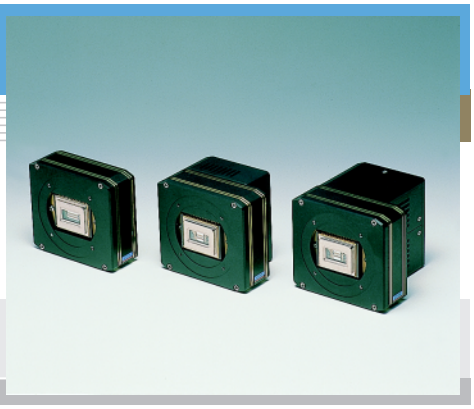
InGaAs multichannel detector head
C7221, C7251, C7369



Designed for InGaAs linear image sensor

C7221, C7251 and C7369 are high sensitivity multichannel detector heads for use with InGaAs linear image sensors. C7251 is designed for the non-cooled InGaAs linear image sensors (G7230 series), while C7221 and C7369 for the thermoelectrically cooled InGaAs linear image sensors (G7231/G7233 series) for detection at even lower light levels. All the devices incorporate a low-noise driver/amplifier circuit that provide reliable operation from simple external signals. C7221 and C7369 also include highly stable temperature controllers that cool the sensor to a preset temperature level (Ts= -10 ˚C) as soon as the power is turned on. If the cooler fails and causes internal circuitry to overheat, the built-in protection circuit automatically turns off the power to the thermoelectric cooler.
Despite its compact size, the housing configuration is designed for good heat dissipation, and threaded mounting holes on the front panel allow connections to other devices such as monochrometers.
The table below shows InGaAs linear image sensors for C7221, C7251 and C7369. They do not come with a InGaAs linear image sensor, so select the desired sensor and order it separately.

Features

- Designed for InGaAs linear image sensor
  C7221, C7369: TE-cooled type
  C7251: non-cooled type
- Built-in driver/amplifier and temperature circuits
- Highly stable temperature controller (C7221, C7369)
  Cooling temperature (Ta=10 to 30 ˚C):
  fixed at -10 ± 0.1 ˚C (C7221), -25 ± 0.1 ˚C (C7369)
- Simple signal input operation
- Compact configuration

Applications

- Near infrared multichannel spectroscopy
- Radiation thermometry
- Non-destructive inspection
- Optical fiber transmittance measurement

■ Selection guide

Type No.	InGaAs linear image sensor			
	Type No.	Number of pixels	Pixel size [µm (H) × µm (V)]	Active area [mm (H) × mm (V)]
C7221	G7231-128	128	50 × 200	6.4 × 0.2
	G7231-256	256		12.8 × 0.2
C7251	G7230-128	128		6.4 × 0.2
	G7230-256	256		12.8 × 0.2
C7369	G7233-128	128		6.4 × 0.2
	G7233-256	256		12.8 × 0.2

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■ Absolute maximum ratings

Parameter		Symbol	Min.	Typ.	Max.	Unit
Supply voltage (for digital circuitry)		$+V_{D1/2}$ *1	-0.5	-	+7	V
Supply voltage (for analog circuitry)		$\pm V_A$	-	-	±18	V
Supply voltage *2		+Vp	-	-	+7	V
		$+V_F$	-	-	+14	V
Digital input voltage		-	-	-	$V_{D1/2}$ *1	V
Operating temperature	C7221, C7369	Topr	+10	-	+30	°C
	C7251		0	-	+50	°C
Storage temperature	C7221, C7369	Tstg	0	-	+50	°C
	C7251		0	-	+50	°C

■ Electrical characteristics

(Ta=25 °C, V_{D1}=+5 V, V_A=±15 V , V_{D2}=+5 V (C7221, C7251)/+6 V (C7369), Vp=+5 V (C7221, C7251)/+6 V (C7369), V_F=+12 V, unless otherwise noted)

