AL5816QEV2 User Guide
4.5V~60VDC Linear LED Driver

General Description

The AL5816Q is a 5-terminal adjustable constant current linear LED controller offering excellent temperature stability and current capability. The AL5816Q can work with a wide input voltage range from 4.5V to 60V. With its low 200mV current sense FB voltage, it controls the regulation of LED current with minimum power dissipation compared with traditional linear LED drivers. This makes it ideal for medium to high current LEDs.

The device has an internal output drive up to 15mA, which enables it to drive external bipolar transistors or MOSFETs. It also provides the capability to drive longer LED chains with low drop out voltage and multiple LED channels.

The AL5816Q has LED current adjusted and controlled by a sense resistor connected across FB pin and GND. The voltage across this resistor is controlled to a precise 0.2V thus controlling the current.

The AL5816Q can be dimmed by PWM signal through PWM pin, it can run at frequencies higher than 200Hz.

The AL5816Q is available in SOT25 package, and is Automotive-Compliant, qualified to AEC-Q100 Grade 1, supporting PPAP documentation.

Applications

- Linear LED Driver
- LED Signs
- Instrumentation Illumination
- Refrigerator Lights

Key Features

- Qualified to AEC-Q100 Grade 1
- Wide Input Voltage Range from 4.5~ 60V
- Low Reference Voltage (VFB = 0.2V)
- 5% Reference Voltage Tolerance
- Up to 15mA Driver Capability for Bipolar Transistor
- PWM Dimming Capable
- Input Under Voltage Lock-out
- Over Temperature Shutdown

AL5816QEV2 Specifications

Parameter	Value
Input Voltage	4.5VDC to 16VDC
LED Current	150mA x 8Channels
Total ILED	1.2A
Number of LEDs	1~17pcs
XY Dimension	109mm x 76mm

Figure 1: Top View

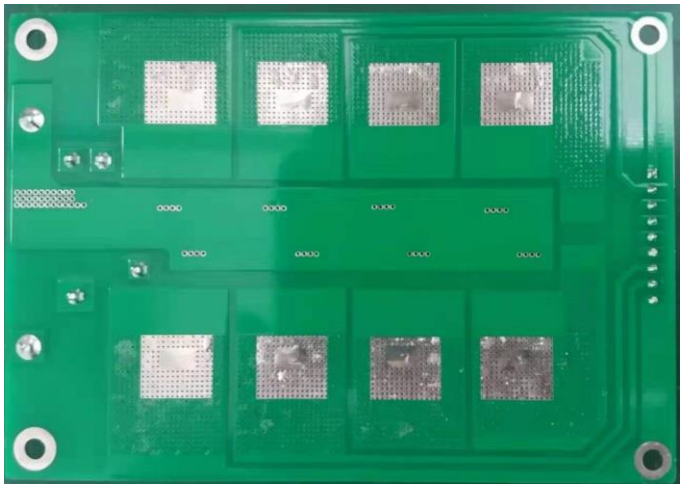


Figure 2: Bottom View

Connection Instructions

Power Supply Input: 4.5~16V$_{DC}$ (VIN+, GND)
Connect 8 channels LED string anode to Vo+ of P1 connector;
Connect LED string cathode to LED1- ~ LED8- of P1 connector;
For PWM dimming operation: supply a 0-3.3V 200Hz~500Hz signal between PWM & GND.

