



# **iW3614-00 for 30V350mA LED Driver EBC900**

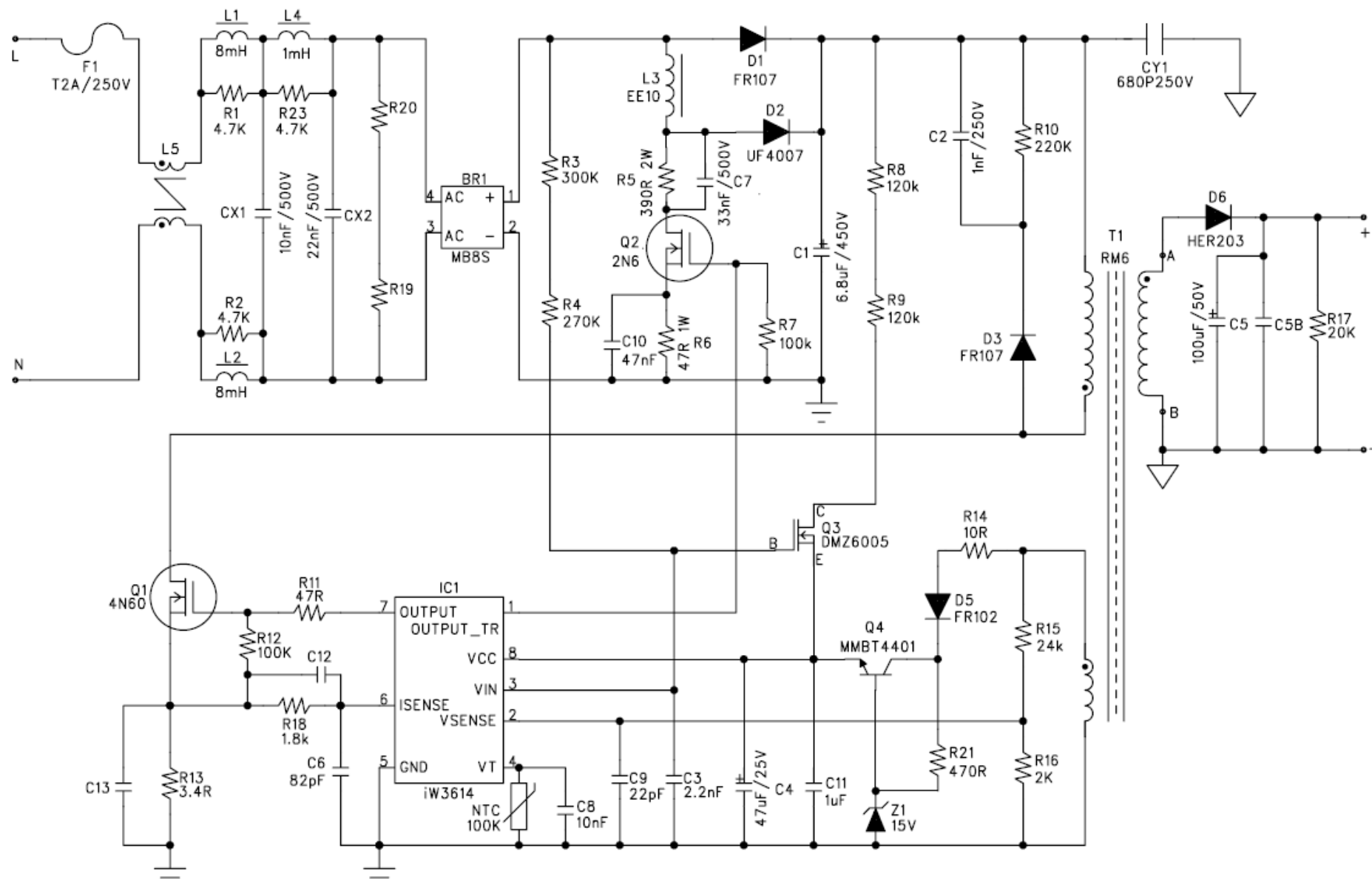
## **General Design Specification:**

- 1.AC Input Range 180-264Vac**
- 2.DC Output 30V, 350mA(Constant Current )**
- 3.Isolated High efficiency ,High PF**
- 4.Best dimming performance with wide world dimmers, Leading edge and trailing edge**