Parameter			Symbol	Min.	Typ.	Max.	Unit
Digital input	High level		V_{IH}	+2.0	-	$+V_{D1/2}$ *1	V
	Low level		V_{IL}	-0.5	-	+0.8	V
CLK frequency			f_{CLK}	-	-	2	MHz
Data video readout frequency			fv	-	-	$f_{CLK}/4$	Hz
Start pulse width			tst	$1/f_{CLK}$	-	-	s
Digital output	High level (Io= -6 mA)		V_{IH}	+2.0	-	-	V
	Low level (Io=+6 mA)		V_{IL}	-	-	+0.8	V
Power supply conditions							
Voltage	Digital circuitry		$+V_D$	+4.75	+5.0	+5.25	V
	Analog circuitry		$\pm V_A$	±14.5	±15.0	±15.5	V
	Other *2	C7221, C7251	$+V_{D2}$	+4.75	+5.0	+5.25	V
		C7369		+5.75	+6.0	+6.25	V
		C7221, C7251	+Vp	+4.75	+5.0	+5.25	V
		C7369		+5.75	+6.0	+6.25	V
			$+V_F$	+11.75	+12.0	+12.75	V
Current	$+V_{D1}$ (+5 VDC)		-	-	-	+100	mA
	$+V_A$ (+15 VDC)		-	-	-	+100	mA
	$-V_A$ (-15 VDC)		-	-	-	-100	mA
	$+V_{D2}$ *2 C7221: +5 VDC C7369: +6 VDC		-	-	-	+20	mA
	+Vp *2	C7221: +5 VDC	-	-	+1.5	+1.7	A
		C7369: +6 VDC	-	-	+2.0	+3.0	A
	$+V_F$ (+12 VDC) *2		-	-	+100	-	mA

■ Electrical and optical characteristics

(Ta=25 °C, Ts= -10 °C (C7221)/-25 °C (C7369), V_{D1}=+5 V, ±V_A=±15 V, V_{D2}=+5 V (C7221, C7251)/+6 V (C7369), Vp=+5 V (C7221, C7251)/+6 V (C7369), V_F=+12 V)

Parameter		Symbol	Min.	Typ.	Max.	Unit
Spectral response range	C7221, C7251	λ	-	0.9 to 1.7	-	µm
	C7369		-	1.2 to 2.6	-	µm
Peak sensitivity wavelength	C7221, C7251	λp	-	1.55	-	µm
	C7369		-	2.3	-	µm
Saturation output charge		Qsat	-	10	-	pC
Conversion gain *3		G	-	1	-	V/pC
Dark current	C7221, C7251	I_D	-	0.1	4	pA/pixel
	C7369		-	3,000	12,000	pA/pixel
Photo response non-uniformity *4	C7221, C7251	PRNU	-	-	±5	%
	C7369		-	-	±10	%

*1: C7251 ($+V_{D1}$ only)
*2: C7221, C7369
*3: Including the circuit gain.
*4: Measured at 50 % of the saturated output charge. Except for the start pixel and the last pixel.

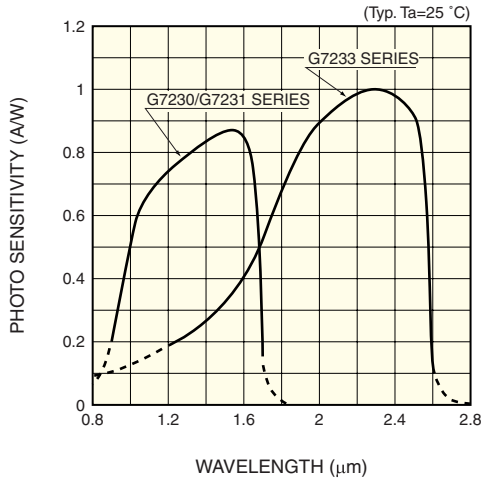
■ Specifications for temperature controller (only for C7221, C7369)

(Ta=25 °C, V_{D1}=+5 V, ±V_A=±15 V, V_{D2}=+5 V (C7221)/+6 V (C7369), Vp=+5 V (C7221)/+6 V (C7369), V_F=+12 V)

Parameter *5		Symbol	Min.	Typ.	Max.	Unit
Cooling temperature	C7221	Ts	-11	-10	-9	°C
	C7369		-26	-25	-24	°C
Temperature control range		ΔTs	-0.1	-	+0.1	°C
Power dissipation of Peltier element	C7221	Pp	-	-	4	W
	C7369		-	-	13	W
Cool down time to preset temperature		to	-	-	5	min.
Setting temperature for overheat protection		To	-	+45	-	°C

*5: Other functions include error display, automatic power off, and detection of electrical opens and shorts by the thermosensor.