Evaluation Board Schematic

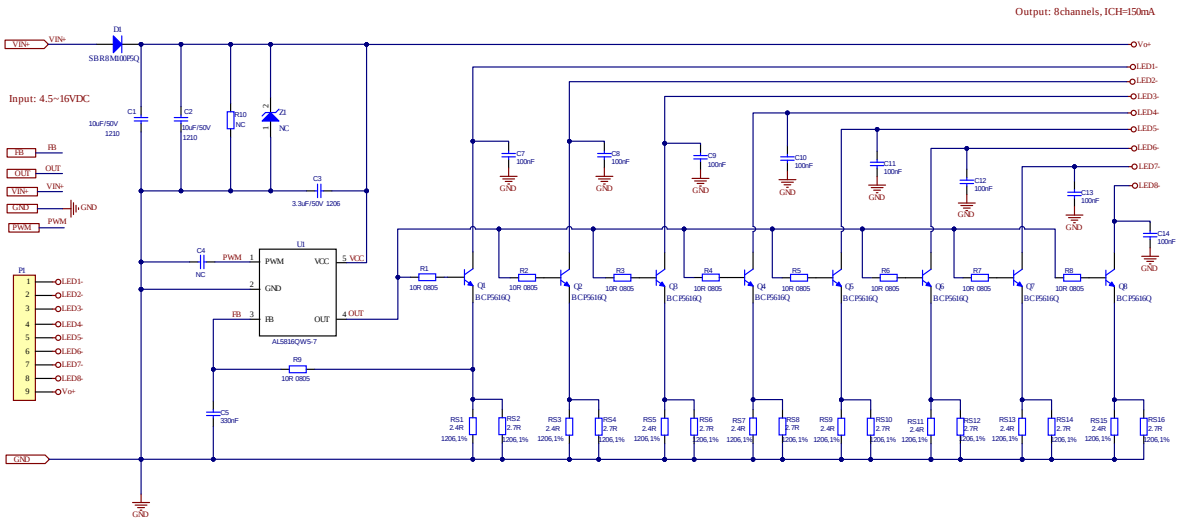


Figure 3: Evaluation Board Schematic

Evaluation Board Layout

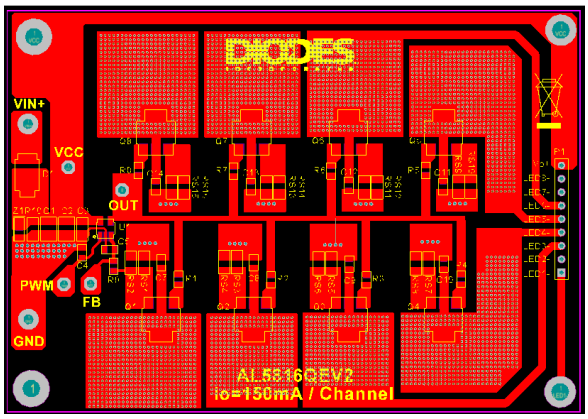


Figure 4: PCB Board Layout Top View

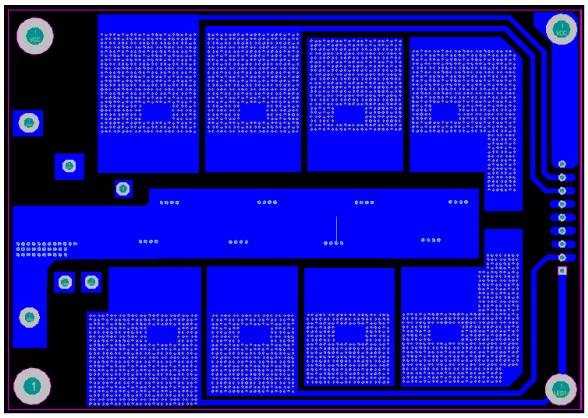


Figure 5: PCB Board Layout Bottom View

Quick Start Guide

1. By default, the LED current of evaluation board is preset at 150mA per channel.
2. Ensure that the DC source is switched OFF or disconnected before soldering or connecting.
3. Connect the anode wire of external LED string to Vo+ of P1 connector.
4. Connect the cathode wire of external LED string to LEDx- of P1 connector.
5. Connect two DC line wires to the VIN and GND terminals on the evaluation board.
6. Ensure that the area around the board is clear and safe, and preferably that the board and LEDs are enclosed in a transparent safety cover.
7. Turn on the main switch. LED string should light up.