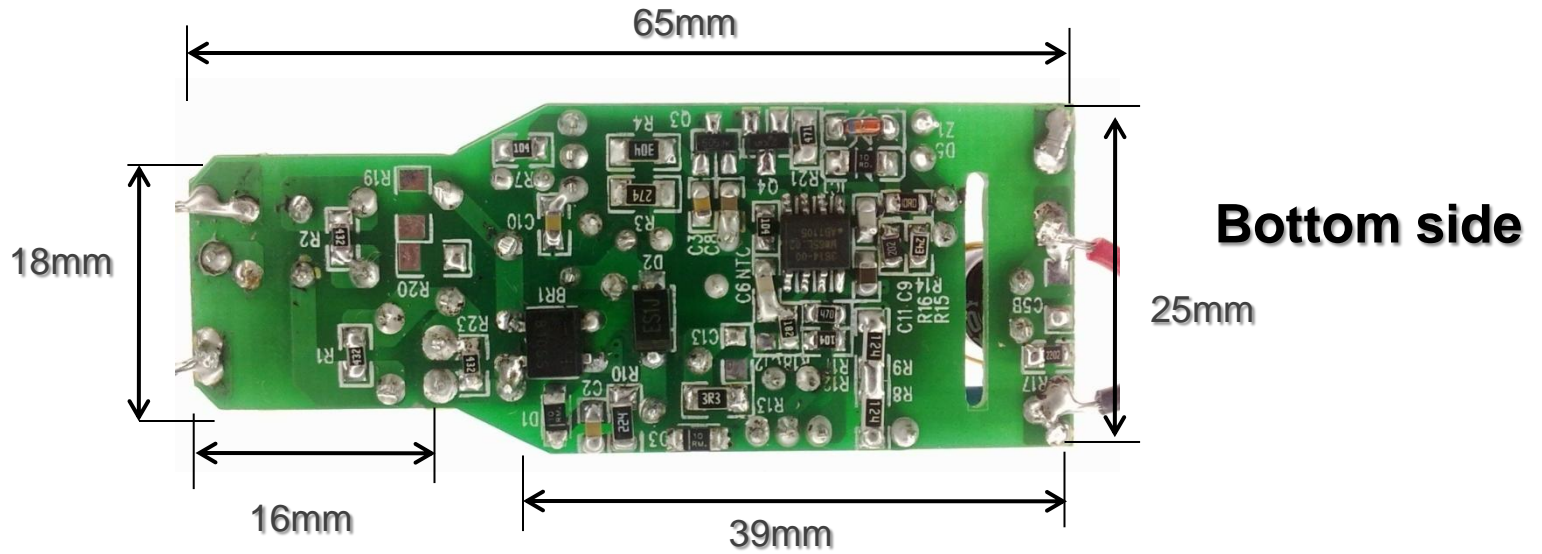
# 1. Specification

Description		Symbol	Min	Typ	Max	Units	Comment	
Input								
Voltage		$V_{IN}$	180		264	V <sub>AC</sub>	2 Wire	
Frequency		$f_{LINE}$	47	50	63	Hz		
Open-load Input Power (264V <sub>AC</sub> )						W		
Output								
Const Voltage	Output Voltage	$V_{OUT\_CV}$		30		V	Measured at the PCB connector	
	Output Current	$I_{OUT\_CV}$				A		
Const Current	Output Voltage	$V_{OUT\_CV}$				V	Min Vout is depend on Vcc	
	Output Current	$I_{OUT\_CV}$		350		mA		
Total Output Power								
Continuous Output Power		$P_{OUT}$		12		W		
Over Current Protection		$I_{OUT\_MAX}$				A	Auto-restart	
Efficiency		$\eta$	82			%	Measured at end of PCB@230	
Power Fact		$PF$		0.96			Harmonic meet IEC61000-3-2	
Turn on Delay Time						Sec		
Conducted EMI			Meets EN55015B					
Hi-pot test						KV		
Operation temperature		$T_{opr}$		40		° C	Free convection, sea level	

