Low Noise, Wideband PMT Transimpedance Amplifier

TIA60

Description

The TIA60 is a transimpedance amplifier designed to amplify the output signal from a photomultiplier tube (PMT), a PIN or APD photodiode or other signal that requires transimpediance amplification. It has a wideband range from DC to 60 MHz and low noise, 4.8pA/√Hz @ 1 MHz, operation. A DC offset adjustment is provided to improve dynamic range into the data collection system.

The TIA60 is offered in a housing designed to be mounted close to the detector to reduce the noise coupled into the low level signal between the detector and the amplifier. Specifically it is mechanically compatible with the Hamamatsu H7422 series PMT.

Specifications

TIA60 AC Performance	
Bandwidth (3 dB, C_{in} = 4 pF)[a]	DC to 60 MHz
Rise/Fall Time (10% to 90%)	5.5 ns
Settling Time (3%, 0.5 V Output)	16 ns

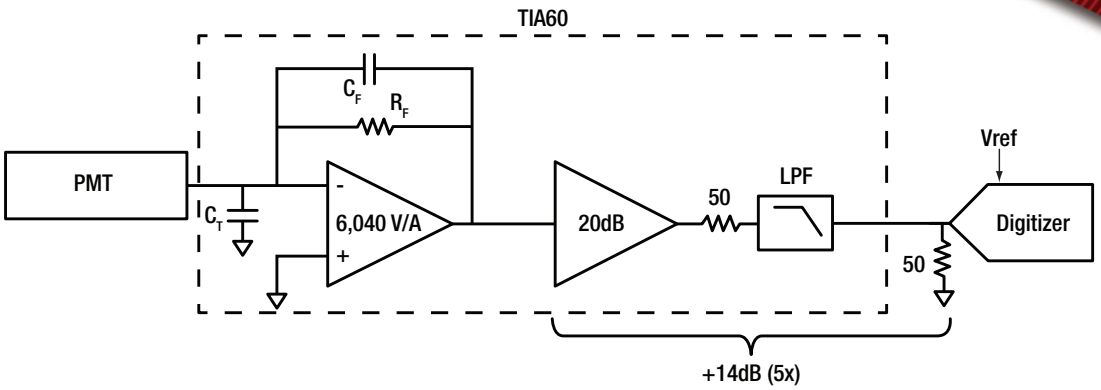
TIA60 Specifications				
	Conditions	**Min**	**Typical**	**Max**
Total Transimpedance[b]	Combined Stages, DC	29000 V/A	30200 V/A	32000 V/A
Transresistance	Input Stage Z-Amp, DC	-	6.04 kΩ	-
Linear Input Range	0 V Output Bias	-	-	±50 µA
Maximum Input[c]		-	-	±500 µA
DC Input Impedance		-	33 Ω	-
Input Reference		-	0 V	-
Input Current Noise[a]	@ 1 MHz, C_{in} = 4 pF	-	4.8 pA/√Hz	-
Total Input RMS Noise[a]	DC to 60 MHz	-	50 nA	-
Output DC Bias	50 Ω Load	-0.15 VDC	0 VDC	1.5 VDC
Output Range	50 Ω Load	-1.5 V	-	1.5 V
Output Impedance	DC to 60 MHz	-	50 Ω	-
Output Return Loss	DC to 60 MHz	15 dB	-	-
Output Slew Rate		-	625 V/µs	-
DC Offset Voltage Drift	Average, @ Output	-	±103 µV/°C	-
Power Input Voltage		9 V	12 V	15 V
Power Input Current			65 mA	100 mA
Operating Temperature		5 °C	-	55 °C
Storage Temperature		-40 °C	-	55 °C

a) Bandwidth and equivalent input current noise are typical values, which depend on the source capacitance. Keep the source capacitance as low as possible by using short cables at the input to achieve best possible bandwidth and noise performance.

b) Positive Gain; current is considered positive flowing into the amplifier input, and produces a resulting positive output voltage.

c) A significant chance of damaging the amplifier exists if operating above this specification.

