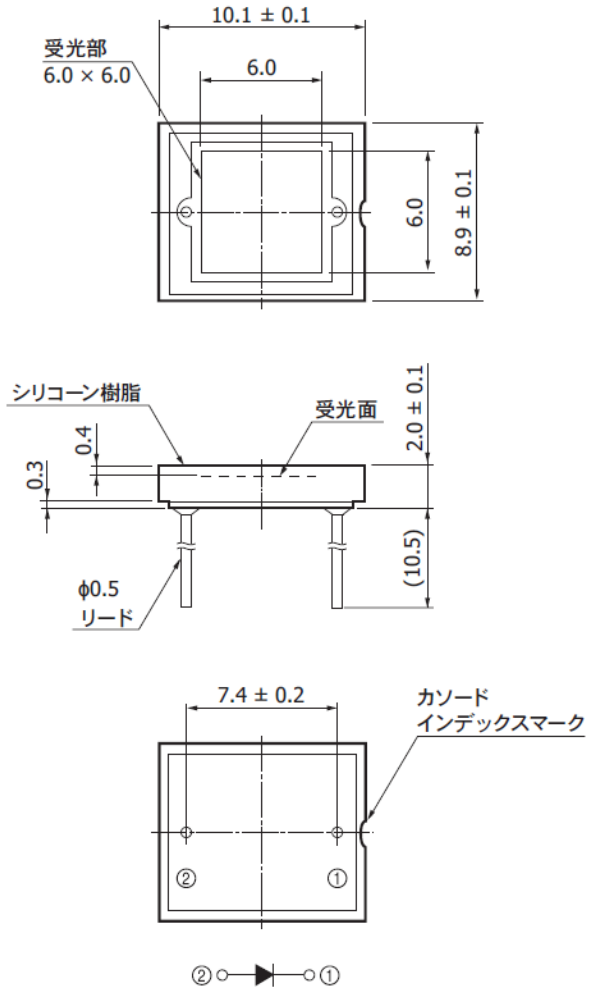
MPPC Signal

MPPC S13360-6050CS



電気的および光学的特性 (指定のない場合はTyp. Ta=25 °C)

型名	測定条件	感度波長範囲 λ (nm)	最大感度波長 λp (nm)	検出効率 PDE*4 λ=λp (%)	ダークカウント*5 Typ. (kcps)	ダークカウント*5 Max. (kcps)	端子間容量 Ct (pF)	増倍率 M	降伏電圧 VBR (V)	クロストーク確率 (%)	推奨動作電圧 Vop (V)	推奨動作電圧の温度係数 ΔTVop (mV/°C)
S13360-1325CS	Vover =5 V	270 ~ 900	450	25	70	210	60	7.0 × 10^5	53 ± 5	1	VBR + 5	54
S13360-1325PE		320 ~ 900										
S13360-3025CS		270 ~ 900			400	1200	320					
S13360-3025PE		320 ~ 900										
S13360-6025CS		270 ~ 900			1600	5000	1280					
S13360-6025PE		320 ~ 900										
S13360-1350CS	Vover =3 V	270 ~ 900		40	90	270	60	1.7 × 10^6		3	VBR + 3	
S13360-1350PE		320 ~ 900										
S13360-3050CS		270 ~ 900			500	1500	320					
S13360-3050PE		320 ~ 900										
S13360-6050CS		270 ~ 900			2000	6000	1280					
S13360-6050PE		320 ~ 900										

リード材質: Fe-Ni-Co合金
リード処理: Auメッキ
指示なき公差: ±0.2
チップ位置精度:
パッケージの中心を基準として X, Y ≦ ±0.3
コーティング樹脂は、パッケージ上面より
最大0.1 mm盛り上がる場合があります。

LED (S/N : UV5TZ-395-30)

Bivar **UV5TZ-XXX-XX** Tight Tolerance Ultraviolet (UV) LEDs have peak wavelengths in the highly desirable ranges from 385 to 405nm with a tight tolerance of +/-2.5nm. These UV LEDs also have a built-in Zener Diode providing protective circuit against electrostatic discharge (ESD).