# 2 Schematic

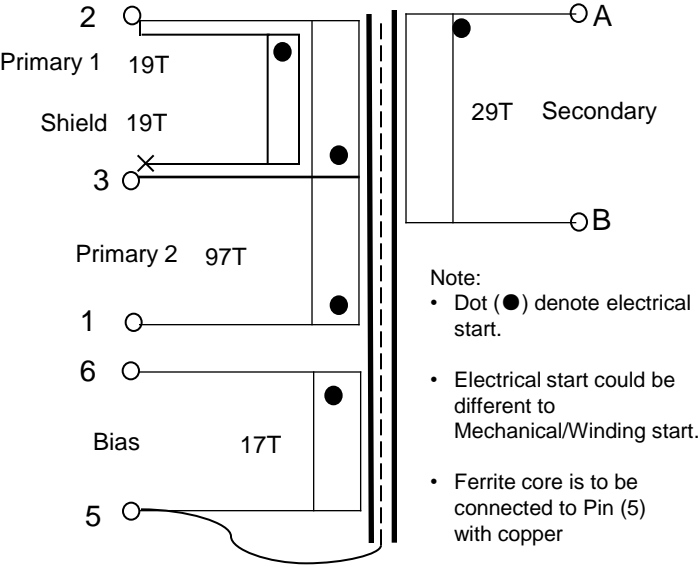


### 3. Circuit Board Photograph



# 4. Transformer Design

**SCHEMATIC**



**ELECTRICAL SPECIFICATIONS:**

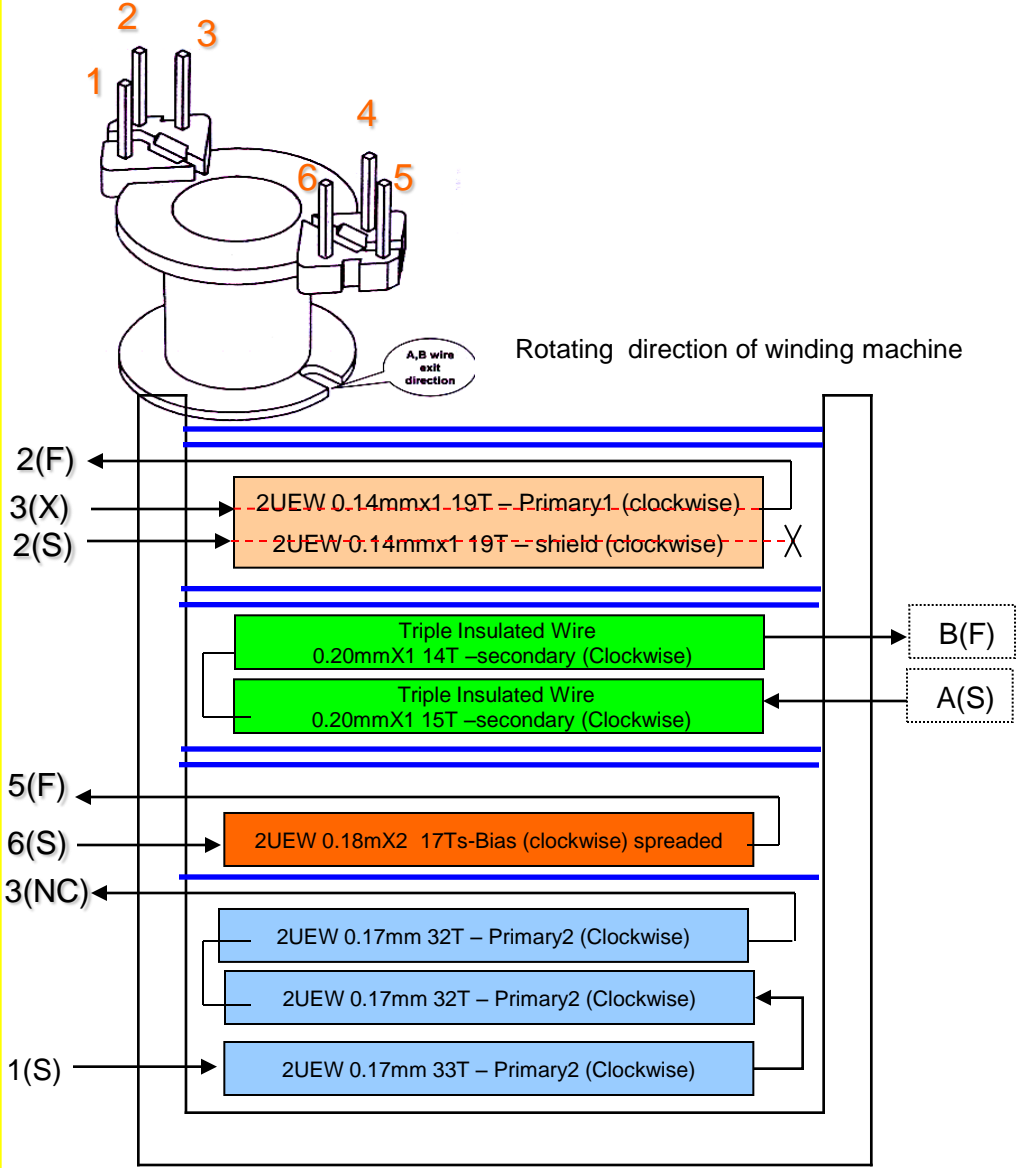
1. Primary Inductance ( $L_p$ ) = 3.6mH @10KHz
2. Primary Leakage Inductance ( $L_k$ ) <= 60uH @10KHz
3. Electrical Strength = 3KV, 50/60Hz, 1Min

**MATERIALS:**

1. Core : RM6 (Ferrite Material TDK PC40 or equivalent)
2. Bobbin : RM6 Horizontal. Primary=3, Secondary=3
3. Magnet Wires (Pri) : Type 2-UEW
4. Magnet Wire (Sec) : Triple Insulated Wires
5. Layer Insulation Tape : 3M1298 or equivalent.

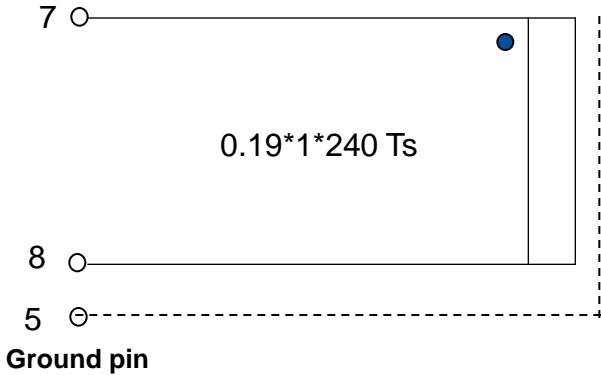
**FINISHED :**

1. Cut remained of Pin after wires termination
2. Core is connected to PRI-GND pin5.
3. Varnish the complete assembly

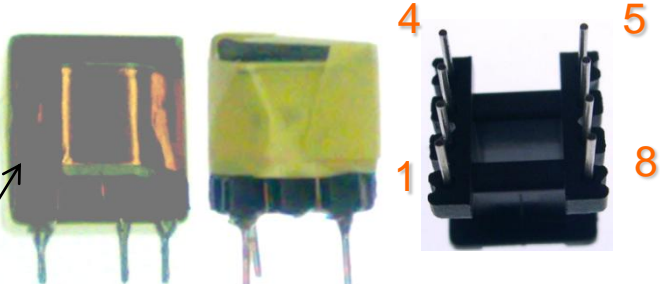


# 5.PFC choke and EMI Inductor\_\_ For input 230Vac

## L3 SCHEMATIC



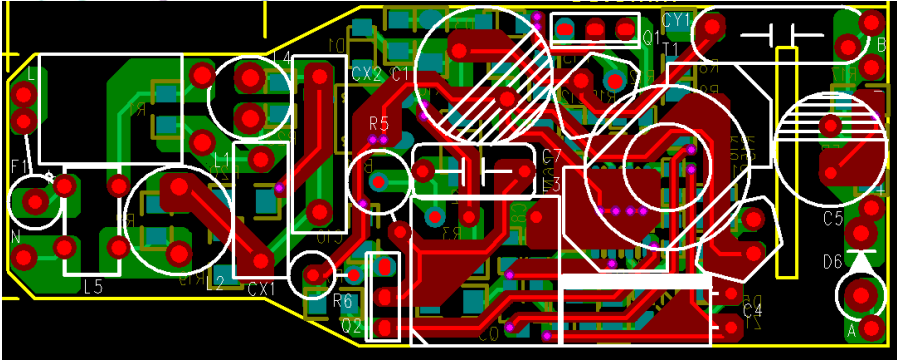
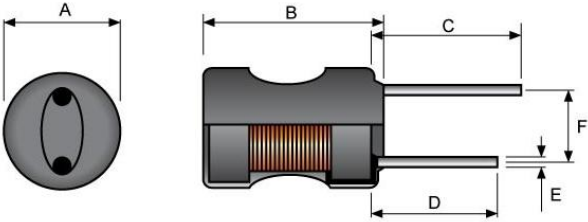
Copper shielding is connected to pin 5