■ Spectral response (G7230/G7231/G7233 series)



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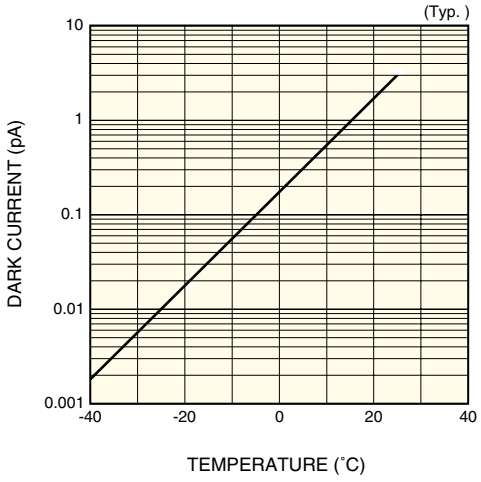
■ Temperature characteristic for dark current



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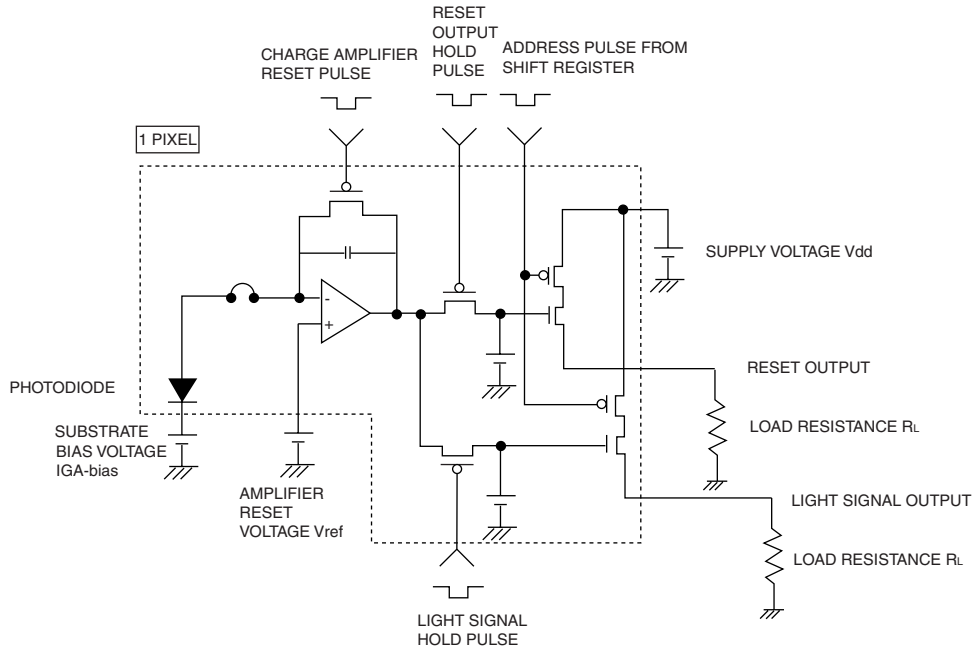
■ Equivalent circuit (G7230/G7231/G7233 series)