Electrical Characteristics

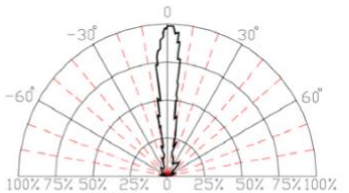
T_A = 25°C & I_F = 20 mA unless otherwise noted

Part Number	Forward Voltage (V)[1]			Recommend Forward Current (mA)			Reverse Current (mA)	Peak Wavelength λp (nm)[2]			Emitting Power (mW)		50% Power Angle (deg)
	MIN	TYP	MAX	MIN	TYP	MAX	MAX	MIN	TYP	MAX	MIN	TYP[3]	TYP
UV5TZ-385-15	3.2	3.4	3.6					382.5	385.0	387.5	10	20	
UV5TZ-390-15	3.2	3.4	3.6					387.5	390.0	392.5	20	40	
UV5TZ-395-15	3.1	3.3	3.5	10	15	20	100	392.5	395.0	397.5	20	40	15
UV5TZ-400-15	3.1	3.3	3.5					397.5	400.0	402.5	20	40	
UV5TZ-405-15	3.1	3.3	3.5					402.5	405.0	407.5	20	40	
UV5TZ-385-30	3.2	3.4	3.6					382.5	385.0	387.5	10	20	
UV5TZ-390-30	3.2	3.4	3.6					387.5	390.0	392.5	20	40	
UV5TZ-395-30	3.1	3.3	3.5	10	15	20	100	392.5	395.0	397.5	20	40	30
UV5TZ-400-30	3.1	3.3	3.5					397.5	400.0	402.5	20	40	
UV5TZ-405-30	3.1	3.3	3.5					402.5	405.0	407.5	20	40	

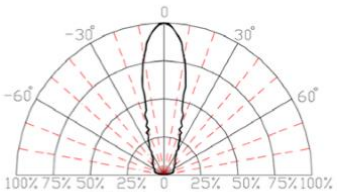
Notes: 1. Tolerance of forward voltage : ±0.05V. 2. Tolerance of peak wavelength : ±1.0nm. 3. Tolerance of emitting power (Typ) : ±15%.

Directivity Radiation — Relative Luminous Intensity vs. Radiation Angle

T_A = 25°C unless otherwise noted



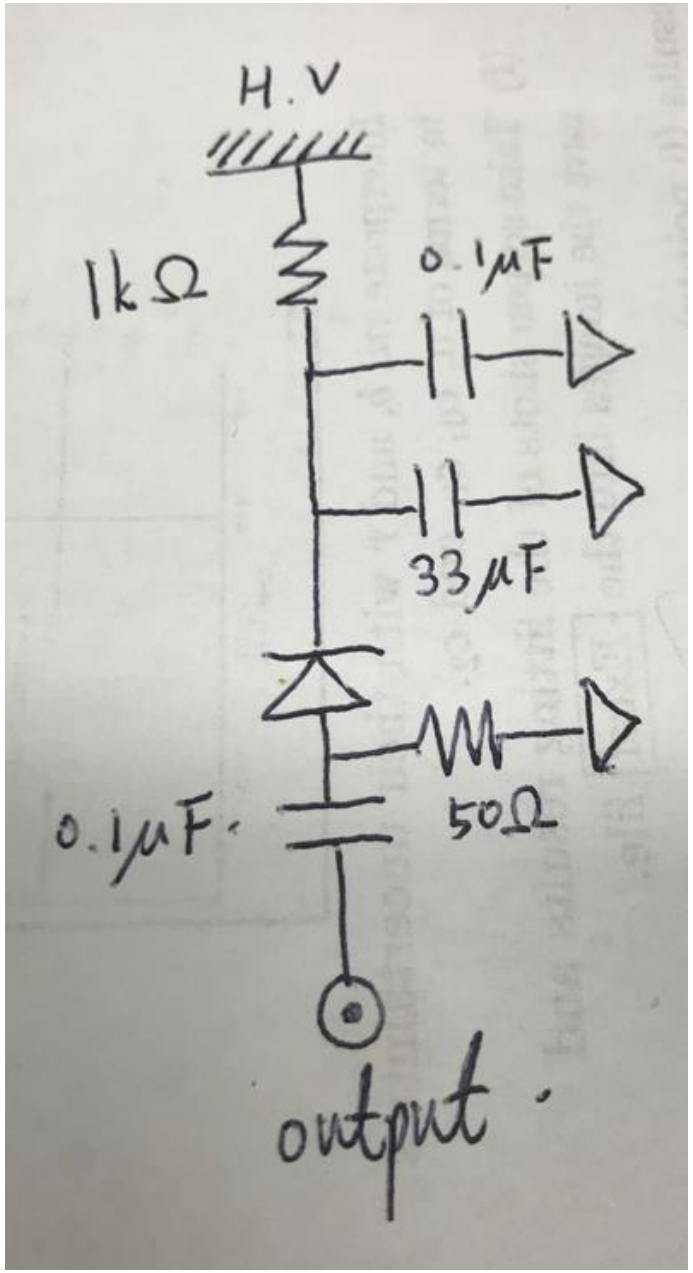
(15° Viewing Angle)



(30° Viewing Angle)

