Railroad ChiP DCM3623 EMI Test Report

Input Voltage Range : EN50155
EMI Filtering : EN50121-3-2
Transients : RIA12

Summary:

EMI

Input Voltage	EMI Filter	Output Capacitor (OUT-EXT)	Result
43 V	Single Stage	1000uF/20,000uF	PASS
100 V	Single Stage	1000uF/20,000uF	PASS
154 V	Single Stage	1000uF/20,000uF	PASS

TRANSIENTS

Type of Disturbance	Voltage Level	Duration	Result
Supple Related Surge	3.5 x Vnominal (i.e., 3.5x110 = 385V)	20 ms, 2ms rise/fall time	PASS

Prepared by:
Vamshi Domudala
Applications Engineering
Date: 7/26/2018

Input voltage requirements as per EN50155:

Normal operation : $0.7V_N$ to $1.25V_N$
Transient operation : $0.6V_N$, low transient for 100ms
$1.4V_N$, high transient for 1s

Where V_N is the nominal input voltage

Nominal Input	**Input Ranges**	**Transient Low (100ms)**	**Transient High (1s)**	**Vicor ChiP DCM Input Range**
72 V	50 – 90 V	43 V	101 V	43 – 154 V
96 V	67 – 120 V	58 V	135 V	
110 V	77 – 137 V	66 V	154 V	

EMI requirements as per EN50121-3-2:

150kHz to 500kHz – 99dBµV quasi-peak
500kHz to 30MHz – 93dBµV quasi-peak

VICOR CONFIDENTIAL

REV	DESCRIPTION	DATE	APPROVED
1	APPLICATIONS ENGINEERING	5/22/2020	VD

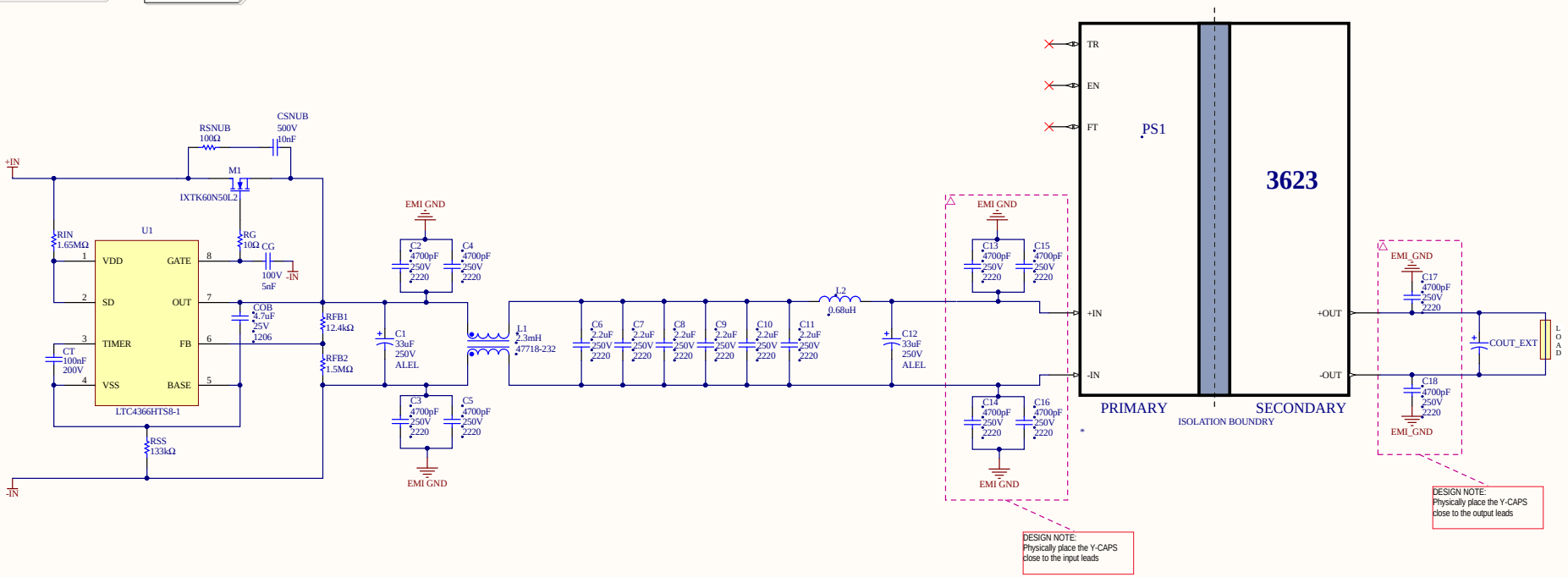
BOARD REVISION NOTES

REVISION NOTES:

1 - Redraw based on existing schematic; 5/22/2020

SHEET TO DO

TO DO:



A

SCHEMATIC

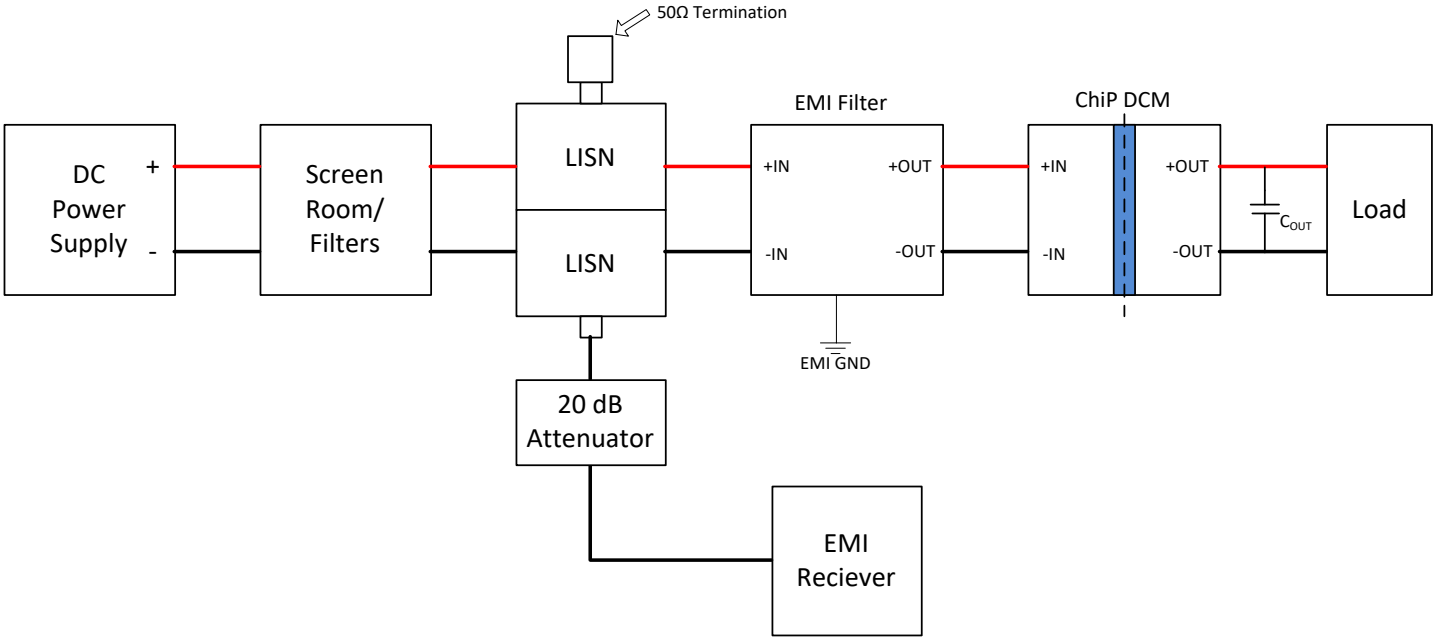
EMI FILTER REFERENCE DESIGN - RAILROAD CHIP DCMs

APPLICATION: Altium Designer	SIZE B	FSCM NO. 67131	DWG NO. N/A	REV 1
FILENAME:				
DRAWN: Vamshi Domudala DATE: 5/22/2020	SCALE: scale	SHEET 1 OF 1		

Bill of Material:

REFERENCE DESIGNATOR	DESCRIPTION	MFG PART NUMBER	MANUFACTURER	QUANTITY	VALUE NOM	RATING NOM
C1, C12	Capacitor	UVZ2E330MHD	Nichicon	2	33uF	250V
C2 - C5, C13 - C18	Capacitor	GA355DR7GF472KW01L	Murata Manufacturing	10	4700pF	250V
C6 - C11	Capacitor	C5750X7T2E225K250KE	TDK	6	2.2uF	250V
CSNUB	Capacitor	12107C103MAT2A	AVX	1	10nF	500V
CT	Capacitor	CL43B104KDFNNNE	Samsung	1	100nF	200V
CG	Capacitor	06031C562KAT2A	AVX	1	5.6nF	100V
COB	Capacitor	C3216X7R1E475K085AB	TDK	1	4.7uF	25V
COUT-EXT	Min/Max from the ChiP DCM datasheet			1		
L1	Ind Com Mode 7065	47718-232	Vicor	1	2.3mH	8A
L2	Inductor	744373460068	Wurth Elektronik	1	0.68uH	11A
M1	N-Channel MOSFET	IXTK60N50L2	IXYS	1		500V, 60A
PS1	DCM3623 43 - 154Vin		Vicor	1		
RFB1	Resistor	NRC06F1242TRF	NIC Components	1	12.4kΩ	
RFB2	Resistor	ERJ-3EKF1504V	Panasonic	1	1.5MΩ	
RG	Resistor	ERJ-3EKF1504V	Panasonic	1	10Ω	
RIN	Resistor	ERJ-8ENF1654V	Panasonic	1	1.65MΩ	
RSNUB	Resistor	NRCP25J101TRF	NIC Components	1	100Ω	
RSS	Resistor	NRC06F1333TRF	NIC Components	1	133kΩ	
U1	High Voltage Surege Stopper	LTC4366	ADI	1	9V to >500V	

Test setup details:
EMI Filter



A 50Ω termination is used for LISN and voltage across the RED and BLACK leads are measured at various load conditions.