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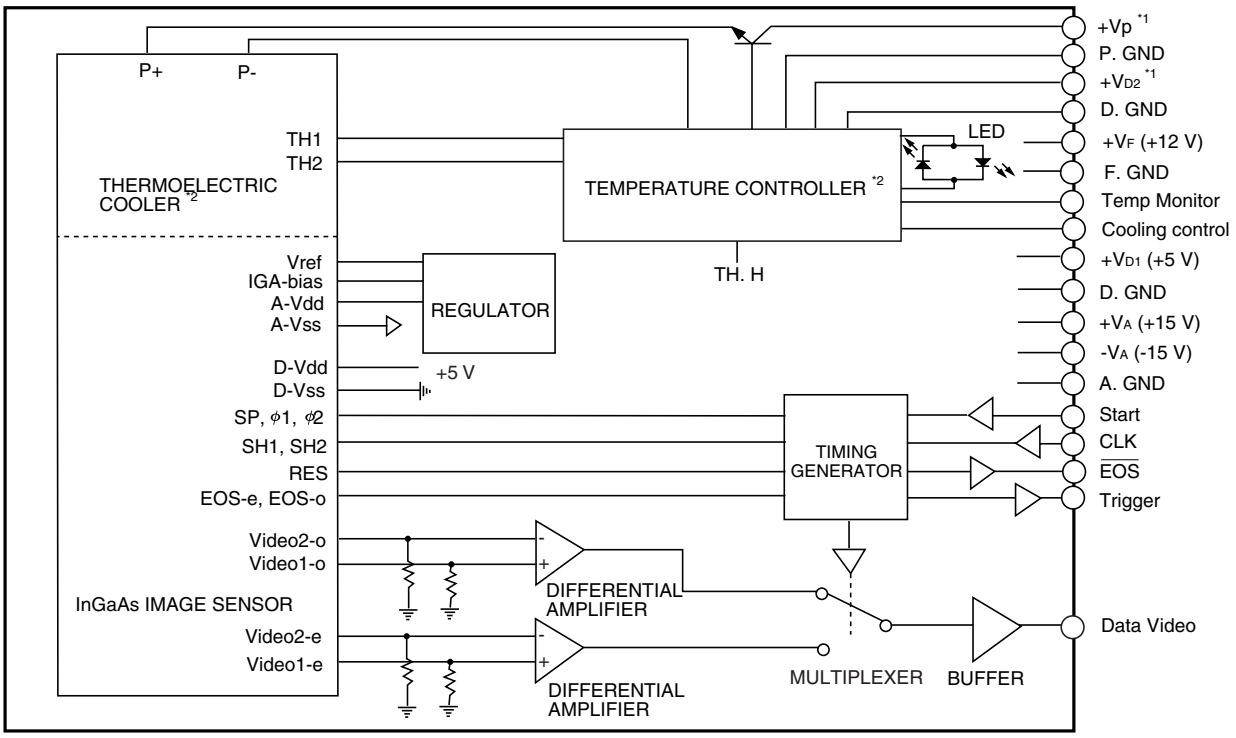
■ Block diagram (C7221, C7369)



*1: +5 V (C7221), +6 V (C7369)
*2: C7251 does not include the temperature controller and thermoelectric cooler.

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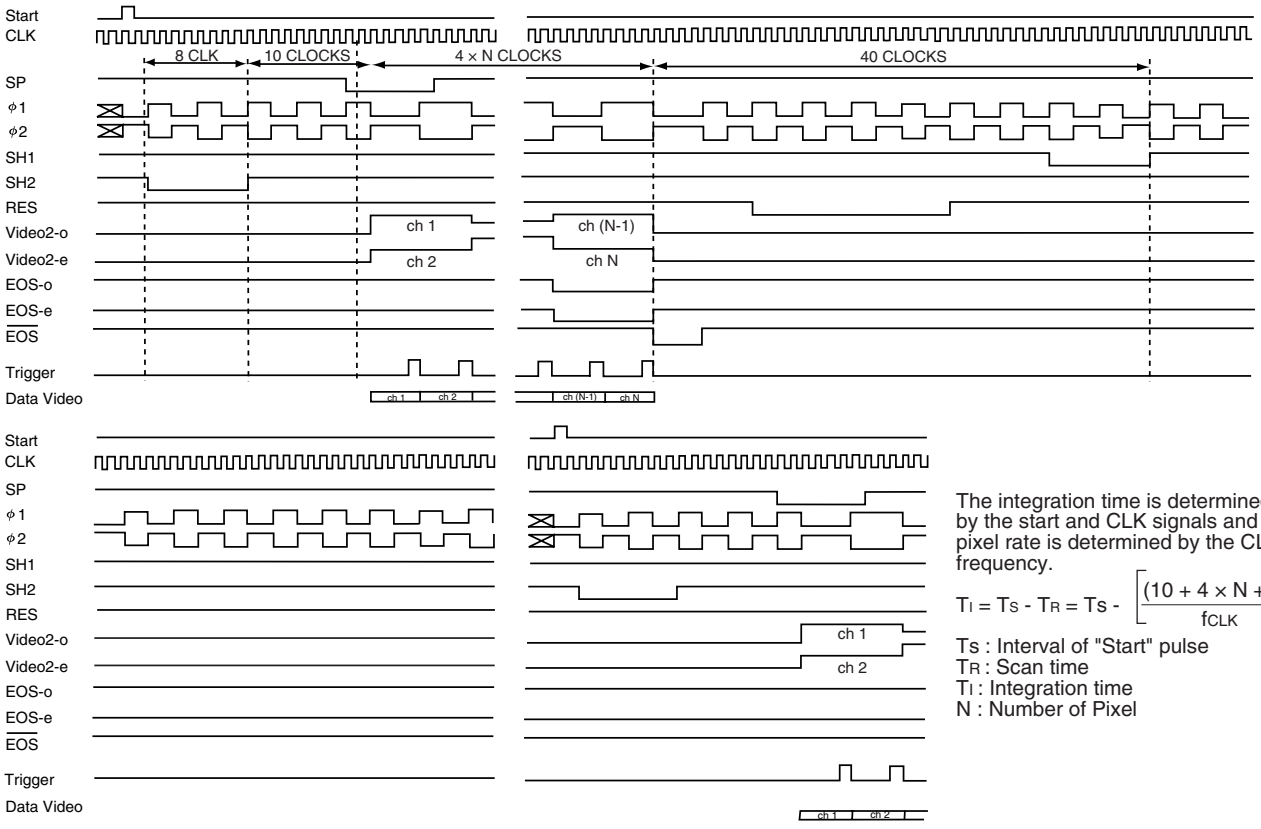
■ Timing chart