### ELECTRICAL SPECIFICATIONS:

1. Inductance ( $L_p$ ) = 3.3mH @10KHz
2. Core : EE10 (Ferrite Material TDK PC40 or equivalent)
3. Bobbin : EE10 Horizontal
4. Ferrite core is connected to Pin 5 after assembling
5. Cut Pin 1,2,3,4,6after wires termination
6. Varnish the complete assembly

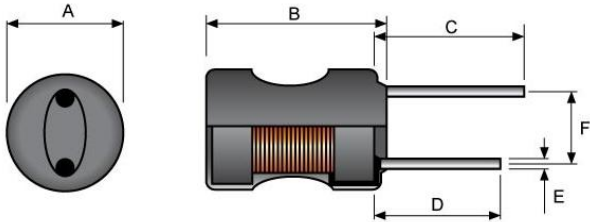
## EMI Inductor L1,L2



Ferrite core size : Ax B 8x10mm 0.14\*500T  
 Inductance @10kHz, 1V: 8mH +/-20%  
 DCR: 8 OHM +/-20%

# 5.PFC choke and EMI Inductor\_\_ For input 230Vac

## EMI Inductor L4



Ferrite core size : Ax B 6x8mm 0.15\*190T  
 Inductance @10kHz, 1V: 1mH +/-20%  
 DCR: 4OHM +/-20%

## Common Mode Inductor L5



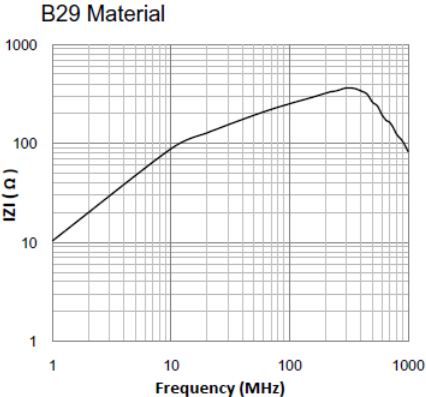
Core size:T8\*4\*3  
 Wire gauge: 0.3mm\*2 (Insulation& 2-UEW wire)  
 Turns10.5T  
 Inductance @10kHz, 1V: 30uH +/-20%



### Contacts Information

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 No.1 Sui Wo Road, Fo Tan, N.T. Hong Kong

Impedance Vs Frequency Curve (Ni-Zn)



# 6.BOM \_\_Input 230Vac \_\_30V350mA

Ref.	Description	Qty	Ref.	Description	Qty
IC1	iW3614-00, Digital PWM Controller,Dimmable,	1	R11	47Ω ±5%, SMD-0805	1
CX1	0.01uF,275V, X2 10.5X9X4	1	R14	10Ω ±5%, SMD-0805	1
CX2	0.022uF,275V, X2 13X9X4	1	R15	24KΩ ±1%, SMD-0805	1
C7	33nF/400V	1	R16	2KΩ ±1%, SMD-0603	1
C1	6.8uF, 450V, E-CAP, 105°C	1	NTC	100KΩ ±5%, SMD-0603	1
C2	1nF, 250V, X7R, SMD1206	1	R17	20KΩ ±5%, SMD-0805	1
C3	2.2nF,25V, X7R, SMD 0805	1	L3	3.3mH, EE10,0.19mmX240Ts	1
C6	82pF,25V, X7R, SMD 0603	1	T1	RM6, Transformer	1
C8	1nF,50V, X7R, SMD 0603	1	FR1	T2A250V	1
C9	22pF,50V, X7R, SMD 0603	1	BR1	DB107S, SMD	1
C11	1uF, 25V, X7R, SMD 1206	1	L1,L2	8mH, Drum choke, 8X10mm, 0.14m	2
C10	47nF,50V, X7R, SMD 0805	1	L4	1mH, Drum choke, 6X8mm, 0.15m	1
C4	47uF, 25V, E-CAP	1	D1,D3	FR107,1A1000V	2
C5	100uF,50V,E-CAP	1	D2	UF4007/ES1J	1
R1, R2,R23	4.7KΩ ±5%, SMD-0805	3	D5	FR102 1A 1000V SMD	1
R3	300KΩ,±1%, SMD-1206	1	D6	HER203 2A/200V	1
R4	270KΩ,±1%, SMD-1206	1	Z1	Zener, 15V, SMD	1
R5	390Ω,±5%, 2W	1	CY1	Y1,680pF,250V	1
R6	47Ω ,±5%, 1W	1	Q1	4N60,TO-251	1
R10	220KΩ,±5%, SMD-1206	1	Q2	2N60, TO-251	1
R7,R12	100KΩ±5%, SMD-0805	2	Q3	DMZ6005, N-Depletion, 600V, SOT	1
R8,R9	120KΩ,±5%, SMD-1206	2	Q4	Transistor, MMBT4401	1
R18	1.8KΩ ±1%, SMD-0603	1			
R13	3.3Ω ±1%, SMD-1206	1			
R21	470Ω ±1%, SMD-0805	1			