LISN Part Number:
Solar Electronics Company
TYPE 8028-50-BP-24-BNC

ChiP DCM:
DCM3623TA5N31B4T00
S/N: AP0021PTH745029
Date Code: 1818

Test Results: RED LEAD

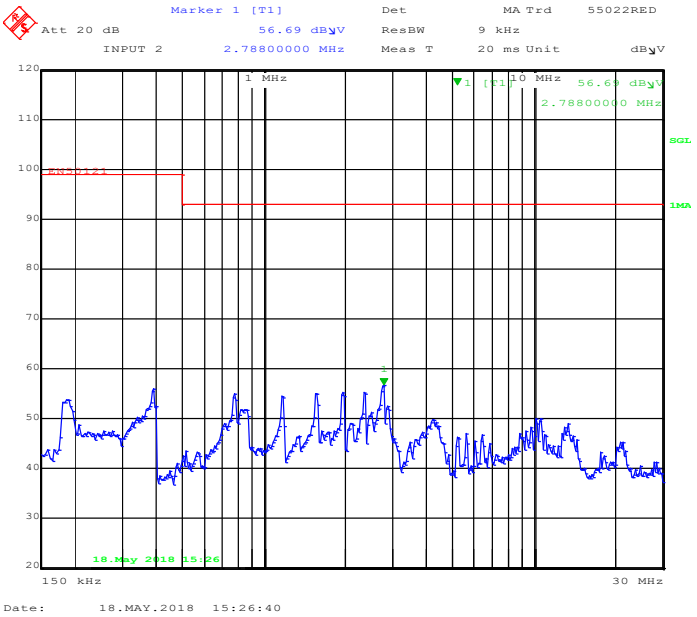


Figure 1: Vin 43V, Vout 28V, Load 0%, Cout 1000uF

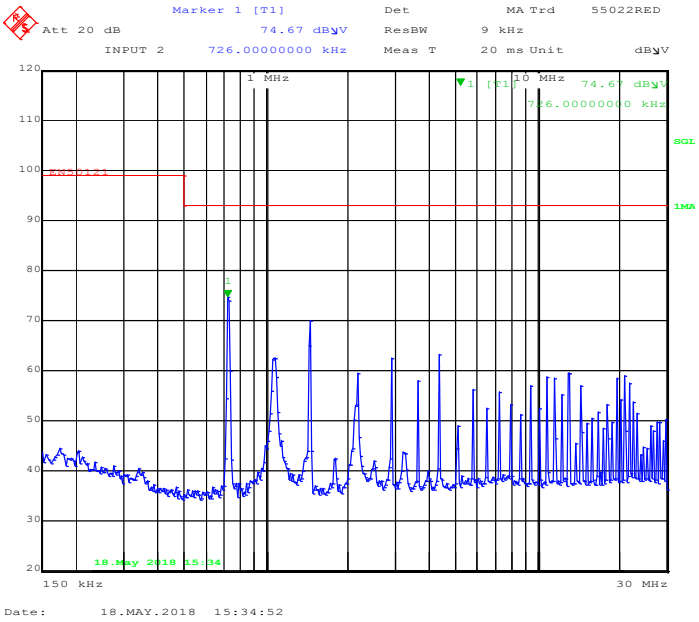


Figure 2: Vin 43V, Vout 28V, Load 50%, Cout 1000uF

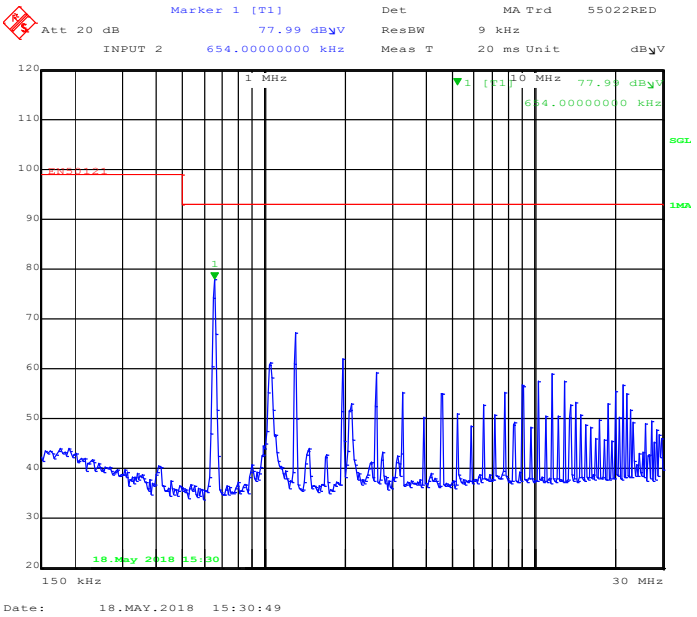


Figure 3: Vin 43V, Vout 28V, Load 100%, Cout 1000uF

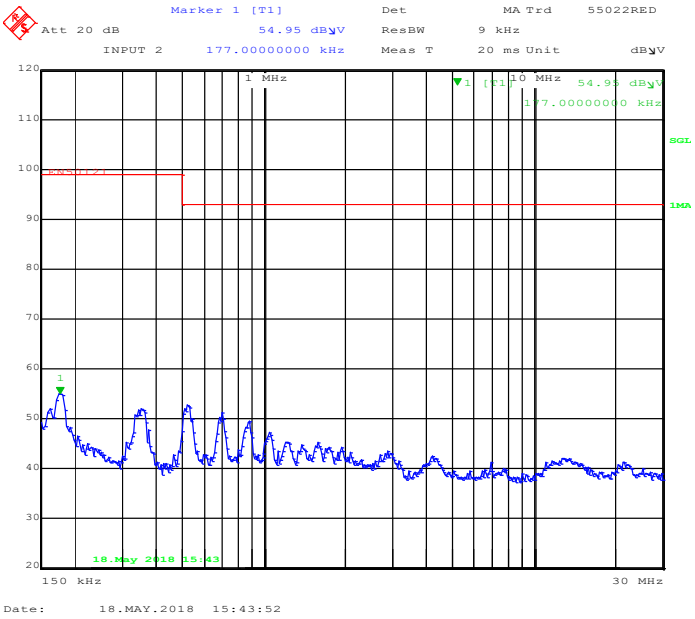


Figure 4: Vin 100V, Vout 28V, Load 0%, Cout 1000uF

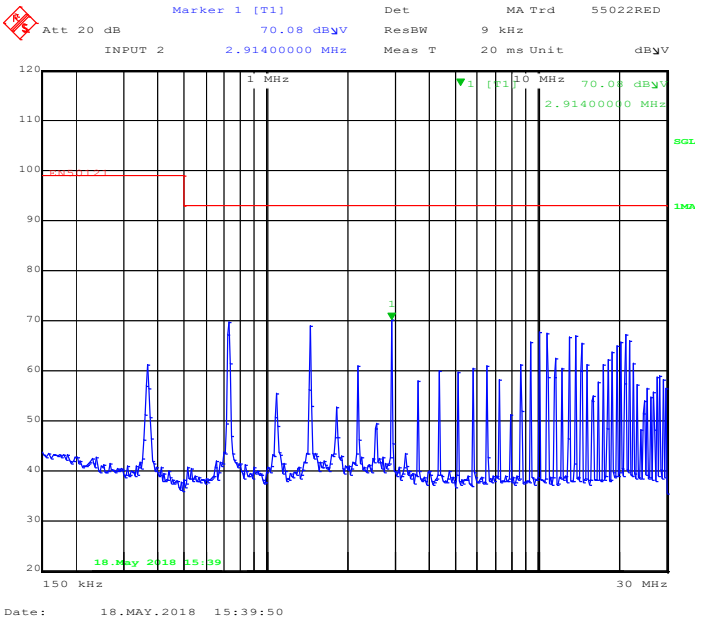