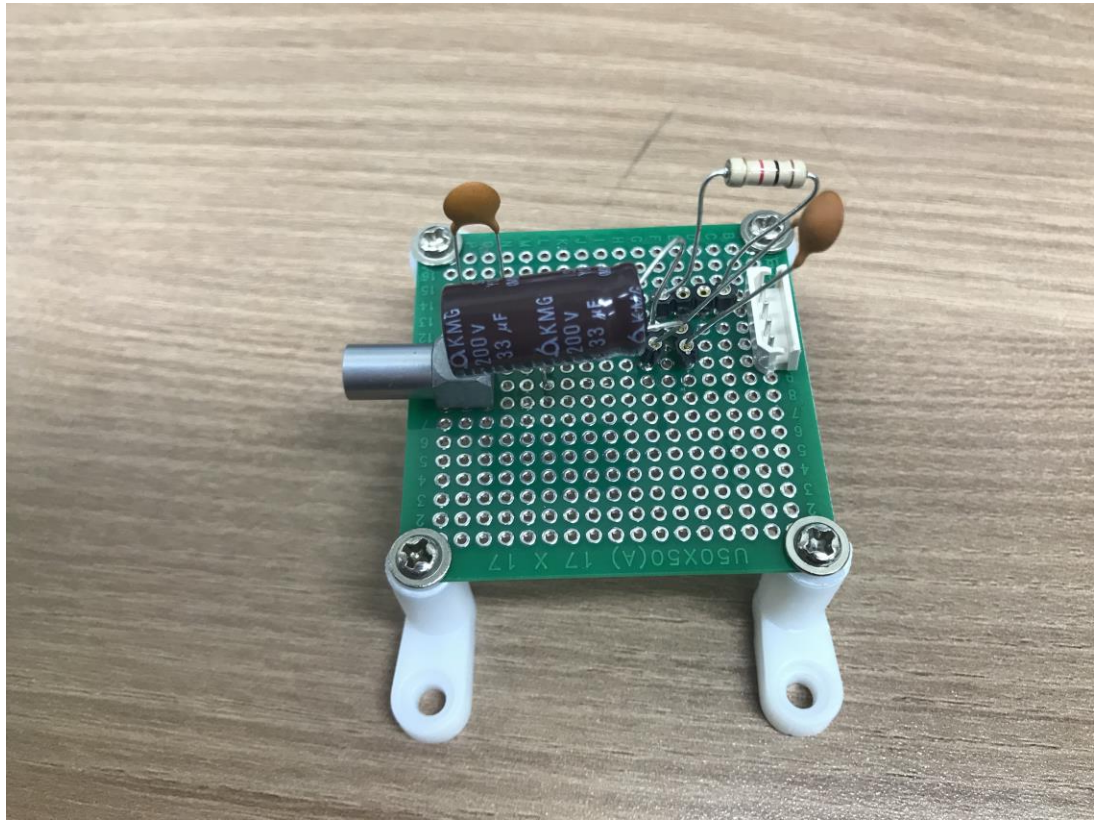
MPPC read-out circuit

- For stability, A 1 k Ω resistor was placed in front of the MPPC.
- To remove DC offset, 0.1 μF is placed behind the MPPC.
- 50 Ω was installed for impedance matching.