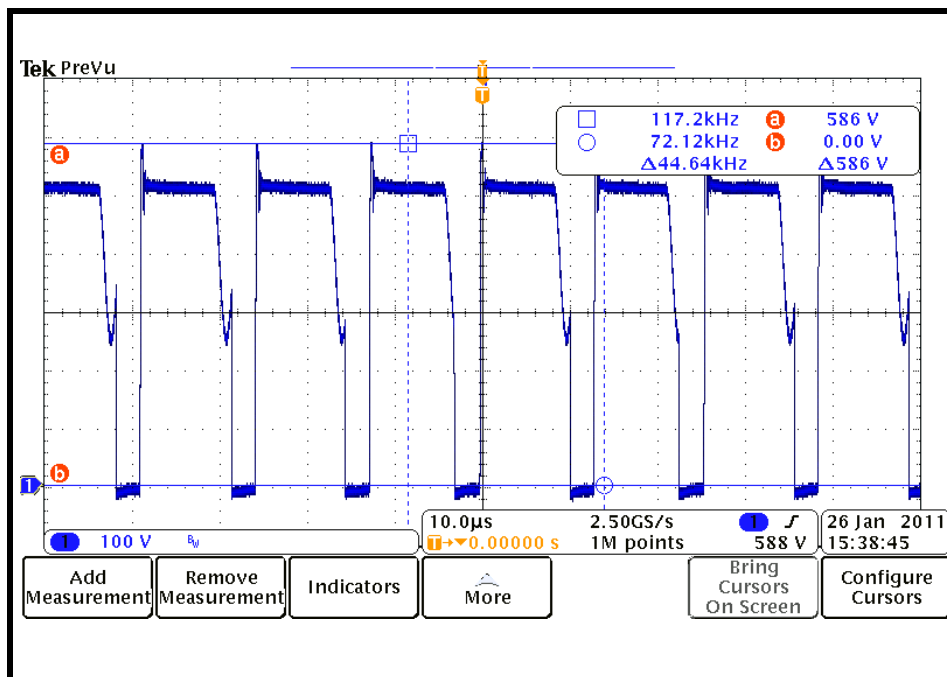


# 7.Constant Current and Efficiency \_\_No Dimmer

(AC input 180~264Vac,Output 9 LEDs)

#of LEDs	Vin	Pin	Vout	Iout	ripple current(mA)	efficiency	PF
	(V)	(W)	(V)	(A)			
9LEDs	180	13.74	31.27	0.360	68	81.92%	0.990
	190	13.68	31.26	0.360	64	82.27%	0.990
	200	13.71	31.28	0.360	64	82.14%	0.989
	210	13.61	31.21	0.359	64	82.32%	0.986
	220	13.61	31.19	0.359	64	82.27%	0.982
	230	13.65	31.31	0.361	64	82.81%	0.977
	240	13.50	31.16	0.358	68	82.63%	0.969
	250	13.49	31.15	0.358	60	82.67%	0.958
	260	13.48	31.13	0.358	60	82.67%	0.942
	264	13.48	31.12	0.357	56	82.42%	0.931

# 8. Q1 MOSFET $V_{ds}$ waveform



Test Condition:

$V_{IN}=264V_{AC}$ ,  $I_{out}=350mA$

Result:

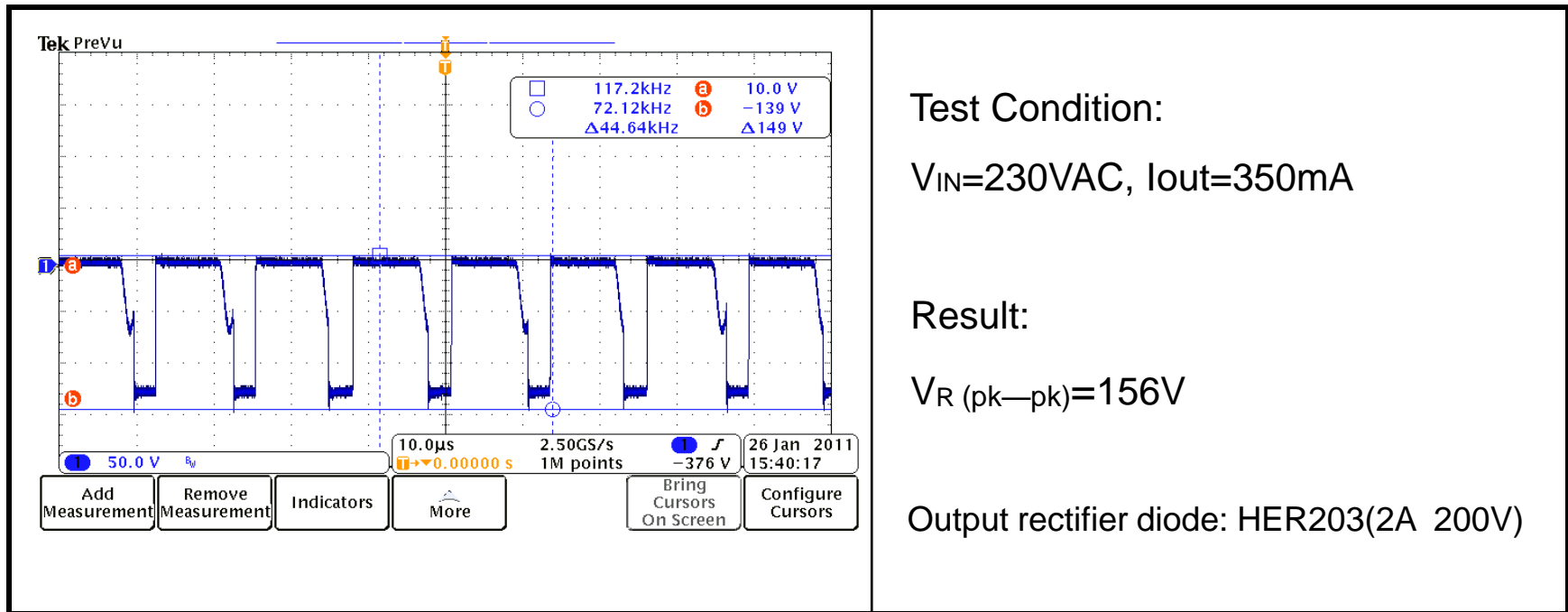
$V_R$  (pk-pk)=586V

Q2: SPD02N60C3/A04N60C3 (INFINEON)

