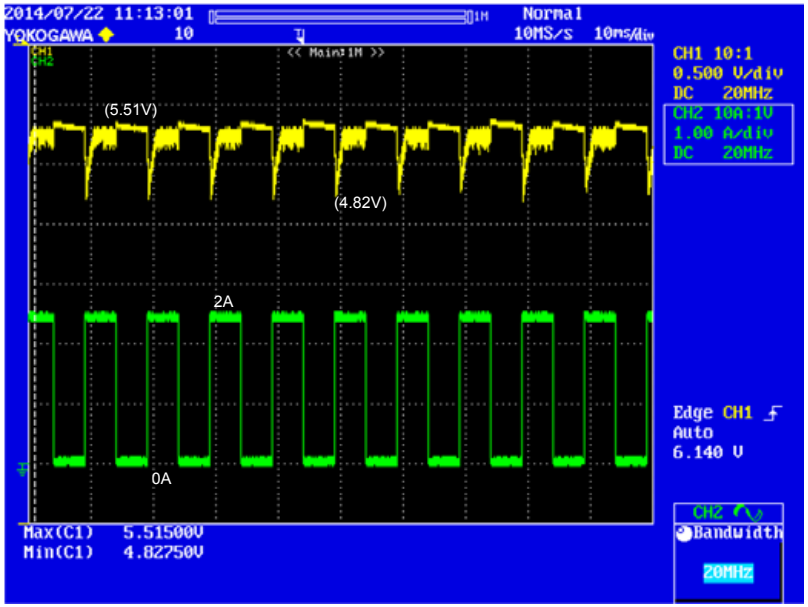
V_{IN}=90Vac

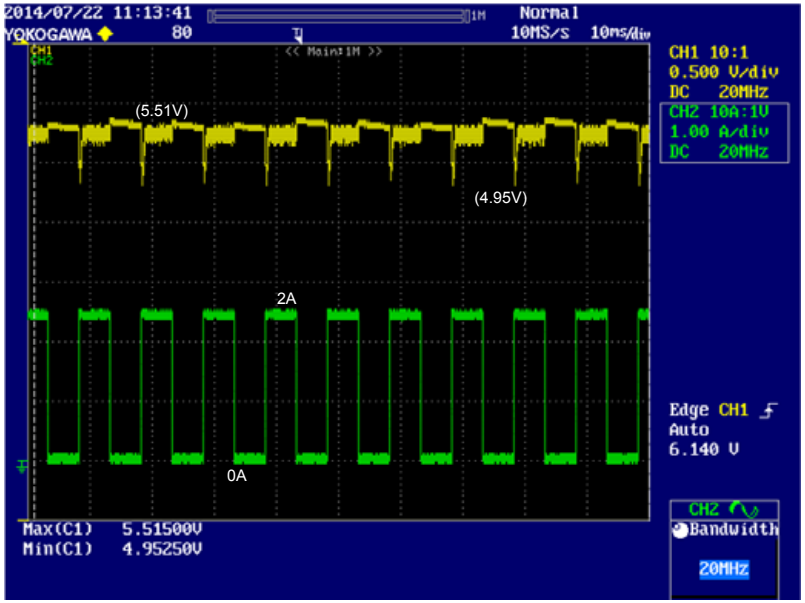


V_{IN}=264Vac

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

10. DLR Load Response (5ms/5ms,measure at PCB end)





CH4: Output Voltage, 0.5V/Div
CH2: Output Current, 1A/Div

Test Conditions:

1. **AC input = 90VAC**
2. **Load range: 0A-2.4A-0A**
3. **Frequency: 100Hz(5ms/5ms)**
4. **Slew rate: 0.25A/S**

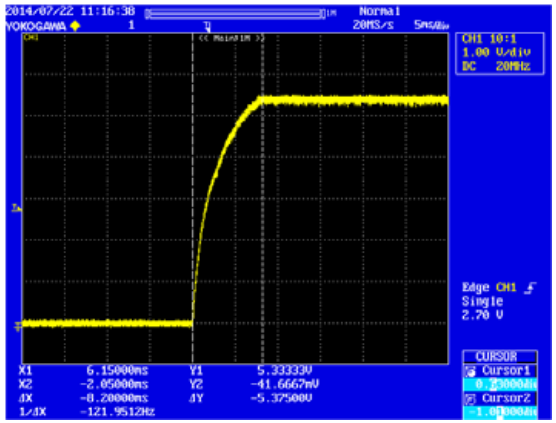
CH1: Output Voltage, 0.5V/Div
CH2: Output Current, 1A/Div

Test Conditions:

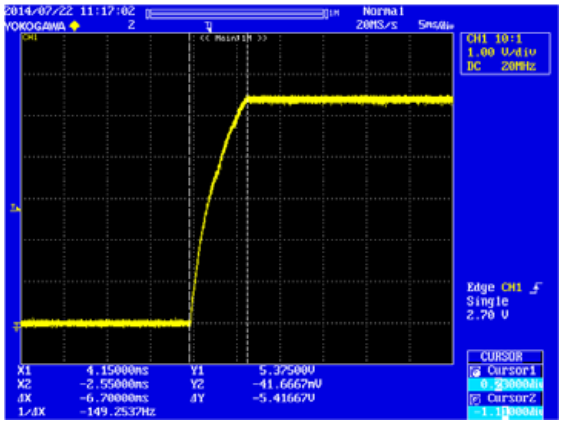
1. **AC input = 264VAC**
2. **Load range: 0A-2.4A-0A**
3. **Frequency: 100Hz(5ms/5ms)**
4. **Slew rate: 0.25A/S**