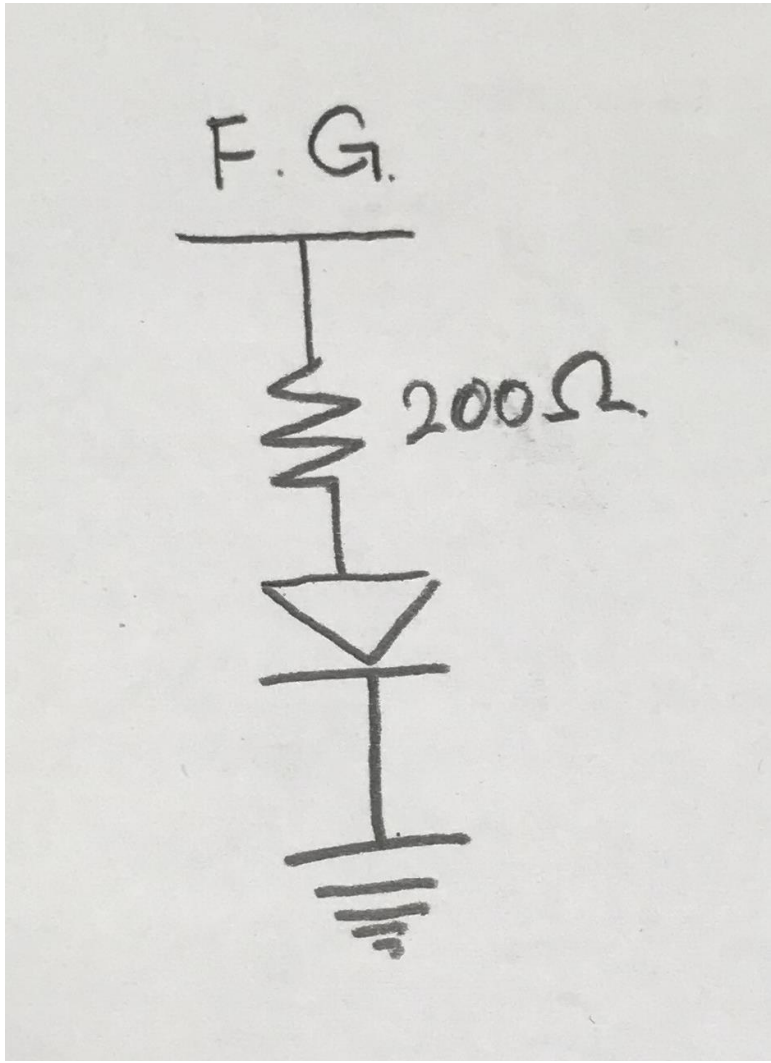
MPPC read-out circuit

- The photo on the right is actual MPPC read-out circuit.
- The circuit was designed to change resistors and capacitors

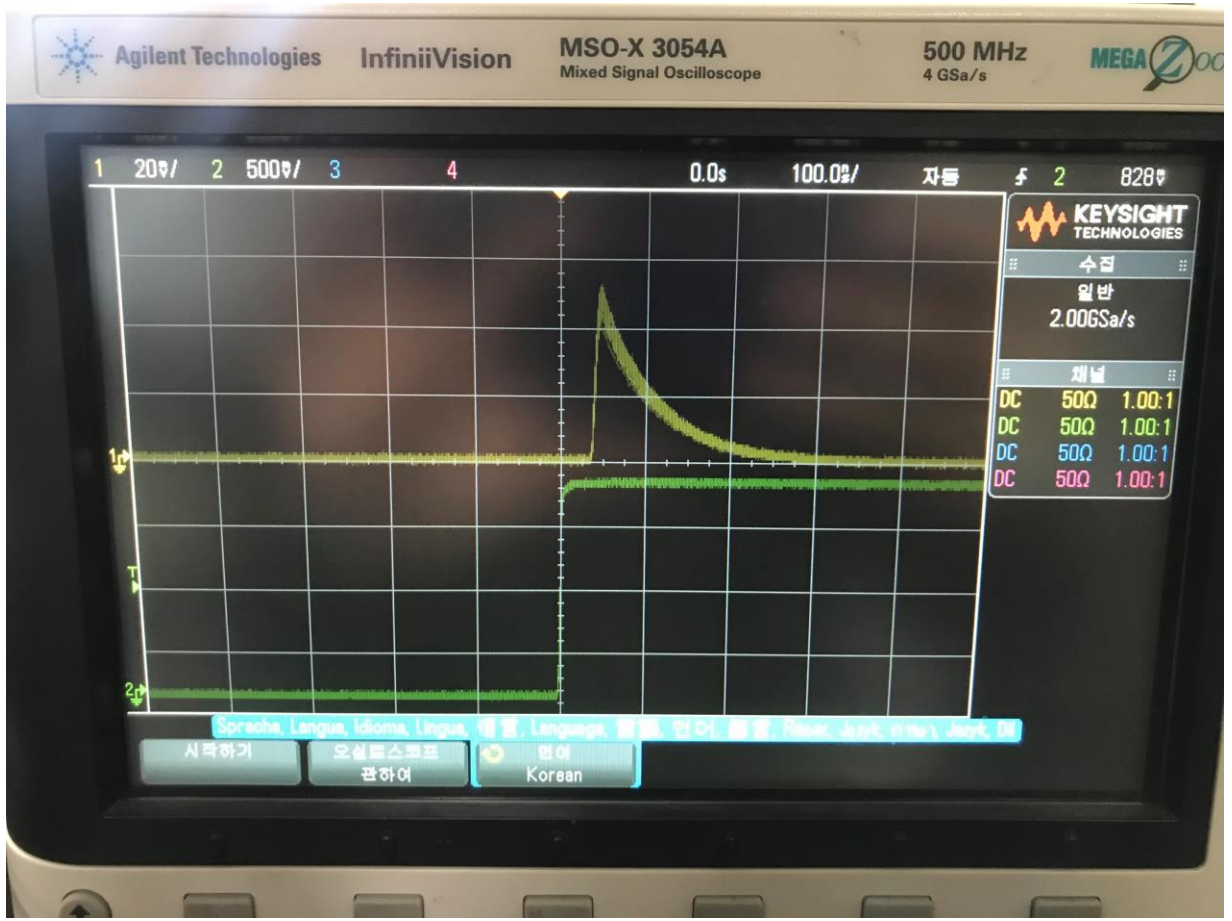


LED Circuit

- The resistor in front of the LED was 200 ohms resistor.
- We also check visually that LED was working in wide pulse width(1ms, 500Hz).