Figure 5: Vin 100V, Vout 28V, Load 50%, Cout 1000uF

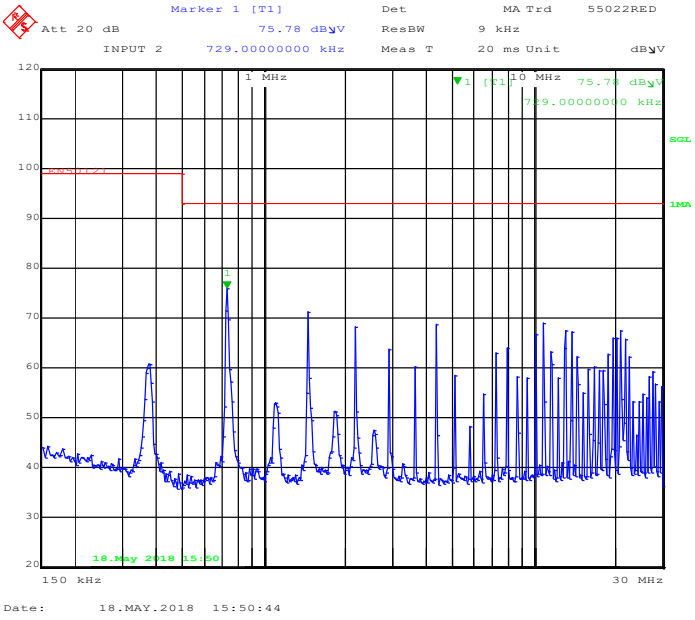


Figure 6: Vin 100V, Vout 28V, Load 100%, Cout 1000uF

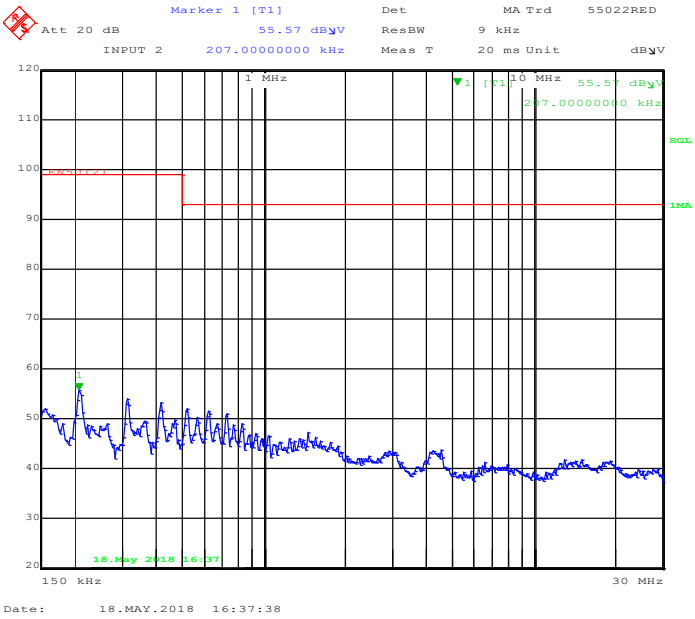


Figure 7: Vin 154V, Vout 28V, Load 0%, Cout 1000uF

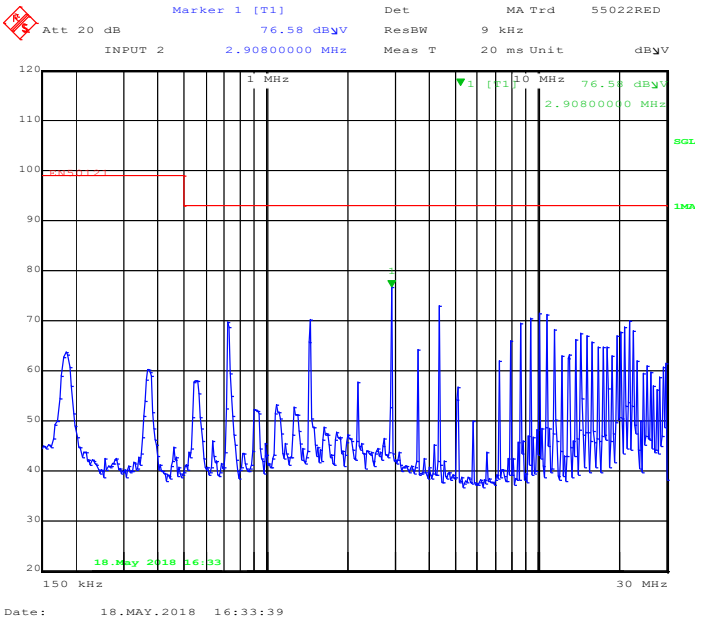


Figure 8: Vin 154V, Vout 28V, Load 50%, Cout 1000uF

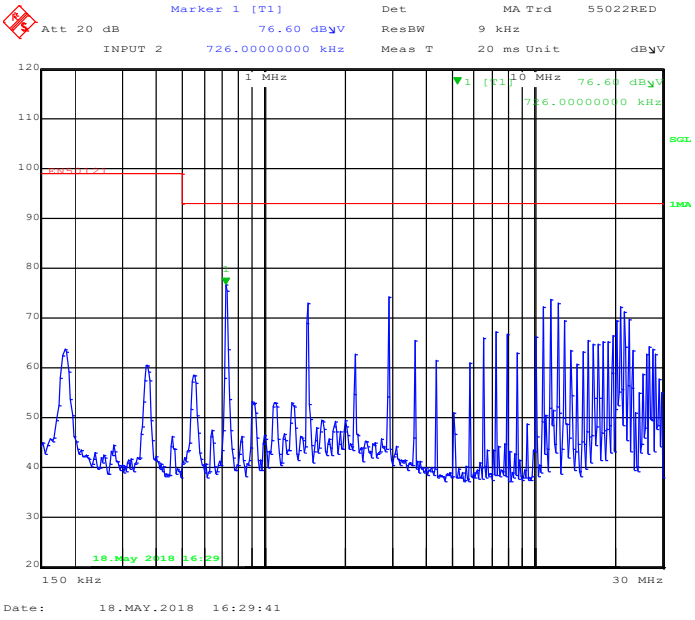


Figure 9: Vin 154V, Vout 28V, Load 100%, Cout 1000uF

Test Results: BLACK LEAD

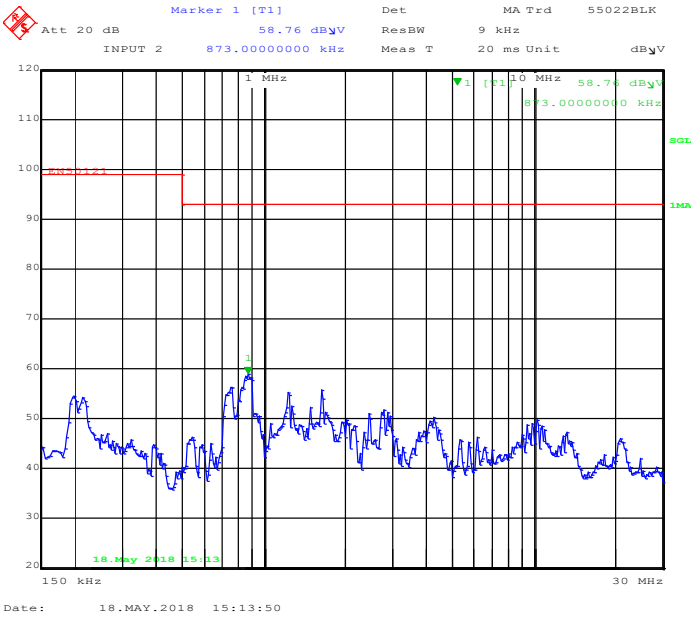


Figure 30: Vin 43V, Vout 28V, Load 0%, Cout 1000uF

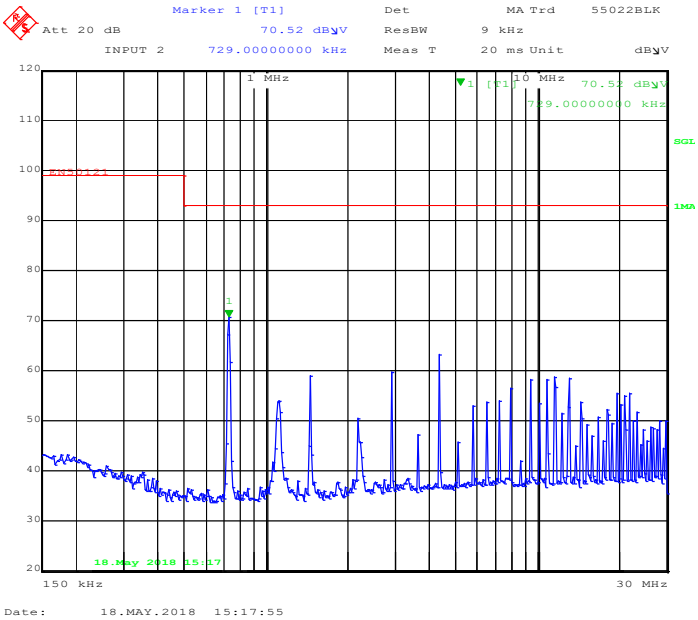