Electrical Characteristics, at  $T_J=25^\circ C$  unless otherwise specified

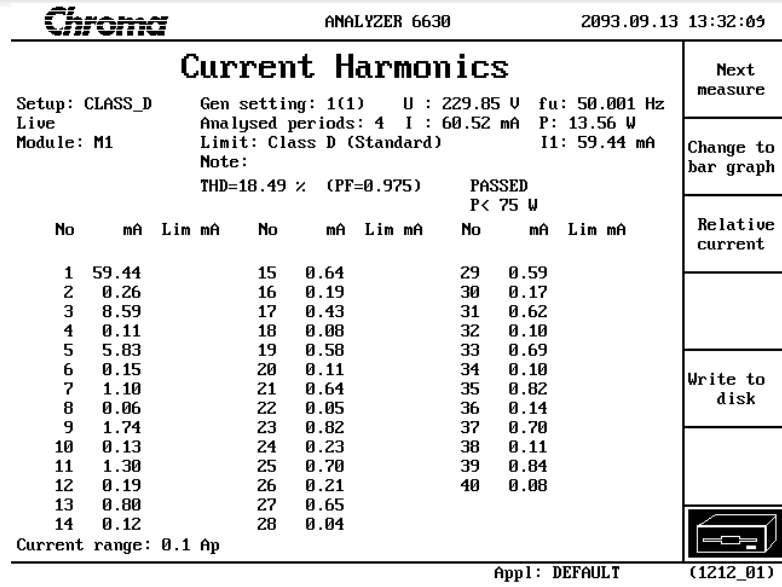
Parameter	Symbol	Conditions	Values			Unit
			min.	typ.	max.	
Drain-source breakdown voltage	$V_{(BR)DSS}$	$V_{GS}=0V, I_D=0.25mA$	600	-	-	V
Drain-Source avalanche breakdown voltage	$V_{(BR)DS}$	$V_{GS}=0V, I_D=0.25A$	-	700	-	
Gate threshold voltage	$V_{GS(th)}$	$I_D=80\mu A, V_{GS}=V_{DS}$	2.1	3	3.9	

# 9. Output diode $V_R$ waveform

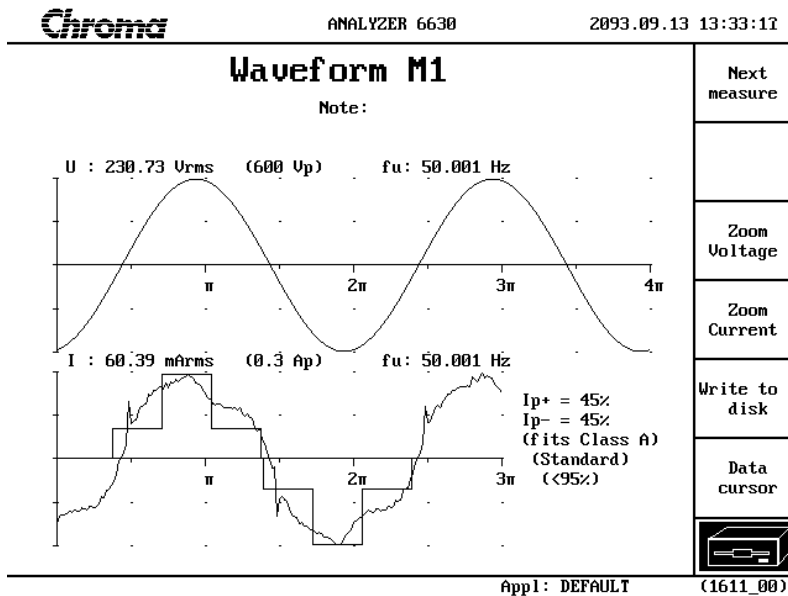


Characteristic	Symbol	HER 201	HER 202	HER 203	HER 204	HER 205	HER 206	HER 207	HER 208	Unit
Peak Repetitive Reverse Voltage	$V_{RRM}$									
Working Peak Reverse Voltage	$V_{RWM}$	50	100	200	300	400	600	800	1000	V
DC Blocking Voltage	$V_R$									
RMS Reverse Voltage	$V_{R(RMS)}$	35	70	140	210	280	420	560	700	V
Average Rectified Output Current (Note 1) @ $T_A = 55^\circ C$	$I_o$	2.0								A