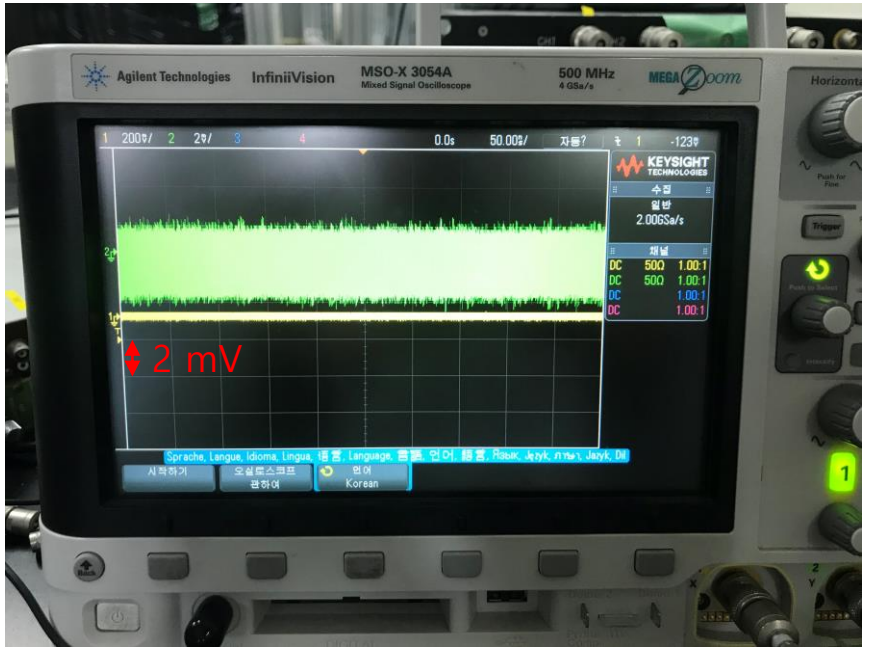
MPPC Signal



MPPC signal with 56.50 V(high voltage) and LED(3.5 V, 20.0 ns)