Figure 11: Vin 43V, Vout 28V, Load 50%, Cout 1000uF

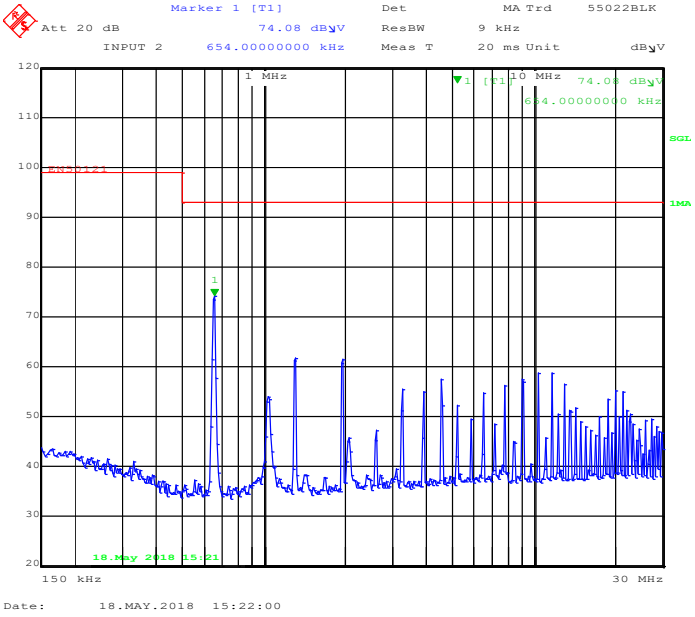


Figure 12: Vin 43V, Vout 28V, Load 100%, Cout 1000uF

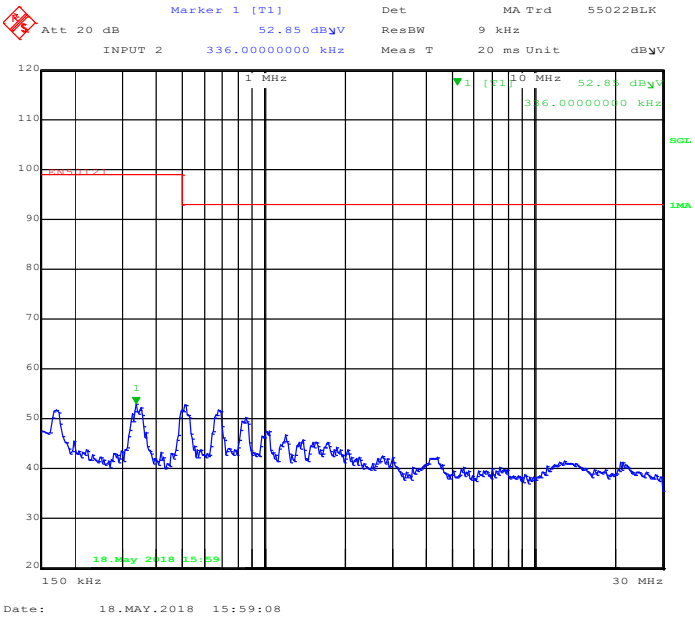


Figure 13: Vin 100V, Vout 28V, Load 0%, Cout 1000uF

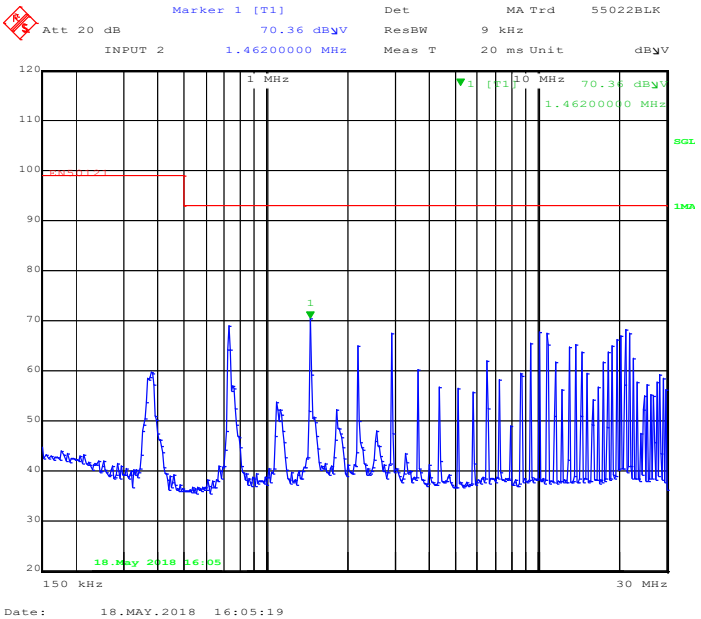


Figure 14: Vin 100V, Vout 28V, Load 50%, Cout 1000uF

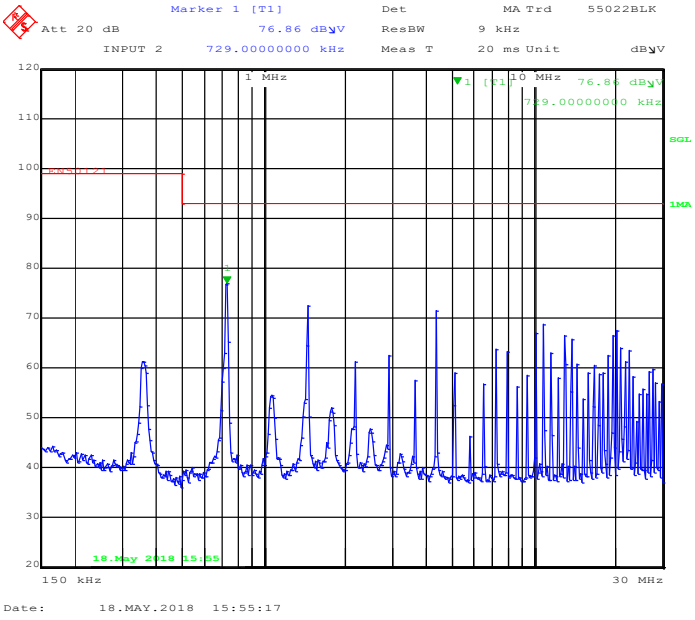


Figure 15: Vin 100V, Vout 28V, Load 100%, Cout 1000uF

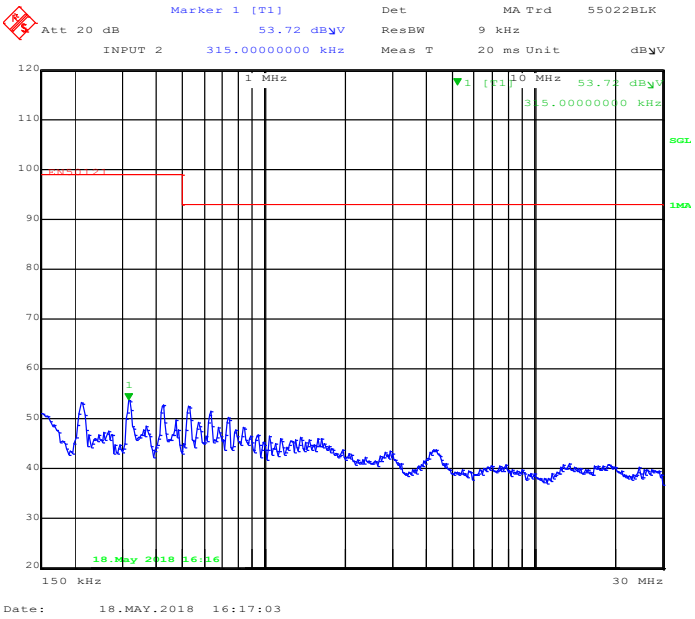


Figure 16: Vin 154V, Vout 28V, Load 0%, Cout 1000uF

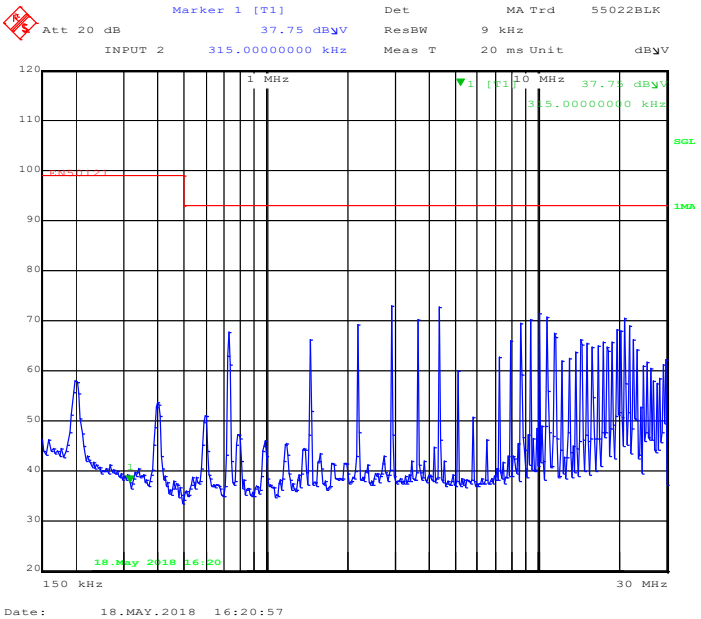