Bill of Material

Location	Description	Package
D1	SBR8M100P5Q,100V,8A, AEC-Q101 Qualified, DIODES	PowerDI5
Q1,Q2,Q3,Q4,Q5,Q6,Q7,Q8	BCP5616QTA, 80V,1A, AEC-Q101 Qualified, DIODES	SOT223
R1,R2,R3,R4,R5,R6,R7,R8	10ohm, 1%, 0805	0805
RS2,RS4,RS6,RS8,RS10,RS12,RS14,RS16	2R7, 1%, 1206	1206
RS1,RS3,RS5,RS7,RS9,RS11,RS13,RS15	2R4, 1%, 1206	1206
R9	10ohm, 5%, 0805	0805
C1,C2	MLCC, 10uF,50V, 1210	1210
C3	MLCC, 3.3uF,50V, 1206	1206
C7,C8,C9,C10,C11,C12,C13,C14	MLCC, 100nF,50V, 0805	0805
C5	MLCC, 330nF,50V, 0805	0805
P1	Connector,9Pin,Pitch=2.54mm	-
VIN	PC test point, 0.06inch(1.6mm), red	-
PWM	PC test point, 0.06inch(1.6mm), white	-
GND	PC test point, 0.06inch(1.6mm), black	-
VCC	PC test point, 0.06inch(1.6mm), yellow	-
OUT	PC test point, 0.06inch(1.6mm), yellow	-
FB	PC test point, 0.06inch(1.6mm), yellow	-
PCB	FR4, 2oz, 90mm x 65mm	-
U1	IC, AL5816Q, AEC-Q100 Grade 1, DIODES	SOT25

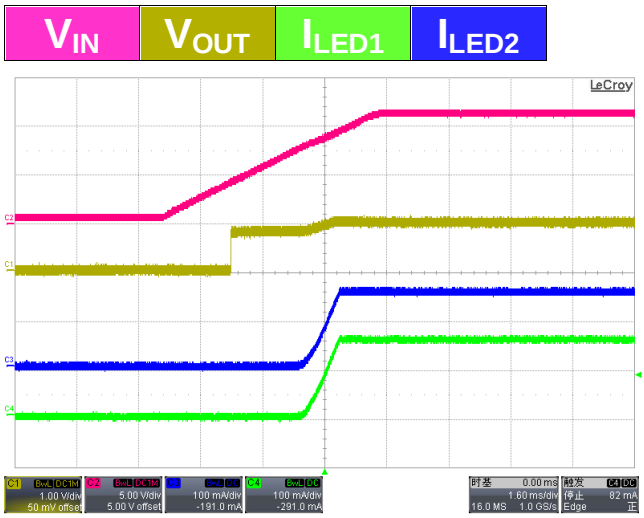
System Performance

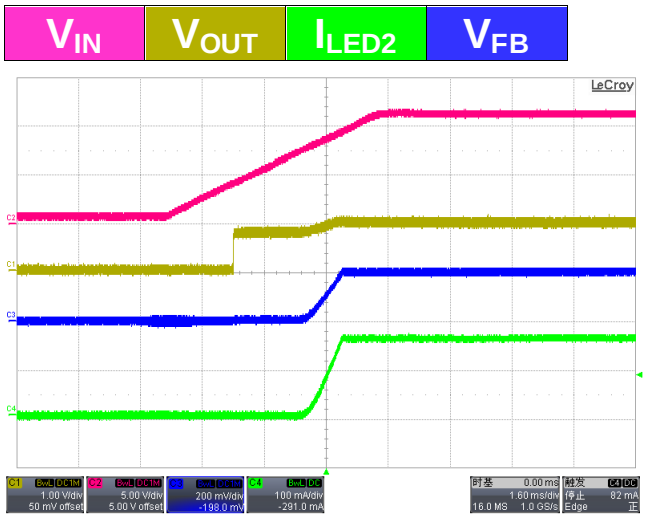
Test @ V_{LEDx} = 9.1V

Vin(V)	Io1(mA)	Io2(mA)	Io3(mA)	Io4(mA)	Io5(mA)	Io6(mA)	Io7(mA)	Io8(mA)
11	149.54	150.46	148.96	149.13	148.47	151.54	152.05	154.14
12	149.67	151.05	149.34	149.78	149.02	152.24	152.93	154.37
13	149.53	150.54	149.41	149.71	149.11	152.61	153.46	154.43
14	149.41	150.37	149.25	149.26	148.82	152.72	153.67	154.43
15	149.3	150.39	149.05	148.71	148.46	152.84	153.13	154.39