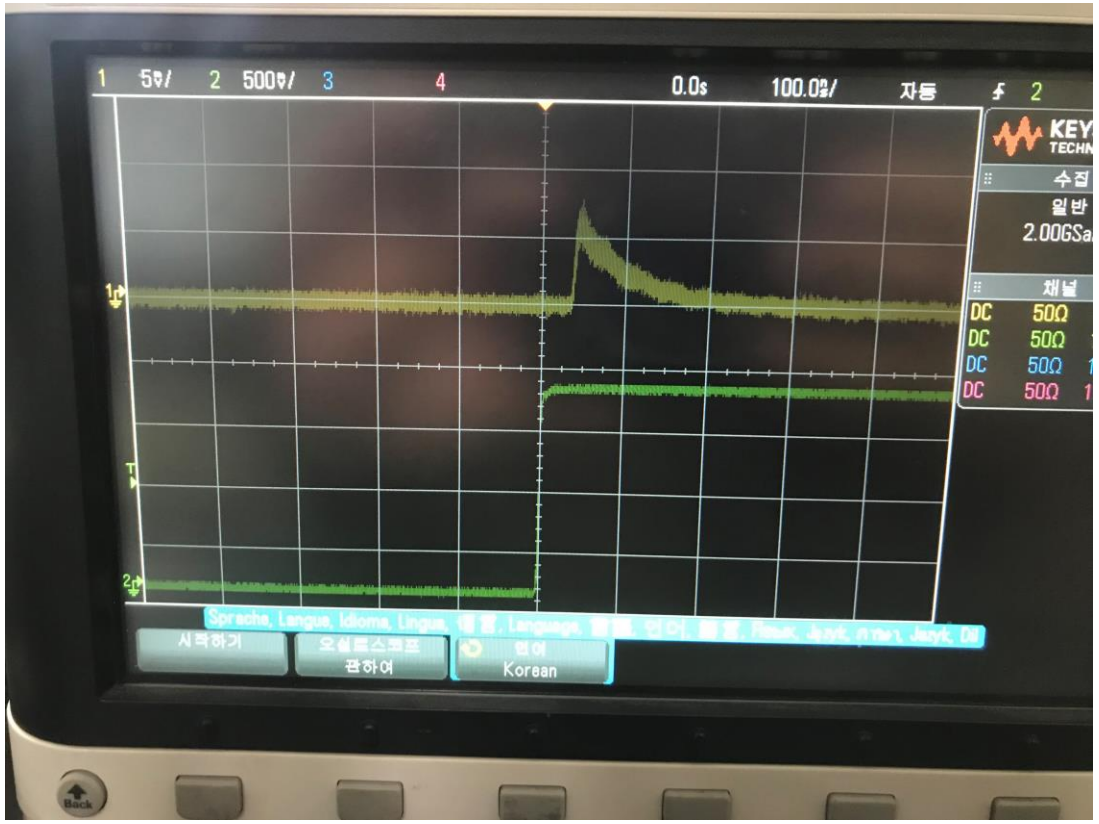
Bypass capacitor

- To reduce high voltage noise, a bypass capacitor was installed in front of the MPPC.
- As a result, the noise of the MPPC circuit, which was about 4 mV, was reduced to less than 2 mV.

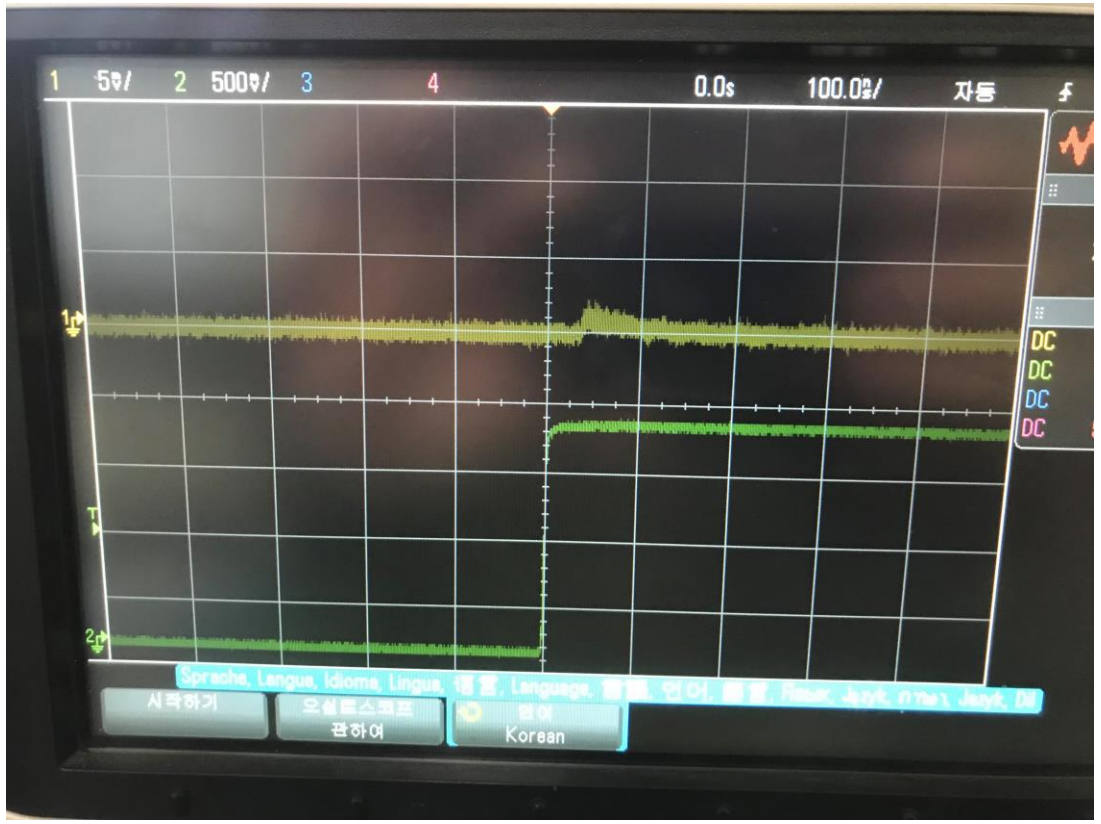


MPPC signal depending on LED pulse width

The voltage applied is 54.31 V, the operating voltage.