The integration time is determined by the start and CLK signals and the pixel rate is determined by the CLK frequency.

$$T_I = T_S - T_R = T_S - \left[\frac{(10 + 4 \times N + 40)}{f_{CLK}}\right]$$

Ts : Interval of "Start" pulse
TR : Scan time
TI : Integration time
N : Number of Pixel

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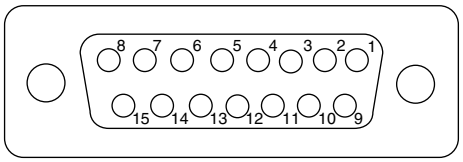
■ Pin assignment of "SIGNAL I/O" connector
15-pin D-sub connector



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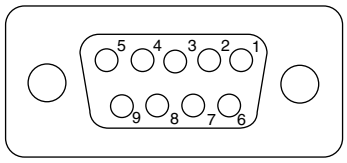
Pin No.	Terminal name	Description
1	NC	No connection
2	Data video	Analog video output. Positive polarity.
3	+V_A (+15 V)	Analog power supply
4	-V_A (-15 V)	Analog power supply
5	+V_{D1} (+5 V)	Digital power supply
6	Start	Digital input signal for initializing the circuit. HCMOS compatible. Positive logic. The interval of the start pulses determine the integration time of InGaAs image sensor.
7	CLK	Digital input signal to specify the circuit operation. HCMOS compatible. Operates at the rising edge.
8	$\overline{EOS}$	Digital output signal to indicate the end of scan of the InGaAs image sensor. HCMOS compatible. Negative logic.
9	A. GND	Analog ground
10	A. GND	Analog ground
11	NC	No connection
12	D. GND	Digital ground
13	D. GND	Digital ground
14	D. GND	Digital ground
15	Trigger	Digital output signal for A/D conversion. HCMOS compatible. Positive polarity.

■ Pin assignment of "TE CONTROL I/O" connector (C7221, C7369)
9-pin D-sub connector