Figure 17: Vin 154V, Vout 28V, Load 50%, Cout 1000uF

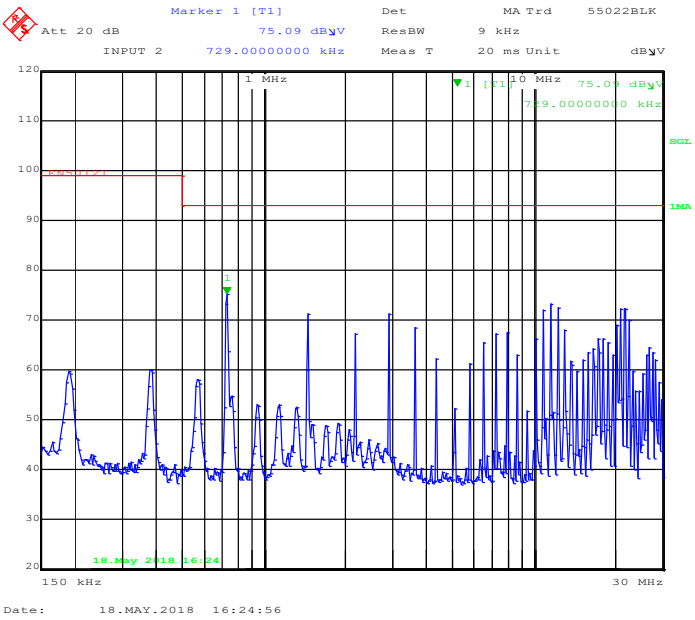


Figure 18: Vin 154V, Vout 28V, Load 100%, Cout 1000uF

Test Results: RED LEAD

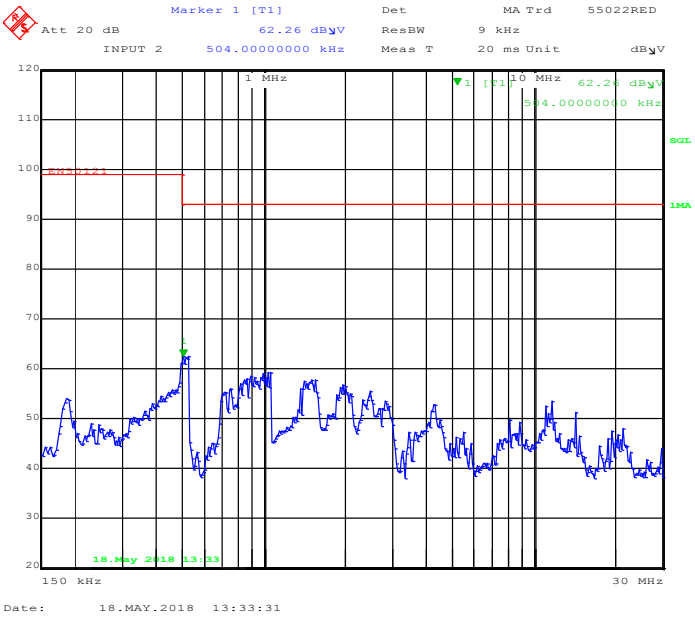


Figure 49: Vin 43V, Vout 28V, Load 0%, Cout 20,000uF

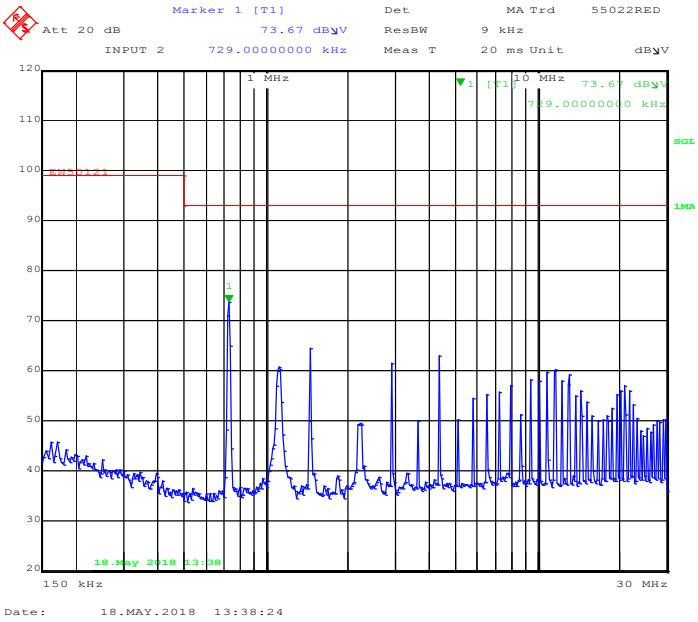


Figure 50: Vin 43V, Vout 28V, Load 50%, Cout 20,000uF

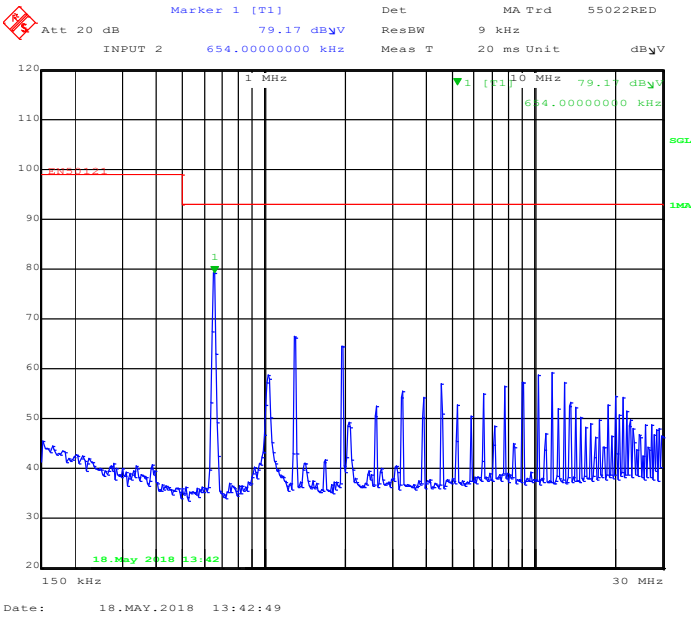


Figure 21: Vin 43V, Vout 28V, Load 100%, Cout 20,000uF

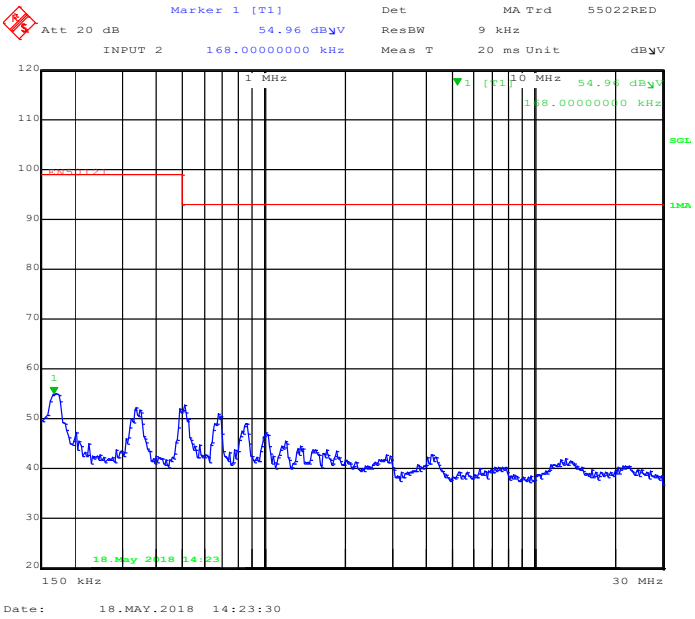


Figure 22: Vin 100V, Vout 28V, Load 0%, Cout 20,000uF