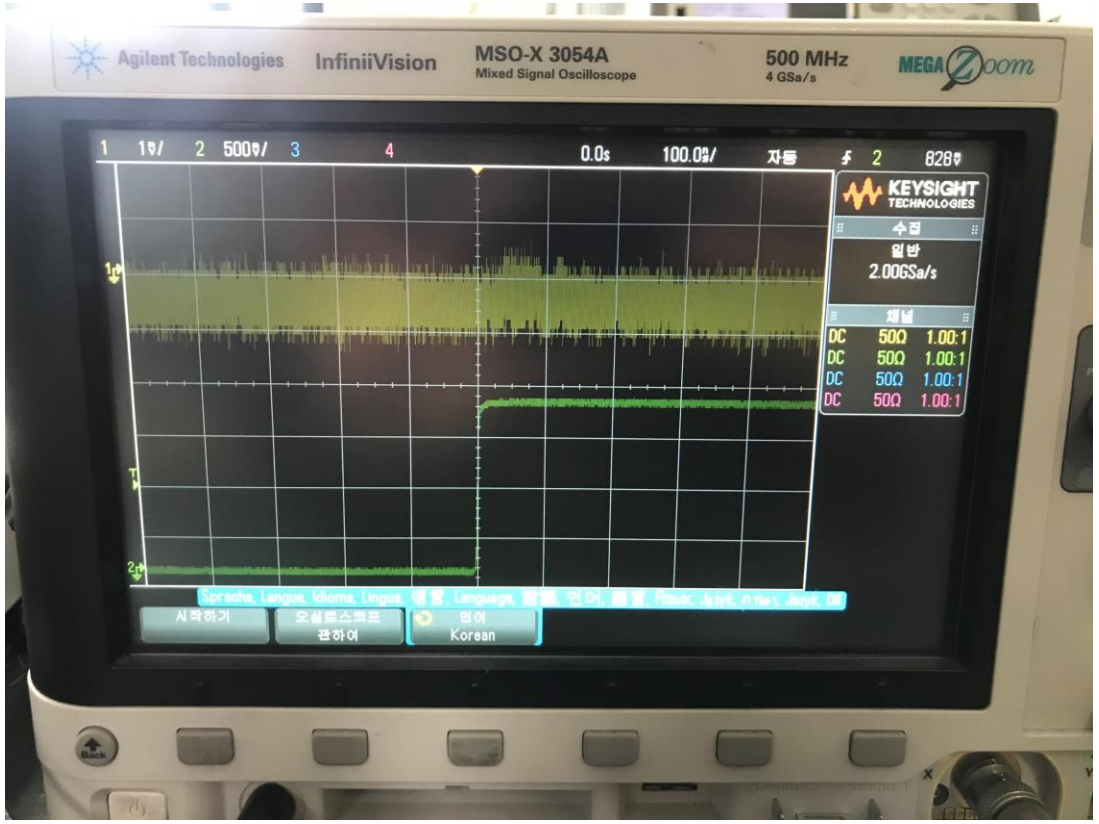


Pulse width : 19 ns



Pulse width : 18 ns

MPPC signal depending on LED pulse width



Pulse width : 17 ns

- We tried to find the point where the frequency of the signal appeared decreased, but we could not find it because the height of the signal decreased and then disappeared.
- That is, the single photon signal could not be confirmed

Expected height for single photon

- According the signal in previous slide, pulse width is about 100 ns.
- And gain of MPPC is 1.7 X 10^6.
- If you regard the shape of pulse as triangle,

$$Q = I \times t = \frac{V}{R} t = \frac{1}{2} \times \frac{V \times 100ns}{50\Omega} = 1.6 \times 10^{-19} \times 1.7 \times 10^{6}$$

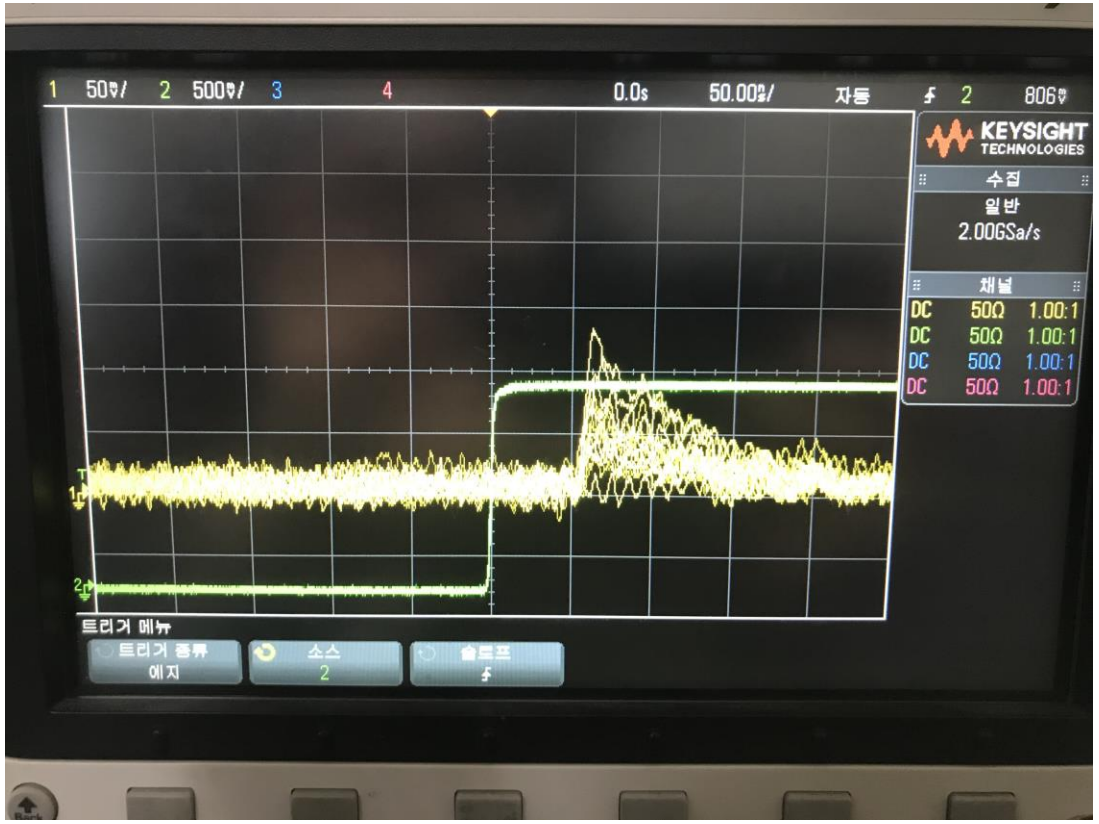
- Peak height is 0.272 mV.
- According to this calculation, we cannot see single photon signal.