# 10. Harmonic and current waveform 3614-00



Harmonics current @230Vac  
 Meet IEC61000-3-2  
 requirement



Ac current waveform @230Vac  
 PF=0.975

# 11.1 Dimmer Compatibility Test



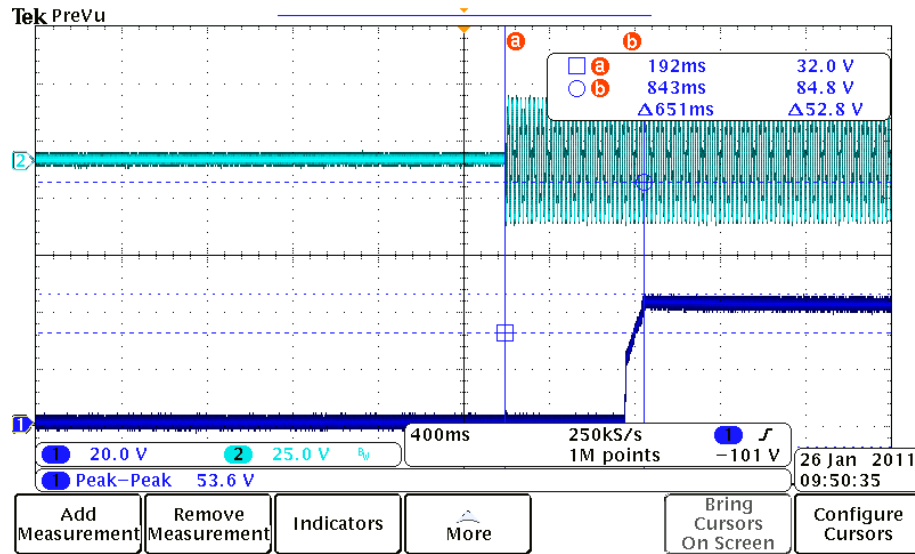
	Input	Maximum Level				Middle level					Minimum level			
Dimmer	Volt.	Pin	Pout	VLED	ILED	Pin	Pout	VLED	ILED	AC peak curr	Pin	Pout	VLED	ILED
	(V)	(W)	(W)	(V)	(mA)	(W)	(W)	(V)	(mA)	(mA)	(W)	(W)	(V)	(mA)
Etman	180	14.03	10.43	30.86	338	8.21	5.15	29.61	174	600	2.57	0.21	26.24	8
ETM321S 315w	230	15.14	10.77	30.77	350	8.86	4.83	29.29	165	600	3.76	0.29	26.47	11
Trailing	264	15.76	10.85	30.81	352	9.77	4.90	29.34	167	720	4.73	0.35	26.61	13
Niko	180	10.93	8.11	30.61	265	7.25	4.71	29.60	159	520	2.5	0.52	27.18	19
320W	230	13.75	10.48	31.09	337	7.93	4.96	29.70	167	540	3.97	1.14	27.07	42
Trailing	264	15.90	10.83	30.78	352	10.20	5.12	29.41	174	680	6.37	1.36	27.67	49
Wuyun	180	14.33	11.05	31.22	354	7.51	5.17	29.74	174	1760	0.52	0.02	24.16	1
400W	230	13.71	11.12	31.24	356	7.90	5.17	29.73	174	1840	0.64	0.05	24.25	2
Leading	264	13.77	11.02	31.22	353	8.24	5.23	29.73	176	1840	0.93	0.18	26.23	7
Phasenbschnitt	180	14.76	11.02	31.23	353	7.66	5.39	29.77	181	540	2.47	0.80	27.44	29
T46 315W	230	14.11	11.11	31.29	355	7.87	5.17	29.72	174	540	3.17	1.02	27.68	37
Trailing	264	14.06	11.11	31.29	355	8.23	5.20	29.74	175	580	3.59	1.05	27.72	38

# 11.2 Dimmer Compatibility Test



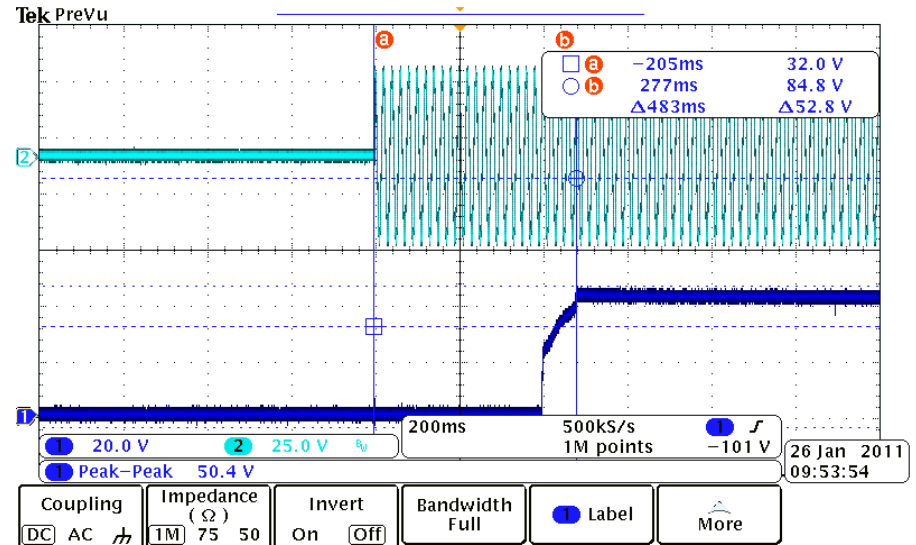
	Input	Maximum Level				Middle level					Minimum level			
Dimmer	Volt.	Pin	Pout	VLED	ILED	Pin	Pout	VLED	ILED	AC peak curr	Pin	Pout	VLED	ILED
	(V)	(W)	(W)	(V)	(mA)	(W)	(W)	(V)	(mA)	(mA)	(W)	(W)	(V)	(mA)
LICHTRGLER	180	13.66	11.00	31.07	354	7.48	5.37	29.69	181	1500	0.84	0.27	26.60	10
T43 400w	230	13.34	11.04	31.09	355	7.50	5.16	29.63	174	1800	0.85	0.21	26.48	8
Leading	264	13.37	11.06	31.15	355	7.72	5.19	29.65	175	1880	3.23	1.69	28.16	60
LUFENG	180	13.08	9.60	30.76	312	7.98	5.12	29.61	173	500	2.32	0.49	27.00	18
220V 300W	230	15.29	11.25	31.25	360	8.43	4.99	29.72	168	540	3.60	0.97	27.73	35
Trailing China	264	15.63	11.02	31.05	355	8.83	4.96	29.55	168	560	4.26	1.14	27.74	41
Songben	180	14.38	10.92	31.01	352	8.06	5.11	29.55	173	1440	1.27	0.13	25.64	5
220V 300W	230	14.48	10.98	31.03	354	8.62	5.37	29.66	181	1800	1.63	0.05	24.24	2
leading China	264	14.97	10.93	30.96	353	12.51	6.39	29.84	214	1820	2.31	0.18	26.25	7
TCL	180	14.52	10.88	31.00	351	7.58	4.86	29.46	165	1260	1.36	0.07	24.95	3
300W	230	14.85	10.94	30.99	353	8.68	5.11	29.54	173	1600	2.14	0.18	26.20	7
Leading China	264	15.42	10.97	31.09	353	9.14	4.92	29.48	167	1780	3.90	0.99	27.56	36