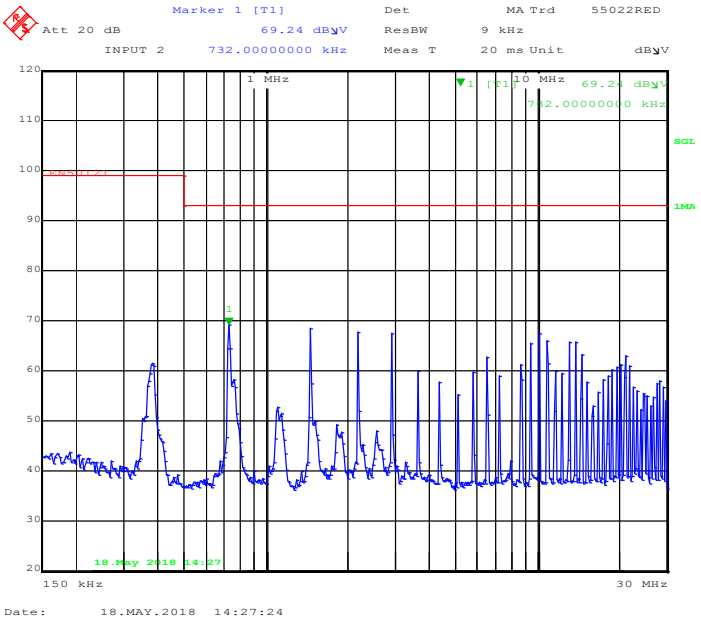


Figure 23: Vin 100V, Vout 28V, Load 50%, Cout 20,000uF

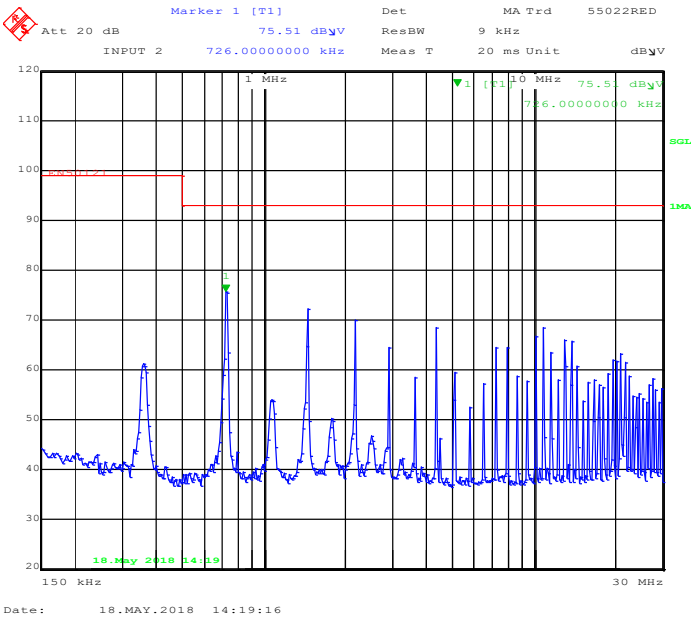


Figure 24: Vin 100V, Vout 28V, Load 100%, Cout 20,000uF

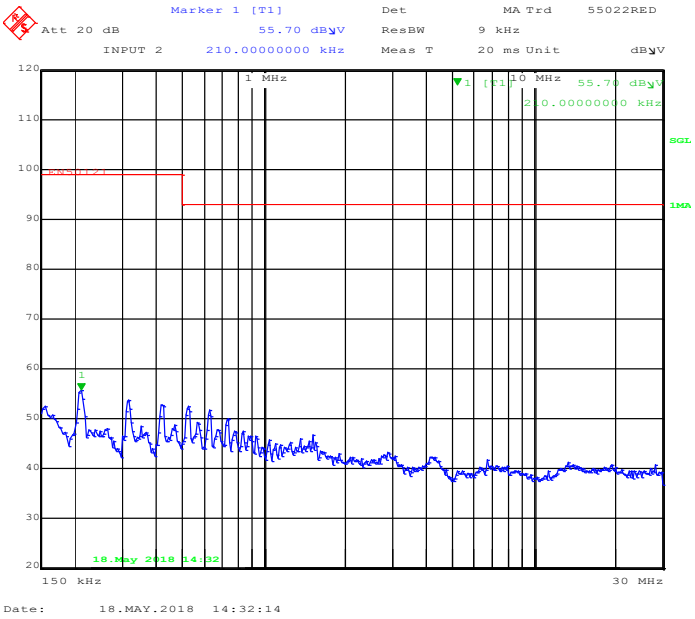


Figure 25: Vin 154V, Vout 28V, Load 0%, Cout 20,000uF

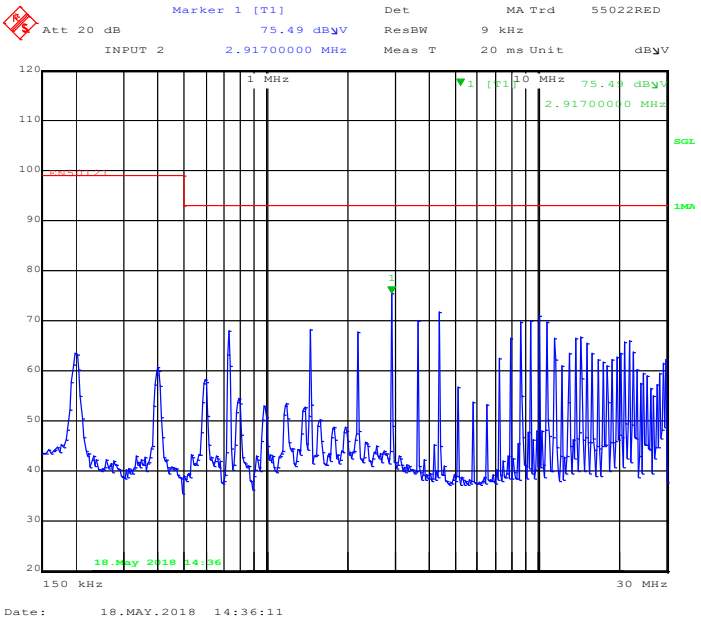


Figure 26: Vin 154V, Vout 28V, Load 50%, Cout 20,000uF

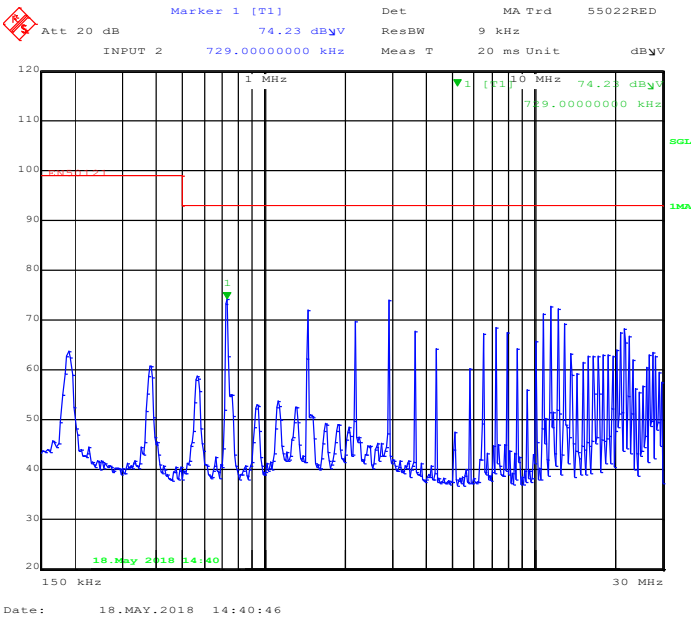


Figure 27: Vin 154V, Vout 28V, Load 100%, Cout 20,000uF

Test Results: BLACK LEAD

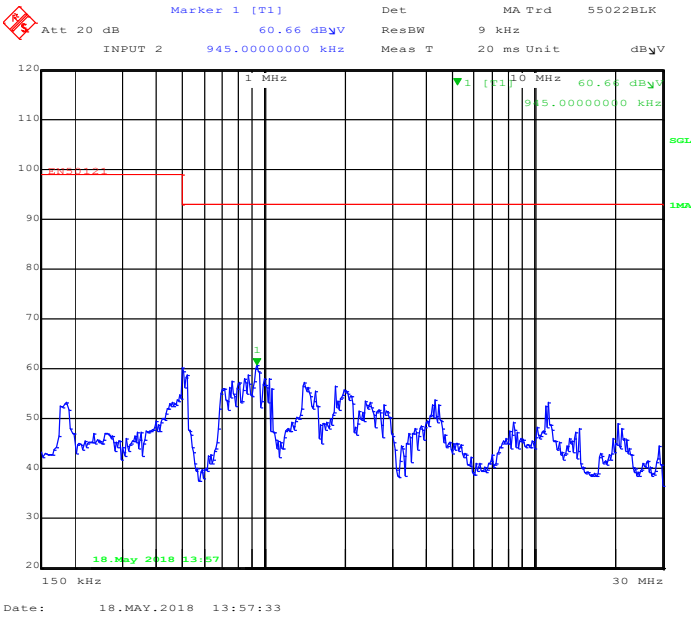