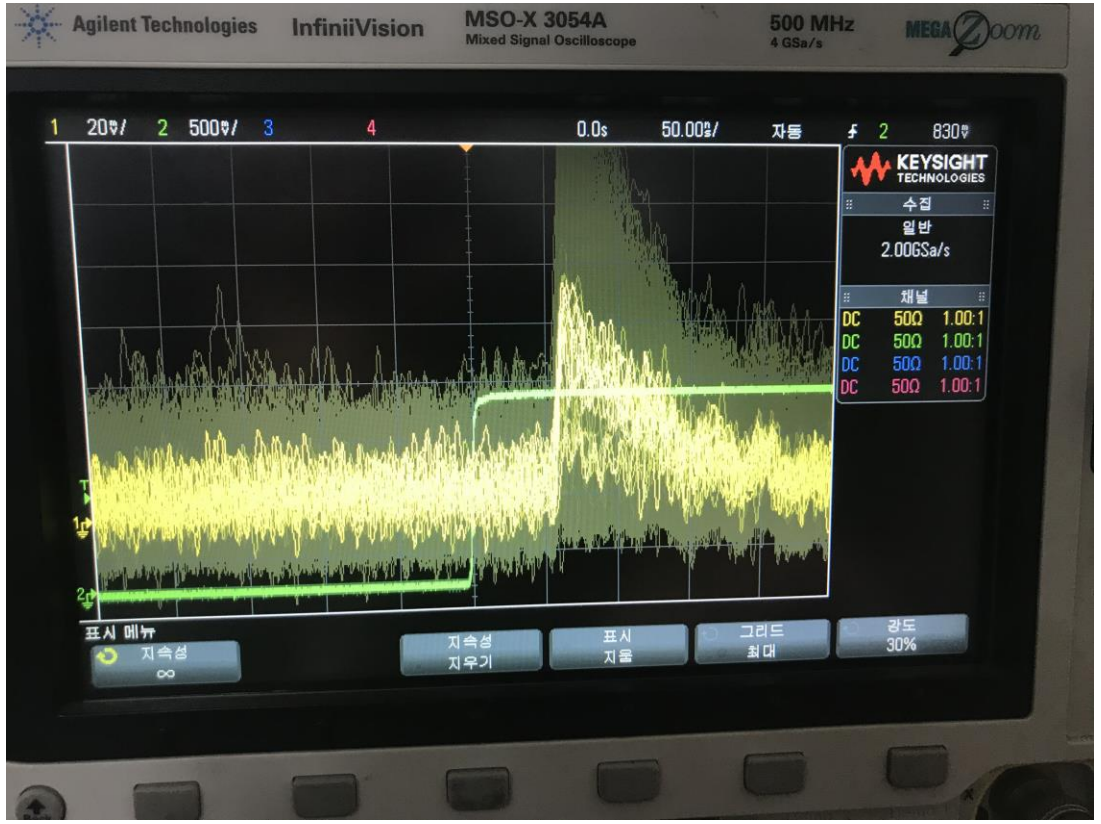
Conclusion

- To see the single photon signal, we need pre-amp to amplify the singal.

+MPPC signal

Nim Amp(X 50)





Applied voltage is 57.31 V and Pulse width of LED is 20.0 ns (Lead edge time = trail edge time = 8.4 ns)