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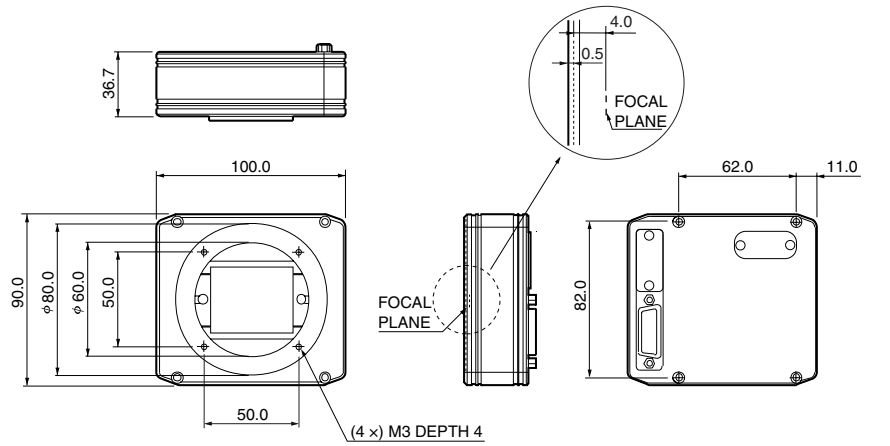
Pin No.	Terminal name	Description
1	+V_{D2} *	Power supply for temperature controller
2	Temp monitor	Analog output signal of the temperature of the InGaAs image sensor
3	Cooling control	Digital input signal for starting to cool down. HCMOS compatible. High level or left open: cooling Low level: stand-by
4	+Vp *	Power supply for the thermoelectric cooler mounted in the InGaAs image sensor (Please use AWG 18 wire)
5	+V_F (+12 V)	Power supply for cooling fan
6	D. GND	Ground
7	D. GND	Ground
8	P. GND	Power supply return for the thermoelectric cooler mounted in the InGaAs image sensor (Please use AWG 18 wire)
9	F. GND	Ground return for cooling fan

* C7221: +5 V, C7369: +6 V
Available for using same power supply (C7221: +5 V, C7369: +6 V) for "+V_{D2}" and "+Vp".
Caution: Do not connect "V_{D2}" and "Vp" together on the backside of the 9-pin D-sub connector.
These may be connected (shorted) at the power supply end, not 9-pin D-sub connector.

■ Dimensional outlines (unit: mm)

C7251



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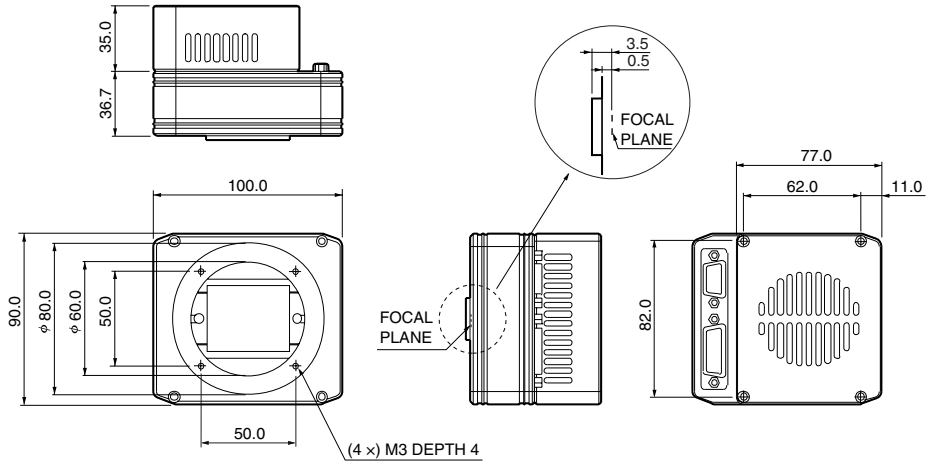
C7221