Figure 28: Vin 43V, Vout 28V, Load 0%, Cout 20,000uF

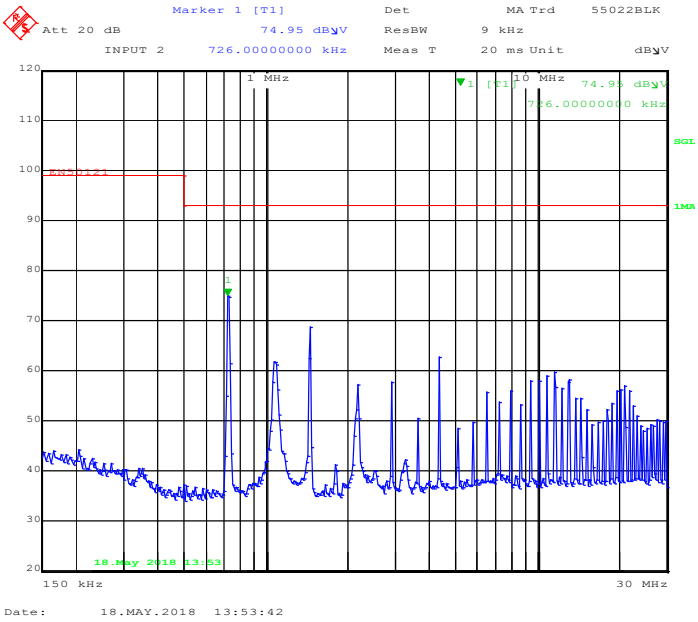


Figure 29: Vin 43V, Vout 28V, Load 50%, Cout 20,000uF

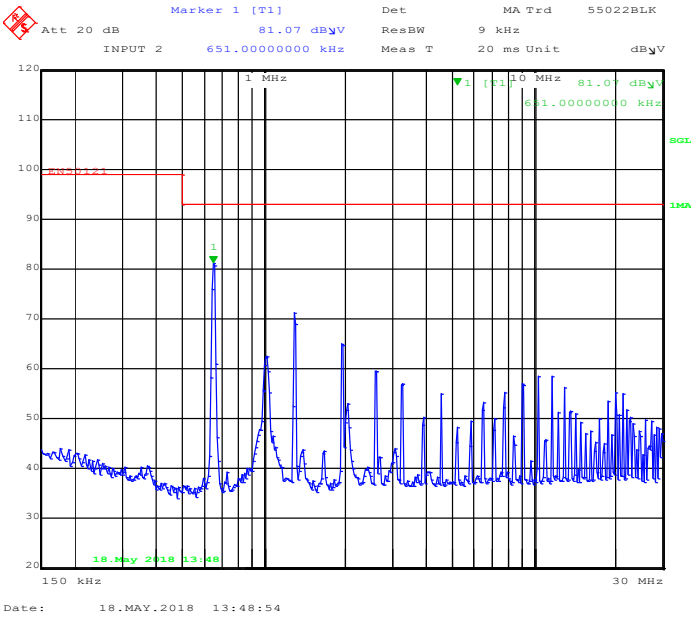


Figure 30: Vin 43V, Vout 28V, Load 100%, Cout 20,000uF

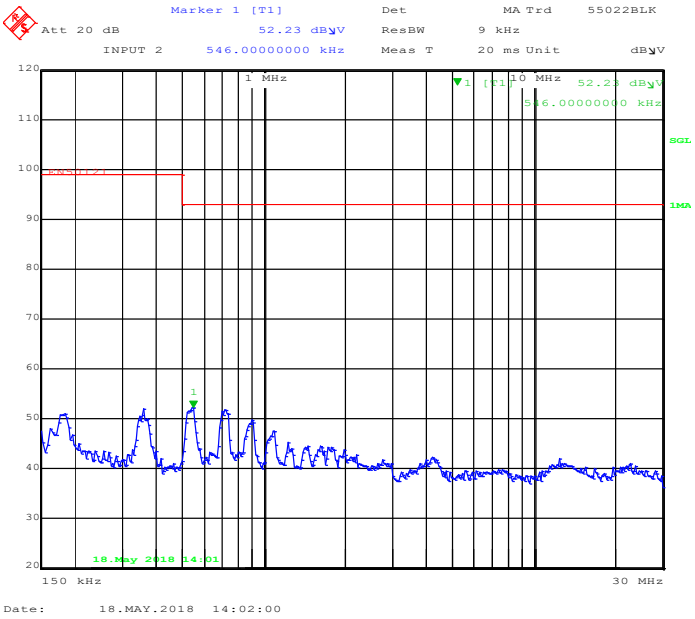


Figure 31: Vin 100V, Vout 28V, Load 0%, Cout 20,000uF

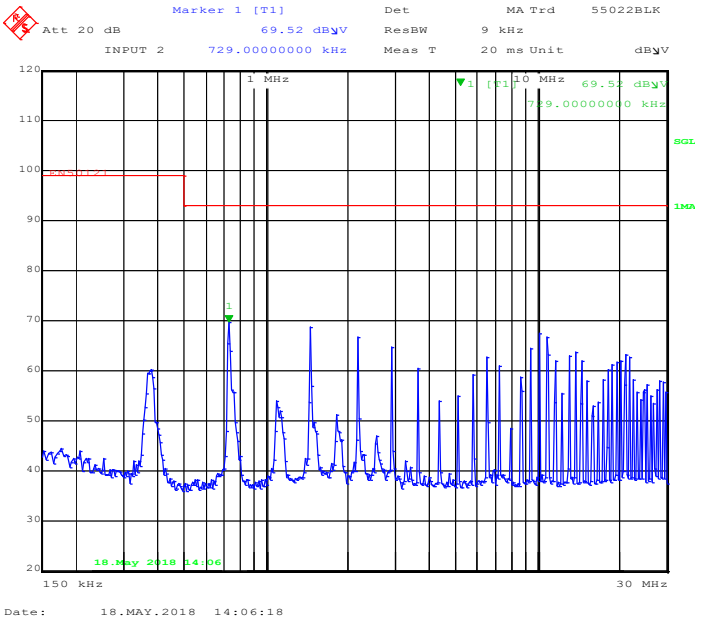


Figure 32: Vin 100V, Vout 28V, Load 50%, Cout 20,000uF

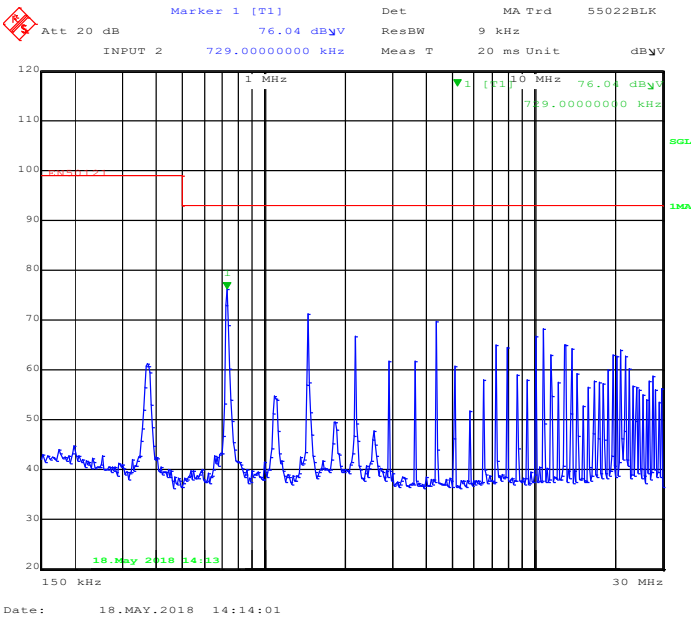


Figure 33: Vin 100V, Vout 28V, Load 100%, Cout 20,000uF

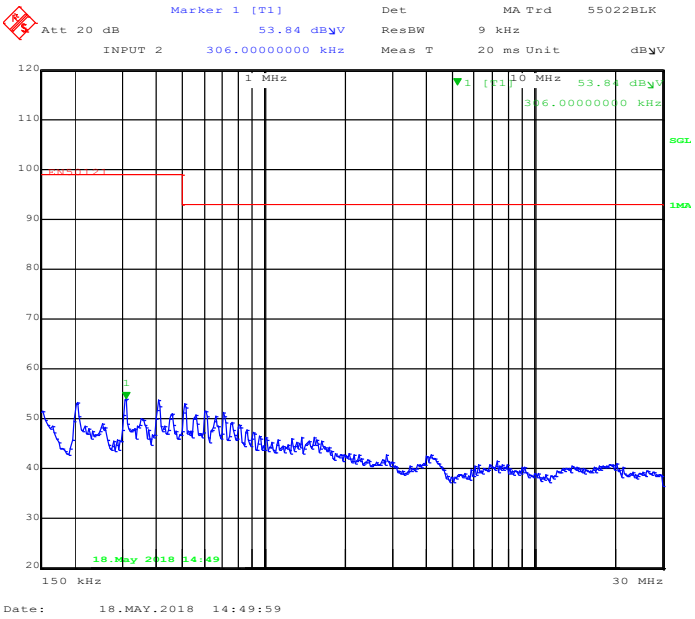