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

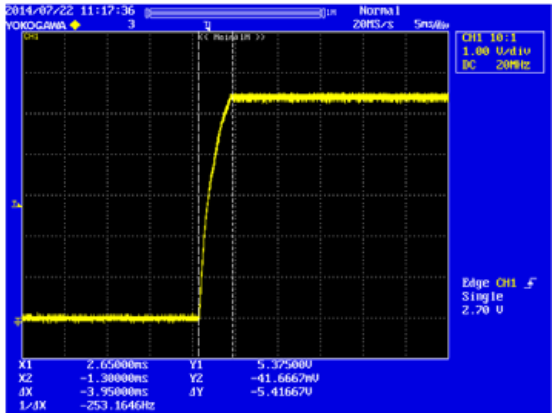
11. Output Rise Time (2A load)



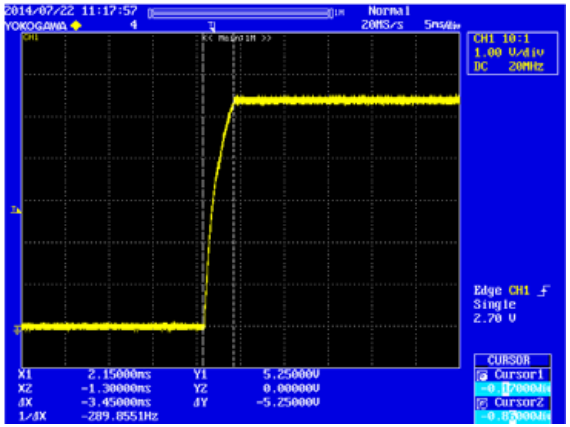
90Vac
Rise time=8.2ms



115Vac
Rise time=6.7ms



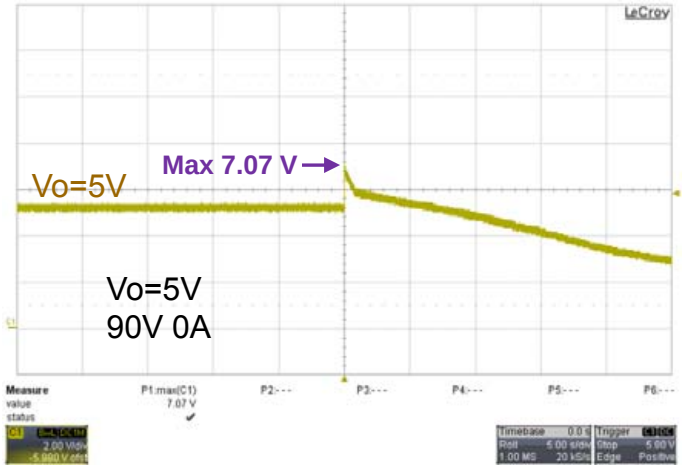
230Vac
Rise time=3.9ms

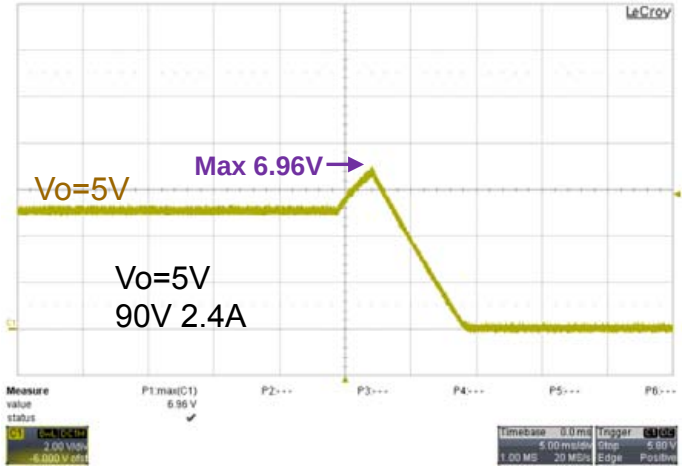


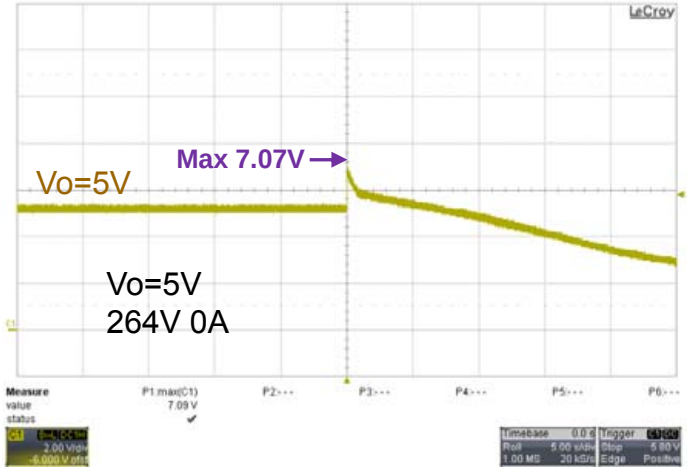
264Vac
Rise time=3.45ms

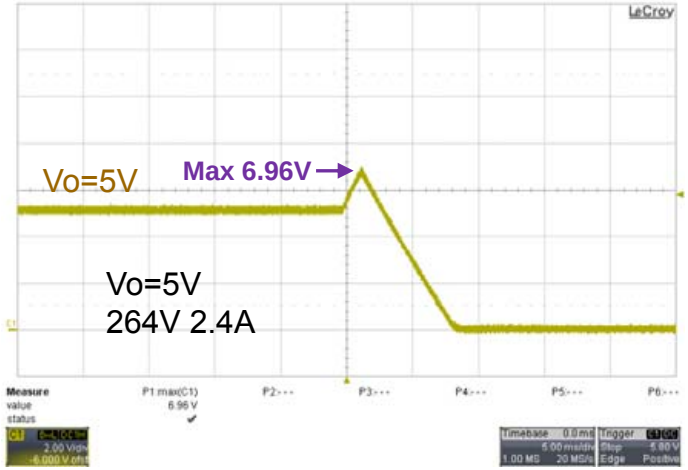
Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