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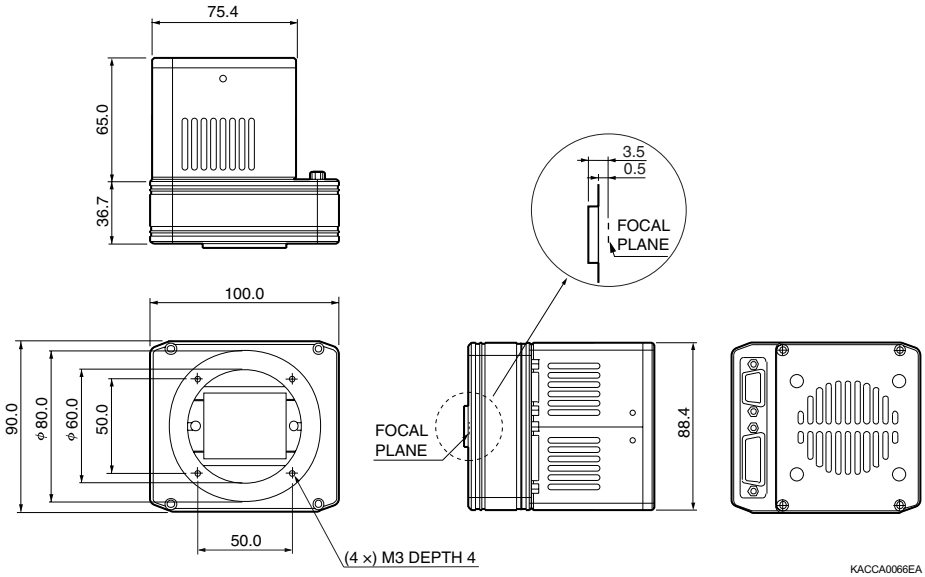
C7369



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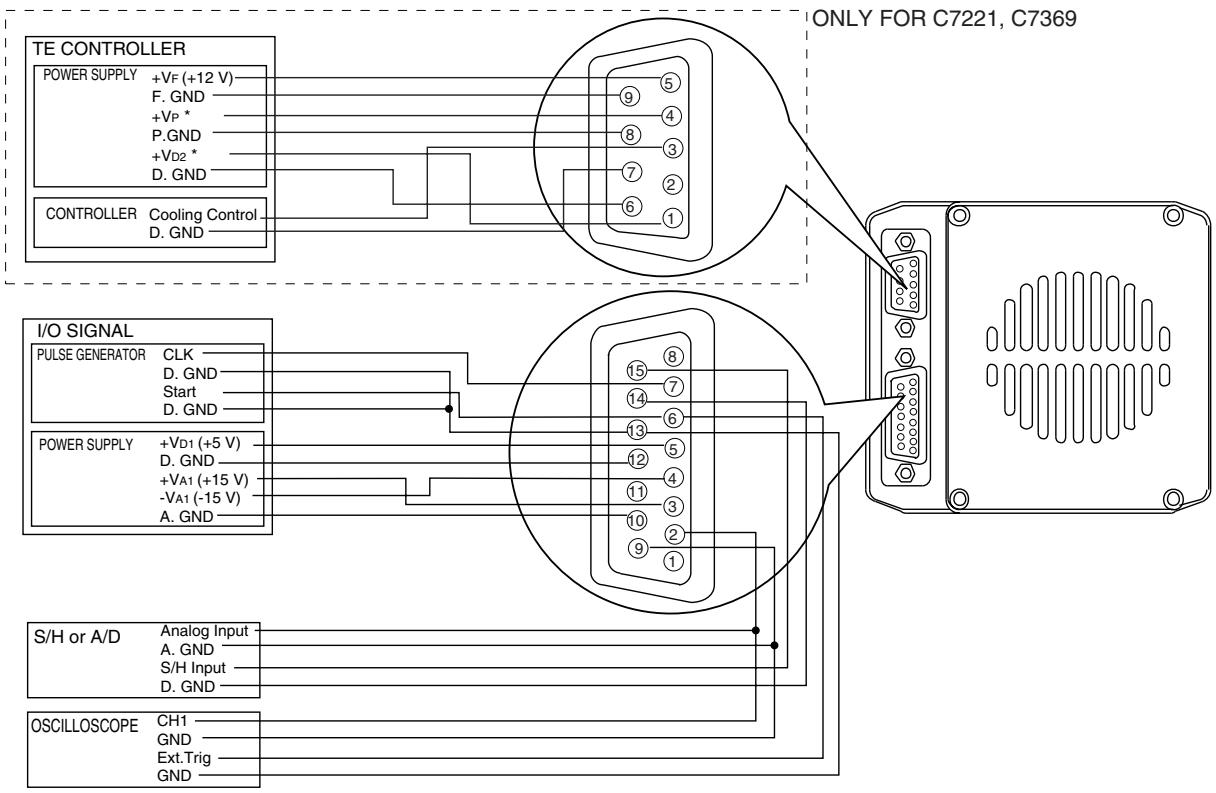
■ Connection example



* C7221: +5 V, C7369: +6 V

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