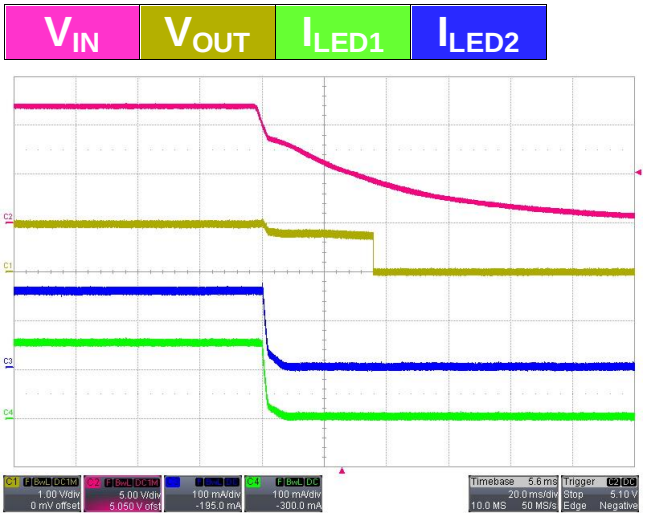
Waveforms:

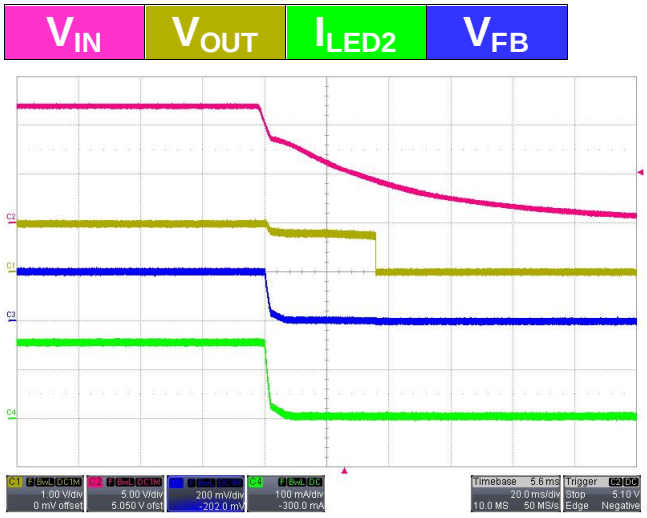
Turn ON:



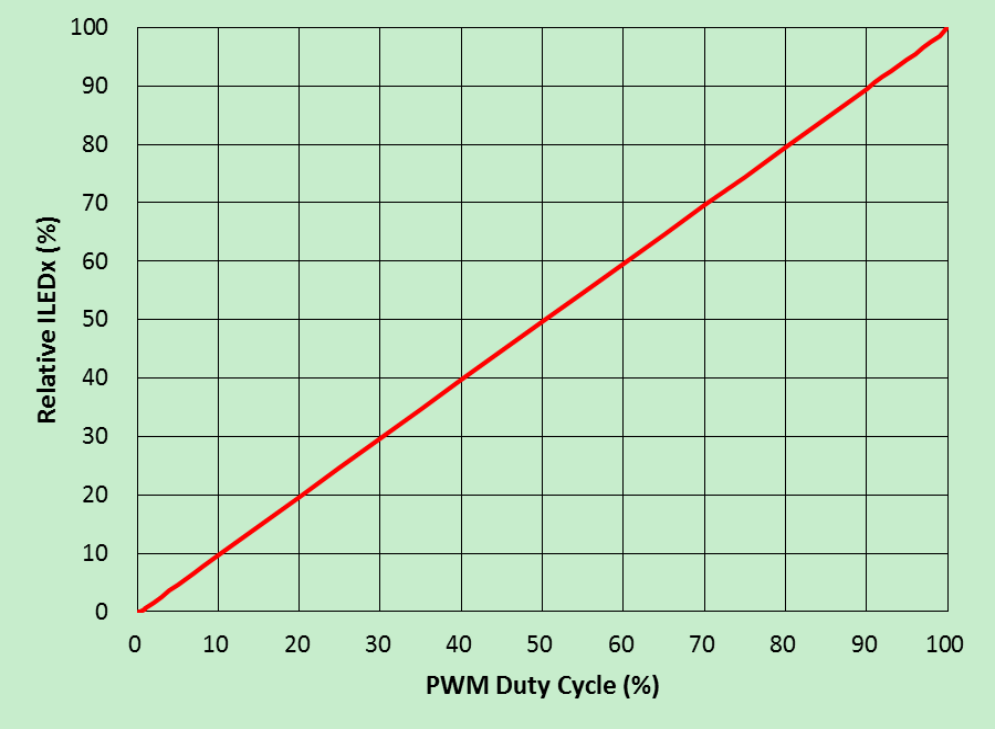


Turn OFF:

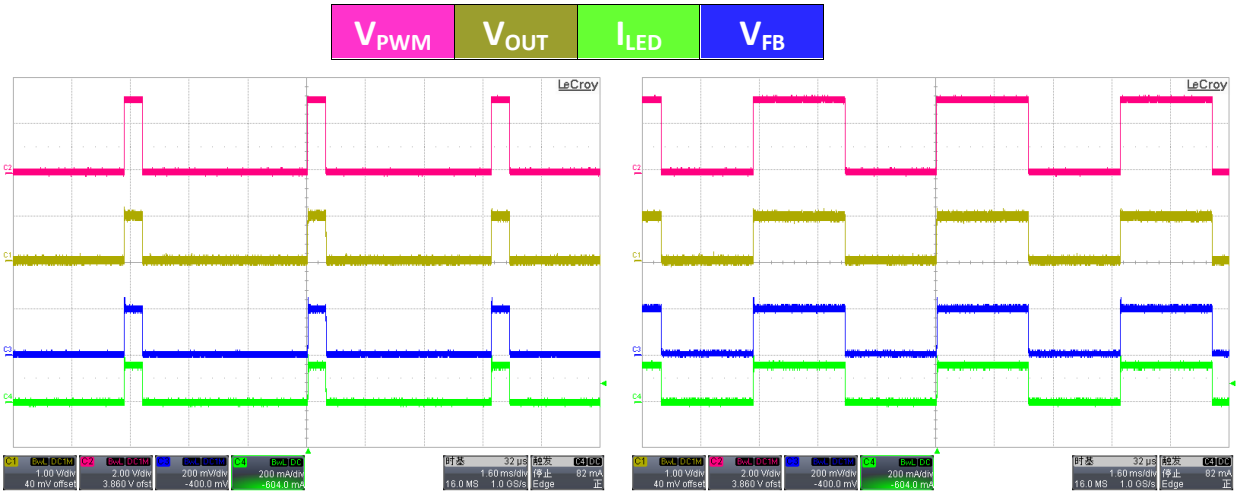




PWM Dimming (f_{PWM}=200Hz):



PWM Dimming Curve in 200Hz



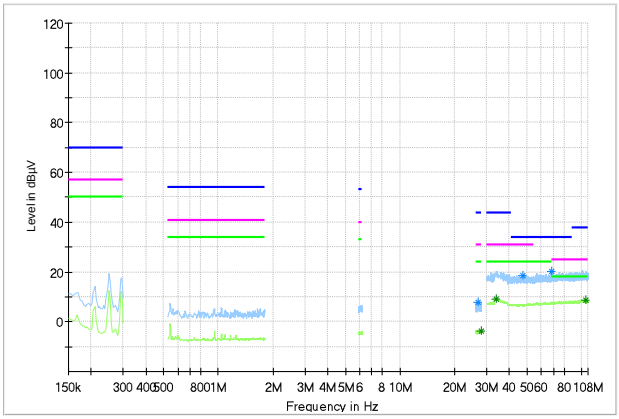
PWM Duty=10% **PWM Duty=50%**

BCI Test:

EVB can pass ISO11452-4 200mA BCI test without LED flicker and output current decrease.