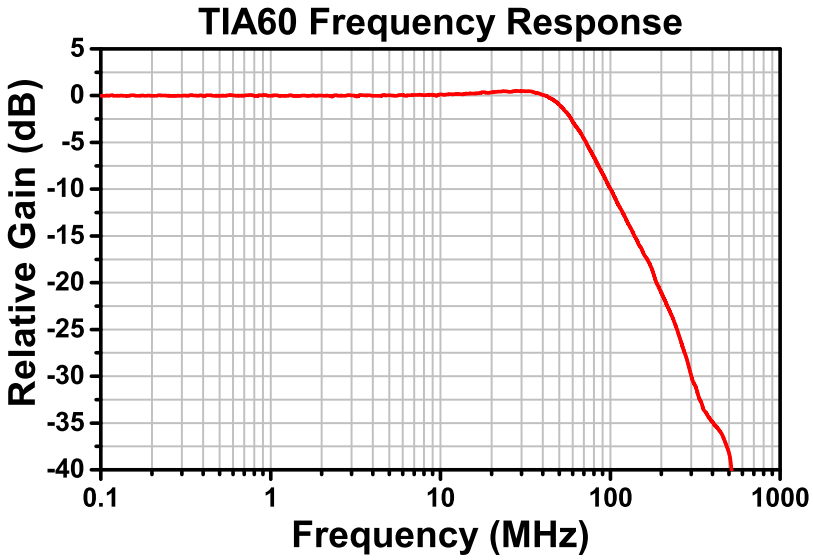
Electrical Schematic

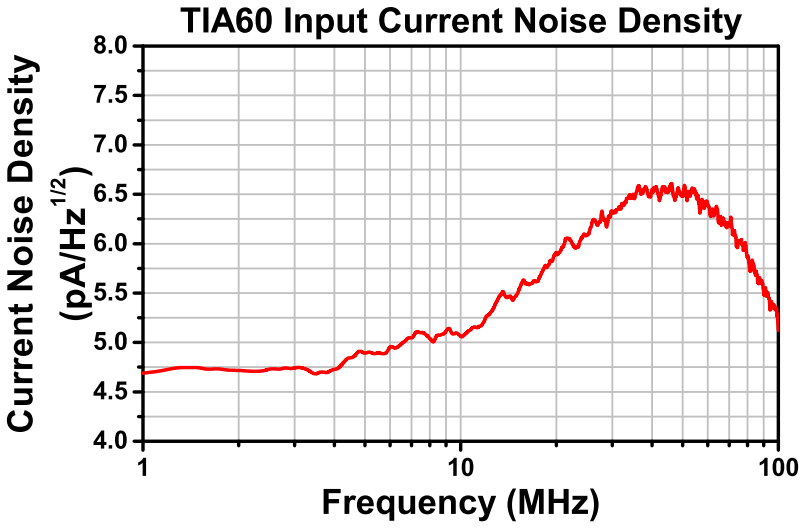


The above is an electrical schematic of an amplified PMT system. The schematic of the TIA60 is represented inside the dashed box.

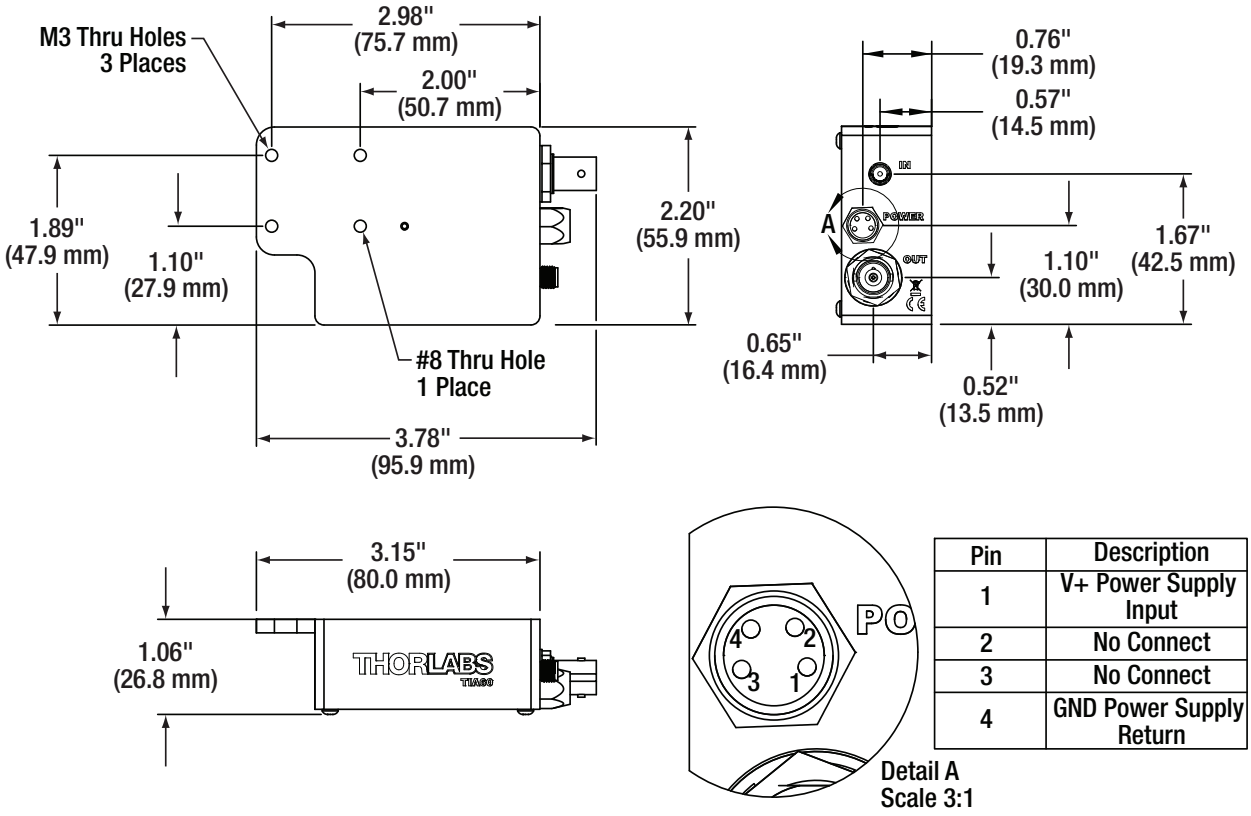
Performance Plots

$T_{ambient}$ = 25 °C, V_{Source} = +15 VDC (KPS101). Total C_{in} = 4 pF + the capacitance from a 4" RG-174 coaxial cable. Output Coaxial Cable: 12" - RG223 with a 50 Ω Load.





Drawings



Pin	Description
1	V+ Power Supply Input
2	No Connect
3	No Connect
4	GND Power Supply Return

The above is a simplified mechanical drawing for the TIA60. Access to the #8 thru hole and one of the M3 thru holes requires the removal of the top plate of the amplifier. This can be accomplished by removing the two screws which secure the lid to the body with a 1.5 mm hex wrench.