12. OVP Test (with Primary OVP)



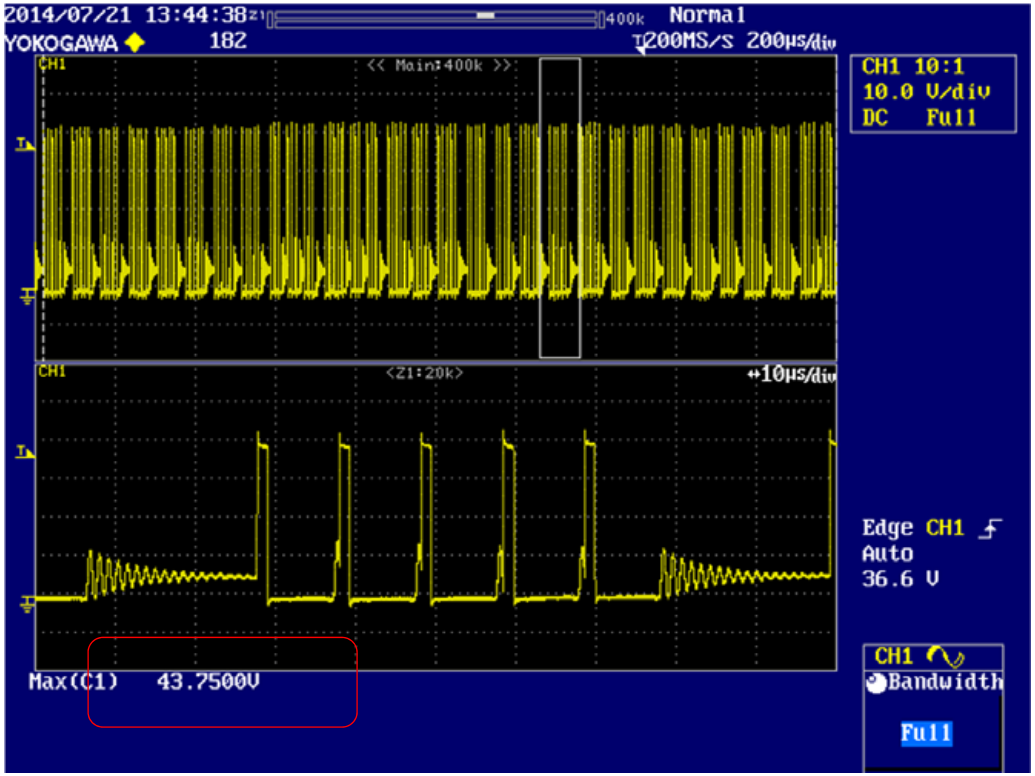






Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

13. Output SR-FET Maximum PIV



Test Condition:

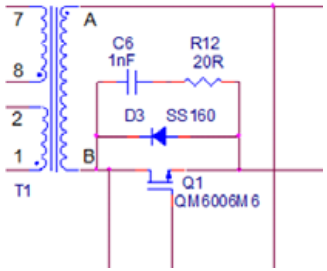
V_{IN}=264V_{AC}, Iout=2.4A

RESULT: PIV= 43.7V

Device used :

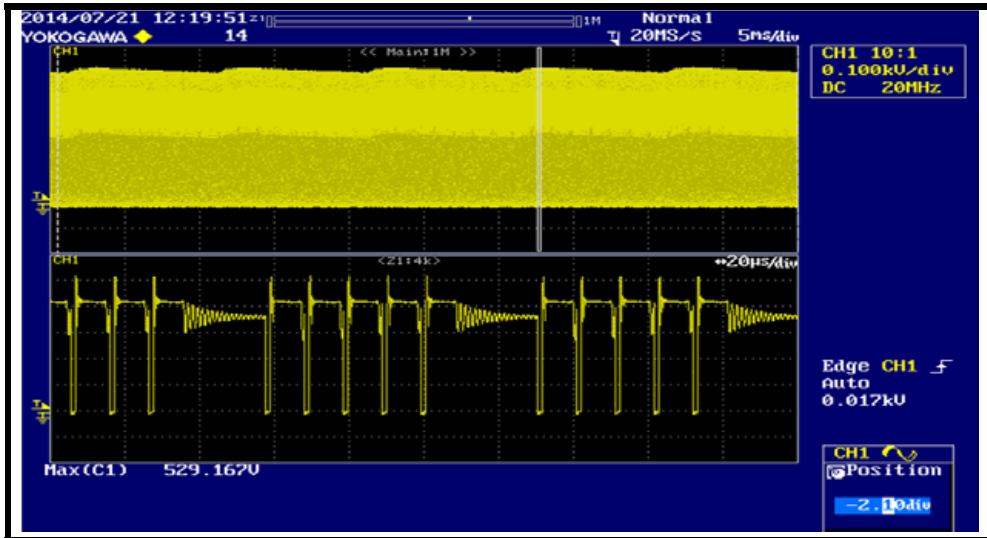
a) SR-FET (Q1) = *QM6016S@6A/60V;

b) Parallel Diode (D3) : SS160 @1A/60V



Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

14. Maximum Drain Voltage During Start up



Test Condition:

V_{IN}=264V_{AC}, I_{OUT}=2.4A

Power ON

RESULT: $V_{DRAIN-MAX}$ =**529**V

(InnoSwitch, SC1225K)

SC1225K

Absolute Maximum Ratings[1,2]

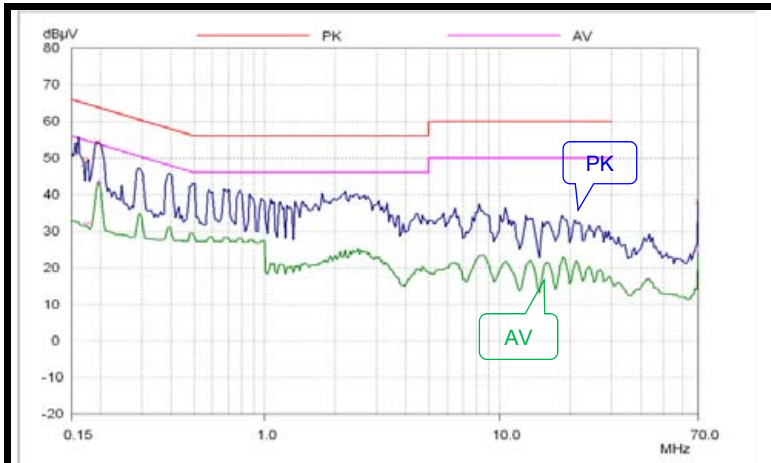
DRAIN Pin Voltage	-0.3 V to 650 V
DRAIN Pin Peak Current	1360 (2550) mA[3]
PRIMARY BYPASS/SECONDARY BYPASS Pin Voltage	-0.3 V to 9 V
PRIMARY BYPASS/SECONDARY BYPASS Pin Current	100 mA
FORWARD Pin Voltage	-1.5 V to 70 V
FEEDBACK Pin Voltage	-0.3 V to 9 V
SR/P Pin Voltage	-0.3 V to 9 V
OUTPUT VOLTAGE Pin Voltage	-0.3 V to 9 V
Storage Temperature	-65 to 125 °C
Operating Junction Temperature[4]	-40 to 125 °C
Ambient Temperature	-40 to 85 °C
Lead Temperature	260 °C

Notes:
1. All voltages referenced to Source and Secondary Ground, T_A = 25 °C.
2. Maximum ratings specified may be applied one at a time without causing permanent damage to the product. Exposure to Absolute Maximum Ratings conditions for extended periods of time may affect product reliability.
3. Higher peak Drain current is allowed while the Drain voltage is simultaneously less than 400 V.
4. Normally limited by internal circuitry.
5. 1/16" from case for 5 seconds.

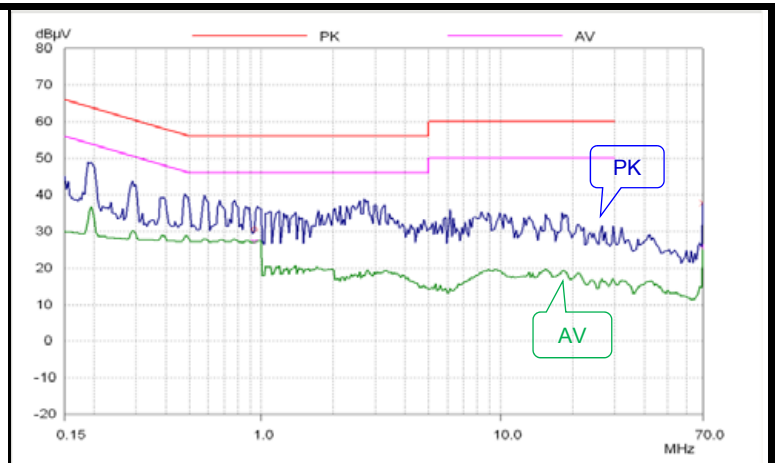
Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

15. Conduction EMI (PK and AV)

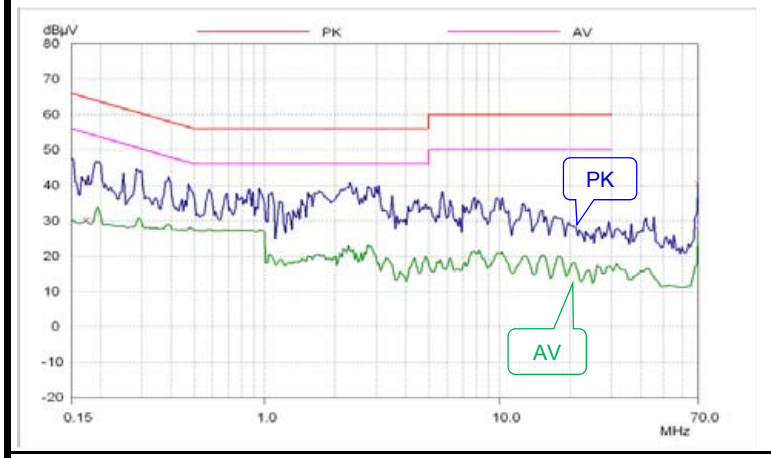
(Output Floating, EN55022 Class-B Limited)