EMI Test:

CE Test: (CISPR 25 Class 5, minimum margin = 9.27dB)

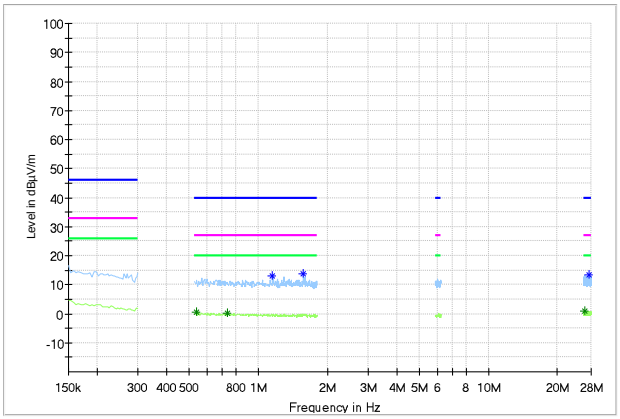


Critical_Freqs

Frequency	MaxPeak	Average	Limit	Margin	Meas._Time	Bandwidth	Line	Corr.
MHz	dBµV	dBµV	dBµV	dB	ms	kHz		dB
26.712000	7.99	---	44.00	36.01	---	---	Single Line	0.7
27.812000	---	-3.53	24.00	27.53	---	---	Single Line	0.7
33.650000	---	9.26	24.00	14.74	---	---	Single Line	0.8
47.650000	18.69	---	34.00	15.31	---	---	Single Line	0.9
68.200000	20.07	---	34.00	13.93	---	---	Single Line	1.1
104.900000	---	8.73	18.00	9.27	---	---	Single Line	1.5

RE Test: (CISPR 25 Class 5, minimum margin = 10.25dB)

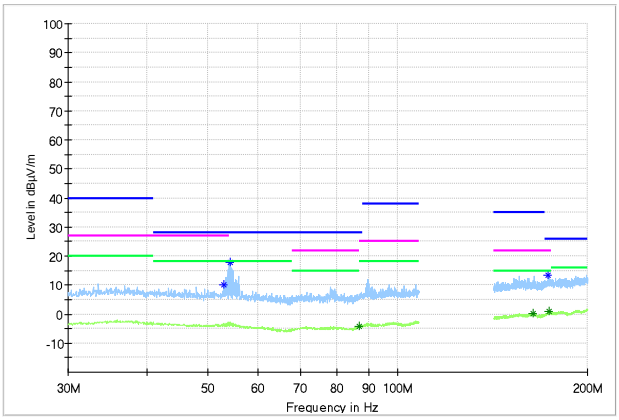
150kHz~28MHz



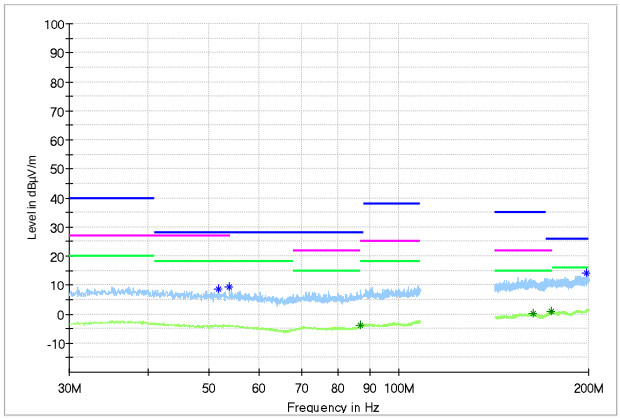
Critical_Freqs

Frequency	MaxPeak	Average	Limit	Margin	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	dB/m
53.00	10.09	---	28.00	17.91	-14.3
54.25	17.75	---	28.00	10.25	-14.5
86.75	---	-4.22	15.00	19.23	-14.6
164.10	---	0.19	15.00	14.81	-10.4
173.45	13.34	---	26.00	12.66	-10.0
174.05	---	0.84	15.00	14.16	-9.9