Figure 34: Vin 154V, Vout 28V, Load 0%, Cout 20,000uF

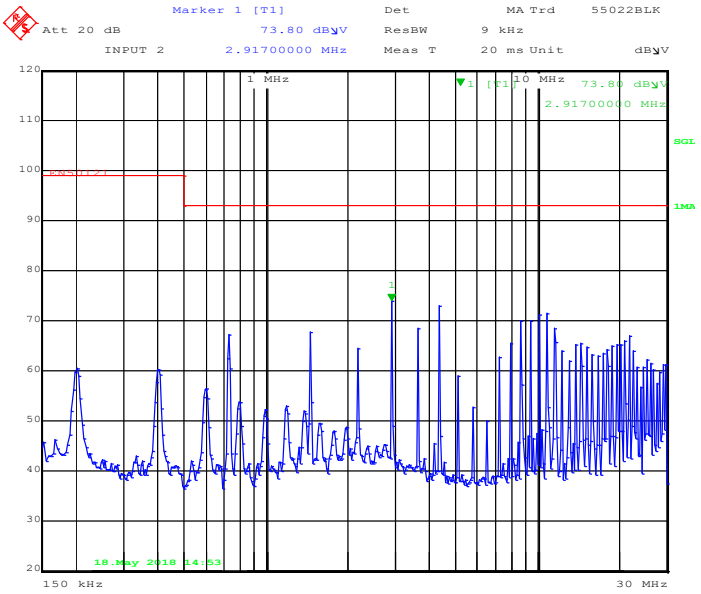


Figure 35: Vin 154V, Vout 28V, Load 50%, Cout 20,000uF

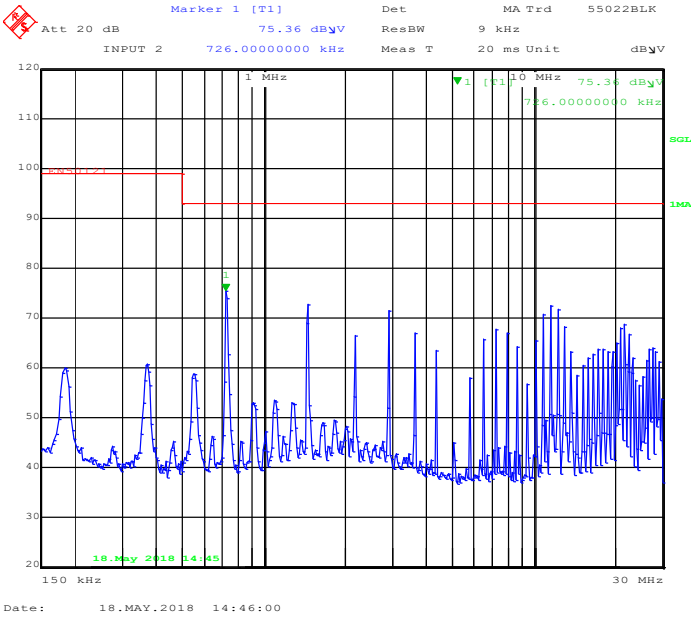
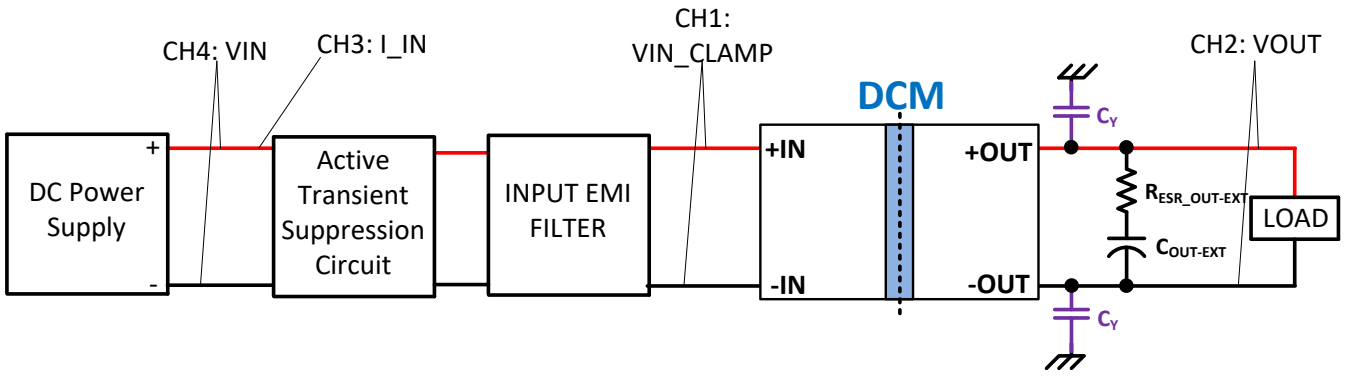
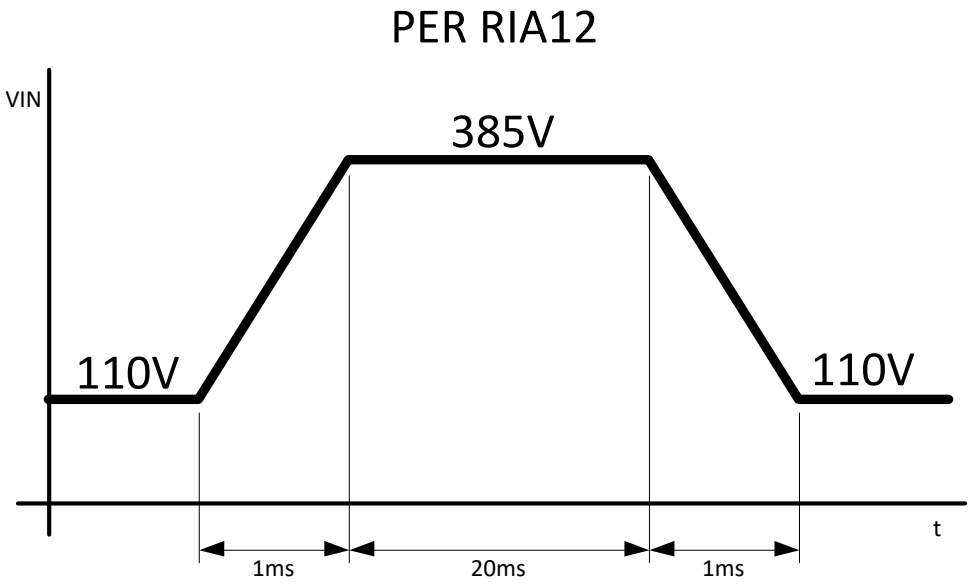


Figure 36: Vin 154V, Vout 28V, Load 100%, Cout 20,000uF

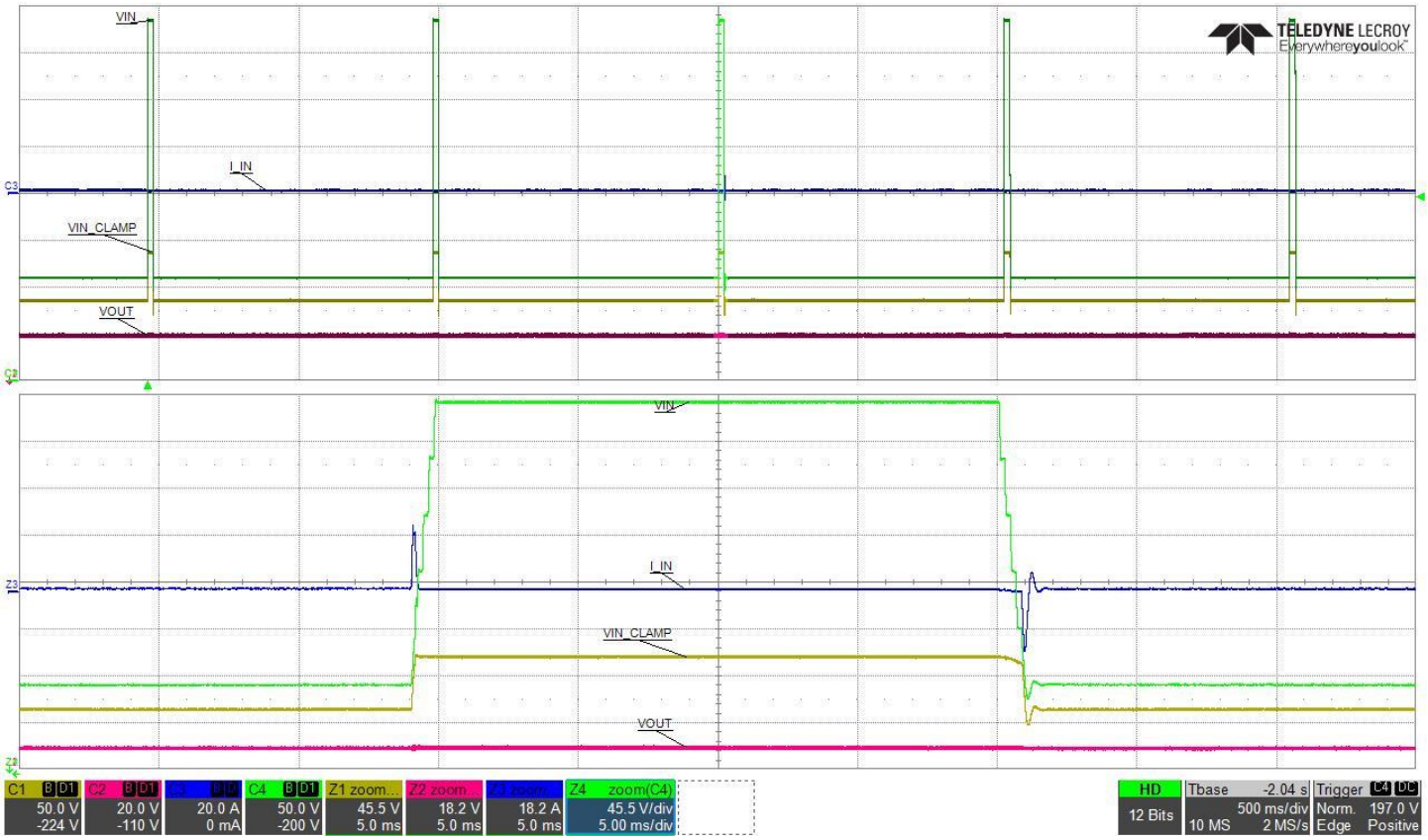
Test setup details:
Transient RIA12



ChiP DCM: DCM3623TA5N53B4T00
VIN Range: 43-154V
VIN Nominal: 110VDC
VOUT: 48V
POUT: 240W



Test Results:



CH4: VIN = 385V, 20ms
CH3: IIN
CH1: VIN_CLAMP = 162V
CH2: VOUT = 48V