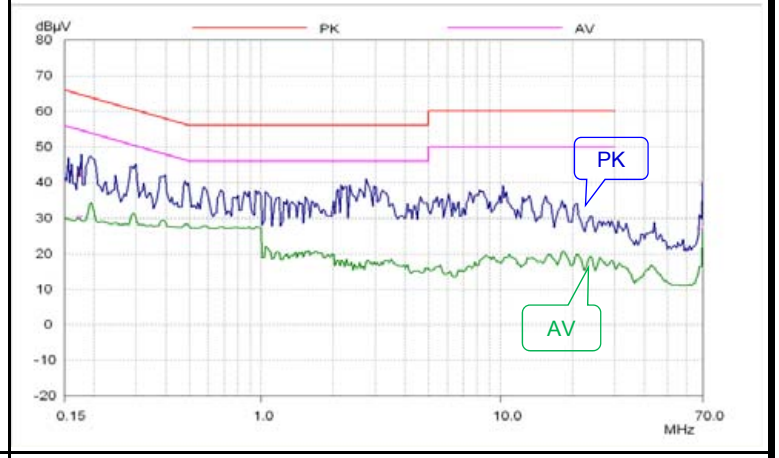
115VAC, L



115VAC, N



230VAC, L



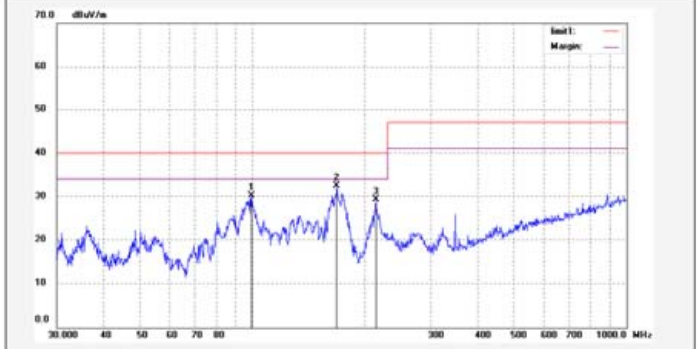
230VAC, N

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

16.1 RE test

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

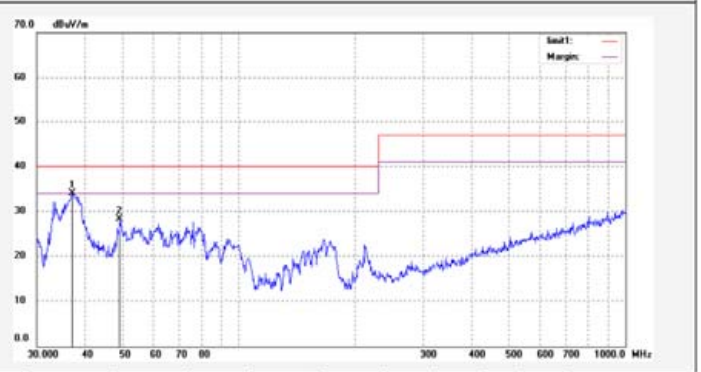
Job No.: PI #1798
Standard: EN55022 ClassB Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT:
Mode: FULL LOAD
Model: 5V 2.4A
Manufacturer:
Polarization: Horizontal
Power Source: AC 230V/50Hz
Date: 2014/08/26
Time: 16:29:09
Engineer Signature:
Distance: 3m
Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	99.4177	43.50	-13.32	30.18	40.00	-9.82	peak			
2	168.4043	46.39	-13.93	32.46	40.00	-7.54	peak			
3	213.8535	41.26	-11.95	29.31	40.00	-10.69	peak			

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg,A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: PI #1799
Standard: EN55022 ClassB Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT:
Mode: FULL LOAD
Model: 5V 2.4A
Manufacturer:
Polarization: Vertical
Power Source: AC 230V/50Hz
Date: 2014/08/26
Time: 16:31:18
Engineer Signature:
Distance: 3m
Note:



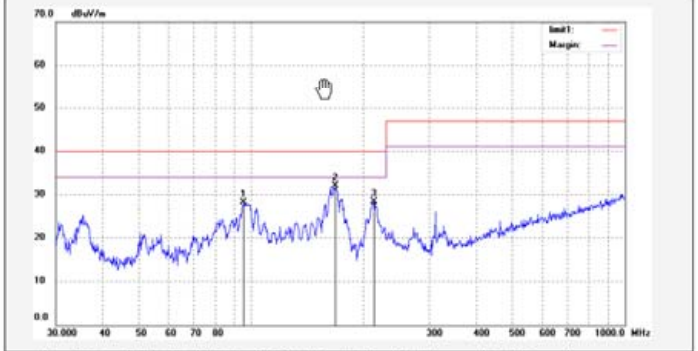
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	37.1709	44.88	-10.90	33.98	40.00	-6.02	peak			
2	49.2354	40.91	-12.60	28.31	40.00	-11.69	peak			

230Vac

16.2 RE test

ATC® ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg.A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

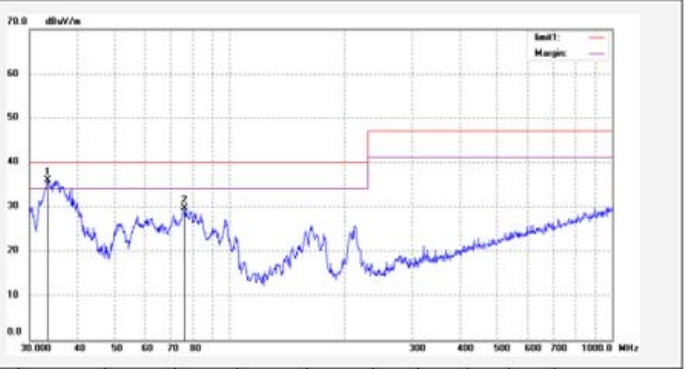
Job No.: PI #1801
Standard: EN55022 ClassB Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT:
Mode: FULL LOAD
Model: 5V 2.4A
Manufacturer:
Polarization: Horizontal
Power Source: AC 120V/60Hz
Date: 2014/08/26
Time: 16:36:59
Engineer Signature:
Distance: 3m
Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	95.3131	42.96	-14.72	28.24	40.00	-11.76	peak			
2	167.8136	46.16	-14.03	32.13	40.00	-7.87	peak			
3	213.1035	40.47	-11.99	28.48	40.00	-11.52	peak			