30MHz~200MHz



Vertical



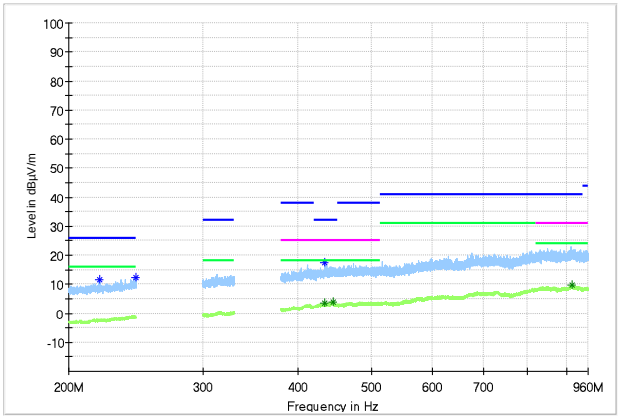
Horizontal

Critical_Freqs

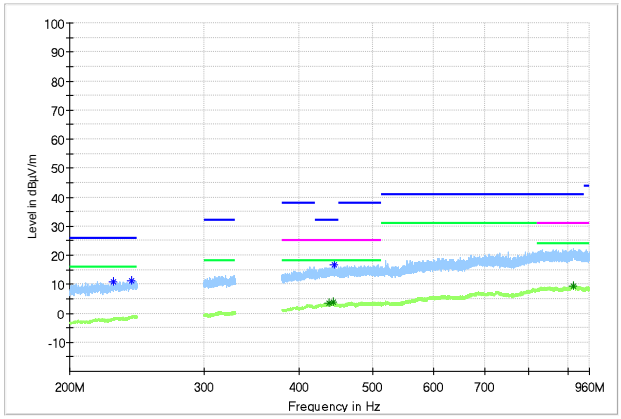
Frequency	MaxPeak	Average	Limit	Margin	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	dB/m
53.00	10.09	---	28.00	17.91	-14.3
54.25	17.75	---	28.00	10.25	-14.5
86.75	---	-4.22	15.00	19.23	-14.6
164.10	---	0.19	15.00	14.81	-10.4
173.45	13.34	---	26.00	12.66	-10.0
174.05	---	0.84	15.00	14.16	-9.9

Frequency	MaxPeak	Average	Limit	Margin	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	dB/m
51.70	8.47	---	28.00	19.53	-14.2
53.90	9.45	---	28.00	18.55	-14.4
87.00	---	-3.94	15.00	18.94	-14.6
163.40	---	0.31	15.00	14.69	-10.4
174.25	---	0.77	15.00	14.23	-9.9
198.55	14.22	---	26.00	11.78	-8.8

200MHz~960MHz



Vertical



Horizontal

Critical_Freqs

Frequency	MaxPeak	Average	Limit	Margin	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	dB/m
219.70	11.67	---	26	14.33	-13.3
244.90	12.25	---	26	13.75	-12.1
433.60	---	3.44	18	14.56	-7.7
433.80	17.28	---	32	14.72	-7.7
444.85	---	3.99	18	14.01	-7.2
915.65	---	9.73	24	14.27	-0.8

Frequency	MaxPeak	Average	Limit	Margin	Corr.
MHz	dBµV/m	dBµV/m	dBµV/m	dB	dB/m
228.25	10.83	---	26	15.17	-12.9
240.75	11.14	---	26	14.86	-12.2
437.75	---	3.39	18	14.61	-7.5
443.70	---	3.84	18	14.16	-7.3
444.45	16.79	---	32	15.21	-7.2
913.30	---	9.42	24	14.58	-0.8

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