# 12. Turn On Delay Time



180V<sub>AC</sub>, Full Load

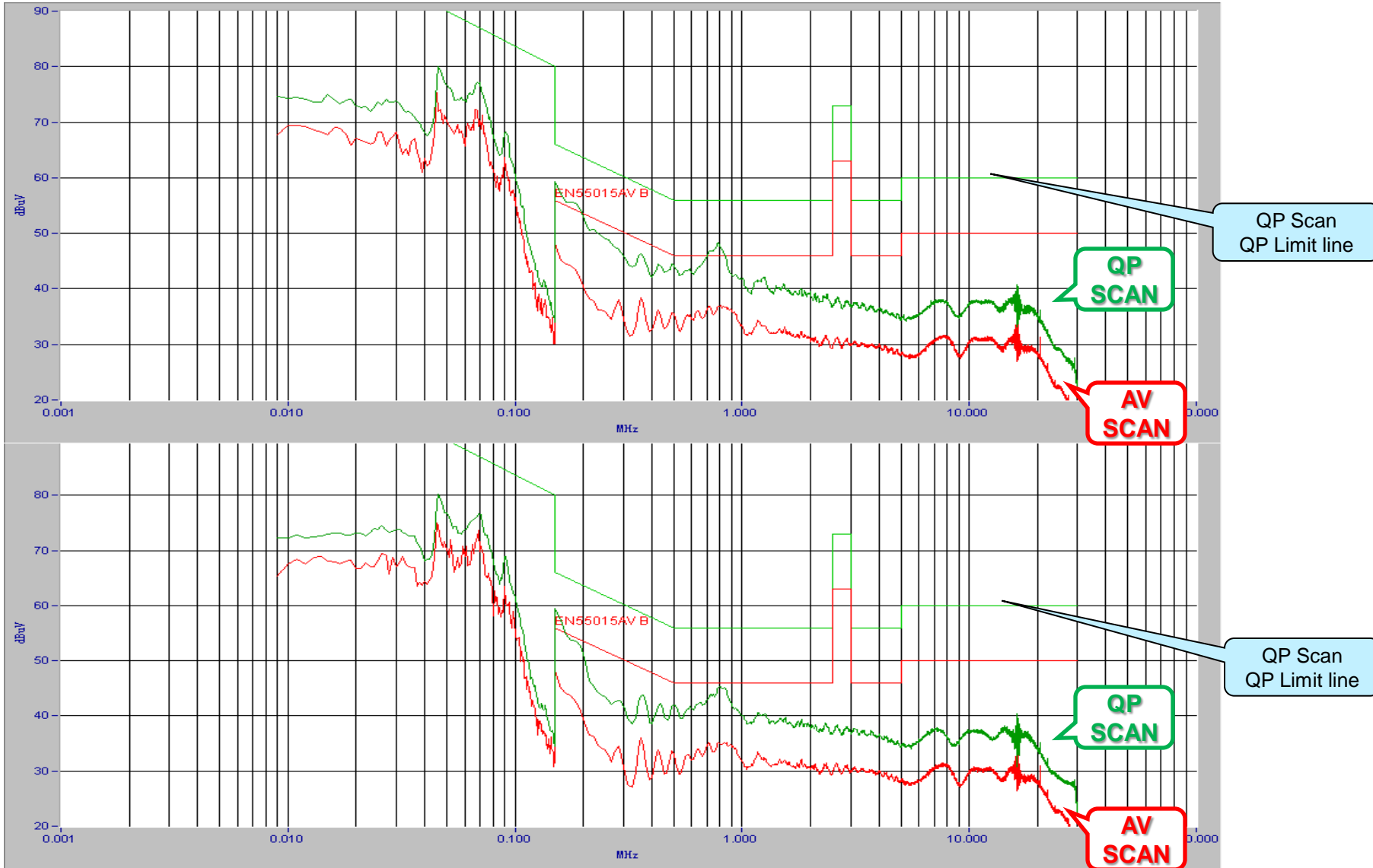
T<sub>ST\_DELAY</sub>=**653mS**



264V<sub>AC</sub>, Full Load

T<sub>ST\_DELAY</sub>=**483mS**

# 13. Conducted EMI ( Input 230Vac LEDs Load )





# 21. Radiated IEM (for reference)



The radiated EMI margin is 2.75dBuV  
Note: 1, Vin=230Vac