ATC® ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg.A,Changyuan New Material Port Keyuan Rd, Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: PI #1800
Standard: EN55022 ClassB Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT:
Mode: FULL LOAD
Model: 5V 2.4A
Manufacturer:
Polarization: Vertical
Power Source: AC 120V/60Hz
Date: 2014/08/26
Time: 16:34:32
Engineer Signature:
Distance: 3m
Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	33.4522	46.17	-10.26	35.91	40.00	-4.09	peak			
2	76.1190	46.44	-16.71	29.73	40.00	-10.27	peak			

120Vac

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

17. Temperature Rise

Test Setup :

a) Perform under a controlled temperature chamber with Ambient 40℃;

b) PCB is being mounted inside an enclosed simulated plastic housing ;

c) Thermal coupler (type-K) are attached to respective measuring points;

d) Temperature is recorded after 2 hours from initial turn on.

	Input:90Vac Load:4A	Input:264Vac Load:4A
Components	**Temperature(℃)**	**Temperature(℃)**
T-Ambient	40.5	40.3
U1(SC1225K)	98.2	94.8
Core	100.2	99.2
T1(winding)	102.1	101.3
Q1, SR-MOSFET	101.7	103.2
EC3, Solid-Ecap 560uF 6.3V	98.0	99.5
EC2,bulk cap	89.0	82.6

Test set up with UUT inside a simulated casing

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

18. Product Selection Table

Part used in current design

Nickname	QC Standard	QC+2A Legacy	Single Output	QC Premium	QC Plus	Single Output
PN	SC1221K	SC1222K	SC1225K	SC1223K	SC1224K	SC1226K
Die Size (FET)	4	4	4	5	5	5
CC [A] on 5V	1.5	2	2	2	2	2
Power Max [W]	15	15	15	20	20	20
Suggested Transformer	ELPD16-8/ RM6	ELPD16-8/ RM6	ELPD16-8/ EPC17	EDR2010/ RM7/8	EDR2010/ RM7/8	EDR2010/ RM7/8
Current Profile	117	176	Not for QC	117	186	Not for QC
Actual (5V, 9V, 12V)	1.5A/1.5A/1.13A	2.0A/1,5A/1.25A	2A	2.0A/2.0A/1.5A	2.0A/1.65A/1.25A	2A
I-lim Low C_{BP} = 1.0 uF	650	650	650	850	850	850
I-lim Standard C_{BP} = 0.1uF	750	750	750	950	950	950
I-lim High C_{BP} = 10uF	850	850	850	1050	1050	1050
Cable Drop (CDC)	6%	6%	6%	6%	6%	6%
Auto-Restart (A/R)	65%	65%	65%	65%	65%	65%
Operating Freq.	100kHz	100kHz	100kHz	100kHz	100kHz	100kHz

17 Mar 2014

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

19. Product Specification

(for < 15W, part used in current design)

SC1225K
InnoSwitch™ Family

Off-Line CV/CC Flyback Switcher IC with Integrated MOSFET, Sync-Rect and Feedback

Product Highlights

Highly Integrated, Compact Footprint
- Incorporates flyback controller, 725 V MOSFET, secondary-side sensing and synchronous rectification
- Integrated, HIPOT-isolated, feedback link
- Exceptional CV/CC accuracy, independent of transformer design or external components
- Instantaneous transient response ±5% CV with 0-100-0% load step

EcoSmart™– Energy Efficient
- <10 mW No-load @ 230 VAC with optional bias winding
- Easily meets all global energy efficiency regulations
- Low heat dissipation

Advanced Protection / Safety Features
- Primary sensed output OVP with optional bias winding
- Secondary sensed output overshoot clamp
- Secondary sensed output OCP to zero output voltage
- Hysteretic thermal shutdown

Full Safety and Regulatory Compliance
- 100% production HIPOT compliance testing at 6 kV DC/1 sec
- Reinforced insulation
- Isolation voltage = 3,500 VAC
- UL1577 and TUV (EN60950) safety approved
- EN61000-4-8 (100 A/m) and EN61000-4-9 (1000 A/m) compliant

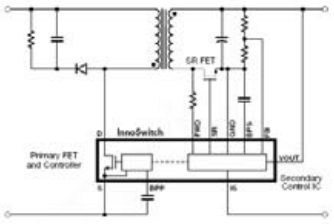
Green Package
- Halogen free and RoHS compliant

Applications
- Chargers and adapters for smart mobile devices
- LED lighting
- High efficiency, low voltage, high current power supplies

Description

The InnoSwitch family of ICs dramatically simplifies the development and manufacturing of low voltage, high current power supplies, particularly those in compact enclosures or with high efficiency requirements. The InnoSwitch architecture is revolutionary in that the devices incorporate both primary and secondary controllers, with sense elements and a safety-rated feedback mechanism into a single IC.

Close component proximity and innovative use of the integrated communication link permit accurate control of a secondary-side synchronous rectification MOSFET and optimization of primary-side switching to maintain high efficiency across the entire load range. Additionally, the minimal DC bias requirements of the link, enables the system to achieve less than 10 mW no-load in challenging applications such as smart-mobile device chargers.



(a) Typical Application Schematic

Figure 1. Typical Application/Performance.

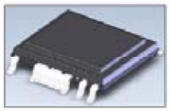


Figure 2. High Creepage, Safety-Compliant eSOP Package.

Output Power Table

Product[3]	230 VAC ±15%		85-265 VAC	
	Adapter[1]	Peak or Open Frame[2]	Adapter[1]	Peak or Open Frame[2]
SC1225K	15 W	20 W	15 W	20 W

Table 1. Output Power Table.

Notes:
1. Minimum continuous power in a typical non-ventilated enclosed adapter measured at 40 °C ambient. Assumes +12 V output.
2. Minimum peak power capability.
3. Package: KR: eSOP-R16B.

www.powerint.com

PRELIMINARY

January 2014

This document contains information on a new product. Specifications and information herein are subject to change without notice.

(for design < 20W)

SC1226K
InnoSwitch™ Family

Off-Line CV/CC Flyback Switcher IC with Integrated MOSFET, Sync-Rect and Feedback

Product Highlights

Highly Integrated, Compact Footprint
- Incorporates flyback controller, 650 V MOSFET, secondary-side sensing and synchronous rectification
- Integrated, HIPOT-isolated, feedback link
- Exceptional CV/CC accuracy, independent of transformer design or external components
- Instantaneous transient response ±5% CV with 0-100-0% load step

EcoSmart™– Energy Efficient
- <10 mW No-load @ 230 VAC with optional bias winding
- Easily meets all global energy efficiency regulations
- Low heat dissipation

Advanced Protection / Safety Features
- Primary sensed output OVP with optional bias winding
- Secondary sensed output overshoot clamp
- Secondary sensed output OCP to zero output voltage
- Hysteretic thermal shutdown

Full Safety and Regulatory Compliance
- 100% production HIPOT compliance testing at 6 kV DC/1 sec
- Reinforced insulation
- Isolation voltage = 3,500 VAC
- UL1577 and TUV (EN60950) safety approved
- EN61000-4-8 (100 A/m) and EN61000-4-9 (1000 A/m) compliant

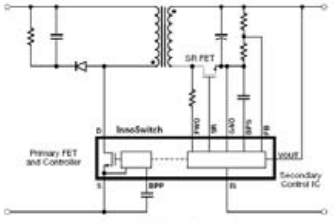
Green Package
- Halogen free and RoHS compliant

Applications
- Chargers and adapters for smart mobile devices
- LED lighting
- High efficiency, low voltage, high current power supplies

Description

The InnoSwitch family of ICs dramatically simplifies the development and manufacturing of low voltage, high current power supplies, particularly those in compact enclosures or with high efficiency requirements. The InnoSwitch architecture is revolutionary in that the devices incorporate both primary and secondary controllers, with sense elements and a safety-rated feedback mechanism into a single IC.

Close component proximity and innovative use of the integrated communication link permit accurate control of a secondary-side synchronous rectification MOSFET and optimization of primary-side switching to maintain high efficiency across the entire load range. Additionally, the minimal DC bias requirements of the link, enables the system to achieve less than 10 mW no-load in challenging applications such as smart-mobile device chargers.



(a) Typical Application Schematic

Figure 1. Typical Application/Performance.

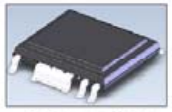


Figure 2. High Creepage, Safety-Compliant eSOP Package.

Output Power Table

Product[3]	230 VAC ±15%		85-265 VAC	
	Adapter[1]	Peak or Open Frame[2]	Adapter[1]	Peak or Open Frame[2]
SC1226K	18 W	22 W	18 W	22 W

Table 1. Output Power Table.

Notes:
1. Minimum continuous power in a typical non-ventilated enclosed adapter measured at 40 °C ambient. Assumes +12 V output.
2. Minimum peak power capability.
3. Package: KR: eSOP-R16B.

www.powerint.com

PRELIMINARY

February 2014

This document contains information on a new product. Specifications and information herein are subject to change without notice.

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

20. SR-FETs (Preferred Sources)

Part used in current design

UBIQ Semiconductor Corp.

QM6016S

N-Ch 60V Fast Switching MOSFETs

General Description

The QM6016S is the highest performance trench N-ch MOSFETs with extreme high cell density , which provide excellent RDSON and gate charge for most of the synchronous buck converter applications .

The QM6016S meet the RoHS and Green Product requirement , 100% EAS guaranteed with full function reliability approved.

Features

- Advanced high cell density Trench technology
- Super Low Gate Charge
- Excellent CdV/dt effect decline
- 100% EAS Guaranteed
- Green Device Available

Product Summery

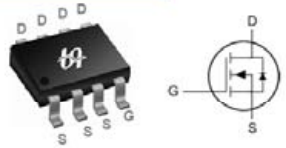
Green

BVDSS	RDSON	ID
60V	12mΩ	8A

Applications

- High Frequency Point-of-Load Synchronous Buck Converter for MB/NB/UMPC/VGA
- Networking DC-DC Power System
- LCD/LED back light

SOP8 Pin Configuration



Absolute Maximum Ratings

Symbol	Parameter	Rating	Units
V_{DS}	Drain-Source Voltage	60	V
V_{GS}	Gate-Source Voltage	±20	V
I_D@T_A=25℃	Continuous Drain Current, V_{GS} @ 10V[1]	8	A
I_D@T_A=70℃	Continuous Drain Current, V_{GS} @ 10V[1]	6.4	A
I_{DM}	Pulsed Drain Current[2]	32	A
EAS	Single Pulse Avalanche Energy[3]	123	mJ
I_{AS}	Avalanche Current	38	A
P_D@T_A=25℃	Total Power Dissipation[4]	1.5	W
T_{STG}	Storage Temperature Range	-55 to 150	℃
T_J	Operating Junction Temperature Range	-55 to 150	℃

Thermal Data

Symbol	Parameter	Typ.	Max.	Unit
$R_{\theta JA}$	Thermal Resistance Junction-Ambient [1]	---	85	℃/W
$R_{\theta JC}$	Thermal Resistance Junction-Case[1]	---	24	℃/W

Rev A.01 D121409

www.ubiq-semi.com

1

ALPHA & OMEGA SEMICONDUCTOR

AO4438

60V N-Channel MOSFET

General Description

The AO4438 uses advanced trench technology to provide excellent $R_{DS(ON)}$ and low gate charge. This device is suitable for use as a load switch or in PWM applications.

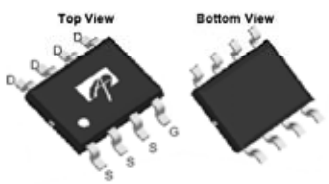
Product Summary

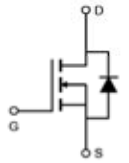
V_{DS} (V) = 60V
I_D = 8.2A (V_{GS} = 10V)
$R_{DS(ON)}$ < 22mΩ (V_{GS} = 10V)
$R_{DS(ON)}$ < 27mΩ (V_{GS} = 4.5V)

100% UIS Tested
100% Rg Tested

Green Product

SOIC-8





Absolute Maximum Ratings T_A=25℃ unless otherwise noted

Parameter		Symbol	Maximum	Units
Drain-Source Voltage		V_{DS}	60	V
Gate-Source Voltage		V_{GS}	±20	V
Continuous Drain Current [A]	T_A=25℃	I_D	8.2	A
	T_A=70℃		6.6	
Pulsed Drain Current [B]		I_{DM}	40	
Power Dissipation	T_A=25℃	P_D	3.1	W
	T_A=70℃		2	
Junction and Storage Temperature Range		T_J, T_{STG}	-55 to 150	℃

Thermal Characteristics

Parameter		Symbol	Typ	Max	Units
Maximum Junction-to-Ambient [A]	t ≤ 10s	$R_{\theta JA}$	24	40	℃/W
Maximum Junction-to-Ambient [A]	Steady-State		54	75	℃/W
Maximum Junction-to-Lead [C]	Steady-State	$R_{\theta JL}$	21	30	℃/W

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

POWER INTEGRATIONS®

21. Change Revision History

Revision History				
Date	Author	Revision	Description & changes	Reviewed
2 Sep-2014	RL	Rev-1	Initial Release	EH Quek

Power Integrations China-ShenZhen Branch
17rd Floor, Hivac Building, No 2,
Keji South 8th Road, Nanshan District, ShenZhen, China. Zip Code: 518057
TEL:+86-755-8672-8689; FAX:+86-755-8672-8690 E-mail: chinasales@powerint.com

China Sale Contacts and Important Note

China Sales Contacts

CHINA (Shanghai)
Room 2410,Charity Plaza,
No. 88, North Caoxi Road,
Shanghai, PRC 200030
TEL: +86-21-6354 6323
FAX: +86-21-6354 6325
E-mail: chinasales@powerint.com

中国上海
上海市漕溪北路88号
圣爱广场2410室
邮编: 200030
电话:+86-21-6354 6323
传真:+86-21-6354 6325
电子邮件: chinasales@powerint.com

CHINA (Shenzhen)
17/F, Hivac Building, No 2, Keji South 8th Road, Nanshan District,
Shenzhen China
Zip Code: 518057
TEL:+86 755 8672 8689
FAX:+86 755 8672 8690
E-mail: chinasales@powerint.com

中国深圳
广东省深圳南山区科技南八路二号豪威科技大厦17楼 518057
电话:+86 755 8672 8689
传真:+86 755 8672 8690
电子邮件：chinasales@powerint.com

CHINA (PI Guangzhou Lab)
Room 311,3nd floor, No.9, Jianggong Road, Tianhe Software Park,
Zhongshan thoroughfard,
Tianhe District, Guangzhou,
China, 510660
TEL:+86 20-8566-4509
FAX:+86 20-8555-1081
E-mail: chinasales@powerint.com

中国深圳-广州实验室
广州市天河区中山大道
天河软件园建工路9号3楼311室
邮编:510660
电话:+86-20-8566-4509
传真 +86 20-8555-1081
E-mail: chinasales@powerint.com

CHINA (PI Chengdu Lab)
Room 1426,Colorful Holiday Internation Mansion
No.2 Baisi Street,Chengdu,
China, 610016
TEL: +86-28-8676-3012
FAX: +86-28-8676-3011
E-mail: chinasales@powerint.com

中国深圳-成都实验室
四川省成都市白丝街2号
缤纷假日国际公寓1426号
邮编:610016
电话:+86-28-8676-3012
传真:+86-28-8676-3011
E-mail: chinasales@powerint.com

Important note

Power Integrations reserves the right to make changes to its products at any time to improve reliability or manufacturability.

Power Integrations does not assume any liability arising from the use of any device or circuit described herein.

POWER INTEGRATIONS MAKES NO WARRANTY HEREIN AND SPECIFICALLY DISCLAIMS ALL WARRANTIES INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, AND NON-INFRINGEMENT OF THIRD PARTY RIGHTS.

PATENT INFORMATION
The products and applications illustrated herein (including transformer construction and circuits' external to the products) may be covered by one or more U.S. and foreign patents, or potentially by pending U.S. and foreign patent applications assigned to Power Integrations. A complete list of Power Integrations' patents may be found at www.powerint.com.

Power Integrations grants its customers a license under certain patent rights as set forth at http://www.powerint.com/ip.htm

For the latest updates, visit our website: ***www.powerint.com***